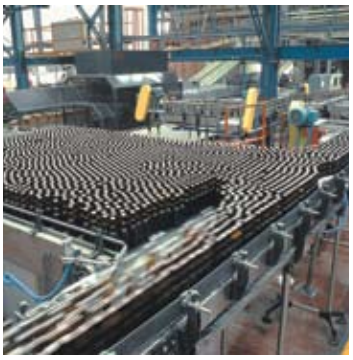
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aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding





Pneumatic Actuator Products

Cylinders, Guided Cylinders and Rotary Actuators

Catalog 0900P-5



Parker

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Warning, Offer of Sale

⚠ WARNING

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Application Engineering Data		A Engineering Data
Tie Rod Cylinders	***3MA/4MA Series, 3MAJ/4MAJ Series, 4MNR Series, ACVB Option, LPSO Option, S Series, C Series***	B Tie Rod Cylinders
ISO Cylinders	***P1D Series, P1A Series***	C ISO Cylinders
Round Body Cylinders	***SR Series, SRM Series, SRD/SRDM Series, SRX Series, P1L Series, P Series***	D Round Body Cylinders
Compact Cylinders	***P1M Series, P1M Series with Tooling Plate, P1M Series Swing Clamp, LP/LPM Series, C05 Series, P1G Series***	E Compact Cylinders
Guided Cylinders	***P5T Series, P5T2 Series, P5L Series, HB Series, P5E Series***	F Guided Cylinders
Rodless Cylinders	***OSP-P, P1X Series, P1Z Series, RC Series, GDL***	G Rodless Cylinders
Rotary Actuators	***PV Series, PRN(A) Series, WR Series, PTR Series, B671/F672 Series, HP Series, P5W Series***	H Rotary Actuators
Pneumatic Grippers	***For Complete Information, Refer to Catalog 1900-2***	J Pneumatic Grippers
Air Motors	***P1V-S Series*** ***For Complete Information, Refer to Catalog PDE2554TCUK-ul***	K Air Motors
Complementary Products	***Linear Alignment Couplers, Flow Controls, 4TK Air Oil Tanks, PRL Series, Transition Kits***	L Complementary Products
Electronic Sensors	***Solid State, Reed and Proximity Sensors***	M Electronic Sensors
Industrial Shock Absorbers	***Industrial Shock Absorbers (Linear Decelerators)***	N Industrial Shock Absorbers
Fax Forms, Safety Guide, Offer of Sale	***Application FAX Forms***	P Fax Forms, Safety Guide, Offer of Sale

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3MA/4MA NFPA Cylinders

- Lightweight Aluminum - Durable Construction
- 9 Bore Sizes: 1-1/8" through 8"
- Mounting Styles:
  - 3MA - 18 standard
  - 4MA - 20 standard
- 3MA Series: General Purpose Cylinder.
- 4MA Series: All Purpose Cylinder with Many Options.



3MAJ / 4MAJ Series

- Cylinder with Manual Override Rod Lock
- 8 Bore sizes: 1-1/2" through 8"
- Mounting styles: 17 standard
- Bolt-On Modularity



4MNR Series

- Multiple Piston Rods, Non-rotating Cylinder
- 6 Bore sizes: 1-1/8" through 4"
- Mounting styles: 14 standard
- Steel Tool Plate Included



ACVB Option

- Cylinder with Directional Valve Combination
- 6 Bore Sizes: 1-1/2" through 5"
- Two Different Manifold Sizes & Three Different Valve Sizes
- Utilizes 3MA and 4MA Series Cylinders with B-Series Valves



LPSO Option

- Cylinder with Linear Position Sensor Option
- 7 Bore Sizes: 2" through 8"
- Mounting Styles: 16 Standard
- Continuous Analog Position Feedback

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P1D Series
ISO Pneumatic Cylinders

- 32-125mm bore sizes available
- Four versions
  - Standard (die cast end caps, composite piston)
  - Removable Gland
  - Clean (positive geometry/hygenic design)
  - Tie Rod (traditional tube and tie rod)
- Conforms to the ISO6431/VDMA24562 standards
- Rod locking device available



P1A Series
Mini-ISO Cylinders

- 10, 12, 16, 20 and 25mm bore sizes
- Stroke lengths from 20 - 500mm
- Conforms to ISO 6432 dimensional specifications
- Single and double acting versions available



P1L Series
High-Performance
Repairable Cylinders

- 8 Bore sizes: 20mm through 100mm
- Stroke lengths to 1,000mm
- 9 Mounting styles
- Metric, Aluminum, Threaded Body Design



SR/SRM/SRD/SRDM/SRX Series
Non-Repairable Cylinders

- 304 Stainless Steel Body
- 12 Bore Sizes: 5/16" through 3"
- 28 standard mounting styles
- Piston position sensing available
- Delrin® end caps available
- Continuous position feedback capability

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P1M Series
Extra Low Profile Cylinders

- 10 Bore Sizes: 12mm through 100mm
- Three versions
  - Standard Cylinder
  - Tool Plate (12mm through 50mm bores)
  - Swing Clamp (32, 40 and 50mm bores)
- Flexible Porting
- Piston Position Sensing Available



LP/LPM Series

- Non-lube compact air cylinder
- Low profile design
- 8 Bore sizes: 9/16" through 4"
- Stroke lengths from 1/8" to 6"
- Piston Position Sensing Available



C05 Series
Short Stroke Cylinders

- 8, 12, 20, 32, 50 and 63mm bore sizes
- Strokes up to 25 mm
- Single and double acting versions
- Ideal for clamping or locking in confined areas



P1G Series
Cartridge Cylinders

- 6, 10 and 15mm bore sizes
- Stroke lengths up to 15mm
- Nickel plated body and stainless steel piston
- Threaded body provides space savings

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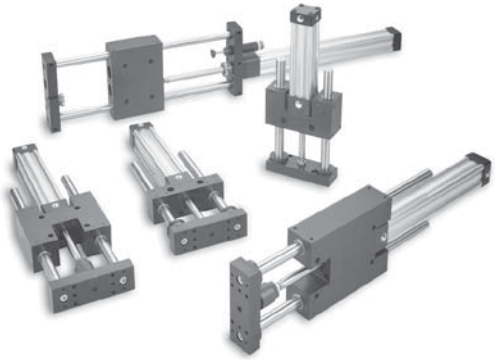
P5T Series Thrusters

- Heavy duty short stroke applications
- Compact housing with integral cylinder
- 9 Bore sizes: 16mm through 100mm
- Strokes to 200mm depending on model
- Force output at 75 psi: 23.6 to 913 lb



P5L Series Guided Cylinders

- Thrust, reach and base styles
- 8 Bore Sizes: 20mm through 100mm
- Stroke lengths in excess of 1500 mm
- Shocks, Bumpers, Cushions Available
- Loads in excess of 9000 N (2025 lb)
- Powered by P1L Cylinders



HB Series Guided Cylinders

- Medium duty to extremely heavy duty service
- Compact, Thrust, Reach and Base Versions
- Bore Sizes: 40, 50 and 63mm ISO
  1.5", 2" and 2.5" NFPA
- Force output at 80 psi: 117 to 368 lb
- Powered by 12 standard cylinder types

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Parker-Origa System Plus OSP-P Rodless Cylinders

- Bore Sizes: 10mm through 80mm
- Stroke length up to 6m
- Magnetic piston sensing and transfer porting available
- Various guidance systems available

The Parker-Origa System Plus is a totally modular concept which offers the choice of guidance and control modules to suit the exact needs of individual applications. The actuators at the core of the system all have a common extruded profile, with double dovetail mounting rails on three sides, which are the principle building blocks of the system to which all modular options are directly attached.



P1X Series Rodless Cylinders

- Bore Sizes: 16mm through 63mm
- Stroke length up to 5m
- Magnetic piston sensing and transfer porting standard

The P1X Series Compact Rodless Cylinders feature a high load carrying capability coupled with an oval piston design to provide a band-style rodless cylinder that meets today's aggressive performance requirements. In addition to its space saving features, the P1X Series incorporates a variety of options so that it can be applied to the widest variety of applications.



P1Z Series Rodless Cylinders

- 16, 20 and 32mm bore sizes
- Basic and guided versions

The P1Z Series Magnetically Coupled Rodless Cylinders feature a magnetic piston and carriage that allow rodless cylinder design with no external leakage. The P1Z Series cylinders are available in two versions, the basic version in which the load must be externally guided and a guided version that has the guides built in.

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PV Series
Vane Rotary Actuators

- 8 model sizes
- Single and Double vanes available
- 2 Standard rotations with stroke adjusters available
- 8 to 1800 lb-in torque at 100 psi
- Low temperature versions available



PRNA Series
Vane Rotary Actuators

- 5 miniature and 4 standard models
- Rotation angles 90°, 100°, 270° and 280°
- Oscillating reference points of 40°, 45° and 90°
- 1.33 to 2355 lb-in torque at 100 psi



PTR Series
Rack and Pinion Rotary Actuators

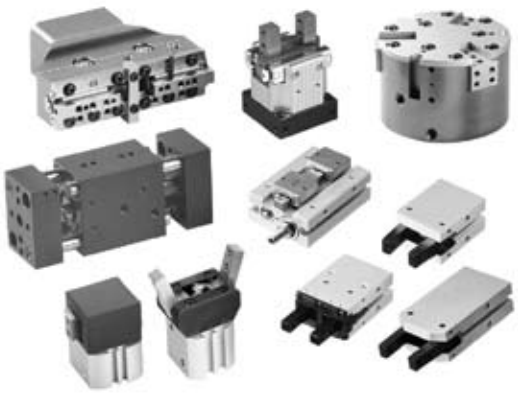
- 5 Bore sizes: 1" through 3-1/4"
- 5 Standard rotations
- Single and Double Rack Versions in all bore sizes
- 39 to 2250 lb-in torque at 100 psi
- Air/Oil, 3-Position and Antibacklash units available



HP Series
Heavy Duty Rotary Actuators

- 2 Large bore sizes: 6" and 8"
- 3 Standard rotations
- Robust construction
- 4,500 and 10,000 lb-in torque at 100 psi
- End of stroke cushions and stroke adjusters available

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Pneumatic Grippers

- Parallel, Angular and 3-Jaw models available
- Grip Forces: up to 3000 lbs
- Single acting, double acting, spring assist and spring return

Grippers are available in either true parallel with strokes ranging from 0.12 to 6 inches or angular with 30° or 180° degree gripping configurations in sizes from miniature to heavy duty.

Gripper options include spring assist or spring return grippers which provide a fail-safe mode in the event of a power failure. Reed or Hall Effect switches or proximity sensors are also available with many series.



Industrial Shock Absorbers

- Industry interchangeable
- Miniature, small, medium and large bore sizes
- Metric and inch mounting threads available
- Highest effective weight ratings

Parker industrial shock absorbers decrease machine down time, and increase productivity by reducing impact damage.



P1V-S Series Air Motors

- Stainless steel external components
- Seven different sizes
- Power range from 20 to 1,200 watts
- Speeds from 5 to 24,000 rpm
- Sealed design for use in food grade applications

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A

The Parker 5-Year Extended Warranty

Parker Hannifin Corporation will extend its warranty on all pneumatic components to sixty (60) months providing they are correctly installed and protected by Parker pneumatic filters which are properly maintained. Components covered by this warranty include all cylinders, valves and pneumatic automation components manufactured by Parker in any of our global facilities. This warranty covers our components anywhere in the world you may ship your equipment.

Parker's obligation under this warranty is limited to the replacement or repair of any failed components. The buyer understands that the seller will not be liable for any other costs or damages.

The buyers of quality Parker components and filters benefit by having ONE source for all pneumatic needs - **Parker.**



R. Sherrard

Roger Sherrard
President
Automation Group

Parker

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Notes

A

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Catalog Section	Cylinder Series	Bore Size																												
			5/16"		7/16"	9/16"	3/4"	7/8"	1"	1-1/16"	1-1/8"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"	3-1/4"	3-5/8"	4"	4-1/2"	5"	6"	7"	8"	10"	12"	14"
		6mm	8mm	10mm	12mm	16mm	20mm		25mm			32mm	40mm		50mm	63mm		80mm		100mm		125mm	160mm		200mm			
B – Tie Rod	3MA										◆		◆		◆	◆		◆		◆		◆						
	4MA												◆		◆	◆		◆		◆		◆	◆		◆			
	3MAJ												◆		◆	◆		◆		◆		◆						
	4MAJ												◆		◆	◆		◆		◆		◆	◆		◆			
	ACVB											◆	◆		◆	◆		◆		◆		◆	S		S			
	S						◆		◆		◆	◆																
	C											◆		◆		◆			◆		◆							
C – ISO	P1D											■	■		■	■		■		■		■	■		■			
	P1A			■	■	■	■		■																			
D – Round Body	SR		◆		◆	◆	◆	◆		◆		◆	◆	◆	◆	◆	◆											
	SRM					◆	◆			◆		◆	◆	◆	◆	◆												
	SRD					◆	◆			◆			◆		◆													
	SRDM					◆	◆			◆			◆		◆													
	SRX									◆			◆		◆	◆	◆											
	P1L						■		■			■	■		■	■		■		■								
	P										◆		◆		◆	◆	◆			◆								
E – Compact	P1M				■	■	■		■			■	■		■	■		■		■								
	P1M Tooling Plate											■	■		■													
	P1M Swing Clamp											■	■		■													
	LP					◆	◆				◆		◆		◆	◆	◆			◆								
	LPM					◆	◆				◆		◆		◆	◆	◆			◆								
	C05				■		■					■			■	■												
	C05S		■		■		■					■			■	■												
	P1G	■		■		■																						
G – Rodless	OSP-P			■		■			■			■	■		■	■		■										
	P1X					■	■		■			■	■		■	■												
	P1Z					■	■					■																
	RC								■			■	■		■	■												
	GDL (Pages 185-199)																											

◆ = Inch Bore Size
■ = Metric Bore Size
● = Standard
❍ = Optional
R = Required
F = Fixed Cushions
E = End of Stroke Only
S = Special, Consult Factory

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Construction	Cylinder Body Material	End Cap Material	# of Mountings	Pressure Range (PSI)	Single Acting	Double Acting	Adjustable Air Cushions	Flexible Porting Option	Piston Sensing Option	Cylinder Series	Catalog Section
NFPA	Aluminum	Aluminum	20	250	N/A	●	❍		●	**3MA**	**B – Tie Rod (Inch)**
NFPA	Aluminum	Aluminum	15	250	S	●	❍		❍	**4MA**	
NFPA	Aluminum	Aluminum	15	100	N/A	●	●		●	**3MAJ**	
NFPA	Aluminum	Aluminum	11	100	S	●	●		❍	**4MAJ**	
NFPA	N/A	N/A	17	145	N/A	N/A	N/A	N/A	N/A	**ACVB**	
N/A	Brass	Steel	5	200	❍	●	F			**S**	
N/A	Aluminum	Aluminum	5	200	❍	●	❍			**C**	
ISO/VDMA	Aluminum	Aluminum	10	145	S	●	❍		●	**P1D**	**C – ISO**
Non-repairable	Stainless Steel	Aluminum	4	145	❍	●	❍		●	**P1A**	
Non-repairable	Stainless Steel	Aluminum	28	250	●	●	❍			**SR**	**D – Round Body**
Non-repairable	Stainless Steel	Aluminum	24	250	●	●	❍		●	**SRM**	
Non-repairable	Stainless Steel	Delrin ®	2	100	S	●				**SRD**	
Non-repairable	Stainless Steel	Delrin ®	2	100	S	●			●	**SRDM**	
Non-repairable	Stainless Steel	Aluminum	3	150		●			●	**SRX**	
Threaded	Aluminum	Aluminum	9	150	S	●	❍		❍	**P1L**	
Snap-Ring	Aluminum	Aluminum	4	150	❍	●	❍		❍	**P**	
Bolted	Aluminum	Aluminum	6	150	❍	●		●	❍	**P1M**	**E – Compact**
Bolted	Aluminum	Aluminum	3	150		●		●	❍	**P1M Tooling Plate**	
Bolted	Aluminum	Aluminum	4	150		●		●	❍	**P1M Swing Clamp**	
Tie Rod	Aluminum	Aluminum	6	250	❍	●				**LP**	
Tie Rod	Aluminum	Aluminum	6	250	❍	●			●	**LPM**	
Block	Aluminum	N/A	1	150		●				**C05**	
Block	Aluminum	N/A	1	150	●					**C05S**	
Cartridge	Nickel Plated Brass	N/A	1	100	●					**P1G**	
Band-Type	Aluminum	Aluminum	11	120			●	●	●	**OSP-P**	**G – Rodless**
Band-Type Rodless	Aluminum	Aluminum	5	100	N/A	●	●	●	●	**P1X**	
Magnetically Coupled Rodless	Aluminum	Aluminum	3	100		●	●	●	●	**P1Z**	
Band-Type Rodless	Aluminum	Aluminum	5	115		●	R	❍	❍	**RC**	
Rails & Cassettes	Aluminum									**GDL (Pages 185-199**	

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Operating Fluids and Temperature Range
Fluidpower cylinders are designed for use with pressurized air, hydraulic oil and fire resistant fluids, in some cases special seals are required.

Standard Seals (class 1)
Class 1 seals are what is normally provided in a cylinder unless otherwise specified. They are intended for use with fluids such as: air, nitrogen, mineral base hydraulic oil or MIL-H-5606 within the temperature range of -10°F (-23°C) to +165°F (+74°C). Generally they are nitrile except for piston rod seals in hydraulic cylinders. However the individual seals may be nitrile (Buna-N) enhanced polyurethane, polymyte, P.T.F.E. or filled P.T.F.E.

Water Base Fluid Seals (class 2)
Generally class 2 seals are intended for use with water base fluids within the temperature of -10°F (-23°C) to +165°F (+74°C) except for High Water Content Fluids (H.W.C.F.) in which case Class 6 seals should be used. Typical water base fluids are: Water, Water-Glycol, Water-in Emulsion, Houghto-Safe 27, 620, 5040, Mobil Pyrogard D, Shell Irus 905, Ucon Hydrolube J-4. These seals are nitrile. Lipseal will have polymyte or P.T.F.E. back-up washer when required. O-rings will have nitrile back-up washers when required.

Ethylene Propylene (E.P.R.) Seals (class 3)
Class 3 seals are intended for use with some Phosphate Ester Fluids between the temperatures of -10°F (-23°C) to +130°F (+54°C). Typical fluids compatible with E.P.R. seals are Skydrol 500 and 700. E.P.R. are Ethylene Propylene. Lipseals will have a P.T.F.E. back-up washer when required. O-rings will have EPR back-up washers when required. Note: E.P.R. seals are not compatible with mineral base hydraulic oil or greases. Even limited exposure to these fluids will cause severe swelling. P.T.F.E. back-up washer may not be suitable when used in a radiation environment.

Low Temperature Nitrile Seals (class 4)
Class 4 seals are intended for low temperature service with the same type of fluids as used with Class 1 seals within the temperature range of -50°F (-46°C) to +150°F (+66°C). Lipseals will have leather, polymyte or P.T.F.E. back-up washers when required. O-rings will have nitrile back-up washers when required.

Fluorocarbon Seals (class 5)
Class 5 seals are intended for elevated temperature service or for some Phosphate Ester Fluids such as Houghto-Safe 1010, 1055, 1120; Fyrquel 150, 220, 300, 350; Mobile Pyrogard 42, 43, 53, and 55. Note: In addition, class 5 seals can be used with fluids listed below under standard service. However, they are not compatible with Phosphate Ester Fluids such as Skydrols. Class 5 seals can operate with a temperature range of -10°F (-23°C) to +250°F (+121°C). Class 5 seals may be operated to +400°F (+204°C) with limited service life, but please consult the Actuator Division for possible cylinder material changes. For temperatures above +250°F (+120°C) the cylinder must be manufactured with non-studded piston rod and thread and a pinned piston to rod connection. Class 5 Lipseals will have P.T.F.E. back-up washers when required. O-rings will have fluorocarbon back-up when required.

Warning ⚠
The piston rod stud and the piston rod to piston threaded connections are secured with an anaerobic adhesive which is temperature sensitive. Cylinders specified with Class 5 seals are assembled with anaerobic adhesive having a maximum temperature rating of +250°F (+74°C). Cylinders specified with all other seal compounds are assembled with anaerobic adhesive having a maximum operating temperature rating +165°F (+74°C). These temperature limitations are necessary to prevent the possible loosening of the threaded
connections. Cylinders originally manufactured with class 1 seals (Nitrile) that will be exposed to ambient temperatures above +165°F (+74°C) must be modified for higher temperature service. Contact the factory immediately and arrange for the piston to rod and the stud to piston rod connections to be properly re-assembled to withstand the higher temperature service.

Lipseal Pistons
Under most conditions lipseals provide the best all around service for pneumatic applications. Lipseals with a back-up washer are often used for hydraulic applications when virtually zero static leakage is required. Lipseals will function properly in these applications when used in conjunction with moderate hydraulic pressures.

Water Service
For pressures up to 400 PSIG, 4ML series cylinders can be modified to make them more suitable for use with water as the operating medium. Chrome plated 17-4 PH stainless steel piston rod is recommended to inhibit corrosion.

Warranty
Parker Hannifin will warrant cylinders modified for water or high water content fluid service to be free of defects in materials or workmanship, but cannot accept responsibility to premature failure due to excessive wear due to lack of lubricity or where failure is caused by corrosion, electrolysis or mineral deposits within the cylinder.

Non-Lubricated Air Cylinders
Cylinder series rated "Non-Lube" (such as 3MA, 4MA, P1D, P1L, 2AN, etc.) are recommended for non-lubricated air service. These cylinders are originally lubricated at the factory and typically do not require any additional lubrication for most applications. Please note that the use of air-line oil lubricators will wash away the original grease lubricant, so it must be continued until the cylinder is serviced with the appropriate grease lubricant.

Many of the terms and drawings in this Engineering Section (such as mounting styles) utilize 2A, 3MA or 4MA Series cylinders as examples. Although the terms, designs and drawings for other product series may be different, many basic principles apply. Please refer to these individual product sections in this catalog for additional information.

Class No.	Typical Fluids	Temperature Range
1 (Standard) (Nitrile Polyurethane)	Air, Nitrogen, Hydraulic Oil, Mil-H-5606 Oil	-10°F (-23°C) to +165°F (+74°C)
2 Optional Water Base Fluid Seal	Water, Water-Glycol, H.W.C.F. — See Class 6 below. Water-in-Oil Emulsion Houghto-Safe, 271, 620, 5040 Mobil Pyrogard D, Shell Irus 905 Ucon Hydrolube J-4	-10°F (-23°C) to +165°F (+74°C)
3 Special (E.P.R.) (At extra cost) Note: (E.P.R.) seals are not compatible with Hydraulic Oil	Some Phosphate Ester Fluids Skydrol 500, 7000	-10°F (-23°C) to +130°F (+54°C)
4 Special (Nitrile) (At extra cost)	Low Temperature Air or Hydraulic Oil	-50°F (-46°C) to +150°F (+66°C)
5 Optional (At extra cost) (Fluorocarbon Seals) Note: Fluorocarbon seals are not suitable for use with Skydrol fluid, but can be used with hydraulic oil if desired	High Temperature Houghto-Safe 1010, 1055, 1120 Fyrquel 150, 220, 300, 550 Mobil Pyrogard 42,43,53,55	See above paragraph on fluorocarbon seals for recommended temperature range.

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Fundamental Cylinders

Standard Double-Acting Cylinders
Power stroke is in both directions and is used in the majority of applications.

Single-Acting Cylinders
When thrust is needed in only one direction, a single-acting cylinder may be used. The inactive end is vented to atmosphere through a breather/filter for pneumatic applications, or vented to reservoir below the oil level in hydraulic application.

Double-Rod Cylinders
Used when equal displacement is needed on both sides of the piston, or when it is mechanically advantageous to couple a load to each end. The extra end can be used to mount cams for operating limit switches, etc.

Spring Return, Single-Acting Cylinders
Usually limited to very small, short stroke cylinders used for holding and clamping. The length needed to contain the return spring makes them undesirable when a long stroke is needed.

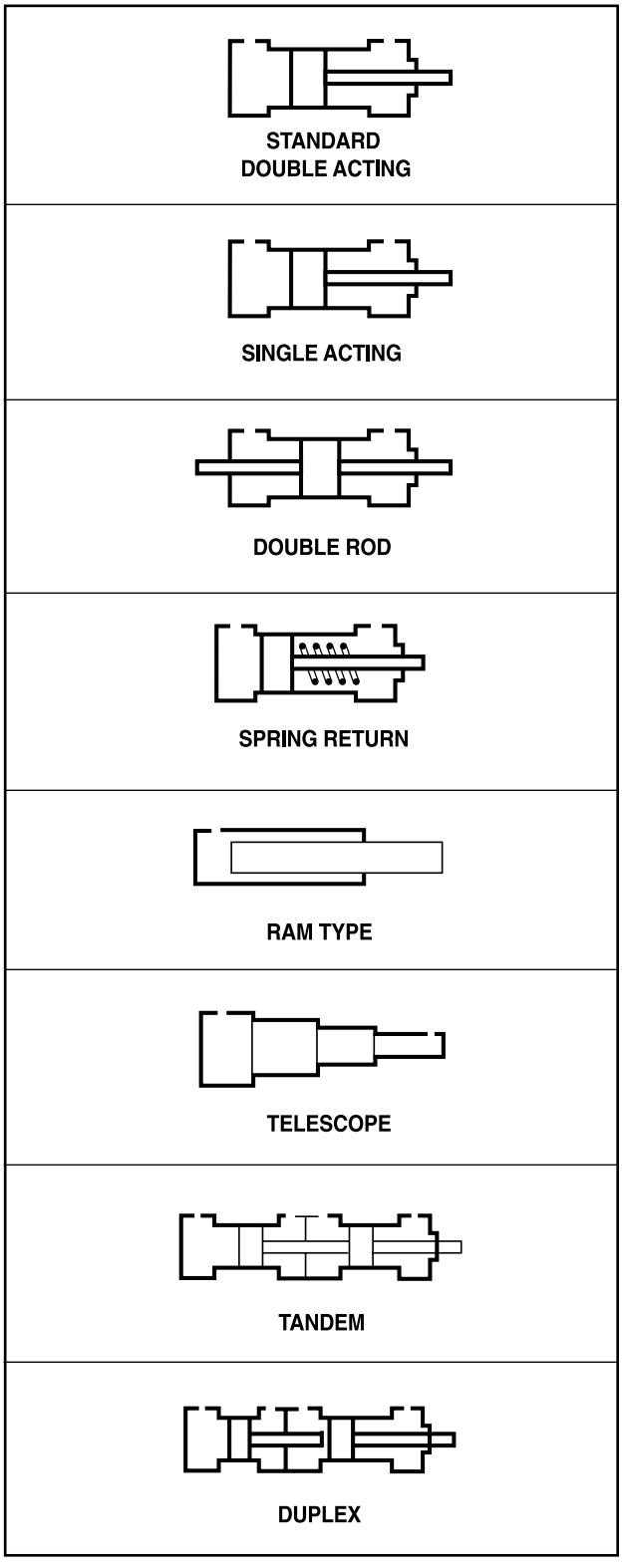
Ram Type, Single-Acting Cylinders
Containing only one fluid chamber, this type of cylinder is usually mounted vertically. The weight of the load retracts the cylinder. They are sometimes know as “displacement cylinders”, and are practical for long strokes.

Telescoping Cylinders
Available with up to 4 or 5 sleeves; collapsed length is shorter than standard cylinders. Available either single or double-acting, they are relatively expensive compared to standard cylinders.

Tandem Cylinders
A tandem cylinder is made up of two cylinders mounted in line with pistons connected by a common piston rod and rod seals installed between the cylinders to permit double acting operation of each. Tandem cylinders allow increased output force when mounting width or height are restricted.

Duplex Cylinders
A duplex cylinder is made up of two cylinders mounted in line with pistons not connected and with rod seals installed between the cylinders to permit double acting operation of each. Cylinders may be mounted with piston rod to piston (as shown) or back to back and are generally used to provide three position operation.

Illustration B29



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A

Calculation of Cylinder Forces – Inch Based Product

Theoretical Push and Pull Forces for Pneumatic Cylinders

Push Force and Displacement

Cylinder Bore Size (inch)	Piston Area (in^2)	Cylinder Push Stroke Force in Pounds at Various Pressures (PSI)						Cu. Ft. Free Air at 80 lbs. Pressure, Required to Move Max. Load 1 Inch	Displacement Per Inch of Stroke (ft^3)
		25	50	65	80	100	250		
1-1/8	0.994	25	50	65	80	99	249	0.00371	0.0005751
1-1/2	1.767	44	88	115	142	177	443	0.00659	0.0010225
2	3.14	79	157	204	251	314	785	0.01171	0.0018171
2-1/2	4.91	123	245	319	393	491	1228	0.01830	0.0028414
3-1/4	8.30	208	415	540	664	830	2075	0.03093	0.0048032
4	12.57	314	628	817	1006	1257	3143	0.04685	0.0072743
5	19.64	491	982	1277	1571	1964	4910	0.07320	0.0113657
6	28.27	707	1414	1838	2262	2827	7068	0.10541	0.0163599
7	38.49	962	1924	2502	3079	3849	9623	0.14347	0.0222743
8	50.27	1257	2513	3268	4022	5027	12568	0.18740	0.0290914

Deductions for Pull Force and Displacement

Piston Rod Dia. (inch)	Piston Rod Area (in^2)	Piston Rod Diameter Force In Pounds At Various Pressures (PSI) To determine Cylinder Pull Force or Displacement, deduct the following Force or Displacement corresponding to Rod Size, from selected Push Stroke Force or Displacement corresponding to Bore Size in table above.						Cu. Ft. Free Air at 80 lbs. Pressure, Required to Move Max. Load 1 Inch	Displacement Per Inch of Stroke (ft^3)
		25	50	65	80	100	250		
3/8	0.110	3	6	7	9	11	28	0.00041	0.0000636
1/2	0.196	5	10	13	16	20	49	0.00073	0.0001134
5/8	0.307	8	15	20	25	31	77	0.00114	0.0001776
1	0.785	20	39	51	65	79	196	0.00293	0.0004542
1-3/8	1.49	37	75	97	119	149	373	0.00554	0.0008622
1-3/4	2.41	60	121	157	193	241	603	0.00897	0.0013946

General Formula

The cylinder output forces are derived from the formula:

$$F = P \times A$$

Where F = Force in pounds.

P = Pressure at the cylinder in pounds per square inch, gauge.

A = Effective area of cylinder piston in square inches.

Free Air refers to normal atmospheric conditions of the air at sea level (14.7 PSI). Use above cu. ft. free air required data to compute CFM required from a compressor at 80 PSI. Cu. ft. of free air required at other pressures can be calculated using formula below.

$$V_1 = \frac{(P_2 + 14.7)\, V_2}{14.7}$$

Where V_1 = Free air consumption per inch of stroke (cubic feet).

V_2 = Cubic feet displaced per inch of stroke.

P_2 = Gauge pressure required to move maximum load.

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Single rod type, fluid power cylinders are commonly available in 20 standard mounting styles ranging from head or cap end mounts to intermediate mounts. Many mounting styles are also available in double rod type cylinders. Refer to NFPA Std. B93.15-1981 or Parker air or hydraulic cylinder catalogs for detailed description.

Standard mounting styles for fluid power cylinders fall into three basic groups. The groups can be described as follows.

Group 1 – Straight line force transfer with fixed mounts which absorb force on cylinder centerline.

Group 3 – Straight line force transfer with fixed mounts which do not absorb force on cylinder centerline.

Group 2 – Pivot force transfer with pivot mounts which absorb force on cylinder centerline and permit cylinder to change alignment in one plane.

Cylinder mounting directly affects the maximum pressure at which the fluid power cylinder can be used, and proper selection of mounting style will have a bearing on cylinder operation and service life. Whether the cylinder is used in thrust or tension, its stroke length, piston rod diameter and the method of connection to load also must be considered when selecting a mounting style.

Many pneumatic cylinders are offered for use with air pressure up to 250 PSI. The industrial tie rod types, known as NFPA cylinders, with square heads and caps, plus mountings lend themselves to standardized mounts which are similar in appearance for air cylinders.

Straight Line Force Transfer (Group 1)

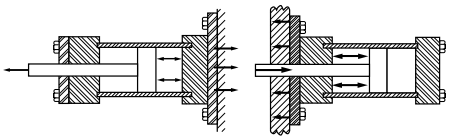
Cylinders with fixed mounts (Group 1) which absorb the force on centerline are considered the best for straight line force transfer. Tie rods extended, flange or centerline lug mounts are symmetrical and allow the thrust or tension forces of the piston rod to be distributed uniformly about the cylinder centerline. Mounting bolts are subjected to simple tension or simple shear without compound forces, and when properly installed damaging cylinder bearing sideloading is kept to a minimum.

Tie Rods Extended are considered to be of the centerline mount type. The cylinder tie rods are designed to withstand maximum rated internal pressure and can be extended and used to mount the cylinder at cap or head end. This often overlooked mounting will securely support the cylinder when bolted to the panel or machine member to which the cylinder is mounted. The torque value for the mounting nuts should be the same as the tie rod nut torque recommended by the cylinder manufacturer. Cylinders are available with tie rod extended both ends. In such applications one end is used for mounting and the opposite end to support the cylinder or to attach other machine components.

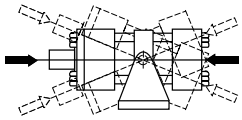
Tie rod mount cylinders may be used to provide thrust or tension forces at full rated pressures.

Tie rods extended head end (Style TB), cap end (Style TC) or extended both ends (Style TD) are readily available and fully dimensioned in Parker cylinder product catalogs.

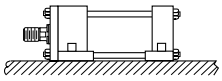
Flange Mount cylinders are also considered to be centerline mount type and thus are among the best mounts for use on straight line force transfer applications. The machine designer has a choice of mounting styles at each end, such as head rectangular flange (Style J), head square flange (Style JB), cap rectangular flange (Style H), and cap square flange (Style HB). Selection of a flange mounting style depends, in part, upon whether the major force applied to the load will result in compression (push) or tension (pull) stresses of the cylinder piston rod. Cap end mounting styles are recommended for thrust loads (push), while head end mounting styles are recommended where the major load puts the piston rod in tension (pull).



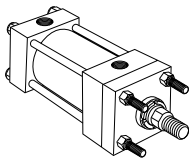
Group 1



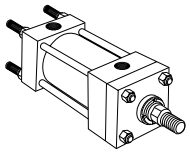
Group 2



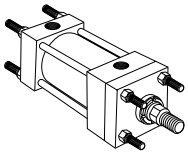
Group 3



Tie rods extended head end, Style TB

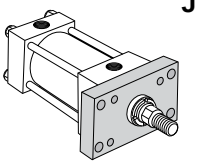


Tie rods extended cap end, Style TC

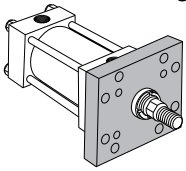


Tie rods extended both ends, Style TD

J



JB



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Catalog 0900P-5
Mounting Information

A

Flange mounts are best used when end face is mounted against the machine support member. (Fig. 1) This is especially true where head rectangular flange type (Style J) is used with major load in tension. In this mode, the flange is not subjected to flexure or bending stresses, nor are the mounting bolts stressed to unusually high levels. The use of head rectangular flange (Style J) mount with major load in compression (see Fig. 2) is not recommended except on reduced pressure systems. The use of Style J mount in compression subjects the flange to bending and the mounting bolts to tension stresses, which could result in early fatigue failure. For applications where push forces require full rated system pressure, head square flange (Style JB) mounts are recommended.

Cap flange mounts are also best used when end face is mounted against the machine support member. The use of cap rectangular flange mount, Style H, is not recommended on applications where the major load is in tension (pull) except at reduced pressure.

For applications where pull forces involved require full rated system pressure, cap square flange, Style HB mounts are recommended.

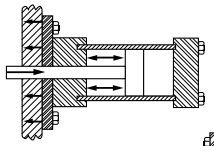
Straight Line Force Transfer (Group 3)

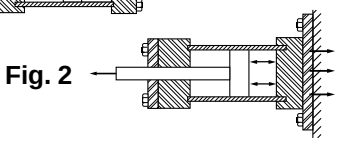
Side Mount cylinders are considered to be fixed mounts which do not absorb force on their centerline. Cylinders of this group have mounting lugs connected to the ends, and one style has side tapped holes for flush mounting. The plane of their mounting surfaces is not through the centerline of the cylinder, and for this reason side mounted cylinders produce a turning moment as the cylinder applies force to the load. (Fig. 4) This turning moment tends to rotate the cylinder about its mounting bolts. If the cylinder is not well secured to the machine member on which it is mounted or the load is not well-guided, this turning moment results in side load applied to rod gland and piston bearings. To avoid this problem, side mount cylinders should be specified with a stroke length at least equal to the bore size.

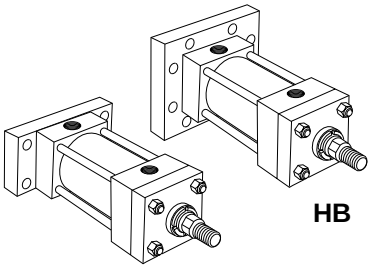
Shorter stroke, large bore cylinders tend to sway on their mountings when subjected to heavy loads, especially side end lug or side and angle mounts. (Fig. 5)

Side mount cylinders are available in several mounting styles, such as side lug (Style C), Side tapped (Style F or TEF), side end lug (Style G) and side end angle (Style CB). Of these, the side lug mount its the most popular and reliable, since the mounting lugs are part of the head and cap (4MA and 2A) or a structural steel bracket (3MA).

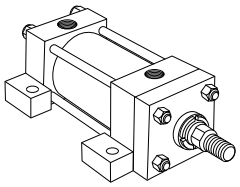
Side tapped mount is the choice when cylinders must be mounted side by side at minimum center-to-center distance. Another narrow side mount style is the side end lug mount which has lugs threaded to the tie rods. Thus the end lugs serve a dual function of holding the cylinder together and act as a means of mounting. This mounting style should be used only on medium- to light-duty applications, because the end lugs are subjected to compound stresses which could result in early failure.


Fig. 1


Fig. 2


HB

H


C

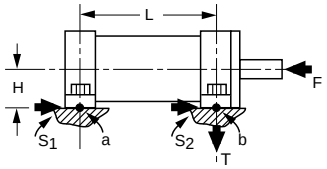
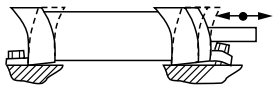
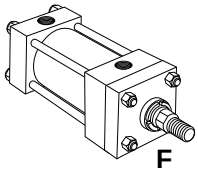
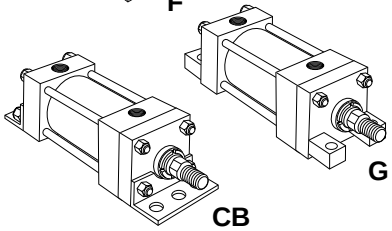


Fig. 4


Fig. 5


F


G

CB

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The side end angle mount is also a narrow mount type, but is the weakest of the side mount styles. Its use should be limited to a maximum pressure of 150 PSI and minimum stroke length of two times the bore size. For pressure rating of longer strokes, consult the cylinder manufacturer.

Consideration should also be given to design of the machine frame used to support cylinders non-centerline mount, since stronger members are often required to resist bending moments. (See Fig. 6)

Side mount cylinders depend wholly on the friction of their mounting surfaces in contact with the machine member to absorb the force produced. Thus the torque applied to the mounting bolts is an important consideration. Since the mounting bolts are the same diameter as the tie rods for a given cylinder, it is recommended that the torque applied to the mounting bolts be the same as the tie rod torque recommended by the cylinder manufacturer for the given bore size.

For heavy loads or high shock conditions, side mounted cylinders should be held in place to prevent shifting by keying or pinning. A shear key, consisting of a plate extending from side of cylinder, can be supplied on most cylinders. (Fig. 7) This method may be used where a keyway can be milled into a machine member. It serves to take up shear loads and also provides accurate alignment of the cylinder.

Side lug mounts are designed so as to allow dowel pins to be used to pin the cylinder to the machine member. Pins, when used, are installed on both sides of the cylinder but not at both ends. (See Fig. 8)

The use of a separate shear key is fairly common. It should be placed at the proper end of the cylinder to absorb the major load. (see Fig. 9)

Side mount cylinders should not be pinned or keyed at both ends. Changes in temperature and pressure under normal operating conditions cause the cylinder to increase (or decrease) in length from its installed length and therefore must be free to expand and contract. If pinned or keyed at both ends, the advantages of cylinder elasticity in absorbing high shock loads will be lost. (Fig. 10)

If high shock loads are the major consideration, the cylinder should be mounted and pins or shear key so located as to take full advantage of the cylinder's inherent elasticity. For major shock load in tension, locate key at rear face of head or pin the head in place. For major shock load in thrust, pin cap in place or locate key at front face of cap.

Pivot Force Transfer (Group 2)

Cylinders with pivot mounts which absorb force on centerline should be used on applications where the machine member to be moved travels in a curved path. There are two basic ways to mount a cylinder so that it will pivot during the work cycle: clevis or trunnion mounts, with variations of each. Pivot mount cylinders are available in cap fixed clevis (Style BB), cap detachable clevis (Style BC), cap spherical bearing (Style SB), head trunnion (Style D), cap trunnion (Style DB), and intermediate fixed trunnion (Style DD).

Pivot mount cylinders can be used on tension (pull) or thrust (push) applications at full rated pressure, except long stroke thrust cylinders are limited by piston rod column strength. See Piston Rod Selection Chart on page B136.

Clevis or single ear mounts are usually an integral part of the cylinder cap (though one style is detachable) and provide a single pivot point for mounting the cylinder. A pivot pin of proper length and of sufficient diameter to withstand the maximum shear load developed by the cylinder at rated operating pressure is included as a part of the clevis mount style. The fixed clevis mount, Style BB, is the most popular of the pivot force transfer types and is used on applications where the piston rod end travels in a curved path in one plane. It can be used vertically or horizontally or any angle in between. On long stroke push applications it may be necessary to use a larger diameter piston rod to prevent buckling or stop tube to minimize side loading due to "jackknife" action of cylinder in extended position. Fixed clevis mount cylinders will not function well if the curved path of piston rod travel is other than one plane. Such an application results in misalignment and causes the gland and piston bearing surfaces to be subjected to unnecessary side loading. For applications where the piston rod will travel in a path not more than 3° either side of the true plane motion, a cap spherical bearing mount is recommended. A spherical bearing rod eye should be used at rod end. Most spherical bearing mounts have limited pressure ratings. Consult cylinder manufacturer's product catalog.

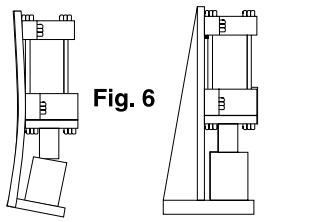


Fig. 6

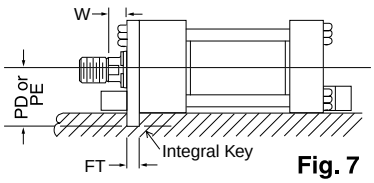


Fig. 7

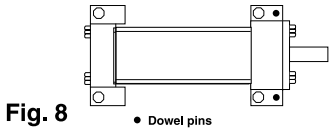


Fig. 8

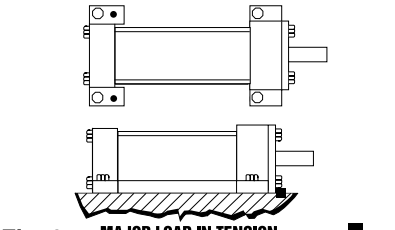


Fig. 9
Right

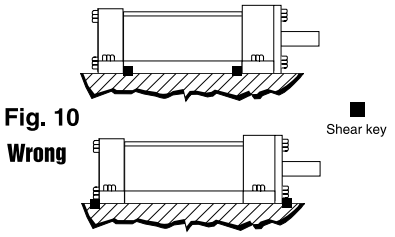
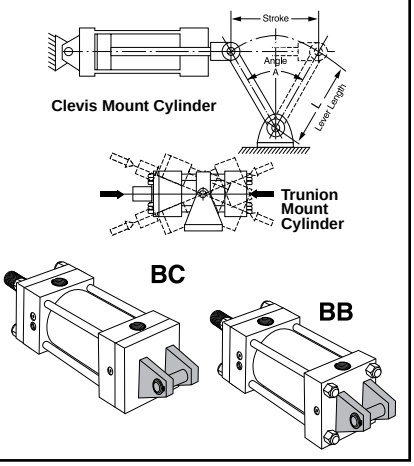


Fig. 10
Wrong



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Cap detachable clevis mounts are usually used for air service. Cap detachable clevis mounts are longer, centerline of pivot pin to shoulder of piston rod, than fixed clevis mount in any given bore size. They are most often specified to avoid port relocation charges. Application parameters are the same as described for fixed clevis mounting.

Trunnion mount cylinders are a second type of pivot mounts used on applications where the piston rod travels in a curved path in one plane. Three styles are available – head trunnion (Style D), cap trunnion (Style DB) and intermediate fixed trunnion (Style DD). Trunnion pins are designed for shear loads only and should not be subjected to bending stresses. Pillow blocks, rigidly mounted with bearings at least as long as the trunnion pins, should be used to minimize bending stresses. The support bearings should be mounted as close to the head, cap or intermediate trunnion shoulder faces as possible.

Cap end trunnion mounts are used on cylinder applications similar to fixed clevis mounts, and the same application data applies.

Head trunnion mount cylinders can usually be specified with smaller diameter piston rods than cylinders with pivot point at cap end or at an intermediate position. This is evident in data shown in piston rod selection chart on page B136. On head end trunnion mount, long stroke, cylinder applications consideration should be given to the overhanding weight at cap end of cylinder. To keep trunnion bearing loading within limits, stroke lengths should be not more than 5 times the bore size. If cylinder stroke is greater than 5 times the bore size and piston speed exceeds 35 ft/minute, consult factory.

Intermediate fixed trunnion mount is the best of the trunnion mount types. The trunnion can be located so as to balance the weight of the cylinder, or it can be located at any point between the head or cap to suit the application. It is of fixed design, and the location of the trunnion must be specified (XI dimension) at time of order. The location cannot be easily changed once manufactured.

Thrust exerted by a pivot transfer cylinder working at an angle is proportional to the angle of the lever arm which it operates. In Fig. 12 that vector force, T, which is at right angle to the lever axis, is effective for turning the lever. The value of T varies with the acute angle A between cylinder centerline and lever axes. To calculate effective thrust T, multiply cylinder thrust by the power factor shown in table below.

Accessories

Rod clevises or rod knuckles are available for use with either fixed or pivot mount cylinders. Such accessories are usually specified with pivot mount cylinders and are used with pivot pin centerline in same axis as pivot pin centerline on cylinder. Pivot pins for accessories must be ordered separately.

Pin size of rod clevis or rod knuckle should be at least equal in diameter to the pin diameter of the cap fixed clevis pin for the cylinder bore size specified. Larger accessories are more costly and usually result in a mismatch of pin diameters, especially when used with oversize piston rods.

Removable Trunnion Pins

Removable trunnion pins are a convenience when machine structures or confined space prohibit the use of separate pillow blocks situated close to the cylinder sides.

Spherical Bearing Mount

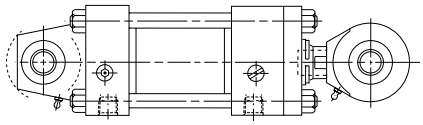
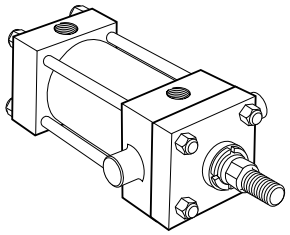
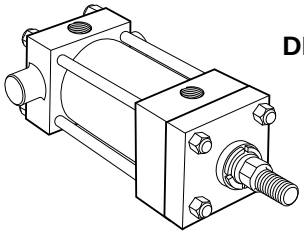


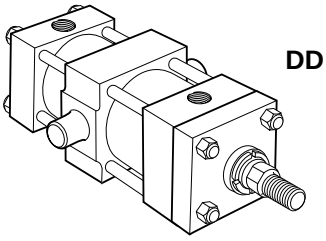
Fig. 11



D



DB



DD

Clevis Mount Cylinder

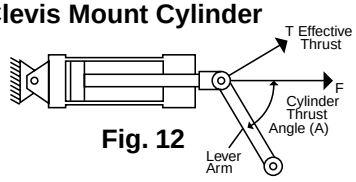


Fig. 12

Power Factor Table

Angle A Degrees	Pwr. Factor (SIN A)	Angle A Degrees	Pwr. Factor (SIN A)
5	0.087	50	0.766
10	0.174	55	0.819
15	0.259	60	0.867
20	0.342	65	0.906
25	0.423	70	0.940
30	0.500	75	0.966
35	0.573	80	0.985
40	0.643	85	0.996
45	0.707	90	1.000

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Ports

Parker hydraulic and pneumatic cylinders can be supplied with S.A.E. straight O-ring ports or N.P.T.F. pipe thread ports. For the type of port recommended and port size, see respective product catalogs. If specified on your order, extra ports can be provided on the sides of heads or caps that are not occupied by mountings or cushion valve on all cylinders.

Standard port location is position 1 as shown on line drawings in product catalog and Figure 1 below. Cushion adjustment needle valves are at positions 2 and 4 (or 3), depending on mounting style. Heads or caps which do not have an integral mounting can be rotated and assembled with ports at 90° or 180° from standard position. Mounting styles on which head or cap can be rotated at no extra charge are shown in Table A below. To order, specify by position number. In such assemblies the cushion adjustment needle valves rotate accordingly, since their relationship with port position does not change.

Figure 1

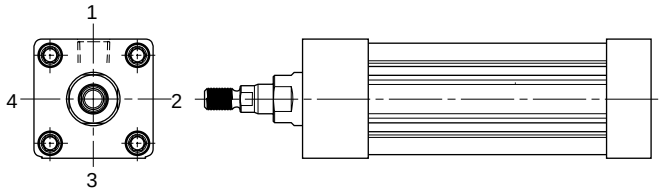


Table A

Mounting Style	Head End	Cap End
T, TB, TC, TD, H, HB, J, JB, DD	1, 2, 3 or 4	1, 2, 3 or 4
BB, DB	1, 2, 3 or 4	1 or 3
D	1 or 3	1, 2, 3 or 4
C, F	1	1

Straight Thread Ports

The S.A.E. straight thread O-ring port is recommended for hydraulic applications. Parker will furnish this port configuration at positions shown in Table A above. This port can also be provided at positions other than those shown in Table A at an extra charge. Size number, tube O.D. and port thread size for S.A.E. ports are listed in Table C. S.A.E. ports are available at extra cost.

Table C

S.A.E. Straight Thread "O" Ring Ports

Size No.	Tube O.D. (In.)	Thread Size	Size No.	Tube O.D. (In.)	Thread Size
2	1/8"	5/16 - 24	12	3/4"	1-1/16 - 12
3	3/16"	3/8 - 24	—	—	—
4	1/4"	7/16 - 20	16	1"	1- 5/16 - 12
5	5/16"	1/2 - 20	20	1-1/4"	1-5/8 - 12
6	3/8"	9/16 - 18	24	1-1/2"	1-7/8 - 12
8	1/2"	3/4 - 16	32	2"	2-1/2 - 12
10	5/8"	7/8 - 14	—	—	—

Note: For the pressure ratings of individual connectors, contact your connector supplier.

Cylinder Port Options

Option "T" SAE Straight Thread O-Ring Port. Recommended for most hydraulic applications.

Option "U" Conventional NPTF Ports (Dry-Seal Pipe Threads). Recommended for pneumatic applications only.

Option "R" BSPP Port (British Parallel Thread). ISO 228 port commonly used in Europe.

Option "P" SAE Flange Pots Code 61. Recommended for hydraulic applications requiring larger port sizes.

Option "B" BSPT (British Tapered Thread).

Option "G" Metric Straight Thread Port similar to Option "R" with metric thread. Popular in some European applications.

Option "Y" ISO-6149-1 Metric Straight Thread Port. Recommended for all hydraulic applications designed per ISO standards.

Ports can be supplied at positions other than those shown in Table A at an extra charge. To order, specify port position as shown in Figure 1.

International Ports

Other port configurations to meet international requirements are available at extra cost. Parker cylinders can be supplied, on request, with British standard taper port (BSPT). Such port has a taper of 1 in 16 measured on the diameter (1/16" per inch). The thread form is Whitworth System, and size and number of threads per inch are as follows:

Table D

British Standard Pipe Threads

Nominal Pipe Size	No. Threads Per Inch	Pipe O.D.
1/8	28	.383
1/4	19	.518
3/8	19	.656
1/2	14	.825
3/4	14	1.041
1	11	1.309
1-1/4	11	1.650
1-1/2	11	1.882
2	11	2.347

British standard parallel internal threads are designated as BSP and have the same thread form and number of threads per inch as the BSPT type and can be supplied, on request, at extra cost. Unless otherwise specified, the BSP or BSPT port size supplied will be the same nominal pipe size as the N.P.T.F. port for a given bore size cylinder.

Metric ports options G or Y can also be supplied to order at extra cost.

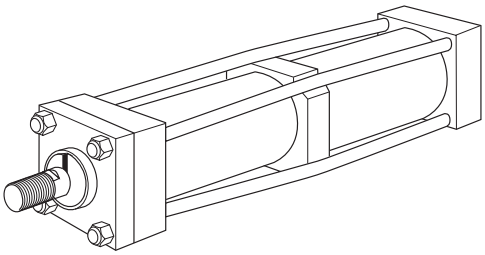
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A

Stroke Data

Parker cylinders are available in any practical stroke length. The following information should prove helpful to you in selecting the proper stroke for your cylinder application.

Stroke Tolerances – Stroke length tolerances are required due to build-up of tolerances of piston, head, cap and cylinder body. Standard production stroke tolerances run +1/32" to -1/64" up to 20" stroke, +1/32" to -.020" for 21" to 60" stroke and +1/32" to -1/32" for greater than 60" stroke. For closer tolerances on stroke length, it is necessary to specify the required tolerance plus the operating pressure and temperature at which the cylinder will operate. Stroke tolerances smaller than .015" are not generally practical due to elasticity of cylinders. If machine design requires such close tolerances, use of a stroke adjuster (below) may achieve the desired result.



Tie Rod Supports

Rigidity of Envelope – The pre-stressed tie rod construction of Parker cylinders has advantages in rigidity within the limits of the cylinder tube to resist buckling. For long stroke cylinders within practical limits, Parker provides exclusive TIE ROD SUPPORTS (see table below) which move the tie rod centerlines radially outward.

Standard tie rod supports are kept within the envelope dimensions of the head and cap, and generally do not interfere with mounting a long cylinder.

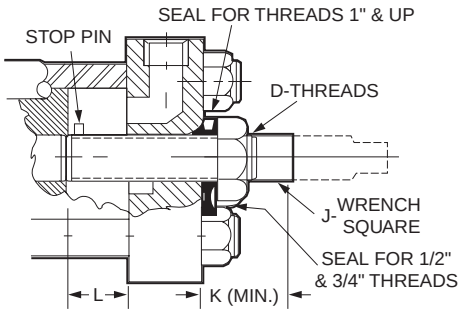
Number of Supports Required	Bore	Stroke (inches)											
		36	48	60	72	84	96	108	120	132	144	156	168
	1	—	1	1	1	2	Consult Factory						
	1-1/2	—	—	1	1	1	2	2	2	3	3	3	4
	2	—	—	—	1	1	1	1	2	2	2	2	3
	2-1/2	—	—	—	—	—	1	1	1	1	1	2	2
	3-1/4	—	—	—	—	—	—	—	1	1	1	1	1
	4	—	—	—	—	—	—	—	—	—	1	1	1

Note: 5" through 14" bore sizes — no supports required.

Stroke Adjusters

(only with metallic piston)

Stroke Adjusters – For the requirement where adjusting the stroke is specified. Parker has several designs to offer, one of which is illustrated below. This is suitable for infrequent adjustment and is economical.*



Here a “retracting stroke adjuster” must be called for in specifications, and the length *of the adjustment must be specified*.

Where frequent adjustment or cushions at the cap end are required, other designs are available according to application needs. Please contact Wadsworth, Ohio facility for more information.

*Infrequent is defined by positioning the retract stroke in a couple of attempts at original machine set up. The frequent stroke adjuster is
recommended for adjustments required after the original equipment has been adjusted by the original machine manufacturer.

Bore Size	D	J	K	L (Max.)
1-1/2, 2	1/2 - 20	5/16	15/16	5
2-1/2, 3-1/4, 4	3/4 - 16	7/16	1-1/4	8
5, 6	1 - 14	5/8	1-11/16	9
8	1-1/2 - 12	15/16	2-1/8	18

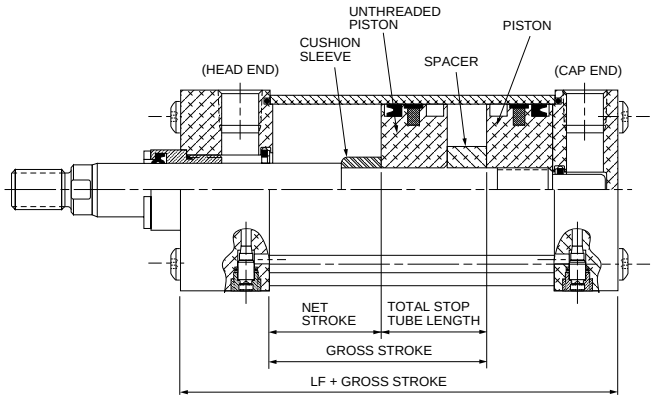
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Stop Tubing
(only with metallic piston)

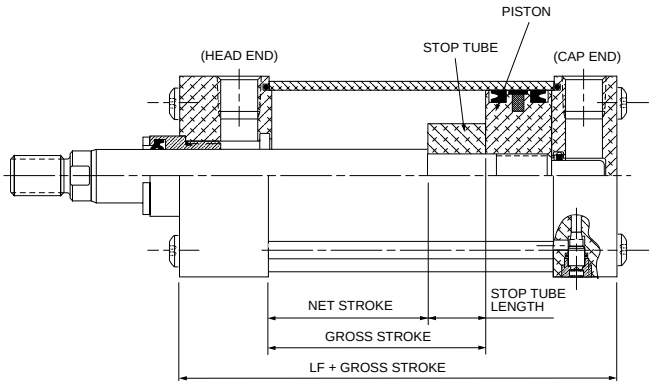
Long stroke cylinders, fixed or pivot mounted, tend to jack-knife or buckle on push load applications, resulting in high bearing loading at the rod gland or piston. Use of a stop tube to lengthen the distance between the gland and piston when cylinder rod is fully extended is recommended to reduce these bearing loads. The drawing below shows stop tube construction for fluid power cylinders. Refer to chart on next page to determine stop tube length.

When specifying cylinders with long stroke and stop tube, be sure to call out the net stroke and the length of the stop tube. Machine design can be continued without delay by laying in a cylinder equivalent in length to the NET STROKE PLUS STOP TUBE LENGTH, which is referred to as GROSS STROKE.

Refer to the next page to determine stop tube length.



Double piston design is supplied on air cylinders with cushion head end or both ends.



This design is supplied on cushioned cap or non-cushioned cylinders.

Cushion Selection

Cushions are required when cylinder piston rod speed exceeds 4" per second.

Mounting Classes

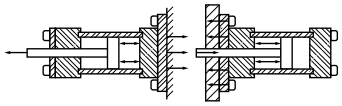
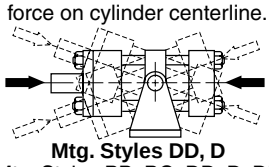
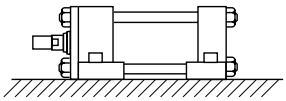
Standard mountings for fluid power cylinders fall into three basic groups. The groups can be summarized as follows:

Group 1 – Straight Line Force Transfer with fixed mounts which absorb force on cylinder centerline.

Group 2 – Pivot Force Transfer. Pivot mountings permit a cylinder to change its alignment in one plane.

Group 3 – Straight Line Force Transfer with fixed mounts which do not absorb force on cylinder centerline.

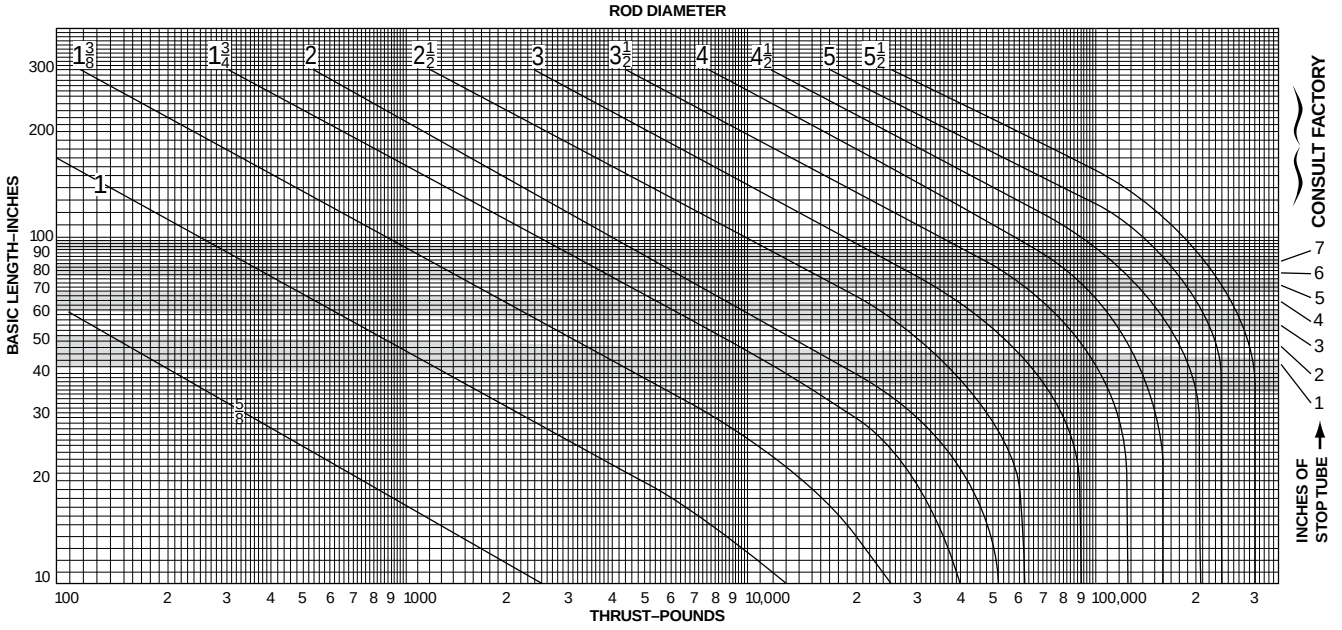
Because a cylinder's mounting directly affects the maximum pressure at which the cylinder can be used, the charts below should be helpful in the selection of the proper mounting combination for your application. Stroke length, piston rod connection to load, extra piston rod length over standard, etc. should be considered for thrust loads. Alloy steel mounting bolts are recommended for all mounting styles, and thrust keys are recommended for Group 3.

	GROUP 1
	FIXED MOUNTS which absorb force on cylinder centerline. 
HEAVY-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles TC Mtg. Styles TB
MEDIUM-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles H, HB Mtg. Styles J, JB
LIGHT-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles J, JB Mtg. Styles H, HB
	GROUP 2
	PIVOT MOUNTS which absorb force on cylinder centerline. 
HEAVY-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	**Mtg. Styles DD, D** Mtg. Styles BB, BC, DD, D, DB
MEDIUM-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles BB, BC, BE Mtg. Styles BB, BC, BE
	GROUP 3
	FIXED MOUNTS which do not absorb force on the centerline. 
HEAVY-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles C Mtg. Styles C
MEDIUM-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles F Mtg. Styles F
LIGHT-DUTY SERVICE For Thrust Loads _____ For Tension Loads _____	Mtg. Styles CB† Mtg. Styles CB†

† Mounting style CB recommended for maximum pressure of 150 PSI.

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Piston Rod — Stroke Selection Chart



How to Use the Chart

The selection of a piston rod for thrust (push) conditions requires the following steps:

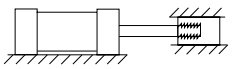
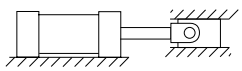
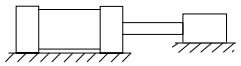
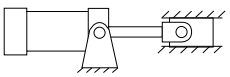
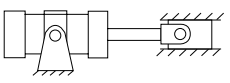
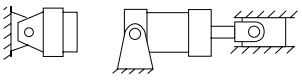
1. Determine the type of cylinder mounting style and rod end connection to be used. Then consult the chart below and find the "stroke factor" that corresponds to the conditions used.
2. Using this stroke factor, determine the "basic length" from the equation:

   Basic Length = Actual Stroke x Stroke Factor

   The graph is prepared for standard rod extensions beyond the face of the gland retainers. For rod extensions greater than standard, add the increase to the stroke in arriving at the "basic length."
3. Find the load imposed for the thrust application by multiplying the full bore area of the cylinder by the system pressure.
4. Enter the graph along the values of "basic length" and "thrust" as found above and note the point of intersection:
   A) The correct piston rod size is read from the diagonally curved line labeled "Rod Diameter" next *above* the point of intersection.
   B) The required length of stop tube is read from the right of the graph by following the shaded band in which the point of intersection lies.
   C) If required length of stop tube is in the region labeled "consult factory," submit the following information for an individual analysis:
      1) Cylinder mounting style.
      2) Rod end connection and method of guiding load.
      3) Bore, required stroke, length of rod extension (Dim. "LA or LAF") if greater than standard, and series of cylinder used.
      4) Mounting position of cylinder. (Note: If at an angle or vertical, specify direction of piston rod.)
      5) Operating pressure of cylinder if limited to less than standard pressure for cylinder selected.

Warning ⚠

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod end to fail. If these types of additional loads are expected to be imposed on the piston rods, their magnitude should be made known to our Engineering Department so they may be properly addressed. Additionally, cylinder users should always make sure that the piston rod is securely attached to the machine member.

Recommended Mounting Styles for Maximum Stroke and Thrust Loads	Rod End Connection	Case	Stroke Factor
Groups 1 or 3 Long stroke cylinders for thrust loads should be mounted using a heavy-duty mounting style at one end, firmly fixed and aligned to take the principal force. Additional mounting should be specified at the opposite end, which should be used for alignment and support. An intermediate support may also be desirable for long stroke cylinders mounted horizontally. Machine mounting pads can be adjustable for support mountings to achieve proper alignment.	Fixed and Rigidly Guided	I 	0.50
	Pivoted and Rigidly Guided	II 	0.70
	Supported but not Rigidly Guided	III 	2.00
Group 2 Style D — Trunnion on Head	Pivoted and Rigidly Guided	IV 	1.00
Style DD — Intermediate Trunnion	Pivoted and Rigidly Guided	V 	1.50
Style DB — Trunnion on Cap or Style BB — Clevis on Cap	Pivoted and Rigidly Guided	VI 	2.00

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Cushion ratings for **Air Cylinders Only** are described in **Table b-2** and **Graph b-1**. To determine whether a cylinder will adequately stop a load without damage to the cylinder, the weight of the load (including the weight of the piston and the piston rod from **Table b-1**) and the maximum speed of the piston rod must first be determined. Once these two factors are known, the **Kinetic Energy Graph** may be used. Enter the graph at its base for the value of weight determined, and project vertically to the required speed value. The point of intersection of these two lines will be the cushion rating number required for the application.

To determine the total load to be moved, the weight of the piston and rod must be included.

Total Weight = weight of the piston and non-stroke rod length (column 1) + weight of the rod per inch of stroke x the inches of stroke (Column 2) + the load to be moved.

Example: a 3-1/4" bore cylinder with a 1" rod diameter and 25" of stroke; external load to be moved is 85 lbs. Total load to be moved is then (3.3 lbs) + (0.223 lbs/inch X 25 inches) + (85 lbs) for a total of 93.9 lbs.

3MA and 4MA Piston Rod Assembly Weight Table

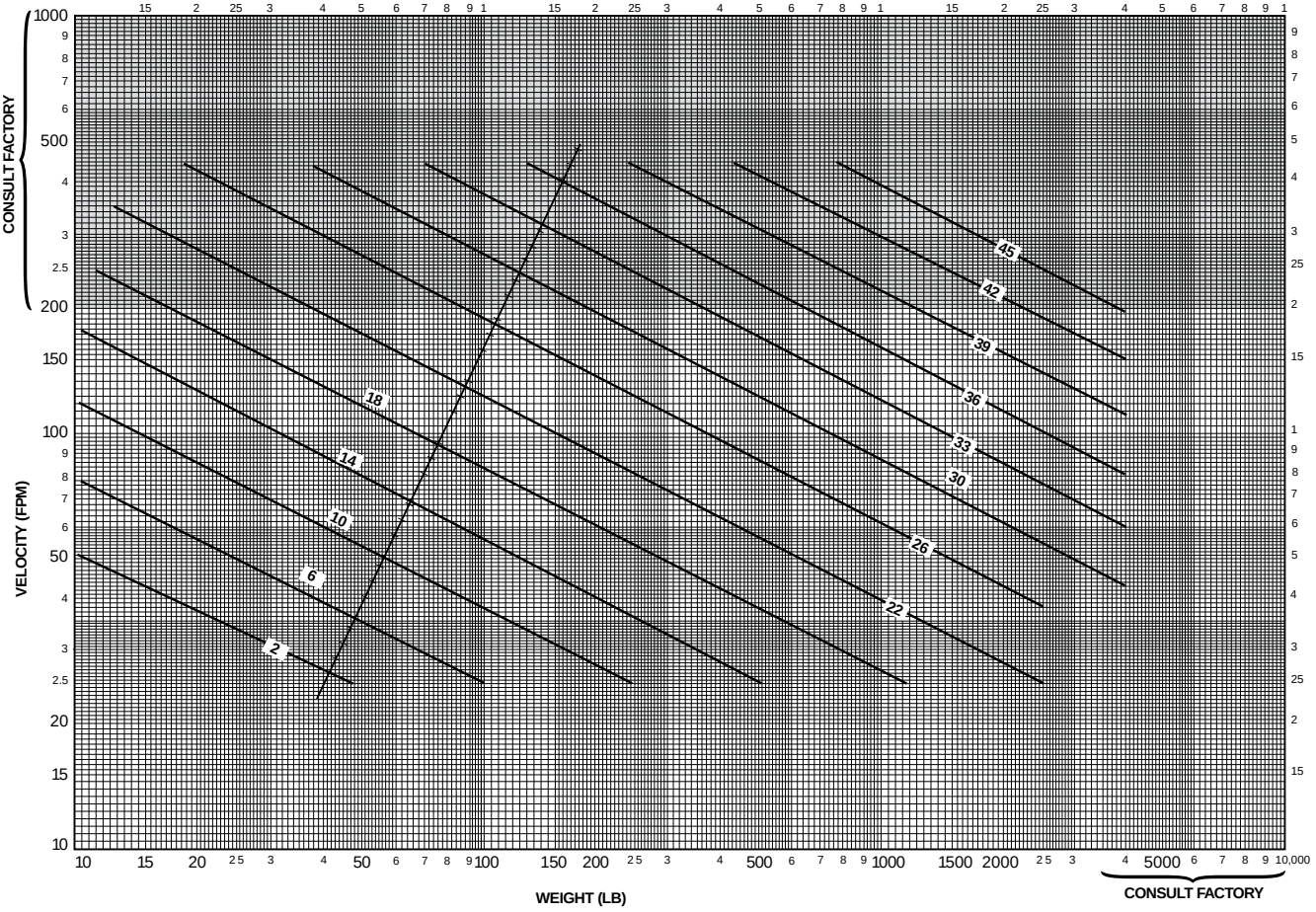
Table b-1

Bore	Rod Dia. MM	Column 1 Basic Weight for Piston and Non-Stroke Rod (lbs)	Column 2 Basic Weight for each 1" of Stroke (lbs)
1-1/2	5/8	1.1	0.087
	1	n/a	n/a
2	5/8	1.2	0.087
	1	2.1	0.223
2-1/2	5/8	1.5	0.087
	1	2.3	0.223
3-1/4	1	3.3	0.223
	1-3/8	4.9	0.421
4	1	3.8	0.223
	1-3/8	5.4	0.421
5	1	5.0	0.223
	1-3/8	6.5	0.421
6	1-3/8	8.3	0.421
	1-3/4	11.8	0.682
8	1-3/8	12.4	0.421
	1-3/4	15.0	0.682

Note: aluminum piston used for weight calculation

Kinetic Energy Graph – Air Cylinders

Graph b-1



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Now refer to **Table b-2** and find the cushion ratings, using bore size and rod diameter of the cylinder selected. If a simple circuit is used, with no meter out or speed control, use the "Rating with No Back Pressure" column values. If a meter out or speed control is to be used, use the "Rating with Back Pressure" column values. If the cushion rating found in **Table b-2** below is **greater** than the number determined in **Graph b-1,** then the cylinder will stop the load adequately. If the cushion rating in **Table b-2** is **smaller** than the number found in **Graph b-1**, then a larger bore cylinder should be used. In those applications where back pressures exist in the exhaust lines, it is possible to exceed the cushion ratings shown in **Table b-2**. In these cases, consult the factory and advise the amount of back pressure.

Air Cylinder Cushion Ratings Table

Table b-2

3MA Cushion Ratings			
Bore	**Rod Dia. MM**	**Rating with No Back Pressure**	**Rating with Back Pressure**
1-1/2	5/8	8	14
2	5/8	12	18
2-1/2	5/8	14	20
3-1/4	1	18	24
4	1	20	27
5	1	23	28

4MA Cushion Ratings			
Bore	**Rod Dia. MM**	**Rating with No Back Pressure**	**Rating with Back Pressure**
1-1/2	5/8	8	14
	1	n/a	n/a
2	5/8	12	18
	1	9	15
2-1/2	5/8	14	20
	1	14	19
3-1/4	1	18	24
	1-3/8	17	23
4	1	20	27
	1-3/8	20	26
5	1	23	28
	1-3/8	23	28
6	1-3/8	26	31
	1-3/4	26	31
8	1-3/8	29	35
	1-3/4	29	34

In general, if the cushion rating number from the Kinetic Energy Graph is greater than the cushion rating for a particular bore and rod diameter, other and external means of decelerating the load will be necessary for proper cylinder application. Parker options include shock absorbers, Par-Check hydraulic resistance units and NuCushion bumpers.

Shock absorbers provide the greatest selection of decelerating products, and many can be incorporated into the cap end of cylinders for retract stroke deceleration. Additional product information can be found in Industrial Shock Absorbers Catalog AU08-1022-1/NA, and please contact the Wadsworth, OH facility for cylinder modification details.



Shock Absorber



NuCushion Bumper
2-1/2" - 4" Bores

Inch Based Cylinders
Air Requirement Per Inch of Cylinder Stroke

The amount of air required to operate a cylinder is determined from the volume of the cylinder and its cycle in strokes per minute. This may be determined by use of the following formulae which apply to a single-acting cylinder.

$$V = \frac{3.1416\ L\ D^2}{4} \qquad C = \frac{\ƒV}{1728}$$

Where: V = Cylinder volume, cu. in.
L = Cylinder stroke length, in.
D = Internal diameter of cylinder in.
C = Air required, cfm
ƒ = Number of strokes per minute

The air requirements for a double-acting cylinder is almost double that of a single-acting cylinder, except for the volume of the piston rod.

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The air flow requirements of a cylinder in terms of cfm should not be confused with compressor ratings which are given in terms of free air. If compressor capacity is involved in the consideration of cylinder air requirements it will be necessary to convert cfm values to free air values. This relationship varies for different gauge pressures.

Thrust (pounds) = operating pressure x area of cylinder bore.

Note: *That on the "out" stroke the air pressure is working on the entire piston area but on the "in" stroke the air pressure works on the piston area less the rod area.*

Graph b-2 and **b-3** offer a simple means to select pneumatic components for dynamic cylinder applications. It is only necessary to know the force required, the desired speed and the pressure which can be maintained at the inlet to the air preparation system. The graphs assume average conditions relative to air line sizes, system layout, friction, etc. At higher speeds, consider appropriate cushioning of cylinders.

The general procedure to follow when using these graphs is:

1. Select the appropriate graph depending upon the pressure which can be maintained to the system – **Graph b-2** for 100 PSIG and **Graph b-3** for 80 PSIG.
2. Determine appropriate cylinder bore. Values underneath the diagonal cylinder bore lines indicate the maximum recommended dynamic thrust developed while the cylinder is in motion. The data in the table at the bottom of each graph indicates available static force applications in which clamping force is a prime consideration in determining cylinder bore. Please reference table number b-3 and b-4 for approximate thrust developed at a given operating pressure.

Graph b-2

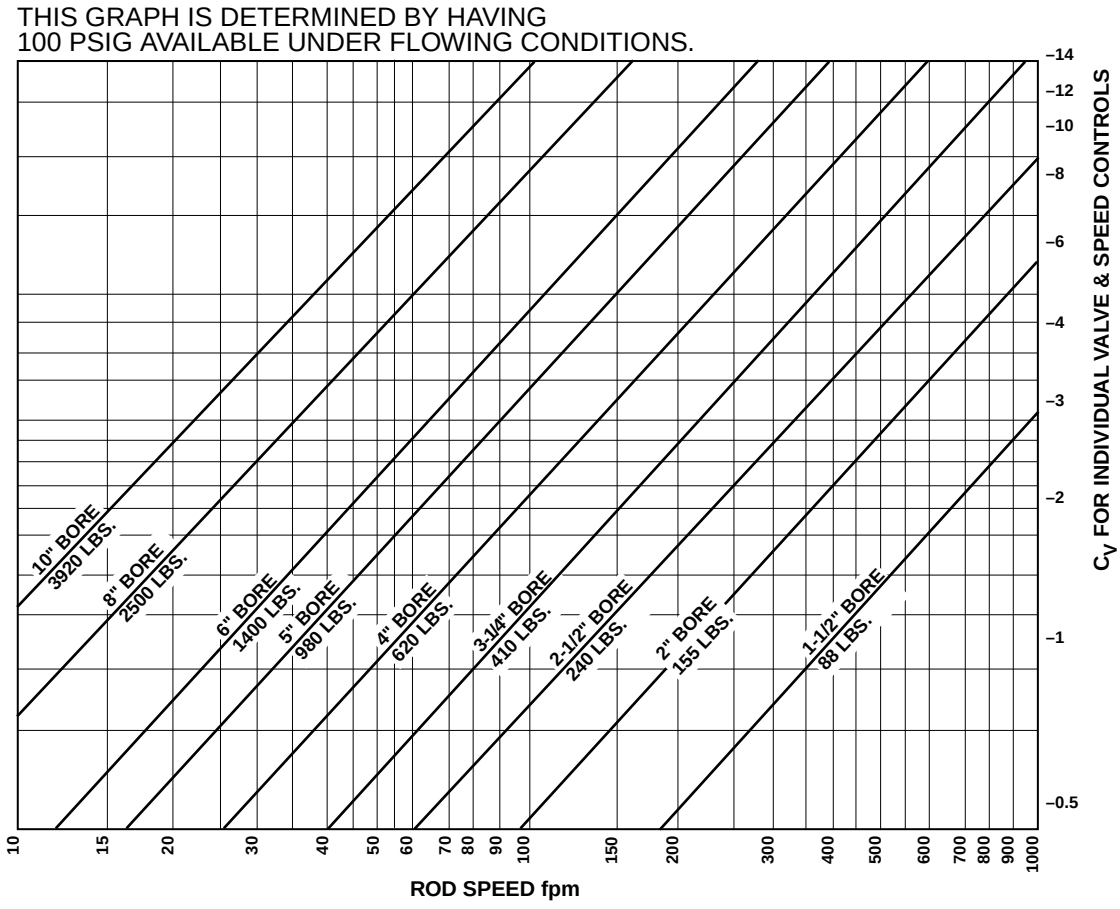


Table b-3
Thrust Developed

Bore Size	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"	8"
Dynamic Thrust (lbs.)	88	155	240	410	620	980	1400	500
Static Thrust (lbs.)	177	314	491	830	1250	1960	2820	5020

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3. Read upward on appropriate rod speed line to intersection with diagonal cylinder bore line. Read right from intersection point to determine the required C_v of the valve and the speed controls. Both the valve and speed controls must have this C_v.

The following examples illustrate use of the graphs:

Example 1: *Assume it is necessary to raise a 900-pound load 24 inches in two seconds. With 100 PSIG maintained at the inlet to the air preparation system, use* **Graph b-2**. *The 5-inch bore cylinder is capable of developing the required thrust while in motion. Since 24 inches in two seconds is equal to 60 fpm, read upward on the 60 fpm line to the intersection of the 5-inch bore diagonal line. Reading to the right indicates that the required valve and speed controls must each have a C_v of over 1.9.*

Example 2: *Assume similar conditions to Example 1 except that only 80- PSIG will be available under flowing conditions. Using* **Graph b-3**, *a 6-inch bore cylinder is indicated. Read upward on the 60 fpm line to the intersection point. Interpolation of the right-hand scale indicates a required valve and speed control C_v of over 2.8.*

Example 3: *Assume similar conditions to Example 1 except that the load is being moved in a horizontal plane with a coefficient of sliding friction of 0.2. Only a 180-pound thrust is now required (900 lb. x 0.2). Consult* **Graph b-3**. *The 2-1/2 inch bore cylinder will develop sufficient thrust, and at 60 fpm requires a valve and speed control C_v of about 0.5.*

Graph b-3

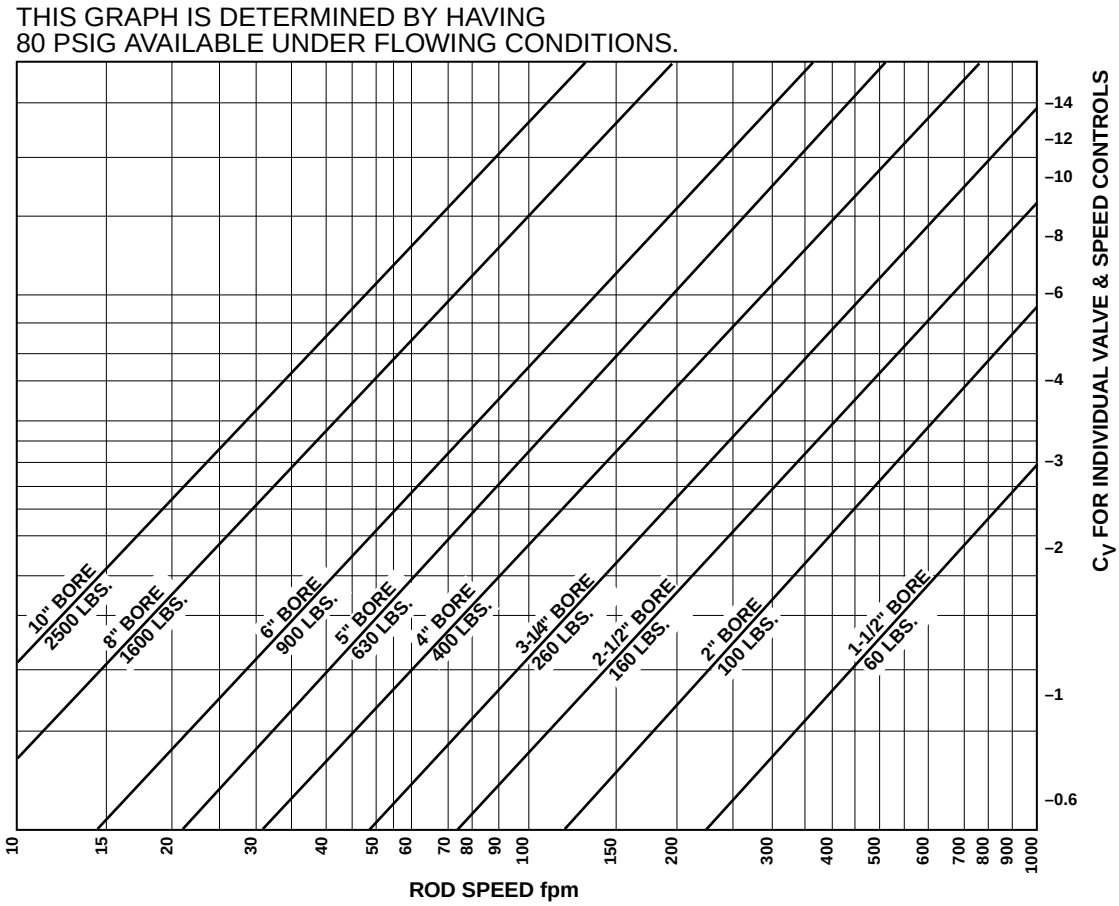


Table b-4
Thrust Developed

Bore Size	1-1/2"	2"	2-1/2"	3-1/4"	4"	5"	6"	8"
Dynamic Thrust (lbs.)	60	100	160	260	400	630	900	1600
Static Thrust (lbs.)	141	251	393	663	1000	1570	2260	4010

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Rod End Data

Rod end dimension symbols as shown comply with the National Fluid Power Association dimensional code. The following chart indicates the symbols used in this catalog.

Description	Symbol
Thread diameter and pitch	KK or CC
Length of thread	A
Length of rod extension from face of gland retainer to end of retracted rod	LA or LAF (Male Thread) W or WF (Female Thread)

Five rod ends for Parker cylinders are offered as shown on the dimension pages of this catalog. They are Parker styles 4, 6, 8, 9 and 55, and all five are optional without price penalty.

Warning ⚠

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod end to fail. If these types of additional loads are expected to be imposed on the piston rods, their magnitude should be made known to our Application Engineering Department so they may be properly addressed. Additionally, cylinder users should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double rods. In some cases a stop is threaded onto one of the piston rods and used as an external stroke adjuster. This can cause a potential safety concern and can also lead to premature piston rod failure. The external stop will create a pinch point and the cylinder user should consider appropriate use of guards. If an external stop is not parallel to the final contact surface it will place a bending moment on the piston rod. An external stop will also negate the effect of a cushion and will subject the piston rod to an impact loading. These two (2) conditions can cause piston rod failure. The use of external stroke adjusters should be reviewed with our Application Engineering Department.

Piston Rod End Threads

Standard piston rod end thread lengths are shown as dimension “A” in Catalog dimension pages. Special rod end threads which are two times standard length can be supplied at a small extra cost. Available thread lengths are shown in the table below. To order, add suffix “2” to piston rod model number code and specify as Style #42 or Style #82.

Optional Piston Rod End Studs

Piston Rod Dia.	Rod End Thread Style #42		Rod End Thread Style #82	
	Thread Dia. & Pitch (KK)	Length (= 2 × A)	Thread Dia. & Pitch (CC)	Length (= 2 × A)
5/8	7/16-20	1-1/2	1/2-20	1-1/2
1	3/4-16	2-1/4	7/8-14	2-1/4
1-3/8	1-14	3-1/4	1-1/4 - 12	3-1/4
1-3/4	1-1/4 - 12	4	1-1/2 - 12	4

International Rod End Threads

Piston rod threads to meet international requirements are available at extra cost. Parker cylinders can be supplied with British standard fine (W) or metric (M). To order, specify in model number. For dimensions, consult factory.

Special Rod Ends

If a rod end configuration other than the standard styles is required, such special rod ends can be provided. The designation “Style 3” is assigned to such specials and is incorporated in the cylinder model number. To order, specify “Style 3” and give desired dimensions for KK; A; LA, LAF, W, or WF. If otherwise special, send a dimensioned sketch.

Special Assemblies from Standard Parts

Each dimensioned drawing in this catalog has position numbers shown on the end view to identify the four sides of the cylinder. These aid in communications and simplify the writing of specifications that cover changes in port positions, etc. Following are several suggested special assemblies that can be made up from standard parts.

a) By calling out the position numbers for the desired locations for head and cap ports, many mounting styles can be assembled with ports located at 90° or 180° from standard. In such special assemblies, the cushion needle valves are also repositioned since their relation with the port position does not change.

b) On mounting styles D, DB and DD, the cushion needle valves are provided only on the side position 3 on the head or cap which accommodates the mounting. The opposite head or cap can be rotated.

c) Standard mountings in different combinations can be provided: for example Style J mounting on head end with Style C on the cap end. This would be made up from standard parts and would be designated Model (bore size) **JC**-4MAU14A (stroke).

Single-Acting Cylinders

Double-acting cylinders are supplied as standard. They can also be used a single-acting cylinders where air or hydraulic force is applied to only one side of the piston, with the load or other external forces acting to “return” the piston after pressure is exhausted.

Spring-Returned, Single-Acting Cylinders (only with metallic piston) – Single-acting, spring-returned models can also be provided. Load conditions and friction factors must be considered in supplying the proper spring for the application. In addition, it is necessary that information be supplied as to which side of the piston the spring should act upon. Specify “Spring to return piston rod” or “Spring to advance piston rod.”

On longer stroke spring-returned cylinders, it is recommended that tie rod extensions be specified on the cylinder end in which the spring is located so that the cap or head against which the spring is acting can be “backed-off” slowly until compression of the spring is relieved. In such cases it should also be specified that the tie rod nuts be welded to the tie rods at the opposite end of the cylinder to further insure safe disassembly.

Consult factory when ordering spring-returned cylinders.

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Modifications

The following modifications can be supplied on most cylinders.

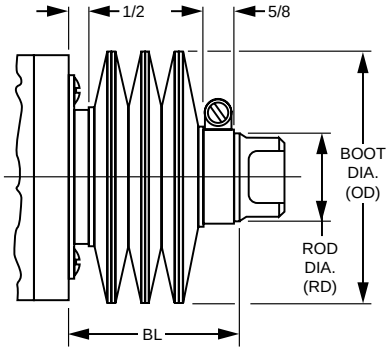
Metallic Rod Wiper Gland Assembly

When specified metallic rod wipers can be supplied instead of the standard wiper. Recommended in applications where contaminants tend to adhere to the extended piston rod and would damage the standard wiper. Installation of metallic rod wiper does not affect cylinder dimensions. It is available at extra cost. Please contact the Wadsworth, OH facility for more information.

Rod End Boots

Most Parker cylinders have a hardened bearing surface on the standard piston rod to resist external damage, and are equipped with a high efficiency wiper to remove external dust and dirt. Exposed piston rods that are subjected to contaminants with air hardening properties, such as paint, should be protected. In such applications, the use of a collapsing cover should be considered. This is commonly referred to as a “boot”. Calculate the longer rod end required to accommodate the collapsed length of the boot from the following data.

RD	1/2	5/8	1	1-3/8	1-3/4
OD	2-1/4	2-1/4	2-5/8	3	3-3/8
LF	.13	.13	.13	.13	.13



To determine extra length of piston rod required to accommodate boot, calculate:

BL = Stroke x LF + 1-1/8"

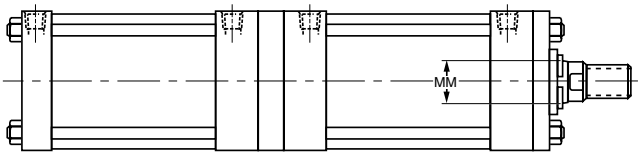
BL + std LAF (male rod end) or WF (female rod end) dimension = length of piston rod to extend beyond the head face.

Note: Please compare the Boot OD size to the standard E dimension per desired cylinder series and bore. This may be critical for foot mounted cylinders.

Rod Boots are available for many cylinder series.
Please contact the Wadsworth, OH facility for rod boot options.

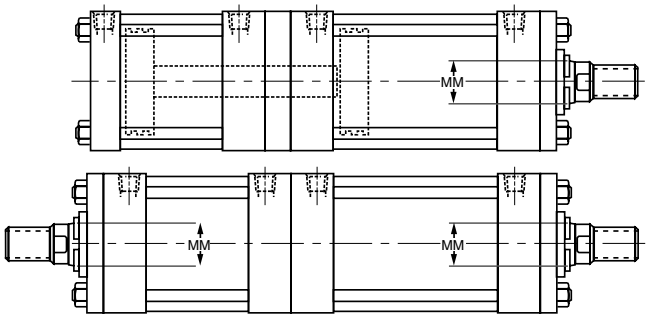
Tandem Cylinders

A tandem cylinder is made up of two cylinders mounted in line with pistons connected by a common piston rod and rod seals installed between the cylinders to permit double acting operation of each. Tandem cylinders allow increased output force when mounting width or height are restricted. Please contact the Wadsworth, OH facility for more information.



Duplex Cylinders

A duplex cylinder is made up of two cylinders mounted in line with pistons not connected and with rod seals installed between the cylinders to permit double acting operation of each. Cylinders may be mounted with piston rod to piston (as shown) or back to back and are generally used to provide three position operation. Please contact the Wadsworth, OH facility for more information.



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Design Torque

Design torque represents the maximum torque that an actuator must supply in an application. This maximum is the greater of the Demand Torque or the Cushion Torque. If the demand torque exceeds what the actuator can supply, the actuator will either move too slowly or stall. If the cushion torque is too high, the actuator may be damaged by excessive pressure. Demand torque and cushion torque are defined below in terms of load, friction, and acceleration torque.

Equations for calculating demand torque and cushion torque for some general applications are provided on the following pages.

T - Torque

The amount of turning effort exerted by a rotary actuator.

T_D - Demand Torque

This is the torque required from the actuator to do the job and is the sum of the load torque, friction torque, and acceleration torque, multiplied by an appropriate design factor. Design factors vary with the applications and the designers' knowledge.

Equation 4-3) $$T_D = T_\alpha + T_f + T_L$$

T_L - Load torque

This is the torque required to equal the weight or force of the load. For example, in Fig. 4-8a, the load torque is 563 Nm *(5000 lb-in.)*; in Fig. 4-8b the load torque is zero; in Fig. 4-8c the load torque is 563 Nm *(5000 lb-in.).* The load torque term is intended to encompass all torque components that aren't included in the friction or acceleration terms.

T_f - Friction torque

This is the torque required to overcome friction between any moving parts, especially bearing surfaces. In Fig. 4-8a, the friction torque is zero for the hanging load; in Fig. 4-8b the friction torque is 775 Nm *(6880 lb-in)* for the sliding load; in Fig. 4-8c the friction torque is zero for the clamp.

Equation 4-4) $$T_f = \mu W r$$

T_a - Acceleration Torque

This is the torque required to overcome the inertia of the load in order to provide a required acceleration or deceleration. In Fig. 4-8a the load is suspended motionless so there is no acceleration. In Fig. 4-8b, the load is accelerated from 0 to some specified angular velocity. If the mass moment of inertia about the axis of rotation is I and the angular acceleration is a, the acceleration torque is equal to Ia. In Fig. 4-8c there is no acceleration.

Some values for mass moment of inertia are given in Table 4. Some useful equations for determining a are listed in Table 5. Equation 5 below shows the general equation for acceleration torque.

Equation 4-5) $$T_\alpha = I\alpha$$

T_C - Cushion Torque

This is the torque that the actuator must apply to provide a required deceleration. This torque is generated by restricting the flow out of the actuator (meter-out) so as to create a back pressure which decelerates the load. This back pressure (deceleration) often must overcome both the inertia of the load and the driving pressure (system pressure) from the pump. See applications.

Equation 4-6) $$T_c = T_\alpha + \frac{P_r V}{\theta} - T_f \pm T_L$$

The friction torque T_f reduces the torque the actuator must apply to stop the load. The load torque T_L may add to, or subtract from the torque required from the actuator, depending upon the orientation of the load torque. For example, a weight being swung upward would result in a load torque that is subtracted.

Warning: Rapid deceleration can cause high pressure intensification at the outlet of the actuator. Always insure that cushion pressure does not exceed the manufacturer's pressure rating for the actuator.

KE – Kinetic Energy ($1/2\ J_m\omega^2$)

This is the amount of energy that a rotating load has. The rotator must be able to stop the load. All products have kinetic energy rating tables. Choose the appropriate deceleration option (i.e., bumper, cushions, shock absorbers,

Pages A21-A22 and A24-A25 excerpted from the Parker Hannifin Design Engineers Handbook.

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Demand Torque Examples

A) Example of load torque

The load is held motionless as shown.

$T_D = T_\alpha + T_f + T_L$

$T_\alpha = 0$

$T_f = 0$

$T_L = (500\ lb)(10\ in) = 5{,}000\ lb\text{-}in$

$T_D = 5{,}000\ lb\text{-}in$

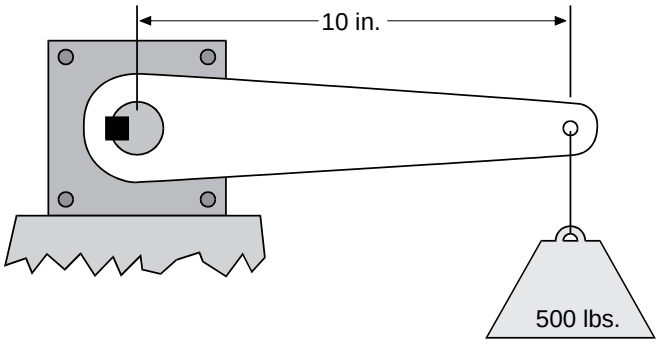


Figure 4-8a

B) Due to friction and acceleration

The 500 lb rotating index table is supported by bearings with a coefficient of friction of 0.25. The table's acceleration a is 2 rad/sec^2. The table's mass moment of inertia I is 2,330 lb-in-sec^2.

$T_D = T_\alpha + T_f + T_L$

$T_\alpha = I_\alpha = (2{,}330\ lb\text{-}in\text{-}sec2)(2/sec2) = 4{,}660\ lb\text{-}in$

$T_f = \mu W r_b = 0.25\ (500\ lb)(55\ in) = 6{,}880\ lb\text{-}in$

$T_L = 0$

$T_D = 4{,}660\ lb\text{-}in + 6{,}880\ lb\text{-}in = 11{,}540\ lb\text{-}in$

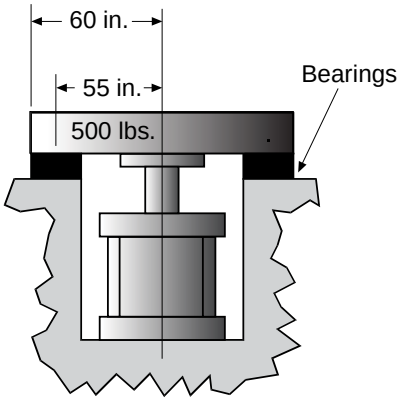


Figure 4-8b

C) Load torque example

$T_D = T_\alpha + T_f + T_L$

$T_\alpha = 0$

$T_f = 0$

$T_L = (500\ lb)(10\ in) = 5{,}000\ lb\text{-}in$

$T_D = 5{,}000\ lb\text{-}in$

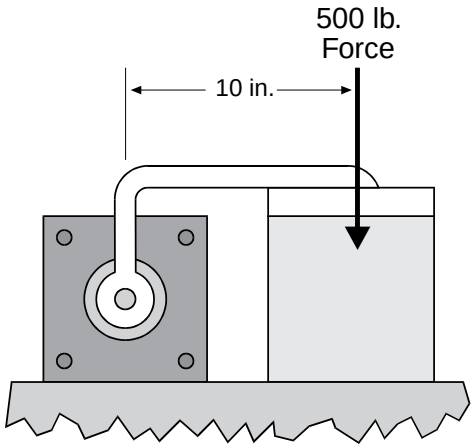


Figure 4-8c

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Torque Selection

Parker rotary actuators provide output torque up to 10,000 lb-in. The chart to the right shows the nominal torque output range of various actuator models at 100 PSI.

Caution:

This chart is intended as a guide only. Refer to actual product data in this catalog before specifying an actuator. Factors such as pressure rating, rotation, and actual torque output may be affected by specific product details and options.

Nominal Torque at 100 PSI

Output Torque (lb-in)	Rotation < 95°		Rotation > 100°	
	Vane Models	Rack & Pinion Models	Vane Models	Rack & Pinion Models
10000		HP10		HP10
9000				
8000				
7000				
6000				
5000		HP4.5		HP4.5
4000				
3500				
3000	PRN800D	B6714		B6714
2500		PTR322		PTR322
2000	PV46D			
1750				
1500	PRN800S		PRN800S	
1250	PV44D	PTR321, B6713		PTR321, B6713
1000				
900	PRN300D	PTR252	PV46	PTR252
800				
700	PV36D, PV42D			
600		PTR202, B6712	PV44	PTR202, B6712
500	PV42D, PRN150D	PTR251		PTR251
400	PV33D, PRN300S		PV36, PRN300S	
300		PTR201	PV42	PTR201
250		PTR152, XR20		PTR152, XR20
200	PRN150S		PV33, PRN150S	
150	PV22D, PRN50D	PTR151, B6711		PTR151, B6711
100	PRN30D	XR15		XR15
80		PTR102	PV22	PTR102
60	PRN50S		PRN50S	
40	PRN30S	PTR101, XR10	PRN30S	PTR101, XR10
35	PV11D			
30				
25	PRNA20S		PRNA20S	
20	PV10D	XR07		XR07
15	PRNA10S		PV11, PRNA10S	
10		XR05	PV10	XR05
5	PRNA1S, PRNA3S		PRNA1S, PRNA3S	
0				

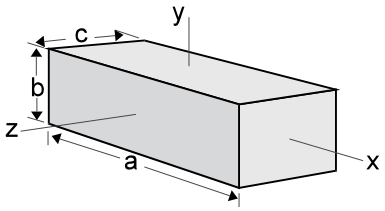
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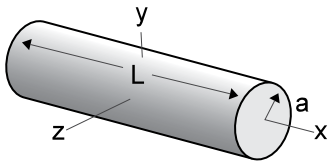
Table 4: Mass Moments of Inertia

Rectangular prism

$$I_x = \frac{1}{12}m\left(b^2 + c^2\right)$$
$$I_y = \frac{1}{12}m\left(c^2 + a^2\right)$$
$$I_z = \frac{1}{12}m\left(a^2 + b^2\right)$$



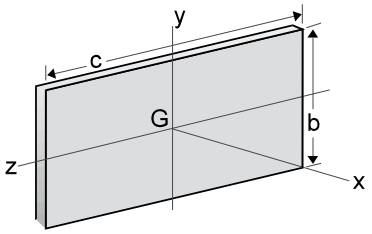
Circular cylinder



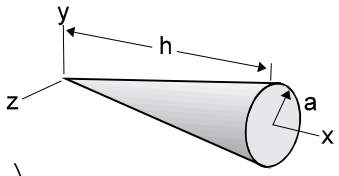
$$I_x = \frac{1}{2}ma^2$$
$$I_y = I_z = \frac{1}{12}m\left(3a^2 + L^2\right)$$

Thin rectangular plate

$$I_x = \frac{1}{12}m\left(b^2 + c^2\right)$$
$$I_y = \frac{1}{12}mc^2$$
$$I_z = \frac{1}{12}mb^2$$



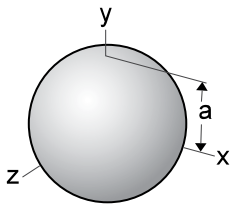
Circular cone



$$I_x = \frac{3}{10}ma^2$$
$$I_y = I_z = \frac{3}{5}m\left(\frac{1}{4}a^2 + h^2\right)$$

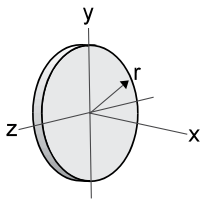
Sphere

$$I_x = I_y = I_z = \frac{2}{5}ma^2$$



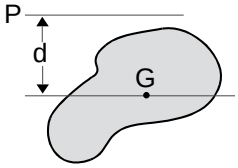
Thin disk

$$I_x = \frac{1}{2}mr^2$$
$$I_y = I_z = \frac{1}{4}mr^2$$



Parallel Axis Theorem:

$$I_p = \bar{I} + md^2$$



I_p = Mass moment of inertia about an axis parallel to a centroidal axis
$\bar{I}$ = Mass moment of inertia about a centroidal axis
m = Mass
d = Distance between axes

When acceleration is constant:

$$\theta = \omega_0 t + \frac{1}{2}\alpha t^2$$
$$\theta = \omega_0 t + \frac{1}{2}\omega_t t$$
$$\omega = \omega_0 + \alpha t$$
$$\omega = \left(\omega_0^2 + 2\alpha\theta\right)^{1/2}$$
$$\alpha = \frac{2\theta}{t^2}$$
$$\alpha = \frac{(\omega_t - \omega_0)^2}{2\theta}$$
$$\alpha = \frac{(\omega_t - \omega_0)}{t}$$

When velocity is constant:

$$\theta = \omega t$$

t = *time*
θ = *angular position*
ω_t = *angular velocity at time = t*
ω_0 = *angular velocity at time = 0*
α = *angular acceleration*

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Basic Velocity, Acceleration, Kinetic Energy And Torque Equations

A

Equations below are based on triangular velocity profile.

$$\omega_{max} = .035 \times \frac{\Theta}{t}$$

$$\alpha = \frac{\omega_{max}^2}{\left(\frac{\Theta}{57.3}\right)}$$

$$\alpha = \frac{\omega_{max}}{(t/2)}$$

$$K.E. = 1/2\ J_m\ \omega^2$$

$$T_a = \alpha \times J_m$$

$$T_f = W \times U_s \times \left(\text{Distance from pivot point to center of external bearings}\right)$$

$$T_L = \left(\text{Torque arm length to C.G. of load}\right) \times WL \times \cos(\phi)$$

Where ϕ = Angle between torque arm and horizontal plane

Where:

- Θ = Angle of Rotation (Degrees)
- t = Time to rotate through Θ (sec)
- ω = Angular velocity, radians/sec
- α = Angular accelerations (radians/sec^2)
- W_L = Weight of load (lbf)
- T_a = Torque to accelerate load (lb-in)
- U_s = Coefficient of static friction
- J_m* = Rotational mass moment of inertia (lb-in-sec2)
- T_f = Torque to overcome friction (lb-in)
- T_L = Torque to overcome effects of gravity

*Use “I” values from Table 4.

Coefficients of Friction

Material*	μ_s	μ_k
Steel on Steel	0.80	0.40
Steel on Steel (lubricated)	0.16	0.03
Aluminum on Steel	0.45	0.30
Copper on Steel	0.22	0.22
Brass on Steel	0.35	0.19
Teflon on Steel	0.04	0.04

*dry contact unless noted

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Force Conversion Factors

Multiply value A by conversion factor in table to calculate value B.

A \ B	oz	lbf	N	kg(f)
oz	1	0.0625	0.2780	0.0284
lbf	16	1	4.4482	0.4536
N	3.5970	0.2248	1	0.1020
kg(f)	35.2740	2.2050	9.8068	1

Torque Conversion Factors

Multiply value A by conversion factor in table to calculate value B.

A \ B	oz-in	lb-in	lb-ft	Nm
oz-in	1	0.0625	5.2083E-03	7.0616E-03
lb-in	16	1	0.0833	0.1130
lb-ft	192	12	1	1.356
Nm	141.61	8.8507	0.7376	1

Rotational Inertia Conversion Factors

Multiply value A by conversion factor in table to calculate value B.

A \ B	oz-in^2	oz-in-sec^2	lb-in^2	lb-in-sec^2	lb-ft^2	lb-ft-sec^2	kg-m^2	kg-m-sec^2	kg-cm^2	kg-cm-sec^2
oz-in^2	1	2.5900E-03	6.2500E-02	1.6190E-04	4.3403E-04	1.3490E-05	1.8290E-05	1.8650E-06	1.8290E-01	1.8650E-04
oz-in-sec^2	3.8610E+02	1	2.4130E+01	6.2500E-02	1.6760E-01	5.2080E-03	7.0620E-03	7.2010E-04	7.0620E+01	7.2010E-02
lb-in^2	1.6000E+01	4.1442E-02	1	2.5900E-03	6.9444E-03	2.1583E-04	2.9260E-04	2.9840E-05	2.9260E+00	2.9840E-03
lb-in-sec^2	6.1767E+03	1.6000E+01	3.8610E+02	1	2.6810E+00	8.3333E-02	1.1300E-01	1.1520E-02	1.1300E+03	1.1520E+00
lb-ft^2	2.3040E+03	5.9666E+00	1.4400E+02	3.7300E-01	1	3.1080E-02	4.2140E-02	4.2970E-03	4.2140E+02	4.2970E-01
lb-ft-sec^2	7.4129E+04	1.9201E+02	4.6333E+03	1.2000E+01	3.2175E+01	1	1.3560E+00	1.3824E-01	1.3560E+04	1.3824E+01
kg-m^2	5.4675E+04	1.4160E+02	3.4176E+03	8.8496E+00	2.3730E+01	7.3746E-01	1	1.0190E-01	1.0000E+04	1.0190E+01
kg-m-sec^2	5.3619E+05	1.3887E+03	3.3512E+04	8.6806E+01	2.3272E+02	7.2338E+00	9.8135E+00	1	9.8130E+04	1.0000E+02
kg-cm^2	5.4675E+00	1.4160E-02	3.4176E-01	8.8496E-04	2.3730E-03	7.3746E-05	1.0000E-04	1.0191E-05	1	1.0190E-03
kg-cm-sec^2	5.3619E+03	1.3887E+01	3.3512E+02	8.6806E-01	2.3272E+00	7.2338E-02	9.8135E-02	1.0000E-02	9.8135E+02	1

Length/Distance Conversion Factors

Multiply value A by conversion factor in table to calculate value B.

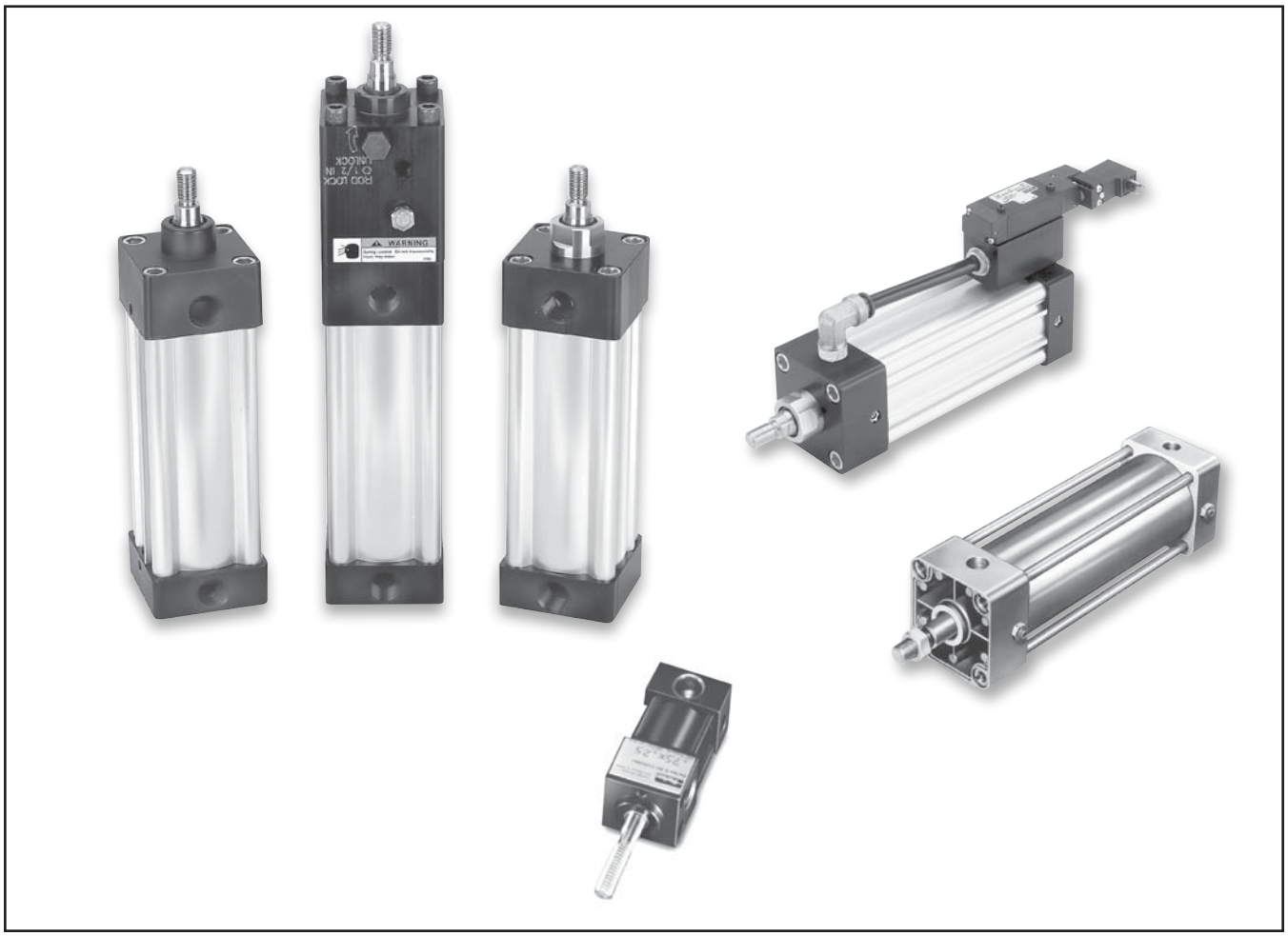
A \ B	in	ft	mm	cm	m
in	1	0.0833	25.4	2.54	0.0254
ft	12	1	304.8	30.48	0.3048
mm	0.03937	0.00328	1	0.1	0.001
cm	0.3937	0.03281	10	1	0.01
m	39.37	3.281	1000	100	1

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Tie Rod Design Pneumatic Cylinders

Inch Based Product

Section B



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Section B – Tie Rod Design Pneumatic Cylinders

B

NFPA Cylinders

3MA/4MA Series

- Lightweight Aluminum – Durable Construction
- 9 Bore Sizes: 1-1/8" through 8"
- Mounting Styles:
  3MA – 18 Standard
  4MA – 20 Standard
- 3MA Series: General Purpose Cylinder
- 4MA Series: All Purpose Cylinder with Many Options

3MAJ/4MAJ Series

- Cylinder with Manual Override Rod Lock
- 8 Bore Sizes: 1-1/2" through 8"
- Mounting Styles: 17 Standard
- Bolt-On Modularity

4MNR Series

- Multiple Piston Rods, Non-Rotating Cylinder
- 6 Bore Sizes: 1-1/8" through 4"
- Mounting Styles: 14 Standard
- Steel Tool Plate Included

ACVB Option

- Cylinder with Directional Valve Combination
- 6 Bore Sizes: 1-1/2" through 5"
- Two Different Manifold Sizes & Three Different Valve Sizes
- Utilizes 3MA and 4MA Series Cylinders with B-Series Valves

LPSO Option

- Cylinder with Linear Position Sensor Option
- 7 Bore Sizes: 2" through 8"
- Mounting Styles: 16 Standard
- Continuous Analog Position Feedback

Other Tie Rod Cylinders

S Series

- “Universal Miniature” Cylinder
- 4 Bore Sizes: 3/4", 1", 1-1/8", 1-1/4"
- Mounting Styles: Universal (Bottom Tapped) or Nose Mounted
- Single and Double Acting Versions

C Series

- Medium Duty Industrial Cylinder
- 5 Bore Sizes: 1-1/4", 1-3/4", 2-1/2", 3-5/8", 4-1/2"
- Mounting Styles: 6 Standard with Mounting Kits
- Single and Double Acting Versions

Also in Guided Cylinder Section F:

HB Series (Powered by 3MA and 4MA Cylinders)

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3MA/4MA Series

Non-Lube NFPA Air Cylinders

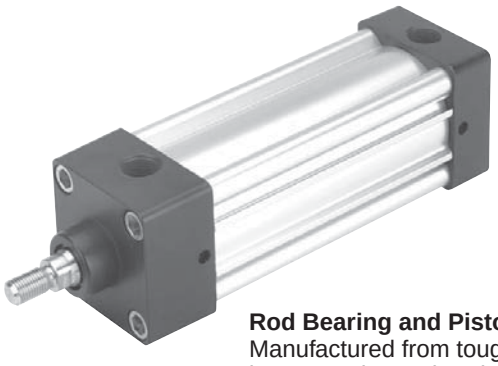


Contents

3MA Series 1-1/2" to 5" Bore B5-B10
4MA Series 1-1/2" to 5" Bore B11-B15
How to Select a 3MA or 4MA Cylinder B16
3MA Basic Dimensions – 1-1/2" to 5" Bore B17-B18
4MA Basic Dimensions – 1-1/2" to 5" Bore B19-B20
3MA/4MA Series "K" Type Dimensions – 1-1/2" to 5" Bore B21
3MA/4MA Series Detailed Dimensions B22-B28
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3MA/4MA Standard Options B105-B107
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Rod Bearing and Piston
Manufactured from tough, impact-resistant, bearing-grade materials, the composite rod bearing and piston provide excellent wear resistance. Other advantages include noise reduction without the need for bumpers and lower friction than other materials. Aluminum piston with wear band is available for bumper piston seals and other options.

Piston Seals
Carboxylated nitrile rounded-lip piston seals combine low friction with leak-free service and long service life. Optional bumper piston seals provide additional noise reduction and smooth end-of-stroke deceleration.

Piston Assembly
High strength steel fastener (composite piston) or piston rod thread (aluminum piston) connects the piston to the rod and is secured in place with anaerobic adhesive.

Ports
NPTF ports are standard.

Endcap Fasteners
Zinc plated steel endcap fasteners for tough environments. Stainless steel is available as an option.

Rod Seal
Carboxylated nitrile rounded-lip rod seal combines low friction with leak-free service and long service life.

Magnetic Piston Ring
Included as a standard feature for use with a variety of sensors.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept both Global and Mini-Global Sensors. Single corner lobe of extrusion will accept legacy 2MA sensor brackets. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction.

Adjustable Cushions
Included as a standard feature.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Heads and Caps
High-pressure die cast aluminum heads and caps are designed with the most flexible mounting platform. TEF mount is standard. Anodized for corrosion resistance.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

For a complete list of 3MA options, please see pages B6 and B16.

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B

How to Order 3MA Series Cylinders for 1-1/2" to 5" Bore

3MA cylinders can be specified by model number by using the table below.

2.00	C		J		3MA		U			1	4		A	C	6.000

Bore Size
1.50
2.00
2.50
3.25
4.00
5.00

Cushion Head End

C	Standard (cushioned head end)
Blank	Non-cushioned head end

Double Rod Cylinder [5]
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code (see table on following page).

Series
3MA

Cylinder Construction

Blank	Standard (extruded body, standard round lobe orientation) *
A	Extruded body, round lobe orientation rotated 90 degrees from standard *
N	Extruded body, round lobe orientation rotated 180 degrees from standard *
Z	Extruded body, round lobe orientation rotated 270 degrees from standard *
T	Aluminum round tube and carbon steel tie rods and nuts

* See Table on page B10. Only applies to 1-1/2" to 4" Bore.

Ports
Standard (NPTF)

Seals

Blank	Standard (nitrile seals)
E	Fluorocarbon rod wiper and rod seal only [2]

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes.

Piston Rod Number
Standard (rod code number 1) [3]

Piston Type

Blank	Standard (lipseals and magnetic ring) [5]
1	Lipseals, no magnetic ring [5]
2	Lipseals, no magnetic ring (aluminum piston)
3	Lipseals and magnetic ring (aluminum piston)
4	Bumper seals, no magnetic ring
6	Bumper seals and magnetic ring
B	Lipseals, 1/4" thick bumpers both ends [1]
H	Lipseals, 1/4" thick bumper head end [1]
C	Lipseals, 1/4" thick bumper cap end [1]
D	Lipseals and magnetic ring, 1/4" thick bumpers both ends [1]
F	Lipseals and magnetic ring, 1/4" thick bumper head end [1]
R	Lipseals and magnetic ring, 1/4" thick bumper cap end [1]

Piston Rod Thread Style

4	Small male
8	Intermediate male
9	Short female
55	For use with Split Coupler [4]
3	Special (and specify all dimensions required)

Rod Material Code

Blank	Standard
Y	17-4 PH stainless steel
J	303 stainless steel
S	316 stainless steel

Piston Rod Thread Type

A	Standard (UNF Unified Thread)
W	BSF British Fine
M	Metric (see page B106)

Cushion Cap End

C	Standard (cushioned cap end)
Blank	Non-cushioned cap end

Stroke Length
Specify stroke length required in inches.

How to order 3MA Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

1. Cylinder model number must have a Piston Type with a magnetic ring ((blank), 3, 6, D, F or R).
2. Please refer to pages M1-M9 for sensor part numbers and specifications. Global, Mini-Global, NAMUR and Weld Immune Sensors will fit the 3MA Series.
3. Style DD mounts and tie rod versions with Global Sensors will require tie rod bracket P8S-TMA0X. Please refer to page M9 for more information.

[1] Addition of 1/4" bumper results in a 1/4" stroke loss per bumper, per end. For example, a 6" stroke cylinder with 1/4" bumpers at both ends (option B) has an effective stroke of 5-1/2".

[2] Used for external chemical compatibility applications, not high temperature.

[3] Review Piston Rod Selection Chart on page A14 to determine proper piston rod diameter. (Note: 3MA has only one rod diameter per bore size, so proper piston rod diameter from chart result may lead to bore size change). For oversize rod within the same bore size, please see 4MA section.

[4] For additional information regarding this style, refer to page B105. If non-standard Rod Material Code is required with this option, please place an "S" for special in Special Modification field and specify rod material in the item notes.

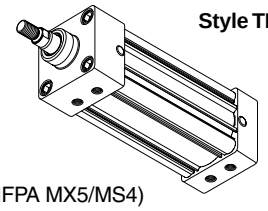
[5] Double rod cylinders not available with composite piston type.

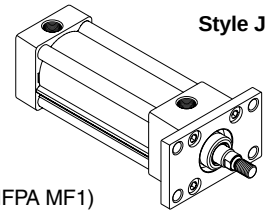
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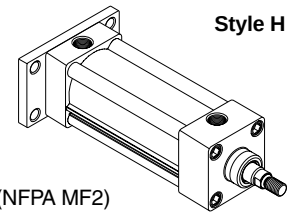
3MA Series Mounting Styles for 1-1/2" to 5" Bore

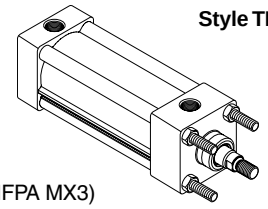
Mounting Code	NFPA Mounting	Description	Available Bore Sizes 3MA
TEF	MX5/MS4	Sleeve Nut with Side Tap (standard mount)	1-1/2 - 5
T	MX0	No Mount (same construction as TEF)	1-1/2 - 5
TE	MX5	Sleeve Nut (same construction as TEF)	1-1/2 - 5
F	MS4	Side Tap (same construction as TEF)	1-1/2 - 5
J	MF1	Head Rectangular Flange	1-1/2 - 5
H	MF2	Cap Rectangular Flange	1-1/2 - 5
TB	MX3	Tie Rods Extended Head End	1-1/2 - 5
TC	MX2	Tie Rods Extended Cap End	1-1/2 - 5
TD	MX1	Tie Rods Extended Both Ends	1-1/2 - 5
C	MS2	Side Lug	1-1/2 - 5
CB	MS1	Side End Angle	1-1/2 - 5
G	MS7	Side End Lug	1-1/2 - 4
NB	N/A	Base Bar	1-1/2 - 4
BB	MP1	Cap Fixed Clevis	1-1/2 - 5
BC	MP2	Cap Detachable Clevis	1-1/2 - 5
BE	MP4	Cap Detachable Eye	1-1/2 - 4
DD	MT4	Intermediate Trunnion	1-1/2 - 5
KTEF*	MDX5/MDS4	Double Rod End, TEF Mount	1-1/2 - 5

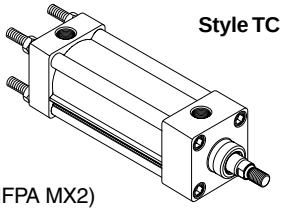
*Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page B19).

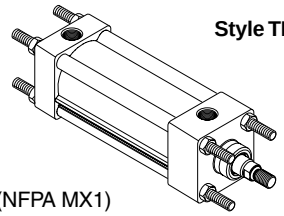
Standard Mount
Style TEF

(NFPA MX5/MS4)

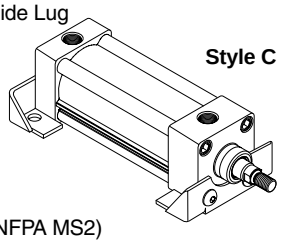
Head Rectangular Flange
Style J

(NFPA MF1)

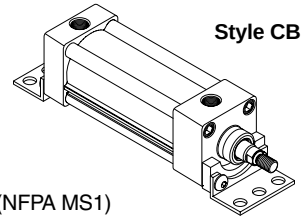
Cap Rectangular Flange
Style H

(NFPA MF2)

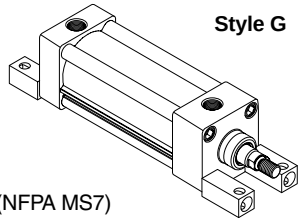
Tie Rods Ext. Head End
Style TB

(NFPA MX3)

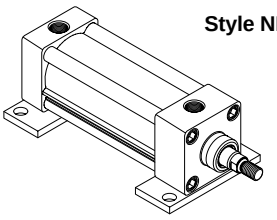
Tie Rods Ext. Cap End
Style TC

(NFPA MX2)

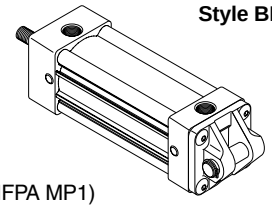
Tie Rods Ext. Both Ends
Style TD

(NFPA MX1)

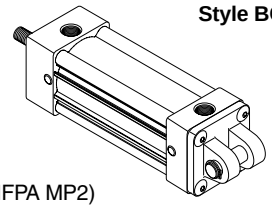
Side Lug
Style C

(NFPA MS2)

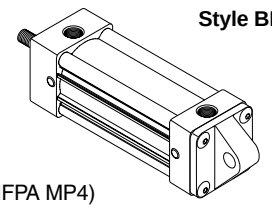
Side End Angle
Style CB

(NFPA MS1)

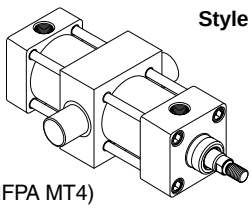
Side End Lug
Style G

(NFPA MS7)

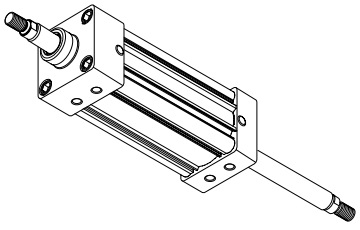
Base Bar Mount
Style NB


Cap Fixed Clevis
Style BB

(NFPA MP1)

Cap Detachable Clevis
Style BC

(NFPA MP2)

Cap Detachable Eye
Style BE

(NFPA MP4)

Intermediate Trunnion
Style DD

(NFPA MT4)

Double Rod End
Style KTEF

(NFPA MDX0)

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B

General Specifications

- NFPA interchangeable
- Bore sizes – 1-1/2", 2", 2-1/2", 3-1/4", 4" and 5"
- Strokes – available in any practical stroke length
- Rod diameters – 5/8" and 1"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – standard and adjustable at both ends, optional non-cushioned
- Operating pressure – 250 PSIG (17 Bar) maximum air service
- Media – dry, filtered air
- Temperature range – -10°F to +165°F (-23°C to +74°C)
- Mounting styles – 18 standard styles
- One porting style – NPTF
- RoHS compliant

For material options, including seals and piston rods, please see Material Specifications on next page.

Cylinder Weights – 3MA Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 3MA	
		Base Wt. (lbs.)	Per Inch (lbs.)
1-1/2	5/8	1.57	0.20
2	5/8	2.13	0.21
2-1/2	5/8	2.87	0.23
3-1/4	1	5.73	0.42
4	1	7.51	0.49
5	1	10.99	0.61

Mounting Weight Adders

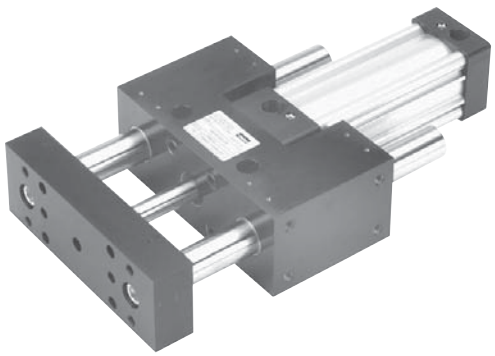
Bore (inch)	Weight (lbs) by Mounting Style						
	J, H	BB	CB, G	DD	BE	C	BC
1-1/2	0.51	0.15	0.36	1.70	0.23	0.15	0.20
2	0.76	0.26	065	2.38	0.32	0.15	0.29
2-1/2	1.13	0.38	1.05	3.00	0.42	0.15	0.41
3-1/4	2.76	0.98	1.38	5.35	1.26	0.35	1.06
4	4.05	1.35	2.20	6.75	1.62	0.35	1.49
5	6.46	1.20	4.29	8.77	N/A	0.57	2.41

Standard Cushion Position

Mounting Code	Position
All 3MA mounts	2

Standard Port Sizes

Bore	NPTF
1-1/2	3/8
2	3/8
2-1/2	3/8
3-1/4	1/2
4	1/2
5	1/2



For a guided version of the 3MA Series, please see the HB Series in Section F.

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Material Specifications – Standard Temperatures and Applications

Head and cap ..... Black anodized aluminum alloy
Head and cap screws ..... Zinc plated steel alloy
Cylinder body ..... Clear anodized aluminum alloy
Piston rod ..... Case-hardened, chrome plated carbon steel
Rod seal ..... Carboxylated nitrile (Nitroxile)
Rod wiper ..... Molythane
Rod bearing ..... Composite
Needle valve inserts ..... Composite
Piston ..... Composite (standard)
Aluminum alloy (optional)
Piston seals ..... Carboxylated nitrile (Nitroxile)
Piston bearing ..... Composite (for standard piston)
MolyGard™ (for aluminum piston)
Magnetic ring ..... Plastic-bound magnetic material
Piston fastener ..... Zinc plated steel alloy (for composite piston)
Piston rod for aluminum piston
O-rings ..... Nitrile
End seals ..... Nitrile
Cushion seals ..... Urethane
Cushion needle valves ..... Composite
Tie-rods/studs ..... Blackened carbon steel (some mounts)
Tie-rod nuts ..... Steel alloy, SAE J995 Grade 8 (some mounts)

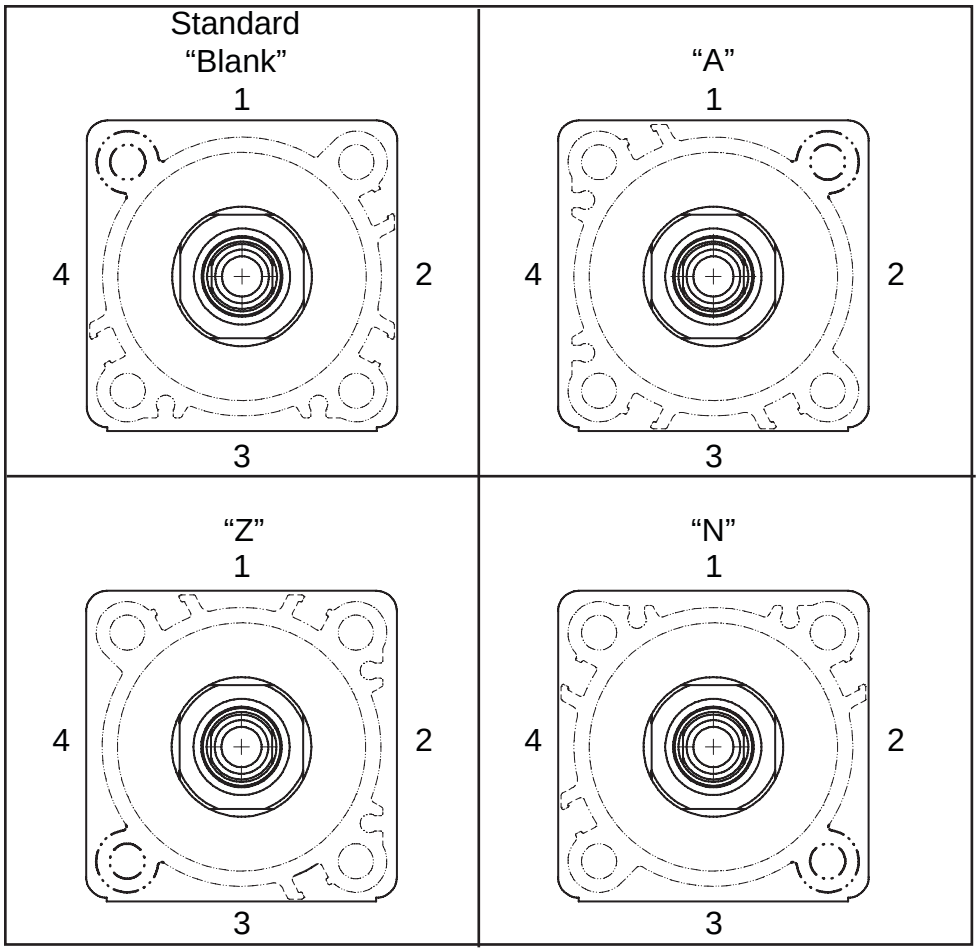
Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon rod wiper and rod seal for external chemical compatibility
	Other seal options available, please consult factory
Bumper piston seal options	Carboxylated nitrile (Nitroxile) for standard temperatures
Piston rod material options	Case-hardened, chrome plated carbon steel (standard)
	17-4 PH stainless steel, chrome plated
	303 stainless steel, chrome plated
	316 stainless steel, chrome plated
	(for stainless steel without chrome plating, please consult factory)
1/4" thick bumpers option	Urethane

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B

3MA/4MA Extruded Cylinder Body Orientation Options*



* Only applies to 1-1/2" to 4" Bore

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Piston
Manufactured from tough, impact-resistant, bearing-grade materials, the composite piston provides excellent wear resistance. Other advantages include noise reduction without the need for bumpers and lower friction than other materials. Aluminum piston with wear band (shown) is available for bumper piston seals, hydraulic service and other options.

Piston Assembly
High strength steel fastener or piston rod thread connects the piston to the rod and is secured in place with anaerobic adhesive.

Ports
NPTF ports are standard. Other port styles available.

Piston Seals
Carboxylated nitrile rounded-lip piston seals combine low friction with leak-free service and long service life. Optional bumper piston seals provide additional noise reduction and smooth end-of-stroke deceleration.

Endcap Fasteners
Zinc plated steel endcap fasteners for tough environments. Stainless steel is available as an option.

Rod Seal
Carboxylated nitrile rounded-lip rod seal combines low friction with leak-free service and long service life.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Magnetic Piston Ring
Included as a standard feature for use with a variety of sensors.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept both Global and Mini-Global Sensors. Single corner lobe of extrusion will accept legacy 2MA sensor brackets. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction.

Adjustable Cushions Available

Heads and Caps
High-strength aluminum heads and caps are designed with the most flexible mounting platform. TEF mount is standard. Using our proprietary extrusion, we can offer customization of the endcaps for unique designs, including extra ports, duplex, tandem and many special mountings. Anodized for corrosion resistance.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

Rod Gland/Bearing
Threaded bronze rod gland is externally removable, without cylinder disassembly, for easy maintenance. Machined flats permit the use of common tools for removal and installation. Options include HI LOAD design for side load conditions and metallic wiper design for extremely tough rod contaminant/adherent applications.

For a complete list of 4MA options, please see pages B12 and B16.

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B

How to Order 4MA Series Cylinders for 1-1/2" to 5" Bore

4MA cylinders can be specified by model number by using the table below.

2.00			J		4MA		U			1	4		A		6.000

Bore Size

1.50 [1]
2.00
2.50
3.25
4.00
5.00

Double Rod Cylinder [12]

Specify "K" only if double rod cylinder is required.

Mounting Style

Specify mounting style code (see table on following page).

Series

4MA	Air service
4ML	Hydraulic service [2]

Ports

U	NPTF
R	BSPP
B	BSPT
T	SAE

Piston Rod Number

Specify rod code number for required diameter. [8, 2]

Stroke Length

Specify stroke length required in inches. [11]

Cushion Cap End

Blank	Non-cushioned cap end
C	Cushioned cap end (not available for 4ML)

Cushion Head End

Blank	Non-cushioned head end
C	Cushioned head end (n/a for 1.50" bore with 1" rod or 4ML)

Seals

Blank	Standard (nitrile seals)
V	Fluorocarbon seals [4]
E	Fluorocarbon rod wiper and rod seal only [5]
4	Low temperature seals [4]
M	Metallic rod wiper, nitrile seals [6]

Piston Rod Thread Type

A	Standard (UNF Unified Thread)
W	BSF British Fine
M	Metric (see page B106)

Cylinder Construction

Blank	Standard (extruded body, standard round lobe orientation) *
A	Extruded body, round lobe orientation rotated 90 degrees from standard *
N	Extruded body, round lobe orientation rotated 180 degrees from standard *
Z	Extruded body, round lobe orientation rotated 270 degrees from standard *
T	Aluminum round tube and carbon steel tie rods and nuts

* See Table on page B10. Only applies to 1-1/2" to 4" Bore.

Specia Modification

Specify "S" only for special modification other than rod end, and then describe modification in item notes. (Includes 4MA with Linear Position Sensor Option) [7]

Piston Rod Thread Style

4	Small male
8	Intermediate male
9	Short female
55	For use with Split Coupler [9]
3	Special (and specify all dimensions required)

Rod Material and Gland Code

Blank	Standard rod and gland
H	Standard rod and HI LOAD gland
Y	17-4 PH stainless steel rod and standard gland
Z	17-4 PH stainless steel rod and HI LOAD gland
J	303 stainless steel rod and standard gland [10]
K	303 stainless steel rod and HI LOAD gland [10]
S	316 stainless steel rod and standard gland [10]
T	316 stainless steel rod and HI LOAD gland [10]

Piston Type [2]

Blank	Standard (lipseals and magnetic ring) [12]
1	Lipseals, no magnetic ring [12]
2	Lipseals, no magnetic ring (aluminum piston)
3	Lipseals and magnetic ring (aluminum piston) (standard for 4ML)
4	Bumper seals, no magnetic ring
6	Bumper seals and magnetic ring
B	Lipseals, 1/4" thick bumpers both ends [3]
H	Lipseals, 1/4" thick bumper head end [3]
C	Lipseals, 1/4" thick bumper cap end [3]
D	Lipseals and magnetic ring, 1/4" thick bumpers both ends [3]
F	Lipseals and magnetic ring, 1/4" thick bumper head end [3]
R	Lipseals and magnetic ring, 1/4" thick bumper cap end [3]

1 Not available with Linear Position Sensor Option (LPSO).

2 Piston Types (blank), 1, 4 and 6 not available for 4ML. Piston Types (blank) and 1 not available for oversize rod numbers 2 and 3. Seals option V only available with Piston Types 2 and 4. Seals option 4 only available with Piston Types 2 and 3.

3 Addition of 1/4" bumper results in a 1/4" stroke loss per bumper, per end. For example, a 6" stroke cylinder with 1/4" bumpers at both ends (option B) has an effective stroke of 5-1/2".

4 Reed and solid-state sensors only available with standard seals or options E and M. See footnote 2.

5 Used for external chemical compatibility applications, not high temperature.

6 If fluorocarbon seals are required with this option, please place an "S" for special in the Special Modification field and specify the "fluorocarbon seals and metallic rod wiper" in the item notes.

7 For Linear Position Sensor Option (LPSO), please include the following information for the Special Modification item notes:
   a. Sensor part number (see pages B100-B104)
   b. Sensor position
   c. Port position (if other than position 1)
   d. Length of stop tubing, gross stroke and net stroke (if required)
   Also, Piston Type option (blank), 3, 6, D, F or R is required.

8 Review Piston Rod Selection Chart on page A14 to determine proper piston rod diameter.

9 For additional information regarding this style, refer to page B105. If non-standard Rod Material and Gland Code is required with this option, please place an "S" for special in Special Modification field and specify Rod Material and Gland Code in the item notes.

10 Not available for 4ML.

11 If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes. Not available with Piston Types (blank) and 1.

12 Double rod cylinders not available with composite piston type.

How to order 4MA/4ML Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

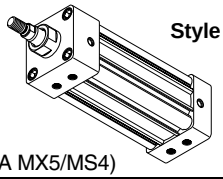
1. Cylinder model number must have a Piston Type with a magnetic ring ((blank), 3, 6, D, F or R).
2. Please refer to pages M1-M9 for sensor part numbers and specifications. Global, Mini-Global, NAMUR and Weld Immune Sensors will fit the 4MA/4ML Series.
3. Style DD mounts and tie rod versions with Global Sensors will require tie rod bracket P8S-TMA0X. Please refer to page M9 for more information.

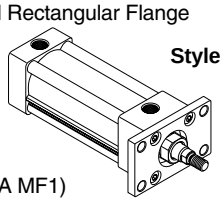
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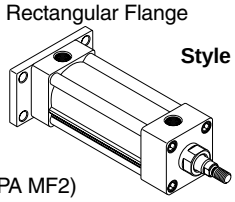
4MA Series Mounting Styles for 1-1/2" to 5" Bore

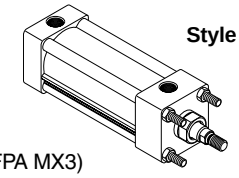
Mounting Code	NFPA Mounting Style	Description	Available Bore Sizes		
			4MA/4ML	4MA/4ML-LPSO w/o Stop Tube	4MA/4ML-LPSO w/Stop Tube
TEF	MX5/MS4	Sleeve Nut with Side Tap (standard mount)	1-1/2 - 5*	2 - 5	2 - 5
T	MX0	No Mount (same construction as TEF)	1-1/2 - 5	2 - 5	2 - 5
TE	MX5	Sleeve Nut (same construction as TEF)	1-1/2 - 5	2 - 5	2 - 5
F	MS4	Side Tap (same construction as TEF)	1-1/2 - 5*	2 - 5	2 - 5
J	MF1	Head Rectangular Flange	1-1/2 - 5	2 - 5**	2 - 5
H	MF2	Cap Rectangular Flange	1-1/2 - 5	2 - 5**	2 - 5**
TB	MX3	Tie Rods Extended Head End	1-1/2 - 5	-	2 - 5
TC	MX2	Tie Rods Extended Cap End	1-1/2 - 5	-	-
TD	MX1	Tie Rods Extended Both Ends	1-1/2 - 5	-	-
C	MS2	Side Lug	1-1/2 - 5	2 - 5	2 - 5
CB	MS1	Side End Angle	1-1/2 - 5	2 - 5	2 - 5
G	MS7	Side End Lug	1-1/2 - 4*	2 - 4	2 - 4
NB	N/A	Base Bar	1-1/2 - 4*	2 - 4	2 - 4
BB	MP1	Cap Fixed Clevis	1-1/2 - 5	2 - 5**	2 - 5**
BC	MP2	Cap Detachable Clevis	1-1/2 - 5	2 - 5**	2 - 5**
BE	MP4	Cap Detachable Eye	1-1/2 - 5	2 - 5**	2 - 5**
D	MT1	Head Trunnion	1-1/2 - 5*	2 - 5	2 - 5
DB	MT2	Cap Trunnion	1-1/2 - 5	2 - 5**	2 - 5**
DD	MT4	Intermediate Trunnion	1-1/2 - 5	-	-
KTEF***	MDX5/MDS4	Double Rod End, TEF Mount	1-1/2 - 5	2 - 5	2 - 5

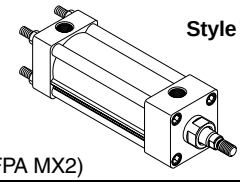
* Mounts TEF, F, G, NB and D not available for 1-1/2" bore with 1" rod.
** May interfere with mounting. Please provide clearance for Linear Position Sensor overhang (see page B101).

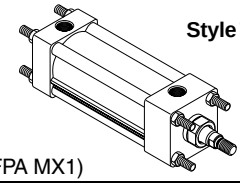
Standard Mount
Style TEF

(NFPA MX5/MS4)

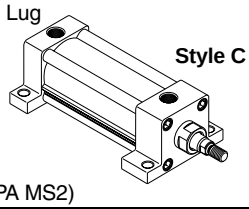
Head Rectangular Flange
Style J

(NFPA MF1)

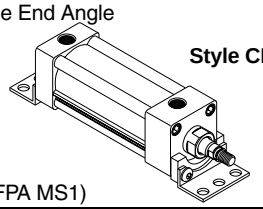
Cap Rectangular Flange
Style H

(NFPA MF2)

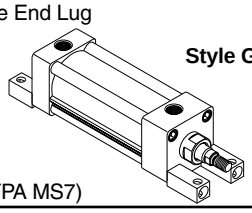
Tie Rods Ext. Head End
Style TB

(NFPA MX3)

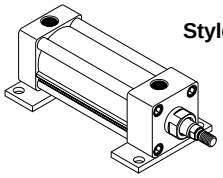
Tie Rods Ext. Cap End
Style TC

(NFPA MX2)

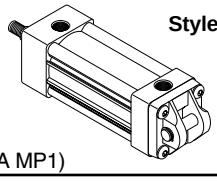
Tie Rods Ext. Both Ends
Style TD

(NFPA MX1)

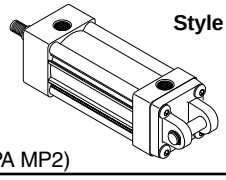
Side Lug
Style C

(NFPA MS2)

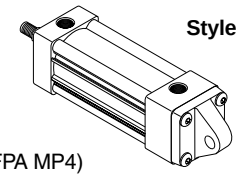
Side End Angle
Style CB

(NFPA MS1)

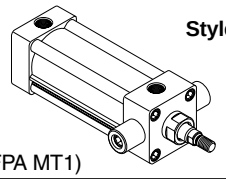
Side End Lug
Style G

(NFPA MS7)

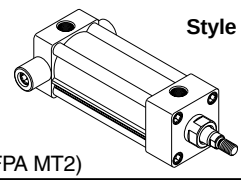
Base Bar Mount
Style NB

(NFPA MP1)

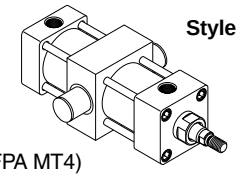
Cap Fixed Clevis
Style BB

(NFPA MP1)

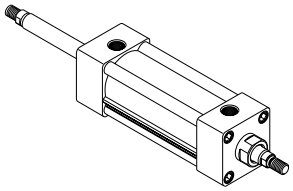
Cap Detachable Clevis
Style BC

(NFPA MP2)

Cap Detachable Eye
Style BE

(NFPA MP4)

Head Trunnion
Style D

(NFPA MT1)

Cap Trunnion
Style DB

(NFPA MT2)

Intermediate Trunnion
Style DD

(NFPA MT4)

Double Rod End
Style KTEF

(NFPA MDX0)

***Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page B21).

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B

General Specifications

- NFPA interchangeable
- Bore sizes – 1-1/2", 2", 2-1/2", 3-1/4", 4" and 5"
- Strokes – available in any practical stroke length
- Rod diameters – 5/8", 1" and 1-3/8"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – optional and adjustable at either end or both ends (n/a for 4ML Hydraulic Version)
- Operating pressure – 4MA = 250 PSIG (17 Bar) maximum air service
  4ML = 400 PSIG (27 Bar) maximum hydraulic service
- Media 4MA = dry, filtered air
  4ML = filtered hydraulic oil
- Temperature range –
  -10°F to +165°F (-23°C to +74°C) with standard seals
  -10°F to +250°F (-23°C to +121°C) with fluorocarbon seals option
  -50°F to +150°F (-46°C to +66°C) with low temperature seals option
- Mounting styles – 20 standard styles
- RoHS compliant

For material options, including seals, piston rods and glands, please see Material Specifications on next page.

Cylinder Weights – 4MA/4ML Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 4MA/4ML		No Mount Double Rod	
		Base Wt. (lbs.)	Per Inch (lbs.)	Base Wt. (lbs.)	Per Inch (lbs.)
1-1/2	0.625	1.73	0.20	2.16	0.28
2	0.625	2.40	0.21	3.05	0.30
	1.00	2.99	0.35	4.34	0.58
2-1/2	0.625	3.25	0.23	3.96	0.31
	1.00	4.06	0.37	5.74	0.60
3-1/4	1.00	6.45	0.42	7.65	0.64
	1.375	7.93	0.62	11.46	1.05
4	1.00	8.80	0.49	10.32	0.71
	1.375	10.29	0.69	14.37	1.12
5	1.00	13.20	0.61	15.84	0.84
	1.375	14.72	0.81	18.89	1.24

Mounting Weight Adders

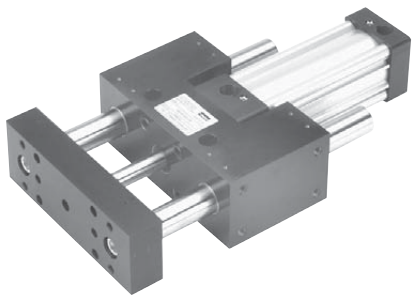
Bore (inch)	Weight (lbs) by Mounting Style							
	J, H	D, DB	BB	CB, G	DD	BE	C	BC
1-1/2	0.51	0.50	0.15	0.36	1.70	0.23	0.15	0.20
2	0.76	0.50	0.26	065	2.38	0.32	0.15	0.29
2-1/2	1.13	0.50	0.38	1.05	3.00	0.42	0.15	0.41
3-1/4	2.76	0.50	0.98	1.38	5.35	1.26	0.35	1.06
4	4.05	0.50	1.35	2.20	6.75	1.62	0.35	1.49
5	6.46	0.50	1.20	4.29	8.77	1.26	0.57	2.41

Standard Cushion Position

Mounting Code	Position
All except D, DB, DD	2
D, DB, DD	3

Standard Port Sizes

Bore	NPTF	BSPT	BSPP	SAE
1-1/2	3/8	Rc3/8	G3/8	6
2	3/8	Rc3/8	G3/8	6
2-1/2	3/8	Rc3/8	G3/8	6
3-1/4	1/2	Rc1/2	G1/2	10
4	1/2	Rc1/2	G1/2	10
5	1/2	Rc1/2	G1/2	10



For a guided version of the 4MA or 4ML Series, please see the HB Series in Section F.

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Material Specifications – Standard Temperatures and Applications

Head and cap	Black anodized aluminum alloy
Head and cap screws	Zinc plated steel alloy
Cylinder body	Clear anodized aluminum alloy
Piston rod	Case-hardened, chrome plated carbon steel
Rod seal	Carboxylated nitrile (Nitroxile)
Rod wiper	Molythane
Rod bearing (gland)	Bronze alloy
Piston	Composite (standard) Aluminum alloy (optional)
Piston seals	Carboxylated nitrile (Nitroxile)
Piston bearing	Composite (for standard piston) MolyGard™ (for aluminum piston)
Magnetic ring	Plastic-bound magnetic material
Piston fastener	Zinc plated steel alloy (for composite piston) Piston rod for aluminum piston
O-rings	Nitrile
End seals	Nitrile
Cushion seals	Urethane
Cushion needle valves	Stainless steel
Tie-rods/studs	Blackened carbon steel (some mounts)
Tie-rod nuts	Steel alloy, SAE J995 Grade 8 (some mounts)

4MA Options – Material and Part Changes

High temperatures (-10°F to +250°F)	All seals and wiper are fluorocarbon Aluminum piston only (without magnetic ring)
Low temperatures (-50°F to +150°F)	Rod seal, piston seals, o-rings and end seals are low temperature-rated nitrile Aluminum piston only

4ML Hydraulic Version – Material and Part Changes

Hydraulic service (general)	Aluminum piston only (all temperatures) Cushions and bumper piston seals not available
Hydraulic service (std temp)	Polyurethane TS-2000 rod seal and nitrile piston seals (for hydraulic use)
Hydraulic service (high temp)	Fluorocarbon TS-2000 rod seal; wiper and all seals are fluorocarbon (for hydraulic use)

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon for high temperatures or chemical compatibility Other seal options available, please consult factory
Bumper piston seal options (4MA only, n/a for 4ML)	Carboxylated nitrile (Nitroxile) for standard temperatures Fluorocarbon for high temperatures or chemical compatibility
1/4" thick bumpers option	Urethane
Piston rod material options	Case-hardened, chrome plated carbon steel (standard) 17-4 PH stainless steel, chrome plated 303 stainless steel, chrome plated (n/a for 4ML) 316 stainless steel, chrome plated (n/a for 4ML) (for stainless steel without chrome plating, please consult factory)
HI LOAD gland option	Composite bearing pressed into bronze alloy gland
Metallic rod scraper option	Dual high strength bronze wipers with PTFE (5/8" rod only) or fluorocarbon energizer

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How to Select a 3MA or 4MA Cylinder

Parker cylinders are available based on air or hydraulic operating pressure. The many styles, sizes and optional features available assure that your application requirements are precisely met. To select a cylinder, follow these simple steps:

B

Step 1 - **Determine the correct cylinder bore size** necessary to achieve required force using the available operating pressure.

Step 2 - **Determine the series cylinder to use**, based on operating pressure.

Step 3 - **Turn to the appropriate cylinder selection section.** Select the mounting style that fits your installation needs. Determine the bore and rod sizes available for the model you select. Then complete model selection.

- Choose a rod end style and the desired rod end accessories.
- Size the cylinder to meet your application requirements.

Step 4 - **Consider the following conditions** which may require further modifications to the cylinder you have selected.

Application Condition	Check the Following
Quick Starts or Stops	Confirm that determined thrust is sufficient to accelerate or decelerate cylinder and load within prescribed distance. Optional cushions should be used to reduce shock during deceleration, check that peak pressures will be within tolerable limits.
Long Push Stroke	Check whether stop tube (4MA with aluminum piston only) is required to prevent excessive bearing loads and wear.
High-column Loading Long Push Stroke	Determine if standard size piston rod is strong enough to accommodate intended load. See Application Engineering section for recommendations.
Long Horizontal Stroke	Determine if standard size piston rod is strong enough to accommodate intended load.
High Operating Temperatures	For temperatures between 165°F and 250°F use 4MA or 4ML cylinder with high temperature seals.

General Options and Modifications

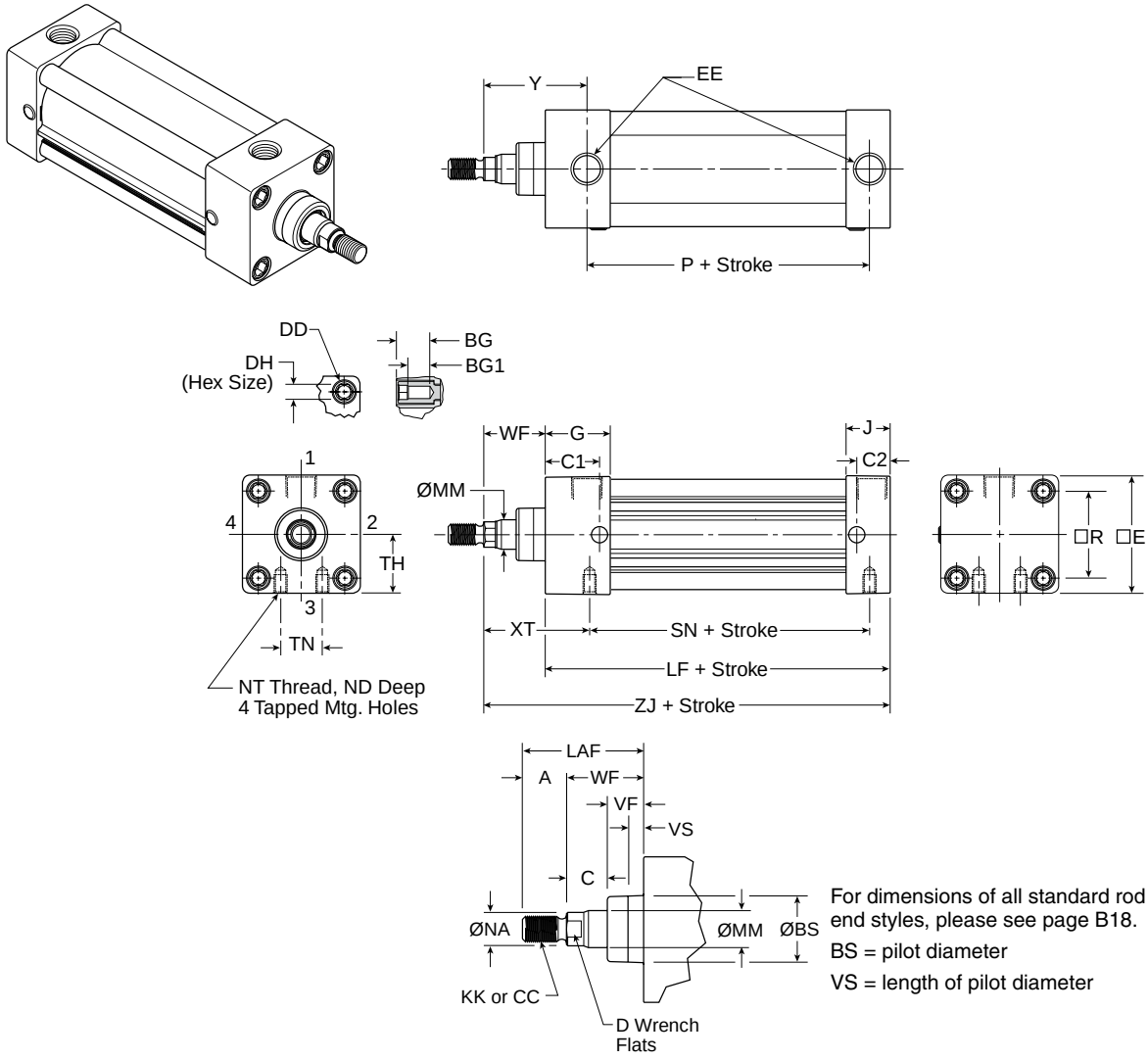
3MA
- Non-Cushioned (adjustable cushions standard)
- Non-Magnetic piston (magnetic ring standard)
- Piston Bumper Seals
- Piston Bumpers (1/4" thick)
- Port Relocation (cushions will follow)
- Double Rod End
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Fluorocarbon Rod Wiper and Rod Seal only
- Mixed Mountings
- Round Tube and Tie Rod Construction
- Stainless Steel Fasteners/Tie Rods
- Hydro-Check unit for smooth hydraulic control
- Air Cylinder/Valve Combination (ACVB)
- Adjustable Point Sensors (order separately)
- Rod lock version (see 3MAJ)

4MA
- Adjustable Cushions
- Non-Magnetic Piston (magnetic ring standard)
- Piston Bumper Seals
- Piston Bumpers (1/4" thick)
- Port and Adjustable Cushion Relocation
- Port Thread Styles
- Multiple Ports

4MA (continued)
- Special Heads, Caps, Pistons and Mounts
- Double Rod End
- Oversize Rod Diameters
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Fluorocarbon Rod Wiper and Rod Seal only
- Fluorocarbon Seals (all cylinder seals)
- Metallic Rod Wiper
- HI LOAD Gland Assembly
- Stop Tube
- Mixed Mountings
- Round Tube and Tie Rod Construction
- Stainless Steel Fasteners/Tie Rods
- Shock Absorber on Cap End
- NuCushion Bumpers
- LECTROFLUOR® Coating
- Hydro-Check unit for smooth hydraulic control
- Air Cylinder/Valve Combination (ACVB)
- Adjustable Point Sensors (order separately)
- Continuous Linear Position Sensing (LPSO)
- High Temperature Service (to +250°F)
- Low Temperature Service (to -50°F)
- Hydraulic Service (4ML) (400 PSIG)
- Rod lock version (see 4MAJ)

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3MA Single Rod Dimensioned Drawings for 1-1/2" to 5" Bore Size (Styles TEF, T, TE and F)



For dimensions of all standard rod end styles, please see page B18.

BS = pilot diameter

VS = length of pilot diameter

3MA Cylinder Dimensions – Styles TEF, T, TE and F

Bore Size	Rod No.	Rod Dia. MM	Thread		A	AA	BG	BG1	+.000 -.004 BS	C	C1	C2	D	DD	DH	E	EE (NPTF)	G
			Style 8 CC	Style 4 & 9 KK														
1-1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	0.562	0.374	1.124	0.385	1.000	0.500	1/2	1/4-28	1/4	2.000	3/8	1.438
2	1	5/8	1/2-20	7/16-20	0.750	2.600	0.562	0.362	1.124	0.385	1.148	0.711	1/2	5/16-24	5/16	2.500	3/8	1.375
2-1/2	1	5/8	1/2-20	7/16-20	0.750	3.100	0.562	0.362	1.124	0.385	1.117	0.711	1/2	5/16-24	5/16	3.000	3/8	1.344
3-1/4	1	1	7/8-14	3/4-16	1.125	3.900	0.700	0.500	1.499	0.510	1.350	0.881	7/8	3/8-24	3/8	3.750	1/2	1.594
4	1	1	7/8-14	3/4-16	1.125	4.700	0.700	0.500	1.499	0.510	1.350	0.881	7/8	3/8-24	3/8	4.500	1/2	1.594
5	1	1	7/8-14	3/4-16	1.125	5.800	0.781	0.531	1.499	0.510	1.350	0.975	7/8	1/2-20	1/2	5.500	1/2	1.594

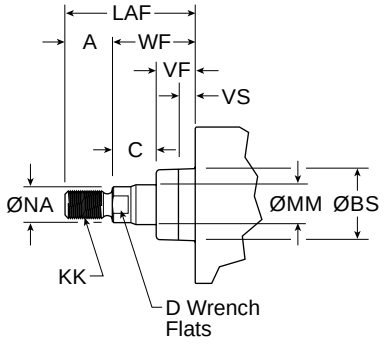
Bore Size	Rod No.	Rod Dia. MM	J	LAF	NA	ND	NT	R	+.005 -.005 TH	TN	VF	VS	WF	XT	Y	Add Stroke			
																LF	P	SN	ZJ
1-1/2	1	5/8	0.938	1.750	0.563	0.375	1/4-20	1.430	0.993	0.625	0.615	-	1.000	1.938	1.875	3.625	2.313	2.250	4.625
2	1	5/8	0.938	1.750	0.563	0.438	5/16-18	1.840	1.243	0.875	0.615	0.250	1.000	1.938	1.875	3.625	2.313	2.250	4.625
2-1/2	1	5/8	0.938	1.750	0.563	0.625	3/8-16	2.190	1.493	1.250	0.615	0.250	1.000	1.938	1.938	3.750	2.375	2.375	4.750
3-1/4	1	1	1.125	2.500	0.938	0.750	1/2-13	2.760	1.868	1.500	0.865	0.250	1.375	2.438	2.438	4.250	2.625	2.625	5.625
4	1	1	1.125	2.500	0.938	0.750	1/2-13	3.320	2.243	2.063	0.865	0.250	1.375	2.438	2.438	4.250	2.625	2.625	5.625
5	1	1	1.219	2.500	0.938	0.938	5/8-11	4.100	2.743	2.688	0.865	0.250	1.375	2.438	2.438	4.500	2.875	2.875	5.875

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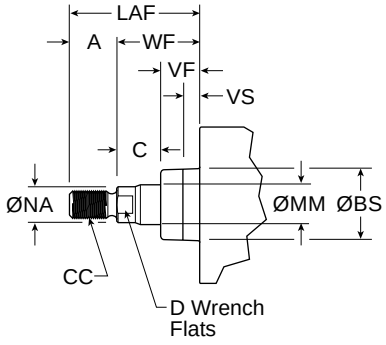
B

3MA Rod End Dimensions – 1-1/2" to 5" Bore Size

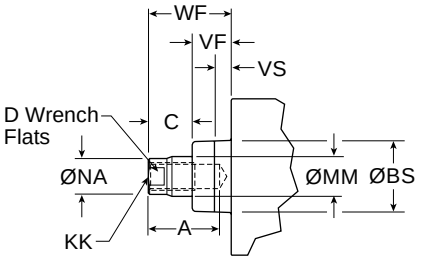
Thread Style 4
(NFPA Style SM)
Small Male



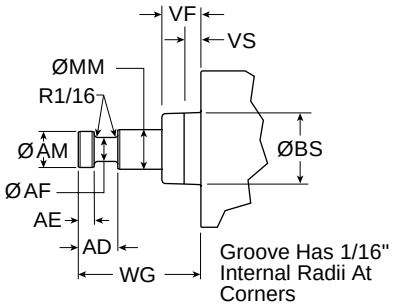
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B105 for more information)



Applies to all rod ends:
BS = pilot diameter
VS = length of pilot diameter

Rod End Dimensions

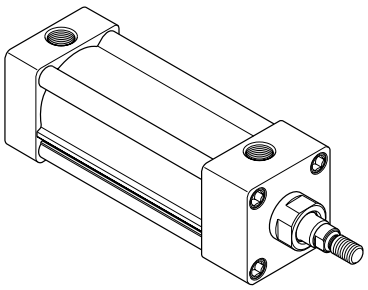
Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.004 BS	C	D	LAF	NA	VF	VS	WF	WG
1-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1.750	0.563	0.615	-	1.000	1.750
2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1.750	0.563	0.615	0.250	1.000	1.750
2-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1.750	0.563	0.615	0.250	1.000	1.750
3-1/4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	2.500	0.938	0.865	0.250	1.375	2.375
4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	2.500	0.938	0.865	0.250	1.375	2.375
5	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	2.500	0.938	0.865	0.250	1.375	2.375

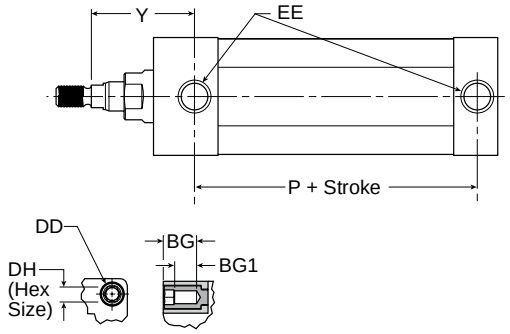
Thread Style 3 - "Special Thread"

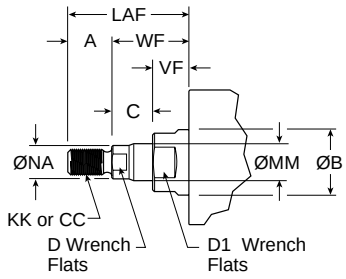
Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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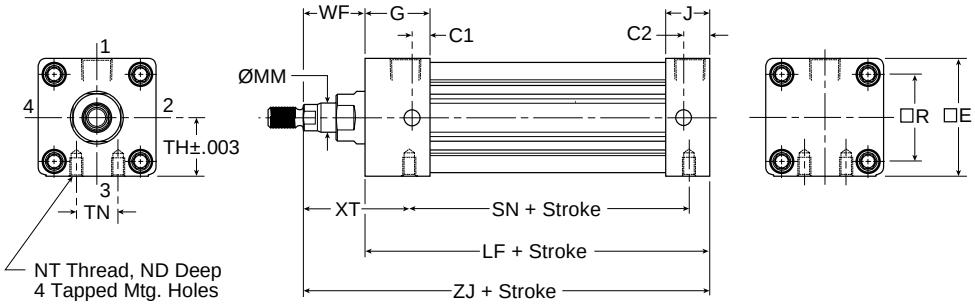
4MA Single Rod Dimensioned Drawings for 1-1/2" to 5" Bore Size (Styles TEF, T, TE and F)







For dimensions of all standard rod end styles, please see page B20.



1-1/2" bore with 1" rod is TE mount, F mount not available

1-1/2" bore with 1" rod cannot have a cushion at head end

4MA Cylinder Dimensions – Styles TEF, T, TE and F

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AA	+.000 -.002 B	BG	BG1	C	C1	C2	D	D1	DD	DH	E	EE (NPTF)	G
1-1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	1.124	0.562	0.374	0.385	1.000	0.500	1/2	1	1/4-28	1/4	2.000	3/8	1.438
	2	1	7/8-14	3/4-16	1.125	2.020	1.499	0.562	0.374	0.510	–	0.500	7/8	1-3/8	1/4-28	1/4	2.000	3/8	1.438
2	1	5/8	1/2-20	7/16-20	0.750	2.600	1.124	0.562	0.362	0.385	1.000	0.562	1/2	1	5/16-24	5/16	2.500	3/8	1.375
	3	1	7/8-14	3/4-16	1.125	2.600	1.499	0.562	0.362	0.510	1.000	0.562	7/8	1-3/8	5/16-24	5/16	2.500	3/8	1.375
2-1/2	1	5/8	1/2-20	7/16-20	0.750	3.100	1.124	0.562	0.362	0.385	1.000	0.594	1/2	1	5/16-24	5/16	3.000	3/8	1.344
	3	1	7/8-14	3/4-16	1.125	3.100	1.499	0.562	0.362	0.510	1.000	0.594	7/8	1-3/8	5/16-24	5/16	3.000	3/8	1.344
3-1/4	1	1	7/8-14	3/4-16	1.125	3.900	1.499	0.700	0.500	0.510	1.188	0.719	7/8	1-3/8	3/8-24	3/8	3.750	1/2	1.594
	3	1-3/8	1-1/4-12	1-14	1.625	3.900	1.999	0.700	0.500	0.635	1.188	0.719	1-1/8	1-7/8	3/8-24	3/8	3.750	1/2	1.594
4	1	1	7/8-14	3/4-16	1.125	4.700	1.499	0.700	0.500	0.510	1.188	0.719	7/8	1-3/8	3/8-24	3/8	4.500	1/2	1.594
	3	1-3/8	1-1/4-12	1-14	1.625	4.700	1.999	0.700	0.500	0.635	1.188	0.719	1-1/8	1-7/8	3/8-24	3/8	4.500	1/2	1.594
5	1	1	7/8-14	3/4-16	1.125	5.800	1.499	0.781	0.531	0.510	1.188	0.813	7/8	1-3/8	1/2-20	1/2	5.500	1/2	1.594
	3	1-3/8	1-1/4-12	1-14	1.625	5.800	1.999	0.781	0.531	0.635	1.188	0.813	1-1/8	1-7/8	1/2-20	1/2	5.500	1/2	1.594

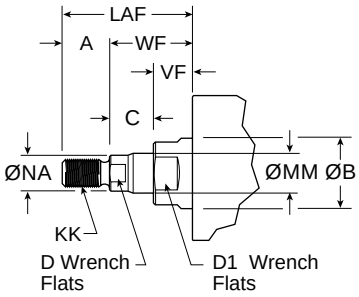
Bore Size	Rod No.	Rod Dia. MM	J	LAF	NA	ND	NT	R	+.003 -.003 TH	TN	VF	WF	XT	Y	Add Stroke LF	Add Stroke P	Add Stroke SN	Add Stroke ZJ
1-1/2	1	5/8	0.938	1.750	0.563	0.375	1/4-20	1.430	0.993	0.625	0.615	1.000	1.938	1.875	3.625	2.313	2.250	4.625
	2	1	0.938	2.500	0.938	-	-	1.430	0.993	-	0.865	1.375	-	2.250	3.625	2.313	-	5.000
2	1	5/8	0.937	1.750	0.563	0.438	5/16-18	1.840	1.243	0.875	0.615	1.000	1.938	1.875	3.625	2.313	2.250	4.625
	3	1	0.937	2.500	0.938	0.375	5/16-18	1.840	1.243	0.875	0.865	1.375	2.313	2.250	3.625	2.313	2.250	5.000
2-1/2	1	5/8	0.938	1.750	0.563	0.625	3/8-16	2.190	1.493	1.250	0.615	1.000	1.938	1.938	3.750	2.375	2.375	4.750
	3	1	0.938	2.500	0.938	0.625	3/8-16	2.190	1.493	1.250	0.865	1.375	2.313	2.313	3.750	2.375	2.375	5.125
3-1/4	1	1	1.125	2.500	0.938	0.750	1/2-13	2.760	1.868	1.500	0.865	1.375	2.438	2.438	4.250	2.625	2.625	5.625
	3	1 3/8	1.125	3.250	1.313	0.750	1/2-13	2.760	1.868	1.500	0.990	1.625	2.688	2.688	4.250	2.625	2.625	5.875
4	1	1	1.125	2.500	0.938	0.750	1/2-13	3.320	2.243	2.063	0.865	1.375	2.438	2.438	4.250	2.625	2.625	5.625
	3	1-3/8	1.125	3.250	1.313	0.750	1/2-13	3.320	2.243	2.063	0.990	1.625	2.688	2.688	4.250	2.625	2.625	5.875
5	1	1	1.219	2.500	0.938	0.938	5/8-11	4.100	2.743	2.688	0.865	1.375	2.438	2.438	4.500	2.875	2.875	5.875
	3	1-3/8	1.219	3.250	1.313	0.938	5/8-11	4.100	2.743	2.688	0.990	1.625	2.688	2.688	4.500	2.875	2.875	6.125

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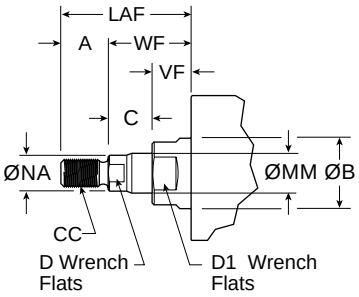
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4MA Rod End Dimensions – 1-1/2" to 5" Bore Size

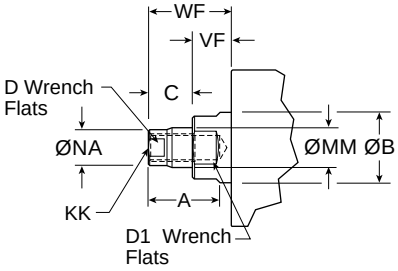
Thread Style 4
(NFPA Style SM)
Small Male



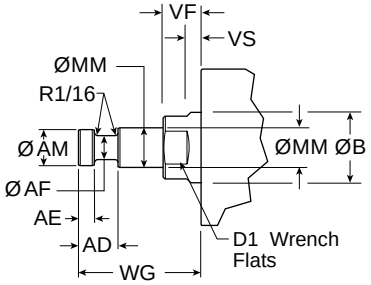
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B105 for more information)



Groove Has 1/16" Internal Radii At Corners

Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.002 B	C	D	D1	LAF	NA	VF	WF	WG
1-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1	1.750	0.563	0.615	1.000	1.750
	2	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1	1.750	0.563	0.615	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
2-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	0.385	1/2	1	1.750	0.563	0.615	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
3-1/4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
5	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	0.510	7/8	1-3/8	2.500	0.938	0.865	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750

Thread Style 3 - "Special Thread"

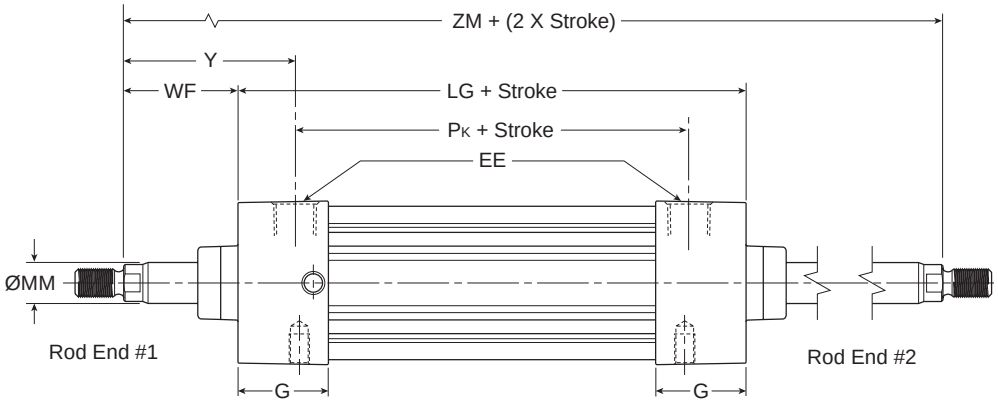
Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension G at both ends, and that LG replaces LF, P_K replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

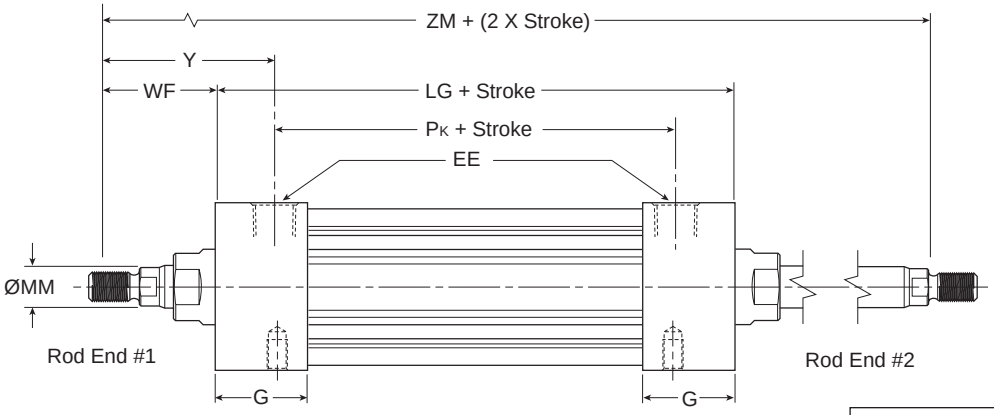
When a double rod end cylinder has two different rod ends, please clearly state which rod end is to be available at which head end.

3MA K-type for 1-1/2" to 5" Bore



Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
CB	KCB
D	KD
DD	KDD
F	KF
G	KG
J	KJ
NB	KNB
T	KT
TB	KTB
TD	KTD
TE	KTE
TEF	KTEF

4MA K-type for 1-1/2" to 5" Bore



Double rod cylinders not available with composite piston type.

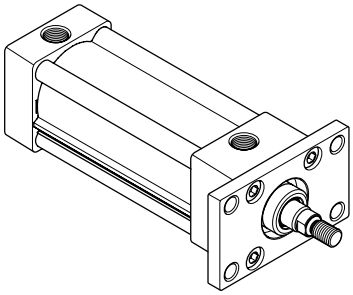
Cylinder Dimensions – K-type

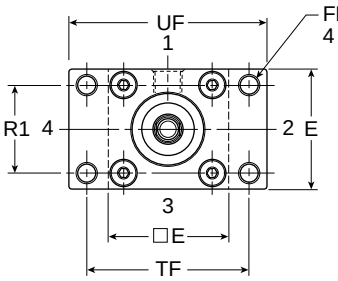
Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	WF	Y	Add Stroke								Add 2X Stroke
							LG	P_K	SA_K	XA_K	SS_K	SN_K	SE_K	XE_K	ZM
1-1/2	1	5/8	3/8	1.438	1.000	1.875	4.125	2.375	6.125	6.125	3.375	2.250	6.375	6.250	6.125
	2	1	3/8	1.438	1.375	2.250	4.125	2.375	6.500	6.500	3.375	–	–	–	5.760
2	1	5/8	3/8	1.375	1.000	1.875	4.125	2.375	6.125	6.125	3.375	2.250	6.750	6.438	6.125
	3	1	3/8	1.375	1.375	2.250	4.125	2.375	6.125	6.500	3.375	2.250	6.750	6.813	6.875
2-1/2	1	5/8	3/8	1.344	1.000	1.938	4.250	2.375	6.250	6.250	3.500	2.375	7.125	6.688	6.250
	3	1	3/8	1.344	1.375	2.313	4.250	2.375	6.250	6.625	3.500	2.375	7.125	7.063	7.000
3-1/4	1	1	1/2	1.594	1.375	2.438	4.750	2.625	7.250	7.375	3.750	2.625	7.750	7.625	7.500
	3	1-3/8	1/2	1.594	1.625	2.688	4.750	2.625	7.250	7.625	3.750	2.625	7.750	7.875	8.000
4	1	1	1/2	1.594	1.375	2.438	4.750	2.625	7.250	7.375	3.750	2.625	8.000	7.750	7.500
	3	1-3/8	1/2	1.594	1.625	2.688	4.750	2.625	7.250	7.625	3.750	2.625	8.000	8.000	8.000
5	1	1	1/2	1.594	1.375	2.438	4.938	2.813	7.688	7.688	3.563	2.813	–	–	7.688
	3	1-3/8	1/2	1.594	1.625	2.688	4.938	2.813	7.688	7.938	3.563	2.813	–	–	8.188
Replaces Dimension							LF	P	SA	XA	SS	SN	SE	XE	–
On Single Rod Mounting Styles							All Styles		CB		C	TEF, F	G		All

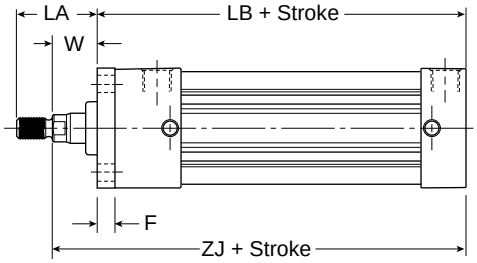
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B

Head Rectangular Flange
Style J
(NFPA MF1)

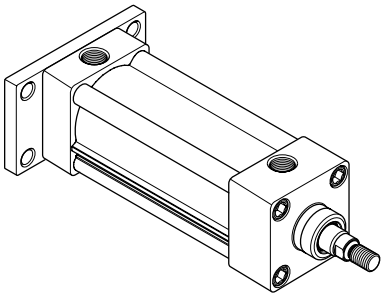


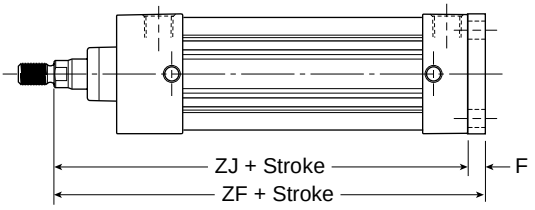


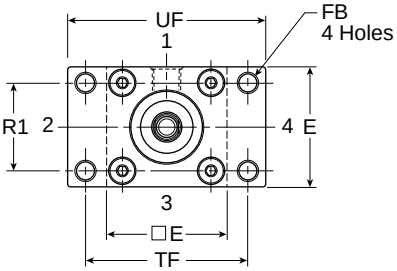


Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J.
For reference, WF = W + F and LA = W + A.

Cap Rectangular Flange
Style H
(NFPA MF2)





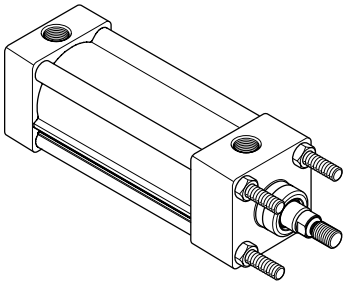


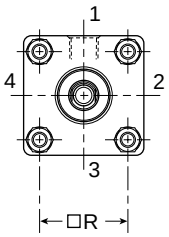
Cylinder Dimensions – Styles J and H

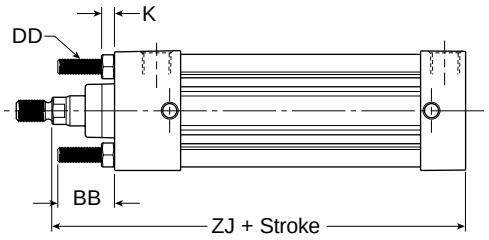
Bore Size	Rod No.	Rod Dia. MM	A	E	F	FB	LA	R1	TF	UF	W	Add Stroke		
												LB	ZF	ZJ
1-1/2	1	5/8	0.750	2.000	0.375	0.313	1.375	1.430	2.750	3.375	0.625	4.000	5.000	4.625
	2	1	1.125	2.000	0.375	0.313	2.125	1.430	2.750	3.375	1.000	4.000	5.375	5.000
2	1	5/8	0.750	2.500	0.375	0.375	1.375	1.840	3.375	4.125	0.625	4.000	5.000	4.625
	3	1	1.125	2.500	0.375	0.375	2.125	1.840	3.375	4.125	1.000	4.000	5.375	5.000
2-1/2	1	5/8	0.750	3.000	0.375	0.375	1.375	2.190	3.875	4.625	0.625	4.125	5.125	4.750
	3	1	1.125	3.000	0.375	0.375	2.125	2.190	3.875	4.625	1.000	4.125	5.500	5.125
3-1/4	1	1	1.125	3.750	0.625	0.438	1.875	2.760	4.688	5.500	0.750	4.875	6.250	5.625
	3	1-3/8	1.625	3.750	0.625	0.438	2.625	2.760	4.688	5.500	1.000	4.875	6.500	5.875
4	1	1	1.125	4.500	0.625	0.438	1.875	3.320	5.438	6.250	0.750	4.875	6.250	5.625
	3	1-3/8	1.625	4.500	0.625	0.438	2.625	3.320	5.438	6.250	1.000	4.875	6.500	5.875
5	1	1	1.125	5.500	0.625	0.563	1.875	4.100	6.625	7.625	0.750	5.125	6.500	5.875
	3	1-3/8	1.625	5.500	0.625	0.563	2.625	4.100	6.625	7.625	1.000	5.125	6.750	6.125

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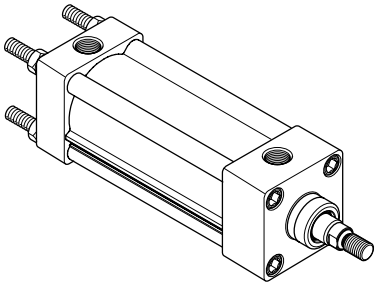
Tie Rods Ext. Head End
Style TB
(NFPA MX3)

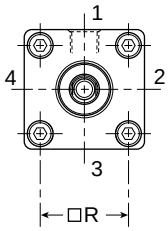


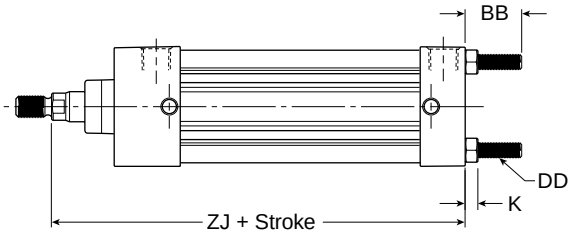




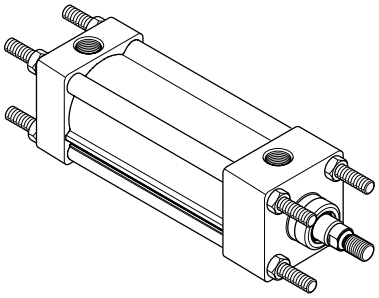
Tie Rods Ext. Cap End
Style TC
(NFPA MX2)

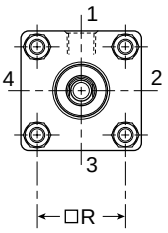


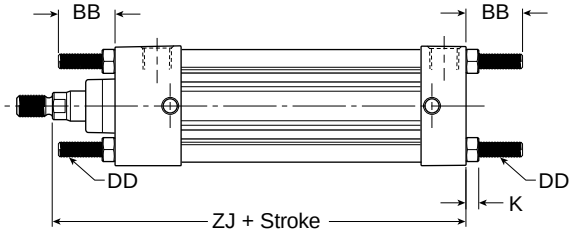




Tie Rods Ext. Both Ends
Style TD
(NFPA MX1)







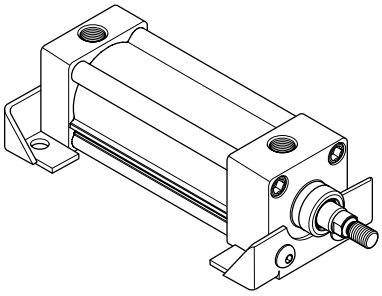
Cylinder Dimensions – Styles TB, TC and TD

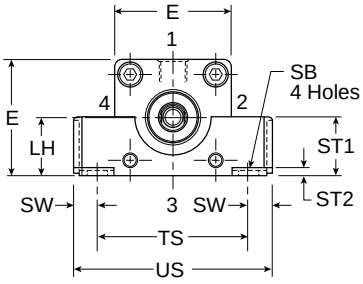
Bore Size	Rod No.	Rod Dia. MM	BB	DD	E	K	R	Add Stroke ZJ
1-1/2	1	5/8	1.000	1/4-28	2.000	0.250	1.430	4.625
	2	1	1.000	1/4-28	2.000	0.250	1.430	5.000
2	1	5/8	1.125	5/16-24	2.500	0.313	1.840	4.625
	3	1	1.125	5/16-24	2.500	0.313	1.840	5.000
2-1/2	1	5/8	1.125	5/16-24	3.000	0.313	2.190	4.750
	3	1	1.125	5/16-24	3.000	0.313	2.190	5.125
3-1/4	1	1	1.375	3/8-24	3.750	0.375	2.760	5.625
	3	1-3/8	1.375	3/8-24	3.750	0.375	2.760	5.875
4	1	1	1.375	3/8-24	4.500	0.375	3.320	5.625
	3	1-3/8	1.375	3/8-24	4.500	0.375	3.320	5.875
5	1	1	1.813	1/2-20	5.500	0.438	4.100	5.875
	3	1-3/8	1.813	1/2-20	5.500	0.438	4.100	6.125

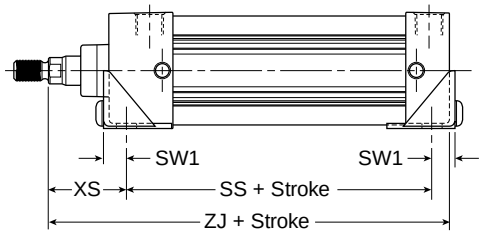
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B

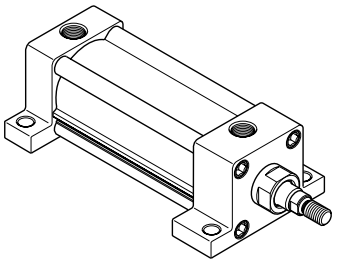
Side Lug
Style C for 3MA
(NFPA MS2)

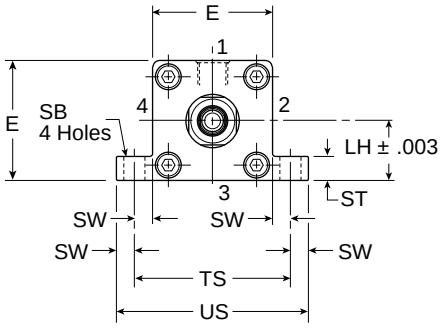


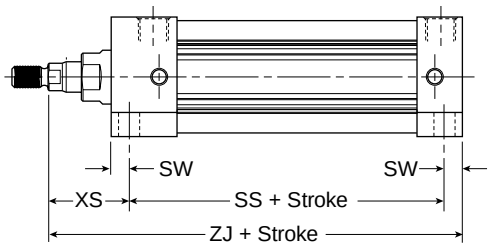




Side Lug
Style C for 4MA/4ML
(NFPA MS2)





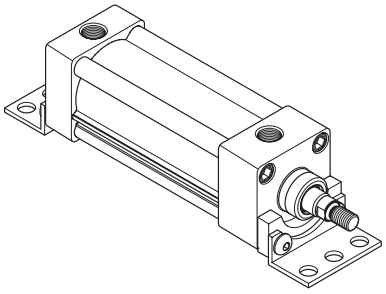


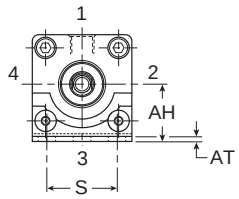
Cylinder Dimensions – Style C

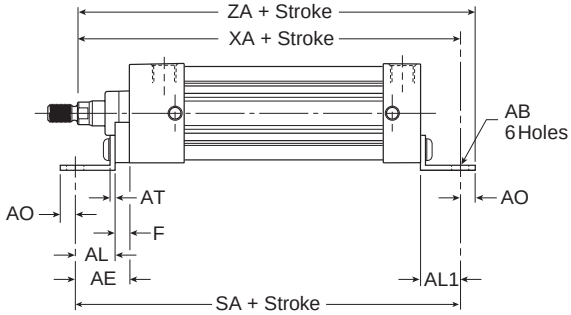
Bore Size	Rod No.	Rod Dia. MM	E	LH	SB	ST	ST1	ST2	SW	SW1	TS	US	XS	Add Stroke	
														SS	ZJ
1-1/2	1	5/8	2.000	0.993	0.438	0.500	1.000	0.120	0.375	0.495	2.750	3.500	1.375	2.875	4.625
	2	1	2.000	0.993	0.438	0.500	1.000	0.120	0.375	0.495	2.750	3.500	1.750	2.875	5.000
2	1	5/8	2.500	1.243	0.438	0.500	1.250	0.120	0.375	0.495	3.250	4.000	1.375	2.875	4.625
	3	1	2.500	1.243	0.438	0.500	1.250	0.120	0.375	0.495	3.250	4.000	1.750	2.875	5.000
2-1/2	1	5/8	3.000	1.493	0.438	0.500	1.343	0.120	0.375	0.495	3.750	4.500	1.375	3.000	4.750
	3	1	3.000	1.493	0.438	0.500	1.343	0.120	0.375	0.495	3.750	4.500	1.750	3.000	5.125
3-1/4	1	1	3.750	1.868	0.563	0.750	1.500	0.188	0.500	0.688	4.750	5.750	1.875	3.250	5.625
	3	1-3/8	3.750	1.868	0.563	0.750	1.500	0.188	0.500	0.688	4.750	5.750	2.125	3.250	5.875
4	1	1	4.500	2.243	0.563	0.750	1.500	0.188	0.500	0.688	5.500	6.500	1.875	3.250	5.625
	3	1-3/8	4.500	2.243	0.563	0.750	1.500	0.188	0.500	0.688	5.500	6.500	2.125	3.250	5.875
5	1	1	5.500	2.743	0.813	1.000	1.500	0.250	0.688	0.938	6.875	8.250	2.063	3.125	5.875
	3	1-3/8	5.500	2.743	0.813	1.000	1.500	0.250	0.688	0.938	6.875	8.250	2.313	3.125	6.125

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Side End Angle*
Style CB
(NFPA MS1)







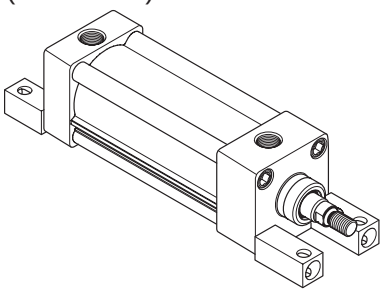
Note: Dim "S" Is For The Holes In The Mount (Not The Screw To Screw Dim)

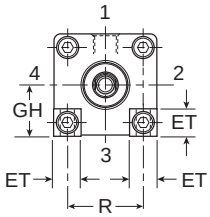
*Maximum recommended pressure for this mount is 150 PSIG

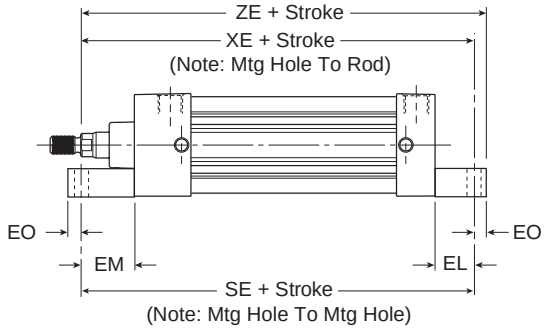
Cylinder Dimensions – Style CB

Bore Size	Rod No.	Rod Dia. MM	AB	AE	AH	AL	AL1	AO	AT	E	F	S	Add Stroke SA	Add Stroke XA	Add Stroke ZA
1-1/2	1	5/8	0.438	1.375	1.188	1.000	1.000	0.375	0.125	2.000	0.375	1.250	6.000	5.625	6.000
	2	1	0.438	1.375	1.188	1.000	1.000	0.375	0.125	2.000	0.375	1.250	6.000	6.000	6.375
2	1	5/8	0.438	1.375	1.438	1.000	1.000	0.375	0.125	2.500	0.375	1.750	6.000	5.625	6.000
	3	1	0.438	1.375	1.438	1.000	1.000	0.375	0.125	2.500	0.375	1.750	6.000	6.000	6.375
2-1/2	1	5/8	0.438	1.375	1.625	1.000	1.000	0.375	0.125	3.000	0.375	2.250	6.125	5.750	6.125
	3	1	0.438	1.375	1.625	1.000	1.000	0.375	0.125	3.000	0.375	2.250	6.125	6.125	6.500
3-1/4	1	1	0.563	1.875	1.938	1.250	1.250	0.500	0.125	3.750	0.625	2.750	7.375	6.875	7.375
	3	1-3/8	0.563	1.875	1.938	1.250	1.250	0.500	0.125	3.750	0.625	2.750	7.375	7.125	7.625
4	1	1	0.563	–	2.250	1.875	1.250	0.500	0.125	4.500	–	3.500	7.375	6.875	7.375
	3	1-3/8	0.563	–	2.250	1.875	1.250	0.500	0.125	4.500	–	3.500	7.375	7.125	7.625
5	1	1	0.688	2.000	2.750	1.375	1.375	0.625	0.188	5.500	0.625	4.250	7.875	7.250	7.875
	3	1-3/8	0.688	2.000	2.750	1.375	1.375	0.625	0.188	5.500	0.625	4.250	7.875	7.500	8.125

Side End Lug
Style G
(NFPA MS7)







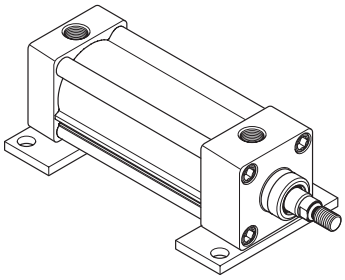
Cylinder Dimensions – Style G

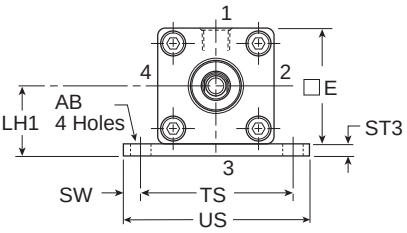
Bore Size	Rod No.	Rod Dia. MM	E	EB	EL	EM	EO	ET	GH	R	Add Stroke SE	Add Stroke XE	Add Stroke ZE
1-1/2	1	5/8	2.000	0.281	0.750	1.125	0.250	0.563	0.993	1.430	5.500	5.375	5.625
	2	1	–	–	–	–	–	–	–	–	–	–	–
2	1	5/8	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	5.875	5.563	5.875
	3	1	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	5.875	5.938	6.250
2-1/2	1	5/8	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	6.250	5.813	6.125
	3	1	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	6.250	6.188	6.500
3-1/4	1	1	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	6.625	6.500	6.875
	3	1-3/8	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	6.625	6.750	7.125
4	1	1	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	6.875	6.625	7.000
	3	1-3/8	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	6.875	6.875	7.250

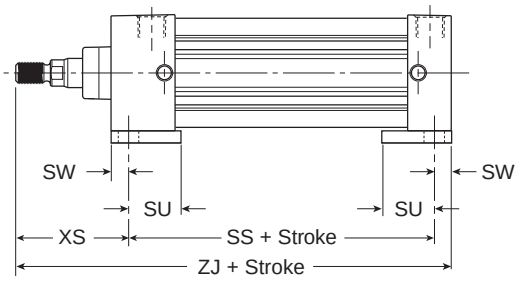
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B

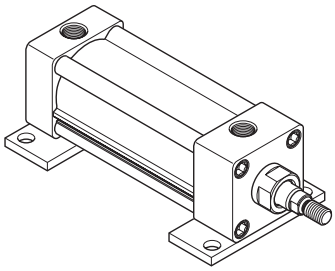
Base Bar Mount
Style NB for 3MA

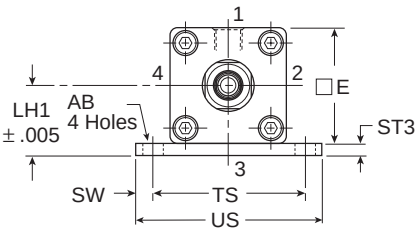


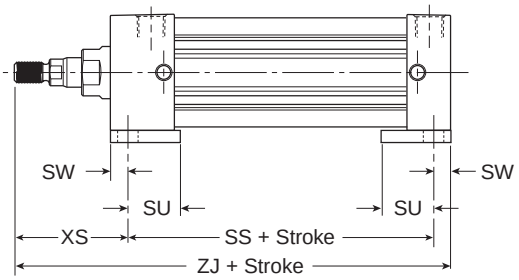




Base Bar Mount
Style NB for 4MA







Note: Fasteners for NB base bar mount have been applied with removable threadlocking compound and torqued to bottom of endcaps.

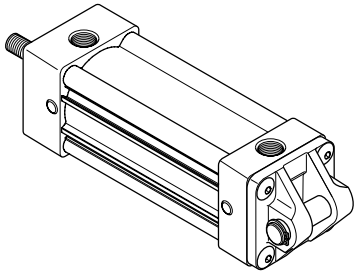
Cylinder Dimensions – Style NB

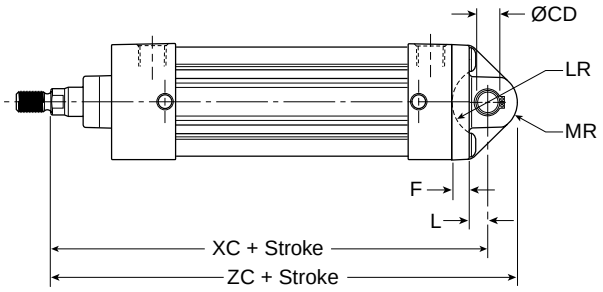
Bore Size	Rod No.	Rod Dia. MM	AB	E	LH1	ST3	SU	SW	TS	US	XS	Add Stroke	
												SS	ZJ
1-1/2	1	5/8	0.438	2.000	1.243	0.250	1.125	0.375	2.750	3.500	1.375	2.875	4.625
	2	1	–	–	–	–	–	–	–	–	–	–	–
2	1	5/8	0.438	2.500	1.493	0.250	1.125	0.375	3.250	4.000	1.375	2.875	4.625
	3	1	0.438	2.500	1.493	0.250	1.125	0.375	3.250	4.000	1.750	2.875	5.000
2-1/2	1	5/8	0.438	3.000	1.868	0.375	1.125	0.375	3.750	4.500	1.375	3.000	4.750
	3	1	0.438	3.000	1.868	0.375	1.125	0.375	3.750	4.500	1.750	3.000	5.125
3-1/4	1	1	0.563	3.750	2.368	0.500	1.250	0.500	4.750	5.750	1.875	3.250	5.625
	3	1-3/8	0.563	3.750	2.368	0.500	1.250	0.500	4.750	5.750	2.125	3.250	5.875
4	1	1	0.563	4.500	2.743	0.500	1.250	0.500	5.500	6.500	1.875	3.250	5.625
	3	1-3/8	0.563	4.500	2.743	0.500	1.250	0.500	5.500	6.500	2.125	3.250	5.875

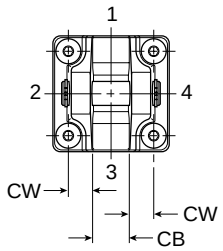
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Cap Fixed Clevis
Style BB
(NFPA MP1)

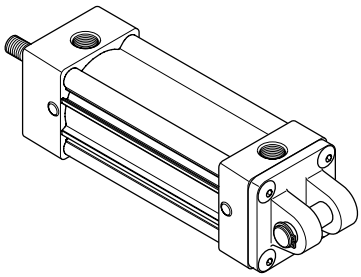
Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page B108.

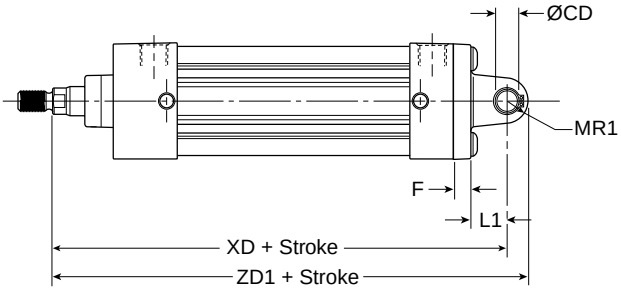


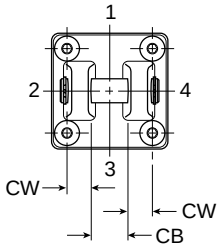




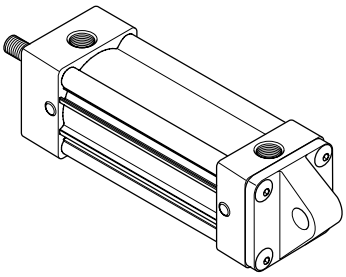
Cap Detachable Clevis
Style BC
(NFPA MP2)

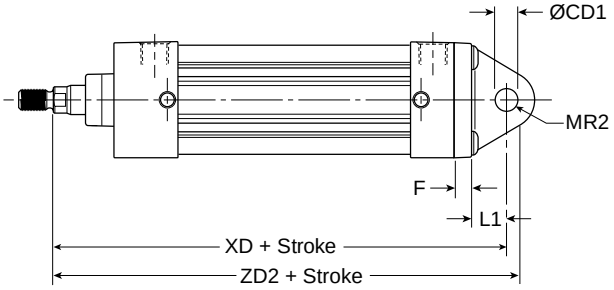


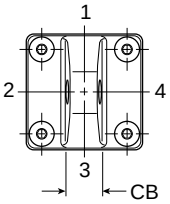




Cap Detachable Eye*
Style BE
(NFPA MP4)







*Not available for 5" bore 3MA, please specify 4MA

Cylinder Dimensions – Styles BB, BC and BE

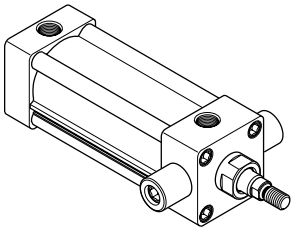
Bore Size	Rod No.	Rod Dia. MM	CB	+.000 -.002 CD	+.002 +.004 CD1	CW	E	F	L	LR	L1	MR	MR1	MR2	Add Stroke XC	XD	ZC	ZD1	ZD2
1-1/2	1	5/8	0.750	0.501	0.500	0.500	2.000	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.375	5.750	6.000	6.250	6.375
	2	1	0.750	0.501	0.500	0.500	2.000	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.750	6.125	6.375	6.625	6.750
2	1	5/8	0.750	0.501	0.500	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.375	5.750	6.000	6.250	6.375
	3	1	0.750	0.501	0.500	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	0.625	5.750	6.125	6.375	6.625	6.750
2-1/2	1	5/8	0.750	0.501	0.500	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	0.688	5.500	5.875	6.125	6.375	6.563
	3	1	0.750	0.501	0.500	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	0.688	5.875	6.250	6.500	6.750	6.313
3-1/4	1	1	1.250	0.751	0.750	0.625	3.750	0.625	0.625	1.000	1.250	0.938	0.750	0.875	6.875	7.500	7.813	8.250	8.375
	3	1-3/8	1.250	0.751	0.750	0.625	3.750	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.125	7.750	8.063	8.500	8.625
4	1	1	1.250	0.751	0.750	0.625	4.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	6.875	7.500	7.813	8.250	8.375
	3	1-3/8	1.250	0.751	0.750	0.625	4.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.125	7.750	8.063	8.500	8.625
5	1	1	1.250	0.751	0.750	0.625	5.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.125	7.750	8.063	8.500	8.625
	3	1-3/8	1.250	0.751	0.750	0.625	5.500	0.625	0.625	1.000	1.250	0.938	0.750	0.875	7.375	8.000	8.313	8.750	8.875

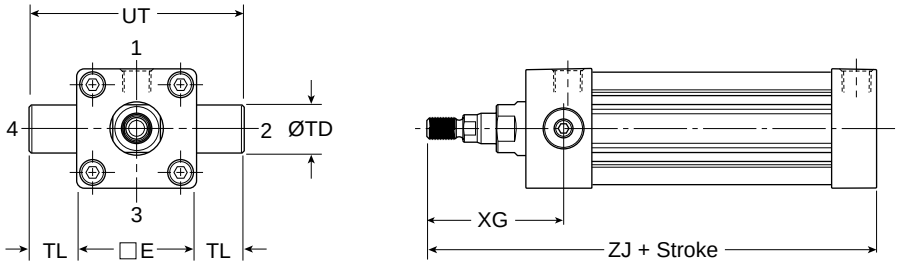
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B

Head Trunnion*

Style D (only for 4MA/4ML)
(NFPA MT1)

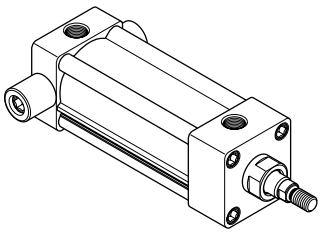


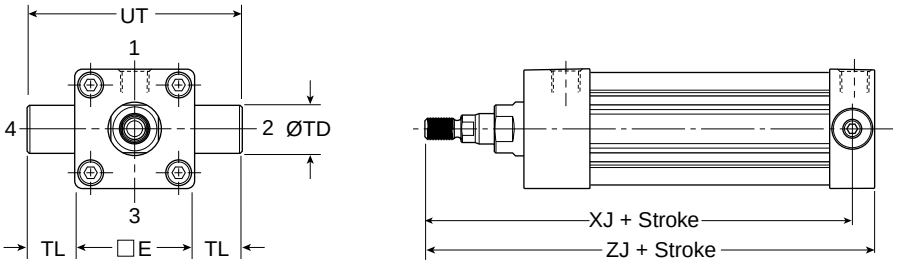


*Not available for 1-1/2" bore with 1" rod

Cap Trunnion

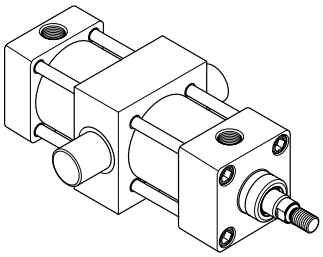
Style DB (only for 4MA/4ML)
(NFPA MT2)

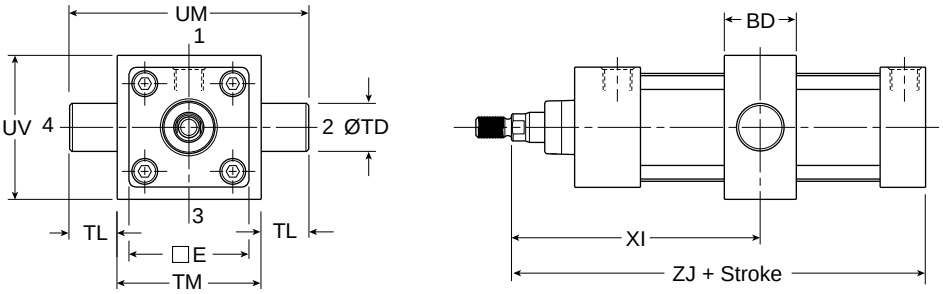




Intermediate Trunnion

Style DD
(NFPA MT4)





Cylinder Dimensions – Styles D, DB and DD

Note: Tie rod nuts for Style DD have a slot instead of internal hex.

Bore Size	Rod No.	Rod Dia. MM	E	BD	+.000 –.001 TD	TL	TM	UM	UT	UV	XG	Min. XI	Add Stroke XJ	Add Stroke ZJ
1–1/2	1	5/8	2.000	1.250	1.000	1.000	2.500	4.500	4.000	2.500	1.750	3.036	4.125	4.625
	2	1	2.000	1.250	1.000	1.000	2.500	4.500	4.000	2.500	–	3.437	4.250	5.000
2	1	5/8	2.500	1.500	1.000	1.000	3.000	5.000	4.500	3.000	1.750	3.125	4.125	4.625
	3	1	2.500	1.500	1.000	1.000	3.000	5.000	4.500	3.000	2.125	3.500	4.500	5.000
2-1/2	1	5/8	3.000	1.500	1.000	1.000	3.500	5.500	5.000	3.500	1.750	3.094	4.250	4.750
	3	1	3.000	1.500	1.000	1.000	3.500	5.500	5.000	3.500	2.125	3.469	4.625	5.125
3-1/4	1	1	3.750	2.000	1.000	1.000	4.500	6.500	5.750	4.250	2.250	3.969	5.000	5.625
	3	1-3/8	3.750	2.000	1.000	1.000	4.500	6.500	5.750	4.250	2.500	4.219	5.250	5.875
4	1	1	4.500	2.000	1.000	1.000	5.250	7.250	6.500	5.000	2.250	3.969	5.000	5.625
	3	1-3/8	4.500	2.000	1.000	1.000	5.250	7.250	6.500	5.000	2.500	4.219	5.250	5.875
5	1	1	5.500	2.000	1.000	1.000	6.250	8.250	7.500	6.000	2.250	3.969	5.250	5.875
	3	1-3/8	5.500	2.000	1.000	1.000	6.250	8.250	7.500	6.000	2.500	4.219	5.500	6.125

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Piston Seals (hidden)
Carboxylated nitrile rounded-lip piston seals combine low friction with leak-free service and long service life.

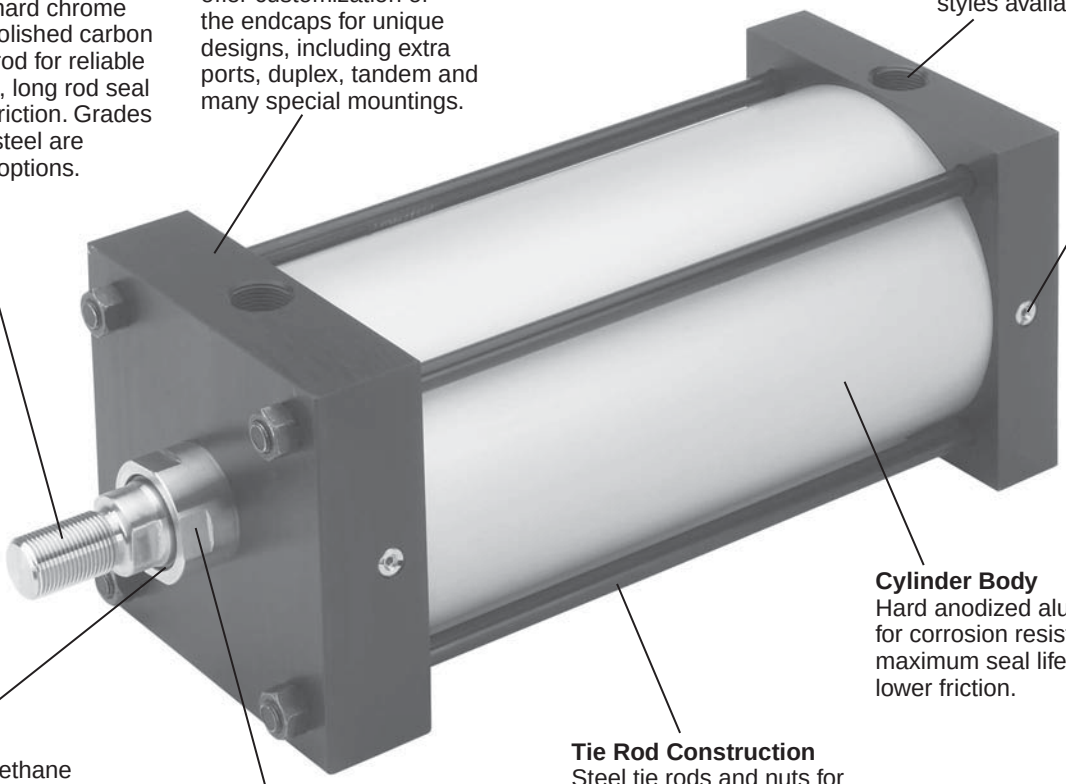
Piston Assembly (hidden)
Aluminum piston with wear band increases service life and eliminates metal-to-metal contact. Optional magnetic piston ring for use with a variety of sensors. Anaerobic adhesive is used to permanently lock and seal the piston to the rod.

Heads and Caps
High-strength aluminum heads and caps are anodized for corrosion resistance. We can offer customization of the endcaps for unique designs, including extra ports, duplex, tandem and many special mountings.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

Ports
NPTF ports are standard. Other port styles available.

Adjustable Cushions Available



Cylinder Body
Hard anodized aluminum for corrosion resistance, maximum seal life and lower friction.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Rod Gland/Bearing
Threaded bronze rod gland is externally removable, without cylinder disassembly, for easy maintenance. Machined flats permit the use of common tools for removal and installation. Options include HI LOAD design for side load conditions and metallic wiper design for extremely tough rod contaminant/adherent applications.

Rod Seal (hidden)
Carboxylated nitrile rounded-lip rod seal combines low friction with leak-free service and long service life.

Tie Rod Construction
Steel tie rods and nuts for heavy-duty use. Stainless steel is available as an option.

For a complete list of 4MA options, please see pages B30 and B34.

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B

How to Order 4MA Series Cylinders for 6" and 8" Bore

4MA cylinders can be specified by model number by using the table below.

6.00			J	4MA		U			1	4		A		12.000

Bore Size
6.00
8.00

Double Rod Cylinder
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code (see table on following page).

Series
4MA Air service
4ML Hydraulic service

Ports
U NPTF
R BSPP
B BSPT
T SAE

Piston Rod Number
Specify rod code number for required diameter.[5]

Stroke Length
Specify stroke length required in inches.[8]

Cushion Head End
Blank Non-cushioned head end
C Cushioned head end (not available for 4ML)

Seals
Blank Standard (nitrile seals)
V Fluorocarbon seals[1]
E Fluorocarbon rod wiper and rod seal only[2]
4 Low temperature seals[1]
M Metallic rod wiper, nitrile seals[3]

Cushion Cap End
Blank Non-cushioned cap end
C Cushioned cap end (not available for 4ML)

Piston Rod Thread Type
A Standard (UNF Unified Thread)
W BSF British Fine
M Metric (see page B106)

Piston Type
Blank Standard (lipseals, no magnetic ring)
3 Lipseals and magnetic ring

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes. (Includes 4MA with Linear Position Sensor Option)[4]

Rod Material and Gland Code
Blank Standard rod and gland
H Standard rod and HI LOAD gland
Y 17-4 PH stainless steel rod and standard gland
Z 17-4 PH stainless steel rod and HI LOAD gland
J 303 stainless steel rod and standard gland[7]
K 303 stainless steel rod and HI LOAD gland[7]
S 316 stainless steel rod and standard gland[7]
T 316 stainless steel rod and HI LOAD gland[7]

Piston Rod Thread Style
4 Small male
8 Intermediate male
9 Short female
55 For use with Split Coupler[6]
3 Special (and specify all dimensions required)

[1] Reed and solid-state sensors only available with standard seals or options E and M.

[2] Used for external chemical compatibility applications, not high temperature.

[3] If fluorocarbon seals are required with this option, please place an "S" for special in the Special Modification field and specify the "fluorocarbon seals and metallic rod wiper" in the item notes.

[4] For Linear Position Sensor Option (LPSO), please include the following information for the Special Modification item notes:

a. Sensor part number (see pages B100-B104)

b. Sensor position

c. Port position (if other than position 1)

d. Length of stop tubing, gross stroke and net stroke (if required)

Also, Piston Type 3 is required.

[5] Review Piston Rod Selection Chart on page A14 to determine proper piston rod diameter.

[6] For additional information regarding this style, refer to page B105. If non-standard Rod Material and Gland Code is required with this option, please place an "S" for special in Special Modification field and specify Rod Material and Gland Code in the item notes.

[7] Not available for 4ML.

[8] If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes.

How to order 6"-8" Bore 4MA/4ML Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

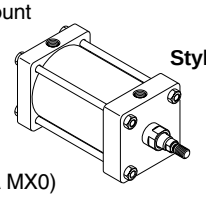
1. Cylinder model number must have Piston Type 3.
2. Please refer to pages M1-M9 for sensor part numbers and specifications. Global, NAMUR and Weld Immune Sensors will fit the 6"-8" Bore 4MA/4ML Series.
3. Tie rod bracket P8S-TMA0X will be required for Global Sensors. Please refer to page M9 for more information.

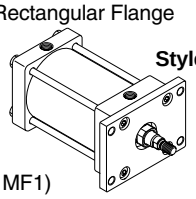
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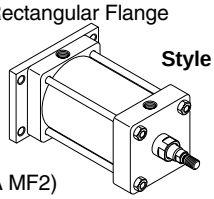
4MA Series Mounting Styles – 6" and 8" Bore

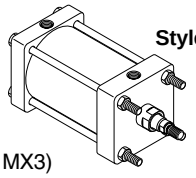
Mounting Code	NFPA Mounting Style	Description	Available Bore Sizes		
			4MA/4ML	4MA/4ML-LPSO w/o Stop Tube	4MA/4ML-LPSO w/Stop Tube
T	MX0	No Mount	6 - 8	6 - 8	6 - 8
J	MF1	Head Rectangular Flange	6	6*	6
H	MF2	Cap Rectangular Flange	6	6*	6*
TB	MX3	Tie Rods Extended Head End	6 - 8	-	6 - 8
TC	MX2	Tie Rods Extended Cap End	6 - 8	-	-
TD	MX1	Tie Rods Extended Both Ends	6 - 8	-	-
TE	MX5	Sleeve Nut	6 - 8	6 - 8	6 - 8
TEF	MX5/MS4	Sleeve Nut with Side Tap	6 - 8	6 - 8	6 - 8
C	MS2	Side Lug	6 - 8	6 - 8	6 - 8
F	MS4	Side Tap	6 - 8	6 - 8	6 - 8
CB	MS1	Side End Angle	6 - 8	6 - 8	6 - 8
BB	MP1	Cap Fixed Clevis	6 - 8	6 - 8*	6 - 8*
BC	MP2	Cap Detachable Clevis	6 - 8	6 - 8*	6 - 8*
BE	MP4	Cap Detachable Eye	6	6*	6*
D	MT1	Head Trunnion	6 - 8	6 - 8	6 - 8
DB	MT2	Cap Trunnion	6 - 8	6 - 8*	6 - 8*
DD	MT4	Intermediate Trunnion	6 - 8	-	-
JB	ME3	Head Square	8	-	8
HB	ME4	Cap Square	8	-	-
KT**	MDX0	Double Rod End, No Mount	6 - 8	6 - 8	6 - 8

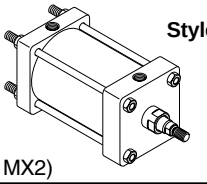
* May interfere with mounting. Please provide clearance for Linear Position Sensor overhang (see page B101).
** Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page B37).

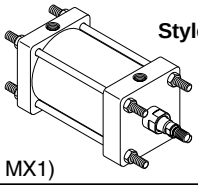
No Mount
Style T

(NFPA MX0)

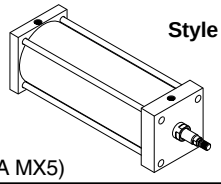
Head Rectangular Flange
Style J

(NFPA MF1)

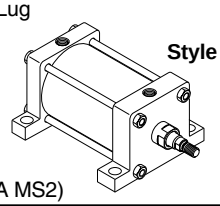
Cap Rectangular Flange
Style H

(NFPA MF2)

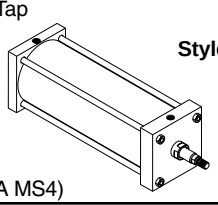
Tie Rods Ext. Head End
Style TB

(NFPA MX3)

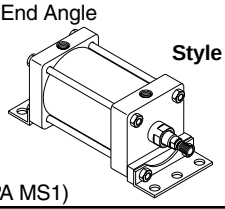
Tie Rods Ext. Cap End
Style TC

(NFPA MX2)

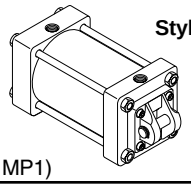
Tie Rods Ext. Both Ends
Style TD

(NFPA MX1)

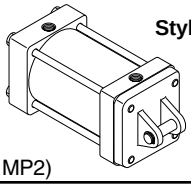
Sleeve Nut
Style TE

(NFPA MX5)

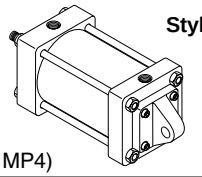
Side Lug
Style C

(NFPA MS2)

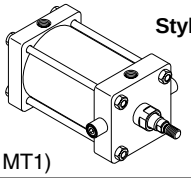
Side Tap
Style F

(NFPA MS4)

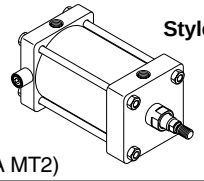
Side End Angle
Style CB

(NFPA MS1)

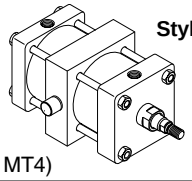
Cap Fixed Clevis
Style BB

(NFPA MP1)

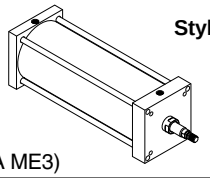
Cap Detachable Clevis
Style BC

(NFPA MP2)

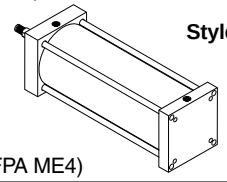
Cap Detachable Eye
Style BE

(NFPA MP4)

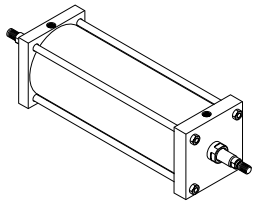
Head Trunnion
Style D

(NFPA MT1)

Cap Trunnion
Style DB

(NFPA MT2)

Intermediate Trunnion
Style DD

(NFPA MT4)

Head Square
Style JB

(NFPA ME3)

Cap Square
Style HB

(NFPA ME4)

Double Rod End
Style KT

(NFPA MDX0)

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B

General Specifications

- NFPA interchangeable
- Bore sizes – 6" and 8"
- Strokes – available in any practical stroke length
- Rod diameters – 1-3/8" and 1-3/4"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – optional and adjustable at either end or both ends
  (n/a for 4ML Hydraulic Version)
- Operating pressure –
  4MA = 250 PSIG (17 Bar) maximum air service
  4ML = 400 PSIG (27 Bar) maximum hydraulic service
- Media – 4MA = dry, filtered air
  4ML = filtered hydraulic oil
- Temperature range –
  -10°F to +165°F (-23°C to +74°C) with standard seals
  -10°F to +250°F (-23°C to +121°C) with fluorocarbon seals option
  -50°F to +150°F (-46°C to +66°C) with low temperature seals option
- Mounting styles – 20 standard styles
- RoHS compliant

For material options, including seals, piston rods and glands, please see Material Specifications on next page.

Cylinder Weights – 4MA/4ML Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 4MA/4ML		No Mount Double Rod	
		Base Wt. (lbs.)	Per Inch (lbs.)	Base Wt. (lbs.)	Per Inch (lbs.)
6	1.375	20.50	0.87	25.65	1.30
	1.75	22.61	1.13	30.41	1.82
8	1.375	35.50	1.25	41.15	1.68
	1.75	37.63	1.51	45.90	2.20

Mounting Weight Adders

Bore (inch)	Weight (lbs) by Mounting Style							
	J, H	D, DB	BB	CB	DD	BE	C	BC
6	10.74	1.22	2.91	5.88	15.52	2.91	0.69	11.38
8	N/A	1.22	2.91	7.84	25.01	N/A	0.67	17.31

Standard Cushion Position

Mounting Code	Position
All except D, DB, DD	2
D, DB, DD	3

Standard Port Sizes

Bore	NPTF	BSPT	BSPP	SAE
6	3/4	Rc3/4	G3/4	12
8	3/4	Rc3/4	G3/4	12

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Material Specifications – Standard Temperatures and Applications

Head and cap	Black anodized aluminum alloy
Cylinder body	Clear hard-coat anodized aluminum alloy
Piston rod	Case-hardened, chrome plated carbon steel
Rod seal	Carboxylated nitrile (Nitroxile)
Rod wiper	Molythane
Rod bearing (gland)	Bronze alloy
Piston	Aluminum alloy
Piston seals	Carboxylated nitrile (Nitroxile)
Piston bearing	MolyGard™
Magnetic ring	Plastic-bound magnetic material
Piston fastener	Piston rod for aluminum piston
O-rings	Nitrile
End seals	Nitrile
Cushion seals	Urethane
Cushion needle valves	Brass cushion needle valves
Tie-rods	Blackened carbon steel
Tie-rod nuts	Steel alloy, SAE J995 Grade 8

4MA Options – Material and Part Changes

High temperatures (-10°F to +250°F)	All seals and wiper are fluorocarbon Aluminum piston only (without magnetic ring)	Low temperatures (-50°F to +150°F)	Rod seal, piston seals, o-rings and end seals are low temperature-rated nitrile

4ML Hydraulic Version – Material and Part Changes

Hydraulic service (general)	Cushions not available	Hydraulic service (high temp)	Fluorocarbon TS-2000 rod seal; wiper and all seals are fluorocarbon (for hydraulic use)
Hydraulic service (std temp)	Polyurethane TS-2000 rod seal and nitrile piston seals (for hydraulic use)		

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon for high temperatures or chemical compatibility Other seal options available, please consult factory	HI LOAD gland option Metallic rod scraper option	Composite bearing pressed into bronze alloy gland Dual high strength bronze wipers with fluorocarbon energizer
Piston rod material options	Case-hardened, chrome plated carbon steel (standard) 17-4 PH stainless steel, chrome plated 303 stainless steel, chrome plated (n/a for 4ML) 316 stainless steel, chrome plated (n/a for 4ML) (for stainless steel without chrome plating, please consult factory)		

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B

How to Select a 6" - 8" Bore 4MA Cylinder

Parker cylinders are available based on air or hydraulic operating pressure. The many styles, sizes and optional features available assure that your application requirements are precisely met. To select a cylinder, follow these simple steps:

Step 1 - **Determine the correct cylinder bore size** necessary to achieve required force using the available operating pressure.

Step 2 - **Determine the series cylinder to use**, based on operating pressure.

Step 3 - **Turn to the appropriate cylinder selection section.** Select the mounting style that fits your installation needs. Determine the bore and rod sizes available for the model you select. Then complete model selection.

- Choose a rod end style and the desired rod end accessories.
- Size the cylinder to meet your application requirements.

Step 4 - **Consider the following conditions** which may require further modifications to the cylinder you have selected.

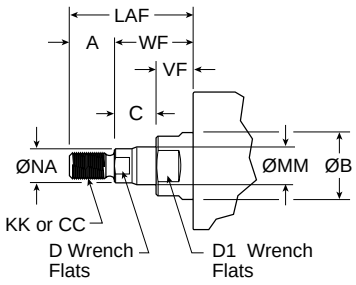
Application Condition	Check the Following
Quick Starts or Stops	Confirm that determined thrust is sufficient to accelerate or decelerate cylinder and load within prescribed distance. Optional cushions should be used to reduce shock during deceleration, check that peak pressures will be within tolerable limits.
Long Push Stroke	Check whether stop tube is required to prevent excessive bearing loads and wear.
High-column Loading Long Push Stroke	Determine if standard size piston rod is strong enough to accommodate intended load. See Application Engineering section for recommendations.
Long Horizontal Stroke	Determine if standard size piston rod is strong enough to accommodate intended load.
High Operating Temperatures	For temperatures between 165°F and 250°F use 4MA cylinder with high temperature seals.

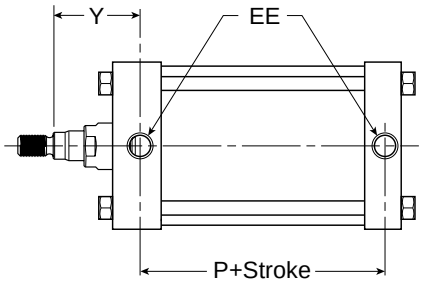
General Options and Modifications:

- Adjustable Cushions
- Magnetic Piston
- Port and Adjustable Cushion Relocation
- Port Thread Styles
- Multiple Ports
- Special Heads, Caps, Pistons and Mounts
- Double Rod End
- Oversize Rod Diameters
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Stainless Steel Tie Rods and Nuts
- Fluorocarbon Rod Wiper and Rod Seal only
- Fluorocarbon Seals (all cylinder seals)
- Metallic Rod Wiper
- HI LOAD Gland Assembly
- Stop Tube
- Mixed Mountings
- Shock Absorber on Cap End
- Air Cylinder/Valve Combination (ACVB)
- Adjustable Point Sensors (order separately)
- Continuous Linear Position Sensing (LPSO)
- High Temperature Service (to +250°F)
- Low Temperature Service (to -50°F)
- Hydraulic Service (4ML) (400 PSIG)
- Rod lock version (see 4MAJ)

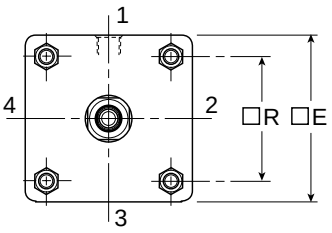
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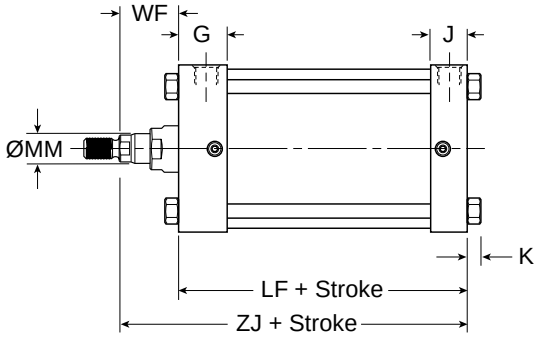
4MA Series Single Rod Dimensions – 6" and 8" Bore





For dimensions of all standard rod end styles, please see page B36.





Cylinder Dimensions – Style T

Bore Size	Rod No.	Rod Dia. MM	Thread		A	AA	+.000 -.002 B	C	D	D1	E	EE (NPTF)	G
			Style 8 CC	Style 4 & 9 KK									
6	1	1-3/8	1-1/4 - 12	1-14	1.625	6.900	1.999	0.635	1-1/8	1-7/8	6.500	3/4	1.910
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	6.900	2.374	0.760	1-1/2	2-3/16	6.500	3/4	1.910
8	1	1-3/8	1-1/4 - 12	1-14	1.625	9.100	1.999	0.635	1-1/8	1-7/8	8.500	3/4	1.810
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	9.100	2.374	0.760	1-1/2	2-3/16	8.500	3/4	1.810

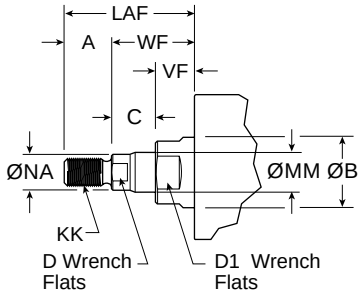
Bore Size	Rod No.	Rod Dia. MM	J	K	LAF	NA	R	VF	WF	Y	Add Stroke		
											LF	P	ZJ
6	1	1-3/8	1.410	0.438	3.250	1.313	4.880	0.990	1.625	2.813	5.000	3.125	6.625
	3	1-3/4	1.410	0.438	3.875	1.688	4.880	1.115	1.875	3.063	5.000	3.125	6.875
8	1	1-3/8	1.440	0.563	3.250	1.313	6.440	0.990	1.625	2.750	5.125	3.250	6.750
	3	1-3/4	1.440	0.563	3.875	1.688	6.440	1.115	1.875	3.000	5.125	3.250	7.000

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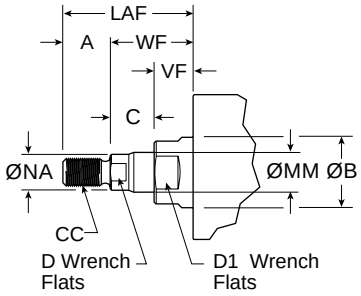
B

4MA Rod End Dimensions – 6" and 8" Bore Sizes

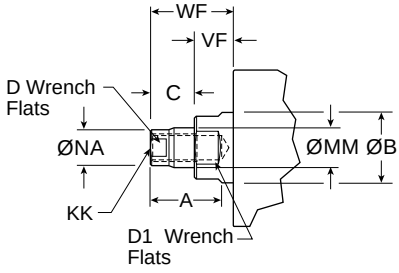
Thread Style 4
(NFPA Style SM)
Small Male



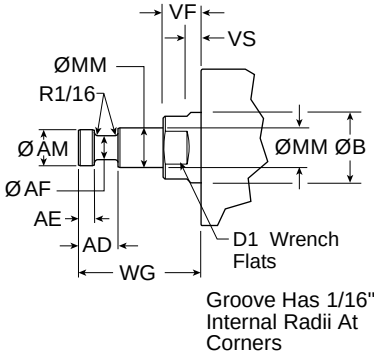
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B105 for more information)



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.002 B	C	D	D1	LAF	NA	VF	WF	WG
6	1	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	1.313	0.500	1.125	1.700	2.374	0.760	1-1/2	2-3/16	3.875	1.688	1.115	1.875	3.125
8	1	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	0.635	1-1/8	1-7/8	3.250	1.313	0.990	1.625	2.750
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	1.313	0.500	1.125	1.700	2.374	0.760	1-1/2	2-3/16	3.875	1.688	1.115	1.875	3.125

Thread Style 3 - "Special Thread"

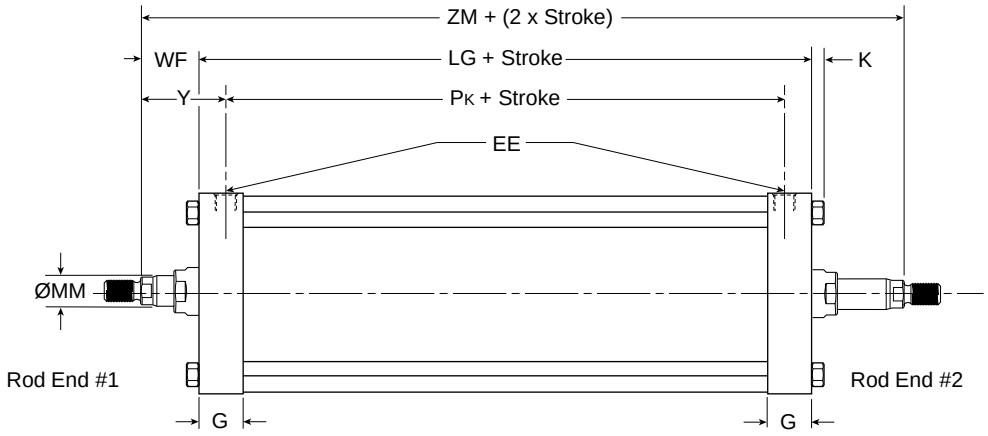
Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below.
Note that double rod end cylinders have a head dimension G at both ends, and that LG replaces LF, P_K replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

When a double rod end cylinder has two different rod ends, please clearly state which rod end is to be available at which head end.

4MA Series K-type Drawing – 6" and 8" Bore



Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
CB	KCB
D	KD
DD	KDD
F	KF
J	KJ
T	KT
TB	KTB
TD	KTD
TE	KTE
TEF	KTEF

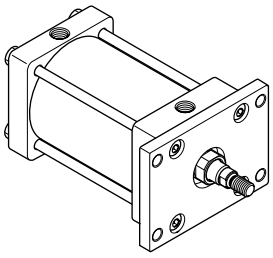
Cylinder Dimensions – Style KT

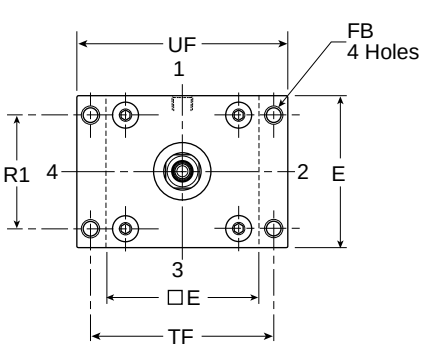
Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	K	WF	Y	Add Stroke						Add 2X Stroke
								LG	P_K	SA_K	XA_K	SS_K	SN_K	ZM
6	1	1-3/8	3/4	1.910	0.438	1.625	2.813	5.500	3.125	8.250	8.500	4.125	3.125	8.750
	3	1-3/4	3/4	1.910	0.438	1.875	3.063	5.500	3.125	8.250	8.750	4.125	3.125	9.250
8	1	1-3/8	3/4	1.810	0.563	1.625	2.750	5.500	3.250	9.125	8.938	4.125	3.125	8.750
	3	1-3/4	3/4	1.810	0.563	1.875	3.000	5.500	3.250	9.125	9.188	4.125	3.125	9.250
Replaces Dimension								LF	P	SA	XA	SS	SN	–
On Single Rod Mounting Styles								All Styles		CB		C	F, TEF	All

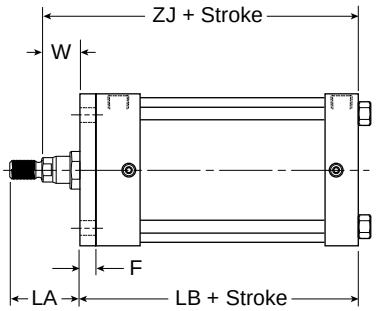
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B

Head Rectangular Flange
Style J
(NFPA MF1)
(only 6" Bore)

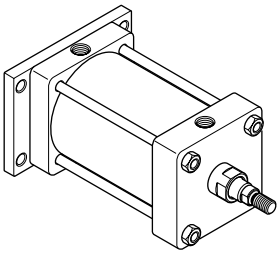


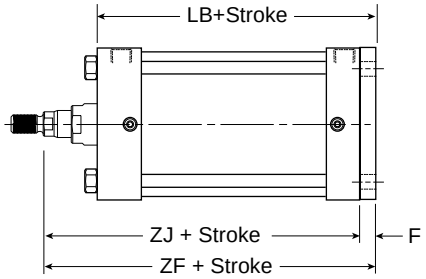


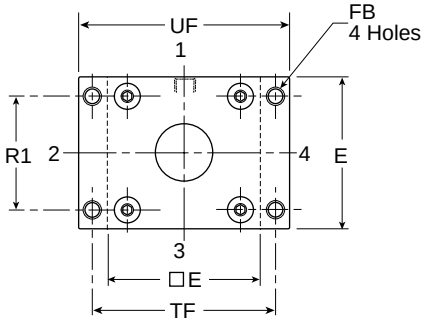


Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J.
For reference, WF = W + F and LA = W + A.

Cap Rectangular Flange
Style H
(NFPA MF2)
(only 6" Bore)





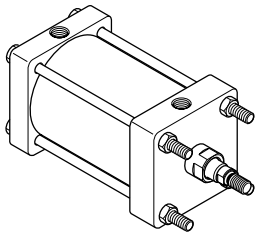


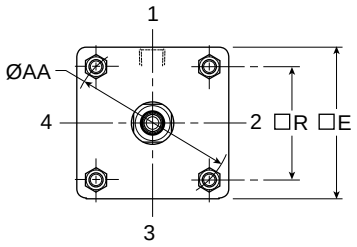
Cylinder Dimensions – Styles J and H

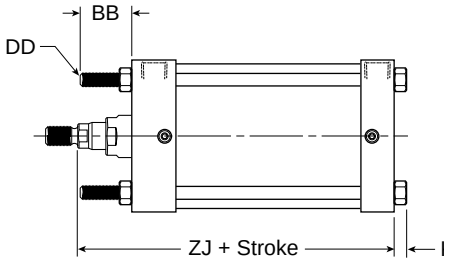
Bore Size	Rod No.	Rod Dia. MM	A	E	F	FB	LA	R1	TF	UF	W	Add Stroke		
												LB	ZF	ZJ
6	1	1-3/8	1.625	6.500	0.750	0.563	2.500	4.880	7.625	8.625	0.875	5.750	7.375	6.625
	3	1-3/4	2.000	6.500	0.750	0.563	3.125	4.880	7.625	8.625	1.125	5.750	7.625	6.875

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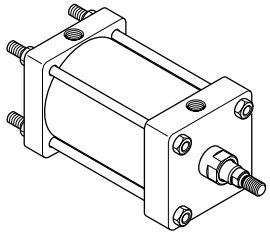
Tie Rods Ext. Head End
Style TB
(NFPA MX3)

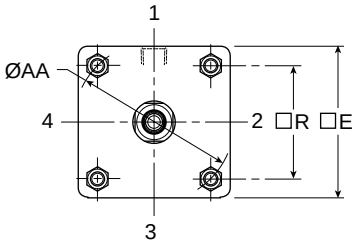


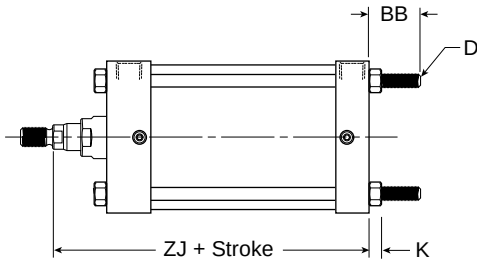




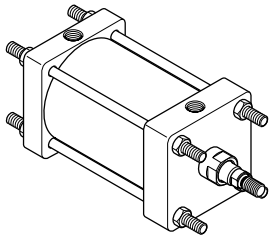
Tie Rods Ext. Cap End
Style TC
(NFPA MX2)

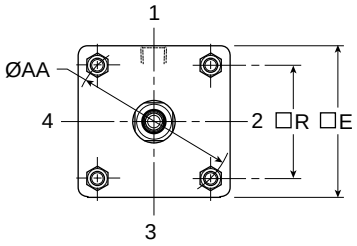


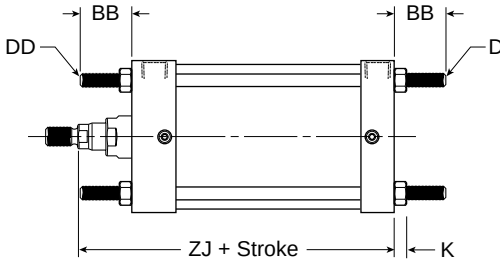




Tie Rods Ext. Both Ends
Style TD
(NFPA MX1)







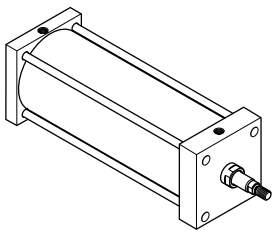
Cylinder Dimensions – Styles TB, TC and TD

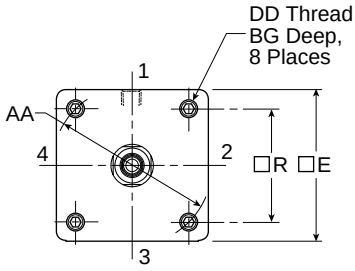
Bore Size	Rod No.	Rod Dia. MM	AA	BB	DD	E	K	R	Add Stroke ZJ
6	1	1-3/8	6.900	1.813	1/2-20	6.500	0.438	4.880	6.625
	3	1-3/4	6.900	1.813	1/2-20	6.500	0.438	4.880	6.875
8	1	1-3/8	9.100	2.313	5/8-18	8.500	0.563	6.440	6.750
	3	1-3/4	9.100	2.313	5/8-18	8.500	0.563	6.440	7.000

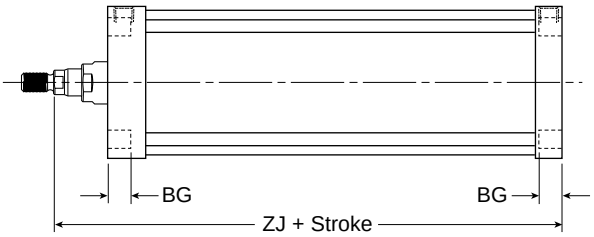
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B

Sleeve Nut
Style TE
(NFPA MX5)





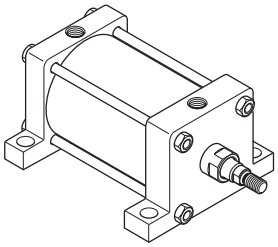


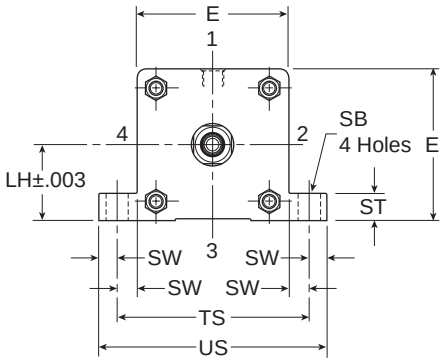
Cylinder Dimensions – Style TE

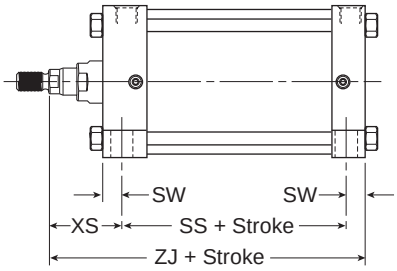
Bore Size	Rod No.	Rod Dia. MM	AA	BG	DD	E	R	Add Stroke ZJ
6	1	1-3/8	6.900	0.500	1/2-20	6.500	4.880	6.625
	3	1-3/4	6.900	0.500	1/2-20	6.500	4.880	6.875
8	1	1-3/8	9.100	0.620	5/8-18	8.500	6.440	6.750
	3	1-3/4	9.100	0.620	5/8-18	8.500	6.440	7.000

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Side Lug
Style C
(NFPA MS2)



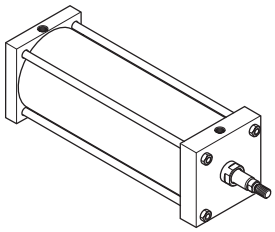


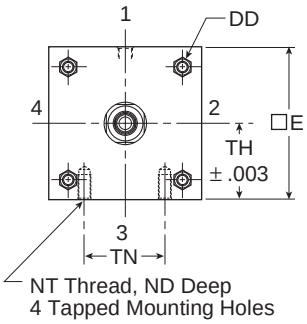


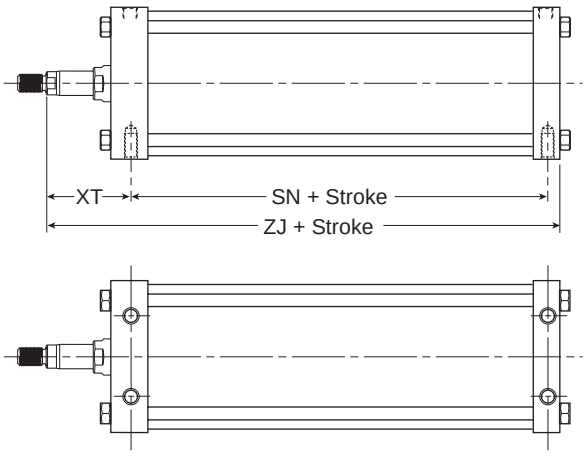
Cylinder Dimensions – Style C

Bore Size	Rod No.	Rod Dia. MM	E	+/-.003 LH	SB	ST	SW	TS	US	XS	Add Stroke SS	Add Stroke ZJ
6	1	1-3/8	6.500	3.243	0.813	1.000	0.688	7.875	9.250	2.313	3.625	6.625
	3	1-3/4	6.500	3.243	0.813	1.000	0.688	7.875	9.250	2.563	3.625	6.875
8	1	1-3/8	8.500	4.243	0.813	1.000	0.688	9.875	11.250	2.313	3.750	6.750
	3	1-3/4	8.500	4.243	0.813	1.000	0.688	9.875	11.250	2.563	3.750	7.000

Side Tap
Style F
(NFPA MS4)







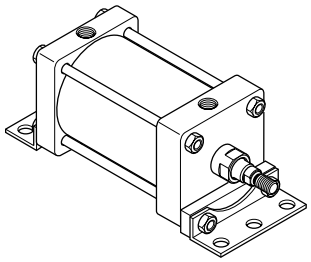
Cylinder Dimensions – Style F

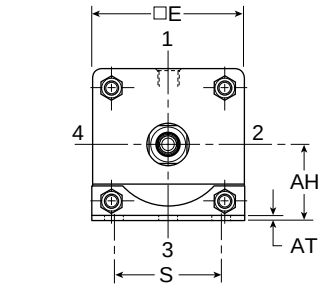
Bore Size	Rod No.	Rod Dia. MM	E	ND	NT	+/-.003 TH	TN	XT	Add Stroke SN	Add Stroke ZJ
6	1	1-3/8	6.500	1.125	3/4-10	3.243	3.250	2.813	3.125	6.625
	3	1-3/4	6.500	1.125	3/4-10	3.243	3.250	3.063	3.125	6.875
8	1	1-3/8	8.500	1.125	3/4-10	4.243	4.500	2.813	3.250	6.750
	3	1-3/4	8.500	1.125	3/4-10	4.243	4.500	3.063	3.250	7.000

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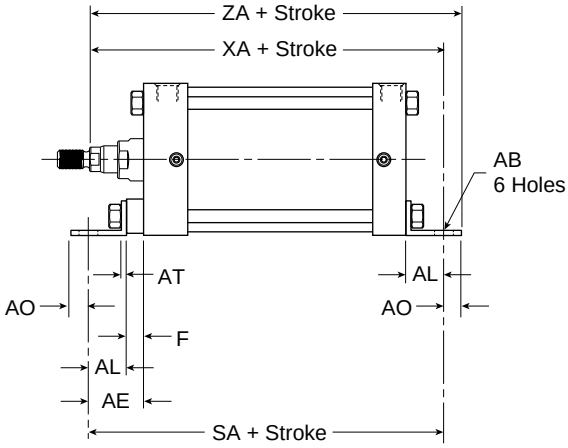
B

Side End Angle*
Style CB
(NFPA MS1)





Note:
Dim. "S" Is For The Holes In The Mount
(Not The Tie Rod To Tie Rod Dim.)



*Maximum recommended pressure for this mount is 150 PSIG

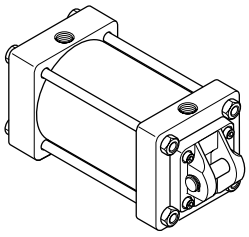
Cylinder Dimensions – Style CB

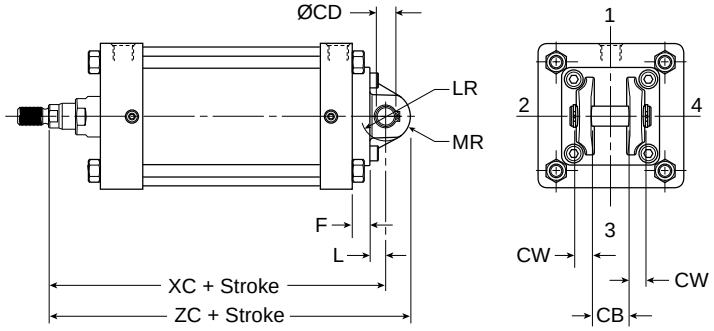
Bore Size	Rod No.	Rod Dia. MM	AB	AE	AH	AL	AO	AT	E	F	S	Add Stroke		
												SA	XA	ZA
6	1	1-3/8	0.813	2.125	3.250	1.375	0.625	0.188	6.500	0.750	5.250	8.500	8.000	8.625
	3	1-3/4	0.813	2.125	3.250	1.375	0.625	0.188	6.500	0.750	5.250	8.500	8.250	8.875
8	1	1-3/8	0.813	1.813	4.250	1.813	0.688	0.250	8.500	–	7.125	8.750	8.563	9.250
	3	1-3/4	0.813	1.813	4.250	1.813	0.688	0.250	8.500	–	7.125	8.750	8.813	9.500

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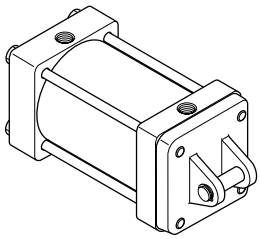
Cap Fixed Clevis
Style BB
(NFPA MP1)

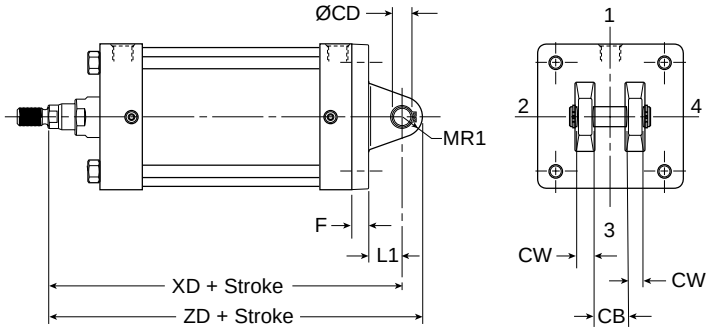
Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page B108.





Cap Detachable Clevis
Style BC
(NFPA MP2)

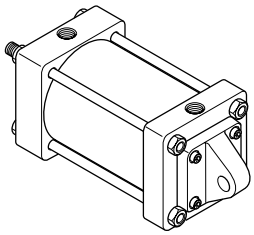


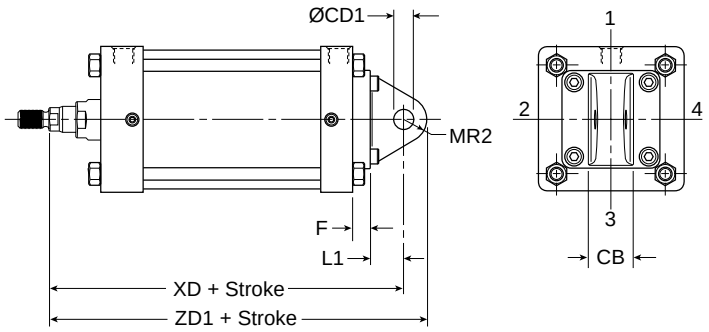


Cylinder Dimensions – Styles BB and BC

Bore Size	Rod No.	Rod Dia. MM	CB	+.000 -.002 CD	CW	E	F	L	LR	L1	MR	MR1	Add Stroke XC	XD	ZC	ZD
6	1	1- 3/8	1.500	1.001	0.750	6.500	0.750	0.750	1.250	1.500	1.125	1.000	8.125	8.875	9.250	9.875
	3	1-3/4	1.500	1.001	0.750	6.500	0.750	0.750	1.250	1.500	1.125	1.000	8.375	9.125	9.500	10.125
8	1	1-3/8	1.500	1.001	0.750	8.500	0.750	0.750	1.250	1.500	1.125	1.000	8.250	9.000	9.375	10.000
	3	1-3/4	1.500	1.001	0.750	8.500	0.750	0.750	1.250	1.500	1.125	1.000	8.500	9.250	9.625	10.250

Cap Detachable Eye
Style BE
(NFPA MP4)





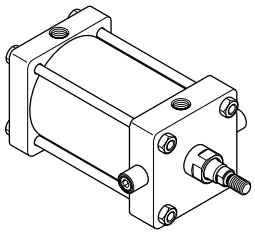
Cylinder Dimensions – Style BE

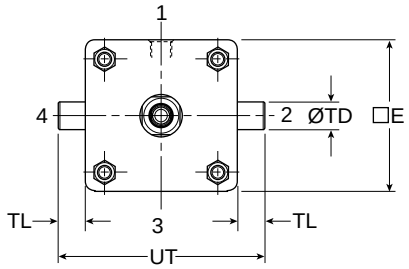
Bore Size	Rod No.	Rod Dia. MM	CB	+.002 +.004 CD1	E	F	L1	MR2	Add Stroke XD	ZD1
6	1	1-3/8	1.500	1.000	6.500	0.750	1.500	1.125	8.875	10.000
	3	1-3/4	1.500	1.000	6.500	0.750	1.500	1.125	9.125	10.250

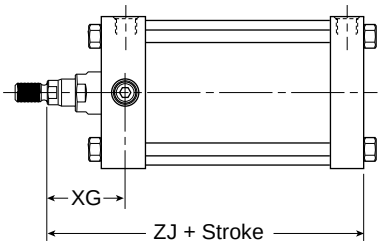
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B

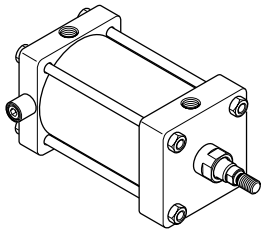
Head Trunnion
Style D
(NFPA MT1)

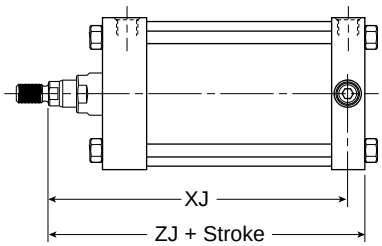


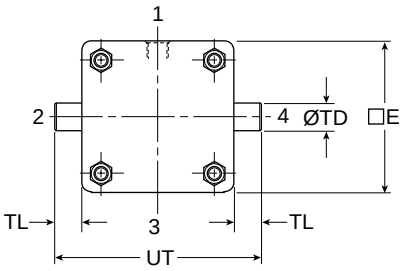




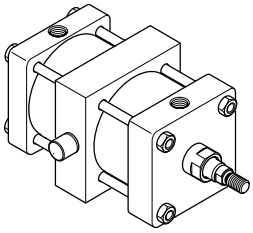
Cap Trunnion
Style DB
(NFPA MT2)

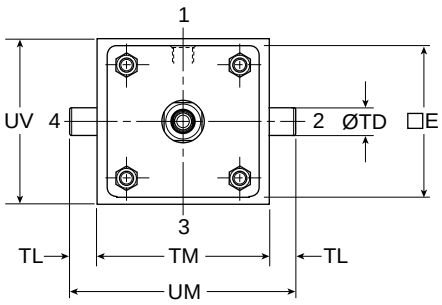


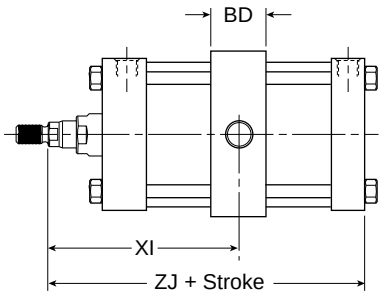




Intermediate Trunnion
Style DD
(NFPA MT4)





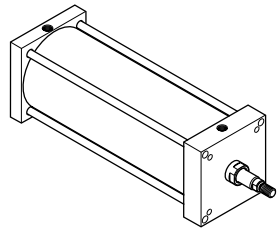


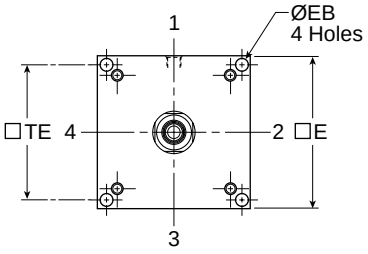
Cylinder Dimensions – Style D, DB and DD

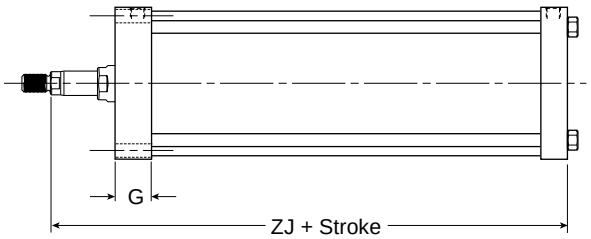
Bore Size	Rod No.	Rod Dia. MM	E	BD	+.000 -.001 TD	TL	TM	UM	UT	UV	XG	Min. XI	Add Stroke	
													XJ	ZJ
6	1	1-3/8	6.500	2.500	1.375	1.375	7.625	10.375	9.250	7.000	2.625	4.813	5.875	6.625
	3	1-3/4	6.500	2.500	1.375	1.375	7.625	10.375	9.250	7.000	2.875	5.063	6.125	6.875
8	1	1-3/8	8.500	2.500	1.375	1.375	9.750	12.500	11.250	9.500	2.625	4.750	6.000	6.750
	3	1-3/4	8.500	2.500	1.375	1.375	9.750	12.500	11.250	9.500	2.875	5.000	6.250	7.000

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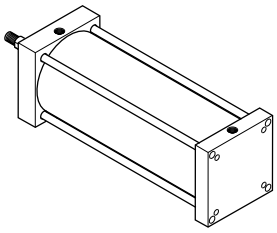
Head Square
Style JB
(NFPA ME3)
(only 8" Bore)

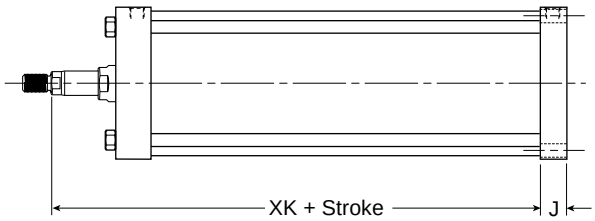


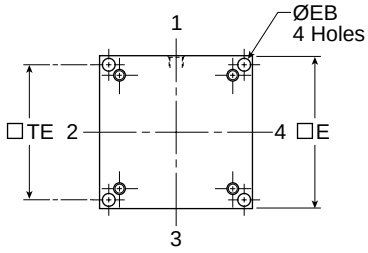




Cap Square
Style HB
(NFPA ME4)
(only 8" Bore)







Cylinder Dimensions – Styles JB and HB

Bore Size	Rod No.	Rod Dia. MM	E	EB	G	J	TE	Add Stroke	
								XK	ZJ
8	1	1-3/8	8.500	0.688	1.810	1.440	7.570	5.313	6.750
	3	1-3/4	8.500	0.688	1.810	1.440	7.570	5.563	7.000

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Piston Assembly
Aluminum piston with wear band increases service life and eliminates metal-to-metal contact. Anaerobic adhesive is used to permanently lock and seal the piston to the rod.

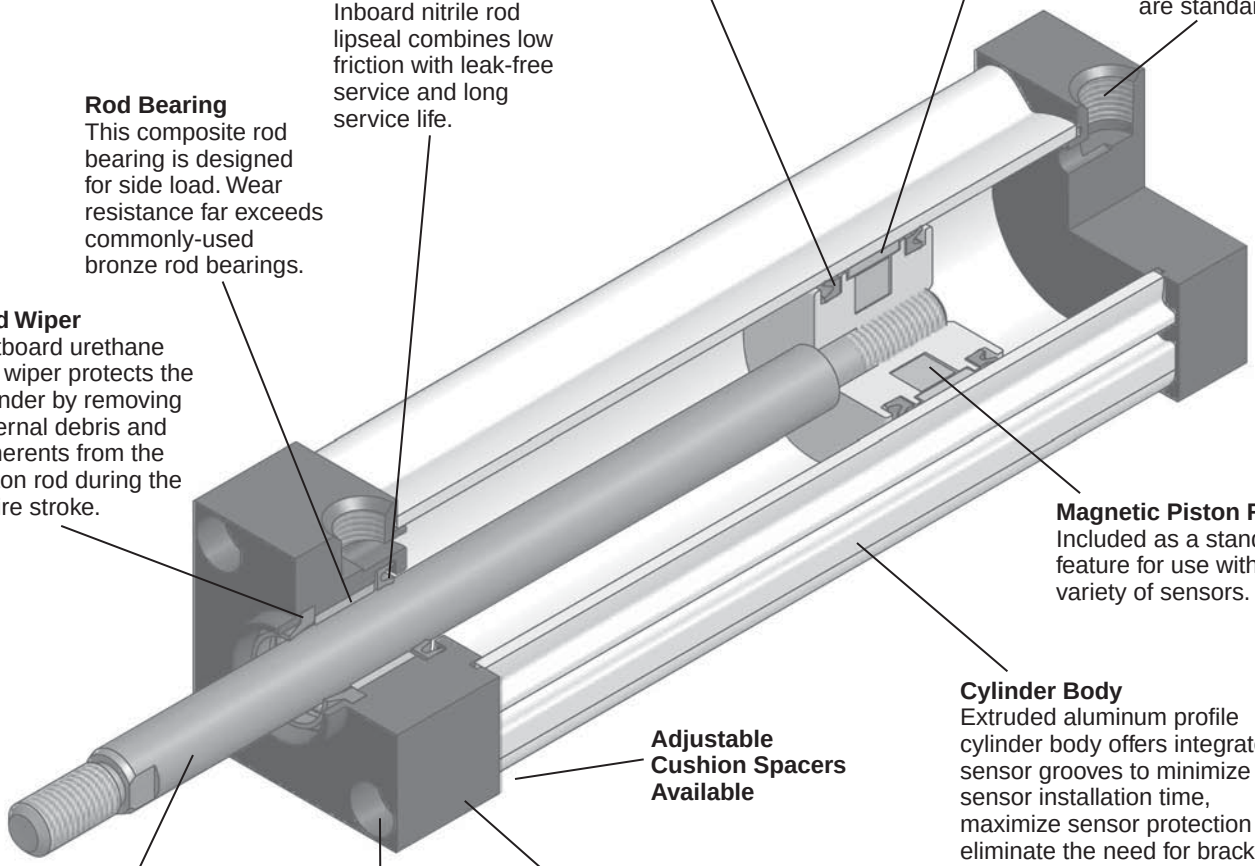
Piston Seals
Nitrile piston lipseals combine low friction with leak-free service and long service life. Optional bumper piston seals provide additional noise reduction and smooth end-of-stroke deceleration.

Ports
1/8" NPTF ports are standard.

Rod Seal
Inboard nitrile rod lipseal combines low friction with leak-free service and long service life.

Rod Bearing
This composite rod bearing is designed for side load. Wear resistance far exceeds commonly-used bronze rod bearings.

Rod Wiper
Outboard urethane rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.



Magnetic Piston Ring
Included as a standard feature for use with a variety of sensors.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept Mini-Global Sensors. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction. A few mounts require anodized aluminum tube and steel tie rod construction (tie rod brackets for sensors available).

Adjustable Cushion Spacers Available

Heads and Caps
Steel alloy heads and caps are black zinc-plated for corrosion resistance

Piston Rod
Hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. Grades of stainless steel are available as options.

Endcap Fasteners
Zinc-plated steel endcap fasteners (and tie rods for some mounts) for heavy-duty use. Stainless steel is available as an option.

For a complete list of 3MA options, please see pages B48 and B52.

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B

How to Order 3MA Series Cylinders for 1-1/8" Bore

3MA cylinders can be specified by model number by using the table below.

1.12			J	3MA		U			1	6		A		4.000

Bore Size
1.12 1-1/8"

Double Rod Cylinder
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code (see table on following page).

Series
3MA Air service
3ML Hydraulic service

Ports
U 1/8" NPTF (standard)
T SAE #4 (adapter)[5]

Seals
Blank Standard (nitrile seals)
V Fluorocarbon seals[2]
E Fluorocarbon rod wiper and rod seal only[3]

Piston Rod Number
1 3/8" rod
3 1/2" rod
Specify rod code number for required diameter.

Stroke Length
Specify stroke length required in inches.[4]

Cushion Cap End
Blank Non-cushioned cap end
C Cushioned cap end (not available for 3ML)

Cushion Head End
Blank Non-cushioned head end
C Cushioned head end (not available for 3ML)

Piston Rod Thread Type
A Standard (UNF Unified Thread)
W BSF British Fine
M Metric (see page B106)

Piston Type
Blank Standard (lipseals and magnetic ring)
2 Lipseals, no magnetic ring
4 Bumper seals, no magnetic ring[1]
6 Bumper seals and magnetic ring[1]

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes.

Rod Material Code
Blank Standard
Y 17-4 PH stainless steel
J 303 stainless steel[1]
S 316 stainless steel[1]

Piston Rod Thread Style
6 Full male
4 Small male
9 Short female
3 Special (and specify all dimensions required)

[1] Not available for 3ML

[2] Reed and solid-state sensors only available with standard seals or seal option E.

[3] Used for external chemical compatibility applications, not high temperature.

[4] If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes.

[5] Not available with US mount. Adapter height is approximately 0.83" when installed. Adapter body extends 0.15" from cap face. Use of mountings at cap end may be affected by this port type.

How to order 1-1/8" Bore 3MA/3ML Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

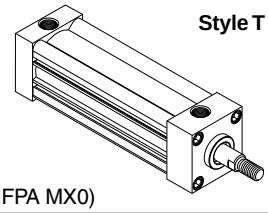
1. Cylinder model number must have Piston Type (blank) or 6.
2. Please refer to pages M1-M9 for sensor part numbers and specifications. Mini-Global, NAMUR and Weld Immune Sensors will fit the 1-1/8" Bore 3MA/3ML Series (Global Sensors not available).
3. Tie rod bracket P8S-TMA0Z will be required for Mini-Global Sensors with Mounting Styles US, F, MR, TB, TC, TD or other tie rod versions.
   Please refer to page M9 for more information.

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3MA Series Mounting Styles for 1-1/8" Bore

No Mount Basic

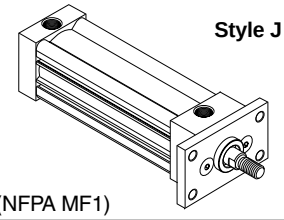
Style T



(NFPA MX0)

Head Rectangular Flange

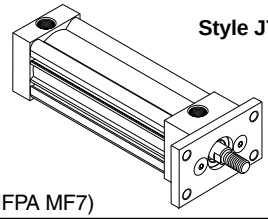
Style J



(NFPA MF1)

Head Rect. Flange (no pilot)

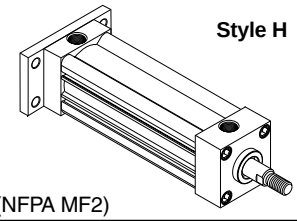
Style J7



(NFPA MF7)

Cap Rectangular Flange

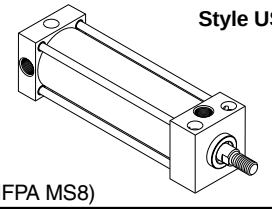
Style H



(NFPA MF2)

Side Thru Hole

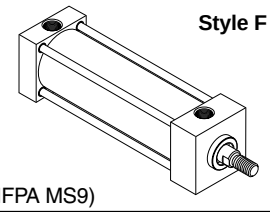
Style US



(NFPA MS8)

Side Tap

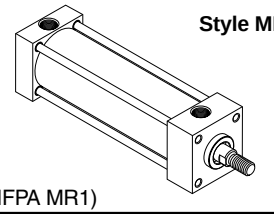
Style F



(NFPA MS9)

Head Tap

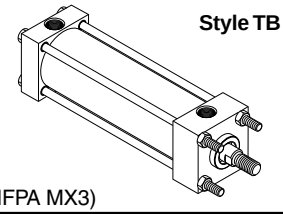
Style MR



(NFPA MR1)

Tie Rods Ext. Head End

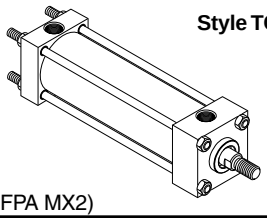
Style TB



(NFPA MX3)

Tie Rods Ext. Cap End

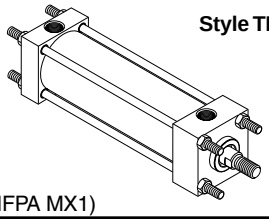
Style TC



(NFPA MX2)

Tie Rods Ext. Both Ends

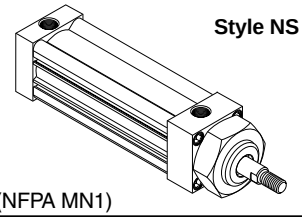
Style TD



(NFPA MX1)

Threaded Nose

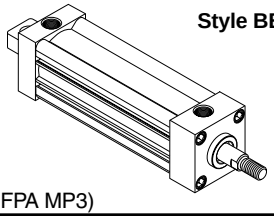
Style NS



(NFPA MN1)

Cap Pivot Eye

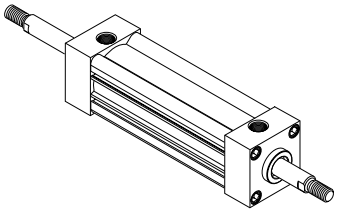
Style BE



(NFPA MP3)

Double Rod End

Style KT



(NFPA MDX0)

Double rod end cylinders can be ordered with head mountings, i.e. KJ (see page B53).

Note: Styles US, F, MR, TB, TC and TD are tie rod construction only, profile body not available. If Mini-Global sensors are required, please order one tie rod bracket (P8S-TMA0Z) for each sensor.

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B

General Specifications

- NFPA interchangeable – NFPA/T3.6.11 R1-1998 (R2004)
- Strokes – available in any practical stroke length
- Rod diameters – 3/8" and 1/2"
- Rod end styles – 3 standard, specials available
- Single rod end or double rod ends
- Cushions – optional and adjustable at either end or both ends (n/a for 3ML Hydraulic Version)
- Operating pressure –
  3MA = 250 PSIG (17 Bar) max. air service
  3ML = 1,100 PSIG (76 Bar) max. hydraulic service
- Media – 3MA = dry, filtered air
  3ML = filtered hydraulic oil
- Temperature range –
  -10°F to +165°F (-23°C to +74°C) with standard seals
  -10°F to +250°F (-23°C to +121°C) with fluorocarbon seals option
  -50°F to +150°F (-46°C to +66°C) with low temperature seals (consult factory)
- Mounting styles – 13 standard styles

For material options, including seals and piston rods, please see Material Specifications on next page.

Cylinder Weights – 1-1/8" Bore

3MA/3ML Cylinders

Bore (inch)	Rod (inch)	No Mount Single Rod 3MA	
		Base Wt. (lbs.)	Per Inch (lbs.)
1-1/8	3/8	1.26	0.10
	1/2		0.13

Standard Cushion Position

Mounting Code	Position
All mounts	2

Standard Port Size

Bore	NPTF
1-1/8	1/8

Recommended Maximum Extend Stroke Length

Rod (inch)	Pressure (PSIG)			
	100	200	500	1100
3/8	26"	18"	12"	9"
1/2	46"	32"	21"	15"

Please consult Actuator Division for longer stroke lengths.

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Material Specifications – Standard Temperatures and Applications

Head and cap	Black zinc plated steel alloy
Head and cap screws	Zinc plated steel alloy
Cylinder body	Clear anodized aluminum alloy
Piston rod	Chrome plated carbon steel
Rod seal	Nitrile
Rod wiper	Molythane
Rod bearing	Composite
Piston	Aluminum alloy
Piston seals	Nitrile
Piston bearing	MolyGard™
Magnetic ring	Plastic-bound magnetic material
Piston fastener	Piston rod for aluminum piston
O-rings	Nitrile
End seals	Nitrile
Cushion spacer	Black zinc plated steel alloy
Cushion seals	Urethane
Cushion needle valves	Stainless steel
Tie-rods (some mounts)	Blackened carbon steel
Tie-rod nuts (some mounts)	Black oxided steel alloy
Cylinder accessories	Black zinc plated steel alloy

3MA Options – Material and Part Changes

High temperatures (-10°F to +250°F)	All seals and wiper are fluorocarbon Aluminum piston only (without magnetic ring)	Low temperatures (-50°F to +150°F)	Rod seal, piston seals, o-rings and end seals are low temperature-rated nitrile (consult factory)

3ML Hydraulic Version – Material and Part Changes

Hydraulic service (general)	Cushions and bumper piston seals not available	Hydraulic service (high temp)	All seals and wiper are fluorocarbon (for hydraulic use)
Hydraulic service (std temp)	Nitrile rod seal and piston seals (for hydraulic use)		

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon for high temperatures or chemical compatibility Other seal options available, please consult factory	Piston rod material options	Chrome plated carbon steel (standard) 17-4 PH stainless steel 303 stainless steel (n/a for 3ML) 316 stainless steel (n/a for 3ML) (for stainless steel with chrome plating, please consult factory) Case-hardened, chrome plated carbon steel
Bumper piston seal options (3MA only, n/a for 3ML)	Carboxylated nitrile (Nitroxile) for standard temperatures Fluorocarbon for high temperatures and chemical compatibility		

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B

How to Select a 1-1/8" Bore 3MA Cylinder

Parker cylinders are available based on air or hydraulic operating pressure. The many styles, sizes and optional features available assure that your application requirements are precisely met. To select a cylinder, follow these simple steps:

Step 1 - **Verify that the 1-1/8" bore size is** appropriate to achieve required force using the available operating pressure.

Step 2 - **Determine the series cylinder to use**, based on operating pressure.

Step 3 - **Turn to the appropriate cylinder selection section.** Select the mounting style that fits your installation needs.

- Choose a rod end style and the desired rod end accessories.
- Size the cylinder to meet your application requirements.

Step 4 - **Consider the following conditions** which may require further modifications to the cylinder you have selected.

Application Condition	Check the Following
Quick Starts or Stops	Confirm that determined thrust is sufficient to accelerate or decelerate cylinder and load within prescribed distance. Optional cushions should be used to reduce shock during deceleration, check that peak pressures will be within tolerable limits.
Long Push Stroke	Check whether stop tube is required to prevent excessive bearing loads and wear.
High-column Loading Long Push Stroke	Determine if standard size piston rod is strong enough to accommodate intended load. See Application Engineering section for recommendations.
Long Horizontal Stroke	Determine if standard size piston rod is strong enough to accommodate intended load.
High Operating Temperatures	For temperatures between 165°F and 250°F use 3MA or 3ML cylinder with high temperature seals.

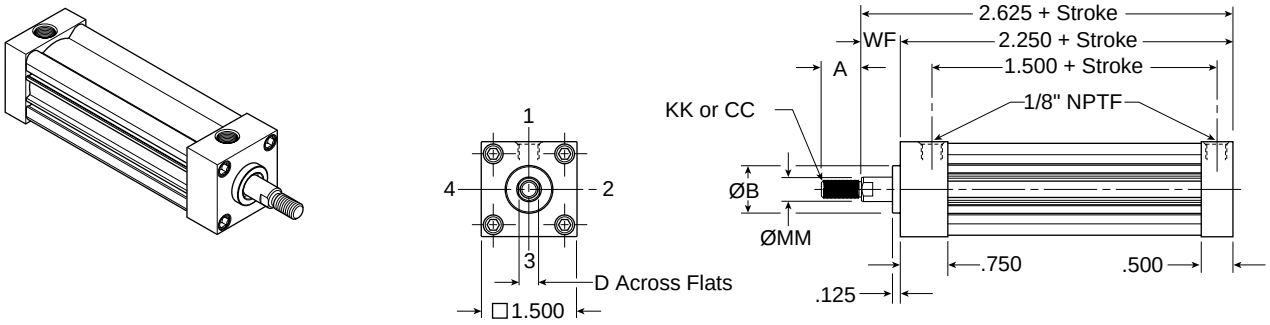
General Options and Modifications:

- Adjustable Cushions (Cushion Spacers)
- Non-Magnetic Piston (magnetic ring standard)
- Piston Bumper Seals
- Port and Adjustable Cushion Relocation
- Port Thread Styles
- Multiple Ports
- Special Heads, Caps, Pistons and Mounts
- Double Rod End
- Oversize Rod Diameters
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Fluorocarbon Rod Wiper and Rod Seal only
- Fluorocarbon Seals (all cylinder seals)
- Stop Tube
- Mixed Mountings
- Round Tube and Tie Rod Construction
- Stainless Steel Fasteners/Tie Rods
- Shock Absorber on Cap End
- LECTROFLUOR® Coating
- Adjustable Point Sensors (order separately)
- High Temperature Service (to +250°F)
- Hydraulic Service (3ML) (1,100 PSIG)

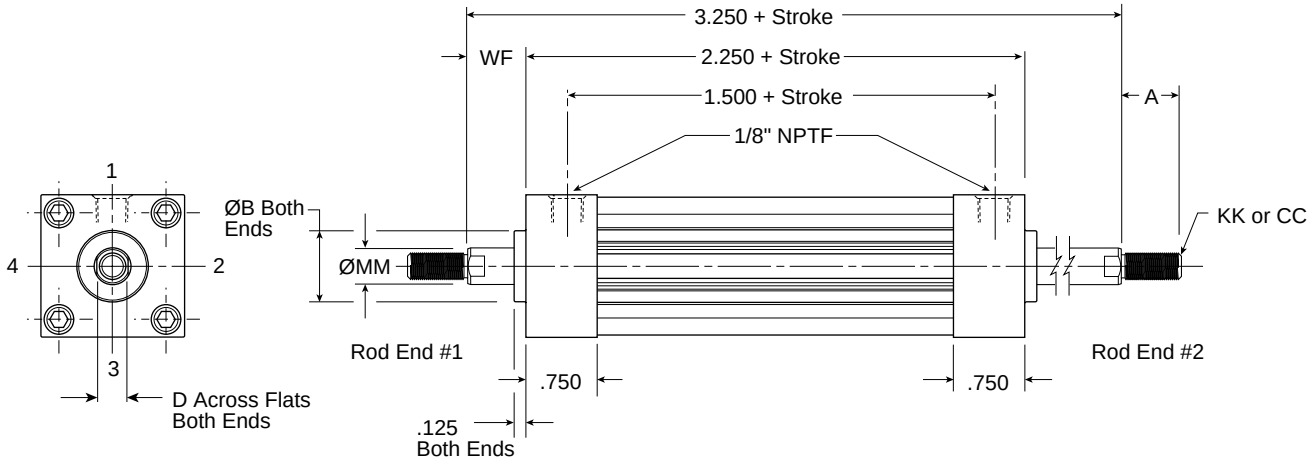
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Single Rod, Double Rod and Cushioned Cylinder Dimensions

Single Rod – T Mount Dimensions

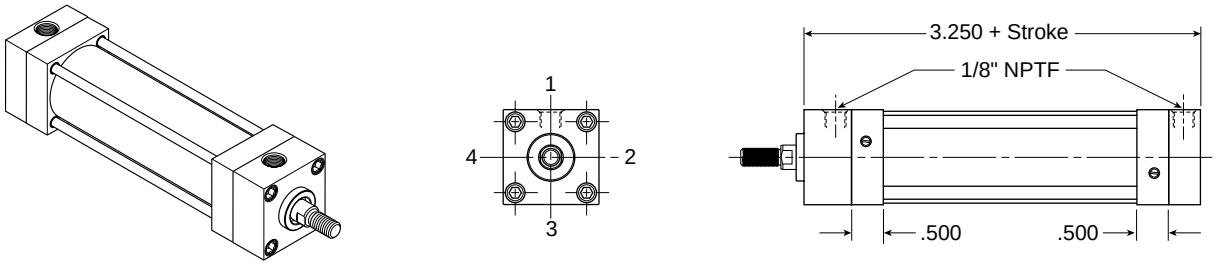


Double Rod – KT Mount Dimensions



Single rod end mounts T, J, J7, TB, TD and NS can become double rod end mounts KT, KJ, KJ7, KTB, KTD and KNS. Please use the appropriate dimensions from head face of the single rod end mount drawings with KT drawing above for double rod end cylinder dimensions.

Cushioned Cylinder Dimensions



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 6 CC	Thread Style 4 KK	Thread Style 9 KK	A	-0.001 -0.003 B	D	LAF	WF
1-1/8	1	3/8	3/8-24	5/16-24	1/4-28	0.625	0.750	5/16	1.000	0.375
	3	1/2	1/2-20	7/16-20	3/8-24	0.750	0.750	7/16	1.125	0.375

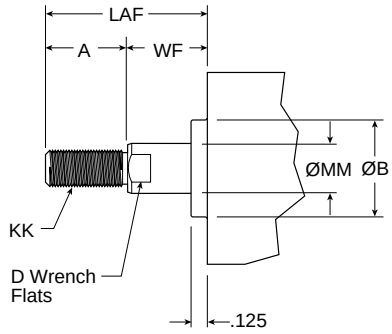
Note: Adjustable cushions will add 0.50" to each end. Cushions at both ends will add a total of 1.00" to the base cylinder length. Single rod configuration shown above. Available with single rod and double rod cylinders.

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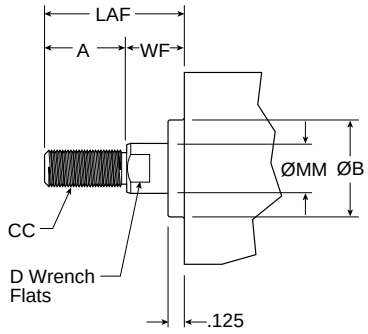
B

3MA Series Rod End Dimensions – 1-1/8" Bore

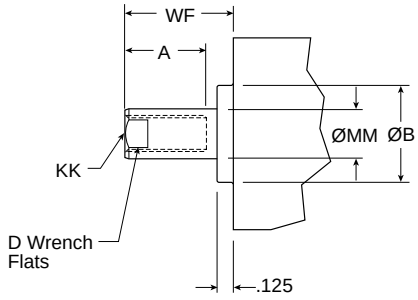
Thread Style 4
Small Male



Thread Style 6
Full Male



Thread Style 9
Short Female



Rod End Dimensions

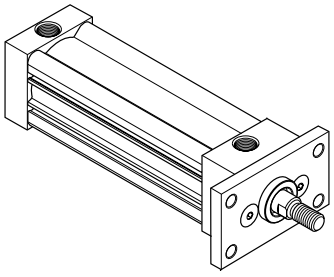
Bore Size	Rod No.	Rod Dia. MM	Thread Style 6 CC	Thread Style 4 KK	Thread Style 9 KK	A	-0.001 -0.003 B	D	LAF	WF
1-1/8	1	3/8	3/8-24	5/16-24	1/4-28	0.625	0.750	5/16	1.000	0.375
	3	1/2	1/2-20	7/16-20	3/8-24	0.750	0.750	7/16	1.125	0.375

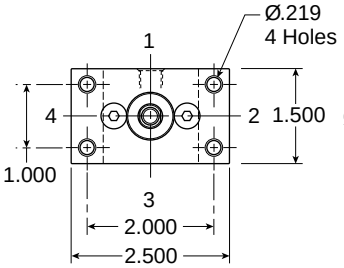
Thread Style 3 - "Special Thread"

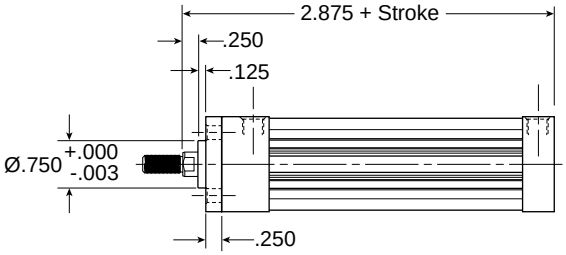
Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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Head Rectangular Flange
Style J
(NFPA MF1)

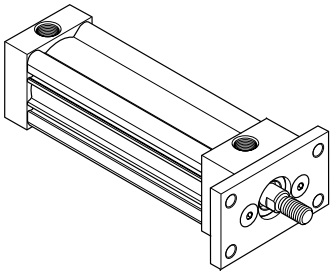


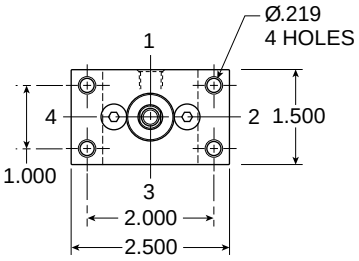


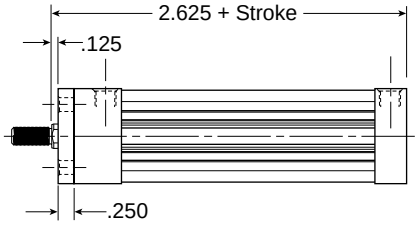


W dimension = .375

Head Rectangular Flange (no pilot)
Style J7
(NFPA MF7)

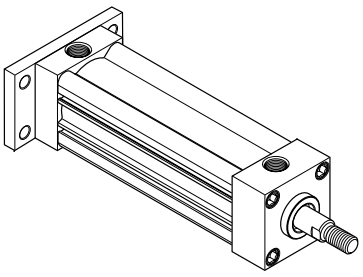


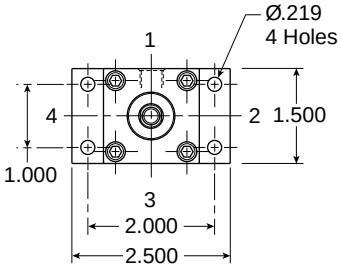


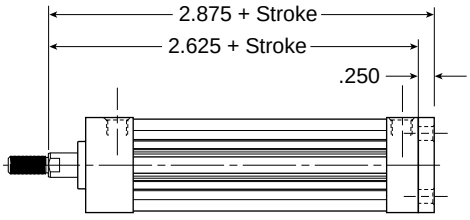


W dimension = .125

Cap Rectangular Flange
Style H
(NFPA MF2)



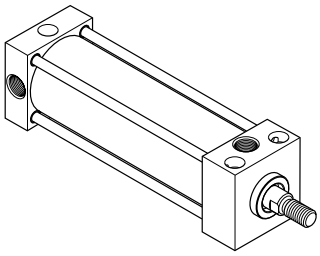


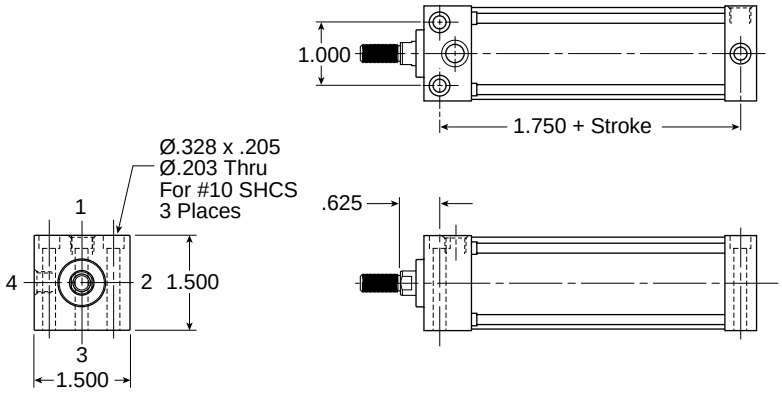


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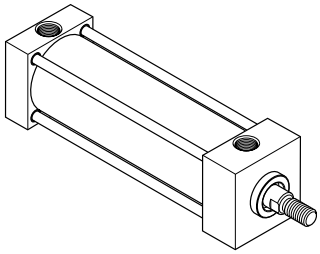
B

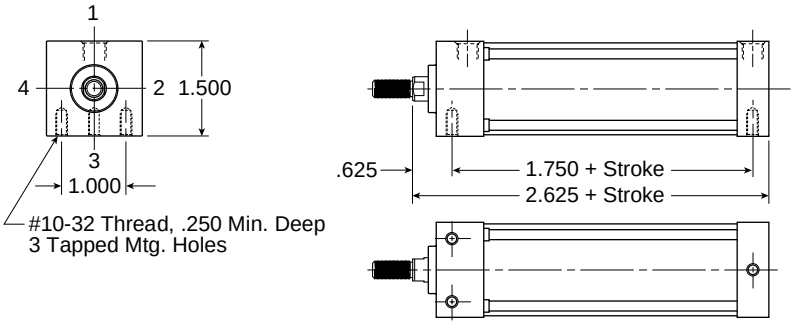
Side Thru Hole
Style US
(NFPA MS8)



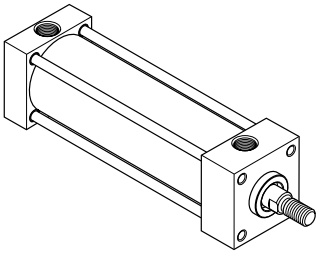


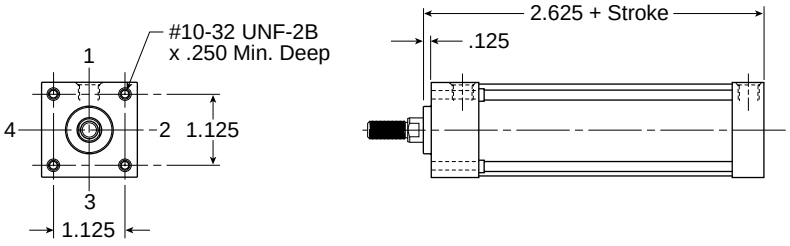
Side Tap
Style F
(NFPA MS9)





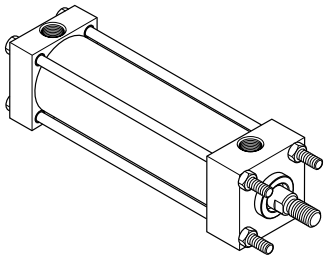
Head Tap
Style MR
(NFPA MR1)

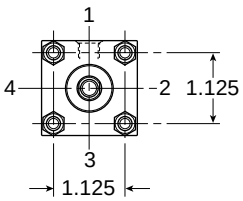


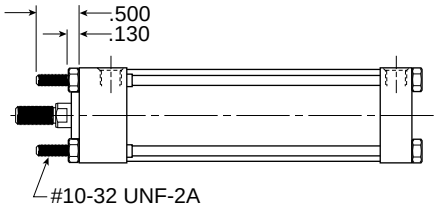


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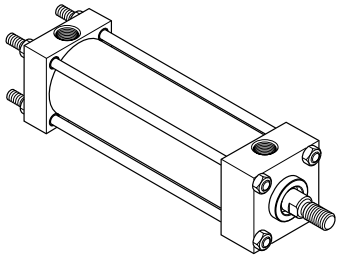
Tie Rods Ext. Head End
Style TB
(NFPA MX3)

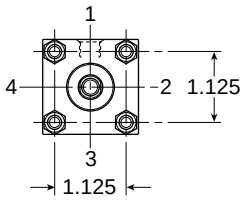


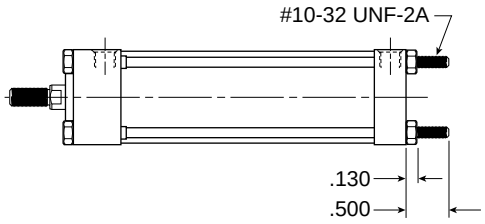




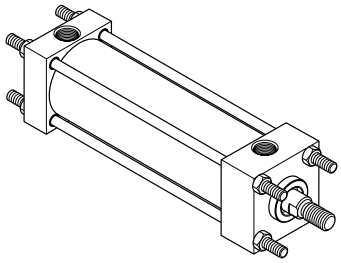
Tie Rods Ext. Cap End
Style TC
(NFPA MX2)

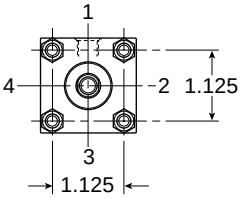


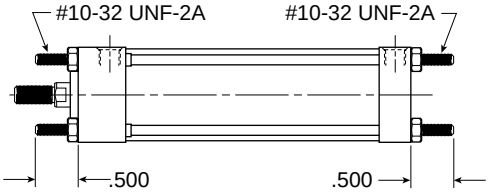




Tie Rods Ext. Both Ends
Style TD
(NFPA MX1)



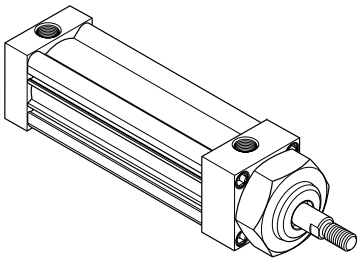


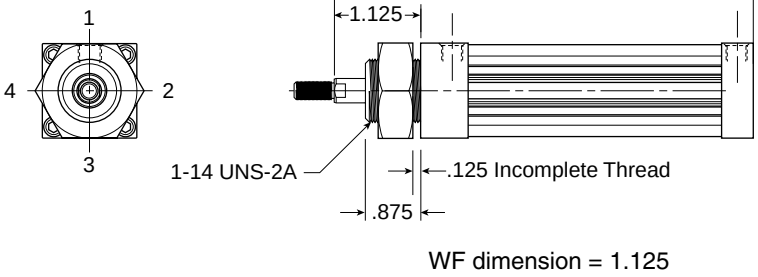


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B

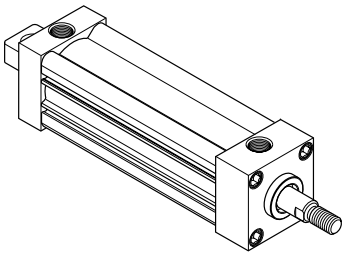
Threaded Nose
Style NS
(NFPA MN1)

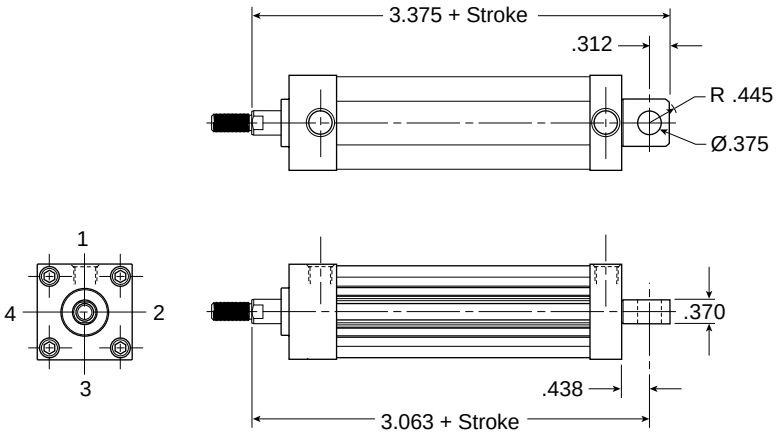




WF dimension = 1.125

Cap Pivot Eye
Style BE
(NFPA MP3)



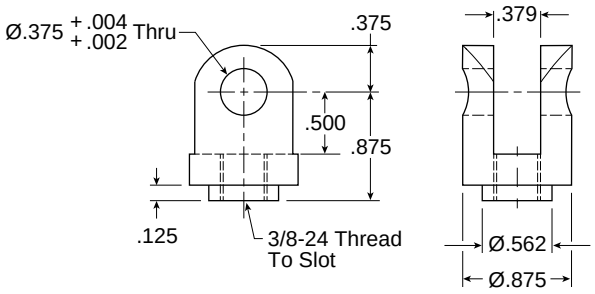


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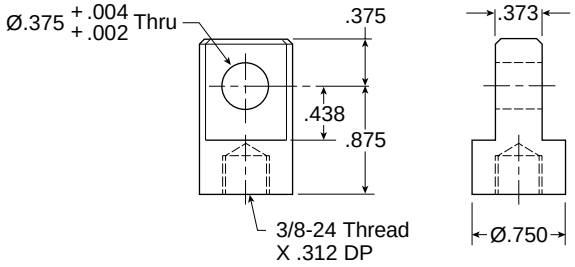
Cylinder Accessories

Note: Pivot Pin Assembly must be ordered separately

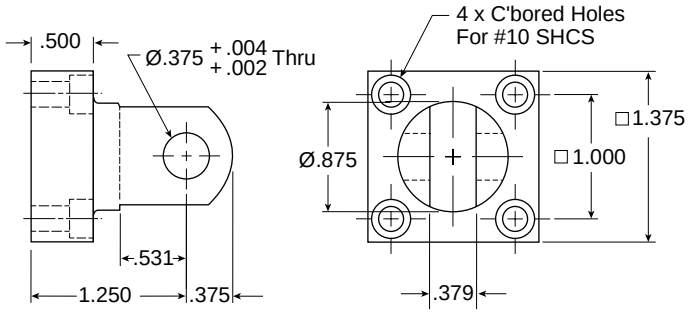
Rod Clevis P/N 1458030038



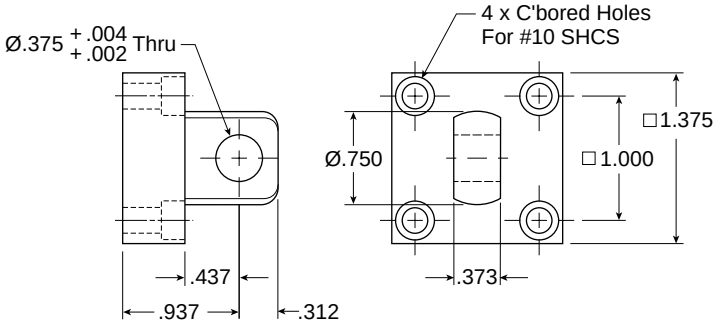
Rod Eye P/N 1458040038



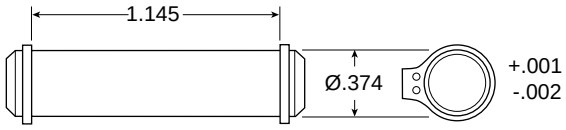
Clevis Bracket P/N 1458050038



Eye Bracket P/N 1458060038

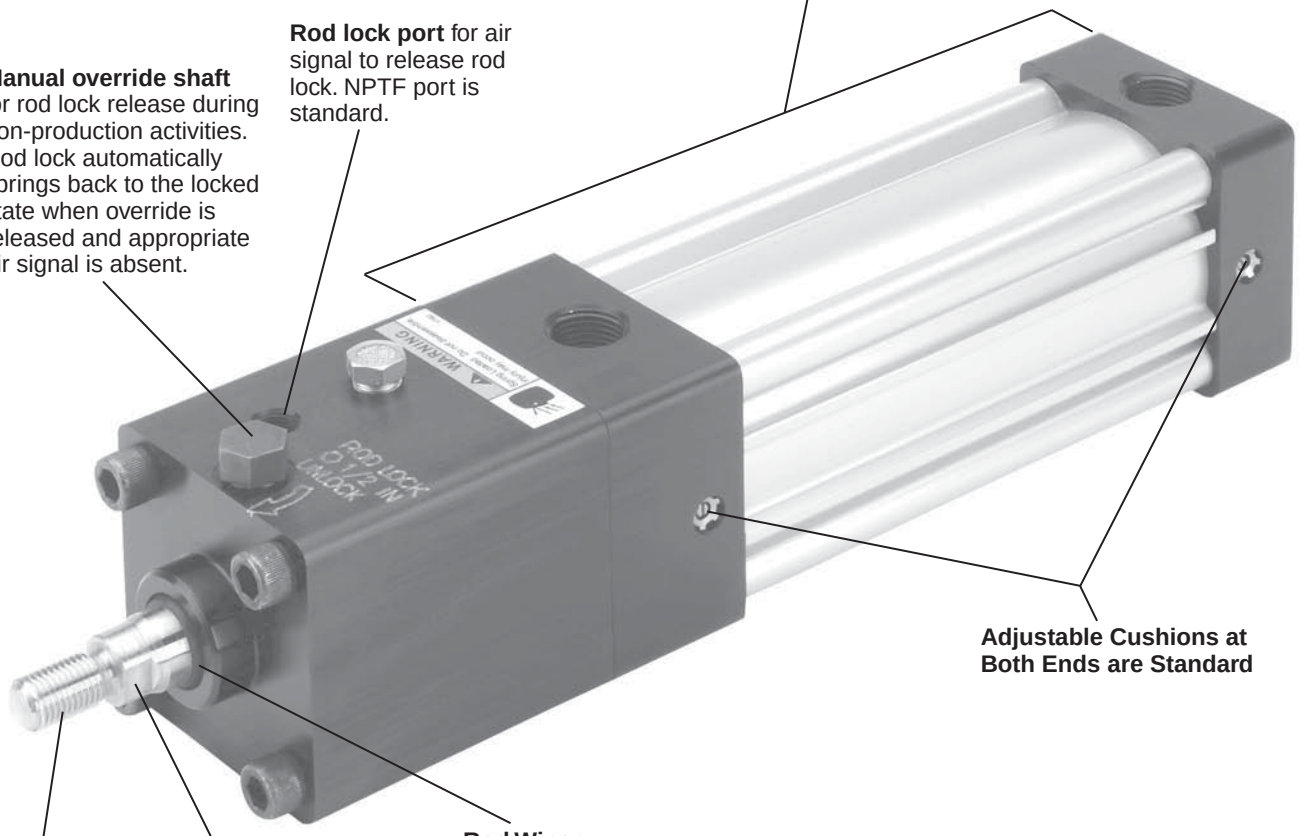


Pivot Pin Assembly P/N 0856640038



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B



3MA or 4MA cylinder for heavy-duty applications and reliable performance.

Rod lock port for air signal to release rod lock. NPTF port is standard.

Manual override shaft for rod lock release during non-production activities. Rod lock automatically springs back to the locked state when override is released and appropriate air signal is absent.

Adjustable Cushions at Both Ends are Standard

Rod Wiper
Outboard fluorocarbon rod wiper protects the cylinder by removing external debris and adherents from the piston rod during the entire stroke.

Standard NFPA rod end dimensions from the face of the rod lock.

Piston Rod
Standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rod for reliable performance, long rod seal life and low friction. 17-4PH stainless steel available as an option.

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3MAJ and 4MAJ Series Cylinders

NFPA Non-Lube Pneumatic Cylinder with Manual Override Rod Lock

Rod lock versions of the 3MA Series (the 3MAJ) and 4MA Series (the 4MAJ) are available. These rod lock version provides precise load holding with virtually zero backlash and features high accuracy for demanding applications. The rod lock is a spring-activated type with air pressure release and clamps the piston rod to lock it into position. In the absence of an appropriate air signal, full holding force is applied to the piston rod. When a 60 PSI (or greater) air signal is present, the locking device is released. All rod locks include a manual override shaft to free the rod lock without air pressure during non-production activities.

Some key benefits of the 3MAJ and 4MAJ Series Cylinders:

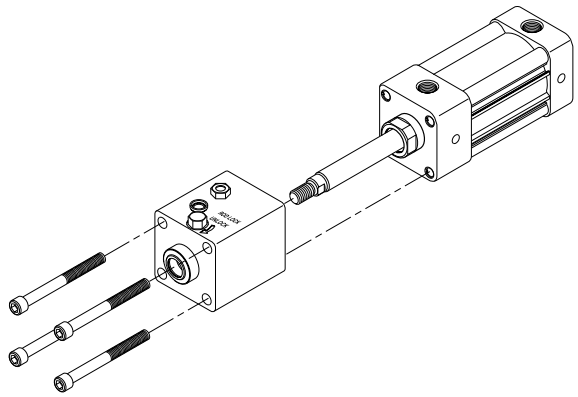
Bolt-On Modularity – As a true cylinder accessory, the rod lock may be removed without affecting the base cylinder (1-1/2" to 5" bores). The same, great cylinder remains intact, allowing the rod lock to bolt-on with minimal length change. This modularity can be extremely important for special installations or while servicing the cylinder. Rod locks for 6" - 8" bores and all Style DD mounts (NFPA MT4) are fastened to the base cylinder using the base cylinder's tie rods. See drawings below.

Aesthetics – we have designed our rod locks with the same anodized aluminum extrusion used for the cylinder endcaps, resulting in a virtually seamless assembly. In addition, we focused every effort to create the shortest overall package, minimizing the need for customers to accommodate significantly longer cylinder lengths.

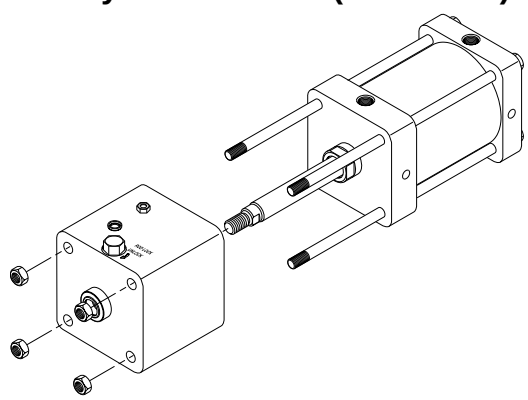
Functionality – With a holding force corresponding to 100 PSI on the cap end for nearly every bore size, the rod lock can be used for a variety of holding applications. The manual override shaft allows occasional release of the piston rod and automatically returns the rod lock back to the locked state when it is released and the appropriate air signal is absent. The front pilot diameter meets NFPA specifications and facilitates proper installation of the cylinder to customer equipment or cylinder accessories.

Ease of Order Entry – To order the 3MA or 4MA Series with the rod lock option, just change the product series to 3MAJ or 4MAJ (the "J" is required for the rod lock option). See model code on page B64 for additional information.

1-1/2" to 5" Bores



6" to 8" Bores and all Style DD Mounts (NFPA MT4)



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B

3MAJ and 4MAJ Series Cylinders

NFPA Non-Lube Pneumatic Cylinder with Manual Override Rod Lock

Connection

The signal air for the locking device can be obtained directly from a main air supply, or from the air supply serving the valve that controls the cylinder itself. For controlled ON/OFF operation of the locking device, a separate quick-venting valve is used.

The piston rod should not be moving when the locking device is activated. The locking device is not intended to brake a movement in repeated sequences.

NOTE: The 3MAJ and 4MAJ is not intended for use in water service applications, or in environments that have high humidity levels and/or splashing fluids present.

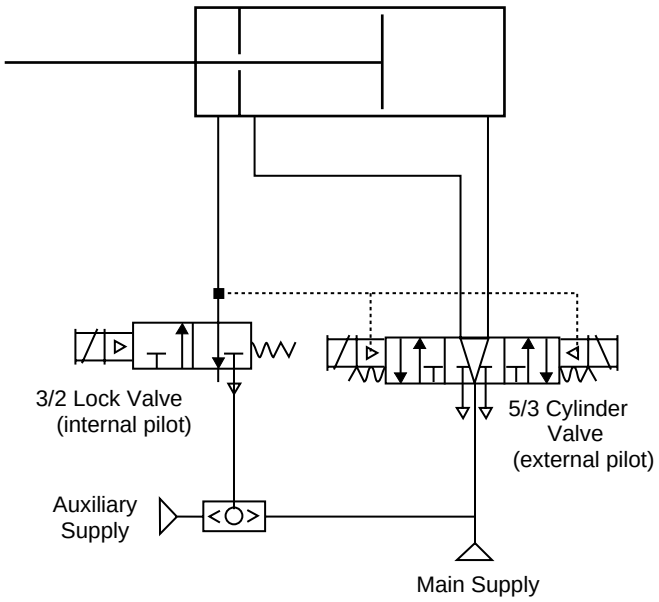
NOTE: Exhaust air from the rod lock can be piped away when there are demands for a contaminant-free environment.

Operation at pressures lower than 60 PSI may lead to inadvertent engagement of the rod lock device.

Other Cylinder and Rod Lock Features:

- The 3MAJ and 4MAJ rod lock will operate in both directions, engaging with the same holding force.
- The 3MAJ and 4MAJ can be mounted in any position.
- Piston rod rotation is not allowed when the rod lock is engaged (not intended for torsional braking).
- Rod lock is suitable for infrequent dynamic braking (emergency stops). Since the 3MAJ and 4MAJ rod lock is designed for static applications, repeated dynamic stops will cause rod and/or bearing wear and reduce holding forces.
- The rated holding force corresponds to static load conditions. If the rated value is exceeded, slipping and other problems may occur.
- If personal safety is required, an unrelated, redundant safety system is recommended.

Sample Pneumatic Circuit



1. Lock valve must be maintained energized during cylinder motion, otherwise rod lock is engaged and cylinder valve shifts to mid position.
2. Cylinder valve must be maintained energized during extend or retract. Also keep energized at end of stroke until change of direction is desired.
3. Mid position of 5/3 Cylinder valve may be pressurized outlets if the combination of pressure load on the cylinder and inertia effects of the attached load do not exceed the holding force rating of the rod lock device, including allowance for wear.
4. Do not use cylinder lines for any logic functions – pressure levels vary too much.

Basic Rod Lock Specifications

Bore Size	Rod No.	Rod Dia. MM	Air Chamber Volume (in^3)	Engagement Time (seconds)	Rated Holding Force (lbs)	Minimum Torque to Override (ft-lbs to hex shaft)
1-1/2	1	5/8	0.25	0.030	180	2
2	1	5/8	0.71	0.040	314	5
	3	1	0.68	0.040	250	5
2-1/2	1	5/8	1.26	0.045	491	7
	3	1	1.49	0.050	491	7
3-1/4	1	1	3.20	0.070	830	17
	3	1-3/8	2.11	0.060	830	17
4	1	1	6.73	0.100	1,256	45
	3	1-3/8	4.78	0.100	1,256	45
5	1	1	11.50	0.150	1,963	72
	3	1-3/8	9.50	0.130	1,963	72
6	1	1-3/8	14.08	0.175	2,830	135
	3	1-3/4	12.75	0.165	2,830	135
8	1	1-3/8	22.66	0.265	5,026	160
	3	1-3/4	23.21	0.265	5,026	160

Note: This specification data applies only to the rod lock part of the 3MAJ and 4MAJ cylinder.

For cylinder volume and performance, please use cylinder dimensions and application criteria.

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B

How to Order 3MAJ/4MAJ Series Cylinders for 1-1/2" to 8" Bore

3MAJ/4MAJ cylinders can be specified by model number by using the table below.

2.00	C		J		4MAJ		U			1	4		A	C	6.000

Bore Size

1.50 [1]
2.00
2.50
3.25
4.00
5.00
6.00 [2]
8.00 [2]

Double Rod Cylinder [12]

Specify "K" only if double rod cylinder is required.

Mounting Style

Specify mounting style code (see table on following page).

Series

4MAJ	4MA Rod Lock Cylinder
3MAJ	3MA Rod Lock Cylinder

Ports [4]

U	NPTF
R	BSPP
B	BSPT
T	SAE

Seals

Blank	Standard (nitrile seals)
V	Fluorocarbon seals [2,5]
E	Fluorocarbon rod wiper and rod seal only [6]

Piston Rod Number

Specify rod code number for required diameter. [8]

Stroke Length

Specify stroke length required in inches. [10]

Cushion Cap End

Cushioned cap end "C" is required.

Cushion Head End

Cushioned head end "C" is required.

Piston Rod Thread Type

A	Standard (UNF Unified Thread)
W	BSF British Fine
M	Metric (see page B106)

Cylinder Construction

Blank	Standard (extruded body, standard round lobe orientation) *
A	Extruded body, round lobe orientation rotated 90 degrees from standard *
N	Extruded body, round lobe orientation rotated 180 degrees from standard *
Z	Extruded body, round lobe orientation rotated 270 degrees from standard *
T	Aluminum round tube and carbon steel tie rods and nuts

* See Table on page B10

Special Modification

Specify "S" only for special modification other than rod end, and then describe modification in item notes. (Includes 4MAJ with Linear Position Sensor Option) [7]

Rod Material Code

Blank	Standard rod and gland
H	Standard rod and HI LOAD gland [2]
Y	17-4 PH stainless steel rod and standard gland
Z	17-4 PH stainless steel rod and HI LOAD gland [2]

Piston Rod Thread Style

4	Small male
8	Intermediate male
9	Short female
55	For use with Split Coupler [9]
3	Special (and specify all dimensions required)

Piston Type [11]

Blank	Standard (lipseals and magnetic ring) [12]
1	Lipseals, no magnetic ring [12]
2	Lipseals, no magnetic ring (aluminum piston)
3	Lipseals and magnetic ring (aluminum piston)
4	Bumper seals, no magnetic ring
6	Bumper seals and magnetic ring
B	Lipseals, 1/4" thick bumpers both ends [3]
H	Lipseals, 1/4" thick bumper head end [3]
C	Lipseals, 1/4" thick bumper cap end [3]
D	Lipseals and magnetic ring, 1/4" thick bumpers both ends [3]
F	Lipseals and magnetic ring, 1/4" thick bumper head end [3]
R	Lipseals and magnetic ring, 1/4" thick bumper cap end [3]

[1] Not available with 1" rod diameter (rod number 2) for 1-1/2" bore. Not available with Linear Position Sensor Option (LPSO).

[2] Not available for 3MAJ, please specify 4MAJ.

[3] Addition of 1/4" bumper results in a 1/4" stroke loss per bumper, per end. For example, a 6" stroke cylinder with 1/4" bumpers at both ends (option B) has an effective stroke of 5-1/2".

[4] Port thread styles only for base cylinder. Rod lock port is always NPTF. If a different rod lock port thread style is required, place an "S" for special in the Special Modification field and indicate the desired rod lock port thread style in the item notes. NPTF cylinder ports are must be ordered for 3MAJ.

[5] Fluorocarbon seals for 4MAJ are only for external chemical compatibility applications, not high temperature.

[6] Used for external chemical compatibility applications, not high temperature.

[7] For Linear Position Sensor Option (LPSO), please include the following information for the Special Modification item notes:
a. Sensor part number (see pages B100-B104)
b. Sensor position
c. Port position (if other than position 1)
d. Length of stop tubing, gross stroke and net stroke (if required)
LPSO not available for 3MAJ, please specify 4MAJ. Cylinder dimensions will approximate dimensions for 4MAJ. Piston Type option (blank), 3, 6, D, F or R is required. Please consult the Actuator Division for additional information.

[8] Review Piston Rod Selection Chart on page A14 to determine proper piston rod diameter.

[9] For additional information regarding this style, refer to page B105. If non-standard Rod Material and Gland Code is required with this option, please place an "S" for special in Special Modification field and specify Rod Material and Gland Code in the item notes.

[10] If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes. Not available with Piston Types (blank) and 1 for 1-1/2" - 5" bore cylinders. Stop tube not available for 3MAJ, please specify 4MAJ.

[11] 6"-8" bore 4MAJ can accept only Piston Types (blank) and 3. The (blank) piston for 6"-8" bores is aluminum, lipseals, no magnetic ring. Composite pistons not available with oversize rod number 3.

[12] Double rod cylinders not available with composite piston type.

How to order 3MAJ/4MAJ Series cylinders with sensors:

Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.

1. Cylinder model number must have a Piston Type with a magnetic ring ((blank, thru 5" bore) 3, 6, D, F or R).
2. Please refer to pages M1-M9 for sensor part numbers and specifications. Global, NAMUR and Weld Immune Sensors will fit the 3MAJ/4MAJ Series.
3. Style DD mounts, 6"-8" Bore and other tie rod versions with Global Sensors will require tie rod bracket P8S-TMA0X. Please refer to page M9 for more information.

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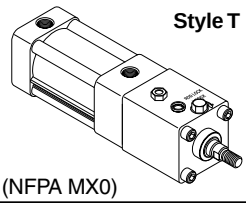
3MAJ/4MAJ Series Mounting Styles

Mounting Code	NFPA Mounting Style	Description	Available Bore Sizes		
			4MAJ/3MAJ*	4MAJ-LPSO w/o Stop Tube	4MAJ-LPSO w/Stop Tube
T	MX0	No Mount	1-1/2 - 8	2 - 8	2 - 8
J	MF1	Head Rectangular Flange	1-1/2 - 6	2 - 6**	2 - 6
H	MF2	Cap Rectangular Flange	1-1/2 - 6	2 - 6**	2 - 6**
TB	MX3	Tie Rods Extended Head End	1-1/2 - 8	–	2 - 8
TC	MX2	Tie Rods Extended Cap End	1-1/2 - 8	–	–
TD	MX1	Tie Rods Extended Both Ends	1-1/2 - 8	–	–
C	MS2	Side Lug	1-1/2 - 8	2 - 8	2 - 8
F	MS4	Side Tap	1-1/2 - 8	2 - 8	2 - 8
CB	MS1	Side End Angle	1-1/2 - 8	2 - 8	2 - 8
G	MS7	Side End Lug	1-1/2 - 4	2 - 4	2 - 4
BB	MP1	Cap Fixed Clevis	1-1/2 - 8	2 - 8**	2 - 8**
BC	MP2	Cap Detachable Clevis	1-1/2 - 8	2 - 8**	2 - 8**
BE	MP4	Cap Detachable Eye	1-1/2 - 6	2 - 6**	2 - 6**
D	MT1	Head Trunnion	1-1/2 - 8	2 - 8	2 - 8
DB	MT2	Cap Trunnion	1-1/2 - 8	2 - 8**	2 - 8**
DD	MT4	Intermediate Trunnion	1-1/2 - 8	–	–
KT	MDX0	Double Rod End, No Mount	1-1/2 - 8	2 - 8	2 - 8

* 3MAJ utilizes base 3MA cylinder and is available in 1-1/2" to 5" bore sizes. Mounting style codes C, D and DB not available for 3MAJ

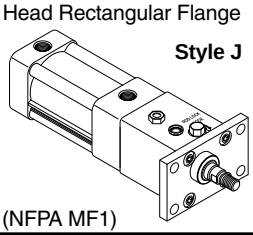
** May interfere with mounting. Please provide clearance for Linear Position Sensor overhang (see page B101).

No Mount Basic **Style T**



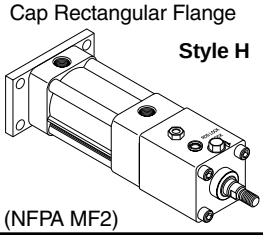
(NFPA MX0)

Head Rectangular Flange **Style J**



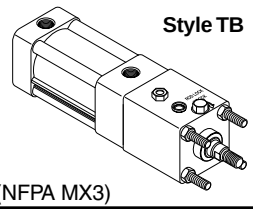
(NFPA MF1)

Cap Rectangular Flange **Style H**



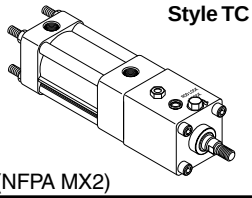
(NFPA MF2)

Tie Rods Ext. Head End **Style TB**



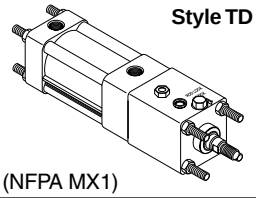
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Tie Rods Ext. Cap End **Style TC**



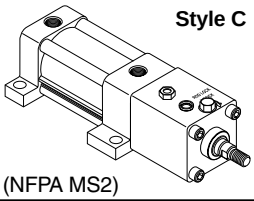
(NFPA MX2)

Tie Rods Ext. Both Ends **Style TD**



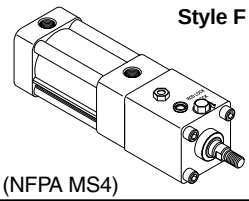
(NFPA MX1)

Side Lug **Style C**



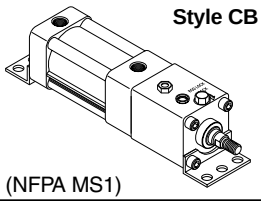
(NFPA MS2)

Side Tap **Style F**



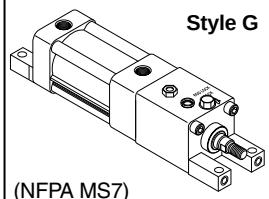
(NFPA MS4)

Side End Angle **Style CB**



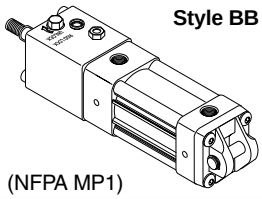
(NFPA MS1)

Side End Lug **Style G**



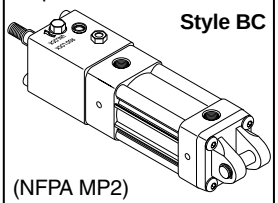
(NFPA MS7)

Cap Fixed Clevis **Style BB**



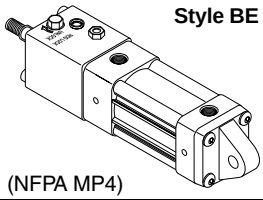
(NFPA MP1)

Cap Detachable Clevis **Style BC**



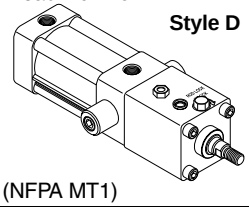
(NFPA MP2)

Cap Detachable Eye **Style BE**



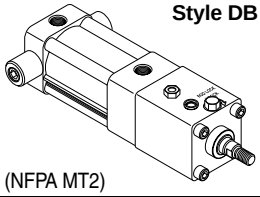
(NFPA MP4)

Head Trunnion **Style D**



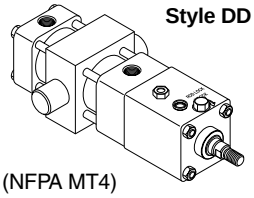
(NFPA MT1)

Cap Trunnion **Style DB**



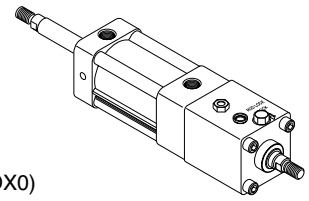
(NFPA MT2)

Intermediate Trunnion **Style DD**



(NFPA MT4)

Double Rod End **Style KT**



(NFPA MDX0)

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B

General Specifications

- NFPA interchangeable*
- Bore sizes – 1-1/2", 2", 2-1/2", 3-1/4", 4", 5", 6" and 8"
- Strokes – available in any practical stroke length
- Rod diameters – 5/8", 1", 1-3/8" and 1-3/4"
- Rod end styles – 4 standard, specials available
- Single rod end or double rod ends
- Cushions – required and adjustable at both ends
- Operating pressure –

  100 PSIG (6.9 Bar)** maximum air service, except for 2" bore with 1" rod (rated at 80 PSIG)

  60 PSIG (4.1 Bar) minimum air pressure to release rod lock
- Media – dry, filtered air
- Temperature range – -10°F to +165°F (-23°C to +74°C)
- Mounting styles – 18 standard styles

* NFPA standards do not specify rod lock cylinder dimensions. The base 3MA or 4MA cylinder and mounting accessories subscribe to NFPA standards.

** The pressure ratings are for these devices as stated. However, the rated holding forces of the rod locks are as stated on page 62.

For material options, including seals and piston rods, please see Material Specifications on next page.

Cylinder Weights – 3MAJ and 4MAJ

Bore (inch)	Rod (inch)	No Mount Single Rod 3MAJ and 4MAJ		No Mount Double Rod	
		Base Wt. (lbs.)	Per Inch (lbs.)	Base Wt. (lbs.)	Per Inch (lbs.)
1-1/2	0.625	4.23	0.20	4.66	0.28
2	0.625	5.90	0.21	6.55	0.30
	1.00	6.49	0.35	7.84	0.58
2-1/2	0.625	7.75	0.23	8.46	0.31
	1.00	8.56	0.37	10.24	0.60
3-1/4	1.00	13.95	0.42	15.15	0.64
	1.375	15.93	0.62	19.46	1.05
4	1.00	20.80	0.49	22.32	0.71
	1.375	22.29	0.69	26.37	1.12
5	1.00	31.20	0.61	33.84	0.84
	1.375	32.72	0.81	36.89	1.24
6	1.375	55.50	0.87	60.63	1.30
	1.75	57.61	1.13	65.41	1.82
8	1.375	94.50	1.25	100.15	1.68
	1.75	96.63	1.51	104.90	2.20

Standard Cushion Position

Mounting Code	Position
All except D, DB, DD	2
D, DB, DD (4MAJ only)	3

Standard Cylinder Port Sizes***

Bore	NPTF / BSPT	BSPP	SAE
1-1/2	3/8	G3/8	6
2	3/8	G3/8	6
2-1/2	3/8	G3/8	6
3-1/4	1/2	G1/2	10
4	1/2	G1/2	10
5	1/2	G1/2	10
6	3/4	G3/4	12
8	3/4	G3/4	12

Port thread styles for base cylinder only. Rod lock port is always NPTF. If a different rod lock port thread style is required, place an “S” for special in the Special Modification field and indicate the desired rod lock port thread style in the item notes. Standard rod lock port sizes are detailed in cylinder dimension tables.

***3MAJ only available with NPTF ports.

Mounting Weight Adders

Bore (inch)	Weight (lbs) by Mounting Style							
	J, H	D, DB	BB	CB, G	DD	BE	C	BC
1-1/2	0.51	0.50	0.15	0.36	1.70	0.23	0.15	0.20
2	0.76	0.50	0.26	065	2.38	0.32	0.15	0.29
2-1/2	1.13	0.50	0.38	1.05	3.00	0.42	0.15	0.41
3-1/4	2.76	0.50	0.98	1.38	5.35	1.26	0.35	1.06
4	4.05	0.50	1.35	2.20	6.75	1.62	0.35	1.49
5	6.46	0.50	1.20	4.29	8.77	1.26	0.57	2.41
6	10.74	1.22	2.91	5.88	15.52	2.91	0.69	11.38
8	N/A	1.22	2.91	7.84	25.01	N/A	0.67	17.31

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Material Specifications – Standard Temperatures and Applications

Same as 3MA for 3MAJ, and 4MA for 4MAJ, with the following additions/changes:

Piston rod (other materials not available)	Case-hardened, chrome plated carbon steel (standard).
	17-4 PH stainless steel, chrome plated.
Rod lock housing	Black anodized aluminum alloy
Rod lock wiper	Fluorocarbon
Manual override shaft	416 stainless steel
Rod lock screws	Black oxided steel alloy

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B

How to Select a 3MAJ and 4MAJ Cylinder

Parker cylinders are available based on air operating pressure. The many styles, sizes and optional features available assure that your application requirements are precisely met. To select a cylinder, follow these simple steps:

Step 1 - **Determine the correct cylinder bore size** necessary to achieve required force using the available operating pressure.

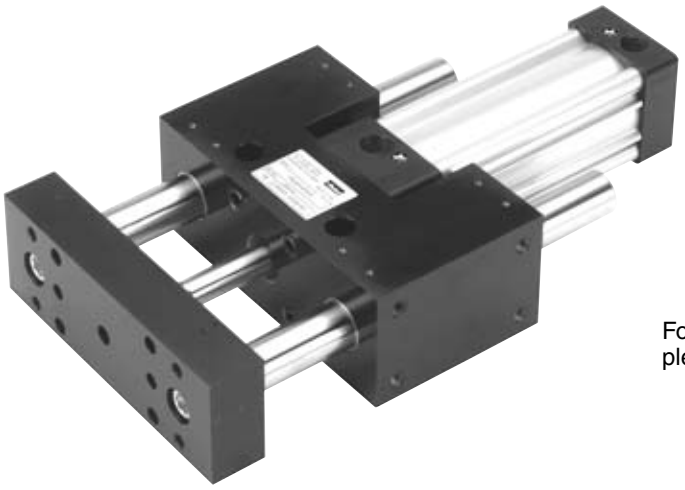
Step 2 - **Determine the series cylinder to use**, based on operating pressure.

Step 3 - **Turn to the appropriate cylinder selection section.** Select the mounting style that fits your installation needs. Determine the bore and rod sizes available for the model you select. Then complete model selection.

- Choose a rod end style and the desired rod end accessories.
- Size the cylinder to meet your application requirements.

Step 4 - **Consider the following conditions** which may require further modifications to the cylinder you have selected.

Application Condition	Check the Following	
Quick Starts or Stops	Confirm that determined thrust is sufficient to accelerate or decelerate cylinder and load within prescribed distance. Mandatory cushions can be used to reduce shock during deceleration, check that peak pressures will be within tolerable limits.	
Long Push Stroke	Check whether stop tube (4MAJ with aluminum piston only) is required to prevent excessive bearing loads and wear.	
High-column Loading Long Push Stroke	Determine if standard size piston rod is strong enough to accommodate intended load. See Piston Rod Selection Chart or Application Engineering section for recommendations.	
Long Horizontal Stroke	Determine if standard size piston rod is strong enough to accommodate intended load.	
Options and Modifications (4MAJ only, please refer to 3MA section regarding 3MAJ option availability beyond model code)	- Piston Bumper Seals - Piston Bumpers (1/4" Thick) - Port and Cushion Adjust Relocation - Port Thread Styles - Multiple Ports - Adjustable Sensors - Linear Position Sensing Option (LPSO) - Double Rod End	- Rod End Modifications - Stop Tube - Mixed Mountings - Shock Absorber on Cap End - Round Tube and Tie Rod Construction - LECTROFLUOR® Coating - Air Cylinder/Valve Combination (ACVB) - Hydro-Check for smooth hydraulic control

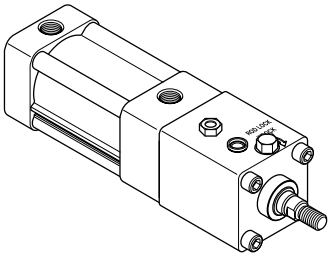


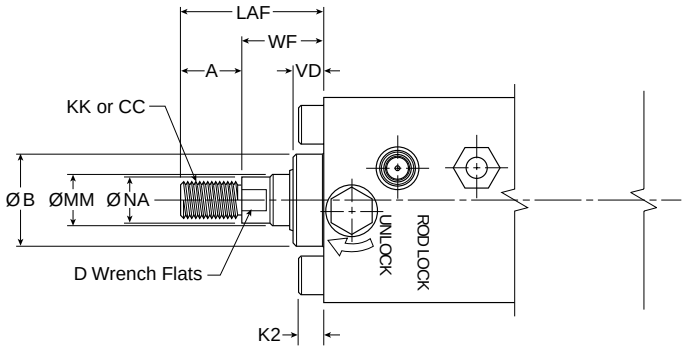
For a guided version of the 4MAJ Series, please see the HB Series in Section F.

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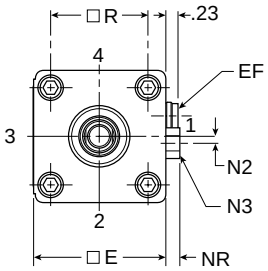
3MAJ/4MAJ Series Single Rod Dimensions – 1-1/2" to 5" Bore Size

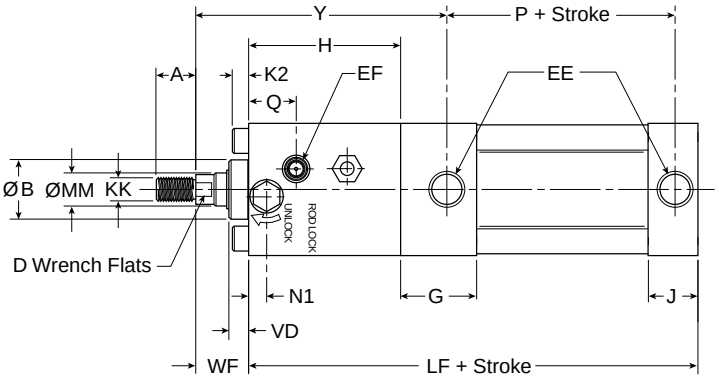
No Mount Basic
Style T
(NFPA MX0)





For dimensions of all standard rod end styles, please see page B70.





Cylinder Dimensions – Style T

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AA	+.000 -.002 B	D	E	EE (NPTF)	EF (NPTF)	G	H	J
1-1/2	1	5/8	1/2-20	7/16-20	0.750	2.020	1.124	1/2	2.000	3/8	1/8	1.438	2.625	0.938
2	1	5/8	1/2-20	7/16-20	0.750	2.600	1.124	1/2	2.500	3/8	1/8	1.375	2.875	0.937
	3	1	7/8-14	3/4-16	1.125	2.600	1.499	7/8	2.500	3/8	1/8	1.375	3.875	0.937
2-1/2	1	5/8	1/2-20	7/16-20	0.750	3.100	1.124	1/2	3.000	3/8	1/8	1.344	2.875	0.938
	3	1	7/8-14	3/4-16	1.125	3.100	1.499	7/8	3.000	3/8	1/8	1.344	4.000	0.938
3-1/4	1	1	7/8-14	3/4-16	1.125	3.900	1.499	7/8	3.750	1/2	1/4	1.594	4.500	1.125
	3	1-3/8	1-1/4 - 12	1-14	1.625	3.900	1.999	1-1/8	3.750	1/2	1/4	1.594	4.875	1.125
4	1	1	7/8-14	3/4-16	1.125	4.700	1.499	7/8	4.500	1/2	1/4	1.594	4.875	1.125
	3	1-3/8	1-1/4 - 12	1-14	1.625	4.700	1.999	1-1/8	4.500	1/2	1/4	1.594	5.125	1.125
5	1	1	7/8-14	3/4-16	1.125	5.800	1.499	7/8	5.500	1/2	1/4	1.594	5.375	1.219
	3	1-3/8	1-1/4 - 12	1-14	1.625	5.800	1.999	1-1/8	5.500	1/2	1/4	1.594	5.750	1.219

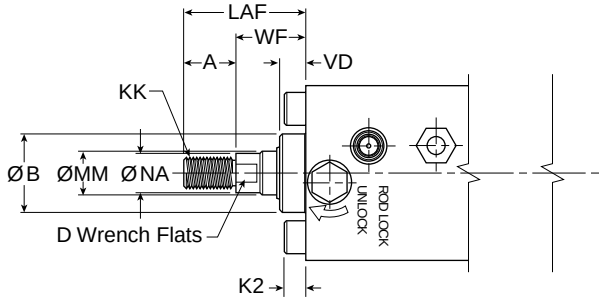
Bore Size	Rod No.	Rod Dia. MM	K2	LAF	N1	N2	Hex N3	NA	NR	Q	R	VD	WF	Y	Add Stroke LF	Add Stroke P
1-1/2	1	5/8	0.250	1.750	0.220	0.140	5/16	0.563	0.190	0.715	1.430	0.375	1.000	4.500	6.250	2.313
2	1	5/8	0.313	1.750	0.340	0.130	1/2	0.563	0.265	0.895	1.840	0.375	1.000	4.750	6.500	2.313
	3	1	0.313	2.500	0.338	0.146	1/2	0.938	0.275	1.065	1.840	0.500	1.375	6.125	7.500	2.313
2-1/2	1	5/8	0.313	1.750	0.346	0.150	1/2	0.563	0.265	0.755	2.190	0.500	1.000	4.813	6.625	2.375
	3	1	0.313	2.500	0.346	0.148	1/2	0.938	0.265	1.120	2.190	0.500	1.375	6.313	7.750	2.375
3-1/4	1	1	0.375	2.500	0.631	0.180	5/8	0.938	0.340	1.510	2.760	0.500	1.375	6.938	8.750	2.625
	3	1-3/8	0.375	3.250	0.813	0.247	5/8	1.313	0.350	1.645	2.760	0.625	1.625	7.563	9.125	2.625
4	1	1	0.375	2.500	0.625	0.240	7/8	0.938	0.500	1.725	3.320	0.500	1.375	7.313	9.125	2.625
	3	1-3/8	0.375	3.250	0.771	0.276	7/8	1.313	0.490	1.679	3.320	0.750	1.625	7.813	9.375	2.625
5	1	1	0.500	2.500	0.720	0.220	7/8	0.938	0.500	1.995	4.100	0.500	1.375	7.813	9.875	2.875
	3	1-3/8	0.500	3.250	0.720	0.220	7/8	1.313	0.490	2.330	4.100	0.750	1.625	8.438	10.250	2.875

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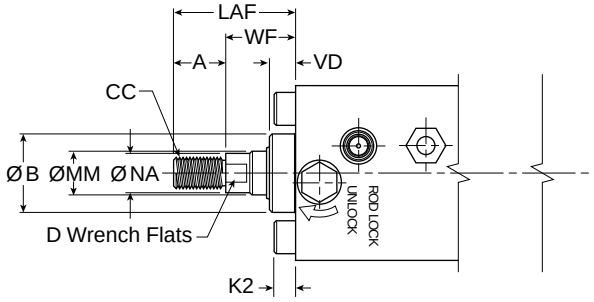
B

Rod End Dimensions – 1-1/2" to 5" Bore Size

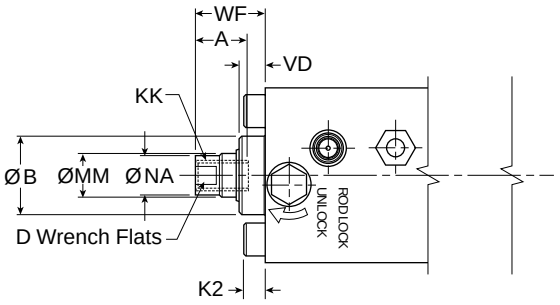
Thread Style 4
(NFPA Style SM)
Small Male



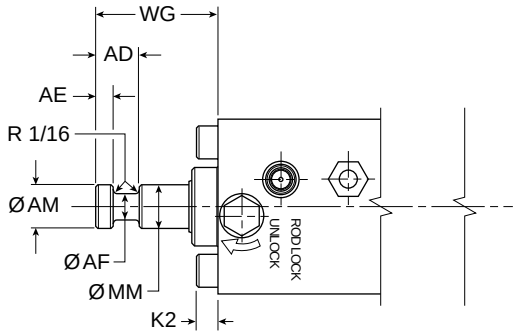
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B105 for more information)



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.002 B	D	K2	LAF	NA	VD	WF	WG
1-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	1/2	0.250	1.750	0.563	0.375	1.000	1.750
2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	1/2	0.313	1.750	0.563	0.375	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.313	2.500	0.938	0.500	1.375	2.375
2-1/2	1	5/8	1/2-20	7/16-20	0.750	0.625	0.250	0.375	0.570	1.124	1/2	0.313	1.750	0.563	0.500	1.000	1.750
	3	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.313	2.500	0.938	0.500	1.375	2.375
3-1/4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.375	2.500	0.938	0.500	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.375	3.250	1.313	0.625	1.625	2.750
4	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.375	2.500	0.938	0.500	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.375	3.250	1.313	0.750	1.625	2.750
5	1	1	7/8-14	3/4-16	1.125	0.938	0.375	0.688	0.950	1.499	7/8	0.500	2.500	0.938	0.500	1.375	2.375
	3	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.500	3.250	1.313	0.750	1.625	2.750

Thread Style 3 - "Special Thread"

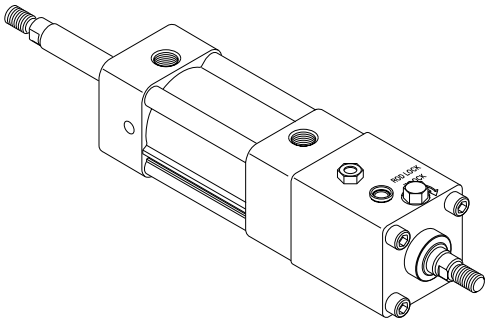
Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

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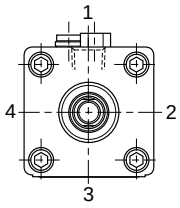
To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension G at both ends, and that LG replaces LF, P_K replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

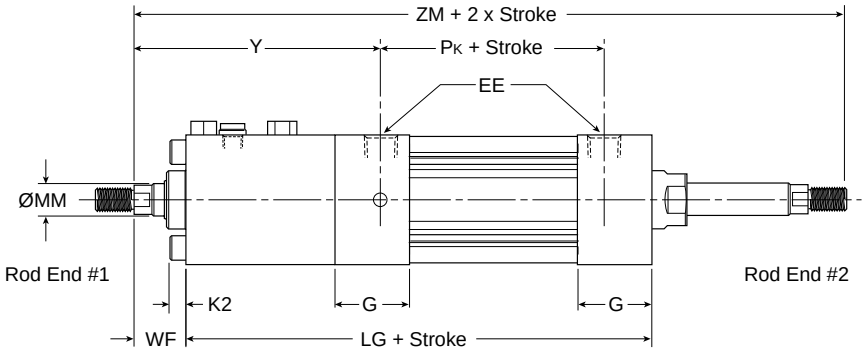
When a double rod end cylinder has two different rod ends, please clearly state which rod end is to be available at which head end.

1-1/2" to 5" Bore Size K-type 3MAJ/4MAJ



Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
CB	KCB
D	KD
DD	KDD
F	KF
G	KG
J	KJ
T	KT
TB	KTB
TD	KTD





Double rod cylinders not available with composite piston type.

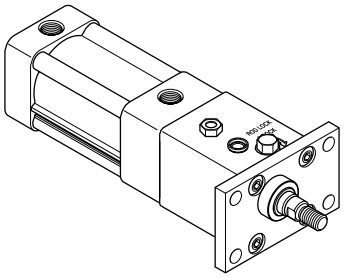
Cylinder Dimensions – Style KT

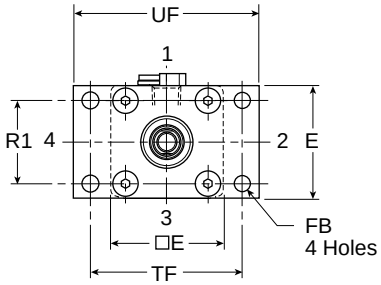
Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	K2	WF	Y	Add Stroke								Add 2X Stroke
								LG	P_K	SA_K	XA_K	SS_K	SN_K	SE_K	XE_K	ZM
1-1/2	1	5/8	3/8	1.438	0.250	1.000	4.500	6.750	2.375	8.750	8.750	3.375	2.250	9.000	8.875	8.750
2	1	5/8	3/8	1.375	0.313	1.000	4.750	7.000	2.375	9.000	9.000	3.375	2.250	9.625	9.313	9.000
	3	1	3/8	1.375	0.313	1.375	6.125	8.000	2.375	10.000	10.375	3.375	2.250	10.625	10.688	10.750
2-1/2	1	5/8	3/8	1.344	0.313	1.000	4.813	7.125	2.375	9.125	9.125	3.500	2.375	10.000	9.563	9.125
	3	1	3/8	1.344	0.313	1.375	6.313	8.250	2.375	10.250	10.625	3.500	2.375	11.125	11.063	11.000
3-1/4	1	1	1/2	1.594	0.375	1.375	6.938	9.250	2.625	11.750	11.875	3.750	2.625	12.250	12.125	12.000
	3	1-3/8	1/2	1.594	0.375	1.625	7.563	9.625	2.625	12.125	12.500	3.750	2.625	12.625	12.750	12.875
4	1	1	1/2	1.594	0.375	1.375	7.313	9.625	2.625	12.125	12.250	3.750	2.625	12.875	12.625	12.375
	3	1-3/8	1/2	1.594	0.375	1.625	7.813	9.875	2.625	12.375	12.750	3.750	2.625	13.125	13.125	13.125
5	1	1	1/2	1.594	0.500	1.375	7.813	10.313	2.813	13.063	13.063	3.563	2.813	–	–	13.063
	3	1-3/8	1/2	1.594	0.500	1.625	8.438	10.688	2.813	13.438	13.688	3.563	2.813	–	–	13.938
Replaces Dimension								LF	P	SA	XA	SS	SN	SE	XE	–
On Single Rod Mounting Styles								All Styles		CB		C	F	G		All

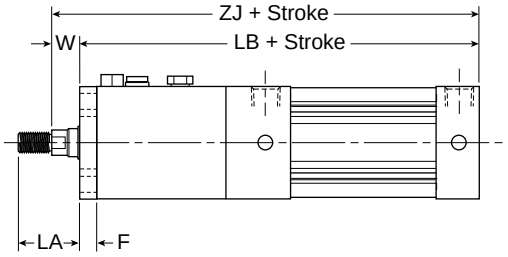
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B

Head Rectangular Flange
Style J
(NFPA MF1)

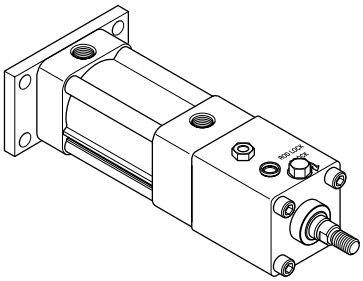


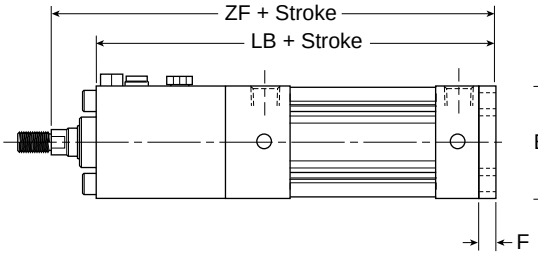


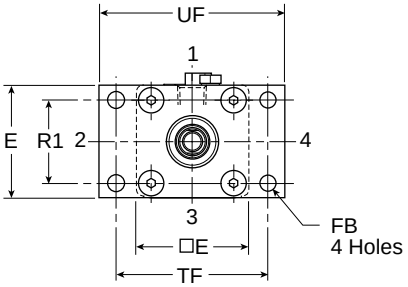


Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J.
For reference, WF = W + F and LA = W + A.

Cap Rectangular Flange
Style H
(NFPA MF2)





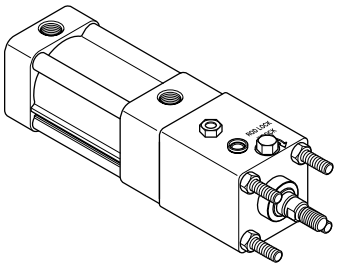


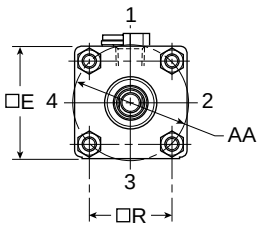
Cylinder Dimensions – Styles J and H

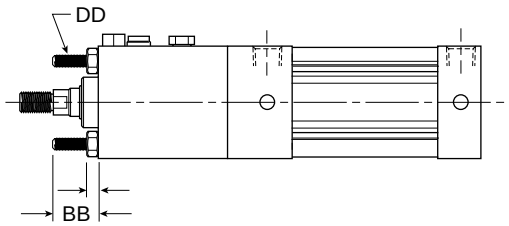
Bore Size	Rod No.	Rod Dia. MM	A	E	F	FB	LA	R1	TF	UF	W	Add Stroke		
												LB	ZF	ZJ
1-1/2	1	5/8	0.750	2.000	0.375	0.313	1.375	1.430	2.750	3.375	0.625	6.625	7.625	7.250
2	1	5/8	0.750	2.500	0.375	0.375	1.375	1.840	3.375	4.125	0.625	6.875	7.875	7.500
	3	1	1.125	2.500	0.375	0.375	2.125	1.840	3.375	4.125	1.000	7.875	9.250	8.875
2-1/2	1	5/8	0.750	3.000	0.375	0.375	1.375	2.190	3.875	4.625	0.625	7.000	8.000	7.625
	3	1	1.125	3.000	0.375	0.375	2.125	2.190	3.875	4.625	1.000	8.125	9.500	9.125
3-1/4	1	1	1.125	3.750	0.625	0.438	1.875	2.760	4.688	5.500	0.750	9.375	10.750	10.125
	3	1-3/8	1.625	3.750	0.625	0.438	2.625	2.760	4.688	5.500	1.000	9.750	11.375	10.750
4	1	1	1.125	4.500	0.625	0.438	1.875	3.320	5.438	6.250	0.750	9.750	11.125	10.500
	3	1-3/8	1.625	4.500	0.625	0.438	2.625	3.320	5.438	6.250	1.000	10.000	11.625	11.000
5	1	1	1.125	5.500	0.625	0.563	1.875	4.100	6.625	7.625	0.750	10.500	11.875	11.250
	3	1-3/8	1.625	5.500	0.625	0.563	2.625	4.100	6.625	7.625	1.000	10.875	12.500	11.875

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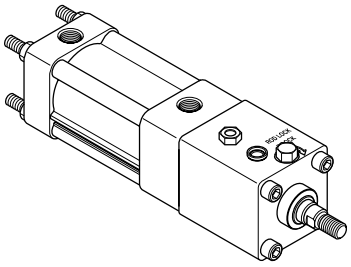
Tie Rods Extended Head End Mount
Style TB
(NFPA MX3)

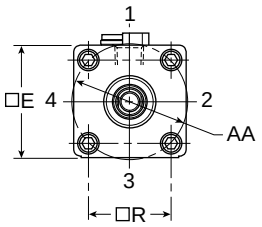


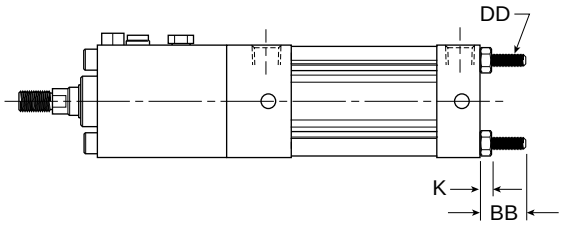




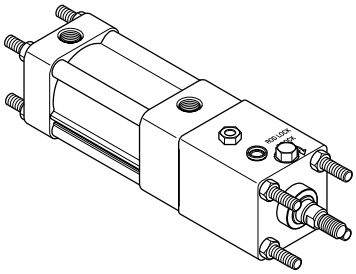
Tie Rods Extended Cap End Mount
Style TC
(NFPA MX2)

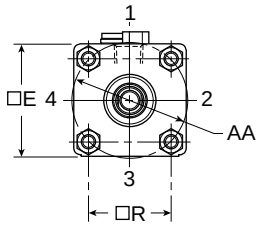


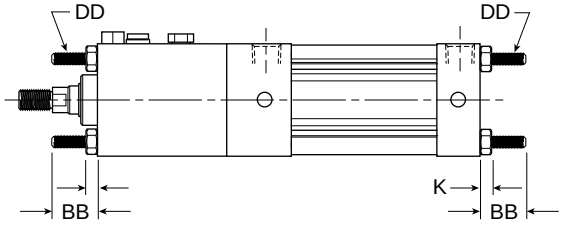




Tie Rods Extended Both Ends Mount
Style TD
(NFPA MX1)







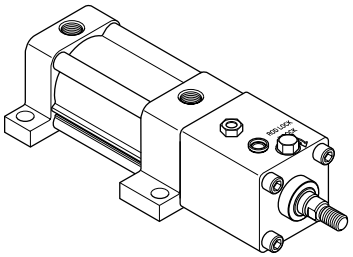
Cylinder Dimensions – Styles TB, TC and TD

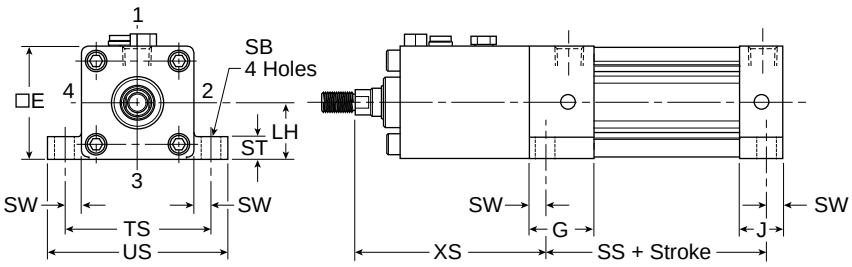
Bore Size	Rod No.	Rod Dia. MM	AA	BB	DD	E	K	R
1-1/2	1	5/8	2.020	1.000	1/4-28	2.000	0.250	1.430
2	1	5/8	2.600	1.125	5/16-24	2.500	0.313	1.840
	3	1	2.600	1.125	5/16-24	2.500	0.313	1.840
2-1/2	1	5/8	3.100	1.125	5/16-24	3.000	0.313	2.190
	3	1	3.100	1.125	5/16-24	3.000	0.313	2.190
3-1/4	1	1	3.900	1.375	3/8-24	3.750	0.375	2.760
	3	1-3/8	3.900	1.375	3/8-24	3.750	0.375	2.760
4	1	1	4.700	1.375	3/8-24	4.500	0.375	3.320
	3	1-3/8	4.700	1.375	3/8-24	4.500	0.375	3.320
5	1	1	5.800	1.813	1/2-20	5.500	0.438	4.100
	3	1-3/8	5.800	1.813	1/2-20	5.500	0.438	4.100

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B

Side Lug Mount
Style C (only 4MAJ)
(NFPA MS2)

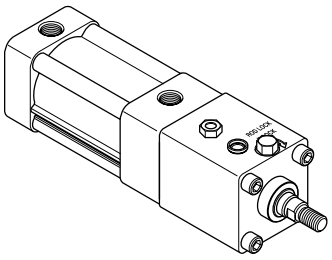


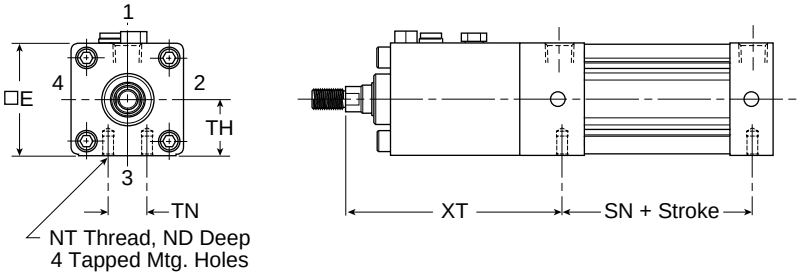


Cylinder Dimensions – Style C

Bore Size	Rod No.	Rod Dia. MM	E	G	J	+/-.003 LH	SB	ST	SW	TS	US	XS	Add Stroke SS
1-1/2	1	5/8	2.000	1.438	0.938	0.993	0.438	0.500	0.375	2.750	3.500	4.000	2.875
2	1	5/8	2.500	1.375	0.937	1.243	0.438	0.500	0.375	3.250	4.000	4.250	2.875
	3	1	2.500	1.375	0.937	1.243	0.438	0.500	0.375	3.250	4.000	5.625	2.875
2-1/2	1	5/8	3.000	1.344	0.938	1.493	0.438	0.500	0.375	3.750	4.500	4.250	3.000
	3	1	3.000	1.344	0.938	1.493	0.438	0.500	0.375	3.750	4.500	5.750	3.000
3-1/4	1	1	3.750	1.594	1.125	1.868	0.563	0.750	0.500	4.750	5.750	6.375	3.250
	3	1-3/8	3.750	1.594	1.125	1.868	0.563	0.750	0.500	4.750	5.750	7.000	3.250
4	1	1	4.500	1.594	1.125	2.243	0.563	0.750	0.500	5.500	6.500	6.750	3.250
	3	1-3/8	4.500	1.594	1.125	2.243	0.563	0.750	0.500	5.500	6.500	7.250	3.250
5	1	1	5.500	1.594	1.219	2.743	0.813	1.000	0.688	6.875	8.250	7.438	3.125
	3	1-3/8	5.500	1.594	1.219	2.743	0.813	1.000	0.688	6.875	8.250	8.063	3.125

Side Tap Mount
Style F
(NFPA MS4)



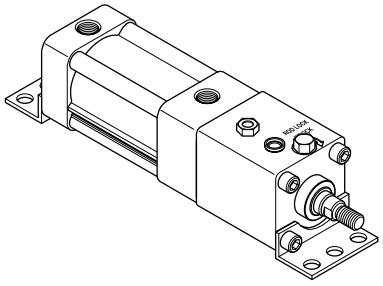


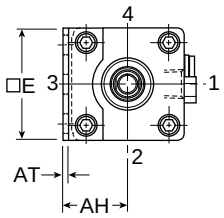
Cylinder Dimensions – Style F

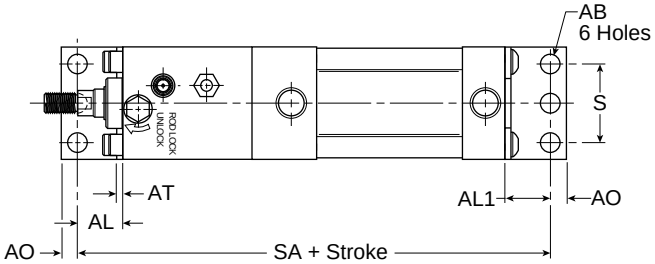
Bore Size	Rod No.	Rod Dia. MM	E	ND	NT	+/-.003 TH	TN	XT	Add Stroke SN
1-1/2	1	5/8	2.000	0.375	1/4-20	0.993	0.625	4.563	2.250
2	1	5/8	2.500	0.438	5/16-18	1.243	0.875	4.813	2.250
	3	1	2.500	0.375	5/16-18	1.243	0.875	6.188	2.250
2-1/2	1	5/8	3.000	0.625	3/8-16	1.493	1.250	4.813	2.375
	3	1	3.000	0.625	3/8-16	1.493	1.250	6.313	2.375
3-1/4	1	1	3.750	0.750	1/2-13	1.868	1.500	6.938	2.625
	3	1-3/8	3.750	0.750	1/2-13	1.868	1.500	7.563	2.625
4	1	1	4.500	0.750	1/2-13	2.243	2.063	7.313	2.625
	3	1-3/8	4.500	0.750	1/2-13	2.243	2.063	7.813	2.625
5	1	1	5.500	0.938	5/8-11	2.743	2.688	7.813	2.875
	3	1-3/8	5.500	0.938	5/8-11	2.743	2.688	8.438	2.875

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Side End Angle Mount
Style CB
(NFPA MS1)



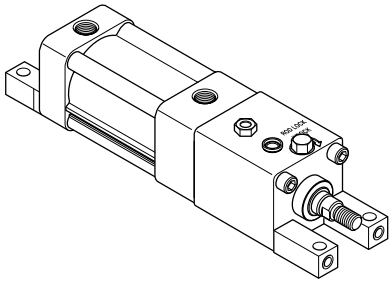


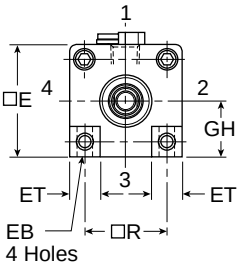


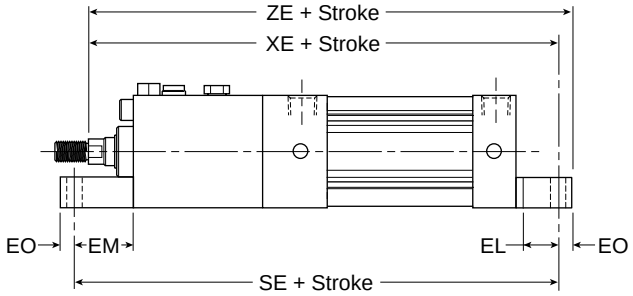
Cylinder Dimensions – Style CB

Bore Size	Rod No.	Rod Dia. MM	AB	AH	AL	AL1	AO	AT	E	S	Add Stroke SA
1-1/2	1	5/8	0.438	1.188	1.000	1.000	0.375	0.125	2.000	1.250	8.250
2	1	5/8	0.438	1.438	1.000	1.000	0.375	0.125	2.500	1.750	8.500
	3	1	0.438	1.438	1.000	1.000	0.375	0.125	2.500	1.750	9.500
2-1/2	1	5/8	0.438	1.625	1.000	1.000	0.375	0.125	3.000	2.250	8.625
	3	1	0.438	1.625	1.000	1.000	0.375	0.125	3.000	2.250	9.750
3-1/4	1	1	0.563	1.938	1.250	1.250	0.500	0.125	3.750	2.750	11.250
	3	1-3/8	0.563	1.938	1.250	1.250	0.500	0.125	3.750	2.750	11.625
4	1	1	0.563	2.250	1.875	1.250	0.500	0.125	4.500	3.500	12.250
	3	1-3/8	0.563	2.250	1.875	1.250	0.500	0.125	4.500	3.500	12.500
5	1	1	0.688	2.750	1.375	1.375	0.625	0.188	5.500	4.250	12.625
	3	1-3/8	0.688	2.750	1.375	1.375	0.625	0.188	5.500	4.250	13.000

Side End Lug Mount
Style G
(NFPA MS7)







Cylinder Dimensions – Style G

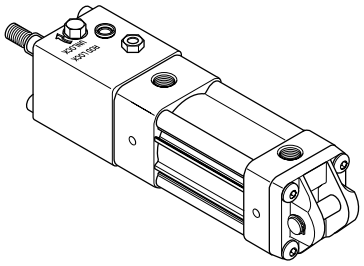
Bore Size	Rod No.	Rod Dia. MM	E	EB	EL	EM	EO	ET	+/-.003 GH	R	Add Stroke SE	Add Stroke XE	Add Stroke ZE
1-1/2	1	5/8	2.000	0.281	0.750	1.125	0.250	0.563	0.993	1.430	8.125	8.000	8.250
2	1	5/8	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	8.750	8.438	8.750
	3	1	2.500	0.344	0.938	1.313	0.313	0.688	1.243	1.840	9.750	9.813	10.125
2-1/2	1	5/8	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	9.125	8.688	9.000
	3	1	3.000	0.344	1.063	1.438	0.313	0.813	1.493	2.190	10.250	10.188	10.500
3-1/4	1	1	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	11.125	11.000	11.375
	3	1-3/8	3.750	0.406	0.875	1.500	0.375	1.000	1.868	2.760	11.500	11.625	12.000
4	1	1	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	11.750	11.500	11.875
	3	1-3/8	4.500	0.406	1.000	1.625	0.375	1.188	2.243	3.320	12.000	12.000	12.375

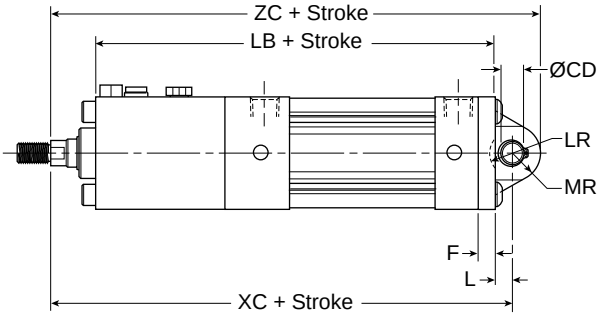
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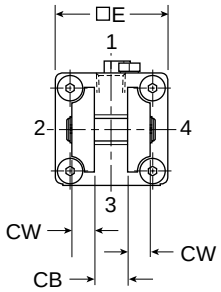
Cap Fixed Clevis Mount
Style BB
(NFPA MP1)

Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page B108.

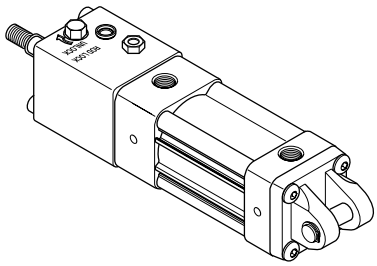
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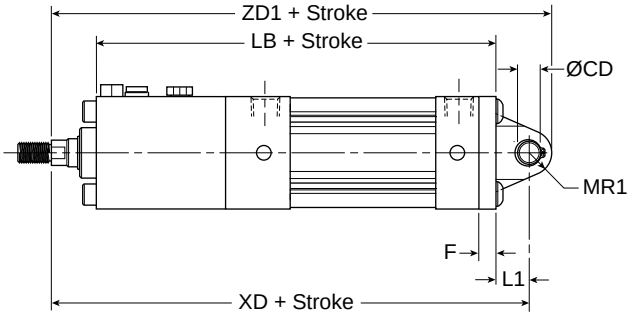


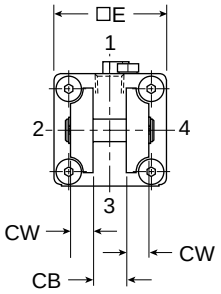




Cap Detachable Clevis Mount
Style BC
(NFPA MP2)





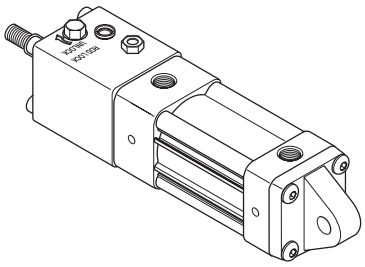


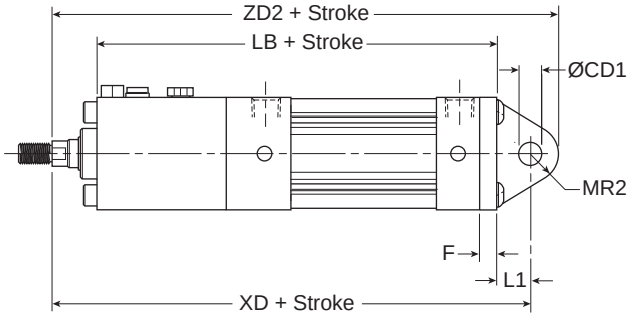
Cylinder Dimensions – Styles BB and BC

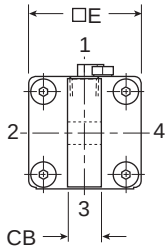
Bore Size	Rod No.	Rod Dia. MM	CB	+.000 -.002 CD	CW	E	F	L	L1	LR	MR	MR1	Add Stroke				
													LB	XC	XD	ZC	ZD1
1-1/2	1	5/8	0.750	0.501	0.500	2.000	0.375	0.375	0.750	0.750	0.625	0.500	6.625	8.000	8.375	8.625	8.875
2	1	5/8	0.750	0.501	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	6.875	8.250	8.625	8.875	9.125
	3	1	0.750	0.501	0.500	2.500	0.375	0.375	0.750	0.750	0.625	0.500	7.875	9.625	10.000	10.250	10.500
2-1/2	1	5/8	0.750	0.501	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	7.000	8.375	8.750	9.000	9.250
	3	1	0.750	0.501	0.500	3.000	0.375	0.375	0.750	0.750	0.625	0.500	8.125	9.875	10.250	10.500	10.750
3-1/4	1	1	1.250	0.751	0.625	3.750	0.625	0.625	1.250	1.000	0.938	0.750	9.375	11.375	12.000	12.313	12.750
	3	1-3/8	1.250	0.751	0.625	3.750	0.625	0.625	1.250	1.000	0.938	0.750	9.750	12.000	12.625	12.938	13.375
4	1	1	1.250	0.751	0.625	4.500	0.625	0.625	1.250	1.000	0.938	0.750	9.750	11.750	12.375	12.688	13.125
	3	1-3/8	1.250	0.751	0.625	4.500	0.625	0.625	1.250	1.000	0.938	0.750	10.000	12.250	12.875	13.188	13.625
5	1	1	1.250	0.751	0.625	5.500	0.625	0.625	1.250	1.000	0.938	0.750	10.500	12.500	13.125	13.438	13.875
	3	1-3/8	1.250	0.751	0.625	5.500	0.625	0.625	1.250	1.000	0.938	0.750	10.875	13.125	13.750	14.063	14.500

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Cap Detachable Eye Mount*
Style BE
(NFPA MP4)







*Not available for 5" bore 3MAJ, please specify 4MAJ

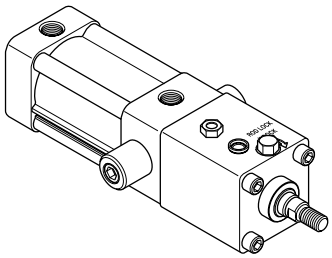
Cylinder Dimensions – Style BE

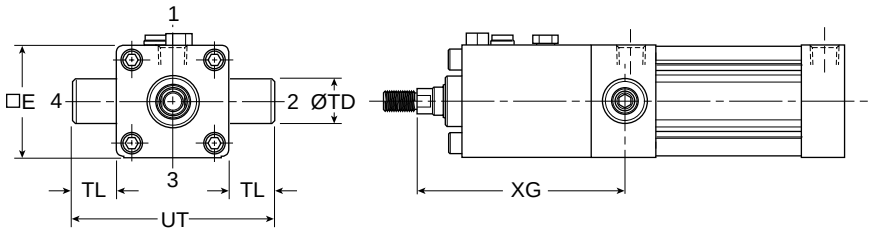
Bore Size	Rod No.	Rod Dia. MM	CB	+.002 +.004 CD1	E	F	L1	MR2	Add Stroke		
									LB	XD	ZD2
1-1/2	1	5/8	0.750	0.500	2.000	0.375	0.750	0.625	6.625	8.375	9.000
2	1	5/8	0.750	0.500	2.500	0.375	0.750	0.625	6.875	8.625	9.250
	3	1	0.750	0.500	2.500	0.375	0.750	0.625	7.875	10.000	10.625
2-1/2	1	5/8	0.750	0.500	3.000	0.375	0.750	0.688	7.000	8.750	9.438
	3	1	0.750	0.500	3.000	0.375	0.750	0.688	8.125	10.250	10.938
3-1/4	1	1	1.250	0.750	3.750	0.625	1.250	0.875	9.375	12.000	12.875
	3	1-3/8	1.250	0.750	3.750	0.625	1.250	0.875	9.750	12.625	13.500
4	1	1	1.250	0.750	4.500	0.625	1.250	0.875	9.750	12.375	13.250
	3	1-3/8	1.250	0.750	4.500	0.625	1.250	0.875	10.000	12.875	13.750
5	1	1	1.250	0.750	5.500	0.625	1.250	0.875	10.500	13.125	14.000
	3	1-3/8	1.250	0.750	5.500	0.625	1.250	0.875	10.875	13.750	14.625

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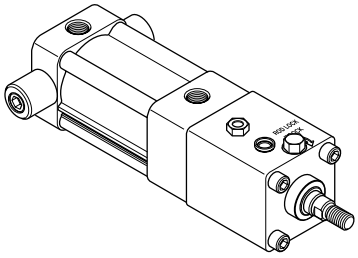
B

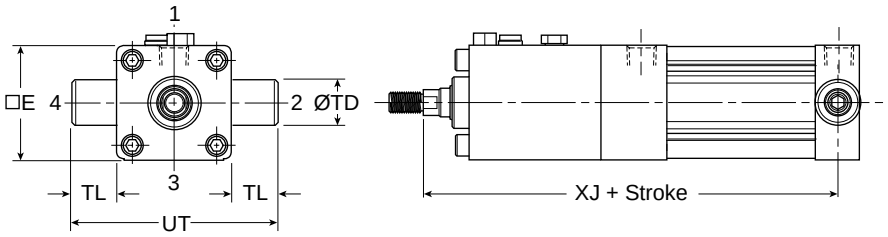
Head Trunnion Mount
Style D (only 4MAJ)
(NFPA MT1)





Cap Trunnion Mount
Style DB (only 4MAJ)
(NFPA MT2)



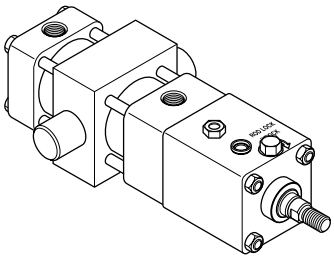


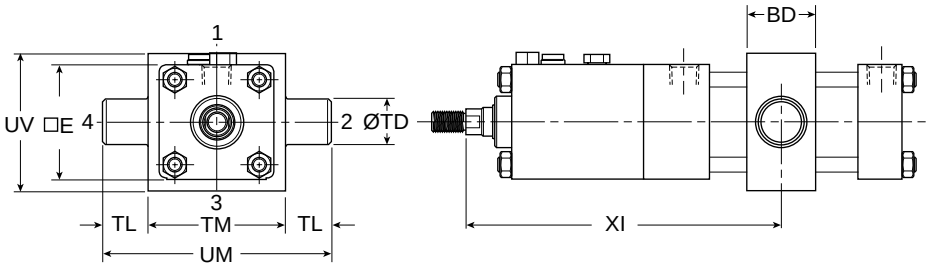
Cylinder Dimensions – Styles D and DB

Bore Size	Rod No.	Rod Dia. MM	E	+.000 -.001 TD	TL	UT	XG	XJ
1-1/2	1	5/8	2.000	1.000	1.000	4.000	4.375	6.750
2	1	5/8	2.500	1.000	1.000	4.500	4.625	7.000
	3	1	2.500	1.000	1.000	4.500	6.000	8.375
2-1/2	1	5/8	3.000	1.000	1.000	5.000	4.625	7.125
	3	1	3.000	1.000	1.000	5.000	6.125	8.625
3-1/4	1	1	3.750	1.000	1.000	5.750	6.750	9.500
	3	1-3/8	3.750	1.000	1.000	5.750	7.375	10.125
4	1	1	4.500	1.000	1.000	6.500	7.125	9.875
	3	1-3/8	4.500	1.000	1.000	6.500	7.625	10.375
5	1	1	5.500	1.000	1.000	7.500	7.625	10.625
	3	1-3/8	5.500	1.000	1.000	7.500	8.250	11.250

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Intermediate Trunnion Mount
Style DD
(NFPA MT4)





Cylinder Dimensions – Style DD

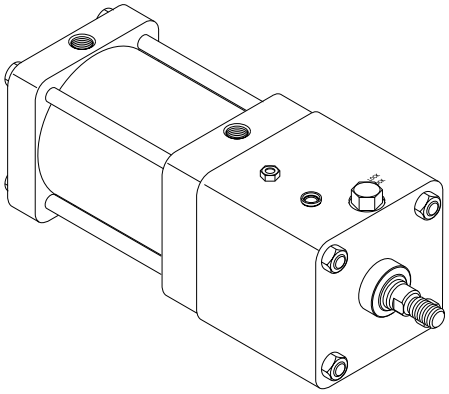
Bore Size	Rod No.	Rod Dia. MM	E	BD	+.000 -.001 TD	TL	TM	UM	UV	Min. XI	Min. Stroke
1-1/2	1	5/8	2.000	1.250	1.000	1.000	2.500	4.500	2.500	5.69	3.250
2	1	5/8	2.500	1.500	1.000	1.000	3.000	5.000	3.000	6.00	4.000
	3	1	2.500	1.500	1.000	1.000	3.000	5.000	3.000	7.38	4.000
2-1/2	1	5/8	3.000	1.500	1.000	1.000	3.500	5.500	3.500	5.97	3.875
	3	1	3.000	1.500	1.000	1.000	3.500	5.500	3.500	7.47	3.875
3-1/4	1	1	3.750	2.000	1.000	1.000	4.500	6.500	4.250	13.72	4.375
	3	1-3/8	3.750	2.000	1.000	1.000	4.500	6.500	4.250	14.34	4.375
4	1	1	4.500	2.000	1.000	1.000	5.250	7.250	5.000	14.09	4.875
	3	1-3/8	4.500	2.000	1.000	1.000	5.250	7.250	5.000	14.59	4.875
5	1	1	5.500	2.000	1.000	1.000	6.250	8.250	6.000	16.34	5.125
	3	1-3/8	5.500	2.000	1.000	1.000	6.250	8.250	6.000	16.97	5.125

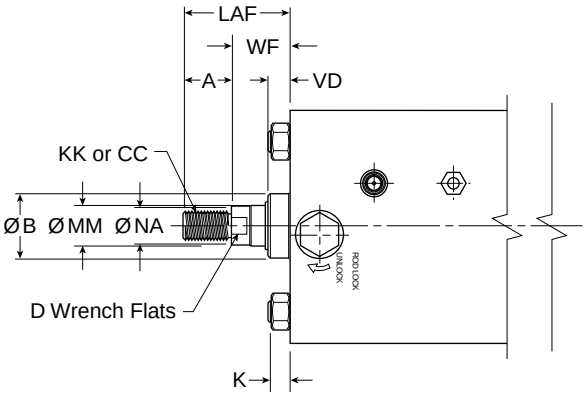
Note: Tie rod nuts for Style DD have a slot instead of external hex.
Note: Style DD requires Minimum Stroke per table.

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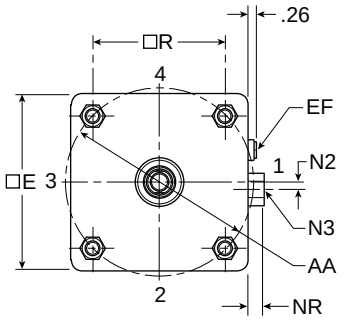
B

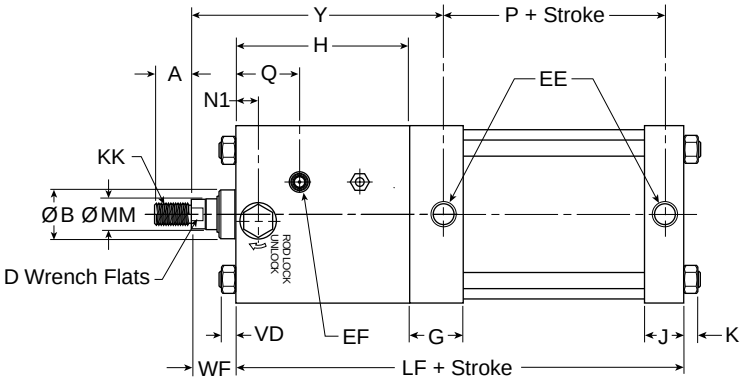
No Mount
Style T
(NFPA MX0)





For dimensions of all standard rod end styles, please see page B81.





Cylinder Dimensions – Style T

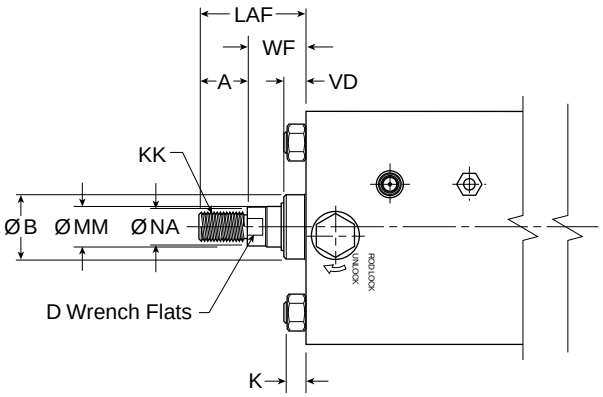
Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AA	+.000 -.002 B	D	E	EE (NPTF)	EF (NPTF)	G	H	J
6	1	1-3/8	1-1/4 - 12	1-14	1.625	6.900	1.999	1-1/8	6.500	3/4	1/4	1.910	6.375	1.410
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	6.900	2.374	1-1/2	6.500	3/4	1/4	1.910	6.875	1.410
8	1	1-3/8	1-1/4 - 12	1-14	1.625	9.100	1.999	1-1/8	8.500	3/4	1/4	1.810	6.625	1.440
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	9.100	2.374	1-1/2	8.500	3/4	1/4	1.810	7.125	1.440

Bore Size	Rod No.	Rod Dia. MM	K	LAF	N1	N2	Hex N3	NA	NR	Q	R	VD	WF	Y	Add Stroke LF	Add Stroke P
6	1	1-3/8	0.438	3.250	1.165	0.177	1-5/16	1.313	0.750	2.705	4.880	0.755	1.625	9.188	11.375	3.125
	3	1-3/4	0.438	3.875	1.495	0.177	1-5/16	1.688	0.740	3.055	4.880	0.875	1.875	9.938	11.875	3.125
8	1	1-3/8	0.563	3.250	1.305	0.177	1-5/16	1.313	0.740	2.885	6.440	0.755	1.625	9.375	11.750	3.250
	3	1-3/4	0.563	3.875	1.570	0.177	1-5/16	1.688	0.740	3.145	6.440	0.875	1.875	10.125	12.250	3.250

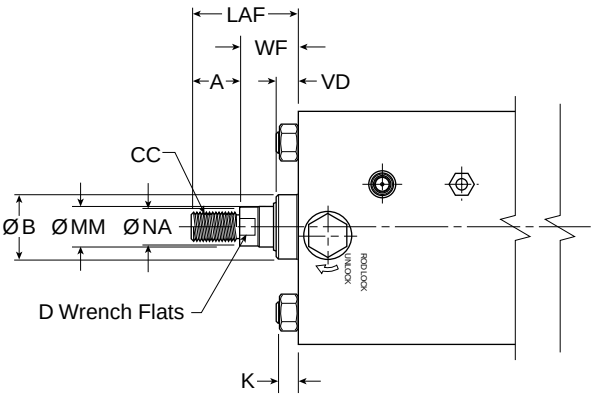
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Rod End Dimensions – 6" to 8" Bore Sizes

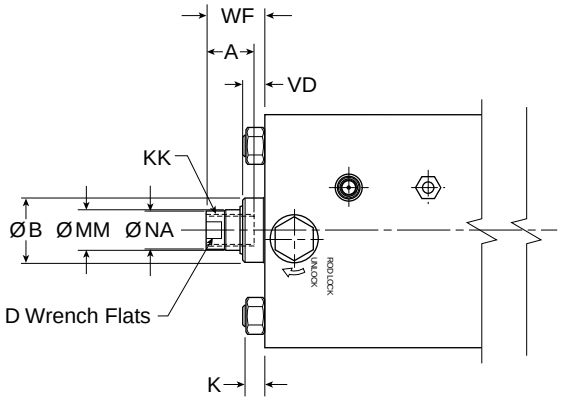
Thread Style 4
(NFPA Style SM)
Small Male



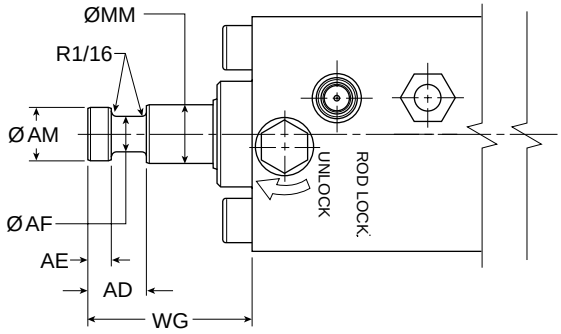
Thread Style 8
(NFPA Style IM)
Intermediate Male



Thread Style 9
(NFPA Style SF)
Short Female



Thread Style 55
For use with Split Coupler
(see page B105 for more information)



Rod End Dimensions

Bore Size	Rod No.	Rod Dia. MM	Thread Style 8 CC	Thread Style 4 & 9 KK	A	AD	AE	AF	AM	+.000 -.002 B	D	K	LAF	NA	VD	WF	WG
6	1	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.438	3.250	1.313	0.755	1.625	2.750
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	1.313	0.500	1.125	1.700	2.374	1-1/2	0.438	3.875	1.688	0.875	1.875	3.125
8	1	1-3/8	1-1/4 - 12	1-14	1.625	1.063	0.375	0.875	1.320	1.999	1-1/8	0.563	3.250	1.313	0.755	1.625	2.750
	3	1-3/4	1-1/2 - 12	1-1/4 - 12	2.000	1.313	0.500	1.125	1.700	2.374	1-1/2	0.563	3.875	1.688	0.875	1.875	3.125

Thread Style 3 - "Special Thread"

Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK or CC, A and W or WF.
If otherwise special, please supply dimensioned sketch.

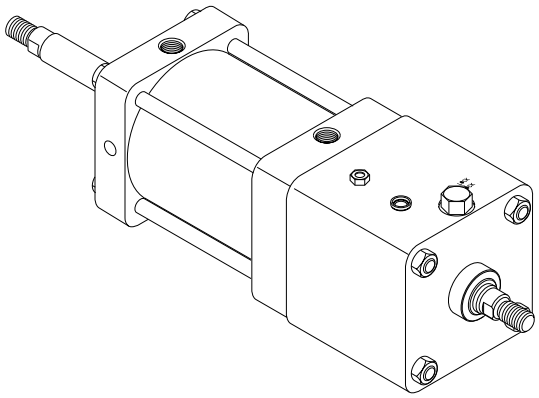
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To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension G at both ends, and that LG replaces LF, P_K replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.

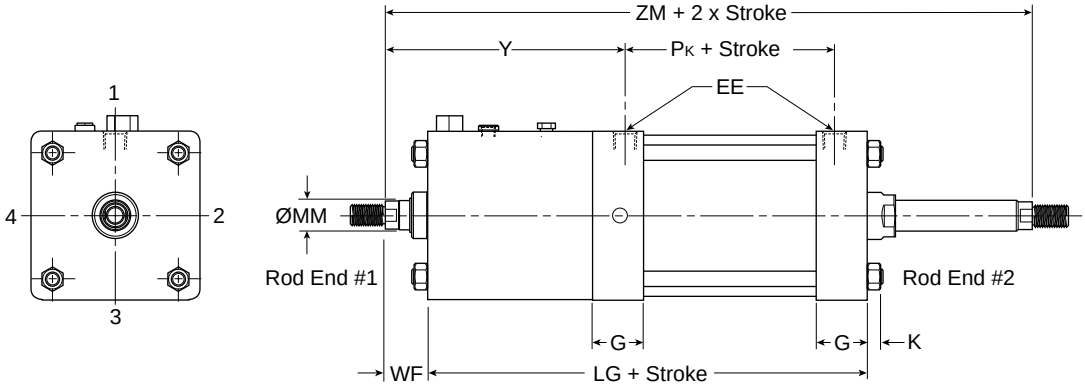
When a double rod end cylinder has two different rod ends, please clearly state which rod end is to be available at which head end.

B

K-type drawings



Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
CB	KCB
D	KD
DD	KDD
F	KF
J	KJ
T	KT
TB	KTB
TD	KTD



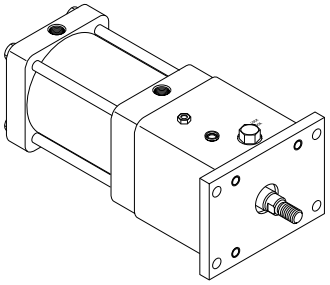
Cylinder Dimensions – Style KT

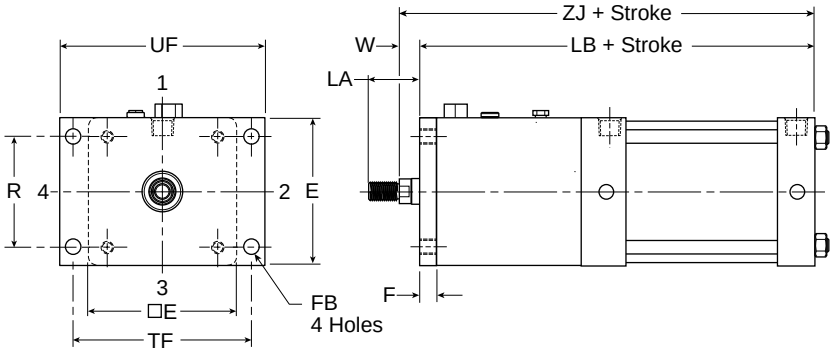
Bore Size	Rod No.	Rod Dia. MM	EE (NPTF)	G	K	WF	Y	Add Stroke						Add 2X Stroke
								LG	PK	SAK	XAK	SSK	SNK	ZM
6	1	1-3/8	3/4	1.910	0.438	1.625	9.188	11.875	3.125	14.625	14.875	4.125	3.125	15.125
	3	1-3/4	3/4	1.910	0.438	1.875	9.938	12.375	3.125	15.125	15.625	4.125	3.125	16.125
8	1	1-3/8	3/4	1.810	0.563	1.625	9.375	12.125	3.250	15.750	15.563	4.125	3.125	15.375
	3	1-3/4	3/4	1.810	0.563	1.875	10.125	12.625	3.250	16.250	16.313	4.125	3.125	16.375
Replaces Dimension On								LF	P	SA	XA	SS	SN	–
Single Rod Mounting Styles								All Styles		CB		C	F	All

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Head Rectangular Flange Mount

Style J
(NFPA MF1)
(only 6" Bore)

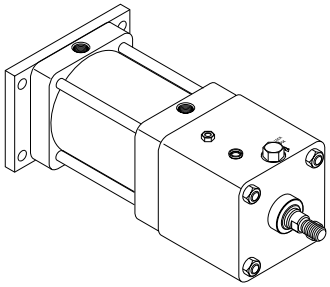


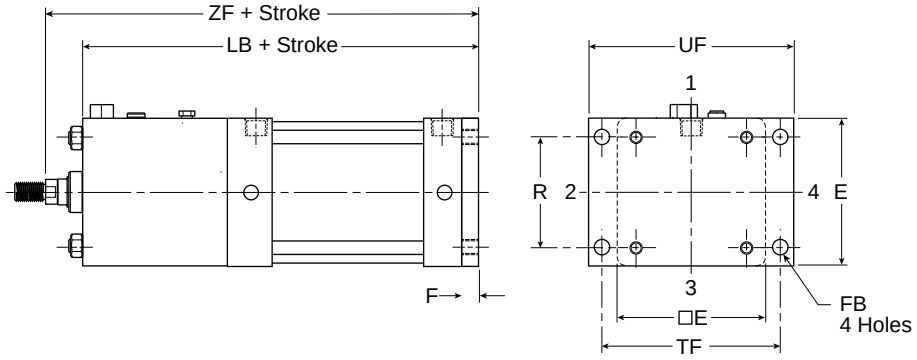


Note: Style J has a W dimension instead of WF and a LA dimension instead of LAF because of the flange installation. Please use dimensions W and LA regarding rod ends only for Style J.
For reference, WF = W + F and LA = W + A.

Cap Rectangular Flange Mount

Style H
(NFPA MF2)
(only 6" Bore)





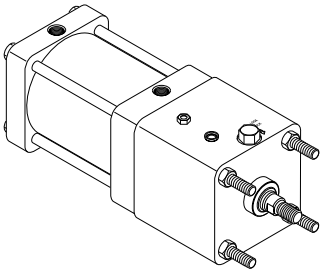
Cylinder Dimensions – Styles J and H

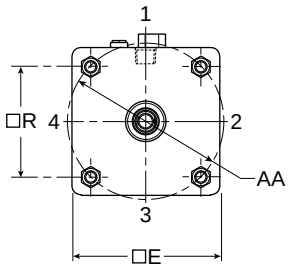
Bore Size	Rod No.	Rod Dia. MM	A	E	F	FB	LA	R	TF	UF	W	Add Stroke		
												LB	ZF	ZJ
6	1	1-3/8	1.625	6.500	0.750	0.563	2.500	4.880	7.625	8.625	0.875	12.125	13.750	13.000
	3	1-3/4	2.000	6.500	0.750	0.563	3.125	4.880	7.625	8.625	1.125	12.625	14.500	13.750

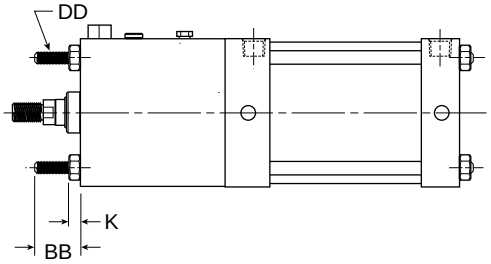
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B

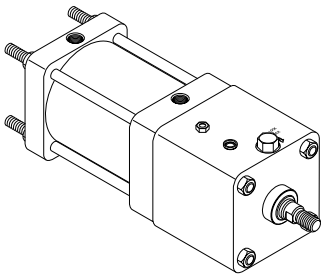
Tie Rods Extended Head End Mount
Style TB
(NFPA MX3)

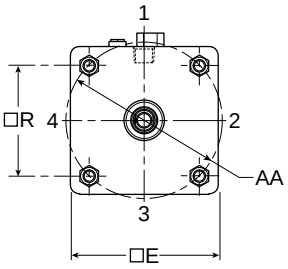


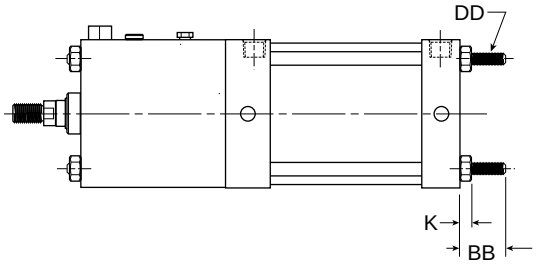




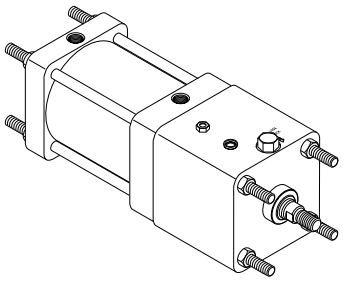
Tie Rods Extended Cap End Mount
Style TC
(NFPA MX2)

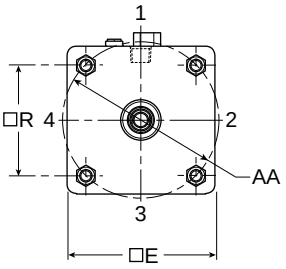


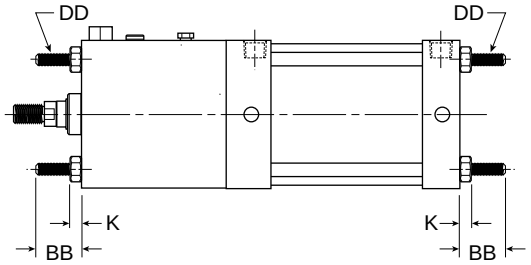




Tie Rods Extended Both Ends Mount
Style TD
(NFPA MX1)





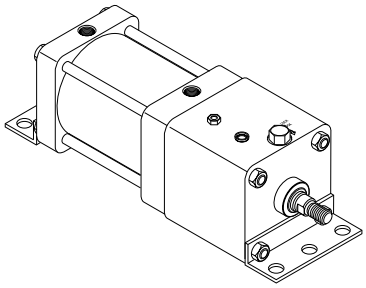


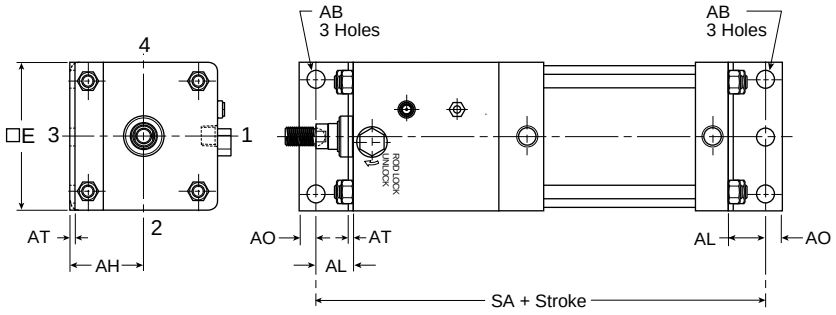
Cylinder Dimensions – Styles TB, TC and TD

Bore Size	Rod No.	Rod Dia. MM	AA	BB	DD	E	K	R
6	1	1-3/8	6.900	1.813	1/2-20	6.500	0.438	4.880
	3	1-3/4	6.900	1.813	1/2-20	6.500	0.438	4.880
8	1	1-3/8	9.100	2.313	5/8-18	8.500	0.563	6.440
	3	1-3/4	9.100	2.313	5/8-18	8.500	0.563	6.440

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Side End Angle Mount
Style CB
(NFPA MS1)

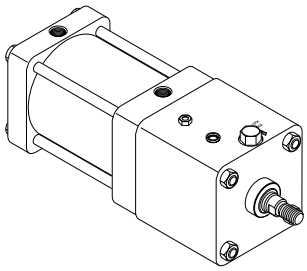


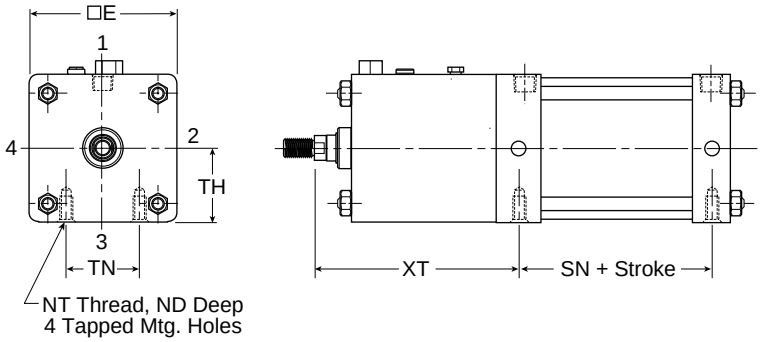


Cylinder Dimensions – Style CB

Bore Size	Rod No.	Rod Dia. MM	AB	AH	AL	AO	AT	E	S	Add Stroke SA
6	1	1-3/8	0.813	3.250	1.375	0.625	0.188	6.500	5.250	14.125
	3	1-3/4	0.813	3.250	1.375	0.625	0.188	6.500	5.250	14.625
8	1	1-3/8	0.813	4.250	1.813	0.688	0.250	8.500	7.125	15.375
	3	1-3/4	0.813	4.250	1.813	0.688	0.250	8.500	7.125	15.875

Side Tap Mount
Style F
(NFPA MS4)





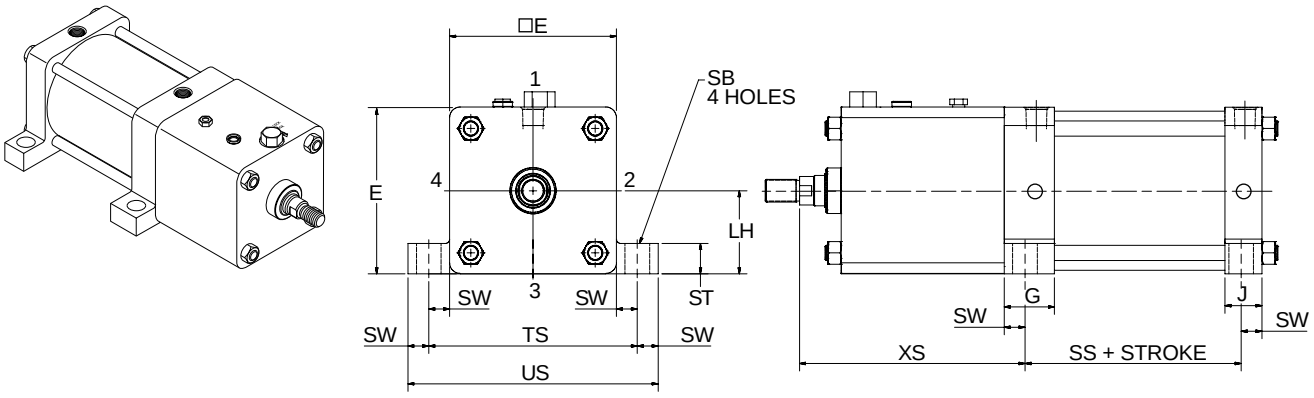
Cylinder Dimensions – Style F

Bore Size	Rod No.	Rod Dia. MM	E	ND	NT	+/-.003 TH	TN	XT	Add Stroke SN
6	1	1-3/8	6.500	1.125	3/4-10	3.243	3.250	9.188	3.125
	3	1-3/4	6.500	1.125	3/4-10	3.243	3.250	9.938	3.125
8	1	1-3/8	8.500	1.125	3/4-10	4.243	4.500	9.438	3.250
	3	1-3/4	8.500	1.125	3/4-10	4.243	4.500	10.188	3.250

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Side Lug Mount
Style C
(NFPA MS2)

B



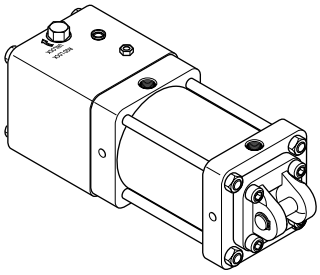
Cylinder Dimensions – Style C

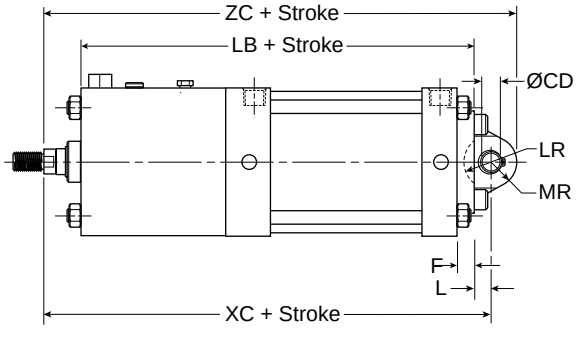
Bore Size	Rod No.	Rod Dia. MM	E	G	J	+/-.003 LH	SB	ST	SW	TS	US	XS	Add Stroke SS
6	1	1-3/8	6.500	1.910	1.410	3.243	0.813	1.000	0.688	7.875	9.250	8.688	3.625
	3	1-3/4	6.500	1.910	1.410	3.243	0.813	1.000	0.688	7.875	9.250	9.438	3.625
8	1	1-3/8	8.500	1.810	1.440	4.243	0.813	1.000	0.688	9.875	11.250	8.938	3.750
	3	1-3/4	8.500	1.810	1.440	4.243	0.813	1.000	0.688	9.875	11.250	9.688	3.750

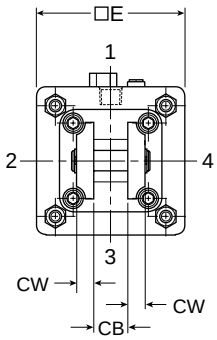
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Cap Fixed Clevis
Style BB
(NFPA MP1)

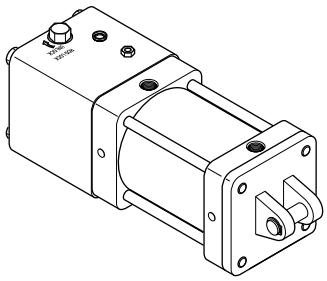
Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page B108.

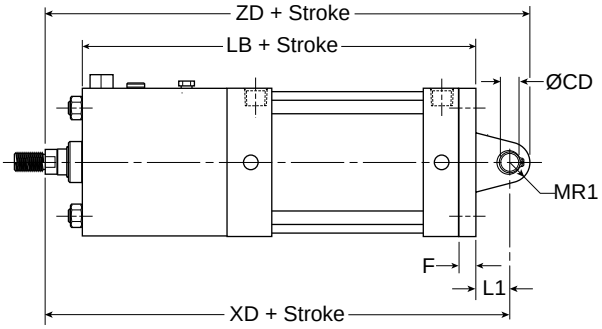


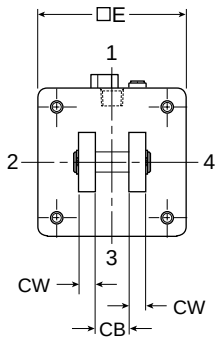




Cap Detachable Clevis
Style BC
(NFPA MP2)



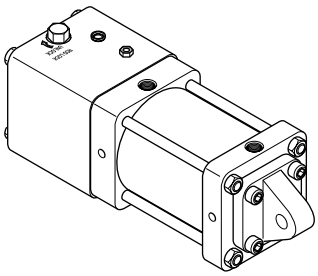


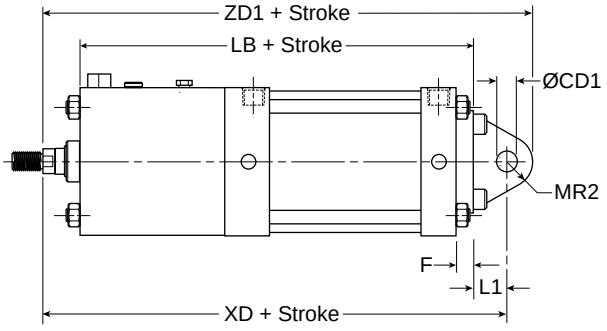


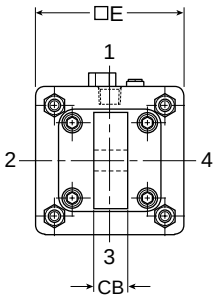
Cylinder Dimensions – Styles BB and BC

Bore Size	Rod No.	Rod Dia. MM	CB	+.000 -.002 CD	CW	E	F	L	L1	LR	MR	MR1	Add Stroke LB	XC	XD	ZC	ZD
6	1	1-3/8	1.500	1.001	0.750	6.500	0.750	0.750	1.500	1.250	1.125	1.000	12.125	14.500	15.250	15.625	16.250
	3	1-3/4	1.500	1.001	0.750	6.500	0.750	0.750	1.500	1.250	1.125	1.000	12.625	15.250	16.000	16.375	17.000
8	1	1-3/8	1.500	1.001	0.750	8.500	0.750	0.750	1.500	1.250	1.125	1.000	12.500	14.875	15.625	16.000	16.625
	3	1-3/4	1.500	1.001	0.750	8.500	0.750	0.750	1.500	1.250	1.125	1.000	13.000	15.625	16.375	16.750	17.375

Cap Detachable Eye Mount
Style BE
(NFPA MP4)
(only 6" Bore)







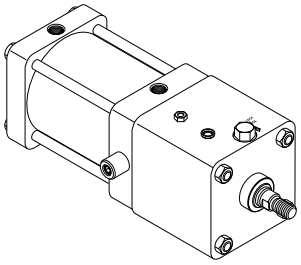
Cylinder Dimensions – Style BE

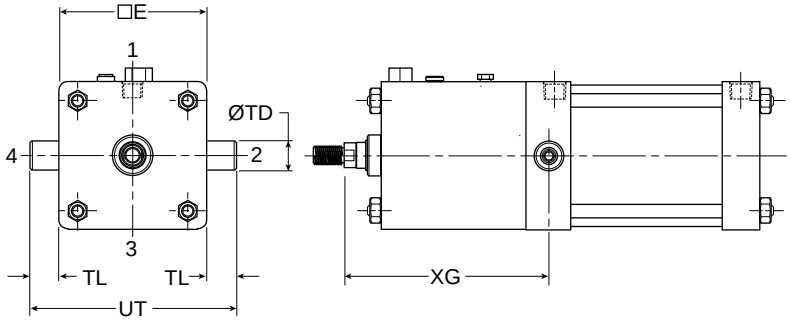
Bore Size	Rod No.	Rod Dia. MM	CB	+.002 +.004 CD1	E	F	L1	MR2	Add Stroke LB	XD	ZD1
6	1	1-3/8	1.500	1.000	6.500	0.750	1.500	1.125	12.125	15.250	16.375
	3	1-3/4	1.500	1.000	6.500	0.750	1.500	1.125	12.625	16.000	17.125

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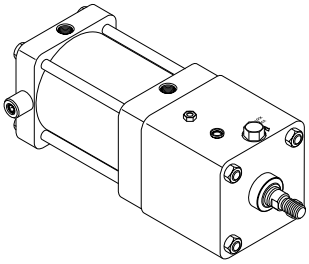
B

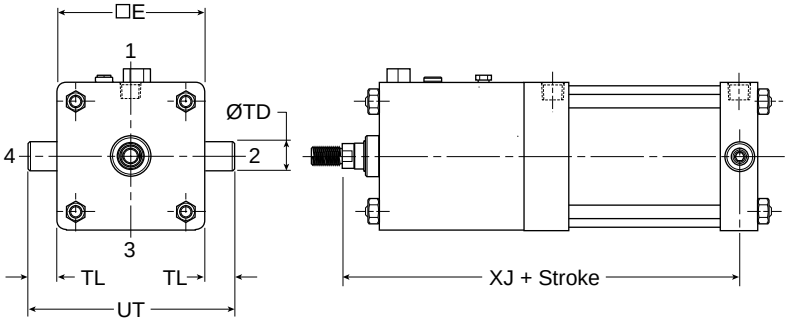
Head Trunnion Mount
Style D
(NFPA MT1)





Cap Trunnion Mount
Style DB
(NFPA MT2)



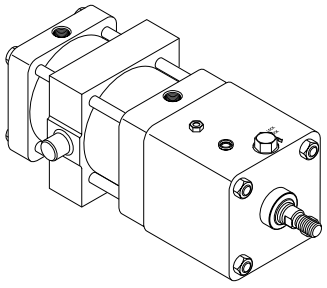


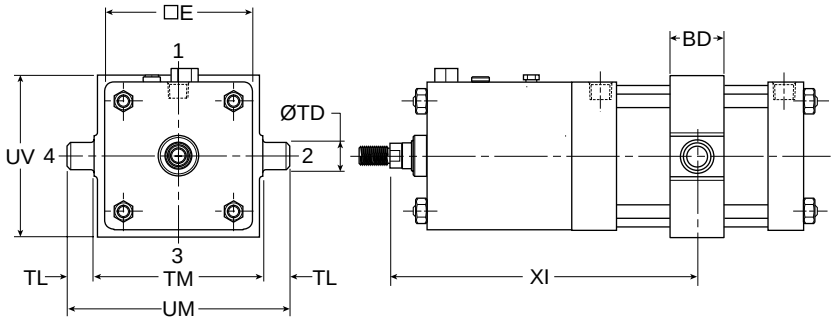
Cylinder Dimensions – Styles D and DB

Bore Size	Rod No.	Rod Dia. MM	E	+.000 -.001 TD	TL	UT	XG	XJ
6	1	1-3/8	6.500	1.375	1.375	9.250	9.000	12.250
	3	1-3/4	6.500	1.375	1.375	9.250	9.750	13.000
8	1	1-3/8	8.500	1.375	1.375	11.250	9.250	12.625
	3	1-3/4	8.500	1.375	1.375	11.250	10.000	13.375

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Intermediate Trunnion Mount
Style DD
(NFPA MT4)





Cylinder Dimensions – Style DD

Bore Size	Rod No.	Rod Dia. MM	E	BD	+.000 -.001 TD	TL	TM	UM	UV	Min. XI	Min. Stroke
6	1	1-3/8	6.500	2.500	1.375	1.375	7.625	10.375	7.000	20.16	6.125
	3	1-3/4	6.500	2.500	1.375	1.375	7.625	10.375	7.000	20.19	6.125
8	1	1-3/8	8.500	2.500	1.375	1.375	9.750	12.500	9.500	26.31	6.500
	3	1-3/4	8.500	2.500	1.375	1.375	9.750	12.500	9.500	27.06	6.500

Note: Style DD requires Minimum Stroke per table.

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B

How to Order ACVB Option fully assembled to 3MA or 4MA Cylinder

2.00			J		4MA		U		S	1	4		A		6.000

Bore Size
1.50
2.00
2.50
3.25
4.00
5.00

Double Rod Cylinder [1]
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code per available 3MA or 4MA mount.

Series
3MA
4MA

Ports
U NPTF

Piston Rod Number
See 3MA/4MA section for more details.

Stroke Length
Specify stroke length required in inches.

Cushion Head End

Blank	Non-cushioned head end
C	Cushioned head end

Seals

Blank	Standard (nitrile seals)
E	Fluorocarbon rod wiper and rod seal only
M	Metallic rod wiper, nitrile seals*

Cushion Cap End

Blank	Non-cushioned cap end
C	Cushioned cap end

Cylinder Construction

Blank	Standard (extruded body, standard round lobe orientation) *
A	Extruded body, round lobe orientation rotated 90 degrees from standard *
N	Extruded body, round lobe orientation rotated 180 degrees from standard *
Z	Extruded body, round lobe orientation rotated 270 degrees from standard *
T	Aluminum round tube and carbon steel tie rods and nuts

* See Table on page B10

Piston Rod Thread Type

A	Standard (UNF Unified Thread)
W	BSF British Fine
M	Metric (see page B106)

Special Modification
Specify "S" for ACVB options and any other special modification other than rod end. See examples below.

Rod Material and Gland Code

Blank	Standard rod and gland
H	Standard rod and HI LOAD gland*
Y	17-4 PH stainless steel rod and standard gland
Z	17-4 PH stainless steel rod and HI LOAD gland*
J	303 stainless steel rod and standard gland
K	303 stainless steel rod and HI LOAD gland*
S	316 stainless steel rod and standard gland
T	316 stainless steel rod and HI LOAD gland*

*4MA only.

Piston Type

Blank	Standard (lipseals and magnetic ring) [1]
1	Lipseals, no magnetic ring [1]
2	Lipseals, no magnetic ring (aluminum piston)
3	Lipseals and magnetic ring (aluminum piston)
4	Bumper seals, no magnetic ring
6	Bumper seals and magnetic ring
B	Lipseals, 1/4" thick bumpers both ends
H	Lipseals, 1/4" thick bumper head end
C	Lipseals, 1/4" thick bumper cap end
D	Lipseals and magnetic ring, 1/4" thick bumpers both ends
F	Lipseals and magnetic ring, 1/4" thick bumper head end
R	Lipseals and magnetic ring, 1/4" thick bumper cap end

[1] Double rod cylinders not available with composite piston type.

Piston Rod Thread Style

4	Small male
8	Intermediate male
9	Short female
55	For use with Split Coupler
3	Special (and specify all dimensions required)

Example

2.00 CJ3MAUS14AC 6.000
S = ACVB Valve Combination
S = 3C2B54 Manifold Code
(See following page.)

Flow Control Option

Add "S = with SP37 Flow Controls" to item notes

Muffler Option

Add "S = with EM Mufflers" to item notes

For ACVB with the 2A Series, please use the 2A Series Model Code and specify the following in the item notes:
S = ACVB Valve Combination
S = (Manifold Code from following page)

ACVB Minimum Stroke Requirements**	
Bore	**3MA/4MA**
Compact Manifold	
1.50	0.500
2.00	0.500
2.50	0.438
Full Manifold	
1.50	5.813
2.00	5.813
2.50	5.750
3.25	5.500
4.00	5.500
5.00	5.250

**For desired strokes less than the minimum requirement, specify a stop tube for the cylinder assembly. Total stroke should be (desired net stroke) + (stop tube length to help exceed minimum stroke). Stop tube only available for 4MA with aluminum piston.

Example: 1.50" bore 4MA with 5.000" of desired net stroke:

Gross stroke = 5.813"

Stop tube = 0.813"

Net stroke = 5.000"

Note: place gross stroke in cylinder model number and specify stop tube length and net stroke in the item notes.

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ACVB Series Valve/Manifold Codes

Valve Series	
3	B3
5	B5
6	B6

Manifold Type / Location	
C	Compact Manifold / Cap End (For use with B3 valve only)
D	Compact Manifold / Head End (For use with B3 valve only)
F	Full Manifold / Cap End (For use with B3, B5 or B6 valves)
G	Full Manifold / Head End (For use with B3, B5 or B6 valves)

Operator Type / Function	
1	Single Solenoid / Air Return
2	Double Solenoid
3	Single Remote Pilot / Air Return
4	Double Remote Pilot

NOTE: Cylinders with single solenoid valves mounted at the CAP END will be NORMALLY RETRACTED. Cylinders with single solenoid valves mounted at the HEAD END will be NORMALLY EXTENDED.

Pilot Source / Pilot Exhaust	
A	Internal - Port #1 / Tapped M5 (B5, B6 only)
B	Internal - Port #1 / Vented
0	None. Remote Pilot Valve

Connector / Valve Series Available	
(Connector can be rotated in 90° increments for Options A-H)	
0	None / B3, B5, B6 (Remote Pilot)
5	15mm 3-PIN DIN 43650C / B3, B5, B6 (Male Connector)
6	15mm 3-PIN DIN 43650C (rotated 180°) / B3, B5, B6 (Male Connector)
A	30mm Square 3-PIN ISO 4400 Form A / B5, B6 (Male Connector)
B	22mm Rectangular 3-PIN Type B Industrial / B5, B6 (Male Connector)
C	3-PIN Automotive Mini / B5 (Female Connector)
D	5-PIN Automotive Mini / B5 (Female Connector)
F	Hazardous Duty 1/2" Conduit 18" Leads / B5, B6
H	1/2" NPT Conduit 18" Leads / B5, B6

Customer orientation of connector at 45 degree increments possible on Options A through H on B5 and B6 valves.

Voltage	
4	24 VDC
5	110 VAC
X	Remote Pilot

Example: 6 F 2 A 5 5

6	F	2	A	5	5
B6 Valve	Cap Mounted Full Manifold	Double Solenoid	Internal Pilot (Port 1)	15mm 3-PIN Square Connector	110 VAC

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B

Compact Manifold



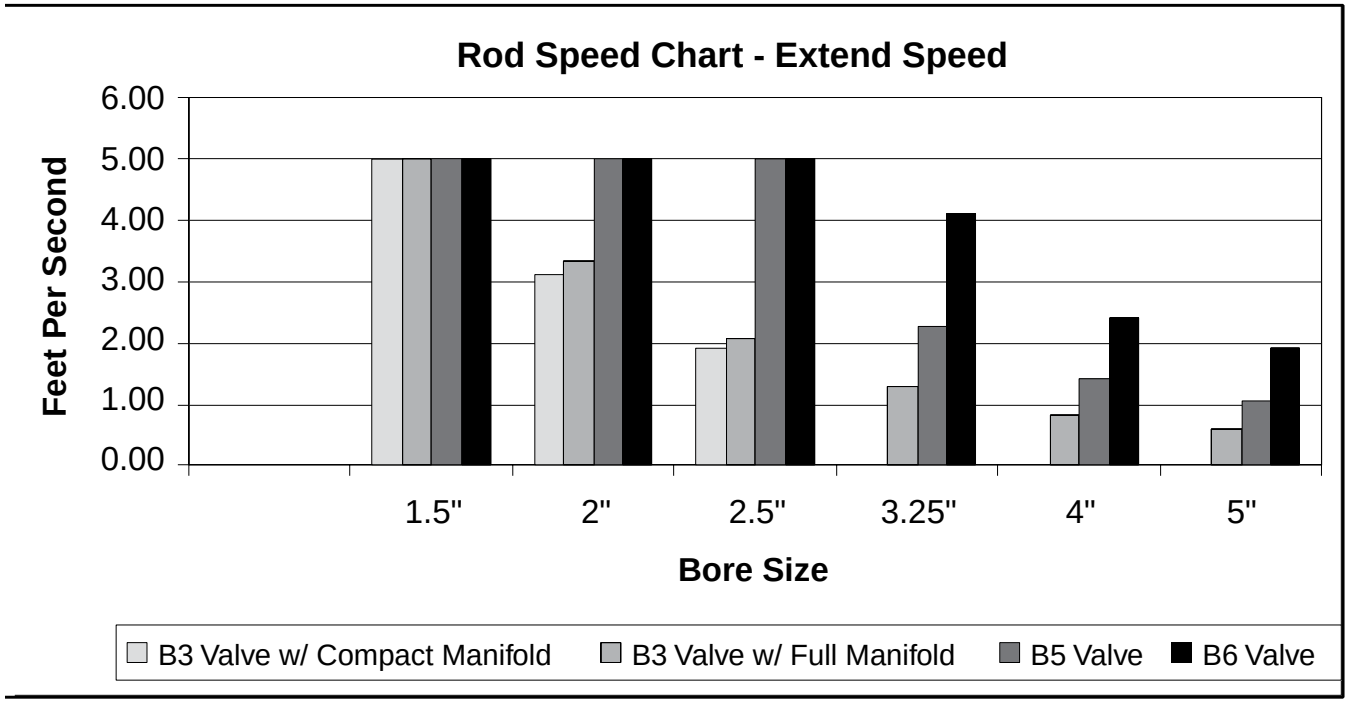
- Standard Fluid – Dry, filtered air.
- Standard Temperature – -5°F to 120°F (-15°C to 49°C).
- Maximum 145 PSI operating pressure.
- Fits 1-1/2" through 2-1/2" Bore 3MA and 4MA standard cylinders.
- Uses standard Parker fittings, tubing, and seals.
- Compact manifold accommodates B3 Series valve from Parker Pneumatic Division North America without field modification to cylinder.

Full Manifold



- Standard Fluid – Dry, filtered air.
- Standard Temperature – -5° F to 120° F (-15°C to 49°C).
- Maximum 145 PSI operating pressure.
- Fits 1-1/2" through 5” Bore 3MA and 4MA standard cylinders.
- Uses standard Parker fittings, tubing, and seals.
- Full manifold accommodates B3, B5 and B6 series Parker Pneumatic valves, without field modification to cylinder (B6 series shown).
- Bolt pattern conforms to NAMUR standard on B5 and B6 valves.
- Manifold and valve do not overhang beyond head or cap fasteners.

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Steps to size a cylinder-valve system

Step 1. Gather the Application Parameters

Total load
Maximum velocity needed to move load in specified time*
Minimum pressure available

Step 2. Size Cylinder

Use equations in engineering section of Pneumatic Actuator Catalog to calculate minimum bore size

Step 3. Size Valve/Manifold

Use the Rod Speed Chart above
Choose valve/manifold system that will supply maximum velocity needed for bore size chosen above

Step 4. Choose the Appropriate Model Code**

Specify necessary valve and manifold
Choose type of control required
Choose type of connection and voltage required

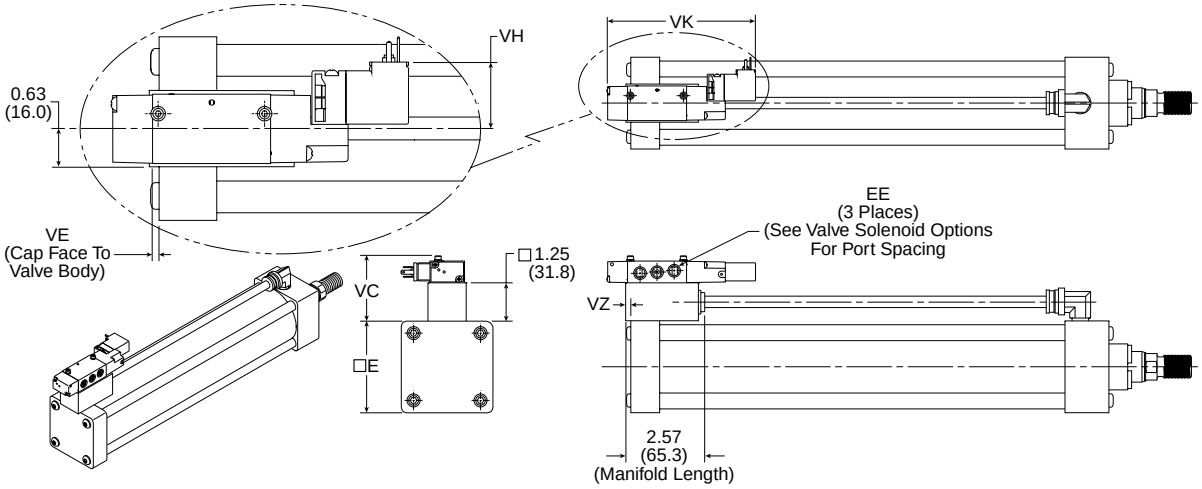
* If maximum velocity is not easily calculated, divide the total stroke distance by the total stroke time and multiply by 2.

** See the ACVB Series Valve/Manifold Code page for more details.

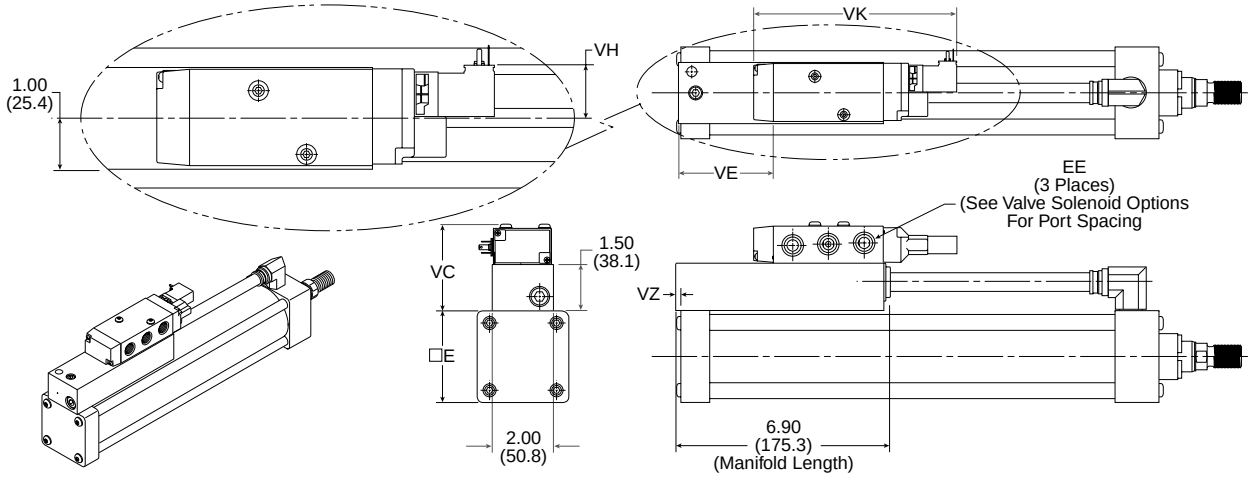
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B

Compact Manifold



Full Manifold



Dimensions

Bore	E (SQ.)	Manifold	Valve	VE*	VZ** 3MA/4MA
1-1/2	2	Compact	B3	0.17 (4.3)	0.23 (5.8)
		Full	B3	3.78 (96.3)	0.23 (5.8)
			B5	3.48 (88.4)	0.13 (3.3)
			B6	2.97 (75.4)	0.13 (3.3)
2	2-1/2	Compact	B3	0.17 (4.3)	0.23 (5.8)
		Full	B3	3.78 (96.3)	0.13 (3.3)
			B5	3.36 (85.3)	0.13 (3.3)
			B6	2.97 (75.4)	0.13 (3.3)
2-1/2	3	Compact	B3	0.17 (4.3)	0.23 (5.8)
		Full	B3	3.78 (96.3)	0.13 (3.3)
			B5	3.36 (85.3)	0.13 (3.3)
			B6	2.97 (75.4)	0.13 (3.3)
3-1/4	3-3/4	Full	B3	3.90 (99.1)	0.00
			B5	3.48 (88.4)	0.00
			B6	3.10 (78.7)	0.00
4	4-1/2	Full	B3	3.90 (99.1)	0.00
			B5	3.48 (88.4)	0.00
			B6	3.10 (78.7)	0.00
5	5-1/2	Full	B3	3.90 (99.1)	0.00
			B5	3.48 (88.4)	0.00
			B6	3.10 (78.7)	0.00

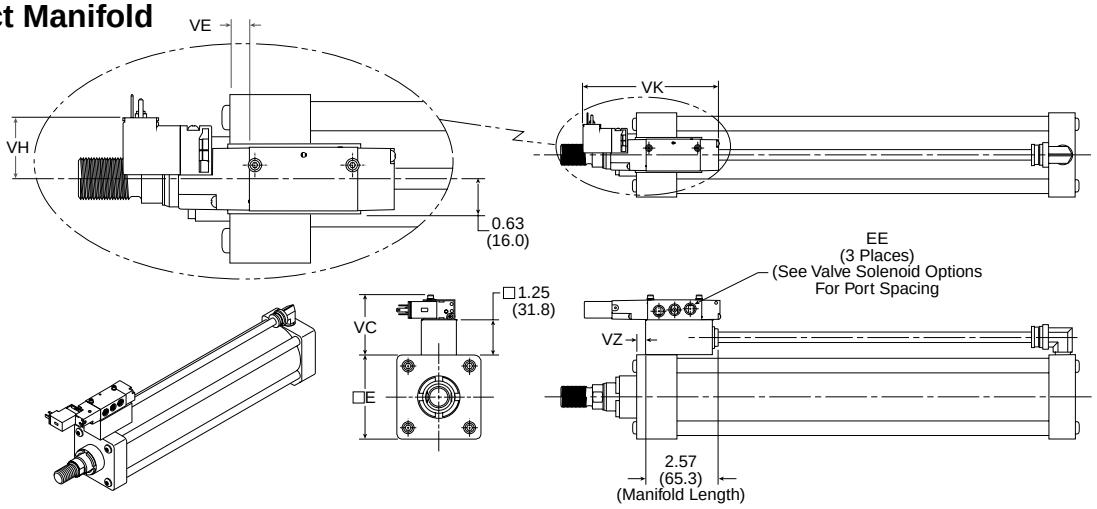
Valve	EE (NPTF)	VH	VK	VC	
B3	1/8	1.09 (27.7)	4.67 (118.6)	Compact Manifold	2.12 (53.8)
				Full Manifold	2.37 (60.2)
B5	1/4	1.12 (28.4)	5.78 (146.8)	Full Manifold	2.81 (71.4)
B6	3/8	1.12 (28.4)	6.67 (169.4)	Full Manifold	2.81 (71.4)

* VE = Dimension from edge of endcap to edge of valve body.
** VZ = Dimension from edge of endcap to edge of manifold.

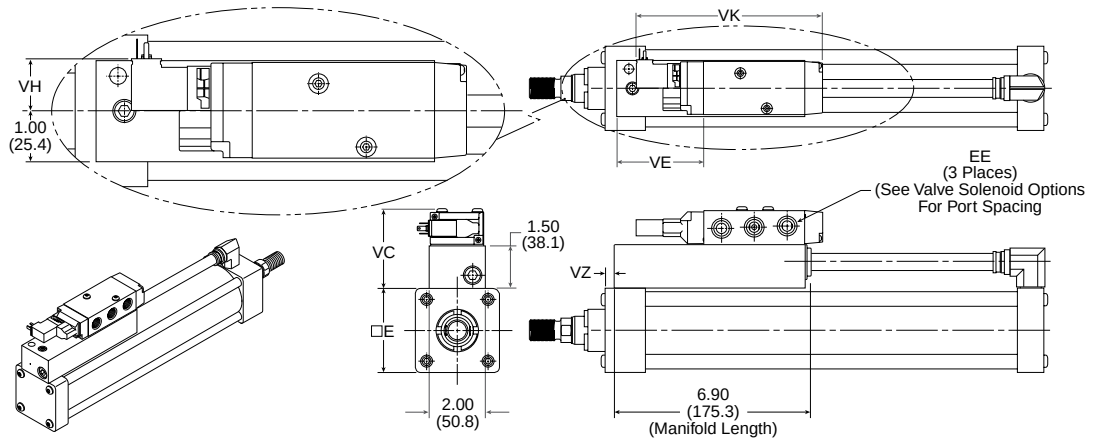
Note: Dimensions shown are for a single solenoid enclosure with Option 5. For other valve or enclosure option dimensions, see pages B96-B97.

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Compact Manifold



Full Manifold



Dimensions

Bore	E (SQ.)	Manifold	Valve	VE*	VZ**
				3MA/4MA	3MA/4MA
1-1/2	2	Compact	B3	0.26 (6.6)	0.20 (5.1)
		Full	B3	4.21 (106.9)	0.31 (7.9)
			B5	3.79 (96.3)	0.31 (7.9)
			B6	3.41 (86.6)	0.31 (7.9)
2	2-1/2	Compact	B3	0.26 (6.6)	0.20 (5.1)
		Full	B3	4.21 (106.9)	0.31 (7.9)
			B5	3.79 (96.3)	0.31 (7.9)
			B6	3.41 (86.6)	0.31 (7.9)
2-1/2	3	Compact	B3	0.33 (8.4)	0.27 (6.9)
		Full	B3	4.27 (108.5)	0.38 (9.6)
			B5	3.86 (98.0)	0.38 (9.6)
			B6	3.47 (88.1)	0.38 (9.6)
3-1/4	3-3/4	Full	B3	4.40 (111.8)	0.50 (12.7)
			B5	3.98 (101.1)	0.50 (12.7)
			B6	3.60 (91.4)	0.50 (12.7)
4	4-1/2	Full	B3	4.40 (111.8)	0.50 (12.7)
			B5	3.98 (101.1)	0.50 (12.7)
			B6	3.60 (91.4)	0.50 (12.7)
5	5-1/2	Full	B3	4.40 (111.8)	0.50 (12.7)
			B5	3.98 (101.1)	0.50 (12.7)
			B6	3.60 (91.4)	0.50 (12.7)

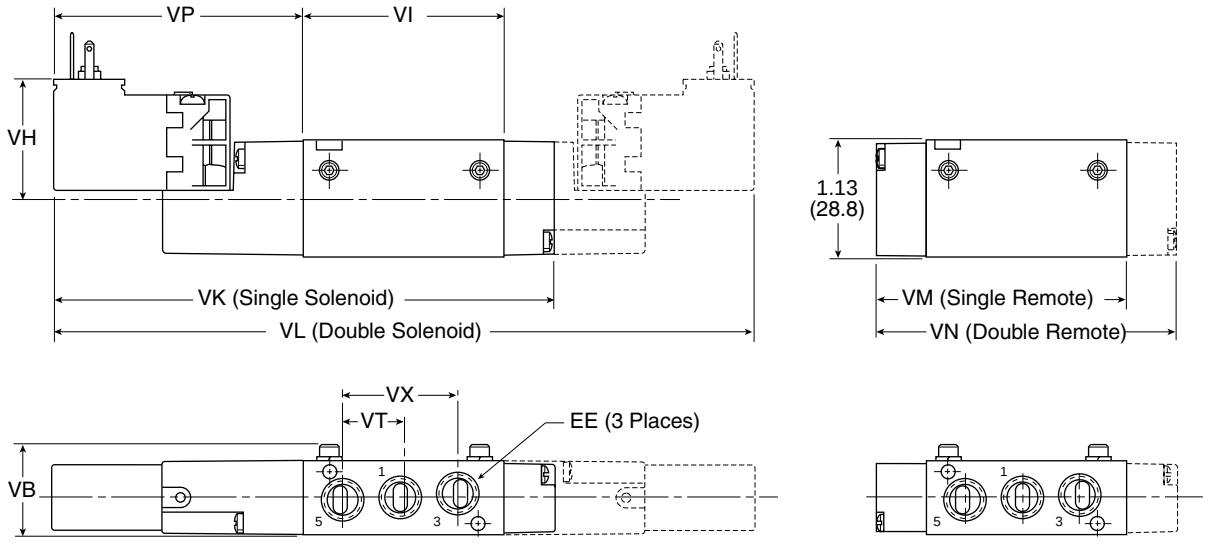
Valve	EE (NPTF)	VH	VK	VC	
B3	1/8	1.09 (27.7)	4.67 (118.6)	Compact Manifold	2.12 (53.8)
				Full Manifold	2.37 (60.2)
B5	1/4	1.12 (28.4)	5.78 (146.8)	Full Manifold	2.81 (71.4)
B6	3/8	1.12 (28.4)	6.67 (169.4)	Full Manifold	2.81 (71.4)

* VE = Dimension from edge of endcap to edge of valve body.
** VZ = Dimension from edge of endcap to edge of manifold.

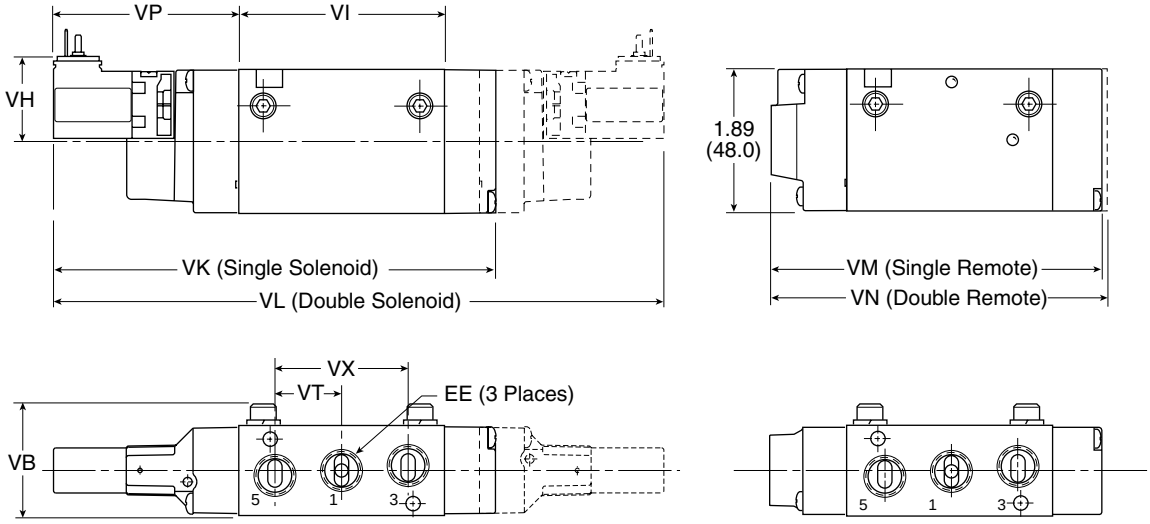
Note: Single Solenoid with enclosure 5 shown. For other valve options, see pages B96-B97.

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B3 Valve



B5 and B6 Valve

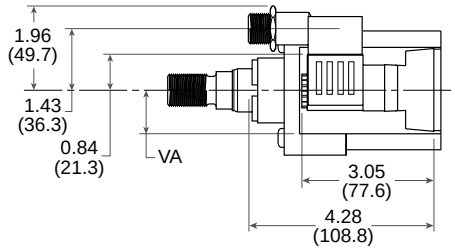


Dimensions

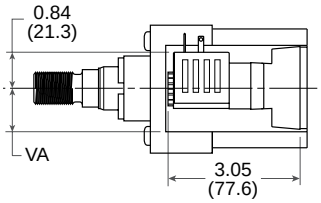
Valve	EE (NPTF)	VB	VH	VI	VK	VL	VM	VN	VP	VT	VX
B3	1/8	0.87 (22.1)	1.09 (27.7)	1.93 (49.0)	4.67 (118.6)	6.44 (163.6)	3.12 (79.2)	3.33 (84.6)	2.25 (57.2)	0.56 (14.2)	1.12 (28.4)
B5	1/4	1.31 (33.3)	1.12 (28.4)	2.70 (68.6)	5.78 (146.8)	7.51 (190.8)	4.37 (111.0)	4.70 (119.4)	2.40 (61.0)	0.88 (22.4)	1.75 (44.5)
B6	3/8	1.31 (33.3)	1.12 (28.4)	3.60 (91.5)	6.67 (169.4)	8.41 (213.6)	5.26 (133.6)	5.59 (142.0)	2.40 (61.0)	1.17 (29.7)	2.34 (59.4)

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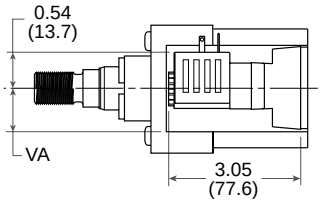
Optional Electrical Connections



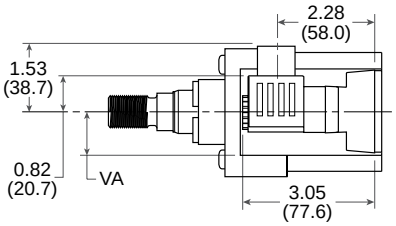
Enclosure C, D



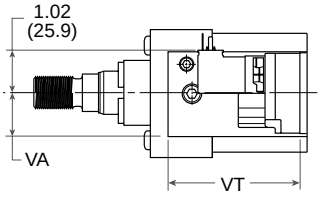
Enclosure A



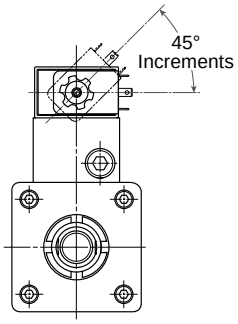
Solenoid Option A, B, C, D, F & H
(Can be rotated in 45° increments as shown)



Enclosure 5



Enclosure F & H
(B5 & B6 Only)

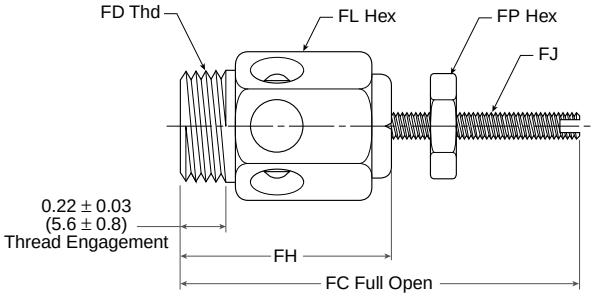


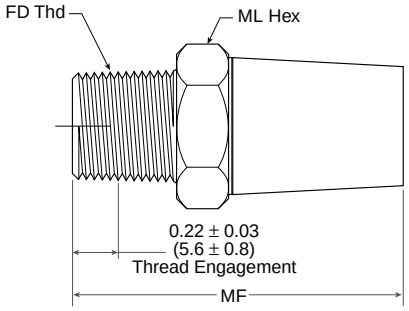
Enclosure B

Optional Electrical Connections Dimensions

Valve	VA	VT
B3	0.63 (16.0)	2.25 (57.2)
B5	1.00 (25.4)	2.40 (61.0)
B6	1.00 (25.4)	2.40 (61.0)

Optional Flow Controls / Mufflers





Optional Flow Controls / Mufflers Dimensions

Valve	FC	FD	FJ	FH	FL	FP	MF	ML
B3	1.48 (37.6)	1/8	10-32	0.90 (22.9)	1/2	3/8	1.00 (25.4)	7/16
B5	1.92 (48.8)	1/4	1/4-28	1.17 (29.7)	9/16	7/16	1.32 (33.5)	9/16
B6	1.92 (48.8)	3/8	1/4-28	1.27 (32.3)	11/16	7/16	1.54 (39.1)	11/16

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B

Manifold Kits Without Valve

Bore Size	Compact Manifold	Full Manifold	
	1-1/2", 2", and 2-1/2"	1-1/2", 2" and 2-1/2"	3-1/4", 4", and 5"
Kit w/ Tubing	L078350000	L078380000	L078390000
Kit w/o Tubing	L078370000	L078400000	L078410000
Max. Stroke for Kit w/ Tubing*	34.5"	39.5"	39"
Tubing Part #	0880383836	0880386336	

Example:

Manifold Kits:

Without Tubing Include:

- Manifold
- Grease
- O-rings for all applicable valves
- All necessary fasteners
- All necessary fittings
- Assembly Instructions

With Tubing Include:

- All “without tubing” items
- 36" of appropriate tubing
  – 3/8" O.D. for compact manifold
  – 5/8" O.D. for full manifold
- See above table for maximum stroke lengths.

Valve:

To Order Valve:

- Consult latest revision of Parker Pneumatic Products Catalog (Catalog #0600P).
- Specify “T” code as port size/thread type on B3, B5 or B6 valve order.
- All valves supplied with flush, locking overrides (code ‘C’).
- Manifolds designed for 2 position valves only.

Example: B61TBCH49A defines:

B6 ACVB Single Solenoid Valve, Flush Locking Override, with 1/2" NPT conduit, using 24VDC voltage.

Flow Controls & Mufflers:

- Order as separate line items.

Valve Size	Port Size (NPTF)	Flow Control Part #	Muffler Part #
B3	1/8	0881480001	0882410013
B5	1/4	0881480002	0882410025
B6	3/8	0881480003	0882410038

⚠ WARNING

The Prestomatic fittings on the manifold and cylinder end caps are to be used in conjunction with Parker Air Brake tubing PFT-6B and PFT-10B only. The use of other tubing may not be compatible with the Prestomatic fittings. This may lead to a tubing failure which could cause the cylinder piston rod to suddenly retract or extend at high speed.

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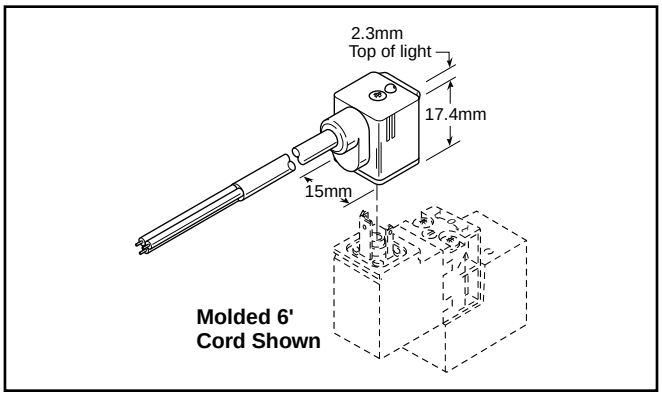
Female Electrical Connectors

15mm 3-Pin DIN 43650C
(Use with Enclosure "5")

Connector	Connector with 6' (2m) Cord	Description
PS2932BP	PS2932JBP	Unlighted
PS294679BP	PS2946J79BP*	Light – 24VAC or DC
PS294683BP	PS2946J83BP*	Light – 110/120VAC

*LED with surge suppression.

Note: Max Ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

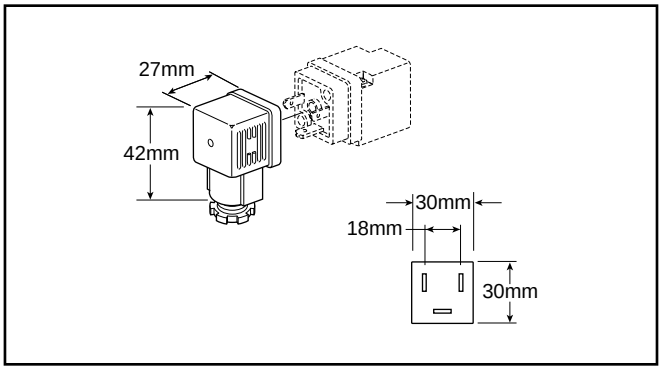


30mm Square 3-Pin – ISO 4400, DIN 43650A
(Use with Enclosure "A")

Connector	Connector with 6' (2m) Cord	Description
PS2028BP	PS2028JBP	Unlighted
PS203279BP	PS2032J79BP*	Light – 6-48V, 50/60Hz, 6-48VDC
PS203283BP	PS2032J83BP*	Light – 120V/60Hz

*LED with surge suppression.

Note: Max Ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.

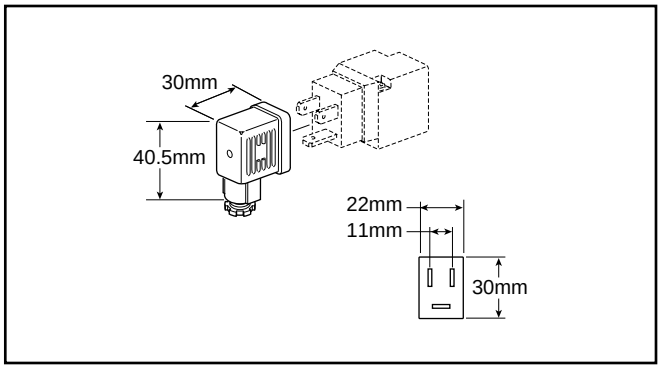


22mm Rectangular 3-Pin – Type B Industrial
(Use with Enclosure "B")

Connector	Connector with 6' (2m) Cord	Description
PS2429BP	PS2429JBP	Unlighted
PS243079BP	PS2430J79BP*	Light – 24V/60Hz, 24VDC
PS243083BP	PS2430J83BP*	Light – 120V/60Hz

*LED with surge suppression.

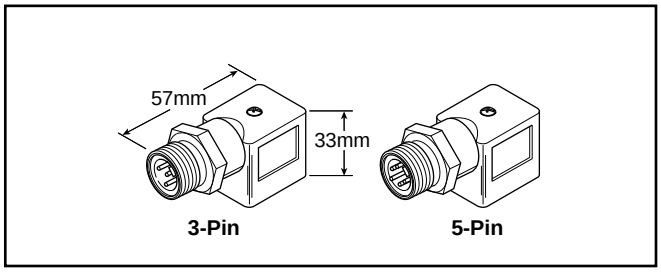
Note: Max Ø6.5mm cable size required for connector w/o 6' (2m) cord. IP65 rated when properly installed.



3-Pin / 5-Pin Male Automotive Connectors
(Use on 22mm Rectangular 3-Pin Solenoid)

3-Pin	5-Pin	Description
PS2893CP	PS2893DP	Unlighted
PS2893C##P	PS2893D83P	Lighted - Voltage

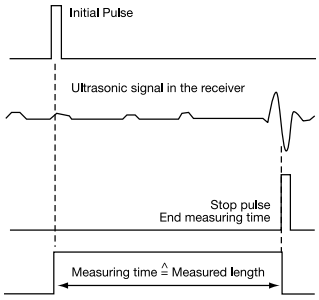
– '83' for 120VAC
'79' for 24VDC & 24VAC



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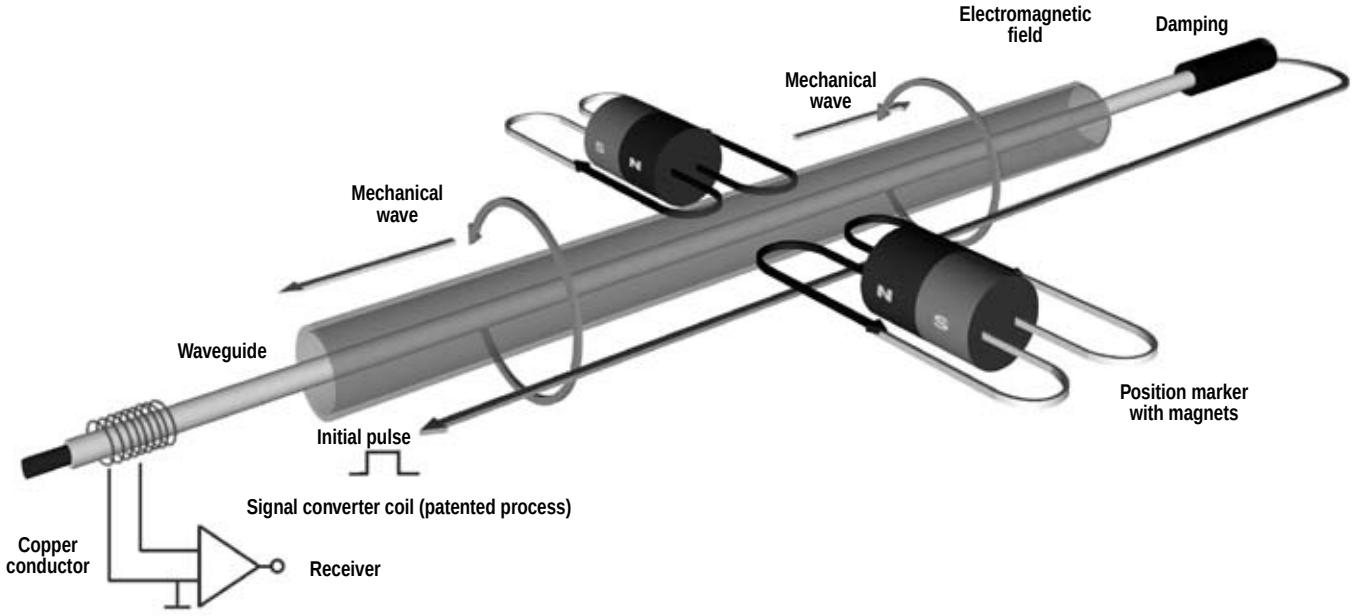
Linear Position Sensor for Continuous Position Feedback

B



Generation of the ultrasonic torsion pulse in a metallic conductor based on the principle of magnetostriction.





Principles of Operation

The measuring element (“waveguide”), consists of a special nickel-alloy tube.

A copper conductor is introduced through the length of this tube. The start of measurement is initiated by a short current pulse.

This current generates a circular magnetic field which rotates around the waveguide. A permanent magnet at the point of measurement is used as the marker element, whose lines of field run at right angles to the electromagnetic field. In the area on the waveguide where the two fields intersect, a magneto-strictive effect causes an elastic deformation of the waveguide, which propagates along the wave guide in both directions in the form of a mechanical wave.

The propagation velocity of this wave in the waveguide is 2830 m/s, and is nearly insensitive to environmental effects (e.g., temperature, shock, contamination).

The component of the wave which reaches the far end of the waveguide is damped there, whereas the component which arrives at the signal converter is changed into an electrical signal by reversing the magnetostrictive effect. The wave travel time from its point of origin to the signal converter is directly proportional to the distance between the permanent magnet and the signal converter. A time measurement then allows the distance to be determined with extremely high accuracy.

Design

The transducers are made to the same safety and reliability standards for use in the harshest conditions:

- The electronics unit is compactly designed using SMD technology. The boards are protected in a space-saving, rugged aluminum extruded housing.
- The waveguide is protected in the extruded aluminum housing.

Quality

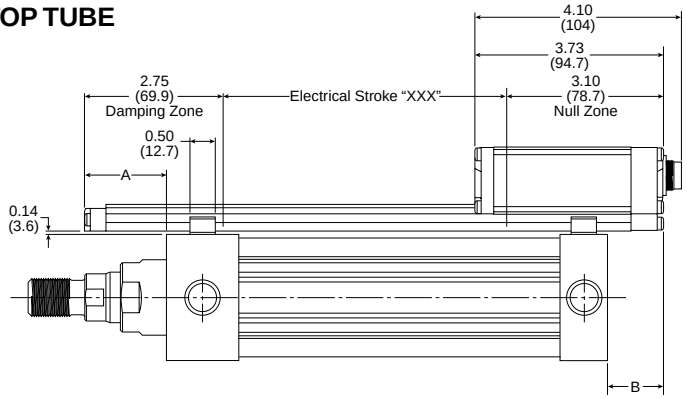
Each and every transducer undergoes a specially designed, computer-controlled testing procedure which includes 100% checking of all specified data.

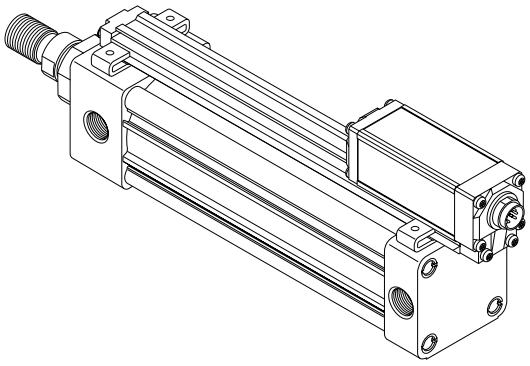
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The drawings below show that the Linear Position Sensor is longer than the cylinder of the same stroke length. The sensor overhang on the head end of the cylinder, as indicated by dimension A, may be eliminated by adding stop tubing, which effectively increases the gross stroke of the cylinder. The recommended stop tube lengths are provided in the table below for each bore size. The examples show that the electrical stroke of the sensor will always match the **net** stroke of the cylinder.

As a result of the limited sensing range of the sensor, it will overhang at the cap end of the cylinder by the amount of dimension B.

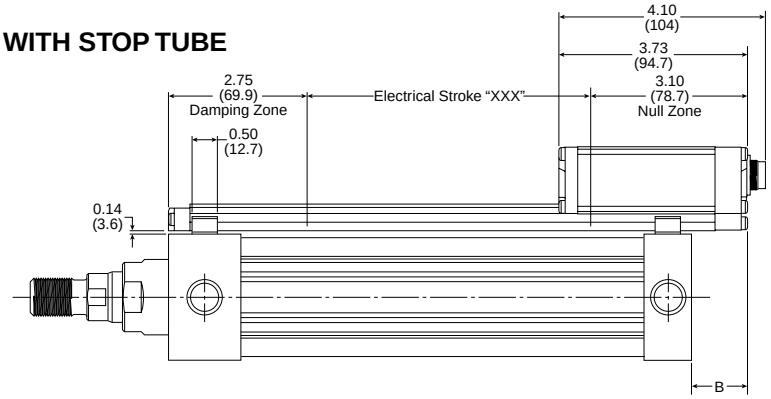
NO STOP TUBE

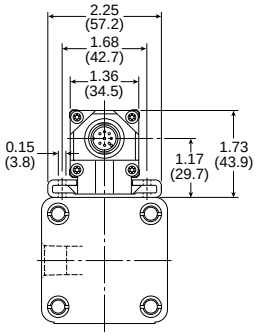




Example A: 12" Stroke cylinder without stop tube equals 12" Electrical Stroke for the Sensor.

WITH STOP TUBE





Example B: To eliminate sensor overhang on the head end of a 2.0" bore cylinder, add 1.0" of recommended stop tube length. The cylinder gross stroke becomes 13" and the net stroke remains 12". Specify a sensor with an electrical stroke of 12". Note that the electrical stroke equals cylinder **net** stroke length.

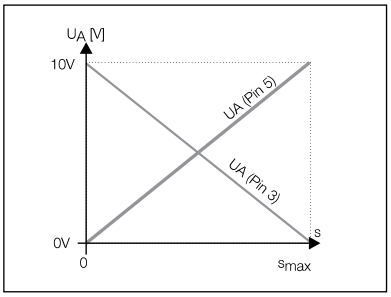
Example C: To eliminate sensor overhang on the head end of a 5.0" bore cylinder, add 0.625" of recommended stop tube length. The cylinder gross stroke becomes 12.625" and the net stroke remains 12". Specify a sensor with an electrical stroke of 12". Note that the electrical stroke equals cylinder **net** stroke length.

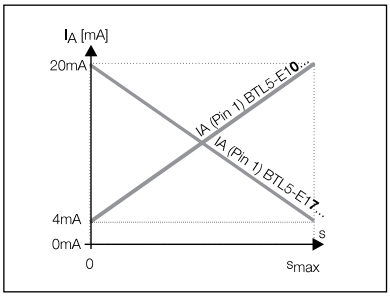
Bore	Rod Code	Rod Diameter	No Stop Tube		With Stop Tube		
			A	B	Stop Tube Length	A_1	B
2	1	5/8	0.95	1.3	1.0	0	1.3
	3	1					
2-1/2	1	5/8	0.90	1.25	1.0	0	1.25
	3	1					
3-1/4	1	1	0.64	1.0	0.75	0	1.0
	3	1-3/8					
4	1	1	0.63	0.99	0.75	0	0.99
	3	1-3/8					
5	1	1	0.55	0.79	0.625	0	0.79
	3	1-3/8					
6	1	1-3/8	0.47	0.46	0.50	0	0.45
	3	1-3/4					
8	1	1-3/8	0.28	0.44	0.375	0	0.44
	3	1-3/4					

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B

Output signal	analog	analog
Transducer interface	**A**	**E**
Input interface	analog	analog





Ordering code	BTL5-**A11**-M_ _ _ _-RSU022S32	BTL5-**E1**_-M_ _ _ _-RSU022S32
Output voltage	**0...10 V**	
Output current		**4...20 mA**
Load current	max. 10 mA	
max. ripple.	≤ 5 mV	
Load resistance		≤ 500 Ohm
System resolution	≤ **0.1 mV**	≤ **0.2 µA**

Hysteresis		≤ 4 µm
Repeatability		6 µm (hysteresis + resolution)
Output update rate		STANDARD = 1 ms ≤1400 mm
max. non-linearity		±100 µm to 500 mm stroke
		±0.02 % 501...3606 mm stroke
Temperature coefficient	Voltage output	[150 µV/°C + (5 ppm/°CxPxU/L)]xDT
	Current output	[0.6 µA/°C + (10 ppm/°CxPxI/L)]x DT
Shock loading		100 g/11 ms per IEC 68-2-27
Vibration		12 g, 10...2000 Hz per IEC 68-2-6
Traverse velocity of magnet		any
Operating voltage		24 V DC ± 20%
Current draw		≤150 mA
Polarity reversal protected		yes
Overvoltage protection		Transzorb protection diodes
Dielectric constant		500 V (Ground to housing)
Operating temperature		-40...185 °F (-40...85°C)
Storage temperature		-40...212 °F (-40...100°C)

S32 Pin assignments	Pin	Color	BTL5-**A11**...	BTL5-**E1**...BTL5-**E7**...
Output signals	1	YE	not used	4...20 mA 20...4 mA
	2	GY	signal GND	0 V output
	3	PK	10...0 V	10...0 V
	5	GN	0...10 V	0...10 V
Supply voltage	6	BU	GND	GND
	7	BN	+24 V DC	+24 V DC
	8	WH	(GND)	(GND)

Connect shield to housing.

Specifications subject to change.

Please enter code for output signal and nominal stroke in ordering code.

BTL transducers with analog outputs are available in the ranges of 0...10V, 4...20mA with rising or falling signal.

Ordering Sample:

BTL5-A11-M_ _ _ _-R-SU 022S32

Output signal
1 increasing and decreasing (for A)
0 increasing
7 decreasing (for E)

Standard stroke lengths (mm)

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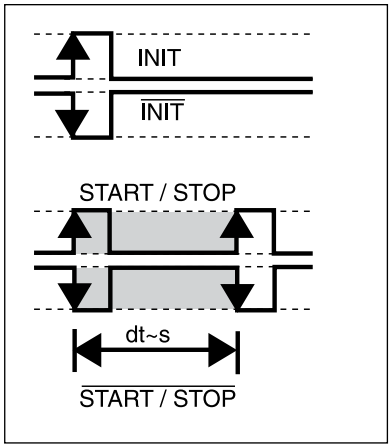
M Interface

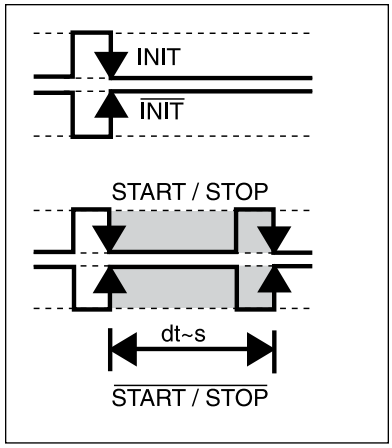
Differential **START/STOP** control-specific interface.

P Interface

Compatible with BTA processors and various OEM controls. Reliable signal transmission, even over cable lengths up to 500 m (1640ft.) between BTA and BTL, is assured by the especially noise-immune RS485 differential drivers and receivers. Noise signals are effectively suppressed.

Series	BTL5 Low Profile	BTL5 Low Profile
Transducer interface	pulse **M**	pulse **P**
User interface	pulse **M**	pulse **P**





Ordering code	BTL5-**M**1-M_ _ _ _-RSU022S32	BTL5-**P**1-M_ _ _ _-RSU022S32
System resolution	Process-dependent/control dependent	
Repeatability	Hysteresis + Resolution	
Resolution	≤ 2 µm	
Hysteresis	≤ 4 µm	
Standard sampling rate	STANDARD = 1 kHz ≤1400 mm	
max. non-linearity	±100 µm to 500 mm nominal stroke	
	±0.02 % 501...3750 mm nominal stroke	
Temperature coefficient of overall system	(6 µm + 5 ppm x L)/°C	
Traverse velocity of magnet	any	
Operating voltage	24 V DC ±20 % or ±15V DC ±2% (optional)	
Current draw	≤100 mA	
Operating temperature	–40...185 °F (-40...85°C)	
Storage temperature	–40...212 °F (-40...100°C)	

S32 Pin assignments		Pin	Color	BTL5-**M**1-M...	BTL5-**P**1-M...
Input/output signals	Input	1	YE	INIT	INIT
	Output	2	GY	START/STOP	START/STOP
	Input	3	PK	INIT	INIT
	Output	5	GN	START/STOP	START/STOP
Supply voltage		6	BU	GND	GND
		7	BN	+24 V DC	+24 V DC
		8	WH	(GND)	(GND)

Shield connected to housing

Specifications subject to change.

Please enter code for nominal stroke in ordering code.

Ordering Sample:

BTL5-P1-M_ _ _ _-R-SU 022S32

Output signal

Standard stroke lengths (mm)

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B

Sensor Ordering Code

BTL-5 - A 1 1 - M 0305 - R SU022 S32

Output Signal

A	0...10V
E	4...20mA
M	Differential Start/Stop, leading edge active
P	Differential Start/Stop, trailing edge active

Nominal Stroke

Specify whole mm using 4 digits, i.e. 0305 = 305mm active electrical stroke*

* Electrical stroke = net cylinder stroke.

Connection Type

S32	8-pin Quick Disconnect Metal Connector
KA05	Integral Axial Cable (specify cable length in whole meters using 2 digits, i.e. 05 = 5m)

Supply Voltage

1	24 V ±20%

Housing Geometry

R	Low Profile Extrusion

Output Signal (Analog only)

1	V_{min} or V_{max} at Connector End, i.e. user selectable rising or falling*
0	I_{min} at Connector End (rising toward opposite end)**
7	I_{max} at Connector End (falling toward opposite end)**

* Available only with 0...10V output signal (A).

**Available only with 4...20mA output signal (E).

Please see page B12 or B30 to order 4MA cylinder configuration.

Standard Lengths

Electrical Stroke

inches	mm
2	0051
3	0077
4	0102
5	0127
6	0152
7	0178
8	0203
9	0230
10	0254
11	0280
12	0305
13	0330

inches	mm
15	0381
16	0407
18	0457
20	0508
22	0560
24	0610
26	0661
28	0711
30	0762
32	0813
36	0914
40	1016

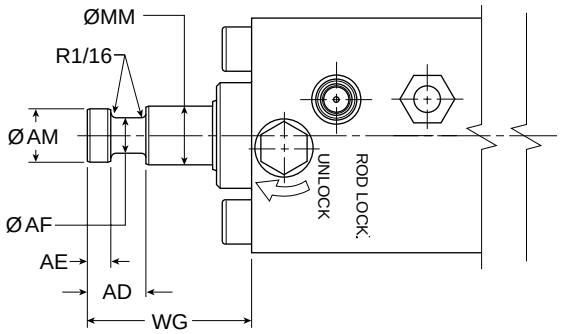
inches	mm
42	1067
48	1220
50	1270
60	1524
70	1778
80	2032
90	2286
100	2540
110	2794
120	3048

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Parker "Style 55" Piston Rod End

Rod end flange coupling for Parker 3MA, 4MA, 4ML, 3MAJ and 4MAJ Series cylinders:

- Simplifies alignment
- Reduces assembly time
- Allows full rated pneumatic pressure in push and pull directions
- Available in 5/8" through 1-3/4" piston rod diameters



Example: Style 55 Rod End
shown on 4MAJ Series cylinder

How To Order

Complete Model Number and place a "55" in the Piston Rod End designator position.

Example: 2.00 CJ4MAJU155C 6.000

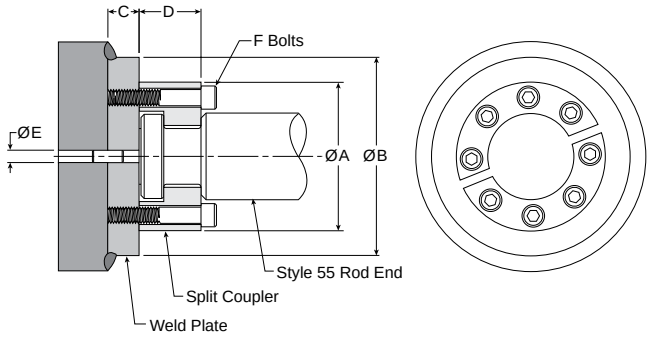
Consult factory for availability of mounting accessories and hardware.

Style 55 Rod End Dimensions

MM Rod Dia.	AD	AE	AF	AM	WG
5/8	5/8	1/4	3/8	.57	1-3/4
1	1-5/16	3/8	11/16	.95	2-3/8
1-3/8	1-1/16	3/8	7/8	1.32	2-3/4
1-3/4	1-5/16	1/2	1-1/8	1.70	3-1/8

See 3MA, 4MA or 3MAJ/4MAJ Series sections for more dimensions

Split Couplers and Weld Plates



⚠WARNING: Piston rod separation from the machine member can result in severe personal injury or even death to nearby personnel. The cylinder user must make sure the weld holding the weld plate to the machine is of sufficient quality and size to hold the intended load. The cylinder user must also make sure the bolts holding split coupler to the weld plate are of sufficient strength to hold the intended load and installed in such a way that they will not become loose during the machine's operation.

NOTE: Screws are not included with split coupler or weld plate.

Table 1 — Part Numbers and Dimensions

Rod Dia.	A	B	C	D	E	F	Bolt Size	Bolt Circle	Split Coupler Part No.	Weld Plate Part No.
0.625	1.50	2.00	0.50	0.56	0.250	4	#10-24 x .94 LG	1.125	1472340062	1481740062
1.00	2.00	2.50	0.50	0.88	0.250	6	.250-20 x 1.25 LG	1.500	1472340100	1481740100
1.375	2.50	3.00	0.63	1.00	0.250	6	.312-18 x 1.50 LG	2.000	1472340138	1481740138
1.75	3.00	4.00	0.63	1.25	0.250	8	.312-18 x 1.75 LG	2.375	1472340175	1481740175

Note: All dimensions without a tolerance are reference dimensions.

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B

Metric Rod Threads

Standard Metric Thread Sizes for Piston Rod Thread Type M

Rod Dia. MM	Styles 4 & 9 KK	Style 8* CC
3/8	M6 x 1.0	M8 x 1.25
1/2	M8 x 1.25	M12 x 1.25
5/8	M10 x 1.5	M12 x 1.5
1	M20 x 1.5	M22 x 1.5
1-3/8	M26 x 1.5	M30 x 2.0
1-3/4	M33 x 2.0	M39 x 2.0

*Style 6 for 1-1/8" bore 3MA
Note: All other rod end dimensions are standard per catalog.

Check Seal Cushions

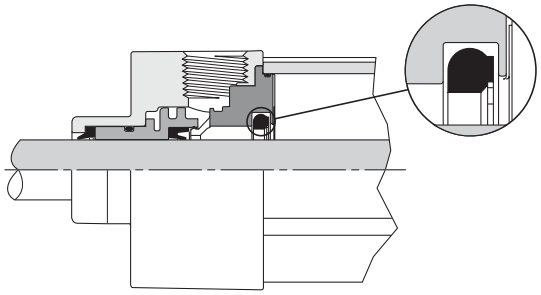
For Increased Productivity and Maximum Performance

The check seal cushion is new and different from ordinary cushion designs. It combines the sealing capabilities of a lipseal for efficient capture of air to effectively cushion and to provide check valve action for quick stroke reversal.

The design also provides “floating cushions” to assure cushion repeatability and long life. At the start of the stroke in each direction, the check valve design allows full flow to piston face with a minimum pressure drop for a maximum power stroke.

Additional benefits of the new check seal cushions are increased productivity and top performance for faster cycle time, minimum wear, easy adjustment and low pressure drop.

The basic cushion design is available at both ends without change in envelope or mounting dimensions. A captive cushion adjusting needle is supplied for easy, precise adjustment on all bore sizes.

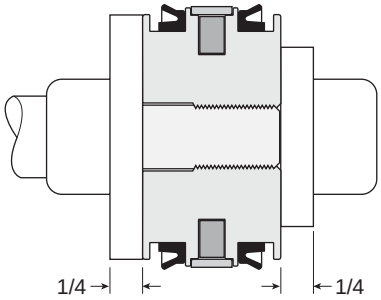


Bumpers

Impact dampening conventional bumpers can be provided on one or both sides of the piston with a 1/4" stroke loss per bumper. This style of bumper is ideal for applications subjected to high speeds where cycle time may discourage the use of cushions.

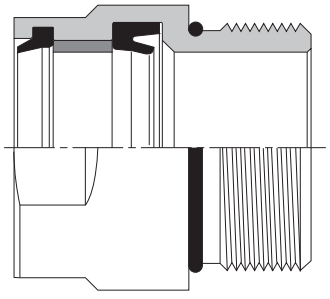
Available in 1-1/2" - 4" bore sizes for 3MA, 4MA, 4ML, 3MAJ and 4MAJ Series cylinders.

Bumper Option



HI LOAD Gland Assembly

Applications with inherent side load require a slide package for maximum service life. In some cases, there may be limitations to the size or expense of these additional components. One possible solution may be the use of the optional HI LOAD gland assembly that incorporates a high strength composite bearing for radial load conditions. Extensive testing showed an approximate 50% increase in service life for general applications. Please note that each application is unique and results may vary. Includes seal options for standard, high and low temperature applications with air (4MA) or hydraulic (4ML) service.

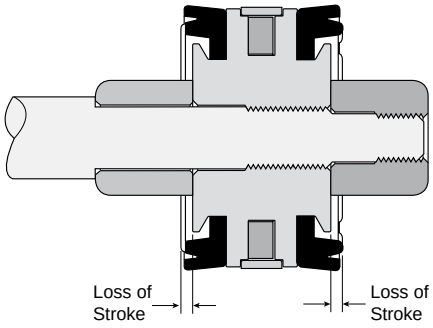


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Bumper Seal Option

Impact dampening Bumper Seals are now optional on all 3MA, 4MA, 3MAJ and 4MAJ cylinders from 1-1/8" to 5" bore. The Bumper Seal piston combines the features of low-friction, rounded lipseals and impact-damping bumpers to provide reduced noise and smoother end-of-stroke deceleration. At pressure greater than 80 PSI, the compressible Buna Nitrile or Fluorocarbon Bumper Seal has minimal effect on stroke loss. When specified, Bumper Seals will be supplied on both ends of the piston, eliminating the need to specify head end or cap end only.

Bumper Seal Option



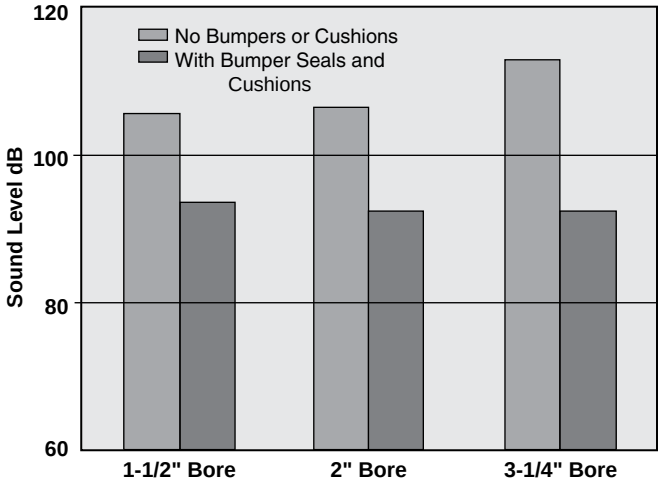
Summary of Accelerometer Test Results

Bore Size	Piston Type	Cushioning Efficiency (Maximum G's of Deceleration Force Created)	Cushioning Time (ms)
1-1/2"	Standard Piston	13.4	22
	Bumper Seal Piston	5.1	22
2"	Standard Piston	12.6	33
	Bumper Seal Piston	7.8	26
2-1/2"	Standard Piston	12.2	36
	Bumper Seal Piston	5.2	24

Bumper Seals Reduce Noise

The special profile of the Bumper Seal prevents the piston from noisily banging into the end cap at the end of stroke. Independent testing shows that the Bumper Seal, when combined with cushions, will absorb the final piston inertia and reduce the stroke noise by as much as 20 dB. The Sound Level Comparison graph illustrates the noise-reducing effects of the Bumper Seal piston when combined with cushions.

Impact noise was recorded at a distance of 3 feet from the front of the cylinder, inside a semi-anechoic chamber. Cylinders were operating at 95 PSI.



Sound Level Comparison

Bumper Seals have Minimum Effect on Stroke Length

The accompanying chart depicts typical amounts of overall stroke loss incurred at various system pressures. The amount of stroke loss may vary slightly due to design tolerances of seal size, variance in seal durometer and compression set associated with cylinder wear. To determine the stroke loss at either end of the cylinder, divide the values by two.

Pressure (PSI)	Typical Overall Loss of Stroke (inch) by Bore Size				
	1-1/2"	2"	2-1/2"	3-1/4"	4"
0	0.16	0.13	0.19	0.22	0.22
20	0.12	0.11	0.12	0.18	0.18
40	0.10	0.08	0.09	0.12	0.12
60	0.08	0.07	0.07	0.09	0.09
80	0.06	0.05	0.05	0.06	0.06
100	0.05	0.03	0.02	0.04	0.04

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B

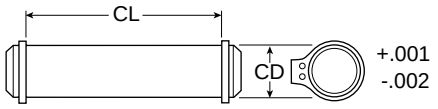
1-1/2" to 8" Bore Cylinder Accessories

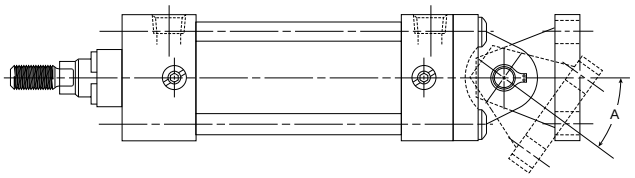
Rod end accessories can be selected by cylinder rod end thread size from Table A & B below.
Mating parts for rod end accessories are listed just to the right of the knuckle or clevis selected.
Mounting plates for style MP1 & MP4 cylinder mounts are selected by bore size from Table C.

Rod End Thread Size	TABLE A			TABLE B			TABLE C		
	Female Rod Clevis	Mating Parts		Knuckle	Mating Parts		Bore Size	Mounting Plates	
		Eye Bracket	Pivot Pin		Clevis Bracket	Pivot Pin		For Mtg. Style MP1 Cylinder	For Mtg. Style MP4 Cylinder
7/16-20	1458030044	1458060050	0856640050	1458040044	1458050050	0856640050	**1-1/2**	1458060050	1458050050
1/2-20	1458030050	1458060050	0856640050	1458040050	1458050050	0856640050	**2**	1458060050	1458050050
3/4-16	1458030075	1458060075	0856640075	1458040075	1458050075	0856640075	**2-1/2**	1458060050	1458050050
7/8-14	1458030088	1458060100	0856640100	1458040088	1458050100	0856640100	**3-1/4**	1458060075	1458050075
1-14	1458030100	1458060100	0856640100	1458040100	1458050100	0856640100	**4**	1458060075	1458050075
1-1/4-12	1458030125	1458060138	0856640138	1458040125	1458050138	0856640138	**5**	1458060075	—
1-1/2-12	1458030150	1458060175	0856640175	1458040150	1458050175	0856640175	**6**	1458060100	—
							8	1458060100	—

Note: For 1-1/8" bore 3MA cylinder accessories, please refer to page B59.

Pivot Pin





Symbol	0856640044	0856640050	0856640075	0856640100	0856640138	0856640175
CD	7/16	1/2	3/4	1	1-3/8	1-3/4
CL	1-5/16	1-7/8	2-5/8	3-1/8	4-1/8	5-3/16
Shear Cap. (lbs)	6600	8600	19300	34300	65000	105200

Note: Pivot Pin must be ordered separately for single lug pivot mounting.

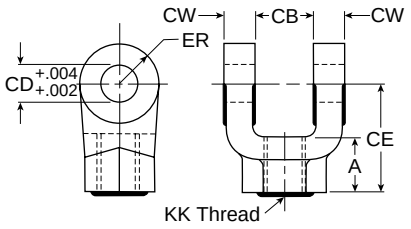
Maximum Pivot Angle for Rear Clevis Mounts (BB Mounts) and Accessories

Bore	1-1/2	2	2-1/2	3-1/4	4	5	6	8
Angle A	52	43	29	50	49	45	42	42

Note: All 3MA / 4MA Cylinder Mounting Kits and Assembly Instructions can be found on page B110. These kits can all be bolted onto cylinders with standard TEF mounts.

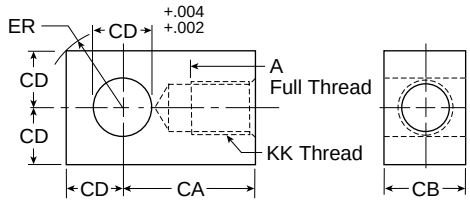
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Female Rod Clevis



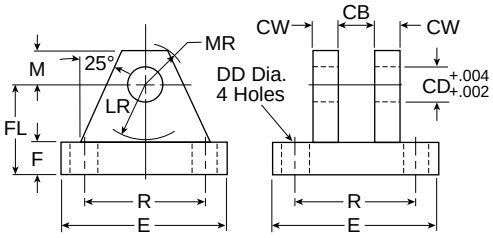
Symbol	1458030044	1458030050	1458030075	1458030088	1458030100	1458030125	1458030150
A	3/4	3/4	1-1/8	1-5/8	1-5/8	2	2-1/4
CB	3/4	3/4	1-1/4	1-1/2	1-1/2	2	2-1/2
CD	1/2	1/2	3/4	1	1	1-3/8	1-3/4
C E	1-1/2	1-1/2	2-1/8	2-15/16	2-15/16	3-3/4	4-1/2
CW	1/2	1/2	5/8	3/4	3/4	1	1-1/4
ER	1/2	1/2	3/4	1	1	1-3/8	1-3/4
KK	7/16-20	1/2-20	3/4-16	7/8-14	1-14	1-1/4-12	1-1/2-12
Load Capacity (lbs)	4250	4900	11200	18800	19500	33500	45600

Rod Eye Knuckle



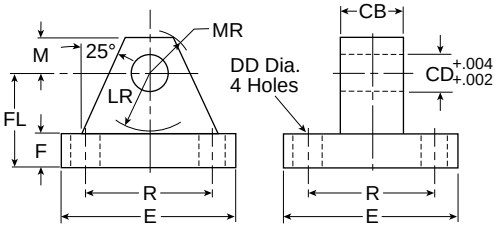
Symbol	1458040044	1458040050	1458040075	1458040088	1458040100	1458040125	1458040150
A	3/4	3/4	1-1/8	1-1/8	1-5/8	2	2-1/4
CA	1-1/2	1-1/2	2-1/16	2-3/8	2-13/16	3-7/16	4
CB	3/4	3/4	1-1/4	1-1/2	1-1/2	2	2-1/2
CD	1/2	1/2	3/4	1	1	1-3/8	1-3/4
ER	23/32	23/32	1-1/16	1-7/16	1-7/16	1-31/32	2-1/2
KK	7/16-20	1/2-20	3/4-16	7/8-14	1-14	1-1/4-12	1-1/2-12
Load Capacity (lbs)	5000	5700	12100	13000	21700	33500	45000

Clevis Bracket



Symbol	1458050044	1458050050	1458050075	1458050100	1458050138	1458050175
CB	15/32	3/4	1-1/4	1-1/2	2	2-1/2
CD	7/16	1/2	3/4	1	1-3/8	1-3/4
CW	3/8	1/2	5/8	3/4	1	1-1/4
DD	17/64	13/32	17/32	21/32	21/32	29/32
E	2-1/4	3-1/2	5	6-1/2	7-1/2	9-1/2
F	3/8	1/2	5/8	3/4	7/8	7/8
FL	1	1-1/2	1-7/8	2-1/4	3	3-5/8
LR	5/8	3/4	1-3/16	1-1/2	2	2-3/4
M	3/8	1/2	3/4	1	1-3/8	1-3/4
MR	1/2	5/8	29/32	1-1/4	1-21/32	2-7/32
R	1.75	2.55	3.82	4.95	5.73	7.50
Load Capacity (lbs)	3600	7300	14000	19200	36900	34000

Mounting Plate & Eye Bracket



Symbol	1458060031	1458060050	1458060075	1458060100	1458060138	1458060175
CB	15/16	3/4	1-1/4	1-1/2	2	2-1/2
CD	15/16	1/2	3/4	1	1-3/8	1-3/4
DD	17/64	13/32	17/32	21/32	21/32	29/32
E	2-1/4	2-1/2	3-1/2	4-1/2	5	6-1/2
F	3/8	3/8	5/8	7/8	7/8	1-1/8
FL	1	1-1/8	$1^{7}/_{8}$	2-3/8	3	3-3/8
LR	5/8	3/4	1-1/4	1-1/2	2-1/8	2-1/4
M	3/8	1/2	3/4	1	1-3/8	1-3/4
MR	1/2	9/16	7/8	1-1/4	1-5/8	2-1/8
R	1.75	1.63	2.55	3.25	3.82	4.95
Load Capacity (lbs)	1700	4100	10500	20400	21200	49480

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B

Mounting Kit Assembly

Perform the following steps when installing mounting kits onto 1-1/2" - 5" bore 3MA, 4MA and 4ML cylinders with the standard mount (TE or TEF).

1) Clean mating parts to remove oil, grease and dirt.
2) Fasteners should be clean, dry and burr free.
3) Brush mounting fastener threads thoroughly with anti-seize lubricant.
4) Follow the appropriate procedure below for the desired mounting.

Rear Pivot Mounting Kits – Style BB, BC and BE (Fig. 1)
Place pivot mount over end cap, lining up the four fastener holes in the end cap with the pivot mounting plate. Note that the pivot mount can be rotated allowing for different cylinder port locations. Secure mounting to cylinder cap (finger tight) using the four fasteners. Torque the fasteners to the specifications in the table below.

End Angle Mounting Kit – Style CB (Fig. 2)
The end angles bolt to the front and rear of the cylinder end caps. The spacer plate** provided is to be assembled at the rod end under the angle plate. Line up the two holes of the spacer plate and angle plate with the two fastener holes in the cylinder head. If 2 different length fasteners are in the kit, use the longer fasteners for the cylinder head end (rod end) mount. Secure (finger tight) using two fasteners. Repeat this assembly at the opposite end (less spacer). Place the assembly with the end angles down on a flat surface and torque the four fasteners to the specifications shown in the table below.

Flange Mounting Kits – Style J and H Single and Double Rod Cylinders (Fig. 3)
Place rectangular flange plate over appropriate end cap. Line up the four holes in the mounting plate with the four fastener holes in the cylinder end cap. Note that the rectangular mounting plate can be rotated to allow for different port locations. Secure the rectangular mounting plate to the end cap (finger tight) using the four fasteners. Then torque the four fasteners to the specifications shown in the table below.

Side End Lug Mounting Kits – Style G (Fig. 4)
Attach the two longer lugs with the fasteners provided in the kit to the cylinder head as shown. Attach the two shorter lugs to the cylinder cap in a similar fashion. Place the assembly with the lugs down on a flat surface and torque the four fasteners to the specifications shown in the table below.

Side Lug Mount – Style C (not shown)
Place one bracket over one cylinder endcap. Align the lower two fastener holes in the endcap with the thru holes in the bracket. Note that the bracket can be rotated allowing for different cylinder port locations. Secure the bracket to the endcap (finger tight) using two fasteners. Repeat for the other bracket and endcap. Place the assembly with the brackets down on a flat surface and torque the four fasteners on both brackets to specifications shown in the table below.

Fig. 1 - Pivot Mounting Kit

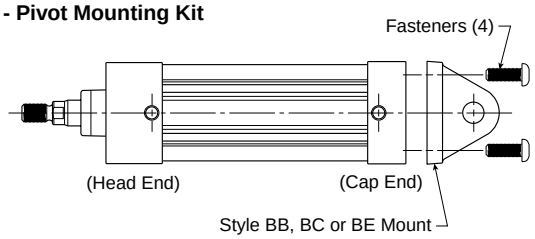


Fig. 2 - End Angle Mounting Kit

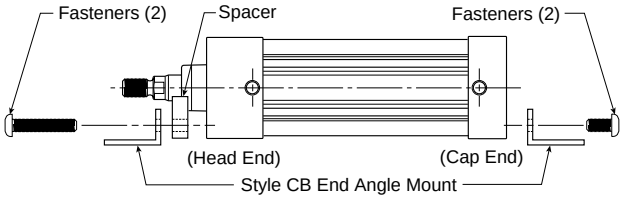


Fig. 3 - Flange Mounting Kit

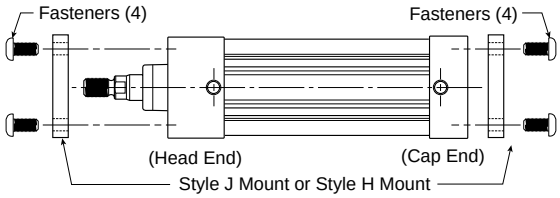
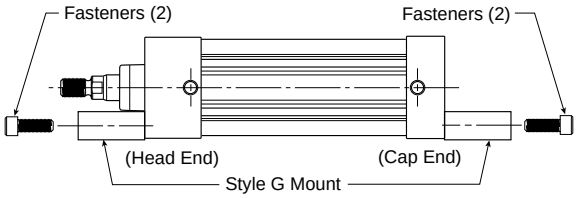


Fig. 4 - Side End Lug Mounting Kit - Style MS7



3MA and 4MA Mounting Kits										
Bore Size	J (MF1) Head Rectangular Flange	H (MF2) Cap Rectangular Flange	BB (MP1) Cap Fixed Clevis	BC (MP2) Cap Detachable Clevis	BE (MP4) Cap Detachable Eye	CB (MS1) Side End Angles	C (MS2) Side Lug (3MA only)	G (MS7) Side End Lug	Kit Fastener Torque Units	
	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	Kit Number	USA inch-lbs	Metric N-m
1-1/2	L079700150	L079700150	L079710150	L079730150	L079720150	L079740150	L079830150	L079750150	32 - 36	3.6 - 4.1
2	L079700200	L079700200	L079710200	L079730200	L079720200	L079740200	L079830200	L079750200	72 - 82	8 - 9
2-1/2	L079700250	L079700250	L079710250	L079730250	L079720250	L079740250	L079830250	L079750250	72 - 82	8 - 9
3-1/4	L079700325	L079700325	L079710325	L079730325	L079720325	L079740325	L079830325	L079750325	216 - 228	24 - 25.3
4	L079700400	L079700400	L079710400	L079730400	L079720400	L079740400	L079830400	L079750400	216 - 228	24 - 25.3
5	L079700500	L079700500	L079710500	L079730500	N/A	L079740500	L079830500	N/A	360 - 372	41 - 42

** Spacer plate not used for 4" bore or double rod cylinders

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1-1/8" Bore 3MA/3ML Individual and Complete Cylinder Kits

3MA kits – pneumatic service only

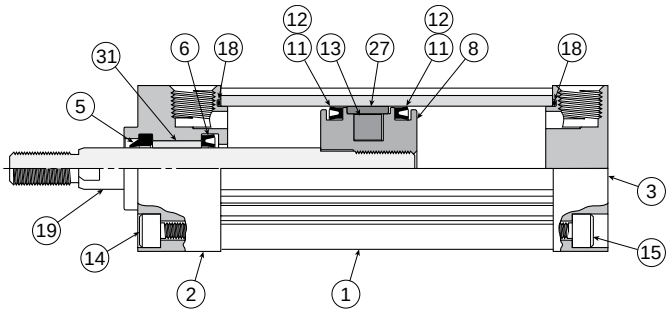
3ML kits – hydraulic service

Temperatures:

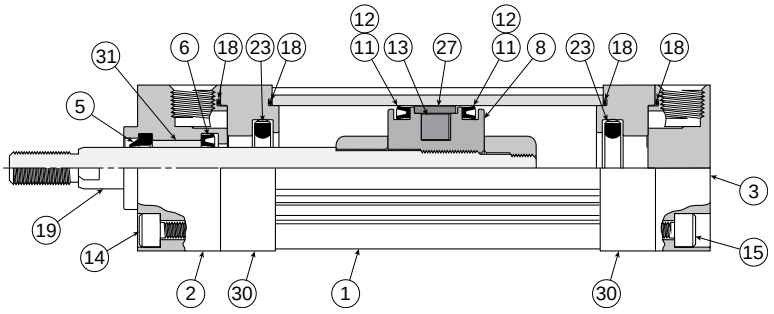
- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)



Non-cushioned (3MA or 3ML)



Cushioned (3MA only)



Symbol Legend

Symbol	Description
1	Cylinder body
2	Head
3	Cap
5	Rod wiper
6	Rod seal
8	Piston
11	Piston seal (lipseal)
12	Piston seal (bumper seal option)
13	Magnetic ring
14	Head fastener
15	Cap fastener
18	O-ring - cylinder body to head & cap
19	Piston rod
23	Cushion check seal
24	Tie rod nut (Some mounts)
27	Wear band
28	Tie rod (Some mounts)
30	Cushion spacer
31	Rod bearing (1-1/2" bore)

Servicing the complete cylinder

The SK kit offers all parts to service an entire 3MA or 3ML cylinder with standard piston lipseals. Kits are available with Nitrile or Fluorocarbon seals. This kit is a combination of the rod wiper, rod seal, rod bearing and standard Piston Seal Kit.

1 tube of Lube-A-Cyl is also included with each kit.

3MA Kits

Rod Dia.	Rod No.	PK - Piston Seal Kit, Standard Lipseals Includes (2) each of symbol 11 & 18, and (1) of symbol 27		BK - Piston Seal Kit, Bumper Seals Includes (2) each of symbol 12 & 18, and (1) of symbol 27		Magnetic Ring Symbol 13 Only with Nitrile Seals	Endcap Fastener or Tie Rod Torque Units	
		Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Part Number	USA inch-lbs	Metric N-m
3/8	1	PK11003MA1	PK11003MA5	BK01123MA1	BK01123MA5	086513S112	32-36	3.6-4.1
1/2	3							

Rod Dia.	Rod No.	CH - Cushion Kit for either end Includes 1 each of symbol 18, 23 and cushion needle valve assembly (no symbol)		SK - Complete Cylinder Kit Includes 1 each of symbol 5, 6, 31 and Standard Piston Seal Kit		Endcap Fastener or Tie Rod Torque Units	
		Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	USA inch-lbs	Metric N-m
3/8	1	CH11003MA1	CH11003MA5	SK11103MA1	SK11103MA5	32-36	3.6-4.1
1/2	3	CH11003MA1	CH11003MA5	SK11303MA1	SK11303MA5		

3ML Kits

Rod Dia.	Rod No.	PK - Piston Seal Kit, Standard Lipseals Includes (2) each of symbol 11 & 18, and (1) of symbol 27		Magnetic Ring Symbol 13 Only with Nitrile Seals	SK - Complete Cylinder Kit Includes 1 each of symbol 5, 6, 31 and Standard Piston Seal Kit		Endcap Fastener or Tie Rod Torque Units	
		Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Part Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	USA inch-lbs	Metric N-m
3/8	1	PK1123ML01	PK1123ML05	086513S112	SK11103ML1	SK11103ML5	32-36	3.6-4.1
1/2	3	PK1123ML01	PK1123ML05	086513S112	SK11303ML1	SK11303ML5		

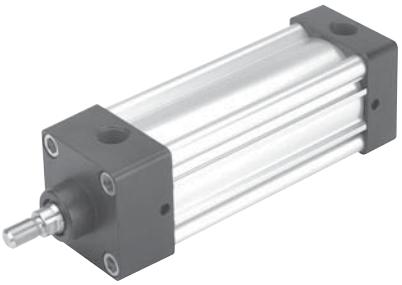
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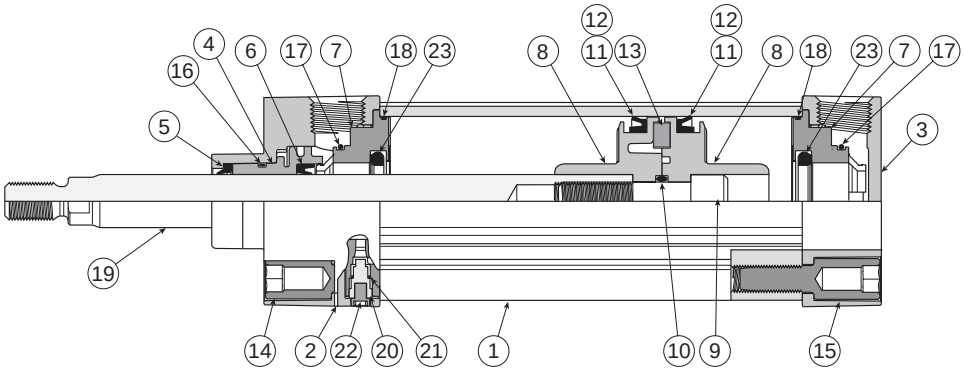
1-1/2" - 5" Bore 3MA Piston Seal Kits (Piston and cylinder body seals)

Pneumatic service only

Temperatures:

• Nitrile -10°F to +165°F (-23°C to +74°C)





Composite piston assembly shown above.

Aluminum piston options available.

The same piston lipseals fit both piston types.

Servicing the piston seals – see next page

Warning ⚠ The piston rod (or fastener) to piston threaded connection is secured with an anaerobic adhesive that is temperature sensitive. Cylinders are assembled with an anaerobic adhesive having a maximum operating temperature rating of +165°F (+74°C). This temperature limitation is necessary to prevent possible loosening of the threaded connections.

Note: the maximum temperature rating for the 1-1/2"-5" bore 3MA is +165°F (+74°C).

Every standard piston seal kit (PK) contains 2 of the following:

Symbol	Description
11	Piston seal (lipseal)
18	O-ring - cylinder body to head & cap

Every bumper piston seal kit (BK) contains 2 of the following:

Symbol	Description
12	Piston seal (bumper seat cushion)
18	O-ring - cylinder body to head & cap

1 tube of Lube-A-Cyl is also included with each PK or BK kit.

Bore Size	PK - Piston Seal Kit, Standard Lipseals Includes 2 each of symbol 11 & 18 Includes wear band (#27) for aluminum pistons and 4" and 5" composite pistons Nitrile Seals Kit Number	BK - Piston Seal Kit, Bumper Seals Includes 2 each of symbol 12 & 18 Includes wear band (#27) for aluminum pistons and 4" and 5" composite pistons Nitrile Seals Kit Number	Magnetic Ring (not replaceable for composite piston, only for aluminum piston) Part Number	Torque Units Endcap Fastener or Tie Rod USA inch-lbs	Torque Units Endcap Fastener or Tie Rod Metric N-m
1-1/2	PK1503MA01	BK01503MA1	0865130151	32 - 36	3.6 - 4.1
2	PK2003MA01	BK02003MA1	0865130200	72 - 82	8 - 9
2-1/2	PK2503MA01	BK02503MA1	0865130250	72 - 82	8 - 9
3-1/4	PK3253MA01	BK03253MA1	0865130325	216 - 228	24 - 25.3
4	PK4003MA01	BK04003MA1	0865130400	216 - 228	24 - 25.3
5	PK5003MA01	BK05003MA1	0865130500	360 - 372	41 - 42

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Parker Lube-A-Cyl...

Is recommended for use in air cylinders during normal operation, and particularly when servicing and reassembling cylinders. It is a multi-purpose lubricant in grease form that provides lubrication without deteriorating effects on synthetic seals. It produces a thin film which will not blow out with exhaust air. It provides piston, rod and seal lubrication, and has excellent resistance to water and mechanical breakdown with temperature range of -10°F (-23°C) to +350°F (+177°C). Lube-A-Cyl is packaged in 1.5 oz. tubes, a sufficient quantity for average size air cylinder. One application should last for a period of 6 to 18 months depending upon service. Order by part number 0761630000.

Servicing the Piston Seals

Disassemble the cylinder completely, remove the old seals and clean all the parts. The cylinder bore and piston should then be examined for evidence of scoring. (The light scratch marks usually present on both cylinder bore and piston will generally have no detrimental effects on the performance of the cylinder.)

Apply Parker "Lube-A-Cyl" to O.D. of piston and all grooves. Install one piston Lipseal (sym. # 11 or 12) in the groove nearest the rod. The two "lips" of this seal should face toward the rod end of the piston. **Aluminum and 4" & 5" composite pistons only** – If required, install magnetic ring (sym. #13) in the bottom of the middle groove and then install wear band (sym. #27) in the top of the middle groove.

Coat the inside of the cylinder body with Parker "Lube-A-Cyl" and insert the piston – cap end first – into the cylinder body as shown in detail "2" below.

Next, turn the cylinder body on its side and push the piston and rod assembly through the barrel just far enough to expose the groove for the second Lipseal. (See detail "3" below.) For aluminum pistons, be careful not to move the piston too far so as to expose the wear strip (sym. #27). If the piston should move too far, push the piston and rod assembly completely through the cylinder body and again start the piston from the original end. Now install the second Lipseal (sym. # 11 or 12) in the exposed groove with the two "lips" facing away from the rod and pull the piston into the cylinder body.

The piston and rod are securely locked together with anaerobic adhesive. This threaded connection should only be disassembled or reassembled by factory trained personnel.

NOTE: An extreme pressure lubricant (such as molybdenum disulphate) should be used on the tie rod threads and bearing faces to reduce friction and tie rod twist.

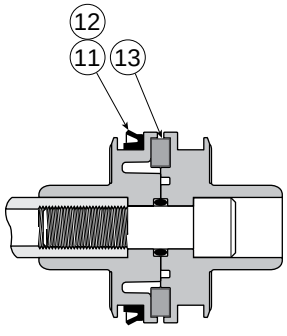
Assemble both cap and head, complete with cylinder body O-Rings (sym. # 18), to each end of the cylinder body. Install end cap fasteners and tighten to appropriate torque, using opposite corner to corner torquing sequence.

In case of a "DD" – center trunnion – mounted cylinder, care must be taken to prevent binding the cylinder body when repositioning the trunnion collar. The proper method of assembling this type of cylinder is as follows:

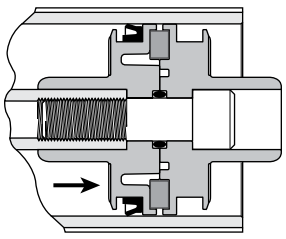
After all the piston seals have been installed on the piston and the piston is in the cylinder body, fit the cap with its O-ring (sym. # 18) in position onto the cylinder body. Then "stud" into the trunnion collar the four tie rods that connect the cap to the trunnion collar. Hand tighten the four tie rod nuts at the cap. Distances from the inner face of the cap to the finished face of the trunnion collar should the be made equal at all four tie rods when all four tie rod nuts are in contact with the cap.

When the assembly is ready for final torquing, it may be necessary to adjust the tie rods at the cap when torquing the tie rods at the head in order to position the trunnion collar in its final position.

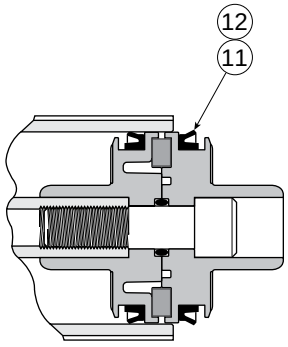
As a check, to be certain the trunnion mount will not interfere with cylinder operation, move the piston and rod assembly by hand to determine whether there is any tendency for the piston to bind at the spot where the trunnion collar is located. If any binding is noticeable, readjust the tie rods.



Detail "1"



Detail "2"



Detail "3"

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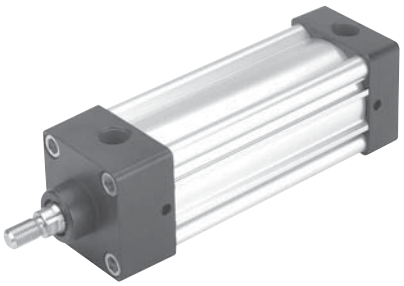
B

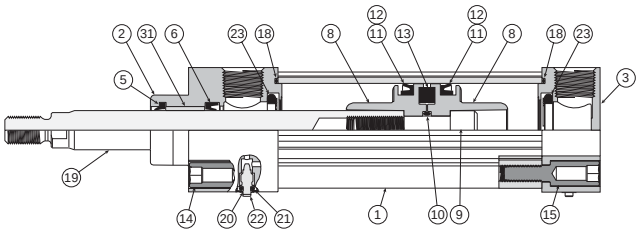
1-1/2"- 5" Bore 3MA Complete Cylinder Kits (All parts to service entire cylinder)

Pneumatic service only

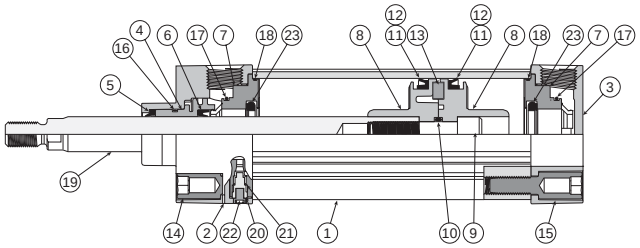
Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon rod seals only (all other Nitrile) -10°F to +165°F (-23°C to +74°C)





1-1/2" Bore



2"-5" Bores

Servicing the complete cylinder

The SK kit offers all parts to service an entire 3MA cylinder with the standard piston lipseals. Kits are available with Nitrile seals or Fluorocarbon rod seals only (all other Nitrile).

This kit a combination of the rod wiper, rod seal, rod bearing, Standard Piston Seal Kit, two Cushion Kits and any other necessary seals. These kits can service cylinders with either the composite or aluminum piston (lipseal). Depending on cylinder configuration, some parts may not be used. Please refer to the pages or bulletins of these individual kits for service instructions.

Bore Size	Rod Dia.	Rod No.	SK - Complete Cylinder Kit Includes (1) each of symbol 5, 6, 31 (or 4); (1 Standard Piston Seal Kit and (2) Cushion Kits		Endcap Fastener or Tie Rod Torque Units	
			Nitrile Seals Kit Number	Fluorocarbon Rod Seals Only (all other Nitrile) Kit Number	USA inch-lbs	Metric N-m
1-1/2	5/8	1	SK15003MA1	SK15003MA5	32 - 36	3.6 - 4.1
2	5/8	1	SK20003MA1	SK20003MA5	72 - 82	8 - 9
2-1/2	5/8	1	SK25003MA1	SK25003MA5	72 - 82	8 - 9
3-1/4	1	1	SK32003MA1	SK32003MA5	216 - 228	24 - 25.3
4	1	1	SK40003MA1	SK40003MA5	216 - 228	24 - 25.3
5	1	1	SK50003MA1	SK50003MA5	360 - 372	41 - 42

Cushion Kits

Bore Size	Rod Dia.	Rod No.	CH - Cushion Kit for either end Includes 1 each of symbol 7, 17, 18, 20, 21, 22 & 23	Endcap Fastener or Tie Rod Torque Units	
			Nitrile Seals Kit Number	USA inch-lbs	Metric N-m
1-1/2	5/8	1	CH15003MA1	32 - 36	3.6 - 4.1
2	5/8	1	CH20003MA1	72 - 82	8 - 9
2-1/2	5/8	1	CH25003MA1	72 - 82	8 - 9
3-1/4	1	1	CH32003MA1	216 - 228	24 - 25.3
4	1	1	CH40003MA1	216 - 228	24 - 25.3
5	1	1	CH50003MA1	360 - 372	41 - 42

Symbol Legend

Symbol	Description
1	Cylinder body
2	Head
3	Cap
4	Rod bearing insert (2"-5" bores)
5	Rod wiper
6	Rod seal
7	Needle valve insert
8	Piston (composite or aluminum)
9	Piston fastener (only for composite piston)
10	O-ring - piston fastener to piston
11	Piston seal (lipseal)
12	Piston seal (bumper seal option)
13	Magnetic ring
14	Head fastener
15	Cap fastener
16	O-ring - rod bearing insert
17	O-ring - needle valve insert
18	O-ring - cylinder body to head & cap
19	Piston rod
20	Cushion needle valve
21	O-ring - cushion needle valve
22	Cushion knob
23	Cushion check seal
24	Tie rod nut (Style DD mounts)
27	Wear band (aluminum and 4" & 5" composite pistons)
28	Tie rod (Style DD mounts)
31	Rod bearing (1-1/2" bore)

1 tube of Lube-A-Cyl is also included with each SK or CH kit.

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4MA Gland Kits (Gland cartridges and rod seals)

Pneumatic service only

Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)

Servicing the rod gland (Cylinder disassembly is not required)

Air leakage around the piston rod at the gland area will normally indicate a need to replace the gland cartridge.

The Parker 4MA gland is a unique cartridge design. It is threaded into the cylinder head and all sizes are removable without disturbing the endcap fasteners.

To remove the old gland cartridge from the cylinder:

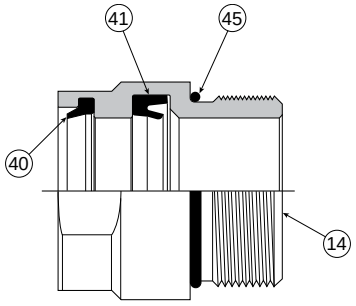
1. Inspect the piston rod to be sure it is free of burrs or other foreign material that would prevent sliding the gland off the rod.
2. Disconnect any attachments to the piston rod end thread.
3. Lubricate the rod with Lube-A-Cyl (included in kit).
4. Unscrew the gland cartridge from the head using the appropriate wrench (see D1 dimension in catalog).
5. Slide the gland cartridge off the piston rod.
6. Verify that the gland-to-head o-ring (#45) is also removed from the head.

To install the new gland cartridge onto the cylinder:

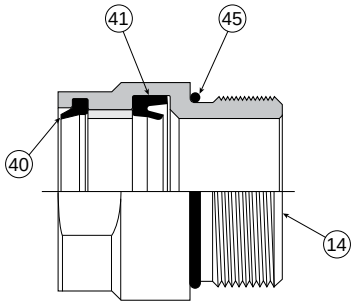
1. Re-inspect the surface of the piston rod for scratches, dents and other surface damage, and repair if necessary.
2. Clean and lubricate the surface of the piston rod with Lube-A-Cyl (included in kit).
3. Lubricate the rod wiper (#40), rod seal (#41), o-ring (#45) and the inside surfaces of the gland cartridge with Lube-A-Cyl.
4. Slide the gland cartridge onto the piston rod, align it with the threads in the head, and tighten (clockwise) until seated firmly against the head.
5. Torque the gland cartridge to the specifications shown below. Tools are available to assist this process (see below).

   Note: Make sure the gland cartridge is sufficiently tight. Failure to do so may result in loosening during operation.

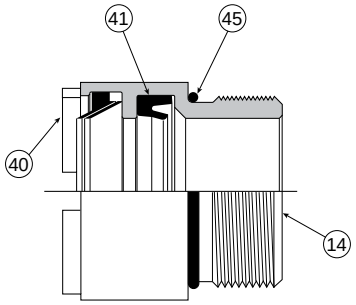
Rod Dia.	Standard & HI LOAD Gland	Metallic Rod Wiper Gland	
	Gland Wrench	Gland Wrench	Spanner Wrench
5/8	0695800000	0695900000	0116760000
1	0695810000	0695910000	0116760000
1-3/8	0695820000	0695920000	0117030000
1-3/4	0695830000	0695930000	0116770000



Standard Rod Gland



HI LOAD Rod Gland
(includes composite bearing)



Metallic Rod Wiper Gland

Every gland cartridge kit contains 1 each of the following:

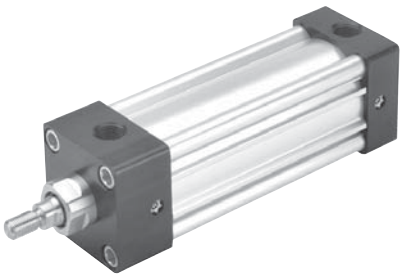
Symbol	Description
14	Gland
40	Rod Wiper
41	Rod Seal
45	O-ring - Gland to head

Bore Size	Rod Dia.	Rod No.	Standard Rod Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		HI LOAD Rod Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		Metallic Rod Wiper Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		Gland to Head Torque Units	
			Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	USA Ft-Lbs	Metric N-m
1-1/2	5/8	1	RG04MA0061	RG04MA0065	RG04MAH061	RG04MAH065	RG04MAM061	RG04MAM065	40 - 45	54 - 61
	1	2	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
2	5/8	1	RG04MA0061	RG04MA0065	RG04MAH061	RG04MAH065	RG04MAM061	RG04MAM065	40 - 45	54 - 61
	1	3	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
2-1/2	5/8	1	RG04MA0061	RG04MA0065	RG04MAH061	RG04MAH065	RG04MAM061	RG04MAM065	40 - 45	54 - 61
	1	3	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
3-1/4	1	1	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
	1-3/8	3	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
4	1	1	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
	1-3/8	3	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
5	1	1	RG04MA0101	RG04MA0105	RG04MAH101	RG04MAH105	RG04MAM101	RG04MAM105	45 - 50	61 - 68
	1-3/8	3	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
6	1-3/8	1	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
	1-3/4	3	RG04MA0171	RG04MA0175	RG04MAH171	RG04MAH175	RG04MAM171	RG04MAM175	90 - 95	122- 129
8	1-3/8	1	RG04MA0131	RG04MA0135	RG04MAH131	RG04MAH135	RG04MAM131	RG04MAM135	75 - 80	102 - 108
	1-3/4	3	RG04MA0171	RG04MA0175	RG04MAH171	RG04MAH175	RG04MAM171	RG04MAM175	90 - 95	122- 129

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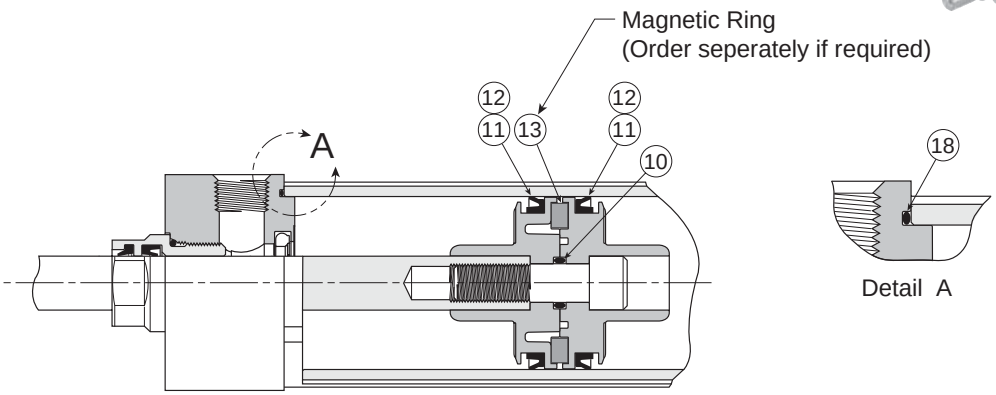
4MA Piston Seal Kits (Piston and cylinder body seals)



Pneumatic service only

Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)



Composite piston assembly shown above.

Aluminum piston options available.

The same piston lipseals fit both piston types.

Servicing the piston seals – see next page

Warning – The piston rod (or fastener) to piston threaded connection is secured with an anaerobic adhesive that is temperature sensitive. Cylinders specified with all fluorocarbon seals are assembled with an anaerobic adhesive having a maximum operating temperature rating of +250°F (+121°C). Cylinders specified with other seal compounds are assembled with an anaerobic adhesive having a maximum operating temperature rating of +165°F (+74°C). These temperature limitations are necessary to prevent possible loosening of the threaded connections. Cylinders originally manufactured with Class 1 seals (Nitrile) that will be exposed to ambient temperatures above +165°F (+74°C) must be modified for higher temperature service. Contact the Wadsworth, OH facility immediately and arrange for the piston to rod connection to be properly re-assembled to withstand the higher temperature service and other cylinder changes.

Note: the maximum temperature rating for the composite piston is +165°F (+74°C).

Every standard piston seal kit (PK) contains 2 of the following:

Symbol	Description
11	Piston seal (lipseal)
18	O-ring - cylinder body to head & cap

Every bumper piston seal kit (BK) contains 2 of the following:

Symbol	Description
12	Piston seal (bumper seat cushion)
18	O-ring - cylinder body to head & cap

1 tube of Lube-A-Cyl is also included with each PK or BK kit.

Bore Size	PK - Piston Seal Kit, Standard Lipseals Includes 2 each of symbol 11 & 18		BK - Piston Seal Kit, Bumper Seals Includes 2 each of symbol 12 & 18		Magnetic Ring (not replaceable for composite piston)	Torque Units Endcap Fastener or Tie Rod	
	Includes wear band (#27) for aluminum pistons and 4" and 5" composite pistons						
	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Only with Nitrile Seals Part Number	USA inch-lbs	Metric N-m
1-1/2	PK1504MA01	PK1504MA05	BK01504MA1	BK01504MA5	0865130151	32 - 36	3.6 - 4.1
2	PK2004MA01	PK2004MA05	BK02004MA1	BK02004MA5	0865130200	72 - 82	8 - 9
2-1/2	PK2504MA01	PK2504MA05	BK02504MA1	BK02504MA5	0865130250	72 - 82	8 - 9
3-1/4	PK3254MA01	PK3254MA05	BK03254MA1	BK03254MA5	0865130325	216 - 228	24 - 25.3
4	PK4004MA01	PK4004MA05	BK04004MA1	BK04004MA5	0865130400	216 - 228	24 - 25.3
5	PK5004MA01	PK5004MA05	BK05004MA1	BK05004MA5	0865130500	360 - 372	41 - 42
6	PK6004MA01	PK6004MA05	N/A	N/A	0865130600	420 - 432	48 - 49
8	PK8004MA01	PK8004MA05	N/A	N/A	0865130800	960 - 972	109 - 115

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Parker Lube-A-Cyl...

Is recommended for use in air cylinders during normal operation, and particularly when servicing and reassembling cylinders. It is a multi-purpose lubricant in grease form that provides lubrication without deteriorating effects on synthetic seals. It produces a thin film which will not blow out with exhaust air. It provides piston, rod and seal lubrication, and has excellent resistance to water and mechanical breakdown with temperature range of -10°F (-23°C) to +350°F (+177°C). Lube-A-Cyl is packaged in 1.5 oz. tubes, a sufficient quantity for average size air cylinder. One application should last for a period of 6 to 18 months depending upon service. Order by part number 0761630000.

Servicing the Piston Seals

Disassemble the cylinder completely, remove the old seals and clean all the parts. The cylinder bore and piston should then be examined for evidence of scoring. (The light scratch marks usually present on both cylinder bore and piston will generally have no detrimental effects on the performance of the cylinder.)

Apply Parker "Lube-A-Cyl" to O.D. of piston and all grooves. Install one piston Lipseal (sym. # 11 or 12) in the groove nearest the rod. The two "lips" of this seal should face toward the rod end of the piston. **Aluminum and 4" & 5" composite pistons only** – If required, install magnetic ring (sym. #13) in the bottom of the middle groove and then install wear band (sym. #27) in the top of the middle groove.

Coat the inside of the cylinder body with Parker "Lube-A-Cyl" and insert the piston – cap end first – into the cylinder body as shown in detail "2" below.

Next, turn the cylinder body on its side and push the piston and rod assembly through the barrel just far enough to expose the groove for the second Lipseal. (See detail "3" below.) For aluminum pistons, be careful not to move the piston too far so as to expose the wear strip (sym. #27). If the piston should move too far, push the piston and rod assembly completely through the cylinder body and again start the piston from the original end. Now install the second Lipseal (sym. # 11 or 12) in the exposed groove with the two "lips" facing away from the rod and pull the piston into the cylinder body.

The piston and rod are securely locked together with anaerobic adhesive. This threaded connection should only be disassembled or reassembled by factory trained personnel.

NOTE: An extreme pressure lubricant (such as molybdenum disulphate) should be used on the tie rod threads and bearing faces to reduce friction and tie rod twist.

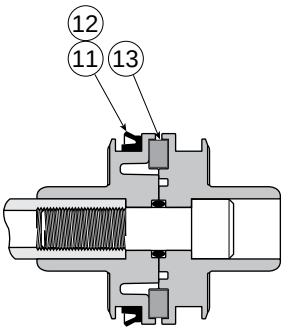
Assemble both cap and head, complete with cylinder body O-Rings (sym. # 18), to each end of the cylinder body. Install end cap fasteners and tighten to appropriate torque, using opposite corner to corner torquing sequence.

In case of a "DD" – center trunnion – mounted cylinder, care must be taken to prevent binding the cylinder body when repositioning the trunnion collar. The proper method of assembling this type of cylinder is as follows:

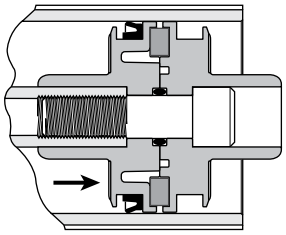
After all the piston seals have been installed on the piston and the piston is in the cylinder body, fit the cap with its O-ring (sym. # 18) in position onto the cylinder body. Then "stud" into the trunnion collar the four tie rods that connect the cap to the trunnion collar. Hand tighten the four tie rod nuts at the cap. Distances from the inner face of the cap to the finished face of the trunnion collar should the be made equal at all four tie rods when all four tie rod nuts are in contact with the cap.

When the assembly is ready for final torquing, it may be necessary to adjust the tie rods at the cap when torquing the tie rods at the head in order to position the trunnion collar in its final position.

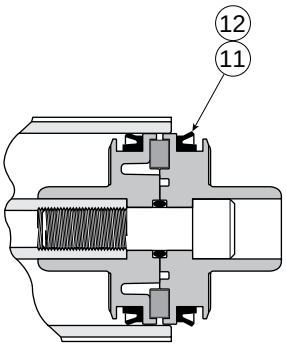
As a check, to be certain the trunnion mount will not interfere with cylinder operation, move the piston and rod assembly by hand to determine whether there is any tendency for the piston to bind at the spot where the trunnion collar is located. If any binding is noticeable, readjust the tie rods.



Detail "1"



Detail "2"



Detail "3"

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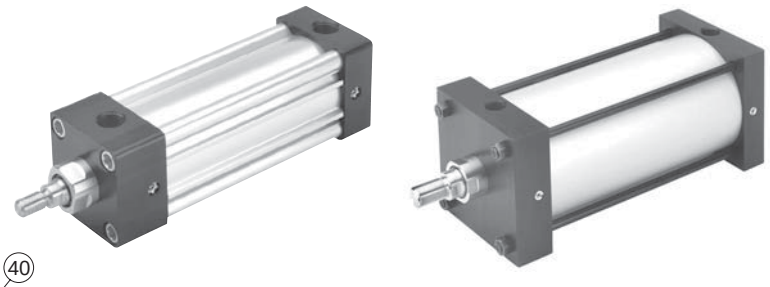
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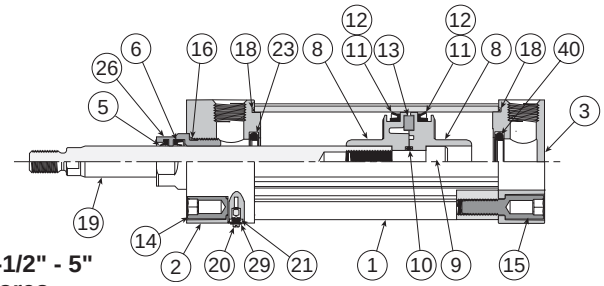
4MA Complete Cylinder Kits (All parts to service entire cylinder)

Pneumatic service only

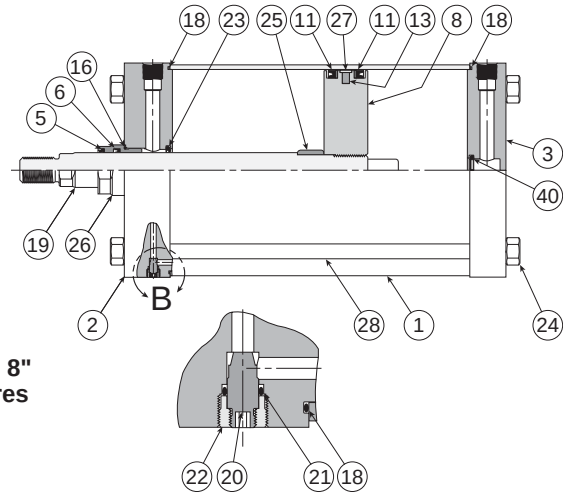
Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)





1-1/2" - 5" Bores



Detail B

6" - 8" Bores

Symbol Legen

Symbol	Description
1	Cylinder body
2	Head
3	Cap
5	Rod wiper
6	Rod seal
8	Piston (composite or aluminum)
9	Piston fastener (only for composite piston)
10	O-ring - piston fastener to piston
11	Piston seal (lipseal)
12	Piston seal (Bumper seal option)
13	Magnetic ring
14	Head fastener
15	Cap fastener
16	O-ring - gland to head
18	O-ring - cylinder body to head & cap
19	Piston rod
20	Cushion needle valve
21	O-ring - cushion needle valve
22	Cushion needle valve retainer (6" & 8")
23	Cushion check seal - head
24	Tie rod nut (6" & 8" bore or Style DD mounts)
25	Head cushion sleeve
26	Gland
27	Wear band (aluminum and 4" & 5" composite pistons)
28	Tie rod (6" & 8" bore or Style DD mounts)
29	Retaining washer
40	Cushion check seal - cap

Servicing the complete cylinder

This kit offers all parts to service an entire 4MA cylinder with the standard rod gland and standard piston lipseals. Kits are available with Nitrile or Fluorocarbon seals.

This kit is a combination of the Standard Gland Kit, Standard Piston Seal Kit, Head Cushion Kit and Cap Cushion Kit. The kits can service cylinders with either the composite or aluminum piston (lipseal). Depending on cylinder configuration, some parts may not be used. Please refer to the pages or bulletins of these individual kits for service instructions.

1 tube of Lube-A-Cyl is also included with each SK kit.

Bore Size	Rod Dia.	Rod No.	SK - Complete Cylinder Kit Includes 1 each of Standard Rod Gland Kit, Standard Piston Seal Kit, Head Cushion Kit and Cap Cushion Kit		Gland to Head Torque Units		Endcap Fastener or Tie Rod Torque Units	
			Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	USA Ft-Lbs	Metric N-m	USA inch-lbs	Metric N-m
1-1/2	5/8	1	SK15104MA1	SK15104MA5	40 - 45	54 - 61	32 - 36	3.6 - 4.1
	1	2	SK15304MA1*	SK15304MA5*	45 - 50	61 - 68		
2	5/8	1	SK20104MA1	SK20104MA5	40 - 45	54 - 61	72 - 82	8 - 9
	1	3	SK20304MA1	SK20304MA5	45 - 50	61 - 68		
2-1/2	5/8	1	SK25104MA1	SK25104MA5	40 - 45	54 - 61	72 - 82	8 - 9
	1	3	SK25304MA1	SK25304MA5	45 - 50	61 - 68		
3-1/4	1	1	SK32104MA1	SK32104MA5	45 - 50	61 - 68	216 - 228	24 - 25.3
	1-3/8	3	SK32304MA1	SK32304MA5	75 - 80	102 - 108		
4	1	1	SK40104MA1	SK40104MA5	45 - 50	61 - 68	216 - 228	24 - 25.3
	1-3/8	3	SK40304MA1	SK40304MA5	75 - 80	102 - 108		
5	1	1	SK50104MA1	SK50104MA5	45 - 50	61 - 68	360 - 372	41 - 42
	1-3/8	3	SK50304MA1	SK50304MA5	75 - 80	102 - 108		
6	1-3/8	1	SK60104MA1	SK60104MA5	75 - 80	102 - 108	420 - 432	48 - 49
	1-3/4	3	SK60304MA1	SK60304MA5	90 - 95	122- 129		
8	1-3/8	1	SK80104MA1	SK80104MA5	75 - 80	102 - 108	960 - 972	109 - 115
	1-3/4	3	SK80304MA1	SK80304MA5	90 - 95	122- 129		

*Does not include Head Cushion Kit (not available)

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4ML Gland Kits (Gland cartridges and rod seals)

Hydraulic service (includes TS-2000 rod seal)

Temperatures:

- Nitrile/Polyurethane (PUR) -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)

Servicing the rod gland (Cylinder disassembly is not required)

Fluid leakage around the piston rod at the gland area will normally indicate a need to replace the gland cartridge.

The Parker 4ML gland is a unique cartridge design. It is threaded into the cylinder head and all sizes are removable without disturbing the endcap fasteners.

To remove the old gland cartridge from the cylinder:

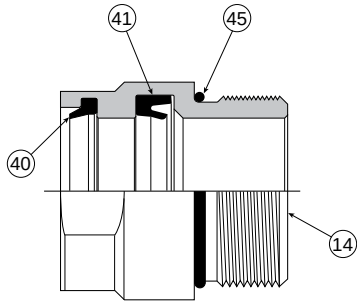
To remove the old gland cartridge from the cylinder:

1. Inspect the piston rod to be sure it is free of burrs or other foreign material that would prevent sliding the gland off the rod.
2. Disconnect any attachments to the piston rod end thread.
3. Lubricate the rod with clean light oil.
4. Unscrew the gland cartridge from the head using the appropriate wrench (see D1 dimension in catalog).
5. Slide the gland cartridge off the piston rod.
6. Verify that the gland-to-head o-ring (#45) is also removed from the head.

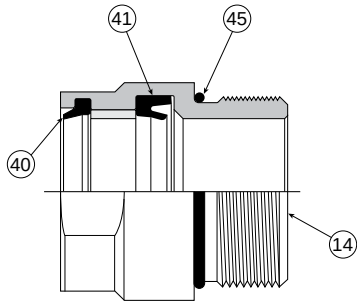
To install the new gland cartridge onto the cylinder:

1. Re-inspect the surface of the piston rod for scratches, dents and other surface damage, and repair if necessary.
2. Clean and lubricate the surface of the piston rod with clean light oil.
3. Lubricate the rod wiper (#40), rod seal (#41), o-ring (#45) and the inside surfaces of the gland cartridge with clean light oil.
4. Slide the gland cartridge onto the piston rod, align it with the threads in the head, and tighten (clockwise) until seated firmly against the head.
5. Torque the gland cartridge to the specifications shown below. Tools are available to assist this process (see below).

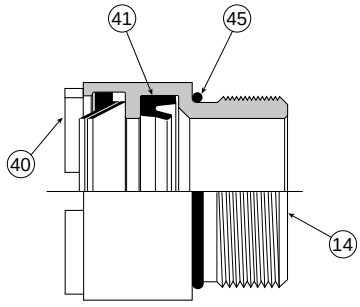
   Note: Make sure the gland cartridge is sufficiently tight. Failure to do so may result in loosening during operation.



Standard Rod Gland



HI LOAD Rod Gland
(includes composite bearing)



Metallic Rod Wiper Gland

Rod Dia.	Standard & HI LOAD Gland	Metallic Rod Wiper Gland	
	Gland Wrench	Gland Wrench	Spanner Wrench
5/8	0695800000	0695900000	0116760000
1	0695810000	0695910000	0116760000
1-3/8	0695820000	0695920000	0117030000
1-3/4	0695830000	0695930000	0116770000

Every gland cartridge kit contains 1 each of the following:

Symbol	Description
14	Gland
40	Rod Wiper
41	Rod Seal
45	O-ring - Gland to head

Bore Size	Rod Dia.	Rod No.	Standard Rod Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		HI LOAD Rod Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		Metallic Rod Wiper Gland Cartridge Kit Includes 1 each of symbol 14, 40, 41 & 45		Gland to Head Torque Units	
			Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	USA Ft-Lbs	Metric N-m
1-1/2	5/8	1	RG04ML0061	RG04ML0065	RG04MLH061	RG04MLH065	RG04MLM061	RG04MLM065	40 - 45	54 - 61
	1	2	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
2	5/8	1	RG04ML0061	RG04ML0065	RG04MLH061	RG04MLH065	RG04MLM061	RG04MLM065	40 - 45	54 - 61
	1	3	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
2-1/2	5/8	1	RG04ML0061	RG04ML0065	RG04MLH061	RG04MLH065	RG04MLM061	RG04MLM065	40 - 45	54 - 61
	1	3	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
3-1/4	1	1	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
	1-3/8	3	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
4	1	1	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
	1-3/8	3	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
5	1	1	RG04ML0101	RG04ML0105	RG04MLH101	RG04MLH105	RG04MLM101	RG04MLM105	45 - 50	61 - 68
	1-3/8	3	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
6	1-3/8	1	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
	1-3/4	3	RG04ML0171	RG04ML0175	RG04MLH171	RG04MLH175	RG04MLM171	RG04MLM175	90 - 95	122- 129
8	1-3/8	1	RG04ML0131	RG04ML0135	RG04MLH131	RG04MLH135	RG04MLM131	RG04MLM135	75 - 80	102 - 108
	1-3/4	3	RG04ML0171	RG04ML0175	RG04MLH171	RG04MLH175	RG04MLM171	RG04MLM175	90 - 95	122- 129

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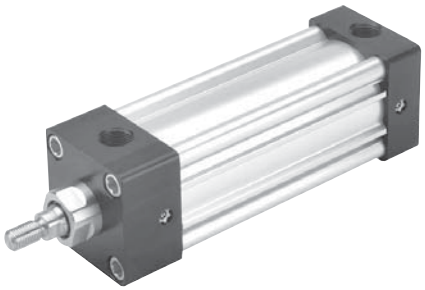
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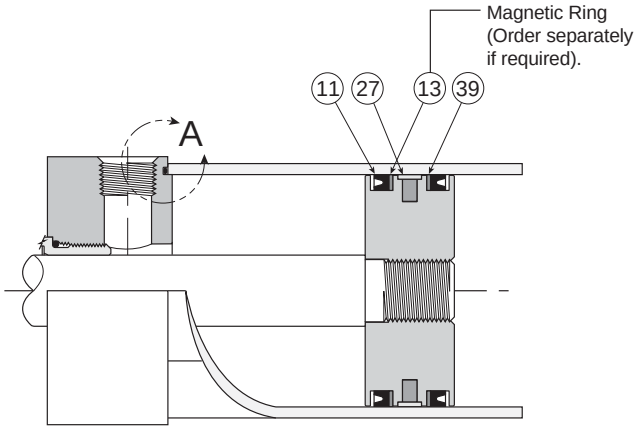
4ML Piston Seal Kits (Piston and cylinder body seals)

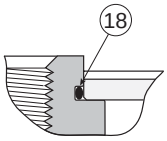
Hydraulic service

Temperatures:

- Nitrile -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)







Detail A

Servicing the piston seals – see next page

Warning – The piston rod (or fastener) to piston threaded connection is secured with an anaerobic adhesive that is temperature sensitive. Cylinders specified with all fluorocarbon seals are assembled with an anaerobic adhesive having a maximum operating temperature rating of +250°F (+121°C). Cylinders specified with other seal compounds are assembled with an anaerobic adhesive having a maximum operating temperature rating of +165°F (+74°C). These temperature limitations are necessary to prevent possible loosening of the threaded connections. Cylinders originally manufactured with Class 1 seals (Nitrile) that will be exposed to ambient temperatures above +165°F (+74°C) must be modified for higher temperature service. Contact the Wadsworth, OH facility immediately and arrange for the piston to rod connection to be properly re-assembled to withstand the higher temperature service and other cylinder changes.

Every piston seal kit (PK) contains (2) of symbols 11, 18 and 39, and (1) of symbol 27

Symbol	Description
11	Piston seal (lipseal)
18	O-ring - cylinder body to head & cap
27	Wear band
39	Piston seal backup washer

Bore Size	PK - Piston Seal Kit, Standard Lipseals Includes 2 each of symbol 11, 39 & 18 Wear band (#27) for aluminum piston included		Magnetic Ring Symbol 13 Only with Nitrile Seals	Endcap Fastener or Tie Rod Torque Units	
	Nitrile Seals Kit Number	Fluorocarbon Seals Kit Number	Part Number	USA inch-lbs	Metric N-m
1-1/2	PK1504ML01	PK1504ML05	0865130151	32 - 36	3.6 - 4.1
2	PK2004ML01	PK2004ML05	0865130200	72 - 82	8 - 9
2-1/2	PK2504ML01	PK2504ML05	0865130250	72 - 82	8 - 9
3-1/4	PK3254ML01	PK3254ML05	0865130325	216 - 228	24 - 25.3
4	PK4004ML01	PK4004ML05	0865130400	216 - 228	24 - 25.3
5	PK5004ML01	PK5004ML05	0865130500	360 - 372	41 - 42
6	PK6004ML01	PK6004ML05	0865130600	420 - 432	48 - 49
8	PK8004ML01	PK8004ML05	0865130800	960 - 972	109 - 115

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Servicing the Piston Seals

Disassemble the cylinder completely, remove the old seals and clean all the parts. The cylinder bore and piston should then be examined for evidence of scoring. (The light scratch marks usually present on both cylinder bore and piston will generally have no detrimental effects on the performance of the cylinder.)

Apply clean light oil to O.D. of piston and all grooves. Install one piston Lipseal (sym. # 11) & one Back-Up Washer (sym. #39) in the groove nearest the rod. The two "lips" of the Lipseal (sym. #11) should face toward the rod end of the piston and the Back-Up Washer (sym. #39) should be installed in the same piston groove as shown. If required, install the magnetic ring (sym. # 13) in the bottom of the middle groove. (See detail "1" below) Next, install the wear strip (sym. # 27) in the top of the middle groove – (See detail "2" below).

Coat the inside of the cylinder body with clean light oil and insert the piston – cap end first – into the cylinder body as shown in detail "3" below.

Next, turn the cylinder body on its side and push the piston and rod assembly through the barrel just far enough to expose the piston groove for the second Lipseal. (See detail "4" below.) Be careful not to move the piston too far so as to expose the wear strip (sym. # 27). If the piston should move too far, push the piston and rod assembly completely through the cylinder body and again start the piston from the original end. Now install the second Lipseal (sym. # 11) & Back-Up Washer (sym. #39) in the exposed groove with the two "lips" of the Lipseal (sym. #11) facing away from the rod and the Back-Up Washer (sym. #39) positioned as shown. Then pull the piston into the cylinder body.

The piston and rod are securely locked together with anaerobic adhesive. This threaded connection should only be disassembled or reassembled by factory trained personnel.

NOTE: An extreme pressure lubricant (such as molybdenum disulphate) should be used on the tie rod threads and bearing faces to reduce friction and tie rod twist.

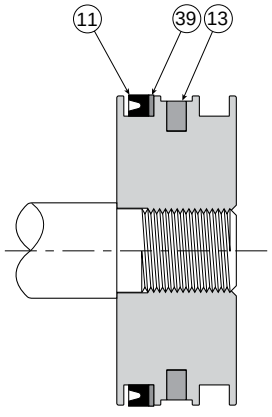
Assemble both cap and head, complete with cylinder body O-Rings (sym. # 18), to each end of the cylinder body. Install end cap fasteners and tighten to appropriate torque, using opposite corner to corner torquing sequence. After screws are torqued, firmly torque the rod gland against the head.

In case of a "DD" – center trunnion – mounted cylinder, care must be taken to prevent binding the cylinder body when repositioning the trunnion collar. The proper method of assembling this type of cylinder is as follows:

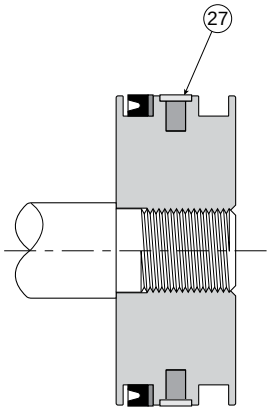
After all the piston seals have been installed on the piston and the piston is in the cylinder body, fit the cap with its O-ring (sym. # 18) in position onto the cylinder body. Then "stud" into the trunnion collar the four tie rods that connect the cap to the trunnion collar. Hand tighten the four tie rod nuts at the cap. Distances from the inner face of the cap to the finished face of the trunnion collar should the be made equal at all four tie rods when all four tie rod nuts are in contact with the cap.

When the assembly is ready for final torquing, it may be necessary to adjust the tie rods at the cap when torquing the tie rods at the head in order to position the trunnion collar in its final position.

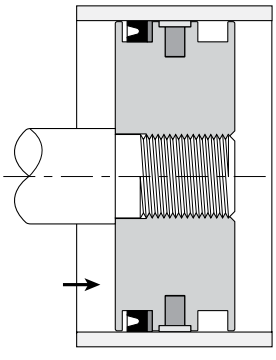
As a check, to be certain the trunnion mount will not interfere with cylinder operation, move the piston and rod assembly by hand to determine whether there is any tendency for the piston to bind at the spot where the trunnion collar is located. If any binding is noticeable, readjust the tie rods.



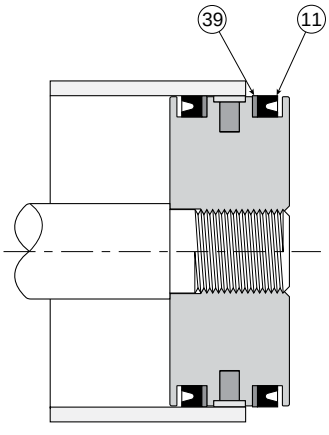
Detail "1"



Detail "2"



Detail "3"

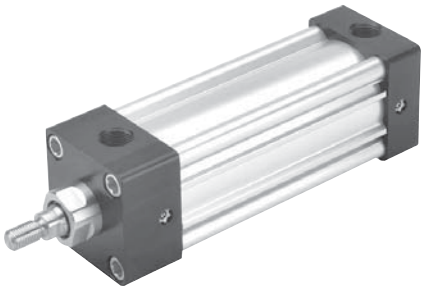


Detail "4"

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B

4ML Complete Cylinder Kits (All parts to service entire cylinder)



Hydraulic service

Temperatures:

- Nitrile/Polyurethane (PUR) -10°F to +165°F (-23°C to +74°C)
- Fluorocarbon -10°F to +250°F (-23°C to +121°C)

Servicing the complete cylinder

This kit offers all parts to service an entire 4ML cylinder with the standard rod gland and standard piston lipseals. Kits are available with Nitrile/Polyurethane or Fluorocarbon seals.

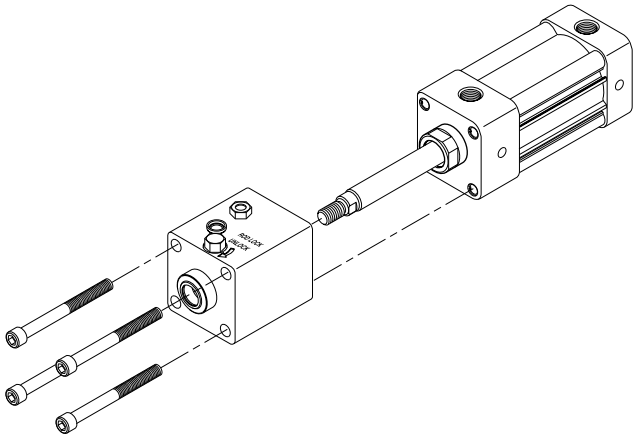
This kit is a combination of the Standard Gland Kit and Standard Piston Seal Kit. Please refer to the pages or bulletins of these individual kits for service instructions.

Bore Size	Rod Dia.	Rod No.	SK - Complete Cylinder Kit Includes 1 each of Standard Rod Gland Kit and Piston Seal Kit		Gland to Head Torque Units		Endcap Fastener or Tie Rod Torque Units	
			Nitrile & PUR Seals Kit Number	Fluorocarbon Seals Kit Number	USA Ft-Lbs	Metric N-m	USA inch-lbs	Metric N-m
1-1/2	5/8	1	SK15104ML1	SK15104ML5	40 - 45	54 - 61	32 - 36	3.6 - 4.1
	1	2	SK15304ML1	SK15304ML5	45 - 50	61 - 68		
2	5/8	1	SK20104ML1	SK20104ML5	40 - 45	54 - 61	72 - 82	8 - 9
	1	3	SK20304ML1	SK20304ML5	45 - 50	61 - 68		
2-1/2	5/8	1	SK25104ML1	SK25104ML5	40 - 45	54 - 61	72 - 82	8 - 9
	1	3	SK25304ML1	SK25304ML5	45 - 50	61 - 68		
3-1/4	1	1	SK32104ML1	SK32104ML5	45 - 50	61 - 68	216 - 228	24 - 25.3
	1-3/8	3	SK32304ML1	SK32304ML5	75 - 80	102 - 108		
4	1	1	SK40104ML1	SK40104ML5	45 - 50	61 - 68	216 - 228	24 - 25.3
	1-3/8	3	SK40304ML1	SK40304ML5	75 - 80	102 - 108		
5	1	1	SK50104ML1	SK50104ML5	45 - 50	61 - 68	360 - 372	41 - 42
	1-3/8	3	SK50304ML1	SK50304ML5	75 - 80	102 - 108		
6	1-3/8	1	SK60104ML1	SK60104ML5	75 - 80	102 - 108	420 - 432	48 - 49
	1-3/4	3	SK60304ML1	SK60304ML5	90 - 95	122- 129		
8	1-3/8	1	SK80104ML1	SK80104ML5	75 - 80	102 - 108	960 - 972	109 - 115
	1-3/4	3	SK80304ML1	SK80304ML5	90 - 95	122- 129		

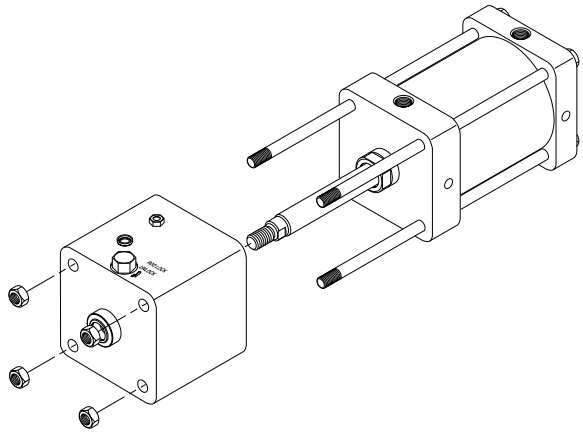
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Rod Lock Removal and Re-assembly

1-1/2" to 5" Bores



6" to 8" Bores and all Style DD Mounts (NFPA MT4)



To remove the rod lock from the 3MAJ/4MAJ cylinder in order to service the base 3MAJ/4MAJ cylinder, please perform the following steps:

1. Remove the 3MAJ/4MAJ cylinder from the application to a serviceable area.
2. Using a corner-to-corner sequence, loosen the four SHCS fasteners (1-1/2" to 5" bores) or tie rod nuts (6" to 8" bores and all Style DD mounts (NFPA MT4) at the rod lock face and remove them from the rod lock. Please note that the tie rod nuts for 6" to 8" bores and all Style DD mounts are also used to assemble the base cylinder.
3. Apply a minimum of 60 PSI air pressure to the rod lock port, or apply the appropriate amount of torque to the manual override shaft, in order to release the rod lock from the piston rod.
4. Carefully slide the rod lock off the piston rod and away from the base cylinder. The rod lock is piloted and sealed to the gland OD, so some force may be required.
5. Particularly at larger bores, the rod lock can be heavy. Please remove the rod lock from the piston rod and follow all necessary safety precautions.

3MAJ/4MAJ Bore Size	SHCS Fastener Torque or Tie Rod Torque	
	inch-lbs	Nm
1-1/2	32-36	3.6-4.1
2	72-82	8-9
2-1/2	72-82	8-9
3-1/4	216-228	24-25.3
4	216-228	24-25.3
5	360-372	41-42
6	420-432	48-49
8	960-972	109-115

To re-assemble the rod lock to the base 3MAJ/4MAJ cylinder, please perform the following steps:

1. Remove all dirt and debris from the mating features of the rod lock, base cylinder, fasteners (or nuts) and threads.
2. Apply a minimum of 60 PSI air pressure to the rod lock port, or apply the appropriate amount of torque to the manual override shaft, in order to open the rod lock.
3. Carefully slide the rod lock onto the piston rod and toward the base cylinder. The rod lock is piloted and sealed to the gland OD, so some force may be required. Press the rod lock to the head face as close as possible, avoiding damage to the rod lock o-ring that seals the gland OD.
4. Using a corner-to-corner sequence, install and tighten, to approximately 75% of final torque specifications, the SHCS fasteners (1-1/2" to 5" bores) or tie rod nuts (6" to 8" bores and all Style DD mounts (NFPA MT4)) at the rod lock face. See torque specification table below.
5. Using a calibrated torque wrench, tighten the fasteners or nuts to the final torque specification using the same corner-to-corner sequence.
6. Remove the air pressure from the rod lock port or remove the torque from the manual override shaft to return the rod lock to the locked state.

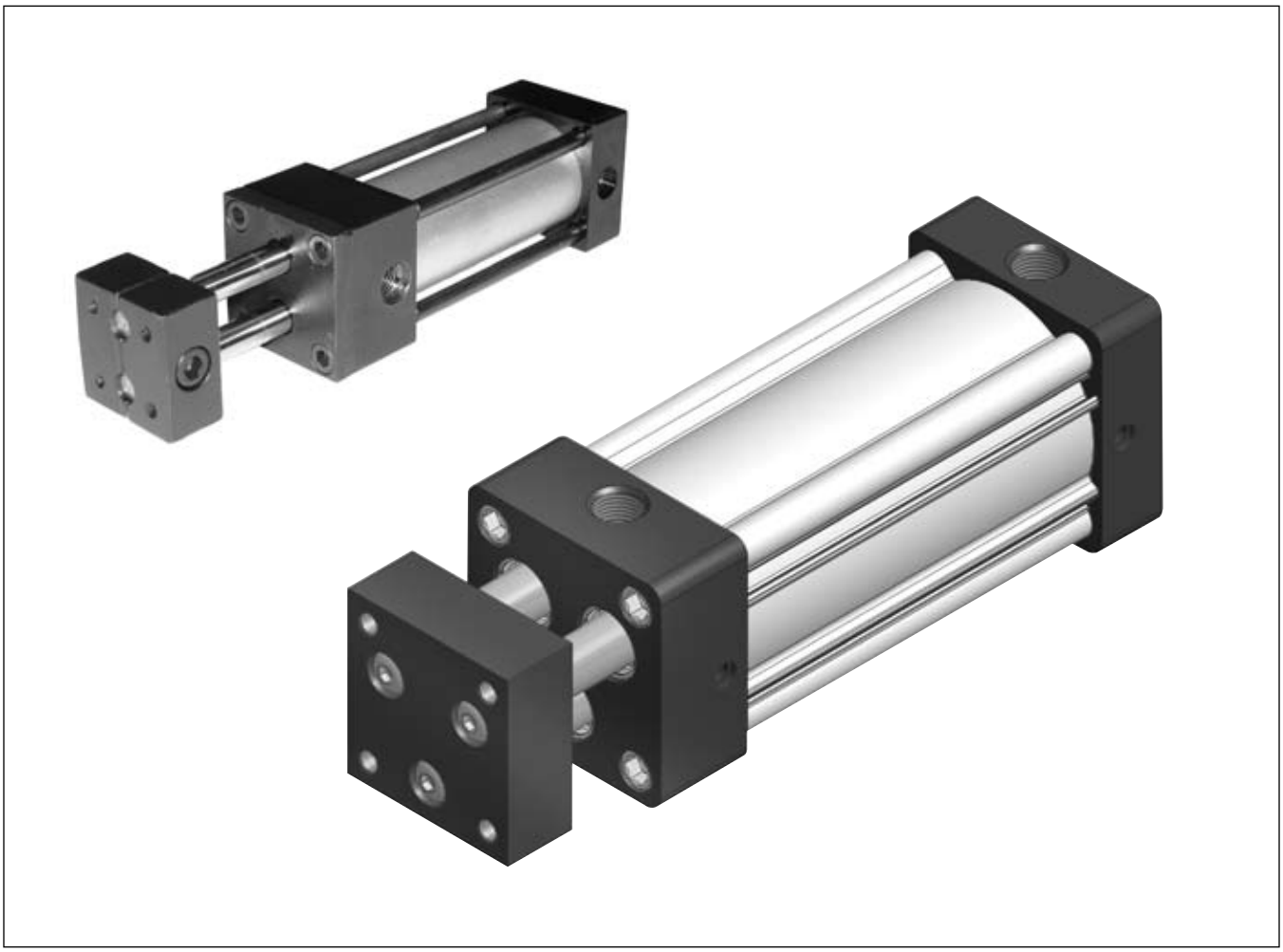
The rod lock units are not field-repairable and must be returned to the Pneumatic Division for any repairs. Please contact the Wadsworth, Ohio facility for any assistance.

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4MNR Series

Non-Rotating Pneumatic Cylinders



Contents

Features B126
Ordering Information..... B127
Mounting Styles & Specifications B128-B131
Technical Data..... B132
Envelope and Mounting Dimensions..... B133-B140
Cylinder Accessories..... B141-B142
Service Kits B142

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Heads and Caps
High-strength aluminum heads and caps are designed with the most flexible mounting platform. Using our proprietary extrusion, we can offer customization of the endcaps for unique designs, including extra ports, duplex, tandem and many special mountings. Anodized for corrosion resistance.

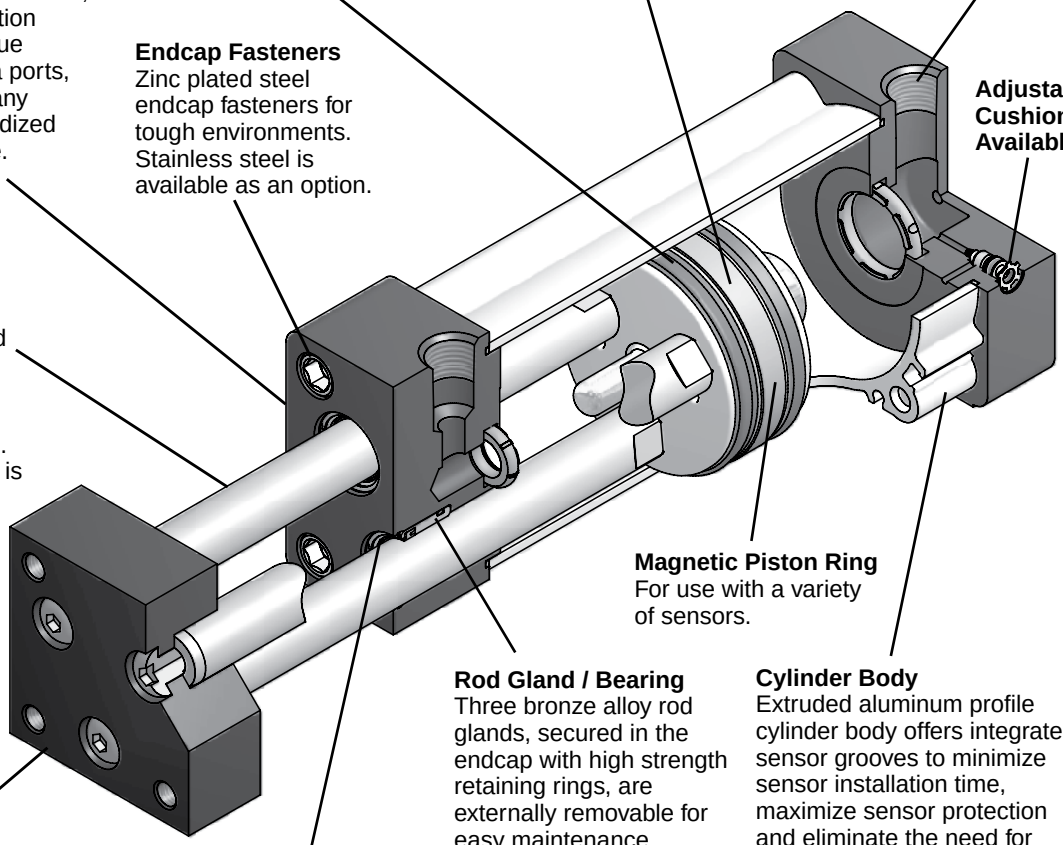
Piston Seals
Carboxylated nitrile rounded-lip piston seals combine low friction with leak-free service and long service life.

Piston Assembly
Steel piston rod threads connect the rods to the aluminum alloy piston. The assembly is permanently sealed and secured in place with high strength anaerobic adhesive. MolyGard wear band offers maximum service life.

Ports
NPTF ports are standard. Other port styles available.

Endcap Fasteners
Zinc plated steel endcap fasteners for tough environments. Stainless steel is available as an option.

Adjustable Cushions Available



Multiple Piston Rods
Three standard case-hardened (50-64 Rc), hard chrome plated and polished carbon steel piston rods for reliable performance, long rod seal life and low friction. 17-4 PH stainless steel is available as an option.

Magnetic Piston Ring
For use with a variety of sensors.

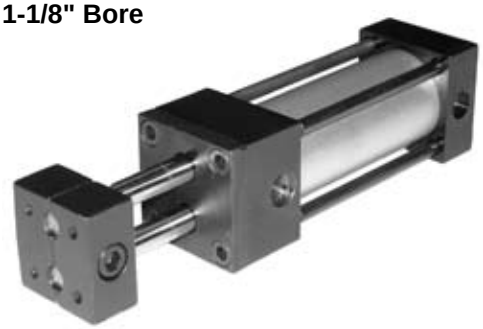
Rod Gland / Bearing
Three bronze alloy rod glands, secured in the endcap with high strength retaining rings, are externally removable for easy maintenance.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept both Global and Mini-Global Sensors. Single corner lobe of extrusion will accept legacy 2MNR sensor brackets. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction.

Tooling Plate
Cold rolled carbon steel tooling plate with corrosion-resistant finish is easily removable for maintenance.

Rod Wiperseal
Polyurethane wiperseal functions as a rod seal and rod wiper for durable, leak-free service and prevention of external contaminants inside the cylinder.

1-1/8" Bore



Notes:
Retainer is steel on 1-1/8" bore. Rod seals are also inboard.
Rod bearing is close-grained cast iron on 1-1/8" bore.
1-1/8" bore has traditional tube and tie-rod design.

For a complete list of 4MNR options, please see pages B127 and B131.

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How to Order 4MNR Series Cylinders

4MNR cylinders can be specified by model number by using the table below.

2.00			J		4MNR	2	U			T	9		A		6.000

Bore Size
1.12[1]
1.50[1]
2.00
2.50
3.25
4.00

Cushion Head End
Blank Non-cushioned head end
C Cushioned head end

Double Rod Cylinder [5]
Specify "K" only if double rod cylinder is required.

Mounting Style
Specify mounting style code (see table on following page).

Series
4MNR

Cylinder Construction
Blank Standard (extruded body, standard round lobe orientation) *
A Extruded body, round lobe orientation rotated 90 degrees from standard *
N Extruded body, round lobe orientation rotated 180 degrees from standard *
Z Extruded body, round lobe orientation rotated 270 degrees from standard *
T Aluminum round tube and carbon steel tie rods and nuts

* See Table on page B10

Piston Type[2]
2 Lipseals, no magnetic ring (aluminum piston)
3 Lipseals and magnetic ring (aluminum piston)

Ports
U NPTF
R BSPP

Seals
Blank Standard (nitrile seals)
V Fluorocarbon seals[3]
E Fluorocarbon rod wiper and rod seal only[4]

Special Modification
Specify "S" only for special modification other than rod end, and then describe modification in item notes.
(Includes 4MNR with Linear Position Sensor Option)[5]

Tooling Plate
T Standard Plate
M Special Plate (please specify details)

Piston Rod Thread Style
9 Standard
3 Special (and specify all dimensions required)

Rod Material and Gland Code
Blank Standard rod and gland
Y 17-4 PH stainless steel rod and standard gland

Piston Rod Thread Type
A Standard (UNF Unified Thread)

Cushion Cap End
Blank Non-cushioned cap end
C Cushioned cap end

Stroke Length
Specify stroke length required in inches.

[1] Not available with Linear Position Sensor Option (LPSO).
[2] Seals option V only available with Piston Type 2.
[3] Reed and solid-state sensors only available with standard seals or options E. See footnote 2.
[4] Used for external chemical compatibility applications, not high temperature.
[5] For Linear Position Sensor Option (LPSO), please include the following information for the Special Modification item notes:
a. Sensor part number (see pages B100-B104)
b. Sensor position
c. Port position (if other than position 1)
d. Length of stop tubing, gross stroke and net stroke (if required)
Also, Piston Type option 3 is required.

How to order 4MNR Series cylinders with sensors:
Sensors must be ordered separately and are not mounted to the cylinder prior to shipment.
1. Cylinder model number must have a Piston Type 3.
2. Please refer to pages M1 - M9 for sensor part numbers and specifications. Global, Mini-Global, NAMUR and Weld Immune Sensors will fit the 4MNR Series.
3. Style DD mounts and tie rod versions with Global Sensors will require tie rod bracket P8S-TMA0X. Please refer to page M9 for more information.

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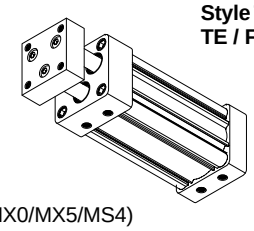
B

4MNR Series Mounting Styles

Mounting Code	NFPA Mounting Style	Description	Available Bore Sizes	
			4MNR	4MNR-LPSO w/o Stop Tube
TEF	MX5/MS4	Sleeve Nut with Side Tap (standard mount)	1-1/2 - 4	2 - 4
T	MX0	No Mount (same construction as TEF)	1-1/8 - 4	2 - 4
TE	MX5	Sleeve Nut (same construction as TEF)	1-1/2 - 4	2 - 4
F	MS4	Side Tap (same construction as TEF)	1-1/8 - 4	2 - 4
J	MF1	Head Rectangular Flange	1-1/8 - 4	2 - 4*
H	MF2	Cap Rectangular Flange	1-1/8 - 4	2 - 4*
TC	MX2	Tie Rods Extended Cap End	1-1/2 - 4	—
C	MS2	Side Lug	1-1/2 - 4	2 - 4
NB	N/A	Base Bar	1-1/8 - 4	2 - 4
BB	MP1	Cap Fixed Clevis	1-1/2 - 4	2 - 4*
BC	MP2	Cap Detachable Clevis	1-1/8 - 4	2 - 4*
BE	MP4	Cap Detachable Eye	1-1/8 - 4	2 - 4*
DB	MT2	Cap Trunnion	1-1/2 - 4	2 - 4*
DD	MT4	Intermediate Trunnion	1-1/2 - 4	—

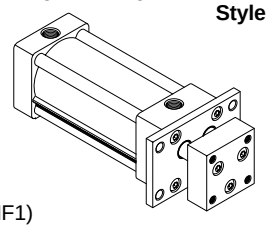
**May interfere with mounting. Please provide clearance for Linear Position Sensor overhang (see LPSO Sensor Section pages B100 - B104).

Standard Mount
Style TEF / T / TE / F



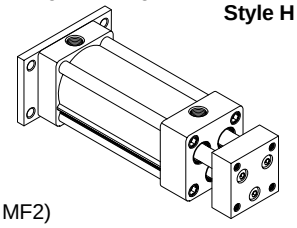
(NFPA MX0/MX5/MS4)

Head Rectangular Flange
Style J



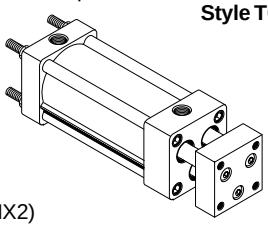
(NFPA MF1)

Cap Rectangular Flange
Style H



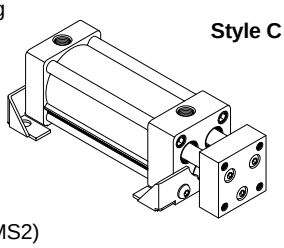
(NFPA MF2)

Tie Rods Ext. Cap End
Style TC



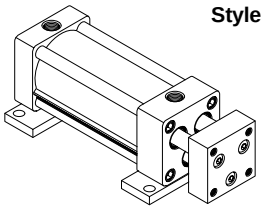
(NFPA MX2)

Side Lug
Style C

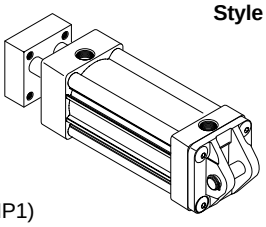


(NFPA MS2)

Base Bar Mount
Style NB

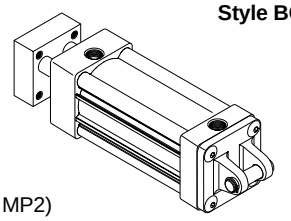


Cap Fixed Clevis
Style BB



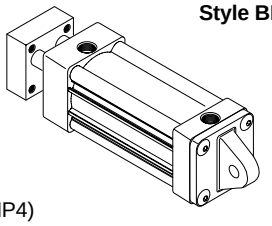
(NFPA MP1)

Cap Detachable Clevis
Style BC



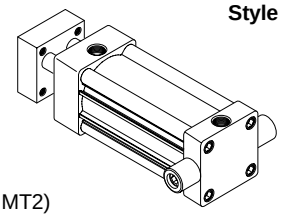
(NFPA MP2)

Cap Detachable Eye
Style BE



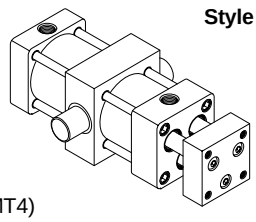
(NFPA MP4)

Cap Trunnion
Style DB



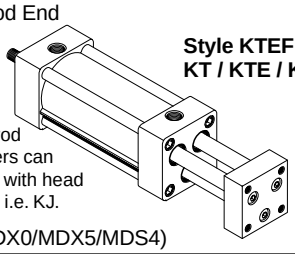
(NFPA MT2)

Intermediate Trunnion
Style DD



(NFPA MT4)

Double Rod End
Style KTEF / KT / KTE / KF



***Double rod end cylinders can be ordered with head mountings, i.e. KJ.

(NFPA MDX0/MDX5/MDS4)

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General Specifications

- NFPA interchangeable
- Bore sizes – 1-1/8", 1-1/2", 2", 2-1/2", 3-1/4", and 4"
- Strokes – available in any practical stroke length
- Rod diameters – 8mm, 12mm and 16mm
- Tooling plates – 1 standard, specials available
- Single rod end or double rod ends
- Cushions – optional and adjustable at either end or both ends
- Operating pressure – 250 PSIG (17 Bar)
- Media – dry, filtered air
- Temperature range –
  -10°F to +165°F (-23°C to +74°C) with standard seals
  -10°F to +250°F (-23°C to +121°C) with fluorocarbon seals option
- Mounting styles – 14 standard styles
- RoHS compliant

For material options, including seals and piston rods, please see Material Specifications on next page.

Cylinder Weights – 4MNR Cylinders

Bore (inch)	No Mount Single Rod		No Mount Double Rod	
	Base Wt. (lbs.)	Per Inch (lbs.)	Base Wt. (lbs.)	Per Inch (lbs.)
1-1/2	1.73	0.20	2.16	0.28
2	2.99	0.35	4.34	0.58
2-1/2	4.06	0.37	5.74	0.60
3-1/4	7.93	0.62	11.46	1.05
4	10.29	0.69	14.37	1.12

Standard Cushion Position

Mounting Code	Position
All except DB, DD	2
DB, DD	3

Standard Port Sizes

Bore	NPTF	BSPP
1-1/2	3/8	G3/8
2	3/8	G3/8
2-1/2	3/8	G3/8
3-1/4	1/2	G1/2
4	1/2	G1/2

Mounting Weight Adders

Bore (inch)	Weight (lbs) by Mounting Style						
	J, H	DB	BB	DD	BE	C, NB	BC
1-1/2	0.51	0.50	0.15	1.70	0.23	0.15	0.20
2	0.76	0.50	0.26	2.38	0.32	0.15	0.29
2-1/2	1.13	0.50	0.38	3.00	0.42	0.15	0.41
3-1/4	2.76	0.50	0.98	5.35	1.26	0.35	1.06
4	4.05	0.50	1.35	6.75	1.62	0.35	1.49

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Material Specifications – Standard Temperatures and Applications

Head and cap	Black anodized aluminum alloy
Head and cap screws	Zinc plated steel alloy
Cylinder body	Clear anodized aluminum alloy
Piston Rods	Case-hardened, chrome plated carbon steel
Rod Wiperseal	Polyurethane
Rod bearings (glands)	Bronze alloy
Piston	Aluminum alloy
Piston seals	Carboxylated nitrile (Nitroxile)
Piston bearing	MolyGard™ (for aluminum piston)
Magnetic ring	Plastic-bound magnetic material
O-rings	Nitrile
End seals	Nitrile
Cushion seals	Urethane
Cushion needle valves	Stainless steel
Tie-rods/studs (some mounts)	Blackened carbon steel
Tie-rod nuts (some mounts)	Steel alloy, SAE J995 Grade 8
Tooling plate	Black oxided steel alloy
Tooling plate screws	Black oxided steel alloy

High Temperature Option – Material and Part Changes

High temperatures (-10°F to +250°F)	All seals are fluorocarbon No magnetic ring

Other Standard Options – Material and Part Changes

Cylinder seal options	Fluorocarbon for high temperatures or chemical compatibility Other seal options available, please consult factory
Piston rod material options	Case-hardened, chrome plated carbon steel (standard) 17-4 PH stainless steel, chrome plated

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How to Select a 4MNR Cylinder

Parker cylinders are available based on air operating pressure. The many styles, sizes and optional features available assure that your application requirements are precisely met. To select a cylinder, follow these simple steps:

Step 1 - **Determine the correct cylinder bore size** necessary to achieve required force using the available operating pressure.

Step 2 - **Determine the series cylinder to use**, based on operating pressure.

Step 3 - **Turn to the appropriate cylinder selection section.** Select the mounting style that fits your installation needs. Determine the bore and rod sizes available for the model you select. Then complete model selection.

- Size the cylinder to meet your application requirements.

Step 4 - **Consider the following conditions** which may require further modifications to the cylinder you have selected.

Application Condition	Check the Following
Quick Starts or Stops	Confirm that determined thrust is sufficient to accelerate or decelerate cylinder and load within prescribed distance. Optional cushions should be used to reduce shock during deceleration, check that peak pressures will be within tolerable limits.
Long Push Stroke	Check whether stop tube is required to prevent excessive bearing loads and wear.
High-column Loading Long Push Stroke	Determine if standard size piston rod is strong enough to accommodate intended load. See Application Engineering section for recommendations.
Long Horizontal Stroke	Determine if standard size piston rod is strong enough to accommodate intended load.
High Operating Temperatures	For temperatures between 165°F and 250°F use 4MNR cylinder with high temperature seals.

General Options and Modifications

4MNR

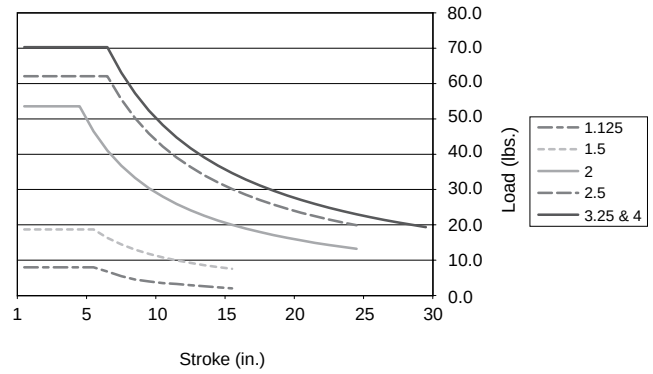
- Adjustable Cushions
- Non-Magnetic Piston (magnetic ring standard)
- Port Thread Styles
- Multiple Ports
- Special Heads, Caps, Pistons and Mounts
- Double Rod End
- Rod End Modifications
- Rod Materials (grades of stainless steel)
- Fluorocarbon Rod Wiperseal only
- Fluorocarbon Seals (all cylinder seals)
- Stop Tube
- Mixed Mountings
- Round Tube and Tie Rod Construction
- Stainless Steel Fasteners/Tie Rods/Tooling Plate
- Shock Absorber on Cap End
- Hydro-Check unit for smooth hydraulic control
- Air Cylinder/Valve Combination (ACVB)
- Adjustable Point Sensors (order separately)
- Continuous Linear Position Sensing (LPSO)
- High Temperature Service (to +250°F)
- Rod lock version for double rod cylinder

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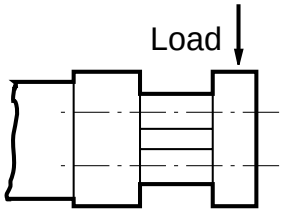
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Loading Information

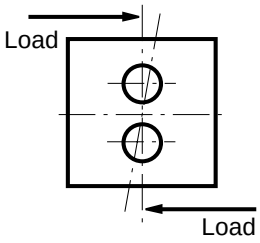
Side Load Versus Stroke



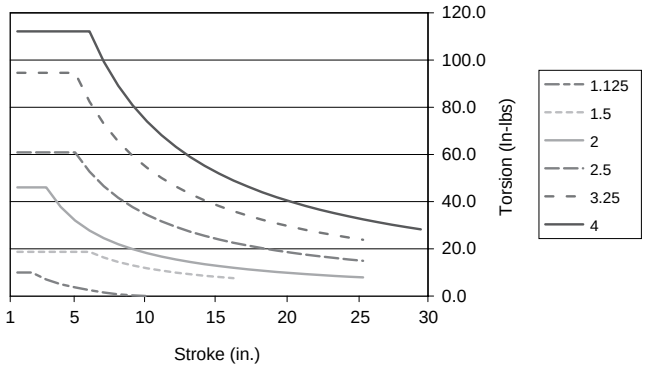
Side Load



Torsional Load



Torsional Load Versus Stroke



Theoretical Extend and Retract Forces in Pounds

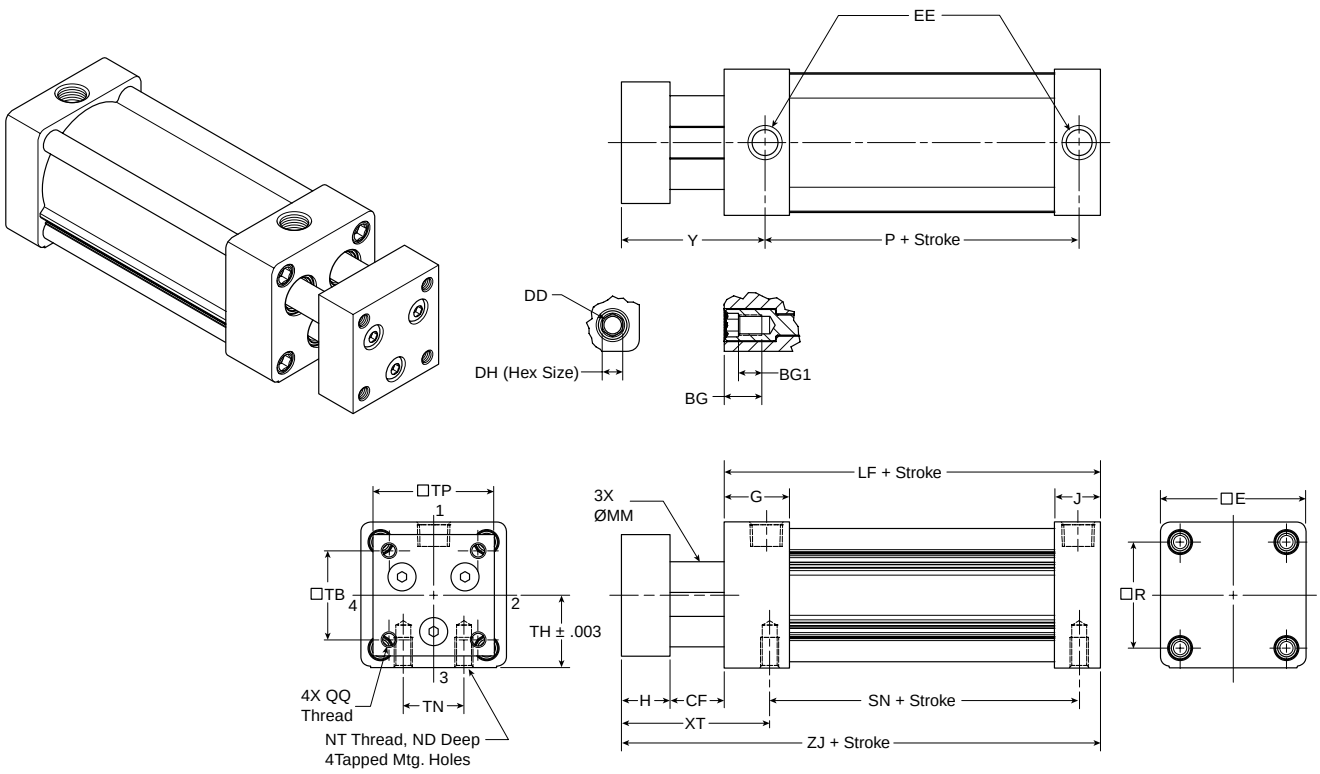
Bore Size	Movement	Effective Area (in^2)	Pressure (PSI)								Cu. Ft. of Displacement per inch of Stroke
			20	40	60	80	100	150	200	250	
1-1/8"	Extend	0.994	25	49	74	98	123	184	245	307	0.00071
	Retract	0.841	22	43	65	86	108	162	216	270	0.00062
1-1/2"	Extend	1.767	35	71	106	141	177	265	353	442	0.00102
	Retract	1.537	31	61	92	123	154	231	307	384	0.00089
2"	Extend	3.142	63	126	188	251	314	471	628	785	0.00182
	Retract	2.553	51	102	153	204	255	383	511	638	0.00148
2-1/2"	Extend	4.909	98	196	295	393	491	736	982	1227	0.00284
	Retract	3.988	80	160	239	319	399	598	798	997	0.00231
3-1/4"	Extend	8.296	166	332	498	664	830	1244	1659	2074	0.00480
	Retract	7.375	148	295	443	590	738	1106	1475	1844	0.00427
4"	Extend	12.566	251	503	754	1005	1257	1885	2513	3142	0.00727
	Retract	11.646	233	466	699	932	1165	1747	2329	2911	0.00674

Double Rod Extend Forces – Single Rod Style

Bore Size	Rod Size	Effective Area (in^2)	Pressure (PSI)								Cu. Ft. of Displacement per inch of Stroke
			20	40	60	80	100	150	200	250	
1-1/8"	1/2"	0.798	16	32	48	64	80	120	160	199	0.00046
1-1/2"	5/8"	1.460	29	58	88	117	146	219	292	365	0.00085
2"	5/8"	2.835	57	113	170	227	283	425	567	709	0.00164
2-1/2"	5/8"	4.602	92	184	276	368	460	690	920	1150	0.00266
3-1/4"	1"	7.510	150	300	451	601	751	1127	1502	1878	0.00435
4"	1"	11.781	236	471	707	942	1178	1767	2356	2945	0.00682

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Style TEF, T, TE & F
(NFPA MX0, MX5, MS4)



4MNR Cylinder Dimensions – Styles TEF, T, TE and F

Bore	Rod Dia. MM	BG	BG1	CF	DD	DH	E	EE (NPTF)	G	H	J	ND	NT
1-1/8 *	5/16	-	-	0.875	10-32	-	1.500	1/8	1.000	0.625	0.625	0.250	10-32
1-1/2	8mm	0.056	0.375	1.125	1/4-28	1/4	2.000	3/8	1.438	0.750	0.938	0.375	1/4-20
2	12mm	0.056	0.362	1.125	5/16-24	5/16	2.500	3/8	1.375	0.750	0.938	0.438	5/16-18
2-1/2	16mm	0.056	0.362	1.125	5/16-24	5/16	3.000	3/8	1.344	1.000	0.938	0.625	3/8-16
3-1/4	16mm	0.700	0.500	1.375	3/8-24	3/8	3.750	1/2	1.594	1.000	1.125	0.750	1/2-13
4	16mm	0.700	0.500	1.375	3/8-24	3/8	4.500	1/2	1.594	1.000	1.125	0.750	1/2-13

Bore	Rod Dia. MM	QQ	R	TB	TH	TP	TN	XT	Y	Add Stroke LF	P	SN	ZJ
1-1/8 *	5/16	6-32	1.125	0.750	0.750	1.250	0.500	2.000	2.031	2.500	1.468	1.500	3.750
1-1/2	8mm	10-32	1.430	1.120	0.993	1.500	0.625	2.812	2.750	3.625	2.313	2.250	5.375
2	12mm	1/4-28	1.840	1.430	1.243	2.000	0.875	2.812	2.750	3.625	2.313	2.250	5.375
2-1/2	16mm	5/16-24	2.190	1.840	1.493	2.500	1.250	3.062	3.062	3.750	2.375	2.375	5.875
3-1/4	16mm	3/8-24	2.760	2.190	1.680	3.250	1.500	3.437	3.437	4.250	2.625	2.625	6.500
4	16mm	3/8-24	3.320	2.760	2.243	4.000	2.063	3.437	3.437	4.250	2.625	2.625	6.500

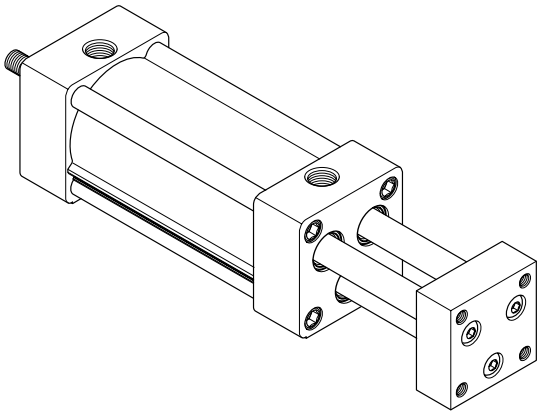
* Twin Rod with Flange Construction (not shown)

Thread Style 3 - "Special Thread"
Special threads, rod extensions, rod eyes, blanks, etc. are also available.
To order, specify "Style 3" and give desired dimensions for KK (thread size), A (thread length) and W or WF.
If otherwise special, please supply dimensioned sketch.

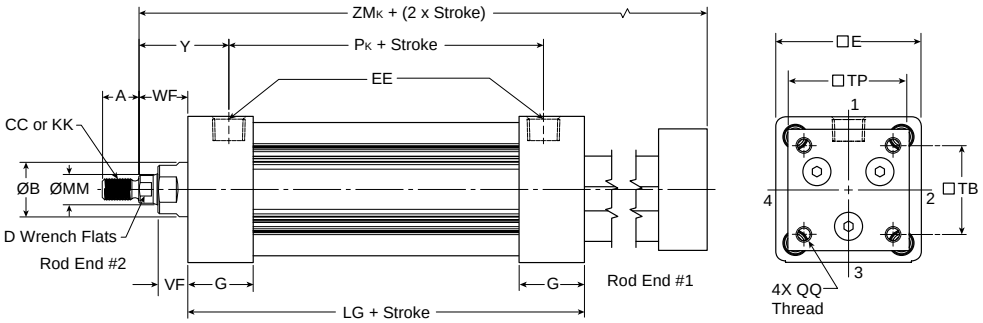
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B

To determine dimensions for a double rod end cylinder, first refer to the desired single rod end mounting style cylinder shown in this catalog section. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod end dimensions with those shown in the drawings and dimension table below. Note that double rod end cylinders have a head dimension G at both ends, and that LG replaces LF, P_K replaces P, etc. The double rod end dimensions differ from, or are in addition to, those for single rod cylinders.



Mounting Styles for Single Rod Models	Corresponding Mounting Styles for Double Rod Models
C	KC
DD	KDD
F	KF
J	KJ
NB	KNB
T	KT
TE	KTE
TEF	KTEF



Cylinder Dimensions – K-type

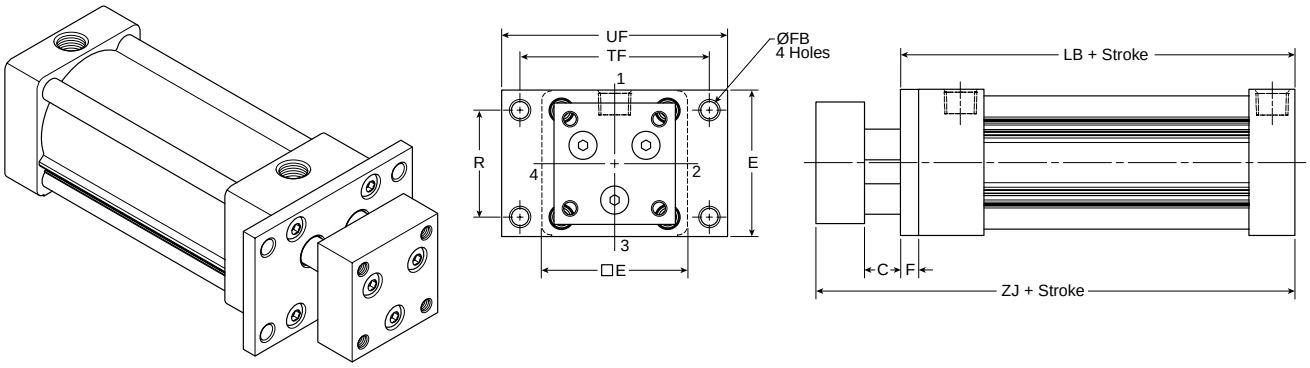
Bore	Rod Dia. MM	THREAD STYLE 8 CC	THREAD STYLE 4 & 9 KK	A	B +0.000 -0.002	D	E	EE (NPTF)	G	Y
1-1/8 *	3/8	3/8-24	5/16-24/ 1/4-28	0.625	0.75 -0.002	5/16	1.500	1/8	1.000	2.031
1-1/2	5/8	1/2-20	7/16-20	0.750	1.124	1/2	2.000	3/8	1.438	2.750
2	5/8	1/2-20	7/16-20	0.750	1.124	1/2	2.500	3/8	1.375	2.750
2-1/2	5/8	1/2-20	7/16-20	0.750	1.124	1/2	3.000	3/8	1.344	3.062
3-1/4	1	7/8-14	3/4-16	1.125	1.499	7/8	3.750	1/2	1.594	3.437
4	1	7/8-14	3/4-16	1.125	1.499	7/8	4.500	1/2	1.594	3.437

Bore	Rod Dia. MM	QQ	TB	TP	VF	WF	Add Stroke		Add 2X Stroke
							LG	P_K	ZM_K
1-1/8 *	3/8	6-32	0.750	1.250	0.125	0.375	2.875	1.844	4.625
1-1/2	5/8	10-32	1.120	1.500	0.625	1.000	4.125	2.375	6.625
2	5/8	1/4-28	1.430	2.000	0.625	1.000	4.125	2.375	6.875
2-1/2	5/8	5/16-24	1.840	2.500	0.625	1.000	4.250	2.375	7.375
3-1/4	1	3/8-24	2.190	3.250	0.750	1.375	4.750	2.625	8.375
4	1	3/8-24	2.760	4.000	0.750	1.375	4.750	2.625	8.375

* Twin Rod with Flange Construction (not shown)

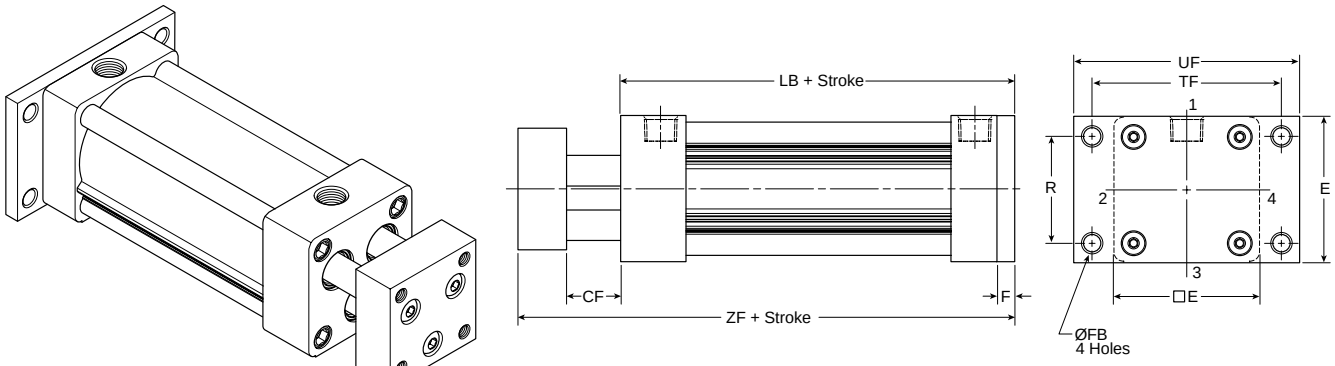
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Head Rectangular Flange
Style J
(NFPA MF1)



Note: Style J has a “C” dimension instead of “CF” because of the flange installation. For reference, CF = C + F

Cap Rectangular Flange
Style H
(NFPA MF2)



Cylinder Dimensions – Styles J and H

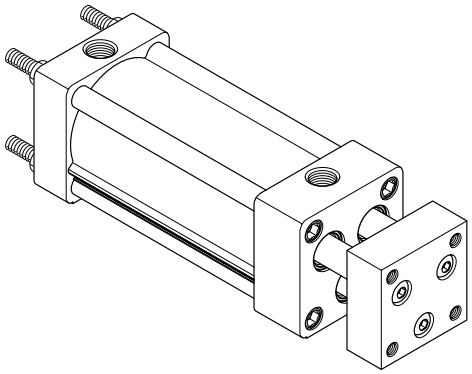
Bore	Rod Dia. MM	C	CF	E	F	FB	H	R	TF	UF	Add Stroke LB	Add Stroke ZF	Add Stroke ZJ
1-1/8 *	5/16	0.625	0.875	1.500	0.250	0.219	0.625	1.000	2.000	2.500	2.750	4.250	4.000
1-1/2	8mm	0.750	1.125	2.000	0.375	0.313	0.750	1.430	2.750	3.375	4.000	5.875	5.500
2	12mm	0.750	1.125	2.500	0.375	0.375	0.750	1.840	3.375	4.125	4.000	5.875	5.500
2-1/2	16mm	0.750	1.125	3.000	0.375	0.375	1.000	2.190	3.875	4.625	4.125	6.250	5.875
3-1/4	16mm	0.750	1.375	3.750	0.625	0.438	1.000	2.760	4.688	5.500	4.875	7.250	6.625
4	16mm	0.750	1.375	4.500	0.625	0.438	1.000	3.320	5.438	6.250	4.875	7.250	6.625

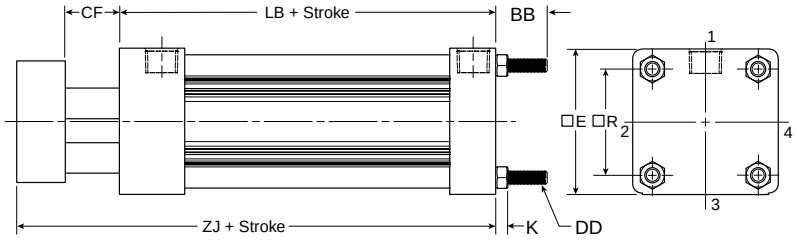
* Twin Rod with Flange Construction (not shown)

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Tie Rods Ext. Cap End
Style TC
(NFPA MX2)

B



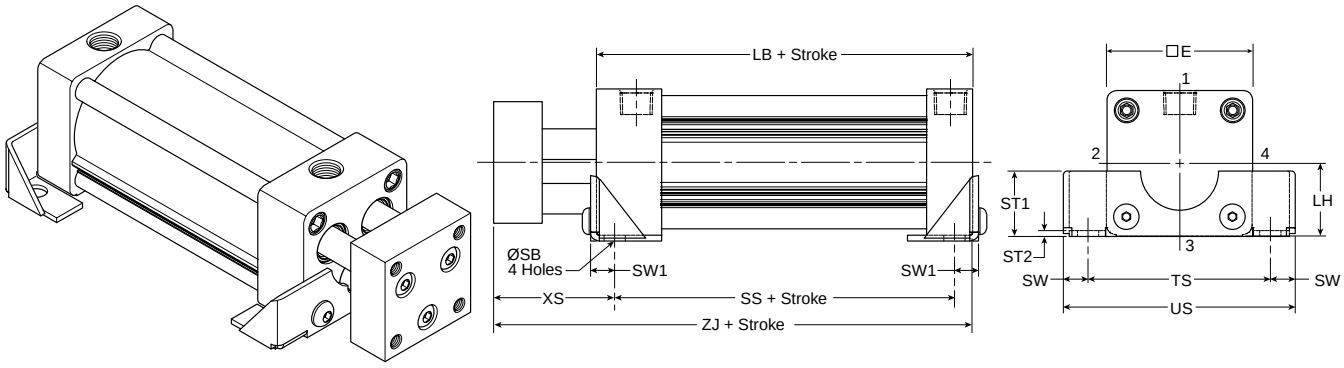


Cylinder Dimensions – Styles TC

Bore	Rod Dia. MM	BB	DD	CF	E	K	R	Add Stroke LB	Add Stroke ZJ
1-1/2	8mm	1.000	1/4-28	1.125	2.000	0.250	1.430	4.000	5.500
2	12mm	1.125	5/16-24	1.125	2.500	0.313	1.840	4.000	5.500
2-1/2	16mm	1.125	5/16-24	1.125	3.000	0.313	2.190	4.125	5.875
3-1/4	16mm	1.375	3/8-24	1.375	3.750	0.375	2.760	4.875	6.625
4	16mm	1.375	3/8-24	1.375	4.500	0.375	3.320	4.875	6.625

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Side Lug
Style C for 3MA
(NFPA MS2)



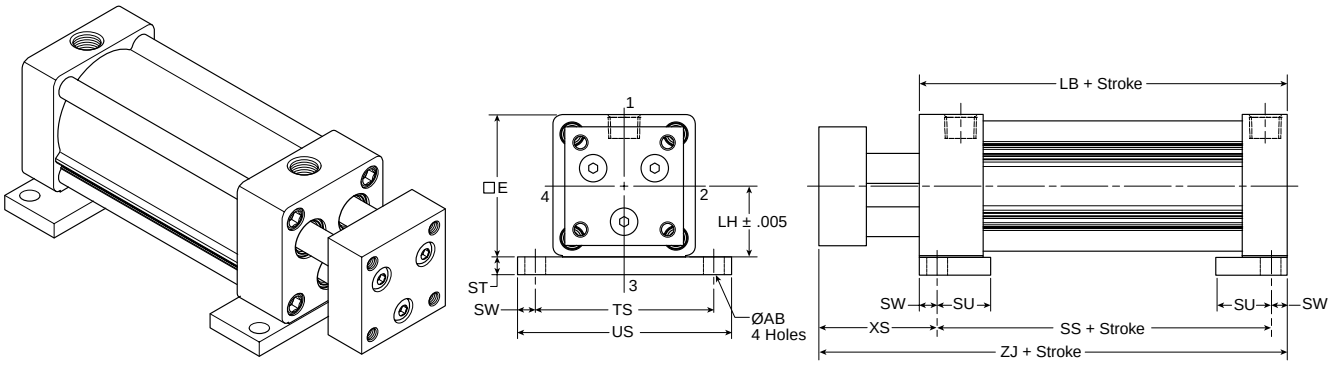
Cylinder Dimensions – Style C

Bore	Rod Dia. MM	E	LH	SB	ST1	ST2	SW	SW1	TS	US	XS	Add Stroke LB	Add Stroke SS	Add Stroke ZJ
1-1/2	8mm	2.000	0.993	0.438	1.000	0.120	0.375	0.495	2.750	3.500	2.250	4.000	2.875	5.500
2	12mm	2.500	1.243	0.438	1.250	0.120	0.375	0.495	3.250	4.000	2.250	4.000	2.875	5.500
2-1/2	16mm	3.000	1.493	0.438	1.343	0.120	0.375	0.495	3.750	4.500	2.500	4.125	3.000	5.875
3-1/4	16mm	3.750	1.868	0.563	1.500	0.188	0.500	0.688	4.750	5.750	2.875	4.875	3.250	6.625
4	16mm	4.500	2.243	0.563	1.500	0.188	0.500	0.688	5.500	6.500	2.875	4.875	3.250	6.625

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Base Bar Mount
Style NB for 4MNR

B



Note: Fasteners for NB base bar mount have been applied with removable threadlocking compound and torqued to bottom of endcaps.

Cylinder Dimensions – Style NB

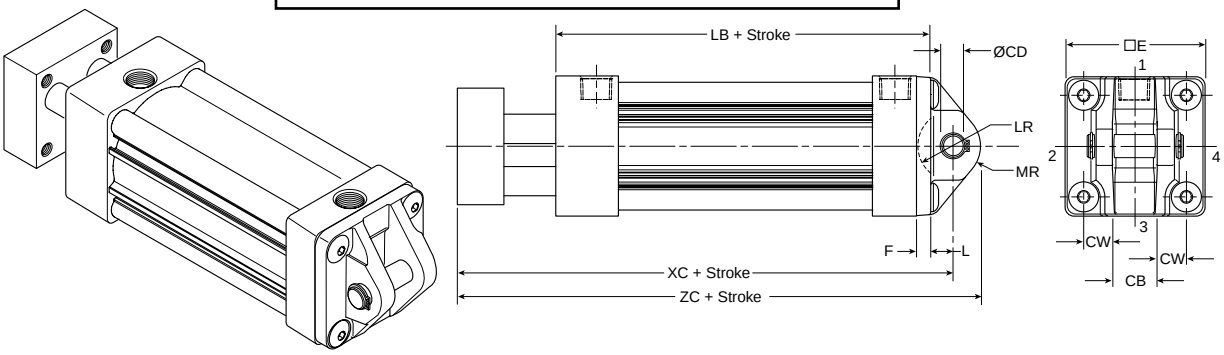
Bore	Rod Dia. MM	AB	E	LH	ST	SU	SW	TS	US	XS	Add Stroke LB	Add Stroke SS	Add Stroke ZJ
1-1/8 *	5/16	0.203	1.500	1.000	0.250	0.750	0.250	1.875	2.375	1.750	2.750	1.750	3.750
1-1/2	8mm	0.438	2.000	1.243	0.250	1.125	0.375	2.750	3.500	2.250	4.000	2.875	5.500
2	12mm	0.438	2.500	1.493	0.250	1.125	0.375	3.250	4.000	2.250	4.000	2.875	5.500
2-1/2	16mm	0.438	3.000	1.868	0.375	1.125	0.375	3.750	4.500	2.500	4.125	3.000	5.875
3-1/4	16mm	0.563	3.750	2.368	0.500	1.250	0.500	4.750	5.750	2.875	4.875	3.250	6.625
4	16mm	0.563	4.500	2.743	0.500	1.250	0.500	5.500	6.500	2.875	4.875	3.250	6.625

* Twin Rod with Flange Construction (not shown)

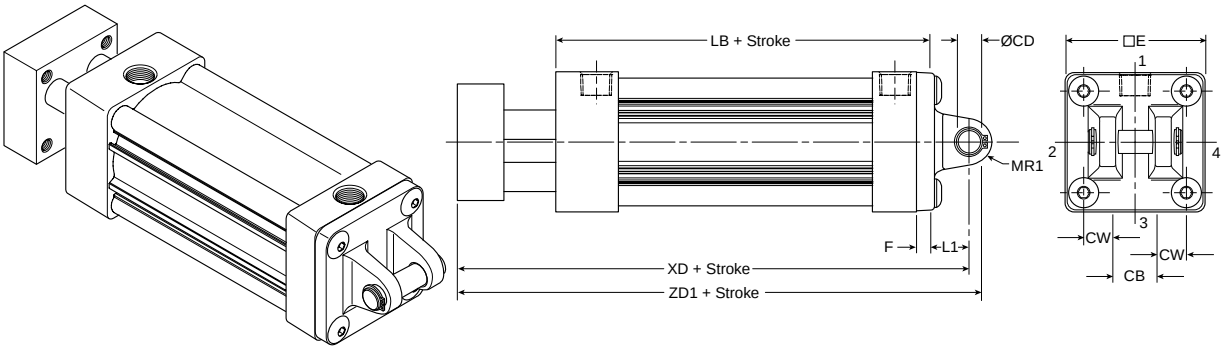
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Cap Fixed Clevis*
Style BB (NFPA MP1)

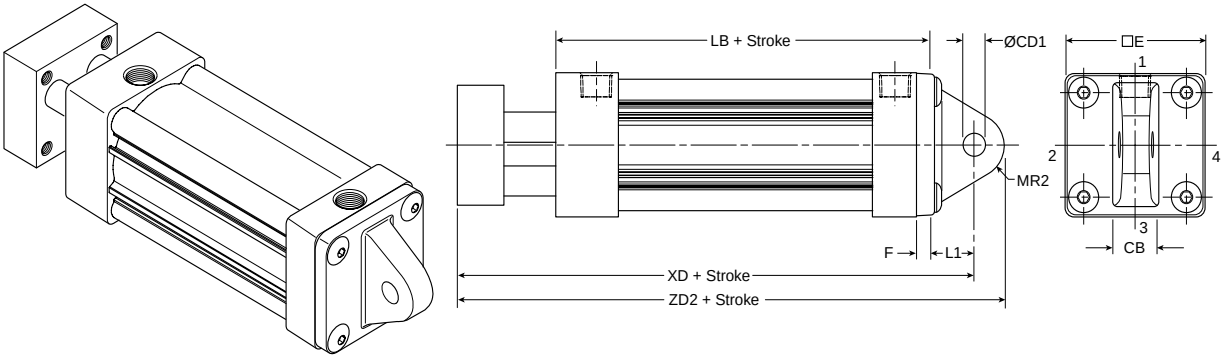
Note: For maximum swivel angle of BB mount with rear mounting plate, see Cylinder Accessories on page B141.



Cap Detachable Clevis
Style BC (NFPA MP2)



Cap Detachable Eye
Style BE (NFPA MP4)



Cylinder Dimensions – Styles BB, BC and BE

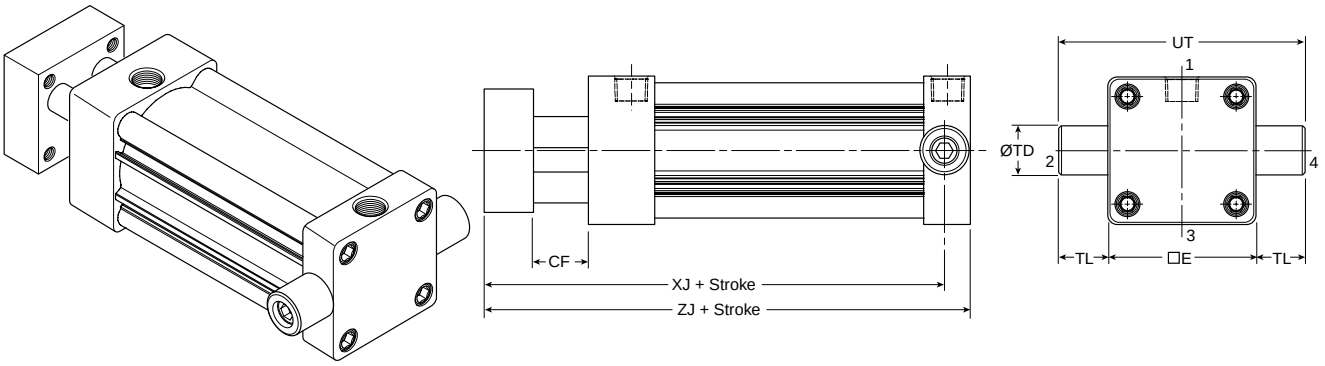
Bore	Rod Dia. MM	CB	CD	CD1	CW	E	F	L	LR	L1
1-1/2	8mm	0.750	0.501	0.500	0.500	2.000	0.375	0.375	0.750	0.750
2	12mm	0.750	0.501	0.500	0.500	2.500	0.375	0.375	0.750	0.750
2-1/2	16mm	0.750	0.501	0.500	0.500	3.000	0.375	0.375	0.750	0.750
3-1/4	16mm	1.250	0.751	0.750	0.625	3.750	0.625	0.625	1.000	1.250
4	16mm	1.250	0.751	0.750	0.625	4.500	0.625	0.625	1.000	1.250

Bore	Rod Dia. MM	MR	MR1	MR2	Add Stroke LB	XC	XD	ZC	ZD1	ZD2
1-1/2	8mm	0.625	0.500	0.625	4.000	6.250	6.625	6.875	7.125	7.250
2	12mm	0.625	0.500	0.625	4.000	6.250	6.625	6.875	7.125	7.250
2-1/2	16mm	0.625	0.500	0.688	4.125	6.625	7.000	7.250	7.500	7.688
3-1/4	16mm	0.938	0.750	0.875	4.875	7.875	8.500	8.813	9.250	9.375
4	16mm	0.938	0.750	0.875	4.875	7.875	8.500	8.813	9.250	9.375

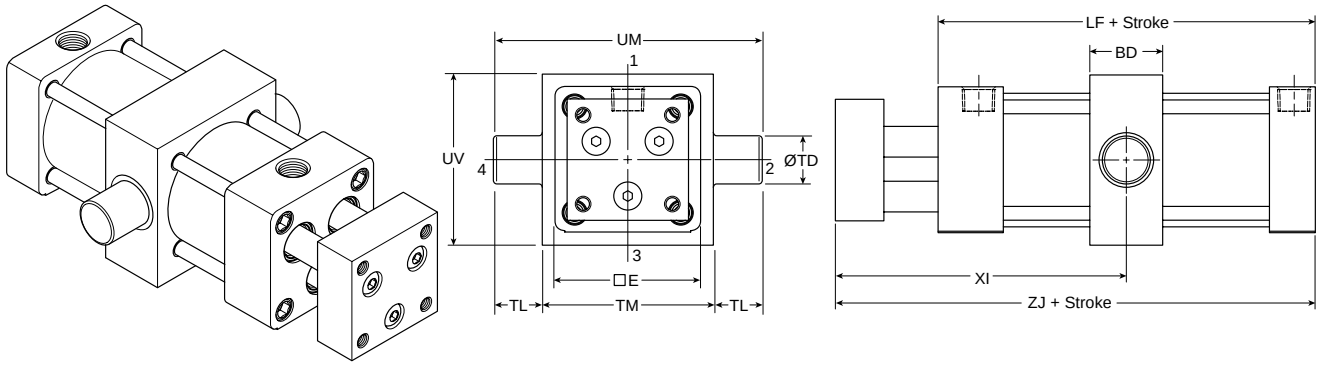
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B

Cap Trunnion
Style DB
(NFPA MT2)



Intermediate Trunnion
Style DD
(NFPA MT4)



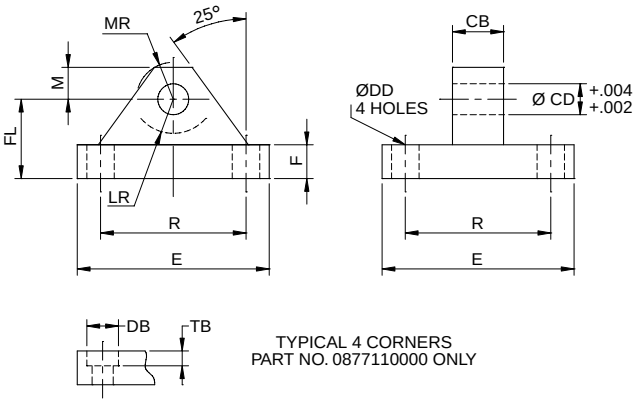
Cylinder Dimensions – Styles D, DB and D

Note: Tie rod nuts for Style DD have a slot instead of internal hex.

Bore	Rod Dia. MM	E	BD	CF	TD	TL	TM	UM	UT	UV	Min. XI	Add Stroke		
												LF	XJ	ZJ
1-1/2	8mm	2.000	1.250	1.125	1.000	1.000	2.500	4.500	4.000	2.500	4.000	4.000	5.000	5.875
2	12mm	2.500	1.500	1.125	1.000	1.000	3.000	5.000	4.500	3.000	4.125	4.000	5.000	5.875
2-1/2	16mm	3.000	1.500	1.125	1.000	1.000	3.500	5.500	5.000	3.500	4.375	4.125	5.375	6.250
3-1/4	16mm	3.750	2.000	1.375	1.000	1.000	4.500	6.500	5.750	4.250	5.125	4.875	6.000	7.250
4	16mm	4.500	2.000	1.375	1.000	1.000	5.250	7.250	6.500	5.000	5.125	4.875	6.000	7.250

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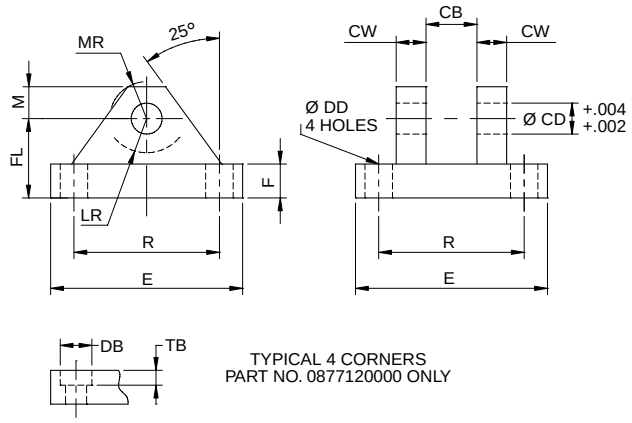
Mounting Plate & Eye Bracket



Eye Bracket Dimensions

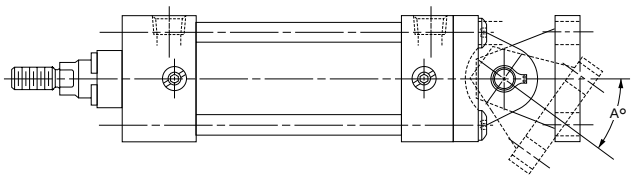
Bore Size	1-1/8	1-1/2, 2, 2-1/2	3-1/4, 4
Part No.	0877110000	1458060050	1458060075
CB	3/8	3/4	1-1/4
CD	3/8	1/2	3/4
DB	21/64	–	–
DD	13/64	13/32	17/32
E	1-1/2	2-1/2	3-1/2
F	1/2	3/8	5/8
FL	1-1/8	1-1/8	1-7/8
LR	5/8	3/4	1-1/4
M	3/8	1/2	3/4
MR	–	9/16	7/8
R	1.12	1.63	2.55
TB	5/16	–	–

Clevis Bracket Dimensions



Clevis Bracket Dimensions

Bore Size	1-1/8	1-1/2, 2, 2-1/2	3-1/4, 4
Part No.	0877120000	1458050050	1458050075
CB	3/8	3/4	1-1/4
CD	3/8	1/2	3/4
CW	1/4	1/2	5/8
DD	13/64	13/32	17/32
E	1-1/2	3-1/2	5
F	1/2	1/2	5/8
FL	1-1/8	1-1/2	1-7/8
LR	5/8	3/4	1-3/16
M	3/8	1/2	3/4
MR	3/8	5/8	29/32
R	1.15	2.55	3.82
TB	5/16	–	–



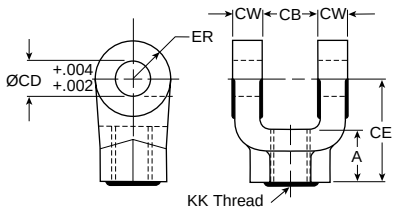
Bore	1-1/8	1-1/2	2	2-1/2	3-1/4	4
Angle A*	45	52	43	29	50	49

*Angle of rotation specified is for 'BB' Style mount only.

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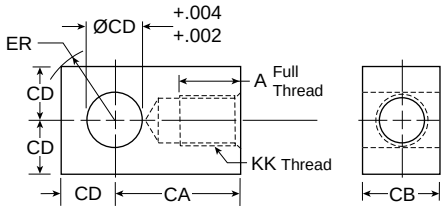
Female Rod Clevis



Female Rod Clevis Dimensions

Part Number	1458030044	1458030050	1458030075
A	3/4	3/4	1-1/16
CB	3/4	3/4	1-1/4
CD	1/2	1/2	3/4
CE	1-1/2	1-1/2	2-1/8
CW	1/2	1/2	5/8
ER	1/2	1/2	3/4
KK	7/16 - 20	1/2 - 20	3/4 - 16

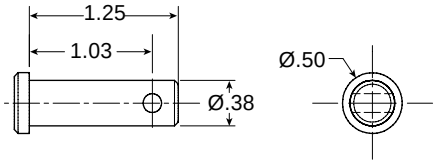
Rod Eye Knuckle



Rod Eye Dimensions

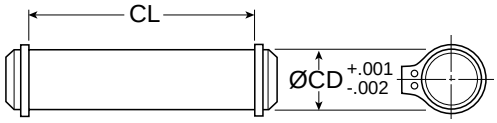
Part Number	1458040044	1458040050	1458040075
A	3/4	3/4	1-1/8
CB	3/4	3/4	1-1/4
CD	1/2	1/2	3/4
CA	1-1/2	1-1/2	2-1/16
ER	23/32	23/32	1-1/16
KK	7/16 - 20	1/2 - 20	3/4 - 16

1-1/8" Bore Pin



Part Number 0883030000

Pivot Pin



Pivot Pin Dimensions

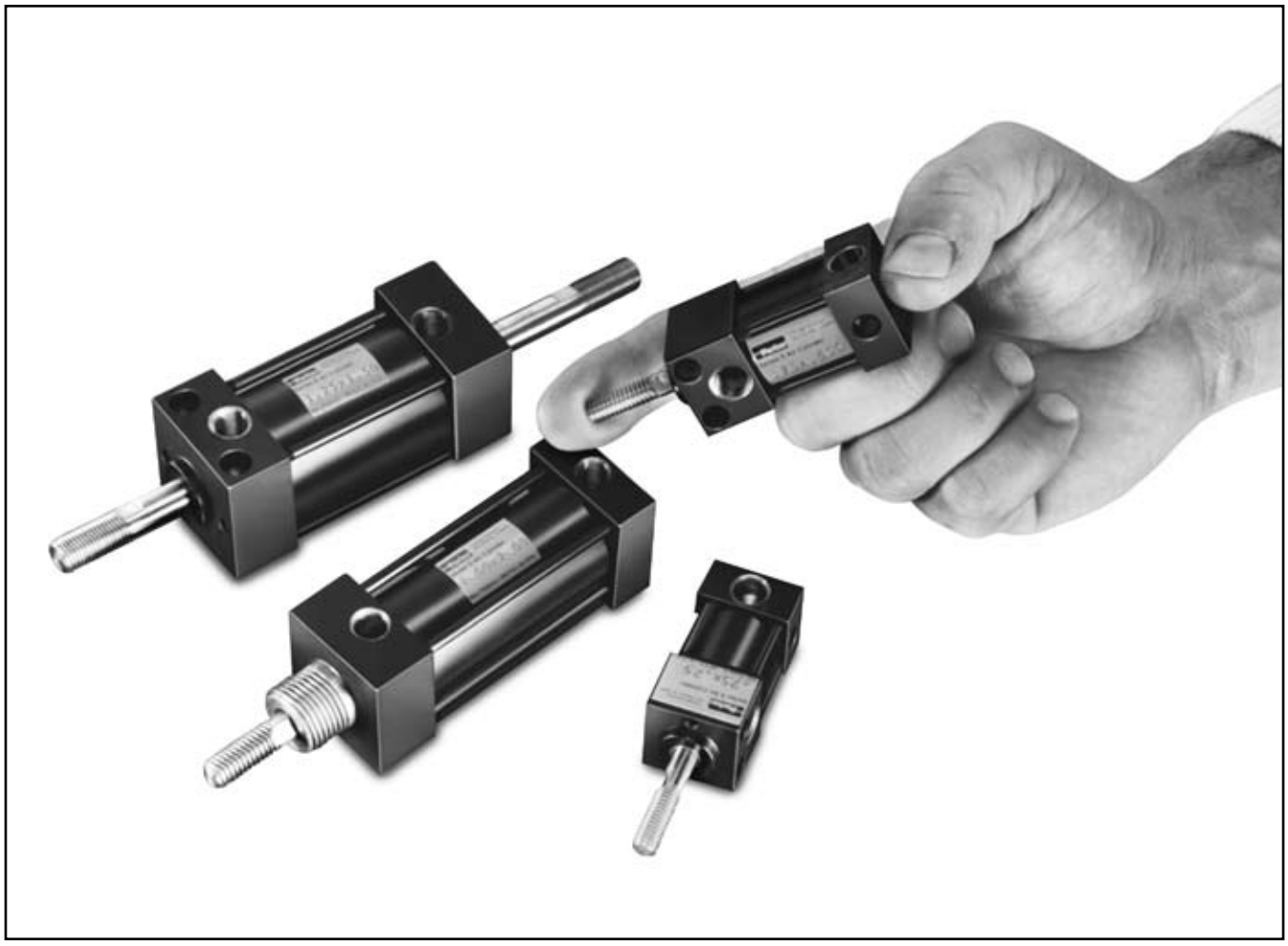
Part Number	0856640050	0856640075
CD	1/2	3/4
CL	1-7/8	2-5/8

Seal Kits

Bore Size	Complete Cylinder Kit Type	Kit Number
1-1/8"	Standard Seals	NBSK-225H
1-1/2"	Standard Seals	SG4MNR1501
	Fluorocarbon Seals	SG4MNR1505
2"	Standard Seals	SG4MNR2001
	Fluorocarbon Seals	SG4MNR2005
2-1/2"	Standard Seals	SG4MNR2501
	Fluorocarbon Seals	SG4MNR2505
3-1/4"	Standard Seals	SG4MNR3201
	Fluorocarbon Seals	SG4MNR3205
4"	Standard Seals	SG4MNR4001
	Fluorocarbon Seals	SG4MNR4005

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S Series
Universal Miniature Pneumatic Cylinders



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Specifications / Mounting.....B146
Dimensional Data B147-B154
Mounting Kits / Accessories B155
Service Kits B156

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B

Your choice of mountings – basic cylinder can be mounted four different ways – (1) with mounting bolts through the top of the head and cap (position 1); (2) into tapped holes in the bottom of the head and cap (position 3); (3) into tapped holes in the front of the head; and (4) into tapped holes in the back of the cap.

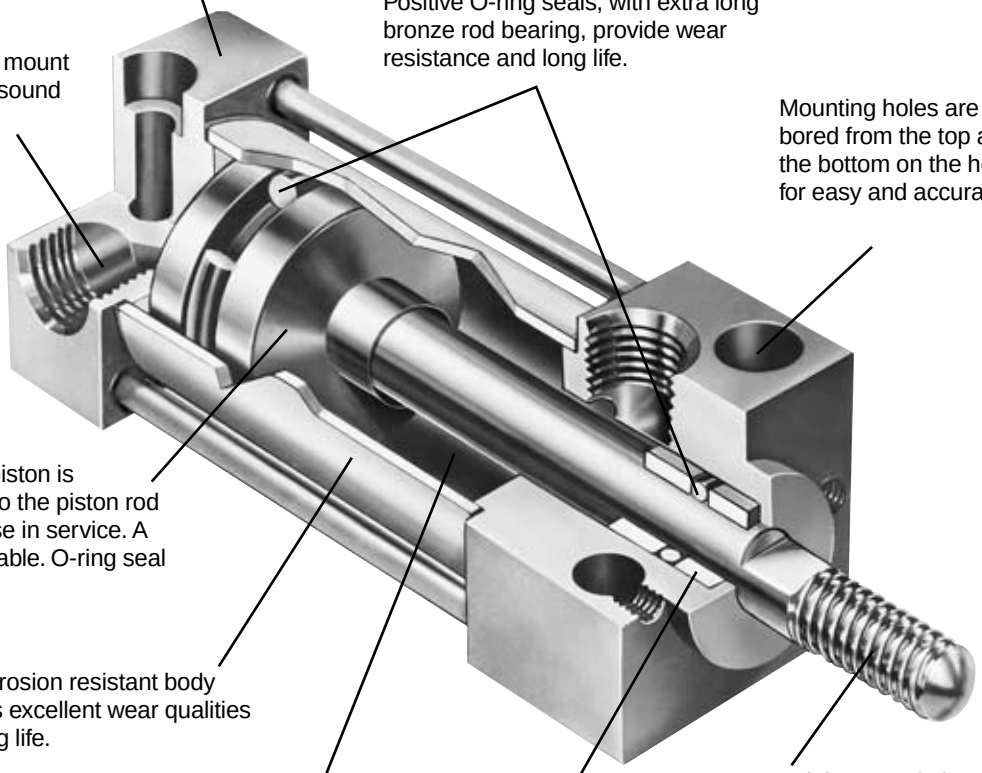
Additional clevis and flange attachments provide a mounting to meet every requirement. Nose mounted models are standard.

Square head and cap are made of precision machined steel for durable long lasting performance.

Positive O-ring seals, with extra long bronze rod bearing, provide wear resistance and long life.

The flush-type tie rod mount assembly provides a sound base for kit mounting.

Mounting holes are counter bored from the top and tapped at the bottom on the head and cap for easy and accurate mounting.



The one piece steel piston is permanently brazed to the piston rod so it cannot work loose in service. A lipseal design is available. O-ring seal is standard.

The corrosion resistant body ensures excellent wear qualities and long life.

Factory prelubricated for millions of maintenance free cycles.

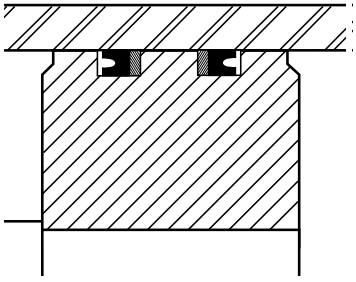
Stainless steel piston rod has a tough rust-proof construction for smooth operation and reliable performance.

Oil impregnated rod bushing is bronze, reamed to a close tolerance to ensure smooth operation and long life.

Availability

Double-acting Parker Universal Miniature Cylinders can be shipped from stock in 1/2", 1", 1-1/2", 2", 2-1/2" and 3" stroke lengths in all bore sizes. Universal Miniature Cylinders with other strokes up to 12” can be shipped within five days. Spring return cylinders are available from stock in 1" and 2" strokes in basic style USR (pressure to be applied at cap end). Other spring return models can be shipped within five days.

OPTIONAL FEATURE



Lipseal® Pistons

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How to Order S Series Cylinders

Each Parker S Series Cylinder is assigned a model number, which together with the bore size and stroke, is a coded description of the cylinder. The outline below shows all possible elements of such a model number, and explains the use of each. To order S Series Cylinders, specify Bore Size, Model Number and Stroke.

1-1/8"			U	S		U				1	6		2.000

Bore Size
3/4"
1"
1-1/8"
1-1/4"

Cushion Head End*
Blank No Cushion
C Cushion

Double Rod
Blank Single Rod
K Double Rod

Mounting Style
U Universal
N Nose Mounted

Lipseal Piston
Blank Std. Piston
L Lipseal Piston

Ports
U NPTF

Seals
Blank Buna-N
V Fluorocarbon

Spring
Blank No Spring
E Spring Extend
R Spring Return

Special Features
Use "S" only if special feature is required (specify).
Note: Do not use Symbol "S" for Rod End Modifications.

Rod Diameter No.
1 Standard
3 Oversize

Rod End Thread**
6 Standard
3 Special – specify KK, A and LA dimensions.

Cushion Cap End*
Blank No Cushion
C Cushion

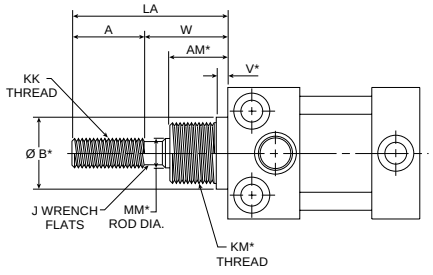
Stroke
Specify in inches.

* Note: Cushion will increase cylinder length by 1/2" each end. Cushions are fixed and non-adjustable.

** On a double-end rod cylinder where the two rod ends will be different, be sure to state clearly which rod end is to go at which end of the cylinder.

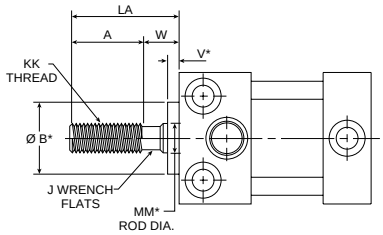
NOTE: Mounting attachments and accessories must be ordered separately. See accessories page for part numbers.

Nose Mounting Rod End Threads



*** Requires an S designation in model number.**

Universal Mounting Rod End Threads



*** Requires an S designation in model number.**

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Standard Specifications

- Nominal pressure – up to 200 PSI air service.
- Standard temperature -10°F to +165°F.
- Fluorocarbon seals (optional) for high temperature service -10°F to +250°F
- Standard construction – square head steel design.
- Stainless steel piston rod is provided as standard for smooth performance and long life.
- Fixed cushions are available on all bore sizes.
- Four bore sizes available: 3/4", 1", 1-1/8", 1-1/4" bores.
- Standard and oversize piston rods
- Factory pre-lubed.
- Rod bushing is oil impregnated bronze.
- Spring return and extend cylinders available.
- Multiple mounting styles available – front or bottom.
- Attachable mounting kits are available.
- Field-repairable.
- Strokes – available in any practical stroke length up to 12". For longer stroke length, consult the factory.

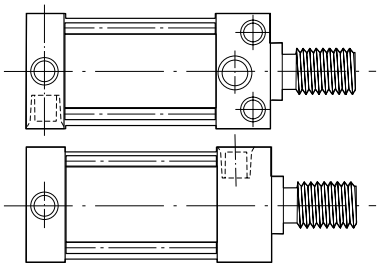
Force Data

To determine force, multiply your operating pressure by the area figures.

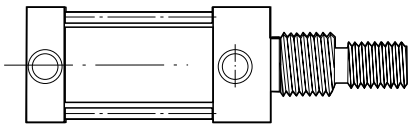
Bore	Rod Dia.	Major Area (Sq. In.)	Minor Area (Sq. In.)
3/4	STD. 1/4	0.442	0.393
	O.S. 5/16		0.365
1	STD. 5/16	0.785	0.709
	O.S. 3/8		0.675
1-1/8	STD. 3/8	0.994	0.884
	O.S. 1/2		0.799
1-1/4	STD. 3/8	1.227	1.117
	O.S. 1/2		1.031

Available Mounting Styles – Single Rod

Basic Style US
(Universal Mounting)

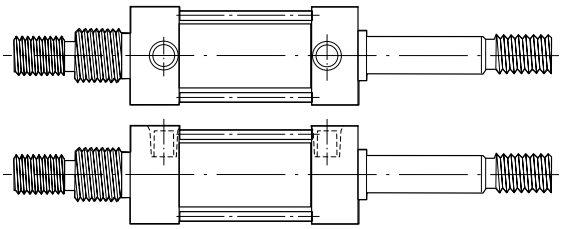


Basic Style NS
(Nose Mounting)

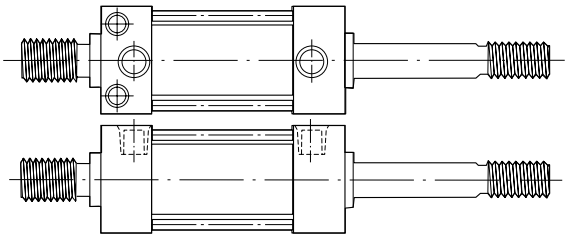


Available Mounting Styles – Double Rod

Style KNS Double Rod
(Nose Mounting)



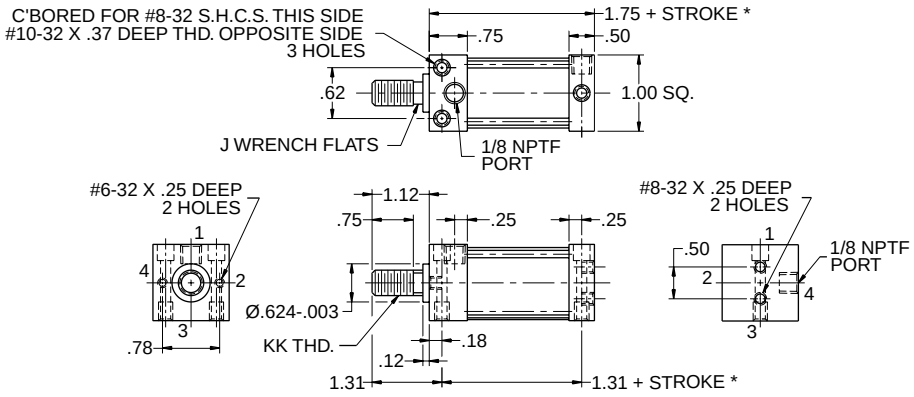
Style KUS Double Rod
(Universal Mounting)



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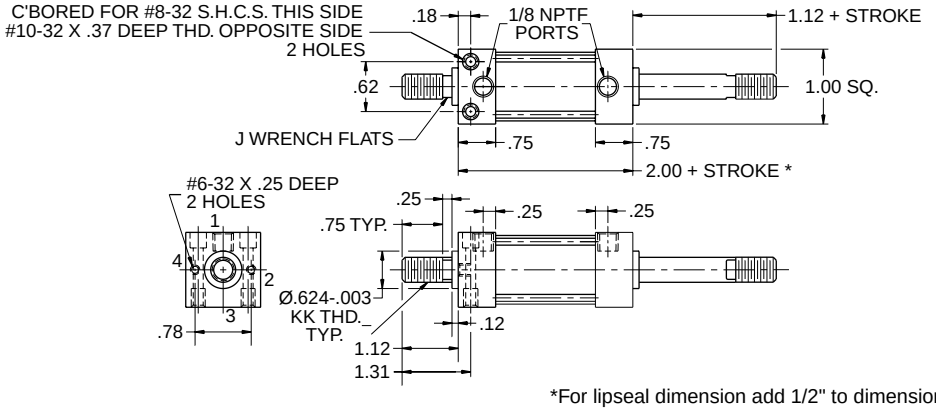
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Basic Style US
Universal Mounting



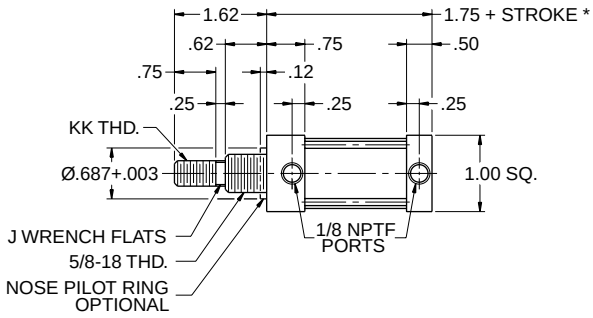
*For lipseal dimension add 1/2" to dimension shown.

Mounting Style KUS
Double Rod
Universal Mounting



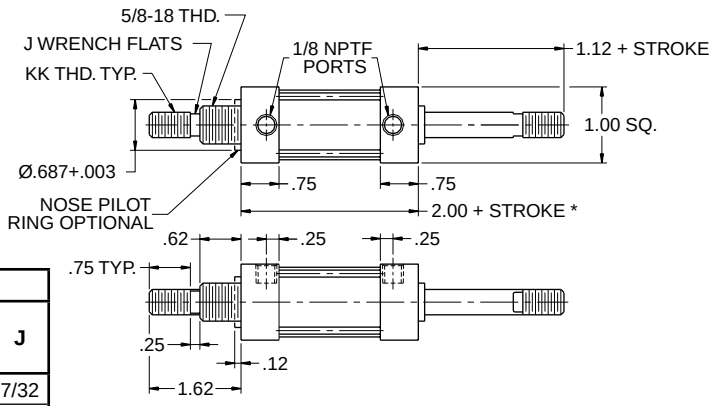
*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting



*For lipseal dimension add 1/2" to dimension shown.

Mounting Style KNS
Double Rod
Nose Mounting



*For lipseal dimension add 1/2" to dimension shown.

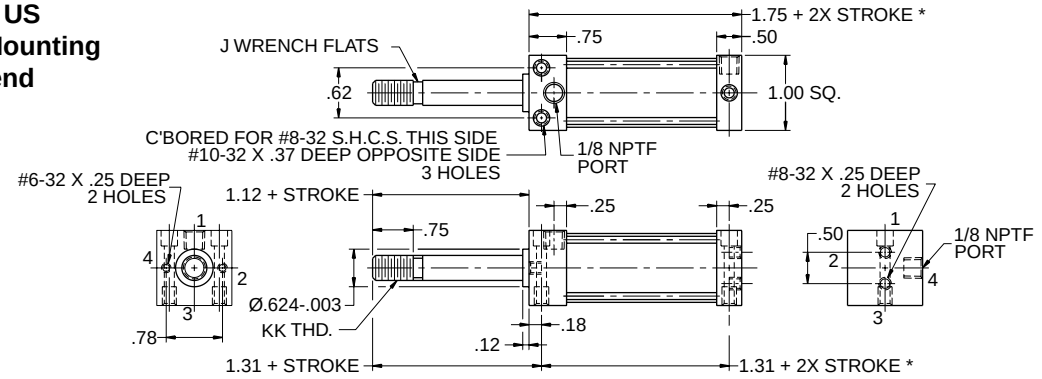
Rod End Dimensions				
Bore	Rod		Thd. KK Style 6	J
	No.	Dia.		
3/4"	1-Std.	1/4	1/4-20	7/32
	3-O.S.	5/16	5/16-18	1/4

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B

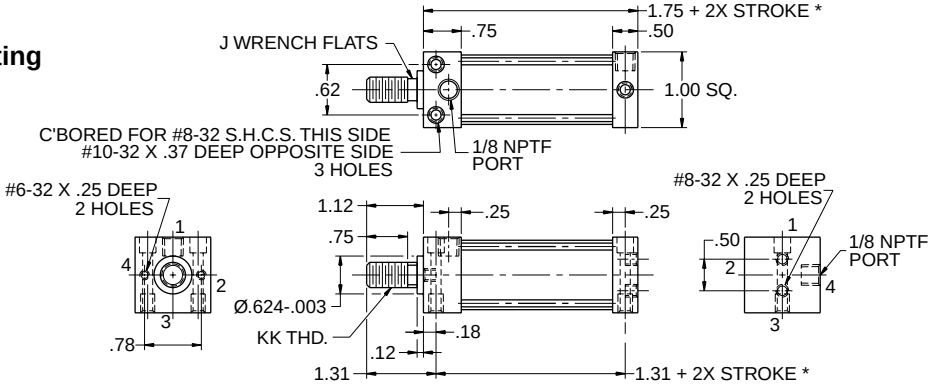
C086

Basic Style US
Universal Mounting
Spring Extend



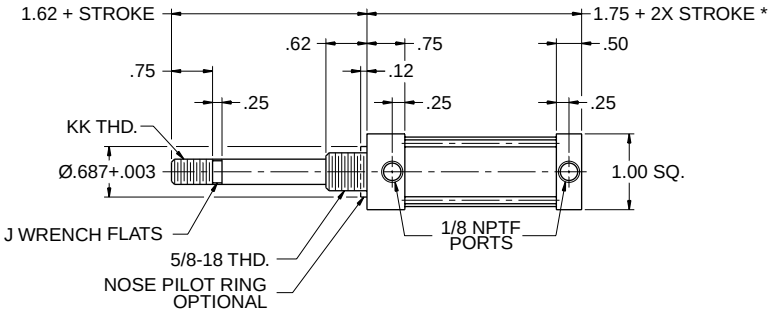
*For lipseal dimension add 1/2" to dimension shown.

Basic Style US
Universal Mounting
Spring Retract



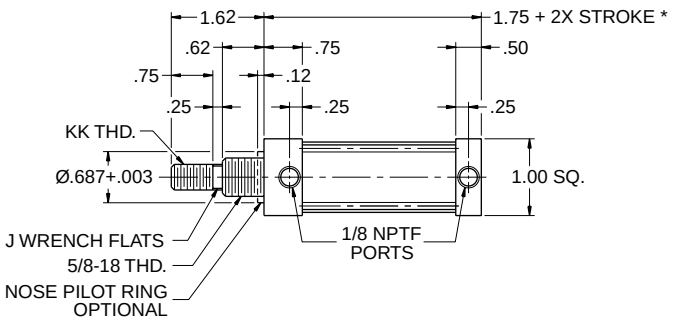
*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting
Spring Extend



*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting
Spring Retract



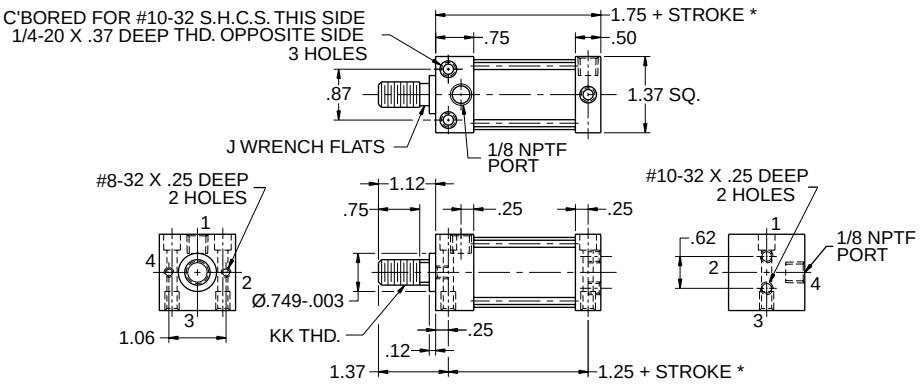
Rod End Dimensions				
Bore	Rod		Thd. KK Style 6	J
	No.	Dia.		
3/4"	1-Std.	1/4	1/4-20	7/32
	3-O.S.	5/16	5/16-18	1/4

*For lipseal dimension add 1/2" to dimension shown.

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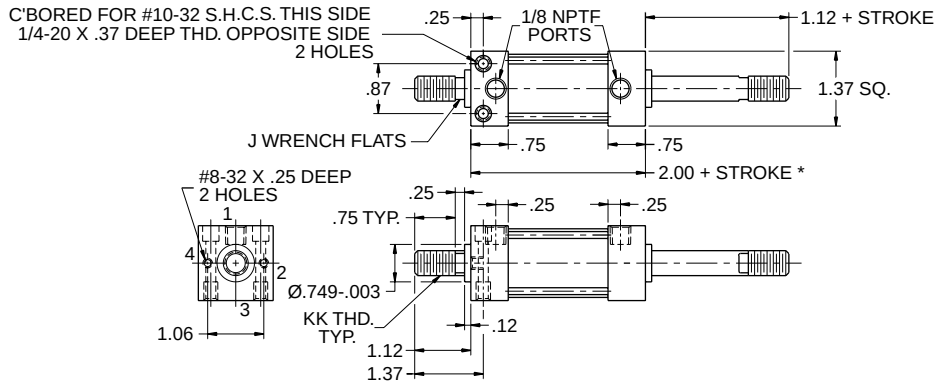
C086

Basic Style US
Universal Mounting



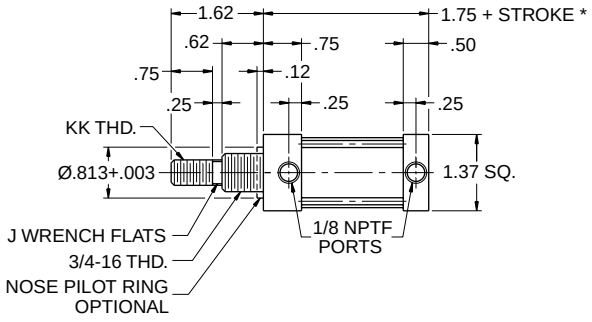
*For lipseal dimension add 1/2" to dimension shown.

Mounting Style KUS
Double Rod
Universal Mounting



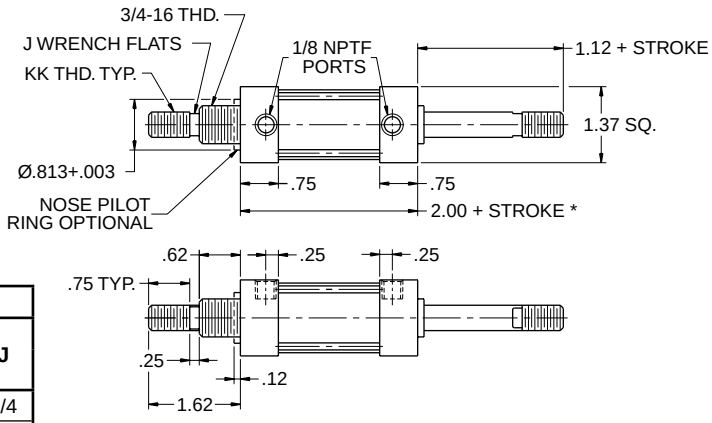
*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting



*For lipseal dimension add 1/2" to dimension shown.

Mounting Style KNS
Double Rod
Nose Mounting



*For lipseal dimension add 1/2" to dimension shown.

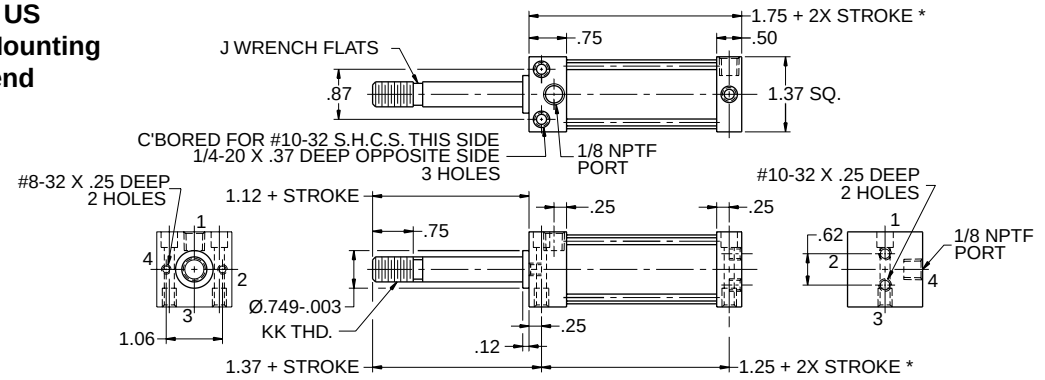
Rod End Dimensions				
Bore	Rod		Thd. KK Style 6	J
	No.	Dia.		
1"	1-Std.	5/16	5/16-18	1/4
	3-O.S.	3/8	3/8-24	5/16

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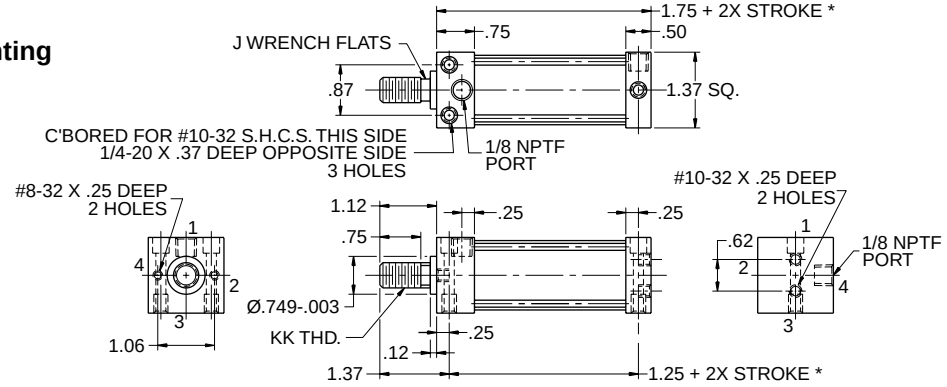
B

Basic Style US
Universal Mounting
Spring Extend



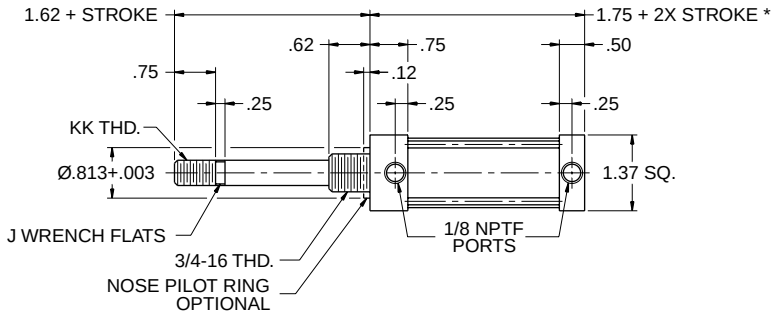
*For lipseal dimension add 1/2" to dimension shown.

Basic Style US
Universal Mounting
Spring Retract



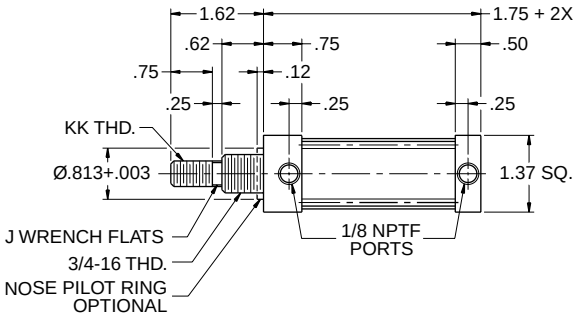
*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting
Spring Extend



*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting
Spring Retract



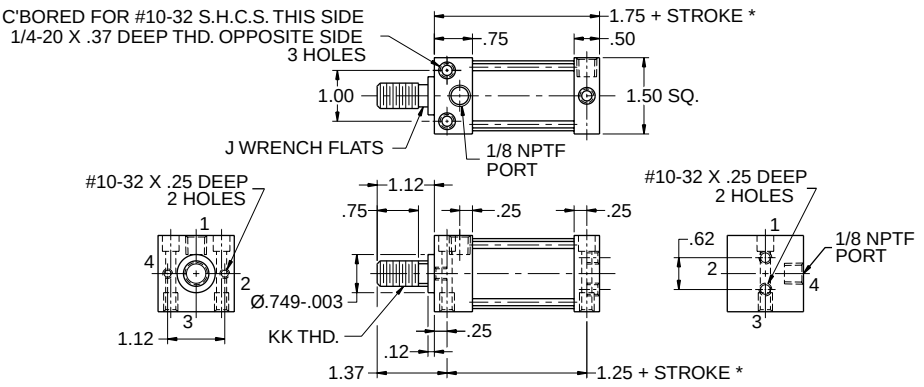
*For lipseal dimension add 1/2" to dimension shown.

Rod End Dimensions				
Bore	Rod		Thd. KK Style 6	J
	No.	Dia.		
1"	1-Std.	5/16	5/16-18	1/4
	3-O.S.	3/8	3/8-24	5/16

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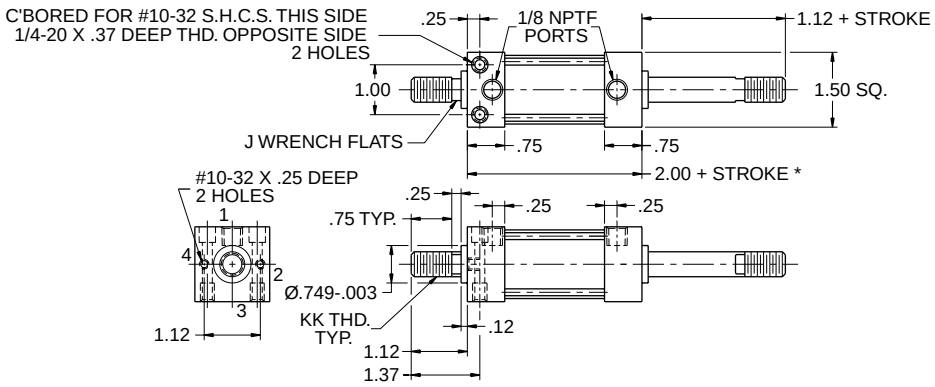
C086

Basic Style US
Universal Mounting



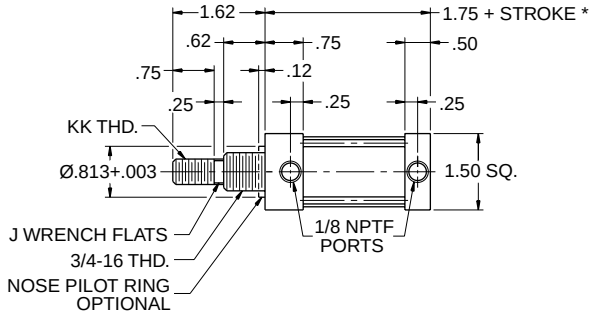
*For lipseal dimension add 1/2" to dimension shown.

Mounting Style KUS
Double Rod
Universal Mounting



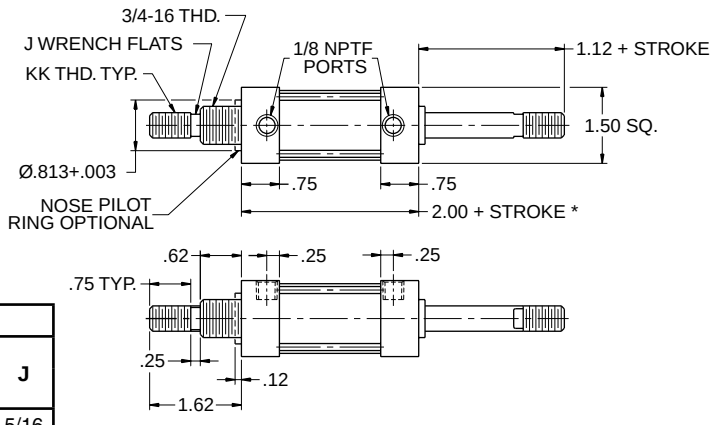
*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting



*For lipseal dimension add 1/2" to dimension shown.

Mounting Style KNS
Double Rod
Nose Mounting



*For lipseal dimension add 1/2" to dimension shown.

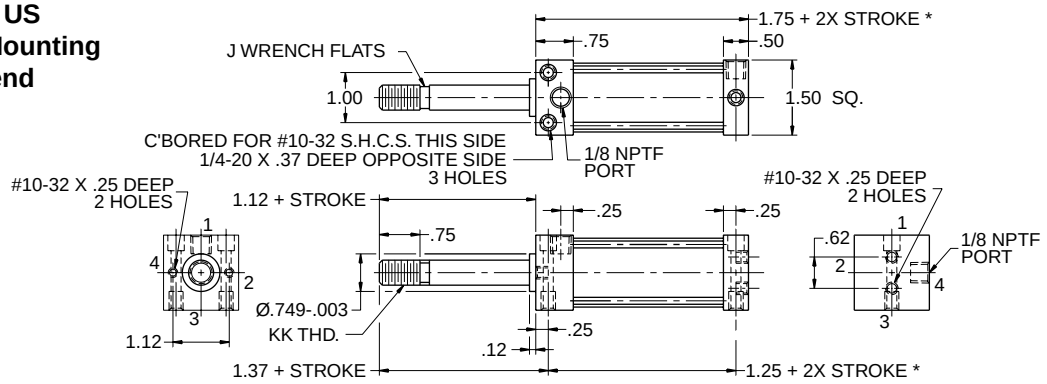
Rod End Dimensions				
Bore	Rod		Thd. KK Style 6	J
	No.	Dia.		
1-1/8"	1-Std.	3/8	3/8-24	5/16
	3-O.S.	1/2	1/2-20	7/16

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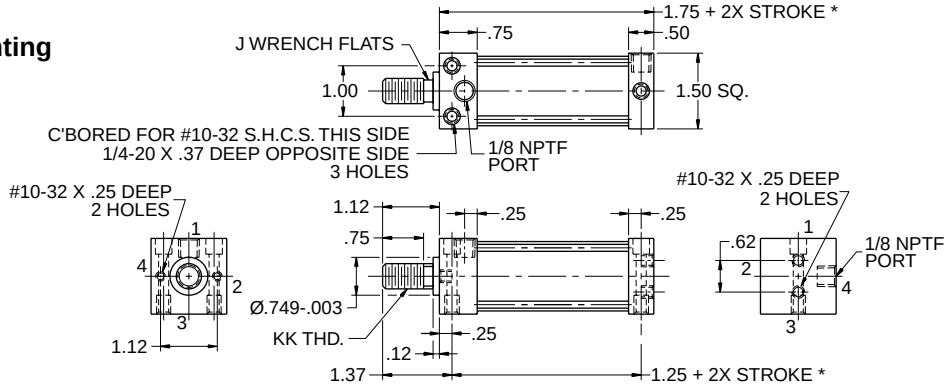
B

Basic Style US
Universal Mounting
Spring Extend



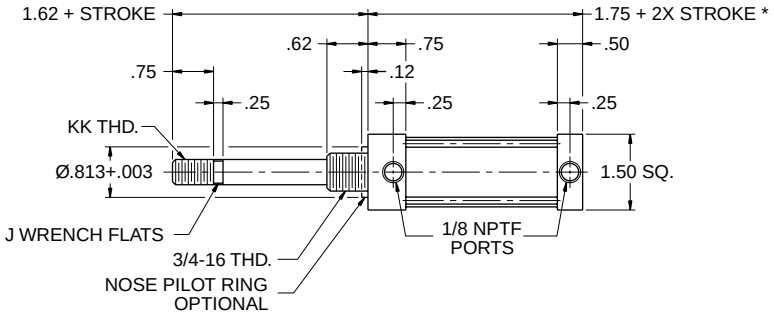
*For lipseal dimension add 1/2" to dimension shown.

Basic Style US
Universal Mounting
Spring Retract



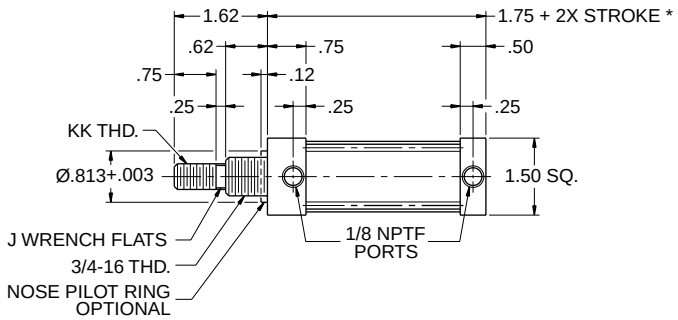
*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting
Spring Extend



*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting
Spring Retract



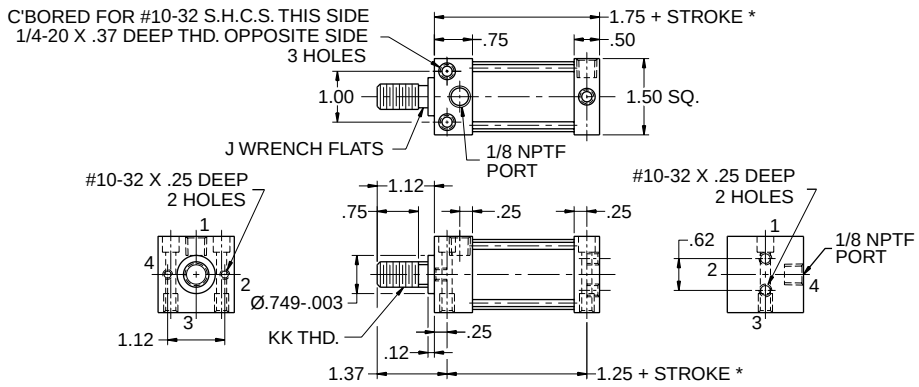
*For lipseal dimension add 1/2" to dimension shown.

Rod End Dimensions				
Bore	Rod		Thd. KK Style 6	J
	No.	Dia.		
1-1/8"	1-Std.	3/8	3/8-24	5/16
	3-O.S.	1/2	1/2-20	7/16

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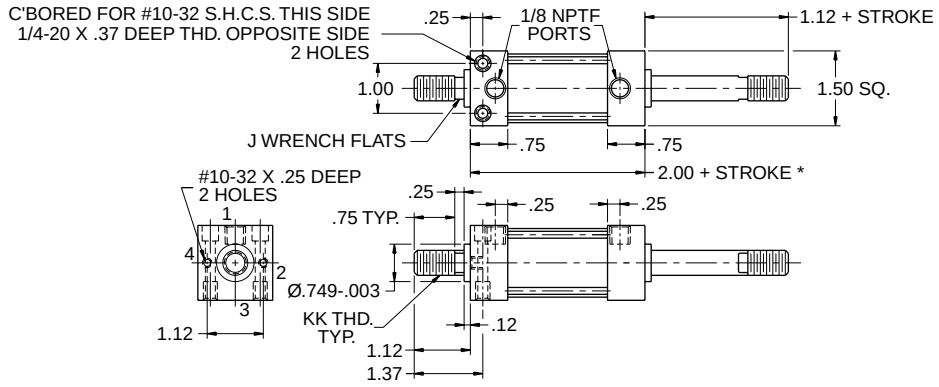
C086

Basic Style US
Universal Mounting



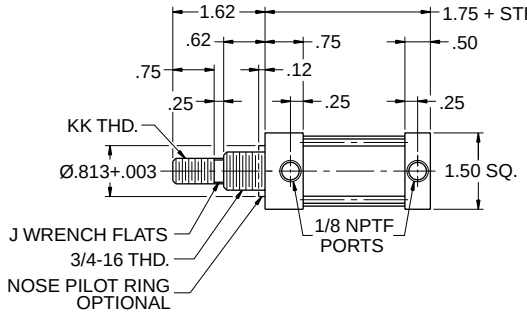
*For lipseal dimension add 1/2" to dimension shown.

Mounting Style KUS
Double Rod
Universal Mounting



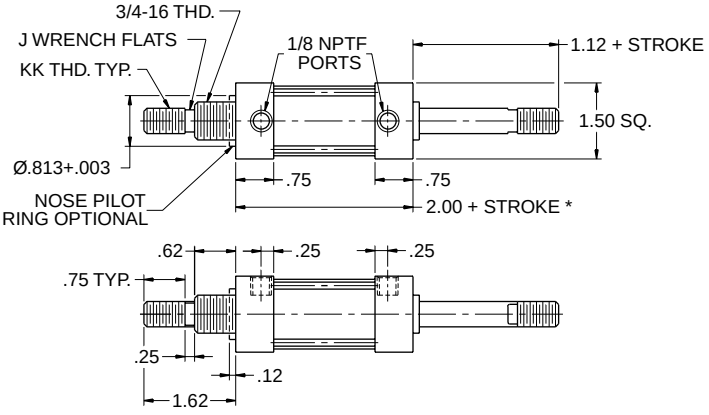
*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting



*For lipseal dimension add 1/2" to dimension shown.

Mounting Style KNS
Double Rod
Nose Mounting



*For lipseal dimension add 1/2" to dimension shown.

Rod End Dimensions				
Bore	Rod		Thd. KK	J
	No.	Dia.	Style 6	
1-1/4"	1-Std.	3/8	3/8-24	5/16
	3-O.S.	1/2	1/2-20	7/16

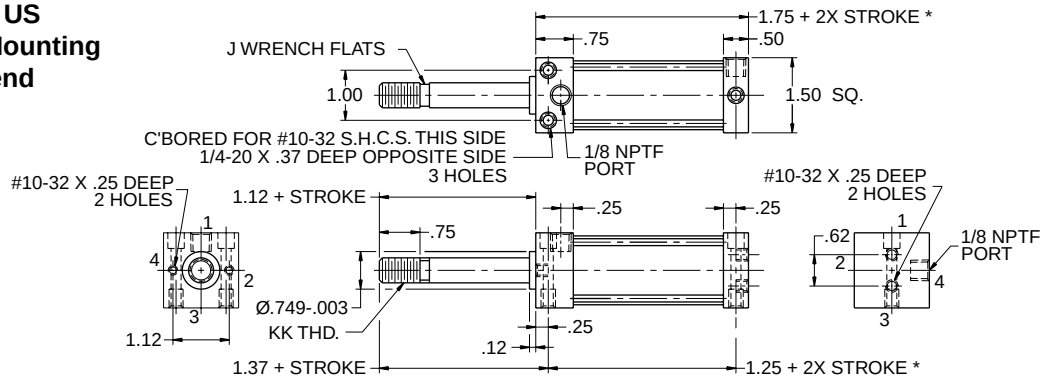
Note: Oversize rods shown are maximum size allowable.

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B

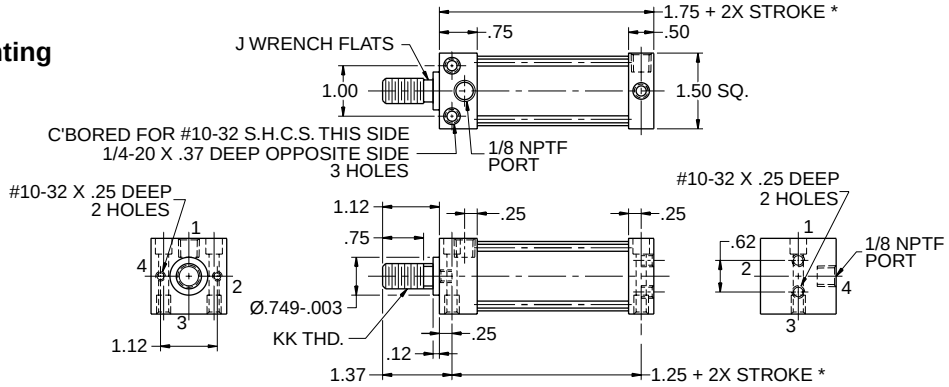
C086

Basic Style US
Universal Mounting
Spring Extend



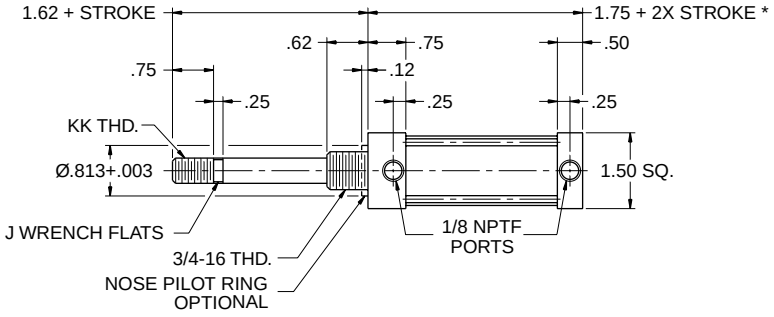
*For lipseal dimension add 1/2" to dimension shown.

Basic Style US
Universal Mounting
Spring Retract



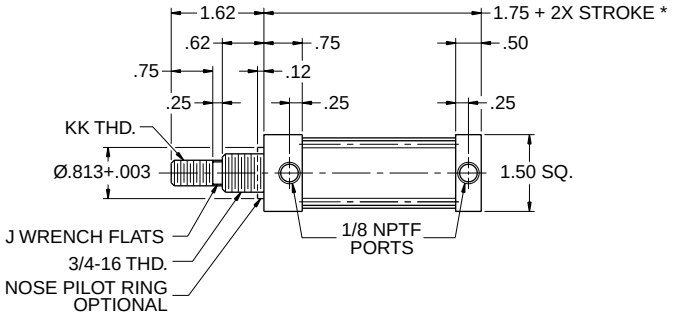
*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting
Spring Extend



*For lipseal dimension add 1/2" to dimension shown.

Basic Style NS
Nose Mounting
Spring Retract



*For lipseal dimension add 1/2" to dimension shown.

Rod End Dimensions				
Bore	Rod		Thd. KK Style 6	J
	No.	Dia.		
1-1/4"	1-Std.	3/8	3/8-24	5/16
	3-O.S.	1/2	1/2-20	7/16

Note: Oversize rods shown are maximum size allowable.

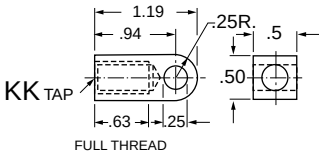
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Accessories

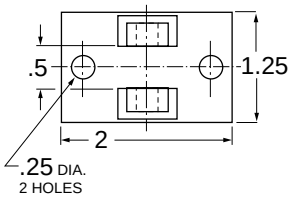
Rod Eye (Knuckle)

Rod Eyes (Rod End Knuckles) are available to fit standard S Series Rod Ends. To order, specify part name and number.

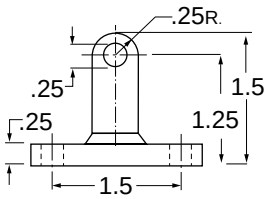


Clevis Bracket

Clevis Brackets to fit the Type B Clevis Mounting Attachment and also the Rod Eyes are available. Pivot pin is furnished with the bracket. To order, specify part name and number.



Note: Mounting attachments or accessories may be ordered separately for use with S Series cylinders. Specify by part name and number.



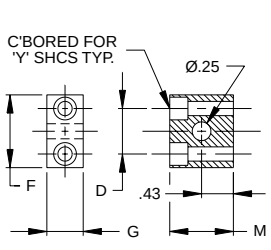
Bore	Rod No.	Rod Dia.	Part Numbers		
			Rod Eye	Clevis Bracket	Nose Ring
3/4	1-STD.	1/4	0179270000	0179300000	0179320000
	3-O.S.	5/16	0179280000		
1	1-STD.	5/16	0179280000	0179300000	0179330000
	3-O.S.	3/8	0179290000		
1-1/8	1-STD.	3/8	0179290000	0179300000	0179330000
	3-O.S.	1/2	–		
1-1/4	1-STD.	3/8	0179290000	0179300000	0179330000
	3-O.S.	1/2	–		

Bore	Rod No.	Rod Dia.	Part Numbers		
			B Clevis	H Flange	J Flange
3/4	1-STD.	1/4	0179180000	0179210000	0179240000
	3-O.S.	5/16			
1	1-STD.	5/16	0179190000	0179220000	0179250000
	3-O.S.	3/8			
1-1/8	1-STD.	3/8	0179190000	0179230000	0179260000
	3-O.S.	1/2			
1-1/4	1-STD.	3/8	0179190000	0179230000	0179260000
	3-O.S.	1/2			

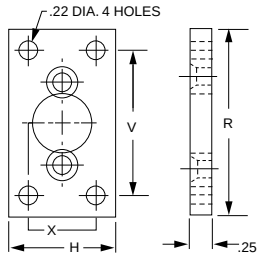
Mounting Kits

Dimensions

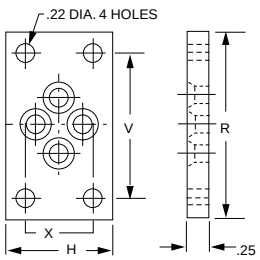
Symbol	Bore Size			
	3/4"	1"	1-1/8"	1-1/4"
D	0.50	0.62	0.62	0.62
F	0.81	1.00	1.00	1.00
G	0.37	0.50	0.50	0.50
H	1.00	1.38	1.50	1.50
M	0.75	0.87	0.87	0.87
R	2.00	2.37	2.50	2.50
V	1.50	1.87	2.00	2.00
X	0.50	0.87	1.00	1.00
Y	8-32	10-32	10-32	10-32



Type B Clevis
(Cap End)
Mounting



Type J Flange
(Head End)
Mounting



Type H Flange
(Cap End)
Mounting

NOTE: Mounting attachments, together with their mounting screws, are bagged and packed loose in the cylinder carton for assembly at time of cylinder installation. To order, specify part name and number.

Right Angle Flow Controls

Available mounted to the cylinder or packaged with your cylinder.

#1 – Brass with threaded NPT threads.

#2 – Presto-Lok with an internal grab ring for use on plastic or soft metal piping.

Model #	Thread	Tube Size
32510125	1/8 NPT	–
L073910012	1/8 NPT Includes Barbed Fitting	–
32511215	1/8 NPT	5/32
32511225	1/8 NPT	1/4

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Bore Size	Rod Dia.	Rod No.	Seal Kits (Standard Seals) Contains: Piston seals, Rod seals & End seals for single rod cylinders.*		"Cushion Kits (Standard Seals)"
			"O-Ring type Piston"	"Lipseal type Piston"	"Includes seals for one end only. Order 2 kits for cushioned both ends"
			Part No.	Part No.	Part No.
3/4"	1/4"	1	SK0075S025	SKL075S025	CK0075S025
	5/16"	3	SK0075S031	SKL075S031	CK0075S031
1"	5/16"	1	SK0100S031	SKL100S031	CK0100S031
	3/8"	3	SK0100S037	SKL100S037	CK0100S037
1 1/8"	3/8"	1	SK0112S037	SKL112S037	CK0112S037
	1/2"	3	SK0112S050	SKL112S050	CK0112S050
1 1/4"	3/8"	1	SK0125S037	SKL125S037	CK0125S037
	1/2"	3	SK0125S050	SKL125S050	CK0125S050

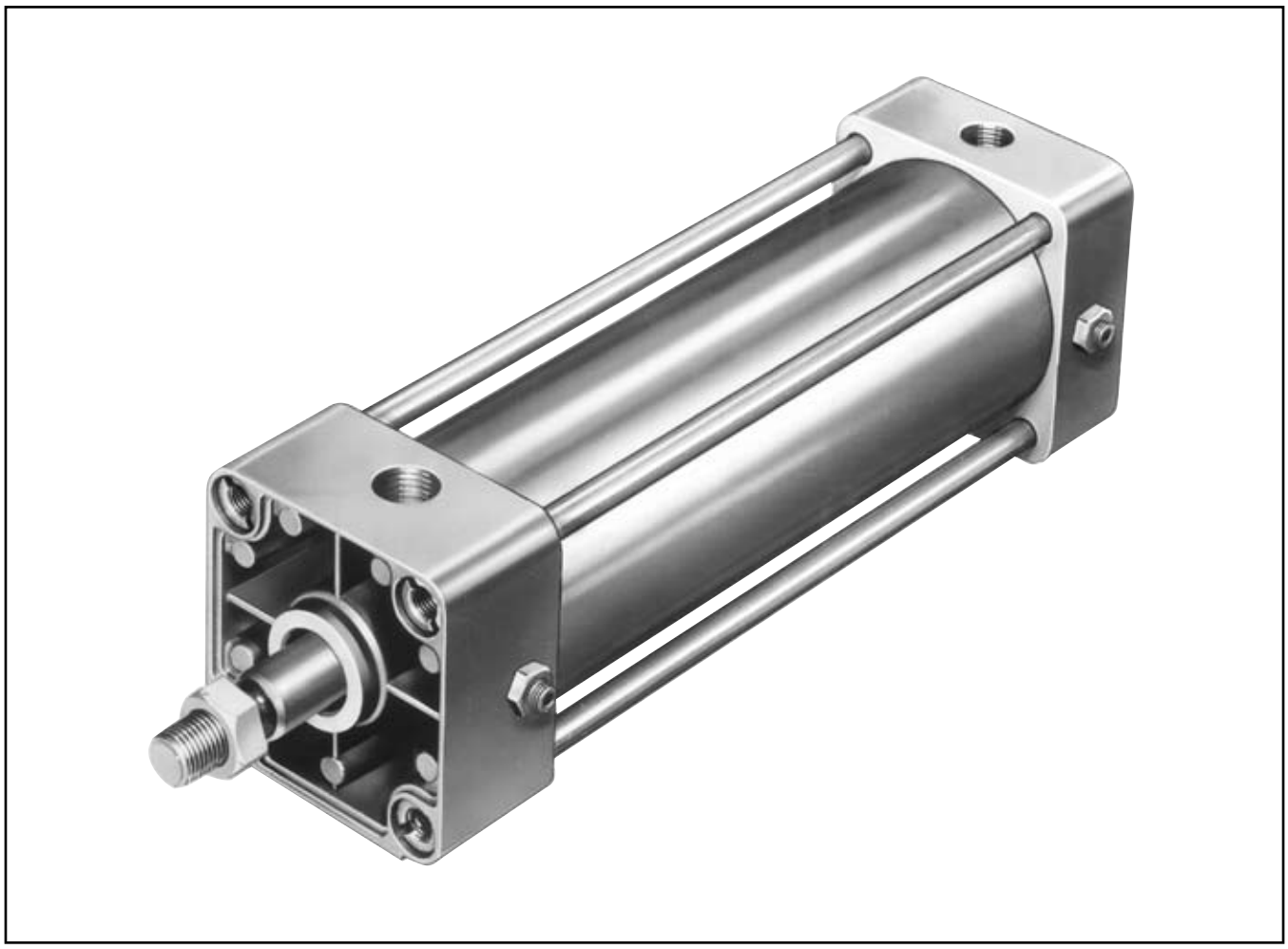
Bore Size	Rod Dia.	Rod No.	Seal Kits (Fluorocarbon Seals) Contains: Piston seals, Rod seals & End seals for single rod cylinders.*		"Cushion Kits (Fluorocarbon Seals)"
			"O-Ring type Piston"	"Lipseal type Piston"	"Includes seals for one end only. Order 2 kits for cushioned both ends"
			Part No.	Part No.	Part No.
3/4"	1/4"	1	SK0075SV25	SKL075SV25	CK0075SV25
	5/16"	3	SK0075SV31	SKL075SV31	CK0075SV31
1"	5/16"	1	SK0100SV31	SKL100SV31	CK0100SV31
	3/8"	3	SK0100SV37	SKL100SV37	CK0100SV37
1 1/8"	3/8"	1	SK0112SV37	SKL112SV37	CK0112SV37
	1/2"	3	SK0112SV50	SKL112SV50	CK0112SV50
1 1/4"	3/8"	1	SK0125SV37	SKL125SV37	CK0125SV37
	1/2"	3	SK0125SV50	SKL125SV50	CK0125SV50

* For double rod cylinder seal kits, consult factory.

** Order 2 kits for cushioned ends.

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Pneumatic Division
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C Series
Medium Duty Air Cylinders

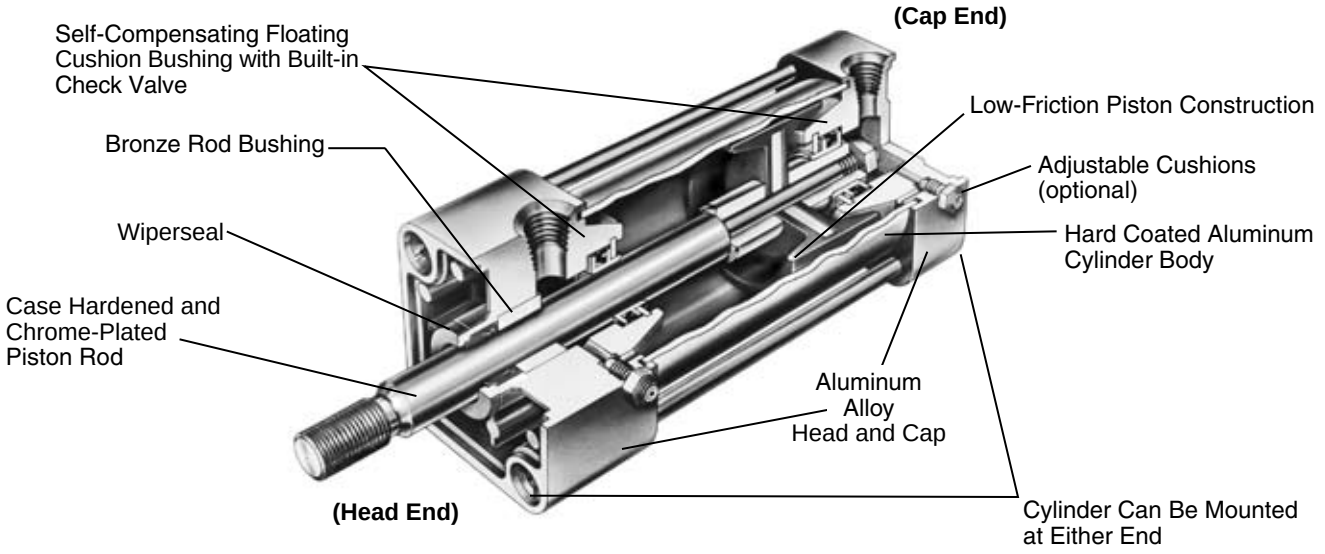


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Service Kits B161

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B



Parker C Series Cylinders

Parker C Series cylinders are designed for the budget conscious user who demands a high-quality cylinder. Advanced manufacturing processes provide a cylinder that ensures long-term performance at an affordable price.

Innovative Design

C Series cylinders incorporate many innovative design features, such as:

- "Wiperseal" rod seal minimizes the possibility of leakage, while keeping contamination out.
- Oil impregnated, bronze rod bushing provides maximum bearing area and a non-abrasive surface for long service life.
- Synthetic rubber coated piston is designed to compensate for wear, eliminating metal-to-metal contact.
- Fully adjustable, floating cushions offer an efficient means of decelerating heavy loads.
- Modular design offers flexibility by providing three different mounting options with the basic cylinder. In addition to this, four different mounting kits can be bolted on quickly and easily.

In line with our policy of continuing product improvements, specifications in this catalog are subject to change.

Specifications

Bore Sizes: 1-1/4", 1-3/4", 2-1/2", 3-5/8", and 4-1/2"

Strokes: Available in any practical stroke length, with a maximum stroke of 20" standard. For longer stroke lengths, consult the Actuator Division.

Operating Pressure: 200 PSI Air Maximum

Operating Temperature: -4° to +165°F for optimal service life. C Series cylinders can be operated up to 200°F with reduced service life.

Spring Extend & Spring Return Models: Can be supplied upon request. LB and LD dimensions may increase in length. For specific dimensional information on spring return or spring extend cylinders, consult the Actuator Division.

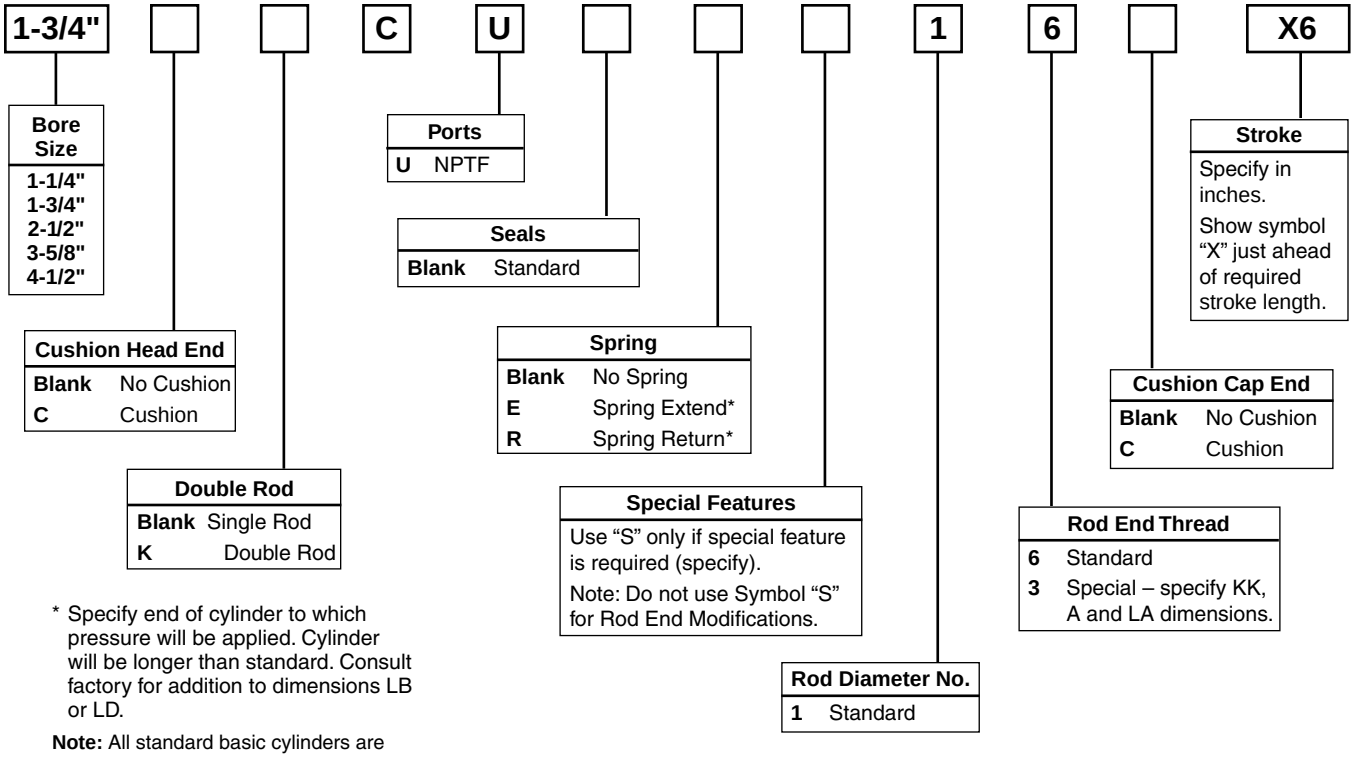
Force Data: To determine force, multiply your air pressure by these area figures:

Bore	Cap End Major Area	Head End Minor Area
1-1/4"	1.23 sq. in.	1.03 sq. in.
1-3/4"	2.40 sq. in.	2.10 sq. in.
2-1/2"	4.91 sq. in.	4.60 sq. in.
3-5/8"	10.32 sq. in.	9.54 sq. in.
4-1/2"	15.90 sq. in.	15.12 sq. in.

Prelubrication
C Series air cylinders are factory pre-lubricated. Parker Lube-A-Cyl is applied to cylinder bore, piston rod and seals. Lube-A-Cyl is an extreme pressure lubricant which adheres to the surfaces and for medium duty service, additional lubrication is not necessary.

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How to Order Parker C Series Cylinders



* Specify end of cylinder to which pressure will be applied. Cylinder will be longer than standard. Consult factory for addition to dimensions LB or LD.

Note: All standard basic cylinders are furnished with a jam nut on the piston rod.

Specify the following:

- Basic Model Number
- Mounting Kits (if required) – specify kit numbers
- Rod End Accessory Kits (if required) – specify kit number
- Quantities
- Desired Delivery Date

Mounting Kit Numbers

Bore Size	Part Numbers			
	End Lugs Head & Cap Set of 4	Rectangular Flange Head or Cap End	Detachable Clevis* (Cap End)	Detachable Eye (Cap End)
1-1/4"	L-4501	L-4506	L-4511	L-4516
1-3/4"	L-4502	L-4507	L-4512	L-4517
2-1/2"	L-4503	L-4508	L-4513	L-4518
3-5/8"	L-4504	L-4509	L-4514	L-4519
4-1/2"	L-4505	L-4510	L-4515	L-4520

* Furnished complete with pivot pin and cotter pin.
Mounting Kits include fasteners for attaching to basic cylinders.

Rod End Accessory Kit Numbers

Bore Size	Part Numbers		
	Long Clevis* (Female)	Short Clevis* (Female)	Rod Button
1-1/4"	L-4521	L-4523	18153
1-3/4"	L-4522	L-4524	18154
2-1/2"	L-4522	L-4524	18154
3-5/8"	–	L-4525	74718
4-1/2"	–	L-4525	74718

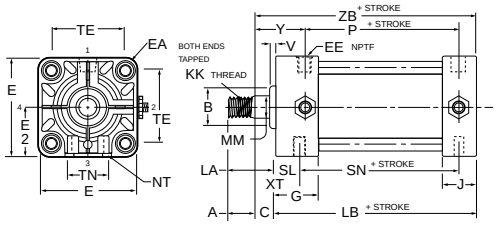
* Furnished complete with pivot pin and cotter pin.

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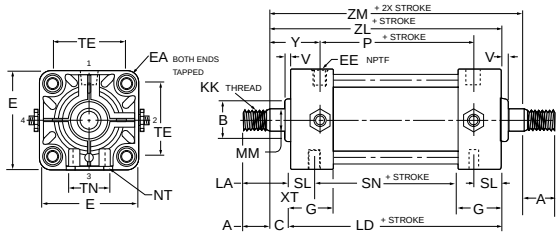
B

Symbol	Bore Size				
	1-1/4"	1-3/4"	2-1/2"	3-5/8"	4-1/2"
A	1	1	1	1-5/8	1-5/8
B +0.000 -0.005	0.999	1.124	1.124	1.749	1.749
BD	7/8	7/8	7/8	7/8	1-7/8
BE	6	6	6	7-7/8	7-7/8
BF	5/8	5/8	5/8	1-1/4	1-1/4
BG	1-1/2	1-1/2	1-1/2	2-1/2	2-1/2
BH	7/8	7/8	7/8	1-3/8	1-3/8
BJ	3/4	3/4	3/4	1-1/8	1-1/8
C	9/16	5/8	5/8	1	1
CB	1/4	1/2	1/2	3/4	3/4
CD	3/8	1/2	1/2	3/4	3/4
CE	1-1/16	1-3/16	1-3/16	2-1/4	2-1/4
CH	1/4	9/32	9/32	–	–
CJ	1/2	9/16	9/16	–	–
CK	1-39/64	1-37/64	1-37/64	–	–
CM	23/32	13/16	13/16	–	–
CN	2-7/8	3	3	–	–
CP	7/16	1/2	1/2	–	–
CQ	13/16	15/16	15/16	–	–
CR	1/4	5/16	5/16	5/8	5/8
CW	1/4	5/16	5/16	7/16	7/16
E	1-3/4	2-1/4	2-7/8	4	5
EA	1/4-28	5/16-24	5/16-24	3/8-24	1/2-20
EB	9/32	3/8	3/8	7/16	9/16
EE	1/4	1/4	1/4	1/2	1/2
EL	7/16	7/16	3/8	11/16	3/4
EO	5/16	5/16	3/8	7/16	1/2
ET	9/16	5/8	11/16	1	1-1/8
EW	1/4	1/2	1/2	3/4	3/4
F	3/8	1/2	1/2	3/4	3/4
FB	9/32	3/8	3/8	7/16	9/16
FL	1	1-1/4	1-1/2	1-7/8	2-1/4
G	1-3/4	1-3/4	1-7/16	2	1-29/32
J	1-1/8	1-1/8	1-1/16	1-1/2	1-13/32
KK	7/16-20	1/2-20	1/2-20	7/8-14	7/8-14
L	9/16	5/8	5/8	1-1/8	1-1/8
LA	1-9/16	1-5/8	1-5/8	2-5/8	2-5/8
LB	3-13/16	3-31/32	3-21/32	4-29/32	4-15/16
LD	4-7/16	4-19/32	4-1/32	5-13/32	5-7/16
MM	1/2	5/8	5/8	1	1
MR	1/2	1/2	9/16	7/8	1
NT	10-24 x 1/4	5/16-18 x 3/8	5/16-18 x 1/2	3/8-16 x 1	5/8-11 x 1-1/4
P	2-7/16	2-19/32	2-5/32	2-25/32	2-7/8
R	1.18	1.62	2.18	3.00	3.87
SL	1-1/8	1-1/8	15/16	1-5/16	1-9/32
SN	2-3/16	2-11/32	2-5/32	2-25/32	2-7/8
TE	1.18	1.62	2.18	3.00	3.87
TF	2-3/8	3	3-9/16	4-7/8	6-1/8
TN	5/8	11/16	1-1/4	1-3/4	2-1/4
UF	2-7/8	3-5/8	4-1/8	5-5/8	7-1/8
UL	1-3/4	2-1/4	2-7/8	4	5
V	1/8	1/8	1/8	3/16	3/16
W	3/16	1/8	1/8	1/4	1/4
XT	1-11/16	1-3/4	1-9/16	2-5/16	2-9/32
Y	1-9/16	1-5/8	1-9/16	2-5/16	2-9/32
ZB	4-3/8	4-19/32	4-9/32	5-29/32	5-15/16
ZL	5	5-7/32	4-21/32	6-13/32	6-7/16
ZM	5-9/16	5-27/32	5-9/32	7-13/32	7-7/16

Single Rod End Cylinders



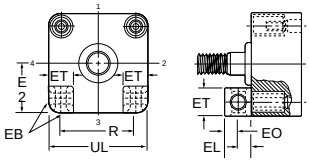
Double Rod End Cylinders



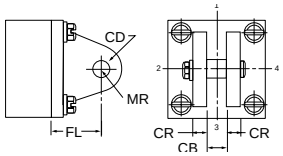
Mounting Kits

Mountings are available in packaged kits. Detachable Clevis is furnished with pivot and cotter pins. See Ordering Information page for Kit Numbers.

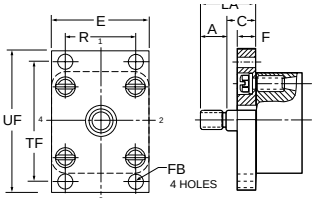
End Lugs (Head and Cap)



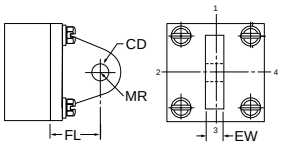
Detachable Clevis (Cap End)



Rectangular Flange (Head End)



Detachable Eye (Cap End)

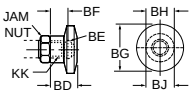


Detachable Clevis and Detachable Eye are mating parts that provide for mounting of cylinder to a structural member.

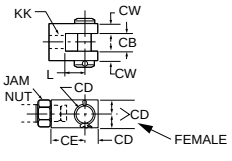
Rod End Accessories

Accessories are available packaged separately. Clevis furnished complete with pivot and cotter pins. See Ordering Information page for Kit Numbers.

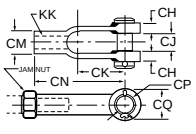
Rod Button



Short Clevis (Female)



Long Clevis (Female)



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	Bore Size				
	1-1/4"	**1-3/4"**	**2-1/2"**	**3-5/8"**	**4-1/2"**
Complete Cylinder Seal Kit	SK1200C051	SK1700C061	SK2500C061	SK3600C101	SK4500C101
Cushion Kit - Head End	CH1200C001	CH1700C001	CH2500C001	CC3600C001	CC4500C001
Cushion Kit - Head End	CC1200C001	CC1700C001	CC2500C001	CC3600C001	CC4500C001

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ISO Pneumatic Cylinders

Section C



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Section C – ISO Pneumatic Cylinders

ISO / VDMA Tie Rod Cylinders

P1D Series

- Conforms to ISO 6431/ISO15552/VDMA 24562
- Flexible Design With 3 Major Versions (Standard, Clean, and Removable Gland)
- Standard Version – Performance at an Affordable Price
- Removable Gland Version – Performance, Ease of Maintenance and Customization at all Bore Sizes
- Clean Version – For Applications Requiring High Cleanliness and Sanitary Standards
- Rod Lock Options Available
- 10 Bar (145 PSI) Air Service

Mini-ISO Cylinders

P1A Series (Non-Repairable)

- Conforms to ISO 6432 and CETOP RP52P Standards
- Stainless Steel Body with Black Anodized Aluminum End Caps
- Stainless Steel Piston Rod
- Magnetic Piston and Bumpers Standard
- 5 Bore Sizes, 10mm through 25mm
- 10 Bar (145 PSI) Air Service

Also in the Guided Cylinders Section:

P5E Series

- Low Profile Guided Assembly
- Powered by the P1D Cylinder
- Bore Sizes 32, 40, 50, 63, 80 and 100mm
- Rod Lock Options Available
- 10 Bar (145 PSI) Air Service

HB Series

- Medium Duty to Extremely Heavy Duty Linear Motion
- Powered by the P1D Cylinder
- Bore Sizes 40, 50, and 63mm
- Rod Lock Options Available
- 10 Bar (145 PSI) Air Service with Other Options Available

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P1D Series

ISO 6431 / ISO 15552 / VDMA 24562
Pneumatic Cylinders



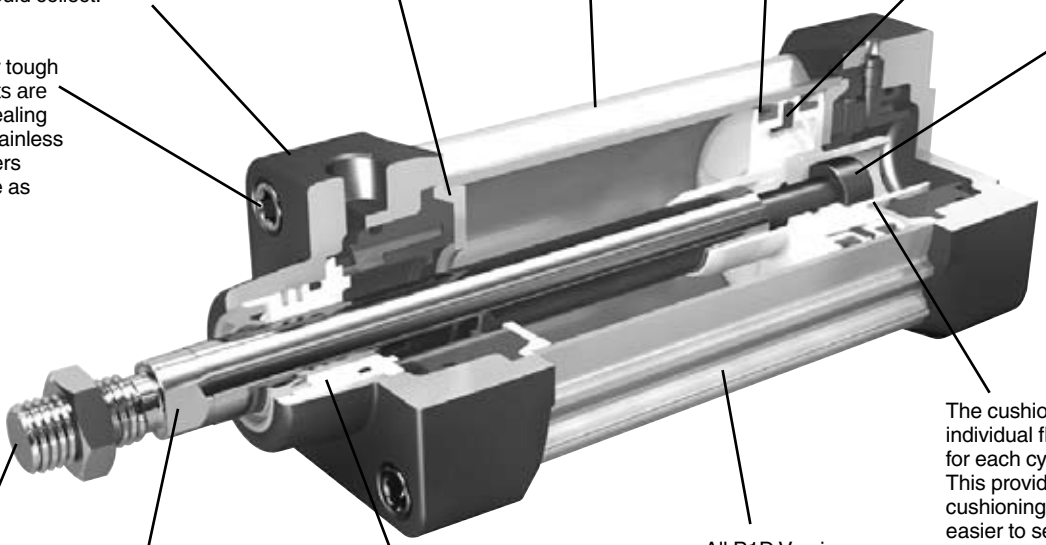
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C086

P1D Standard Version



P1D Standard Version

P1D Standard Version cylinders are available in 32-125mm bores and utilize internal composite technology to save weight, while assuring the high performance and functionality expected of ISO cylinders. Cushions and bumpers at both ends and a magnetic piston are included as standard. The Standard Version serves all markets where performance at an affordable price is desired.

International standards
The new P1D Series complies with the current ISO 6431, ISO/DIS 15552, VDMA 24562 and AFNOR installation dimensional standards for customer reassurance world-wide.

Mechanically protected sensor technology
The body extrusion has recessed sensor grooves on three sides of the cylinder. The new Global Sensors drop into the sensor groove quickly and easily. Both the cable and the sensor are protected. Choose a sensor in a variety of cable lengths and with flying leads, 8mm connector or 12mm connector.

Optimized cushioning
Thanks to the plastic inserts in the end covers, each cylinder bore has been given individual flow geometry. This provides optimized cushioning, which is quicker and easier to set and adjust.

Smooth, quiet operation and long service life
All seals and end-of-stroke bumpers are made from polyurethane (PUR), the bearings and piston are made from proven engineering plastics with excellent bearing properties and all cylinders are greased at the factory with a transparent, food-grade grease. Altogether, this gives the P1D Series very long service life and smooth, quiet operation.

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P1D Removable Gland Version

P1D Removable Gland Version cylinders are available in 32-200mm bores and utilize bar stock endcaps and a removable high-strength bronze bearing for traditional and custom applications. The bronze bearing assembly is externally removable for quick and easy maintenance. No other ISO cylinder manufacturer in the world produces a Removable Gland Version and meets these demands. This version covers all applications which require performance and customization at all bore sizes.

Removable Gland
An extra-long inboard bearing surface ensures lubrication from within the cylinder. Outboard of the bearing are two leak-proof seals. The rod wiper seal wipes away any dirt on the rod. This means less wear on bearing surfaces and internal parts. The result is positive, no-leak sealing, regardless of conditions. And with the famous Parker removable style gland, you can replace the rod seals and/or bearings when necessary without disassembling the rest of the cylinder and without the need of any special wrenches.

Aluminum Piston Option
For high temperature applications, an aluminum piston is available with fluorocarbon seals. The piston is threaded onto the piston rod and secured in place with anaerobic adhesive which is temperature sensitive. For applications above +121°C (+250°F) specify a pinned piston to rod connection. The polyurethane seals that are standard on the nylon piston are also an available option with the aluminum piston. The magnet that is cleverly hidden underneath the wear-band is also a standard feature on the aluminum piston. The durable wear-band prevents any metal-to-metal contact between the piston and the cylinder body wall increasing the overall life of the cylinder.

Machined End Caps with Captive Cushion Screw Adjustment
The end caps are made of precision lightweight aluminum. This allows for maximum flexibility and quick manufacturing for any customization that is required. The end caps also feature a captive cushion needle valve adjustment screw for optimized cushioning that is inherent throughout the P1D family of ISO cylinders.

C086

P1D Series Rod Lock Cylinder

The P1D Series Rod Lock Cylinder incorporates a powerful piston rod locking device, which clamps the piston rod and locks it in position. The locking device is a spring lock with an air pressure release and is integrated into the front (head) cover of the cylinder.

In the absence of air signal pressure, full holding force is applied to the piston rod. When air is present at 4 Bar (58 psi), the locking device is released.

The P1D Series Rod Lock Cylinder is available for cylinder bores 32-125mm. The design provides several valuable characteristics, such as:

- A holding force corresponding to a pressure of 7 Bar (102 psi)
- A clean design, with the front (head) end cover and locking device built into a common block for compact installation
- Easy to clean, well-sealed construction
- Exhaust air from the locking device can be piped away when there are high demands for a contaminant free environment



P1D Series Rod Lock Cylinder with Manual Override

The P1D Series Rod Lock Cylinder with Manual Override is available for rod lock release during non-production activities. It incorporates the same features as the standard rod lock cylinder.



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C086

C

Convex shape for optimum hygiene
What makes the P1D Clean version unique is its convex body extrusion, which allows the cylinder to be kept clean. Regardless of orientation, fluids will run off the cylinder body surfaces.

Cushioning screw with positive geometry
To offer the best hygiene properties, the projecting cushioning screw is sealed against the end cover. This eliminates dirt-collecting cavities and gives the best hygiene, since it is so easy to clean.

Sealing plugs
Plastic sealing plugs are installed in the end cover screws which are not used for the cylinder installation. To ensure the sealing function, the plugs cannot be re-used. When installed in the end cover screws, they are tapped lightly with a hammer for high axial force.



Up to four integral sensors
Cylinders for two integral sensors have two undivided camshafts along the entire stroke. Free choice of cable exit, front or rear. There is also a version with divided camshafts for up to four sensors, which are installed two from each end cover, with cable exiting both front and rear.

Patent applied for system of integrated standard sensors
The Clean Version of the P1D cylinder has a system of sensors, which are fully integrated into the body extrusion to give the cylinders a clean external design. Up to four sensors chosen from the range of P1D standard sensors, can be mounted in two dedicated grooves beneath a transparent, sealed molding. Tightening the stop screw onto the cam shaft will lock each sensor in the desired position. The sensor LEDs are always fully visible, which facilitates initial set-up, adjustment and trouble-shooting. The entire sensor system has a hose-proof design equivalent to IP65.

P1D Clean Version

The P1D Clean Version is completely designed for the food industry. The stringent requirements for hygiene regarding choice of material and corrosion resistance have guided the development of this cylinder version. Available with BSPP ports (ISO 1179-1 with ISO 228-1 threads).

All the main dimensions of the P1D Clean comply with ISO 6431, ISO/DIS 1555, VDMA 24562 and AFNOR standards except the somewhat larger footprint of the end covers and envelope of the body extrusion, due to the hygienic, convex, easy-to-clean geometry of the cushioning adjustment screw and the components of the integrated sensor system.

P1D Tie-Rod Version

The P1D Tie-Rod Version cylinders are based on the same high level technology as the Standard Version. They accept either Standard Version or Removable Gland Version heads and caps. This cylinder is the perfect choice wherever a true tie-rod cylinder is needed.

International standards
The P1D Tie-Rod Version complies with ISO 6431, ISO/DIS 15552, VDMA 24562 and AFNOR installation dimension standards, for customer reassurance world-wide.

“Drop-in” sensor
The P1D Tie-Rod Version utilizes the same drop-in Global Sensors as the other versions. An ingenious multi-jointed adapter clamps the sensors to the tie rod in any chosen position along the stroke.

Large Bore Sizes
The P1D Tie-Rod Version is now available in 160 and 200mm bore sizes.

32-125mm bores





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C086

Using P1D cylinders as a platform, a number of different designs can be produced to suit differing requirements. Please refer to the Ordering Information page for the designation of each variant.

Alternative piston rod materials
All P1D cylinders in all bores, Ø32-200 mm, can be ordered with the following piston rod materials:
– Steel, hard chrome plated (standard)
– Stainless steel, hard chrome plated
– Acid proof steel



Alternative Piston Rod Materials

Double rod cylinders
All bore sizes of all versions are available with a double rod. Cylinders with a double rod can take higher side forces thanks to the double support for the piston rod. In addition, this design makes it easier to install external mechanical position sensors as well as giving equal force and flow on both sides of the piston.



Double Rod

High ambient temperature
The Removable Gland Version can be supplied in special high ambient temperature version. The cylinders have seal systems, materials and grease for elevated temperature ranges. The high temperature version does not have a magnetic piston (no function at high temperatures). The aluminum piston option is required for service above +80°C (+176°F) and a pinned piston to rod connection is required for service above +121°C (+250°F).
Ambient temperature range:
-10°C to +121°C, peaks up to +150°C
(+14°F to +250°F, peaks up to +300°F).



High Ambient Temperature

Low pressure hydraulics
All bore sizes of the Removable Gland Version can be supplied with special seals for operation with low pressure hydraulics up to 10 bar. Temperature range -20 °C to +80 °C (-4°F to +176°F).



3 and 4 Position Cylinders

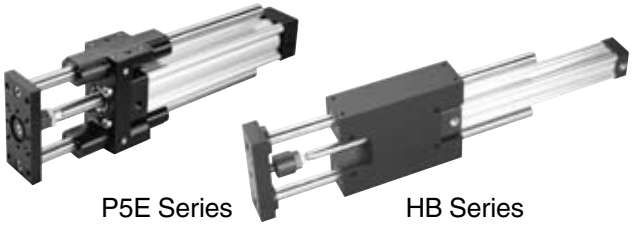
Duplex cylinder – 3 and 4 position cylinders
By installing two cylinders with the same or different stroke, it is possible to build a working unit with three or four positions. This type of unit is available as factory-fitted P1D Tie-Rod Version cylinders in all bore sizes. Other P1D cylinders can be flange mounted back-to-back with a special mounting.



Tandem Cylinders

Tandem cylinder
The P1D Tie-Rod Version is also available as a tandem cylinder, i.e. two cylinders connected in series. This cylinder unit has almost twice the force, which is a great advantage in restricted spaces.

Guided Cylinders
For guided versions of the P1D, see the P5E Series and HB Series in Section F.



P5E Series HB Series

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C086

C

P1D	–	S	032	M	C	–

Continued on next page

Piston Style		
Cushions	**Piston Material**	
	Composite [1]	**Aluminum** [2]
None	**M**	**Y**
Cush B/E	**–** [3]	**4**
Cush head	**J**	**5**
Cush cap	**K**	**6**

1 Not available for 160-200mm bores.
2 Not available on Clean Version.
3 Must be placed in model code.

Bore Size	
032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm
125	125mm
160	160mm [8]
200	200mm [8]

8 Tie Rod Version E must be specified for these bores.

Cylinder Ports Front & Rear	
–	BSPP Ports (G Threads)**
E	NPTF Ports*
Q	BSPT Ports (R_C Threads)*

* Not available on Clean or Die Cast Versions.
** ISO 1179-1 with ISO 228-1 threads.

Version				
	Cylinder Body Profile	**Rod Lock**		
		None	**Fitted w/Std Rod Lock** [7]	**Fitted w/Manual Override Rod Lock** [7]
Die Cast End Caps [4]	Standard	**S**	**L**	N/A
	Tie Rod [14]	**T**	**M**	N/A
	Clean	**C**	**D**	N/A
Removable Gland [5] (Machined Endcaps)	Standard	**G**	**R**	**J**
	Tie Rod [14]	**E**	**7** [4]	Consult Factory
Special [6]	Any Special	**/**		

4 Not available for 160-200mm bores or with fluorocarbon seals.
5 When Removable Gland Version is fitted with rod lock, gland cannot be replaced without disassembling cylinder.
6 If special cylinder is ordered (other than rod end), End Cap Style, Cylinder Body Profile and Rod Lock option must be given in addition to the special request.
7 Cylinders fitted with rod locks must be cushioned on both ends.

Function				
Fastener Type	**Rod Wiper Style**	**Double Acting**	**Double Rod**	**Tandem** [14]
Standard end cover screws	Std scraper	**M**	**F**	**C**
	Metal scraper	**Q**	**R**	**J**
Stainless steel end cover screws [9]	Std scraper	**A**	**G**	N/A
	Metal scraper	**S**	**T**	N/A

9 Applies only to end cover screws for 32-125mm bores. For stainless steel tie rods and nuts (all bore sizes), change Version to special and request stainless steel tie rods and nuts.
10 If used for temperature above +80°C (+176°F), aluminum piston required. Not available with die cast end caps.
11 Hydraulic seal option valid for Removable Gland Version only. Adjustable cushion options and Rod Lock Versions not available.
12 Not available on Clean Version.
13 Only available on Clean Version.
14 Tie Rod Version is required for Tandem Function.
15 Consult factory for this option.

Piston Rod & Seal Material			
Piston Rod Material	**Seal Material**		
	Standard	**Fluorocarbon** [10]	**Hydraulic** [11]
Chrome plated carbon steel [12]	**C**	**G**	**J**
Chrome plated stainless steel [12,15]	**R**	**D**	**Z**
316 Stainless steel [13]	**S**	N/A	N/A
Acid-resistant stainless steel	**M**	**N** [12]	N/A

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0500	N	N	N	N	N

Stroke [1]

Specify whole mm using 4 digits, i.e. 0500

Rod Mountings & Plugs [2]		
Rod Mounting	**No Plugs** [3]	**With Plugs** [4]
Swivel rod eye	**S**	**A**
Swivel rod eye SS	**T**	**1**
Swivel rod eye with clevis bracket GA [7]	**V**	**E**
Swivel rod eye SS with clevis bracket GA	**W**	**2**
Clevis	**C**	**B**
Clevis SS	**D**	**3**
Flexco coupling	**F**	**G**
One additional piston rod nut	**X**	**P**
Stainless steel piston rod nut	**Y**	**4**
Acid-resistant nut	**Z**	**5**
None (piston rod nut only)	**N**	**R**

Rod End

N	Metric male
6	Metric female
3	Special*

* Please provide desired dimensions for KK, AM and WH. If otherwise special, provide dimensioned sketch.

Sensors [5]			
Prepared for Factory-fitted Sensors	**Cable Location**		
	Front or Left	**Rear or Right**	**Front & Rear**
P1D Clean Version	**6**	**7**	**8**
P1D all versions (except Clean) prepared for sensors or Clean Version without sensor capability [6]	**N**		

Mounting Style		
	Standard	**Rotated 90°**
Flange MF1 at head (front) end	**1**	**3**
Flange MF2 at cap (rear) end	**B**	**4**
Flanges MF1 and MF2 at both ends	**2**	**K**
Foot brackets MS1	**F**	**R**
Clevis bracket GA aluminum	**C**	**U**
Rear eye MP4 aluminum	**E**	**V**
Rear swivel eye MP6 aluminum	**S**	**W**
Clevis bracket MP2 aluminum	**T**	**Y**
Rear eye + clevis (MP4 + MP2) aluminum	**L**	**Z**
Clevis bracket MP2 + pivot hinge aluminum	**X**	**5**
Clevis bracket GA aluminum + steel swivel hinge	**Q**	**0**
Rear swivel eye + clevis bracket GA aluminum	**M**	**A**
Intermediate trunnion MT4 (requires XV dimension)	**G**	**7**
Trunnion flange at head (front) end [4]	**H**	**P**
Trunnion flange at cap (rear) end [4]	**J**	**8**
None (MX0)	**N**	**9**

Notes:

1 When specifying a stop tube, place a "/" in the version field. Then specify the version, amount of stop tube and amount of net stroke. The stroke used in the model code should be gross stroke (net stroke plus stop tube).

2 Please review Piston Rod Selection Chart in the Engineering Section to check for a rod buckling condition.

3 Clean Version comes standard with plugs. Use this column when ordering Clean Version.

4 Not available for 160-200mm bores.

5 For sensor part numbers and specifications, please refer to Electronic Sensors section.

6 P1D Clean Version ordered without sensors ***cannot*** be retrofitted with sensor capability.

7 Consult factory for this option.

Double Rod Cylinders

Double rod option is available with Mounting Styles MX0, MS1, MF1, MF2 and MT4.

For double rod cylinders, it is assumed that the rod number and rod end are the same for both piston rods. On a double rod cylinder where the two rod ends are different, use a rod end of '3' and be sure to clearly state which rod end is to be assembled at which end.

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Specifications

- Bore sizes 32-200mm
- Max stroke 2800mm
- Min stroke 25mm
  (must specify Tie Rod Version for strokes <25mm)
- Rod Ends – 2 standard, specials to order
- Single rod end and double rod end styles
- Working pressure Max 10 Bar (145 PSI)
- Working temperature

	min	max
Standard	-20°C (-4°F)	+80°C (+176°F)
High temp version	-10°C (+14°F)	+121°C (+250°F)

  Aluminum piston is required for service above +80°C (+176°F)
- Greased for life (non-lube), does not normally need additional lubrication. If air line lubrication is initiated, it must always be continued.
- Working medium Dry, filtered compressed air to ISO 8573-1 class 3. 4. 3. or better

P1D Clean Version

Min stroke	25mm
Protection class	Hose-proof in accordance with IP65
Chemical resistance	Tested for normally used industrial detergents, both acid and alkaline

P1D Rod Lock Version

- Fluid Medium: Dry, filtered, compressed air
- Maximum Cylinder Operating Pressure: 10 Bar (145 PSI)
- Required Pressure to Unlock[1]: 4 Bar (58 PSI)
- Minimum Torque Required for Manual Override Version:
  - 32mm Bore = 0.9 N-m / 8 in-lbs
  - 40mm Bore = 0.9 N-m / 8 in-lbs
  - 50mm Bore = 2.7 N-m / 24 in-lbs
  - 63mm Bore = 2.7 N-m / 24 in-lbs
  - 80mm Bore = 27.1 N-m / 240 in-lbs
  - 100mm Bore = 36.6 N-m / 324 in-lbs
  - 125mm Bore = 61.0 N-m / 540 in-lbs
- Maximum Operating Temperature: -10°C to +75°C, +14°F to +167°F
- Maximum Cylinder Operating Speed: 5 feet per second

[1]Signal pressure to port on locking device. Operation at pressures lower than 4 Bar (58 psi) may lead to inadvertent engagement of the rod lock device.

Quick Reference

Bore Size	Cylinder Area, cm²	Piston Rod			Cushioning Length mm	Air Consumption [1] litre	Connection Thread [4]	Theoretical Cylinder Forces at 6 Bar (N) [2]	
		Dia. mm	Area, cm²	Male Thread				Extend Stroke	Retract Stroke
32	8.0	12	1.1	M10x1.25	17	0.105	G1/8	482	414
40	12.6	16	2.0	M12x1.25	19	0.162	G1/4	754	633
50	19.6	20	3.1	M16x1.5	20	0.253	G1/4	1178	989
63	31.2	20	3.1	M16x1.5	23	0.414	G3/8	1870	1681
80	50.3	25	4.9	M20x1.5	23	0.669	G3/8	3016	2721
100	78.5	25	4.9	M20x1.5	27	1.043	G1/2	4712	4417
125	122.7	32	8.0	M27x2	30	1.662	G1/2	7363	6880
160	201.1	40	12.6	M36x2	38	2.724	G3/4	12.064	11,310
200	314.2	40	12.6	M36x2	38	4.256	G3/4	18.850	18,096

Cylinder Bore Size	Total Mass (kg)						Total Mass (kg) Moving Components	
	0mm Stroke [3]			Supplement per 10mm Stroke			at 0mm Stroke	Supplement per 10mm Stroke
	Standard	Tie-Rod	Clean	Standard	Tie-Rod	Clean	All Variants	All Variants
32	0.55	0.54	0.60	0.023	0.022	0.047	0.13	0.009
40	0.80	0.79	0.88	0.033	0.030	0.063	0.24	0.016
50	1.20	1.20	1.32	0.048	0.048	0.094	0.42	0.025
63	1.73	1.73	1.86	0.051	0.051	0.101	0.50	0.025
80	2.45	2.47	2.63	0.075	0.079	0.142	0.90	0.039
100	4.00	4.00	4.22	0.084	0.084	0.168	1.10	0.039
125	6.87	6.73	7.01	0.138	0.129	0.248	2.34	0.063
160	—	16.19	—	—	0.160	—	Consult Factory	Consult Factory
200	—	22.23	—	—	0.185	—	Consult Factory	Consult Factory

1 Free air consumption per 10 mm stroke for a double stroke at 6 bar

2 The values for cylinder forces are theoretical and should be reduced to suit working conditions.

3 Total Mass for composite piston for 32-125mm bores and aluminum piston for 160-200mm bores.

4 ISO 1179-1 with ISO 228-1 threads

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Standard Version

Body extrusion	Clear anodized aluminium
End covers	Powder coated or black anodized aluminum
End cover inserts	POM
End cover nuts/screws	Zinc plated steel 8.8
Piston rod nut	Zinc plated steel
Piston rod	Chrome-plated steel (standard)
Rod wiperseal	PUR
Piston rod bearing	POM
Piston	POM
Piston bearing	POM
Magnetic ring	Plastic bound magnetic material
Piston fastener	Zinc plated steel (composite piston)
Piston seal	PUR
O-rings	Nitrile rubber, NBR
End-of-stroke bumpers and end seals	PUR
Cushioning seals	PUR
Cushioning screws	PA

Piston Rod Material Options

(or with equivalent properties):

Standard	Case-hardened, chrome plated carbon steel
Chrome plated stainless steel	17-4 PH, chrome plated stainless steel
Stainless steel	303 stainless steel
Acid-resistant stainless steel	316 stainless steel

Additional/Substitute Specifications

P1D Clean Version

Transparent molding	Silicone
Transparent cover	ABS
Screws, sensor system	Stainless steel
Upper seal, cover	EPDM
Lower seal, cover	Rubber
Sealing plugs	PA
Piston rod nut	Stainless steel

P1D Tie-Rod Version

Tie-rods	Blackened steel

P1D Removable Gland Version

End covers	Black anodized aluminum
End cover screws	Zinc plated steel 8.8 (32-125mm bores)
Cylinder Body	Clear anodized aluminum
Rod gland	PTFE filled high strength bronze
Rod seal	Buna Nitrile for sealing action
Rod wiper	Buna Nitrile for wiping action
Piston rod	Case hardened chrome-plated steel
Piston rod nut	Zinc plated steel
Piston	POM (standard) Aluminum (optional)
Piston seals	PUR
Piston bearing	POM or Molyguard wear band for aluminum piston
Magnetic ring	Plastic bound magnetic material
Piston fastener	Zinc plated steel (composite piston)
O-rings	Buna Nitrile
Cushioning seals	PUR
Cushioning screws	Stainless steel (brass for 160 and 200mm bores)

Design Variants for Removable Gland Version

High temperature option includes:

All seals	Fluorocarbon
Piston	Aluminum (without magnetic ring)

Low pressure hydraulic option includes:

Rod seal	Buna Nitrile
Rod wiper	PUR
Piston seals	Buna Nitrile
Piston	Aluminum (non-cushioned)

Metallic Rod Scraper includes:

Rod wiper	Dual high strength bronze wipers with nitrile or fluorocarbon energizer

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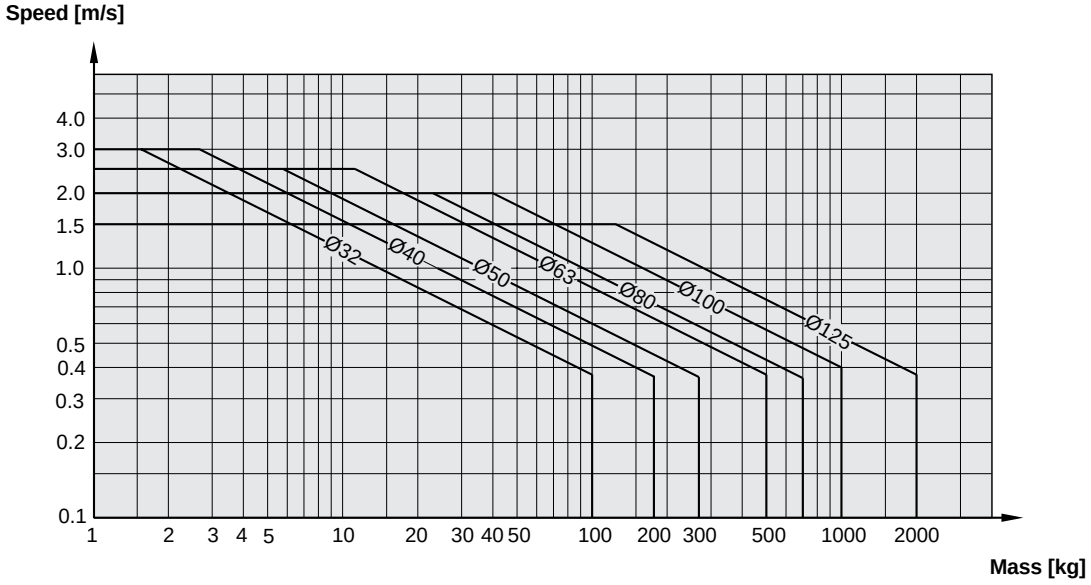
Cushioning Characteristics

The diagram below is used for sizing of cylinders related to the cushioning capacity. The maximum cushioning capacity shown in the diagram assumes the following:

- Low load, i.e. low pressure drop across the piston
- Equilibrium speed
- Correctly adjusted cushioning screw
- 6 bar at cylinder port

The load is the sum of internal and external friction, plus any gravitational forces. At high relative load (pressure drop exceeding 1 bar), we recommend that for any given speed, the mass should be reduced by a factor of 2.5, or for a given mass, the speed should be reduced by a factor of 1.5. This is in relation to the maximum performance given in the diagram.

C



Recommended Air Quality for Cylinders

For best possible service life and trouble-free operation, ISO 8573-1 quality class 3.4.3 should be used. This means 5 µm filter (standard filter) dew point +3°C (+37°F) for indoor operation (a lower dew point should be selected for outdoor operation) and oil concentration 1.0 mg oil/m³, which is what a standard compressor with a standard filter gives.

ISO 8573-1 Quality Classes

Quality Class	Polution		Water		Oil
	Particle Size (µm)	Max. Concentration (mg/m³)	Max Pressure Dew Point (°C)	Max Pressure Dew Point (°F)	Max. Concentration (mg/m³)
1	0.1	0.1	-70	-94	0.01
2	1	1	-40	-40	-0.1
3	5	5	-20	-4	1.0
4	15	8	+3	+37	5.0
5	40	10	+7	+44	25
6	–	–	+10	+50	–

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Guide for Selecting Suitable Tubing

The selection of the correct size of tubing is often based on experience, with no great thought to optimizing energy efficiency and cylinder velocity. This is usually acceptable, but making a rough calculation can result in worthwhile economic gains.

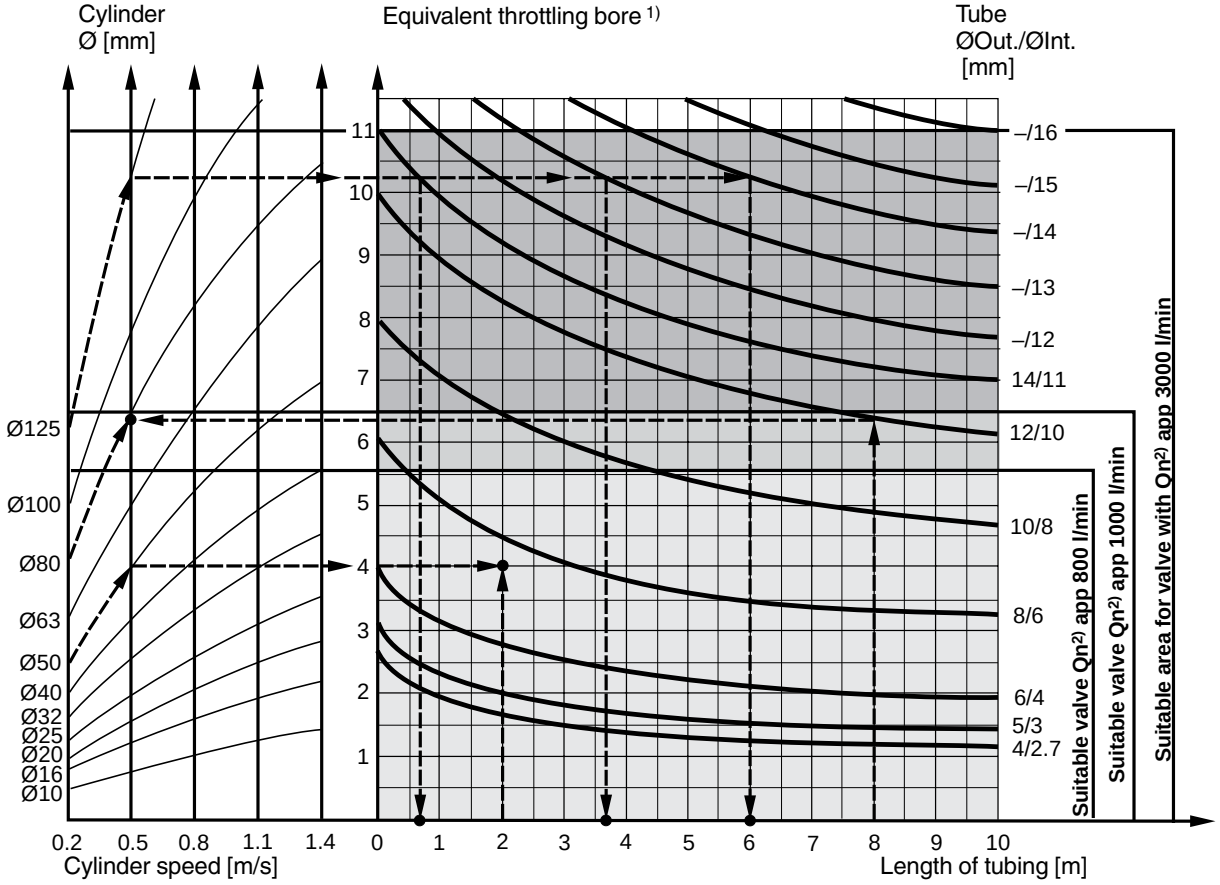
The following is the basic principle:

1. The primary line to the working valve could be over sized (this does not cause any extra air consumption and consequently does not create any extra costs in operation).
2. The tubes between the valve and the cylinder should, however, be optimized according to the principle that an insufficient bore throttles the flow and thus limits the cylinder speed, while an oversized pipe creates a dead volume which increases the air consumption and filling time.

The chart below is intended to help when selecting the correct size of tube to use between the valve and the cylinder.

The following prerequisites apply:
The cylinder load should be about 50% of the theoretical force (= normal load). A lower load gives a higher velocity and vice versa. The tube size is selected as a function of the cylinder bore, the desired cylinder velocity and the tube length between the valve and the cylinder.

If you want to use the capacity of the valve to its maximum, and obtain maximum speed, the tubing should be chosen so that they at least correspond with the equivalent restriction diameter (see description below), so that the tubing does not restrict the total flow. This means that a short tubing must have at least the equivalent restriction diameter. If the tubing is longer, choose it from the table below. Straight fittings should be chosen for highest flow rates. (Elbow and banjo fittings cause restriction.)



1) The "equivalent throttling bore" is a long throttle (for example a tube) or a series of throttles (for example, through a valve) converted to a short throttle which gives a corresponding flow rate. This should not be confused with the "orifice" which is sometimes specified for valves. The value for the orifice does not normally take account of the fact that the valve contains a number of throttles.

2) Qn is a measure of the valve flow capacity, with flow measured in liter per minute (l/min) at 6 bar(e) supply pressure and 1 bar pressure drop across the valve.

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P1D Rod Lock Version – Rod Lock Data

Connection

The signal air for the locking device can be obtained directly from a main air supply, or from the air supply serving the valve that controls the cylinder itself. For controlled ON/OFF operation of the locking device, a separate quick-venting valve is used.

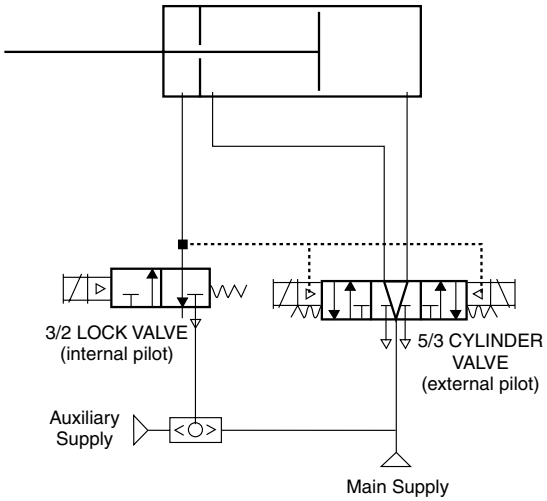
The piston rod should not be moving when the locking device is activated. The locking device is not intended to brake a movement in repeated sequences.

Holding Forces

Bore Size	Holding Forces	
	(N)	(lbs)
32mm	550	123
40mm	860	193
50mm	1345	303
63mm	2140	481
80mm	3450	755
100mm	5390	1211
125mm	8425	1894

NOTE: All P1D Rod Lock Versions are not intended for use in water service applications, or in environments that have high humidity levels and/or splashing fluids present.

Sample Pneumatic Circuit

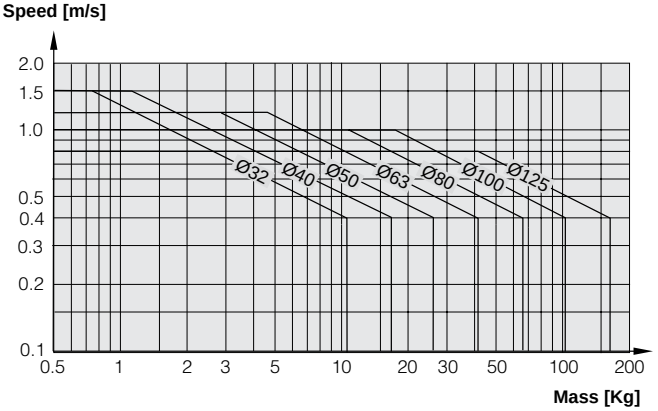


1. Lock valve must be maintained energized during cylinder motion, otherwise rod lock is engaged and cylinder valve shifts to mid position.
2. Cylinder valve must be maintained energized during extend or retract. Also keep energized at end of stroke until change of direction is desired.
3. Mid position of 5/3 Cylinder valve may be pressurized outlets if the combination of pressure load on the cylinder and inertia effects of the attached load do not exceed the holding force rating of the rod lock device, including allowance for wear.
4. Do not use cylinder lines for any logic functions — pressure levels vary too much.

Use as a Brake

The chart to the right shows the maximum values for speed and braking mass if the cylinder is used as a brake. The cylinder should not be exposed to additional compressive forces as this significantly reduces the external mass that can be braked.

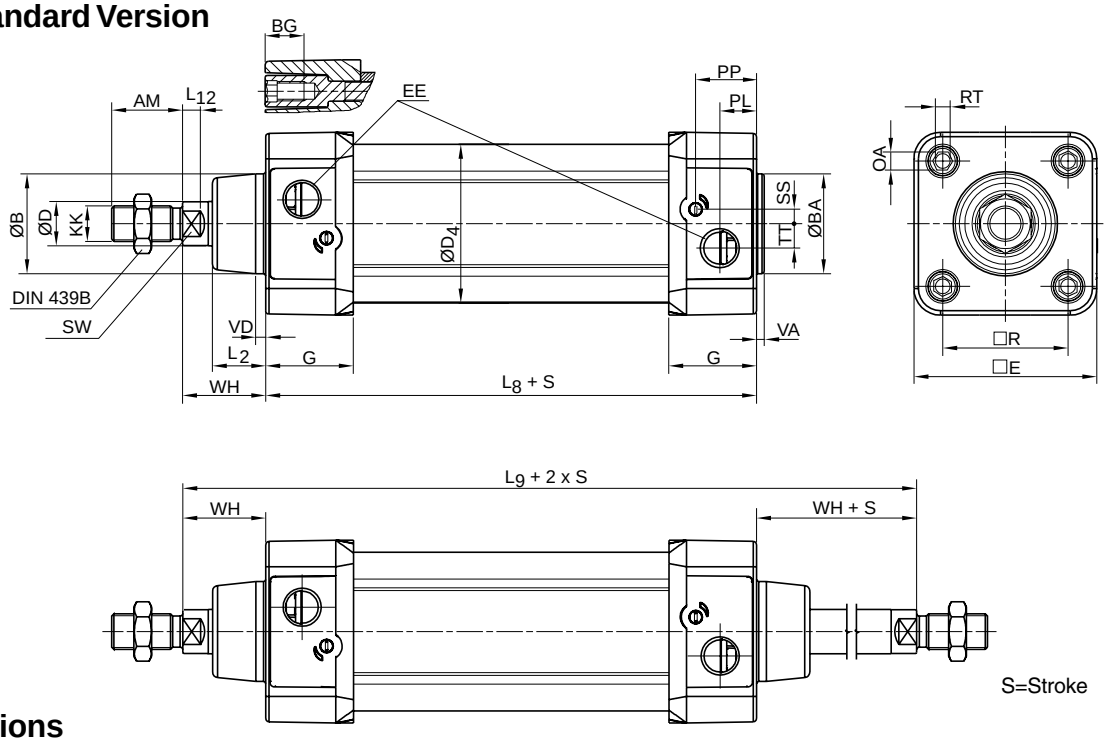
We recommend systems in which the cylinder does not act as a motor during braking. Heat is generated if the brake is used frequently, and this must be taken into account to ensure that the maximum temperature is not exceeded.



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P1D Standard Version



S=Stroke

Dimensions

Cylinder Bore	AM mm	B mm	BA mm	BG mm	D mm	D4 mm	E	EE BSPP[1]	EE NPTF/ BSPT	G mm	KK	L_2 mm	L_8 mm	L_9 mm	L_{12} mm
32	22	30	30	16	12	45.0	50.0	G1/8	1/8	28.5	M10x1.25	16.0	94	146	6.0
40	24	35	35	16	16	52.0	57.4	G1/4	1/4	33.0	M12x1.25	19.0	105	165	6.5
50	32	40	40	16	20	60.7	69.4	G1/4	1/4	33.5	M16x1.5	24.0	106	180	8.0
63	32	45	45	16	20	71.5	82.4	G3/8	3/8	39.5	M16x1.5	24.0	121	195	8.0
80	40	45	45	17	25	86.7	99.4	G3/8	3/8	39.5	M20x1.5	30.0	128	220	10.0
100	40	55	55	17	25	106.7	116.0	G1/2	1/2	44.5	M20x1.5	32.4	138	240	10.0
125	54	60	60	20	32	134.0	139.0	G1/2	1/2	51.0	M27x2	45.0	160	290	13.0

Cylinder Bore	OA mm	PL mm	PP mm	R mm	RT	SS mm	SW mm	TT mm	VA mm	VD mm	WH mm
32	6	13	21.8	32.5	M6	4.0	10	4.5	3.5	4.5	26
40	6	14	21.9	38.0	M6	8.0	13	5.5	3.5	4.5	30
50	8	14	25.9	46.5	M8	4.0	17	7.5	3.5	4.5	37
63	8	16	27.4	56.5	M8	6.5	17	11.0	3.5	4.5	37
80	6	16	30.5	72.0	M10	0	22	15.0	3.5	4.5	46
100	6	18	35.8	89.0	M10	0	22	20.0	3.5	4.5	51
125	8	23	40.5	110.0	M12	0	27	17.5	3.5	6.5	65

1 ISO 1179-1 with ISO 228-1 threads

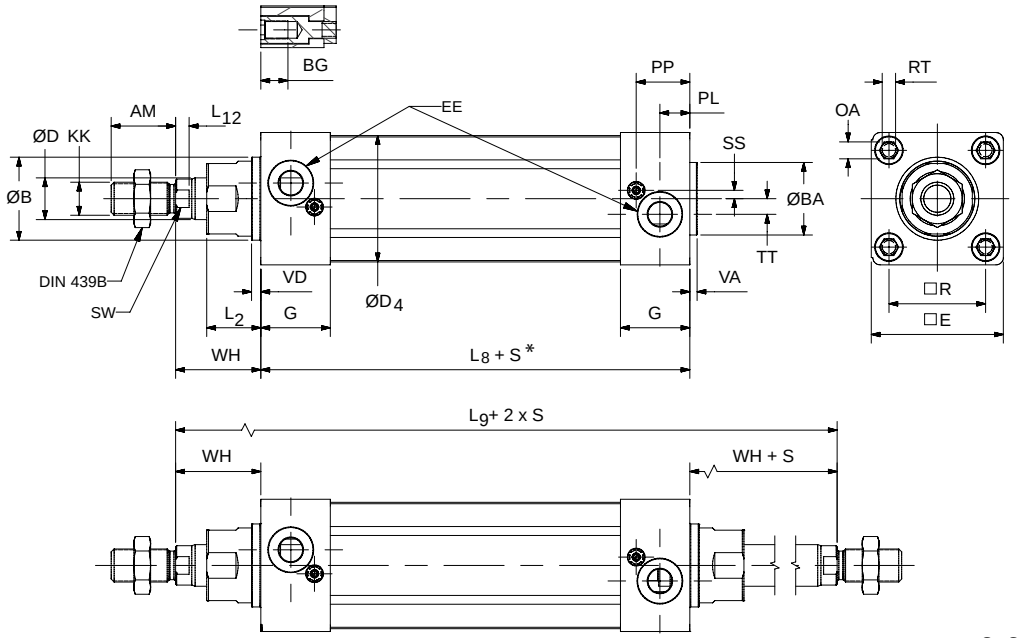
Tolerances

Cylinder Bore	B	BA mm	L_8 mm	L_9 mm	R mm	Stroke tolerance
32	d11	d11	±0.4	±2	±0.5	+1/-0
40	d11	d11	±0.7	±2	±0.5	+1/-0
50	d11	d11	±0.7	±2	±0.6	+1/-0
63	d11	d11	±0.8	±2	±0.7	+1/-0
80	d11	d11	±0.8	±3	±0.7	+1/-0
100	d11	d11	±1.0	±3	±0.7	+1/-0
125	d11	d11	±1.0	±3	±1.1	+1/-0

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P1D Removable Gland Version



S=Stroke

Dimensions

Cylinder bore	AM mm	B mm	BA mm	BG mm	D mm	D_4 mm	E mm	EE BSPP [1]	EE NPTF/ BSPT	G mm	KK	L_2 mm	L_8 mm	L_9 mm	L_{12} mm
32	22	30	30	16	12	45.0	46.5	G1/8	1/8	28.5	M10x1.25	18	94	146	6.0
40	24	35	35	16	16	52.0	52.0	G1/4	1/4	33.0	M12x1.25	20	105	165	6.5
50	32	40	40	16	20	60.7	63.5	G1/4	1/4	33.5	M16x1.5	26	106	180	6.5
63	32	45	45	16	20	71.5	76.0	G3/8	3/8	39.5	M16x1.5	26	121	195	6.5
80	40	45	45	17	25	86.7	95.5	G3/8	3/8	39.5	M20x1.5	33	128	220	10.0
100	40	55	55	17	25	106.7	114.5	G1/2	1/2	44.5	M20x1.5	33	138	240	10.0
125	54	60	60	20	32	134.0	140.0	G1/2	1/2	51.0	M27x2	41	160	290	13.0

Cylinder bore	OA mm	PL mm	PP mm	R mm	RT	SS mm	SW mm	TT mm	VA mm	VD mm	WH mm
32	6	13	21.8	32.5	M6	6.5	10	4.5	3.5	4.5	26
40	6	14	21.9	38.0	M6	8.0	13	5.5	3.5	4.5	30
50	8	14	25.9	46.5	M8	4.0	17	7.5	3.5	4.5	37
63	8	16	27.4	56.5	M8	6.5	17	11.0	3.5	4.5	37
80	6	16	30.5	72.0	M10	0	22	15.0	3.5	4.5	46
100	6	18	35.8	89.0	M10	0	22	20.0	3.5	4.5	51
125	8	23	40.5	110.0	M12	0	27	17.5	5.5	6.5	65

1 ISO 1179-1 with ISO 228-1 threads

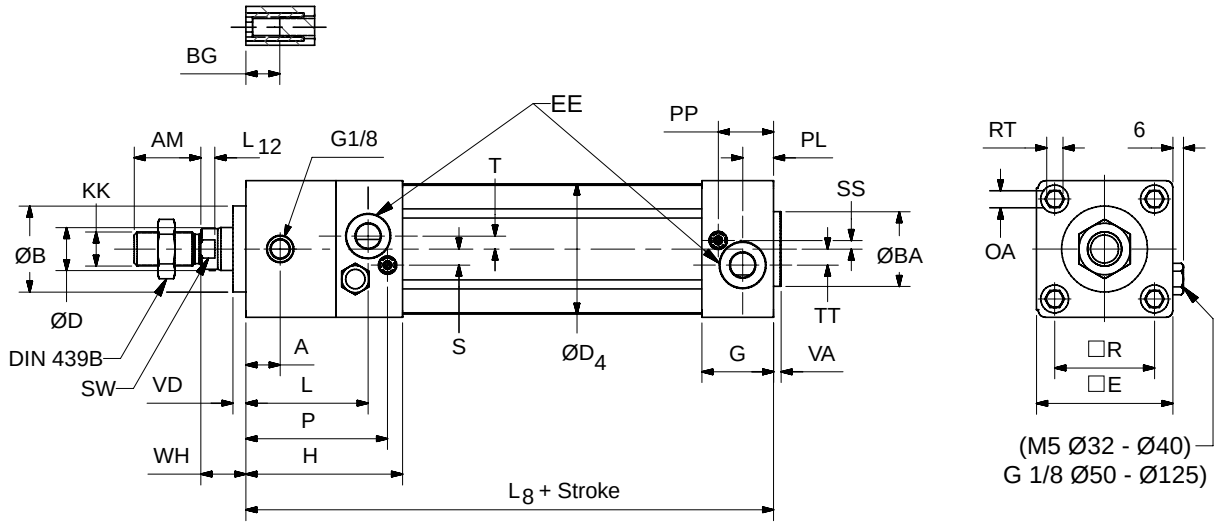
Tolerances

Cylinder Bore	B	BA mm	L_8 mm	L_9 mm	R mm	Stroke tolerance
32	d11	d11	±0.4	±2	±0.5	+1/-0
40	d11	d11	±0.7	±2	±0.5	+1/-0
50	d11	d11	±0.7	±2	±0.6	+1/-0
63	d11	d11	±0.8	±2	±0.7	+1/-0
80	d11	d11	±0.8	±3	±0.7	+1/-0
100	d11	d11	±1.0	±3	±0.7	+1/-0
125	d11	d11	±1.0	±3	±1.1	+1/-0

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C086

P1D Rod Lock Version
(Version R or L)



Dimensions

Cylinder Bore	A mm	AM mm	B mm	BA mm	BG mm	D mm	D_4 mm	E mm	EE[1]	G mm	H mm	KK	L mm	L_8 mm	L_{12} mm
32	16	22	30	30	16	12	45.0	46.5	G1/8	28.5	71.5	M10x1.25	56.0	137	6.0
40	16	24	35	35	16	16	52.0	52.0	G1/4	33.0	77.0	M12x1.25	56.0	149	6.5
50	18	32	40	40	16	20	60.7	63.5	G1/4	33.5	80.5	M16x1.5	62.5	153	6.5
63	26	32	45	45	16	20	71.5	76.0	G3/8	39.5	96.5	M16x1.5	74.5	178	6.5
80	35	40	45	45	17	25	86.7	95.5	G3/8	39.5	110.5	M20x1.5	87.0	199	10.0
100	50	40	55	55	17	25	106.7	114.5	G1/2	44.5	132.5	M20x1.5	106.0	226	10.0
125	60	54	60	60	20	32	134.0	140.0	G1/2	51.0	145.0	M27x2	117.0	254	13.0

Cylinder Bore	OA mm	P mm	PL mm	PP mm	R mm	RT mm	S mm	SS mm	SW mm	T mm	TT mm	VA mm	VD mm	WH mm
32	6	64.8	13	21.8	32.5	M6	7	6.5	10	2.5	4.5	3.5	4.5	15
40	6	68.0	14	21.9	38.0	M6	9	8.0	13	2.0	5.5	3.5	4.5	16
50	8	73.5	14	25.9	46.5	M8	8	4.0	17	4.0	7.5	3.5	5.0	17
63	8	89.5	16	27.4	56.5	M8	8	6.5	17	2.0	11.0	3.5	5.0	17
80	6	101.5	16	30.5	72.0	M10	9	0	22	5.0	15.0	3.5	4.0	20
100	6	123.5	18	35.8	89.0	M10	12	0	22	6.0	20.0	3.5	4.0	20
125	8	136.0	23	40.5	110.0	M12	12	0	27	6.0	17.5	5.5	6.0	27

1 ISO 1179-1 with ISO 228-1 threads

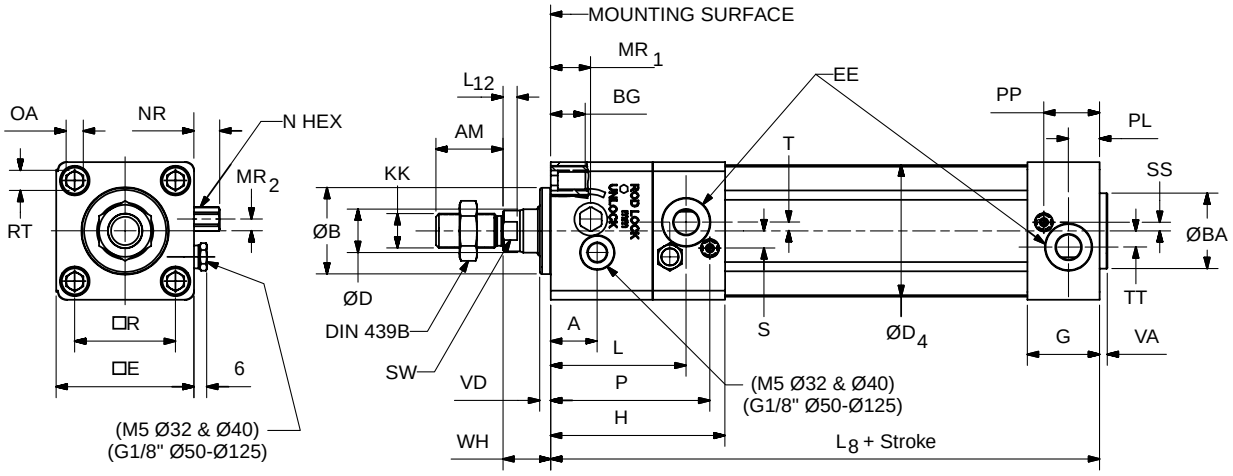
Tolerances

Cylinder Bore	B mm	R mm	L_8 mm	BA mm	Stroke-length Tolerance mm
32	d11	±0.5	±0.4	d11	+1/-0
40	d11	±0.5	±0.7	d11	+1/-0
50	d11	±0.6	±0.7	d11	+1/-0
63	d11	±0.7	±0.8	d11	+1/-0
80	d11	±0.7	±0.8	d11	+1/-0
100	d11	±0.7	±1.0	d11	+1/-0
125	d11	±1.1	±1.0	d11	+1/-0

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C086

P1D Rod Lock Version with Manual Override
(Version J)



Dimensions

Cylinder Bore	A mm	AM mm	B mm	BA mm	BG mm	D mm	D_4 mm	E mm	EE [1]	G mm	H mm	KK	L mm	L_8 mm	L_{12} mm	MR_1 mm	MR_2 mm
32	27.0	22	30	30	16	12	45.0	46.5	G1/8	28.5	71.5	M10X1.25	56.0	137	6.0	16.0	3.0
40	27.0	24	35	35	16	16	52.0	52.0	G1/4	33.0	77.0	M12X1.25	56.0	149	6.5	16.0	3.0
50	21.5	32	40	40	16	20	60.7	63.5	G1/4	33.5	80.5	M16X1.5	62.5	153	6.5	18.5	5.5
63	39.0	32	45	45	16	20	71.5	76.0	G3/8	39.5	96.5	M16X1.5	74.5	178	6.5	22.0	4.0
80	38.5	40	45	45	17	25	86.7	95.5	G3/8	39.5	110.5	M20X1.5	87.0	199	10.0	15.0	19. 8
100	55.0	40	55	55	17	25	106.7	114.5	G1/2	44.5	132.5	M20X1.5	106.0	226	10.0	15.0	20.8
125	61.0	54	60	60	20	32	134.0	140.0	G1/2	51.0	145.0	M27X2	117.0	254	13.0	19.0	23.0

Cylinder Bore	N mm	NR mm	OA mm	P mm	PL mm	PP mm	R mm	RT	S mm	SS mm	SW mm	T mm	TT mm	VA mm	VD mm	WH mm
32	8	10.0	6	64.8	13	21.8	32.5	M6	7	6.5	10	2.5	4.5	3.5	4.5	15
40	8	10.0	6	68.0	14	21.9	38.0	M6	9	8.0	13	2.0	5.5	3.5	4.5	16
50	10	12.0	8	73.5	14	25.9	46.5	M8	8	4.0	17	4.0	7.5	3.5	5.0	17
63	10	12.0	8	89.5	16	27.4	56.5	M8	8	6.5	17	2.0	11.0	3.5	5.0	17
80	11	12.5	6	101.5	16	30.5	72.0	M10	9	0	22	5.0	15.0	3.5	14.0	30
100	11	12.5	6	123.5	18	35.8	89.0	M10	12	0	22	6.0	20.0	3.5	14.0	30
125	11	12.5	8	136.0	23	40.5	110.0	M12	12	0	27	6.0	17.5	5.5	16.0	37

1 ISO 1179-1 with ISO 228-1 threads

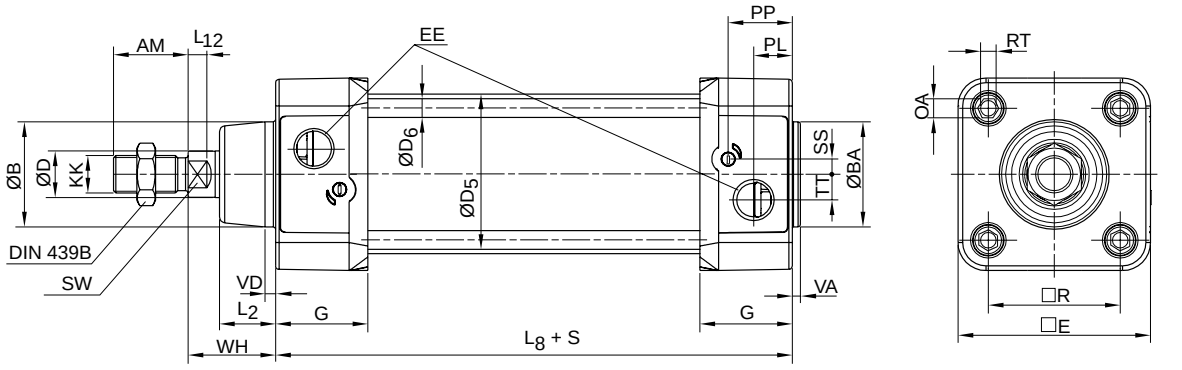
Tolerances

Cylinder Bore	B mm	R mm	L_8 mm	BA mm	Stroke-length Tolerance mm
32	d11	±0.5	±0.4	d11	+1/-0
40	d11	±0.5	±0.7	d11	+1/-0
50	d11	±0.6	±0.7	d11	+1/-0
63	d11	±0.7	±0.8	d11	+1/-0
80	d11	±0.7	±0.8	d11	+1/-0
100	d11	±0.7	±1.0	d11	+1/-0
125	d11	±1.1	±1.0	d11	+1/-0

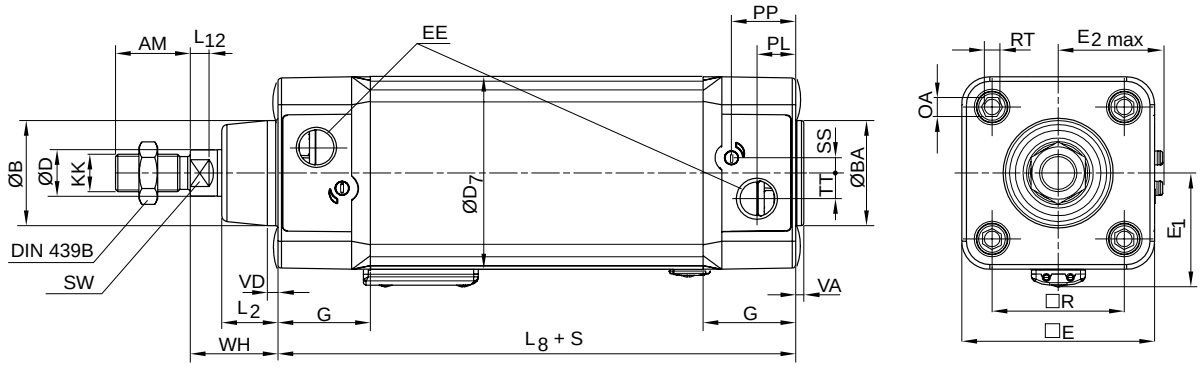
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C086

P1D Tie-Rod Version (32-125mm)



P1D Clean Version



Dimensions

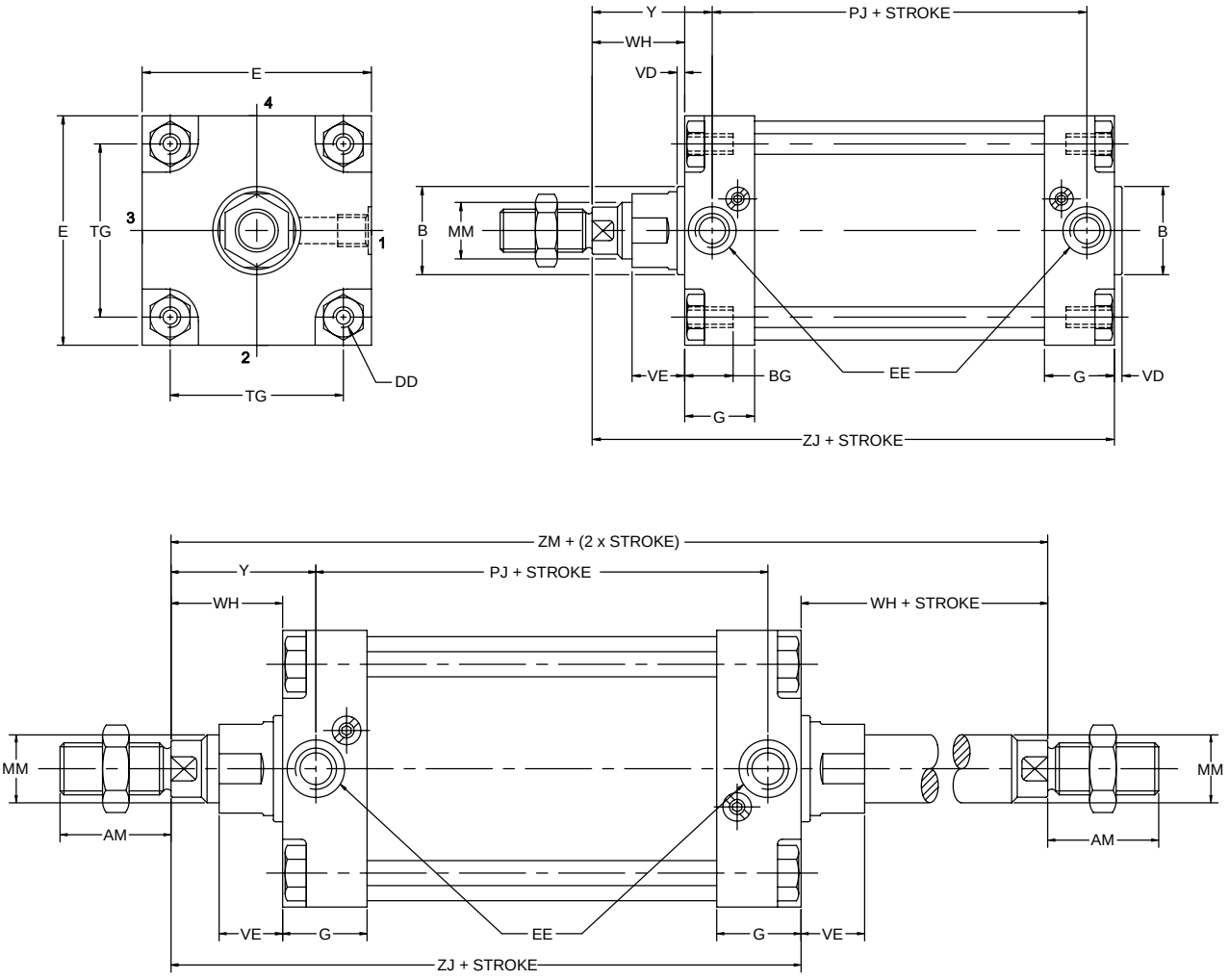
Cylinder Bore	D_5 mm	D_6 mm	D_7 mm	E_1 mm	E_2 max mm
32	36	5.3	49.6	32	5
40	45	5.3	57.3	36	6
50	55	7.1	69.3	42	6
63	68	7.1	82.3	49	5
80	85	8.9	99.3	57	5
100	105	8.9	117.6	68	6
125	132	10.7	142.8	81	6

Other dimensions, see page C15.

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C086

P1D Tie-Rod Version (160-200mm)



Rod End #1

Rod End #2

Dimensions

Cylinder Bore	AM mm	B d11 mm	BG mm	DD	E mm	EE BSPP [3]	EE NPTF/ BSPT	G mm	MM mm	TG mm	VD mm	VE mm	WH mm	Y mm	PJ [1] mm	ZJ [1] mm	ZM [2] mm
160	72	65	24	M16	177	G3/4	3/4	54	40	140	6	56	80	105	130	260	340
200	72	75	24	M16	214	G3/4	3/4	54	40	175	6	56	95	120	130	275	370

1 Add stroke

2 Add 2× stroke

3 ISO 1179-1 with ISO 228-1 threads

Double Rod Cylinders

Double rod option is available on Mounting Styles MX0, MS1, MF1, MF2 and MT4.

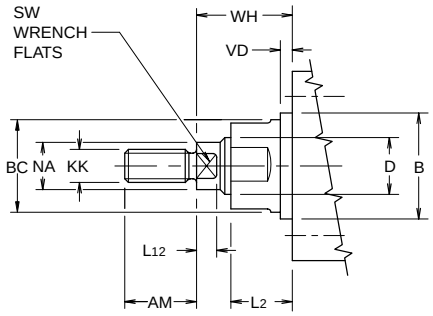
For double rod cylinders, it is assumed that the rod number and rod end are the same for both piston rods. On a double rod cylinder where the two rod ends are different, use a rod end of '3' and be sure to clearly state which rod end is to be assembled at which end.

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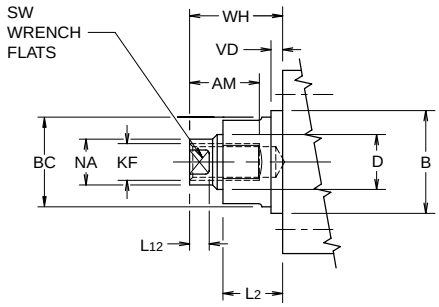
C086

All Mountings Except MF1

Thread Style N



Thread Style 6



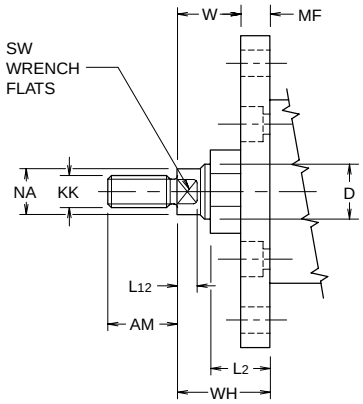
"Special Thread" Style 3
Special thread, extension, rod eye, blank, etc are also available. To order, specify "Style 3" and provide desired dimensions for KF or KK, AM and WH. If otherwise special, furnish dimensioned sketch.

Bore	D	KK	KF	AM	B d11	BC	SW across flats	L_{12}	NA	VD	L_2	WH*
32	12	M10x1.25	M8x1	22	30	27	10	6	11	4.5	18	26
40	16	M12x1.25	M10x1.25	24	35	32	13	6.5	15	4.5	20	30
50	20	M16x1.5	M14x1.5	32	40	36	17	6.5	19	4.5	26	37
63	20	M16x1.5	M14x1.5	32	45	36	17	6.5	19	4.5	26	37
80	25	M20x1.5	M18x1.5	40	45	41	22	10	24	4.5	33	46
100	25	M20x1.5	M18x1.5	40	55	41	22	10	24	4.5	33	51
125	32	M27x2	M24x2	54	60	50	27	13	31	6.5	41	65
160	40	M36x2	M30x2	72	65	60	36	16	39	6	56	80
200	40	M36x2	M30x2	72	75	60	36	16	39	6	56	95

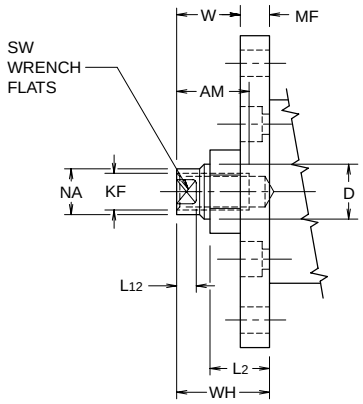
***NOTE:** Dimensions do not apply to Rod Lock Versions.

With MF1 Mounting

Thread Style N



Thread Style 6



"Special Thread" Style 3
Special thread, extension, rod eye, blank, etc are also available. To order, specify "Style 3" and provide desired dimensions for KF or KK, AM and WH. If otherwise special, furnish dimensioned sketch.

Bore	D	KK	KF	AM	SW across flats	L_{12}	MF	NA	L_2	W†	WH†
32	12	M10x1.25	M8x1	22	10	6	10	11	18	16	26
40	16	M12x1.25	M10x1.25	24	13	6.5	10	15	20	20	30
50	20	M16x1.5	M14x1.5	32	17	6.5	12	19	26	25	37
63	20	M16x1.5	M14x1.5	32	17	6.5	12	19	26	25	37
80	25	M20x1.5	M18x1.5	40	22	10	16	24	33	30	46
100	25	M20x1.5	M18x1.5	40	22	10	16	24	33	35	51
125	32	M27x2	M24x2	54	27	13	20	31	41	45	65
160	40	M36x2	M30x2	72	36	16	20	39	56	60	80
200	40	M36x2	M30x2	72	36	16	25	39	56	70	95

†**NOTE:** Dimensions do not apply to Rod Lock Versions.

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C086

3 and 4-Position Duplex Cylinders

This type of cylinder function can consist of two cylinders installed back to back. Two cylinders with the same stroke result in a 3-position cylinder with a symmetrical center position, whereas two different strokes result in a 4-position cylinder where the two central positions can be calculated from the different stroke lengths.



A 3-position duplex cylinder can also be obtained by mounting two cylinders of different strokes, in series, but not connecting the piston rods together. This concept is illustrated in a guided cylinder application shown on page F162 of the HB series.

These 3 and 4-position cylinders can be ordered in two ways as follows.

Factory-fitted P1D Duplex Cylinders

P1D tie-rod version duplex cylinders are completed at the factory and are joined together as one unit by special tie-rods. This version needs to be ordered as a special (/). Please consult factory for assistance.

Customer-Installed Mounting Kit

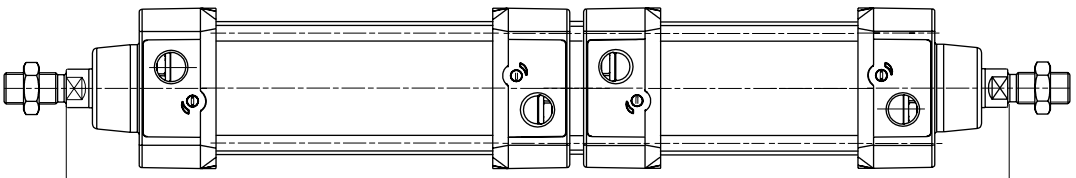
There is an installation mounting kit available for cylinder bores 32-100mm which makes it possible to join any two P1D cylinders, of the same bore, together at any time to make a 3 or 4-position cylinder. Please refer to the cylinder mountings on top of page C28.

Tandem Cylinders

In addition to the duplex cylinder options above, the P1D tie-rod version is also available as a tandem cylinder. By ordering two cylinders of equal strokes, mounted in series, and connecting the piston rods together, you achieve almost twice the output force, at the same pressure, as a standard cylinder. This is a great advantage when restricted mounting space prevents the use of a larger bore cylinder. Please review version and function options in the model code on page C8.

Cylinder Bore	A (mm)	
	P1D-T	P1D-S
32	247	256
40	277	286
50	293	306
63	323	336
80	355	373
100	385	403
125	461	–

S=Stroke



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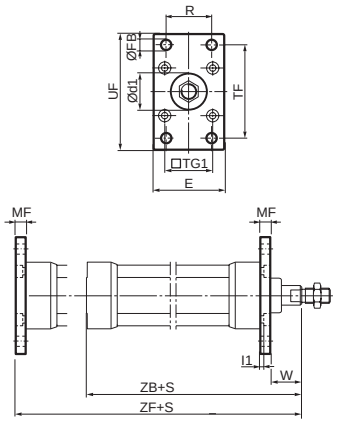
C086

Flange MF1
Flange MF2



Intended for fixed mounting of cylinder. Flange can be fitted to front or rear end cover of cylinder.

Materials
32-100mm bore flange: Surface-treated aluminum, black
125-200mm bore flange: Steel, black
Mounting screws acc. to DIN 6912: Zinc-plated steel 8.8
Supplied complete with mounting screws for attachment to cylinder.



According to ISO MF1/MF2, VDMA 24 562, AFNOR

Bore mm	d1 H11 mm	FB H13 mm	TG1 mm	E mm	R JS14 mm	MF JS14 mm	TF JS14 mm	UF	I1 -0.5 mm	W mm	ZF mm	ZB mm	Weight kg	Part Number
32	30	7	32.5	45	32	10	64	80	5.0	16	130	123.5	0.23	**P1C-4KMBA**
40	35	9	38.0	52	36	10	72	90	5.0	20	145	138.5	0.28	**P1C-4LMBA**
50	40	9	46.5	65	45	12	90	110	6.5	25	155	146.5	0.53	**P1C-4MMBA**
63	45	9	56.5	75	50	12	100	120	6.5	25	170	161.5	0.71	**P1C-4NMBA**
80	45	12	72.0	95	63	16	126	150	8.0	30	190	177.5	1.59	**P1C-4PMBA**
100	55	14	89.0	112	75	16	150	185	8.0	35	205	192.5	2.19	**P1C-4QMBA**
125	60	16	110.0	140	90	20	180	220	10.5	45	245	230.5	3.78	**P1C-4RMB**
160	65	18	140.0	180	115	20	230	260	9.5	60	280	266	C.F.	**L075370160**
200	75	22	175.0	220	135	25	270	300	12.5	70	300	281	C.F.	**L075370200**

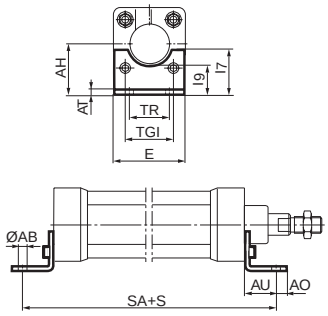
S = Stroke length C.F. = Consult Factory

Foot Bracket MS1



Intended for fixed mounting of cylinder. Foot bracket can be fitted to front and rear end covers of cylinder.

Materials
Foot bracket: Surface-treated steel, black
Mounting screws acc. to DIN 912: Zinc-plated steel 8.8
Supplied in pairs with mounting screws for attachment to cylinder.



According to ISO MS1, VDMA 24 562, AFNOR

Bore mm	AB H14 mm	TG1 mm	E mm	TR JS14 mm	AO mm	AU mm	AH JS15 mm	I7 mm	AT mm	I9 JS14 mm	SA mm	Weight* kg	Part Number
32	7	32.5	45	32	10	24	32	30	4.5	17.0	142	0.06	**P1C-4KMF**
40	9	38.0	52	36	8	28	36	30	4.5	18.5	161	0.08	**P1C-4LMF**
50	9	46.5	65	45	13	32	45	36	5.5	25.0	170	0.16	**P1C-4MMF**
63	9	56.5	75	50	13	32	50	35	5.5	27.5	185	0.25	**P1C-4NMF**
80	12	72.0	95	63	14	41	63	49	6.5	40.5	210	0.50	**P1C-4PMF**
100	14	89.0	115	75	15	41	71	54	6.5	43.5	220	0.85	**P1C-4QMF**
125	16	110.0	140	90	22	45	90	71	8.0	60.0	250	1.48	**P1C-4RMF**
160	18	140.0	180	115	15	60	115	100	9.0	63.5	300	C.F.	**L075380160**
200	22	175.0	220	135	30	70	135	100	12.0	65.0	320	C.F.	**L075380200**

S = Stroke length C.F. = Consult Factory *Weight per item

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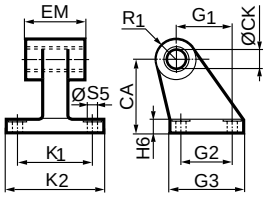
C086

Pivot Bracket with Rigid Bearing



Intended for flexible mounting of cylinder. The pivot bracket can be combined with clevis bracket MP2.

Materials
Pivot bracket: Surface-treated aluminium, black
Bearing: Sintered oil-bronze bushing



C

According to CETOP RP 107 P, VDMA 24 562, AFNOR

Bore mm	CK H9 mm	S5 H13 mm	K1 JS14 mm	K2	G1 JS14 mm	G2 JS14 mm	EM mm	G3 mm	CA JS15 mm	H6 mm	R1 mm	Weight kg	Part Number
32	10	6.6	38	51	21	18	25.5	31	32	8	10.0	0.06	**P1C-4KMD**
40	12	6.6	41	54	24	22	27.0	35	36	10	11.0	0.08	**P1C-4LMD**
50	12	9.0	50	65	33	30	31.0	45	45	12	13.0	0.15	**P1C-4MMD**
63	16	9.0	52	67	37	35	39.0	50	50	12	15.0	0.20	**P1C-4NMD**
80	16	11.0	66	86	47	40	49.0	60	63	14	15.0	0.33	**P1C-4PMD**
100	20	11.0	76	96	55	50	59.0	70	71	15	19.0	0.49	**P1C-4QMD**
125	25	14.0	94	124	70	60	69.0	90	90	20	22.5	1.02	**P1C-4RMD**
160	30	14.0	118	156	97	89	88.5	126	115	25	31.0	C.F.	**L075480160**
200	30	16.0	122	162	105	89	88.5	130	135	30	31.0	C.F.	**L075480200**

C.F. = Consult Factory

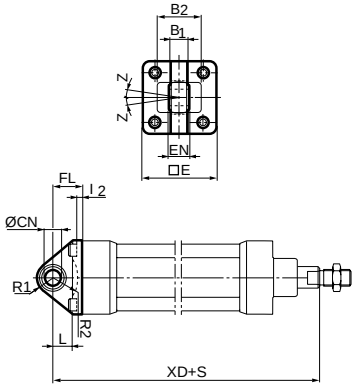
Swivel Eye Bracket (MP6)



Intended for use together with clevis bracket GA

Material
Bracket: Surface-treated aluminium, black
(Cast iron for 160-200mm bores)
Swivel bearing acc. to DIN 648K: Hardened steel

Supplied complete with mounting screws
for attachment to cylinder.



According to VDMA 24 562, AFNOR

Bore mm	E mm	B1 mm	B2 mm	EN mm	R1 mm	R2 mm	FL mm	I2 mm	L mm	CN H7 mm	XD mm	Z	Weight kg	Part Number
32	45	10.5	–	14	16	–	22	5.5	12	10	142	4°	0.08	**P1C-4KMSA**
40	52	12.0	–	16	18	–	25	5.5	15	12	160	4°	0.11	**P1C-4LMSA**
50	65	15.0	51	21	21	19	27	6.5	15	16	170	4°	0.20	**P1C-4MMSA**
63	75	15.0	–	21	23	–	32	6.5	20	16	190	4°	0.27	**P1C-4NMSA**
80	95	18.0	–	25	29	–	36	10.0	20	20	210	4°	0.52	**P1C-4PMSA**
100	115	18.0	–	25	31	–	41	10.0	25	20	230	4°	0.72	**P1C-4QMSA**
125	140	25.0	–	37	40	–	50	10.0	30	30	275	4°	1.53	**P1C-4RMSA**
160	177	30.0	–	43	44	41	55	4.0	41	35	315	16°	C.F.	**L075420160**
200	214	30.0	–	43	48	42	60	8.0	42	35	335	16°	C.F.	**L075420200**

S = Stroke length C.F. = Consult Factory

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Clevis bracket MP2

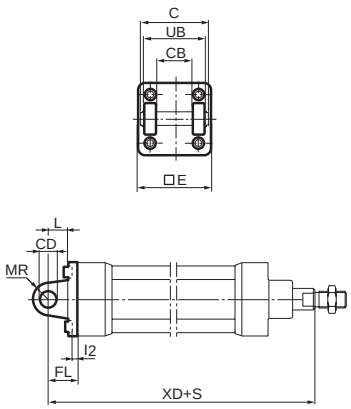


Now in aluminum!

Intended for flexible mounting of cylinder. Clevis bracket MP2 can be combined with clevis bracket MP4.

Materials
Clevis bracket: Surface-treated aluminium, black for 32-160mm bores; Cast iron for 200mm bore
Pin: Surface hardened steel
Circlips according to DIN 471: Spring steel
Mounting screws acc. to DIN 912: Zinc-plated steel 8.8

Supplied complete with mounting screws for attachment to cylinder.

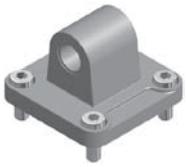


According to ISO MP2, VDMA 24 562, AFNOR

Bore mm	C mm	E mm	UB h14 mm	CB H14 mm	FL ±0.2 mm	L mm	I2 mm	CD H9 mm	MR mm	XD mm	Weight kg	Part Number
32	53	45	45	26	22	13	5.5	10	10	142	0.08	**P1C-4KMT**
40	60	52	52	28	25	16	5.5	12	12	160	0.11	**P1C-4LMT**
50	68	65	60	32	27	16	6.5	12	12	170	0.14	**P1C-4MMT**
63	78	75	70	40	32	21	6.5	16	16	190	0.29	**P1C-4NMT**
80	98	95	90	50	36	22	10.0	16	16	210	0.36	**P1C-4PMT**
100	118	115	110	60	41	27	10.0	20	20	230	0.64	**P1C-4QMT**
125	139	140	130	70	50	30	10.0	25	25	275	1.17	**P1C-4RMT**
160	178	180	170	90	55	35	10.0	30	25	315	C.F.	**L075390160**
200	178	200	170	90	60	35	14.0	30	25	335	C.F.	**L075390200**

S = Stroke length C.F. = Consult Factory

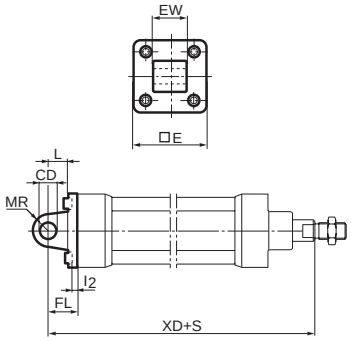
Clevis Bracket MP4



Intended for flexible mounting of cylinder. Clevis bracket MP4 can be combined with clevis bracket MP2.

Materials
Clevis bracket: Surface-treated aluminium, black for 32-125mm bores; Cast iron for 160-200mm bores
Mounting screws acc. to DIN 912: Zinc-plated steel 8.8

Supplied complete with mounting screws for attachment to cylinder.



According to ISO MP4, VDMA 24 562, AFNOR

Bore mm	E mm	EW mm	FL mm	L ±0.2 mm	I2 mm	CD mm	MR H9 mm	XD mm	Weight kg	Part Number
32	45	26	22	13	5.5	10	10	142	0.09	**P1C-4KME**
40	52	28	25	16	5.5	12	12	160	0.13	**P1C-4LME**
50	65	32	27	16	6.5	12	12	170	0.17	**P1C-4MME**
63	75	40	32	21	6.5	16	16	190	0.36	**P1C-4NME**
80	95	50	36	22	10.0	16	16	210	0.46	**P1C-4PME**
100	115	60	41	27	10.0	20	20	230	0.83	**P1C-4QME**
125	140	70	50	30	10.0	25	25	275	1.53	**P1C-4RME**
160	180	90	55	35	10.0	30	25	315	C.F.	**L075410160**
200	220	90	60	35	14.0	30	25	335	C.F.	**L075410200**

S = Stroke length C.F. = Consult Factory

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Clevis Bracket GA

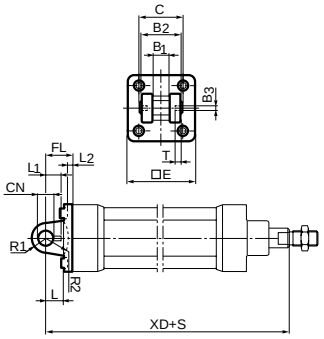


Now in aluminium!

Intended for flexible mounting of cylinder. Clevis bracket GA can be combined with pivot bracket with swivel bearing, swivel eye bracket and swivel rod eye.

Materials
Clevis bracket: Surface-treated aluminium
Pin: Surface hardened steel
Locking pin: Spring steel
Circlips according to DIN 471: Spring steel
Mounting screws acc. to DIN 912: Zinc-plated steel 8.8

Supplied complete with mounting screws for attachment to cylinder.



C

According to VDMA 24 562, AFNOR

Bore mm	C mm	E mm	B2 d12 mm	B1 H14 mm	T mm	B3 mm	R2 mm	L1 mm	FL ±0.2 mm	I2 mm	L mm	CN F7 mm	R1 mm	XD mm	Weight kg	Part Number
32	41	45	34	14	3	3.3	17	11.5	22	5.5	12	10	11	142	0.09	**P1C-4KMCA**
40	48	52	40	16	4	4.3	20	12.0	25	5.5	15	12	13	160	0.13	**P1C-4LMCA**
50	54	65	45	21	4	4.3	22	14.0	27	6.5	17	16	18	170	0.17	**P1C-4MMCA**
63	60	75	51	21	4	4.3	25	14.0	32	6.5	20	16	18	190	0.36	**P1C-4NMCA**
80	75	95	65	25	4	4.3	30	16.0	36	10.0	20	20	22	210	0.58	**P1C-4PMCA**
100	85	115	75	25	4	4.3	32	16.0	41	10.0	25	20	22	230	0.89	**P1C-4QMCA**
125	110	140	97	37	6	6.3	42	24.0	50	10.0	30	30	30	275	1.75	**P1C-4RMCA**
160	140	178	122	43	6	6.3	46	26.5	55	10.0	37	35 h9	36	C.F.	C.F.	**L075510160**
200	175	218	122	43	6	6.3	49	26.5	60	11.5	40	35 h9	38	C.F.	C.F.	**L075510200**

S = Stroke length C.F. = Consult Factory

Stainless Steel Pin Set GA

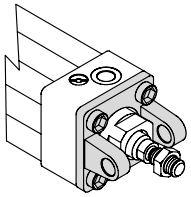
Materials
Pin: Stainless steel
Locking pin: Stainless steel
Circlips according to DIN 471: Stainless steel

Bore mm	Weight kg	Part Number
32	0.05	**9301054311**
40	0.06	**9301054312**
50	0.07	**9301054313**
63	0.07	**9301054314**
80	0.17	**9301054315**
100	0.31	**9301054316**
125	0.54	**9301054317**

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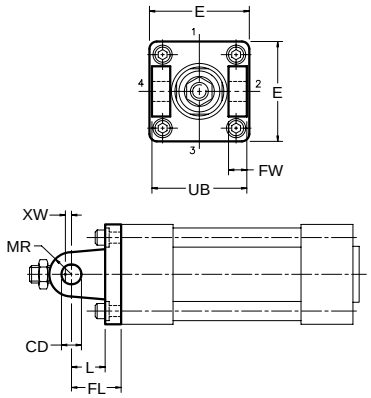
Head Detachable Clevis MP7



Intended for flexible mounting of cylinder

Materials
Clevis bracket: Cast iron for 32-63mm bores;
Surface treated aluminum, black for 80-200mm bores
Mounting screws acc. to DIN 912: Zinc-plated steel 8.8

Supplied complete with mounting screws for attachment to cylinder.



According to ISO MP7, VDMA 24 562, AFNOR

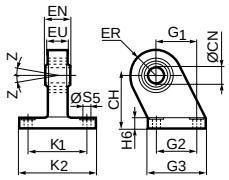
Bore	CD mm	E mm	FL mm	FW mm	L mm	MR mm	UB mm	XW mm	Part Number
32	10	46.5	22	8	12	10	45	4	**L075400032**
40	12	52	25	9	15	12	52	5	**L075400040**
50	12	63.5	27	10	15	13	60	10	**L075400050**
63	16	76	32	15	20	16	70	5	**L075400063**
80	16	95.5	36	20	20	17	90	10	**L075400080**
100	20	114.5	41	25	25	21	110	10	**L075400100**
125	25	140	50	30	35	25	130	15	**L075400125**
160	30	177	55	40	36	30	170	25	**L075400160**
200	30	214	60	40	41	30	170	35	**L075400200**

Pivot Bracket with Swivel Bearing



Intended for use together with clevis bracket GA.

Material
Pivot bracket: Surface-treated steel, black
Swivel bearing acc. to DIN 648K: Hardened steel



According to VDMA 24 562, AFNOR

Bore mm	CN H7 mm	S5 H13 mm	K1 JS14 mm	K2 mm	EU mm	G1 JS14 mm	G2 JS14 mm	EN mm	G3 mm	CH JS15 mm	H6 mm	ER mm	Z	Weight kg	Part Number
32	10	6.6	38	51	10.5	21	18	14	31	32	10	16	4°	0.18	**P1C-4KMA**
40	12	6.6	41	54	12.0	24	22	16	35	36	10	18	4°	0.25	**P1C-4LMA**
50	16	9.0	50	65	15.0	33	30	21	45	45	12	21	4°	0.47	**P1C-4MMA**
63	16	9.0	52	67	15.0	37	35	21	50	50	12	23	4°	0.57	**P1C-4NMA**
80	20	11.0	66	86	18.0	47	40	25	60	63	14	28	4°	1.05	**P1C-4PMA**
100	20	11.0	76	96	18.0	55	50	25	70	71	15	30	4°	1.42	**P1C-4QMA**
125	30	14.0	94	124	25.0	70	60	37	90	90	20	40	4°	3.10	**P1C-4RMA**

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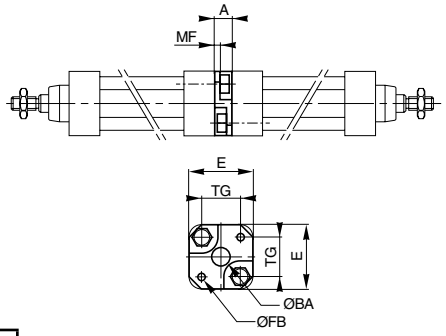
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Mounting Kit



Mounting kit for back to back mounted cylinders, 3 and 4 position duplex cylinders.

Material
Mounting: Aluminium
Mounting screws: Zinc-plated steel 8.8



Bore mm	E mm	TG mm	ØFB mm	MF mm	A mm	ØBA mm	Weight kg	Part Number
32	50	32.5	6.5	5	16	30	0.060	**P1E-6KB0**
40	60	38.0	6.5	5	16	35	0.078	**P1E-6LB0**
50	66	46.5	8.5	6	20	40	0.162	**P1E-6MB0**
63	80	56.5	8.5	6	20	45	0.194	**P1E-6NB0**
80	100	72.0	10.5	8	25	45	0.450	**P1E-6PB0**
100	118	89.0	10.5	8	25	55	0.672	**P1E-6QB0**

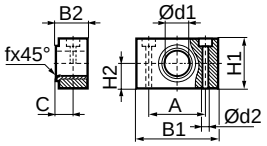
Pivot Bracket for MT4



Intended for use together with central trunnion MT4.

Material
Pivot bracket: Surface-treated aluminium
Bearing acc. to DIN 1850 C: Sintered oil-bronze bushing

Supplied in pairs.



According to ISO, VDMA 24 562, AFNOR

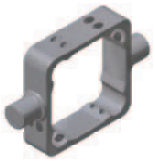
Bore mm	B1 mm	B2 mm	A mm	C mm	d1 mm	d2 H13 mm	H1 mm	H2 mm	fx45° min mm	Weight* kg	Part Number
32	46	18.0	32	10.5	12	6.6	30	15	1.0	0.04	**9301054261**
40	55	21.0	36	12.0	16	9.0	36	18	1.6	0.07	**9301054262**
50	55	21.0	36	12.0	16	9.0	36	18	1.6	0.07	
63	65	23.0	42	13.0	20	11.0	40	20	1.6	0.12	**9301054264**
80	65	23.0	42	13.0	20	11.0	40	20	1.6	0.12	
100	75	28.5	50	16.0	25	14.0	50	25	2.0	0.21	**9301054266**
125	75	28.5	50	16.0	25	14.0	50	25	2.0	0.21	

*Weight per item

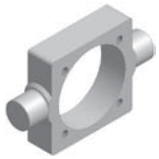
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Intermediate Trunnion MT4



Standard*

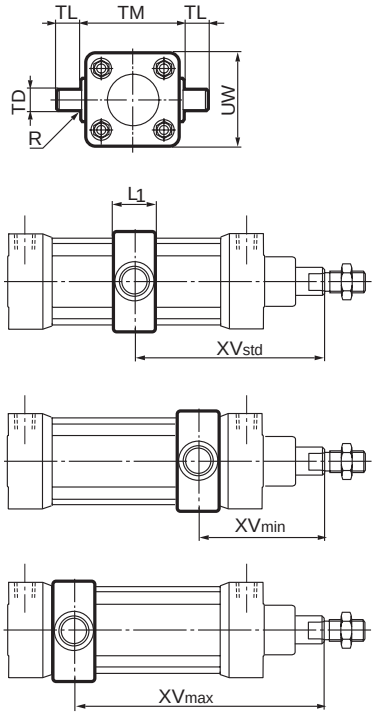


Tie Rod Version

Intended for articulated mounting of cylinder. The trunnion is factory-fitted at an optional location. Order by specifying Mounting Style G or 7 and providing the desired XV dimension (3-digit measure in mm). ***See page C9 for Ordering Information.*** Combined with pivot bracket for MT4 for 32-125mm bores.

Material:
Trunnion: Zinc plated steel (Cast iron for 160-200mm bores)

*Standard mounting is for the Standard cylinder body and is permanently affixed by the factory.

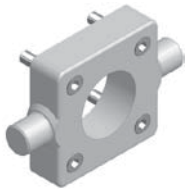


According to ISO MT4, VDMA 24 562, AFNOR

Bore mm	TM h14 mm	TL h14 mm	TD e9 mm	R mm	UW mm	L1 mm	X1 mm	XV_{min} mm	X2 mm	Weight kg
32	50	12	12	1.0	46	15	73.0	62.0	84.0	0.13
40	63	16	16	1.6	59	20	82.5	73.0	92.0	0.31
50	75	16	16	1.6	69	20	90.0	80.5	99.5	0.37
63	90	20	20	1.6	84	25	97.5	89.5	106.0	0.69
80	110	20	20	1.6	102	25	110.0	98.0	122.0	0.89
100	132	25	25	2.0	125	30	120.0	110.5	129.5	1.58
125	160	25	25	2.0	155	32	145.0	132.0	158.0	2.60
160	200	32	32	2.5	190	70	C.F.	169	C.F.	C.F.
200	250	32	32	2.5	242	70	C.F.	184	C.F.	C.F.

XVstd = X1 + Stroke length/2 XVmax = X2 + Stroke length C.F. = Consult Factory

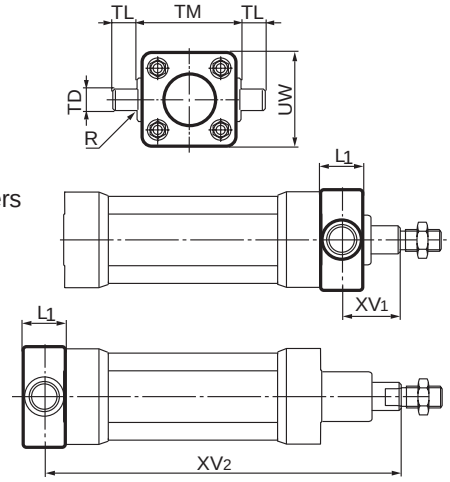
Flange Mounted Trunnion



Intended for articulated mounting of cylinder. This trunnion can be flange mounted on the front or rear end cover of all P1D cylinders. If you choose, you can order a complete cylinder with factory-fitted flange mounted trunnion – see the ordering information on pages C8 and C9. Individual trunnions have part numbers as shown below.

Material
Trunnion: zinc plated steel
Screws: zinc plated steel, 8.8

Delivered complete with mounting screws for attachment to the cylinder



According to ISO MT4, VDMA 24 562, AFNOR

Bore mm	TM h14 mm	TL h14 mm	TD e9 mm	R mm	UW mm	L1 mm	XV_1 mm	X mm	Weight kg	Part Number
32	50	12	12	1.0	46	14	19.0	127.0	0.17	**P1D-4KMYF**
40	63	16	16	1.6	59	19	20.5	144.5	0.43	**P1D-4LMYF**
50	75	16	16	1.6	69	19	27.5	152.5	0.55	**P1D-4MMYF**
63	90	20	20	1.6	84	24	25.0	170.0	1.10	**P1D-4NMYF**
80	110	20	20	1.6	102	24	34.0	186.0	1.66	**P1D-4PMYF**
100	132	25	25	2.0	155	29	36.5	203.5	3.00	**P1D-4QMYF**

XV_2 = X + Stroke length

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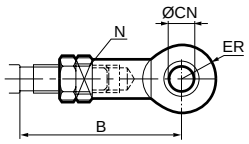
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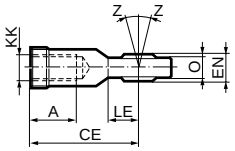
Swivel Rod Eye



Swivel rod eye for articulated mounting of cylinder.
Swivel rod eye can be combined with clevis bracket GA.
Maintenance-free.

Materials
Swivel rod eye: Zinc-plated steel
Swivel bearing according to DIN 648K: Hardened steel





Stainless Steel Swivel Rod Eye

Materials
Swivel rod eye: Stainless steel
Swivel bearing according to DIN 648K: Stainless steel

Use stainless steel nut (see page C31) with stainless steel swivel rod eye.

According to ISO 8139

Bore mm	A mm	B min mm	B max mm	CE mm	CN H9 mm	EN h12 mm	ER mm	KK	LE min mm	N mm	O mm	Z	Weight kg	Part Number	Stainless Steel Part Number
32	20	48.0	55	43	10	14	14	M10x1.25	15	17	10.5	12°	0.08	**P1C-4KRS**	**P1S-4JRT**
40	22	56.0	62	50	12	16	16	M12x1.25	17	19	12.0	12°	0.12	**P1C-4LRS**	**P1S-4LRT**
50	28	72.0	80	64	16	21	21	M16x1.5	22	22	15.0	15°	0.25	**P1C-4MRS**	**P1S-4MRT**
63	28	72.0	80	64	16	21	21	M16x1.5	22	22	15.0	15°	0.25		
80	33	87.0	97	77	20	25	25	M20x1.5	26	32	18.0	15°	0.46	**P1C-4PRS**	**P1S-4PRT**
100	33	87.0	97	77	20	25	25	M20x1.5	26	32	18.0	15°	0.46		
125	51	123.5	137	110	30	37	35	M27x2	36	41	25.0	15°	1.28	**P1C-4RRS**	**P1S-4RRT**
160/200	56	C.F.	C.F.	125	35*	43	40	M36x2	40	50	28.0	15°	C.F.	**L075470036**	**C.F.**

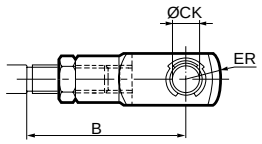
*H7 C.F. = Consult Factory

Clevis



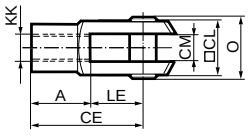
Clevis for articulated mounting of cylinder.

Material
Clevis, clip: Galvanized steel
Pin: Hardened steel



Stainless Steel Clevis

Material
Clevis: Stainless steel
Pin: Stainless steel
Circlips according to DIN 471: Stainless steel



According to ISO 8140

Bore mm	A mm	B min mm	B max mm	CE mm	CK h11/E9 mm	CL mm	CM mm	ER mm	KK	LE mm	O mm	Weight kg	Part Number	Stainless Steel Part Number
32	20	45.0	52	40	10	20	10	16	M10x1.25	20	28.0	0.09	**P1C-4KRC**	**P1S-4JRD**
40	24	54.0	60	48	12	24	12	19	M12x1.25	24	32.0	0.15	**P1C-4LRC**	**P1S-4LRD**
50	32	72.0	80	64	16	32	16	25	M16x1.5	32	41.5	0.35	**P1C-4MRC**	**P1S-4MRD**
63	32	72.0	80	64	16	32	16	25	M16x1.5	32	41.5	0.35		
80	40	90.0	100	80	20	40	20	32	M20x1.5	40	50.0	0.75	**P1C-4PRC**	**P1S-4PRD**
100	40	90.0	100	80	20	40	20	32	M20x1.5	40	50.0	0.75		
125	56	123.5	137	110	30	55	30	45	M27x2	54	72.0	2.10	**P1C-4RRC**	**P1S-4RRD**
160/200	71	C.F.	C.F.	144	35	70	35	57	M36x2	72	95	C.F.	**L075490036**	**C.F.**

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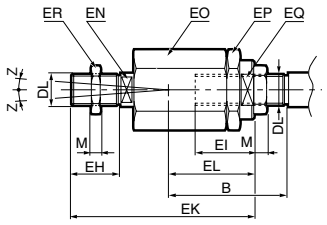
Flexo Coupling



Flexo coupling for articulated mounting of piston rod. Flexo fitting is intended to take up axial angle errors within a range of ±4°.

Material
Flexo coupling, nut: Zinc-plated steel
Socket: Hardened steel

Supplied complete with galvanized adjustment nut.



Bore mm	B min mm	B max mm	DL	EH mm	EI mm	EK mm	EL mm	EN mm	EO mm	EP mm	EQ mm	ER mm	M mm	Z	Weight kg	Part Number
32	36.0	43	M10x1.25	20	23	70	31	12	30	30	19	30	5.0	4°	0.21	**P1C-4KRF**
40	37.0	43	M12x1.25	23	23	67	31	12	30	30	19	30	6.0	4°	0.22	**P1C-4LRF**
50	53.0	61	M16x1.5	40	32	112	45	19	41	41	30	41	8.0	4°	0.67	**P1C-4MRF**
63	53.0	61	M16x1.5	40	32	112	45	19	41	41	30	41	8.0	4°	0.67	
80	57.0	67	M20x1.5	39	42	122	56	19	41	41	30	41	10.0	4°	0.72	**P1C-4PRF**
100	57.0	67	M20x1.5	39	42	122	56	19	41	41	30	41	10.0	4°	0.72	
125	75.5	89	M27x2	48	48	145	60	24	55	55	32	55	13.5	4°	1.80	**P1C-4RRF**
160/200	C.F.	C.F.	M36x2	72	78	251	C.F.	36	75	75	50	55	18.0	4°	C.F.	**L075530036**

C.F. = Consult Factory

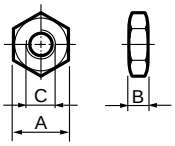
Nuts



Intended for fixed mounting of accessories to the piston rod.

Material: Zinc-plated steel

All P1D cylinders are delivered with a zinc-plated steel piston rod nut, except P1D Clean, which is delivered with a stainless steel piston rod nut instead.



Stainless Steel Nut

Material: Stainless steel A2

All P1D cylinders are delivered with a zinc-plated steel piston rod nut, except P1D Clean, which is delivered with a stainless steel piston rod nut instead.

Acid-proof nut

Material: Acid-proof steel A4

Cylinders with acid-proof piston rod are supplied with nut of acid-proof steel

According to DIN 439 B

Bore mm	A mm	B mm	C	Weight kg	Part Numbers		
					Steel	Stainless Steel	Acid-Proof
32	17	5.0	M10x1.25	0.007	**9128985601**	**9126725404**	**0261109919**
40	19	6.0	M12x1.25	0.010	**0261109910**	**9126725405**	**0261109920**
50	24	8.0	M16x1.5	0.021	**9128985603**	**9126725406**	**0261109917**
63	24	8.0	M16x1.5	0.021			
80	30	10.0	M20x1.5	0.040	**0261109911**	**0261109921**	**0261109916**
100	30	10.0	M20x1.5	0.040			
125	41	13.5	M27x2	0.100	**0261109912**	**0261109922**	**0261109918**
160/200	55	18.0	M36x2	C.F.	**L075540036**	**C.F.**	**C.F.**

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Screw Set for MP2, MP4, MS1 and GA



Set of stainless steel screws for fitting clevis brackets
MP2, MP4 and GA onto the cylinder. The screws have an internal hexagonal head and are used in special environments, e.g. the food industry, or where there are extra demands for protection against corrosion.

Material:
According to DIN 912, Stainless steel, A2

4 pcs per pack.

Bore mm	Weight kg	Part Number
32	0.02	**9301054321**
40	0.02	**9301054321**
50	0.05	**9301054322**
63	0.05	**9301054322**
80	0.09	**9301054323**
100	0.09	**9301054323**
125	0.15	**9301054324**

Screw set for MF1/MF2



Set of stainless steel screws for fitting flanges MF1/MF2 onto the cylinder. The screws have an internal hexagonal head and are used in special environments, e.g. the food industry, or where there are extra demands for protection against corrosion.

Material:
According to DIN 6912, Stainless steel, A2

4 pcs per pack

Bore mm	Weight kg	Part Number
32	0.02	**9301054331**
40	0.02	**9301054331**
50	0.04	**9301054332**
63	0.04	**9301054332**
80	0.07	**9301054333**
100	0.07	**9301054333**
125	0.12	**9301054334**

Sealing plugs



Set of sealing plugs to be fitted in unused end covers.
The plugs can be used for all P1D cylinders to avoid collecting dirt and fluids in the end cover screw recesses.

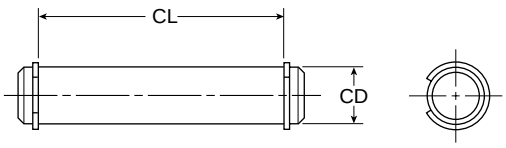
Material:
Polyamid PA

4 pcs per pack

Bore mm	Weight kg	Part Number
32	0.01	**9121742201**
40	0.01	**9121742201**
50	0.02	**9121742202**
63	0.02	**9121742202**
80	0.02	**9121742203**
100	0.02	**9121742203**
125	0.03	**9121742204**

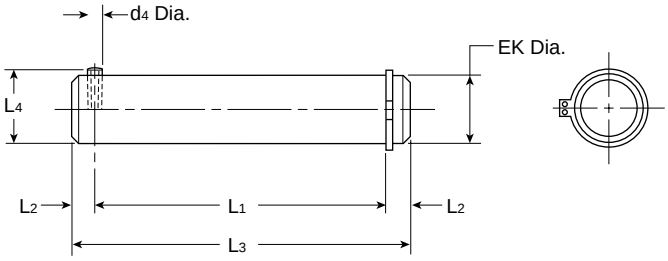
Pivot Pin Sets for 160-200mm Bore Cylinder Accessories

For Clevis Bracket MP2



Bore	CD	CL	Part Number
160/200	30	170.50	L075500160

For Rear Swivel Eye MP6



Bore	EK	d_4	L_1	L_2	L_3	L_4	Part Number
160/200	35	6	119	7	131	41	L075520160

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Seal Kits

Cyl. Bore	P1D Cylinder Version
mm	**Standard** P1D-S, P1D-T, P1D-C, P1D-F
32	SK032P1D01
40	SK040P1D01
50	SK050P1D01
63	SK063P1D01
80	SK080P1D01
100	SK100P1D01
125	SK125P1D01

Grease for P1D



Standard 30g **9127394541**

Gland Seal Kits

Bore Size	Rod Dia.	Rod No.	RG-Rod Gland Cartridge Kit		RK-Rod Seal Kit	
			Nitrile Seals	Fluorocarbon Seals	Nitrile Seals	Fluorocarbon Seals
			Consisting of: 1 each items #14, 41, 45 & 104	Consisting of: 1 each items #14, 41, 45 & 104	Consisting of: 1 each items #41, 45 & 104	Consisting of: 1 each items #41, 45 & 104
mm	mm		Part No.	Part No.	Part No.	Part No.
32	12	1	RG0P1D0121	RG0P1D0125	RK0P1D0121	RK0P1D0125
40	16	1	RG0P1D0161	RG0P1D0165	RK0P1D0161	RK0P1D0165
50 & 63	20	1	RG0P1D0201	RG0P1D0205	RK0P1D0201	RK0P1D0205
80 & 100	25	1	RG0P1D0251	RG0P1D0255	RK0P1D0251	RK0P1D0255
125	32	1	RG0P1D0321	RG0P1D0325	RK0P1D0321	RK0P1D0325

Piston & End Seal Kits

Bore Size	PK – Piston Seal Kit		CB – Cylinder Body End Seal Kit	
	Consisting of: 2 each items # 42 & 47 plus 1 each items 121 and #159. NOTE: (Fluorocarbon seals do not include magnetic ring symbol #159.)		Consisting of: 2 each item #47	
	Nitrile Seals	Fluorocarbon Seals	Nitrile Seals	Fluorocarbon Seals
mm	Part No.	Part No.	Part No.	Part No.
32	PK032P1D01	PK032P1D05	CB032P1D01	CB032P1D05
40	PK040P1D01	PK040P1D05	CB040P1D01	CB040P1D05
50	PK050P1D01	PK050P1D05	CB050P1D01	CB050P1D05
63	PK063P1D01	PK063P1D05	CB063P1D01	CB063P1D05
80	PK080P1D01	PK080P1D05	CB080P1D01	CB080P1D05
100	PK100P1D01	PK100P1D05	CB100P1D01	CB100P1D05
125	PK125P1D01	PK125P1D05	CB125P1D01	CB125P1D05

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P1A Series

Mini ISO 6432
Pneumatic Cylinders

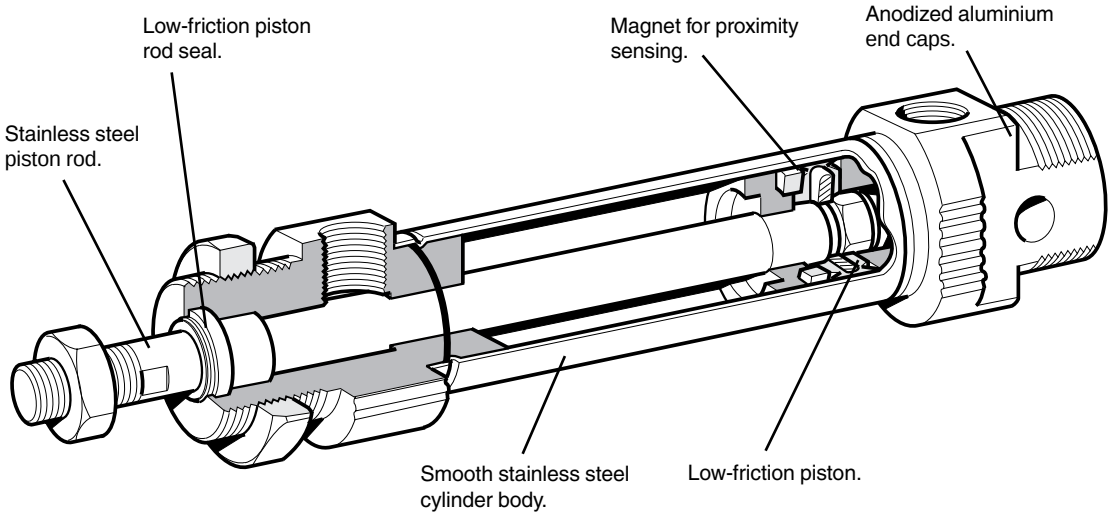


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Technical Data C38-C40
Dimensions C41
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C

The Parker P1A series of pneumatic cylinders are intended for use in a wide range of applications. These cylinders are particularly suitable for lighter duties in the packaging, food and textile industries. Hygienic design, the use of corrosion-resistant materials and initial lubrication with our food-grade grease makes the cylinders suitable for food industry applications.

Proven design and high quality manufacturing throughout ensure long service life and optimum performance.

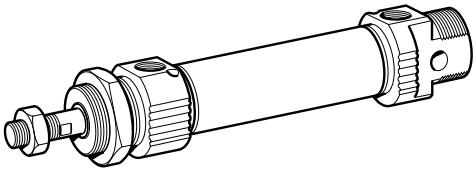
Mounting dimensions are in accordance with ISO 6432 and CETOP RP52P. This greatly simplifies installation and world-wide interchangeability.

The Mini ISO range is available with bumpers or adjustable pneumatic cushioning. Controlled by simple bleed screws for fine adjustment, the adjustable cushioned cylinders can be operated with higher mass loads and at higher speeds than those with fixed end cushioning bumpers.

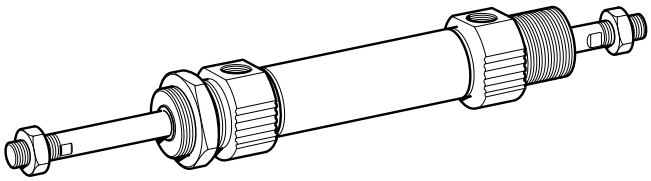
The Mini ISO range is also available in an all-stainless version with piston rod, cylinder body and end covers of stainless steel for use in extremely severe environments. Consult the Wadsworth, Ohio facility for more information.

A complete range of sensors for proximity sensing is available as accessories: both reed and solid state sensors are available. Either can be supplied with flying leads or cable and multi-pin connector. See Electronic Sensors section for specifications and part numbers.

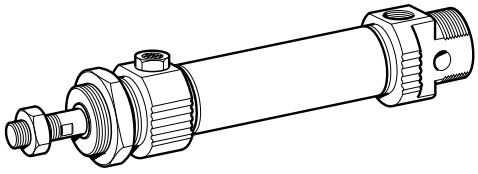
Double Acting



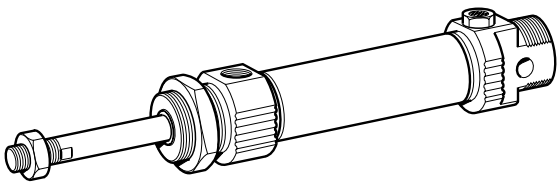
Double Acting, Double Rod



Single-Acting, Spring Return



Single-Acting, Spring Extend



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Order Key

P1A – S **016** **M** **S** **–** **0025**

Cylinder Bore

010	10mm
012	12mm
016	16mm
020	20mm
025	25mm

Cylinder Type / Function

M		Double-acting, adjustable cushioning. Ø16-25 mm. Not for sealing material type F
D		Double-acting, bumpers, Ø10 - Ø25
F		Double-acting, adjustable cushioning, double rod, Ø16-25 mm. Not for sealing material type F.
K		Double-acting, bumpers, double rod, Ø10 - Ø25
S		Single-acting, bumpers, spring return for retract stroke, Ø10-25 mm
T		Single-acting, bumpers, spring extend for advance stroke, Ø16-25 mm

Stroke length, mm

E.g. 0025 = 25 mm
For standard stroke length and max length see table below.

Sealing material

S	Standard -20°C to +80°C (-4°F to +176°F) Magnetic piston
F	High temperature: Ø12 mm, 16 mm, 20 mm and 25 mm -10°C to +150°C. (14°F to 302°F) Non magnetic piston
V	External seals of fluorinated rubber -20°C to +80°C (-4°F to +176°F) Magnetic piston

Stroke Lengths

Cylinder Model	Bore Size	Stroke Length (● = standard, ● = non-standard, blank = N/A)															
		10	15	20	25*	30	40	50*	80*	100*	125*	160*	200*	250*	320*	400*	500*
Double acting with fixed end-cushioning:																	
P1A-S 010 D	10	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
P1A-S 012 D	12	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
P1A-S 016 D	16	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
P1A-S 020 D	20	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
P1A-S 025 D	25	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Double acting with adjustable end-cushioning:																	
P1A-S 016 M	16			●	●	●	●	●	●	●	●	●	●	●	●	●	●
P1A-S 020 M	20			●	●	●	●	●	●	●	●	●	●	●	●	●	●
P1A-S 025 M	25			●	●	●	●	●	●	●	●	●	●	●	●	●	●
Single acting:																	
P1A-S 010 SS	10	●	●	●	●	●	●	●	●								
P1A-S 012 SS	12	●	●	●	●	●	●	●	●								
P1A-S 016 SS(TS)	16	●	●	●	●	●	●	●	●**								
P1A-S 020 SS(TS)	20	●	●	●	●	●	●	●	●								
P1A-S 025 SS(TS)	25	●	●	●	●	●	●	●	●								

*Standard stroke lengths in mm according to ISO 4393
** Not for the TS version

Note: For sensor specifications and part numbers, please refer to the Electronic Sensors section.

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Standard Specifications

Working pressure max	10bar (145 PSI)	
Working temperature	max	+80°C (176°F)
	min	–20°C (4°F)
High-temperature version	max	+150°C (Ø20 and 25 mm) 302°F +120°C (Ø10, 12 and 16 mm) 248°F
	min	–10°C 14°F

Prelubricated, further lubrication is not normally necessary.
If additional lubrication is introduced it must be continued.

C

Material Specification

Piston rod	Stainless steel, DIN X 10 CrNiS 18 9
Piston rod seal	Fluorocarbon rubber FPM
Piston rod bearing	Multilayer PTFE/steel
End covers	Anodized aluminium
O-ring, internal	Nitrile rubber, NBR
Cylinder barrel	Stainless steel, DIN X 5 CrNi 18 10
Piston, complete	Nitrile rubber, NBR/steel
Magnet holder	Thermoplastic elastomer
Magnet	Plastic-coated magnetic material
Return spring	Surface-treated steel
Cushioning screw	Stainless steel, DIN X 10 CrNiS 18 9

Cylinders are supplied complete with nose mounting and piston rod nuts.
Cylinders with double piston rods are supplied with two piston rod nuts

Variants Mini ISO:

High-temperature version, type F:

Piston rod seal	Fluorocarbon rubber, FPM
Piston complete, Ø10-Ø16	HNBR/steel
Piston complete, Ø20-Ø25	FPM/steel

PTFE and copper free cylinders, type N:

Piston rod bearing	PA plastic

Cylinders with outer sealings in fluorcarbon, type V:

Piston rod seal/ Scraper ring	Fluorocarbon rubber, FPM

Note: Spare part = new cylinder

Quick Reference

Model #	Cylinder		Piston Rod		Thread	Total Weight at 0mm Stroke (lbs)	Additional Weight per 10mm Stroke (lbs)	Air Consumption	Port Size
	Bore (mm)	Area (cm^2)	Dia. (mm)	Area (cm^2)					
Double acting, cushioned stroke									
P1A-S 010 D	10	0.78	4	0.13	M4	0.09	0.007	0.0004 1)	M5
P1A-S 012 D	12	1.13	6	0.28	M6	0.15	0.009	0.0005 1)	M5
P1A-S 016 D	16	2.01	6	0.28	M6	0.20	0.012	0.0009 1)	M5
P1A-S 020 D	20	3.14	8	0.50	M8	0.40	0.015	0.0010 1)	G1/8
P1A-S 025 D	25	4.91	10	0.78	M10x1.25	0.89	0.025	0.0023 1)	G1/8
Double acting, adjustable cushioning									
P1A-S 016 M	16	2.01	6	0.28	M6	0.20	0.012	0.0009 1)	M5
P1A-S 020 M	20	3.14	8	0.50	M8	0.40	0.015	0.0010 1)	G1/8
P1A-S 025 M	25	4.91	10	0.78	M10x1.25	0.89	0.025	0.0023 1)	G1/8
Single acting									
P1A-S 010 SS	10	0.78	4	0.13	M4	0.09	0.007	0.0002 1)	M5
P1A-S 012 SS	12	1.13	6	0.28	M6	0.18	0.009	0.0003 1)	M5
P1A-S 016 SS(TS)	16	2.01	6	0.28	M6	0.22	0.012	0.0005 1)	M5
P1A-S 020 SS(TS)	20	3.14	8	0.50	M8	0.40	0.015	0.0008 1)	G1/8
P1A-S 025 SS(TS)	25	4.91	10	0.78	M10x1.25	0.58	0.025	0.0013 1)	G1/8

1) Free air consumption per 10 mm stroke length for a double stroke at 6 bar (87 PSI)

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Cylinder Forces

Indicated cylinder forces are theoretical and should be reduced according to the working conditions.

Double Acting

Model Number	Bore Size mm	Theoretical Piston Force (lbs) at 6 Bar (87 PSI)	
		Extension	Retraction
P1A-S 010 D	10	10.57	8.76
P1A-S 012 D	12	15.07	11.25
P1A-S 016 D	16	26.98	23.15
P1A-S 020 D	20	42.27	35.52
P1A-S 025 D	25	66.10	55.53
P1A-S 016 M	16	26.98	23.16
P1A-S 020 M	20	42.27	35.52
P1A-S 025 M	25	66.10	55.53

Single Acting

Model Number	Stroke	Theoretical Piston Force (lbs) at 6 Bar (87 PSI)			
		Spring Retraction		Spring Extension	
		lbs max	lbs. min	lbs. max	lbs. min
P1A-S 010 SS	10	8.5	8.1	2.4	2.0
	15	8.5	8.1	2.4	2.0
	25	8.7	8.1	2.4	2.0
	40	8.5	7.6	2.9	2.0
	50	8.7	7.6	2.9	1.7
	80	8.7	7.6	2.9	1.7
P1A-S 012 SS	10	11.9	11.4	3.6	3.1
	15	11.9	11.4	3.6	3.1
	25	12.3	11.4	3.6	2.7
	40	11.9	10.8	4.2	3.3
	50	11.9	10.8	4.2	3.1
	80	12.3	10.8	4.2	2.7
P1A-S 016 SS(TS)	10	22.0 (19.1)	22.2 (18.8)	4.7 (4.2)	4.0 (4.0)
	15	23.1 (19.3)	22.2 (18.8)	4.7 (4.2)	3.8 (3.8)
	25	23.8 (19.8)	22.2 (18.8)	4.7 (4.2)	3.3 (3.3)
	40	23.8 (20.3)	21.3 (18.8)	5.6 (4.2)	3.1 (3.1)
	50	24.2 (20.4)	21.3 (18.8)	5.6 (4.2)	2.7 (2.7)
	80	24.0 (21.3)	21.3 (18.8)	5.6 (4.2)	2.9 (2.9)
P1A-S 020 SS(TS)	10	36.6 (29.6)	36.1 (29.2)	6.1 (6.3)	5.6 (5.8)
	15	36.8 (29.8)	36.1 (29.2)	6.1 (6.3)	5.4 (5.6)
	25	37.5 (30.3)	36.1 (29.2)	6.1 (6.3)	4.7 (5.1)
	40	37.3 (31.0)	35.7 (29.2)	6.5 (6.3)	4.9 (4.9)
	50	37.7 (31.4)	35.7 (29.2)	6.5 (6.3)	4.5 (4.5)
	80	38.2 (31.2)	36.1 (24.2)	6.1 (11.2)	4.0 (4.2)
P1A-S 025 SS(TS)	10	57.5 (46.1)	56.9 (45.6)	9.2 (9.9)	8.5 (9.4)
	15	58.0 (46.5)	56.9 (45.6)	9.2 (9.9)	8.1 (9.0)
	25	58.9 (47.2)	56.9 (45.6)	9.2 (9.9)	7.2 (8.3)
	40	58.7 (48.1)	56.2 (45.6)	9.9 (9.9)	7.4 (7.4)
	50	59.4 (48.8)	56.2 (45.6)	9.9 (9.9)	6.7 (6.7)
	80	59.4 (50.1)	56.4 (46.3)	9.6 (9.2)	6.7 (5.4)

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Cushioning

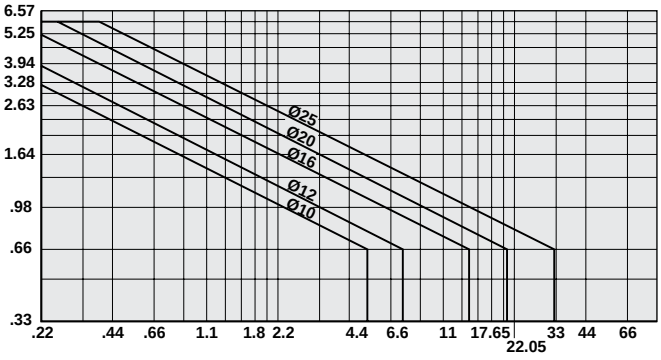
Use the diagram below to determine the necessary size of cylinder to provide the requisite cushioning performance. The maximum cushioning performance, as indicated in the diagram, is based on the following assumptions:

- Low load, i.e. low pressure drop across the piston
- Steady-state piston speed
- Correctly adjusted cushioning screw

The load is the sum of the internal and external friction, together with any gravity forces. At high relative loading it is recommended that, for a given speed, the load should be reduced by a factor of 2.5, or that, for a given mass, the speed should be reduced by a factor of 1.5. These factors apply in relation to the maximum performance as shown in the diagram.

Fixed End-Cushioning (Bumpers)

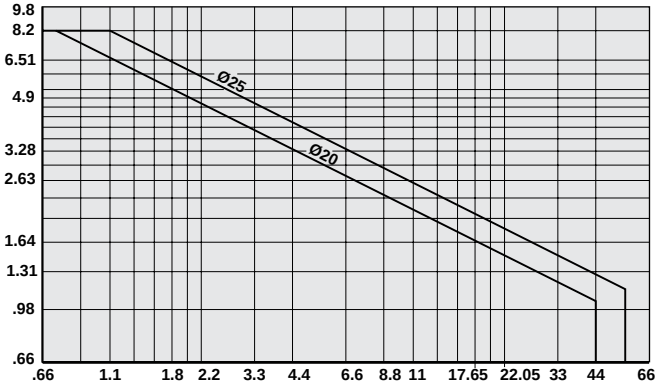
Speed Ft./Sec.



Weight Lbs.

Adjustable Pneumatic End-Cushioning

Speed Ft./Sec.



Weight Lbs.

Double-acting cushioned cylinders

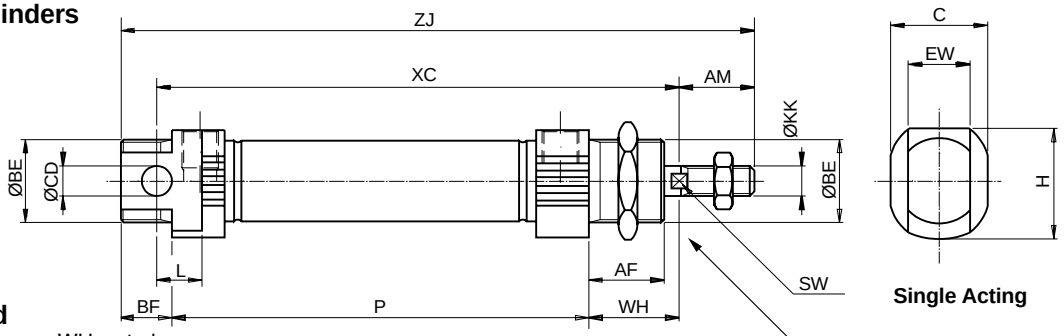
Adjustable pneumatic cushioning permits greater loads and higher operating speeds, making the cylinders suitable for more demanding applications.

These cylinders are available in bores of 16, 20 and 25 mm, with stroke lengths from 20 mm to 500 mm.

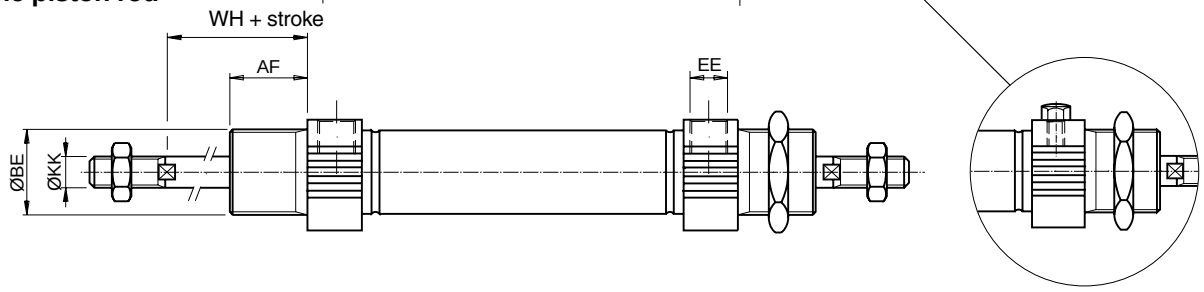
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Double acting cylinders



Double piston rod



Cylinder bore mm	AM 0/-2 mm	BE	AF mm	BF mm	C mm	CD h9 mm	EE	EW mm	H mm	KK	L mm	SW mm	WH±1.2 mm
10	12	M12x1.25	12	10	14.0	4	M5	8	16.7	M4	6	–	16
12	16	M16x1.5	18	13	18.0	6	M5	12	19.1	M6	9	5	22
16[1)]	16	M16x1.5	18	13	18.0	6	M5	12	19.1	M6	9	5	22
16[2)]	16	M16x1.5	18	13	25.0	6	M5	12	24.0	M6	9	5	22
20	20	M22x1.5	20	14	24.0	8	G1/8	16	27.0	M8	12	7	24
25	22	M22x1.5	22	14	27.5	8	G1/8	16	29.0	M10x1.25	12	9	28

1) P1A-S016DS/SS/TS 2) P1A-S016MS

Double acting cylinders

Cylinder bore mm	XC mm	ZJ mm	P mm
10	64 + stroke	84 + stroke	46 + stroke
12	75 + stroke	99 + stroke	48 + stroke
16	82 + stroke	104 + stroke	53 + stroke
20	95 + stroke	125 + stroke	67 + stroke
25	104 + stroke	132 + stroke	68 + stroke

Single-acting, spring return, type SS

Cylinder Bore mm	XC (mm) at Various Strokes						ZJ (mm) at Various Strokes						P (mm) at Various Strokes					
	10	**15**	**25**	**40**	**50**	**80**	**10**	**15**	**25**	**40**	**50**	**80**	**10**	**15**	**25**	**40**	**50**	**80**
10	74	79	89	126	136	174	94	99	109	146	156	194	56	61	71	108	118	156
12	85	90	100	132	142	185	109	114	124	156	166	209	58	63	73	105	115	158
16	92	97	107	122	132	184	114	119	129	144	154	206	63	68	78	93	103	155
20	105	110	120	135	145	191	135	140	150	165	175	221	77	82	92	107	117	163
25	114	119	129	144	154	201	142	147	157	172	182	229	78	83	93	108	118	165

Single-acting, spring-extended, type TS

Cylinder Bore mm	ZC [3)] (mm) at Various Strokes						ZJ [3)] (mm) at Various Strokes						P (mm) at Various Strokes					
	10	**15**	**25**	**40**	**50**	**80**	**10**	**15**	**25**	**40**	**50**	**80**	**10**	**15**	**25**	**40**	**50**	**80**
16	107	112	122	137	147	–	134	139	149	164	174	–	78	83	93	108	118	–
20	120	125	135	150	160	195	156	161	171	186	196	231	92	97	107	122	132	167
25	129	134	144	159	169	205	165	170	180	195	205	241	93	98	108	123	133	169

3) With piston rod retracted, as shown in the dimension drawing

Length tolerances ±1 mm Stroke length tolerance +1.5/0 mm

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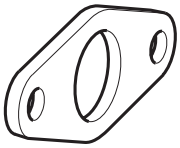
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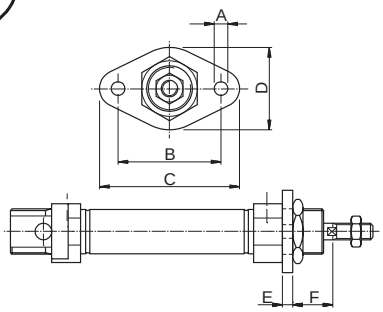
Flange - MF8

Intended for fixed attachment of the cylinder. The flange is designed for mounting on the front or rear end-covers.

Material: Surface-treated steel

This mounting is also available in stainless steel.
Consult the Wadsworth, Ohio facility for additional information.





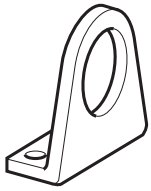
Part Number	Cylinder Ø mm	A	B	C	D	E	F	Weight lbs
P1A-4CMB	10	4.5	30	40	22	3	13	0.025
P1A-4DMB	12-16	5.5	40	52	30	4	18	0.055
P1A-4HMB	20	6.6	50	66	40	5	19	0.100
	25	6.6	50	66	40	5	23	0.100

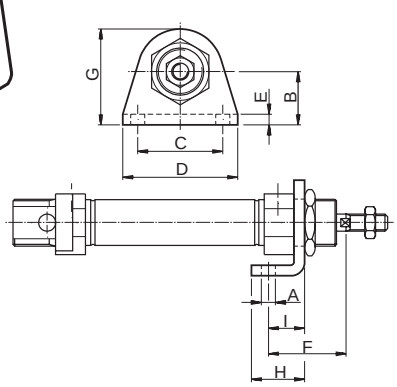
Foot - MS3

Intended for fixed attachement of the cylinder. The bracket is designed for mounting on the front or rear end-covers.

Material: Surface-treated steel

This mounting is also available in stainless steel.
Consult the Wadsworth, Ohio facility for additional information.



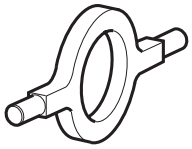


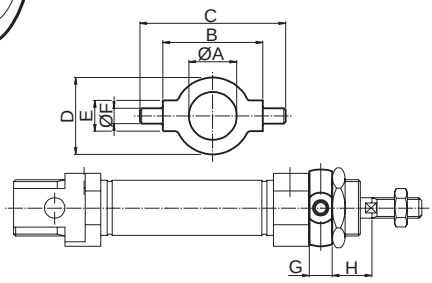
Part Number	Cylinder Ø mm	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I mm	Weight lbs
P1A-4CMF	10	4.5	16	25	35	3	24	26.0	16	11	0.045
P1A-4DMF	12-16	5.5	20	32	42	4	32	32.5	20	14	0.08
P1A-4HMF	20	6.5	25	40	54	5	36	45.0	25	17	0.18
	25	6.5	25	40	54	5	40	45.0	25	17	0.18

Cover Trunnion

Intended for articulated mounting of the cylinder. The flange is designed for mounting on the front or rear end-covers.

Material: Stainless steel, DIN X 10 CrNiS 18 9





Part Number	Cylinder Ø mm	A mm	B h14 mm	C mm	D mm	E e9 mm	F mm	G mm	H mm	Weight lbs
P1A-4CMJ	10	12.5	26	38	20	8	4	6	10	0.03
P1A-4DMJ	12-16	16.5	38	58	25	10	6	8	14	0.07
P1A-4HMJ	20	22.5	46	66	30	10	6	8	16	0.08
	25	22.5	46	66	30	10	6	8	20	0.08

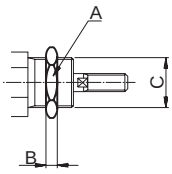
Mounting Nut

Intended for fixed mounting of the cylinder.
Cylinders are supplied complete with one mounting nut.

Material: Galvanized steel

This nut is also available in stainless steel.
Consult the Wadsworth, Ohio facility for further information.





Part Number	Cylinder Ø mm	A mm	B mm	C mm	Weight lbs
9127385101	10	19	6	M12x1.25	0.02
9127385102	12-16	24	8	M16x1.50	0.04
9127385103	20-25	32	11	M22x1.50	0.09

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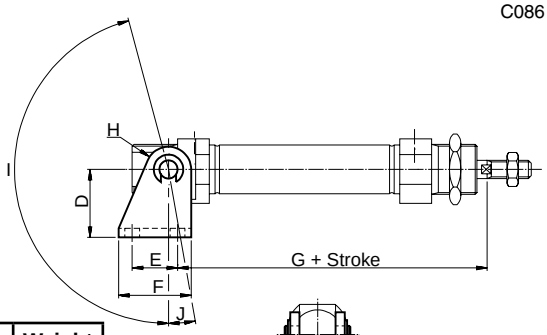
Clevis Bracket

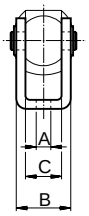
Intended for articulated mounting of the cylinder. Supplied with shaft for mounting on the rear end cover.

Material:
- Bracket: surface-treated steel, black
- Pin: surface hardened steel
- Circlips: according to DIN 471: Stainless steel

This mounting is also available in stainless steel.
Consult the Wadsworth, Ohio facility for additional information.





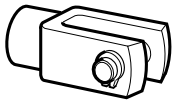


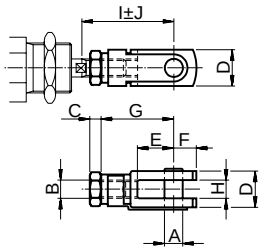
Part Number	Cylinder Ø mm	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm	I °	J °	Weight lbs
P1A-4CMT	10	4.5	13	8	24	12.5	20	65.3	5	160	17	0.045
P1A-4DMT	12	5.5	18	12	27	15.0	25	73.0	7	170	15	0.08
	16	5.5	18	12	27	15.0	25	80.0	7	170	15	0.08
P1A-4HMT	20	6.5	24	16	30	20.0	32	91.0	10	165	10	0.18
	25	6.5	24	16	30	20.0	32	100.0	10	165	10	0.18

Clevis

According to ISO 8140. Intended for articulated mounting of the cylinder.
This mounting is adjustable in the axial direction. Supplied complete with pin.

Material: Galvanized steel
This mounting is also available in stainless steel.
Consult the Wadsworth, Ohio facility for additional information.





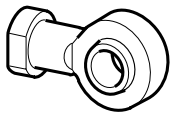
Part Number	Cylinder Ø mm	A mm	B	C mm	D mm	E mm	F mm	G mm	H mm	I mm	J mm	Weight lbs
P1A-4CRC	10	4	M4	2.2	8	8	5	16	4	22.0	2.0	0.015
P1A-4DRC	12-16	6	M6	3.2	12	12	7	24	6	31.0	3.0	0.05
P1A-4HRC	20	8	M8	4.0	16	16	10	32	8	40.5	3.5	0.10
P1A-4JRC	25	10	M10x1.25	5.0	20	20	12	40	10	49.0	3.0	0.21

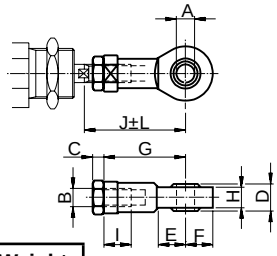
Swivel Rod Eye

According to ISO 8139. Intended for articulated mounting of the cylinder.
This mounting is adjustable in the axial direction.

Material:
- Swivel rod eye: Galvanized steel
- Ball: hardened steel

This mounting is also available in stainless steel.
Consult the Wadsworth, Ohio facility for additional information.





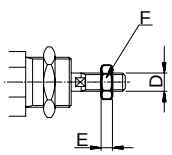
Part Number	Cylinder Ø mm	A mm	B	C mm	D mm	E mm	F mm	G mm	H mm	I mm	J mm	K mm	L mm	Weight lbs
P1A-4CRS	10	5	M4	2.2	8	10	9	27	6.0	8	33.0	9	2.0	0.04
P1A-4DRS	12-16	6	M6	3.2	9	10	10	30	6.8	9	38.5	11	1.5	0.06
P1A-4HRS	20	8	M8	4.0	12	12	12	36	9.0	12	46.0	14	2.0	0.10
P1A-4JRS	25	10	M10x1.25	5.0	14	14	14	43	10.5	15	52.5	17	2.5	0.19

Rod Nut

Intended for fixed mounting on the piston rod. Cylinders are supplied complete with one rod nut.
(cylinders with double piston rod are supplied with two rod nuts.)

Material: Galvanized steel
This nut is also available in stainless steel. Consult the Wadsworth, Ohio facility for additional information.





Part Number	Cylinder Ø mm	D mm	F mm	E mm	Weight lbs
0261110600	10	M4	7	2.2	0.002
0261210800	12-16	M6	10	3.2	0.004
0261211000	20	M8	13	4.0	0.010
9128985601	25	M10x1.25	17	5.0	0.015

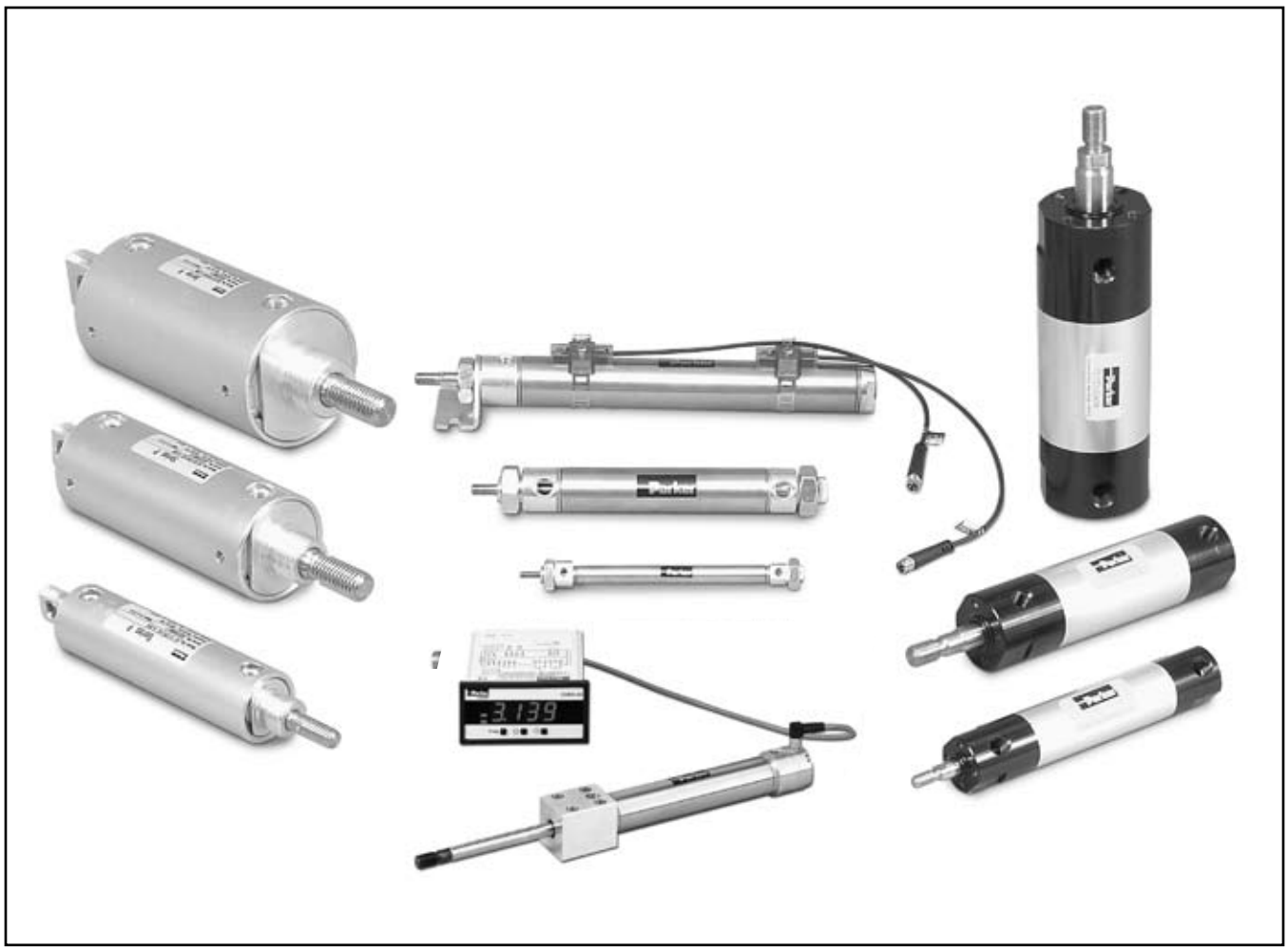
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Round Body Pneumatic Cylinders

Section D



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Section D – Round Body Cylinders

Non-Repairable Cylinders

SR Series

- 304 Stainless Steel Body
- 12 Bore Sizes: 5/16" through 3"
- 28 Mounting Styles
- 250 PSI Air Service

SRM Series

- Piston Position Sensing
- 8 Bore Sizes, 9/16" through 2-1/2"
- 24 Mounting Styles
- 250 PSI Air Service

D

SRD / SRDM Series

- 304 Stainless Steel Body with Delrin® End Caps
- 5 Bore Sizes, 9/16" through 2"
- 2 Mounting Styles
- Piston Position Sensing (SRDM Series Only)
- 100 PSI Air

SRX Series

- Continuous Position Feedback Capability
- 5 Bore Sizes, 1-1/16" through 3"
- 3 Mounting Styles
- 3 Display Modules Available
- 150 PSI Air Service

Repairable Cylinders

P1L Series

- High Performance Cylinder
- Metric, Aluminum Body Threaded Design
- 8 Bore Sizes, 20mm through 100mm
- 12 Mounting Styles
- Piston Position Sensing Capable
- Bumpers Standard, Cushions Available
- 150 PSI Air Service

P Series

- Inch, Round Body Snap-Ring Design
- 6 Bore Sizes, 1-1/8" through 4"
- Universal or Tang Mounting Style
- Cushions Available
- Piston Position Sensing Capable
- 150 PSI Air Service

Also in the Guided Cylinders Section:

P5L Series (powered by P1L Cylinder)

- 3 Body Styles (Thrust, Reach, Base)
- Bore Sizes 20, 25, 32, 40, 50, 63, 80 and 100mm
- Maximum Strokes 400 to 1000mm Depending on Model
- 10 Bar (145 PSI) Air Service

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SR/SRM Series
SRD/SRDM Series

Stainless Steel Body Air Cylinders



Contents

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Mounting Styles D6
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Air Reservoirs D36
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D

Stainless Steel Piston Rods
Corrosion resistant stainless steel is now the standard piston rod material for all bore sizes up to and including 1.50 inch bore at no additional cost. The only exception to the stainless steel standard is when a hollow rod or non-rotating hexagonal rod option is specified. Stainless steel is also the standard material on block, trunnion and KDX mounts.

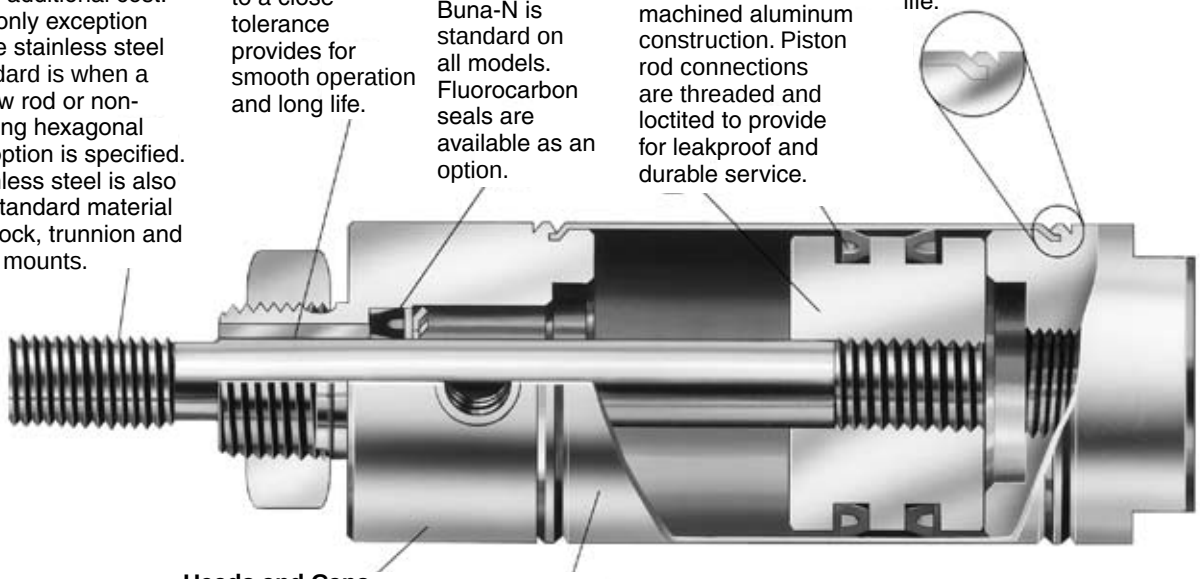
Pre-Lubrication
All SR Series cylinders are factory prelubricated for use with or without added lubrication.

Rod Bushings
Oil impregnated bronze, reamed to a close tolerance provides for smooth operation and long life.

Seals
All piston and rod seals are of a lipseal construction. Buna-N is standard on all models. Fluorocarbon seals are available as an option.

Piston Body
Pistons are precision machined aluminum construction. Piston rod connections are threaded and loctited to provide for leakproof and durable service.

Unitized Construction
Precision double-rolled unitized construction provides durable, leak-proof service and long life.



Heads and Caps
Aluminum construction with precision machining provides a smooth break away. The tube-to-head connection is a strong double rolled construction.

Cylinder Tube
Type 304 stainless steel, polished to a micro-inch finish on the I.D. provides low friction and long life.
A matte finish on the O.D. provides smudge resistance.

Twelve Bore Sizes – 5/16" thru 3". SR Series cylinders are designed to be dimensionally interchangeable with other major stainless steel cylinders.



SRM Series

The SRM Series air cylinder can be ordered with reed or solid state sensors that are easily adjustable anywhere on the cylinder body, with no special mounting rail required. NItrile-barium particle composite surrounds the entire piston diameter for non-contact sensing.

Sensors are compatible with Programmable Controllers; an LED indicator is also standard. A shielded cable is standard, and can be extended to 32 feet maximum by the user.



SRD/SRDM Series

SRD/SRDM Series cylinders are designed to withstand a wide range of operating environments to tolerate moisture and many types of lubricants and solvents. The cylinders have a Delrin® (acetal resin) head and cap, an anodized aluminum piston, stainless steel cylinder tube and stainless steel piston rod. Stainless steel accessories are available.

Delrin® is a registered trademark of Dupont. For detailed information regarding the properties of Delrin, contact Dupont.

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Pneumatic Division
Wadsworth, Ohio
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C086

How To Order SR Series Air Cylinders

1.06	C		D	SR	B	V				C	2.00

Bore Size [1]

.31	5/16"
.44	7/16"
.56	9/16"
.75	3/4"
.88	7/8"
1.06	1-1/16"
1.25	1-1/4"
1.50	1-1/2"
1.75	1-3/4"
2.00	2"
2.50	2-1/2"
3.00	3"

Stroke
Specify in inches.

Cushion Cap [2]
Use "C" only when cushion cap is required.

Non-Standard PIston Rod
Use "3" only when special piston rod end is required.
Specify CC, LE and A Dimensions (See below.)

Cushion Head [2]
Use "C" only when cushion head is required.

Non-Standard Rod
Specify Y for stainless steel piston rod.
Stainless steel is standard on all bore sizes up to and including 1.50" Bore.

Series

SR	Standard Cylinder
SRM	With Magnetic Piston
SRD	With Delrin Caps
SRDM	With Delrin Caps and Magnetic Piston

Double Rod
Use "K" only when double rod is required.
Available on DX and DXH mounting only.

Piston

Blank	No Bumpers
B	With Bumpers [3]

Special
Use "S" only if special modifications are required, except piston rod end.

Mounting [1]
N, NR, NRP, P, R, RP, D, DP, DXP, DX, DXH, A, RA, AP, AR, BRN, BRR, BFD, BRD, BFN, BFR, TRN, TRR, TFD, TRD, TFN or TFR.

Seals

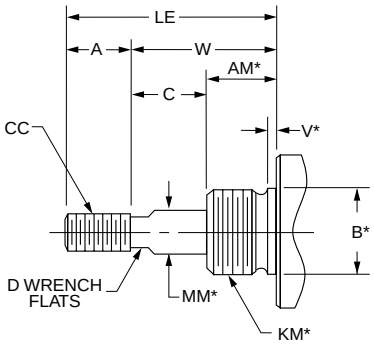
Blank	Standard Seals
V	Fluorocarbon Seals [4]
W	Rod Wiper

1 Bore sizes and mounting styles are limited by series. See table on next page for availability.
2 Cushions not available on SRD/SRDM series.
3 Bumpers may increase cylinder length. See page D37 for adders.
4 Fluorocarbon seals not available on SRM or SRDM series.

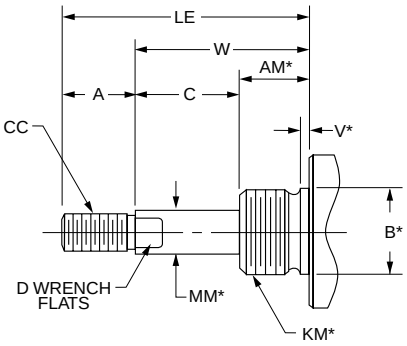
Non-Standard Rods

For non-standard rod dimensions, or undersized rod end threads, put a "3" in model number and describe the rod using the letters shown in the drawing. Specify CC, LE and A dimensions.

Full Diameter Rod End Threads



Undersized Rod End Threads



*Requires an S designation in model number.

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Available Mounting Styles

Mount Style	Description	Bore Size (Reference Notes 1 & 2 for availability)												Max. Stroke (in.)	Page
		5/16" (1,2)	7/16" (1,2)	9/16"	3/4"	7/8" (1,2)	1-1/16"	1-1/4" (2)	1-1/2"	1-3/4" (2)	2"	2-1/2" (2)	3" (1,2)		
N (2)	Nose mount, spring return	●	●	●	●	●	●	●	●	●	▲	—	—	6" (3)	D7
NR (2)	Nose mount, spring return, hex rod (non-rotating)	—	●	●	●	●	●	●	●	●	—	—	—	6"	D8
NRP (2)	Pivot and nose mount, spring return, hex rod (non-rotating)	—	●	●	●	●	●	●	●	●	—	—	—	6"	D9
P (2)	Pivot mount, spring return	●	●	●	●	●	●	●	●	●	▲	—	—	6"	D10
R (2)	Nose mount, spring extended	●	●	●	●	●	●	●	●	●	▲	—	—	6"	D11
RP (2)	Pivot and nose mount, spring extend	●	●	●	●	●	●	●	●	—	▲	—	—	6"	D12
D	Nose mount, double acting	●	●	●	●	●	●	●	●	●	●	●	●	12"	D13
DP (2)	Pivot and nose mount, double acting, pivot pin	—	●	—	●	—	●	—	●	—	—	—	—	12"	D14
DXP	Pivot and nose mount, double acting, no pivot pin	●	●	●	●	●	●	●	●	●	●	●	●	See Note 4	D15
DX	Threaded both ends, double acting	—	See DXP	See DXP	See DXP	See DXP	See DXP	See DXP	●	—	See DXP	—	—	32"	D16
KDX	Threaded both ends, double acting, double rod	—	●	●	●	●	●	●	●	●	●	●	●	See Note 5	D17
KDXH (2)	Threaded both ends, double rod, hollow rod	—	—	—	—	—	●	●	●	●	●	—	—	12"	D18
A (1,2)	Nose mount, spring return, head adjustable stroke	—	—	—	●	—	●	—	●	—	—	—	—	6"	D19
RA (1,2)	Nose mount, spring extend, cap adjustable stroke	—	—	—	●	—	●	—	●	—	—	—	—	6"	D20
AP (1,2)	Pivot mount, spring return, head adjustable stroke	—	—	—	●	—	●	—	●	—	—	—	—	6"	D21
AR (1,2)	Air reservoirs	—	—	—	●	—	●	—	●	—	●	—	—	12"	D34
BRN (2)	Rear block mount, single acting,	—	●	—	●	—	●	—	●	—	—	—	—	6"	D22
BRR (2)	Rear block mount, single acting, spring return	—	—	—	●	—	●	—	●	—	—	—	—	6"	D23
BFD (2)	Front block mount, double acting	●	●	—	●	—	●	—	●	—	—	—	—	12"	D24
BRD (2)	Rear block mount, double acting	—	●	—	●	—	●	—	●	—	—	—	—	12"	D25
BFN (2)	Front block mount, single acting spring return	—	●	—	●	—	●	—	●	—	—	—	—	6"	D26
BFR (2)	Front block mount, single acting spring extend	—	—	—	●	—	●	—	●	—	—	—	—	6"	D27
TRN (2)	Rear trunnion mount, single acting, spring return	—	●	—	●	—	●	—	●	—	—	—	—	6"	D28
TRR (2)	Rear trunnion mount, single acting spring extend	—	—	—	●	—	●	—	●	—	—	—	—	6"	D29
TFD (2)	Front trunnion mount, double acting	—	●	—	●	—	●	—	●	—	—	—	—	12"	D30
TRD (2)	Rear trunnion mount, double acting	—	●	—	●	—	●	—	●	—	—	—	—	12"	D31
TFN (2)	Front trunnion mount, single acting spring return	—	●	—	●	—	●	—	●	—	—	—	—	6"	D32
TFR (2)	Front trunnion mount, single acting spring extend	—	—	—	●	—	●	—	●	—	—	—	—	6"	D33

▲ Recommended maximum stroke is 4" in models N, P, R & RP.
1 Not available on SRM (magnetic piston) cylinders.
2 Not available on SRD/DM (Delrin caps) cylinders.
3 Recommended maximum stroke is 4" for 5/16" bore models.
4 Max stroke 12" for bore sizes under 3/4"; 32" for bore sizes 3/4" and up.
5 Max stroke 6" for bore sizes under 3/4"; 12" for bore sizes 3/4" and up.

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Standard Specifications

- 304 stainless steel cylinder body.
- Aluminum heads and caps.
- Stainless steel piston rods are standard up to 1.50" bore.
- Nominal pressure rating 250 psi for SR and SRM
  100 psi for SRD/SRDM
- Standard temperature -10°F to +165°F for SR
  +14°F to +140°F for SRM
  +32°F to +160°F for SRD/SRDM

In line with our policy of continuing product improvement, the specifications in this catalog are subject to change without notice.

- Twelve bore sizes — 5/16" through 3" (see table for SRM and SRD/DM exclusions).
- 28 standard mounting styles (not all available on SRM and SRD/SRDM – see table on previous page).
- Single and double acting
- Bumpers
- Adjustable cushions
- Rod wipers

For additional mounting styles please consult factory.

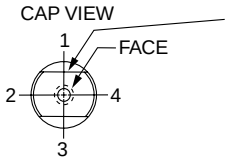
For detailed information regarding the properties of Delrin® contact Dupont.

Port Locations

Mounting Style	Standard Head Port Location	Standard Cap Port Location	Standard Vent Location
AR	Face	Face	None
BFR	2	None	2
BFN	None	Face	2
BRD	2	2	None
BFD	2	Face	None
BRR	2	None	2
BRN	None	2	2
TFR	1	None	1
TFN	None	Face	1
TRD	1	1	None
TFD	1	Face	None
TRR	1	None	1
TRN	None	1	1
AP	None	2	2
RA	2	None	2
A	None	Face	2
KDXH	2	2	None
KDX	2	2	None
DX	2	2	None
DXP	2	2	None
DP	2	2	None
D	2	Face	None
RP	2	None	2
R	2	None	2
P	None	2	2
NRP	None	2	2
NR	None	Face	2
N	None	Face	2

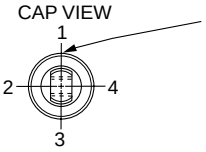
End View of Mountings for Port Location

Mounting Styles N, NR, D, R, AR



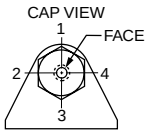
Standard location for cushion adjustment needle when cushions are specified on D mounts.

Mounting Styles P, RP, DXP, NRP, DP, AP

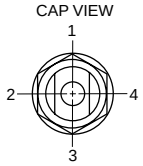


Standard location for cushion adjustment needle when cushions are specified on DXP mounts.

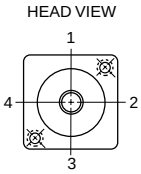
Mounting Style A



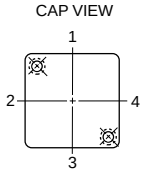
Mounting Style RA



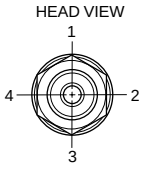
Mounting Styles BFD, BFN, BFR



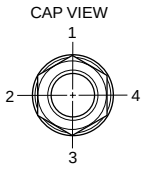
Mounting Styles BRN, BRR, BRD



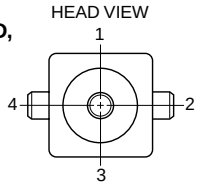
Mounting Styles KDXH, KDX



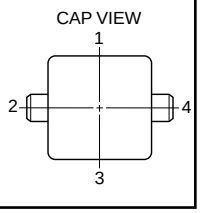
Mounting Style DX



Mounting Styles TFD, TFN, TFR



Mounting Styles TRN, TRR, TRD



Cylinders will have ports at these locations unless otherwise specified.

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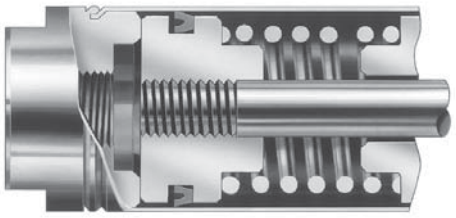
Port Size — Rod Diameter — Spring Force Data

Bore Size	Port Size	Rod Diameter (or Hex)	Force Factor		Spring Return (lbs)		Spring Extend (lbs)	
			Push	Pull	Normal	Extended	Normal	Extended
.31 (5/16")	#10-32	1/8"	0.08	0.06	0.5	1	0.5	1
.44 (7/16")	#10-32	3/16"	0.15	0.12	1	2	1	2
.56 (9/16")	#10-32	3/16"	0.25	0.22	2	4	2	4
.75 (3/4")	1/8 NPTF	1/4"	0.44	0.39	3	6	3	6
.88 (7/8")	1/8 NPTF	1/4"	0.60	0.55	3	6	3	6
1.06 (1-1/16")	1/8 NPTF	5/16"*	0.89	0.81	3†	6†	7.5	15
1.25 (1-1/4")	1/8 NPTF	7/16"	1.23	1.08	7.5	15	7.5	15
1.50 (1-1/2")	1/8 NPTF	7/16"	1.77	1.62	6†	12†	9	18
1.75 (1-3/4")	1/4 NPTF	1/2"	2.40	2.21	11	24	11	24
2.00 (2")	1/4 NPTF	5/8"	3.14	2.84	15	30	15	30
2.50 (2-1/2")	1/4 NPTF	5/8"	4.91	4.60	N/A	N/A	N/A	N/A
3.00 (3")	3/8 NPTF	3/4"	7.07	6.63	N/A	N/A	N/A	N/A

* Non-rotating version uses $^3/_8$" hex.

† Block mount and trunnion mount spring return lbs. equals spring extend lbs.

Springs — shot peened music wire for high cycle life. Spring spacers are provided for every one inch of stroke (1/2" for 5/16" and 7/16" bores) to insure uniform spring rate and prevent spring failure.



Option Availability

Option	Bumpers	Fluorocarbon Seals	Rod Wipers	Cushions	Delrin® End Caps
Bumpers	—	◆	◆	X	◆
Fluorocarbon Seals	—	—	X	S	◆
Rod Wiper	—	—	—	◆	◆
Cushions	—	—	—	—	X

◆ = Available Options
S = Available as Special
X = Not Available

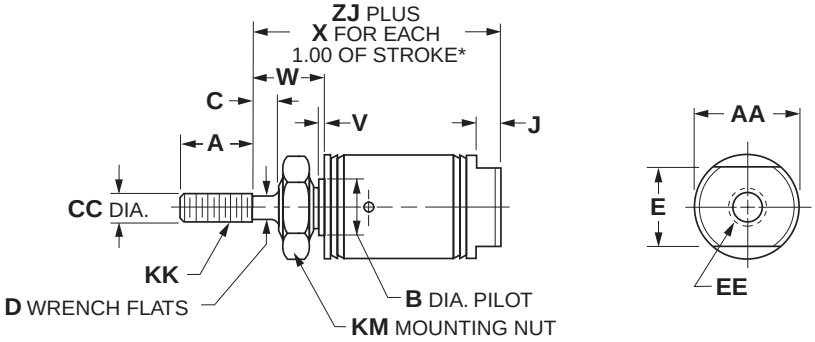
Delrin® is a registered trademark of Dupont.

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Mounting Style N
Nose Mount, Spring Return

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Strokes (in)	Max Stroke (in)	SS Rod Std
5/16"	●		1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	4	✓
7/16"	●		1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	6	✓
9/16"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓
3/4"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓
7/8"	●		1/2, 1, 1-1/2, 2, 3, 4	6	✓
1-1/16"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓
1-1/4"	●	●	1/2, 1, 2, 3, 4	6	✓
1-1/2"	●	●	1/2, 1, 2, 3, 4	6	✓
1-3/4"	●	●	1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	6	
2"	●	●	–	4	

Bore	A	AA	B	C	CC	D	E	EE	J	KK	KM	V	W	X	ZJ	
															SR	SRM
5/16"	0.38	0.36	–	–	0.125	–	0.36	#10-32	–	#5-40 UNC	1/4-28	0	0.25	0.75**	1.12	–
7/16"	0.50	0.50	0.374	–	0.188	–	0.38	#10-32	0.19	#10-32 UNF	3/8-24	0.05	0.31	0.94**	1.31	–
9/16"	0.50	0.62	0.437	–	0.188	–	0.50	#10-32	0.19	#10-32 UNF	7/16-20	0.06	0.38	1.62	1.53	1.76
3/4"	0.50	0.81	0.499	–	0.250	–	0.62	1/8 NPTF	0.19	1/4-28 UNF	1/2-20	0.09	0.44	1.69	1.50	1.75
7/8"	0.50	0.93	0.624	–	0.250	–	0.62	1/8 NPTF	0.19	1/4-28 UNF	5/8-18	0.09	0.50	1.56	1.84	–
1-1/16"	0.50	1.12	0.624	0.12	0.312	0.25	0.88	1/8 NPTF	0.19	5/16-24 UNF	5/8-18	0.09	0.62	1.56	2.06	2.31
1-1/4"	0.75	1.34	0.749	0.25	0.437	0.38	0.88	1/8 NPTF	0.25	7/16-20 UNF	3/4-16	0.09	0.88	1.81	2.66	2.78
1-1/2"	0.75	1.56	0.749	0.25	0.437	0.38	0.88	1/8 NPTF	0.25	7/16-20 UNF	3/4-16	0.09	0.88	1.69	2.44	2.69
1-3/4"	0.88	1.84	1.031	0.38	0.500	7/16	1.25	1/4 NPTF	0.25	1/2-20 UNF	1-14	0.09	0.75	2.0	2.97	3.09
2"	0.88	2.08	1.374	0.38	0.625	0.50	1.25	1/4 NPTF	0.31	1/2-20 UNF	1-1/4-12	0.12	1.19	–	▲	▲

▲ 5.66" for 1" stroke; 7.66" for 2" stroke; 8.91" for 3" stroke; 11.84" for 4" stroke.

* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract a half inch.

** For each 0.50" of stroke

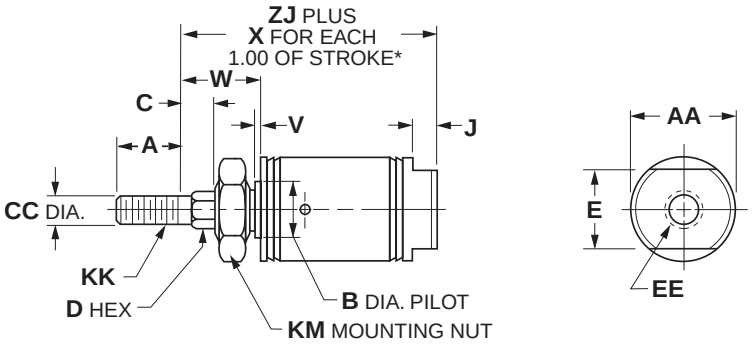
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D

Mounting Style NR
Nose Mount, Spring Return, Hex Rod

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
7/16"	●		1/2, 1, 1-1/2, 2, 3, 4	6	✓
9/16"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓
3/4"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓
7/8"	●		1/2, 1, 1-1/2, 2, 3, 4	6	✓
1-1/16"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓
1-1/4"	●	●	1, 2, 3, 4	6	✓
1-1/2"	●	●	1/2, 1, 2, 3, 4	6	✓
1-3/4"	●	●	1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	6	

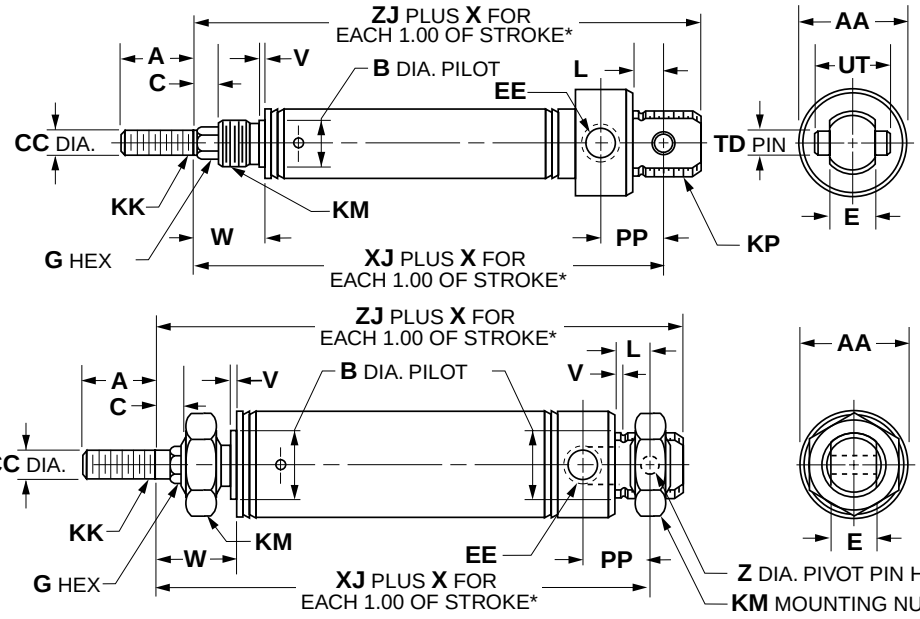
Bore	A	AA	B	C	CC	D	E	EE	J	KK	KM	V	W	X	ZJ	
															SR	SRM
7/16"	0.50	–	0.374	0.25	0.188	3/16	–	#10-32	0.19	#10-32 UNF	3/8-24	0.05	0.56	0.94	1.56	–
9/16"	0.50	–	0.437	0.25	0.188	3/16	–	#10-32	0.19	#10-32 UNF	7/16-20	0.06	0.62	1.62	1.78	2.03
3/4"	0.50	–	0.499	0.25	0.250	1/4	–	1/8 NPTF	0.19	1/4-28 UNF	1/2-20	0.09	0.69	1.69	1.75	2.00
7/8"	0.50	–	0.624	0.25	0.250	1/4	–	1/8 NPTF	0.19	1/4-28 UNF	5/8-18	0.09	0.75	1.56	2.09	–
1-1/16"	0.50	1.12	0.624	0.25	0.312	3/8	0.88	1/8 NPTF	0.19	5/16-24 UNF	5/8-18	0.09	0.75	1.56	2.19	2.44
1-1/4"	0.88	1.34	0.749	0.25	0.437	7/16	0.88	1/8 NPTF	0.25	7/16-20 UNF	3/4-16	0.09	0.88	1.81	2.66	2.78
1-1/2"	0.88	1.56	0.749	0.38	0.437	7/16	0.88	1/8 NPTF	0.25	7/16-20 UNF	3/4-16	0.09	1.00	1.69	2.56	2.81
1-3/4"	0.88	1.84	1.031	0.38	0.500	1/2	1.25	1/4 NPTF	0.25	1/2-20 UNF	1-14	0.09	1.12	2.0	3.03	3.15

* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

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Mounting Style NRP
Pivot & Nose Mount, Spring Return, Hex Rod

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore Sizes
7/16" *
3/4"

Bore Sizes
9/16" *
7/8" *
11/16" *
11/4"
11/2" *
13/4"

*No Mounting Nuts

Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std	A	AA	B	C	CC	E	EE
7/16"	●		1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	0.74	0.374	0.25	0.188	0.31	#10-32
9/16"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	0.62	0.437	0.25	0.188	0.31	#10-32
3/4"	●	●	1, 2, 3, 4	6	✓	0.50	0.86	0.499	0.25	0.250	0.38	1/8 NPTF
7/8"	●		1, 2, 3, 4	6	✓	0.50	0.93	0.624	0.25	0.250	0.38	1/8 NPTF
1-1/16"	●	●	1, 2, 3, 4	6	✓	0.50	1.12	0.624	0.25	0.312	0.38	1/8 NPTF
1-1/4"	●	●	1, 2, 3, 4	6	✓	0.88	1.34	0.749	0.25	0.437	0.50	1/8 NPTF
1-1/2"	●	●	1, 2, 3, 4	6	✓	0.88	1.56	0.749	0.38	0.437	0.62	1/8 NPTF
1-3/4"	●	●	1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	6		0.88	1.84	1.031	0.38	0.500	0.62	1/4 NPTF

Bore	G HEX	KK	KM	KP	L	PP	TD	UT	V	W	X	XJ		Z	ZJ	
												SR	SRM		SR	SRM
7/16"	3/16	#10-32 UNF	3/8-24	7/16-20 UNF	0.25	0.44	0.156	0.50	0.05	0.56	0.94	2.00	–	–	2.25	–
9/16"	3/16	#10-32 UNF	7/16-20	7/16-20 UNF	0.25	0.38	–	–	0.06	0.62	1.62	2.06	2.31	0.157	2.25	2.50
3/4"	1/4	1/4-28 UNF	1/2-20	5/8-18 UNF	0.34	0.62	0.250	0.75	0.09	0.69	1.69	2.53	2.78	–	2.81	3.06
7/8"	1/4	1/4-28 UNF	5/8-18	5/8-18 UNF	0.34	0.62	0.250	0.75	0.09	0.75	1.56	2.72	–	–	3.00	–
1-1/16"	3/8	5/16-24 UNF	5/8-18	5/8-18 UNF	0.34	0.62	0.250	0.75	0.09	0.75	1.56	2.78	3.03	–	3.06	3.31
1-1/4"	7/16	7/16-20 UNF	3/4-16	–	0.41	0.78	0.251	–	0.09	0.88	1.81	3.38	3.50	0.251	3.78	3.91
1-1/2"	7/16	7/16-20 UNF	3/4-16	–	0.50	0.81	0.375	1.00	0.09	1.00	1.69	3.25	3.50	–	3.62	3.87
1-3/4"	1/2	1/2-20 UNF	1-14	–	0.50	1.12	0.376	0.62	0.09	1.12	2.0	4.09	4.21	0.376	4.59	4.71

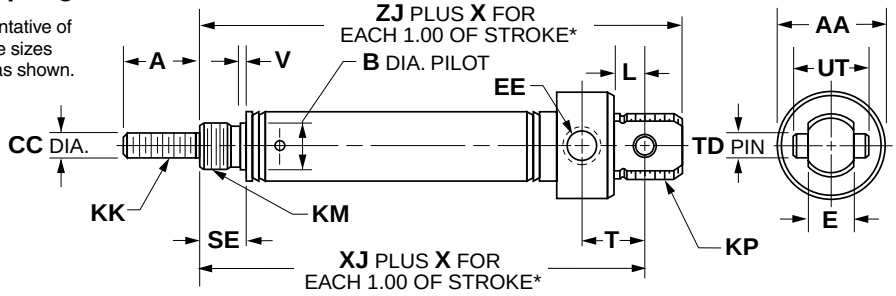
* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

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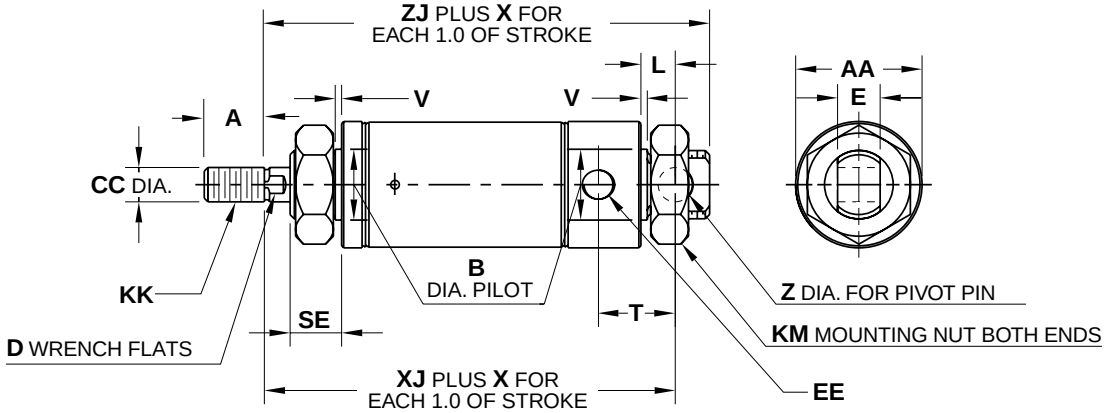
Mounting Style P
Pivot Mount, Spring Return

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore Sizes
5/16"*
7/16"
3/4"

*With Mounting Nuts



Bore Sizes
9/16"*
7/8"*
1-1/16"*
1-1/4"
1-1/2"*
1-3/4"
2" *

*No Mounting Nuts

Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std	A	AA	B	CC	D	E	EE
5/16"	●		1/2, 1, 1-1/2, 2, 3, 4	4	✓	0.38	0.39	–	0.125	–	0.25	#10-32
7/16"	●		1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	0.74	0.374	0.188	–	0.31	#10-32
9/16"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	0.62	0.437	0.188	–	0.31	#10-32
3/4"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	0.86	0.499	0.250	–	0.38	1/8 NPTF
7/8"	●		1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	0.93	0.624	0.250	–	0.38	1/8 NPTF
1-1/16"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	1.12	0.624	0.312	0.25	0.38	1/8 NPTF
1-1/4"	●	●	1, 2, 3, 4	6	✓	0.75	1.34	0.749	0.437	0.38	0.50	1/8 NPTF
1-1/2"	●	●	1, 2, 3, 4	6	✓	0.75	1.56	0.749	0.437	0.38	0.62	1/8 NPTF
1-3/4"	●	●	1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	6		0.88	1.84	1.031	0.500	7/16	0.62	1/4 NPTF
2"	●	●	–	4		0.88	2.08	1.374	0.625	0.50	0.75	1/4 NPTF

Bore	KK	KM	KP	L	SE	T	TD	UT	V	X	XJ		Z	ZJ	
											SR	SRM		SR	SRM
5/16"	#5-40 UNC	3/8-24	–	0.34	0.25	0.34	–	–	–	0.75	1.52	–	0.125	1.68	–
7/16"	#10-32 UNF	3/8-24	7/16-20 UNF	0.25	0.31	0.44	0.156	0.50	0.05	0.94	1.75	–	–	2.00	–
9/16"	#10-32 UNF	7/16-20	7/16-20 UNF	0.25	0.38	0.38	–	–	0.06	1.62	1.81	2.06	0.157	2.00	2.25
3/4"	1/4-28 UNF	1/2-20	5/8-18 UNF	0.34	0.44	0.62	0.250	0.75	0.09	1.69	2.28	2.53	–	2.56	2.81
7/8"	1/4-28 UNF	5/8-18	5/8-18 UNF	0.34	0.50	0.62	0.250	0.75	0.09	1.56	2.47	–	–	2.75	–
1-1/16"	5/16-24 UNF	5/8-18	5/8-18 UNF	0.34	0.50	0.62	0.250	0.75	0.09	1.56	2.66	2.91	–	2.94	3.19
1-1/4"	7/16-20 UNF	3/4-16	–	0.41	0.63	0.78	–	–	0.09	1.81	3.38	3.91	0.251	3.78	3.50
1-1/2"	7/16-20 UNF	3/4-16	–	0.50	0.63	0.81	0.375	1.00	0.09	1.81	3.12	3.37	–	3.50	3.75
1-3/4"	1/2-20 UNF	1-14	–	0.50	0.75	1.12	–	–	0.09	2.0	4.03	4.15	0.376	4.53	4.65
2"	1/2-20 UNF	1-1/4-12	–	0.56	0.81	1.03	–	–	0.12	–	■	✷	–	▲	◆

■ 6.34" for 1" stroke, 8.34" for 2" stroke, 9.59" for 3" stroke, 12.53" for 4" stroke*

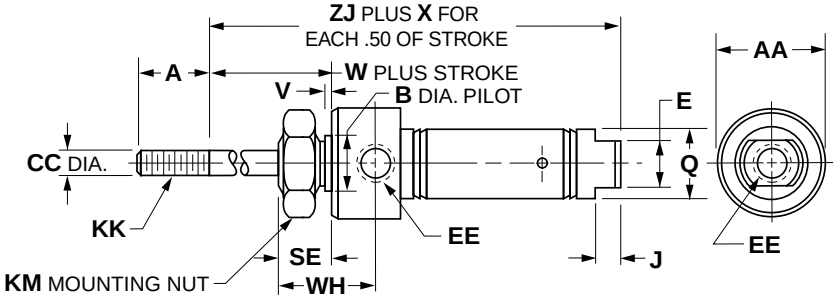
▲ 6.78" for 1" stroke, 8.78" for 2" stroke, 10.03" for 3" stroke, 12.97" for 4" stroke*

* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract a half inch.

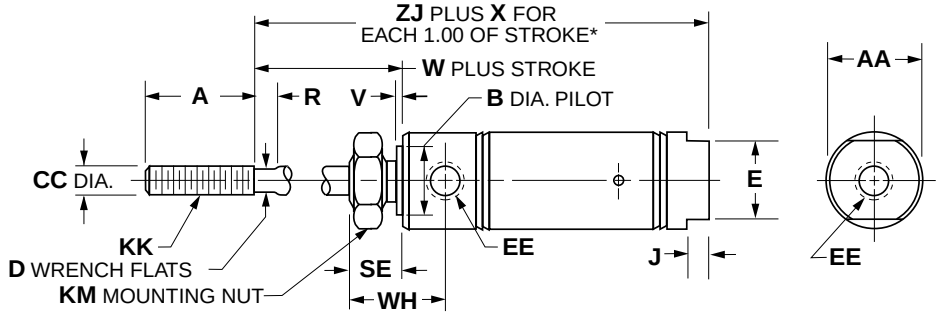
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Pneumatic Division
Wadsworth, Ohio
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Mounting Style R
Nose Mount, Spring Extended

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore Sizes
5/16"
7/16"
3/4"



Bore Sizes
9/16"
7/8"
1-1/16"
1-1/4"
1-1/2"
1-3/4"
2" *

*No Mounting Nut

Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std	A	AA	B	CC	D	E
5/16"	●		1/2, 1, 1-1/2, 2, 2-1/2, 3	4	✓	0.38	0.50 SQ.	–	0.125	–	–
7/16"	●		1/2, 1, 1-1/2, 2, 3	6	✓	0.50	0.74	0.437	0.188	–	0.38
9/16"	●	●	1/2, 1, 1-1/2, 2, 3	6	✓	0.50	0.62	0.437	0.188	–	0.50
3/4"	●	●	1/2, 1, 2, 3, 4	6	✓	0.50	0.86	0.624	0.250	–	–
7/8"	●		1/2, 1, 2, 3, 4	6	✓	0.50	0.93	0.624	0.250	–	–
1-1/16"	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	1.12	0.624	0.312	0.25	–
1-1/4"	●	●	1, 2, 3, 4	6	✓	0.75	1.34	0.749	0.437	0.38	–
1-1/2"	●	●	1, 2, 3, 4	6	✓	1.25	1.56	0.749	0.437	0.38	0.88
1-3/4"	●	●	1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	6		0.88	1.84	1.031	0.500	7/16	–
2"	●	●	–	4		0.88	2.08	1.374	0.625	0.50	–

Bore	EE	J	KK	KM	Q	R	SE	V	W	WH	X	ZJ	
												SR	SM
5/16"	#10-32	–	#5-40 UNC	3/8-24	0.36	–	0.31	–	0.31	0.47	1.25	1.49	–
7/16"	#10-32	0.19	#10-32 UNF	7/16-20	0.50	–	0.38	0.05	0.38	0.72	1.44	1.94	–
9/16"	#10-32	0.19	#10-32 UNF	7/16-20	0.62	–	0.38	0.05	0.38	0.78	2.62	2.00	2.25
3/4"	1/8 NPTF	–	1/4-28 UNF	5/8-18	0.81	–	0.50	0.09	0.50	0.97	2.69**	2.31	2.56
7/8"	1/8 NPTF	–	1/4-28 UNF	5/8-18	–	–	0.50	0.09	0.50	0.97	2.56	2.31	–
1-1/16"	1/8 NPTF	–	5/16-24 UNF	5/8-18	–	0.12	0.50	0.09	0.62	1.06	2.81	2.62	2.87
1-1/4"	1/8 NPTF	–	7/16-20 UNF	3/4-16	–	0.25	0.62	0.09	0.88	1.38	2.81	3.47	3.60
1-1/2"	1/8 NPTF	0.25	7/16-20 UNF	3/4-16	–	0.25	0.62	0.09	0.88	1.25	3.00	3.19	3.44
1-3/4"	1/4 NPTF	–	1/2-20 UNF	1-14	–	–	0.75	0.09	1.06	1.63	3.0	4.03	4.15
2"	1/4 NPTF	–	1/2-20 UNF	1-1/4-12	–	0.38	0.81	0.12	1.19	1.47	–	▲	◆

▲ 7.11" for 1" stroke, 10.11" for 2" stroke, 12.34" for 3" stroke, 16.34" for 4" stroke.*

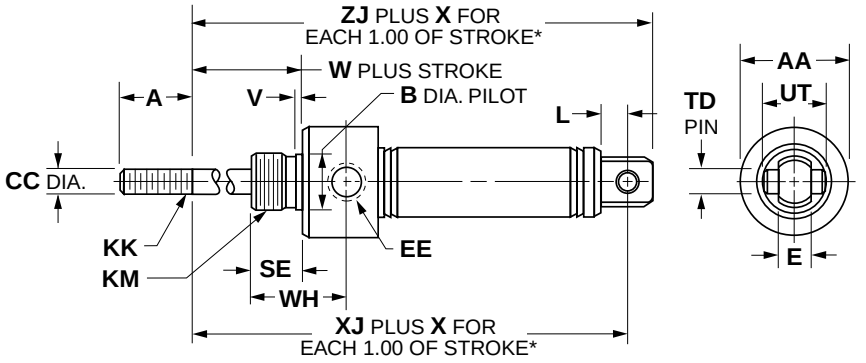
* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

** For each 1.00" of stroke.

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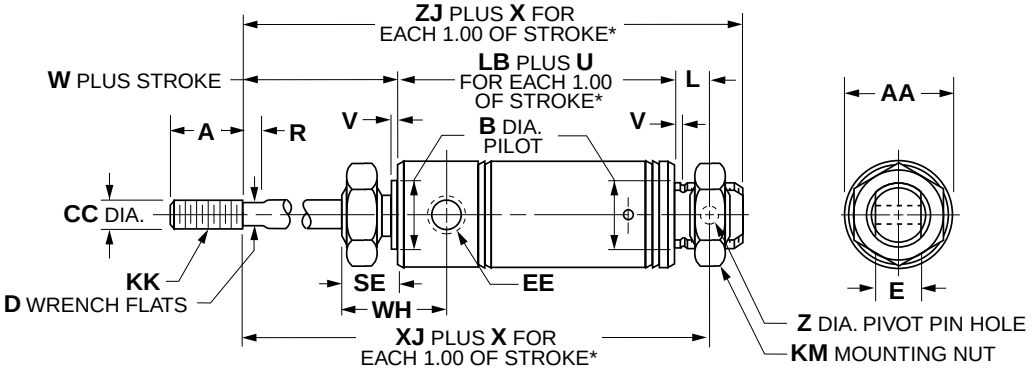
Mounting Style RP
Pivot and Nose Mount, Spring Extended

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore Sizes
5/16"*
7/16"
3/4"

*With Mounting Nuts



Bore Sizes
9/16"*
7/8"*
1-1/16"*
1-1/4"
1-1/2"*
1-3/4"
2" *

*No Mounting Nuts

Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std	A	AA	B	CC	D	E	EE	KK
5/16"	●		1/2, 1, 1-1/2, 2, 2-1/2, 3	4	✓	0.38	0.50 SQ.	–	0.125	–	0.25	#10-32	#5-40 UNC
7/16"	●		1/2, 1, 1-1/2, 2, 3	6	✓	0.50	0.74	0.437	0.188	–	0.31	#10-32	#10-32 UNF
9/16"	●	●	1/2, 1, 1-1/2, 2, 3	6	✓	0.50	0.62	0.437	0.188	–	0.31	#10-32	#10-32 UNF
3/4"	●	●	1/2, 1, 2, 3, 4	6	✓	0.50	0.86	0.624	0.250	–	0.38	1/8 NPTF	1/4-28 UNF
7/8"	●		1/2, 1, 2, 3, 4	6	✓	0.50	0.93	0.624	0.250	–	0.38	1/8 NPTF	1/4-28 UNF
1-1/16"	●	●	1/2, 1, 1- 1/2, 2, 3, 4	6	✓	0.50	1.12	0.624	0.312	0.25	0.38	1/8 NPTF	5/16-24 UNF
1-1/4"	●	●	1, 2, 3, 4	6	✓	0.75	1.34	0.749	0.437	0.38	0.50	1/8 NPTF	7/16-20 UNF
1-1/2"	●	●	1, 2, 3, 4	6	✓	1.25	1.56	0.749	0.437	0.38	0.62	1/8 NPTF	7/16-20 UNF
2"	●	●	–	4		.88	2.08	1.374	0.625	0.50	0.75	1/4 NPTF	1/2-20 UNF

Bore	KM	L	LB	R	SE	TD	U	UT	V	W	WH	X	XJ		Z	ZJ	
													SR	SRM		SR	SRM
5/16"	3/8-24	0.19	–	–	0.31	–	–	–	–	0.31	0.47	1.25	1.88	–	–	2.04	–
7/16"	7/16-20	0.25	–	–	0.38	0.156	–	0.50	0.05	0.38	0.72	1.44	2.38	–	–	2.62	–
9/16"	7/16-20	0.25	–	–	0.38	–	–	–	0.06	0.38	0.78	2.62	2.28	2.53	0.157	2.47	2.72
3/4"	5/8-18	0.34	–	–	0.50	0.250	–	0.75	0.09	0.50	0.97	2.69	2.44	2.69	–	2.72	2.97
7/8"	5/8-18	0.34	–	–	0.50	0.250	–	0.75	0.09	0.50	0.97	2.56	2.63	–	–	2.91	–
1-1/16"	5/8-18	0.34	–	0.12	0.50	0.250	–	0.75	0.09	0.62	1.06	2.81	2.78	3.03	–	3.06	3.31
1-1/4"	3/4-16	0.41	2.47	0.25	0.62	–	1.81	–	0.09	0.88	1.38	2.81	3.78	3.91	0.251	4.16	4.28
1-1/2"	3/4-16	0.50	–	0.25	0.62	0.375	–	1.00	0.09	0.88	1.25	3.00	3.88	4.13	–	4.25	4.50
2"	1-1/4 -12	0.56	–	0.38	0.81	–	–	–	0.12	1.19	1.47	–	■	✷	0.376	▲	◆

■ 8.05" for 1" stroke, 11.05" for 2" stroke, 13.28" for 3" stroke, 17.28" for 4" stroke*

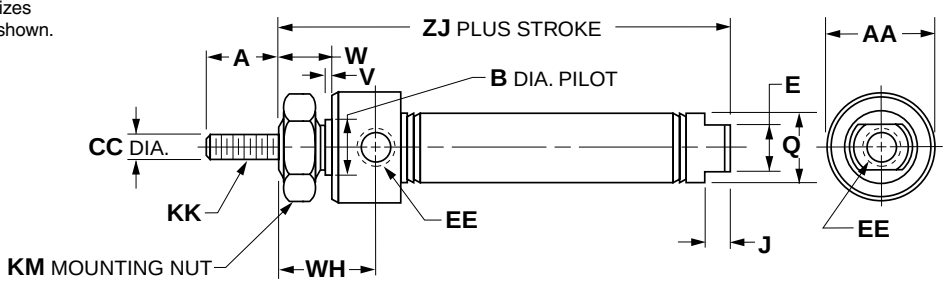
▲ 8.50" for 1" stroke, 11.50" for 2" stroke, 13.72" for 3" stroke, 17.72" for 4" stroke*

* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

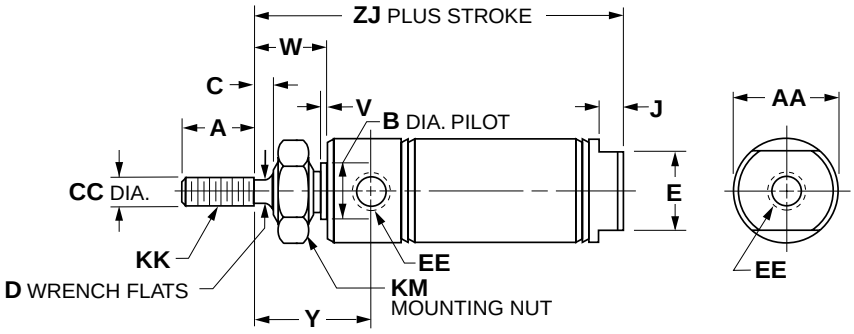
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Pneumatic Division
Wadsworth, Ohio
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Mounting Style D
Nose Mount, Double Acting

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore Sizes
5/16"
7/16"
3/4"



Bore Sizes
9/16"
7/8"
1-1/16"
1-1/4"
1-1/2"
1-3/4"
2" *
2-1/2" *
3" *

*No Mounting Nuts

Bore	SR	SRM	SRD SRDM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std	A	AA	B	C	CC
5/16"	●			1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	4	✓	0.38	0.50 SQ.	–	–	0.125
7/16"	●			1/2, 1, 1-1/2, 2, 3, 4	12	✓	0.50	0.74	0.437	–	0.188
9/16"	●	●	●	1/2, 1, 1-1/2, 2, 3, 4	12	✓	0.50	0.62	0.437	–	0.188
3/4"	●	●	●	1/2, 1, 2, 2-1/2, 3, 4, 5, 6, 8, 10	12	✓	0.50	0.86	0.624	–	0.250
7/8"	●			1/2, 1, 2, 3, 4, 5, 6	12	✓	0.50	0.93	0.624	–	0.250
1-1/16"	●	●	●	1/2, 1, 1-1/2, 2, 2-1/2, 3, 4, 5, 6, 8, 10, 12	12	✓	0.50	1.12	0.624	0.12	0.312
1-1/4"	●	●		1, 2, 3, 4, 5, 6	12	✓	0.75	1.34	0.749	0.25	0.437
1-1/2"	●	●	●	1/2, 1, 2, 3, 4, 5, 6, 8, 10, 12	12	✓	0.75	1.56	0.749	0.25	0.437
1-3/4"	●	●		1/2, 1, 1-1/2, 2, 2-1/2, 3, 4, 5, 6	12		0.88	1.84	1.031	0.31	0.500
2"	●	●	●	–	12		0.88	2.08	1.374	0.38	0.625
2-1/2"	●	●		–	12		0.88	2.62	1.500	0.38	0.625
3"	●			–	12		1.25	3.16	1.630	0.38	0.750

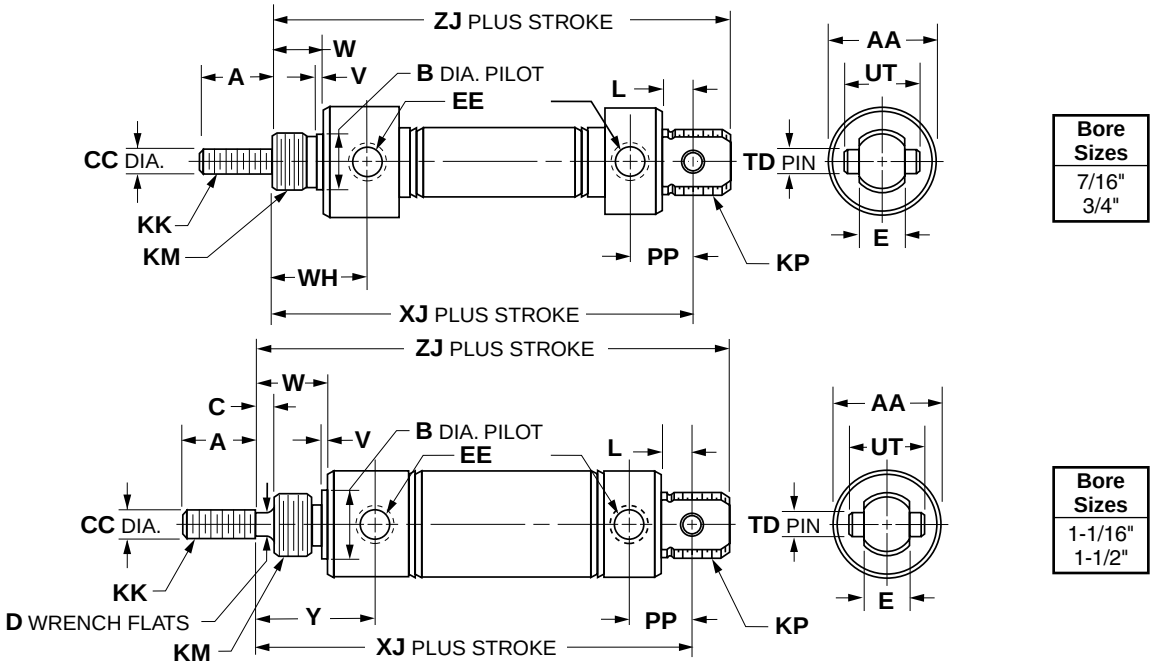
Bore	D	E	EE	J	KK	KM	Q	V	W	WH	Y	ZJ	
												SR	SRM
5/16"	–	–	#10-32	–	#5-40 UNC	3/8-24	0.36	–	0.31	0.47	–	1.64	–
7/16"	–	0.38	#10-32	0.19	#10-32 UNF	7/16-20	0.50	0.05	0.38	0.72	–	2.12	–
9/16"	–	0.50	#10-32	0.19	#10-32 UNF	7/16-20	–	0.06	0.38	0.78	–	2.28	2.53
3/4"	–	0.62	1/8 NPTF	0.19	1/4-28 UNF	5/8-18	0.81	0.09	0.50	0.97	–	2.97	2.97
7/8"	–	0.62	1/8 NPTF	0.19	1/4-28 UNF	5/8-18	–	0.09	0.50	0.97	–	2.94	–
1-1/16"	0.25	0.88	1/8 NPTF	0.19	5/16-24 UNF	5/8-18	–	0.09	0.62	–	1.19	3.25	3.41
1-1/4"	0.38	0.88	1/8 NPTF	0.25	7/16-20 UNF	3/4-16	–	0.09	0.88	–	1.62	4.00	4.03
1-1/2"	0.38	0.88	1/8 NPTF	0.25	7/16-20 UNF	3/4-16	–	0.09	0.88	–	1.50	3.69	3.94
1-3/4"	7/16	1.25	1/4 NPTF	0.25	1/2-20 UNF	1-14	–	0.09	1.06	1.63	–	4.69	4.69
2"	0.50	1.25	1/4 NPTF	0.31	1/2-20 UNF	1-1/4-12	–	0.12	1.19	–	1.84	4.69	4.97
2-1/2"	1/2	1.75	1/4 NPTF	0.31	1/2-20 UNF	1-3/8-12	–	0.13	1.19	–	1.84	4.69	4.69
3"	5/8	2.00	3/8 NPTF	0.31	5/8-18 UNF	1-1/2-12	–	0.19	1.38	–	2.09	5.25	–

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D

Mounting Style DP
Pivot and Nose Mount, Double Acting, Pivot Pin

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod	A	AA	B	CC	D	E
7/16"	●		1/2, 1, 1-1/2, 2, 3, 4	12	✓	0.50	0.74	0.437	0.188	–	0.31
3/4"	●	●	1/2, 1, 2, 2-1/2, 3, 4, 5, 6, 8, 10	12	✓	0.50	0.86	0.624	0.250	–	0.38
1-1/16"	●	●	1/2, 1, 1-1/2, 2, 2-1/2, 3, 4, 5, 6, 8, 10, 12	12	✓	0.50	1.12	0.624	0.312	0.25	0.38
1-1/2"	●	●	1, 2, 3, 4, 5, 6, 8, 10, 12	12	✓	0.75	1.56	0.749	0.437	0.38	0.62

Bore	EE	KK	KM	KP	L	PP	TD	UT	V	W	WH	XJ		Y	ZJ	
												SR	SRM		SR	SRM
7/16"	#10-32	#10-32 UNF	7/16-20	7/16-20 UNF	0.25	0.44	0.156	0.50	0.05	0.38	0.72	2.56	–	–	2.81	–
3/4"	1/8 NPTF	1/4-28 UNF	5/8-18	5/8-18 UNF	0.34	0.62	0.250	0.75	0.09	0.50	0.97	3.75	3.75	–	4.03	4.03
1-1/16"	1/8 NPTF	5/16-24 UNF	5/8-18	5/8-18 UNF	0.34	0.62	0.250	0.75	0.09	0.62	–	3.84	4.00	1.19	4.12	4.28
1-1/2"	1/8 NPTF	7/16-20 UNF	3/4-16	–	0.50	0.81	0.375	1.00	0.09	0.87	–	4.38	4.63	1.50	4.75	5.00

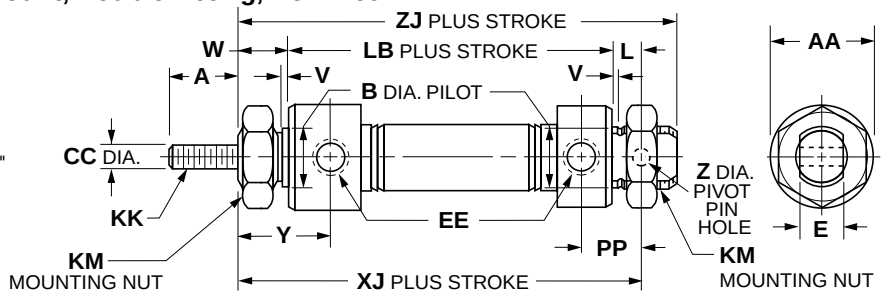
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Mounting Style DXP

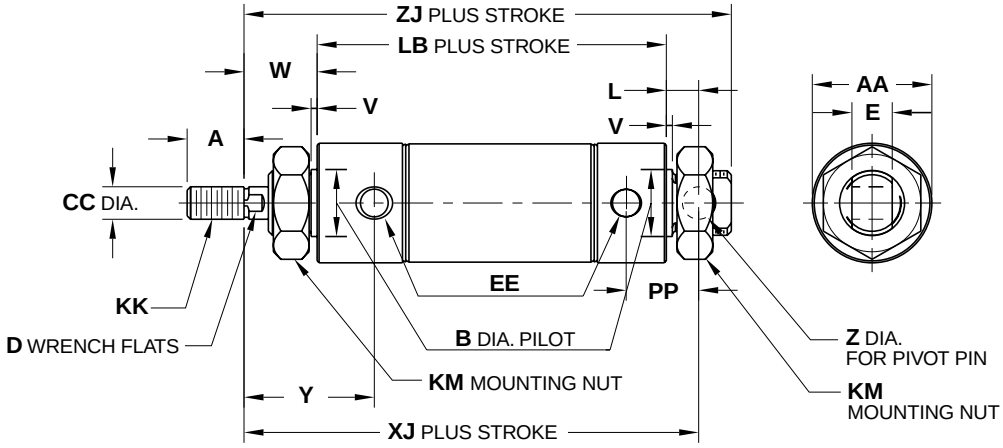
Pivot & Nose Mount, Double Acting, No Pivot Pin

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.

NOTE: Strokes over 12" must be supported at both ends.



Bore Sizes
5/16"
7/16"
3/4"



Bore Sizes
9/16"*
7/8"
1-1/16"
1-1/4"
1-1/2"
1-3/4"
2" *
2-1/2" *
3" *

*No Mounting Nuts

Bore	SR	SRM	SRD SRDM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std	A	AA	B	CC	D	E
5/16"	●			1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	4	✓	0.38	0.50 SQ.	–	0.125	–	0.25
7/16"	●			1/2, 1, 1-1/2, 2, 3, 4	12	✓	0.50	0.74	0.437	0.188	–	0.31
9/16"	●	●	●	1/2, 1, 1-1/2, 2, 3, 4	12	✓	0.50	0.62	0.437	0.188	–	0.31
3/4"	●	●	●	1, 2, 3, 4, 5, 6, 8, 10	32	✓	0.50	0.86	0.624	0.250	–	0.38
7/8"	●			1, 2, 3, 4, 5, 6, 8, 10	32	✓	0.50	0.93	0.624	0.250	–	0.38
1-1/16"	●	●	●	1/2, 1, 1-1/2, 2, 2-1/2, 3, 4, 5, 6, 8, 10, 12	32	✓	0.50	1.12	0.624	0.312	0.25	0.38
1-1/4"	●	●		1, 2, 3, 4, 5, 6, 7, 8, 10, 12	32	✓	0.75	1.34	0.749	0.437	0.38	0.50
1-1/2"	●	●	●	–	32	✓	0.75	1.56	0.749	0.437	0.38	0.62
1-3/4"	●	●		1, 2, 3, 4, 5, 6, 8, 10, 12	32		0.88	1.84	1.031	0.500	7/16	0.62
2"	●	●	●	–	32		0.88	2.08	1.374	0.625	0.50	0.75
2-1/2"	●	●		–	32		0.88	2.62	1.500	0.625	1/2	0.75
3"	●			–	32		1.25	3.16	1.630	0.750	5/8	0.88

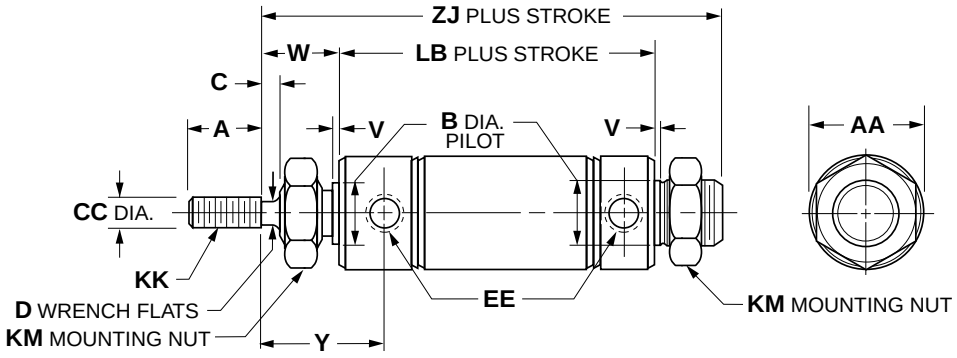
Bore	EE	KK	KM	L	LB	PP	V	W	XJ		Y	Z	ZJ	
									SR	SRM			SR	SRM
5/16"	#10-32	#5-40 UNC	3/8-24	0.19	–	0.34	–	0.31	2.03	–	–	0.125	2.19	–
7/16"	#10-32	#10-32 UNF	7/16-20	0.25	1.94	0.44	0.05	0.38	2.56	–	0.72	0.157	2.81	–
9/16"	#10-32	#10-32 UNF	7/16-20	0.25	–	0.38	0.06	0.38	2.56	2.81	0.78	0.157	2.75	3.00
3/4"	1/8 NPTF	1/4-28 UNF	5/8-18	0.34	2.91	0.62	0.09	0.50	3.75	3.75	0.97	0.251	4.03	4.03
7/8"	1/8 NPTF	1/4-28 UNF	5/8-18	0.34	–	0.62	0.09	0.50	3.56	–	0.97	0.251	3.84	–
1-1/16"	1/8 NPTF	5/16-24 UNF	5/8-18	0.34	–	0.62	0.09	0.62	3.84	–	1.19	0.251	4.12	4.28
1-1/4"	1/8 NPTF	7/16-20 UNF	3/4-16	0.41	–	0.78	0.09	0.88	4.72	4.75	1.62	0.251	5.12	5.16
1-1/2"	1/8 NPTF	7/16-20 UNF	3/4-16	0.50	–	0.81	0.09	0.88	4.38	4.63	1.50	0.376	4.75	5.00
1-3/4"	1/4 NPTF	1/2-20 UNF	1-14	0.50	4.19	1.12	0.09	1.06	5.75	5.75	1.94	0.376	6.25	6.25
2"	1/4 NPTF	1/2-20 UNF	1-1/4-12	0.56	–	1.03	0.12	1.19	5.62	5.91	–	0.376	6.06	6.34
2-1/2"	1/4 NPTF	1/2-20 UNF	1-3/8-12	0.56	–	1.03	0.13	1.19	5.62	5.62	1.84	0.376	6.06	6.06
3"	3/8 NPTF	5/8-18 UNF	1-1/2-12	0.81	–	1.34	0.19	1.38	6.50	–	2.09	0.500	7.12	–

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D

Mounting Style DX
Threaded Both Ends, Double Acting

Drawing represents 1-1/2" bore size. For other sizes, reference art for DXP on previous page.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
7/16" *	●		1/2, 1, 1-1/2, 2, 3, 4	12	✓
9/16" *	●	●	1/2, 1, 1-1/2, 2, 3, 4	12	✓
3/4" *	●	●	1, 2, 3, 4, 5, 6, 8, 10	32	✓
7/8" *	●	●	1, 2, 3, 4, 5, 6, 8, 10	32	✓
1-1/16" *	●	●	1/2, 1, 1-1/2, 2, 2-1/2, 3, 4, 5, 6, 8, 10, 12	32	✓
1-1/4" *	●	●	1, 2, 3, 4, 5, 6, 7, 8, 10, 12	32	✓
1-1/2"	●	●	1, 2, 3, 4, 5, 6, 8, 10, 12	32	✓
2" *	●	●	–	32	

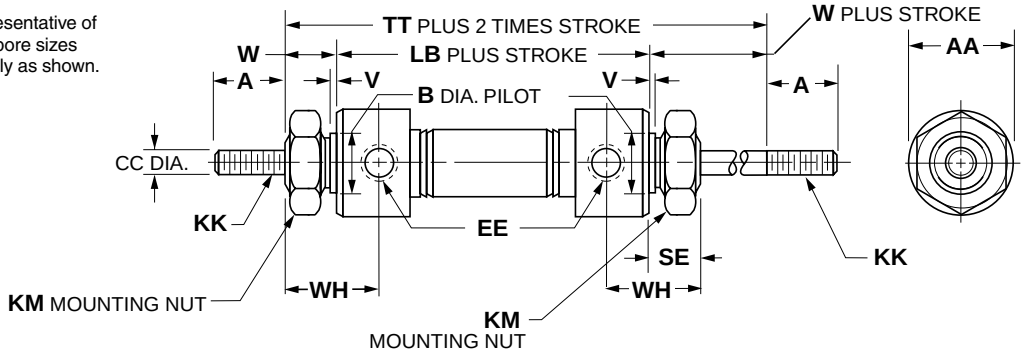
Bore	A	AA	B	C	CC	D	EE	KK	KM	LB		V	W	Y	ZJ	
										SR	SRM				SR	SRM
7/16" *	0.50	0.74	0.437	–	0.188	–	#10-32	#10-32 UNF	7/16-20	1.94		0.05	0.38	0.72	2.81	
9/16" *	0.50	0.62	0.437	–	0.188	–	#10-32	#10-32 UNF	7/16-20	–		0.06	0.38	0.78	2.75	
3/4" *	0.50	0.86	0.624	–	0.250	–	1/8 NPTF	1/4-28 UNF	5/8-18	2.91		0.09	0.50	0.97	4.03	
7/8" *	0.50	0.93	0.624	–	0.250	–	1/8 NPTF	1/4-28 UNF	5/8-18	–		0.09	0.50	0.97	3.84	
1-1/16" *	0.50	1.12	0.624	0.12	0.312	0.25	1/8 NPTF	5/16-24 UNF	5/8-18	–		0.09	0.62	1.19	4.12	
1-1/4" *	0.75	0.34	0.749	0.25	0.437	0.38	1/8 NPTF	7/16-20 UNF	3/4-16	–		0.09	0.88	1.62	5.12	
1-1/2"	0.75	1.56	0.749	0.25	0.437	0.38	1/8 NPTF	7/16-20 UNF	3/4-16	3.00		0.09	0.88	1.50	4.50	
2" *	0.88	2.08	1.374	0.38	0.625	0.50	1/4 NPTF	1/2-20 UNF	1-1/4-12	–		0.12	1.19	–	6.06	

* Available upon request.
Please consult factory.

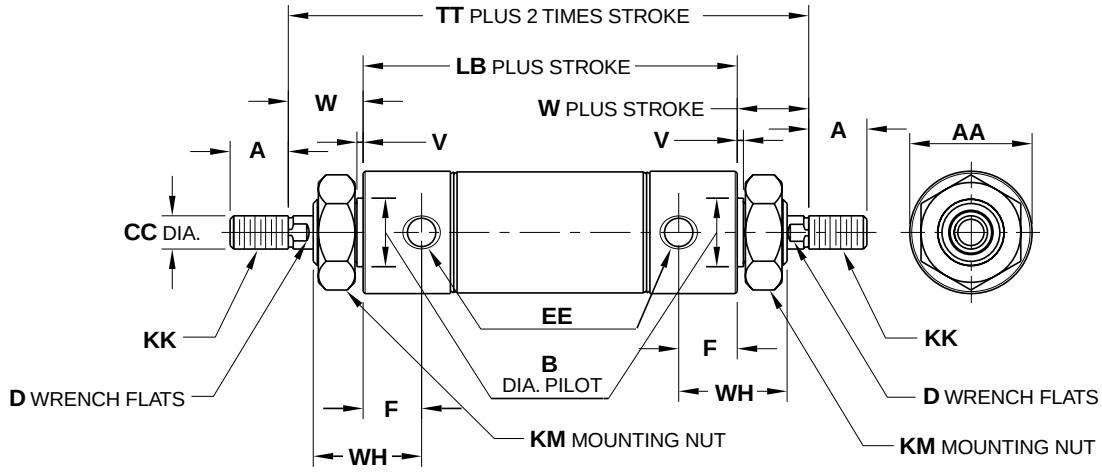
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Mounting Style KDX
Threaded Both Ends, Double Acting, Double Rod

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore Sizes
7/16"
3/4"



Bore Sizes
9/16"
7/8"
1-1/16"
1-1/4"
1-1/2"
1-3/4"
2" *
2-1/2" *
3" *

*No Mounting Nut

Bore	SR	SRM	SRD SRDM	Std. Stroke (in)	Max Stroke (in)	SS Rod	A	AA	B	CC
7/16"	●			1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	0.74	0.437	0.188
9/16"	●	●	●	1/2, 1, 1-1/2, 2, 3, 4	6	✓	0.50	0.62	0.437	0.188
3/4"	●	●	●	1, 2, 3, 4, 5, 6	12	✓	0.50	0.86	0.624	0.250
7/8"	●			1, 2, 3, 4, 6	12	✓	0.50	0.93	0.624	0.250
1-1/16"	●	●	●	1, 2, 3, 4, 5, 6	12	✓	0.50	1.12	0.624	0.312
1-1/4"	●	●		1, 2, 3, 4, 5, 6	12	✓	0.75	1.34	0.749	0.437
1-1/2"	●	●	●	1, 2, 3, 4, 5, 6	12	✓	0.75	1.56	0.749	0.437
1-3/4"	●	●		1, 2, 3, 4, 5, 6	12	✓	0.88	1.84	1.031	0.500
2"	●	●	●	–	12	✓	0.88	2.08	1.374	0.625
2-1/2"	●	●		–	18	✓	0.88	2.62	1.500	0.625
3"	●			–	12	✓	1.25	3.16	1.630	0.750

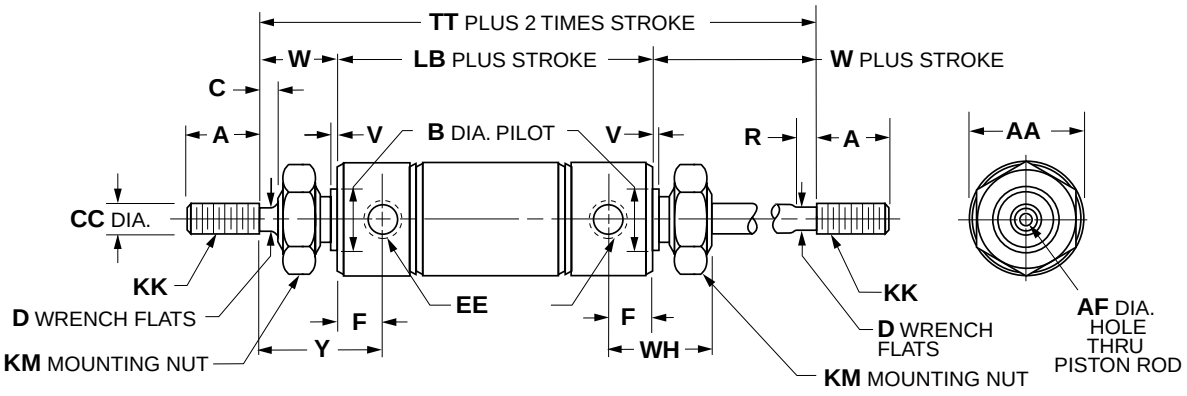
Bore	D	EE	F	KK	KM	LB		SE	TT		V	W	WH
						SR	SRM		SR	SRM			
7/16"	–	#10-32	0.34	#10-32 UNF	7/16-20	2.06	–	0.38	2.81	–	0.05	0.38	0.72
9/16"	–	#10-32	0.40	#10-32 UNF	7/16-20	2.19	2.44	0.38	2.94	3.19	0.06	0.38	0.78
3/4"	–	1/8 NPTF	0.47	1/4-28 UNF	5/8-18	3.00	3.00	0.50	4.00	4.00	0.09	0.50	0.97
7/8"	–	1/8 NPTF	0.47	1/4-28 UNF	5/8-18	2.91	–	0.50	3.91	–	0.09	0.50	0.97
1-1/16"	0.25	1/8 NPTF	0.56	5/16-24 UNF	5/8-18	2.75	3.28	0.50	4.00	4.53	0.09	0.62	1.19
1-1/4"	0.38	1/8 NPTF	0.75	7/16-20 UNF	3/4-16	3.81	3.84	0.63	5.56	5.59	0.09	0.88	1.62
1-1/2"	0.38	1/8 NPTF	0.62	7/16-20 UNF	3/4-16	3.38	3.63	0.63	5.12	5.38	0.09	0.88	1.50
1-3/4"	7/16	1/4 NPTF	0.88	1/2-20 UNF	1-14	4.44	4.44	0.75	6.56	6.56	0.09	1.06	1.63
2"	0.50	1/4 NPTF	0.65	1/2-20 UNF	1-1/4-12	4.19	4.47	–	6.56	6.84	0.12	1.19	1.84
2-1/2"	1/2	1/4 NPTF	0.65	1/2-20 UNF	1-3/8-12	4.19	4.19	–	6.56	6.56	0.13	1.19	1.84
3"	5/8	3/8 NPTF	0.71	5/8-18 UNF	1-1/2-12	4.56	–	–	7.31	–	0.19	1.38	1.72

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Mounting Style KDXH
Threaded Both Ends, Double Rod, Hollow Rod

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.

D



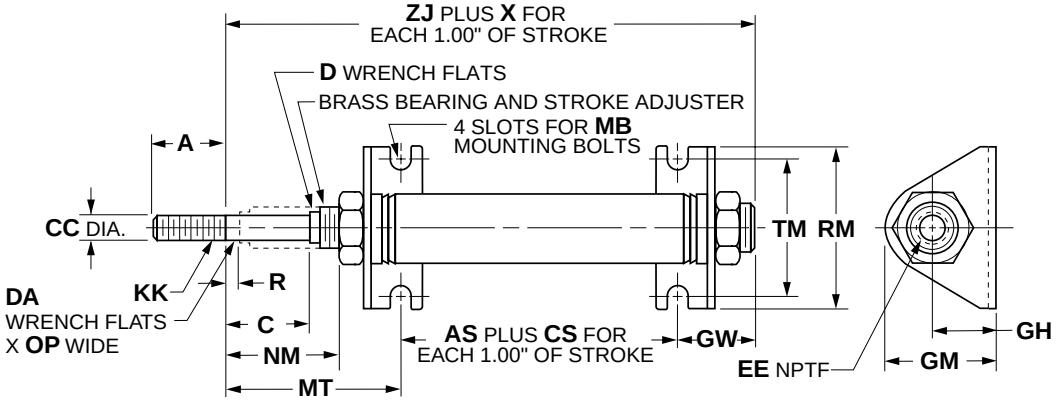
Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod	A	AA	AF	B	C	CC
1-1/16"	●	●	1, 2, 3, 4, 5, 6	12	N/A	0.50	1.12	0.187	0.624	0.12	0.312
1-1/4"	●	●	1, 2, 3, 4, 5, 6	12	N/A	0.75	1.34	0.250	0.749	0.25	0.437
1-1/2"	●	●	1, 2, 3, 4, 5, 6	12	N/A	0.75	1.56	0.250	0.749	0.25	0.437
1-3/4"	●	●	1, 2, 3, 4, 5, 6	12	N/A	0.88	1.84	0.328	1.031	0.38	0.500

Bore	D	EE	F	KK	KM	LB		R	TT		V	W	WH	Y
						SR	SRM		SR	SRM				
1-1/16"	0.25	1/8 NPTF	0.56	5/16-24 UNF	5/8-18	2.75	3.28	0.12	4.00	4.53	0.09	0.62	1.06	1.19
1-1/4"	0.38	1/8 NPTF	0.75	7/16-20 UNF	3/4-16	3.81	3.84	0.25	5.56	5.59	0.09	0.88	1.38	1.62
1-1/2"	0.38	1/8 NPTF	0.62	7/16-20 UNF	3/4-16	3.38	3.63	0.25	5.12	5.38	0.09	0.88	1.25	1.50
1-3/4"	7/16	1/4 NPTF	0.88	1/2-20 UNF	1-14	4.44	4.44	–	6.56	6.56	0.09	1.06	1.63	1.63

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Mounting Style A
Nose Mount, Spring Return, Head Adjustable Stroke

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke	Max Stroke (in)	SS Rod Std
3/4"	●		Stroke adjustment in 1" increments to 3": 1" stroke adjusts 0-1" 2" stroke adjusts 1-2" 3" stroke adjusts 2-3"	6	✓
1-1/16"	●			6	✓
1-1/2"	●			6	✓

Bore	A	AS	C	CC	CS	D	EE	GH	GM	GW
3/4"	0.50	–	1.19	0.250	1.69	–	1/8 NPTF	0.81	1.38	0.88
1-1/16"	0.50	0.32	1.25	0.312	1.56	0.25	1/8 NPTF	0.81	1.38	0.93
1-1/2"	0.75	0.19	1.25	0.437	2.00	0.62	1/8 NPTF	1.00	1.78	1.25

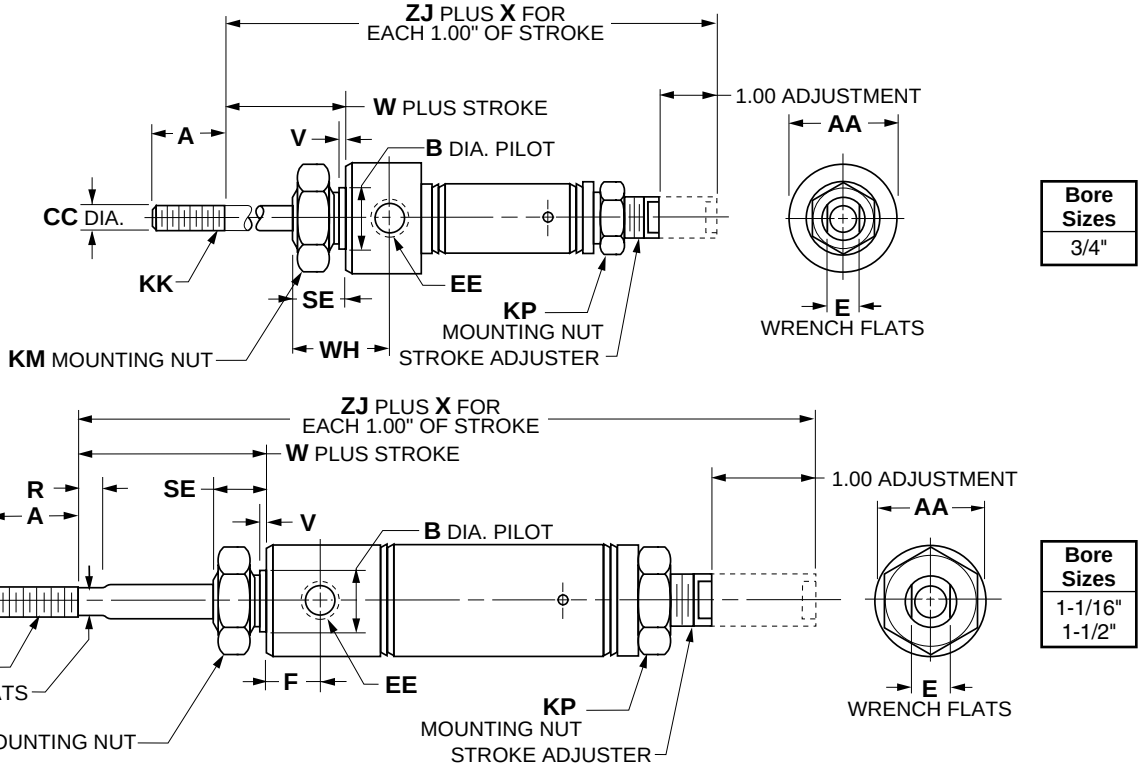
Bore	KK	MB	MT	NM	OP	R	RM	TM	X	ZJ
3/4"	1/4-28 UNF	0.250	2.38	1.44	–	0.19	1.88	1.50	1.69	3.12
1-1/16"	5/16-24 UNF	0.250	2.38	1.44	0.12	0.25	1.88	1.50	1.56	3.63
1-1/2"	7/16-20 UNF	0.250	2.56	1.50	–	0.25	2.50	1.88	2.00	4.00

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D

Mounting Style RA
Nose Mount, Spring Return, Cap Adjustable Stroke

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke	Max Stroke (in)	SS Rod Std
3/4"	●		Stroke adjustment in 1" increments to 3":	6	✓
1-1/16"	●		1" stroke adjusts 0-1"	6	✓
1-1/2"	●		2" stroke adjusts 1-2"	6	✓
			3" stroke adjusts 2-3"		

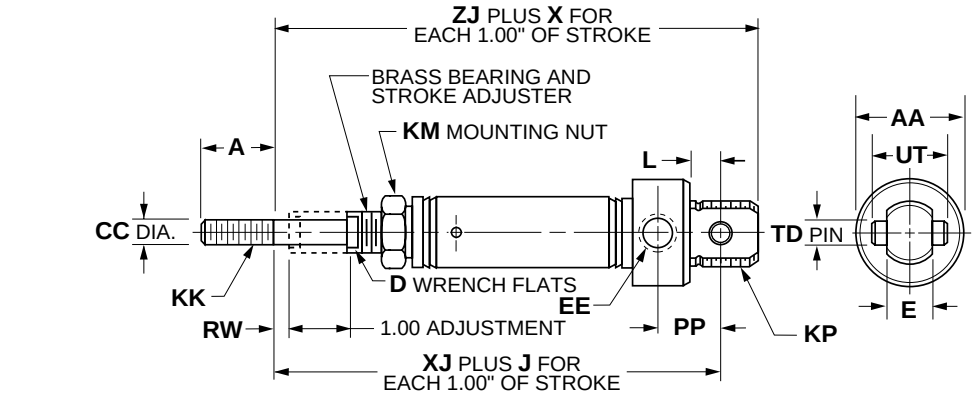
Bore	A	AS	AA	B	CC	D	E	EE	F
3/4"	0.50	1.69	0.86	0.624	0.250	–	0.34	1/8 NPTF	–
1-1/16"	0.50	0.32	1.12	0.624	0.312	0.25	0.50	1/8 NPTF	0.56
1-1/2"	1.25	0.19	1.56	0.749	0.437	0.38	0.62	1/8 NPTF	0.62

3/4"	KK	KM	SE	R	V	W	WH	X	ZJ
1-1/16"	1/4-28 UNF	5/8-18	0.50	–	0.09	0.53	0.97	2.69	3.78
1-1/2"	5/16-24 UNF	5/8-18	0.50	0.12	0.09	0.50	–	2.56	4.03
1-1/2"	7/16-20 UNF	3/4-16	0.62	0.25	0.09	0.88	–	2.00	5.81

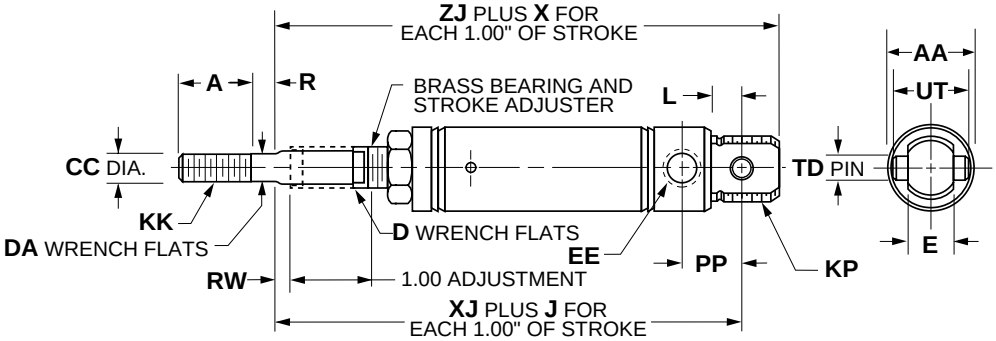
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Mounting Style AP
Pivot Mount, Spring Return, Head Adjustable Stroke

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore Sizes
3/4"



Bore Sizes
1-1/16"
1-1/2"

Bore	SR	SRM	Std. Stroke	Max Stroke (in)	SS Rod Std
3/4"	●		Stroke adjustment in 1" increments to 3": 1" stroke adjusts 0-1" 2" stroke adjusts 1-2" 3" stroke adjusts 2-3"	6	✓
1-1/16"	●			6	✓
1-1/2"	●			6	✓

Bore	A	AA	CC	D	DA	E	EE	J	KK
3/4"	0.50	0.86	0.250	0.34	–	0.38	1/8 NPTF	1.69	1/4-28 UNF
1-1/16"	0.50	1.12	0.312	0.50	0.25	0.38	1/8 NPTF	1.56	5/16-24 UNF
1-1/2"	0.75	1.56	0.437	0.62	0.38	0.62	1/8 NPTF	2.00	7/16-20 UNF

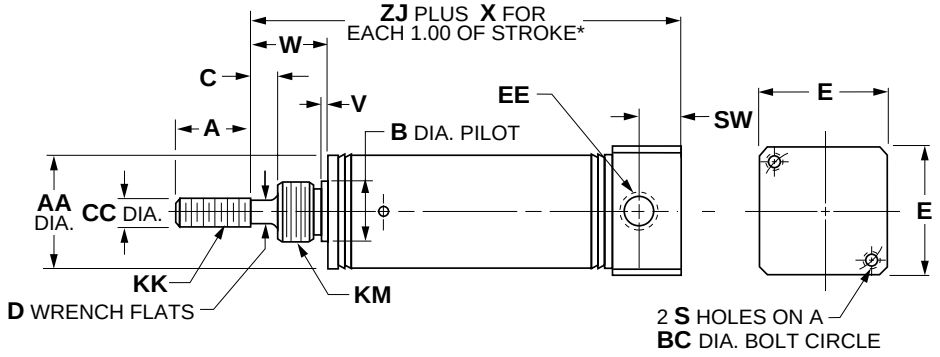
Bore	KM	KP	L	OP	PP	R	RW	TD	UT	X	XJ	ZJ
3/4"	7/16-20	5/8-18 UNF	0.34	–	0.62	0.19	0.19	0.250	0.75	1.69	3.65	3.93
1-1/16"	–	5/8-18 UNF	0.34	0.25	0.62	0.12	0.25	0.250	0.75	1.56	3.97	4.25
1-1/2"	3/4-16	–	0.50	–	0.81	0.25	0.25	0.375	1.00	2.00	4.31	4.69

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Mounting Style BRN
Rear Block Mount, Single Acting, Spring Return

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.

D



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
7/16"	●		1/2, 1, 2, 3, 4	6	✓
3/4"	●	●	1, 2, 3, 4	6	✓
1-1/16"	●	●	1, 2, 3, 4	6	✓
1-1/2"	●	●	1, 2, 3, 4	6	✓

Bore	A	AA	B	C	CC	D	E	EE
7/16"	0.50	0.5	0.374	–	0.188	–	0.75	#10-32
3/4"	0.75	0.81	0.499	0.25	0.250	0.22	1.00	1/8 NPTF
1-1/16"	0.75	1.12	0.624	0.38	0.312	0.25	1.25	1/8 NPTF
1-1/2"	1.25	1.56	0.749	0.25	0.437	0.38	1.75	1/4 NPTF

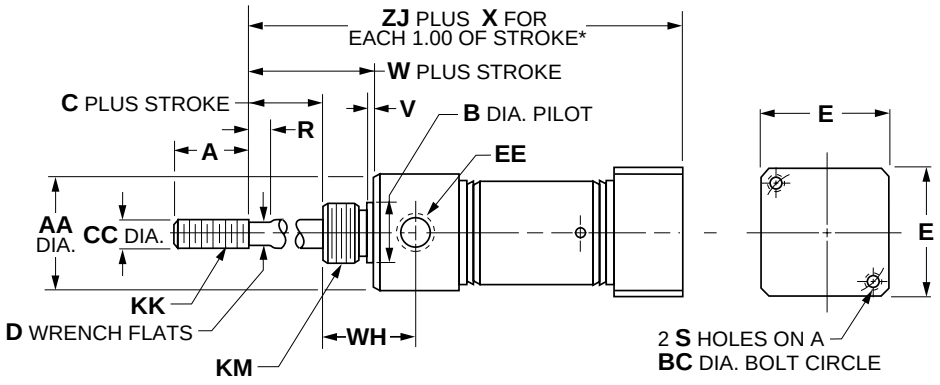
Bore	KK	KM	SW	V	W	X	ZJ	
							SR	SRM
7/16"	#10-32 UNF	3/8-24	0.38	0.05	0.31	0.94	1.62	–
3/4"	1/4-28 UNF	1/2-20	0.44	0.09	0.62	1.69	2.31	2.56
1-1/16"	5/16-24 UNF	5/8-18	0.44	0.09	0.88	1.81	2.81	3.06
1-1/2"	7/16-20 UNF	3/4-16	0.62	0.09	0.88	2.00	3.06	3.31

* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

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Mounting Style BRR
Rear Block Mount, Single Acting, Spring Extend

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
3/4"	●	●	1, 2, 3, 4	6	✓
1-1/16"	●	●	1, 2, 3, 4	6	✓
1-1/2"	●	●	1, 2, 3, 4	6	✓

Bore	A	AA	B	BC	C	CC	D	E	EE
3/4"	0.75	0.86	0.624	1.00	0.25	0.250	0.22	1.00	1/8 NPTF
1-1/16"	0.75	1.12	0.624	1.25	0.38	0.312	0.25	1.25	1/8 NPTF
1-1/2"	1.25	1.56	0.749	1.75	0.25	0.437	0.38	1.75	1/4 NPTF

Bore	KK	KM	R	S	V	W	WH	X	ZJ	
									SR	SRM
3/4"	1/4-28 UNF	5/8-18	0.25	#10-32 UNF	0.09	0.75	0.97	2.69	3.22	3.47
1-1/16"	5/16-24 UNF	5/8-18	0.25	#10-32 UNF	0.09	0.88	1.06	2.81	3.53	3.78
1-1/2"	7/16-20 UNF	3/4-16	0.25	1/4-20 UNC	0.09	0.88	1.25	3.00	3.88	4.13

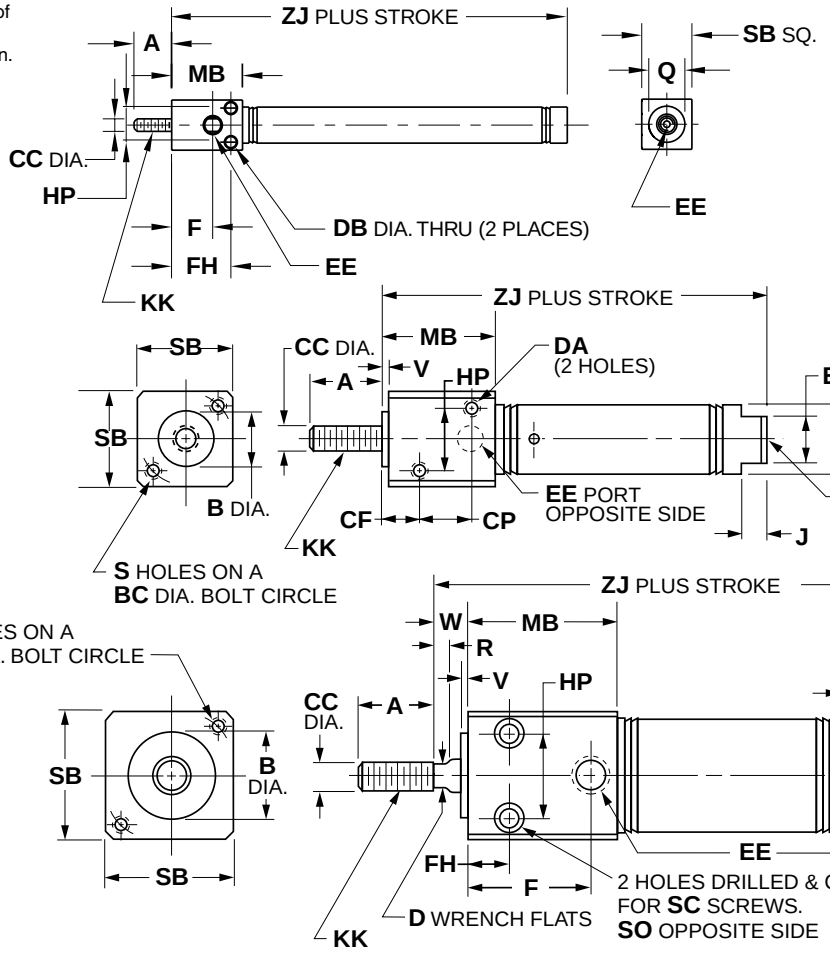
* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

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C086

Mounting Style BFD
Front Block Mount, Double Acting

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore Sizes
5/16"

Bore Sizes
7/16"

Bore Sizes
3/4"
1-1/16"
1-1/2"

Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std	A	AA	B	BC	CC
5/16"	●		1/2, 1, 1-1/2, 2, 2-1/2, 3, 4	4	✓	0.38	–	–	–	0.125
7/16"	●		1/2, 1, 1-1/2, 2, 3, 4	12	✓	0.50	0.50	0.437	0.75	0.188
3/4"	●	●	1/2, 1, 2, 3, 4, 5, 6	12	✓	0.75	0.81	0.624	1.00	0.250
1-1/16"	●	●	1, 2, 3, 4, 5, 6	12	✓	0.75	1.12	0.750	1.25	0.312
1-1/2"	●	●	1, 2, 3, 4, 5, 6	12	✓	1.25	1.56	1.00	1.75	0.437

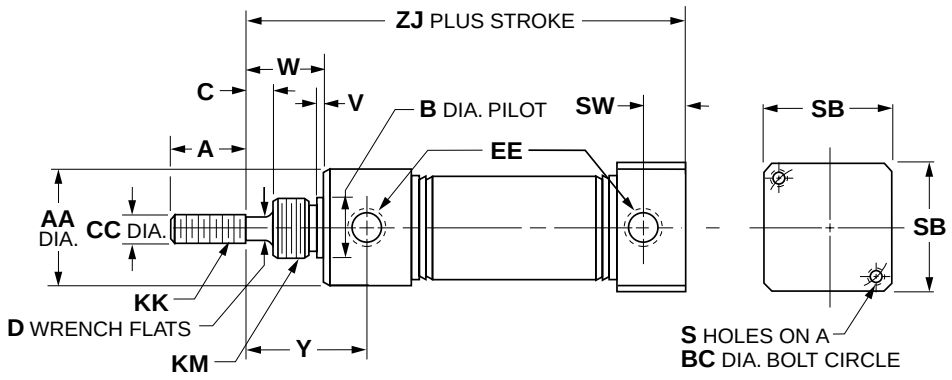
Bore	CF	CP	D	DA	DB	E	EE	F	FH	HP	J
5/16"	–	–	–	–	0.11	–	#10-32	0.41	0.59	0.34	–
7/16"	0.31	0.44	–	#8-32	–	0.38	#10-32	–	0.31	0.44	0.19
3/4"	–	–	0.22	–	–	0.62	1/8 NPTF	0.88	0.38	0.62	0.19
1-1/16"	–	–	0.25	–	–	0.88	1/8 NPTF	1.16	0.62	0.81	0.19
1-1/2"	–	–	0.38	–	–	0.88	1/4 NPTF	1.53	0.88	1.12	0.25

Bore	KK	MB	Q	R	S	SB	SC	SO	V	W	ZJ	
											SR	SRM
5/16"	#5-40 UNC	0.71	0.36	–	–	0.50 SQ	–	–	–	–	1.72	–
7/16"	#10-32 UNF	0.88	–	–	#8-32 UNC	0.75	–	–	0.062	–	2.12	–
3/4"	1/4-28 UNF	1.12	–	–	#10-32 UNF	1.00	#10-32	1/4-20 UNC	0.093	0.34	3.22	3.22
1-1/16"	5/16-24 UNF	1.41	–	0.25	#10-32 UNF	1.25	#10-32	1/4-20 UNC	0.093	0.47	3.75	3.91
1-1/2"	7/16-20 UNF	1.88	–	–	1/4-20 UNC	1.75	1/4-20	5/16-18 UNC	0.125	0.38	4.19	4.44

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Mounting Style BRD
Rear Block Mount, Double Acting

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
7/16"	●		1/2, 1, 2, 3, 4	12	✓
3/4"	●	●	1, 2, 3, 4, 5, 6	12	✓
1-1/16"	●	●	1, 2, 3, 4	12	✓
1-1/2"	●	●	1, 2, 3, 4, 5, 6	12	✓

Bore	A	AA	B	BC	C	CC	D	EE	KK
7/16"	0.50	0.74	0.437	0.75	–	0.188	–	#10-32	#10-32 UNF
3/4"	0.75	0.86	0.624	1.00	0.25	0.250	0.22	1/8 NPTF	1/4-28 UNF
1-1/16"	0.75	1.12	0.624	1.25	0.38	0.312	0.25	1/8 NPTF	5/16-24 UNF
1-1/2"	1.25	1.56	0.749	1.75	0.25	0.437	0.38	1/4 NPTF	7/16-20 UNF

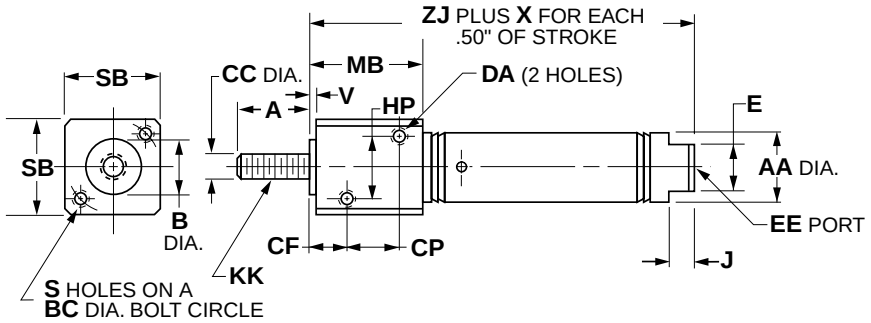
Bore	KM	S	SB	SW	V	W	Y	ZJ	
								SR	SRM
7/16"	7/16-20 UNF	#8-32 UNC	0.75	0.38	0.05	0.43	0.72	2.44	–
3/4"	5/8-18 UNF	#10-32 UNF	1.00	0.44	0.09	0.75	1.22	3.78	3.78
1-1/16"	5/8-18 UNF	#10-32 UNF	1.25	0.44	0.09	0.88	1.44	4.00	4.16
1-1/2"	3/4-16 UNF	1/4-20 UNC	1.75	0.62	0.09	0.88	1.47	4.38	4.63

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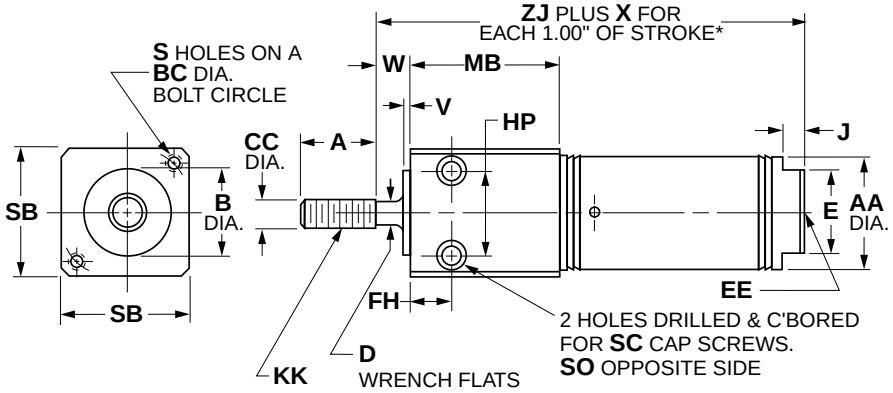
Mounting Style BFN
Front Block Mount, Single Acting, Spring Return

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.

Bore Sizes
7/16"



Bore Sizes
3/4"
1-1/16"
1-1/2"



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
7/16"	●		1/2, 1, 1-1/2, 2, 3	6	✓
3/4"	●	●	1/2, 1, 2, 3, 4	6	✓
1-1/16"	●	●	1, 2, 3, 4	6	✓
1-1/2"	●	●	1, 2, 3, 4	6	✓

Bore	A	AA	B	BC	CC	CF	CP	D	DA	E	EE	FH
7/16"	0.50	0.50	0.437	0.75	0.188	0.31	0.44	–	#8-32 UNC	0.38	#10-32	0.31
3/4"	0.75	0.81	0.624	1.00	0.250	–	–	0.22	–	0.62	1/8 NPTF	0.38
1-1/16"	0.75	1.12	0.750	1.25	0.312	–	–	0.25	–	0.88	1/8 NPTF	0.62
1-1/2"	1.25	1.56	1.00	1.75	0.437	–	–	0.38	–	0.88	1/4 NPTF	0.88

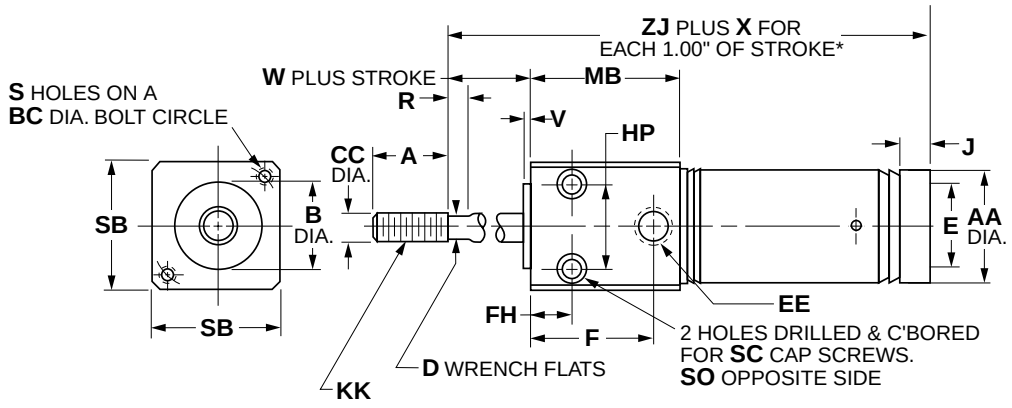
Bore	HP	J	KK	MB	S	SB	SC	SO	V	W	X	ZJ	
												SR	SRM
7/16"	0.44	0.19	#10-32 UNF	0.88	#8-32 UNC	0.75	–	–	0.062	–	0.94	1.94	–
3/4"	0.62	0.19	1/4-28 UNF	1.12	#10-32 UNF	1.00	#10-32	1/4-20 UNC	0.093	0.34	1.69	2.66	2.91
1-1/16"	0.81	0.19	5/16-24 UNF	1.41	#10-32 UNF	1.25	#10-32	1/4-20 UNC	0.093	0.47	1.81	3.38	3.63
1-1/2"	1.12	0.25	7/16-20 UNF	1.88	1/4 UNC	1.75	1/4-20	5/16-18 UNC	0.125	0.38	2.00	3.69	3.94

* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

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Mounting Style BFR
Front Block Mount, Single Acting, Spring Extend

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
3/4"	●	●	1, 2, 3, 4	6	✓
1-1/16"	●	●	1, 2, 3, 4	6	✓
1-1/2"	●	●	1, 2, 3, 4	6	✓

Bore	A	AA	B	BC	CC	D	E	EE	F	FH	HP	J
3/4"	0.75	0.81	0.624	1.00	0.250	0.22	–	1/8 NPTF	0.88	0.38	0.62	0.19
1-1/16"	0.75	1.12	0.750	1.25	0.312	0.25	–	1/8 NPTF	1.16	0.62	0.81	–
1-1/2"	1.25	1.56	1.00	1.75	0.437	0.38	0.88	1/4 NPTF	1.53	0.88	1.12	0.25

Bore	KK	MB	R	S	SB	SC	SO	V	W	X	ZJ	
											SR	SRM
3/4"	1/4-28 UNF	1.12	0.25	#10-32 UNF	1.00	#10-32	1/4-20 UNC	0.093	0.34	2.69	2.56	2.81
1-1/16"	5/16-24 UNF	1.41	0.25	#10-32 UNF	1.25	#10-32	1/4-20 UNC	0.093	0.47	2.81	3.12	3.37
1-1/2"	7/16-20 UNF	1.88	0.25	1/4-20 UNC	1.75	1/4-20	5/16-18 UNC	0.125	0.38	3.00	3.69	3.94

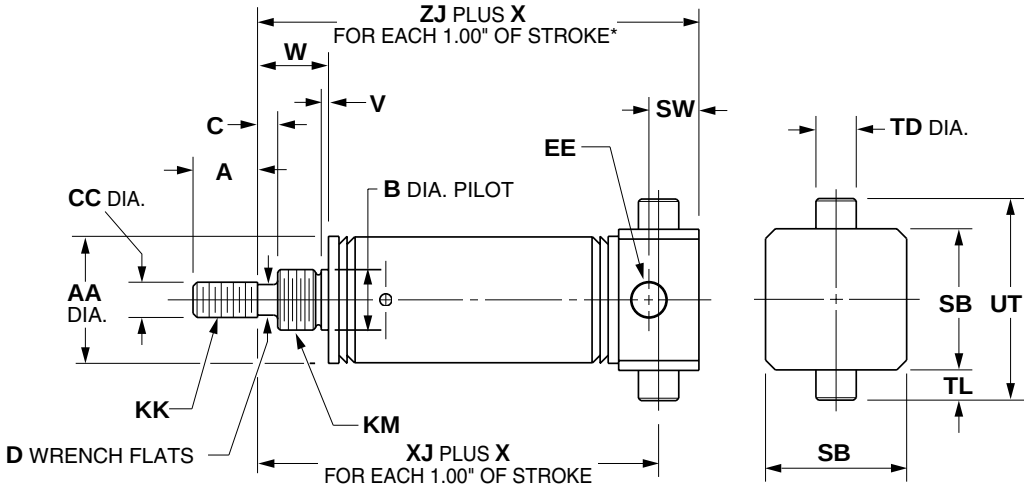
* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

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D

Mounting Style TRN
Rear Trunnion Mount, Single Acting, Spring Return

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
7/16"	●		1/2, 1, 2, 3, 4	6	✓
3/4"	●	●	1, 2, 3, 4	6	✓
1-1/16"	●	●	1, 2, 3, 4	6	✓
1-1/2"	●	●	1, 2, 3, 4	6	✓

Bore	A	AA	B	C	CC	D	EE	KK	KM
7/16"	0.50	0.50	0.374	–	0.188	–	#10-32	#10-32 UNF	3/8-24 UNF
3/4"	0.75	0.81	0.499	0.25	0.250	0.22	1/8 NPTF	1/4-28 UNF	1/2-20 UNF
1-1/16"	0.75	1.12	0.624	0.38	0.312	0.25	1/8 NPTF	5/16-24 UNF	5/8-18 UNF
1-1/2"	1.25	1.56	0.749	0.25	0.437	0.38	1/4 NPTF	7/16-20 UNF	3/4-16 UNF

Bore	SB	SW	TD	TL	UT	V	W	X	XJ		ZJ	
									SR	SRM	SR	SRM
7/16"	0.75	0.38	0.374	0.50	1.25	0.05	0.32	0.94**	1.38	–	1.62	–
3/4"	1.00	0.44	0.500	0.38	1.75	0.09	0.62	1.69	1.94	2.19	2.31	2.56
1-1/16"	1.25	0.44	0.500	0.38	2.00	0.09	0.88	1.81	2.44	2.69	2.81	3.06
1-1/2"	1.75	0.62	0.500	0.38	2.50	0.09	0.88	2.00	2.56	2.81	3.06	3.31

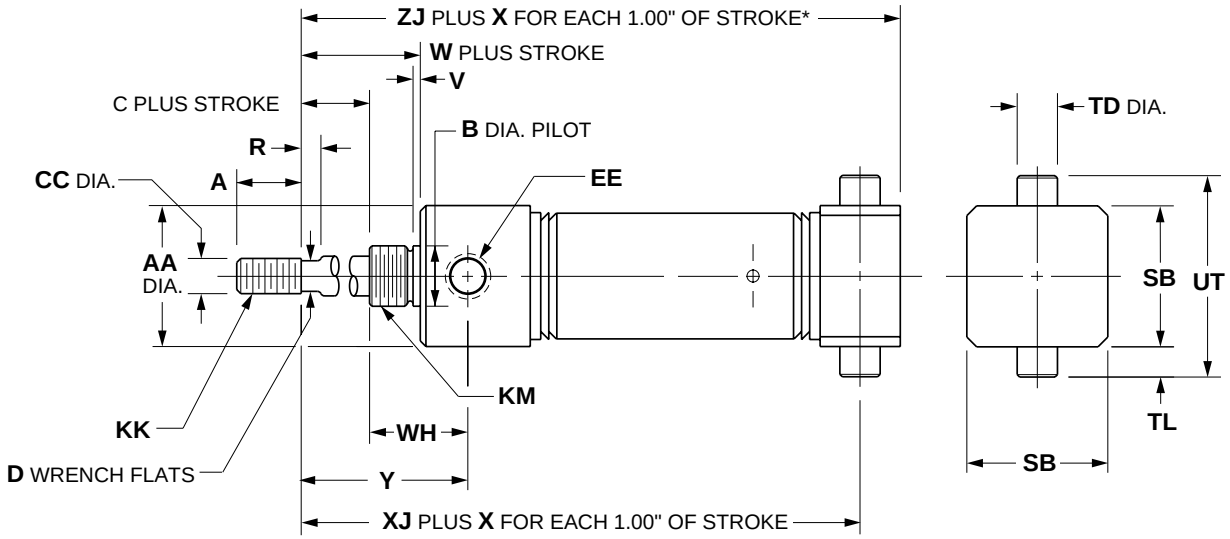
* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

** For each 0.50" of stroke.

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Mounting Style TRR
Rear Trunnion Mount, Single Acting, Spring Extend

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
3/4"	●	●	1, 2, 3, 4	6	✓
1-1/16"	●	●	1, 2, 3, 4	6	✓
1-1/2"	●	●	1, 2, 3, 4	6	✓

Bore	A	AA	B	C	CC	D	EE	KK	KM
3/4"	0.75	0.86	0.624	0.25	0.250	0.22	1/8 NPTF	1/4-28 UNF	1/2-20 UNF
1-1/16"	0.75	1.12	0.624	0.38	0.312	0.25	1/8 NPTF	5/16-24 UNF	5/8-18 UNF
1-1/2"	1.25	1.56	0.749	0.25	0.437	0.38	1/4 NPTF	7/16-20 UNF	3/4-16 UNF

Bore	R	SB	TD	TL	UT	V	W	WH	X	XJ		ZJ	
										SR	SRM	SR	SRM
3/4"	0.25	1.00	0.500	0.38	1.75	0.09	0.75	0.72	2.69	2.85	3.10	3.22	3.47
1-1/16"	0.25	1.25	0.500	0.38	2.00	0.09	0.88	0.68	2.81	3.15	3.40	3.53	3.78
1-1/2"	0.25	1.75	0.500	0.38	2.50	0.09	0.88	1.25	3.00	3.38	3.63	3.88	4.13

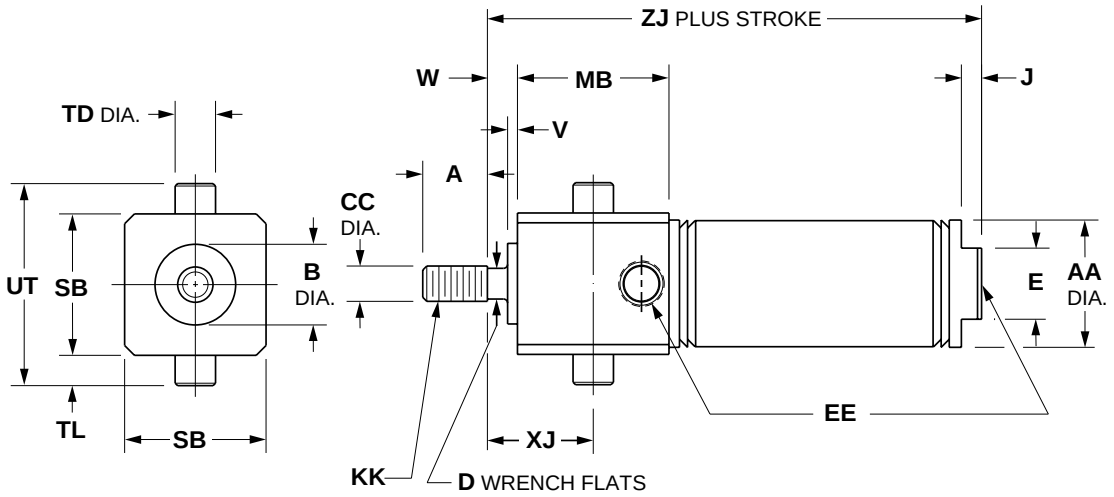
* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

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D

Mounting Style TFD
Front Trunnion Mount, Double Acting

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
7/16"	●		1/2, 1, 1-1/2, 2, 3, 4	12	✓
3/4"	●	●	1, 2, 3, 4, 5, 6	12	✓
1-1/16"	●	●	1, 2, 3, 4, 5, 6	12	✓
1-1/2"	●	●	1, 2, 3, 4, 5, 6	12	✓

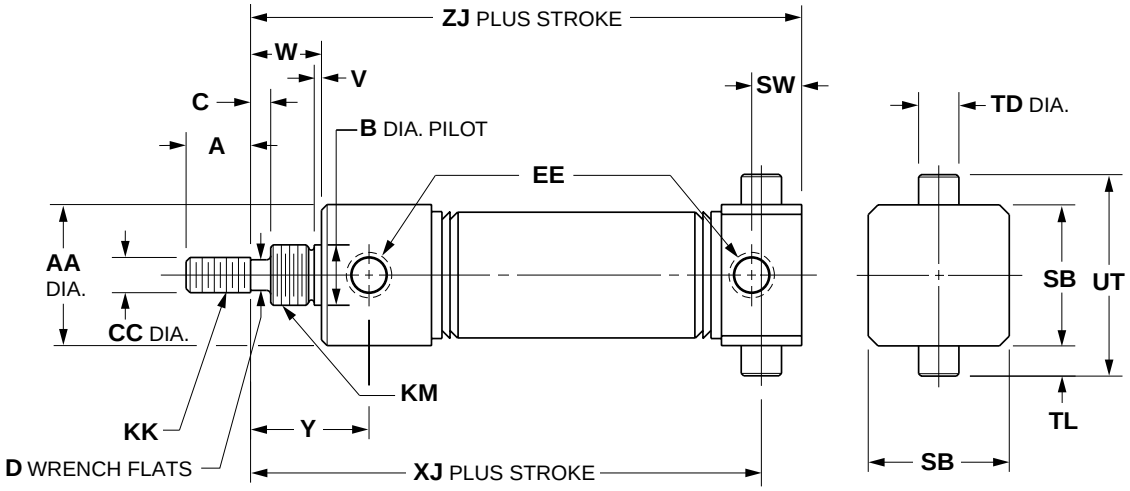
Bore	A	AA	B	CC	D	E	EE	J	KK
7/16"	0.50	0.50	0.437	0.188	–	0.38	#10-32	0.19	#10-32 UNF
3/4"	0.75	0.81	0.624	0.250	0.22	0.62	1/8 NPTF	0.19	1/4-28 UNF
1-1/16"	0.75	1.12	0.750	0.312	0.25	0.88	1/8 NPTF	0.19	5/16-24 UNF
1-1/2"	1.25	1.56	1.000	0.437	0.38	0.88	1/4 NPTF	0.25	7/16-20 UNF

Bore	MB	SB	TD	TL	UT	V	W	XJ	ZJ	
									SR	SRM
7/16"	0.88	0.75	0.374	0.250	1.25	0.062	–	0.31	2.12	–
3/4"	1.12	1.00	0.500	0.38	1.75	0.093	0.34	0.69	3.22	3.22
1-1/16"	1.41	1.25	0.500	0.38	2.00	0.093	0.47	1.09	3.75	3.91
1-1/2"	1.88	1.75	0.500	0.38	2.50	0.125	0.38	1.31	4.19	4.44

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Mounting Style TRD
Rear Trunnion Mount, Double Acting

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
7/16"	●		1/2, 1, 1-1/2, 2, 3, 4	12	✓
3/4"	●	●	1, 2, 3, 4, 5, 6	12	✓
1-1/16"	●	●	1, 2, 3, 4	12	✓
1-1/2"	●	●	1, 2, 3, 4, 5, 6	12	✓

Bore	A	AA	B	C	CC	D	EE	KK	KM
7/16"	0.50	0.74	0.437	–	0.188	–	#10-32	#10-32 UNF	7/16-20 UNF
3/4"	0.75	0.86	0.624	0.25	0.250	0.22	1/8 NPTF	1/4-28 UNF	5/8-18 UNF
1-1/16"	0.75	1.12	0.624	0.38	0.312	0.25	1/8 NPTF	5/16-24 UNF	5/8-18 UNF
1-1/2"	1.25	1.56	0.749	0.25	0.437	0.38	1/4 NPTF	7/16-20 UNF	3/4-16 UNF

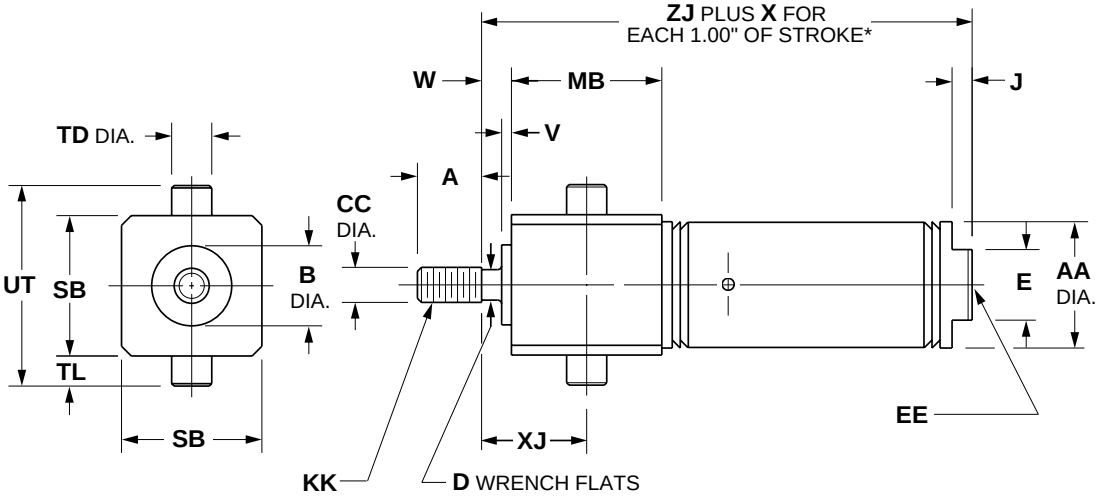
Bore	SB	SW	TD	TL	UT	V	W	XJ		Y	ZJ	
								SR	SRM		SR	SRM
7/16"	0.75	0.38	0.374	0.25	1.25	0.05	0.38	2.19	–	0.72	2.44	–
3/4"	1.00	0.44	0.500	0.38	1.75	0.09	0.75	3.41	3.41	1.22	3.78	3.78
1-1/16"	1.25	0.44	0.500	0.38	2.00	0.09	0.88	3.62	3.62	1.44	4.00	4.16
1-1/2"	1.75	0.62	0.500	0.38	2.50	0.09	0.88	3.88	4.13	1.47	4.38	4.63

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D

Mounting Style TFN
Front Trunnion Mount, Single Acting, Spring Return

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
7/16"	●		1/2, 1, 1-1/2, 2, 3	6	✓
3/4"	●	●	1/2, 1, 2, 3, 4	6	✓
1-1/16"	●	●	1, 2, 3, 4	6	✓
1-1/2"	●	●	1, 2, 3, 4	6	✓

Bore	A	AA	B	CC	D	E	EE	J	KK
7/16"	0.50	0.50	0.437	0.188	–	0.38	#10-32	0.19	#10-32 UNF
3/4"	0.75	0.81	0.624	0.250	0.22	0.62	1/8 NPTF	0.19	1/4-28 UNF
1-1/16"	0.75	1.12	0.750	0.312	0.25	0.88	1/8 NPTF	0.19	5/16-24 UNF
1-1/2"	1.25	1.56	1.000	0.437	0.38	0.88	1/4 NPTF	0.25	7/16-20 UNF

Bore	MB	SB	TD	TL	UT	V	W	X	XJ	ZJ	
										SR	SRM
7/16"	0.88	0.75	0.374	0.25	1.25	0.062	0	0.94**	0.31	1.94	–
3/4"	1.12	1.00	0.500	0.38	1.75	0.093	0.34	1.69	0.69	2.66	2.91
1-1/16"	1.41	1.25	0.500	0.38	2.00	0.093	0.47	1.81	1.09	3.38	3.63
1-1/2"	1.88	1.75	0.500	0.38	2.50	0.125	0.38	2.00	1.31	3.69	3.94

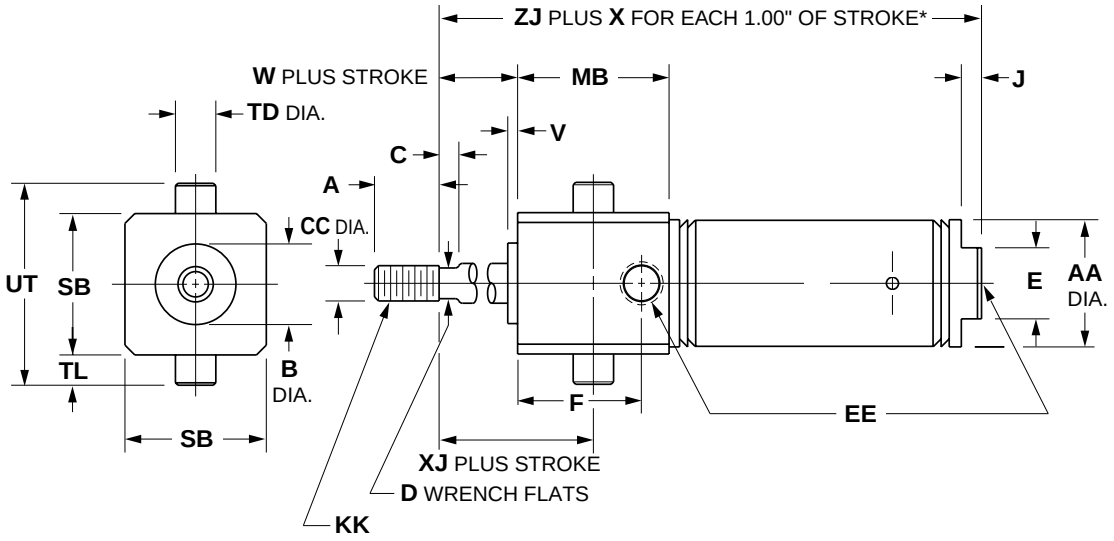
* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

** For each 0.50" of stroke

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Mounting Style TFR
Front Trunnion Mount, Single Acting, Spring Extend

Drawings are representative of cylinders. Certain bore sizes may not look exactly as shown.



Bore	SR	SRM	Std. Stroke (in)	Max Stroke (in)	SS Rod Std
3/4"	●	●	1, 2, 3, 4	6	✓
1-1/16"	●	●	1, 2, 3, 4	6	✓
1-1/2"	●	●	1, 2, 3, 4	6	✓

Bore	A	AA	B	C	CC	D	E	F	EE	J
3/4"	0.75	0.81	0.624	0.25	0.250	0.22	0	0.88	1/8 NPTF	–
1-1/16"	0.75	1.12	0.750	0.25	0.312	0.25	0	1.16	1/8 NPTF	–
1-1/2"	1.25	1.56	1.000	0.25	0.437	0.38	0.88	–	1/4 NPTF	0.25

Bore	KK	MB	SB	TD	TL	UT	V	W	X	XJ	ZJ	
											SR	SRM
3/4"	1/4-28 UNF	1.12	1.00	0.500	0.38	1.75	0.093	0.34	2.69	0.69	2.56	2.81
1-1/16"	5/16-24 UNF	1.41	1.25	0.500	0.38	2.00	0.093	0.47	2.81	1.09	3.12	3.37
1-1/2"	7/16-20 UNF	1.88	1.75	0.500	0.38	2.50	0.125	0.38	3.00	1.31	3.69	3.94

* To determine lengths for half inch stroke increments, determine length for next highest whole number stroke and subtract one half inch.

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Air Reservoirs

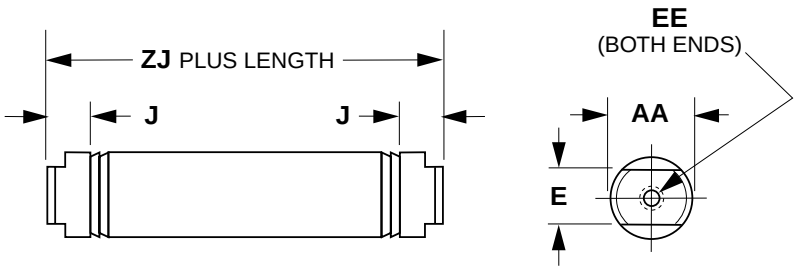
Air Reservoirs installed can significantly reduce the pulsation of a system. In addition air reservoirs can be used as a means to store energy. Caution should always be used when storing energy. Air reservoirs if installed in the correct location and sized correctly can temporarily increase the flow of an actuator or cylinder.
As always never exceed the rated pressure of the cylinder.

How To Order SR Series Air Reservoirs

.75	AR	SR	2.00
Bore Size*	**Mounting**		**Length**
.75 3/4"	**AR** Air Reservoir		Specify in inches. See table below.
1.06 1-1/16"			
1.50 1-1/2"			
2.00 2"			
2.50 2-1/2"			
3.00 3"			

Bore	Standard Lengths	Max Length	Volume (in^3)
3/4"	1" increments to 4"	32"	0.39 plus 0.44 per inch length
1-1/16"	1" increments to 8"	32"	0.99 plus 0.89 per inch length
1-1/2"	1" increments to 16"	32"	1.91 plus 1.77 per inch length
2"	1" increments to 16"	32"	4.22 plus 3.14 per inch length
2-1/2"	1" increments to 16"	32"	7.04 plus 4.91 per inch length
3"	1" increments to 16"	32"	9.90 plus 7.07 per inch length

Dimensions



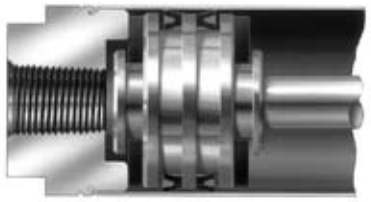
Bore	AA	E	EE	J	ZJ
3/4"	0.813	0.625	1/8" NPTF	0.19	1.938
1-1/16"	1.125	0.88	1/8" NPTF	0.19	2.375
1-1/2"	1.56	0.88	1/8" NPTF	0.250	2.250
2"	2.08	1.25	1/4" NPTF	0.312	2.875
2-1/2"	2.62	1.75	1/4" NPTF	0.312	2.875
3"	3.16	2.00	3/8" NPTF	0.312	3.190

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Bumpers

Bumpers are available at extra cost except where noted as standard. Add the following dimensions to the overall cylinder length by bore



SR Bumper Adder

Cylinder Type	SR Series Bore Size											
	5/16"	7/16"	9/16"	3/4"	7/8"	1-1/16"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"	3"
Spring Return	*	0.062"	0.062"	0.125"	*	0.125"	*	**	*	0.125"	N/A	N/A
Spring Extend	*	0.125"	0.062"	0.125"	*	0.125"	*	**	*	0.125"	N/A	N/A
Double Acting	*	0.188"	0.125"	**	*	0.125"	*	0.125"	*	0.250"	0.250"	N/A
K-type	N/A	0.250"	0.125"	**	*	0.500"	*	0.125"	*	0.250"	0.250"	N/A

*Bumpers are furnished as standard and do not affect overall length. **Bumpers do not affect overall length.

SRM Bumper Adder

Cylinder Type	SRM Series Bore Size							
	9/16"	3/4"	1-1/16"	1-1/4"	1-1/2"	1-3/4"	2"	2-1/2"
Spring Return	0.062"	0.125"	0.125"	0.125"	0.125"	*	0.125"	N/A
Spring Extend	0.062"	0.125"	0.125"	0.125"	0.125"	*	0.125"	N/A
Double Acting	0.125"	0.250"	0.250"	0.250"	0.250"	*	0.250"	0.250"
K-type	0.125"	0.312"	0.250"	0.250"	0.250"	*	0.250"	0.250"

Fluorocarbon Seals

Available on all bore sizes at extra cost. Not available on SRM or SRDM series.

Stainless Steel Piston Rods

Corrosion resistant stainless steel is the standard piston rod material for all bore sizes up to and including 1-1/2 inch bore at no additional cost. The only exception to the stainless steel standard is when a hollow rod, KDXH option is specified. Stainless steel is also the standard material on block, trunnion, hex/non-rotating and KDX mounts. Stainless steel is available on other sizes for an additional charge.

Rod Wiper

SR/SRM Series cylinders can be fitted with a rod wiper that is specially designed to prevent contaminants from clinging to the piston rod and damaging the piston rod seal. Available in 3/4", 1-1/16", and 1-1/2" bores, the piston rod wiper can be added to the SR/SRM and SRD/SRDM series.

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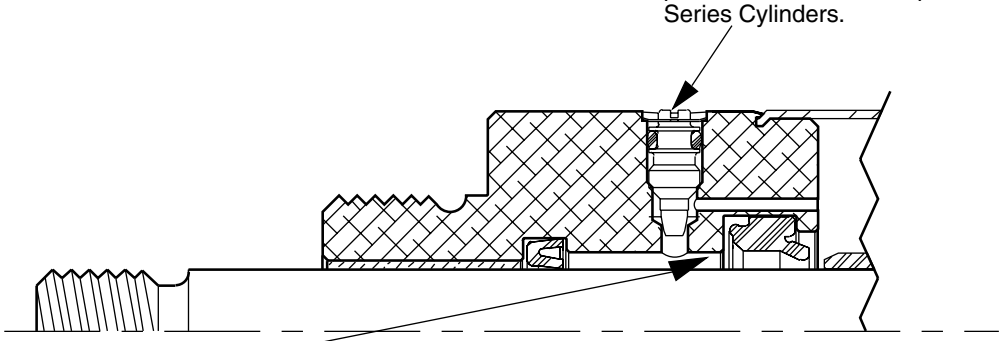
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Adjustable Cushion Option

Cushions can be selected on nine bore sizes, ranging from 0.75" bore to 3.0" bore with mounting styles D, front nose mount, and DXP, rear pivot mount. Adjustable cushions are not available with double rod SR Series cylinders.

Cushion Adjusting Needle Valves

The fine-thread cushion needle valves make precise adjustment quick and easy. The needle valve is fully captured to allow for safe cushion adjustment while cylinder is pressurized. The brass needle valves are corrosion resistant. The standard position for needle valve adjustments is position 1, 90° from the port. See port location table for SR Series Cylinders.



Check Seal Cushion

The "Check Seal" system offers excellent cushioning efficiency and long cushion seal life. This seal is specifically designed for cushion applications and has a long proven history in our products. Extensive side by side testing of the check seal in SR Series cylinders significantly outlasted and outperformed competitors' o-ring shaped seals.

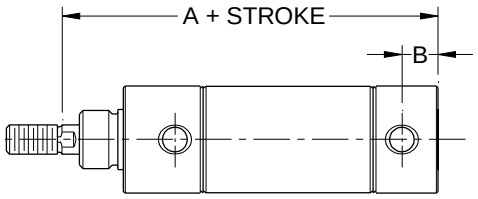
The Check Seal's unique geometry exhibits the dynamic sealing capabilities of a lipseal. As the cushion sleeve enters the Check Seal at the end of stroke, the Check Seal blocks the air from exhausting directly through the port and forces the air through the adjustable needle valve orifice. The exhaust airflow is precisely metered to control the desired rate of deceleration of the cylinder piston.

During stroke reversal, the check valve action of the Check Seal induces a fast out-of-cushion response. The Check Seal floats forward in the retainer groove as the cushion sleeve exits the Cushion Seal, thereby creating a path for maximum air flow around the Check Seal to access the piston face. The quick response of the Check Seal design yields faster cycle times and increased productivity.

Critical Mounting Dimensions for SR Series and SRM Cylinders with Adjustable Cushions

In most cases, cylinder mounting dimensions are not affected when cushions are specified. Standard catalog dimensions apply when cushions are specified at either end of a DXP mount and when specified at the head end only of a D mount. **The only exception to standard catalog dimensions is when a cushion is specified on the cap end or both ends of a D mount**. Please consult Table A for the critical mounting dimensions on D mount SR and SRM cylinders with cushions both ends or cushions cap end only.

Table B shows the cushion lengths for SR and SRM cylinders.



D Mount

Table A:
Critical Mounting Dimensions for D Mount SR and SRM Cylinders with Cushions Both Ends or Cushions Cap End Only.

Bore Size	SR Dimensions		SRM Dimensions	
	A + Stroke	B	A + Stroke	B
.75	3.40	0.28	3.40	0.28
.88	3.25	0.28	N/A	N/A
1.06	3.49	0.28	3.65	0.28
1.25	4.31	0.38	4.34	0.38
1.50	4.12	0.31	4.37	0.31
1.75	5.25	0.42	5.25	0.42
2.00	5.06	0.47	5.34	0.47
2.50	5.06	0.47	5.06	0.47
3.00	5.69	0.53	N/A	N/A

Table B:
Cushion Lengths for SR and SRM Cylinders.

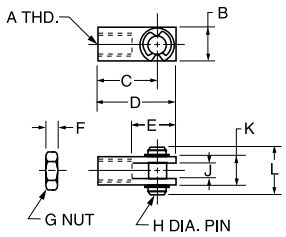
Bore Size	Head	Cap
.75	0.750	0.625
.88	0.750	0.625
1.06	0.750	06.25
1.25	0.750	0.625
1.50	0.750	0.625
1.75	0.875	0.625
2.00	0.875	0.750
2.50	0.875	0.750
3.00	0.875	1.000

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Piston Rod Clevis

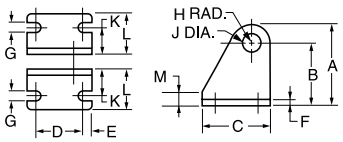
Assembly includes pin and (2) Retainer Rings and (1) Jam Nut.



Part Number	Bore	A	B	C	D	E	F	G	H	J	K	L
L071300025	5/16	#5-40	.31	.44	.56	.38	.11	#5-40	.12	.13	.31	.50
L071300100 L077130100*	7/16, 9/16	#10-32	.38	.75	.94	.56	.12	#10-32	.19	.19	.38	.56
L071300200 L077130200*	3/4, 7/8	1/4-28	.50	.94	1.19	.68	.16	1/4-28	.25	.25	.50	.69
L071300300 L077130300*	1-1/16	5/16-24	.50	.94	1.19	.68	.19	5/16-24	.25	.25	.50	.69
L071300400 L077130400*	1-1/4, 1-1/2	7/16-20	.75	1.31	1.69	.94	.25	7/16-20	.38	.38	.75	1.03
L071300500 L077130500*	1-3/4, 2, 2-1/2	1/2-20	.75	1.31	1.69	.94	.31	1/2-20	.38	.38	.75	1.03
L071300600	3	5/8-18	1.00	2.25	2.75	1.50	.38	5/8-18	.50	.50	1.00	1.38

* Stainless Steel for use with SRD/SRDM cylinders.

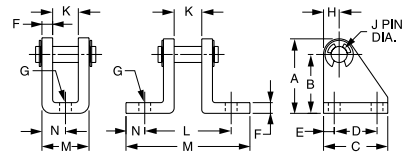
Pivot Brackets



Part Number	Bore	A	B	C	D	E	F	G	H	J	K	L	M
L071310100	7/16	.76	.56	.75	.50	.12	.06	.19	.20	.160	.28	.50	.12
L071310200	3/4, 7/8, 1-1/16	1.19	.88	1.12	.75	.19	.12	.27	.31	.255	.44	.81	.25
L071310300	1-1/2	1.75	1.38	1.50	1.00	.25	.12	.27	.38	.380	.62	1.00	.25

Pivot Bracket Assembly

Assembly includes pin and (2) Retainer Rings.



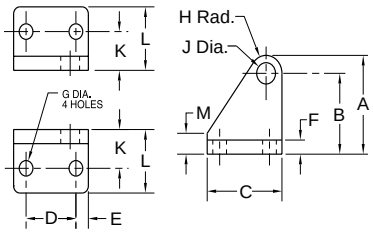
5/16" Bore Only

Part Number	Bore	A	B	C	D	E	F	G	H	J	K	L	M	N
L071320025	5/16	.53	.40	.62	.38	.12	.04	16	.12	.12	.26	–	.36	.18
L071320100 L077150100*	7/16, 9/16	.76	.56	.75	.50	.12	.06	.19	.19	.156	.34	.91	1.34	.22
L071320200 L077150200*	3/4, 7/8, 1-1/16	1.18	.88	1.12	.75	.19	.12	.27	.30	.250	.38	1.25	2.00	.38
L071320300	1-1/4	1.18	.88	1.12	.75	.19	.12	27	.30	.250	.50	1.38	2.14	.38
L071320400 L077150400*	1-1/2, 1-3/4	1.75	1.38	1.50	1.00	.25	.25	.27	.37	.375	.62	2.00	2.88	.44
L071320500 L077150500*	2, 2-1/2	1.75	1.38	1.50	1.00	.25	.25	.27	.37	.375	.75	2.12	3.00	.44
L071320600	3	2.25	1.75	1.75	1.25	.25	.25	.27	50	.50	.88	2.62	3.88	.62

* Stainless Steel for use with SRD/SRDM cylinders.

SR Series Trunnion Brackets

Select brackets for SR Series Trunnion Mount Cylinders from the table below.
(Note: Trunnion Brackets are ordered as a separate item from the cylinder.)

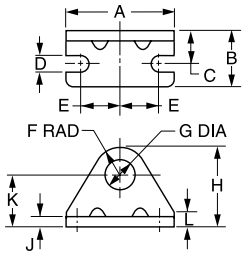


Part Number	Bore Sizes	A	B	C	D	E	F	G	H	J	K	L	M
L076600100	7/16	1.75	1.38	1.50	1	.25	.25	.27	.38	.375	.69	1.12	.37
L076600200	3/4, 11/16, 1-1/2	1.75	1.38	1.50	1	.25	.25	.27	.38	.500	.69	1.12	.37

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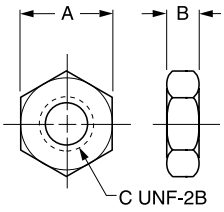
Foot Brackets



Part Number	Bore	A	B	C	D	E	F	G	H	J	K	L
L073790016	5/16	1.00	.37	.25	.13	.37	.31	.25	.75	.06	.44	.12
L073790023	5/16	1.00	.37	.25	.13	.37	.31	.38	.75	.06	.44	.12
L073790024	7/16	1.38	.62	.31	.19	.50	.31	.38	.88	.07	.56	.12
L073790028 **L077160028***	7/16, 9/16	1.38	.62	.38	.19	.50	.38	.44	.94	.09	.56	.12
L073790032	3/4	1.62	.75	.44	.19	.62	.41	.50	1.09	.10	.69	.19
L073790040 **L077160040***	3/4, 7/8, 1-1/16	1.88	1.00	.56	.27	.75	.56	.63	1.38	.12	.81	.25
L073790048 **L077160048***	1-1/4, 1-1/2	2.50	1.50	.75	.27	.94	.75	.75	1.75	.12	1.00	.38
L073790102	1-3/4	3.00	1.50	.87	.35	1.12	.91	1.03	2.16	.19	1.25	.50
L073790124 **L077160124***	2	3.12	1.62	1.00	.34	1.12	1.00	1.38	2.50	.25	1.50	.62
L073790132	2-1/2	3.75	1.62	1.00	.35	1.44	1.25	1.51	3.00	.25	1.75	.75
L073790140	3	4.37	1.62	1.00	.35	1.75	1.25	1.64	3.14	.25	1.89	.89

* Stainless Steel for use with SRD/SRDM cylinders.

Mounting Nut



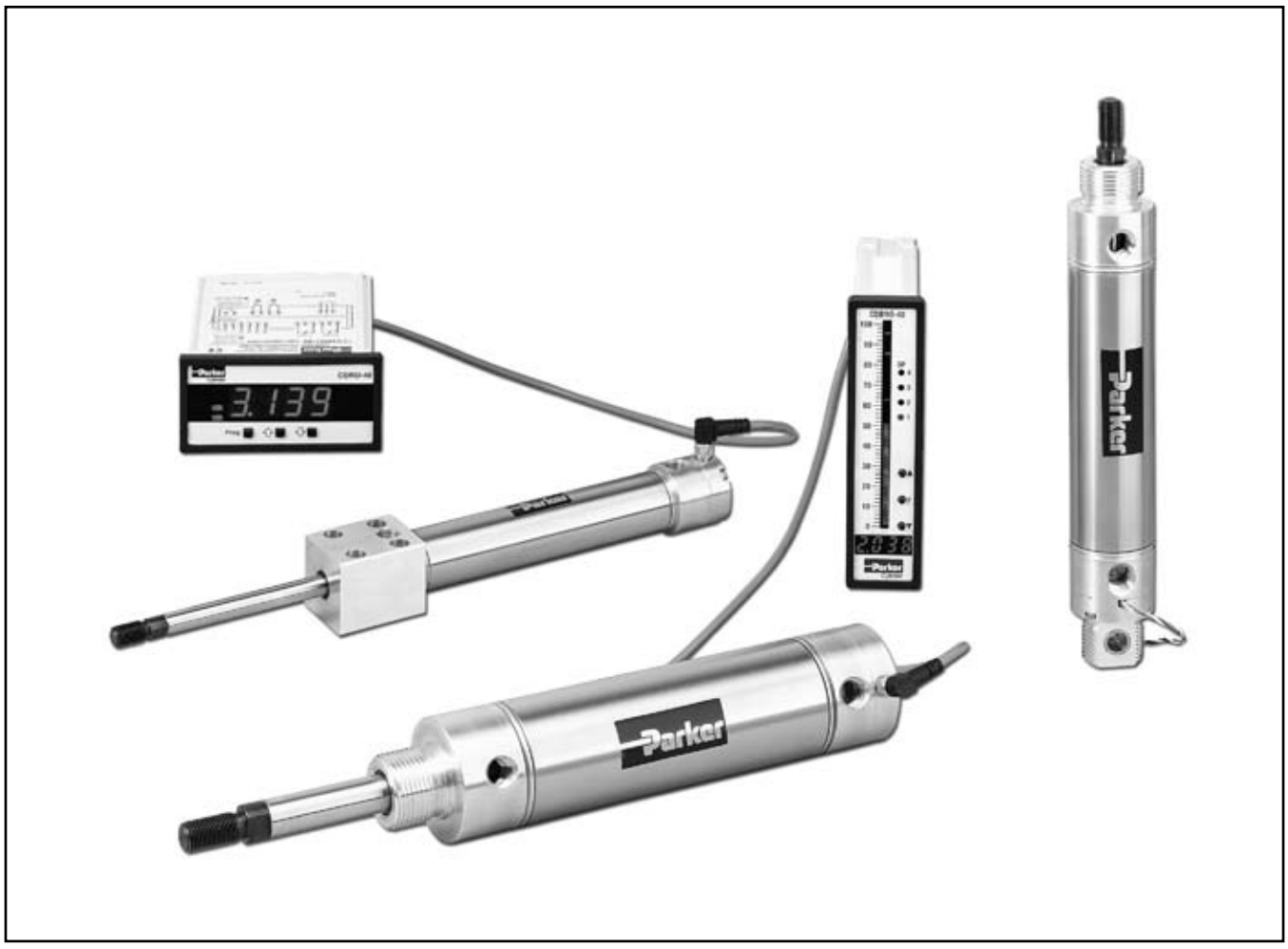
Part Number	Bore	A	B	C
L073800200	5/16	.44	.16	1/4-28
L073800400	5/16, 7/16	.56	.22	3/8-24
L073800500 **L077170500***	7/16, 9/16	.69	.25	7/16-20
L073800600	3/4	.75	.31	1/2-20
L073800800 **L077170800***	3/4, 7/8, 1-1/16	.94	.38	5/8-18
L073800900 **L077170900***	1-1/4, 1-1/2	1.12	.42	3/4-16
L073801100	1-3/4	1.50	.55	1-14
L073801200 **L077171200***	2	1.88	.50	1-1/4-12
L073801400	2-1/2	2.06	.78	1-3/8-12
L073801500	3	2.25	.84	1-1/2-12

* Stainless Steel for use with SRD/SRDM cylinders.

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SRX Series

Stainless Steel Body Air Cylinders with Continuous Position Feedback



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Controller Ordering Information D56

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D

Piston Rod
Hard chrome-plated piston rod polished to a 6-10 Ra surface finish with an anodized steel male rod stud for long seal life and minimal surface drag.

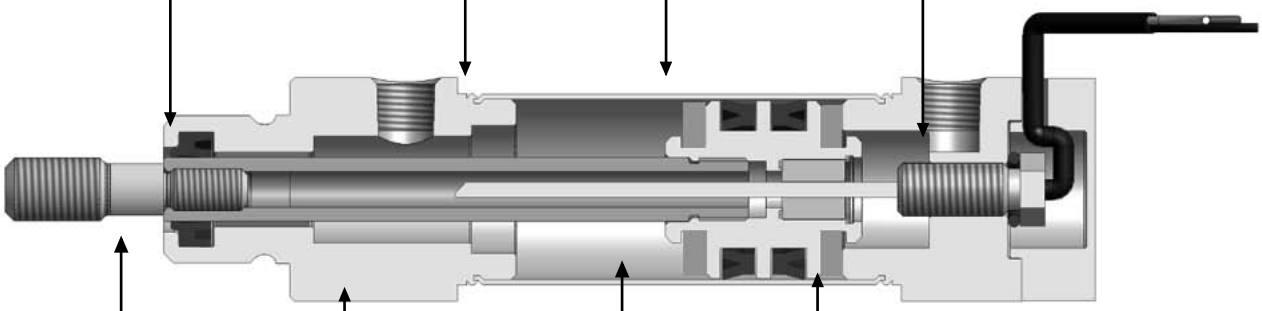
Cylinder Body
304 Stainless Steel cylinder body rated for non-lube service resists corrosion and minimizes maintenance.

LRT
LRT can be easily removed for maintenance, saving cost of purchasing a new cylinder.

Bushing
Oil impregnated bronze rod bushing provides maximum bearing surface area, minimal mod deflection and long service life.

Seals
Standard "LipSeal" piston and rod seal provides maximum sealing capability and long life. Optional low friction piston seal is available.

Connector
Optional "flying lead" or 3-pin connector allows maximum flexibility for the end user.



Outboard Rod Seal
Minimizes dirt and contaminant migration into the cylinder.

End Caps
Precision machined aluminum end caps provide excellent corrosion resistance and smooth breakaway.

Optional Bumpers
Buna-N bumpers reduce noise and provide cushioning for the most demanding applications.

Unitized Construction
Precision double-rolled unitized construction provides durable, leak proof service and long life.

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1.50"	DXP	P	SRX	B	F	S	3	6.00"

Bore Size
1.06"
1.50"
2.00"
2.50"
3.00"

Mounting Style
D Nose Mount
DXP Nose and Pivot Mount
BFD Front Block Mount

Connector Style
P Plug
F Flying Leads

Piston
B Bumper*
Leave blank if not required.

Seals
F Low Friction
Leave blank if not required.

Special
S Special
Leave blank if special modification is not required.

Non-Standard Rod Dimension
3 Non-Standard Dimension
Leave blank if special rod end dimension is not required.

NOTE: For non-standard / special rod ends, see below.

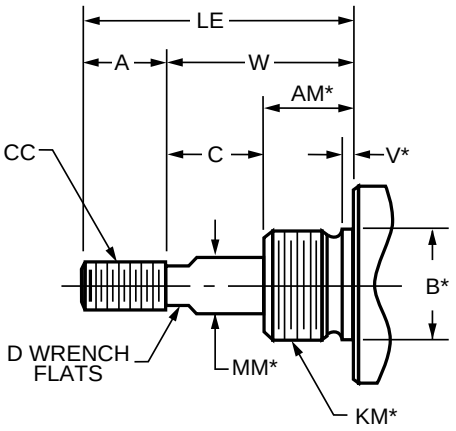
Stroke
Stroke in inches

* Incorporating Bumpers adds 1/4" of overall length to the cylinder.

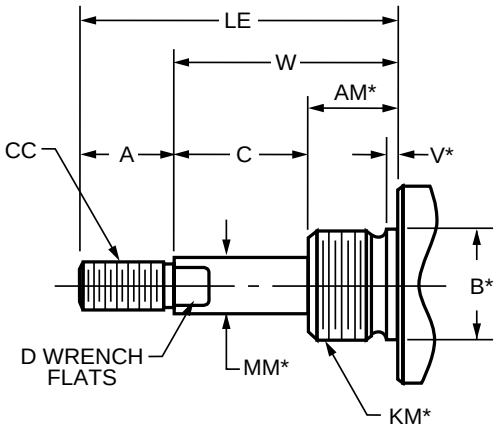
Non-standard Rods

For non-standard rod dimensions, or undersized rod end threads, put a “3” in model number and describe the rod using the letters shown in the drawing. It is necessary to specify only those dimensions that are non-standard.

Full Diameter Rod End Threads



Undersized Rod End Threads



*Requires an “S” designation in model number.

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General Specifications

- Bore Sizes: 1-1/16", 1-1/2", 2", 2-1/2", 3"
- Rod Sizes: 0.38" – 0.75"
- Rod Ends: Standard Male
- Mounts: – Nose Mount (D)
  – Front Block Mount (BFD)
  – Nose and Pivot Mount (DXP)
- Rated Air Pressure: 150 PSI Air
- Standard Temperature: 40°F to 160°F
- Strokes: Available in any practical stroke length up to 24"
- Bumpers: Optional

Available Mountings



Style D
Nose Mount

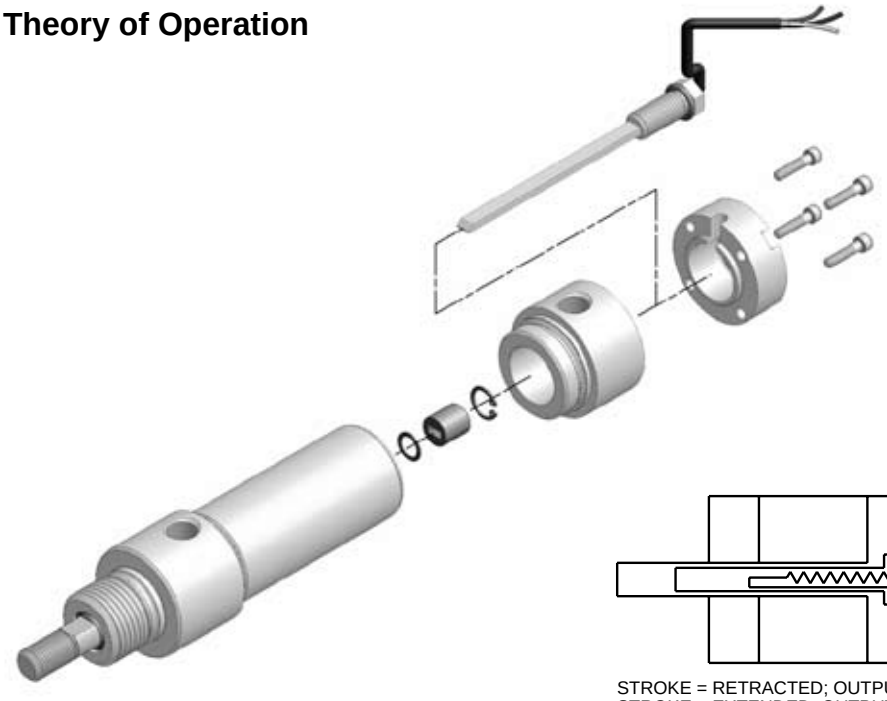


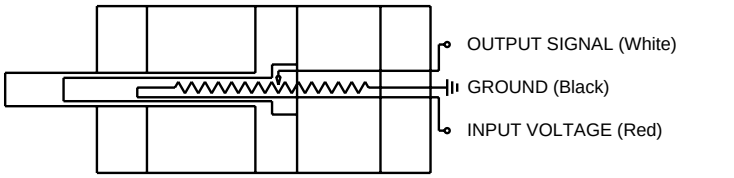
Style BFD
Front Block Mount



Style DXP
Nose and Pivot Mount

Theory of Operation





STROKE = RETRACTED; OUTPUT VOLTAGE = 0 VOLTS (APPROX.)
STROKE = EXTENDED; OUTPUT VOLTAGE = MAXIMUM INPUT VOLTAGE (APPROX.)

The SRX Series Linear Resistive Transducer (LRT) is a position sensor that uses a resistive element, and wiper assembly, to provide a continuous analog output signal relative to the cylinders position. The LRT is a single element type linear potentiometer, with two independent elements mounted on either side of an anodized aluminum extrusion. The LRT operates as a voltage divider by creating a short between the wiper extrusion and the wiper assembly. The position of the wiper changes the resistive load proportionally to its position along the stroke length of the cylinder.

Supplying a 5 to 24VDC voltage energizes the LRT. As the cylinder travels through its range of stroke, the resistive load changes, thus causing a proportional voltage output change of the LRT. The output voltage, at the endpoint of cylinder stroke, is dictated by the input voltage applied across the device.

The probe is mounted into the cap end of the cylinder and inserted into the hollow piston rod assembly. When replacing the probe, care must be taken to align the wiper block with the profile of the LRT extrusion. Please review the above schematic and cutaway drawing for reference purposes.

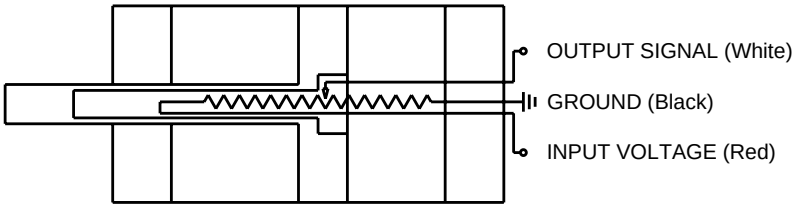
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MLRT

- Repeatability: ±0.001" (interface electronics dependent)
- Non Linearity: ±1% of Full stroke (18" stroke max.)
- Resolution: Infinite
- Signal Input: 5 to 24 VDC
- Signal Output (w/o controls): DC ratiometric voltage*
- Signal Output (w/controls): 0 to 10 VDC or 4 to 20 mA
- Maximum Speed: 50" per second
- Rated Life of MLRT: 500 Million inches of wiper travel
- Pressure Rating: 150 psi
- Temperature Rating: $+40^0$ F to $+165^0$F
- Resistance Rating: 1,000 Ohms per inch ±20%
- Connection Options: 6" Flying leads or 3-pin nano connector

*1 Mega Ohm impedance interface device suggested for limiting sensor current if the controller is not used.

MLRT Circuit Diagram



STROKE = RETRACTED; OUTPUT VOLTAGE = 0 VOLTS (APPROX.)
STROKE = EXTENDED; OUTPUT VOLTAGE = MAXIMUM INPUT VOLTAGE (APPROX.)

MLRT Replacement Kits

For each MLRT replacement kit order, please specify the part number listed below along with the cylinder stroke length and quantity.

A Service Bulletin is included with each kit.

MLRT with Flying Leads

Part #L07831
Example: L07831, 6" Stroke, Qty. 1

MLRT with Plug Connector

Select part number from table
Example: L078320000, 4" Stroke, Qty. 1

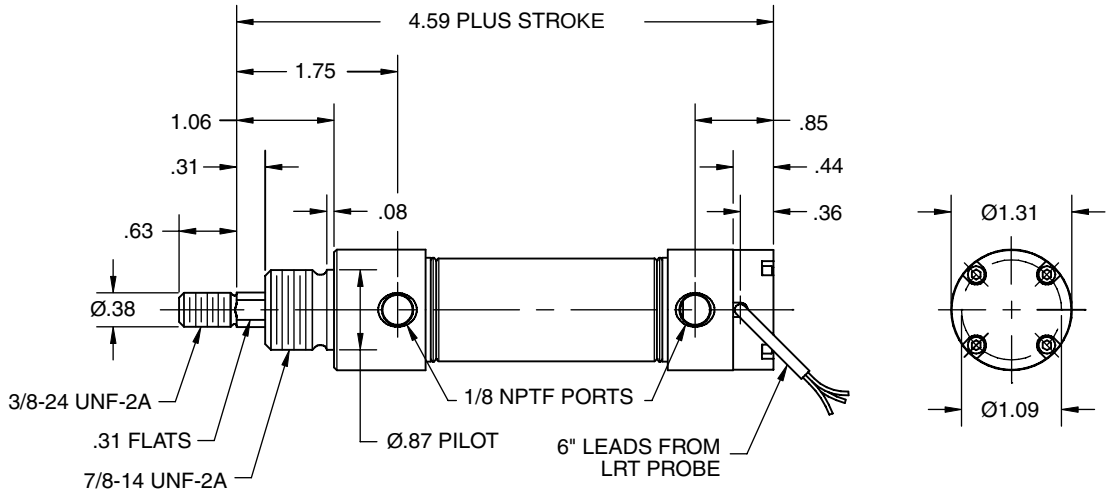
Bore	Mount	Plug Connector MLRT Kit Part Number
1-1/16"	D, BFD	L078320000
	DXP	L078320001
1-1/2"	D, BFD	L078320002
	DXP	L078320003
2"	D, BFD	L078320004
	DXP	L078320005
2-1/2"	D, BFD	L078320006
	DXP	L078320007
3"	D, BFD	L078320008
	DXP	L078320009

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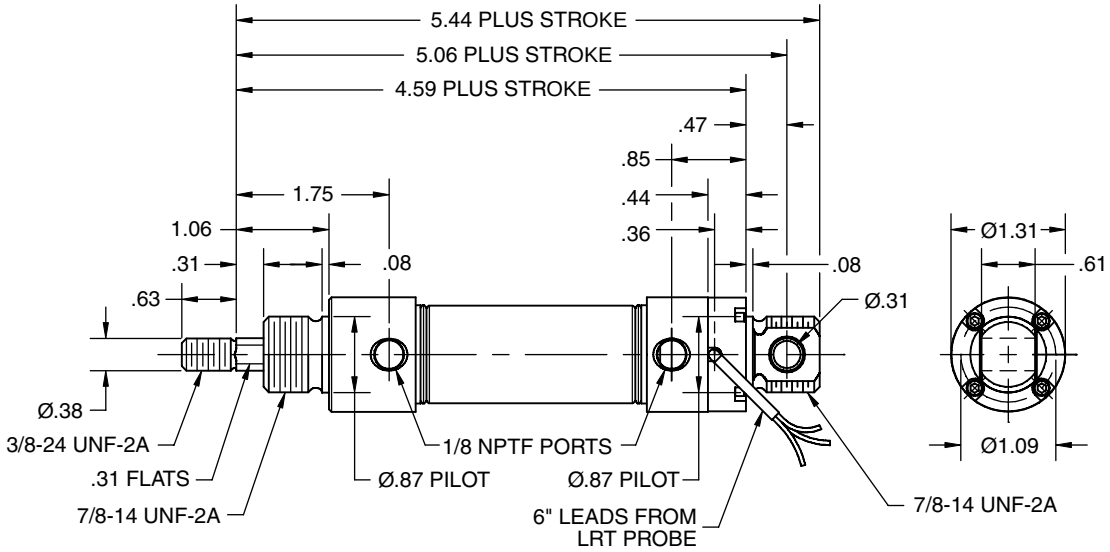
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D

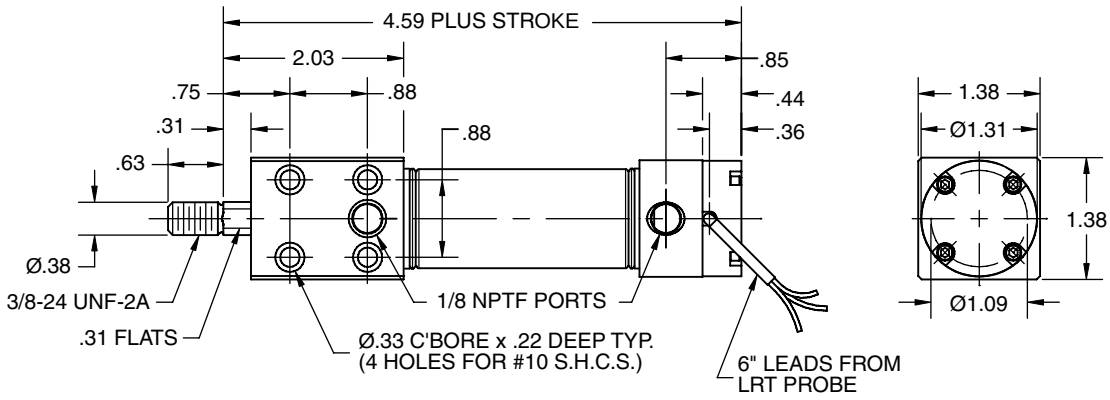
Style D



Style DXP



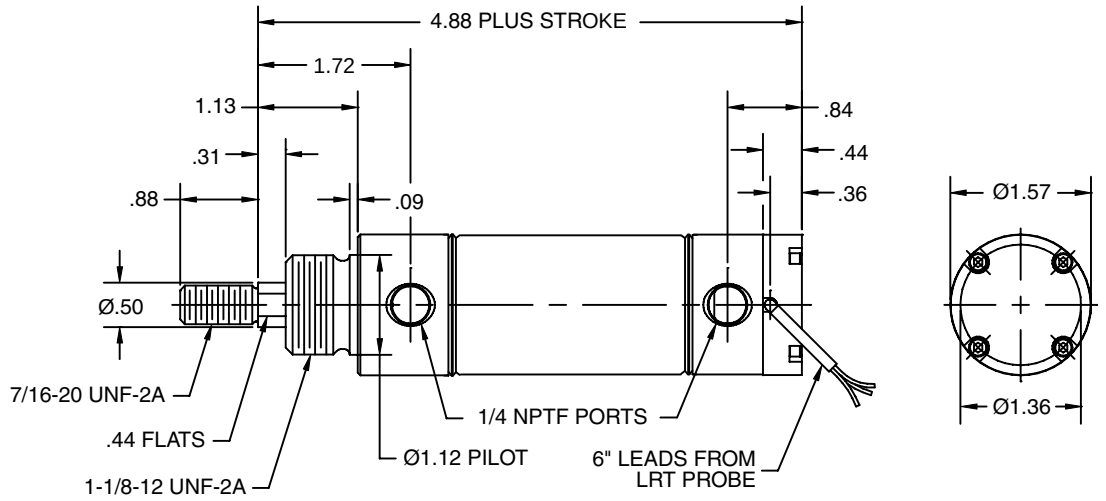
Style BFD



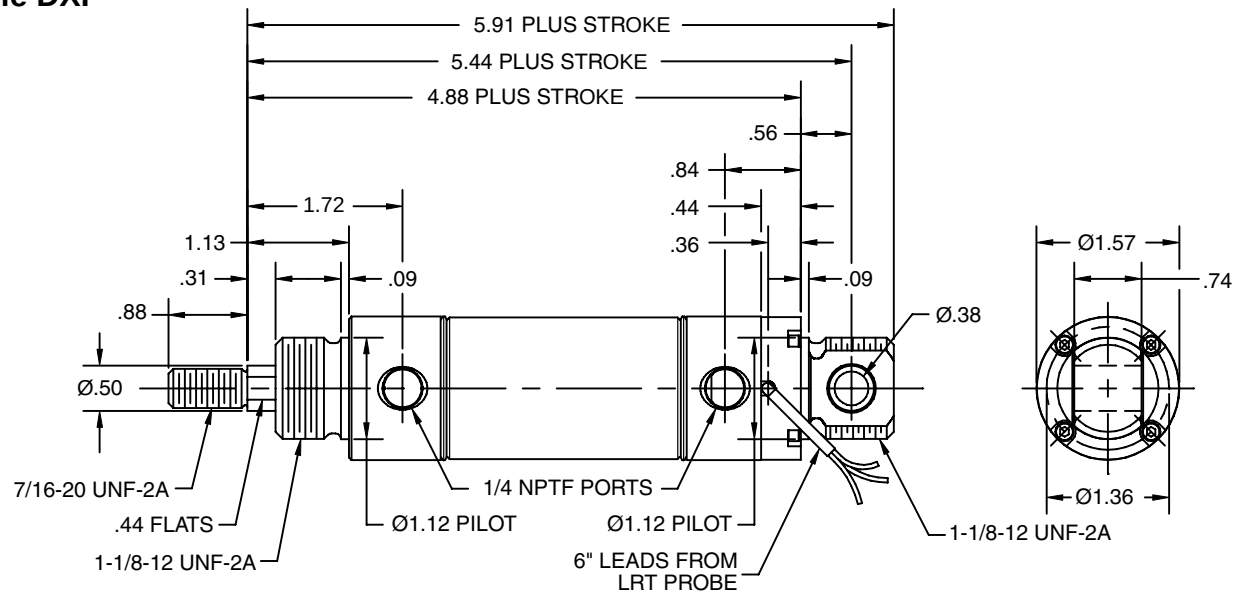
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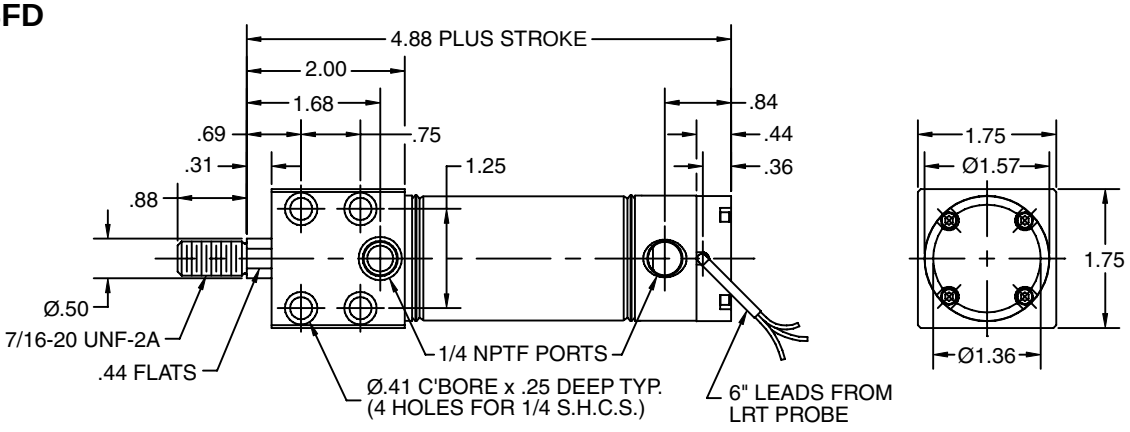
Style D



Style DXP



Style BFD

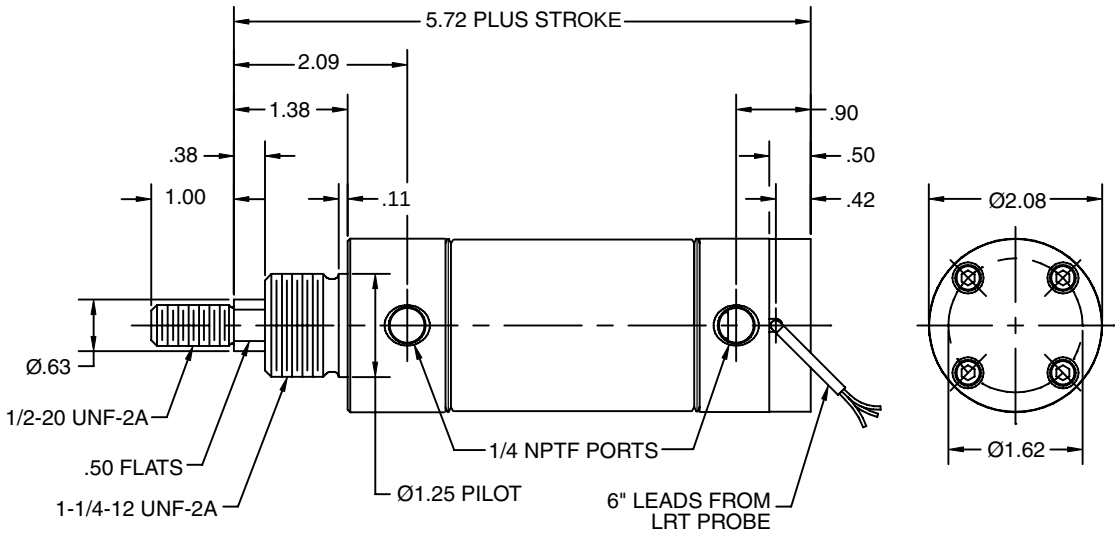


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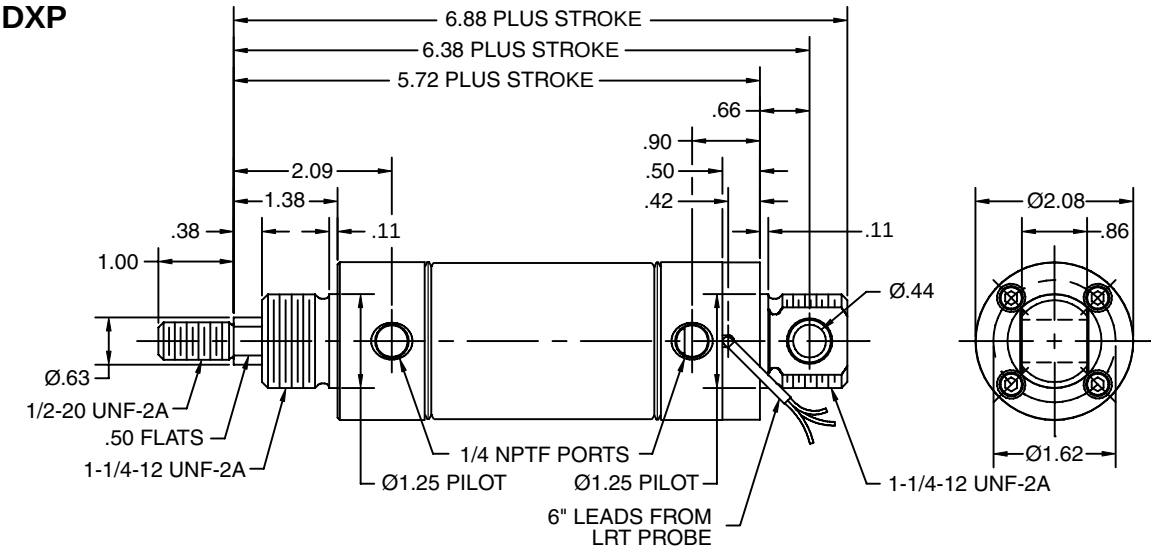
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D

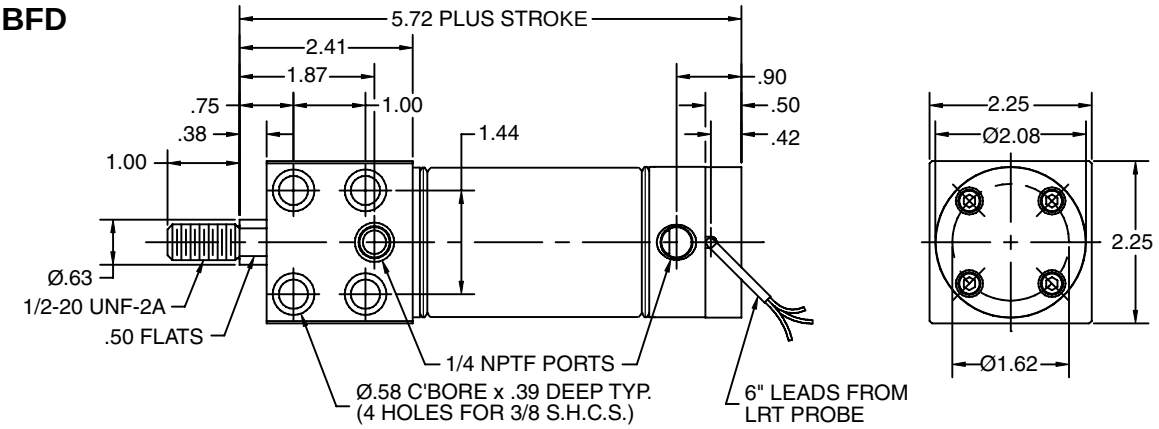
Style D



Style DXP



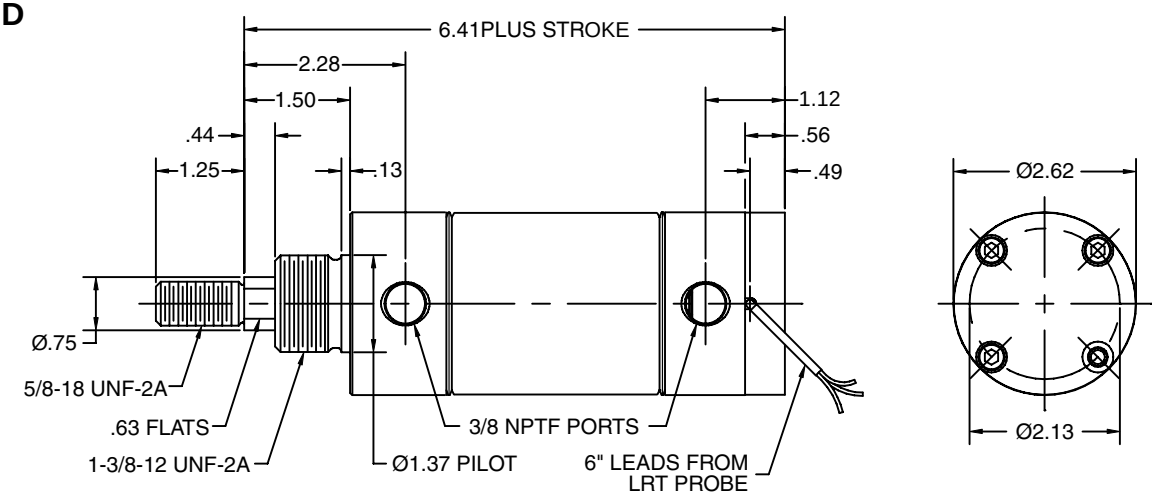
Style BFD



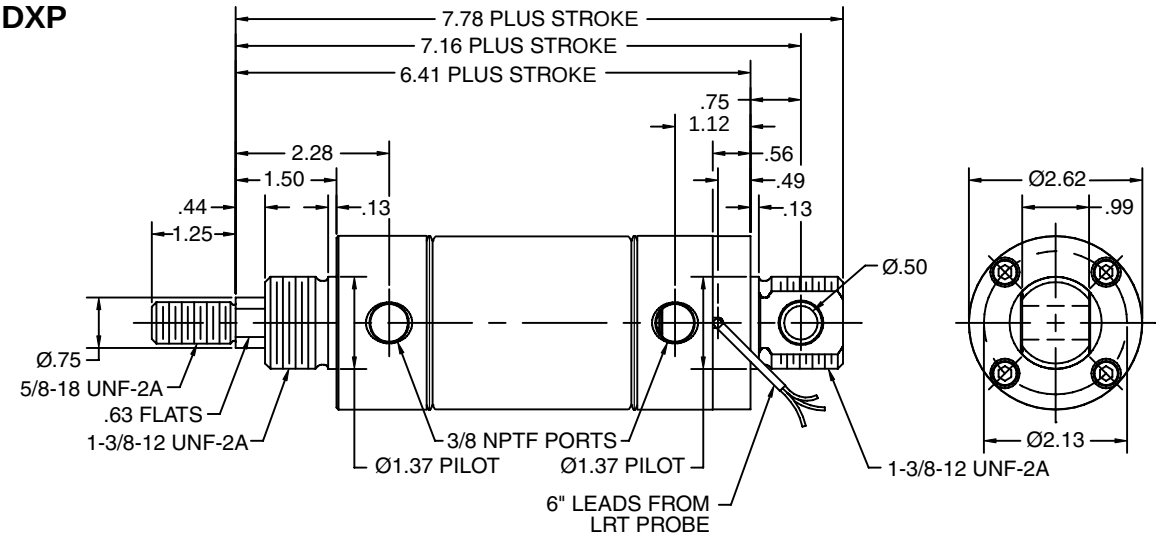
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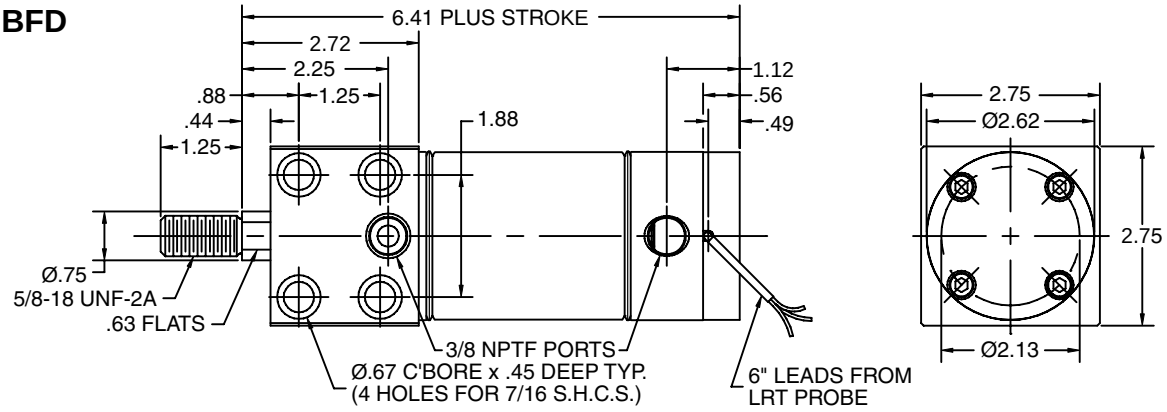
Style D



Style DXP



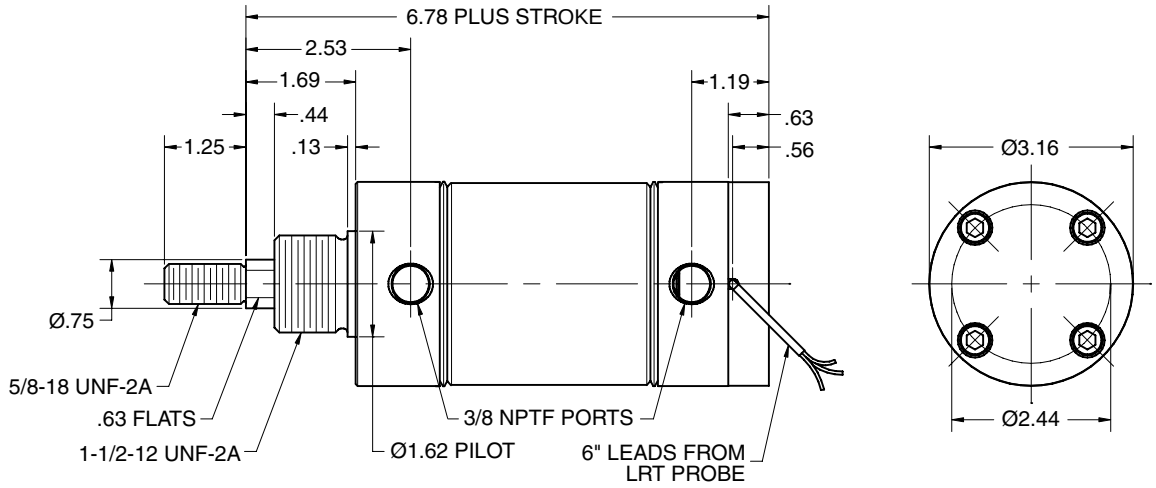
Style BFD



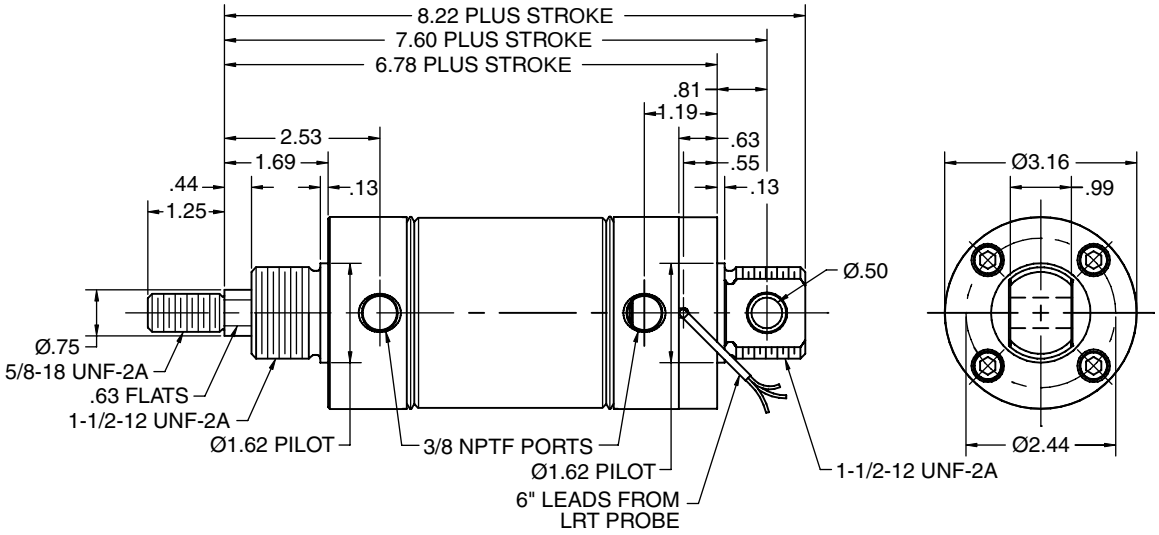
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D

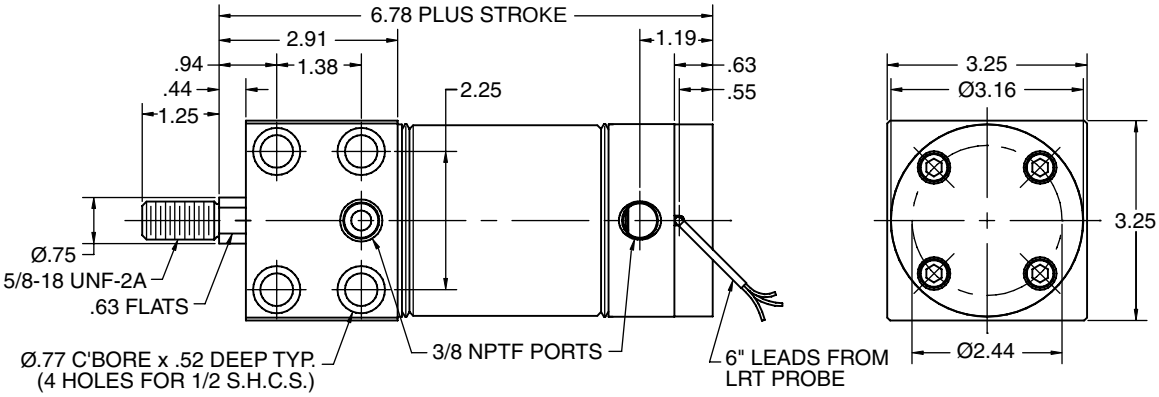
Style D



Style DXP

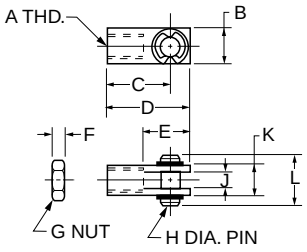


Style BFD



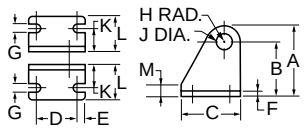
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Piston Rod Clevis



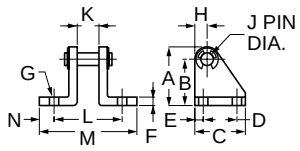
Part Number	Bore	A	B	C	D	E	F	G	H	J	K	L
L071300350	1-1/16	3/8–24	.63	1.38	1.69	.94	.22	3/8–24	.31	.32	.63	.88
L071300400	1-1/2	7/16–20	.75	1.31	1.69	.94	.25	7/16–20	.38	.38	.75	1.03
L071300550	2	1/2–20	.88	1.88	2.31	1.31	.31	1/2–20	.44	.45	.88	1.14
L071300600	2-1/2, 3	5/8–18	1.00	2.25	2.75	1.50	.38	5/8–18	.50	.51	1.00	1.38

Pivot Brackets



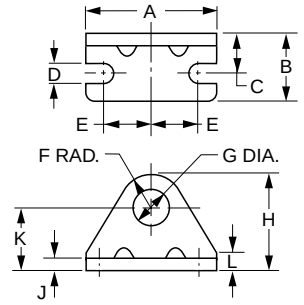
Part Number	Bore	A	B	C	D	E	F	G	H	J	K	L	M
L071310400	1-1/16	1.31	1.00	1.31	.81	.25	.16	.28	.31	.315	.56	.88	.28
L071310500	1-1/2	1.63	1.25	1.63	1.00	.31	.19	.34	.38	.378	.69	1.13	.31
L071310600	2	1.81	1.38	1.81	1.19	.31	.25	.34	.44	.440	.75	1.19	.38
L071310700	2-1/2, 3	2.13	1.63	2.13	1.38	.38	.25	.41	.50	.503	.88	1.38	.38

Pivot Brackets



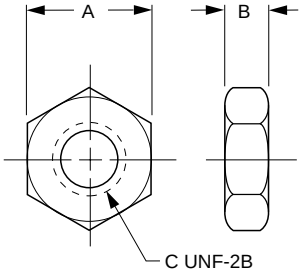
Part Number	Bore	A	B	C	D	E	F	G	H	J	K	L	M	N
L071320250	1-1/16	1.31	1.00	1.31	.81	.25	.16	.28	.31	.312	.62	1.75	2.38	.31
L071320350	1-1/2	1.63	1.25	1.63	1.00	.31	.19	.34	.38	.375	.75	2.13	3.00	.44
L071320450	2	1.81	1.38	1.81	1.19	.31	.25	.34	.44	.437	.88	2.38	3.25	.44
L071320550	2-1/2, 3	2.13	1.63	2.13	1.38	.38	.25	.41	.50	.500	1.00	2.75	3.75	.50

Foot Brackets



Part Number	Bore	A	B	C	D	E	F	G	H	J	K	L
L073790056	1-1/16	2.13	1.16	.66	.28	.75	.75	.88	1.75	.16	1.00	.38
L073790108	1-1/2	2.75	1.44	.81	.35	1.00	.94	1.13	2.19	.19	1.25	.38
L073790116	2	3.00	1.59	.91	.35	1.19	1.06	1.26	2.44	.22	1.38	.44
L073790125	2-1/2	3.75	1.88	1.06	.41	1.50	1.19	1.38	2.81	.25	1.63	.50
L073790140	3	4.38	1.62	1.00	.35	1.75	1.25	1.64	3.14	.25	1.89	.89

Mounting Nut

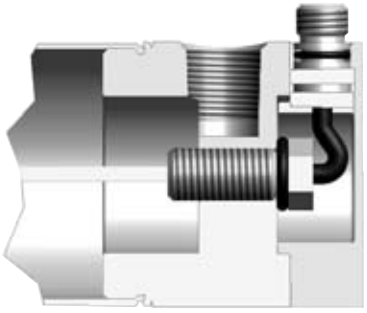


Part Number	Bore	A	B	C
L073801000	1-1/16	1.31	.48	7/8–14
L073801300	1-1/2	1.69	.61	1-1/8–12
L073801200	2	1.88	.50	1-1/4–12
L073801400	2-1/2	2.06	.78	1-3/8–12
L073801500	3	2.25	.84	1-1/2–12

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3-pin Nano Connector





D

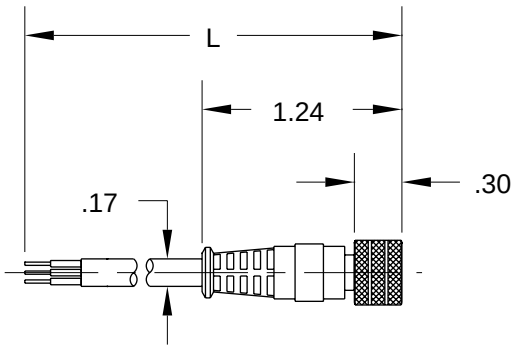
Wire Color

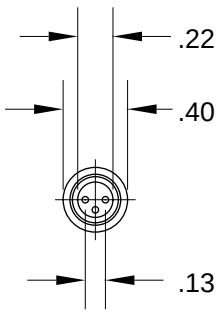
Wires	6" Leads	Plug Option
Input	Red	Brown
Ground	Black	Blue
Output	White	Black

Connectors

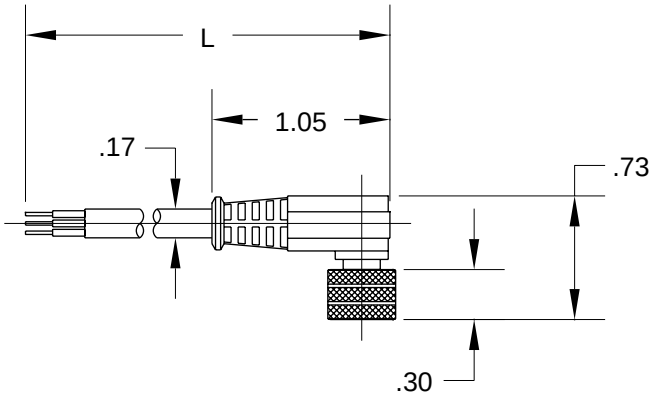
Cable Length	Threaded Straight Connector	Threaded Right Angle Connector
5 meters	086620T005	086620R005
2 meters	086620T002	086620R002

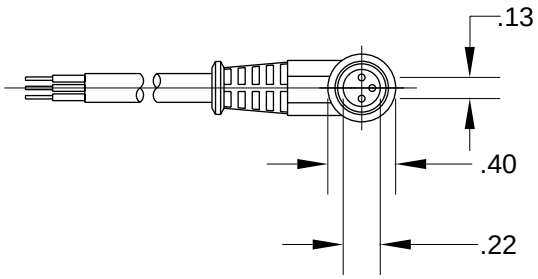
Straight Connector





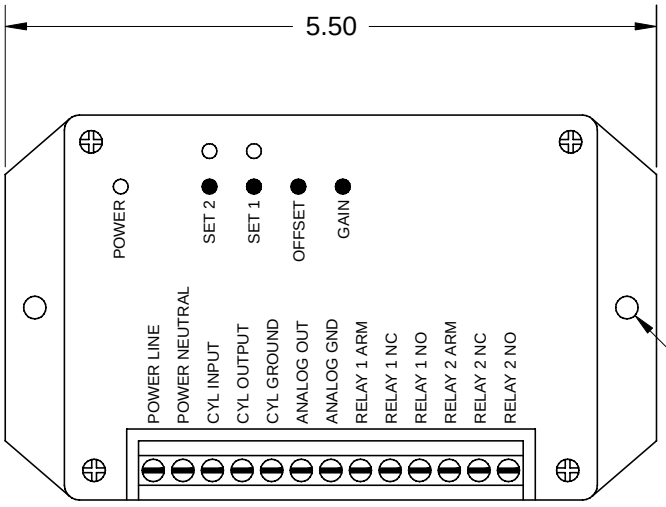
Right-angle Connector





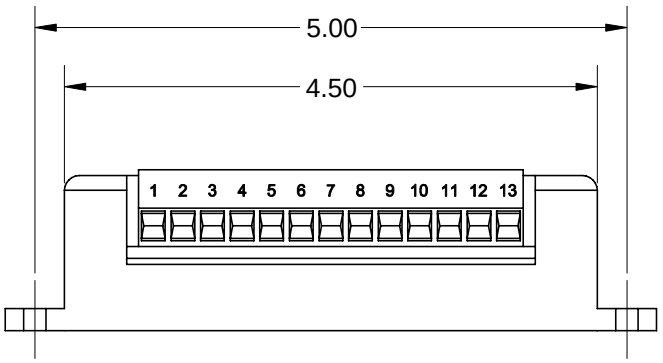
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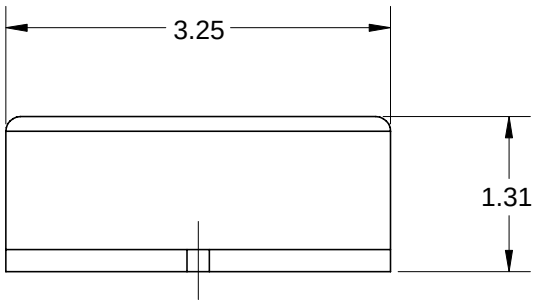
Dual Set Point Controller, Part #149344000__



Ordering Information

Model Number	Input Specifications	Output Specifications
1493440002	120 VAC	0-10 V
1493440003	120 VAC	4-20 mA
1493440004	12-24 VDC	0-10 V
1493440005	12-24 VDC	4-20 mA





Dual Set Point Controller Specifications, Part #149344000__

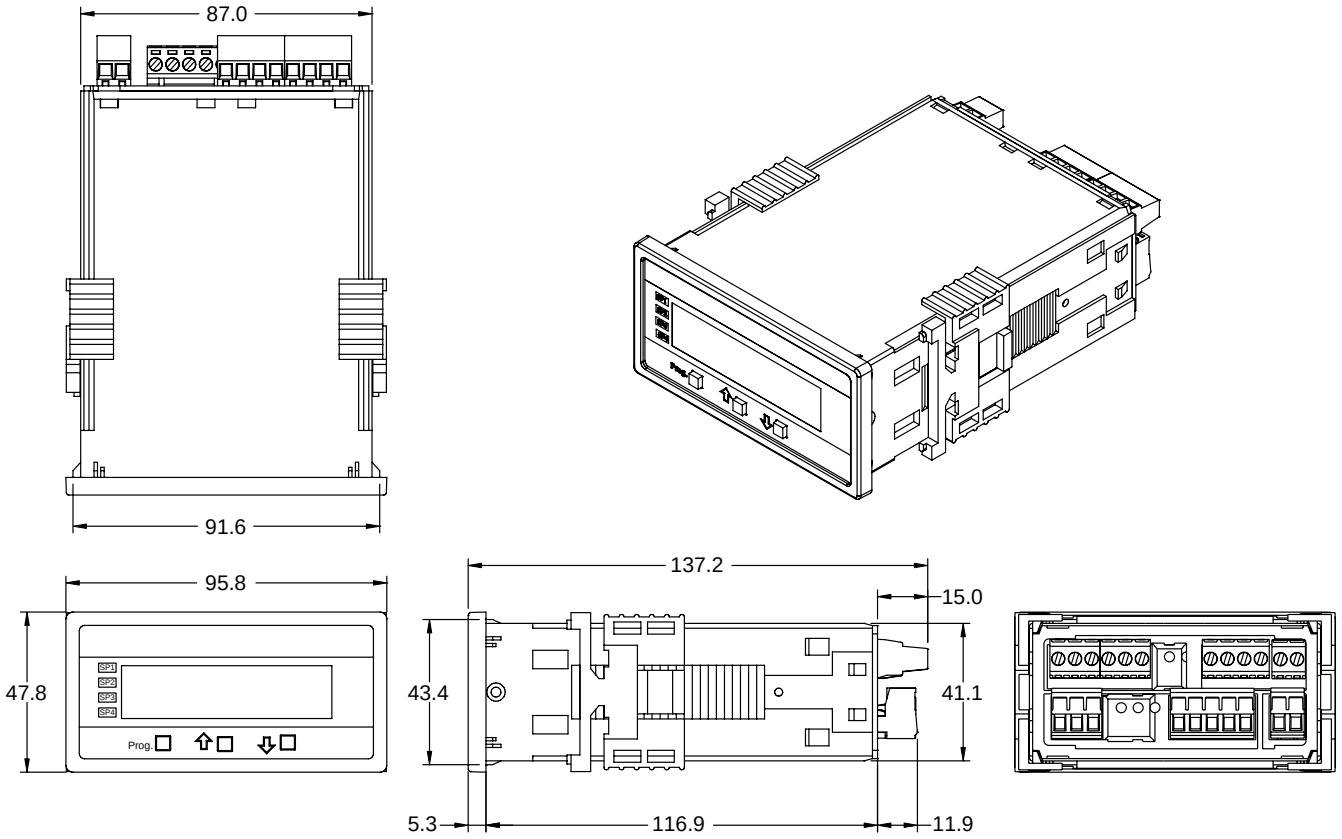
- Power Input Requirements ..... 12 to 24 VDC, 0.1 amps, or 120 VAC, 60 Hz, 0.1 amps
- Output specifications – Set Point..... Relay (2) 2 amps @ 24 VDC or 120 VAC
- Output Specifications – Scaleable..... 0 to 10 V, 1 mA max. output current (10K ohm impedance min.) 4 to 20mA, into 500-ohm max. impedance
- Maximum Zero Offset..... 50% of cylinder stroke
- Minimum Span Range..... 50% of cylinder stroke
- Enclosure Dimensions..... 1.31" h x 5.50" w x 3.25" d
- Electronics Temperature Operating Range.....+40°F to +160°F

Please reference Parker Bulletin #0971-G-B2 for information regarding programming and operation of this controller.

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CDRO Panel Meter Controller Dimensions, Part #149345 _ _ _ _

(See page D56 for complete ordering instructions)



CDRO Panel Meter Controller Specifications, Part #149345 _ _ _ _

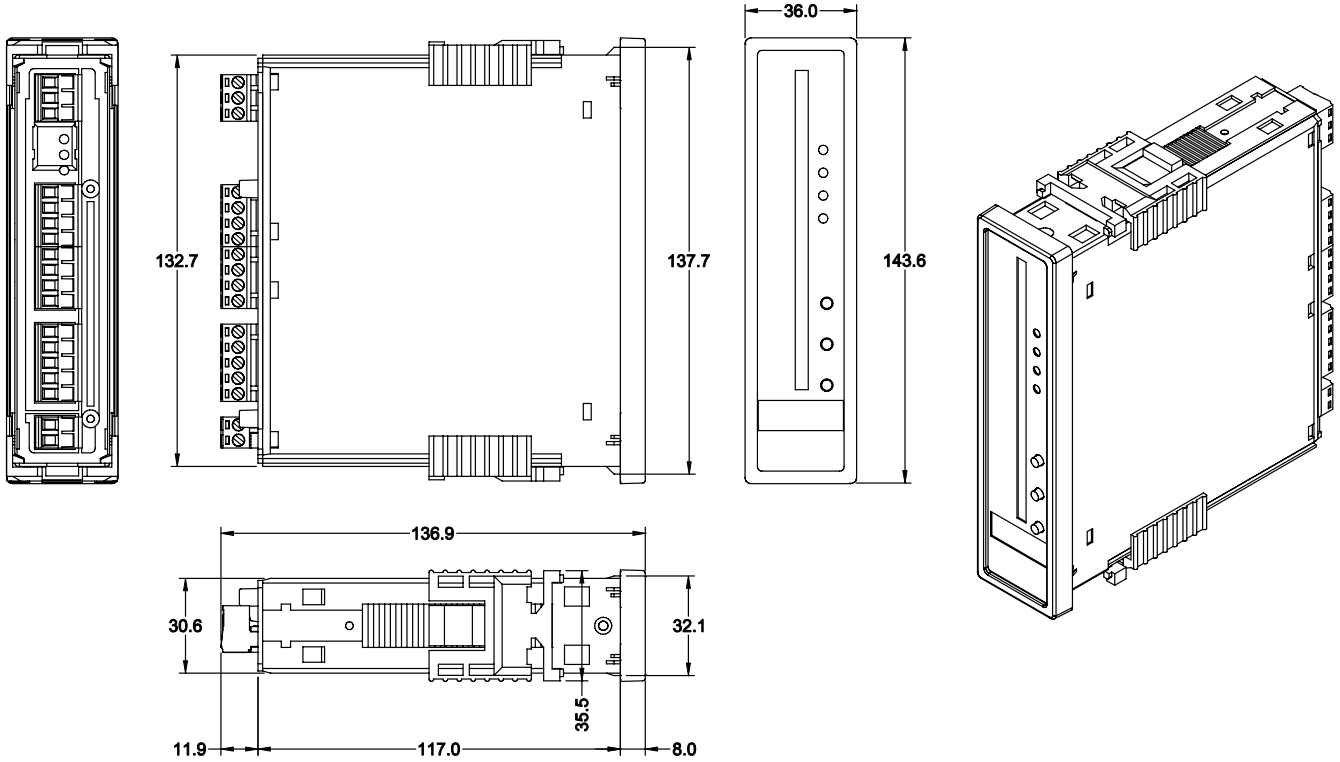
- Power Input Requirements ..... High voltage, 85 – 265 VAC, or 95 – 370 VDC
  Low voltage, 15 – 48 VAC, OR 10 – 72 VDC
- Relay Output Options ..... One 5A Form A Relay
  Dual 5A Form A Relays
  Four 5A Form A Relays
- Analog Output Specification ..... Isolated, 16-bit Current Output; 0 – 20 mA or 4 – 20 mA (Scaleable)
  Isolated, 16-bit Voltage Output; 0 – 10 VDC (Scaleable)
  Accuracy: 0.02% over Full Scale
  Resolution: 1/45,000
  Update Rate: 7 Readings per second
- Internal Resolution ..... 16 Bits
- Operating Temperature Range ..... 0 – 50°C, +32°F to +122°F
- Warm-up Time ..... 10 Minutes
- Numerical Display..... Digital, 4 digits
- Display Range ..... -1,999 to +9,999
- Setpoints..... Setpoint 1 activates Relay 1
  Setpoint 2 activates Relay 2
  Setpoint 3 activates Relay 3
  Setpoint 4 activates Relay 4
- NEMA Rating..... 4 (with cover, Part #087861000)

Please reference Parker Bulletin #0971-B1 for information regarding programming and operation of this controller.

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CDBRO 101 Segment Bargraph Controller Dimensions, Part #149346 _ _ _ _

(See page D56 for complete ordering instructions)



CDBRO 101 Segment Bargraph Controller Specifications, Part #149346 _ _ _ _

- Power Input Requirements ..... High voltage, 85 – 265 VAC, or 95 – 370 VDC
  Low voltage, 15 – 48 VAC, OR 10 – 72 VDC
- Relay Output Options ..... One 5A Form A Relay
  Two 5A Form A Relays
  Dual 10A Form C & Dual 5A Form A Relays
- Analog Output Specification ..... Isolated, 16-bit Current Output; 0 – 20 mA or 4 – 20 mA (Scaleable)
  Isolated, 16-bit Voltage Output; 0 – 10 VDC (Scaleable)
  Accuracy: 0.02% over Full Scale
  Resolution: 1/45,000
  Update Rate: 7 Readings per second
- Internal Resolution ..... 16 Bits
- Operating Temperature Range ..... 0 – 50°C, +32°F to +122°F
- Warm-up Time ..... 10 Minutes
- Vertical Display ..... VRR – 101 Segment, Red LED Vertical Bar Graphic Display
  VTR – 101 Segment, Tri-color Vertical Bar Graphic Display
- Annunciators ..... Six, red LED's on front panel; one annunciator per setpoint
- Numerical Display ..... Digital, 4 digits
- Display Range ..... -1,999 to +9,999
- Setpoints ..... Setpoint 1 activates Relay 1
  Setpoint 2 activates Relay 2
  Setpoint 3 activates Relay 3
  Setpoint 4 activates Relay 4
- NEMA Rating ..... 4 (with cover, Part #087867000)

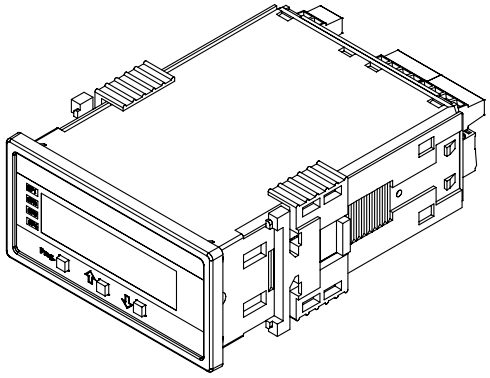
Please reference Parker Bulletin #0971-B2 for information regarding programming and operation of this controller.

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C086

Ordering Code for CDRO Panel Meter Controller

1	4	9	3	4	5				



Relay Output

X	No Relay Output
R1	Single 5A Form A Relay
R2	Dual 5A Form A Relays
R4	Four 5A Form A Relays

Analog Output

X	No Analog Output
C	Isolated 16-bit Current Output, 4-20 mA
V	Isolated 16-bit Voltage Output, 0-10 VDC

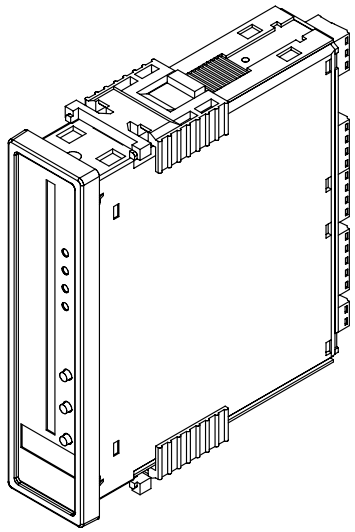
Power Supply

1	85-265 VAC / 95-370 VDC
2	18-48 VAC / 10-72 VDC

Notes:
1) *Input requires a 3-wire potentiometer 1 kOhm min. (0 to 100.0).*
2) *See page D54 for complete electrical and dimensional specifications.*

Ordering Code for CDBRO 101 Segment Bargraph Controller

1	4	9	3	4	6				



Display

R	Red LED Vertical Bargraph with 4-digit Red DPM
T	Tri-color LED Vertical Bargraph with 4-digit Red DPM

Power Supply

1	85-265 VAC / 95-370 VDC
2	18-48 VAC / 10-72 VDC

Analog Output

X	No Analog Output
C	Isolated 16-bit Current Output, 4-20 mA
V	Isolated 16-bit Voltage Output, 0-10 VDC

Relay Output

X	No Relay Output
1	Single 10A Form C Relay
2	Dual 10A Form C Relays
3	Dual 10A Form C & Single 5A Form A Relays
4	Dual 10A Form C & Dual 5A Form A Relays
5	Single 10A Form C & Dual 5A Form A Relays
6	Single 10A Form C & Single 5A Form A Relays

Notes:
1) *Input requires a 3-wire potentiometer 1 kOhm min. (0 to 100.0).*
2) *See page D55 for complete electrical and dimensional specifications.*

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P1L Series

High Performance Repairable Pneumatic Cylinder



Contents

Features D58
Ordering Information..... D59
Specifications D60
Technical Information..... D61
Dimensions.....D62-D81
Mounting Brackets.....D82-D85
Mounting Kits.....D86-D88
Rod End Accessories D89
Mounting Kits & Accessories..... D90

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D

Optional Piston Magnet
Located under wear band, piston magnet is used for through-the-barrel sensors for electronic piston position indication. Does not add length to the piston.

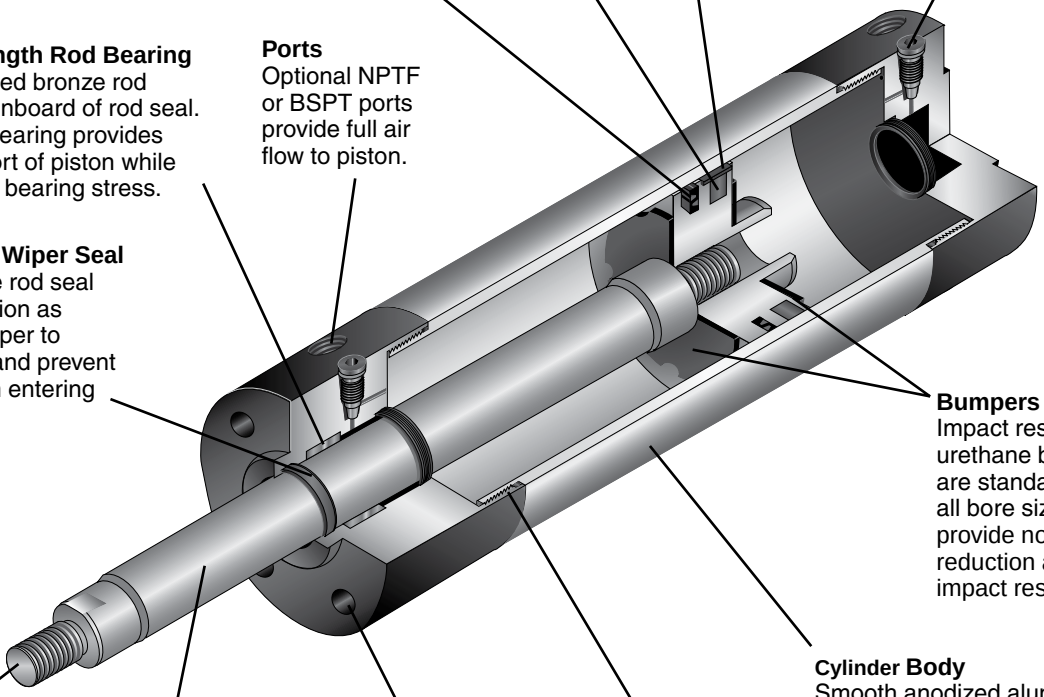
Aluminum Piston with Ultra-Wide Nylon Wear Band
Piston is permanently sealed and locked to rod with anaerobic adhesive. Ultra wide wear band prevents metal-to-metal contact and distributes piston loads across wide bearing area.

Z-Profile Piston Seal
Dynamic nitrile piston seal features two rounded micro sealing edges for maximum wear compensation and rounded grooves for retaining lubrication. Dual lipseal for 40mm to 100mm bore sizes.

Adjustable Cushion Option
Available for high speed applications, it features fine-thread, brass needle valves with a captive design.

High Strength Rod Bearing
PTFE-coated bronze rod bearing is inboard of rod seal. Long rod bearing provides rigid support of piston while minimizing bearing stress.

Ports
Optional NPTF or BSPT ports provide full air flow to piston.



Rounded Lip Rod Wiper Seal
Non-lube, urethane rod seal provides dual function as rod seal and rod wiper to eliminate leakage and prevent contamination from entering the cylinder.

Bumpers
Impact resistant urethane bumpers are standard for all bore sizes to provide noise reduction and impact resistance

Cylinder Body
Smooth anodized aluminum tube provides wear-resistant surface. Clean tubular design eliminates area where contamination can accumulate.

Four Standard Piston Rod Ends
Inch or metric with male or female to meet a variety of requirements.

Tapped Mounting Holes
Inch or metric holes provide flush mounting from the head or cap face. Standard mounting kits can be bolted-on for adapting to a wide range of applications.

Threaded End Cap Construction
Precision-machined, aluminum alloy end caps are black anodized and removable from either end for easy cylinder repair. Construction minimizes cylinder size and weight.

Piston Rod
Ground, polished hard chrome plated steel piston rod. Stainless steel is standard on 20 and 25mm bore. Smooth rod surface finish provides minimum friction and maximum seal life.

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C086

P1L	N	032	D	M	N	0200	W	B	N	N	N

Construction[1]

N	Inch Mounting Threads
M	Metric Mounting Threads

Bores (mm)

020, 025, 032, 040, 050, 063, 080, 100

Function

D	Double Acting, Single Rod
K	Double Acting, Double Rod

Cushions/Magnetic Piston

N	No Cushion, No Magnetic Piston
M	No Cushion, Magnetic Piston[2]
F	Cushioned Both Ends, No Magnetic Piston
Y	Cushioned Both Ends, Magnetic Piston[2]

Seal Material

N	Standard Seals
T	Fluorocarbon

Stroke

Specify in mm

Version[3]

B	Basic
W	With Options
/	Special

Mounting Style

N	No Mountings Fitted (Std.)
J	Front Flange
H	Rear Flange
B	Single Rear Clevis
A	Double Rear Clevis
F	Foot, Front & Rear
G	Nose Mount
E	Front Trunnion
D	Rear Trunnion

Port Type[1]

N	NPT Threads[4]
B	BSPT Threads[5]

Rod End Style[1]

N	Inch Male[4]
6	Metric Female
5	Metric Male[5]
9	Inch Female
3	Special

Rod Material

N	Carbon Steel (std on 32-100mm bores)
S	Stainless (std on 20-25mm bores)

Minimum and Maximum Stroke Length for Standard P1L Cylinders

Bore	Min. Stroke (mm)	Max. Stroke (mm)[6]
20	2	1000
25	2	1000
32	2	1000
40	4	1000
50	5	1000
63	7	1000
80	4	1000
100	4	1000

Notes:

1 When selecting inch or metric construction, be advised that the piston rod end and porting thread will coincide with the mounting thread selected as the standard for the basic cylinder. For example, selecting “M” in the construction field will automatically provide a metric male piston rod end and BSPT ports as standard.

2 Not available with fluorocarbon seal option.

3 If cylinder contains no options, then use “B” as the last digit in the model code. The last 4 boxes are used only when “W” or “/” appears in this field.

4 Standard with Inch Construction

5 Standard with Metric Construction

6 Please consult factory for availability of stroke lengths longer than those listed.

For sensor part numbers and specifications, see the Electronic Sensors Section.

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Specifications

- Bore Sizes: 20 to 100mm (3/4" to 4")
- Rod Diameters: 8 to 32mm (5/16" to 1-1/4")
- Rod Ends: Four Standard, specials to order
- Bumpers standard on both ends
- Adjustable Cushions provided at both ends as an option
- Single End or Double End Mounting
- Mounting Styles: 9 standard
- Rated Air Pressure: 10 bar (145 psi) Non-Lube
- Strokes available in any practical stroke length
- Standard Temperature: -23°C to + 74°C (- 10°F to + 165°F)
- Optional High Temp Service: -23°C to +121°C (-10°F to +250°F)*

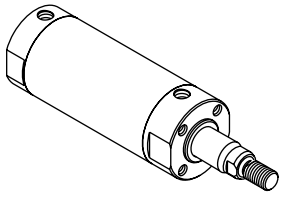
* Option intended for limited exposure to temperatures over +80°C or +176°F. This option is primarily for applications which subject the cylinder to fluids that have an adverse effect on external seals.

D

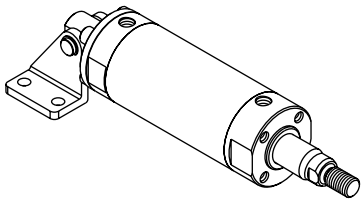
Cylinder Weights

Bore	Base (Lb)	Per 25mm of Stroke (Lb)
20	0.24	0.06
25	0.35	0.08
32	0.55	0.11
40	0.9	0.17
50	1.58	0.25
63	2.19	0.28
80	4	0.41
100	6.75	0.59

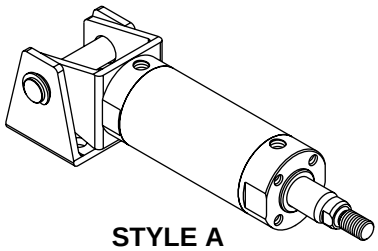
Available Mountings



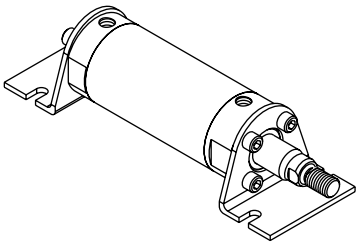
STYLE N
Basic No Mounts



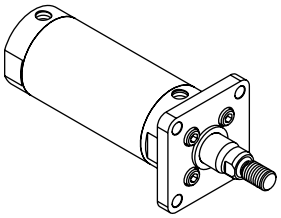
STYLE B
Single Rear Clevis



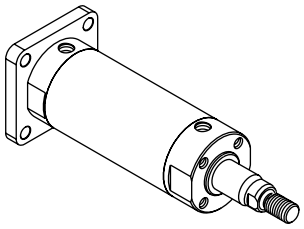
STYLE A
Double Rear Clevis



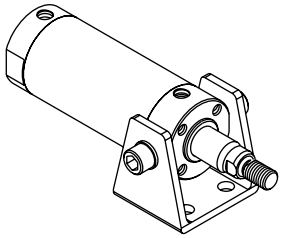
STYLE F
Foot Mount



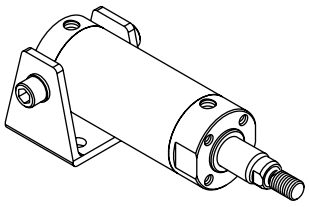
STYLE J
Front Flange



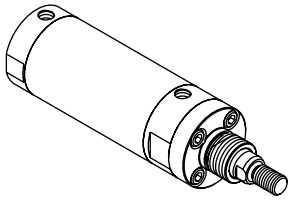
STYLE H
Rear Flange



STYLE E
Front Trunnion



STYLE D
Rear Trunnion



STYLE G
Nose Mount

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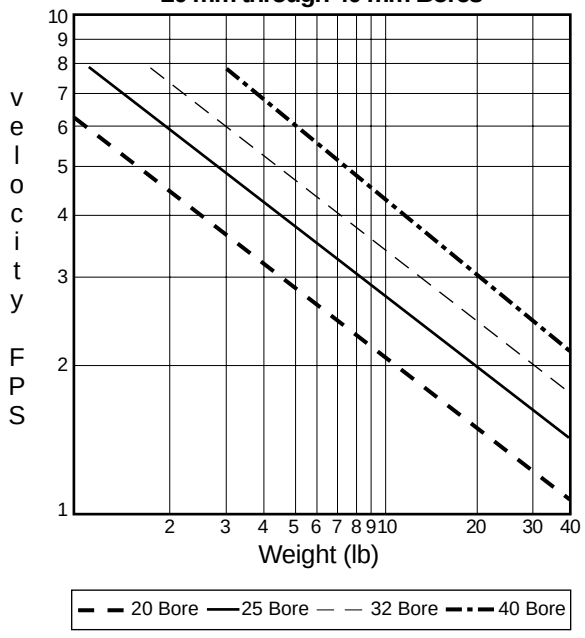
Theoretical Push and Pull Forces in lbs.

Bore mm	Rod Diameter mm	Action	Effective Area in^2	Operating Pressure (PSI)				
				40	60	80	100	125
20	0	Extend	0.5	19	29	39	49	61
	8	Retract	0.4	16	24	33	41	51
25	0	Extend	0.8	30	46	61	76	95
	10	Retract	0.6	26	38	51	64	80
32	0	Extend	1.2	50	75	100	125	156
	12	Retract	1.1	43	64	86	107	134
40	0	Extend	1.9	78	117	156	195	243
	16	Retract	1.6	65	98	131	164	204
50	0	Extend	3.0	122	183	243	304	380
	20	Retract	2.6	102	153	204	256	320
63	0	Extend	4.8	193	290	386	483	604
	20	Retract	4.3	174	261	348	434	543
80	0	Extend	7.8	312	467	623	779	974
	25	Retract	7.0	281	422	562	703	879
100	0	Extend	12.2	487	730	974	1217	1522
	32	Retract	10.93	437	656	874	1093	1366

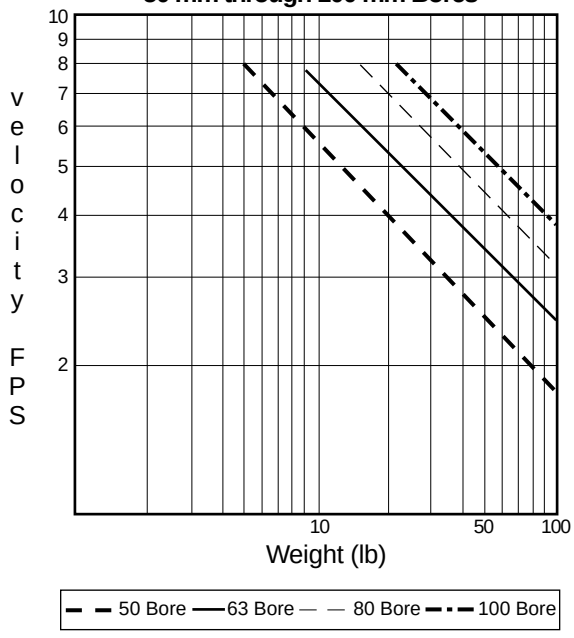
Cushioning Capacity Charts

Use the graphs below to determine whether a cylinder will adequately decelerate a load without damage to the cylinder. Find the point on the graph where the piston rod speed intersects the weight of the load. Any cylinder bore size above the intersect point will adequately decelerate the load at that speed.

20 mm through 40 mm Bores



50 mm through 100 mm Bores



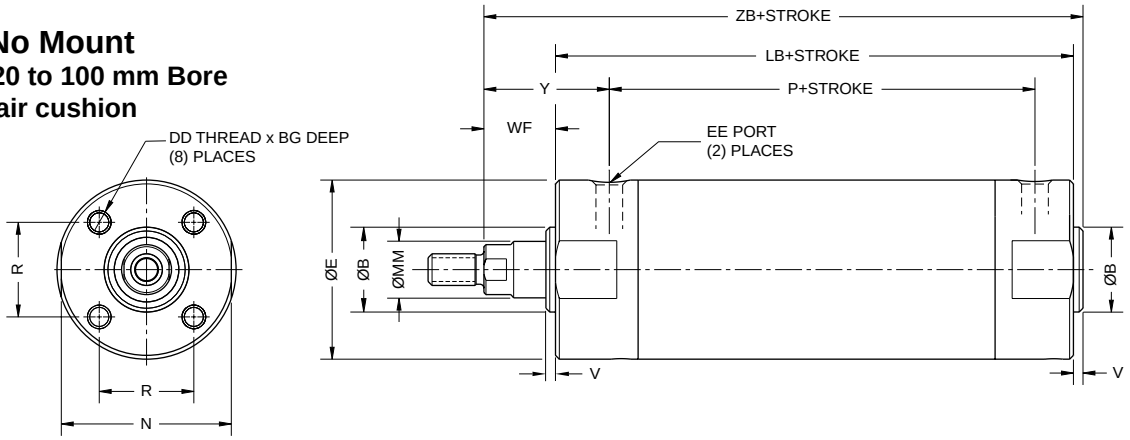
Note: Cushions are recommended for applications with cylinder velocities exceeding 1 ft/sec.

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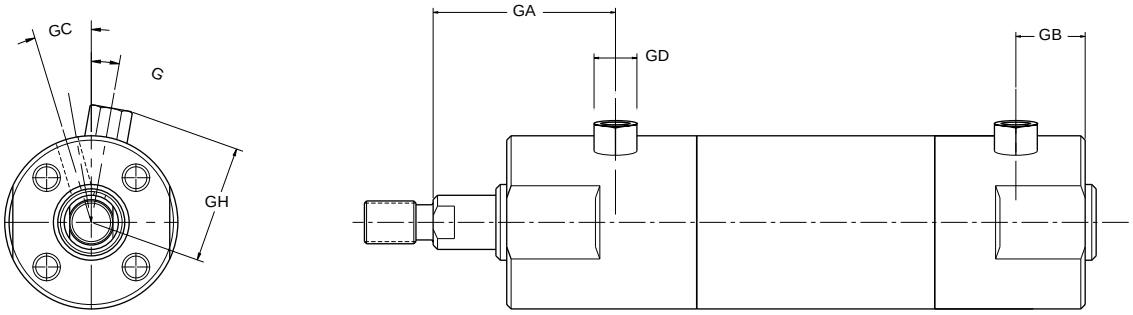
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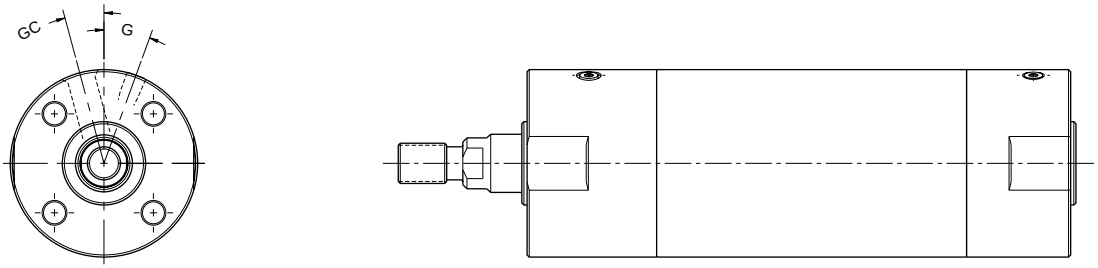
Style N
Basic No Mount
Typical 20 to 100 mm Bore without air cushion



With adjustable air cushion - 20 to 25 mm bores

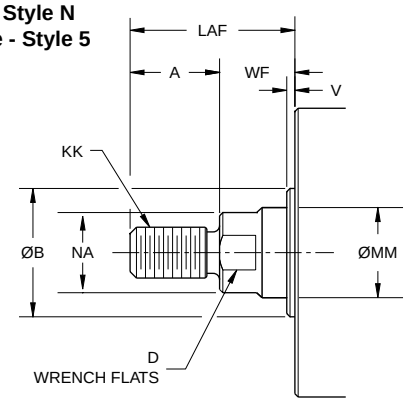


With adjustable air cushion - 32 to 100 mm bores (feature a flush-fit cushion adjustment screw)

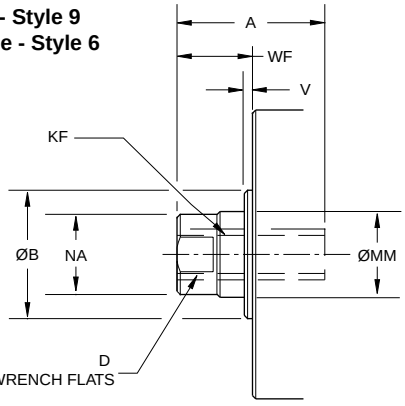


Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3

Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF. If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	DD	BG (Depth)	D	ØE	EE	Thread KK Style 5	Thread KF Style 6	LAF	Ø MM Rod Dia.	N	NA	R	V	WF	Y
20	13	12	M4x0.7	7	6	27	1/8*	M8 x 1.25	M5 x 0.80	26	8	24	–	14	2	13	28
25	13	14	M5x0.8	7.6	8	32	1/8*	M10 x 1.25	M6 x 1.00	29	10	29	–	16.5	2	16	30
32	19	18	M5x0.8	7.6	10	39	1/8	M10 x 1.25	M8 x 1.25	41	12	36	11	20	2	22	40
40	19	25	M6x1	12	12	48.5	1/8	M14 x 1.5	M8 x 1.25	41	16	44	14	26	2	22	42
50	22	30	M8x1.25	16	16	59	1/4	M18 x 1.5	M10 x 1.25	52	20	55	18	32	2	30	53
63	22	32	M10x1.5	16	16	72	1/4	M18 x 1.5	M10 x 1.25	52	20	69	18	38	2	30	53
80	38	40	M10x1.5	22	20	90	3/8	M22 x 1.5	M16 x 1.5	69	25	86	23	50	3	31	59
100	48	50	M12x1.75	22	26	110	1/2	M26 x 1.5	M20 x 1.5	79	32	106	30	60	3	31	57

*Ports are M5 for cushioned versions

Bore	Add Stroke		
	LB	P	ZB
20	69	45	83
25	69	46	86
32	71	43	95
40	78	49	102
50	90	53	122
63	90	52	122
80	108	64	142
100	108	66	142

Bore	Adjustable Air Cushion							
	GA	GB	GD Hex	GC°	G°	GH	EE	Cushion Length
20	33	14	8	13-1/2	25-1/2	20.5	M5 x 0.8	9
25	35	14	8	15-1/2	20-1/2	23	M5 x 0.8	9
32	–	–	–	10-1/2	30-1/2	–	1/8	10
40	–	–	–	10-1/2	22-1/2	–	1/8	12
50	–	–	–	10-1/2	23-1/2	–	1/4	15
63	–	–	–	15-1/2	20-1/2	–	1/4	15
80	–	–	–	15-1/2	25-1/2	–	3/8	15
100	–	–	–	15-1/2	25-1/2	–	1/2	15

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore Size	A	ØB +0 -0.001	DD (UNF)	BG (Depth)	D	ØE	EE (NPTF)	Thread		LAF	ØMM Rod Dia.	N	NA	R	V	WF	Y
								KK (UNF) Style N	KF (UNF) Style 9								
20	0.50	0.472	8-32	0.28	0.24	1.06	1/8†	1/4-28	#10-32	1.00	0.315	0.94	–	0.55	0.08	0.50	1.10
25	0.50	0.551	10-32	0.30	0.31	1.26	1/8†	5/16-24	1/4-28	1.12	0.394	1.14	–	0.65	0.08	0.62	1.18
32	0.75	0.709	10-32	0.30	0.39	1.53	1/8	7/16-20	5/16-24	1.63	0.472	1.42	0.43	0.79	0.08	0.88	1.57
40	0.75	0.984	1/4-28	0.47	0.47	1.91	1/8	7/16-20	3/8-24	1.63	0.630	1.73	0.55	1.02	0.08	0.88	1.65
50	0.88	1.181	5/16-24	0.63	0.63	2.32	1/4	1/2-20	1/2-20	2.07	0.787	2.17	0.71	1.26	0.08	1.19	2.09
63	0.88	1.260	3/8-24	0.63	0.63	2.83	1/4	1/2-20	1/2-20	2.07	0.787	2.72	0.71	1.50	0.08	1.19	2.09
80	1.50	1.575	3/8-24	0.88	0.79	3.54	3/8	3/4-16	5/8-18	2.72	0.984	3.39	0.91	1.97	0.12	1.22	2.32
100	1.88	1.968	1/2-20	0.88	1.02	4.33	1/2	1-14	3/4-16	3.11	1.260	4.17	1.18	2.36	0.12	1.22	2.24

† Ports are 10-32 for cushioned versions

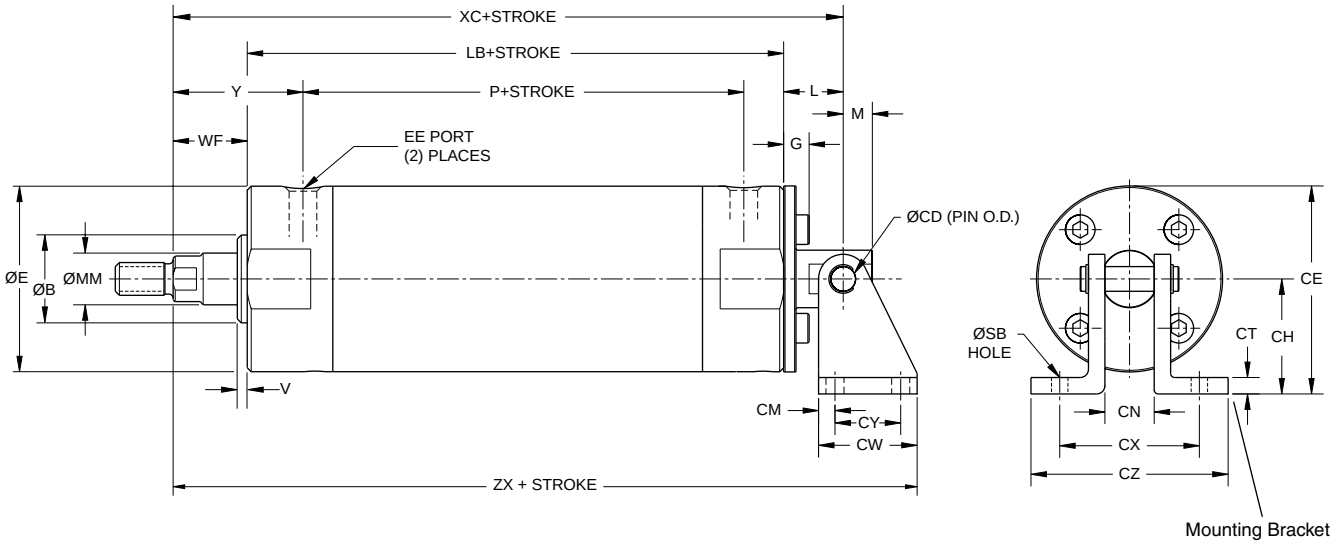
Bore (mm)	Add Stroke		
	LB	P	ZB
20	2.70	1.77	3.28
25	2.70	1.81	3.40
32	2.78	1.69	3.74
40	3.06	1.93	4.02
50	3.53	2.09	4.80
63	3.53	2.05	4.80
80	4.25	2.52	5.59
100	4.25	2.60	5.59

Bore (mm)	Adjustable Air Cushion							
	GA	GB	GD Hex	GC°	G°	GH	EE	Cushion Length
20	1.30	0.55	0.31	13-1/2	25-1/2	0.81	10-32 UNF	0.35
25	1.38	0.55	0.31	15-1/2	20-1/2	0.91	10-32 UNF	0.35
32	–	–	–	10-1/2	30-1/2	–	1/8 NPTF	0.39
40	–	–	–	10-1/2	22-1/2	–	1/8 NPTF	0.47
50	–	–	–	10-1/2	23-1/2	–	1/4 NPTF	0.59
63	–	–	–	15-1/2	20-1/2	–	1/4 NPTF	0.59
80	–	–	–	15-1/2	25-1/2	–	3/8 NPTF	0.59
100	–	–	–	15-1/2	25-1/2	–	1/2 NPTF	0.59

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D

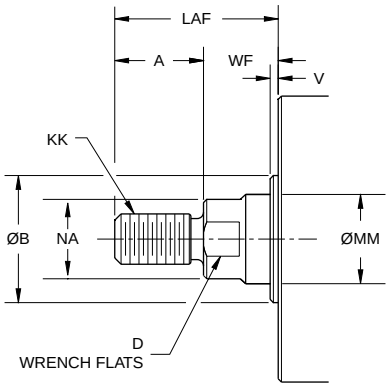
Style B
Single Rear Clevis
Typical 20 to 100 mm Bore



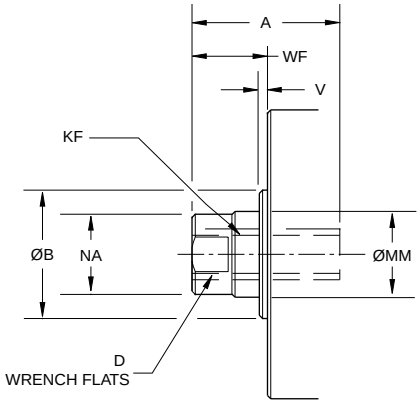
Note: Mating Mounting Bracket and Pin must be ordered as separate items

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Pneumatic Division
Wadsworth, Ohio
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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 - 0.02	ØCD h9	D	ØE	EE (BSPT)	G	Thread KK Style 5	Thread KF Style 6	L	LAF	M	ØMM Rod Dia.	NA	V	WF	Y
20	13	12	6.35	6	27	1/8*	7	M8 x 1.25	M5 x 0.80	18	26	7	8	–	2	13	28
25	13	14	6.35	8	32	1/8*	8	M10 x 1.25	M6 x 1.00	17	29	7	10	–	2	16	30
32	19	18	6.35	10	39	1/8	15.5	M10 x 1.25	M8 x 1.25	27	41	10	12	11	2	22	40
40	19	25	9.52	12	48.5	1/8	10	M14 x 1.5	M8 x 1.25	22	41	10	16	14	2	22	42
50	22	30	9.52	16	59	1/4	12	M18 x 1.5	M10 x 1.25	23	52	11	20	18	2	30	53
63	22	32	9.52	16	72	1/4	13	M18 x 1.5	M10 x 1.25	23	52	11	20	18	2	30	53
80	38	40	19.07	20	90	3/8	15	M22 x 1.5	M16 x 1.5	35	69	19	25	23	3	31	59
100	48	50	19.07	26	110	1/2	17	M26 x 1.5	M20 x 1.5	43	79	19	32	30	3	31	57

Bore	CE	CH	CM	CN	CT	CW	CX	CY	CZ	ØSB	Add Stroke			
											LB	P	XC	ZX
20	35.5	22	5	10	3	29	32	19	51	7	69	45	99	120
25	38	22	5	10	3	29	32	19	51	7	69	46	102	123
32	41.5	22	5	13	3	29	35	19	54	7	71	43	120	141
40	59	35	6	16	3	38	47	25	67	7	78	49	122	151
50	64.5	35	6	19	6	38	54	25	76	7	90	53	143	172
63	80	44	6	19	6	38	54	25	76	7	90	52	143	172
80	96	51	13	28	6	64	72	38	104	11	108	64	173	218
100	115	60	13	32	6	70	76	44	108	14	108	66	189	240

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

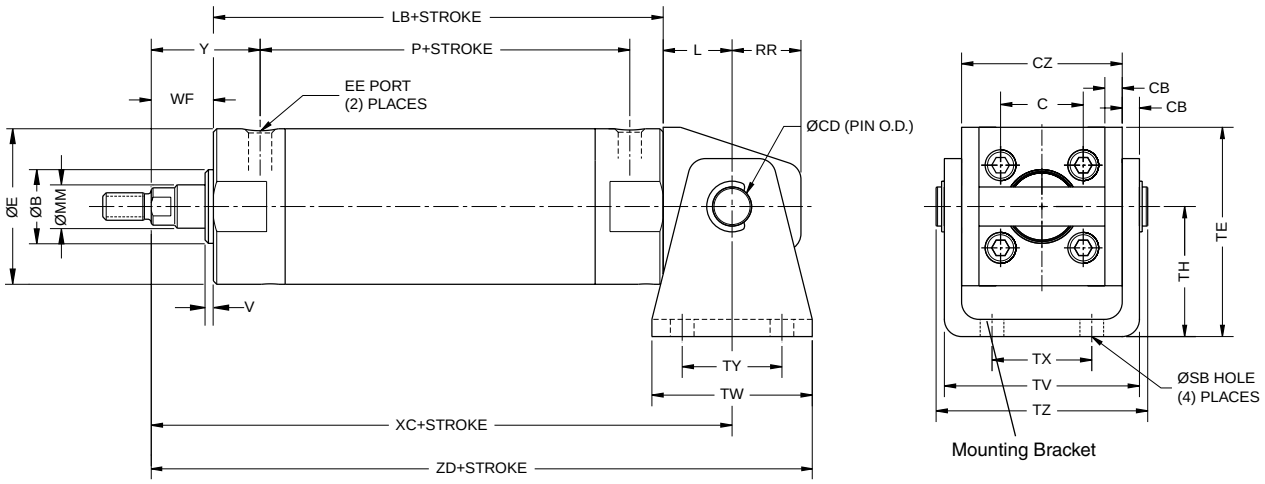
Bore (mm)	A	ØB +0 - 0.001	ØCD +0 - 0.002	D	ØE	EE (NTPF)	G	Thread KK Style N	Thread KF Style 9	L	LAF	M	ØMM Rod Dia.	NA	V	WF	Y
20	0.50	0.472	0.250	0.24	1.06	1/8†	0.26	1/4-28	#10-32	0.70	1.00	0.28	0.315	–	0.08	0.50	1.10
25	0.50	0.551	0.250	0.31	1.26	1/8†	0.27	5/16-24	1/4-28	0.68	1.12	0.28	0.394	–	0.08	0.62	1.18
32	0.75	0.709	0.250	0.39	1.53	1/8	0.57	7/16-20	5/16-24	1.07	1.63	0.39	0.472	0.43	0.08	0.88	1.57
40	0.75	0.984	0.375	0.47	1.91	1/8	0.36	7/16-20	3/8-24	0.88	1.63	0.38	0.630	0.55	0.08	0.88	1.65
50	0.88	1.181	0.375	0.63	2.32	1/4	0.43	1/2-20	1/2-20	0.91	2.07	0.44	0.787	0.71	0.08	1.19	2.09
63	0.88	1.260	0.375	0.63	2.83	1/4	0.46	1/2-20	1/2-20	0.91	2.07	0.44	0.787	0.71	0.08	1.19	2.09
80	1.50	1.575	0.751	0.79	3.54	3/8	0.54	3/4-16	5/8-18	1.38	2.72	0.75	0.984	0.91	0.12	1.22	2.32
100	1.88	1.968	0.751	1.02	4.33	1/2	0.64	1-14	3/4-16	1.69	3.11	0.75	1.260	1.18	0.12	1.22	2.24

Bore (mm)	CE	CH	CM	CN	CT	CW	CX	CY	CZ	ØSB	Add Stroke			
											LB	P	XC	ZX
20	1.39	0.87	0.19	0.38	0.12	1.13	1.25	0.75	2.00	0.27	2.70	1.77	3.91	4.74
25	1.49	0.87	0.19	0.38	0.12	1.13	1.25	0.75	2.00	0.27	2.70	1.81	4.00	4.83
32	1.63	0.87	0.19	0.50	0.12	1.13	1.38	0.75	2.12	0.27	2.78	1.69	4.72	5.55
40	2.31	1.38	0.25	0.62	0.12	1.50	1.86	1.00	2.62	0.27	3.06	1.93	4.81	5.94
50	2.52	1.38	0.25	0.75	0.25	1.50	2.12	1.00	3.00	0.27	3.53	2.09	5.63	6.76
63	3.17	1.75	0.25	0.75	0.25	1.50	2.12	1.00	3.00	0.27	3.53	2.05	5.63	6.76
80	3.77	2.00	0.50	1.09	0.25	2.50	2.84	1.50	4.09	0.42	4.25	2.52	6.82	8.57
100	4.54	2.37	0.50	1.25	0.25	2.75	3.00	1.75	4.25	0.55	4.25	2.60	7.44	9.44

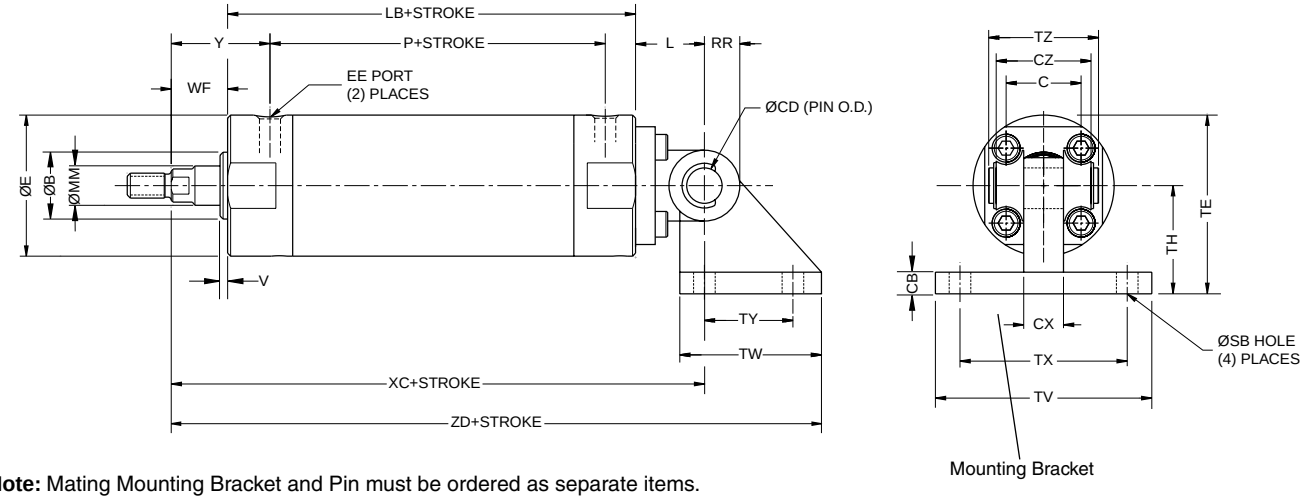
† Ports are 10-32 for cushioned versions

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Style A
Double Rear Clevis
Typical 20 to 63 mm Bore



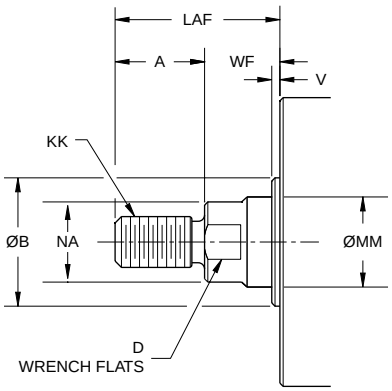
Style A
Double Rear Clevis
Typical 80 to 100 mm Bore



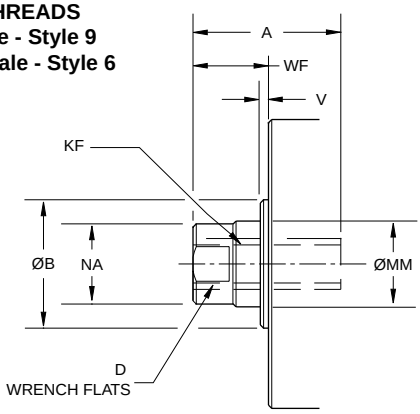
Note: Mating Mounting Bracket and Pin must be ordered as separate items.

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch lthreads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF. If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	C	CB	ØCD d 9	CZ	CX	D	ØE	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	L	LAF	ØMM Rod Dia.	NA	RR	V	WF
20	13	12	14	3	8	29	–	6	27	1/8*	M8x1.25	M5x0.80	14	26	8	–	11	2	13
25	13	14	16.5	3	10	33	–	8	32	1/8*	M10x1.25	M6x1.00	16	29	10	–	13	2	16
32	19	18	20	4.5	12	40	–	10	39	1/8	M10x1.25	M8x1.25	20	41	12	11	15	2	22
40	19	25	26	4.5	14	49	–	12	48.5	1/8	M14x1.5	M8x1.25	22	41	16	14	18	2	22
50	22	30	32	6	16	60	–	16	59	1/4	M18x1.5	M10x1.25	25	52	20	18	20	2	30
63	22	32	38	8	18	74	–	16	72	1/4	M18x1.5	M10x1.25	30	52	20	18	22	2	30
80	38	40	50	11	18	56	28	20	90	3/8	M22x1.5	M16x1.5	35	69	25	23	18	3	31
100	48	50	60	12	22	64	32	26	110	1/2	M26x1.5	M20x1.5	43	79	32	30	22	3	31

Bore	Ø SB	TY	TV	TE	TH	TX	TW	TZ	Y	Add Stroke			
										LB	P	XC	ZD
20	5.5	28	35	38	25	16	42	43.4	28	69	45	95	116
25	5.5	28	39	45.5	30	20	42	48	30	69	46	100	121
32	7	28	49	54	35	22	48	59.4	40	71	43	113	137
40	7	30	58	63.5	40	30	56	71.4	42	78	49	122	150
50	9	36	72	79	50	36	64	86	53	90	53	145	177
63	11	46	90	96	60	46	74	105.4	53	90	52	150	187
80	11	45	110	100	55	85	72	64	59	108	64	174	232.5
100	13.5	60	130	120	65	100	93	72	57	108	66	182	258.5

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	C	CB	ØCD -0.001 -0.003	CZ	CX	D	ØE	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	L	LAF	Ø MM	NA	RR	V	WF
20	0.50	0.472	0.55	0.12	0.315	1.14	–	0.24	1.06	1/8†	1/4-28	#10-32	0.55	1.00	0.315	–	0.43	0.08	0.50
25	0.50	0.551	0.65	0.12	0.394	1.30	–	0.31	1.26	1/8†	5/16-24	1/4-28	0.63	1.12	0.394	–	0.51	0.08	0.62
32	0.75	0.709	0.79	0.18	0.472	1.57	–	0.39	1.53	1/8	7/16-20	5/16-24	0.79	1.63	0.472	0.43	0.59	0.08	0.88
40	0.75	0.984	1.02	0.18	0.551	1.93	–	0.47	1.91	1/8	7/16-20	3/8-24	0.87	1.63	0.630	0.55	0.71	0.08	0.88
50	0.88	1.181	1.26	0.25	0.630	2.36	–	0.63	2.32	1/4	1/2-20	1/2-20	0.98	2.07	0.787	0.71	0.79	0.08	1.19
63	0.88	1.260	1.50	0.31	0.709	2.91	–	0.63	2.83	1/4	1/2-20	1/2-20	1.18	2.07	0.787	0.71	0.87	0.08	1.19
80	1.50	1.575	1.97	0.43	0.709	2.20	1.10	0.79	3.54	3/8	3/4-16	5/8-18	1.38	2.72	0.984	0.91	0.71	0.12	1.22
100	1.88	1.968	2.36	0.47	0.866	2.52	1.26	1.02	4.33	1/2	1-14	3/4-16	1.69	3.11	1.260	1.18	0.87	0.12	1.22

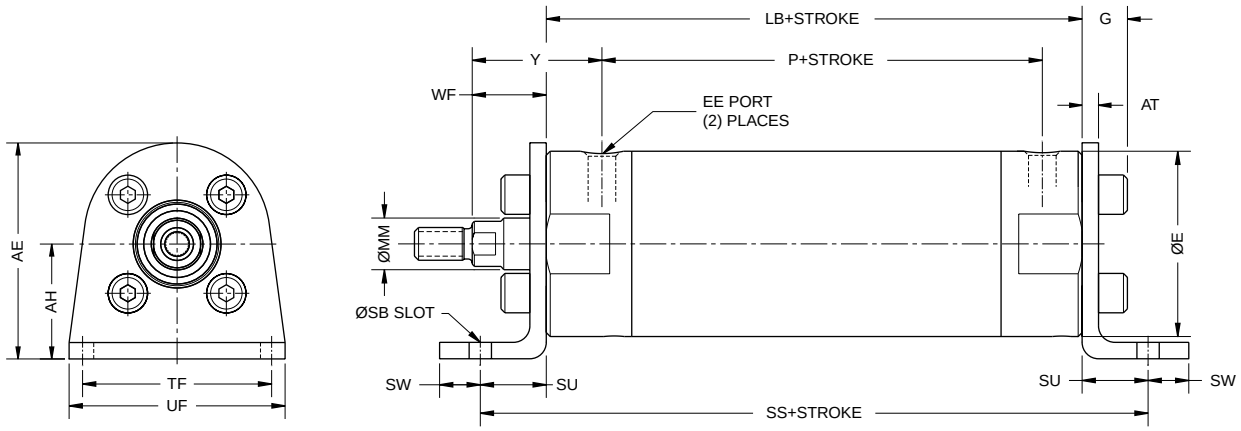
Bore (mm)	ØSB	TY	TV	TE	TH	TX	TW	TZ	Y	Add Stroke			
										LB	P	XC	ZD
20	0.22	1.10	1.39	1.50	0.98	0.63	1.66	1.71	1.10	2.70	1.77	3.75	4.58
25	0.22	1.10	1.55	1.79	1.18	0.79	1.66	1.89	1.18	2.70	1.81	3.95	4.78
32	0.28	1.10	1.93	2.13	1.38	0.87	1.88	2.34	1.57	2.78	1.69	4.45	5.39
40	0.28	1.18	2.28	2.50	1.57	1.18	2.20	2.81	1.65	3.06	1.93	4.81	5.91
50	0.35	1.42	2.83	3.11	1.97	1.42	2.52	3.38	2.09	3.53	2.09	5.70	6.96
63	0.43	1.81	3.54	3.78	2.36	1.81	2.91	4.15	2.09	3.53	2.05	5.90	7.36
80	0.43	1.77	4.33	3.94	2.17	3.35	2.83	2.52	2.32	4.25	2.52	6.85	9.15
100	0.53	2.36	5.12	4.72	2.56	3.94	3.66	2.83	2.24	4.25	2.60	7.17	10.18

†Ports are 10-32 for cushioned versions

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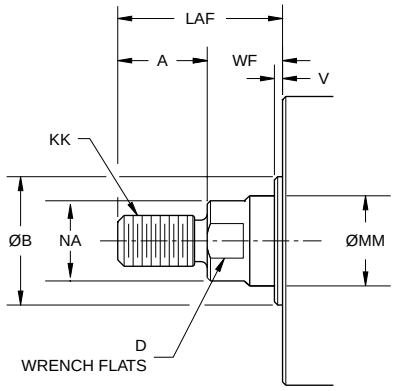
D

Style F
Foot Mount
Typical 20 to 100 mm Bore

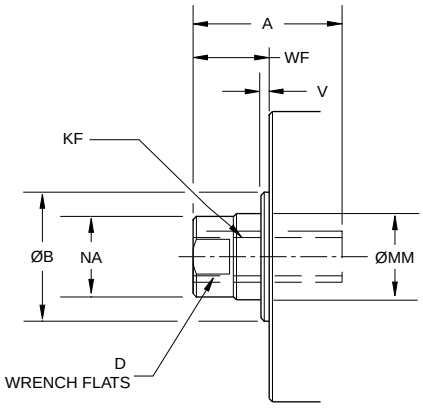


Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	AE	AH	AT	ØB +0 -0.02	D	ØE	EE (BSPT)	G	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	ØSB
20	13	36.5	20.6	3	12	6	27	1/8*	6	M8x1.25	M5x0.80	26	8	–	7
25	13	38.5	20.6	3	14	8	32	1/8*	6.5	M10x1.25	M6x1.00	29	10	–	7
32	19	46.5	25.4	3	18	10	39	1/8	6.5	M10x1.25	M8x1.25	41	12	11	7
40	19	51	25.4	3	25	12	48.5	1/8	7	M14x1.5	M8x1.25	41	16	14	7
50	22	72	38.1	6	30	16	59	1/4	11	M18x1.5	M10x1.25	52	20	18	9
63	22	83.5	44.5	6	32	16	72	1/4	12	M18x1.5	M10x1.25	52	20	18	9
80	38	101	55	6	40	20	90	3/8	12	M22x1.5	M16x1.5	69	25	23	11
100	48	121	65	6	50	26	110	1/2	13	M26x1.5	M20x1.5	79	32	30	14

Bore	SU	SW	TF	UF	V	WF	Y	Add Stroke		
								LB	P	SS
20	14	11	38	48	2	13	28	69	45	97
25	14	11	38	48	2	16	30	69	46	97
32	19	19	48	63.5	2	22	40	71	43	109
40	18	20	48	63.5	2	22	42	78	49	114
50	25	16	57	79	2	30	53	90	53	140
63	25	16	73	95	2	30	53	90	52	140
80	28.5	14	100	125	3	31	59	108	64	165
100	30	16	120	150	3	31	57	108	66	168

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore	A	AE	AH	AT	ØB +0 -0.001	D	Ø E	EE (NPTF)	G	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM	NA	ØSB
20	0.50	1.44	0.81	0.12	0.472	0.24	1.06	1/8†	0.20	1/4-28	#10-32	1.00	0.315	–	0.27
25	0.50	1.52	0.81	0.12	0.551	0.31	1.26	1/8†	0.22	5/16-24	1/4-28	1.12	0.394	–	0.27
32	0.75	1.83	1.00	0.12	0.709	0.39	1.53	1/8	0.22	7/16-20	5/16-24	1.63	0.472	0.43	0.28
40	0.75	2.02	1.00	0.12	0.984	0.47	1.91	1/8	0.25	7/16-20	3/8-24	1.63	0.630	0.55	0.28
50	0.88	2.84	1.50	0.25	1.181	0.63	2.32	1/4	0.41	1/2-20	1/2-20	2.07	0.787	0.71	0.34
63	0.88	3.29	1.75	0.25	1.260	0.63	2.83	1/4	0.44	1/2-20	1/2-20	2.07	0.787	0.71	0.34
80	1.50	3.98	2.17	0.25	1.575	0.79	3.54	3/8	0.44	3/4-16	5/8-18	2.72	0.984	0.91	0.43
100	1.88	4.76	2.56	0.25	1.968	1.02	4.33	1/2	0.50	1-14	3/4-16	3.11	1.260	1.18	0.55

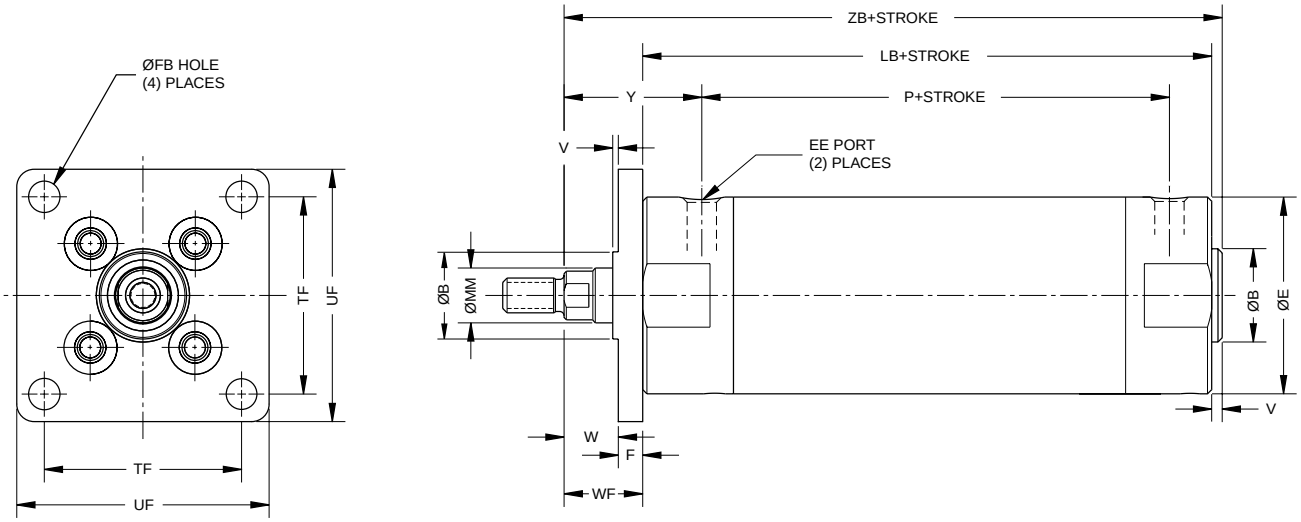
Bore (mm)	SU	SW	TF	UF	V	WF	Y	Add Stroke		
								LB	P	SS
20	0.56	0.44	1.50	1.88	0.08	0.50	1.10	2.70	1.77	3.82
25	0.56	0.44	1.50	1.88	0.08	0.62	1.18	2.70	1.81	3.82
32	0.75	0.75	1.88	2.50	0.08	0.88	1.57	2.78	1.69	4.28
40	0.72	0.78	1.88	2.50	0.08	0.88	1.65	3.06	1.93	4.50
50	1.00	0.62	2.24	3.12	0.08	1.19	2.09	3.53	2.09	5.53
63	1.00	0.62	2.88	3.75	0.08	1.19	2.09	3.53	2.05	5.53
80	1.12	0.55	3.94	4.92	0.12	1.22	2.32	4.25	2.52	6.49
100	1.18	0.63	4.72	5.91	0.12	1.22	2.24	4.25	2.60	6.61

† Ports are 10-32 for cushioned versions

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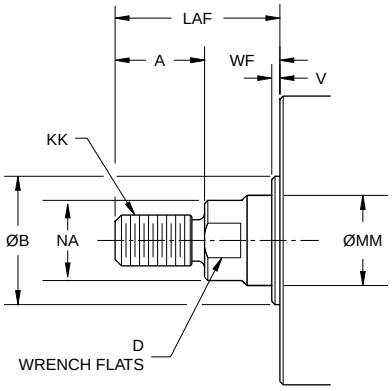
D

Style J
Front Flange
Typical 20 to 100 mm Bore

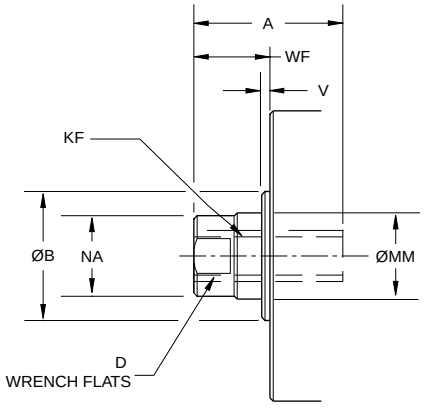


Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	D	ØE	EE (BSPT)	F	ØFB	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	TF	UF	V	WF	W	Y
20	13	12	6	27	1/8*	6	5.5	M8x1.25	M5x0.80	26	8	–	28	40	2	13	7	28
25	13	14	8	32	1/8*	7	5.5	M10x1.25	M6x1.00	29	10	–	32	44	2	16	9	30
32	19	18	10	39	1/8	7	7	M10x1.25	M8x1.25	41	12	11	38	53	2	22	15	40
40	19	25	12	48.5	1/8	8	7	M14x1.5	M8x1.25	41	16	14	46	61	2	22	14	42
50	22	30	16	59	1/4	9	9	M18x1.5	M10x1.25	52	20	18	58	76	2	30	21	53
63	22	32	16	72	1/4	9	11	M18x1.5	M10x1.25	52	20	18	70	92	2	30	21	53
80	38	40	20	90	3/8	11	11	M22x1.5	M16x1.5	69	25	23	82	104	3	31	20	59
100	48	50	26	110	1/2	14	14	M26x1.5	M20x1.5	79	32	30	100	128	3	31	17	57

Bore	Add Stroke		
	LB	P	ZB
20	69	45	83
25	69	46	86
32	71	43	95
40	78	49	102
50	90	53	122
63	90	52	122
80	108	64	142
100	108	66	142

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	D	ØE	EE (NPTF)	F	ØFB	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NA	TF	UF	V	WF	W	Y
20	0.50	0.472	0.24	1.06	1/8†	0.24	0.22	1/4-28	#10-32	1.00	0.315	–	1.10	1.57	0.08	0.50	0.26	1.10
25	0.50	0.551	0.31	1.26	1/8†	0.28	0.22	5/16-24	1/4-28	1.12	0.394	–	1.26	1.73	0.08	0.62	0.34	1.18
32	0.75	0.709	0.39	1.53	1/8	0.28	0.28	7/16-20	5/16-24	1.63	0.472	0.43	1.50	2.09	0.08	0.88	0.60	1.57
40	0.75	0.984	0.47	1.91	1/8	0.31	0.28	7/16-20	3/8-24	1.63	0.630	0.55	1.81	2.40	0.08	0.88	0.57	1.65
50	0.88	1.181	0.63	2.32	1/4	0.35	0.35	1/2-20	1/2-20	2.07	0.787	0.71	2.28	3.00	0.08	1.19	0.84	2.09
63	0.88	1.260	0.63	2.83	1/4	0.35	0.43	1/2-20	1/2-20	2.07	0.787	0.71	2.76	3.62	0.08	1.19	0.84	2.09
80	1.50	1.575	0.79	3.54	3/8	0.43	0.43	3/4-16	5/8-18	2.72	0.984	0.91	3.23	4.09	0.12	1.22	0.79	2.32
100	1.88	1.968	1.02	4.33	1/2	0.55	0.55	1-14	3/4-16	3.11	1.260	1.18	3.94	5.04	0.12	1.22	0.67	2.24

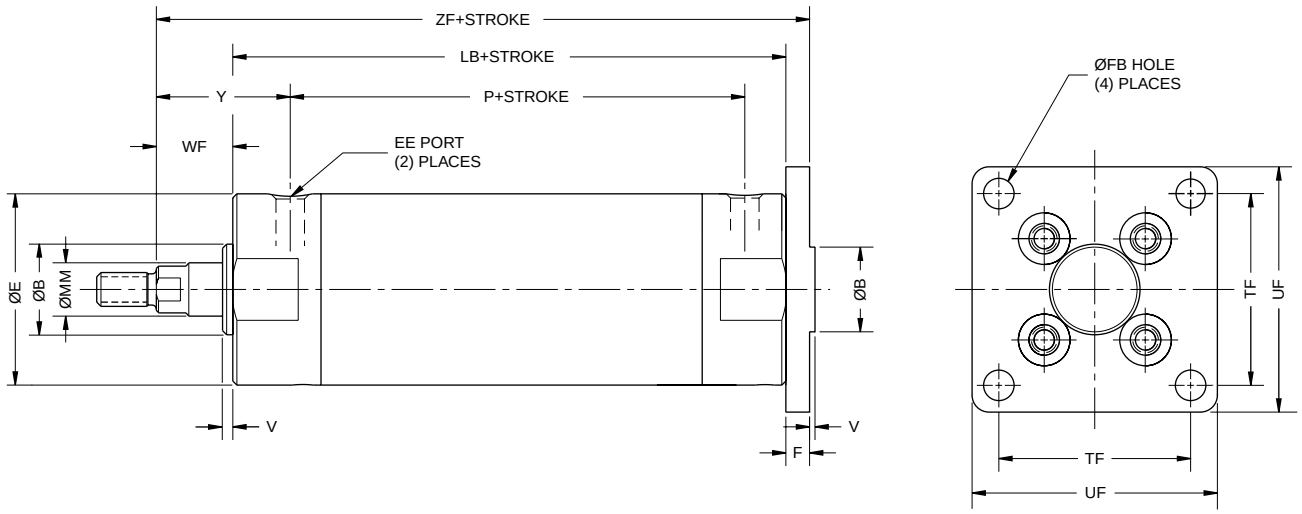
Bore (mm)	Add Stroke		
	LB	P	ZB
20	2.70	1.77	3.28
25	2.70	1.81	3.40
32	2.78	1.69	3.74
40	3.06	1.93	4.02
50	3.53	2.09	4.80
63	3.53	2.05	4.80
80	4.25	2.52	5.59
100	4.25	2.60	5.59

† Ports are 10-32 for cushioned versions

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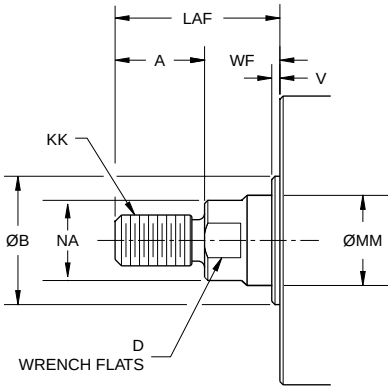
D

Style H
Rear Flange
Typical 20 to 100 mm Bore

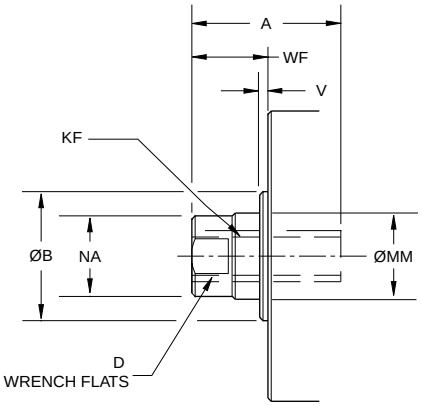


Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	D	ØE	EE (BSPT)	F	ØFB	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	TF	UF	V	WF	Y
20	13	12	6	27	1/8*	6	5.5	M8x1.25	M5x0.80	26	8	–	28	40	2	13	28
25	13	14	8	32	1/8*	7	5.5	M10x1.25	M6x1.00	29	10	–	32	44	2	16	30
32	19	18	10	39	1/8	7	7	M10x1.25	M8x1.25	41	12	11	38	53	2	22	40
40	19	25	12	48.5	1/8	8	7	M14x1.5	M8x1.25	41	16	14	46	61	2	22	42
50	22	30	16	59	1/4	9	9	M18x1.5	M10x1.25	52	20	18	58	76	2	30	53
63	22	32	16	72	1/4	9	11	M18x1.5	M10x1.25	52	20	18	70	92	2	30	53
80	38	40	20	90	3/8	11	11	M22x1.5	M16x1.5	69	25	23	82	104	3	31	59
100	48	50	26	110	1/2	14	14	M26x1.5	M20x1.5	79	32	30	100	128	3	31	57

Bore	Add Stroke		
	LB	P	ZF
20	69	45	87
25	69	46	91
32	71	43	100
40	78	49	108
50	90	53	129
63	90	52	129
80	108	64	150
100	108	66	153

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	D	ØE	EE (NPTF)	F	ØFB	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NA	TF	UF	V	WF	Y
20	0.50	0.472	0.24	1.06	1/8†	0.24	0.22	1/4-28	#10-32	1.00	0.315	–	1.10	1.57	0.08	0.50	1.10
25	0.50	0.551	0.31	1.26	1/8†	0.28	0.22	5/16-24	1/4-28	1.12	0.394	–	1.26	1.73	0.08	0.62	1.18
32	0.75	0.709	0.39	1.53	1/8	0.28	0.28	7/16-20	5/16-24	1.63	0.472	0.43	1.50	2.09	0.08	0.88	1.57
40	0.75	0.984	0.47	1.91	1/8	0.31	0.28	7/16-20	3/8-24	1.63	0.630	0.55	1.81	2.40	0.08	0.88	1.65
50	0.88	1.181	0.63	2.32	1/4	0.35	0.35	1/2-20	1/2-20	2.07	0.787	0.71	2.28	3.00	0.08	1.19	2.09
63	0.88	1.260	0.63	2.83	1/4	0.35	0.43	1/2-20	1/2-20	2.07	0.787	0.71	2.76	3.62	0.08	1.19	2.09
80	1.50	1.575	0.79	3.54	3/8	0.43	0.43	3/4-16	5/8-18	2.72	0.984	0.91	3.23	4.09	0.12	1.22	2.32
100	1.88	1.968	1.02	4.33	1/2	0.55	0.55	1-14	3/4-16	3.11	1.260	1.18	3.94	5.04	0.12	1.22	2.24

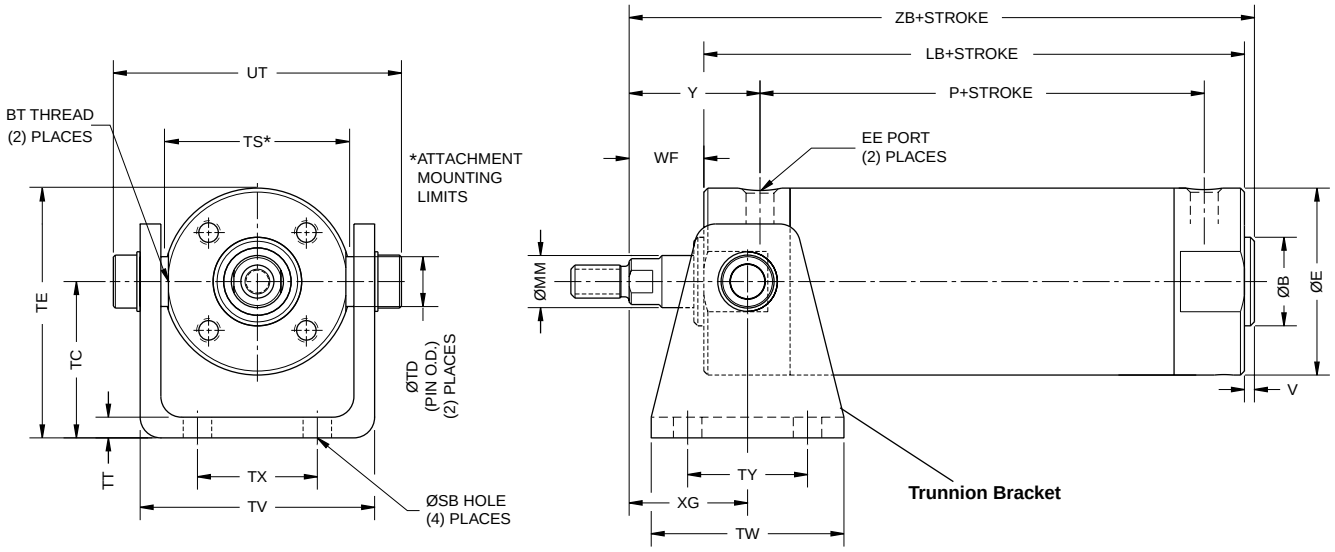
Bore (mm)	Add Stroke		
	LB	P	ZF
20	2.70	1.77	3.44
25	2.70	1.81	3.60
32	2.78	1.69	3.94
40	3.06	1.93	4.25
50	3.53	2.09	5.07
63	3.53	2.05	5.07
80	4.25	2.52	5.91
100	4.25	2.60	6.02

† Ports are 10-32 for cushioned versions

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D

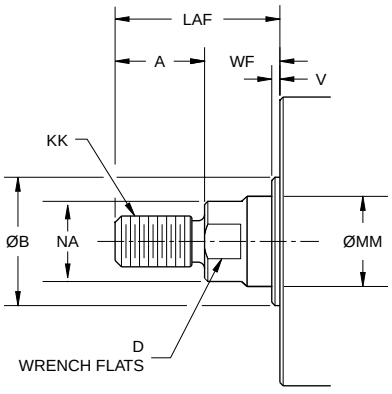
Style E
Front Trunnion
Typical 20 to 63 mm Bore



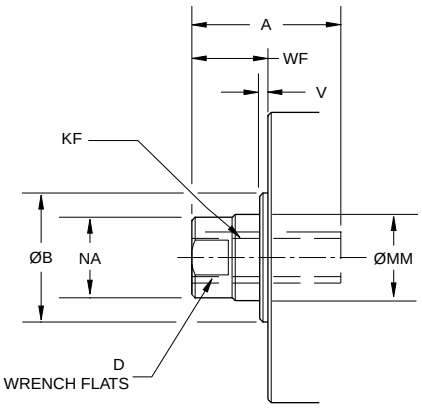
Note: Trunnion Bracket must be ordered as separate item

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	BT	D	ØE	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	V	WF	XG	Y	ØSB
20	13	12	M5x0.80	6	27	1/8*	M8x1.25	M5x0.80	26	8	–	2	13	24	28	5.5
25	13	14	M6x0.75	8	32	1/8*	M10x1.25	M6x1.00	29	10	–	2	16	27	30	5.5
32	19	18	M8x1.00	10	39	1/8	M10x1.25	M8x1.25	41	12	11	2	22	33	40	7
40	19	25	M10x1.25	12	48.5	1/8	M14x1.5	M8x1.25	41	16	14	2	22	34	42	7
50	22	30	M12x1.25	16	59	1/4	M18x1.5	M10x1.25	52	20	18	2	30	43	53	9
63	22	32	M14x1.50	16	72	1/4	M18x1.5	M10x1.25	52	20	18	2	30	43	53	11

Bore	TC	ØTD e8	TE	TS	TT	TV	TW	TX	TY	UT	Add Stroke		
											LB	P	ZB
20	25	8	38.5	28	3	35	42	16	28	47.5	69	45	83
25	30	10	46	33	3	39	42	20	28	53	69	46	86
32	35	12	54.5	40	4.5	49	48	22	28	68	71	43	95
40	40	14	64	49	4.5	58	56	30	30	79	78	49	102
50	50	16	79.5	60	6	72	64	36	36	99	90	53	122
63	60	18	96	74	8	90	74	46	46	119	90	52	122

* Ports are M5 for cushioned versions

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	BT	D	ØE	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NA	V	WF	XG	Y	ØSB
20	0.50	0.472	M5x0.80	0.24	1.06	1/8†	1/4-28	#10-32	1.00	0.315	–	0.08	0.50	0.93	1.10	0.22
25	0.50	0.551	M6x0.75	0.31	1.26	1/8†	5/16-24	1/4-28	1.12	0.394	–	0.08	0.62	1.05	1.18	0.22
32	0.75	0.709	M8x1.00	0.39	1.53	1/8	7/16-20	5/16-24	1.63	0.472	0.43	0.08	0.88	1.31	1.57	0.28
40	0.75	0.984	M10x1.25	0.47	1.91	1/8	7/16-20	3/8-24	1.63	0.630	0.55	0.08	0.88	1.35	1.65	0.28
50	0.88	1.181	M12x1.25	0.63	2.32	1/4	1/2-20	1/2-20	2.07	0.787	0.71	0.08	1.19	1.70	2.09	0.35
63	0.88	1.260	M14x1.50	0.63	2.83	1/4	1/2-20	1/2-20	2.07	0.787	0.71	0.08	1.19	1.70	2.09	0.43

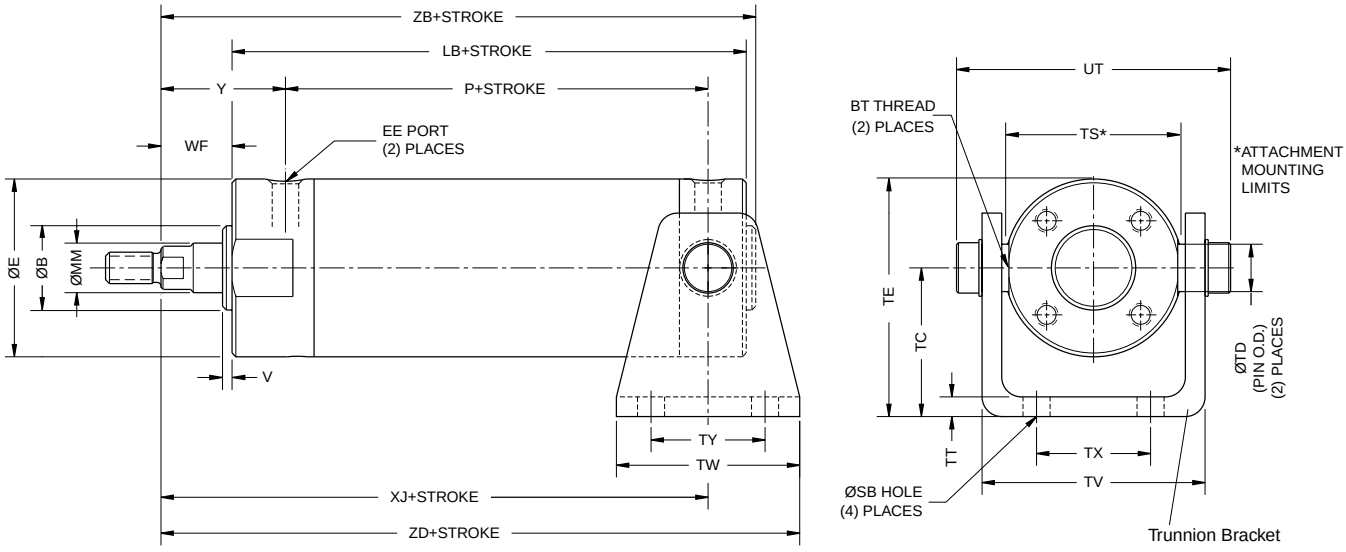
Bore (mm)	TC	ØTD	TE	TS	TT	TV	TW	TX	TY	UT	Add Stroke		
											LB	P	ZB
20	0.98	0.315	1.51	1.10	0.12	1.39	1.66	0.63	1.10	1.87	2.70	1.77	3.28
25	1.18	0.394	1.81	1.30	0.12	1.55	1.66	0.79	1.10	2.09	2.70	1.81	3.40
32	1.38	0.472	2.15	1.58	0.18	1.93	1.88	0.87	1.10	2.67	2.78	1.69	3.74
40	1.57	0.551	2.53	1.93	0.18	2.28	2.20	1.18	1.18	3.10	3.06	1.93	4.02
50	1.97	0.630	3.13	2.36	0.25	2.83	2.52	1.42	1.42	3.88	3.53	2.09	4.80
63	2.36	0.709	3.78	2.91	0.31	3.54	2.91	1.81	1.81	4.69	3.53	2.05	4.80

† Ports are 10-32 for cushioned versions

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D

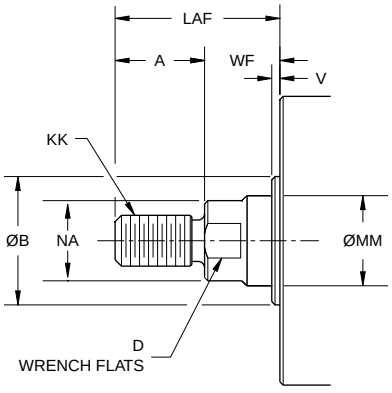
Style D
Rear Trunnion
Typical 20 to 63 mm Bore



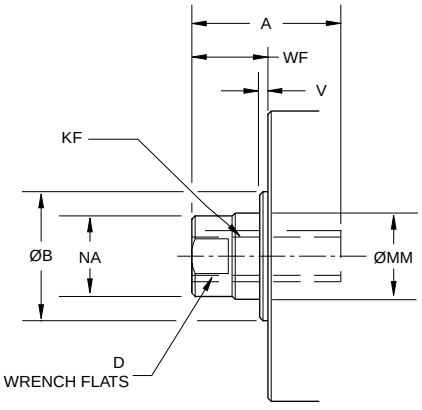
Note: Trunnion Bracket must be ordered as separate item

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	BT	D	ØE	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NA	V	WF	Y	ØSB	TC
20	13	12	M5x0.80	6	27	1/8*	M8x1.25	M5x0.80	26	8	–	2	13	28	5.5	25
25	13	14	M6x0.75	8	32	1/8*	M10x1.25	M6x1.00	29	10	–	2	16	30	5.5	30
32	19	18	M8x1.00	10	39	1/8	M10x1.25	M8x1.25	41	12	11	2	22	40	7	35
40	19	25	M10x1.25	12	48.5	1/8	M14x1.5	M8x1.25	41	16	14	2	22	42	7	40
50	22	30	M12x1.25	16	59	1/4	M18x1.5	M10x1.25	52	20	18	2	30	53	9	50
63	22	32	M14x1.50	16	72	1/4	M18x1.5	M10x1.25	52	20	18	2	30	53	11	60

Bore	ØTD e8	TE	TS	TT	TV	TW	TX	TY	UT	Add Stroke				
										LB	P	XJ	ZB	ZD
20	8	38.5	28	3	35	42	16	28	47.5	69	45	70	83	91
25	10	46	33	3	39	42	20	28	53	69	46	73	86	94
32	12	54.5	40	4.5	49	48	22	28	68	71	43	83	95	107
40	14	64	49	4.5	58	56	30	30	79	78	49	90	102	118
50	16	79.5	60	6	72	64	36	36	99	90	53	108	122	140
63	18	96	74	8	90	74	46	46	119	90	52	108	122	145

***Ports are M5 for cushioned versions**

Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore	A	ØB +0 -0.001	BT	D	ØE	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NA	V	WF	Y	ØSB	TC
20	0.50	0.472	M5x0.80	0.24	1.06	1/8†	1/4-28	#10-32	1.00	0.315	–	0.08	0.50	1.10	0.22	0.98
25	0.50	0.551	M6x0.75	0.31	1.26	1/8†	5/16-24	1/4-28	1.12	0.394	–	0.08	0.62	1.18	0.22	1.18
32	0.75	0.709	M8x1.00	0.39	1.53	1/8	7/16-20	5/16-24	1.63	0.472	0.43	0.08	0.88	1.57	0.28	1.38
40	0.75	0.984	M10x1.25	0.47	1.91	1/8	7/16-20	3/8-24	1.63	0.630	0.55	0.08	0.88	1.65	0.28	1.57
50	0.88	1.181	M12x1.25	0.63	2.32	1/4	1/2-20	1/2-20	2.07	0.787	0.71	0.08	1.19	2.09	0.35	1.97
63	0.88	1.260	M14x1.50	0.63	2.83	1/4	1/2-20	1/2-20	2.07	0.787	0.71	0.08	1.19	2.09	0.43	2.36

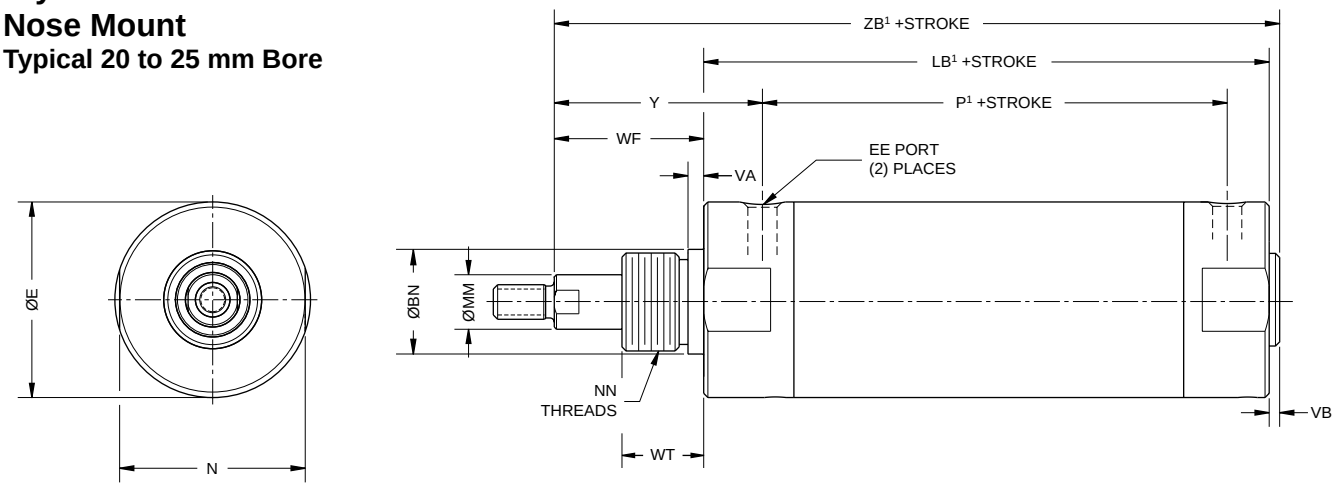
Bore (mm)	ØTD -0.001 -0.002	TE	TS	TT	TV	TW	TX	TY	UT	Add Stroke				
										LB	P	XJ	ZB	ZD
20	0.315	1.51	1.10	0.12	1.39	1.66	0.63	1.10	1.87	2.70	1.77	2.77	3.28	3.60
25	0.394	1.81	1.30	0.12	1.55	1.66	0.79	1.10	2.09	2.70	1.81	2.89	3.40	3.72
32	0.472	2.15	1.58	0.18	1.93	1.88	0.87	1.10	2.67	2.78	1.69	3.27	3.74	4.21
40	0.551	2.53	1.93	0.18	2.28	2.20	1.18	1.18	3.10	3.06	1.93	3.54	4.02	4.64
50	0.630	3.13	2.36	0.25	2.83	2.52	1.42	1.42	3.88	3.53	2.09	4.25	4.80	5.51
63	0.709	3.78	2.91	0.31	3.54	2.91	1.81	1.81	4.69	3.53	2.05	4.25	4.80	5.71

† Ports are 10-32 for cushioned versions

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Style G
Nose Mount
Typical 20 to 25 mm Bore



D

Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	BN +0 -0.08	D	ØE	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	NN	N	VA	VB	WF	WT	Y	Add Stroke		
																	LB1	P1	ZB1
20	13	19.02	6	27	1/8*	M8x1.25	M5x0.80	35	8	3/4-16	24	3	2	22	16	32	66	47	90
25	13	19.02	8	32	1/8*	M10x1.25	M6x1.00	35	10	3/4-16	29	3	2	22	16	32	66	47	90

* Ports are M5 for cushioned versions

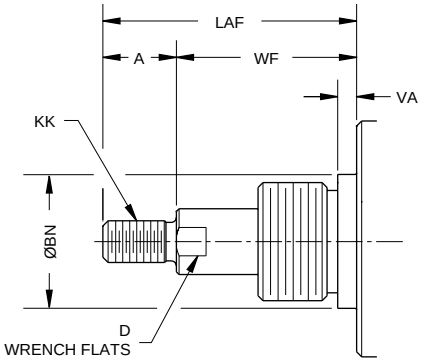
Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore	A	BN +0 -0.003	D	ØE	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	NN	N	VA	VB	WF	WT	Y	Add Stroke		
																	LB1	P1	ZB1
20	0.50	0.749	0.24	1.06	1/8†	1/4-28	#10-32	1.38	0.315	3/4-16	0.94	0.12	0.08	0.88	0.63	1.25	2.60	1.85	3.56
25	0.50	0.749	0.31	1.26	1/8†	5/16-24	1/4-28	1.38	0.394	3/4-16	1.14	0.12	0.08	0.88	0.63	1.25	2.60	1.85	3.56

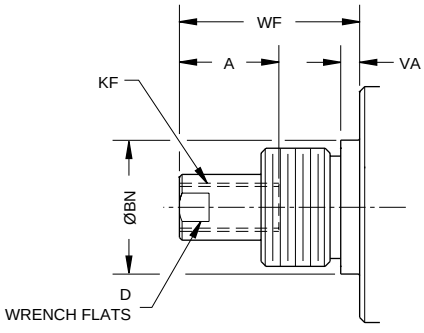
† Ports are 10-32 for cushioned versions

Rod End Details – 20 and 25 mm Bore

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

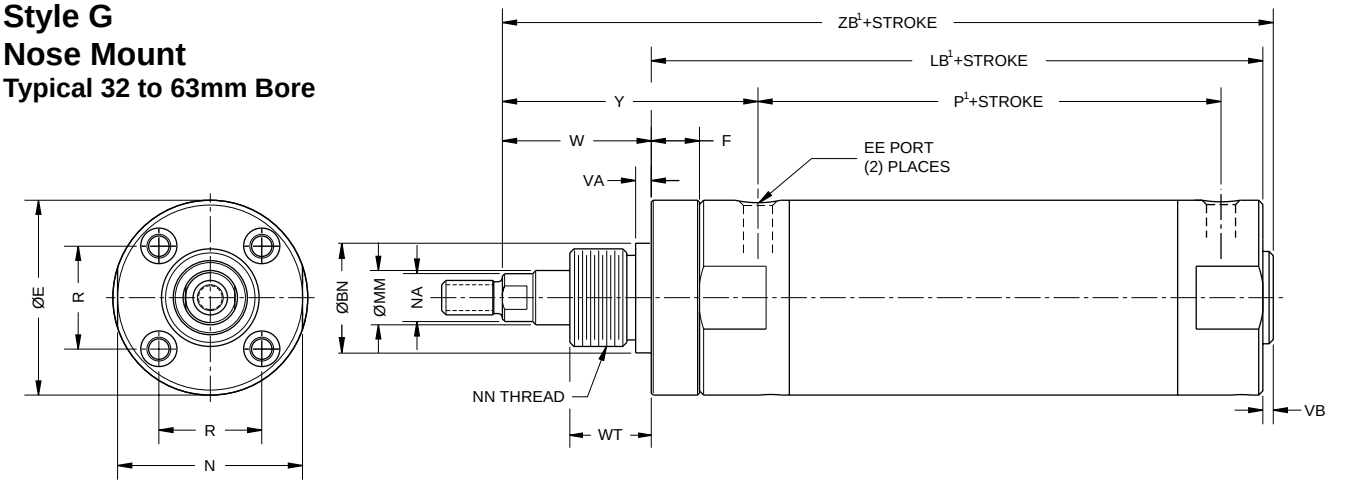
Thread Style 3

Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF. If otherwise special, supply a dimensioned sketch.

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Style G
Nose Mount
Typical 32 to 63mm Bore



Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	BN +0 -0.8	D	ØE	EE* (BSPT)	F	Thread KK Style 5	Thread KF Style 6	LA	ØMM Rod Dia.	NN	N	NA	R	VA	VB	W	WT	Y	Add Stroke		
																				LB[1]	P[1]	ZB[1]
32	19	19.02	10	39	1/8	9	M10x1.25	M8x1.25	41	12	3/4-16	36	11	20	3	2	22	16	49	80	43	104
40	19	26.87	12	48.5	1/8	14	M14x1.5	M8x1.25	51	16	1-14	44	14	26	5	2	32	22	66	92	49	126
50	22	34.90	16	59	1/4	15	M18x1.5	M10x1.25	52	20	1-1/4-12	55	18	32	3	2	30	20.5	68	105	53	137
63	22	38.10	16	72	1/4	16	M18x1.5	M10x1.25	52	20	1-3/8-12	69	18	38	3	2	30	20.5	70	106	52	139

* See Inch Dimensions for NPTF Port Size.

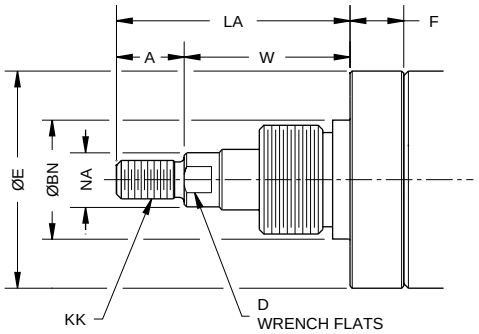
Inch Dimensions – Envelope and Mounting Dimensions (inch)

Bore (mm)	A	BN +0 -0.003	D	ØE	EE* (NPTF)	F	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LA	ØMM Rod Dia.	NN	N	NA	R	VA	VB	W	WT	Y	Add Stroke		
																				LB[1]	P[1]	ZB[1]
32	0.75	0.749	0.39	1.53	1/8	0.37	7/16-20	5/16-24	1.63	0.472	3/4-16	1.42	0.43	0.79	0.12	0.08	0.88	0.63	1.93	3.15	1.69	4.11
40	0.75	1.058	0.47	1.91	1/8	0.56	7/16-20	3/8-24	2.00	0.630	1-14	1.73	0.55	1.02	0.19	0.08	1.25	0.88	2.60	3.62	1.93	4.95
50	0.88	1.374	0.63	2.32	1/4	0.59	1/2-20	1/2-20	2.07	0.787	1-1/4-12	2.17	0.71	1.26	0.12	0.08	1.19	0.81	2.68	4.12	2.09	5.39
63	0.88	1.500	0.63	2.83	1/4	0.63	1/2-20	1/2-20	2.07	0.787	1-3/8-12	2.72	0.71	1.50	0.12	0.08	1.19	0.81	2.76	4.19	2.05	5.46

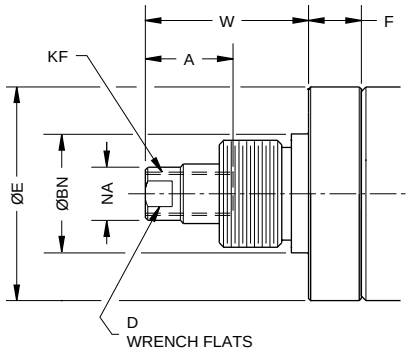
* See Metric Dimensions for BSPT Port Size.

Rod End Details – 32 and 63 mm Bore

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

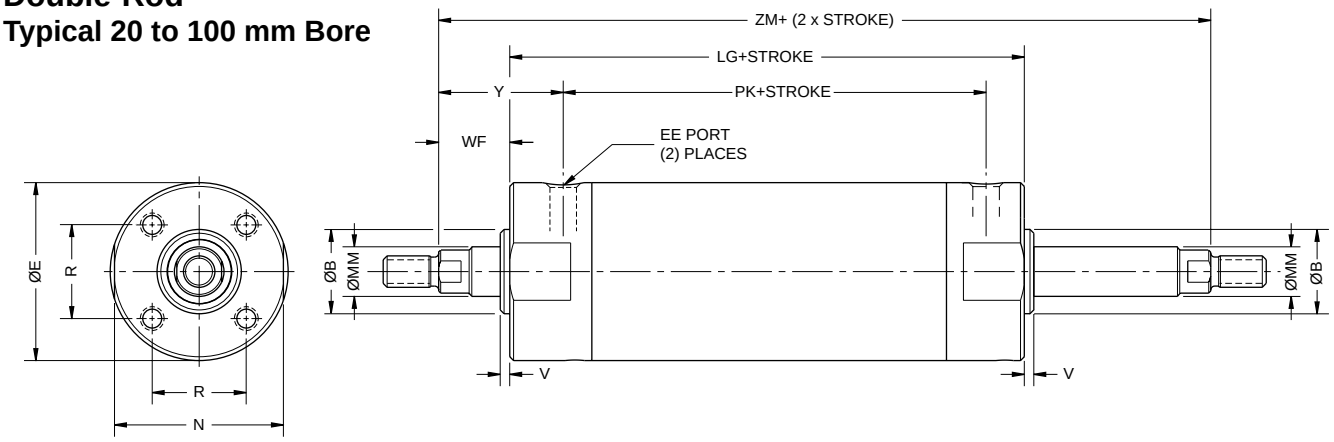
Thread Style 3

Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify "Style 3" and give desired dimensions for KK or KF, A and LAF or WF (Note: LAF = LA+F and WF = W+F). If otherwise special, supply a dimensioned sketch.

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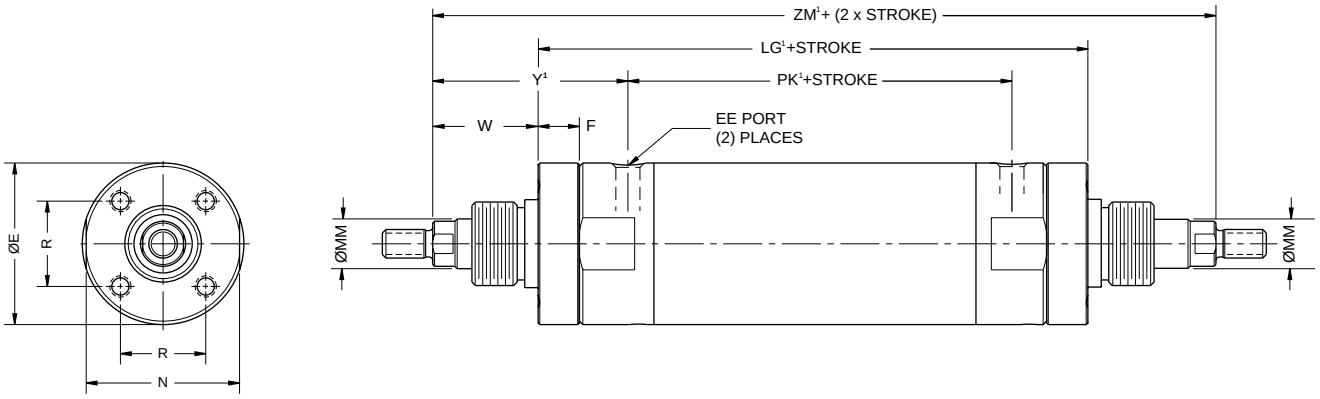
C086

Double-Rod
Typical 20 to 100 mm Bore



D

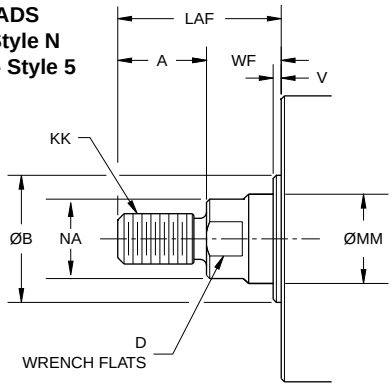
Double-Rod
Nose Mount (32-63mm bore)



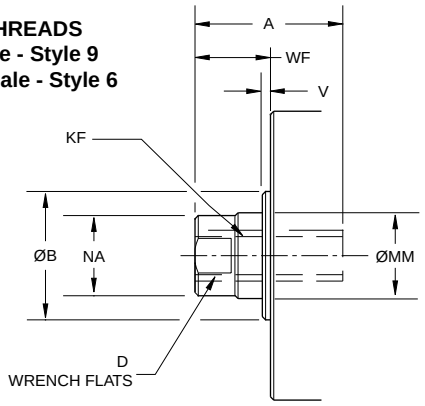
For detailed dimensions for the nose mount from 20 to 63 mm bore, please refer to pages D78 and 2D793.

Rod End Details

MALE THREADS
Inch Male - Style N
Metric Male - Style 5



FEMALE THREADS
Inch Female - Style 9
Metric Female - Style 6



SPECIAL ROD END THREADS

Thread Style 3
Special Metric or Inch threads, extension, blank, etc., are also available. To order, specify “Style 3” and give desired dimensions for KK or KF, A and LAF or WF.
If otherwise special, supply a dimensioned sketch.

When two rod ends are different on double rod cylinder, please clearly indicate what rod end should be provided on which end of the cylinder, or provide a sketch.

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Metric Dimensions – Envelope and Mounting Dimensions (mm)

Bore	A	ØB +0 -0.02	D	ØE	F	EE (BSPT)	Thread KK Style 5	Thread KF Style 6	LAF	ØMM Rod Dia.	N	NA	R	V	W	WF
20	13	12	6	27	–	1/8*	M8x1.25	M5x0.80	26	8	24	–	14	2	–	13
25	13	14	8	32	–	1/8*	M10x1.25	M6x1.00	29	10	29	–	16.5	2	–	16
32	19	18	10	39	9	1/8	M10x1.25	M8x1.25	41	12	36	11	20	2	22	22
40	19	25	12	48.5	14	1/8	M14x1.5	M8x1.25	41	16	44	14	26	2	32	22
50	22	30	16	59	15	1/4	M18x1.5	M10x1.25	52	20	55	18	32	2	30	30
63	22	32	16	72	17	1/4	M18x 1.5	M10x1.25	52	20	69	18	38	2	30	30
80	38	40	20	90	–	3/8	M22 x1.5	M16x1.5	69	25	86	23	50	3	–	31
100	48	50	26	110	–	1/2	M26x1.5	M20x1.5	79	32	106	30	60	3	–	31

Bore	Y	Y[1]	Add Stroke					
			LG	LG[1]	PK	PK[1]	ZM	ZM[1]
20	28	32	75	70	45	50	101	95
25	30	32	75	70	47	50	107	101
32	40	49	78	97	42	42	122	141
40	42	66	87	115	47	47	131	179
50	53	68	100	130	54	54	160	190
63	53	70	100	133	54	54	160	194
80	59	–	119	–	61	–	181	–
100	57	–	119	–	65	–	181	–

* Ports are M5 for cushioned versions

INCH DIMENSIONS - Envelope and Mounting Dimensions (inch)

Bore (mm)	A	ØB +0 -0.001	D	ØE	F	EE (NPTF)	Thread KK (UNF) Style N	Thread KF (UNF) Style 9	LAF	ØMM Rod Dia.	N	NA	R	V	W	WF
20	0.50	0.472	0.24	1.06	–	1/8†	1/4-28	#10-32	1.00	0.315	0.94	–	0.55	0.08	–	0.50
25	0.50	0.551	0.31	1.26	–	1/8†	5/16-24	1/4-28	1.12	0.394	1.14	–	0.65	0.08	–	0.62
32	0.75	0.709	0.39	1.53	0.37	1/8	7/16-20	5/16-24	1.63	0.472	1.42	0.43	0.79	0.08	0.88	0.88
40	0.75	0.984	0.47	1.91	0.56	1/8	7/16-20	3/8-24	1.63	0.630	1.73	0.55	1.02	0.08	1.25	0.88
50	0.88	1.181	0.63	2.32	0.59	1/4	1/2-20	1/2-20	2.07	0.787	2.17	0.71	1.26	0.08	1.19	1.19
63	0.88	1.260	0.63	2.83	0.66	1/4	1/2-20	1/2-20	2.07	0.787	2.72	0.71	1.50	0.08	1.19	1.19
80	1.50	1.575	0.79	3.54	–	3/8	3/4-16	5/8-18	2.72	0.984	3.39	0.91	1.97	0.12	–	1.22
100	1.88	1.968	1.02	4.33	–	1/2	1-14	3/4-16	3.11	1.260	4.17	1.18	2.36	0.12	–	1.22

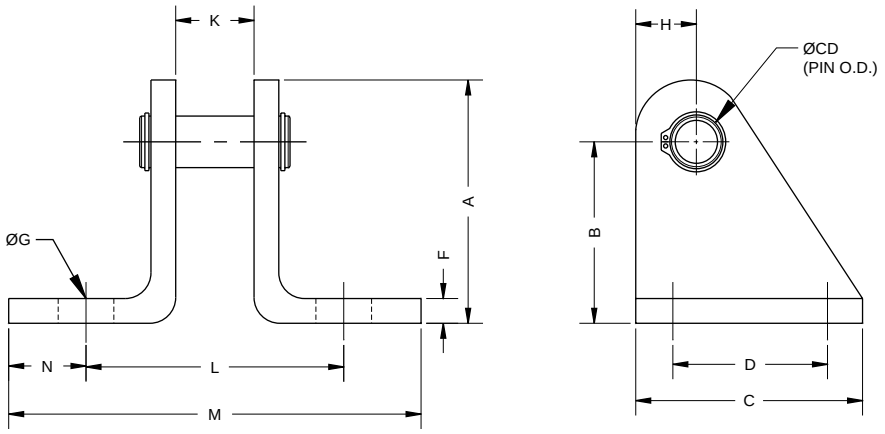
Bore (mm)	Y	Y[1]	Add Stroke					
			LG	LG[1]	PK	PK[1]	ZM	ZM[1]
20	1.10	1.25	2.97	2.74	1.77	1.97	3.97	3.74
25	1.18	1.25	2.97	2.74	1.85	1.97	4.21	3.98
32	1.57	1.93	3.06	3.80	1.65	1.65	4.82	5.56
40	1.65	2.60	3.41	4.53	1.85	1.85	5.17	7.03
50	2.09	2.68	3.93	5.11	2.13	2.13	6.31	7.49
63	2.09	2.76	3.93	5.25	2.13	2.13	6.31	7.63
80	2.32	–	4.70	–	2.40	–	7.14	–
100	2.24	–	4.70	–	2.56	–	7.14	–

† Ports are 10-32 for cushioned versions

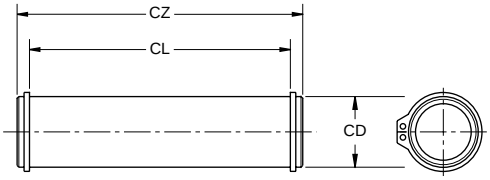
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D

Single Clevis Brackets



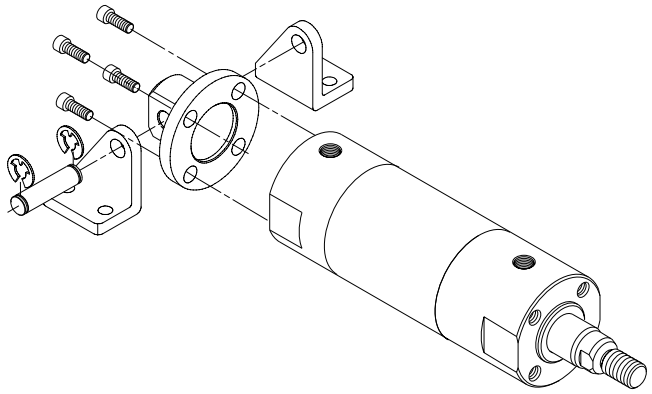
Single Clevis Pin



Note :
Two snap rings shown are included with the pivot pin.
Order clevis bracket separately.

Single Clevis Kit Assembly Instructions

Align the rear clevis with the port location as desired. Insert the four (4) screws through the bracket and thread them into the end caps until they are hand tight. Torque the screws to the values listed in the table below.
Single Clevis Kit, bracket and pivot pin are ordered separately.
Please see next page for part numbers.



Bore	Fastener Size		Torque	
20	8-32	M4x0.7	10-12 in-lbs	1.1-1.4 Nm
25	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
32	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
40	1/4-28	M6x1	32-36 in-lbs	3.6-4.1 Nm
50	5/16-24	M8x1.25	72-82 in-lbs	8.1-9.3 Nm
63	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
80	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
100	1/2-20	M12x1.75	40-44 ft-lbs	54-60 Nm

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Single Clevis Brackets

Metric Dimensions (mm)

Part Number	Bore	A	B	C	ØCD h9	D	F	ØG	H	K	L	M	N
L077520075	20	30	22	29	6.35	19	3	7	8	10	32	51	9
L077520075	25	30	22	29	6.35	19	3	7	8	10	32	51	9
L077520125	32	30	22	29	6.35	19	3	7	8	13	35	54	9
L077520150	40	44	35	38	9.52	25	3	7	9	16	47	67	10
L077520200	50	44	35	38	9.52	25	6	7	9	19	54	76	11
L077520250	63	54	44	38	9.52	25	6	7	9	19	54	76	11
L077520312	80	70	51	64	19.07	38	6	11	19	28	72	104	16
L077520400	100	79	60	70	19.07	44	6	14	19	32	76	108	16

Imperial Dimensions (Inch)

Part Number	Bore (mm)	A	B	C	ØCD +0 -0.002	D	F	ØG	H	K	L	M	N
L077520075	20	1.17	0.87	1.13	0.250	0.75	0.12	0.27	0.30	0.38	1.25	2.00	0.37
L077520075	25	1.17	0.87	1.13	0.250	0.75	0.12	0.27	0.30	0.38	1.25	2.00	0.37
L077520125	32	1.17	0.87	1.13	0.250	0.75	0.12	0.27	0.30	0.50	1.38	2.12	0.37
L077520150	40	1.75	1.38	1.50	0.375	1.00	0.12	0.27	0.37	0.62	1.86	2.62	0.38
L077520200	50	1.75	1.38	1.50	0.375	1.00	0.25	0.27	0.37	0.75	2.12	3.00	0.44
L077520250	63	2.12	1.75	1.50	0.375	1.00	0.25	0.27	0.37	0.75	2.12	3.00	0.44
L077520312	80	2.75	2.00	2.50	0.751	1.50	0.25	0.42	0.75	1.09	2.84	4.09	0.62
L077520400	100	3.12	2.37	2.75	0.751	1.75	0.25	0.55	0.75	1.25	3.00	4.25	0.62

Single Clevis Pins

Metric Dimensions (mm)

Part Number	Bore	ØCD h9	CL	CZ
L077490075	20	6.35	16	22
L077490075	25	6.35	16	22
L077490125	32	6.35	19	25
L077490150	40	9.52	23	29
L077490200	50	9.52	32	39
L077490200	63	9.52	32	39
L077490312	80	19.07	41	51
L077490400	100	19.07	45	55

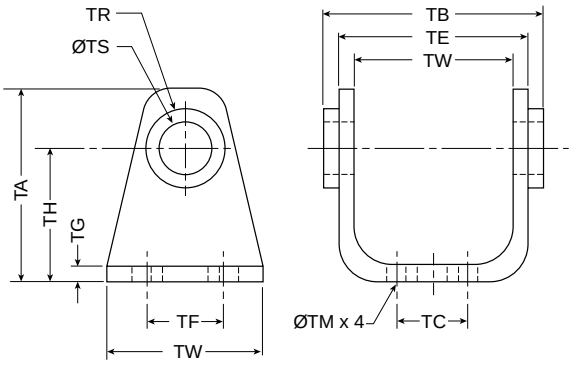
Imperial Dimensions (Inch)

Part Number	Bore	ØCD +0 -0.002	CL	CZ
L077490075	20	0.250	0.63	0.85
L077490075	25	0.250	0.63	0.85
L077490125	32	0.250	0.76	0.97
L077490150	40	0.375	0.89	1.15
L077490200	50	0.375	1.27	1.53
L077490200	63	0.375	1.27	1.53
L077490312	80	0.751	1.63	2.00
L077490400	100	0.751	1.79	2.16

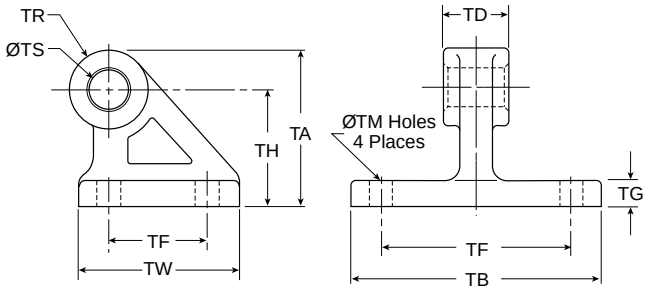
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Double Clevis Brackets

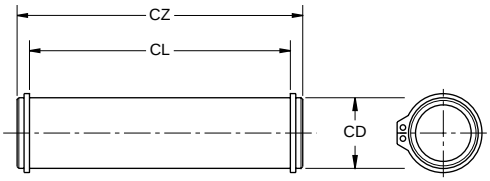
20-63 mm Bore Double Clevis Bracket



80-100 mm Bore Double Clevis Bracket

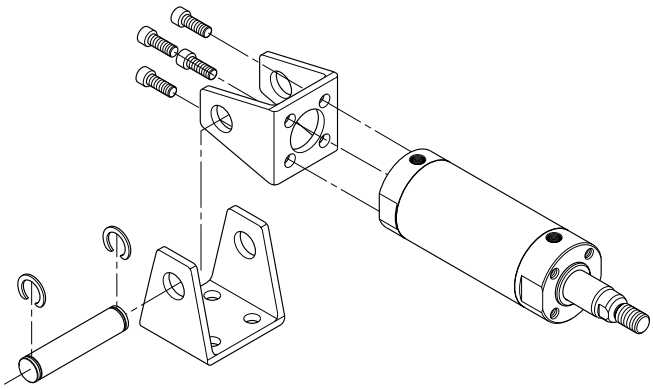


Double Clevis Pin

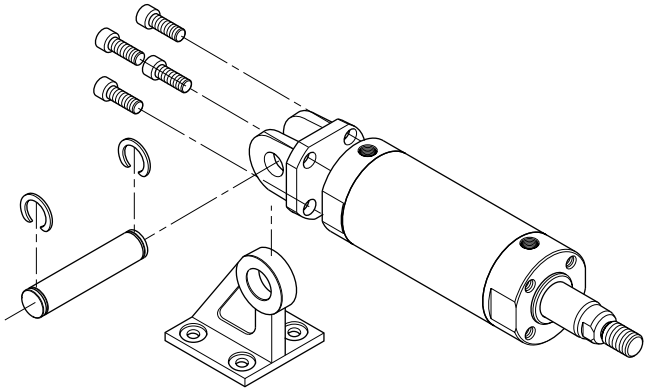


Note:
Two snap rings shown are included with the pivot pin.
Order clevis bracket separately.

Double Clevis 20-63 mm Bore



Double Clevis 80-100 mm Bore



Double Clevis Kit Assembly Instructions

Align the rear clevis with the port location as desired. Insert the four (4) screws through the bracket and thread them into the end caps until they are hand tight. Torque the screws to the values listed in the table beside.
Double Clevis Kit, bracket and pivot pin are ordered separately. Please see next page for part numbers.

Bore	Fastener Size		Torque	
20	8-32	M4x0.7	10-12 in-lbs	1.1-1.4 Nm
25	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
32	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
40	1/4-28	M6x1	32-36 in-lbs	3.6-4.1 Nm
50	5/16-24	M8x1.25	72-82 in-lbs	8.1-9.3 Nm
63	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
80	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
100	1/2-20	M12x1.75	40-44 ft-lbs	54-60 Nm

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Double Clevis Brackets

Metric Dimensions (mm)

Part Number	Bore	TA	TB	TC	TD	TE	TF	TG	TH	TM	TR	TS 49	TW
L077510020	20	36	38	16	29	35	28	3	25	5.5	13	8	42
L077510025	25	43	42	20	33	39	28	3	30	5.5	15	10	42
L077510032	32	50	53.4	22	40	49	28	4.5	35	7	17	12	48
L077510040	40	58	64.4	30	49	58	30	4.5	40	7	21	14	56
L077510050	50	70	78.8	36	60	72	36	6	50	9	24	16	64
L077510063	63	82	96.6	46	74	90	46	8	60	11	26	18	74
L077510080	80	73	110	85	28	110	45	11	55	11	36	18	72
L077510100	100	90	130	100	32	130	60	12	65	13.5	50	22	93

Imperial Dimensions (Inch)

Part Number	Bore	TA	TB	TC	TD	TE	TF	TG	TH	TM	TR	TS +0.002, -0	TW
L077510020	20	1.42	1.50	0.63	1.14	1.39	1.10	0.12	0.98	0.22	0.51	0.315	1.66
L077510025	25	1.69	1.65	0.79	1.30	1.55	1.10	0.12	1.18	0.22	0.59	0.394	1.66
L077510032	32	1.97	2.10	0.87	1.57	1.93	1.10	0.18	1.38	0.28	0.67	0.472	1.88
L077510040	40	2.28	2.53	1.18	1.93	2.28	1.18	0.18	1.57	0.28	0.83	0.551	2.20
L077510050	50	2.76	3.10	1.42	2.36	2.83	1.42	0.25	1.97	0.35	0.94	0.630	2.52
L077510063	63	3.23	3.80	1.81	2.91	3.54	1.81	0.31	2.36	0.43	1.02	0.709	2.91
L077510080	80	2.87	4.33	3.35	1.10	4.33	1.77	0.43	2.17	0.43	1.42	0.709	2.83
L077510100	100	3.54	5.12	3.94	1.26	5.12	2.36	0.47	2.56	0.53	1.97	0.866	3.66

Double Clevis Pins

Metric Dimensions (mm)

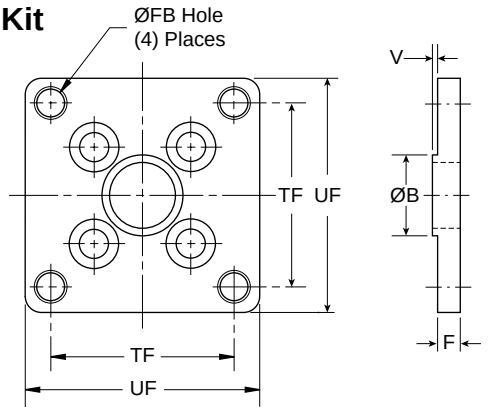
Part Number	Bore	ØCD d9	CL	CZ
L077500020	20	8	38.6	43.4
L077500025	25	10	42.6	48
L077500032	32	12	54	59.4
L077500040	40	14	65	71.4
L077500050	50	16	79.6	86
L077500063	63	18	97.8	105.4
L077500080	80	18	56.2	64
L077500100	100	22	64.2	72

Imperial Dimensions (Inch)

Part Number	Bore	ØCD -0.001 -0.003	CL	CZ
L077500020	20	0.315	1.52	1.71
L077500025	25	0.394	1.68	1.89
L077500032	32	0.472	2.12	2.34
L077500040	40	0.551	2.56	2.81
L077500050	50	0.630	3.13	3.38
L077500063	63	0.709	3.85	4.15
L077500080	80	0.709	2.21	2.52
L077500100	100	0.866	2.53	2.83

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Front or Rear Flange Mount Kit



D

Metric Dimensions (mm)

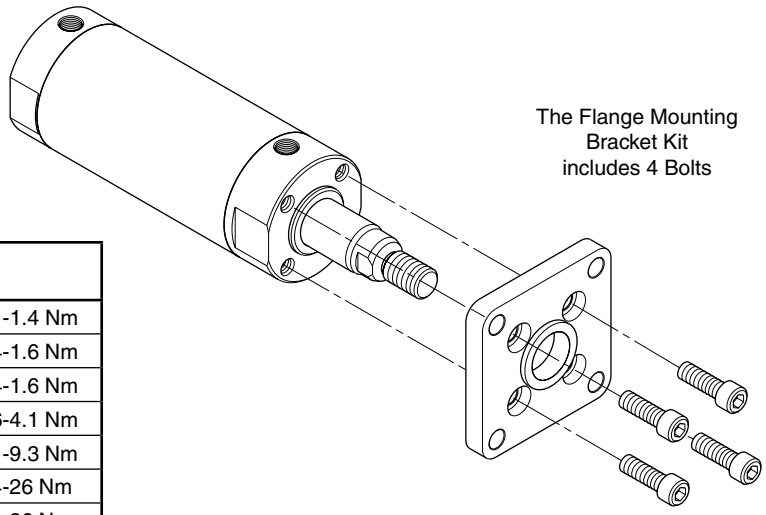
Part Number	Bore	ØB $^{+0}_{-0.02}$	F	FB	UF	TF	V
L077560020	20	12	6	5.5	40	28	2
L077560025	25	14	7	5.5	44	32	2
L077560032	32	18	7	7	53	38	2
L077560040	40	25	8	7	61	46	2
L077560050	50	30	9	9	76	58	2
L077560063	63	32	9	11	92	70	2
L077560080	80	40	11	11	104	82	3
L077560100	100	50	14	14	128	100	3

Imperial Dimensions (Inch)

Part Number	Bore	ØB $^{+0}_{-0.001}$	F	FB	UF	TF	V
L077450075	20	0.472	0.24	0.22	1.57	1.10	0.08
L077450100	25	0.551	0.28	0.22	1.73	1.26	0.08
L077450125	32	0.709	0.28	0.28	2.09	1.50	0.08
L077450150	40	0.984	0.31	0.28	2.40	1.81	0.08
L077450200	50	1.181	0.35	0.35	3.00	2.28	0.08
L077450250	63	1.260	0.35	0.43	3.62	2.76	0.08
L077450312	80	1.575	0.43	0.43	4.09	3.23	0.12
L077450400	100	1.968	0.55	0.55	5.04	3.94	0.12

Flange Mount Kit Installation Instructions

Insert the four (4) screws through the nose mount or the flange mounts and thread them into the cylinder head or cap until they are hand tight. Torque the screws to the values listed in the table below.

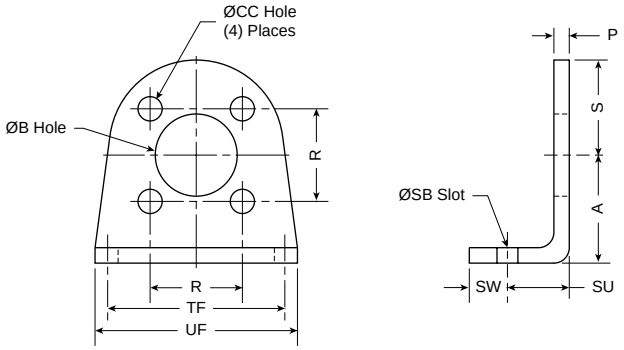


The Flange Mounting Bracket Kit includes 4 Bolts

Bore Size	Fastener Size		Torque	
20	8-32	M4x0.7	10-12 in-lbs	1.1-1.4 Nm
25	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
32	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
40	1/4-28	M6x1	32-36 in-lbs	3.6-4.1 Nm
50	5/16-24	M8x1.25	72-82 in-lbs	8.1-9.3 Nm
63	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
80	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
100	1/2-20	M12x1.75	40-44 ft-lbs	54-60 Nm

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Foot Mount Bracket



Metric Dimensions (mm)

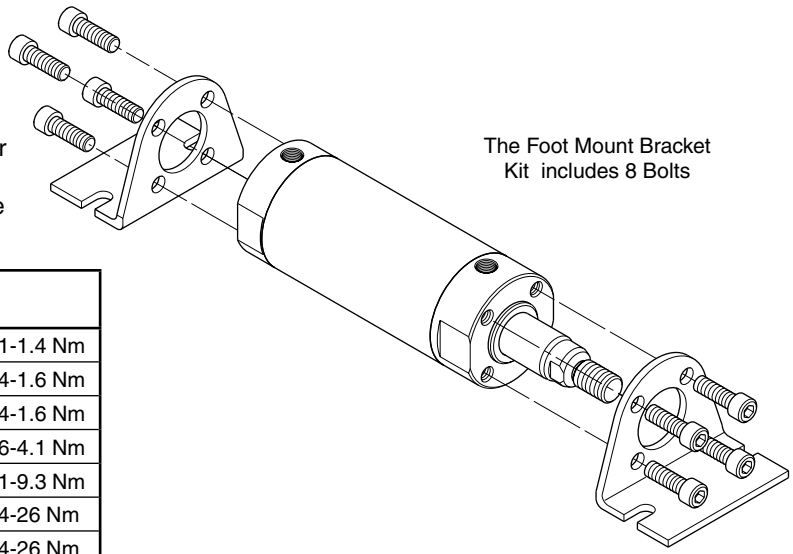
Part Number	Bore	A	ØB $^{+0.15}_{-0}$	ØCC	P	R	S	ØSB	SU	SW	TF	UF
L077550020	20	20.6	12.2	5.00	3	14	16	7	14	11	38	48
L077550025	25	20.6	14.2	5.80	3	16.5	18	7	14	11	38	48
L077550032	32	25.4	18.2	5.80	3	20	21	7	19	19	48	63.5
L077550040	40	25.4	25.2	7.50	3	26	26	7	18	20	48	63.5
L077550050	50	38.1	30.2	9.00	6	32	34	9	25	16	57	79
L077550063	63	44.5	32.2	11.50	6	38	39	9	25	16	73	95
L077550080	80	55	40.2	11.50	6	50	46	11	28.5	14	100	125
L077550100	100	65	50.2	14.50	6	60	56	14	30	16	120	150

Imperial Dimensions (inch)

Part Number	Bore	A	ØB $^{+0.006}_{-0}$	ØCC	P	R	S	ØSB	SU	SW	TF	UF
L077440075	20	0.81	0.480	0.20	0.12	0.55	0.63	0.27	0.56	0.44	1.50	1.88
L077440100	25	0.81	0.559	0.23	0.12	0.65	0.71	0.27	0.56	0.44	1.50	1.88
L077440125	32	1.00	0.717	0.23	0.12	0.79	0.83	0.28	0.75	0.75	1.88	2.50
L077440150	40	1.00	0.992	0.30	0.12	1.02	1.02	0.28	0.72	0.78	1.88	2.50
L077440200	50	1.50	1.189	0.35	0.25	1.26	1.34	0.34	1.00	0.62	2.24	3.12
L077440250	63	1.75	1.268	0.45	0.25	1.50	1.54	0.34	1.00	0.62	2.88	3.75
L077440312	80	2.17	1.583	0.45	0.25	1.97	1.81	0.43	1.12	0.55	3.94	4.92
L077440400	100	2.56	1.976	0.57	0.25	2.36	2.20	0.55	1.18	0.63	4.72	5.91

Foot Mount Kit
Assembly Instructions

Align each of the foot brackets with the port location as desired. Insert the four (4) screws through the foot mounts and thread them into the end caps until they are hand tight. Place the cylinder assembly on to a flat surface and torque the screws to the values listed in the table below. Make sure the foot mounts rest properly on a flat surface.



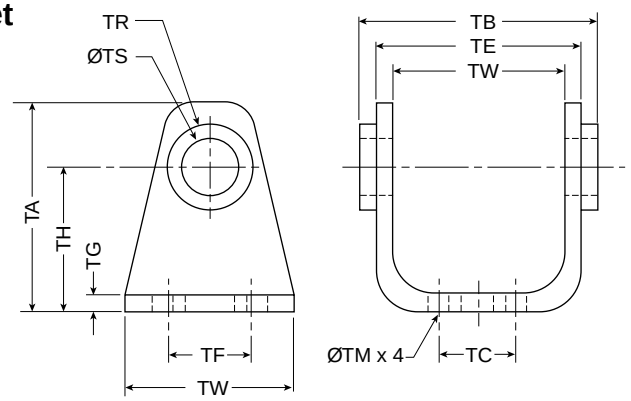
The Foot Mount Bracket Kit includes 8 Bolts

Bore Size	Fastener Size		Torque	
20	8-32	M4x0.7	10-12 in-lbs	1.1-1.4 Nm
25	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
32	10-32	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
40	1/4-28	M6x1	32-36 in-lbs	3.6-4.1 Nm
50	5/16-24	M8x1.25	72-82 in-lbs	8.1-9.3 Nm
63	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
80	3/8-24	M10x1.5	18-19 ft-lbs	24-26 Nm
100	1/2-20	M12x1.75	40-44 ft-lbs	54-60 Nm

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Trunnion Mount Bracket



D

Metric Dimensions (mm)

Part Number	Bore	TA	TB	TC	TD	TE	TF	TG	TH	TM	TR	TS H9	TW
L077510020	20	36	38	16	29	35	28	3	25	5.5	13	8	42
L077510025	25	43	42	20	33	39	28	3	30	5.5	15	10	42
L077510032	32	50	53.4	22	40	49	28	4.5	35	7	17	12	48
L077510040	40	58	64.4	30	49	58	30	4.5	40	7	21	14	56
L077510050	50	70	78.8	36	60	72	36	6	50	9	24	16	64
L077510063	63	82	96.6	46	74	90	46	8	60	11	26	18	74

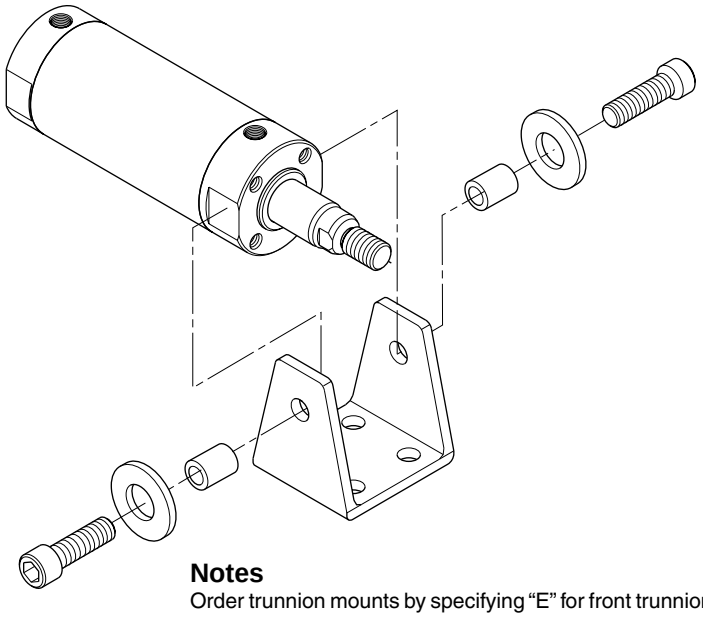
Imperial Dimensions (Inch)

Part Number	Bore	TA	TB	TC	TD	TE	TF	TG	TH	TM	TR	TS $^{+0.002}_{-0}$	TW
L077510020	20	1.42	1.50	0.63	1.14	1.39	1.10	0.12	0.98	0.22	0.51	0.315	1.66
L077510025	25	1.69	1.65	0.79	1.30	1.55	1.10	0.12	1.18	0.22	0.59	0.394	1.66
L077510032	32	1.97	2.10	0.87	1.57	1.93	1.10	0.18	1.38	0.28	0.67	0.472	1.88
L077510040	40	2.28	2.53	1.18	1.93	2.28	1.18	0.18	1.57	0.28	0.83	0.551	2.20
L077510050	50	2.76	3.10	1.42	2.36	2.83	1.42	0.25	1.97	0.35	0.94	0.630	2.52
L077510063	63	3.23	3.80	1.81	2.91	3.54	1.81	0.31	2.36	0.43	1.02	0.709	2.91

Trunnion Mount Assembly Instructions

Align the bracket on the machine member providing cylinder rotation as desired. Securely mount the bracket to the machine member. Align the cylinder head or cap with the bracket. Insert the bearing, washer and pivot bolt on to each side of the cylinder as shown. Torque the pivot bolts to the values listed in the table below. Use only bolts provided, as they have a special adhesive coating for secure fastening.

Bore Size	Trunnion Pivot Bolt	Torque	
20	M5x0.8	12-14 in-lbs	1.4-1.6 Nm
25	M6x0.75	32-36 in-lbs	3.6-4.1 Nm
32	M8x1	72-82 in-lbs	8.1-9.3 Nm
40	M10x1.25	18-19 ft-lbs	24-26 Nm
50	M12x1.25	40-44 ft-lbs	54-60 Nm
63	M14x1.5	70-74 ft-lbs	95-100 Nm



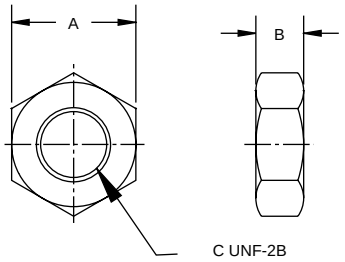
Notes

Order trunnion mounts by specifying “E” for front trunnion or “D” for rear trunnion in the “Mounting Style” digit of the model code. The bearings, washers and pivot bolts will be supplied with the cylinder. The trunnion bracket must be ordered as a separate item, using the part numbers shown above.

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Rod Jam Nut



Rod Jam Nut should be ordered separately on all mounting styles

Rod Jam Nut Dimensions

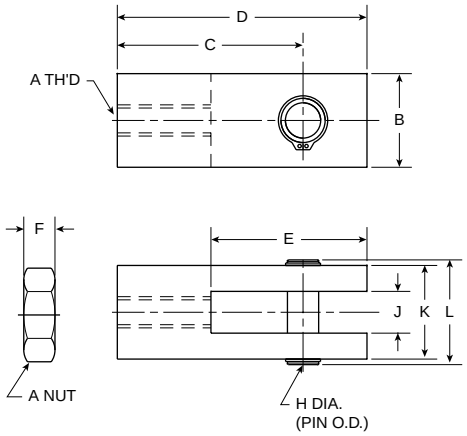
Metric Dimensions (mm)

Part Number	Bore	A	B	C
L075540008	20	13	4	M8 x 1.25
L075540010	25-32	17	5	M10 x 1.25
L075540014	40	22	7	M14 x 1.5
L075540018	50-63	27	8	M18 x 1.5
L075540022	80	32	11	M22 x 1.5
L075540026	100	41	16	M26 x 1.5

Imperial Dimensions (inch)

Part Number	Bore	A	B	C
L077970025	20	0.44	0.16	1/4-28
L077970031	25	0.50	0.19	5/16-24
L077970044	32-40	0.69	0.25	7/16-20
L077970050	50-63	0.75	0.31	1/2-20
L077970075	80	1.12	0.42	3/4 -16
L077970100	100	1.50	0.55	1-14

Piston Rod Clevis



Piston Rod Clevis Dimensions

Metric Dimensions (mm)

Part Number	Bore	A	B	C	D	E	F	H h9	J	K	L
L077590020	20	M8x1.25	13	24	30	18	4	6.35	6.5	13	17.5
L077590025	25	M10x1.25	19	24	30	18	5	6.35	6.5	19	24.5
L077590032	32	M10x1.25	19	34	43	24	5	9.52	10	19	26
L077590040	40	M14x1.5	19	34	43	24	7	9.52	10	19	26
L077590050	50	M18x1.5	28	34	43	24	8	9.52	10	28	36
L077590050	63	M18x1.5	28	34	43	24	8	9.52	10	28	36
PIM-4PRC	80	M22x1.5	38	50	71	48	11	18	28	56	64
L077590100	100	M26x1.5	44	55	79	55	16	22	32	63.5	72

Imperial Dimensions (inch)

Part Number	Bore	A	B	C	D	E	F	H +0 -0.002	J	K	L
L077960025	20	1/4-28	0.50	0.94	1.19	0.69	0.16	0.250	0.26	0.50	0.69
L077960031	25	5/16-24	0.50	0.94	1.19	0.69	0.19	0.250	0.26	0.50	0.69
L077960044	32	7/16-20	0.75	1.32	1.69	0.94	0.25	0.375	0.38	0.75	1.03
L077960044	40	7/16-20	0.75	1.32	1.69	0.94	0.25	0.375	0.38	0.75	1.03
L077960050	50	1/2-20	0.75	1.32	1.69	0.94	0.31	0.375	0.38	0.75	1.03
L077960050	63	1/2-20	0.75	1.32	1.69	0.94	0.31	0.375	0.38	0.75	1.03
L077960075	80	3/4-16	1.25	1.81	2.38	1.31	0.42	0.437	0.52	1.25	1.66
L077960100	100	1-14	1.50	2.63	3.38	1.81	0.55	0.500	0.64	1.50	1.91

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How to Order P1L Mounting Kits as a Separate Item

Bore Size	Foot Mounting		Flange	
	Inch	Metric	Inch	Metric
20	L077440075	L077550020	L077450075	L077560020
25	L077440100	L077550025	L077450100	L077560025
32	L077440125	L077550032	L077450125	L077560032
40	L077440150	L077550040	L077450150	L077560040
50	L077440200	L077550050	L077450200	L077560050
63	L077440250	L077550063	L077450250	L077560063
80	L077440312	L077550080	L077450312	L077560080
100	L077440400	L077550100	L077450400	L077560100

Bore Size	Single Clevis		Double Clevis		Single Clevis Pin	Double Clevis Pin
	Inch	Metric	Inch	Metric		
20	L077470075	L077570020	L077480075	L077580020	L077490075	L077500020
25	L077470100	L077570025	L077480100	L077580025	L077490075	L077500025
32	L077470125	L077570032	L077480125	L077580032	L077490125	L077500032
40	L077470150	L077570040	L077480150	L077580040	L077490150	L077500040
50	L077470200	L077570050	L077480200	L077580050	L077490200	L077500050
63	L077470250	L077570063	L077480250	L077580063	L077490200	L077500063
80	L077470312	L077570080	L077480312	L077580080	L077490312	L077500080
100	L077470400	L077570100	L077480400	L077580100	L077490400	L077500100

Notes :
- "Inch" mounting kits include inch threaded bolts, while "Metric" mounting kits include metric threaded bolts. Please verify that the kit style matches the cylinder Construction type (code "N" or "M") for which it is intended.
- Clevis pins may be used for either Inch or Metric mounting kits.

Mounting Brackets and Rod End Accessories

Bore Size	Trunnion/ Double Clevis Bracket	Single Clevis Bracket	Piston Rod Clevis		Rod Jam Nut	
			Inch	Metric	Inch	Metric
20	L077510020	L077520075	L077960025	L077590020	L077970025	L075540008
25	L077510025	L077520075	L077960031	L077590025	L077970031	L075540010
32	L077510032	L077520125	L077960044	L077590032	L077970044	L075540010
40	L077510040	L077520150	L077960044	L077590040	L077970044	L075540014
50	L077510050	L077520200	L077960050	L077590050	L077970050	L075540018
63	L077510063	L077520250	L077960050	L077590050	L077970050	L075540018
80	L077510080	L077520312	L077960075	PIM-4PRC	L077970075	L075540022
100	L077510100	L077520400	L077960100	L077590100	L077970100	L075540026

Service Kits

Bore Size	Single Rod Cylinder Repair Kits		Double Rod Cylinder Repair Kits	
	Consisting of: 1 ea. Symbol #5, 7, 12, & 2 ea. Symbol #1, 8 11, 14		Consisting of: 1 ea. Symbol #5, 7, & 2 ea. Symbol #1, 8 11, 12, 14	
	Class 1 Seals, Std. Service	Class 5 Seals, High Temp.	Class 1 Seals, Std. Service	Class 5 Seals, High Temp.
mm	**Part No.**	**Part No.**	**Part No.**	**Part No.**
20	P1L020D001	P1L020D005	P1L020K001	P1L020K005
25	P1L025D001	P1L025D005	P1L025K001	P1L025K005
32	P1L032D001	P1L032D005	P1L032K001	P1L032K005
40	P1L040D001	P1L040D005	P1L040K001	P1L040K005
50	P1L050D001	P1L050D005	P1L050K001	P1L050K005
63	P1L063D001	P1L063D005	P1L063K001	P1L063K005
80	P1L080D001	P1L080D005	P1L080K001	P1L080K005
100	P1L100D001	P1L100D005	P1L100K001	P1L100K005

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P Series

Round Aluminum Air Cylinders

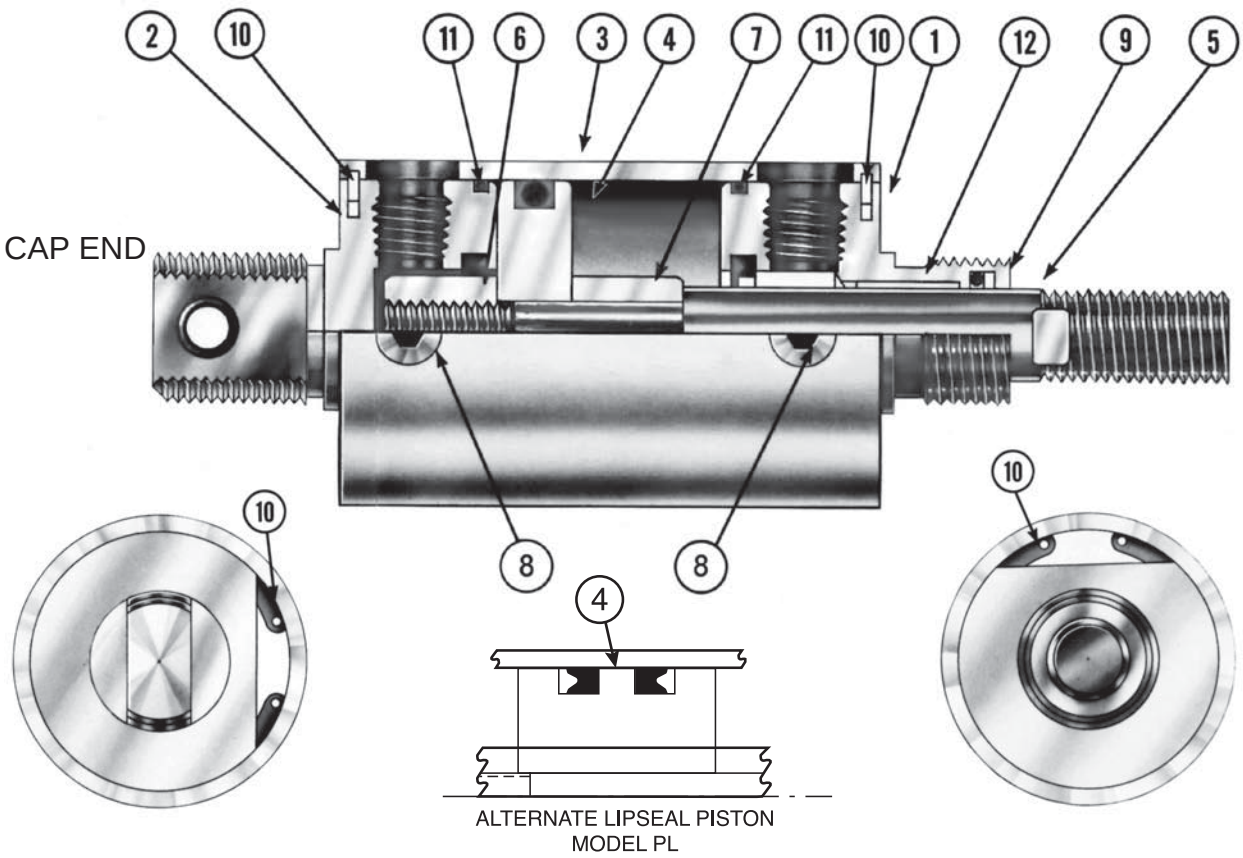


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D

Features

①② **Heads and Caps** are lightweight aluminum for maximum corrosion resistance. The cap is provided with a steel pivot bushing.

③ **Cylinder Body** is hard anodized aluminum for corrosion and abrasion resistance. The smooth I.D. finish provides long seal life.

④ **The Piston** is available with either O-Ring or Lipseal® design.

⑤ **Piston Rod** is chrome plated steel.* The piston is secured to the rod with anaerobic adhesive. Full diameter threads are provided for maximum strength. Wrench flats are standard.

⑥⑦ **Adjustable Cushions** are available on 2" thru 4" bore sizes, while fixed cushions are available on 1-1/8" and 1-1/2" bore sizes.

⑧ **The Cushion Adjustment Needle** is recessed and retained for precise, safe adjustment on all adjustable cushions.

⑨ The wear-compensating **Rod Seal** design conforms to pressure variations and provides maximum seal life.

⑩ **High Strength Steel Retaining Snap Ring** (210,000 PSI ultimate) is precision made to securely lock the head and cap in place. Easily removed for quick disassembly.

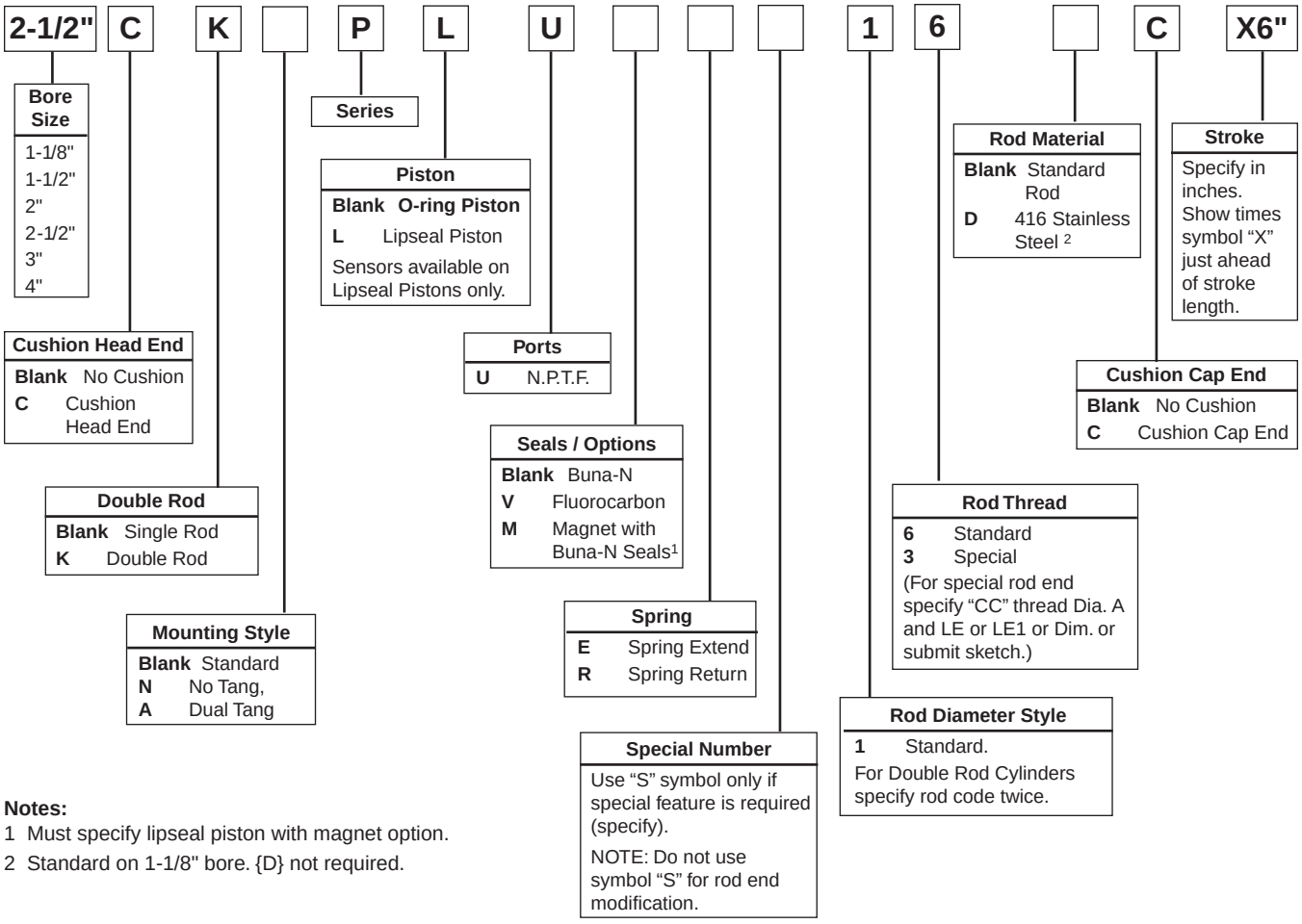
⑪ **O-Ring Static Tube Seal** is standard for positive no-leak sealing.

⑫ **Rod Bearing** is low friction bronze for high performance and longer wear.

* 1-1/8" bore has standard 416 stainless steel piston rod material.

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Notes:
1 Must specify lipseal piston with magnet option.
2 Standard on 1-1/8" bore. {D} not required.

How to Order P Series Cylinders

When ordering P Series cylinders, specify each of the following:

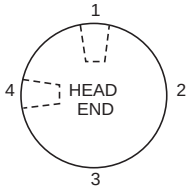
1) Bore size.
2) Basic model number (see chart above).
3) Piston style O-ring or Lipseal.
4) Cushions (if required), specify head end, cap end, or both ends.
5) Spring return (if required).
6) Mounting accessories.
7) Special modifications (if required).

P Series Model Numbers

Each P Series cylinder can be specified by use of symbol numbers. To develop a model number from the chart above select only those symbols that represent the cylinder features desired, and place them in the sequence indicated by the example at the top of the chart.

The example shown is a 2-1/2" bore, cushion head end, double rod cylinder, P SERIES, with Lipseal Piston, standard diameter rod and threads, cushion cap end – 6" stroke. (A 2" bore cylinder with O-Ring piston, no cushions, standard seals and standard rod bearing, 4" stroke would be indicated as **2PU16 4.**)

Safety Cushion Adjustment Location



With port in position 1, cushion location will be position 4.

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Standard Specifications

- Nominal Pressure – up to 150 PSI air
- Repairable Design
- Bore Sizes: 1-1/8", 1-1/2", 2", 2-1/2", 3" and 4"
- Double-Acting, Spring-Return and Spring-Extend Models
- Cushions optional at either or both ends
- Universal Nose and Tang Mounts
- Factory Pre-lubricated
- Standard Temperature Range: -10°F to +165°F. Fluorocarbon Seals for operation up to 250°F are available at extra cost.
- Standard Stroke Lengths to 20 inches in one inch increments, plus 1-1/2", 2-1/2" and 3-1/2" strokes. Fraction strokes and strokes over 20 inches are available upon request.

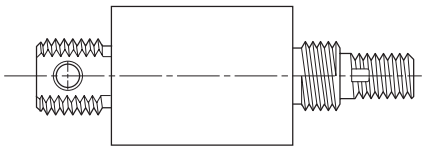
⚠ DANGER

The piston to rod threaded connection is secured with an anaerobic adhesive which is temperature sensitive. Operating cylinders in excess of the following recommendations can cause the piston and piston rod assembly to unthread. Cylinders ordered with standard seals (Buna-N) are assembled with an anaerobic adhesive with a maximum operating temperature rating of +165°F. Cylinders ordered with Fluorocarbon seals are assembled with an anaerobic adhesive with a maximum operating temperature rating of +250°F.

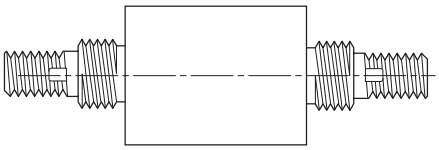
Cylinders originally manufactured with standard seals (Buna-N) that will be exposed to an ambient temperature above +165°F must be modified for higher temperature service. Contact your local factory immediately and arrange for the piston to piston rod connection to be properly modified for the higher temperature service.

D

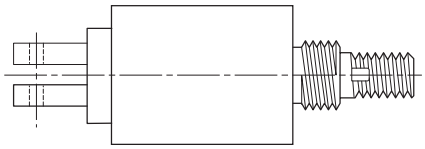
Mounting Styles Available



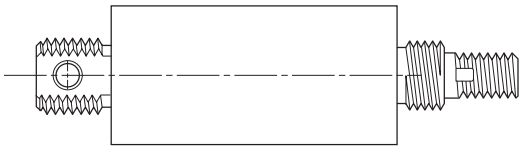
Model P – O-Ring Piston – Single Rod
1 1/8" Bore thru 3" Bore
Model PL – Lipseal Piston – Single Rod
1 1/8" Bore thru 4" Bore



Model KP – O-Ring Piston – Double Rod
1 1/8" Bore thru 3" Bore
Model KPL – Lipseal Piston – Double Rod
1 1/8" Bore thru 4" Bore



Model AP – O-Ring Piston – Single Rod
1 1/8" Bore thru 3" Bore
Model APL – Lipseal Piston – Single Rod
1 1/8" Bore thru 4" Bore



Model PR – O-Ring Piston – Spring Return
Model PE – O-Ring Piston – Spring Extend
1 1/8" Bore thru 3" Bore
Model PLR – Lipseal Piston – Spring Return
Model PLE – Lipseal Piston – Spring Extend
1 1/8" Bore thru 4" Bore

Force Data

(to determine force multiply operating pressure by area figures below)

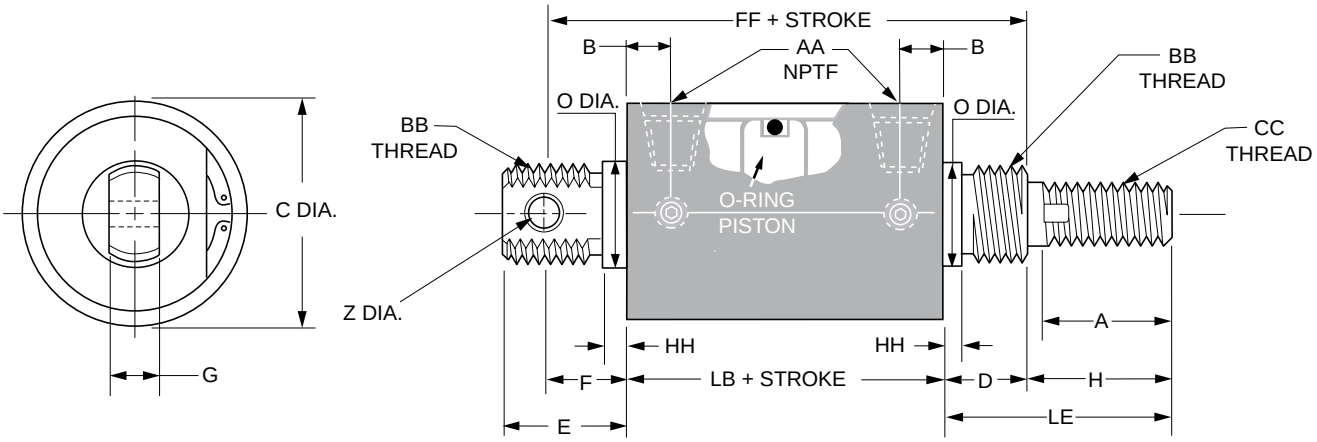
Bore Size	Rod Dia.	Major Area (sq. in.)	Minor Area (sq. in.)
1-1/8"	3/8"	0.992	0.882
1-1/2"	1/2"	1.766	1.570
2"	5/8"	3.141	2.835
2-1/2"	3/4"	4.906	4.464
3"	3/4"	7.065	6.623
4"	1"	12.560	11.775

Cylinder Cushion Lengths

Bore	Head	Cap
1-1/8"	0.560"	0.560"
1-1/2" & 2"	0.750"	0.750"
2-1/2" & 3"	0.875"	0.875"
4"	1.250"	1.250"

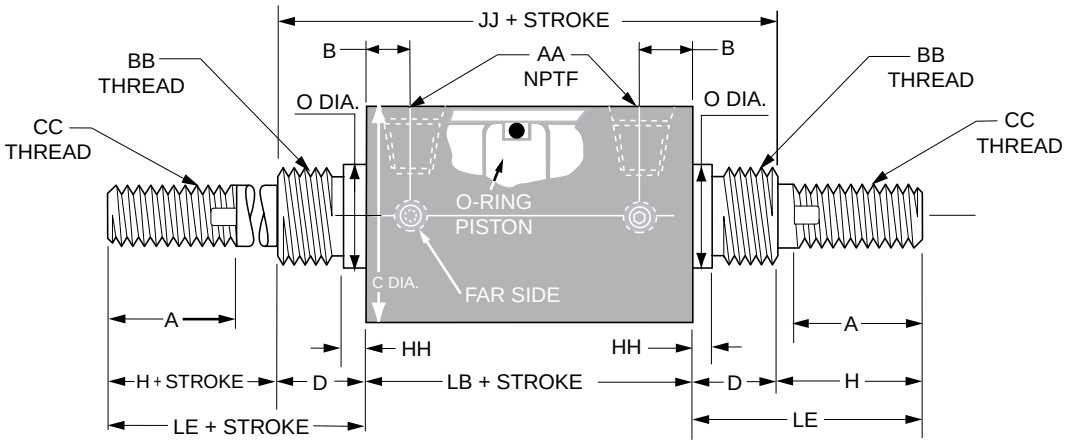
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Model P –
O-Ring Piston – Single Rod



Model P cylinders are available without tang covered by dimension E minus HH at no extra charge. To order specify Model NP.

Model KP –
O-Ring Piston – Double Rod



Mounting nuts not supplied with cylinder.

Dimensions – Model P and KP Single and Double Rod Cylinders

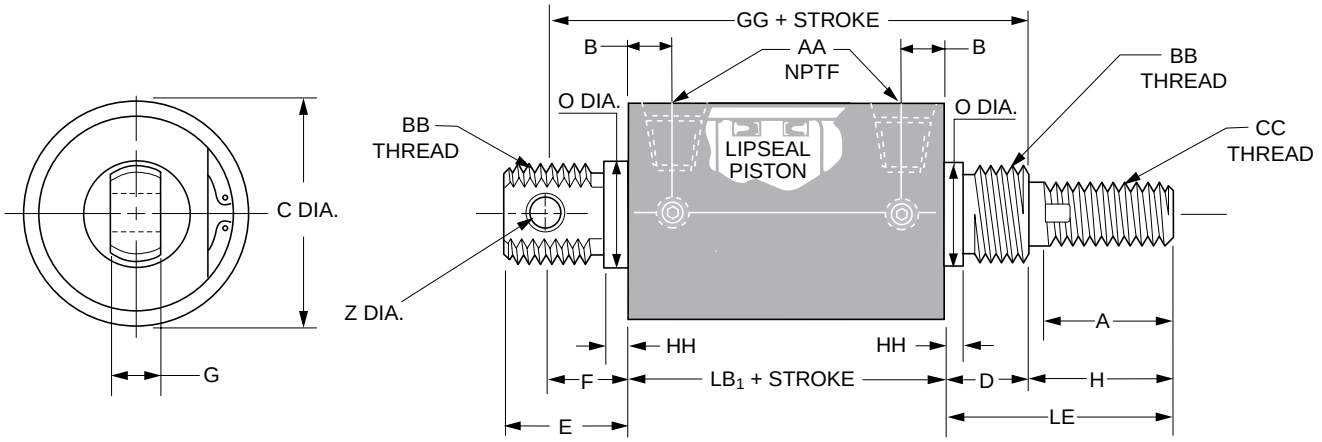
Bore Size	Rod Dia.	LB	B	C	D	E	F	G	H	A	O	Z	AA	BB	CC	FF	HH	JJ	LE
1-1/8	3/8	2-1/16	13/32	1-3/8	5/8	1	11/16	3/8	1	7/8	3/4	1/4	1/8	3/4-16	3/8-16	3-3/8	3/32	3-5/16	1-5/8
1-1/2	1/2	2-5/8	1/2	1-3/4	7/8	1-1/4	7/8	1/2	1-7/16	1-1/4	1-1/16	5/16	1/4	1-14	1/2-13	4-3/8	1/8	4-3/8	2-5/16
2	5/8	2-5/8	1/2	2-1/4	7/8	1-1/4	7/8	1/2	1-7/16	1-1/4	1-1/16	5/16	1/4	1-14	5/8-11	4-3/8	1/8	4-3/8	2-5/16
2-1/2	3/4	3	5/8	2-3/4	1	2	1-3/8	5/8	1-11/16	1-1/2	1-3/8	7/16	3/8	1-3/8-12	3/4-10	5-3/8	3/16	5	2-11/16
3	3/4	3	5/8	3-1/4	1	2	1-3/8	5/8	1-11/16	1-1/2	1-3/8	7/16	3/8	1-3/8-12	3/4-10	5-3/8	3/16	5	2-11/16

Note: 4" bore size offered only with Lipseal Piston.

FLUOROCARBON SEALS for operation to 250°F are available at extra cost. Specify model PV or KPV.

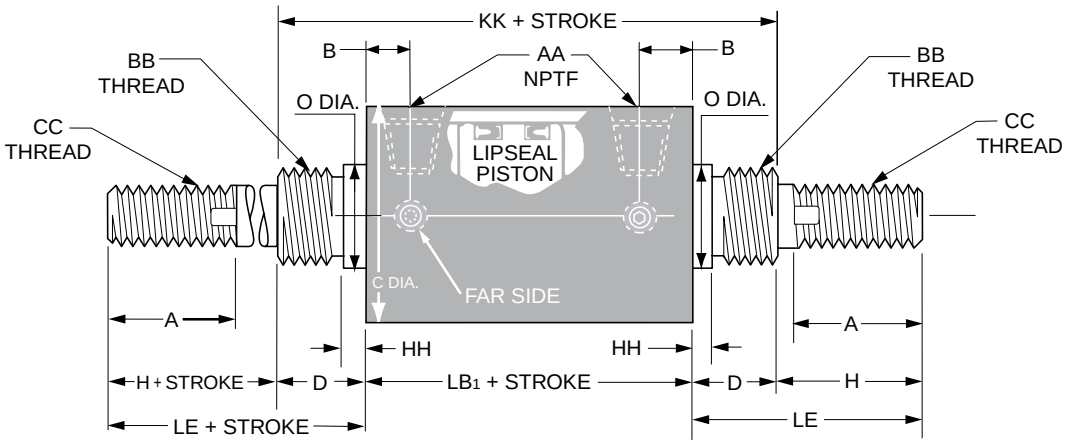
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Model PL –
Lipseal Piston – Single Rod



Model PL cylinders are available without tang covered by dimension E minus HH at no extra charge. To order specify Model NPL.

Model KPL –
Lipseal Piston – Double Rod



Mounting nuts not supplied with cylinder.

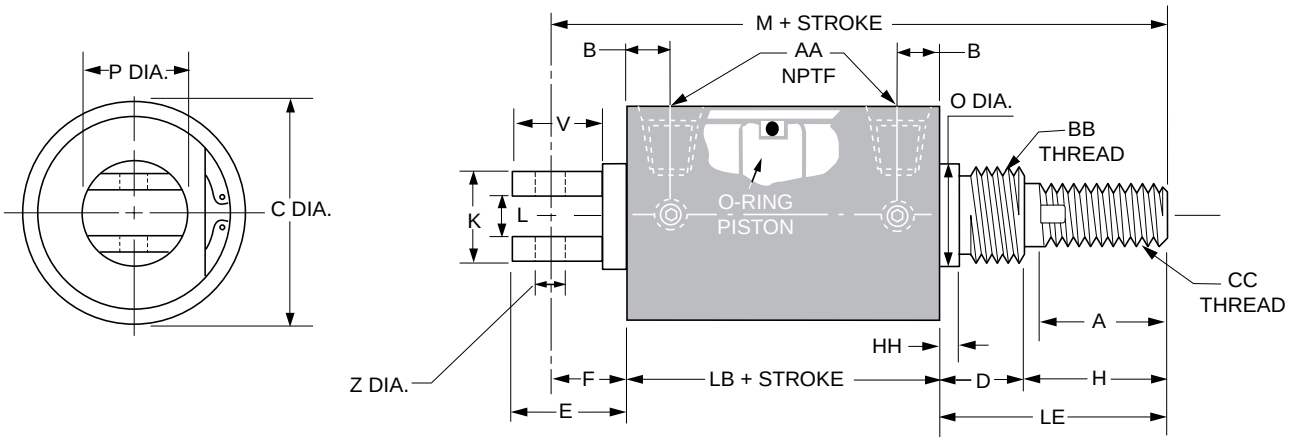
Dimensions – Model PL and KPL Single and Double Rod Cylinders

Bore Size	Rod Dia.	LB_1	B	C	D	E	F	G	H	A	O	Z	AA	BB	CC	GG	HH	KK	LE
1-1/8	3/8	3-1/16	13/32	1-3/8	5/8	1	11/16	3/8	1	7/8	3/4	1/4	1/8	3/4-16	3/8-16	4-3/8	3/32	4-5/16	1-5/8
1-1/2	1/2	3-5/8	1/2	1-3/4	7/8	1-1/4	7/8	1/2	1-7/16	1-1/4	1-1/16	5/16	1/4	1-14	1/2-13	5-3/8	1/8	5-3/8	2-5/16
2	5/8	3-5/8	1/2	2-1/4	7/8	1-1/4	7/8	1/2	1-7/16	1-1/4	1-1/16	5/16	1/4	1-14	5/8-11	5-3/8	1/8	4-3/8	2-5/16
2-1/2	3/4	4	5/8	2-3/4	1	2	1-3/8	5/8	1-11/16	1-1/2	1-3/8	7/16	3/8	1-3/8-12	3/4-10	6-3/8	3/16	6	2-11/16
3	3/4	4	5/8	3-1/4	1	2	1-3/8	5/8	1-11/16	1-1/2	1-3/8	7/16	3/8	1-3/8-12	3/4-10	6-3/8	3/16	6	2-11/16
4	1	5-1/2	15/16	4-3/8	1-1/8	2-3/16	1-7/16	3/4	2-1/4	1-7/8	1-3/4	1/2	1/2	1-3/4-12	1-14	8-1/16	3/16	7-1/4	3-3/8

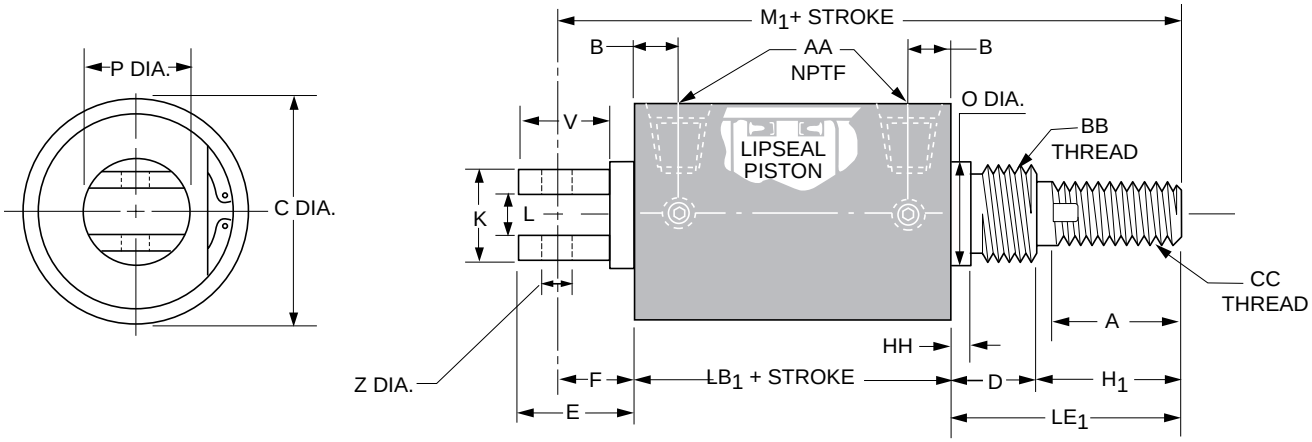
FLUOROCARBON SEALS for operation to 250°F are available at extra cost. Specify model PLV or KPLV.

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Model AP –
O-Ring Piston – Single Rod
1-1/8” Bore thru 3” Bore



Model APL –
Lipseal Piston – Single Rod
1-1/8” Bore thru 4” Bore



Mounting nuts not supplied with cylinder.

Dimensions – Models AP and APL only

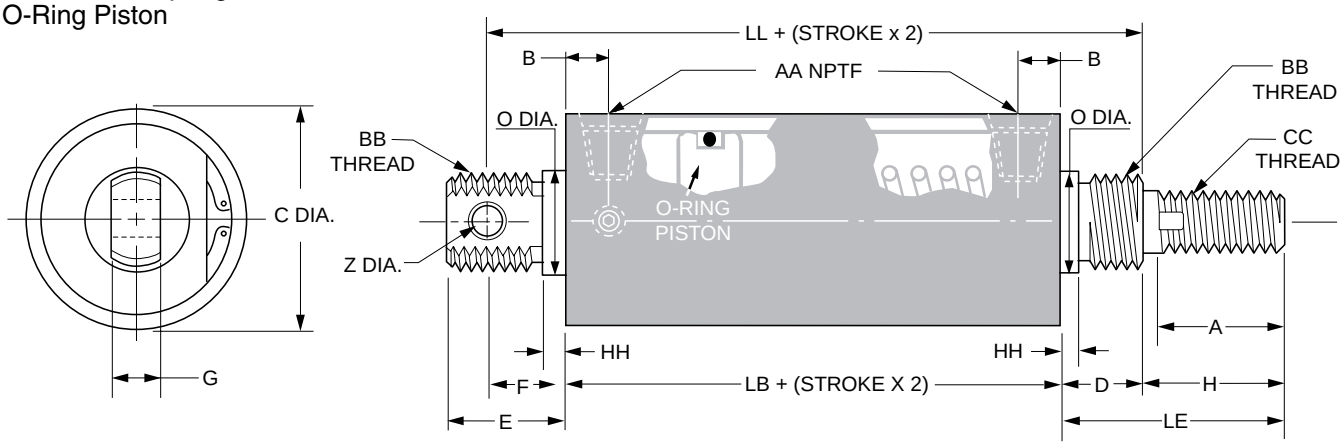
Bore Size	Rod Dia.	LB	LB1	B	C	D	E	F	H	H1	A	K	L	M	M1	O	P	V	Z	AA	BB	CC	HH	LE	LE1
1-1/8	3/8	2-1/16	3-1/16	13/32	1-3/8	5/8	1	11/16	1	1	7/8	15/16	3/8	4-3/8	5-3/8	3/4	15/16	7/8	3/8	1/8	3/4-16	3/8-16	3/32	1-5/8	1-5/8
1-1/2	1/2	2-5/8	3-5/8	1/2	1-3/4	7/8	1-5/8	15/16	2-7/16	1-7/16	1-1/4	1-1/4	1/2	6-7/8	6-7/8	1-1/16	1-1/4	1-1/2	3/8	1/4	1-14	1/2-13	1/8	3-5/16	2-5/16
2	5/8	2-5/8	3-5/8	1/2	2-1/4	7/8	2-1/4	1-9/16	2-7/16	1-7/16	1-1/4	1-1/2	1/2	7-1/2	7-1/2	1-1/16	1-11/16	1-3/4	1/2	1/4	1-14	5/8-11	1/8	3-5/16	2-5/16
2-1/2	3/4	3	4	5/8	2-3/4	1	1-13/16	1-1/8	3-11/16	2-11/16	1-1/2	1-1/2	1/2	8-13/16	8-13/16	1-3/8	2-1/4	1-11/16	1/2	3/8	1-3/8-12	3/4-10	3/16	4-11/16	3-11/16
3	3/4	3	4	5/8	3-1/4	1	2-5/16	1-5/8	3-11/16	2-11/16	1-1/2	1-1/2	1/2	9-5/16	9-5/16	1-3/8	2-1/4	1-3/4	1/2	3/8	1-3/8-12	3/4-10	3/16	4-11/16	3-11/16
4	1	–	5-1/2	15/16	4-3/8	1-1/8	2-7/8	1-7/8	–	2-1/4	1-7/8	2-1/4	3/4	–	10-3/4	1-3/4	3	2-1/2	3/4	1/2	1-3/4-12	1-14	3/16	–	3-3/8

FLUOROCARBON SEALS for operation to 250°F are available at extra cost. Specify model ASPV or ASPLV.

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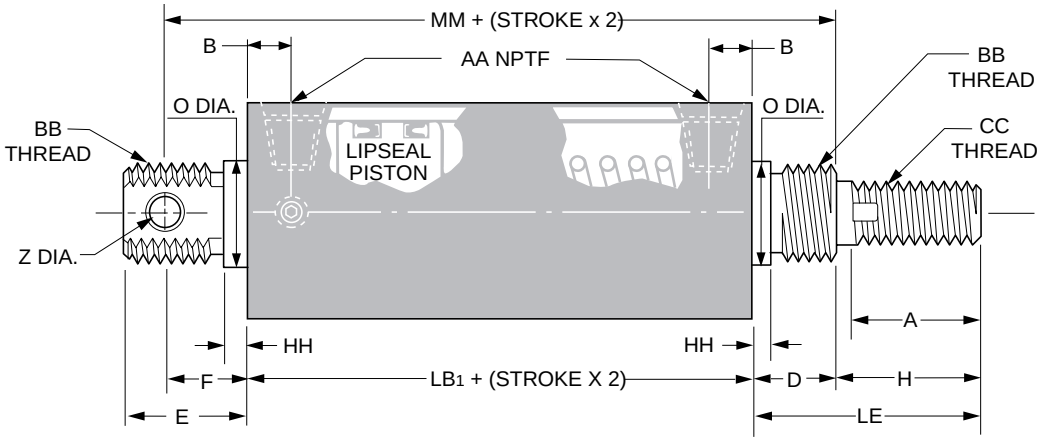
C086

Model PR – Spring Return
Model PE – Spring Extend
O-Ring Piston



Spring return cylinders are available without tail section covered by dimension E minus HH at no extra charge. To order, add letter "N" to model number.

Model PLR – Spring Return
Model PLE – Spring Extend
Lipseal Piston



Mounting nuts not supplied with cylinder.

Dimensions – For Single Rod Spring Return Cylinders up to 6" Stroke (no load spring)

																					Spring Force	
Bore Size	Rod Dia.	LB	LB_1	B	C	D	E	F	G	H	A	O	Z	AA	BB	CC	HH	LL	MM	LE	Pre-load (lbs.)	Max. Load (lbs.)
1-1/8	3/8	2-1/16	3-1/16	13/32	1-3/8	5/8	1	11/16	3/8	1	7/8	3/4	1/4	1/8	3/4-16	3/8-16	3/32	3-3/8	4-3/8	1-5/8	12	36
1-1/2	1/2	2-5/8	3-5/8	1/2	1-3/4	7/8	1-1/4	7/8	1/2	1-7/16	1-1/4	1-1/16	5/16	1/4	1-14	1/2-13	1/8	4-3/8	5-3/8	2-5/16	14	45
2	5/8	2-5/8	3-5/8	1/2	2-1/4	7-/8	1-1/4	7/8	1/2	1-7/16	1-1/4	1-1/16	5/16	1/4	1-14	5/8-11	1/8	4-3/8	5-3/8	2-5/16	18	48
2-1/2	3/4	3	4	5/8	2-3/4	1	2	1-3/8	5/8	1-11/16	1-1/2	1-3/8	7/16	3/8	1-3/8-12	3/4-10	3/16	5-3/8	6-3/8	2-11/16	30	64
3	3/4	3	4	5/8	31/4	1	2	1-3/8	5/8	1-11/16	1-1/2	1-3/8	7/16	3/8	1-3/8-12	3/4-10	3/16	5-3/8	6-3/8	2-11/16	30	64
4	1	▲	5-1/2	15/16	4-3/8	1-1/8	2-3/16	1-7/16	3/4	2-1/4	1-7/8	1-3/4	1/2	1/2	1-3/4-12	1-14	3/16	▲	8-1/16	3-3/8	50	148

▲ 4" bore spring return cylinders, available only with Lipseal Type Piston.

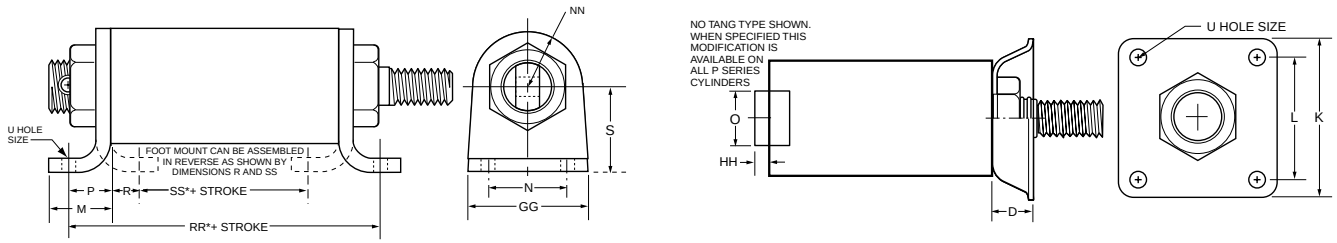
**Net Stroke plus Stop Tube = Gross Stroke.

FLUOROCARBON SEALS for operation to 250°F are available at extra cost. Specify model PVR, PVE, PLVR or PLVE.

*Dimensions shown are for cylinder with no load spring. For heavier springs or double rod spring return cylinders, consult factory.

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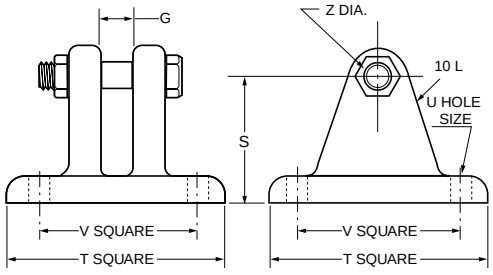
Foot and Flange Mounts



Foot Mount*	Flange Mount**	Bore Size	D	K	L	M	N	O	P	R	S	U	GG	HH	NN	RR	SS
L069190000	L069230000	1-1/8	5/8	2-1/2	2	1-3/8	1-11/16	3/4	7/8	5/8	1-9/32	9/32	2-11/16	3/32	11/16	3-13/16	13/16
L069200000	L069240000	1-1/2	7/8	3-1/4	2-1/2	1-9/32	1-5/8	1-1/16	7/8	9/16	1-3/4	9/32	2-7/16	1/8	1-1/8	4-3/8	1-1/2
L069200000	L069240000	2	7/8	3-1/4	2-1/2	1-9/32	1-5/8	1-1/16	7/8	9/16	1-3/4	9/32	2-7/16	1/8	1-1/8	4-3/8	1-1/2
L069210000	L069250000	2-1/2	1	4-1/2	3-3/8	1-29/32	2-1/4	1-3/8	1-1/4	7/8	2-3/8	13/32	3-9/16	3/16	1-5/8	5-1/2	1-1/4
L069210000	L069250000	3	1	4-1/2	3-3/8	1-29/32	2-1/4	1-3/8	1-1/4	7/8	2-3/8	13/32	3-9/16	3/16	1-5/8	5-1/2	1-1/4
L069220000	L069260000	4	1-1/8	5-1/4	4	2-17/32	3-1/4	1-3/4	1-3/4	1-5/16	3-3/16	15/32	4-13/16	3/16	2-3/16	9▲	2-7/8▲

▲Dimension shown is for Lipseal Piston Type.
*Part number includes one foot mounting and one mounting nut.
**Includes mounting nut.

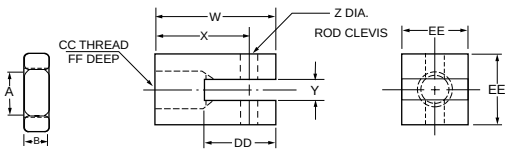
Clevis Bracket



Part Number	Cylinder Bore	G	S	T	U	V	Z
L06730 0000	1-1/8	3/8	1-9/32	2-1/4	9/32	1-3/4	1/4
L06731 0000	1-1/2	1/2	1-3/4	3	9/32	2-1/4	5/16
L06731 0000	2	1/2	1-3/4	3	9/32	2-1/4	5/16
L06732 0000	2-1/2	5/8	2-3/8	4	13/32	3	7/16
L06732 0000	3	5/8	2-3/8	4	13/32	3	7/16
L06733 0000	4	3/4	3-3/16	5	15/32	3-3/4	1/2

Connecting Pin and Locknut furnished with Clevis Bracket.

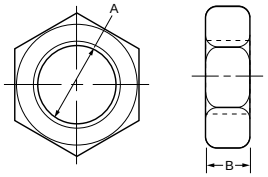
Rod Clevis



Part Number	Cyl. Bore	Rod Dia.	A	B	CC	DD	EE	FF	W	X	Y	Z
L06734 0000	1-1/8	3/8	3/8-16	7/32	3/8-16	1-1/8	3/4	5/8	1-3/4	1-3/8	5/16	1/4
L06735 0000	1-1/2	1/2	1/2-13	5/16	1/2-13	1-5/16	1	15/16	2-1/4	1-3/4	3/8	5/16
L06736 0000	2	5/8	5/8-11	3/8	5/8-11	1-5/16	1	15/16	2-1/4	1-3/4	3/8	5/16
L06737 0000	2-1/2	3/4	3/4-10	27/64	3/4-10	1-5/16	1-1/4	1-1/16	2-3/8	1-13/16	1/2	7/16
L06737 0000	3	3/4	3/4-10	27/64	3/4-10	1-5/16	1-1/4	1-1/16	2-3/8	1-13/16	1/2	7/16
L06738 0000	4	1	1-14	35/64	1-14	1-13/16	1-1/2	1-9/16	3-3/8	2-5/8	5/8	1/2

Note: Rod End Jam Nut furnished with Rod Clevis.

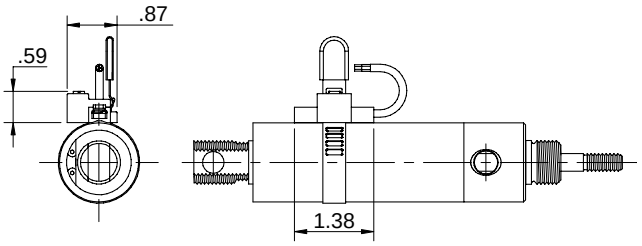
Mounting Nut for Cylinders**



Bore	Part Number	A	B
1-1/8	083301 0048	3/4-16	27/64
1-1/2 & 2	083301 0100	1-14	35/64
2-1/2 & 3	083301 0124	1-3/8-12	25/32
4	083183 0000	1-3/4-12	15/16

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P Series Sensors



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Bore	Piston Travel at Mid Stroke* (Sensor Activated)
1-1/8"	0.33
1-1/2"	0.37
2"	0.49
2-1/2"	0.44
3"	0.40
4"	0.33

* Sensing distance at “End of Stroke” can be adjusted from ‘mid-stroke’ sensing distance to zero. For sensor specifications and part numbers, see Electronic Sensors section.

†Piston travel ±.01".

D

How To Order P Series Sensors

P Series sensors are not mounted to the cylinder prior to shipment. When ordering a cylinder to accommodate a P Series sensor:

1. Derive a proper cylinder number as shown on the Ordering Information page.
2. Place an “S” in the Special column.
3. Place an “L” in the Piston column.
4. Underneath the model number specify:
   1) Cylinder prepared for sensor.
5. As a **separate** item specify the number of sensors required.*
6. As a **third** item specify the quantity of the proper clamp assembly.*

* For information regarding sensors, please refer to the Electronic Sensors section.

Example: To order a 1-1/2" x 6" cylinder with P Series sensors to sense the end of stroke at both head and cap end.

Item	Qty.	Description
A	(1)	**1 1/2 P L U S 16 6** (1) Cylinder prepared for sensor
B	(2)	P8S-GPSHX Sensor
C	(2)	P8S-TMC02 Clamp Assembly

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Table A		
Seal Kit for Series "P" Cylinders with O-Ring Piston Contains: 2 each Symbol #15 & 1 each Symbol #16, 24 & 25		
Bore Size	**Standard Seal Kit Part Number**	**Hi - Temp Seal Kit Part Number**
1-1/8"	L067680000	L067730000
1-1/2"	L067690000	L067740000
2"	L067700000	L067750000
2-1/2"	L067710000	L067760000
3"	L067720000	L067770000

Table B		
Seal Kit for Series "P" Cylinders with Lipseal Piston Contains: 2 each Symbol #15 & 23 & 1 each Symbol #24 & 25		
Bore Size	**Standard Seal Kit Part Number**	**Hi - Temp Seal Kit Part Number**
1-1/8"	L067780000	L067840000
1-1/2"	L067790000	L067850000
2"	L067800000	L067860000
2-1/2"	L067810000	L067870000
3"	L067820000	L067880000
4"	L067830000	L067890000

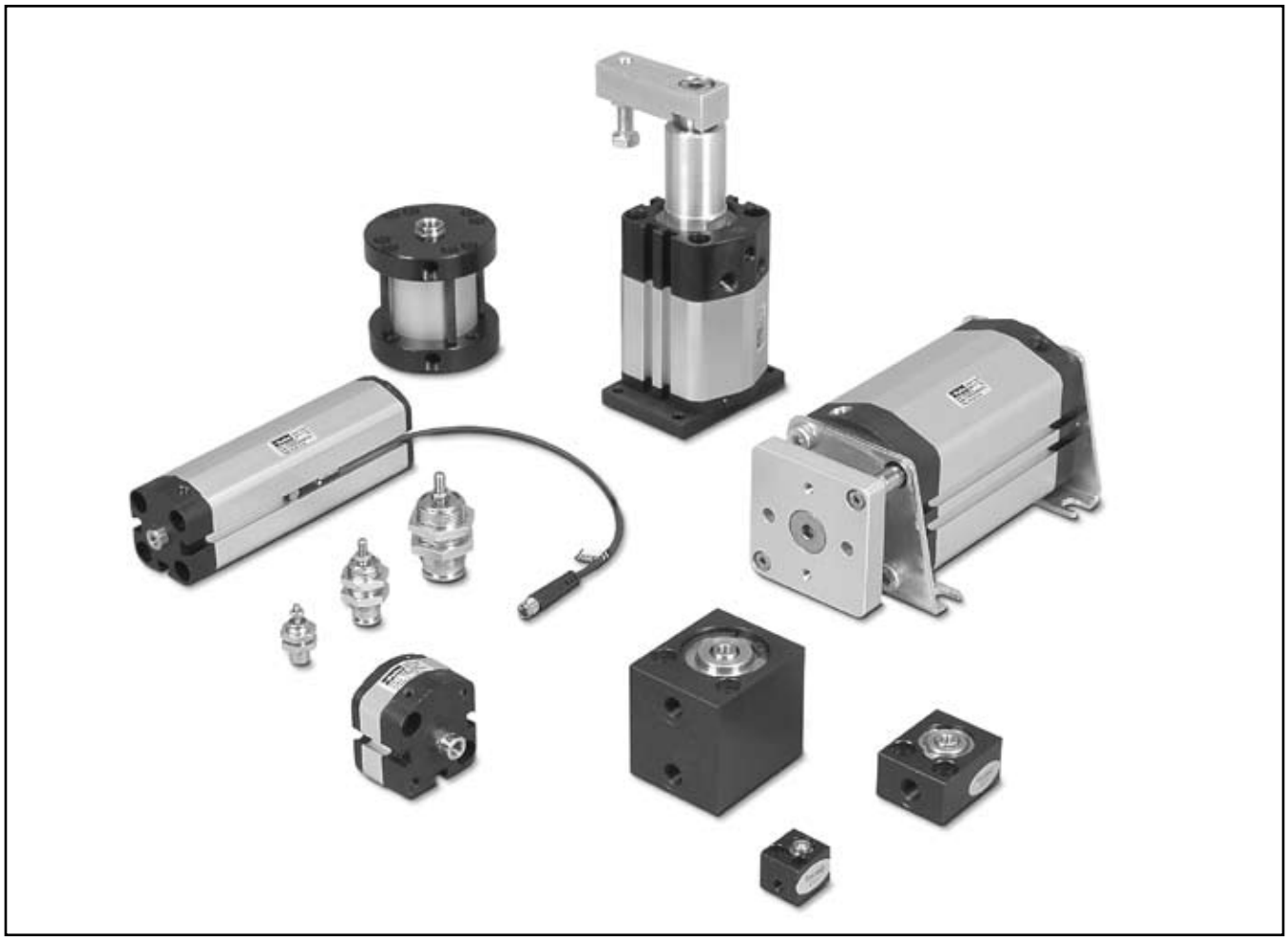
Table C		
Cushion Seal Kit for Series "P Cylinders Contains: 2 each Symbol #19 & 21 (Symbol #21 not required or supplied for 1 1/8" & 1 1/2" bore size cylinders)		
Bore Size	**Standard Seal Kit Part Number**	**Hi - Temp Seal Kit Part Number**
1-1/8"	L067900000	L067950000
1-1/2"	L067910000	L067960000
2"	L067920000	L067970000
2-1/2"	L067930000	L067980000
3"	L067930000	L067980000
4"	L067940000	L067990000

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Compact Pneumatic Cylinders

Section E



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Section E – Compact Pneumatic Cylinders

P1M Series

- 10 Bore Sizes: 12mm through 100mm
- Short Overall Length
- Smooth Extruded Exterior
- Flexible Porting
- Piston Position Sensing

P1M Series with Tooling Plate

- 32, 40 and 50 mm Bore Sizes
- Short Overall Length
- Flexible Porting
- Industry Interchangeable
- Non-Rotating Capability

P1M Series Swing Clamp

- 32, 40 and 50 mm Bore Sizes
- Short Overall Length
- 90° Clamping Rotation
- Right Hand or Left Hand Rotation
- Flexible Porting

LP / LPM Series

- Low Profile Design
- 6 Mounting Styles
- 8 Bore Sizes from 9/16" to 4"
- Strokes from 1/8" to 6"
- Permanent Lubrication

C05 Series

- 6 Bore Sizes – 8mm though 63mm
- Short Stroke Cylinder
- Block Style Mount
- Single and Double Acting Available

P1G Series

- 6, 10, and 16mm Bore Sizes
- 5, 10, and 15mm Stroke Lengths
- Cartridge Style Mount
- Single Acting, Non-Lube Design
- Nickel Plated Brass Body with Stainless Steel Rod for Corrosion

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P1M Series

Extra Low Profile Pneumatic Cylinder

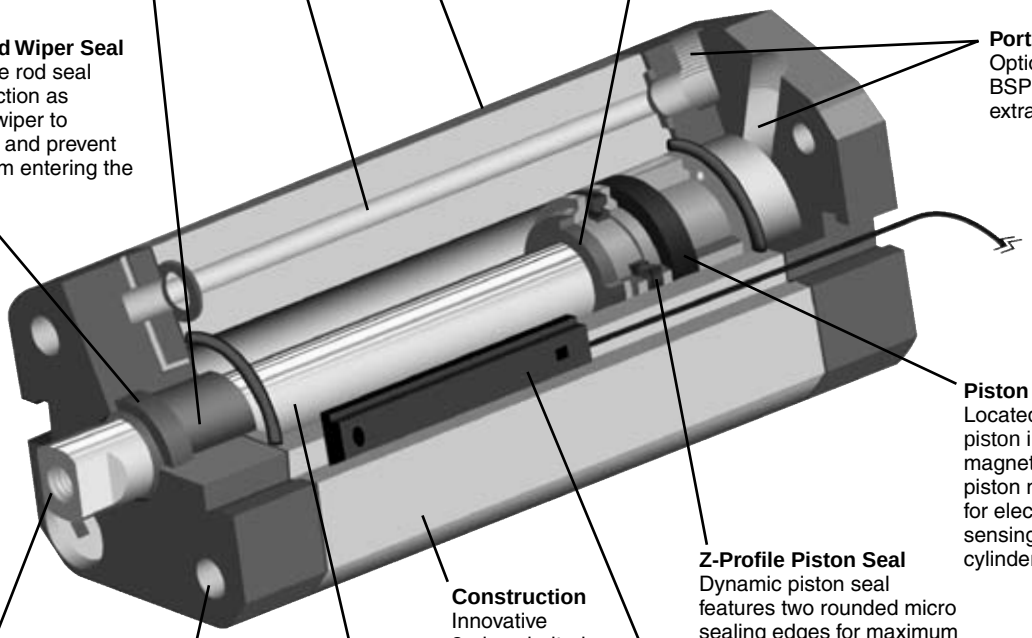


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Double Rod Style Dimensions E16-E17
Rod End Accessories E18-E19
Service Kits E20

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Unique Internal Transfer Tube
Provides a passage that can be used for remote porting.

Bumpers
Optional bumpers provide noise reduction and impact resistance. Urethane for 12-25mm bore sizes, Hytrel® for 32-100mm bore sizes.

Cylinder Body
Smooth anodized aluminum exterior provides wear-resistant surface.

High Strength Rod Bearing
Multilayer PTFE with steel backing.

Rounded Lip Rod Wiper Seal
Non-lube urethane rod seal provides dual function as rod seal and rod wiper to eliminate leakage and prevent contamination from entering the cylinder.

Ports
Optional NPTF or BSPP ports at no extra charge.

Piston Magnet
Located behind the piston in a separate magnet carrier, the piston magnet is used for electronic piston sensing. (Increases cylinder body length.)

Z-Profile Piston Seal
Dynamic piston seal features two rounded micro sealing edges for maximum wear compensation and rounded grooves for retaining lubrication.

Construction
Innovative 3-piece bolted design.

Rod Ends
Four standard piston rod ends to meet a variety of requirements.

Mounting Holes
Counter bored tapped or through holes for mounting.

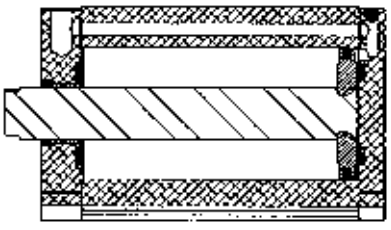
Piston Rod
Stainless steel or hard chrome plated carbon steel piston rods (stainless steel standard on 25mm bore and under).

Sensors
Recessed, flush position sensors available in PNP, NPN or REED styles.

Hytrel® is a registered trademark of DuPont.

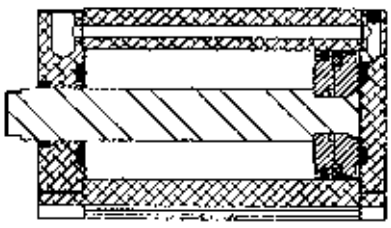
Extra Low Profile Version

The Extra Low Profile Bearing Version allows us to provide the most compact cylinder possible. This bearing version is recommended for applications that require shorter stroke lengths or that are light duty. It is available in stroke lengths up to 50mm in the smaller bore sizes and 150 mm in the larger bore sizes.



Long Bearing Version

The Long Bearing Version provides additional rod bearing and piston bearing support and also includes a magnetic piston with bearing strip for greater piston bearing support. This Long Bearing version is required for stroke lengths beyond the Extra Low Profile maximum stroke length and is recommended for higher duty applications.



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C086

How to Order P1M Series Cylinders

P1M	032	C	/	D	C	P	6	G	012

Bore Size

012	12mm
016	16mm
020	20mm
025	25mm
032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm

Cylinder Style

C	Basic No Mtgs.
A	Double Rear Clevis [1,3]
B	Single Rear Clevis [1,3]
F	Foot Mount [1,4]
J	Front Flange [1]
H	Rear Flange [1, 3]

Insert "**/**" to denote Special

Function

D	Double Acting
K	Double Rod
R	Single Acting Spring Return [6]
E	Single Acting Spring Extend [4]

Piston/Seal Material

Without Magnet [2]

C	No Bumpers Class 1 Std. Temp. Seals
G	No Bumpers Class 5 Fluorocarbon Seals
B	With Bumpers Class 1 Std. Temp. Seals [7]

With Magnet [5]
(Not available on Spring Extend Models)

N	No Bumpers Class 1 Std. Temp. Seals
M	With Bumpers Class 1 Std. Temp. Seals [7]

Piston Rod & Bearings

Extra Low Profile Rod Bearing

P	Chrome Plated Steel Rod Not Available on 12-25mm Bores
Y	Stainless Steel Rod Standard on 12-25mm Bores and Spring Extend Models

Long Rod Bearing [2]

C	Chrome Plated Steel Rod Not Available on 12-25mm Bores
A	Stainless Steel Rod Standard on 12-25mm Bores and Spring Extend Models

Rod Threads

Inch

4	Male
9	Female

Metric

5	Male
6	Female
3	Special Rod End

Ports

BSPP

G	Ported Each End
H	Both Ports Head
J	Both Ports Cap
K	Both Ports Cap Face [3]

NPTF
(Not available on 12-25mm Bores)

N	Ported Each End
M	Both Ports Head
L	Both Ports Cap
P	Both Ports Cap Face [3]

Stroke in mm

NOTES:

1 Fitted with Mounting Accessory
2 Magnetic Piston Option must be specified along with Long Rod Bearing option to achieve Long Bearing Version
3 Porting Options 'K' and 'P' (Both ports cap face) not available with rear mountings
4 Single Acting Spring Extend available with stainless steel rod only.
5 For information regarding sensors, please refer to Electronic Sensors section.
6 Spring return is short bearing version only.
7 Bumper only available on head end for spring extend.
Bumper only available on cap end for spring return.

Maximum Stroke Lengths

Bore	ELP Bearing Version		Long Bearing Version		Single Acting Version
	Min. Stroke*	Max. Stroke	Min. Stroke*	Max. Stroke	Standard Stroke
12	3	50	4	200	5,10
16	3	50	4	200	5,10
20	3	50	8	200	5,10
25	3	50	8	200	5,10
32	3	100	9	320	5,10
40	3	100	7	320	5,10
50	3	100	13	320	10, 20, 25
63	3	100	18	500	10, 20, 25
80	3	150	23	500	10, 20, 25
100	3	150	18	500	10, 20, 25

* Minimum Stroke for Double Rod cylinders: 12-63mm Bores is 5mm
80 &100mm Bores is 10mm

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Material Specifications [1]

Piston Rod	12mm to 25mm bores: Stainless Steel 32mm to 100mm bores: Chrome Plated Carbon Steel Std., Optional Stainless Steel (Stainless Steel std. on single-acting spring extend)
Piston Rod Seal	Polyurethane
Piston Rod Bearing [2]	Multilayer PTFE with Steel Backing
End Covers	Anodized Aluminum Alloy
Assembly Cap Screws	Stainless Steel / Zinc-Plated Steel
O-Rings	Nitrile Rubber, NBR
Cylinder Body	Anodized Aluminum Alloy
Piston	Aluminum Alloy
Piston Seal	Nitrile Rubber, NBR
Magnetic Piston Bearing [3]	Brass (12-25mm) Nylon (32-100mm)
Magnet	Plastic Coated Magnetic Material
Bumpers	Polyurethane
Return Spring	Chrome Silicon Wire

High Temperature Option

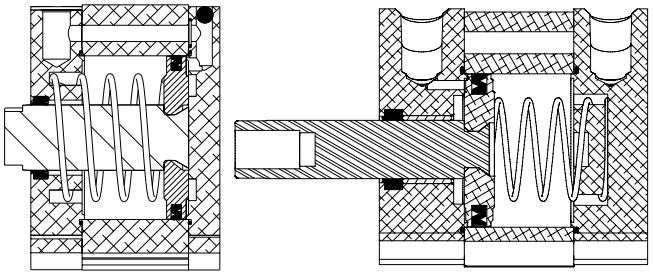
O-Rings	Fluorocarbon, FPM
Piston Rod Seal	Fluorocarbon, FPM
Piston Seal	Fluorocarbon, FPM

Additional Data

Working Pressure	Max.10 Bar Air
Standard Temperature	-20°C to +80°C -4°F to +176°F
High Temperature Service	-10°C to +121°C +14°F to 250°F

1 Dimensions not otherwise noted are listed in millimeters (mm)
2 Excludes 12-25mm bore Rod Style Y
3 Magnetic Piston option is not available on Spring Extend models.

Single Acting Cylinders



Spring Return **Spring Extend**

Additional Length for Bumper Option

Bore	Double Acting*		Single Acting**	
	Single Rod	Double Rod	Spring Return	Spring Extend
12	1.4	2.0	–	1.0
16	1.6	2.0	0.6	1.0
20	2.2	3.0	0.7	1.5
25	2.2	3.0	0.7	1.5
32	1.0	1.0	–	–
40	1.0	1.0	–	–
50	0.8	0.8	–	–
63	1.0	1.0	–	–
80	0.8	0.8	–	–
100	1.0	1.0	–	–

* Bumpers at both ends
** Bumpers at end opposite of spring only.

Bore (mm)	Return Loads		Extend Loads		Standard Stroke Lengths (mm) [2]
	Max (lbs)	Min (lbs)	Max (lbs)	Min (lbs)	
12	2.8	1.0	2.5	1.1	5,10
16	3.5	1.5	4.0	2.0	5,10
20	3.5	1.5	5.0	2.5	5,10
25	4.7	2.5	6.0	2.5	5,10
32	6.0	3.5	6.5	4.0	5,10
40	7.2	4.7	7.0	4.0	5,10
50	14.3	6.0	18.0	8.0	10, 20, 25
63	14.3	6.0	18.0	8.0	10, 20, 25
80	26.0	14.0	25.0	10.0	10, 20, 25
100	26.0	14.0	25.0	10.0	10, 20, 25

NOTES:

1 Overall Length to be the same as double-acting models with comparable bearing, piston and porting configuration.

2 Single-acting cylinders are available in standard stroke lengths. Custom stroke lengths are available upon request.

3 Spring Extend cylinders available with stainless steel rod only.

4 Magnetic Piston Option is not available on Spring Extend Models.

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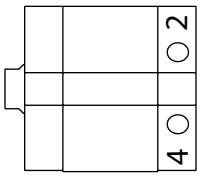
Forces, Weights, Air Consumption

Bore (mm)	Area (cm^2)	Piston Rod		Extend Force* (N)	Retract Force* (N)	Weight		Air Consumption (Liters)**
		Dia. (mm)	Area (cm^2)			Zero Stroke (kg)	Per 10mm Stroke (kg)	
12	1.13	6	0.28	67	50	0.060	0.016	0.0139
16	2.01	8	0.50	120	91	0.090	0.022	0.0246
20	3.14	10	0.78	188	142	0.150	0.032	0.0385
25	4.91	10	0.78	294	247	0.170	0.034	0.0633
32	8.0	12	1.1	482	414	0.260	0.044	0.1050
40	12.6	16	2.0	754	633	0.370	0.060	0.1620
50	19.6	20	3.1	1178	989	0.570	0.085	0.2530
63	31.2	20	3.1	1870	1681	0.860	0.098	0.4140
80	50.3	25	4.9	3016	2721	1.460	0.146	0.6690
100	78.5	25	4.9	4712	4417	2.390	0.155	1.0430

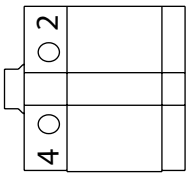
*Theoretical cylinder force at 600 kPa (6 bar).
** Free air consumption per 10mm stroke length for an extend and retract stroke at 600 kPa (6 bar)

Porting Configurations

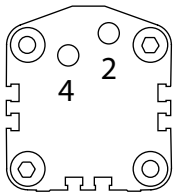
Both Ports Cap



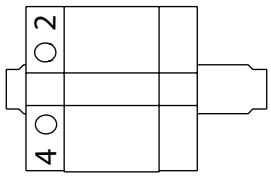
Both Ports Head*



Both Ports Cap Face



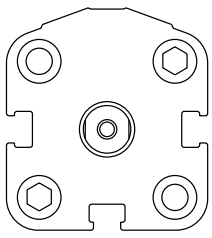
Double Rod Both Ports One End



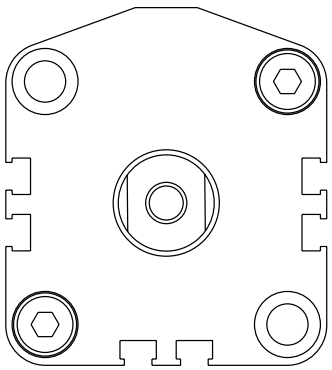
To retract cylinder apply air to port #2
To extend cylinder apply air to port #4
For a double rod cylinder, pressurize port #2 to retract the piston rod into the head containing the ports.

*For 12mm to 16mm bores, although the location of ports #2 and #4 are reversed, porting functions shown above apply.

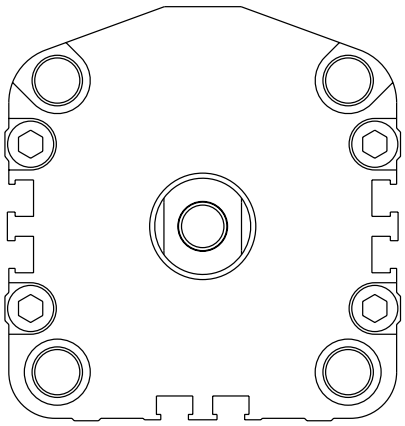
Front Profiles by Bore Size



Bores 12-25mm



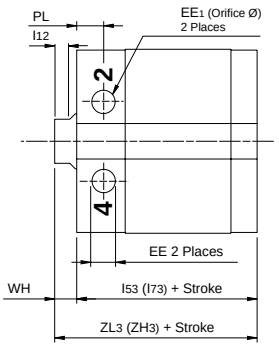
Bores 32-50mm



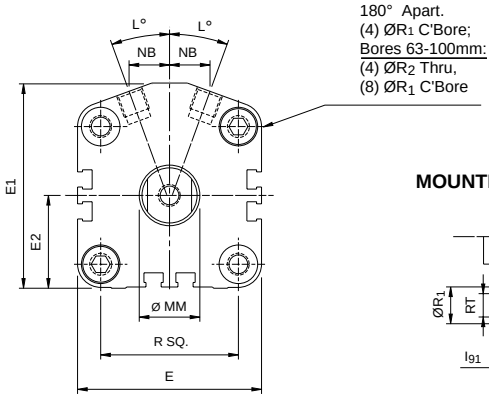
Bores 63-100mm

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BOTH PORTS HEAD

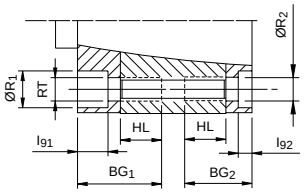


ALL PORTING CONFIGURATIONS



Bores 12-50mm:
(2) ØR2 Thru,
180° Apart.
(4) ØR1 C'Bore;
Bores 63-100mm:
(4) ØR2 Thru,
(8) ØR1 C'Bore

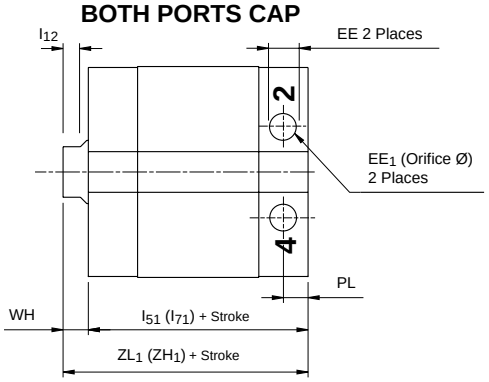
MOUNTING HOLE CONFIGURATION BOTH PORTS HEAD



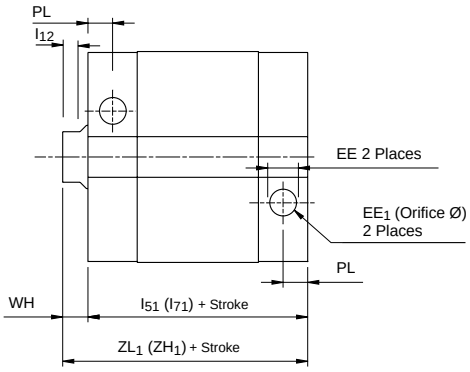
E

OPTIONAL PORTING CONFIGURATIONS

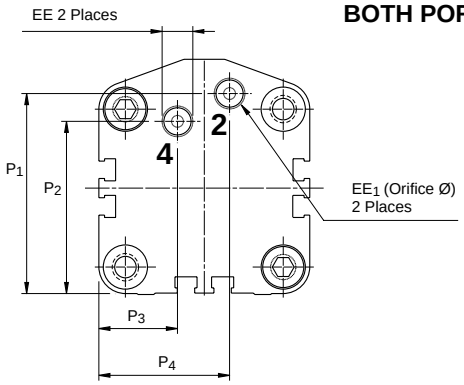
BOTH PORTS CAP

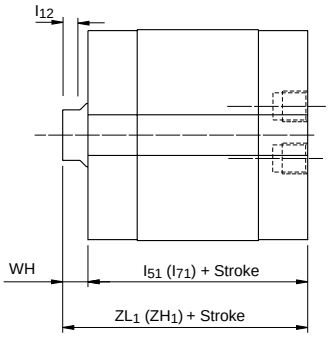


HEAD & CAP PORTED



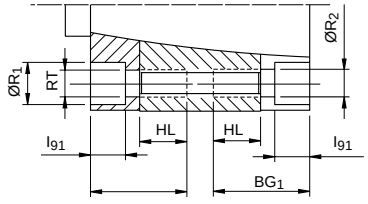
BOTH PORTS CAP FACE





MOUNTING HOLE CONFIGURATION

BOTH PORTS CAP OR CAP FACE, PORTS AT HEAD & CAP



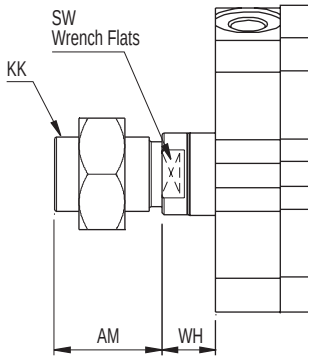
Note: Magnetic Dimensions in Parentheses

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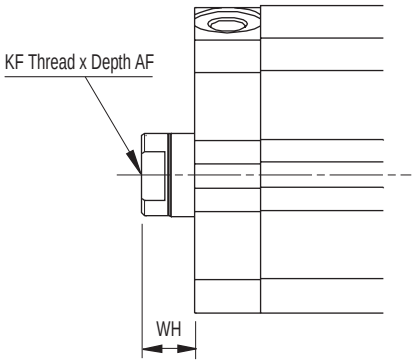
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For special rod ends, specify “3” in model number and give desired WH, AM or AF and KK or KF.

Jam nut is supplied when cylinder is ordered with Style 4 or Style 5 rod end.



Style 5/Style 4



Style 6/Style 9

Bore	Rod	AF		AM		KF		KK		WH		l_{12}	SW
		Style 6	Style 9	Style 5	Style 4	Style 6	Style 9	Style 5	Style 4	Style 4, 9 & 6	Style 5		
12	6	6	5.4	9	8	M3x0.5	#8-32	M5x0.8	#8-32	3.5	5	3	5
16	8	8	5.4	10	8	M4x0.7	#8-32	M6x1.0	#8-32	3.5	5.5	3	7
20	10	7	7	12	8	M5x0.8	#10-32	M8x1.25	#10-32	4.5	6.5	4	9
25	10	12	10	15	9.5	M6x1.0	1/4-28	M10x1.25	1/4-28	5	7.5	4	9
32	12	13	13.3	20.5	12.7	M8x1.25	5/16-24	M12x1.25	5/16-24	7	8	5	10
40	16	13	18.3	20.5	16	M8x1.25	3/8-24	M14x1.5	3/8-24	7	8	5.5	13
50	20	15	17.6	26	19.5	M10x1.5	1/2-20	M18x1.5	1/2-20	8	7.5	5.5	16
63	20	15	17.6	26	19.5	M10x1.5	1/2-20	M18x1.5	1/2-20	8	7.5	5.5	16
80	25	21	24.3	32.5	25.5	M16x2.0	5/8-18	M22x1.5	5/8-18	10	11	6	21
100	25	27	27	32.5	28.5	M20x2.5	3/4-16	M22x1,5	3/4-16	12	11	6	21

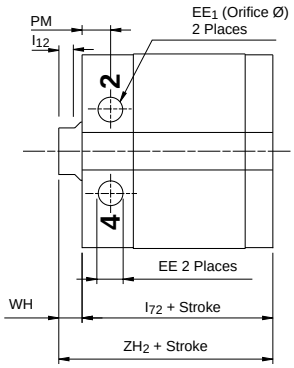
Bore	BG_1	BG_2	E	E_1	E_2	EE		EE_1	HL	l_{91}	l_{92}	L	NB	P_1	P_2
						BSPP	NPTF								
12	16.5	11.5	27	31	14	M5	–	1	8	3.5	3.5	26	5.5	25	9.5
16	17	12	31.5	35	16	M5	–	1.2	8	4	4	20	7	29.5	9.5
20	19	14,5	38.5	42.5	19,5	M5	–	1.3	10	4.5	4.5	20	8	35	13.5
25	21	15	41.5	45.5	21	M5	–	1.8	10	5	5	20	8.5	38.5	14
32	25	17	48	56	24	G1/8	1/8	2.7	10	4	4	25	9.5	45.5	16.5
40	25.5	17.5	56	62.5	28	G1/8	1/8	3.4	10	4	4	20	11.5	51	12
50	29.5	23.5	67	74.5	33.5	G1/8	1/8	4	14	5	5	20	14.5	63	54.5
63	34	28	82	86	40.5	G1/8	1/8	5	18	6.5	8	20	17.5	73.5	64
80	43	34	98	106.5	48.5	G1/4	1/4	5.5	22	8.5	10	20	25.5	92	79.5
100	44	35.5	119	126.5	59.5	G1/4	1/4	6	22	8.5	10	20	31.5	111.5	97.5

Bore	P_3	P_4	PL	PM	R	R_1	R_2*	RT	Non-Magnetic				Magnetic				ELP Max Stroke
									l_{51}	l_{53}	ZL_1	ZL_3	l_{71}	l_{73}	ZH_1	ZH_3	
12	13.5	13.5	5	8.5	15.5	5.8	3.5	M4	22	17	25.5	20.5	33	28	36.5	31.5	50
16	15.5	18	5	9	20	7.4	3.5	M4	23.5	18.5	27	22	34.5	29.5	38	33	50
20	24.5	21.5	5	9	25.5	9	5.5	M6	24	19.5	28.5	24	34	29.5	38.5	34	50
25	27.5	24.5	7	9	28	9	5.5	M6	28.5	22.5	33.5	27.5	38.5	32.5	43.5	37.5	50
32	31.5	28.5	8	10.5	34	10.5	5.5	M6	36.5	28.5	43.5	35.5	46	37.5	53	44.5	100
40	23	33	7.5	9.5	40	10.5	5.5	M6	38.5	29.5	44.5	36.5	47.5	39.5	54.5	46.5	100
50	25	41.5	8	10	50	13.5	7.5	M8	38.5	32.5	46.5	40.5	47.5	41.5	55.5	49.5	100
63	30	53	8	11	60	13.5	9.5	M10	39.5	34	47.5	42	51.5	46	59.5	54	100
80	33	69.5	11.5	11.5	77	16.5	11	M12	52	43	62	53	62.5	53.5	72.5	63.5	150
100	36.5	87.5	12	12	94	17	11	M12	57	48.5	69	60.5	71.5	63	83.5	75	150

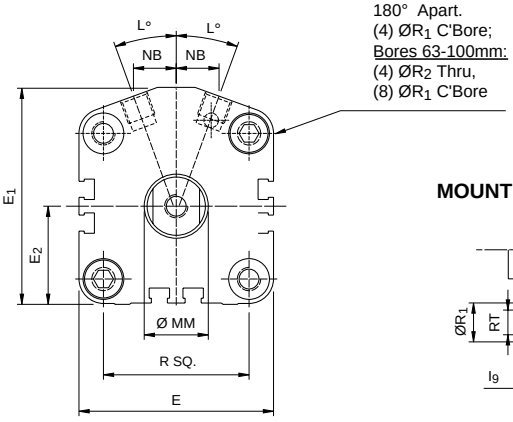
*“R2 thru” not available on 12 and 16mm Bores.

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BOTH PORTS HEAD

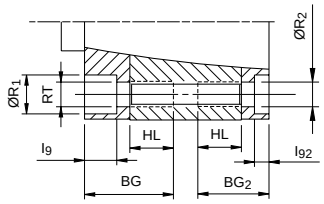


ALL PORTING CONFIGURATIONS



Bores 12-50mm:
(2) ØR2 Thru,
180° Apart.
(4) ØR1 C'Bore;
Bores 63-100mm:
(4) ØR2 Thru,
(8) ØR1 C'Bore

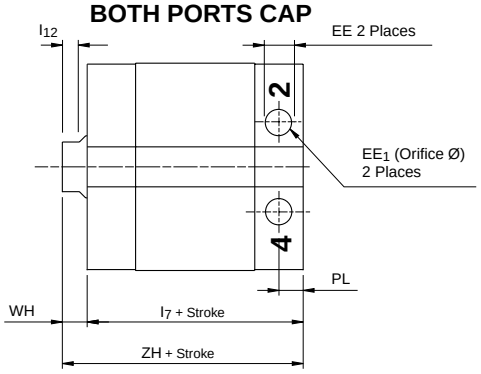
MOUNTING HOLE CONFIGURATION BOTH PORTS HEAD



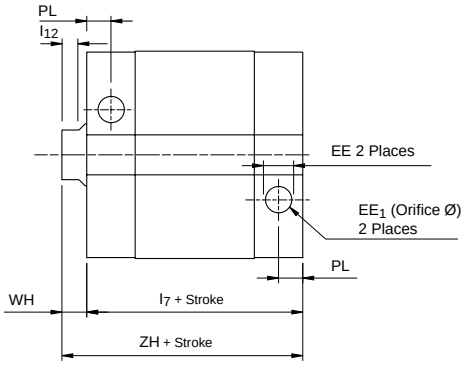
E

OPTIONAL PORTING CONFIGURATIONS

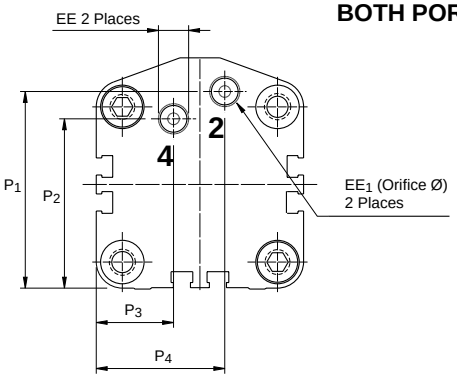
BOTH PORTS CAP

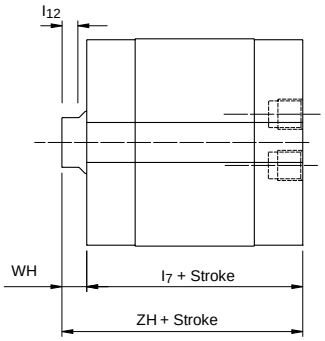


HEAD & CAP PORTED



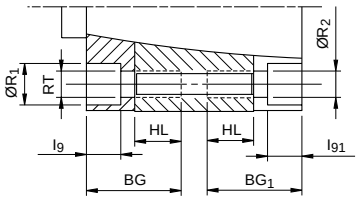
BOTH PORTS CAP FACE





MOUNTING HOLE CONFIGURATION

BOTH PORTS CAP OR CAP FACE, PORTS AT HEAD & CAP



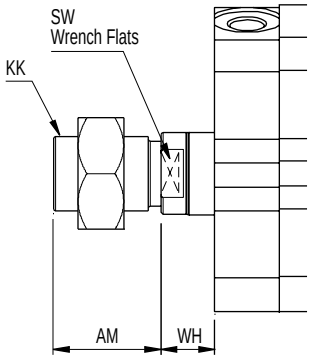
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For special rod ends, specify “3” in model number and give desired WH, AM or AF and KK or KF.

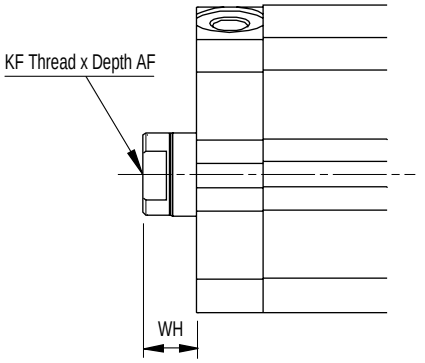
Jam nut is supplied when Style 4 or Style 5 rod end is specified.

Note: Magnetic piston and longer rod bearing are standard with Long Bearing Version.

C086



Style 5/Style 4



Style 6/Style 9

Bore	Rod MM	AF		AM		KF		KK		WH		l_{12}	SW
		Style 6	Style 9	Style 5	Style 4	Style 6	Style 9	Style 5	Style 4	Style 4, 9 & 6	Style 5		
12	6	6	5.4	9	8	M3x0.5	#8-32	M5x0.8	#8-32	3.5	5	3	5
16	8	8	5.4	10	8	M4x0.7	#8-32	M6x1.0	#8-32	3.5	5.5	3	7
20	10	7	7	12	8	M5x0.8	#10-32	M8x1.25	#10-32	4.5	6.5	4	9
25	10	12	10	15	9.5	M6x1.0	1/4-28	M10x1.25	1/4-28	5	7.5	4	9
32	12	13	13.3	20.5	12.7	M8x1.25	5/16-24	M12x1.25	5/16-24	7	8	5	10
40	16	13	18.3	20.5	16	M8x1.25	3/8-24	M14x1.5	3/8-24	7	8	5.5	13
50	20	15	17.6	26	19.5	M10x1.5	1/2-20	M18x1.5	1/2-20	8	7.5	5.5	16
63	20	15	17.6	26	19.5	M10x1.5	1/2-20	M18x1.5	1/2-20	8	7.5	5.5	16
80	25	21	24.3	32.5	25.5	M16x2.0	5/8-18	M22x1.5	5/8-18	10	11	6	21
100	25	27	27	32.5	28.5	M20x2.5	3/4-16	M22x1.5	3/4-16	12	11	6	21

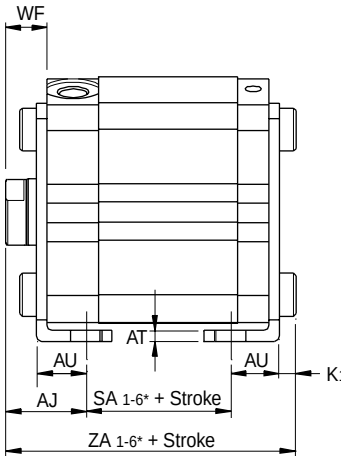
Bore	BG	BG_1	BG_2	E	E_1	E_2	EE		EE_1	HL	l_7	l_{72}	l_9	l_{91}	l_{92}	L
							BSPP	NPTF								
12	21.5	16.5	11.5	27	31	14	M5	–	1	8	38.5	33.5	3.5	3.5	3.5	26
16	22	17	12	31.5	35	16	M5	–	1.2	8	40.5	35.5	5.5	4	4	20
20	24.5	19	14.5	38.5	42.5	19.5	M5	–	1.3	10	40	35.5	10.5	4.5	4.5	20
25	24.5	21	15	41.5	45.5	21	M5	–	1.8	10	42.5	36.5	10.5	5	5	20
32	27.5	25	17	48	56	24	G1/8	1 8	2.7	10	48	40	14	4	4	25
40	27.5	25.5	17.5	56	62.5	28	G1/8	1/8	3.4	10	49.5	41.5	14	4	4	20
50	31.5	29.5	23.5	67	74.5	33.5	G1/8	1/8	4	14	49.5	43.5	13	5	5	20
63	37	34	28	82	86	40.5	G1/8	1/8	5	18	54.5	49	6.5	6.5	8	20
80	43	43	34	98	106.5	48.5	G1/4	1/4	5.5	22	62.5	53.5	9.5	8.5	10	20
100	44	44	35.5	119	126.5	59.5	G1/4	1/4	6	22	71.5	63	9.5	8.5	10	20

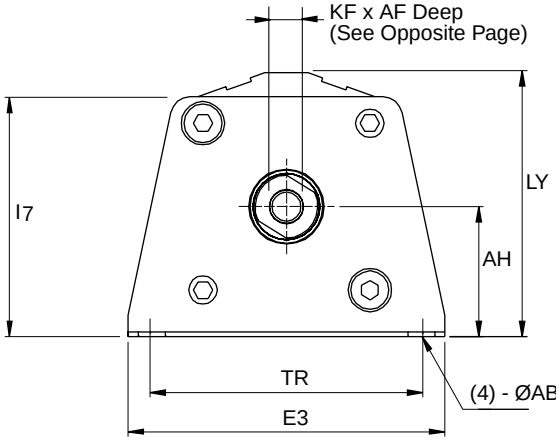
Bore	NB	P_1	P_2	P_3	P_4	PM	R	R_1	R_2*	RT	ZH	ZH_2	Min Stroke	Max Stroke
12	5.5	25	9.5	13.5	13.5	8.5	15.5	5.8	3.5	M4	42	37	4	200
16	7	29.5	9.5	15.5	18	9	20	7.4	3.5	M4	44	39	4	200
20	8	35	13.5	24.5	21.5	9	25.5	9	5.5	M6	44.5	40	8	200
25	8.5	38.5	14	27.5	24.5	9	28	9	5.5	M6	47.5	41.5	8	200
32	9.5	45.5	16.5	31.5	28.5	10.5	34	10.5	5.5	M6	55	47	9	320
40	11.5	51	12	23	33	9.5	40	10.5	5.5	M6	56.5	48.5	7	320
50	14.5	63	54.5	25	41.5	10	50	13.5	7.5	M8	57.5	51.5	13	320
63	17.5	73.5	64	30	53	11	60	13.5	9.5	M10	62.5	57	18	500
80	25.5	92	79.5	33	69.5	11.5	77	16.5	11	M12	72.5	62.5	23	500
100	31.5	111.5	97.5	36.5	87.5	12	94	17	11	M12	83.5	75	18	500

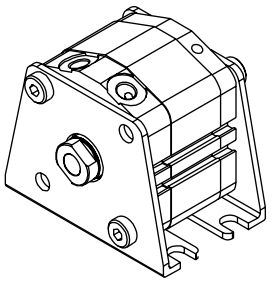
* “R2 thru” not available on 12 and 16mm Bores.

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Foot Mounting – Style F







Please note bearing, piston and porting configuration for selecting proper dimensions.

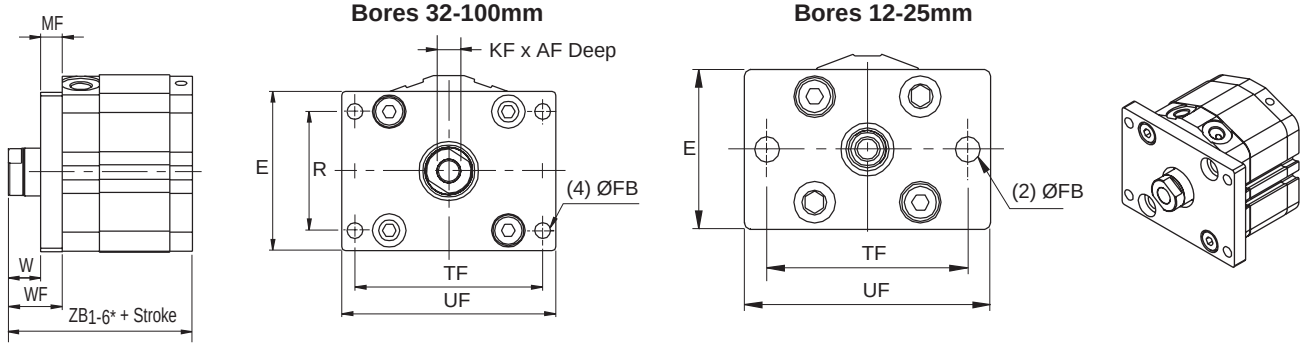
Bore	Kit Part Number	AB	AH	AJ	AT	AU	E_3	l_7	K_1	LY	TR
12	P1M-4DMF	4.5	17	19.5	2	8	44	29.5	2.8	34	35
16	P1M-4FMF	4.5	19	19.5	2	8	48	33.5	2.8	38	39
20	P1M-4HMF	6.5	24	20.5	3.2	9.2	62	42	4	47	50
25	P1M-4JMF	6.5	26	22.5	3.2	10.7	66	46	4	50.5	52
32	P1M-4KMF	6.5	30	25	3.2	11.2	71	54	4	62	60
40	P1M-4LMF	6.5	33	25	3.2	11.2	78	61	4	67.5	67
50	P1M-4MMF	9	39	29.5	3.2	14.7	95	72.5	5	80	82
63	P1M-4NMF	11	46	31	3.2	16.2	113	32	5	91.5	100
80	P1M-4PMF	13	59	35	4.5	19.5	140	42	7	117	118
100	P1M-4QMF	13	71	39	6	23	162	53	7	138	139

Bore	ELP Version Non-Magnetic					ELP Version Magnetic					Long Bearing Version					Style 5 End Length Adjustment
	Both Ports Head		Optional Porting		Min. ** Stroke	Both Ports Head		Optional Porting		Min.** Stroke	Both Ports Head		Optional Porting		Min.** Stroke	
	SA_1	ZA_1*	SA_2*	ZA_2*		SA_3	ZA_3*	SA_4	ZA_4*		SA_5	ZA_5*	SA_6	ZA_6*		
12	5	35.3	10	40.3	15	16	46.3	21	51.3	4	21.5	51.8	26.5	56.8	4	1.5
16	6.5	36.8	11.5	41.8	14	17.5	47.8	22.5	52.8	4	23.5	53.8	28.5	58.8	4	2
20	7.5	41.2	12	45.7	18	17.5	51.2	22	55.7	8	23.5	57.2	28	61.9	8	2
25	7.5	44.7	13.5	50.7	18	17.5	54.7	23.5	60.7	8	21.5	58.7	27.5	64.7	8	2.5
32	12.5	52.5	20.5	60.7	18	21.5	61.7	29.5	69.9	9	24	64	32	72.2	9	1
40	13.5	53.7	21.5	61.9	17	23.5	63.7	31.5	71.9	7	25.5	65.7	33.5	73.9	7	1
50	9.5	58.7	15.5	64.9	22	18.5	67.7	24.5	73.9	13	20.5	69.7	26.5	75.9	13	-0.5
63	8	60.2	13.5	65.7	30	20	72.2	25.5	77.7	18	23	75.2	28.5	80.7	18	-0.5
80	13	74.5	22	83.5	33	23.5	85	32.5	94	23	23.5	85	32.5	94	23	1
100	14.5	83.5	23	92	33	29	98	37.5	106.5	18	29	98	37.5	106.5	18	-1

* For strokes less than 'Min. Stroke', only one bracket will be supplied at rod end.
** Dimensions shown apply only for Rod End Styles 4, 6 and 9. For Rod End Style 5, please include the above length adjustment.
Note: Foot Bracket mounting is not available with cap face porting

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Front Flange Mounting – Style J



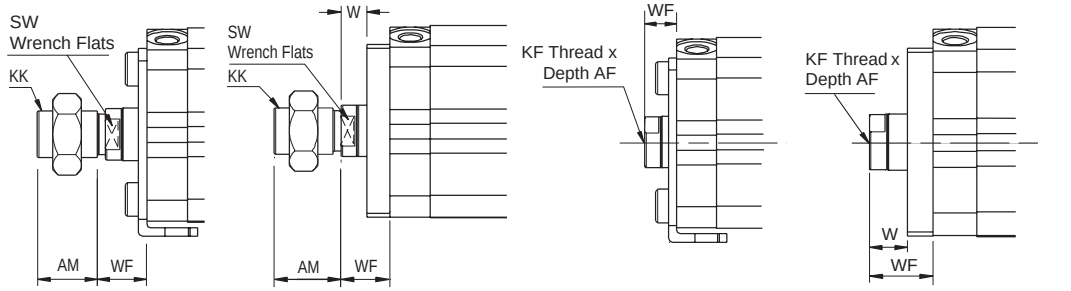
Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	Kit Part Number	E	FB	MF	R	TF	UF	ELP Version Non-Magnetic		ELP Version Magnetic		Long Bearing Version		Style 5 Rod End Length Adjustment
								Both Ports Head	Optional Porting	Both Ports Head	Optional Porting	Both Ports Head	Optional Porting	
								ZB_1*	ZB_2*	ZB_3*	ZB_4*	ZB_5*	ZB_6*	
12	P1M-4DMB	25	4.5	5.5	–	45	55	30.5	35.5	41.5	46.5	47	52	1.5
16	P1M-4FMB	30	4.5	5.5	–	45	55	32	37	43	48	49	54	2
20	P1M-4HMB	39	6.5	8	–	50.5	62	34	38.5	44	48.5	50	54.5	2
25	P1M-4JMB	42	6.5	8	–	53	65	37.5	43.5	47.5	53.5	51.5	57.5	2.5
32	P1M-4KMB	48	5.5	8	34	58	68	45.5	53.5	54.5	62.5	57	65	1
40	P1M-4LMB	54	5.5	8	40	66	76	46.5	54.5	56.5	64.5	58.5	66.5	1
50	P1M-4MMB	67	6.5	9	50	79	90	50.5	56.5	59.5	65.5	61.5	67.5	-0.5
63	P1M-4NMB	80	9	9	60	97	112	52	57.5	64	69.5	67	72.5	-0.5
80	P1M-4PMB	99	11	11	77	116	134	63	72	73.5	82.5	73.5	82.5	1
100	P1M-4QMB	117	11	11	94	137	154	70.5	79	85	93.5	85	93.5	-1

* Dimensions shown apply only for Rod End Styles 4, 6 and 9. For Rod End Style 5, please include the above length adjustment.

Rod End Dimensions Front Mounts F & J

For special rod threads, specify "3" in model number and give desired AM or AF, WF and KK or KF.



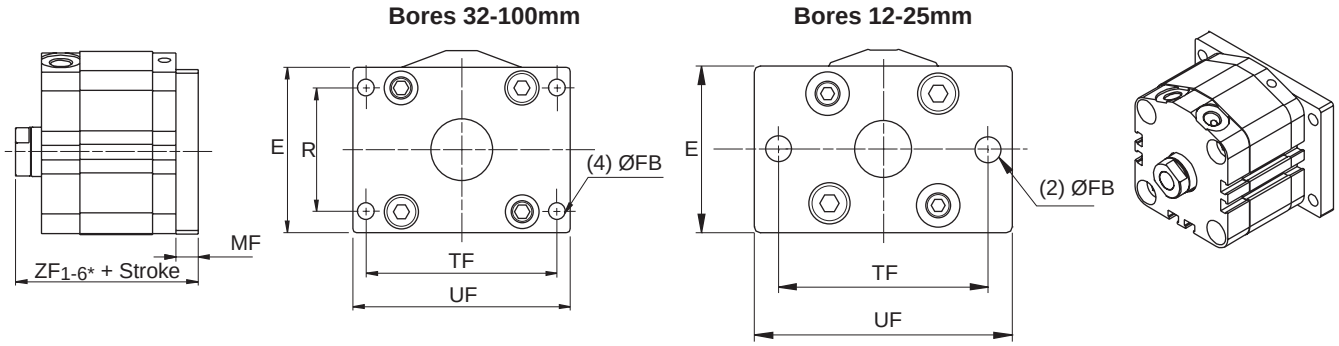
Foot Mounting - Style F **Foot Flange Mounting - Style J** **Foot Mounting - Style F** **Foot Flange Mounting - Style J**

Bore	AF		AM		KF		KK		W		WF		SW
	Style 9	Style 6	Style 4	Style 5	Style 9	Style 6	Style 4	Style 5	Styles 9, 6, 4	Style 5	Styles 9, 6, 4	Style 5	
12	5.4	6	8	9	#8-32	M3X0.5	#8-32	M5X0.8	8	9.5	13.5	15	5
16	5.4	8	8	10	#8-32	M4x0.7	#8-32	M6x1.0	8	10	13.5	15.5	7
20	7	7	8	12	#10-32	M5x0.8	#10-32	M8x1.25	6.5	8.5	14.5	16.5	9
25	10	12	9.5	15	1/4-28	M6x1.0	1/4-28	M10x1.25	7	9.5	15	17.5	9
32	13.3	13	12.7	20.5	5/16-24	M8x1.25	5/16-24	M12x1.25	9	10	17	18	10
40	18.3	13	16	20.5	3/8-24	M8x1.25	3/8-24	M14x1.5	9	10	17	18	13
50	17.6	15	19.5	26	1/2-20	M10x1.5	1/2-20	M18x1.5	9	8.5	18	17.5	16
63	17.6	15	19.5	26	1/2-20	M10x1.5	1/2-20	M18x1.5	9	8.5	18	17.5	16
80	24.3	21	25.5	32.5	5/8-18	M16x2.0	5/8-18	M22x1.5	9	10	20	21	21
100	27	27	28.5	32.5	3/4-16	M20x2.5	3/4-16	M22x1.5	11	10	22	21	21

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Rear Flange Mounting – Style H



E

Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	Kit Part Number	E	FB	MF	R	TF	UF
12	P1M-4DMB	25	4.5	5.5	–	45	55
16	P1M-4FMB	30	4.5	5.5	–	45	55
20	P1M-4HMB	39	6.5	8	–	50.5	62
25	P1M-4JMB	42	6.5	8	–	53	65
32	P1M-4KMB	48	5.5	8	34	58	68
40	P1M-4LMB	54	5.5	8	40	66	76
50	P1M-4MMB	67	6.5	9	50	79	90
63	P1M-4NMB	80	9	9	60	97	112
80	P1M-4PMB	99	11	11	77	116	134
100	P1M-4QMB	117	11	11	94	137	154

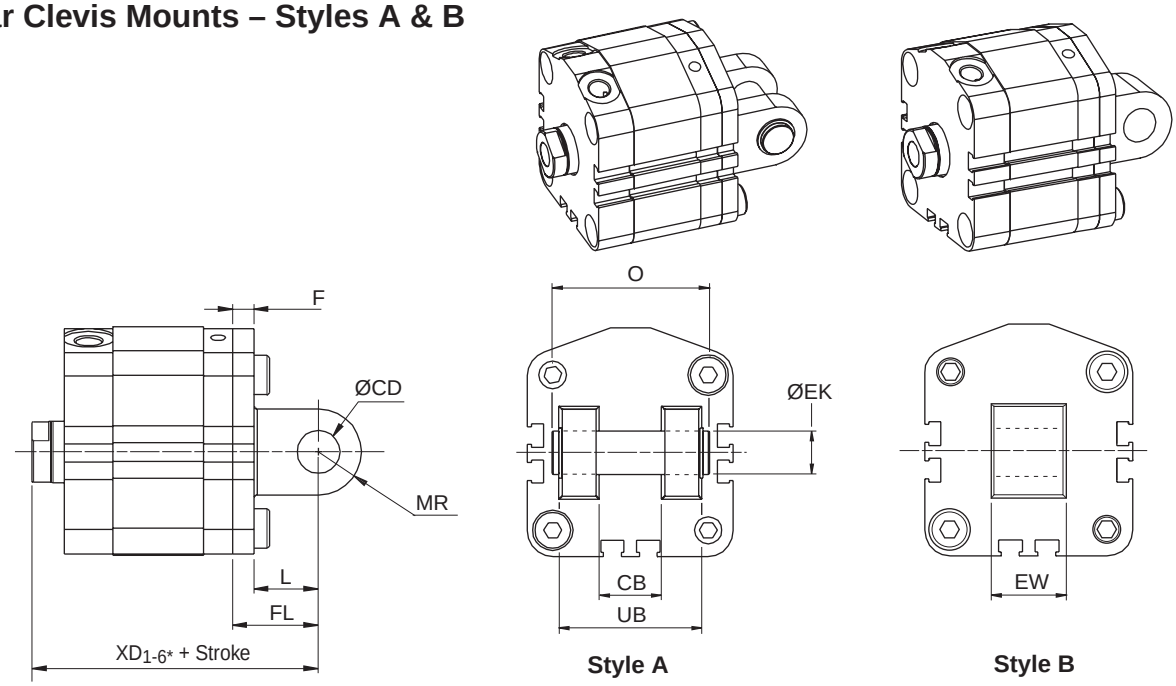
Bore	ELP Version Non-Magnetic		ELP Version Magnetic		Long Bearing Version		Style 5 Rod End Length Adjustment
	Both Ports Head ZF_1*	Optional Porting ZF_2*	Both Ports Head ZF_3*	Optional Porting ZF_4*	Both Ports Head ZF_5*	Optional Porting ZF_6*	
12	26	31	37	42	42.5	47.5	1.5
16	27.5	32.5	38.5	43.5	44.5	49.5	2
20	32	36.5	42	46.5	48	52.5	2
25	35.5	41.5	45.5	51.5	49.5	55.5	2.5
32	43.5	51.5	52.5	60.5	55	63	1
40	44.5	52.5	54.5	62.5	56.5	64.5	1
50	49.5	55.5	58.5	64.5	60.5	66.5	-0.5
63	51	57.5	63	68.5	66	71.5	-0.5
80	64	73	74.5	83.5	74.5	83.5	1
100	71.5	80	86	94.5	86	94.5	-1

Note: Rear Flange mounting is not available with cap face porting.
* Dimensions shown apply only for Rod End Styles 4, 6 and 9.
For Rod End Style 5, please include the above length adjustment.

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Rear Clevis Mounts – Styles A & B



Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	Double Clevis Kit Part Number	Single Clevis Kit Part Number**	CB	CD/EK	EW	F	FL	L	MR	O	UB
12	P1M-4DMT	P1M-4DME	5	5	5	4	14	10	6.5	14.5	10
16	P1M-4FMT	P1M-4FME	6.5	5	6.5	4	15	11	6.5	16.5	12
20	P1M-4HMT	P1M-4HME	8	8	8	5	18	13	10	21	16
25	P1M-4JMT	P1M-4JME	10	10	10	5	20	15	11	25.5	20
32	P1M-4KMT	P1M-4KME	18	10	18	5	20	15	10	41.5	36
40	P1M-4LMT	P1M-4LME	18	10	18	6	22	16	10	41.5	36
50	P1M-4MMT	P1M-4MME	22	14	22	7	28	21	14	50.5	44
63	P1M-4NMT	P1M-4NME	22	14	22	8	30	22	14	50.5	44
80	P1M-4PMT	P1M-4PME	28	18	28	10	38	28	18	64	56
100	P1M-4QMT	P1M-4QME	32	22	32	13	45	32	22	72	64

Bore	ELP Version Non-Magnetic		ELP Version Magnetic		Long Bearing Version		Style 5 Rod End Length Adjustment
	Both Ports Head XD_1*	Optional Porting XD_2*	Both Ports Head XD_3*	Optional Porting XD_4*	Both Ports Head XD_5*	Optional Porting XD_6*	
12	34.5	39.5	45.5	50.5	51	56	1.5
16	37	42	48	53	54	59	2
20	42	46.5	52	56.5	58	62.5	2
25	47.5	53.5	57.5	63.5	61.5	67.5	2.5
32	55.5	63.5	64.5	72.5	67	75	1
40	59.5	66.5	68.5	76.5	70.5	78.5	1
50	68.5	74.5	77.5	83.5	79.5	85.5	-0.5
63	72	78.5	84	89.5	87	92.5	-0.5
80	91	100	101.5	110.5	101.5	110.5	1
100	105.5	114	120	128.5	120	128.5	-1

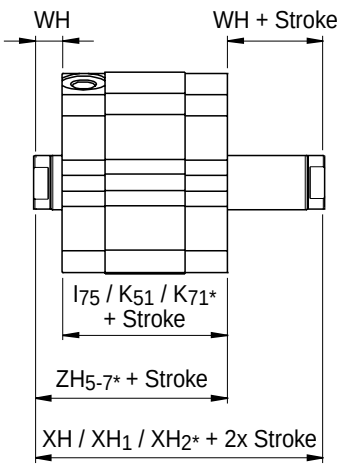
* Dimensions shown apply only for Rod End Styles 4, 6 and 9. For Rod End Style 5, please include the above length adjustment.
** Single Clevis Kit can be used as mounting bracket for double clevis cylinders. Double Clevis Kit can be used as mounting kit for single clevis cylinders.
Note: Rear Clevis mounts are not available with cap face port.

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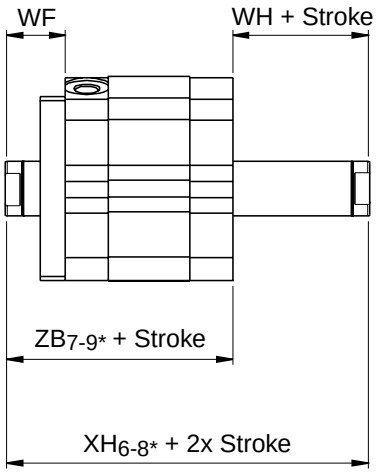
Basic Cylinder – Style C
Flange Mounting – Style J

Heads Ported at Each End or One End

Refer to “Single Rod” (pages E6-E9) for dimensions not listed below. Both rods will be supplied with same rod ends unless called out as special.



Style C



Style J

E

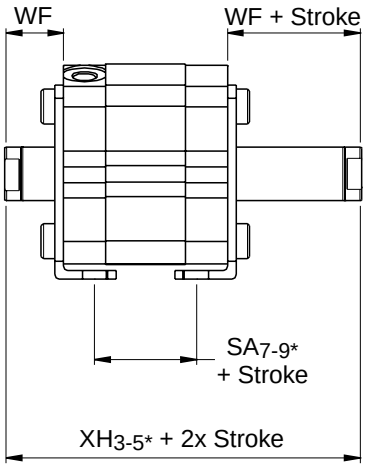
Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	Basic Cylinder – Style C											
	ELP Version Non-Magnetic				ELP Version Magnetic				Long Bearing Version			
	K_{51}	XH_2	ZH_7	Min. Stroke	K_{71}	XH_1	ZH_6	Min. Stroke	I_{75}	XH	ZH_5	Min. Stroke
12	22	29	25.5	15	40	47	43.5	5	45.5	52.5	49	5
16	23.5	30.5	27	14	40	47	43.5	5	46.5	53.5	50	5
20	24	33	28.5	18	38	47	42.5	8	46.5	55.5	51	8
25	28.5	38.5	33.5	18	38.5	48.5	43.5	8	46.5	56.5	51.5	8
32	36.5	50.5	43.5	18	46	60	53	9	50.5	64.5	57.5	9
40	37.5	51.5	44.5	17	47.5	61.5	54.5	14	51.5	65.5	58.5	12
50	38.5	54.5	46.5	22	47.5	63.5	55.5	20	51.5	67.5	59.5	20
63	39.5	55.5	47.5	30	51.5	67.5	59.5	20	57.5	73.5	65.5	20
80	52	72	62	33	62.5	82.5	72.5	25	62.5	82.5	72.5	25
100	57	81	69	33	71.5	95.5	83.5	25	71.5	95.5	83.5	25

Bore	Flange Mounting – Style J									Rod End Dimensions			
	ELP Version Non-Magnetic			ELP Version Magnetic			Long Bearing Version			WF		WH	
	XH_6	ZB_7	Min.* Stroke	XH_7	ZB_8	Min.* Stroke	XH_8	ZB_9	Min.* Stroke	Styles 4, 6, 9	Style 5	Styles 4, 6, 9	Style 5
12	39	35.5	5	57	53.5	5	62.5	59	5	13.5	15	3.5	5
16	40.5	37	5	57	53.5	5	63.5	60	5	13.5	15.5	3.5	5.5
20	43	38.5	8	57	52.5	8	65.5	61	8	14.5	16.5	4.5	6.5
25	48.5	43.5	18	58.5	53.5	8	66.5	61.5	8	15	17.5	5	7.5
32	60.5	53.5	18	70	62.5	9	74.5	67.5	9	17	18	7	8
40	61.5	54.5	17	71,5	64.5	14	75.5	68.5	12	17	18	7	8
50	64.5	56.5	22	73.5	65.5	20	77.5	69.5	20	18	17.5	8	7.5
63	65.5	57.5	30	77.5	69.5	20	83.5	75.5	20	18	17.5	8	7.5
80	82	72	33	92.5	82.5	25	92.5	82.5	25	20	21	10	11
100	91	79	33	105.5	93.5	25	105.5	93.5	25	22	21	12	11

*** Note:** Please consult factory for cylinders that require shorter than minimum stroke length listed above.

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Style F

Please note bearing, piston and porting configuration for selecting proper dimensions.

Bore	ELP Version Non-Magnetic			ELP Version Magnetic			Long Bearing Version		
	SA_7	XH_3	Min.* Stroke	SA_8	XH_4	Min.* Stroke	SA_9	XH_5	Min.* Stroke
12	10	49	5	28	67	5	33.5	72.5	5
16	11.5	50.5	5	28	67	5	34.5	73.5	5
20	12	53	8	26	67	8	34.5	75.5	8
25	13.5	58.5	8	23.5	68.5	5	31.5	76.5	8
32	20.5	70.5	8	29.5	80	5	34.5	84.5	9
40	21.5	71.5	7	31.5	81.5	5	35.5	85.5	12
50	15.5	74.5	12	24.5	83.5	10	28.5	87.5	20
63	13.5	75.5	20	25.5	87.5	10	31.5	93.5	20
80	22	92	23	32.5	102.5	15	32.5	102.5	25
100	23	101	23	37.5	115.5	15	37.5	115.5	25

Bore	Rod End Dimensions			
	WF		WH	
	Styles 4, 6, 9	Style 5	Styles 4, 6, 9	Style 5
12	13.5	15	3.5	5
16	13.5	15.5	3.5	5.5
20	14.5	16.5	4.5	6.5
25	15	17.5	5	7.5
32	17	18	7	8
40	17	18	7	8
50	18	17.5	8	7.5
63	18	17.5	8	7.5
80	20	21	10	11
100	22	21	12	11

*** Note:** Please consult factory for cylinders that require shorter than minimum stroke length listed above.

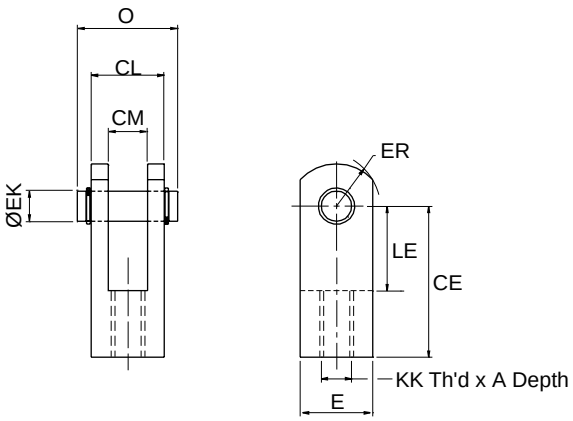
Foot Mounting – Style F

Heads Ported at Each End or One End

E
P1M
P1M Tooling Plate
P1M Swing Clamp
LP(M)
C05(S)
P1G

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Rod Clevis



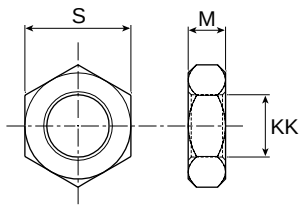
Rod Clevis – Metric

Bore	Kit Part Number	A	E	CE	KK	ER	LE	EK (h9)	CM	CL	O
12	**P1M-4DRC**	7	9.5	16	M5x0.8	6.5	7	5	5	9.5	14.5
16	**P1M-4FRC**	11	11	21	M6x1.0	8	10	5	6.5	11	16.5
20	**P1M-4HRC**	8.5	16	25	M8x1.25	10.5	11.5	8	8	16	21
25	**P1M-4JRC**	10.5	19	30	M10x1.25	13	14	10	10	19	25.5
32	**P1M-4KRC**	16	22 Dia.	30	M12x1.25	12	14	10	18	36	41.5
40	**P1M-4LRC**	16	22 Dia.	30	M14x1.5	12	14	10	18	36	41.5
50/63	**P1M-4MRC**	20	28 Dia.	40	M18x1.5	16	20	14	22	44	50.5
80	**P1M-4PRC**	23	38 Dia.	50	M22x1.5	21	27	18	28	56	64
100	**P1M-4QRC**	24	44 Dia.	55	M22x1.5	24	31	22	32	64	72

Rod Clevis – Inch

Bore	Kit Part Number	A	E	CE	KK	ER	LE	EK (inch) +0, -0.002	CM	CL (inch)	O (inch)
12	**P1M-4DRC-T**	6	9.5	16	#8-32	6.5	7	3/16	5	0.375	0.563
16	**P1M-4FRC-T**	6	11	21	#8-32	8	10	3/16	6.5	0.437	0.625
20	**P1M-4HRC-T**	6	16	25	#10-32	10.5	11.5	5/16	8	0.625	0.875
25	**P1M-4JRC-T**	8	19	30	1/4-28	13	14	3/8	10	0.750	1.031
32	**P1M-4KRC-T**	16	22 Dia.	30	5/16-24	12	14	3/8	18	1.437	1.687
40	**P1M-4LRC-T**	16	22 Dia.	30	3/8-24	12	14	3/8	18	1.437	1.687
50/63	**P1M-4MRC-T**	20	28 Dia.	40	1/2-20	16	20	1/2	22	1.750	2.125
80	**P1M-4PRC-T**	23	38 Dia.	50	5/8-18	21	27	3/4	28	2.250	2.625
100	**P1M-4QRC-T**	24	44 Dia.	55	3/4-16	24	31	7/8	32	2.500	2.875

Jam Nuts



Jam Nut for Style 4

Bore Size	Part Number	KK	M	S
12	**L073800080**	#8-32	1/8	11/32
16	**L073800080**	#8-32	1/8	11/32
20	**L073800100**	#10-32	1/8	3/8
25	**L073800200**	1/4-28	5/32	7/16
32	**L073800300**	5/16-24	3/16	1/2
40	**L073800400**	3/8-24	7/32	9/16
50	**L073800600**	1/2-20	5/16	3/4
63	**L073800600**	1/2-20	5/16	3/4
80	**L073800800**	5/8-18	3/8	15/16
100	**L073800900**	3/4-16	27/64	1-1/8

Dimensions in inches

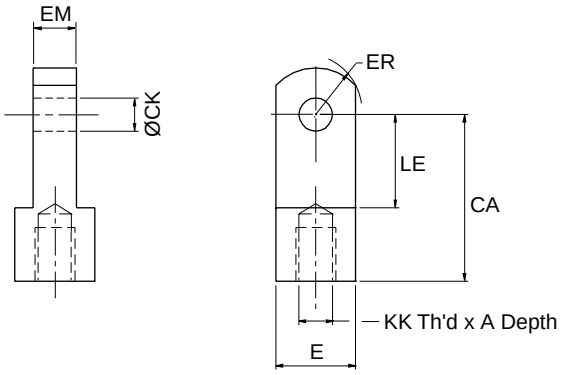
Jam Nut for Style 5

Bore Size	Part Number	KK	M	S
12	**L075540005**	M5x0.8	2.7	18
16	**L075540006**	M6x1.0	3.2	10
20	**L075540008**	M8x1.25	4	13
25	**L075540010**	M10x1.25	5	17
32	**L075540012**	M12x1.25	6	19
40	**L075540014**	M14x1.5	7	22
50	**L075540018**	M18x1.5	8	27
63	**L075540018**	M18x1.5	8	27
80	**L075540022**	M22x1.5	11	32
100	**L075540022**	M22x1.5	11	32

Dimensions in mm

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Rod Eye



Rod Eye – Metric

Bore	Kit Part Number	A	E	CA	KK	ER	LE	CK	EM
12	**P1M-4DRE**	7	9.5 Sq.	16	M5x0.8	6.5	7	5	5
16	**P1M-4FRE**	8	11 Sq.	25	M6x1.0	8	14	5	6.5
20	**P1M-4HRE**	8.5	16 Sq.	25	M8x1.25	10.5	11.5	8	8
25	**P1M-4JRE**	10.5	19 Sq.	30	M10x1.25	13	14	10	10
32	**P1M-4KRE**	15	22 Dia.	30	M12x1.25	12	14	10	18
40	**P1M-4LRE**	14	22 Dia.	30	M14x1.5	12	14	10	18
50/63	**P1M-4MRE**	18.5	28 Dia.	40	M18x1.5	16	20	14	22
80	**P1M-4PRE**	22	38 Dia.	50	M22x1.5	21	27	18	28
100	**P1M-4QRE**	22	44 Dia.	55	M22x1.5	24	31	22	32

Rod Eye – Inch

Bore	Kit Part Number	A	E	CA	KK	ER	LE	CK (inch)	EM
12	**P1M-4DRE-T**	6	9.5 Sq.	16	#8-32	6.5	7	3/16	5
16	**P1M-4FRE-T**	6	11 Sq.	25	#8-32	8	14	3/16	6.5
20	**P1M-4HRE-T**	6	16 Sq.	25	#10-32	10.5	11.5	5/16	8
25	**P1M-4JRE-T**	8	19 Sq.	30	1/4-28	13	14	3/8	10
32	**P1M-4KRE-T**	12	22 Dia.	30	5/16-24	12	14	3/8	18
40	**P1M-4LRE-T**	11	22 Dia.	30	3/8-24	12	14	3/8	18
50/63	**P1M-4MRE-T**	18	28 Dia.	40	1/2-20	16	20	1/2	22
80	**P1M-4PRE-T**	21	38 Dia.	50	5/8-18	21	27	3/4	28
100	**P1M-4QRE-T**	21	44 Dia.	55	3/4-16	24	31	7/8	32

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Bore	Single Rod Cylinders		Double Rod Cylinders	
	Class 1 Seals	Class 5 Seals*	Class 1 Seals	Class 5 Seals*
12	P1M-6DRN	P1M-6DRV	P1M-6DRT	P1M-6DRP
16	P1M-6FRN	P1M-6FRV	P1M-6FRT	P1M-6FRP
20	P1M-6HRN	P1M-6HRV	P1M-6HRT	P1M-6HRP
25	P1M-6JRN	P1M-6JRV	P1M-6JRT	P1M-6JRP
32	P1M-6KRN	P1M-6KRV	P1M-6KRT	P1M-6KRP
40	P1M-6LRN	P1M-6LRV	P1M-6LRT	P1M-6LRP
50	P1M-6MRN	P1M-6MRV	P1M-6MRT	P1M-6MRP
63	P1M-6NRN	P1M-6NRV	P1M-6NRT	P1M-6NRP
80	P1M-6PRN	P1M-6PRV	P1M-6PRT	P1M-6PRP
100	P1M-6QRN	P1M-6QRV	P1M-6QRT	P1M-6QRP

* No Bumpers Included

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P1M Series Tooling Plate

Extra Low Profile Pneumatic Cylinder

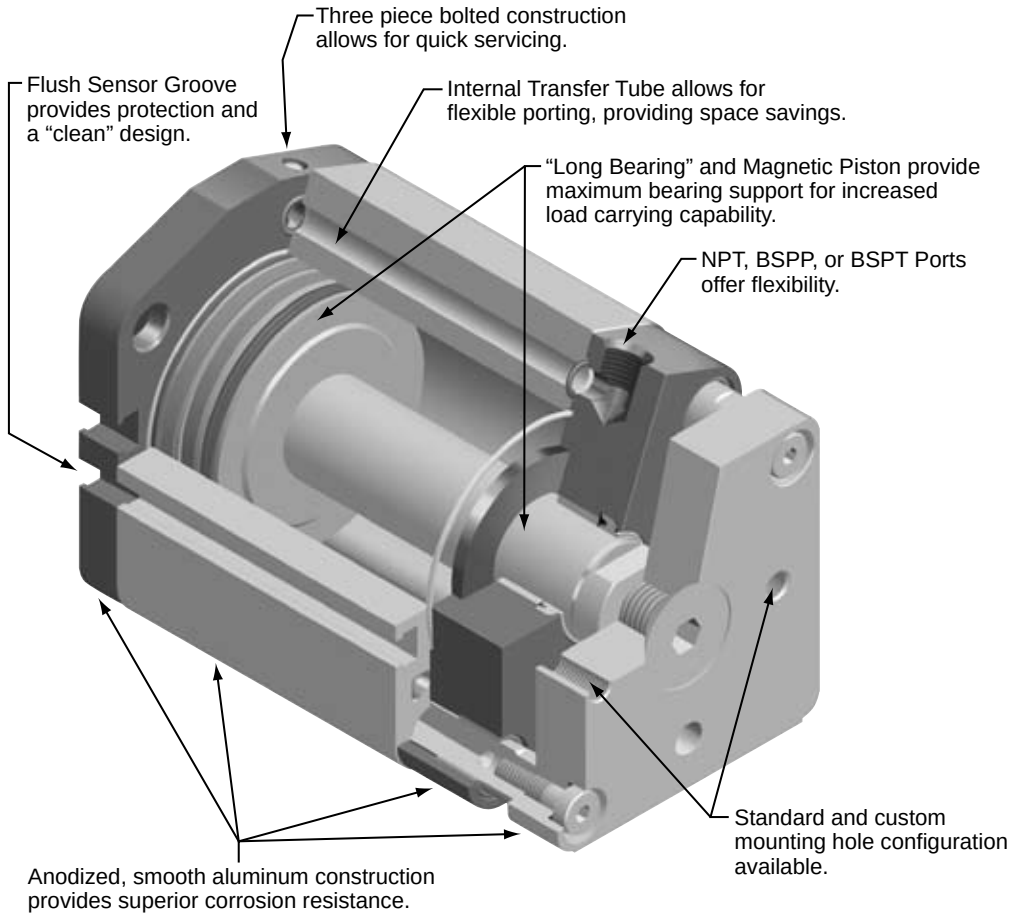


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Ordering Information E23
Cylinder Specifications E24
Performance Data E25-E27
Dimensions E28-E31
Mounting Dimensions E32-E33
Double Rod Style Dimensions E34-E35
Mounting and Service Kits E36

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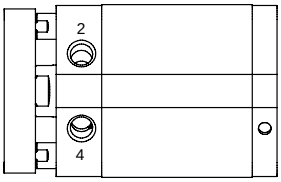
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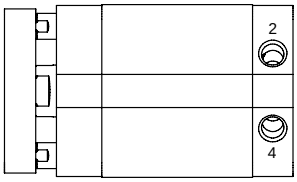
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P1M Series Tooling Plate Flexible Porting Options

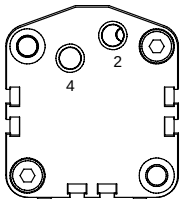
Both Ports Head*



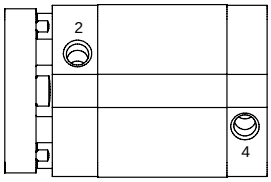
Both Ports Cap (Radial)



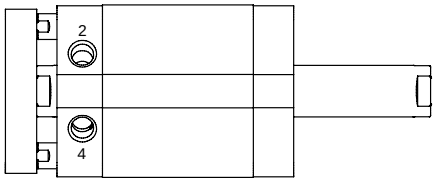
Both Ports Cap Face (Axial)



Head and Cap Ported (Radial)

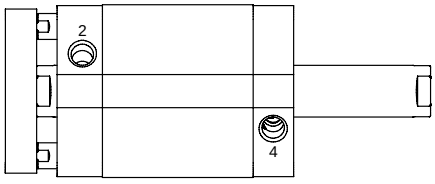


Double Rod, Both Ports Head*



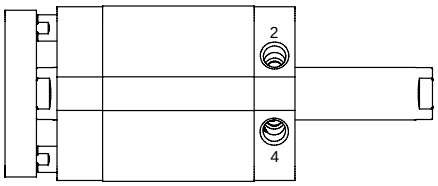
ROD END #1 ROD END #2

Double Rod, Head and Cap Ported (Radial)



ROD END #1 ROD END #2

Double Rod, Both Ports Cap (Radial)



ROD END #1 ROD END #2

To retract cylinder, apply air to port #2.

To extend cylinder, apply air to port #4.

* Both Ports Head [BSPP ports (M5) for 12-25mm bores and 1/8" NPTF ports for 32-50mm bores] is the standard porting configuration for the P1M Tooling Plate Cylinder. Alternate porting options are available at an additional cost.

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How to Order P1M Series Tooling Plate Cylinders

P1M	032	C	F	D	M	A	6	N	020

Bore Size

012	12mm
016	16mm
020	20mm
025	25mm
032	32mm
040	40mm
050	50mm

Stroke in mm

Cylinder Style

C	Basic, no mountings
H	Rear Flange [1]
F	Foot Mount [2]

Cylinder Option

F	Guided Tool Plate
G	Special MTO Tooling Plate [3]
B	Blank Tooling Plate

Function

D	Double Acting
K	Double Acting, Double Rod [4]

Bumpers, Magnets, Seals

B	Std. Seals, Bumpers, No Magnet
F	Fluorocarbon Seals, Bumpers [5], No Magnet
M	Std. Seals, Bumpers, Magnetic Piston [6]

Piston Rod & Bearings

A	Long Bearing Stainless Steel Rod (standard for 12-25mm bores)
C	Long Bearing Chrome Plated Rod (N/A for 12-25mm bores)

Rod Threads

6	Metric Female
3	Special [4]

Port Type & Location

BSPP	
G	Head & Cap Radial
H	Both in Head
J	Both in Cap Radial
K	Both in Cap Axial
NPTF [7]	
N	Head & Cap Radial
M	Both in Head
L	Both in Cap Radial
P	Both in Cap Axial
BSPT [7]	
Q	Head & Cap Radial
R	Both in Head
S	Both in Cap Radial
T	Both in Cap Axial

1 Porting options K, P, and T are not available with rear mountings.

2 When selecting the mount, stroke lengths below 10mm will not receive a head foot bracket.

3 Special Tooling Pate configuration.

4 When ordering double rod style cylinders, please be clear as to which end of the cylinder the tooling plate is to be incorporated as related to porting. The standard rod end configuration for Rod End # 2 (Non Tooling Plate end) is a designator # 6, metric female. Alternate rod ends are available and please consult Section A, P1M Cylinders for how to order.

5 Bumpers for this option are polyurethane. Piston, rod, and body end seals are fluorocarbon. Please review the following specification page for additional information.

6 For information regarding sensors, please refer to Electronic Sensors section.

7 Not available for 12-25mm bores.

Minimum / Maximum Stroke Lengths (mm)

Bore Size	Minimum Stroke		Maximum Stroke
	Single Rod	Double Rod	Single or Double Rod
12	5	5	60
16	5	5	70
20	5	8	85
25	5	8	85
32	5	9	100
40	5	12	100
50	5	20	100

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Cylinder Specifications

- Bore Sizes: 12, 16, 20, 25, 32, 40 and 50mm
- Maximum Operating Pressure: 10 Bar or 145 PSI
- Standard Operating Temperature: -20°C to +80°C, -4°F to +176°F
- Optional (limited exposure) High Temperature: -10°C to +121°C, +14°F to +250°F

Material Specifications

- Piston Rod and Guide Rods: Hard Chrome Plated Steel, 100,000 PSI Yield (303 Stainless Steel standard on 12-25mm bores)
- Piston Rod Seal: Polyurethane
- Piston Rod Bearing: Multilayer PTFE with Steel Backing
- Tooling Plate Guide Rod Bearing: Multilayer PTFE with Steel Backing
- End Covers: Black Anodized Aluminum
- Assembly and Tooling Plate Fasteners: Stainless Steel / Zinc Plated Steel
- O-Rings: Nitrile Rubber, NBR
- Cylinder Body: Clear Anodized Aluminum
- Piston: Aluminum Alloy
- Piston Seal: Nitrile Rubber, NBR
- Magnet: Plastic Coated Magnetic Material
- Bumpers: Polyurethane (12-25mm bores) or Hytrel® (32-50mm bores)

High Temperature/Chemical Compatibility Seal Option Material*

- O-Rings: Fluorocarbon, FPM
- Piston Rod Seal: Fluorocarbon, FPM
- Piston Seal: Fluorocarbon, FPM
- Bumpers: Polyurethane (12-25mm bores) or Hytrel® (32-50mm bores)

* Option intended for limited exposure to elevated temperatures over 80°C, or 176°F. Option is primarily for applications which subject the cylinder to fluids and or chemicals that have an adverse effect on external seals. If continued exposure to elevated temperatures is required, please consult the Actuator Division for alternative options.

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E

Forces, Weights, Air Consumption

Bore (mm)	Area (cm^2)	Piston Rod		Extend Force* (N)	Retract Force* (N)	Weight		Air Consumption** (Liters)
		Dia. (mm)	Area (cm^2)			Zero Stroke (kg)	Per 10mm Stroke (kg)	
12	1.1	6	0.3	68	51	0.073	0.020	0.0139
16	2.0	8	0.5	121	90	0.106	0.026	0.0246
20	3.1	10	0.8	188	141	0.184	0.040	0.0385
25	4.3	10	0.8	295	247	0.216	0.042	0.0633
32	8.0	12	1.1	483	415	0.314	0.052	0.1050
40	12.6	16	2.0	754	633	0.438	0.068	0.1620
50	19.6	20	3.1	1178	990	0.737	0.097	0.2530

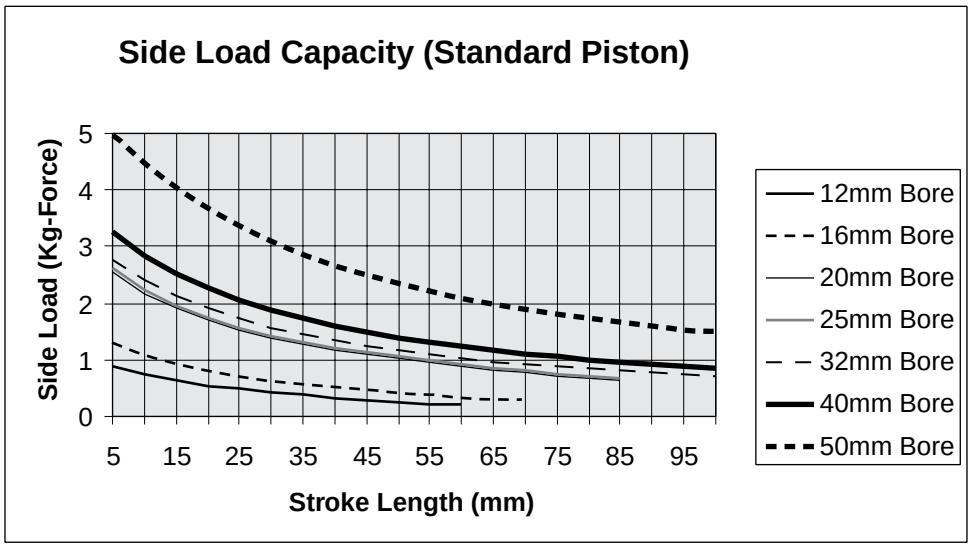
*Theoretical cylinder force at 600 kPa (6 Bar).

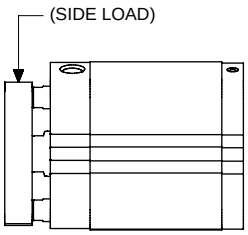
**Free air consumption per 10mm stroke length for an extend and retract stroke at 600 kPa (6 Bar).

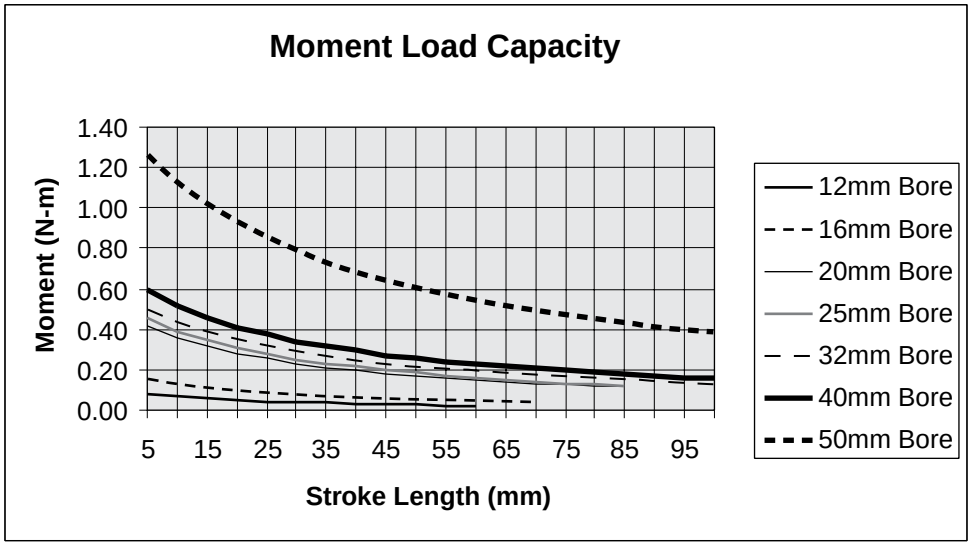
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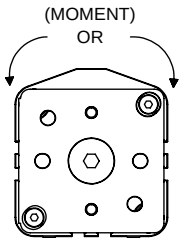
P1M Series Tooling Plate Performance Data – Standard Piston

The following graphs represent maximum loading capacities for the standard piston option. Use of the standard piston option provides space savings by reducing the piston thickness, thus reducing overall length. Please review the following graphs to determine if the application load falls into acceptable operating ranges. In the event that the induced load falls out of the acceptable operating range, you may either increase the bore size or incorporate a magnetic piston for increased load capacity. For information regarding magnetic piston load carrying capability, please review the following page.



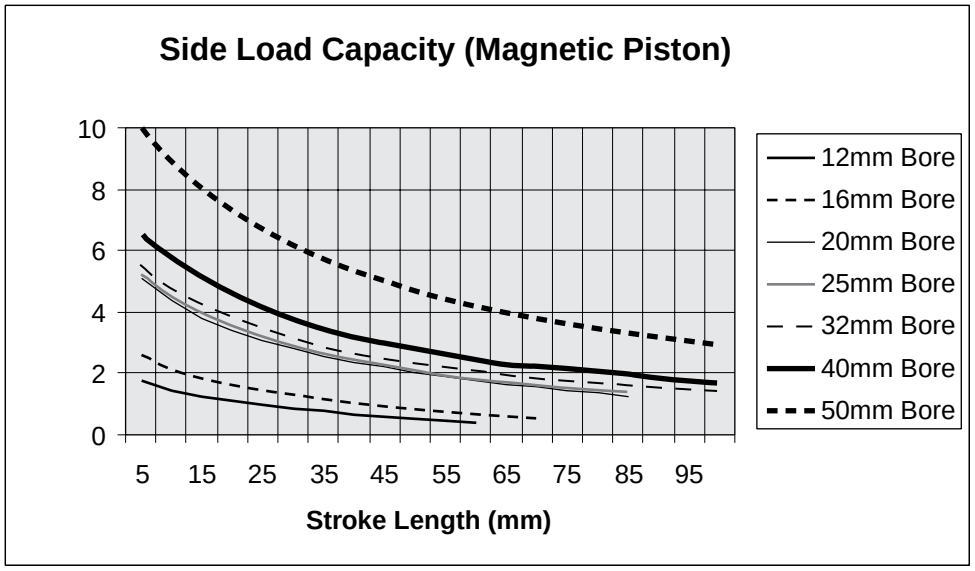


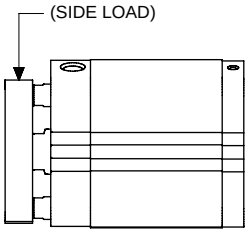


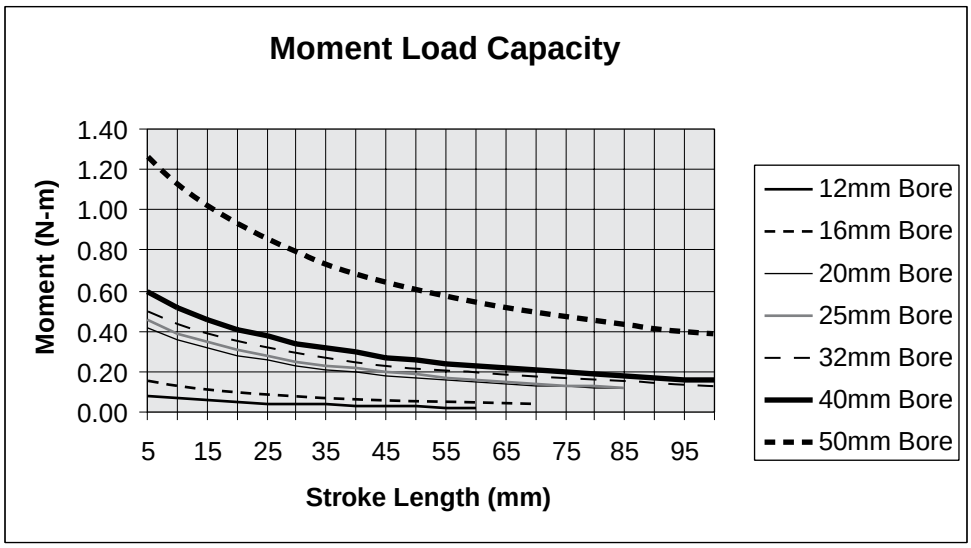


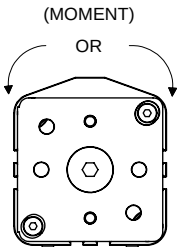
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P1M Series Tooling Plate Performance Data – Magnetic Piston







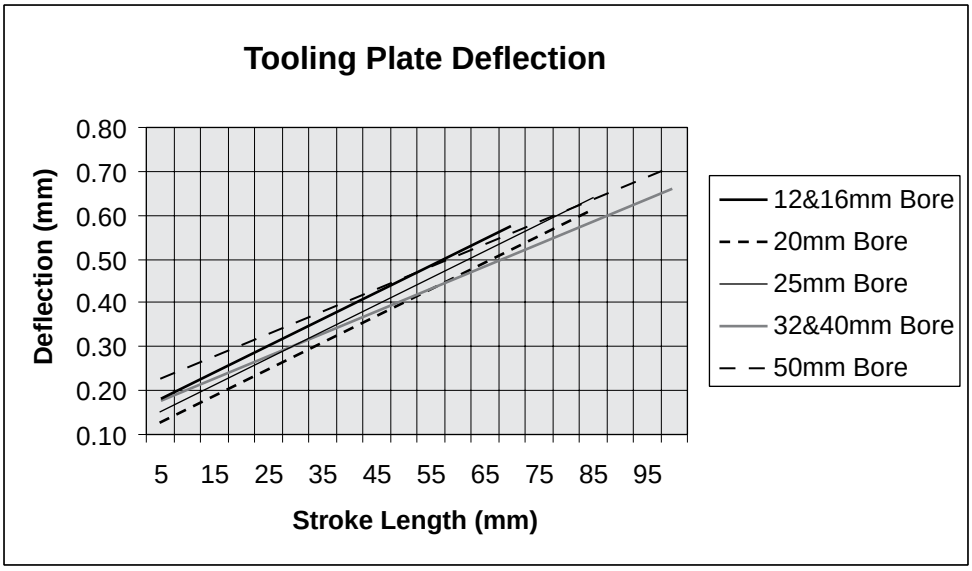


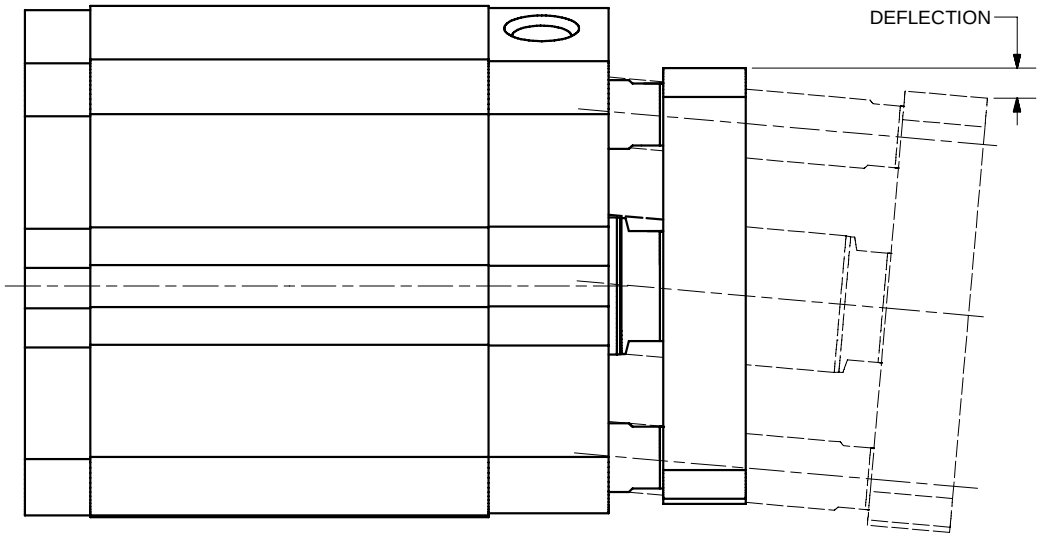
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P1M Series Tooling Plate Performance Data – Tooling Plate Deflection

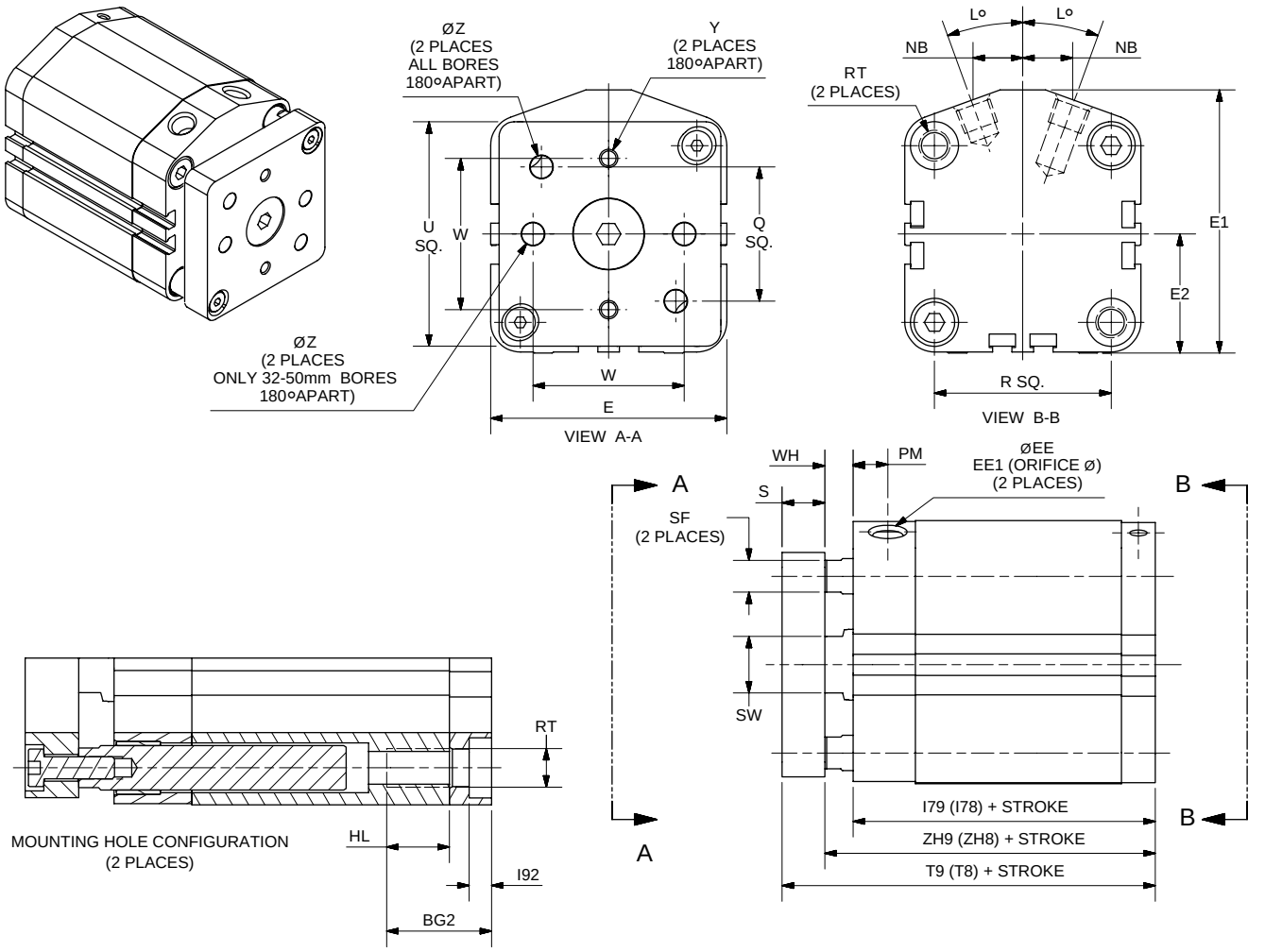
The following graph represents typical tooling plate deflection for P1M Tooling Plate Cylinders. The amount of tooling plate deflection is dependent on induced application load and the working stroke length of the cylinder. Depicted deflection is typical of a cylinder operating within the allowable side load and maximum allowable moment ranges per a given bore size and piston option.





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E

Both Ports Head*

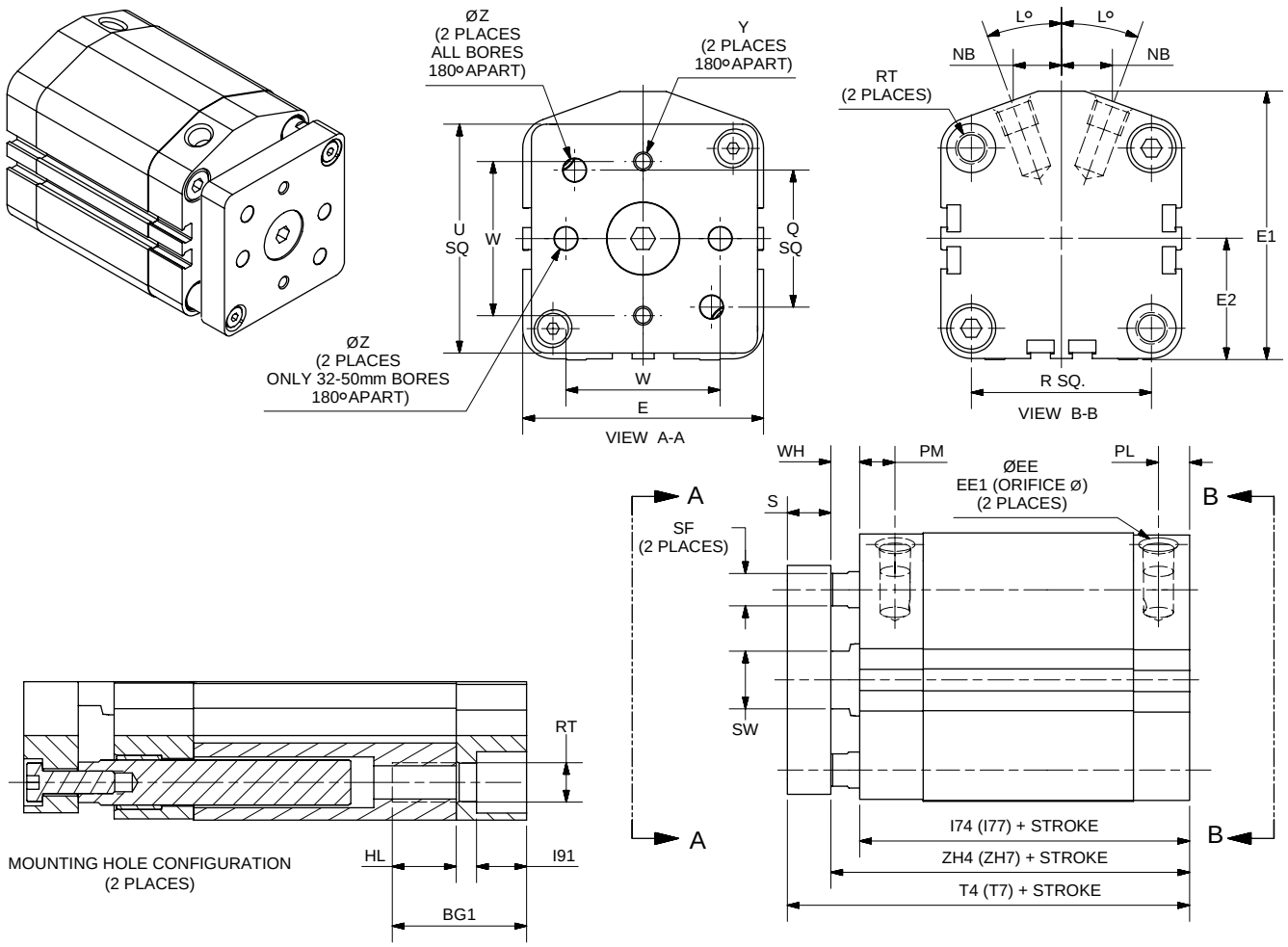
Bore	BG2	E	E1	E2	EE			EE1	HL	L	NB	PM	R	RT
					BSPP	BSPT	NPTF							
12	11.5	27	31	14	M5	—	—	1	8	26	5.5	8.5	15.5	M4x0.7
16	12	31.5	35	16	M5	—	—	1.2	8	20	7	9	20	M4x0.7
20	14.5	38.5	42.5	19.5	M5	—	—	1.3	10	20	8	9	25.5	M6x1.0
25	15	41.5	45.5	21	M5	—	—	1.8	10	20	8.5	9	28	M6x1.0
32	17	48	56	24	G1/8	R_C 1/8	1/8	2.7	10	25	9.5	10.5	34	M6x1.0
40	17.5	56	62.5	28	G1/8	R_C 1/8	1/8	3.4	10	20	11.5	9.5	40	M6x1.0
50	21.5	67	74.5	33.5	G1/8	R_C 1/8	1/8	4	12	20	14.5	10	50	M8x1.25

Bore	I92	S	SF	SW	U	Q	W	WH	Y	Z	Standard Piston			Magnetic Piston		
											I79	T9	ZH9	I78	T8	ZH8
12	3.5	6	4	5	25.4	20	14	3.5	M3x0.5	4.1	24	33.5	27.5	34.9	44.4	38.4
16	4	6	4	7	28.6	20	20	3.5	M3x0.5	4.1	26.2	35.7	29.7	37.1	46.6	40.6
20	4.5	6.9	7	9	34.9	26	27	4.5	M4x0.7	4.1	27.8	39.2	32.3	37.7	49.1	42.2
25	5	8.3	7	9	39	26	27	5	M4x0.7	4.1	28.8	42.1	33.8	38.7	52	43.7
32	4	8.3	7	10	44.5	32	30	7	M4x0.7	5.2	31.9	47.2	38.9	41	56.3	48
40	4	8.3	7	13	50.8	32	30	7	M4x0.7	5.2	32.6	47.9	39.6	42.5	57.8	49.5
50	5	12.1	9	16	63.5	38	42.8	8	M5x0.8	6.4	35.4	55.5	43.4	44.3	64.4	52.3

* Both Ports Head [BSPP ports (M5) for 12-25mm bores and 1/8" NPTF ports for 32-50mm bores] is the standard porting configuration for the P1M Tooling Plate Cylinder. Alternate porting options are available at an additional cost.

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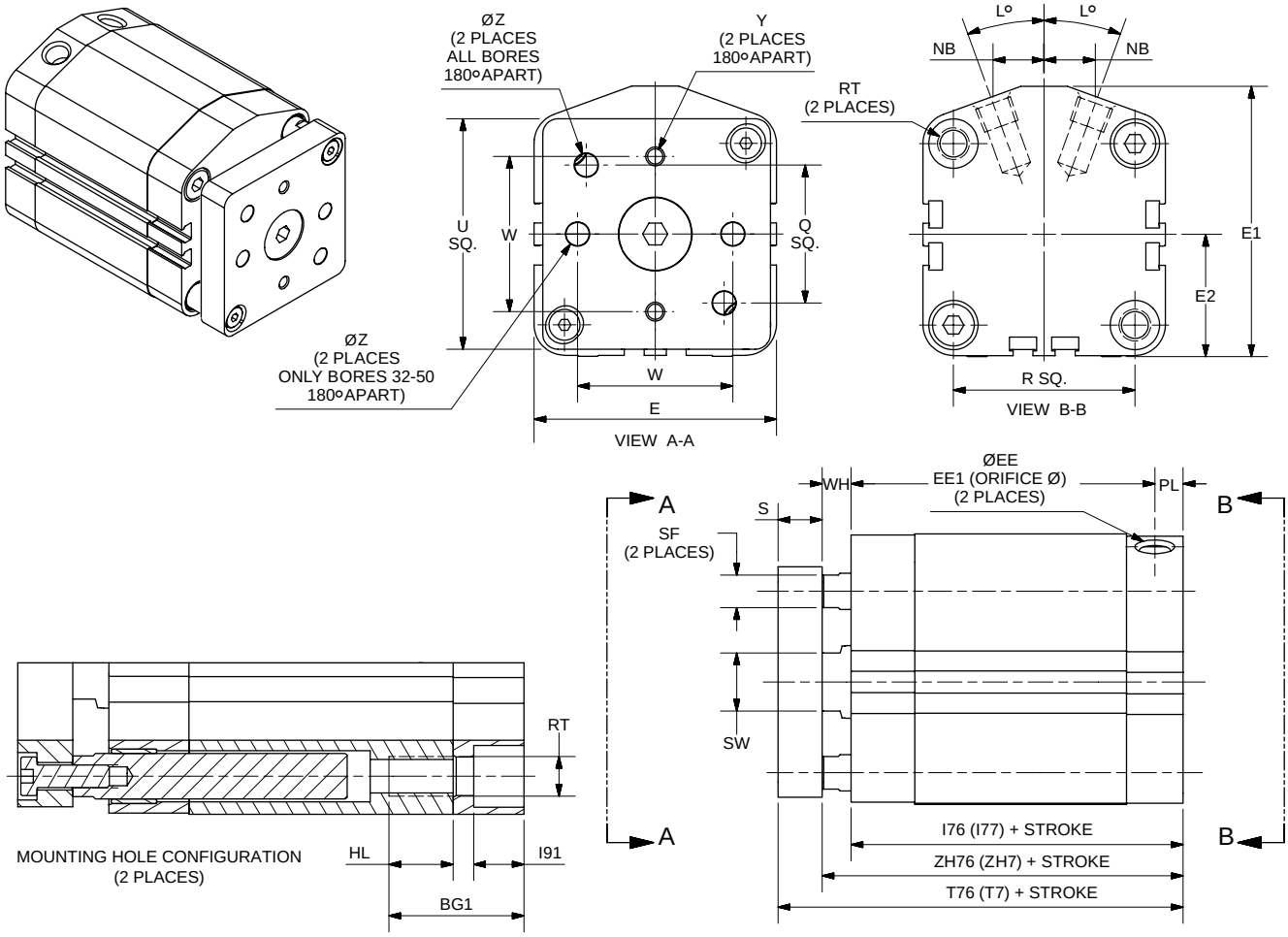


Head and Cap Ported (Radial

Bore	BG1	E	E1	E2	EE			EE1	HL	L	NB	PL	PM	R	RT
					BSPP	BSPT	NPTF								
12	16.5	27	31	14	M5	—	—	1	8	26	5.5	5	8.5	15.5	M4x0.7
16	17	31.5	35	16	M5	—	—	1.2	8	20	7	5	9	20	M4x0.7
20	19	38.5	42.5	19.5	M5	—	—	1.3	10	20	8	5	9	25.5	M6x1.0
25	21	41.5	45.5	21	M5	—	—	1.8	10	20	8.5	7	9	28	M6x1.0
32	25	48	56	24	G1/8	R_C 1/8	1/8	2.7	10	25	9.5	8	10.5	34	M6x1.0
40	25.5	56	62.5	28	G1/8	R_C 1/8	1/8	3.4	10	20	11.5	7.5	9.5	40	M6x1.0
50	27.6	67	74.5	33.5	G1/8	R_C 1/8	1/8	4	12	20	14.5	8	10	50	M8x1.25

Bore	I91	S	SF	SW	U	Q	W	WH	Y	Z	Standard Piston			Magnetic Piston		
											I74	T4	ZH4	I77	T7	ZH7
12	3.5	6	4	5	25.4	20	14	3.5	M3x0.5	4.1	29	38.5	32.5	39.9	49.4	43.4
16	4	6	4	7	28.6	20	20	3.5	M3x0.5	4.1	31.2	40.7	34.7	42.1	51.6	45.6
20	4.5	6.9	7	9	34.9	26	27	4.5	M4x0.7	4.1	32.3	43.7	36.8	42.2	53.6	46.7
25	5	8.3	7	9	39	26	27	5	M4x0.7	4.1	34.8	48.1	39.8	44.7	58	49.7
32	4	8.3	7	10	44.5	32	30	7	M4x0.7	5.2	39.9	55.2	46.9	49	64.3	56
40	4	8.3	7	13	50.8	32	30	7	M4x0.7	5.2	40.6	55.9	47.6	50.5	65.8	57.5
50	5	12.1	9	16	63.5	38	42.8	8	M5x0.8	6.4	41.4	61.5	49.4	50.3	70.4	58.3

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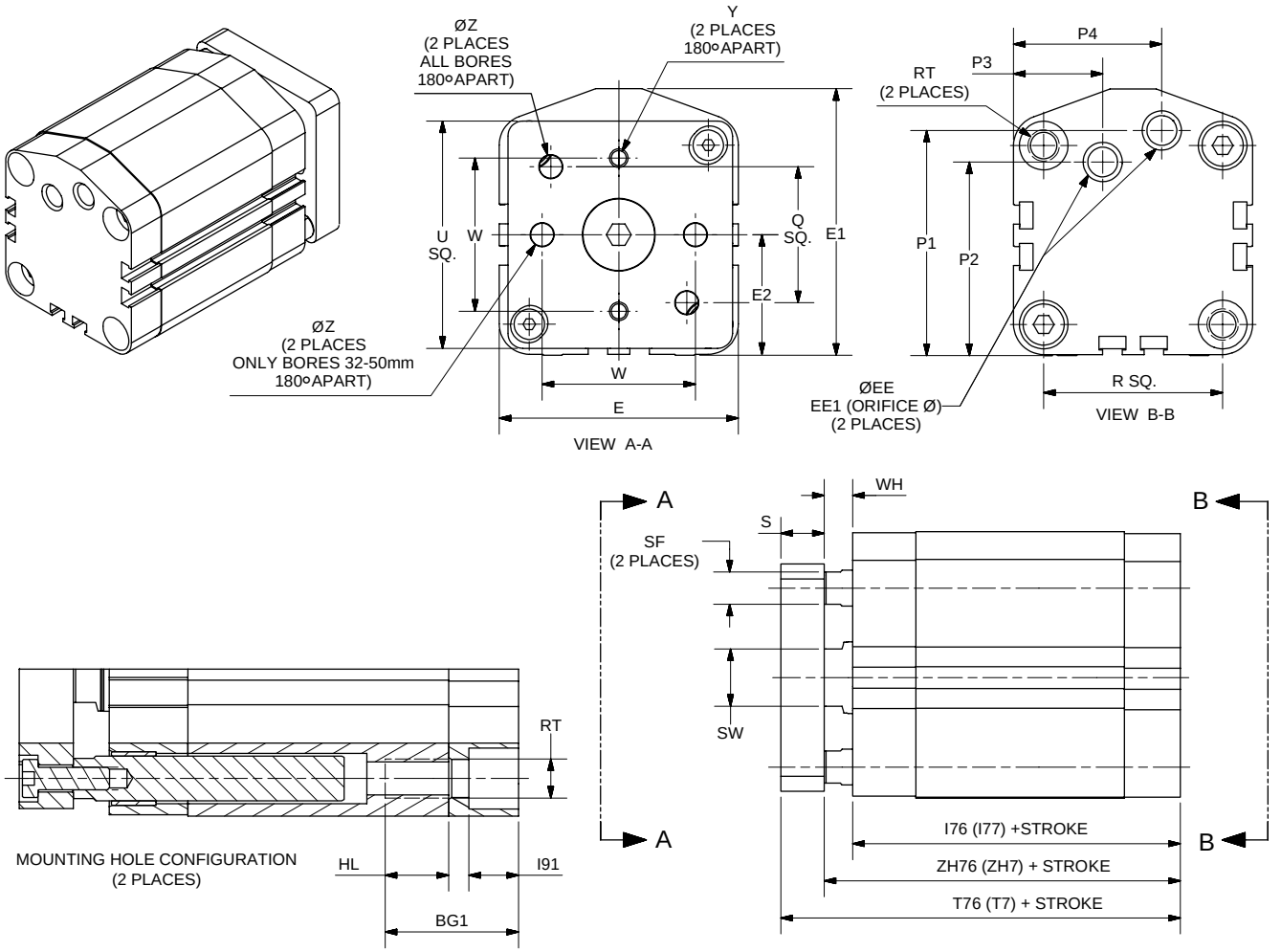
E

Both Ports Cap (Radial)

Bore	BG1	E	E1	E2	EE			EE1	HL	L	NB	PL	R	RT
					BSPP	BSPT	NPTF							
12	16.5	27	31	14	M5	—	—	1	8	26	5.5	5	15.5	M4x0.7
16	17	31.5	35	16	M5	—	—	1.2	8	20	7	5	20	M4x0.7
20	19	38.5	42.5	19.5	M5	—	—	1.3	10	20	8	5	25.5	M6x1.0
25	21	41.5	45.5	21	M5	—	—	1.8	10	20	8.5	7	28	M6x1.0
32	25	48	56	24	G1/8	R_C1/8	1/8	2.7	10	25	9.5	8	34	M6x1.0
40	25.5	56	62.5	28	G1/8	R_C1/8	1/8	3.4	10	20	11.5	7.5	40	M6x1.0
50	27.6	67	74.5	33.5	G1/8	R_C1/8	1/8	4	12	20	14.5	8	50	M8x1.25

Bore	I91	S	SF	SW	U	Q	W	WH	Y	Z	Standard Piston			Magnetic Piston		
											I76	T76	ZH76	I77	T7	ZH7
12	3.5	6	4	5	25.4	20	14	3.5	M3x0.5	4.1	29	38.5	32.5	39.9	49.4	43.4
16	4	6	4	7	28.6	20	20	3.5	M3x0.5	4.1	31.2	40.7	34.7	42.1	51.6	45.6
20	4.5	6.9	7	9	34.9	26	27	4.5	M4x0.7	4.1	32.3	43.7	36.8	42.2	53.6	46.7
25	5	8.3	7	9	39	26	27	5	M4x0.7	4.1	34.8	48.1	39.8	44.7	58	49.7
32	4	8.3	7	10	44.5	32	30	7	M4x0.7	5.2	39.9	55.2	46.9	49	64.3	56
40	4	8.3	7	13	50.8	32	30	7	M4x0.7	5.2	40.6	55.9	47.6	50.5	65.8	57.5
50	5	12.1	9	16	63.5	38	42.8	8	M5x0.8	6.4	41.4	61.5	49.4	50.3	70.4	58.3

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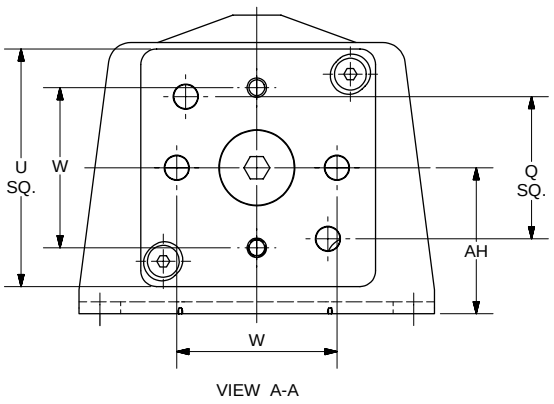
Both Ports Cap Face (Axial)

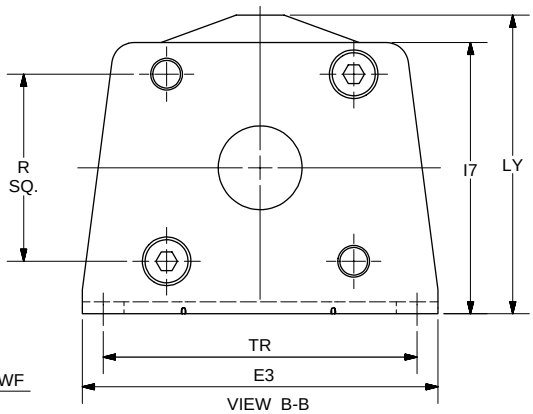
Bore	BG1	E	E1	E2	EE			EE1	HL	P1	P2	P3	P4	R	RT
					BSPP	BSPT	NPTF								
12	16.5	27	31	14	M5	—	—	1	8	25	9.5	13.5	13.5	15.5	M4x0.7
16	17	31.5	35	16	M5	—	—	1.2	8	29.5	9.5	15.5	18	20	M4x0.7
20	19	38.5	42.5	19.5	M5	—	—	1.3	10	35	13.5	24.5	21.5	25.5	M6x1.0
25	21	41.5	45.5	21	M5	—	—	1.8	10	38.5	14	27.5	24.5	28	M6x1.0
32	25	48	56	24	G1/8	R_C1/8	1/8	2.7	10	45.5	16.5	31.5	28.5	34	M6x1.0
40	25.5	56	62.5	28	G1/8	R_C1/8	1/8	3.4	10	51	12	23	33	40	M6x1.0
50	27.6	67	74.5	33.5	G1/8	R_C1/8	1/8	4	12	63	54.5	25	41.5	50	M8x1.25

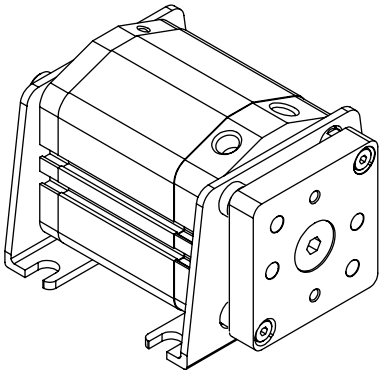
Bore	I91	S	SF	SW	U	Q	W	WH	Y	Z	Standard Piston			Magnetic Piston		
											I76	T76	ZH76	I77	T7	ZH7
12	3.5	6	4	5	25.4	20	14	3.5	M3x0.5	4.1	29	38.5	32.5	39.9	49.4	43.4
16	4	6	4	7	28.6	20	20	3.5	M3x0.5	4.1	31.2	40.7	34.7	42.1	51.6	45.6
20	4.5	6.9	7	9	34.9	26	27	4.5	M4x0.7	4.1	32.3	43.7	36.8	42.2	53.6	46.7
25	5	8.3	7	9	39	26	27	5	M4x0.7	4.1	34.8	48.1	39.8	44.7	58	49.7
32	4	8.3	7	10	44.5	32	30	7	M4x0.7	5.2	39.9	55.2	46.9	49	64.3	56
40	4	8.3	7	13	50.8	32	30	7	M4x0.7	5.2	40.6	55.9	47.6	50.5	65.8	57.5
50	5	12.1	9	16	63.5	38	42.8	8	M5x0.8	6.4	41.4	61.5	49.4	50.3	70.4	58.3

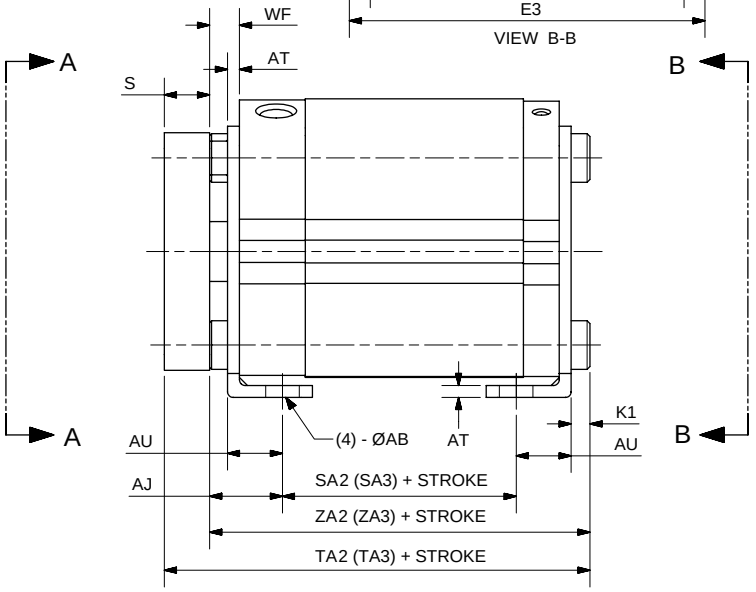
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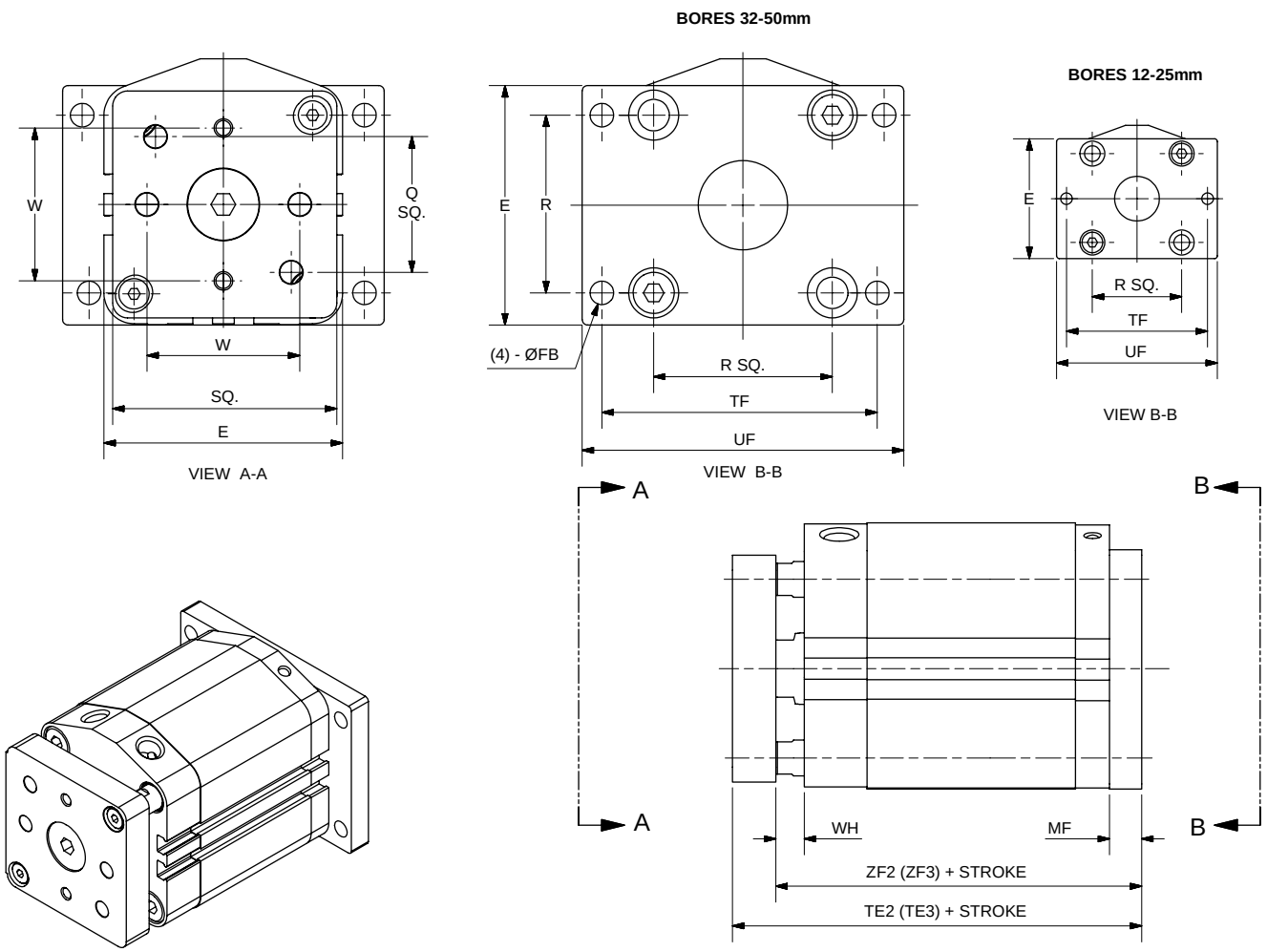
Foot Mount

Bore	AB	AH	AJ	AT	AU	E3	I7	K1	LY	R	S	TR	WF
12	4.5	17	19.5	2	8	44	29.5	2.8	34	15.5	6	35	13.5
16	4.5	19	19.5	2	8	48	33.5	2.8	38	20	6	39	13.5
20	6.5	24	20.5	3.2	9.2	62	42	4	47	25.5	6.9	50	14.5
25	6.5	26	22.5	3.2	10.7	66	46	4	50.5	28	8.3	52	15
32	6.5	30	25	3.2	11.2	71	54	4	62	34	8.3	60	17
40	6.5	33	25	3.2	11.2	78	61	4	67.5	40	8.3	67	17
50	9	39	29.5	3.2	14.7	95	72.5	5	80	50	12.1	82	18

Bore	Both Ports Head						Hand and Cap Ported (Radial)						Both Ports Cap (Radial)					
	Standard Piston			Magnetic Piston			Standard Piston			Magnetic Piston			Standard Piston			Magnetic Piston		
	SA2	TA2	ZA2	SA3	TA3	ZA3	SA2	TA2	ZA2	SA3	TA3	ZA3	SA2	TA2	ZA2	SA3	TA3	ZA3
12	12	48.3	42.3	22.9	59.2	53.2	17	53.3	47.3	27.9	64.2	58.2	17	53.3	47.3	27.9	64.2	58.2
16	14.2	50.5	44.5	25.1	61.4	55.4	19.2	55.5	49.5	30.1	66.4	60.4	19.2	55.5	49.5	30.1	66.4	60.4
20	15.8	56.4	49.5	25.7	66.3	59.4	20.3	60.9	54	30.2	70.8	63.9	20.3	60.9	54	30.2	70.8	63.9
25	13.8	59.3	51	23.7	69.2	60.9	19.8	5.3	57	29.7	75.2	66.9	19.8	65.3	57	29.7	75.2	66.9
32	15.9	64.4	56.1	25	73.5	65.2	23.9	72.4	64.1	33	81.5	73.2	23.9	72.4	64.1	33	81.5	73.2
40	16.6	65.1	56.8	26.5	75	66.7	24.6	73.1	64.8	34.5	83	74.7	24.6	73.1	64.8	34.5	83	74.7
50	12.4	73.7	61.6	21.3	82.6	70.5	18.4	79.7	67.6	27.3	88.6	76.5	18.4	79.7	67.6	27.3	88.6	76.5

Note: Stroke lengths below 10mm do not receive a head foot bracket.
Corner thru holes cannot be used with Foot Mount if fasteners are inserted from Tooling Plate inside face (interference).

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Rear Flange Mount

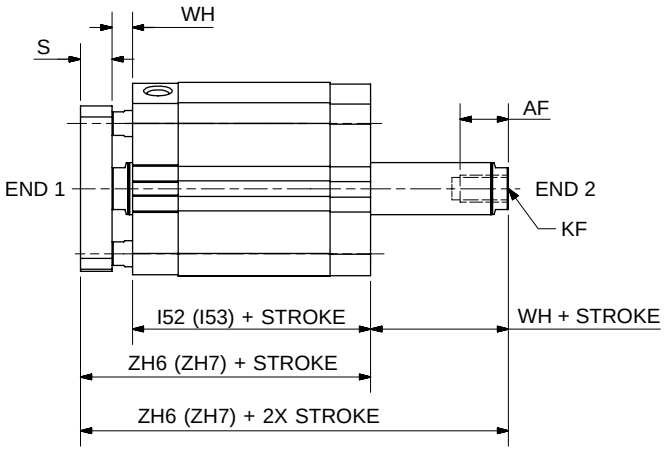
Bore	E	FB	MF	R	S	TF	U	UF	W	WH
12	25	4.5	5.5	—	6	45	25.4	55	14	3.5
16	30	4.5	5.5	—	6	45	28.6	55	20	3.5
20	39	6.5	8	—	6.9	50.5	34.9	62	27	4.5
25	42	6.5	8	—	8.3	53	39	65	27	5
32	48	5.5	8	34	8.3	58	44.5	68	30	7
40	54	5.5	8	40	8.3	66	50.8	76	30	7
50	67	6.5	9	50	12.1	79	63.5	90	42.8	8

Bore	Both Ports Head				Hand and Cap Ported (Radial)				Both Ports Cap (Radial)			
	Standard Piston		Magnetic Piston		Standard Piston		Magnetic Piston		Standard Piston		Magnetic Piston	
	TE2	ZF2	TE3	ZF3	TE2	ZF2	TE3	ZF3	TE2	ZF2	TE3	ZF3
12	39	33	49.9	43.9	44	38	54.9	48.9	44	38	54.9	48.9
16	41.2	35.2	52.1	46.1	46.2	40.2	57.1	51.1	46.2	40.2	57.1	51.1
20	47.2	40.3	57.1	50.2	51.7	44.8	61.6	54.7	51.7	44.8	61.6	54.7
25	50.1	41.8	60	51.7	56.1	47.8	66	57.7	56.1	47.8	66	57.7
32	55.2	46.9	64.3	56	63.2	54.9	72.3	64	63.2	54.9	72.3	64
40	55.9	47.6	65.8	57.5	63.9	55.6	73.8	65.5	63.9	55.6	73.8	65.5
50	64.5	52.4	73.4	61.3	70.5	58.4	79.4	67.3	70.5	58.4	79.4	67.3

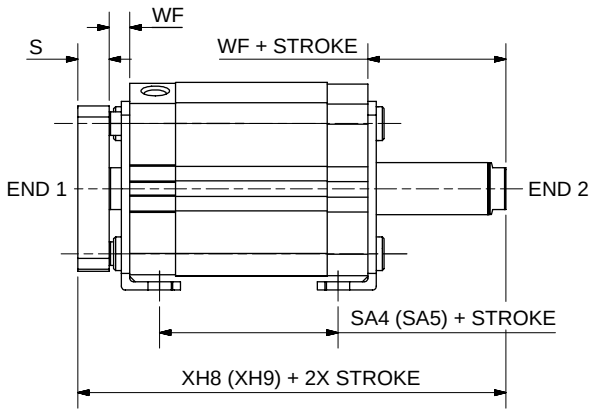
Rear Flange Mounting Kits can be ordered assembled to the cylinder or separately as needed. Please refer to the How To Order Code section to order the rear flange assembled to the cylinder.
For separate mounting kits, please refer to page E36 for the proper kit per bore size.

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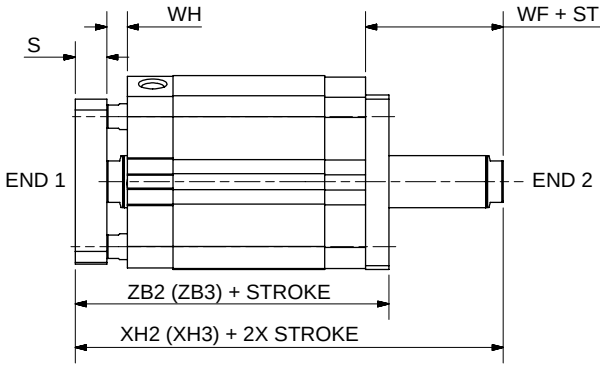
Basic Mount



Foot Mount



Rear Flange Mount



E

Double Rod

Bore	S	AF	KF	WF	WH
12	6	6	M3x0.5	13.5	3.5
16	6	8	M4x0.7	13.5	3.5
20	6.9	7	M5x0.8	14.5	4.5
25	8.3	12	M6x1.0	15	5
32	8.3	13	M8x1.25	17	7
40	8.3	13	M8x1.25	17	7
50	12.1	15	M10x1.5	18	8

The double rod dimensions differ from, or are in addition to, those for single rod cylinders depicted on previous pages.

To determine dimensions for a double rod cylinder, first refer to the desired single rod porting style cylinder configuration you wish to incorporate on preceding pages of this catalog. After selecting the necessary dimensions from that drawing, return to this page and supplement the single rod dimensions with those shown on these dimensional tables.

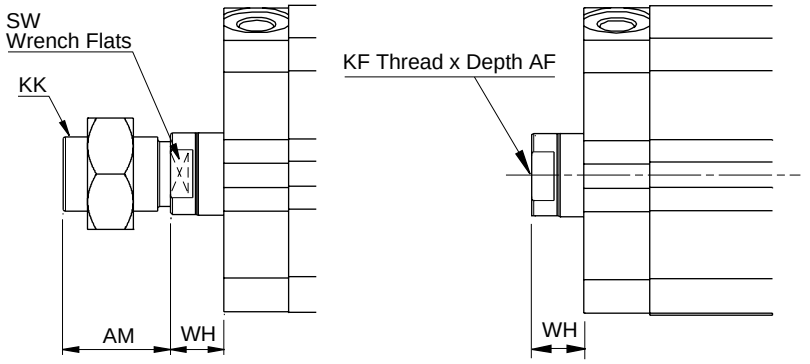
Note: Double rod end 2 will have a Short Bearing head as standard.

Bore	Basic Mount - Style C						Foot Mount - Style F				Rear Flange Mount - Style J			
	Standard Piston			Magnetic Piston			Standard Piston		Magnetic Piston		Standard Piston		Magnetic Piston	
	I52	ZH6	XH6	I53	ZH7	XH7	SA4	XH8	SA5	XH9	ZB2	XH2	ZB3	XH3
12	31.1	40.6	44.1	42	51.5	55	19.1	64.1	30	75	46.1	54.1	57	65
16	31.6	41.1	44.6	42.5	52	55.5	19.6	64.6	305	75.5	46.6	54.6	57.5	65.5
20	33.5	44.9	49.4	43.4	54.8	59.3	20.6	68.5	305	78.4	52.9	59.4	62.8	69.3
25	35.6	48.9	53.9	45.5	58.8	63.8	20.6	73.9	305	83.8	56.9	63.9	66.8	73.8
32	40.1	55.4	62.4	49.2	64.5	71.5	24.1	82.4	33.2	91.5	63.4	72.4	72.5	81.5
40	40.6	55.9	62.9	50.5	65.8	72.8	24.6	82.9	34.5	92.8	63.9	72.9	73.8	82.8
50	41.4	61.5	69.5	50.3	70.4	78.4	18.4	89.5	27.3	98.4	70.5	79.5	79.4	88.4

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Rod End Dimensions
Basic Mount

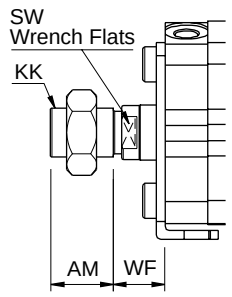
For special rod ends, specify “3” in model number and give desired WH, AM or AF and KK or KF.

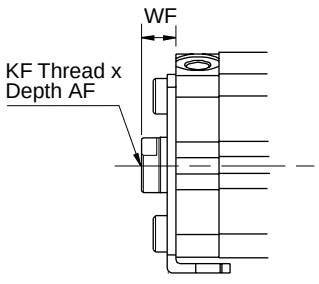


Rod End Dimensions
Foot Mount and Rear Flange Mount

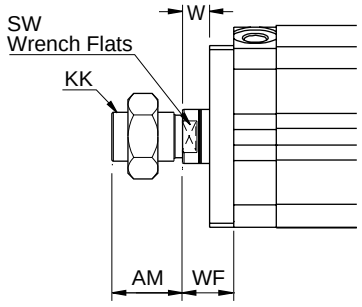
For special rod threads, specify “3” in model number and give desired AM or AF, WF and KK or KF.

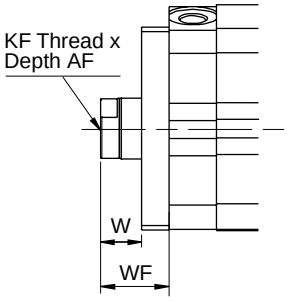
Foot Mount





Rear Flange Mount





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Rear Flange Mount Kits

Bore Size	Kit Number
12	P1M-4DMB
16	P1M-4FMB
20	P1M-4HMB
25	P1M-4JMB
32	P1M-4KMB
40	P1M-4LMB
50	P1M-4MMB

Foot Bracket Mounting Kits

Bore Size	Stroke	Kit Number
12	<10mm	L078290012
	≥10mm	L078300012
16	<10mm	L078290016
	≥10mm	L078300016
20	<10mm	L078290020
	≥10mm	L078300020
25	<10mm	L078290025
	≥10mm	L078300025
32	<10mm	L078290032
	≥10mm	L078300032
40	<10mm	L078290040
	≥10mm	L078300040
50	<10mm	L078290050
	≥10mm	L078300050

Seal Kits

Bore Size	Single Rod Cylinders		Double Rod Cylinders	
	Class 1 Seals	Class 5 Seals	Class 1 Seals	Class 5 Seals
12	P1M-6DRN	P1M-6DRV	P1M-6DRT	P1M-6DRP
16	P1M-6FRN	P1M-6FRV	P1M-6FRT	P1M-6FRP
20	P1M-6HRN	P1M-6HRV	P1M-6HRT	P1M-6HRP
25	P1M-6JRN	P1M-6JRV	P1M-6JRT	P1M-6JRP
32	P1M-6KRN	P1M-6KRV	P1M-6KRT	P1M-6KRP
40	P1M-6LRN	P1M-6LRV	P1M-6LRT	P1M-6LRP
50	P1M-6MRN	P1M-6MRV	P1M-6MRT	P1M-6MRP

Available Gripper Series and Sizes per P1M Tooling Plate Cylinder Bore Size

Bore Size	Gripper Series* and Sizes
12	P5G-AP3, P5G-AA3, P5G-AW3
16	P5G-AP3, P5G-AA3, P5G-AW3
20	P5G-AP4, P5G-AA4, P5G-AW4
25	P5G-AP4, P5G-AA4, P5G-AW4
32	P5G-AP5, P5G-AA5, P5G-AW5
40	P5G-AP5, P5G-AA5, P5G-AW5
50	P5G-AP6, P5G-AA6, P5G-AW6

Mounting Assembly Fastener Selection Chart

Mounting Configuration	Qty	Fastener Thread Length "L"						
		12mm Bore	16mm Bore	20mm Bore	25mm Bore	32mm Bore	40mm Bore	50mm Bore
Head (Front End Cover)								
Style F - Foot Mount* , Short	—	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Style F - Foot Mount*, Std.	2	23mm	23mm	28mm	28mm	30mm	30mm	32mm
Cap (Rear End Cover)								
Non-Ported Cap (Ports H, M, R)								
Style F - Foot Mount	2	12mm	12mm	18mm	18mm	20mm	20mm	25mm
Style H - Rear Flange Mount	2	12mm	12mm	18mm	18mm	20mm	20mm	25mm
Ported Cap (Ports G, J, K, N, L, P Q, S, T)								
Style F - Foot Mount	2	20mm	20mm	23mm	23mm	30mm	30mm	30mm
Style H - Rear Flange Mount	2	20mm	20mm	23mm	23mm	30mm	30mm	30mm

*Use cylinder assembly fasteners to assemble front foot mount options.

Short = Stroke lengths <10mm and without magnet.

Std. = Stroke lengths longer than or equal to 10mm or with magnet option.

1. Determine the bore size, stroke, porting and mounting configuration of the cylinder.
2. Select the appropriate thread length fastener for both the head and cap (end cover)
3. Use a quantity of (2) each to assemble mounts to the respective end covers.
4. Ensure sufficient thread length engagement (1-1.5 x thread diameter) into mating thread.

Example:
40mm bore, 15mm stroke, M porting, foot mount
Head assembly fastener = 30mm thread length
Cap assembly fastener = 20mm thread length
(use quantity of 2 each)

Bore Size	Cylinder Assembly Fasteners				Piston Rod Fastener				Guide Rod Fasteners			
	Fastener Thread	Fastener Torque		Hex Key	Fastener Thread	Fastener Torque		Hex Key	Fastener Thread	Fastener Torque		Hex Key
	Size	Nm	in-lb	Size	Size	Nm	in-lb	Size	Size	Nm	in-lb	Size
12	M4x0.7	1.4-1.8	12-16	2.5	M3x0.5	0.6-0.9	5-8	2	M3x0.5	0.6-0.9	5-8	2
16	M4x0.7	1.4-1.8	12-16	2.5	M4x0.7	1.4-1.8	12-16	2.5	M3x0.5	0.6-0.9	5-8	2
20	M5x0.8	2.5-2.9	22-26	3	M5x0.8	2.5-2.9	22-26	3	M4x0.7	1.4-1.8	12-16	2.5
25	M5x0.8	2.5-2.9	22-26	3	M6x1.0	4.1-4.5	36-40	4	M4x0.7	1.4-1.8	12-16	2.5
32	M6x1.0	4.1-4.5	36-40	4	M8x1.25	10.2-11.1	90-98	5	M4x0.7	1.4-1.8	12-16	2.5
40	M6x1.0	4.1-4.5	36-40	4	M8x1.25	10.2-11.1	90-98	5	M4x0.7	1.4-1.8	12-16	2.5
50	M8x1.25	10.2-11.1	90-98	5	M10x1.5	21.5-22.6	190-200	6	M5x0.8	2.5-2.9	22-26	3

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P1M Series Swing Clamp

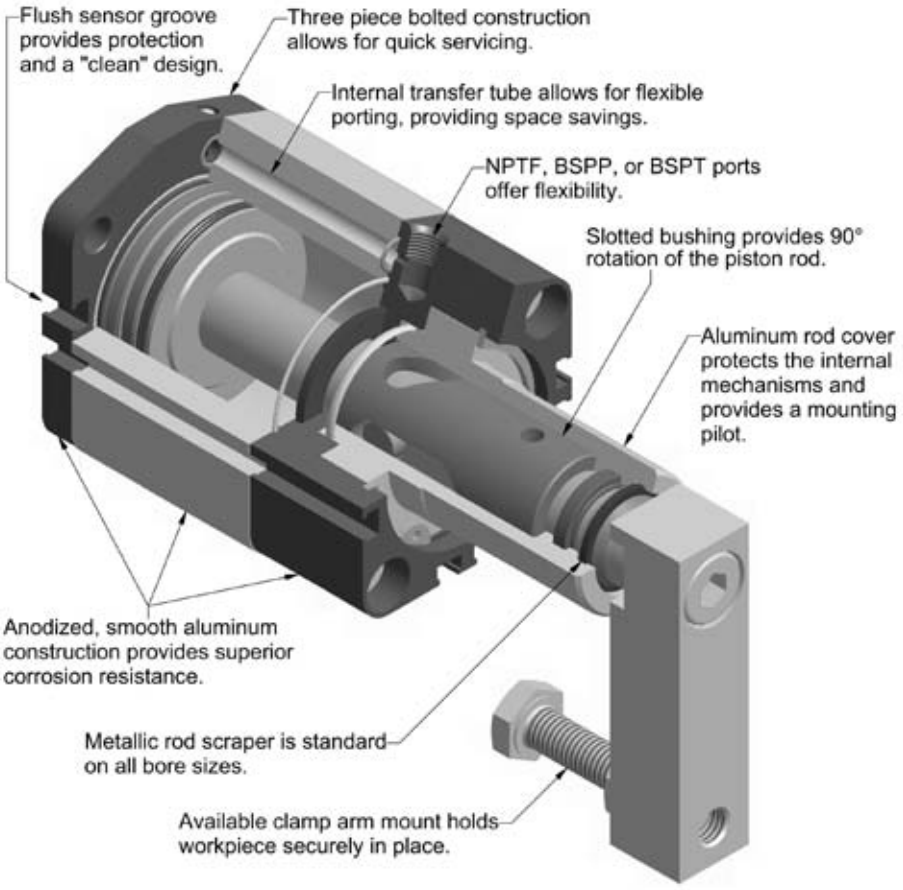
Extra Low Profile Pneumatic Cylinders



Contents

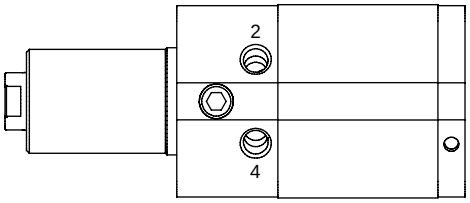
Features and Benefits E38
Ordering Information E39
Cylinder Specifications E40
Performance Data E41
Dimensions E42-E48
Mechanical Accessories E49
Service Kits E50

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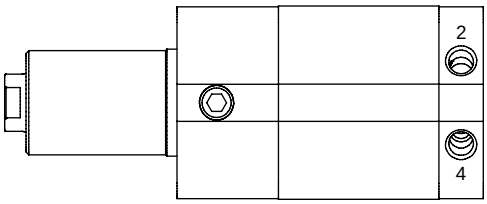


P1M Series Swing Clamp Flexible Porting Options

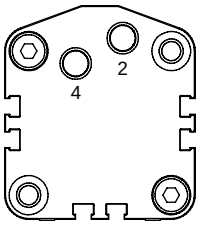
Both Ports Head*



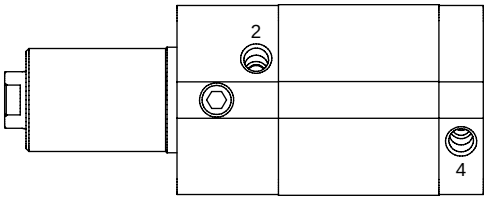
Both Ports Cap



Both Ports Cap Face



Head and Cap Ported



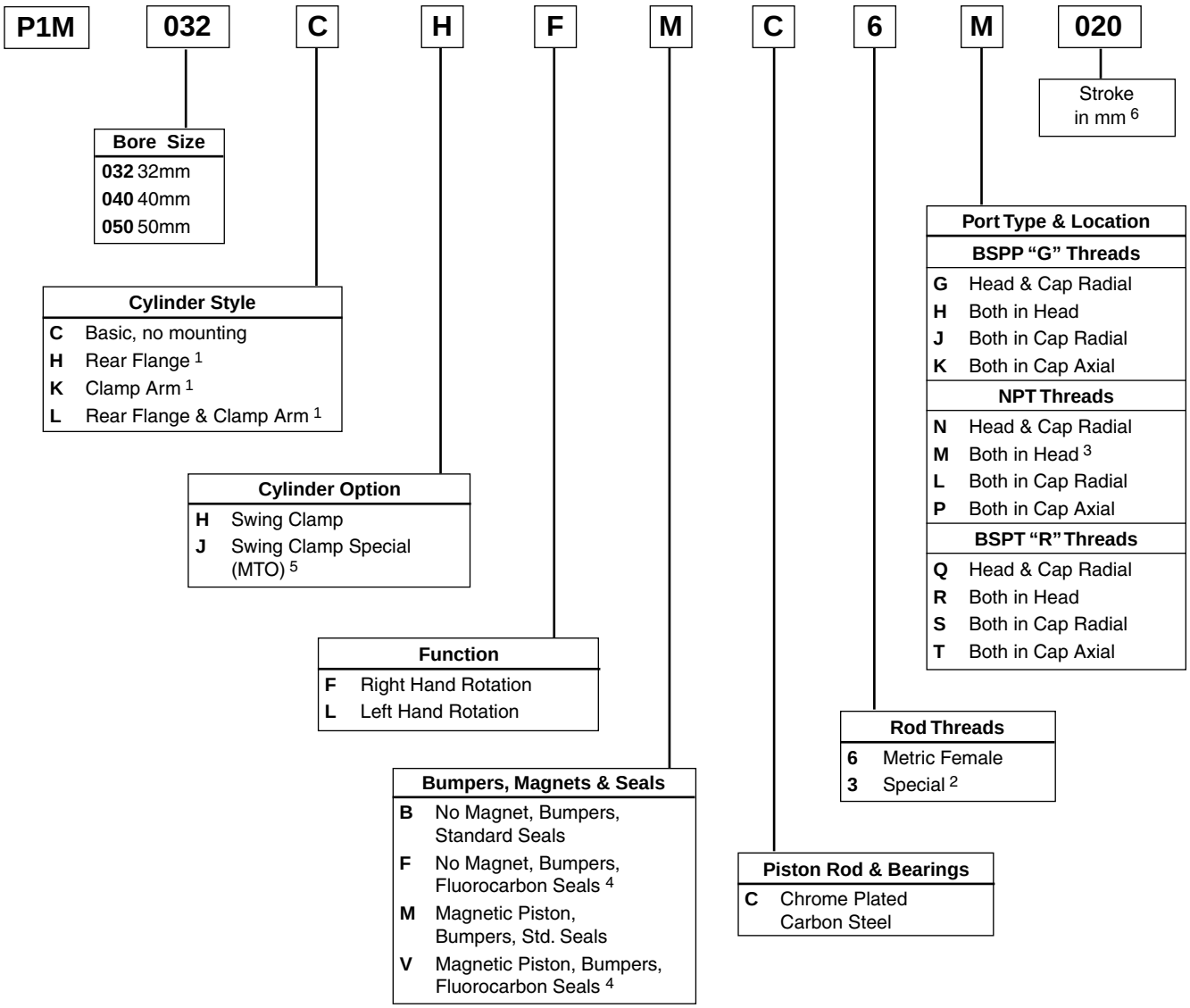
* Both Ports Head (NPT) is the standard porting configuration for the P1M Swing Clamp Cylinder. Alternate porting options are available at an additional cost.

To retract cylinder, apply air to port #2.
To extend cylinder, apply air to port #4.

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How to Order P1M Series Swing Clamp Cylinders



1 Cylinder with mounting fitted
2 Designator #3 should be selected for special rod ends only. When selecting this option, please provide rod style (male or female), thread pitch, thread depth, and wrench flat dimension.
3 Both Ports Head NPT is the standard porting arrangement for this cylinder. Alternate porting arrangements are available at an additional cost.
4 Bumpers for this option are polyurethane. Piston, rod and body end seals are fluorocarbon. Please review the following specification page for additional information.
5 Designator J should be selected for cylinders that require a special option not covered in catalog.
6 See specification table for stroke lengths available per a given bore size.

Note: For sensor specifications and part numbers, please refer to the Electronic Sensors section.

Seal Kit Part Numbers

Bore	Class 1	Class 5
32	L078660032	L078670032
40	L078660040	L078670040
50	L078660050	L078670050

Service kits of expendable parts for fluid power cylinders are stocked in principal industrial locations across the U.S.A. and other countries. For prompt delivery and complete information, contact your nearest distributor.

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Cylinder Specifications

- Bore Sizes: 32, 40 and 50mm
- Maximum Operating Pressure: 10 Bar or 145 PSI
- Standard Operating Temperature: -20°C to +80°C or -4°F to +176°F
- Optional High Temperature: -10°C to +121°C or +14°F to +250°F

Material Specifications

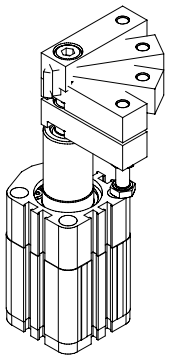
- Piston Rod: Hard Chrome Plated Steel, 100,000 PSI Yield
- Piston Rod Bearing: Stress Proof Steel
- Piston Rod Seal: Polyurethane
- Outboard Rotating Mechanism Cover: 2011 T3 Aluminum
- End Covers: Black Anodized Aluminum
- End Cover Fasteners: Zinc Plated Carbon Steel
- Cylinder Body: Clear Anodized Aluminum
- O-Rings: Nitrile Rubber, NBR
- Piston: Aluminum Alloy
- Piston Seal: Nitrile Rubber, NBR
- Magnet: Plastic Coated Magnetic Material
- Bumpers: Polyurethane

High Temperature Seal Option Material*

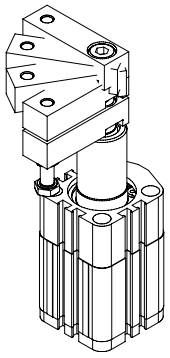
- End Cover O-Rings: Fluorocarbon, FPM
- Piston Rod Seal: Fluorocarbon, FPM
- Piston Seal: Fluorocarbon, FPM

* Option intended for limited exposure to temperatures over 80°C, or 176°F. Option is primarily for applications which subject the cylinder to fluids and or chemicals that have an adverse effect on external seals. If continued exposure to elevated temperatures is required, please consult the Cylinder Division for alternative options.

Right Hand (Clockwise) Clamping Rotation



Left Hand (Counter-Clockwise) Clamping Rotation



Specifications

	Bore (mm)		
	32	**40**	**50**
Rotary Stroke, mm	15		19
Clamp Stroke, mm	10/20		20/50
Allowable Moment, Nm (ft-lbs)	27 (20)	47 (35)	107 (79)
Degree of Non-Rotation	±1.0°	±1.0°	±0.8°

Clamp Forces, N (lbs)

Bore (mm)	Rod Dia. (mm)	Net Area (cm^2)	Force, N (lb) at Various Operating Pressures, Mpa (PSI)				
			0.2 (29)	**0.4 (58)**	**0.6 (87)**	**0.8 (116)**	**1.0 (145)**
32	16	6.03	121 (27)	241 (54)	362 (81)	483 (108)	603 (136)
40	16	10.56	211 (47)	422 (95)	633 (142)	844 (190)	1056 (237)
50	20	16.49	330 (74)	660 (148)	990 (222)	1319 (297)	1649 (371)

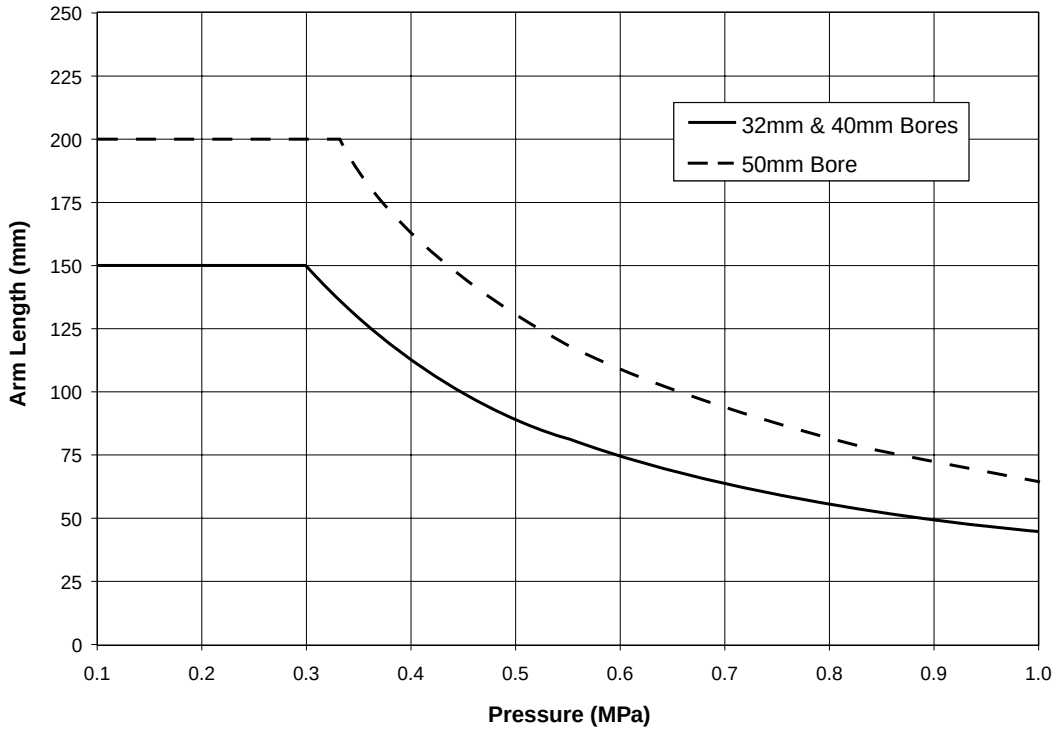
Cylinder Weights, g (lbs)

Bore (mm)	Clamp Stroke (mm)	Basic Mount	Clamp Arm Mount	Rear Flange Mount	Arm & Flange Mount
32	10	600 (1.32)	691 (1.52)	664 (1.46)	755 (1.66)
	20	673 (1.48)	764 (1.68)	736 (1.62)	827 (1.82)
40	10	700 (1.54)	791 (1.74)	782 (1.72)	873 (1.92)
	20	800 (1.76)	891 (1.96)	882 (1.94)	973 (2.14)
50	20	1355 (2.98)	1527 (3.36)	1500 (3.30)	1673 (3.68)
	50	1736 (3.82)	1909 (4.20)	1882 (4.14)	2055 (4.52)

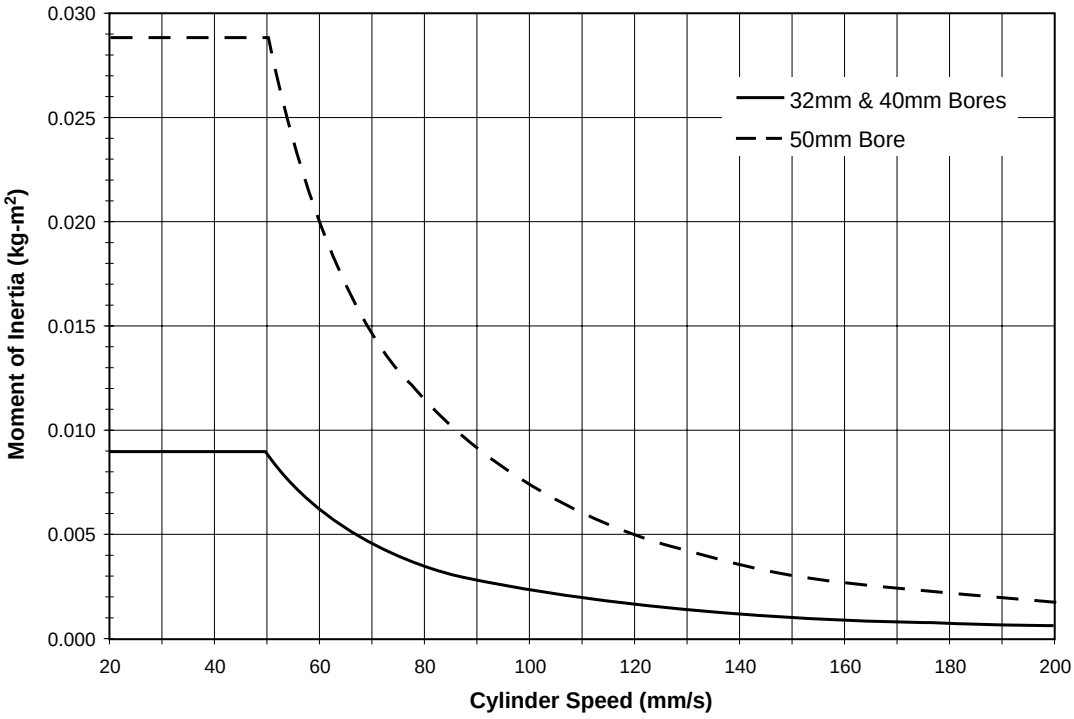
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Guidelines for Custom Clamp Arms

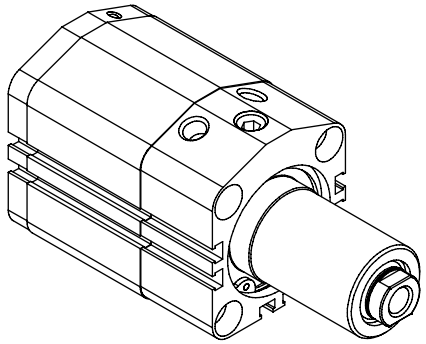
The following graph represents maximum clamp arm lengths per a given bore and operating pressure. Care should be taken not to exceed maximum operating limits outlined in this graph.

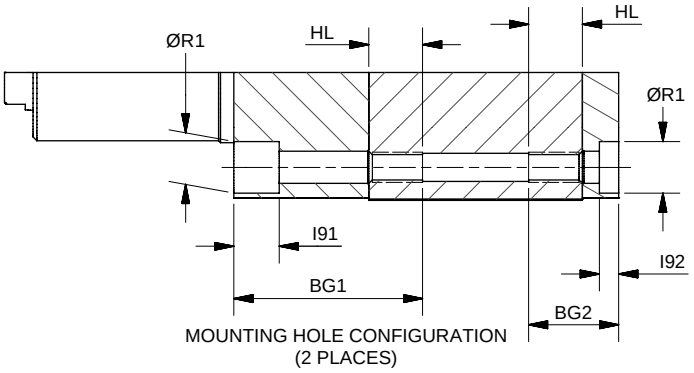


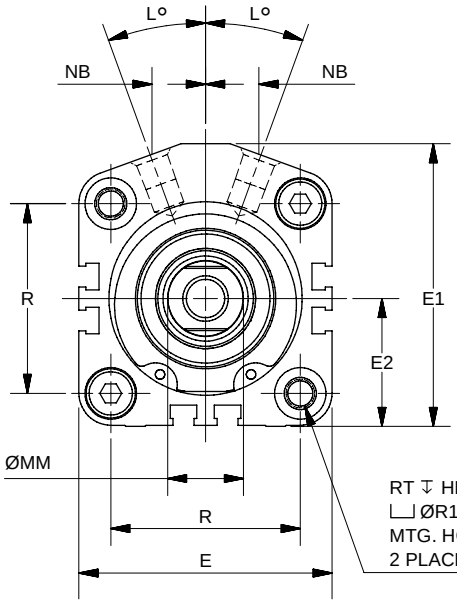
The following graph represents maximum operating speeds per a given inertia moment when incorporating a custom clamp arm. Exceeding the parameters outlined in the graph will lead to internal cylinder component damage. Please refer to the following page for examples and formulas when designing the clamp arm to be applied.

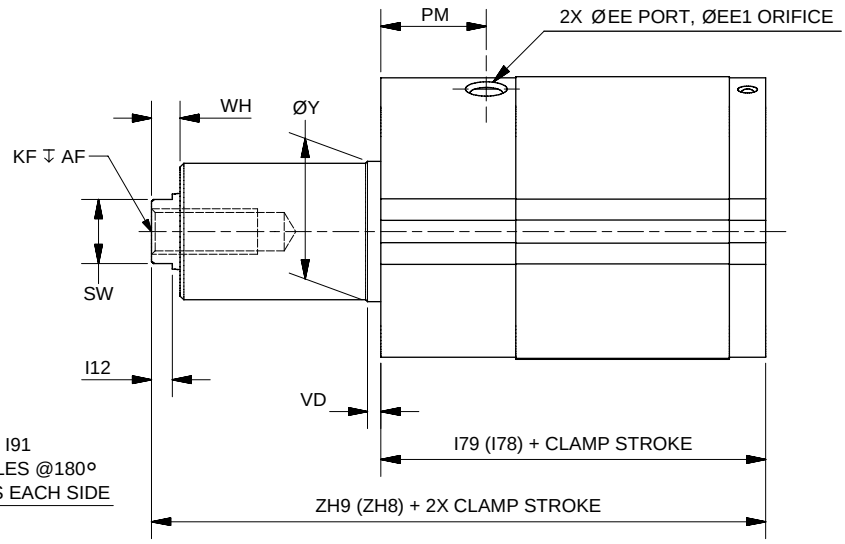


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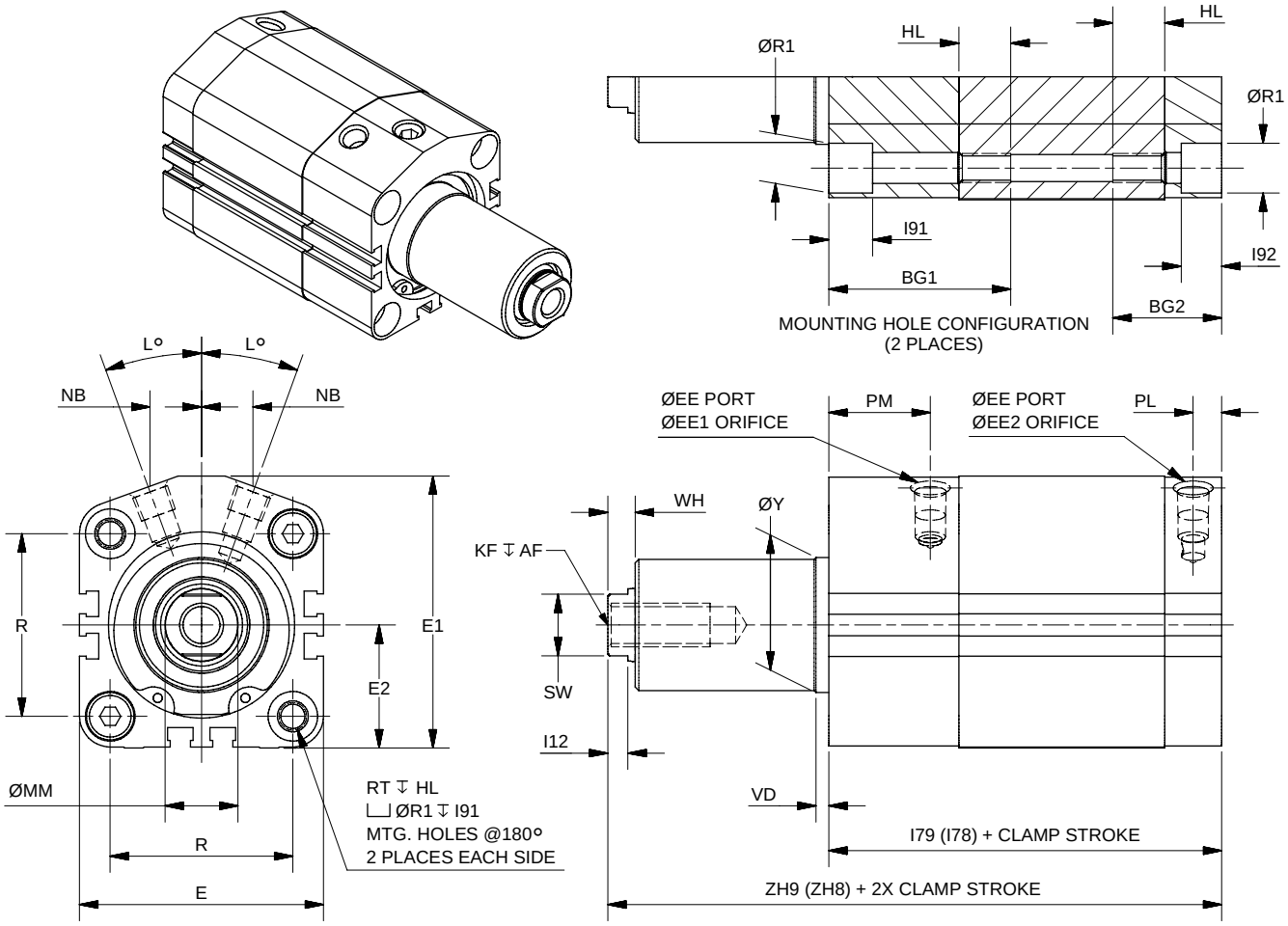
Head Ported Dimensions

Bore	AF	BG1	BG2	E	E1	E2	EE			EE1	HL	I12	I91	I92	KF
							BSPP	BSPT	NPTF						
32	18	46.5	17	48	56	24	G 1/8	Rc 1/8	1/8	1.1	9	5.5	13.5	4	M10x1.5
40	18	39	17.5	56	62.5	28	G 1/8	Rc 1/8	1/8	1.5	9	5.5	10	4	M10x1.5
50	25	47.5	23.5	67	74.5	33.5	G 1/8	Rc 1/8	1/8	2	12	5.5	12	5	M12x1.75

Bore	L	MM	NB	PM	R	R1	RT	SW -0.1 -0.2	VD	WH	Y	Non-Magnetic		Magnetic	
												I79	ZH9	I78	ZH8
32	25	16	9.5	30.5	34	10.5	M6x1	14	3	6.5	30 h9	67	92.5	76	101.5
40	20	16	11.5	22	40	10.5	M6x1	14	3	6.5	30 h9	60	92.5	70	102.5
50	20	20	14.5	28	50	13.5	M8x1.25	17	3.5	7.5	37 h9	72.5	113	81.5	122

* Both Ports Head (NPT) is the standard porting configuration for the P1M Swing Clamp Cylinder. Alternate porting options are available at an additional cost.

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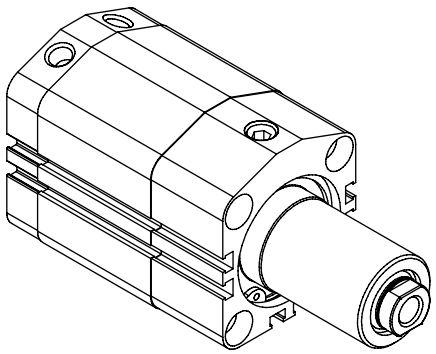


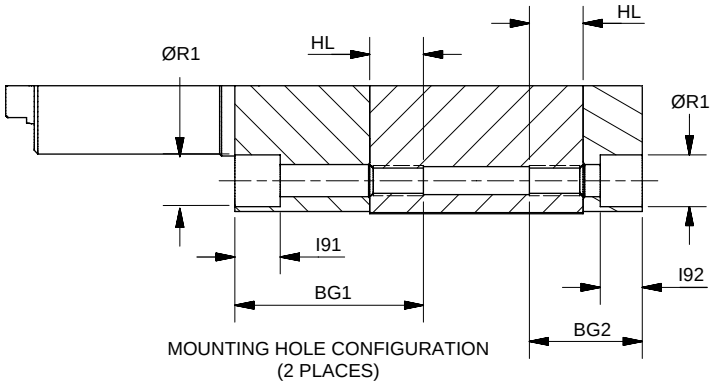
Head and Cap Ported Dimensions

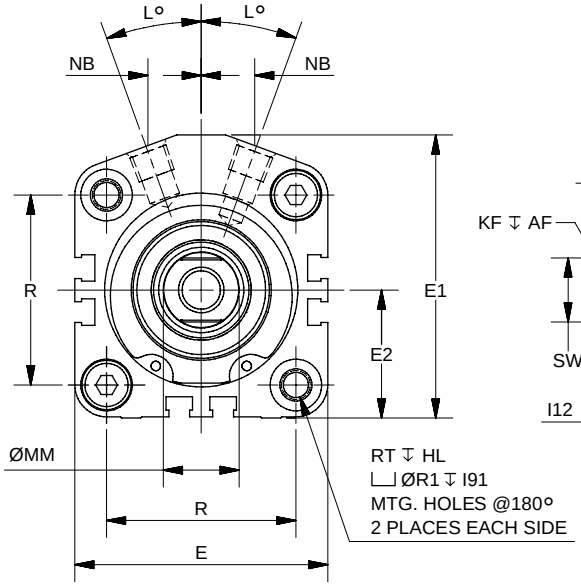
Bore	AF	BG1	BG2	E	E1	E2	EE			EE1	EE2	HL	I12	I91	I92	KF
							BSPP	BSPT	NPTF							
32	18	46.5	25	48	56	24	G 1/8	Rc 1/8	1/8	1.1	2.7	9	5.5	13.5	11.5	M10x1.5
40	18	39	25.5	56	62.5	28	G 1/8	Rc 1/8	1/8	1.5	3.4	9	5.5	10	12	M10x1.5
50	25	47.5	29.5	67	74.5	33.5	G 1/8	Rc 1/8	1/8	2	4	12	5.5	12	11	M12x1.75

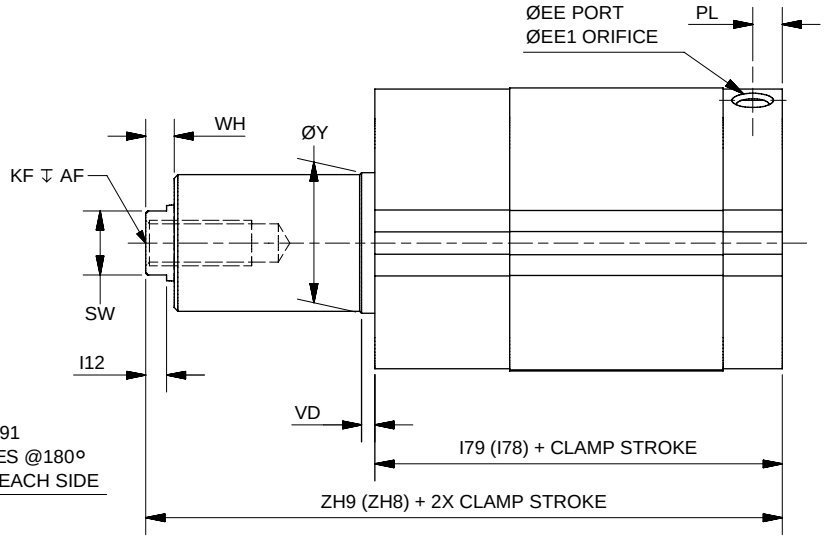
Bore	L	MM	NB	PL	PM	R	R1	RT	SW -0.1 -0.2	VD	WH	Y	Non-Magnetic		Magnetic	
													I79	ZH9	I78	ZH8
32	25	16	9.5	8	30.5	34	10.5	M6x1	14	3	6.5	30 h9	75	100.5	84	109.5
40	20	16	11.5	7.5	22	40	10.5	M6x1	14	3	6.5	30 h9	68	100.5	78	110.5
50	20	20	14.5	8	28	50	13.5	M8x1.25	17	3.5	7.5	37 h9	78.5	119	87.5	128

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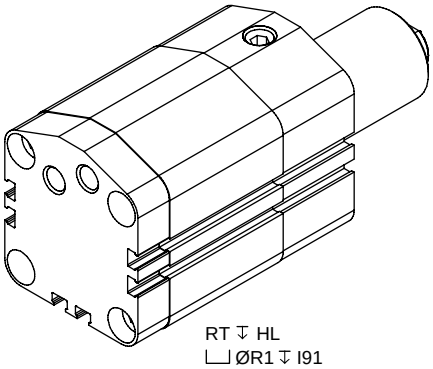


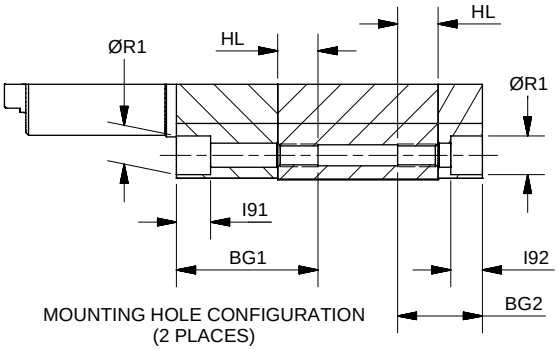
Cap Radial Ported Dimensions

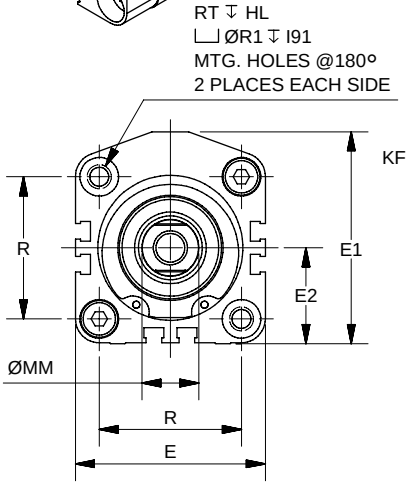
Bore	AF	BG1	BG2	E	E1	E2	EE			EE1	HL	I12	I91	I92	KF
							BSPP	BSPT	NPTF						
32	18	46.5	25	48	56	24	G 1/8	Rc 1/8	1/8	1.1	9	5.5	13.5	11.5	M10x1.5
40	18	39	25.5	56	62.5	28	G 1/8	Rc 1/8	1/8	1.5	9	5.5	10	12	M10x1.5
50	25	47.5	29.5	67	74.5	33.5	G 1/8	Rc 1/8	1/8	2	12	5.5	12	11	M12x1.75

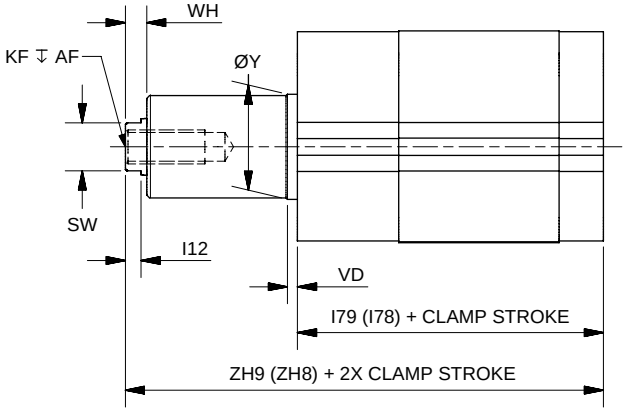
Bore	L	MM	NB	PL	R	R1	RT	SW -0.1 -0.2	VD	WH	Y	Non-Magnetic		Magnetic	
												I79	ZH9	I78	ZH8
32	25	16	9.5	8	34	10.5	M6x1	14	3	6.5	30 h9	75	100.5	84	109.5
40	20	16	11.5	7.5	40	10.5	M6x1	14	3	6.5	30 h9	68	100.5	78	110.5
50	20	20	14.5	8	50	13.5	M8x1.25	17	3.5	7.5	37 h9	78.5	119	87.5	128

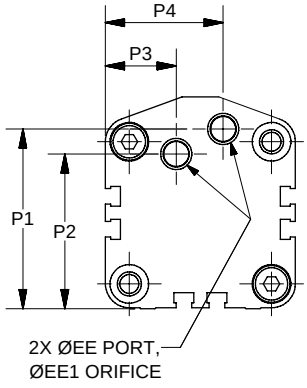
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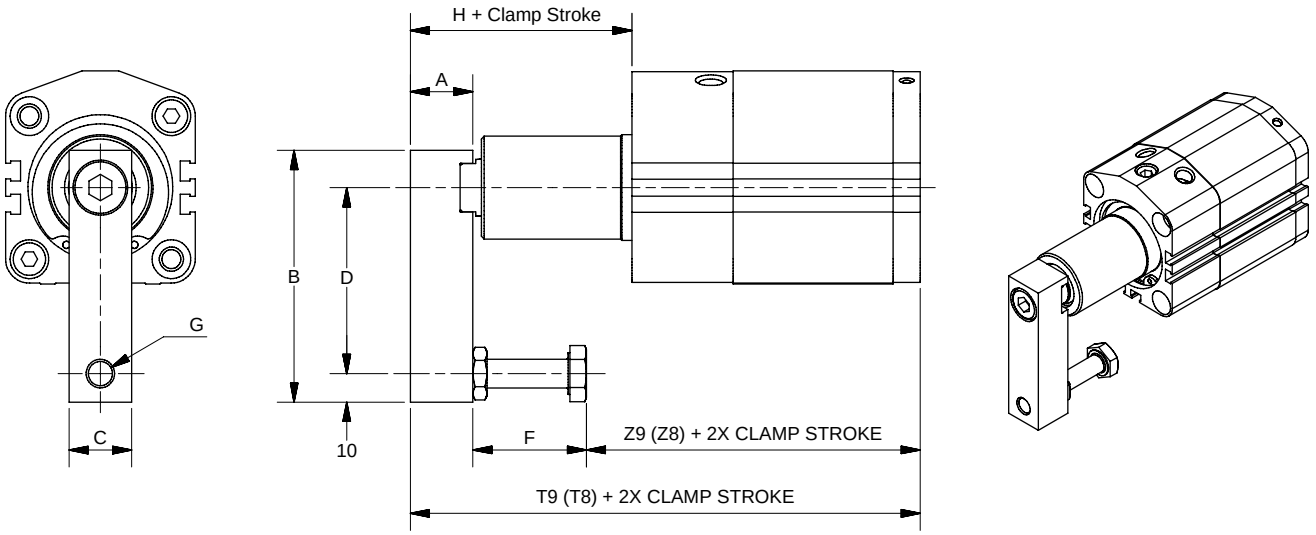


Cap Rear Face Ported Dimensions

Bore	AF	BG1	BG2	E	E1	E2	EE			EE1	HL	I12	I91	I92	KF
							BSPP	BSPT	NPTF						
32	18	46.5	25	48	56	24	G 1/8	Rc 1/8	1/8	1.1	9	5.5	13.5	11.5	M10x1.5
40	18	39	25.5	56	62.5	28	G 1/8	Rc 1/8	1/8	1.5	9	5.5	10	12	M10x1.5
50	25	47.5	29.5	67	74.5	33.5	G 1/8	Rc 1/8	1/8	2	12	5.5	12	11	M12x1.75

Bore	MM	P1	P2	P3	P4	R	R1	RT	SW -0.1 -0.2	VD	WH	Y	Non-Magnetic		Magnetic	
													I79	ZH9	I78	ZH8
32	16	45.5	16.5	32	28.5	34	10.5	M6x1	14	3	6.5	30 h9	75	100.5	84	109.5
40	16	51	12	23	33	40	10.5	M6x1	14	3	6.5	30 h9	68	100.5	78	110.5
50	20	63	54.5	25	41.5	50	13.5	M8x1.25	17	3.5	7.5	37 h9	78.5	119	87.5	128

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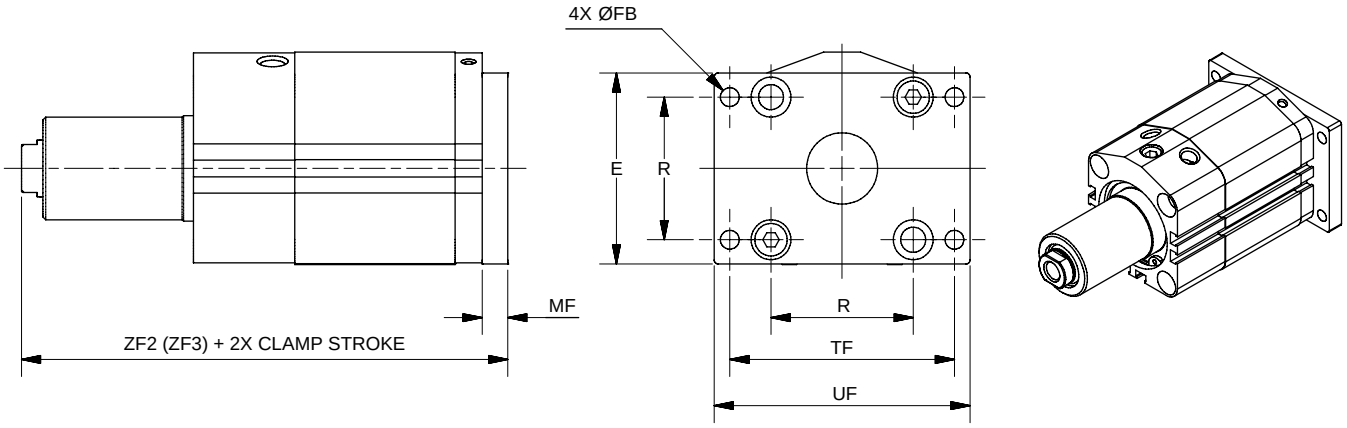


Clamp Arm Mount Dimensions

Bore	A	B	C	D	F	G	H
32	18	67	20	45	25	M8x1.25	39
40	18	67	20	45	25	M8x1.25	46
50	22	88	22	63	40	M10x1.5	58

Bore	Head Ported Only				Head and Cap Ported				Cap Radial Ported				Cap Rear Face Ported			
	Non-Magnetic		Magnetic		Non-Magnetic		Magnetic		Non-Magnetic		Magnetic		Non-Magnetic		Magnetic	
	T9	Z9	T8	Z8	T9	Z9	T8	Z8	T9	Z9	T8	Z8	T9	Z9	T8	Z8
32	106	63	115	72	114	71	123	80	114	71	123	80	114	71	123	80
40	106	63	116	73	114	71	124	81	114	71	124	81	114	71	124	81
50	130.5	68.5	139.5	77.5	136.5	74.5	145.5	83.5	136.5	74.5	145.5	83.5	136.5	74.5	145.5	83.5

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Rear Flange Mount Dimensions

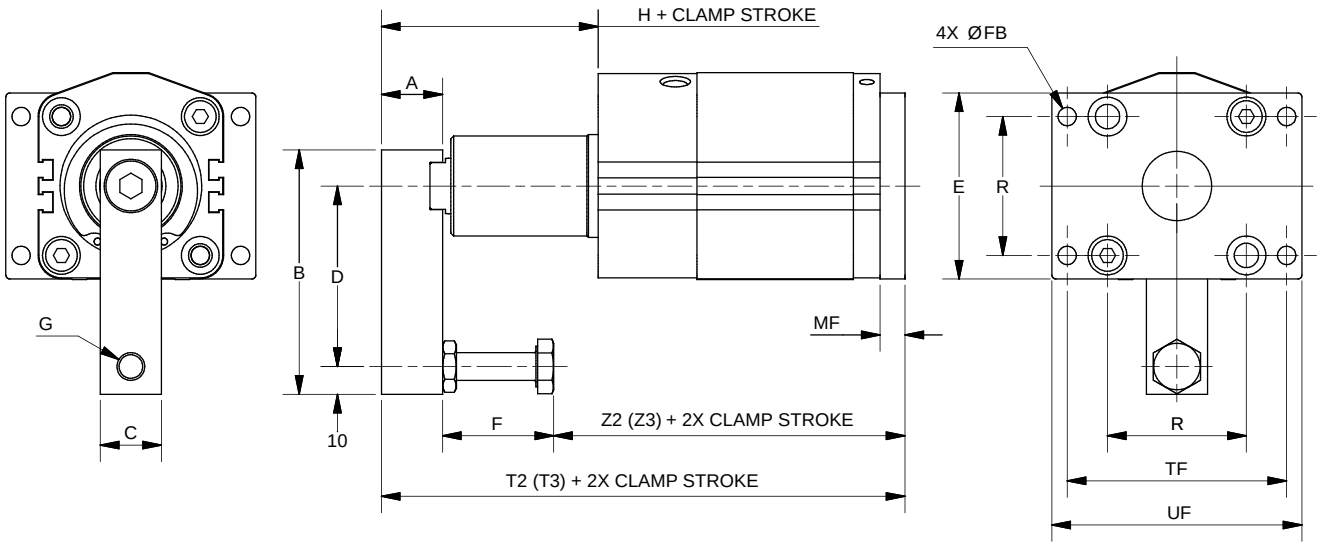
Bore	E	FB	MF	R	TF	UF
32	48	5.5	8	34	58	68
40	54	5.5	8	40	66	76
50	67	6.6	9	50	79	90

Rear Flange Mounting Kits can be ordered assembled to the cylinder or separately as needed. Please refer to page E49 for proper rear flange mounting kits associated with a given bore size.

Bore	Head Ported Only		Head and Cap Ported		Cap Radial Ported	
	Non-Magnetic	Magnetic	Non-Magnetic	Magnetic	Non-Magnetic	Magnetic
	ZF2	ZF3	ZF2	ZF3	ZF2	ZF3
32	100.5	109.5	108.5	117.5	108.5	117.5
40	100.5	110.5	108.5	118.5	108.5	118.5
50	122	131	128	137	128	137

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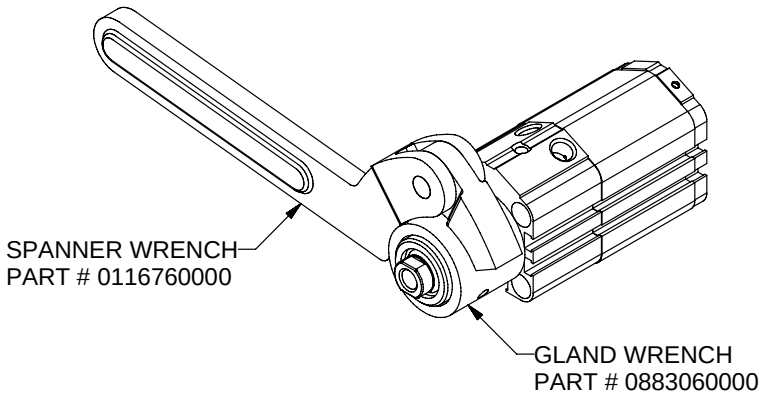
E

Rear Flange and Clamp Arm Mount Dimensions

Bore	A	B	C	D	E	F	G	H	FB	MF	R	TF	UF
32	18	67	20	45	48	25	M8x1.25	39	5.5	8	34	58	68
40	18	67	20	45	54	25	M8x1.25	46	5.5	8	40	66	76
50	22	88	22	63	67	40	M10x1.5	58	6.5	9	50	79	90

Bore	Head Ported Only				Head and Cap Ported				Cap Radial Ported			
	Non-Magnetic		Magnetic		Non-Magnetic		Magnetic		Non-Magnetic		Magnetic	
	T2	Z2	T3	Z3	T2	Z2	T3	Z3	T2	Z2	T3	Z3
8932	114	71	123	80	122	79	131	88	122	79	131	88
40	114	71	124	81	122	79	132	89	122	79	132	89
50	139.5	77.5	148.5	86.5	145.5	83.5	154.5	92.5	145.5	83.5	154.5	92.5

32mm Bore Assembly

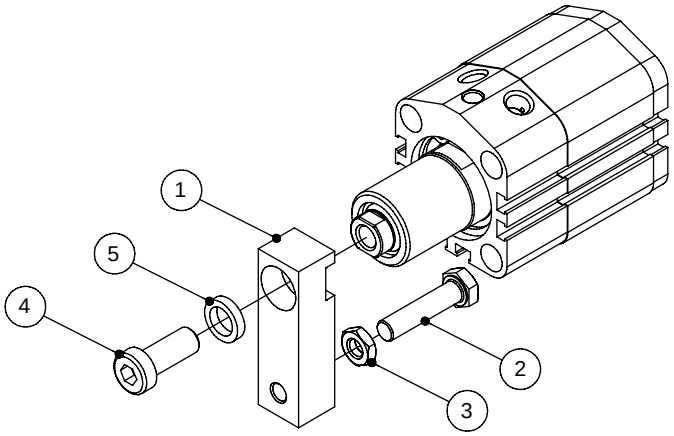


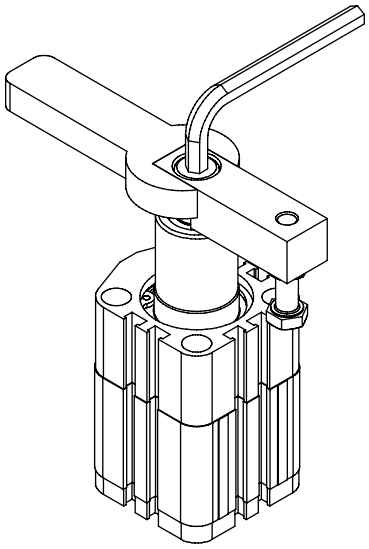
To disassemble the front end cover, the rod cover must first be removed. To do this the ring nut must be unscrewed (right-hand thread) using the spanner and gland wrench shown to the left. Order each component separately.

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Clamp Arm Mounting Kit 32, 40, and 50mm Bore





Clamp Arm Mounting Kit

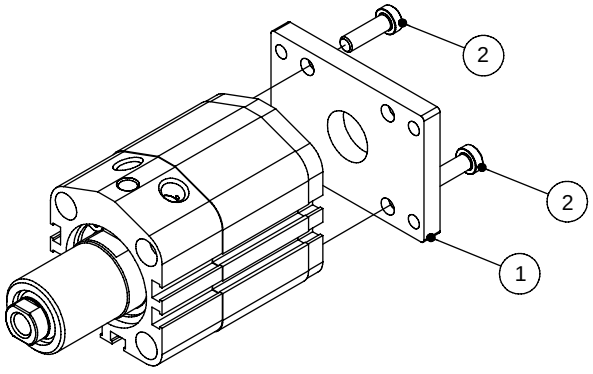
Bore	Part Number	Fastener Torque	
		Nm	In-lbs
32	L078550000	8 - 10	70 - 88
40	L078550000	8 - 10	70 - 88
50	L078560000	14 - 16	124 - 142

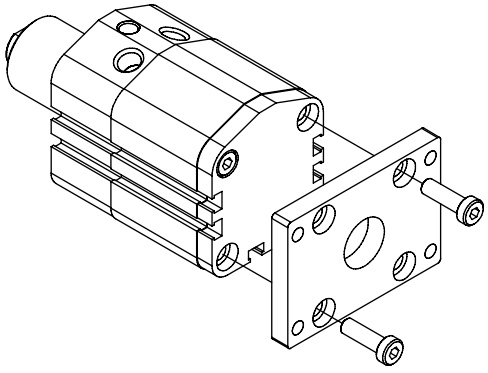
Note: To remove or install the arm on the piston rod, use a wrench to secure the arm while loosening or tightening the socket head cap screw. Do not secure any other part of the cylinder.

Component Identification

Item Number	Part Description	Material
1	Clamp Arm	Aluminum
2	Clamp Bolt	Steel
3	Hex Jam Nut	Steel
4	Socket Head Cap Screw	Steel
5	Lock Washer	Steel

Rear Flange Mount Kit 32, 40, and 50mm Bore





Rear Flange Mounting Kit

Bore	Part Number	Fastener Torque	
		Nm	In-lbs
32	P1M-4KMB	3.6 - 4.0	32 - 36
40	P1M-4LMB	3.6 - 4.0	32 - 36
50	P1M-4MMB	8.0 - 9.0	72 - 80

Component Identification

Item Number	Part Description	Material
1	Flange	Aluminum
2	Socket Head Cap Screw	Steel

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Seal Kits

Bore	Class 1	Class 5
32	L078660032	L078670032
40	L078660040	L078670040
50	L078660050	L078670050

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LP/LPM Series

Non-Lube Air Cylinder



Contents

Features E52
Ordering Information E53
Specifications E54
Basic Dimensions E55
Mounting Options E56
Spring Data E57
Rod Options E58
Accessories E59
Bumpers / Sensors E60
Service Kits E61

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Piston Rod Seal
Buna-N quad seal provides positive sealing to keep pressure in and dirt out for less maintenance and trouble free performance.

Piston Rod
High strength steel, hard chrome plated for reliable smooth performance, long life, and extended seal life.

Cylinder Body
Hard coated heavy wall aluminum alloy. The tube I.D. coating has extreme hardness, excellent wear and seizure resistance, low coefficient of friction, and high corrosion resistance. This provides excellent wear qualities and quick break-a-ways.

Piston
Attached securely to the rod to provide maximum strength and durability.

Rod Bearing
High density iron provides maximum support for longer life.

Heads and Caps
Anodized aluminum alloy for solid, lightweight, high strength performance. This provides excellent corrosion resistance, durability, and a long lasting quality appearance.

Piston Seal
Buna-N quad seal provides positive sealing with air.

E

- Reduces Design Height
- Light Weight
- Reduces Cylinder Overhang
- Specials Available

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How to Order LP/LPM Series Cylinders

1.50	K	N	LP	L	V	B	E	S	9	1.25"

Bore Size
0.56"
0.75"
1.12"
1.50"
2.00"
2.50"
3.00"
4.00"

Double Rod Cylinder

Blank	Single Rod
K	Double Rod

Mounting Style

N	Basic (Std.)
	Single Rod Styles
4F	Head Bolt
4R	Cap Bolt
2F	Head Trunnion [1]
2R	Cap Trunnion [1]
1	Cap Pivot Eye
	Double Rod Styles
N	Basic
4R	Cap Bolt
2F	Head Trunnion
	Hollow Rod Styles [1,2,5]
NH	Basic
4RH	Cap Bolt
2FH	Head Trunnion

Series

LP	Standard
LPM	Magnetic Piston [5]

Piston Seal

Blank	Standard Seal
L	Lipseal Piston Seal [3]

Seals

Blank	Standard
V	Class 5 Seals

Bumpers

Blank	No Bumpers
B	Bumpers Both Ends
H	Head End Only
C	Cap End Only [4]

(See page E60 for stroke reduction.)

Spring

Blank	None
E	Spring Extend
R	Spring Return

Special Feature

Blank	No Special Feature
S	Special Feature

Rod End Thread Style

9	Standard Female Rod End
4	Optional Male Rod End
3	Special Rod End (specify dimensions or sketch)

Stroke
Specify in inches.

1. Not available on 9/16" bore.
2. Hollow rods are used on double rod cylinders. All hollow rod options require the double rod prefix “K”.
3. Lipseal piston is not available on LPM Series.
4. Not available on spring extend.
5 LPM Series with hollow rod option are not available on the 9/16", 3/4" and 1-1/8" bore sizes.

Note: For sensor specifications and part numbers, please refer to the Electronic Sensors section.

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Specifications

- Low Profile Design
- 6 Mounting Styles
- 8 Bore Sizes from 9/16" to 4"
- Temperature Range: -10°F to 200°F
  (LPM Series 140°F max.)
- Strokes from 1/8" to 6"
- Permanent Lubrication
- Maximum Operating Pressure: 250 PSI Air

Technical Data

E

Push/Pull Forces

Bore dia.	Rod area	Piston area Push/Pull		PSI									
				40	50	60	80	100	125	150	175	200	250
9/16		Push	0.248	10	12.5	15	20	25	31	37	43	50	62
	0.048	Pull	0.200	8	10	12	16	20	25	30	35	40	50
3/4		Push	0.442	17.5	22	26.5	35	44	55	66	77	88	111
	0.076	Pull	0.366	14.6	18	22	29	37	46	55	64	73	92
1-1/8		Push	0.994	40	50	60	80	99	124	149	174	200	249
	0.196	Pull	0.798	32	40	48	64	80	100	120	140	160	200
1-1/2		Push	1.767	71	88	106	141	177	221	265	309	353	443
	0.307	Pull	1.460	58	73	88	117	146	182	219	256	292	365
2		Push	3.141	126	157	188	251	314	393	471	550	628	785
	0.442	Pull	2.699	108	135	162	216	270	337	405	472	540	675
2-1/2		Push	4.908	196	245	294	393	491	613	736	859	982	1227
	0.442	Pull	4.466	178	223	268	357	447	558	670	781	893	1116
3		Push	7.069	283	353	424	566	707	884	1060	1237	1414	1767
	.601	Pull	6.468	259	324	389	519	649	811	973	1135	1297	1622
4		Push	12.57	503	628	754	1006	1257	1571	1885	2200	2514	3142
	0.781	Pull	11.79	471	589	707	942	1178	1484	1767	2062	2356	2945

Weights – Basic Cylinders

Bore Dia.	Basic N Mount Weight in ounces*	Add per 1/8" of Stroke (ounces)
9/16	1.1	0.08
3/4	2.0	0.1
1-1/8	5.0	0.2
1-1/2	8.5	0.4
2	11.7	0.5
2-1/2	18.6	0.6
3	25.1	0.7
4	51.1	1.1

* Base weight includes 1/8 inch of stroke.

Tie Rod Torque

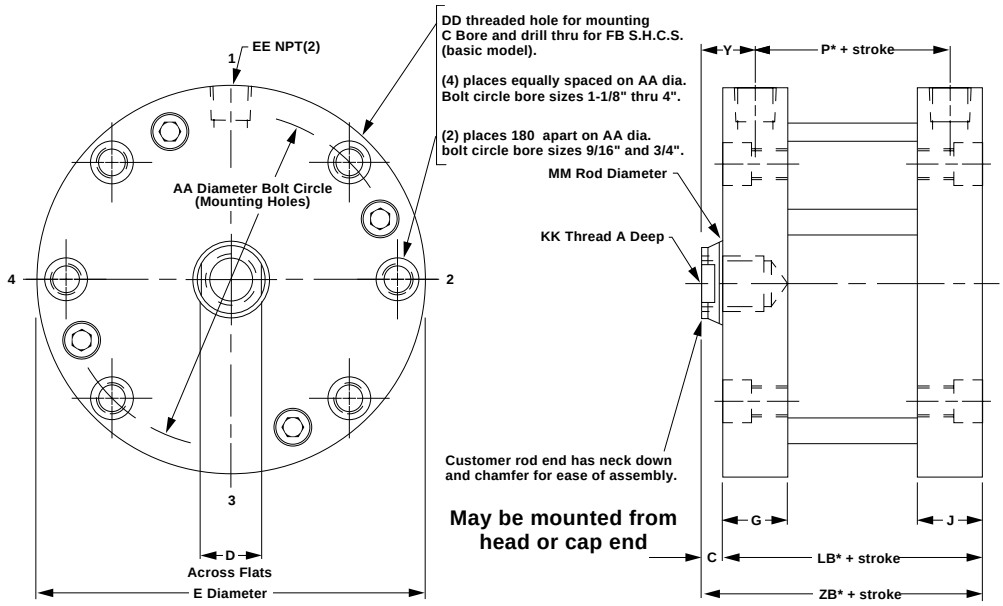
Bore	Torque (inch pounds)
9/16	8 - 10
3/4	20 - 25
1-1/8	20 - 25
1-1/2	35 - 40
2	35 - 40
2-1/2	50 - 60
3	70 - 80
4	150 - 160

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www.parker.com/pneumatics

Mounting Style N

Cylinder Dimensions
Double Acting
Single Rod End,
Female Rod Style No. 9

Temperature: -10°F to 200°F (optional Fluorocarbon seals). All air cylinders are permanently lubricated. LPM Series maximum temperature 140°F.



Bore Dia.	A	C	D	E	G	J	P*	Y	AA	DD	EE	FB	KK	LB*	MM	ZB*
9/16	0.40	1/8	7/32	1-1/8	23/64	23/64	11/32	17/64	0.875	#8-32	#10-32	#4	#8-32	5/8	1/4	3/4
3/4	0.44	1/8	1/4	1-1/2	23/64	23/64	3/8	17/64	1.219	#10-32	#10-32	#6	#10-32	21/32	5/16	25/32
1-1/8	0.62	1/8	7/16	2	1/2	1/2	27/64	3/8	1.687	#10-32	1/8	#6	5/16-24	59/64	1/2	1-3/64
1-1/2	0.62	1/8	1/2	2-5/8	1/2	1/2	1/2	3/8	2.187	1/4-28	1/8	#10	3/8-24	1	5/8	1-1/8
2	0.70†	1/8	5/8	3-1/8	1/2	1/2	9/16	3/8	2.687	1/4-28	1/8	#10	1/2-20	1-1/16	3/4	1-3/16
2-1/2	0.70†	1/8	5/8	3-3/4	5/8	5/8	5/8	7/16	3.250	5/16-24	1/4	1/4	1/2-20	1-1/4	3/4	1-3/8
3	0.75†	1/8	3/4	4-1/4	43/64	43/64	21/32	7/16	3.781	5/16-24	1/4	1/4	5/8-18	1-9/32	7/8	1-13/32
4	0.75†	1/8	7/8	5-1/2	27/32	27/32	49/64	17/32	4.937	3/8-24	3/8	5/16	3/4-16	1-5/8	1	1-3/4

* These dimensions are for the LP Series with standard piston.
† For strokes less than 0.25", A dimension = 0.66".

Added Length Table for LPM or Lipseal Piston Options

Bore Dia.	LPM Option*						LP with Lipseal Piston Option				
	P	LB	XD	XJ	ZB	Stroke	P	LB	XD	XJ	ZB
9/16†	15/16	1-7/32	2	–	1-11/32	1/2	5/8	29/32	1-11/16	–	1-1/32
3/4†	31/32	1-1/4	2-1/32	1-3/16	1-3/8	1/2	21/32	15/16	1-23/32	7/8	1-1/16
1-1/8†	63/64	1-31/64	2-3/8	1-23/64	1-39/64	9/16	43/64	1-11/64	2-1/16	1-3/64	1-19/64
1-1/2	1-1/8	1-5/8	2-13/16	1-1/2	1-3/4	7/16	13/16	1-5/16	2-1/2	1-3/16	1-7/16
2	1-9/32	1-25/32	3-1/32	1-21/32	1-29/32	7/16	61/64	1-29/64	2-45/64	1-21/64	1-37/64
2-1/2	1-21/64	1-61/64	3-21/64	1-3/4	2-5/64	1/2	1	1-5/8	3	1-27/64	1-3/4
3	1-27/64	2-3/64	3-53/64	1-53/64	2-11/64	1/2	1-3/32	1-23/32	3-1/2	1-1/2	1-27/32
4	1-1/2	2-23/64	4-11/64	2	2-31/64	1/2	1-11/64	2-1/32	3-27/32	1-43/64	2-5/32

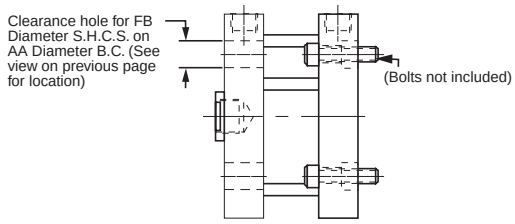
Note minimum strokes for LPM option.
† These bore sizes not available for the LPM option with the hollow rod option.
* The LPM option is only available with the standard quad seal.

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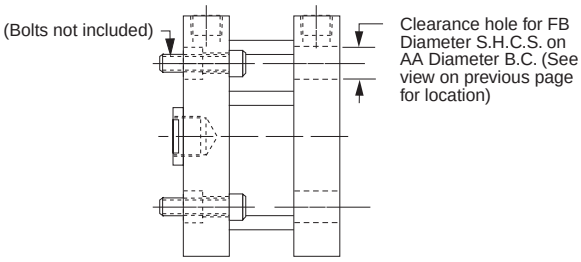
Head Bolt Clearance Holes

Mounting Style 4F
Available Head End



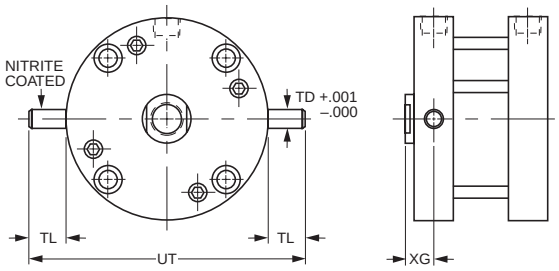
Cap Bolt Clearance Holes

Mounting Style 4R
Available Cap End



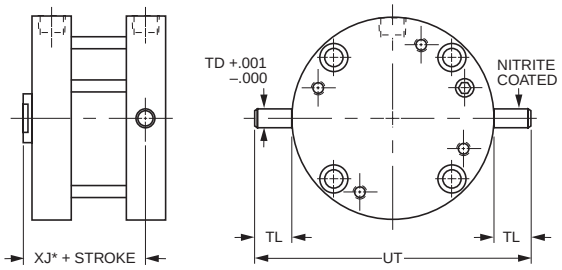
Head Trunnion

Mounting Style 2F (9/16" bore not available)



Cap Trunnion

Mounting Style 2R (9/16" bore not available)

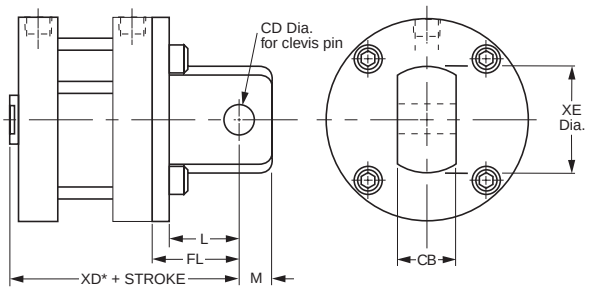


Bore Dia.	TD	TL	UT	XG	XJ*
3/4	0.125	5/16	2-1/8	5/16	19/32
1-1/8	0.250	1/2	3	3/8	51/64
1-1/2	0.250	1/2	3-5/8	3/8	7/8
2	0.250	1/2	4-1/8	3/8	15/16
2-1/2	0.312	5/8	5	29/64	1-3/64
3	0.312	5/8	5-1/2	15/32	1-1/16
4	0.375	3/4	7	35/64	1-17/64

* These dimensions are for the LP Series with standard piston.

Cap Pivot Eye

Mounting Style 1



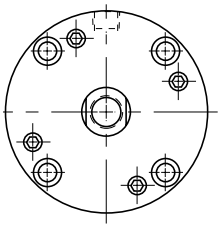
Bore Dia.	L	M	CB	CD	FL	XD*	XE
9/16	1/2	1/4	3/8	3/16	21/32	1-13/32	19/32
3/4	1/2	1/4	3/8	3/16	21/32	1-7/16	3/4
1-1/8	1/2	1/4	3/8	3/16	49/64	1-13/16	3/4
1-1/2	13/16	7/16	3/4	3/8	1-1/16	2-3/16	1-3/8
2	13/16	7/16	3/4	3/8	1-1/8	2-5/16	1-3/8
2-1/2	13/16	7/16	3/4	3/8	1-1/4	2-5/8	1-3/8
3	1-9/32	9/16	1	5/8	1-21/32	3-1/16	1-7/8
4	1-9/32	9/16	1	5/8	1-11/16	3-7/16	1-7/8

Order clevis pin from accessories when required.

*These dimensions are for the LP Series with standard piston.
See table on the previous page for dimensions for the lipseal piston or LPM options.

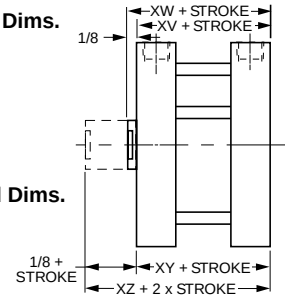
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Spring Extend & Spring Return Cylinders
(Available through 2" stroke)

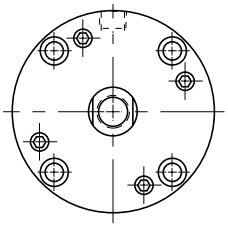


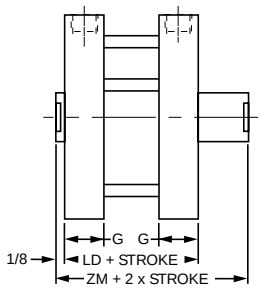
Spring Return Dims.
Model NLPR

Spring Extend Dims.
Model NLPE



Double Rod Spring Extend & Spring Return Cylinders
(Available through 2" stroke)





Bore Dia.	1/8" to 1" Stroke				Over 1" to 2" Stroke				Add this length to XV, XW, XY, XZ for Lipseal Piston
	XV	XW	XY	XZ	XV	XW	XY	XZ	
9/16	1	1-1/8	57/64	1-1/64	1-11/16	1-13/16	1-37/64	1-45/64	9/32
3/4	1-1/64	1-9/64	59/64	1-3/64	1-45/64	1-53/64	1-39/64	1-47/64	9/32
1-1/8	1-23/64	1-31/64	1-9/32	1-13/32	1-63/64	2-7/64	1-29/32	2-1/32	1/4
1-1/2	1-25/64	1-33/64	1-11/32	1-15/32	2-1/64	2-9/64	1-31/32	2-3/32	5/16
2	1-11/64	1-19/64	1-13/32	1-17/32	1-51/64	1-59/64	2-1/32	2-5/32	25/64
2-1/2	1-3/8	1-1/2	1-23/32	1-27/32	2	2-1/8	2-11/32	2-15/64	3/8
3	1-1/2	1-5/8	1-55/64	1-63/64	2-1/8	2-1/4	2-31/64	2-39/64	7/16
4	1-27/32	1-31/32	2-13/64	2-21/64	2-15/32	2-19/32	2-53/64	2-61/64	13/32

Bore Dia.	G	Spring Return/Extend – LP					Spring Return/Extend – LPM				
		≥ 1/8", ≤ 1"			<1", ≤ 2"		≥ 1/8", >1"			>1", ≤ 2"	
		LD	ZM	Min.* Stroke	LD	ZM	LD	ZM	Min.* Stroke	LD	ZM
9/16	23/64	1-1/8	1-3/8	5/16	1-13/16	2-1/16	1-23/32	1-27/32	3/16	2-13/32	2-17/32
3/4	23/64	1-11/64	1-27/64	1/8	1-55/64	2-7/64	1-49/64	1-57/64	3/16	2-29/64	2-37/64
1-1/8	1/2	1-1/2	1-3/4	1/8	2-1/8	2-3/8	2-1/16	2-3/16	1/8	2-11/16	2-13/16
1-1/2	1/2	1-11/16	1-15/16	1/8	2-5/16	2-9/16	2-5/16	2-7/16	1/4	2-15/16	3-1/16
2	1/2	1-31/64	1-47/64	1/8	2-7/64	2-23/64	2-13/64	2-21/64	1/4	2-53/64	2-61/64
2-1/2	5/8	1-3/4	2	1/8	2-3/8	2-5/8	2-29/64	2-37/64	3/16	3-5/64	3-13/64
3	43/64	1-29/32	2-5/32	1/8	2-17/32	2-25/32	2-43/64	2-51/64	1/8	3-19/64	3-27/64
4	27/32	2-1/4	2-1/2	1/8	2-7/8	3-1/8	2-63/64	3-7/64	1/8	3-39/64	3- 47/64

* Note minimum strokes for LPM option.

Spring Force Data

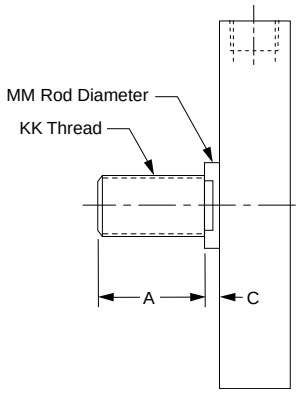
1/8" to 1" Stroke			Over 1" to 2" Stroke		
Bore dia.	**Max. Spring Force (lbs)**	**Spring Rate (lb/in)**	**Bore dia.**	**Max. Spring Force (lbs)**	**Spring Rate (lb/in)**
9/16	5.7	4.25	9/16	5.7	1.75
3/4	9	6	3/4	9	2.5
1-1/8	10	6	1-1/8	10	2.5
1-1/2	13	5.5	1-1/2	12	2.25
2	13	5.5	2	12	2.25
2-1/2	17.5	6	2-1/2	16	2.5
3 & 4	24	6.5	3 & 4	23	2.75

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Optional Male Rod End

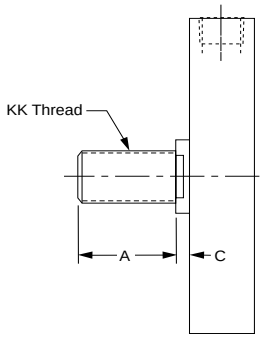
Specify #4



Bore Dia.	A	C	KK	MM
9/16	0.38	1/8	#8-32	1/4
3/4	0.50	1/8	#10-32	5/16
1-1/8	0.50	1/8	5/16-24	1/2
1-1/2	0.50	1/8	3/8-24	5/8
2	0.62	1/8	1/2-20	3/4
2-1/2	0.62	1/8	1/2-20	3/4
3	0.75	1/8	5/8-18	7/8
4	0.75	1/8	3/4-16	1

Non-Standard Rods

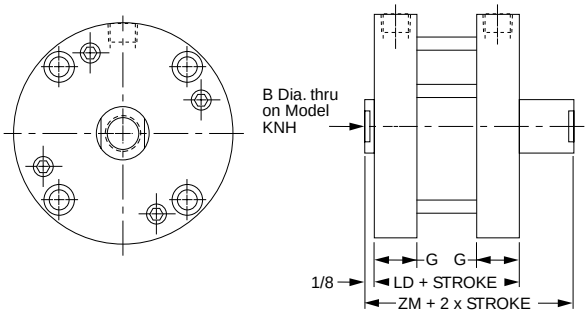
For non-standard rod ends, please specify rod thread style 3 and provide the KK, A, and C dimensions as needed.



E

Double or Hollow Rod Cylinders

Note: Cylinders with hollow rod option should not be bottomed out during stroke.



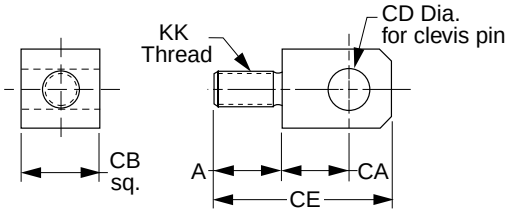
LP Double or Hollow Rod Option, LPM, Lipseal Piston

Bore Dia.	B	G	Standard Double Rod End or with Hollow Rod		LPM Option		LP with Lipseal Piston Option	
			LD	ZM	LD	ZM	LD	ZM
9/16	*	23/64	3/4	1	1-11/32	1-15/32	1-1/32	1-9/32
3/4	9/64	23/64	13/16	1-1/16	1-13/32	1-17/32	1-3/32	1-11/32
1-1/8	7/32	1/2	1-3/16	1-7/16	1-3/4	1-7/8	1-7/16	1-11/16
1-1/2	9/32	1/2	1-19/64	1-35/64	1-59/64	2-3/64	1-39/64	1-55/64
2	3/8	1/2	1-3/8	1-5/8	2-3/32	2-7/32	1-49/64	2-1/64
2-1/2	3/8	5/8	1-5/8	1-7/8	2-21/64	2-29/64	2	2-1/4
3	7/16	43/64	1-11/16	1-15/16	2-29/64	2-37/64	2-1/8	2-3/8
4	1/2	27/32	2-1/32	2-9/32	2-49/64	2-57/64	2-7/16	2-11/16

*Hollow rod not available on 9/16" bore.

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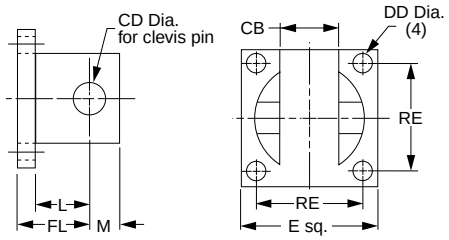
Rod Eye



Bore	Part #	A	CA	CB	CD	CE	KK
9/16	**L073810008**	3/8	15/32	3/8	3/16	1-3/32	#8-32
3/4	**L073810010**	3/8	15/32	3/8	3/16	1-3/32	#10-32
1-1/8	**L073810020**	9/16	15/32	3/8	3/16	1-9/32	5/16-24
1-1/2	**L073810024**	5/8	23/32	3/4	3/8	1-25/32	3/8-24
2-2-1/2	**L073810032**	21/32	23/32	3/4	3/8	1-27/32	1/2-20
3	**L073810040**	21/32	1	1	5/8	2-3/8	5/8-18
4	**L073810048**	21/32	1	1	5/8	2-3/8	3/4-16

Clevis Bracket

(Supplied with Pin)

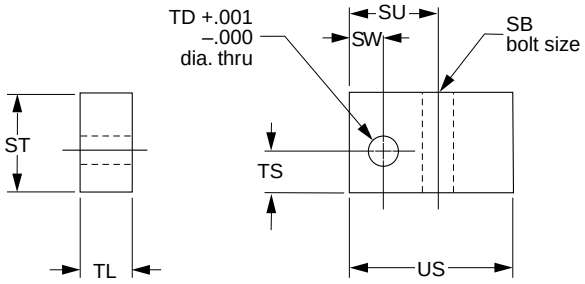


Part #	E	L	M	CB	CD	DD	FL	RE
L073820012	1	13/32	7/32	25/64	3/16	9/64	9/16	3/4
L073820024	1-3/4	25/32	13/32	49/64	3/8	11/64	15/16	1-3/8
L073820040	2-1/2	1	9/16	1-1/64	5/8	17/64	1-1/4	2

Use L073820012 on 9/16", 3/4" and 1-1/8" bore.
Use L073820024 on 1-1/2", 2" and 2-1/2" bore.
Use L073820040 on 3" and 4" bore.

Note: The Clevis Bracket is an accessory for the rod eye or the cap pivot eye and cannot be mounted directly to the cylinder.

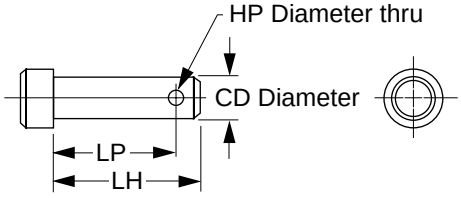
Trunnion Bracket



Part #	SB	ST	SU	SW	TD	TL	TS	US
L073840016	1/4	7/8	13/16	5/16	.252	1/2	3/8	1-1/2
L073840020	5/16	1	15/16	3/8	.314	5/8	29/64	1-5/8
L073840024	3/8	1-1/4	1- 1/16	7/16	.377	3/4	35/64	1-7/8

Use L073840016 on 1-1/8", 1-1/2" and 2" bore.
Use L073840020 on 2- 1/2" and 3" bore.
Use L073840024 on 4" bore.

Clevis Pin



Part #	CD	HP	LH	LP
L073830012	3/16	3/32	1	29/32
L073830024	3/8	5/32	1-5/8	1-15/32
L073830040	5/8	5/32	2	1-27/32

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Noise Dampening Bumpers

Bumpers both ends – B
Bumpers rod end – R
Bumper cap end – C*

Bumpers are available at either or both ends of the cylinder to reduce noise for quieter operation. Bumper material is a 70 durometer nitrile.

The table shows the distance the stroke is reduced when incorporating bumpers. This varies with operating pressure as indicated in the table. Example: 1.50 NL PB9 x 0.50" stroke. Bumpers both ends cylinder will have a working stroke of 0.43" instead of 0.50" operating at 80 psi. For special applications call the factory.

NOTES:

Bumpers shorten actual strokes and are not practical on short stroke with low operating pressure.

Bumpers on Cap End or Both Ends will add the "BC" length in chart to "C" dimension (rod extension).

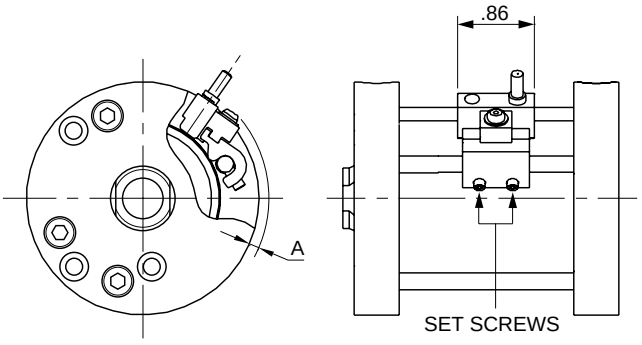
Bumpers on Double End Cylinders will add the "BR" length in chart to the "C" dimension (rod extension).

* Not available on spring extend.

Stroke Reduction (in.) Using Bumpers

Bore Dia.	Bumper Location	Dim.	Operating Pressure (PSI)					
			0	20	40	60	80	100
0.56	Cap End	BC	0.03	0.02	0.02	0.01	0.01	0.01
	Head End	BR	0.07	0.07	0.06	0.06	0.05	0.04
	Both Ends	BB	0.10	0.09	0.08	0.07	0.06	0.05
0.75	Cap End	BC	0.07	0.07	0.06	0.05	0.05	0.04
	Head End	BR	0.07	0.06	0.05	0.05	0.04	0.03
	Both Ends	BB	0.14	0.13	0.11	0.10	0.09	0.07
1.12	Cap End	BC	0.10	0.09	0.09	0.07	0.07	0.06
	Head End	BR	0.10	0.09	0.08	0.07	0.07	0.06
	Both Ends	BB	0.20	0.18	0.17	0.14	0.14	0.12
1.50	Cap End	BC	0.11	0.10	0.09	0.08	0.07	0.06
	Head End	BR	0.10	0.08	0.08	0.07	0.06	0.06
	Both Ends	BB	0.21	0.18	0.17	0.15	0.13	0.12
2.00	Cap End	BC	0.11	0.09	0.08	0.07	0.06	0.05
	Head End	BR	0.10	0.08	0.06	0.06	0.06	0.05
	Both Ends	BB	0.21	0.17	0.14	0.13	0.12	0.10
2.50	Cap End	BC	0.08	0.06	0.05	0.03	0.03	0.03
	Head End	BR	0.10	0.07	0.06	0.05	0.05	0.04
	Both Ends	BB	0.18	0.13	0.11	0.08	0.08	0.07
3.00	Cap End	BC	0.10	0.06	0.04	0.03	0.02	0.01
	Head End	BR	0.14	0.09	0.08	0.08	0.07	0.07
	Both Ends	BB	0.24	0.15	0.12	0.11	0.09	0.08
4.00	Cap End	BC	0.10	0.08	0.05	0.03	0.03	0.02
	Head End	BR	0.21	0.15	0.13	0.12	0.11	0.11
	Both Ends	BB	0.31	0.23	0.18	0.15	0.14	0.13

Sensor Mounting Data



To sense piston position, mount sensor along tie rod using 2 each small set screws.

Size	A	Piston Travel at Midstroke (in ±0.01) (Sensor On)	Minimum Activation Distance from End of Stroke (in)	
			Head	Cap
9/16	0.32	0.20	0.13	0.13
3/4	0.25	0.23	0.13	0.13
1-1/8	0.20	0.32	0.13	0.13
1-1/2	0.10	0.32	0.07	0.07
2	0.10	0.35	0.06	0.06
2-1/2	0.03	0.42	0.06	0.06
3	0.03	0.47	0.12	0.12
4	0.00	0.47	0.12	0.12

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Seal Kits (Standard Piston)

Bore Size	Rod Dia.	Single Rod Cylinders	
		Class 1 Seals Part No.	Class 5 Seals Part No.
9/16	1/4"	SKS05LP251	SKS05LP255
3/4	5/16"	SKS07LP311	SKS07LP315
1-1/8	1/2"	SKS12LP501	SKS12LP505
1-1/2	5/8"	SKS15LP621	SKS15LP625
2	3/4"	SKS20LP751	SKS20LP755
2-1/2	3/4"	SKS25LP751	SKS25LP755
3	7/8"	SKS30LP871	SKS30LP875
4	1"	SKS40LP101	SKS40LP105

Seal Kits (Lipseal Piston)

Bore Size	Rod Dia.	Single Rod Cylinders	
		Class 1 Seals Part No.	Class 5 Seals Part No.
9/16	1/4"	KS05LPL251	KS05LPL255
3/4	5/16"	KS07LPL311	KS07LPL315
1-1/8	1/2"	KS12LPL501	KS12LPL505
1-1/2	5/8"	KS15LPL621	KS15LPL625
2	3/4"	KS20LPL751	KS20LPL755
2-1/2	3/4"	KS25LPL751	KS25LPL755
3	7/8"	KS30LPL871	KS30LPL875
4	1"	KS40LPL101	KS40LPL105

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C05 & C05S Series

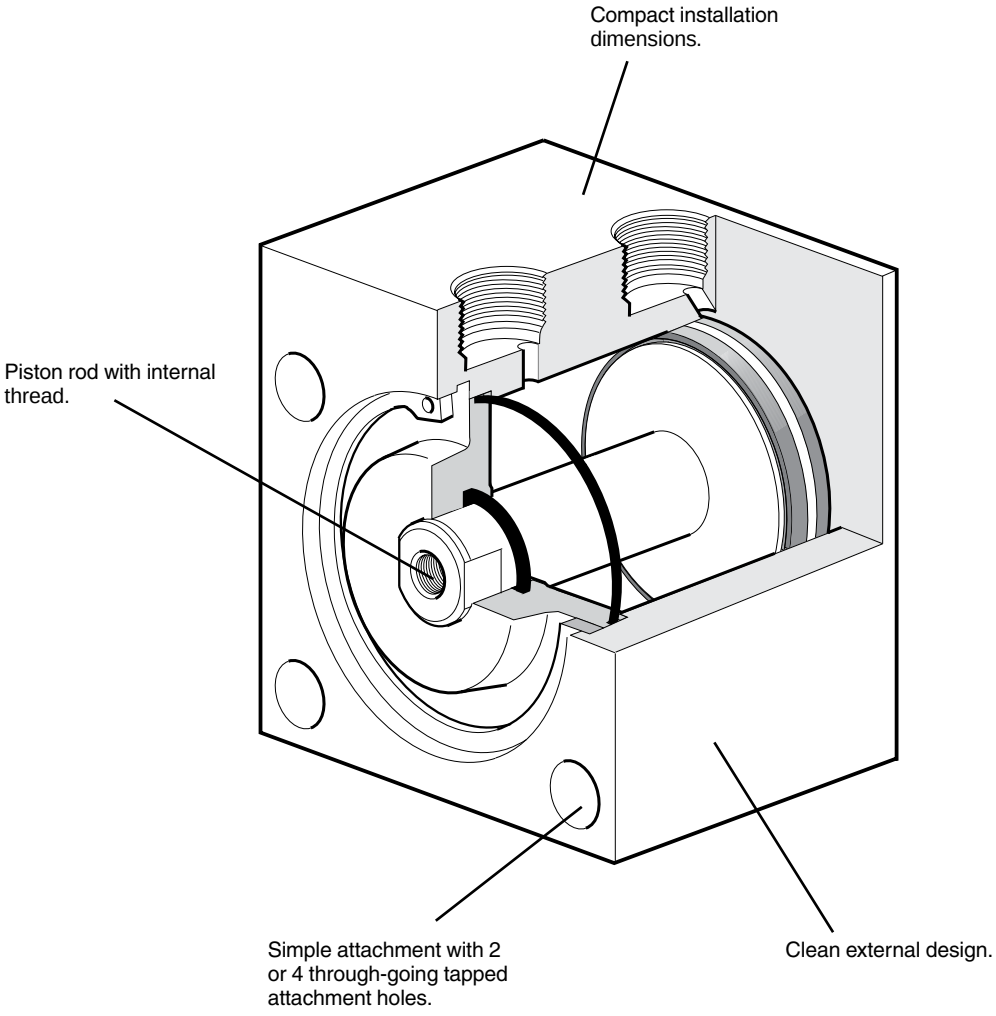
Short Stroke Pneumatic Cylinders



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E

Cylinders, type C05 and C05S

Compact short stroke cylinders available in single and double acting versions. Ideally suited for clamping and locking operations, the range includes bores from 8 to 63 mm, providing thrust forces of up to 3000 N.

The design has been optimized to include the following features:

Installation

The compact design (with mounting holes through the cylinder body) makes the unit easy to install in confined spaces.

Clean design

The main body is machined from one piece, thus providing an easy to clean unit. Stainless steel piston rods are standard for corrosion resistance.

Maintenance free

The units are pre-lubricated for use without additional lubrication, reducing maintenance costs and providing an improved working environment.

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Model Code

C05S – **50** – **16** – **10**

Cylinder type	
C05	Double acting Ø12-Ø63
C05S	Single acting

Cylinder Bore	
8	8mm
12	12mm
20	20mm
32	32mm
50	50mm
63	63mm

Piston Rod, mm

Stroke, mm

Cylinder Type	Bore Size	Piston Rod	Port Size	Stroke
Double Acting C05	12	5/-	M5	10
	20	10/M5	M5	10
	32	12/M6	G1/8	10
			G1/8	25
	50	16/M8	G1/4	25
	63	16/M8	G1/4	25
Single Acting C05S	8	4/-	M5	4
	12	5/-	M5	4
	20	10/M5	G1/8	4
	32	12/M6	G1/8	5
	50	16/M8	G1/4	10
	63	16/M8	G1/4	10

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Performance Specifications

Working pressure	Max 10 bar (145 PSI)
Working temperature	-20°C to +70°C (-4°F to +158°F)

Pre-lubricated, further lubrication is not normally necessary.
If additional lubrication is introduced it has to be continued.

Material Specifications

Cylinder housing	Black anodized aluminium
Front end cover	Brass
Front end cover, single action Ø50-63	Black anodized aluminium
Piston rod bearing single action Ø50-63	Brass/PTFE/lead
Piston, Ø8-32 mm	Stainless steel
Piston, Ø50-63 mm	Aluminium
Piston rod	Stainless steel
Seals	Nitrile, NBR
Circlip	Steel spring
Return spring	Surface treated steel spring

Quick Reference

Cylinder	Cylinder		Piston Rod		Theoretical Force at 6 Bar (N)		Air 1) Consumption (l)	Spring Force (N)		Stroke (mm)	Mass Weight (kg)
	Bore (mm)	Area (cm^2)	Dia. (mm)	Area (cm^2)	Extend	Retract		Max.	Min.		
C05S-8-4-4	8	0.5	4	0.13	28	—	0.0045	—	—	4	0.016
C05S-12-5-4	12	1.1	5	0.20	65	—	0.0099	—	—	4	0.023
C05S-20-10-4	20	3.1	10	0.79	184	—	0.0151	—	—	4	0.067
C05S-32-12-5	32	8.0	12	1.13	463	—	0.0653	—	—	5	0.192
C05S-50-16-10	50	19.6	16	2.01	1145	—	0.1695	—	—	10	0.416
C05S-63-16-10	63	31.1	16	2.01	1825	—	0.2602	—	—	10	0.663
C05-12-5-10	12	1.1	5	0.20	68	56	0.0186	3	2	10	0.045
C05-20-1 0-10	20	3.1	10	0.79	190	143	0.0505	7	3	10	0.125
C05-32-12-10	32	8.0	12	1.13	480	415	0.1236	10	6	10	0.320
C05-32-12-25	32	8.0	12	1.13	480	415	0.1236	25	19	25	0.400
C05-50-16-25	50	19.6	16	2.01	1180	1060	0.3167	42	35	25	0.675
C05-63-16-25	63	31.1	16	2.01	1870	1750	0.4982	58	45	25	0.800

1) Consumption of free air per 10 mm stroke for a double stroke at 600 kPa (6 bar).

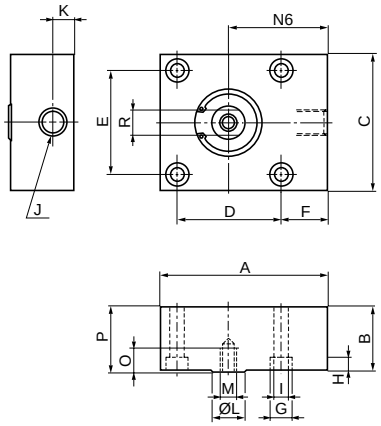
Important
Before attempting any external or internal work on the cylinder or any connected components, make sure the cylinder is vented and disconnect the air supply in order to ensure isolation of the air supply.

Note
Air quality is essential for maximum cylinder service life (see ISO 8573).

Note
All technical data in this catalog is typical data only.

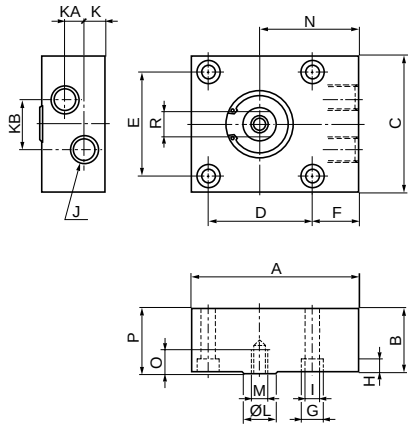
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Single Acting



Type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
C05S-8-4-4	20	16	18	0*	11	5.5	6	3.4	3.4	M5	5.0	4	—	13.5	—	17	—
C05S-12-5-4	25	16	20	0*	13	7.0	6	3.4	3.4	M5	6.0	5	—	15.0	—	17	—
C05S-20-10-4	40	20	32	0*	20	9.0	10	5.0	5.5	G1/8	9.5	10	M5	24.0	8	21	—
C05S-32-12-5	55	26	45	0*	32	14.0	10	5.0	5.5	G1/8	9.5	12	M6	32.0	12	27	9
C05S-50-16-10	80	30	65	50	50	22.5	11	6.5	6.5	G1/4	11.0	16	M8	47.5	12	31	14
C05S-63-16-10	90	35	80	62	62	19.0	15	9.0	9.0	G1/4	11.0	16	M8	50.0	14	36	14

Double Acting



Type	A	B	C	D	E	F	G	H	I	J	K	KA	KB	L	M	N	O	P	R
C05-12-5-10	25	27	20	0*	13	7,0	6	3.4	3.4	M5	6.0	13.0	3	5	—	16.0	—	28	—
C05-20-10-10	40	30	32	0*	20	9,0	10	5.0	5.5	M5	6.0	16.0	6	10	M5	24.0	8	31	—
C05-32-12-10	55	36	45	0*	32	14,0	10	5.0	5.5	G1/8	9.5	16.5	14	12	M6	32.0	12	37	9
C05-32-12-25	55	51	45	0*	32	14,0	10	5.0	5.5	G1/8	9.5	31.5	0**	12	M6	32.0	12	52	9
C05-50-16-25	80	50	65	50	50	22,5	11	6.5	6.5	G1/4	11.0	28.0	0**	16	M8	47.5	12	51	14
C05-63-16-25	90	55	80	62	62	19,0	15	9.0	9.0	G1/4	11.0	33.0	0**	16	M8	50.0	14	56	14

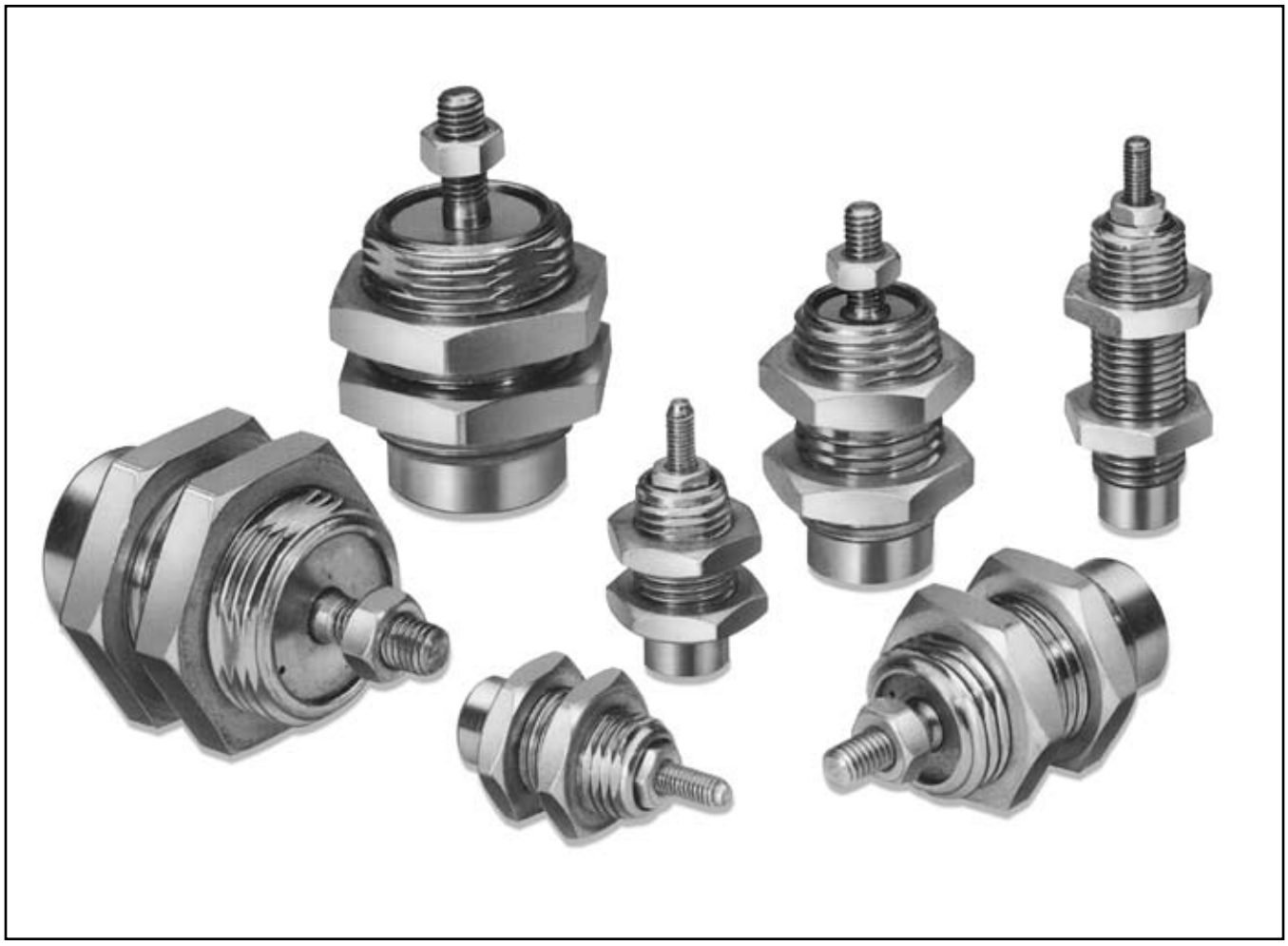
* Only two mounting holes (F).
** Connections in-line.

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P1G Series

Cartridge Cylinders

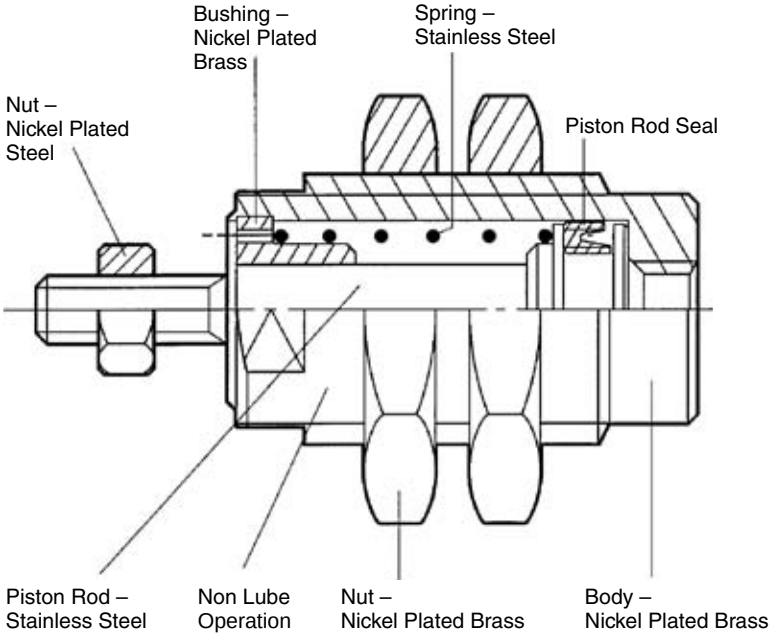


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Features



Ordering Information

Example: P1G-S006SS-10

P1G-S	006	SS-	10

Bore Size	
006	6mm
010	10mm
016	16mm

Stroke	
05	5mm
10	10mm
15	15mm

Technical Information

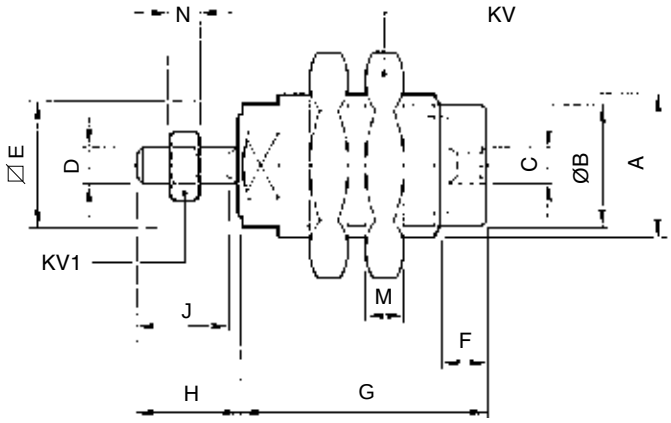
Temperature: -4°F to +176°F (-20°C to +80°C)

Pressure: max. 102 PSI (7 bar) min. 29 PSI (2 bar)

Caution

Use clean air.
Avoid side loads on the piston rod.
Avoid loading the piston rod during retraction.
Do not operate the cylinders with excessive inertia.

Dimensions



Spring Forces (N)

Ø	Retract	Extended
6	1.5	4
10	2.5	6
16	4.5	11

Weights (g)

Ø	Strokes		
	5	10	15
6	10	13	15
10	27	32	36
16	70	78	87

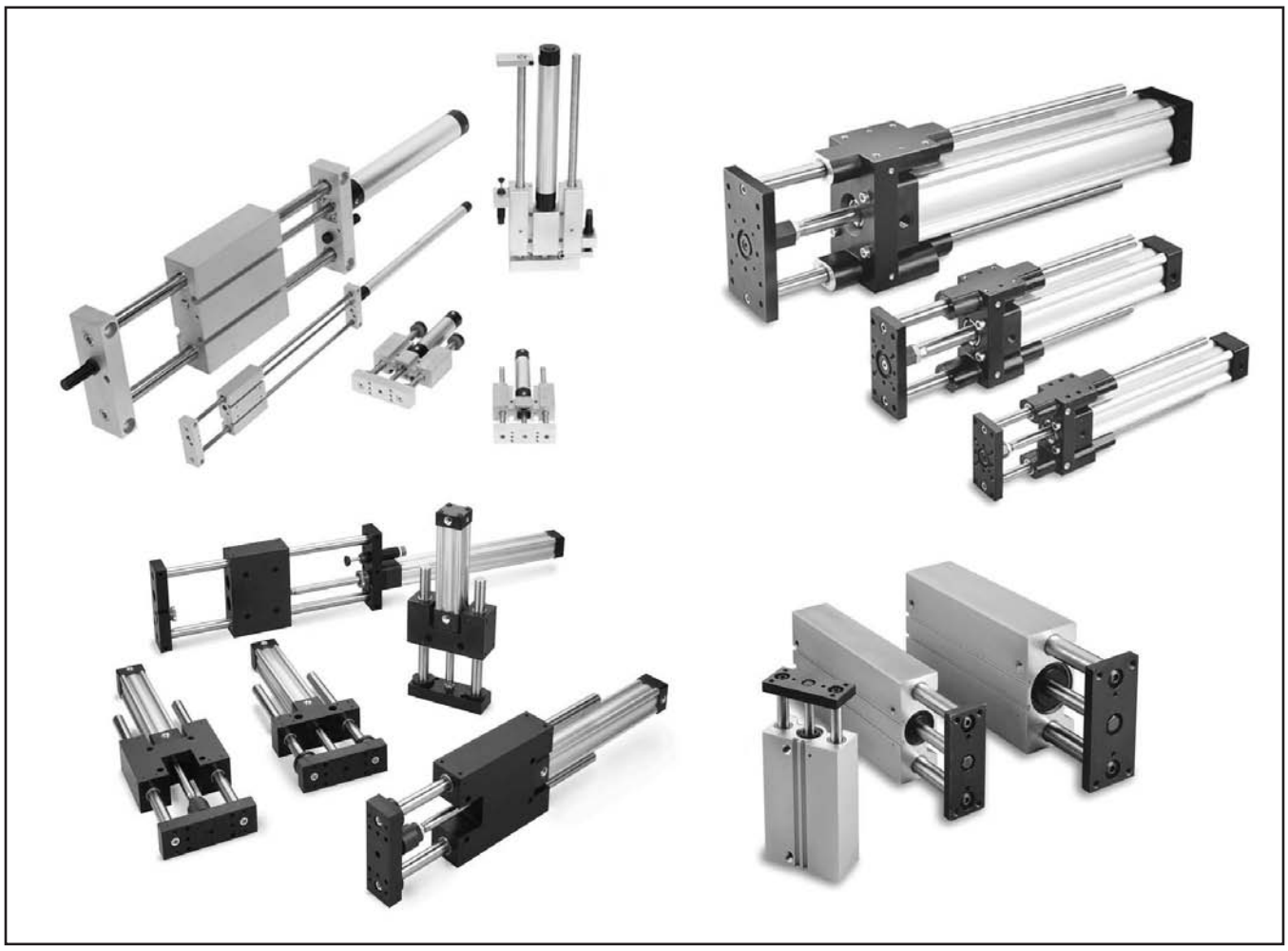
Dimensions (mm)

Ø	A	ØB	C	D	E	F	G			H	J	KV A/F	KV1	M	N
							5	10	15						
6	M10 X 1	8.5	M5	M3 X 0.5	9	5	18.5	25.5	32.5	9.0	9	14	5.5	3	2.4
10	M15 X 1.5	13.0	M5	M4 X 0.7	14	5	20.5	27.0	34.0	11.5	11	19	7.0	4	3.2
16	M22 X 1.5	19.0	M5	M5 X 0.8	20	6	23.5	29.5	36.0	14.0	12	27	8.0	5	4.0

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Guided Cylinders

Section F



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Section F – Guided Cylinders

P5T Series

- Heavy Duty Short Stroke Applications
- Compact Housing with Integral Cylinder
- Bore Sizes 16, 20, 25, 32, 40, 50, 63, 80 and 100mm
- Strokes 10 to 200mm Depending on Model
- Force Output at .5 Mpa (75 PSI): 23.6 to 913 lb (105 to 3927 N)
- Maximum Operating Pressure: 10 bar (145 PSI)

P5T2 Series

- Heavy Duty Short Stroke Thruster
- Bore Sizes 12, 16, 20, 25, 32, 40, 50, 63, 80 And 100mm
- Stroke Lengths from 10mm to 200mm Depending on Model
- Force Output at .5 Mpa (75 PSI): 13 to 913 lb (59 to 4063 N)
- Maximum Operating Pressure: 10 bar (145 PSI)
- Through-body Mounting on All Models

P5L Series

- 3 Body Styles (Thrust, Reach, Base)
- Bore Sizes 20, 25, 32, 40, 50, 63, 80 and 100mm
- Powered by P1L Cylinder
- Maximum Strokes 400 to 1000mm Depending on Model
- Force Output at 80 PSI (5.5 bar): 39 to 974 lb (173 to 4332 N)
- 10 bar (145 PSI) Air Service

HB Series

- Medium Duty to Extremely Heavy Duty Linear Motion
- Powered by the P1D ISO Cylinder with NFPA Options Available
- Bore Sizes 40, 50 and 63mm
- Force Output at 80 PSI: 117 to 368 lb
- 10 bar (145 PSI) Air Service with Other Options Available

P5E Series

- Low Profile Guided Assembly
- Powered by the P1D Cylinder
- Bore Sizes 32, 40, 50, 63, 80 and 100mm
- Strokes to Any Practical Length
- Rod Lock Options Available
- 10 bar (145 PSI) Air Service

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Selection Guide

Basic performance features of the product line are shown below. See catalog sections for greater detail and ordering information. Consult factory for requirements beyond the scope of these guidelines.

Cylinder Type		NFPA/ISO	Round Body	ISO	Built-in
Series		**HB**	**P5L**	**P5E**	**P5T**
Bore Size Range		1½ - 2½ in NFPA 40 to 63mm ISO	20 to 100mm	32 to 100mm	16 to 100mm
Maximum Shaft Diameter		35mm	50mm	30mm	35mm
Maximum Thrust (lbs) at 80 PSI	Extend	393	974	974	913
	Retract	368	874	913	856
Maximum Suggested Stroke		42 in.	100mm	C	200mm (8")
Maximum Pressure Rating		150 PSI	10 Bar (145 PSI)	10 Bar (145 PSI)	10 Bar (145 PSI)
Shaft Bearing Type		Composite or Linear Ball Bushings	Composite or Linear Ball Bushings	Composite or Linear Ball Bushings	Composite or Linear Ball Bushings
Non-Lube Service		●		●	●
Sensor Options	Solid State	●	●	●	●
	Reed	●	●	●	●
	Proximity	●	●		
Mounting & Porting Threads	Metric	C	●	●	●
	Inch	●	●	C	C
Stroke Adjustment		●	●	●	●
Piston Magnet Standard		●		●	●
Energy Dissipation	Cushions	●	●	●	
	Bumpers	●	●	●	●
	Shock Absorbers	●	●		
Port Relocation		●			●
3-Position		●		●	
Rod Lock Option		●		●	
Hydraulic Service Option		●		●	
Alignment Coupler		●		●	
Fluorocarbon Seals		●	●	●	●
Washdown		C		C	●
Clean Room		C		C	C

● = Available from catalog
C = Consult Factory

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Notes

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P5T Series

Short Stroke Thruster

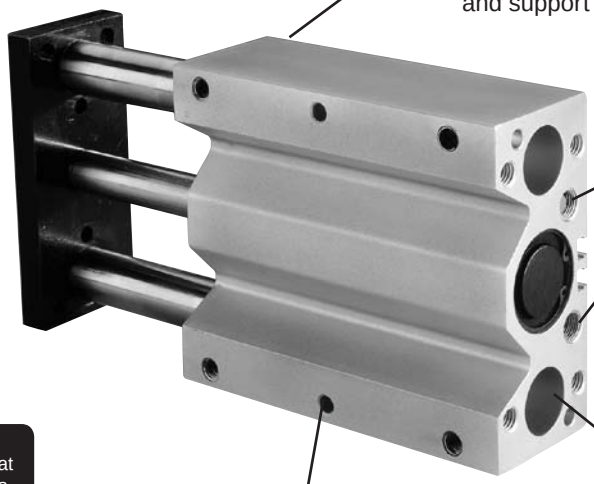


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Compact, One-Piece Body
Provides economy and minimum package size by integrating a low profile cylinder and support shafts into a single body.



Rear Porting
Rear and side porting are available as options.

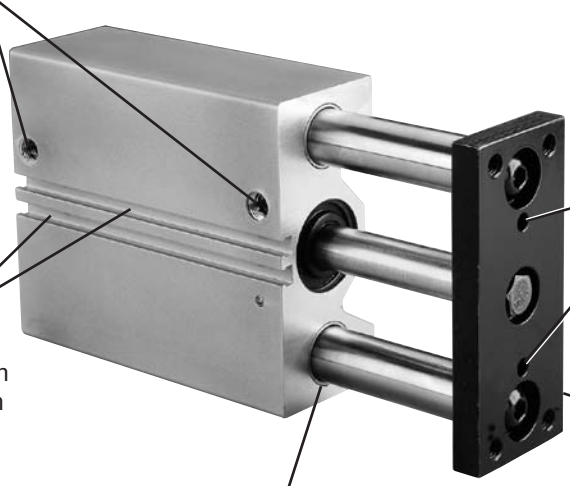
3D CAD FILES
available for download at parker.com/pneumatics

F

Standard Dowel Holes
Dowel holes on body provide simple, economical and precise mounting.

Internal Bumpers
Are standard on all units. These provide energy dissipation and noise reduction which result in longer operating life.

Top Porting
Top porting is standard. Optional side and rear porting is available.



Dowel Holes
Standard dowel holes provide precision mounting and alignment on the tool plate.

Sensor Grooves
Allow reed or solid state sensors to be mounted flush to the body. Magnetic piston is standard.

Tooling Plate
Precision machined from steel, the tooling plate is thick and rigid to provide a durable connection.

Composite Bushings or Linear Ball Bearings
Parker uses a PTFE impregnated **composite bushing** which serves as a lubrication reservoir. This results in higher load carrying capabilities, both dynamic and static, with excellent resistance to shock loading. The impregnated lubricant also makes the bearings more dirt tolerant. **Composite bushings with oversized shafting** are available for high impact loads. Optional **recirculating ball bearings** provide precision operation with very low friction and wear.

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Model Code and Ordering Information

Example: P5T-J032DHSN100

P5T	–	J	032	D	H	S	N	100

Shaft / Bearing Type

J	Composite Bearing, Chrome Plated Shaft (Std)
H	Ball Bearing, Stainless Steel Shaft
C	Composite Bearing, Stainless Steel Shaft

Bore Size

016	16mm
020	20mm
025	25mm
032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm

Port Location / Mounting

D	Dowel Holes, Top Ports (Std)
R	Dowel Holes, Rear Ports, Top Plugged (Std)
S	Dowel Holes, Side Ports [1] and Top Ports

Port Style

H	NPTF (Std)
G	BSPP
P	Flow Control, BSPP Port, Prestolok Tube (mm) [1]
F	Flow Control, NPTF Port, Prestolok Tube (inch) [1]
B	Flow Control, BSPP [1]
N	Flow Control, NPTF [1]

Seals

S	Nitrile (Std)
F	Fluorocarbon (High Temp)

Options

N	None (Std)
B	High Load Bearings [2]
A	Bumpers, Adjustable Stop Collars (Extend Only) and Dual Tool Plate (Side Ports Rec) [3, 4]
E	Bumpers and Adjustable Stop Collars (Extend Only) [3]
G	High Load Bearings, Bumpers and Adjustable Stop Collars (Extend Only) [2, 3]
D	Dual Tool Plate [3, 4]
X	Special

Stroke

See table below for standard stroke lengths. Consult factory for special stroke lengths.

NOTES:

1 Cannot combine flow controls, side ports and 25mm stroke.
2 Not available with rear mounting and ports.
3 Not available with rear port location (R).
4 Includes high load bearings as standard.

Bore Size (mm)	Standard Strokes (mm)*									
	10	25	40	50	75	100	125	150	175	200
16	●	●	●	●	●	●				
20		●	●	●	●	●	●			
25		●		●	●	●	●	●		
32 - 100		●		●	●	●	●	●	●	●

*Consult factory for special stroke lengths.

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A074

Specifications

- Maximum operating pressure: 1 MPa (10 bar/145 psi)
- Operating characteristics: Double acting
- Support rod sizes: ∅8 to 35mm
- Mounting: Unrestricted
- Operating temperature range (cylinder):
  - Nitrile seals (standard) -18° to 74°C (0° to 165°F)
  - Fluorocarbon seals* -18° to 121°C (0° to 250°F)
- Filtration requirement: 40 micron, filtered dry air

* See Fluorocarbon seal option for high temperature applications.

Construction

Body ..... Aluminum
End Caps ..... Aluminum
Tool Plate ..... Steel
Piston Rod ..... Stainless Steel
Support Rods ..... Steel (Chrome Plated)
Rod Bolts ..... Steel

Mounting Bolts

Bore Size	Socket Head Cap
16	M5 x .8
20	M5 x .8
25	M6 x 1.0
32	M8 x 1.25
40	M8 x 1.25
50	M10 x 1.5
63	M10 x 1.5
80	M12 x 1.75
100	M14 x 2.0

Note: *When the P5T is used as an impact stopping system, mounting bolt thread engagement should be 1.5 times bolt diameter.*

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Quick Reference Data

Model (Bore Size)	Piston Rod (mm)	Bushings	Support Rods (mm)	Piston Bore Ares Non-Rod Side		Max Stroke (mm)	Theoretical Force			
							Extend @75 PSI (0.5 MPa)		Retract @75 PSI (0.5 MPa)	
				mm²	in²		N	lb	N	lb
16	8	Ball	8	200	0.31	100	105	23.6	77.4	17.4
		Composite	10	200	0.31	100	105	23.6	77.4	17.4
20	10	Ball	10	316	0.49	125	164	36.8	123	27.8
		Composite	12	316	0.49	125	164	36.8	123	27.8
25	10	Ball	12	490	0.76	150	254	57	213.5	48
		Composite	16	490	0.76	150	254	57	213.5	48
32	16	Ball	16	804	1.25	200	402	93	302	70
		Composite	20	804	1.25	200	402	93	302	70
40	16	Ball	16	1257	1.95	200	628	146	528	123
		Composite	20	1257	1.95	200	628	146	528	123
50	20	Ball	20	1964	3.04	200	982	228	825	192
		Composite	25	1964	3.04	200	982	228	825	192
63	20	Ball	20	3117	4.83	200	1559	362	1492	326
		Composite	25	3117	4.83	200	1559	362	1492	326
80	25	Ball	25	5027	7.79	200	2513	584	2268	527
		Composite	30	5027	7.79	200	2513	584	2268	527
100	25	Ball	30	7854	12.17	200	3927	913	3574	856
		Composite	35	7854	12.17	200	3927	913	3574	856

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Units with Composite Bushings

Weights in kg (lb)

Model	Standard Stroke (mm)									
	10	25	40	50	75	100	125	150	175	200
16	0.35 (0.77)	0.43 (0.95)	0.51 (1.13)	0.57 (1.25)	0.70 (1.54)	0.84 (1.84)	–	–	–	–
20	–	0.76 (1.66)	0.86 (1.90)	0.94 (2.06)	1.11 (2.45)	1.29 (2.85)	1.47 (3.24)	–	–	–
25	–	1.13 (2.48)	–	1.39 (3.05)	1.65 (3.63)	1.91 (4.20)	2.17 (4.77)	2.43 (5.35)	–	–
32	–	1.67 (3.68)	–	2.07 (4.55)	2.46 (5.42)	2.86 (6.29)	3.26 (7.17)	3.65 (8.04)	4.05 (8.91)	4.45 (9.78)
40	–	2.00 (4.40)	–	2.42 (5.32)	2.84 (6.25)	3.26 (7.17)	3.68 (8.10)	4.10 (9.02)	4.52 (9.94)	4.84 (10.65)
50	–	2.63 (5.78)	–	3.22 (7.08)	3.81 (8.38)	4.40 (9.69)	4.99 (10.99)	5.59 (12.29)	6.18 (13.59)	6.77 (14.89)
63	–	3.29 (7.24)	–	3.98 (8.75)	4.66 (10.25)	5.34 (11.75)	6.02 (13.25)	6.71 (14.76)	7.39 (16.26)	8.07 (17.76)
80	–	6.06 (13.33)	–	7.12 (15.66)	8.18 (18.00)	9.24 (20.33)	10.30 (22.66)	11.36 (24.99)	12.42 (27.33)	13.48 (29.66)
100	–	10.69 (23.52)	–	12.03 (26.47)	13.37 (29.42)	14.71 (32.37)	16.05 (35.32)	17.39 (38.27)	18.73 (41.22)	20.08 (44.17)

Units with Linear Ball Bushings

Weights in kg (lb)

Model	Standard Stroke (mm)									
	10	25	40	50	75	100	125	150	175	200
16	0.32 (0.70)	0.39 (0.86)	0.46 (1.02)	0.51 (1.13)	0.64 (1.40)	0.76 (1.67)	—	—	—	—
20	—	0.70 (1.53)	0.80 (1.75)	0.86 (1.90)	1.03 (2.26)	1.19 (2.62)	1.36 (2.99)	—	—	—
25	—	0.98 (2.15)	—	1.20 (2.64)	1.43 (3.14)	1.65 (3.64)	1.88 (4.14)	2.11 (4.63)	—	—
32	—	1.51 (3.31)	—	1.86 (4.09)	2.21 (4.86)	2.56 (5.63)	2.91 (6.41)	3.27 (7.18)	3.62 (7.96)	3.97 (8.73)
40	—	1.82 (4.01)	—	2.20 (4.83)	2.57 (5.66)	2.95 (6.49)	3.32 (7.31)	3.70 (8.14)	4.08 (8.97)	4.45 (9.79)
50	—	2.35 (5.17)	—	2.87 (6.32)	3.39 (7.47)	3.92 (8.62)	4.44 (9.76)	4.96 (10.91)	5.48 (12.06)	6.01 (13.21)
63	—	2.99 (6.58)	—	3.60 (7.93)	4.22 (9.28)	4.83 (10.63)	5.45 (11.98)	6.06 (13.33)	6.67 (14.68)	7.29 (16.03)
80	—	5.66 (12.45)	—	6.63 (14.59)	7.61 (16.74)	8.58 (18.88)	9.56 (21.03)	10.53 (23.18)	11.51 (25.32)	12.49 (27.47)
100	—	10.16 (22.36)	—	11.40 (25.09)	12.64 (27.82)	13.89 (30.55)	15.13 (33.28)	16.37 (36.01)	17.61 (38.74)	18.85 (41.46)

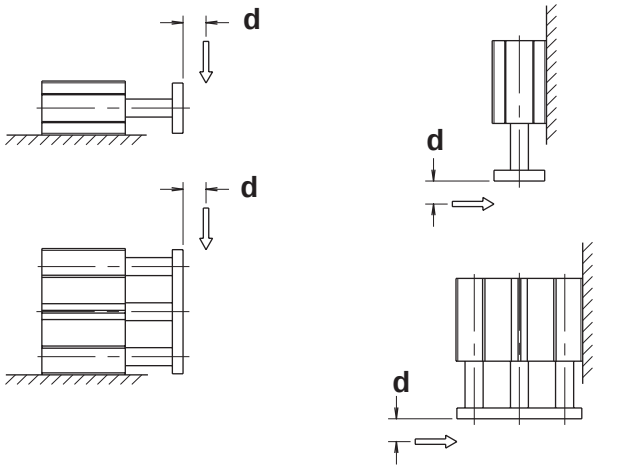
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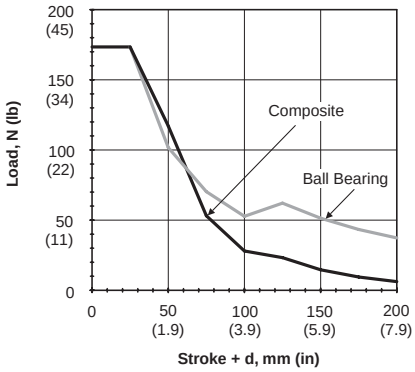
Horizontal Load Capacity
Standard Unit

P5T Series units will have the same load capacity regardless of orientation. The graphs below show maximum load capacity based on a unit life of 10 million cycles .

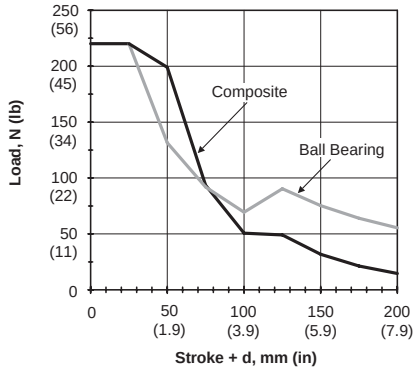
EXAMPLE: A P5T-16 with "stroke + d" of 75mm and composite bushings would have a load capacity of 50N.



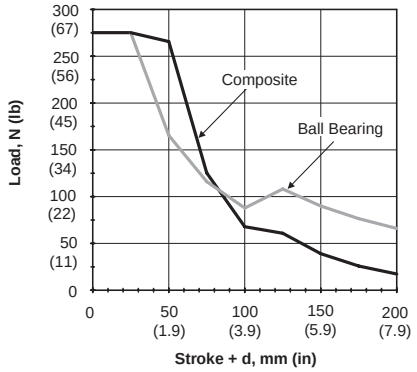
16mm Bore Size



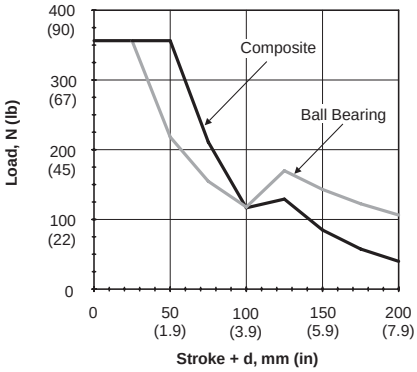
20mm Bore Size



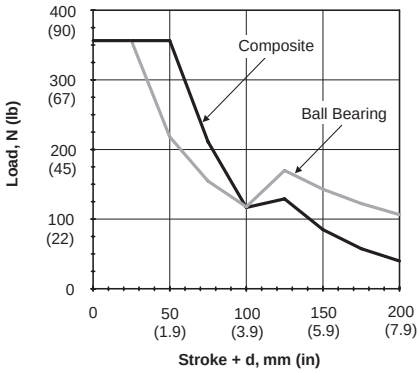
25mm Bore Size



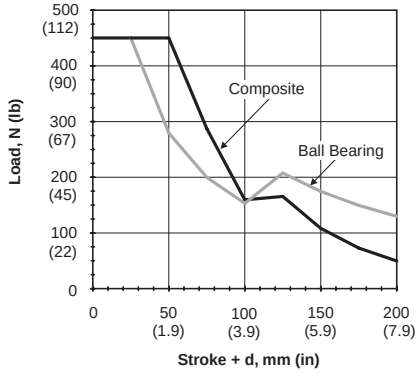
32mm Bore Size



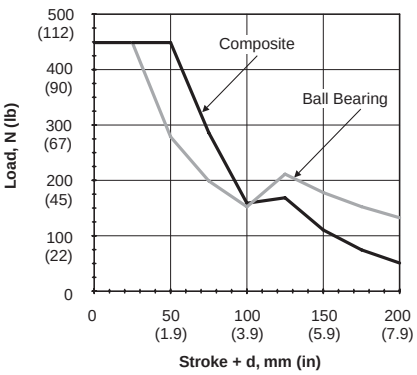
40mm Bore Size



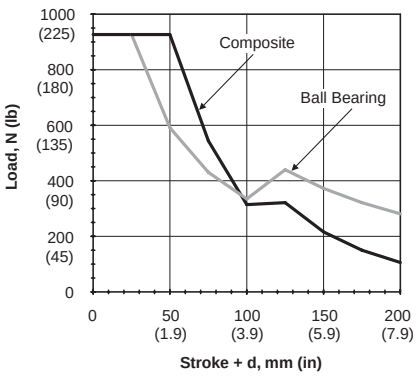
50mm Bore Size



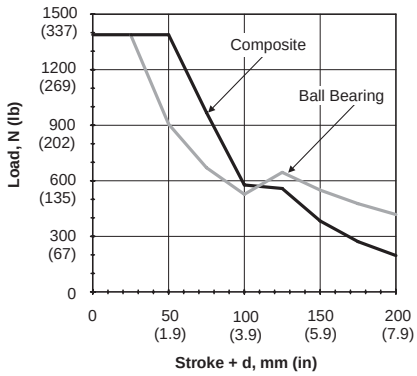
63mm Bore Size



80mm Bore Size



100mm Bore Size



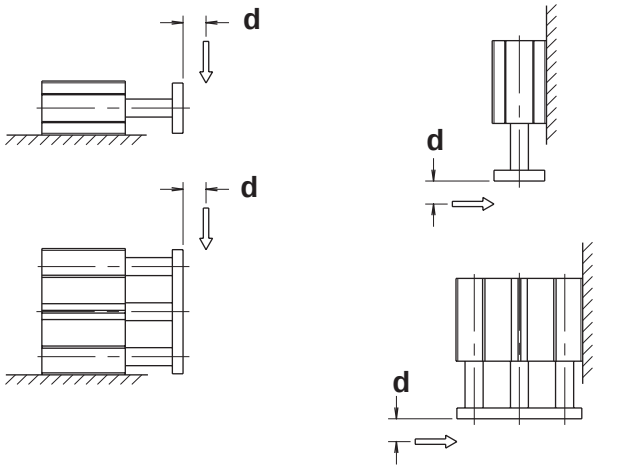
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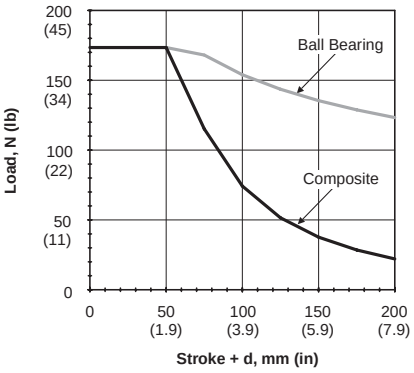
Horizontal Load Capacity with High Load Bearings and Dual Tool Plate (D, A, B)

P5T Series units will have the same load capacity regardless of orientation. The graphs below show maximum load capacity based on a unit life of 10 million cycles.

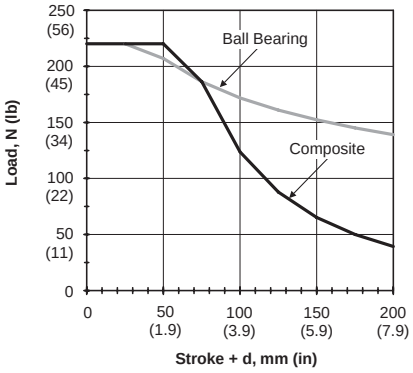
EXAMPLE: A P5T-20 with "stroke + d" of 100mm and high load composite bushings would have a load capacity of 125N.



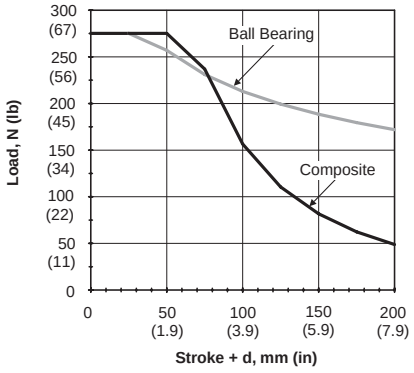
16mm Bore Size



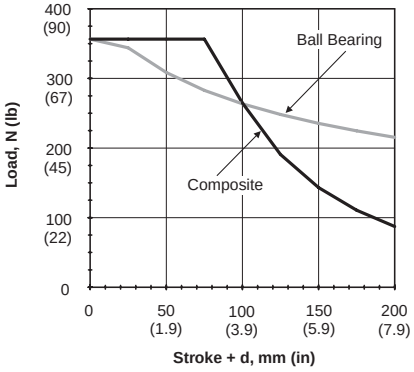
20mm Bore Size



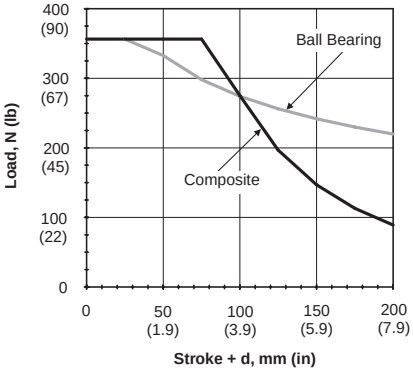
25mm Bore Size



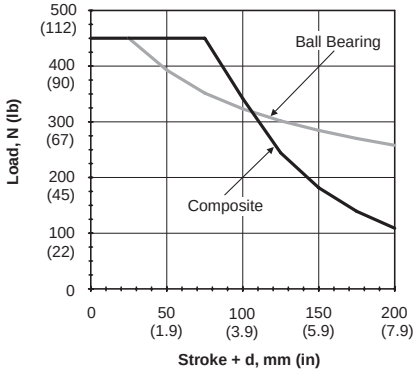
32mm Bore Size



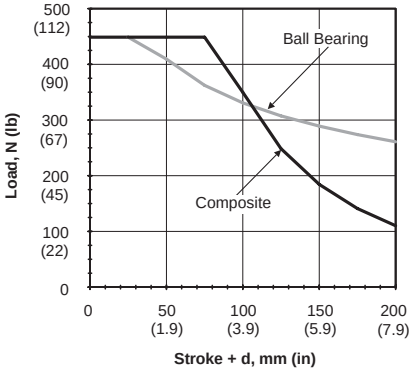
40mm Bore Size



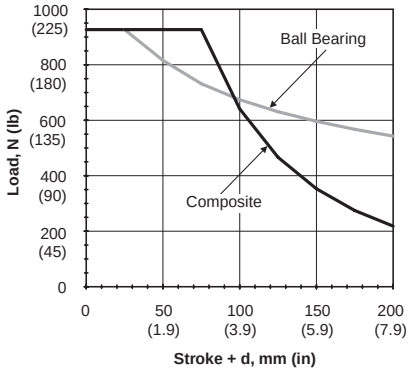
50mm Bore Size



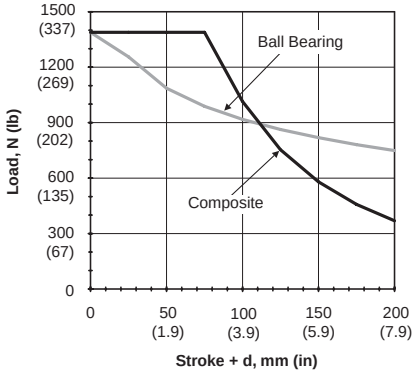
63mm Bore Size



80mm Bore Size



100mm Bore Size



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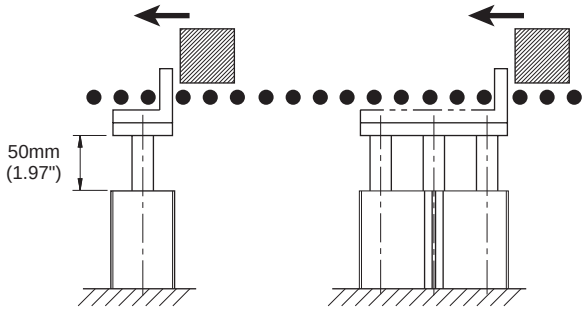
Load Stopping Capacity
Standard Unit

P5T Series actuators are ideal for conveyor stopping applications. Units can be mounted horizontally or vertically.

Composite bushings are strongly recommended for this type of application.

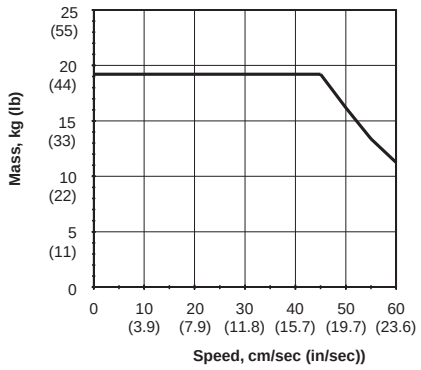
EXAMPLE: A P5T-50 unit with a stroke up to 50mm will stop an object moving at 40 cm/second (15.75 in/s) that weighs up to 50 kg (110 lb).

Note: The following graphs are based on 50mm of stroke.

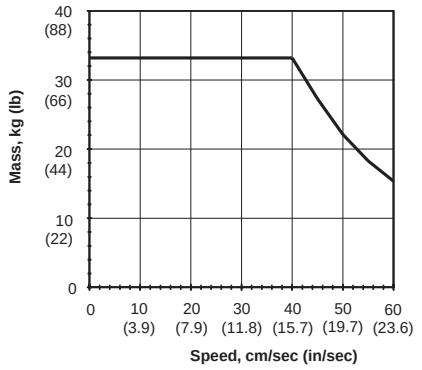


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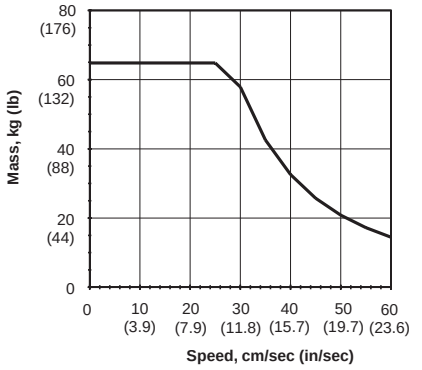
16mm Bore Size



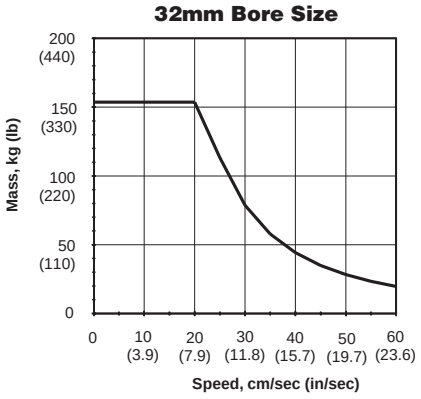
20mm Bore Size



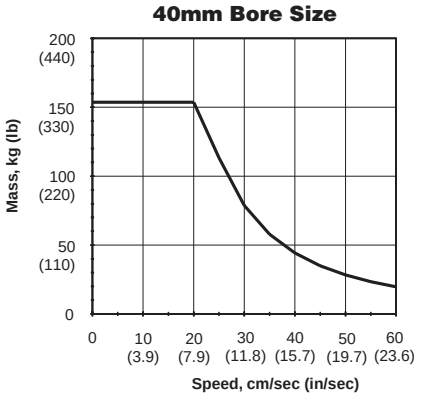
25mm Bore Size



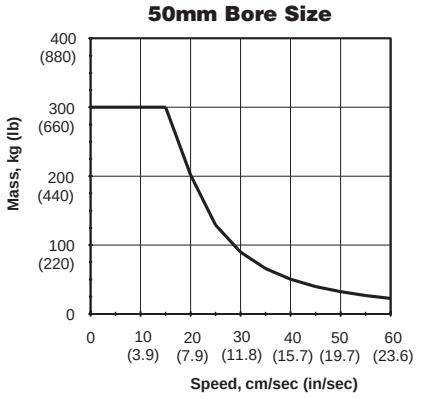
32mm Bore Size



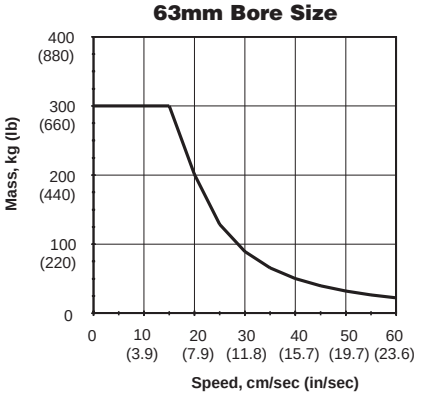
40mm Bore Size



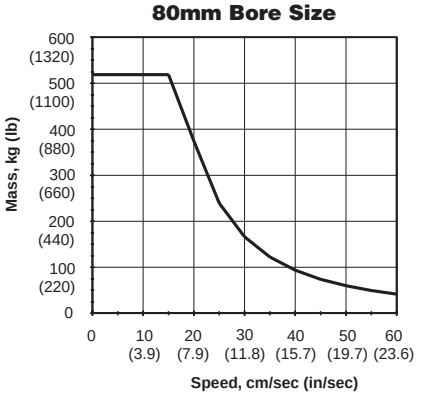
50mm Bore Size



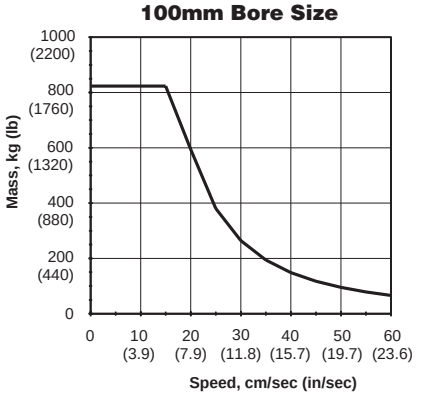
63mm Bore Size



80mm Bore Size



100mm Bore Size



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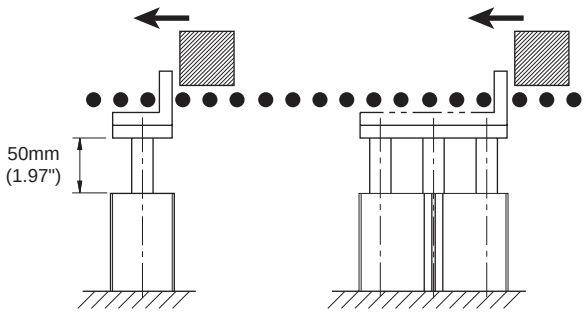
Load Stopping Capacity with High Load Bearings and Dual Tool Plate (D, A, B)

P5T Series actuators are ideal for conveyor stopping applications. Units can be mounted horizontally or vertically.

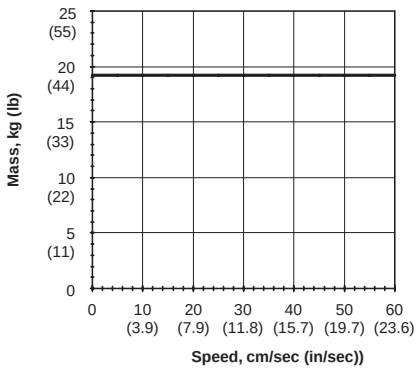
Composite bushings are strongly recommended for this type of application.

EXAMPLE: A P5T-25 unit with a stroke up to 50mm will stop an object moving at 40 cm/second (15.7 in/s) that weighs up to 46 kg (101 lb).

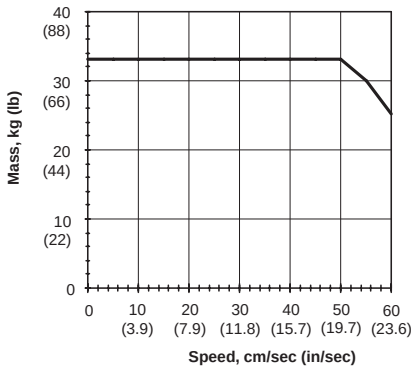
Note: The following graphs are based on 50mm of stroke.



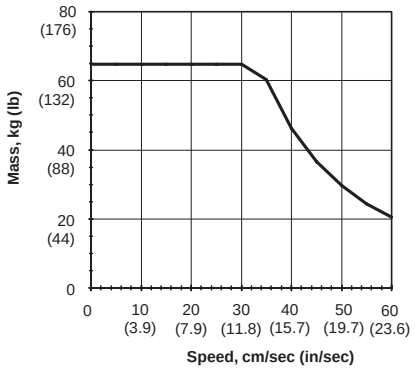
16mm Bore Size



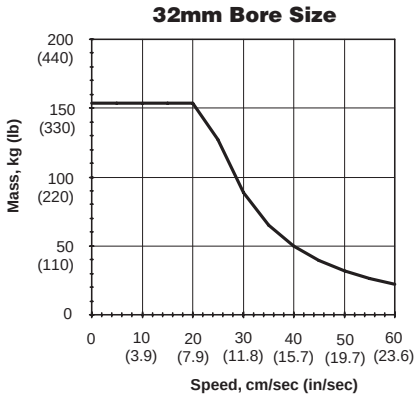
20mm Bore Size



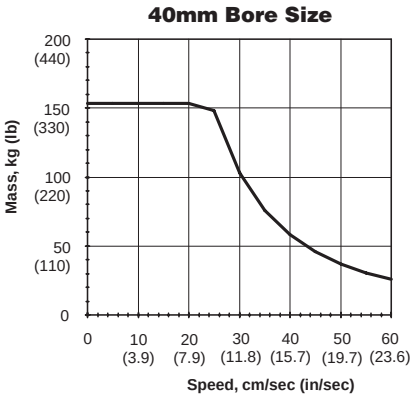
25mm Bore Size



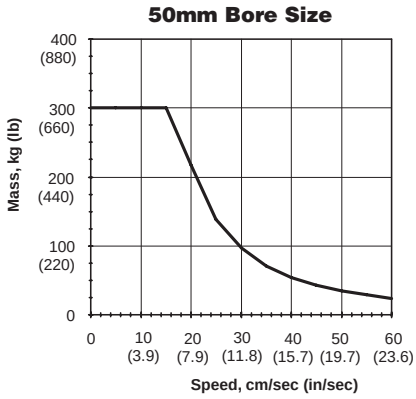
32mm Bore Size



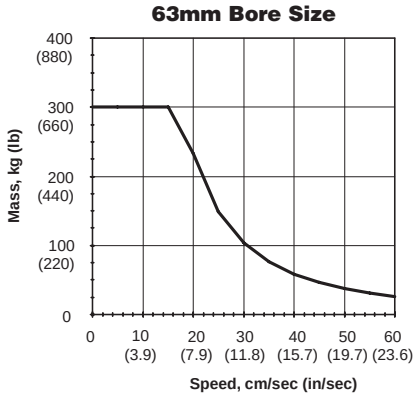
40mm Bore Size



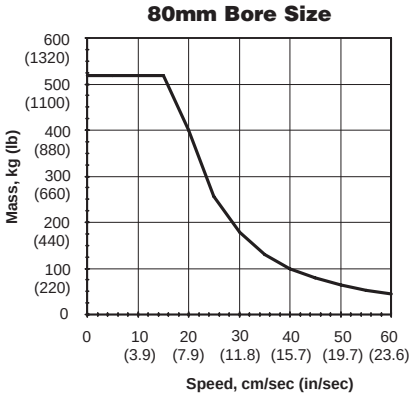
50mm Bore Size



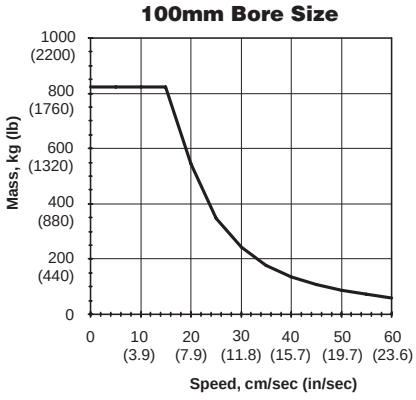
63mm Bore Size



80mm Bore Size



100mm Bore Size



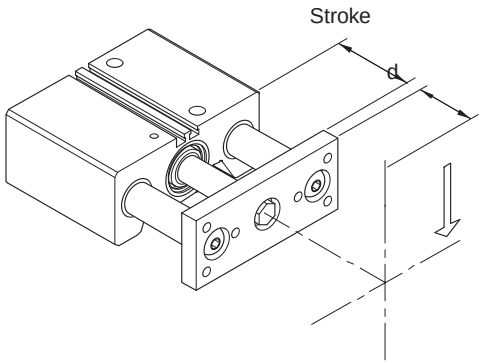
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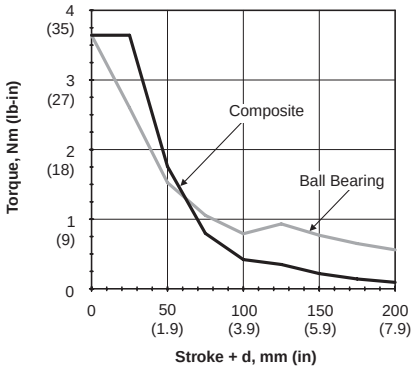
Asymmetrical Torque Capacity Standard Unit

Asymmetrical loading occurs when the load is applied to one side of the unit. P5T Series units can resist torsional loads that are asymmetrical.

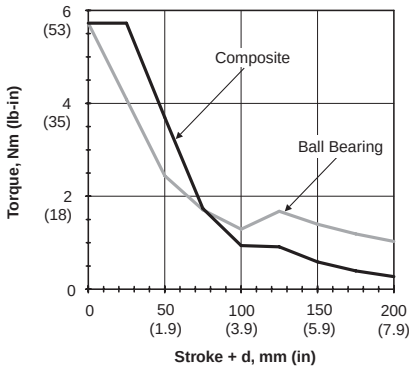
EXAMPLE: A mechanism exerts an asymmetrical load of 15Nm on a P5T-50 with 50mm "stroke+d". The P5T-50 with composite bushings will have adequate torsional capacity.



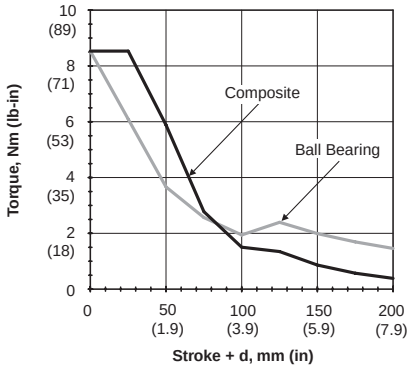
16mm Bore Size



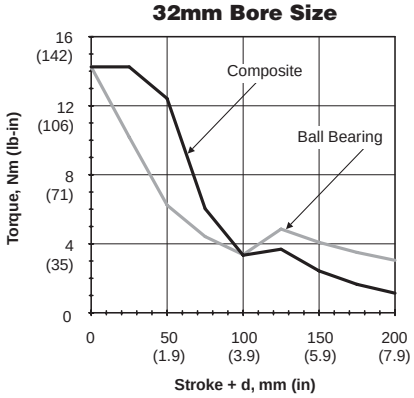
20mm Bore Size



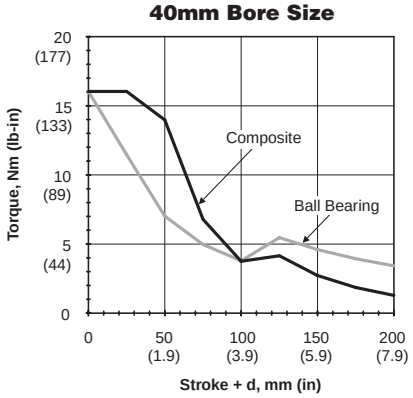
25mm Bore Size



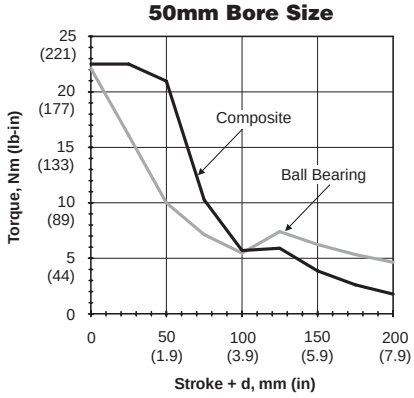
32mm Bore Size



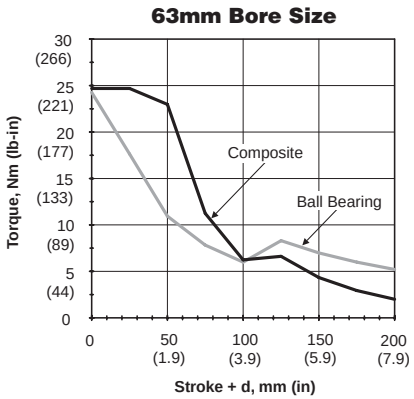
40mm Bore Size



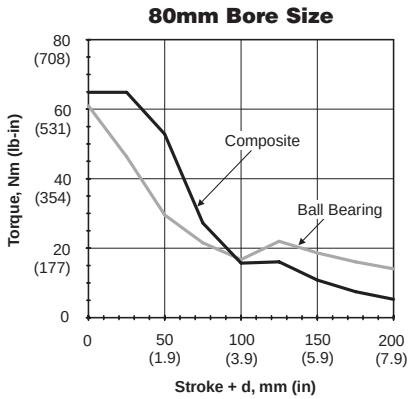
50mm Bore Size



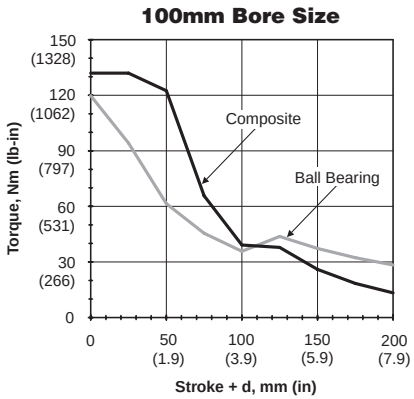
63mm Bore Size



80mm Bore Size



100mm Bore Size



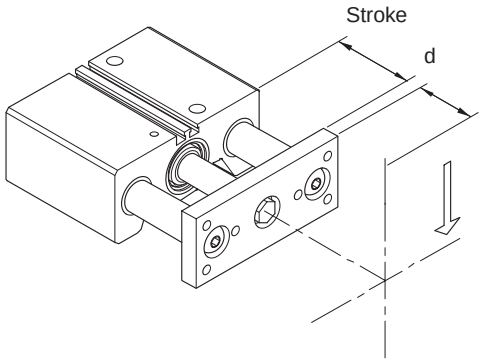
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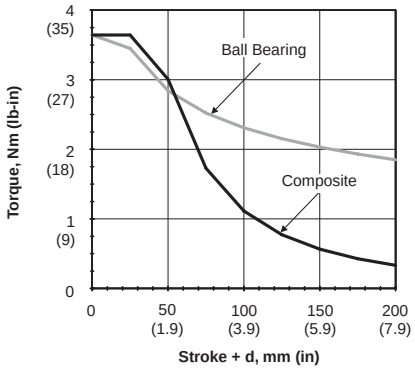
Asymmetrical Torque Capacity with High Load Bearings and Dual Tool Plate (D, A, B)

Asymmetrical loading occurs when the load is applied to one side of the unit. P5T Series units can resist torsional loads that are asymmetrical.

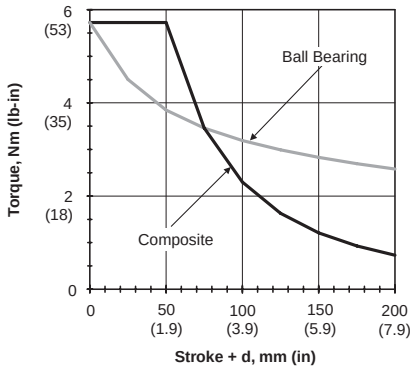
EXAMPLE: A mechanism exerts an asymmetrical load of 15Nm on a P5T-50 with 50mm "stroke+d". The P5T-50 with composite bushings will have adequate torsional capacity.



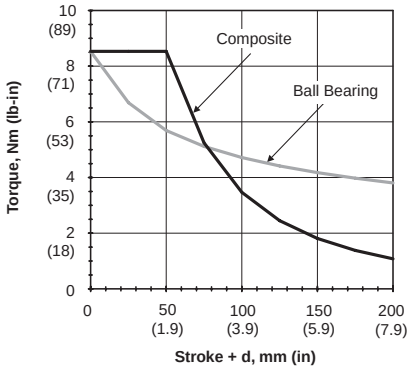
16mm Bore Size



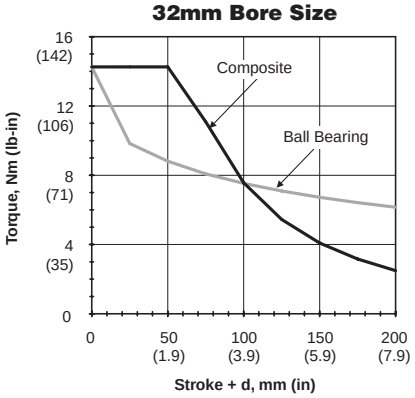
20mm Bore Size



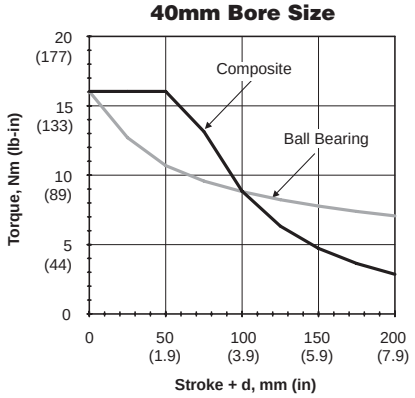
25mm Bore Size



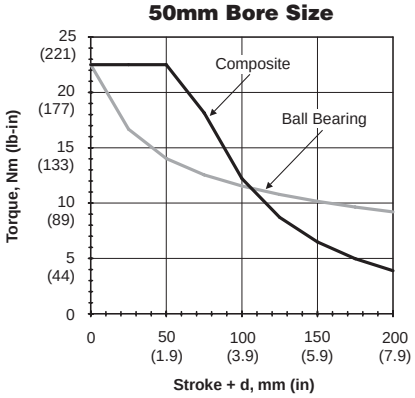
32mm Bore Size



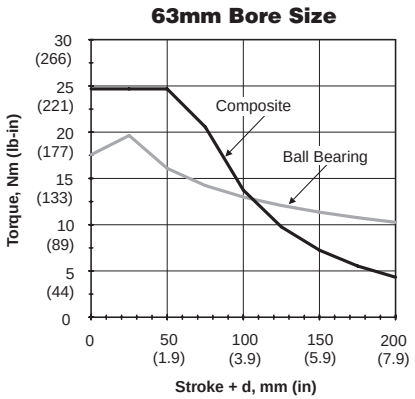
40mm Bore Size



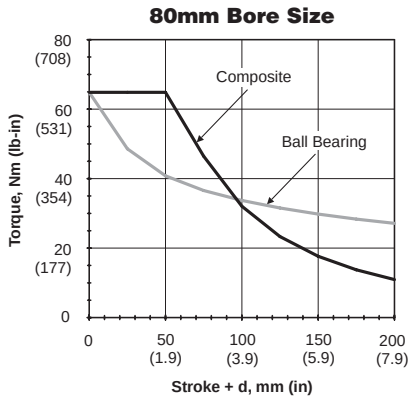
50mm Bore Size



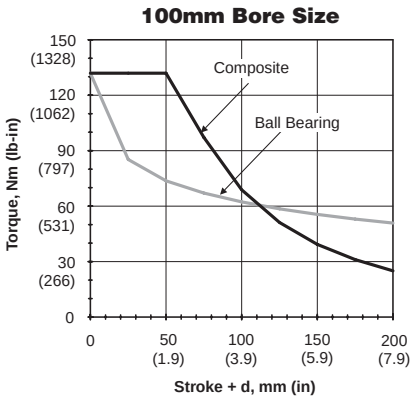
63mm Bore Size



80mm Bore Size



100mm Bore Size



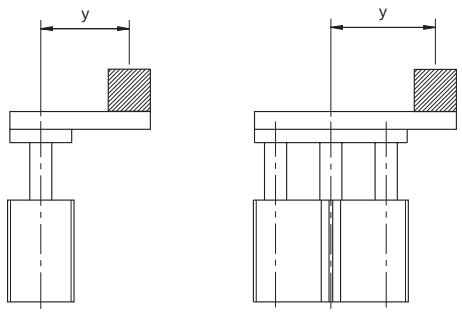
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Vertical Eccentric Load Capacity
Standard Unit

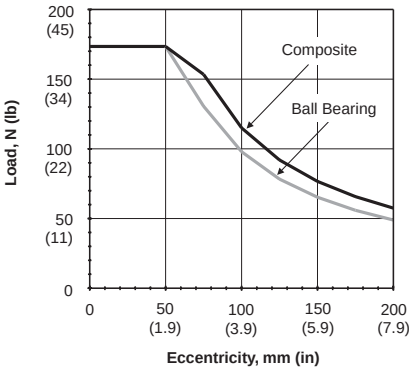
P5T Series units mounted vertically will have the same eccentric load capacity regardless of orientation. The graphs provide maximum load capacity for an eccentric mounted load. The load is assumed to be mounted at the face of the tooling plate.

These load curves illustrate load ratings based on the bearing system of the product. Load rating is a key selection criterion but is not the only one to consider in the selection of a product.

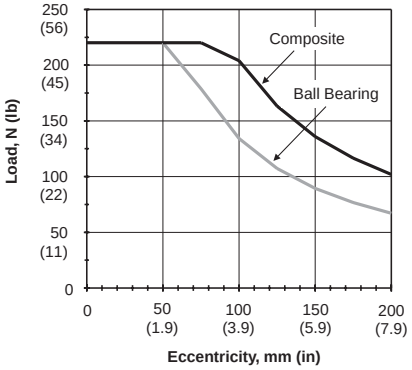


y = eccentricity distance

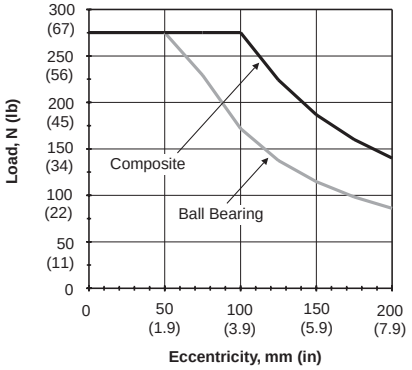
16mm Bore Size



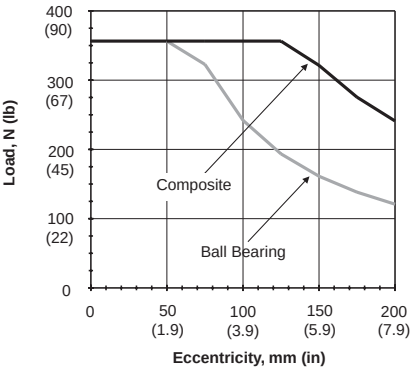
20mm Bore Size



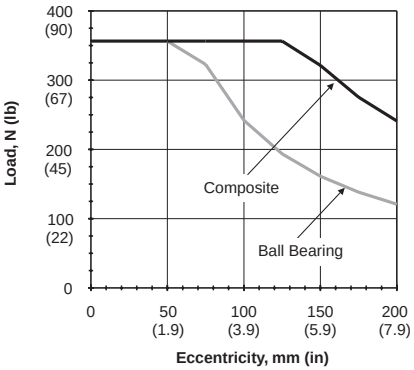
25mm Bore Size



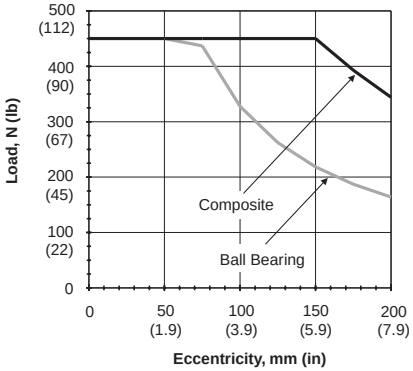
32mm Bore Size



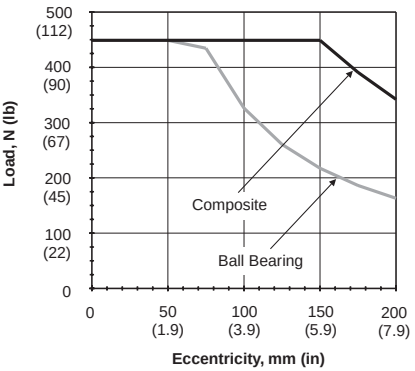
40mm Bore Size



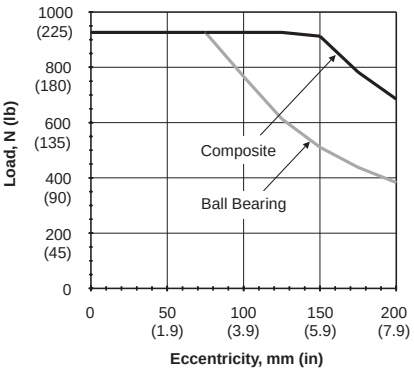
50mm Bore Size



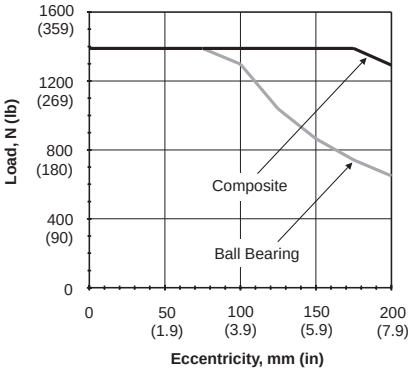
63mm Bore Size



80mm Bore Size



100mm Bore Size



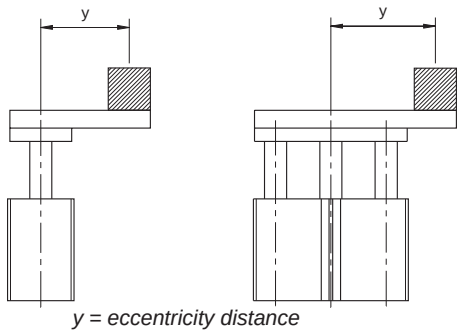
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Vertical Eccentric Load Capacity with High Load Bearings and Dual Tool Plate (D, A, B)

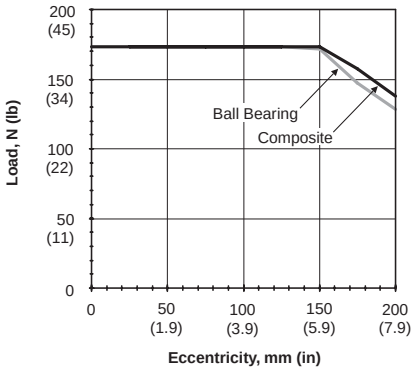
P5T Series units mounted vertically will have the same eccentric load capacity regardless of orientation. The graphs provide maximum load capacity for an eccentric mounted load. The load is assumed to be mounted at the face of the tooling plate.

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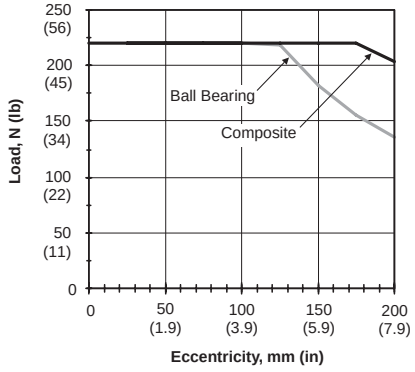


y = eccentricity distance

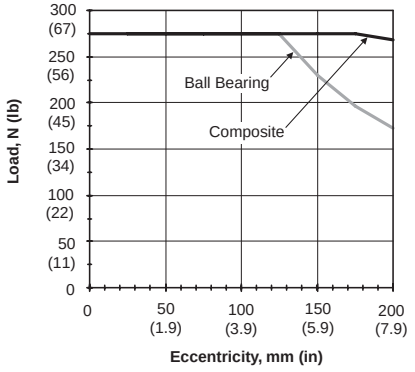
16mm Bore Size



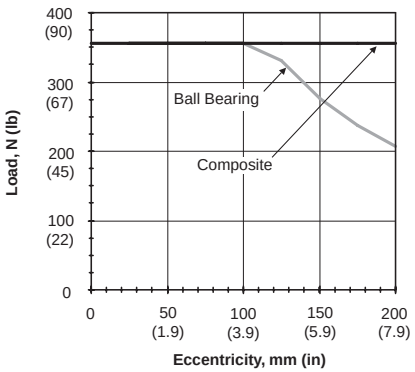
20mm Bore Size



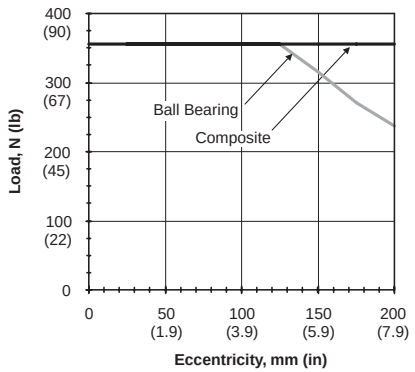
25mm Bore Size



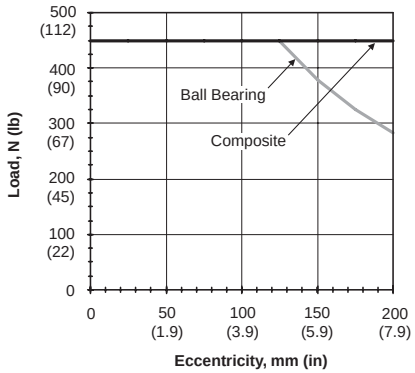
32mm Bore Size



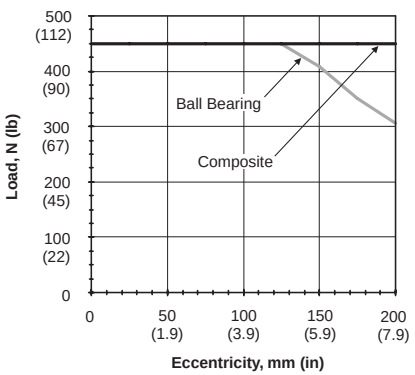
40mm Bore Size



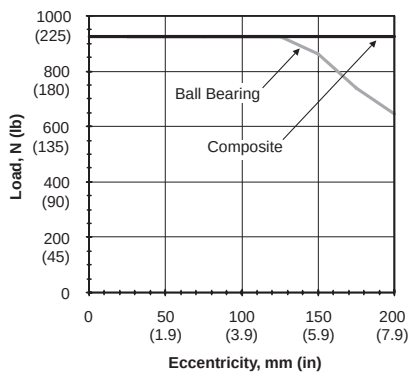
50mm Bore Size



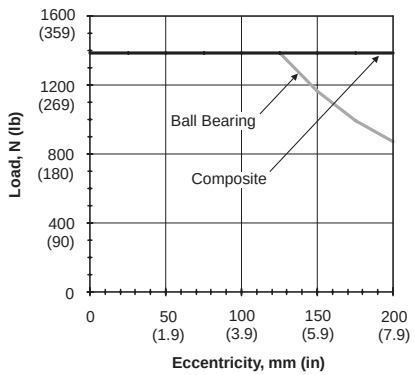
63mm Bore Size



80mm Bore Size



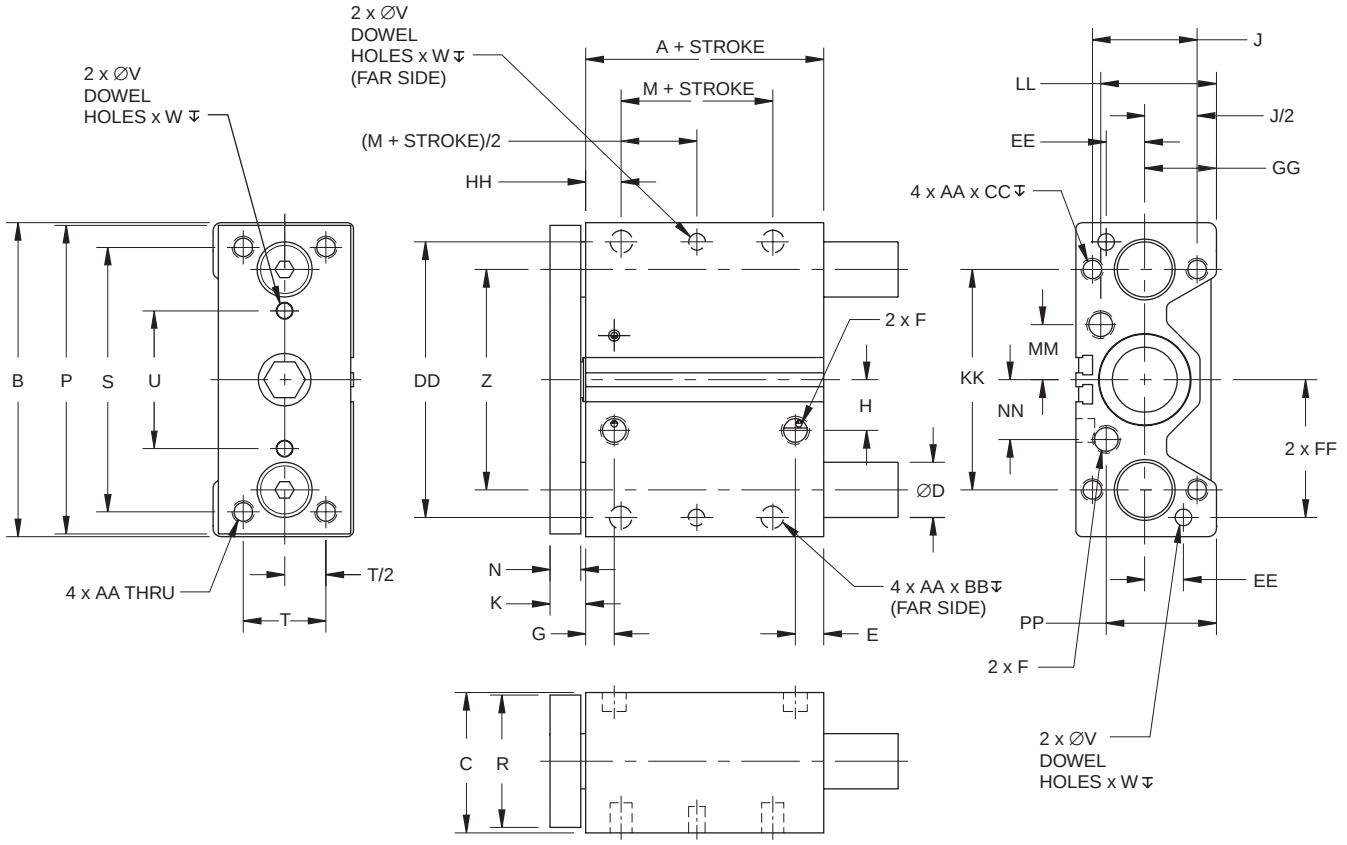
100mm Bore Size



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Basic Unit



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Note: On 16mm bore size only, one sensor groove is available. When utilizing two sensors on the 16mm bore size with 25mm stroke or less, use right angle short sensors.

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Wadsworth, Ohio
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Basic Unit

Model	A**	B	C	D	D2	E**	F	G	H	J	K
16	37.75 (1.49)	64 (2.52)	31 (1.22)	8 (0.315)	10 (0.394)	10.1 (0.40)	M5/10-32	10.1 (0.40)	6.95 (0.27)	22 (0.866)	9.94 (0.39)
20	36 (1.42)	74 (2.91)	36 (1.42)	10 (0.394)	12 (0.472)	19 (0.75)	1/8 NPTF or BSPP	10 (0.39)	15.8 (0.62)	26 (1.024)	9.94 (0.39)
25	38 (1.50)	88 (3.46	42 (1.65)	12 (0.472)	16 (0.630)	21 (0.83)	1/8 NPTF or BSPP	11.4 (0.45)	15.5 (0.61)	32 (1.260)	9.94 (0.39)
32	36 (1.42)	114 (4.49)	51 (2.00)	16 (0.630)	20 (0.787)	10.26 (0.40)	1/8 NPTF or BSPP	10.35 (0.41)	18.42 (0.73)	38 (1.496)	13.1 (0.52)
40	44 (1.73)	124 (4.88)	52 (2.05)	16 (0.630)	20 (0.787)	12.10 (0.48)	1/8 NPTF or BSPP	14.9 (0.59)	22.53 (0.89)	38 (1.496)	13.1 (.052)
50	44.9 (1.77)	140 (5.51)	62 (2.44)	20 (0.787)	25 (0.984)	14.5 (0.57)	1/4 NPTF or BSPP	16.1 (0.63)	27 (1.06)	44 (1.732)	14.7 (0.58)
63	50.05 (1.97)	150 (5.91)	75 (2.95)	20 (0.787)	25 (0.984)	16.4 (0.65)	1/4 NPTF or BSPP	14.5 (0.57)	33 (1.30)	44 (1.732)	14.7 (0.58)
80	60.3 (2.37)	188 (7.40)	95 (3.74)	25 (0.984)	30 (1.181)	17.5 (0.610)	3/8 NPTF or BSPP	19 (0.75)	37 (1.46)	56 (2.205)	18 (0.71)
100**	67.5 (2.60)	224 (8.82)	115 (4.53)	30 (1.181)	35 (1.38)	21.9 (0.862)	3/8 NPTF or BSPP	23 (0.91)	40 (1.57)	62 (2.441)	18 (0.71)

Model	M	N	P	R	S	T	U	V	W	Z	AA	BB
16	7 (0.276)	7.94 (0.31)	62 (2.44)	25.4 (1.00)	52 (2.047)	16 (.630)	20 (0.787)	3 (0.118)	6 (0.236)	42 (1.654)	M5 X 0.8	7.5 (0.30)
20	10 (0.394)	7.94 (0.31)	72 (2.83)	31.8 (1.25)	60 (2.362)	18 (.709)	30 (1.181	4 (0.157)	6 (0.236)	52 (2.047)	M5 X 0.8	7.5 (0.30)
25	10 (0.394)	7.94 (0.31)	86 (3.39)	38 (1.50)	70 (2.756)	26 (1.024)	34 (1.339)	4 (0.157)	6 (0.236)	62 (2.441)	M6 X 1.0	9 (0.35)
32	5 (0.197)	11.1 (0.44)	112 (4.41)	44.5 (1.75)	96 (3.780)	30 (1.181)	50 (1.969)	6 (0.236)	6 (0.236)	80 (3.150)	M8 X 1.25	11 (0.43)
40	10 (0.394)	11.1 (0.44)	122 (4.80)	44.5 (1.75)	106 (4.173)	30 (1.181)	60 (2.362)	6 (0.236)	6 (0.236)	90 (3.543)	M8 X 1.25	11 0.43)
50	10 (0.394)	12.7 (0.50)	138 (5.43)	57.2 (2.25)	120 (4.724)	40 (1.575)	60 (2.362)	8 (0.315)	8 (0.315)	100 (3.937)	M10 X 1.5	12 (0.47)
63	10 (0.394)	12.7 (0.50)	148 (5.83)	69.9 (2.75)	130 (5.118)	50 (1.969)	72 (2.835)	8 (0.315)	8 (0.315)	110 (4.331)	M10 X 1.5	15 (0.59)
80	15 (0.591)	16 (0.63)	185 (7.28)	89 (3.50)	160 (6.299)	60 (2.362)	92 (3.622)	10 (0.394)	10 (0.394)	140 (5.512)	M12 X 1.75	18 (0.71)
100	15 (0.591)	16 (0.63)	221 (8.70)	108 (4.25)	190 (7.480)	80 (3.150)	114 (4.488)	10 (0.394)	10 (0.394)	170 (6.693)	M14 X 2.0	21 (0.83)

Model	CC	DD	EE	FF	GG	HH	KK	LL	MM	NN	PP	Piston Rod
16	10 (0.39)	54 (2.126)	8 (0.315)	27 (1.063)	15 (0.591)	13.06 (0.514)	42 (1.654)	22.5 (0.88)	11.25 (0.44)	9.7 (0.38)	23.0 (0.91)	8 (0.315)
20	10 (0.39)	64 (2.520)	10 (0.394)	32 (1.260)	17 (0.669)	13.06 (0.514)	52 (2.126)	26.0 (1.02)	15.4 (0.61)	15.4 (0.61)	26.0 (1.0)	10 (0.394)
25	12 (0.47)	76 (2.992)	11 (0.433)	38 (1.496)	21 (0.827)	14.06 (0.553)	62 (2.441)	33.4 (1.31)	17 (0.67)	17 (0.67)	33.4 (1.31)	10 (0.394)
32	16 (0.63)	100 (3.937)	14 (0.551)	50 (1.969)	26 (1.024)	12.9 (0.508)	80 (3.150)	42 (1.65)	20 (0.79)	21.7 (0.85)	38 (1.50)	16 (0.630)
40	16 (0.63)	110 (4.33)	14 (0.551)	55 (2.165)	26 (1.024)	13.9 (0.547)	90 (3.543)	41 (1.61)	24 (0.95)	26.4 (1.04)	37.9 (1.49)	16 (0.630)
50	20 (0.79)	124 (4.882)	16 (0.630)	62 (2.441)	30 (1.181)	14.3 (0.563)	100 (3.937)	51 (2.01)	29 (1.14)	33 (1.30)	44 (1.73)	20 (0.787)
63	20 (0.79)	132 (5.197)	18 (0.709)	66 (2.598)	36.5 (1.437)	16.3 (0.642)	110 (4.331)	62 (2.44)	36 (1.42)	37.75 (1.49)	57.75 (2.27)	20 (0.787)
80	24 (0.94)	166 (6.535)	22 (0.866)	83 (3.268)	46.5 (1.831)	21 (0.83)	140 (5.512)	78 (3.07)	45 (1.77)	48 (1.89)	75.5 (2.97)	25 (0.984)
100	28 (1.10)	200 (7.874)	24 (0.945)	100 (3.937)	56.5 (2.224)	25 (0.98)	170 (6.693)	91.5 (3.60)	53 (2.09)	51 (2.01)	95.5 (3.76)	25 (0.984)

D^1 With linear ball bearing D^2 With composite bushing

** For Model 100 with 25mm stroke, A = 100.3 (3.95") and E = 28 (1.10")

All dimensions in mm (inch)

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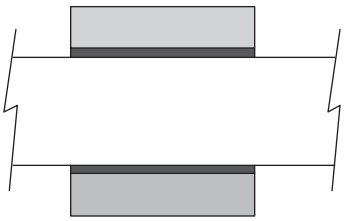
Shaft Bearings

Composite bushings are supplied as standard.
Linear ball bearings are optional.

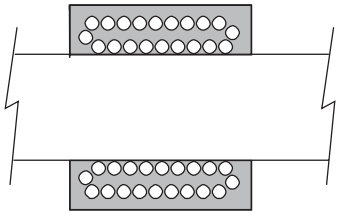
Selection should be based on the following criteria:

Application Requirement	Ball	Composite
Precision	Excellent	Good
Friction	Low	Higher
Friction coefficient	Constant	Variable
Precision over life of bearing	Constant	Variable
Static Load Capacity	Good	Excellent
Dynamic Load Capacity	Good	Good with lower efficiency
Vibration Resistance	Fair	Excellent
Contamination Resistance	Poor	Excellent
Washdown Compatibility	Poor	Excellent

For bearing load capacities, reference the Engineering Data section.



Composite Bushing (J,C)

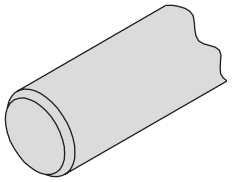


Recirculating Ball Bearing (H)

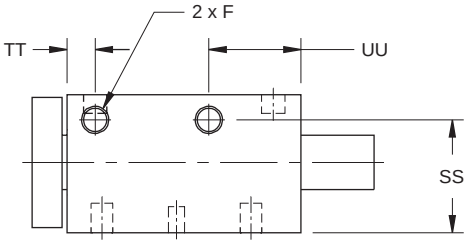
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Corrosion Resistant Shafting (C, H)

Chrome-plated case hardened, high carbon alloy steel shafting with composite bearings is utilized for standard slides. This may corrode in some applications. Stainless steel corrosion resistant shafting is available.



Side Porting (S)



NOTES:

1 Side ports not available on 100mm bore units with 25mm of stroke.

2 Cannot use flow controls with 25mm stroke on any bore size.

Dimensions

Model	SS mm (in)	TT mm (in)	UU mm (in)	F
16	24.1 (.95)	10 (.39)	20 (.79)	10-32 or M5
20	29.00 (1.15)	10 (.39)	20 (.79)	10-32 or M5
25	35.15 (1.38)	11.4 (.45)	24 (.94)	10-32 or M5
32	43.2 (1.70)	10.35 (.41)	34 (1.34)	1/8 NTPF or BSPP
40	43.0 (1.69)	14.9 (.59)	34 (1.34)	1/8 NPTF or BSPP
50	51.25 (2.02)	16.1 (.64)	38 (1.50)	1/4 NTPF or BSPP
63	60.70 (2.39)	15.55 (.61)	41.8 (1.65)	1/4 NPTF or BSPP
80	75.5 (2.97)	19 (.75)	47 (1.85)	3/8 NTPF or BSPP
100	83.7 (3.30)	23 (.91)	53.3 (2.10)	3/8 NPTF or BSPP

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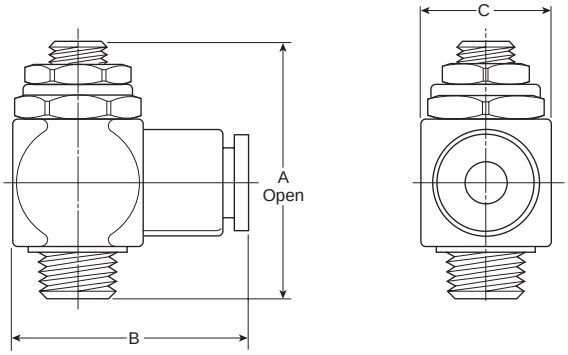
Flow Controls (B, F, N, P)

Right angle flow control valves allow precise adjustment of cylinder speed by metering exhaust air flow. Prestolok push-in or threaded ports provide 360° orientation capability.

Model	A (in)	B (in)	C (in)	Imperial	
				Prestolok (F)	NPT (N)
16, 20*, 25*	0.87	0.96	0.39	5/32"	10-32
20, 25, 32, 40	1.63	1.38	0.67	5/32"	1/8
50, 63	1.86	1.64	0.91	1/4"	1/4
80, 100	2.15	1.90	1.06	3/8"	3/8

Model	A (mm)	B (mm)	C (mm)	Metric	
				Prestolok (P)	BSPP (B)
16, 20*, 25*	22.0	24.5	10.0	4mm	M5
20, 25, 32, 40	34.5	31.6	14.4	6mm	1/8
50	41.0	34.9	18.4	6mm	1/4
63	41.0	41.3	18.4	10mm	1/4
80	51.0	46.7	21.6	10mm	3/8
100	51.0	46.7	21.6	12mm	3/8

* Side ports only.



Note: When flow controls are specified with rear ports, a 90° right angle fitting is supplied to provide ample rod clearance in the rear.

Prestolok flow controls are not available on 32-100mm bore sizes with 25mm of stroke.

Fluorocarbon Seals (F)

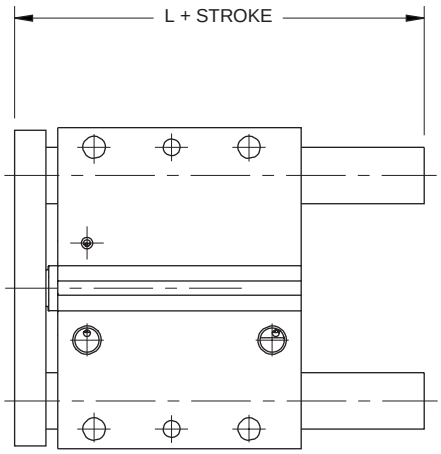
Standard abrasion resistant nitrile seals should be used for general purpose applications with temperatures of -18 to 74°C (0 to 165°F). Fluorocarbon seals are recommended for high temperature applications up to 121°C (250°F).

Feature	Temperature Range
Bumpers	-18 to 93°C (0 to 200°F)
Magnets	-18 to 74°C (0 to 165°F)
Sensors	-10 to 85°C (14 to 185°F)

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Standard Length – No Options (N)



Dimensions

Model	Stroke (mm)	L	
		mm	inch
16	10*, 25, 40, 50, 75	60.2	2.37
	100	75.2	2.96
20	25, 40, 50, 75	66.9	2.63
	100, 125	91.9	3.62
25	25, 50, 75	69.9	2.75
	100, 125, 150	91.9	3.62
32	25, 50, 75, 100	77.9	3.07
	125, 150, 175, 200	116.0	4.57
40	25, 50, 75, 100	77.9	3.07
	125, 150, 175, 200	116.0	4.57
50	25, 50, 75, 100	84.0	3.31
	125, 150, 175, 200	124.1	4.89
63	25, 50, 75, 100	84.0	3.31
	125, 150, 175, 200	124.1	4.89
80	25, 50, 75, 100	101.8	4.00
	125, 150, 175, 200	140.0	5.51
100	25**, 50, 75, 100	120.3	4.74
	125, 150, 175, 200	158.4	6.24

* For Model 16 with 10mm stroke, L = 37.7 mm (1.48").

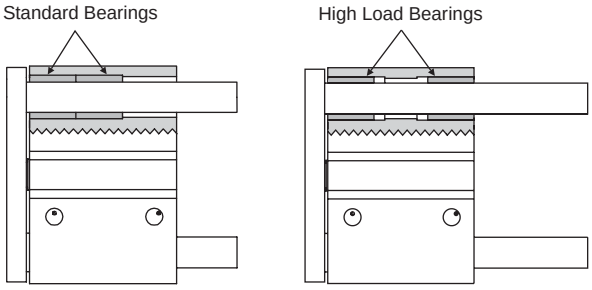
** For Model 100 with 25mm stroke, L = 122.8mm (4.8").

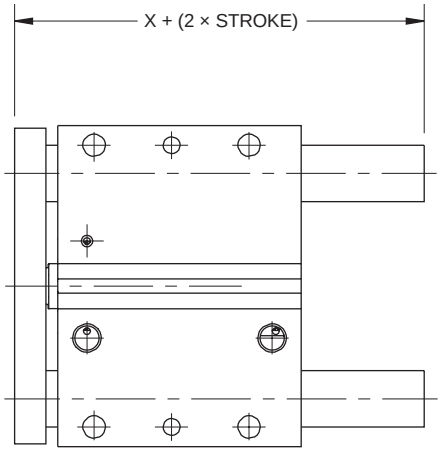
F

High Load Bearings (B)

The standard bearing configuration locates both sets of bearings at the tooling plate end of the actuator providing a compact actuator package. The high load bearings option (B) locates the bearings at the extreme ends of the housing, increasing the dynamic and static load capacity. The bearing centerlines increase as stroke length increases.

Note: Rear mounting and ports are not available with the high load bearing option.



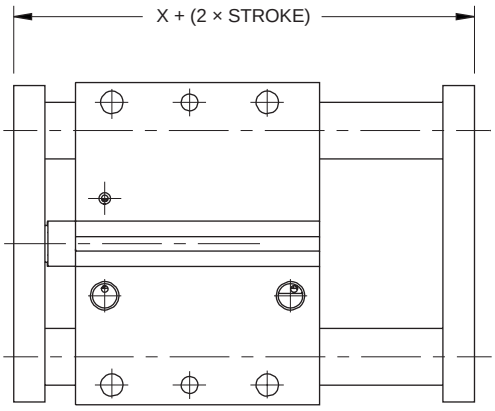


Dimensions

Model	X	
	mm	inch
16	49.7	1.955
20	47.0	1.849
25	49.9	1.963
32	51.1	2.012
40	59.1	2.327
50	61.6	2.425
63	66.8	2.630
80	79.6	3.135
100	86.1	3.391

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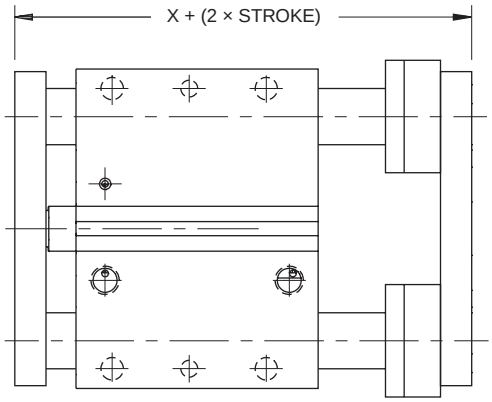
Dual Tool Plate (D)



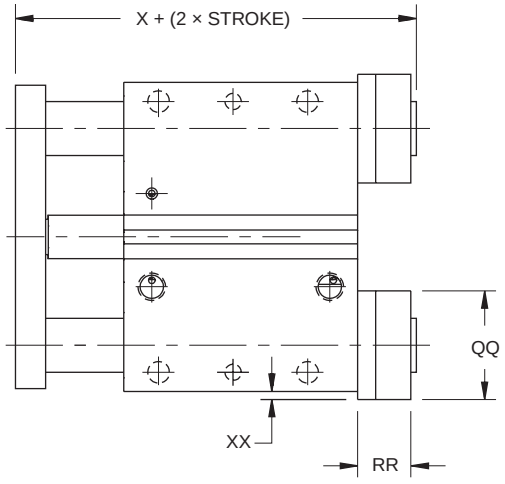
Notes:

1. Load capacities increase on dual tool plate (D & A). For load capacities, use the high load bearing graphs.
2. Rear mounting holes and rear ports are not available with Options D, A, and E.

Bumpers, Stop Collars & Dual Tool Plate (A)



Bumpers & Adjustable Stop Collars, Extend Only (E)



Dimensions

Model	Rod Dia.	X			QQ	RR	XX
		D Option	A Option	E Option			
16	8	57.7 (2.27)	70.7 (2.78)	62.7 (2.47)	18.0 (0.71)	15.7 (0.62)	0
	10	57.7 (2.27)	70.7 (2.78)	62.7 (2.47)	24.0 (0.95)	15.7 (0.62)	1 (0.04)
20	10	54.7 (2.15)	67.9 (2.67)	59.9 (2.36)	24.0 (0.95)	15.7 (0.62)	1 (0.04)
	12	54.7 (2.15)	72.6 (2.86)	64.6 (2.54)	28.0 (1.10)	17.7 (0.70)	3 (0.12)
25	12	58.8 (2.31)	76.5 (3.01)	68.1 (2.68)	28.0 (1.10)	17.7 (0.70)	1 (0.04)
	16	58.8 (2.31)	78.5 (3.09)	70.1 (2.76)	34.0 (1.34)	19.7 (0.78)	4 (0.16)
32	16	62.2 (2.45)	81.9 (3.22)	70.8 (2.79)	34.0 (1.34)	19.7 (0.78)	0
	20	62.2 (2.45)	83.9 (3.30)	72.8 (2.87)	40.0 (1.57)	21.7 (0.85)	3.7 (0.15)
40	16	70.2 (2.76)	89.9 (3.54)	78.8 (3.10)	34.0 (1.34)	19.7 (0.78)	0
	20	70.2 (2.76)	91.9 (3.62)	80.8 (3.18)	41.4 (1.63)	21.7 (0.85)	3.7 (0.15)
50	20	74.3 (2.93)	96.0 (3.78)	83.3 (3.28)	41.4 (1.63)	21.7 (0.85)	0.7 (0.03)
	25	74.3 (2.93)	96.0 (3.78)	83.3 (3.28)	45.0 (1.77)	21.7 (0.85)	5.4 (0.21)
63	20	79.5 (3.13)	101.2 (3.98)	88.5 (3.48)	41.4 (1.63)	21.7 (0.85)	0.7 (0.03)
	25	79.5 (3.13)	101.2 (3.98)	88.5 (3.48)	50.8 (2.00)	21.7 (0.85)	5.4 (0.21)
80	25	96.1 (3.78)	117.8 (4.64)	101.9 (4.01)	50.8 (2.00)	21.7 (0.85)	1.4 (0.06)
	30	96.1 (3.78)	117.8 (4.64)	101.9 (4.01)	54.0 (2.13)	21.7 (0.85)	6.3 (0.25)
100	30	103.3 (4.07)	125.8 (4.95)	109.1 (4.30)	60.5 (2.38)	21.7 (0.85)	3.3 (0.13)
	35	103.3 (4.07)	125.8 (4.95)	109.1 (4.30)	57.0 (2.24)	21.7 (0.85)	5.5 (0.22)

All dimensions in mm (inch)

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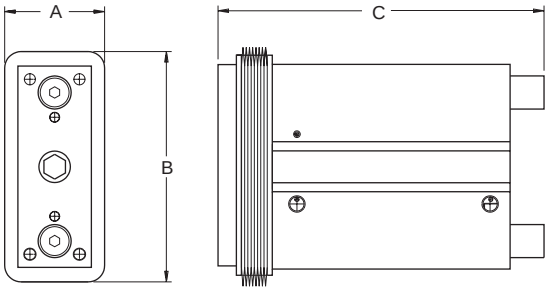
Contaminant & Weld Flash Covers

A contaminant cover protects the guide rods and bearings from particles and fluid that could cause premature failure.

A weld flash cover protects guide rods and bearings from weld spatter.

Cover option can be ordered on models having the bearings both ends option.

Consult factory to order.



Weld Flash Cover Specifications

Coating Material (exposed side)..... PVC (Black)
Base Material ..... Nomex
Coating Material (other side)..... PVC (Black)
Material Thickness Range ..... .012" - .016" (.3-.4mm)
Temperature Resistance (Nomex)
  Briefly..... 642°F (450°C)
  Continuously..... -22° to 572°F (-30° to 300°C)
Temperature Resistance (Coating)
  Briefly..... 392°F (200°C)
  Continuously..... -22° to 302°F (-30° to 150°C)
Resistant to..... Chemicals, coolants, solvents, oil
Characteristics..... self-extinguishing, abrasion resistant
Material Weight..... 400 grams/square meter

F

Dimensions

MODEL	A	B	10	25	40	50	75	100	125	150	175	200
16	42 (1.65)	86 (3.39)	61.2 (2.41)	100.2 (3.94)	135.2 (5.32)	135.2 (5.32)	160.2 (6.31)	200.2 (7.88)	–	–	–	–
20	45 (1.77)	98 (3.86)	–	106.9 (4.21)	141.9 (5.59)	141.9 (5.59)	166.9 (6.57)	216.9 (8.54)	241.9 (9.52)	–	–	–
25	49 (1.93)	112 (4.41)	–	119.9 (4.72)	–	144.9 (5.70)	169.9 (6.69)	194.9 (7.67)	241.9 (9.52)	266.9 (10.51)	–	–
32	62 (2.44)	142 (5.59)	–	127.9 (5.04)	–	152.9 (6.02)	177.9 (7.00)	202.9 (7.99)	266 (10.47)	291 (11.46)	316 (12.44)	341 (13.43)
40	62 (2.44)	152 (5.98)	–	127.9 (5.04)	–	152.9 (6.02)	177.9 (7.00)	202.9 (7.99)	266 (10.47)	291 (11.46)	316 (12.44)	341 (13.43)
50	66 (2.60)	167 (6.57)	–	134 (5.28)	–	159 (6.26)	184 (7.24)	209 (8.23)	274.1 (10.79)	299.1 (11.78)	324.1 (12.76)	349.1 (13.74)
63	77 (3.03)	187 (7.36)	–	134 (5.28)	–	159 (6.26)	184 (7.24)	209 (8.23)	274.1 (10.79)	299.1 (11.78)	324.1 (12.76)	349.1 (13.74)
80	104 (4.09)	244 (9.61)	–	151.8 (5.98)	–	176.8 (6.96)	201.8 (7.94)	226.8 (8.93)	290 (11.42)	315 (12.40)	340 (13.39)	365 (14.37)
100	109 (4.29)	279 (10.98)	–	170.3 (6.70)	–	195.3 (7.69)	220.3 (8.67)	245.3 (9.66)	308.4 (12.14)	333.4 (13.13)	358.4 (14.11)	383.4 (15.09)

All dimensions in mm (inch)

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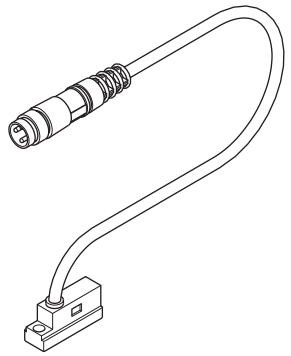
Reed and Solid State Sensors

Sensors are available in both short and standard configurations. Both styles mount in the sensor grooves on the P5T body. The standard sensors mount flush to the body. The short sensor extends out 4.5mm to the cable.
Both styles are available with quick connector or flying leads.

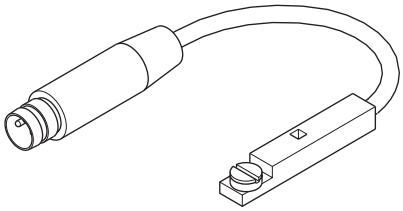
Magnetic piston is standard.

See Electronic Sensors section for part numbers and specifications.

Slide-in Short Sensor



Drop-in Sensor



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Seal Kits

Bore Size	Seal Kit Part Number	
	Nitrile Seals	Fluorocarbon Seals
16	PSK-P5T16	PSK-P5T16-F
20	PSK-P5T20	PSK-P5T20-F
25	PSK-P5T25	PSK-P5T25-F
32	PSK-P5T32	PSK-P5T32-F
40	PSK-P5T40	PSK-P5T40-F
50	PSK-P5T50	PSK-P5T50-F
63	PSK-P5T63	PSK-P5T63-F
80	PSK-P5T80	PSK-P5T80-F
100	PSK-P5T100	PSK-P5T100-F

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P5T2 Series

Short Stroke Thruster



Contents

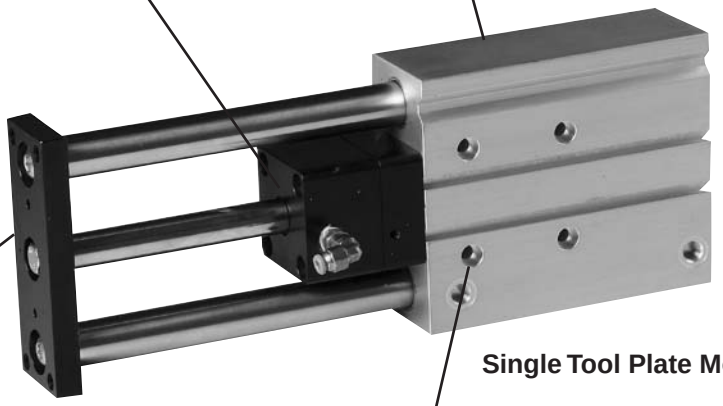
Features F28
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Options F44-F50
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Rod Lock
True rod-lock mechanism stops unit in current position upon loss of air pressure.

Compact, One-Piece Body
The housing provides a small and economical package by integrating a low profile cylinder and support shafts into a single clear anodized body.



Porting
Top porting is standard. Rear and side porting are available.

Tool Plate
A precision machined steel tool plate provides a rigid, durable connection.

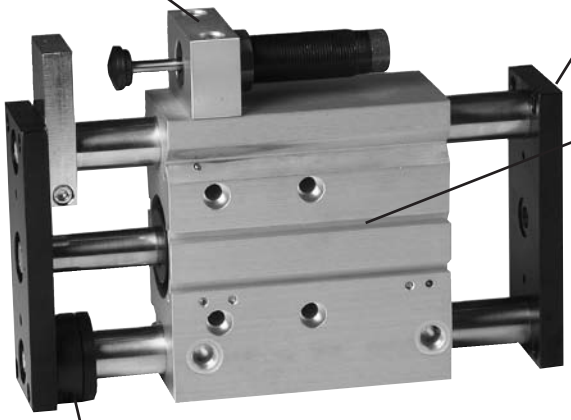
Single Tool Plate Model

Through-Hole Mounting
Standard through-hole mounting patterns ensure drop-in capabilities for a variety of installations.

Air Cushions
Fully adjustable air cushions allow for superior energy absorption compared to rubber bumpers alone.

Shock Absorbers
Adjustable external mounted shock absorbers provide excellent impact dampening in aggressive applications.

Dual Tool Plate



Sensor Grooves
The global sensors are mounted flush to the outside of the housing. Both reed and solid state are available. Magnetic piston is standard. A new low-profile proximity sensor is also available which mounts in the same groove.

Dual Tool Plate Model

Bumpers and Stop Collars
Bumpers and stop collars allow for adjustable retract and extend strokes.

Composite Bushings or Linear Ball Bearings
A PTFE impregnated **composite bushing** is standard. This bushing provides high load carrying capabilities with excellent resistance to shock loading. Optional **linear ball bearings** provide precision operation with very low friction and wear.

3D CAD FILES
available for download at
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Model Code and Ordering Information

Example: P5T2A032J1KN1BGR025A

P5T2	A	032	J1	K	N	1	B	G	J	025	A

Construction

A	Standard, Metric Mounting Threads
E	Cushions [6], Metric Mounting Threads

Bore Size

012	12mm
016	16mm
020	20mm
025	25mm
032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm

Bearings / Shaft

J1	Composite Bushings, Chrome Plated Rod
J3	Composite Bushings, Stainless Steel Rod
K1	Composite High Load Bearings, Chrome Plated Rod [7]
K3	Composite High Load Bearings, Stainless Steel Rod [7]
H3	Linear Ball Bearings, Stainless Steel Rod
L3	Linear Ball High Load Bearings, Stainless Steel Rod [7]

Extend Options

A	Shock Absorber [1, 9]
K	Bumpers and Adjustable Stop Collars [2]
L	Bumpers and Shock Absorbers [3, 9]
N	None

Retract Options

A	Shock Absorber [4, 9]
K	Bumpers and Adjustable Stop Collars [4]
L	Bumpers and Shock Absorber [4, 9]
R	Rod Lock (Sizes 32-100 only)
N	None

Port Location

1	Top
2	Side
3	Rear

Ports / Flow Controls

Ports	Flow Controls [5]		
	None	**Prestolok**	**Threaded**
NPTF	**A**	**E**	**P**
BSPP or M5	**B**	**F**	**R**

Other Options

Tool Plate	Seals	
	Buna-N	**Fluorocarbon**
Front	**G**	**L**
Front & Rear [5]	**H**	**M**

Gross Stroke

Order standard stroke from tables below using 3 digits, i.e. 025 = 25mm

Type	Connection	Sensor Option			
		Proximity Sensor [8]			None
		Extend	Retract	Extend & Retract	
PNP	Lead Type	U	A	E	N
	Plug in	V	B	F	
NPN	Lead Type	W	C	J	
	Plug in	Y	D	K	

Solid state and reed sensors can be ordered separately from pages M2-M4.

Standard Strokes, Basic Units*

Bore Size	10	20	25	30	40	50	75	100	125	150	175	200
12 - 16	●	●		●	●	●	●	●	●	●	●	●
20 - 25		●		●	●	●	●	●	●	●	●	●
32 - 100			●			●	●	●	●	●	●	●

Standard Strokes, Cushioned Units*

Bore Size	10	20	25	30	40	50	75	100	125	150	175	200
20 - 63			●			●	●	●	●	●	●	●
80 - 100						●	●	●	●	●	●	●

*Consult factory for special stroke lengths.

NOTES:

1 Not available with rear or side port; not available with Retract Option L; not available on 100mm size with 25mm stroke.
2 Not available with rear ports.
3 Not available with rear or side ports; not available with Retract Option A.
4 Not available with Rod Lock.
5 Not available with rear ports.
6 Cushions not available on Sizes 12 &16. Cushions may not be effective in combination with shocks or bumpers/stop collars.
7 High load bearings option only available with 50mm and greater strokes.
8 Consult factory for retract proximity sensors on rodlock unit.
9 Shock absorbers not available on Sizes 12 & 16.

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Specifications

- Maximum operating pressure: 1 MPa (10 bar/145 psi)
- Operating characteristics: Double acting
- Support rod sizes: ∅8 to 35mm
- Mounting: Unrestricted
- Operating temperature range (cylinder):
  - Nitrile seals (standard) -18° to 74°C (0° to 165°F)
  - Fluorocarbon seals* -18° to 121°C (0° to 250°F)
- Filtration requirement: 40 micron, filtered dry air

* See Fluorocarbon seal option for high temperature applications.

Construction

Body .....Aluminum
End Caps.....Aluminum
Tool Plate..... Steel
Piston Rod..... Stainless Steel
Support Rods ..... Steel
Rod Bolts..... Steel

F

Mounting Bolts

Bore Size	Bottom Hole Threads	Thru Hole Socket Head Cap Screw	
		Screw Size	Minimum Length (1.5 x dia. screw engagement)
12	M5 x 0.8	M4	28mm
16	M5 x 0.9	M4	32mm
20	M6 x 1.0	M5	38mm
25	M6 x 1.0	M5	44mm
32	M8 x 1.25	M6	50mm
40	M8 x 1.25	M6	56mm
50	M10 x 1.5	M8	68mm
63	M10 x 1.5	M8	82mm
80	M12 x 1.75	M10	100mm
100	M14 x 2.0	M12	96mm

Note: *When the P5T2 is used as an impact stopping system, mounting bolt thread engagement should be 1.5 times bolt diameter.*

Quick Reference Data

Model Bore	Piston Rod Diameter (mm)	Bushings	Support Rods (mm)	Force Output on Extension at 75 PSI		Force Output on Retraction at 75 PSI	
				N	lbs	N	lbs
12	6	Ball	6	59	13	44	10
		Composite	8				
16	8	Ball	8	102	23	78	18
		Composite	10				
20	10	Ball	10	165	37	120	27
		Composite	12				
25	10	Ball	12	254	57	214	48
		Composite	16				
32	12	Ball	16	414	93	356	80
		Composite	20				
40	16	Ball	16	650	146	547	123
		Composite	20				
50	20	Ball	20	1015	228	854	192
		Composite	25				
63	20	Ball	20	1611	362	1451	326
		Composite	25				
80	25	Ball	25	2599	584	2345	527
		Composite	30				
100	25	Ball	30	4063	913	3809	856
		Composite	35				

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Weights

Basic Units with Single Tool Plate

Model Bore	Support Rod Diameter	Standard Unit Weight				Cushioned Unit Weight			
		Base Weight (zero stroke)		Stroke Multiplier (per 5mm)		Base Weight (zero stroke)		Stroke Multiplier (per 5mm)	
		kg	lbs	kg	lbs	kg	lbs	kg	lbs
12	6	0.18	0.39	0.02	0.04	NA	NA	NA	NA
	8	0.18	0.39	0.02	0.04	NA	NA	NA	NA
16	8	0.27	0.59	0.02	0.05	NA	NA	NA	NA
	10	0.27	0.58	0.03	0.06	NA	NA	NA	NA
20	10	0.45	0.98	0.04	0.08	0.65	1.42	0.03	0.08
	12	0.47	1.03	0.04	0.09	0.69	1.52	0.04	0.09
25	12	0.80	1.76	0.04	0.10	0.90	1.99	0.04	0.10
	16	0.78	1.72	0.05	0.12	0.94	2.08	0.05	0.11
32	16	1.32	2.91	0.06	0.13	1.46	3.21	0.06	0.13
	20	1.33	2.93	0.07	0.15	1.53	3.38	0.07	0.15
40	16	1.45	3.21	0.07	0.16	1.75	3.85	0.08	0.17
	20	1.58	3.48	0.08	0.18	1.80	3.97	0.08	0.19
50	20	2.35	5.17	0.11	0.24	2.82	6.22	0.11	0.24
	25	2.57	5.67	0.12	0.27	3.02	6.64	0.12	0.27
63	20	3.01	6.64	0.13	0.28	3.69	8.12	0.13	0.28
	25	3.18	7.01	0.14	0.31	4.02	8.87	0.14	0.31
80	25	5.90	13.00	0.20	0.43	7.38	16.26	0.20	0.43
	30	6.11	13.47	0.21	0.47	7.72	17.02	0.21	0.47
100	30	8.79	19.37	0.20	0.44	10.71	23.60	0.21	0.45
	35	8.98	19.79	0.22	0.48	11.13	24.52	0.23	0.50

See example below

Example:

P5T2 size 40 cushioned unit, 20mm support rod with a 75mm stroke.

Base Weight = 3.97 lbs
Stroke Multiplier: 75mm ÷ 5 = 15
Stroke Weight = 15 × 0.19 lbs = 2.85 lbs

Total Weight = 3.97 lbs + 2.85 lbs = 6.82 lbs

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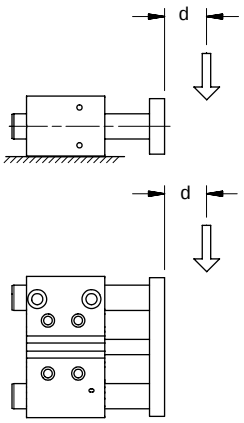
A074

Horizontal Load Capacity with Standard Bearings (J1, J3, H3)

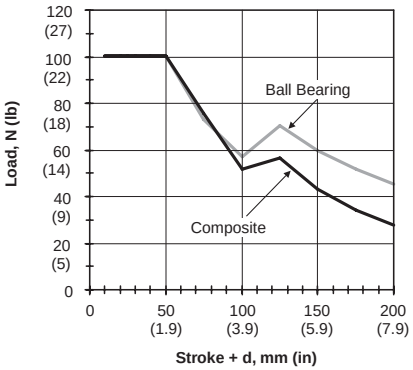
P5T2 Series units will have the same load capacity regardless of orientation. The graphs below show maximum load capacity based on a unit life of 10 million cycles.

These load curves illustrate load ratings based on the bearing system of the product. Load rating is a key selection criterion but is not the only one to consider in the selection of a product.

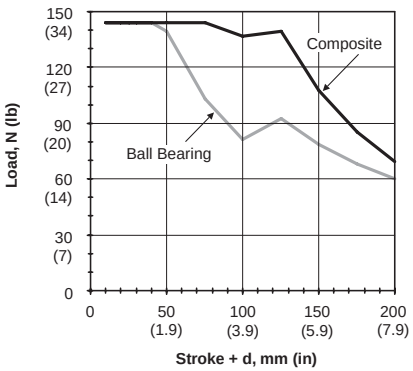
EXAMPLE: A P5T2-016 with "stroke + d" of 100mm and linear ball bearings would have a load capacity of 80 N. The capacity would be 135 N with composite bushings.



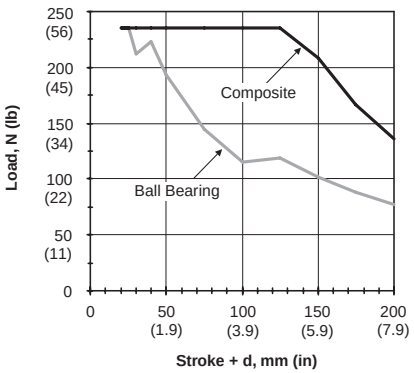
12mm Bore Size



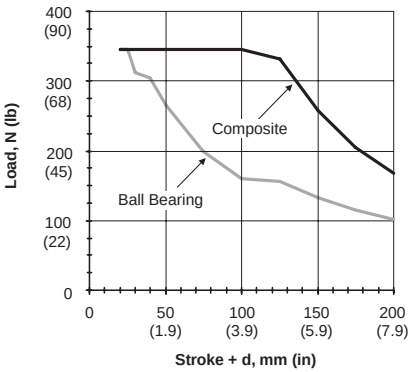
16mm Bore Size



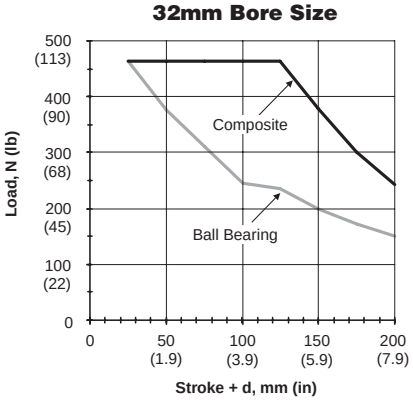
20mm Bore Size



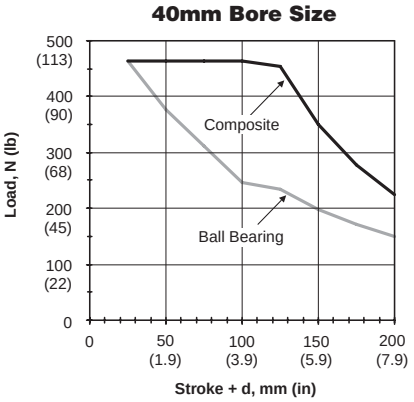
25mm Bore Size



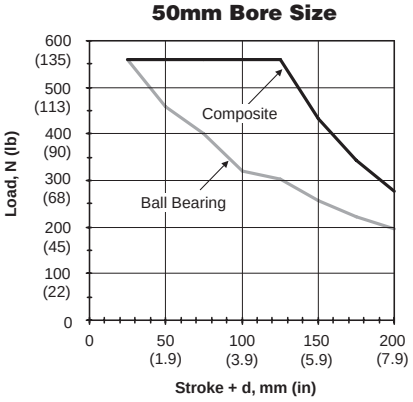
32mm Bore Size



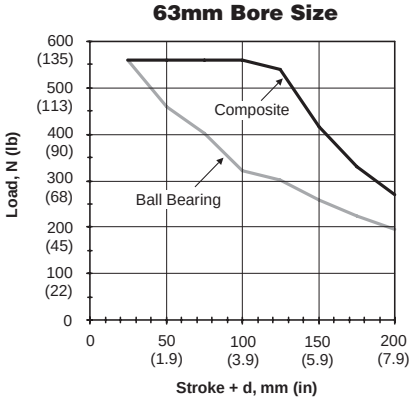
40mm Bore Size



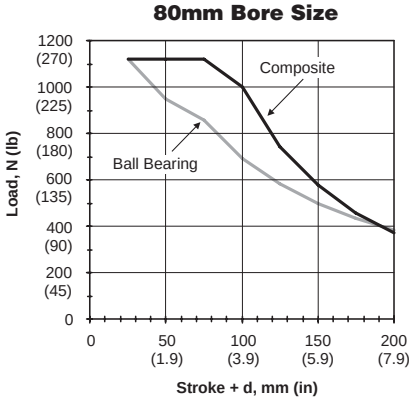
50mm Bore Size



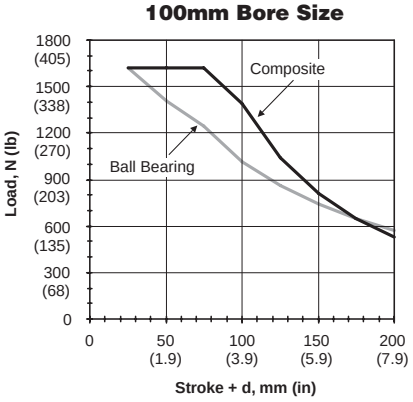
63mm Bore Size



80mm Bore Size



100mm Bore Size



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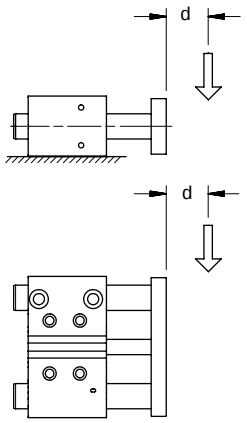
A074

Horizontal Load Capacity with High Load Bearings (K1, K3, L3)

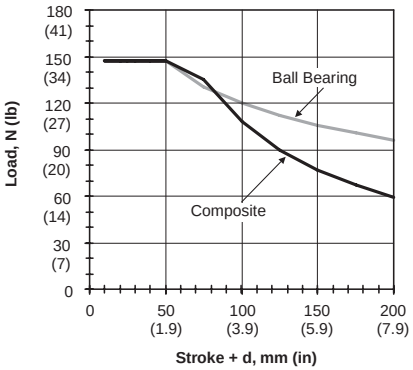
P5T2 Series units will have the same load capacity regardless of orientation. The graphs below show maximum load capacity based on a unit life of 10 million cycles.

These load curves illustrate load ratings based on the bearing system of the product. Load rating is a key selection criterion but is not the only one to consider in the selection of a product.

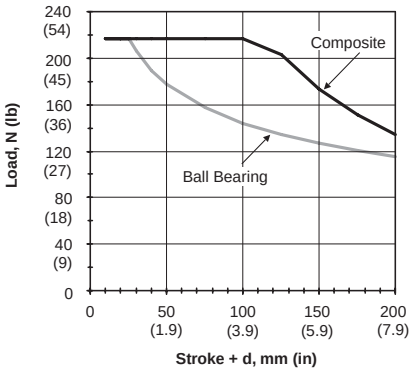
EXAMPLE: A P5T2-020 with "stroke + d" of 100mm and high load composite bushings would have a load capacity of 300 N. With linear ball bearings, the capacity would be 190 N.



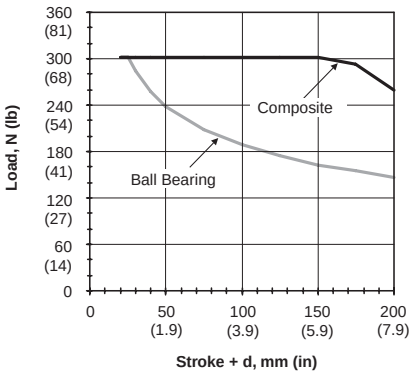
12mm Bore Size



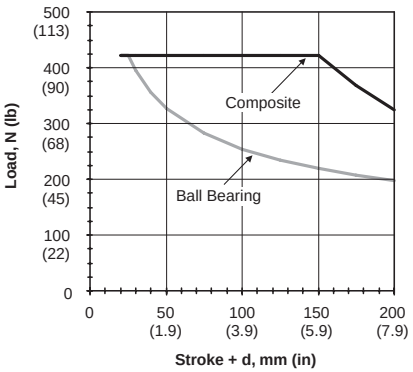
16mm Bore Size



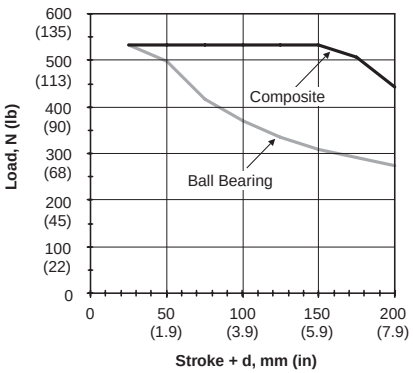
20mm Bore Size



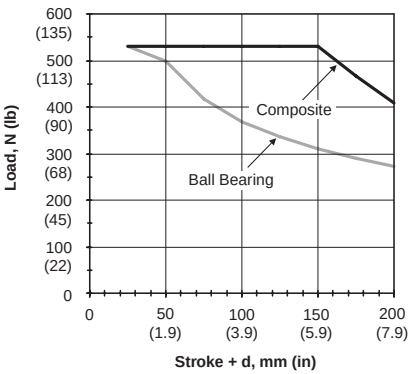
25mm Bore Size



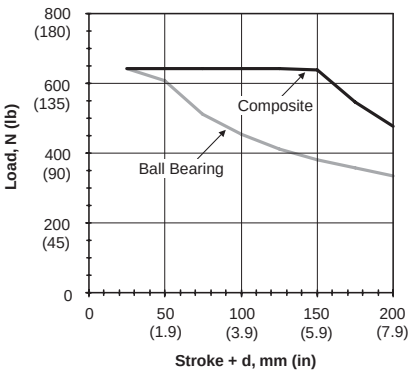
32mm Bore Size



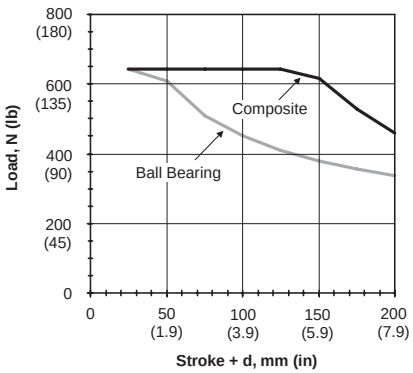
40mm Bore Size



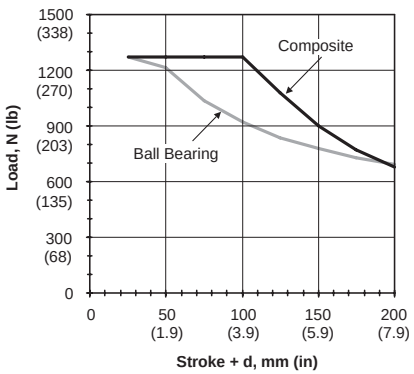
50mm Bore Size



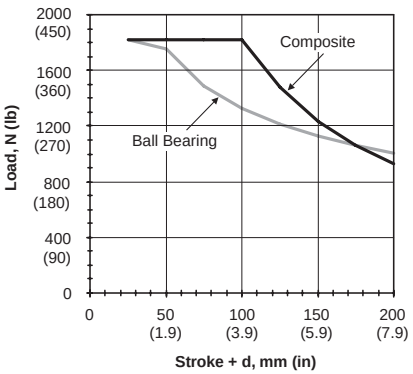
63mm Bore Size



80mm Bore Size



100mm Bore Size



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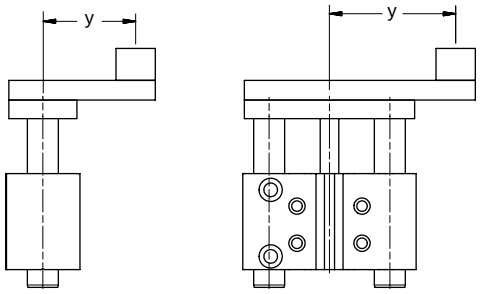
A074

Vertical Eccentric Load Capacity

P5T2 Series units mounted vertically will have the same eccentric load capacity regardless of orientation. The graphs provide maximum load capacity for an eccentric mounted load. The load is assumed to be mounted at the face of the tool plate.

These load curves illustrate load ratings based on the bearing system of the product. Load rating is a key selection criterion but is not the only one to consider in the selection of a product.

EXAMPLE: A P5T2-050 unit will lift up to a 90-lb load, offset 170mm from actuator centerline.

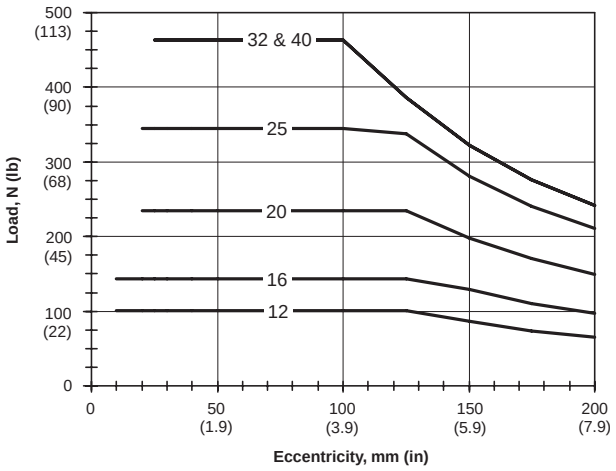


y = distance from the center of gravity of the moveable load to the center of the actuator.

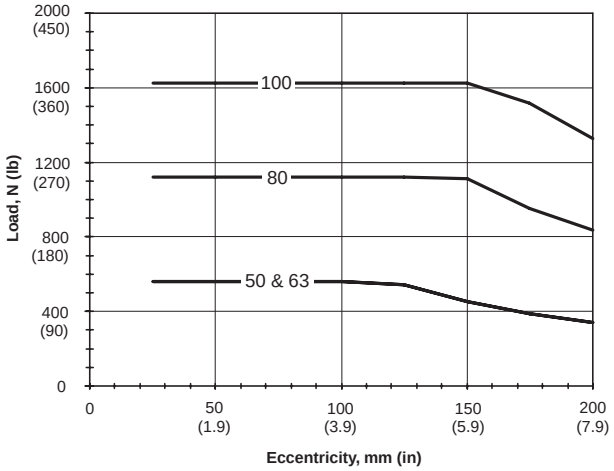
F

Standard Unit

12 - 40mm Bore Sizes

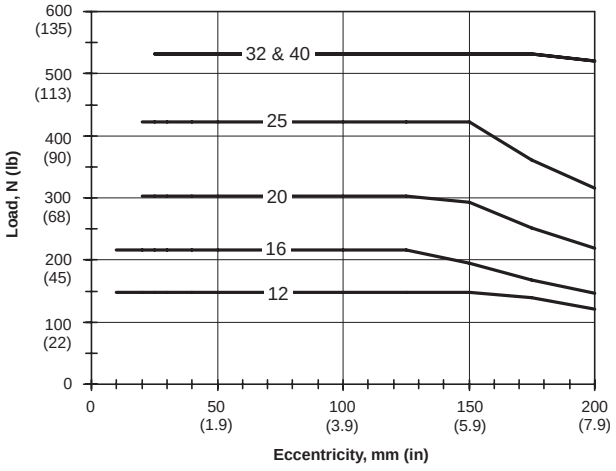


50 - 100mm Bore Sizes

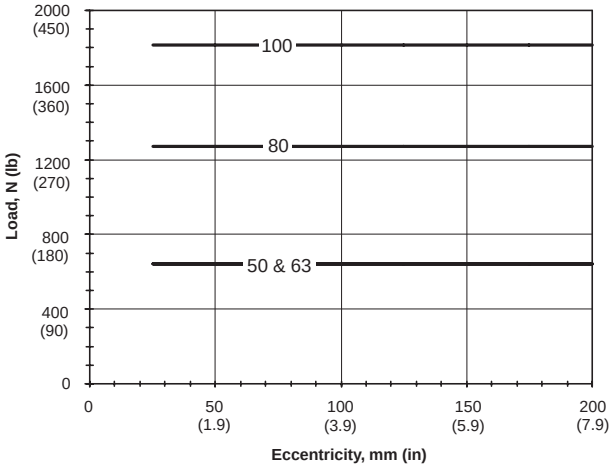


High Load Bearings

12 - 40mm Bore Sizes



50 - 100mm Bore Sizes



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A074

Load Stopping Capacity

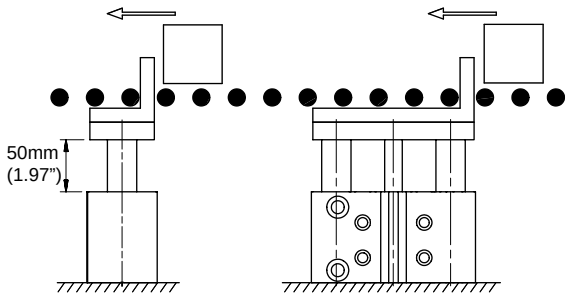
P5T2 Series actuators are ideal for conveyor stopping applications. Units can be mounted horizontally or vertically.

These load curves illustrate load ratings based on the bearing system of the product. Load rating is a key selection criterion but is not the only one to consider in the selection of a product.

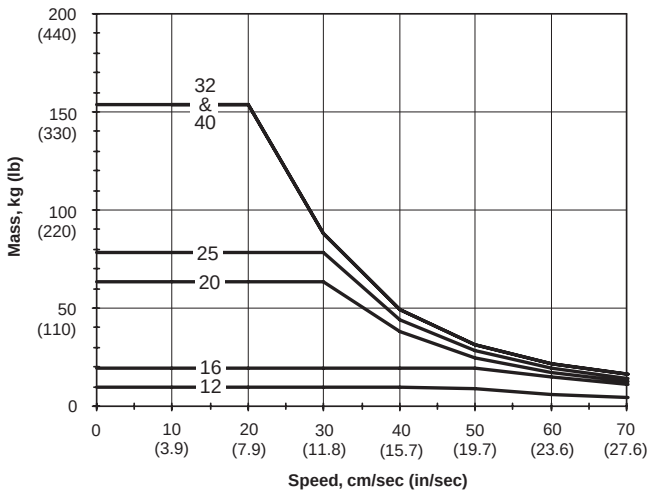
Composite bushings are strongly recommended for this type of application.

EXAMPLE: A P5T2-032 unit with a stroke up to 50mm will stop an object moving at 40 cm/second (15.7 in/s) that weighs up to 50 kg (110 lb).

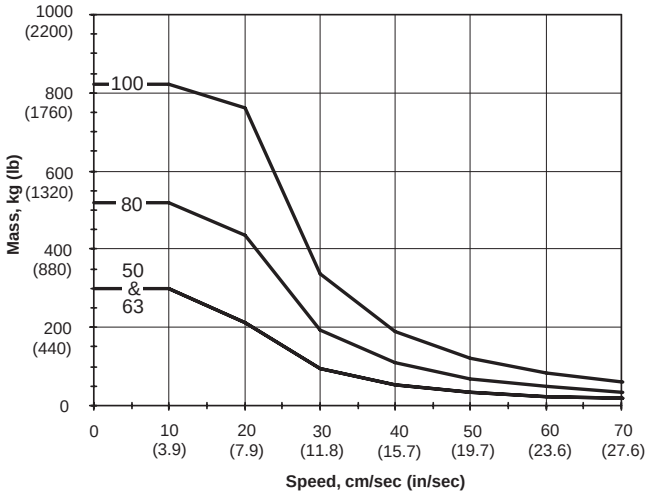
Note: The following graphs are based on 50mm of stroke.



12 - 40mm Bore Sizes



50 - 100mm Bore Sizes

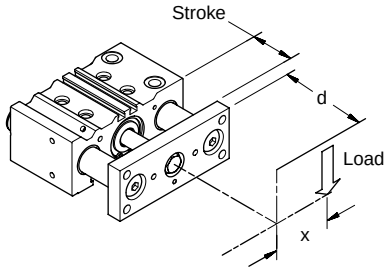


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Asymmetrical Torque Capacity with Standard Bearings (J1, J3, H3)

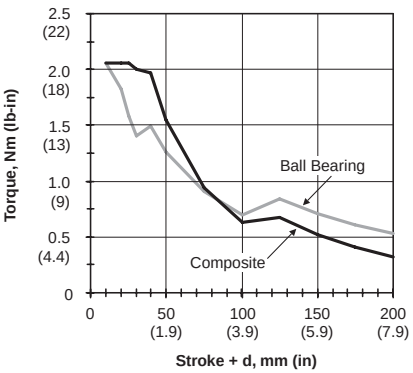
Asymmetrical loading occurs when the load is applied to one side of the unit. P5T2 Series units can resist torsional loads that are asymmetrical up to the charted lines.

EXAMPLE: A mechanism exerts an asymmetrical load of 15 Nm on a unit with 50mm "stroke+d". The P5T2-050 with composite bushings will have adequate torsional capacity.

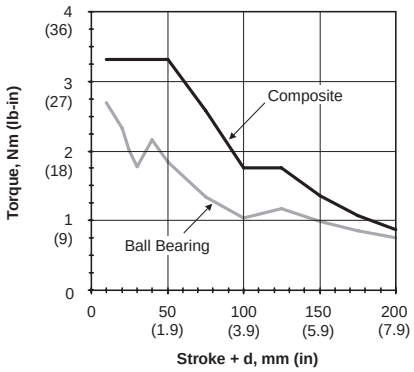


Torque is calculated by multiplying the distance 'x' by the load. The torque will be either Nm or lb-in.

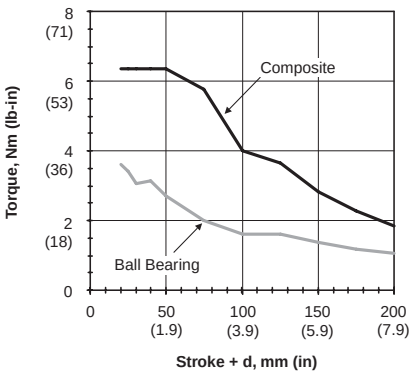
12mm Bore Size



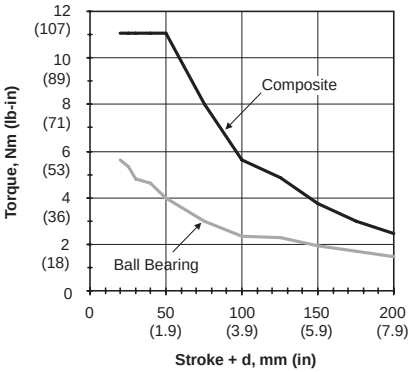
16mm Bore Size



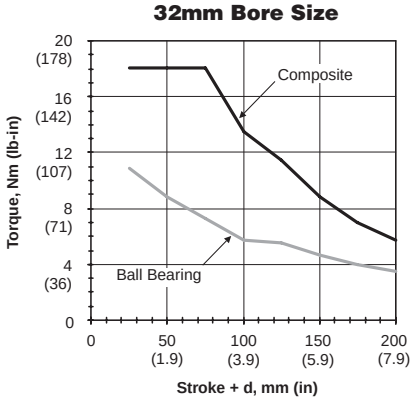
20mm Bore Size



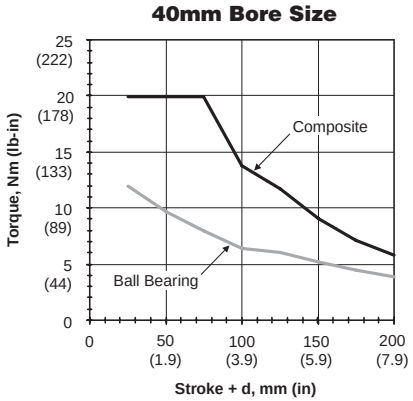
25mm Bore Size



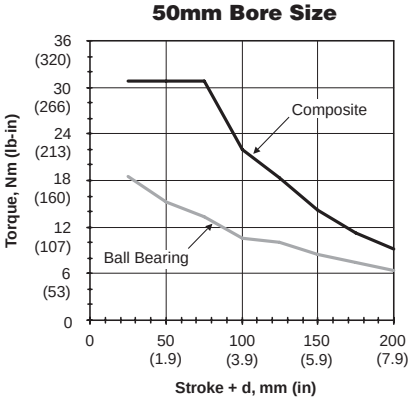
32mm Bore Size



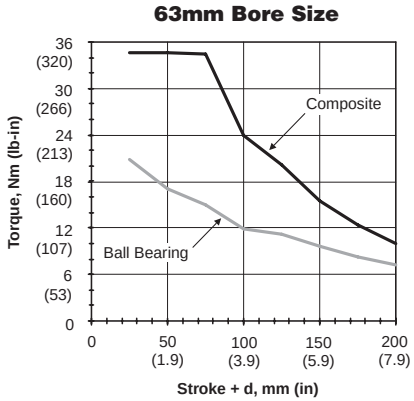
40mm Bore Size



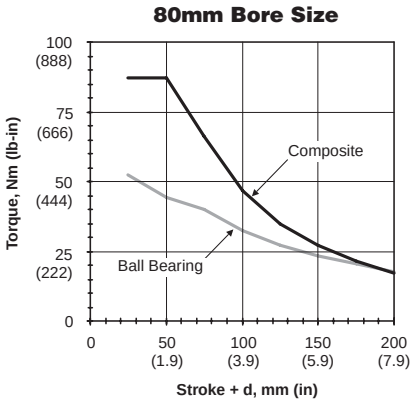
50mm Bore Size



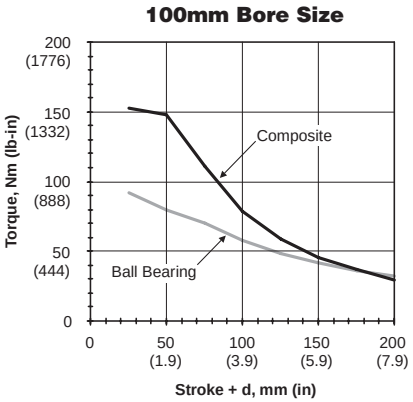
63mm Bore Size



80mm Bore Size



100mm Bore Size



F

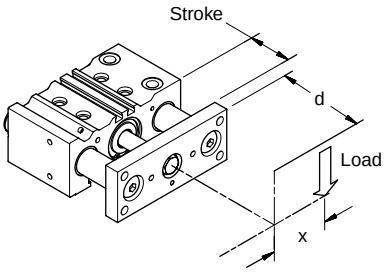
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Asymmetrical Torque Capacity with High Load Bearings (K1, K3, L3)

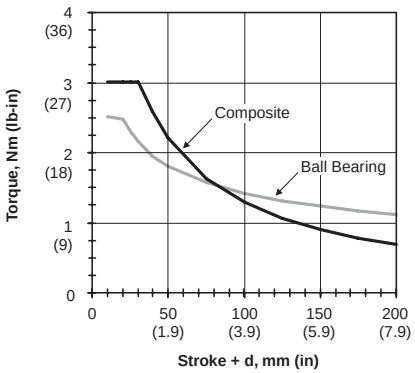
Asymmetrical loading occurs when the load is applied to one side of the unit. P5T2 Series units can resist torsional loads that are asymmetrical.

EXAMPLE: A mechanism exerts an asymmetrical load of 15 Nm on a unit with 50mm “stroke+d”. The P5T2-050 with composite bushings or ball bearings will have adequate torsional capacity.

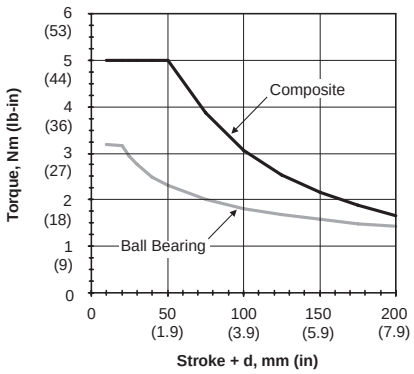


Torque is calculated by multiplying the distance 'x' by the load. The torque will be either Nm or lb-in.

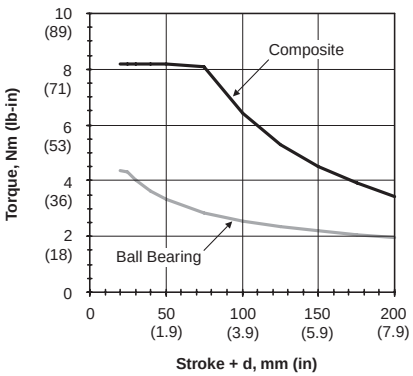
12mm Bore Size



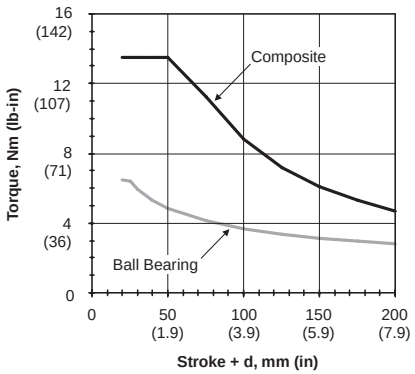
16mm Bore Size



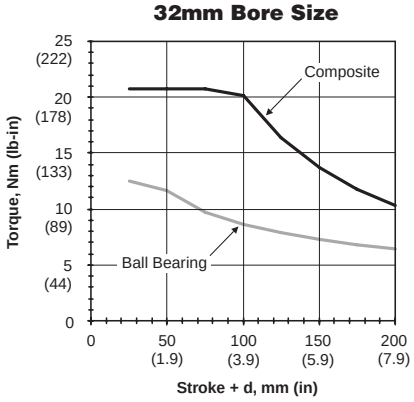
20mm Bore Size



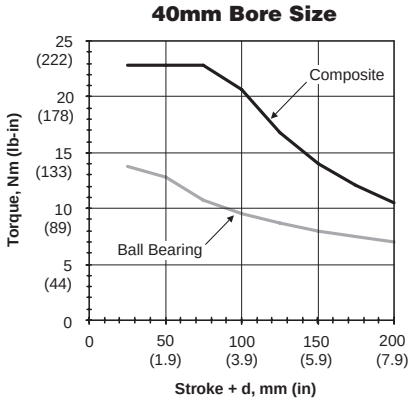
25mm Bore Size



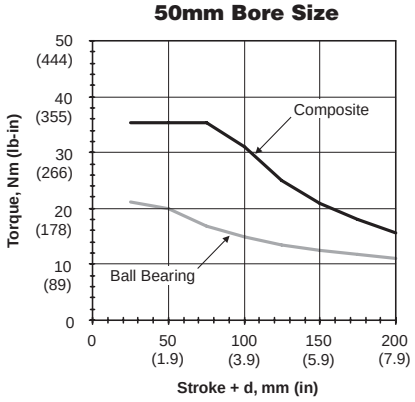
32mm Bore Size



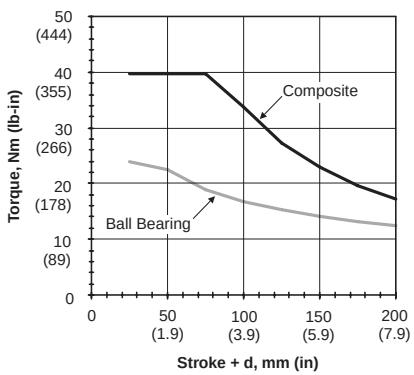
40mm Bore Size



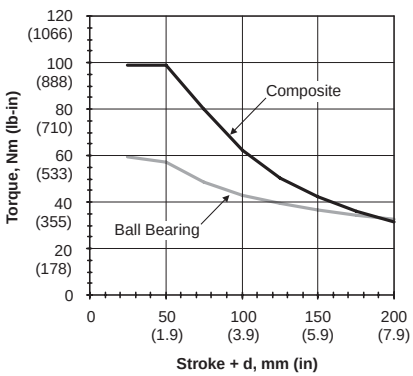
50mm Bore Size



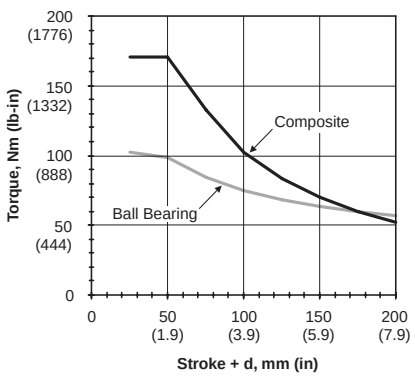
63mm Bore Size



80mm Bore Size



100mm Bore Size



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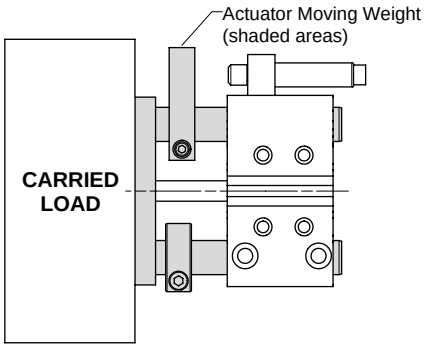
A074

Kinetic Energy

Moving weight is defined as the weight of the carried load and the weight of any moving parts of the actuator (support rods, tool plate, etc.). The moving weight from the charts below should be considered when using the graphs on the following page.

Actuator Moving Weight =
Base Weight + [(Stroke/5) × Stroke Multiplier]

Total Moving Weight =
Actuator Moving Weight + Carried Load



Model Bore	Support Rod Diameter	Actuator Moving Weight							
		Single Tool Plate				Dual Tool Plate			
		Base @ Zero Stroke		Stroke Multiplier (per 5mm)		Base @ Zero Stroke		Stroke Multiplier (per 5mm)	
		kg	lbs	kg	lbs	kg	lbs	kg	lbs
20	10	0.16	0.35	0.009	0.020	0.211	0.47	0.015	0.03
	12	0.19	0.43	0.012	0.026	0.251	0.55	0.021	0.05
25	12	0.22	0.48	0.012	0.026	0.293	0.65	0.021	0.05
	16	0.31	0.69	0.019	0.042	0.394	0.87	0.035	0.08
32	16	0.45	0.98	0.024	0.052	0.604	1.33	0.039	0.09
	20	0.58	1.27	0.033	0.072	0.749	1.65	0.057	0.13
40	16	0.50	1.11	0.024	0.052	0.669	1.48	0.039	0.09
	20	0.65	1.43	0.033	0.072	0.827	1.82	0.057	0.13
50	20	0.87	1.92	0.037	0.082	1.210	2.67	0.062	0.14
	25	1.11	2.44	0.051	0.112	1.485	3.27	0.089	0.20
63	20	1.05	2.31	0.037	0.082	1.465	3.23	0.062	0.14
	25	1.30	2.86	0.051	0.112	1.753	3.87	0.089	0.20
80	25	2.02	4.46	0.058	0.127	2.947	6.50	0.096	0.21
	30	2.37	5.22	0.075	0.165	3.348	7.38	0.130	0.29
100	30	3.26	7.18	0.068	0.150	4.816	10.62	0.123	0.27
	35	3.73	8.23	0.088	0.194	5.390	11.88	0.163	0.36

See example below.

EXAMPLE:

P5T2-032, 20mm support rods, dual tool plate, 100mm stroke

Base Weight = 1.65 lbs
Extra Weight for Stroke Length: (100 ÷ 5) × 0.13 lbs = 2.60 lbs
Actuator Moving Weight = 1.65 lbs + 2.60 lbs = 4.25 lbs

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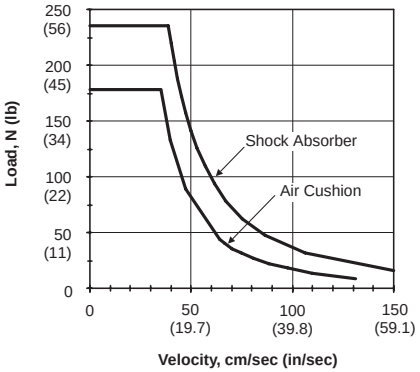
Kinetic Energy

These graphs illustrate the kinetic energy absorption of the P5T2 Series as a total moving weight versus speed chart for both air cushions and shock absorbers.

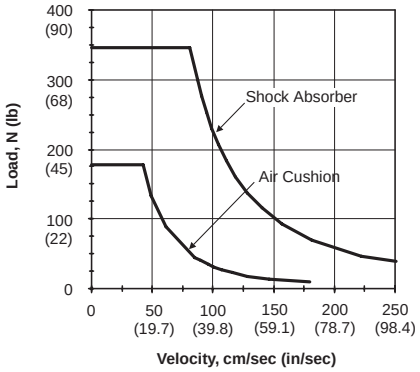
Note: These charts are to be used only to determine the energy absorption of each guided cylinder and to determine if shocks or cushions are needed.

1 kg = 9.80 Newtons (N)
1 Newton = 0.225 lbs

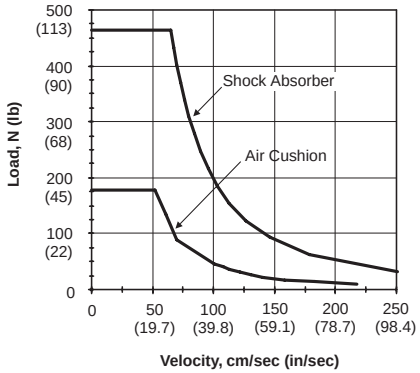
20mm Bore Size



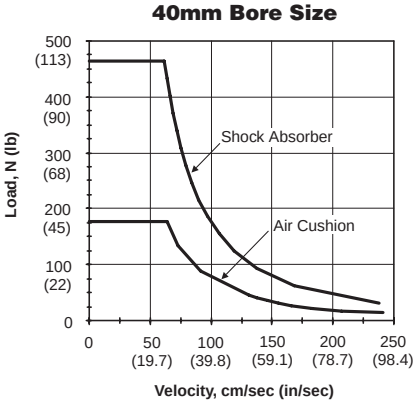
25mm Bore Size



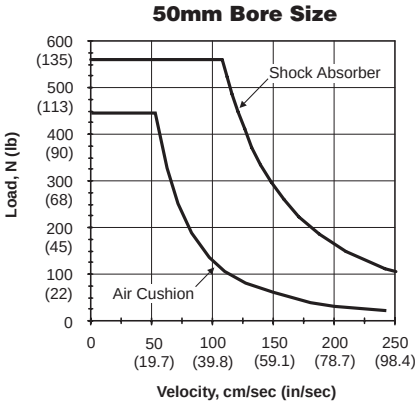
32mm Bore Size



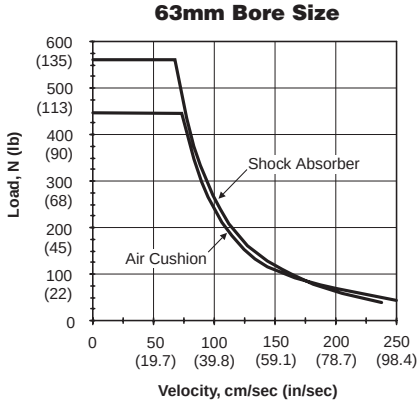
40mm Bore Size



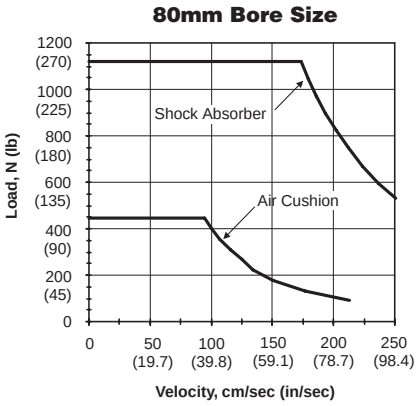
50mm Bore Size



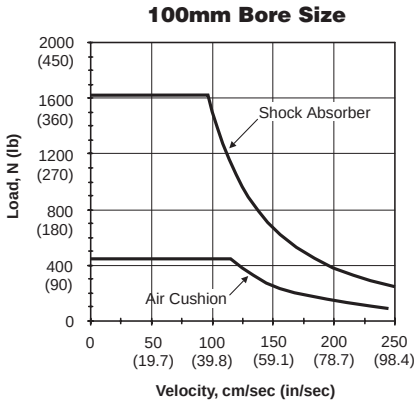
63mm Bore Size



80mm Bore Size

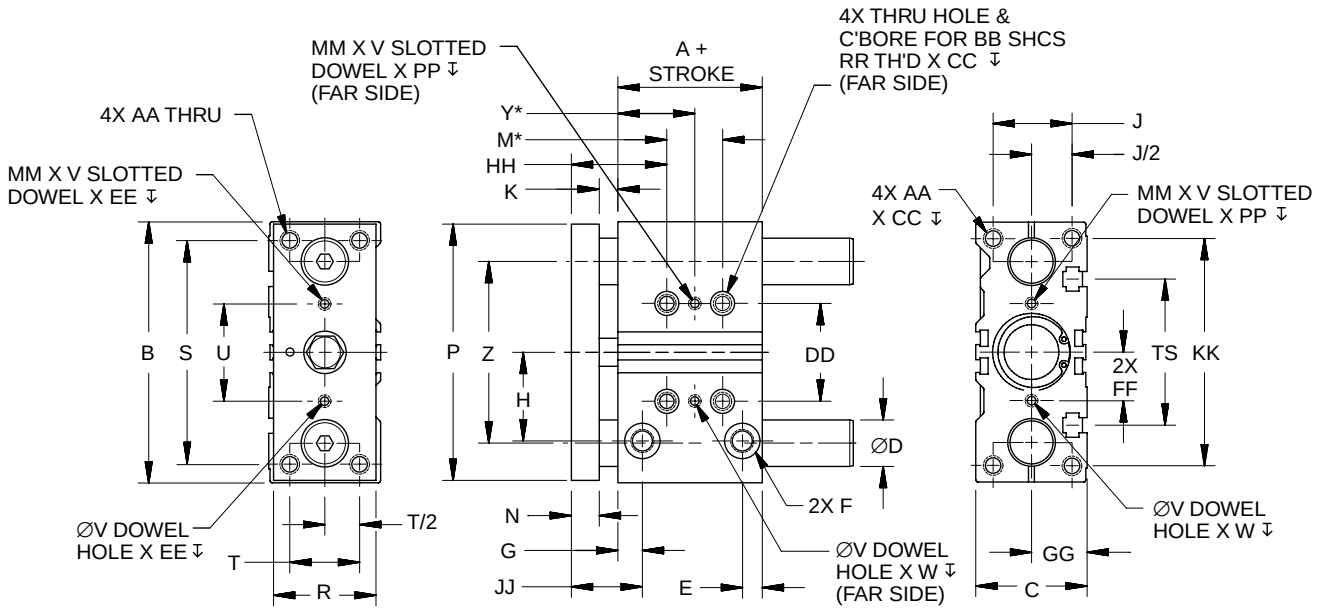


100mm Bore Size



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Basic Unit



F

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**** See page F42 for these stroke dependent dimensions.***

Bore	A	B	C	D_1	D_2	E	F	G	H	J	K	N	P	R	S	T	U
12	29 (1.14)	58 (2.28)	26 (1.02)	6 (0.24)	8 (0.31)	6.75 (0.27)	M5x0.8*	10.5 (0.41)	7.5 (0.30)	18 (0.71)	6 (0.24)	7 (0.28)	56 (2.20)	22 (0.87)	48 (1.89)	14 (0.55)	23 (0.91)
16	33 (1.30)	64 (2.52)	30 (1.18)	8 (0.31)	10 (0.39)	6.2 (0.24)	M5x0.8*	12 (0.47)	16.5 (0.65)	22 (0.87)	5 (0.20)	8 (0.31)	62 (2.44)	25 (0.98)	54 (2.13)	16 (0.63)	24 (0.94)
20	37 (1.46)	83 (3.27)	36 (1.42)	10 (0.39)	12 (0.47)	10 (0.39)	1/8 BSPP 1/8 NPTF	11 (0.43)	25 (0.98)	24 (0.94)	8 (0.31)	8 (0.31)	81 (3.19)	30 (1.18)	70 (2.76)	18 (0.71)	28 (1.10)
25	37.5 (1.48)	93 (3.66)	42 (1.65)	12 (0.47)	16 (0.63)	10.5 (0.41)	1/8 BSPP 1/8 NPTF	10.5 (0.41)	30 (1.18)	30 (1.18)	8 (0.31)	8 (0.31)	91 (3.58)	38 (1.50)	78 (3.07)	26 (1.02)	34 (1.34)
32	37.5 (1.48)	112 (4.41)	48 (1.89)	16 (0.63)	20 (0.79)	10.75 (0.42)	1/8 BSPP 1/8 NPTF	11.75 (0.46)	37.5 (1.48)	34 (1.34)	10 (0.39)	12 (0.47)	110 (4.33)	44 (1.73)	96 (3.78)	30 (1.18)	42 (1.65)
40	44 (1.73)	120 (4.72)	54 (2.13)	16 (0.63)	20 (0.79)	11.5 (0.45)	1/8 BSPP 1/8 NPTF	16 (0.63)	42 (1.65)	40 (1.57)	10 (0.39)	12 (0.47)	118 (4.65)	44 (1.73)	104 (4.09)	30 (1.18)	50 (1.97)
50	44 (1.73)	148 (5.83)	64 (2.52)	20 (0.79)	25 (0.98)	12.5 (0.49)	1/4 BSPP 1/4 NPTF	16 (0.63)	49 (1.93)	46 (1.81)	15 (0.59)	13 (0.51)	146 (5.75)	60 (2.36)	130 (5.12)	40 (1.57)	66 (2.60)
63	49 (1.93)	162 (6.38)	78 (3.07)	20 (0.79)	25 (0.98)	13 (0.51)	1/4 BSPP 1/4 NPTF	16 (0.63)	57 (2.24)	58 (2.28)	15 (0.59)	13 (0.51)	158 (6.22)	70 (2.76)	130 (5.12)	50 (1.97)	80 (3.15)
80	56.5 (2.22)	202 (7.95)	91.5 (3.60)	25 (0.98)	30 (1.18)	17 (0.67)	3/8 BSPP 3/8 NPTF	18 (0.71)	74 (2.91)	54 (2.13)	18 (0.71)	22 (0.87)	198 (7.80)	75 (2.95)	174 (6.85)	52 (2.05)	100 (3.94)
100	66 (2.60)	240 (9.45)	112 (4.41)	30 (1.18)	35 (1.38)	20 (0.79)	3/8 BSPP 3/8 NPTF	23 (0.91)	94 (3.70)	48 (1.89)	25 (0.98)	25 (0.98)	236 (9.29)	89 (3.50)	210 (8.27)	64 (2.52)	124 (4.88)

D_1 with linear ball bearing; D_2 with composite bushing

*10-32 fittings will fit into M5x0.8 ports.

All dimensions in mm (inch)

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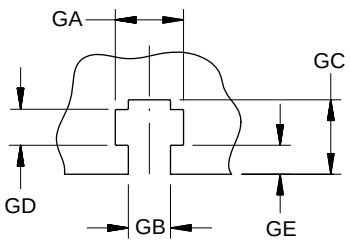
A074

Basic Unit

Bore	V $^{+0.01}_{-0.00}$	W	Z	AA	BB	CC	DD	EE	FF	GG	HH	JJ	KK	MM**	PP	RR	TS
12	3.06 (0.12)	6 (0.24)	41 (1.61)	M4 x0.7	M4	10 (0.39)	23 (0.91)	4.5 (0.18)	11.5 (0.45)	13 (0.51)	18 (0.71)	23.5 (0.93)	50 (1.97)	3.5 (0.14)	3 (0.12)	M5 x0.8	37 (1.46)
16	3.06 (0.12)	6 (0.24)	46 (1.81)	M5 x0.8	M4	10 (0.39)	24 (0.94)	4.5 (0.18)	12 (0.47)	15 (0.59)	18 (0.71)	25 (0.98)	56 (2.20)	3.5 (0.14)	3 (0.12)	M5 x0.8	38 (1.50)
20	3.06 (0.12)	6 (0.24)	54 (2.13)	M5 x0.8	M5	12 (0.47)	28 (1.10)	4.5 (0.18)	14 (0.55)	18 (0.71)	33 (1.30)	27 (1.06)	72 (2.83)	3.5 (0.14)	3 (0.12)	M6 x1.0	44 (1.73)
25	4.06 (0.16)	6 (0.24)	64 (2.52)	M6 x1.0	M5	12 (0.47)	34 (1.34)	4.5 (0.18)	17 (0.67)	21 (0.83)	33 (1.30)	26.5 (1.04)	82 (3.23)	4.5 (0.18)	3 (0.12)	M6 x1.0	50 (1.97)
32	4.06 (0.16)	6 (0.24)	78 (3.07)	M8 x1.25	M6	16 (0.63)	42 (1.65)	5.5 (0.22)	21 (0.83)	24 (0.94)	43 (1.69)	33.75 (1.33)	98 (3.86)	4.5 (0.18)	3 (0.12)	M8 x1.25	63 (2.48)
40	4.06 (0.16)	6 (0.24)	86 (3.39)	M8 x1.25	M6	16 (0.63)	50 (1.97)	5.5 (0.22)	25 (0.98)	27 (1.06)	44 (1.73)	38 (1.50)	106 (4.17)	4.5 (0.18)	3 (0.12)	M8 x1.25	72 (2.83)
50	5.04 (0.20)	8 (0.31)	110 (4.33)	M10 x1.5	M8	20 (0.79)	66 (2.60)	5.5 (0.22)	33 (1.30)	32 (1.26)	52 (2.05)	44 (1.73)	130 (5.12)	6 (0.24)	4 (0.16)	M1 x1.5	92 (3.62)
63	5.04 (0.20)	8 (0.31)	124 (4.88)	M10 x1.5	M8	20 (0.79)	80 (3.15)	5.5 (0.22)	40 (1.57)	39 (1.54)	52 (2.05)	44 (1.73)	142 (5.59)	6 (0.24)	4 (0.16)	M10 x1.5	110 (4.33)
80	6.04 (0.24)	10 (0.39)	156 (6.14)	M12 x1.75	M10	24 (0.94)	100 (3.94)	7.0 (0.28)	50 (1.97)	46 (1.81)	68 (2.68)	58 (2.28)	180 (7.09)	7 (0.28)	5 (0.20)	M12 x1.75	140 (5.51)
100	6.04 (0.24)	10 (0.39)	188 (7.40)	M14 x2.0	M12	28 (1.10)	124 (4.88)	7.0 (0.28)	62 (2.44)	56 (2.20)	61 (2.40)	73 (2.87)	221 (8.70)	7 (0.28)	5 (0.20)	M14 x2.0	166 (6.54)

** Slot length

T-Slot Detail



Bore	GA	GB	GC	GD	GE
12	7.4 (0.29)	4.5 (0.18)	6.2 (0.24)	3.7 (0.15)	2.0 (0.08)
16	7.4 (0.29)	4.5 (0.18)	7.7 (0.30)	3.7 (0.15)	3.0 (0.12)
20	8.5 (0.33)	5.5 (0.22)	9.4 (0.37)	4.5 (0.18)	3.7 (0.15)
25	8.5 (0.33)	5.5 (0.22)	9.5 (0.37)	4.5 (0.18)	3.0 (0.12)
32	10.5 (0.41)	6.5 (0.26)	10.5 (0.41)	5.5 (0.22)	3.5 (0.14)
40	10.5 (0.41)	6.5 (0.26)	12.5 (0.49)	5.5 (0.22)	4.0 (0.16)
50	13.5 (0.53)	8.5 (0.33)	15.0 (0.59)	7.5 (0.30)	3.5 (0.14)
63	16.8 (0.66)	10.8 (0.43)	21.0 (0.83)	10.0 (0.39)	7.0 (0.28)
80	18.7 (0.74)	12.8 (0.50)	24.8 (0.98)	12.0 (0.47)	10.3 (0.41)
100	23.0 (0.91)	15.0 (0.59)	31.0 (1.22)	14.0 (0.55)	10.0 (0.39)

All dimensions in mm (inch)

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Basic Unit

Stroke Dependent Dimensions

Size	Dim	Standard Stroke Length (mm)											
		10	**20**	**25**	**30**	**40**	**50**	**75**	**100**	**125**	**150**	**175**	**200**
12	M	20 (0.79)	20 (0.79)	N/A	20 (0.79)	40 (1.57)	40 (1.57)	40 (1.57)	40 (1.57)	110 (4.33)	110 (4.33)	110 (4.33)	110 (4.33)
	Y	15 (0.59)	15 (0.59)	N/A	15 (0.59)	25 (0.98)	25 (0.98)	25 (0.98)	25 (0.98)	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)
16	M	24 (0.94)	24 (0.94)	N/A	24 (0.94)	44 (1.73)	44 (1.73)	44 (1.73)	44 (1.73)	110 (4.33)	110 (4.33)	110 (4.33)	110 (4.33)
	Y	17 (0.67)	17 (0.67)	N/A	17 (0.67)	27 (1.06)	27 (1.06)	27 (1.06)	27 (1.06)	60 (2.36)	60 (2.36)	60 (2.36)	60 (2.36)
20, 25	M	N/A	24 (0.94)	N/A	24 (0.94)	44 (1.73)	44 (1.73)	44 (1.73)	44 (1.73)	120 (4.72)	120 (4.72)	120 (4.72)	120 (4.72)
	Y	N/A	29 (1.14)	N/A	29 (1.14)	39 (1.54)	39 (1.54)	39 (1.54)	39 (1.54)	77 (3.03)	77 (3.03)	77 (3.03)	77 (3.03)
32	M	N/A	N/A	24 (0.94)	N/A	N/A	48 (1.89)	48 (1.89)	48 (1.89)	124 (4.88)	124 (4.88)	124 (4.88)	124 (4.88)
	Y	N/A	N/A	33 (1.30)	N/A	N/A	45 (1.77)	45 (1.77)	45 (1.77)	83 (3.27)	83 (3.27)	83 (3.27)	83 (3.27)
40	M	N/A	N/A	24 (0.94)	N/A	N/A	48 (1.89)	48 (1.89)	48 (1.89)	124 (4.88)	124 (4.88)	124 (4.88)	124 (4.88)
	Y	N/A	N/A	34 (1.34)	N/A	N/A	46 (1.81)	46 (1.81)	46 (1.81)	84 (3.31)	84 (3.31)	84 (3.31)	84 (3.31)
50	M	N/A	N/A	24 (0.94)	N/A	N/A	48 (1.89)	48 (1.89)	48 (1.89)	124 (4.88)	124 (4.88)	124 (4.88)	124 (4.88)
	Y	N/A	N/A	36 (1.42)	N/A	N/A	48 (1.89)	48 (1.89)	48 (1.89)	86 (3.39)	86 (3.39)	86 (3.39)	86 (3.39)
63	M	N/A	N/A	24 (0.94)	N/A	N/A	52 (2.05)	52 (2.05)	52 (2.05)	128 (5.04)	128 (5.04)	128 (5.04)	128 (5.04)
	Y	N/A	N/A	38 (1.50)	N/A	N/A	50 (1.97)	50 (1.97)	50 (1.97)	88 (3.46)	88 (3.46)	88 (3.46)	88 (3.46)
80	M	N/A	N/A	28 (1.10)	N/A	N/A	52 (2.05)	52 (2.05)	52 (2.05)	128 (5.04)	128 (5.04)	128 (5.04)	128 (5.04)
	Y	N/A	N/A	42 (1.65)	N/A	N/A	54 (2.13)	54 (2.13)	54 (2.13)	92 (3.62)	92 (3.62)	92 (3.62)	92 (3.62)
100	M	N/A	N/A	48 (1.89)	N/A	N/A	72 (2.83)	72 (2.83)	72 (2.83)	148 (5.83)	148 (5.83)	148 (5.83)	148 (5.83)
	Y	N/A	N/A	35 (1.38)	N/A	N/A	47 (1.85)	47 (1.85)	47 (1.85)	85 (3.35)	85 (3.35)	85 (3.35)	85 (3.35)

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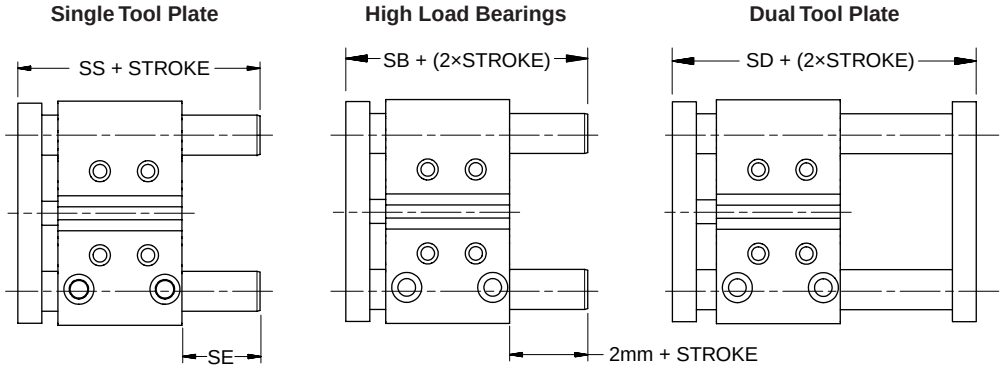
All dimensions in mm (inch)

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A074

Overall Length without Extend and Retract Options

A single tool plate unit with no options has the same support rod lengths with or without cushions.



SIZE	Stroke						SB @ zero stroke		SD @ zero stroke		YY_2	PA	PB
	10, 20, 30,		40, 50, 75, 100		125, 150, 175, 200		Non-cushion	Cushion	Non-cushion	Cushion			
	SS at stroke	SE at retract	SS at stroke	SE at retract	SS at stroke	SE at retract							
12	41 (1.61)	0 0.00	55 (2.17)	13 (0.51)	85 (3.35)	43 (1.69)	44 (1.73)	N/A	50 (1.97)	N/A	15 (0.59)	10 (0.39)	25 (0.98)
16	39 (1.54)	0 0.00	65 (2.56)	19 (0.75)	95 (3.74)	49 (1.93)	48 (1.89)	N/A	55 (2.17)	N/A	15 (0.59)	11 (0.43)	26 (1.02)

SIZE	Stroke						SB @ zero stroke		SD @ zero stroke		YY_2	PA	PB
	20, 25, 30		40, 50, 75, 100		125, 150, 175, 200		Non-cushion	Cushion	Non-cushion	Cushion			
	SS at stroke	SE at retract	SS at stroke	SE at retract	SS at stroke	SE at retract							
20	44 (1.73)	0 0.00	80 (3.15)	27 (1.06)	104 (4.09)	51 (2.01)	55 (2.17)	80 (3.15)	62.0 (2.44)	87.0 (3.43)	17 (0.67)	10 (0.39)	27 (1.06)
25	70 (2.74)	16 (0.63)	86 (3.37)	32 (1.26)	105 (4.11)	51 (2.01)	56 (2.19)	81 (3.17)	62.5 (2.46)	87.5 (3.44)	19 (0.75)	12 (0.47)	31 (1.22)

SIZE	Stroke						SB @ zero stroke		SD @ zero stroke		YY_2	PA	PB
	25, 50		75, 100		125, 150, 175, 200		Non-cushion	Cushion	Non-cushion	Cushion			
	SS at stroke	SE at retract	SS at stroke	SE at retract	SS at stroke	SE at retract							
32	84 (3.31)	25 (0.96)	98 (3.86)	39 (1.52)	118 (4.65)	59 (2.30)	63 (2.46)	88 (3.44)	73 (2.85)	97.5 (3.84)	21 (0.83)	12 (0.47)	33 (1.30)
40	85 (3.35)	19 (0.75)	98 (3.86)	32 (1.26)	118 (4.65)	52 (2.05)	69 (2.72)	94 (3.70)	79 (3.11)	104.0 (4.09)	21 (0.83)	12 (0.47)	33 (1.30)
50	93 (3.66)	21 (0.83)	114 (4.49)	42 (1.65)	134 (5.28)	62 (2.44)	75 (2.95)	100 (3.94)	86 (3.39)	111.0 (4.37)	21 (0.83)	7 (0.28)	28 (1.10)
63	93 (3.66)	16 (0.63)	114 (4.49)	37 (1.46)	134 (5.28)	57 (2.24)	80 (3.15)	105 (4.13)	91 (3.58)	116.0 (4.57)	21 (0.83)	7 (0.28)	28 (1.10)
80	123 (4.84)	27 (1.04)	142 (5.59)	46 (1.79)	142 (5.59)	46 (1.79)	100 (3.92)	125 (4.90)	120 (4.70)	144.5 (5.69)	21 (0.83)	4 (0.16)	25 (0.98)
100	103 (4.06)	0 0.00	162 (6.38)	46 (1.81)	162 (6.38)	46 (1.81)	119 (4.69)	144 (5.67)	142 (5.59)	167.0 (6.57)	21 (0.83)	0 0.00	18 (0.71)

Overall Length with Extend and Retract Options

Option	Single Tool Plate	High Load Bearing	Dual Tool Plate
Retract Option	SS + STROKE + PA	SB + (2× STROKE) + PA	SD + (2× STROKE) + PA
Extend Option	SB + (2× STROKE) + YY_2	SB + (2× STROKE) + YY_2	SD + (2× STROKE) + YY_2
Extend & Retract Option	SB + (2× STROKE) + PB	SB + (2× STROKE) + PB	SD + (2× STROKE) + PB

Example: High load bearing style, 32mm bore, 175mm stroke with an extend option and a retract option.

Overall Length = SB + (2×STROKE) + PB = 63 + (2×175) + 33 = 446mm

All dimensions in mm (inch)

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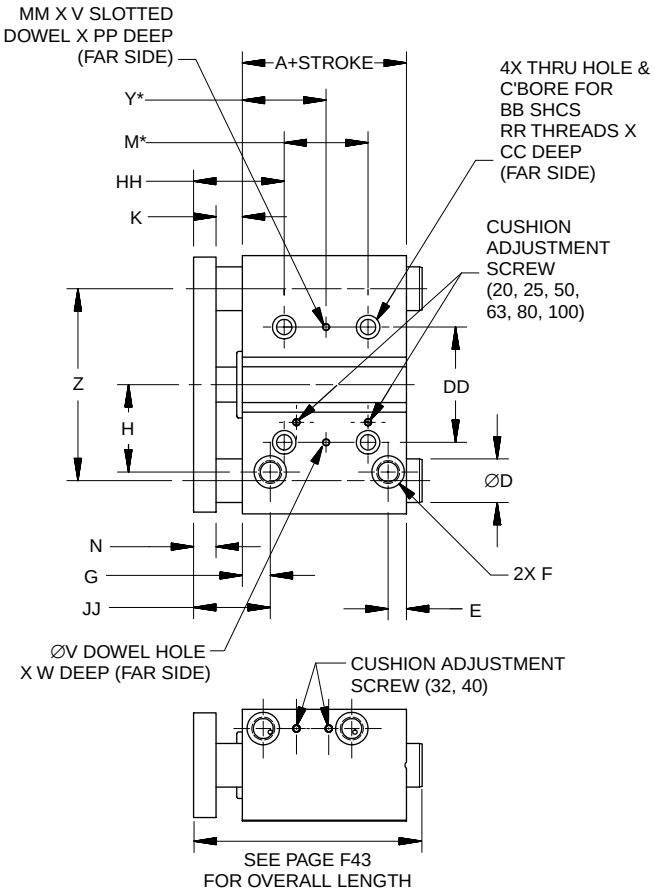
A074

Cushions (E, F)

P5T2 units in bore sizes 20mm - 100mm are available with adjustable air cushions to absorb Kinetic energy at end of stroke. Internal cushions should be used in lieu of bumpers when more energy dissipation is required. Cushions are not available in 12mm and 16mm bore sizes.

Cushions may not operate effectively when combined with shocks, adjustable stop collars and/or bumpers.

See charts on pages F38-F39 for sizing. For additional mounting dimensions not shown, please refer to basic dimensions on pages F40-F41.



Dimensions

Bore	A	D_1	D_2	E	F
20	62 (2.44)	10 (0.39)	12 (0.47)	10 (0.39)	1/8 BSPP 1/8 NPTF
25	62.5 (2.46)	12 (0.47)	16 (0.63)	10.5 (0.41)	1/8 BSPP 1/8 NPTF
32	62.5 (2.46)	16 (0.63)	20 (0.79)	10.75 (0.42)	1/8 BSPP 1/8 NPTF
40	69 (2.72)	16 (0.63)	20 (0.79)	11.5 (0.45)	1/8 BSPP 1/8 NPTF
50	69 (2.72)	20 (0.79)	25 (0.98)	12.5 (0.49)	1/4 BSPP 1/4 NPTF
63	74 (2.91)	20 (0.79)	25 (0.98)	13 (0.51)	1/4 BSPP 1/4 NPTF
80	81.5 (3.21)	25 (0.98)	30 (1.18)	17 (0.67)	3/8 BSPP 3/8 NPTF
100	91 (3.58)	30 (1.18)	35 (1.38)	19.5 (0.77)	3/8 BSPP 3/8 NPTF

D_1 with Linear Ball Bearing
D_2 with Composite Bushing

**** See next page for stroke dependent dimensions.***

Bore	G	H	K	N	V $^{+0.01}_{-0.00}$	W	Z	BB	CC	DD	HH	JJ	MM*	PP	RR
20	11 (0.43)	25 (0.98)	8 (0.31)	8 (0.31)	3.06 (0.12)	6 (0.24)	54 (2.13)	M5	12 (0.47)	28 (1.10)	33 (1.30)	27 (1.06)	3.5 (0.14)	3 (0.12)	M6x1.0
25	10.5 (0.41)	30 (1.18)	8 (0.31)	8 (0.31)	4.06 (0.16)	6 (0.24	64 (2.52)	M5	12 (0.47)	34 (1.34)	33 (1.30)	26.5 (1.04)	4.5 (0.18)	3 (0.12)	M6x1.0
32	11.75 (0.46)	37.5 (1.48)	10 (0.39)	12 (0.47)	4.06 (0.16)	6 (0.24)	78 (3.07)	M6	16 (0.63)	42 (1.65)	43 (1.69)	33.75 (1.33)	4.5 (0.18)	3 (0.12)	M8x1.25
40	16 (0.63)	42 (1.65)	10 (0.39)	12 (0.47)	4.06 (0.16)	6 (0.24)	86 (3.39)	M6	16 (0.63)	50 (1.97)	44 (1.73)	38 (1.50)	4.5 (0.18)	3 (0.12)	M8x1.25
50	16 (0.63)	49 (1.93)	15 (0.59)	13 (0.51)	5.04 (0.20)	8 (0.31)	110 (4.33)	M8	32 (1.26)	66 (2.60)	52 (2.05)	44 (1.73)	6 (0.24)	4 (0.16)	M10x1.5
63	16 (0.63)	57 (2.24)	15 (0.59)	13 (0.51)	5.04 (0.20)	8 (0.31)	124 (4.88)	M8	20 (0.79)	80 (3.15)	52 (2.05)	44 (1.73)	6 (0.24)	4 (0.16)	M10x1.5
80	18 (0.71)	74 (2.91)	18 (0.71)	22 (0.87)	6.04 (0.24)	10 (0.39)	156 (6.14)	M10	24 (0.94)	100 (3.94)	68 (2.68)	58 (2.28)	7 (0.28)	5 (0.20)	M12x1.75
100	23 (0.91)	93.5 (3.68)	25 (0.98)	25 (0.98)	6.04 (0.24)	10 (0.39)	188 (7.40)	M12	28 (1.10)	124 (4.88)	61 (2.40)	73 (2.87)	7 (0.28)	5 (0.20)	M14x2.0

*Slot length

All dimensions in mm (inch)

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Cushions

Dimensions

Size	Dim	Stroke Length (mm)							
		25	**50**	**75**	**100**	**125**	**150**	**175**	**200**
20, 25	M	44 (1.73)	44 (1.73)	44 (1.73)	120 (4.72)	120 (4.72)	120 (4.72)	120 (4.72)	200 (7.87)
	Y	39 (1.54)	39 (1.54)	39 (1.54)	77 (3.03)	77 (3.03)	77 (3.03)	77 (3.03)	117 (4.61)
32	M	48 (1.89)	48 (1.89)	48 (1.89)	124 (4.88)	124 (4.88)	124 (4.88)	124 (4.88)	200 (7.87)
	Y	45 (1.77)	45 (1.77)	45 (1.77)	83 (3.27)	83 (3.27)	83 (3.27)	83 (3.27)	121 (4.76)
40	M	48 (1.89)	48 (1.89)	48 (1.89)	124 (4.88)	124 (4.88)	124 (4.88)	124 (4.88)	200 (7.87)
	Y	46 (1.81)	46 (1.81)	46 (1.81)	84 (3.31)	84 (3.31)	84 (3.31)	84 (3.31)	122 (4.80)
50	M	48 (1.89)	48 (1.89)	48 (1.89)	124 (4.88)	124 (4.88)	124 (4.88)	124 (4.88)	200 (7.87)
	Y	48 (1.89)	48 (1.89)	48 (1.89)	86 (3.39)	86 (3.39)	86 (3.39)	86 (3.39)	124 (4.88)
63	M	52 (2.05)	52 (2.05)	52 (2.05)	128 (5.04)	128 (5.04)	128 (5.04)	128 (5.04)	200 (7.87)
	Y	50 (1.97)	50 (1.97)	50 (1.97)	88 (3.46)	88 (3.46)	88 (3.46)	88 (3.46)	124 (4.88)
80	M	NA	52 (2.05)	52 (2.05)	128 (5.04)	128 (5.04)	128 (5.04)	128 (5.04)	200 (7.87)
	Y	NA	54 (2.13)	54 (2.13)	92 (3.62)	92 (3.62)	92 (3.62)	92 (3.62)	128 (5.04)
100	M	NA	72 (2.83)	72 (2.83)	148 (5.83)	148 (5.83)	148 (5.83)	148 (5.83)	220 (8.66)
	Y	NA	47 (1.85)	47 (1.85)	85 (3.35)	85 (3.35)	85 (3.35)	85 (3.35)	121 (4.76)

All dimensions in mm (inch)

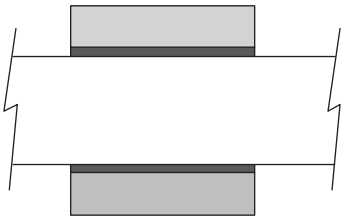
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Shaft Bearings

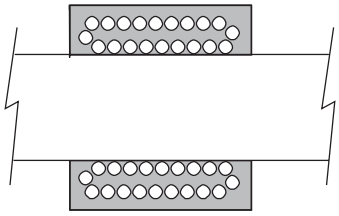
Composite bushings are supplied as standard.
Linear ball bearings are optional.

Selection should be based on the following criteria:

Application Requirement	Ball	Composite
Precision	Excellent	Good
Friction	Low	Higher
Friction coefficient	Constant	Variable
Precision over	Constant	Variable
Static Load Capacity	Good	Excellent
Dynamic Load Capacity	Good	Good with lower efficiency
Vibration Resistance	Fair	Excellent
Contamination Resistance	Poor	Excellent
Washdown Compatibility	Poor	Excellent



Composite Bushing (J, K)



Linear Ball Bearing (H, L)

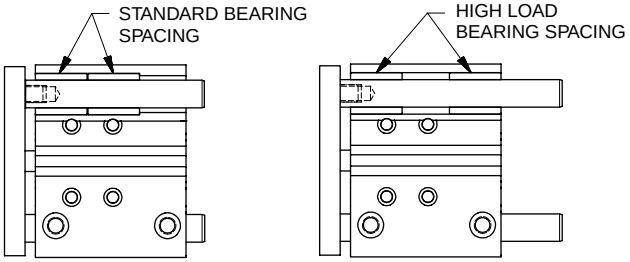
F

High Load Bearings (K1, K3, L3)

The standard bearing configuration locates both sets of bearings at the tool plate end of the actuator providing a compact actuator package.

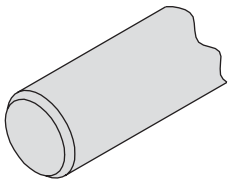
The High Load Bearings option locates the bearings at the extreme ends of the housing, increasing the dynamic and static load capacity. The bearing spacing increases as stroke length increases.

The High Load Bearing spacing is not available on strokes less than 50mm.



Corrosion Resistant Shafting

Chrome-plated steel shafting with composite bearings is utilized for standard slides. Stainless steel corrosion resistant shafting is available for extreme conditions.

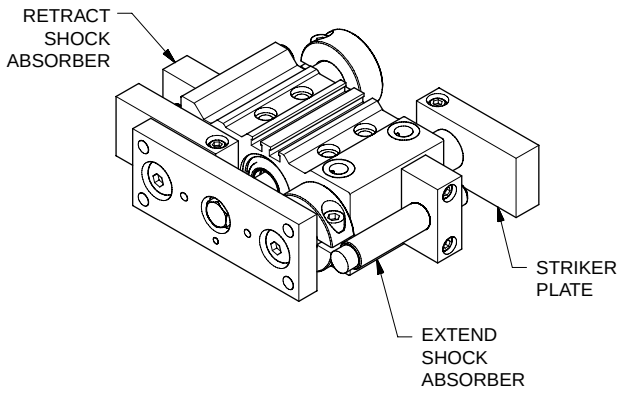


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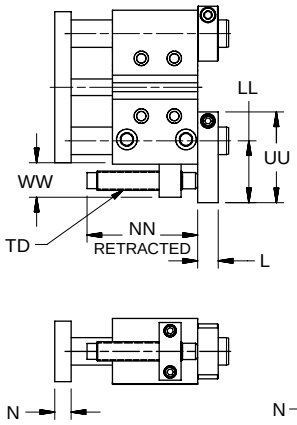
A074

Extend and Retract Options

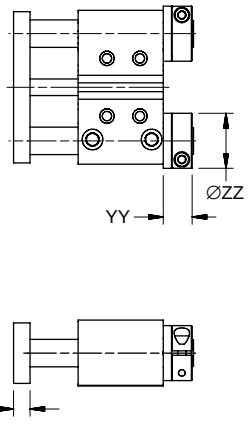
Shock Absorber (A)
Bumpers & Adj. Stop Collars (K)
Bumpers & Shock Absorber (L)



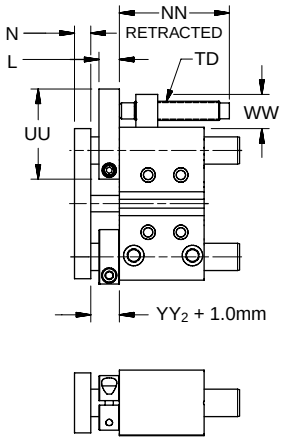
Shock Absorber Extend



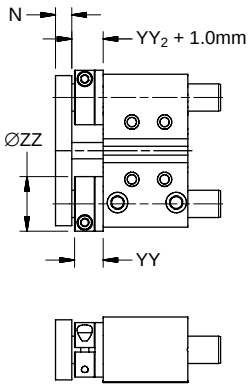
Bumpers & Adj. Stop Collars Extend



Shock Absorber Retract



Bumpers & Adj. Stop Collars Retract



Note: See page F43 for overall length.

Dimensions

Bore	L_1	L_2	N	LL	NN	TD	UU	WW	YY_1	YY_2	ZZ_1	ZZ_2
12	N/A	N/A	7 (0.28)	N/A	N/A	N/A	N/A	N/A	15 (0.59)	15 (0.59)	16 (0.63)	18 (0.71)
16	N/A	N/A	8 (0.31)	N/A	N/A	N/A	N/A	N/A	15 (0.59)	15 (0.59)	18 (0.71)	24 (0.94)
20	9 (0.35)	11 (0.43)	8 (0.31)	33.0 (1.30)	74 (2.91)	M12x1.0	48 (1.89)	19 (0.75)	15 (0.59)	17 (0.67)	24 (0.94)	28 (1.10)
25	11 (0.43)	13 (0.51)	8 (0.31)	39.0 (1.54)	80 (3.15)	M14x1.5	57 (2.24)	24 (0.94)	17 (0.67)	19 (0.75)	28 (1.10)	34 (1.34)
32	13 (0.51)	15 (0.59)	12 (0.47)	45.0 (1.77)	80 (3.15)	M14x1.5	66 (2.60)	24 (0.94)	19 (0.75)	21 (0.83)	34 (1.34)	40 (1.57)
40	15 (0.59)	15 (0.59)	12 (0.47)	45.0 (1.77)	99.5 (3.92)	M20x1.5	66 (2.60)	35 (1.38)	19 (0.75)	21 (0.83)	34 (1.34)	40 (1.57)
50	15 (0.59)	15 (0.59)	13 (0.51)	54.0 (2.13)	117 (4.61)	M25x1.5	79 (3.11)	40 (1.57)	21 (0.83)	21 (0.83)	40 (1.57)	45 (1.77)
63	15 (0.59)	15 (0.59)	13 (0.51)	54.0 (2.13)	117 (4.61)	M25x1.5	79 (3.11)	40 (1.57)	21 (0.83)	21 (0.83)	40 (1.57)	45 (1.77)
80*	15 (0.59)	15 (0.59)	22 (0.87)	71.0 (2.80)	140.5 (5.53)	M33x1.5	98 (3.86)	48 (1.89)	21 (0.83)	21 (0.83)	45 (1.77)	54 (2.13)
100*	15 (0.59)	15 (0.59)	25 (0.98)	76.0 (2.99)	140.5 (5.53)	M36x1.5	108 (4.25)	50 (1.97)	21 (0.83)	21 (0.83)	54 (2.13)	57 (2.24)

1 with Linear Ball Bearing

2 with Composite Bushing

* Shocks not available with 25mm stroke.

All dimensions in mm (inch)

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Rod Lock (R)

P5T2 Series units in 32mm - 100mm bore sizes are available with an integral rod lock mechanism.

The powerful rod lock device is air/spring activated and enables the piston rod to be locked in any position. In the absence of air signal pressure, full holding force is applied to the piston rod. When an air signal pressure of 60 PSI (4 Bar) is applied, the locking device is released. Exhaust air can be piped away when a contaminant-free environment is required.

Applications: Vertical guided cylinders
In the event of pressure loss
In the event of electrical control failure

Design Tip: The piston rod should not be moving when the locking device is activated. The locking device is not intended to repeatedly brake movement. See sample pneumatic circuit.

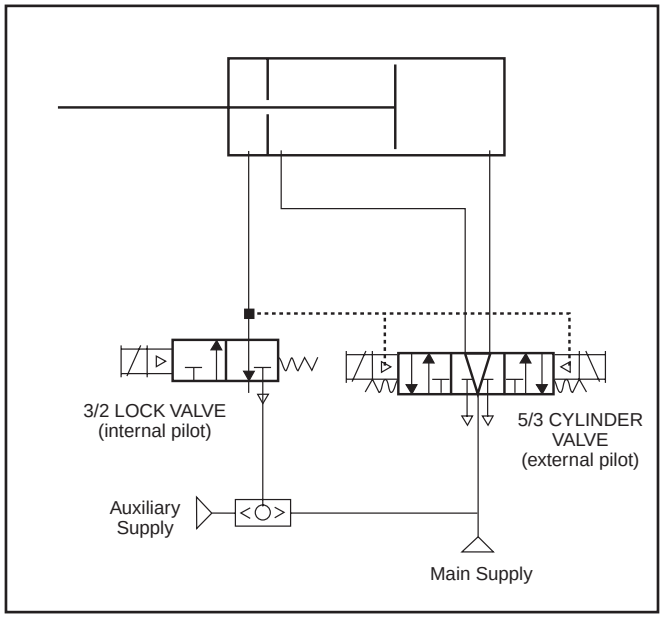
Technical Data

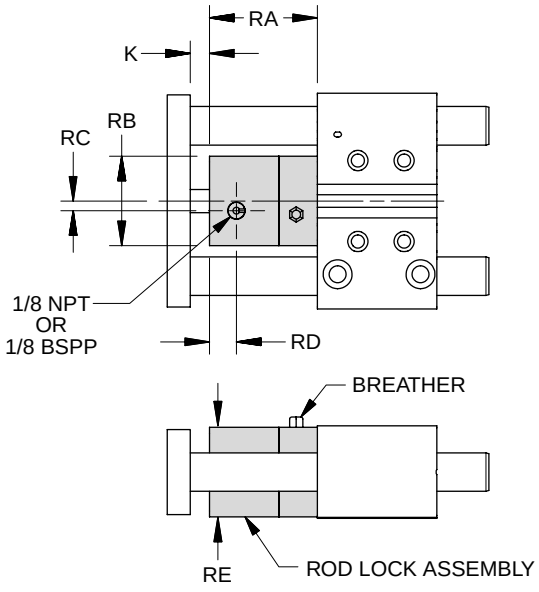
Maximum Pressure: 145 PSI (10 Bar)
Pressure Required to Unlock: 60 PSI (4 Bar)

Bore Size (mm)	Holding Force @7 Bar (102 PSI)	
	lb	N
32	123	550
40	193	860
50	303	1345
63	481	2140
80	755	3450
100	1211	5390

ROD LOCK CIRCUIT

Lock valve must be maintained energized during cylinder motion, otherwise rod lock is engaged and cylinder valve shifts to mid position. For manual override of the rod lock, insert a shuttle valve and an auxiliary air supply to disable rod lock.





Dimensions

Bore	RA	RB	RC	RD	RE	K
32	56 (2.20)	46.5 (1.83)	5 (0.20)	14 (0.55)	46.5 (1.83)	10 (0.39)
40	58 (2.28)	50.8 (2.00)	6 (0.24)	10 (0.39)	50.8 (2.00)	10 (0.39)
50	66 (2.60)	63.5 (2.50)	0 0.00	14 (0.55)	63.5 (2.50)	15 (0.59)
63	83 (3.27)	76.2 (3.00)	7.4 (0.29)	18 (0.71)	76.2 (3.00)	15 (0.59)
80	100 (3.94)	95.25 (3.75)	10 (0.39)	26 (1.02)	92.75 (3.65)	18 (0.71)
100	116 (4.57)	111 (4.37)	10 (0.39)	43 (1.69)	111 (4.37)	25 (0.98)

All dimensions in mm (inch)

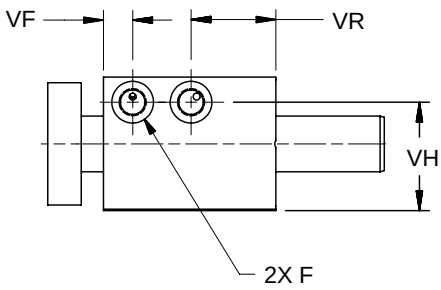
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Optional Port Location (2, 3)

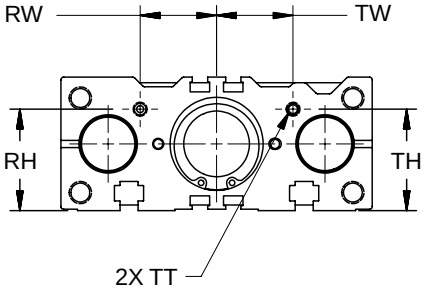
Top porting (1) is standard (see drawing on page F40). Optional side (2) and rear (3) porting is available. When ordering either optional port location, the top ports will also be present with threaded port plugs installed.

Certain configurations cannot be used with side or rear ports. Reference Model Code & Ordering Information on page F29.

Side Ports (2)



Rear Ports (3)



Dimensions

Bore	F	VH	TT	VR	VF	RW	RH	TW	TH
12	M5 x 0.8	21.5 (0.85)	M5 x 0.8	17.5 (0.69)	9.5 (0.37)	10.5 (0.41)	17.5 (0.69)	12 (0.47)	18.5 (0.73)
16	M5 x 0.8	25.5 (1.00)	M5 x 0.8	20 (0.79)	10 (0.39)	12 (0.47)	20 (0.79)	12 (0.47)	20 (0.79)
20	1/8 BSPP 1/8 NPTF	29.5 (1.16)	M5 x 0.8	25.5 (1.00)	11 (0.43)	20.5 (0.81)	28.5 (1.12)	20.5 (0.81)	28.5 (1.12)
25	1/8 BSPP 1/8 NPTF	34.5 (1.36)	M5 x 0.8	25 (0.98)	11.5 (0.45)	26.1 (1.03)	34.75 (1.37)	26.1 (1.03)	34.8 (1.37)
32	1/8 BSPP 1/8 NPTF	40 (1.57)	M5 x 0.8	30.75 (1.21)	11.75 (0.46)	29 (1.14)	37.8 (1.49)	29 (1.14)	37.8 (1.49)
40	1/8 BSPP 1/8 NPTF	46 (1.81)	1/8 BSPP 1/8 NPTF	34 (1.34)	14 (0.55)	33 (1.30)	45 (1.77)	33 (1.30)	45 (1.77)
50	1/4 BSPP 1/4 NPTF	53.75 (2.12)	1/4 BSPP 1/4 NPTF	34 (1.34)	12 (0.47)	38.5 (1.52)	48.5 (1.91)	38.5 (1.52)	48.5 (1.91)
63	1/4 BSPP 1/4 NPTF	63 (2.48)	1/4 BSPP 1/4 NPTF	36 (1.42)	16 (0.63)	45 (1.77)	63 (2.44)	45 (1.77)	62 (2.44)
80	3/8 BSPP 3/8 NPTF	74 (2.91)	3/8 BSPP 3/8 NPTF	42 (1.65)	13.5 (0.53)	61.5 (2.42)	75 (2.95)	61.5 (2.42)	75 (2.95)
100	3/8 BSPP 3/8 NPTF	83 (3.27)	3/8 BSPP 3/8 NPTF	50 (1.97)	18 (0.71)	68 (2.68)	76 (2.99)	68 (2.68)	76 (2.99)

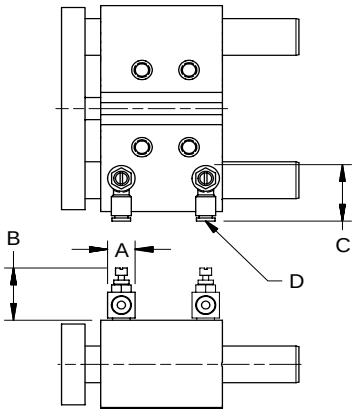
All dimensions in mm (inch)

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Flow Controls

Right angle flow control valves allow precise adjustment of cylinder speed by metering exhaust air flow. Prestolok push-in tube fittings or threaded fittings provide 360° orientation capability. In some rear porting instances, the flow control may not have 360° of orientation due to support rod interference.



Dimensions

Model	NPT Cylinder Ports								BSPP Cylinder Ports							
	Threaded (P, S)				Prestolok (E, K)				Threaded (R, T)				Prestolok (F, N)			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
12, 16	NA	NA	NA	NA	NA	NA	NA	NA	10.0 (0.39)	28.5 (1.12)	17.5 (0.69)	M5	10.0 (0.39)	18 (0.71)	19.5 (0.77)	4mm tube
20, 25, 32, 40	17.2 (0.68)	28.4 (1.12)	55.4 (2.18)	1/8	17.2 (0.68)	25.2 (0.99)	55.4 (2.18)	1/4"* tube	14.4 (0.57)	25.4 (1.00)	28.5 (1.12)	1/8	14.4 (0.57)	31.6 (1.24)	28.5 (1.12)	6mm tube
50, 63	17.2 (0.68)	32.4 (1.28)	65.2 (2.57)	1/4	17.2 (0.68)	38.3 (1.51)	65.2 (2.57)	3/8" tube	18.4 (0.72)	34.3 (1.35)	27.4 (1.08)	1/4	18.4 (0.72)	41.3 (1.63)	34 (1.34)	10mm tube
80, 100	25.0 (0.98)	39.0 (1.54)	80.2 (3.16)	3/8	30.0 (1.18)	47.4 (1.87)	98.0 (3.86)	3/8" tube	21.6 (0.85)	40.2 (1.58)	34 (1.34)	3/8	21.6 (0.85)	46.7 (1.84)	44 (1.73)	12mm tube

Fluorocarbon Seals (L, M)

Standard abrasion resistant Buna-N nitrile seals should be used for general purpose applications with temperatures of 18° to 74°C (0° to 165°F). Fluorocarbon seals are recommended for high temperature applications up to 121°C (250°F).

Other components in the actuator may be affected by the higher temperatures. Please see chart for temperature ratings of other commonly used components.

Feature	Temperature Range
Bumpers	-18° to 93°C (0° to 200°F)
Shock Absorbers	0° to 66°C (32° to 150°F)
Magnets	-18° to 74°C (0° to 165°F)
Switches	-10° to 85°C (14° to 185°F)

All dimensions in mm (inch)

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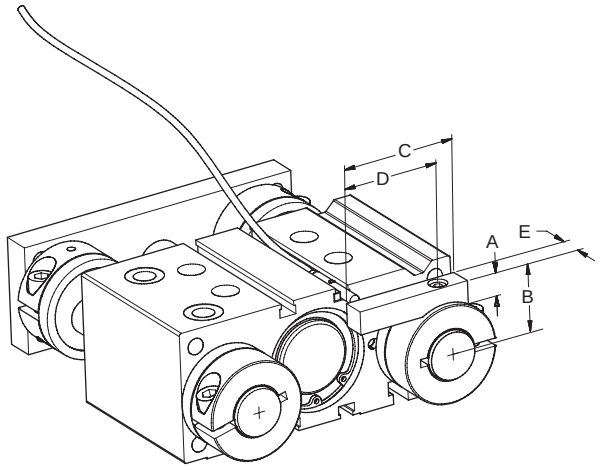
A074

Proximity Sensors – 4mm

Proximity sensors are normally ordered with the unit as part of the model number. Use the part numbers below for spare parts only.

Type	Quick Connect	Flying Leads	Bracket
PNP	B8829-QC-P*	B8829-FL-P	HW-3
NPN	B8829-QC-N**	B8829-FL-N	

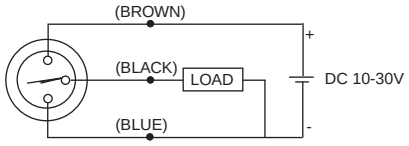
* Order cordset B8757-P separately.
** Order cordset B8757-N separately.



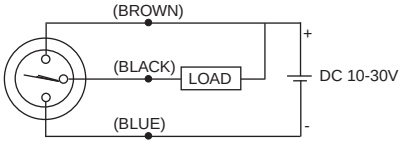
Electrical Specifications

Voltage..... 10-30 VDC (3 wire) PNP or NPN
No Load Current..... 3-10 mA
Continuous Current ..... 100 mA
Switching Speed..... 8 ms
Switch Frequency ..... 1800 Hz
Switching Distance ..... Aluminum = 0.024 in (0.6mm) Brass = 0.041 in (1.05mm) Steel = 0.059 in (1.5mm)
Overload Protection..... Triggered at 170mA
Reverse Polarity Protection ..... Incorporated
Temp. Range..... -13° to 158°F (-25° to 70°C)
Enclosure Rating ..... Meets NEMA 1, 3, 4, 6, 13 and IEC IP67, fully encapsulated

PNP WIRING CONNECTION



NPN WIRING CONNECTION



Dimensions

Size	Support Rod Dia.	A	B	C	D	E
12	6mm	8.0 (0.31)	14.3 (0.56)	31.8 (1.25)	24.1 (0.95)	9.5 (0.38)
	8mm	9.5 (0.38)	16.0 (0.63)	34.9 (1.38)	26.5 (1.05)	9.5 (0.38)
16	8mm	9.5 (0.38)	16.0 (0.63)	34.9 (1.38)	26.5 (1.05)	9.5 (0.38)
	10mm	9.5 (0.38)	19.0 (0.75)	34.9 (1.38)	26.5 (1.04)	9.5 (0.38)
20	10mm	9.5 (0.38)	19.0 (0.75)	34.9 (1.38)	26.5 (1.04)	9.5 (0.38)
	12mm	9.5 (0.38)	21.5 (0.85)	37.8 (1.49)	30.8 (1.21)	9.5 (0.38)
25	12mm	9.5 (0.38)	21.5 (0.85)	37.8 (1.49)	30.8 (1.21)	9.5 (0.38)
	16mm	9.5 (0.38)	24.5 (0.96)	45.4 (1.79)	37.4 (1.47)	9.5 (0.38)
32	16mm	9.5 (0.38)	24.5 (0.96)	45.4 (1.79)	37.4 (1.47)	9.5 (0.38)
	20mm	9.5 (0.38)	26.8 (1.06)	47.5 (1.87)	37.4 (1.47)	9.5 (0.38)
40	16mm	9.5 (0.38)	24.5 (0.96)	45.4 (1.79)	37.4 (1.47)	9.5 (0.38)
	20mm	9.5 (0.38)	26.8 (1.06)	47.5 (1.87)	37.4 (1.47)	9.5 (0.38)
50	20mm	19.0 (0.75)	37.0 (1.46)	59.6 (2.35)	50.8 (2.00)	9.5 (0.38)
	25mm	19.0 (0.75)	37.2 (1.47)	64.0 (2.52)	50.8 (2.00)	12.7 (0.50)
63	20mm	19.0 (0.75)	37.0 (1.46)	59.6 (2.35)	50.8 (2.00)	9.5 (0.38)
	25mm	19.0 (0.75)	37.2 (1.47)	64.0 (2.52)	50.8 (2.00)	12.7 (0.50)
80	25mm	25.4 (1.00)	45.1 (1.78)	69.3 (2.73)	58.4 (2.30)	12.7 (0.50)
	30mm	19.0 (0.75)	44.5 (1.75)	69.1 (2.72)	58.4 (2.30)	12.7 (0.50)
100	30mm	19.0 (0.75)	44.5 (1.75)	69.1 (2.72)	58.4 (2.30)	12.7 (0.50)
	35mm	12.7 (0.50)	38.1 (1.50)	69.8 (2.75)	52.1 (2.05)	12.7 (0.50)

All dimensions in mm (inch)

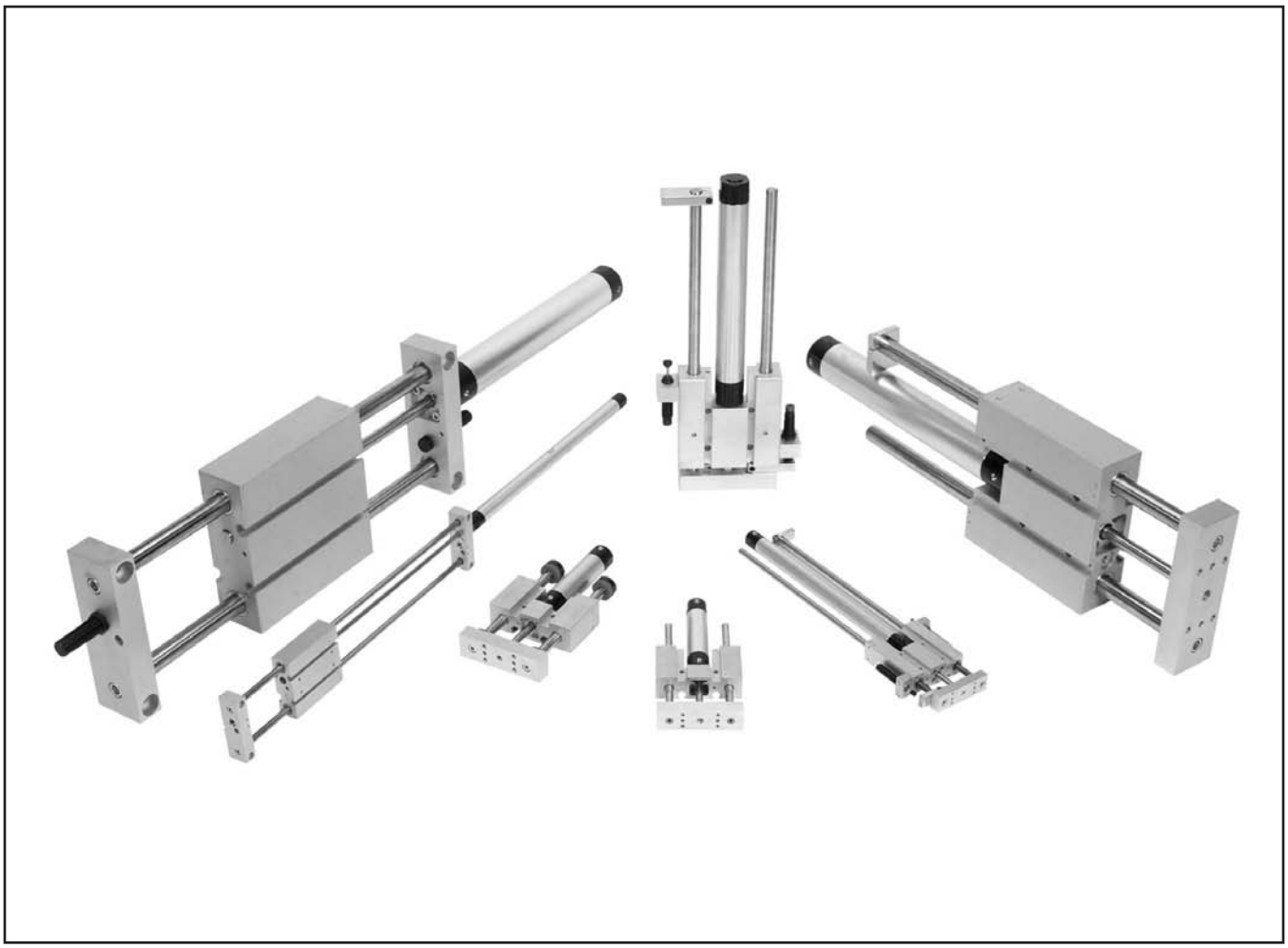
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P5L Series

Guided Cylinders



Contents

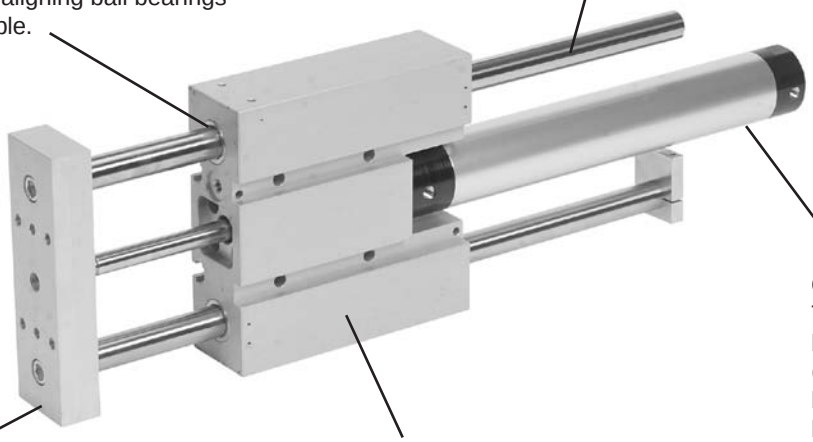
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P5L-R Reach Slide Shown

Support Rods
High strength, case hardened support rods available in chrome plated, carbon or stainless steel. The chrome plated and stainless steel shafts are available in oversized versions for high load applications.

Bushings
Composite bushings with standard or oversized shafts are available. For precision applications optional recirculating ball bearings can be specified and for extremely high loads self-aligning ball bearings are available.

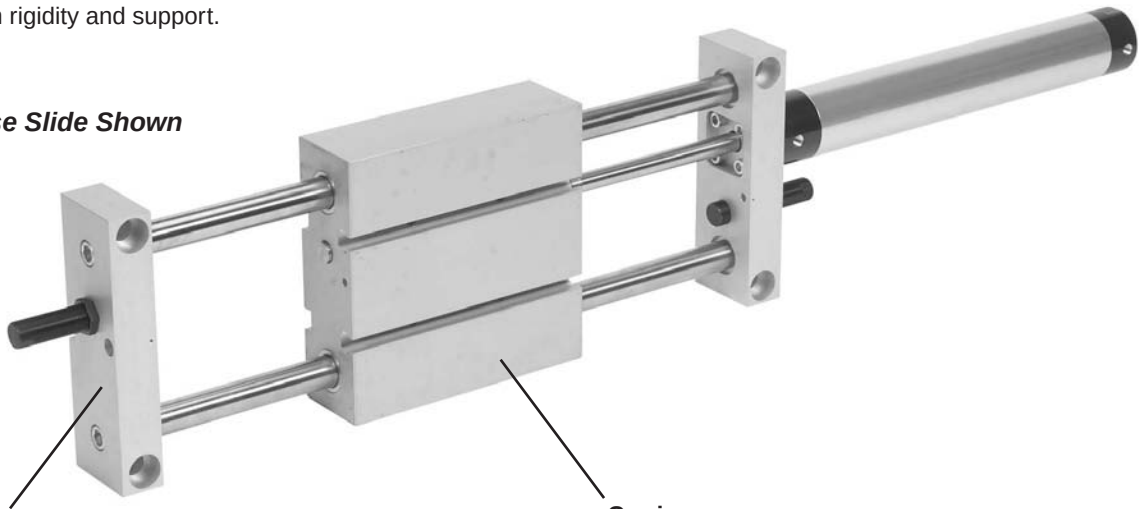


Cylinder
The all new P1L round body repairable cylinder (available in 20 to 100mm bore) is the driving force behind the P5L guided cylinder product line. Parker guided cylinders come standard with a magnetic piston for easy installation of reed or solid state sensors.

Tooling Plate
A precision machined, anodized aluminum tooling plate with standard tapped and counterbored mounting holes provides mounting from two faces. Dowel pin holes are also included for accurate positioning of custom tooling. The support rods are attached to the tooling plate using two socket head cap screws, providing maximum rigidity and support.

Body
Extruded aluminum and anodized body with recessed through holes. Standard dowel pin holes to provide mounting accuracy. Integrated T-slots provide mounting flexibility and quick set up. T-slots are standard on 20mm to 40mm bore models and optional on 50mm to 100mm bore models.

P5L-B Base Slide Shown



End Plates
Precision machined, anodized aluminum end plates have counterbored through holes for mounting. For precision, one keyway and one dowel pin are included. The support rods are attached to the tooling plate using two socket head cap screws providing maximum rigidity and support.

Carriage
Extruded aluminum and anodized carriage with recessed through holes. Standard dowel pin holes to provide mounting accuracy. Integrated t-slots provide mounting flexibility and quick set up. T-slots are standard on 20-40mm bore models and optional on 50-100mm bore models.

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Model Number Code

Example: P5L-RL100J1AANFN-0900-A

P5L	–	R	L	100	J1	A	A	N	F	N	–	0900	–	A

Series

T	Thrust Slide
R	Reach Slide
B	Base Slide

Cylinder Type

L	P1L Cylinder

Bore Size

020	20mm Bore
025	25mm Bore
032	32mm Bore
040	40mm Bore
050	50mm Bore
063	63mm Bore
080	80mm Bore
100	100mm Bore

Bushings

J1	Composite Bushing, Chrome Plated Shafts
J2	Composite Bushing, Oversized Chrome Plated Shafts
J3	Composite Bushing, Stainless Steel Shafts
J4	Composite Bushing, Oversized Stainless Steel Shafts
G1	Composite Bushing, Chrome Plated Shafts, Contaminent Tolerant Seals
G3	Composite Bushing, Stainless Steel Shafts, Contaminent Tolerant Seals
H3	Linear Ball Bearings, Stainless Steel Shafts
H5	Linear Ball Bearings, Carbon Steel Shafts
S3*	Self Aligning Linear Ball Bearings, Stainless Steel Shafts
S5*	Self Aligning Linear Ball Bearings, Carbon Steel Shafts

Extend Options

N	None
A	Shock/Stroke Adjusters
B	Bumpers (Base Slides only)
C	Cushions Both Ends
E	Micro-adjusters and Cushions (both ends only)
H	Cushions and Bumpers (includes Options C & K)
K	Bumpers and Adjustable stop collars
L	Shock absorbers and bumpers (N/A on Base Slides)

Retract Options

N	None
A	Shock/Stroke Adjusters
B	Bumpers Only
C	Cushions Both Ends
E	Micro-adjusters and Cushions (both ends only)
H	Cushions and Bumpers (includes Options C & K)
K	Bumpers and Adjustable stop collars
L	Shock absorbers and bumpers (N/A on Base Slides)

Cylinder Seals

N	Nitrile (Standard)
V	Fluorocarbon (High Temperature)

Cylinder Port Style

G	BSPT Ports
H	NPTF Ports
P	BSPT Ports w/ Presto-lok Flow Controls (mm)
F	NPTF Ports w/ Presto-lok Flow Controls (inch)
B	BSPT Ports w/ Flow Controls
N	NPTF Ports w/ Flow Controls

Proximity Sensor Options

N	No Sensor
P	PNP, Lead Type
R	NPN, Lead Type
S	PNP, Plug in Type
T	NPN, Plug in Type
W	Prox Ready, 8mm (No sensor supplied)
Z	Prox Ready, 12mm (No sensor supplied)

Note: Piston magnet is standard on all cylinders. Inductive proximity sensors are included with Options P, R, S & T.

T-Slots

–	Standard (Extruded T-slots on sizes 20-40, no T-slots on sizes 50-100)
A	Machined T-slots (Sizes 50-100)**

** N/A on sizes 20-40

Stroke

Order in 1mm increments.

Design Series

A	Current Design

** Not available on 20mm bore models*

Order P8S Series reed and solid state sensors separately from Electronic Sensors Section.

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Specifications

- Maximum operating pressure: 10 bar (145 PSI)
- Operating characteristics: double acting
- Support rod sizes from 10mm to 60mm
- Operating temperature range (cylinder):
  Standard seals -17° to 74°C (0 to 165°F)
  Fluorocarbon seals* -17° to 121°C (0 to 250°F)
- Filtration requirement: 40 micron filtered, dry air

*See fluorocarbon seal option for high temperature applications.

Quick Reference Data

Bore	Standard Support Rod Diameter		Oversized Support Rod Diameter		Output Force on Extension @5.5 Bar (80 psi)		Output Force on Retract @5.5 Bar (80 psi)		Maximum Suggested Stroke**	
	mm	(in)	mm	in	N	lbs	N	lbs	mm	in
20	10	0.39	12	0.47	173	39	147	33	400	16
25	12	0.47	16	0.63	271	61	227	51	400	16
32	16	0.63	20	0.79	445	100	383	86	450	18
40	20	0.79	25	0.98	694	156	583	131	550	22
50	25	0.98	30	1.18	1081	243	907	204	750	30
63	30	1.18	40	1.57	1717	386	1548	348	900	35
80	40	1.57	50	1.97	2771	623	2500	562	1000	39
100	50	1.97	60	2.36	4332	974	3888	874	1000	39

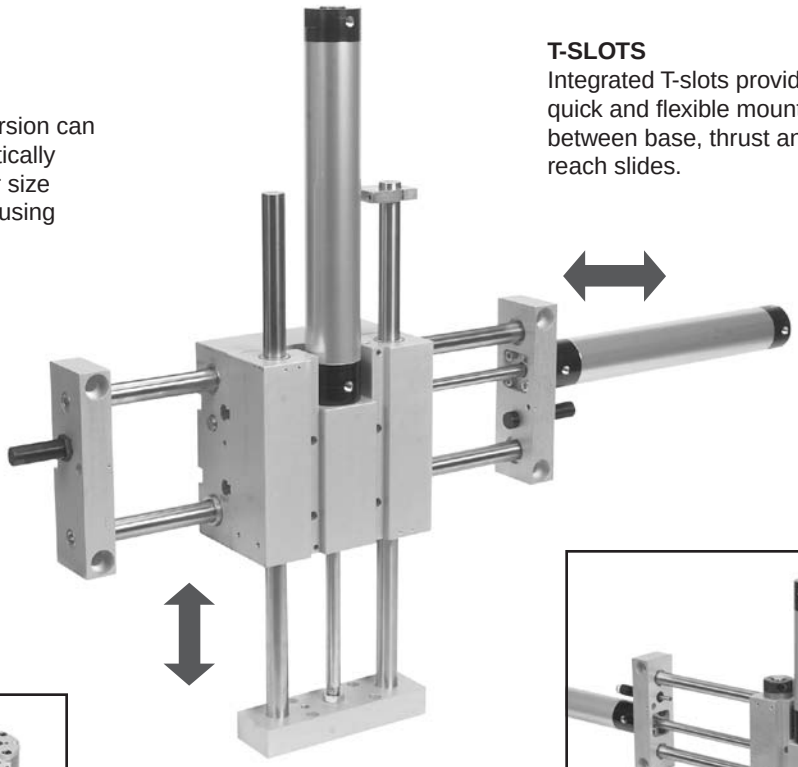
**Longer stroke lengths are available, but load capacities are greatly reduced. Consult factory with application parameters.

Weights

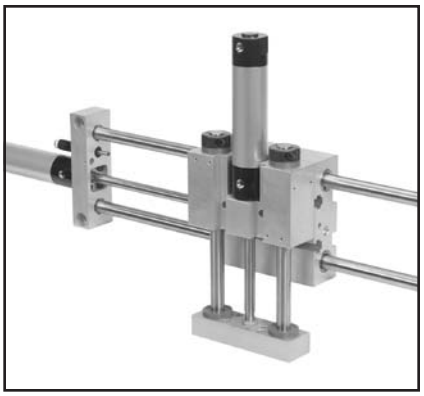
Bore	Actuator Weights (Standard Shaft)								Actuator Weights (Oversized Shaft)							
	Zero Stroke Unit Weight						Per Inch Stroke		Zero Stroke Unit Weight						Per Inch Stroke	
	Thrust		Reach		Base				Thrust		Reach		Base			
	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs
20	0.69	1.5	0.96	2.1	1.09	2.4	0.04	0.09	0.77	1.7	1.07	2.3	1.04	2.3	0.05	0.11
25	1.24	2.7	1.77	3.9	2.12	4.7	0.06	0.13	1.45	3.2	2.05	4.5	1.99	4.4	0.08	0.17
32	1.99	4.4	2.84	6.3	3.26	7.2	0.09	0.20	2.32	5.1	3.25	7.2	3.15	6.9	0.11	0.25
40	3.5	7.7	4.9	10.9	5.6	12.4	0.14	0.31	4.1	9.1	5.9	13.0	5.75	12.7	0.17	0.39
50	7.3	16.2	11.2	24.6	12.1	26.7	0.21	0.47	8.5	18.8	12.8	28.1	12.50	27.6	0.25	0.56
63	12.6	27.8	18.6	41.0	21.8	48.1	0.27	0.59	15.1	33.3	22.3	49.2	21.92	48.3	0.38	0.83
80	22.5	49.5	34.4	75.8	39.4	86.9	0.44	0.96	26.8	59.2	40.5	89.3	40.47	89.2	0.58	1.27
100	40.7	89.8	61.7	136.0	72.4	159.7	0.66	1.45	42.1	92.8	63.9	140.9	65.49	144.4	0.83	1.83

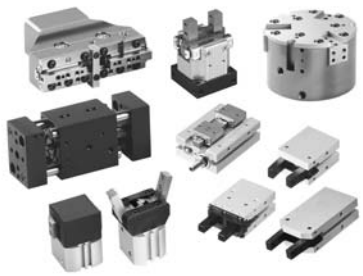
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Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

DIRECT MOUNTING
Each thrust and reach version can direct mount to the indentically sized base version. Other size combinations can mount using transition plates.

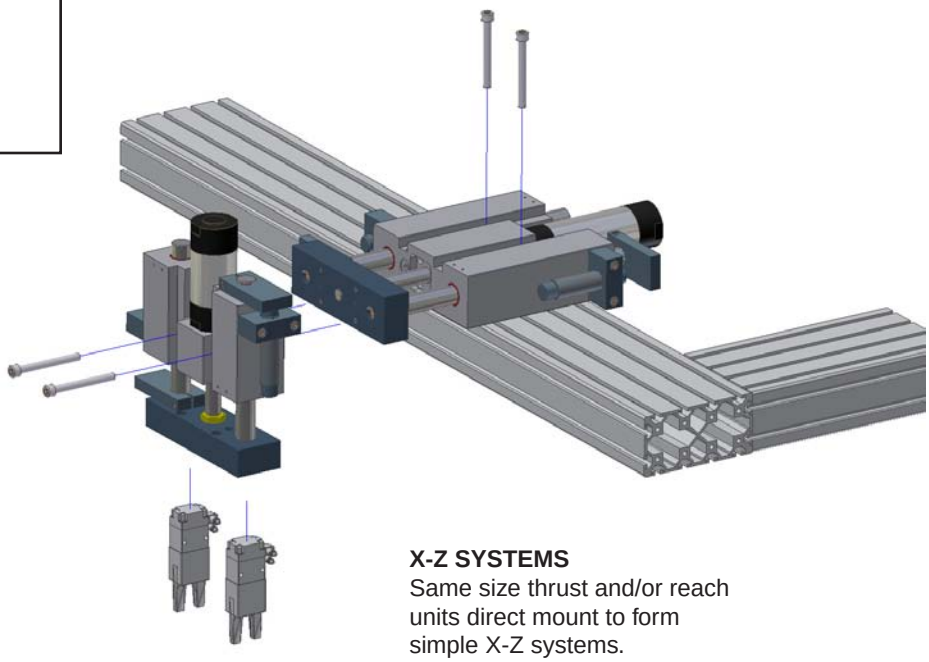


T-SLOTS
Integrated T-slots provide quick and flexible mounting between base, thrust and reach slides.





Parker has a complete line of pneumatic grippers for pick & place applications. Consult Parker Catalog 1900-2.



X-Z SYSTEMS
Same size thrust and/or reach units direct mount to form simple X-Z systems.

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Horizontal Load Capacity & Deflection with Standard Shafting

- Standard Composite w/ Chrome Plated or Stainless Steel Rods
- Recirculating Ball Bearings w/ Carbon or Stainless Steel Rods
- Self Aligning Ball Bearings w/ Carbon or Stainless Steel Rods

The graphs on these two pages illustrate the maximum suggested side load at a given actuator stroke and distance (d) from the face of the tooling plate. The graphs include the weight of the support rods and tooling plate and are based on a bearing life of 10 million cycles under a dynamic loading condition. For an equivalent static load capacity multiply the information in these graphs by 1.5.

See the P5L options section of this catalog for more bearing selection information.

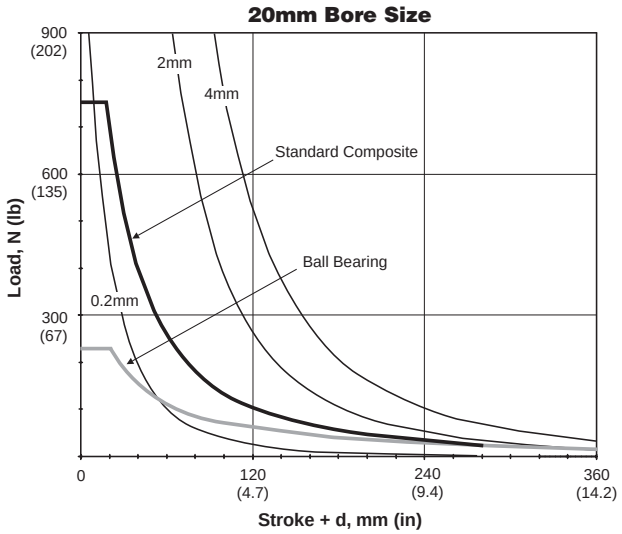
Dynamic loading is defined as a load which is affixed to the actuator tooling plate during the extend or retract motion of the actuator. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application.

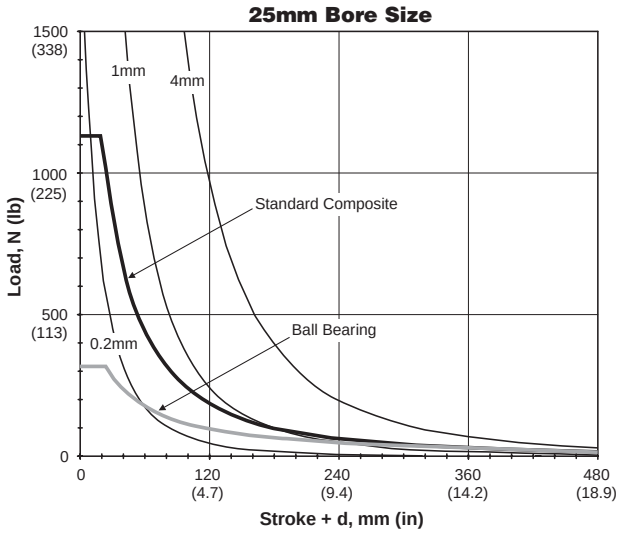
Note: The following variables commonly affect the bearing life of a guided cylinder:

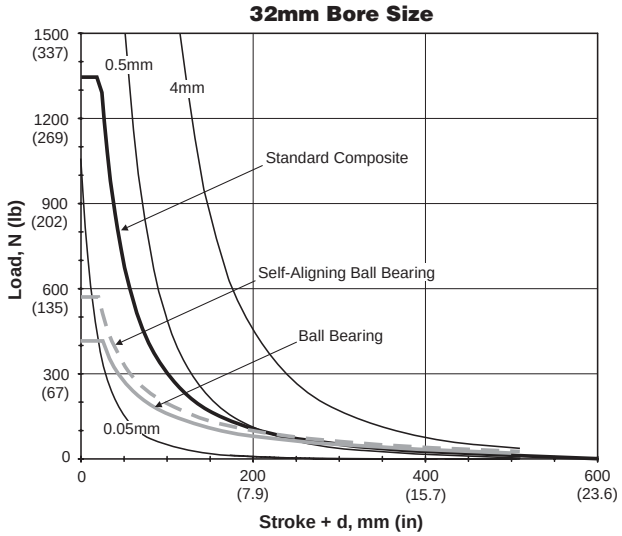
- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

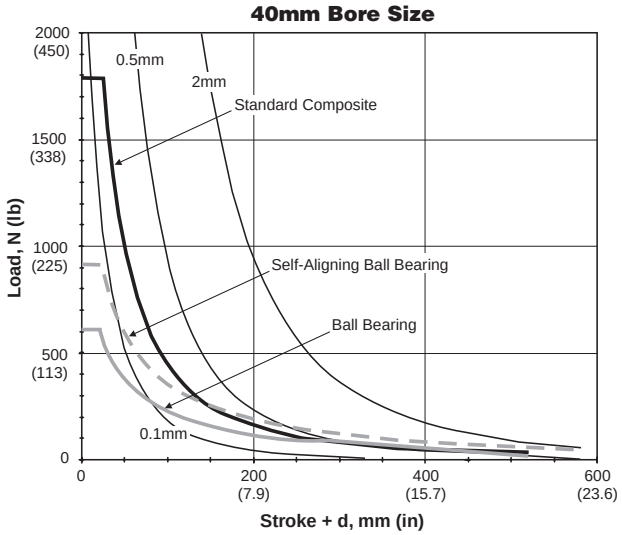
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P5L Thrust Slides



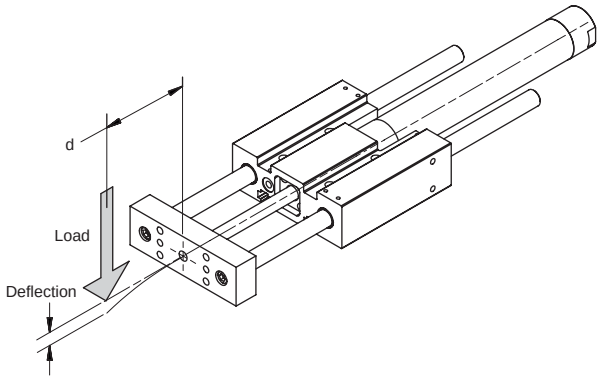






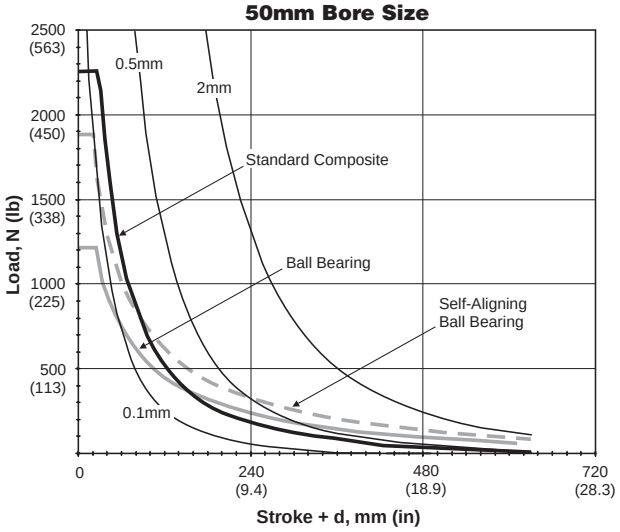
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Horizontal Load Capacity & Deflection with Standard Shafting

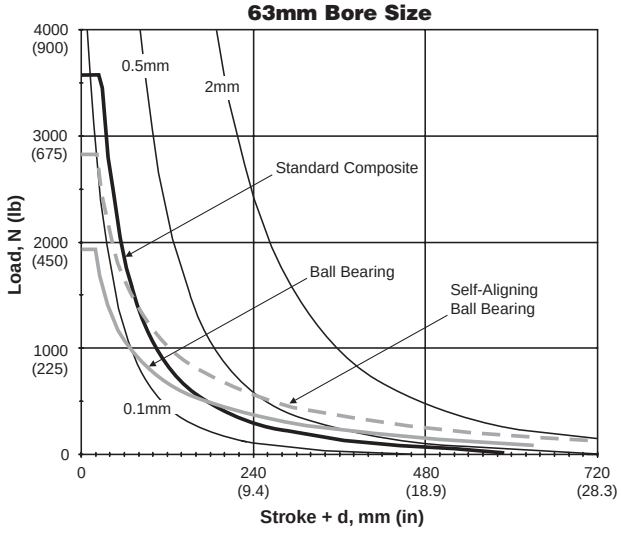


P5L Thrust Slides

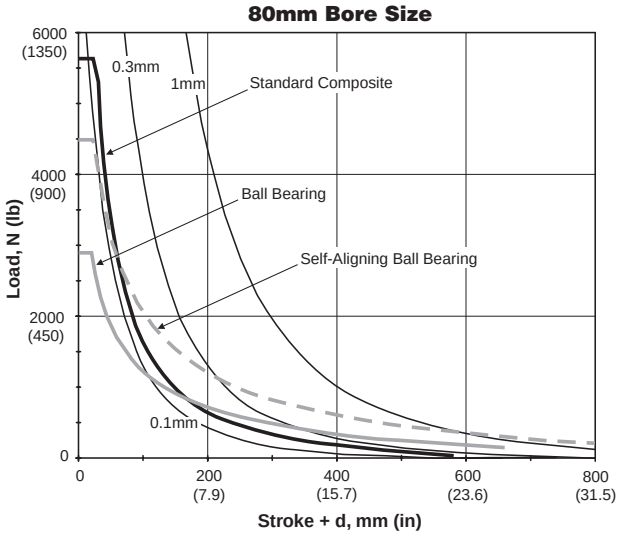
50mm Bore Size



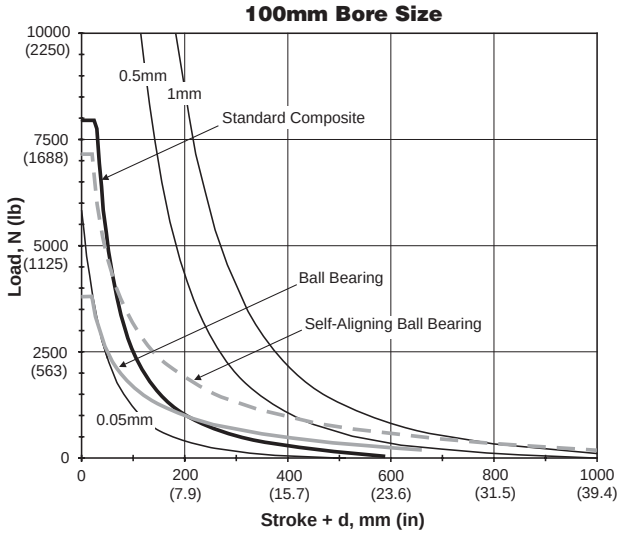
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Horizontal Load Capacity & Deflection with Oversized Shafting

- Oversized Composite w/ Chrome Plated or Stainless Steel Rods

The graphs on these two s illustrate the maximum suggested side load at a given actuator stroke and distance (d) from the face of the tooling plate. The graphs include the weight of the support rods and tooling plate and are based on a bearing life of 10 million cycles under a dynamic loading condition. For an equivalent static load capacity multiply the information in these graphs by 1.5.

See the P5L options section of this catalog for more bearing selection information.

Dynamic loading is defined as a load which is affixed to the actuator tooling plate during the extend or retract motion of the actuator. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application.

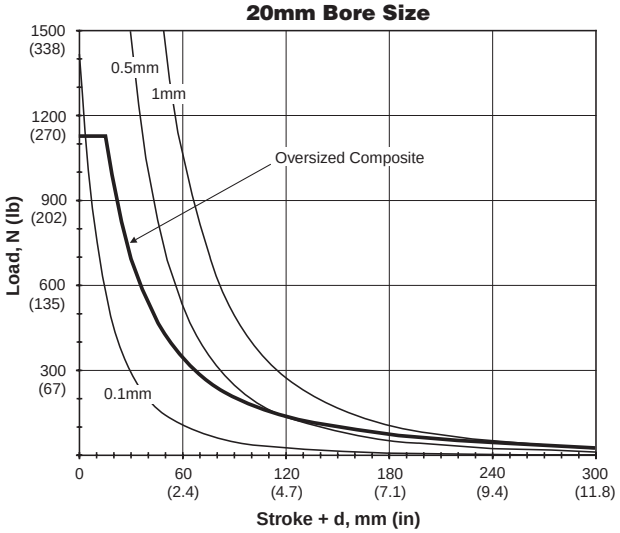
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

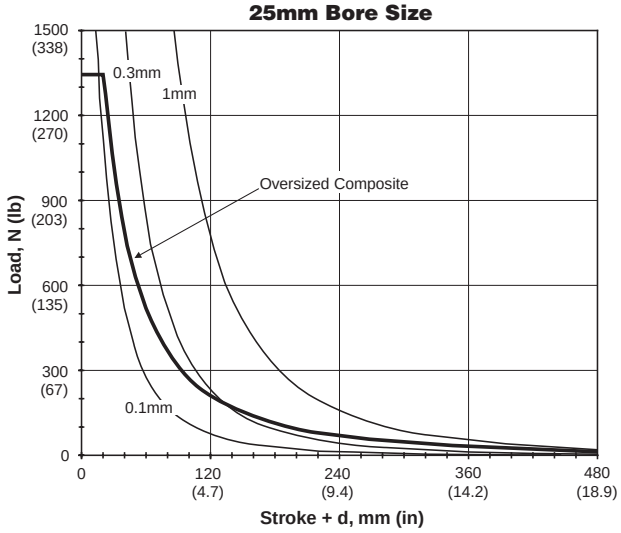
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P5L Thrust Slides

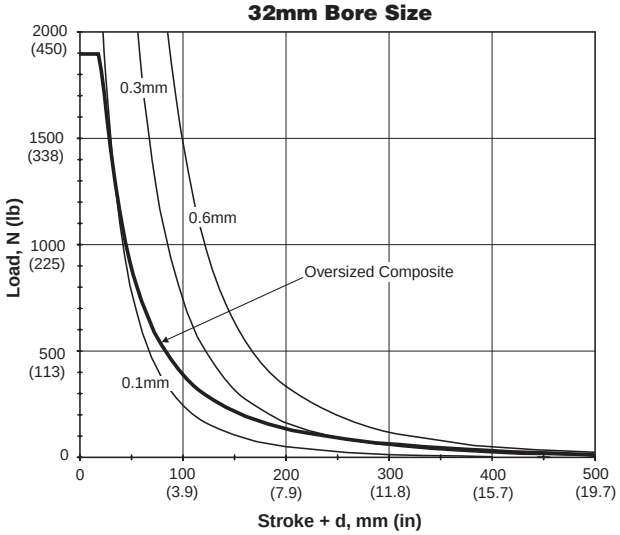
20mm Bore Size



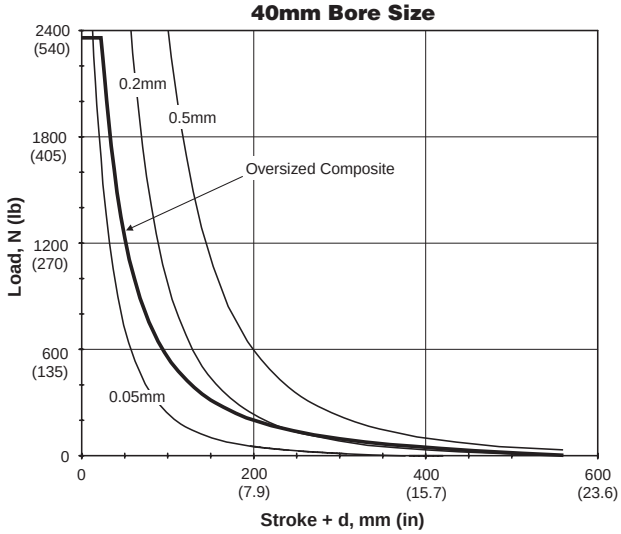
25mm Bore Size



32mm Bore Size

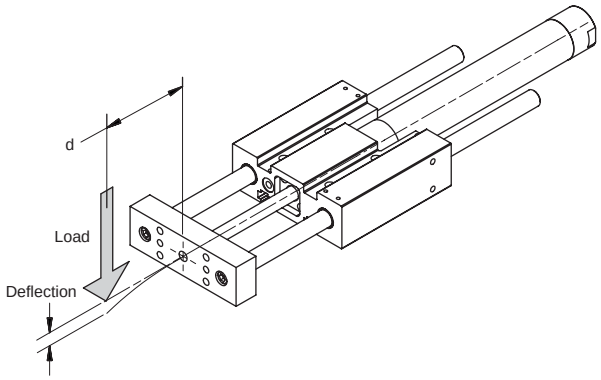


40mm Bore Size



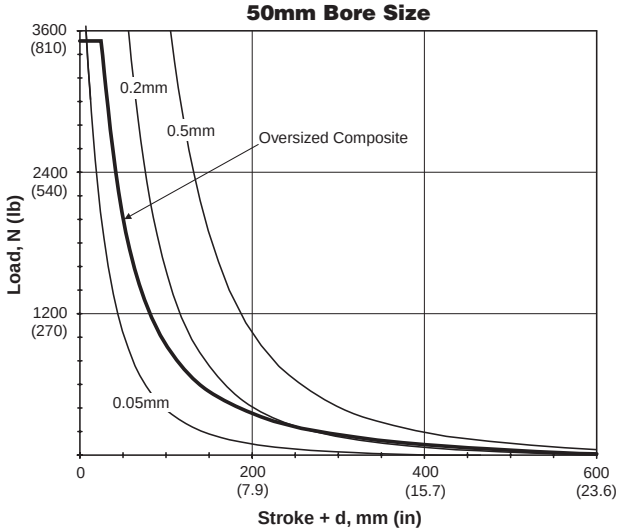
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Horizontal Load Capacity & Deflection with Oversized Shafting

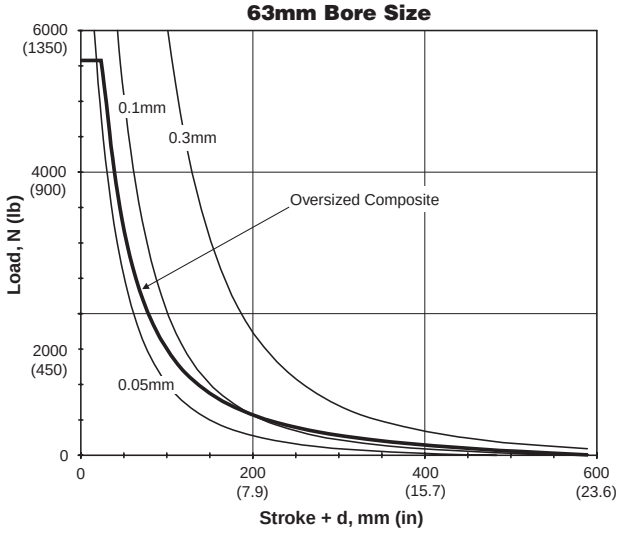


P5L Thrust Slides

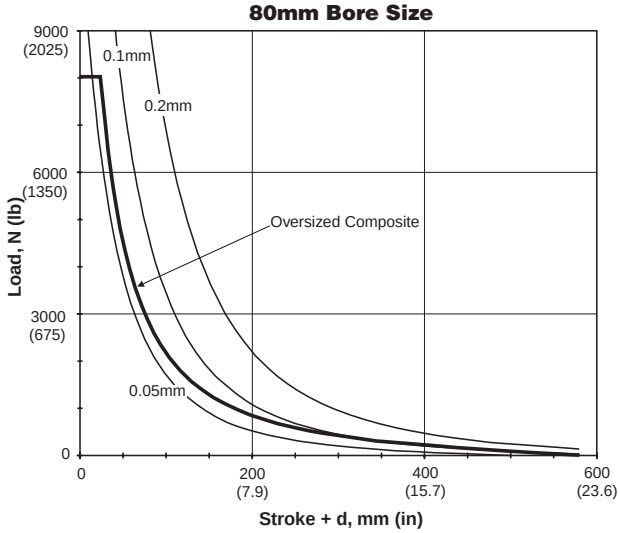
50mm Bore Size



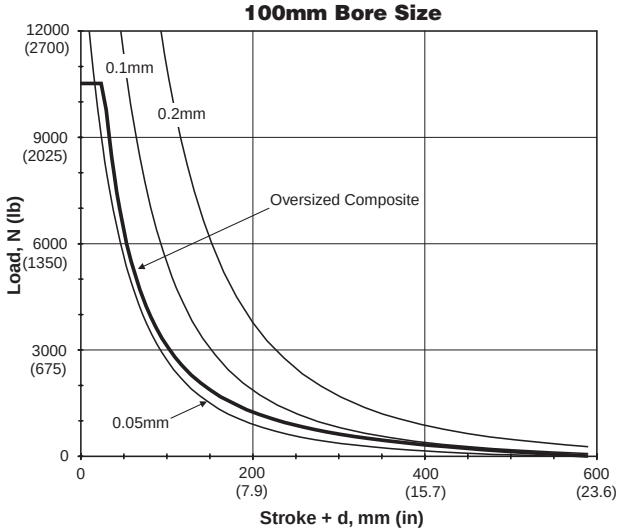
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Horizontal Load Capacity & Deflection with Standard Shafting

- Recirculating Ball Bearings w/ Carbon or Stainless Steel Rods
- Self Aligning Ball Bearings w/ Carbon or Stainless Steel Rods

The graphs on these two pages illustrate the maximum suggested side load at a given actuator stroke and distance (d) from the face of the tooling plate. The graphs include the weight of the support rods and tooling plate and are based on a bearing life of 10 million cycles under a dynamic loading condition. For an equivalent static load capacity multiply the information in these graphs by 1.5.

See the P5L options section of this catalog for more bearing selection information.

Dynamic loading is defined as a load which is affixed to the actuator tooling plate during the extend or retract motion of the actuator. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application.

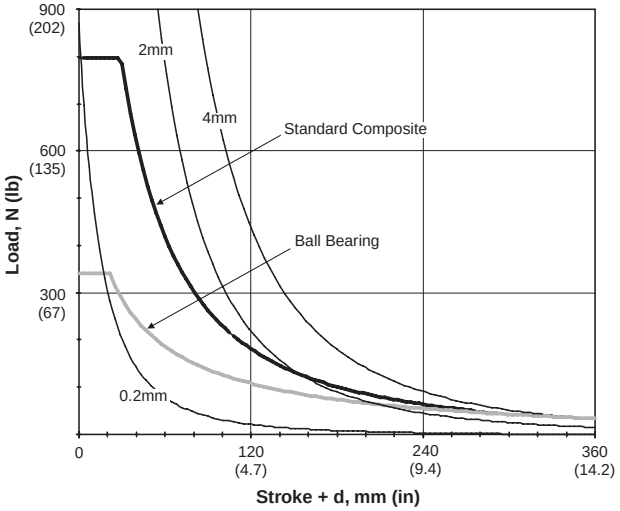
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

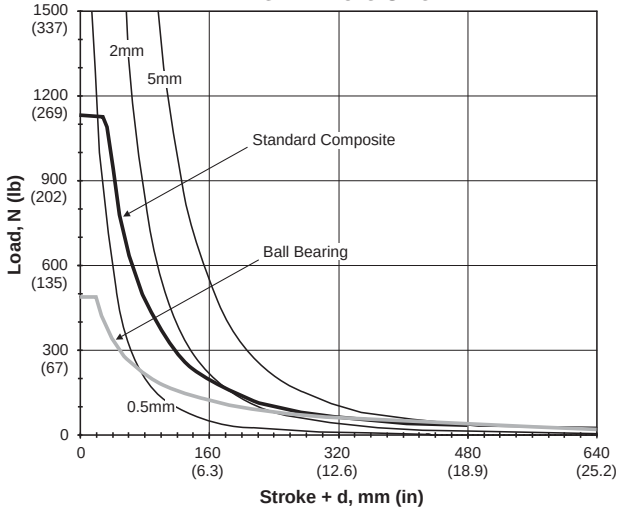
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P5L Reach Slides

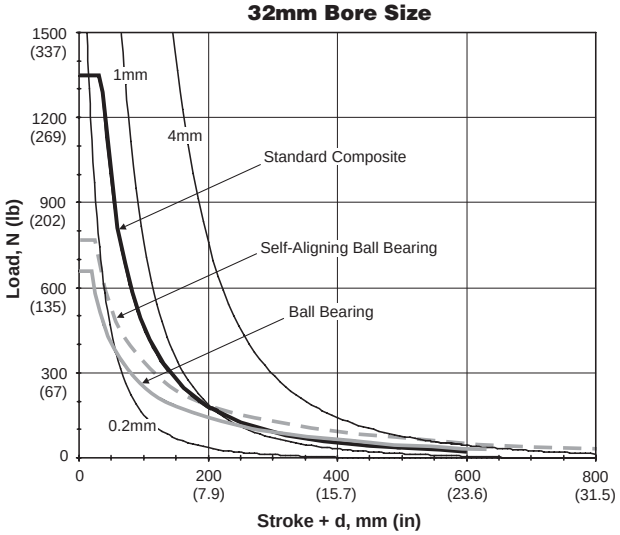
20mm Bore Size



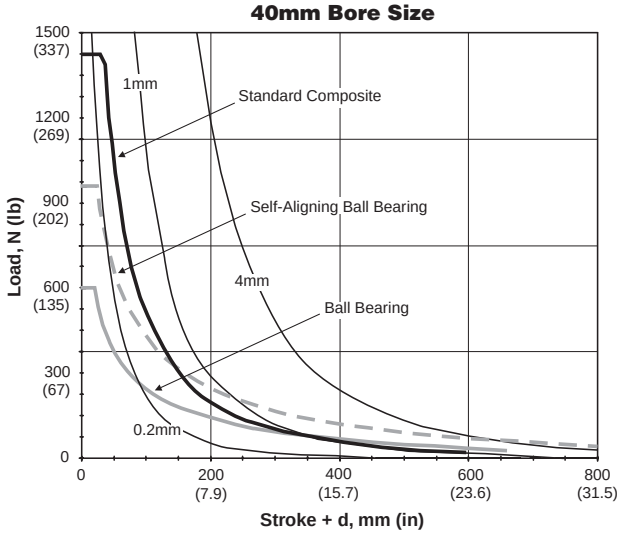
25mm Bore Size



32mm Bore Size

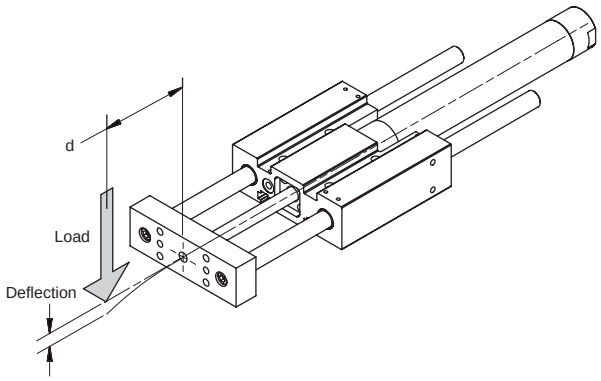


40mm Bore Size



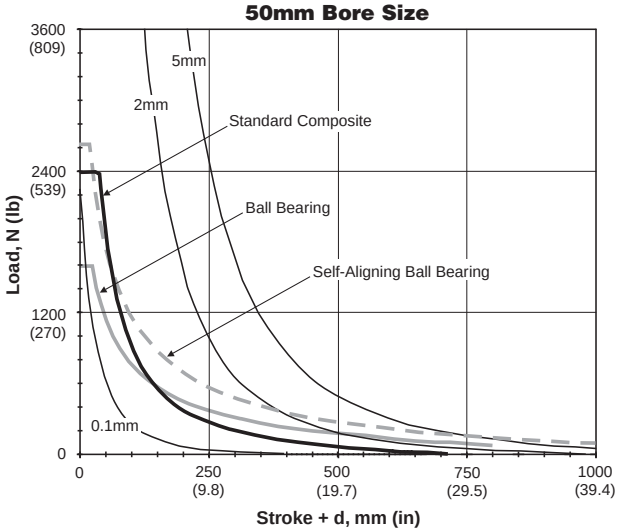
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Horizontal Load Capacity & Deflection with Standard Shafting

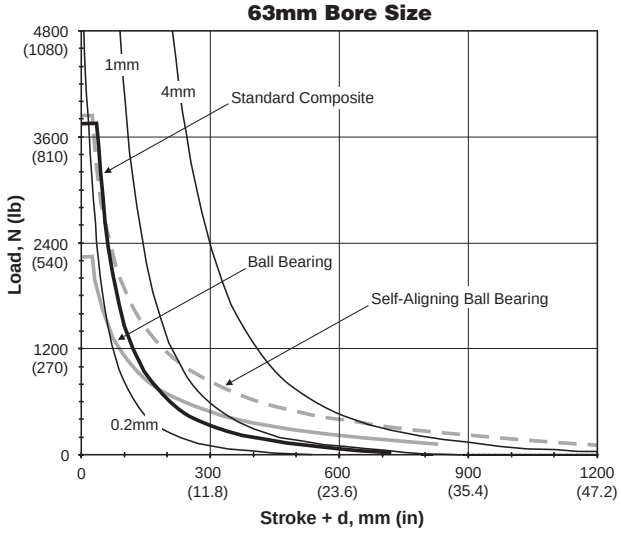


P5L Reach Slides

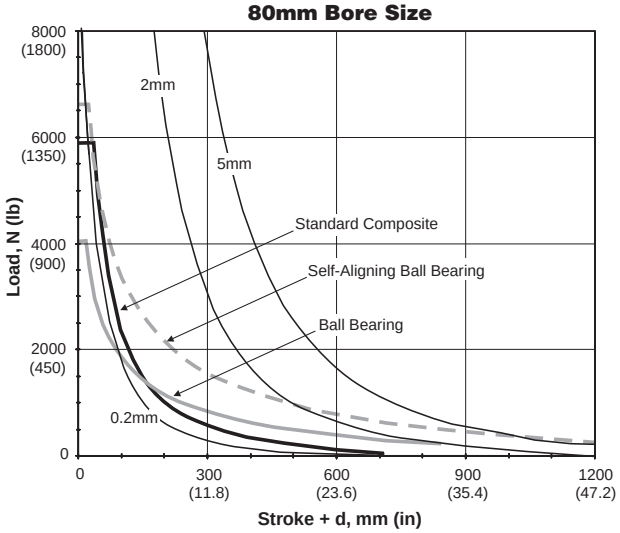
50mm Bore Size



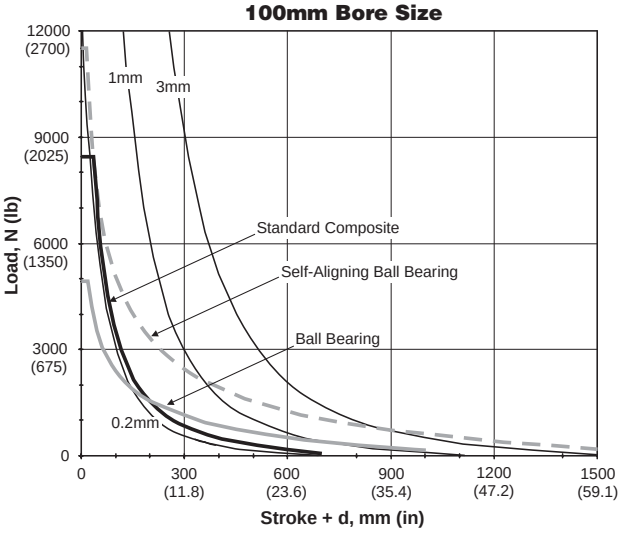
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Horizontal Load Capacity & Deflection with Oversized Shafting

- Oversized Composite w/ Chrome Plated or Stainless Steel Rods

The graphs on these two pages illustrate the maximum suggested side load at a given actuator stroke and distance (d) from the face of the tooling plate. The graphs include the weight of the support rods and tooling plate and are based on a bearing life of 10 million cycles under a dynamic loading condition. For an equivalent static load capacity multiply the information in these graphs by 1.5.

See the P5L options section of this catalog for more bearing selection information.

Dynamic loading is defined as a load which is affixed to the actuator tooling plate during the extend or retract motion of the actuator. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application.

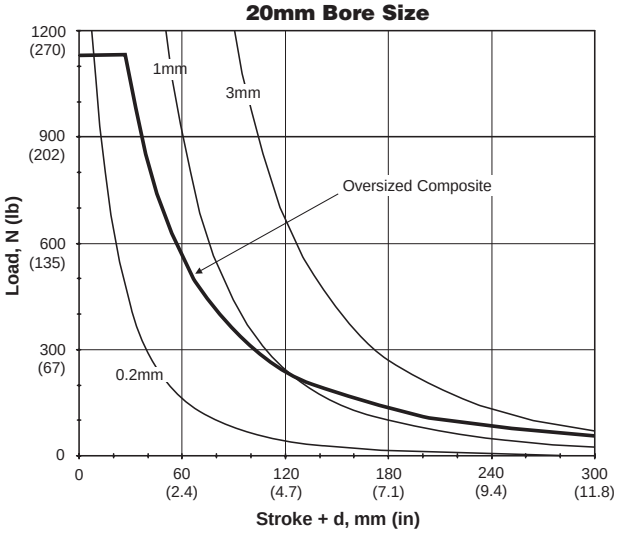
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

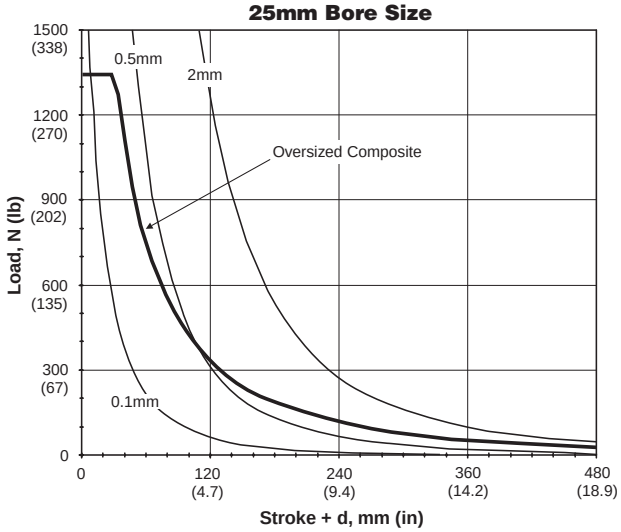
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P5L Reach Slides

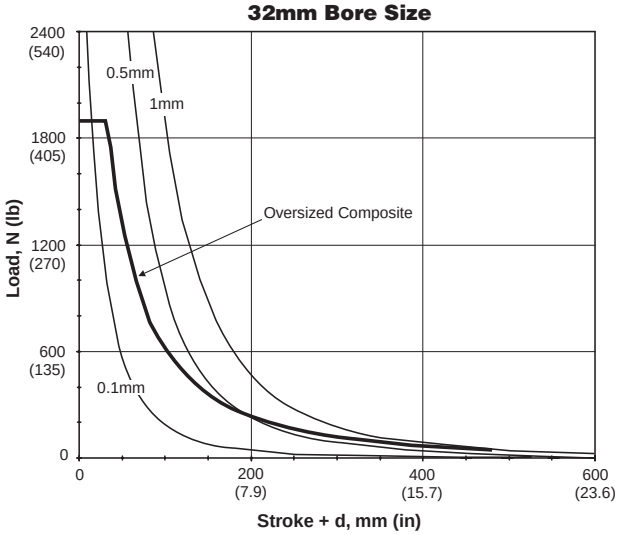
20mm Bore Size



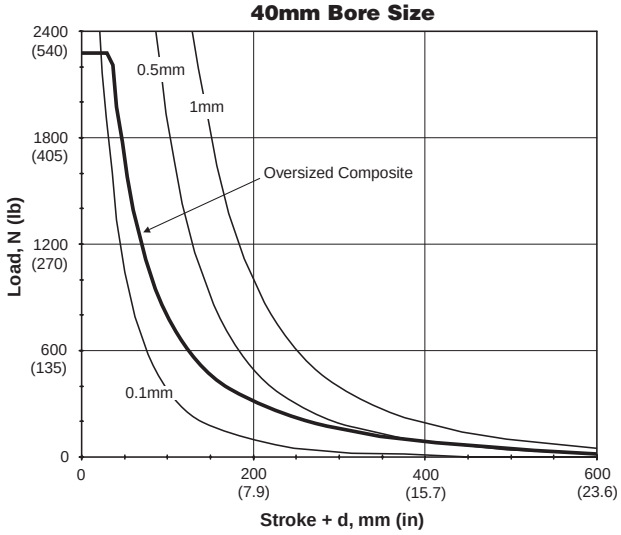
25mm Bore Size



32mm Bore Size

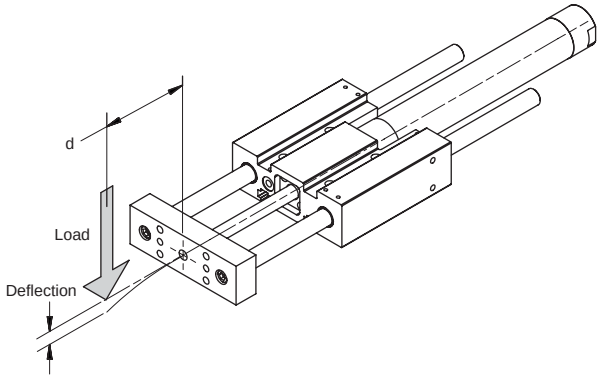


40mm Bore Size



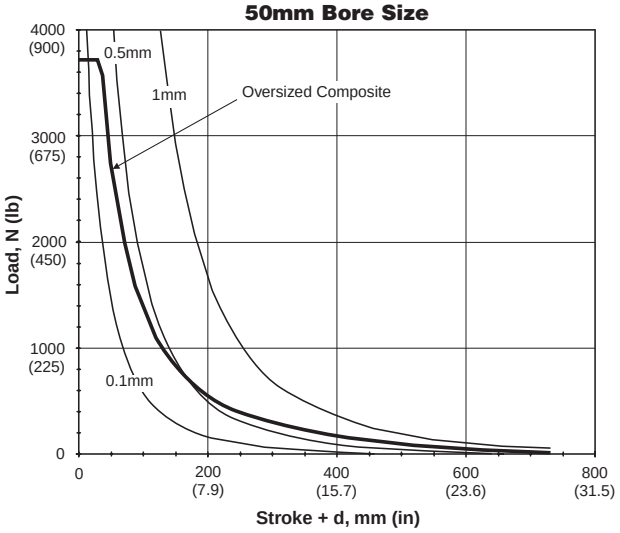
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Horizontal Load Capacity & Deflection with Oversized Shafting

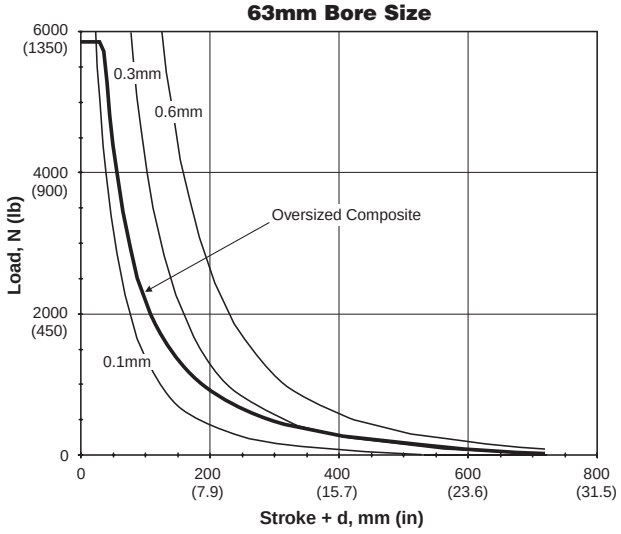


P5L Reach Slides

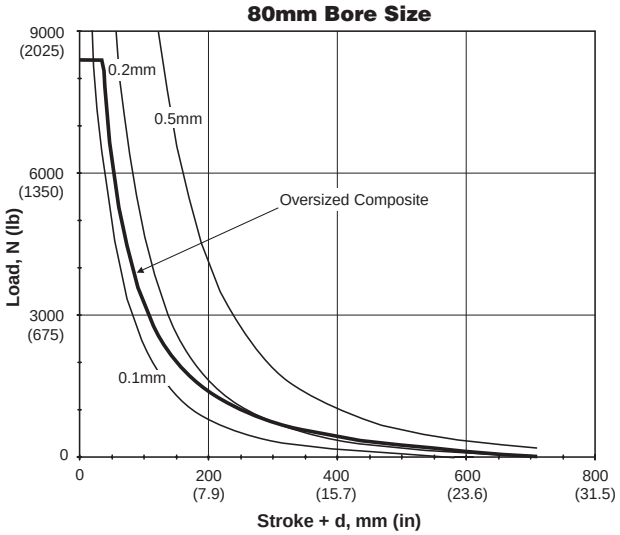
50mm Bore Size



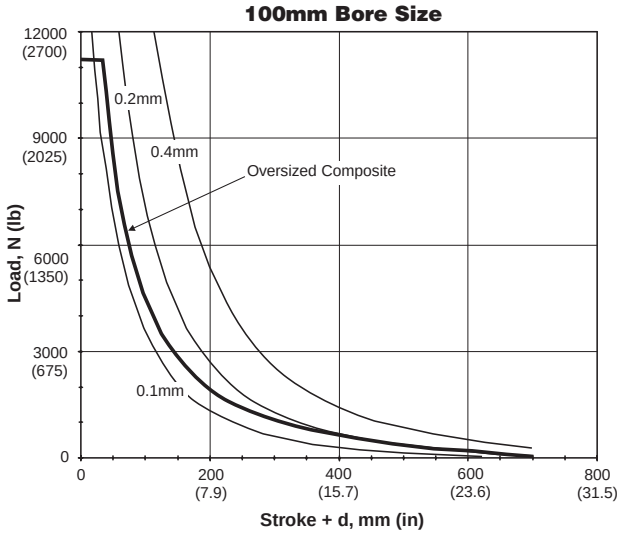
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Asymmetrical Torque Capacity

- Standard Composite w/ Chrome Plated or Stainless Steel Rods
- Oversized Composite w/ Chrome Plated or Stainless Steel Rods
- Recirculating Ball Bearings w/ Carbon or Stainless Steel Rods
- Self Aligning Ball Bearings w/ Carbon or Stainless Steel Rods

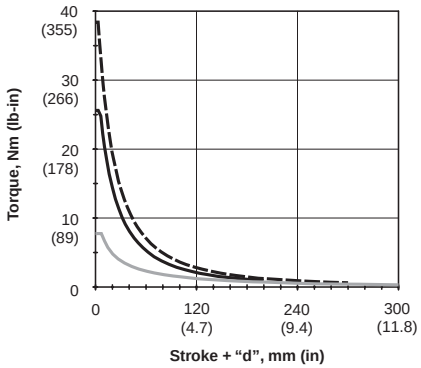
The graphs on these two pages illustrate the maximum suggested asymmetrical load at a given actuator stroke and distance (d) from the face of the tooling plate. The graphs include the weight of the support rods and tooling plate and are based on a bearing life of 10 million cycles under a dynamic loading condition. For an equivalent static load capacity multiply the information in these graphs by 1.5.

Dynamic loading is defined as a load which is affixed to the actuator tooling plate during the extend or retract motion of the actuator. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application. An asymmetrical load is defined as a perpendicular load applied at some horizontal distance, "m" from the center of the tooling plate.

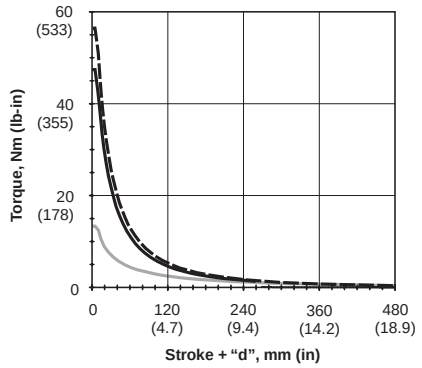
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P5L Thrust Slides

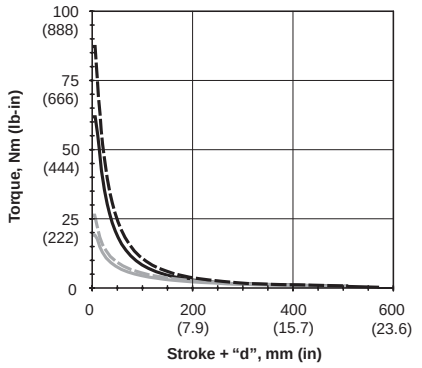
20mm Bore Size



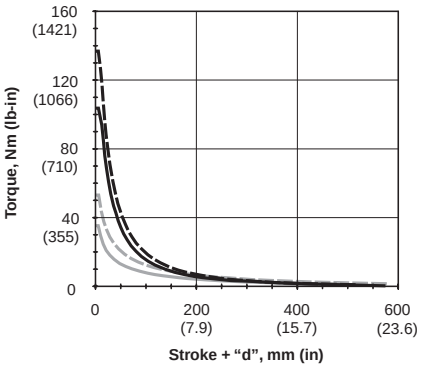
25mm Bore Size



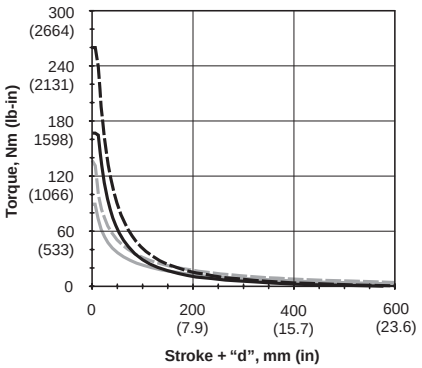
32mm Bore Size



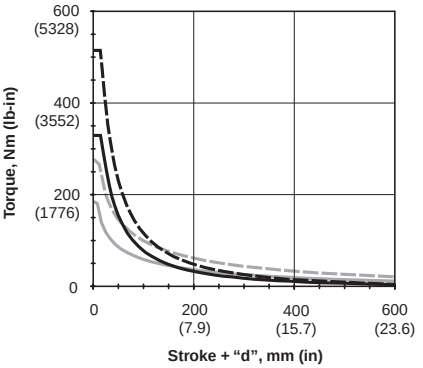
40mm Bore Size



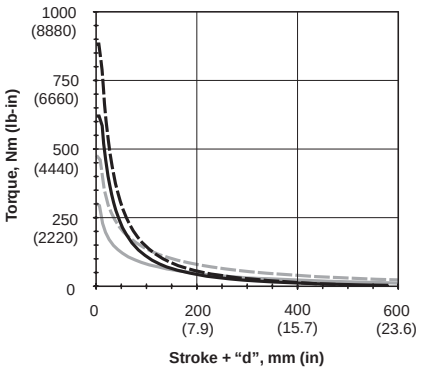
50mm Bore Size



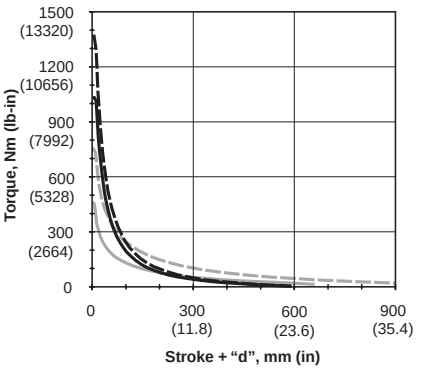
63mm Bore Size

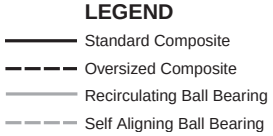


80mm Bore Size



100mm Bore Size



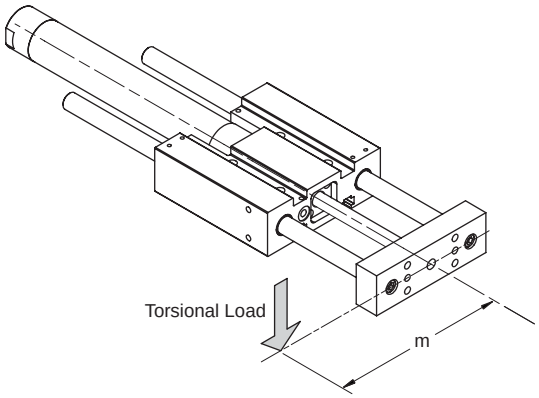


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Asymmetrical Torque Capacity

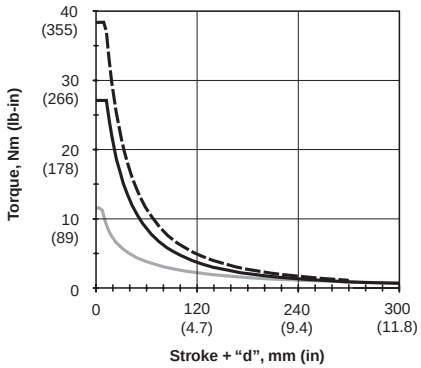
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

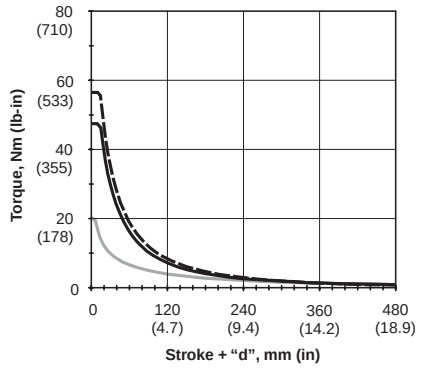


P5L Reach Slides

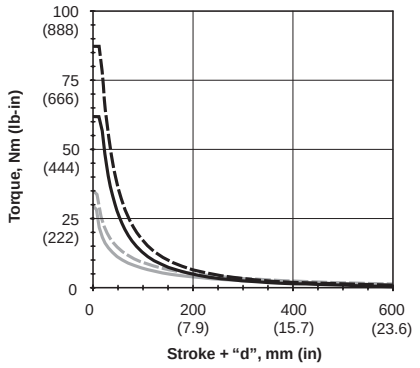
20mm Bore Size



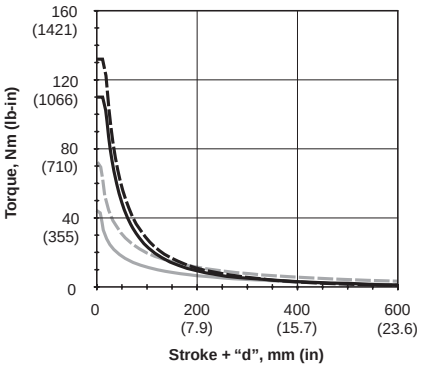
25mm Bore Size



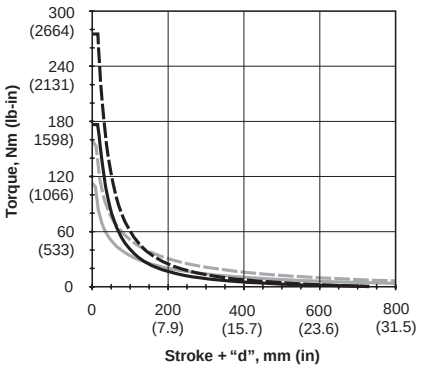
32mm Bore Size



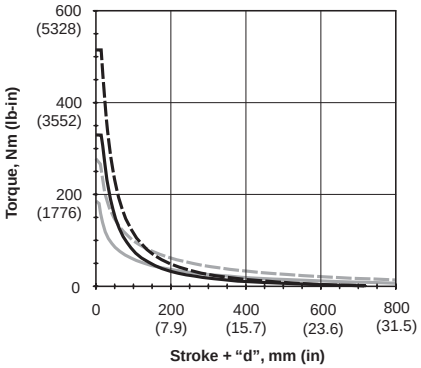
40mm Bore Size



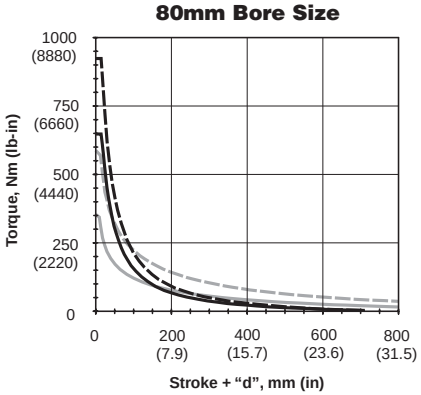
50mm Bore Size



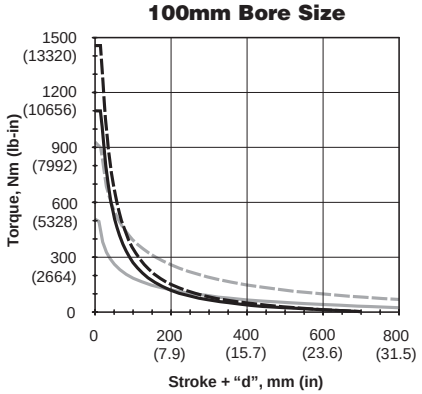
63mm Bore Size



80mm Bore Size



100mm Bore Size



LEGEND

- Standard Composite
- Oversized Composite
- Recirculating Ball Bearing
- Self Aligning Ball Bearing

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Vertical Eccentric Load Capacity

- Standard Composite w/ Chrome Plated or Stainless Steel Rods
- Oversized Composite w/ Chrome Plated or Stainless Steel Rods
- Recirculating Ball Bearings w/ Carbon or Stainless Steel Rods
- Self Aligning Ball Bearings w/ Carbon or Stainless Steel Rods

The graphs on these two pages illustrate the maximum suggested eccentric load based on a stroke of 100mm (4 inches).

An eccentric load is defined as a load applied in the same direction as the motion of the cylinder however, acting at some distance (eccentricity "h") from the center of the tooling plate. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application.

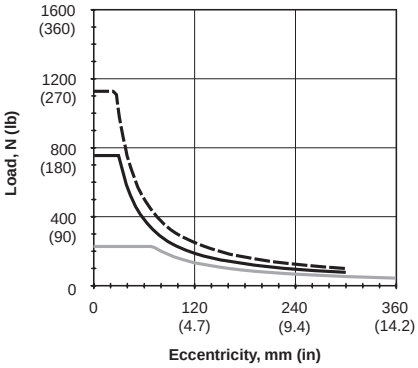
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

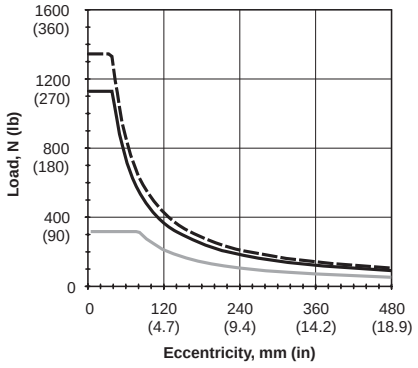
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P5L Thrust Slides

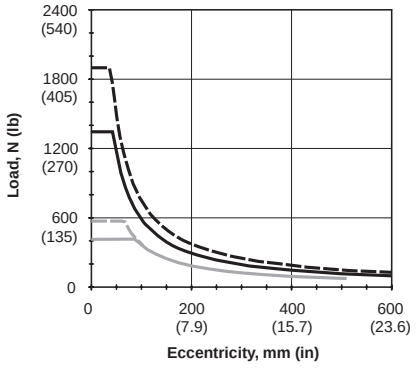
20mm Bore Size



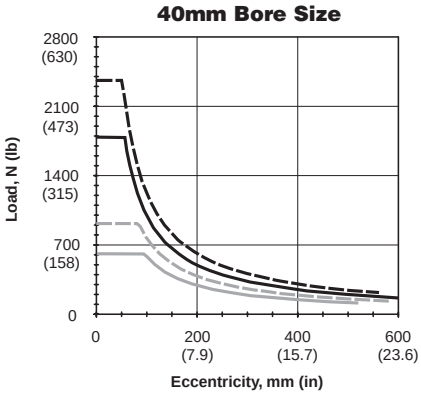
25mm Bore Size



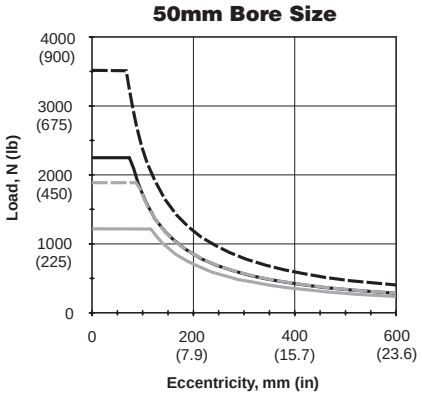
32mm Bore Size



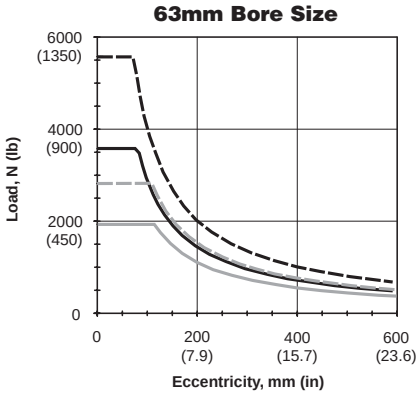
40mm Bore Size



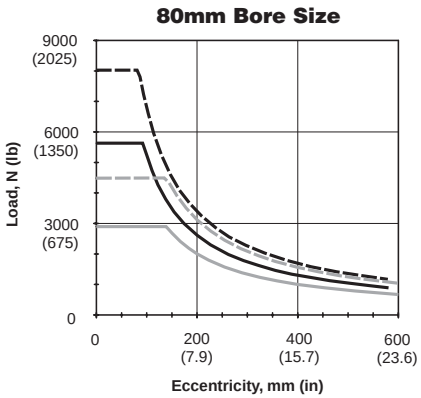
50mm Bore Size



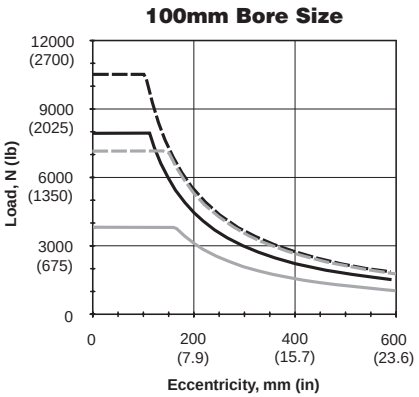
63mm Bore Size

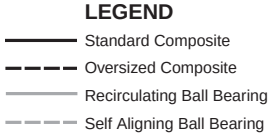


80mm Bore Size



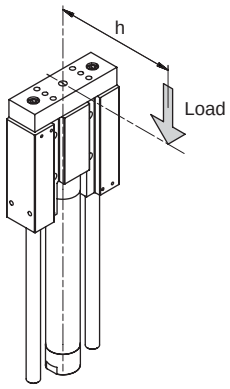
100mm Bore Size





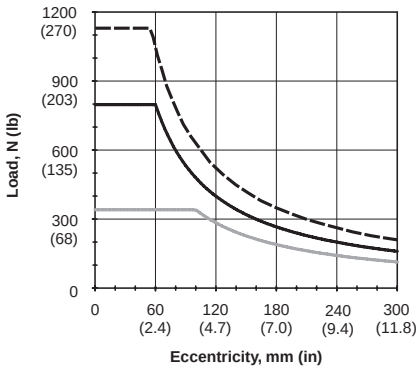
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Vertical Eccentric Load Capacity

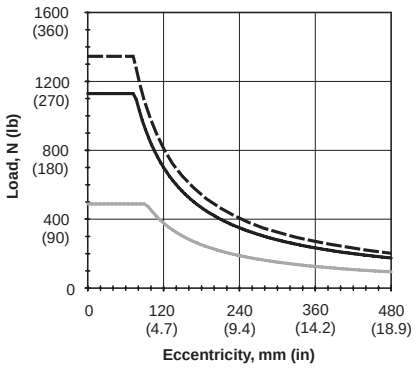


P5L Reach Slides

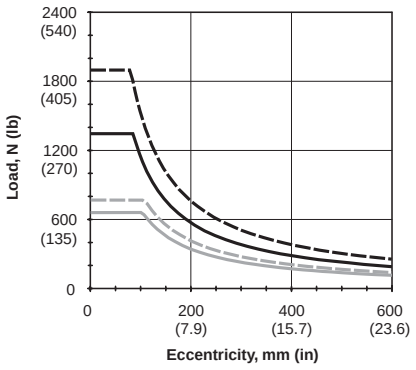
20mm Bore Size



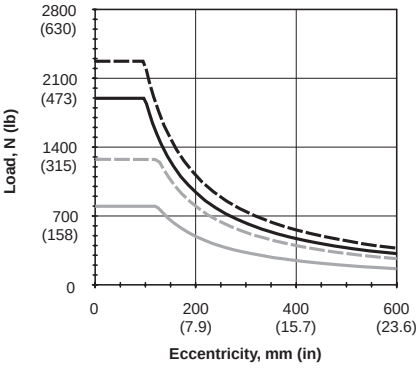
25mm Bore Size



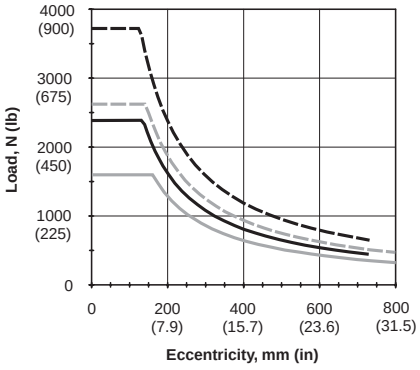
32mm Bore Size



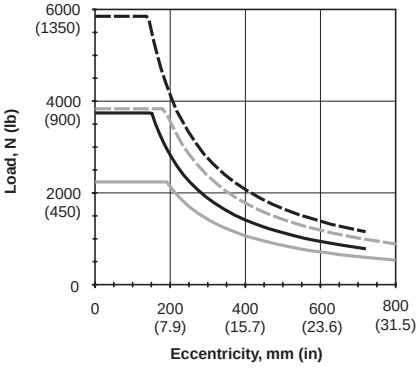
40mm Bore Size



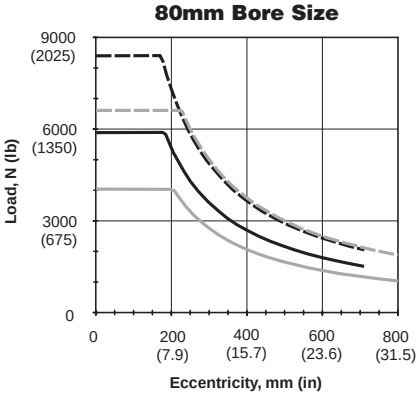
50mm Bore Size



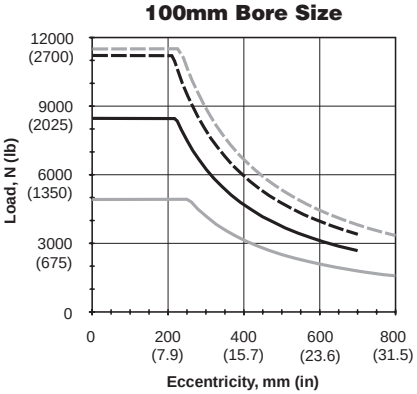
63mm Bore Size

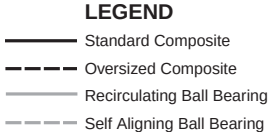


80mm Bore Size



100mm Bore Size





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Load Stopping Capacity

- Standard Composite w/ Chrome Plated or Stainless Steel Rods
- Oversized Composite w/ Chrome Plated or Stainless Steel Rods

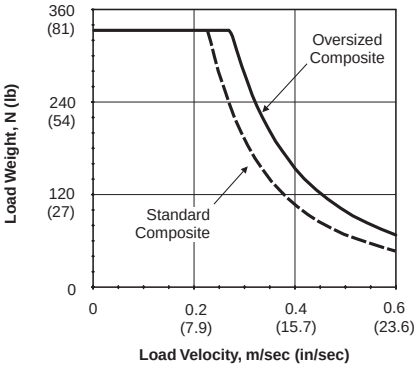
The P5L series can be used in conveyor stopping applications. The graphs on these two pages illustrate the maximum stopping or impact capacity for the P5L Series. The maximum stopping capacity will vary with actuator stroke. These graphs are based on a stroke of 50mm (2 inches), assuming that the moving load is moving perpendicularly to the support rods. Care should be taken to ensure that the support rods are not damaged during this type of loading. The load should also be centered on the tooling plate.

Note: Ball bearings should not be used in this type of application.

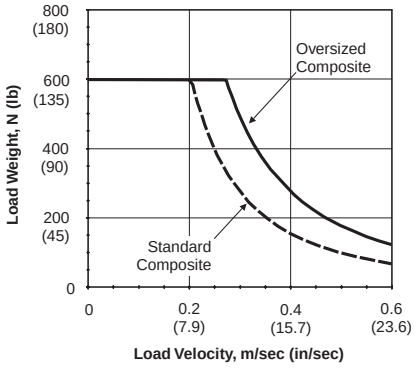
F

P5L Thrust Slides

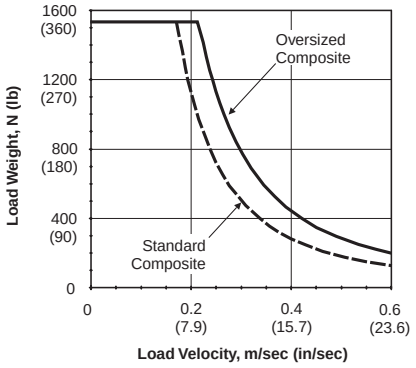
20mm Bore Size



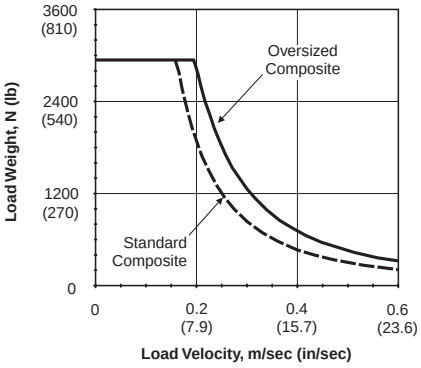
25mm Bore Size



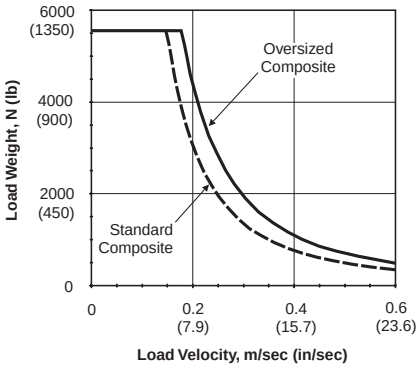
32mm Bore Size



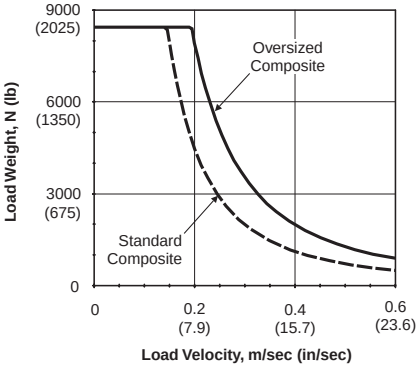
40mm Bore Size



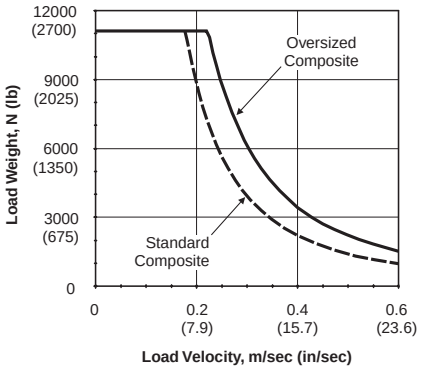
50mm Bore Size



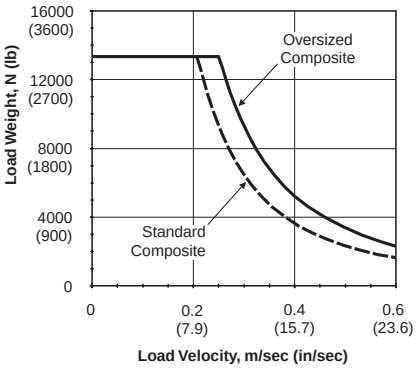
63mm Bore Size



80mm Bore Size

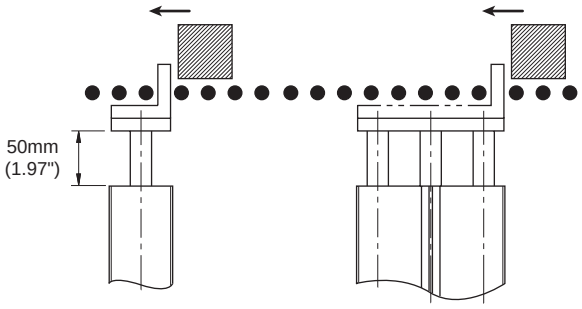


100mm Bore Size



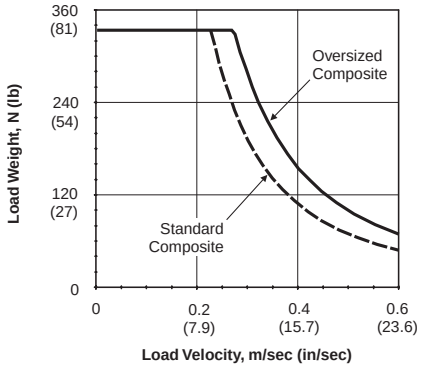
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Load Stopping Capacity

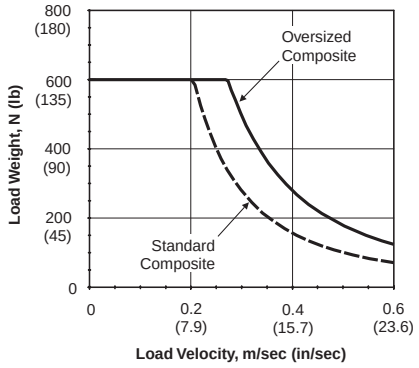


P5L Reach Slides

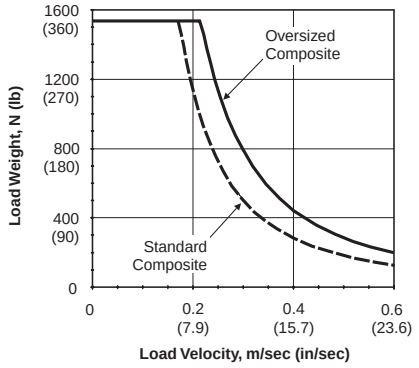
20mm Bore Size



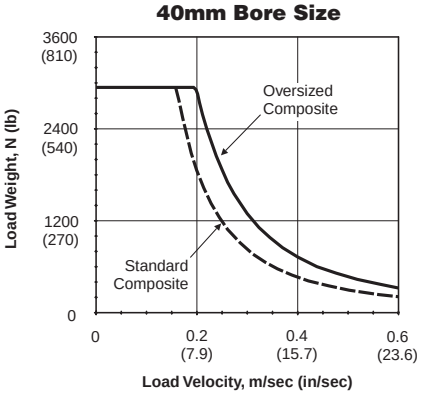
25mm Bore Size



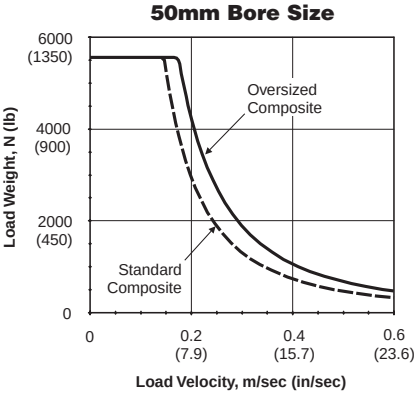
32mm Bore Size



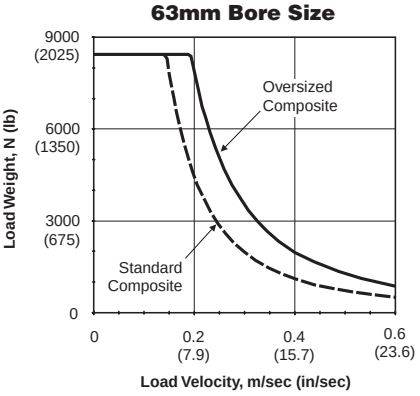
40mm Bore Size



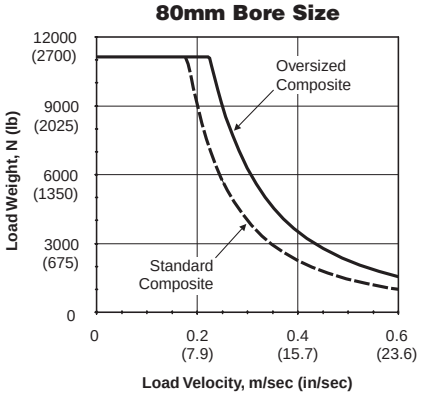
50mm Bore Size



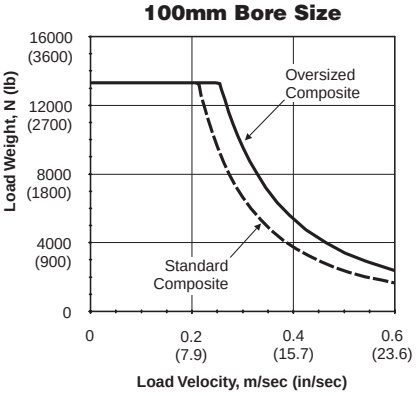
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Kinetic Energy

These graphs illustrate the kinetic energy absorption of the P5L series as a total moving weight versus speed chart for both air cushions and shock absorbers.

Moving weight is defined as the weight of the carried load and the weight of any moving parts of the actuator (support rods, tooling plate, etc.). The moving weight from the charts on page F73 should be considered.

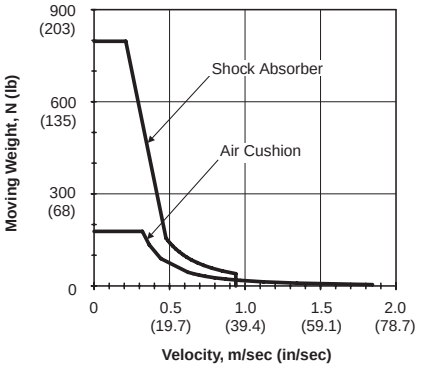
Actuator Moving Weight =
Base Unit Weight + (Stroke × Per Inch Weight)

Total Moving Weight =
Actuator Moving Weight + Carried Load

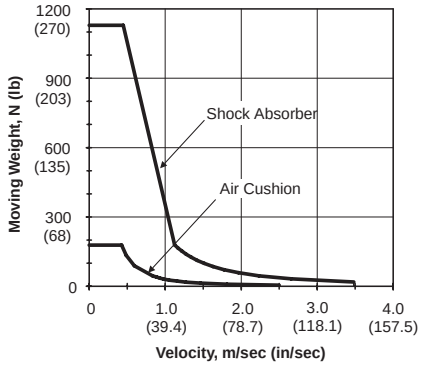
Note: These charts are to be used only to determine the energy absorption of each guided cylinder and to determine if shocks or cushions are needed.

P5L Thrust Slides

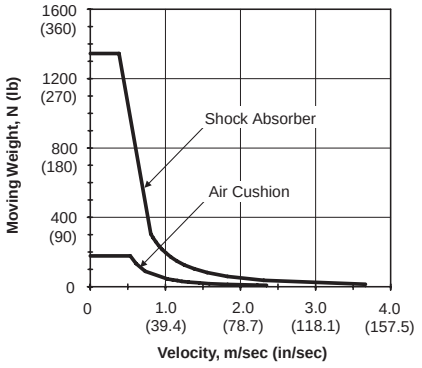
20mm Bore Size



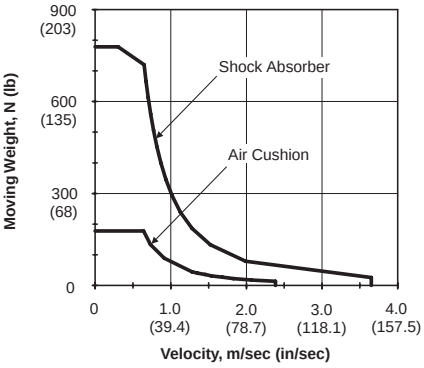
25mm Bore Size



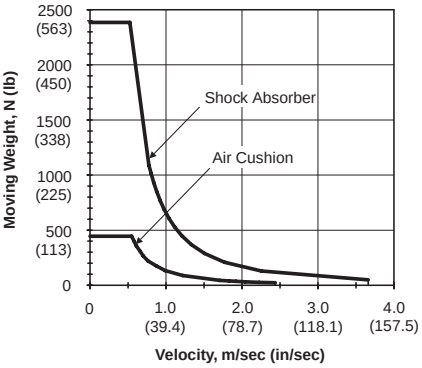
32mm Bore Size



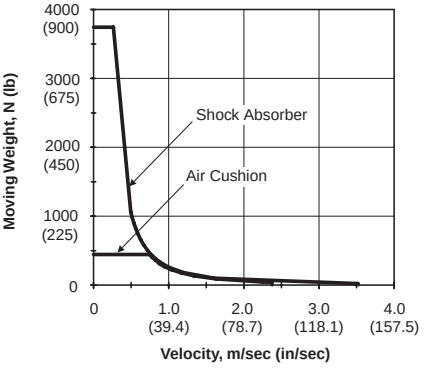
40mm Bore Size



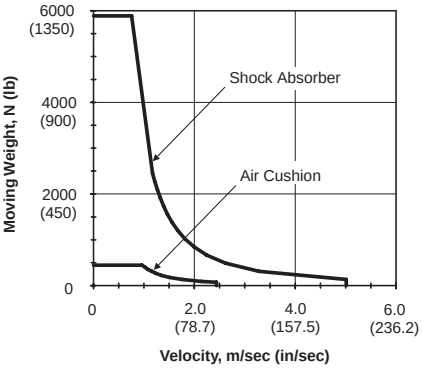
50mm Bore Size



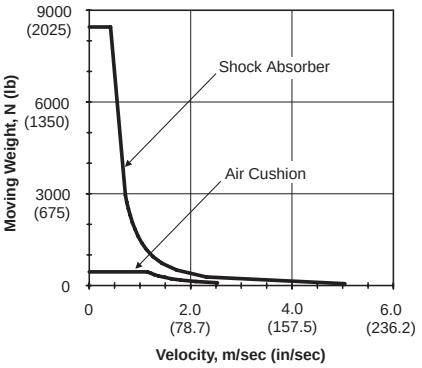
63mm Bore Size



80mm Bore Size



100mm Bore Size

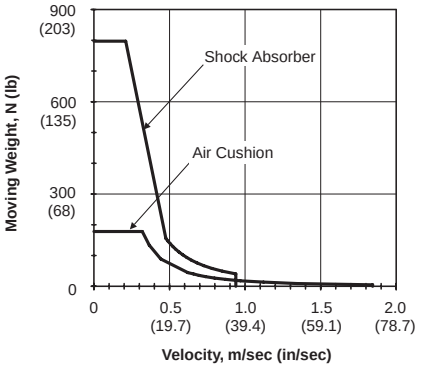


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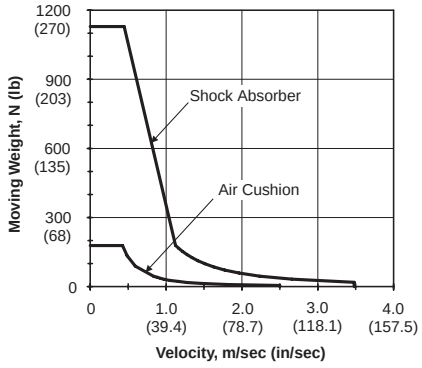
Bore	Moving Weights (Standard Shaft)						Moving Weights (Oversized Shaft)					
	Basic Thrust Unit		Basic Reach Unit		Per Inch		Basic Thrust Unit		Basic Reach Unit		Per Inch	
	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs
20	0.27	0.6	0.32	0.7	0.02	0.05	0.35	0.8	0.43	0.96	0.03	0.07
25	0.45	1.0	0.53	1.2	0.03	0.07	0.68	1.5	0.85	1.88	0.06	0.13
32	0.78	1.7	0.95	2.1	0.06	0.13	1.15	2.5	1.45	3.20	0.09	0.21
40	1.4	3.2	1.7	3.8	0.09	0.21	2.2	4.7	2.82	6.2	0.15	0.32
50	2.8	6.1	3.4	7.5	0.15	0.32	4.0	8.8	5.21	11.5	0.21	0.47
63	4.7	10.5	6.0	13.2	0.21	0.47	7.5	16.6	10.27	22.6	0.38	0.83
80	9.0	19.7	11.7	25.8	0.26	0.58	13.9	30.7	19.08	42.1	0.59	1.29
100	16.4	36.2	21.6	47.6	0.59	1.29	18.1	40.0	25.57	56.4	0.84	1.86

P5L Reach Slides

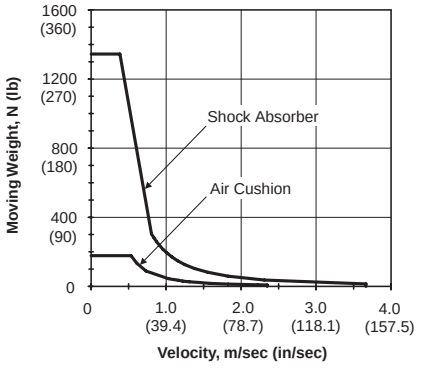
20mm Bore Size



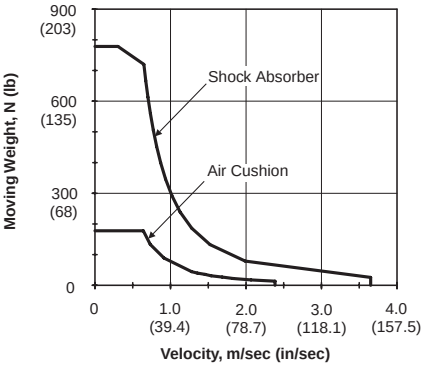
25mm Bore Size



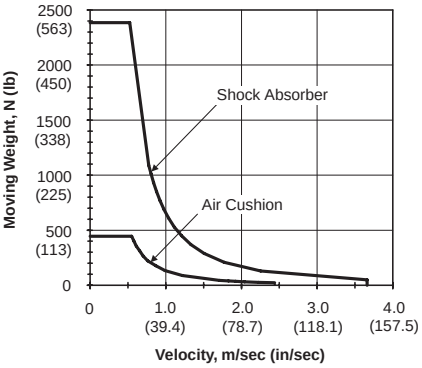
32mm Bore Size



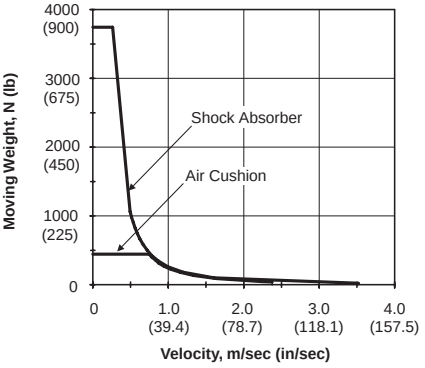
40mm Bore Size



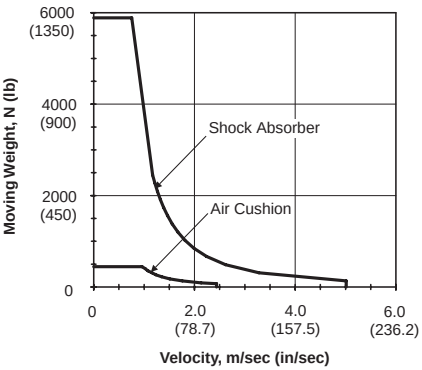
50mm Bore Size



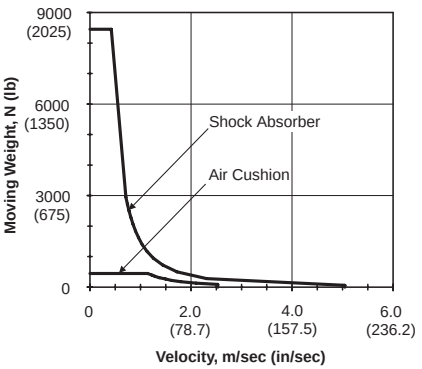
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Horizontal Load Capacity & Deflection with Standard Shafting

- Standard Composite w/ Chrome Plated or Stainless Steel Rods
- Recirculating Ball Bearings w/ Carbon or Stainless Steel Rods
- Self Aligning Ball Bearings w/ Carbon or Stainless Steel Rods

The graphs on these two pages illustrate the maximum suggested side load at a given actuator stroke. The graphs include the weight of the carriage and are based on a bearing life of 10 million cycles under a dynamic loading condition. For an equivalent static load capacity multiply the information in these graphs by 1.5.

See the P5L options section of this catalog for more bearing selection information.

Dynamic loading is defined as a load which is affixed to the actuator tooling plate during the extend or retract motion of the actuator. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application.

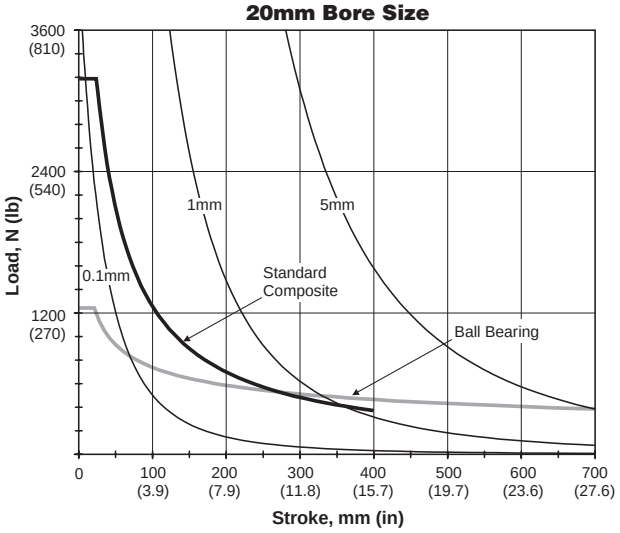
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

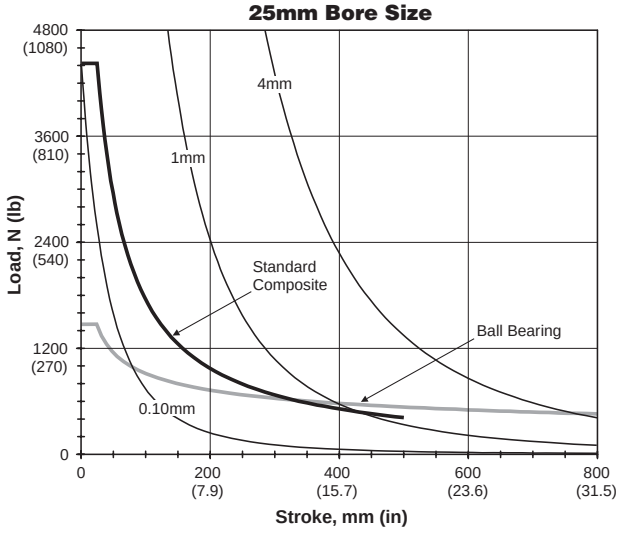
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P5L Base Slides

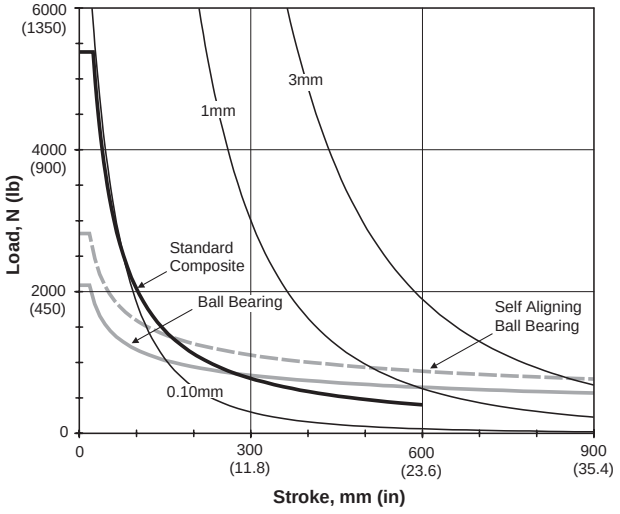
20mm Bore Size



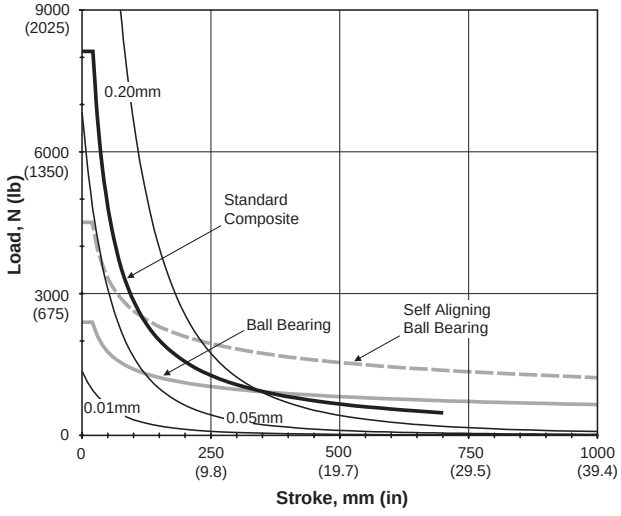
25mm Bore Size



32mm Bore Size

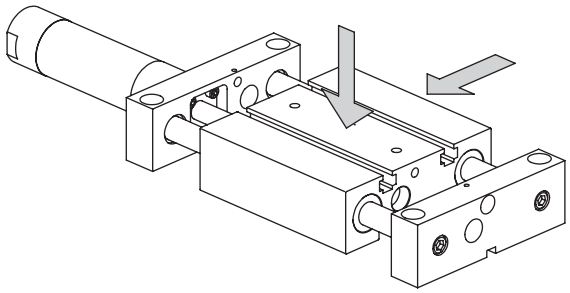


40mm Bore Size



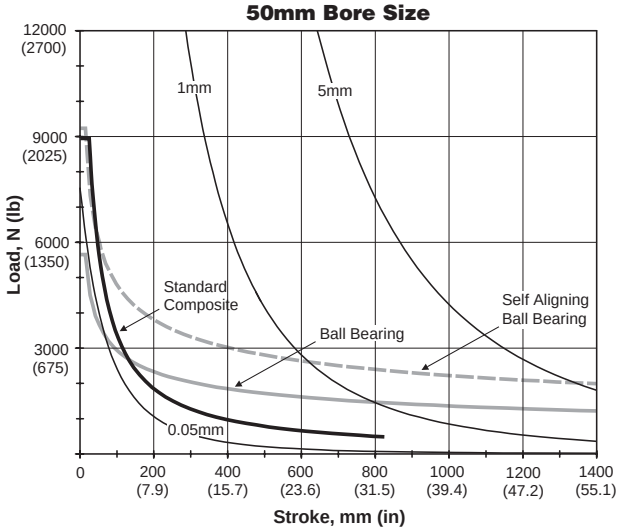
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Wadsworth, Ohio
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Horizontal Load Capacity & Deflection with Standard Shafting

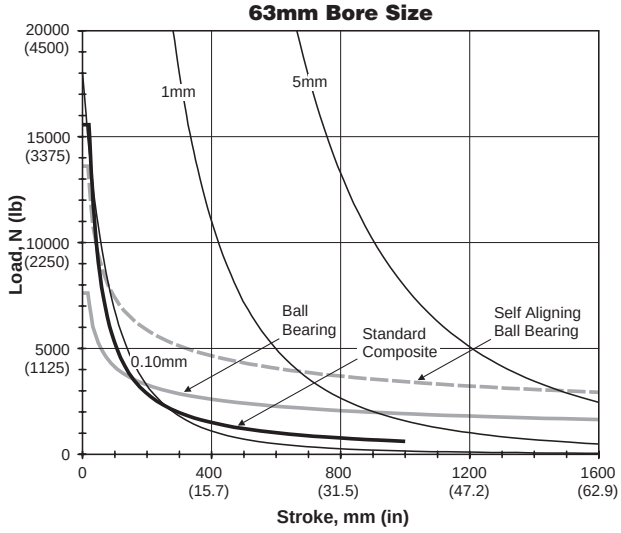


P5L Base Slides

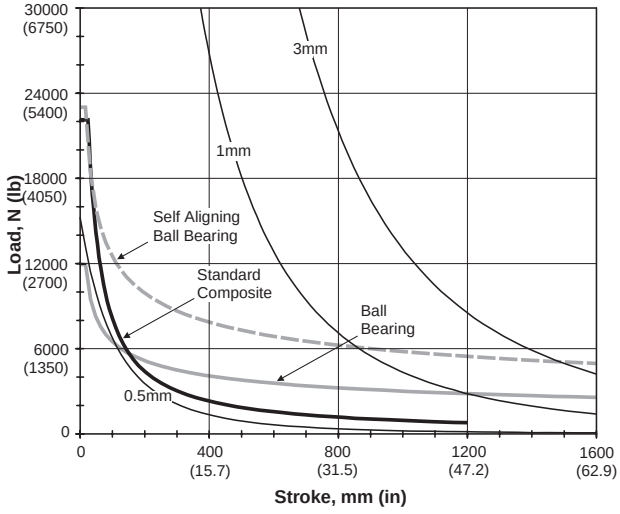
50mm Bore Size



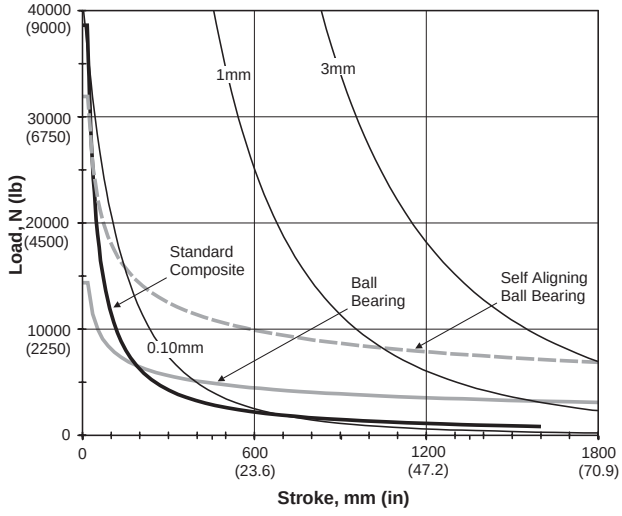
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Horizontal Load Capacity & Deflection with Oversized Shafting

- Oversized Composite w/ Chrome Plated or Stainless Steel Rods

The graphs on these two pages illustrate the maximum suggested side load at a given actuator stroke. The graphs include the weight of the carriage and are based on a bearing life of 10 million cycles under a dynamic loading condition. For an equivalent static load capacity multiply the information in these graphs by 1.5.

See the P5L options section of this catalog for more bearing selection information.

Dynamic loading is defined as a load which is affixed to the actuator tooling plate during the extend or retract motion of the actuator. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application.

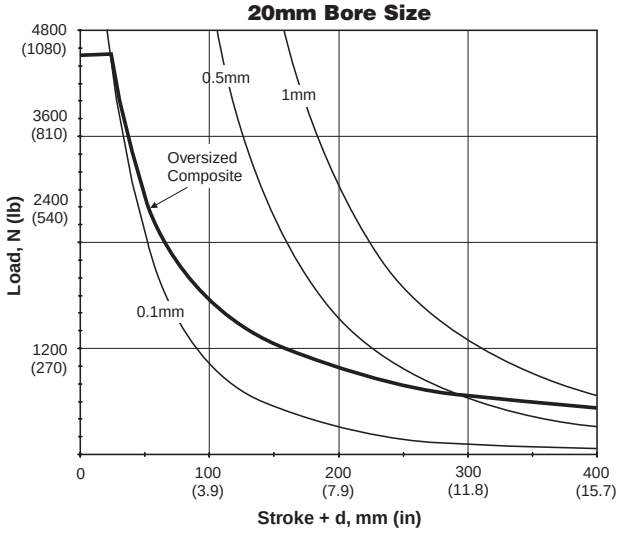
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

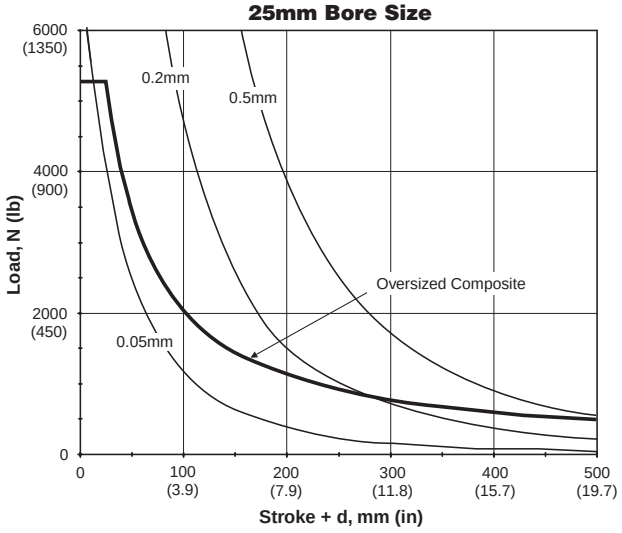
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P5L Base Slides

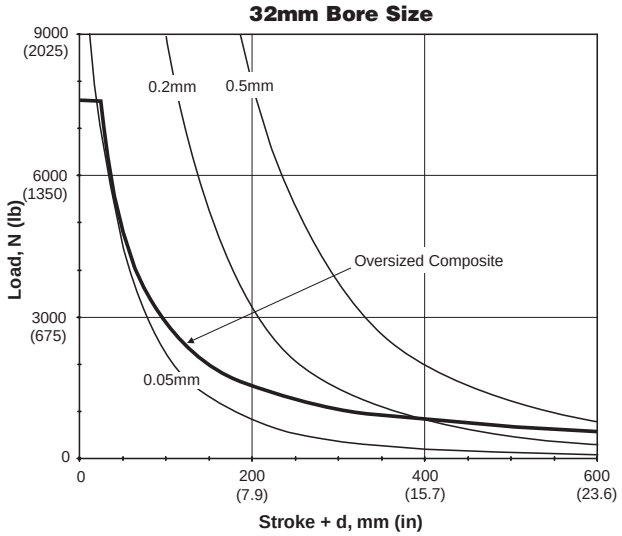
20mm Bore Size



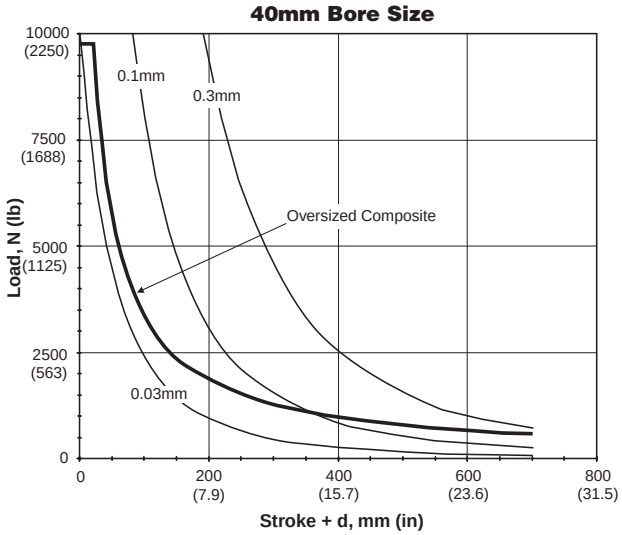
25mm Bore Size



32mm Bore Size

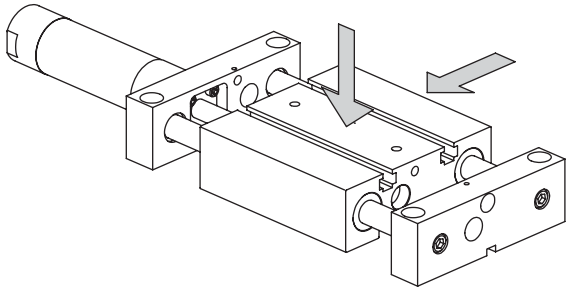


40mm Bore Size

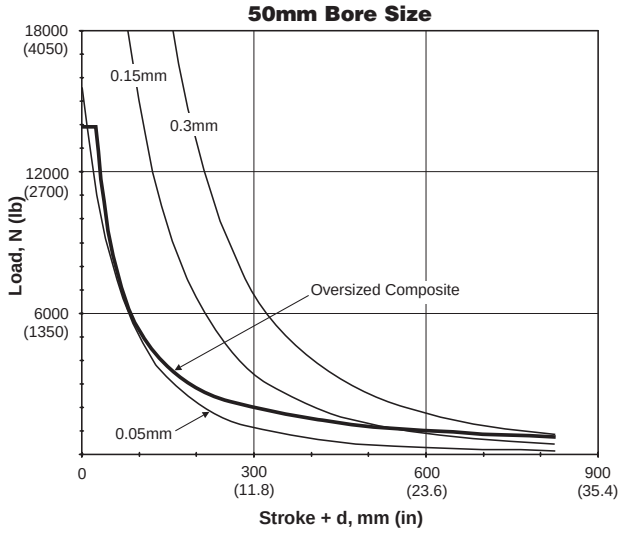


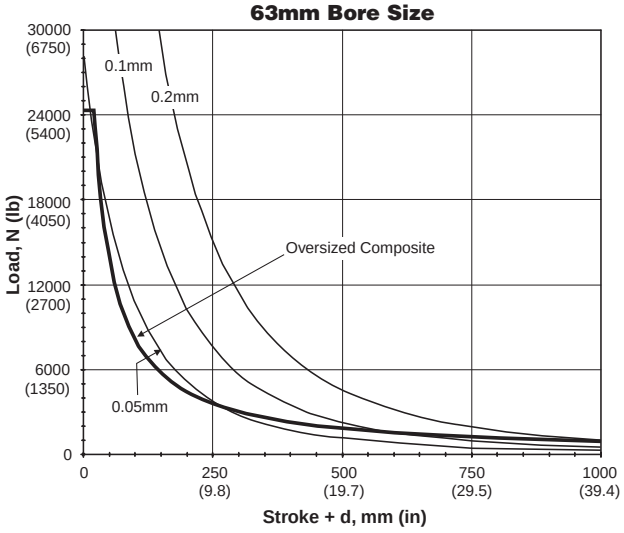
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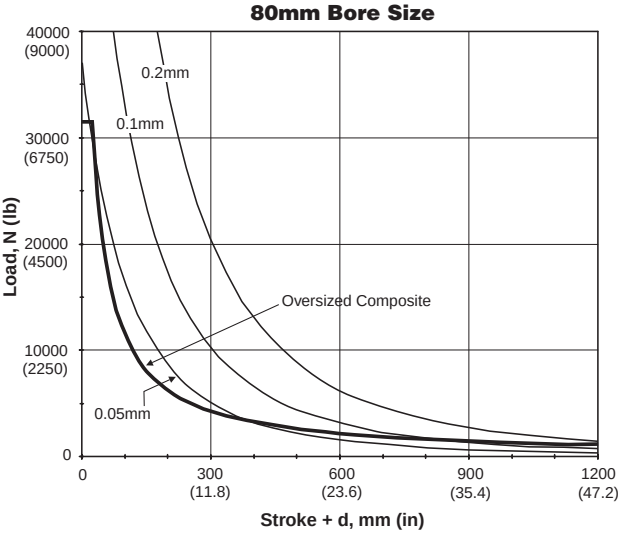
Horizontal Load Capacity & Deflection with Oversized Shafting

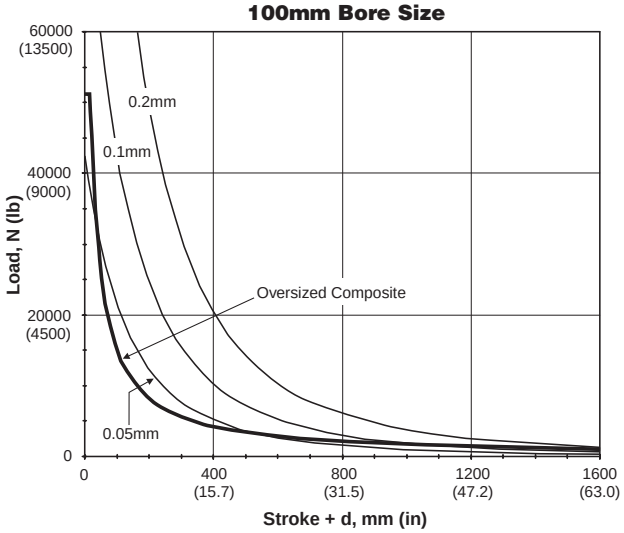


P5L Base Slides









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Symmetrical Roll Torsional Loading

The graphs on these two pages illustrate the maximum suggested roll load at a given actuator stroke. It is assumed that the moment loading is acting about the centerline of the carriage. The graphs include the weight of the carriage and are based on a bearing life of 10 million cycles under a dynamic loading condition. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application. For an equivalent static load capacity multiply the information in these graphs by 1.5.

Heavy lines show loading; lighter lines show various degrees of deflection.

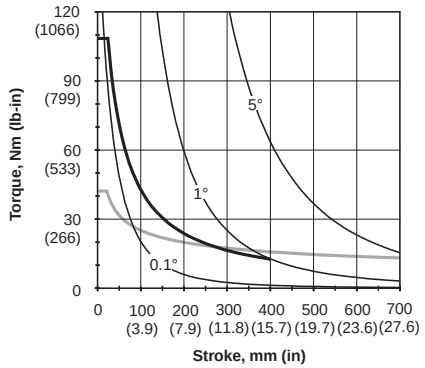
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

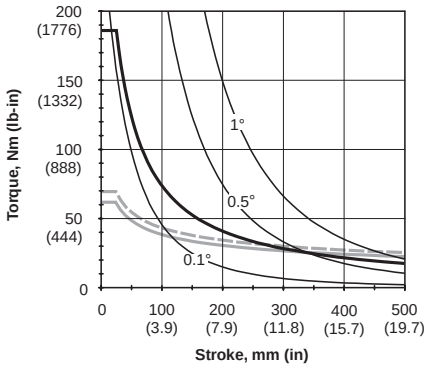
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Standard Shafting

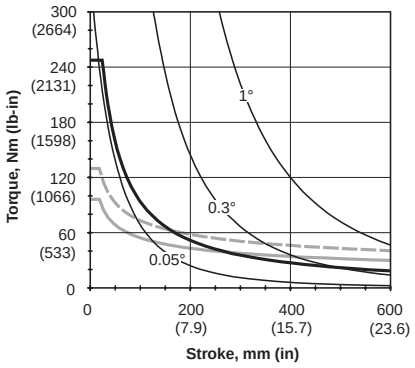
20mm Bore Size



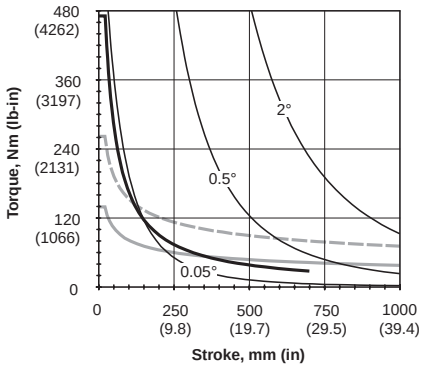
25mm Bore Size



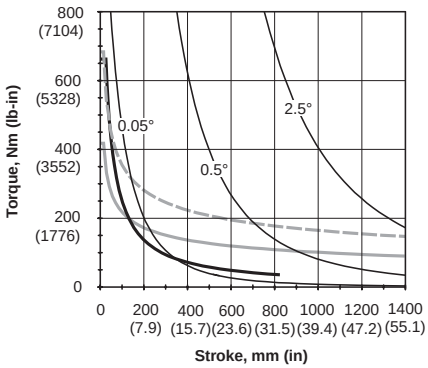
32mm Bore Size



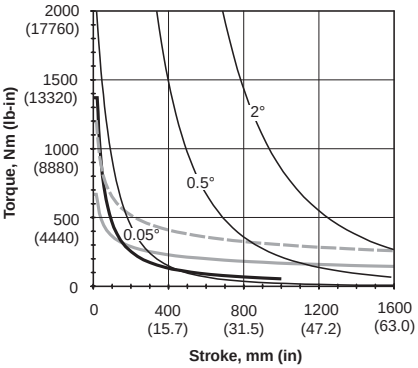
40mm Bore Size



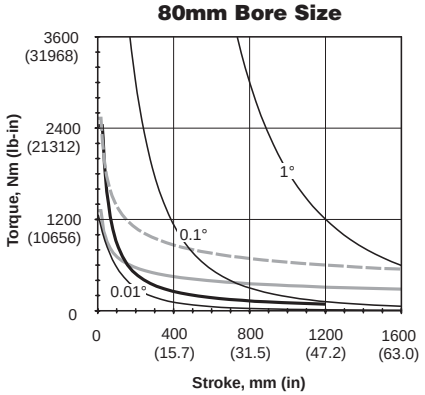
50mm Bore Size



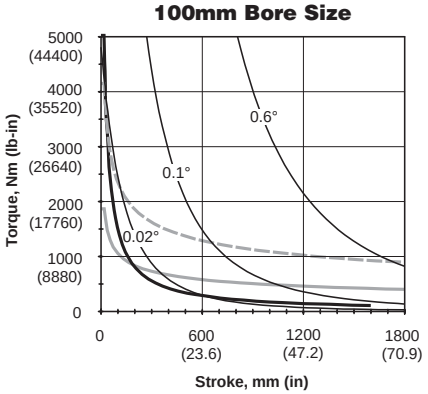
63mm Bore Size



80mm Bore Size



100mm Bore Size

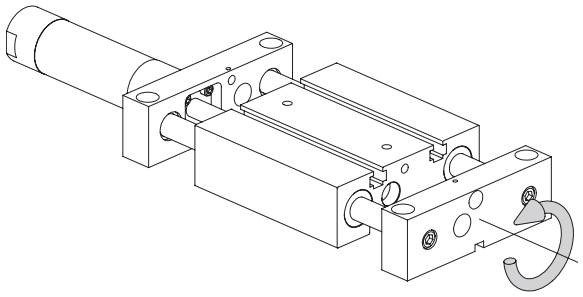


LEGEND

- Standard Composite
- Recirculating Ball Bearing
- Self Aligning Ball Bearing

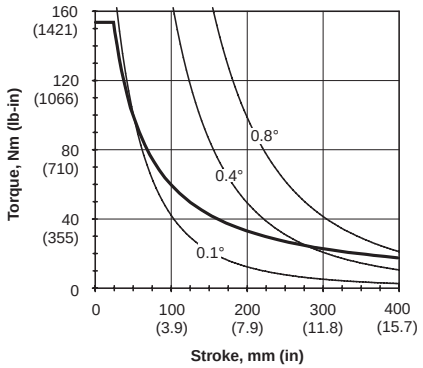
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Symmetrical Roll Torsional Loading

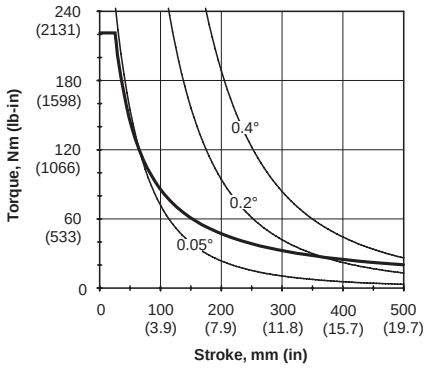


Oversized Shafting

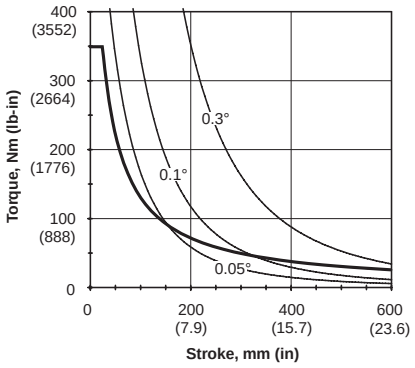
20mm Bore Size



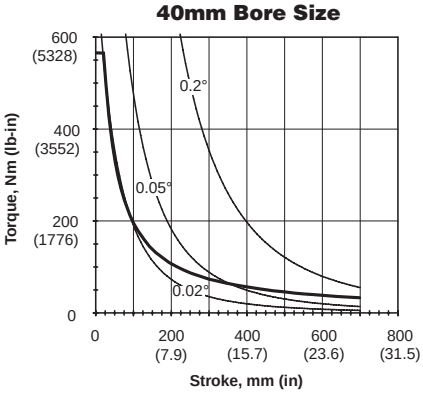
25mm Bore Size



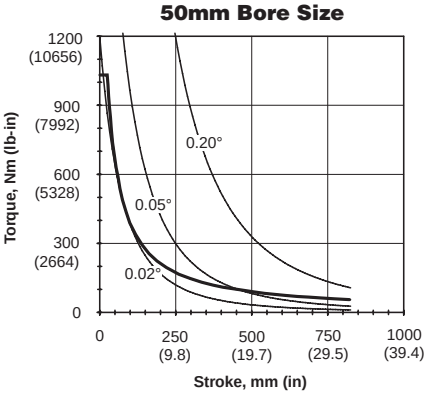
32mm Bore Size



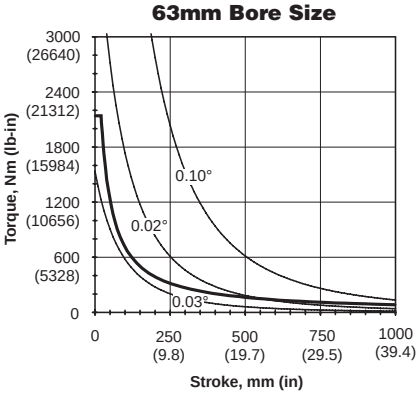
40mm Bore Size



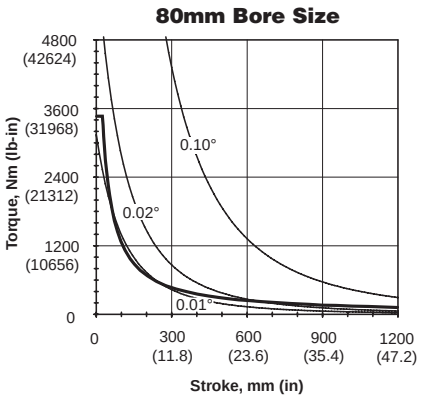
50mm Bore Size



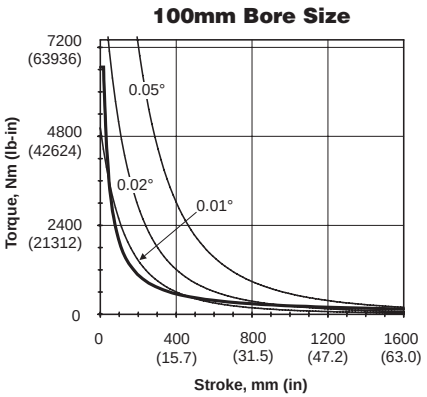
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Symmetrical Pitch Torsional Loading

The graphs on these two pages illustrate the maximum suggested pitch load at a given actuator stroke. It is assumed that the moment loading is acting about the centerline of the carriage. The graphs include the weight of the carriage and are based on a bearing life of 10 million cycles under a dynamic loading condition. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application. For an equivalent static load capacity multiply the information in these graphs by 1.5.

Heavy lines show loading; lighter lines show various degrees of deflection.

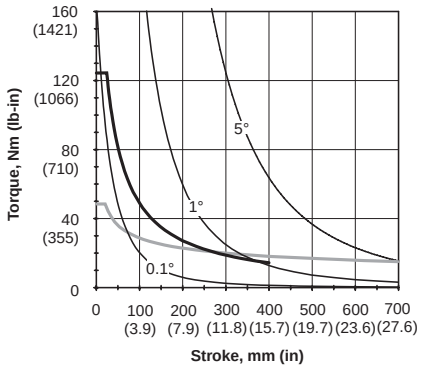
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

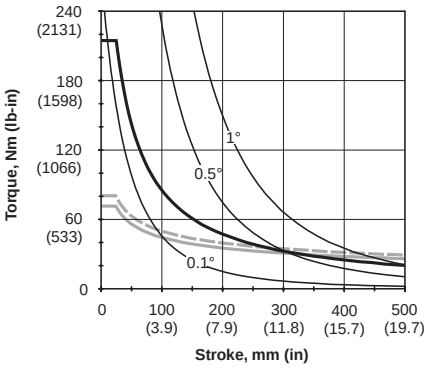
F

Standard Shafting

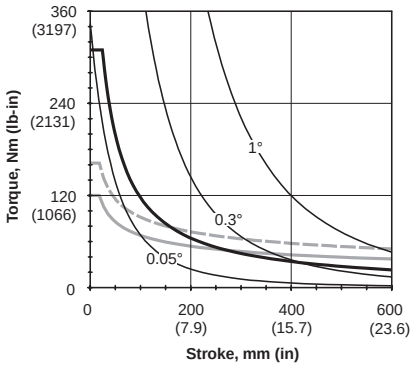
20mm Bore Size



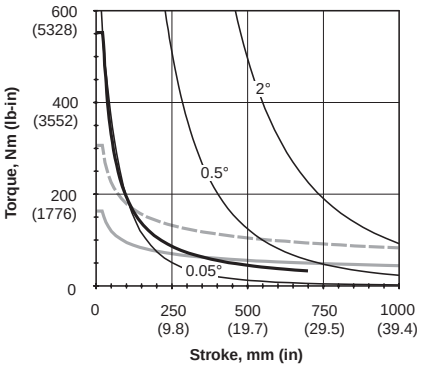
25mm Bore Size



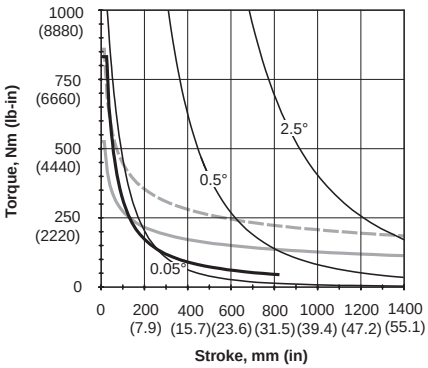
32mm Bore Size



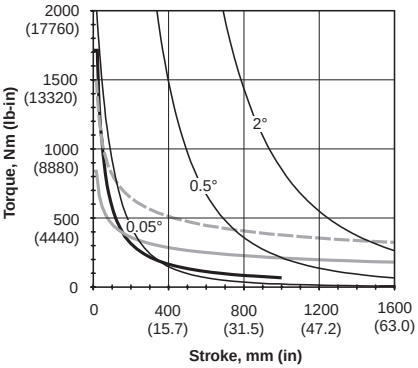
40mm Bore Size



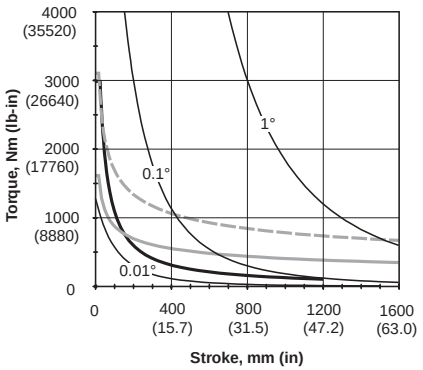
50mm Bore Size



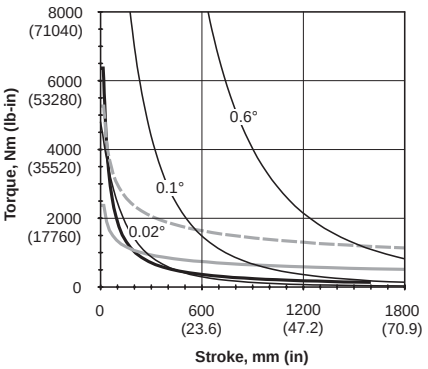
63mm Bore Size



80mm Bore Size



100mm Bore Size

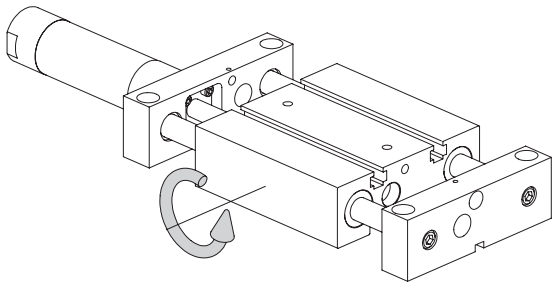


LEGEND

- Standard Composite
- Recirculating Ball Bearing
- Self Aligning Ball Bearing

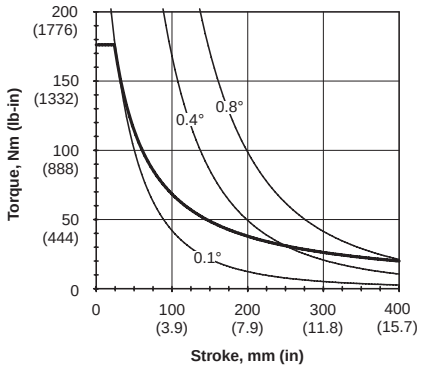
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Symmetrical Pitch Torsional Loading

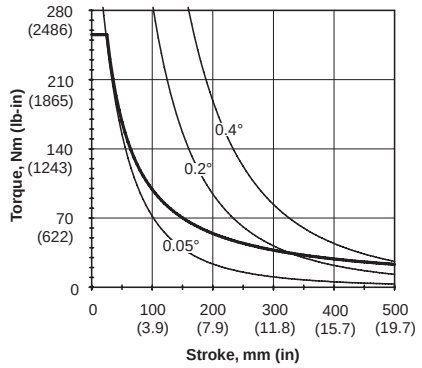


Oversized Shafting

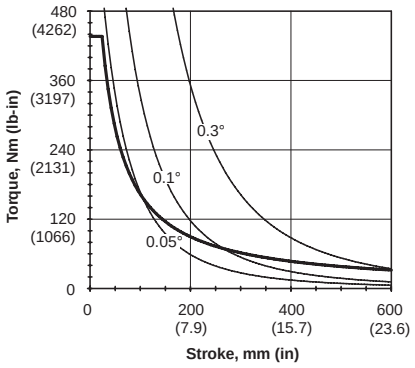
20mm Bore Size



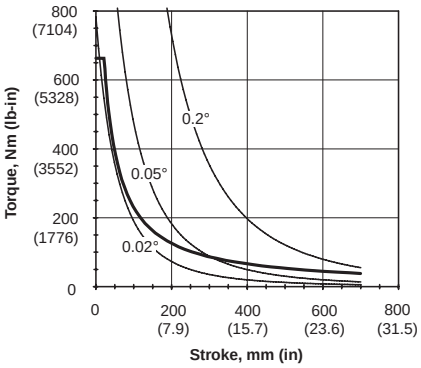
25mm Bore Size



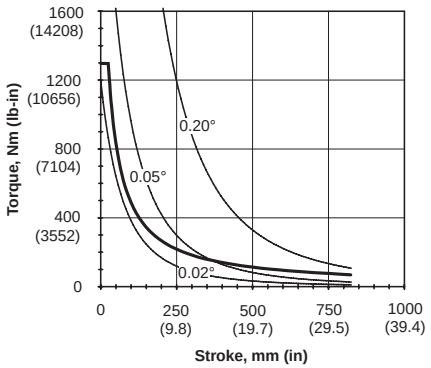
32mm Bore Size



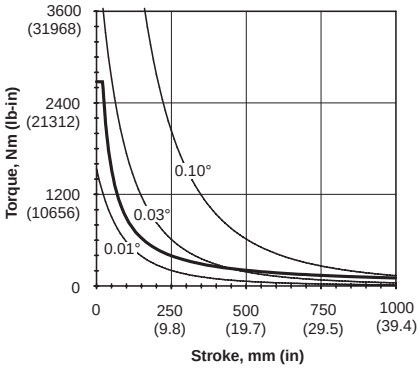
40mm Bore Size



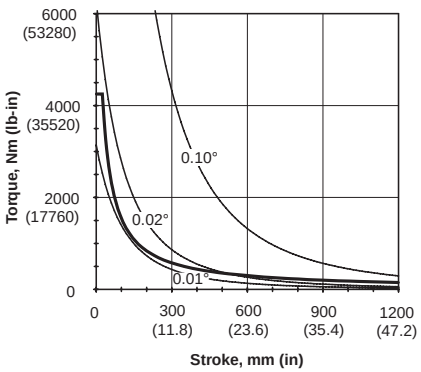
50mm Bore Size



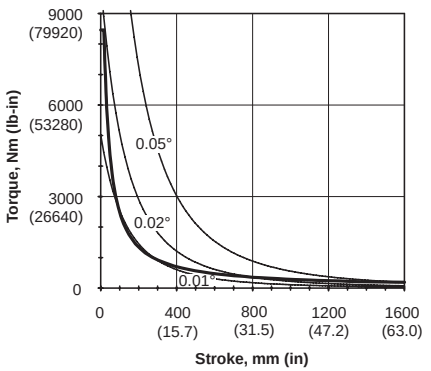
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Symmetrical Yaw Torsional Loading

The graphs on these two pages illustrate the maximum suggested yaw load at a given actuator stroke. It is assumed that the moment loading is acting about the centerline of the carriage. The graphs include the weight of the carriage and are based on a bearing life of 10 million cycles under a dynamic loading condition. Capacities are based on bearing and shafts only. Mounting bolts/hardware should be investigated per customer application. For an equivalent static load capacity multiply the information in these graphs by 1.5.

Heavy lines show loading; lighter lines show various degrees of deflection.

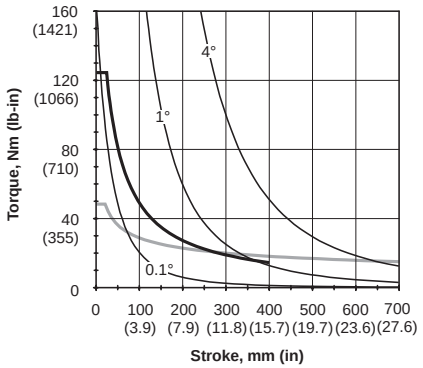
Note: The following variables commonly affect the bearing life of a guided cylinder:

- Velocity
- Vibration
- Orientation
- Environment (Dust, moisture, etc.)

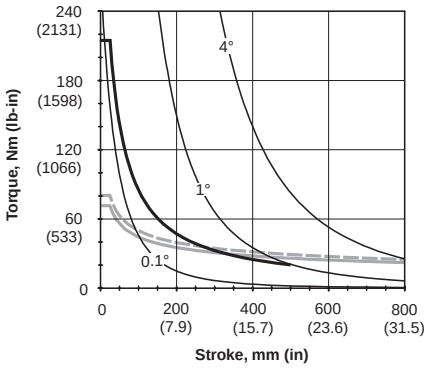
F

Standard Shafting

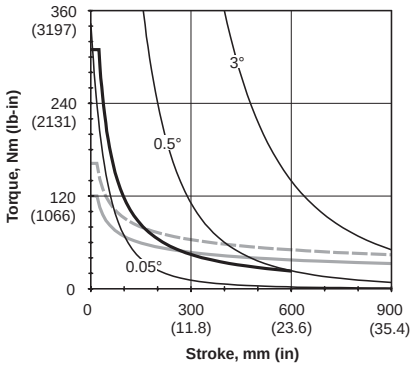
20mm Bore Size



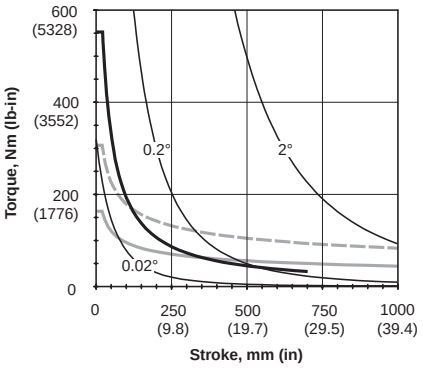
25mm Bore Size



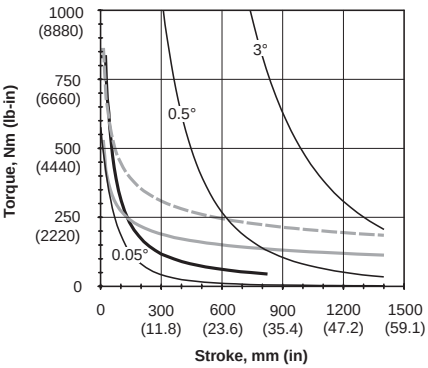
32mm Bore Size



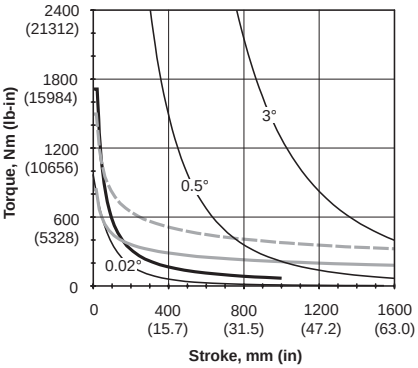
40mm Bore Size



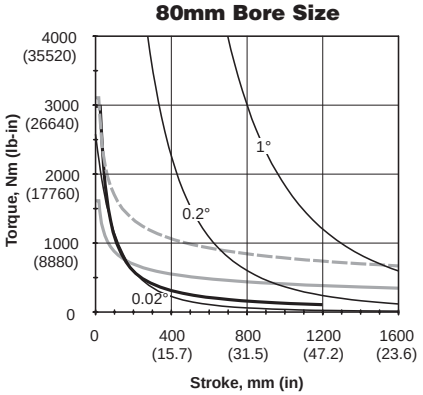
50mm Bore Size



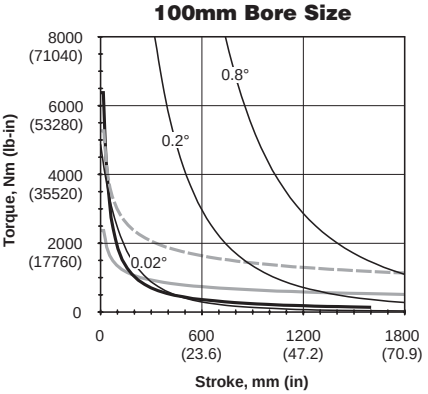
63mm Bore Size

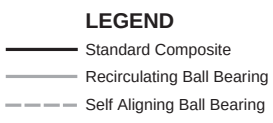


80mm Bore Size



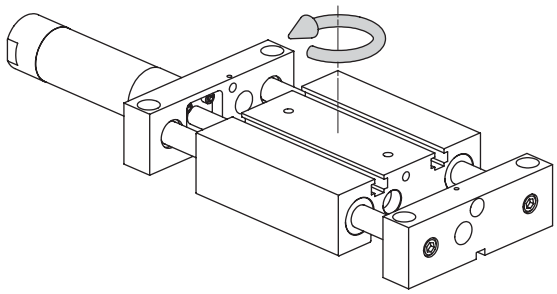
100mm Bore Size





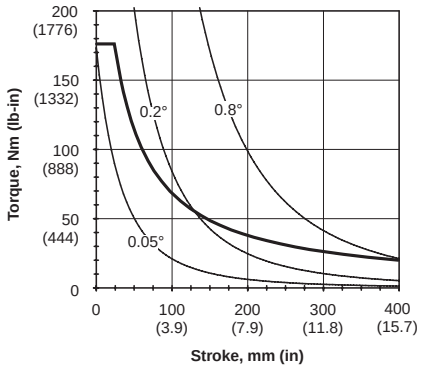
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Pneumatic Division
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Symmetrical Yaw Torsional Loading

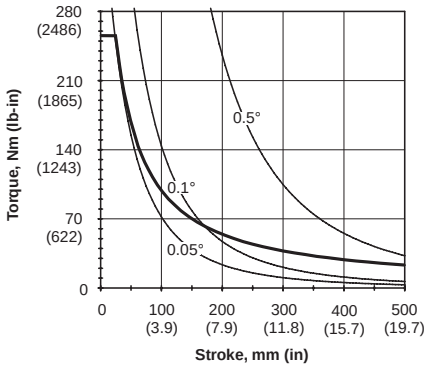


Oversized Shafting

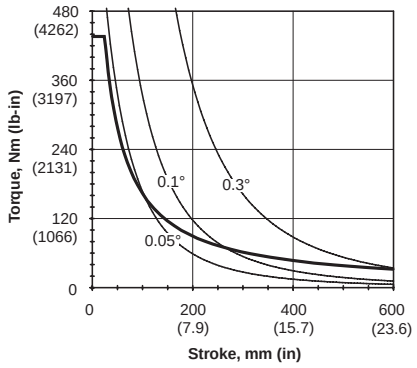
20mm Bore Size



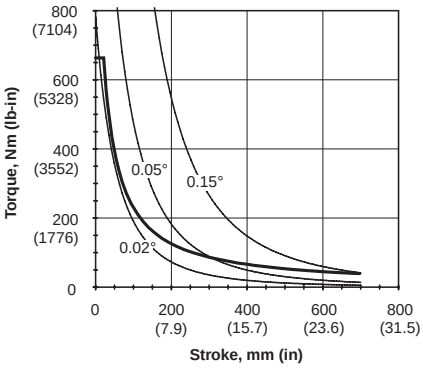
25mm Bore Size



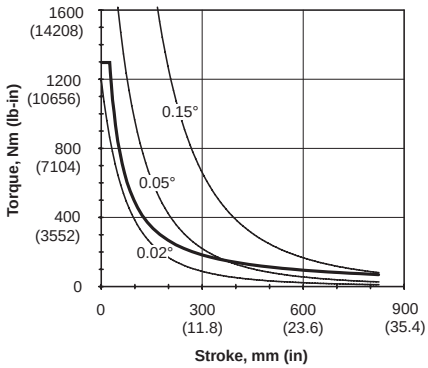
32mm Bore Size



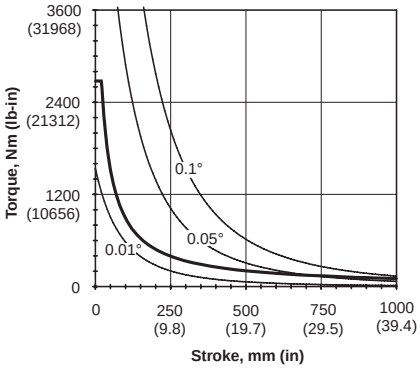
40mm Bore Size



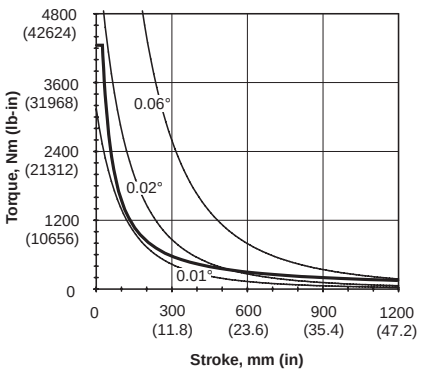
50mm Bore Size



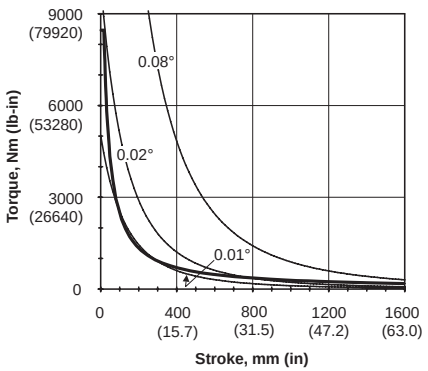
63mm Bore Size



80mm Bore Size



100mm Bore Size



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Kinetic Energy

These graphs illustrate the kinetic energy absorption of the P5L series as a weight versus speed chart for both air cushions and shock absorbers.

Moving weight is defined as the weight of the carried load and the weight of any moving parts of the actuator (support rods, tooling plate, etc.). The moving weight from the chart to the right should be considered.

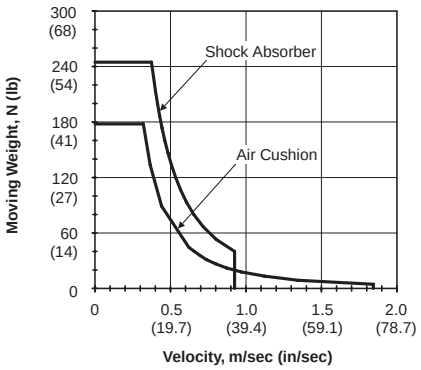
Note: These charts are to be used only to determine the energy absorption of each guided cylinder and to determine if shocks or cushions are needed.

Bore	Moving Weights (Standard Shaft)		Moving Weights (Oversized Shaft)	
	kg	lbs	kg	lbs
20	0.60	1.3	0.51	1.1
25	1.17	2.6	1.01	2.2
32	1.77	3.9	1.51	3.3
40	3.10	6.8	2.70	5.9
50	7.10	15.7	6.70	14.8
63	13.4	29.5	10.9	24.0
80	22.5	49.6	19.3	42.6
100	41.9	92.4	33.9	746.5

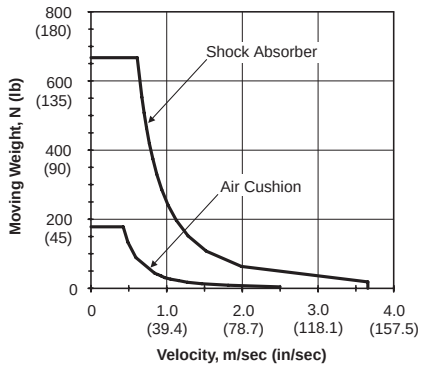
Note: Cylinder moving parts considered negligible.

P5L Base Slides

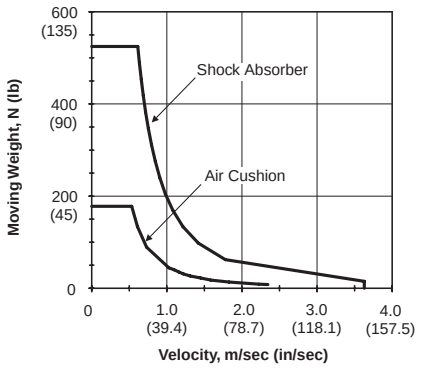
20mm Bore Size



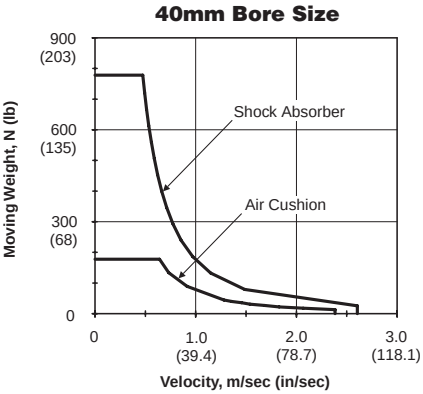
25mm Bore Size



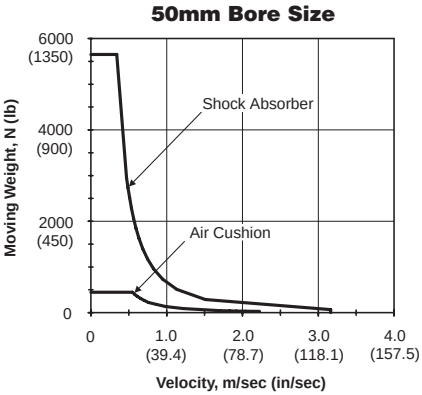
32mm Bore Size



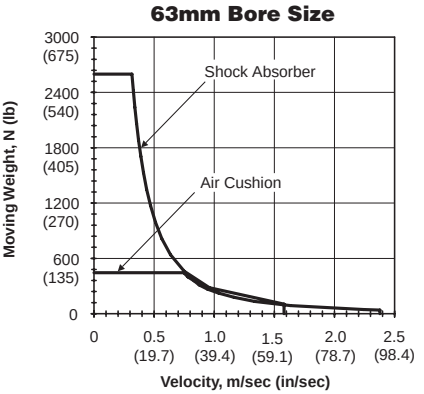
40mm Bore Size



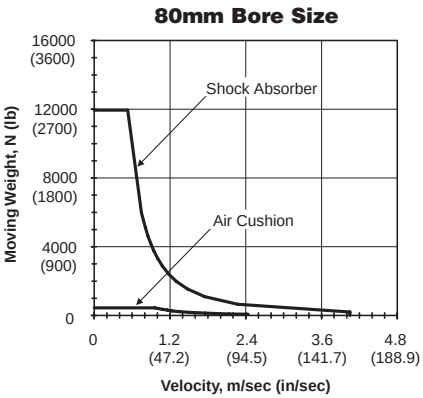
50mm Bore Size



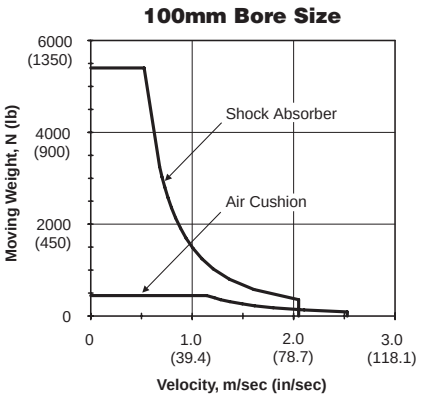
63mm Bore Size



80mm Bore Size

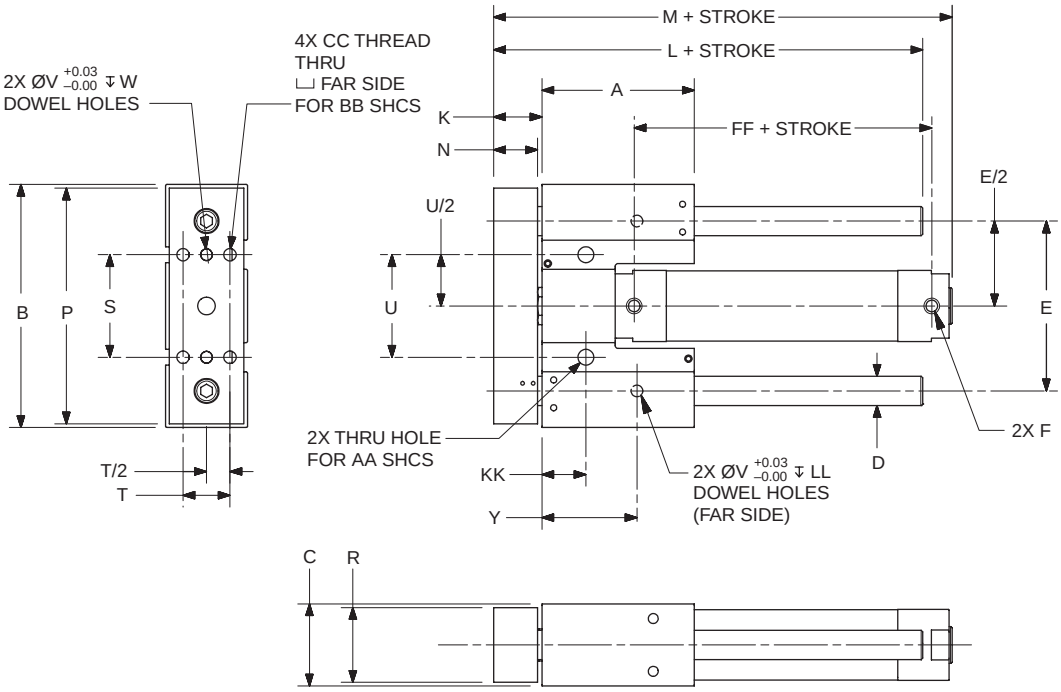


100mm Bore Size



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Thrust Slides



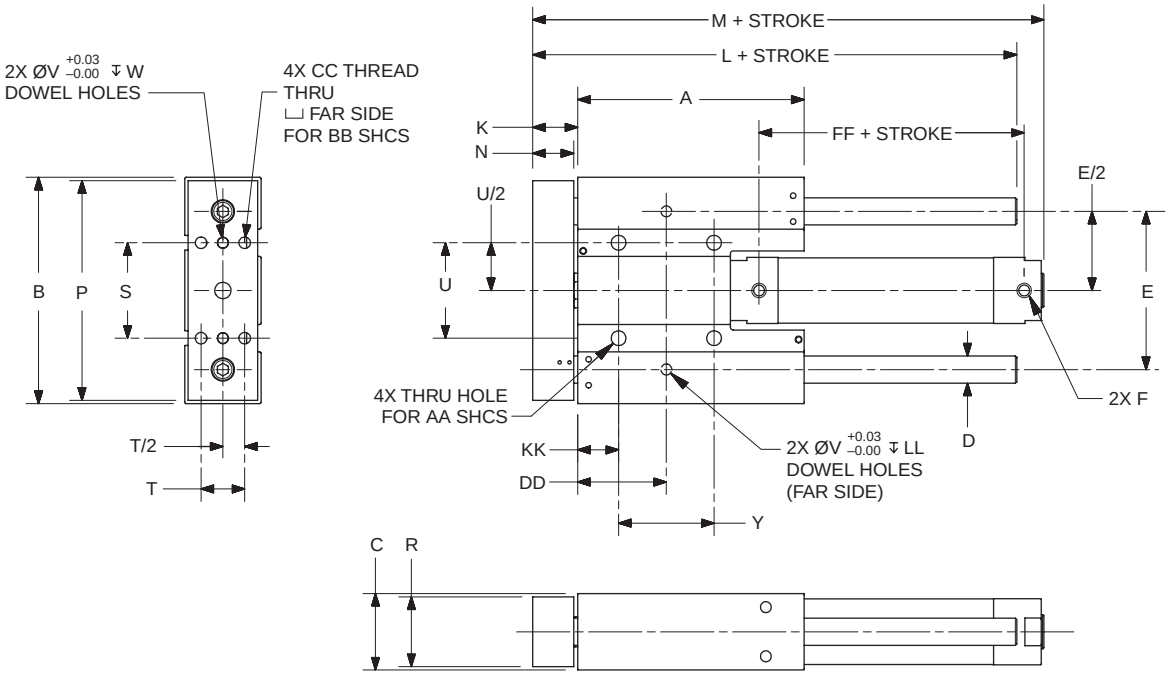
Bore	A	B	C	Ds*	Do*	E	F**	K	L	M	N	P	R
20	60 (2.4)	98 (3.9)	30 (1.2)	10 (0.4)	12 (0.5)	68 (2.7)	1/8†	20 (0.8)	86 (3.4)	114 (4.5)	17 (0.7)	96 (3.8)	26 (1.0)
25	76 (3.0)	122 (4.8)	38 (1.5)	12 (0.5)	16 (0.6)	84 (3.3)	1/8†	25 (1.0)	107 (4.2)	126 (5.0)	22 (0.9)	119 (4.7)	33 (1.3)
32	84 (3.3)	140 (5.5)	44 (1.7)	16 (0.6)	20 (0.8)	92 (3.6)	1/8	27 (1.1)	117 (4.6)	140 (5.5)	24 (0.9)	137 (5.4)	39 (1.5)
40	104 (4.1)	166 (6.5)	56 (2.2)	20 (0.8)	25 (1.0)	116 (4.6)	1/8	33 (1.3)	143 (5.6)	163 (6.4)	30 (1.2)	161 (6.3)	51 (2.0)
50	130 (5.1)	216 (8.5)	70 (2.8)	25 (1.0)	30 (1.2)	148 (5.8)	1/4	39 (1.5)	175 (6.9)	195 (7.7)	36 (1.4)	211 (8.3)	63 (2.5)
63	152 (6.0)	260 (10.2)	84 (3.3)	30 (1.2)	40 (1.6)	176 (6.9)	1/4	43 (1.7)	203 (8.0)	219 (8.6)	40 (1.6)	255 (10.0)	77 (3.0)
80	180 (7.1)	320 (12.6)	102 (4.0)	40 (1.6)	50 (2.0)	220 (8.7)	3/8	49 (1.9)	237 (9.3)	249 (9.8)	46 (1.8)	315 (12.4)	95 (3.7)
100	222 (8.7)	390 (15.4)	120 (4.7)	50 (2.0)	60 (2.4)	260 (10.2)	1/2	59 (2.3)	289 (11.4)	306 (12.0)	56 (2.2)	383 (15.1)	111 (4.4)

Bore	S	T	U	V	W	Y	AA	BB	CC	FF	KK	LL
20	40 (1.6)	16 (0.6)	40 (1.6)	4.03 (0.2)	4 (0.2)	36 (1.4)	M5	M4	M5x0.8	45 (1.8)	16 (0.6)	4 (0.2)
25	48 (1.9)	20 (0.8)	48 (1.9)	5.03 (0.2)	5 (0.2)	46 (1.8)	M6	M5	M6x1.0	46 (1.8)	22 (0.9)	5 (0.2)
32	50 (2.0)	24 (0.9)	50 (2.0)	6.03 (0.2)	6 (0.2)	53 (2.1)	M8	M6	M8x1.25	43 (1.7)	28 (1.1)	6 (0.2)
40	70 (2.8)	32 (1.3)	70 (2.8)	8.03 (0.3)	8 (0.3)	65 (2.6)	M10	M8	M10x1.5	49 (1.9)	30 (1.2)	8 (0.3)
50	80 (3.1)	42 (1.7)	80 (3.1)	8.03 (0.3)	8 (0.3)	83 (3.3)	M10	M8	M10x1.5	53 (2.1)	43 (1.7)	8 (0.3)
63	100 (3.9)	52 (2.0)	100 (3.9)	10.03 (0.4)	10 (0.4)	101 (4.0)	M12	M10	M12x1.75	52 (2.0)	51 (2.0)	10 (0.4)
80	124 (4.9)	62 (2.4)	124 (4.9)	12.03 (0.5)	12 (0.5)	127 (5.0)	M16	M14	M16x1.5	64 (2.5)	65 (2.6)	12 (0.5)
100	148 (5.8)	72 (2.8)	148 (5.8)	12.03 (0.5)	12 (0.5)	154 (6.1)	M20	M16	M20x2.5	66 (2.6)	80 (3.1)	12 (0.5)

Dimensions in mm (in) ** s = standard, o = oversized* *** NPTF or BSPT* *† w/cushions M5/10-32*

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Reach Slides



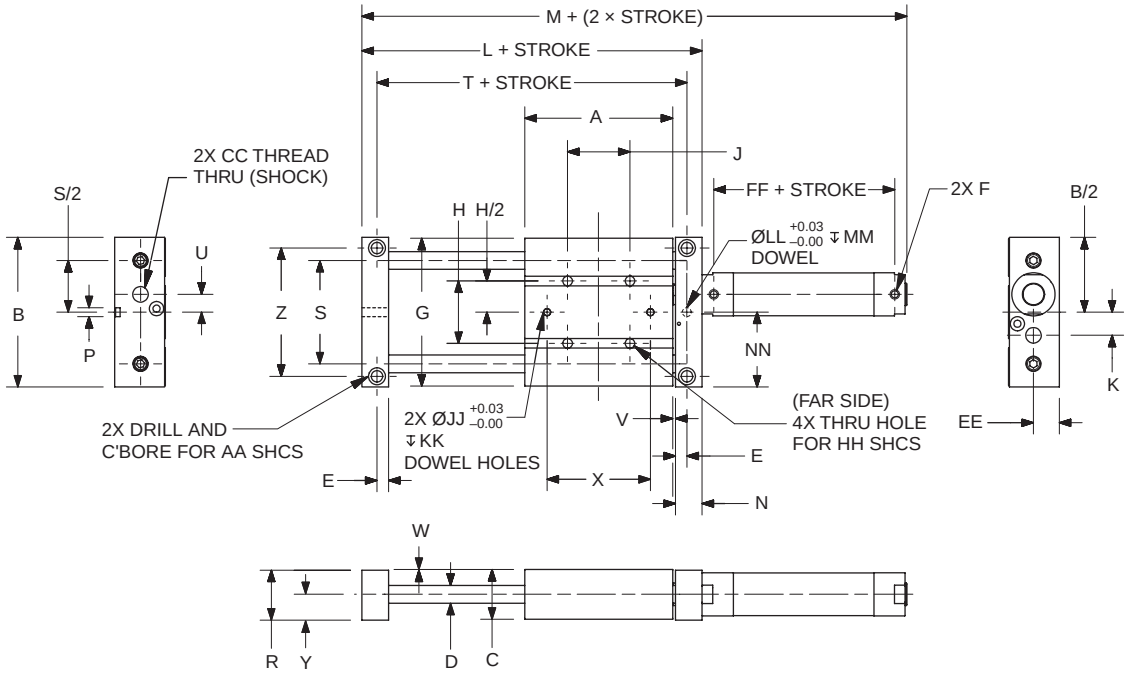
Bore	A	B	C	Ds*	Do*	E	F**	K	L	M	N	P	R
20	98 (3.9)	98 (3.9)	30 (1.2)	10 (0.4)	12 (0.5)	68 (2.7)	1/8†	20 (0.8)	124 (4.9)	152 (6.0)	17 (0.7)	96 (3.8)	26 (1.0)
25	122 (4.8)	122 (4.8)	38 (1.5)	12 (0.5)	16 (0.6)	84 (3.3)	1/8†	25 (1.0)	153 (6.0)	172 (6.8)	22 (0.9)	119 (4.7)	33 (1.3)
32	140 (5.5)	140 (5.5)	44 (1.7)	16 (0.6)	20 (0.8)	92 (3.6)	1/8	27 (1.1)	173 (6.8)	196 (7.7)	24 (0.9)	137 (5.4)	39 (1.5)
40	166 (6.5)	166 (6.5)	56 (2.2)	20 (0.8)	25 (1.0)	116 (4.6)	1/8	33 (1.3)	205 (8.1)	225 (8.9)	30 (1.2)	161 (6.3)	51 (2.0)
50	216 (8.5)	216 (8.5)	70 (2.8)	25 (1.0)	30 (1.2)	148 (5.8)	1/4	39 (1.5)	261 (10.3)	281 (11.1)	36 (1.4)	211 (8.3)	63 (2.5)
63	260 (10.2)	260 (10.2)	84 (3.3)	30 (1.2)	40 (1.6)	176 (6.9)	1/4	43 (1.7)	311 (12.2)	327 (12.9)	40 (1.6)	255 (10.0)	77 (3.0)
80	320 (12.6)	320 (12.6)	102 (4.0)	40 (1.6)	50 (2.0)	220 (8.7)	3/8	49 (1.9)	377 (14.8)	389 (15.3)	46 (1.8)	315 (12.4)	9 (3.7)
100	390 (15.4)	390 (15.4)	120 (4.7)	50 (2.0)	60 (2.4)	260 (10.2)	1/2	59 (2.3)	457 (18.0)	474 (18.7)	56 (2.2)	383 (15.1)	111 (4.4)

Bore	S	T	U	V	W	Y	AA	BB	CC	DD	FF	KK	LL
20	40 (1.6)	16 (0.6)	40 (1.6)	4.03 (0.2)	4 (0.2)	40 (1.6)	M5	M4	M5X0.8	36 (1.4)	45 (1.8)	16 (0.6)	4 (0.2)
25	48 (1.9)	20 (0.8)	48 (1.9)	5.03 (0.2)	5 (0.2)	48 (1.9)	M6	M5	M6X1.0	46 (1.8)	46 (1.8)	22 (0.9)	5 (0.2)
32	50 (2.0)	24 (0.9)	50 (2.0)	6.03 (0.2)	6 (0.2)	50 (2.0)	M8	M6	M8X1.25	53 (2.1)	43 (1.7)	28 (1.1)	6 (0.2)
40	70 (2.8)	32 (1.3)	70 (2.8)	8.03 (0.3)	8 (0.3)	70 (2.8)	M10	M8	M10X1.5	65 (2.6)	49 (1.9)	30 (1.2)	8 (0.3)
50	80 (3.1)	42 (1.7)	80 (3.1)	8.03 (0.3)	8 (0.3)	80 (3.1)	M10	M8	M10X1.5	83 (3.3)	53 (2.1)	43 (1.7)	8 (0.3)
63	100 (3.9)	52 (2.0)	100 (3.9)	10.03 (0.4)	10 (0.4)	100 (3.9)	M12	M10	M12X1.75	101 (4.0)	52 (2.0)	51 (2.0)	10 (0.4)
80	124 (4.9)	62 (2.4)	124 (4.9)	12.03 (0.5)	12 (0.5)	124 (4.9)	M16	M14	M16X1.5	127 (5.0)	64 (2.5)	65 (2.6)	12 (0.5)
100	148 (5.8)	72 (2.8)	148 (5.8)	12.03 (0.5)	12 (0.5)	148 (5.8)	M20	M16	M20X2.5	154 (6.1)	66 (2.6)	80 (3.1)	12 (0.5)

Dimensions in mm (in) ** s = standard, o = oversized* *** NPTF or BSPT* *† w/cushions M5/10-32*

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Base Slides



Bore	A	B	C	Ds*	Do*	E	F**	G	H	J	K	L	M	N	P+.03	R	S
20	98 (3.9)	100 (3.9)	30 (1.2)	10 (0.4)	12 (0.5)	8 (0.3)	1/8†	98 (3.9)	40 (1.6)	40 (1.6)	18 (0.7)	140 (5.5)	211 (8.3)	18 (0.7)	5.03 (0.2)	30 (1.2)	68 (2.7)
25	122 (4.8)	124 (4.9)	38 (1.5)	12 (0.5)	16 (0.6)	14 (0.6)	1/8†	122 (4.8)	48 (1.9)	48 (1.9)	22 (0.9)	176 (6.9)	247 (9.7)	24 (0.9)	6.03 (0.2)	38 (1.5)	84 (3.3)
32	140 (5.5)	142 (5.6)	44 (1.7)	16 (0.6)	20 (0.8)	12 (0.5)	1/8	140 (5.5)	50 (2.0)	50 (2.0)	22 (0.9)	198 (7.8)	271 (10.7)	26 (1.0)	6.03 (0.2)	44 (1.7)	92 (3.6)
40	166 (6.5)	168 (6.6)	56 (2.2)	20 (0.8)	25 (1.0)	13 (0.5)	1/8	166 (6.5)	70 (2.8)	70 (2.8)	26 (1.0)	232 (9.1)	312 (12.3)	30 (1.2)	10.03 (0.4)	56 (2.2)	116 (4.6)
50	216 (8.5)	218 (8.6)	70 (2.8)	25 (1.0)	30 (1.2)	16 (0.6)	1/4	216 (8.5)	80 (3.1)	80 (3.1)	28 (1.1)	292 (11.5)	384 (15.1)	35 (1.4)	10.03 (0.4)	70 (2.8)	148 (5.8)
63	260 (10.2)	262 (10.3)	84 (3.3)	30 (1.2)	40 (1.6)	19 (0.7)	1/4	260 (10.2)	100 (3.9)	100 (3.9)	42 (1.7)	350 (13.8)	442 (17.4)	42 (1.7)	12.03 (0.5)	84 (3.3)	176 (6.9)
80	320 (12.6)	322 (12.7)	102 (4.0)	40 (1.6)	50 (2.0)	24 (0.9)	3/8	320 (12.6)	124 (4.9)	124 (4.9)	42 (1.7)	434 (17.1)	545 (21.5)	54 (2.1)	16.03 (0.6)	102 (4.0)	220 (8.7)
100	390 (15.4)	392 (15.4)	120 (4.7)	50 (2.0)	60 (2.4)	28 (1.1)	1/2	390 (15.4)	148 (5.8)	148 (5.8)	62 (2.4)	528 (20.8)	639 (25.2)	66 (2.6)	16.03 (0.6)	120 (4.7)	260 (10.2)

Bore	T	U	V***	W	X	Y	Z	AA	CC	EE	FF	HH	JJ	KK	LL	MM	NN
20	120 (4.7)	11 (0.4)	3 (0.1)	1 (0.0)	68 (2.7)	14 (0.6)	86 (3.4)	M6	M12	16 (0.6)	45 (1.8)	M5	4.03 (0.2)	4 (0.2)	5.03 (0.2)	5 (0.2)	50 (2.0)
25	156 (6.1)	12 (0.5)	3 (0.1)	1 (0.0)	84 (3.3)	18 (0.7)	104 (4.1)	M8	M14	20 (0.8)	46 (1.8)	M6	5.03 (0.2)	5 (0.2)	6.03 (0.2)	6 (0.2)	62 (2.4)
32	170 (6.7)	11 (0.4)	3 (0.1)	1 (0.0)	92 (3.6)	21 (0.8)	120 (4.7)	M10	M14	23 (0.9)	43 (1.7)	M8	6.03 (0.2)	6 (0.2)	6.03 (0.2)	6 (0.2)	71 (2.8)
40	198 (7.8)	20 (0.8)	3 (0.1)	1 (0.0)	116 (4.6)	27 (1.1)	144 (5.7)	M12	M20	29 (1.1)	49 (1.9)	M10	8.03 (0.3)	8 (0.3)	10.03 (0.4)	10 (0.4)	84 (3.3)
50	254 (10.0)	22 (0.9)	3 (0.1)	1 (0.0)	148 (5.8)	34 (1.3)	188 (7.4)	M16	M25	36 (1.4)	53 (2.1)	M10	8.03 (0.3)	8 (0.3)	10.03 (0.4)	10 (0.4)	109 (4.3)
63	304 (12.0)	30 (1.2)	3 (0.1)	1 (0.0)	176 (6.9)	41 (1.6)	224 (8.8)	M20	M25	43 (1.7)	52 (2.0)	M12	10.03 (0.4)	10 (0.4)	12.03 (0.5)	12 (0.5)	131 (5.2)
80	374 (4.7)	36 (1.4)	3 (0.1)	1 (0.0)	220 (8.7)	50 (2.0)	276 (10.9)	M24	M33	52 (2.0)	64 (2.5)	M16	12.03 (0.5)	12 (0.5)	16.03 (0.6)	16 (0.6)	161 (6.3)
100	452 (17.8)	36 (1.4)	3 (0.1)	1 (0.0)	260 (10.2)	59 (2.3)	336 (13.2)	M30	M36	61 (2.4)	66 (2.6)	M20	12.03 (0.5)	12 (0.5)	16.03 (0.6)	16 (0.6)	196 (7.7)

** s = standard; o = oversized* *** NPTF or BSPT* *† w/cushions M5/10-32*
**** Space between housing and end plate in both extend and retract positions.*

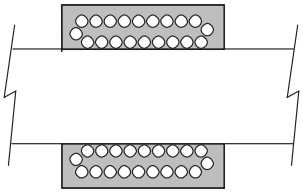
Dimensions in mm (in)

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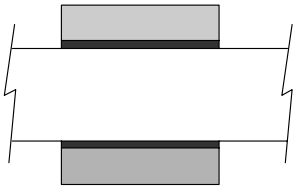
Bushings (J*, G*, H*, S*)

Several bushing, bearing and shaft options are available. To assure maximum life from the P5L guidance system, it is critical to match the bearing and shaft type to the application and environment it will be used in.

For bushing load capacities, reference the Engineering Data pages of this section.



Recirculating Ball Bearing



Composite Bushing

Bearing Type	Load Capacity		Stroke Lengths	Wet Environment	Wear Characteristics
	Short Stroke	Long Strokes			
Composite	Very Good	Average	Short	Excellent	Good
Recirculating Ball Bearings	Good*	Very Good	Long	Poor	Excellent
Self-Aligning Recirculating Ball Bearings	Good*	Excellent	Longest	Poor	Excellent

*It is not recommended to use ball bearings in extremely short strokes subject to rapid cycling

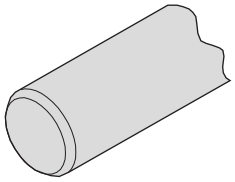
Note: Stainless steel shafts should be used in damp or wet environments

F

Stainless Steel Shafts

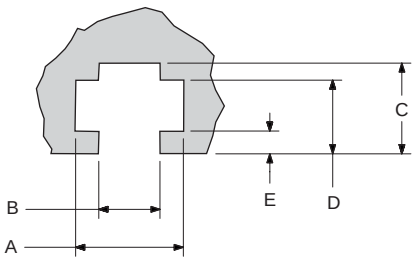
Case hardened, high carbon alloy steel shafting is utilized for standard slides. Stainless steel shafting can be specified for corrosive applications.

Note: Carbon steel rods should not be used in any application subject to any amount of moisture.



T-Slots (-, A)

Mounting T-slots provide quick and flexible mounting between base, thrust and reach slides. Extruded T-slots are standard on models with bore sizes 20-40mm. Machined T-slots are optional on models with bore sizes from 50-100mm.



Dimensions in mm (in)

Bore	A	B	C	D	E
20	10.0 (0.39)	5.8 (0.23)	9.0 (0.35)	7.0 (0.28)	2.0 (0.08)
25	12.0 (0.47)	6.8 (0.27)	12.0 (0.47)	9.0 (0.35)	3.0 (0.12)
32	15.0 (0.59)	8.8 (0.35)	14.0 (0.55)	11.0 (0.43)	3.5 (0.14)
40	19.0 (0.75)	10.8 (0.43)	15.0 (0.59)	12.0 (0.47)	3.0 (0.12)
50	19.0 (0.75)	10.8 (0.43)	16 (0.63)	13 (0.51)	4.0 (0.16)
63	21 (0.83)	12.8 (0.50)	21.5 (0.85)	18.5 (0.73)	7.5 (0.30)
80	27 (1.06)	16.8 (0.66)	29.5 (1.16)	24.5 (0.96)	9.5 (0.37)
100	33 (1.30)	21 (0.83)	35 (1.38)	30 (1.18)	12.5 (0.49)

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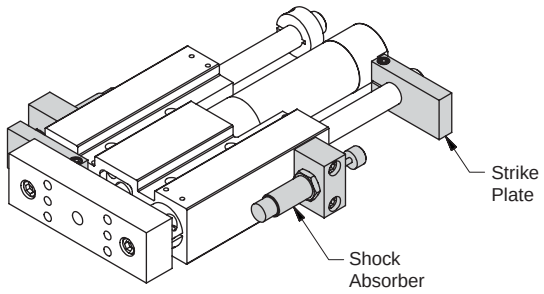
Shock Absorbers

Optional adjustable shock absorbers are available on the P5L series. When specifying this option verify the kinetic energy on pages F72-F73.

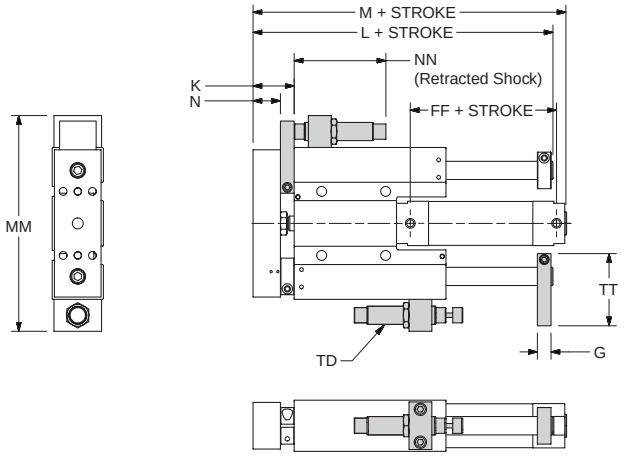
To achieve proper operation it is important to adjust the shock absorber per the application. To properly adjust the shock absorber, cycle the guided cylinder to impact the shock absorber. Rotate the shock adjustment knob, located on the front or the rear of the shock, to achieve a smooth deceleration. Reducing the setting (achieved by rotating the adjustment knob in the counterclockwise direction or towards 9) decreases the resistance. Increasing the setting (achieved by rotating the adjustment in the clockwise direction of towards 0) increases the resistance. A properly adjusted shock absorber will provide smooth deceleration through the stroke of the shock.

The shock absorber option can also be used as a stroke adjuster. To adjust the stroke of the actuator, loosen the socket head cap screw on the striker plate.

Note: Using the shock absorber option as a stroke adjuster will only reduce the actuator stroke from a maximum value given in the actuator part number and cannot add additional stroke.



Shock Absorbers Extend and Retract (AA)

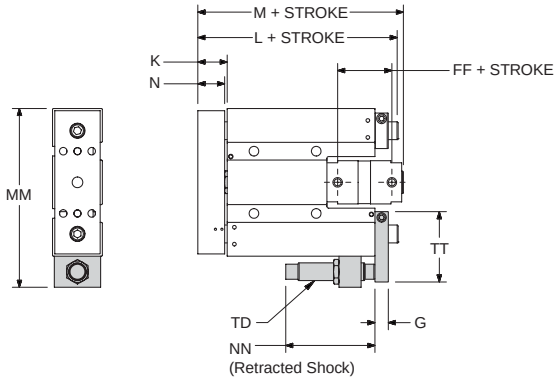


Bore	Gs*	Ks*	Go*	Ko*	Thrust			Reach			N	FF	MM	NN	TD	TT
					Ls*	Lo*	M	Ls*	Lo*	M						
20	9 (0.4)	26 (1.0)	11 (0.4)	28 (1.1)	100 (3.9)	102 (4.0)	126 (5.0)	138 (5.4)	140 (5.5)	164 (6.5)	17 (0.7)	51 (2.0)	136 (5.4)	74 (2.9)	M12X1.0	48 (1.9)
25	11 (0.4)	33 (1.3)	13 (0.5)	35 (1.4)	123 (4.8)	127 (5.0)	140 (5.5)	169 (6.7)	173 (6.8)	186 (7.3)	22 (0.9)	52 (2.0)	170 (6.7)	80.1 (3.2)	M14X1.5	57 (2.2)
32	13 (0.5)	37 (1.5)	15 (0.6)	39 (1.5)	136 (5.4)	140 (5.5)	156 (6.1)	192 (7.6)	196 (7.7)	212 (8.3)	24 (0.9)	49 (1.9)	188 (7.4)	80.1 (3.2)	M14X1.5	66 (2.6)
40	15 (0.6)	45 (1.8)	15 (0.6)	45 (1.8)	166 (6.5)	166 (6.5)	181 (7.1)	228 (9.0)	228 (9.0)	243 (9.6)	30 (1.2)	55 (2.2)	236 (9.3)	99.5 (3.9)	M20X1.5	79 (3.1)
50	15 (0.6)	51 (2.0)	15 (0.6)	51 (2.0)	198 (7.8)	198 (7.8)	213 (8.4)	284 (11.2)	284 (11.2)	299 (11.8)	36 (1.4)	59 (2.3)	296 (11.7)	117.3 (4.6)	M25X1.5	98 (3.9)
63	15 (0.6)	55 (2.2)	15 (0.6)	55 (2.2)	224 (8.8)	224 (8.8)	237 (9.3)	332 (13.1)	332 (13.1)	345 (13.6)	40 (1.6)	58 (2.3)	340 (13.4)	117.3 (4.6)	M25X1.5	108 (4.3)
80	15 (0.6)	61 (2.4)	19 (0.7)	65 (2.6)	258 (10.2)	266 (10.5)	267 (10.5)	398 (15.7)	406 (15.6)	407 (16.0)	46 (1.8)	70 (2.8)	416 (16.4)	140.5 (5.5)	M33X1.5	126 (5.0)
100	19 (0.7)	75 (3.0)	19 (0.7)	75 (3.0)	318 (12.5)	318 (12.5)	328 (12.9)	486 (19.1)	486 (19.1)	496 (19.5)	56 (2.2)	72 (2.8)	498 (19.6)	140.5 (5.5)	M36X1.5	157 (6.2)

Dimensions in mm (in) ** s = standard, o = oversized*

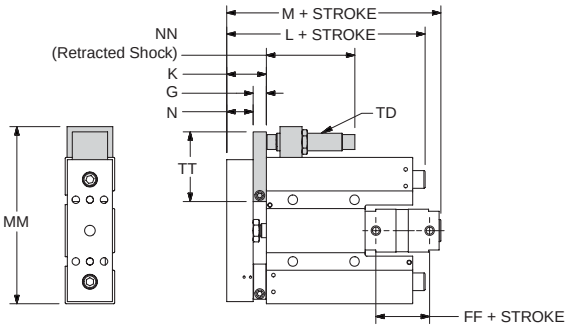
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Shock Absorbers Extend Only (AN)



Bore	Gs*	Go*	K	Thrust Ls*	Thrust Lo*	Thrust M	Reach Ls*	Reach Lo*	Reach M	N	FF	MM	NN	TD	TT
20	9 (0.4)	11 (0.4)	20 (0.8)	100 (3.9)	102 (4.0)	117 (4.6)	138 (5.4)	140 (5.5)	153 (6.0)	17 (0.7)	48 (1.9)	117 (4.6)	74 (2.9)	M12x1.0	48 (1.9)
25	11 (0.4)	13 (0.5)	25 (1.0)	123 (4.8)	127 (5.0)	129 (5.1)	169 (6.7)	173 (6.8)	185 (7.3)	22 (0.9)	49 (1.9)	146 (5.7)	80.1 (3.2)	M14x1.5	57 (2.2)
32	13 (0.5)	15 (0.6)	27 (1.1)	136 (5.4)	140 (5.5)	143 (5.6)	192 (7.6)	196 (7.7)	197 (7.8)	24 (0.9)	46 (1.8)	164 (6.5)	80.1 (3.2)	M14x1.5	66 (2.6)
40	15 (0.6)	15 (0.6)	33 (1.3)	166 (6.5)	166 (6.5)	166 (6.5)	228 (9.0)	228 (9.0)	228 (9.0)	30 (1.2)	52 (2.0)	201 (7.9)	99.5 (3.9)	M20x1.5	79 (3.1)
50	15 (0.6)	15 (0.6)	39 (1.5)	198 (7.8)	198 (7.8)	198 (7.8)	284 (11.2)	284 (11.2)	284 (11.2)	36 (1.4)	56 (2.2)	256 (10.1)	117.3 (4.6)	M25x1.5	98 (3.9)
63	15 (0.6)	15 (0.6)	43 (1.7)	224 (8.8)	224 (8.8)	222 (8.7)	332 (13.1)	332 (13.1)	330 (13.0)	40 (1.6)	55 (2.2)	300 (11.8)	117.3 (4.6)	M25x1.5	108 (4.3)
80	15 (0.6)	19 (0.7)	49 (1.9)	258 (10.2)	266 (10.5)	252 (9.9)	398 (15.7)	406 (15.6)	388 (15.3)	46 (1.8)	67 (2.6)	368 (14.5)	140.5 (5.5)	M33x1.5	126 (5.0)
100	19 (0.7)	19 (0.7)	59 (2.3)	318 (12.5)	318 (12.5)	309 (12.2)	486 (19.1)	486 (19.1	477 (18.8)	56 (2.2)	69 (2.7)	444 (17.5)	140.5 (5.5)	M36x1.5	157 (6.2)

Shock Absorbers Retract Only (NA)



Bore	Gs*	Ks*	Go*	Ko*	Thrust Ls*	Thrust Lo*	Thrust M	Reach Ls*	Reach Lo*	Reach M	N	FF	MM	NN	TD	TT
20	9 (0.4)	26 (1.0)	11 (0.4)	28 (1.1)	100 (3.9)	102 (4.0)	123 (4.8)	138 (5.4)	140 (5.5)	161 (6.3)	17 (0.7)	48 (1.9)	117 (4.6)	74 (2.9)	M12x1.0	48 (1.9)
25	11 (0.4)	33 (1.3)	13 (0.5)	35 (1.4)	123 (4.8)	127 (5.0)	137 (5.4)	169 (6.7)	173 (6.8)	183 (7.2)	22 (0.9)	49 (1.9)	146 (5.7)	80.1 (3.2)	M14x1.5	57 (2.2)
32	13 (0.5)	37 (1.5)	15 (0.6)	39 (1.5)	136 (5.4)	140 (5.5)	153 (6.0)	192 (7.6)	196 (7.7)	209 (8.2)	24 (0.9)	46 (1.8)	164 (6.5)	80.1 (3.2)	M14x1.5	66 (2.6)
40	15 (0.6)	45 (1.8)	15 (0.6)	45 (1.8)	166 (6.5)	166 (6.8)	178 (7.0)	228 (9.0)	228 (9.0)	240 (9.4)	30 (1.2)	52 (2.0)	201 (7.9)	99.5 (3.9)	M20x1.5	79 (3.1)
50	15 (0.6)	51 (2.0)	15 (0.6)	51 (2.0)	198 (7.8)	198 (7.8)	210 (8.3)	284 (11.2)	284 (11.2)	296 (11.7)	36 (1.4)	56 (2.2)	256 (10.1)	117.3 (4.6)	M25x1.5	98 (3.9)
63	15 (0.6)	55 (2.2)	15 (0.6)	55 (2.2)	224 (8.8)	224 (8.8)	234 (9.2)	332 (13.1)	332 (13.1)	342 (13.5)	40 (1.6)	55 (2.2)	300 (11.8)	117.3 (4.6)	M25x1.5	108 (4.3)
80	15 (0.6)	61 (2.4)	19 (0.7)	65 (2.6)	258 (10.2)	266 (10.5)	264 (10.4)	398 (15.7)	406 (15.6)	404 (15.9)	46 (1.8)	67 (2.6)	368 (14.5)	140.5 (5.5)	M33x1.5	126 (5.0)
100	19 (0.7)	75 (3.0)	19 (0.7)	75 (3.0)	318 (12.5)	318 (12.5)	325 (12.8)	486 (19.1)	486 (19.1)	493 (19.4)	56 (2.2)	69 (2.7)	444 (17.5)	140.5 (5.5)	M36x1.5	157 (6.2)

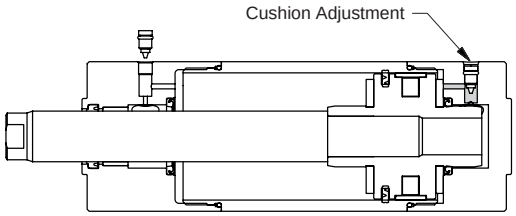
Dimensions in mm (in) ** s = standard, o = oversized*

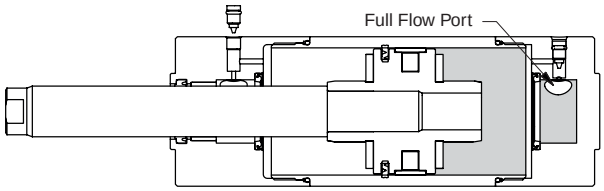
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Cylinder Cushions

Fully adjustable cylinder cushions can be provided to reduce speed and energy at the end of cylinder stroke.

Note: If stroke adjustment is used in conjunction with cylinder cushions, the cushion effectiveness may be affected.



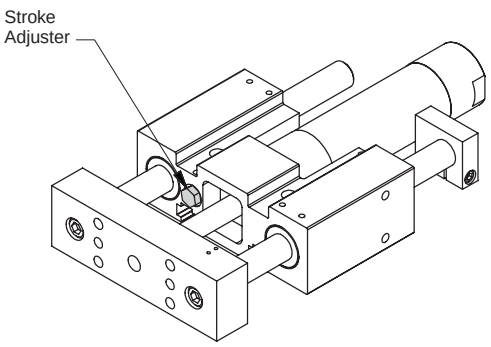


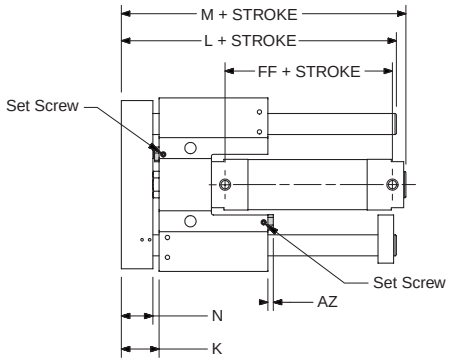
Micro Adjust (EE)

Micro adjusters can be used as an accurate and fine adjustment of end of stroke position. Actual per end stroke adjustment depends on model size. See chart below.

Micro adjusters must be ordered as both ends only. Caution should be used as cushion effectiveness may be affected.

Note: Using micro adjusters will only reduce the actuator stroke from a maximum value given in the actuator part number and cannot add additional stroke.





Bore	Kmin	Kmax	Thrust			Reach			N	AZmin	AZmax	FF
			Ls*	Lo*	M	Ls*	Lo*	M				
20	23 (0.9)	28 (1.1)	100 (3.9)	102 (4.0)	123 (4.8)	138 (5.4)	140 (5.5)	161 (6.3)	17 (0.7)	3.5 (0.1)	8.5 (0.3)	51 (2.0)
25	28 (1.1)	37 (1.5)	123 (4.8)	127 (5.0)	135 (5.3)	169 (6.7)	173 (6.8)	181 (7.1)	22 (0.9)	3.5 (0.1)	12.5 (0.5)	52 (2.0)
32	30 (1.2)	38 (1.5)	136 (5.4)	140 (5.5)	149 (5.9)	192 (7.6)	196 (7.7)	205 (8.1)	24 (0.9)	4 (0.2)	12 (0.5)	49 (1.9)
40	36 (1.4)	48 (1.9)	166 (6.5)	166 (6.5)	172 (6.8)	228 (9.0)	228 (9.0)	234 (9.2)	30 (1.2)	5.3 (0.2)	17.3 (0.7)	55 (2.2)
50	42 (1.7)	57 (2.2)	198 (7.8)	198 (7.8)	204 (8.0)	284 (11.2)	284 (11.2)	290 (11.4)	36 (1.4)	6.4 (0.3)	21.4 (0.8)	59 (2.3)
63	46 (1.8)	63 (2.5)	224 (8.8)	224 (8.8)	228 (9.0)	332 (13.1)	332 (13.1)	336 (13.2)	40 (1.6)	7.5 (0.3)	24.5 (1.0)	58 (2.3)
80	52 (2.0)	69 (2.7)	258 (10.2)	266 (10.5)	258 (10.2)	398 (15.7)	406 (15.6)	398 (15.7)	46 (1.8)	7.5 (0.3)	24.5 (1.0)	70 (2.8)
100	62 (2.4)	76 (3.0)	318 (12.5)	318 (12.5)	315 (12.4)	486 (19.1)	486 (19.1)	483 (19.0)	56 (2.2)	10 (0.4)	24 (0.9)	72 (2.8)

Dimensions in mm (in) ** s = standard, o = oversized*

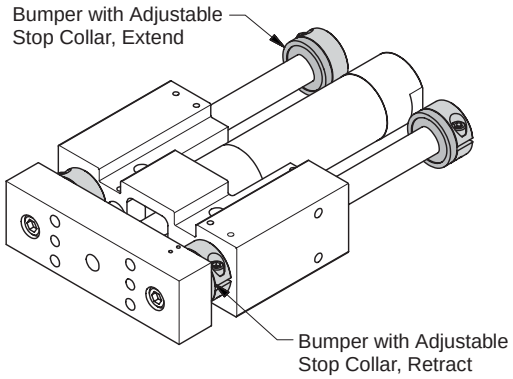
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Bumpers and Adjustable Stop Collars

Bumpers provide end of stroke noise reduction. Bumpers can be used in conjunction with adjustable stop collars to provide adjustment. When a bumper is specified in the extend stroke a stop collar is provided.

Bumpers provide minimal energy absorption. If high speeds are present consult the kinetic energy section of this catalog to determine if cylinder cushions or shock absorbers are recommended.

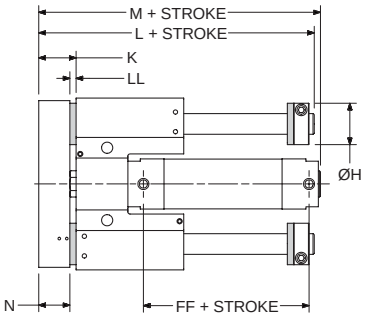
A properly adjusted bumper and stop collar will prevent the cylinder from bottoming on the cylinder end cap thus increasing cylinder life.



P5L-T thrust slide shown

F

Bumpers Both Ends (KB)



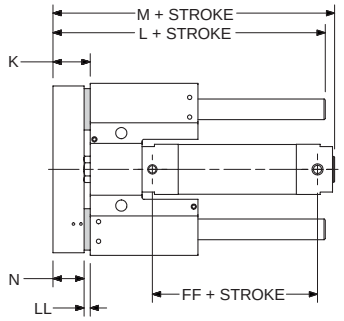
Bore	Hs*	Ho*	K	Thrust			Reach			N	FF	LL
				Ls*	Lo*	M	Ls*	Lo*	M			
20	24 (0.9)	28 (1.1)	23 (0.9)	100 (3.9)	102 (4.0)	123 (4.8)	138 (5.4)	140 (5.5)	161 (6.3)	17 (0.7)	51 (2.0)	6 (0.2)
25	28 (1.1)	34 (1.3)	28 (1.1)	123 (4.8)	127 (5.0)	135 (5.3)	169 (6.6)	173 (6.8)	181 (7.1)	22 (0.9)	52 (2.0)	6 (0.2)
32	34 (1.3)	40 (1.6)	30 (1.2)	136 (5.4)	140 (5.5)	149 (5.9)	192 (7.6)	248 (9.8)	205 (8.1)	24 (0.9)	49 (1.9)	6 (0.2)
40	40 (1.6)	45 (1.8)	36 (1.4)	166 (6.5)	166 (6.5)	172 (6.8)	228 (9.0)	290 (11.4)	234 (9.2)	30 (1.2)	55 (2.2)	6 (0.2)
50	45 (1.8)	54 (2.1)	42 (1.7)	198 (7.8)	198 (7.8)	204 (8.0)	284 (11.2)	370 (14.6)	290 (11.4)	36 (1.4)	59 (2.3)	6 (0.2)
63	54 (2.1)	60 (2.4)	46 (1.8)	224 (8.8)	224 (8.8)	228 (9.0)	332 (13.1)	440 (17.3)	336 (13.2)	40 (1.6)	58 (2.3)	6 (0.2)
80	60 (2.4)	78 (3.1)	52 (2.0)	258 (10.1)	266 (10.5)	258 (10.2)	398 (15.7)	538 (21.2)	398 (15.7)	46 (1.8)	70 (2.8)	6 (0.2)
100	78 (3.1)	88 (3.5)	62 (2.4)	318 (12.5)	318 (12.5)	315 (12.4)	486 (19.1)	654 (25.7)	483 (19.0)	56 (2.2)	72 (2.8)	6 (0.2)

Dimensions in mm (in) ** s = standard, o = oversized*

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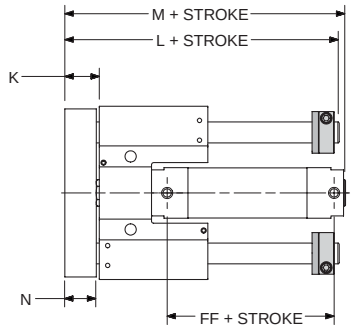
Bumpers on Retract Only (NB)

Bore	K	Thrust			Reach			N	FF	LL
		Ls*	Lo*	M	Ls*	Lo*	M			
20	23 (0.9)	100 (3.9)	102 (4.0)	120 (4.7)	138 (5.4)	140 (5.5)	158 (6.2)	17 (0.7)	48 (1.9)	6 (0.2)
25	28 (1.1)	123 (4.8)	127 (5.0)	132 (5.2)	169 (6.7)	173 (6.8)	178 (7.0)	22 (0.9)	49 (1.9)	6 (0.2)
32	30 (1.2)	136 (5.4)	140 (5.5)	146 (5.7)	192 (7.6)	196 (7.7)	202 (8.0)	24 (0.9)	46 (1.8)	6 (0.2)
40	36 (1.4)	166 (6.5)	166 (6.5)	169 (6.7)	228 (9.0)	228 (9.0)	231 (9.1)	30 (1.2)	52 (2.0)	6 (0.2)
50	42 (1.7)	198 (7.8)	198 (7.8)	201 (7.9)	284 (11.2)	284 (11.2)	287 (11.3)	36 (1.4)	56 (2.2)	6 (0.2)
63	46 (1.8)	224 (8.8)	224 (8.8)	225 (8.9)	332 (13.1)	332 (13.1)	333 (13.1)	40 (1.6)	55 (2.2)	6 (0.2)
80	52 (2.0)	258 (10.2)	266 (10.5)	255 (10.0)	398 (15.7)	406 (16.0)	395 (15.6)	46 (1.8)	67 (2.6)	6 (0.2)
100	62 (2.4)	318 (12.5)	318 (12.5)	312 (12.3)	486 (19.1)	486 (19.1)	480 (18.9)	56 (2.2)	69 (2.7)	6 (0.2)



Bumpers and Adjustable Stop Collars, Extend Only (KN)

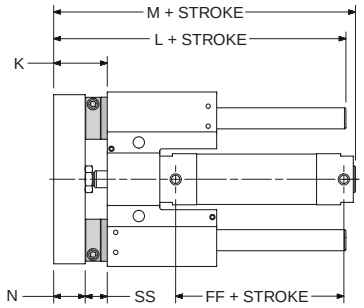
Bore	K	Thrust			Reach			N	FF
		Ls*	Lo*	M	Lo*	Ls*	M		
20	20 (0.8)	109 (4.3)	111 (4.4)	117 (4.6)	147 (5.8)	149 (5.9)	155 (6.1)	17 (0.7)	48 (1.9)
25	25 (1.0)	134 (5.3)	138 (5.4)	129 (5.1)	180 (7.1)	184 (7.2)	175 (6.9)	22 (0.9)	49 (1.9)
32	27 (1.1)	148 (5.8)	152 (6.0)	143 (5.6)	204 (8.0)	208 (8.2)	199 (7.8)	24 (0.9)	46 (1.8)
40	33 (1.3)	178 (7.0)	178 (7.0)	166 (6.5)	240 (9.4)	240 (9.4)	228 (9.0)	30 (1.2)	52 (2.0)
50	39 (1.5)	210 (8.3)	210 (8.3)	198 (7.8)	296 (11.7)	296 (11.7)	284 (11.2)	36 (1.4)	56 (2.2)
63	43 (1.7)	236 (9.3)	236 (9.3)	222 (8.7)	344 (13.5)	344 (13.5)	330 (13.0)	40 (1.6)	55 (2.2)
80	49 (1.9)	271 (10.7)	279 (11.0)	252 (9.9)	411 (16.2)	419 (16.5)	392 (15.4)	46 (1.8)	67 (2.6)
100	59 (2.3)	330 (13.0)	330 (13.0)	309 (12.2)	498 (19.6)	498 (19.6)	478 (18.8)	56 (2.2)	69 (2.7)



Dimensions in mm (in) ** s = standard, o = oversized*

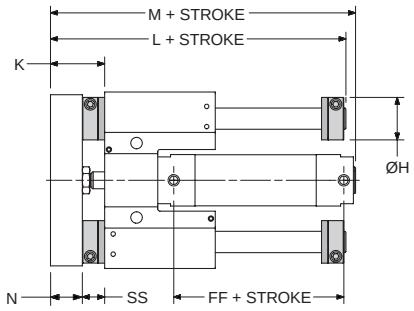
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Bumpers and Adjustable Stop Collars, Retract Only (NK)



Bore	Ks	Ko	Thrust				Reach				N	FF	SSs*	SSo*
			Ls*	Lo*	Ms*	Mo*	Ls*	Lo*	Ms*	Mo*				
20	32 (1.3)	34 (1.3)	109 (4.3)	111 (4.4)	129 (5.1)	131 (5.2)	147 (5.8)	149 (5.9)	167 (6.6)	169 (6.7)	17 (0.7)	48 (1.9)	15 (0.6)	17 (0.7)
25	39 (1.5)	41 (1.6)	134 (5.3)	138 (5.4)	143 (5.6)	145 (5.7)	180 (7.1)	184 (7.2)	189 (7.4)	191 (7.5)	22 (0.9)	49 (1.9)	17 (0.7)	19 (0.7)
32	43 (1.7)	45 (1.8)	148 (5.8)	152 (6.0)	159 (6.3)	161 (6.3)	204 (8.0)	208 (8.2)	215 (8.5)	217 (8.5)	24 (0.9)	46 (1.8)	19 (0.7)	21 (0.8)
40	51 (2.0)	51 (2.0)	178 (7.0)	178 (7.0)	184 (7.2)	184 (7.2)	240 (9.4)	240 (9.4)	246 (9.7)	246 (9.7)	30 (1.2)	52 (2.0)	21 (0.8)	21 (0.8)
50	57 (2.2)	57 (2.2)	210 (8.3)	210 (8.3)	216 (8.5)	216 (8.5)	296 (11.7)	296 (11.7)	302 (11.9)	302 (11.9)	36 (1.4)	56 (2.2)	21 (0.8)	21 (0.8)
63	61 (2.4)	61 (2.4)	236 (9.3)	236 (9.3)	240 (9.4)	240 (9.4)	344 (13.5)	344 (13.5)	348 (13.7)	348 (13.7)	40 (1.6)	55 (2.2)	21 (0.8)	21 (0.8)
80	67 (2.6)	71 (2.8)	271 (10.7)	279 (11.0)	270 (10.6)	274 (10.8)	411 (16.2)	419 (16.5)	410 (16.1)	414 (16.3)	46 (1.8)	67 (2.6)	21 (0.8)	25 (1.0)
100	81 (3.2)	81 (3.2)	330 (13.0)	330 (13.0)	331 (13.0)	331 (13.0)	492 (19.4)	492 (19.4)	499 (19.6)	499 (19.6)	56 (2.2)	69 (2.7)	25 (1.0)	25 (1.0)

Bumpers and Adjustable Stop Collars, Both Ends (KK)



Bore	Hs*	Ho*	Ks*	Ko*	Thrust				Reach				N	FF	SSs*	SSo*
					Ls*	Lo*	Ms*	Mo*	Ls*	Lo*	Ms*	Mo*				
20	24 (0.9)	28 (1.1)	32 (1.3)	34 (1.3)	109 (4.3)	111 (4.4)	132 (5.2)	134 (5.3)	147 (5.8)	149 (5.9)	170 (6.7)	172 (6.8)	17 (0.7)	51 (2.0)	15 (0.6)	17 (0.7)
25	28 (1.1)	34 (1.3)	39 (1.5)	41 (1.6)	134 (5.3)	138 (5.4)	146 (5.7)	148 (5.8)	180 (7.1)	184 (7.2)	192 (7.6)	194 (7.6)	22 (0.9)	52 (2.0)	17 (0.7)	19 (0.7)
32	34 (1.3)	40 (1.6)	43 (1.7)	45 (1.8)	148 (5.8)	152 (6.0)	162 (6.4)	164 (6.5)	204 (8.0)	208 (8.2)	218 (8.6)	220 (8.7)	24 (0.9)	49 (1.9)	19 (0.7)	21 (0.8)
40	40 (1.6)	45 (1.8)	51 (2.0)	51 (2.0)	178 (7.0)	178 (7.0)	187 (7.4)	187 (7.4)	240 (9.4)	240 (9.4)	249 (9.8)	249 (9.8)	30 (1.2)	55 (2.2)	21 (0.8)	21 (0.8)
50	45 (1.8)	54 (2.1)	57 (2.2)	57 (2.2)	210 (8.3)	210 (8.3)	219 (8.6)	219 (8.6)	296 (11.7)	296 (11.7)	305 (12.0)	305 (12.0)	36 (1.4)	59 (2.3)	21 (0.8)	21 (0.8)
63	54 (2.1)	60 (2.4)	61 (2.4)	61 (2.4)	236 (9.3)	236 (9.3)	243 (9.6)	243 (9.6)	344 (13.5)	344 (13.5)	351 (13.8)	351 (13.8)	40 (1.6)	55 (2.2)	21 (0.8)	21 (0.8)
80	60 (2.4)	78 (3.1)	67 (2.6)	71 (2.8)	271 (10.7)	279 (11.0)	273 (10.7)	277 (10.9)	411 (16.2)	419 (16.5)	413 (16.3)	417 (16.4)	46 (1.8)	69 (2.7)	21 (0.8)	25 (1.0)
100	78 (3.1)	88 (3.5)	81 (3.2)	71 (2.8)	330 (13.0)	330 (13.0)	334 (13.1)	334 (13.1)	498 (19.6)	498 (19.6)	502 (19.8)	502 (19.8)	56 (2.2)	71 (2.8)	25 (1.0)	25 (1.0)

Dimensions in mm (in) ** s = standard, o = oversized*

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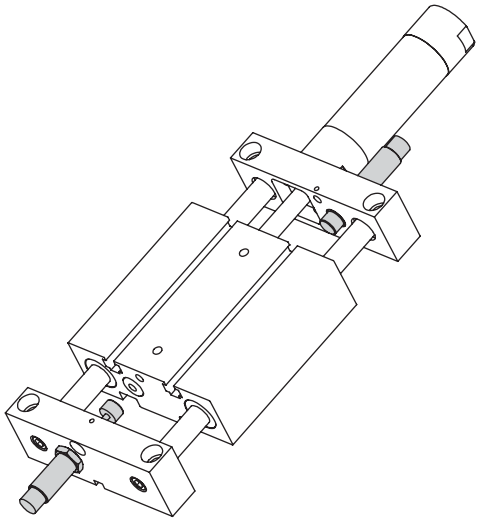
Shock Absorbers

Optional adjustable shock absorbers are available on the P5L series. When specifying this option verify the kinetic energy on page F84.

To achieve proper operation it is important to adjust the shock absorber per the application. To properly adjust the shock absorber, cycle the guided cylinder to impact the shock absorber. Rotate the shock adjustment knob, located on the front or the rear of the shock, to achieve a smooth deceleration. Reducing the setting (achieved by rotating the adjustment knob in the counterclockwise direction or towards 9) decreases the resistance. Increasing the setting (achieved by rotating the adjustment in the clockwise direction of towards 0) increases the resistance. A properly adjusted shock absorber will provide smooth deceleration through the stroke of the shock.

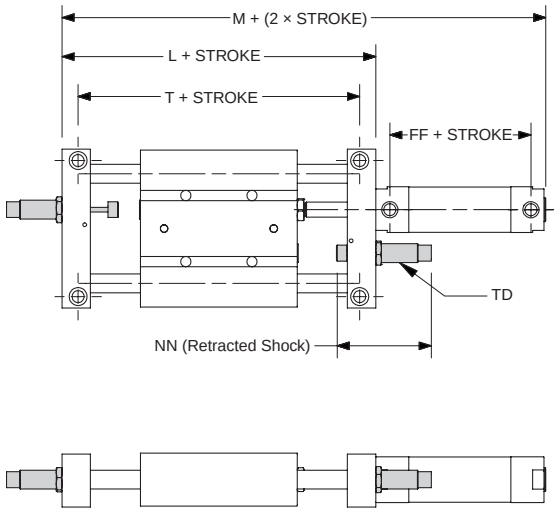
The shock absorber option can also be used as a stroke adjuster. To adjust the stroke of the actuator, loosen the jam nut and thread shock in/out.

Note: Using the shock absorber option as a stroke adjuster will only reduce the actuator stroke from a maximum value given in the actuator part number and cannot add additional stroke.



Shock Absorbers Both Ends (AA)

Bore	L	M	T	FF	NN	TD
20	140 (5.5)	217 (8.5)	120 (4.7)	51 (2.0)	74 (2.9)	M12X1.0
25	176 (6.9)	253 (10.0)	156 (6.1)	52 (2.0)	80.1 (3.2)	M14X1.5
32	198 (7.8)	277 (10.9)	170 (6.7)	49 (1.9)	80.1 (3.2)	M14X1.5
40	232 (9.1)	318 (12.5)	198 (7.8)	55 (2.2)	99.5 (3.9)	M20X1.5
50	292 (11.5)	390 (15.4)	254 (10.0)	59 (2.3)	117.3 (4.6)	M25X1.5
63	350 (13.8)	448 (17.6)	304 (12.0)	58 (2.3)	117.3 (4.6)	M25X1.5
80	434 (17.1)	551 (21.7)	374 (14.7)	70 (2.8)	140.5 (5.5)	M33X1.5
100	528 (20.8)	645 (25.4)	452 (17.8)	72 (2.8)	140.5 (5.5)	M36X1.5

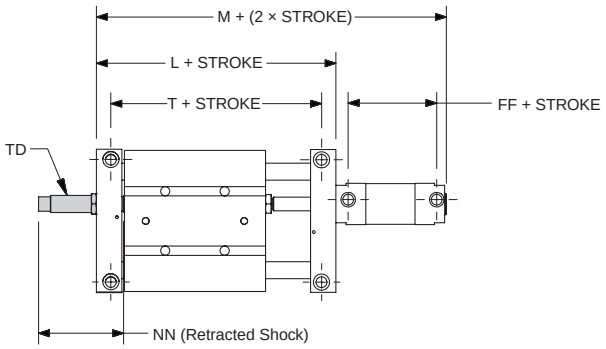


Dimensions in mm (in)

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Shock Absorber Extend Only (AN)

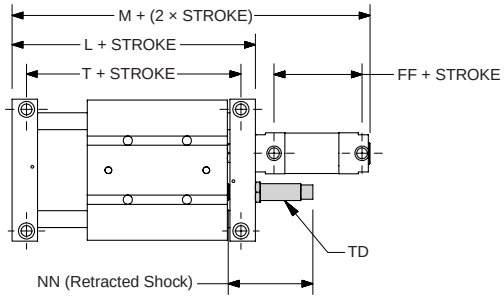
Bore	L	M	T	FF	NN	TD
20	140 (5.5)	214 (8.4)	120 (4.7)	48 (1.9)	74 (2.9)	M12x1.0
25	176 (6.9)	250 (9.8)	156 (6.1)	49 (1.9)	80.1 (3.2)	M14x1.5
32	198 (7.8)	274 (10.8)	170 (6.7)	46 (1.8)	80.1 (3.2)	M14x1.5
40	232 (9.1)	315 (12.4)	198 (7.8)	52 (2.0)	99.5 (3.9)	M20x1.5
50	292 (11.5)	387 (15.2)	254 (10.0)	56 (2.2)	117.3 (4.6)	M25x1.5
63	350 (13.8)	445 (17.5)	304 (12.0)	55 (2.2)	117.3 (4.6)	M25x1.5
80	434 (17.1)	548 (21.6)	374 (14.7)	67 (2.6)	140.5 (5.5)	M33x1.5
100	528 (20.8)	642 (25.3)	452 (17.8)	69 (2.7)	140.5 (5.5)	M36x1.5



F

Shock Absorber Retract Only (NA)

Bore	L	M	T	FF	NN	TD
20	140 (5.5)	214 (8.4)	120 (4.7)	48 (1.9)	74 (2.9)	M12x1.0
25	176 (6.9)	250 (9.8)	156 (6.1)	49 (1.9)	80.1 (3.2)	M14x1.5
32	198 (7.8)	274 (10.8)	170 (6.7)	46 (1.8)	80.1 (3.2)	M14x1.5
40	232 (9.1)	315 (12.4)	198 (7.8)	52 (2.0)	99.5 (3.9)	M20x1.5
50	292 (11.5)	387 (15.2)	254 (10.0)	56 (2.2)	117.3 (4.6)	M25x1.5
63	350 (13.8)	445 (17.5)	304 (12.0)	55 (2.2)	117.3 (4.6)	M25x1.5
80	434 (17.1)	548 (21.6)	374 (14.7)	67 (2.6)	140.5 (5.5)	M33x1.5
100	528 (20.8)	642 (25.3)	452 (17.8)	69 (2.7)	140.5 (5.5)	M36x1.5



Dimensions in mm (in)

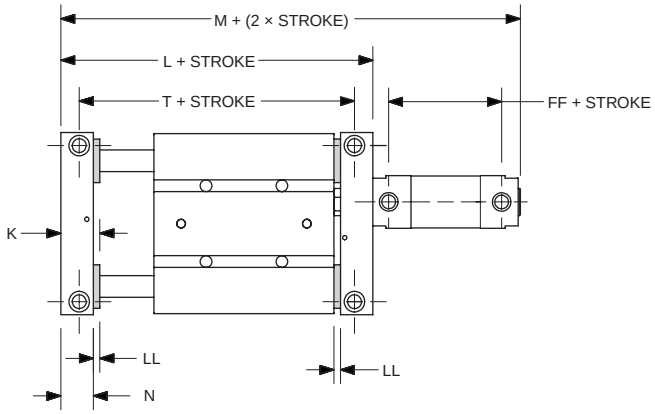
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Bumpers (B)

Bumpers absorb shock, reduce noise and permit faster cycle times, thereby increasing production rates. They can be placed on the extend, retract or both positions.

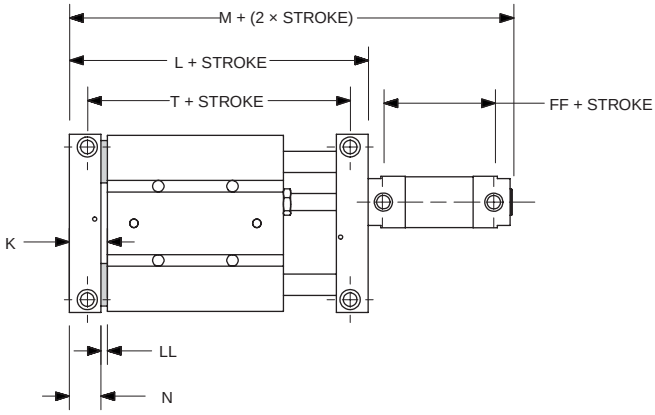
Bumpers Both Ends (BB)

Bore	K	L	M	N	T	FF	LL
20	24 (0.9)	146 (5.7)	223 (8.8)	18 (0.7)	126 (5.0)	51 (2.0)	6 (0.2)
25	30 (1.2)	182 (7.2)	259 (10.2)	24 (0.9)	163 (6.4)	52 (2.0)	6 (0.2)
32	32 (1.3)	204 (8.0)	283 (11.1)	26 (1.0)	176 (6.9)	49 (1.9)	6 (0.2)
40	36 (1.4)	238 (9.4)	324 (12.8)	30 (1.2)	204 (8.0)	55 (2.2)	6 (0.2)
50	41 (1.6)	298 (11.7)	396 (15.6)	35 (1.4)	260 (10.2)	59 (2.3)	6 (0.2)
63	48 (1.9)	356 (14.0)	454 (17.9)	42 (1.7)	310 (12.2)	58 (2.3)	6 (0.2)
80	60 (2.4)	440 (17.3)	557 (21.9)	54 (2.1)	380 (15.0)	70 (2.8)	6 (0.2)
100	72 (2.8)	534 (21.0)	651 (25.6)	66 (2.6)	458 (18.0)	72 (2.8)	6 (0.2)



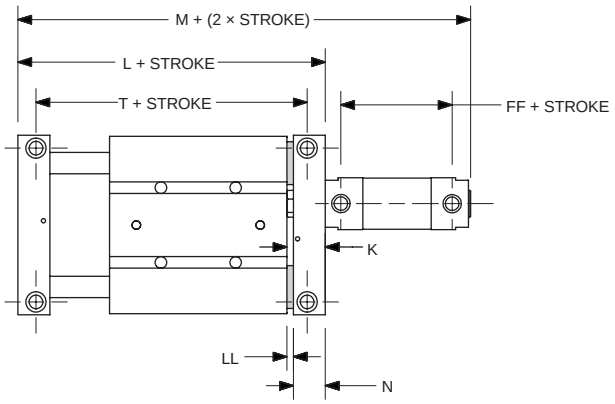
Bumpers, Extend Only (BN)

Bore	K	L	M	N	T	FF	LL
20	24 (0.9)	143 (5.6)	217 (8.5)	18 (0.7)	123 (4.8)	48 (1.9)	6 (0.2)
25	30 (1.2)	179 (7.0)	253 (10.0)	24 (0.9)	159 (6.3)	49 (1.9)	6 (0.2)
32	32 (1.3)	201 (7.9)	277 (10.9)	26 (1.0)	173 (6.8)	46 (1.8)	6 (0.2)
40	36 (1.4)	235 (9.3)	318 (12.5)	30 (1.2)	201 (7.9)	52 (2.0)	6 (0.2)
50	41 (1.6)	295 (11.6)	390 (15.4)	35 (1.4)	257 (10.1)	56 (2.2)	6 (0.2)
63	48 (1.9)	353 (13.9)	448 (17.6)	42 (1.7)	307 (12.1)	55 (2.2)	6 (0.2)
80	60 (2.4)	437 (17.2)	551 (21.7)	54 (2.1)	377 (14.8)	67 (2.6)	6 (0.2)
100	72 (2.8)	531 (20.9)	645 (25.4)	66 (2.6)	455 (17.9)	69 (2.7)	6 (0.2)



Bumpers on Retract Only (NB)

Bore	K	L	M	N	T	FF	LL
20	24 (0.9)	143 (5.6)	217 (8.5)	18 (0.7)	123 (4.8)	48 (1.9)	6 (0.2)
25	30 (1.2)	179 (7.0)	253 (10.0)	24 (0.9)	159 (6.3)	49 (1.9)	6 (0.2)
32	32 (1.3)	201 (7.9)	277 (10.9)	26 (1.0)	173 (6.8)	46 (1.8)	6 (0.2)
40	36 (1.4)	235 (9.3)	318 (12.5)	30 (1.2)	201 (7.9)	52 (2.0)	6 (0.2)
50	41 (1.6)	295 (11.6)	390 (15.4)	35 (1.4)	257 (10.1)	56 (2.2)	6 (0.2)
63	48 (1.9)	353 (13.9)	448 (17.6)	42 (1.7)	307 (12.1)	55 (2.2)	6 (0.2)
80	60 (2.4)	437 (17.2)	551 (21.7)	54 (2.1)	377 (14.8)	67 (2.6)	6 (0.2)
100	72 (2.8)	531 (20.9)	645 (25.4)	66 (2.6)	455 (17.9)	69 (2.7)	6 (0.2)



Dimensions in mm (in)

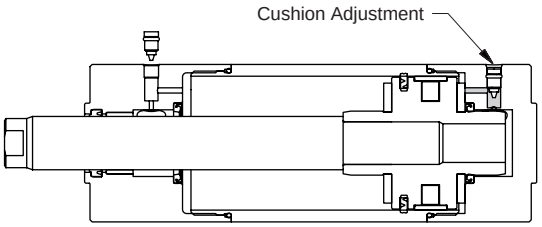
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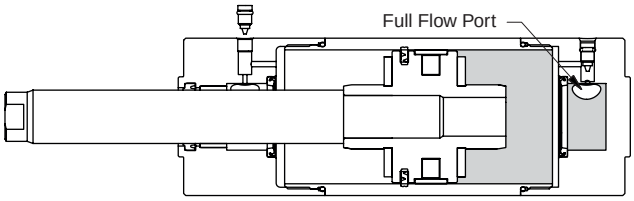
Cylinder Cushions (CC)

Fully adjustable cylinder cushions can be provided to reduce speed and energy at the end of cylinder stroke.

Cushions must be ordered as both ends only.

Note: If stroke adjustment is used in conjunction with cylinder cushions, the cushion effectiveness may be affected.



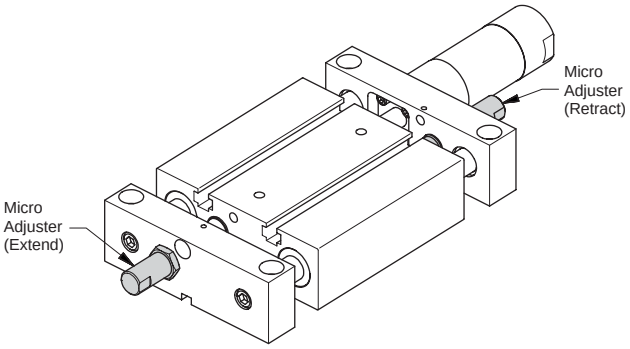


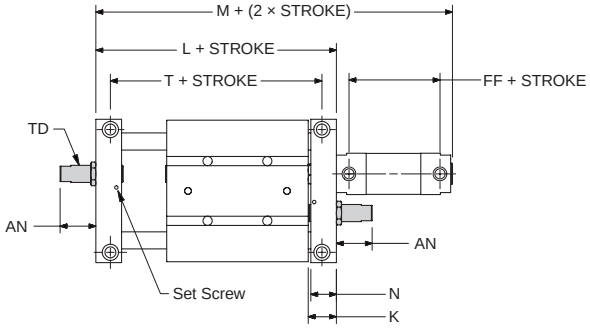
Micro Adjusters (EE)

Micro adjusters can be used as an accurate and fine adjustment of end of stroke position. Actual per end stroke adjustment depends on model size. See chart below.

Micro adjusters must be ordered as both ends only. Caution should be used as cushion effectiveness may be affected.

Note: Using micro adjusters will only reduce the actuator stroke from a maximum value given in the actuator part number and cannot additional stroke.





Bore	Kmin	Kmax	L	M	N	T	TD	FF	AN
20	21 (0.8)	48 (1.9)	140 (5.5)	217 (8.5)	18 (0.7)	120 (4.7)	M12x1.5	51 (2.0)	42 (1.7)
25	27 (1.1)	45 (1.8)	176 (6.9)	253 (10.0)	24 (0.9)	156 (6.1)	M14x1.5	52 (2.0)	36 (1.4)
32	29 (1.1)	45 (1.8)	198 (7.8)	277 (10.9)	26 (1.0)	170 (6.7)	M14x1.5	49 (1.9)	34 (1.3)
40	33 (1.3)	56 (2.2)	232 (9.1)	318 (12.5)	30 (1.2)	198 (7.8)	M20x1.5	55 (2.2)	42 (1.7)
50	38 (1.5)	71 (2.8)	292 (11.5)	390 (15.4)	35 (1.4)	254 (10.0)	M25x1.5	59 (2.3)	53 (2.1)
63	45 (1.8)	104 (4.1)	350 (13.8)	448 (17.6)	42 (1.7)	304 (12.0)	M25x1.5	55 (2.2)	77 (3.0)
80	57 (2.2)	87 (3.4)	434 (17.1)	551 (21.7)	54 (2.1)	374 (14.7)	M33x1.5	69 (2.7)	52 (2.0)
100	69 (2.7)	87 (3.4)	528 (20.8)	645 (25.4)	66 (2.6)	452 (17.8)	M36x1.5	71 (2.8)	40 (1.6)

Dimensions in mm (in)

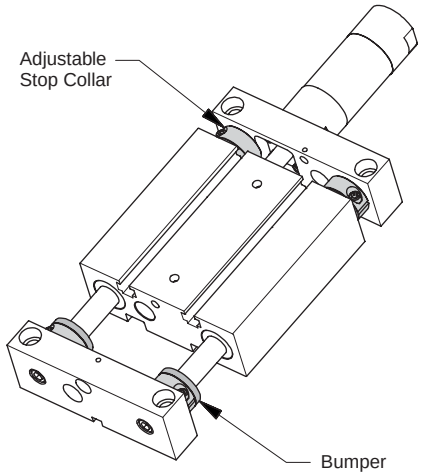
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Bumpers and Adjustable Stop Collars

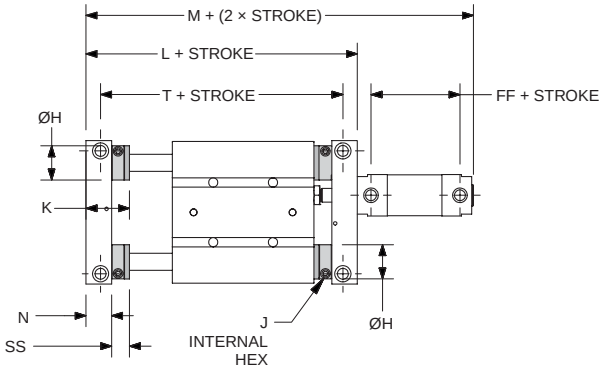
Bumpers provide end of stroke noise reduction. Bumpers can be used in conjunction with adjustable stop collars to provide adjustment. When a bumper is specified in the extend stroke a stop collar is provided.

Bumpers provide little energy absorption. If high speeds are present consult the kinetic energy section of this catalog to determine if cylinder cushions or shock absorbers are recommended.

A properly adjusted bumper and stop collar will prevent the cylinder from bottoming on the cylinder end cap thus increasing cylinder life.



Bumpers and Adjustable Stop Collars, Both Ends (KK)

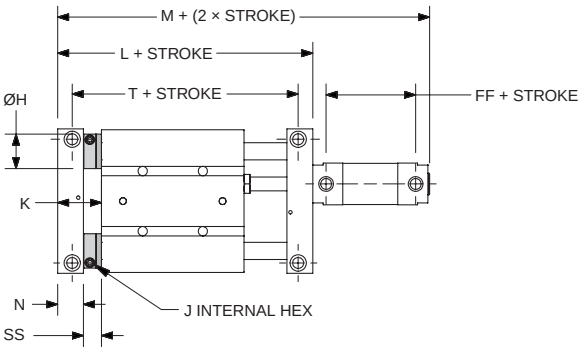


Bore	Hs*	Ho*	Js*	Jo*	Ks*	Ko*	Ls*	Lo*	Ms*	Mo*	N	Ts*	To*	FF	SSs*	SSo*
20	24 (0.9)	28 (1.1)	2.5 (0.1)	3 (0.1)	33 (1.3)	35 (1.4)	164 (6.5)	170 (6.7)	241 (9.5)	245 (9.6)	18 (0.7)	144 (5.7)	148 (5.8)	51 (2.0)	15 (0.6)	17 (0.7)
25	28 (1.1)	34 (1.3)	3 (0.1)	4 (0.2)	41 (1.6)	43 (1.7)	204 (8.0)	208 (8.2)	281 (11.1)	285 (11.2)	24 (0.9)	184 (7.2)	188 (7.4)	52 (2.0)	17 (0.7)	19 (0.7)
32	34 (1.3)	40 (1.6)	4 (0.2)	5 (0.2)	45 (1.8)	47 (1.9)	230 (9.1)	234 (9.2)	309 (12.2)	313 (12.3)	26 (1.0)	202 (8.0)	206 (8.1)	49 (1.9)	19 (0.7)	21 (0.8)
40	40 (1.6)	45 (1.8)	5 (0.2)	5 (0.2)	51 (2.0)	51 (2.0)	268 (10.6)	268 (10.6)	354 (13.9)	354 (13.9)	30 (1.2)	234 (9.2)	234 (9.2)	55 (2.2)	21 (0.8)	21 (0.8)
50	45 (1.8)	54 (2.1)	5 (0.2)	5 (0.2)	56 (2.2)	56 (2.2)	328 (12.9)	328 (12.9)	426 (16.8)	426 (16.8)	35 (1.4)	290 (11.4)	290 (11.4)	59 (2.3)	21 (0.8)	21 (0.8)
63	54 (2.1)	60 (2.4)	5 (0.2)	5 (0.2)	63 (2.5)	63 (2.5)	396 (15.6)	396 (15.6)	484 (19.1)	484 (19.1)	42 (1.7)	340 (13.4)	340 (13.4)	58 (2.3)	21 (0.8)	21 (0.8)
80	60 (2.4)	78 (3.1)	5 (0.2)	6 (0.2)	75 (3.0)	79 (3.1)	470 (18.5)	478 (18.8)	587 (23.1)	595 (23.4)	54 (2.1)	410 (16.1)	418 (16.5)	70 (2.8)	21 (0.8)	25 (1.0)
100	78 (3.1)	88 (3.5)	6 (0.2)	6 (0.2)	91 (3.6)	91 (3.6)	572 (22.5)	572 (22.5)	689 (27.1)	689 (27.1)	66 (2.6)	496 (19.5)	496 (19.5)	72 (2.8)	25 (1.0)	25 (1.0)

Dimensions in mm (in)

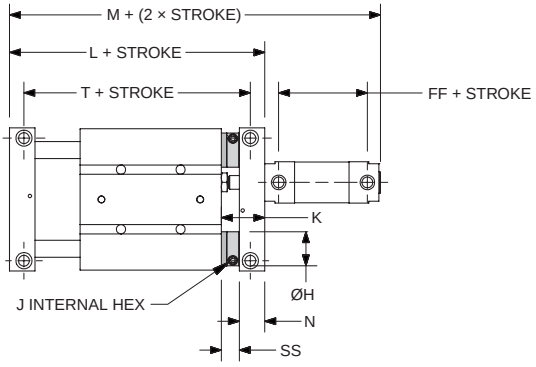
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Bumpers and Adjustable Stop Collars, Extend Only (KN)



Bore	Hs*	Ho*	Js*	Jo*	Ks*	Ko*	Ls*	Lo*	Ms*	Mo*	N	Ts*	To*	FF	SSs*	SSo*
20	24 (0.9)	28 (1.1)	2.5 (0.1)	3 (0.1)	33 (1.3)	35 (1.4)	152 (6.0)	156 (6.1)	226 (8.9)	230 (9.1)	18 (0.7)	132 (5.2)	136 (5.4)	48 (1.9)	15 (0.6)	17 (0.7)
25	28 (1.1)	34 (1.3)	3 (0.1)	4 (0.2)	41 (1.6)	43 (1.7)	190 (7.5)	194 (7.6)	264 (10.4)	268 (10.6)	24 (0.9)	170 (6.7)	174 (6.9)	49 (1.9)	17 (0.7)	19 (0.7)
32	34 (1.3)	40 (1.6)	4 (0.2)	5 (0.2)	45 (1.8)	47 (1.9)	214 (8.4)	218 (8.6)	290 (11.4)	294 (11.6)	26 (1.0)	186 (7.3)	190 (7.5)	46 (1.8)	19 (0.7)	21 (0.8)
40	40 (1.6)	45 (1.8)	5 (0.2)	5 (0.2)	51 (2.0)	51 (2.0)	250 (9.8)	250 (9.8)	333 (13.1)	333 (13.1)	30 (1.2)	216 (8.5)	216 (8.5)	52 (2.0)	21 (0.8)	21 (0.8)
50	45 (1.8)	54 (2.1)	5 (0.2)	5 (0.2)	56 (2.2)	56 (2.2)	310 (12.2)	310 (12.2)	405 (15.9)	405 (15.9)	35 (1.4)	272 (10.7)	272 (10.7)	56 (2.2)	21 (0.8)	21 (0.8)
63	54 (2.1)	60 (2.4)	5 (0.2)	5 (0.2)	63 (2.5)	63 (2.5)	368 (14.5)	368 (14.5)	463 (18.2)	463 (18.2)	42 (1.7)	322 (12.7)	322 (12.7)	55 (2.2)	21 (0.8)	21 (0.8)
80	60 (2.4)	78 (3.1)	5 (0.2)	6 (0.2)	75 (3.0)	79 (3.1)	452 (17.8)	460 (18.1)	566 (22.3)	574 (22.6)	54 (2.1)	392 (15.4)	400 (15.7)	67 (2.6)	21 (0.8)	25 (1.0)
100	78 (3.1)	88 (3.5)	6 (0.2)	6 (0.2)	91 (3.6)	91 (3.6)	550 (21.7)	550 (21.7)	664 (26.1)	664 (26.1)	66 (2.6)	474 (18.7)	474 (18.7)	69 (2.7)	25 (1.0)	25 (1.0)

Bumpers and Adjustable Stop Collars, Retract Only (NK)



Bore	Hs*	Ho*	Js*	Jo*	Ks*	Ko*	Ls*	Lo*	Ms*	Mo*	N	Ts*	To*	FF	SSs*	SSo*
20	24 (0.9)	28 (1.1)	2.5 (0.1)	3 (0.1)	33 (1.3)	35 (1.4)	152 (6.0)	156 (6.1)	226 (8.9)	230 (9.1)	18 (0.7)	132 (5.2)	136 (5.4)	48 (1.9)	15 (0.6)	17 (0.7)
25	28 (1.1)	34 (1.3)	3 (0.1)	4 (0.2)	41 (1.6)	43 (1.7)	190 (7.5)	194 (7.6)	264 (10.4)	268 (10.6)	24 (0.9)	170 (6.7)	174 (6.9)	49 (1.9)	17 (0.7)	19 (0.7)
32	34 (1.3)	40 (1.6)	4 (0.2)	5 (0.2)	45 (1.8)	47 (1.9)	214 (8.4)	218 (8.6)	290 (11.4)	294 (11.6)	26 (1.0)	186 (7.3)	190 (7.5)	46 (1.8)	19 (0.7)	21 (0.8)
40	40 (1.6)	45 (1.8)	5 (0.2)	5 (0.2)	51 (2.0)	51 (2.0)	250 (9.8)	250 (9.8)	333 (13.1)	333 (13.1)	30 (1.2)	216 (8.5)	216 (8.5)	52 (2.0)	21 (0.8)	21 (0.8)
50	45 (1.8)	54 (2.1)	5 (0.2)	5 (0.2)	56 (2.2)	56 (2.2)	310 (12.2)	310 (12.2)	405 (15.9)	405 (15.9)	35 (1.4)	272 (10.7)	272 (10.7)	56 (2.2)	21 (0.8)	21 (0.8)
63	54 (2.1)	60 (2.4)	5 (0.2)	5 (0.2)	63 (2.5)	63 (2.5)	368 (14.5)	368 (14.5)	463 (18.2)	463 (18.2)	42 (1.7)	322 (12.7)	322 (12.7)	55 (2.2)	21 (0.8)	21 (0.8)
80	60 (2.4)	78 (3.1)	5 (0.2)	6 (0.2)	75 (3.0)	79 (3.1)	452 (17.8)	460 (18.1)	566 (22.3)	574 (22.6)	54 (2.1)	392 (15.4)	400 (15.7)	67 (2.6)	21 (0.8)	25 (1.0)
100	78 (3.1)	88 (3.5)	6 (0.2)	6 (0.2)	91 (3.6)	91 (3.6)	550 (21.7)	555 (21.9)	664 (26.1)	664 (26.1)	66 (2.6)	474 (18.7)	474 (18.7)	69 (2.7)	25 (1.0)	25 (1.0)

Dimensions in mm (in) ** s = standard; o = oversized*

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Fluorocarbon Seals (V)

Standard nitrile seals are used for applications within the temperatures of -18° to 74°C (0° to 165°F). For high temperature applications, up to 121°C (250° F), fluorocarbon seals are available.

When temperatures exceed 60°C (140°F) other components may not be applicable. See chart for temperature ratings of other commonly used components.

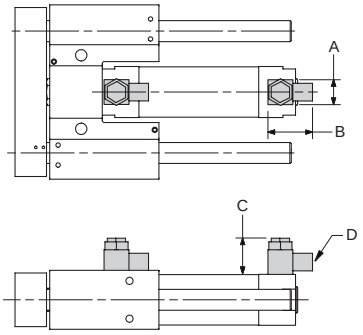
Option	Temperature Range	
Shock Absorbers	0° to 66°C	32° - 150°F
Bumpers	-18° to 93°C	0° - 200°F
Piston Magnets	-18° to 74°C	0° - 165°F
Sensors	-10° to 60°C	14° - 140°F

Flow Controls (P, F, B, N)

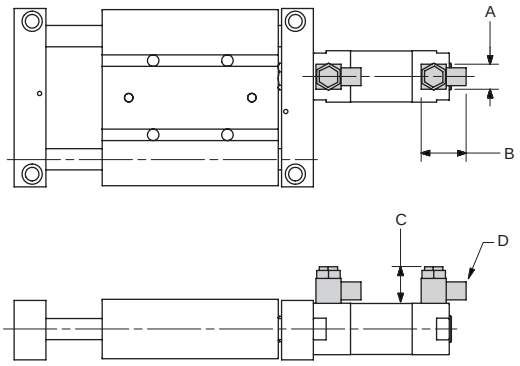
Right angle flow controls provide speed control. It is recommended that applications involving heavy loads use flow controls to provide maximum cylinder life.

Parker flow controls are available in Prestolok (push-in) and threaded style connections with the ability to rotate the head 360°.

Thrust Reach



Base

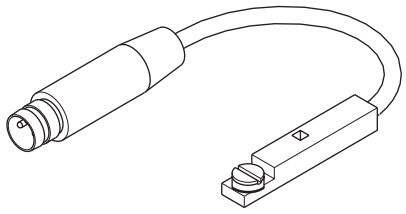


Bore	NPT Cylinder Port								BSPT Cylinder Port							
	Threaded (N)				Presto-lok (F)				Threaded (B)				Presto-lok (P)			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
20, 25, 32, 40	17.2 (0.68)	28.4 (1.12)	55.4 (2.18)	1/8	17.2 (0.68)	25.2 (0.99)	55.4 (2.18)	1/4"* tube	14.4 (0.57)	25.4 (1.00)	28.5 (1.12)	1/8	14.4 (0.57)	31.6 (1.24)	28.5 (1.12)	6mm tube
50, 63	17.2 (0.68)	32.4 (1.27)	65.2 (2.57)	1/4	17.2 (0.68)	38.3 (1.51)	65.2 (2.57)	3/8" tube	18.4 (0.72)	34.3 (1.35)	27.4 (1.08)	1/4	18.4 (0.72)	41.3 (1.63)	34 (1.34)	10mm tube
80	25.0 (0.98)	39.0 (1.54)	80.2 (3.16)	3/8	30.0 (1.18)	47.4 (1.87)	98.0 (3.86)	3/8" tube	21.6 (0.85)	40.2 (1.58)	34.0 (1.34)	3/8	21.6 (0.85)	46.7 (1.84)	44 (1.73)	12mm tube
100	30.0 (1.18)	45.5 (1.79)	98.0 (3.86)	1/2	30.0 (1.18)	51.4 (2.02)	98.0 (3.86)	1/2" tube	26.5 (1.04)	49.1 (1.93)	42.0 (1.65)	1/2	26.5 (1.04)	52.1 (2.05)	52 (2.05)	12mm tube

*1/8" on 20 and 25mm bore

Reed and Solid State Sensors

The P5L series guided cylinder includes a standard magnetic piston to allow for field installation of reed or solid state sensors. The sensor, bracket and cable must be ordered separately from the Electronic Sensors section of this catalog.



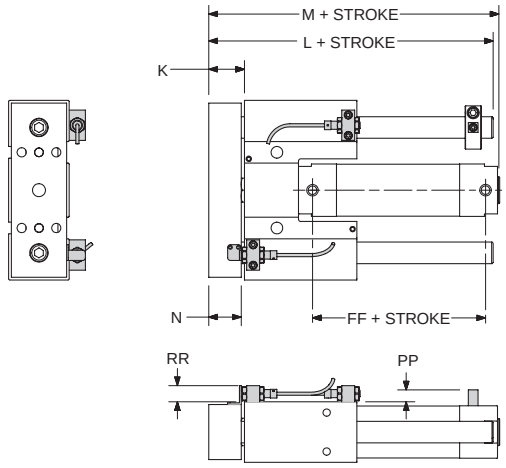
Dimensions in mm (in)

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Proximity Sensors

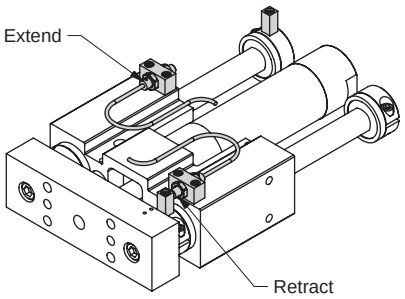
8mm proximity sensors may be ordered as part of the P5L ordering code.

A P5L can also be ordered prepared for proximity sensors which would include all the brackets necessary to mount either 8mm or 12mm proximity sensors. See Electronic Sensors section for specifications and part numbers.

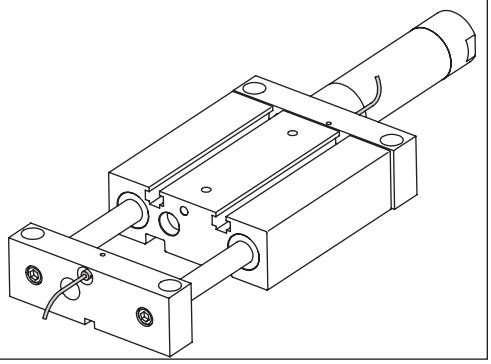


Thrust/Reach

Drawing illustrates proximity sensor and bumper options.

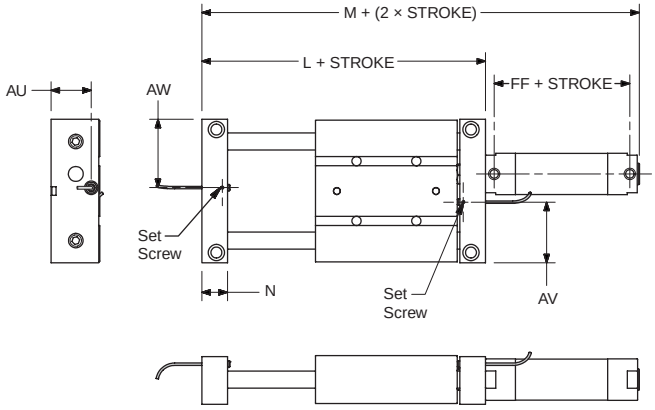


Base Slide



Dimensions – Thrust / Reach

Bore	K	Thrust			Reach			N	FF	PP	RR	
		Ls*	Lo*	M	Ls*	Lo*	M				8mm	12mm
20	20 (0.8)	100 (3.9)	102 (4.0)	120 (4.7)	138 (5.4)	140 (5.5)	158 (6.2)	17 (0.7)	45 (1.8)	13 (0.5)	17 (0.7)	NA
25	25 (1.0)	123 (4.8)	127 (5.0)	132 (5.2)	169 (6.7)	173 (6.8)	178 (7.0)	22 (0.9)	46 (1.8)	13 (0.5)	15 (0.6)	22 (0.9)
32	27 (1.1)	136 (5.4)	140 (5.5)	146 (5.7)	192 (7.6)	196 (7.7)	202 (8.0)	24 (0.9)	43 (1.7)	12.5 (0.5)	15 (0.6)	22 (0.9)
40	33 (1.3)	166 (6.5)	166 (6.5)	169 (6.7)	228 (9.0)	228 (9.0)	231 (9.1)	30 (1.2)	49 (1.9)	13 (0.5)	15 (0.6)	22 (0.9)
50	39 (1.5)	198 (7.8)	198 (7.8)	201 (7.9)	284 (11.2)	284 (11.2)	287 (11.3)	36 (1.4)	53 (2.1)	13.5 (0.5)	15 (0.6)	22 (0.9)
63	43 (1.7)	224 (8.8)	224 (8.8)	225 (8.9)	332 (13.1)	332 (13.1)	333 (13.1)	40 (1.6)	52 (2.0)	13 (0.5)	15 (0.6)	22 (0.9)
80	49 (1.9)	258 (10.2)	266 (10.5)	255 (10.0)	398 (15.7)	406 (16.0)	395 (15.6)	46 (1.8)	64 (2.5)	13.5 (0.5)	15 (0.6)	22 (0.9)
100	59 (2.3)	318 (12.5)	318 (12.5)	312 (12.3)	486 (19.1)	486 (19.1)	480 (18.9)	56 (2.2)	66 (2.6)	13 (0.5)	15 (0.6)	22 (0.9)



Dimensions in mm (in) ** s = standard, o = oversized*

Dimensions – Base Slides

Bore	L	M	N	AU	AV	AW	FF
20	140 (5.5)	211 (8.3)	18 (0.7)	22 (0.9)	43 (1.7)	51 (2.0)	45 (1.8)
25	176 (6.9)	247 (9.7)	24 (0.9)	29 (1.1)	51 (2.0)	62 (2.4)	46 (1.8)
32	198 (7.8)	271 (10.7)	26 (1.0)	35 (1.4)	58 (2.3)	69 (2.7)	43 (1.7)
40	232 (9.1)	312 (12.3)	30 (1.2)	47 (1.9)	71 (2.8)	80 (3.1)	49 (1.9)
50	292 (11.5)	384 (15.1)	35 (1.4)	60 (2.4)	95 (3.7)	101 (4.0)	53 (2.1)
63	350 (13.8)	442 (17.4)	42 (1.7)	73 (2.9)	114 (4.5)	121 (4.8)	52 (2.0)
80	434 (17.1)	545 (21.5)	54 (2.1)	92 (3.6)	144 (5.7)	145 (5.7)	64 (2.5)
100	528 (20.8)	639 (25.2)	66 (2.6)	109 (4.3)	169 (6.7)	180 (7.1)	66 (2.6)

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Seal Kits for Cylinder Only*

Bore	Nitrile	Fluorocarbon
20mm	P1L020D001	P1L020D005
25mm	P1L025D001	P1L025D005
32mm	P1L032D001	P1L032D005
40mm	P1L040D001	P1L040D005
50mm	P1L050D001	P1L050D005
63mm	P1L063D001	P1L063D005
80mm	P1L080D001	P1L080D005
100mm	P1L0100D001	P1L0100D005

* Additional Information on page D90 of P1L Series Section.

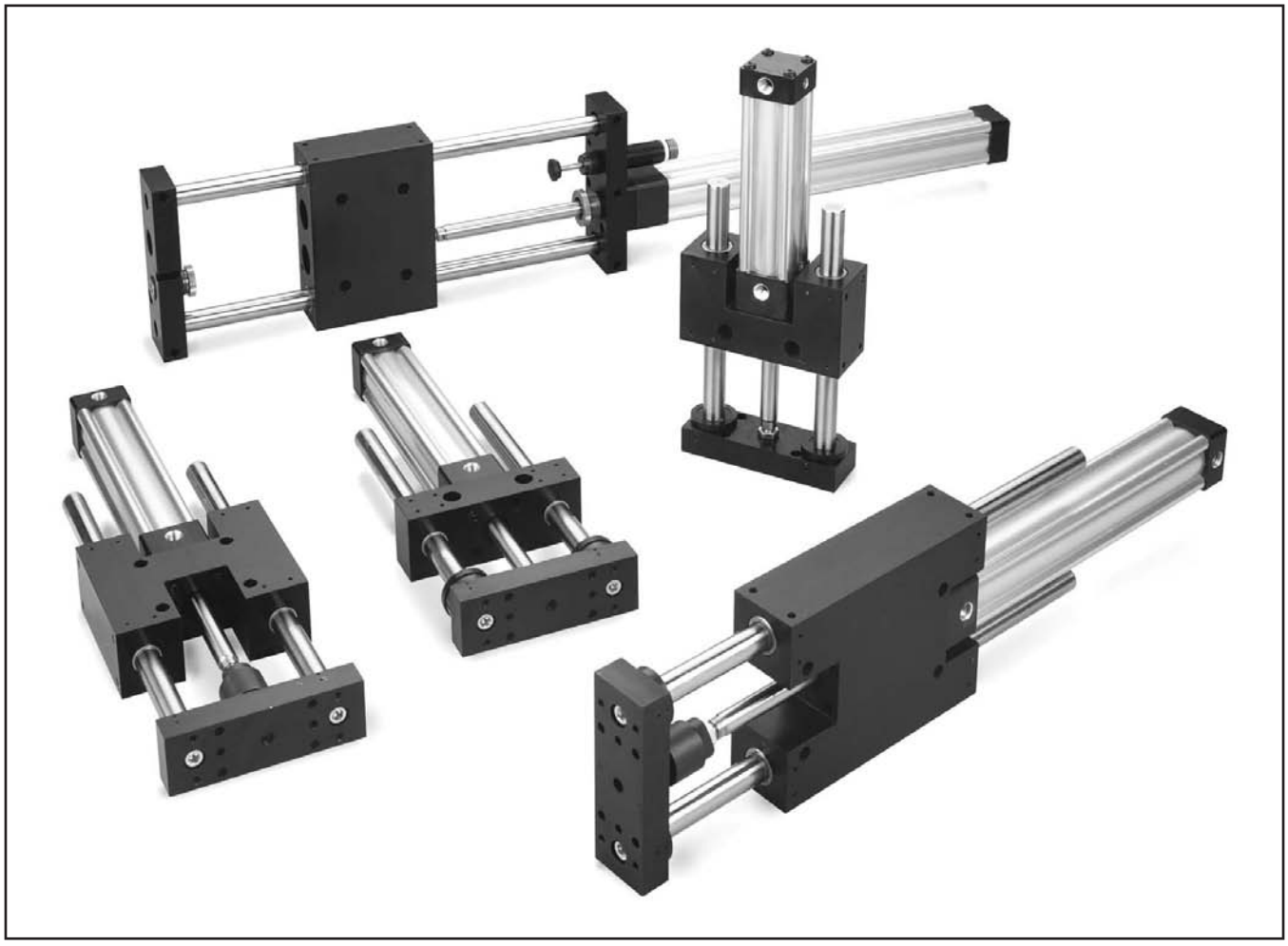
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HB Series

Guided Cylinders



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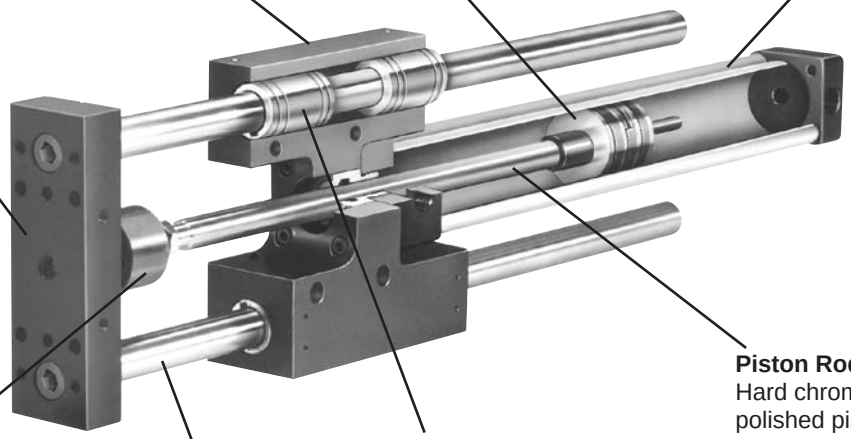
Model HBT Shown

Tooling Plate
Precision machined from aluminum and then anodized, the tooling plate allows mounting on two sides. Standard dowel pin holes provide accurate mounting.

Body
A machined aluminum one-piece anodized body with tapped and counterbored through holes on three faces for mounting flexibility. Standard dowel pin holes provide accurate mounting.

Cylinder Piston
Aluminum piston with nylon wearband eliminates metal-to-metal contact. This increases cylinder life especially when the support shafts deflect under load. Magnetic piston is standard on all HB slides.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept both Global and Mini-Global Sensors. Single corner lobe of extrusion will accept legacy 2MA sensor brackets. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction.



3D CAD FILES
available for download at parker.com/pneumatics

F

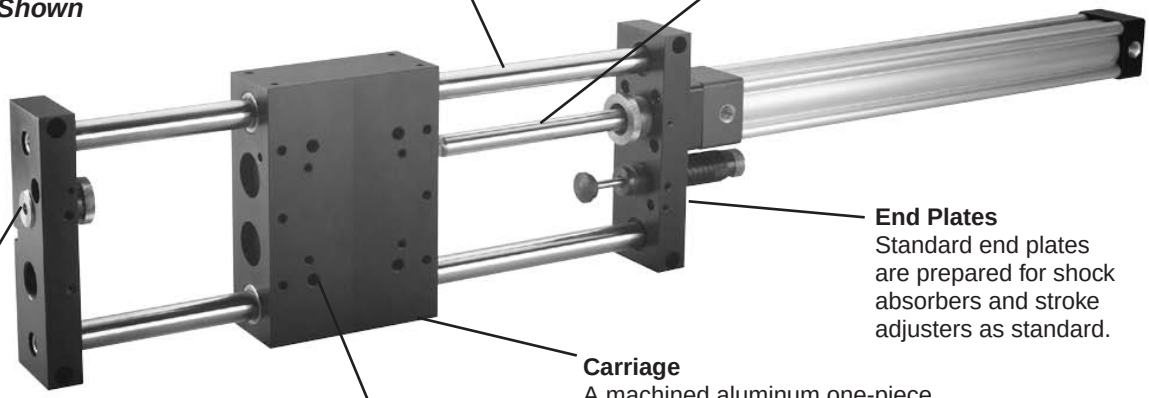
Alignment Coupler
For long stroke or heavy load applications, the alignment coupler allows the piston rod to self-center, thus increasing cylinder life. Not available for HBC Series due to shorter strokes.

Support Shafts
Case hardened to Rc 60 - 65, support shafts are machined from high carbon alloy steel and chrome plated. Stainless steel and oversized shafting are available.

Bushings
Composite bushings with oversized shafting are available for higher loads and lower cost. Sealed recirculating ball bearings provide precise alignment with very low friction and wear.

Piston Rod
Hard chrome plated and polished piston rod of 100,000 PSI yield, high tensile strength steel, case hardened to Rc 50-54 for reliable performance, reduced friction and long rod seal life.

Model HBB Shown



End Plates
Standard end plates are prepared for shock absorbers and stroke adjusters as standard.

Carriage
A machined aluminum one-piece anodized body with tapped and counterbored through holes on three faces for mounting flexibility. Standard dowel pin holes provide accurate mounting.

Threaded Stroke Adjusters
Used to achieve precise end of stroke adjustment. Available with shock absorbers and optional shock pads to reduce noise.

Direct Mounting
Tapped holes provide direct mounting capabilities to HBC Series.

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Model Number Code for HBC, HBT and HBR

Example: HBT25-08AP1T1FEV-B

HBT	25	–	08	A	P1	T1	F	E	V	–	B	

Series

HBC	Compact Slide
HBT	Thrust Slide
HBR	Reach Slide

Model

15	1-1/2" Bore, 20mm Shaft
20	2" Bore, 25mm Shaft
25	2-1/2" Bore, 30mm Shaft

Stroke

Order in 1" increments. [4]

For 3-position units, specify intermediate and total stroke separated by a "/", i.e. 02/06.

Consult factory for strokes over 36".

Slide Configuration Options

Blank	None
A	Shock Absorber, Both Ends
A1	Shock Absorber, Extend only
A2	Shock Absorber, Retract only
A3	Shock Ready, Both Ends
A4	Shock Ready, Extend
A5	Shock Ready, Retract
B	Bumpers Both Ends [1]
B1	Bumper & Adjustable Stop Collar, Extend only
B2	Bumper Retract only
B3	Bumper & Adjustable Stop Collar, Retract only
B4	Bumper & Adjustable Stop Collar, Both Ends
C	Cushions on Cylinder, Both Ends [2]
C1	Cushion on Cylinder, Extend only [2]
C2	Cushion on Cylinder, Retract only [2]
X	Special Slide Configuration (Please specify)

Proximity Sensor Options

Blank	None
P	PNP, Flying Lead Type
N	NPN, Flying Lead Type
P1	PNP, Plug-in Connector
N1	NPN, Plug-in Connector
J	8mm Sensor Mounting Bracket, no sensor supplied
J1	12mm Sensor Mounting Bracket, no sensor supplied

Note: 8mm inductive proximity sensors are included with Options P, N, P1, N1. Magnetic piston is standard for 3MA, 4MA, 4MAJ, 4ML and P1D cylinders. Order reed and solid state sensors separately for these cylinders from the Electronic Sensors section.

Bushings

T	Composite (Standard)
D	Linear Ball Bearing
T1	Composite with Oversized Support Shafts
TC	Composite with Contaminant-tolerant Seals

Other Options
(More than one selection is possible)

Blank	None
F	Flow Controls (Presto-Lok)
G	Flow Controls (NPT)
K	Stainless Steel Support Shafting

Cylinder Type

3A	3MA NFPA Air Cylinder, NPTF Ports [2]
4A	4MA NFPA Air Cylinder, NPTF Ports
4J	4MAJ NFPA Air Cylinder with Manual Override Rodlock, NPTF Ports, 100 PSIG max.
D	P1D ISO Cylinder w/Removable Gland, BSPP Ports
D1	P1D ISO Cylinder w/Removable Gland, Standard Rodlock, BSPP Ports
D2	P1D ISO Cylinder w/Removable Gland, Manual Override Rodlock, BSPP Ports
E	P1D ISO Cylinder w/Removable Gland, NPTF Ports
E1	P1D ISO Cylinder w/Removable Gland, Standard Rodlock, NPTF Ports
E2	P1D ISO Cylinder w/Removable Gland, Manual Override Rodlock, NPTF Ports
4L	4ML NFPA Hydraulic Cylinder, NPTF Ports, 400 PSIG max. [2]
S	2A NFPA Steel Air Cylinder, 250 PSIG max.
S1	3L NFPA Steel Hydraulic Cylinder, 750 PSIG max.
Q	No Cylinder, NFPA Cylinder Mounting
Q1	No Cylinder, ISO Cylinder Mounting
X	Special Cylinder Type (Please specify)

Cylinder Options
(More than one selection is possible)

Blank	None
V	Fluorocarbon cylinder seals [3]
L1	Left hand assembly
L3	Cylinder ports at position 3

Design Series

B	Current Design Level

Special Options

Blank (STD)

(Two digit code assigned by factory and applies when any "X" appears in the model number or when special options or features are required.)

NOTES

1 Option B includes Options B1 and B2.

2 Cushions are not available with 4ML cylinders or 3MA cylinders on HB products.

3 Fluorocarbon seals not available with 3MA or rodlock cylinders.

4 P1D cylinders have strokes only in whole mm. The HB inch stroke will be changed (rounded up) to reflect this.

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Model Number Code for HBB

Example: HBB25-08AP1T1FLV-B

HBB	25	–	08	A	P1	T1	F	3A	V	–	B	

Series

HBB	Base Slide

Model

15	1½" Bore, 20mm Shaft
20	2" Bore, 25mm Shaft
25	2½" Bore, 30mm Shaft

Stroke

Order in 1" increments. [4]

For 3-position units, specify intermediate and total stroke separated by a "/", i.e. 02/06.

Consult factory for strokes over 36".

Slide Configuration Options

Blank	None
A	Shock Absorber, Both Ends
A1	Shock Absorber, Extend only
A2	Shock Absorber, Retract only
A3	Shock Ready, Both Ends
B	Bumpers Both Ends
B1	Bumper & Adjustable Stop Collar, Extend only
B2	Bumper Retract only
B3	Bumper & Adjustable Stop Collar, Retract only
B4	Bumpers & Adjustable Stop Collar, Extend only
B5	Bumper & Adjustable Stop Collar, Both Ends
C	Cushions on Cylinder, Both Ends [2]
C1	Cushion on Cylinder, Extend only [2]
C2	Cushion on Cylinder, Retract only [2]
E	Threaded Stroke Adjusters, Both Ends
E1	Stroke Adjusters with Shock Pads, Both Ends
E2	Stroke Adjusters with Shock Pads, Extend only
E3	Stroke Adjusters with Shock Pads, Retract only
X	Special Slide Configuration (Please specify)

Proximity Sensor Options

Blank	None
P	PNP, Flying Lead Type
N	NPN, Flying Lead Type
P1	PNP, Plug-in Connector
N1	NPN, Plug-in Connector
J	8mm Sensor Mounting Bracket, no sensor supplied
J1	12mm Sensor Mounting Bracket, no sensor supplied

Note: 8mm inductive proximity sensors are included with Options P, N, P1, N1. Magnetic piston is standard for 3MA, 4MA, 4MAJ, 4ML and P1D cylinders. Order reed and solid state sensors separately for these cylinders from the Electronic Sensors section.

Bushings

T	Composite (Standard)
D	Linear Ball Bearings
T1	Composite with Oversized Support Shafts
TC	Composite with Contaminant-tolerant Seals

Other Options
(More than one selection is possible)

Blank	None
F	Flow Controls (Presto-Lok)
G	Flow Controls (NPT)
K	Stainless Steel Guide Shafting

Cylinder Type

3A	3MA NFPA Air Cylinder, NPTF Ports [2]
4A	4MA NFPA Air Cylinder, NPTF Ports
4J	4MAJ NFPA Air Cylinder with Manual Override Rodlock, NPTF Ports, 100 PSIG max.
D	P1D ISO Cylinder w/Removable Gland, BSPP Ports
D1	P1D ISO Cylinder w/Removable Gland, Standard Rodlock, BSPP Ports
D2	P1D ISO Cylinder w/Removable Gland, Manual Override Rodlock, BSPP Ports
E	P1D ISO Cylinder w/Removable Gland, NPTF Ports
E1	P1D ISO Cylinder w/Removable Gland, Standard Rodlock, NPTF Ports
E2	P1D ISO Cylinder w/Removable Gland, Manual Override Rodlock, NPTF Ports
4L	4ML NFPA Hydraulic Cylinder, NPTF Ports, 400 PSIG max. [2]
S	2A NFPA Steel Air Cylinder, 250 PSIG max.
S1	3L NFPA Steel Hydraulic Cylinder, 750 PSIG max.
Q	No Cylinder, NFPA Cylinder Mounting
Q1	No Cylinder, ISO Cylinder Mounting
X	Special Cylinder Type (Please specify)

Cylinder Options
(More than one selection is possible)

Blank	None
V	Fluorocarbon Cylinder Seals [3]
L3	Cylinder Ports at Position 3

Design Series

B	Current Design Level

Special Options

Blank (STD)

(Two digit code assigned by factory applies when any "X" appears in the model number or when special options or features are required.)

NOTES

1 Option B includes Options B1 and B2.

2 Cushions are not available with 4ML cylinders or 3MA cylinders on HB products.

3 Fluorocarbon seals not available with 3MA or rodlock cylinders.

4 P1D cylinders have strokes only in whole mm. The HB inch stroke will be changed (rounded up) to reflect this.

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Specifications

- Maximum operating pressure: 100 psi (air) – 4MAJ cylinder
  150 psi (air) – P1D cylinder
  250 psi (air) – 3MA, 4MA and 2A cylinders
  400 psi (oil) – 4ML cylinder only
  750 psi (oil) – 3L cylinder only
- Operating characteristics: double acting
- Four support shaft sizes: 20, 25, 30 and 35 mm
- Stroke tolerance: +.030, -.000
- Mounting: unrestricted
- Operating temperature range (cylinder):
  Standard seals 0 to 165°F
  Fluorocarbon seals* 0 to 250°F
- Filtration requirement:
  40 micron filtered, dry air or
  filtered hydraulic oil (4ML or 3L)

* See fluorocarbon seal option for high temperature applications. Not available for 3MA or rod lock cylinders.

Quick Reference Data

Model	Support Shaft Diameter mm (in)	Oversized Shaft Diameter mm (in)	3MA, 4MA, 4MAJ, 4ML NFPA Cylinder Bore Size (in)	P1D ISO Cylinder Bore Size (mm)	Force Output on Extend at 80 PSI (lb)	Force Output on Retract at 80 PSI (lb)
15	20 (0.79)	25 (0.98)	1½	40	142	117
20	25 (0.98)	30 (1.18)	2	50	251	226
25	30 (1.18)	35 (1.38)	2½	63	393	368

Model	Maximum Suggested Stroke, inches*				Weights, Standard Shaft (lb)					Weights, Oversized Shaft (lb)				
					Base Unit				Per Inch Stroke	Base Unit				Per Inch Stroke
	HBC	HBT	HBR	HBB	HBC	HBT	HBR	HBB		HBC	HBT	HBR	HBB	
15	8	24	30	30	6.54	8.86	12.76	11.05	0.48	7.24	9.83	14.20	11.92	0.63
20	10	30	36	36	11.57	14.35	24.02	18.65	0.64	12.60	15.67	26.19	19.81	0.83
25	12	36	42	42	20.57	24.45	42.03	31.78	0.85	22.03	25.69	44.50	33.32	1.08

*Consult factory for longer strokes.

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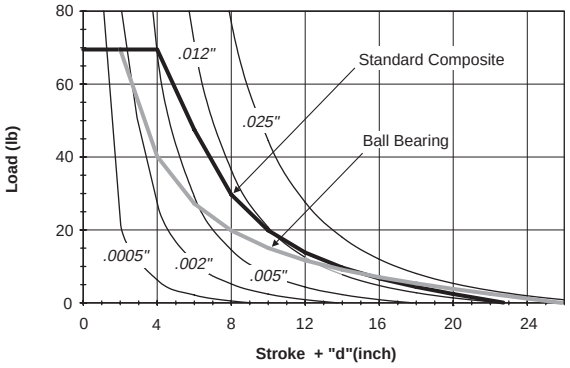
Horizontal Load Capacity & Deflection with Standard Shafting

The plots on these two pages illustrate the side load vs. actuator stroke for the three HB slide sizes. Applied loads will cause a slight deflection of the support rods. Deflection distance is also shown except for HBN, which should be used on non-rotating applications. The graphs include the weight of the support rods and tooling plate and are based on a bearing life equivalent to 10 million cycles for dynamic conditions. Higher dynamic loads will reduce cycle life. For static loads, multiply the information in the graph by 1.5. The vertical load for HBN does not include the weight of the tool plate and support rods.

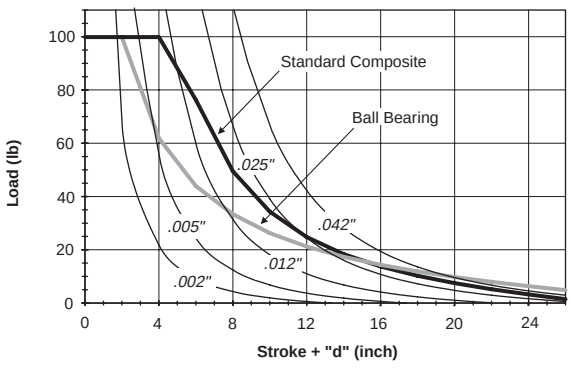
Note: Actuator life may vary depending on the severity of the following variables:

- Acceleration
- Velocity
- Vibration
- Orientation

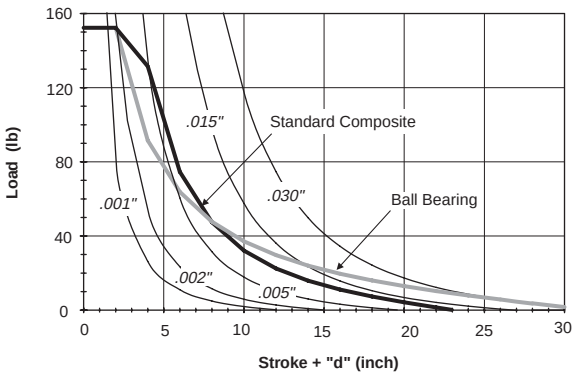
HBC15



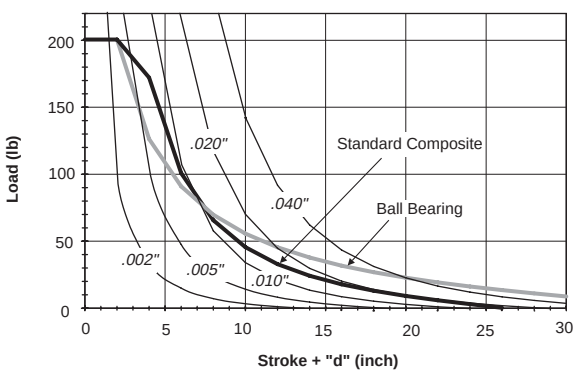
HBT15



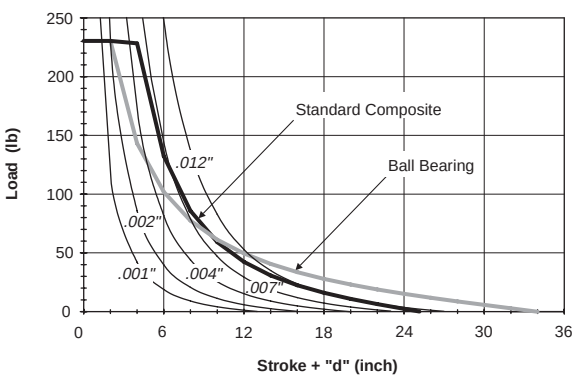
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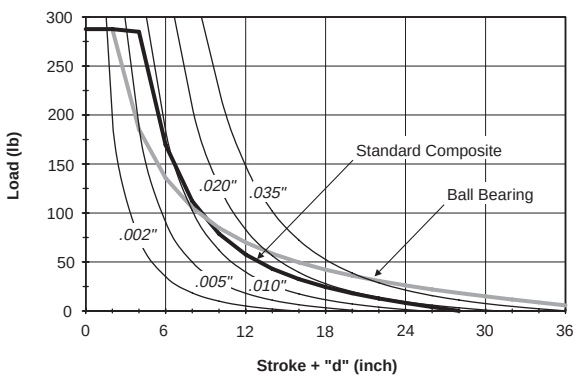
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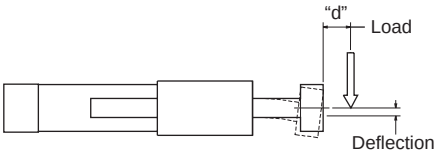
HBC25



HBT25

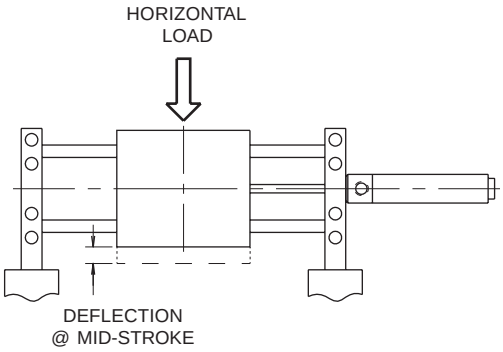


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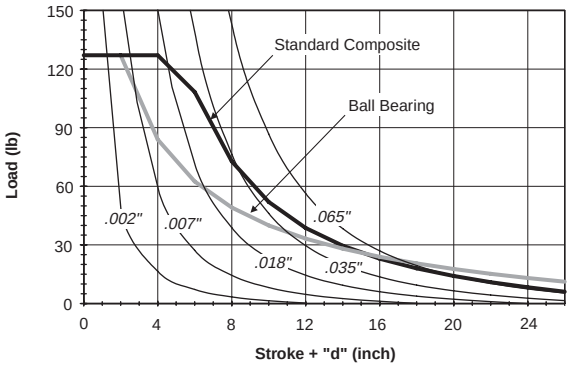


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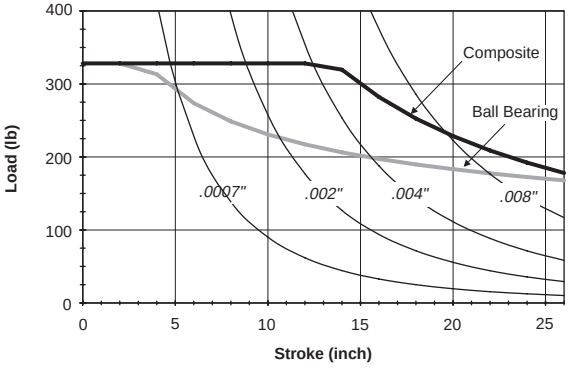
An HBT15 with ball bearings and a "stroke+d" of 12" would have a load capacity of 20 lbs.



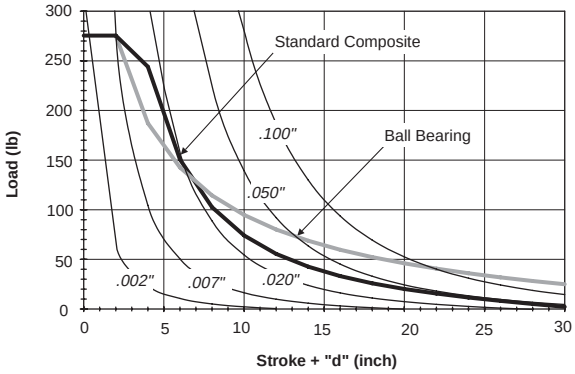
HBR15



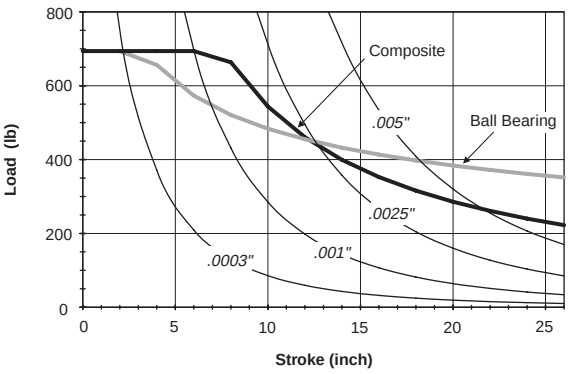
HBB15



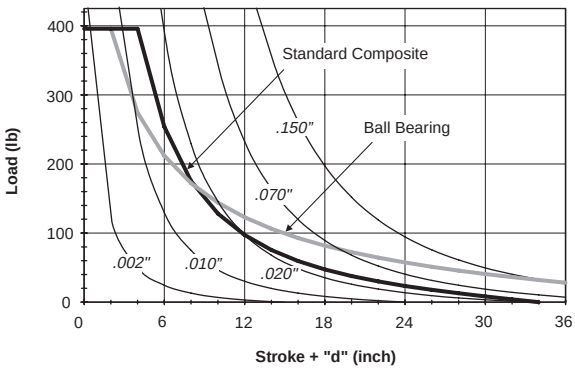
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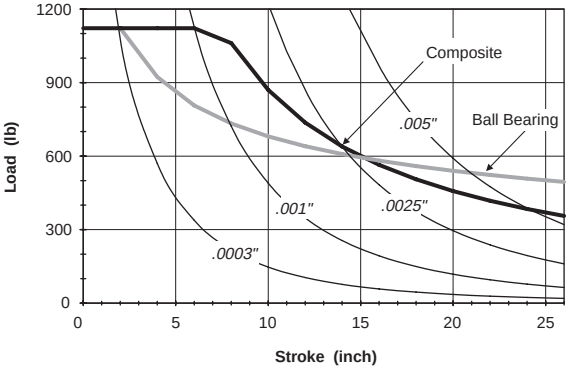
HBB20



HBR25



HBB25



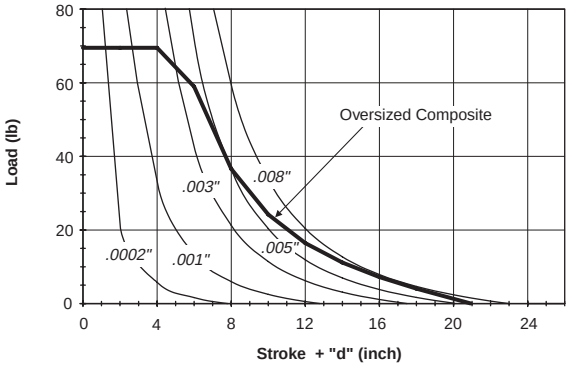
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Horizontal Load Capacity & Deflection with Oversized Shafting

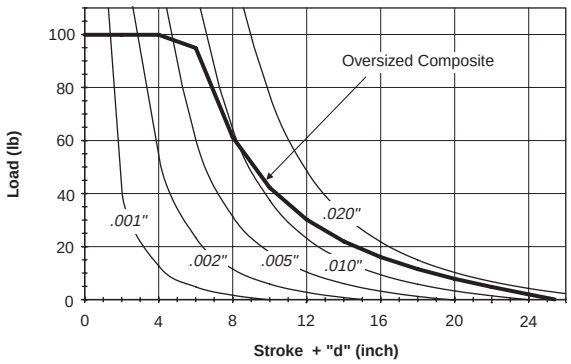
The plots on these two pages illustrate the side load vs. actuator stroke for the three HB slide sizes. Applied loads will cause a slight deflection of the support rods. Deflection distance is also shown. The graphs include the weight of the support rods and tooling plate and are based on a bearing life equivalent to 10 million cycles for dynamic conditions. Higher dynamic loads will reduce cycle life. For static loads, multiply the information in the graph by 1.5.

Note: Actuator life may vary depending on the severity of the following variables:
- Acceleration
- Velocity
- Vibration
- Orientation

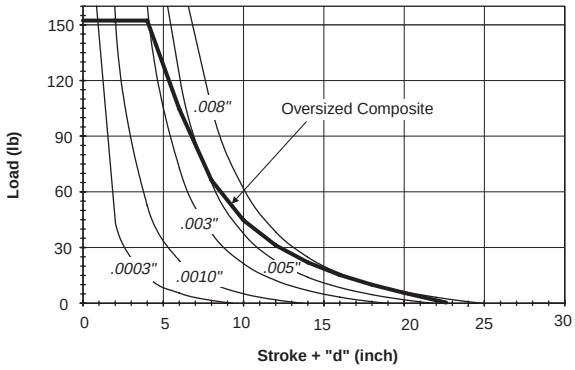
HBC15



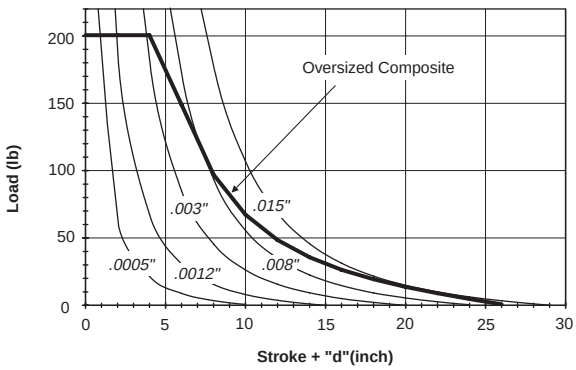
HBT15



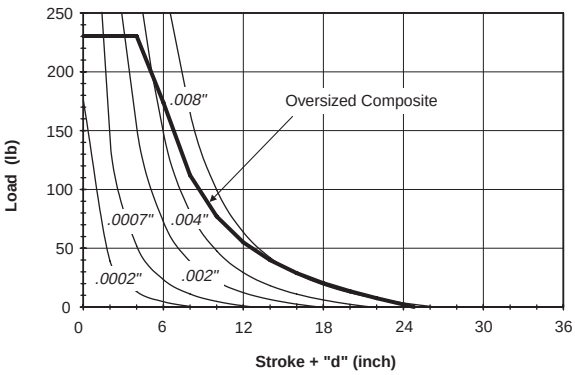
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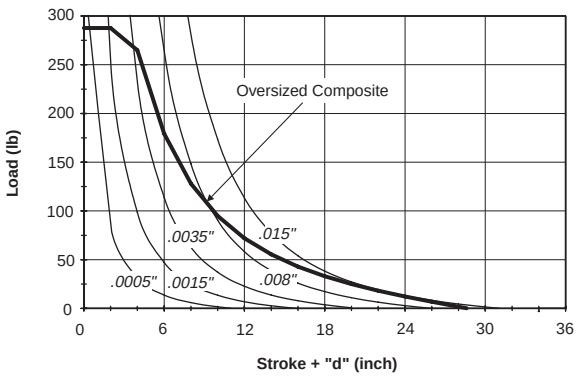
HBT20



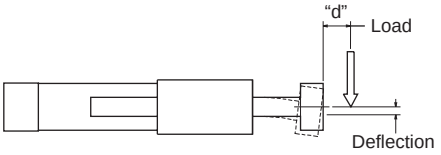
HBC25



HBT25

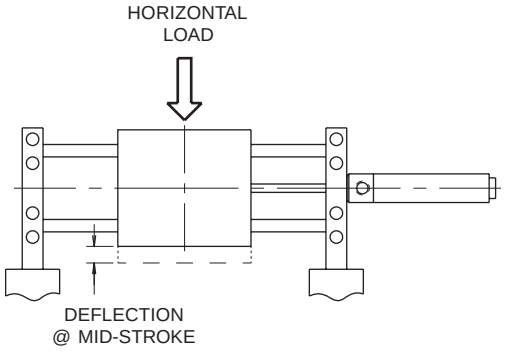


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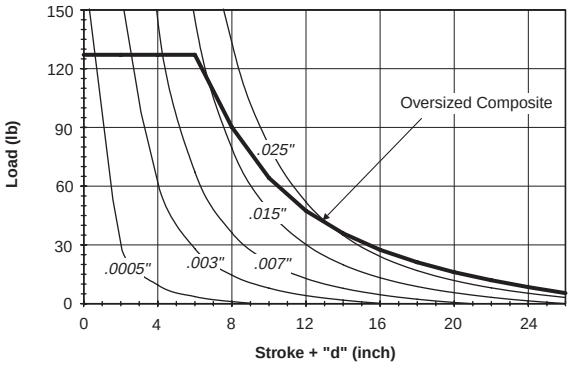


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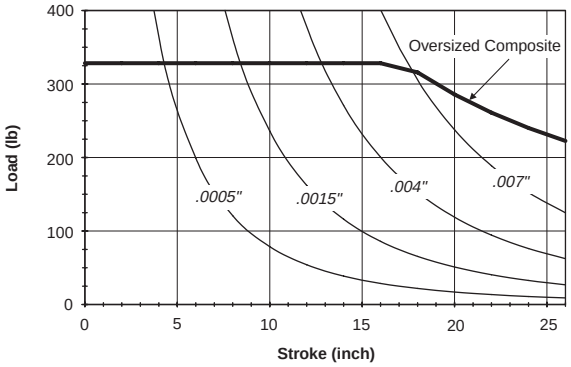
An HBT15 with oversized composite bushings and a "stroke+d" of 8" would have a load capacity of 60 lbs.



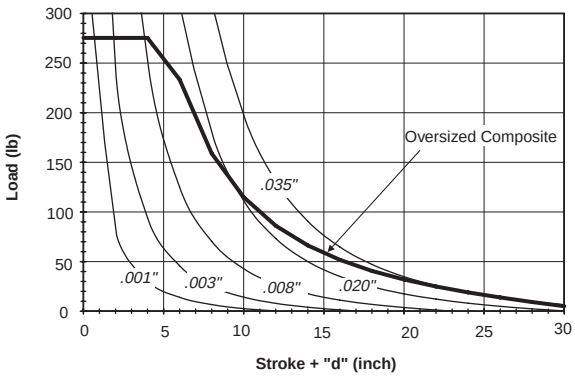
HBR15



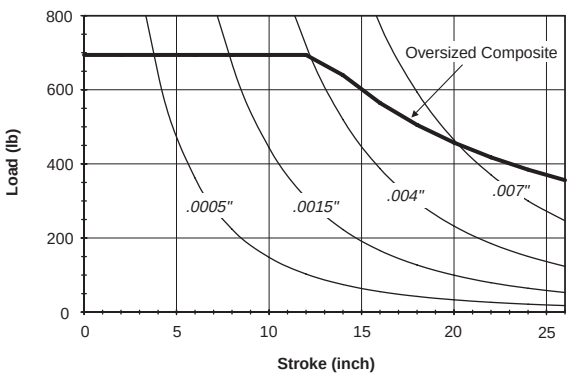
HBB15



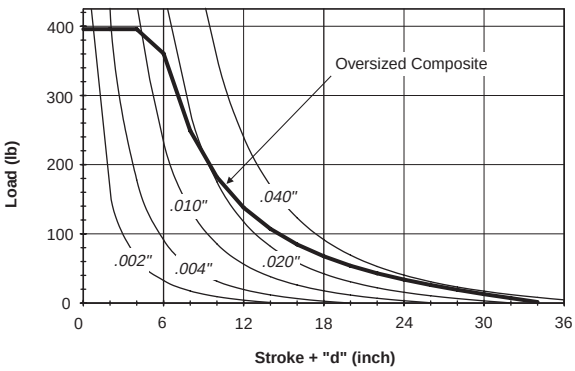
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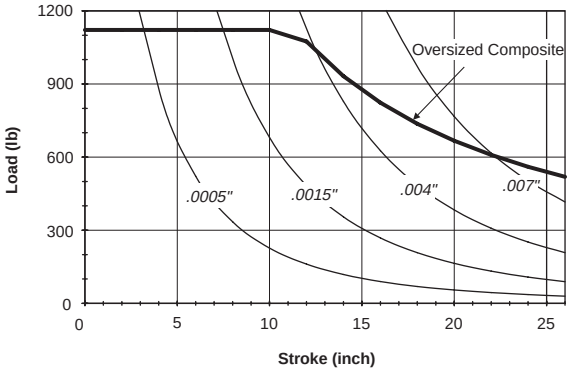
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HBR25



HBB25



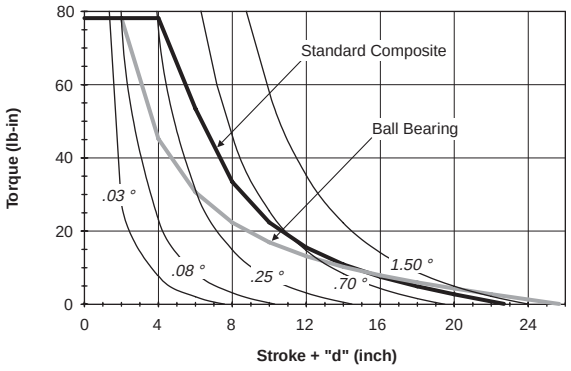
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Symmetrical Torque Capacity with Standard Shafting

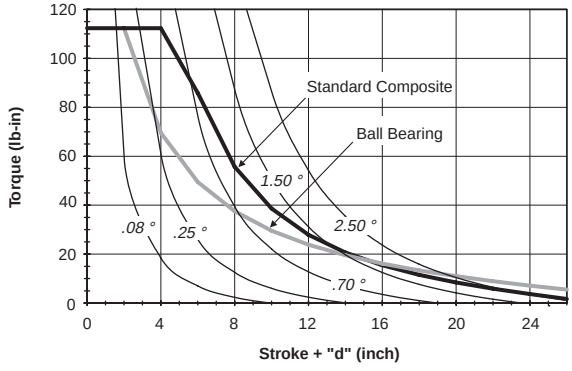
The plots on these two pages provide the torsional load vs. actuator stroke for various slide sizes. Torsional loads will cause a slight amount of angular deflection of the tooling plate. Angular deflection is also shown except for HBN, which should be used in non-rotating applications. The data presented is based on a bearing life equivalent to 10 million cycles for dynamic conditions. Higher dynamic torques will reduce cycle life. For static torque, multiply the information in the graph by 1.5. The vertical load for HBN does not include the weight of the tool plate and support rods.

Note: Actuator life may vary depending on the severity of the following variables:
- Acceleration
- Velocity
- Vibration
- Orientation

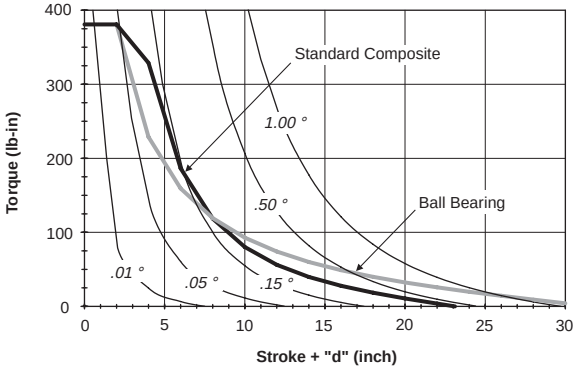
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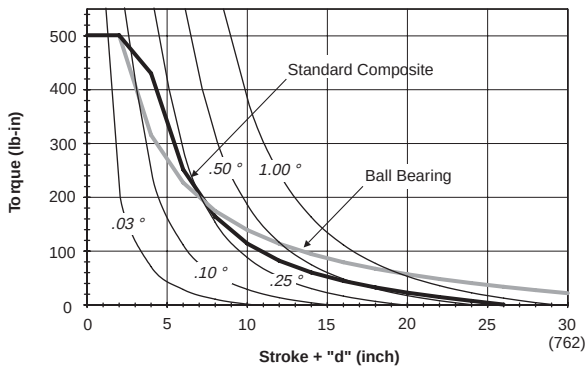
HBT15



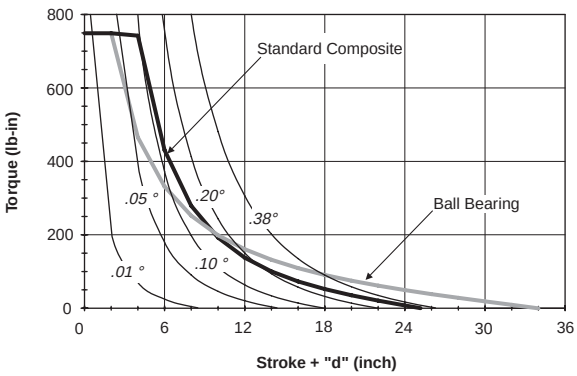
HBC20



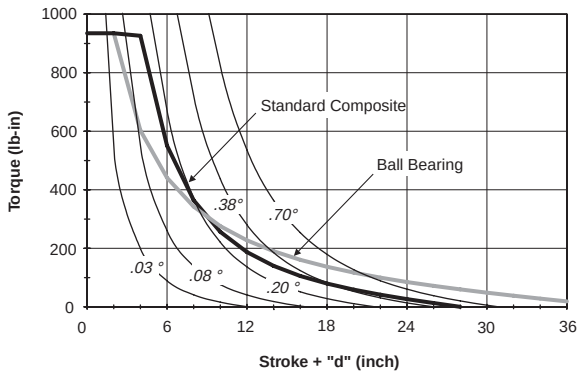
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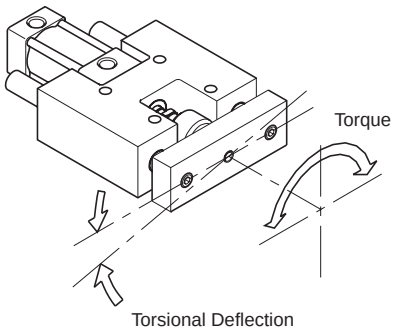
HBC25



HBT25



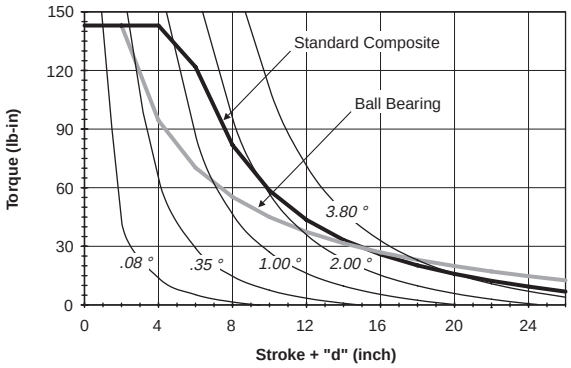
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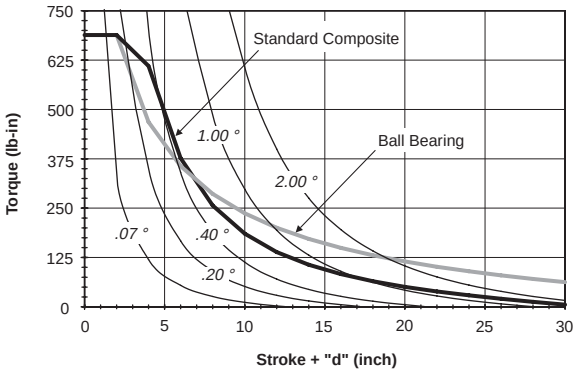
EXAMPLE:

An HBT25 with composite bushings and a “stroke+d” of 12" would have a torque capacity of 200 lb-in.

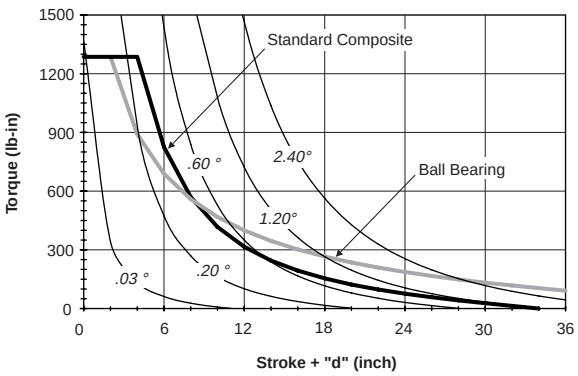
HBR15



HBR20



HBR25



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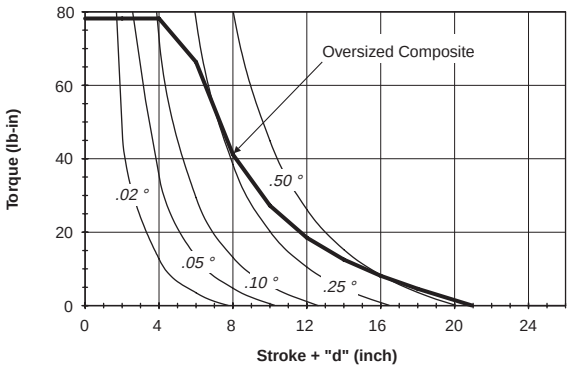
Symmetrical Torque Capacity with Oversized Shafting

The plots on these two pages provide the torsional load vs. actuator stroke for various slide sizes. Torsional loads will cause a slight amount of angular deflection of the tooling plate. Angular deflection is also shown. The data presented is based on a bearing life equivalent to 10 million cycles for dynamic conditions. Higher dynamic torques will reduce cycle life. For static torque, multiply the information in the graph by 1.5.

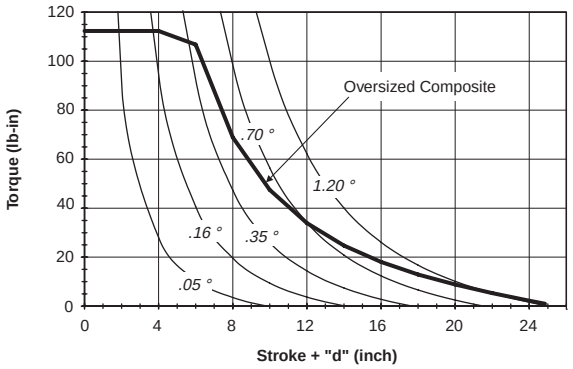
Note: Actuator life may vary depending on the severity of the following variables:

- Acceleration
- Velocity
- Vibration
- Orientation

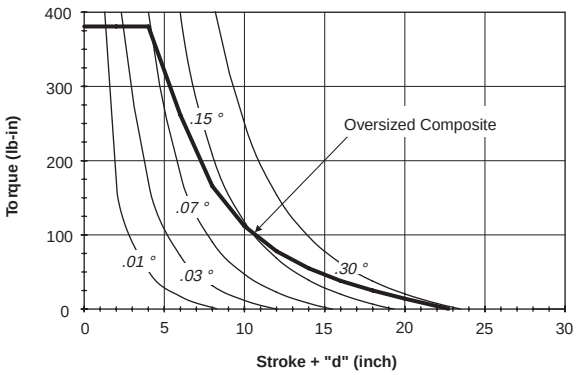
HBC15



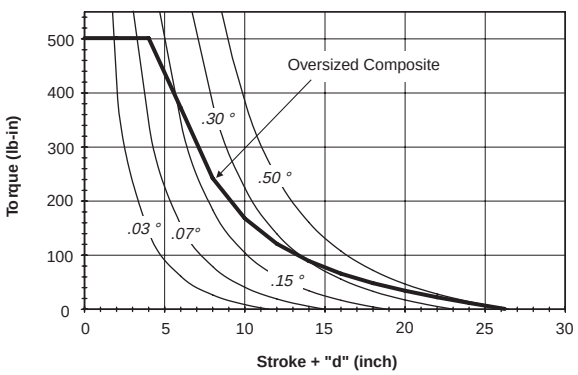
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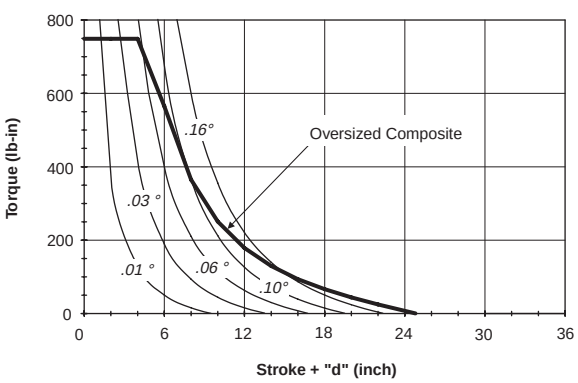
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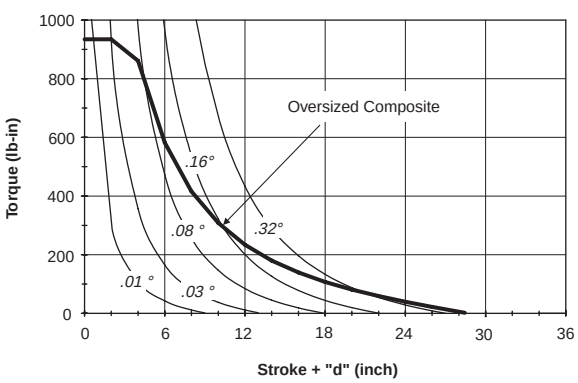
HBT20



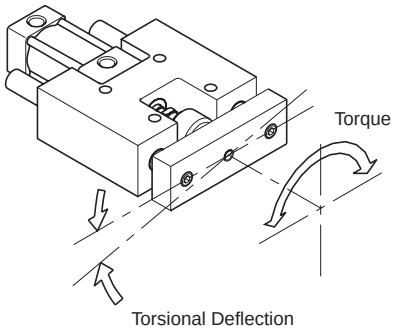
HBC25



HBT25



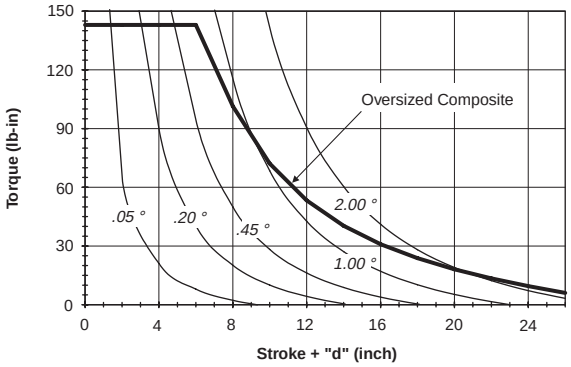
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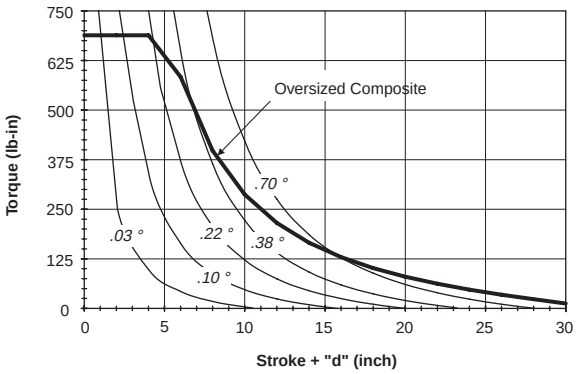
EXAMPLE:

An HBT25 with oversized composite bushings and a "stroke+d" of 6" would have a torque capacity of 600 lb-in.

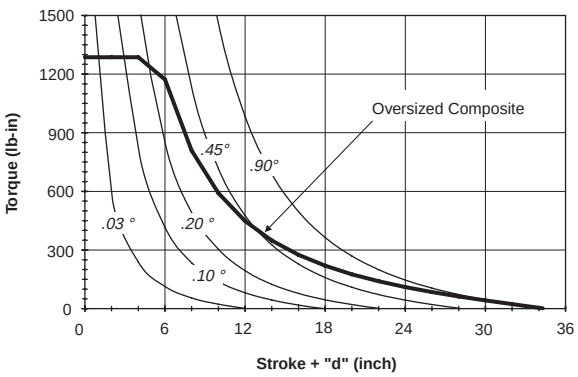
HBR15



HBR20



HBR25



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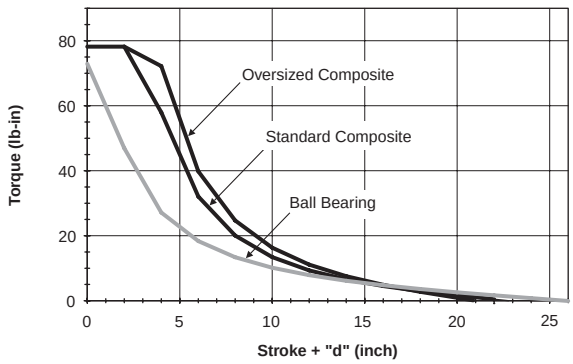
Asymmetrical Torque Capacity

Asymmetrical loading occurs when the load is applied to one side of the unit. HB Series units can resist torsional loads that are asymmetrical. The graphs on these two pages show torsional load capacity for both standard and oversized shafting under dynamic conditions For static applications, multiply the information in the graphs by 1.5. The vertical load for HBN does not include the weight of the tool plate and support rods.

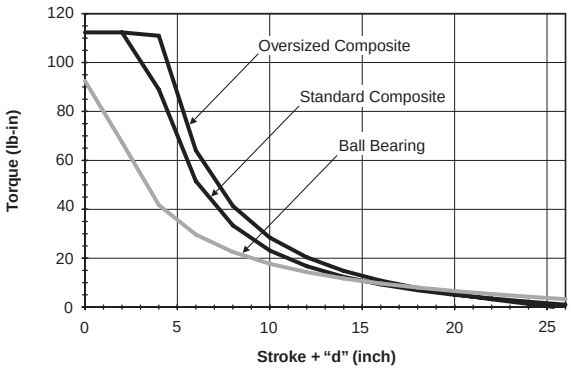
Note: Actuator life may vary depending on the severity of the following variables:

- Acceleration
- Velocity
- Vibration
- Orientation

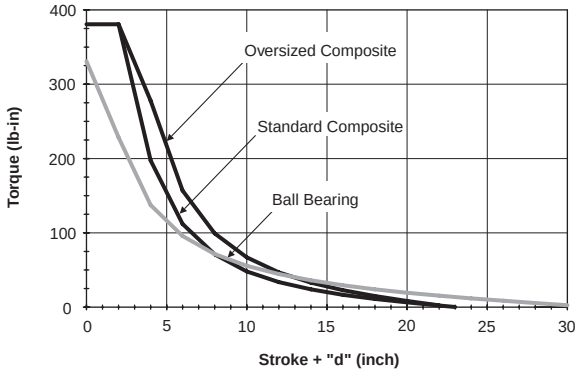
HBC15



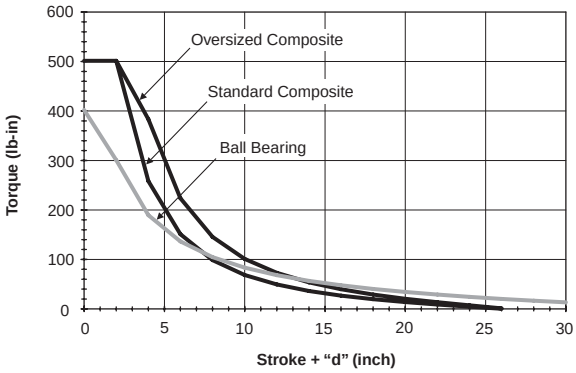
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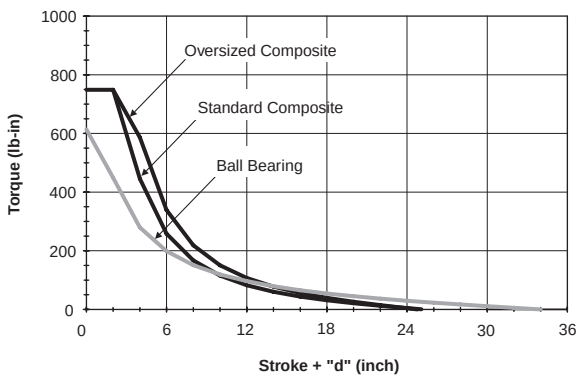
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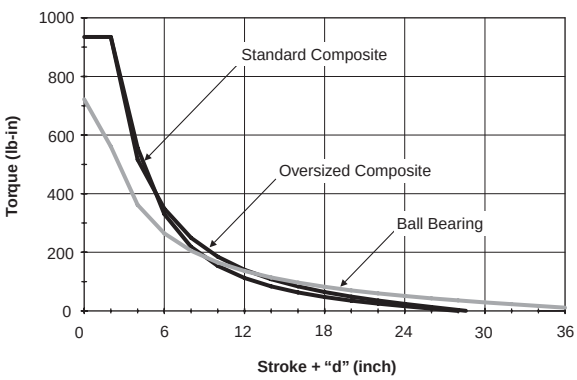
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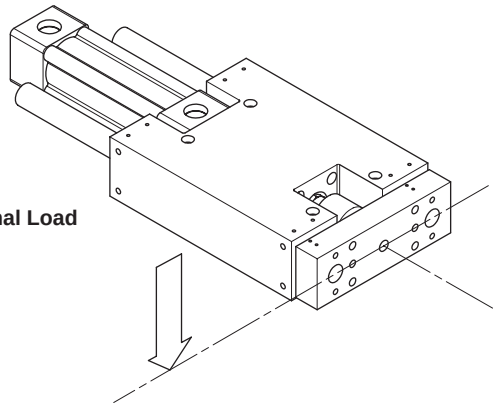
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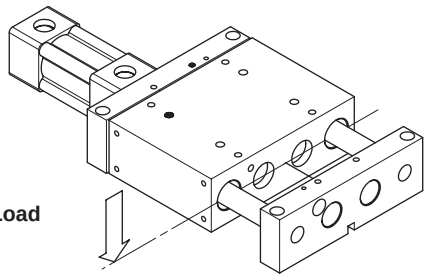
HBT25



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Torsional Load

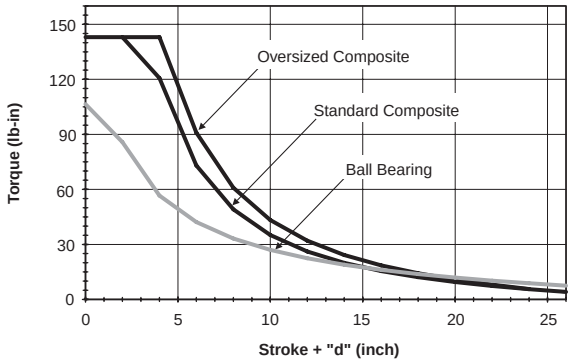


Torsional Load

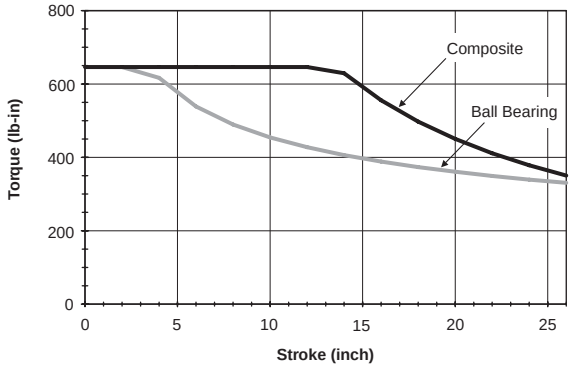
EXAMPLE:

An HBT-20 with standard composite bushings and a stroke + d of 10 inches would have an asymmetrical torque capacity of 80 lb-in.

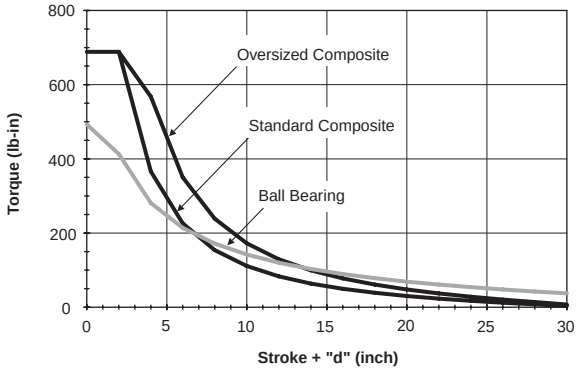
HBR15



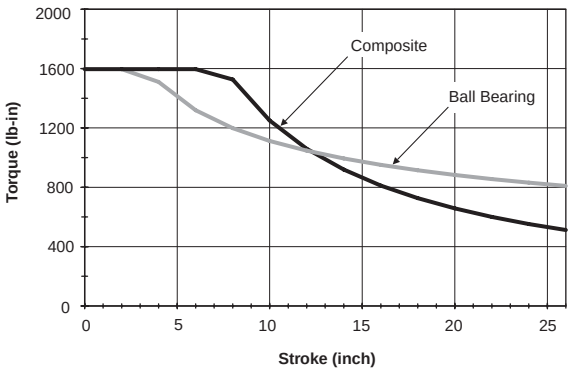
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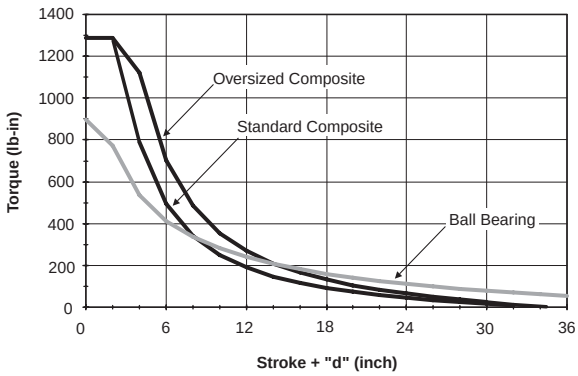
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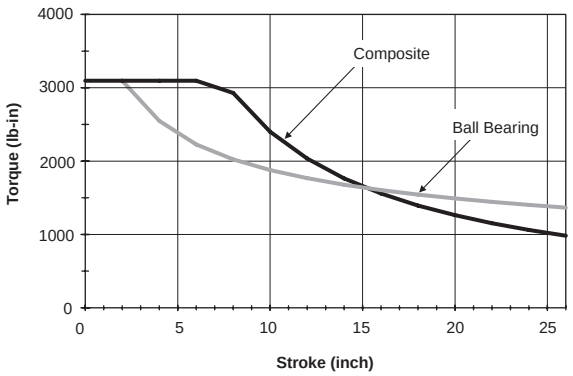
HBB20



HBR25



HBB25



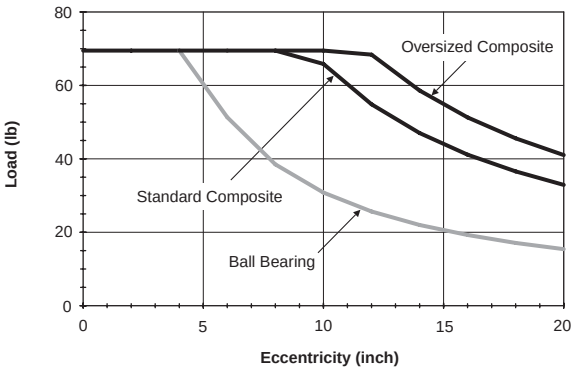
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Vertical Eccentric Load Capacity

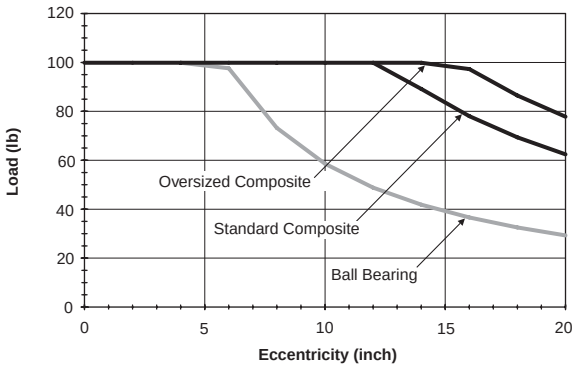
HB Series units mounted vertically will have the same eccentric load capacity regardless of orientation. The graphs provide maximum load capacity for an eccentric mounted load on a 4" stroke cylinder. The load is assumed to be mounted at the face of the tooling plate.

Note: Actuator life may vary depending on the severity of the following variables:
- Acceleration
- Velocity
- Vibration

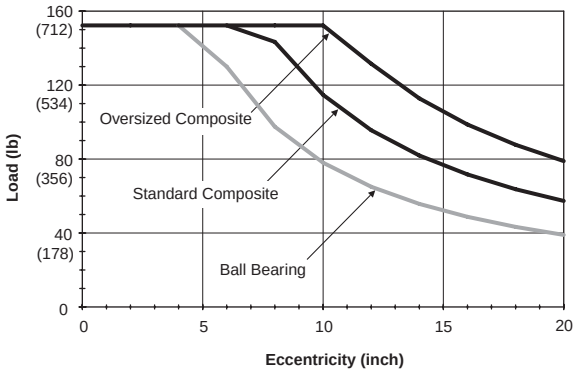
HBC15



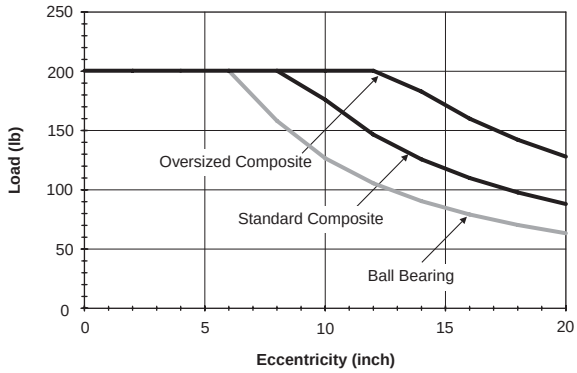
HBT15



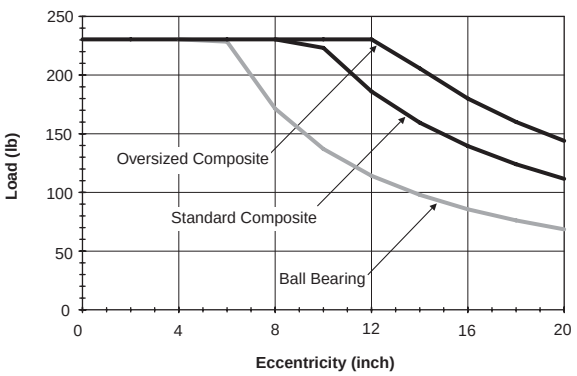
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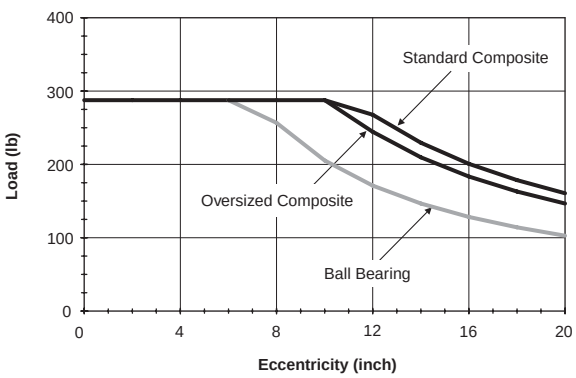
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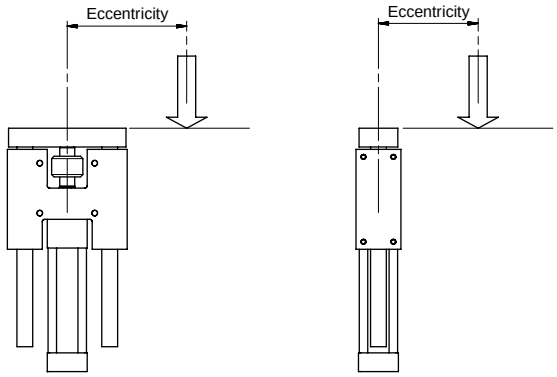
HBC25



HBT25



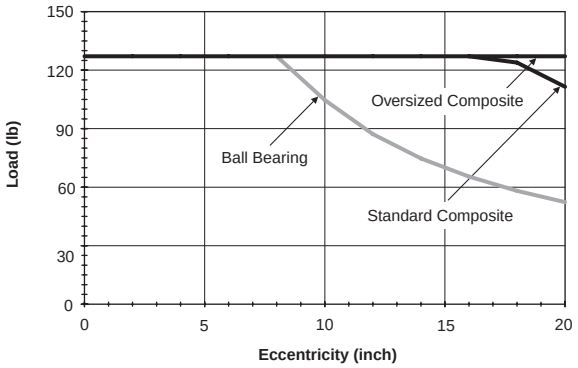
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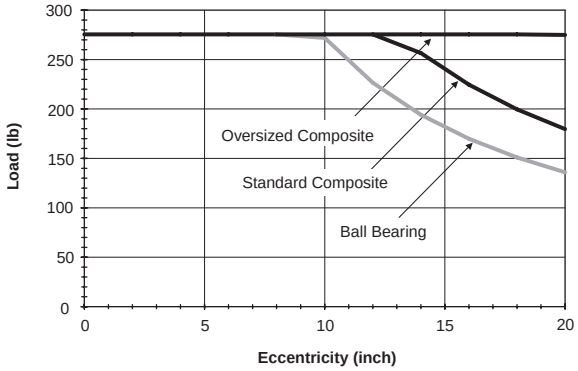
EXAMPLE:

An HBT15 with ball bearings carrying an eccentric load with an eccentricity distance of 15" would have a load capacity of 40 lbs.

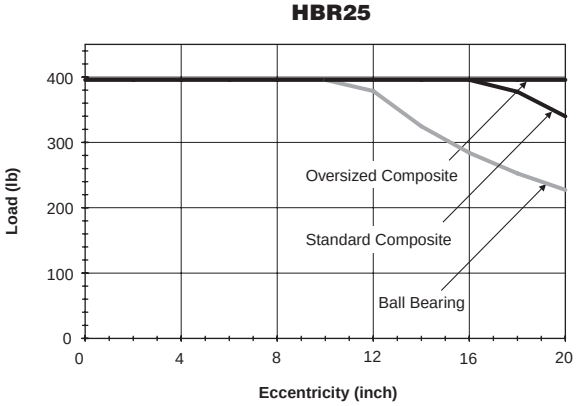
HBR15



HBR20



HBR25



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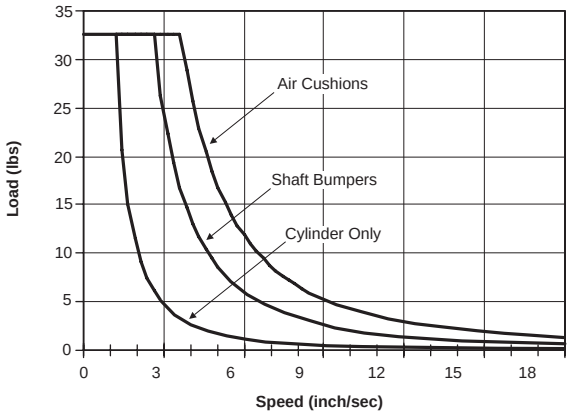
Kinetic Energy

These plots illustrate the stopping capacity of the HB Series with bumpers, cushions or cylinder only. This type of sizing is based on the weight of the load and the speed at which the load is moving. The bumper plots are based on a 0.020 deflection.

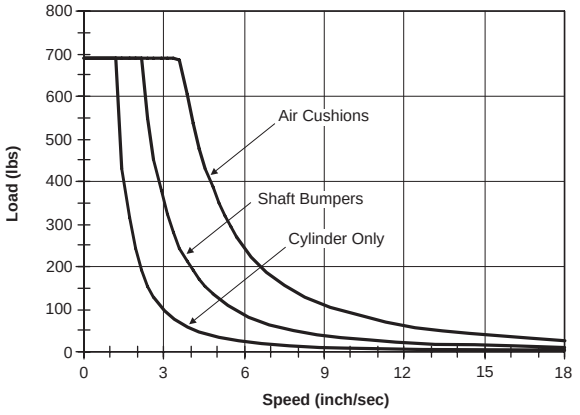
For values above the cushion line, shock absorbers must be specified. Follow the shock absorber sizing steps on the following page to ensure proper stopping capacity.

Note: These charts are to be used only to determine the stopping capacity of each guided cylinder.

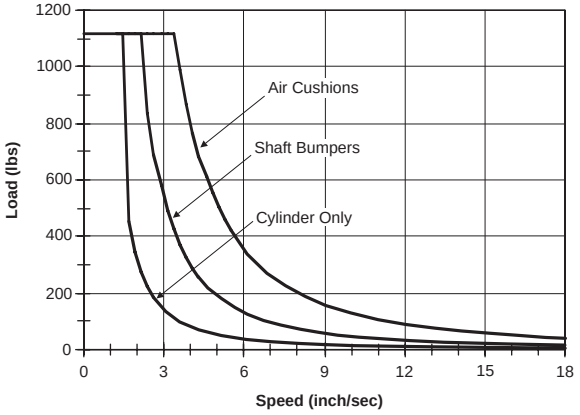
HB*15



HB*20



HB*25



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Kinetic Energy

Steps to sizing a guided cylinder with shocks:

1) Determine the "Moving Weight", W.

   Use Table 1 to determine the "Kinetic Energy Weight" of a given slide. This value should be added to the weight of the load the slide will be carrying.

   Moving Weight (lbs) =
   Kinetic Energy Weight (lbs) + Weight of Load (lbs)

2) Determine the velocity of the load, V (ft/second)

3) Determine the cylinder force output at the operating pressure, $F_{cylinder}$ (lbs)

4) Determine the Kinetic Energy of the load:

   $KE = 0.2 \times W \times V^2$ (lb-in)

5) Determine the Energy per Cycle, E_{cycle} (lb-in):

   E_{cycle} = KE + $F_{cylinder}$ × Shock Stroke
   (unless stroke adjusters are used, 1 inch is standard)

   This value should be less than the value listed in table 2

6) Determine the Energy per Hour: E_{hour} (in-lbs)

   E_{hour} = 2 × E_{cycle} × # of cycles in one hour
   (a cycle is defined as the extension and retraction of the slide)

   This value should be less than the value listed in table 2

7) Determine the Effective Weight of the load

$$W_{effective} = \frac{E_{cycle}}{0.2 \times V^2}$$

   This value should be between the values listed in table 2

Example:

An HBT20-10D-B with standard support rods and shock absorbers will be carrying a load of 40 lbs at a velocity of 17 in/second (cycling 15 times per hour) while operating at 80psi. Is this unit properly sized?

1) Moving Weight = [8.35 + (10 × 0.65)] + 40 lbs = 54.85 lbs
2) V = 17 in/second = 1.4 ft/second
3) $F_{cylinder}$ = 251 lbs
4) $KE = 0.2 \times 54.85 \times 1.4^2 = 21.5$ lb-in
5) E_{cycle} = 21.5 + 251 = 272.5 lb-in
6) $E_{hour} = 2 \times 272.5 \times 15 = 8175$ lb-in

7) $$W_{effective} = \frac{272.5}{0.2 \times (1.4)^2} = 695 \text{ lbs}$$

The shock will dissipate the energy of the load.

Table 1

Model	Base Weight (lb)	Stroke Adder (lb/inch)	Base Weight, Oversized (lb)	Stroke Adder (lb/inch)
HBC15	3.66	0.36	4.36	0.52
HBC20	7.15	0.65	8.19	0.84
HBC25	12.73	1.04	14.19	1.27
HBT15	4.70	0.36	5.67	0.52
HBT20	8.35	0.65	9.67	0.84
HBT25	14.22	1.04	16.01	1.27
HBR15	5.52	0.36	6.96	0.52
HBR20	10.29	0.65	12.46	0.84
HBR25	17.63	1.04	20.66	1.27
HBB15*	7.93	0.09	7.93	0.09
HBB20*	13.94	0.22	13.94	0.22
HBB25*	25.03	0.42	25.03	0.42

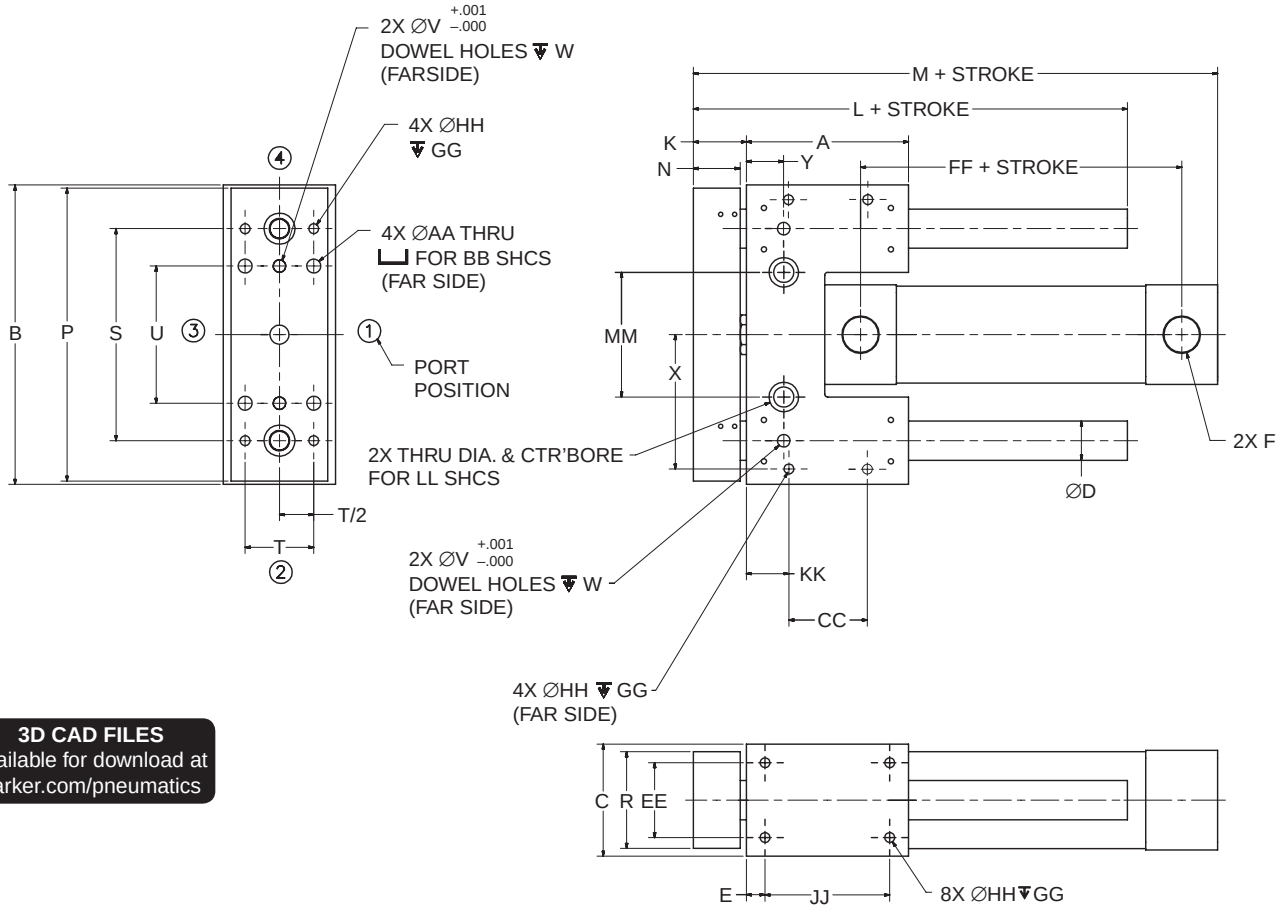
*Support rods do not move with the carriage, so kinetic energy is the same for standard and oversized rods.

Table 2

Size	Total Energy per Cycle (lb-in)	Total Energy per Hour (lb-in)	Effective Weight (lb)	Velocity Range (in/sec)
15	600	600,000	20 - 3000	6 - 144
20	900	800,000	30 - 4500	6 - 144
25	1500	670,000	28 - 3800	6 - 120

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HBC Series



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Model	A	B	C	Ds*	Do**	E	F NPTF	F BSPP	K	L	M	N	P	R	S	T	U
15	3.25	6.00	2.25	20mm (0.79)	25mm (0.98)	0.375	1/4 [1]	1/4	1.06	5.19	6.26	0.94	5.88	1.94	4.250	1.375	2.750
20	4.00	7.25	2.75	25mm (0.98)	30mm (1.18)	0.500	3/8	1/4	1.31	6.39	7.00	1.19	7.13	2.44	5.000	1.750	3.250
25	5.00	9.00	3.25	30mm (1.18)	35mm (1.38)	0.500	3/8	3/8	1.56	7.82	8.38	1.44	8.88	2.88	6.500	2.000	3.750

Model	V	W	X	Y	AA	BB	CC	EE	FF	GG	HH	JJ	KK	LL	MM
15	0.251	0.27	2.750	0.750	0.28	1/4	1.750	1.500	2.31	0.50	1/4-20	2.50	0.75	3/8	2.500
20	0.313	0.33	3.250	0.750	0.34	5/16	2.250	1.750	2.31	0.63	5/16-18	3.00	0.88	3/8	3.000
25	0.376	0.39	4.000	1.532	0.41	3/8	3.000	2.250	2.38	0.75	3/8-16	4.00	1.00	1/2	4.000

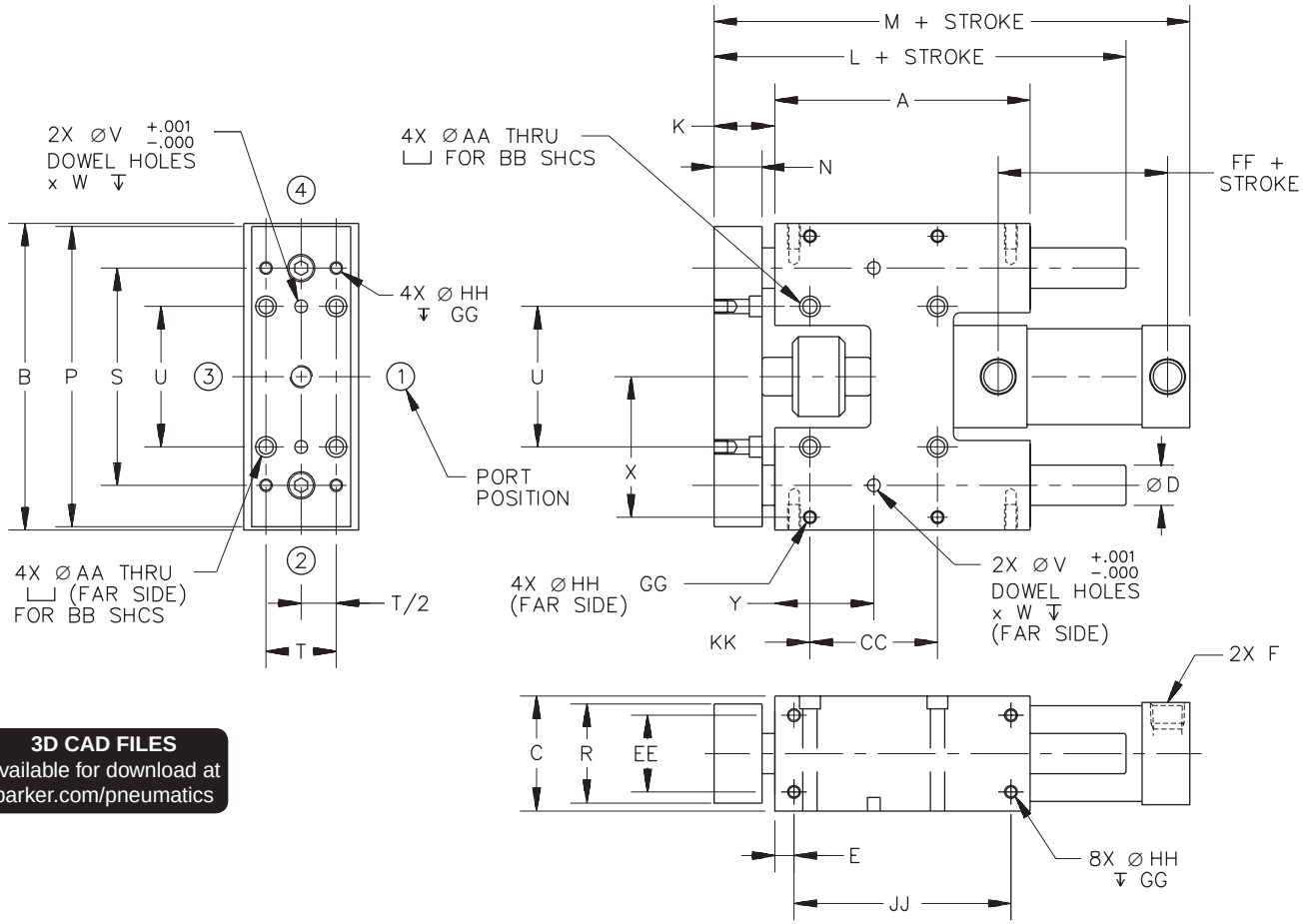
* Standard shafting
** Oversized shafting

1 Model 15 with Cylinder Type 3A (3MA cylinder) has 3/8" NPTF ports.

All dimensions in inches unless otherwise noted.

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HBT Series



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Model	A	B	C	Ds*	Do**	E	F NPTF	F BSPP	K	L	M	N	P	R	S	T
15	5.0	6.00	2.25	20mm (0.79)	25mm (0.98)	0.375	1/4 [1]	1/4	1.06	6.94	8.19	0.94	5.88	1.94	4.250	1.375
20	5.5	7.25	2.75	25mm (0.98)	30mm (1.18)	0.500	3/8	1/4	1.31	7.88	8.94	1.19	7.13	2.44	5.000	1.750
25	6.5	9.00	3.25	30mm (1.18)	35mm (1.38)	0.500	3/8	3/8	1.56	9.31	10.31	1.44	8.88	2.88	6.500	2.000

Model	U	V	W	X	Y	AA	BB	CC	EE	FF	GG	HH	JJ	KK
15	2.750	0.251	0.27	2.750	1.938	0.28	1/4	2.500	1.500	2.31	0.50	1/4-20	4.25	0.69
20	3.250	0.313	0.33	3.250	2.250	0.34	5/16	2.750	1.750	2.31	0.63	5/16-18	4.50	0.88
25	3.750	0.376	0.39	4.000	2.750	0.41	3/8	3.500	2.250	2.38	0.75	3/8-16	5.50	1.00

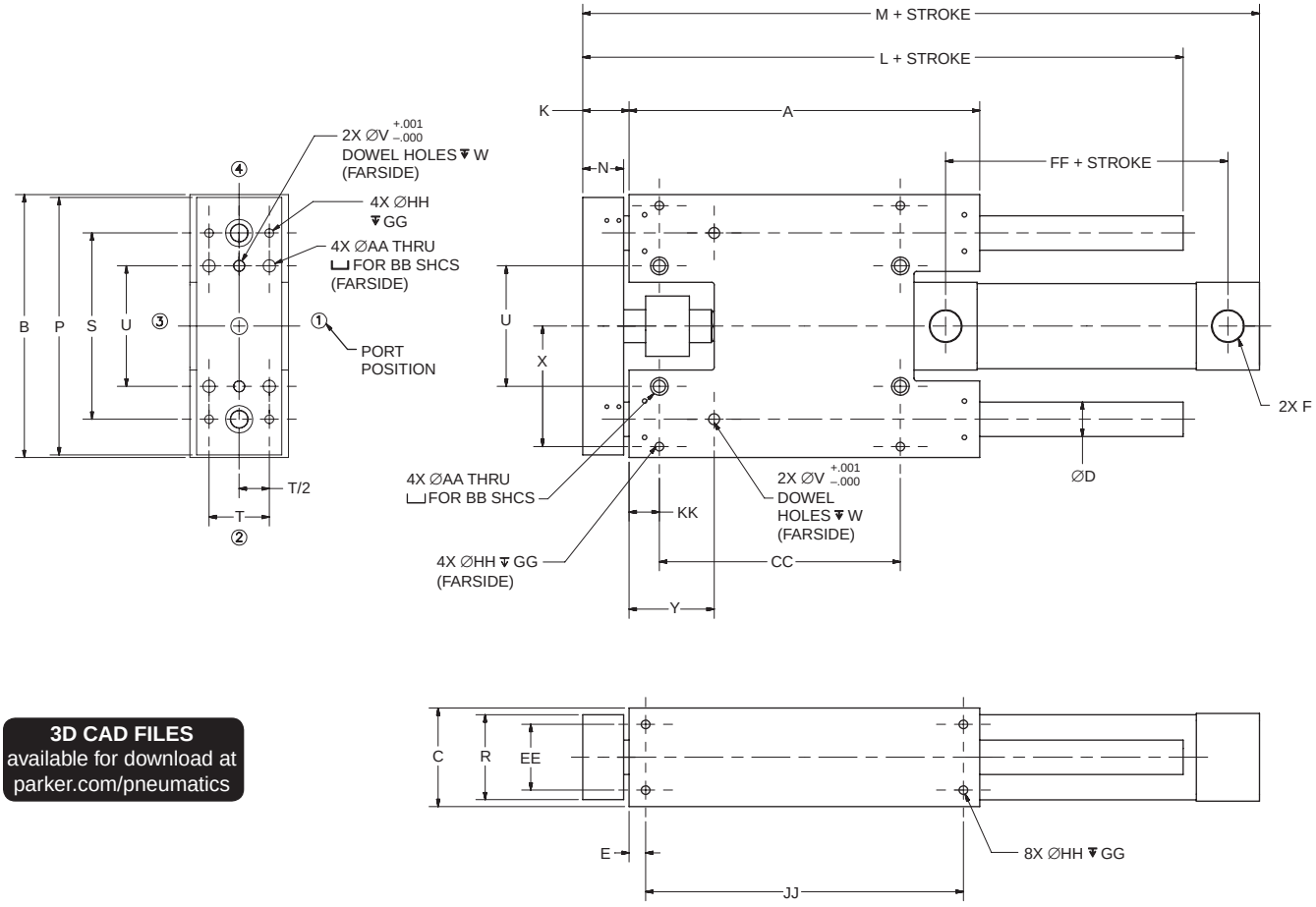
* Standard shafting
** Oversized shafting

1 Model 15 with Cylinder Type 3A (3MA cylinder) has 3/8" NPTF ports.

All dimensions in inches unless otherwise noted.

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HBR Series



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Model	A	B	C	Ds*	Do**	E	F NPTF	F BSPP	K	L	M	N	P	R	S	T
15	8.00	6.00	2.25	20mm (0.79)	25mm (0.98)	0.375	1/4 [1]	1/4	1.06	9.94	11.19	0.94	5.88	1.94	4.250	1.375
20	10.00	7.25	2.75	25mm (0.98)	30mm (1.18)	0.500	3/8	1/4	1.31	12.39	13.44	1.19	7.13	2.44	5.000	1.750
25	12.00	9.00	3.25	30mm (1.18)	35mm (1.38)	0.500	3/8	3/8	1.56	14.82	15.82	1.44	8.88	2.88	6.500	2.000

Model	U	V	W	X	Y	AA	BB	CC	EE	FF	GG	HH	JJ	KK
15	2.750	0.251	0.27	2.750	1.938	0.28	1/4	5.500	1.500	2.31	0.50	1/4-20	7.25	0.69
20	3.250	0.313	0.33	3.250	2.250	0.34	5/16	7.250	1.750	2.31	0.63	5/16-18	9.00	0.88
25	3.750	0.376	0.39	4.000	2.760	0.41	3/8	9.000	2.250	2.38	0.75	3/8-16	11.00	1.00

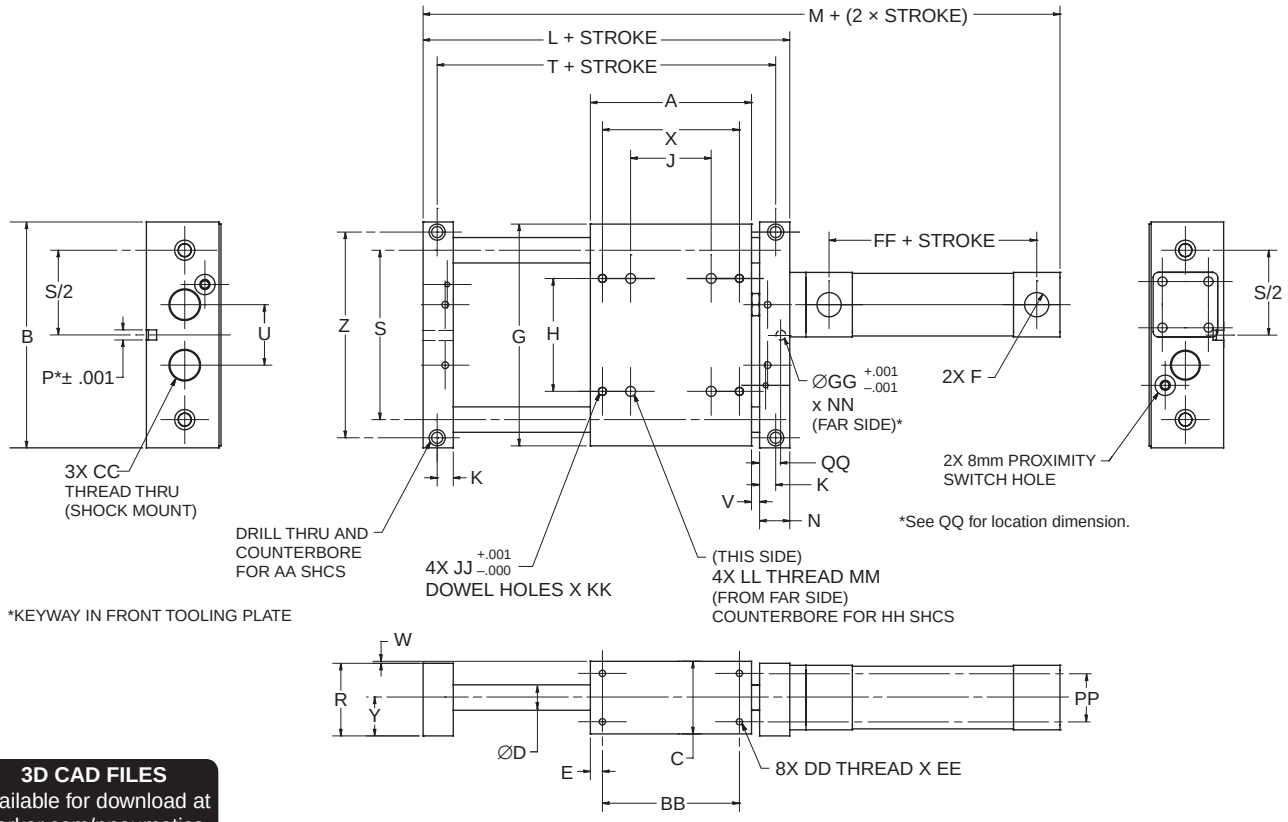
* Standard shafting
** Oversized shafting

1 Model 15 with Cylinder Type 3A (3MA cylinder) has 3/8" NPTF ports.

All dimensions in inches unless otherwise noted.

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HBB Series



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Model	A	B	C	Ds*	Do**	E	F NPTF	F BSPP	G	H	J	K	L	M
15	5.00	7.00	2.25	20mm (0.79)	25mm (0.98)	0.375	1/4 [1]	1/4	6.875	3.50	2.50	0.50	7.00	11.13
20	5.50	8.75	2.75	25mm (0.98)	30mm (1.18)	0.500	3/8	1/4	8.625	4.50	2.50	0.50	8.00	12.13
25	6.50	11.00	3.25	30mm (1.18)	35mm (1.38)	0.500	3/8	3/8	10.875	6.00	3.00	0.50	9.50	13.75

Model	N	P	R	S	T	U	V	W	X	Y	Z	AA	BB
15	0.94	0.313	2.25	5.25	6.13	1.88	0.13	0.06	4.25	1.188	6.375	5/16-18	4.25
20	1.19	0.313	2.75	6.50	6.63	2.25	0.13	0.06	4.25	1.438	8.000	3/8-16	4.50
25	1.44	0.313	3.25	8.50	7.63	3.50	0.13	0.06	5.00	1.688	10.000	1/2-13	5.50

Model	CC	DD	EE	FF	GG	HH	JJ	KK	LL	MM	NN	PP	QQ
15	25mm	1/4-20	0.50	2.31	0.313	5/16-18	0.251	0.27	3/8-16	0.75	0.25	1.50	0.500
20	25mm	5/16-18	0.63	2.31	0.313	5/16-18	0.251	0.27	3/8-16	0.75	0.25	1.75	0.594
25	1¼-12	3/8-16	0.75	2.38	0.313	5/16-18	0.313	0.33	3/8-16	0.75	0.25	2.75	0.719

* Standard shafting
** Oversized shafting

1 Model 15 with Cylinder Type 3A (3MA cylinder) has 3/8" NPTF ports.

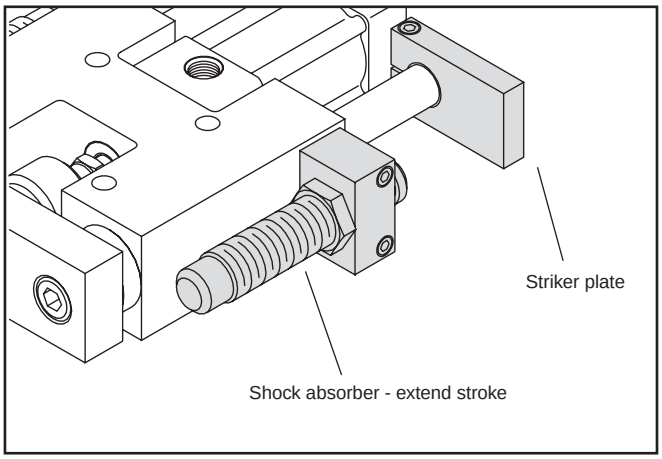
All dimensions in inches unless otherwise noted.

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Shock Absorbers/Stroke Adjusters (A, A1, A2)

Adjustable shock absorbers are provided when this option is specified. These dissipate kinetic energy over a wide range of velocities and weights. Cylinder stroke is adjusted by moving the shock striker plate.

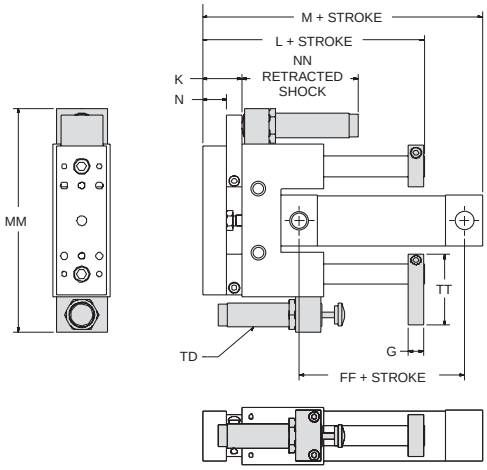
Shock Absorber Adjustment Procedure: Proper adjustment is important to maximize a shock absorber's performance. With a range of zero to ten, shocks are factory preset at five. Cycle the slide to impact the shock absorber. Rotate the shock's adjustment knob to achieve smooth deceleration. Adjusting towards zero increases resistance. If the initial impact is too hard, rotate the knob towards ten to lessen the resistance. If the final setting is less than one, a larger shock and/or slide should be considered. Tighten the adjusting knob set screw to maintain resistance



Shock Absorbers/Stroke Adjusters Extend and Retract (A)

F

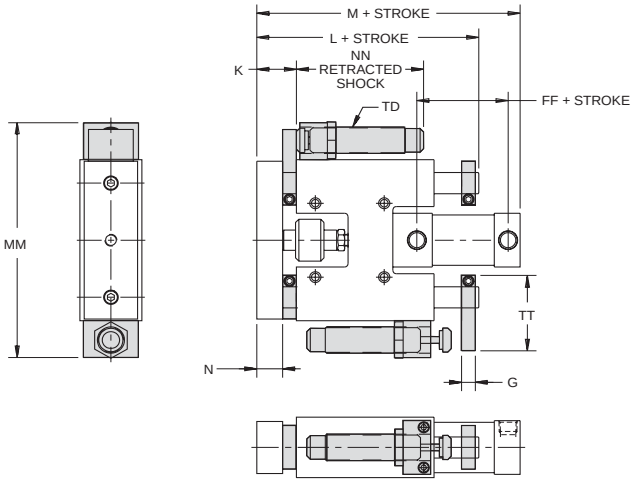
HBC



Model	G	K	L	M	N
HBC15	0.50	1.53	5.66	6.97	0.94
HBC20	0.63	1.88	6.95	7.82	1.19
HBC25	0.75	2.31	8.57	9.38	1.44

Model	FF	MM	NN	TD	TT
HBC15	2.56	8.75	4.62	M25 x 1.5	2.81
HBC20	2.56	10.00	5.86	M25 x 1.5	3.25
HBC25	2.63	12.50	4.45	1 1/4 - 12	4.13

HBT / HBR



Model	G	K	L	M	N
HBT15	0.50	1.53	7.31	8.81	0.94
HBT20	0.63	1.88	8.44	9.75	1.19
HBT25	0.75	2.31	10.06	11.31	1.44
Model	**FF**	**MM**	**NN**	**TD**	**TT**
HBT15	2.56	8.75	4.62	M25 x 1.5	2.81
HBT20	2.56	10.00	5.86	M25 x 1.5	3.25
HBT25	2.63	12.50	4.45	1 1/4 - 12	4.13

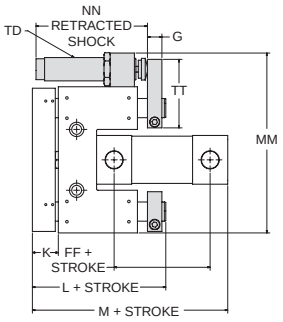
Model	G	K	L	M	N
HBR15	0.50	1.53	10.41	11.90	0.94
HBR20	0.63	1.88	12.95	14.26	1.19
HBR25	0.75	2.31	15.57	16.82	1.44
Model	**FF**	**MM**	**NN**	**TD**	**TT**
HBR15	2.56	8.75	4.62	M25 x 1.5	2.81
HBR20	2.56	10.00	5.86	M25 x 1.5	3.25
HBR25	2.63	12.50	4.45	1 1/4 - 12	4.13

All dimensions shown in inches.

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Shock Absorbers Extend Only (A1)

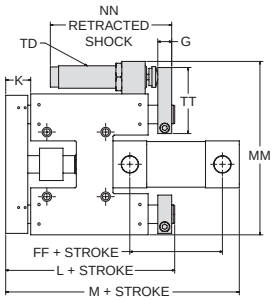
HBC



Model	G	K	L	M	N
HBC15	0.50	1.06	5.19	6.38	0.94
HBC20	0.63	1.31	6.39	7.13	1.19
HBC25	0.75	1.56	7.82	8.50	1.44

Model	FF	MM	NN	TD	TT
HBC15	2.44	7.38	4.62	M25 x 1.5	2.81
HBC20	2.44	8.63	5.86	M25 x 1.5	3.25
HBC25	2.50	10.75	4.45	1 1/4 - 12	4.13

HBT / HBR



Model	G	K	L	M	N
HBT15	0.50	1.06	6.94	8.32	0.94
HBT20	0.63	1.31	7.88	9.07	1.19
HBT25	0.75	1.56	9.31	10.44	1.44

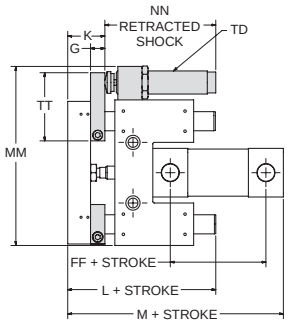
Model	FF	MM	NN	TD	TT
HBT15	2.44	7.38	4.62	M25 x 1.5	2.81
HBT20	2.44	8.63	5.86	M25 x 1.5	3.25
HBT25	2.50	10.75	4.45	1 1/4 - 12	4.13

Model	G	K	L	M	N
HBR15	0.50	1.06	9.94	11.31	0.94
HBR20	0.63	1.31	12.39	13.57	1.19
HBR25	0.75	1.56	14.82	15.94	1.44

Model	FF	MM	NN	TD	TT
HBR15	2.44	7.38	4.62	M25 x 1.5	2.81
HBR20	2.44	8.63	5.86	M25 x 1.5	3.25
HBR25	2.50	10.75	4.45	1 1/4 - 12	4.13

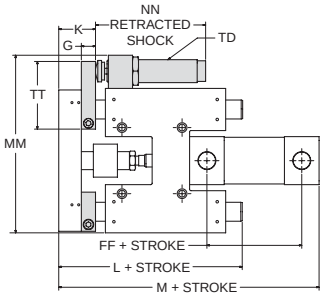
Shock Absorbers Retract Only (A2)

HBC



Model	K	L	M	FF	G	MM	NN	TD	TT
HBC15	1.53	5.66	6.85	2.44	0.50	7.38	4.62	M25 x 1.5	2.81
HBC20	1.88	6.95	7.69	2.44	0.63	8.63	5.86	M25 x 1.5	3.25
HBC25	2.32	8.57	9.26	2.50	0.75	10.75	4.45	1 1/4-12	4.13

HBT / HBR



Model	K	L	M	FF	G	MM	NN	TD	TT
HBT15	1.53	7.41	8.78	2.44	0.50	7.38	4.62	M25 x 1.5	2.81
HBT20	1.88	8.45	9.63	2.44	0.63	8.63	5.86	M25 x 1.5	3.25
HBT25	2.32	10.07	11.20	2.50	0.75	10.75	4.45	1 1/4-12	4.13

Model	K	L	M	FF	G	MM	NN	TD	TT
HBR15	1.53	10.40	11.78	2.44	0.50	7.38	4.62	M25 x 1.5	2.81
HBR20	1.88	12.95	14.13	2.44	0.63	8.63	5.86	M25 x 1.5	3.25
HBR25	2.32	15.57	16.70	2.50	0.75	10.75	4.45	1 1/4-12	4.13

All dimensions shown in inches.

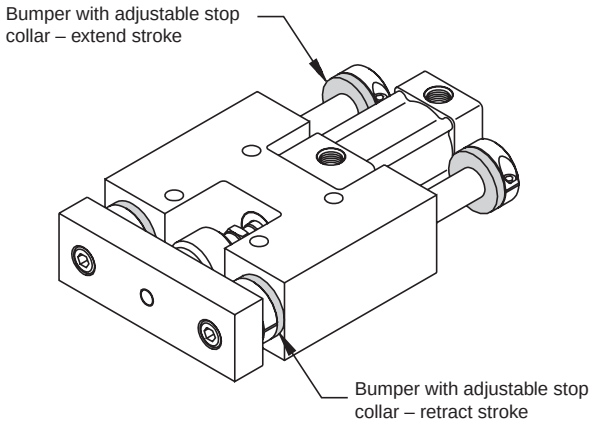
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Bumpers/Adjustable Stop Collars (B, B1, B2, B3, B4)

Bumpers absorb shock, reduce noise and permit faster cycle times thereby increasing production rates. They can be placed on the extend, retract or both positions.

When bumpers are specified, an adjustable stop collar is supplied on the extend stroke as standard. An extend stop collar provides travel adjustment. A stop collar can also be specified for the retract stroke. This stop collar is optional and is only provided if requested.

Note: Stop collars must be adjusted evenly to avoid creating a moment between the guide rods.

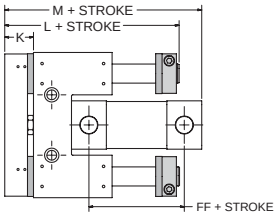


HBT shown with B4 option

Bumpers Both Ends (B)

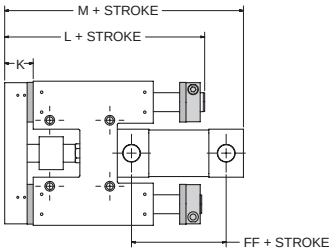
F

HBC



Model	K	L	M	FF
HBC15	1.19	5.32	6.62	2.56
HBC20	1.44	6.51	7.38	2.56
HBC25	1.69	7.94	8.75	2.63

HBT / HBR



Model	K	L	M	FF
HBT15	1.19	7.07	8.56	2.56
HBT20	1.44	8.01	9.32	2.56
HBT25	1.69	9.44	10.69	2.63

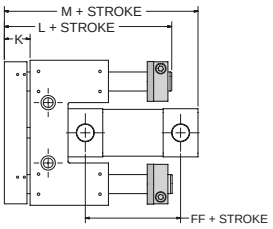
Model	K	L	M	FF
HBR15	1.19	10.07	11.56	2.56
HBR20	1.44	12.51	13.82	2.56
HBR25	1.69	14.94	16.19	2.63

All dimensions shown in inches.

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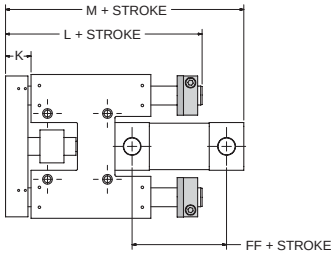
Bumpers and Adjustable Stop Collars, Extend Only (B1)

HBC



Model	K	L	M	FF
HBC15	1.06	5.19	6.37	2.44
HBC20	1.31	6.39	7.13	2.44
HBC25	1.56	7.82	8.50	2.50

HBT / HBR

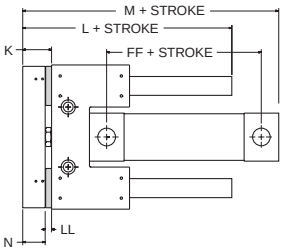


Model	K	L	M	FF
HBT15	1.06	6.94	8.31	2.44
HBT20	1.31	7.89	9.07	2.44
HBT25	1.56	9.32	10.44	2.50

Model	K	L	M	FF
HBR15	1.06	9.94	11.31	2.44
HBR20	1.31	12.39	13.57	2.44
HBR25	1.56	14.82	15.94	2.50

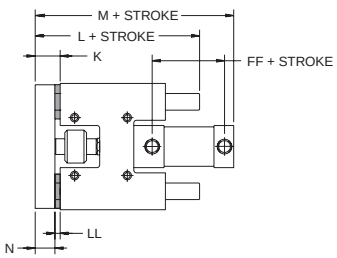
Bumpers on Retract Only (B2)

HBC



Model	K	L	M	N	FF	LL
HBC15	1.19	5.32	6.51	0.94	2.44	0.25
HBC20	1.44	6.51	7.26	1.19	2.44	0.25
HBC25	1.69	7.94	8.63	1.44	2.50	0.25

HBT / HBR



Model	K	L	M	N	FF	LL
HBT15	1.19	7.07	8.44	0.94	2.44	0.25
HBT20	1.44	8.01	9.19	1.19	2.44	0.25
HBT25	1.69	9.44	10.57	1.44	2.50	0.25

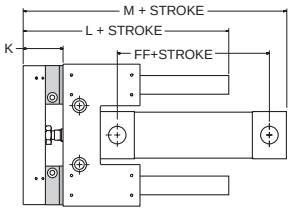
Model	K	L	M	N	FF	LL
HBR15	1.19	10.07	11.44	0.94	2.44	0.25
HBR20	1.44	12.51	13.70	1.19	2.44	0.25
HBR25	1.69	14.94	16.07	1.44	2.50	0.25

All dimensions shown in inches.

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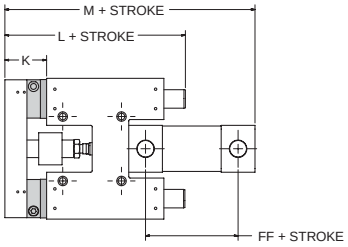
Bumpers and Adjustable Stop Collars, Retract Only (B3)

HBC



Model	K	L	M	FF
HBC15	1.78	5.91	7.10	2.44
HBC20	2.03	7.10	7.84	2.44
HBC25	2.28	8.53	9.22	2.50

HBT / HBR



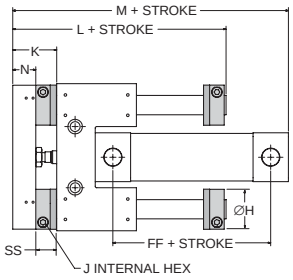
Model	K	L	M	FF
HBT15	1.78	7.66	9.03	2.44
HBT20	2.03	8.60	9.78	2.44
HBT25	2.28	10.03	11.16	2.50

Model	K	L	M	FF
HBR15	1.78	10.66	12.03	2.44
HBR20	2.03	13.10	14.28	2.44
HBR25	2.28	15.53	16.66	2.50

F

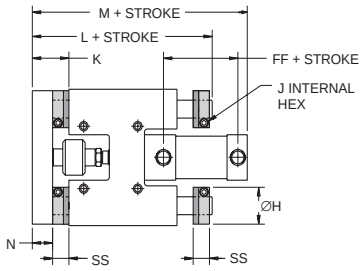
Bumpers and Adjustable Stop Collars, Both Ends (B4)

HBC



Model	H(s)*	H(o)**	J	K	L	M	N	FF	SS
HBC15	1.57	1.77	3/16	1.78	5.91	7.22	0.94	2.56	0.84
HBC20	1.77	2.12	3/16	2.03	7.10	7.97	1.19	2.56	0.84
HBC25	2.12	2.23	3/16	2.28	8.53	9.34	1.44	2.63	0.84

HBT / HBR



Model	H(s)*	H(o)**	J	K	L	M	N	FF	SS
HBT15	1.57	1.77	3/16	1.78	7.56	9.06	0.94	2.56	0.84
HBT20	1.77	2.12	3/16	2.03	8.69	10.00	1.19	2.56	0.84
HBT25	2.12	2.23	3/16	2.28	10.31	11.56	1.44	2.63	0.84

Model	H(s)*	H(o)**	J	K	L	M	N	FF	SS
HBR15	1.57	1.77	3/16	1.78	10.66	12.15	0.94	2.56	0.84
HBR20	1.77	2.12	3/16	2.03	13.10	14.41	1.19	2.56	0.84
HBR25	2.12	2.23	3/16	2.28	15.53	16.78	1.44	2.63	0.84

All dimensions shown in inches.

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Shock Absorbers

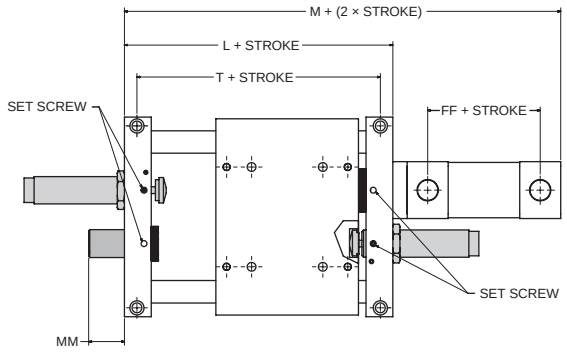
Adjustable shock absorbers are provided when this option is specified. These dissipate kinetic energy over a wide range of velocities and weights. Cylinder stroke is adjusted by moving the threaded stroke adjuster. It is important to adjust the threaded stroke adjuster to prevent the shock from "bottoming". **Maximum adjustment is 1/2".**

Shock Absorber Adjustment Procedure: Proper adjustment is important to maximize a shock absorber's performance. With a range of zero to ten, shocks are factory pre-set at five. Cycle the slide to impact the shock absorber. Rotate the shock's adjustment knob to achieve smooth deceleration. Adjusting towards zero increases resistance. If the initial impact is too hard, rotate the knob towards ten to lessen the resistance. If the final setting is less than one, a larger shock and/or slide should be considered. Tighten the adjusting knob set screw to maintain resistance.

Note: A standard HBB unit includes mounting holes in the end plates to allow field installation of the shock absorbers.

Shock Absorbers (A, A1, A2)

HBB



Model	L	T	M	FF	MM
HBB15	7.38	6.50	11.75	2.56	1.25
HBB20	8.38	7.00	12.75	2.56	1.00
HBB25	9.88	8.00	14.38	2.63	1.00

All dimensions shown in inches.

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Bumpers/Adjustable Stop Collars

(B, B1, B2, B3, B4, B5)

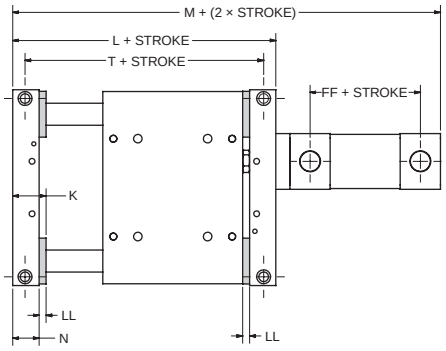
Bumpers absorb shock, reduce noise and permit faster cycle times thereby increasing production rates. They can be placed on the extend, retract or both positions.

A stop collar can be provided for travel adjustment. This stop collar is optional and is only provided if requested.

Note: Stop collars must be adjusted evenly to avoid creating a moment between the guide rods.

Bumpers Both Ends (B)

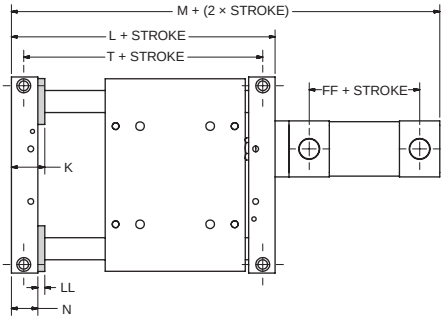
HBB



Model	L	T	M	K	N	FF	LL
HBB15	7.375	6.50	11.75	1.19	0.94	2.56	0.25
HBB20	8.375	7.00	12.75	1.44	1.19	2.56	0.25
HBB25	9.875	8.00	14.38	1.69	1.44	2.63	0.25

Bumpers, Extend Only (B1)

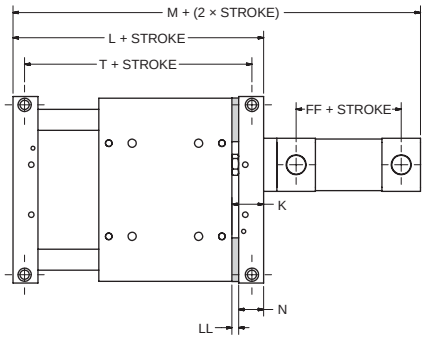
HBB



Model	L	T	M	K	N	FF	LL
HBB15	7.25	6.38	11.50	1.19	0.94	2.44	0.25
HBB20	8.25	6.88	12.50	1.44	1.19	2.44	0.25
HBB25	9.75	7.88	14.13	1.69	1.44	2.51	0.25

Bumpers on Retract Only (B2)

HBB



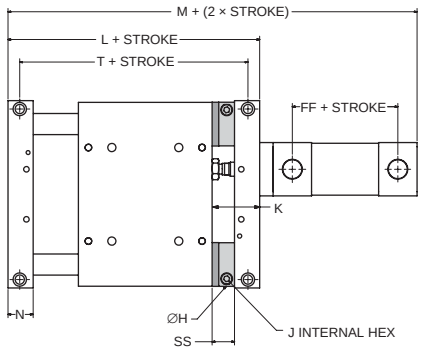
Model	L	T	M	K	N	FF	LL
HBB15	7.13	6.25	11.38	1.19	0.94	2.44	0.25
HBB20	8.13	6.75	12.38	1.44	1.19	2.44	0.25
HBB25	9.63	7.75	14.00	1.69	1.44	2.51	0.25

All dimensions shown in inches.

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Bumpers and Adjustable Stop Collars, Retract Only (B3)

HBB

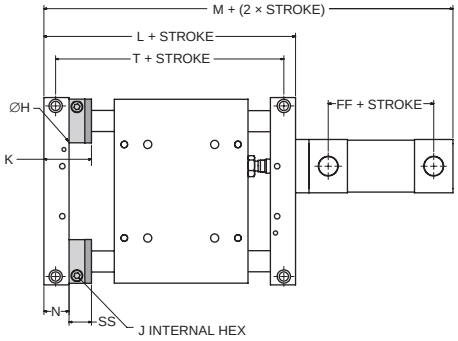


Model	L	T	M	K	N
HBB15	7.72	6.84	11.98	1.78	0.94
HBB20	8.72	7.34	12.98	2.03	1.19
HBB25	10.22	8.34	14.60	2.28	1.44

Model	H(s)*	H(o)**	J	FF	SS
HBB15	1.57	1.77	3/16	2.44	0.84
HBB20	1.77	2.12	3/16	2.44	0.84
HBB25	2.12	2.23	3/16	2.50	0.84

Bumpers and Adjustable Stop Collars, Extend Only (B4)

HBB

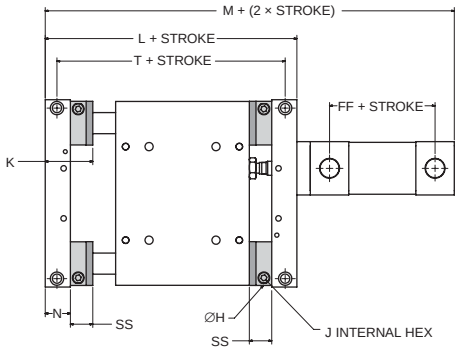


Model	L	T	M	K	N
HBB15	7.85	6.97	12.10	1.78	0.94
HBB20	8.85	7.47	13.10	2.03	1.19
HBB25	10.35	8.47	14.73	2.28	1.44

Model	H(s)*	H(o)**	J	FF	SS
HBB15	1.57	1.77	3/16	2.44	0.84
HBB20	1.77	2.12	3/16	2.44	0.84
HBB25	2.12	2.23	3/16	2.50	0.84

Bumpers and Adjustable Stop Collars, Both Ends (B5)

HBB



Model	L	T	M	K	N
HBB15	8.56	7.68	12.93	1.78	0.94
HBB20	9.56	8.18	13.93	2.03	1.19
HBB25	11.06	9.18	15.56	2.28	1.44

Model	H(s)*	H(o)**	J	FF	SS
HBB15	1.57	1.77	3/16	2.56	0.84
HBB20	1.77	2.12	3/16	2.56	0.84
HBB25	2.12	2.23	3/16	2.63	0.84

* Standard support rods
** Oversized support rods

All dimensions shown in inches.

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Threaded Stroke Adjusters (E, E1, E2, E3)

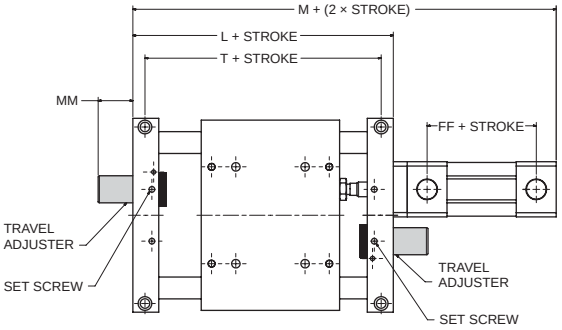
The threaded stroke adjust option allows for precise end of stroke positioning. The maximum stroke adjustment is one inch (1"). Threaded stroke adjusters are standard with shock absorbers.

Note:

Not available with Bumper Options B, B1, B2, B3, B4.

Threaded Stroke Adjusters, Both Ends (E)

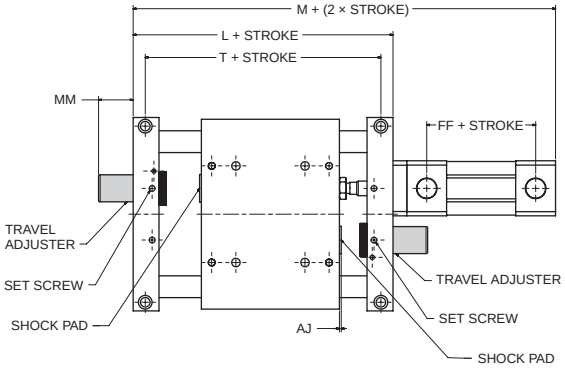
HBB



Model	L	T	M	FF	MM
HBB15	7.38	6.50	11.75	2.56	1.25
HBB20	8.38	7.00	12.75	2.56	1.00
HBB25	9.88	8.00	14.38	2.63	1.00

Stroke Adjusters and Shock Pads (E1, E2, E3)

HBB



Both Ends (E1)

Model	L	T	M	FF	MM	AJ
HBB15	7.63	6.75	12.00	2.56	1.25	0.13
HBB20	8.63	7.25	13.00	2.56	1.00	0.13
HBB25	10.13	8.25	14.63	2.63	1.00	0.13

Extend Only (E2)

Model	L	T	M	FF	MM	AJ
HBB15	7.38	6.50	11.75	2.56	1.25	0.13
HBB20	8.38	7.00	12.75	2.56	1.00	0.13
HBB25	9.88	8.00	14.38	2.63	1.00	0.13

Retract Only (E3)

Model	L	T	M	FF	MM	AJ
HBB15	7.25	6.38	11.63	2.56	1.25	0.13
HBB20	8.25	6.88	12.63	2.56	1.00	0.13
HBB25	9.75	7.88	14.25	2.63	1.00	0.13

All dimensions shown in inches.

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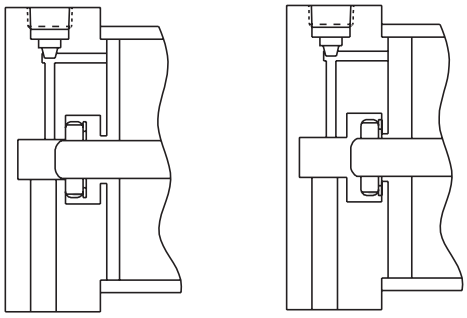
Cushions on Cylinder (C, C1, C2)

Optional cylinder cushions are available at either or both ends. The check seal cushions float radially to compensate for problems with misalignment. Flow paths molded on the circumference of the seal allow exceptionally rapid return stroke without the use of ball checks. A captive cushion screw provides safe cushion adjustment while the cylinder is pressurized. The brass adjustment screw provides maximum corrosion resistance.

Cushion Location*: The cushion adjustment screws are located on the same face as the port unless specified otherwise. The port is machined off-center to allow space for the cushion screw.

Note: Cushions not available with Cylinder Type 3A (3MA cylinder).

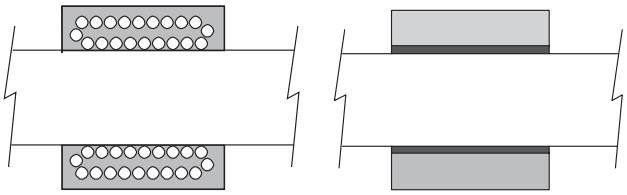
* For steel cylinders, the cushion adjustment screw is located on the face opposite the port. Consult factory for other locations.



Bushings (D, T, T1, TC)

Selection should be based on the following criteria:

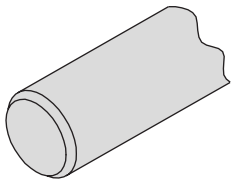
Application Requirement	Ball Bearing	Composite
Precision	Excellent	Good
Friction	Low	Higher
Friction Coefficient	Constant	Variable
Precision over Life of Bearing	Constant	Variable
Static Load Capacity	Good	Excellent
Dynamic Load Capacity	Good	Good with Lower Efficiency
Lubrication	Required	Not Required
Vibration Resistance	Fair	Excellent
Contamination Resistance	Fair	Excellent
Washdown Compatibility	Poor	Excellent



For bushing load capacities, reference the Engineering Data pages of this section.

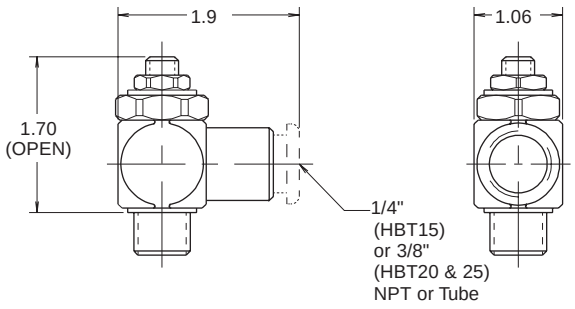
Stainless Steel Shafts (K)

Chrome plated, case-hardened carbon steel shafting is standard for slides. Stainless steel shafting can be specified for corrosive applications.



Flow Controls (F, G)

Right angle flow control valves allow precise adjustment of cylinder speed by metering exhaust air flow. Presto-Lok push-in or NPT ports provide 360° orientation capability.



All dimensions shown in inches.

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NFPA Steel Air Cylinder (S)*

Parker's 2A Series NFPA steel air cylinder is available for extremely rugged applications. Magnetic pistons are not available with this option. Consult factory for other switching or sensing options.

250 PSI NFPA Air Cylinder (3A, 4A)

Parker's 3MA and 4MA Series aluminum NFPA air cylinders are available for general purpose use.

400 PSI NFPA Hydraulic Cylinder (4L)

Parker's 4ML Series aluminum NFPA cylinder is available for 400 PSI hydraulic service. Cushions are not available.

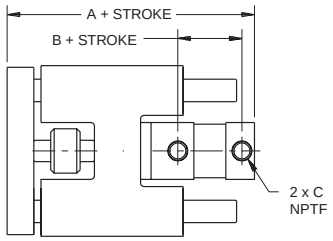
750 PSI NFPA Hydraulic Cylinder (S1)*

Parker's 3L Series NFPA steel cylinder is available for hydraulic service requiring higher force and precise control.

Magnetic pistons are not available with this option. Consult factory for other switching or sensing options.

**If cushions are specified with this option, the adjustment screw is located on the face opposite the port. Consult factory for other locations.*

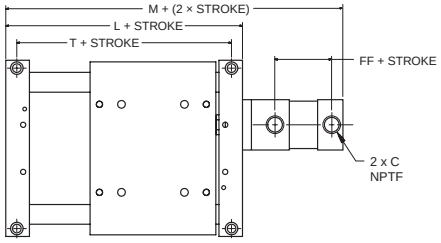
HBC
HBT
HBR



Model	A			B	C	Cylinder Bore (in)
	HBC	HBT	HBR			
15	C/F	8.56	11.56	2.25	3/8	1-1/2
20	C/F	9.31	13.81	2.25	3/8	2
25	C/F	10.69	16.2	2.38	3/8	2-1/2

C/F = Consult Factory

HBB

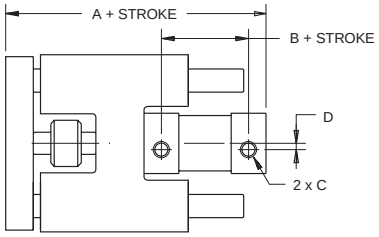


Model	L	T	M	C (NPTF)	FF	Cylinder Bore (in)
15	7.00	6.13	C/F	3/8	2.25	1-1/2
20	8.00	6.63	C/F	3/8	2.25	2
25	9.50	7.63	C/F	3/8	2.38	2-1/2

ISO Air Cylinder (D, E)

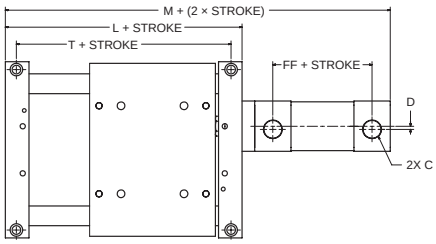
An ISO cylinder (Parker's P1D Series) is available for ISO or metric requirements. Magnetic pistons are standard.
If sensors are required, they must be ordered from the Electronic Sensors section of this catalog.

HBC
HBT
HBR



Model	A			B	C		Bore (mm)
	HBC	HBT	HBR		BSPP	NPTF	
15	6.77	8.69	11.70	2.95	1/4	3/8	40
20	7.55	9.48	13.99	2.83	1/4	3/8	50
25	9.39	11.32	16.83	3.50	3/8	3/8	63

HBB



Model	L	T	M	C		D	FF	Bore (mm)
				BSPP	NPTF			
15	7.0	6.1 3	11.63	1/4	1/4	0.22	2.95	40
20	8.0	6.63	12.67	1/4	3/8	0.34	2.83	50
25	9.5	7.63	14.76	3/8	3/8	0.24	3.50	63

All dimensions shown in inches.

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Rod Lock Cylinder (D1, D2, E1, E2)

The P1D Series Rod Lock Cylinder incorporates a powerful piston rod locking device, which clamps the piston rod and locks it in position. The locking device is a spring lock with an air pressure release and is integrated into the front (head) cover of the cylinder. This increases the cylinder length as shown below.

In the absence of air signal pressure, full holding force is applied to the piston rod. When air is present at 4 Bar (58 PSI), the locking device is released. A manual override rod lock version is also available.

Applications: Vertical guided cylinders
In the event of pressure loss
In the event of electrical control failure

Design Tip: The piston rod should not be moving when the locking device is activated. The locking device is not intended to repeatedly brake movement. See sample pneumatic circuit.

Note: Rod locking cylinders automatically include cushions, but include cushions ("C") in model code. If sensors are required, they must be ordered from the Electronic Sensors section of this catalog.

TECHNICAL DATA

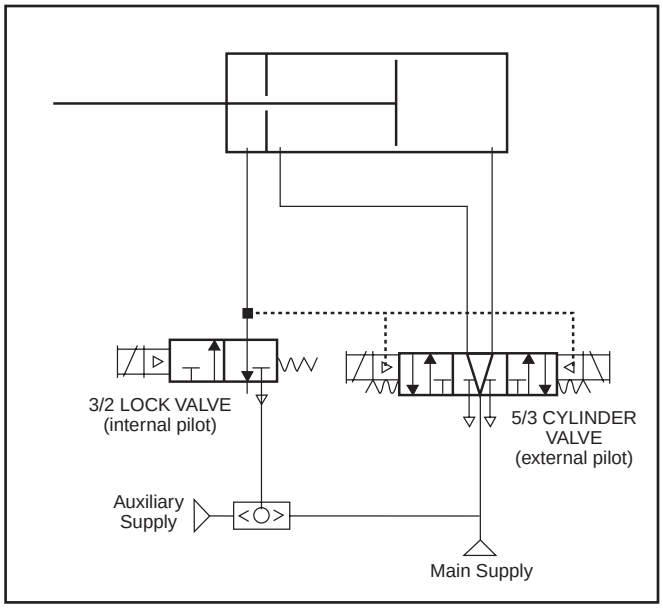
Maximum Pressure: 145 PSI (10 Bar)
Pressure Required to Unlock: 58 PSI (4 Bar) [1]

[1]Signal pressure to port on locking device. Operation at pressures lower than 4 Bar (58 PSI) may lead to inadvertent engagement of the rod lock device.

Model	Bore (mm)	Holding Force, lb (N)
15	40	193 (860)
20	50	303 (1345)
25	63	481 (2140)

ROD LOCK CIRCUIT

Lock valve must be maintained energized during cylinder motion, otherwise rod lock is engaged and cylinder valve shifts to mid position. For manual override of the rod lock, insert a shuttle valve and an auxiliary air supply to disable rod lock.

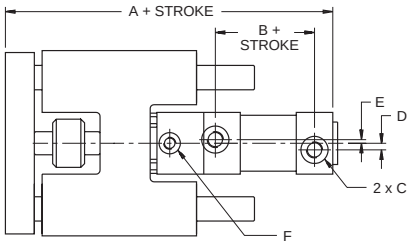


NOTES:

Cushion adjust (head only) located at position #4 for bore sizes 32-63mm. Head end port and cushion cannot be repositioned.

All P1D Rod Lock Versions are not intended for use in water service applications, or in environments that have high humidity levels and/or splashing fluids present.

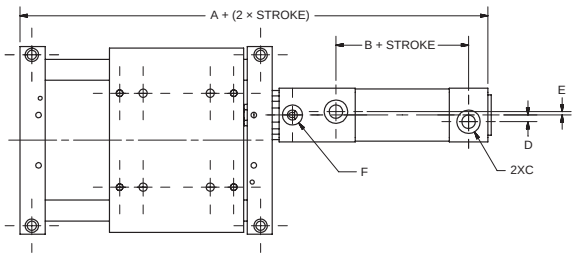
HBC
HBT
HBR



Model	A			B	C*	D	E	F*	Cylinder Bore (mm)
	HBC	HBT	HBR						
15	8.50	10.43	13.43	3.11	1/4	0.22	0.08	1/8	40
20	9.39	11.33	15.93	3.01	1/4	0.30	0.16	1/8	50
25	11.63	13.57	19.07	3.45	3/8	0.43	0.08	1/8	63

*BSPP or NPTF

HBB



HBB Model	A	B	C*	D	E	F*	Cylinder Bore (mm)
15	13.37	3.11	1/4	0.22	0.08	1/8	40
20	14.52	3.01	1/4	0.30	0.16	1/8	50
25	17.00	3.45	3/8	0.43	0.08	1/8	63

*BSPP or NPTF

All dimensions shown in inches.

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NFPA Rod Lock Cylinder (4J)

The 4MAJ Series Rod Lock Cylinder incorporates a powerful piston rod locking device, which clamps the piston rod and locks it in position. The locking device is a spring lock with an air pressure release and is attached to the front (head) cover of the cylinder. This increases the cylinder length as shown below.

In the absence of air signal pressure, full holding force is applied to the piston rod. When air is present at 60 PSIG or greater, the locking device is released. The manual override version is standard.

Applications: Vertical guided cylinders
In the event of pressure loss
In the event of electrical control failure

Design Tip: The piston rod should not be moving when the locking device is activated. The locking device is not intended to repeatedly brake movement. See sample pneumatic circuit.

Note: Rod locking cylinders automatically include cushions, but include cushions ("C") in model code. If sensors are required, they must be ordered from the Electronic Sensors section of this catalog.

F

TECHNICAL DATA

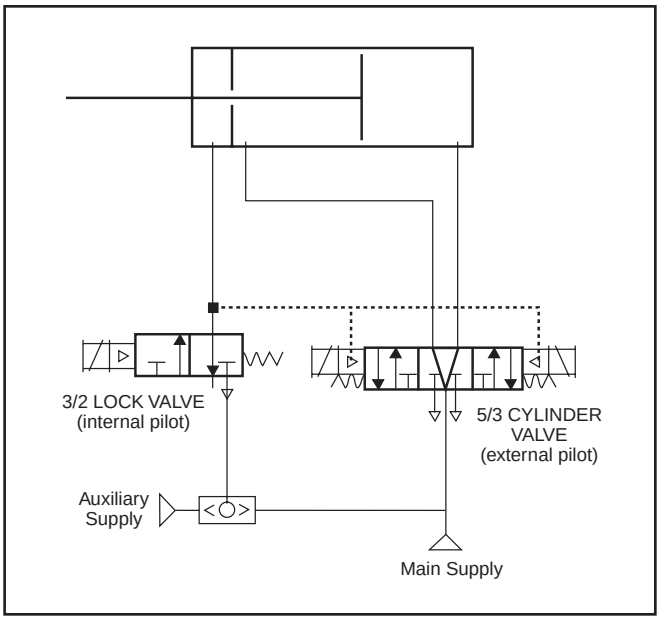
Maximum Pressure: 100 PSIG
Pressure Required to Unlock: 60 PSIG [1]

[1] Signal pressure to port on locking device. Operation at pressures lower than 60 PSIG may lead to inadvertent engagement of the rod lock device.

Model	Bore (inch)	Holding Force, lb
15	1½	180
20	2	314
25	2½	491

ROD LOCK CIRCUIT

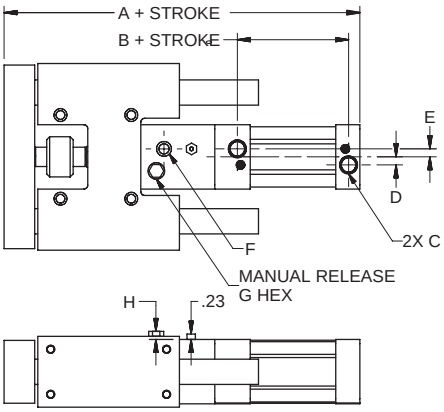
Lock valve must be maintained energized during cylinder motion, otherwise rod lock is engaged and cylinder valve shifts to mid position. For manual override of the rod lock, insert a shuttle valve and an auxiliary air supply to disable rod lock.



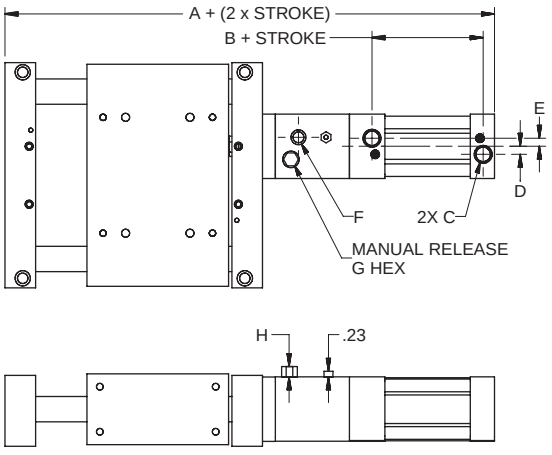
Note:

All 4MAJ rod lock cylinders are not intended for use in water service applications, or in environments that have high humidity levels and/or splashing fluids present.

HBC
HBT
HBR



HBB



Model	A				B	C NPTF	D	E	F NPTF	G HEX	H	Cylinder Bore (inch)
	HBC	HBT	HBR	HBB								
15	8.89	10.82	13.82	14.26	2.31	3/8	0.31	0.31	1/8	5/16	0.19	1-1/2
20	9.88	11.82	16.32	15.51	2.31	3/8	0.31	0.31	1/8	1/2	0.27	2
25	11.26	13.19	18.70	17.13	2.38	3/8	0.31	0.31	1/8	1/2	0.27	2-1/2

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Special (X)

Other common modifications are available. Consult factory for specifications. Examples include:

- NC9 Series NFPA Pneumatic Cylinder
- 2AN Series NFPA Pneumatic Cylinder
- Cylinders with Continuous Position Feedback
- Bumpers on cylinder only

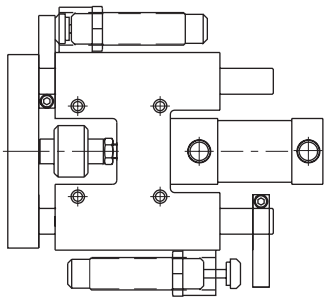
No Cylinder (Q, Q1)

The unit is supplied with cylinder mounting but no cylinder so that one may be field-added. Consult factory for required cylinder piston rod length.

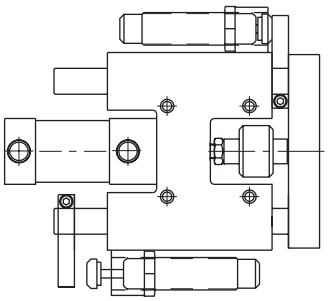
Left Hand Assembly (L1)

Units with shock absorbers can be assembled with shocks on the opposite sides.

Standard Orientation



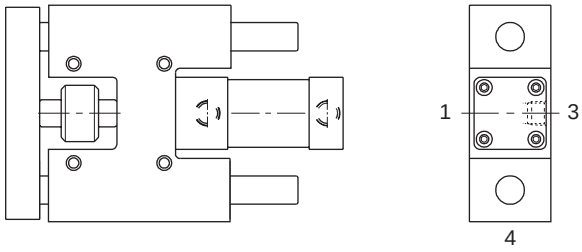
Left Hand Orientation



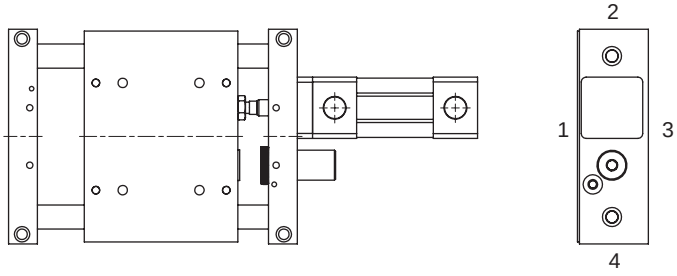
Port Location (L3)

Cylinder ports are located in position 3, opposite the standard position when L3 is specified. Port positions 2 and 4 are not possible.

HBC
HBT
HBR



HBB



Fluorocarbon Seals (V)

Standard abrasion-resistant nitrile seals should be used for general purpose applications with temperatures of 0 - 165°F. **Fluorocarbon** seals are recommended for high temperature applications up to 250°F.

Note: Fluorocarbon seals are not available for the 3MA Series cylinder.

Option	Temperature Range (°F)
Shock Absorbers	32 - 150
Bumpers	0 - 200
Piston Magnets	0 - 165
Sensors	14 - 140

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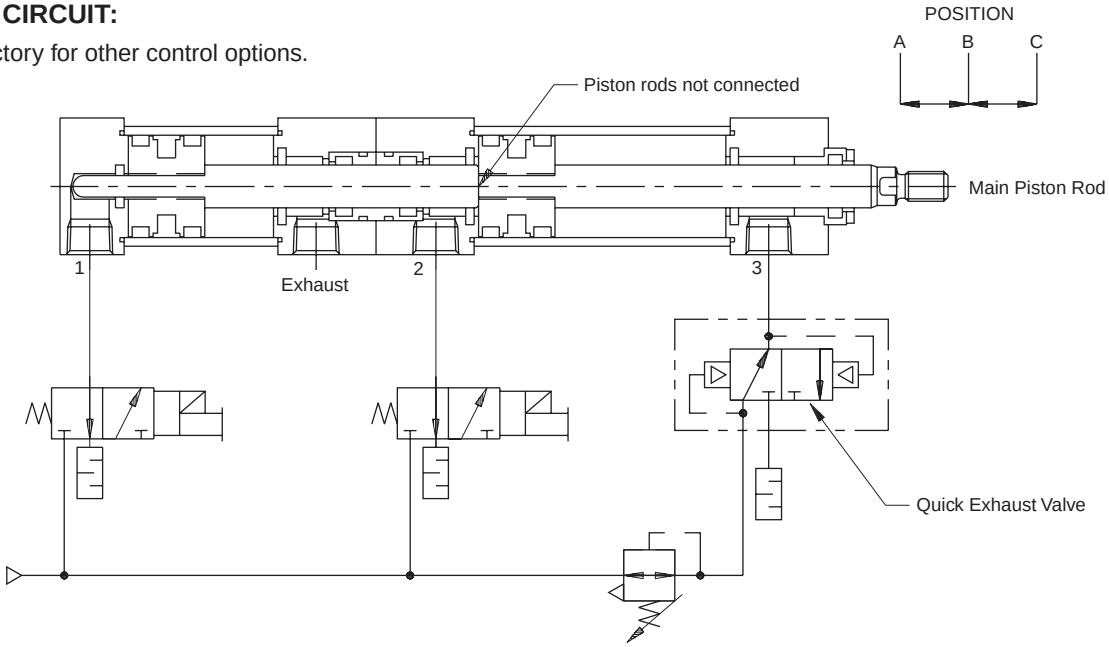
Three Position Cylinder

The three position unit utilizes a duplex air cylinder to provide the center position. This option can be specified with all other options. However, bumpers and body mounted inductive proximity sensors operate on the fully extended and retracted positions only. Cylinder mounted reed and solid state sensors can be used to detect the center position of the slide.

Note: The Three Position Cylinder is not available for the 3MA Series cylinder.

SAMPLE CIRCUIT:

Consult factory for other control options.



OPERATION:

Position A (fully retracted) is obtained by applying pressure to Port 3 with Ports 2 and 1 vented to atmosphere.

Position B (mid-position) is obtained by applying pressure to Port 1 while maintaining a lower pressure to Port 3. The pressure at Port 3 prevents the main piston rod from over-travelling. A quick exhaust valve can be used to maintain pressure while allowing full exhaust capability.

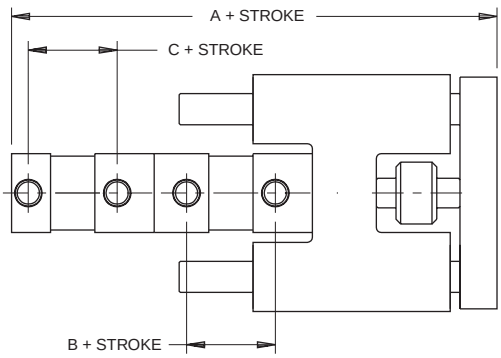
Position C (fully extended) is obtained by applying pressure to Port 2.

DIMENSIONAL DATA:

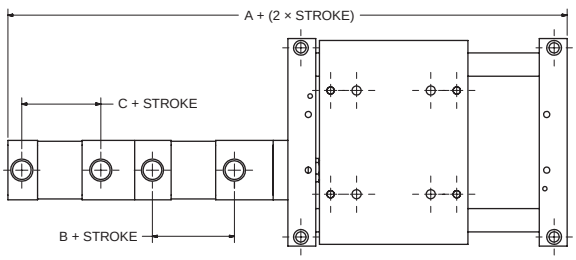
Three position units utilize a longer cylinder.
All other dimensions remain the same.

Model	A				B	C
	HBC	HBT	HBR	HBB		
15	10.38	12.31	15.31	15.25	2.38	2.31
20	11.12	13.06	17.56	16.25	2.38	2.31
25	12.57	14.50	20.01	17.94	2.38	2.38

HBC
HBT
HBR



HBB



All dimensions shown in inches.

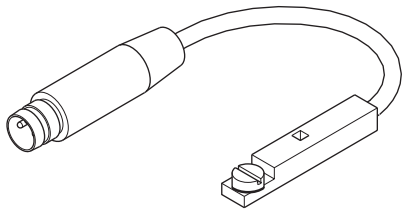
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Solid State and Reed Sensors

Sensors must be ordered separately.

Magnetic piston is standard.

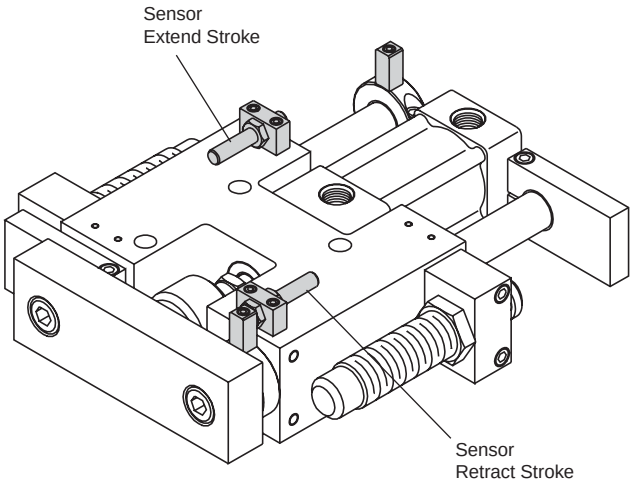
See Electronic Sensors section for part numbers and sensor specifications.



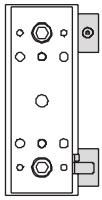
Inductive Proximity Sensors

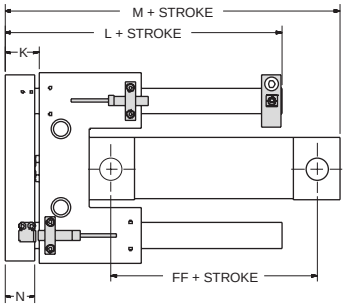
8mm barrel type proximity sensors may be ordered with the HB Series slides (options P, N, P1, N1). The slides can also be ordered “prox ready” (J, J1). A magnetic piston is standard.

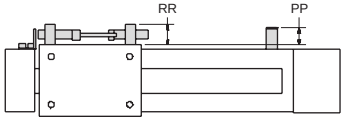
See Electronic Sensors section for sensor specifications.



HBC







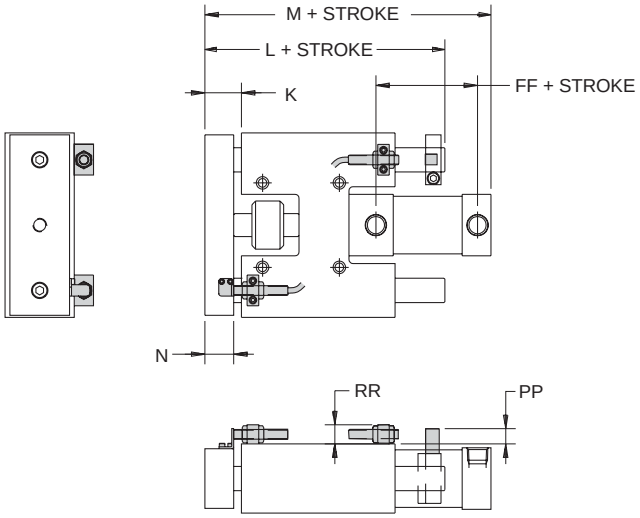
Model	K	L	M	N
HBC15	1.06	5.19	6.26	0.94
HBC20	1.31	6.39	7.00	1.19
HBC25	1.56	7.82	8.38	1.44

Model	FF	PP	RR	
			8mm	12mm
HBC15	2.31	0.50	0.63	0.88
HBC20	2.31	0.50	0.63	0.88
HBC25	2.38	0.50	0.63	0.88

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Proximity Sensor Dimensions

HBT
HBR



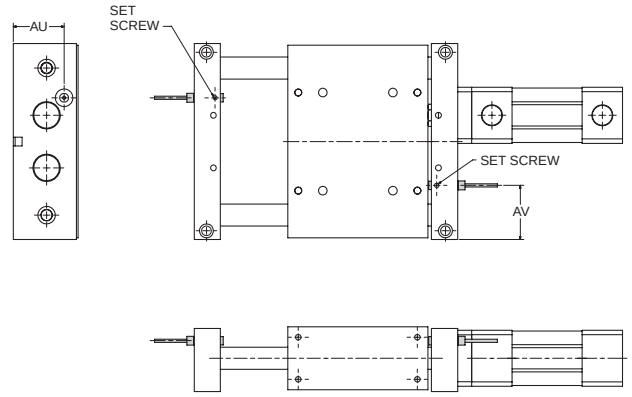
Model	K	L	M	N
HBT15	1.06	6.94	8.19	0.94
HBT20	1.31	7.88	8.94	1.19
HBT25	1.56	9.31	10.31	1.44

Model	FF	PP	RR	
			8mm	12mm
HBT15	2.31	0.50	0.63	0.88
HBT20	2.31	0.50	0.63	0.88
HBT25	2.38	0.50	0.63	0.88

Model	K	L	M	N
HBR15	1.06	9.94	11.19	0.94
HBR20	1.31	12.39	13.44	1.19
HBR25	1.56	14.82	15.82	1.44

Model	FF	PP	RR	
			8mm	12mm
HBR15	2.31	0.50	0.63	0.88
HBR20	2.31	0.50	0.63	0.88
HBR25	2.38	0.50	0.63	0.88

HBB



Model	AU	AV
HBB15	1.81	1.94
HBB20	2.19	2.63
HBB25	2.31	2.75

All dimensions shown in inches.

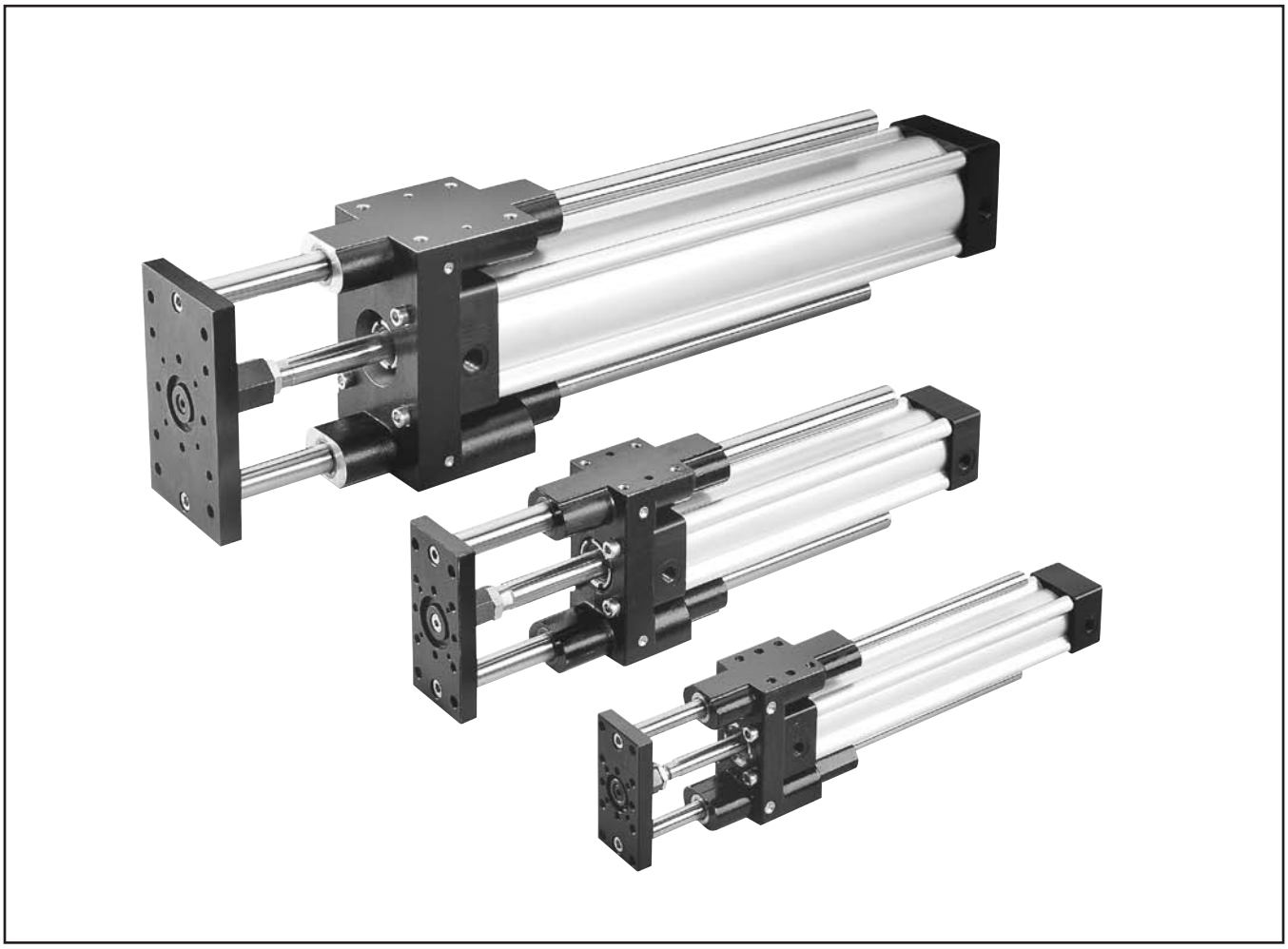
HB Series Service Kits

Cylinder Type	Info Location
3MA	pages B112-B114
4MA	pages B115-B118
4ML	pages B119-B122
4MAJ	page B123
2A	see Catalog 0106-6
P1D	page C33
3L	see Catalog 0106-6

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P5E Series

P1D ISO Guided Cylinders

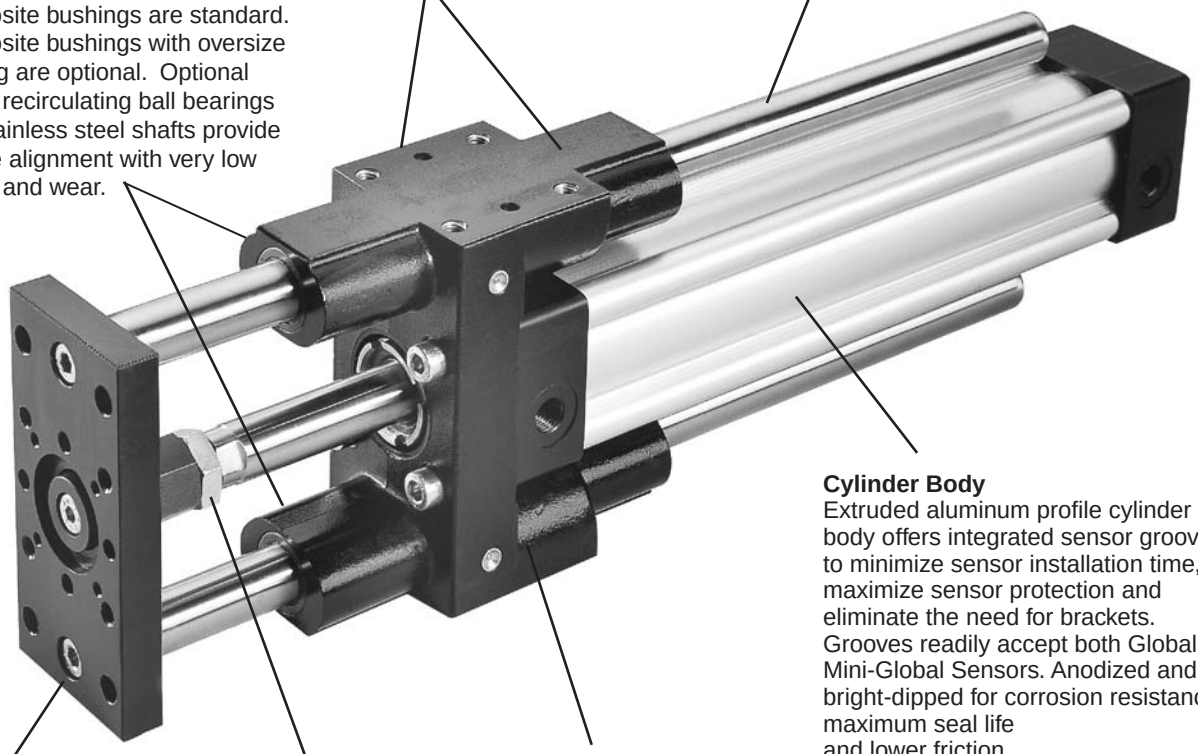


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Rod Lock Options F157-F159
Bumpers F160
Sensors F160
Mounting Kits..... F161
Service Kits F162

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F



Support Shafts
Chrome plated, case hardened support shafts are machined from high carbon alloy steel. Stainless steel and oversized shafting are available.

Cast Aluminum Body
Lightweight, unitized design provides strength and 3 mounting faces.

Bushings
Composite bushings are standard. Composite bushings with oversize shafting are optional. Optional sealed recirculating ball bearings with stainless steel shafts provide precise alignment with very low friction and wear.

Cylinder Body
Extruded aluminum profile cylinder body offers integrated sensor grooves to minimize sensor installation time, maximize sensor protection and eliminate the need for brackets. Grooves readily accept both Global and Mini-Global Sensors. Anodized and bright-dipped for corrosion resistance, maximum seal life and lower friction.

Cylinder Mounting
Conforms to ISO 6431, ISO/DIS 15552, VDMA 24562 and AFNOR standards

Tooling Plate
Precision machined and anodized, the aluminum tooling plate allows mounting on two sides. Dowel pin holes provide accurate mounting.

Alignment Coupler
Allows piston rod to self-center, thus increasing cylinder life, especially when the support shafts deflect under load.

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Model Number Code
Example: P5E-J032FGN0250

P5E	–	J	032	F	G	N	0250

Shaft / Bearing Type

J	Composite Bearing, Chrome Plated Standard Shaft
M	Composite Bearing , Chrome Plated Oversize Shaft [1]
C	Composite Bearing, Stainless Steel Shaft
H	Ball Bearing, Stainless Steel Shaft

Bore Size

032	32mm
040	40mm
050	50mm
063	63mm
080	80mm
100	100mm

Cylinder Type [3]

F	P1D Removable Gland Cylinder
G	P1D Removable Gland Cylinder with Cushions
K	P1D Rod Lock Cylinder with Cushions
S	P1D Manual Override Rod Lock Cylinder with Cushions
Q	No Cylinder
X	Special – please specify

Port Style

H	NPTF (Std)
G	BSPP
N	NPTF with Flow Controls (Std. Female Ports)
B	BSPP with Flow Controls (ISO Female Ports)
F	Flow Controls, NPTF Port, Prestolok Tube (inch)
P	Flow Controls, BSPP Port, Prestolok Tube (mm)

Bumpers / Adjustable Stop Collars

N	None
B	Bumpers, retract only [2]
E	Bumpers and Adjustable Stop Collars, extend only
T	Bumpers both ends, Adjustable Stop Collars on extend [2]
R	Bumpers and Adjustable Stop Collars on retract [2]
S	Bumpers and Adjustable Stop Collars both ends [2]

Stroke

Specify whole millimeters, i.e. 0250 = 250mm stroke

1 Bumpers and adjustable stop collars are not available with oversize shaft option.

2 These options will increase the cylinder length. To achieve a specific usable stroke length with these options, add the corresponding value(s) in the Adder table on page F156 to the desired stroke length. See Bumper Options for explanation.

Adders are not used when P1D Rod Lock (K) or P1D Manual Override Rod Lock (S) are specified with bumpers.

3 Tie Rod Version or composite piston option must be specified as Special (X).

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Specifications

- Maximum Operating Pressure: 145 PSI (10 Bar)
- Support Shaft Sizes: ∅12 to 30mm
- Cylinder Mounting: ISO 6431, ISO/DIS 15552, VDMA 24 562 and AFNOR standards
- Mounting: Unrestricted
- Operating Temperature Range: -10°C to +74°C (14°F to 165°F)
- Filtration Requirement: 40 micron, dry filtered air

Quick Reference Data

Model (Bore Size)	Piston Rod (mm)	Bushings	Support Shafts (mm)	Piston Bore Area Non-Rod Side		Max.* Stroke (mm)	Theoretical Force		Weights	
				(mm^2)	(in^2)		Extend @80 PSI (5.5 Bar), N (lb)	Retract @80 PSI (5.5 Bar), N (lb)	Base Weight, kg (lb)	Per 100 mm Stroke, kg (lb)
32	16	Standard	12	804	1.25	500	444 (100)	334 (75)	0.97 (2.14)	0.175 (0.39)
		Oversized	16							
40	16	Standard	16	1257	1.95	625	694 (156)	583 (131)	1.55 (3.41)	0.315 (0.69)
		Oversized	20							
50	20	Standard	20	1964	3.04	775	1081 (243)	907 (204)	2.56 (5.64)	0.495 (1.09)
		Oversized	25							
63	20	Standard	20	3117	4.83	950	1717 (386)	1544 (347)	3.57 (7.84)	0.495 (1.09)
		Oversized	25							
80	25	Standard	25	5027	7.79	1150	2771 (623)	2500 (562)	6.53 (14.4)	0.770 (1.70)
		Oversized	30							
100	25	Standard	25	7854	12.17	1350	4333 (974)	4061 (913)	8.76 (19.32)	0.770 (1.70)
		Oversized	30							

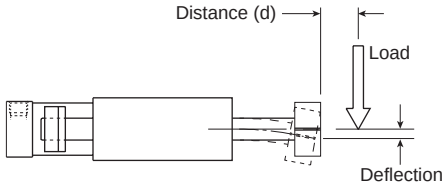
* Ball bearings suggested on long-stroke applications. Consult factory for longer strokes.

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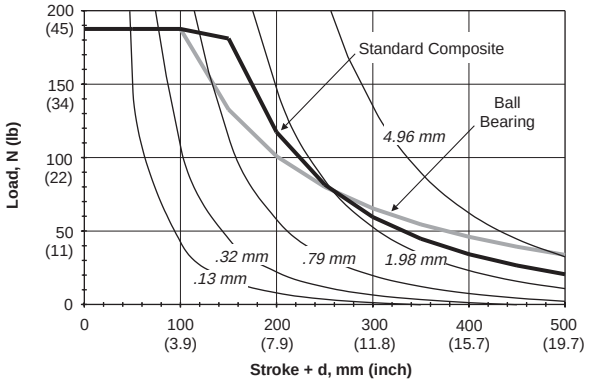
Maximum Load Capacity with Standard Shaft

The following curves are based on 10 million cycles at a speed of 0.20 m/s (40 fpm). Higher dynamic loads will reduce cycle life. For static conditions, multiply the information in the graphs by 1.5.

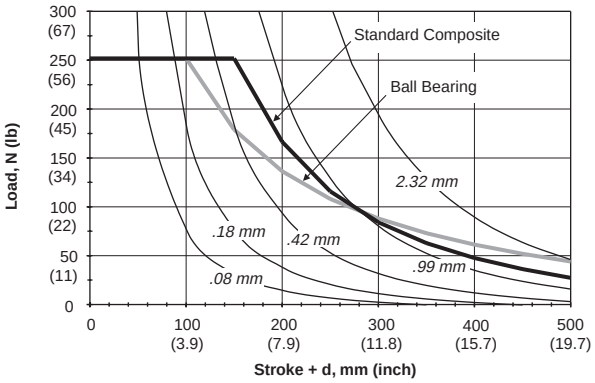
EXAMPLE: A P5E with 40mm bore, composite bushings and a "stroke+d" of 400mm will have a load capacity of 48N.



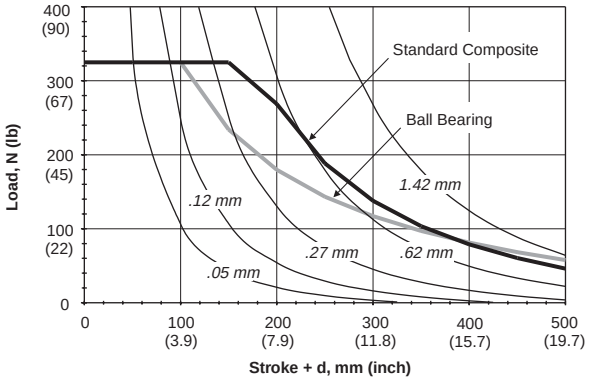
32mm Bore Size



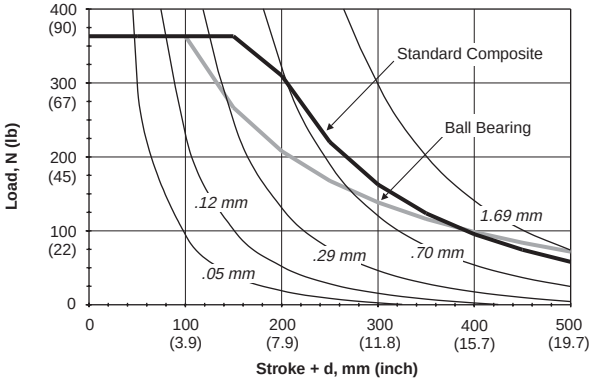
40mm Bore Size



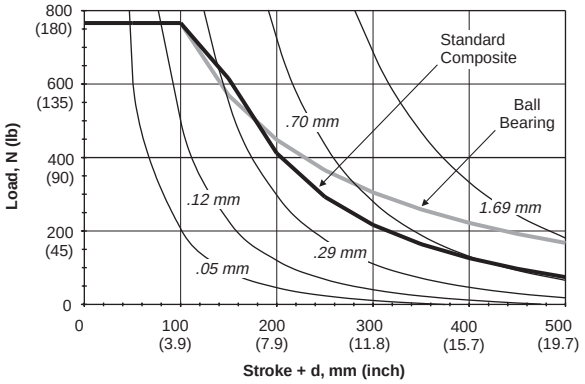
50mm Bore Size



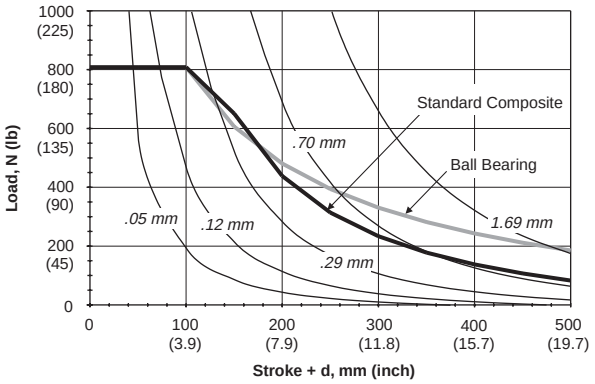
63mm Bore Size



80mm Bore Size



100mm Bore Size

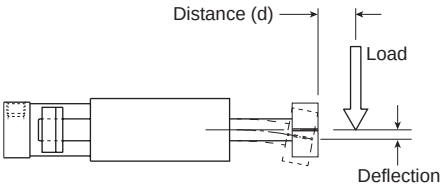


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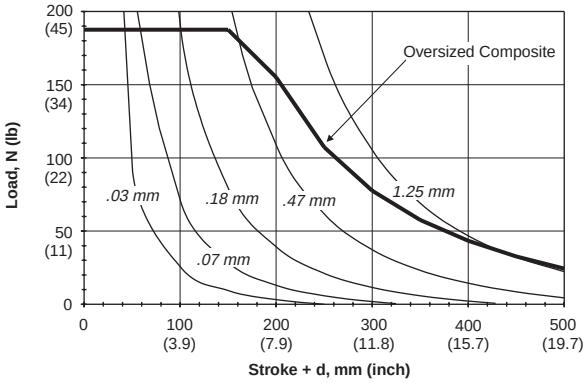
Maximum Load Capacity with Oversized Shaft

The following curves are based on 10 million cycles at a speed of 0.20 m/s (40 fpm). Higher dynamic loads will reduce cycle life. For static conditions, multiply the information in the graphs by 1.5.

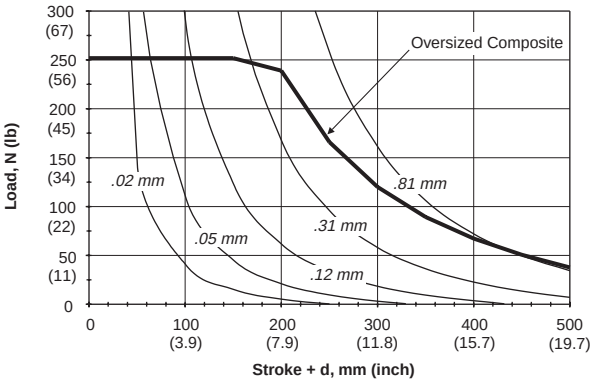
EXAMPLE: A P5E with 63mm bore, oversized support shafts and a "stroke+d" of 300mm would have a load capacity of 200N.



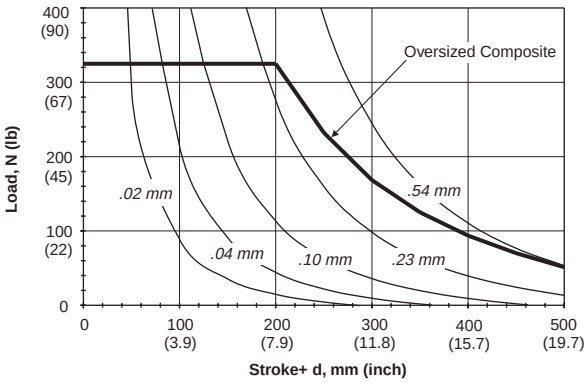
32mm Bore Size



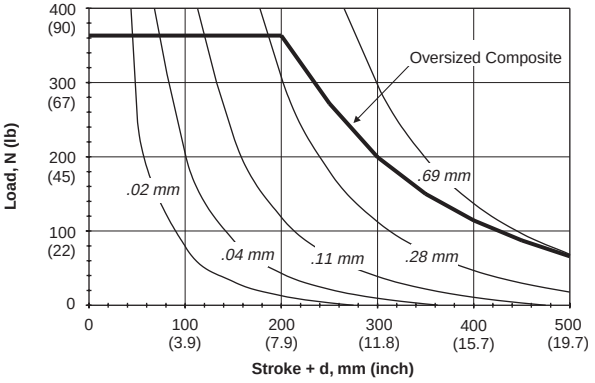
40mm Bore Size



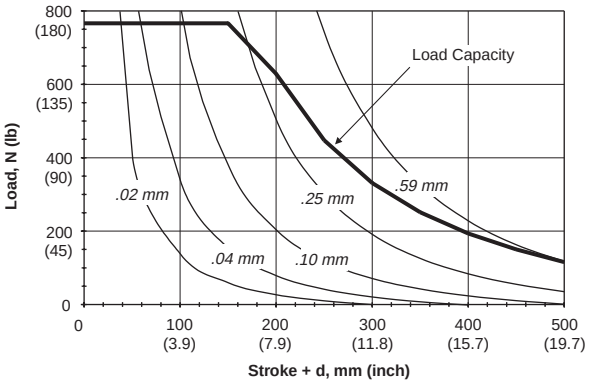
50mm Bore Size



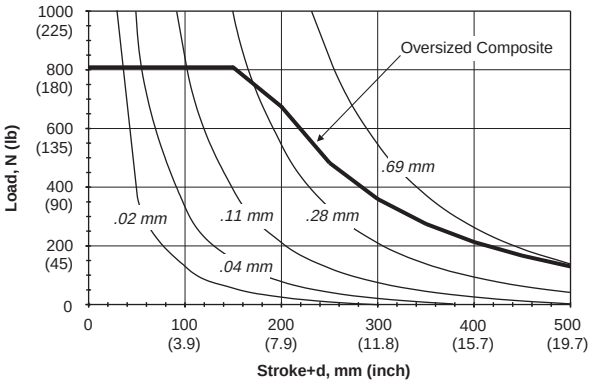
63mm Bore Size



80mm Bore Size



100mm Bore Size

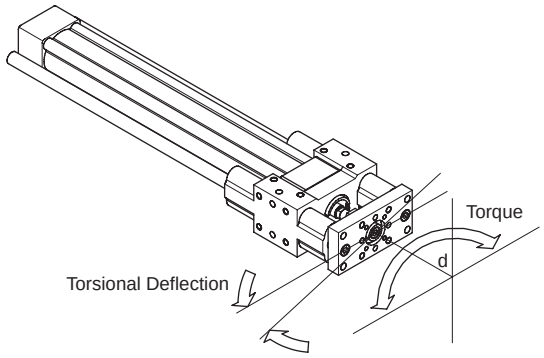


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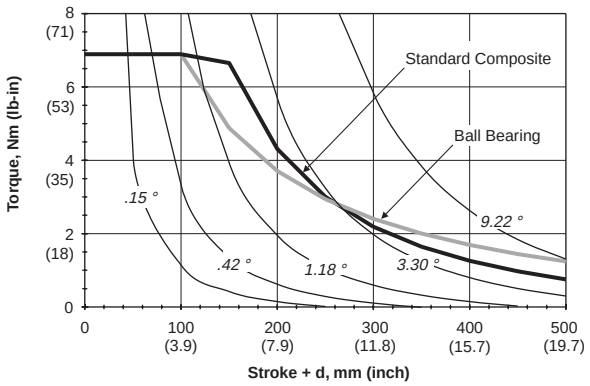
Symmetrical Torque Capacity with Standard Shaft

These curves provide the maximum permissible torsional load vs. stroke for various slide sizes. The data presented is based on a bearing life equivalent to 10 million cycles for dynamic conditions. Higher dynamic torques will reduce cycle life. For static conditions, multiply the information in the graphs by 1.5.

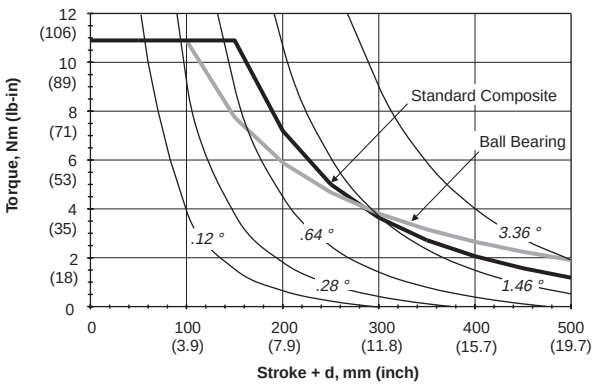
EXAMPLE: A P5E with 100mm bore, composite bushings and a "stroke + d" of 300mm would have a torque capacity of 20 Nm.



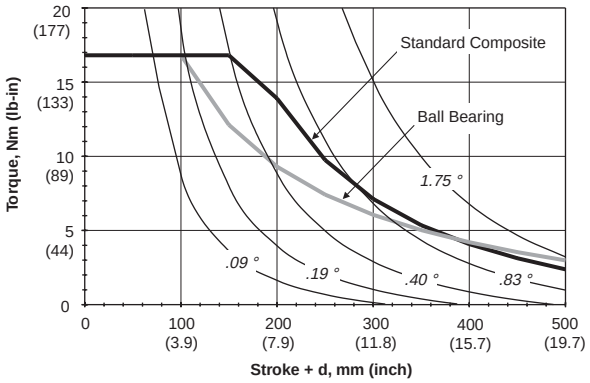
32mm Bore Size



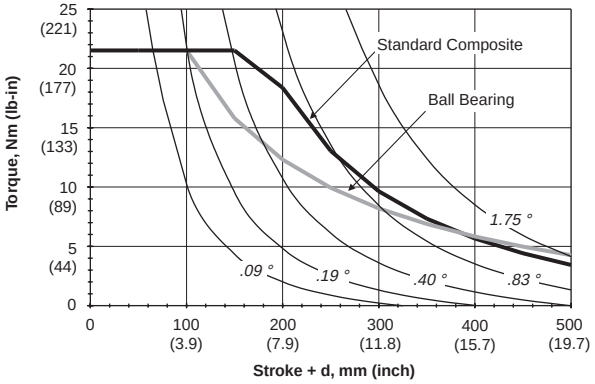
40mm Bore Size



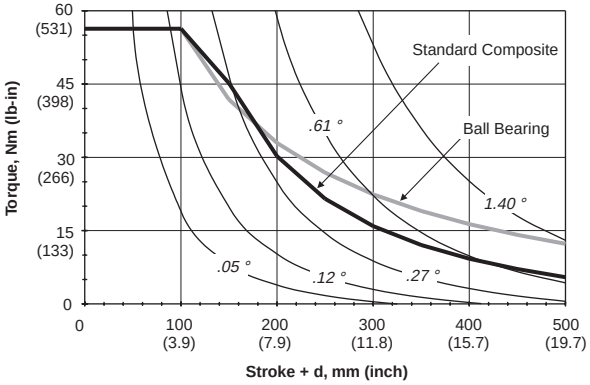
50mm Bore Size



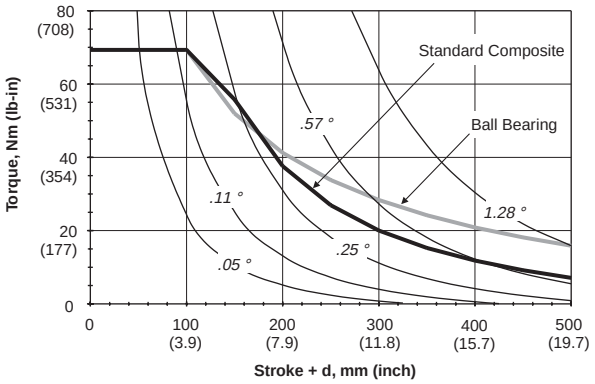
63mm Bore Size



80mm Bore Size



100mm Bore Size

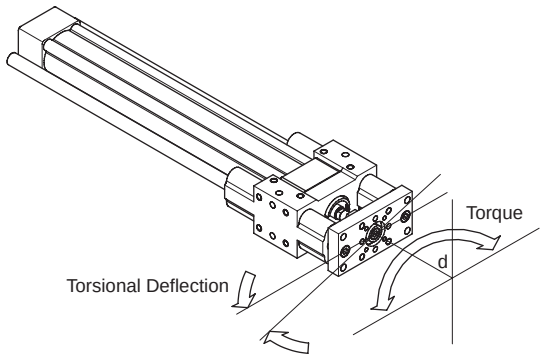


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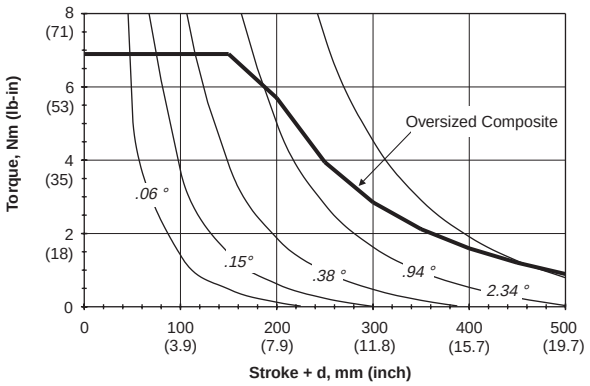
Symmetrical Torque Capacity with Oversized Shaft

These curves provide the maximum permissible torsional load vs. stroke for various slide sizes. The data presented is based on a bearing life equivalent to 10 million cycles for dynamic conditions. Higher dynamic torques will reduce cycle life. For static conditions, multiply the information in the graphs by 1.5.

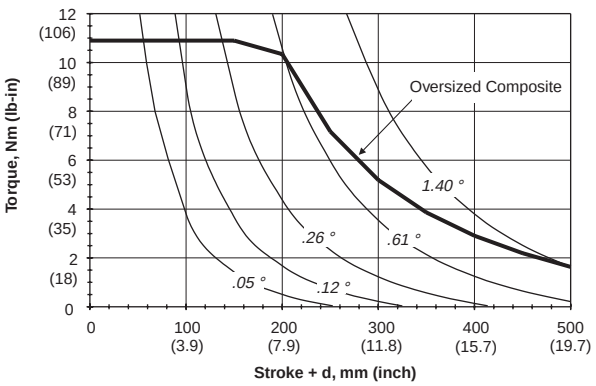
EXAMPLE: A P5E with 50mm bore, oversized support shafts and a "stroke + d" of 400mm would have a torque capacity of 5 Nm.



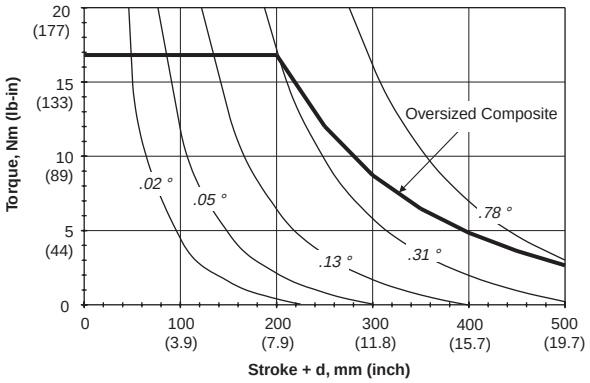
32mm Bore Size



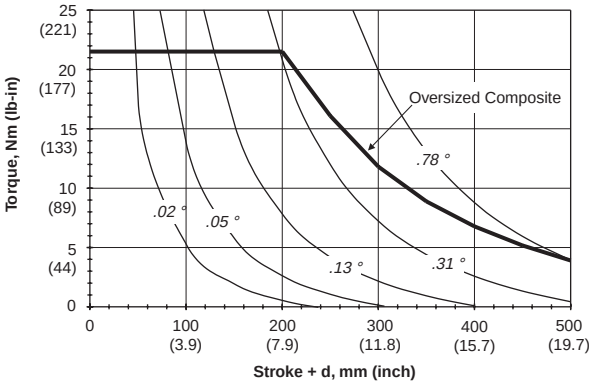
40mm Bore Size



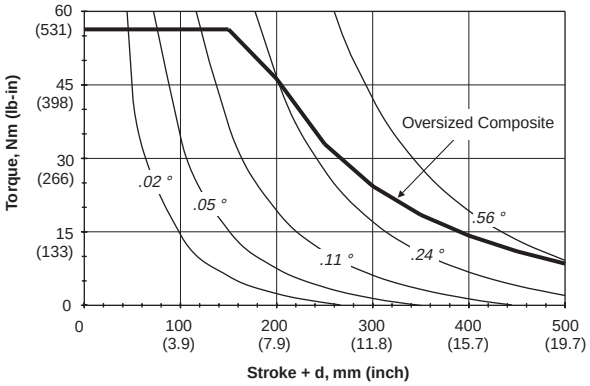
50mm Bore Size



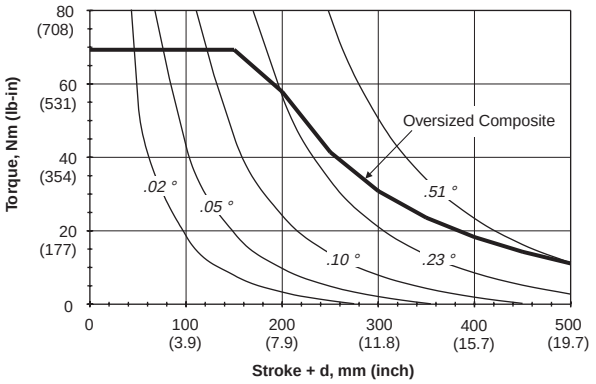
63mm Bore Size



80mm Bore Size



100mm Bore Size

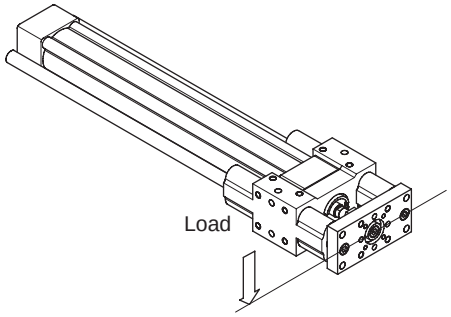


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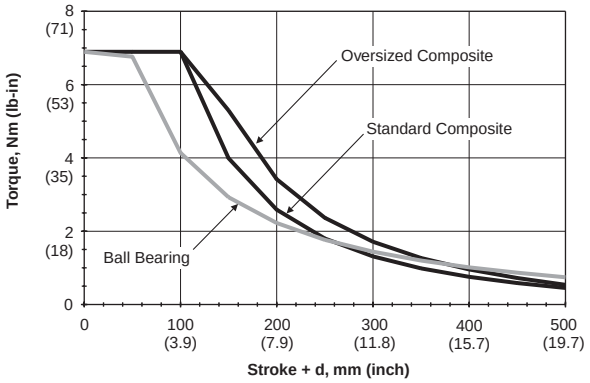
Asymmetrical Torque Capacity

Asymmetrical loading occurs when an off-center load is applied to the unit. P5E Series units can resist torsional loads that are asymmetrical.

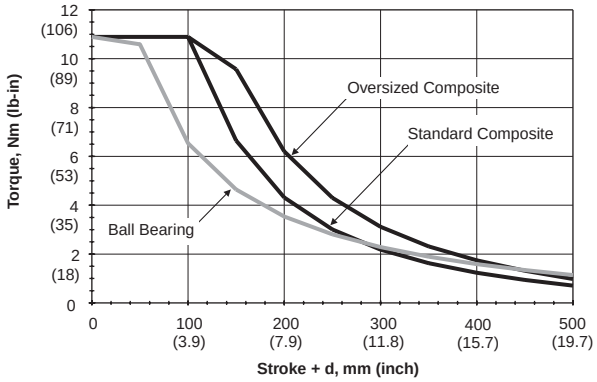
EXAMPLE: A P5E with 63mm bore, ball bearings and a "stroke + d" of 300mm would have an asymmetrical torque capacity of 5 Nm.



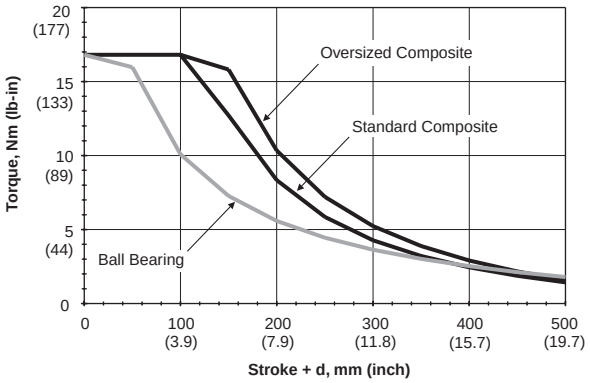
32mm Bore Size



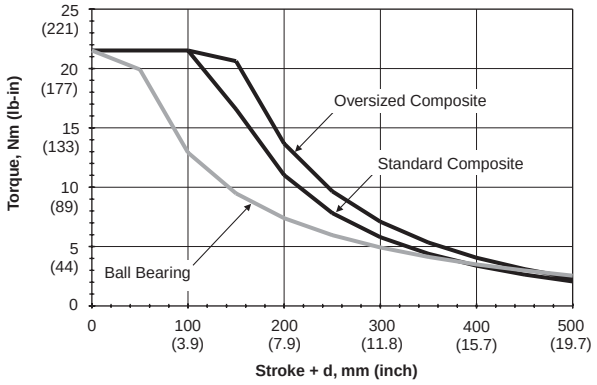
40mm Bore Size



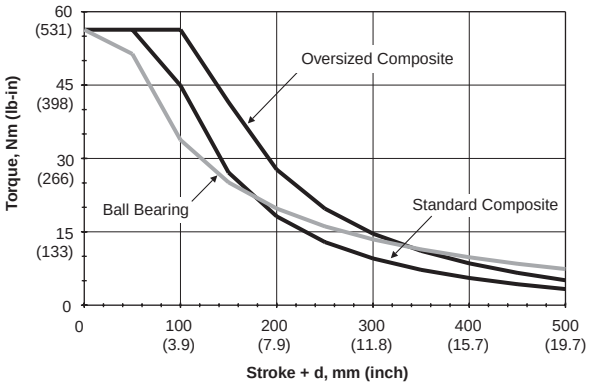
50mm Bore Size



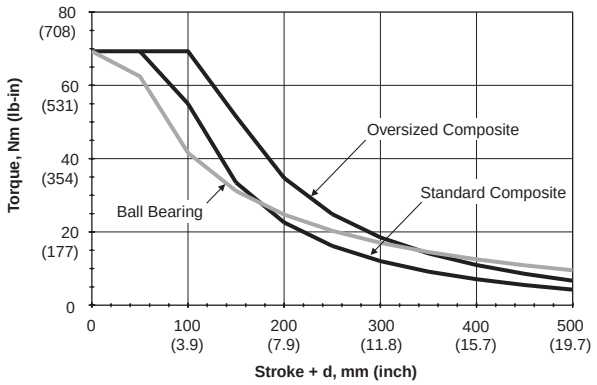
63mm Bore Size



80mm Bore Size



100mm Bore Size



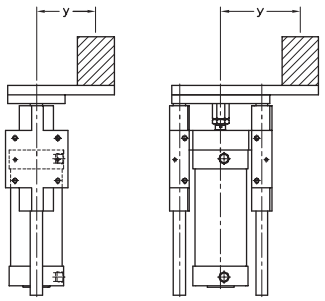
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Vertical Eccentric Load Capacity

P5E Series units mounted vertically will have the same eccentric load capacity regardless of orientation. The graphs provide maximum load capacity for an eccentric mounted load. The load is assumed to be mounted at the face of the tooling plate.

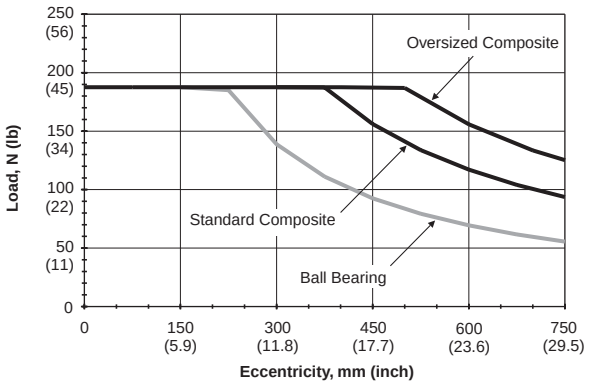
These load curves illustrate load ratings based on the bearing system of the product. Load rating is a key selection criterion but is not the only one to consider in the selection of a product.

Note: Charts are based on 100mm of stroke.

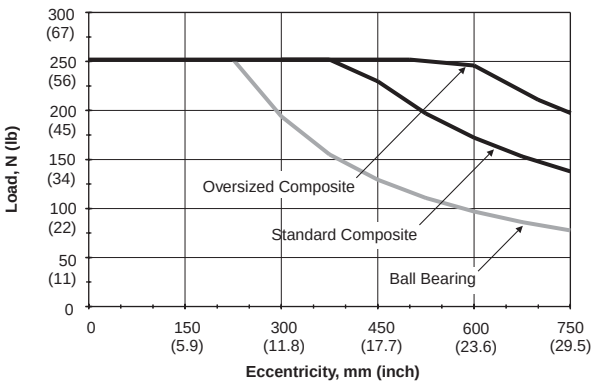


EXAMPLE: A P5E with a 40mm bore carrying an eccentric load located 300mm from the centerline has a capacity of approximately 200N (45 lbs).

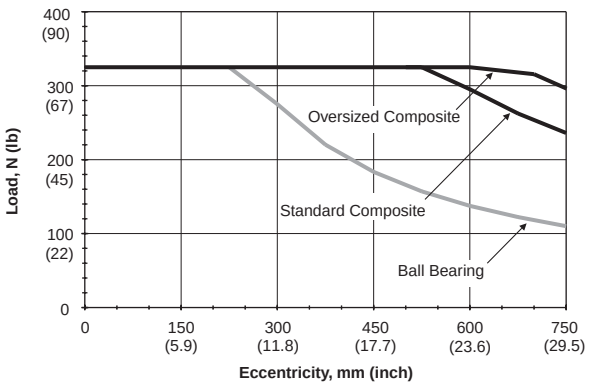
32mm Bore Size



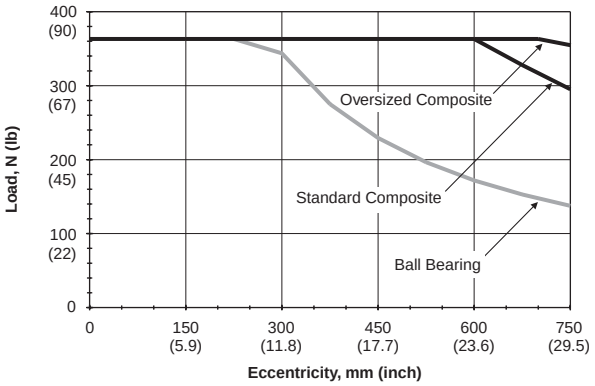
40mm Bore Size



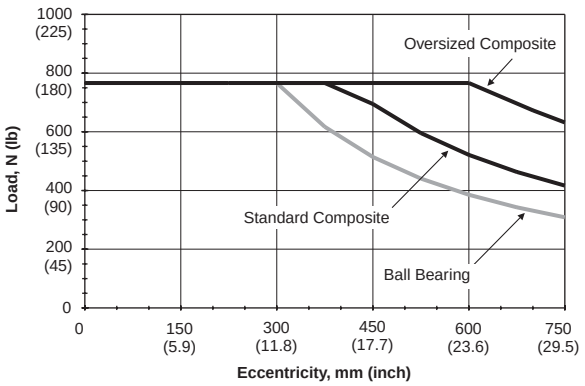
50mm Bore Size



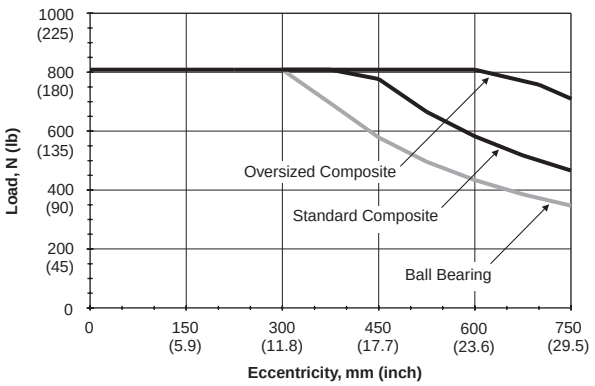
63mm Bore Size



80mm Bore Size

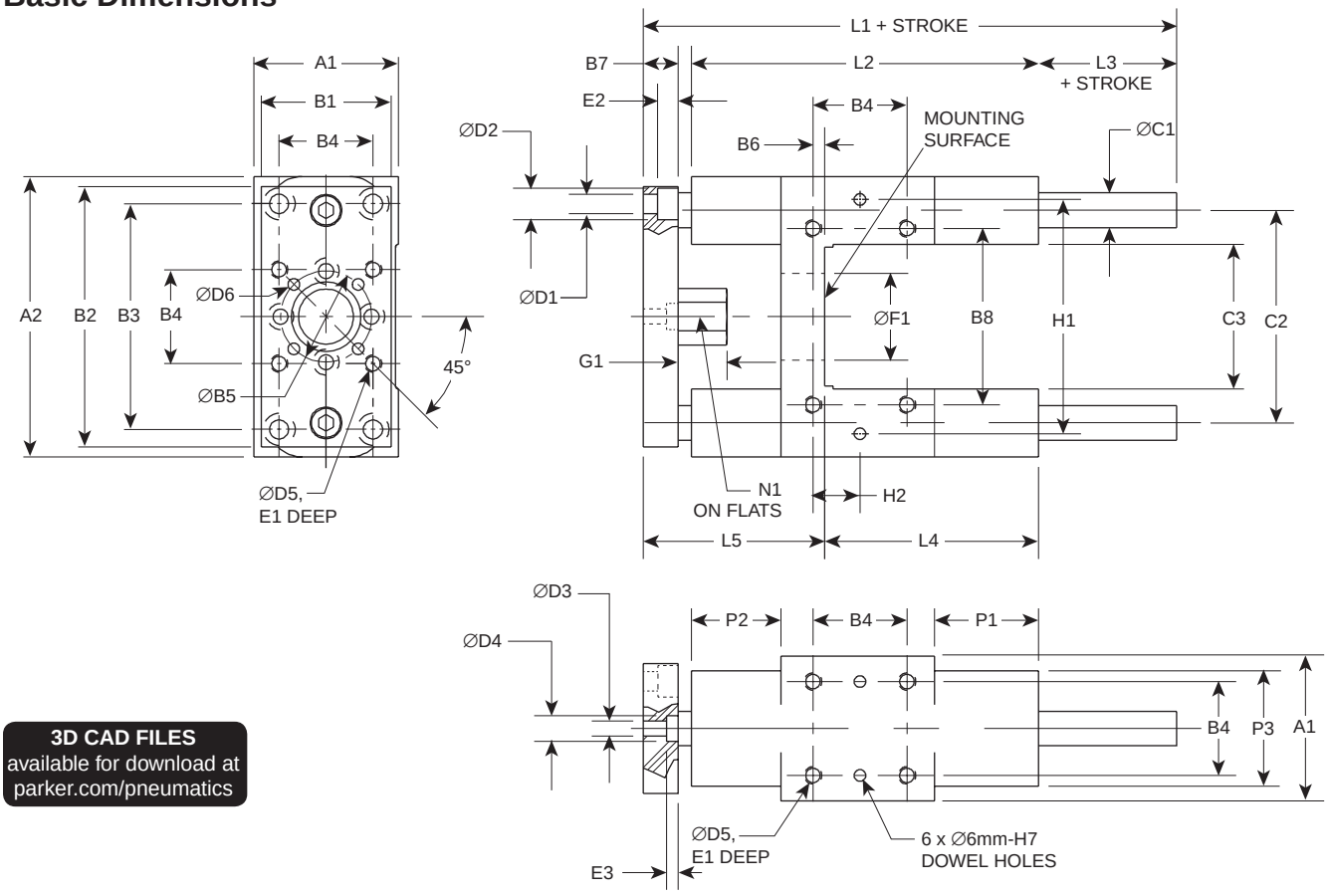


100mm Bore Size



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Basic Dimensions



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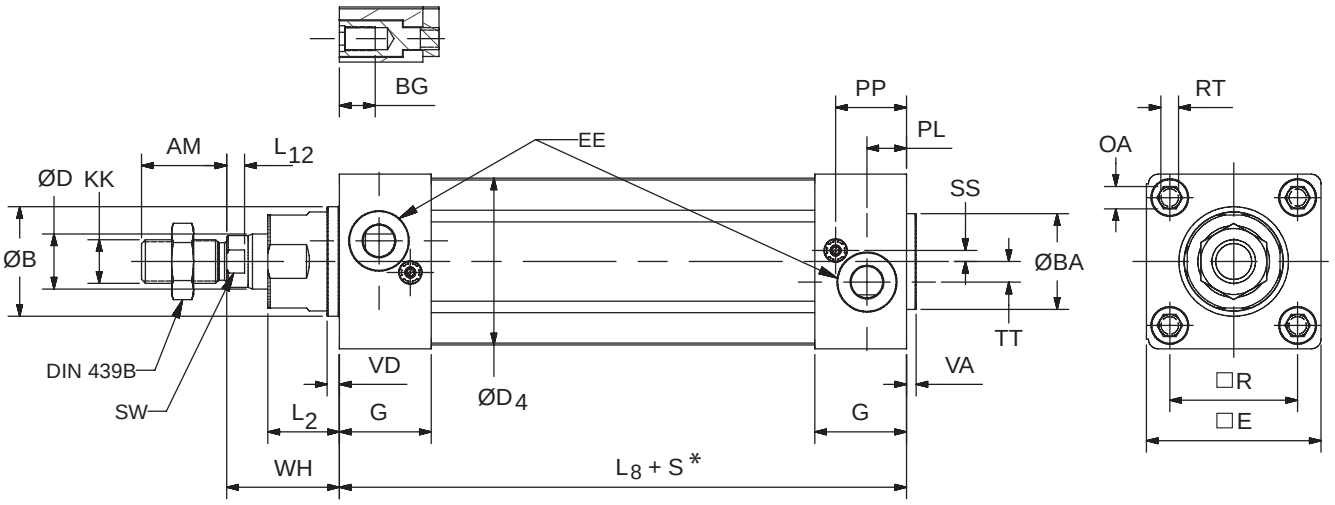
Dimensions, mm (inch)

Bore	A1	A2	B1	B2	B3	B4	ØB5	B6	B7	B8	ØC1 Std.	ØC1 O.S.	C2	C3	ØD1	ØD2	ØD3	ØD4	ØD5	ØD6
32	50 (1.97)	97 (3.82)	45 (1.77)	92 (3.62)	78 (3.07)	32.5 (1.28)	31.5 (1.24)	4 (0.16)	12.7 (0.50)	61 (2.40)	12 (0.47)	16 (0.63)	73.5 (2.89)	50 (1.97)	6.6 (0.26)	11 (0.43)	5.2 (0.20)	9 (0.35)	M6 x 1.00	4 (0.16)
40	58 (2.28)	115 (4.53)	50.8 (2.00)	110 (4.33)	84 (3.31)	38 (1.50)	31.5 (1.24)	11 (0.43)	12.7 (0.50)	69 (2.72)	16 (0.63)	20 (0.79)	86.5 (3.41)	58 (2.28)	6.6 (0.27)	11 (0.43)	5.2 (0.20)	9 (0.35)	M6 x 1.00	4 (0.16)
50	70 (2.76)	137 (5.39)	63 (2.48)	132 (5.20)	100 (3.94)	46.5 (1.83)	50 (1.97)	19 (0.75)	16 (0.63)	85 (3.35)	20 (0.79)	25 (0.98)	103.5 (4.07)	70 (2.76)	9 (0.35)	14 (0.55)	6.4 (0.25)	11 (0.43)	M8 x 1.25	4 (0.16)
63	85 (3.35)	152 (5.98)	82.5 (3.25)	145 (5.71)	105 (4.13)	56.5 (2.24)	50 (1.97)	15 (0.59)	16 (0.63)	100 (3.94)	20 (0.79)	25 (0.98)	118.5 (4.67)	85 (3.35)	9 (0.35)	14 (0.55)	6.4 (0.25)	11 (0.43)	M8 x 1.25	4 (0.16)
80	105 (4.13)	189 (7.44)	100 (3.94)	180 (7.09)	130 (5.12)	72 (2.83)	76 (2.99)	21 (0.83)	19 (0.75)	130 (5.12)	25 (0.98)	30 (1.18)	147 (5.79)	105 (4.13)	11 (0.43)	17 (0.67)	8.4 (0.33)	14 (0.55)	M10 x 1.50	6 (0.24)
100	130 (5.12)	213 (8.39)	120 (4.72)	200 (7.87)	150 (5.91)	89 (3.50)	76 (2.99)	24.5 (0.97)	19 (0.75)	150 (5.91)	25 (0.98)	30 (1.18)	171.5 (6.75)	130 (5.12)	11 (0.43)	17 (0.67)	8.4 (0.33)	14 (0.55)	M10 x 1.50	6 (0.24)

Bore	E1	E2	E3	ØF1	G1	H1	H2	L1	L2	L3	L4	L5	N1	P1	P2	P3	Port Size NPT/ BSPP	Piston Rod Thread
32	12 (0.47)	7 (0.28)	4 (0.16)	30 (1.18)	17 (0.67)	81 (3.19)	16 (0.63)	153 (6.02)	120 (4.72)	17 (0.67)	71 (2.80)	64.7 (2.55)	17 (0.67)	36 (1.42)	31 (1.22)	40 (1.57)	1/8	M10 x 1.25
40	12 (0.47)	7 (0.28)	4 (0.16)	35 (1.38)	24 (0.94)	99 (3.90)	19 (0.75)	166 (6.54)	130 (5.12)	20 (0.79)	71 (2.80)	74.7 (2.94)	17 (0.67)	36 (1.42)	36 (1.42)	44 (1.73)	1/4	M12 x 1.25
50	16 (0.63)	9 (0.35)	9 (0.35)	40 (1.57)	27 (1.06)	119 (4.69)	23 (0.91)	194 (7.64)	150 (5.90)	25 (0.98)	79 (3.11)	90 (3.54)	24 (0.94)	42 (1.65)	44 (1.73)	50 (1.97)	1/4	M16 x 1.5
63	16 (0.63)	9 (0.35)	9 (0.35)	45 (1.77)	27 (1.06)	132 (5.20)	28 (1.10)	224 (8.82)	180 (7.09)	25 (0.98)	109 (4.29)	90 (3.54)	24 (0.94)	58 (2.28)	44 (1.73)	60 (2.36)	3/8	M16 x 1.5
80	20 (0.79)	11 (0.43)	5 (0.19)	45 (1.77)	32 (1.26)	166 (6.54)	36 (1.42)	252 (9.92)	200 (7.87)	30 (1.18)	113 (4.45)	109 (4.29)	30 (1.18)	50 (1.97)	52 (2.05)	70 (2.76)	3/8	M20 x 1.5
100	20 (0.79)	11 (0.43)	5 (0.20)	55 (2.17)	32 (1.26)	190 (7.48)	45 (1.77)	272 (10.71)	220 (8.66)	30 (1.18)	128 (5.04)	114 (4.49)	30 (1.18)	49 (1.93)	51 (2.01)	70 (2.76)	1/2	M20 x 1.5

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P1D Removable Gland Version



F

Dimensions

								EE						
Cylinder Bore	**AM mm**	**B mm**	**BA mm**	**BG mm**	**D mm**	**D4 mm**	**E mm**	**BSPP**	**NPTF/ BSPT**	**G mm**	**KK**	**L_2 mm**	**L_8 mm**	**L_{12} mm**
32	22	30	30	16	12	45.0	46.5	G1/8	1/8	28.5	M10x1.25	18	94	6.0
40	24	35	35	16	16	52.0	52.0	G1/4	1/4	33.0	M12x1.25	20	105	6.5
50	32	40	40	16	20	60.7	63.5	G1/4	1/4	33.5	M16x1.5	26	106	6.5
63	32	45	45	16	20	71.5	76.0	G3/8	3/8	39.5	M16x1.5	26	121	6.5
80	40	45	45	17	25	86.7	95.5	G3/8	3/8	39.5	M20x1.5	33	128	10.0
100	40	55	55	17	25	106.7	114.5	G1/2	1/2	44.5	M20x1.5	33	138	10.0

Cylinder Bore	**OA mm**	**PL mm**	**PP mm**	**R mm**	**RT**	**SS mm**	**SW mm**	**TT mm**	**VA mm**	**VD mm**	**WH mm**
32	6	13	21.8	32.5	M6	6.5	10	4.5	3.5	4.5	26
40	6	14	21.9	38.0	M6	8.0	13	5.5	3.5	4.5	30
50	8	14	25.9	46.5	M8	4.0	17	7.5	3.5	4.5	37
63	8	16	27.4	56.5	M8	6.5	17	11.0	3.5	4.5	37
80	6	16	30.5	72.0	M10	0	22	15.0	3.5	4.5	46
100	6	18	35.8	89.0	M10	0	22	20.0	3.5	4.5	51

S=Stroke

Tolerances

Cylinder Bore	**B**	**BA mm**	**L_8 mm**	**L_9 mm**	**R mm**	**Stroke Tolerance**
32	d11	d11	±0.4	±2	±0.5	+1/-0
40	d11	d11	±0.7	±2	±0.5	+1/-0
50	d11	d11	±0.7	±2	±0.6	+1/-0
63	d11	d11	±0.8	±2	±0.7	+1/-0
80	d11	d11	±0.8	±3	±0.7	+1/-0
100	d11	d11	±1.0	±3	±0.7	+1/-0

*Stroke Adder for Cylinder Bumper Options

Cylinder Bore	**Option**				
	B	**T**	**R**	**S**	E
32, 40, 50 63, 80	5 (0.20)	25 (0.98)	25 (0.98)	25 (0.98)	25 (0.98)
100	5 (0.20)	5 (0.20)	25 (0.98)	25 (0.98)	0

Adder dimensions in mm (inch)

Note: Adders not used when P1D Rod Lock (K) and P1D Manual Override Rod Lock (S) are specified with bumpers.

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P1D Rod Lock (K, S)

The P1D Series Rod Lock Cylinder incorporates a powerful piston rod locking device, which clamps the piston rod and locks it in position. The locking device is a spring lock with an air pressure release and is integrated into the front (head) cover of the cylinder. In the absence of air signal pressure, full holding force is applied to the piston rod. When air is present at 4 Bar (58 psi), the locking device is released.

The design provides several valuable characteristics, such as:

- A holding force corresponding to a pressure of 7 Bar (102 psi)
- A clean design, with the front (head) end cover and locking device built into a common block for compact installation.
- Easy to clean, well-sealed construction.
- Exhaust air from the locking device can be piped away when there are high demands for contaminant free environment.

Note: The P1D with rod lock product line is not intended for use in water service applications, or in environments that have high humidity levels and/or splashing fluids present.

Specifications

- Fluid Medium: Dry, filtered, compressed air
- Maximum Cylinder Operating Pressure: 10 Bar (145 PSI)
- Required Pressure to Unlock[1]: 4 Bar (58 PSI)
- Minimum Torque Required for Override:

  32mm Bore = 0.9 N-m / 8 in-lbs
  40mm Bore = 0.9 N-m / 8 in-lbs
  50mm Bore = 2.7 N-m / 24 in-lbs
  63mm Bore = 2.7 N-m / 24 in-lbs
  80mm Bore = 27.1 N-m / 240 in-lbs
  100mm Bore = 36.6 N-m / 324 in-lbs

- Maximum Operating Temperature: -10°C to +75°C, +14°F to +167°F
- Maximum Cylinder Operating Speed: 5 feet per second

[1]Signal pressure to port on locking device. Operation at pressures lower than 4 Bar (58 psi) may lead to inadvertent engagement of the rod lock device.

Connection

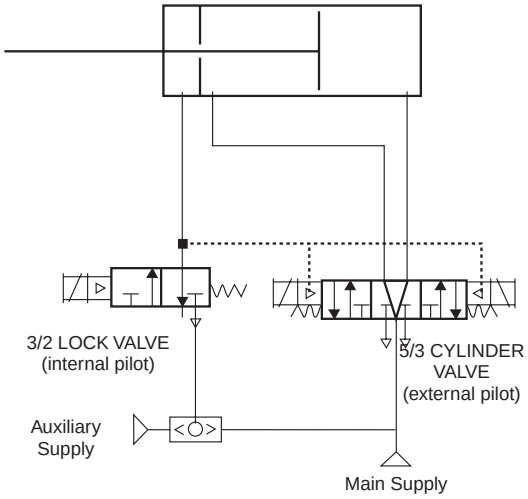
The signal air for the locking device can be obtained directly from a main air supply, or from the air supply serving the valve that controls the cylinder itself. For controlled ON/OFF operation of the locking device, a separate quick-venting valve is used.

The piston rod should not be moving when the locking device is activated. The locking device is not intended to brake a movement in repeated sequences.

Holding Forces

Bore Size	Holding Forces	
	(N)	(lbs)
32mm	550	123
40mm	860	193
50mm	1345	303
63mm	2140	481
80mm	3450	755
100mm	5390	1211

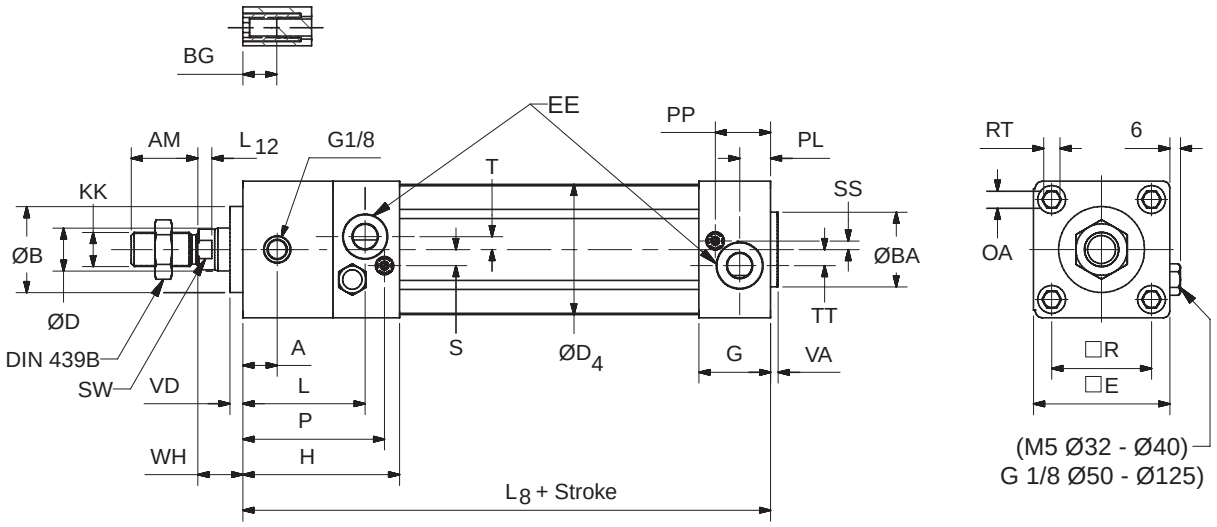
Note: All P1D Rod Lock Versions are not intended for use in water service applications, or in environments that have high humidity levels and/or splashing fluids present.



1. Lock valve must be maintained energized during cylinder motion, otherwise rod lock is engaged and cylinder valve shifts to mid position.
2. Cylinder valve must be maintained energized during extend or retract. Also keep energized at end of stroke until change of direction is desired.
3. Mid position of 5/3 Cylinder valve may be pressurized outlets if the combination of pressure load on the cylinder and inertia effects of the attached load do not exceed the holding force rating of the rod lock device, including allowance for wear.
4. Do not use cylinder lines for any logic functions — pressure levels vary too much.

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P1D Rod Lock Version (K)



F

Dimensions

Cylinder Bore	A mm	AM mm	B mm	BA mm	BG mm	D mm	D_4 mm	E mm	EE	G mm	H mm	KK	L mm	L_8 mm	L_{12} mm
32	16	22	30	30	16	12	45.0	46.5	G1/8	28.5	71.5	M10x1.25	56.0	137	6.0
40	16	24	35	35	16	16	52.0	52.0	G1/4	33.0	77.0	M12x1.25	56.0	149	6.5
50	18	32	40	40	16	20	60.7	63.5	G1/4	33.5	80.5	M16x1.5	62.5	153	6.5
63	26	32	45	45	16	20	71.5	76.0	G3/8	39.5	96.5	M16x1.5	74.5	178	6.5
80	35	40	45	45	17	25	86.7	95.5	G3/8	39.5	110.5	M20x1.5	87.0	199	10.0
100	50	40	55	55	17	25	106.7	114.5	G1/2	44.5	132.5	M20x1.5	106.0	226	10.0

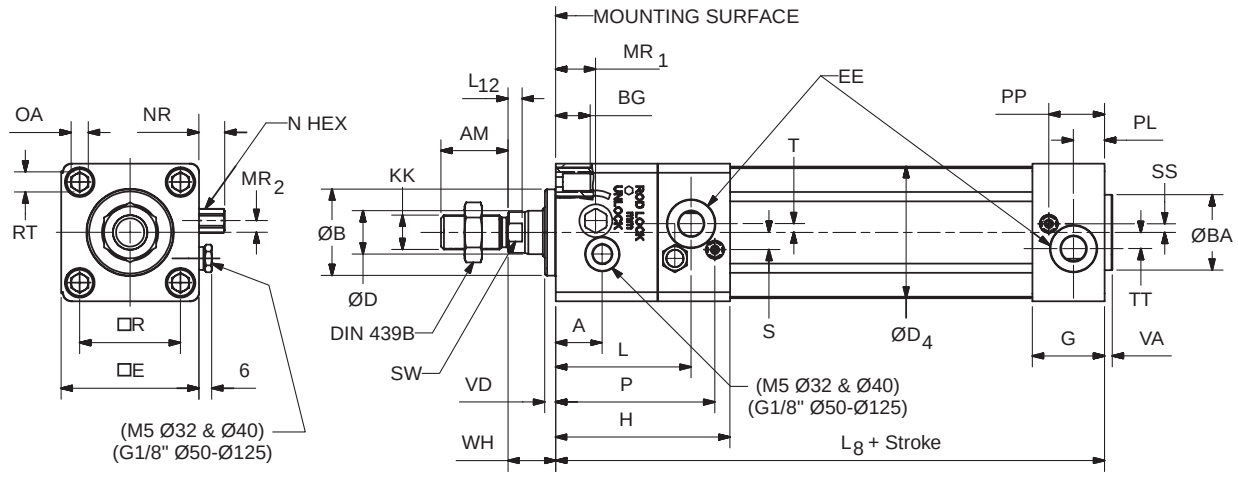
Cylinder Bore	OA mm	P mm	PL mm	PP mm	R mm	RT mm	S mm	SS mm	SW mm	T mm	TT mm	VA mm	VD mm	WH mm
32	6	64.8	13	21.8	32.5	M6	7	6.5	10	2.5	4.5	3.5	4.5	15
40	6	68.0	14	21.9	38.0	M6	9	8.0	13	2.0	5.5	3.5	4.5	16
50	8	73.5	14	25.9	46.5	M8	8	4.0	17	4.0	7.5	3.5	5.0	17
63	8	89.5	16	27.4	56.5	M8	8	6.5	17	2.0	11.0	3.5	5.0	17
80	6	101.5	16	30.5	72.0	M10	9	0	22	5.0	15.0	3.5	4.0	20
100	6	123.5	18	35.8	89.0	M10	12	0	22	6.0	20.0	3.5	4.0	20

Tolerances

Cylinder Bore	B mm	R mm	L_8 mm	BA mm	Stroke-length Tolerance mm
32	d11	±0.5	±0.4	d11	+1/-0
40	d11	±0.5	±0.7	d11	+1/-0
50	d11	±0.6	±0.7	d11	+1/-0
63	d11	±0.7	±0.8	d11	+1/-0
80	d11	±0.7	±0.8	d11	+1/-0
100	d11	±0.7	±1.0	d11	+1/-0

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P1D Rod Lock Version with Manual Override (S)



Dimensions

Cylinder Bore	A mm	AM mm	B mm	BA mm	BG mm	D mm	D_4 mm	E mm	EE	G mm	H mm	KK	L mm	L_8 mm	L_{12} mm	MR_1 mm	MR_2 mm
32	27.0	22	30	30	16	12	45.0	46.5	G1/8	28.5	71.5	M10X1.25	56.0	137	6.0	16.0	3.0
40	27.0	24	35	35	16	16	52.0	52.0	G1/4	33.0	77.0	M12X1.25	56.0	149	6.5	16.0	3.0
50	21.5	32	40	40	16	20	60.7	63.5	G1/4	33.5	80.5	M16X1.5	62.5	153	6.5	18.5	5.5
63	39.0	32	45	45	16	20	71.5	76.0	G3/8	39.5	96.5	M16X1.5	74.5	178	6.5	22.0	4.0
80	38.5	40	45	45	17	25	86.7	95.5	G3/8	39.5	110.5	M20X1.5	87.0	199	10.0	15.0	19.8
100	55.0	40	55	55	17	25	106.7	114.5	G1/2	44.5	132.5	M20X1.5	106.0	226	10.0	15.0	20.8

Cylinder Bore	N mm	NR mm	OA mm	P mm	PL mm	PP mm	R mm	RT	S mm	SS mm	SW mm	T mm	TT mm	VA mm	VD mm	WH mm
32	8	10.0	6	64.8	13	21.8	32.5	M6	7	6.5	10	2.5	4.5	3.5	4.5	15
40	8	10.0	6	68.0	14	21.9	38.0	M6	9	8.0	13	2.0	5.5	3.5	4.5	16
50	10	12.0	8	73.5	14	25.9	46.5	M8	8	4.0	17	4.0	7.5	3.5	5.0	17
63	10	12.0	8	89.5	16	27.4	56.5	M8	8	6.5	17	2.0	11.0	3.5	5.0	17
80	11	12.5	6	101.5	16	30.5	72.0	M10	9	0	22	5.0	15.0	3.5	14.0	30
100	11	12.5	6	123.5	18	35.8	89.0	M10	12	0	22	6.0	20.0	3.5	14.0	30

Tolerances

Cylinder Bore	B mm	R mm	L_8 mm	BA mm	Stroke-length Tolerance mm
32	d11	±0.5	±0.4	d11	+1/-0
40	d11	±0.5	±0.7	d11	+1/-0
50	d11	±0.6	±0.7	d11	+1/-0
63	d11	±0.7	±0.8	d11	+1/-0
80	d11	±0.7	±0.8	d11	+1/-0
100	d11	±0.7	±1.0	d11	+1/-0

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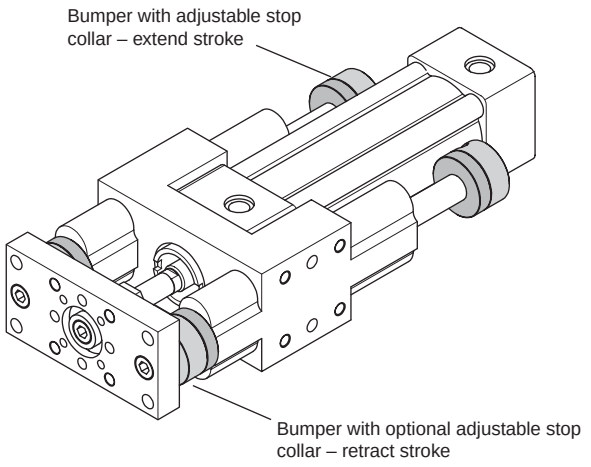
Bumpers / Adjustable Stop Collars

Bumpers absorb shock, reduce noise and permit faster cycle times, thereby increasing production rates. They can be placed on the extend, retract or both positions.

When bumpers are specified on the extend stroke, an adjustable stop collar is required and provides travel adjustment. An optional stop collar can also be specified for the retract stroke.

OPTIONS:

B – Bumpers (retract only)
E – Bumpers, adjustable stop collars (extend only)
R – Bumpers, adjustable stop collars (retract only)
S – Bumpers, adjustable stop collars (both ends)
T – Bumpers both ends, adjustable stop collars on extend



Bumpers and adjustable stop collars, both ends (S)

NOTES:

1. Bumpers and adjustable stop collars are not available with oversize shaft options.
2. To achieve the desired useable stroke length with options B, E, T, R or S, the cylinder length will increase. See Stroke Adder table for cylinder dimensions adders.
3. Bumpers and adjustable stop collars on the extend stroke require additional cylinder stroke lengths on some bore sizes in order for the collars to clear the cylinder end cap. *Therefore, cushions on extend stroke are not available with this option.* See Stroke Adder table for cylinder dimension adders with options E, T or S.

Stroke Adder for Cylinder Bumper Options

Cylinder Bore	Option				
	B	**T**	**R**	**S**	E
32, 40, 50 63, 80	5 (0.20)	25 (0.98)	25 (0.98)	25 (0.98)	25 (0.98)
100	5 (0.20)	5 (0.20)	25 (0.98)	25 (0.98)	0

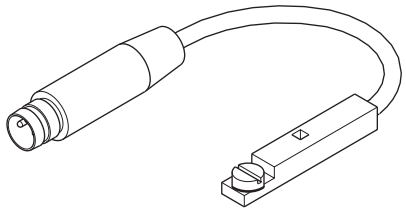
Adder dimensions in mm (inch)

Note: Adders not used when P1D Rod Lock (K) and P1D Manual Override Rod Lock (S) are specified with bumpers.

Sensors

Optional solid state and reed sensors sense the position of the magnetic ring on the cylinder piston. Drop-in Global Sensors are installed into the integral sensor grooves on the cylinder body and are easily positioned. Magnetic piston is standard.

Order sensors separately. See Electronic Sensors section for part numbers and specifications.



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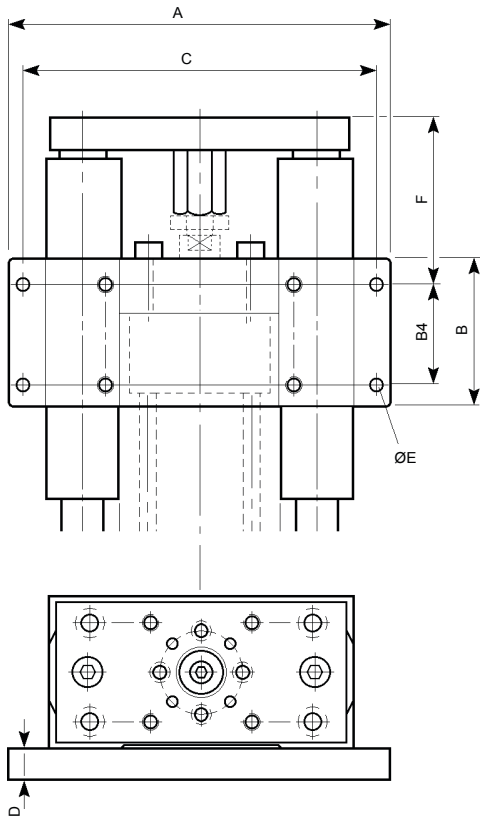
Mounting Kits

Mounting kits conform to ISO 6431, ISO/DIS 15552, VDMA 24 562 and AFNOR standards.

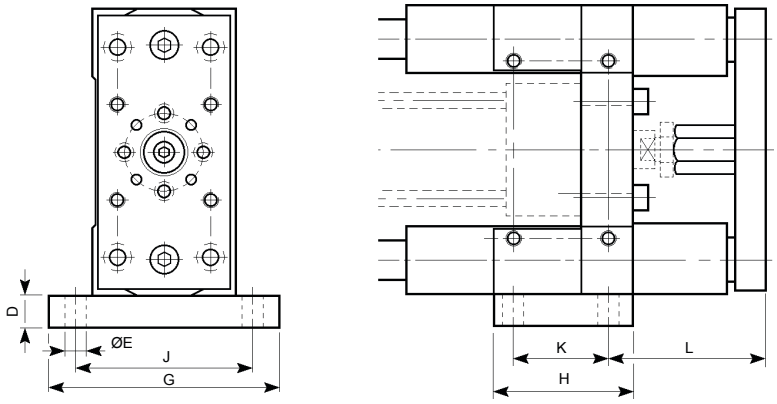
Kits include 4 mounting screws.

Raw Material: Galvanized steel

Horizontal Mounting Kit (1)



Vertical Mounting Kit (2)



Dimensions & Weights

Bore Size	Mounting (1) Horizontal	Mounting (2) Vertical	A	B	B4	C	D	E	F	G	H	J	K	L	Weight, g (lb) (1)	(2)
32	**32-2801R**	**PIC-4KMB**	128 (5.04)	50 (1.97)	32.5 (1.28)	116 (4.57)	10 (0.39)	6.6 (0.26)	60 (2.37)	80 (3.15)	47 (1.85)	64 (2.52)	32 (1.26)	60 (2.37)	500 (1.10)	230 (0.51)
40	**40-2801R**	**PIC-4LMB**	155 (6.10)	55 (2.16)	38 (1.50)	140 (5.51)	10 (0.39)	9 (0.35)	63 (2.48)	92 (3.62)	53 (2.09)	72 (2.83)	36 (1.42)	64 (2.52)	700 (1.54)	280 (0.62)
50	**50-2801R**	**PIC-4MMB**	175 (6.89)	70 (2.76)	46.5 (1.83)	160 (6.30)	12 (0.47)	9 (0.35)	70 (2.76)	113 (4.45)	65 (2.56)	90 (3.54)	45 (1.77)	71 (2.79)	1180 (2.60)	530 (1.17)
63	**63-2801R**	**PIC-4NMB**	190 (7.48)	80 (3.15)	56.5 (2.22)	175 (6.89)	12 (0.47)	9 (0.35)	74 (2.91)	129 (5.08)	74 (2.91)	100 (3.94)	50 (1.97)	77 (3.03)	1450 (3.20)	710 (1.57)
80	**80-2801R**	**PIC-4PMB**	240 (9.45)	100 (3.94)	72 (2.83)	218 (8.58)	16 (0.63)	11 (0.43)	89 (3.50)	153 (6.02)	97 (3.82)	126 (4.96)	63 (2.48)	93.5 (3.68)	3000 (6.61)	1590 (3.51)
100	**100-2801R**	**PIC-4QMB**	270 (10.63)	120 (4.72)	89 (3.50)	245 (9.65)	16 (0.63)	13 (0.51)	90.5 (3.56)	186 (6.93)	111 (4.37)	150 (5.91)	75 (2.95)	97.5 (3.84)	4100 (9.04)	2190 (4.83)

Note: All dimensions in mm or (inch) unless otherwise noted.

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Seal Kits for Cylinder Only

Please see P1D Series Section Page C33.

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Rodless Pneumatic Cylinders

Section G



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Section G – Rodless Pneumatic Cylinders

OSP-P

- 8 Bore Sizes - 10mm - 80mm
- 6 Guide Options - can be retrofitted in field
- Superior Sealing with Band Design
- Long Life (8,000 kilometers)
- Extensive Range of Options

P1X Series

- 7 Bore Sizes – 16mm through 63mm
- Two Port Locations Standard
- Large Carriage for Stability
- Integral Sensor Mounting Rail
- Optional Adjustable Stroke and Shock Absorbers

P1Z Series

- 3 Bore Sizes – 16mm, 20mm and 32mm
- Magnetically Coupled
- Bandless Design for Increased Durability
- Available in Basic and Guided Versions
- Manufactured Globally

RC Series

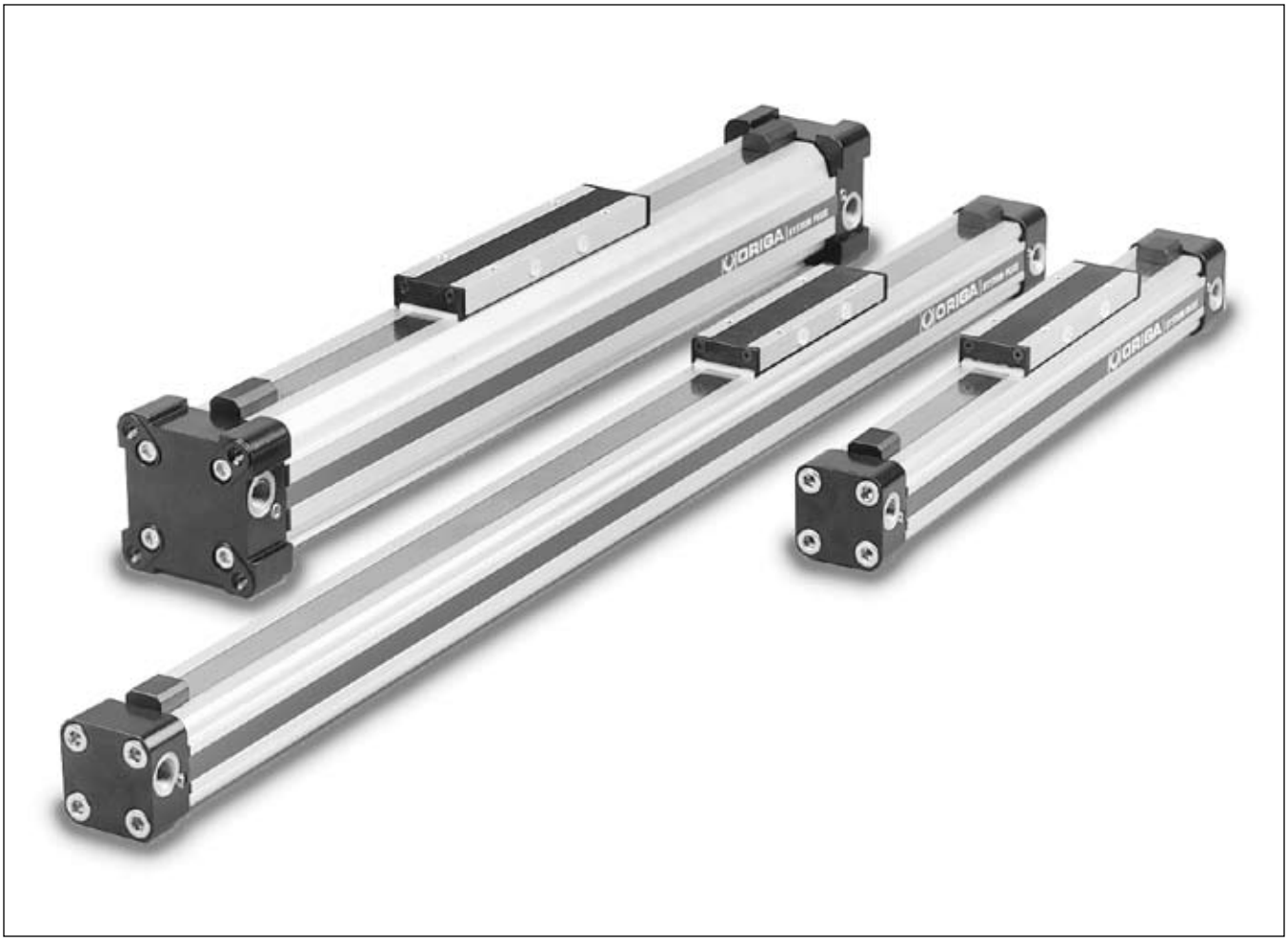
- 5 Bore Sizes – 25mm through 63mm
- Band Type Rodless Cylinder
- Load Support Bearings
- Optional Dual Ported End Caps
- Optional Piston Sensing

GDL Series

- Sizes 12-45
- Aluminum Construction – Light Weight, Smooth, Fast
- Needle Roller Bearing
- Butt Joint Option for Unlimited Rail Length
- Corrosion Resistant Options

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Rodless Standard Pneumatic Cylinders Series OSP-P



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OSP
ORIGA
SYSTEM
PLUS
ELECTRIC ACTUATOR

2D & 3D CAD Drawings can be downloaded from website www.parker.com/pneu/rodless

ATTENTION!

Contact PARKER-ORIGA for sizing software and/or technical assistance
630-871-8300

G

All dimensions are in European-Standard.
Please convert all in US-Standard.

Conversion Table

Multiply	By	To Obtain
Millimeters	.03937	Inches
Newtons	.2248	Lbs.(F)
Newton-Meters	8.8512	In-Lbs
Kilograms	2.205	Lbs.
Inches	25.4	Millimeters
Lbs.(F)	4.448	Newtons
In-Lbs	.113	Newtons-Meters
Lbs.	.45359	Kilograms

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PARKER-ORIGA rodless pneumatic cylinders are the first rodless cylinders that have been approved for use in potentially explosive atmospheres in Equipment Group II, Category 2 GD

The Cylinders are to the ATEX Certification 94/9/EG (ATEX 95) for Pneumatic Components.





for use in Ex-Areas



for Clean Room Applications certified to DIN EN ISO 14644-1



Stainless steel version for special applications



with special pneumatic cushioning system for cycle time optimization, for Ø 16 to 50 mm – on request



High Temperature Version for temperatures up to +120°C



Low Temperature Version for temperatures up to -40°C



Slow Speed Version v = 0.005 – 0.2 m/s



High Speed Version $v_{max.}$ = 30 m/s

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Based on the ORIGA rodless cylinder, proven in world wide markets, PARKER-ORIGA now offers the complete solution for linear drive systems. Designed for absolute reliability, high performance, ease of use and optimized engineering the ORIGA SYSTEM PLUS satisfies even the most demanding applications.

ORIGA SYSTEM PLUS

is a totally modular concept which offers the choice of pneumatic or electric actuation, with guidance and control modules to suit the exact needs of individual installations.

The actuators at the core of the system all have a common aluminum extruded profile, with double dovetail mounting rails on three sides, these

are the principle building blocks of the system to which all modular options are directly attached.



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SYSTEM MODULARITY

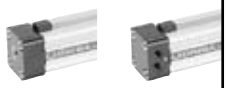
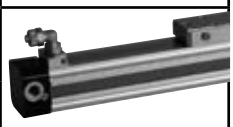
- **Pneumatic Drive**
  – For all round versatility and convenience, combining ease of control and broad performance capability. Ideally suited for point-to point operations, reciprocating movements and simple traverse / transfer applications.
- **Electric Screw Drive**
  – For high force capability and accurate path and position control.
- **Electric Belt Drive**
  – For high speed applications, accurate path and position control and longer strokes.

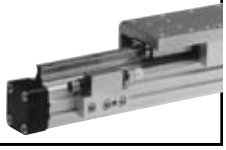
For additional information on electric linear actuators, please contact factory for OSP-E literature.

- Different guidance options provide the necessary level of precision, performance and duty for various applications.
- Compact solutions, which are simple to install and can be easily retrofitted.
- Valves and control options can be directly mounted to the actuator system.
- Diverse mounting options to provide total installation flexibility.

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*** For information on Electric Linear Drives, contact factory for literature**

Basic Linear Drive Standard Version • Series OSP-P • Series OSP-E* Belt drive Belt drive with integrated Guides Vertical belt drive with recirculating ball bearing guide • Series OSP-E* Screw drive (Ball Screw, Trapezoidal Screw)	
Air Connection on the End-face or both at One End • Series OSP-P	
Clean Room Cylinder certified to DIN EN ISO 146644-1 • Series OSP-P • Series OSP-E..SB	
Bi-parting Version • Series OSP-P	
Integrated 3/2 Way Valves • Series OSP-P	
Clevis Mounting • Series OSP-P • Series OSP-E Belt drive* • Series OSP-E Screw drive*	
End Cap Mounting • Series OSP-P • Series OSP-E Belt drive* • Series OSP-E Screw drive*	
Mid-Section Support • Series OSP-P • Series OSP-E Belt drive* • Series OSP-E Screw drive*	
Inversion Mounting • Series OSP-P • Series OSP-E Belt drive* • Series OSP-E Screw drive*	
Standard Version • Series OSP-P	
Multiplex Connection • Series OSP-P	

Linear Guides – SLIDELINE • Series OSP-P • Series OSP-E Screw drive*	
Linear Guides – POWERSLIDE • Series OSP-P • Series OSP-E Belt drive* • Series OSP-E Screw drive*	
Linear Guides – PROLINE • Series OSP-P • Series OSP-E Belt drive* • Series OSP-E Screw drive*	
Linear Guides – STARLINE • Series OSP-P	
Linear Guides – KF • Series OSP-P	
Heavy Duty Linear Guides – HD • Series OSP-P • Series OSP-E Screw drive*	
Intermediate Stop Module – ZSM • Series OSP-P	
Brakes • Active Brakes • Passive Brakes	
Magnetic Switches • Series OSP-P • Series OSP-E Belt drive* • Series OSP-E Screw drive*	
SENSOFLEX – Measuring System • Series SFI-plus	
Variable Stop VS • Series OSP-P with Linear Guide STL, KF, HD	

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Linear Drives	OSP-P10	OSP-P16	OSP-P25	OSP-P32	OSP-P40	OSP-P50	OSP-P63	OSP-P80
Theoretical Force at 6 bar (N)	47	120	295	483	754	1178	1870	3010
Effective Force at 6 bar (N)	32	78	250	420	640	1000	1550	2600
Velocity v (m/s)	> 0.005	> 0.005	> 0.005	> 0.005	> 0.005	> 0.005	> 0.005	> 0.005
Magnetic Piston (three sides)	X	❑	❑	❑	❑	❑	❑	❑
Lubrication - Prelubricated	❑	❑	❑	❑	❑	❑	❑	❑
Multiple Air Ports (4 x 90°)	X	❑	❑	❑	❑	❑	❑	❑
Both Air Connections at End-face	X	❍	❍	❍	❍	❍	❍	❍
Air Connection on the End-face	X	❍	❍	❍	❍	❍	❍	❍
Cushioning	❑	❑	❑	❑	❑	❑	❑	❑
Cushioning Length (mm)	2,50	11	17	20	27	30	32	39
Stroke Length (mm) ▲	1 - 6000	1 - 6000	1 - 6000	1 - 6000	1 - 6000	1 - 6000	1 - 6000	1 - 6000
Pressure Range pmax (bar)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Temperature Range (°C) ✳	-10 – + 80	-10 – + 80	-10 – + 80	-10 – + 80	-10 – + 80	-10 – + 80	-10 – + 80	-10 – + 80
Viton / Chemical Resistance	❍	❍	❍	❍	❍	❍	❍	❍
Stainless Steel Parts	❍	❍	❍	❍	❍	❍	❍	❍
Clevis Mounting	❍	❍	❍	❍	❍	❍	❍	❍
Slow Speed Lubrication	❍	❍	❍	❍	❍	❍	❍	❍
Duplex Connection / Multiplex Connection	X	on request	❍	❍	❍	❍	on request	on request
Tandem Piston	❍	❍	❍	❍	❍	❍	❍	❍
Basic Cylinder								
F (N)	20	120	300	450	750	1200	1650	2400
Mx (Nm)	0.2	0.45	1.5	3	6	10	12	24
My (Nm)	1	4	15	30	60	115	200	360
Mz (Nm)	0.3	0.5	3	5	8	15	24	48
SLIDELINE								
F (N)	X	325	675	925	1500	2000	2500	2500
Mx (Nm)	X	6	14	29	50	77	120	120
My (Nm)	X	11	34	60	110	180	260	260
Mz (Nm)	X	11	34	60	110	180	260	260
PROLINE								
F (N)	X	542	857	1171	2074	3111	X	X
Mx (Nm)	X	8	16	29	57	111	X	X
My (Nm)	X	12	39	73	158	249	X	X
Mz (Nm)	X	12	39	73	158	249	X	X
POWERSLIDE								
F (N)	X	1400	1400 - 3000	1400 - 3000	3000	3000 - 4000	X	X
Mx (Nm)	X	14	14 - 65	20 - 65	65 - 90	90 - 140	X	X
My (Nm)	X	45	63 - 175	70 - 175	175 - 250	250 - 350	X	X
Mz (Nm)	X	45	63 - 175	70 - 175	175 - 250	250 - 350	X	X
STARLINE								
F (N)	X	1000	3100	3100	4000-7500	4000-7500	X	X
Mx (Nm)	X	15	50	62	150	210	X	X
My (Nm)	X	30	110	160	400	580	X	X
Mz (Nm)	X	30	110	160	400	580	X	X
– Variable Stop	X	❍	❍	❍	❍	❍	X	X
KF Guide								
F (N)	X	1000	3100	3100	4000-7500	4000-7500	X	X
Mx (Nm)	X	12	35	44	119	170	X	X
My (Nm)	X	25	90	133	346	480	X	X
Mz (Nm)	X	25	90	133	346	480	X	X
– Variable Stop	X	❍	❍	❍	❍	❍	X	X

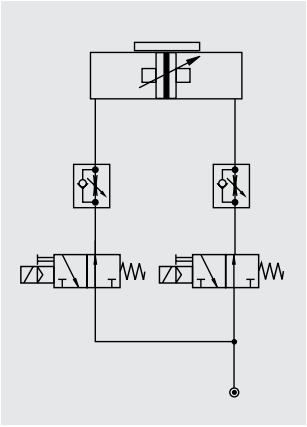
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Linear Drives	OSP-P10	OSP-P16	OSP-P25	OSP-P32	OSP-P40	OSP-P50	OSP-P63	OSP-P80
HD Heavy Duty Guide								
F (N)	X	X	6000	6000	15000	18000	X	X
Mx (Nm)	X	X	260	285	800	1100	X	X
My (Nm)	X	X	320	475	1100	1400	X	X
Mz (Nm)	X	X	320	475	1100	1400	X	X
– Variable Stop	X	X	❍	❍	❍	❍	X	X
– Intermediate Stop Module	X	X	❍	X	X	X	X	X
Active Brake								
Braking Force at 6 bar (brake surface dry) (N)	X	X	350	590	900	1400	2170	4000
SLIDELINE SL / PROLINE PL with Brakes								
Active Brake								
SL Braking Force at 6 bar (brake surface dry) (N)	X	X	325	545	835	1200	X	X
PL Braking Force at 6 bar (brake surface dry) (N)	X	X	on request	on request	on request	on request	X	X
Passive Brake Multibrake								
SL Braking Force at 6 bar (brake surface dry) (N)	X	X	470	790	1200	1870	2900	2900
PL Braking Force at 6 bar (brake surface dry) (N)	X	X	315	490	715	1100	–	–
Magnetic Switches								
Standard Version	❍	❍	❍	❍	❍	❍	❍	❍
T-Nut Version	❍	❍	❍	❍	❍	❍	❍	❍
Displacement Measuring Systems								
SFI-plus Incremental	X	X	❍	❍	❍	❍	❍	❍
Integrated Valves 3/2 WV NO VOE	X	X	❍	❍	❍	❍	on request	on request
Mountings								
End Cap Mounting / Mid-Section Support	❍	❍	❍	❍	❍	❍	❍	❍
Inversion Mounting	X	❍	❍	❍	❍	❍	❍	❍
Shock Absorber for Intermediate Positioning	X	X	on request	on request	on request	on request	X	X
Adaptor Profile / T-Nut Profile	X	❍	❍	❍	❍	❍	X	X
Special Cylinders								
Special Pneumatical Cushioning System	X	on request	on request	on request	on request	on request	X	X
Clean Room Cylinders to DIN EN ISO 14644-1	X	❍	❍	❍	X	X	X	X
Bi-parting Version	X	X	X	X	❍	X	X	X
High-Speed up to 30 m/s	X	on request	on request	on request	X	X	X	X

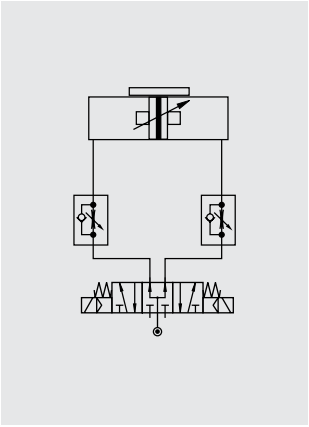
❑ = Standard Version
▲ = Longer Strokes on Request
❊ = other temperature Ranges on Request
❍ = Option
X = Not Applicable

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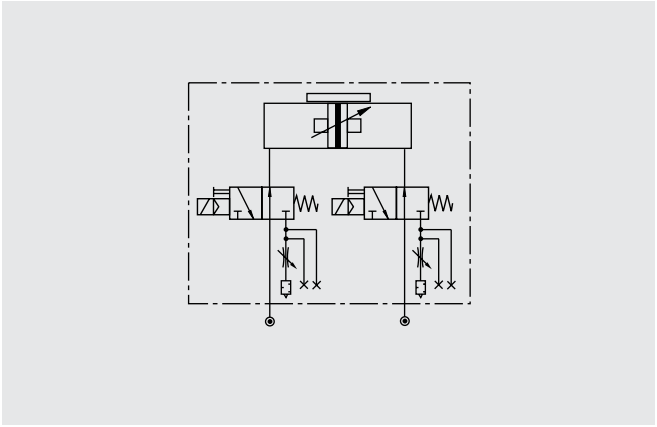
Circuit diagram for end of stroke application. Intermediate positioning is also possible.

The cylinder is controlled by two 3/2-way valves (normally open). The speed can be adjusted independently for both directions.



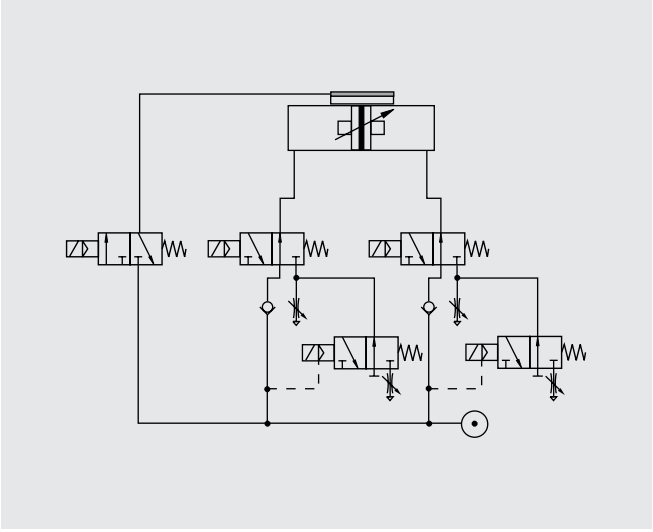
Circuit diagram for end of stroke application. Intermediate positioning is also possible.

The cylinder is controlled by a 5/3-way valve (middle position pressurized). The speed can be adjusted independently for both directions.

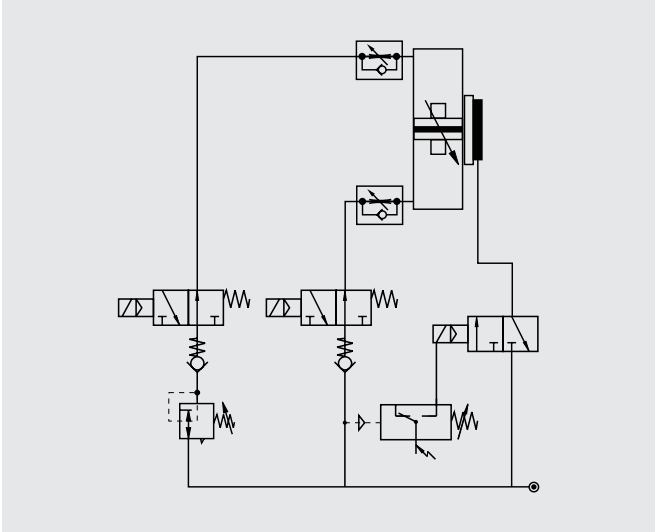


The optional integrated VOE Valves offer optimal control, and allow accurate positioning of intermediate positions and the lowest possible speeds.

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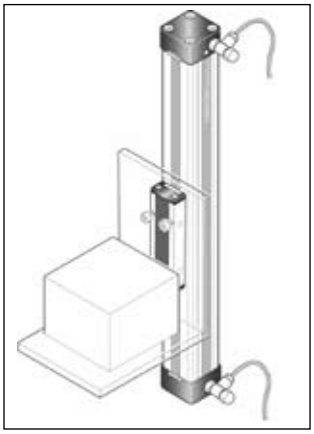
Fast/Slow speed cycle control with pneumatic brake for accurate positioning at high velocities. Additional 3/2-way valves with adjustable throttle valves at the exhaust of the standard directional control valves for two displacement speeds in each direction of the piston's travel.
The valve controlling the brake is activated after the slow speed cycle is activated.



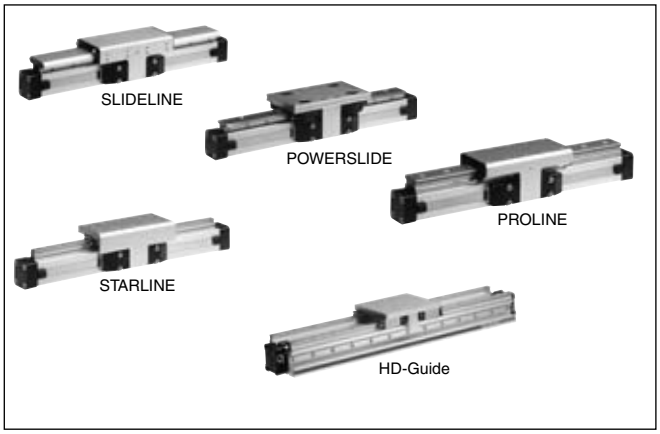
The combination of an OSP-cylinder with the passive MULTIBRAKE as shown here, allows accurate positioning and safety in case of loss of pneumatic air pressure.

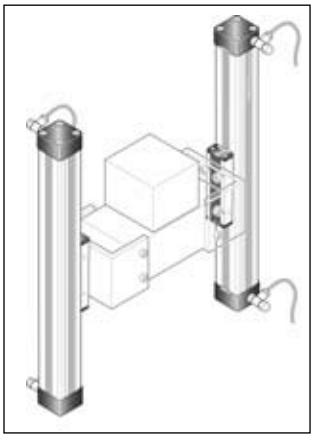
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ORIGA SYSTEM PLUS – rodless linear drives offer maximum flexibility for any application.



The high load capacity of the piston can cope with high bending moments without additional guides.



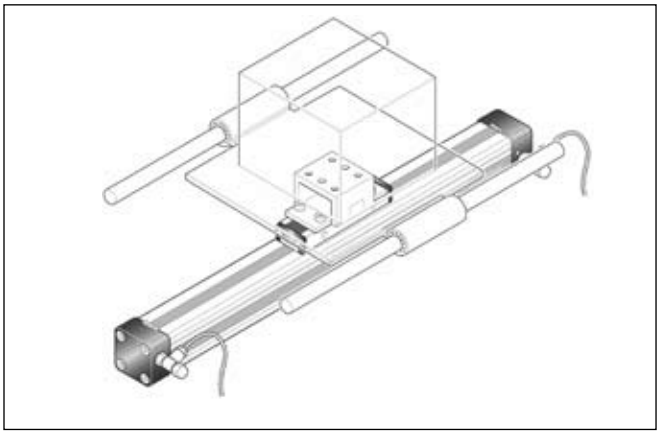


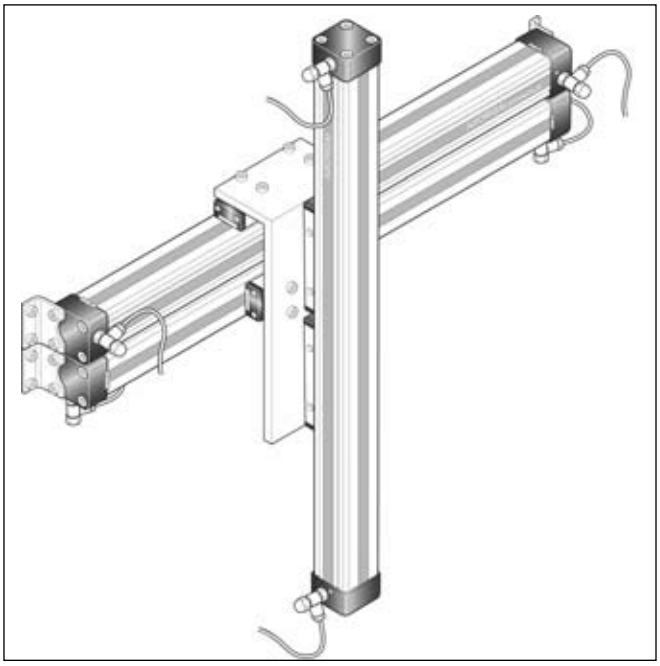
The mechanical design of the OSP-P allows synchronized movement of two cylinders.

Integrated guides offer optimal guidance for applications requiring high performance, easy assembly and maintenance free operation.

Optimal system performance by combining multi-axis cylinder combinations.

When using external guides, the clevis mounting is used to compensate for deviations in parallelism.





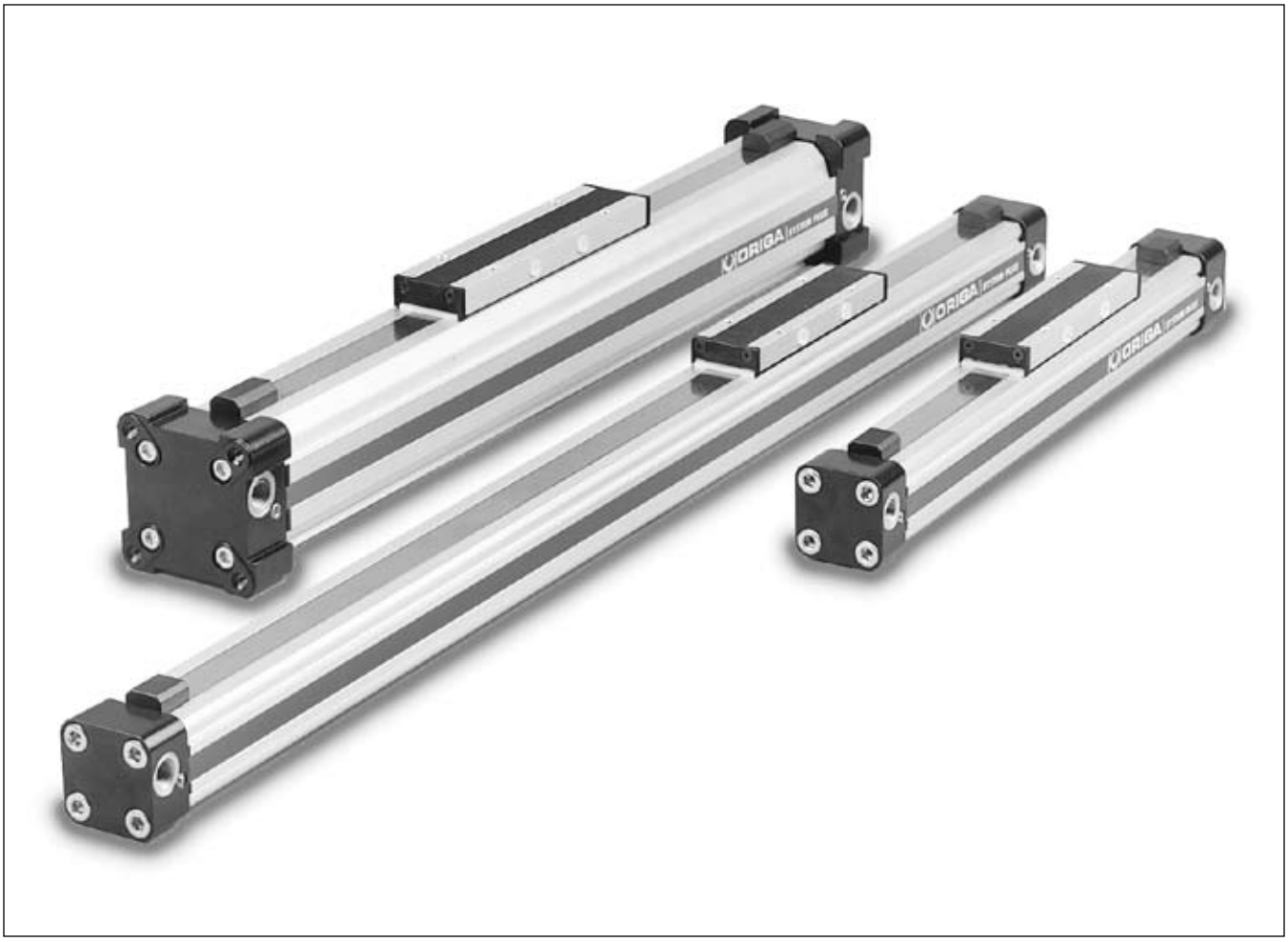
For further information and assembly instructions, please contact your local PARKER-ORIGA dealer.

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Notes

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Rodless Pneumatic Cylinders Series OSP-P



Standard Rodless Pneumatic Cylinders
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- Active Brakes.....G28-G31
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- Technical Data G43-G44
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Bi-parting Rodless Cylinders
- Technical Data G47
- Dimensions.....G48
- Ordering Information G49

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ORIGA SYSTEM PLUS – INNOVATION FROM A PROVEN DESIGN

A completely new generation of linear drives which can be simply and neatly integrated into any machine layout.

A NEW MODULAR LINEAR DRIVE SYSTEM

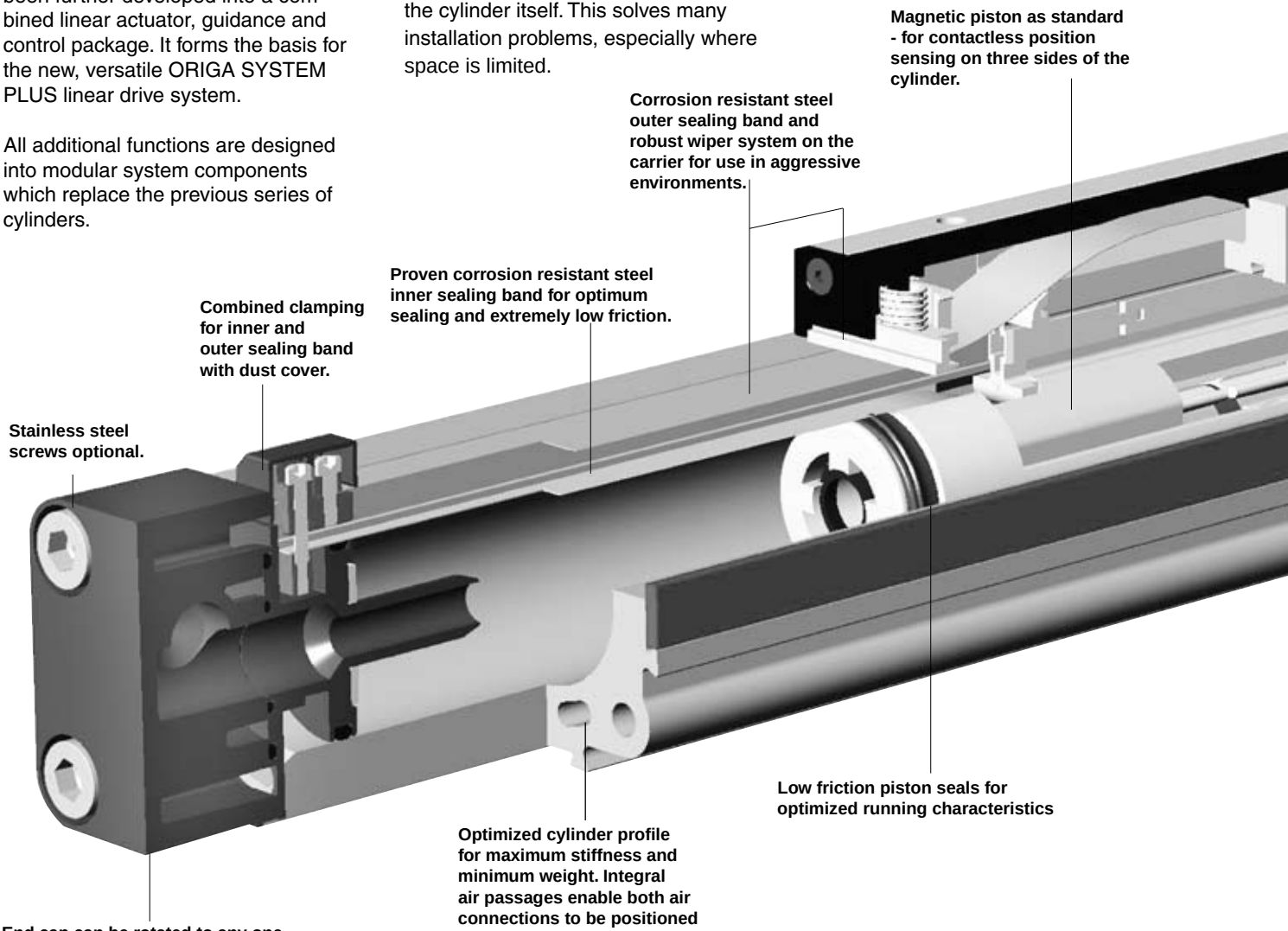
With this second generation linear drive PARKER-ORIGA offers design engineers complete flexibility. The well known ORIGA cylinder has been further developed into a combined linear actuator, guidance and control package. It forms the basis for the new, versatile ORIGA SYSTEM PLUS linear drive system.

All additional functions are designed into modular system components which replace the previous series of cylinders.

MOUNTING RAILS ON 3 SIDES

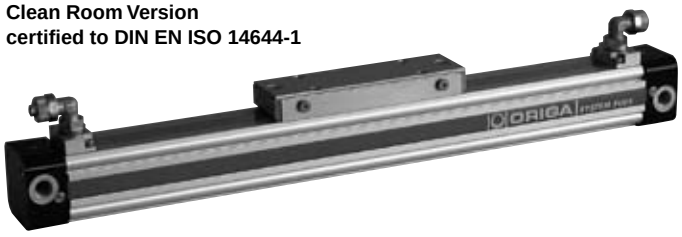
Mounting rails on 3 sides of the cylinder enable modular components such as linear guides, brakes, valves, magnetic switches etc. to be fitted to the cylinder itself. This solves many installation problems, especially where space is limited.

The modular system concept forms an ideal basis for additional customer-specific functions.



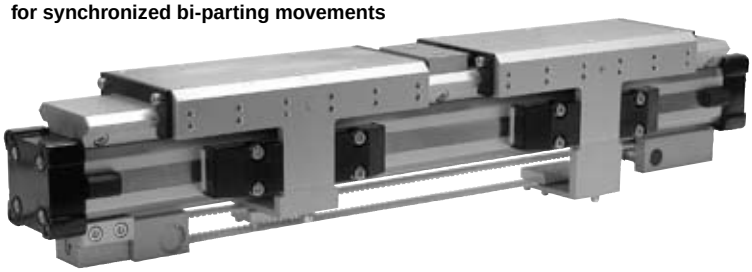
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Clean Room Version
certified to DIN EN ISO 14644-1

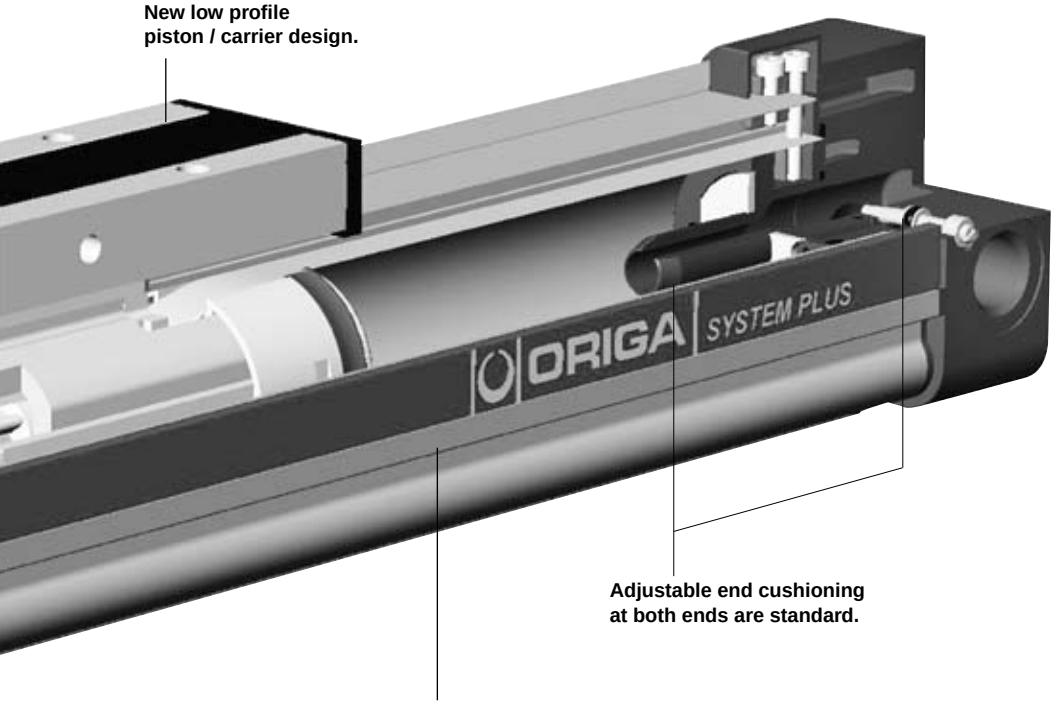




Rodless Cylinder
for synchronized bi-parting movements



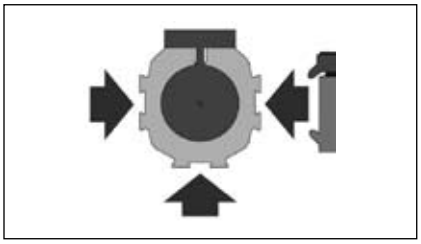
New low profile
piston / carrier design.



Adjustable end cushioning
at both ends are standard.

Integral dovetail rails on three sides provide many adaptation possibilities (linear guides, magnetic switches, etc.).

Modular system components are simply clamped on.



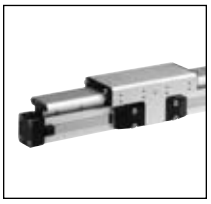
INTEGRATED VOE VALVES
The complete compact solution for optimal cylinder control.



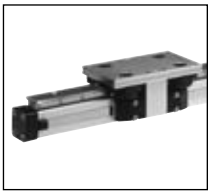
SENSOFLEX
SFI-plus incremental measuring system with 0.1 (1.0) mm resolution



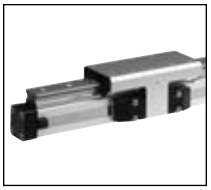
SLIDELINE
Combination with linear guides provides for heavier loads.



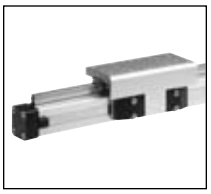
POWERSLIDE
Roller bearing precision guidance for smooth travel and high dynamic or static loads.



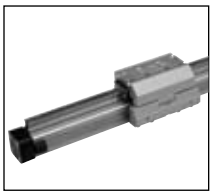
PROLINE
The compact aluminum roller guide for high loads and velocities.



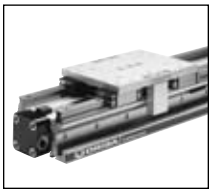
STARLINE
Recirculating ball bearing guide for very high loads and precision



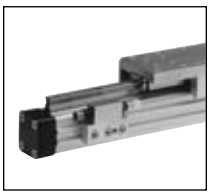
KF GUIDE
Recirculating ball bearing guide – the mounting dimensions correspond to FESTO Type: DGPL-KF



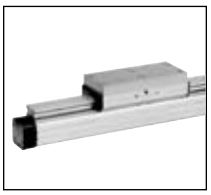
HEAVY DUTY GUIDE HD
for heavy duty applications.



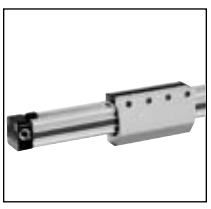
VARIABLE STOP VS
The variable stop provides simple stroke limitation.



Passive pneumatic brake reacts automatically to pressure failure.



Active pneumatic brake for secure, positive stopping at any position.



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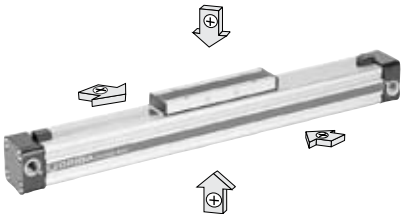
OPTIONS AND ACCESSORIES FOR SYSTEM VERSATILITY

SERIES OSP-P

STANDARD VERSIONS OSP-P10 to P80

Pages G19-G27

Standard carrier with integral guidance. End cap can be rotated 4 x 90° to position air connection on any side.
Magnetic piston as standard. Dovetail profile for mounting of accessories and the cylinder itself.



BASIC CYLINDER OPTIONS

CLEAN ROOM CYLINDERS

Page G42-G46

For use in clean room applications, certified with the IPA-Certificate (to DIN EN ISO 14644-1).

The special design of the linear drive enables all emissions to be led away.

STAINLESS VERSION

For use in constantly damp or wet environments. All screws are A2 quality stainless steel

SLOW SPEED OPTIONS

Specially formulated grease lubrication facilitates slow, smooth and uniform piston travel in the speed range from 0.005 to 0.2 m/s.

Minimum achievable speeds are dependent on several factors. Please consult our technical department.

Slow speed lubrication in combination with Viton® on demand.

Oil free operation preferred.

VITON® VERSION

For use in an environment with high temperatures or in chemically aggressive areas.

All seals are made of Viton®.

Sealing bands: Stainless steel

END-FACE AIR CONNECTION

Page G24

To solve special installation problems.



BOTH AIR CONNECTIONS AT ONE END

Page G25

For simplified tubing connections and space saving.



INTEGRATED VOE VALVES

Page G26

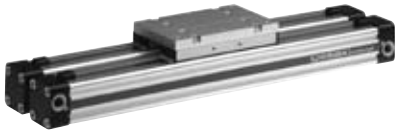
The complete compact solution for optimal cylinder control.



JOINT CLAMP CONNECTION

Page G30

The joint clamp connection combines two OSP-P cylinders of the same size into a compact unit with high performance.



MULTIPLEX CONNECTION

Page G31

The multiplex connection combines two or more OSP-P cylinders of the same size into one unit.

The orientation of the carriers can be freely selected.



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ACCESSORIES

MAGNETIC SWITCHES
TYPE RS, ES, RST, EST

Pages G114-G120

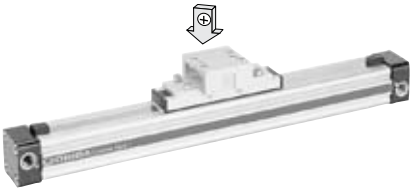
For electrical sensing of end and intermediate piston positions, also in EX-Areas.



CLEVIS MOUNTING

Page G32-G33

Carrier with tolerance and parallelism compensation for driving loads supported by external linear guides.



INVERSION MOUNTING

Page G34

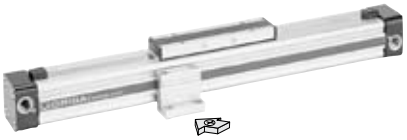
The inversion mounting transfers the driving force to the opposite side, e. g. for dirty environments.



END CAP MOUNTING

Page G35

For end-mounting of the cylinder.



MID-SECTION SUPPORT

Page G36

For supporting long cylinders or mounting the cylinder by its dovetail rails.



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G

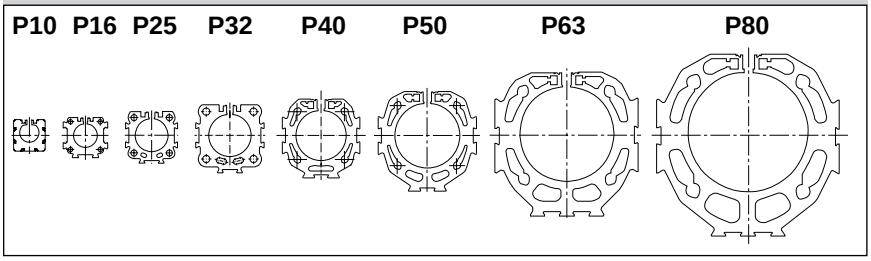
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Characteristics				Pressures quoted as gauge pressure
Characteristics		Symbol	Unit	Description
General Features				
Type				Rodless cylinder
Series				OSP-P
System				Double-acting, with cushioning, position sensing capability
Mounting				See drawings
Air Connection				Threaded
Ambient temperature range		T_{min} T_{max}	°C °C	-10 +80 Other temperature ranges on request
Weight (mass)			kg	See table below
Installation				In any position
Medium				Filtered, unlubricated compressed air (other media on request)
Lubrication				Permanent grease lubrication (additional oil mist lubrication not required) Option: special slow speed grease
Material	Cylinder Profile			Anodized aluminum
	Carrier (piston)			Anodized aluminum
	End caps			Aluminum, lacquered / Plastic (P10)
	Sealing bands			Corrosion resistant steel
	Seals			NBR (Option: Viton®)
	Screws			Galvanized steel Option: stainless steel
	Dust covers, wipers			Plastic
Max. operating pressure		p_{max}	bar	8

Weight (mass) kg

Cylinder series (Basic cylinder)	Weight (Mass) kg	
	At 0 mm stroke	per 100 mm stroke
OSP-P10	0.087	0.052
OSP-P16	0.22	0.1
OSP-P25	0.65	0.197
OSP-P32	1.44	0.354
OSP-P40	1.95	0.415
OSP-P50	3.53	0.566
OSP-P63	6.41	0.925
OSP-P80	12.46	1.262

Size Comparison

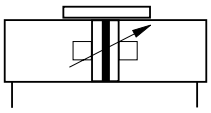


Rodless Pneumatic Cylinder

ø 10-80 mm

OSP
ORIGA SYSTEM PLUS

Series OSP-P..



Standard Versions:

- Double-acting with adjustable end cushioning
- With magnetic piston for position sensing
- Long-Stroke Cylinders for stroke lengths up to 41m (consult factory)

Special Versions:

- With special pneumatic cushioning system (on request)
- Clean room cylinders (see page G43-G46)
- Stainless steel screws
- Slow speed lubrication
- Viton® seals
- Both air connections on one end
- Air connection on the end-face
- Integrated Valves

- End cap can be rotated 4 x 90° to position air connection as desired
- Free choice of stroke length up to 6000 mm, Long-Stroke version (Ø50-80mm) for stroke lengths up to 41m



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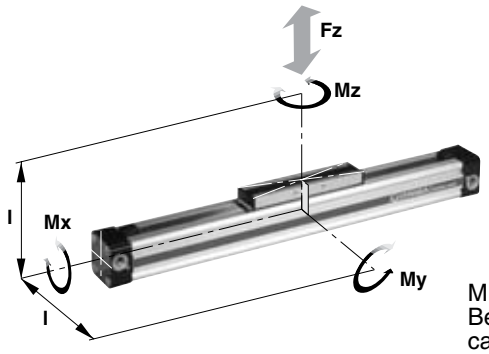
Loads, Forces and Moments

Choice of cylinder is decided by:

- Permissible loads, forces and moments
- Performance of the pneumatic end cushions. The main factors here are the mass to be cushioned and the piston speed at start of cushioning (unless external cushioning is used, e. g. hydraulic shock absorbers).

The adjacent table shows the maximum values for light, shock-free operation, which must not be exceeded even in dynamic operation. **Load and moment data are based on speeds v ≤ 0.5 m/s.**

When working out the action force required, it is essential to take into account the friction forces generated by the specific application or load.



M = F ·l
Bending moments are calculated from the center of the linear actuator

Cylinder Series (mm Ø)	Theoretical Action Force at 6 bar (N)	Effective Action Force F_A at 6 bar (N)	max. Moments			max. Load F (N)	Cushion Length (mm)
			Mx (Nm)	My (Nm)	Mz (Nm)		
OSP-P10	47	32	0.2	1	0.3	20	2.5 *
OSP-P16	120	78	0.45	4	0.5	120	11
OSP-P25	295	250	1.5	15	3	300	17
OSP-P32	483	420	3	30	5	450	20
OSP-P40	754	640	6	60	8	750	27
OSP-P50	1178	1000	10	115	15	1200	30
OSP-P63	1870	1550	12	200	24	1650	32
OSP-P80	3016	2600	24	360	48	2400	39

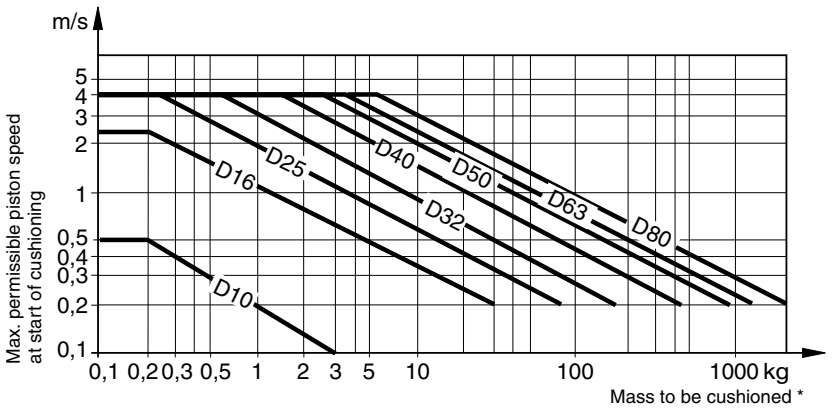
* A rubber element (non-adjustable) is used for end cushioning.
To deform the rubber element enough to reach the absolute end position would require a Δp of 4 bar!

Cushioning Diagram

Work out your expected moving mass and read off the maximum permissible speed at start of cushioning.

Alternatively, take your desired speed and expected mass and find the cylinder size required.

Please note that piston speed at start of cushioning is typically ca. 50% higher than the average speed, and that it is this higher speed which determines the choice of cylinder. If these maximum permissible values are exceeded, additional shock absorbers must be used.

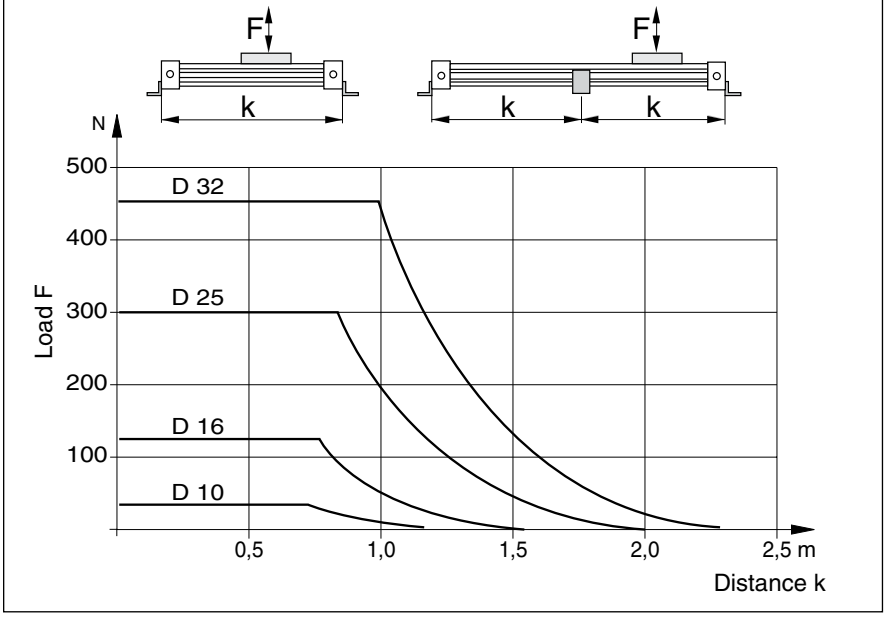


* For cylinders with linear guides or brakes, please be sure to take the mass of the carriage or the brake housing into account.

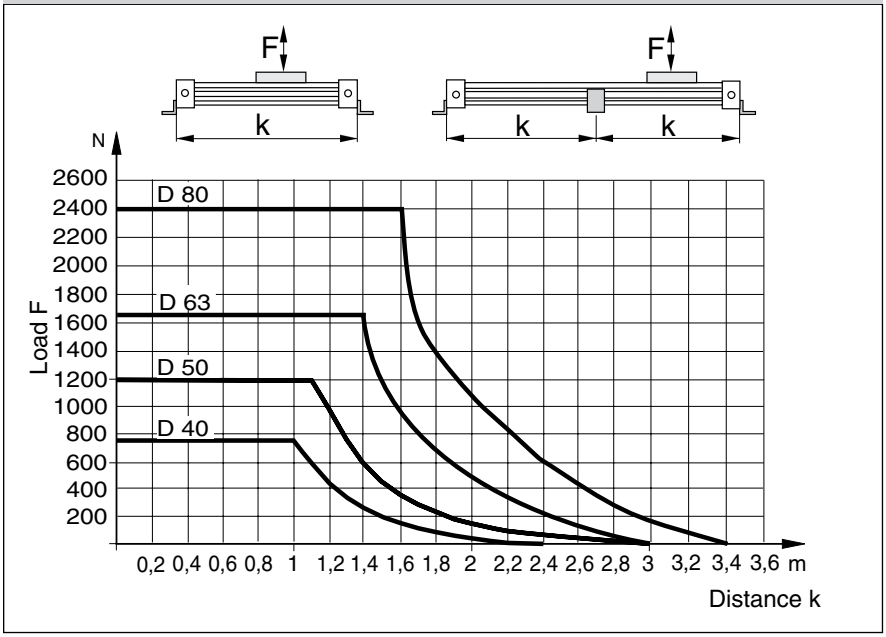
If the permitted limit values are exceeded, either additional shock absorbers should be fitted in the area of the center of gravity or you can consult us about our special cushioning system – we shall be happy to advise you on your specific application.

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Permissible Support Spacings: OSP - P10 - P32



Permissible Support Spacings: OSP - P40 - P80



Mid-Section Supports

To avoid excessive bending and oscillation of the cylinder, mid-section supports are required dependent on specified stroke lengths and applied loads. The diagrams show the maximum possible support spacings depending on the load.

Bending up to max. 0.5 mm is permissible between supports. The mid-section supports are clamped on to the dovetail profile of the cylinder tube. They are also able to take the axial forces.

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Cylinder Stroke and Dead Length A

- Free choice of stroke length up to 6000 mm in 1 mm steps.
- Longer strokes on request.

Tandem Cylinder

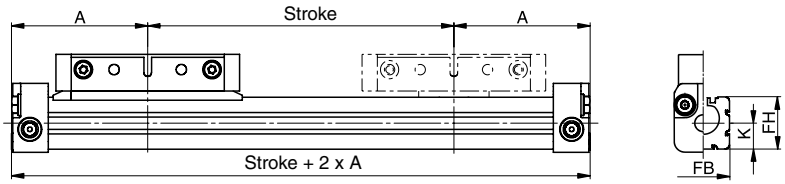
Two pistons are fitted: dimension "Z" is optional. (Please note minimum distance "Zmin").

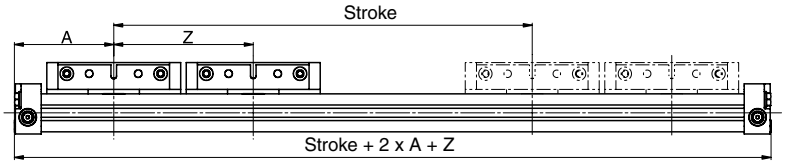
- Free choice of stroke length up to 6000 mm in 1 mm steps.
- Longer strokes on request.
- **Stroke length to order is stroke + dimension "Z"**

Please note:
To avoid multiple actuation of magnetic switches, the second piston is not equipped with magnets.

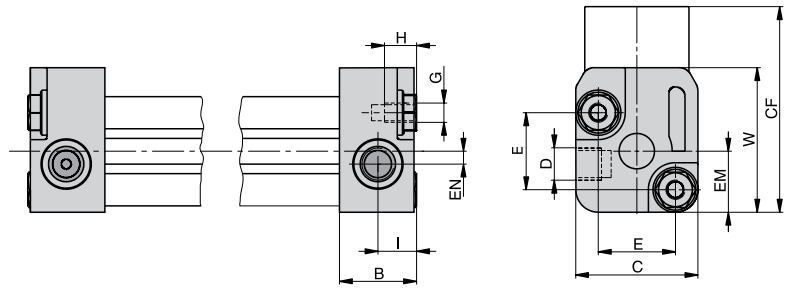
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Dimensions of Basic Cylinder OSP-P10

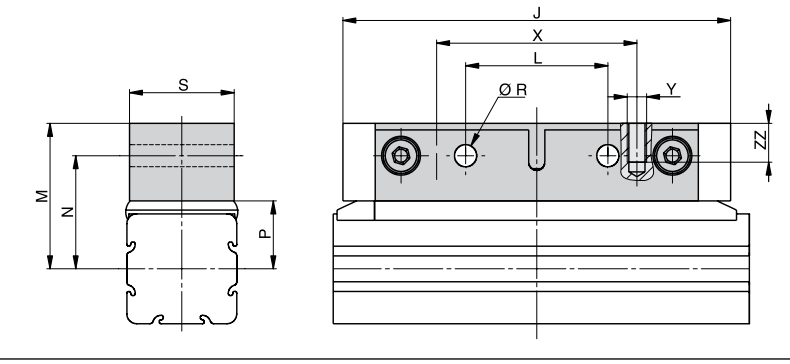




End Cap/Air Connection Series OSP-P10



Carrier Series OSP-P10

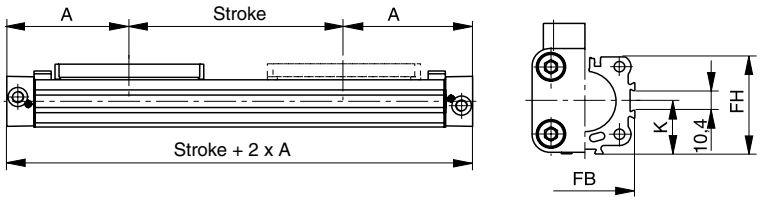


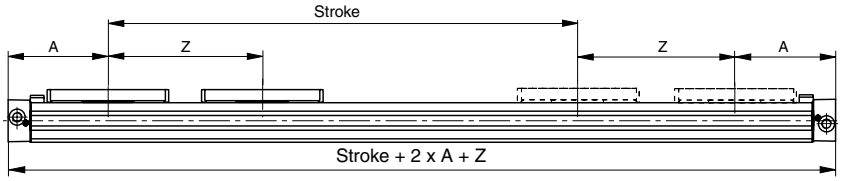
Dimension Table (mm)

Cylinder Series	A	B	C	D	E	G	H	I	J	K	L	M	N	P	R	S	W	X	Y	Z_{min}	CF	EM	EN	FB	FH	ZZ
OSP-P10	44.5	12	19	M5	12	M3	5	6	60	8.5	22	22.5	17.5	10.5	3.4	16	22.5	31	M3	64	32	9.5	2	17	17	6

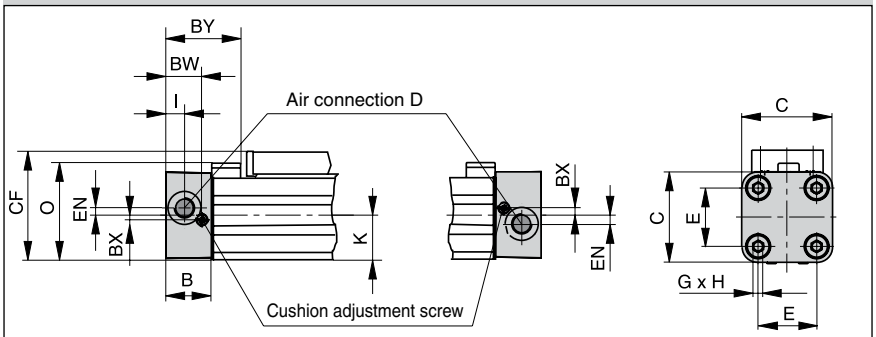
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Dimensions of Basic Cylinder OSP - P16-P80

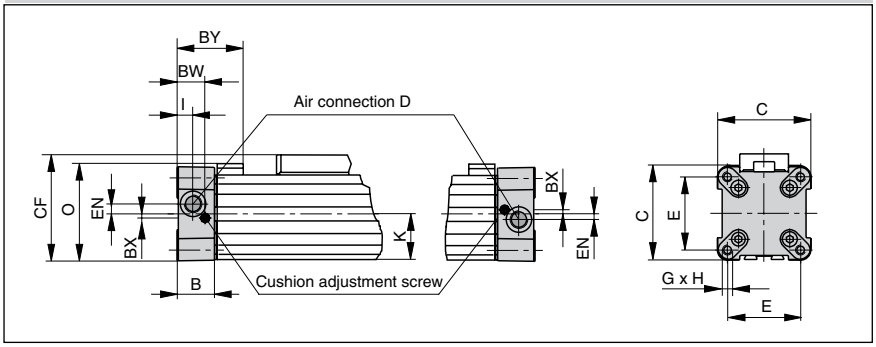




End Cap/Air Connection can be rotated 4 x 90° Series OSP-P16 to P32



End Cap/Air Connection can be rotated 4 x 90° Series OSP-P40 to P80



Cylinder Stroke and Dead Length A

- Free choice of stroke length up to 6000 mm in 1 mm steps.
- Longer strokes on request.

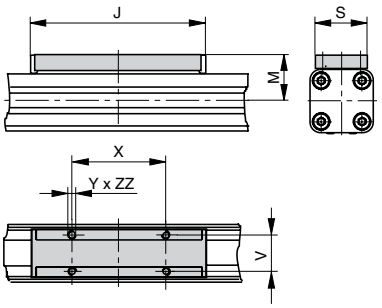
Tandem Cylinder

Two pistons are fitted: dimension "Z" is optional. (Please note minimum distance "Zmin").

- Free choice of stroke length up to 6000 mm in 1 mm steps.
- Longer strokes on request.
- **Stroke length to order is stroke + dimension "Z"**

Please note:
To avoid multiple actuation of magnetic switches, the second piston is not equipped with magnets.

Carrier Series OSP-P16 to P80



Dimension Table (mm)

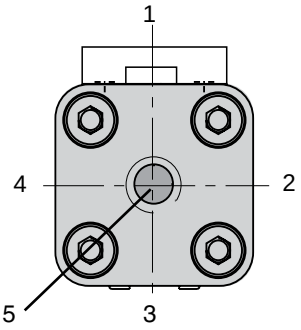
Cylinder Series	A	B	C	D	E	G	H	I	J	K	M	O	S	V	X	Y	Z	BW	BX	BY	CF	EN	FB	FH	ZZ
OSP-P16	65	14	30	M5	18	M3	9	5.5	69	15	23	33.2	22	16.5	36	M4	81	10.8	1.8	28.4	38	3	30	27.2	7
OSP-P25	100	22	41	G1/8	27	M5	15	9	117	21.5	31	47	33	25	65	M5	128	17.5	2.2	40	52.5	3.6	40	39.5	8
OSP-P32	125	25.5	52	G1/4	36	M6	15	11.5	152	28.5	38	59	36	27	90	M6	170	20.5	2.5	44	66.5	5.5	52	51.7	1
OSP-P40	150	28	69	G1/4	54	M6	15	12	152	34	44	72	36	27	90	M6	212	21	3	54	78.5	7.5	62	63	10
OSP-P50	175	33	87	G1/4	70	M6	15	14.5	200	43	49	86	36	27	110	M6	251	27	–	59	92.5	11	76	77	10
OSP-P63	215	38	106	G3/8	78	M8	21	14.5	256	54	63	107	50	34	140	M8	313	30	–	64	117	12	96	96	16
OSP-P80	260	47	132	G1/2	96	M10	25	22	348	67	80	133	52	36	190	M10	384	37.5	–	73	147	16.5	122	122	20

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Air Connection on the End-Face #5

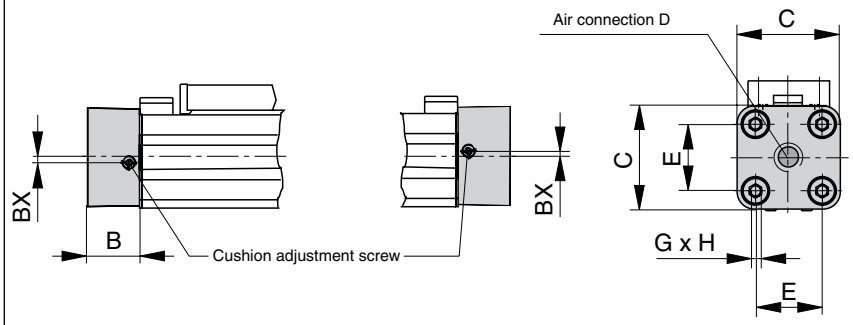
In some situations it is necessary or desirable to fit a special end cap with the air connection on the end-face instead of the standard end cap with the air connection on the side. The special end cap can also be rotated 4 x 90° to locate the cushion adjustment screw as desired. Supplied in pairs.



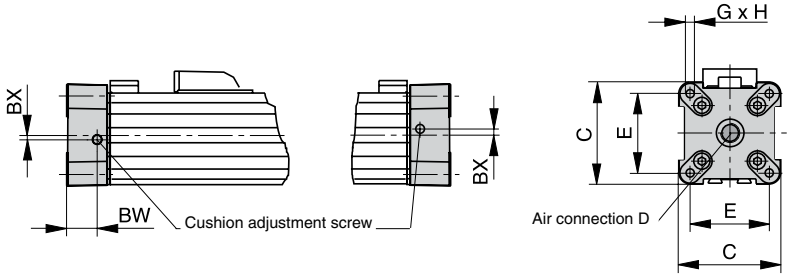


Note: Position #2 is the standard location.

Series OSP-P16 to P32



Series OSP-P40 to P80

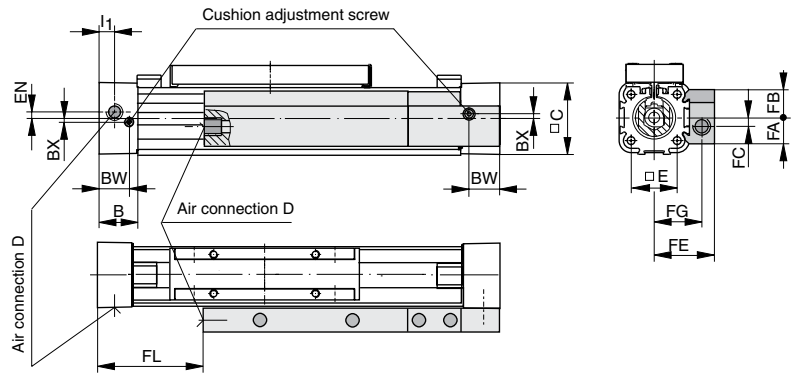


Dimension Table (mm)

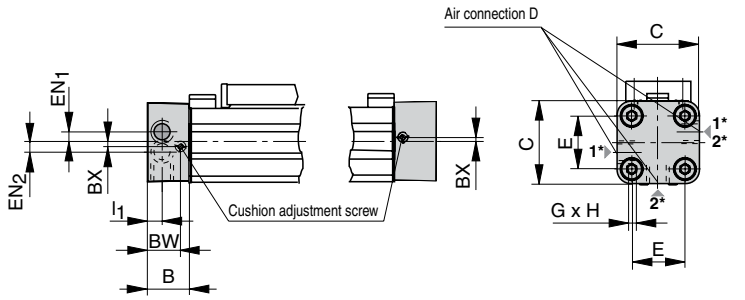
Cylinder Series	B	C	D	E	G	H	BX	BW
OSP-P16	14	30	M5	18	M3	9	1.8	10.8
OSP-P25	22	41	G1/8	27	M5	15	2.2	17.5
OSP-P32	25.5	52	G1/4	36	M6	15	2.5	20.5
OSP-P40	28	69	G1/4	54	M6	15	3	21
OSP-P50	33	87	G1/4	70	M6	15	–	27
OSP-P63	38	106	G3/8	78	M8	21	–	30
OSP-P80	47	132	G1/2	96	M10	25	–	37.5

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Series OSP-P16

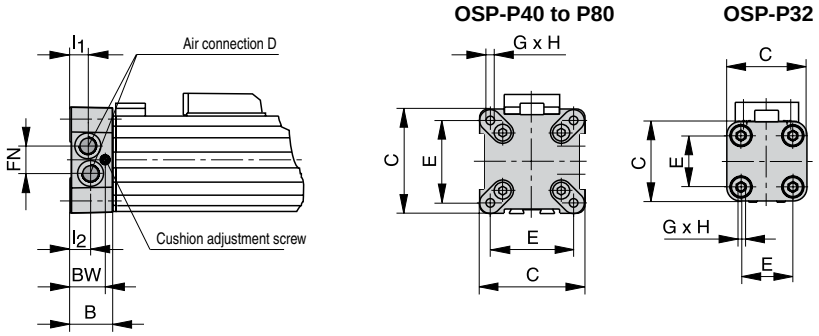


Series OSP-P25



* Versions of Air Connection Positions: 1 → 1 or 2 → 2

Series OSP-P32 to P80



Single End Porting

A special end cap with both air connections on one side is available for situations where shortage of space, simplicity of installation or the nature of the process make it desirable.
Air supply to the other end is via internal air passages (OSP-P25 to P80) or via a hollow aluminum profile fitted externally (OSP-P16).
In this case the end caps cannot be rotated.



Please note:
When combining the OSP-P16 single end porting with inversion mountings, RS magnetic switches can only be mounted directly opposite to the external air-supply profile.

Dimension Table (mm)

Cylinder Series	B	C	D	E	G	H	l_1	l_2	BX	BW	EN	EN_1	EN_2	FA	FB	FC	FE	FG	FL	FN
OSP-P16	14	30	M5	18	M3	9	5.5	–	1.8	10.8	3	–	–	12.6	12.6	4	27	21	36	–
OSP-P25	22	41	G1/8	27	M5	15	9	–	2.2	17.5	–	3.6	3.9	–	–	–	–	–	–	–
OSP-P32	25.5	52	G1/8	36	M6	15	12.2	10.5	–	20.5	–	–	–	–	–	–	–	–	–	15.2
OSP-P40	28	69	G1/8	54	M6	15	12	12	–	21	–	–	–	–	–	–	–	–	–	17
OSP-P50	33	87	G1/4	70	M6	15	14.5	14.5	–	27	–	–	–	–	–	–	–	–	–	22
OSP-P63	38	106	G3/8	78	M8	21	16.5	13.5	–	30	–	–	–	–	–	–	–	–	–	25
OSP-P80	47	132	G1/2	96	M10	25	22	17	–	37.5	–	–	–	–	–	–	–	–	–	34.5

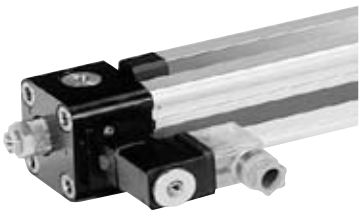
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Integrated 3/2 Way Valves VOE

For optimal control of the OSP-P cylinder, 3/2 way valves integrated into the cylinder's end caps can be used as a compact and complete solution. They allow for easy positioning of the cylinder, smooth operation at the lowest speeds and fast response, making them ideally suited for the direct control of production and automation processes.

Characteristics:

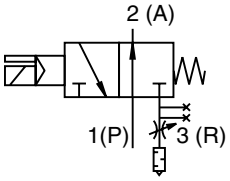
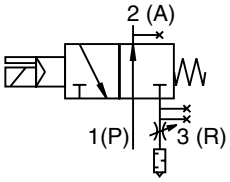
- Complete compact solution
- Various connection possibilities: Free choice of air connection with rotating end caps with VOE valves, Air connection can be rotated 4 x 90°, Solenoid can be rotated 4 x 90°, Pilot Valve can be rotated 180°
- High piston velocities can be achieved with max. 3 exhaust ports
- Minimal installation requirements
- Requires just one air connection per valve
- Optimal control of the OSP-P cylinder
- Excellent positioning characteristics
- Integrated operation indicator
- Integrated exhaust throttle valve
- Manual override - indexed
- Adjustable end cushioning
- Easily retrofitted – please note the increase in the overall length of the cylinder!



Integrated 3/2 Way Valves VOE Series OSP-P25, P32, P40 and P50



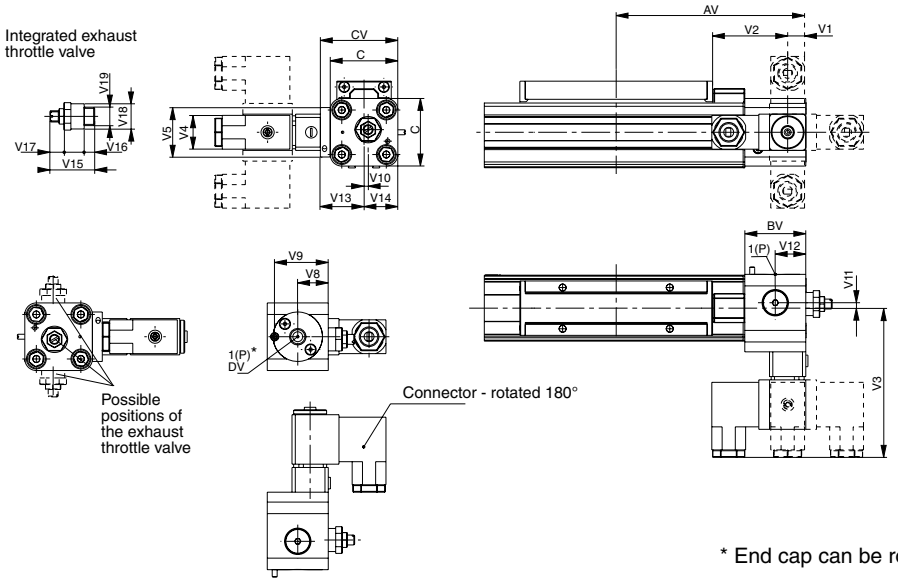
Characteristics 3/2 Way Valves VOE

Characteristics	3/2 Way Valves with spring return			
Pneumatic diagram				
Type	VOE-25	VOE-32	VOE-40	VOE-50
Actuation	electrical			
Basic position	P → A open, R closed			
Type	Poppet valve, non overlapping			
Mounting	integrated in end cap			
Installation	in any position			
Port size	G 1/8	G 1/4	G 3/8	G 3/8
Temperature	-10°C to +50°C *			
Operating pressure	2-8 bar			
Nominal voltage	24 V DC / 230 V AC, 50 Hz			
Power consumption	2,5 W / 6 VA			
Duty cycle	100%			
Electrical Protection	IP 65 DIN 40050			

* other temperature ranges on request

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Dimensions VOE Valves OSP-P25 and P32

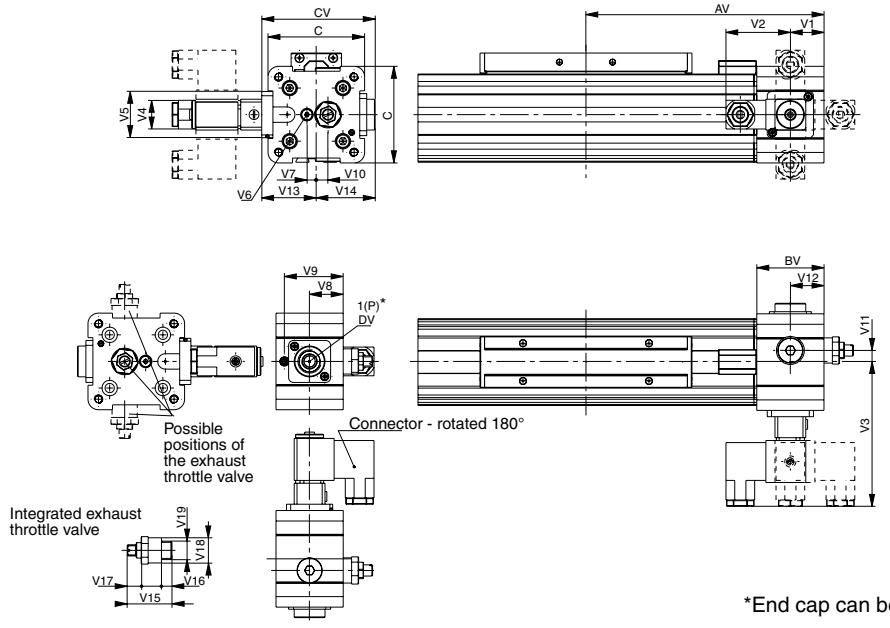


* End cap can be rotated 4x90°

Dimension Table (mm)

Cylinder Series	AV	BV	C	CV	DV	V1	V2	V3	V4	V5	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19
OSP-P25	115	37	41	47	G1/8	11	46	90.5	22	30	18.5	32.5	2.5	3.3	18.5	26.5	20.5	24	5	4	14	G1/8
OSP-P32	139	39.5	52	58	G1/4	20.5	46	96	22	32	20.5	34.7	6	5	20.5	32	26	32	7.5	6	18	G1/4

Dimensions VOE Valves OSP-P40 and P50



*End cap can be rotated 4x90°

Dimension Table (mm)

Cylinder Series	AV	BV	C	CV	DV	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15	V16	V17	V18	V19
OSP-P40	170	48	69	81	G3/8	24	46	103	22	33	M5	6.7	24	42	8.3	8.3	24	39	42	32	7.5	6	18	G1/4
OSP-P50	190	48	87	82	G3/8	24	46	102	22	33	M5	4.5	24	42	12.2	12.2	24	38	44	32	7.5	6	18	G1/4

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Active Brake

OSP
ORIGA SYSTEM PLUS

Series AB 25 to 80
for linear drive

- **Series OSP-P**

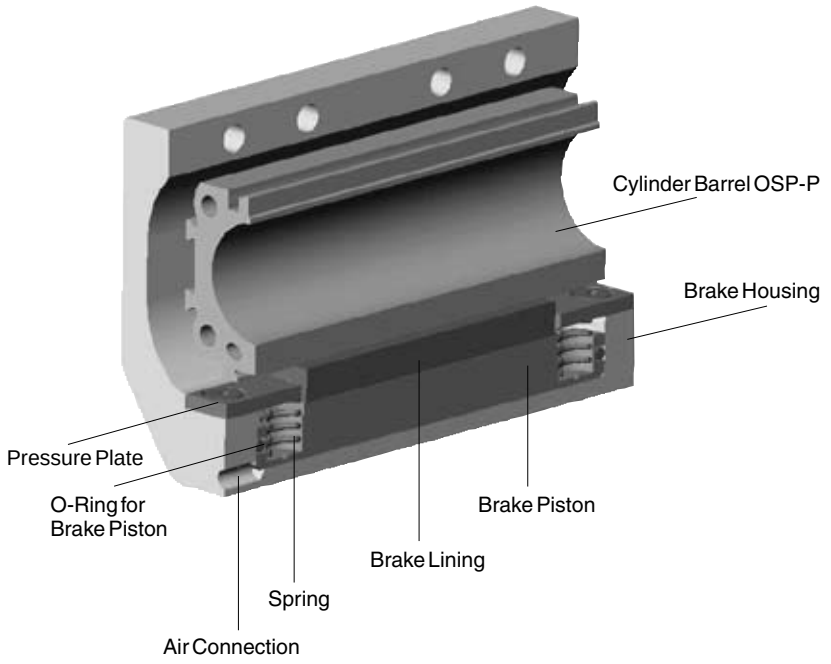
Features:
- Actuated by pressurization
- Released by spring actuation
- Completely stainless version
- Holds position, even under changing load conditions

G

For further technical data, please refer to the data sheets for linear drives OSP-P (page G19)

Note:
For combinations Active Brake AB + SFI-plus + Magnetic Switch contact our technical department please.

Function



Forces and Weights

Series	For linear drive	Max. braking force (N) (1	Brake pad way (mm)	Mass (kg) Linear drive with brake 0 mm stroke	Mass (kg) Linear drive with brake increase per 100mm stroke	Mass (kg) brake*	Order No. Active brake
AB 25	OSP-P25	350	2.5	1.0	0.197	0.35	**20806**
AB 32	OSP-P32	590	2.5	2.02	0.354	0.58	**20807**
AB 40	OSP-P40	900	2.5	2.83	0.415	0.88	**20808**
AB 50	OSP-P50	1400	2.5	5.03	0.566	1.50	**20809**
AB 63	OSP-P63	2170	3.0	9.45	0.925	3.04	**20810**
AB 80	OSP-P80	4000	3.0	18.28	1.262	5.82	**20811**

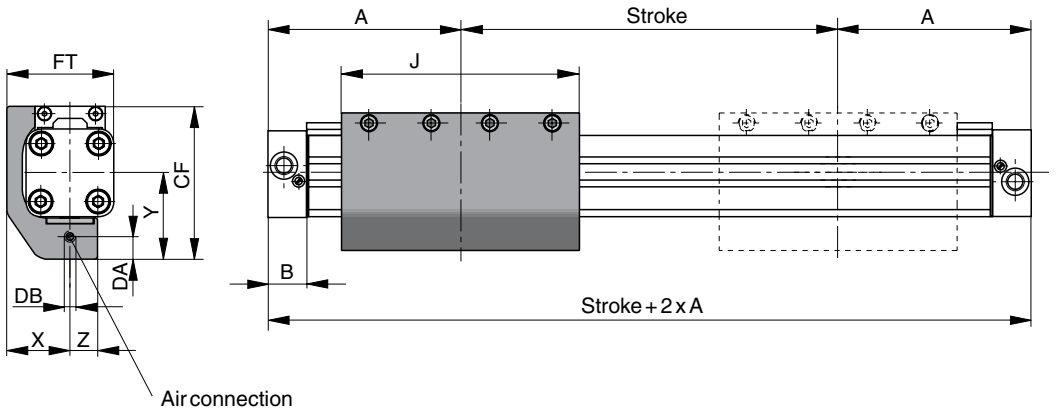
(1 – at 6 bar
both chambers pressurized with 6 bar
Braking surface dry
– oil on the braking surface will reduce the braking force

*** Please Note:**
The mass of the brake has to be added to the total moving mass when using the cushioning diagram.

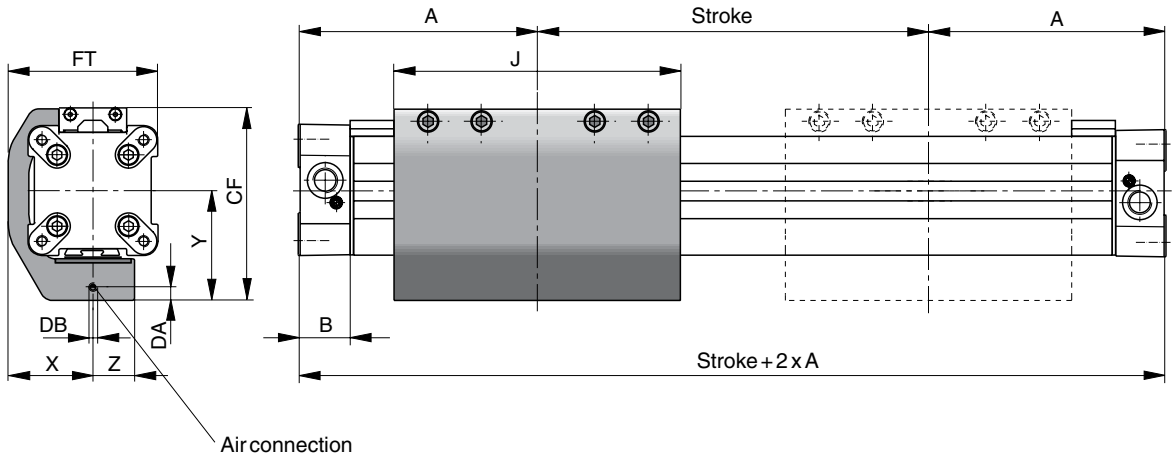


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Series OSP-P25 and P32 with Active Brake AB



Series OSP-P40, P50, P63, P80 with Active Brake AB



Dimension Table (mm)

Series	A	B	J	X	Y	Z	CF	DA	DB	FT
AB 25	100	22	117	29.5	43	13	74	4	M5	50
AB 32	125	25.5	151.4	36	50	15	88	4	M5	62
AB 40	150	28	151.4	45	58	22	102	7	M5	79.5
AB 50	175	33	200	54	69.5	23	118.5	7.5	M5	97.5
AB 63	215	38	256	67	88	28	151	9	G1/8	120
AB 80	260	47	348	83	105	32	185	10	G1/8	149

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End Cap Mountings

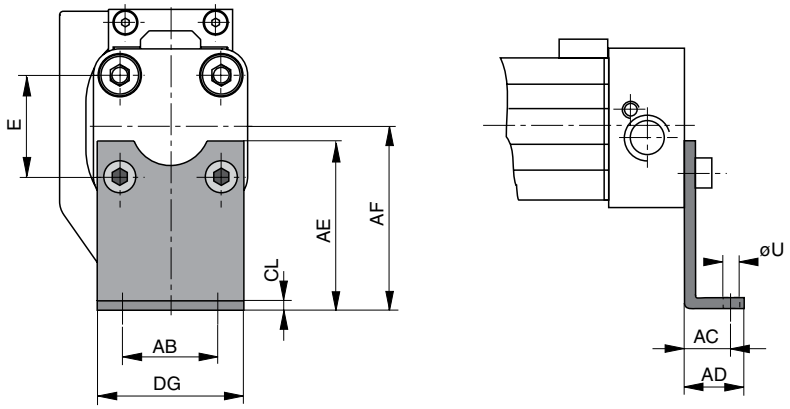
On the end-face of each cylinder end cap there are four threaded holes for mounting the cylinder. The hole layout is square, so that the mounting can be fitted to the bottom, top or either side.

Material:
Series OSP-P25, P32:
Galvanized steel

The mountings are supplied in pairs.



Series OSP – P25 and P32 with Active Brake AB: Type A3



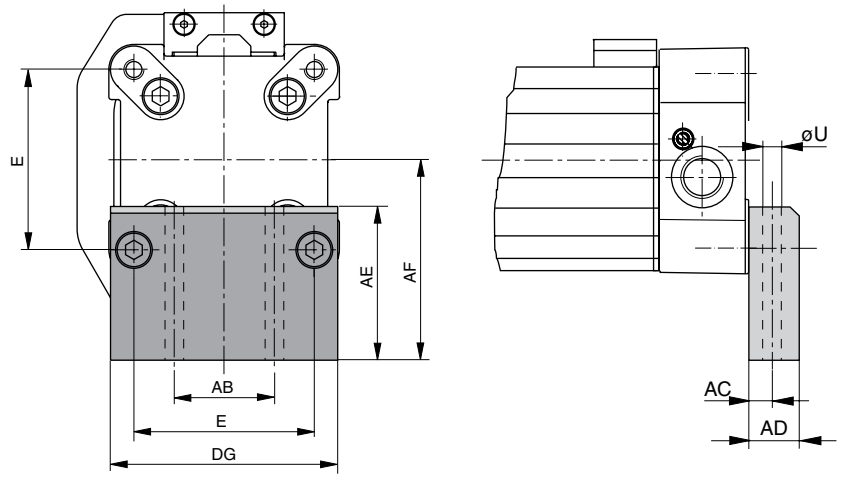
Material:
Series OSP-P40,P50, P63, P80:
Anodized aluminum

The mountings are supplied in pairs.

Stainless steel version on request.



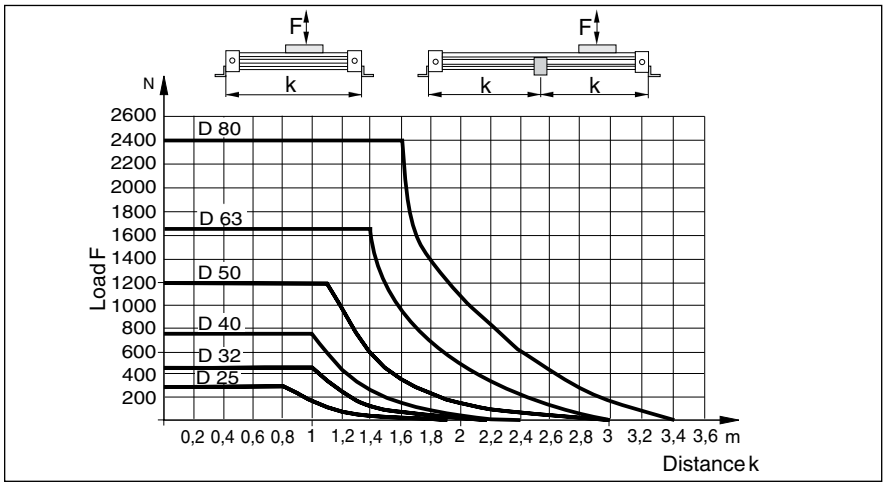
Series OSP – P40 , P50, P63, P80 with Active Brake AB: Type C3



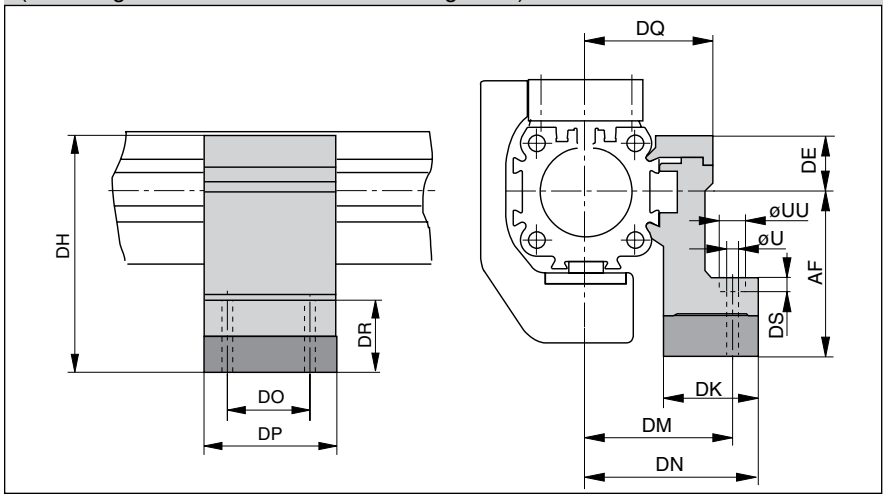
Dimension Table (mm)

Series	E	øU	AB	AC	AD	AE	AF	CL	DG	Order No. Type A3	Order No. Type C3
AB 25	27	5.8	27	16	22	45	49	2.5	39	**2060**	–
AB 32	36	6.6	36	18	26	42	52	3	50	**3060**	–
AB 40	54	9	30	12.5	24	46	60	–	68	–	**20339**
AB 50	70	9	40	12.5	24	54	72	–	86	–	**20350**
AB 63	78	11	48	15	30	76	93	–	104	–	**20821**
AB 80	96	14	60	17.5	35	88	110	–	130	–	**20822**

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Series OSP-P25 to P80 with Active Brake AB: Type E3
(Mounting from above / below with through-bolt)



Mid-Section Support

Mid-section supports are required from a certain stroke length to prevent excessive deflection and vibration of the linear drive.

The diagrams show the maximum permissible unsupported length in relation to loading. Deflection of 0.5 mm max. between supports is permissible.

The Mid-Section supports are attached to the dovetail rails, and can take axial loads.

Mid-Section Supports

Note to Type E3:

Mid-Section supports can only be mounted opposite of the brake housing.

Stainless steel version available on request.



Dimension Table (mm)

Series	U	UU	AF	DE	DH	DK	DM	DN	DO	DP	DQ	DR	DS	Order No. Type E3
AB 25	5.5	10	49	16	65	26	40	47.5	36	50	34.5	35	5.7	**20353**
AB 32	5.5	10	52	16	68	27	46	54.5	36	50	40.5	32	5.7	**20356**
AB 40	7	–	60	23	83	34	53	60	45	60	45	32	–	**20359**
AB 50	7	–	72	23	95	34	59	67	45	60	52	31	–	**20362**
AB 63	9	–	93	34	127	44	73	83	45	65	63	48	–	**20453**
AB 80	11	–	110	39.5	149.5	63	97	112	55	80	81	53	–	**20819**

Accessories for linear drives with Active Brakes – please order separately

Description	For detailed information, see page no.
Clevis mounting	**G33**
Adaptor profile	**G37**
T-groove profile	**G38**
Connection profile	**G39**
Magnetic switch (can **only** be mounted opposite of the brake housing)	**G114-G120**
Incremental displacement measuring system SFI-plus	**G125-G127**

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Linear Drive Accessories

ø 10 mm
Clevis Mounting

OSP
ORIGA SYSTEM PLUS

For Linear-drive
- **Series OSP-P**

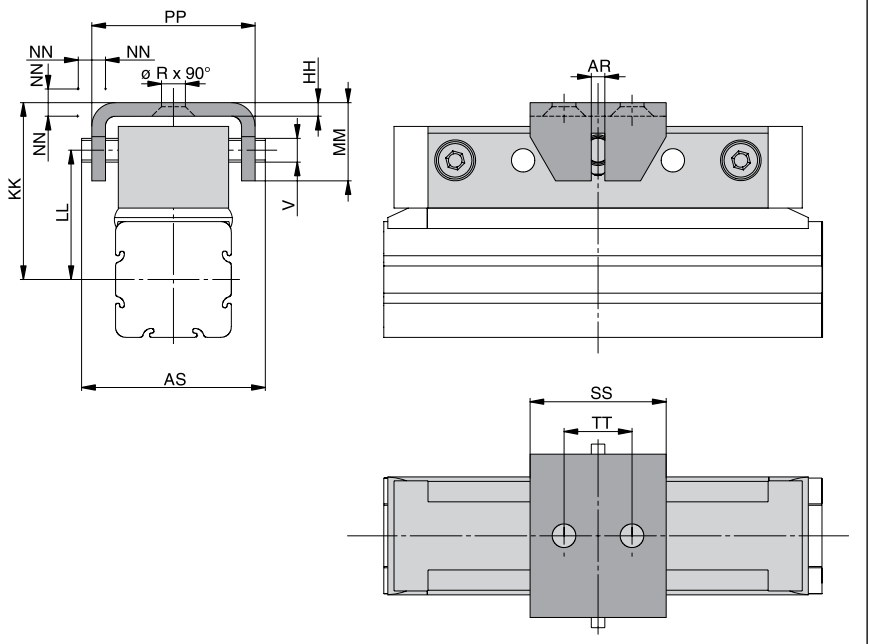
When external guides are used, parallelism deviations can lead to mechanical strain on the piston. This can be avoided by the use of a clevis mounting.

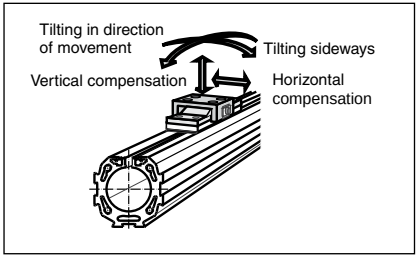
In the drive direction, the mounting has very little play.

Freedom of movement is provided as follows:

- **Tilting in direction of movement**
- **Vertical compensation**
- **Tilting sideways**
- **Horizontal compensation**

Series OSP-P10





Dimension Table (mm)

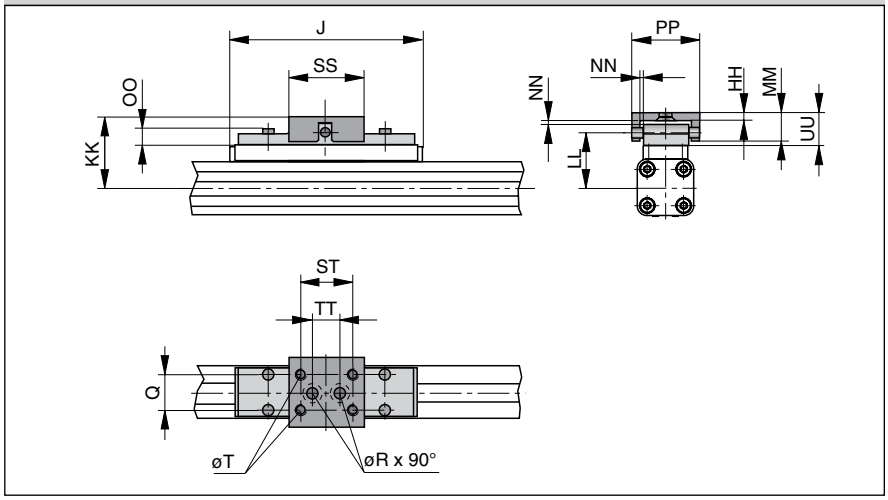
Series	ø R	V	AR	AS	HH	KK	LL	MM	NN*	PP	SS	TT	Order No. Standard	Order No. Stainless
OSP-P10	3.4	3.5	2	27	2	26	19	11.5	1	24	20	10	**20971**	–

* Dimension NN gives the possible plus and minus play in horizontal and vertical movement, which also makes tilting sideways possible.

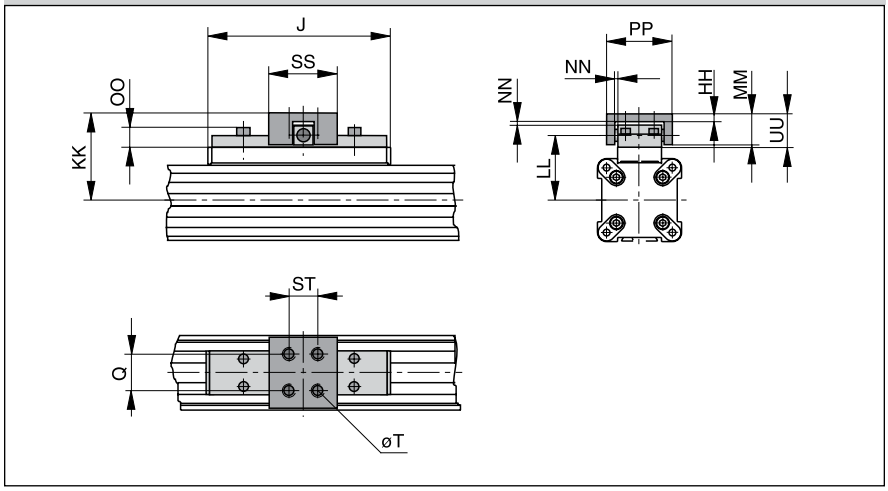


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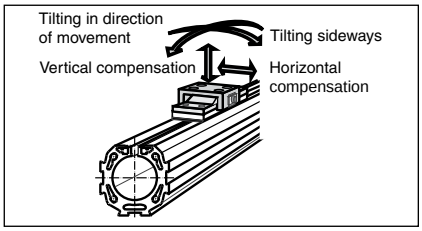
Series OSP-P16 to 32



Series OSP-P40 to 80



Please note:
When using additional inversion mountings, take into account the dimensions in page G34.



Linear Drive Accessories

ø 16-80 mm
Clevis Mounting

OSP
ORIGA
SYSTEM
PLUS

For Linear-drive
- **Series OSP-P**

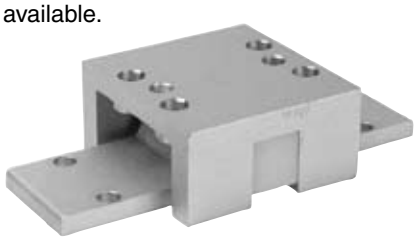
When external guides are used, parallelism deviations can lead to mechanical strain on the piston. This can be avoided by the use of a clevis mounting.

In the drive direction, the mounting has very little play.

Freedom of movement is provided as follows:

- **Tilting in direction of movement**
- **Vertical compensation**
- **Tilting sideways**
- **Horizontal compensation**

A stainless steel version is also available.



Dimension Table (mm)

Series	J	Q	T	ø R	HH	KK	LL	MM	NN*	OO	PP	SS	ST	TT	UU	Order No. Standard	Order No. Stainless
OSP-P16	69	10	M4	4.5	3	34	26.6	10	1	8.5	26	28	20	10	11	**20462**	**20463**
OSP-P25	117	16	M5	5.5	3.5	52	39	19	2	9	38	40	30	16	21	**20005**	**20092**
OSP-P32	152	25	M6	6.6	6	68	50	28	2	13	62	60	46	40	30	**20096**	**20094**
OSP-P40	152	25	M6	–	6	74	56	28	2	13	62	60	46	–	30	**20024**	**20093**
OSP-P50	200	25	M6	–	6	79	61	28	2	13	62	60	46	–	30	**20097**	**20095**
OSP-P63	256	37	M8	–	8	100	76	34	3	17	80	80	65	–	37	**20466**	**20467**
OSP-P80	348	38	M10	–	8	122	96	42	3	16	88	90	70	–	42	**20477**	**20478**

* Dimension NN gives the possible plus and minus play in horizontal and vertical movement, which also makes tilting sideways possible.

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Linear Drive Accessories

ø 16-80 mm
Inversion Mounting

OSP
ORIGA SYSTEM PLUS

For Linear-drive
- **Series OSP-P**

In dirty environments, or where there are special space problems, inversion of the cylinder is recommended.

The inversion bracket transfers the driving force to the opposite side of the cylinder. The size and position of the mounting holes are the same as on the standard cylinder.

Stainless steel version on demand.

Please note:

Other components of the OSP system such as **mid-section supports, magnetic switches** and **the external air passage for the P16,** can still be mounted on the free side of the cylinder.

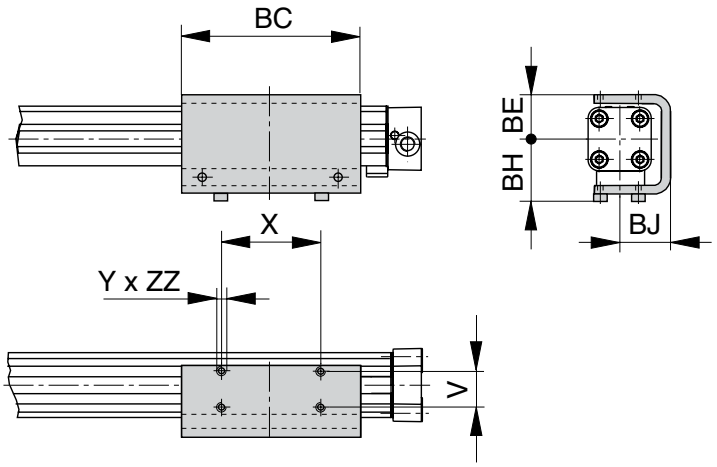
When combining single end porting with inversion mountings, RS magnetic switches can only be mounted directly opposite to the external air-supply profile.

Important Note:

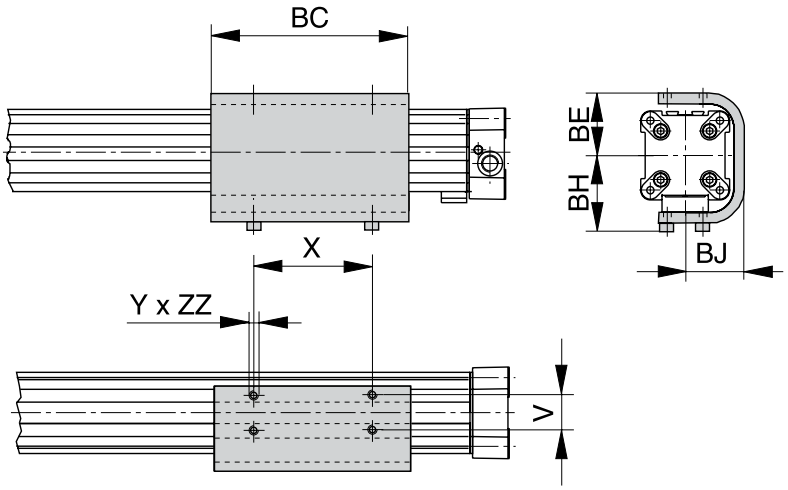
May be used in combination with Clevis Mounting, ref. dimensions in pages G32-G33.



Series OSP-P16 to 32



Series OSP-P40 to 80

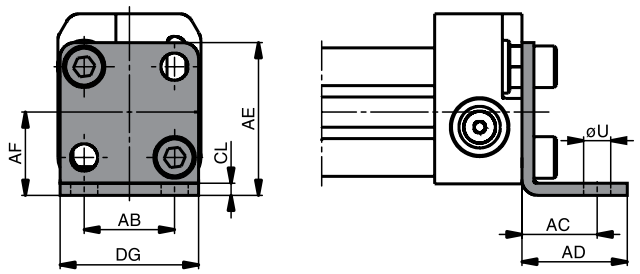


Dimension Table (mm)

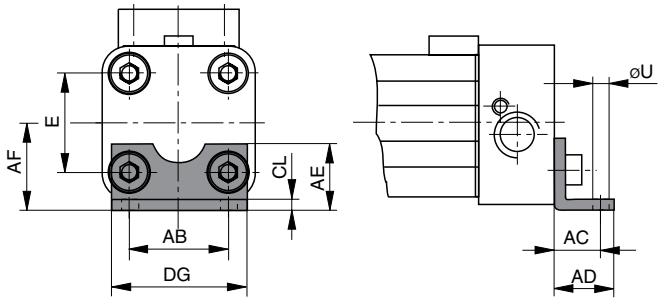
Series	V	X	Y	BC	BE	BH	BJ	ZZ	Order No.
OSP-P16	16.5	36	M4	69	23	33	25	4	**20446**
OSP-P25	25	65	M5	117	31	44	33.5	6	**20037**
OSP-P32	27	90	M6	150	38	52	39.5	6	**20161**
OSP-P40	27	90	M6	150	46	60	45	8	**20039**
OSP-P50	27	110	M6	200	55	65	52	8	**20166**
OSP-P63	34	140	M8	255	68	83.5	64	10	**20459**
OSP-P80	36	190	M10	347	88	107.5	82	15	**20490**

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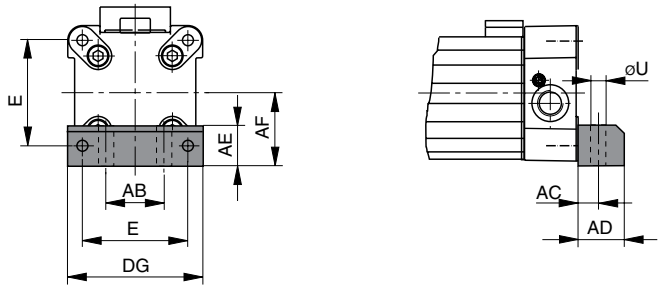
Series OSP-P10 : Type A1



Series OSP-P16 to 32: Type A1



Series OSP-P40 to 80: Type C1



Linear Drive Accessories

ø 10-80 mm
End Cap Mountings

OSP
ORIGA SYSTEM PLUS

For Linear-drive
- **Series OSP-P**

On the end-face of each end cap there are four threaded holes for mounting the actuator.
The hole layout is square, so that the mounting can be fitted to the bottom, top or either side, regardless of the position chosen for the air connection.

Material:
Series OSP-P10 – P32:
Galvanized steel.
Series OSP-P40 – P80:
Anodized aluminum.

The mountings are supplied in pairs.



Dimension Table (mm)

Series	E	ØU	AB	AC	AD	AE	AF	CL	DG	Order No. (* Type A1	Order No. (* Type C1
OSP-P10	-	3.6	12	10	14	20.2	11	1.6	18.4	**0 240**	**–**
OSP-P16	18	3.6	18	10	14	12.5	15	1.6	26	**20408**	**–**
OSP-P25	27	5.8	27	16	22	18	22	2.5	39	**2010**	**–**
OSP-P32	36	6.6	36	18	26	20	30	3	50	**3010**	**–**
OSP-P40	54	9	30	12.5	24	24	38	–	68	**–**	**4010**
OSP-P50	70	9	40	12.5	24	30	48	–	86	**–**	**5010**
OSP-P63	78	11	48	15	30	40	57	–	104	**–**	**6010**
OSP-P80	96	14	60	17.5	35	50	72	–	130	**–**	**8010**

(*= Pair

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Linear Drive Accessories

ø 10-80 mm
Mid-Section Support

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For Linear-drive
- **Series OSP-P**

Note on Types E1 and D1 (P16 – P80):

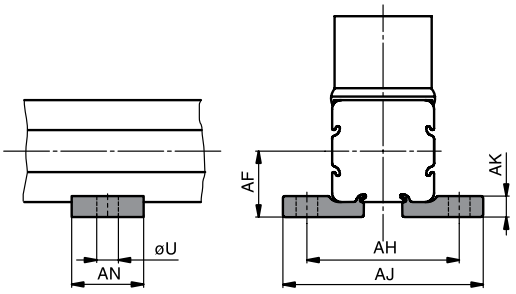
The mid-section support can also be mounted on the underside of the actuator, in which case its distance from the center of the actuator is different.

G

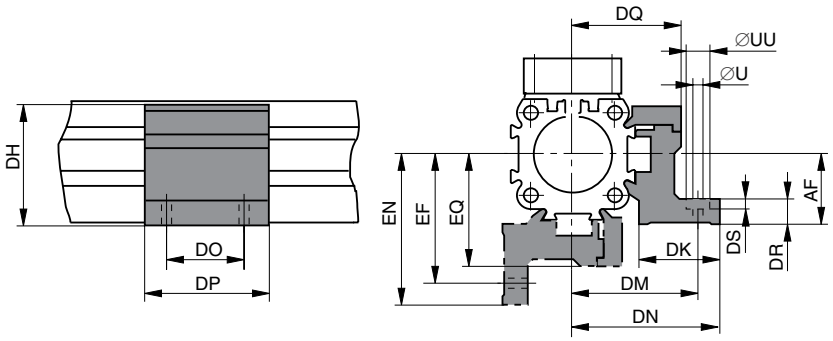
Stainless steel version on demand.



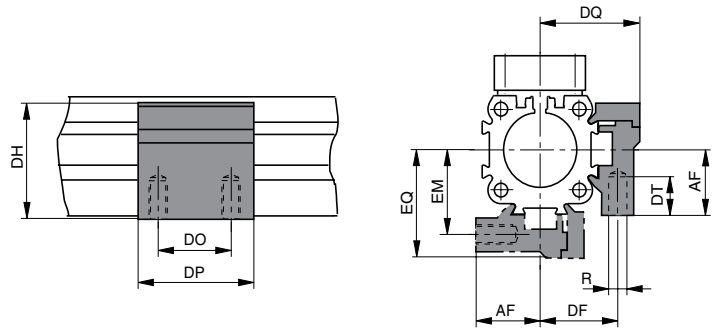
Series OSP-10, Type E1
(Mounting from above / below using a cap screw)



Series OSP-P16 to P80: Type E1
(Mounting from above / below using a cap screw)



Series OSP-16 to 80, Type D1
(Mountings from below with 2 screws)



Dimension Table (mm) Series OSP-P10

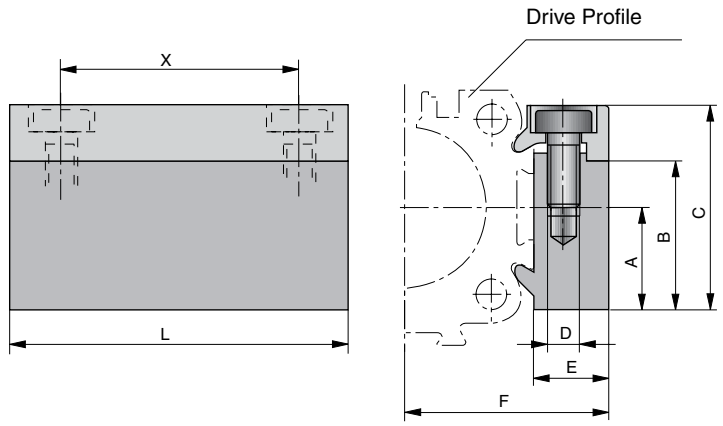
Series	U	AF	AH	AJ	AK	AN	Order No. Type E1	Order No. Type D1
OSP-P10	3.6	11	25.4	33.4	3.5	12	**0250**	**-**

Dimension Table (mm) – Series OSP-P16 to P80

Series	R	U	UU	AF	DF	DH	DK	DM	DN	DO	DP	DQ	DR	DS	DT	EF	EM	EN	EQ	Order No. Type E1	Order No. Type D1
OSP-P16	M3	3.4	6	15	20	29.2	24	32	36.4	18	30	27	6	3.4	6.5	32	20	36.4	27	**20435**	**20434**
OSP-P25	M5	5.5	10	22	27	38	26	40	47.5	36	50	34.5	8	5.7	10	41.5	28.5	49	36	**20009**	**20008**
OSP-P32	M5	5.5	10	30	33	46	27	46	54.5	36	50	40.5	10	5.7	10	48.5	35.5	57	43	**20158**	**20157**
OSP-P40	M6	7	–	38	35	61	34	53	60	45	60	45	10	–	11	56	38	63	48	**20028**	**20027**
OSP-P50	M6	7	–	48	40	71	34	59	67	45	60	52	10	–	11	64	45	72	57	**20163**	**20162**
OSP-P63	M8	9	–	57	47.5	91	44	73	83	45	65	63	12	–	16	79	53.5	89	69	**20452**	**20451**
OSP-P80	M10	11	–	72	60	111.5	63	97	112	55	80	81	15	–	25	103	66	118	87	**20482**	**20480**

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Dimensions



Linear Drive Accessories

ø 16-50 mm
Adaptor Profile

OSP
ORIGA SYSTEM PLUS

For Linear-drive
- **Series OSP-P**

Adaptor Profile OSP
- A universal attachment for mounting of valves etc.
- Solid material

Dimension Table (mm)

Series	A	B	C	D	E	F	L	X	Order No. Standard	Order No. Stainless
OSP-P16	14	20.5	28	M3	12	27	50	38	**20432**	**20438**
OSP-P25	16	23	32	M5	10.5	30.5	50	36	**20006**	**20186**
OSP-P32	16	23	32	M5	10.5	36.5	50	36	**20006**	**20186**
OSP-P40	20	33	43	M6	14	45	80	65	**20025**	**20267**
OSP-P50	20	33	43	M6	14	52	80	65	**20025**	**20267**



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Linear Drive Accessories

ø 16-50 mm
T-Slot Profile

OSP
ORIGA
SYSTEM
PLUS

For Linear-drive

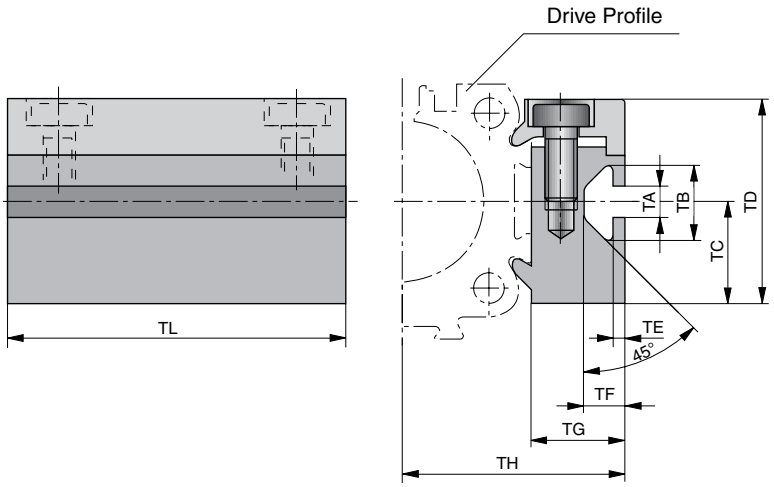
- **Series OSP-P**

T-Slot Profile OSP

- A universal attachment for mounting with standard T-Nuts

G

Dimensions



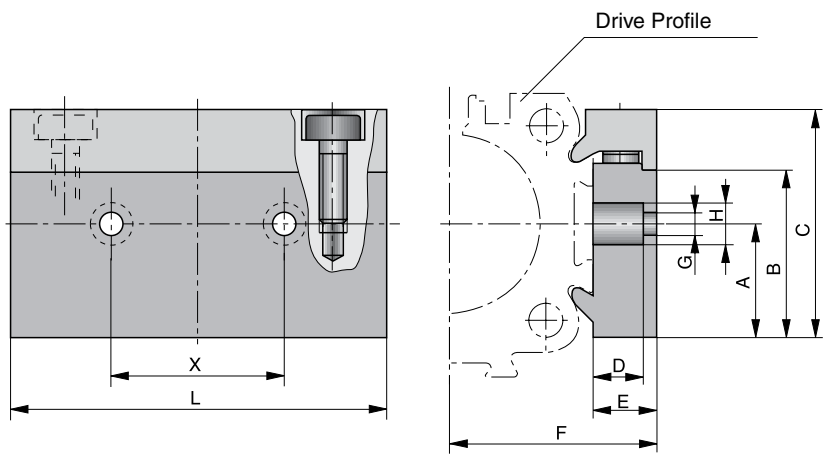
Dimension Table (mm)

Series	TA	TB	TC	TD	TE	TF	TG	TH	TL	Order No. Standard	Order No. Stainless
OSP-P16	5	11.5	14	28	1.8	6.4	12	27	50	**20433**	**20439**
OSP-P25	5	11.5	16	32	1.8	6.4	14.5	34.5	50	**20007**	**20187**
OSP-P32	5	11.5	16	32	1.8	6.4	14.5	40.5	50	**20007**	**20187**
OSP-P40	8.2	20	20	43	4.5	12.3	20	51	80	**20026**	**20268**
OSP-P50	8.2	20	20	43	4.5	12.3	20	58	80	**20026**	**20268**



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Dimensions



Linear Drive Accessories

ø 16-50 mm
Connection Profile

OSP
ORIGA SYSTEM PLUS

For combining

- **Series OSP-P with system profiles**
- **Series OSP-P with Series OSP-P**

Dimension Table (mm)

Cylinder Series	for mounting on the carrier of	A	B	C	D	E	F	G	H	L	X	Order No.
OSP-P16	OSP25	14	20.5	28	8.5	12	27	5.5	10	50	25	**20849**
OSP-P25	OSP32-50	16	23	32	8.5	10.5	30.5	6.6	11	60	27	**20850**
OSP-P32	OSP32-50	16	23	32	8.5	10.5	36.5	6.6	11	60	27	**20850**
OSP-P40	OSP32-50	20	33	43	8	14	45	6.6	11	60	27	**20851**
OSP-P50	OSP32-50	20	33	43	8	14	52	6.6	11	60	27	**20851**

Possible Combinations

Combination of Series OSP-P with system profiles



Combination of Series OSP-P with Series OSP-P





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Linear Drive Accessories

ø 25-50 mm Joint Clamp Connection

OSP
ORIGA SYSTEM PLUS

For connection of cylinders of the Series OSP-P

The joint clamp connection combines two OSP-P cylinders of the same size into a compact unit with high performance.

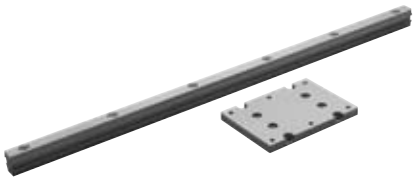
Features

- Increased load and torque capacity
- Higher driving forces

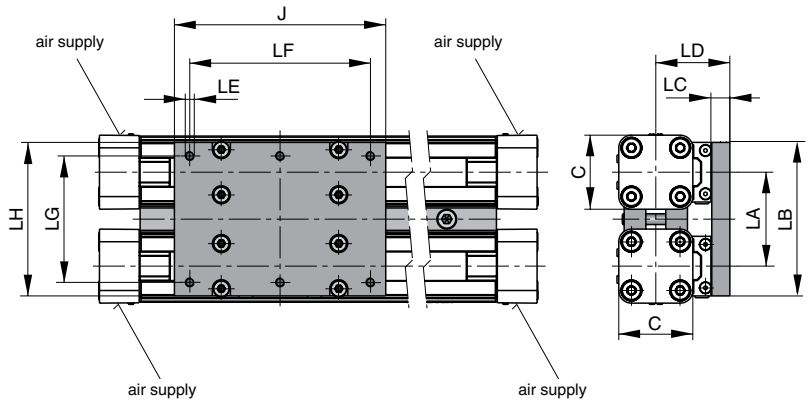
Included in delivery:

2 clamping profiles with screws

1 mounting plate with fixings

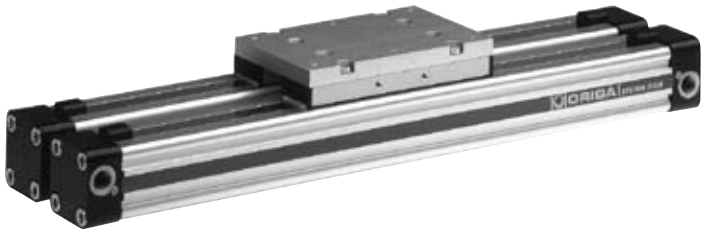


Dimensions



Dimension Table (mm)

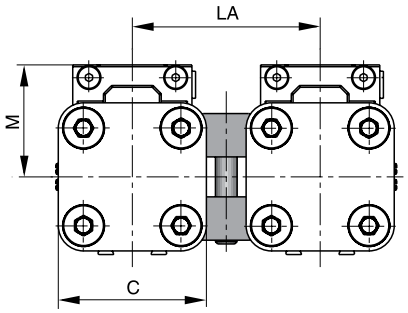
Cylinder Series	C	J	LA	LB	LC	LD	LE	LF	LG	LH
OSP-P25	41	117	52	86	10	41	M5	100	70	85
OSP-P32	52	152	64	101	12	50	M6	130	80	100
OSP-P40	69	152	74	111	12	56	M6	130	90	110
OSP-P50	87	200	88	125	12	61	M6	180	100	124



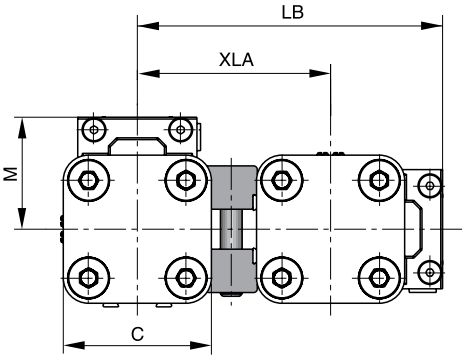
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Dimensions

Installation:
Top carrier/Top carrier

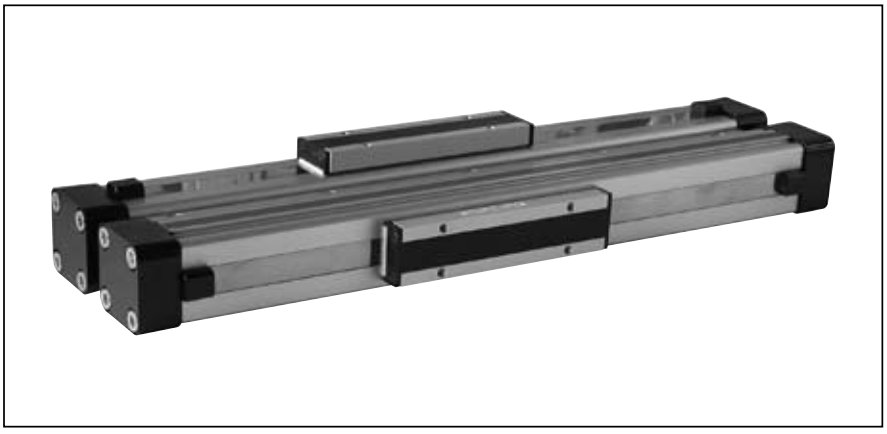


Installation:
Top carrier/Side carrier



Dimension Table (mm)

Cylinder Series	C	M	LA	LE	XLA	Order No.	
						Standard	Stainless
OSP-P25	41	31	52	84.5	53.5	**20035**	**20193**
OSP-P32	52	38	64	104.5	66.5	**20167**	**20265**
OSP-P40	69	44	74	121.5	77.5	**20036**	**20275**
OSP-P50	87	49	88	142.5	93.5	**20168**	**20283**



Linear Drive Accessories

ø 25-50 mm Multiplex Connection

OSP
ORIGA SYSTEM PLUS

For connection of cylinders of the Series OSP-P

The multiplex connection combines two or more OSP-P cylinders of the same size into on unit.

Features

- The orientation of the carriers can be freely selected

Included in delivery:

2 clamping profiles with clamping screws



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Ordering Instructions / Part Numbering System for OSP-P Rodless Basic Pneumatic Series

6		7	8	9	10	11	12-16	17	18	19	20	21	22	23	24	25
OSPP	25	0	0	1	0	0	01100	0	0	1	0	0	0	0	0	0

Bore
10
16
25
32
40
50
63
80

Piston Style
0 Standard
1 Tandem
S Special

Air Connections / Porting
0 Standard (position #2)
1 End Face (position #5)
2 Single End Porting
3 Left Stand (pos #2), Right End Face (pos #5)
4 Right Stand (pos #2), Left End Face (pos #5)
6 Single End Porting End Face
A 3/2 Way Valve VOE 24V = (25,32,40,50)
B 3/2 Way Valve VOE 220V~/110V= (25,32,40,50)
C 3/2 Way Valve VOE 48V=(25,32,40,50)
E 3/2 Way Valve VOE 110V~ (25,32,40,50)
S Special

Notes: 10mm bore can only have standard port locations.
Single End Porting on 16mm bore, then end caps cannot be rotated.

Seals
0 Standard
1 Viton
S Special

Lubrication
0 Standard
1 Slow Speed
4 Food
5 Clean Room
S Special

Corrosion Resist, Hardware
0 Standard
1 Stainless
S Special

Stroke
x x x x x

End Cap Position
0 l+r 0° = In Front (pos #2)
1 l+r 90° = Underneath (pos #3)
2 l+r 180° = At the Back (pos # 4)
3 l+r 270° = Same Face as Outerband (pos #2,1)
4 l 90° = Underneath; r 0° = In Front (pos #3,2)
5 l 180° = At the Back; r 0° = In Front (pos #4,2)
6 l 270° = Same Face as Outerband; r 0° = In Front (pos #1,2)
7 l 0° = In Front; r 90° = Underneath (pos #2, 3)
8 l 180° = At the Back; r 90° = Underneath (pos #4,3)
9 l 270° = Same Face as Outerband; r 90° = Underneath (pos #1,3)
A l 0° = In Front; r 180° = At the Back (pos #2,4)
B l 90° = Underneath; r 180° = At the Back (pos #3,4)
C l 270° = Same Face as Outerband; r 180° = At the Back (pos #1,4)
D l 0° = In Front; r 270° = Same Face as Outerband (pos #2,1)
E l 90° = Underneath; r 270° = Same Face as Outerband (pos #3,1)
F l 180° = At the Back; r 270° = Same Face as Outerband (pos #4,1)
S Special

Cushioning / Stops
0 Standard
S Special

Piston Mountings
0 None
1 Floating Mount (NR25)
8 Joint Clamp Plate (NR24)
S Special

Guides / Brakes / Inversion Mounts
0 Non e
A AB Activebrake
M Inversion (NR30)
N Joint Clamp (25,32,40,50)
S Special

add. Carriage
0 Without
S Special

Dovetail Cover
0 Standard
X Without Cover Rail
S Special

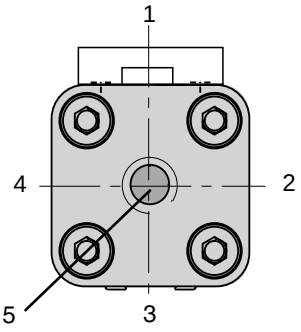
End Cap Mounts
0 Without
1 A1 (10,16,25,32)
2 A2 (16,25,32)
3 A3 (25,32)
4 B1 (25,32)
6 B3 (16)
7 B4 (25,32)
8 B5 (32)
9 C1 (40,50,63,80)
A C2 (40,50)
B C3 (40,50,63,80)
C C4 (40,50)

Note: Comes in pairs

Version

Switches / Measuring System
0 none
1 NO Reed-KL3045 (All except 10mm) Qty. 2
2 NC Reed-KL3048 (All except 10mm) Qty. 2
3 PNP KL3054+4041 (All except 10mm) Qty. 2
4 NPN KL3060+4041 (All except 10mm) Qty. 2
5 NO Reed-KL3045 (10mm only)
6 PNP 3049+4041 (10mm only) Qty. 2
7 PNP 3753+4041 (10mm only) Qty. 2
X 21240 SFI 0,1mm
Y 21241 SFI 1mm
Z 4650 SFA
S Special

Note: 2 switches will be supplied. For different quantity, please order as a separate line item.



Note: Position #2 is the standard location.

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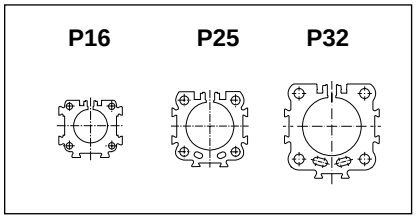
Characteristics				Pressure quoted as gauge pressure
Characteristics		Symbol	Unit	Description
General Features				
Type				Rodless Cylinder
Series				OSP-P
System				Double-acting, with cushioning, position sensing capability
Mounting				see drawings
Air connection				Threaded
Ambient and medium temperature range		T_{min} T_{max}	°C °C	-10 – other temperature ranges +80 on request
Weight (Mass)			kg	See table below
Installation				In any position
Medium				Filtered, unlubricated compressed air (other media on request)
Lubrication				Permanent grease lubrication (additional oil mist lubrication not required) Option: special slow speed grease
Material	Cylinder profile			Anodized aluminum
	Carrier (piston)			Anodized aluminum
	End caps			Aluminum, lacquered
	Sealing bands			Corrosion resistant steel
	Seals			NBR (Option: Viton®)
	Screws			Stainless steel
	Covers			Anodized aluminum
	Guide plate			Plastic
Max. operating pressure*		p_{max}	bar	8

* Pressure quoted as gauge pressure

Weight (Mass) kg

Cylinder series (basic cylinder)	Weight (Mass) kg	
	at 0 mm stroke	per 100 mm stroke
OSP-P16	0.22	0.1
OSP-P25	0.65	0.197
OSP-P32	1.44	0.354

Size Comparison



Clean Room Cylinder

ø 16 – 32 mm Rodless Cylinder certified to DIN EN ISO 14644-1

OSP
ORIGA SYSTEM PLUS

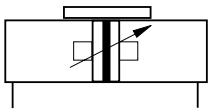
Standard Versions:

- Double-acting with adjustable end cushioning
- With magnetic piston for position sensing
- Stainless steel screws

Special Versions:

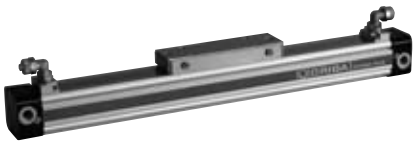
- Slow speed lubrication
- Viton® seals

Series OSP-P..



Features:

- Clean room classification
  ISO Class 4 at v_m = 0.14 m/s
  ISO Class 5 at v_m = 0.5 m/s
- Suitable for smooth slow speed operation up to v_{min} = 0.005 m/s
- Optional stroke length up to 1200 mm (longer strokes on request)
- Low maintenance
- Compact design with equal force and velocity in both directions
- Aluminum piston with bearing rings to support high direct and cantilever loads



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Certification

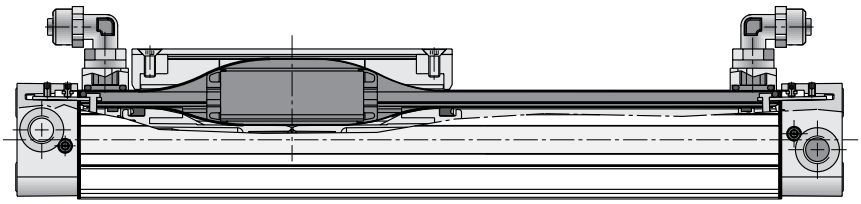
Based on the PARKER-ORIGA rodless cylinder, proven in world wide markets, PARKER-ORIGA now offers the only rodless cylinder on the market with a certification from IPA Institute for the cleanroom specification according to DIN EN ISO 14644-1.



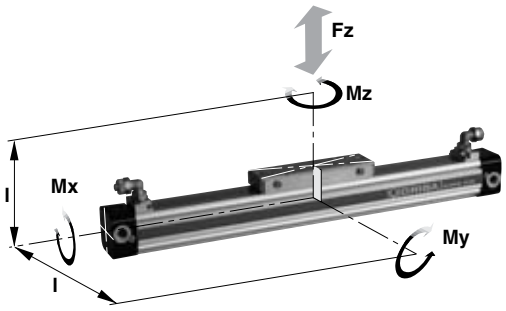
Function:

The clean room cylinders of the ORIGA SYSTEM PLUS (OSP-P) combines the efficiency of the PARKER-ORIGA slot seal system with vacuum protection against progressive wear and contamination from the sliding components. A partial vacuum drawn between inner and outer sealing bands prevents emission into the clean room. To achieve the necessary vacuum a suction flow of ca. 4 m^3/h is required.

Function Diagram



Loads, Forces and Moments



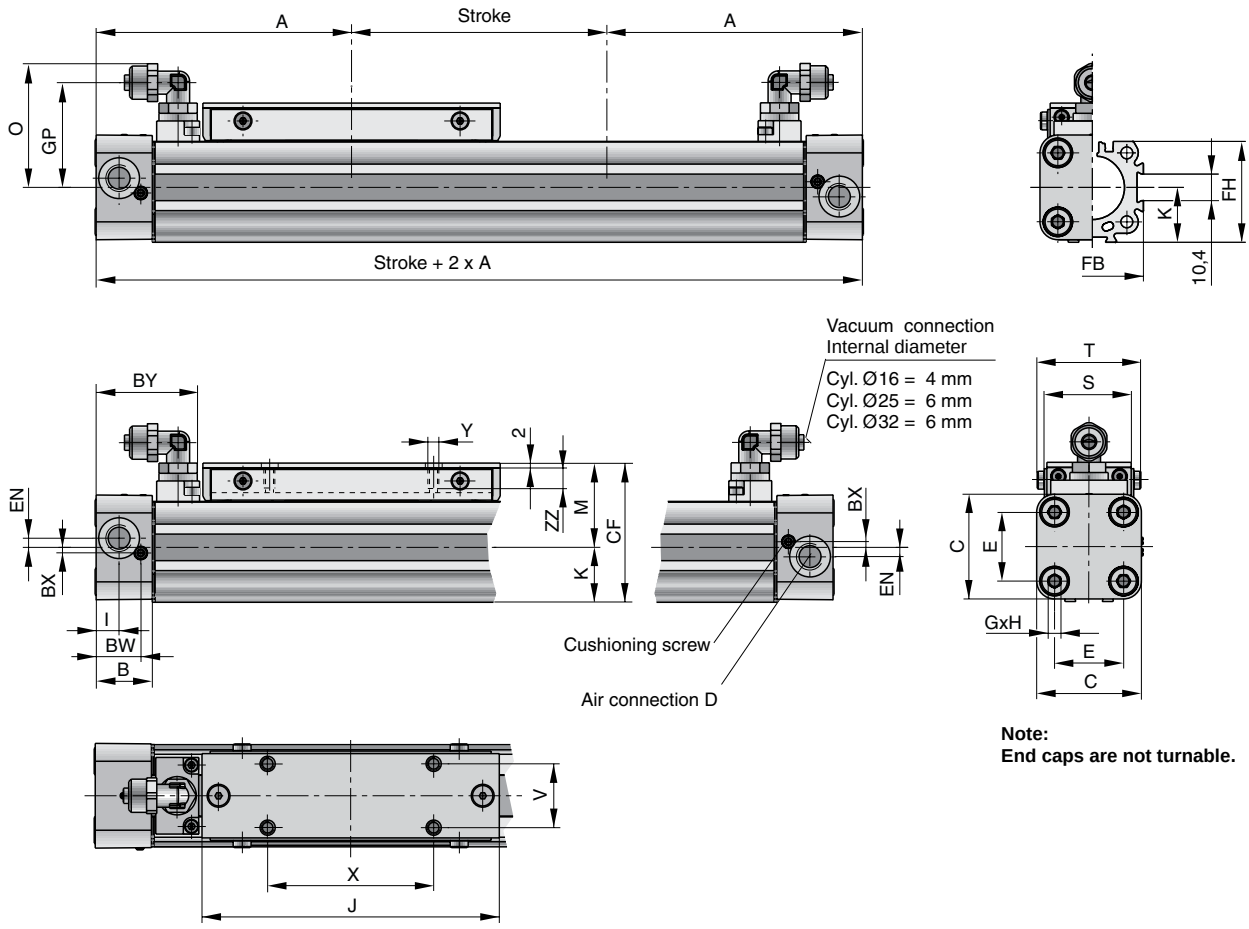
Mx = F · l
My = F · l
Mz = F · l

Cylinder Series (mm Ø)	Effective Force at 6 bar (N)	Max. Moment Mx (Nm)	My (Nm)	Mz (Nm)	Max. Load Fz (N)	Cushion length (mm)
OSP-P16	78	0.45	4	0.5	120	11
OSP-P25	250	1.5	15	3.0	300	17
OSP-P32	420	3.0	30	5.0	450	20

Load and moment data are based on speeds v ≤ 0.2 m/s.
The adjacent table shows the maximum values for light, shock-free operation which must not be exceeded even in dynamic operation.

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Dimensions (mm)



Note:
End caps are not turnable.

Dimension Table (mm)

Cylinder Series	A	B	C	D	E	G	H	I	J	K	M	O	S
OSP-P16	65	14	30	M5	18	M3	9	5.5	69	15	25	31	24
OSP-P25	100	22	41	G1/8	27	M5	15	9	117	21.5	33	48.5	35
OSP-P32	125	25.5	52	G1/4	36	M6	15	11.5	152	28.5	40	53.6	38

Cylinder Series	T	V	X	Y	BW	BX	BY	CF	EN	FB	FH	GP	ZZ
OSP-P16	29.6	16.5	36	M4	10.8	1.8	28.5	40	3	30	27.2	25.7	7
OSP-P25	40.6	25	65	M5	17.5	2.2	40.5	54.5	3.6	40	39.5	41	8
OSP-P32	45	27	90	M6	20.5	2.5	47.1	68.5	5.5	52	51.7	46.2	10

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Ordering Instructions / Part Numbering System for OSP-P Clean Room Series

6		7	8	9	10	11	12-16	17	18	19	20	21	22	23	24	25
OSPP	32	0	0	0	0	S	02500	0	0	0	G	0	0	2	0	0

Bore
16
25
32

Piston Style
0 Standard

Air Connection / Porting
7 Clean Room

Seals
0 Standard
1 Viton
S Special

Lubrication
0 Standard
1 Slow Speed
4 Food
5 Clean Room
S Special

Corrosion Resist, Hardware
0 Standard
1 Stainless
S Special

Stroke
x x x x x

End Cap Position
0 I+r 0° = In Front (pos #2)

Cushioning / Stops
0 Standard

Piston Mountings
0 None

Guides / Brakes
0 None

add. Carriage
0 Without

Dovetail Cover
0 Standard
X Without Cover Rail
S Special

End Cap Mounts
0 Without
1 A1 (16,25,32)
2 A2 (16,25,32)
3 A3 (25,32)
4 B1 (25,32)
6 B3 (16)
7 B4 (25,32)
8 B5 (32)

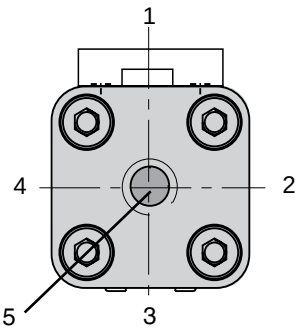
Note: Comes in pairs

Version

Switches / Measuring System
0 none
1 NO Reed- KL3045 Qty. 2
2 NC Reed- KL3048 Qty. 2
3 PNP KL3054+4041 Qty. 2
4 NPN KL3060+4041 Qty. 2

Note: 2 switches will be supplied. For different quantity, please order as a separate line item.

G



Note: Position #2 is the standard location.

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Rodless Cylinder Ø 40 mm

for synchronized bi-parting movements

Type OSP-P40-SL-BP

OSP
ORIGA SYSTEM PLUS

Features:

- Accurate bi-parting movement through toothed belt synchronization
- Optimum slow speed performance
- Increased action force
- Anodized aluminum guide rail with prism-form slideway arrangement
- Adjustable polymer slide units
- Combined sealing system with polymer and felt elements to remove dirt and lubricate the slideway
- Integrated grease nipples for guide lubrication

Applications:

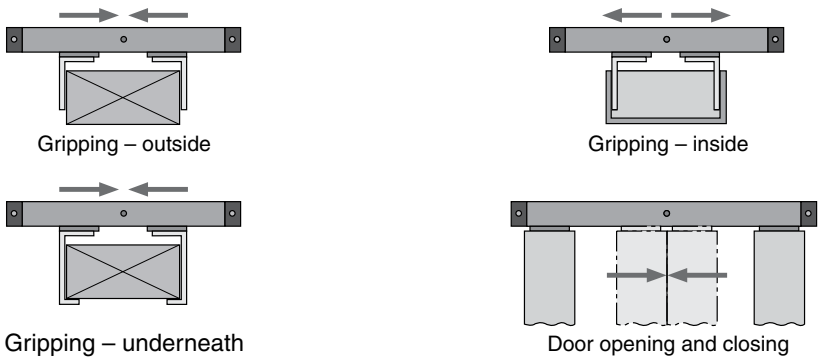
- Opening and closing operations
- Gripping of workpieces – outside
- Gripping of hollow workpieces – inside
- Gripping underneath larger objects
- Clamping force adjustable via pressure regulator



Characteristics

Characteristics	Symbol	Unit	Description
General Features			
Type			Rodless cylinder for synchronized bi-parting movements
Series			OSP-P
System			Double acting with end cushioning. For contactless position sensing
Guide			Slideline SL40
Synchronization			Toothed belt
Mounting			See drawings
Ambient temperature range	T_{min} T_{max}	°C °C	-10 +60
Weight (Mass)		kg	see table page G48
Medium			Filtered, unlubricated compressed air (other media on request)
Lubrication			Special slow speed grease – additional oil mist lubrication not required
Material			
Toothed Belt			Steel-corded polyurethane
Belt wheel			Aluminum
Operating pressure range	p_{max}	bar	6
Cushioning middle position			Elastic buffer
Max. Speed	v_{max}	m/s	0.2
Max. stroke of each stroke		mm	500
Max. mass per guide carrier		kg	25
Max. moments on guide carrier			
lateral moment	Mx_{max}	Nm	25
axial moment	My_{max}	Nm	46
rotating moment	Mz_{max}	Nm	46
For more technical information see pages B41			

Applications



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Weight (mass) kg		
Cylinder series (Basic cylinder)	Weight (Mass) kg	
	At 0 mm stroke	per 100 mm stroke
OSP-P40-SL-BP	10.334	2.134

Function:

The OSP-P40-SL-BP bidirectional linear drive is based on the OSP-P40 rodless pneumatic cylinder and adapted SLIDELINE SL40 polymer plain-bearing guides.

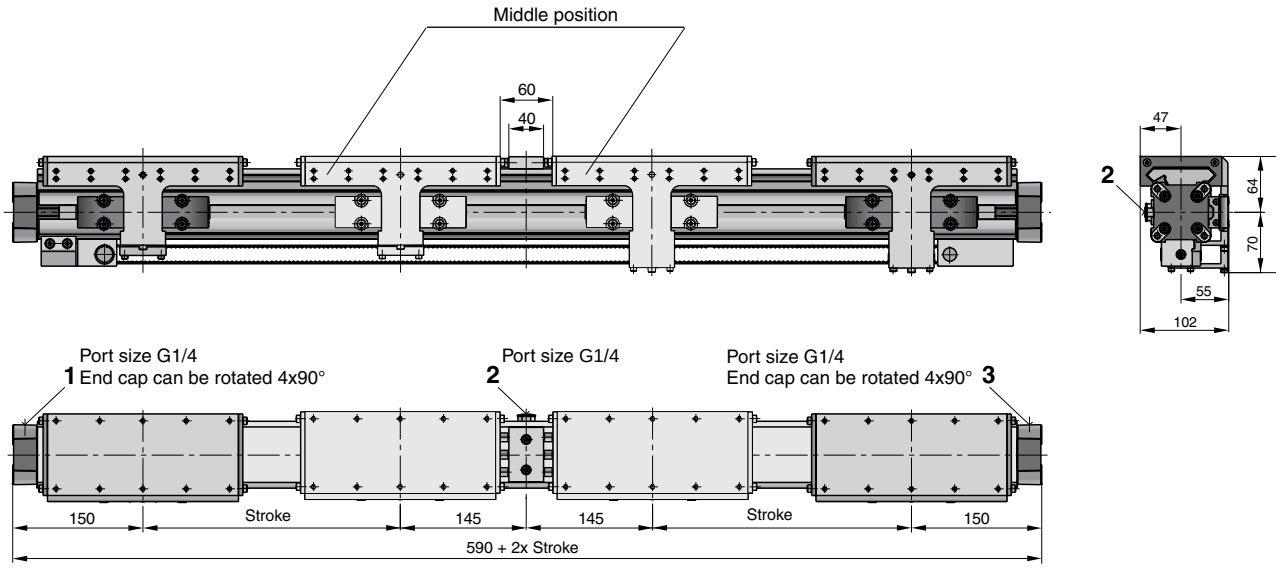
Two pistons in the cylinder bore are connected via yokes and carriers to the SLIDELINE guide carriers, which handle the forces and moments generated.

The bi-parting movements of the guide carriers are accurately synchronized by a recirculating toothed belt.

The two pistons are driven from the middle to the end positions via a common G1/4 air connection in the middle of the cylinder, and are driven from the end positions to the middle via an air connection in each end cap.

End position cushioning is provided by adjustable air cushioning in the end caps, and middle position cushioning by rubber buffers.

Dimensions (mm)



Air connections:

To drive the guide carriers to the middle position: pressurize ports 1 and 3.

To drive the guide carriers to the end positions: pressurize port 2.

For more dimensions see pages G23 and G54

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Ordering Instructions / Part Numbering System for OSP-P Bi-Parting Rodless Cylinders Series

6	7	8	9	10	11	12-16	17	18	19	20	21	22	23	24	25
OSPP	40	N	7	0	5	0	01000	0	0	0	0	0	0	9	0	0

Bore
40

Piston Style
N Bi-Parting

Air Connections / Porting
- 0 Standard (position #2)
- 1 End Face (position #5
- 2 Single End Porting
- 3 Left Stand (pos #2), Right End Face (pos #5)
- 4 Right Stand (pos #2), Left End Face (pos #5)
- 6 Single End Porting End Face
- S Special

Seals
0 Standard

Lubrication
0 Standard

Corrosion Resist, Hardware
- 0 Standard
- 1 Stainless
- S Special

Stroke
x x x x x

End Cap Position
- 0 l+r 0° = In Front (pos #2)
- 1 l+r 90° = Underneath (pos #3)
- 2 l+r 180° = At the Back (pos # 4)
- 3 l+r 270° = Same Face as Outerband (pos #2,1)
- 4 l 90° = Underneath; r 0° = In Front (pos #3,2)
- 5 l 180° = At the Back; r 0° = In Front (pos #4,2)
- 6 l 270° = Same Face as Outerband; r 0° = In Front (pos #1,2)
- 7 l 0° = In Front; r 90° = Underneath (pos #2, 3)
- 8 l 180° = At the Back; r 90° = Underneath (pos #4,3)
- 9 l 270° = Same Face as Outerband; r 90° = Underneath (pos #1,3)
- A l 0° = In Front; r 180° = At the Back (pos #2,4)
- B l 90° = Underneath; r 180° = At the Back (pos #3,4)
- C l 270° = Same Face as Outerband; r 180° = At the Back (pos #1,4)
- D l 0° = In Front; r 270° = Same Face as Outerband (pos #2,1)
- E l 90° = Underneath; r 270° = Same Face as Outerband (pos #3,1)
- F l 180° = At the Back; r 270° = Same Face as Outerband (pos #4,1)
- S Special

Cushioning / Stops
0 Standard

Piston Mountings
0 None

Guides / Brakes
0 None

add. Carriage
0 Without

Dovetail Cover
- 0 Standard
- X Without Cover Rail
- S Special

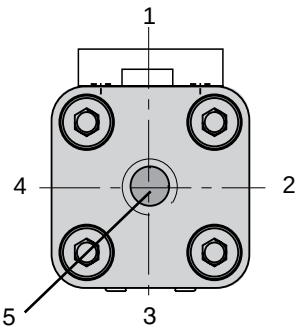
End Cap Mounts
- 0 Without
- 9 C1
- A C2
- B C3
- C C4

Note: Comes in pairs

Version

Switches / Measuring System
- 0 none
- 1 NO Reed-KL3045 Qty. 2
- 2 NC Reed-KL3048 Qty. 2
- 3 PNP KL3054+4041 Qty. 2
- 4 NPN KL3060+4041 Qty. 2

Note: 2 switches will be supplied. For different quantity, please order as a separate line item.



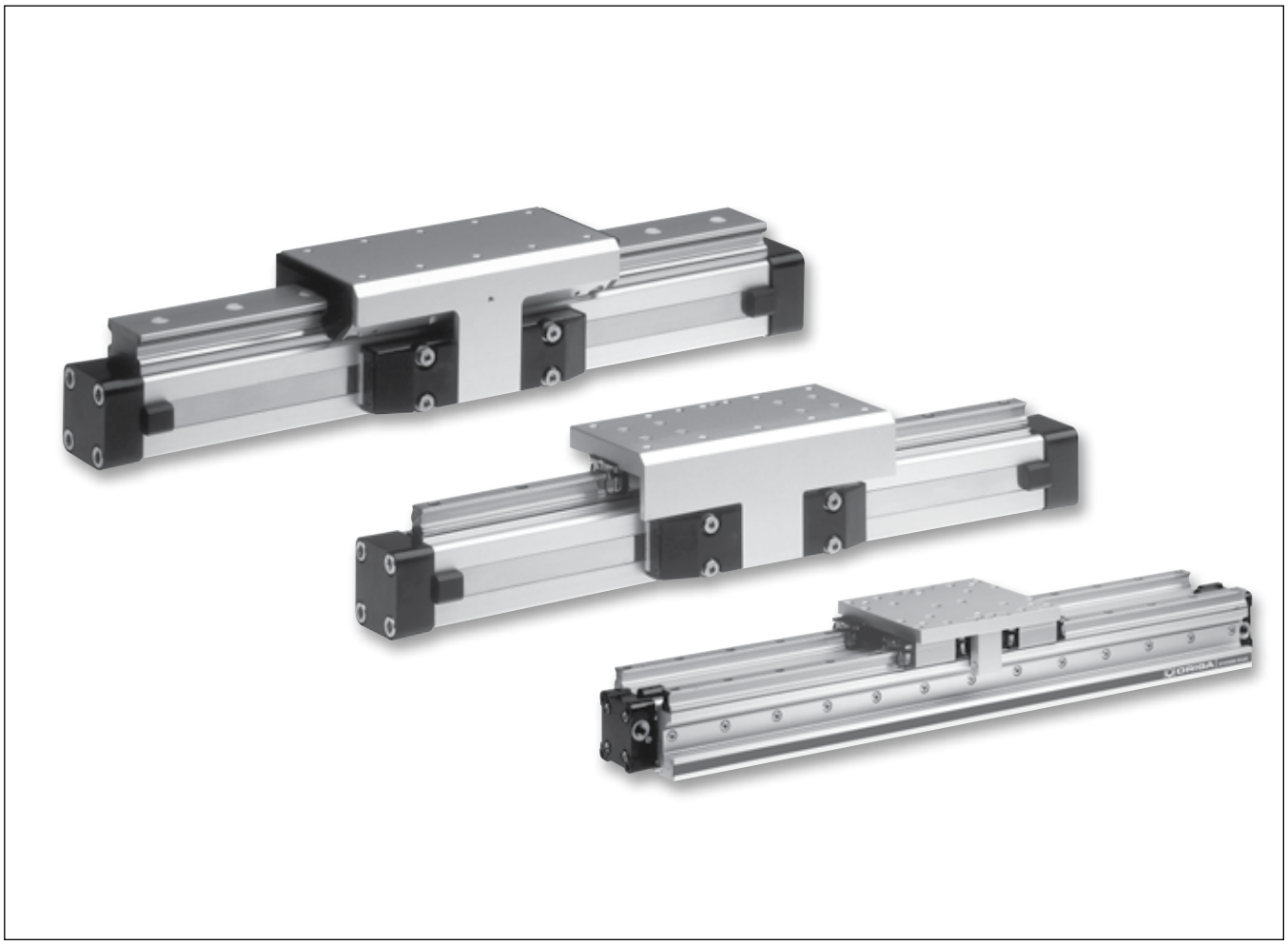
Note: Position #2 is the standard location.

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Linear Guides for Series OSP-P



Overview G52
Plain Bearing Guide SLIDELINE
- Technical G53
- Dimensions G54
- Multi-Brakes G55-G58
- Accessories (Mountings & Supports) G59-G61
- Ordering Information G62

Roller Guide POWERSLIDE
- Technical G63-G66
- Dimensions G64
- Accessories (Mountings & Supports) G67-G69
- Ordering Information G70

Aluminum Roller Guide PROLINE
- Technical G71
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Recirculating Ball Bearing Guide STARLINE
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- Variable Stops G83-G85
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Recirculating Ball Bearing Guide KF
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Heavy Duty Guide HD
- Technical G104
- Dimensions G105-G106
- Variable Stops G107
- Intermediate Stop G108-G110
- Ordering Information G111

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OSP
ORIGA SYSTEM PLUS

Adaptive modular system

The Origa system plus – OSP – provides a comprehensive range of linear guides for the pneumatic and electric linear drives.

Advantages:

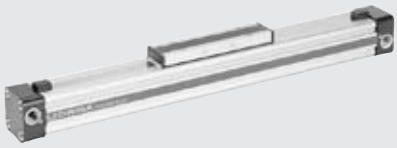
- Takes high loads and forces
- High precision
- Smooth operation
- Can be retrofitted
- Can be installed in any position

G

Rodless Pneumatic Cylinder
Series OSP - P

Piston diameters 10 – 80 mm

See page:
G19 (Standard)



Linear Guides

SLIDELINE
The cost-effective plain bearing guide for medium loads.
Active/ Passive Brake optional.
Piston diameters 16 – 80 mm



POWERSLIDE
The roller guide for heavy loads and hard application conditions
Piston diameters 16 – 50 mm



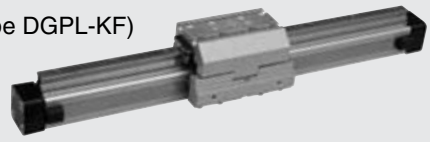
PROLINE
The compact aluminum roller guide for high loads and velocities.
Active/ Passive Brake optional.
Piston diameters 16 – 50 mm



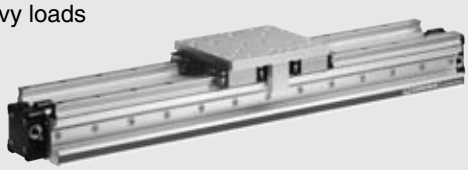
STARLINE
Recirculating ball bearing guide for very high loads and precision
Piston diameters 16 – 50 mm



KF GUIDE
Recirculating ball bearing guide for highest loads and precision.
Correspond to FESTO dimensions (Type DGPL-KF)
Piston diameters 16 – 50 mm



HD HEAVY DUTY GUIDE
The ball bushing guide for the heavy loads and greatest accuracy.
Piston diameters 25 – 50 mm

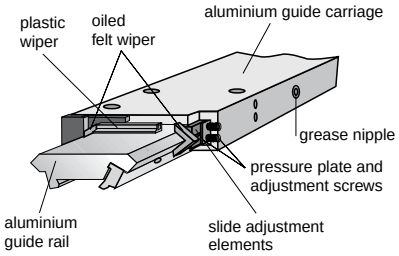


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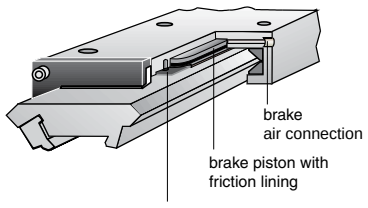
Versions

for pneumatic linear drive:
Series OSP-P





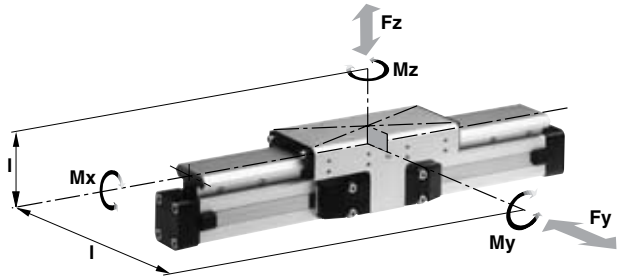
Option – Integrated Brake



Integrated Brake (optional)
for series OSP-P25 to OSP-P50:
- Actuated by pressure
- Released by exhausting and spring return

For further technical data see also linear drives OSP-P (page G19)

Loads, Forces and Moments



Technical Data

The table shows the maximum permissible values for smooth operation, which should not be exceeded even under dynamic conditions.

The load and moment figures apply to speeds v < 0.2 m/s.

*** Please note:**
In the cushioning diagram, add the mass of the guide carriage to the mass to be cushioned.

Plain Bearing Guide SLIDELINE

OSP
ORIGA SYSTEM PLUS

Series SL 16 to 80
for Linear-drive
- **Series OSP-P**

Features:
- Adjustable plastic slide elements – optional with integral brake
- Composite sealing system with plastic and felt wiper elements to remove dirt and lubricate the slideways.
- Corrosion resistant version available on request.
- Any length of stroke up to 5500 mm (longer strokes on request)

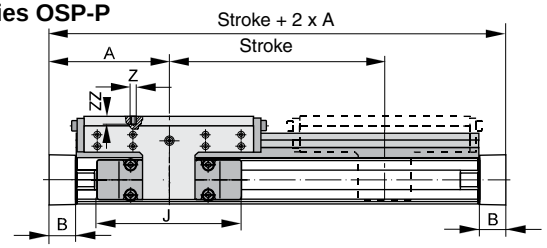
[1] Only with integrated brake: Braking force on dry oil-free surface Values are decreased for lubricated slideways
[2] Corrosion resistant fixtures available on request

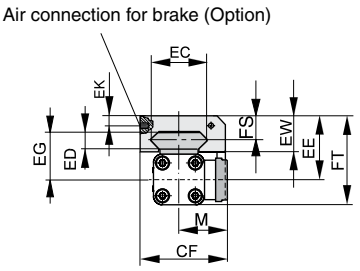
Series	For linear drive	Max. moments (Nm)			Max. loads (N)	Maximum braking force at 6 bar (N) [1]	Mass of linear drive with guide (kg)		Mass * of guide carriage (kg)
			Mx	My	Mz	Fy, Fz	with 0 mm stroke	increase per 100 mm stroke	
SL16	OSP-P16	6	11	11	325	–	0.57	0.22	0.23
SL 25	OSP-P25	14	34	34	675	325	1.55	0.39	0.61
SL 32	OSP-P32	29	60	60	925	545	2.98	0.65	0.95
SL 40	OSP-P40	50	110	110	1500	835	4.05	0.78	1.22
SL50	OSP-P50	77	180	180	2000	1200	6.72	0.97	2.06
SL63	OSP-P63	120	260	260	2500	–	11.66	1.47	3.32
SL80	OSP-P80	120	260	260	2500	–	15.71	1.81	3.32

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Dimensions

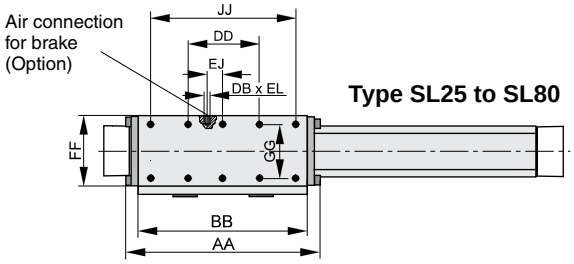
Series OSP-P



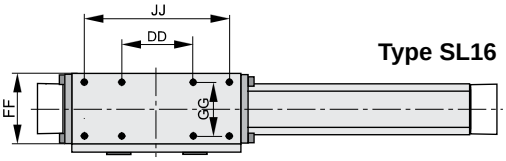


For further mounting elements and options see accessories.

For further information and technical data see data sheets for linear drives OSP-P (page G19)



Type SL25 to SL80



Type SL16

Dimension Table (mm)

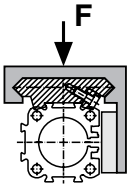
Series	A	B	J	M	Z	AA	BB	DB	DD	CF	EC	ED	EE	EG	EJ	EK	EL	EW	FF	FT	FS	GG	JJ	ZZ
SL16	65	14	69	31	M4	106	88	–	30	55	36	8	40	30	–	–	–	22	48	55	14	36	70	8
SL25	100	22	117	40.5	M6	162	142	M5	60	72.5	47	12	53	39	22	6	6	30	64	73.5	20	50	120	12
SL32	125	25.5	152	49	M6	205	185	M5	80	91	67	14	62	48	32	6	6	33	84	88	21	64	160	12
SL40	150	28	152	55	M6	240	220	M5	100	102	77	14	64	50	58	6	6	34	94	98.5	21.5	78	200	12
SL50	175	33	200	62	M6	284	264	M5	120	117	94	14	75	56	81	6	6	39	110	118.5	26	90	240	16
SL63	215	38	256	79	M8	312	292	–	130	152	116	18	86	66	–	–	–	46	152	139	29	120	260	14
SL80	260	47	348	96	M8	312	292	–	130	169	116	18	99	79	–	–	–	46	152	165	29	120	260	14

Mid-Section Support

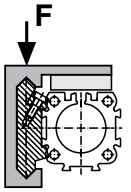
(for versions see pages G59)

Mid-section supports are required from a certain stroke length to prevent excessive deflection and vibration of the linear drive. The diagrams show the maximum permissible unsupported length in relation to loading. A distinction must be drawn between loading 1 and loading 2. Deflection of 0.5 mm max. between supports is permissible.

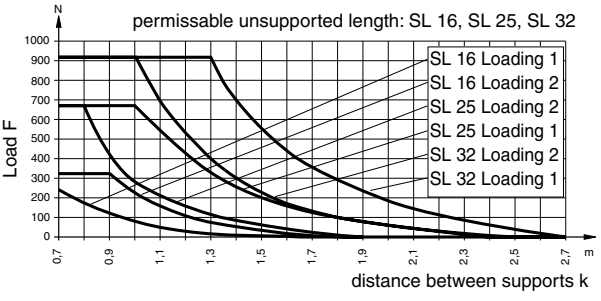
Note:
For speeds v > 0.5 m/s the distance between supports should not exceed 1 m.

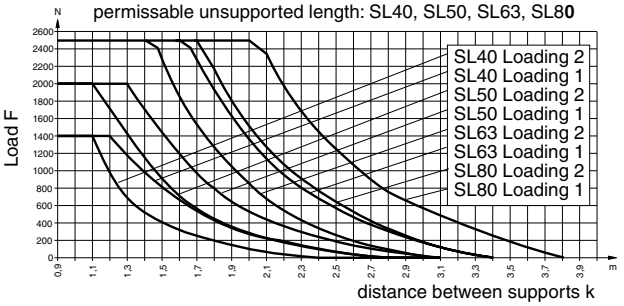


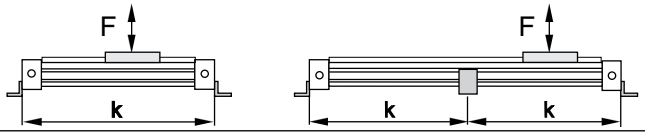
loading 1



loading 2







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Multi-Brake Passive Brake

with plain bearing guide Slideline SL

OSP
ORIGA SYSTEM PLUS

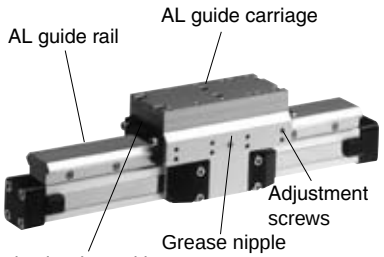
Series MB-SL 25 to 80 for Linear-drive

- **Series OSP-P**

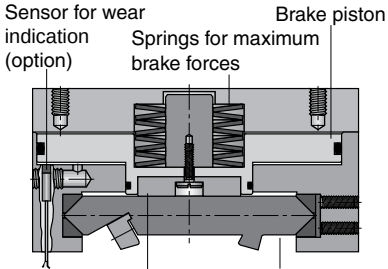
Features:

- Brake operated by spring actuation
- Brake release by pressurization
- Optional sensor to indicate brake lining wear
- Anodized aluminum rail, with prism shaped slide elements
- Adjustable plastic slide elements
- Composite sealing system with plastic and felt wiper elements to remove dirt and lubricate the slideway
- Replenishable guide lubrication by integrated grease nipples
- Blocking function in case of pressure loss
- Intermediate stops possible

Versions



Function

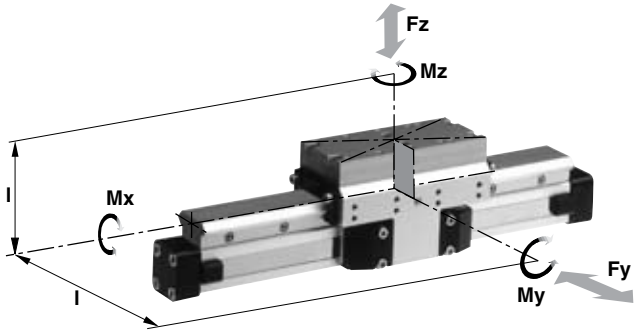


Function:

The Multi-Brake is a passive device. When the air pressure is removed the brake is actuated and movement of the cylinder is blocked. The brake is released by pressurization.

The high friction, wear resistant brake linings allow the Multi-Brake to be used as a dynamic brake to stop cylinder movement in the shortest possible time. The powerful springs also allow the Multi-Brake to be used effectively in positioning applications.

Loads, Forces and Moments



Technical Data:

The table shows the maximum values for light, shock-free operation, which must not be exceeded even in dynamic operation.

Load and moment data are based on speeds v < 0.2 m/s.

Operating pressure 4.5 - 8 bar
A pressure of 4.5 bar is required to release the brake.

For further technical information, please refer to the data sheets for linear drives OSP-P (page G19)

[1] Braking surface dry – oil on the braking surface will reduce the braking force

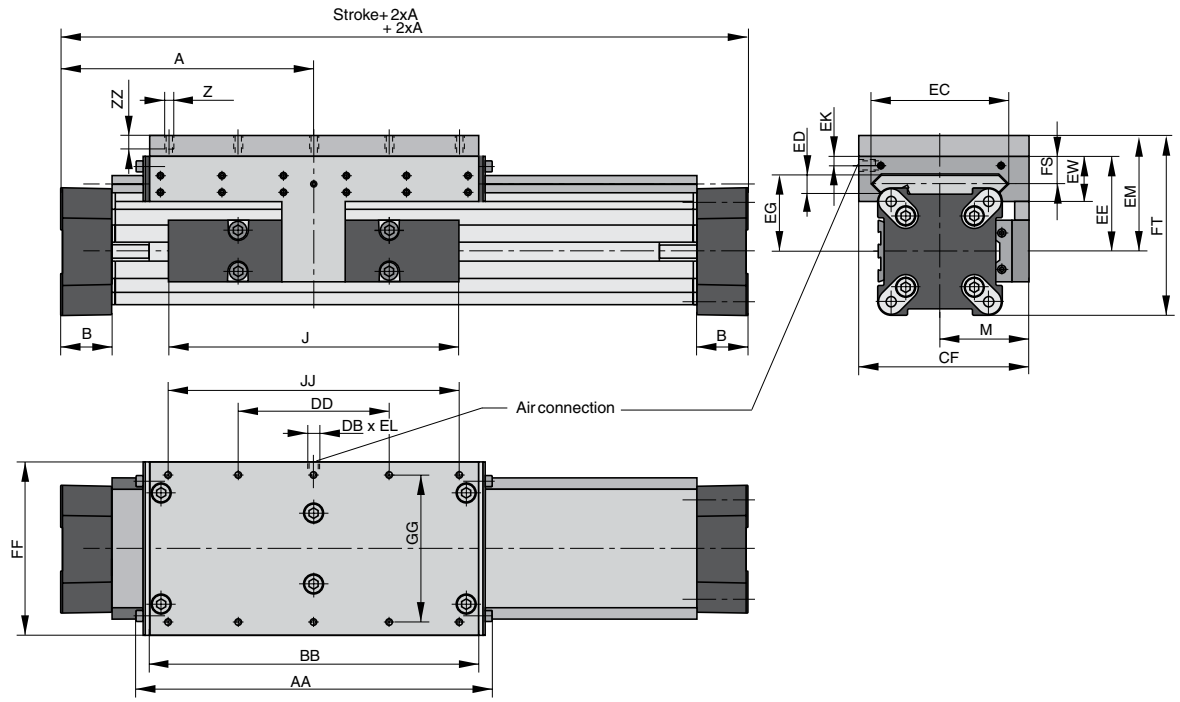
*** Please note:**

in the cushioning diagram, the mass of the guide carriage has to be added to the total moving mass.

Series	For linear drive	Max. moments (Nm)			Max. loads (N)	Max. brake force (N) [1]	Mass of linear drive with guide (kg)		Mass* guide carriage (kg)
		Mx	My	Mz	Ly, Lz		with 0 mm stroke	increase per 100 mm stroke	
MB-SL 25	OSP-P25	14	34	34	675	470	2.04	0.39	1.10
MB-SL 32	OSP-P32	29	60	60	925	790	3.82	0.65	1.79
MB-SL 40	OSP-P40	50	110	110	1500	1200	5.16	0.78	2.34
MB-SL 50	OSP-P50	77	180	180	2000	1870	8.29	0.97	3.63
MB-SL 63	OSP-P63	120	260	260	2500	2900	13.31	1.47	4.97
MB-SL 80	OSP-P80	120	260	260	2500	2900	17.36	1.81	4.97

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Series OSP-P with Passive Brake MB-SL



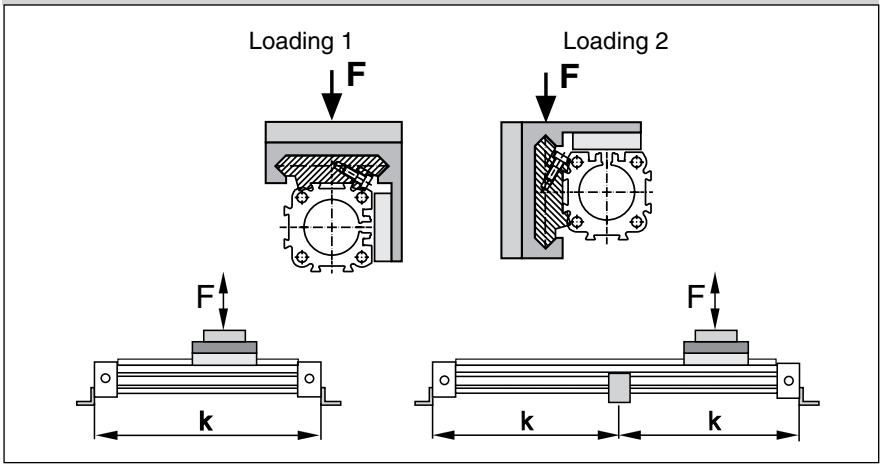
Dimension Table (mm)

Series	A	B	J	M	Z	AA	BB	DB	DD	CF	EC	ED	EE	EG	EK	EL	EM	EW	FF	FT	FS	GG	JJ	ZZ
MB-SL25	100	22	117	40,5	M6	162	142	M5	60	72.5	47	12	53	39	9	5	73	30	64	93.5	20	50	120	12
MB-SL32	125	25.5	152	49	M6	205	185	G1/8	80	91	67	14	62	48	7	10	82	33	84	108	21	64	160	12
MB-SL40	150	28	152	55	M6	240	220	G1/8	100	102	77	14	64	50	6.5	10	84	34	94	118.5	21.5	78	200	12
MB-SL50	175	33	200	62	M6	284	264	G1/8	120	117	94	14	75	56	10	12	95	39	110	138.5	26	90	240	12
MB-SL63	215	38	256	79	M8	312	292	G1/8	130	152	116	18	86	66	11	12	106	46	152	159	29	120	260	13
MB-SL80	260	47	348	96	M8	312	292	G1/8	130	169	116	18	99	79	11	12	119	46	152	185	29	120	260	13

G

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Loading



Mid Section Support

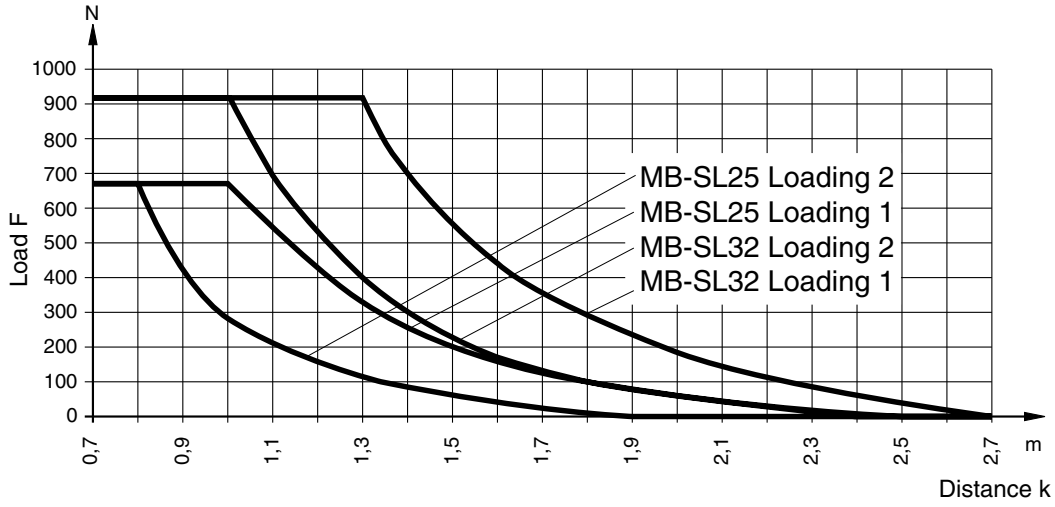
(for versions see page G59)

Mid-Section supports are required from a certain stroke length to prevent excessive deflection and vibration of the linear drive.

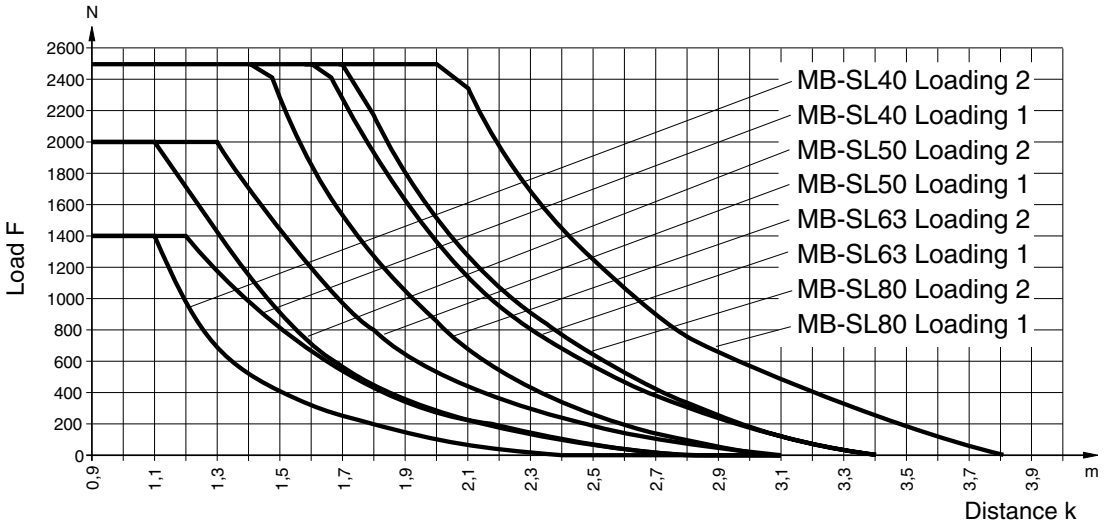
The diagrams show the maximum permissible unsupported length in relation to loading. A distinction must be drawn between loading 1 and loading 2. Deflection of 0.5 mm max. between supports is permissable.

Note:
For speeds v > 0.5 m/s the distance between supports should not exceed 1 m.

Permissible Unsupported Length MB-SL25, MB-SL32



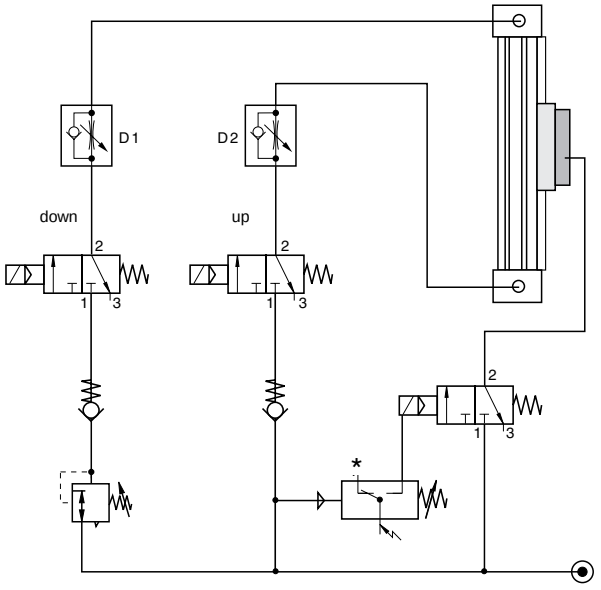
Permissible Unsupported Length MB-SL40, MB-SL50, MB-SL63 and MB-SL80



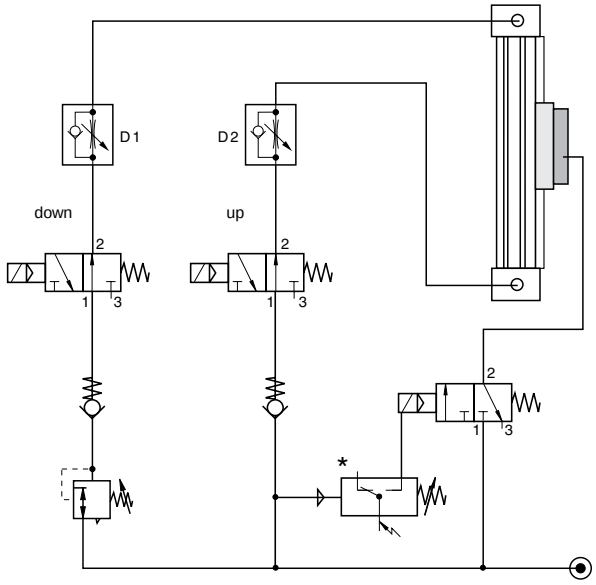
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Application Example - Vertical Application

Control of a cylinder with
3/2 way valves. Basic position – **exhausted**



Control of a cylinder with
3/2 way valves. Basic position – **pressurized**



G

Control Examples

Under normal operating circumstances the pressure switch is closed and the air flows through the 3/2 way solenoid valves from port 1 to 2, thus lifting the brake from the rail (operating condition).

The brake is pressurized by means of a 3/2 way valve in combination with a pressure switch. When there is a pressure loss, the brake is actuated by the pressure switch.

When the air pressure is restored to both cylinder chambers, the brake is lifted and the linear drive can be moved again.

The speed regulating valves D1 and D2 control the speed of the linear drive, and have no influence on the brake. The two non-return valves give the system a higher stability.

The pressure regulating valve is used to compensate for the downward force in this vertical application.

Please note:

Before the brake is lifted, make sure that both air chambers of the linear drive are pressurized.

Small diameter tubing, fittings and valves with a nominal diameter, and tubing that is too long all change the reaction time of the brake!

***Tip:**

The pressure switch actuates the brake when the pressure drops below the set value.

For accessories, such as tubing and fittings, please refer to our separate catalogue.

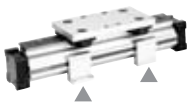
Required Components

Way Valves
Port size
M5, G1/8
G1/4, G1/2
Pressure Regulating Valves
G1/8 - G3/8
Pneumatic Accessories
P/E-Switch
Non-Return
Valves
G1/8 - G3/8
Screw-in
Speed Regulating
Valves
M5 - G1/4

Contact factory for literature on the above valves/accessories

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Overview

Mounting Type	Type	Type – OSP Guides: SLIDELINE PROLINE MULTIBRAKE 16 [1]	25	32	40	50	63 [1]	80 [1]	POWERSLIDE 16/25	25/25	25/35	25/44	32/35	32/44	40/44	40/60	50/60	50/76
End cap mounting 	Type A1	X							X									
	Type A2	O	O	O														
	Type A3									O	O		O					
End cap mounting, reinforced 	Type B1		X	X						X	X	X	X	X				
	Type B3								O									
	Type B4											O		O				
	Type B5																	
End cap mounting 	Type C1				X	X	X	X							X	X	X	X
	Type C2				O	O												
	Type C3						O	O							O		O	
	Type C4															O		O
Mid-Section support, small	Type D1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mid-Section support, wide 	Type E1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Type E2	O	O	O	O	O												
	Type E3						O	O	O	O	O		O		O		O	
	Type E4											O		O		O		O
	Type E5																	

X = carriage mounted in top (12 o'clock position)

O = carriage mounted in lateral (3 or 9 o'clock position)

= available components

1) = not available for all sizes

Linear Drive Accessories

Mountings for Linear Drives fitted with OSP-Guides

OSP
ORIGA SYSTEM PLUS

For Linear-drives

- **Series OSP-P**



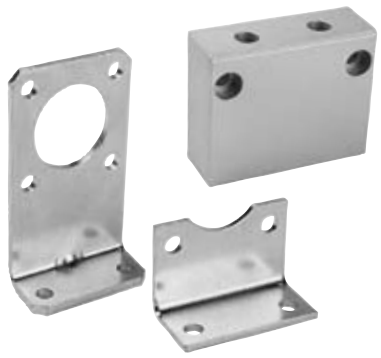
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End Cap Mountings

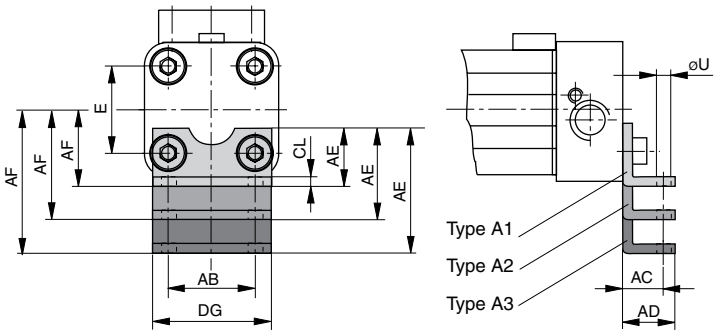
Four internal screw threads are located in the end faces of all OSP actuators for mounting the drive unit. End cap mountings may be secured across any two adjacent screws.

Material: Series OSP-16, 25, 32:
Galvanized steel
Series OSP-40,50, 63, 80:
Anodized aluminum

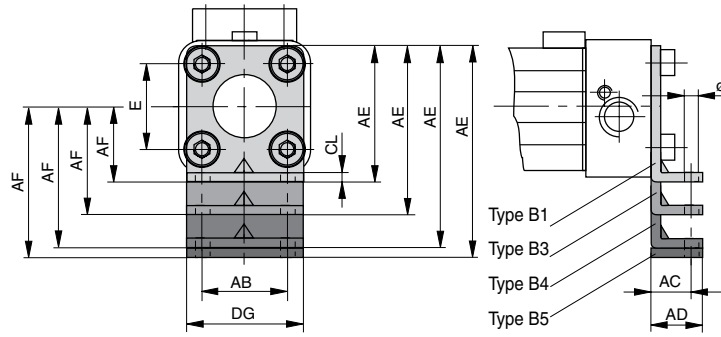
The mountings are supplied in pairs.



Series OSP-P16, 25, 32: Type A



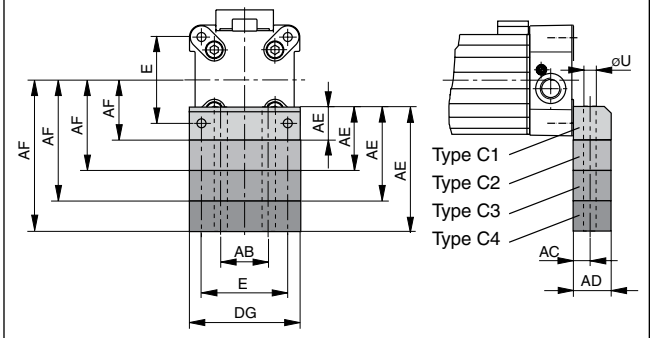
Series OSP-P16, 25, 32: Type B



Dimension Table (mm)
– Dimensions AE and AF (Dependent on the mounting type)

Mount. type	Dimensions AE for size							AF for size						
	16	25	32	40	50	63	80	16	25	32	40	50	63	80
A1	12.5	18	20	–	–	–	–	15	22	30	–	–	–	–
A2	27.5	33	34	–	–	–	–	30	37	44	–	–	–	–
A3	–	45	42	–	–	–	–	–	49	52	–	–	–	–
B1	–	42	55	–	–	–	–	–	22	30	–	–	–	–
B3	55	–	–	–	–	–	–	42	–	–	–	–	–	–
B4	–	80	85	–	–	–	–	–	60	60	–	–	–	–
B5	–	–	90	–	–	–	–	–	–	65	–	–	–	–
C1	–	–	–	24	30	40	50	–	–	–	38	48	57	72
C2	–	–	–	37	39	–	–	–	–	–	51	57	–	–
C3	–	–	–	46	54	76	88	–	–	–	60	72	93	110
C4	–	–	–	56	77	–	–	–	–	–	70	95	–	–

Series OSP-P40, 50, 63, 80: Type C



Dimension Table (mm)

Series	E	øU	AB	AC	AD	CL	DG
OSP-P16	18	3.6	18	10	14	1.6	26
OSP-P25	27	5.8	27	16	22	2.5	39
OSP-P32	36	6.6	36	18	26	3	50
OSP-P40	54	9	30	12.5	24	-	68
OSP-P50	70	9	40	12.5	24	-	86
OSP-P63	78	11	48	15	30	-	104
OSP-P80	96	14	60	17.5	35	-	130

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Mid-Section Support

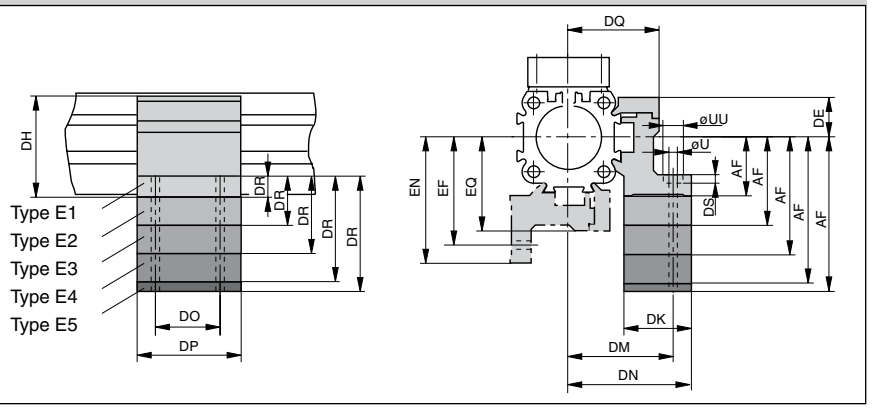
Information regarding type E1 and D1:

Mounting of the Mid-Section supports is also possible on the lower side of the drive. In this case, please note the new center line dimensions.

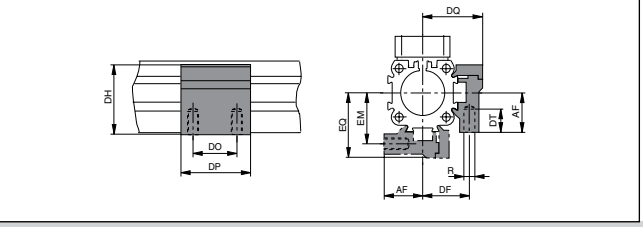
Stainless steel version on request.



Series OSP-P16 to 80: Type E
(Mounting from above / below using a cap screw)



Series OSP-P16 to 80: Type D1
(Mounting from below with thread screw)



Dimension Table (mm)
– Dimensions AF and DR (Dependent on the mounting type)

Mount. type	Dimensions DR for size							Dimensions AF for size						
	16	25	32	40	50	63	80	16	25	32	40	50	63	80
D1	–	–	–	–	–	–	–	15	22	30	38	48	57	72
E1	6	8	10	10	10	12	15	15	22	30	38	48	57	72
E2	21	23	24	23	19	–	–	30	37	44	51	57	–	–
E3	33	35	32	32	34	48	53	42	49	52	60	72	93	110
E4	–	46	40	42	57	–	–	–	60	60	70	95	–	–
E5	–	–	45	–	–	–	–	–	–	65	–	–	–	–

Dimension Table (mm)

Series	R	U	UU	DE	DF	DH	DK	DM	DN	DO	DP	DQ	DS	DT	EF	EM	EN	EQ
OSP-P16	M3	3.4	6	14.2	20	29.2	24	32	36.4	18	30	27	3.4	6.5	32	20	36.4	27
OSP-P25	M5	5.5	10	16	27	38	26	40	47.5	36	50	34.5	5.7	10	41.5	28.5	49	36
OSP-P32	M5	5.5	10	16	33	46	27	46	54.5	36	50	40.5	5.7	10	48.5	35.5	57	43
OSP-P40	M6	7	–	23	35	61	34	53	60	45	60	45	–	11	56	38	63	48
OSP-P50	M6	7	–	23	40	71	34	59	67	45	60	52	–	11	64	45	72	57
OSP-P63	M8	9	–	34	47.5	91	44	73	83	45	65	63	–	16	79	53.5	89	69
OSP-P80	M10	11	–	39.5	60	111.5	63	97	112	55	80	81	–	25	103	66	118	87

Ordering information for mountings Type A – Type B – Type C – Type D – Type E

Mounting type (versions)	Order No. size						
	16	25	32	40	50	63	80
A1*)	20408	2010	3010	–	–	–	–
A2*)	20464	2040	3040	–	–	–	–
A3*)	–	2060	3060	–	–	–	–
B1*)	–	20311	20313	–	–	–	–
B3*)	20465	–	–	–	–	–	–
B4*)	–	20312	20314	–	–	–	–
B5*)	–	–	20976	–	–	–	–
C1*)	–	–	–	4010	5010	6010	8010
C2*)	–	–	–	20338	20349	–	–
C3*)	–	–	–	20339	20350	20821	20822
C4*)	–	–	–	20340	20351	–	–
D1	20434	20008	20157	20027	20162	20451	20480
E1	20435	20009	20158	20028	20163	20452	20482
E2	20436	20352	20355	20358	20361	–	–
E3	20437	20353	20356	20359	20362	20453	20819
E4	–	20354	20357	20360	20363	–	–
E5	–	–	20977	–	–	–	–

(*Pair

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Ordering Instructions / Part Numbering System for OSP-P SLIDELINE Series

6		7	8	9	10	11	12-16	17	18	19	20	21	22	23	24	25
OSPP	25	0	2	0	0	0	01500	0	0	0	2	0	0	0	0	0

Bore
16
25
32
40
50
63
80

Piston Style
0 Standard
1 Tandem
S Special

Air Connections / Porting
0 Standard (position #2)
1 end face (position #5)
2 single end porting
3 left stand (pos #2), right end face (pos#5)
4 right stand (pos #2), left end face (pos #5)
6 single end porting end face
A 3/2 Way valve VOE 24V = (25,32,40,50)
B 3/2 Way valve VOE 220V~/110V= (25,32,40,50)
C 3/2 Way valve VOE 48V=(25,32,40,50)
E 3/2 Way valve VOE 110V~ (25,32,40,50)
S Special

Note: Single End Porting on 16mm bore, then end caps cannot be rotated.

Seals
0 Standard
1 Viton
S Special

Lubrication
0 Standard
1 Slow Speed
4 Food
5 Clean Room
S Special

Corrosion Resist, Hardware
0 Standard
1 Stainless
S Special

Stroke
x x x x x

End Cap Position
0 l+r 0° = in front (pos #2)
1 l+r 90° = underneath (pos #3)
2 l+r 180° = at the back (pos # 4)
3 l+r 270° = same face as outerband (pos #2,1)
4 l 90° = underneath; r 0° = in front (pos #3,2)
5 l 180° = at the back; r 0° = in front (pos #4,2)
6 l 270° = same face as outerband; r 0° = in front (pos #1,2)
7 l 0° = in front; r 90° = underneath (pos #2, 3)
8 l 180° = at the back; r 90° = underneath (pos #4,3)
9 l 270° = same face as outerband; r 90° = underneath (pos #1,3)
A l 0° = in front; r 180° = at the back (pos #2,4)
B l 90° = underneath; r 180° = at the back (pos #3,4)
C l 270° = same face as outerband; r 180° = at the back (pos #1,4)
D l 0° = in front; r 270° = same face as outerband (pos #2,1)
E l 90° = underneath; r 270° = same face as outerband (pos #3,1)
F l 180° = at the back; r 270° = same face as outerband (pos #4,1)
S Special

Cushioning / Stops
0 Standard
S Special

Piston Mountings
0 none

Guides / Brakes
2 SL Slideline
3 SL Slideline with Activebrake
4 SL Slideline with Multibrake (without sensors)

add. Carriage
0 without
2 Guide Carriage Slideline SL
3 Guide Carriage SL-AB
4 Guide Carriage SL-MB
M Guide Carriage SL-MB without Brake Function

Dovetail Cover
0 Standard
X Without Cover Rail
S Special

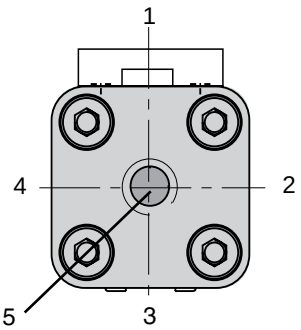
End Cap Mounts
0 without
1 A1 (16,25,32)
2 A2 (16,25,32)
3 A3 (25,32)
4 B1 (25,32)
6 B3 (16)
7 B4 (25,32)
8 B5 (32)
9 C1 (40,50,63,80)
A C2 (40,50)
B C3 (40,50,63,80)
C C4 (40,50)

Note: Comes in pairs

Version

Switches / Measuring System
0 none
1 NO Reed-KL3045 Qty. 2
2 NC Reed-KL3048 Qty. 2
3 PNP KL3054+4041 Qty. 2
4 NPN KL3060+4041 Qty. 2
X 21240 SFI 0,1mm
Y 21241 SFI 1mm
Z 4650 SFA
S Special

Note: 2 switches will be supplied. For different quantity, please order as a separate line item.



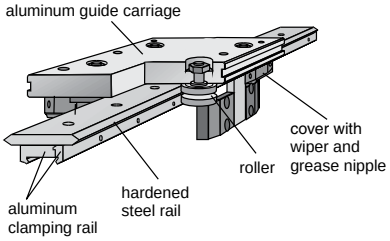
Note: Position #2 is the standard location.

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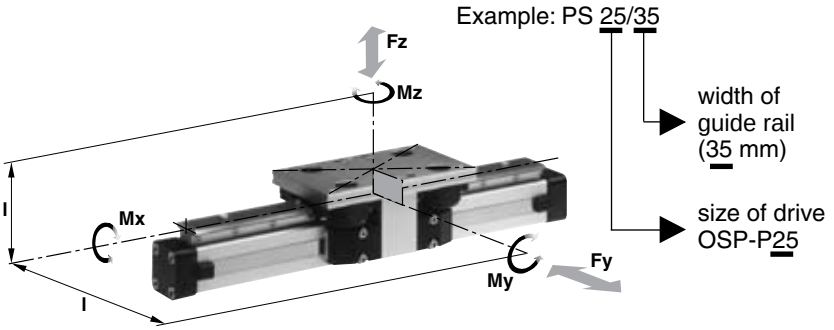
Versions

for pneumatic linear drive:
Series OSP-P





Loads, Forces and Moments



Technical Data

The Table shows the maximum permissible values for smooth operation, which should not be exceeded even under dynamic conditions.

For further information and technical data see page G19 for linear drives OSP-P

*** Please note:**
In the cushioning diagram, add the mass of the guide carriage to the mass to be cushioned.

Roller Guide POWER-SLIDE

OSP
ORIGA SYSTEM PLUS

Series PS 16 to 50
for Linear-drive
- **Series OSP-P**

Features:
- Anodized aluminum guide carriage with vee rollers having 2 rows of ball bearings
- Hardened steel guide rail
- Several guide sizes can be used on the same drive
- Corrosion resistance version available on request
- Max. speed v = 3 m/s,
- Tough roller cover with wiper and grease nipple
- Any length of stroke up to 3500 mm, (longer strokes on request)

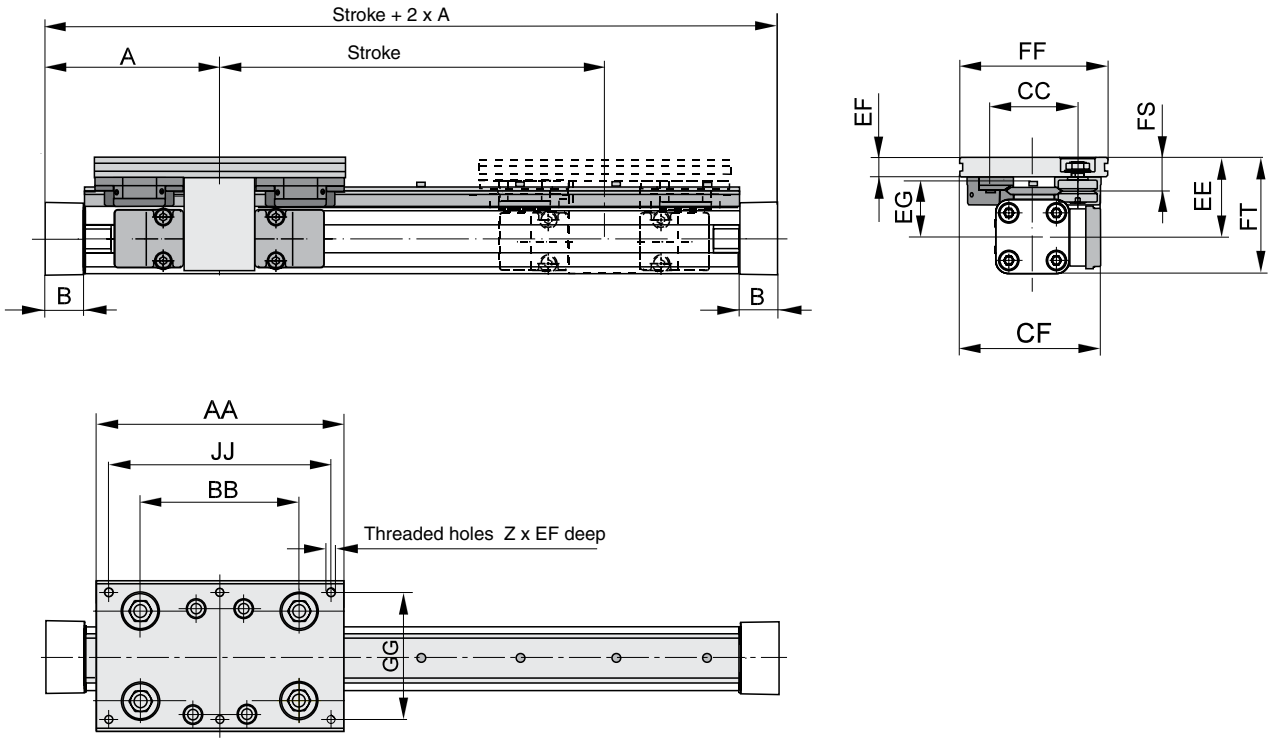
Series	For linear drive	Max. moments (Nm)			Max. load (N)	Mass of linear drive with guide (kg)		Mass * of guide carriage (kg)
		Mx	My	Mz	Fy, Fz	with 0 mm stroke	increase per 100 mm stroke	
PS 16/25	OSP-P16	14	45	45	1400	0.93	0.24	0.7
PS 25/25	OSP-P25	14	63	63	1400	1.5	0.4	0.7
PS 25/35	OSP-P25	20	70	70	1400	1.7	0.4	0.8
PS 25/44	OSP-P25	65	175	175	3000	2.6	0.5	1.5
PS 32/35	OSP-P32	20	70	70	1400	2.6	0.6	0.8
PS 32/44	OSP-P32	65	175	175	3000	3.4	0.7	1.5
PS 40/44	OSP-P40	65	175	175	3000	4.6	1.1	1.5
PS 40/60	OSP-P40	90	250	250	3000	6	1.3	2.2
PS 50/60	OSP-P50	90	250	250	3000	7.6	1.4	2.3
PS 50/76	OSP-P50	140	350	350	4000	11.5	1.8	4.9

[1] corrosion resistance version available on request (max. loads and moments are 25% lower)

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Dimensions

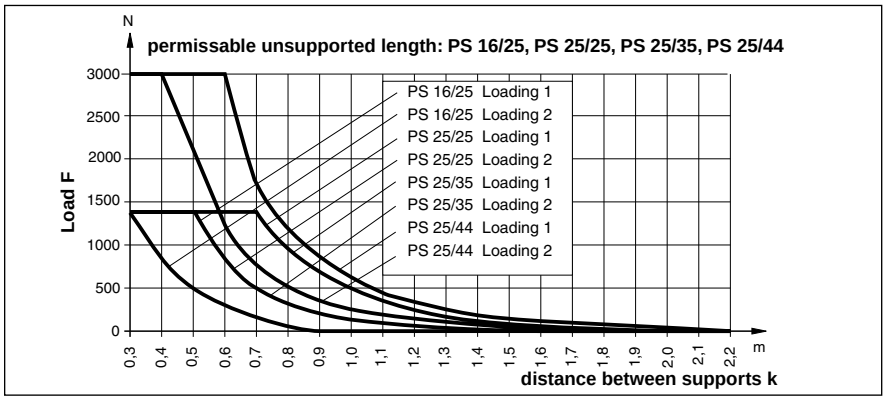
Series OSP-P

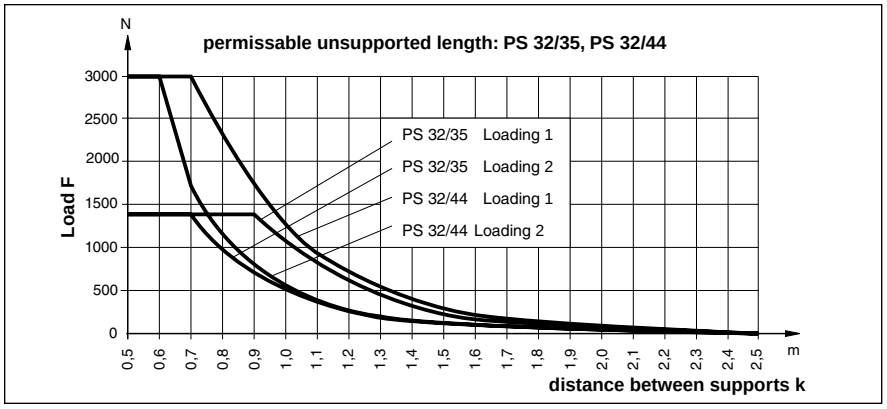


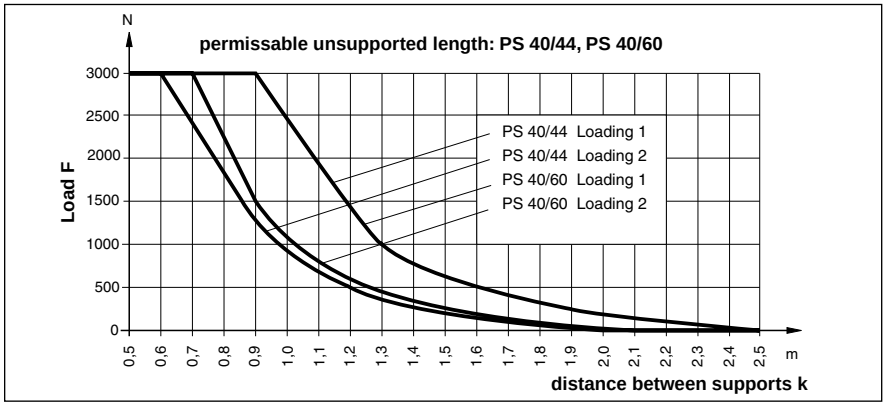
Dimension Table (mm)

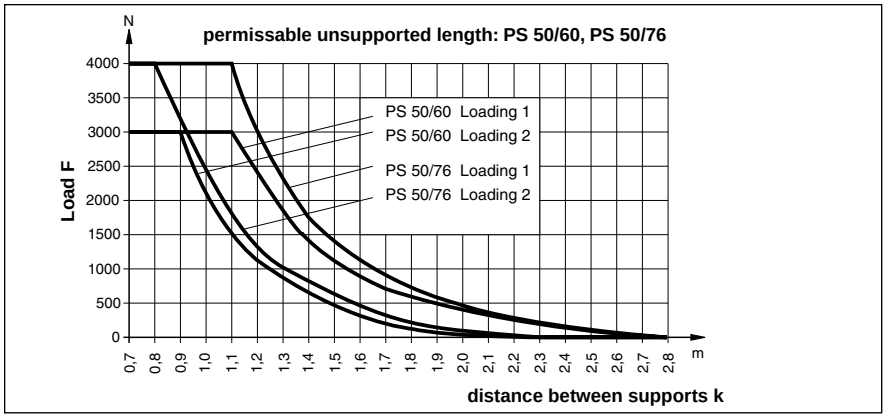
Series	A	B	Z	AA	BB	CC	CF	EE	EF	EG	FF	FS	FT	GG	JJ
PS 16/25	65	14	4xM6	120	65	47	80	49	12	35	80	21	64	64	100
PS 25/25	100	22	6xM6	145	90	47	79.5	53	11	39	80	20	73.5	64	125
PS 25/35	100	22	6xM6	156	100	57	89.5	52.5	12.5	37.5	95	21.5	73	80	140
PS 25/44	100	22	6xM8	190	118	73	100	58	15	39	116	26	78.5	96	164
PS 32/35	125	25.5	6xM6	156	100	57	95.5	58.5	12.5	43.5	95	21.5	84.5	80	140
PS 32/44	125	25.5	6xM8	190	118	73	107	64	15	45	116	26	90	96	164
PS 40/44	150	28	6xM8	190	118	73	112.5	75	15	56	116	26	109.5	96	164
PS 40/60	150	28	6xM8	240	167	89	122.5	74	17	54	135	28.5	108.5	115	216
PS 50/60	175	33	6xM8	240	167	89	130.5	81	17	61	135	28.5	123.5	115	216
PS 50/76	175	33	6xM10	280	178	119	155.5	93	20	64	185	39	135.5	160	250

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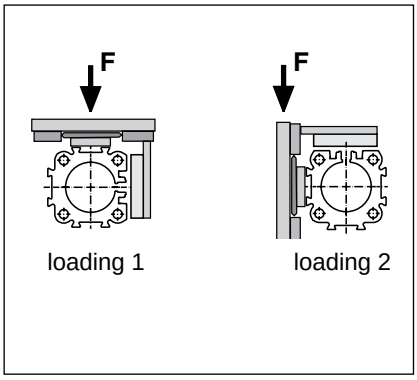


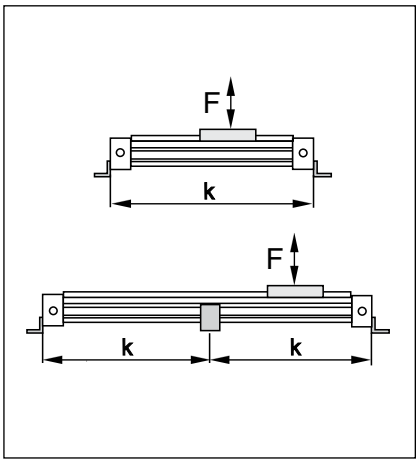
Mid-Section Support

(for versions, see accessories)

Mid-Section supports are required from a certain stroke length to prevent excessive deflection and vibration of the linear drive. The diagrams show the maximum permissible unsupported length in relation to loading.
A distinction must be drawn between loading 1 and loading 2.
Deflection of 0.5 mm max. between supports is permissible.

Note
For speeds v > 0.5 m/s the distance between supports should not exceed 1m.





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Service Life

Calculation of service life is achieved in two stages:

- Determination of load factor L_F from the loads to be carried
- Calculation of service life in km

1. Calculation of load factor L_F

$$L_F = \frac{Mx}{Mx_{max}} \quad \frac{My}{My_{max}} + \frac{Mz}{Mz_{max}} + \frac{Fy}{Fy_{max}} + \frac{Fz}{Fz_{max}} +$$

with combined loads, L_F should not exceed the value 1.

Lubrication

For maximum system life, lubrication of the rollers must be maintained at all times.

Only high quality Lithium based greases should be used.

Lubrication intervals are dependent on environmental conditions

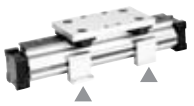
(temperature, running speed, grease quality etc.) therefore the installation should be regularly inspected.

2. Service life calculation

- **For PS 16/25, PS 25/25, PS 25/35, and PS 32/35** — Service life (km) = $\frac{106}{(L_F + 0{,}02)^3}$
- **For PS 25/44, PS 32/44, PS 40/44, PS 40/60 and PS 50/60:** — Service life (km) = $\frac{314}{(L_F + 0{,}015)^3}$
- **For PS 50/76:** — Service life (km) = $\frac{680}{(L_F + 0{,}015)^3}$

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Overview

Mounting Type	Type	Type – OSP Guides: SLIDELINE PROLINE MULTIBRAKE 16 [1]	25	32	40	50	63 [1]	80 [1]	POWERSLIDE 16/25	25/25	25/35	25/44	32/35	32/44	40/44	40/60	50/60	50/76
End cap mounting 	Type A1	X							X									
	Type A2	O	O	O														
	Type A3									O	O		O					
End cap mounting, reinforced 	Type B1		X	X						X	X	X	X	X				
	Type B3								O									
	Type B4											O		O				
	Type B5																	
End cap mounting 	Type C1				X	X	X	X							X	X	X	X
	Type C2				O	O												
	Type C3						O	O							O		O	
	Type C4															O		O
Mid-Section support, small	Type D1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mid-Section support, wide 	Type E1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Type E2	O	O	O	O	O												
	Type E3						O	O	O	O	O		O		O		O	
	Type E4											O		O		O		O
	Type E5																	

X = carriage mounted in top (12 o'clock position)

O = carriage mounted in lateral (3 or 9 o'clock position)

= available components

1) = not available for all sizes

Linear Drive Accessories

Mountings for Linear Drives fitted with OSP-Guides

OSP
ORIGA SYSTEM PLUS

For Linear-drives

- **Series OSP-P**



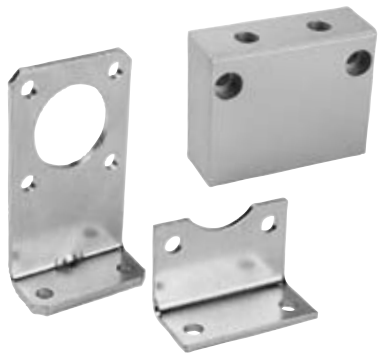
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End Cap Mountings

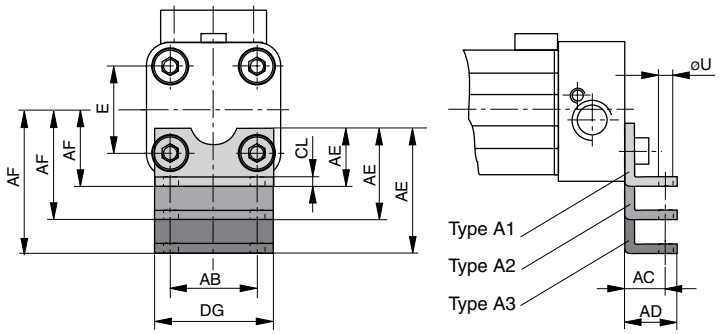
Four internal screw threads are located in the end faces of all OSP actuators for mounting the drive unit. End cap mountings may be secured across any two adjacent screws.

Material: Series OSP-16, 25, 32:
Galvanized steel
Series OSP-40,50, 63, 80:
Anodized aluminum

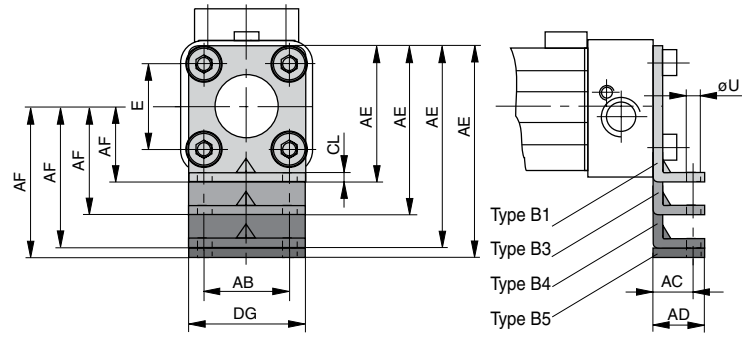
The mountings are supplied in pairs.



Series OSP-P16, 25, 32: Type A



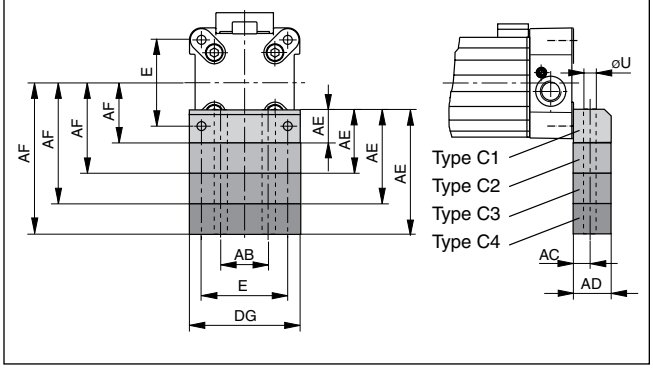
Series OSP-P16, 25, 32: Type B



Dimension Table (mm)
– Dimensions AE and AF (Dependent on the mounting type)

Mount. type	Dimensions AE for size							AF for size						
	16	25	32	40	50	63	80	16	25	32	40	50	63	80
A1	12.5	18	20	–	–	–	–	15	22	30	–	–	–	–
A2	27.5	33	34	–	–	–	–	30	37	44	–	–	–	–
A3	–	45	42	–	–	–	–	–	49	52	–	–	–	–
B1	–	42	55	–	–	–	–	–	22	30	–	–	–	–
B3	55	–	–	–	–	–	–	42	–	–	–	–	–	–
B4	–	80	85	–	–	–	–	–	60	60	–	–	–	–
B5	–	–	90	–	–	–	–	–	–	65	–	–	–	–
C1	–	–	–	24	30	40	50	–	–	–	38	48	57	72
C2	–	–	–	37	39	–	–	–	–	–	51	57	–	–
C3	–	–	–	46	54	76	88	–	–	–	60	72	93	110
C4	–	–	–	56	77	–	–	–	–	–	70	95	–	–

Series OSP-P40, 50, 63, 80: Type C



Dimension Table (mm)

Series	E	øU	AB	AC	AD	CL	DG
OSP-P16	18	3.6	18	10	14	1.6	26
OSP-P25	27	5.8	27	16	22	2.5	39
OSP-P32	36	6.6	36	18	26	3	50
OSP-P40	54	9	30	12.5	24	-	68
OSP-P50	70	9	40	12.5	24	-	86
OSP-P63	78	11	48	15	30	-	104
OSP-P80	96	14	60	17.5	35	-	130

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Mid-Section Support

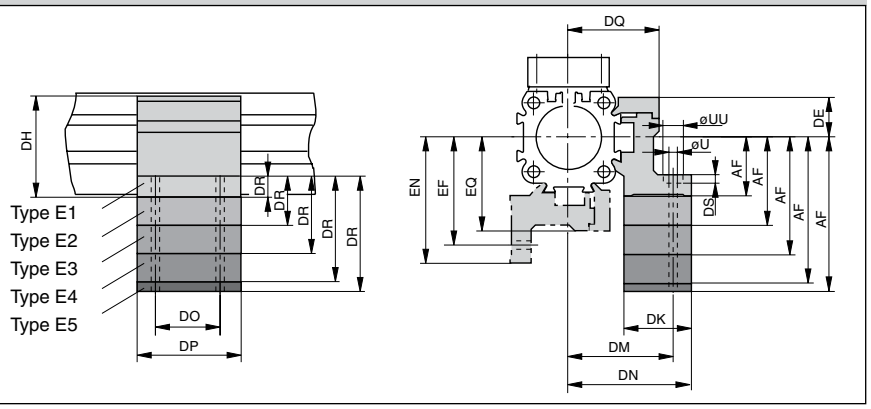
Information regarding type E1 and D1:

Mounting of the Mid-Section supports is also possible on the lower side of the drive. In this case, please note the new center line dimensions.

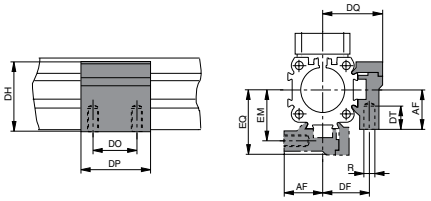
Stainless steel version on request.



Series OSP-P16 to 80: Type E
(Mounting from above / below using a cap screw)



Series OSP-P16 to 80: Type D1
(Mounting from below with thread screw)



Dimension Table (mm)
– Dimensions AF and DR (Dependent on the mounting type)

Mount. type	Dimensions DR for size							Dimensions AF for size						
	16	25	32	40	50	63	80	16	25	32	40	50	63	80
D1	–	–	–	–	–	–	–	15	22	30	38	48	57	72
E1	6	8	10	10	10	12	15	15	22	30	38	48	57	72
E2	21	23	24	23	19	–	–	30	37	44	51	57	–	–
E3	33	35	32	32	34	48	53	42	49	52	60	72	93	110
E4	–	46	40	42	57	–	–	–	60	60	70	95	–	–
E5	–	–	45	–	–	–	–	–	–	65	–	–	–	–

Dimension Table (mm)

Series	R	U	UU	DE	DF	DH	DK	DM	DN	DO	DP	DQ	DS	DT	EF	EM	EN	EQ
OSP-P16	M3	3.4	6	14.2	20	29.2	24	32	36.4	18	30	27	3.4	6.5	32	20	36.4	27
OSP-P25	M5	5.5	10	16	27	38	26	40	47.5	36	50	34.5	5.7	10	41.5	28.5	49	36
OSP-P32	M5	5.5	10	16	33	46	27	46	54.5	36	50	40.5	5.7	10	48.5	35.5	57	43
OSP-P40	M6	7	–	23	35	61	34	53	60	45	60	45	–	11	56	38	63	48
OSP-P50	M6	7	–	23	40	71	34	59	67	45	60	52	–	11	64	45	72	57
OSP-P63	M8	9	–	34	47.5	91	44	73	83	45	65	63	–	16	79	53.5	89	69
OSP-P80	M10	11	–	39.5	60	111.5	63	97	112	55	80	81	–	25	103	66	118	87

Ordering information for mountings Type A – Type B – Type C – Type D – Type E

Mounting type (versions)	Order No.						
	size						
	16	25	32	40	50	63	80
A1*)	20408	2010	3010	–	–	–	–
A2*)	20464	2040	3040	–	–	–	–
A3*)	–	2060	3060	–	–	–	–
B1*)	–	20311	20313	–	–	–	–
B3*)	20465	–	–	–	–	–	–
B4*)	–	20312	20314	–	–	–	–
B5*)	–	–	20976	–	–	–	–
C1*)	–	–	–	4010	5010	6010	8010
C2*)	–	–	–	20338	20349	–	–
C3*)	–	–	–	20339	20350	20821	20822
C4*)	–	–	–	20340	20351	–	–
D1	20434	20008	20157	20027	20162	20451	20480
E1	20435	20009	20158	20028	20163	20452	20482
E2	20436	20352	20355	20358	20361	–	–
E3	20437	20353	20356	20359	20362	20453	20819
E4	–	20354	20357	20360	20363	–	–
E5	–	–	20977	–	–	–	–

(*Pair

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Ordering Instructions / Part Numbering System for OSP-P POWERSLIDE Series

6		7	8	9	10	11	12-16	17	18	19	20	21	22	23	24	25
OSPP	32	0	0	0	0	S	02500	0	0	0	G	0	0	2	0	0

Bore
16
25
32
40
50

Piston Style
0 Standard
1 Tandem
S Special

Air Connections / Porting
0 Standard (position #2)
1 end face (position #5)
2 single end porting
3 left stand (pos #2), right end face (pos#5)
4 right stand (pos #2), left end face (pos #5)
6 single end porting end face
A 3/2 Way valve VOE 24V = (25,32,40,50)
B 3/2 Way valve VOE 220V~/110V= (25,32,40,50)
C 3/2 Way valve VOE 48V=(25,32,40,50)
E 3/2 Way valve VOE 110V~ (25,32,40,50)
S Special

Note: Single End Porting on 16mm bore, then end caps cannot be rotated.

Seals
0 Standard
1 Viton
S Special

Lubrication
0 Standard
1 Slow Speed
4 Food
5 Clean Room
S Special

Corrosion Resist, Hardware
0 Standard
1 Stainless
S Special

Stroke
x x x x x

End Cap Position
0 I+r 0° = in front (pos #2)
1 I+r 90° = underneath (pos #3)
2 I+r 180° = at the back (pos # 4)
3 I+r 270° = same face as outerband (pos #2,1)
4 I 90° = underneath; r 0° = in front (pos #3,2)
5 I 180° = at the back; r 0° = in front (pos #4,2)
6 I 270° = same face as outerband; r 0° = in front (pos #1,2)
7 I 0° = in front; r 90° = underneath (pos #2, 3)
8 I 180° = at the back; r 90° = underneath (pos #4,3)
9 I 270° = same face as outerband; r 90° = underneath (pos #1,3)
A I 0° = in front; r 180° = at the back (pos #2,4)
B I 90° = underneath; r 180° = at the back (pos #3,4)
C I 270° = same face as outerband; r 180° = at the back (pos #1,4)
D I 0° = in front; r 270° = same face as outerband (pos #2,1)
E I 90° = underneath; r 270° = same face as outerband (pos #3,1)
F I 180° = at the back; r 270° = same face as outerband (pos #4,1)
S Special

Cushioning / Stops
0 Standard
S Special

Piston Mountings
0 none

Guides / Brakes
E PSXX/25 Powerslide (16,25)
F PSXX/35 Powerslide (25,32)
G PSXX/44 Powerslide (25,32,40)
H PSXX/60 Powerslide (40,50)
I PSXX/76 Powerslide (50)

add. Carriage
0 without
E Guide Carriage Powerslide PSXX/25 (16,25)
F Guide Carriage Powerslide PSXX/35 (25,32)
G Guide Carriage Powerslide PSXX/44 (25,32,40)
H Guide Carriage Powerslide PSXX/60 (40,50)

Dovetail Cover
0 Standard
X Without Cover Rail
S Special

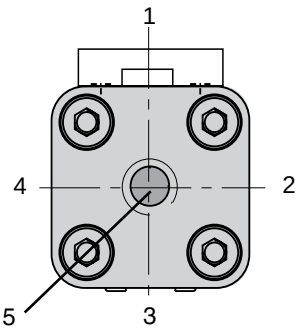
End Cap Mounts
0 without
1 A1 (16,25,32)
2 A2 (16,25,32)
3 A3 (25,32)
4 B1 (25,32)
6 B3 (16)
7 B4 (25,32)
8 B5 (32)
9 C1 (40,50)
A C2 (40,50)
B C3 (40,50)
C C4 (40,50)

Note: Comes in pairs

Version

Switches / Measuring System
0 none
1 NO Reed-KL3045 Qty. 2
2 NC Reed-KL3048 Qty. 2
3 PNP KL3054+4041 Qty. 2
4 NPN KL3060+4041 Qty. 2
X 21240 SFI 0,1mm
Y 21241 SFI 1mm
Z 4650 SFA
S Special

Note: 2 switches will be supplied. For different quantity, please order as a separate line item.



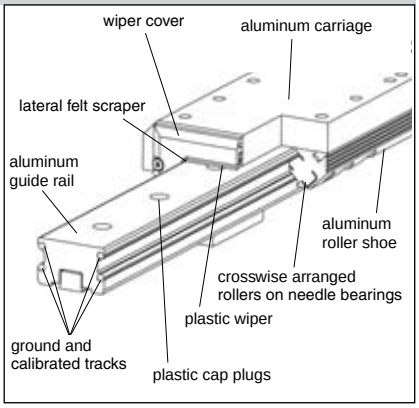
Note: Position #2 is the standard location.

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Versions

for pneumatic linear drive:
Series OSP-P





Technical Data

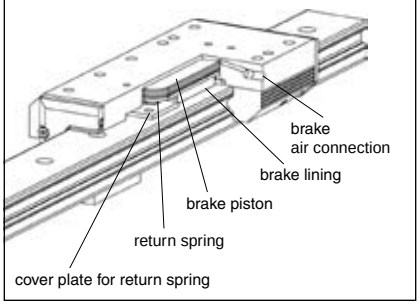
The table shows the maximal permissible loads. If multiple moments and forces act upon the cylinder simultaneously, the following equation applies:

$$\frac{Mx}{Mx_{max}} + \frac{My}{My_{max}} + \frac{Mz}{Mz_{max}} + \frac{Fy}{Fy_{max}} + \frac{Fz}{Fz_{max}} \leq 1$$

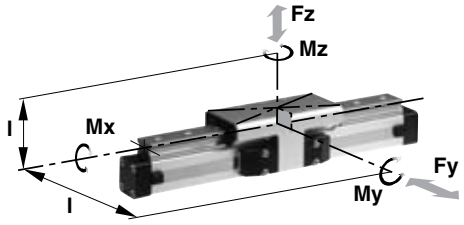
The sum of the loads should not exceed >1. With a load factor of less than 1, service life is 8000 km

The table shows the maximum permissible values for light, shock-free operation, which must not be exceeded even under dynamic conditions.

Option – Integrated Brake



Loads, Forces and Moments



Aluminum Roller Guide PROLINE

OSP
ORIGA SYSTEM PLUS

Series PL 16 to 50
for Linear-drive
- **Series OSP-P**

Features:
- High precision
- High velocities (10 m/s)
- Smooth operation - low noise
- Integated wiper system
- Long life lubrication
- Compact dimensions - compatible to Slideline plain bearing guide
- Any length of stroke up to 3750 mm

Integrated Brake (optional)
for Series OSP-P25 to OSP-P50:
- Actuated by pressurization
- Release by depressurization and spring actuation

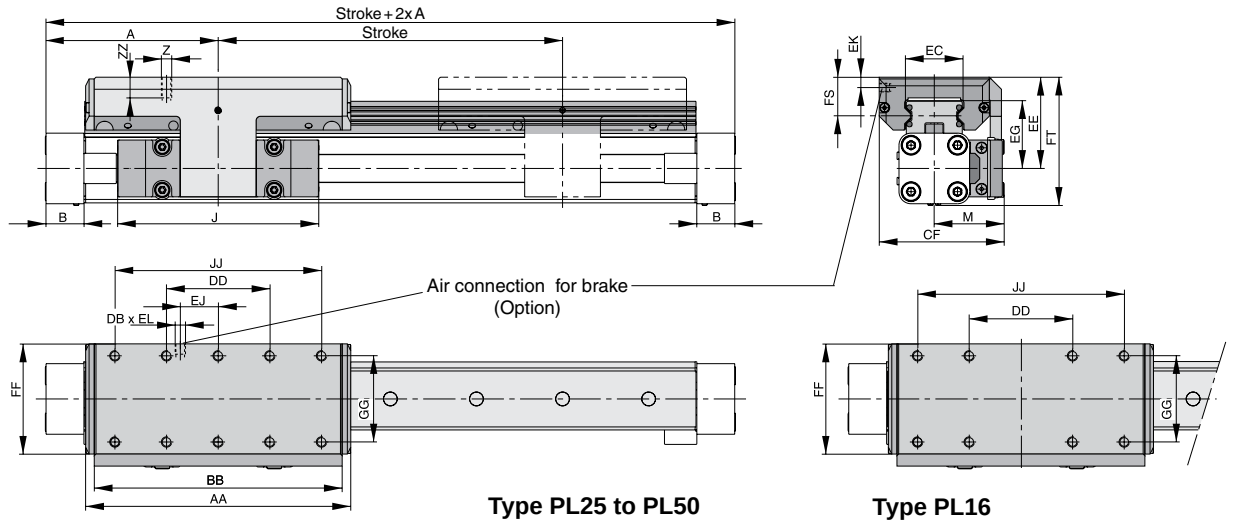
*** Please note:**
The mass of the carriage has to be added to the total moving mass when using the cushioning diagram.

Series	For linear drive	Max. moments (Nm) Mx	My	Mz	Max. loads (N) Fy, Fz	Maximum braking force at 6 bar (N) [1]	Mass of linear drive with guide (kg) with 0 mm stroke	increase per 100 mm stroke	Mass * guide carriage (kg)
PL 16	OSP-P16	8	12	12	542	–	0.55	0.19	0.24
PL 25	OSP-P25	16	39	39	857	on request	1.65	0.40	0.75
PL 32	OSP-P32	29	73	73	1171	on request	3.24	0.62	1.18
PL 40	OSP-P40	57	158	158	2074	on request	4.35	0.70	1.70
PL 50	OSP-P50	111	249	249	3111	on request	7.03	0.95	2.50

[1] Only for version with brake:
Braking surface dry – oiled surface reduces the effective braking force.

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Dimension Table (mm) Series OSP-P PL16, PL25, PL32, PL40, PL50



Type PL25 to PL50 **Type PL16**

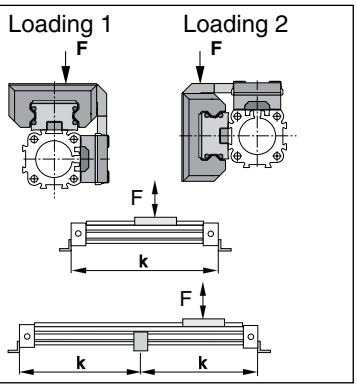
Dimension Table (mm) Series OSP-P PL16, PL25, PL32, PL40, PL50

Series	A	B	J	M	Z	AA	BB	DB	DD	CF	EC	EE	EG	EJ	EK	EL	FF	FS	FT	GG	JJ	ZZ
PL16	65	14	69	31	M4	98	88	-	30	55	23	40	30	-	-	-	48	17	55	36	70	8
PL25	100	22	117	40.5	M6	154	144	M5	60	72.5	32.5	53	39	22	6	6	64	23	73.5	50	120	12
PL32	125	25.5	152	49	M6	197	187	M5	80	91	42	62	48	32	6	6	84	25	88	64	160	12
PL40	150	28	152	55	M6	232	222	M5	100	102	47	64	50.5	58	6	6	94	23.5	98.5	78	200	12
PL50	175	33	200	62	M6	276	266	M5	120	117	63	75	57	81	6	6	110	29	118.5	90	240	16

G

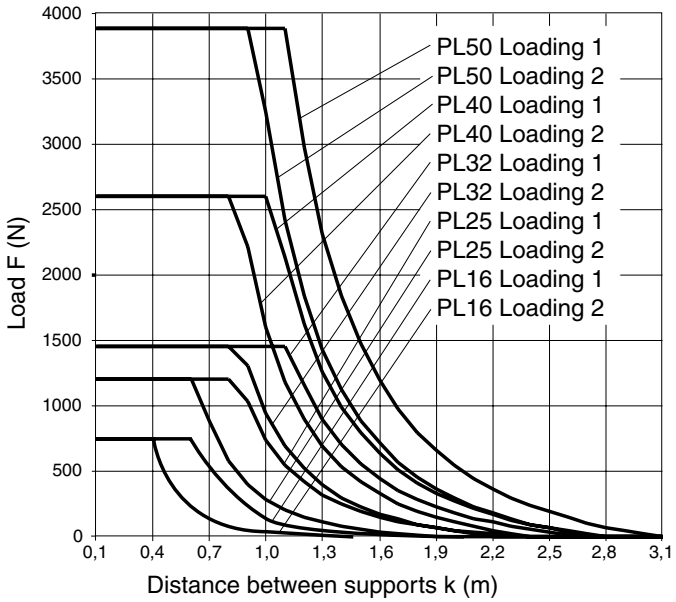
Mid-Section Support

(For versions, see page G76)
Mid-section supports are required from a certain stroke length to prevent excessive deflection and vibration of the linear drive. The diagrams show the maximum permissible unsupported length in relation to loading. A distinction must be drawn between loading 1 and loading 2. Deflection of 0.5 mm max. between supports is permissible.



Note:
For speeds v > 0.5 m/s the distance between supports should not exceed 1 m.

Permissible Unsupported Length PL16, PL25, PL32, PL40 and PL50



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Multi-Brake Passive Brake

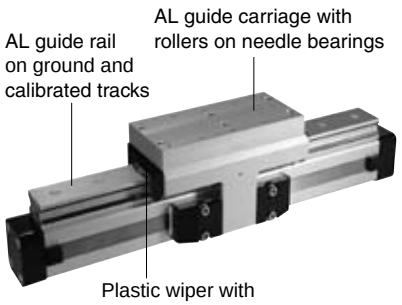
with Aluminum Roller Guide Proline PL

OSP
ORIGA SYSTEM PLUS

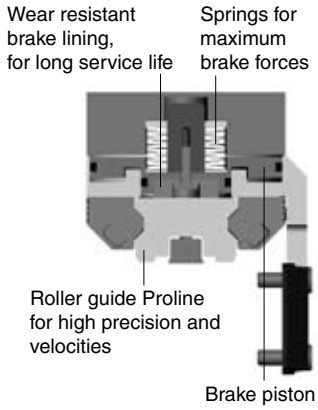
Series MB-PL 25 to 50 for Linear-drive

- **Series OSP-P**

Versions



Function

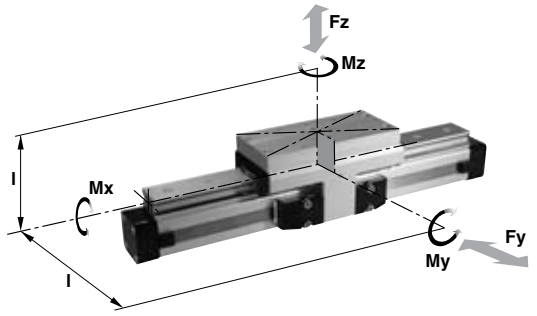


Function:

The Multi-Brake is a passive device. When the air pressure is removed the brake is actuated and movement of the cylinder is blocked. The brake is released by pressurization.

The high friction, wear resistant brake linings allow the Multi-Brake to be used as a dynamic brake to stop cylinder movement in the shortest possible time. The powerful springs also allow the Multi-Brake to be used effectively in positioning applications.

Loads, Forces and Moments



Technical Data

The table shows the maximal permissible loads. If multiple moments and forces act upon the cylinder simultaneously, the following equation applies:

$$\frac{Mx}{Mx_{max}} + \frac{My}{My_{max}} + \frac{Mz}{Mz_{max}} + \frac{Ly}{Ly_{max}} + \frac{Lz}{Lz_{max}} \leq 1$$

The sum of the loads should not exceed >1. With a load factor of less than 1, service life is 8000 km

The table shows the maximum permissible values for light, shock-free operation, which must not be exceeded even under dynamic conditions.
Operating Pressure 4.5 - 8 bar.
A pressure of min. 4.5 bar release the brake.

Features:

- Brake operated by spring actuation
- Brake release by pressurization
- Optional sensor to indicate brake lining wear
- Composite sealing system with plastic and felt wiper elements to remove dirt and lubricate the slideway
- Blocking function in case of pressure loss
- Intermediate stops possible

[1] Braking surface dry – oil on the braking surface will reduce the braking force

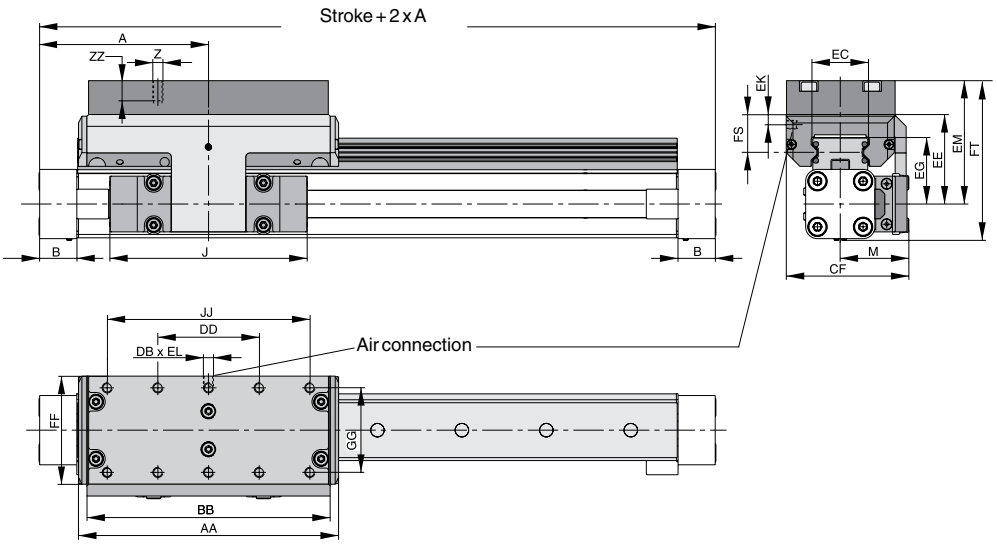
*** Please note:**

In the cushioning diagram, the mass of the guide carriage has to be added to the total moving mass.

Series	For linear drive	Max. moments (Nm) Mx	My	Mz	Max. loads (N) Fy, Fz	Max. brake force (N) [1]	Mass of linear drive with guide (kg) with 0 mm stroke	increase per 100 mm stroke	Mass* guide carriage (kg)
MB-PL25	OSP-P25	16	39	39	857	315	2.14	0.40	1.24
MB-PL32	OSP-P32	29	73	73	1171	490	4.08	0.62	2.02
MB-PL40	OSP-P40	57	158	158	2074	715	5.46	0.70	2.82
MB-PL50	OSP-P50	111	249	249	3111	1100	8.60	0.95	4.07

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Series OSP-P with Passive Brake MB-PL



Dimension Table (mm) Series OSP-P MB-PL25, MB-PL32, MB-PL40, MB-PL50

Series	A	B	J	M	Z	AA	BB	DB	DD	CF	EC	EE	EG	EK	EL	EM	FF	FS	FT	GG	JJ	ZZ
MB-PL25	100	22	117	40.5	M6	154	144	M5	60	72.5	32.5	53	39	9	5	73	64	23	93.5	50	120	12
MB-PL32	125	25.5	152	49	M6	197	187	G1/8	80	91	42	62	48	7	10	82	84	25	108	64	160	12
MB-PL40	150	28	152	55	M6	232	222	G1/8	100	102	47	64	50.5	6.5	10	84	94	23.5	118.5	78	200	12
MB-PL50	175	33	200	62	M6	276	266	G1/8	120	117	63	75	57	10	12	95	110	29	138.5	90	240	16

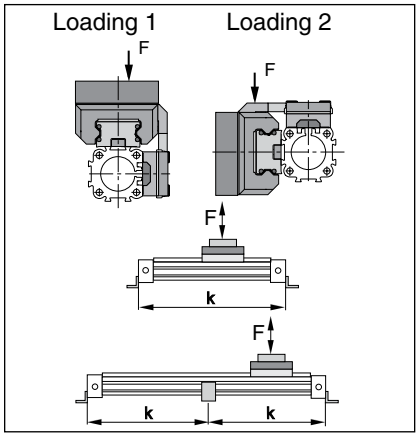
G

Mid Section Support

(for versions see page G78)

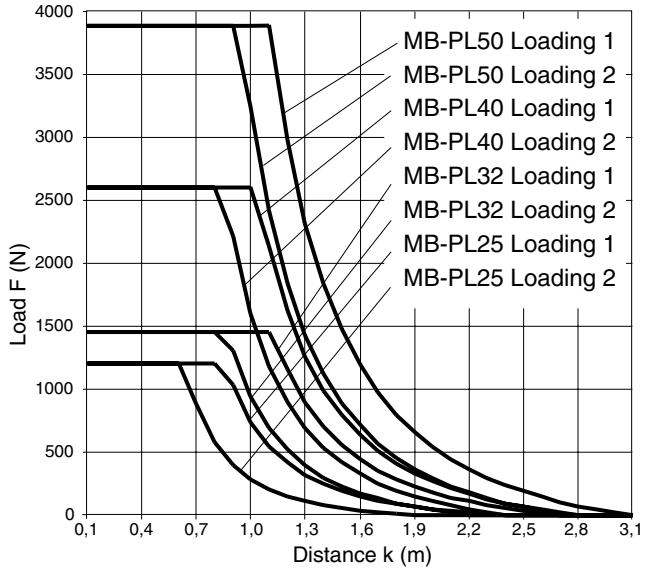
Mid-Section supports are required from a certain stroke length to prevent excessive deflection and vibration of the linear drive. The diagrams show the maximum permissible unsupported length in relation to loading.

A distinction must be drawn between loading 1 and loading 2. Deflection of 0.5 mm max. between supports is permissible.



Note:
For speeds v > 0.5 m/s the distance between supports should not exceed 1 m.

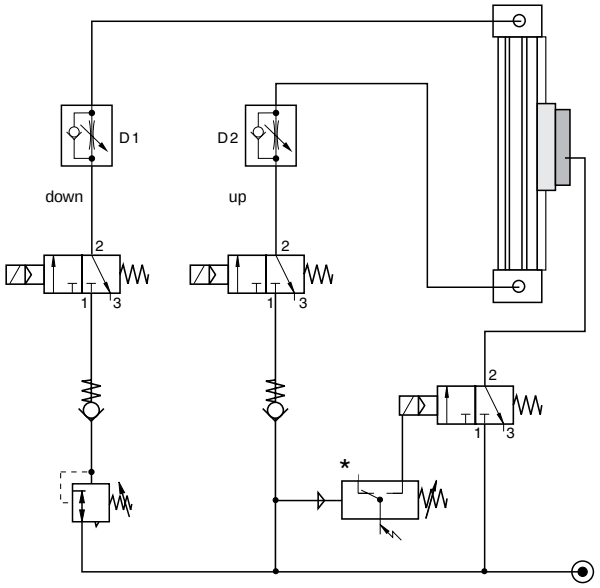
Permissible Unsupported Length OSP-P MB-PL25, MB-PL32, MB-PL40, MB-PL50



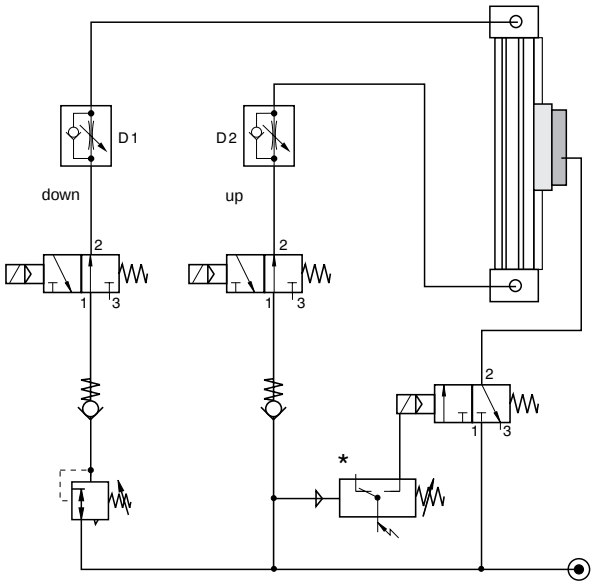
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Application Example - Vertical Application

Control of a cylinder with
3/2 way valves. Basic position – **exhausted**



Control of a cylinder with
3/2 way valves. Basic position – **pressurized**



Control Examples

Under normal operating circumstances the pressure switch is closed and the air flows through the 3/2 way solenoid valves from port 1 to 2, thus lifting the brake from the rail (operating condition).

The brake is pressurized by means of a 3/2 way valve in combination with a pressure switch. When there is a pressure loss, the brake is actuated by the pressure switch.

When the air pressure is restored to both cylinder chambers, the brake is lifted and the linear drive can be moved again.

The speed regulating valves D1 and D2 control the speed of the linear drive, and have no influence on the brake. The two non-return valves give the system a higher stability.

The pressure regulating valve is used to compensate for the downward force in this vertical application.

Please note:

Before the brake is lifted, make sure that both air chambers of the linear drive are pressurized.

Small diameter tubing, fittings and valves with a nominal diameter, and tubing that is too long all change the reaction time of the brake!

***Tip:**

The pressure switch actuates the brake when the pressure drops below the set value.

Required Components

Way Valves
Port size
M5, G1/8 G1/4, G1/2
Pressure Regulating Valves
G1/8 - G3/8
Pneumatic Accessories
P/E-Switch
Non-Return Valves G1/8 - G3/8
Screw-in Speed Regulating Valves M5 - G1/4

Contact factory for literature on the above valves/accessories

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Linear Drive Accessories

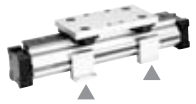
Mountings for Linear Drives fitted with OSP-Guides

OSP
ORIGA SYSTEM PLUS

For Linear-drives
- **Series OSP-P**

G

Overview

Mounting Type	Type	Type – OSP Guides: SLIDELINE PROLINE MULTIBRAKE 16 [1]	25	32	40	50	63 [1]	80 [1]	POWERSLIDE 16/25	25/25	25/35	25/44	32/35	32/44	40/44	40/60	50/60	50/76
End cap mounting 	Type A1	X							X									
	Type A2	O	O	O														
	Type A3									O	O		O					
End cap mounting, reinforced 	Type B1		X	X						X	X	X	X	X				
	Type B3								O									
	Type B4											O		O				
	Type B5																	
End cap mounting 	Type C1				X	X	X	X							X	X	X	X
	Type C2				O	O												
	Type C3						O	O							O		O	
	Type C4															O		O
Mid-Section support, small	Type D1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mid-Section support, wide 	Type E1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Type E2	O	O	O	O	O												
	Type E3						O	O	O	O	O		O		O		O	
	Type E4											O		O		O		O
	Type E5																	



X = carriage mounted in top (12 o'clock position)

O = carriage mounted in lateral (3 or 9 o'clock position)

= available components

1) = not available for all sizes

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End Cap Mountings

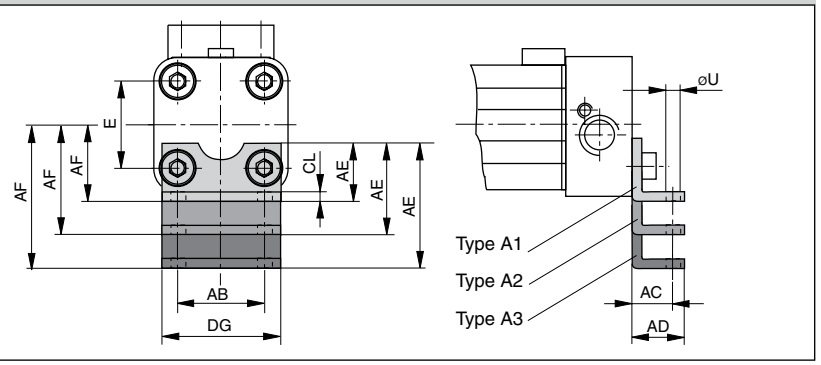
Four internal screw threads are located in the end faces of all OSP actuators for mounting the drive unit. End cap mountings may be secured across any two adjacent screws.

Material:
Series OSP-16, 25, 32:
Galvanized steel
Series OSP-40,50, 63, 80:
Anodized aluminum

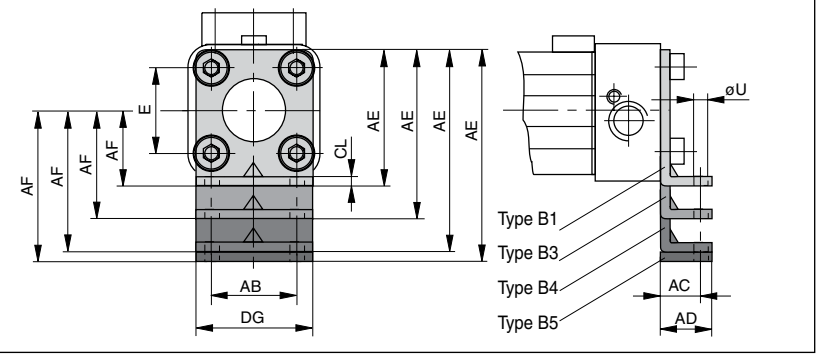
The mountings are supplied in pairs.



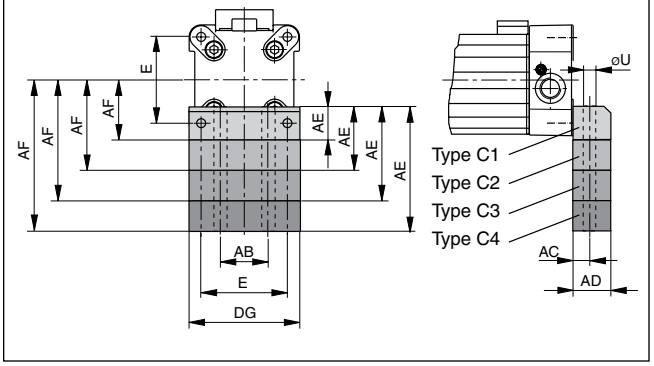
Series OSP-P16, 25, 32: Type A



Series OSP-P16, 25, 32: Type B



Series OSP-P40, 50, 63, 80: Type C



Dimension Table (mm)
– Dimensions AE and AF (Dependent on the mounting type)

Mount. type	Dimensions AE for size							AF for size						
	16	25	32	40	50	63	80	16	25	32	40	50	63	80
A1	12.5	18	20	–	–	–	–	15	22	30	–	–	–	–
A2	27.5	33	34	–	–	–	–	30	37	44	–	–	–	–
A3	–	45	42	–	–	–	–	–	49	52	–	–	–	–
B1	–	42	55	–	–	–	–	–	22	30	–	–	–	–
B3	55	–	–	–	–	–	–	42	–	–	–	–	–	–
B4	–	80	85	–	–	–	–	–	60	60	–	–	–	–
B5	–	–	90	–	–	–	–	–	–	65	–	–	–	–
C1	–	–	–	24	30	40	50	–	–	–	38	48	57	72
C2	–	–	–	37	39	–	–	–	–	–	51	57	–	–
C3	–	–	–	46	54	76	88	–	–	–	60	72	93	110
C4	–	–	–	56	77	–	–	–	–	–	70	95	–	–

Dimension Table (mm)

Series	E	øU	AB	AC	AD	CL	DG
OSP-P16	18	3.6	18	10	14	1.6	26
OSP-P25	27	5.8	27	16	22	2.5	39
OSP-P32	36	6.6	36	18	26	3	50
OSP-P40	54	9	30	12.5	24	-	68
OSP-P50	70	9	40	12.5	24	-	86
OSP-P63	78	11	48	15	30	-	104
OSP-P80	96	14	60	17.5	35	-	130

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Mid-Section Support

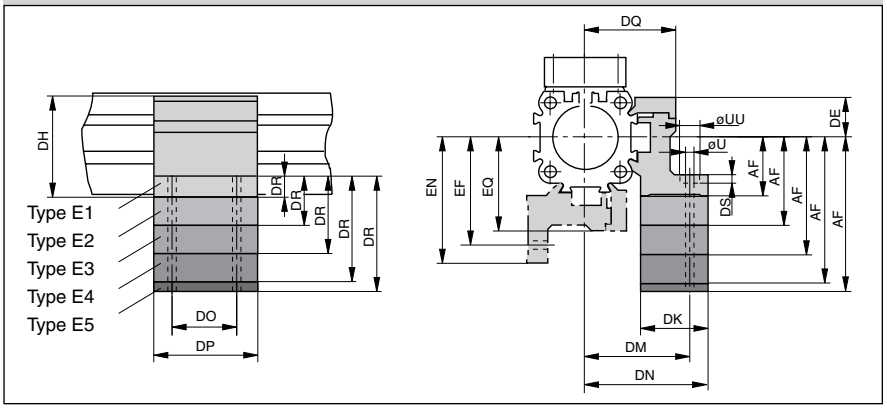
Information regarding type E1 and D1:

Mounting of the Mid-Section supports is also possible on the lower side of the drive. In this case, please note the new center line dimensions.

Stainless steel version on request.



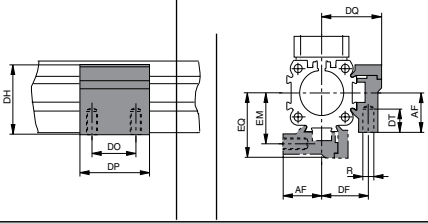
Series OSP-P16 to 80: Type E
(Mounting from above / below using a cap screw)



Dimension Table (mm)
– Dimensions AF and DR (Dependent on the mounting type)

Mount. type	Dimensions DR for size							Dimensions AF for size						
	16	25	32	40	50	63	80	16	25	32	40	50	63	80
D1	–	–	–	–	–	–	–	15	22	30	38	48	57	72
E1	6	8	10	10	10	12	15	15	22	30	38	48	57	72
E2	21	23	24	23	19	–	–	30	37	44	51	57	–	–
E3	33	35	32	32	34	48	53	42	49	52	60	72	93	110
E4	–	46	40	42	57	–	–	–	60	60	70	95	–	–
E5	–	–	45	–	–	–	–	–	–	65	–	–	–	–

Series OSP-P16 to 80: Type D1
(Mounting from below with thread screw)



Dimension Table (mm)

Series	R	U	UU	DE	DF	DH	DK	DM	DN	DO	DP	DQ	DS	DT	EF	EM	EN	EQ
OSP-P16	M3	3.4	6	14.2	20	29.2	24	32	36.4	18	30	27	3.4	6.5	32	20	36.4	27
OSP-P25	M5	5.5	10	16	27	38	26	40	47.5	36	50	34.5	5.7	10	41.5	28.5	49	36
OSP-P32	M5	5.5	10	16	33	46	27	46	54.5	36	50	40.5	5.7	10	48.5	35.5	57	43
OSP-P40	M6	7	–	23	35	61	34	53	60	45	60	45	–	11	56	38	63	48
OSP-P50	M6	7	–	23	40	71	34	59	67	45	60	52	–	11	64	45	72	57
OSP-P63	M8	9	–	34	47.5	91	44	73	83	45	65	63	–	16	79	53.5	89	69
OSP-P80	M10	11	–	39.5	60	111.5	63	97	112	55	80	81	–	25	103	66	118	87

Ordering information for mountings Type A – Type B – Type C – Type D – Type E

Mounting type (versions)	Order No. size						
	16	25	32	40	50	63	80
A1*)	20408	2010	3010	–	–	–	–
A2*)	20464	2040	3040	–	–	–	–
A3*)	–	2060	3060	–	–	–	–
B1*)	–	20311	20313	–	–	–	–
B3*)	20465	–	–	–	–	–	–
B4*)	–	20312	20314	–	–	–	–
B5*)	–	–	20976	–	–	–	–
C1*)	–	–	–	4010	5010	6010	8010
C2*)	–	–	–	20338	20349	–	–
C3*)	–	–	–	20339	20350	20821	20822
C4*)	–	–	–	20340	20351	–	–
D1	20434	20008	20157	20027	20162	20451	20480
E1	20435	20009	20158	20028	20163	20452	20482
E2	20436	20352	20355	20358	20361	–	–
E3	20437	20353	20356	20359	20362	20453	20819
E4	–	20354	20357	20360	20363	–	–
E5	–	–	20977	–	–	–	–

(* Pair

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Ordering Instructions / Part Numbering System for OSP-P PROLINE Series

6		7	8	9	10	11	12-16	17	18	19	20	21	22	23	24	25
OSPP	32	0	0	0	0	0	02500	0	0	0	6	0	0	0	0	0

Bore
- 16
- 25
- 32
- 40
- 50

Piston Style
- 0 Standard
- 1 Tandem
- S Special

Air Connections / Porting
- 0 Standard (position #2)
- 1 end face (position #5)
- 2 single end porting
- 3 left stand (pos #2), right end face (pos#5)
- 4 right stand (pos #2), left end face (pos #5)
- 6 single end porting end face
- A 3/2 Way valve VOE 24V = (25,32,40,50)
- B 3/2 Way valve VOE 220V~/110V= (25,32,40,50)
- C 3/2 Way valve VOE 48V=(25,32,40,50)
- E 3/2 Way valve VOE 110V~ (25,32,40,50)
- S Special

Note: Single End Porting on 16mm bore, then end caps cannot be rotated.

Seals
- 0 Standard
- 1 Viton
- S Special

Lubrication
- 0 Standard
- 1 Slow Speed
- 4 Food
- 5 Clean Room
- S Special

Corrosion Resist, Hardware
- 0 Standard
- 1 Stainless
- S Special

Stroke
- x x x x x

End Cap Position
- 0 l+r 0° = in front (pos #2)
- 1 l+r 90° = underneath (pos #3)
- 2 l+r 180° = at the back (pos # 4)
- 3 l+r 270° = same face as outerband (pos #2,1)
- 4 l 90° = underneath; r 0° = in front (pos #3,2)
- 5 l 180° = at the back; r 0° = in front (pos #4,2)
- 6 l 270° = same face as outerband; r 0° = in front (pos #1,2)
- 7 l 0° = in front; r 90° = underneath (pos #2, 3)
- 8 l 180° = at the back; r 90° = underneath (pos #4,3)
- 9 l 270° = same face as outerband; r 90° = underneath (pos #1,3)
- A l 0° = in front; r 180° = at the back (pos #2,4)
- B l 90° = underneath; r 180° = at the back (pos #3,4)
- C l 270° = same face as outerband; r 180° = at the back (pos #1,4)
- D l 0° = in front; r 270° = same face as outerband (pos #2,1)
- E l 90° = underneath; r 270° = same face as outerband (pos #3,1)
- F l 180° = at the back; r 270° = same face as outerband (pos #4,1)
- S Special

Cushioning / Stops
- 0 Standard
- S Special

Piston Mountings
- 0 none

Guides / Brakes
- 6 PL Proline
- 7 PL Proline with Activebrake
- 8 PL Proline with Multibrake

add. Carriage
- 0 without
- 2 Guide Carriage Proline PL
- 3 Guide Carriage PL-AB
- 4 Guide Carriage PL-MB
- M Guide Carriage PL-MB without Brake Function

Dovetail Cover
- 0 Standard
- X Without Cover Rail
- S Special

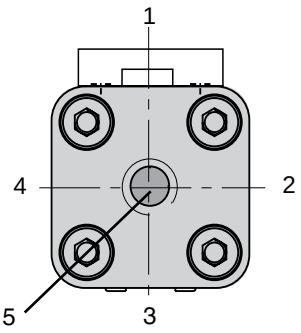
End Cap Mounts
- 0 without
- 1 A1 (16,25,32)
- 2 A2 (16,25,32)
- 3 A3 (25,32)
- 4 B1 (25,32)
- 6 B3 (16)
- 7 B4 (25,32)
- 8 B5 (32)
- 9 C1 (40,50)
- A C2 (40,50)
- B C3 (40,50)
- C C4 (40,50)

Note: Comes in pairs

Version

Switches / Measuring System
- 0 none
- 1 NO Reed-KL3045 Qty. 2
- 2 NC Reed-KL3048 Qty. 2
- 3 PNP KL3054+4041 Qty. 2
- 4 NPN KL3060+4041 Qty. 2
- X 21240 SFI 0,1mm
- Y 21241 SFI 1mm
- Z 4650 SFA
- S Special

Note: 2 switches will be supplied. For different quantity, please order as a separate line item.



Note: Position #2 is the standard location.

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Recirculating Ball Bearing Guide STARLINE

OSP
ORIGA SYSTEM PLUS

Series STL 16 to 50
for Linear Drive Series OSP-P

Features:

- Polished and hardened steel guide rail
- For very high loads in all directions
- High precision
- Integrated wiper system
- Integrated grease nipples
- Any length of stroke up to 3700 mm
- Anodized aluminum guide carriage – dimensions compatible with OSP guides SLIDELINE and PROLINE
- Installation height (STL16 - 32) compatible with OSP guides SLIDELINE and PROLINE

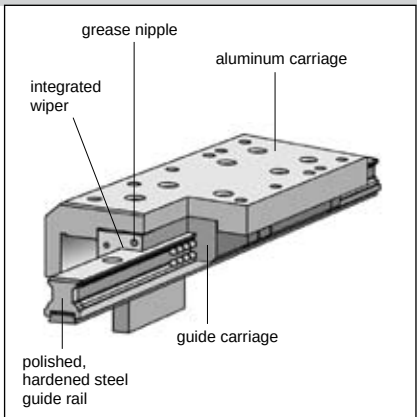
- Maximum speed
  STL16: v = 3 m/s
  STL25 to 50: v = 5 m/s

**** Please note:**
The mass of the carriage has to be added to the total moving mass when using the cushioning diagram.

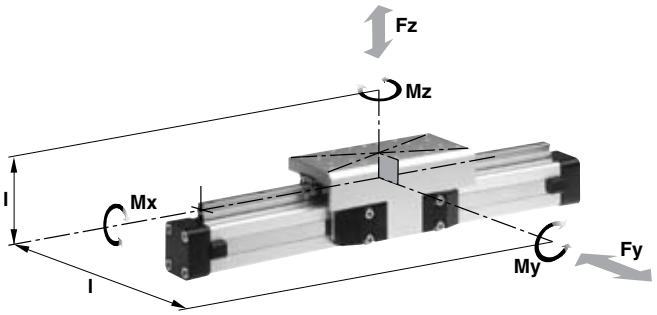
Versions

for pneumatic linear drive:
Series OSP-P





Loads, Forces and Moments



Technical Data
The table shows the maximum permissible loads. If multiple moments and forces act upon the cylinder simultaneously, the following equation applies:

$$\frac{Mx}{Mx_{max}} + \frac{My}{My_{max}} + \frac{Mz}{Mz_{max}} + \frac{Fy}{Fy_{1max}} + \frac{Fz}{Fz_{max}} \leq 1$$

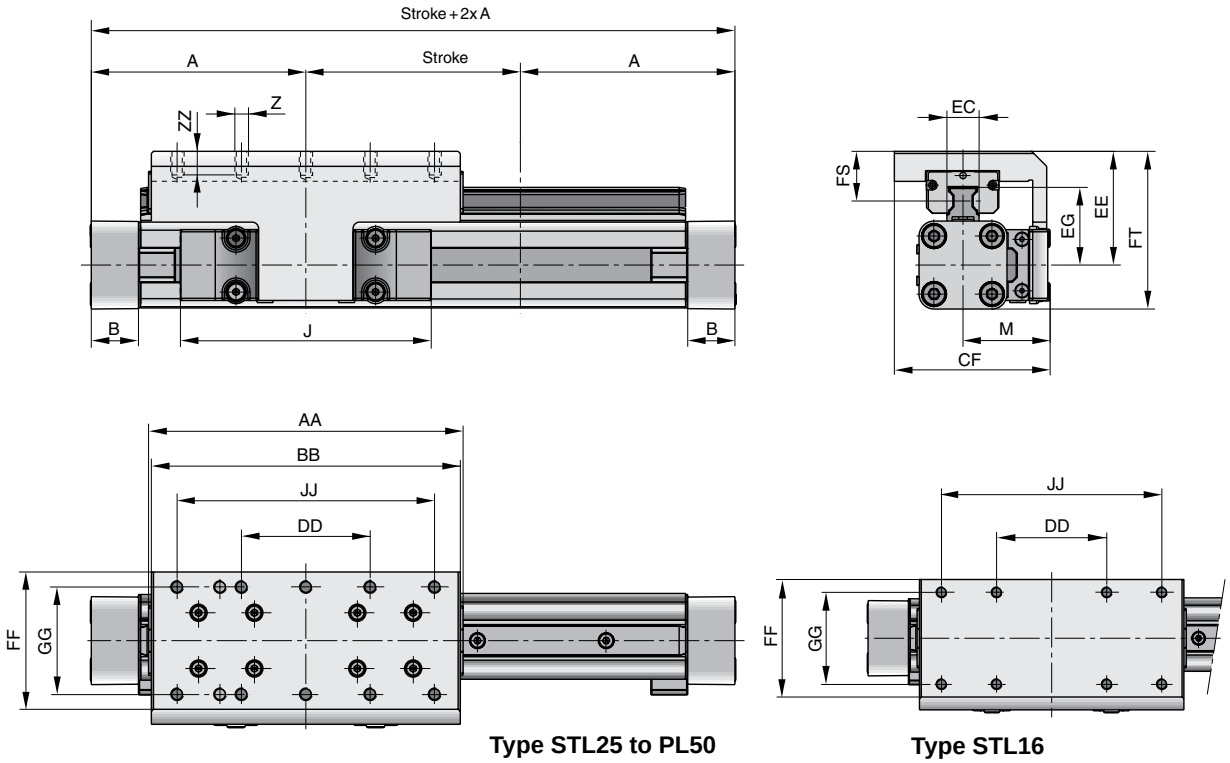
The sum of the loads should not exceed >1

The table shows the maximum permissible values for light, shock-free operation, which must not be exceeded even under dynamic conditions.

Series	For linear drive	Max. moments (Nm)			Max. loads (N)		Mass of linear drive with guide (kg)		Mass ** guide carriage (kg)
		Mx	My	Mz	Fy	Fz	with 0 mm stroke	increase per 100 mm stroke	
STL16	OSP-P16	15	30	30	1000	1000	0.598	0.210	0.268
STL25	OSP-P25	50	110	110	3100	3100	1.733	0.369	0.835
STL32	OSP-P32	62	160	160	3100	3100	2.934	0.526	1.181
STL40	OSP-P40	150	400	400	4000	7500	4.452	0.701	1.901
STL50	OSP-P50	210	580	580	4000	7500	7.361	0.936	2.880

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Dimensions Series OSP-P STL16 to STL 50



Type STL25 to PL50

Type STL16

Dimension Table (mm) Series OSP-P STL16 to STL50

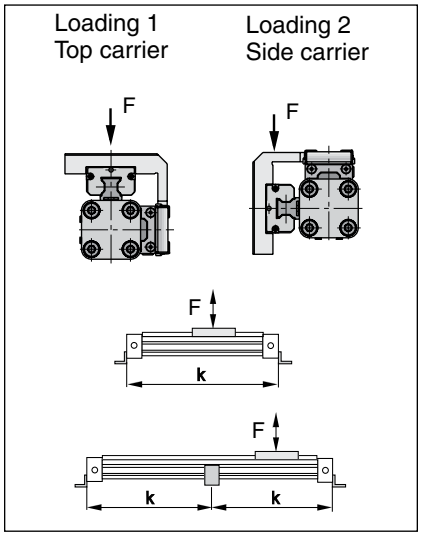
Series	A	B	J	M	Z	AA	BB	CF	DD	EC	EE	EG	FF	FS	FT	GG	JJ	ZZ
STL16	65	14	69	31	M4	93	90	55	30	15	40	24.6	48	18	55	36	70	8
STL25	100	22	117	40.5	M6	146.6	144	72.5	60	15	53	36.2	64	23.2	73.5	50	120	12
STL32	125	25.5	152	49	M6	186.6	184	91	80	15	62	42.2	84	26.2	88	64	160	12
STL40	150	28	152	55	M6	231	226	102	100	20	72	51.6	94	28.5	106.5	78	200	12
STL50	175	33	200	62	M6	270.9	266	117	120	23	85	62.3	110	32.5	128.5	90	240	16

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Mid-Section Support

(For versions, see pages G88-G89)

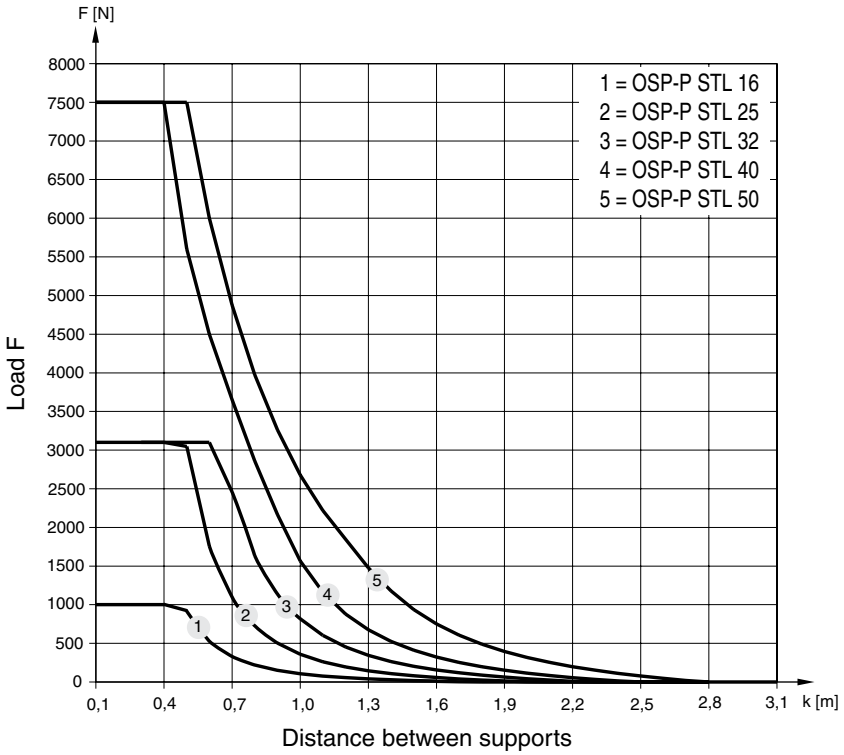
Mid-section supports are required from a certain stroke length to prevent excessive deflection and vibration of the linear drive. The diagrams show the maximum permissible unsupported length in relation to loading. A distinction must be drawn between loading 1 and loading 2. Deflection of 0.5 mm max. between supports is permissible.



Note:
For speeds v > 0.5 m/s the distance between supports should not exceed 1 m.

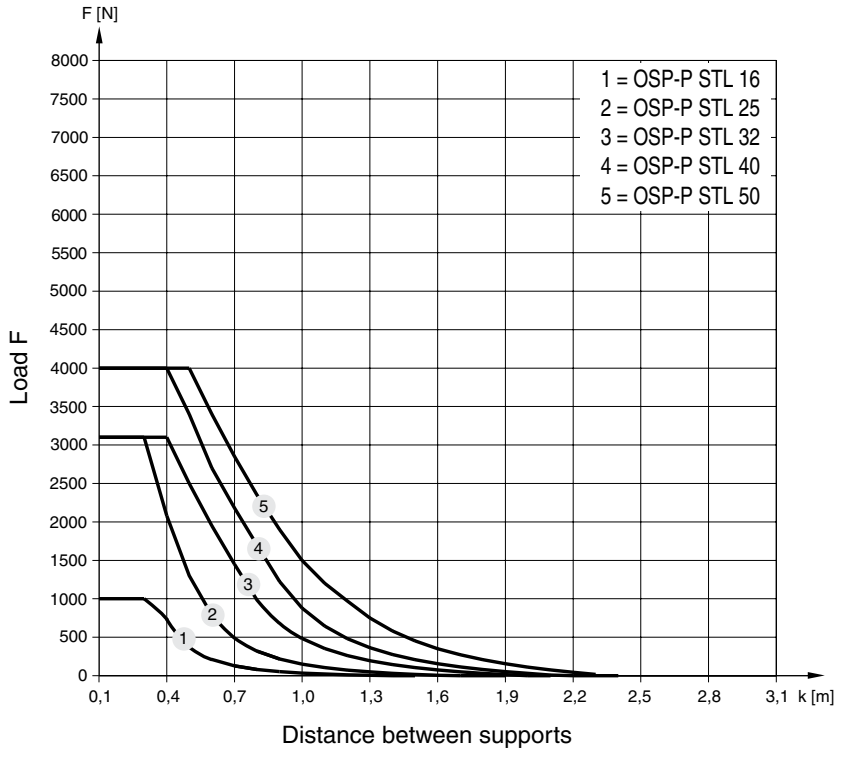
Permissible Unsupported Length STL16 to STL50

Loading 1 – Top carrier



Permissible Unsupported Length STL16 to STL50

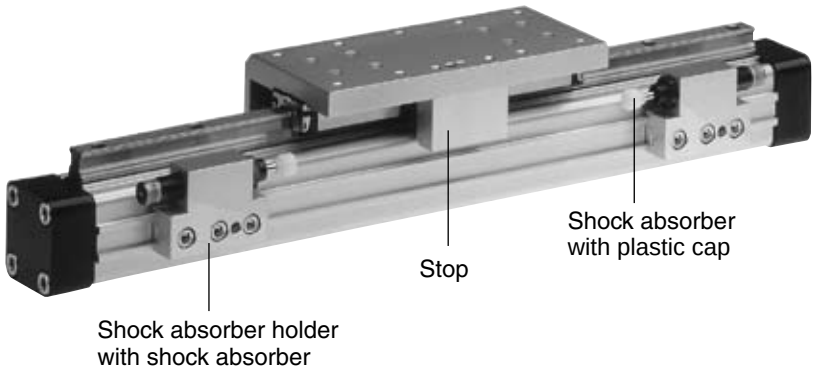
Loading 2 – Side carrier



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Variable Stop Type VS16 to VS50

Arrangement with two variable stops



Variable Stop

The variable stop Type VS provides simple stroke limitation.

It can be retrofitted and positioned anywhere along the stroke length.

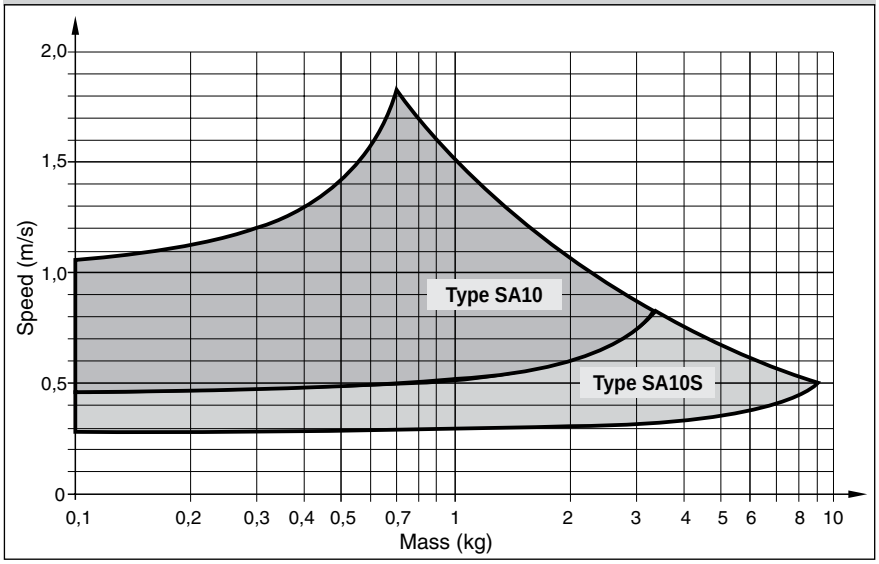
For every cylinder diameter two types of shock absorber are available

– see “Shock Absorber Selection” below.

Mid-section supports and magnetic switches can still be fitted on the same side as the variable stop.

Depending on the application, two variable stops can be fitted if required.

Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-STL16



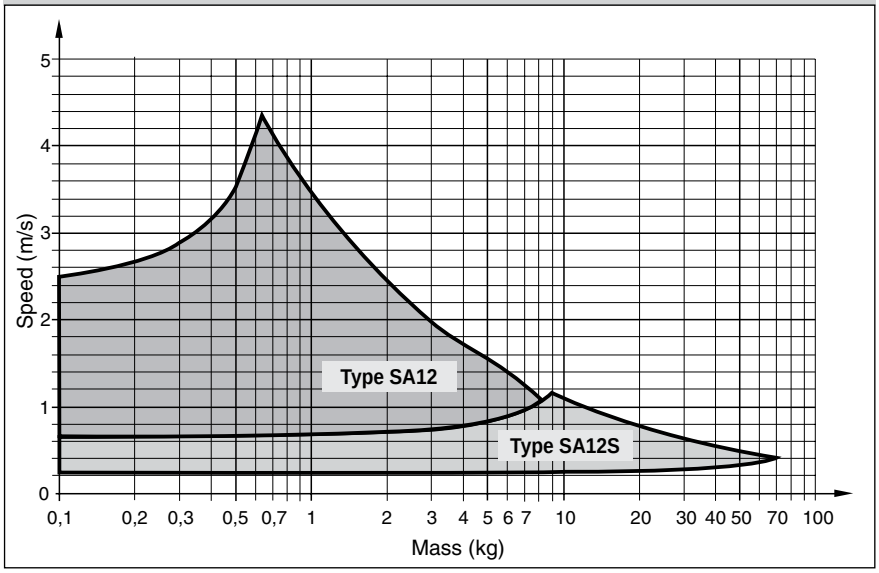
Shock Absorber Selection

The shock absorber is selected in dependence on the mass and speed.

The mass of the carrier itself must be taken into account.

The values relate to an effective driving force of 78 N (6 bar)

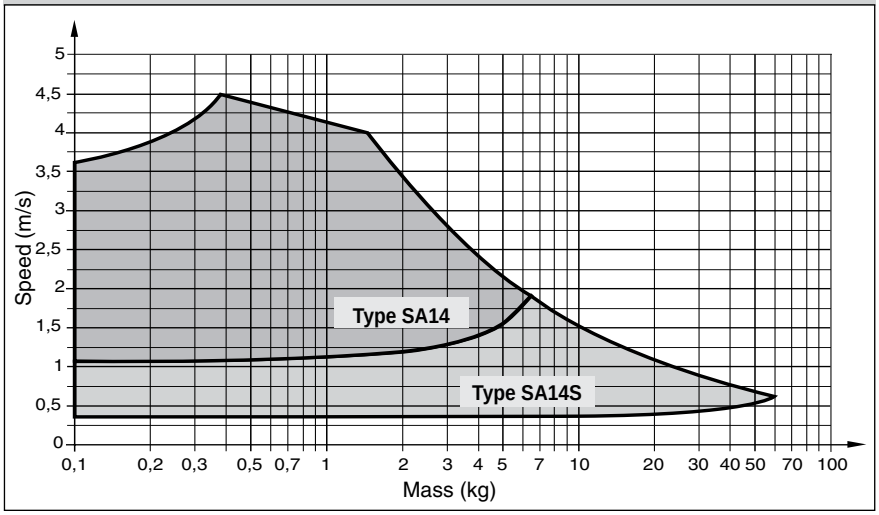
Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-STL25



The values relate to an effective driving force of 250 N (6 bar)

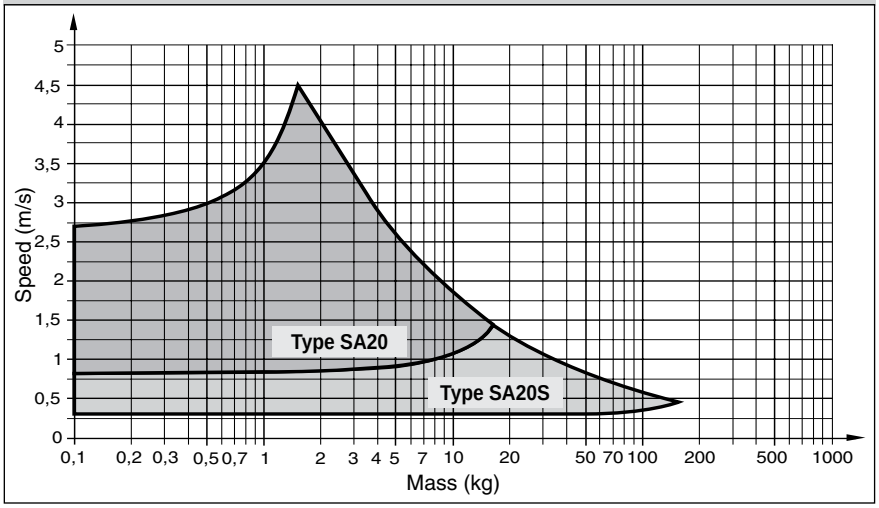
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Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-STL32



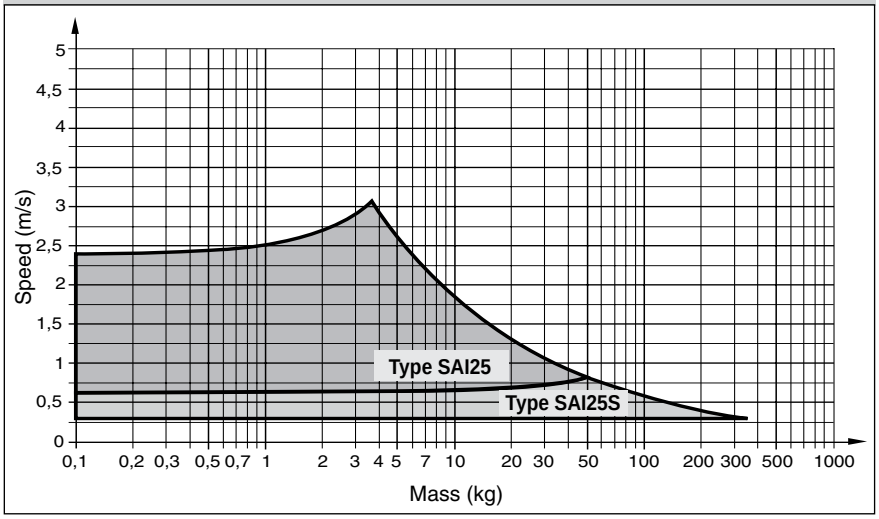
The values relate to an effective driving force of 420 N (6 bar)

Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-STL40



The values relate to an effective driving force of 640 N (6 bar)

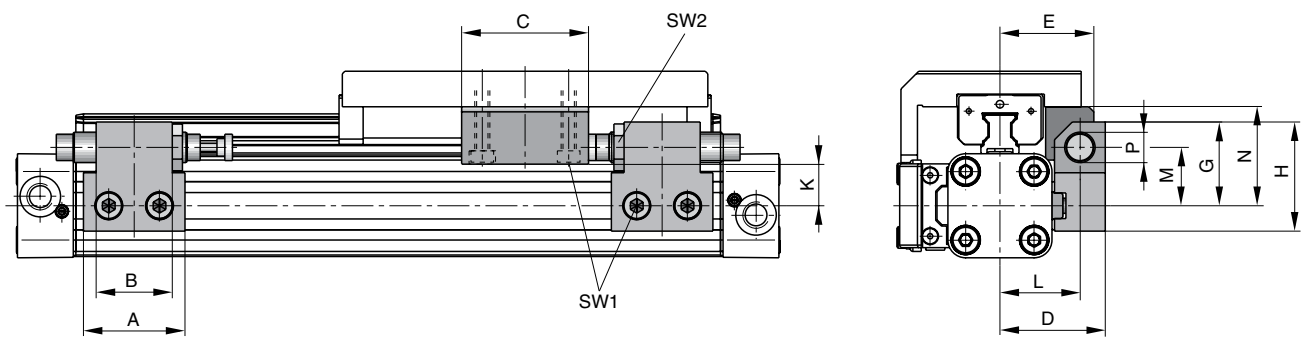
Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-STL50



The values relate to an effective driving force of 1000 N (6 bar)

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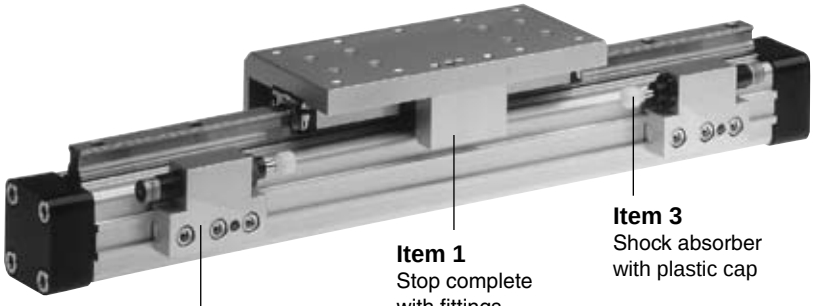
Dimensions – Variable Stop Type VS16 to VS50



Dimension Table (mm) – Variable Stop Type VS16 to VS50

Series	Type	A	B	C	D	E	G	H	K	L	M	N	P	SW1	SW2
OSP-STL16	**VS16**	30	14	25	33	30	28	38	16.2	25.5	20.5	30	M10x1	4	12.5
OSP-STL25	**VS25**	40	30	50	41.5	37	33	43	18	31.5	23	39	M12x1	5	16
OSP-STL32	**VS32**	60	40	50	45.5	42	35	45	19	35.5	25	48	M14x1.5	5	17
OSP-STL40	**VS40**	84	52	60	64	59	48	63	25.6	50	34	58.6	M20x1.5	5	24
OSP-STL50	**VS50**	84	-	60	75	69	55	70	26.9	57	38	66.9	M25x1.5	5	30

Order Information – Variable Stop Type VS16 to VS50



Item 1
Stop complete
with fittings

Item 2
Shock absorber holder
complete with fittings
– without shock absorber

Item 3
Shock absorber
with plastic cap

Order Instructions – Variable Stop Type VS16 to VS50

Item	Description	Size VS16		VS25		VS32		VS40		VS50	
		Type	Order No.	Type	Order No.	Type	Order No.	Type	Order No.	Type	Order No.
1	Stop, complete	–	**21196**	–	**21197**	–	**21198**	–	**21199**	–	**21200**
2	Shock absorber holder, complete	–	**21201**	–	**21202**	–	**21203**	–	**21204**	–	**21205**
3 *	Shock absorber, standard	**SA10**	**7718**	**SA12**	**7706**	**SA14**	**7708**	**SA20**	**7710**	**SAI25**	**7712**
	Shock absorber, version S	**SA10S**	**7721**	**SA12S**	**7707**	**SA14S**	**7709**	**SA20S**	**7711**	**SAI25S**	**7835**
	* Shock absorber with plastic cap										

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Linear Drive Accessories

Ø 16 to 32 mm
End Cap Mounting
Type: B

for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P STL**
- **Series OSP-P KF**

Material:
Galvanized steel
Anodized aluminum

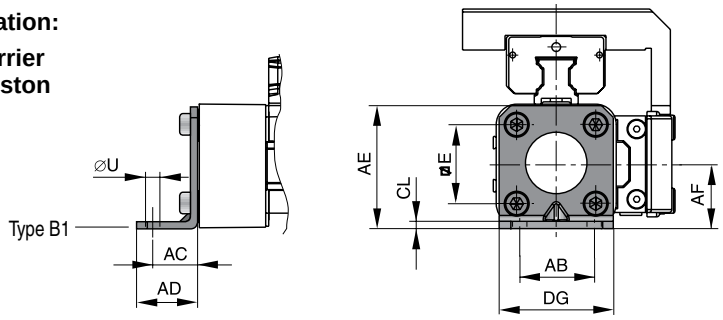
The mountings are supplied in pairs.



G

Series OSP-P STL40, STL50: Type C1
Series OSP-P KF40, KF50: Type C1

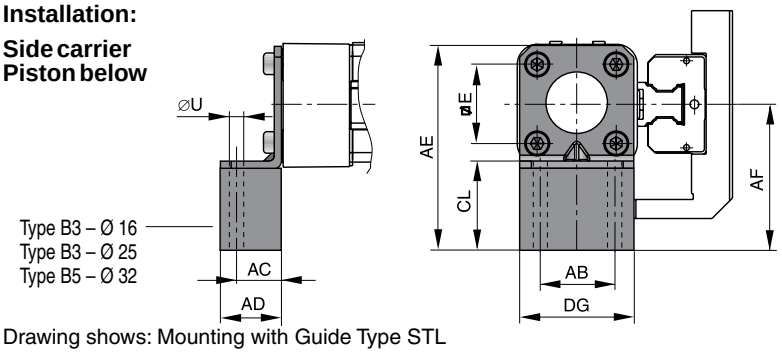
Installation:
Top carrier
Side piston



Drawing shows: Mounting with Guide Type STL

Series OSP-P STL16, STL25, STL32: Type B3 (Ø 32: B5)
Series OSP-P KF16, KF25, KF32: Type B3 (Ø 32: B5)

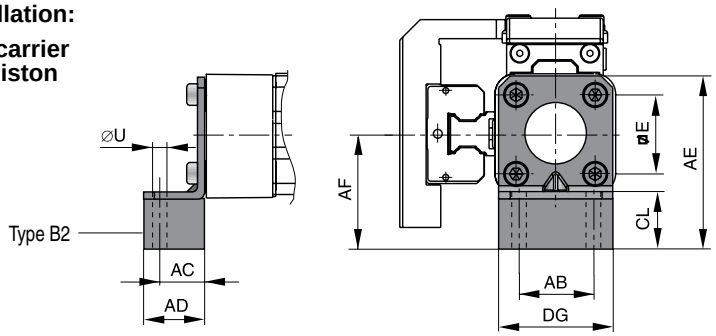
Installation:
Side carrier
Piston below



Drawing shows: Mounting with Guide Type STL

Series OSP-P STL16, STL25, STL32: Type B2
Series OSP-P KF16, KF25, KF32: Type B2

Installation:
Side carrier
Top piston



Drawing shows: Mounting with Guide Type STL

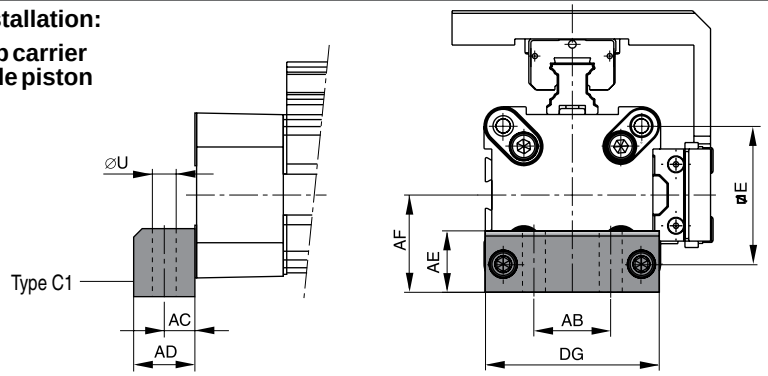
Dimension Table (mm) for End Cap Mounting Type: B1 to B5

Series Type	Mounting	E	ØU	AB	AC	AD	AE	AF	CL	DG	Order No. (pair)
OSP-P STL16	**B1**	18	3.6	18	10	14	28	15	2	26	**21135**
OSP-P KF16	**B2**	18	3.6	18	10	14	43	30	17	26	**21136**
	B3	18	3.6	18	10	14	55	42	29	26	**21137**
OSP-P STL25	**B1**	27	5.8	27	16	22	42	22	2.5	39	**20311**
OSP-P KF25	**B2**	27	5.8	27	16	22	57	37	17.5	39	**21138**
	B3	27	5.8	27	16	22	69	49	29.5	39	**21139**
OSP-P STL32	**B1**	36	6.6	36	18	26	55	30	3	50	**20313**
OSP-P KF32	**B2**	36	6.6	36	18	26	69	44	17	50	**21140**
	B5	36	6.6	36	18	26	90	65	9	50	**21141**

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Series OSP-P STL40, STL50: Type C1
Series OSP-P KF40, KF50: Type C1

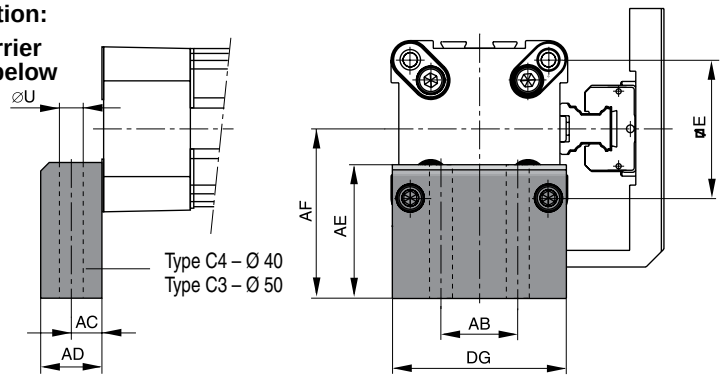
Installation:
Top carrier
Side piston



Drawing showes: Mounting with Guide Type STL

Series OSP-P STL40, STL50: Type C4 (Ø 50: C3)
Series OSP-P KF40, KF50: Type C4 (Ø 50: C3)

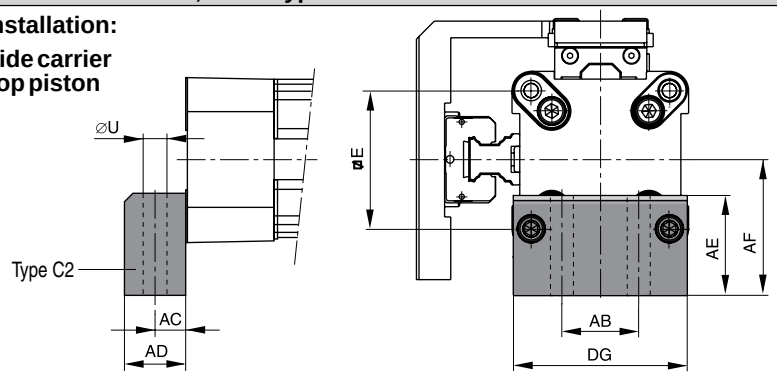
Installation:
Side carrier
Piston below



Drawing showes: Mounting with Guide Type STL

Series OSP-P STL40, STL50: Type C2
Series OSP-P KF40, KF50: Type C2

Installation:
Side carrier
Top piston



Drawing shows: Mounting with Guide Type STL

Ø 40 to 50 mm End Cap Mounting Type: C

for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P STL**
- **Series OSP-P KF**

Material:
Anodized aluminum

The mountings are supplied in pairs.



Dimension Table (mm) for End Cap Mounting Type: C1 to C4

Series Type	Mounting	E	ØU	AB	AC	AD	AE	AF	DG	Order No. (pair)
OSP-P STL40	C1	54	9	30	12.5	24	24	38	68	4010
OSP-P KF40	C2	54	9	30	12.5	24	37	51	68	20338
	C4	54	9	30	12.5	24	56	70	68	20340
OSP-P STL50	C1	70	9	40	12.5	24	30	48	86	5010
OSP-P KF50	C2	70	9	40	12.5	24	39	57	86	20349
	C3	70	9	40	12.5	24	54	72	86	20350

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Linear Drive Accessories

Ø 16 to 50 Mid-Section Support Type: D1ST

for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P STL**
- **Series OSP-P KF**

Note on Types D1ST
The mid-section support can also be mounted on the underside of the actuator, in which case its distance from the center of the actuator is different.

For design notes, see page
B70 (Series OSP-P STL)
B81 (Series OSP-P KF)



Mid-Section Support Type: E1ST to E5ST

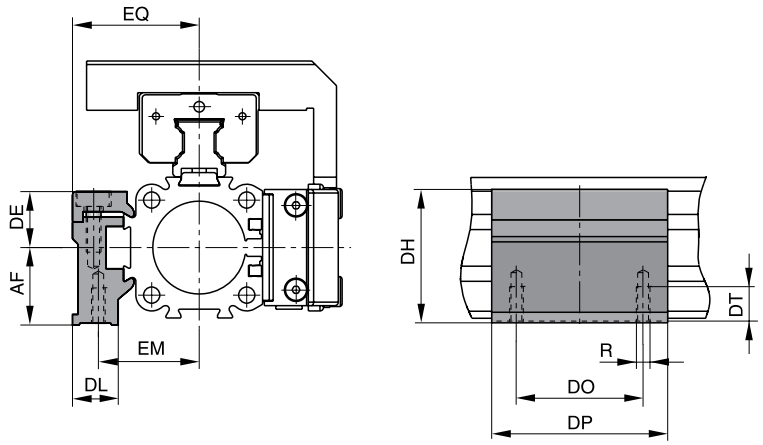
for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P STL**
- **Series OSP-P KF**



Series OSP-P STL16 to STL50: Type D1ST
Series OSP-P KF16 to KF50: Type D1ST

Mountings from below with 2 screws



Drawing shows: Mounting with Guide Type STL

Dimension Table (mm) Mid-Section Support D1ST

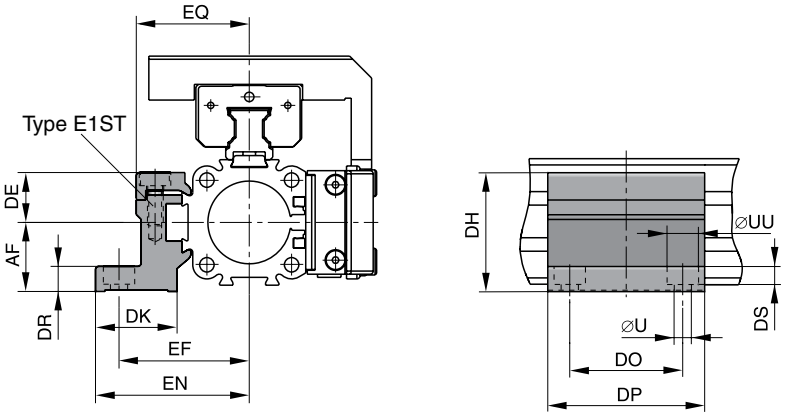
Series OSP-P	Mounting Type	R	AF	DE	DH	DL	DO	DP	DT	EM	EQ	Order No.
STL/KF16	**D1ST**	M3	15	14.2	29.2	14.6	18	30	6.5	20	27	**21125**
STL/KF25	**D1ST**	M5	22	16	38	13	36	50	10	28.5	36	**21126**
STL/KF32	**D1ST**	M5	30	16	46	13	36	60	10	35.5	43	**21127**
STL/KF40	**D1ST**	M6	38	23	61	19	45	60	11	38	48	**21128**
STL/KF50	**D1ST**	M6	48	23	71	19	45	60	11	45	57	**21129**

Order example: Type D1ST16 Order No. 21125

Series OSP-P STL16 to STL50: Type E1ST
Series OSP-P KF16 to KF50: Type E1ST

Installation:
Top carrier
Side position

Mounting from above / below using a cap screw



Drawing shows: Mounting with Guide Type STL

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Mid-Section Support Type: E1ST to E5ST

for Linear Drives with Recirculating Ball Bearing Guide

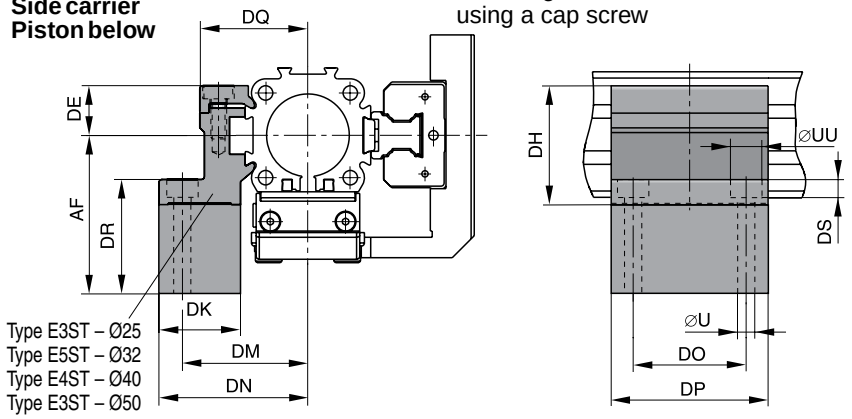
- **Series OSP-P STL**
- **Series OSP-P KF**



Series OSP-P STL25 to STL50: Type E3ST, E4ST, E5ST
Series OSP-P STL25 to STL50: Type E3ST, E4ST, E5ST

Installation:
Side carrier
Piston below

Mounting from above / below using a cap screw

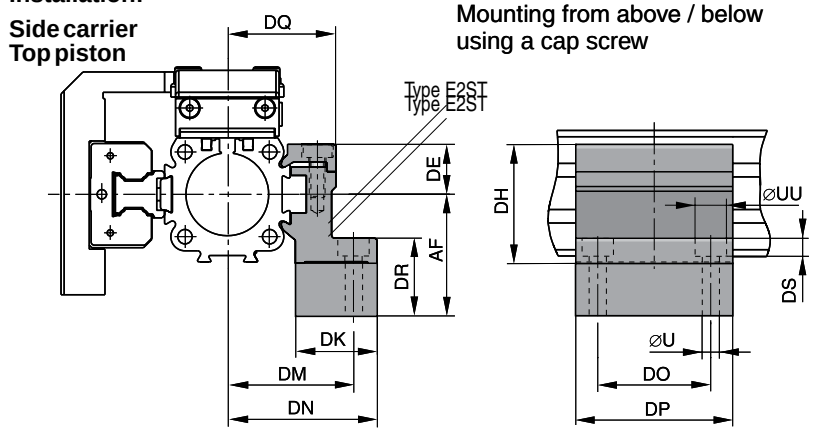


Drawing shows: Mounting with Guide Type STL

Series OSP-P STL16 to STL50: Type E2ST
Series OSP-P KF16 to KFL50: Type E2ST

Installation:
Side carrier
Top piston

Mounting from above / below using a cap screw



Drawing shows: Mounting with Guide Type STL

Dimension Table (mm) for Mid-Section Support E1ST to E5ST

Series OSP-P	Mounting Type	ØU	ØUU	AF	DE	DH	DK	DM	DN	DO	DP	DR	DQ	DS	EF	EN	EQ	Order No.
STL/KF16	**E1ST**	3.4	6	15	14.2	29.2	24	32	36.4	18	30	6	27	3.4	32	36.4	27	**21130**
STL/KF16	**E2ST**	3.4	6	30	14.2	29.2	24	32	36.4	18	30	21	27	3.4	32	36.4	27	**21142**
STL/KF25	**E1ST**	5.5	10	22	16	38	26	40	47.5	36	50	8	34.5	5.7	41.5	49	36	**21131**
STL/KF25	**E2ST**	5.5	10	37	16	38	26	40	47.5	36	50	23	34.5	5.7	41.5	49	36	**21143**
STL/KF25	**E3ST**	5.5	10	49	16	38	26	40	47.5	36	50	35	34.5	5.7	41.5	49	36	**21148**
STL/KF32	**E1ST**	5.5	10	30	16	46	27	46	54.5	36	60	10	40.5	5.7	48.5	57	43	**21132**
STL/KF32	**E2ST**	5.5	10	44	16	46	27	46	54.5	36	60	24	40.5	5.7	48.5	57	43	**21144**
STL/KF32	**E5ST**	5.5	10	65	16	46	27	46	54.5	36	60	45	40.5	5.7	48.5	57	43	**21151**
STL/KF40	**E1ST**	7	-	38	23	61	34	53	60	45	60	10	45	-	56	63	48	**21133**
STL/KF40	**E2ST**	7	-	51	23	61	34	53	60	45	60	23	45	-	56	63	48	**21145**
STL/KF40	**E4ST**	7	-	70	23	61	34	53	60	45	60	42	45	-	56	63	48	**21150**
STL/KF50	**E1ST**	7	-	48	23	71	34	59	67	45	60	10	52	-	64	72	57	**21134**
STL/KF50	**E2ST**	7	-	57	23	71	34	59	67	45	60	19	52	-	64	72	57	**21146**
STL/KF50	**E3ST**	7	-	72	23	71	34	59	67	45	60	34	52	-	64	72	57	**21149**

Order example: Type E1ST16 Order No. 21130

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Ordering Instructions / Part Numbering System for OSP-P STARLINE Series

6	7	8	9	10	11	12-16	17	18	19	20	21	22	23	24	25
OSPP	32	0	0	0	0	0	02500	0	2	0	B	0	0	0	0	0

Bore
16
25
32
40
50

Piston Style
0 Standard
1 Tandem
S Special

Air Connections / Porting
0 Standard (position #2)
1 end face (position #5)
2 single end porting
3 left stand (pos #2), right end face (pos#5)
4 right stand (pos #2), left end face (pos #5)
6 single end porting end face
A 3/2 Way valve VOE 24V = (25,32,40,50)
B 3/2 Way valve VOE 220V~/110V= (25,32,40,50)
C 3/2 Way valve VOE 48V=(25,32,40,50)
E 3/2 Way valve VOE 110V~ (25,32,40,50)
S Special

Note: Single End Porting on 16mm bore, then end caps cannot be rotated.

Seals
0 Standard
1 Viton
S Special

Lubrication
0 Standard
1 Slow Speed
4 Food
5 Clean Room
S Special

Corrosion Resist, Hardware
0 Standard
1 Stainless
S Special

Stroke
x x x x x

End Cap Position
0 l+r 0° = in front (pos #2)
1 l+r 90° = underneath (pos #3)
2 l+r 180° = at the back (pos # 4)
3 l+r 270° = same face as outerband (pos #2,1)
4 l 90° = underneath; r 0° = in front (pos #3,2)
5 l 180° = at the back; r 0° = in front (pos #4,2)
6 l 270° = same face as outerband; r 0° = in front (pos #1,2)
7 l 0° = in front; r 90° = underneath (pos #2, 3)
8 l 180° = at the back; r 90° = underneath (pos #4,3)
9 l 270° = same face as outerband; r 90° = underneath (pos #1,3)
A l 0° = in front; r 180° = at the back (pos #2,4)
B l 90° = underneath; r 180° = at the back (pos #3,4)
C l 270° = same face as outerband; r 180° = at the back (pos #1,4)
D l 0° = in front; r 270° = same face as outerband (pos #2,1)
E l 90° = underneath; r 270° = same face as outerband (pos #3,1)
F l 180° = at the back; r 270° = same face as outerband (pos #4,1)
S Special

Cushioning / Stops
0 Standard
2 VS soft left
3 VS hard left
4 VS soft right
5 VS hard right
6 VS soft both sides
7 VS hard both sides
S Special

Piston Mountings
0 none

Guides / Brakes
B STL Starline

add. Carriage
0 without
B Guide Carriage Starline STL

Dovetail Cover
0 Standard
X Without Cover Rail
S Special

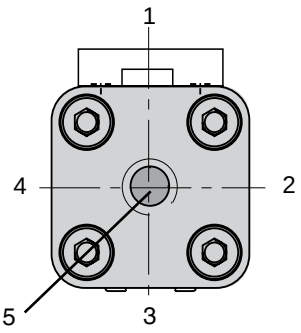
End Cap Mounts
0 without
4 B1 (16,25,32)
5 B2 (16,25,32)
6 B3 (16,25)
8 B5 (32)
9 C1 (40,50)
A C2 (40,50)
B C3 (50)
C C4 (40)

Note: Comes in pairs

Version

Switches / Measuring System
0 none
1 NO Reed-KL3045 Qty. 2
2 NC Reed-KL3048 Qty. 2
3 PNP KL3054+4041 Qty. 2
4 NPN KL3060+4041 Qty. 2
X 21240 SFI 0,1mm
Y 21241 SFI 1mm
Z 4650 SFA
S Special

Note: 2 switches will be supplied. For different quantity, please order as a separate line item.



Note: Position #2 is the standard location.

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Recirculating Ball Bearing Guide KF

OSP
ORIGA SYSTEM PLUS

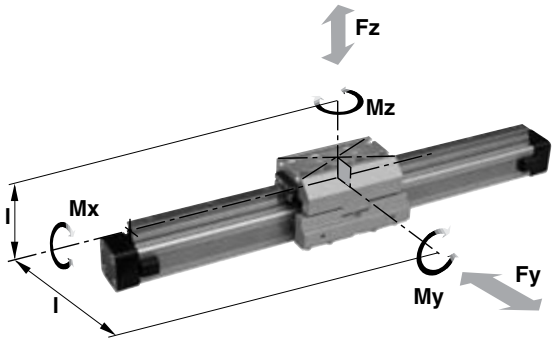
Series KF16 to KF50
For Linear Drives
Series OSP-P CLASSIC

Versions

for Pneumatic Linear Drive:
Series OSP-P KF



Loads, Forces and Moments



Features:

- Anodized aluminum guide carriage, the mounting dimensions correspond to FESTO Type: DGPL-KF
- Polished and hardened steel guide rail
- For high loads in all directions
- High precision
- Integrated wiper system
- Integrated grease nipples
- Any length of stroke up to 3700 mm
- Maximum speed
  KF16, KF40: v = 3 m/s
  KF25, KF32, KF50: v = 5 m/s

Technical Data

The table shows the maximum permissible loads. If multiple moments and forces act upon the cylinder simultaneously, the following equation applies:

$$\frac{Mx}{Mx_{max}} + \frac{My}{My_{max}} + \frac{Mz}{Mz_{max}} + \frac{Fy}{Fy_{max}} + \frac{Fz}{Fz_{max}} \leq 1$$

The sum of the loads should not exceed >1

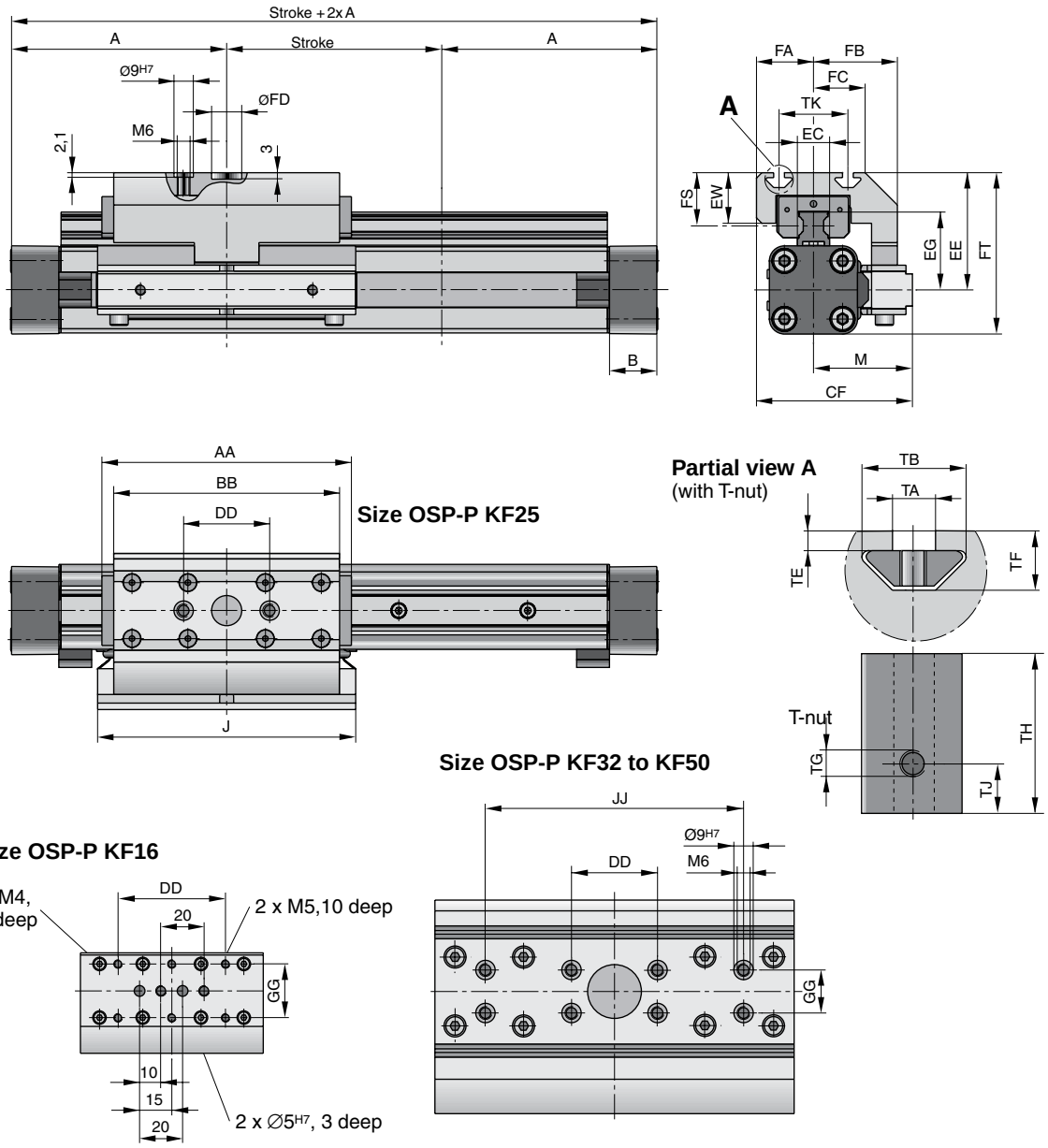
The table shows the maximum permissible values for light, shock-free operation, which must not be exceeded even under dynamic conditions.

*** Please note:**
the mass of the carriage has to be added to the total moving mass when using the cushioning diagram.

Series	for Linear Drive	Max. Moments (Nm)			Max. Load (N)		Mass of drive with guide (kg)		Mass * guide carriage	Groove stone
		Mx	My	Mz	Fy	Fz	with 0 mm stroke	increase per 100 mm stroke	(kg)	Thread Size
KF16	OSP-P16	12	25	25	1000	1000	0.558	0.21	0.228	–
KF25	OSP-P25	35	90	90	3100	3100	1.522	0.369	0.607	M5
KF32	OSP-P32	44	133	133	3100	3100	2.673	0.526	0.896	M5
KF40	OSP-P40	119	346	346	4000	7100	4.167	0.701	1.531	M6
KF50	OSP-P50	170	480	480	4000	7500	7.328	0.936	2.760	M8

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Dimensions Series OSP-P KF16 to KF50



Dimension Table (mm) Series OSP-P KF16, KF25, KF32, KF40, KF50

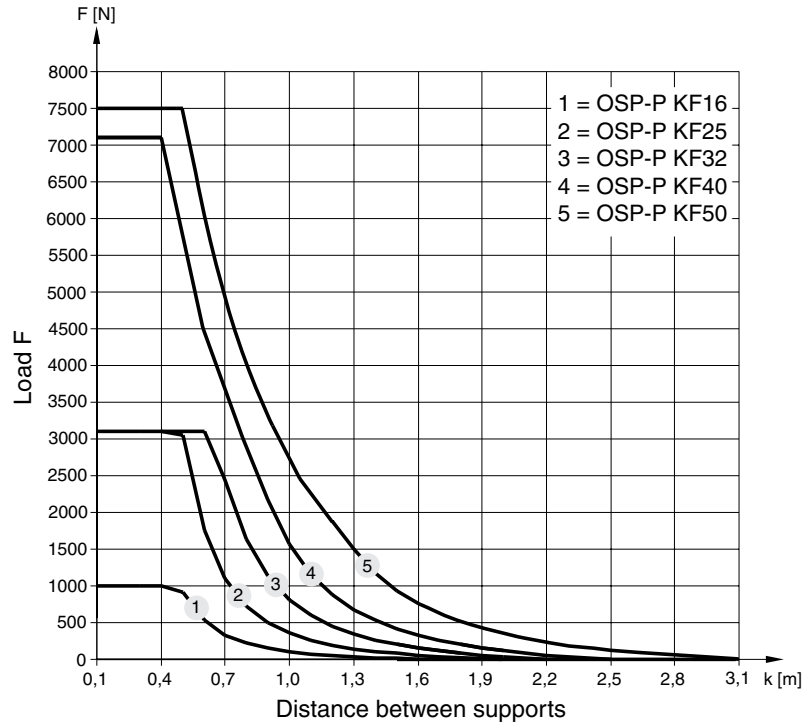
Series	A	B	J	AA	BB	CF	DD	EC	EE	EG	EW	JJ	GG	M
KF16	65	14	76	93	85	48	50	15	41	24.6	10	–	25	30
KF25	100	22	120	120.2	105	72.5	40	15	54.5	36.2	23.5	–	–	46
KF32	125	25.5	160	146.2	131	93.8	40	15	60.5	42.2	23.5	–	20	59.8
KF40	150	28	150	188.5	167	103.3	40	20	69.5	51.6	26.5	120	20	60.8
KF50	175	33	180	220.2	202	121	40	23	90.5	62.3	32.5	120	40	69

Series	FA	FB	FC	FD	FT	FS	TA	TB	TE	TF	TG	TH	TJ	TK
KF16	17.7	29	16.5	–	56	19	–	–	–	–	–	–	–	–
KF25	26.5	39	24	14 G7	75	24.7	5	12.1	2.3	6.9	M5	11.5	4	32
KF32	34	53.8	34	25 G7	86.5	24.7	5	12.1	1.8	6.4	M5	11.5	4	47
KF40	42.5	56.8	41	25 G7	104	26	6	12.8	1.8	8.4	M6	17	5.5	55
KF50	52	65	50	25 G7	134	38	8	21.1	4.5	12.5	M8	23	7.5	72

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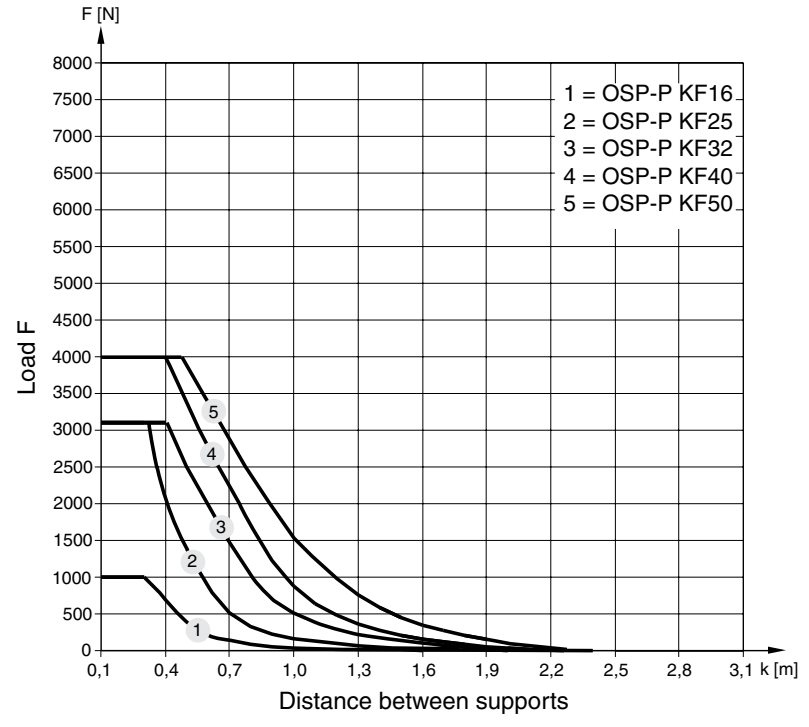
Permissible Unsupported Length OSP-P KF16 to KF50

Loading 1 – Top carrier



Permissible Unsupported Length OSP-P KF16 to KF50

Loading 2 – Side carrier

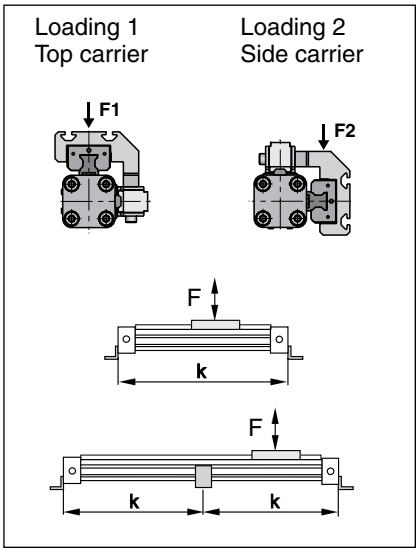


Mid-Section Support

(For versions, see pages G99-G100)

Mid-section supports are required from a certain stroke length to prevent excessive deflection and vibration of the linear drive. The diagrams show the maximum permissible unsupported length in relation to loading. A distinction must be drawn between loading 1 and loading 2.

Deflection of 0.5 mm max. between supports is permissible.



Note:
For speeds v > 0.5 m/s the distance between supports should not exceed 1 m.

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Variable Stop

The variable stop Type VS provides simple stroke limitation.

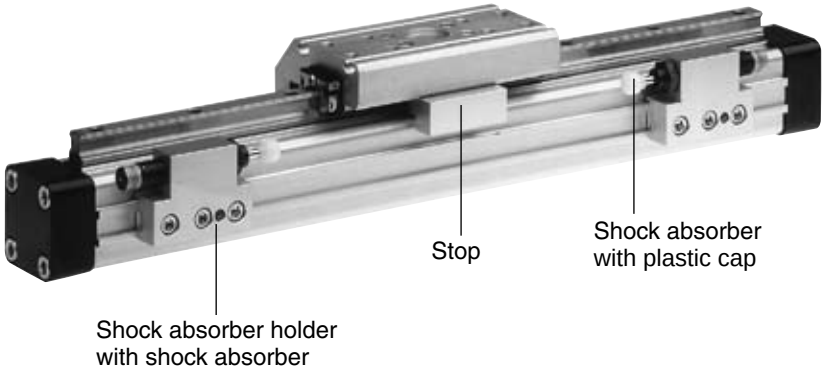
It can be retrofitted and positioned anywhere along the stroke length. For every cylinder diameter two types of shock absorber are available – see "Shock Absorber Selection" below.

Mid-section supports and magnetic switches can still be fitted on the same side as the variable stop.

Depending on the application, two variable stops can be fitted if required.

Variable Stop Type VS16 to VS50

Arrangement with two variable stops

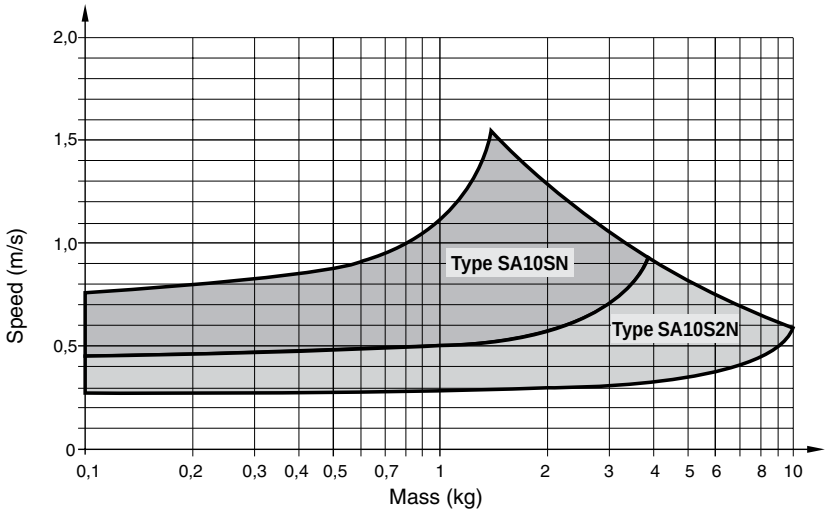


Shock Absorber Selection

The shock absorber is selected in dependence on the mass and speed.

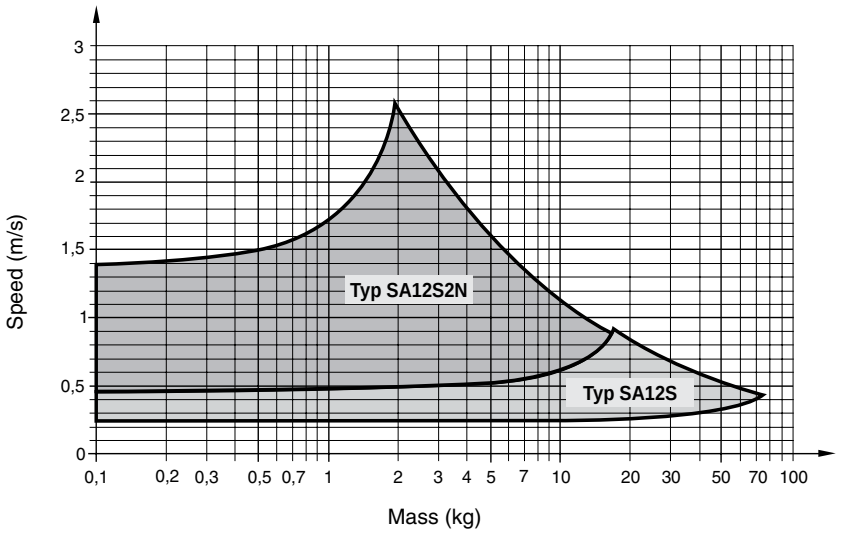
The mass of the carrier itself must be taken into account.

Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-KF16



The values relate to an effective driving force of 78 N (6 bar)

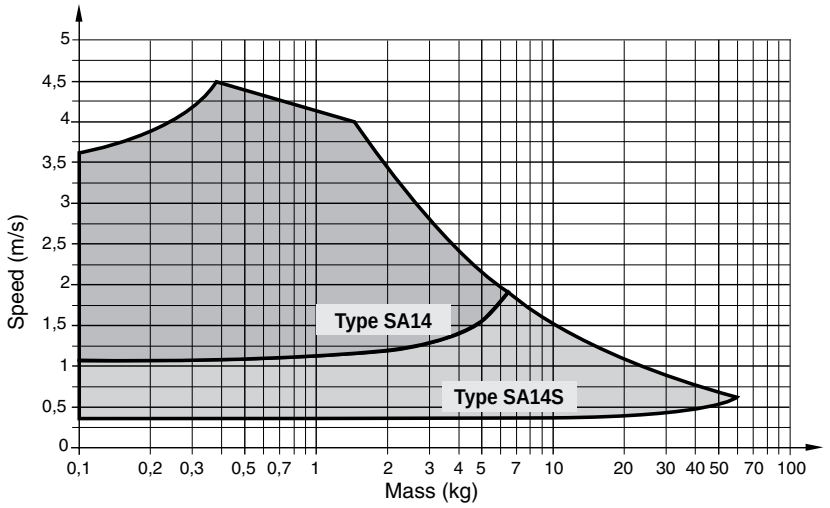
Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-KF25



The values relate to an effective driving force of 250 N (6 bar)

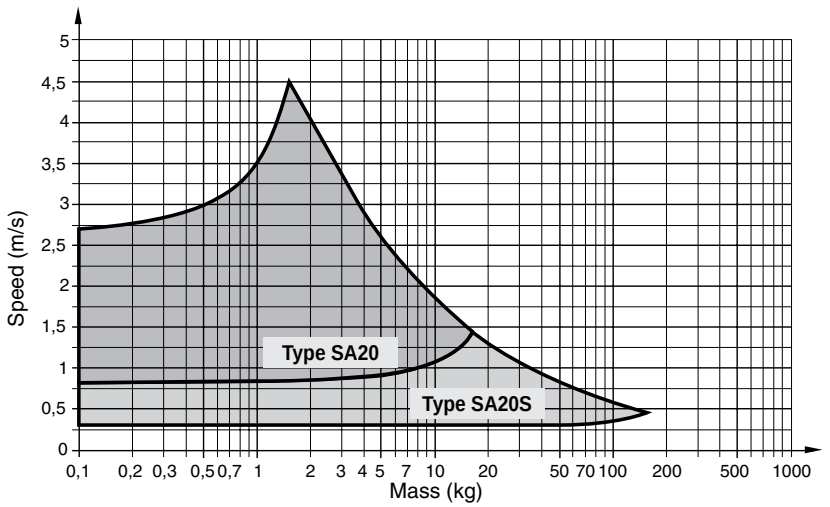
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Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-KF32



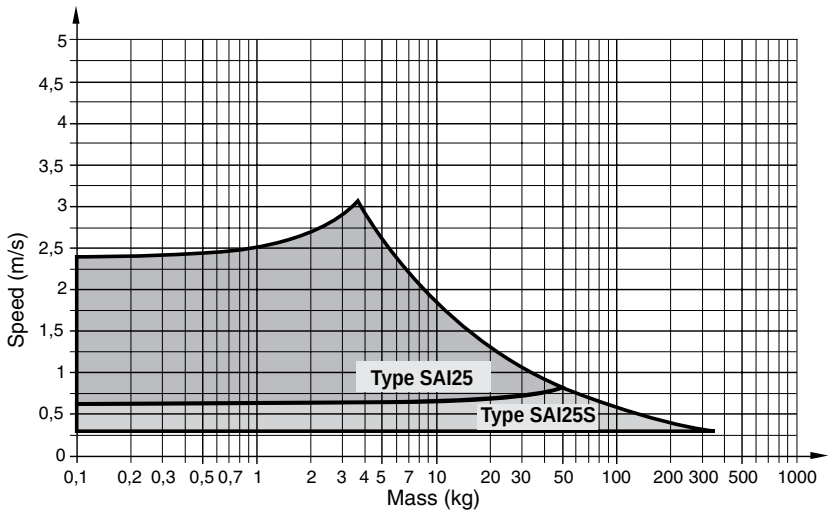
The values relate to an effective driving force of 420 N (6 bar)

Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-KF40



The values relate to an effective driving force of 640 N (6 bar)

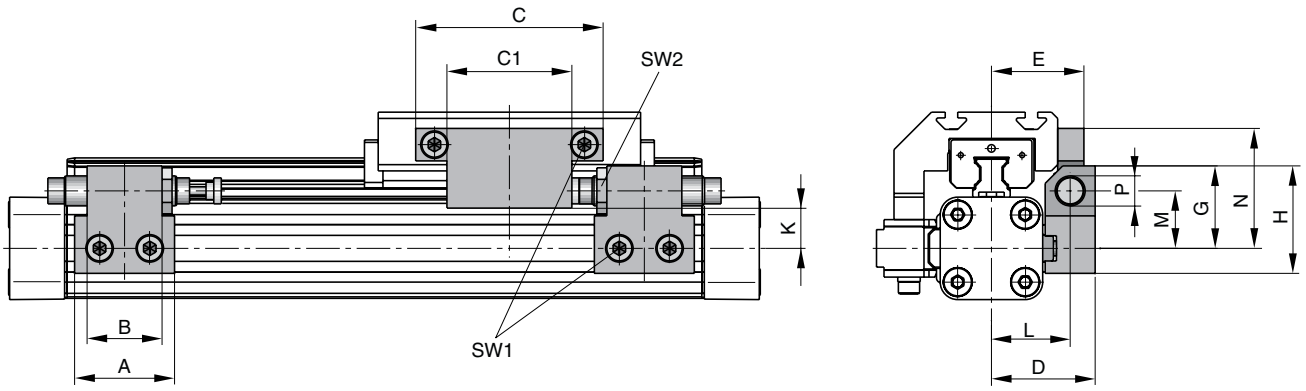
Shock Absorber Selection in Dependence on Mass and Speed for Series OSP-KF50



The values relate to an effective driving force of 1000 N (6 bar)

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Dimensions – Variable Stop Type VS16 to VS50

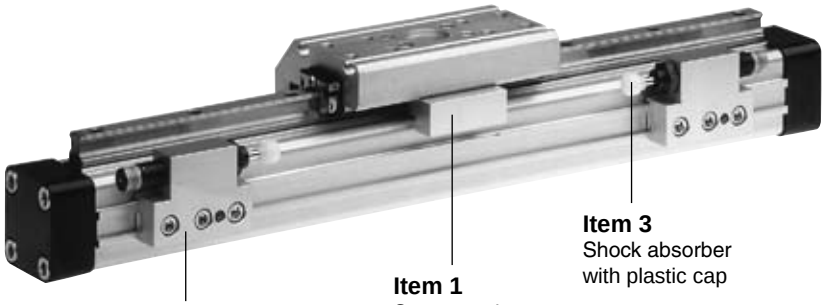


Dimension Table (mm) – Variable Stop Type VS16 to VS50

Series	Type	A	B	C	C1	D	E	G	H	K	L	M	N	P	SW1	SW2
OSP-KF16	**VS16**	30	14	50	25	33	29.7	28	38	16.2	25.5	20.5	40.5	M10 x 1	4	12.5
OSP-KF25	**VS25**	40	30	75	50	41.5	37	33	43	18	31.5	23	48	M12 x 1	5	16
OSP-KF32	**VS32**	60	40	50	-	45.5	41.5	35	45	19	35.5	25	37	M14 x 1.5	5	17
OSP-KF40	**VS40**	84	52	60	-	64	59	48	63	25.5	50	34	43	M20 x 1.5	5	24
OSP-KF50	**VS50**	84	-	60	-	75	69	55	70	26.9	57	38	58	M25 x 1.5	5	30

G

Order Information – Variable Stop Type VS16 to VS50



Item 2
Shock absorber holder complete with fittings – without shock absorber

Item 1
Stop complete with fittings

Item 3
Shock absorber with plastic cap

Order Instructions – Variable Stop Type VS16 to VS50

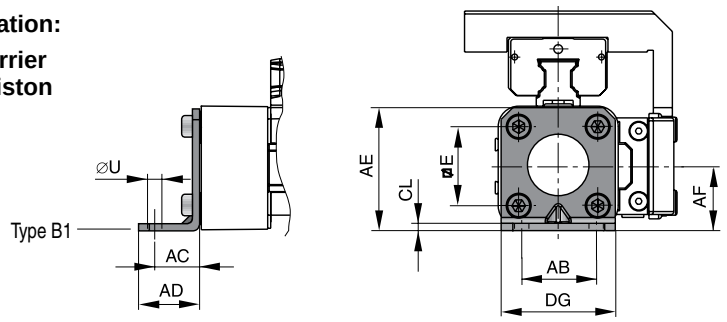
Item	Description	Size VS16		VS25		VS32		VS40		VS50	
		Type	**Order No.**	**Type**	**Order No.**	**Type**	**Order No.**	**Type**	**Order No.**	**Type**	**Order No.**
1	Stop, complete	**–**	**21186**	**–**	**21187**	**–**	**21188**	**–**	**21189**	**–**	**21190**
2	Shock absorber holder, complete	**–**	**21201**	**–**	**21202**	**–**	**21203**	**–**	**21204**	**–**	**21205**
3 *	Shock absorber, standard	**SA10SN**	**7718**	**SA12S2N**	**7723**	**SA14**	**7708**	**SA20**	**7710**	**SAI25**	**7712**
	Shock absorber, version S	**SA10S2N**	**7721**	**SA12S**	**7707**	**SA14S**	**7709**	**SA20S**	**7711**	**SAI25S**	**7713**
	* Shock absorber with plastic cap										

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Series OSP-P STL40, STL50: Type C1
Series OSP-P KF40, KF50: Type C1

Installation:

Top carrier
Side piston

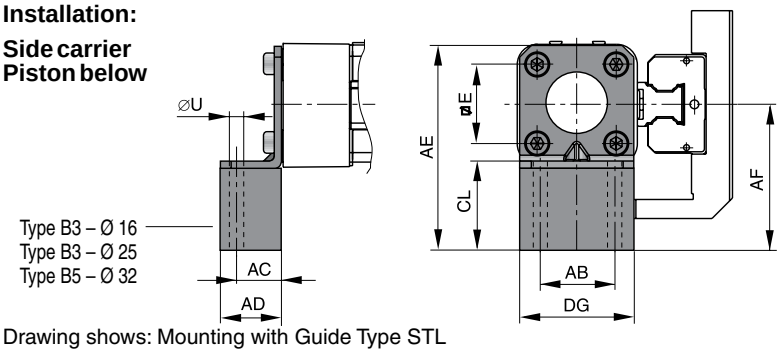


Drawing shows: Mounting with Guide Type STL

Series OSP-P STL16, STL25, STL32: Type B3 (Ø 32: B5)
Series OSP-P KF16, KF25, KF32: Type B3 (Ø 32: B5)

Installation:

Side carrier
Piston below

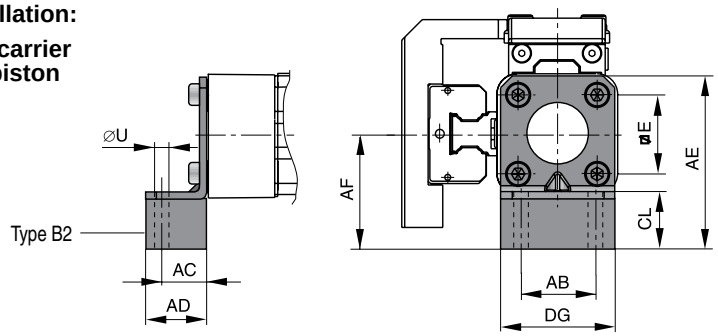


Drawing shows: Mounting with Guide Type STL

Series OSP-P STL16, STL25, STL32: Type B2
Series OSP-P KF16, KF25, KF32: Type B2

Installation:

Side carrier
Top piston



Drawing shows: Mounting with Guide Type STL

Dimension Table (mm) for End Cap Mounting Type: B1 to B5

Series Type	Mounting	E	ØU	AB	AC	AD	AE	AF	CL	DG	Order No. (pair)
OSP-P STL16	**B1**	18	3.6	18	10	14	28	15	2	26	**21135**
OSP-P KF16	**B2**	18	3.6	18	10	14	43	30	17	26	**21136**
	B3	18	3.6	18	10	14	55	42	29	26	**21137**
OSP-P STL25	**B1**	27	5.8	27	16	22	42	22	2.5	39	**20311**
OSP-P KF25	**B2**	27	5.8	27	16	22	57	37	17.5	39	**21138**
	B3	27	5.8	27	16	22	69	49	29.5	39	**21139**
OSP-P STL32	**B1**	36	6.6	36	18	26	55	30	3	50	**20313**
OSP-P KF32	**B2**	36	6.6	36	18	26	69	44	17	50	**21140**
	B5	36	6.6	36	18	26	90	65	9	50	**21141**

Linear Drive Accessories

Ø 16 to 32 mm End Cap Mounting Type: B

for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P STL**
- **Series OSP-P KF**

Material:
Galvanized steel
Anodized aluminum

The mountings are supplied in pairs.



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Ø 40 to 50 mm End Cap Mounting Type: C

for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P STL**
- **Series OSP-P KF**

Material:
Anodized aluminum

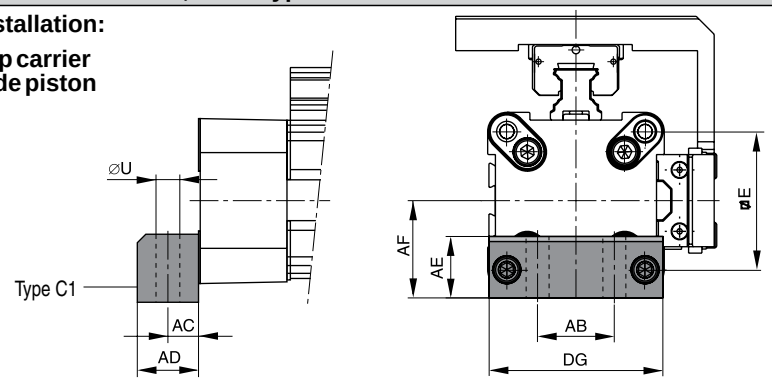
The mountings are supplied in pairs.



G

Series OSP-P STL40, STL50: Type C1
Series OSP-P KF40, KF50: Type C1

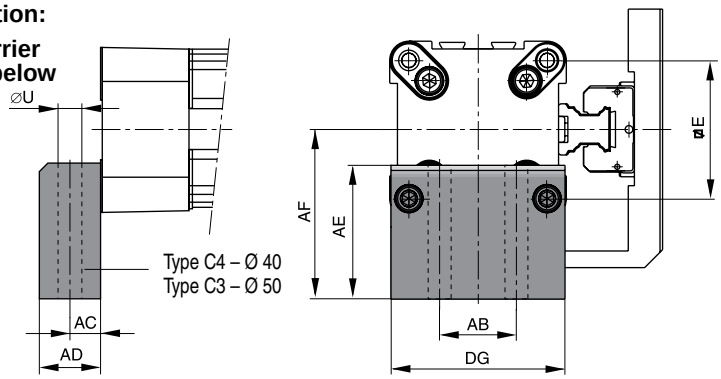
Installation:
Top carrier
Side piston



Drawing showes: Mounting with Guide Type STL

Series OSP-P STL40, STL50: Type C4 (Ø 50: C3)
Series OSP-P KF40, KF50: Type C4 (Ø 50: C3)

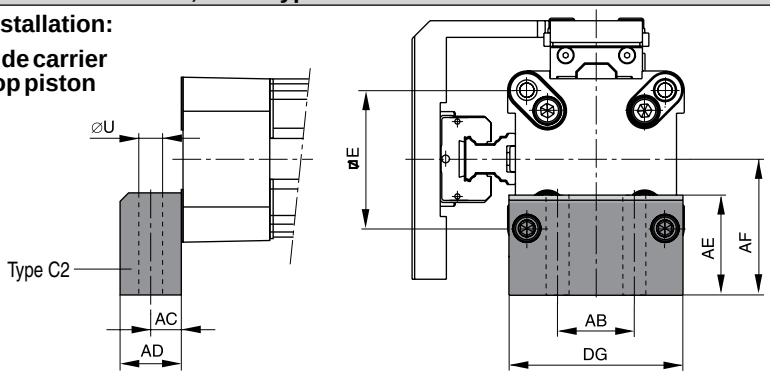
Installation:
Side carrier
Piston below



Drawing showes: Mounting with Guide Type STL

Series OSP-P STL40, STL50: Type C2
Series OSP-P KF40, KF50: Type C2

Installation:
Side carrier
Top piston



Drawing shows: Mounting with Guide Type STL

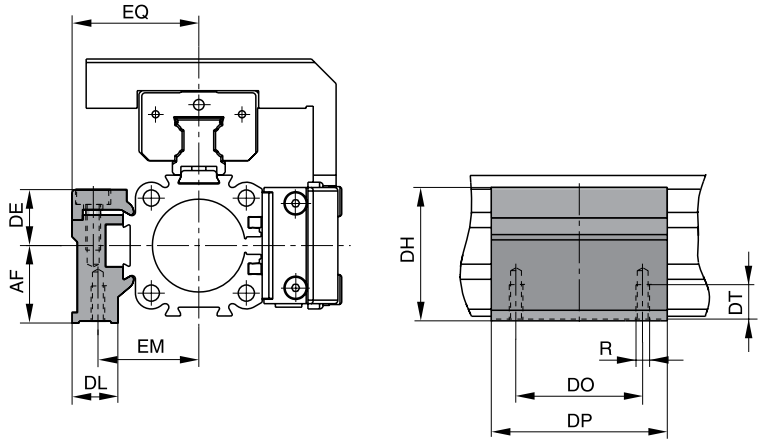
Dimension Table (mm) for End Cap Mounting Type: C1 to C4

Series Type	Mounting	E	ØU	AB	AC	AD	AE	AF	DG	Order No. (pair)
OSP-P STL40	**C1**	54	9	30	12.5	24	24	38	68	**4010**
OSP-P KF40	**C2**	54	9	30	12.5	24	37	51	68	**20338**
	C4	54	9	30	12.5	24	56	70	68	**20340**
OSP-P STL50	**C1**	70	9	40	12.5	24	30	48	86	**5010**
OSP-P KF50	**C2**	70	9	40	12.5	24	39	57	86	**20349**
	C3	70	9	40	12.5	24	54	72	86	**20350**

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Series OSP-P STL16 to STL50: Type D1ST
Series OSP-P KF16 to KF50: Type D1ST

Mountings from below with 2 screws



Drawing shows: Mounting with Guide Type STL

Dimension Table (mm) Mid-Section Support D1ST

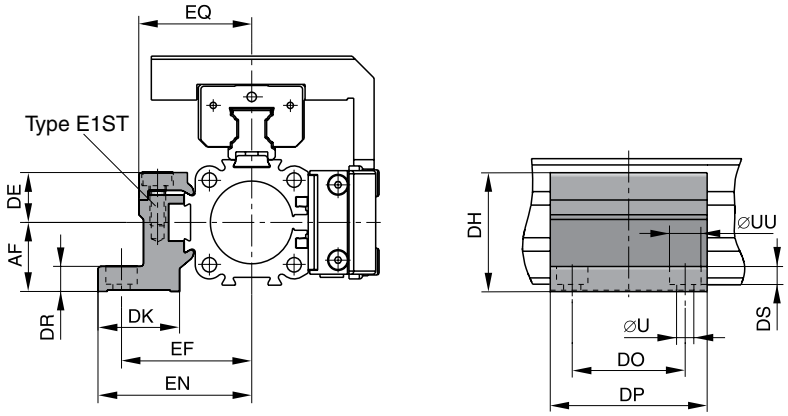
Series OSP-P	Mounting Type	R	AF	DE	DH	DL	DO	DP	DT	EM	EQ	Order No.
STL/KF16	**D1ST**	M3	15	14.2	29.2	14.6	18	30	6.5	20	27	**21125**
STL/KF25	**D1ST**	M5	22	16	38	13	36	50	10	28.5	36	**21126**
STL/KF32	**D1ST**	M5	30	16	46	13	36	60	10	35.5	43	**21127**
STL/KF40	**D1ST**	M6	38	23	61	19	45	60	11	38	48	**21128**
STL/KF50	**D1ST**	M6	48	23	71	19	45	60	11	45	57	**21129**

Order example: Type D1ST16 Order No. 21125

Series OSP-P STL16 to STL50: Type E1ST
Series OSP-P KF16 to KF50: Type E1ST

Installation:
Top carrier
Side position

Mounting from above / below using a cap screw



Drawing shows: Mounting with Guide Type STL

Linear Drive Accessories

Ø 16 to 50 Mid-Section Support Type: D1ST

for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P STL**
- **Series OSP-P KF**

Note on Types D1ST
The mid-section support can also be mounted on the underside of the actuator, in which case its distance from the center of the actuator is different.

For design notes, see page
G82 (Series OSP-P STL)
G93 (Series OSP-P KF)



Mid-Section Support Type: E1ST to E5ST

for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P STL**
- **Series OSP-P KF**



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Mid-Section Support Type: E1ST to E5ST

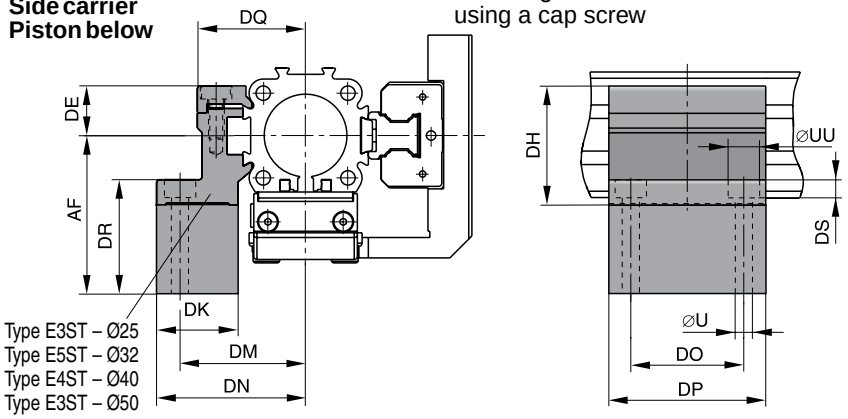
for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P STL**
- **Series OSP-P KF**



Series OSP-P STL25 to STL50: Type E3ST, E4ST, E5ST
Series OSP-P STL25 to STL50: Type E3ST, E4ST, E5ST

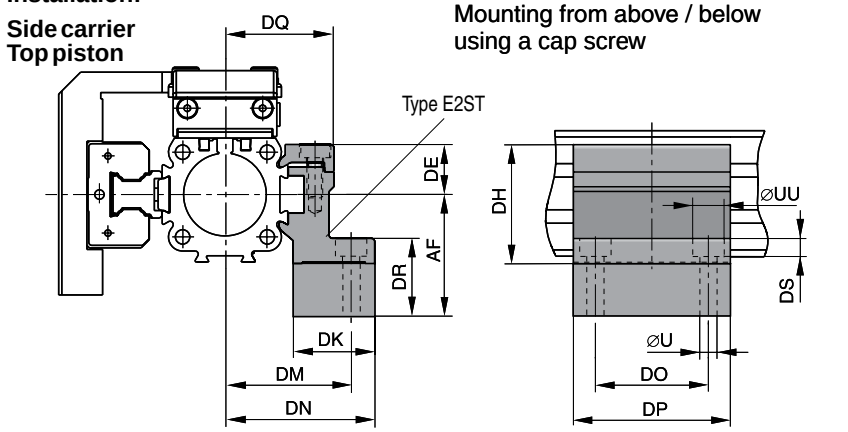
Installation:
Side carrier
Piston below



Drawing shows: Mounting with Guide Type STL

Series OSP-P STL16 to STL50: Type E2ST
Series OSP-P KF16 to KFL50: Type E2ST

Installation:
Side carrier
Top piston



Drawing shows: Mounting with Guide Type STL

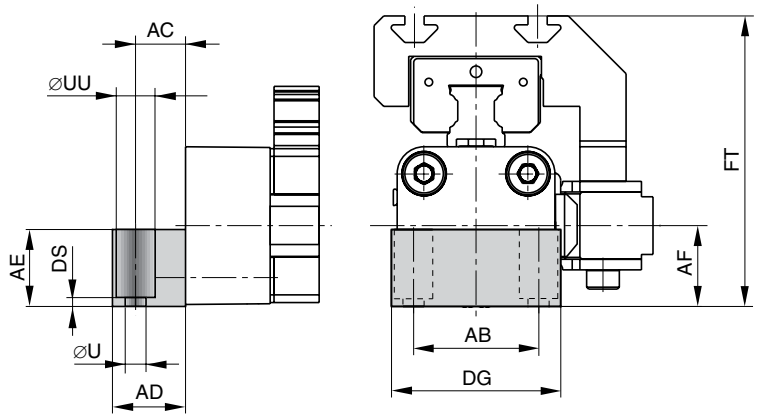
Dimension Table (mm) for Mid-Section Support E1ST to E5ST

Series OSP-P	Mounting Type	ØU	ØUU	AF	DE	DH	DK	DM	DN	DO	DP	DR	DQ	DS	EF	EN	EQ	Order No.
STL/KF16	**E1ST**	3.4	6	15	14.2	29.2	24	32	36.4	18	30	6	27	3.4	32	36.4	27	**21130**
STL/KF16	**E2ST**	3.4	6	30	14.2	29.2	24	32	36.4	18	30	21	27	3.4	32	36.4	27	**21142**
STL/KF25	**E1ST**	5.5	10	22	16	38	26	40	47.5	36	50	8	34.5	5.7	41.5	49	36	**21131**
STL/KF25	**E2ST**	5.5	10	37	16	38	26	40	47.5	36	50	23	34.5	5.7	41.5	49	36	**21143**
STL/KF25	**E3ST**	5.5	10	49	16	38	26	40	47.5	36	50	35	34.5	5.7	41.5	49	36	**21148**
STL/KF32	**E1ST**	5.5	10	30	16	46	27	46	54.5	36	60	10	40.5	5.7	48.5	57	43	**21132**
STL/KF32	**E2ST**	5.5	10	44	16	46	27	46	54.5	36	60	24	40.5	5.7	48.5	57	43	**21144**
STL/KF32	**E5ST**	5.5	10	65	16	46	27	46	54.5	36	60	45	40.5	5.7	48.5	57	43	**21151**
STL/KF40	**E1ST**	7	-	38	23	61	34	53	60	45	60	10	45	-	56	63	48	**21133**
STL/KF40	**E2ST**	7	-	51	23	61	34	53	60	45	60	23	45	-	56	63	48	**21145**
STL/KF40	**E4ST**	7	-	70	23	61	34	53	60	45	60	42	45	-	56	63	48	**21150**
STL/KF50	**E1ST**	7	-	48	23	71	34	59	67	45	60	10	52	-	64	72	57	**21134**
STL/KF50	**E2ST**	7	-	57	23	71	34	59	67	45	60	19	52	-	64	72	57	**21146**
STL/KF50	**E3ST**	7	-	72	23	71	34	59	67	45	60	34	52	-	64	72	57	**21149**

Order example: Type E1ST16 Order No. 21130

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Series OSP-P KF25 to KF50: Type HP (Correspond to FESTO dimensions)



Note:
Correspond to FESTO DGPL-KF,
when the End Cap Mountings HP are mounted on the opposite side to the carriage (see drawing)

Dimension Table (mm)

Series	ØU	AB	AC	AD	AE	AF	DG	DS	FT	ØUU	Order No.
HP25	5.5	32.5	13	19	20	21	44	2	75.5	10	**21107**
HP32	6.6	38	17	24	24	27	52	3	87.5	11	**21108**
HP40	6.6	45	17.5	24	24	35	68	2	104.5	11	**21109**
HP50	9	65	25	35	35	48	86	6	138.5	15	**21110**

Linear Drive Accessories

Ø 25-50 mm
End Cap Mounting
correspond to FESTO dimensions HP25 – 50

for Linear Drives with Recirculating Ball Bearing Guide

- **Series OSP-P KF**

On the end-face of each end cap there are four threaded holes for mounting the actuator.

Material:
Series OSP-P KF25 – 50:
Anodized aluminum.

The mountings are supplied in pairs.

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Linear Drive Accessories

Ø 25-50 mm Mid-Section Support

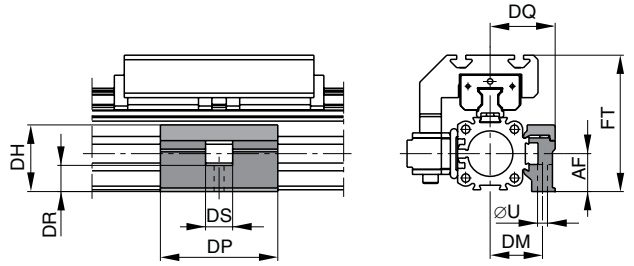
correspond to FESTO dimensions MUP25 – 50

for Linear Drives with Recirculating Ball Bearing Guide

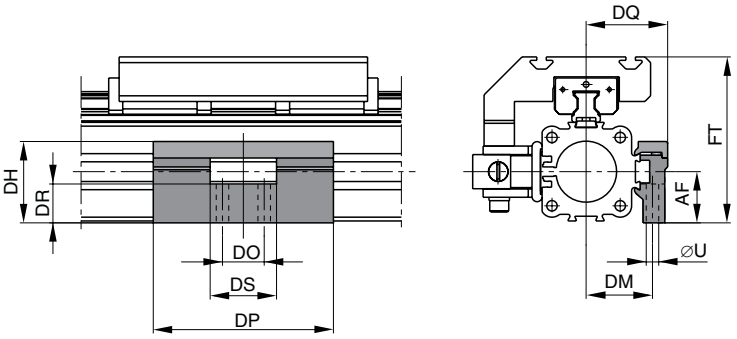
- **Series OSP-P KF**

G

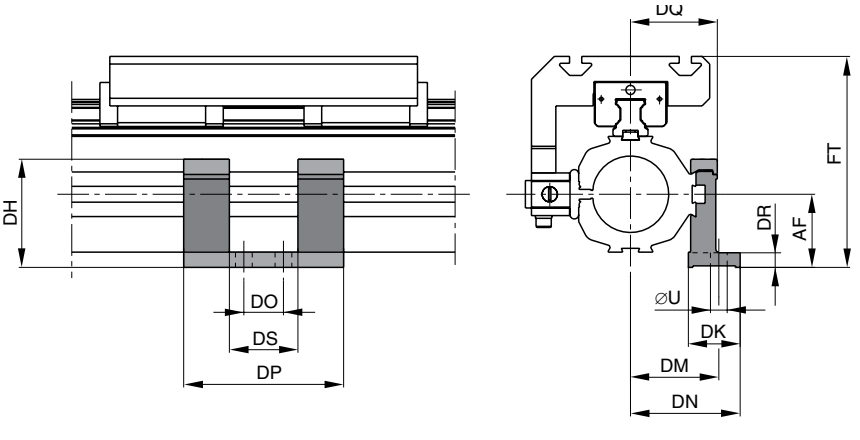
Series OSP-P KF25: Type MUP (Mounting over through holes)



Series OSP-P KF32 to KF40: Type MUP (Mounting over through holes)



Series OSP-P KF50: Type MUP (Mounting over through holes)



Note:
Correspond to FESTO DGPL-KF, when the Mid-Section Support MUP are mounted on the 90° side to the carriage (see drawings).

Dimension Table (mm)

Series	ØU	AF	DH	DK	DM	DN	DO	DP	DQ	DR	DS	FT	Order No.
MUP25	5.5	21	36.9	–	29	–	–	65	36	14.5	15	75.5	21119
MUP32	6.6	27	42.9	–	35	–	22	95	43	20.5	35	87.5	21120
MUP40	6.6	35	58	–	40	–	22	95	48	28.5	35	104.5	21121
MUP50	11	48	71	34	58	72	26	105	57	10	45	138.5	21122

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Ordering Instructions / Part Numbering System for OSP-P KF Series

6	7	8	9	10	11	12-16	17	18	19	20	21	22	23	24	25
OSPP	32	0	0	0	0	0	02500	0	2	0	C	0	0	5	0	0

Bore
16
25
32
40
50

Piston Style
0 Standard
1 Tandem
S Special

Air Connections / Porting
0 Standard (position #2)
1 end face (position #5)
2 single end porting
3 left stand (pos #2), right end face (pos#5)
4 right stand (pos #2), left end face (pos #5)
6 single end porting end face
A 3/2 Way valve VOE 24V = (25,32,40,50)
B 3/2 Way valve VOE 220V~/110V= (25,32,40,50)
C 3/2 Way valve VOE 48V=(25,32,40,50)
E 3/2 Way valve VOE 110V~ (25,32,40,50)
S Special

Note: Single End Porting on 16mm bore, then end caps cannot be rotated.

Seals
0 Standard
1 Viton
S Special

Lubrication
0 Standard
1 Slow Speed
4 Food
5 Clean Room
S Special

Corrosion Resist, Hardware
0 Standard
1 Stainless
S Special

Stroke
x x x x x

End Cap Position
0 I+r 0° = in front (pos #2)
1 I+r 90° = underneath (pos #3)
2 I+r 180° = at the back (pos # 4)
3 I+r 270° = same face as outerband (pos #2,1)
4 I 90° = underneath; r 0° = in front (pos #3,2)
5 I 180° = at the back; r 0° = in front (pos #4,2)
6 I 270° = same face as outerband; r 0° = in front (pos #1,2)
7 I 0° = in front; r 90° = underneath (pos #2, 3)
8 I 180° = at the back; r 90° = underneath (pos #4,3)
9 I 270° = same face as outerband; r 90° = underneath (pos #1,3)
A I 0° = in front; r 180° = at the back (pos #2,4)
B I 90° = underneath; r 180° = at the back (pos #3,4)
C I 270° = same face as outerband; r 180° = at the back (pos #1,4)
D I 0° = in front; r 270° = same face as outerband (pos #2,1)
E I 90° = underneath; r 270° = same face as outerband (pos #3,1)
F I 180° = at the back; r 270° = same face as outerband (pos #4,1)
S Special

Cushioning / Stops
0 Standard
2 VS soft left
3 VS hard left
4 VS soft right
5 VS hard right
6 VS soft both sides
7 VS hard both sides
S Special

Piston Mountings
0 none

Guides / Brakes
C KF

add. Carriage
0 without
C Guide Carriage KF

Dovetail Cover
0 Standard
X Without Cover Rail
S Special

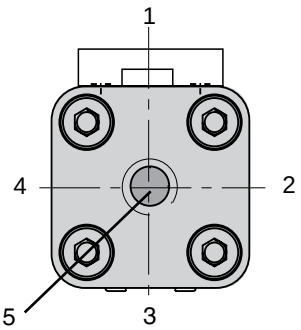
End Cap Mounts
0 without
4 B1 (16,25,32)
5 B2 (16,25,32)
6 B3 (16,25)
8 B5 (32)
9 C1 (40,50)
A C2 (40,50)
B C3 (50)
C C4 (40)
D HP (25,32,40,50)

Note: Comes in pairs

Version

Switches / Measuring System
0 none
1 NO Reed-KL3045 Qty. 2
2 NC Reed-KL3048 Qty. 2
3 PNP KL3054+4041 Qty. 2
4 NPN KL3060+4041 Qty. 2
X 21240 SFI 0,1mm
Y 21241 SFI 1mm
Z 4650 SFA
S Special

Note: 2 switches will be supplied. For different quantity, please order as a separate line item.



Note: Position #2 is the standard location.

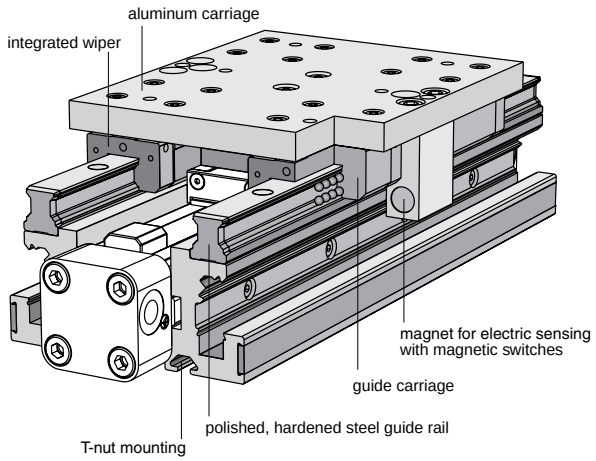
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Heavy Duty-Guide HD

OSP
ORIGA SYSTEM PLUS

Series HD 25 to 50
for Linear Drive Series OSP-P

Version with Pneumatic Linear Drive Series OSP-P

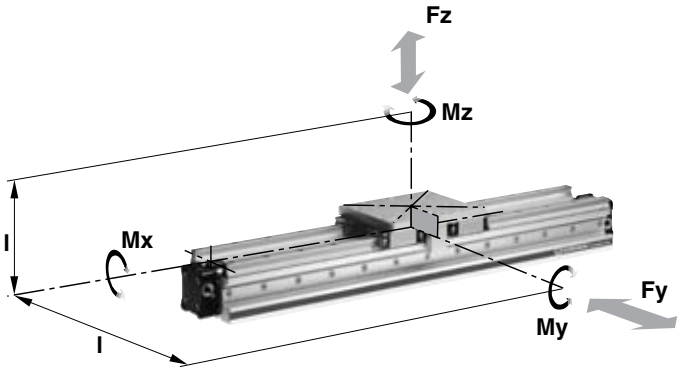


Features:

- Guide system: 4-row recirculating ball bearing guide
- Polished and hardened steel guide rail
- For highest loads in all directions
- Highest precision
- Integrated wiper system
- Integrated grease nipples
- Any lengths of stroke up to 3700 mm (longer strokes on request)
- Anodized aluminum guide carriage - dimensions compatible with OSP guide GUIDELINE
- Maximum speed v = 5 m/s



Loads. Forces and Moments



Technical Data

The table shows the maximum permissible loads. If multiple moments and forces act upon the cylinder simultaneously, the following equation applies:

$$\frac{Mx}{Mx_{max}} + \frac{My}{My_{max}} + \frac{Mz}{Mz_{max}} + \frac{Fy}{Fy_{max}} + \frac{Fz}{Fz_{max}} \leq 1$$

The sum of the loads should not >1

The table shows the maximum permissible values for light, shock-free operation which must not be exeeded even under dynamic conditions.

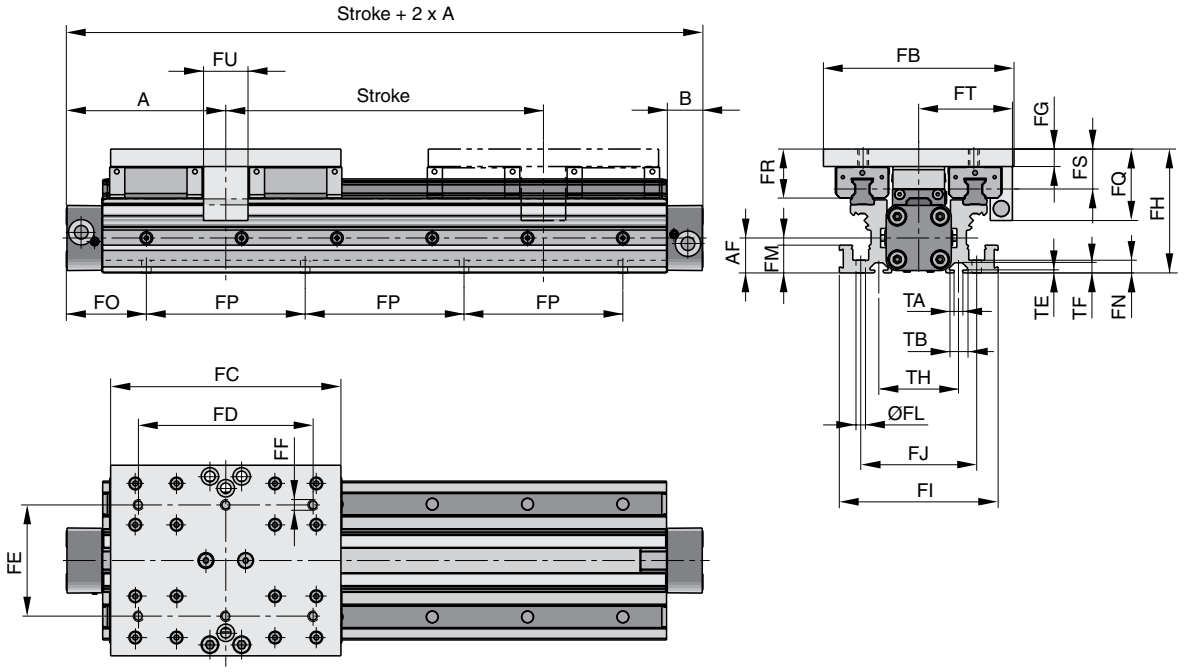
*** Please note:**
The mass of the carriage does not have to be added to the total moving mass when using the cushioning diagram.

Series	for linear drive	Max. moments (Nm)			Max. loads (N)		Mass of the linear drive with guide (kg)		Mass * guide carriage (kg)
		Mx	My	Mz	Fy	Fz	with 0 mm stroke	increase per 100 mm stroke	
HD 25	OSP-P25	260	320	320	6000	6000	3.065	0.924	1.289
HD 32	OSP-P32	285	475	475	6000	6000	4.308	1.112	1.367
HD 40	OSP-P40	800	1100	1100	15000	15000	7.901	1.748	2.712
HD 50	OSP-P50	1100	1400	1400	18000	18000	11.648	2.180	3.551

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Dimensions

Series OSP-P



Note:

The HD heavy duty guide must be mounted on a flat surface for its entire length.

If T-grooves or T-bolts are used, the distance between them should not exceed 100 mm.

Variable Stop

Type VS25 to VS50

The variable stop provides simple stroke limitation and can be supplied mounted on the right or left, as required.

For further information see following data sheets:

For dimensions and order instructions see page G107

For shock absorber selection see pages G83-G84

Incremental displacement measuring system ORIGA-Sensoflex

Series SFI-plus can be supplied mounted on the right or left, as required.

For further information see page G125

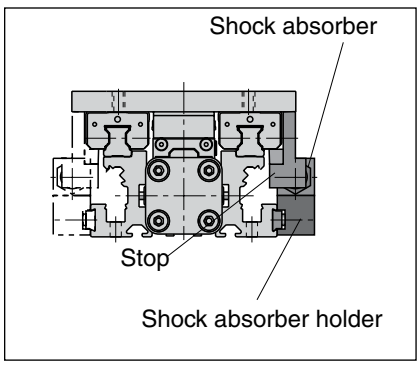
Arrangement of magnetic switches:

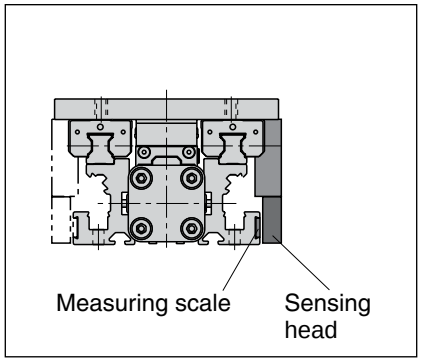
Magnetic switches can be fitted anywhere on either side.

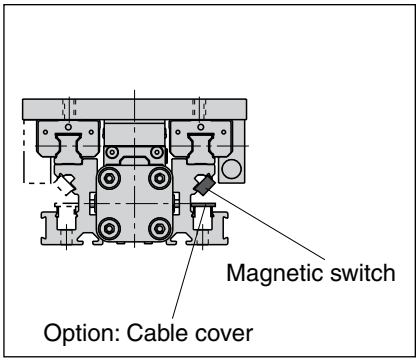
For further information see following data sheets:

Magnetic Switches see pages BG114-G120

Dovetail Cover see page G121







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Dimension Table (mm)

Series	A	B	AF	FB	FC	FD	FE	FF	FG	FH	FI	FJ	ØFL
HD25	100	22	22	120	145	110	70	M6	11	78	100	73	6
HD32	125	25.5	30	120	170	140	80	M6	11	86	112	85	6
HD40	150	28	38	160	180	140	110	M8	14	108	132	104	7.5
HD50	175	33	48	180	200	160	120	M8	14	118	150	118	7.5

Series	FM	FN	FP	FQ	FR	FS	FT	FU	TA	TB	TE	TF	TH
HD25	17.5	8	100	45	31	25	59	28	5.2	11.5	1.8	6.4	50
HD32	17.5	8	100	45	31	25	63	30	5.2	11.5	1.8	6.4	60
HD40	22	10	100	58	40	31.5	76	30	8.2	20	4.5	12.3	66
HD50	22	10	100	58	44	35.5	89	30	8.2	20	4.5	12.3	76

Note:

the dimension FO is derived from the last two digits of the stroke:

Example:

Stroke 15**25 mm**

X

For a cylinder OSP-P25 the adjacent table indicates that for x = 25 mm:

FO = 62.5 mm

G

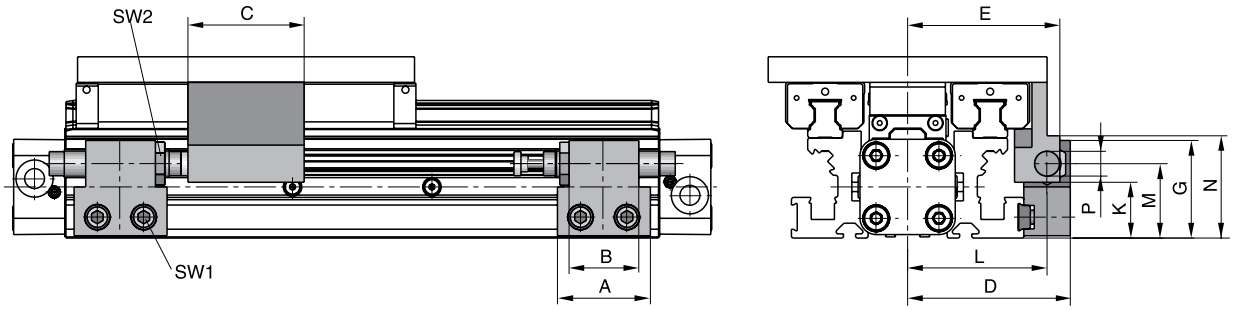
FO				
OSP-P				
x	HD25	HD32	HD40	HD50
00	50.0	75.0	50.0	75.0
01	50.5	75.5	50.5	75.5
02	51.0	76.0	51.0	76.0
03	51.5	76.5	51.5	76.5
04	52.0	77.0	52.0	77.0
05	52.5	77.5	52.5	77.5
06	53.0	78.0	53.0	78.0
07	53.5	78.5	53.5	78.5
08	54.0	79.0	54.0	79.0
09	54.5	79.5	54.5	79.5
10	55.0	80.0	55.0	80.0
11	55.5	80.5	55.5	80.5
12	56.0	81.0	56.0	81.0
13	56.5	81.5	56.5	81.5
14	57.0	82.0	57.0	82.0
15	57.5	82.5	57.5	82.5
16	58.0	83.0	58.0	83.0
17	58.5	83.5	58.5	83.5
18	59.0	84.0	59.0	84.0
19	59.5	84.5	59.5	84.5
20	60.0	85.0	60.0	85.0
21	60.5	85.5	60.5	85.5
22	61.0	36.0	61.0	86.0
23	61.5	36.5	61.5	86.5
24	62.0	37.0	62.0	87.0
25	62.5	37.5	62.5	87.5
26	63.0	38.0	63.0	88.0
27	63.5	38.5	63.5	88.5
28	64.0	39.0	64.0	89.0
29	64.5	39.5	64.5	89.5
30	65.0	40.0	65.0	90.0
31	65.5	40.5	65.5	90.5
32	66.0	41.0	66.0	91.0
33	66.5	41.5	66.5	91.5

FO				
OSP-P				
x	HD25	HD32	HD40	HD50
34	67.0	42.0	67.0	92.0
35	67.5	42.5	67.5	92.5
36	68.0	43.0	68.0	93.0
37	68.5	43.5	68.5	43.5
38	69.0	44.0	69.0	44.0
39	69.5	44.5	69.5	44.5
40	70.0	45.0	70.0	45.0
41	70.5	45.5	70.5	45.5
42	71.0	46.0	71.0	46.0
43	71.5	46.5	71.5	46.5
44	72.0	47.0	72.0	47.0
45	72.5	47.5	72.5	47.5
46	73.0	48.0	73.0	48.0
47	73.5	48.5	73.5	48.5
48	74.0	49.0	74.0	49.0
49	74.5	49.5	74.5	49.5
50	75.0	50.0	75.0	50.0
51	75.5	50.5	75.5	50.5
52	76.0	51.0	76.0	51.0
53	76.5	51.5	76.5	51.5
54	77.0	52.0	77.0	52.0
55	77.5	52.5	77.5	52.5
56	78.0	53.0	78.0	53.0
57	78.5	53.5	78.5	53.5
58	79.0	54.0	79.0	54.0
59	79.5	54.5	79.5	54.5
60	80.0	55.0	80.5	55.0
61	80.5	55.5	80.5	55.5
62	81.0	56.0	81.0	56.0
63	81.5	56.5	81.5	56.5
64	82.0	57.0	82.0	57.0
65	32.5	57.5	82.5	57.5
66	33.0	58.0	83.0	58.0
67	33.5	58.5	83.5	58.5

FO				
OSP-P				
x	HD25	HD32	HD40	HD50
68	34.0	59.0	84.0	59.0
69	34.5	59.5	84.5	59.5
70	35.0	60.0	85.0	60.0
71	35.5	60.5	85.5	60.5
72	36.0	61.0	86.0	61.0
73	36.5	61.5	86.5	61.5
74	37.0	62.0	87.0	62.0
75	37.5	62.5	87.5	62.5
76	38.0	63.0	88.0	63.0
77	38.5	63.5	38.5	63.5
78	39.0	64.0	39.0	64.0
79	39.5	64.5	39.5	64.5
80	40.0	65.0	40.0	65.0
81	40.5	65.5	40.5	65.5
82	41.0	66.0	41.0	66.0
83	41.5	66.5	41.5	66.5
84	42.0	67.0	42.0	67.0
85	42.5	67.5	42.5	67.5
86	43.0	68.0	43.0	68.0
87	43.5	68.5	43.5	68.5
88	44.0	69.0	44.0	69.0
89	44.5	69.5	44.5	69.5
90	45.0	70.0	45.0	70.0
91	45.5	70.5	45.5	70.5
92	46.0	71.0	46.0	71.0
93	46.5	71.5	46.5	71.5
94	47.0	72.0	47.0	72.0
95	47.5	72.5	47.5	72.5
96	48.0	73.0	48.0	73.0
97	48.5	73.5	48.5	73.5
98	49.0	74.0	49.0	74.0
99	49.5	74.5	49.5	74.5

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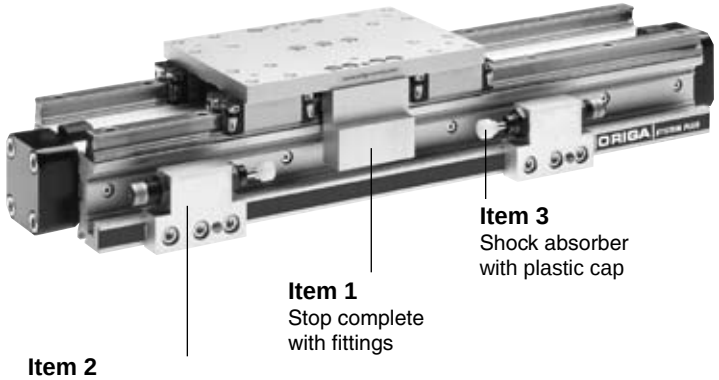
Dimensions – Variable Stop Type VS25 to VS50



Dimension Table (mm) – Variable Stop Type VS25 to VS50

Series	Type	A	B	C	D	E	G	K	L	M	N	P	SW1	SW2
OSP-HD25	VS25	40	30	50	70	65.5	42	26	60	32	42	M12 x 1	5	16
OSP-HD32	VS32	60	40	54	73	71	44	28	63	34	53	M14 x 1.5	5	17
OSP-HD40	VS40	84	52	55	96	92	59	35	82	45	61	M20 x 1.5	5	24
OSP-HD50	VS50	84	-	60	107	105	66	37	89	49	66	M25 x 1.5	5	30

Order Information – Variable Stop Type VS25 to VS50



Item 3
Shock absorber
with plastic cap

Item 1
Stop complete
with fittings

Item 2
Shock absorber holder
complete with fittings
– without shock absorber

Shock Absorber Selection

For shock absorber selection in dependence on mass and speed
see pages G94-G95

Order Instructions – Variable Stop Type VS25 to VS50

Item	Description	Size VS25		VS32		VS40		VS50	
		Type	**Order No.**	**Type**	**Order No.**	**Type**	**Order No.**	**Type**	**Order No.**
1	Stop, complete	**–**	**21257**	**–**	**21258**	**–**	**21259**	**–**	**21260**
2	Shock absorber holder, complete	**–**	**21202**	**–**	**21203**	**–**	**21204**	**–**	**21205**
3 *	Shock absorber, standard	**SA12**	**7706**	**SA14**	**7708**	**SA20**	**7710**	**SAI25**	**7712**
	Shock absorber, version S	**SA12S**	**7707**	**SA14S**	**7709**	**SA20S**	**7711**	**SAI25S**	**7835**
	* Shock absorber with plastic cap (see pages G94-G95)								

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Intermediate Stop Module

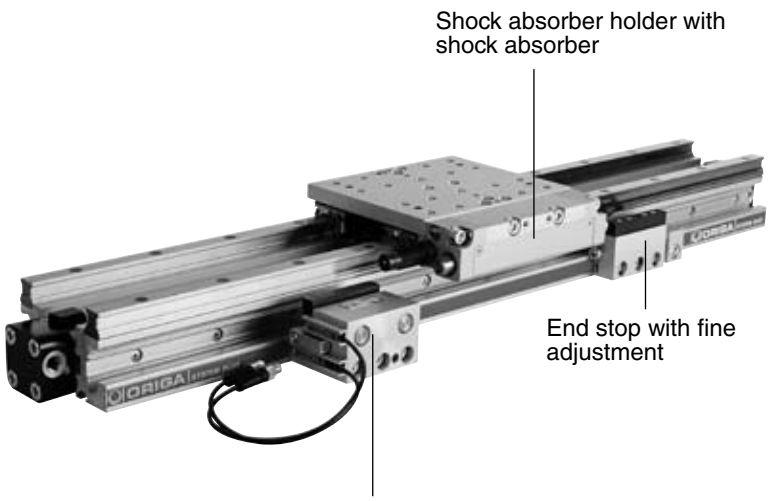
The intermediate stop module ZSM allows the guide carriage to stop at any desired intermediate positions with high accuracy. It can be retrofitted. Depending on the application, i.e. the number of intermediate stops, one or more intermediate position stops can be used. The intermediate position stops can be retracted and extended without the need for the guide carriage to be moved back out of position.

Therefore the guide carriage can be made to stop at the defined intermediate positions in any order.

ORIGA intermediate stop module ZSM:

- Allows stopping at any intermediate positions
- Intermediate position stops can be located steplessly anywhere along the whole stroke length
- Movement to the next position without reverse stroke
- Compact unit
- Cost-effective positioning module without electrical or electronic components
- Option: end stop with fine adjustment

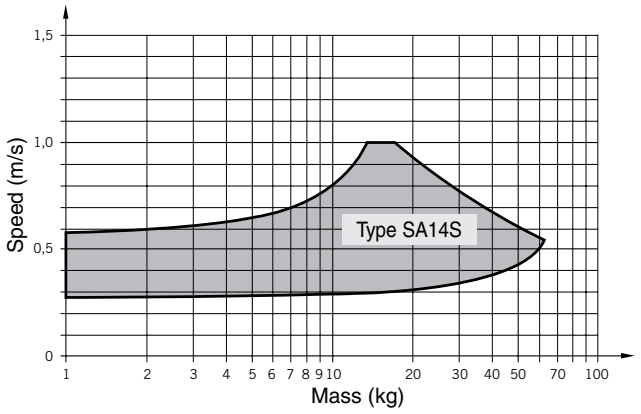
Intermediate Stop Module Type ZSM..HD



Technical Data

Temperature range	-10°C to +70°C
Operating pressure range	4 – 8 bar
Intermediate position grid	85 mm

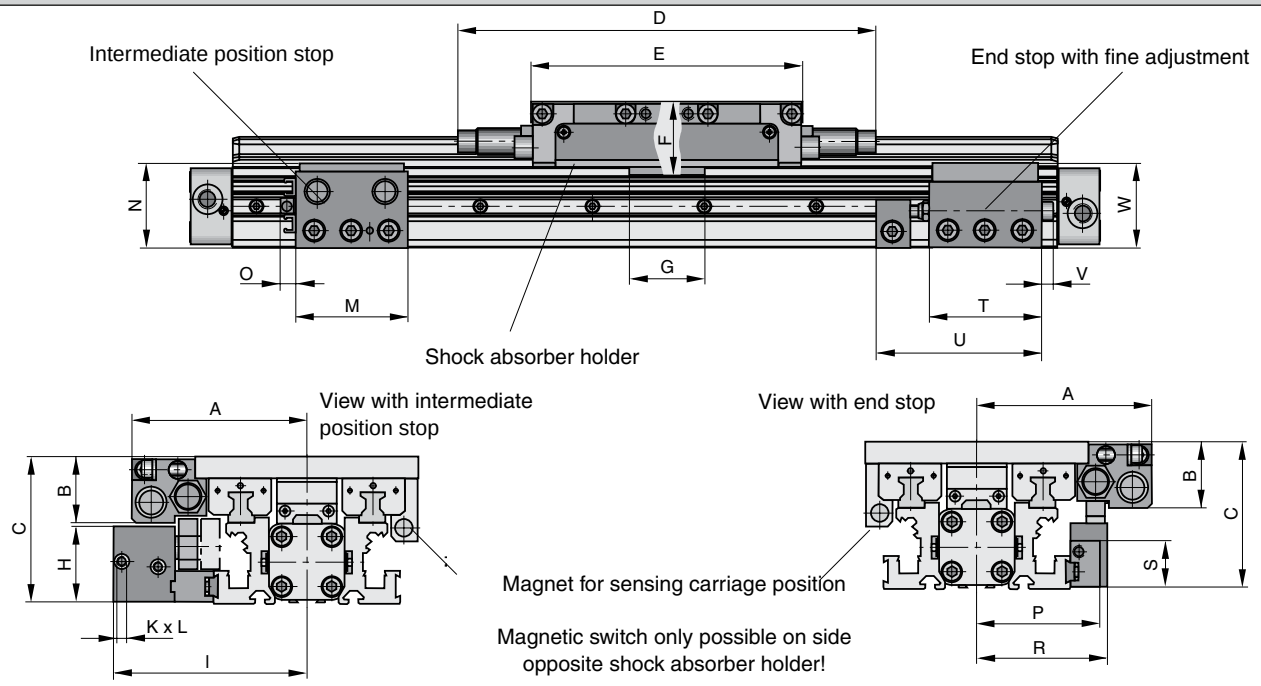
Shock Absorber Type SA14S



The values relate to an effective driving force of 250 N (6 bar)

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Dimensions – intermediate stop module Type ZSM..HD

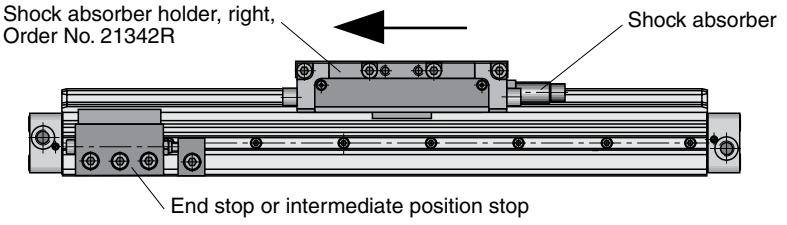


Dimension Table (mm) – intermediate Stop Module Type ZSM..HD

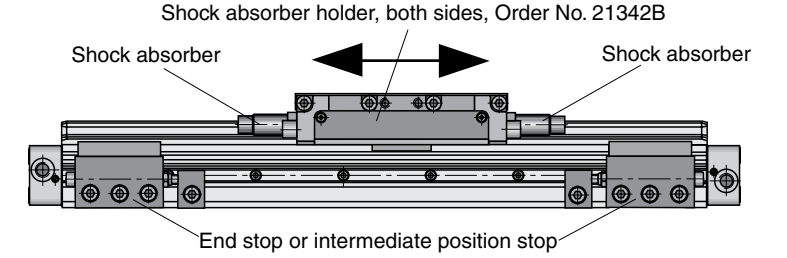
Series	A	B	C	D	E	F	G	H	I	K	L	M	N	O	P	R	S	T	U	V	W
ZSM25	94	35	78	224	145	39	40	41	104	M5	5	60	45	8	66	70	26	60	93	6	45

Shock Absorber Arrangement in Dependence on Direction of Movement

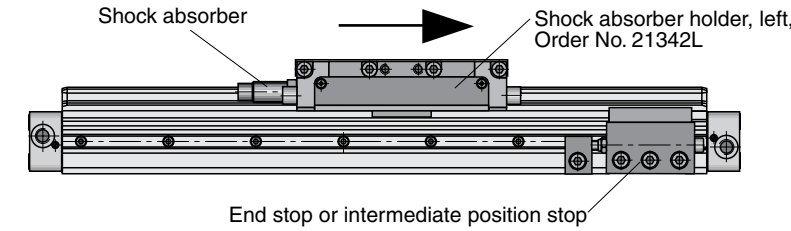
From right to left



In both directions



From left to right



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Order Instructions – intermediate Stop Module Type ZSM..HD

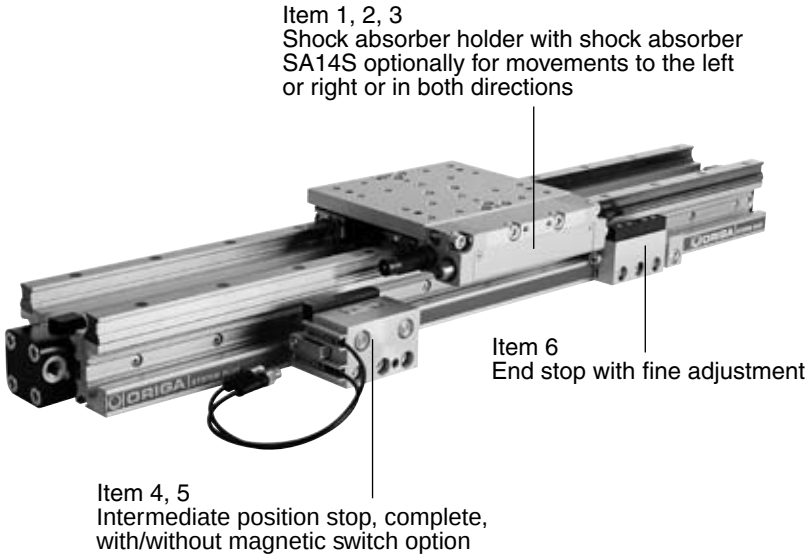


Illustration shows version with shock absorber holder for movement in both directions and magnetic switch option with T-slot switches.

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Order instructions – intermediate stop module Type ZSM..HD

Item	Description	For intermediate stop module	Order-No.
1*	Shock absorber holder with shock absorber SA14S, both sides	ZSM25HD	**21342B**
2*	Shock absorber holder with shock absorber SA14S, left	ZSM25HD	**21342L**
3*	Shock absorber holder with shock absorber SA14S, right	ZSM25HD	**21342R**
4	Intermediate position stop complete, without magnetic switch option	ZSM25HD	**21343**
5	Intermediate position stop complete, with magnetic switch option	ZSM25HD	**21344**
6	End stop with fine adjustment	ZSM25HD	**21346**

* The shock absorbers are installed in the shock absorber holder and adjusted in our workshop.

Note:
For movement onwards from the intermediate position, the intermediate position stop must advance.
The intermediate position stop can only advance if both cylinder chambers of the OSP-P cylinder are pressurized.

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Ordering Instructions / Part Numbering System for OSP-P HD Series

6	7	8	9	10	11	12-16	17	18	19	20	21	22	23	24	25
OSPP	50	0	0	0	0	0	02500	0	3	0	D	0	0	0	0	0

Bore
- 25
- 32
- 40
- 50

Piston Style
- 0 Standard
- 1 Tandem
- S Special

Air Connections / Porting
- 0 Standard (position #2)
- 1 end face (position #5)
- 2 single end porting
- 3 left stand (pos #2), right end face (pos#5)
- 4 right stand (pos #2), left end face (pos #5)
- 6 single end porting end face
- A 3/2 Way valve VOE 24V = (25,32,40,50)
- B 3/2 Way valve VOE 220V~/110V= (25,32,40,50)
- C 3/2 Way valve VOE 48V=(25,32,40,50)
- E 3/2 Way valve VOE 110V~ (25,32,40,50)
- S Special

Seals
- 0 Standard
- 1 Viton
- S Special

Lubrication
- 0 Standard
- 1 Slow Speed
- 4 Food
- 5 Clean Room
- S Special

Corrosion Resist, Hardware
- 0 Standard
- 1 Stainless
- S Special

Stroke
- x x x x x

End Cap Position
- 0 I+r 0° = in front (pos #2)
- 1 I+r 90° = underneath (pos #3)
- 2 I+r 180° = at the back (pos # 4)
- 3 I+r 270° = same face as outerband (pos #2,1)
- 4 I 90° = underneath; r 0° = in front (pos #3,2)
- 5 I 180° = at the back; r 0° = in front (pos #4,2)
- 6 I 270° = same face as outerband; r 0° = in front (pos #1,2)
- 7 I 0° = in front; r 90° = underneath (pos #2, 3)
- 8 I 180° = at the back; r 90° = underneath (pos #4,3)
- 9 I 270° = same face as outerband; r 90° = underneath (pos #1,3)
- A I 0° = in front; r 180° = at the back (pos #2,4)
- B I 90° = underneath; r 180° = at the back (pos #3,4)
- C I 270° = same face as outerband; r 180° = at the back (pos #1,4)
- D I 0° = in front; r 270° = same face as outerband (pos #2,1)
- E I 90° = underneath; r 270° = same face as outerband (pos #3,1)
- F I 180° = at the back; r 270° = same face as outerband (pos #4,1)
- S Special

Cushioning / Stops
- 0 Standard
- 2 VS soft left
- 3 VS hard left
- 4 VS soft right
- 5 VS hard right
- 6 VS soft both sides
- 7 VS hard both sides
- S Special

Piston Mountings
- 0 none

Guides / Brakes
- D HD Heavy Duty

add. Carriage
- 0 without
- D Guide Carriage Heavy Duty HD

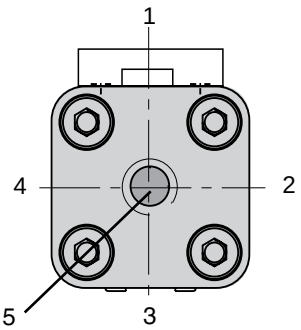
Dovetail Cover
- 0 Standard
- X Without Cover Rail
- S Special

End Cap Mounts
- 0 without

Version

Switches / Measuring System
- 0 none
- 1 NO Reed-KL3045 Qty. 2
- 2 NC Reed-KL3048 Qty. 2
- 3 PNP KL3054+4041 Qty. 2
- 4 NPN KL3060+4041 Qty. 2
- X 21240 SFI 0,1mm
- Y 21241 SFI 1mm
- Z 4650 SFA
- S Special

Note: 2 switches will be supplied. For different quantity, please order as a separate line item.



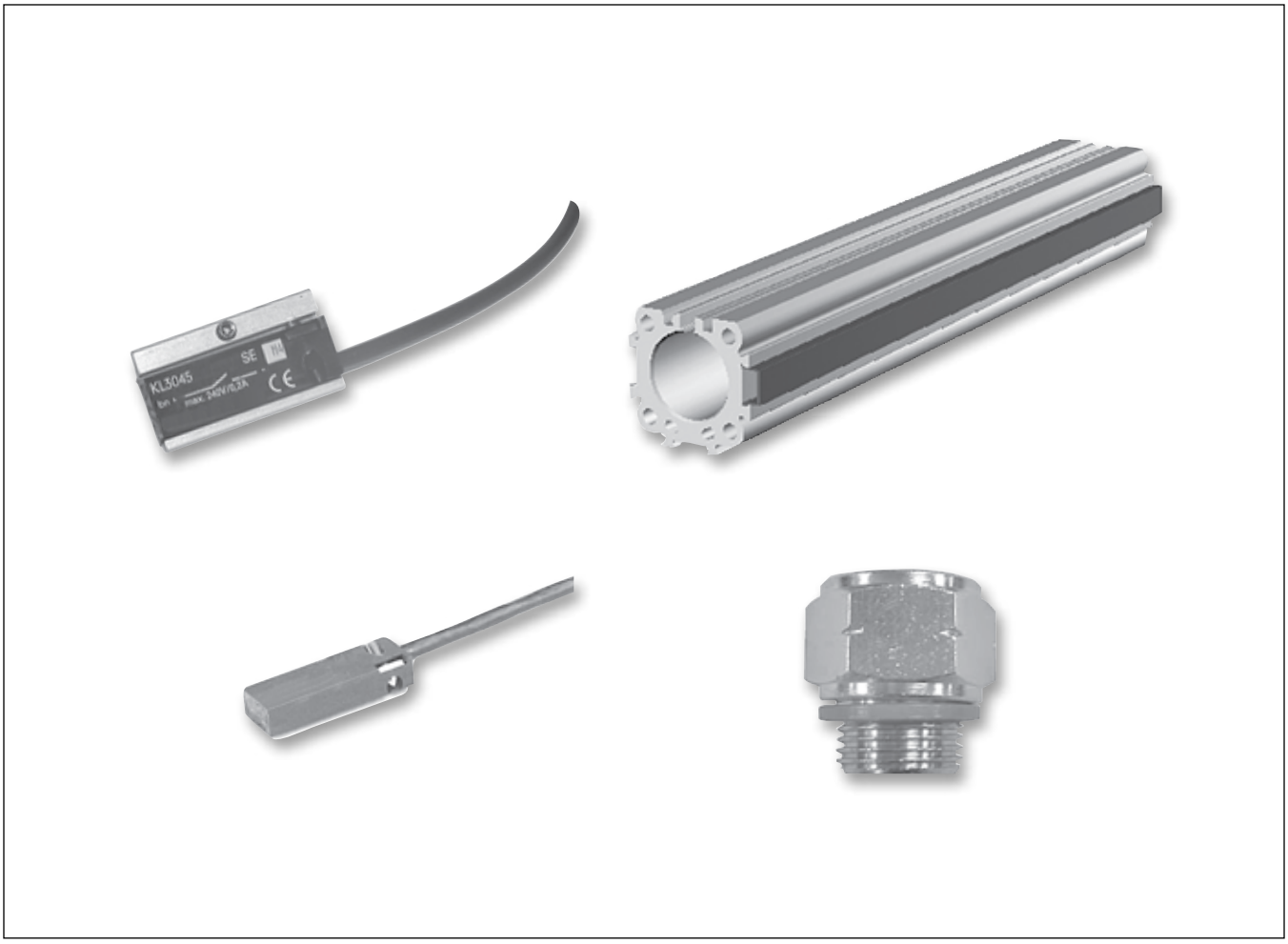
Note: Position #2 is the standard location.

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OSP-P Sensors & Service Parts



Magnetic Switch, Standard Version.....G114-G116
Magnetic Switch for T-Slot Mounting G117-G120
Dovetail Cover.....G121
Service Packs & Seal Kits.....G122

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Linear Drive Accessories

ø 10-80 mm Magnetic Switches

OSP
ORIGA SYSTEM PLUS

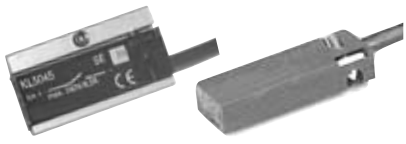
For electrical sensing of the carrier position, e.g. at the end positions, magnetic switches may be fitted. Position sensing is contactless and is based on magnets fitted as standard to the carrier. A yellow LED indicates operating status.

The universal magnetic switches are suitable for all PARKER-ORIGA OSP-Actuators and aluminum profile rod type cylinders.

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Piston, speed and switching distance affect signal duration and should be considered in conjunction with the minimum reaction time of ancillary control equipment.

$$\text{Min. reaction time} = \frac{\text{Switching distance}}{\text{Piston speed}}$$



Characteristics

Characteristics	Unit	Description	
Electrical Characteristics		**Type RS**	**Type ES**
Switching output		Reed	PNP, NPN
Operating voltage	V	10-240 AC/DC (NO) 10-150 AC/DC (NC)	10-30 DC
Residual voltage	V	< 3	< 3
Connection		Two wire	Three wire
Output function		normally open normally closed	normally open
Permanent current	mA	200	200
Max. switching capacity	VA (W)	10 VA	—
Power consumption without load	mA	—	< 20
Function indicator		LED, yellow	
Typical switching time	ms	On: < 2	On: < 2
Switch-off delay	ms	—	ca. 25
Pole reversal does not work		LED	—
Pole reversal protection		—	Built in
Short-circuit protection		—	Built in
Switchable capacity load		µF	0.1 at 100 Ω, 24
VDC			
Switching point accuracy	mm	± 0,2	
Switching distance	mm	ca. 15	ca. 15
Hysteresis for OSP	mm	ca. 8	ca. 3
Lifetime		3×10^6, up to 6×10^6 cycles	Theoretically unlimited
Mechanical Characteristics			
Housing		Makrolon, smoke color	
Cable cross section	mm^2	2 x 0.14	3 x 0.14
Cable type *)		PVC	PUR, black
Bending radius fixed	mm	≥ 20	
moving	mm	≥ 70	
Weight (Mass)	kg	0.012	
Degree of protection	IP	67 to DIN EN 60529	
Ambient temperature range *)[1)]	°C °C	-25 other temperature ranges +80 on request	
Shock resistance	m/s^2	100 (contact switches)	500

*) other versions on request
1) for the magnetic switch temperature range, please take into account the surface temperature and the self-heating properties of the linear drive.

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Type RS

In the type RS contact is made by a mechanical **reed switch** encapsulated in glass.
Direct connection with 2-pole cable, 5 m long, open ended **(Type RS-K).**

Type ES

In the type ES contact is made by an **electronic switch** – without bounce or wear and protected from pole reversal. The output is short circuit proof and insensitive to shocks and vibrations. Connection is by 3-pole connector for easy disconnection. Fitted with connection cable 100 mm long with connector.
A 5 m cable with connector and open end can be ordered separately, or use the Order No. for the complete Type ES with 5 m cable.

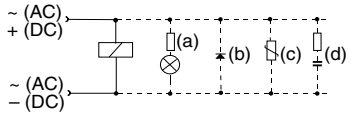
Magnetic Switches RS and ES

Electrical Service Life
Protective Measures
Magnetic switches are sensitive to excessive currents and inductions. With high switching frequencies and inductive loads such as relays, solenoid valves or lifting magnets, service life will be greatly reduced.

With **resistive and capacitative loads** with high switch-on current, such as light bulbs, a protective resistor should be fitted. This also applies to long cable lengths and voltages over 100 V.

In the switching of inductive loads such as relays, solenoid valves and lifting magnets, voltage peaks (transients) are generated which must be suppressed by protective diodes, RC loops or varistors.

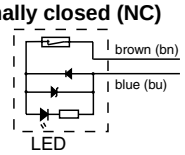
Connection Examples
Load with protective circuits
(a) Protective resistor for light bulb
(b) Freewheel diode on inductively
(c) Varistor on inductively
(d) RC element on inductively



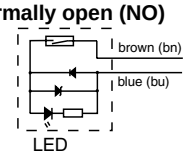
For the type ES, external protective circuits are not normally needed.

Electrical Connection, Type RS

Normally closed (NC)

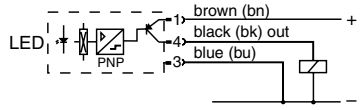


Normally open (NO)

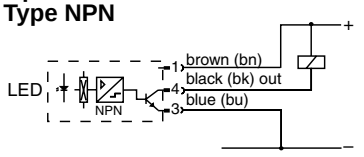


Electrical Connection, Type ES

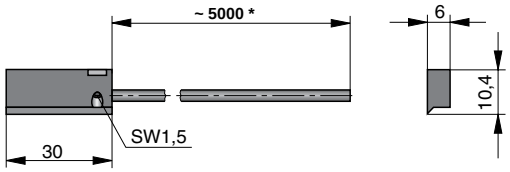
Standard Version:
Type PNP



Optional Version
Type NPN

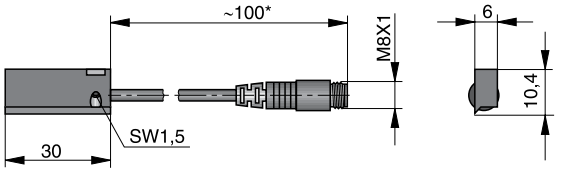


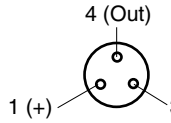
Dimensions (mm) – Type RS-K



* Length with possible minus tolerance, see chart below

Dimensions (mm) – Type ES-S





PIN assignment (view of pins) according to DIN EN 50044

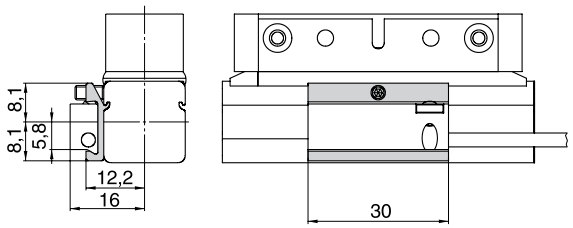
* Length with possible minus tolerance, see chart below

Length of connection cable with length tolerance

Magnetic Switch Order No.	Nominal cable length	Length tolerance
KL3045	5000 mm	–50 mm
KL3048	5000 mm	–50 mm
KL3054	100 mm	–20 mm
KL3060	145 mm	±5 mm

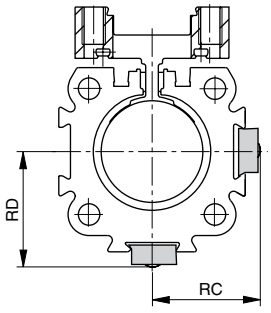
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Dimensions Series OSP-P10



Note:
Sensors can not be mounted directly opposite of the carrier

Dimensions Series OSP-P16 to 80



Dimension Table (mm) and Order Instructions

Series	Dimensions		Order No.						
	RC	RD	RS closer Normally open	RS opener Normally closed	ES PNP	ES NPN	ES compl. with 5 m cable PNP	ES compl. with 5 m cable NPN	Adapter only for OSP-P10)
OSP-P10	–	–	Type:	Type:	Type:	Type:	Type:	Type:	20968
OSP-P16	20	20.5	RS-K	RS-K	ES-S	ES-S	ES-S	ES-S	please order separately
OSP-P25	25	27	KL3045	KL 3048	KL 3054	KL 3060	KL 3054 + 4041	KL 3060 + 4041	
OSP-P32	31	34							
OSP-P40	36	39							
OSP-P50	43	48							
OSP-P63	53	59							
OSP-P80	66	72							
Cable 5 m with connector and with open end for magnetic switches Type ES-S					4041				

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Characteristics			
Characteristics	Unit	Description	
Electrical Characteristics		**Type RST**	**Type EST**
Switching output		Reed	PNP
Operating voltage	V	10-30 AC/DC	10-30 DC
Ripple		-	≤10%
Voltage drop	V	≤3	≤2
Electrical configuration		2 wire	3 wire
Output function		normally open normally closed	normally open
Permanent current	mA	≤ 100	≤ 100
Breaking capacity	W	≤ 6 peak	-
Power consumption, at U_B = 24V, switched on, without load	mA	-	≤ 10
Function indicator		LED, yellow (not for normally closed)	
Response time	ms	≤2	≤0.5
Sensitivity	mT	2–4	2–4
Time delay before availability	ms	-	≤2
Reverse polarity prot.		yes	yes
Short-circuit protection		no	yes (pulsed)
Switchable capacity load	µF	0.1 at 100 Ω, 24 VDC	
Switching frequency	Hz	≤400	≤5 k
Repeatability	mm	≤0.2	≤0.2
Hysteresis	mm	≤1.5	≤1.5
EMC	EN	60947-5-2	
Lifetime		≥35 Mio. cycles with PLC load	unlimited
Power-up pulse suppression		-	yes
Protection for inductive load		-	yes
Mechanical Characteristics			
Housing		Plastic / PA66 + PA6I red	
Cable cross section	mm^2	2 x 0.14	3 x 0.14
Cable type		PUR, black	PUR, black
Bending radius	mm	≥36	≥30
Weight	kg	ca. 0.030 RST-K ca. 0.010 RST-S	ca. 0.030 EST-K ca. 0.010 EST-S
Degree of protection	IP	67 to EN 60529	
Ambient temperature range [1]	°C	-25 to +80	-25 to +75 at U_B=10 – 30 V -25 to +80 at U_B=10 – 28 V
– with adapter	°C	-25 to +60	
Adapter tightening torque	Nm	0.15 (tightening torque of screwing adapter on to magnetic switch)	
Shock resistance			
Vibration to EN 60068-2-6	G	15, 11 ms, 10 to 55 Hz, 1 mm	
Shock to EN 60068-2-27 G	50, 11 ms		
Bump to EN 60068-2-29 G	30, 11 ms, 1000 bumps each axis		

Linear Drive Accessories

ø 10-80 mm Magnetic Switches for T-Slot

OSP
ORIGA SYSTEM PLUS

Series RST
EST

Magnetic switches are used for electrical sensing of the position of the piston, e.g. at its end positions. They can also be used for sensing of intermediate positions.

Sensing is contactless, based on magnets which are built-in as

standard. A yellow LED indicates operating status.

The universal magnetic switches are suitable for all PARKER-ORIGA OSP-Actuators and aluminum profile rod type cylinders.

[1] for the magnetic switch temperature range, please take into account the surface temperature and the self-heating properties of the linear drive.



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Type RST

In the type RST contact is made by a mechanical **reed switch** encapsulated in glass.

Type EST

In the type EST contact is made by an **electronic switch** – without bounce or wear and protected from pole reversal. The output is short circuit proof and insensitive to shocks and vibrations. Connection is by 3-pole connector for easy disconnection. Fitted with connection cable 100 mm long with connector.
A 5 m cable with connector and open end can be ordered separately, or use the Order No. for the complete Type ES with 5 m cable.

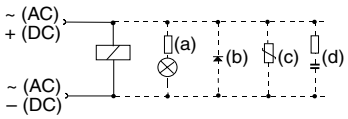
Magnetic Switches RST and EST

Electrical Service Life
Protective Measures
Magnetic switches are sensitive to excessive currents and inductions. With high switching frequencies and inductive loads such as relays, solenoid valves or lifting magnets, service life will be greatly reduced.

With **resistive and capacitative loads** with high switch-on current, such as light bulbs, a protective resistor should be fitted. This also applies to long cable lengths and voltages over 100 V.

In the switching of inductive loads such as relays, solenoid valves and lifting magnets, voltage peaks (transients) are generated which must be suppressed by protective diodes, RC loops or varistors.

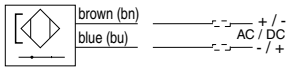
Connection Examples
Load with protective circuits
(a) Protective resistor for light bulb
(b) Freewheel diode on inductively
(c) Varistor on inductively
(d) RC element on inductively



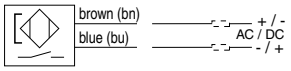
For the type EST, external protective circuits are not normally needed.

Electrical Connection Type RST-K

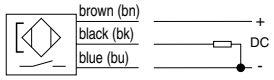
Normally closed



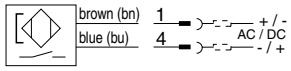
Normally open



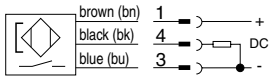
Electrical Connection Type EST-K



Electrical Connection Type RST-S



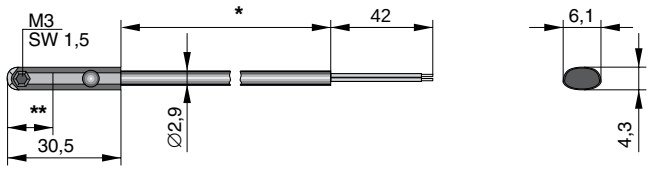
Electrical Connection Type EST-S



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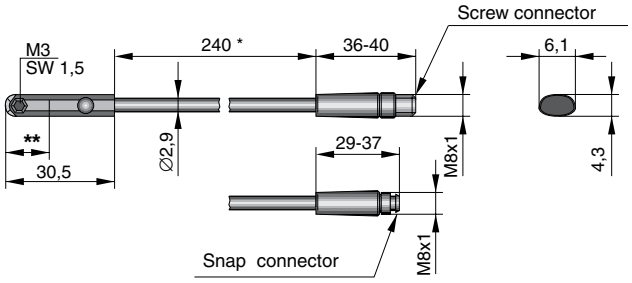
Dimensions (mm) – Type RST-K, EST-K



* Cable lengths available: 5000 mm ± 75 mm
2000 mm ± 40 mm

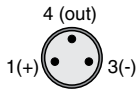
** Switching point: Type RST-K Normally closed 14 mm
Type RST-K Normally open 12.3 mm
Type EST-K Normally open 8.1 mm

Dimensions (mm) – Type RST-S, EST-S



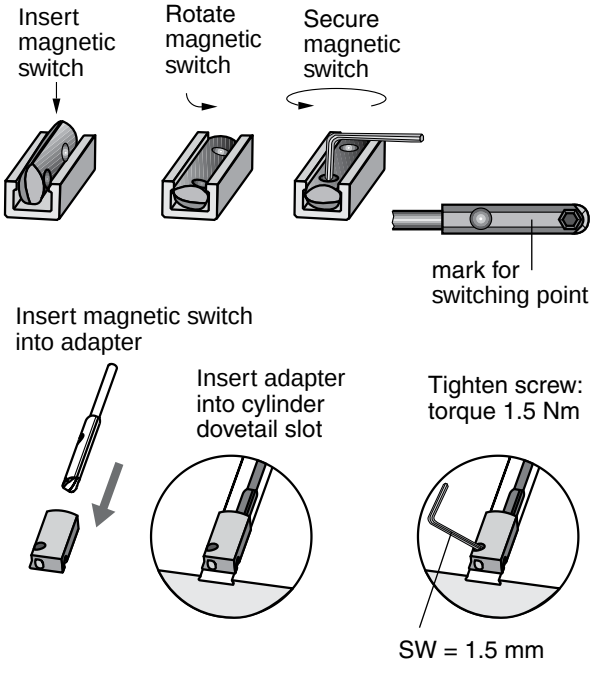
* ± 6 mm

** Switching point: Type RST-K Normally closed 14 mm
Type RST-K Normally open 12.3 mm
Type EST-K Normally open 8.1 mm

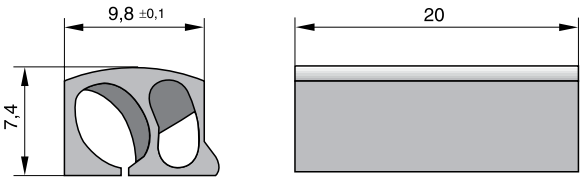


PIN assignment
(view of pins)
to DIN EN 50044

Installation



Dimensions of Adapter for Magnetic Switch



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Order Instructions

Version	Voltage	Type	Order No.
Magnetic switch, reed contact, normally open, LED indicator, cable 2 m	10-30 V AC / DC	**RST-K**	**KL 3301**
Magnetic switch, reed contact, normally open, LED indicator, cable 5 m	10-30 V AC / DC	**RST-K**	**KL 3300**
Magnetic switch, reed contact, normally open, snap connector M8, LED indicator, cable 0.24 m	10-30 V AC / DC	**RST-S**	**KL 3302**
Magnetic switch, reed contact, normally open, screw connector M8, LED indicator, cable 0.24 m	10-30 V AC / DC	**RST-S**	**KL 3303**
Magnetic switch, reed contact, normally closed, cable 5 m	10-30 V AC / DC	**RST-K**	**KL 3305**
Magnetic switch, electronic, PNP LED indicator, cable 2 m	10-30 V DC	**EST-K**	**KL 3308**
Magnetic switch, electronic, PNP LED indicator, cable 5 m	10-30 V DC	**EST-K**	**KL 3309**
Magnetic switch, electronic, PNP snap connector M8, LED indicator	10-30 V DC	**EST-S**	**KL 3312**
Magnetic switch, electronic, PNP screw connector M8, LED indicator	10-30 V DC	**EST-S**	**KL 3306**

Included in delivery: 1 magnetic switch
1 adapter for dovetail groove mounting

Accessories

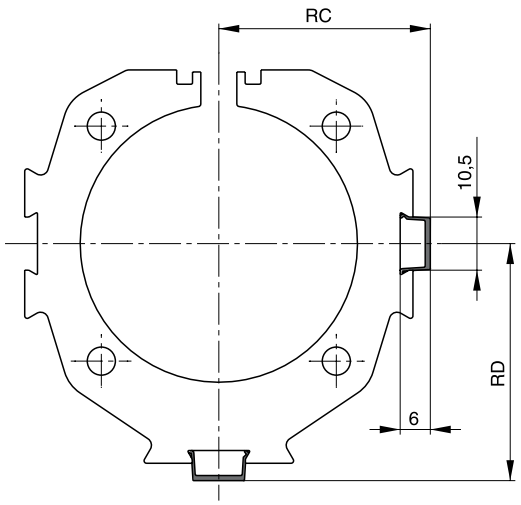
Description	Type	Order No.
Cable M8, 2.5 m without lock nut	**KS 25**	**KY 3240**
Cable M8, 5.0 m without lock nut	**KS 50**	**KY 3241**
Cable M8, 10.0 m without lock nut	**KS 100**	**KY 3140**
Cable M8, 2.5 m with lock nut	**KSG 25**	**KC 3102**
Cable M8, 5.0 m with lock nut	**KSG 50**	**KC 3104**
Adapter for dovetail groove (pack of 10)		**KL 3333**

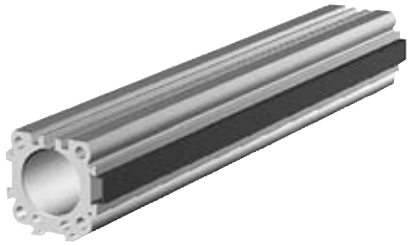
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Linear Drive Accessories

ø 16-80 mm Dovetail Cover

Dimensions (mm)





For clean guidance of magnetic switch cables along the cylinder body.

Contains a maximum of 3 cables with diameter 3 mm.

Material: Plastic

Color: Red

Temperature Range: –10 to +80°C

Dimension Table (mm) and Order Instructions

Series	Dimensions (mm) RC	RD	Order No.
OSP-P16	18.5	19	**13039**
OSP-P25	23.5	25.5	
OSP-P32	29.5	32	Minimal length: 1m Max. profile length: 2m Multiple profiles can be used.
OSP-P40	34.5	37.5	
OSP-P50	41.5	46.5	
OSP-P63	51.5	57.5	
OSP-P80	64.5	70.5	

Metric Conversion Fittings

Order Number	Port Size	Bore Size
2521-1/8-02	G1/8 to 1/8" NPT	P25
2521-1/4-04	G1/4 to 1/4" NPT	P32, P40, P50
2521-3/8-06	G3/8 to 3/8" NPT	P63
2521-1/2-08	G1/2 to 1/2" NPT	P80



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Service Packs

		Bore Sizes						
		16mm	25mm	32mm	40mm	50mm	63mm	80mm
BUNA Service Pack Single Piston	Part Number	11111	11112	11113	11114	11115	11116	11118
Viton Service Pack Single Piston	Part Number	11121	11122	11123	11124	11125	11126	11128
BUNA Service Pack Single Piston - Slow Speed Grease	Part Number	11131	11132	11133	11134	11135	11136	11138
Viton Service Pack Single Piston - Slow Speed Grease	Part Number	11141	11142	11143	11144	11145	11146	11148

*Behind part number, please add stroke length in mm

Service Pack Information
Service Packs, containing all the components necessary to completely rebuild a Parker-Origa rodless cylinder, are available. Each pack contains a complete seal kit, inner and outer bands, Parker-Origa grease tube, cleaning tool and repair instructions. It's all packaged in an easy-to-ship, easy-to-store box clearly labeled to indicate the cylinder type, bore and stroke for which it is intended. Contact your local Parker-Origa distributor for more information.

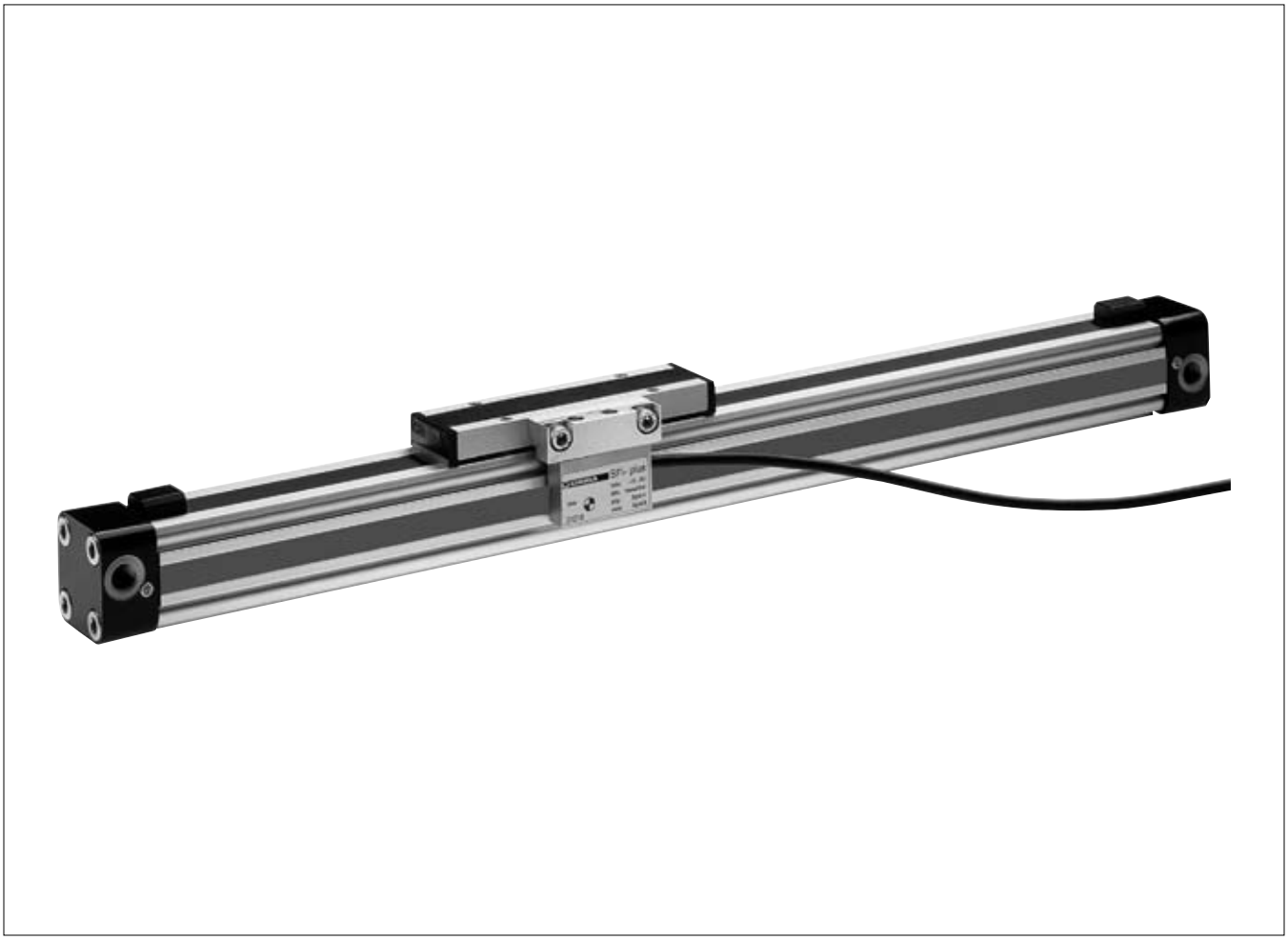
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Seal Kits

		Bore Sizes						
		16mm	25mm	32mm	40mm	50mm	63mm	80mm
BUNA Seal Kit - Standard Cylinder	Part Number	11052	11053	11054	11055	11056	11057	11058
Viton Seal Kit - Standard Cylinder	Part Number	11059	11060	11061	11062	11063	11064	11065
Seal Kit - Sideline Carriage	Part Number	11066	11067	11068	11069	11070	–	–
Seal Kit Active Brake - Standard Cylinder	Part Number	–	11822	11823	11824	11825	11826	11827
Seal Kit - Multibrake	Part Number	–	11089	11090	11091	11092	11093	–

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ORIGA-SENSOFLEX Displacement Measuring System for Cylinder Series OSP-P



Overview..... G124
Technical Data SFI-plus..... G125
Dimensions SFI-plus G126
Order Information G127

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ORIGA-Sensoflex

Displacement measuring system for automated movement

Series SFI-plus (incremental measuring system)

for cylinder series

• OSP-P...



Characteristics

- Contactless magnetic displacement measurement system
- Displacement length up to 32 m
- Resolution 0.1 mm (option: 1 mm)
- Displacement speed up to 10 m/s
- For linear and non-linear rotary motion
- Suitable for almost any control or display unit with a counter input

The SFI-plus magnetic displacement measuring system consists of 2 main components.

• Measuring Scale

Self-adhesive magnetic measuring scale

• Sensing Head

Converts the magnetic poles into electrical signals which are then processed by counter inputs downstream

(e.g. PLC, PC, digital counter)

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Characteristics			
Characteristics	**Unit**	**Description**	
Type		**21210**	**21211**
Output Function			
Resolution	mm	0.1	1
Pole lengths magnetic scale	mm	5	
Maximum speed	m/s	10	
Repeat accuracy		± 1 Increment	
Distance between sensor and scale	mm	≤ 4	
Tangential deviation		≤ 5°	
Lateral deviation	mm	≤ ± 1.5	
Switching output		PNP	
Electrical Characteristics			
Operating voltage U_b	V DC	18 – 30	
Voltage drop	V	≤ 2	
Continuous current for each output	mA	≤ 20	
Power consumption at U_b = 24V, switched on, without load	mA	≤ 50	
Short-circuit protection		yes	
Reverse polarity protection			yes
Protection from inductive load		yes	
Power-up pulse suppression		yes	
EMC			
Electrostatic discharge immunity	kV	6, B, to EN 61000-4-2	
Electromagnetic field immunity	V/m	10, A, to EN61000-4-3	
Electrical fast transient/burst immunity (for signal connections)	kV	1, B, to EN 61000-4-4	
Electrical fast transient/burst immunity (for DC connections)	kV	2, B, to EN 61000-4-4	
Surge immunity (for signal connections)	kV	1, B, to EN 61000-4-5	
Surge immunity (for DC connections)	kV	0,5, B, to EN 61000-4-5	
Immunity to conducted disturbances	V	10, A, to EN 61000-4-6	
Power frequency magnetic field immunity at 50 Hz	A/m	30, A, to EN 61000-4-8	
Emission standard for residential		to EN 61000-6-4	
Radio disturbance characteristics		to EN 55011, Group 1, A	
Mechanical Characteristics			
Housing		Aluminum	
Cable length	m	5.0 – fixed, open end	
Cable cross section	mm^2	4 x 0.14	
Cable type		PUR, black	
Bending radius	mm	≥ 36	
Weigth (mass)	kg	ca. 0.165	
Environmental Conditions / Shock Resistance			
Degree of protection	IP	67 to EN60529	
Ambient temperature range	°C	-25 to +80	
Broad-band random vibration to EN 60068-2-64	g	5, 5 Hz to 2 kHz, 0.5 h each axis	
Vibration stress to EN 60068-2-6	g	12, 10 Hz to 2 kHz, 2 mm, 5 h each axis	
Shock to EN 60068-2-27	g	100, 6 ms, 50 bumps each axis	
Bump to EN 60068-2-29	g	5, 2 ms, 8000 bumps each axis	

Displacement Measuring System

for automated movement

ORIGA-Sensoflex
(incremental displacement measuring system)

Series SFI-plus for cylinder series

- **OSP-P...**

Note:

For combinations Active Brake AB + SFI-plus + Magnetic Switch contact our technical department please.

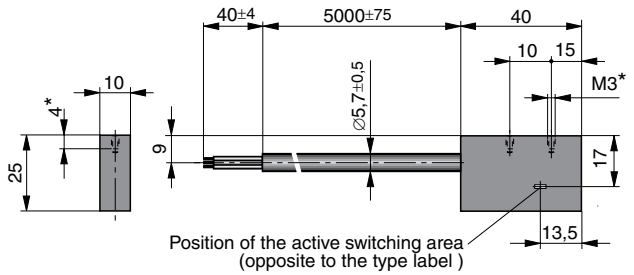


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Sensing Head

The sensing head provides two pulsating, 90° out of phase counter signals (phase A/B) with a 0.4 mm resolution (option 4 mm).
External processing can improve the resolution to 0.1 mm (option 1 mm).
The counting direction can be determined automatically from the phase variance of the counter signals.

Dimensions (mm) – Sensing Head

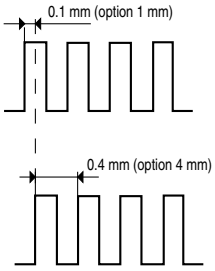


* Maximum thread depth 4mm

Electrical Connection

Color	Description
bn = brown	+ DC
bu = blue	– DC
bl = black	Phase A
wt = white	Phase B

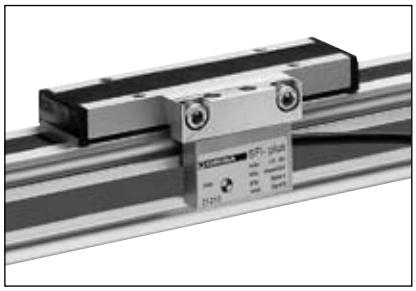
Output signal – Sensing Head

$U_a = U_e$	Phase B	U_{a1}	0°	
	Phase A	U_{a2}	90°	

G

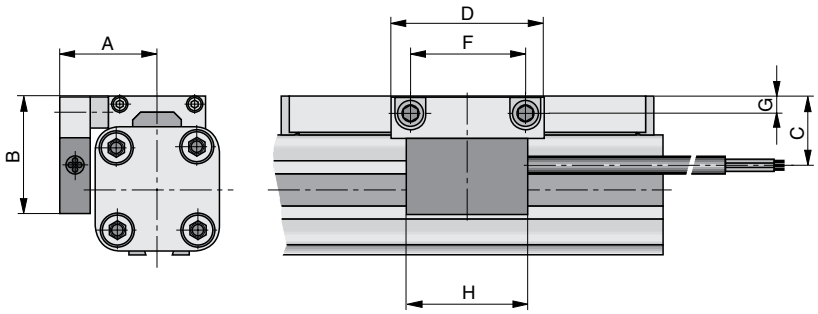
SFI-plus mounted on a rodless cylinder series OSP-P

The SFI-plus system can be mounted directly on a rodless OSP-P cylinder with the special mounting kit.
The position of the sensing head is generally 90° to the carrier.



Combinations consisting of SFI-plus and OSP-P Cylinders with guides are available on request.

Dimensions – in combination with OSP-P cylinders



Dimension Table (mm)

Series	A	B	C	D	F	G	H
OSP-P25	32	39	23	50	38	5.5	40
OSP-P32	37.5	46	30	50	38	6.5	40
OSP-P40	42.5	50	34	50	38	6.5	40
OSP-P50	49.5	55	39	50	38	6.5	40
OSP-P63	59.5	65	49	50	38	10	40
OSP-P80	72.5	80	64	50	38	12	40

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Order instructions

Description	Order No.
Sensing head with measuring scale – Resolution 0.1 mm (scale length = required measuring distance + a minimum of – see table below)	**21240**
Option: Sensing head with measuring scale – Resolution 1 mm (scale length = required measuring distance + a minimum of – see table below)	**21241**
Sensing head – Resolution 0.1 mm (spare part)	**21210**
Option: Sensing head – Resolution 1 mm (spare part)	**21211**
Measuring scale per meter (spare part)	**21235**
Mounting kit for OSP-P25	**21213**
Mounting kit for OSP-P32	**21214**
Mounting kit for OSP-P40	**21215**
Mounting kit for OSP-P50	**21216**
Mounting kit for OSP-P63	**21217**
Mounting kit for OSP-P80	**21218**

* Overall length of the measuring scale results from stroke length of the cylinder + dead length
Dead length for linear drives series OSP-P see table.

Series	Dead length (mm)
OSP-P 25	154
OSP-P 32	196
OSP-P 40	240
OSP-P 50	280
OSP-P 63	350
OSP-P 80	422

Example:
Cylinder OSP-P, Ø25 mm, stroke length 1000 mm

dead length	+ stroke length	= overall length of the measuring scale
154 mm	**+ 1000 mm**	**= 1154 mm**

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Notes

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P1X Series

Compact Rodless Air Cylinders



Contents

Features and Benefits G130
Ordering Information..... G131
Specifications, Weights and Forces..... G132
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Mounting Bracket Dimensions..... G139-G141
Accessories & Options G142-G143
End Port Piping..... G143
Shock Absorbers G144-G147
Stroke Adjustment Unit..... G147-G148

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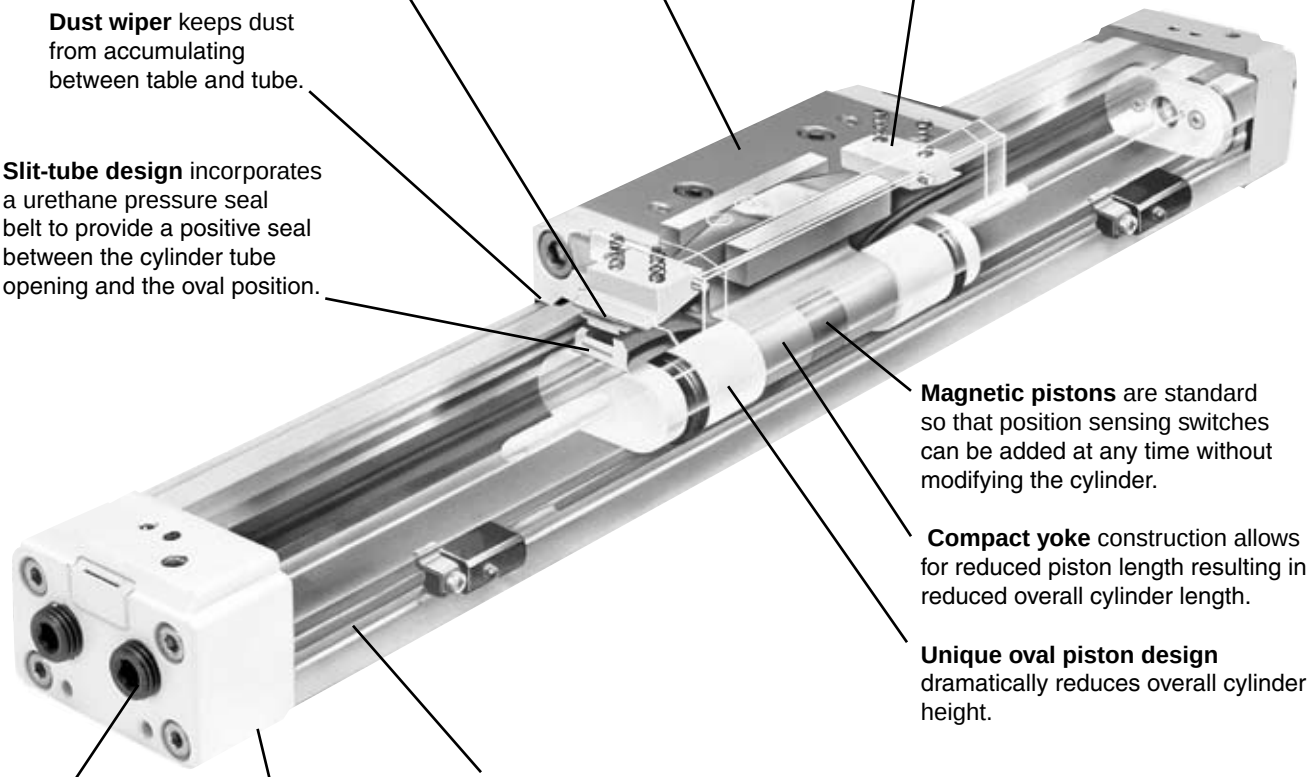
Large carriage with four strategically placed mounting holes ensures a high degree of stability and flexibility.

Spring-loaded tension arms located on the work table maintain constant pressure on the dust seal belt to ensure external sealing protection.

Dust-seal belt located above the pressure seal belt, prevents contamination from entering the cylinder tube.

Dust wiper keeps dust from accumulating between table and tube.

Slit-tube design incorporates a urethane pressure seal belt to provide a positive seal between the cylinder tube opening and the oval position.



Magnetic pistons are standard so that position sensing switches can be added at any time without modifying the cylinder.

Compact yoke construction allows for reduced piston length resulting in reduced overall cylinder length.

Unique oval piston design dramatically reduces overall cylinder height.

Additional ports in one end cap for optional piping location.

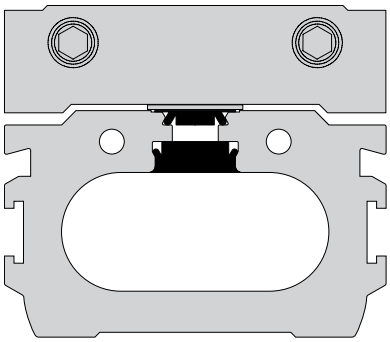
Note: End cap ports shown on this view are for representation only. Actual end ports are at other end of cylinder in relation to standard side ports and end ports are normally furnished plugged.

Integral switch mounting rail provides convenient mounting location for position sensing switches. Switches available include Solid State and Reed, AC or DC, with or without indicator lights. Bi-Color switches are available with 2 indicators to identify when maximum efficiency of contact is made.

Adjustable cushions for deceleration at end of stroke are standard.

Oval Piston Design

Oval piston design provides greater load carrying capacity than typical rodless cylinders with round pistons.



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Model Code

P1X	N	032	D	A	N	0500	W	D	N	N	N	-B

Series

P1X	Global Rodless

Construction

N	Inch
M	Metric

Bore Size

016	16mm
020	20mm
025	25mm
032	32mm
040	40mm
050	50mm
063	63mm

Carriage

D	Double Acting

Seal Material

N	Standard

Stroke Length

Basic or Options

B†	Standard
W†	With Options
/	Special (for factory use only)

Carriage Mounting Style

Standard	Inverted	Carriage Mounting
D (std)	**J**	Single, Basic Mount
A	**G**	Single, Swivel Mount

Porting Options

N	NPTF
G	BSPP
Q	BSPT*

* Not available with N construction

Piston/Shock Style

A	Cushions Both Ends (Standard)
R	Cushion Right End Only*
L	Cushion Left End Only*
N	No Cushions or Shock Absorbers
H	Shock Absorber Both Ends**
B	Shock Absorber Right End Only**
C	Shock Absorber Left End Only**

* As viewed from port side of cylinder
** Cannot be combined with inverted carriage

Mounting Options

No Foot Mount	End Mount Foot Bracket	Bottom Mount Foot Bracket	Intermediate Supports
N	**F**	**A**††	No Support
H	**M**	**B**††	One Support
K	**P**	**C**††	Two Supports
T	**R**	**D**††	Three Supports

Fastener Type

N	Standard - Zinc-Plated
S	Stainless Steel

† When "B" is specified, the remaining digits in the part number are not necessary. If "W" is used, the remaining digits in the part number must be filled out.

†† Not available on 40, 50 and 63mm bore sizes.

Essential Information
Optional Features

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Specifications

Model	P1X (Standard w/Switch)			
Operating Medium	Compressed Air			
Maximum Pressure	100 PSI (7 BAR)			
Minimum Pressure	Ø16, Ø20 Bores 29 PSI (2 Bar) Ø25, Ø32, Ø40 Bores 14.5 PSI (1 Bar) Ø50, Ø63 Bores 7 PSI (0.5 Bar)			
Proof Pressure	152 PSI (10.5 Bar)			
Bore Size mm (inch nominal)	16 (5/8)	20 (3/4), 25 (1)	32 (1-1/4), 40 (1-1/2)	50 (2), 63 (21/2)
Port Size – N Series	M5 (10-32)	1/8 NPT	1/4 NPT	3/8 NPT
Port Size – M Series	M5 (10-32)	1/8 Rc	1/4 Rc	3/8 Rc
Ambient Temperature °F (°C)	40 to 140°F (5 to 60°C)			
Stroke Tolerance in.	±0.080 to 39"	±0.100 to 118"	±0.120 to 196"	
Piston Speed, *in./sec.	2-80 IPS with side ports on each end (Ø16 & Ø20 bores 2-40 IPS with single end porting with 39" stroke) (Ø25, Ø32, Ø40, Ø50 & Ø63 bores 2-40 IPS with single end porting with 78" stroke)			
Cushion	Air Cushion Standard			
Lubrication	Not Required (if you choose to lubricate your system, continuing lubrication will be required.)			

***Note:** Actual piston speed with one end ports will vary depending on stroke length.

G

Weight & Theoretical Force Characteristics

Bore	Area In²	Weights								Theoretical Force (lbs)				
		Weight at Zero Stroke						Weight per 1" (25.4mm) Stroke		at Pressure (PSI)				
		M00		MLB		MLB1								
		lbs	kg	lbs	kg	lbs	kg	lbs	kg	30	40	60	80	100
16	0.31	0.70	0.3	0.73	0.3	0.77	0.4	0.07	0.03	9	12	19	25	31
20	0.49	1.15	0.5	1.19	0.5	1.28	0.6	0.10	0.04	15	20	29	39	49
25	0.84	2.21	1.0	2.43	1.1	2.43	1.1	0.15	0.07	23	30	46	61	76
32	1.26	3.31	1.5	3.53	1.6	3.75	1.7	0.20	0.09	38	50	69	100	125
40	1.96	5.29	2.4	5.51	2.5	—		0.27	0.12	59	78	117	156	195
50	3.08	7.94	3.6	8.16	3.7			0.40	0.18	91	122	182	243	304
63	4.86	13.67	6.2	14.33	6.5			0.63	0.28	145	193	290	386	483

Replacement Seal Kits

Bore (mm)	Part Number
16	L079020016
20	L079020020
25	L080100025
32	L080100032
40	L080100040
50	L080100050
63	L080100063

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Moments

Figure 5 shows the maximum allowable moments for each of the three types of loading: pitch, roll and yaw.

The sum total of each of these types of moments, divided by each of the maximum values, determines a Load-Moment Factor (LMF) should be equal to or less than 1.0. On horizontal mountings, the total load (L) should also be divided by the maximum load allowable (Figure 6) and factored into the equation.

Horizontal Mountings:

$$\frac{L}{[L]} + \frac{M}{[M]} + \frac{Ms}{[Ms]} + \frac{Mv}{[Mv]} = LMF \leq 1.0$$

Vertical Mountings:

$$\frac{M}{[M]} + \frac{Ms}{[Ms]} + \frac{Mv}{[Mv]} = LMF \leq 1.0$$

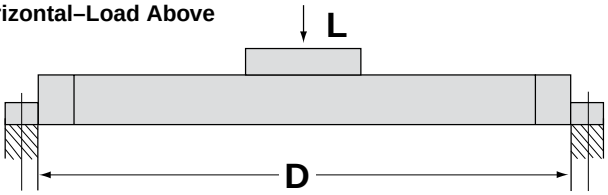
Figure 5

Maximum Allowable Moments N-m (lb-in)						
Bore	[M] Pitch Moment		[Ms] Roll Moment		[Mv] Yaw Moment	
	Std.	Inverted	Std.	Inverted	Std.	Inverted
16	5 (44)	3.5 (31)	1 (9)	0.5 (4)	1 (9)	1 (9)
20	10 (89)	7 (62)	1.5 (13)	0.7 (6)	3 (27)	3 (27)
25	17 (150)	12 (106)	5 (44)	2.5 (22)	10 (89)	10 (89)
32	36 (319)	25 (221)	10 (89)	5 (44)	21 (186)	21 (186)
40	77 (682)	54 (478)	23 (204)	11.5 (102)	26 (230)	26 (230)
50	154 (1363)	108 (956)	32 (283)	16 (142)	42 (372)	42 (372)
63	275 (2434)	193 (1708)	52 (460)	26 (230)	76 (673)	76 (673)

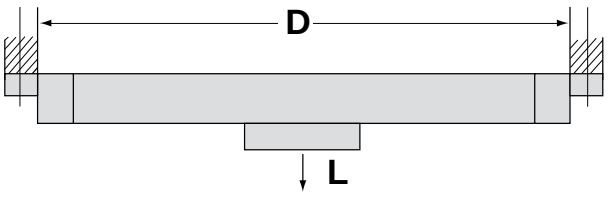
Load and Deflection

Figure 6 shows the maximum load [L] that the cylinder can accept, as well as the maximum length [D] between supports at the maximum load.

Horizontal–Load Above



Horizontal–Load Below



Horizontal–Tube Support

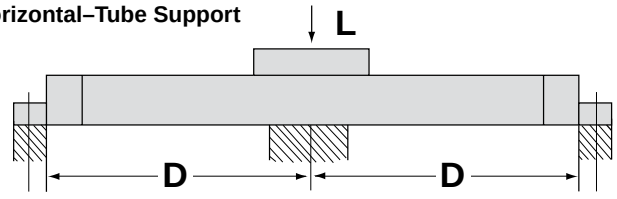
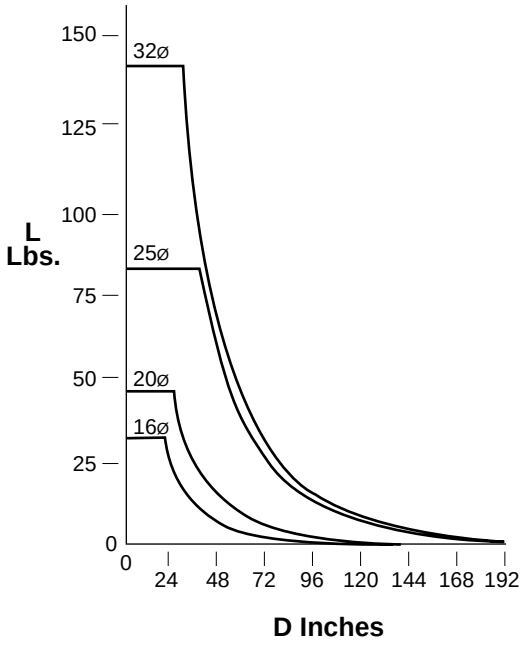


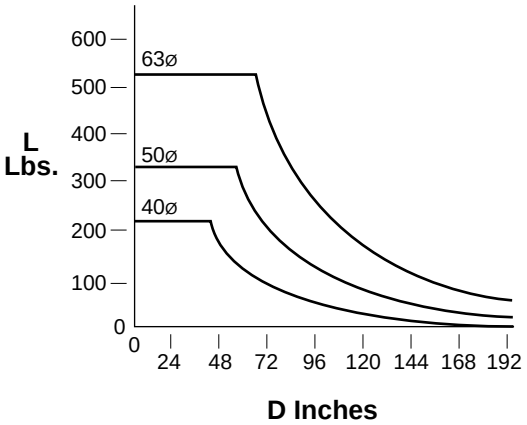
Figure 6

Bore Size	Max. Allowable Load [L] N (lbs)		Max. Unsupported Length mm (in) at Max. Load
	Std.	Inverted	
16	141 (32)	70 (16)	450 (17.7)
20	198 (45)	101 (23)	551 (21.7)
25	356 (81)	180 (41)	899 (35.4)
32	616 (140)	308 (70)	749 (29.5)
40	959 (218)	480 (109)	1000 (39.4)
50	1456 (331)	726 (165)	1300 (51.2)
63	2297 (522)	1148 (261)	1600 (63.0)

Acceptable length and load combinations for the various bore sizes can be determined from the charts in Figure 7.

Figure 7





To determine cylinder deflections under the load (or resistive force perpendicular to the piston table) without mid-support, see the graphs on page G135.

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Inertia Moment Consideration

When the weight is stopped at the end of the stroke by the cylinder cushion, inertial force is created. This inertial force (Fi) can be determined by using the formula:

Fi = LG

L = Load attached to the cylinder carriage (lbs.)

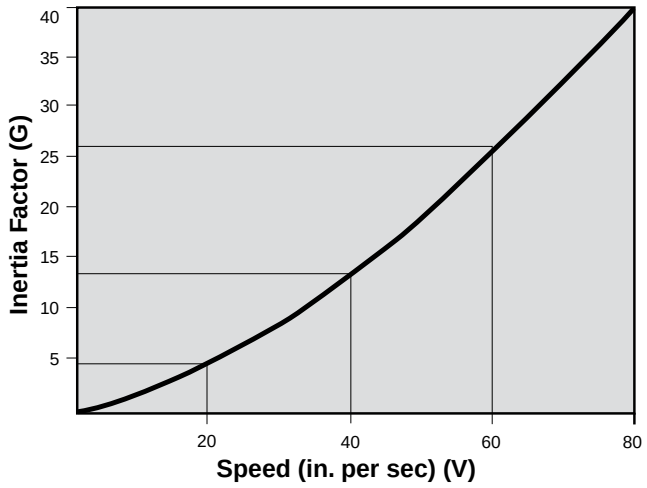
G = Inertia factor (Figure 8)

Example:
A speed of 40 in/sec corresponds to an inertia factor G of 13.

The inertial force calculated would then be multiplied by the distance from the center of gravity of the load to the centerline of the cylinder, and added to the previously calculated M and Mv moments. This will give an M Total and Mv Total. Ensure that the M Total and the Mv Total do not exceed the [M] and [Mv] values shown in Figure 5 (previous page). If they exceed these values, consult the factory.

See pages G144-G146 for additional information on shock absorbers.

Figure 8

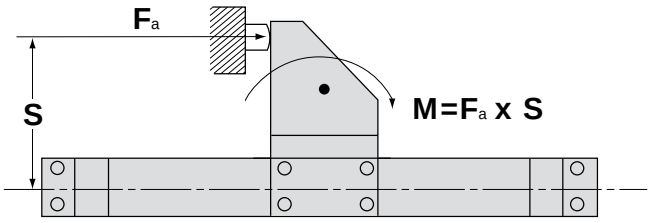


External Stops

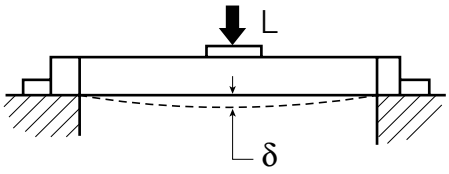
When the load attached to the cylinder is stopped externally, it creates an additional moment equal to the cylinder force (Fa) times the distance (S). This additional moment, plus the previously calculated Load-Moment factor, should not exceed the allowable values. See previous page.

When reducing the stroke with external stops, remember that the cushion length and the energy absorption capacity are not directly proportional. Reducing the cushioning distance by 50% corresponds to a reduction of 60-70% in cushion effectiveness.

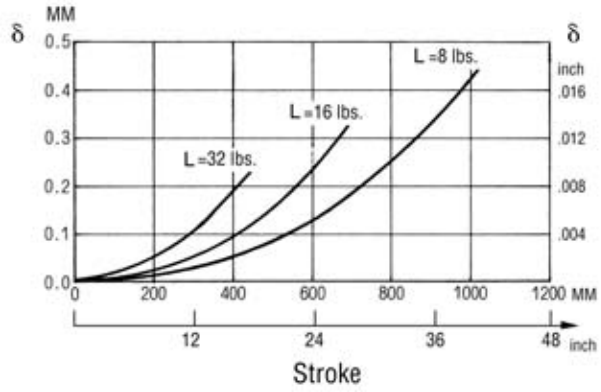
Figure 9



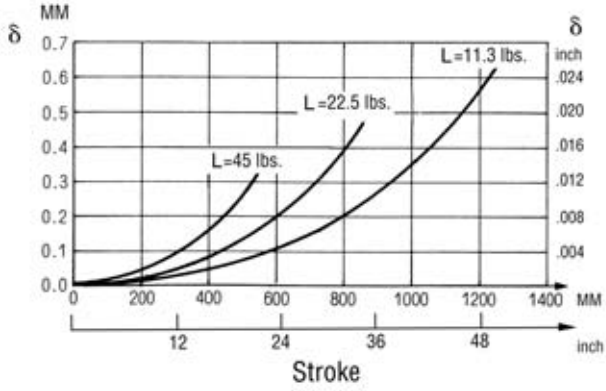
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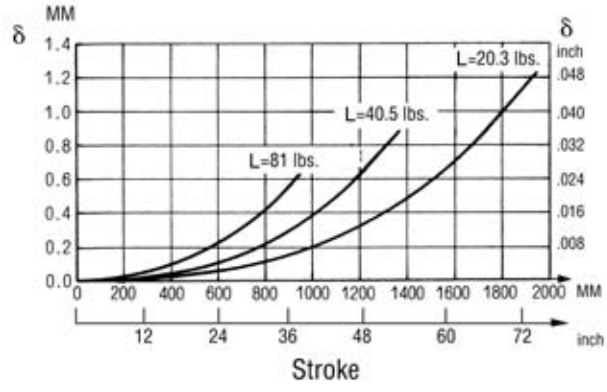
16 mm Bore



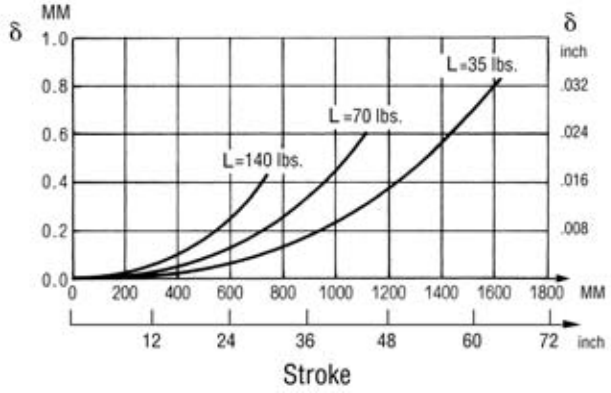
20 mm Bore



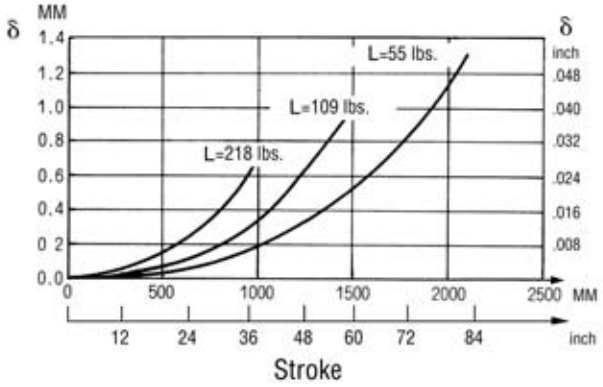
25 mm Bore



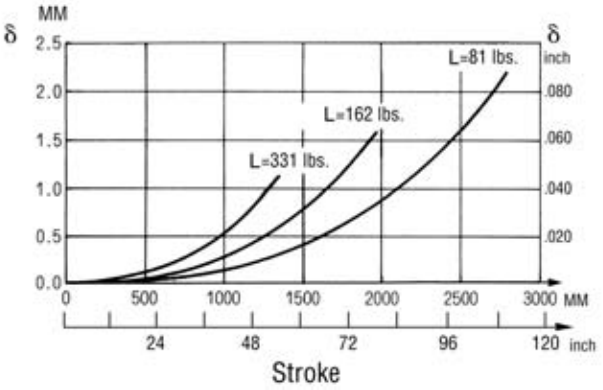
32 mm Bore



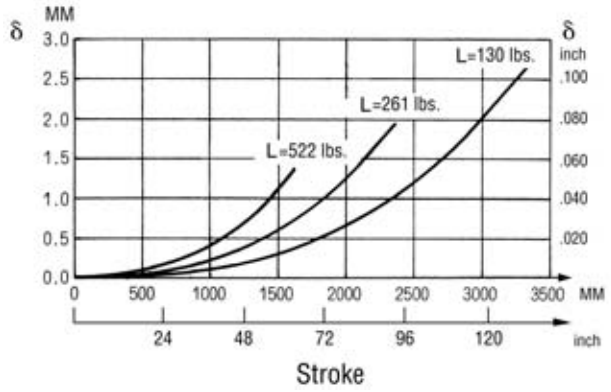
40 mm Bore



50 mm Bore

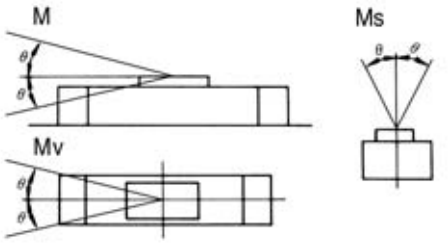


63 mm Bore

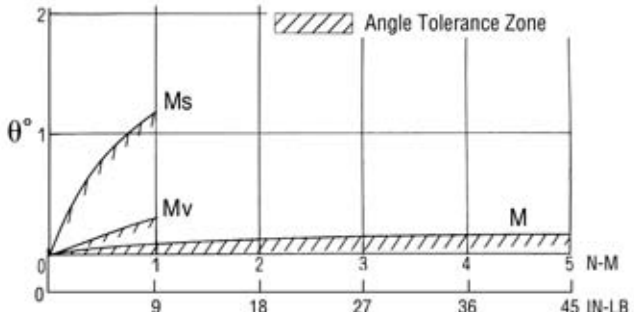


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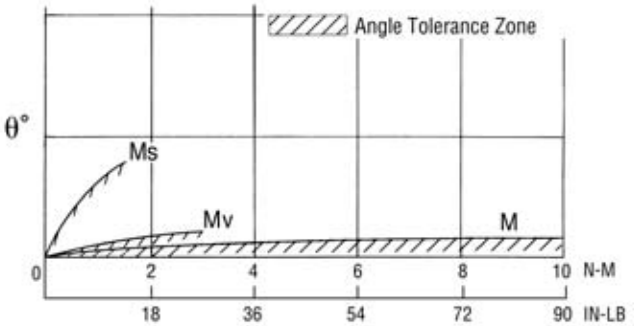
Piston Table Angular Deflection Due To Load Moments Applied



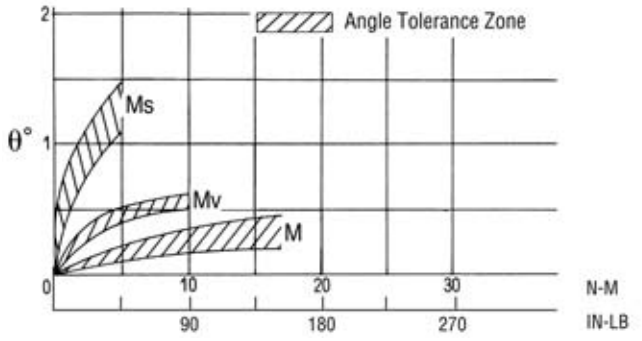
16 mm Bore



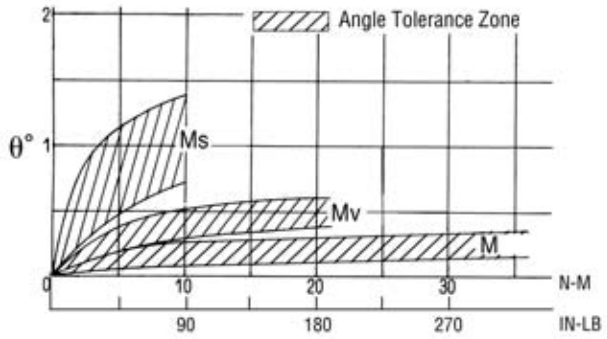
20 mm Bore



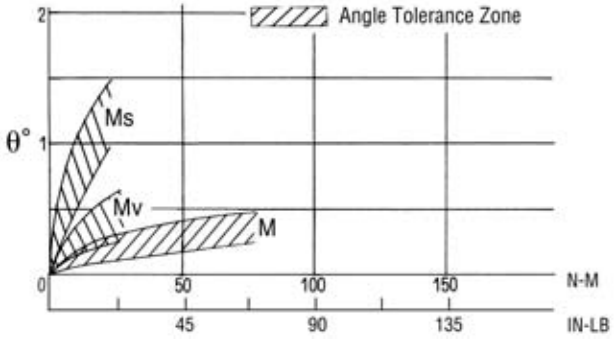
25 mm Bore



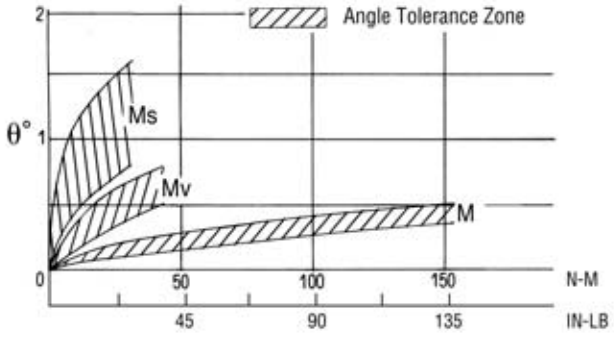
32 mm Bore



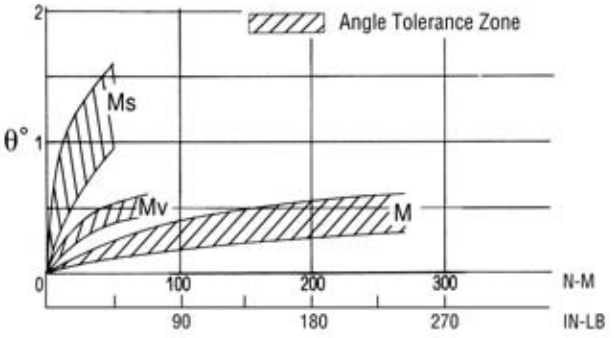
40 mm Bore



50 mm Bore



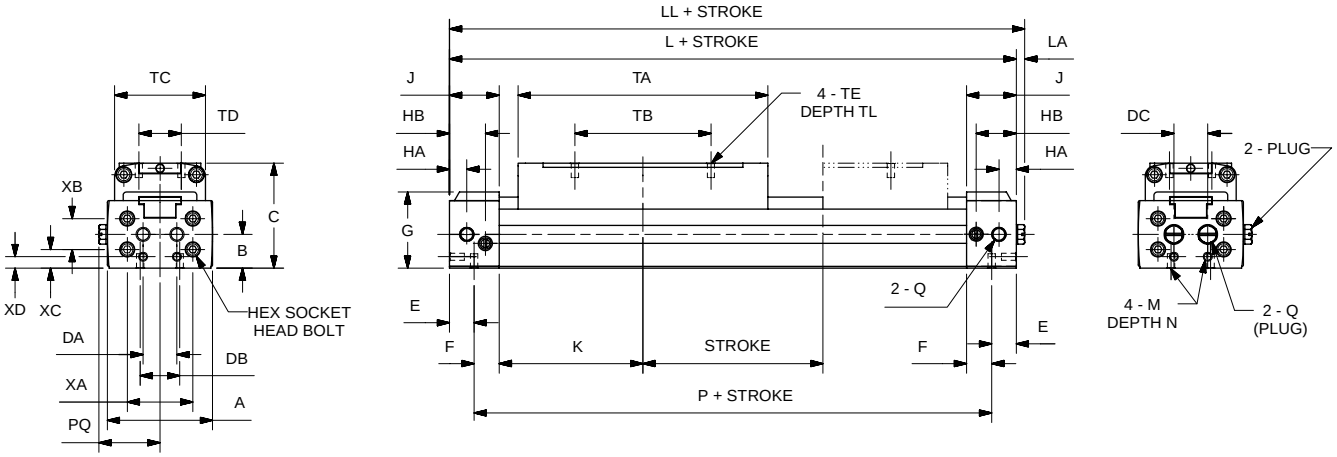
63 mm Bore



G

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Basic Cylinder

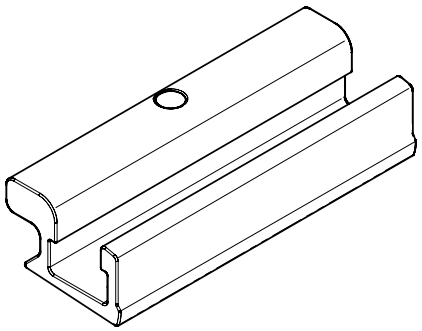


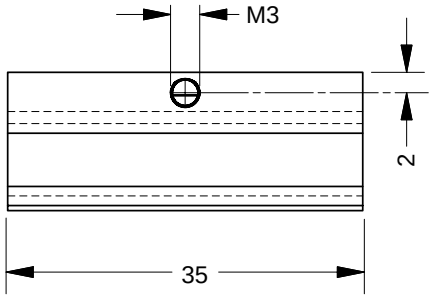
Bore (mm)		A	B	C	DA	DB	DC	E	F	G	HA	HB	J	K	L	LL	LA	M	N
16	inches	1.46	0.47	1.46	0.47	0.55	0.47	0.34	0.35	1.06	0.24	0.55	0.69	2.24	5.87	5.98	0.12	5-40	0.20
	mm	37	12	37	12	14	12	8.5	9	27	6	14	17.5	57	149	152	3	M3	5
20	inches	1.73	0.55	1.65	0.55	0.63	0.63	0.41	0.45	1.22	0.34	0.73	0.87	2.46	6.65	6.75	0.10	8-32	0.26
	mm	44	14	42	14	16	16	10.5	11.5	31	8.5	18.5	22	62.5	169	171.5	2.5	M4	6.5

Bore (mm)		P	PQ	Q	TA	TB	TC	TD	TE	TL	XA	XB	XC	XD
16	inches	5.20	0.83	10-32 NPT	3.47	1.89	1.26	0.59	5-40	0.20	0.91	0.43	0.26	0.16
	mm	132	21	M5	88	48	32	15	M3	5	23	11	6.5	4
20	inches	5.83	0.97	1/8 NPT	3.94	2.36	1.50	0.71	8-32	0.24	1.10	0.63	0.24	0.20
	mm	148	24.5	1/8 Rc	100	60	38	18	M4	6	28	16	6	5

Sensor Adapter Bracket

Part Number P8S-TMA0Y
(Shown larger than actual size)

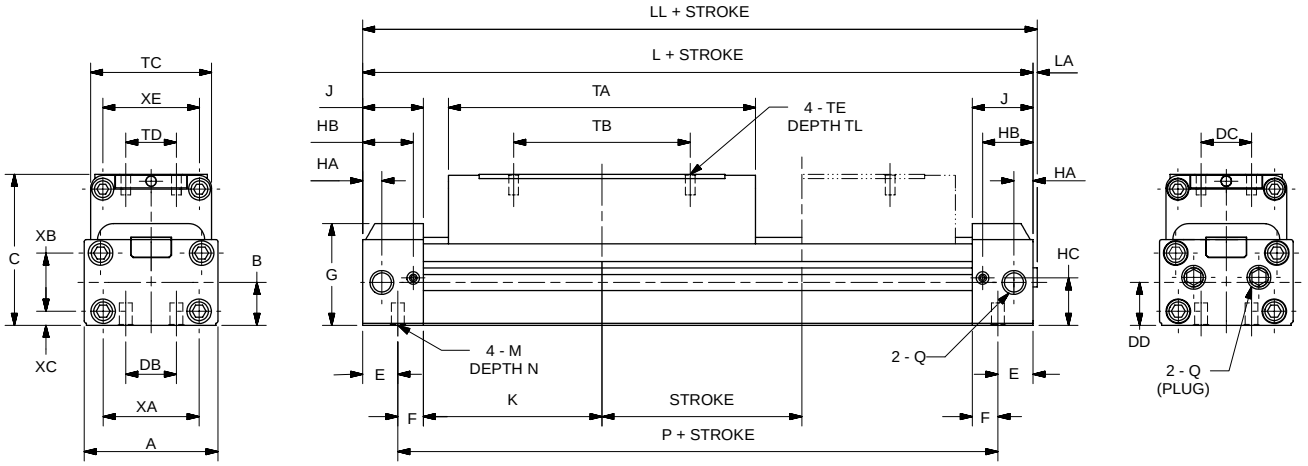




NOTE: Must be ordered separately when ordering sensors.
for sensor information, please see Section M.

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Basic Cylinder



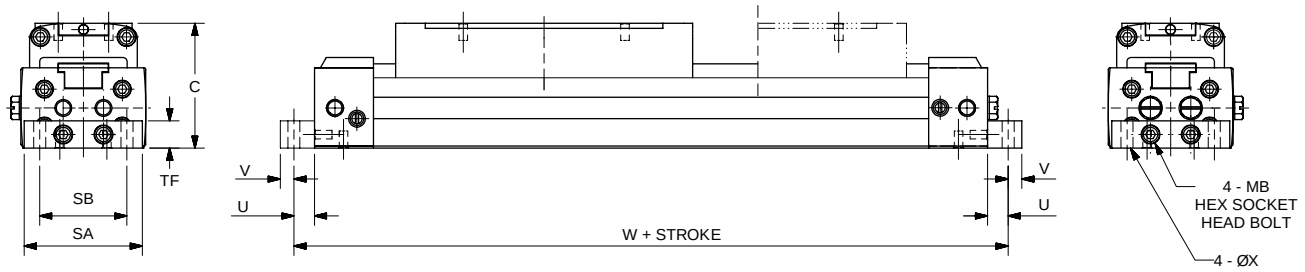
G

Bore (mm)		A	B	C	DB	DC	DD	E	F	G	HA	HB	HC	J	K	L	LL	LA	M	N
25	inches	2.09	0.67	2.09	0.79	1.02	0.75	0.55	0.39	1.59	0.30	0.79	0.74	0.95	2.80	7.48	7.56	0.08	1/4-20	0.35
	mm	53	17	53	20	26	19	14	10	40.5	7.5	20	18.9	24	71	190	192	2	M6	9
32	inches	2.60	0.73	2.24	1.26	1.06	0.83	0.59	0.51	1.71	0.39	0.93	0.85	1.10	3.35	8.90	9.00	0.10	1/4-20	0.35
	mm	66	18.5	57	32	27	21	15	13	43.5	10	23.5	21.5	28	85	226	228.5	2.5	M6	9
40	inches	3.15	0.87	2.64	1.42	1.38	1.10	0.67	0.55	2.03	0.51	1.02	1.06	1.22	3.58	9.61	9.71	0.10	5/16-18	0.47
	mm	80	22	67	36	35	28	17	14	51.5	13	26	27	31	91	244	246.5	2.5	M8	12
50	inches	3.78	1.10	3.23	1.77	1.38	1.38	0.91	0.63	2.40	0.59	1.30	1.39	1.54	3.54	10.16	10.26	0.10	5/16-18	0.47
	mm	96	28	82	45	35	35	23	16	61	15	33	35.3	39	90	258	260.5	2.5	M8	12
63	inches	4.65	1.38	3.74	1.97	1.54	1.65	0.75	0.79	2.91	0.59	1.26	1.69	1.54	4.29	11.65	11.75	0.10	3/8-16	0.59
	mm	118	35	95	50	39	42	19	20	74	15	32	43	39	109	296	298.5	2.5	M10	15

Bore (mm)		P	Q	TA	TB	TC	TD	TE	TL	XA	XB	XC	XE
25	inches	6.38	1/8 NPT	4.80	2.76	1.89	0.79	10-24	0.32	1.50	0.91	0.22	1.58
	mm	162	1/8 Rc	122	70	48	20	M5	8	38	23	5.5	40
32	inches	7.72	1/4 NPT	5.28	3.15	2.21	0.79	1/4-20	0.35	1.89	0.98	0.24	1.85
	mm	196	1/4 Rc	134	80	56	20	M6	9	48	25	6	47
40	inches	8.27	1/4 NPT	5.83	3.54	2.68	1.18	1/4-20	0.43	2.36	1.18	0.28	2.28
	mm	210	1/4 Rc	148	90	68	30	M6	11	60	30	7	58
50	inches	8.35	3/8 NPT	5.98	3.94	3.15	1.18	5/16-18	0.51	2.91	1.42	0.39	2.76
	mm	212	3/8 Rc	152	100	80	30	M8	13	74	36	10	70
63	inches	10.16	3/8 NPT	6.61	4.33	4.02	1.58	5/16-18	0.51	3.78	1.65	0.55	3.54
	mm	258	3/8 Rc	168	110	102	40	M8	13	96	42	14	90

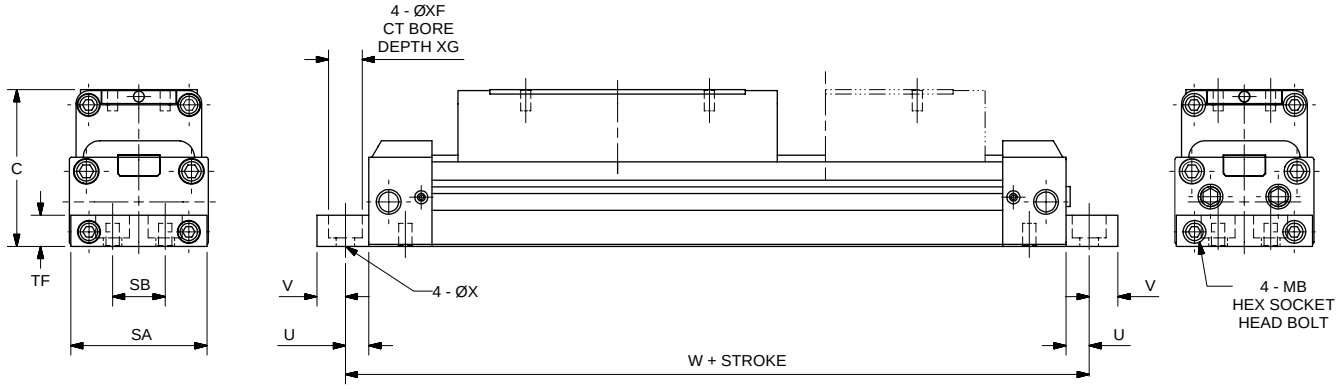
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Glendale Heights, Illinois
www.parker.com/pneu/rodless

16-32 mm Bore Sizes



See page G133 for end port usage.

40-63 mm Bore Sizes

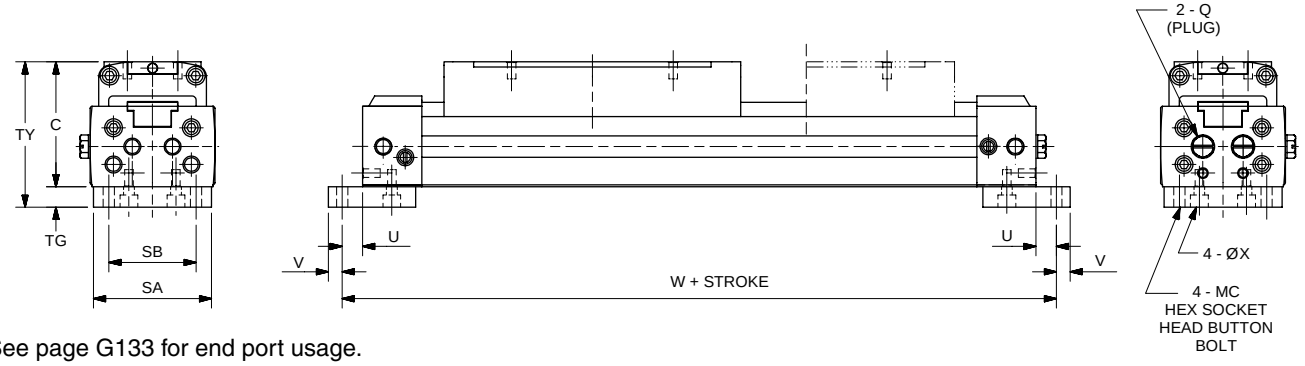


See page G133 for end port usage.

Bore (mm)		C	SA	SB	TF	U	V	W	X	XF	XG	MB
16	inches	1.46	1.38	1.02	0.32	0.24	0.16	6.34	0.14	—		–
	mm	37	35	26	8	6	4	161	3.6			M3x10
20	inches	1.65	1.69	1.30	0.39	0.24	0.24	7.13	0.19			–
	mm	42	43	33	10	6	6	181	4.7			M4x12
25	inches	2.09	2.05	0.79	0.47	0.35	0.43	8.19	0.28			
	mm	53	52	20	12	9	11	208	7			M5x50
32	inches	2.24	2.52	1.26	0.47	0.35	0.43	9.61	0.28			
	mm	57	64	32	12	9	11	244	7			M5x50
40	inches	2.64	3.15	1.18	0.59	0.49	0.45	10.60	0.35	0.51	0.34	
	mm	67	80	30	15	12.5	11.5	269	9	13	8.7	M6x55
50	inches	3.23	3.70	1.57	0.79	0.49	0.45	11.10	0.35	0.51	0.34	
	mm	82	94	40	20	12.5	11.5	283	9	13	8.7	M8x65
63	inches	3.74	4.57	1.89	0.98	0.59	0.59	12.80	0.43	0.61	0.41	
	mm	95	116	48	25	15	15	326	11	15.5	10.5	M8x70

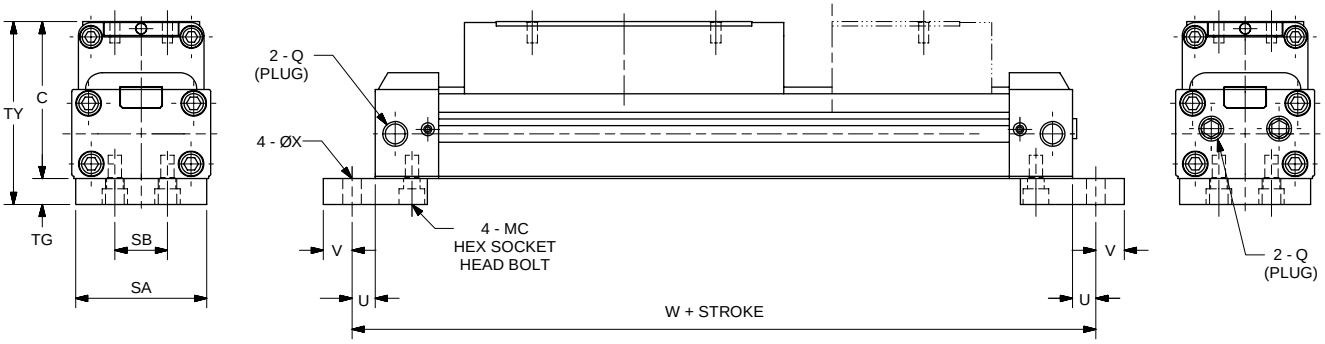
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16-20 mm Bore Sizes



See page G133 for end port usage.

25-32 mm Bore Sizes



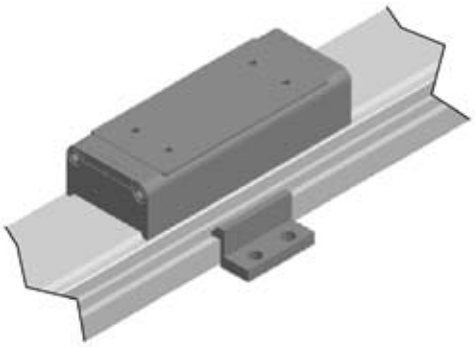
See page G133 for end port usage.

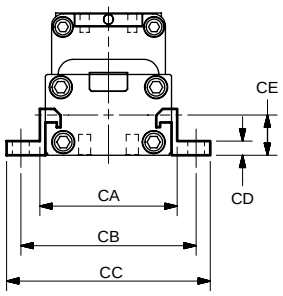
Bore (mm)		C	Q	SA	SB	TG	TY	U	V	W	X	MC
16	inches	1.46	10-32	1.38	1.02	0.24	1.69	0.24	0.16	6.34	0.13	5-40, 1/4 LG
	mm	37	M5	35	26	6	43	6	4	161	3.4	
20	inches	1.65	1/8 NPT	1.69	1.30	0.32	1.97	0.24	0.24	7.13	0.18	8-32, 3/8 LG
	mm	42	1/8 Rc	43	33	8	50	6	6	181	4.5	
25	inches	2.09	1/8 NPT	1.97	0.79	0.39	2.48	0.35	0.43	8.19	0.28	1/4-20 x 1/2 LG
	mm	53	1/8 Rc	50	20	10	63	9	11	208	7	
32	inches	2.24	1/4 NPT	2.52	1.26	0.39	2.64	0.35	0.43	9.61	0.28	1/4-20 x 1/2 LG
	mm	57	1/4 Rc	64	32	10	67	9	11	244	7	
40	inches	2.64	1/4 NPT	—								
	mm	67	1/4 Rc									
50	inches	3.23	3/8 NPT									
	mm	82	3/8 Rc									
63	inches	3.74	3/8 NPT									
	mm	95	3/8 Rc									

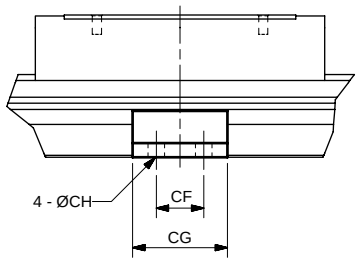
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Glendale Heights, Illinois
www.parker.com/pneu/rodless

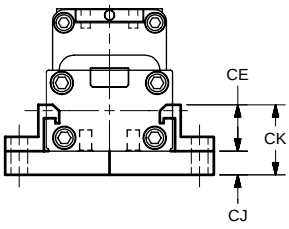
Intermediate Support Brackets

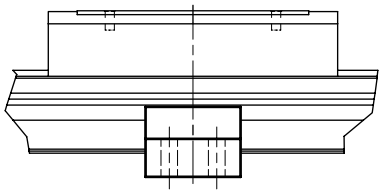
End Mount











Intermediate Support Brackets (2 per kit)

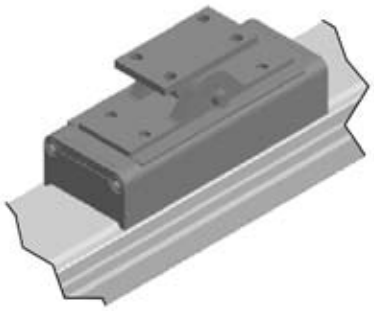
Bore		CA	CB	CC	CD	CE	CF	CG	CH
16 mm	inches	1.654	2.205	2.52	0.118	0.472	0.787	1.378	0.157
	mm	42	56	64	3	12	20	35	4
20 mm	inches	1.929	2.52	2.953	0.157	0.551	0.787	1.496	0.197
	mm	49	64	75	4	14	20	38	5
25 mm	inches	2.362	2.992	3.465	0.236	0.768	0.787	1.575	0.276
	mm	60	76	88	6	19.5	20	40	7
32 mm	inches	2.913	3.465	3.937	0.236	0.846	0.787	1.575	0.276
	mm	74	88	100	6	21.5	20	40	7
40 mm	inches	3.543	4.252	4.882	0.236	0.965	1.181	2.362	0.354
	mm	90	108	124	6	24.5	30	60	9
50 mm	inches	4.173	4.882	5.512	0.315	1.201	1.181	2.362	0.354
	mm	106	124	140	8	30.5	30	60	9
63 mm	inches	5.118	5.984	6.772	0.394	1.516	1.969	3.543	0.433
	mm	130	152	172	10	38.5	50	90	11

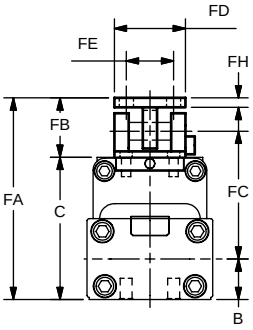
Bore		CJ	CK	Kit Part Number	
				End Mount or No Mount	Bottom Mount
16 mm	inches	0.236	0.709	L080180016	L080190016
	mm	6	18		
20 mm	inches	0.315	0.866	L080180020	L080190020
	mm	8	22		
25 mm	inches	0.394	1.161	L080180025	L080190025
	mm	10	29.5		
32 mm	inches	0.394	1.24	L080180032	L080190032
	mm	10	31.5		
40 mm	inches	—	—	L080180040	—
	mm				
50 mm	inches			L080180050	
	mm				
63 mm	inches			L080180063	
	mm				

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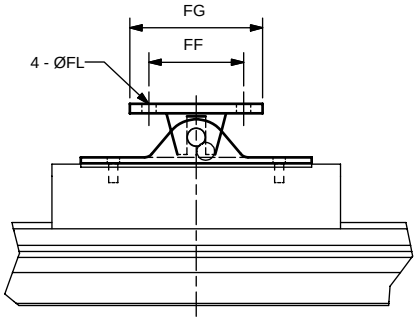
Swivel Mount

Absorbs misalignment between cylinder and load





FJ dimension is the maximum horizontal float



FK dimension is the maximum vertical float

Swivel Mounts

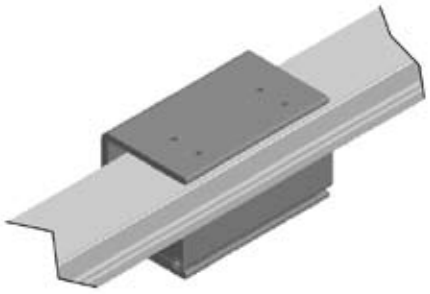
Bore		FA	FB	FC	FD	FE	FF	FG	FH
16 mm	inches	2.238	0.827	1.339	0.945	0.673	1.181	1.575	0.118
	mm	58	21	34	24	16	30	40	3
20 mm	inches	2.638	0.984	1.535	1.181	0.787	1.575	2.205	0.157
	mm	67	25	39	30	20	40	56	4
25 mm	inches	3.071	0.984	1.85	1.181	0.787	1.575	2.205	0.157
	mm	78	25	47	30	20	40	56	4
32 mm	inches	3.74	1.496	2.185	1.772	1.181	1.969	2.756	0.236
	mm	95	38	55.5	45	30	50	70	6
40 mm	inches	4.134	1.496	2.441	1.772	1.181	1.969	2.756	0.236
	mm	105	38	62	45	30	50	70	6
50 mm	inches	4.961	1.732	2.874	2.362	1.575	2.756	3.543	0.315
	mm	126	44	73	60	40	70	90	8
63 mm	inches	5.472	1.732	3.11	2.362	1.575	2.756	3.543	0.315
	mm	139	44	79	60	40	70	90	8

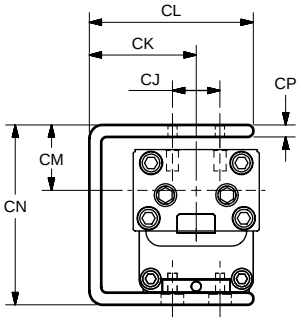
Bore		FJ	FK	FL	B	C	Part Number
16 mm	inches	0.118	0.118	0.134	0.472	1.457	L078930016
	mm	3	3	3.4	12	37	
20 mm	inches	0.118	0.118	0.177	0.551	1.654	L080160020
	mm	3	3	4.5	14	42	L08016M020
25 mm	inches	0.118	0.118	0.236	0.669	2.087	L080160025
	mm	3	3	6	17	53	L08016M025
32 mm	inches	0.197	0.197	0.276	0.728	2.244	L080160032
	mm	5	5	7	18.5	57	L08016M032
40 mm	inches	0.197	0.197	0.276	0.866	2.638	L080160040
	mm	5	5	7	22	67	L08016M040
50 mm	inches	0.197	0.197	0.354	1.102	3.228	L080160050
	mm	5	5	9	28	82	L08016M050
63 mm	inches	0.197	0.197	0.354	1.378	3.74	L080160063
	mm	5	5	9	35	95	L08016M063

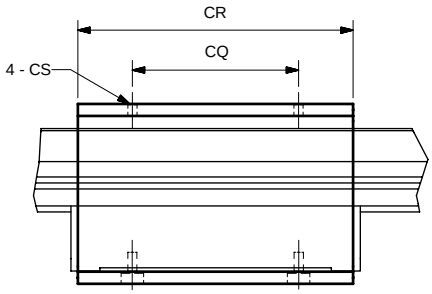
Parker Hannifin Corporation
Parker-Origa
Glendale Heights, Illinois
www.parker.com/pneu/rodless

Inverted Mount

Provides mounting surface 180° from carriage







Inverted Mounts*

Bore		CJ	CK	CL	CM	CN	CP	CQ	CR	CS	Part Number**
16 mm	inches	0.591	1.398	1.969	1.142	2.362	0.236	1.89	3.465	5-40	L080170016
	mm	15	35.5	50	29	60	6	48	88		L08017M016
20 mm	inches	0.709	1.28	1.969	1.024	2.362	0.236	2.362	3.937	8-32	L080170020
	mm	18	32.5	50	26	60	6	60	100		L08017M020
25 mm	inches	0.787	1.772	2.717	1.102	2.795	0.197	2.756	4.567	10-24	L080170025
	mm	20	45	69	28	71	5	70	116		L08017M025
32 mm	inches	0.787	2.126	3.209	1.319	3.15	0.276	3.15	5.039	1/4-20	L080170032
	mm	20	54	81.5	33.5	80	7	80	128		L08017M032
40 mm	inches	1.181	2.48	3.76	1.496	3.602	0.315	3.543	5.433	1/4-20	L080170040
	mm	30	63	95.5	38	91.5	8	90	138		L08017M040
50 mm	inches	1.181	2.913	4.449	1.89	4.429	0.394	3.937	5.591	5/16-18	L080170050
	mm	30	74	113	48	112.5	10	100	142		L08017M050
63 mm	inches	1.575	3.465	5.433	2.283	5.157	0.512	4.331	6.22	5/16-18	L080170063
	mm	40	88	138	58	131	13	110	158		L08017M063

*Inverted mounts not available with adjustable stroke, shock absorber or tube center support bracket.

**Use this part number when ordering as a separate part. When ordering with cylinder, use “C” option as part of cylinder part number.

End Port Piping

Refer to Figure 10 to determine when end port piping can be used with various types of mountings relative to fitting clearance.

On all bore sizes with foot mounting, the end port pipe fittings will obstruct the mounting holes. To avoid this problem, mount the cylinder first and tighten the mounting bolts and then attach the pipe fittings to the cylinder ports.

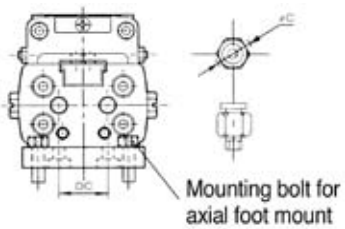


Figure 10

Bore Size (mm)	øC [O.D. of fittings - mm (in.)]		
	No Mount	End Mount	Bottom Mount
16	12 (0.472)	End Port Piping Not Available	12 (0.472)
20	16 (0.630)		16 (0.630)
25	26 (1.024)		26 (1.024)
32	27 (1.065)		27 (1.063)
40	35 (1.378)	26 (1.024)	
50	35 (1.378)	30 (1.181)	
63	39 (1.535)	34 (1.339)	

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Selection Criteria

The Shock Absorber Advantage

- Increase equipment throughput
- Smoother deceleration of loads
- Adjustable end of stroke positioning
- Prevents impact damage
- Minimize shock loads on equipment
- Improves product performance

Four Steps to Great Performance

Step 1. Gather the Application Parameters

- Total load weight (pounds)
- Final velocity at impact (inches/second)*
- Cycle rate (cycles per hour)

Step 2. Verify Shock Absorber Performance

- See charts on the following pages
- Determine that shock absorber will do the job

Step 3. Verify the Cycle Rate

- See shock specifications below and verify application is within cycle rate

Step 4. Choose the Appropriate Option in Model Code

*If final velocity cannot be easily calculated, double the average velocity.

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Shock Absorber Specifications

Figure 11 Specifications

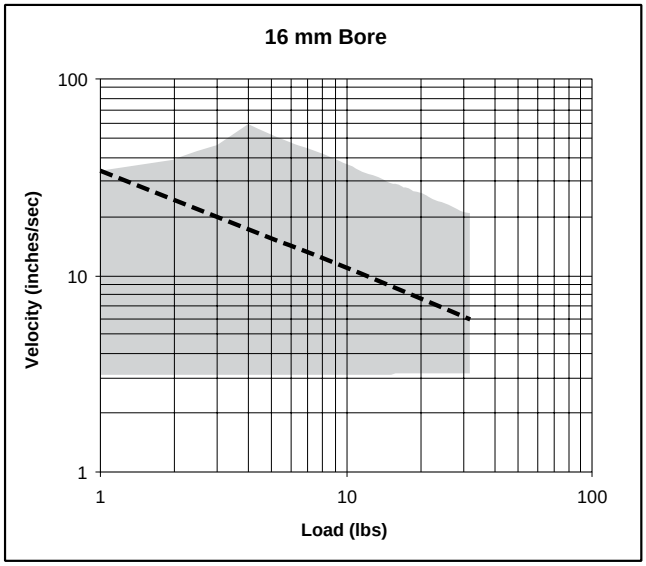
Cylinder	16mm	20mm	25mm	32mm	40mm	50, 63mm
Shock Absorber No.	**0887790016**	**0887790020**	**0887790025**	**0887790032**	**0887790040**	**0887790050**
Max. Energy Absorption - in-lbs (kgf·m)	26.0 (0.3)	60.8 (0.7)	104.2 (1.2)	226 (2.6)	608 (7.0)	1042 (12)
Stroke - inches	0.236	0.315	0.394	0.590	0.787	0.984
Energy Absorption/hour - in.-lbs/hour	54,700	109,380	187,510	338,560	729,200	750,000
Max. Impact Velocity - in./sec.	59	59	78.7	78.7	98.4	118.1
Max. Cycle Rate per Hour	2100	1800	1800	1500	1200	720
Ambient Temperature - °F (°C)	41-140 (5-60)					
Spring Return Force - lb. Extended Compressed	0.65 1.01	0.45 0.97	0.65 1.33	1.33 2.65	2.20 4.86	3.60 7.49
Return Time - Sec.	0.3	0.3	0.3	0.3	0.4	0.4

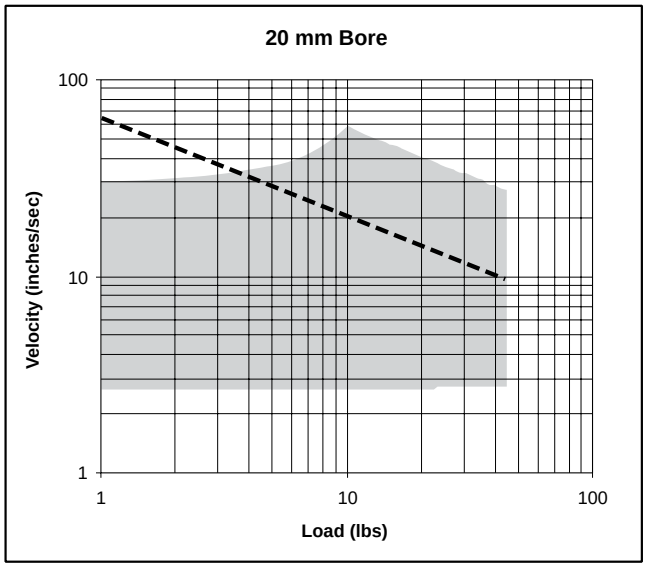
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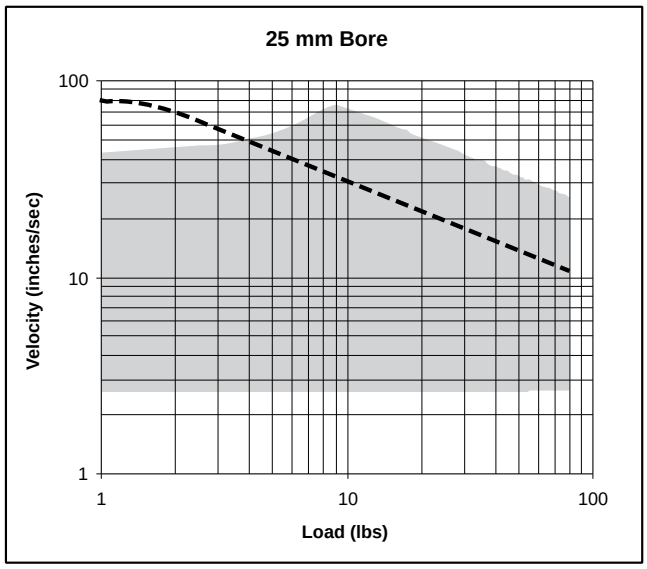
Performance Data (16 - 32mm Bores)

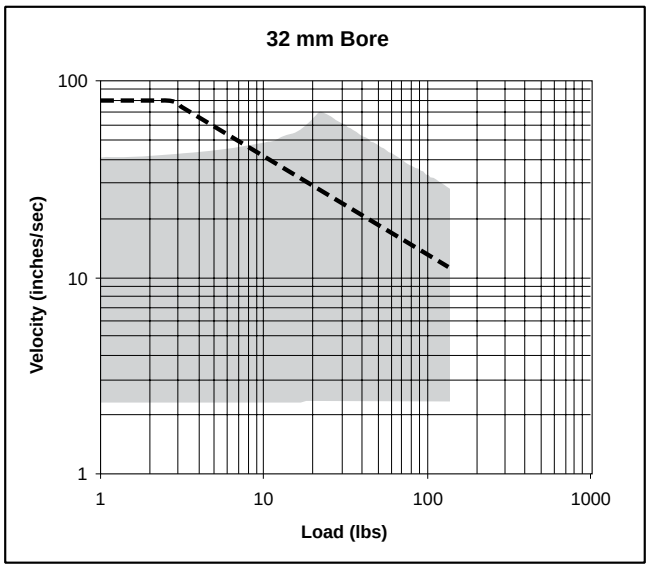
Air Cushion w/back pressure (flow controls or other meter out device)

Shock Absorber









Notes: 1. If the cylinder is vertical in orientation, double the total load for bottom shock absorber.

2. Use the total load that is being moved by shock absorber. If a weight transfer application, this would include La.

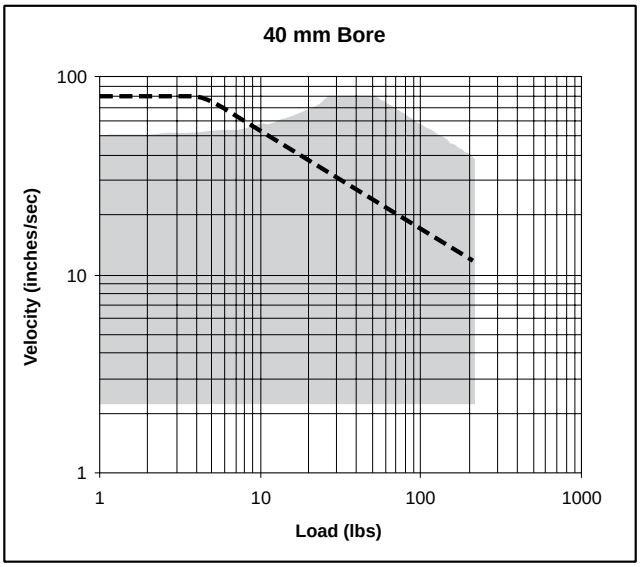
3. If final velocity cannot be easily determined, use two times the stroke divided by the stroke time.

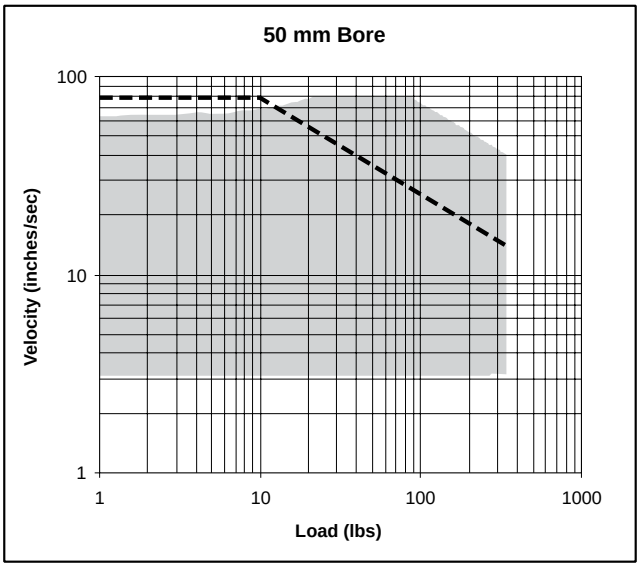
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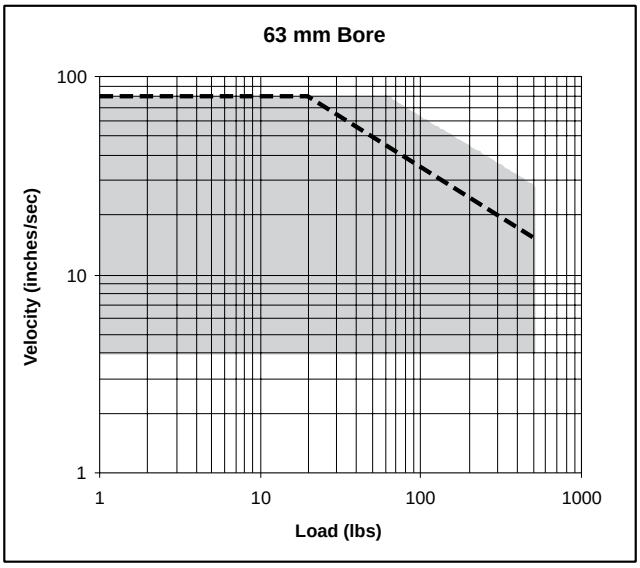
Performance Data (40 - 63mm Bores)

Air Cushion w/back pressure (flow controls or other meter out device)

Shock Absorber







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Notes: 1. If the cylinder is vertical in orientation, double the total load for bottom shock absorber.

2. Use the total load that is being moved by shock absorber. If a weight transfer application, this would include La.

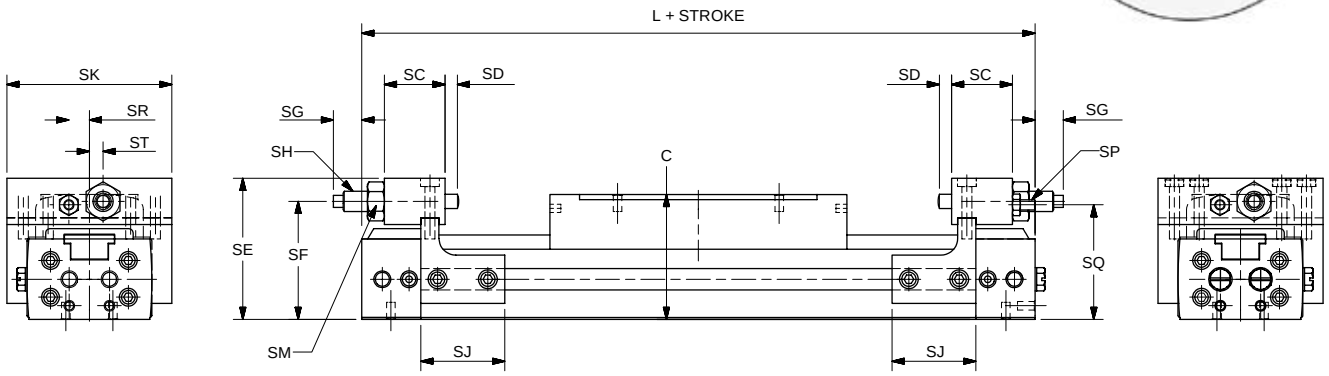
3. If final velocity cannot be easily determined, use two times the stroke divided by the stroke time.

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Stroke Adjustment and Shock Absorber Dimensions

16-25 mm Bore Sizes

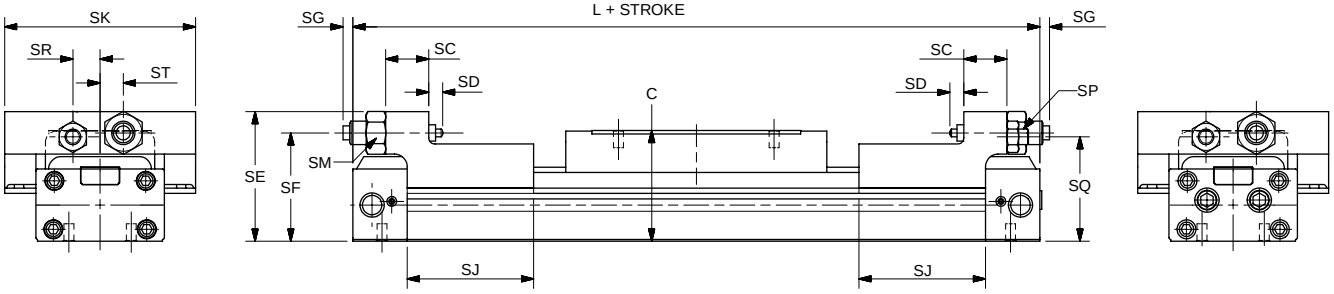




Bore (mm)		SC	SD	SE	SF	SG		SH in-lbs	SJ	SK	SP	SQ	SR	ST	C	L
						Max	Min									
16	in.	0.71	0.16	1.65	1.38	0.57	0.18	26	0.98	1.93	M3	1.34	0.24	0.16	1.46	5.87
	mm	18	4	42	35	14.5	4.5		25	49		34	6	4	37	149
20	in.	0.89	0.14	1.89	1.57	0.57	0.18	61	1.54	2.24	M4	1.50	0.32	0.20	1.65	6.65
	mm	22.5	3.5	48	40	14.5	4.5		39	57		38	8	5	42	169
25	in.	0.79	0.10	2.46	2.03	0.57	0.18	104	1.97	3.03	M6	1.97	0.47	0.39	2.09	7.48
	mm	20	2.5	62.5	51.5	14.5	4.5		50	77		50	12	10	53	190

SH = max. energy absorption

32-63 mm Bore Sizes

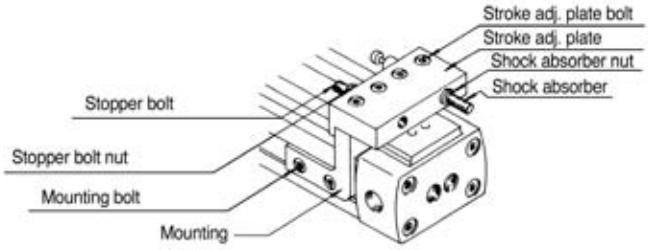


Bore (mm)		SC	SD	SE	SF	SG		SH in-lbs	SJ	SK	SP	SQ	SR	ST	C	L
						Max	Min									
32	in.	0.87	0.28	2.62	2.19	1.06	0.67	226	2.56	3.86	M8	2.11	0.55	0.47	2.24	8.90
	mm	22	7	66.5	55.5	27	17		65	98		53.5	14	12	57	226
40	in.	1.26	0.28	3.09	2.58	1.34	0.94	608	2.56	4.41	M10	2.50	0.67	0.47	2.64	9.61
	mm	32	7	78.5	65.5	34	24		65	112		63.5	17	12	67	244
50	in.	1.50	0.32	3.90	3.15	2.17	1.77	1042	2.76	5.35	M12	3.05	0.87	0.67	3.23	10.16
	mm	38	8	99	80	55	45		70	136		77.5	22	17	82	258
63	in.	1.50	0.32	4.41	3.68	1.73	1.34	1042	2.76	6.22	M16	3.50	0.98	0.79	3.74	11.65
	mm	38	8	112	93.5	44	34		70	158		89	25	20	95	296

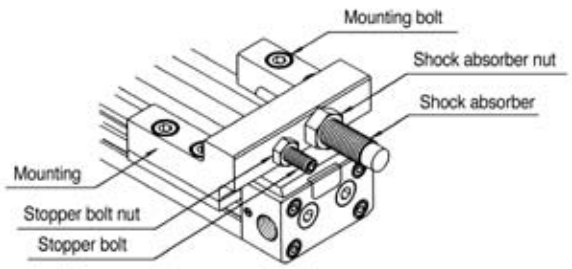
SH = max. energy absorption

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Positioning of Stroke Adjustment Unit



ø16~ø25



ø32~ø63

(1) Moving the stroke adjustment unit.
The stroke adjustment unit can be moved by loosening the mounting bolts.

(2) Locking of stroke adjustment unit.
After moving the stroke adjustment unit to the appropriate position, lock it there by tightening the mounting bolts to the torque values shown in Figure 12. Insufficient torque may cause the stroke adjustment unit to slip out of position.

Figure 12

Torque values for tightening stroke adjustment unit.

Bore Size	Tightening Torque	
	Mounting Bolt (lb-in)	Stroke Adj. Plate Bolt (lb-in)
16mm	9-11	4-6
20mm	22-24	
25mm	46-50	22-24
32mm	195-213	–
40mm	390-415	–
50, 63mm	682-735	–

(3) Stroke adjustment using the stopper bolt.
Adjust the stroke by loosening the stopper bolt nut and turning the stopper bolt. After adjusting the stroke, tighten the stopper bolt nut to the torque values shown in Figure 12a. When adjusting the 16-25 mm cylinders, due to the small amount of clearance between the table and the stroke adjustment plate, adjust the stroke by moving the complete stroke adjustment unit.

Figure 12a

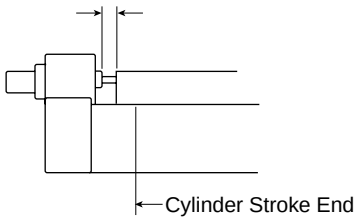
Torque values for tightening stopper bolt nut and shock absorber nut.

Bore Size	Tightening Torque	
	Stopper Bolt Nut (lb-in)	Shock Absorber Nut (lb-in)
16mm	10-11	12-16
20mm	22-24	26-35
25mm	73-84	40-53
32mm	195-213	66-89
40mm	390-425	195-266
50mm	682-735	487-620
63mm	1772-1914	487-620

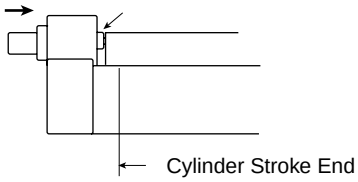
(4) Adjustment of shock absorber.
Adjust the absorption energy of the shock absorber by changing the operating stroke of the shock absorber. This is done by loosening the shock absorber nut and turning the unit. When adjustment is complete, tighten the shock absorber nut to the torque values shown in Figure 12a.

(5) Notes on usage.
The shock absorber absorbs rated energy with rated stroke. The factory setting allows a small amount of shock absorber stroke before it bottoms out. Readjust the location of the shock absorber so that the complete stroke of the absorber is utilized.

Absorption energy as set at factory:
Small margin with stroke of shock absorber.



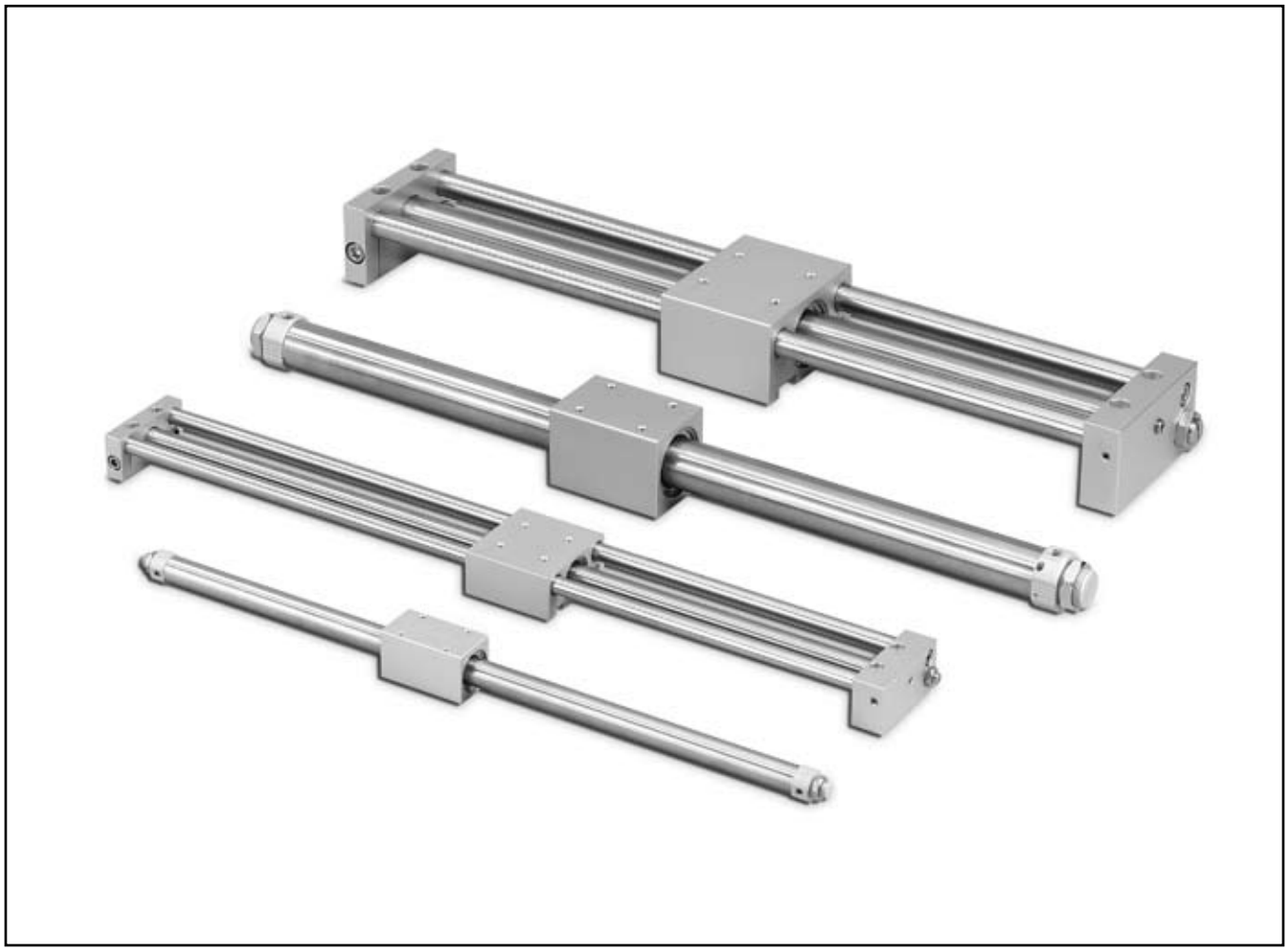
Adjust the position of the shock absorber until the plunger of the shock absorber is fully depressed.



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P1Z Series

Magnetically Coupled Rodless Air Cylinders



Contents

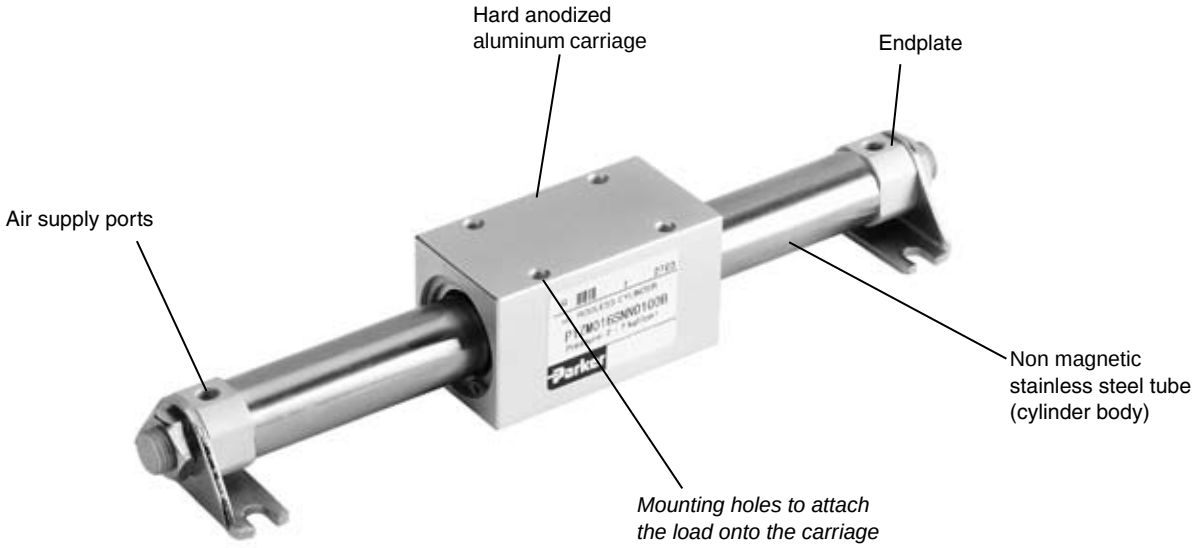
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- Mountings G155

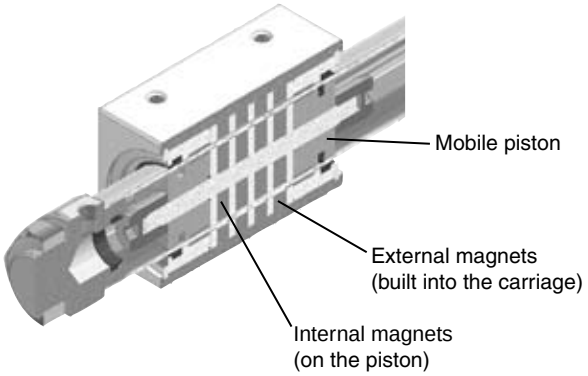
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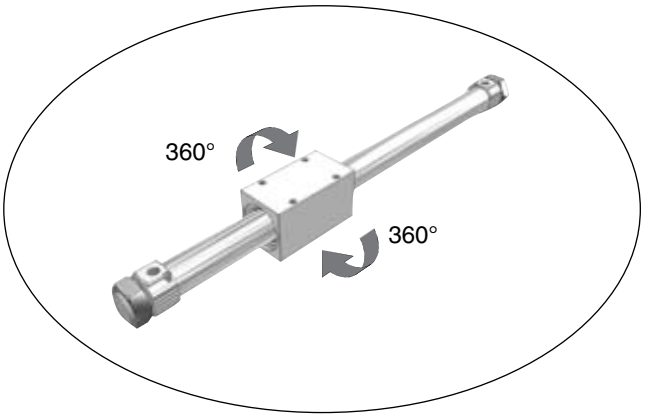
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Basic Version







G

Description

The magnetic rodless cylinder is a pneumatic cylinder featuring a mobile piston fitted with annular magnets.

The mobile carriage is also equipped with magnets to provide magnetic coupling between the piston and carriage.

It incorporates the following features:

- end of stroke cushioning/bumpers
- mounting:
  - threaded endcaps
  - optional foot mount
  - optional flange mount

Cushioning

Ø 16 mm: non-adjustable bumper or adjustable pneumatic cushioning

Ø 20 and 32 mm: adjustable pneumatic cushioning

Mounting

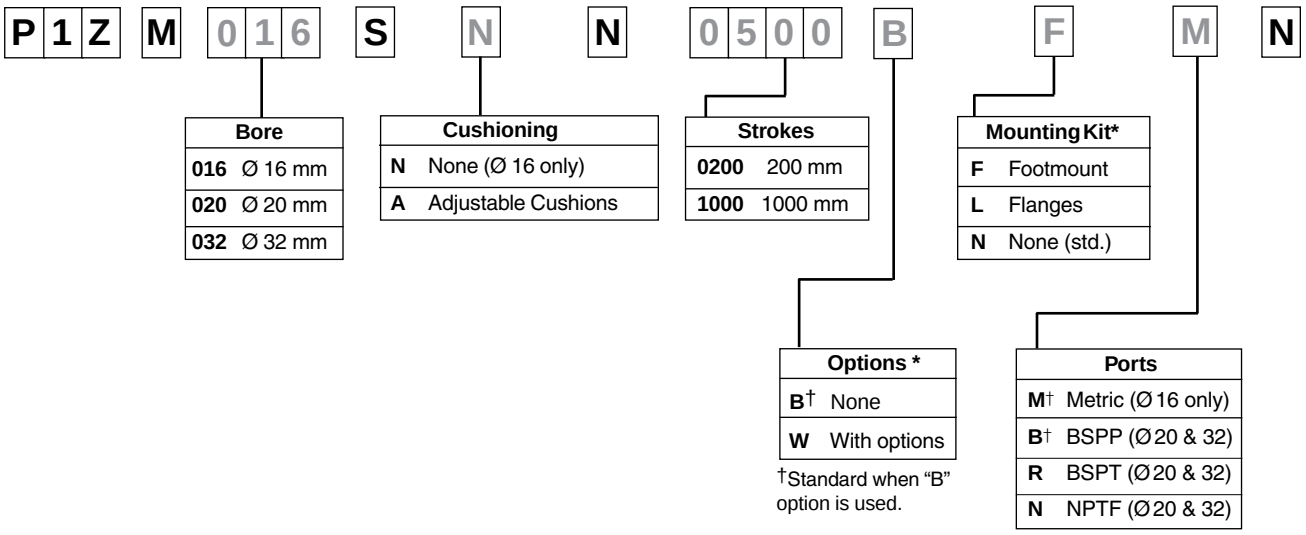
The mobile carriage is free to rotate 360° around the cylinder axis. This feature facilitates the adaptation of the cylinder to various mounting arrangements.

The load must be guided by an external device.

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C347

Standard cylinder (15 positions)	Options (16 positions)



*** Cylinders are supplied with mounting nuts fitted on each endplate.**

Ø	**Stroke** (mm)	(in)
16	0 to 1000	0 to 39.4
20	0 to 1500	0 to 59.1
32	0 to 2000	0 to 78.7

Order code examples:

- **P1ZM016SNN0100B** Ø 16 mm bore 100 mm stroke cylinder supplied with mounting nut on each endplate
- **P1ZM020SAN1000WFBN** Ø 20 mm bore 1 m stroke cylinder with foot mount on each endplate

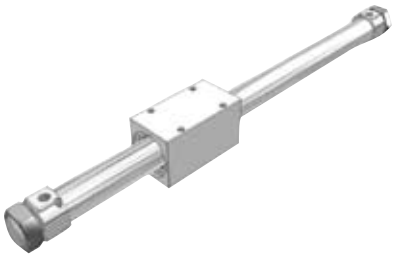
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C347

General Features

Magnetic Rodless cylinder, basic version

Available in 3 bores with stroke lengths up to 2000 mm.
Adjustable air cushioning is available on all cylinders.
The load is fixed onto the mobile carriage by 4 tapped holes.
The cylinder is attached by the ends with jam nuts, flanges or foot mounts.



Specifications for P1Z Series Magnetically Coupled Rodless

Operating Medium	Compressed Air		
Maximum Pressure - Bar (PSI)	7 (100)		
Minimum Pressure - Bar (PSI)	2 (29)		
Bore Size mm (inch nominal)	16 (5/8)	20 (3/4)	32 (1 1/4)
Port Size	M5 BSPP, 10-32 NPT	1/8 BSPP, 1/8 NPT	1/8 BSPP, 1/8 NPT
Ambient Temperature °F (°C)	15 to 140°F (-10 to 160°C)		
Maximum Stroke mm (inch)	1000 (39.4)	1500 (59.1)	2000 (78.7)
Stroke Tolerance mm	+1.5/-0	<=1000 +1.5/-0; >1000 +2/-0	
Piston Speed m/s (inch/sec)	0.1 to 0.4 (4 to 15.75)		
Max. Coupling Force N (Lbs)	157 (35)	236 (53)	703 (158)
Cushion	Air Cushion Standard		
Lubrication	Not Required (If you choose to lubricate your system, continuing lubrication will be required.)		

G

Technical Data

Bore Size		Weights			
		Weight at Zero Stroke		Weight per 25mm of Stroke	
mm	inch	kg	lbs	kg	lbs
16	5/8	0.28	0.62	0.01	0.02
20	3/4	0.46	1.01	0.02	0.05
32	1-1/4	1.35	2.98	0.04	0.08

Conditions of Use

If external lubrication is added, this must always be continued.

Working medium, air quality

Working medium Dry, filtered compressed air to ISO 8573-1 class 3. 4. 3. or better

Recommended air quality for cylinders

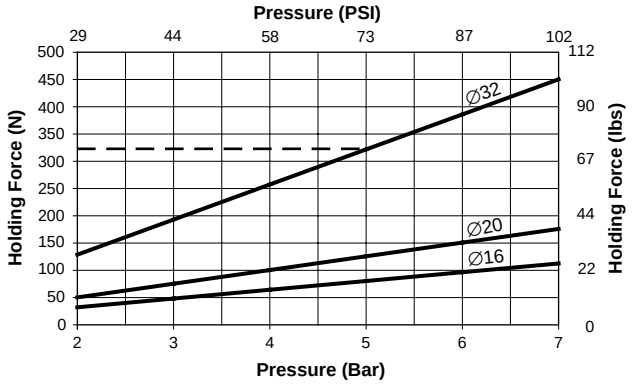
For best possible service life and trouble-free operation, ISO 8573-1. quality class 3.4.3 should be used. This means 5 µm filter (standard filter), dew point +3°C for indoor operation (a lower dew point should be selected for outdoor operation) and oil concentration 1.0 mg oil/m³, which is what a standard compressor with a standard filter gives.

ISO 8573-1 Quality Classes

Quality Class	Max. Pollution		Water	Oil
	particules size (µm)	max. concentration (mg/m³)	max. pressure dew point (°C)	max. concentration (mg/m³)
1	0.1	0.1	-70	0.01
2	1	1	-40	0.1
3	5	5	-20	1.0
4	15	8	+3	5.0
5	40	10	+7	25
6	–	–	+10	–

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Pressure in the Cylinder / Pneumatic Holding Force



Example:

Pressure: 5 bar

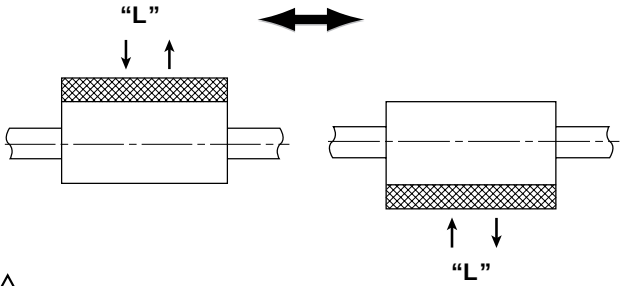
F_{max} = 322 N for Ø 32 mm cylinder

⚠ Calculate the kinetic energy due to the load moved

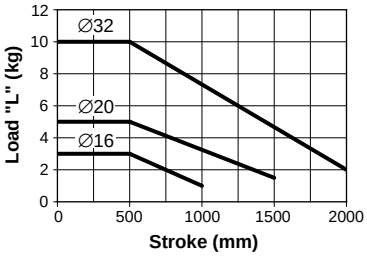
Acceleration or deceleration should not exceed the magnetic coupling force of cylinder

Load Diagrams

Permissible radial loads, horizontal mounting

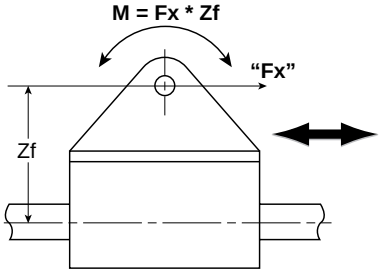


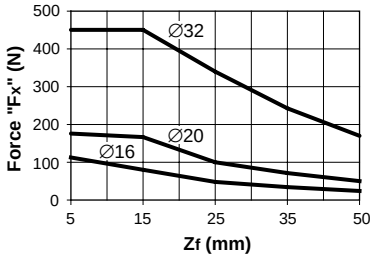
⚠ The load must be guided by a device from outside the cylinder



Ø	L Max. (kg)	(lbs.)
16	3	6.6
20	5	11.0
32	10	22.0

Permissible axial loads, horizontal mounting



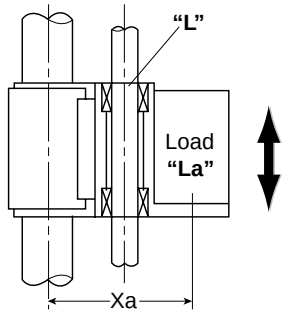


Ø	Max. Moment M (Nm)	(in-lbs.)	Max. Fx* (N)	(lbs.)
16	1.2	11	112	25
20	2.5	22	175	39
32	8.5	75	450	101

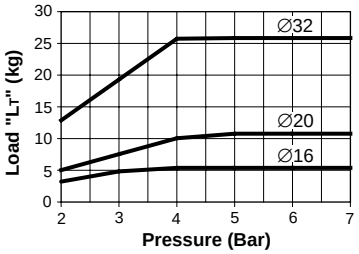
***** at 7 bar

⚠ The load must be guided by a device from outside the cylinder

Permissible axial loads, vertical mounting



* If force due friction is unknown, use 0.1 × (L + La).



Ø	Max. load T (kg)	(lbs.)	Max. XA (mm)	(in.)
16	5	11	122	4.8
20	10	22	142	5.6
32	24	53	174	6.8

***** at 6.5 bar

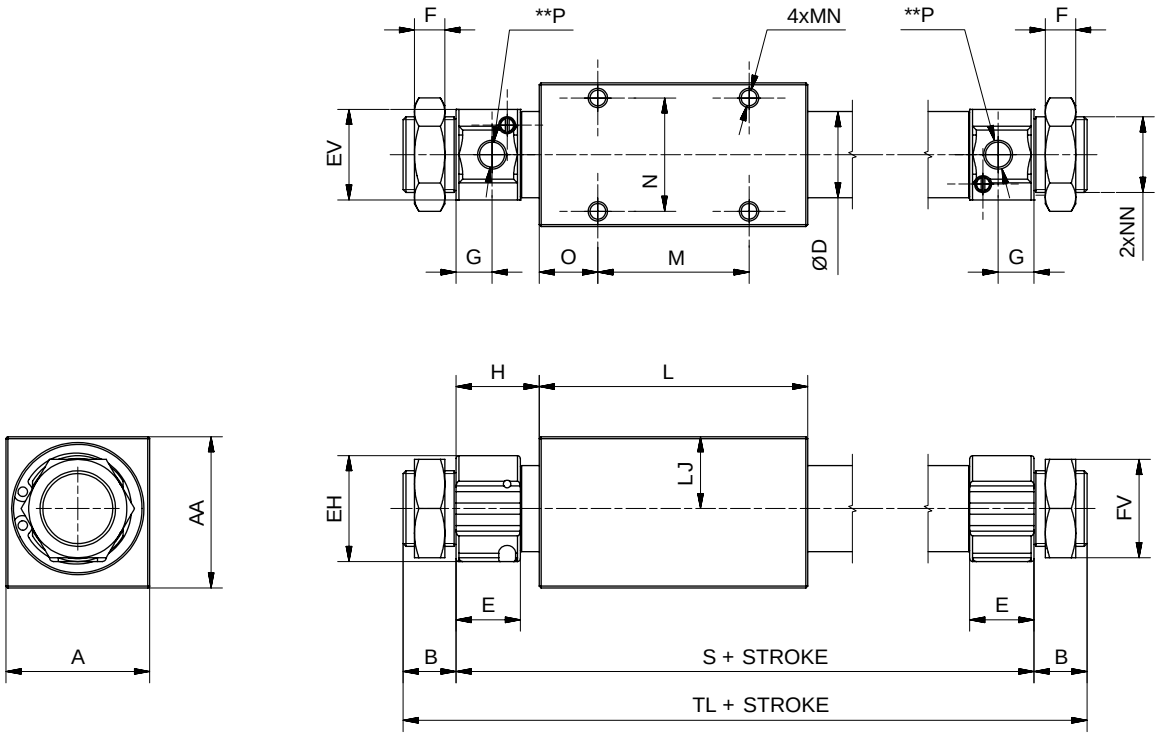
L = Load guided by external device
La = Direct mounting onto the cylinder
Ff = Force due to friction*

L_T = Load weight + guiding device weight + force due to friction

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Dimensions

****** = Air supply Ports

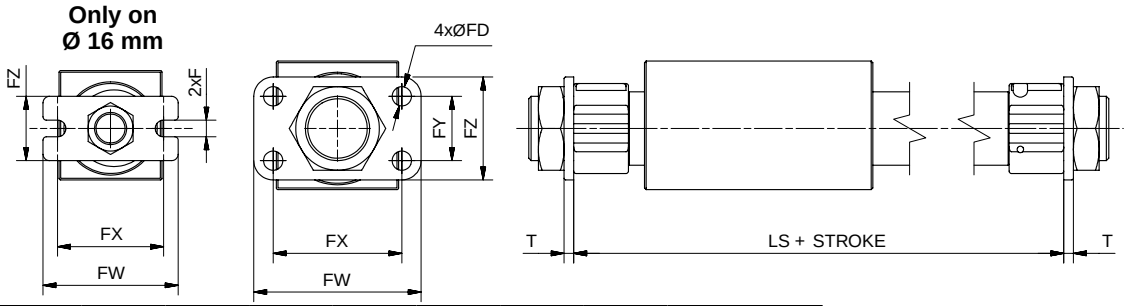


Ø	A	AA	B	ØD	E	Ø EH	Ø EV	F	FV	G	H	L	LJ	M	N	O
16	32 (1.26)	34 (1.34)	10 (0.39)	18 (0.71)	11 (0.43)	18 (0.71)	18 (0.71)	4 (0.16)	14 (0.55)	5.5 (0.22)	15.5 (0.61)	61 (2.40)	16 (0.63)	34 (1.34)	25 (0.98)	13.5 (0.53)
20	38 (1.50)	40 (1.57)	14 (0.55)	22.8 (0.90)	17 (0.67)	28 (1.10)	24 (0.94)	8 (0.31)	26 (1.02)	9.5 (0.37)	22 (0.87)	71 (2.80)	19 (0.75)	40 (1.57)	30 (1.18)	15.5 (0.61)
32	60 (2.36)	60 (2.36)	16 (0.63)	35 (1.38)	17 (0.67)	40 (1.57)	36 (1.42)	8 (0.31)	32 (1.26)	9.5 (0.37)	23 (0.91)	87 (3.43)	30 (1.18)	50 (1.97)	40 (1.57)	18.5 (0.73)

Ø	P	MN	NN	S	TL
16	M5 x 0.8 (10-32)	M4 x 0.7 x 6	M10 x 1 x 6	92 (3.62)	112 (4.41)
20	G 1/8 (1/8)	M5 x 0.8 x 8	M20 x 1.5 x 7	115 (4.53)	143 (5.63)
32	G 1/8 (1/8)	M6 x 1 x 10	M26 x 1.5 x 7	133 (5.24)	165 (6.50)

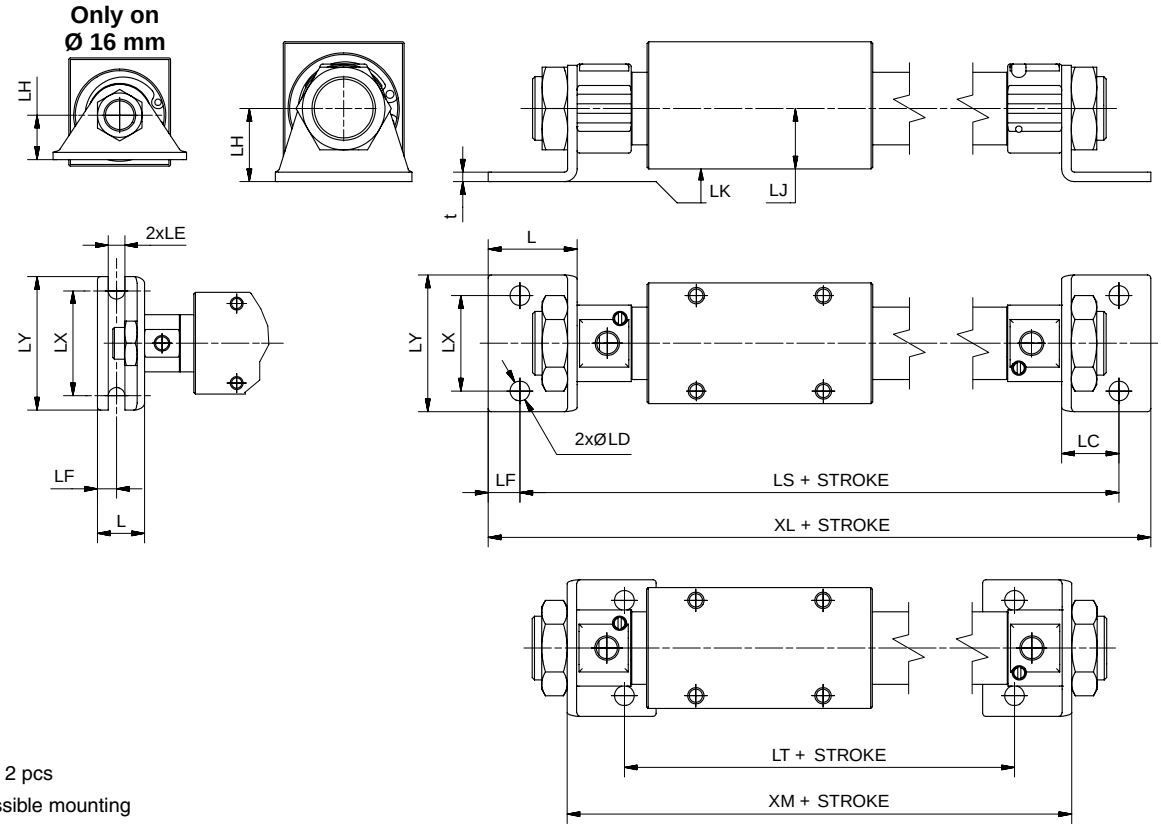
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Mountings
Flanges



Ø	F	ØFD	FW	FX	FY	FZ	T	LS	Order Code
16	5.2 (0.20)	–	42 (1.65)	33 (1.30)	–	20 (0.79)	2.3 (0.09)	92 (3.62)	**PDC15-FH**
20	–	6 (0.24)	52 (2.05)	40 (1.57)	20 (0.78)	32 (1.26)	3 (0.12)	115 (4.53)	**PK1A20-FH**
32	–	7 (0.28)	80 (3.15)	64 (2.52)	28 (1.10)	44 (1.73)	5 (0.20)	133 (5.24)	**PK1A25-FH**

Brackets



* Set of 2 pcs

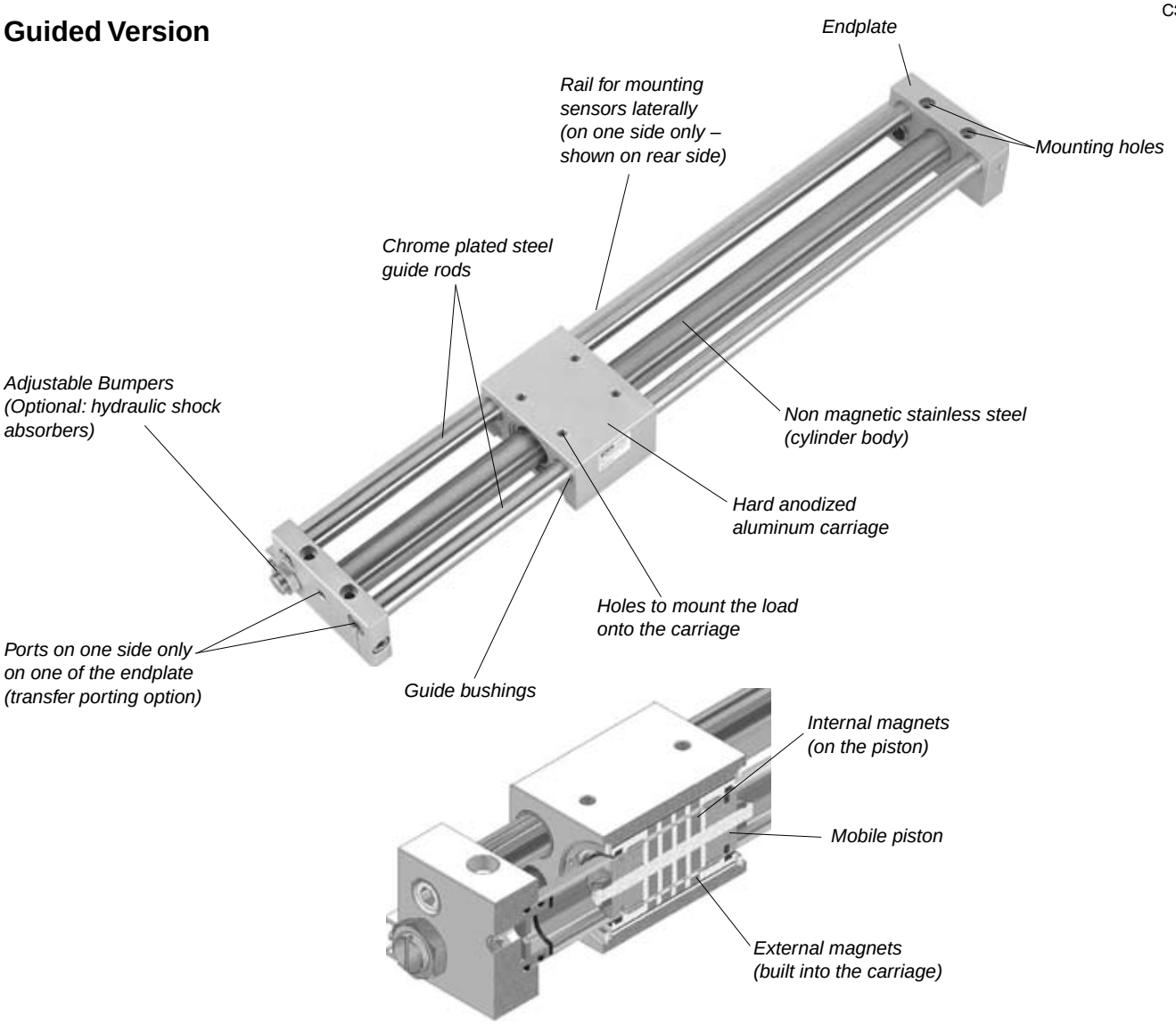
** Impossible mounting

Ø	t	L	LC	ØLD	LE	LF	LH	LJ	LK	LX	LY	LS	LT	XL	XM	Order Code
16	2.3 (0.09)	14.8 (0.58)	8.8 (0.35)	–	5.2 (0.20)	6 (0.24)	14 (0.55)	16 (0.63)	-2 (-0.08)	33 (1.30)	42 (1.65)	109.6 (4.32)	79 (3.11)	121.6 (4.79)	96.6 (3.80)	**PDC15-LB***
20	3 (0.12)	28 (1.10)	18 (0.71)	6.2 (0.24)	–	10 (0.39)	23 (0.91)	19 (0.75)	4 (0.16)	30 (1.18)	43 (1.69)	151 (5.94)	85 (3.35)	171 (6.73)	121 (4.76)	**PK1A20-LB***
32	3 (0.12)	35 (1.38)	23 (0.91)	7 (0.28)	–	12 (0.47)	30 (1.18)	30 (1.18)	0 (0)	46 (1.81)	62 (2.44)	179 (7.05)	**	203 (7.99)	**	**PK1A25-LB***

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C347

Guided Version



G

Description

The magnetic rodless cylinder is a pneumatic cylinder featuring a mobile piston with annular magnets.

The mobile carriage is also equipped with magnets to give magnetic coupling between the piston and carriage. The carriage slides along the main tube and is guided by two guide rods.

It incorporates the following features:

- Built-in guide rods
- Adjustable end-of-stroke bumpers
- Optional magnetic piston sensing
- Optional transfer porting

Guidance

The guided version consists of a carriage fitted with 4 plain bearings, guided on 2 rods.

This design provides high rigidity, accurate guidance and smooth movement of the carriage.

End of Stroke

Each endplate can be fitted with an adjustable bumper or self-compensating shock absorbers.

Optional transfer porting

Cylinder air supply is located on one end only to facilitate cylinder installation and avoid long tube lengths for longer strokes.

Options

The following options are available to enhance the Magnetic Rodless cylinder functions:

- ***External bumpers:*** when low operating pressure, light loads and short strokes.
- ***External hydraulic shock absorbers:*** recommended for arduous applications.
- ***Reed and solid state sensors:*** provide sensing at an adjustable position along the entire stroke of the cylinder.

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Standard version (15 positions)	Options (18 positions)

P 1 Z M 0 1 6 T N N 0 5 0 0 B N M L

Bore	
016	Ø 16 mm
020	Ø 20 mm
032	Ø 32 mm

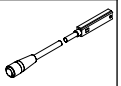
Cushioning	
N	No stops**
C	Adjustable stop
H	Hydraul. shock absorber

Strokes	
0200	200 mm
1000	1000 mm

Cyl. Port type	
M†	Metric (Ø 16 only)
B†	BSP (Ø 20 and 32)
R	BSPT (Ø 20 and 32)
N	NPTF (Ø 20 and 32)

Options	
B†	None
W	With options

Function	
G	Guided
T	Guided with transfer porting

End of stroke sensing			
NPN	**PNP**	**Reed**	**Sensors type (Qty: 2)**
	L		With rail, no sensor
D	**K**	**S**	0.3 m **with** 8mm connector 
A	**H**	**C**	3 m flying leads 
F	**U**	**B**	10 m flying leads
G	**W**	**E**	0.3 m **with** M12 connector
	N† **(std.)**		No sensor rail
	P		Proximity sensor in end caps

†Standard when "B" option is used.

****** Do not exceed coupling force on deceleration.

Ø	**Maximum Strokes** (mm)	(in.)
16	0 to 750	0 to 29.5
20	0 to 1000	0 to 39.4
32	0 to 1500	0 to 59.1

Order code examples:

- P1ZM016GCN0100B 16 mm bore, 100 mm stroke cylinder supplied with adjustable stop

- P1ZM020GHN1000WNBL 20 mm bore, 1 m stroke cylinder supplied with hydraulic shock absorbers and rail for sensors

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Range

Magnetic Rodless Cylinder, guided version

Available in 3 diameters with possible strokes up to 1500 mm (59 in).

4 tapped mounting holes on the carriage.

Endcap mounting provided by 4 tapped and counterbored holes.



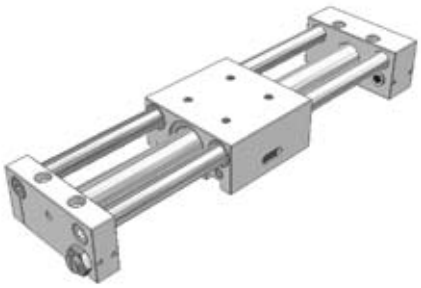
Options

External adjustable bumpers

Can be fitted on cylinder endcaps and provide noise reduction and adjustment at the end of stroke.

Used when light loads and short strokes.

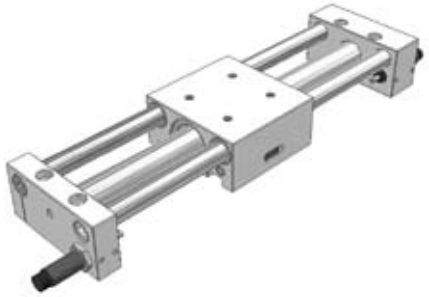
Pneumatic air supply on one side only (transfer porting option).



External hydraulic shock absorbers

Self-compensating hydraulic shock absorbers can be used instead of bumpers for a greater cushioning effect at the end of stroke.

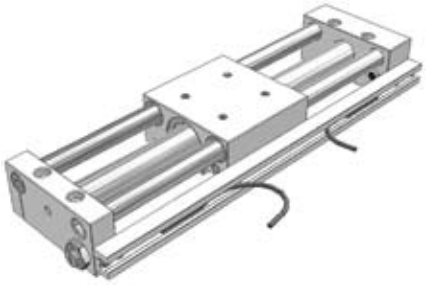
They are recommended for arduous applications.



Reed or Solid State Sensors:

A rail fitted on one side only of the cylinder provides mounting and position adjustment of sensors.

The rail is located on same side as the end of stroke stops.



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General Features

Specifications for P1Z Series Magnetically Coupled Rodless

Operating Medium	Compressed Air		
Maximum Pressure Bar (PSI)	7 (100)		
Minimum Pressure Bar (IPS)	2 (29)		
Bore Size mm (inch nominal)	16 (5/8)	20 (3/4)	32 (1 1/4)
Port Size	M5 BSPP, 10-32 NPT	1/8 BSPP, 1/8 NPT	1/8 BSPP, 1/8 NPT
Ambient Temperature °F (°C)	15 to 140°F (-10 to 160°C)		
Maximum Stroke mm (inch)	750 (29.5)	1000 (39.4)	1500 (59.1)
Stroke Tolerance mm	+1.5/-0	<=1000 +1.5/-0; >1000 +2/-0	
Piston Speed m/s (inch/sec)	0.1 to 0.4 (4 to 15.75)		
Max. Coupling Force N (Lbs)	157 (35)	236 (53)	703 (158)
Cushion	Air Cushion Standard		
Lubrication	Not Required (If you choose to lubricate your system, continuing lubrication will be required.)		

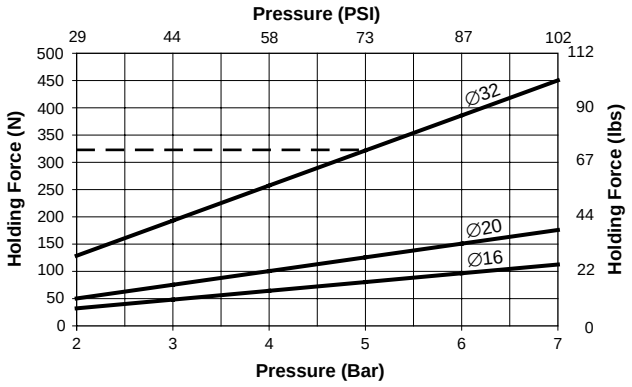
Bore Size		Weights			
		Weight at Zero Stroke		Weight per 25mm of Stroke	
mm	inch	kg	lbs	kg	lbs
16	5/8	0.9	1.98	0.05	0.11
20	3/4	1.52	3.35	0.08	0.17
32	1-1/4	3.63	8.00	0.13	0.29

Options

Function	Description
Detection	Sensors mounting in T-slot
	Reed or solid state sensors (PNP or NPN)
External rubber bumpers	Supplied pre-fitted in endplates if chosen
Hydraulic shock absorbers	Self-compensating shock absorbers supplied pre-fitted in endplates if chosen

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Pressure in the Cylinder / Pneumatic Holding Force



Example:

Pressure: 5 bar (73 PSI)

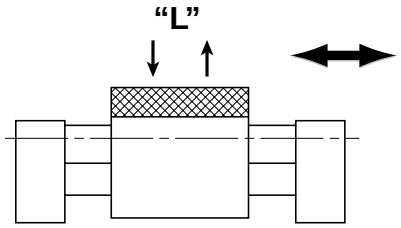
F_{max} = 322 N (72 lbs.) for Ø 32 mm cylinder

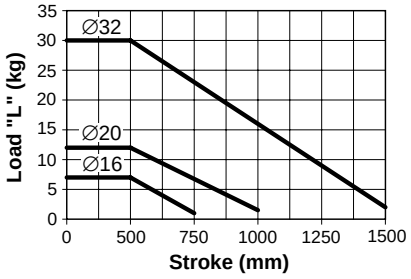
⚠ Calculate the kinetic energy due to the load moved.

Acceleration or deceleration should not exceed the magnetic coupling force of cylinder.

Load Diagrams

Permissible radial loads, horizontal mounting

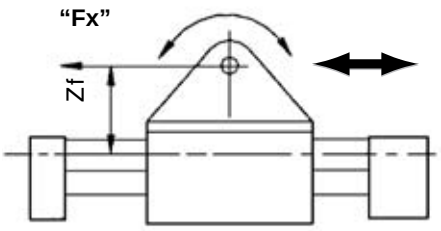




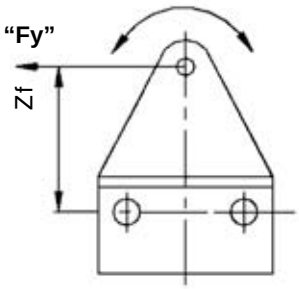
Ø	Max. L (kg)	(lbs.)
16	7	15
20	12	26
32	30	66

Permissible axial loads, horizontal mounting

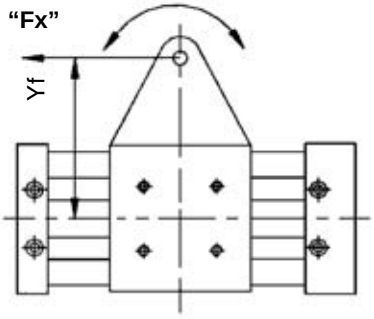
M = Fx * Zf



Ms = Fy * Zf



Mv = Fx * Yf



Ø	Max. moment M (Nm)	(in-lbs.)	Max. moment Ms (Nm)	(in-lbs.)	Max. moment Mv (Nm)	(in-lbs.)
16	2.4	21	0.5	4.4	2.4	21
20	5	44	1	8.9	5	44
32	15	133	3	26.6	15	133

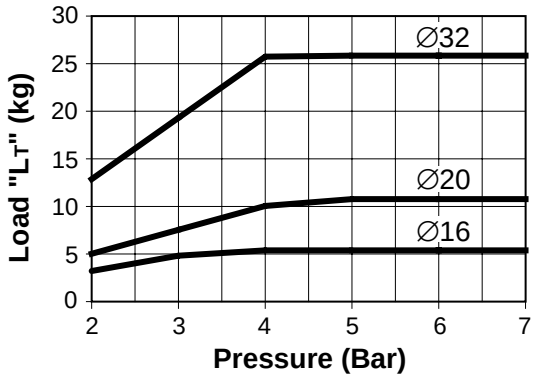
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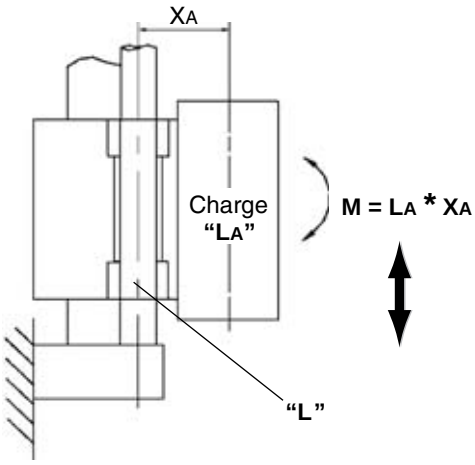
Loads Diagram

Permissible axial loads, vertical mounting

Ø	Max. Load L_T* (kg)	Max. X_A (mm)
16	5	122
20	10	142
32	24	174

***** at 6.5 bar





L = Load guided by external device

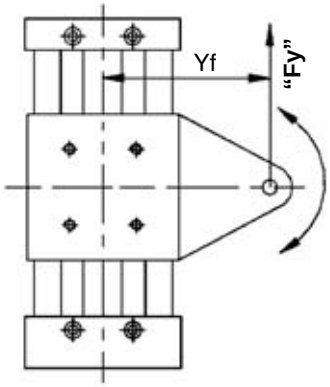
L_A = Mounting direct onto cylinder

L_T = Load weight + guiding device weight + force due to friction

Ff* = Force due to friction

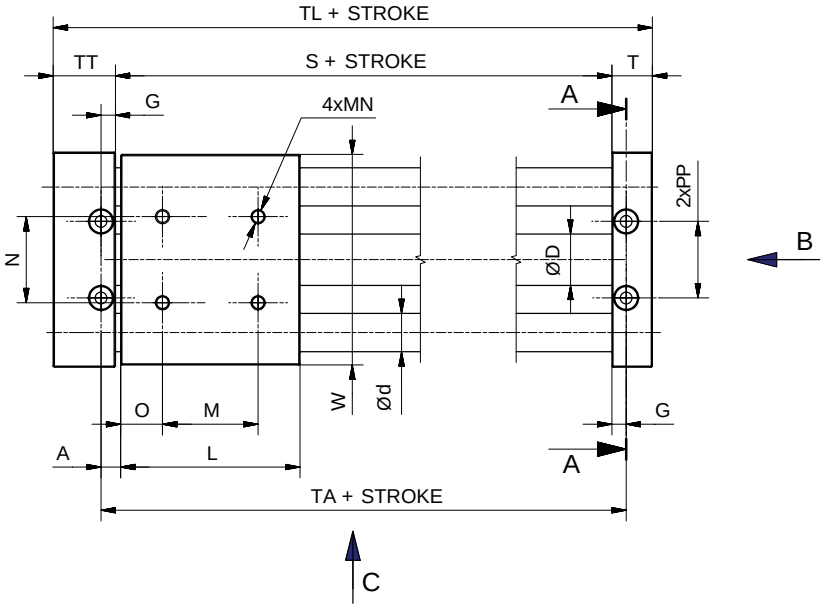
*If force due to friction is unknown, use 0.1 * (L + L_A)

Mv = Fy * Yf

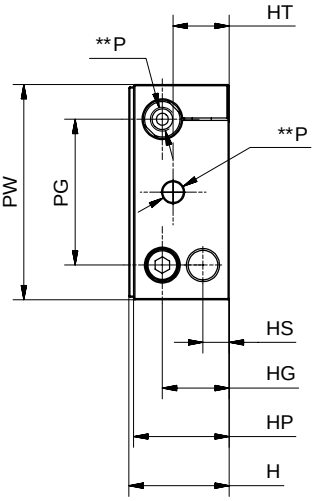


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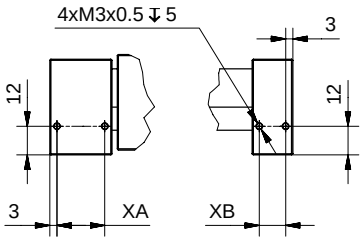
Dimensions



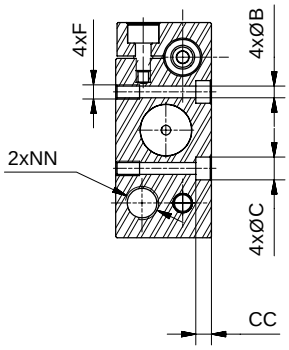
According to B view



According to C view



A-A



** = Air supply ports

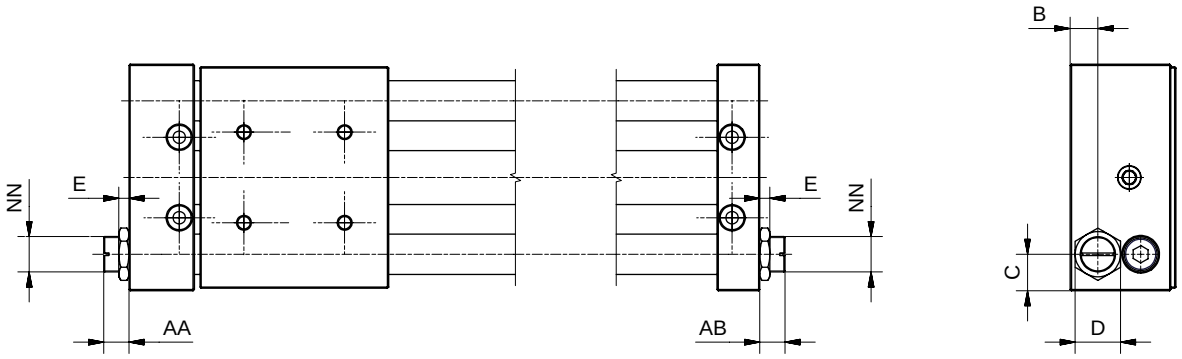
Ø	A	ØB	ØC	CC	ØD	Ød	F	G	H	HP	HG	HS	HT	L	M	N	MN
16	8 (.31)	4.3 (.17)	8 (.31)	4.5 (.18)	17.4 (.69)	12 (.47)	M5x0.8 x 10	6 (.24)	34 (1.34)	33.5 (1.32)	25 (0.98)	12 (.47)	21.5 (0.85)	65 (2.56)	34 (1.34)	30 (1.18)	M5 x 0.8 x 8
20	8 (.31)	5.5 (.22)	9.5 (.37)	6.5 (.26)	21.4 (.84)	16 (.63)	M6x1 x 10	6 (.24)	42 (1.65)	40 (1.57)	28 (1.10)	12 (.47)	23.5 (.93)	75 (2.95)	40 (1.57)	36 (1.42)	M6 x 1 x 10
32	13.5 (.53)	8.7 (.34)	14 (.55)	8 (.31)	33.6 (1.32)	20 (.79)	M10x1.5 x 15	10 (.39)	66 (2.60)	64 (2.52)	46 (1.81)	20 (.79)	41 (1.61)	91 (3.58)	60 (2.36)	50 (1.97)	M8 x 1.25 x 12

Ø	NN	O	P	PG	PW	PP	T	TT	S	TA	TL	W	XA	XB
16	M10 x 1 x 6	15.5 (0.61)	M5 x 0.8	50 (1.97)	70 (2.76)	27 (1.06)	14 (0.55)	23 (0.91)	69 (2.76)	81 (3.19)	106 (4.17)	68 (2.68)	17 (0.67)	8 (0.31)
20	M14 x1.5 x 7	17.5 (0.69)	G1/8	61 (2.40)	90 (3.54)	32 (1.26)	17 (0.67)	26 (1.02)	79 (3.11)	91 (3.58)	122 (4.80)	88 (3.46)	20 (0.79)	11 (0.43
32	M20 x 1.5 x 7	15.5 (0.61)	G1/8	86 (3.39)	122 (4.80)	50 (1.97)	20 (0.79)	28 (1.10)	97 (3.82)	117 (4.61)	145 (5.71)	118 (4.65)	22 (0.87)	14 (0.55)

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Optional External Adjustable Bumpers

Dimensions



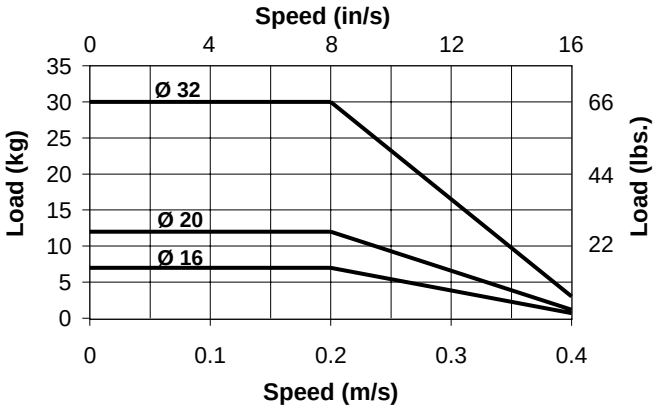
Ø	AA	AB	B	C	D	E	NN
16	7.5 (0.30)	6.5 (0.26)	12 (0.47)	10 (0.39)	14 (0.55)	4 (0.16)	M10 x 1
20	10 (0.39)	10 (0.39)	11 (0.43)	14.5 (0.57)	18 (0.71)	4 (0.16)	M14 x 1.5
32	11 (0.43)	12 (0.47)	20 (0.79)	18 (0.71)	26 (1.02)	8 (0.31)	M20 x 1.5

External Hydraulic Shock Absorbers

Loads / Speeds diagram

The diagram to the right exhibits the P1Z cylinders maximum capacities with an adjustable bumper.

If the intersection exhibits between speed and load is above the curves, it is imperative to use hydraulic shock absorbers to prevent cylinder damage.



Example:

Ø 32 mm cylinder with a 0.3 m/s speed and 25 kg load

Choose the hydraulic shock absorber option

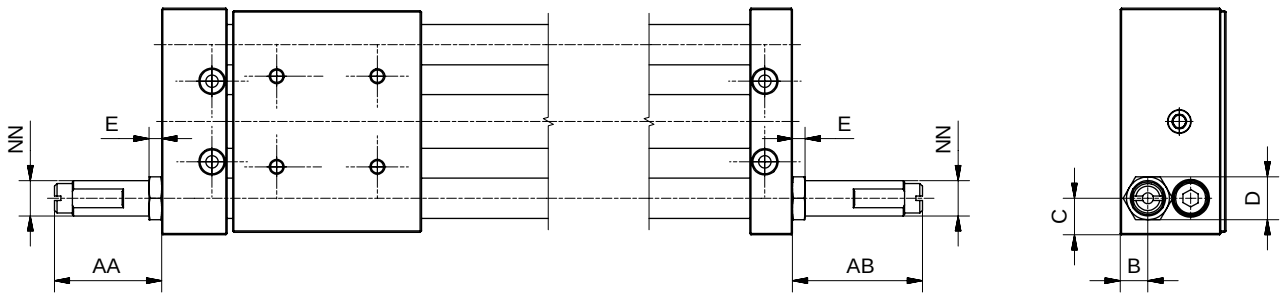
Ø 20mm cylinder with 0.2 m/s speed and 10 kg load

Choose the adjustable bumpers option

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Optional External Hydraulic Shock Absorbers

Dimensions

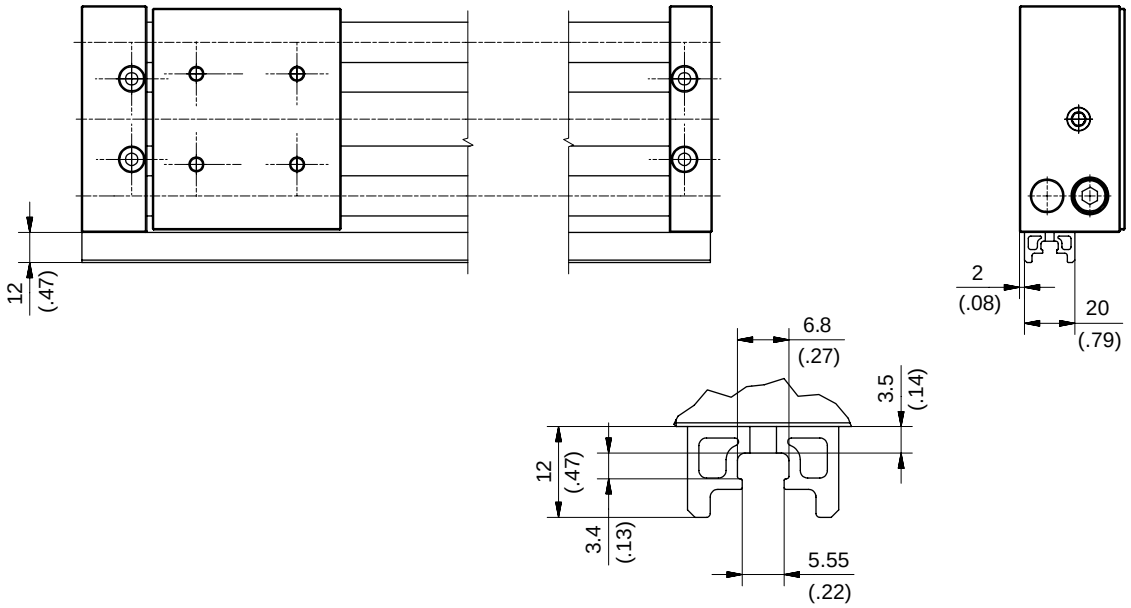


Ø	AA	AB	B	C	D	E	NN
16	18 (0.71)	27 (1.06)	12 (0.47)	10 (0.39)	13 (0.51)	3 (0.12)	M10 x 1
20	50 (1.97)	59 (2.32)	11 (0.43)	14.5 (0.57)	17 (0.67)	5 (0.20)	M14 x 1.5
32	56 (2.20)	66 (2.60)	20 (0.79)	18 (0.71)	24 (0.94)	6 (0.24)	M20 x 1.5

G

Optional Sensor Rail

Dimensions

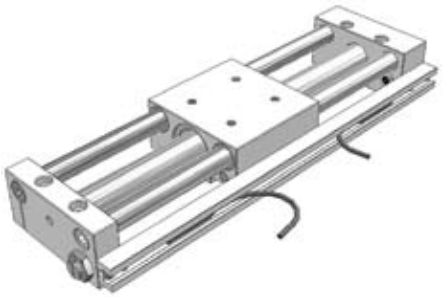


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Detection

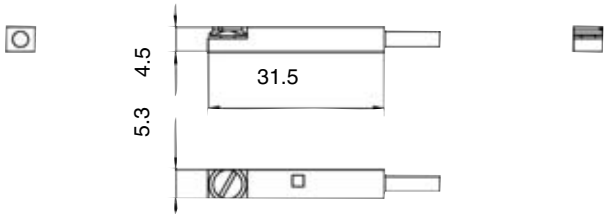
Reed or Solid State Sensor mounting is possible on one cylinder side only.

External aluminum profile integrates 1 T-slot for sensor mounting.

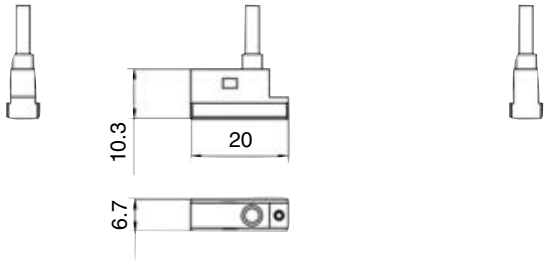


Dimensions (mm)

Drop-in Global Sensor



Sensors with connection at 90°



Technical Data (see Electronic Sensors Section)

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Spare Parts

End of stroke rubber bumpers *(2 pieces)*

Ø	Order Code
16	**9129609AS**
20	**9129610AS**
32	**9129611AS**

End of Stroke Hydraulic Shock Absorber
(1 piece)

Ø	Order Code
16	**MC25MH-NB**
20	**MC150MH**
32	**SC300M-3 NB**

G

Flow Controls *(1 piece)*

Ø	Order Code		
	BSP Ports	**NPT Ports**	**Metric Ports**
16	**–**	**–**	**0876300300**
20	**PTFL4PB6-1/8**	**0876300400**	**–**
32	**PTFL4PB6-1/8**	**0876300400**	**–**

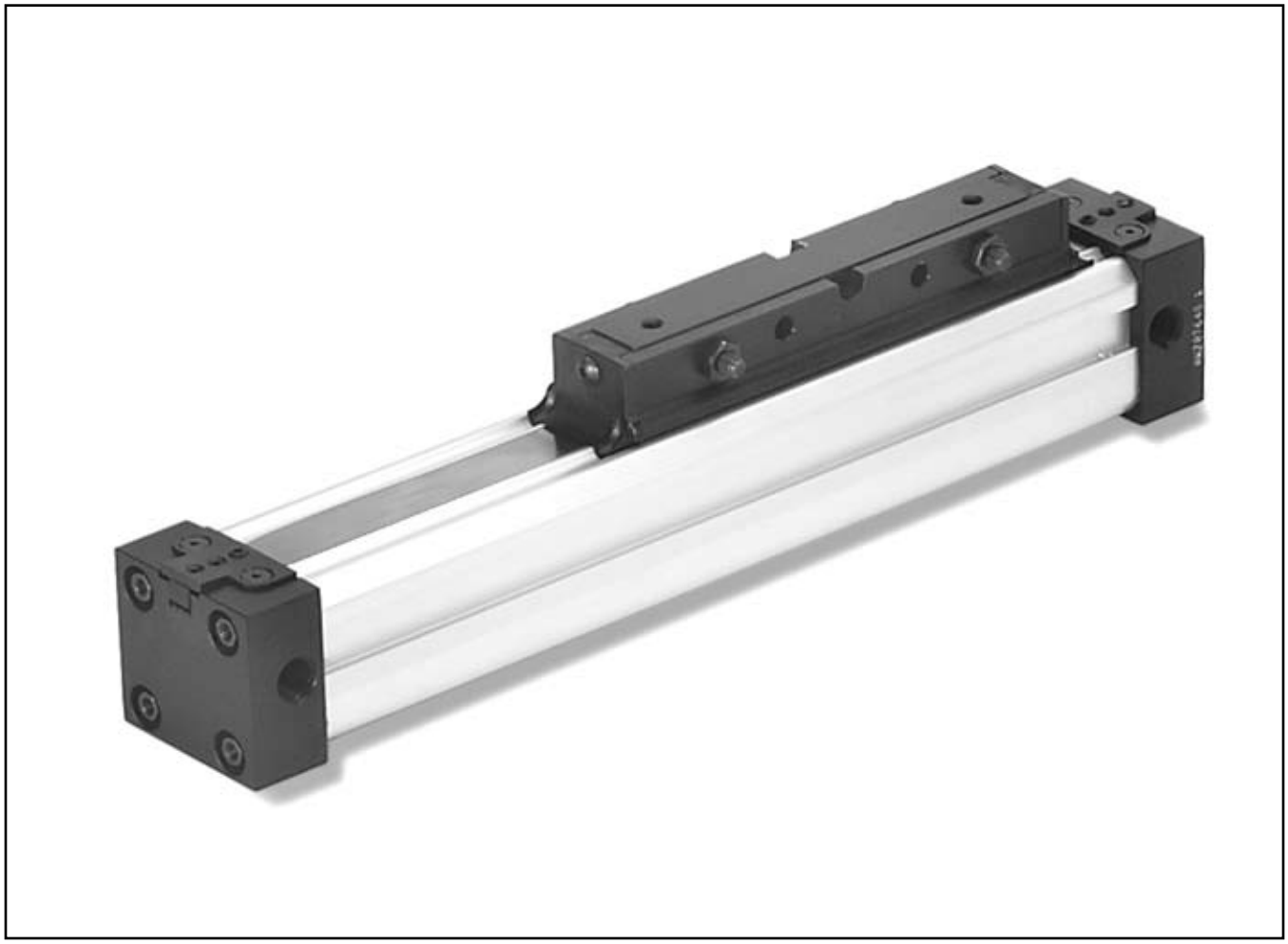
Repair Kits

Ø	Basic Version	Guided Version
16 (Cushioned)	**P1ZM016SAN-R**	**–**
16 (Non-cushioned)	**P1ZM016SNN-R**	**P1ZM016GNN-R**
20	**P1ZM020SAN-R**	**P1ZM020GNN-R**
32	**P1ZM032SAN-R**	**P1ZM032GNN-R**

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RC Series

Rodless Air Cylinder



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Inverted Carriage Mounting Styles G182-G183
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Service Kits G184

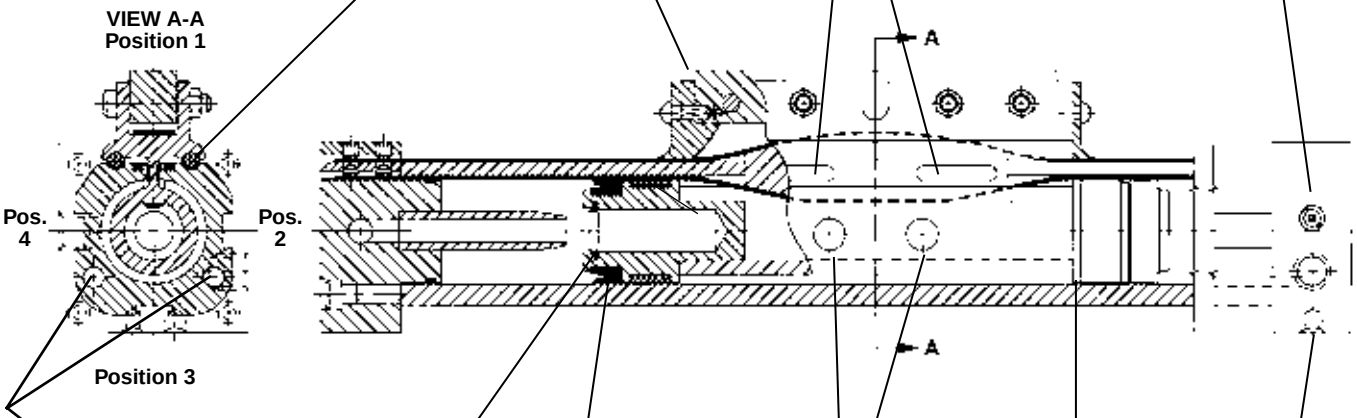
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Band Wipers: The wiper cleans and reseats the upper band, keeping dirt and contaminants from the sealing area of the cylinder. The wiper assembly also cleans the path of the Delrin® support rods ensuring the piston carriage travels smoothly.

Bearing Strips
Located on the side of the piston carriage, the bearing strips slide along the slot in the cylinder tube. They reduce the effects of side loads on piston wear and cylinder life.

Retained Cushion Adjusting Screws
The captive screw increases safety during machine operation and maintenance. It cannot be accidentally backed out too far—cushion adjustment screw "blowout" is prevented.

Piston Carriage Supports
Delrin® rods support and guide carriage loads (not available in 25mm bore). This unique design transfers the loading from the piston to the support rods and increases seal life. The negative effects of moderate side loading are minimized.



Transfer Tube
The standard RC Series cylinder features a transfer tube which allows air to be directed to both sides of the piston from one end of the cylinder. Long tubing or hose runs can be eliminated. When double-porting is required for faster piston travel, an optional end cap design is available.

Self-Checking Cushion Seals
Adjustable cushions, supplied as standard, decelerate piston smoothly at end of stroke.

Piston Seals
Cylinder can be operated without the addition of lubrication. Seals ride a thin film of Teflon® impregnated lubricant for smoother piston travel and extended seal life.

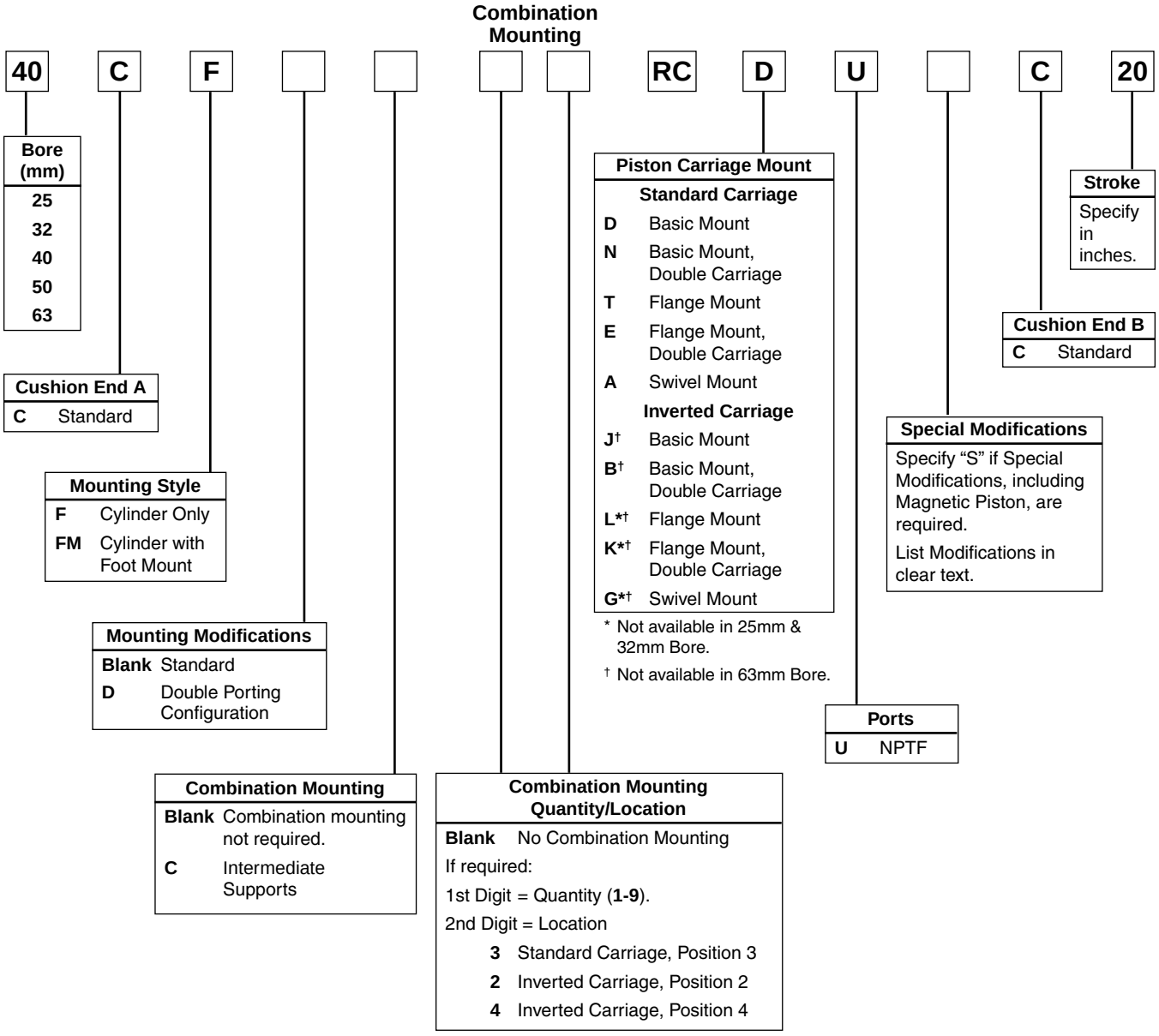
Magnetic Piston
An optional magnetic piston, with reed or solid state sensors, provides piston position sensing. The sensor assembly is dovetail mounted; offering many sensor locations for desired feedback without the expensive and cumbersome, add-on track mounted sensors.

Nylon Piston Wear Bands
Nylon piston bearings increase cylinder life and load bearing capacity by the elimination of metal-to-metal contact. Friction resistance characteristics are also enhanced.

Integral Mounting Holes
Two tapped holes on the bottom surface and four tapped holes on the face of each end cap add to mounting possibilities. The cylinder can be installed without the addition of any accessories. If needed, the optional foot mounts can be used.

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Model Code



Sensors

To order cylinder prepared for sensors, specify "S" for special modification and then list appropriate sensor code:

RCRS Cylinder prepared for reed sensor operation

RCSS Cylinder prepared for solid state sensor operation

For sensor specifications and part numbers, please refer to the Electronic Sensors section.

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Specifications

- Anodized Aluminum
  End Caps, Body, Piston Carriage
- Stainless Steel Sealing Band
- Buna-N Piston Seals
- Retained Adjustable Cushions
- Integral Mounting Holes
- Transfer Port (optional)
- Nominal Pressure Rating 115 PSI
- Standard Operating Temperature -10°F to 165°F
- Strokes Available Up to 24 ft.
- Standard Fluid: Filtered, Lubricated or Non-Lubricated Air

Weights

Bore	Base Weight (lb) by Mounting Style							Weight per Inch Stroke (lb)
	D,T,A	N,E	J	B	L	K	G	
25mm	2.5	3.7	3.1	4.8	N/A	N/A	N/A	0.20
32mm	5.4	7.8	6.4	9.8	N/A	N/A	N/A	0.25
40mm	7.5	11.4	9.3	15.2	9.3	15.2	9.3	0.30
50mm	11.1	15.6	14.1	21.6	14.1	21.6	14.1	0.48
63mm	19.8	27.4	23.6	35.0	23.6	35.0	23.6	0.65

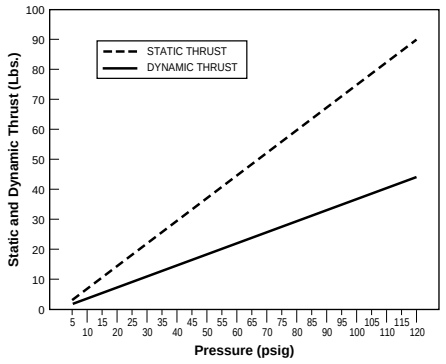
Force Data

To determine the thrust available from your RC Series cylinder, enter the graph along the base at the pressure to be supplied at the inlet of the cylinder. Project vertically to the appropriate thrust line. The corresponding value on the left axis is the available force from the cylinder. Static thrust values indicate the force available when the cylinder is not in motion.

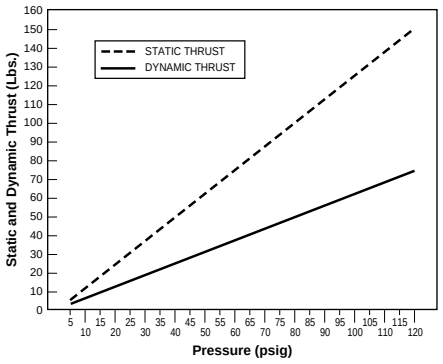
(**Note:** Rodless cylinders are not recommended for load holding applications. If used in this type of application a continuous pressure supply must be maintained).

Dynamic thrust values indicate the maximum recommended load capacity for a cylinder in motion. In a dynamic condition, there is pressure on the back side of the piston (dependent upon the plumbing and valving used in the system) which must be overcome in addition to moving a load. These factors, coupled with the compressibility of air and cylinder friction, result in dynamic thrust being a percentage of static thrust. This graph assumes average conditions relative to air line sizes, system layout, component sizes, friction, etc. The resulting dynamic thrust is approximately 50% of corresponding static values.

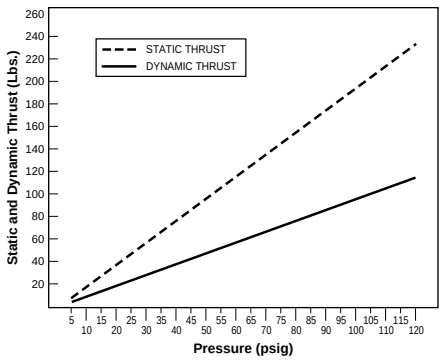
Force at Various Pressures
Thrust Developed (25 mm Bore)



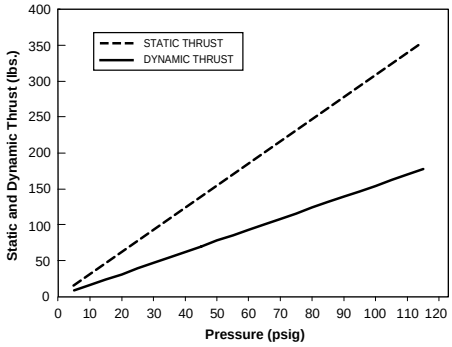
Force at Various Pressures
Thrust Developed (32 mm Bore)



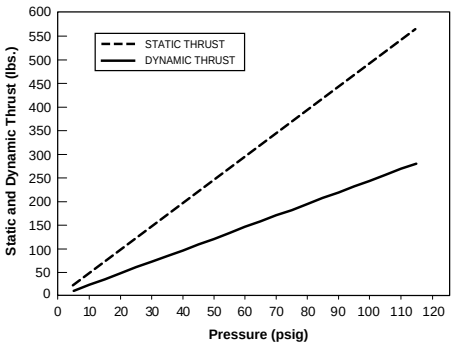
Force at Various Pressures
Thrust Developed (40 mm Bore)



Force at Various Pressures
Thrust Developed (50 mm Bore)



Force at Various Pressures
Thrust Developed (63 mm Bore)



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Application of Parker RC Series Cylinders requires that external loading forces be considered. Exceeding design stresses by overloading the cylinders may affect the construction integrity and operation of the cylinder. Shown below are various loading characteristics inherent to rodless cylinder applications and RC Series load capacities. Load and Moment Data apply to both standard and inverted piston carriage construction. Each application should be within the limits for the appropriate bore size. Exceeding these boundaries can result in premature cylinder wear and/or failure of the cylinder.

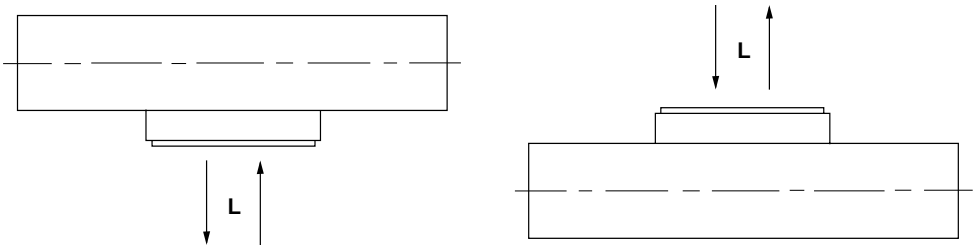
⚠ CAUTION

The force of deceleration, especially if a large mass is attached to the carriage, should be considered when calculating loads to be carried by the rodless cylinder. A large mass, in conjunction with a high deceleration force, can cause damage to the cylinder and/or the loss of control of the load. Either can result in equipment damage and danger to nearby personnel.

High deceleration forces may occur, but are not limited to the initial set-up of a machine. To minimize the potential danger, the following steps are suggested in addition to normal set-up procedures.

A. The rodless cylinder should be plumbed with flow controls in a "meter out" mode.
B. 1. Open the cushion needle valve adjustment screw 1/4 of a turn from completely closed.
   2. Open the flow control valves 1/2 of a turn from completely closed.
C. Cycle the cylinder.
D. To adjust the speed of the cylinder, slowly open the flow control valves. To adjust the cushion, slowly adjust the cushion needle valve screw.
E. Repeat the procedure until the required piston velocity and cushion performance is achieved.

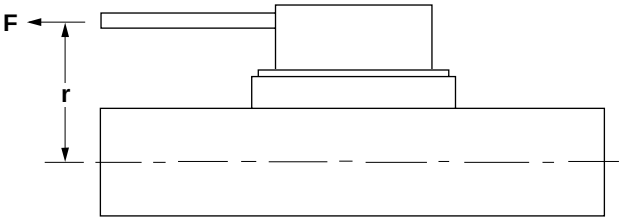
Maximum Load – L



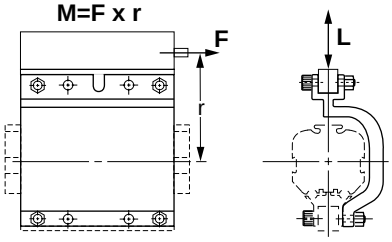
Maximum Bending Moment – M

M = F x r

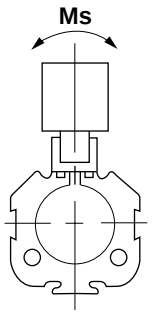
Standard Carriage Mount



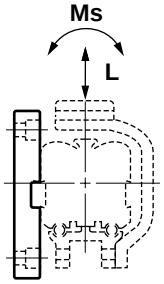
Inverted Carriage Mount



Maximum Bending Moment – M_S

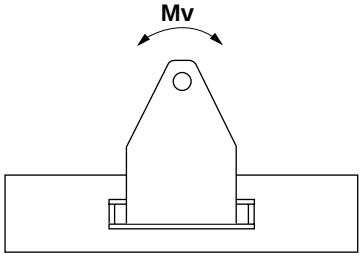


***Intermediate Mount Inverted Carriage**



***NOTE:** Intermediate Mount Inverted Piston Load and Moment Data (see preceding page).

Maximum Torsional Moment – M_V



Top View

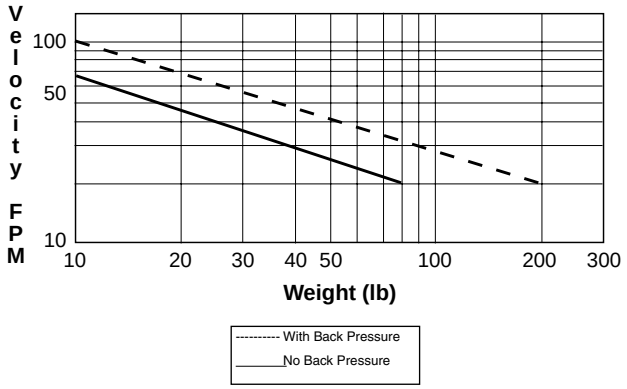
Bore Size	Maximum Bending Moment					Maximum Torsion Stress		Max Load (L)	
	Standard Carriage		Double Carriage		Inverted Carriage	Standard Carriage	Double Carriage	Standard/Double	Inverted
	M lbs-ft	M_S lbs-ft	M lbs-ft	M_S lbs-ft	M lbs-ft	M_V lbs-ft	M_V lbs-ft	lbs	lbs
25	5.5	.38	14	0.8	5.5	1.2	1.9	33	9
32	13.3	1.5	30	3	13.3	5	25	58	29
40	22	1.5	50	3	22	5	15	85	33
50	43	4	85	8	42.5	13	61	135	72
63	74	4.8	148	9.5	74	14.5	67	185	96

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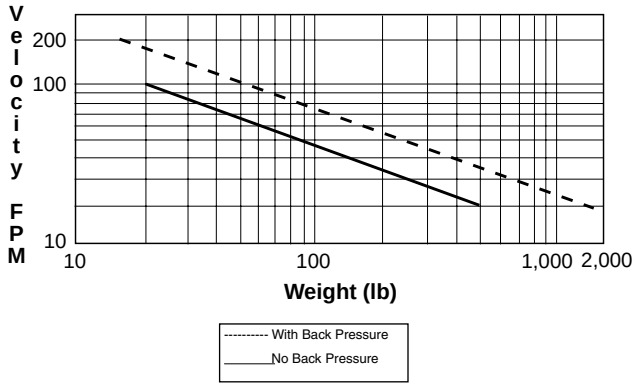
Cushion Data

Check the graph at right to determine whether a cylinder will adequately stop a load without damage to the cylinder. To determine the weight of the load and the maximum speed of the piston carriage, enter the graph at the base and project vertically to the required speed. This point of intersection should fall below the appropriate back pressure line.

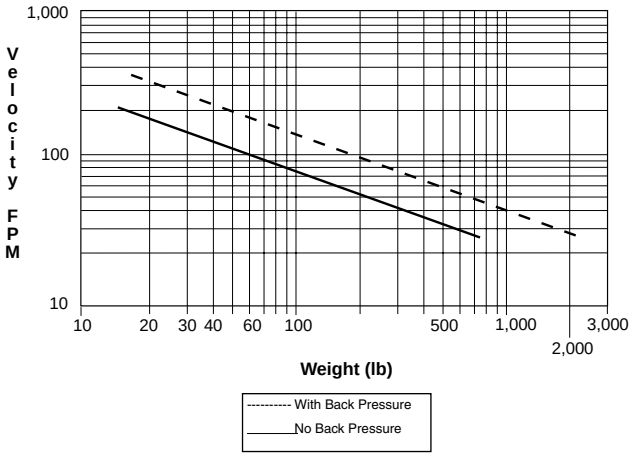
Cushion Data
Kinetic Energy Graph (25 mm Bore)



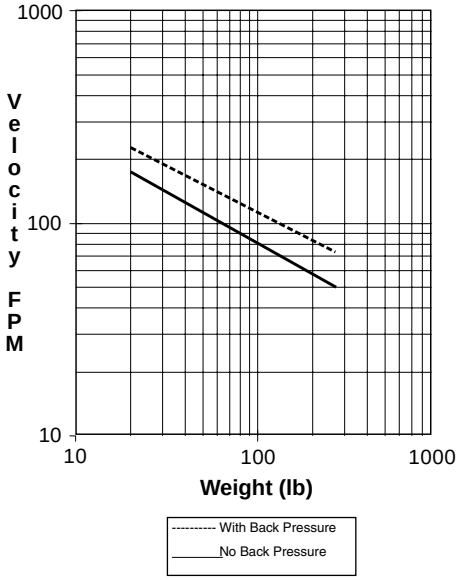
Cushion Data
Kinetic Energy Graph (32 mm Bore)



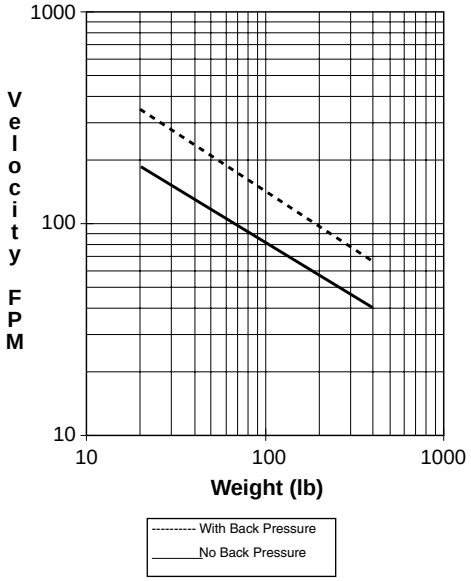
Cushion Data
Kinetic Energy Graph (40 mm Bore)



Cushion Data
Kinetic Energy Graph (50 mm Bore)



Cushion Data
Kinetic Energy Graph (63 mm Bore)



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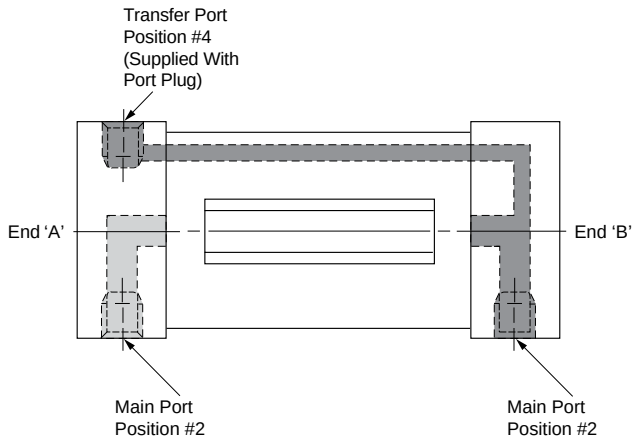
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Porting Configurations

The RC Series cylinder is available in two porting/end cap configurations. In the standard configuration, End A is at your left when looking at the cylinder and viewing both ports. Looking at the face of the cap on End A with the tube slot at the top, position 1 is on top, with 2, 3, and 4 continuing in a clockwise direction. With the standard porting configuration, air can be directed to and exhausted from the "End A" side of the piston by using port #2 on "End A". Air can be directed to and exhausted from the "End B" side of the piston by using either or both ports #2 on "End B" or #4 on "End A".

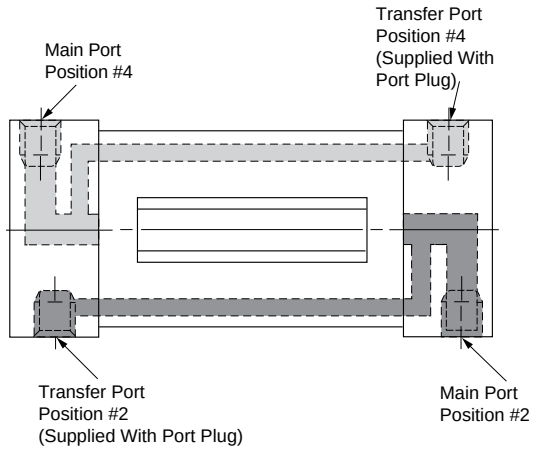
Bore	Main	Transfer
25mm	1/8" NPTF	1/8" NPTF
32mm	1/4" NPTF	1/8" NPTF
40mm	1/4" NPTF	1/4" NPTF
50mm	3/8" NPTF	1/4" NPTF
63mm	3/8" NPTF	3/8" NPTF

Top View



**Standard Porting
Cylinder Configuration**

Top View



**Double Porting
Cylinder Configuration**

The double porting configuration has the same end caps on both sides. With the double porting configuration, *each* side of the piston can be fed and exhausted by two ports as explained in the example above describing the "End B" side of the piston. Main pressure ports are located on opposite sides of the cylinder.

Cylinder Selection

How to Select Your Parker RC Series Cylinder

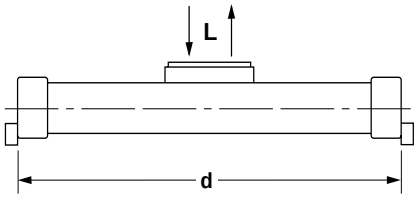
1. Consult Force Chart to determine the bore required.
2. Cushions are standard on the RC Series cylinder. Check the cushion data chart to verify that the cushions are sufficient to decelerate the load. If not, external means of deceleration must be considered.
3. Choose the cylinder mounting style and piston carriage.
4. For cylinders requiring sensors, configure sensor code for sensors required.
5. Determine if intermediate supports are necessary. For cylinders with the standard piston carriage, intermediate supports will be supplied in position #3 only. If the inverted piston carriage is used, select position #2 or position #4. Other intermediate support positions are available as a special order.
6. Consult the porting configuration diagrams for an illustration of available flow characteristics. Choose between the standard porting and the double porting configuration.

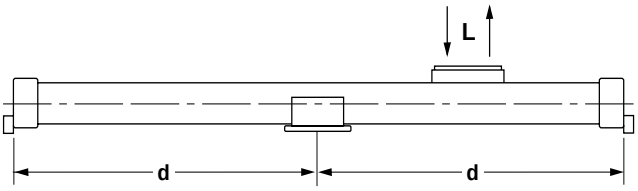
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Placing of Supports

A main advantage of the Parker RC Series air cylinder is its ability to act as its own support member as it spans the length of the carriage travel. The cylinder body does not require support over its entire stroke.

In the example below, a cylinder with an end to end dimension of “d”, and with a load “L” can span a distance of “d” with no intermediate support required. If the stroke of the cylinder is in excess of distance “d” or if Load “L” increases even if “d” remains constant, an intermediate support member must be placed so that the distance “d” is not exceeded for the corresponding Load (L).



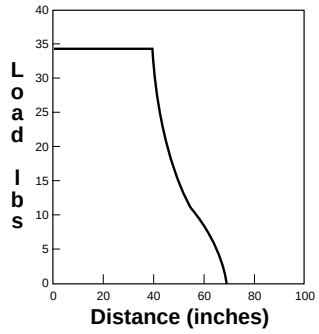


Parker RC Series cylinders can be fitted with intermediate supports that attach to dovetail mounts along the side of the cylinder. Consult the charts below to determine if intermediate supports are required on your cylinder. Points along the curve indicate the maximum distance allowed between supports for a corresponding load (L).

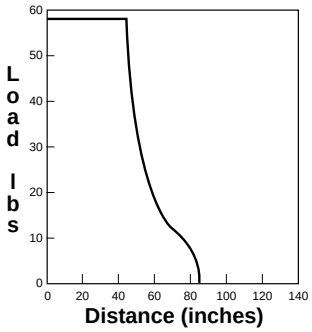
Intermediate supports are designed for use with the orientation shown below. For an application with any other orientation, consult factory.

G

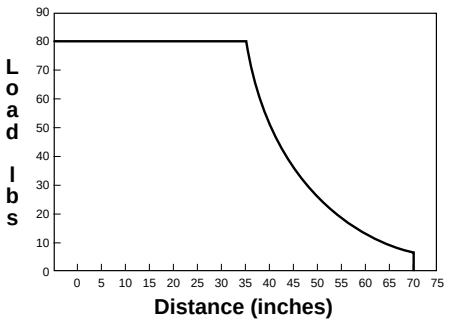
Intermediate Support
Loading Conditions (25 mm Bore)



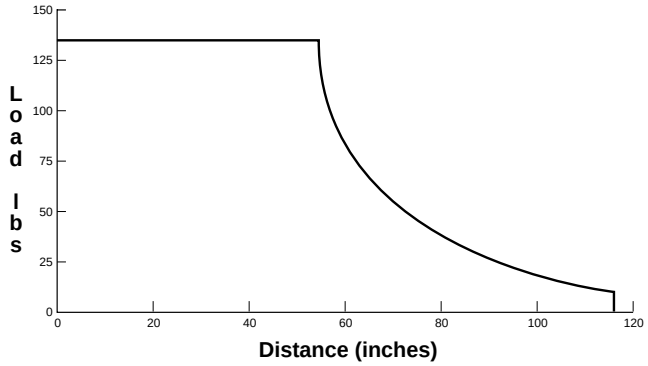
Intermediate Support
Loading Conditions (32 mm Bore)



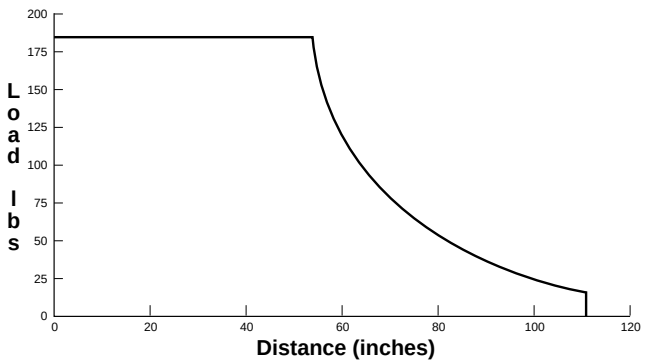
Intermediate Support
Loading Conditions (40 mm Bore)



Intermediate Support
Loading Conditions (50 mm Bore)



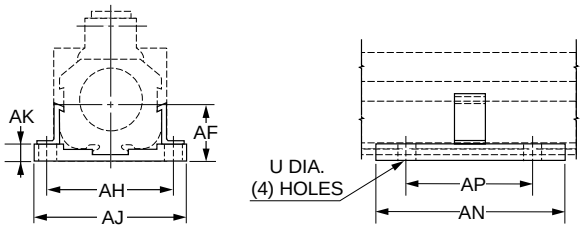
Intermediate Support
Loading Conditions (63 mm Bore)



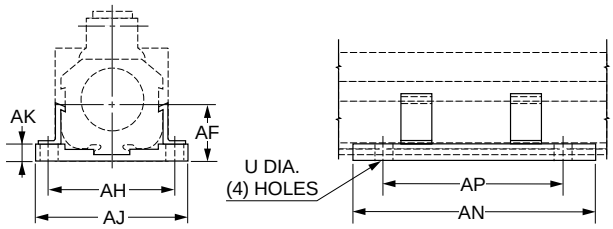
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Parker-Origa
Glendale Heights, Illinois
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Intermediate Support

25mm & 32mm Bore Size



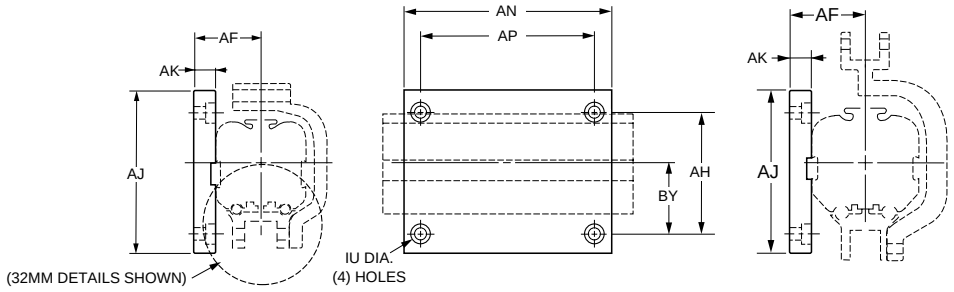
40mm, 50mm & 63mm Bore Size



Bore	Unit	AF	AH	AJ	AK	AN	AP	U
25mm	in.	0.94	2.38	3.00	0.24	2.00	1.25	0.22
	mm	23.9	60.5	76.2	6.10	50.8	31.8	5.59
32mm	in.	1.43	2.69	3.38	0.46	2.50	1.75	0.22
	mm	36.3	68.3	85.9	11.7	63.5	44.5	5.59
40mm	in.	1.50	3.12	3.87	0.43	6.30	4.75	0.35
	mm	38	80	98	11	160	121	9
50mm	in.	2.01	3.63	4.38	0.57	6.25	4.75	0.35
	mm	51.1	92.2	111.3	14.5	158.8	120.7	8.9
63mm	in.	2.24	4.38	5.13	0.53	6.25	4.75	0.35
	mm	56.9	111.3	130.3	13.5	158.8	120.7	8.9

Intermediate Supports
Inverted Carriage Mounts

40mm, 50mm &
63mm Bore Size



Bore	Unit	AF	AH	AJ	AK	AN	AP	BY	IU
25mm	in.	1.44	2.38	3.13	0.50	3.00	2.25	1.34	0.28
	mm	36.6	60.5	79.5	12.7	76.2	57.15	34	7.1
32mm	in.	1.55	2.88	3.75	0.50	5.00	4.25	1.65	0.28
	mm	39.37	73.2	95.25	12.7	127	107.95	41.91	7.1
40mm	in.	1.80	2.88	3.75	0.50	5.00	4.25	1.54	0.28
	mm	45.72	73.2	95.25	12.7	127	107.95	39.1	7.1
50mm	in.	2.01	3.75	4.75	0.5	5.13	4.25	1.86	0.35
	mm	51.1	95.3	120.6	12.7	130.3	107.9	47.2	8.9
63mm	in.	2.38	4.13	5.38	0.50	5.13	4.25	2.14	0.35
	mm	60.45	104.9	136.7	12.7	130.3	107.9	54.4	8.9

Load & Moment Data for Intermediate Mount (Inverted Piston)*

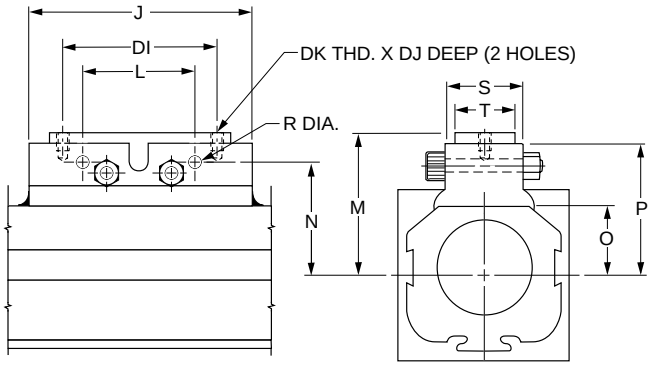
Bore	Maximum Bending Moment Ms (ft-lbs)	Load (lbs)
25mm	0.38	33
32mm	1.5	58
40mm	1.5	85
50mm	4	108
63mm	4.8	108

*See following page.

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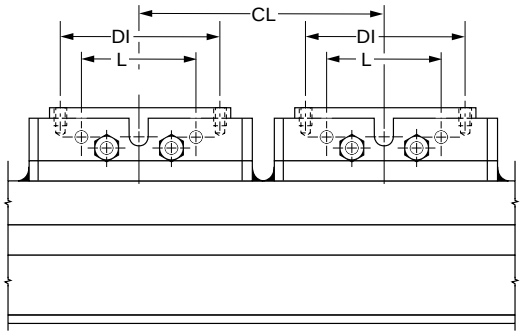
C347

Basic Mount – Style D

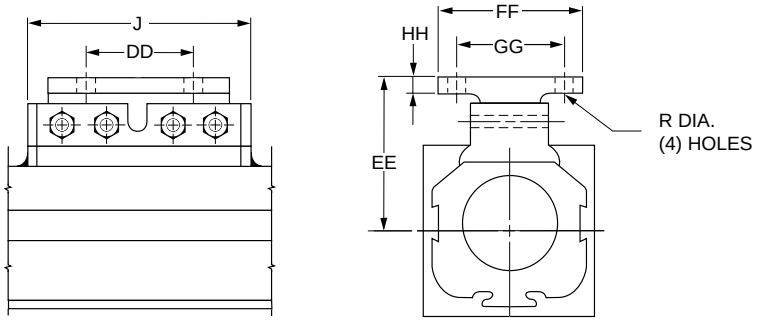


See Table 1 for dimensions

Basic Mount Double Carriage – Style N

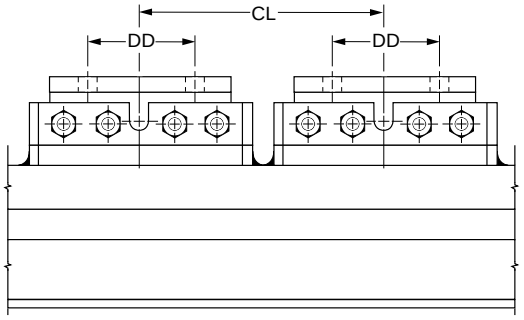


Flange Mount – Style T

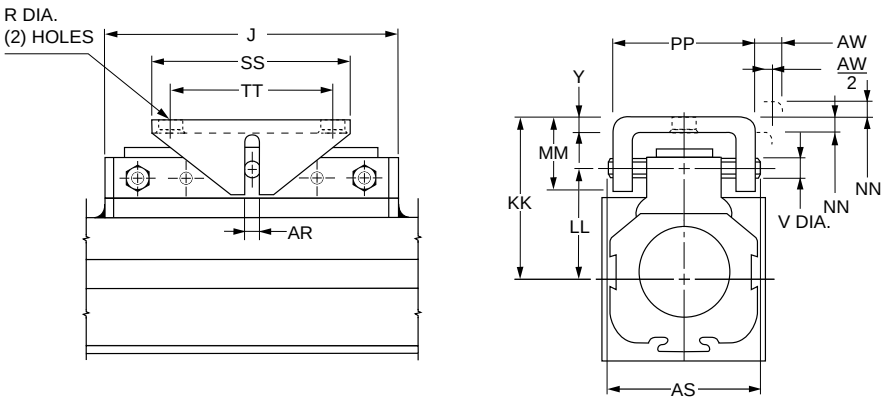


See Table 1 for dimensions

Flange Mount Double Carriage – Style E



Swivel Mount – Style A

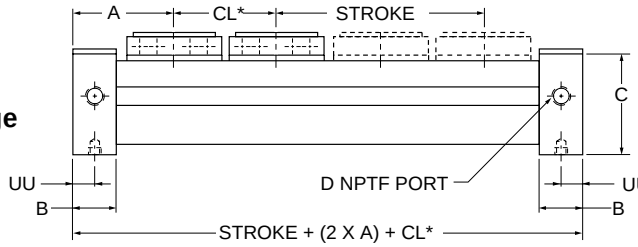


See Table 1 for dimensions

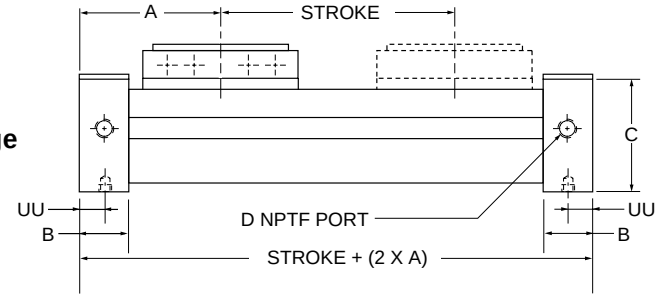
Parker Hannifin Corporation
Parker-Origa
Glendale Heights, Illinois
www.parker.com/pneu/rodless

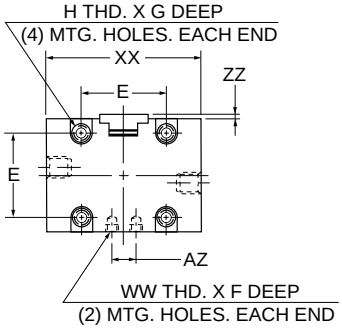
Mount Dimensions

Double Carriage



Single Carriage

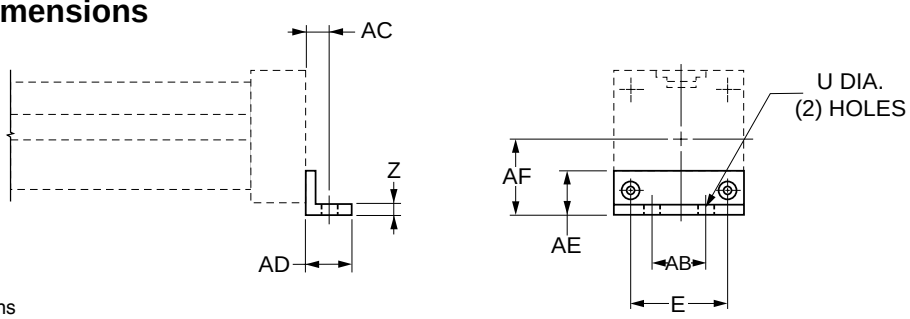




* For double carriage mounts, the piston carriages are not connected. The "CL" dimension is the minimum distance between the centerline of each carriage. The "CL" dimension can be increased, depending upon customer mounting. The effective stroke of the cylinder will be decreased by the same distance that the "CL" dimension is increased.

See Table 2 for dimensions

Foot Mount Dimensions



See Table 2 for dimensions

Table 1 — Envelope and Mounting Dimensions

Bore	Unit	GG	HH	KK	LL	MM	NN	PP	RR	SS	TT	AR	AS	AW	J	L
25 mm	in.	1.50	.19	2.05	1.50	.79	±.10	1.46	—	1.25	.63	.20	1.65	±.19	4.98	1.97
	mm	38.1	4.83	52.1	38.1	20.1	±2.54	37.1	—	31.8	16.0	5.08	41.9	±4.83	126.5	50.0
32 mm	in.	1.88	.19	2.60	1.89	1.18	±.16	1.90	—	2.75	1.97	.32	2.28	±.31	6.56	3.94
	mm	47.8	4.83	66.0	48.0	30.0	±4.06	48.3	—	69.9	50.0	8.13	57.9	±7.87	166.6	100.1

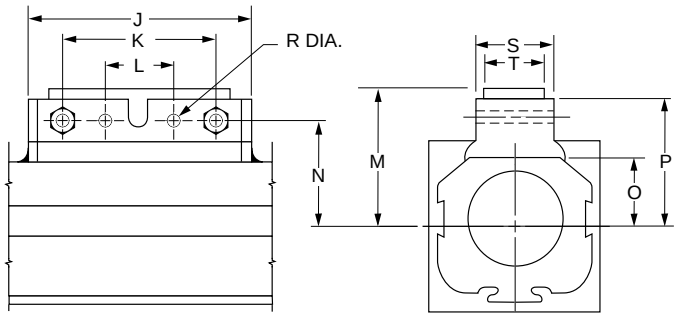
Bore	Unit	M	N	O	P	R	S	T	V	DD	DI	DJ	DK	EE	FF	Y
25mm	in.	1.50	1.30	0.70	1.50	0.22	1.02	0.59	0.31	3.00	3.15	0.312	#10-32	1.75	2.00	0.12
	mm	38.1	33.0	17.8	38.1	5.59	25.9	14.99	7.87	76.2	80	7.9	—	44.5	50.8	3.05
32mm	in.	1.89	1.57	0.97	1.89	0.28	1.26	0.72	0.47	4.50	4.73	0.50	1/4-20	2.20	2.50	1.16
	mm	48.0	39.9	24.6	48.0	7.11	32.0	18.3	12.0	114.3	120.14	12.7	—	55.9	63.5	4.06

Table 2 — Envelope and Mounting Dimensions

Bore	Unit	A	B	C	D	E	F	G	H	U	AB	AC	AD	AE	AF	AZ	UU	WW	XX	Z	ZZ	Min. CL
25mm	in.	3.94	0.97	1.58	1/8" NPTF	1.06	0.25	0.40	#10-32	0.22	1.06	0.63	0.87	0.71	0.94	0.38	0.56	#10-32	2.25	0.08	0.06	4.94
	mm	100.1	24.6	40.1	—	26.9	6.35	10.2	—	5.5	26.9	16.0	22.1	18.1	23.9	9.7	14.2	—	57.1	2.0	1.52	125.5
32mm	in.	4.92	1.00	2.09	1/4" NPTF	1.42	0.19	0.40	#10-32	0.28	1.42	0.47	0.79	1.02	1.43	0.63	0.63	1/4-20	2.25	0.13	0.05	6.84
	mm	125.0	25.4	53.1	—	36.1	4.8	10.2	—	7.11	36.1	11.9	20.1	25.9	36.3	16.0	16.0	—	57.1	3.3	1.27	173.7

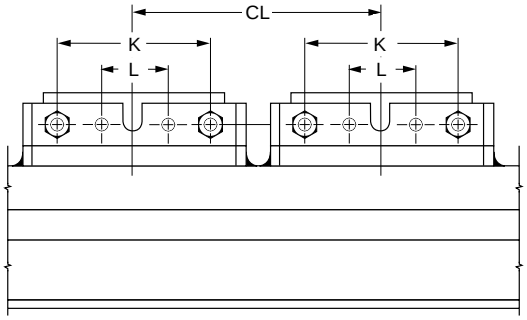
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Basic Mount – Style D

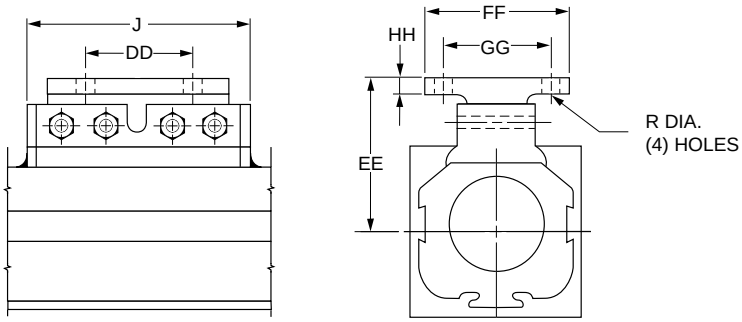


See Table 1 for dimensions

Basic Mount Long – Style N

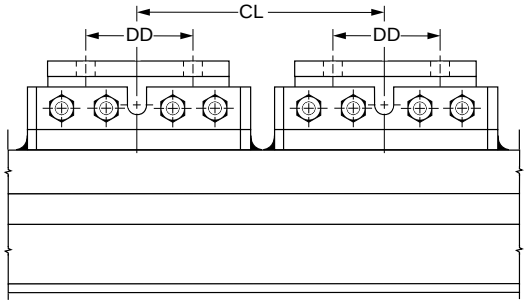


Flange Mount – Style T

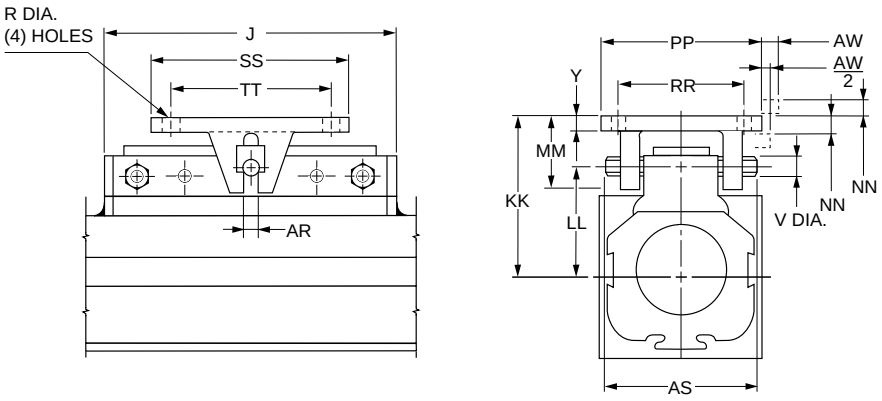


See Table 1 for dimensions

Flange Mount Long – Style E



Swivel Mount – Style A



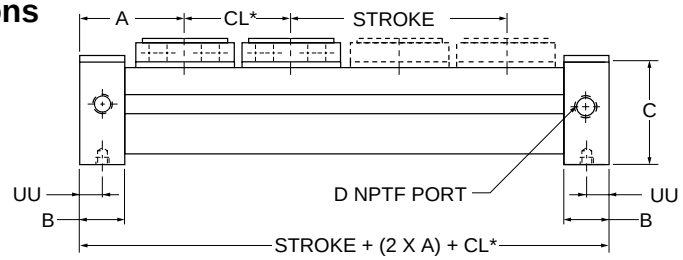
See Table 1 for dimensions

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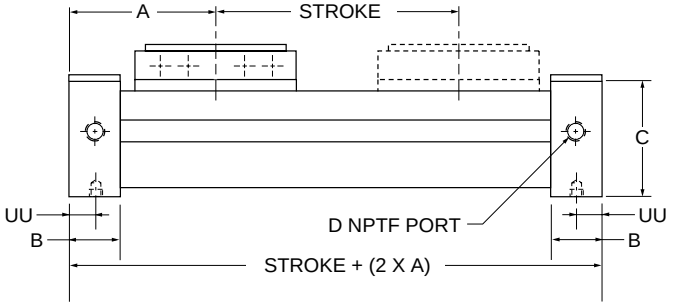
C347

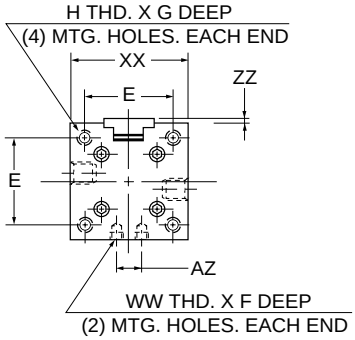
Mount Dimensions

Double Carriage



Single Carriage

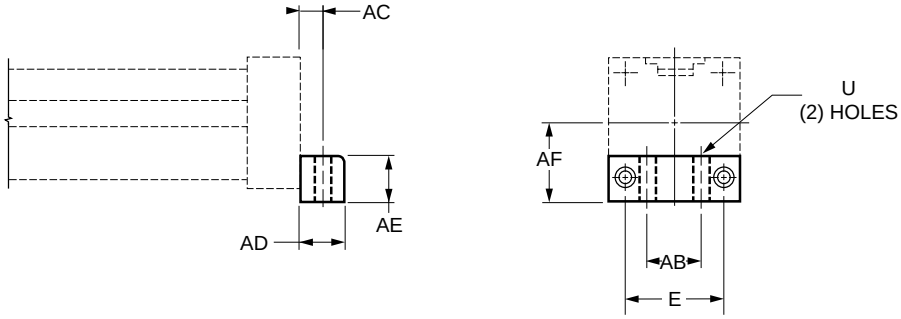




* For double carriage mounts, the piston carriages are not connected. The "CL" dimension is the minimum distance between the centerline of each carriage. The "CL" dimension can be increased, depending upon customer mounting. The effective stroke of the cylinder will be decreased by the same distance that the "CL" dimension is increased.

See Table 2 for dimensions

Foot Mount Dimensions



See Table 2 for dimensions

Table 1. — Envelope and Mounting Dimensions

Bore	Unit	GG	HH	KK	LL	MM	NN	PP	RR	SS	TT	AR	AS	AW	J
40mm	in.	1.77	0.24	2.95	2.00	1.50	.30	2.76	2.17	3.54	2.95	0.31	2.75	±30	6.16
	mm	45	6	75	51	38	8	70	55	90	75	8	70	±7.5	156
63mm	in.	2.36	0.28	3.87	2.81	1.72	.35	3.54	2.76	4.72	3.94	0.38	3.23	0.26	8.92
	mm	59.9	7.1	98.3	71.4	43.7	8.9	89.9	70.1	119.9	100.1	9.7	82.0	6.6	226.6

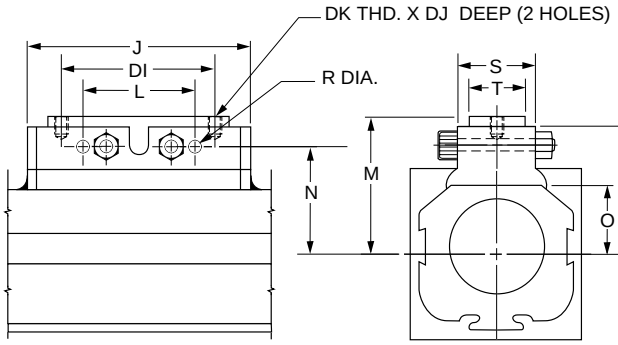
Bore	Unit	K	L	M	N	O	P	R	S	T	V	DD	EE	FF	W	Y
40mm	in.	4.33	2.17	2.40	1.93	1.13	2.27	0.28	1.10	0.71	0.47	3.15	2.60	2.36	1.93	0.24
	mm	110	55	61	49	28.8	57.6	7	28	18	12	80	66	60	49	6
63mm	in.	7.09	3.54	3.27	2.68	1.79	3.07	0.35	1.19	0.74	0.63	5.12	3.51	3.15	2.68	0.25
	mm	180.1	89.9	83.1	68.1	45.5	78.0	8.9	30.2	18.8	16.0	130.0	89.2	80.0	68.1	6.4

Table 2. — Envelope and Mounting Dimensions

Bore	Unit	A	B	C	D	E	F	G	H	U	AB	AC	AD	AE	AF	AZ	UU	WW	XX	CL	ZZ
40 mm	in.	5.91	1.18	2.83	1/4 NPT	2.13	0.19	0.50	1/4-20	0.35	1.18	0.49	0.94	0.94	1350	0.63	0.59	1/4-20	2.83	8.21	0.03
	mm	150	30	72		54	438	12.7		9	30	12.5	24	24	38	16	15		72	208.6	0.76
63 mm	in.	8.47	1.50	4.17	3/8 NPT	3.07	0.50	0.87	5/16-18	0.41	1.89	0.59	1.18	1.58	2.24	0.63	0.75	5/16-18	4.17	12.18	0.01
	mm	215.1	38.1	105.9		78	12.7	22.1		10.4	48	15.0	30	40.1	56.9	16	19.1		105.9	309.4	0.25

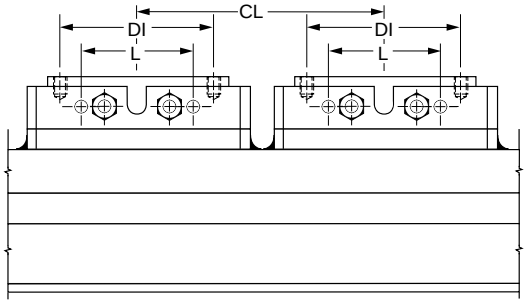
Parker Hannifin Corporation
Parker-Origa
Glendale Heights, Illinois
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Basic Mount – Style D

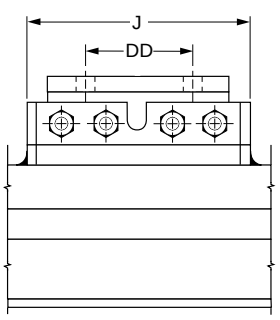


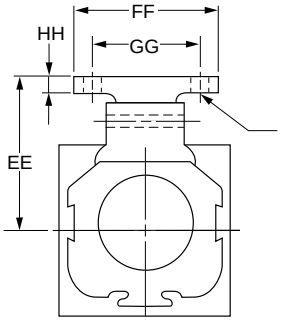
See Table 1 for dimensions

Basic Mount Double Carriage – Style N



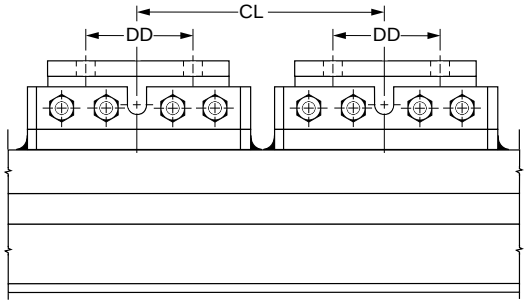
Flange Mount – Style T



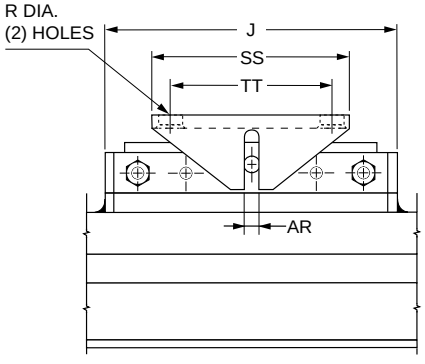


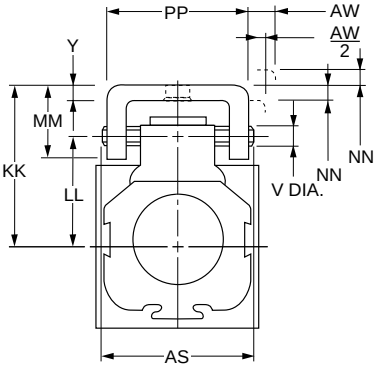
See Table 1 for dimensions

Flange Mount Double Carriage – Style E



Swivel Mount – Style A





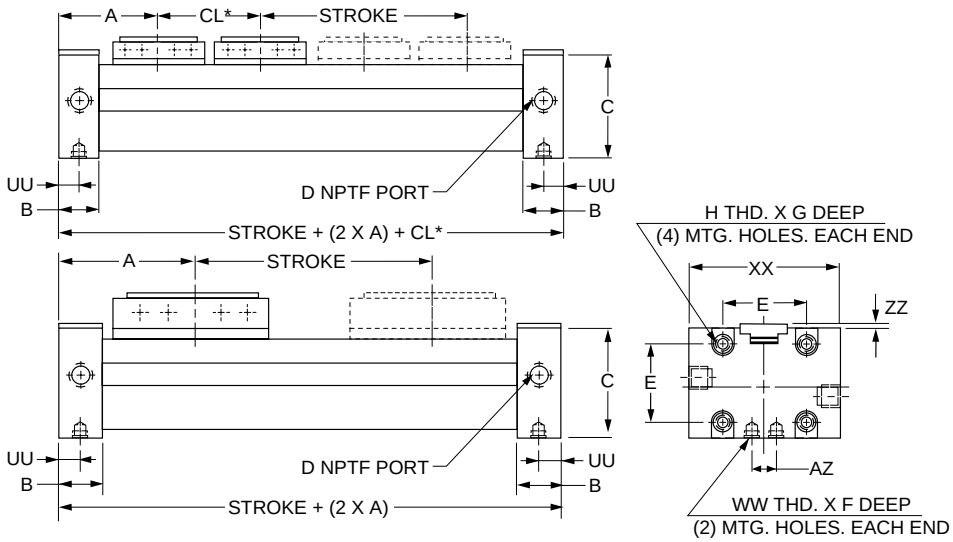
See Table 1 for dimensions

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Mount Dimensions

Double Carriage

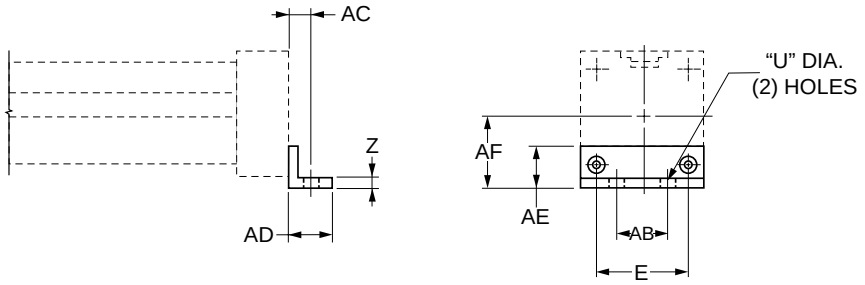
Single Carriage



See Table 2 for dimensions

* For double carriage mounts, the piston carriages are not connected. The "CL" dimension is the minimum distance between the centerline of each carriage. The "CL" dimension can be increased, depending upon customer mounting. The effective stroke of the cylinder will be decreased by the same distance that the "CL" dimension is increased.

Foot Mount Dimensions



See Table 2 for dimensions

Table 1. — Envelope and Mounting Dimensions

Bore	Unit	GG	HH	KK	LL	MM	NN	PP	SS	TT	AR	AS	AW	J	L
50mm	inch	2.36	0.28	3.54	2.56	1.69	0.24	2.27	3.94	3.15	0.38	2.83	0.24	8.61	5.51
	mm	59.9	7.1	89.9	65.0	42.9	6.1	57.7	100.1	80.0	9.7	71.9	6.1	218.7	140.0

Bore	Unit	M	N	O	P	R	S	T	V	DD	DI	DJ	DK	EE	FF	Y
50mm	inch	2.56	2.17	1.41	2.56	0.35	1.34	0.74	0.63	5.12	6.30	0.69	5/16-18	3.02	3.15	0.19
	mm	65.0	55.1	35.8	65.0	8.9	34.0	18.8	16.0	130.0	160.0	17.48		76.7	80.0	4.8

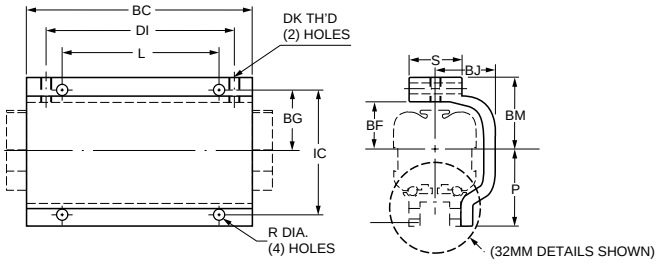
Table 2. — Envelope and Mounting Dimensions

Bore	Unit	A	B	C	D	E	F	G	H	U	AB	AC	AD	AE	AF	AZ	UU	WW	XX	Z	ZZ	Min. CL
50 mm	inch	6.70	1.25	3.07	3/8 NPT	2.13	0.50	0.50	5/16-18	0.35	2.13	0.71	1.10	1.34	2.01	0.63	0.63	5/16-18	3.38	0.14	.16	9.9
	mm	170.1	31.75	77.97		54.1	12.7	12.7		8.89	54.1	18.0	27.9	34.0	51.1	16.0	16.0		85.9	3.6	3.96	251.5

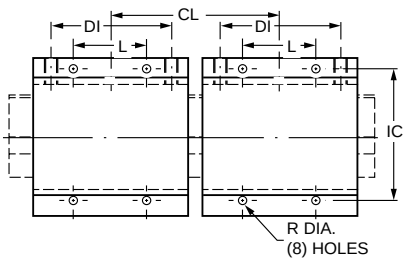
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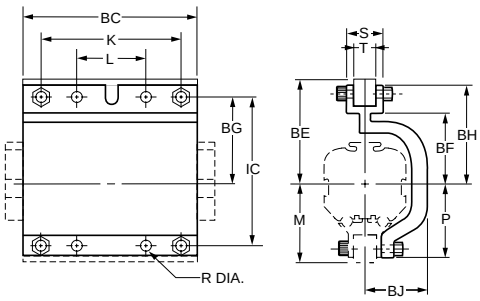
Inverted Basic Mount – Style J
25mm & 32mm Bore Sizes



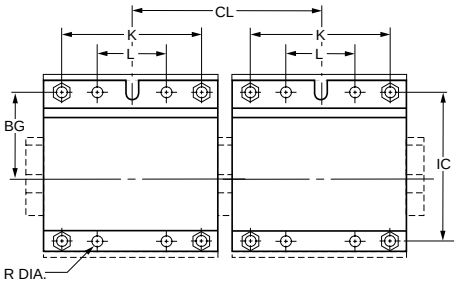
Inverted Basic Mount
Double Carriage – Style B



Inverted Basic Mount – Style J
40mm & 63mm Bore Size

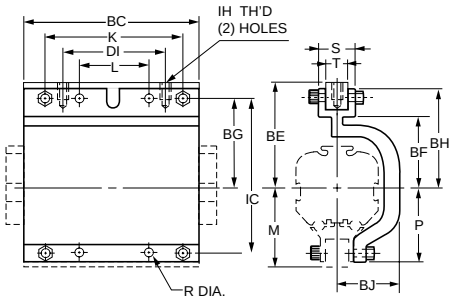


Inverted Basic Mount
Double Carriage – Style B

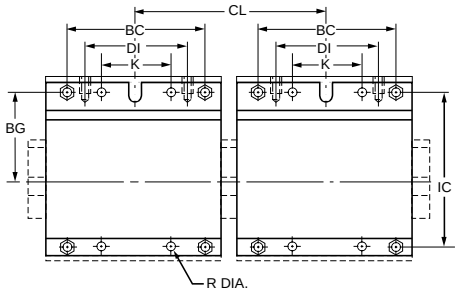


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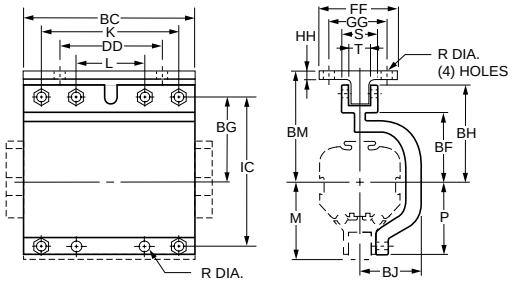
Inverted Basic Mount – Style J
50mm Bore Size



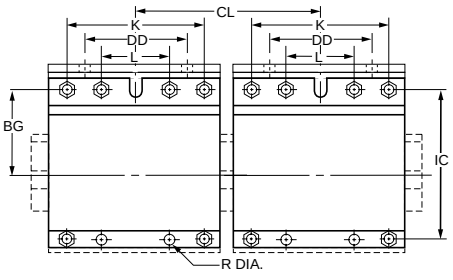
Inverted Basic Mount
Double Carriage – Style B



Inverted Flange Mount – Style L
40mm, 50mm & 63mm Bore Sizes



Inverted Flange Mount
Double Carriage – Style K

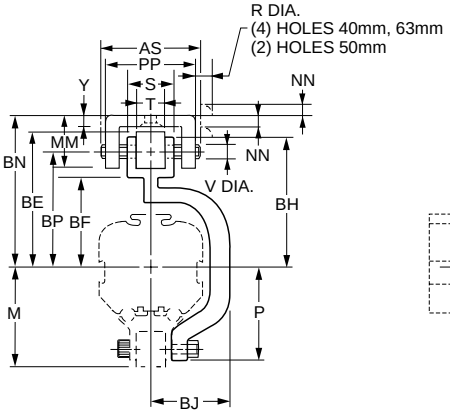


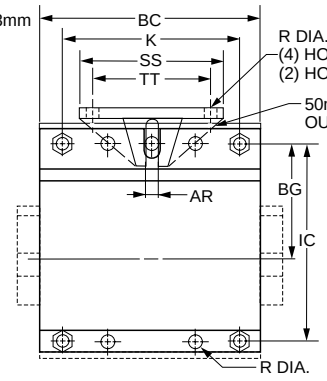
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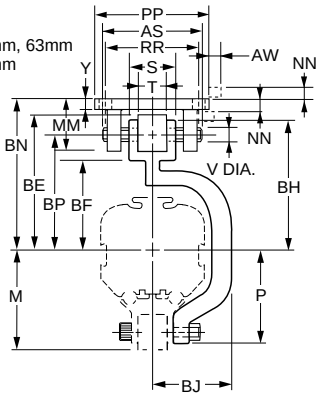
Inverted Swivel Mount – Style G

40mm, 50mm & 63mm Bore Sizes

50mm Bore







40 & 63mm Bore

Inverted Carriage Mounts – Dimensions

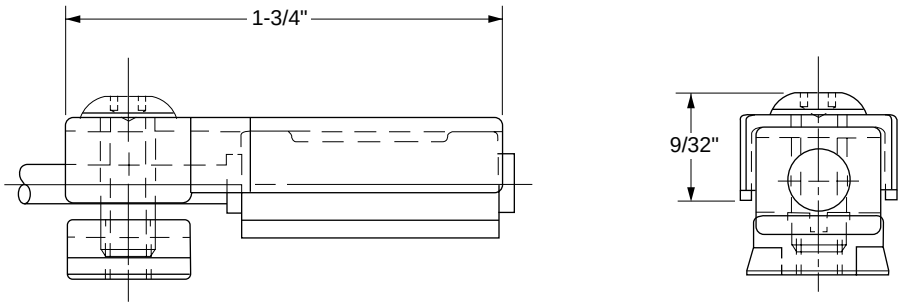
Bore	Unit	K	L	M	P	R	S	T	V	Y	AR	AS	AW	BC	BE	BF	BG	BH	BJ
25 mm	in.	–	1.97	–	1.50	0.22	1.02	–	–	–	–	–	–	4.25	–	1.07	1.30	–	1.38
	mm	–	50.0	–	38.1	5.59	25.9	–	–	–	–	–	–	107.95	–	27.2	33	–	35.1
32 mm	in.	–	3.94	–	1.89	0.28	1.26	–	–	–	–	–	–	5.67	–	1.25	1.57	–	1.50
	mm	–	100.1	–	48.0	7	32	–	–	–	–	–	–	144	–	31.75	39.9	–	38.1
40 mm	in.	4.33	2.17	2.40	2.27	0.28	1.10	0.71	0.47	0.24	0.31	2.75	±.30	5.43	3.34	2.31	2.87	3.19	1.99
	mm	110	55	61	57.6	7	28	18	12	6	8	70	±7.5	137.9	84.9	58.7	72.9	81	50.5
50 mm	in.	5.51	3.75	2.56	2.56	0.35	1.34	0.74	0.63	0.19	0.38	2.83	±0.24	7.24	3.63	2.46	3.24	3.63	2.56
	mm	139.9	95.25	65.0	65.0	8.9	34.0	18.8	16.0	4.8	9.7	71.9	±6.1	183.9	92.2	62.5	82.3	92.2	65.0
63 mm	in.	7.09	3.54	3.27	3.07	0.35	1.19	0.74	0.63	0.21	0.38	3.23	±0.26	8.19	4.61	3.23	4.01	4.41	3
	mm	180.0	89.9	83.1	78.0	8.9	30.0	18.8	16.0	5.5	9.7	82.0	±6.6	208.0	117.1	82.0	101.9	112	76.2

Bore	Unit	BM	BN	BP	CL	DD	DI	DJ	DK	FF	GG	HH	IC	MM	NN	PP	RR	SS	TT
25 mm	in.	1.50	–	–	4.94	–	3.15	–	#10-32	–	–	–	2.60	–	–	–	–	–	–
	mm	38.1	–	–	125.5	–	80	–		–	–	–	66	–	–	–	–	–	–
32 mm	in.	1.89	–	–	6.84	–	4.73	–	1/4-20	–	–	–	3.14	–	–	–	–	–	–
	mm	48.0	–	–	173.7	–	120.14	–		–	–	–	79.8	–	–	–	–	–	–
40 mm	in.	3.54	3.89	2.95	8.2	3.15	–	–	–	2.36	1.77	0.24	4.80	1.50	±0.30	2.76	2.17	3.54	2.95
	mm	89.92	98.81	74.93	208.6	80	–	–	–	60	45	6	122	38	±8	70	55	90	75
50 mm	in.	4.09	4.61	3.63	9.90	5.12	6.3	0.69	5/16-18	3.15	2.36	0.28	5.41	1.69	±0.24	2.27	–	3.94	3.15
	mm	103.9	117.1	92.2	251.5	130.0	160.0	17.48		80.0	59.9	7.1	137.4	42.9	±6.1	57.7	–	100.1	80.0
63 mm	in.	4.85	5.21	4.15	12.18	5.12	–	–	–	3.15	2.36	0.28	6.69	1.72	±0.35	3.54	2.76	4.72	3.94
	mm	123.2	132.3	105.4	309.4	130.0	–	–	–	80.0	59.9	7.1	169.9	43.7	±8.9	89.9	70.1	119.9	100.1

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Sensors

Solid state and reed sensors are available for use with the RC Series Cylinders. See the Electronic Sensors Section for specifications and part numbers.



G

Service Kits

		Bore Size (mm)				
		25	**32**	**40**	**50**	**63**
Outer Band	Single Carriage	L078470025	L078470032	L078470040	L078470050	L078470063
	Double Carriage	L078480025	L078480032	L078480040	L078480050	L078480063
Inner Band	Single Carriage	L078450025	L078450032	L078450040	L078450050	L078450063
	Double Carriage	L078460025	L078460032	L078460040	L078460050	L078460063
	Piston Assembly	1468750250	1468750320	1468750400	1468750500	1468750630

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GDL Aluminum Roller Guides



The Guideline Concept G186
The Guideline System G187
Overview & Descriptions G188
General Facts & Dimensions G189
Load and Moment Ratings G190
GDL Roller Guides / Accessories G191
Wipers / Butt-jointed Rail Options G192
Conversion Tables G193
Technical information G194-G197
Ordering Information G198
GDL Application Sheet G199

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Light, Smooth and FAST

Aluminum roller guides in a cutting machine for spectacle lenses. Both the work piece carriers and the motorized X - Y table axis are equipped with roller guides. The smooth operation and precision of the equipment ensures a fine cutting action.



Aluminum roller guides in an automatic vibrator for flattening printed sheets of paper. To guarantee even pressure on the sheets of paper, the roller bridge is supported by precision roller guides.

(Baumann company photo)



Handling units for medical equipment. Smooth, easy movement with guideline roller guides.

(Dräger company photo)



Aluminum roller guides in the sliding carriage of a machine for producing cables. The projecting arm of the carriage is guided by two double rails each with two roller cassettes and can be moved manually with minimal force because of the low friction properties.

(Kabelmat company photo)

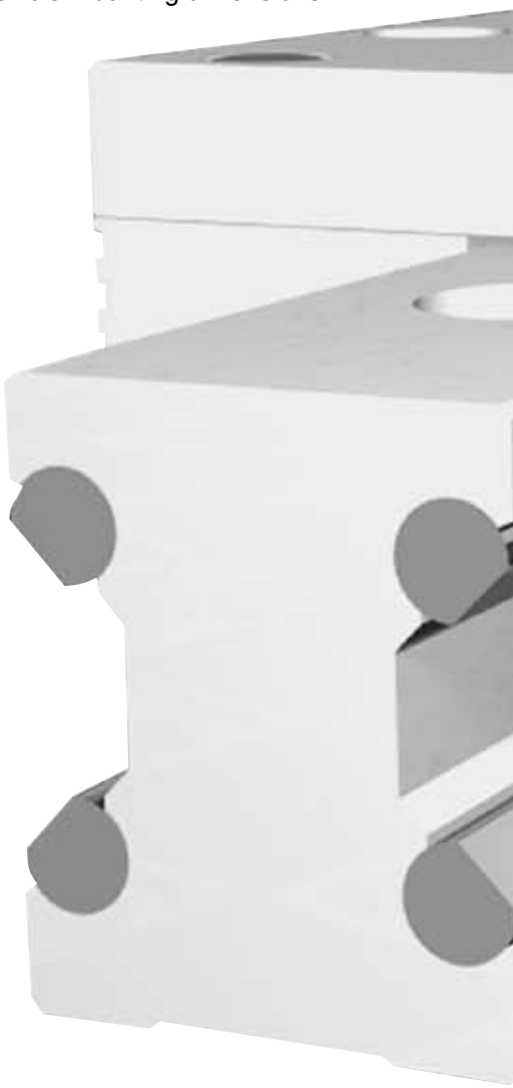


Single rail and roller shoe versions of the aluminum roller guide in a handling arrangement for stacks of paper. Various fittings and limit stops for stacking are moved on two axes horizontally and vertically. The robustness and reliability of the roller guides allows for continuous operation under high load conditions.

(Solms company photo)



- Light weight (anodized aluminum)
- Smooth and quiet operation
- Speeds up to 10 m/s
- Acceleration/deceleration up to 40 m/s^2
- Loading from any direction
- Permanently lubricated guidance system
- Broad product range in various series high performance, standard and stainless steel versions
- High load and moment capacities
- Very cost effective
- Flexible mounting dimensions



G

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GDL Linear Guides Offer a Variety of Series and Options — High Performance… "Smooth Guidance"

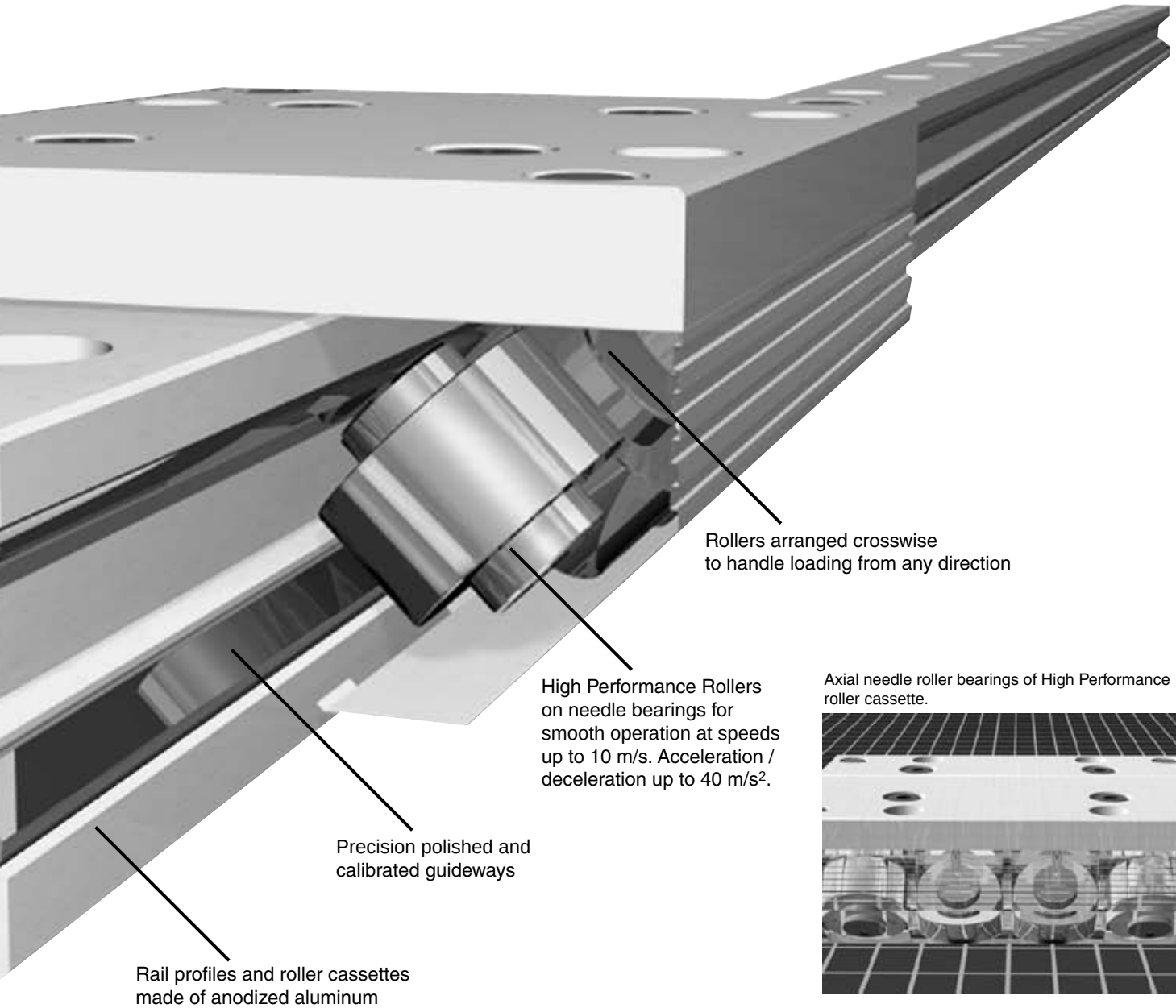
Aluminum roller guides provide smooth operation and high load carrying capacity for industrial automation.

By the use of lightweight aluminum components the moving masses are minimized, travel speeds are increased and actuation energy is saved.

Aluminum roller guides are designed to carry medium weight loads economically. Their smooth action and speeds up to 10 m/s make them ideal for widespread use in many areas of application.

Aside from a main featured High Performance guide, others such as the Standard, Corrosion Resistant, High Dynamics and Grease-free versions are also available.

Aluminum roller guides are available in sizes 12, 15, 20, 25, 35 and 45mm. Rail lengths are from 200 mm to 4000 mm. For longer travel lengths, guide rails can be butt-jointed together.



Axial needle roller bearings of High Performance roller cassette.

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GDL Product Line Overview

Characteristic	Unit	Description
Full profile wipers		Rollershoes and cassette are provided with snap-on full profile wipers. The snap-on full profile wipers are easily replaceable with available wipers kits. See page G162 for respective wiper kit order numbers.
Mounting		Rollershoes and cassettes use ISO screw quality 8.8 and DIN 433 washers. ISO screw quality 8.8 is recommended for mounting the rails also.
Loads		See load and moment rating tables on page G160 for respective load, moment and weight data per size and series.
Acceleration and Deceleration	m/s^2 (ft/sec^2)	40 m/s^2 maximum (131 ft/s^2 maximum)
Guide installation		Possible in any position. See technical information on page G164 for specific instructions on installing various guide configurations.
Drag adjustment set screw		Cassettes can be adjusted at the factory or by the customer.
		Rollershoes can be set-up by the cusomer to incorporate the drag adjustment set screw feature. The drag adjustment set screw components are supplied with each pair of rollershoes.
Coefficient of friction		Variable, but .001 set at standard slide resistance adjustment.
Standard Lubrication		Lifetime lubrication with standard grease-packed roller bearings.
Speed	m/s (ft/s)	Up to 10 m/s (or up to 33 ft/s)
Materials for High Performance or Standard vesions		Rail: Aluminum alloy
		Guideways: Hardened high alloy spring steel
		Cassettes/rollershoes/top plates: Aluminum alloy
		Rollers: Bearing steel
Materials for Corrosion Resistant High Performance & Standard versions		Rail: Aluminum alloy
		Guideways: Stainless steel spring steel
		Cassettes/rollershoes/top plates: Aluminum alloy
		Rollers: Stainless steel bearing steel
Bearing types		Steel axial needle, Specials on request (ex: anti-magnetic, grease free, high dynamics) - consult factory
Operating temperature	C (F)	-10° to 80°C (+14 to 176°F) temperature range
Specials available		Custom length cassettes and rollershoes for 100 piece lots minimum.
		Keyed butt-jointed rail sections for continuous rail lengths over 4000mm.
		Solid continuous length rails between 4000.
		Offset or non-standard “L11” dimensions on opposite ends of cut rails.
		Integrated metal scraper with standard full profile wiper currently available.
		Rail underside blind mounting holes.

G

Descriptions of the Various GDL Series Available:

High Performance Series:

(Sizes FDC12HP-... thru FDC45HP-...)

The High Performance series is the basis for GDL's development, which is used in the majority of applications. High Performance guides consist of 8 axial needle roller bearings, running on precision polished and hardened alloy spring steel guideways. These guide bearings are grease packed and shielded, while offering the highest load and moment rating capacities within the GDL product line.

Standard Performance Series:

(Sizes FDC12SP-... thru FDC45SP-...)

The Standard Performance series is intended for minor loads and moments for particularly economical guidance solutions. Standard Performance guides consist of 8 radial ball roller bearings, running on precision polished and hardened alloy spring steel guideways. These guide bearings are grease packed and sealed, while offering the lowest load and moment ratings available within the GDL product line, with the exception of the Grease-Free and the Anti-Friction / Corrosion Resistant series. Standard Performance series is the second most commonly used GDL guides for various applications and also provides excellent running behavior.

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General Facts Pertaining to all Series:

Snap-on full profile wipers: Rollershoes and cassettes can be provided with snap-on full profile wipers. The snap-on full profile wipers are easily replaceable with available wiper kit. See page G196 for respective wiper kit order numbers.

Cassette adjustment: Cassettes can be adjusted at the factory or by the customer.

Fasteners: Rollershoes and cassettes use ISO screw quality 8.8 and DIN 433 washers. ISO screw quality 8.8 is recommended for mounting the rails also. Special stainless steel fasteners can be requested as necessary.

Carrying Capacity: See load and moment rating tables on page G188 for your guide series of interest.

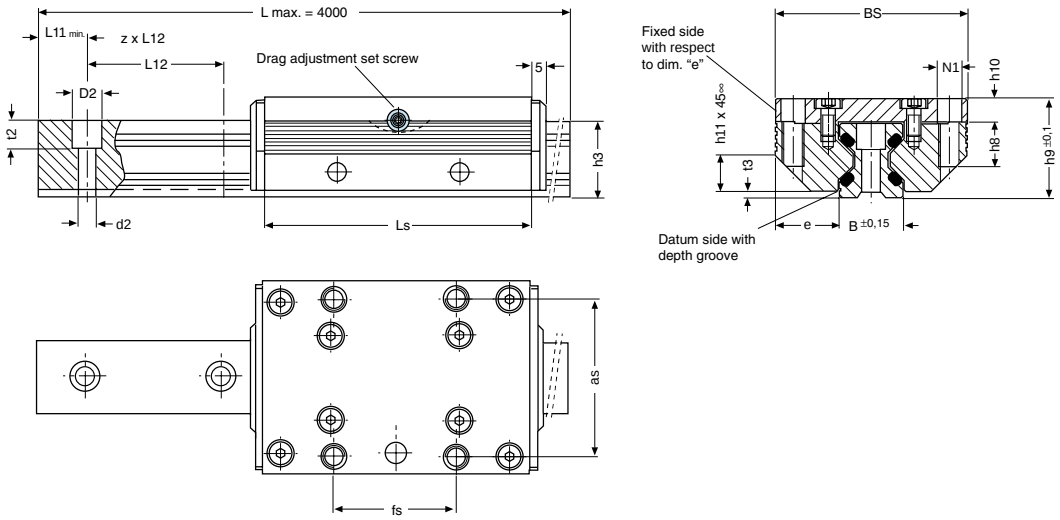
Guide mounting position: Optional.

Lengths: For longer than standard rail lengths, see keyed butt-jointed rail option on page G190.

Lubrication: GDL Aluminum Roller Guides are permanently lubricated with contained roller bearings grease.

See part numbering schemes on pages G196 to define your desired GDL guide features for ordering.

Drawing for Cassette with Double Sided Rail



Dimensions for both Standard FDC Version Guides

Size	Length Ls	Width BE	B	BS	B1	Height B2	h1	h3	h9	as	d2	D2	e	fs	h7	h8	h10	h11	L8	L9	L11 min.	L12	t2	t3	N1	N2	N3	PF1	PF2	S1	S2	S3
12	64	12.00	12.0	37	24.4	11.9	15.0	14.7	19	30	3.4	6	12.50	25	6.0	8	4.0	6	29	57	10	40	5.5	1.4	M4	M3	M4	5.5	3.4	3.4	4.9	9.7
15	78	15.25	15.5	47	30.9	15.2	19.0	18.7	24	38	4.5	8	15.75	30	7.5	10	5.0	8	34	68	10	60	6.0	2.0	M5	M4	M6	7.0	4.4	4.9	5.9	12.4
20	92	20.00	21.0	63	40.9	20.4	23.0	22.6	30	53	5.5	10	21.00	40	8.0	12	7.0	11	42	80	10	60	7.0	2.0	M6	M5	M6	9.5	4.9	5.9	5.9	16.9
25	98	25.00	23.0	70	48.4	22.9	27.5	27.0	36	57	6.6	11	23.50	45	5.0	16	8.5	13	48	84	10	60	10.0	2.5	M8	M5	M8	12.0	6.4	7.4	8.9	19.4
35	135	35.00	32.0	100	68.9	32.9	37.5	37.0	48	82	9.0	15	34.00	62	7.5	20	10.5	20	67	117	12	80	11.5	3.5	M10	M6	M8	17.0	8.9	8.9	8.9	28.4
45	165	45.00	45.0	120	82.4	36.4	46.5	46.0	60	100	11.0	18	37.50	80	9.5	24	13.5	22	83	146	16	105	14.5	4.0	M12	M8	M8	22.0	9.9	9.9	8.9	30.9

Dimensions (mm)

Dimensions for both Underside Mounting Hole FDC Version Guides

(Ref. ordering instructions)

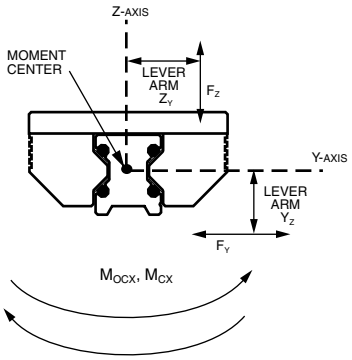
Size	Length Ls	Width BE	B	BS	B1	Height B2	h1	h3	h9	as	d2	D2	e	fs	h7	h8	h10	h11	L8	L9	L11 min.	L12	t2	t3	N1	N2	N3	PF1	PF2	S1	S2	S3
12	64	12.00	12.0	37	24.4	11.9	15.0	14.7	19	30	3.4	6	12.50	29	6.0	8	4.0	6	29	57	10	40	5.5	1.4	M4	M3	M4	5.5	3.4	3.4	4.9	9.7
15	78	15.25	15.5	47	30.9	15.2	19.0	18.7	24	38	4.5	8	15.75	34	7.5	10	5.0	8	34	68	10	60	6.0	2.0	M5	M4	M6	7.0	4.4	4.9	5.9	12.4
20	92	20.00	21.0	63	40.9	20.4	23.0	22.6	30	53	5.5	10	21.00	40	8.0	12	7.0	11	42	80	10	60	7.0	2.0	M6	M5	M6	9.5	4.9	5.9	5.9	16.9
25	98	25.00	23.0	70	48.4	22.9	27.5	27.0	36	57	6.6	11	23.50	45	5.0	16	8.5	13	48	84	10	60	10.0	2.5	M8	M5	M8	12.0	6.4	7.4	8.9	19.4
35	135	35.00	32.0	100	68.9	32.9	37.5	37.0	48	82	9.0	15	34.00	62	7.5	20	10.5	20	67	117	12	80	11.5	3.5	M10	M6	M8	17.0	8.9	8.9	8.9	28.4
45	165	45.00	45.0	120	82.4	36.4	46.5	46.0	60	100	11.0	18	37.50	90	9.5	24	13.5	22	83	146	16	105	14.5	4.0	M12	M8	M8	22.0	9.9	9.9	8.9	30.9

Dimensions (mm)

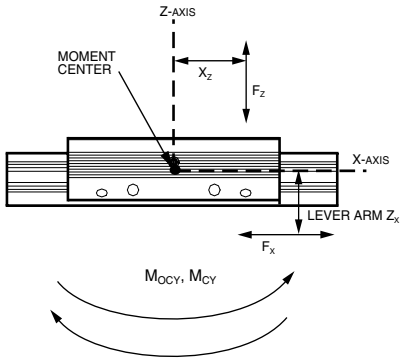
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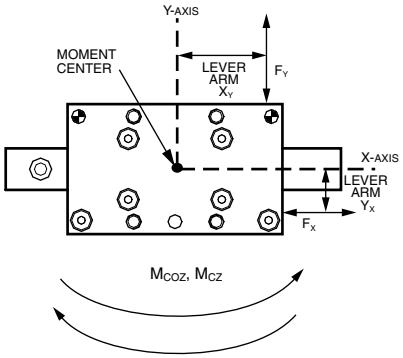
Roll



Pitch



Yaw



Load & Moment Rating Capacities

(for cassettes on double sided rail)

Cassette Series	Dynamic Load Rating C (N)	Static Load Rating Co (N)	Static Moment Rating Capacities:			Dynamic Moment Rating Capacities:			Cassette Weight (kg)	Rail Weight (kg)
			Roll Mocx (Nm)	Pitch Mocy (Nm)	Yaw Mocz (Nm)	Roll Mcx (Nm)	Pitch Mcy (Nm)	Yaw Mcz (Nm)		
High Performance Series										
FDC12HP-...	2800	3000	27	43	43	25	40	40	0.1	0.4
FDC15HP-...	4200	3400	37	58	58	45	72	72	0.3	0.8
FDC20HP-...	5400	5400	76	111	111	76	111	111	0.4	0.9
FDC25HP-...	9000	10100	158	222	222	142	198	198	0.6	1.8
FDC35HP-...	12500	18000	423	559	559	294	388	388	1.5	3.2
FDC45HP-...	21200	25900	827	983	983	678	806	806	2.9	5.5

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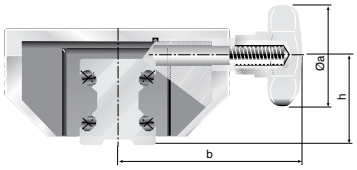
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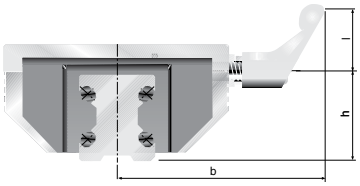
GDL Aluminum Roller Guides

High Performance cassettes with lock device



Special cassette types





The locking cassette with star grip handle can be stopped at any desired location on the rail. The clamping device does not exert forces on the rail guideways.

The clamping device is used in fixtures which are movable manually, clamping and stop ledgers, feeding of tools and work pieces. Also available with L-ratchet handle.

Star Grip Handle Dimensions

Size	Ø a	b	h	Clamp Force	Part Numbers Star grip knob
12	**N/A**				
15	25	41	19.0	200	**FDC15HP-00020000**
20	25	49	23.0	250	**FDC20HP-00020000**
25	32	56	28.0	250	**FDC25HP-00020000**
35	50	83	38.5	350	**FDC35HP-00020000**
45	63	101	48.0	750	**FDC45HP-00020000**

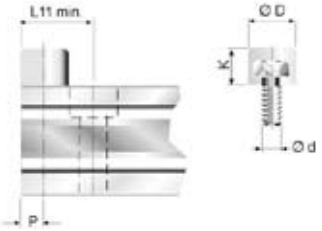
Dimensions (mm), Force (N) with normal manual tightening.

L-Ratchet Handle Dimensions

Size	l	b	h	Clamp Force	Part Numbers L-ratchet handle
12	**N/A**				
15	45	59.5	19.0	200	**FDC15HP-00010000**
20	45	67.5	23.0	250	**FDC20HP-00010000**
25	45	71	28.0	250	**FDC25HP-00010000**
35	63	96	38.5	350	**FDC35HP-00010000**
45	78	116	48.0	750	**FDC45HP-00010000**

End of Stroke Stop screws





The stop screws are screwed into threads (option) on the guide rails. The end of stroke stopping energy is reduced by a rubber cap. With guide rails where the L11 is less than the standard minimum, we offset the mounting hole by half of its diameter.

Note: Customer must drill and tap the holes for the stop screws.

Size	d	D	K	L11 min.	P	Order Number
12	M5	12	8	15.0	6.0	**63504A**
15	M5	12	8	16.0	6.0	**63504A**
20	M5	12	8	17.0	6.0	**63504A**
25	M6	15	10	20.5	7.5	**63505A**
35	M8	19	13	26.5	9.5	**63506A**
45	M10	24	16	33.0	12.0	**63507A**

Dimensions (mm)

GDL Accessories

Rail Mounting Screw Covers





Material: Wear resistant plastic, resistant to oil and aging.

Mounting: Put a plastic plate on top and pound in uniformly. Remove residual burrs with a soft brush or fingernail.

Note: Use respective order numbers for ordering separately or include in rail part number.

Size	Cylindrical Screw DIN912	D	Order Number
12	M3	6	**87752A**
15	M4	8	**87753A**
20	M5	10	**87754A**
25	M6	11	**87755A**
35	M8	15	**87756A**
45	M10	18	**87757A**

Dimensions (mm)

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GDL Aluminum Roller Guides

Version with wipers

Integrated into an additional cover, a felt wiper is saturated with oil. Although dependent on the degree of contaminants, these wipers last for some 6000km, after which the felt wipers can either be washed or replaced.

For optimal cassette rolling performance, all holes in the guide rails should be filled with the plastic rail mounting screw covers (see page G191).

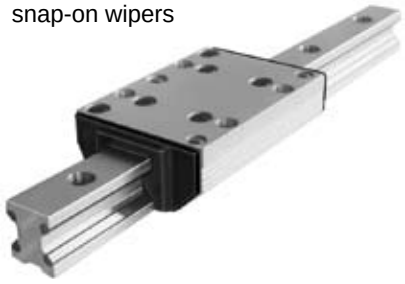
Order numbers for replacement wiper kits

FDC Series and Size	Respective Order Number
12	**84457B**
15	**84480B**
20	**84481B**
25	**84482B**
35	**84483B**
45	**84484B**

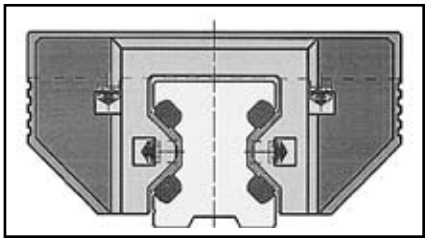
*wiper kits are sold in pairs

NOTE: Use respective order numbers for ordering separately as replacements, or specify in cassette part number. See cassette part numbering on pages G198.

Cassette with full profile snap-on wipers



Full profile snap-on wiper



GDL Coupled with structural aluminum extrusion material and OSP-E actuator

GDL's Keyed Butt-Jointed Rail Option

GUIDELINE rails can be precisely fastened together using a factory offered keyed butt-joint option for continuous rail lengths, as shown in Figures 1 & 2.

Two rail sections are clamped together with mating round bar stock pieces that seat tangent to both rail section guideways on each side of the rail. While the rail sections are clamped together, a keyway slot is machined in the top and bottom sides of the rail, across the butt- joint. Screw holes are then drilled through the rail inside the keyway slot, so the opposing keyways can be drawn together tightly with screws. The round bar stock clamp is then removed, providing a rigid and well aligned keyed butt-joint.

The keyed butt-joint option provides optimum alignment of all guideways from one rail section to the next. This allows for optimum "smooth" guidance of the cassette bearings, while crossing rail butt-joints.

The keyed butt-jointed rail option is currently available in the FDR version 25, 35, & 45 mm rail sizes. For a keyed butt-joint on rail sizes 25, 35 or 45 mm, specify P/N:# GDL-BJK

Consult factory for other size possibilities.



Figure 1

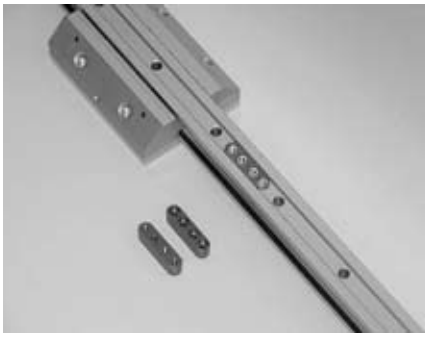


Figure 2

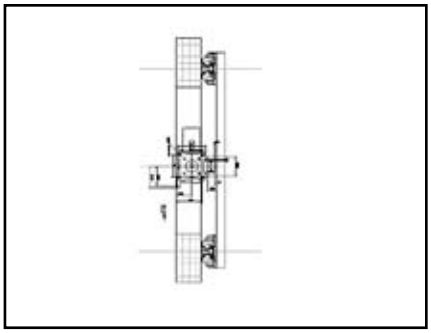


Figure 3

GDL linear guides couple well with various structural aluminum extrusions and Parker-Origa OSP-P and OSP-E actuators. Mounting can be easily accomplished using standard fasteners and mounting brackets. See Figure 3 above.

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Units Conversion Tables

Force Conversions:

Multiply	By Conversion Factor	Result
pound-force	4.448	Newton
Newton	0.225	pound-force
kilogram-force	9.807	Newton
Newton	0.102	kilogram-force

Acceleration Conversions:

Multiply	By Conversion Factor	Result
feet/section^2	0.305	meter/second^2
meter/second^2	3.281	feet/second^2
inch/second^2	0.025	meter/second^2
meter/second^2	39.370	inch/second^2

Mass Conversions:

Multiply	By Conversion Factor	Result
ounce	28.349	gram
gram	0.035	ounce
kilogram	35.279	ounce
gram	0.001	kilgram
pound	0.453	kilogram
kilogram	2.205	pound

Bending Moment or Torque Conversions:

Multiply	By Conversion Factor	Result
pound-foot	1.356	Newton-meter
Newton-meter	0.737	pound-foot
Newton-meter	0.102	kilogram-meter
Kilogram-meter	9.807	Newton-meter

Velocity conversions:

Multiply	By Conversion Factor	Result
mile/hour	1.609	kilometer/hour
kilometer/hour	0.621	mile/hour
feet/second	0.305	meter/second
meter/second	3.281	feet/second
inch/minute	0.025	meter/minute
meter/minute	39.370	inch/minute

Length conversions:

Multiply	By Conversion Factor	Result
inch	25.4	millimeter
millimeter	0.039	inch
inch	0.025	meter
meter	39.370	inch
foot	0.305	meter
meter	3.281	foot

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1. Features of the Guide System

Aluminum roller guides consist of a double sided rail and a roller cassette or two single sided rails and two roller shoes. Aluminum roller guide rails and cassettes are made of aluminum alloy. The rollers are very smooth running on precision polished guideways made of high alloy spring steel. The special cross pattern orientation of the running rollers provides high load and moment capacity in all directions.

Their special features are: light weight, small dimensions, and high speed of displacement. Aluminum roller guides are economical and universal handling components, which are mostly or all corrosion-resistant and available at a favorable price.

2. Size of the Guide System

To select the right guide size, first the moments and forces acting on the bearing have to be determined.

Recommended safety factors (with ISO screws quality 8.8):

Thrust load S > 1.3

Tensile load S > 4.0

Moment load S > 6.0

3. Material

The basic body of GDL aluminum roller guides is made of aluminum alloy. The guideways consist of hardened, high alloy spring steel or of stainless steel. By using basic bodies of aluminum, the moved masses are reduced which allows light-weight construction requiring lower moving forces and reduced energy consumption. Still the integrated GDL system sustains high load and moment ratings.

4. Operating Temperature

GDL linear guides can be operated within a temperature range from -10° C up to + 80° C. For other temperatures, please consult factory.

5. Screwed Connections

GDL linear guides are fixed to the mating structure by the mounting holes in the rails and the cassettes. ISO screw quality 8.8 should be used with DIN 433 washers.

To secure the screwed connections, we recommend that suitable locking means be utilized as necessary.

Mounting screw torque specifications:

	Quality 8.8 [Nm]
M3	1.1
M4	2.5
M5	5.0
M6	8.5
M8	21.0
M10	41.0
M12	71.0

6. Wipers

The guideways of aluminum roller guides are equipped with wipers to protect against coarse environmental contamination.

7. Slide Resistance / Adjustment

Follow the steps on how to adjust GDL cassettes to the rail.

The new GDL catalog has many changes due to an expanded product line. The change to feature descriptive part numbering was done to accommodate all current and future offerings of the GDL product. The goal is to have standard features and options available, for a perfect fit into your application.

Included in the chart below are hex sizes, drag resistance and torque ratings for adjusting the cassette.

GDL CHART						
	FDC 12	**FDC 15**	**FDC 20**	**FDC 25**	**FDC 35**	**FDC 45**
Top plate hex (mm)	2	3	4	4	5	6
Top plate torque (in lbs)	n/a	22.1	44.3	44.3	75.2	186
Adjustment hex (mm)	1	3	3	4	4	4
Drag resistance (oz) HP, HC, GF, VA	1.8-7.9	3.6-10.8	5.4-16.2	7.2-21.6	10.8-32.4	12.6-37.7
Drag resistance (oz) SP & SC	.7-1.8	1.8-3.6	3.6-7.2	5.4-10.8	7.2-14.4	9-18
Drag resistance (oz) HD	n/a	n/a	n/a	9-18	14.4 25	18-28.7

7.1 GDL Adjustment Procedure

Do not measure sliding resistance with wipers on.

1) Lay the rail out on the flat surface with the ***datum*** line facing away from you. Anchor the rail to keep it from shifting when sliding resistance is applied to the cassette.

The datum line is a reference groove on one side of the rail.

2) Set the roller cassette on the rail with the adjustment screw facing towards you, while the datum line on the rail is away from you. Do not install the wipers on the cassette yet.

Do not install the wipers yet.

3) Make sure the four bolts on the adjustable side of the cassette are slightly loose and the bolts on the fixed side are tight before adjusting the drag screw.

One side of the cassette is fixed and the other side is floating.

4) The drag hex screw is located on one side of the cassette. Adjust the screw in for more drag and out for less. Do not try to adjust cassette with top plates bolts tight.

See the chart for drag adjustment hex screw size.

5) Adjust the drag on the cassette by sliding as it slides down the rail. Feel for an even amount of resistance as you turn the hex screw in and out.

6) Tighten down the top plate bolts to the proper torque specification. The tightening of the top plate bolts will add some resistance. If necessary, the adjustment procedure can be repeated for better sliding resistance for your application.

See the chart for top plate hex size and torque rating.

7) If the adjustment is done without a scale, it should move evenly. Some examples of improper adjustment are: If the

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cassette “hops”, it is too tight. If it is too loose, the top plate of the cassette will have play. Try to be in the middle.

8) To check your settings use a pull or push style scale. Slide the cassette down the entire rail at an even speed, measuring the drag resistance. Your highest drag rating should be referenced when looking at the chart.

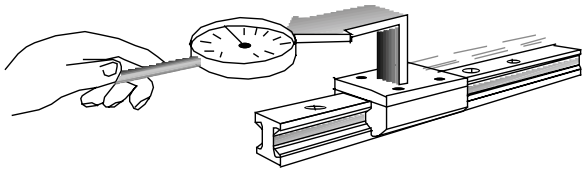
See the chart for drag resistance ratings for the size and type of cassette.

9) Install the clip on wipers. The wipers will add between 1-3 ounces of resistance. The wipers do not add any additional roller preload to the rail.

The clip on wipers can be installed at this time.

7.2 Double Sided Rail and Cassette

Aluminum roller guides are adjusted in such a way that the required stiffness under load is obtained. If self adjustment is preferred, we recommend that you measure the slide resistance as shown below. Before doing so, the mating structure should be checked for dimensional accuracy and flatness.



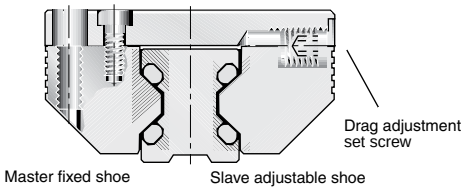
The cassettes which are mounted on the rails are adjusted clearance-free, without play. This adjusting method is required at the point on the rail where the cassette travels with the least slide resistance. Adjustment is completed in the non-loaded condition. The tolerances below refer to this condition.

Slide resistance adjusment tolerance [N]															
Series	FDC__HP, FDC__HC, FDC__AM, FDC__GF, FDC__VA						FDC__SP, FDC__SC						FDC__HD		
Size	12	15	20	25	35	45	12	15	20	25	35	45	25	35	45
Adjust. value	0.5	1.0	1.5	2.0	3.0	3.5	0.2	0.5	1.0	1.5	2.0	2.5	2.5	4.0	5.0
Max. value	2.0	3.0	4.5	6.0	9.0	10.5	0.5	1.0	2.0	3.0	4.0	5.0	5.0	7.0	8.0

All values are without wipers

Tolerances in the guide system may cause slight variations in the slide resistance, when the adjusted cassette is moved along the guide rail.

7.3 Double Sided Rail and Roller Cassette



To change the clearance setting, first the slave adjustable shoe screws on the cassette top plate are slightly loosened. Afterwards, the drag adjustment set screw is turned to increase or decrease slide resistance of the cassette. Turning the drag adjustment set screw effects a displacement of the roller shoe in relation to the cassette top plate.

After re-tightening of the cassette top plate, the slide resistance can be checked. This procedure can be repeated until the desired slide resistance is achieved.

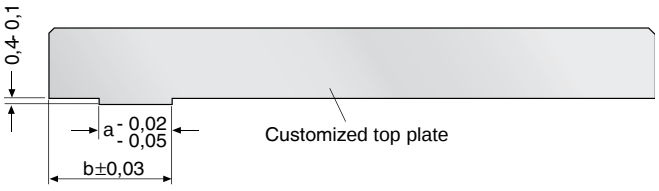
7.4 Rails and Rollershoes

When installing, it is important to distinguish between the master fixed side and the slave adjustable side rollershoe and rail. The rail on the master fixed side is aligned to the mating structure and fastened securely by all screws.

The rail on the slave adjustable side should be lightly tightened and movable with light force during initial alignment of parallel rails. Gauge blocks should be used between the parallel rails, by locating off the aligned and mounted master rail, in order to align the slave rail parallel to the master rail. Slave rail mounting bolts should be tightened as the slave rail is aligned at each bolt position. See paragraph 11.3 for further instructions on mounting parallel single sided rails.

7.5 Centering Groove on the Master Fixed Shoe and Custom Top Plate

Each pair of rollershoes are provided with centering grooves for optimum alignment to their mating top plate during mounting.
One rollershoe should be designated as the master fixed rollershoe, even though both are designed with a centering groove on their top surface. The other shoe will serve as the slave adjustable side rollershoe. The mating customized top plate should be machined with a centering shoulder according to the following data.



Size	a	b
12	4,5	9,6
15	5,0	12,6
20	7,5	16,1
25	10,5	17,6
35	12,5	26,1

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7.6 Adjusting Cassette Built with Rollershoes and Custom Top Plate

The centering shoulder on the top plate should be assembled with its respective fixed rollershoe centering groove and securely torqued to recommended specification. See cassette screw torque specifications under step 5, on page G194.

Assemble the adjustable rollershoe to the top plate also, parallel to the fixed rollershoe on the same side of the top plate. Its fasteners should be lightly tightened so that the adjustable rollershoe can be moved with light finger pressure.

As assembled cassette can then be slid onto parallel rails, while keeping the fixed rollershoe on the master fixed rail side. The incorporated drag adjustment set screw can then be turned clockwise to remove cassette play, or counter clockwise to reduce slide resistance while maintaining zero play.

Once the desired slide resistance is achieved with no cassette play, the adjustable rollershoe fasteners can also be torqued to specification.

8. Running accuracy

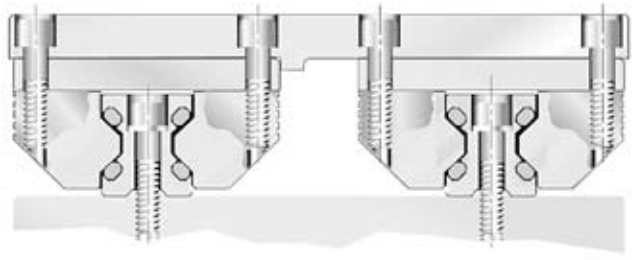
The running accuracy is measured from the top plate surface of the cassette, to the ideal straight line of travel. Running accuracy of the cassette to the rail is +/- .03mm (.0012") per meter, granted no greater than (.0024") straightness deviation per meter is maintained when mounting the rail.

9. Contact and support surfaces

The contact and support surfaces have a substantial influence on functioning and precision of linear guides. Depending on the functional requirements of the system, the mating structure has to be machined with the corresponding degree of precision.
Machining errors on the mating structure will otherwise add to the running error of the guide system. In order to assure troublefree functioning, we recommend that a max. straightness deviation of ≤ 0.1 mm (.0039") per running meter be maintained when mounting the rail.

10. Design hints

10.1 Parallel double sided rails and cassettes



The master fixed rail should always be established straight and true first, within the maximum straightness deviation specified in paragraph 9. With parallel rail arrangements, both rails should be mounted on the same mounting surface elevation and treated with equal surface preparation and tolerancing practices. Precise alignment in terms of spacing, parallelism and height is very important.

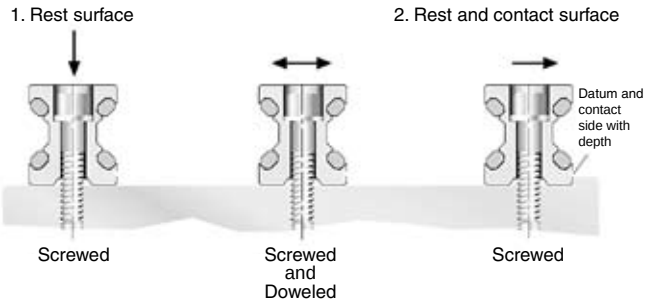
When coupled parallel to a driving actuator system, the adjustable side of the cassette should be placed on the side closest to the driving actuator. This will minimize driving actuator torque transferred to the adjustable side of the cassette.

11. Guide mounting instructions

The useable load capacity is influenced by the connection between the guide elements and the mating structure. For this reason, a flat, straight and solid secure mounting surface should be provided. Adequate support of qualified loads and moments can then be achieved, along with desired running accuracy.

11.1 Mounting Double Sided Rails and Cassette

Depending on the load situation, certain double sided rails should either be screwed or screwed and dowelled, and respectively put into grooves or against a shoulder.



The rails can be secured best against shoulders and are screwed or screwed and dowelled to the mating structure. After final adjustment of rail straightness and parallelism, the rail mounting screws are tightened starting in the middle of the rail length. Rail mounting bolts should be torqued to specification by alternating between each bolt. The installer should start with the bolt in the center of the rail length and proceed by alternating between each bolt left of center and each bolt right of center, while working towards both ends of the rail.

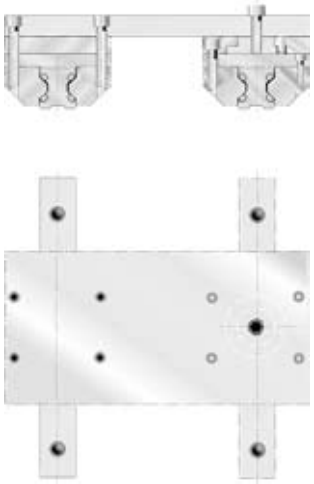
Afterwards, the cassette should be moved back and forth along the total stroke distance of the rail. If the cassette travels smoothly, the mounting process can proceed or be completed.

11.2 Mounting Parallel Double Sided Rails and Cassettes

With parallel double sided rail arrangements, we recommend that the master fixed rail side and slave adjustment rail sides of the guide system be identified. This allows optimum tolerances in parallelism to be achieved best by adjusting the slave adjustable rail, parallel to the master rail. The master fixed rail side should be mounted first to achieve the initial line of straight travel.

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The example below displays a convenient method for adjusting the slave adjustable rail parallel to the fixed master rail. Once the cassette travel is smooth, without play, one can proceed with rail mounting.



Note that the top plate spanning across the cassettes on opposite rails is completely bolted down to the cassette on the master fixed side only. The top plate end over the slave adjustable side is only bolted in one location, in the center of the slave adjustment side cassette. With one bolt holding the top plate to the slave adjustment side cassette, this cassette can pivot while the slave adjustable rail self-aligns parallel to the fixed master rail side. The floating top plate setup is stroked along the entire rail length, to establish the parallelism between the two rails.

Calibrated gauge blocks can also be used to establish equal integrity in rail parallelism. The installer should seat and temporarily clamp short pieces of precision ground round stock, tangent to the two guideways on the inside of each rail.

Rail Size	Precision Round Stock Sizes Ø mm
12	11
15	11
20	14
25	16
35	27
45	35

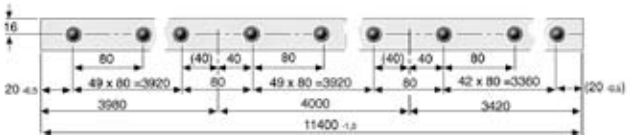
The calibrated gauge blocks can then be used, to locate off the precision round stock on the master fixed rail, in order to set the slave adjustable rail parallel. The gauge blocks are then locating the same way that the floating top plate is, by referencing both the master and slave rail guideway surfaces to establish parallelism.

Once the slave adjustable rail has been self-aligned, its bolts should also be torqued to specification in the order mentioned in paragraph 11.1. The top spanning across both cassettes on opposite rails, can then be securely fastened using all cassette mounting bolt holes.

12. Keyed Butt-jointing of Rail Sections

12.1 Rail Hole Spacing

Butt-jointed rails over L = 4000 mm are sectioned together according to the GDL standard. See “GDL’s Keyed Butt-Jointed Rail Option” on page C8. Butt-jointed rails sections are cut so that the standard rail mounting hole spacing is maintained across all butt-joints.



Keyed butt-jointed rails are usually shipped completely assembled, but sometimes must be shipped partially assembled, due to shipping length limitations and shipping care. Partially assembled butt-jointed rails are supplied with a butt-jointing clamping fixture and the keyways and screws for fastening rail section together.

12.2 Mounting of butt-jointed rails

Clean mounting surfaces, then place rail sections loose on the guide path, one behind the other. Lay the rails in their correct sequence of the system design (i.e.: 1, 2, 3, 4…etc.). The orientation of the depth groove on the lower surface of the rail should always be on the same side for all rail sections being butt-jointed.

Any non-assembled rail sections should be aligned with the factory supplied butt-joint clamping fixture as displayed below.



See explanation of “GDL’s Keyed Butt-Jointed Rail Option” on page G192.

Once all rail sections are assembled, the complete guide path can be aligned and fastened. Alignment and fastening should be conducted according to the applicable guide arrangement and steps previously described in this technical information section.

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C347

Ordering Instructions / Part Numbering System for GDL Rails

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
F	D	R	1	2	H	0	0	0	0	0	0	—	0	0	0	0	0

Series
FD Double Sided Rail Guide* (Standard

Rail
R Standard

Rail Size
1 2*
1 5*
2 0*
2 5*
3 5*
4 5*

Guideway Material
H High Performance Alloy Steel* (Standard)
S Stainless Steel

Coatings
0 Anodized Aluminum* (Standard)
Z Custom (Consult Factory)

Mounting Holes
0 Topside Thru Hole* (Standard)
1 Underside Blind Thread
Z Custom (Consult Factory)

"L11" Dimension
00 Equal on Both Sides* (Standard)
?? Actual Dimension (mm)**
** As measured from left side while viewing the depth groove line.

Long Rail Joining Option
0 None* (Standard)
1 Keyed Butt Joint (Size 25-45 Only)
2 Unkeyed Butt Joint

Screw Covers
0 None* (Standard)
1 Yes*
Note: Quantity supplied to cover all rail holes.

Length (mm)

—	0	0	0	0	0

Note: Maximum length is 4 meters on Size 12.

*Stocked Item

G

Ordering Instructions / Part Numbering System for GDL Cassettes

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
F	D	C	1	2	H	P	–	0	0	0	0	0	0	0	0

Series
FD Double Sided Rail Cassette* (Standard

Cassette
C Standard

Rail Size
1 2*
1 5*
2 0*
2 5*
3 5*
4 5*

Bearing Options
HP Axial Needle - High Performance Alloy Steel* (Standard)
SP Single Row Radial Ball - Standard Performance - Alloy Steel* (Standard)
ZZ Factory** (Consult Factory

Grease
0 High Performance* (Standard)
Z Custom (Consult Factory)

Lubrication Options
0 None* (Standard)
Z Custom (Consult Factory)**

Coatings
0 Anodized and Standard Hardware* (Standard)
1 Anodized and Stainless Steel Hardware*
Z Custom (Consult Factory)

Locking Mechanism
0 None* (Standard)
1 "L" Ratchet Handle*
2 Star Grip Handle*
* Locking mechanism only available on FD Series size 15 thru 45 with Axial Needle Bearing - High Performance - Alloy Steel.

Mounting Holes
0 Topside Threaded Thru* (Standard)
1 Underside Hole Thru (Unthreaded)
2 Underside Hole Thru (Threaded)

Wiper Options
0 With Felt Wipers* (Standard)
1 Without*
2 With Felt Wipers and Scrapers*

Cassette Length
0 Normal Length* (Standard)
Z Custom (Consult Factory)**

Adjustment
0 None* (Standard)
1 Adjusted to Specific Rail*

*Stocked Item
**Minimum Order Quantity Required

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GDL Application Sheet

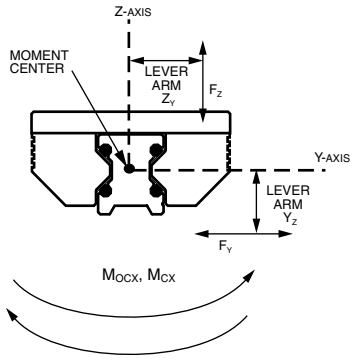
Distributor: _____ End-User: _____

Salesperson: _____

Phone: _____ Fax: _____ e-mail: _____

Other Information: _____

Roll



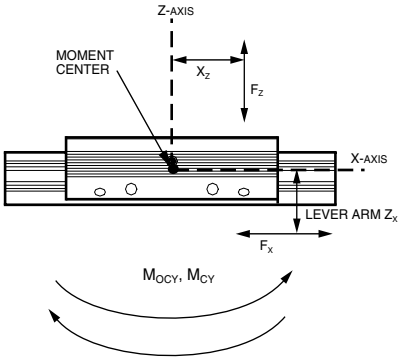
Roll load _____

X - Distance _____

Y - Distance _____

Z - Distance _____

Pitch



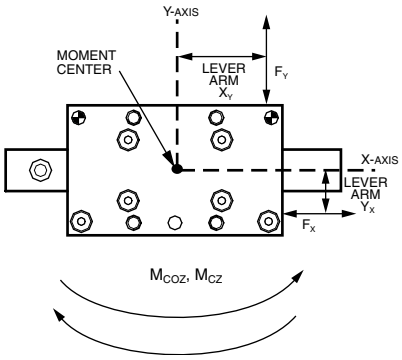
Pitch load _____

X - Distance _____

Y - Distance _____

Z - Distance _____

Yaw

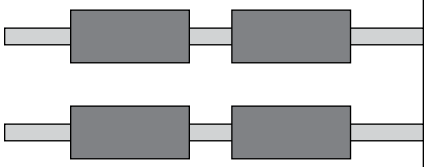


Yaw load _____

X - Distance _____

Y - Distance _____

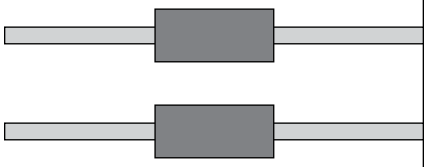
Z - Distance _____



Lengh of rails _____

Distance between rails _____

Distance between cassettes on each rail _____



Technical Data:

Stroke _____

Horizontal _____

Vertical _____

Velocity / Speed _____

Acceleration _____

Load / Mass _____

Load Distances _____

Lifetime Desired _____

Environment:
(Dirt, Humidity...)

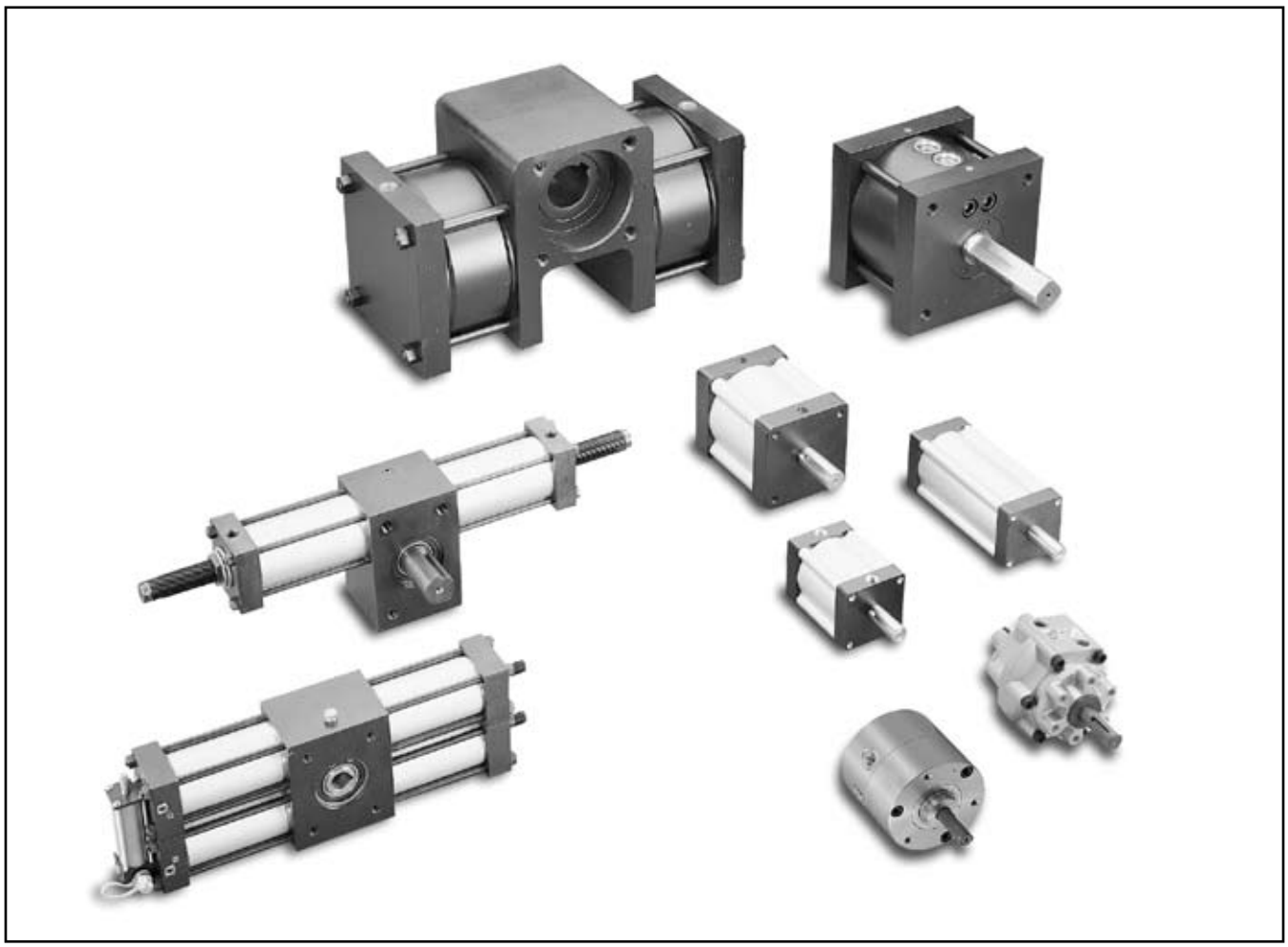
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Rotary Actuators

Section H



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Section H – Rotary Actuators

Vane Actuators

PV Series

- 8 Model Sizes
- Single and Double Vane Models
- 2 Standard Rotations
- 7 to 1800 lb-in Output Torque at 100 PSIG
- Pressures to 150 PSI

PRN(A) Series

- 5 Miniature and 4 Standard Models
- Rotation Angles 90°, 100°, 270° and 280°
- Oscillating Reference Points of 40°, 45° and 90°
- 1.33 to 2355 in-lb torque at 100 PSI

WR Series

- 2 Models
- Adjustable Rotation from 30° to 205°
- 15 and 65 lb-in Output Torque at 100 PSIG

Rack & Pinion Actuators

PTR Series

- 5 Bore Sizes from 1" to 3-1/4"
- 5 Standard Rotations
- 39 to 2250 lb-in Output Torque at 100 PSIG
- Pressure to 250 PSI

B671 / F672 Series

- 4 Bore Sizes from 1-1/2" to 5"
- Hydro-Check Option
- 100 to 2500 lb-in Output Torque at 100 PSI
- Pressures to 140 PSI

HP Series

- 2 Large Bore Models
- 3 Standard Rotations
- 4,500 and 10,000 lb-in Output at 100 PSI

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Selection Guide

Basic performance features of the rotator product line are shown below. See product sections for greater detail and ordering information.

Type		Vane			Rack & Pinion		
Series		**PV**	**PRN(A)**	**WR**	**PTR**	**B671**	**HP**
Standard Rotations		95°/100° [1] 275°/280° [2]	90°/100° [1] 180° [2] 270°/280° [2]	210°	90° 180° 270° 360°	90° 180°	90° 180°
Maximum Torque at 100 PSI (lb-in)		1800	2540	65	2000	2500	10,000
Maximum Air Pressure Rating (PSI)		150	100/140	150	250	140	100
Shaft Bearing Type		Ball or Composite Bushing	Composite	Radial Ball Bushing	Radial Ball Bushing	Bronze Bushing	Bronze Bushing
Non-Lube Service		●	●	●	●	●	●
Metric (M) or Imperial (I)		I	M	I	M,I	I	I
Switch Options	Hall Effect	●	●	C	●		
	Reed	●	●	C	●	C	
	Proximity Sensor			●	●		●
Shaft Options	Double End	●	●		●		
	Female				●	●	●
	Preload Keyway				●		
	Special	C		C	C	C	C
Rotation Options	Stroke Adjust	●	●	●	●		●
	Cushions				●	●	●
	Bumpers	●	●	●	●		
	Shock Absorbers		●	●	●		
Port Relocation		●	●		●	C	●
3-Position		C			●		
Air / Oil					●	● [3]	
Zero Backlash		●	●	●	●		
Fluorocarbon Seals		●	●		●		●
Flange Mount		●	●		●		
Washdown		●	C		C		
Clean Room			C				

● = Available from catalog
C = Consult Factory

[1] Double vane

[2] Single vane

[3] Hydro-check option

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Notes

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PV Series

Pneumatic Vane Rotary Actuators



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Engineering Data H9
Dimensions H10
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Sensors H14
Service Kits H15

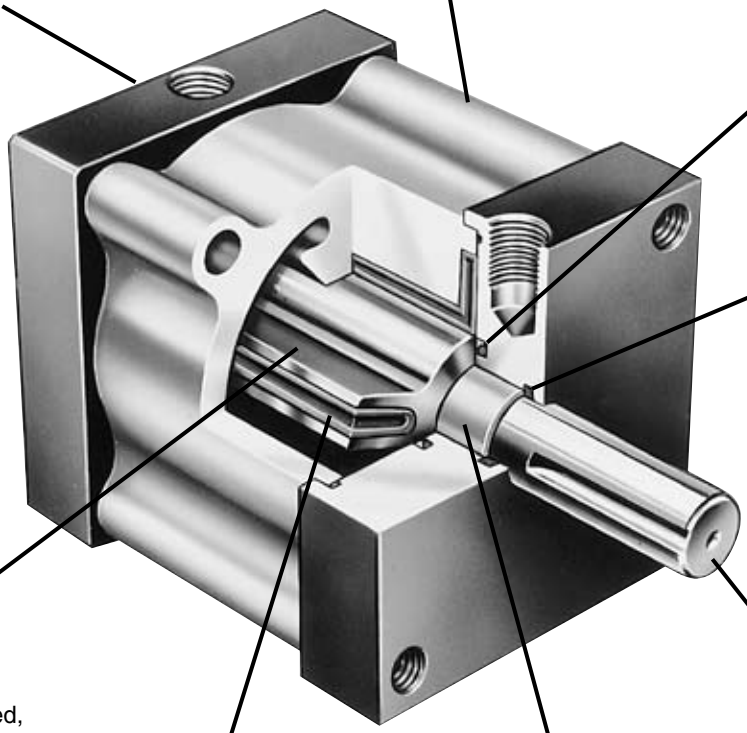
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A076

Heads
Solid stock heads are precision machined from aluminum, then hard-coat anodized and permanently sealed to ensure long seal life and low breakaway pressure. Solid stock heads eliminate cavities where contaminants may collect and also allow rear porting.

Body
The precision body extrusion is hard-coat anodized and permanently sealed, resulting in a smooth, slick seal surface. This guarantees minimum breakaway and maximum seal life. The unitized body incorporates the stator(s) for superior rigidity.

Shoulder Seal
A nitrile energized, glass-filled Teflon® seal is utilized. It reduces bypass flow and friction, providing superior performance and long life.



Shaft Seal
The high quality, self-lubricated, abrasion resistant nitrile seal is a multiple lobe construction for leak-free operation and greater reliability.
(Cleanroom option available on sizes 22, 42, 44 and 46.)

Vane
A hard-coat anodized, precision aluminum extrusion is permanently affixed to shaft. The lightweight vane reduces inertia allowing very fast rotational speeds.

Vane Seal
A special self-lubricated, abrasion resistant nitrile compound is molded into a one-piece vane seal, providing low breakaway pressure and long life, even with no lubrication.

Shaft Bearing
Thermoplastic journal bearing provides washdown capability and low cost. Optional radial ball bushing offers greater precision.

Shaft
Stainless steel provides high strength and corrosion resistance for demanding applications.

3D CAD FILES
available for download at
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Model Code and Ordering Information

Example: PV22D - 090BS - BB2V - B

PV	22	D	–	090BS	–	B	B	2	V	–	B	

Model

10	22	33	42
11		36	44
			46

Vanes / Maximum Rotation

Omit	Single Vane, 280° Rotation (275° on PV10, PV11)
D	Double Vane, 100° Rotation (95° on PV10, PV11)

Rotation Options
(may order more than one)

Omit	Standard Units (no stroke adjusters, bumpers or switches)
090A	**Stroke Adjusters** adjustable from 60° to maximum unit rotation (preadjusted to 90°)
180A	**Stroke Adjusters** (single vane only) adjustable from 60° to 190° (preadjusted to 180°)
090B	**Internal bumpers**, 90° rotation[4]
180B	**Internal bumpers,** 180° rotation (single vane only)
090S	**Magnets**[1] added, 90° setting
180S	**Magnets**[1] added, 180° setting (single vane only)

Mounting

B	Base / Front (Std)
R	Rear Flange [2, 3]
F	Front Flange
S	Base / Rear Face [2]

Shaft

B	Single Male Keyed (Std)
C	Double End Male Keyed [2]

Ports

2	NPTF Top (Std) (10-32 on PV10 & PV11)
7	NPTF Rear [2] (10-32 on PV10 & PV11)

Options

Omit	- None
L	Radial Ball Bushings
V	Fluorocarbon Seals

Design Series

B	Current Design Series

Special Options

Omit - (STD)
Two digit code assigned by factory when any "X" appears in the model number or when special options or features are required.

1. Switches can be used with stroke adjusters or bumpers (example: PV22D-090BS-BB2-B).
2. Not available with switches or stroke adjusters.
3. No tapped mounting holes in face opposite the flange.
4. 90° bumpers (090B) not available on PV10/11 sizes.

Note:
Order Hall effect sensors and reed switches separately from the Electronic Sensors section.

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Specifications

- Maximum operating pressure: 150 psi air
- Output torque @ 100 psi: 8 to 1800 lb-in
- Standard rotations: Single vane units: 280° ± 1° (except size 10 & 11: 275° ± 2.5°)
  Double vane units: 100° ± 1° (except size 10 & 11: 95° ± 2.5°)
  Also available with stroke adjusters and internal stops to provide 90° and 180° rotation
- Maximum breakaway pressure and bypass leakage: see table
- Mounting orientation: unrestricted
- Operating temperature range†: Nitrile seals 30 to 180°F
  Fluorocarbon seals* 30 to 250°F
- Filtration requirement: 40 micron filtered, dry air

* See Fluorocarbon seal option for high temperature applications.
† For low temperature version, please consult factory.

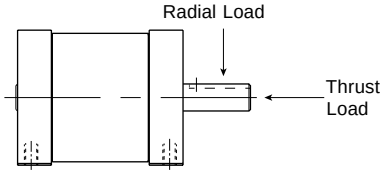
Quick Reference Data

Model	Maximum Rotation (Deg)	Actual Output Torque (lb-in) at Specified Input Pressure (PSI)			Displacement (in^3)	Maximum Breakaway Pressure (PSI)	Maximum Bypass Leakage @100 PSI (cfm)	Unit Weight (lb)
		50	75	100				
10	275	4	6	8	0.52	25	0.15	0.38
10D	95	8	12	16	0.37	20	0.20	0.38
11	275	8	12	16	1.04	20	0.15	0.50
11D	95	17	25	33	0.74	15	0.20	0.50
22	280	32	48	64	3.67	15	0.20	0.50
22D	100	68	101	135	2.62	10	0.25	1.75
33	280	75	112	150	8.70	15	0.20	3.44
33D	100	155	235	315	6.20	10	0.25	3.56
36	280	150	220	300	17.40	15	0.20	5.19
36D	100	315	470	630	12.40	10	0.25	5.50
42	280	140	210	285	17.80	15	0.20	7.13
42D	100	300	450	600	14.58	10	0.25	7.50
44	280	285	425	570	35.61	15	0.20	8.81
44D	100	600	900	1200	29.17	10	0.25	9.38
46	280	425	640	850	53.41	15	0.20	10.50
46D	100	900	1350	1800	43.75	10	0.25	10.75

Kinetic Energy Ratings and Bearing Load Capacities

Model	Composite Bushing Load Capacities (lb)*		Radial Ball Bushing Load Capacities (lb)*		Distance Between Centerline Bearings	Maximum Kinetic Energy Rating for Models Based on Configuration (in-lb)		
	Radial	Thrust	Radial	Thrust		Standard	Stroke Adjusters	Bumpers
10	15	7	50	15	0.88	0.03	0.12	0.05
11	15	7	50	15	1.50	0.06	0.12	0.09
22	50	25	Consult Factory		2.38	0.25	0.50	0.38
33	100	50	Consult Factory		3.50	0.75	1.50	1.13
36	100	50	Consult Factory		6.50	1.00	1.50	1.50
42	200	75	Consult Factory		2.75	2.00	4.00	3.00
44	200	75	Consult Factory		4.75	2.50	4.00	3.75
46	200	75	Consult Factory		6.75	3.00	4.00	4.75

* Bearing capacities only. Check Kinetic Energy ratings to determine if actuator will stop load.



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Kinetic Energy Basic Formula

$KE = 1/2\ Jm\omega^2$

$$\omega = 0.035 \times \frac{\text{Angle Traveled (Deg.)}}{\text{Rotation Time (Sec.)}}$$

where:

KE = Kinetic Energy (in-lb)

Jm = Rotational mass moment of inertia (in-lb-sec^2) (Dependent on physical size of object and weight)

ω = Peak Velocity (rad/sec) (Assuming twice average velocity)

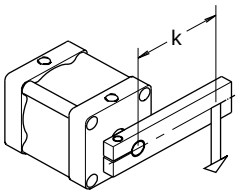
W = Weight of load (lb)

g = Gravitational constant = 386.4 in/sec^2

k = Radius of gyration (in)

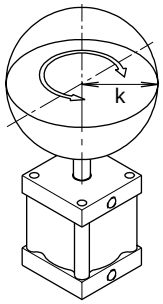
Moments of Inertia

POINT LOAD



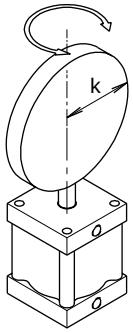
$$Jm = \frac{W}{g} \times k^2$$

SOLID SPHERE -
Mounted on center



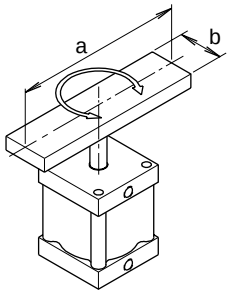
$$Jm = \frac{2}{5} \times \frac{W}{g} \times k^2$$

THIN DISK-
End mounted on center



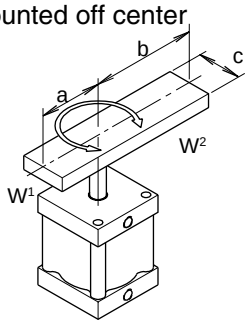
$$Jm = \frac{W}{g} \times \frac{k^2}{4}$$

THIN RECTANGULAR PLATE -
Mounted on center



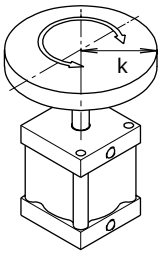
$$Jm = \frac{W}{g} \times \frac{a^2 + b^2}{12}$$

THIN RECTANGULAR PLATE -
Mounted off center



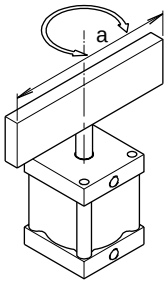
$$Jm = \frac{W^1}{g} \times \frac{4a^2 + c^2}{12} + \frac{W^2}{g} \times \frac{4b^2 + c^2}{12}$$

THIN DISK-
Mounted on center



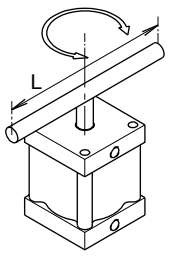
$$Jm = \frac{W}{g} \times \frac{k^2}{2}$$

THIN RECTANGULAR PLATE-
End mounted on center



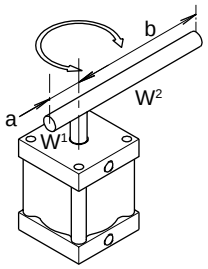
$$Jm = \frac{W}{g} \times \frac{a^2}{12}$$

SLENDER ROD-
Mounted on center



$$Jm = \frac{W}{g} \times \frac{L^2}{12}$$

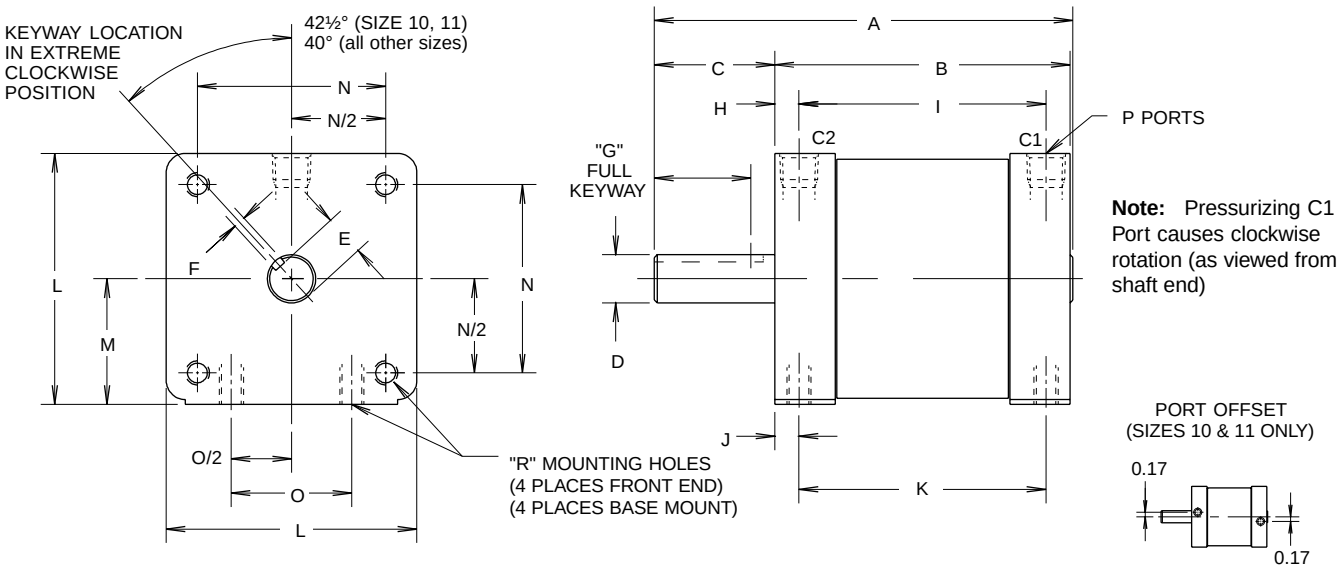
SLENDER ROD -
Mounted off center



$$Jm = \frac{W^1}{g} \times \frac{a^2}{3} + \frac{W^2}{g} \times \frac{b^2}{3}$$

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Standard Face/Base Mount (B) and Male Keyed Shaft (B)



Note: Pressurizing C1 Port causes clockwise rotation (as viewed from shaft end)

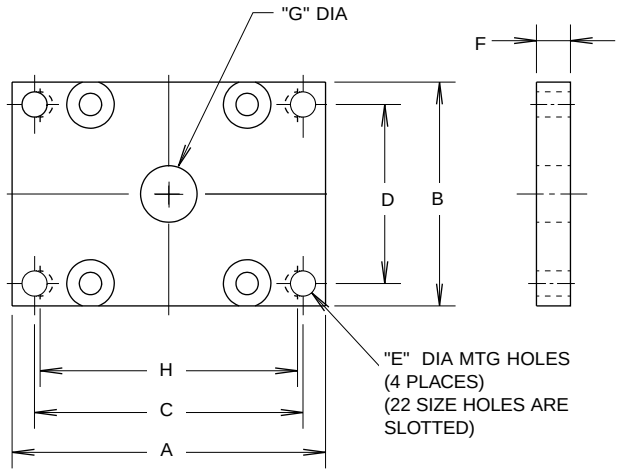
H

3D CAD FILES
available for download at
parker.com/automation

Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R
10	2.280	1.38	0.88	0.312 0.311	0.258 0.253	0.094 0.095	0.63	0.19	1.00	0.19	1.000	1.62	0.810	1.220	0.750	10-32	8-32 x 0.25 DP
11	2.905	2.00	0.88	0.312 0.311	0.258 0.253	0.094 0.095	0.63	0.19	1.63	0.19	1.625	1.62	0.810	1.220	0.750	10-32	8-32 x 0.25 DP
22	4.340	3.06	1.25	0.500 0.499	0.423 0.418	0.125 0.126	0.94	0.25	2.56	0.25	2.560	2.50	1.250	2.000	1.250	1/8 NPTF	1/4-20NC x 0.38 DP
33	6.180	4.40	1.75	0.749 0.748	0.644 0.639	0.188 0.189	1.38	0.35	3.70	0.26	3.875	3.00	1.500	2.436	1.500	1/4 NPTF	5/16-18NC x 0.47 DP
36	9.180	7.40	1.75	0.749 0.748	0.644 0.639	0.188 0.189	1.38	0.35	6.70	0.26	6.875	3.00	1.500	2.436	1.500	1/4 NPTF	5/16-18NC x 0.47 DP
42	6.280	4.00	2.25	0.999 0.998	0.859 0.854	0.250 0.251	2.00	0.50	3.00	0.50	3.000	4.50	2.250	3.500	2.375	1/4 NPTF	3/8-16NC x 0.75 DP
44	8.280	6.00	2.25	0.999 0.998	0.859 0.854	0.250 0.251	2.00	0.50	5.00	0.50	5.000	4.50	2.250	3.500	2.375	1/4 NPTF	3/8-16NC x 0.75 DP
46	10.280	8.00	2.25	0.999 0.998	0.859 0.854	0.250 0.251	2.00	0.50	7.00	0.50	7.000	4.50	2.250	3.500	2.375	1/4 NPTF	3/8-16NC x 0.75 DP

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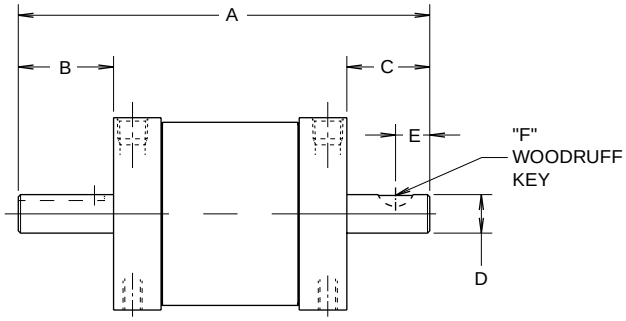
Flange Mount (F, R)*



Model	A	B	C	D	E	F	G	H
10	2.50	1.62	2.000	1.250	0.203	0.19	0.41	N/A
11	2.50	1.62	2.000	1.250	0.203	0.19	0.41	N/A
22	3.50	2.50	3.000	2.000	0.281	0.25	0.66	2.875
33	4.50	3.00	3.750	2.000	0.344	0.38	0.84	N/A
36	4.50	3.00	3.750	2.000	0.344	0.38	0.84	N/A
42	7.32	4.51	5.905	2.953	0.551	0.63	1.61	N/A
44	7.32	4.51	5.905	2.953	0.551	0.63	1.61	N/A
46	7.32	4.51	5.905	2.953	0.551	0.63	1.61	N/A

Note: The face opposite the flange mount does not contain tapped mounting holes. Consult factory if needed.

Double End Male Keyed Shaft (C)



Model	A	B	C	D	E	F
10	2.75	0.88	0.50	0.312 0.311	0.28	#302.5
11	3.38	0.88	0.50	0.312 0.311	0.28	#302.5
22	5.06	1.25	0.75	0.500 0.499	0.44	#404
33	7.15	1.75	1.00	0.749 0.748	0.56	#606
36	10.15	1.75	1.00	0.749 0.748	0.56	#606
42	7.53	2.25	1.28	0.999 0.998	0.72	#808
44	9.53	2.25	1.28	0.999 0.998	0.72	#808
46	11.53	2.25	1.28	0.999 0.998	0.72	#808

Note: Not available with switches or stroke adjustment. Consult factory for rear port option.

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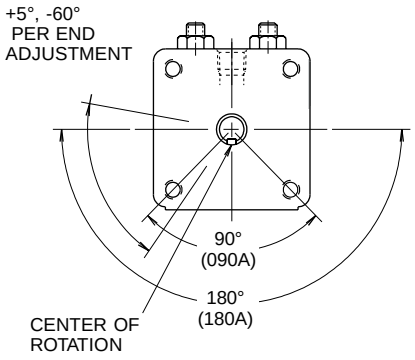
Adjustable Rotation Stop (090A, 180A)

An adjustable positive stop is available to provide end of rotation adjustability in a compact package. Total adjustment range is 60° to 190° on single vane actuators, and 60° to 100° on double vane actuators (95° on PV10/11 sizes). The rotation is factory preset to a nominal 90° or 180° (090A or 180A) for convenient installation.

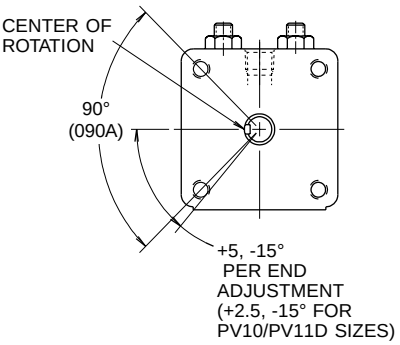
NOTE:

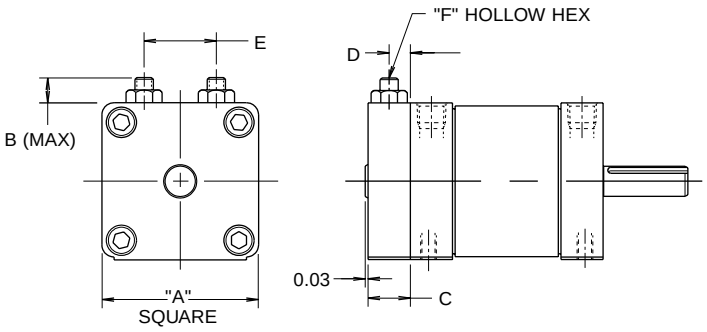
1. Not available with double end shaft.
2. Not available with rear ports.

SINGLE VANE UNIT



DOUBLE VANE UNIT





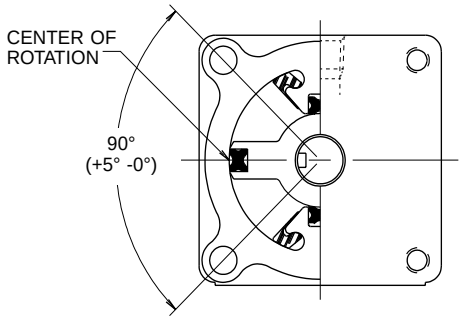
Model	A	B	C	D	E	F
10	1.62	0.63	0.47	0.24	0.75	3/32
11	1.62	0.63	0.47	0.24	0.75	3/32
22	2.50	1.00	0.72	0.36	1.25	5/32
33	3.00	1.16	0.97	0.48	1.56	3/16
36	3.00	1.16	0.97	0.48	1.56	3/16
42	4.50	1.38	1.25	0.56	2.25	7/32
44	4.50	1.38	1.25	0.56	2.25	7/32
46	4.50	1.38	1.25	0.56	2.25	7/32

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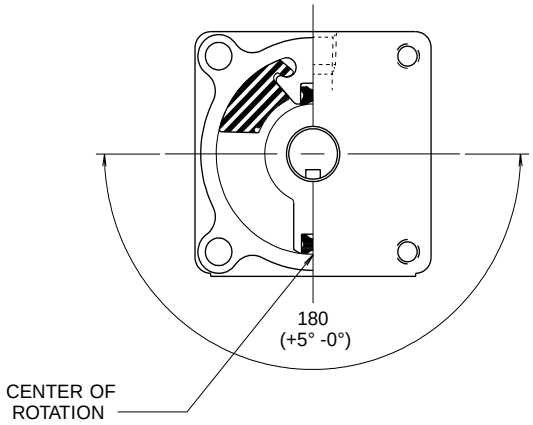
90° or 180° Bumpers (090B, 180B)

Bumpers are available to reduce noise and dissipate energy. This permits faster cycle times and increased production rates. Single vane units are available with 90° or 180° bumpers and double vane units are available with 90° bumpers.

90° BUMPERS (090B)

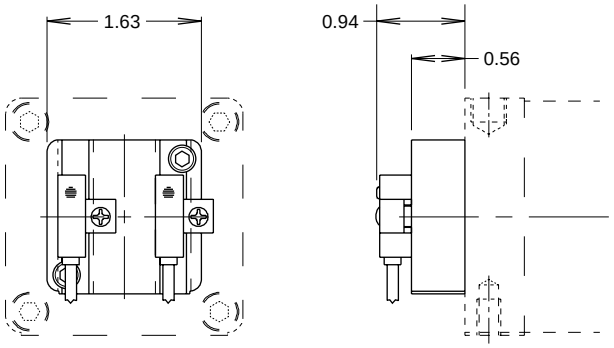


180° BUMPERS (180B)



90° or 180° Magnet (S)

Option "S" provides a magnet(s) attached to the actuator shaft. Hall effect or reed switches sense the position of these magnets. The switches are available in two nominal rotations, 90° or 180°, and the adjustment is ±20° for each switch to provide a total adjustment of ±40°. Adjustable stops, "A", or bumpers, "B", can be supplied in addition to magnets. Order switches separately.



Example Ordering Codes, Keyway Positions and Switch Sensing Locations:

Please note the following keyway position and switch sensing locations, with respect to ordering codes and options, with porting at the 12:00 position as viewed from the output shaft end (as shipped from the factory).

180S,180AS, 180BS - Single vane actuator with magnet or with magnet and stroke adjusters and/or bumpers: Keyway midstroke position at 6:00, magnet positioned to sense at 3:00 and 9:00.

090S, 090AS - Single vane actuator with magnet or with magnet and stroke adjusters: Keyway midstroke position at 6:00, magnet positioned to sense at 4:30 and 7:30.

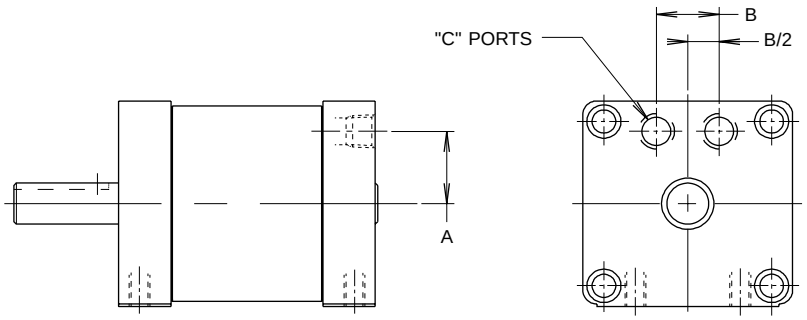
090S, 090AS, 090BS - Double vane actuator with magnet or with magnet and stroke adjusters or bumpers; or single vane actuator with magnet and bumpers: Keyway midstroke position at 9:00, magnet positioned to sense at 7:30 and 10:30.

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Rear Port (7)

Rear porting provides convenience for confined mounting on very small units being face mounted.

This option is not available with switches or stroke adjustment. Consult factory for double end shaft option.



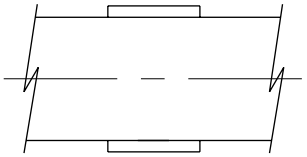
Model	A	B	C
10	0.54	0.50	10-32
11	0.54	0.50	10-32
22	0.88	0.75	1/8 NPTF
33	1.09	0.90	1/8 NPTF
36	1.09	0.90	1/8 NPTF
42	1.68	1.00	1/4 NPTF
44	1.68	1.00	1/4 NPTF
46	1.68	1.00	1/4 NPTF

Bearings - Radial Ball Bushings (L)

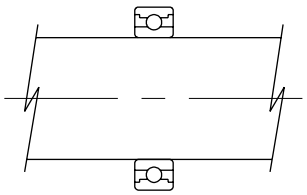
Composite bushings should be used for washdown, highly contaminated, and low priced applications. Radial ball bushings provide greater precision. For bearing load capacities, reference the Engineering Data section of the catalog.

Consult factory for pricing and availability.

Composite Bushing



Radial Ball Bushing



H

Fluorocarbon Seals (V)

Standard self-lubricating, abrasion resistant nitrile seals should be used for general purpose applications with temperatures of 0 to 180°F. Fluorocarbon seals are recommended for high temperature applications up to 250°F.

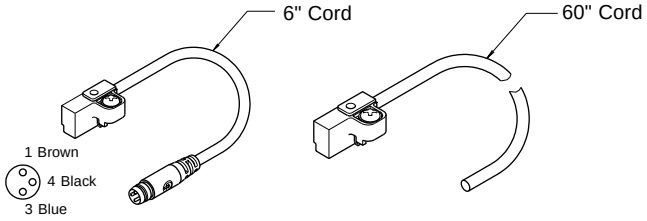
Option	Temperature Range* (°F)
Bumpers	0 - 200
Magnets	0 - 155
Switches	14 - 185

*Consult factory for higher temperature operation.

Solid State (Hall Effect) and Reed Sensors

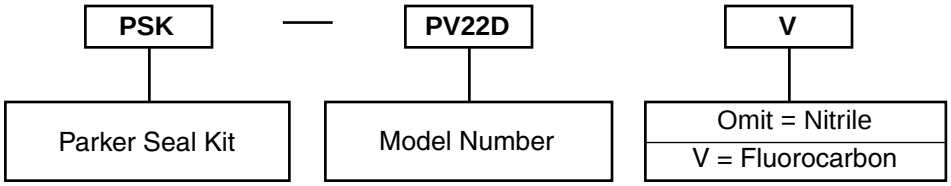
Sensors are available in a normally open or normally closed configuration. The low amp reed sensor is suitable for connection to PLCs or other low current devices. The high amp sensor can be used to drive sequencers, relays, coils or other devices directly.

Sensors must be ordered separately from the Electronic Sensors section.



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Seal Kit Ordering Information



Seal Kit Installation Tool

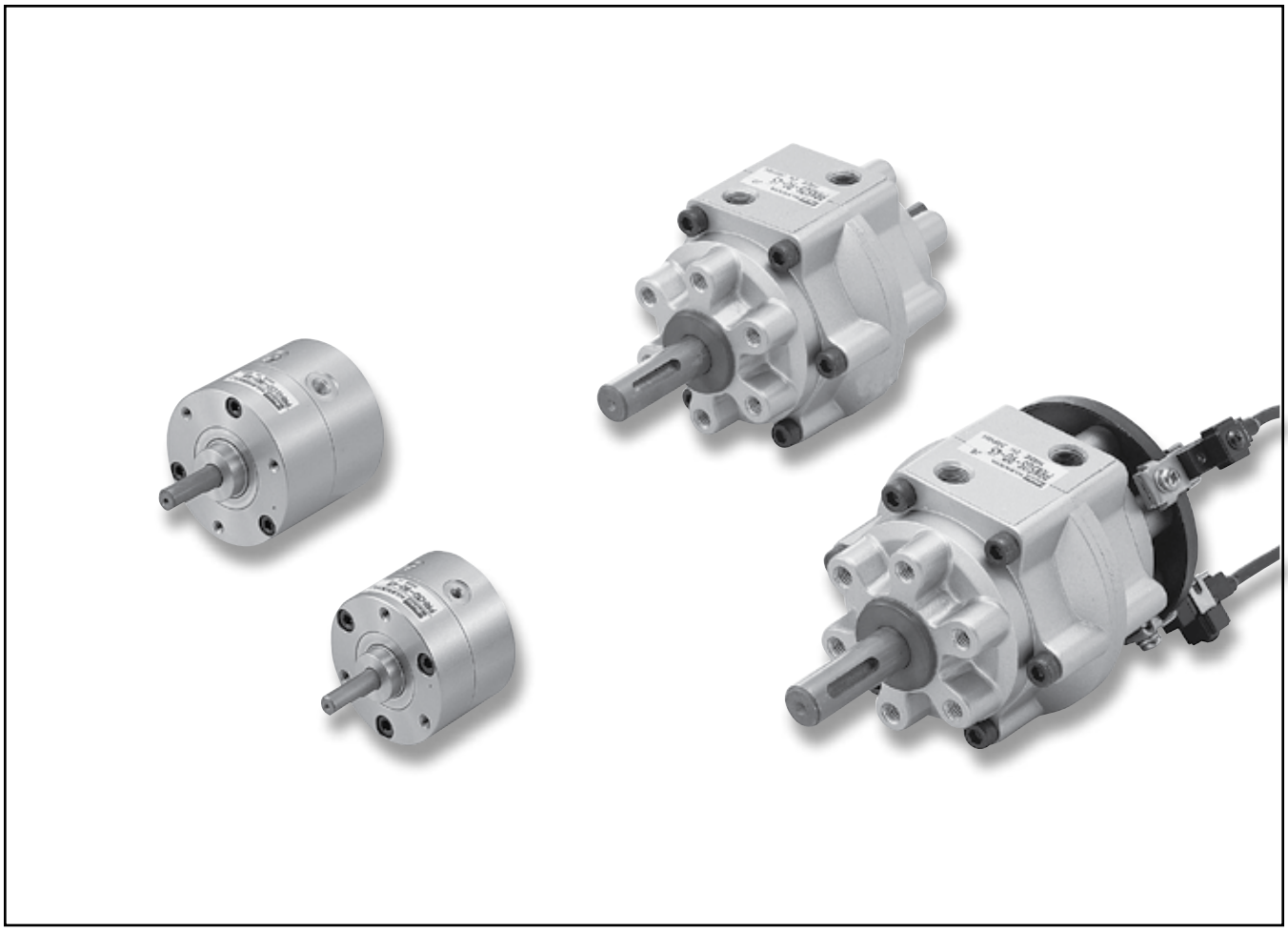
Model (S)	Items	Seal Guide Kit Number
PV10 &11 (D)	21, 22	ATS-PV1
PV22 (D)	21, 22	ATS-PV2
PV33 & 36 (D)	21, 22	ATS-PV3

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PRNA/PRN Series
Vane Rotary Actuators



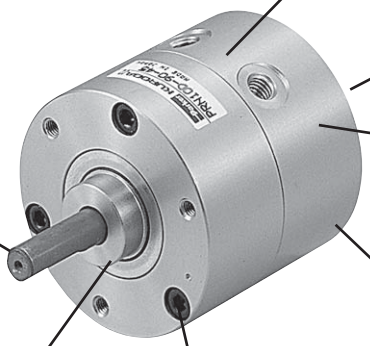
Contents

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Ordering Information H19
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Dimensions H23-H25
Mounting Options H26-H27
Shock Absorbers H28
Sensor Options H29-H30

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PRNA Series – Miniature Sizes 1 to 20



Reference Point Multiple keyway or mill flat orientations are available.

Shaft
A standard, double ended shaft allows for manual override. *Note: the rear shaft is square cut (sizes 20 and 30), and milled flat (sizes 1, 3, 10).*

Shaft & Vane
A one piece shaft, vane and seal with a rounded vane design provides high strength while reducing vane seal bypass.

Body
A two piece, precision machined body incorporates a rounded vane design, virtually eliminating vane seal bypass.

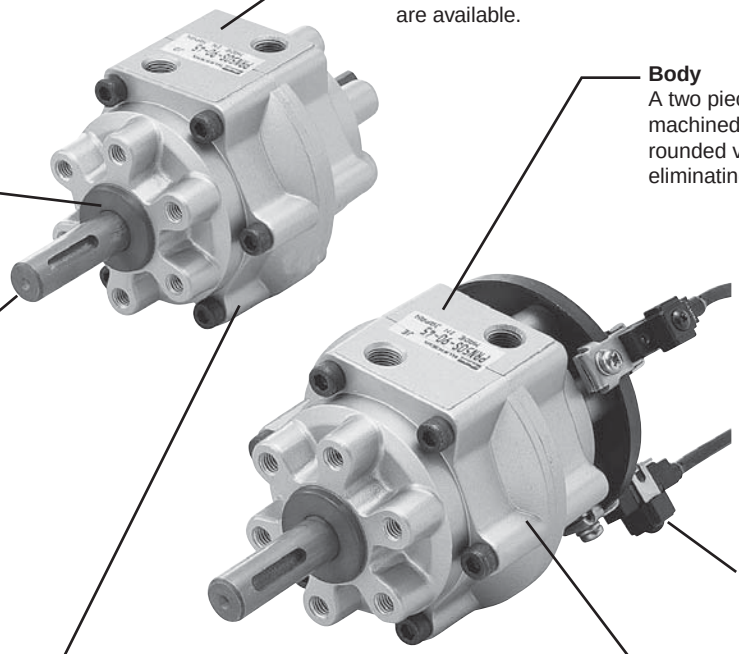
Single or Double Vane Options

Shaft Bushings
The shaft and vane assembly is supported by two composite bushings.

Bumpers
Internal stator with integral bumper design provides long life.

PRN Series – Sizes 30 to 800

H



Reference Point
Multiple keyway or mill flat orientations are available.

Shaft Bushings
The shaft and vane assembly is supported by two composite bushings.

Body
A two piece, cast and machined body incorporates a rounded vane design, virtually eliminating vane seal bypass.

Shaft & Vane
A one piece shaft, vane and seal with a rounded vane design provides high strength while reducing vane seal bypass.

Sensors
Optional solid state sensors are available.

Bumpers
Internal stator with integral bumper design provides long life.

Single or Double Vane Options

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Model Code and Ordering Information

Example: PRNA20S - 90 - 90S

PRNA – **20** – **S** – **90** – **90** – **S**

Type	
PRNA	Sizes 1-20
PRN	Sizes 30-800

Size				
1	**3**	**10**	**20**	**30**
50	**150**	**300**	**800**	

Type	
S	Single Vane
D	Double Vane

Rotation Angle	
90	90° (all sizes, single and double vane)
100	100° (sizes 50 through 800, double vane only)
180	180° (all sizes, single vane only)
270	270° (single vane only, not available on size 1)
280	280° (sizes 50 through 800, single vane only)

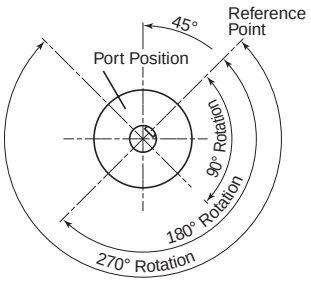
Oscillating Reference Point*	
40	40°
45	45°
90	90°

* See Specification Tables for availability of rotation angle / reference point combinations for the selected model.

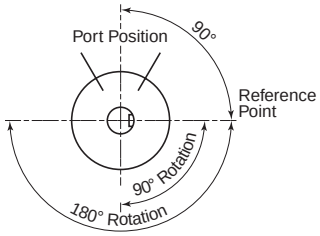
Porting	
Omit	Standard Porting
S	Rear Porting (sizes 3-20 only)

Reference Point and Rotation Orientations

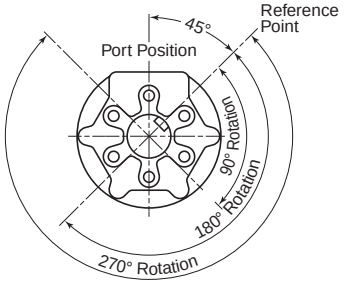
PRNA1S/D, PRNA3S/D, PRNA10S/D
PRNA20S/D, PRN30S/D
Reference Point at 45°



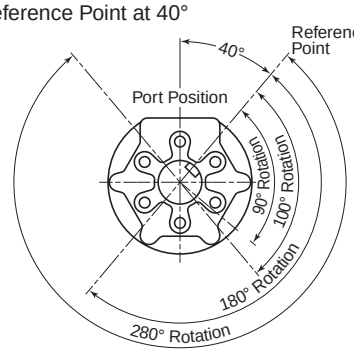
PRN1AS, PRNA3S
PRNA10S, PRNA20S
Reference Point at 90°



PRN50, 150, 300, 800
Reference Point at 45°



PRN50, 150, 300, 800
Reference Point at 40°



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Specifications

- Maximum Operating Pressure: See tables on pages H21-H22
- Output Torque @ 0.7 MPa: 16 to 1120 N•cm (1.4 to 99 in-lb)
- Standard Rotations: 90°, 180°, or 270° (See ordering information for limitations)
- Operating Temperature Range: -5 to 80°C (-23 to 176°)
- Filtration Requirement: 40 Micron Filtered, Dry Air

Quick Reference Data – PRNA Miniature

Model		Theoretical Output Torque								Maximum Breakaway Pressure		Unit Weight	
		0.3 Mpa (45 PSI)		0.5 MPa (75 PSI)		0.7 MPa (100 PSI)		1.0 MPa (145 PSI)					
		Ncm	(in-lb)	Ncm	(in-lb)	Ncm	(in-lb)	Ncm	(in-lb)	MPa	PSI	kg	lb
Single Vane	PRNA1S	8	(0.7)	13	(1.2)	19	(1.6)	—		0.08	(12)	0.04	(0.08)
	PRNA3S	17	(1.5)	31	(3)	45	(4.0)	—		0.10	(15)	0.07	(0.15)
	PRNA10S	46	(4.1)	86	(7.6)	127	(11)	—		0.10	(15)	0.14	(0.31)
	PRNA20S	80	(7.1)	159	(14)	240	(21)	350	(31)	0.10	(15)	0.25	(0.55)
Double Vane	PRNA1D	17	(1.5)	28	(2.5)	41	(3.6)	—		0.10	(15)	0.04	(0.09)
	PRNA3D	32	(2.9)	54	(4.8)	76	(6.7)	—		0.07	(10)	0.07	(0.16)
	PRNA10D	101	(8.9)	168	(15)	235	(21)	—		0.07	(10)	0.15	(0.33)
	PRNA20D	165	(15)	330	(29)	530	(47)	800	(71)	0.06	(9)	0.26	(0.57)

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Quick Reference Data – PRN

Model		Theoretical Output Torque								Maximum Breakaway Pressure		Unit Weight	
		0.3 Mpa (45 PSI)		0.5 MPa (75 PSI)		0.7 MPa (100 PSI)		1.0 MPa (145 PSI)					
		Ncm	(in-lb)	Ncm	(in-lb)	Ncm	(in-lb)	Ncm	(in-lb)	MPa	PSI	kg	(lb)
Single Vane	PRN30S	180	(16)	319	(28)	480	(42)	720	(64)	0.10	(15)	0.47	(1.04)
	PRN50S	259	(23)	479	(42)	700	(62.0)	1060	(94)	0.10	(15)	0.8	(1.8)
	PRN150S	850	(75)	1500	(133)	2100	(186)	3050	(270)	0.08	(12)	2.0	(4.4)
	PRN300S	1650	(146)	2850	(252)	4050	(358)	5750	(509)	0.08	(12)	3.7	(8.2)
	PRN800S	5910	(523)	10200	(903)	14400	(1274)	20500	(1814)	0.05	(7)	13	(28)
Double Vane	PRN30D	440	(39)	770	(68)	1120	(99)	1660	(147)	0.08	(12)	0.48	(1.06)
	PRN50D	579	(51)	1040	(92.0)	1510	(134)	2250	(199)	0.08	(12)	0.8	(1.8)
	PRN150D	1900	(168)	3500	(310)	4800	(425)	6900	(611)	0.06	(9)	2.0	(4.4)
	PRN300D	3900	(345)	6800	(602)	9700	(858)	1370	(121)	0.06	(9)	4.3	(9.5)
	PRN800D	12000	(1062)	20600	(1823)	28800	(2549)	41100	(3637)	0.05	(7)	13	(28)

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Model	Unit	PRNA1S			PRNA3S			PRNA10S			PRNA20S			PRN30S		
Vane		Single Vane														
Rotation	Degree	90	180	270	90	180	270	90	180	270	90	180	270	90	180	270
Rotational Tolerance	Degree	+4, -0														
Reference Point	Degree	90			45, 90		45	45, 90		45	45, 90		45	45		
Port Size		M5			M5			M5			M5			R_C 1/8		
Operating Pressure Range	MPa	0.3 to 0.7			0.2 to 0.7						0.2 to 1					
	psi	45 to 100			30 to 100						30 to 150					
Temperature Range	°C	-5 to 80												-5 to 60		
	°F	23 to 176												23 to 140		
Maximum Frequency*	cycle/min	300	180	70	260	160	60	240	150	100	210	120	60	180	90	60
Displacement	cm^3	1.4	1.4	1.5	3.4	3.4	4	9.8	9.8	12	17	17	21	37		43
	in^3	0.09	0.09	0.09	0.2	0.2	0.2	0.6	0.6	0.7	1.0	1.0	1.3	2.3		2.6

Model	Unit	PRNA1D	PRNA3D	PRNA10D	PRNA20D	PRNA30D
Vane		Double Vane				
Rotation	Degree	90	90	90	90	90
Rotational Tolerance	Degree	+4, -0				
Reference Point	Degree	45	45	45	45	45
Port Size		M5	M5	M5	M5	R_C 1/8
Operating Pressure Range	MPa	0.3 to 0.7	0.2 to 0.7		0.2 to 1	
	psi	45 to 100	30 to 100		30 to 150	
Temperature Range	°C	-5 to 80				-5 to 60
	°F	23 to 176				23 to 140
Maximum Frequency*	cycle/min	240	240	240	200	200
Displacement	cm^3	2	2.4	5	10	34
	in^3	0.12	0.1	0.3	0.6	2.1

Kinetic Energy Ratings and Bearing Load Capacities

Model Number	Bearing Load Capacities				Distance Between Centerline Bearings		Maximum Kinetic Energy Rating	
	Thrust Load		Radial Load					
	N	lb	N	lb	mm	in	mJ	in-lb
PRNA1S	1	0.2	10	2	15	0.6	0.8	0.01
PRNA3S	4	0.9	40	9	20	0.8	4	0.03
PRNA10S	4	0.9	50	11	30	1.2	8	0.07
PRNA20S	25	5.6	300	67	42	1.7	40	0.35
PRN30S	30	6.7	400	90	48	1.9	67	0.60

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Model	Unit	PRN50S				PRN150S				PRN300S			
Vane		Double Vane											
Rotation	Degree	90	180	270	280	90	180	270	280	90	180	270	280
Rotational Tolerance	Degree	+3 -0											
Reference Point	Degree	45	40, 45	45	40	45	40, 45	45	40	45	40, 45	45	40
Port Size		Rc 1/8				Rc 1/4				Rc 3/8			
Operating Pressure Range	MPa	0.2 to 1.0											
	psi	30 to 150											
Temperature Range	°C	5 to 60											
	°F	41 to 140											
Maximum Frequency*	cycle/min	180	90	60		120	80	50		90	60	40	
Displacement	cm^3	51		61	62	146		179	185	244	283	352	365
	in^3	3.1		3.7	3.8	8.9		10.9	11.3	14.9	17	21	22

Model	Unit	PRN800S				PRN50D		PRN150D		PRN300D		PRN800D	
Vane		Double Vane											
Rotation	Degree	90	180	270	280	90	100	90	100	90	100	90	100
Rotational Tolerance	Degree	+3, -0											
Reference Point	Degree	45	40, 45	45	40	40, 45	40	45	40	45	40, 45	45	40
Port Size		Rc 1/2				Rc 1/8		Rc 1/4		Rc 3/8		Rc 1/2	
Operating Pressure Range	MPa	0.2 to 1.0											
	psi	30 to 150											
Temperature Range	°C	5 to 60											
	°F	41 to 140											
Maximum Frequency*	cycle/min	65	45	30									
Displacement	cm^3	754	869	1036	1046	42	43	127	123	244	271	754	774
	in^3	46	53	63	64	2.6	2.6	7.7	7.5	14.9	16.5	46	47

***** Maximum frequency value given at a pressure of 0.5 MPa (73 psi) and under no load.

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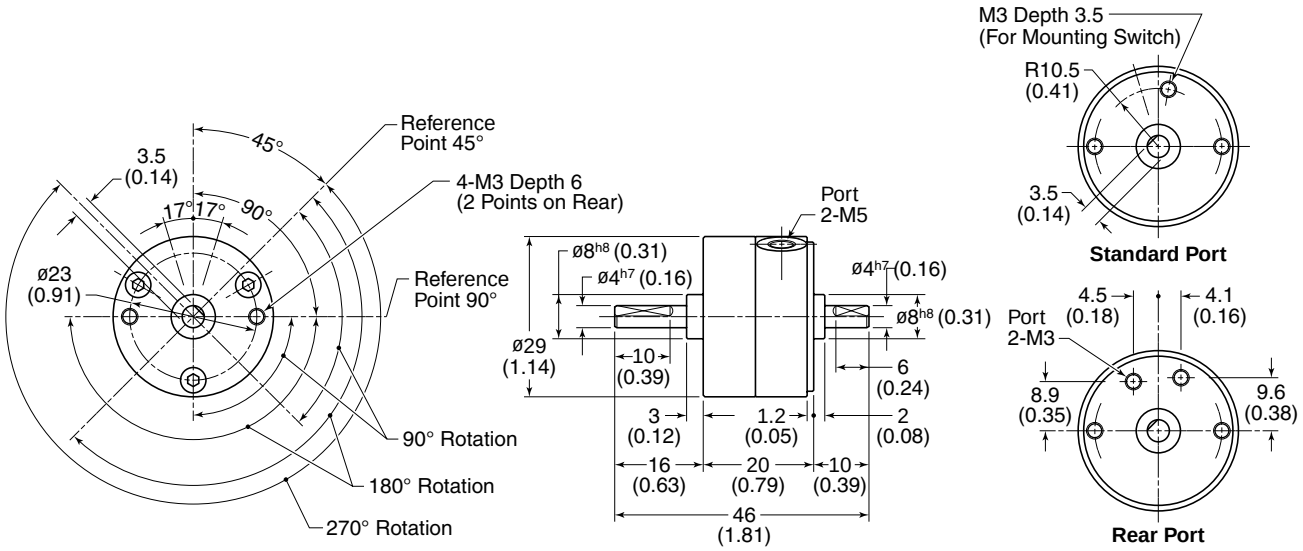
Kinetic Energy Ratings and Bearing Load Capacities

Model	Bearing Load Capacities				Distance Between Centerline Bearings		Maximum Kinetic Energy Rating					
	Thrust Load		Radial Load				Standard Unit		Shock Absorber (per cycle)		Shock Absorber (per cycle)	
	N	lb	N	lb	mm	in	J	in-lb	J	in-lb	J/hr	in-lb/hr
PRN50S/D	44.1	9.9	588	132	66	2.6	0.13	1.2	7.8	69	3100	27000
PRN150S/D	88.2	19.8	1176	264	79.5	3.1	0.6	5.3	10	231	11300	100000
PRN300S/D	147	33.0	1960	441	97.5	3.8	8.0	70	20	462	22000	194000
PRN800S/D	490	110.2	4900	1102	138.5	5.5	10.5	92	156	1387	56500	500000

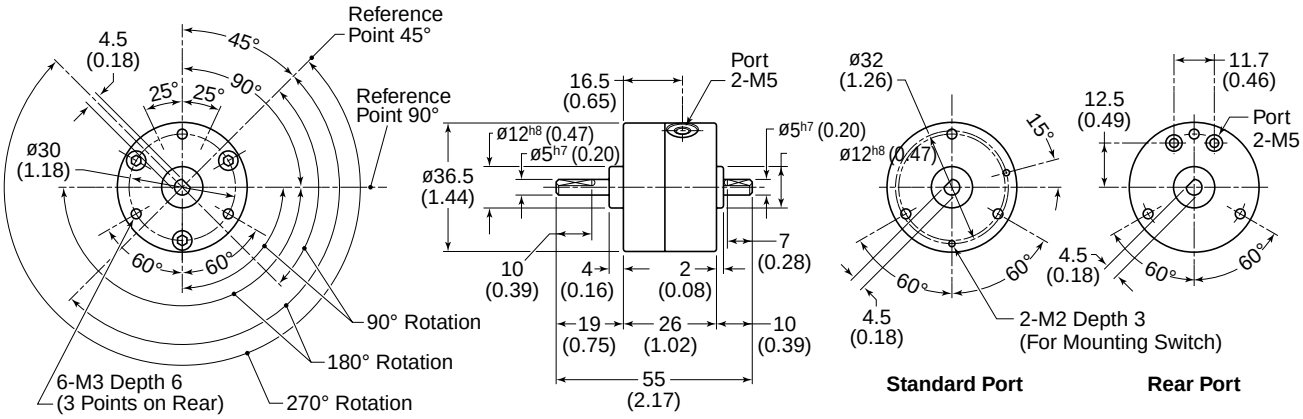
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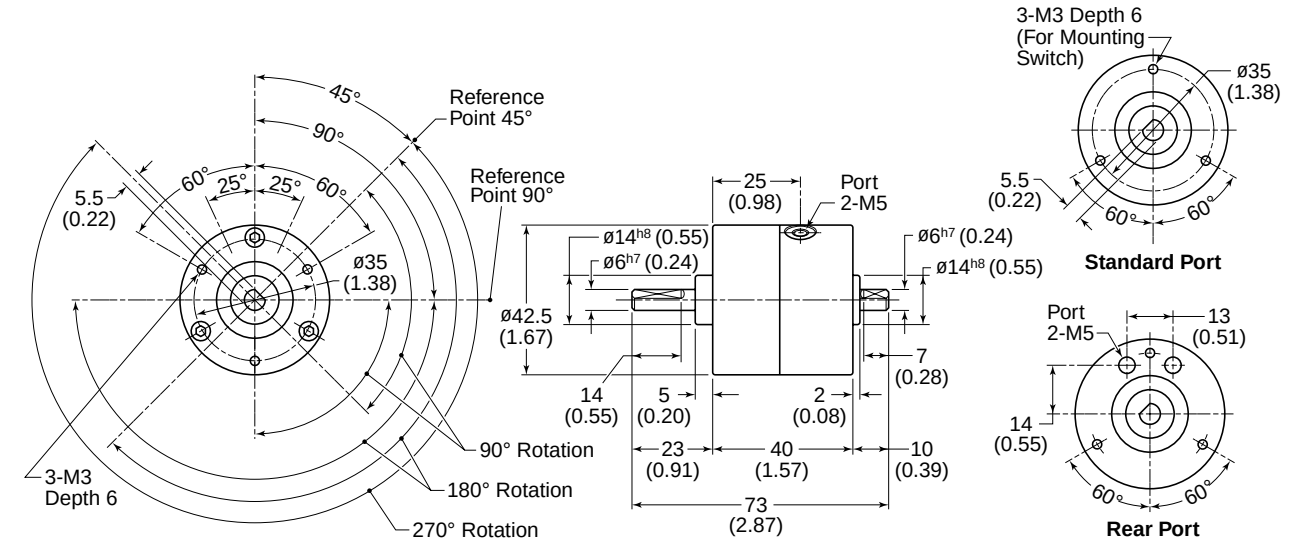
PRNA1S



PRNA3S/D



PRNA10S/D

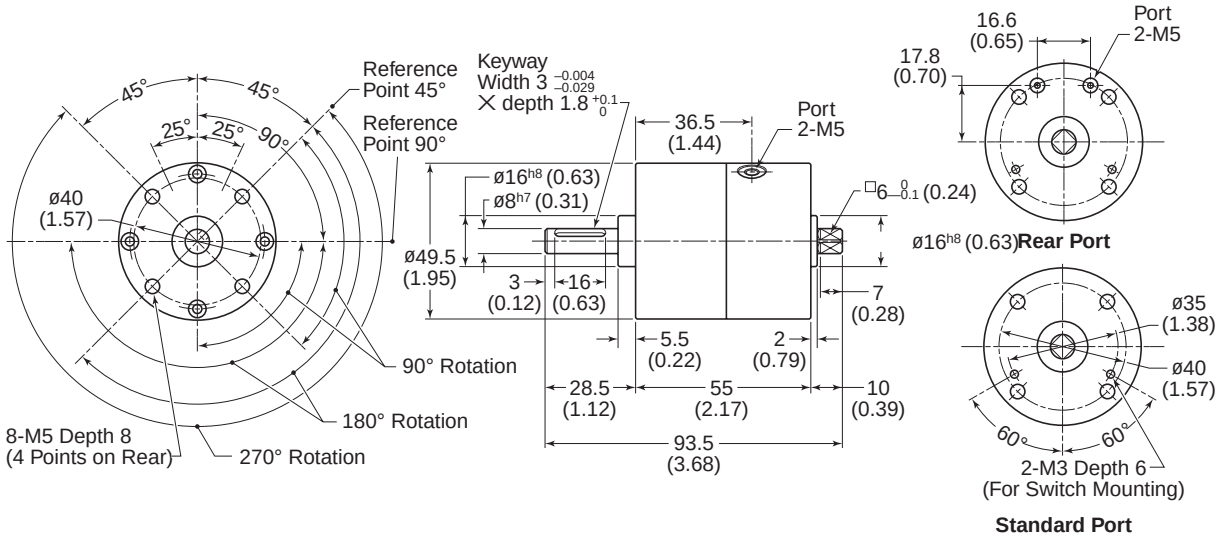


Dimensions are in mm (Inches)

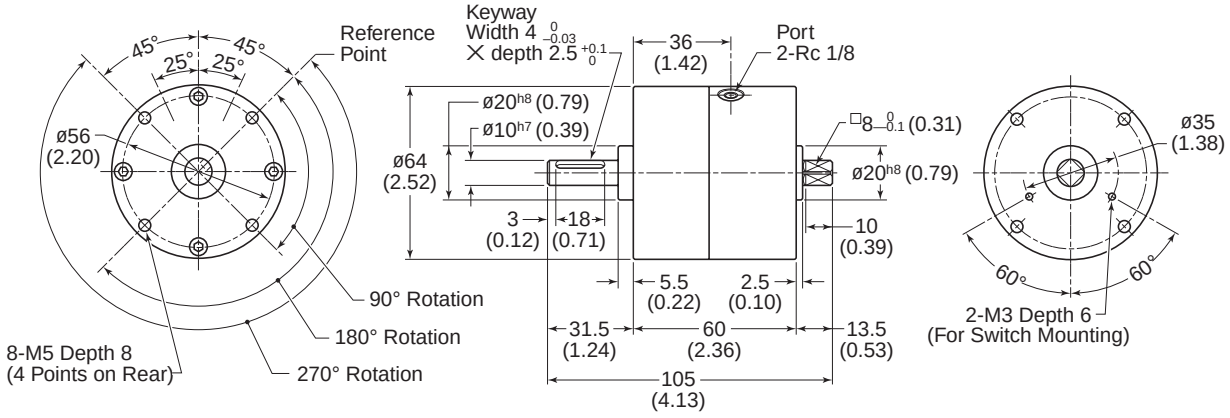
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PRNA20S/D



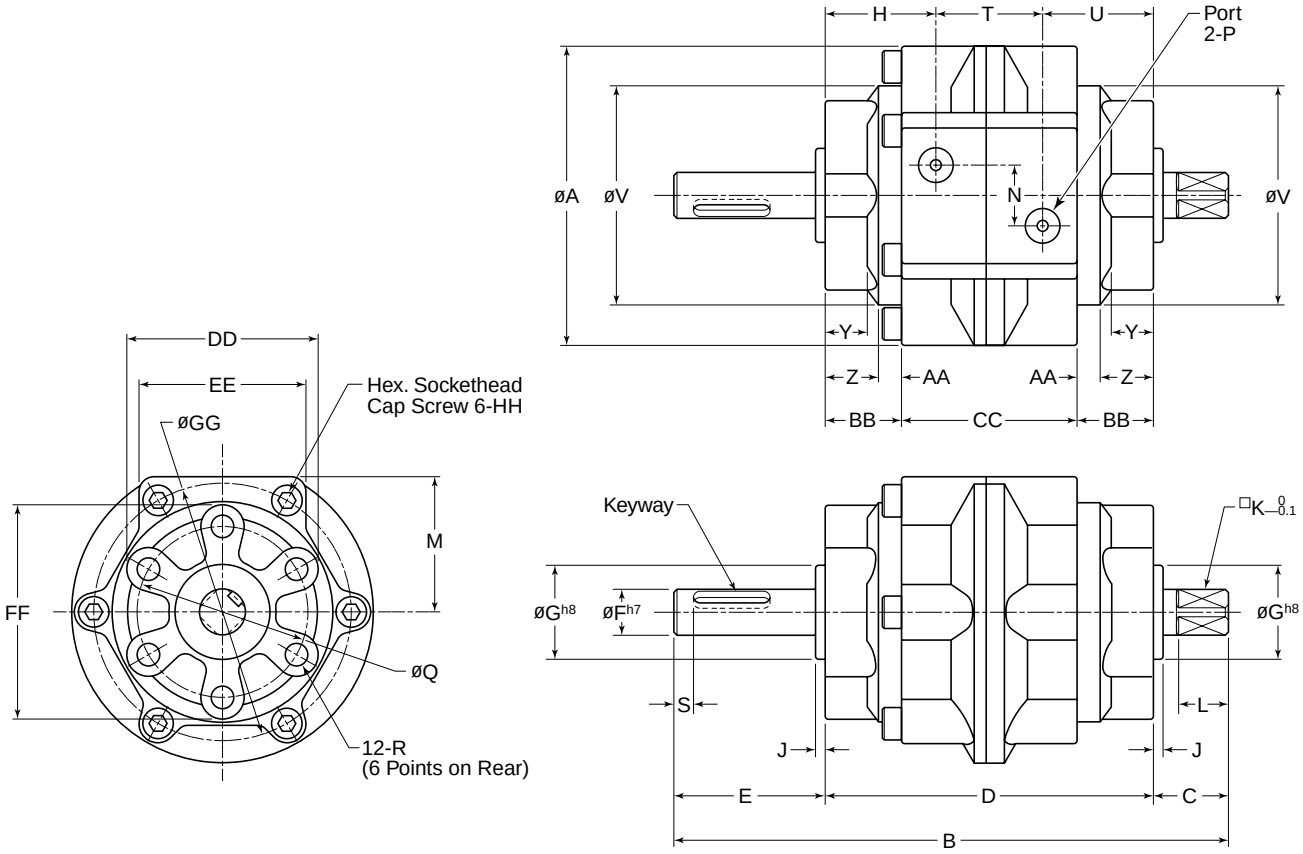
PRN30S/D



Dimensions are in mm (Inches)

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PRN Sizes 50 to 800



Model No.	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S
PRN50	79 (3.11)	145 (5.71)	19.5 (0.77)	86 (3.39)	39.5 (1.56)	12 (0.47)	25 (0.98)	29 (1.14)	2.5 (0.10)	10 (0.39)	13 (0.51)	36 (1.42)	16 (0.63)	Rc1/8	45 (1.77)	M6 x 1, Depth 9	5 (0.20)
PRN150	110 (4.33)	180 (7.09)	23.5 (0.93)	103 (4.06)	53.5 (2.11)	17 (0.67)	30 (1.18)	34.5 (1.36)	3 (0.12)	13 (0.51)	16 (0.63)	51 (2.01)	24 (0.94)	Rc1/4	70 (2.76)	M8 x 1.25, Depth 12	5 (0.20)
PRN300	141.5 (5.57)	220 (8.66)	30 (1.18)	125 (4.92)	65 (2.56)	25 (0.98)	45 (1.77)	41.5 (1.63)	3.5 (0.14)	19 (0.75)	22 (0.87)	66 (2.60)	32 (1.26)	Rc3/8	80 (3.15)	M10 x 1.5, Depth 15	5 (0.20)
PRN800	196 (7.72)	285 (11.22)	44.5 (1.75)	171 (6.73)	69.5 (2.74)	40 (1.57)	70 (2.76)	53.5 (2.11)	4.5 (0.18)	32 (1.26)	35 (1.38)	90 (3.54)	44 (1.73)	Rc1/2	120 (4.72)	M12 x 1.75, Depth 18	10 (0.39)

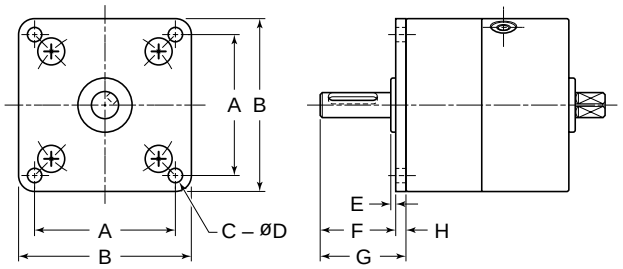
Model No.	T	U	V	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	Keyway Width x Depth x Length
PRN50	28 (1.10)	29 (1.14)	58 (2.28)	11 (0.43)	14 (0.55)	6 (0.24)	20 (0.79)	46 (1.81)	51 (2.01)	44 (1.73)	57 (2.24)	68 (2.68)	M5 x 30	$4\ ^{0}_{-0.03}$ x 2.5 $^{+0.1}_{0}$ x 20
PRN150	34 (1.34)	34.5 (1.36)	85.2 (3.35)	10.5 (0.41)	15.5 (0.61)	8 (0.31)	23.5 (0.93)	56 (2.20)	75 (2.95)	61 (2.40)	85 (3.35)	97 (3.82)	M6 x 35	$5\ ^{0}_{-0.03}$ x 3 $^{+0.1}_{0}$ x 36
PRN300	42 (1.65)	41.5 (1.63)	110 (4.33)	13 (0.51)	17.5 (0.69)	10 (0.39)	27.5 (1.08)	70 (2.76)	88.5 (3.48)	78 (3.07)	98.5 (3.88)	125 (4.92)	M8 x 45	$7\ ^{0}_{-0.03}$ x 4 $^{+0.2}_{0}$ x 40
PRN800	64 (2.52)	53.5 (2.11)	152 (5.98)	14.5 (0.57)	21.1 (0.83)	11.4 (0.45)	32.5 (1.28)	106 (4.17)	130 (5.12)	110 (4.33)	145 (5.71)	173 (6.81)	M12 x 70	$12\ ^{0}_{-0.043}$ x 5 $^{+0.2}_{0}$ x 40

mm (Inches)

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Flange Mount – Sizes 1 to 30

Note: • Should not be used on rear face when rear ports (S) or switches are specified.



Dimensions

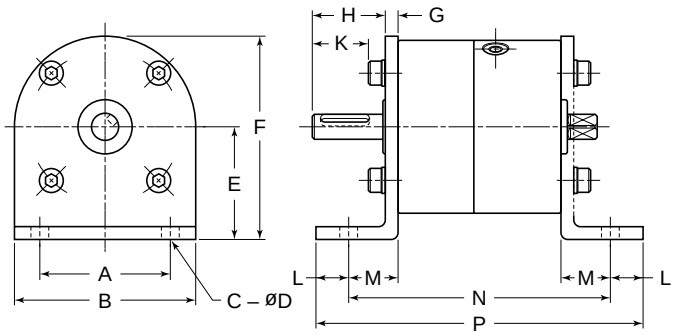
Part No.	A	B	C	D	E	F	G	H
PRNA1-P	24 (0.94)	30 (1.18)	4 (0.16)	3.4 (0.13)	1 (0.04)	14 (0.55)	16 (0.63)	2 (0.08)
PRNA3-P	30 (1.18)	37 (1.46)	4 (0.16)	3.4 (0.13)	1.5 (0.06)	16.5 (0.65)	19 (0.75)	2.5 (0.10)
PRNA10-P	34 (1.34)	42 (1.65)	4 (0.16)	3.5 (0.14)	1.8 (0.07)	19.8 (0.78)	23 (0.91)	3.2 (0.13)
PRNA20-P	41 (1.61)	50 (1.97)	4 (0.16)	5.5 (0.22)	1.9 (0.07)	24.9 (0.98)	28.5 (1.12)	3.6 (0.14)
PRNA30-P	52 2.05)	64 (2.52)	4 (0.16)	5.5 (0.22)	1.9 (0.07)	27.9 (1.10)	31.5 (1.24)	3.6 (0.14)

mm (Inches)

H

Foot Mount – Sizes 1 to 30

Note: • A foot plate can be rotated in intervals of 90°.
- Only one plate included. Two plates must be purchased to mount from both sides (as shown).
- Should not be used on rear face when rear ports (S) or switches are specified.



Dimensions

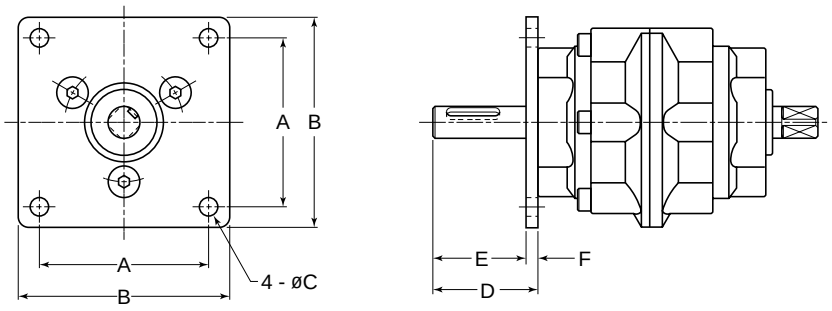
Part No.	A	B	C	D	E	F	G	H	K	L	M	N	P
PRNA1-L	20 (0.79)	30 (1.18)	2 (0.08)	4.8 (0.19)	22 (0.87)	37 (1.46)	2 (0.08)	14 (0.55)	10.3 (0.41)	5 (0.20)	10 (0.39)	40 (1.57)	50 (1.97)
PRNA3-L	26 (1.02)	36 (1.41)	2 (0.08)	4.8 (0.19)	25 (0.98)	43 (1.69)	2.6 (0.10)	16.4 (0.65)	12.7 (0.50)	7 (0.28)	11 (0.43)	48 (1.89)	62 (2.44)
PRNA10-L	30 (1.18)	42 (1.65)	2 (0.08)	5.8 (0.23)	30 (1.18)	51 (2.01)	3.2 (0.13)	19.8 (0.78)	16.1 (0.63)	8 (0.31)	12 (0.47)	64 (2.52)	80 (3.15)
PRNA20-L	36 (1.42)	49 (1.93)	2 (0.08)	7 (0.28)	34 (1.34)	58.5 (2.30)	3.6 (0.14)	24.9 (0.98)	18.6 (0.73)	10 (0.39)	15 (0.59)	85 (3.35)	105 (4.13)
PRNA30-L	48 (1.89)	66 (2.60)	2 (0.08)	6.5 (0.26)	42 (1.65)	75 (2.95)	4.5 (0.18)	27 (1.06)	20.7 (0.81)	12 (0.47)	18 (0.71)	96 (3.78)	120 (4.72)

mm (Inches)

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Flange Mount – Sizes 50 and 150

Note: A flange plate can be rotated in intervals of 60°



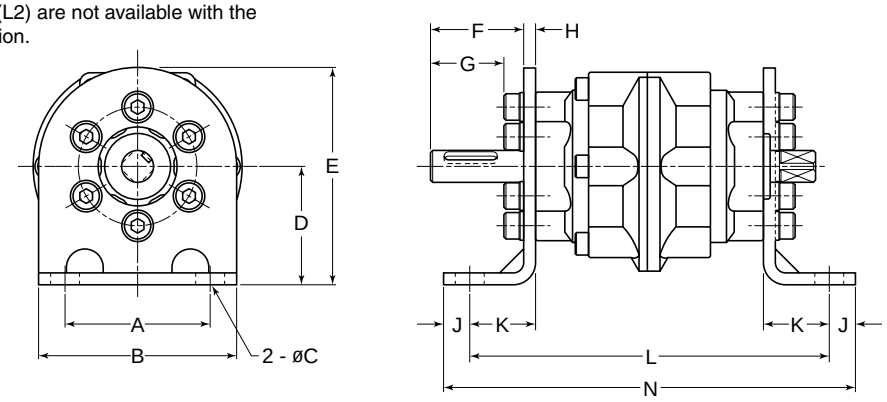
Dimensions

Part No.	A	B	C	D	E	F
PRN50-P	64 (2.52)	80 (3.15)	7 (0.28)	39.5 (1.56)	35 (1.38)	4.5 (0.18)
PRN150-P	88 (3.46)	110 (4.33)	9 (0.35)	53.5 (2.11)	47.5 (1.87)	6 (0.24)

mm (Inches)

Foot Mount – Sizes 50 to 800

Note: • A foot plate can be rotated in intervals of 60°.
• Two foot plates (L2) are not available with the CR, FM, FC option.



Dimensions

Part No.	A	B	C	D	E	F	G	H	J	K	L	N
PRN50-L	55 (2.17)	75 (2.95)	11 (0.43)	45 (1.77)	82.5 (3.25)	35 (1.38)	27.5 (1.08)	4.5 (0.18)	10 (0.39)	25 (0.98)	136 (5.35)	156 (6.14)
PRN150-L	80 (3.15)	110 (4.33)	13 (0.51)	65 (2.56)	115 (4.53)	43.5 (1.71)	33.5 (1.32)	10 (0.39)	12 (0.47)	28 (1.10)	159 (6.26)	183 (7.20)
PRN300-L	100 (3.94)	140 (5.51)	15 (0.59)	80 (3.15)	135 (5.31)	53 (2.09)	40.5 (1.59)	12 (0.47)	13 (0.51)	32 (1.26)	189 (7.44)	215 (8.46)
PRN800-L	140 (5.51)	200 (7.87)	15 (0.59)	110 (4.33)	200 (7.87)	54.5 (2.15)	39.5 (1.56)	15 (0.59)	15 (0.59)	35 (1.38)	241 (9.49)	271 (10.67)

mm (Inches)

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Shock Absorber

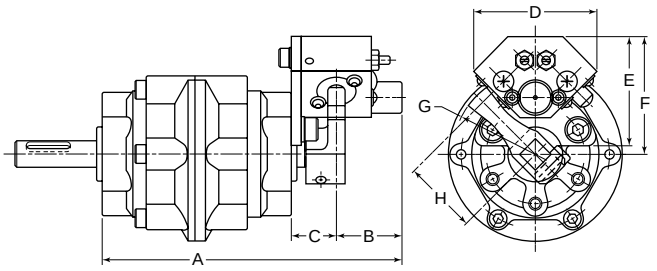
The CRN Series Shock Absorber should be used in applications involving high inertial loads. Inertial loads are a result of any or all of the following:

- High cycle speeds
- Heavy loads
- Physically / dimensionally large loads

When any of these characteristics are present, it is important that some means of deceleration, such as the CRN, is used.

Note:

- It is critical not to exceed the maximum kinetic energy values of the CRN. See chart below for kinetic energy calculations.
- When ordering a CRN, the shock absorber and the shock arm must be ordered separately.
- When a CRN is specified, maintain a minimum working pressure of 0.3 MPa.



Dimensions

Model No.	A	B	C	D	E	F	G	H
CRN50	136.5 (5.37)	30 (1.18)	20.5 (0.81)	56 (2.20)	50 (1.97)	54 (2.13)	R38 (1.50)	34 (1.34)
CRN150	159.5 (6.28)	34 (1.34)	22.5 (0.89)	80 (3.15)	62 (2.44)	71.5 (2.81)	R51 (2.01)	46 (1.81)
CRN300	187.5 (7.38)	37 (1.46)	25.5 (1.00)	95 (3.74)	87 (3.43)	96 (3.78)	R68 (2.68)	62 (2.44)
CRN800	244 (9.61)	42 (1.65)	31 (1.22)	130 (5.12)	118 (4.65)	135 (5.31)	R78 (3.07)	90 (3.54)

mm (Inches)

Shock Absorber Only

CRN50

①

Shock Arm

CRN50 – 90 – 45 – T

① ② ③

H

①

Model	
CRN50	for PRN50
CRN150	for PRN150
CRN300	for PRN300
CRN800	for PRN800

②

Rotation	
90	90°
100	100°
180	180°
270	270°
280	280°

③

Reference Point	
40	40°
45	45°

Relationship Between Rotation and Reference Point

Reference Point Options	Rotation			
	90°	180°	270°	280°
40°	X	X	N/A	X
45°	X	N/A	X	N/A

Note: Select a shock arm based on the reference point and rotation of the PRN to be used.

Model No.	Unit	CRN50	CRN150	CRN300	CRN800
Kinetic Energy (per cycle)	J	7.8	10	20	156
	in-lb	68	85	170	1356
Maximum Angular Velocity	Degree/s	850	750	650	550
Kinetic Energy (per hour)	J/hr	3100	11300	22000	56500
	in-lb/hr	26939	98197	191180	490985
Temperature Range	°C	5 to 50			
	°F	41 to 122			
Deceleration Angle	Degree	11	12	14	15
Weight	g	240	420	780	1620
	lb	0.528	0.924	1.716	3.564

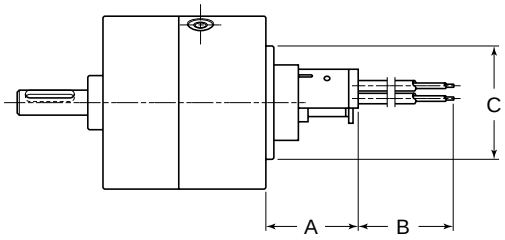
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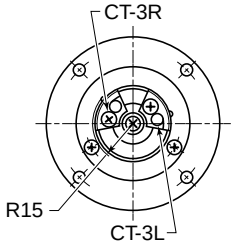
Variable Position Solid State (FR Series) Sensor

The FR Series variable position sensor provides the ability to adjust the sensor to sense along the full travel of the actuator. All switches and sensors must be ordered separately.

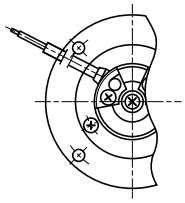
See the Electronic Sensors section for part numbers and sensor specifications.

Note: Not to be used in conjunction with rear ports (S).





FR Switch Unit



FU Switch Unit

Dimensions

Model	A	B	C
PRNA1	31.9 (1.26)	1000 (39.37)	29 (1.14)
PRNA3	30.7 (1.21)	1000 (39.37)	35 (1.38)
PRNA10	34 (1.34)	1000 (39.37)	42 (1.65)
PRNA20	34 (1.34)	1000 (39.37)	42 (1.65)
PRNA30	34 (1.34)	1000 (39.37)	42 (1.65)

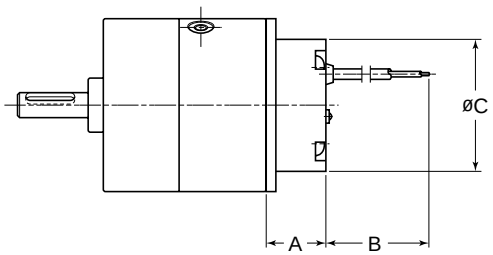
mm (Inches)

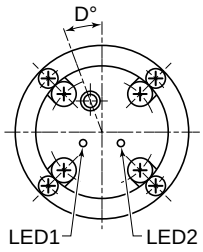
Fixed Position Solid State (SR / SU Series) Sensor

The SR or SU Series fixed position sensor senses the end of stroke only. All switches and sensors must be ordered separately.

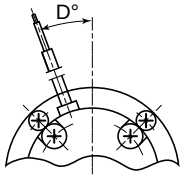
See the Electronic Sensors section for part numbers and sensor specifications.

Note: Not to be used in conjunction with rear ports (S).





SR Switch Unit



SU Switch Unit

Dimensions

Model	A	B	C	D
PRNA1	N/A	N/A	N/A	N/A
PRNA3	18 (0.71)	1000 (39.37)	36 (1.42)	30 (1.18)
PRNA10	18.3 (0.72)	1000 (39.37)	42 (1.65)	25 (0.98)
PRNA20	18.3 (0.72)	1000 (39.37)	49 (1.93)	20 (0.79)
PRNA30	21.8 (0.86)	1000 (39.37)	49 (1.93)	20 (0.79)

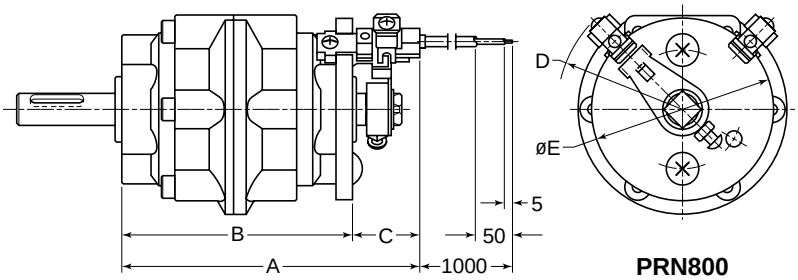
mm (Inches)

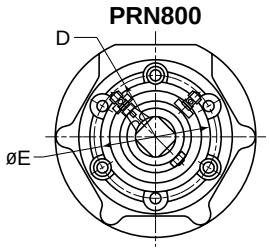
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Wadsworth, Ohio
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Variable Position Solid State (FR / FC Series) Sensor

The FR and FC Series variable position sensor provides the ability to adjust the sensor to sense along the full travel of the actuator. The FR Series sensor is to be used with the standard PRN sizes 50–800, and the FC Series sensor is to be used when a CRN Series shock absorber is specified.

See the Electronic Sensors section for part numbers and sensor specifications.



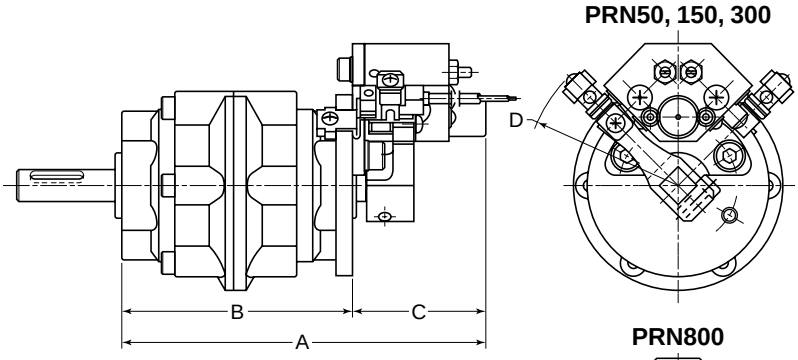


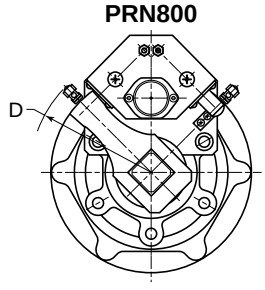
Dimensions

Model No.	A	B	C	D	E
PRN50	115 (4.53)	87.2 (3.43)	27.5 (1.08)	R47 (1.85)	69 (2.72)
PRN150	131.7 (5.19)	104.2 (4.10)	27.5 (1.08)	R61 (2.40)	97 (3.82)
PRN300	161.2 (6.35)	126.2 (4.97)	35 (1.38)	R69 (2.72)	113 (4.45)
PRN800	215.5 (8.48)	174.2 (6.86)	41.3 (1.63)	R60 (2.36)	108 (4.25)

mm (Inches)

H





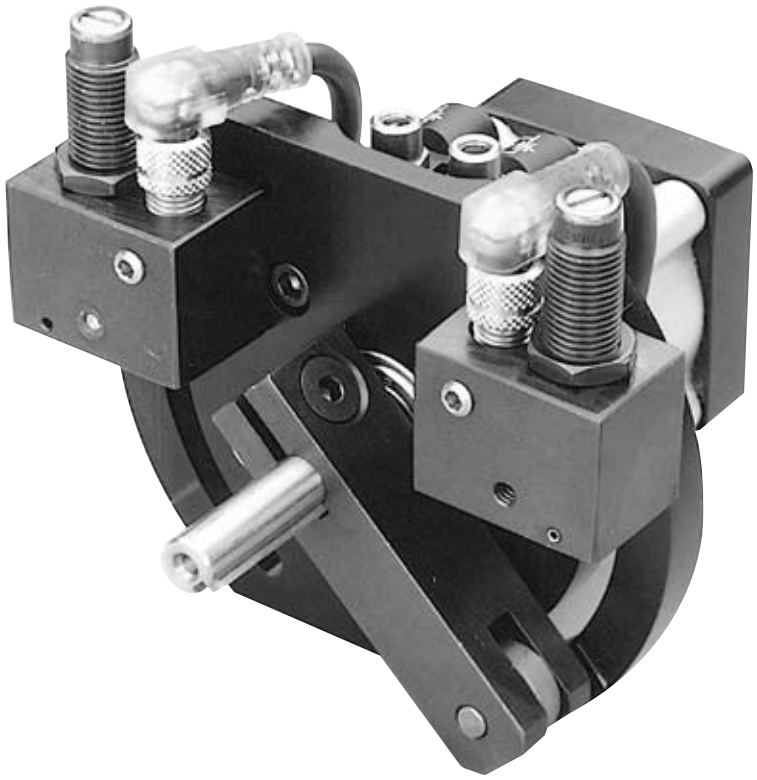
Dimensions

Model No.	A	B	C	D
PRN50	137.7 (5.42)	87.2 (3.43)	50.5 (1.99)	R58.2 (2.29)
PRN150	160.7 (6.33)	104.2 (4.10)	56.5 (2.22)	R72.2 (2.84)
PRN300	188.7 (7.43)	126.2 (4.97)	62.5 (2.46)	R88.2 (3.47)
PRN800	244 (9.61)	174.2 (6.86)	69.8 (2.75)	R118.5 (4.67)

mm (Inches)

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WR Series
Wrist Rotator



Contents

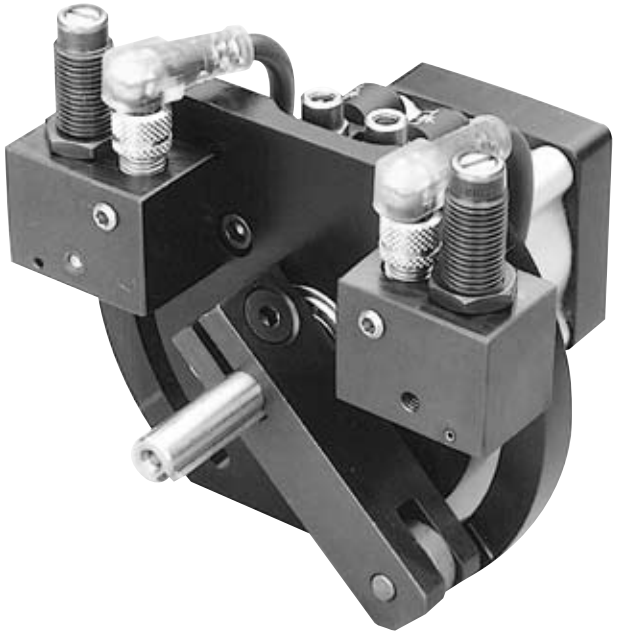
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WR Series Wrist Rotator

The Wrist Rotate Series rotary actuator provides added features to allow use as a modular pick-and-place component or as a precision pneumatic rotary actuator. Rotation stops provide adjustable rotation from 30° to 205° and feature hydraulic shock absorbers or polyurethane bumpers. Optional plug-in style inductive proximity sensors provide an end of rotation signal. Piston magnet option is available for use with Hall Effect and reed sensors for full rotation position sensing. The body features anodized aluminum and stainless steel construction for corrosion resistance.



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Ordering Information

WR **1** – **205** **C** **P** **F** – **A**

Size
- **1** 15 lb-in torque @ 100 psi
- **2** 65 lb-in torque @ 100 psi

Options
- **B** Bumpers (Std)
- **C** Shock absorbers

Sensors
- **Omit** None
- **P** PNP Proximity Sensor
- **N** NPN Proximity Sensor
- **S** Magnets added*

Right Angle Flow Controls
- **F** 5/32 tube connection (Std)

Design Series
- **A** - Current design series

***Order solid state (Hall Effect) and reed sensors separately from the Electronic Sensors section.

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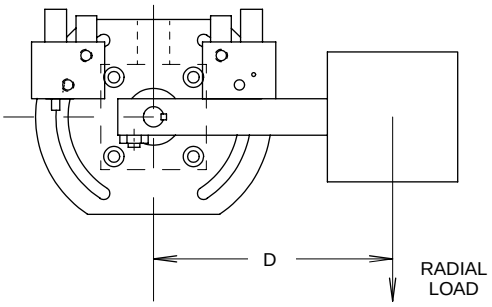
Specifications

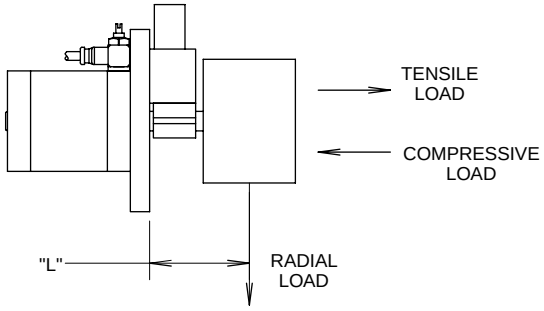
- Maximum operating pressure: 150 psi air
- Output torque @ 100 psi: 15 or 65 lb-in
- Rotation range: 30 to 205°
- Mounting orientation: unrestricted
- Operating temperature range: 0 to 180°F
- Filtration requirement: 40 micron filtered, dry air

Quick Reference

Model	Actual Output Torque (lb-in) at Specified Input Pressure (PSI)			Displacement (in^3)	Maximum Breakaway Pressure	Unit Weight (lb)
	50	75	100			
WR1	5	10	15	1.04	20	1.5
WR2	25	45	65	3.67	15	3.5

Sizing Information





Model	Maximum Dynamic Load Ratings				Max. Kinetic Energy (lb-in)	
	Radial Load (lbs)	Compressive Load (lbs)	Tensile Load (lbs)	Moment Load (lb-in)	With Bumpers	With Shock Absorbers
WR1	5	10	5	25	.11	6.00
WR2	25	50	25	125	.57	30.10

Kinetic Energy Calculations

In many cases, the size and life of a rotary actuator is determined not by its torque output, but rather by its energy dissipation capability. This is based on the assumption that if the actuator is capable of stopping the load, it is certainly capable of starting the load.

Both torque output and kinetic energy absorption must be considered if the actuator physically stops the load.

To calculate Kinetic Energy, the following variables are required:

1. Rotational Mass Moment of Inertia (J_m)
2. Total Rotation (Degrees)
3. Rotation Time (Seconds)

KINETIC ENERGY BASIC FORMULA

$KE = 1/2\ J_m\omega^2$

$$\omega = 0.035 \times \frac{\text{Angle Traveled (deg.)}}{\text{Rotation Time (sec.)}}$$

where

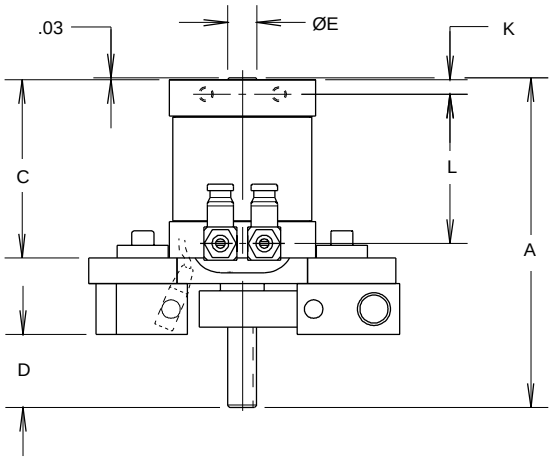
KE = Kinetic Energy (in-lb)

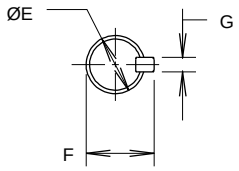
J_m = Rotational Mass Moment of Inertia (in-lb-sec^2)

ω = Peak Velocity (rad/sec)
(Assuming twice average velocity)

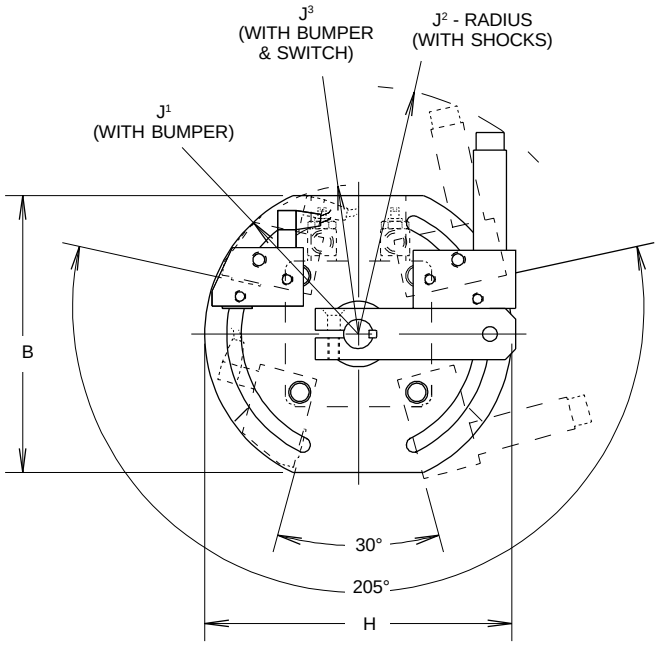
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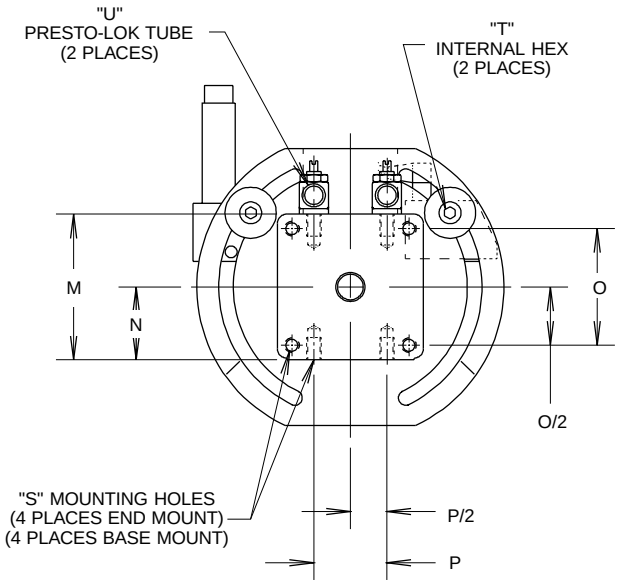
A076





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Dimensions

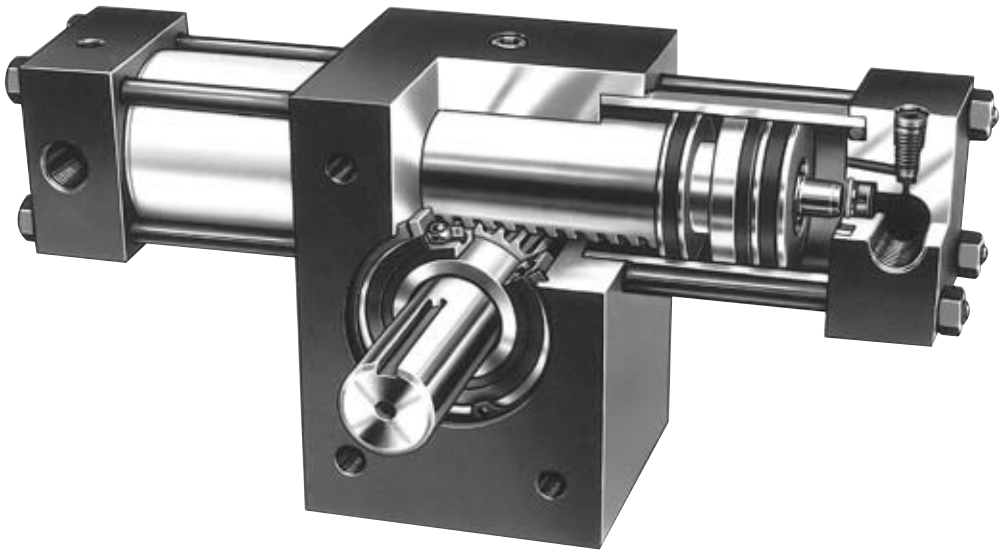
Model	A	B	C	D	ØE	F	G	H	J¹	J²	J³
WR1	3.97	3.00	2.00	0.88	0.312 0.311	0.352 0.347	0.094 0.093	3.63	1.89	2.54	2.30
WR2	5.65	4.75	3.06	1.25	0.499 0.498	0.548 0.543	0.125 0.124	5.25	2.61	4.26	—

Model	K	L	M	N	O	P	S	T	U
WR1	0.19	1.625	1.62	0.810	1.220	0.750	8-32 UNC x 0.25 DEEP	5/32	5/32
WR2	0.25	2.560	2.50	1.250	2.000	1.250	1/4-20 UNC x 0.38 DEEP	3/16	1/4

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PTR Series

Pneumatic Rack & Pinion Rotary Actuator



Contents

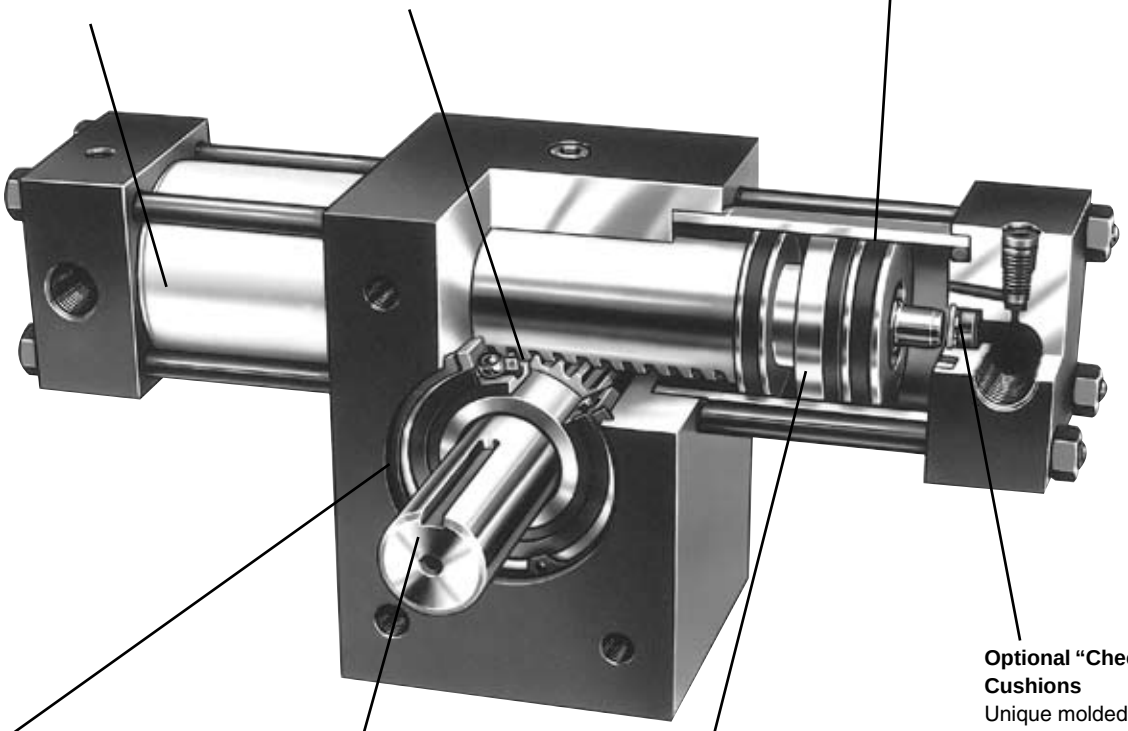
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Piston Seals
Unique geometry of lipseal provides low breakaway pressure and long life. The specially formulated Nitroxile ELF compound incorporates a unique internal lubricant to provide the lowest breakaway and running friction, while maintaining the best wear resistance available. Can be operated with no added lubrication.

Rack & Pinion
Heavy duty gear design is made from through hardened chrome alloy steel for maximum strength and shock resistance. The gear chamber is prelubricated to provide millions of trouble-free cycles.

Tubing & Body
Aluminum is hard-coat anodized and permanently sealed for maximum wear resistance and long life.



Sealed Ball Bearings
Reduce friction and breakaway pressure while providing substantial pinion and shaft support. This ensures a rigid and long lasting assembly, even for high cycle applications.

Standard Male Keyed Shaft
Is as large as possible to ensure superior strength; pinion and output shaft are one- piece to provide long life. A female shaft is available.

Pistons
Floating Wear-Tech® aluminum pistons are supported at both ends by rugged filled PTFE wear bands which prevent cylinder scoring, galling, and binding. A magnet groove is standard on all pistons, allowing field conversion to position sensors.

Optional "Check Seal" Cushions
Unique molded flow passages combine the benefits of floating cushions with check valve action, providing effective cushioning and quick stroke reversal for higher cycle and production rates. This proven design eliminates failure-prone springs and ensures minimum wear. An adjustable needle valve and springless check valve allow exact "tailoring" of the cushion to match the application.

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A076

Model Code and Ordering Information
Example: PTR251 - 0903FP - AB21MV - C

PTR	25	1	–	090	3	F	P	–	A	B	2	1	M	V	–	C	

Model [1]

10	1" Bore
15	1-1/2" Bore
20	2" Bore
25	2-1/2" Bore
32	3-1/4" Bore

Configuration

1	Single Rack
2	Double Rack
3	Three Position Actuator
6	Air/Oil Operation
7	Antibacklash

Rotation [2]

090	90°
180	180°
270	270°
360	360°

Or specify any other rotation.

Cushion / Bumpers

Omit	None
1	Cushioned CW Rotation [3]
2	Cushioned CCW Rotation [3]
3	Cushioned Both Rotations
4	Four Cushions [4]
5	Bumper CW Rotation [3]
6	Bumper CCW Rotation [3]
7	Bumper Both Rotations
9	Special

Stroke Adjusters

Omit	None
D	0-30° CW rotation [3, 5]
E	0-30° CCW Rotation [3, 5]
F	0-30° Both Rotations [5]
H	Shock/Stroke Adj. CW Rotation [3, 7]
K	Shock/Stroke Adj. CCW Rotation [3, 7]
L	Shock/Stroke Adj. Both Rotations [7]
X	Special

Port Flow Controls

Omit	None
P	Flow Control Both Rotations
R	Flow Control CW Rotation [3]
S	Flow Control CCW Rotation [3]

Mounting

A	Face/Base (STD)
F	Front Flange
G	Foot Flange
P	Pilot Ring
R	Rear Flange
X	Special

Shaft

A	Female Keyed
B	Single Male Keyed (STD)
C	Double Male Keyed
R	Preload Keyway
X	Special

Port Type

1	SAE Straight Thread
2	NPTF
4	BSPP (ISO 1179-1 with ISO 228-1 threads)
9	Special

Port Location

1	Position 1 (STD)
2	Position 2
3	Position 3
4	Position 4
5	Position 5 [6]
9	Special

Standard Options

Omit	None
M	Magnetic Piston Ring
S	Shaft Seal Cover
Q	Prepped for External Air/Oil Tank
L	Air/Oil Cushion & Flow Control Adj. at Location 1 (opposite standard)

Seals

Omit	Nitrile
V	Fluorocarbon
X	Special

Design Series

C	Current

Special Options

Omit STD

(Two-digit code assigned by factory and applies when any "X" or "9" appears in the model number or when special options or features are required.)

Other Options

Detail in clear text:
- Proximity Sensors
- Feedback Potentiometer

Order solid state (Hall effect) and reed sensors separately. See Electronic Sensors section for part numbers and specifications.

NOTES:

1 Cylinder bore size. See appropriate tables for torque output.

2 For 3-position units, specify middle and total rotation separated by a "/", ie 090/180. To obtain equal rotation both sides of midstroke (theoretical 12:00), order unit with 5° longer rotation than standard with stroke adjusters.

3 Viewed from shaft end.

4 Double rack models only.

5 Reduces to 10° with cushions.

6 Not available with cushions or stroke adjusters.

7 Refer to page H45 for option configuration compatibility.

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Specifications

- Maximum operating pressure: 250 PSI
- Output torque @ 100 psi: 39 lb-in to 2281 lb-in
- Standard rotations: 90°, 180°, 270°, 360°, 450°
- Maximum breakaway pressure: 5 PSI
- Zero internal and external leakage
- Mounting orientation: unrestricted
- Timing: keyway located at 12:00 position at midstroke of actuator
- Operating temperature range:
  - Standard seals 0 to 180°F
  - Fluorocarbon seals 0 to 250°F
- Filtration requirement: 40 micron filtered, dry air

Unit Weights (lb)

Model	Rotation			
	90°	180°	270°	360°
PTR101	2-1/4	2-1/2	2-3/4	3
PTR102	3-1/2	3-7/8	4-1/4	4-5/8
PTR151	8-1/4	8-3/4	9-1/4	9-3/4
PTR152	11-3/8	12-3/8	13-3/8	14-3/8
PTR201	13-5/8	14-5/8	15-5/8	16-3/4
PTR202	19-3/4	21-7/8	24	26-1/8
PTR251	21-1/8	22-3/4	24-3/8	26
PTR252	30-3/4	34	37-1/4	40-1/2
PTR321	44-1/4	46-5/8	49	51-3/8
PTR322	61-7/8	66-5/8	71-3/8	76-1/8

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Quick Reference Data

Model		Typ. Actual Output Torque @ 100 psi (lb-in)	Theoretical Output Torque* (lb-in) versus Input Pressure (psi)				Displacement per Degree Rotation (in^3/°)	Maximum Angular Backlash (minutes)	Tolerance (degrees)
Single Rack	Double Rack		50	75	100	250			
101		35	19	29	39	98	0.007	60	-0, +5
	102	70	39	59	79	197	0.014	60	-0, +5
151		100	59	88	118	294	0.021	45	-0, +4
	152	200	118	177	236	590	0.042	45	-0, +4
201		250	141	212	282	705	0.049	35	-0, +3
251		375	215	322	430	1074	0.075	35	-0, +3
	202	500	282	423	565	1410	0.099	35	-0, +3
	252	750	430	644	859	2148	0.150	35	-0, +3
321		1000	570	856	1141	2852	0.199	25	-0, +2
	322	2000	1141	1711	2281	5703	0.398	25	-0, +2

* Allow 10% for friction loss. Allow 20% on air/oil units. Use the single rack torque values for all air/oil, three position, and anti-backlash actuators.

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Bearing Load Capacities and Kinetic Energy Ratings

Model	Bearing Load Capacities* (lb)		Distance Between Bearings	Maximum Kinetic Energy absorption Rating for Models Based on Configuration (lb-in)			
	Radial	Thrust		Standard or Stroke Adjusters	Bumper	Cushion**	Shock Absorbers (per Cycle/per Hour)
10	100	50	1.40	0.5	0.75	5.00	15/150,000
15	250	125	2.15	1.50	2.25	15.00	35/200,000
20	500	250	2.15	3.00	4.50	35.00	140/350,000
25	750	375	2.50	5.50	8.25	55.00	140/300,000
32	1000	500	3.75	12.00	18.00	155.00	N/A

* Bearing capacities only. Check Kinetic Energy ratings to determine if actuator will stop load.
** Assuming positive back pressure provided by meter-out flow control.

Kinetic Energy Calculations

In many cases, the size and life of a rotary actuator is determined not by its torque output, but rather by its energy dissipation capability. This is based on the assumption that if the actuator is capable of stopping the load, it is certainly capable of starting the load.

Both torque output and kinetic energy absorption must be considered if the actuator physically stops the load.

To calculate Kinetic Energy, the following variables are required:

1. Rotational Mass Moment of Inertia (J_m) - See next page.
2. Total Rotation (Degrees)
3. Rotation Time (Seconds)

KINETIC ENERGY BASIC FORMULA

$KE = 1/2\ J_m\omega^2$

$$\omega = 0.035 \times \frac{\text{Angle Traveled (deg.)}}{\text{Rotation Time (sec.)}}$$

where

KE = Kinetic Energy (in-lb)

J_m = Rotational Mass Moment of Inertia (in-lb-sec^2)
See next page for formulas.

ω = Peak Velocity (rad/sec)
(Assuming twice average velocity)

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Kinetic Energy Basic Formula

$KE = 1/2\ Jm\omega^2$

$$\omega = 0.035 \times \frac{\text{Angle Traveled (Deg.)}}{\text{Rotation Time (Sec.)}}$$

where

KE = Kinetic Energy (in-lb)

Jm = Rotational mass moment of inertia (in-lb-sec^2)
(Dependent on physical size of object and weight)

ω = Peak Velocity (rad/sec) (Assuming twice average velocity)

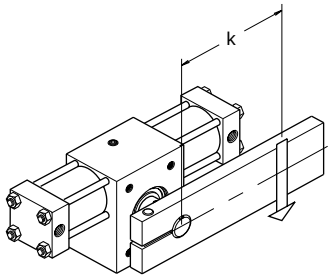
W = Weight of load (lb)

g = Gravitational constant = 386.4 in/sec^2

k = Radius of gyration (in)

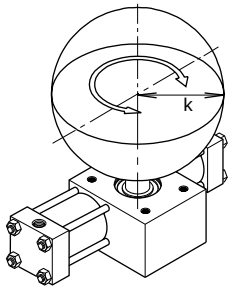
Moments of Inertia

POINT LOAD



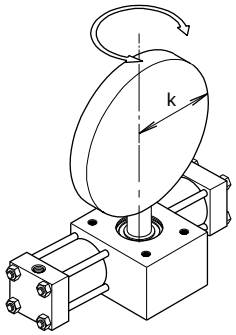
$$Jm = \frac{W}{g} \times k^2$$

SOLID SPHERE -
Mounted on center



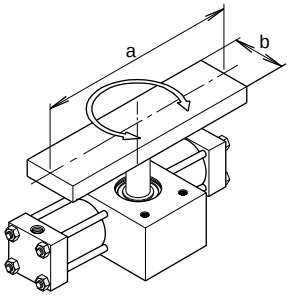
$$Jm = \frac{2}{5} \times \frac{W}{g} \times k^2$$

THIN DISK-
End mounted on center



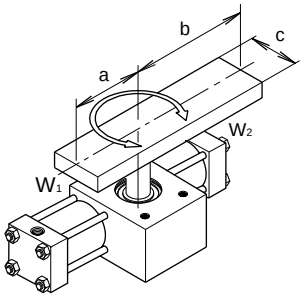
$$Jm = \frac{W}{g} \times \frac{k^2}{4}$$

THIN RECTANGULAR PLATE -
Mounted on center



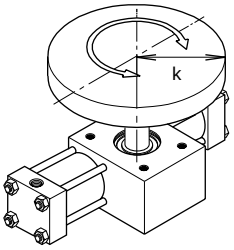
$$Jm = \frac{W}{g} \times \frac{a^2 + b^2}{12}$$

THIN RECTANGULAR PLATE -
Mounted off center



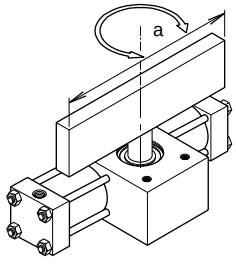
$$Jm = \frac{W_1}{g} \times \frac{4a^2 + c^2}{12} + \frac{W_2}{g} \times \frac{4b^2 + c^2}{12}$$

THIN DISK-
Mounted on center



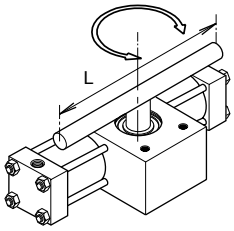
$$Jm = \frac{W}{g} \times \frac{k^2}{2}$$

THIN RECTANGULAR PLATE-
End mounted on center



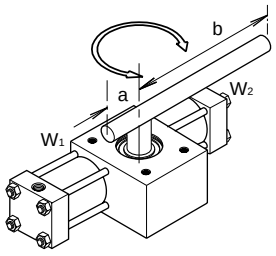
$$Jm = \frac{W}{g} \times \frac{a^2}{12}$$

SLENDER ROD-
Mounted on center



$$Jm = \frac{W}{g} \times \frac{L^2}{12}$$

SLENDER ROD -
Mounted off center



$$Jm = \frac{W_1}{g} \times \frac{a^2}{3} + \frac{W_2}{g} \times \frac{b^2}{3}$$

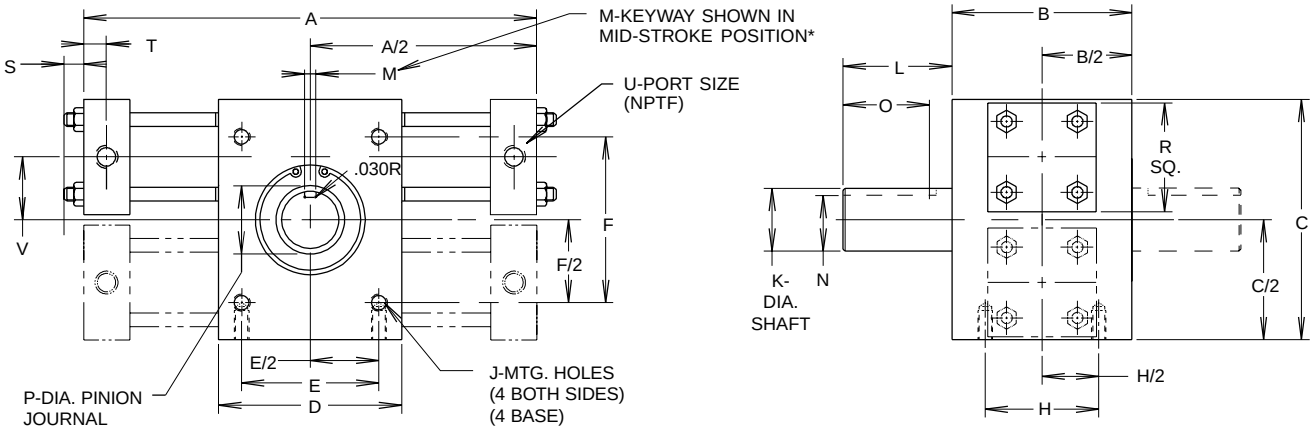
H

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A076

Standard Face Base Mount (A) and Male Keyed Shaft (B)

Double Male Keyed Shaft (C) shown in phantom



3D CAD FILES
available for download at
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Model	Rotation Degrees	A	B	C	D	E	F	H	J	K	L	M	N
10	90 180 360	6-11/16 8-1/4 11-7/16	2	3	2	1.500	2.000	1.500	1/4-20 x 3/8 DP	0.500 0.499	7/8	0.125 0.127	0.430 0.425
15	90 180 360	9-1/8 11-3/16 15-3/8	3	4-1/4	3	2.000	3.000	2.000	5/16-18 x 1/2 DP	0.875 0.874	1-7/8	0.188 0.190	0.771 0.761
20	90 180 360	11-3/16 14-1/16 19-11/16	3	5	4	2.500	3.500	2.000	3/8-16 x 1/2 DP	1.125 1.124	1-7/8	0.250 0.252	0.986
25	90 180 360	12-9/16 15-1/2 20-5/8	3-1/2	6	4	2.500	4.500	2.000	1/2-13 x 3/4 DP	1.375 1.374	2-1/4	0.313 0.315	1.201 1.191
32	90 180 360	16-5/8 21-1/8 29-3/8	5	8	5	3.000	5.000	2. 500	3/4-10 x 1 DP	1.750 1.749	3-1/2	0.375 0.377	1.542 1.532

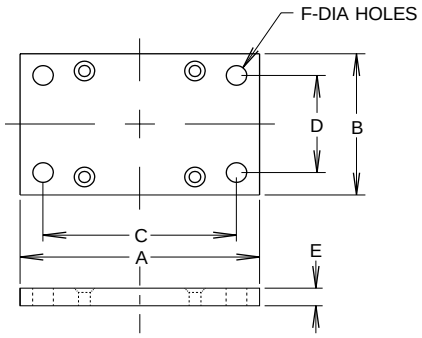
Model	O	P	R	S	T	U	V
10	5/8	0.59	1-1/2	1/4	0.31	1/8	3/4
15	1-1/2	0.98	2	5/16	0.41	1/4	1-1/16
20	1-1/2	1.18	2-1/2	3/8	0.41	1/4	1-1/4
25	1-3/4	1.38	3	3/8	0.41	1/4	1-1/2
32	3	1.77	3-3/4	7/16	0.56	3/8	1-15/16

*To obtain equal rotation both sides of midstroke (theoretical 12:00), order 5° longer rotation than standard with stroke adjusters.

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Mounting Options (F, G, P, R)

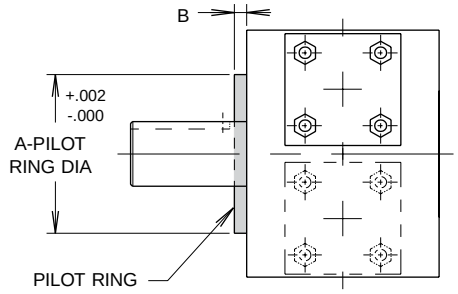
Foot Flange (G)



Model	A	B	C	D	E	F
10	3.25	2.00	2.625	1.375	0.250	0.281
15	4.50	3.00	3.875	2.125	0.438	0.406
20	4.50	4.00	3.875	3.375	0.438	0.406
25	5.50	4.00	4.500	3.000	0.438	0.531
32	8.00	5.00	6.500	3.500	0.750	0.781

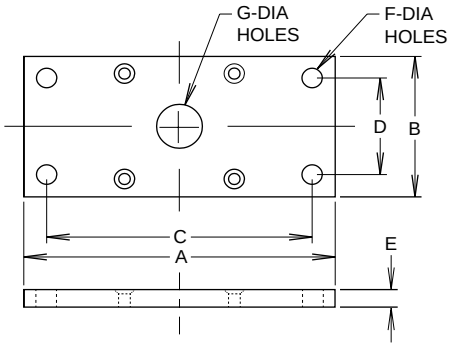
Note: Actuators are shipped with mounting flange installed unless otherwise noted.

Pilot Ring (P)



Model	A	B
10	1.124	0.125
15	2.000	0.25
20	2.167	0.25
25	2.679	0.25
32	3.348	0.25

Front Flange (F)
Rear Flange (R)

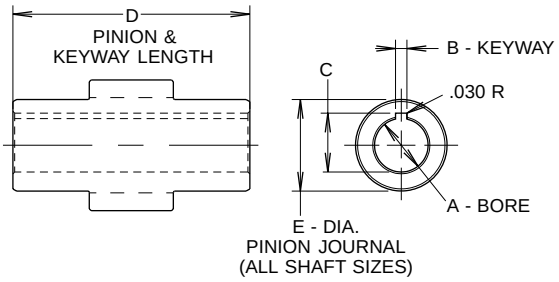


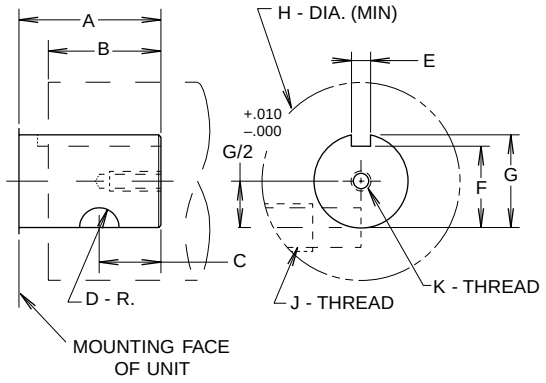
Model	A	B	C	D	E	F	G
10	4.25	2.00	3.625	1.375	0.250	0.281	0.625
15	5.75	3.00	5.125	2.125	0.438	0.406	1.000
20	6.50	4.00	5.875	3.375	0.438	0.406	1.250
25	8.25	4.00	7.250	3.000	0.438	0.531	1.625
32	12.00	5.00	10.000	3.000	0.750	0.781	2.000

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Shaft Options (C, A, R)

Units are equipped standard with single male keyed shaft (B).
Double male keyed (C) also available as shown on page H37.
Also available in female keyed and preload keyway options.





Note: Female keyed pinion designed primarily for pneumatic service. Review shaft stresses before applying on hydraulic service.

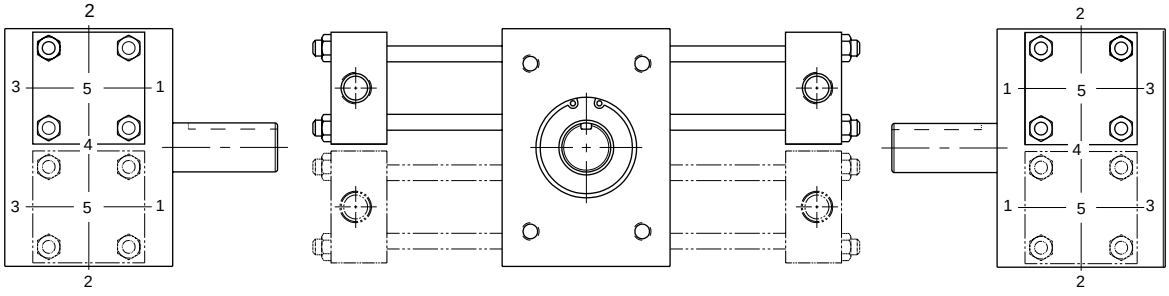
Female Keyed (A)

Model	A	B	C	D	E
10	0.375 0.377	0.093 0.095	0.417 0.422	1-13/32	0.59
15	0.500 0.502	0.125 0.127	0.560 0.565	2-11/16	0.98
20	0.750 0.752	0.187 0.189	0.837 0.847	2-23/32	1.18
25	1.000 1.002	0.250 0.252	1.083 1.093	3-1/8	1.38
32	1.250 1.252	0.250 0.252	1.367 1.377	4-9/16	1.77

PRELOAD KEY (R)

Model	A	B	C	D	E	F	G	H	J	K
10	7/8	5/8	0.375	0.156	0.125 0.127	0.430 0.425	0.500 0.499	1-1/2	3/8-24	10-32 x 3/8 DP
15	1-7/8	1-1/2	0.812	0.219	0.188 0.190	0.771 0.761	0.875 0.874	2	1/2-20	5/16-24 x 1/2 DP
20	1-7/8	1-1/2	0.812	0.250	0.250 0.252	0.986 0.976	1.125 1.124	3	5/8-11	3/8-24 x 9/16 DP
25	2-1/4	1-3/4	1.000	0.250	0.313 0.315	1.201 1.191	1.375 1.374	3-1/2	3/4-10	3/8-24 x 9/16 DP
32	3-1/2	3	1.500	0.437	0.375 0.377	1.542 1.532	1.750 1.749	4	1-8	1/2-20 x 3/4 DP

Port Size and Location (1, 2, 3, 4)



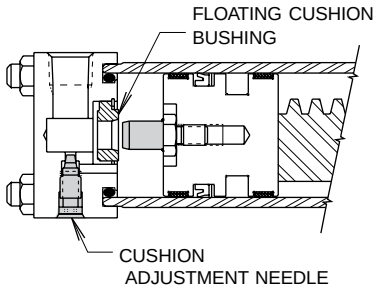
Notes:
1. Port position 1 is standard.
2. Port positions 2, 3 and 4 are standard options available at no additional cost.
3. Port position 4 is for single rack only.
4, Port position 5 is not available with cushions or stroke adjusters.

Model	Optional SAE Straight Thread (1)	Standard NPT (2)
10	7/16 - 20 (SAE 4)	1/8
15	7/16 - 20 (SAE 4)	1/4
20	9/16 - 18 (SAE 6)	1/4
25	9/16 - 18 (SAE 6)	1/4
32	3/4 - 16 (SAE 8)	3/8

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Cushions (1, 2, 3, 4)

The standard cushions operate over the last 30° of rotation in either or both directions. A floating bushing ensures no binding of the cushion spear. For severe operating conditions, four cushions can be fitted on double rack units. All cushions are fully adjustable. On double rack units, cushions will be located on the upper cylinder.



Standard Cushion Needle Locations

(Reference diagram on previous page)

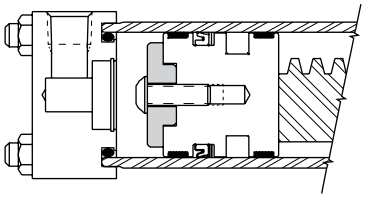
Port Position	Cushion Position
1	2
2	3
3	2
4*	3
5	N/A

*Single Rack only

H

Bumpers (5, 6, 7)

Built-in polyurethane bumper pads absorb shock and noise, thus permitting faster cycle times and increased production rates. Bumpers are available for pneumatic service only.



Notes: 1. Available with or without stroke adjusters
2. Not available with cushions

Bumper Thickness

Add the bumper thickness to overall unit length "A" for each bumper specified.

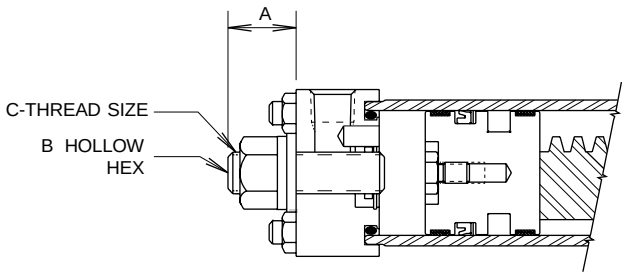
Model	Bumper Only	Bumper with Stroke Adjuster
10	0.13	0.44
15	0.19	0.63
20	0.25	0.75
25	0.25	0.75
32	0.25	1.00

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Stroke Adjusters (D, E, F) 30°

Stroke adjusters will reduce angle of rotation by 30° in either or both directions. Typical applications are for initial set-up purposes where exact rotation cannot be pre-determined or when rotation requirements may change between various operations. Not available with port position 5.



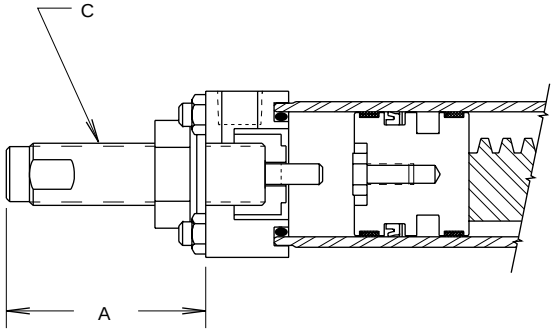
Notes:

1. Standard cushions operate over the last 30° of rotation. Stroke adjusters will decrease the effective cushion length by the same amount. For example, reducing the rotation by 5° yields a 25° cushion length. For effective cushions it is recommended that stroke adjustment not exceed 10° when used in conjunction with cushions.
2. Maximum unit rotation is equal to rotation specified in model code. Adjusters allow rotational positioning equal to or less than the maximum rotation.
3. 30° Stroke Adjusters are available with or without cushions. Double rack units will have cushions on upper rack and adjusters on lower rack. Single rack units with cushions (and double rack units with four cushions) and stroke adjusters will require additional "A" length.
4. Antibacklash can be achieved on double rack units with stroke adjusters as long as extra rotation is ordered.
5. When ordering cushions and stroke adjusters, the maximum adjustment is 10° per side.

Model	(1) Turn Adj.	30° Adjustment w/o Cushioned End Cap, A (Max)	10° Adjustment w/Cushioned End Cap, A (Max)	B	C
10	4.0°	0.63	0.38	1/8	1/4-28 UNF
15	4.6°	0.88	1.13	1/4	1/2-20 UNF
20	3.2°	1.13	1.13	1/4	1/2-20 UNF
25	3.2°	1.13	1.18	1/4	1/2-20 UNF
32	2.4°	1.50	2.13	3/8	3/4-16 UNF

Shock / Stroke Adjusters (H, K, L)

Hydraulic shock absorbers reduce noise and allow increased operating speeds and loads while also providing adjustability for end of rotation position. Shocks are fixed orifice self-compensating type and will provide constant deceleration despite changing energy conditions.



Notes:

1. Not available on Model 32 or with port position 5.
2. When specified with **DOUBLE RACK UNITS**: As a result of high energy levels and driving forces obtained with double rack units, all double rack actuators will contain four shock absorbers.
3. This option is not available in combination with the following options:
   a. Air/Oil (6)
   b. External Air/Oil (Q)
   c. Bumpers (5, 6, 7)
   d. Cushions (1, 2, 3, 4)
   e. Port Flow Controls (P, R, S)
   f. End Cap Mounted Proximity Sensors

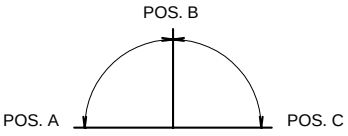
   (Tie rod mounted reed and Hall effect sensors can be specified.)

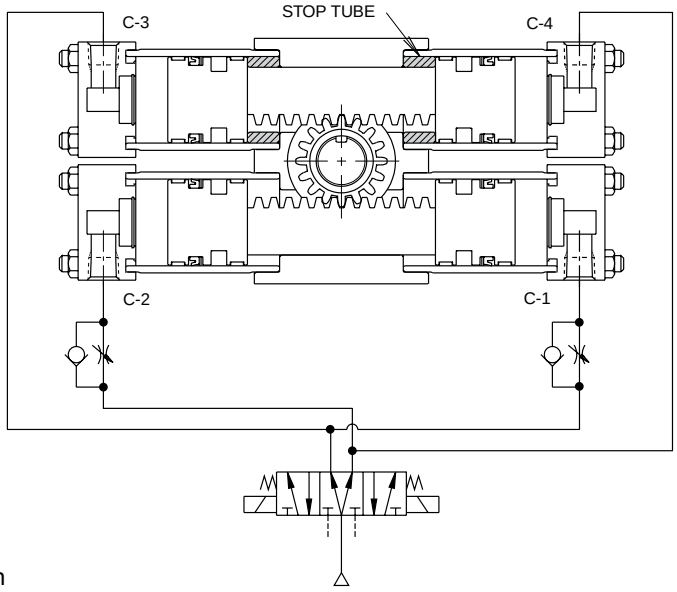
Model	(1) Turn Adjustment	A (Max)	Max. Adjustment	C Thread Size
10	6°	2.20	110°	9/16 - 18 UNF
15	5°	2.40	80°	3/4 - 16 UNF
20	5°	3.66	130°	1 - 12 UNF
25	5°	3.66	130°	1 - 12 UNF

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Three Position Actuator (3)

In addition to the standard two position actuators, three position units are also available. All standard options are also available.





Operation:

A standard double rack unit is fitted with stop tubes on the upper rack. Pressurizing port C-2 (with ports C-1, C-3 exhausted) causes counter-clockwise pinion rotation to angular position A. Alternately applying pressure to C-1 (with C-2, and C-4 exhausted) will cause clockwise rotation to angular position C. Both positions A and C are at end of stroke, thus typical end cap options such as cushions, bumpers, and stroke adjusters will operate at these positions only.

Position B is obtained by pressurizing all ports. Pressure applied to the upper floating pistons centers the rack between the stop tubes, rotating the pinion to position B. The lower rack is free floating as the forces are equal on both ends.

Dimensional Data:

Three position actuator dimensions are identical to the standard double rack units. If stroke adjusters are specified they will be fitted to the upper rack, flow controls and cushions will be on the lower rack. Rotational tolerances are given in the chart at the right.

Output Torque:

Output torque of the multiple position actuator is equivalent to the torque output of the same size single rack unit. The chart to the right gives selected torque values for specified pressures.

Ordering Information:

Three position actuators can be ordered by inserting a 3 into the "configuration" space in the model code. The desired middle and total rotation should be stated in the model code separated by a "/". The beginning position, 0°, need not be specified.

For example: **PTR153-045/180F-AB21-C** is a standard pneumatic actuator, three position, with an output torque of 118 lb-in at 100 psi. Position A is 0°, position B is 45°, and position C is 180°. Both positions A and C are adjustable by 30°, as the stroke adjuster option "F" was ordered.

Rotational Tolerances

Model	Total Rotation, Degrees	Between Positions, Degrees[1]	Backlash, Minutes[2]
103	-0, +5	±1	50
153	-0, +4	±1/2	40
203	-0, +3	±1/2	30
253	-0, +2	±1/2	30
323	-0, +2	±1/4	15

1. Measured from centers of backlash.
2. Zero backlash can be achieved at positions A and C by using optional stroke adjusters.

Theoretical Output Torque (lb-in) at Specified Pressure

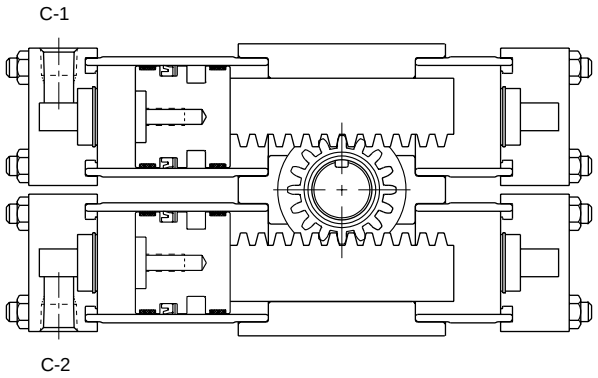
Model	50 psi	100 psi	250 psi
103	19	39	98
153	59	118	294
203	141	282	705
253	215	430	1074
323	570	1141	2852

Note: When magnetic piston ring option "M" is ordered, all pistons will be so equipped.

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Antibacklash Actuator (7)

An antibacklash actuator is used to obtain precision positioning at the end of rotation. The backlash normally associated with rack and pinion actuators is eliminated by this unique configuration.



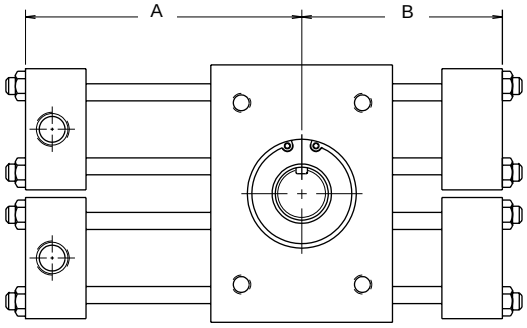
Operation:

A double rack unit is modified for actuation on one end only.

Alternately pressurizing C-1 or C-2 causes clockwise and counter-clockwise rotation, respectively. Backlash in the rack & pinion is eliminated as the pinion is tightly "trapped" between both racks at the end of stroke, preventing any further motion.

Dimensional Data:

Antibacklash actuators are similar in size and configuration to standard double rack units with one set of shorter cylinders. The table to the right shows dimensions for this shorter side. If cushions, stroke adjusters or port flow controls are ordered, they will be fitted to the powered rack side.



Output Torque:

Output torque of the antibacklash actuator is equivalent to the torque output of the same size single rack unit. The chart to the right gives selected torque valves for specified pressures.

Theoretical Output Torque, lb-in, at Specified Pressure

Model	50 psi	100 psi	250 psi
107	19	39	98
157	59	118	294
207	141	282	705
257	215	430	1074
327	570	1141	2852

Ordering Information:

Antibacklash actuators can be ordered by inserting a "7" into the "configuration" space in the model code. For example: **PTR157-180F-AR21-C** is a pneumatic antibacklash actuator with a theoretical output torque of 118 lb-in at 100 psi.

The optional stroke adjusters make the rotation variable between 120° and 180°. The preload key option on the shaft is also specified to eliminate any backlash in the key and coupling interface.

Note:

Antibacklash can also be obtained on double rack actuators by implementing stroke adjusters at end of stroke. This will enable you to maintain double rack output torque.

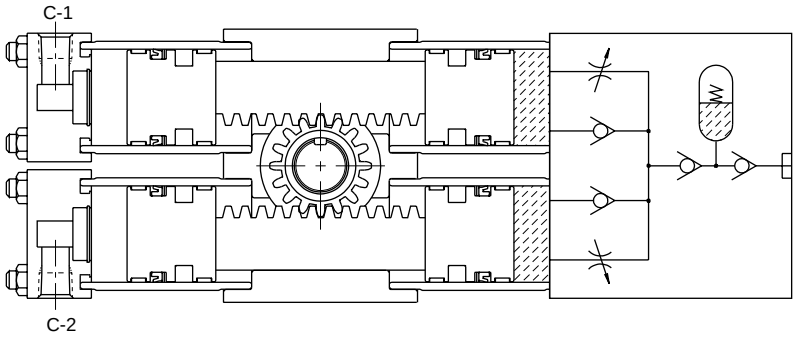
Dimensions

Model	Rotation	A	B
107	90°	3-3/4	2-3/4
	180°	4-1/8	3-3/4
	360°	5-3/4	5
157	90°	4-9/16	3-5/16
	180°	5-5/8	4-9/16
	360°	7-11/16	6-5/8
207	90°	5-5/8	4-1/8
	180°	7-1/16	5-5/8
	360°	9-7/8	8-1/2
257	90°	6-5/16	4-3/8
	180°	7-3/4	6-5/16
	360°	10-5/16	8-13/16
327	90°	8-5/16	5-13/16
	180°	10-9/16	8-5/16
	360°	14-11/16	12-7/16

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Self-Contained Tandem Air / Oil Operation (6)

The Air-Oil Tandem actuator allows precise speed and motion control using standard pneumatic controls. This is possible through the use of a completely sealed oil system which effectively meters and controls actuator movement with no slipping, jerking, or bouncing.



Operation:

A standard double rack unit is equipped with a built in hydraulic reservoir and flow controls. Air pressure is alternately applied to ports C-2 and C-1 to cause rotation in either direction. As oil is displaced from the opposite end of the drive rack it is metered precisely by the needle valve. A check valve allows free flow in the opposite direction so that independent speeds for rotation can be set.

The reservoir is directly attached to the actuator, eliminating plumbing and leakage paths. It is spring loaded to compensate for oil volume changes due to temperature variations and has built in fill port.

Dimensional Data:

Air / Oil Actuators are identical in size and configuration to standard double rack units, with the addition of the integral reservoir as shown.

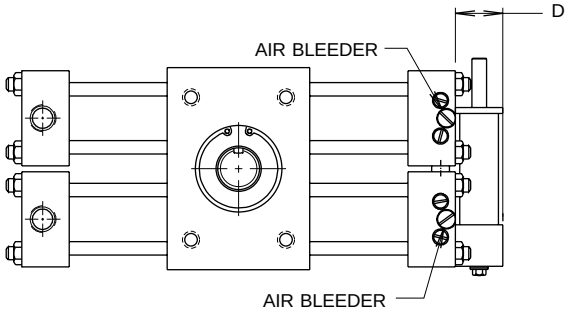
Output Torque:

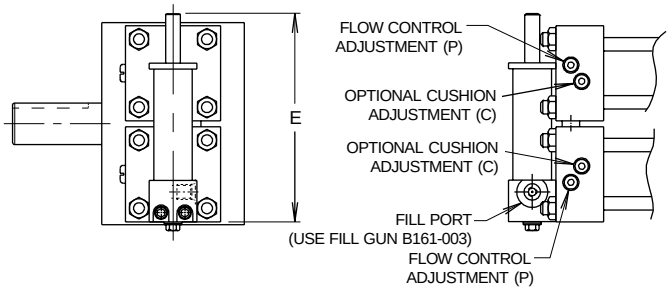
Theoretical output torques are shown in the table below. For design and sizing purposes an actuator should be selected with 20%-50% reserve capacity.

For maximum speed of the Air/Oil actuators please consult the factory or local representative.

Ordering Information:

Air / Oil Tandem actuators can be ordered by placing a "6" into the "configuration" space in the model code. All Air / Oil Tandem actuators include as standard port flow controls and Quad-ring piston seals (oil side only), thus it is not necessary to include a "P" and/or "Q" in the model code. Other options, such as cushions, stroke adjusters and magnetic piston ring are also available. For example: **PTR206-180F-AB21-C** is a standard Air/Oil actuator, with a theoretical output torque of 282 lb-in at 100 psi. Rotation of the unit is 180°, with optional cushions and stroke adjusters.





Dimensions

Model	D	E
106	1.00	3.63
156	1.00	4.38
206	1.25	4.91
256	1.25	4.91
326	1.25	6.29

Note: When magnetic piston ring option "M" is ordered, only the pneumatic pistons will be so equipped.

Theoretical Output Torque, lb-in, at Specified Pressure

Model	50 psi	100 psi	250 psi
106	19	39	98
156	59	118	294
206	141	282	705
256	215	430	1074
326	570	1141	2852

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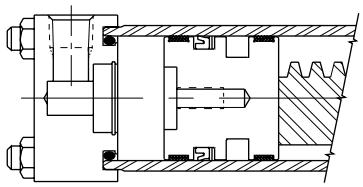
A076

External Air / Oil Operation (Q)

The External Air/Oil actuator allows for connection to a separate air over oil control system. It can also be used for low pressure (less than 150 psi) non-shock hydraulic systems.

Operation:
A standard pneumatic rotary actuator is equipped with special piston seals for all pistons to ensure low breakaway pressure and no leakage. This allows smooth, jerk-free operation, even at very low pressures.

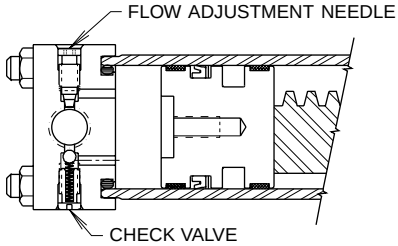
Output Torque:
Theoretical output torques are identical to the ones given at the beginning of the PTR section. For design and sizing purposes, an actuator should be selected with 20% - 50% reserve capacity.



NOTE: When cushions are specified, the actuator will be equipped with bronze cushion bushings in place of the standard nitrile cushion bushings.

Port Flow Controls (P, R, S)

Built in meter-out flow controls provide precise adjustment of actuator speed and eliminate the cost and space of externally plumbed components. A separate ball check is used to provide free flow in the opposite direction. Flow controls may be ordered in conjunction with cushions, bumpers, or stroke adjusters.



Standard Adjustment Needle Locations

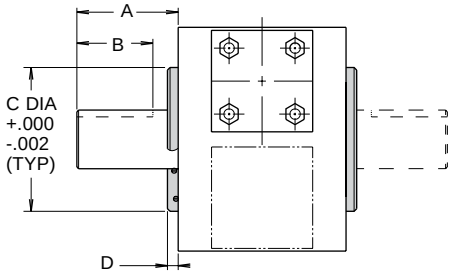
Port Position	Needle Position
1	2
2	3
3	2
4*	3

*Single rack only

Note: When both cushions and port flow controls are specified they will be stamped "C" and "P" respectively.

Shaft Seal Covers (S)

Shaft seal covers are designed to prolong bearing life by isolating them from external contamination and pressure. They are designed for use with standard male shafts only (not hollow shafts).



Specifications
Max. Pressure Differential: 500 psi
Material: Anodized Aluminum
Shaft Seal: Double Lip Wiper
Body Seal: O-Ring

Dimensions

Model	A	B	C	D
10	7/8	1/2	1.875	0.25
15	1-7/8	1-5/16	3.000	0.38
20	1-7/8	1-5/16	3.250	0.38
25	2-1/4	1-5/8	3.625	0.38
32	3-1/2	2-7/8	4.480	0.38

Fluorocarbon Seals (V)

Fluorocarbon seals are recommended for high temperature applications up to 250°F. Standard abrasion resistant nitrile seals should be used for general purpose applications with temperatures of 0 to 180°F.

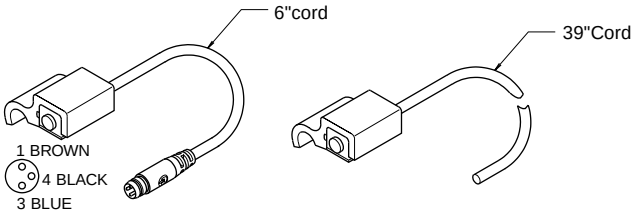
Option	Temperature Range (°F)
Shock Absorbers	32 - 150
Bumpers	0 - 200
Piston Magnets	0 - 165
Proximity Sensors	-4 - 150
Reed/Hall Effect Sensors	14 - 140

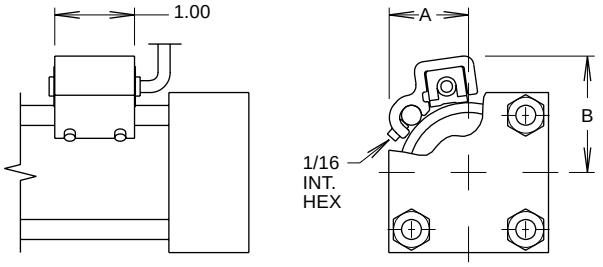
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Magnetic Piston (M)

This option prepares the actuator for use with reed and Hall effect sensors. The "M" option should be specified to provide a magnet on the cylinder piston. Order sensors separately from the Electronic Sensors section.





Model	A	B
10	0.84	1.22
15	0.99	1.46
20	1.27	1.68
25	1.45	1.89
32	1.71	2.20

Proximity Sensors

(Namco Cylindicators or Balluff Cylinder Indicator Sensor)

The inductive type proximity sensor provides end of rotation indication. The non-contact probe senses the presence of the ferrous cushion spear and has no springs, plungers, cams or dynamic seals that can wear out or go out of adjustment. The sensor is solid state and meets NEMA 1, 12 & 13 specifications. For ease of wiring the connector housing is rotatable through 360°. To rotate, lift the cover latch, position and release.

The sensor make/break activation point may occur at 0.125" to ±0.125" from the end of stroke. Depending on the actuator size, this distance may cause activation at 2° to 15° from end of stroke.

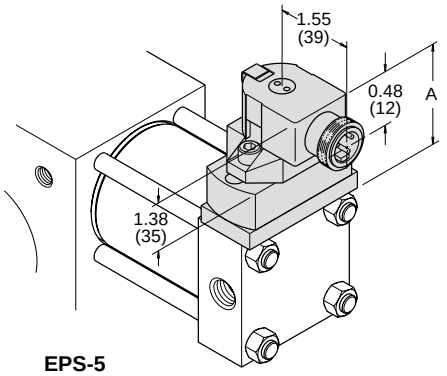
The standard proximity sensor controls 50-230 VAC/DC loads from 5 to 500 mA. The low 1.7 mA off-state leakage current can allow use for direct PLC input. The standard short circuit protection (SCP) protects the sensor from a short in the load or line upon sensing such a condition (5 amp or greater current) by assuming a non-conductive mode. The fault condition must be corrected and the power removed to reset the sensor preventing automatic restarts.

The low voltage DC sensor is also available for use with 10-30 VDC. The sensor is in a non-rotatable housing, but does incorporates the short circuit protection.

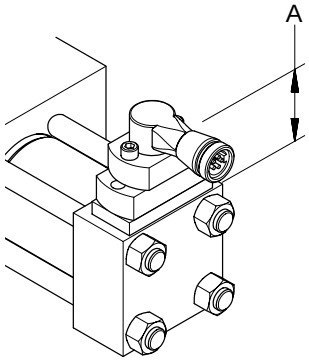
Both sensors are equipped with two LEDs, "Ready" and "Target". The "Ready" LED is lit when power is applied and the cushion spear is not present. The "Target" LED will light and the "Ready" LED will go out when the sensor is closed, indicating the presence of the cushion spear. Both LEDs flashing indicates a short circuit condition.

NOTES:

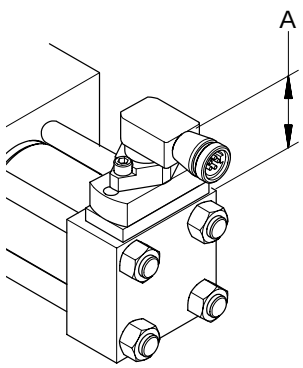
1. Available with or without cushions.
2. Not available with stroke adjusters.
3. Pressure rating: 3000 psi
4. Operating temperature: -4°F to 158°F
5. Specify sensor type, orientation and voltage when ordering.
6. The low voltage DC sensor is available in non-rotatable style only; consult factory for further information.



EPS-5



EPS-6



EPS-7

Model	A	
	EPS-5	**EPS-6 & 7**
15	1.88	2.17
20	2.44	2.75
25	2.16	2.48
32	1.94	2.25

Order proximity sensors separately. See Electronic Sensors section for specifications and ordering information.

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Seal Kit Ordering Information

- Standard units are equipped with Nitrile seals.
- Optional seal compounds are available.
- See parts list for items contained in seal kit.
- Seal kit part numbers as shown:

PSK	—	PTR322	V
Parker Seal Kit		Base Model	Omit - Standard V = Fluorocarbon Q = Quad Ring Piston Seals W = Carboxilated Nitrile Piston Seals

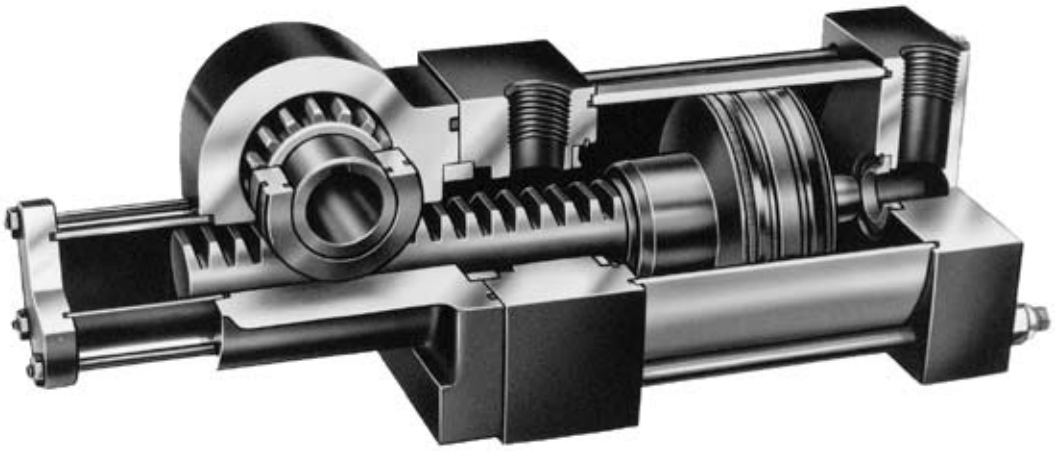
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B671 / F672 Series

Heavy Duty Pneumatic
Rack and Pinion Rotary Actuator



B671 and F672 Series Actuators utilize the durable and time-proven A2 Series cylinder design as the power source.

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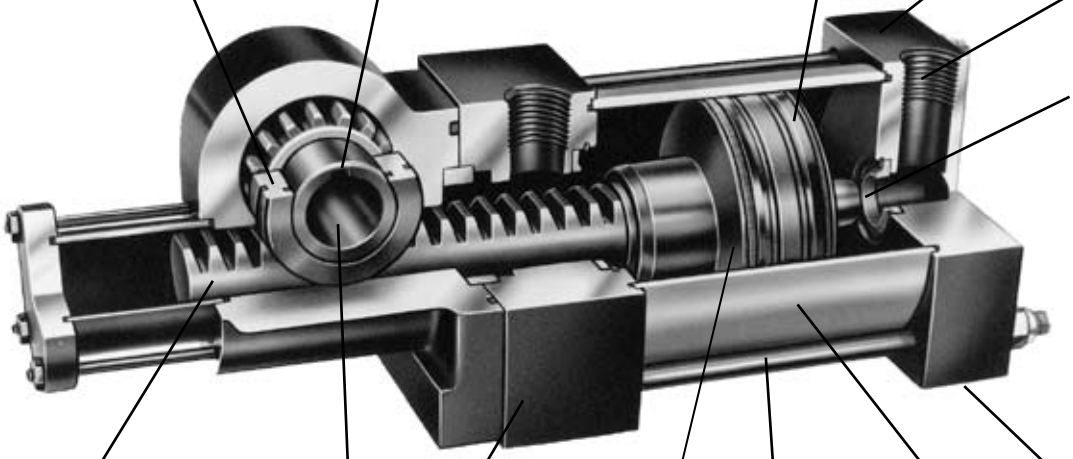
Bearings
High quality bronze bearings reduce friction and Break-away pressure while providing substantial pinion support.

Keyway
At 12:00 position of mid-stroke of actuator.

Piston Seals
Low friction lipseals are fully dynamic and self-compensating for no-leak service and long life at all operating pressures.

End Caps
Precision machined from cold rolled steel to exacting NFPA specifications, then black oxide coated for greater reliability and durability.

Ports
Full area ports provide unrestricted flow for maximum operating speeds.



Optional Cushions
Provide maximum performance and reduced shock in all applications. The floating polyurethane cushion seal provides maximum sealing effectiveness as the spear enters the cushion, yet allows fast "out-stroke" action by functioning as a springless check valve. Full adjustment of the cushion is obtained by the flush mounted adjustment needle.

Rack & Pinion
Chromium alloy steel with flame hardening ensures maximum shock resistance and strength of the rack & pinion.

Housing
A high strength aluminum housing is hard anodized for superior wear and corrosion resistance.

Tie Rods
High tensile steel has precision rolled threads and black oxide coating for greater strength and fatigue resistance.

Side Tapped Mounting Holes
Front and rear heads

Cylinder
Precision finished aluminum alloy tubing is hard anodized for maximum wear resistance and long seal life.

Female Shaft
Designed for direct, on-shaft installation, eliminating the need for couplings and other connections.

Pistons
Are one piece steel for high strength and piloted to the rack assembly to ensure concentricity. A nonmetallic wear strip is employed to provide a non-scoring bearing surface. This high quality assembly eliminates friction, wear and galling while providing smooth operation.

H

Hydro-Check Combination

The Rotary Actuator/Hydro-Check combination consists of the F672 Series Actuator axially linked to an F172-2 or F172-3 Series Hydro-Check. The Hydro-Check is a precision built adjustable hydraulic resistance unit designed to provide controlled feed rates. When coupled to an actuator, excellent rotational control is attained.

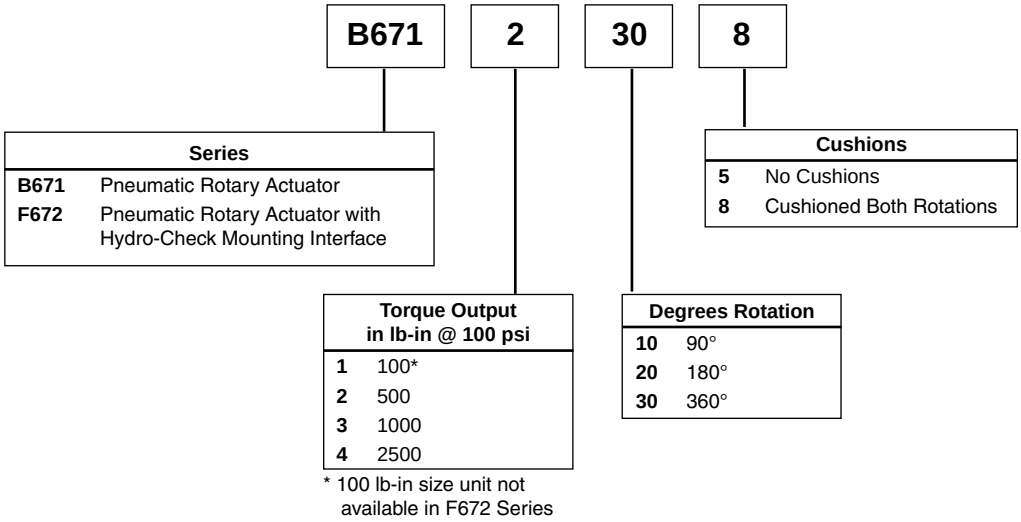
The Rotary Actuator / Hydro-Check combination provides consistent torque with adjustable hydraulic resistance for a smooth controlled rotational feed rate. Axial coupling of these units eliminates eccentric loading of component parts.

These actuators are available in three torque ranges to comply with varying load requirements. The Hydro-Check is capable of checking axial loads to 3,000 lbs. and is available with many controlling options (see Ordering Information). For information on Hydro-Checks not shown in this catalog, consult factory.



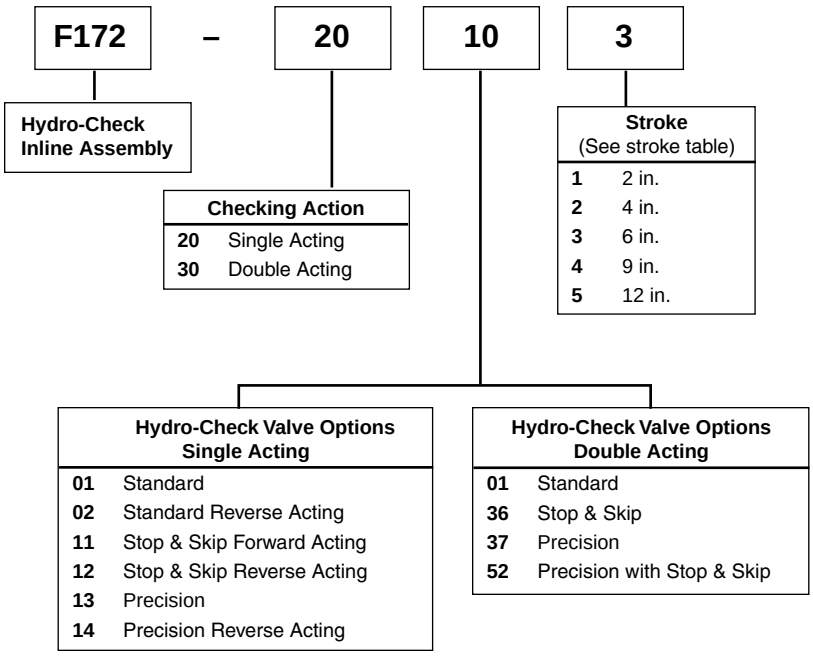
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Model Code and Ordering Information
Example: B6712308



* 100 lb-in size unit not available in F672 Series

F172 Inline Hydro-Check Ordering Information For Use with F672 Rotary Actuator
Example: F172-20103



Hydro-Check Stroke Table

Model	Nominal Torque Output (lb-in)	Rotation Range (°)	Hydro-Check Stroke Required (in)
2	500	30-140	2
		141-284	4
		285-360	6
3	1000	30-112	2
		113-227	4
		228-341	6
		342-360	9
4	2500	30-74	2
		75-151	4
		152-227	6
		228-342	9
		343-360	12

Notes:
1. Hydro-Check must be ordered separately.
2. When both Actuator and Hydro-Check are ordered from Actuator Division, they will be assembled together.
3. Specify voltage with stop and skip function - 12, 115, 220 or 440 VAC.
4. For availability of other Hydro-Check options not listed here, please consult factory.

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Overview

The B671 Series Pneumatic Rotary Actuator is designed to provide force in a reciprocating, rotational motion. It is ideal for any application requiring constant torque through a rotational distance: rotating or lifting heavy objects, positioning or bending operations.

The F672 Series utilizes the same high quality construction found on the B671 Series with the addition of a coupling arrangement for a Hydro-Check. An F672 / Hydro-Check assembly will provide controlled feed rates and excellent rotational control with pneumatic power through adjustable hydraulic resistance.

The B671 / F672 Series Pneumatic Rotary Actuator can be powered by shop air or inert gas. The actuators are pre-lubricated at assembly with NLG1 grade 2 grease with outstanding oxidation stability and corrosion resistant additives. This pre-lubrication is intended for use in pneumatic systems where airline lubrication is not used. However, to assure maximum service life of the cylinder, the air supply should be properly filtered and moisture free.

The pneumatic rotary actuator can be controlled by any conventional 4-way valve - hand, foot, mechanically or electrically controlled. All four sizes of rotary actuators are designed for direct on-shaft installation - no flexible couplings, cam and roller or chain and sprocket combinations are required.

Specifications

- Maximum Operating Pressure: 140 psi
- Standard Rotations: 90°, 180°, 360°
- Output Torque @ 100 psi: 100 lb-in to 2500 lb-in
- Maximum Break-away Pressure: 10 psi
- Mounting Orientation: Unrestricted
- Operating Temperature: 0° F to 180° F
- Leakage: External: 0 cfm
  Internal: 0 cfm
- Theoretical Timing: Keyway located at 12:00 position at mid-stroke position of actuator

B671 / F672 Series Cushion Option

The standard cushions operate at the end of rotation to decelerate the actuator. A floating polyurethane cushion seal provides maximum sealing effectiveness going into the cushion. This durable material ensures millions of trouble free cycles with no wear. The cushion seal also acts as a check valve, allowing full air flow around the seal during outstroke, providing excellent break-away. Cushions, when so ordered, are installed both directions. They are available on both the B671 and F672 Series.

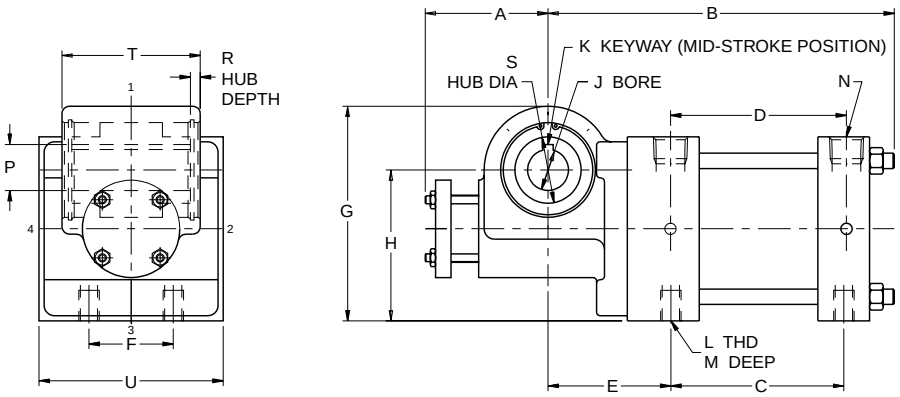
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Quick Reference Data

Model	Cylinder Bore (in)	Actual Output Torque (lb-in) versus Specified Pressure (PSI)				Displacement per Degree Rotation (in^3/°)	Maximum Angular Backlash (minutes)	Maximum Rotational Tolerance (°)
		50	75	100	125			
1	1-1/2	50	75	100	125	0.021	40	-0, +5
2	3-1/4	250	375	500	625	0.116	40	-0, +4
3	4	500	750	1000	1250	0.219	40	-0, +3
4	5	1250	1875	2500	3125	0.514	30	-0, +2

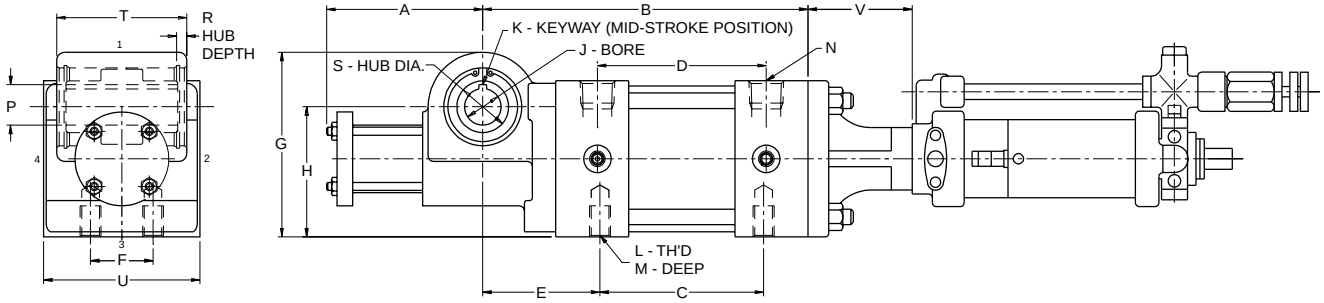
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B671 Series



Model	Rotation	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U
1	90°	2.16	6.45	3.36	3.42	2.19	0.62	2.94	1.92	0.500	0.12 x	1/4-20	0.38	3/8	0.560	0.16	1.00	1.69	2.00
	180°	3.35	7.53	4.44	4.50					0.502	1.31				0.570				
	360°	5.35	9.68	6.60	6.66														
2	90°	2.50	7.95	3.9 2	3.99	2.81	1.50	4.44	3.12	0.875	0.19 x	1/2-13	0.75	1/2	0.964	0.22	1.25	3.12	3.75
	180°	3.75	9.21	5.17	5.25					0.877	2.62				0.974				
	360°	6.25	11.72	7.69	7.76														
3	90°	3.00	8.46	4.23	4.30	3.00	2.06	5.25	3.69	1.000	0.25 x	1/2-13	0.75	1/2	1.117	0.24	1.62	3.38	4.50
	180°	4.56	10.03	5.80	5.87					1.002	2.88				1.127				
	360°	7.96	13.17	8.94	9.01														
4	90°	3.56	10.51	5.28	5.35	3.88	2.69	6.88	4.75	1.500	0.38 x	5/8-11	0.94	1/2	1.668	0.31	2.50	4.12	5.50
	180°	5.75	12.87	7.63	7.71					1.502	3.50				1.678				
	360°	10.75	17.58	12.34	12.42														

F672 Series



F672 Actuator with Hydrocheck

Model	Rotation	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V
2	90°	2.50	7.80	3.92	4.05	2.81	1.50	4.44	3.12	0.875	0.19 x	1/2-13	0.75	1/2	0.964	0.22	1.25	3.12	3.75	2.50
	180°	3.75	9.06	5.17	5.31					0.877	2.62				0.974					
	360°	6.25	11.57	7.69	7.82															
3	90°	3.00	8.30	4.23	4.36	3.00	2.06	5.25	3.69	1.000	0.25 x	1/2-13	0.75	1/2	1.117	0.24	1.62	3.38	4.50	2.50
	180°	4.56	9.87	5.80	5.93					1.002	2.88				1.127					
	360°	7.96	13.01	8.94	9.07															
4	90°	3.56	10.22	5.28	5.41	3.88	2.69	6.88	4.75	1.500	0.38 x	5/8-11	0.94	1/2	1.668	0.31	2.50	4.12	5.50	2.50
	180°	5.75	12.58	7.63	7.77					1.502	3.50				1.678					
	360°	10.75	17.29	12.34	12.48															

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A076

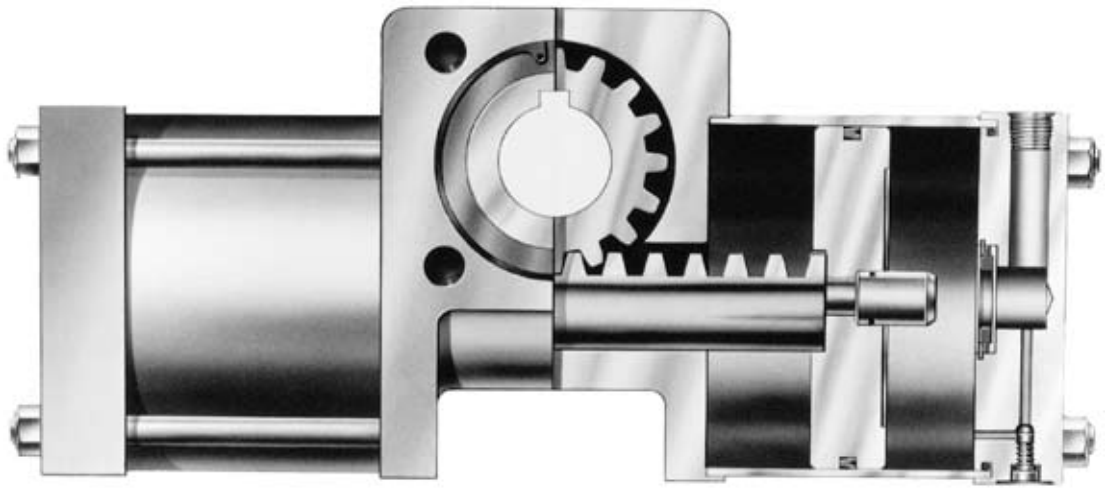
B671 / F672 Series*	
Actuator Size (Cushioned or Non-Cushioned)	**Seal Kit Number**
100 lb-in	B732904
500 lb-in	B732905
1,000 lb-in	B732906
2,500 lb-in	B732907

* Does not include Hydro-Check Seal Kit

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HP Series

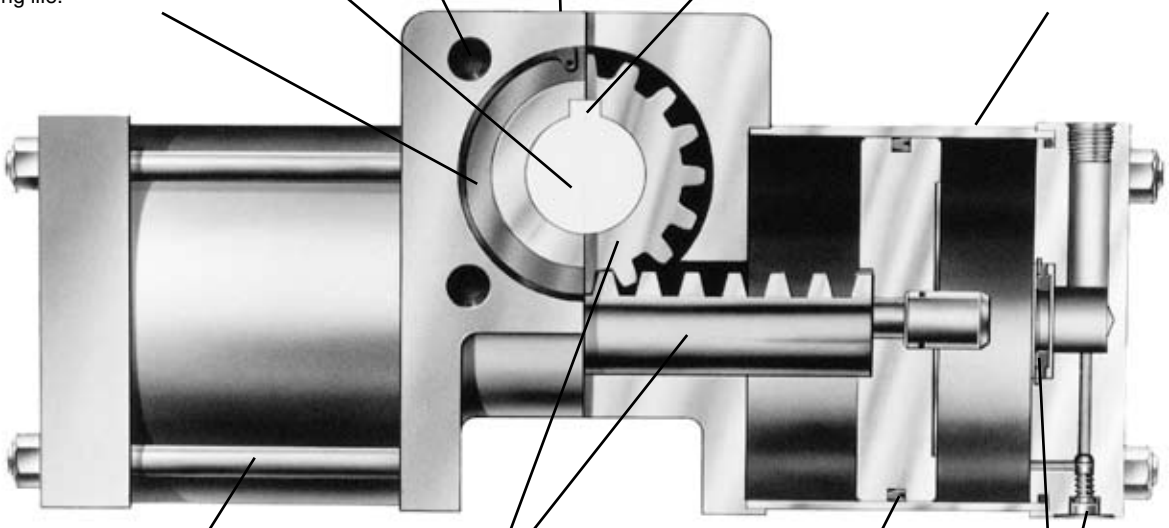
Large Pneumatic
Rack & Pinion Rotary Actuator



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Specifications H62
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Options H64
Proximity Sensors H65
Service Kits H66

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Mounting
Mounting threaded inserts (4) each side.

Housing & Pistons
High strength aluminum with maximum ductility, hard coated and permanently lubricated for long life.

Large Female Pinion
Fits customer's shaft, eliminates need for coupling.

Keyway
In vertical position at midstroke of actuator.*

Cylinders
Precision micro finish honed seamless alloy steel tubing, chrome plated bore.

Bushings
High strength bronze for long life.

Tie Rods
Medium alloy cold worked steel with precision threads.

Rack & Pinion
Specially heat treated and hardened chrome alloy steel for maximum shock resistance; heavy duty gear design is prelubricated.

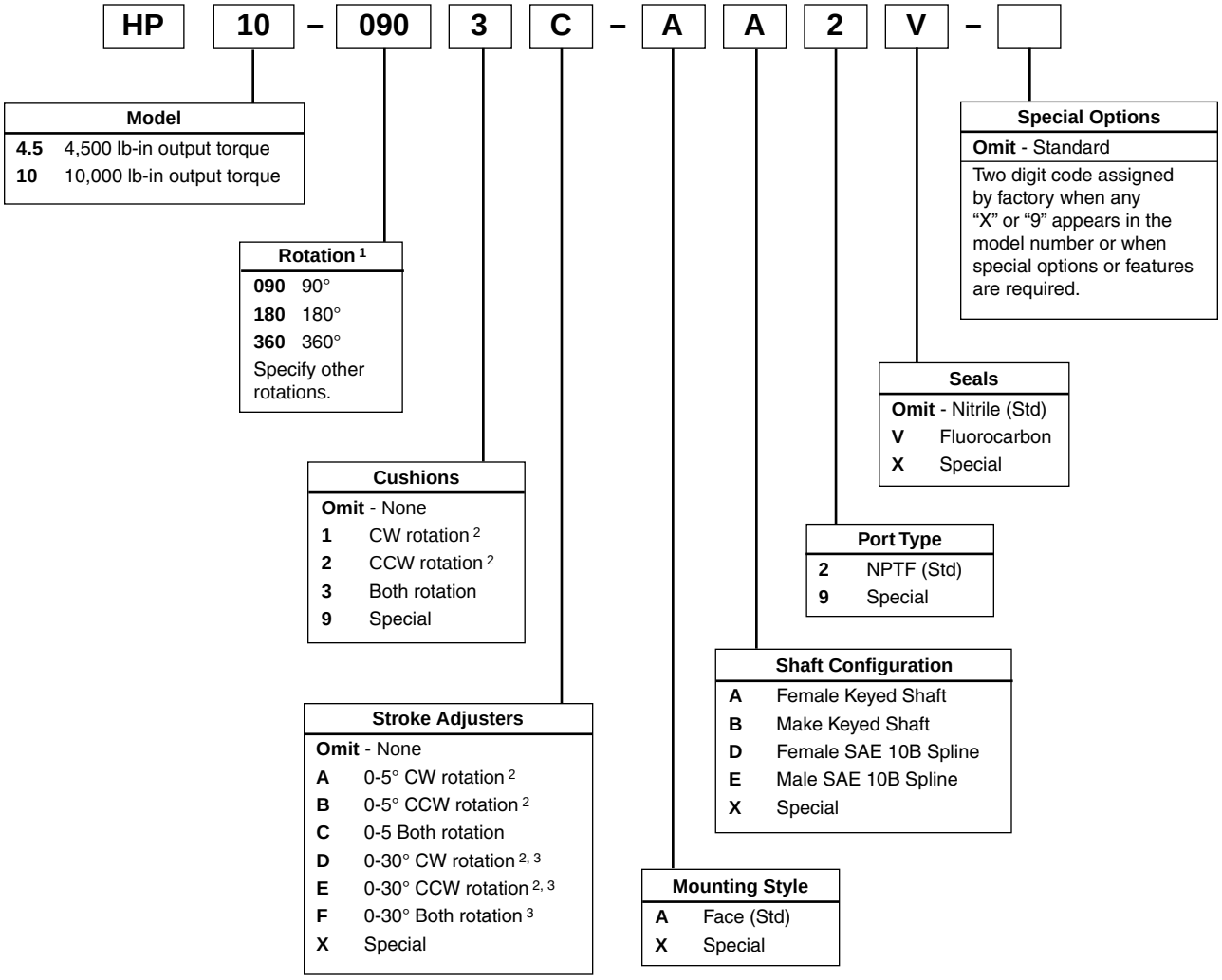
Cushion
Adjustable optional cushion (clockwise and/or counterclockwise).

Seals
Heavy-duty seals for long, trouble-free life.

H

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Model Code and Ordering Information
Example: HP10-0903C-AA2V-14



Notes:

1 To obtain equal rotation both sides of midstroke (theoretical 12:00), order 5° longer rotation than standard with stroke adjusters.

2 Viewed from shaft end.

3 Cannot combine with cushions.

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Specifications

- Maximum operating pressure: 100 psi
- Standard rotations: 90°, 180°, 360° *
- Standard output torque at 100 psi: 4,500 and 10,000 lb-in
- Operating temperature range:
  Nitrile seals 0° to 180°F
  Fluorocarbon seals 0° to 250°F
- Filtration requirement: 40 micron filtration

Quick Reference Data

Model	Rotation* (degrees)	Displacement (cubic inches)	Weight (lb)	Bore Size	Actual Torque Output at 100 PSI (lb-in)	Maximum Rotational Tolerance (degrees)	Maximum Angular Backlash (minutes)
4.5	90	79.93	63	6"	4,500	-0, +2	15
	180	159.86	75				
	360	319.72	95				
10	90	177.64	125	8"	10,000	-0, +2	15
	180	355.28	147				
	360	710.56	190				

* To obtain equal rotation both sides of midstroke (theoretical 12:00), order 5° longer rotation than standard with stroke adjusters.

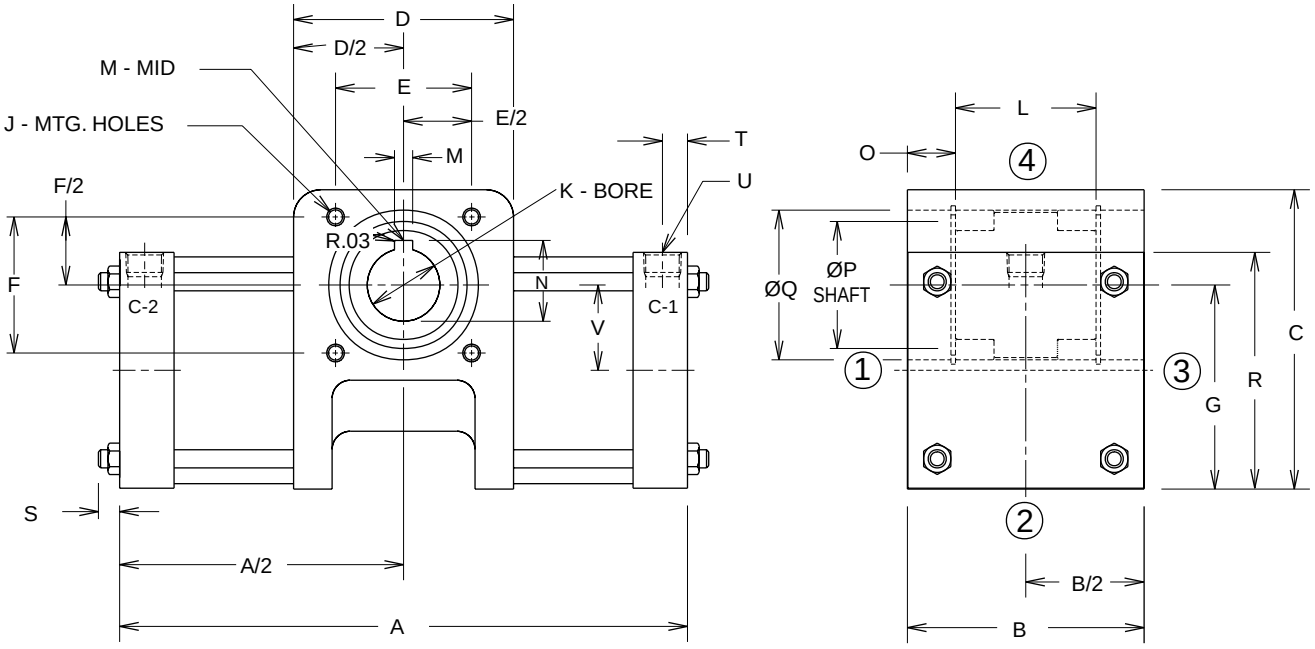
H

Bearing Load Capacities and Kinetic Energy Ratings

Model	Radial Load (lb) per Bearing		Thrust Load (lb)		Distance between Bearings (in.)	Maximum Kinetic Energy Rating for Models Based on Configuration (in-lb)		
	Dynamic	Static	Dynamic	Static		Standard	Stroke Adjusters	Cushion
4.5	2,000	3,000	300	450	2.77	45	45	650
10	2,000	3,000	500	750	3.63	100	100	1450

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Standard Face Mount (A) and Female Keyed Shaft (A) Shown



Note: Numbers above represent possible mounting and port positions.

Dimensions

Model	Rotation	A	B	C	D	E	F	G	J		K
4.5	90°	15-5/8	6.525	8-1/4	6.063	3.750	3.750	5.615	7/16-14 x 21/32 DP		2.000 2.003
	180°	22-1/4									
	360°	33									
10	90°	18	8.525	10-1/2	7.813	5.000	5.000	7.265	5/8-11 x 15/16 DP		2.250 2.253
	180°	26-3/4									
	360°	39-5/8									
Model	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**
4.5	3-7/8	0.500 0.502	2.223 2.233	1-5/16	3-1/2	4-1/8	6-1/2	5/8	0.69	3/4 NPTF	2.35
10	5	0.625 0.628	2.525 2.535	1-3/4	4-1/2	5-1/4	8-1/2	3/4	0.69	3/4 NPTF	3.00

Note:

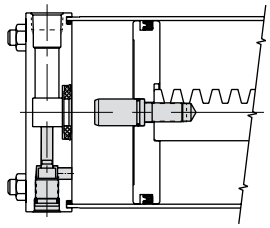
Pressure on C-1 port gives clockwise rotation.
Pressure on C-2 port gives counterclockwise rotation.

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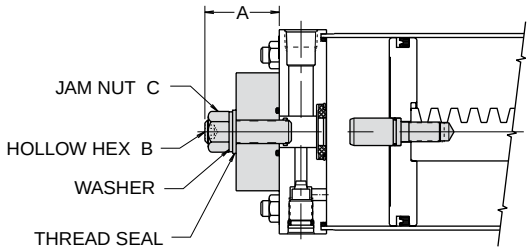
Cushions (1, 2, 3)

The standard cushions operate over the last 20° of rotation in either direction. A floating bushing ensures no binding of cushion spear. All cushions are fully adjustable and are located on the side opposite the port. For other cushion locations specify "9" and describe.

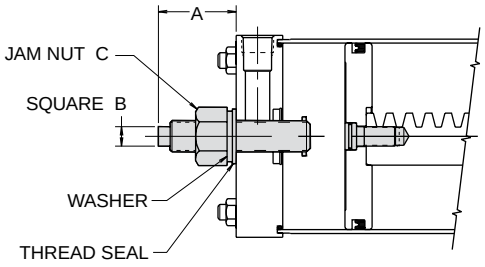


Stroke Adjusters (A - F)

5° Stroke Adjust Option with Cushion Option

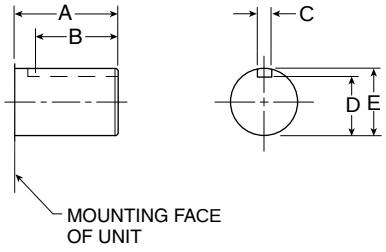


5° or 30° Stroke Adjust Option without Cushion Option



Model	Cushioned End Cap				Non-Cushioned End Cap				
	(1) Turn Adjust	A	B	C	(1) Turn Adjust	A		B	C
						5°	30°		
4.5	2.5°	2.50	5/8	1.00-14	2.0°	2.00	2.81	3/8	3/4-16
10	2.0°	2.50	15/16	1.50-12	1.5°	2.56	3.50	15/16	1-/2-12

Male Shaft (B)



Model	A	B	C	D	E
4.5	2.61	2.38	0.561 0.562	1.928 1.933	2.249 2.250
10	4.38	3.38	0.625 0.627	1.888 1.893	2.249 2.250

Additional Shaft Options (D, E)

Hollowed key shaft is standard. Additional shaft options available are available as a special. Consult factory for information.

Male splined (E)
Female splined (D)

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Fluorocarbon Seals (V)

Standard abrasion resistant nitrile seals should be used for general purpose applications with temperatures of 0 to 180°F. Fluorocarbon seals are recommended for high temperature applications up to 250°F.

Proximity Sensors

(Namco Cylindicators or Balluff Cylinder Indicator Sensor)

The inductive type proximity sensor provides end of rotation indication. The non-contact probe senses the presence of the ferrous cushion spear and has no springs, plungers, cams or dynamic seals that can wear out or go out of adjustment. The sensor is solid state and meets NEMA 1, 12 & 13 specifications. For ease of wiring the connector housing is rotatable through 360°. To rotate, lift the cover latch, position and release.

The sensor make/break activation point may occur at 0.125" to ±0.125" from the end of stroke. Depending on the actuator size, this distance may cause activation at 2° to 15° from end of stroke.

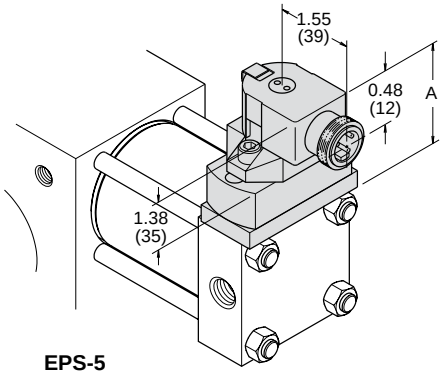
The standard proximity sensor controls 50-230 VAC/DC loads from 5 to 500 mA. The low 1.7 mA off-state leakage current can allow use for direct PLC input. The standard short circuit protection (SCP) protects the sensor from a short in the load or line upon sensing such a condition (5 amp or greater current) by assuming a non-conductive mode. The fault condition must be corrected and the power removed to reset the sensor preventing automatic restarts.

The low voltage DC sensor is also available for use with 10-30 VDC. The sensor is in a non-rotatable housing, but does incorporates the short circuit protection.

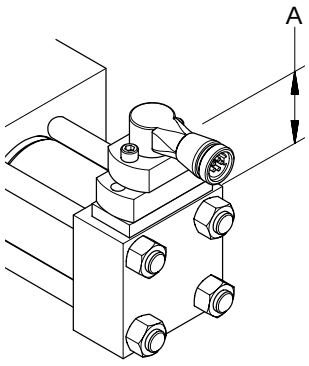
Both sensors are equipped with two LEDs, "Ready" and "Target". The "Ready" LED is lit when power is applied and the cushion spear is not present. The "Target" LED will light and the "Ready" LED will go out when the sensor is closed, indicating the presence of the cushion spear. Both LEDs flashing indicates a short circuit condition.

NOTES:

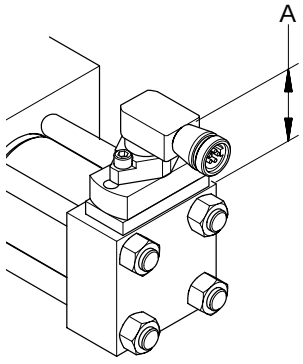
1. Available with or without cushions.
2. Not available with stroke adjusters.
3. Pressure rating: 3000 psi
4. Operating temperature: -4°F to 158°F
5. Specify sensor type, orientation and voltage when ordering.
6. The low voltage DC sensor is available in non-rotatable style only; consult factory for further information.



EPS-5



EPS-6



EPS-7

Model	A (max)	
	EPS-5	EPS-6 & 7
4.5	1.48	1.59
10	2.17	2.28

Order proximity sensors separately. See Electronic Sensors section for specifications and ordering information.

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Seal Kit Ordering Information

- Standard units are equipped with Nitrile seals.
- Optional seal compounds are available.
- See parts list for items contained in seal kit.
- Seal kit part numbers as shown:

PSK	—	HP4.5	V
Parker Seal Kit		Base Model	Omit - Standard V = Fluorocarbon N = Non-Lube

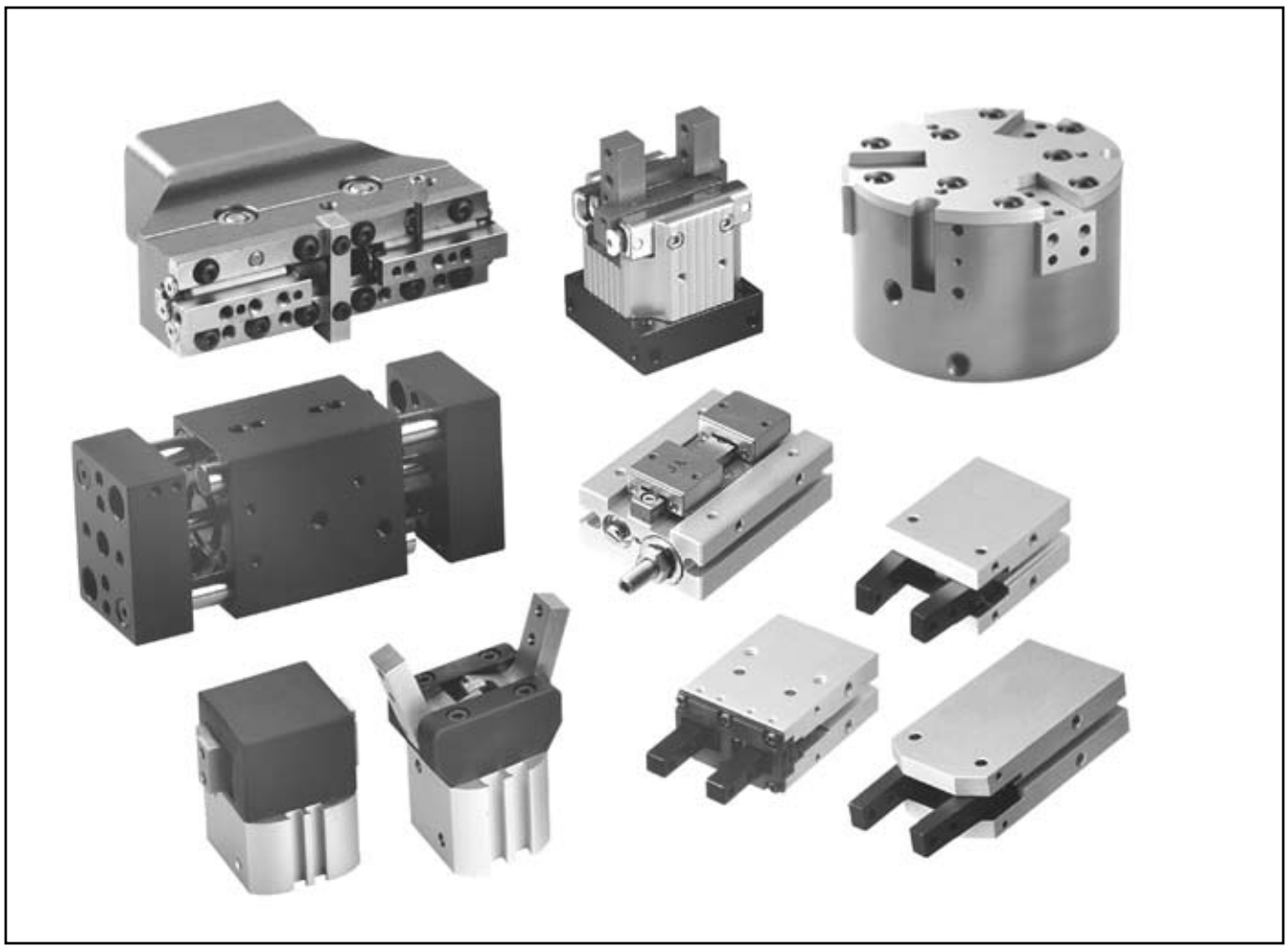
H

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Pneumatic Grippers

Parallel, Angular and Three-Jaw

Section J



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Parallel Gripper Selection Guide J3
Three-Jaw Gripper Selection Guide J4
Angular Gripper Selection Guide.....J4

J

Grippers

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Single Source Supplier for All Automation Needs

Selecting the right gripper for your handling task is easy with Parker Hannifin's extensive offering of pneumatic grippers. Over 100 models are available with a wide variety of options.

Parallel and Angular Grippers

- Universal
- Miniature
- Precision
- High Force
- Long Stroke
- Heavy Duty
- Compact
- Clean

Common Options

- Sensors
- Dust Covers
- Stroke Adjuster
- Alternate Seals
- Spring Assist
- Cleanroom

The more than 1000 possible configurations are sure to suit your unique application requirements.

Connectivity

Integration into your automation system is fast and simple with Parker Hannifin grippers. Standard transition plates and couplers reduce engineering and installation costs. A complete selection of electronic sensors assures control system compatibility.

Specifications

- Stroke Ranges: 0.12 to 6.0 inches
- Grip Forces: up to 3000 lbs
- Operating Characteristics:
  - Single acting
  - Double acting
  - Spring assist and spring return
- Cycle Life: 10 million cycles

For complete information, refer to Catalog 1900-2.

Catalog 1900-2 Contents

- Design Guidelines
- Application Forms
- Product Selection Guide
- Operation Characteristics
- Loading Information
- Ordering Information
- Dimensions

3D CAD FILES
available for download at
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Parallel Grippers

	Series	Max. Strokes	Total Grip Force (lb)	Metric Design	Clean Room	Spring Open	Spring Close	Synch	Non-Synch	Reed Hall	Prox	High Temp Seals
	GPR	10-20 mm	11-46	X							S	
	GPCR	4-14 mm	6-51	X		O					S	
	P5G-HPM	0.13-0.25 in	22-43		O	O			X			O
	P5G-HP (mini)	0.16-0.25 in	25-35	O				X				
	P5G-HP	0.25-1.50 in	35-694	O				X			S	
	GPT	0.625 in	46-86					X		S	S	O
	P5G-AP	5.3-17.9 mm	31-208	X		O	O	X		O	O	O
	GPEL	16-22 mm	10-27	X					X		S	
	GPDL	16-80 mm	10-65	X				X			S	
	P5G-HPL	0.25-1 in	25-33	O	O			X	O	S		O
	P5G-HP-P	0.5-3.0 in	23-498	O				X			S	O
	GPK	24-50 mm	20-90	X				X			S	
	P5G-HPW	0.75-4.50 in	45-450	O				X	O		S	O

X = standard
O = optional
S = order separately

J
Grippers

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Three-Jaw Grippers

	Series	. Stroke	Total Grip Force (lb)	Metric Design	Dust Cover	Spring Open	Spring Close	Synch	Non-Synch	Reed Hall	Prox	High Temp Seals
	P5G-HPC	0.3-1.38 in	80-2800	O				X		S		O

Angular Grippers

	Series	Max. Stroke	Total Grip Force (lb)	Metric Design	Dust Cover	Spring Open	Spring Close	Synch	Reed Hall	Prox	High Temp Seals
	GVC	30°	1.25 - 36	X		O		X		S	
	GAA	30°	2.7 - 6.3					X	S	S	O
	P5G-HA	30°	11 - 134	O				X	S		O
	P5G-AA	30°	17.4 - 198	X			O	X	S	O	O
	P5G-HA	12°	62 - 220	O				X		S	O
	GVH	180°	5 - 54	X				X		S	
	GAW	180°	2.7 - 6.3					X	S	S	O
	P5G-AW	180°	14 - 65	X			O	X	S	O	O

J

X = standard
O = optional
S = order separately

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Air Motors
P1V-S

Section K



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Features	Air Motor	Hydraulic Motor	Electric Motor	Electric Motor Regulated	Electric Motor Regulated with Feedback
Overload safe	***	***	*	**	***
Increased torque at higher loads	***	**	*	**	***
Easy to limit torque	***	***	*	*	***
Easy to vary speed	***	***	*	***	***
Easy to limit power	***	***	*	**	***
Reliability	***	***	***	***	***
Robustness	***	***	*	*	*
Installation cost	***	*	**	**	**
Ease of service	***	**	*	*	*
Safety in damp environments	***	***	*	*	*
Safety in explosive atmospheres	***	***	*	*	*
Safety risk with electrical installations	***	***	*	*	*
Risk of oil leak	***	*	***	***	***
Hydraulic system required	***	*	***	***	***
Weight	**	***	*	**	*
Power density	**	***	*	*	*
High torque for size	**	***	*	*	*
Noise level during operation	*	***	**	**	**
Total energy consumption	*	**	***	***	***
Service interval	*	**	***	***	***
Compressor capacity required	*	***	***	***	***
Purchase price	*	*	***	***	**
Accuracy, speed	*	**	*	**	***
Regulating dynamic	*	*	*	*	***
Communication	*	*	*	***	***

K

* = good

** = average

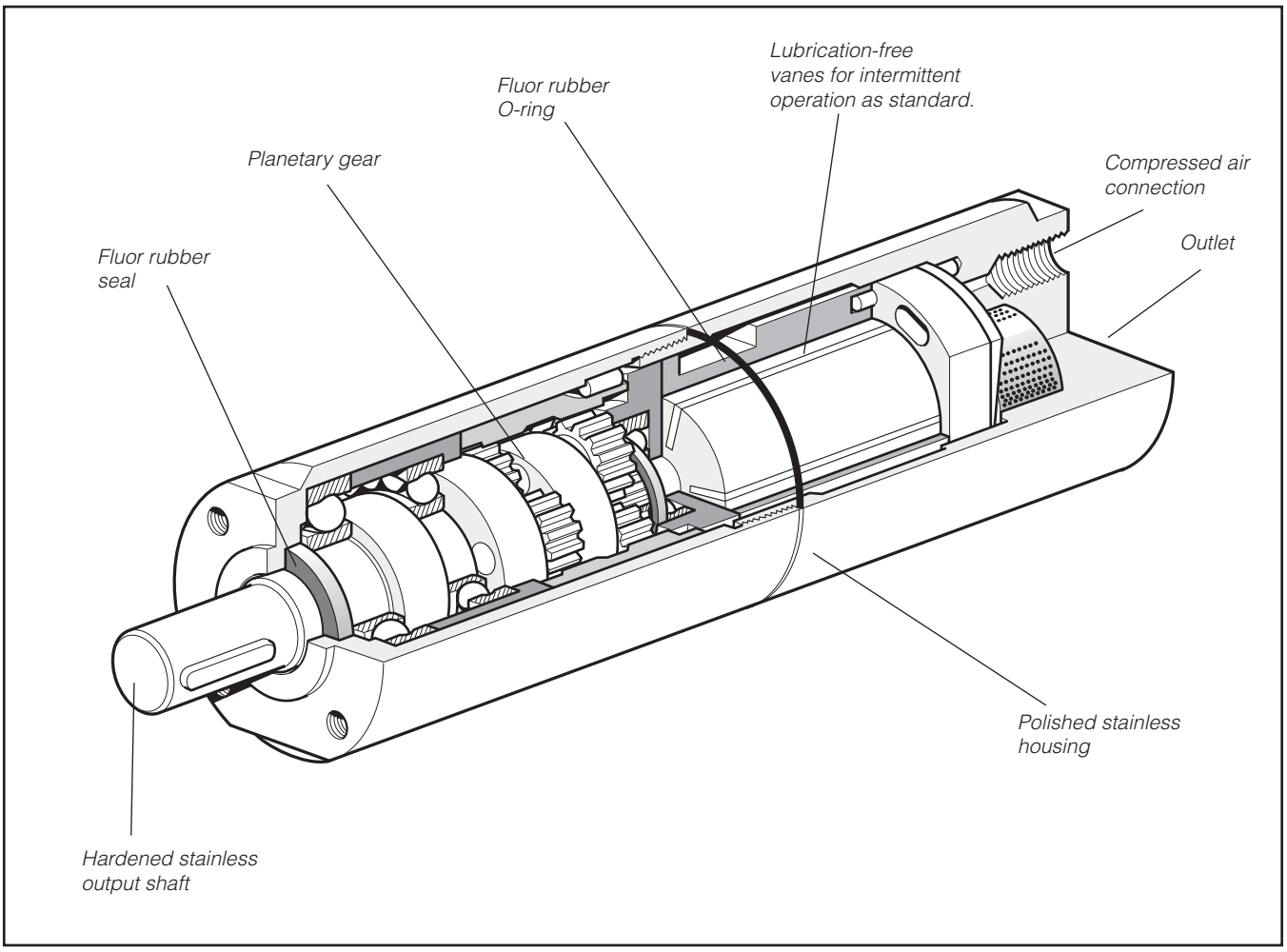
*** = excellent

Important!
Before carrying out service activities, make sure the air motor is vented. Before disassembling the motor, disconnect the primary air hose to ensure that the air supply is interrupted.

NOTE!
All technical data in the catalog are typical values.

The air quality is a major factor in the service life of the motor, see ISO 8573-1.

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Stainless Steel Air Motors, P1V-S Series

P1V-S is a range of air motors with all external components made of stainless steel, which means that they can be used in food grade applications, and in all other applications where there is a risk of corrosion.

The range contains seven different sizes, with powers ranging from 20 to 1 200 Watts, and speeds from 5 to 24 000 rpm. The air motor and planetary reduction gear are built into a polished stainless steel housing, which is sealed by a fluor rubber O-ring. The output shaft, which is made of polished stainless steel, is also sealed by a fluor rubber seal .

Consideration for achieving a clean, hygienic design was given early on in the development of this range of air motors. Thanks to the cylindrical shape, there are no pockets which can accumulate dirt or bacteria. Additionally, the two halves of the motor body are sealed with an o-ring to prevent contamination. The choice of materials reflects the fact that aggressive cleaning materials are used in food grade applications.

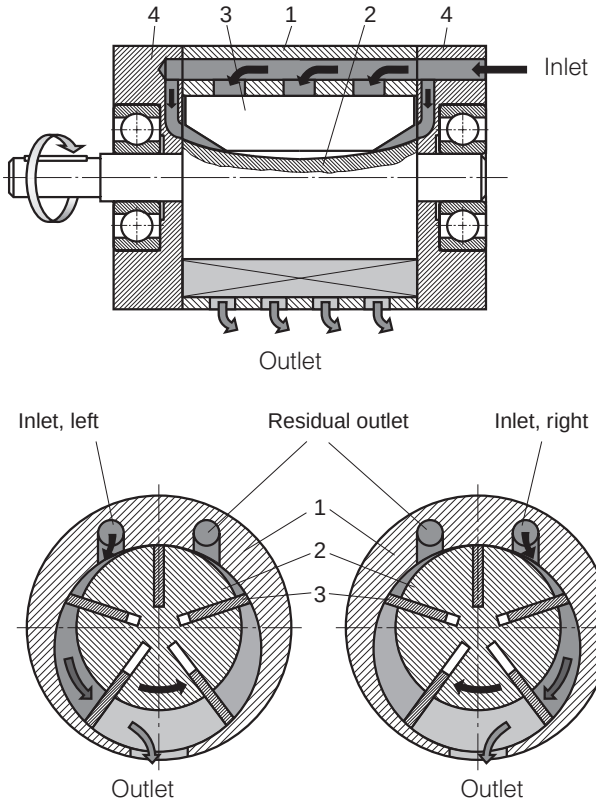
The P1V-S series is designed to be operated in intermittent intervals under non-lubrication conditions. For this reason, no particles of lubricant escape with the exhaust air and the service costs are reduced. This means that the motors can be used directly in food grade applications. The planetary gear, which has one or more reduction stages, is lubricated with an USDA-H1 standard grease, approved for use in food grade applications.



Products particularly suitable for the food industry.

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Principles of Motor Operation

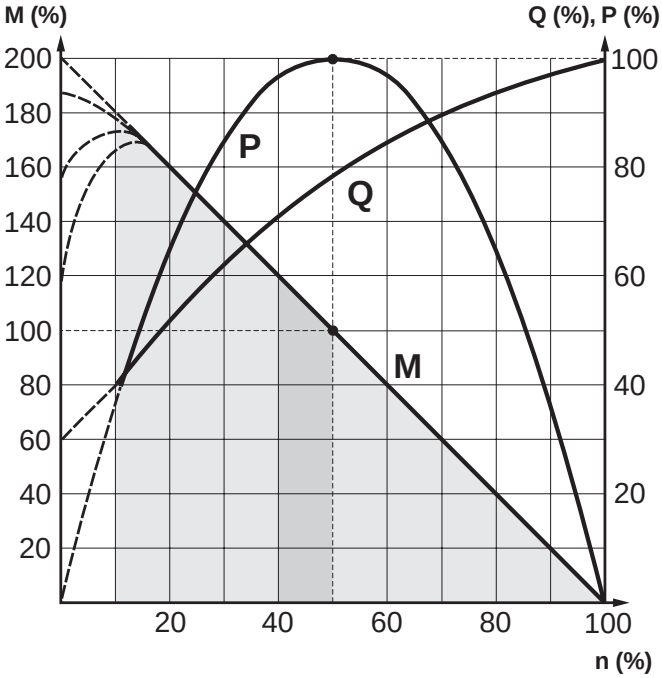


1 Rotor cylinder
2 Rotor
3 Vanes
4 End piece with bearing

There are a number of designs of air motors. Parker Hannifin has chosen to use the vane rotor design, because of its simple design and reliable operation. The small external dimensions of vane motors make them suitable for all applications. The complete unit consists of a motor built together with a planetary reduction gear to give the required speed and torque at the output shaft.

The design of a vane air motor consists of a rotor which incorporates a given number of vanes all enclosed within a cylinder. The cylinder will include three ports; an inlet pressure port, an exhaust port and a residual port. Reliable starting is ensured by the fact that the inlet air presses the vanes against the cylinder wall prior to rotation. During operation, the vanes are pressed outwards by centrifugal force. The air pressure always acts at right angles to the vane surface, which means that the available torque is determined by the surface area of the vanes and by the air pressure. As each vane reached it's lowest point air is released through the exhaust port. As the rotation continues air may be trapped and compressed between vanes. This compressed air is released through the residual port. The residual port doubles as the pressure port when the motor is operated in the reverse direction.

Torque, Power and Air Consumption Graphs



The curve is for 6 bar
P = power **Q = air consumption**
M = torque **n = speed**

Possible working range of motor.

Optimum working range of motor.
Higher speeds = more vane wear

Lower speeds with high torque = more gearbox wear

The performance characteristics of each motor are shown in a family of curves as above, from which torque, power and air consumption can be read off as a function of speed. Power is zero when the motor is stationary and also when running at free speed (100%) with no load. Maximum power (100%) is normally developed when the motor is braked to approximately half the free speed (50%).

Torque at free speed is zero, but increases as soon as a load is applied, rising linearly until the motor stalls. As the motor can stop with the vanes in various positions, it is not possible to specify an exact starting torque. However, a minimum starting torque is shown in all tables.

Air consumption is greatest at free speed, and decreases with decreasing speed, as shown in the above diagram.

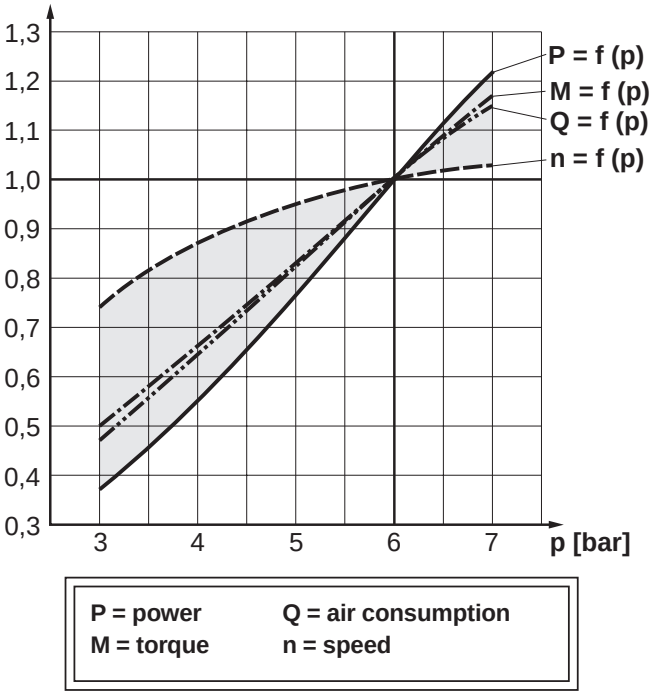
Please refer to the curve on page K63 for these pressures:
3, 4, 5, 6 and 7 bar

K

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Pneumatic Division
Wadsworth, Ohio
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Correction Diagram

Correction Factor



All catalog data and curves are specified at a supply pressure of 6 bar (in the inlet port). This diagram shows the effect of pressure on speed, torque, power and air consumption.

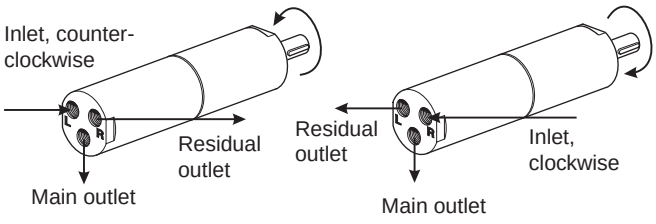
Start off on the curve at the pressure used and then look up to the lines for power, torque, air consumption or speed. Read off the correction factor on the Y axis for each curve and multiply this by the specified catalog data in the table or data read from the torque and power graphs.

Example: at 4 bar supply pressure, the power is only 0,55 x power at 6 bar supply pressure.

This example shows how rapidly the power rating of a motor decreases as the supply pressure is reduced. Therefore, it is critical to ensure that the proper pressure is supplied at the inlet port of the motor.

Direction of Motor Rotation

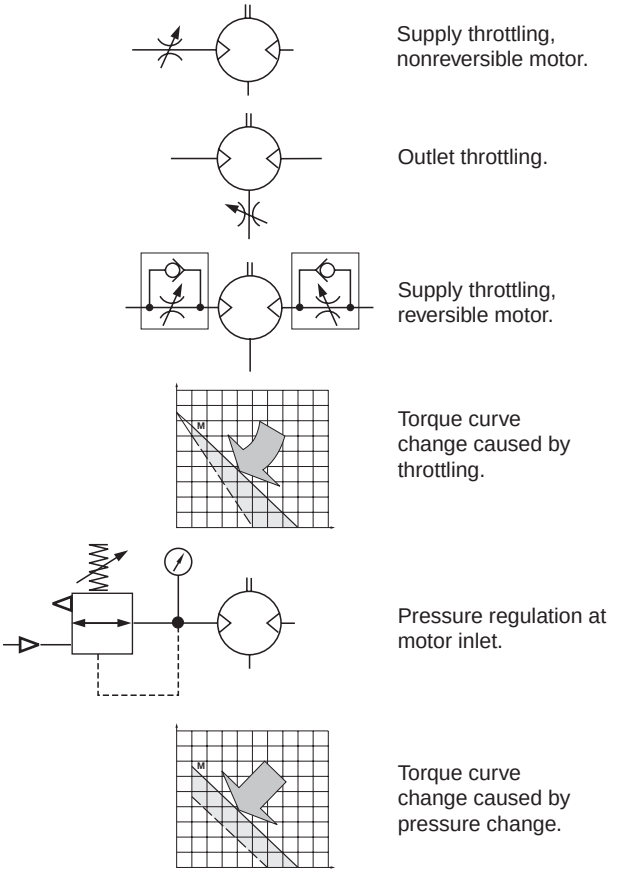
The direction of rotation of reversible motors is controlled by supplying inlet L or inlet R with compressed air. Air motors can be stopped and started continually without damage.



As the motor begins to rotate air is trapped between the vanes and is compressed. This air is exhausted through the exhaust port. As the rotor continues it's rotation, trapped air is compressed and exhausted through the residual port. If this air is not exhausted, the motor will be braked and maximum power will not be obtained.

Speed Regulation

Throttling



The most common way to reduce the speed of a motor is to install a flow control in the air inlet. When the motor is used in applications where it must reverse and it is necessary to restrict the speed in both directions, flow controls with integral non-return function should be used in both directions. Restriction may also be applied to the main outlet which will control the speed in both directions.

Inlet Throttling

If the inlet air is restricted, the air supply is restricted and the free speed of the motor falls, but there is full pressure on the vanes at low speeds. This means full torque is available from the motor at low speed, despite the low air flow.

Since the torque curve becomes “steeper”, this also means that we get a lower torque at any given speed than would be developed at full air flow.

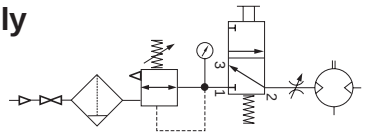
Pressure Regulation

The speed and torque can also be regulated by installing a pressure regulator in the inlet pipe. When the motor is constantly supplied with air at lower pressure and the motor is braked, it develops a lower torque on the output shaft.

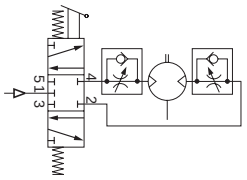
In brief: Inlet throttling gives reduced speed in one direction but maintains torque when braked. The torque curve becomes steeper. A restriction in the main inlet gives reduced speed in both directions but maintains torque when braked. The torque curve becomes steeper. Pressure regulation in the inlet cuts torque when the motor is braked, and also reduces speed. The torque curve is moved parallel.

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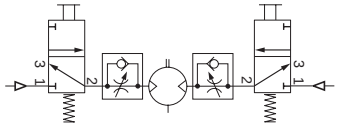
Air Supply



Shut-off, filtering, pressure regulation and control valve



Reversible motor with 5/3 control valve



Reversible motor with two 3/2 control valves

The air supplying the motor must be filtered and regulated. Directional valves are needed to control the pressurized air which will cause the motor to rotate. These valves can be equipped with several means of actuation, such as electric, manual or pneumatic control. When the motor is used in a non-reversible application, it is sufficient to use a 2/2 or 3/2 valve for supply. Either one 5/3 or two 3/2 valves are needed for a reversible motor, to ensure that the motor gets its compressed air and the residual outlet is vented. A flow control can be installed in the inlet pipe to regulate the motor speed if the motor is not used as a reversible motor. One flow control with by-pass is needed to regulate each direction of rotation if the motor is used as a reversible motor. The built-in check valve will then allow air from the residual air outlet to escape through the outlet port in the control valve.

The compressed air supply must have sufficiently large pipes and valves to give the motor maximum power. The motor needs 6 bar at the supply port all the time. A reduction of pressure to 5 bar reduces the power developed to 77%, and to 55% at 4 bar.

Choice of Components for Air Supply

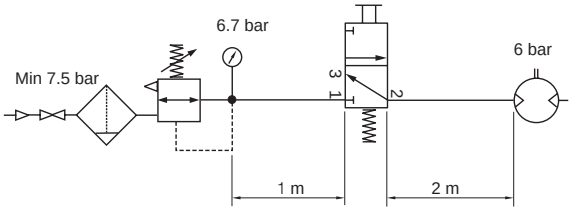
Since the supply pressure at the air motor inlet port is of considerable importance for obtaining the power, speed and torque quoted in the catalog, the recommendations below should be observed.

The following data must be complied with:

Supply pressure to air treatment unit:	Min 7.5 bar
Gauge pressure:	6.7 bar
Pipe length between air treatment unit and valve:	Max. 1 m
Pipe length between valve and air motor:	Max. 2 m

The pressure drop through air treatment unit - pipe - valve - pipe means that 6 bar pressure is obtained at the motor inlet port.

Please refer to the correction diagram on page K5, which shows what lower supply pressure means for power, speed and torque.



The Table can be used as follows:

If you are using only one motor with each air treatment unit and valve, simply follow the table. If you are using more than one motor with the same air treatment unit: read the table values for selecting the air treatment unit and add them together, and select a suitable air treatment unit from the table showing air flows per treatment unit. Then read the values for selecting the valve from the bottom of the table, and select a suitable valve from the table showing air flows per valve family.

The air treatment units have the following flows in Nl/Min at 7.5 bar supply pressure and 0,8 bar pressure drop

FRL Series	Air Flow in Nl/Min
P3H, Moduflex FRL, 40 Series, G1/4	550
P3K, Moduflex FRL, 60 Series, G1/2	1310
P3M, Moduflex FRL, 80 Series, G1	2770
Standard Series FRL, G11/2	9200
Stainless Series FRL PF, G1/4	530
Stainless Series FRL PF, G1/2	1480

Valve series with respective flows in Nl/minute

Valve Series	Qn in Nl/Min
Valvetronic Solstar	33
Interface PS1	100
Adex A05	173
Moduflex Size 1, (2 x 3/2)	220
Valvetronic PVL-B 5/3 Closed Center, 6 mm Push-In	290
Moduflex Size 1, (4/2)	320
B43 Manual and Mechanical	340
Valvetronic PVL-B 2 x 2/3, 6 mm Push-In	350
Valvetronic PVL-B 5/3 Closed Center, G1/8	370
Compact Isomax DX02	385
Valvetronic PVL-B 2 x 3/2 G1/8	440
Valvetronic PVL-B 5/2, 6 mm Push-In	450
Valvetronic PVL-B 5/3 Vented Center, 6 mm Push-In	450
Moduflex Size 2, (2 x 3/2)	450
Flowstar P2V-A	520
Valvetronic PVL-B 5/3 Vented Center, G1/8	540
Valvetronic PVL-B 5/2, G1/8	540
Valvetronic PVL-C 2 x 3/2, 8 mm Push-In	540
Adex A12	560
Valvetronic PVL-C 2 x 3/2 G1/8	570
Compact Isomax DX01	585
VIKING Xtreme P2LAX	660
Valvetronic PVL-C 5/3 Closed Center, 8 mm Push-In	700
Valvetronic PVL-C 5/3 Vented Center, G1/4	700
B3-Series	780
Valvetronic PVL-C 5/3 Vlosed Venter, G1/4	780
Moduflex size 2, (4/2)	800
Valvetronic PVL-C 5/2, 8 mm push in	840
Valvetronic PVL-C 5/3 Vented Center, 8 mm Push-In	840
Valvetronic PVL-C 5/2, G1/4	840
Flowstar P2V-B	1090
ISOMAX DX1	1150
B53 Manual and Mechanical	1160
B4-Series	1170
VIKING Xtreme P2LBX	1290
B5-Series, G1/4	1440
Airline Isolator Valve VE22/23	1470
ISOMAX DX2	2330
VIKING Xtreme P2LCX, G3/8	2460
VIKING Xtreme P2LDX, G1/2	2660
ISOMAX DX3	4050
Airline Isolator Valve VE42/43	5520
Airline Isolator Valve VE82/83	13680

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Air Motors

Air Motor	P1V-S002	P1V-S008	P1V-S012	P1V-S020	P1V-S030	P1V-S060	P1V-S120
Air flow required, Nl/s	1.7	3.8	5.0	6.3	8.0	14.5	27
Air flow required, Nl/min	102	230	300	380	480	870	1620
Min. internal diameter of pipe, mm	4	4	6	10	10	12	19
Choice of air treatment unit: recommended min. air flow in litres/minute at 7,5 bar air supply and 0,8 bar pressure drop							
	110						
		255					
			330				
				420			
					530		
						960	
							1780
Choice of valve: recommended min. air flow in Qn in litres/minute (Qn is the flow through the valve at 6 bar supply pressure and 1 bar pressure drop over the valve).							
	123						
		280					
			360				
				440			
					660		
						1080	
							2160

Drilling Motors

Drilling Motor	P1V-S008	P1V-S017	P1V-S025	P1V-S040			
Air flow required, Nl/s	3.8	5,0	6.3	8.0			
Air flow required, Nl/min	230	300	380	480			
Min. internal diameter of pipe, mm	4	6	6	10			
Choice of air treatment unit: recommended min. air flow in litres/minute at 7.5 bar air supply and 0.8 bar pressure drop							
	255						
		330					
			420				
				530			
Choice of valve: recommended min. air flow in Qn in litres/minute (Qn is the flow through the valve at 6 bar supply pressure and 1 bar pressure drop over the valve).							
	280						
		360					
			440				
				580			

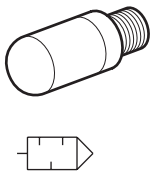
Grinding and Milling Motors

Motor	Grinding P1V-S009	Grinding P1V-S020	Milling P1V-S040				
Air flow required, Nl/s	2.0	6.3	8.0				
Air flow required, Nl/min	120	380	480				
Min. internal diameter of pipe, mm	4	6	10				
Choice of air treatment unit: recommended min. air flow in litres/minute at 7.5 bar air supply and 0.8 bar pressure drop							
	135						
		420					
			530				
Choice of valve: recommended min. air flow in Qn in litres/minute (Qn is the flow through the valve at 6 bar supply pressure and 1 bar pressure drop over the valve).							
	145						
		440					
			580				

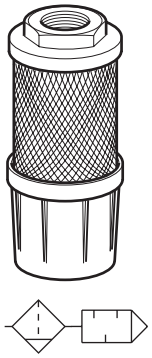
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Silencing

Outlet silencer



Central silencer



The noise from an air motor consists of both mechanical noise and a pulsating noise from the air flowing out of the outlet. The installation of the motor has a considerable effect on mechanical noise. It should be installed so that no mechanical resonance effects occur. The outlet air creates a noise level which can amount to 108 dB(A) if the air is allowed to exhaust freely into the atmosphere. To reduce noise levels, various types of outlet silencer are used. The most common type screws directly into the outlet port of the motor. A wide range of silencers are available. Many are made of sintered brass or sintered plastic. Since the motor function causes the exhaust air to pulsate, it is a good idea to allow the air to exhaust into some kind of chamber first, which reduces the pulsations before they reach the silencer. The best silencing method is to connect a soft hose to a central silencer allowing the speed of the air to reduce as much as possible.

NOTE! *Remember that if a silencer is too small or is blocked, back pressure is generated on the outlet side of the motor, which in turn reduces the motor power.*

Sound Levels

Sound levels are measured at free speed with the measuring instrument positioned 1 m away from the air motor, see the table below.

Air Motor	Free Outlet dB (A)	With Outlet Silencer dB (A)	Exhaust Air Removed with Pipes to Another Room dB (A)
P1V-S002	98	—	74
P1V-S008	95	—	71
P1V-S012	99	92	70
P1V-S020	100	88	71
P1V-S030	103	91	70
P1V-S060	103	94	76
P1V-S120	108	95	87

Drilling, Milling and Grinding Motor	With Integrated Outlet Silencer dB (A)	Exhaust Air Removed with Pipes to Another Room dB (A)
P1V-S008	85	71
P1V-S009	72	—
P1V-S017	74	70
P1V-S025	76	71
P1V-S040	77	70

Compressed Air Quality

Oil and oil mist are avoided whenever possible to ensure a clean work environment. In addition, purchasing, installation and maintenance of oil mist equipment can be expensive. All users in all industries now try to avoid using components which have to be lubricated.

The P1V-S motor is equipped with vanes for intermittent lubrication free operation as standard, which is the most common application of air motors. The motor is also available with optional hard vanes for continuous lubrication-free operation (option “C”).

The P1V-S motor is equipped as standard with food grade grease in the planetary gearbox. An oil which is approved by the food industry is also available if supplementary lubrication is required.

Working pressure	Max. 7 bar (Max. 6 bar in explosive atmospheres Ex)
Working temperature	-30 °C to +100 °C
Ambient temperature	-20 °C to +40 °C in explosive atmospheres Ex
Medium	40 µm filtered, oil mist or dry unlubricated compressed air

Dry Unlubricated Compressed Air

If unlubricated compressed air is used, the compressed air should comply with the purity standards below in order to guarantee the longest possible overall service life. If the unlubricated compressed air has a high water content, condensation forms inside the motor, causing corrosion in all internal components. A ballbearing can be destroyed in a remarkably short time if it comes into contact with a single water droplet.

For indoor use, we recommend ISO8573-1 purity class 3.4.1. To achieve this, compressors must be fitted with aftercoolers, oil filters, refrigerant air dryers and air filters.

For indoor / outdoor use, we recommend ISO8573-1 purity class 1.2.1. To achieve this, compressors must be fitted with aftercoolers, oil filters, adsorption dryers and dust filters.

Oil Mist

If oil mist is used (approx. 1 drop of oil per m³ of compressed air), the oil not only acts as a lubricant but also protects against corrosion. This means that compressed air with a certain water content may be used without causing corrosion problems inside the motor.

ISO8573-1 purity class 3.-.5 may be used without difficulty.

The following oils are recommended for use in the foodstuffs industry: Shell Cassida Fluid HF 32 or Klüberoil 4 UH 1-32

ISO 8573-1 Purity Classes

Quality Class	Contaminants		Water	Oil
	Particle Size (µm)	Max. Concentration (mg/m³)	Max. Pressure Dew Point (°C)	Max. Concentration (mg/m³)
1	0.1	0.1	-70	0.01
2	1	1	-40	0.1
3	5	5	-20	1.0
4	15	8	+3	5.0
5	40	10	+7	25
6	—	—	+10	—

For example: compressed air to purity class 3.4.3

This means a 5 µm filter (standard filter), dew point +3 ºC (refrigerant cooled) and an oil concentration of 1,0 mg oil/m³ (as supplied by a standard compressor with a standard filter).

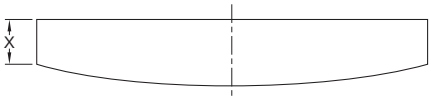
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Service Interval



The first service is due after approximately 500 hours of operation. After the first service, the service interval is determined by the degree of vane wear*. The table below shows new dimensions and the minimum dimensions of worn vanes.

The following normal service intervals should be applied to in order to guarantee problem-free operation in air motors working continuously at load speeds*.



Air Motor	Dimensions on New Vanes X(Mm), Type of Vanes			
	Standard	Z	C	M
P1V-S002	3.3	–	–	–
P1V-S008	4.3	–	–	–
P1V-S012	4.2	4.2	4.2	4.2
P1V-S020	6.5	6.0	6.0	6.0
P1V-S030	6.8	6.2	6.8	6.2
P1V-S060	9.0	9.0	9.0	9.0
P1V-S120	14.7	14.0	14.0	14.0

Air Motor	Minimum Dimensions on Vane X (mm), Type of Vanes			
	Standard	Z	C	M
P1V-S002	3.0	–	–	–
P1V-S008	4.0	–	–	–
P1V-S012	3.3	3.3	3.3	3.3
P1V-S020	5.8	5.3	5.3	5.3
P1V-S030	6.0	5.2	6.0	5.2
P1V-S060	6.0	6.0	6.0	6.0
P1V-S120	14.2	13.5	13.5	13.5

Drilling, Milling and Grinding Motor	New Dimensions X(Mm)	Minimum Dimensions X (Mm)
P1V-S008	4.3	4.0
P1V-S017	4.2	3.3
P1V-S025	6.5	5.8
P1V-S040	6.8	6.0

Intermittent lubrication-free operation of motors with standard vanes

Duty cycle :	70%
Max. duration of intermittent use :	15 minutes
Filtration 40 µm :	750 hours of operation*
Filtration 5 µm :	1 000 hours of operation*

Continuous operation of motors with standard vanes, with lubrication

Duty cycle :	Continuous
Quantity of oil :	1 drop per m³ of air
Filtration 40 µm :	1 000 hours of operation*
Filtration 5 µm :	2 000 hours of operation*

NOTE! After 1000 hours of operation, the grease in the planetary gearbox must be changed

Continuous lubrication-free operation of motors equipped with hard vanes (option C)

Duty cycle :	Continuous
Filtration 40 µm :	750 hours of operation*
Filtration 5 µm :	1000 hours of operation*

CE marking

The air motors are supplied as “Components for installation” – the installer is responsible for ensuring that the motors are installed safely in the overall system. Parker Pneumatic guarantees that its products are safe, and as a supplier of pneumatic equipment we ensure that the equipment is designed and manufactured in accordance with the applicable EU directive.

Most of our products are classed as components as defined by various directives, and although we guarantee that the components satisfy the fundamental safety requirements of the directives to the extent that they are our responsibility, they do not usually carry the CE mark. Nevertheless, most P1V-S motors carry the CE mark because they are ATEX certified (for use in explosive atmospheres).

The following are the currently applicable directives:

- Machinery Directive (essential health and safety requirements relating to the design and structure of machines and safety components)
- EMC Directive
- Simple Pressure Vessels Directive
- Low Voltage Directive
- ATEX Directive (ATEX = ATmosphere EXplosive)



*The specified hours of operation apply when the motor is running at the speed corresponding to maximum power (load speed). This is approximately half free speed.

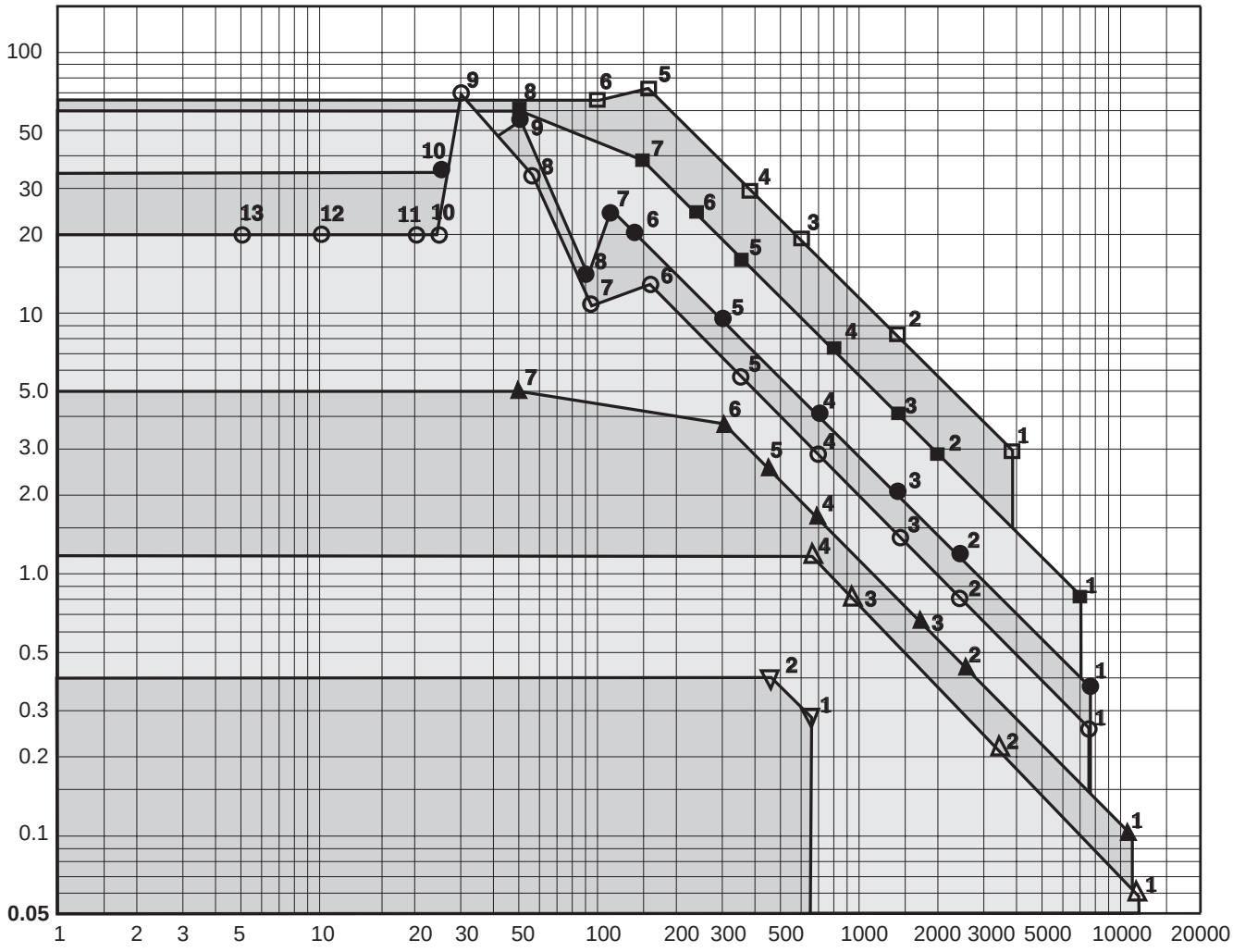
If the motor operates at higher speeds, the service interval is shorter.

If the motor operates at lower speeds, the service interval is longer.

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Choice of Air Motor

Torque at Maximum Power [Nm]



The motor to be used should be selected by starting with the torque needed at a specific shaft speed. In other words, to choose the right motor, you have to know the required speed and torque. Since maximum power is reached at half the motor's free speed, the motor should be chosen so that the oprating point is as close as possible to the maximum power of the motor.

The design principle of the motor means that higher torque is generated when it is braked, which tends to increase the speed, etc. This means that the motor has a kind of speed self-regulation function built in.

Use the above graph to choose the correct motor size. The graph contains the points for the maximum torque of each motor at maximum output. Add your operating point to the graph, then select a marked point above and to the right of your point.

Then use the correct working diagram of the chosen motor to get more detailed technical data. Always select a motor whose requisite technical data are in the shaded area. Also use the correction diagram to find out what operation with different supply pressures would mean for the motor.

Tip: Select a motor which is slightly too fast and powerful, then regulate its speed and torque with a pressure regulator and/or throttle to achieve the optimum working point.

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Air Motors in Diagram on Previous Page

20 Watt

∇ 1	P1V-S002A0130
∇ 2	P1V-S002A0095

Graphs for each motor, see page K19



P1V-S002A

80 Watt

Δ 1	P1V-S008A0Q00
Δ 2	P1V-S008A0700
Δ 3	P1V-S008A0190
Δ 4	P1V-S008A0130

Graphs for each motor, see page K19.

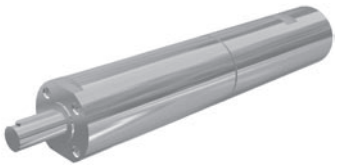


P1V-S008A

120 Watt

▲ 1	P1V-S012A0N00, P1V-S012D0N00
▲ 2	P1V-S012A0550, P1V-S012D0550
▲ 3	P1V-S012A0360, P1V-S012D0360
▲ 4	P1V-S012A0140, P1V-S012D1400
▲ 5	P1V-S012A0090, P1V-S012D0090
▲ 6	P1V-S012A0060, P1V-S012D0060
▲ 7	P1V-S012A0010, P1V-S012D0010

Graphs for each motor, see page K21.



P1V-S012A



P1V-S012D

200 Watt

○ 1	P1V-S020A0E50, P1V-S020D0E50
○ 2	P1V-S020A0460, P1V-S020D0460
○ 3	P1V-S020A0240, P1V-S020D0240
○ 4	P1V-S020A0140, P1V-S020D0140
○ 5	P1V-S020A0070, P1V-S020D0070
○ 6	P1V-S020A0035, P1V-S020D0035
○ 7	P1V-S020A0018, P1V-S020D0018
○ 8	P1V-S020A0011
○ 9	P1V-S020A0006
○ 10	P1V-S020A0005, P1V-S020D0005
○ 11	P1V-S020A0002
○ 12	P1V-S020A0001
○ 13	P1V-S020A00005

Graphs for each motor, see page K23.



P1V-S020A



P1V-S020D

300 Watt

● 1	P1V-S030A0E50, P1V-S030D0E50
● 2	P1V-S030A0460, P1V-S030D0460
● 3	P1V-S030A0240, P1V-S030D0240
● 4	P1V-S030A0140, P1V-S030D0140
● 5	P1V-S030A0060, P1V-S030D0060
● 6	P1V-S030A0028, P1V-S030D0028
● 7	P1V-S030A0023
● 8	P1V-S030A0018, P1V-S030D0018
● 9	P1V-S030A0010
● 10	P1V-S030A0005, P1V-S030D0005

Graphs for each motor, see page K25.



P1V-S030A



P1V-S030D

600 Watt

■ 1	P1V-S060A0E00
■ 2	P1V-S060A0400
■ 3	P1V-S060A0270
■ 4	P1V-S060A0170
■ 5	P1V-S060A0072
■ 6	P1V-S060A0048
■ 7	P1V-S060A0030
■ 8	P1V-S060A0010

Graphs for each motor, see page K27.

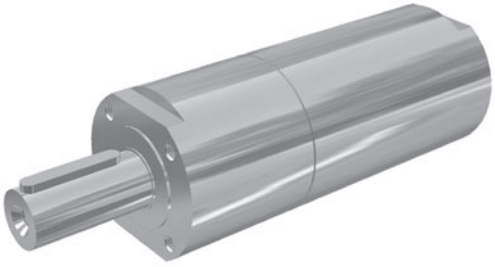


P1V-S060A

1200 Watt

□ 1	P1V-S120A0800
□ 2	P1V-S120A0270
□ 3	P1V-S120A0110
□ 4	P1V-S120A0078
□ 5	P1V-S120A0032
□ 6	P1V-S120A0012

Graphs for each motor, see page K29.



P1V-S120A

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Air Motors

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Technical Data

Working pressure	Max. 7 bar (Max. 6 bar in explosive atmospheres)
Working temperature	-30 °C to +100 °C
Ambient temperature	-20 °C to +40 °C in explosive atmospheres
Medium	40 µm filtered, oil mist or dry unlubricated compressed air

Table and Diagram Data

All values are typical values, with a tolerance of ±10%

Option

Other variants on request

Material Specification

Planetary gearbox for:
P1V-S060A0010 /30 /48
P1V-S120A0012 /32 Stainless steel, X46Cr13

Planetary gearbox for last planet stage incl. installation flange
P1V-S020A0011 /06
P1V-S030A0023 /10 Black oxidised steel (not stainless)

All other housings	Stainless steel, X12CrMoS17
Spindle*	Hardened stainless steel, X20Cr13
Key*	Hardened stainless steel X6CrNiMoTi17-12-2
External seal	Fluor rubber, FPM
Internal steel parts	High grade steel (not stainless)
Planetary gear grease	USDA-h1 approved

* P1V-S020A0011/06 and P1V-S030A0023/10

Key and Shaft	High grade steel (not stainless)
Screws in housing in last planet stage	Surface treated steel (not stainless)
Flange bracket	Stainless steel, X12CrMoS17
Foot bracket	Stainless steel, X5CrNi18
Screws for bracket	Stainless steel DIN A2

Choice of Vanes

0 = Standard

Standard vanes = These motors are of the vane type for intermittent lubrication-free operation. They can operate 70% of the time for up to 15 minutes without lubrication. With lubrication, these motors can operation 100% of the time.

Z = Spring Loaded (Standard) Vanes

Standard vanes = These motors are of the vane type for intermittent lubrication-free operation. They can operate 70% of the time for up to 15 minutes without lubrication. With lubrication, these motors can operation 100% of the time.
Spring loaded vanes = All vanes are spring loaded to ensure that they remain pressed against the cylinder when the motor stops. The spring loaded vane option also prevents the vanes from sliding down in their track if vibration is introduced. The spring loaded vanes therefore provide a higher starting torque, improved starting and low speed characteristics, because the leakage over the vanes is reduced to a minimum.

C = Vanes for Continuous Lubrication-Free Operation

C vanes = This motor is equipped with vanes for continuous lubrication-free operation. (To obtain the longest possible service life, we recommend no oil in the air.)

M = Multi (Combination of Z+C)

C vanes = This motor is equipped with vanes for continuous lubrication-free operation. (To obtain the longest possible service life, we recommend no oil in the air.)
Spring loaded vanes = All vanes are spring loaded to ensure that they remain pressed against the cylinder when the motor stops. The spring loaded vane option also prevents the vanes from sliding down in their track if vibration is introduced. The spring loaded vanes therefore provide a higher starting torque, improved starting and low speed characteristics, because the leakage over the vanes is reduced to a minimum.

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Order Key

P1V-S **020** **A** **0** **E50**

	Air Motor Range
P1V-S	Stainless Vane Motor

	Motor Size
002	20 W
008	80 W
012	120 W
020	200 W
030	300 W
060	600 W
120	1200 W

	Function
A	Keyed Shaft, Reversible
D	Threaded Shaft, Reversible

	Optional Functions
0	Standard
C*	Continuous Lubrication-Free Operation
Z*	Spring Loaded Vanes
M*	Multi: Combination of C+Z
D**	Standard with Brake
E**	Option C with Brake
F**	Option Z with Brake
G**	Option M with Brake

* Not for P1V-S002 and P1V-S008

** Only for P1V-S020 and P1V-S030

	Free Speed per min
0005	5
001 … **999**	10 … 9990
A00 … **E00**	10000 … 14000
E50 … **N00**	14500 … 22000
Q00	24000

Possible combinations

Please refer to pages K18 to K32.

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Introduction to the ATEX directive

Explosive Atmospheres

Directive 94/9/EC defines an explosive atmosphere as a mixture of:

a) **flammable substances** – gases, vapors, mists or dusts
b) with air
c) under specific **atmospheric conditions**
d) in which, after ignition has occurred, combustion spreads to the entire flammable mixture

(NB: with regard to dust, it may be that not all dust is combusted after ignition has occurred)

An atmosphere with the potential to become an explosive atmosphere during operating conditions and/or under the influence of the surroundings is defined as a **potentially explosive atmosphere.** Products covered by directive 94/9/EC are defined as intended for use in potentially explosive atmospheres.

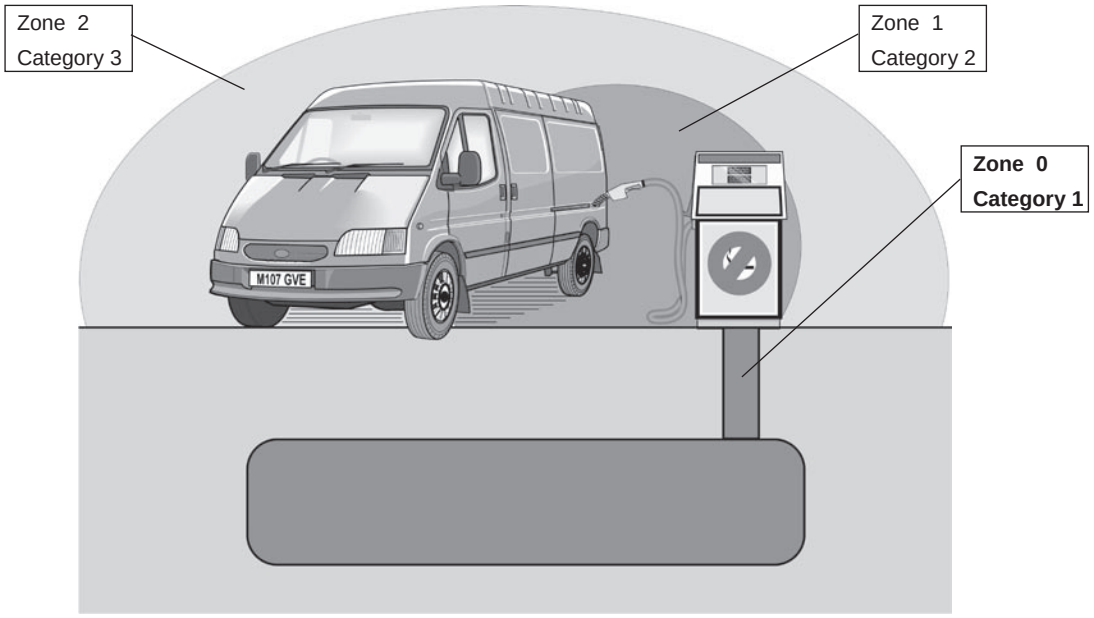
Harmonised European ATEX Standard

The European Union has adopted two harmonised directives in the field of health and safety. The directives are known as ATEX 100a and ATEX 137.

Directive ATEX 100a (94/9/EC) lays down minimum safety requirements for products intended for use in potentially explosive atmospheres in European Union member states. Directive ATEX 137 (99/92/EC) defines minimum requirements for health and safety at the workplace, for working conditions and for the handling of products and materials in potentially explosive atmospheres. This directive also divides the workplace into **zones** and defines criteria by which products are **categorized** within these zones.

The table below describes the **zones** in an installation where there is a potential for explosive atmospheres. The **owner** of the installation must analyse and assess the area in which the explosive gas/dust mixture may occur, and if necessary must divide it into **zones**. This process of zoning then allows the correct plant and equipment to be selected for use in the area.

The ATEX directive has been in force throughout the European Union since 1 July 2003, replacing the existing divergent national and European legislation relating to explosive atmospheres.



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Zones Gas G	Zones Dust D	Presence of Potentially Explosive Atmosphere	Type of risk
0	20	Present continuously or for long periods	Permanent
1	21	Likely to occur in normal operation occasionally	Potential
2	22	Not likely to occur in normal operation but, if it does occur, will persist for a short period only	Minimal

Please note that for the first time, the directive covers mechanical, hydraulic and pneumatic equipment and not just electrical equipment as before.

With regard to the **Machinery Directive** 98/37/EC, note that a number of external requirements in 94/9/EC refer to hazards arising from potentially explosive atmospheres, where the Machinery directive only contains general requirements relating to explosion safety (Annex I 1.5.7).

As a result, directive 94/9/EC (ATEX 100a) takes precedence over the Machinery directive with regard to explosion protection in potentially explosive atmospheres. The requirements in the Machinery directive are applicable to all other risks relating to machinery.

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Levels of Protection for the Various Equipment Categories

The various equipment categories must be capable of operating in accordance with the manufacturer's operating specifications at defined levels of protection.

Level of Protection	Category Group I	Category Group II	Type of protection	Operating Specifications
Very high	M1		Two independent means of protection or safety, ensuring that the equipment remains functional even in the event of two faults occurring independently of each other	The equipment remains energised and and functional even with an explosive atmosphere present
Very high		1	Two independent means of protection or safety, ensuring that the equipment remains functional even in the event of two faults occurring independently of each other	The equipment remains energised and functional in zones 0, 1, 2 (G) and/or zones 20, 21, 22 (D)
High	M2		Protection suitable for normal operation and severe operating conditions	The equipment is de-energised in the event of an explosive atmosphere
High		2	Protection suitable for normal operation and frequent faults, or equipment in which faults normally have to be taken into account	The equipment remains energised and functional in zones 1, 2 (G) and/or zones 21, 22 (D)
Normal		3	Protection suitable for normal operation	The equipment remains energised and functional in zones 2 (G) and/or zones 22 (D)

Definition of Groups (EN 1127-1)

Group I Equipment intended for use in underground parts of mines as well as those parts of surface installations of such mines likely to be endangered by flammable vapors and/or flammable dusts.

Group II Equipment intended for use in other places exposed to explosive atmospheres.

Group	I Mines, Combustible Vapors		II Other Potentially Explosive Atmospheres (Gases, Dust)					
Category	**M1**	**M2**	**1**		**2**		**3**	
Atmosphere*			G	D	G	D	G	D
Zone			0	20	1	21	2	22

G = gas and D = dust

Temperature Classes

Classification of flammable gases and vapors on the basis of ignition temperature

Temperature Class	Ignition Temperature °C
T1	Over 450
T2	(300) – 450
T3	(200) – 300
T4	(135) – 200
T5	(100) – 135
T6	(85) - 100

Declaration of Conformity

The product catalogs contain copies of the declaration of conformity demonstrating that the product meets the requirements of directive 94/9/EC.

The declaration is only valid in conjunction with the instructions contained in the installation manual relating to the safe use of the product throughout its service life.

The instructions relating to the conditions in the surrounding area are particularly important, as the certificate is invalidated if the instructions are found not to have been adhered to during operation of the product.

If there is any doubt as to the validity of the certificate of conformity, contact Parker Hannifin customer service.

Operation, Installation and Maintenance

The installation manual of the product contains instructions relating to the safe storage, handling, operation and servicing of the product.

The manual is available in different languages, and can be downloaded from **www.parker.com/euro_pneumatic**.

This document must be made accessible in a suitable place near where the product is installed. It is used as a reference for all personnel authorized to work with the product throughout its service life.

We, the manufacturer, reserve the right to modify, extend or improve the installation manual in the interests of the users.

For more information about ATEX see EUs homepage: **http://europa.eu.int/comm/enterprise/atex/**

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Additional Safety Instructions For Installation In Explosive Atmospheres

SERIOUS, EVEN FATAL, DAMAGE OR INJURY MAY BE CAUSED BY THE HOT MOVING PARTS OF THE P1V-S MOTORS IN THE PRESENCE OF EXPLOSIVE GAS MIXTURES AND CONCENTRATIONS OF DUST.

All installation, connection, commissioning, servicing and repair work on P1V-S motors must be carried out by qualified personnel taking account of the following

- These instructions
- Notices on the motor
- All other planning documents, commissioning instructions and connection diagrams associated with the application.
- Provisions and requirements specific to the application
- Applicable national/international regulations (explosion protection, safety and accident prevention)

Real Life Applications

P1V-S motors are designed to provide rotary movement in industrial applications, and should only be used in accordance with the instructions in the technical specifications in the catalog, and within the operating range indicated on the motor housing. The motors meet the applicable standards and requirements of the Machinery Directive 94/9/EC (ATEX)

The Motors Must Not Be Used As Brakes In Explosive Atmospheres.
Braking involves driving the motor against the direction of rotation for which the motor is supplied with compressed air. The motor is then operating as a compressor, and there is a corresponding increase in temperature.

The motors must **not** be used underground in mines susceptible to firedamp and/or combustible dust. The motors are intended for use in areas in which explosive atmospheres caused by gases, vapors or mists of combustible liquids, or air/dust mixtures may be expected to occur during normal use (infrequently)

Checklist

Before using the motors in a potentially explosive atmosphere, you should check the following:

Do the motor specifications match the classification of the area of use in accordance with Directive 94/9/EG (previously ATEX 100a)

- Equipment group
- Equipment category
- Zone
- Temperature class
- Max. surface temperature

1. When installing the motor, is it certain that there is no potentially explosive atmosphere, oil, acids, gases, vapors or radiation?
2. Is the ambient temperature as specified in the technical data in the catalog at all times?
3. Is it certain that the P1V-S motor is adequately ventilated and that no additional heat is added (for example in the shaft connection)?
4. Are all the driven mechanical components ATEX certified?

Installation Requirements In Potentially Explosive Atmospheres

- The temperature of the supply air must not exceed the ambient temperature.
- The P1V-S may be installed in any position.
- An air treatment unit must be attached to the inlet of the P1V-S air motor.
- In a potentially explosive atmosphere, none of the motor ports may be blocked because this may cause an increase in temperature. The air from the port must be taken to the silencer or, preferably, outside the potentially explosive area.
- The P1V-S motor must be connected to ground at all times, through its support, a metallic tube or separate conductor.
- The outlet of the P1V-S motor must not open within a potentially explosive area, but must be passed to the silencer or, preferably, removed and released outside the potentially explosive area.
- The P1V-S motor may only drive units that are ATEX certified.
- Ensure that the motor is not exposed to forces greater than those permitted in accordance with the catalog.

Measuring The Temperature On The Outside Of The P1V-S Motor (Only When Used In Potentially Explosive Areas)

During the commissioning process, it is essential to measure temperature increases at the indicated positions on the outside of the P1V-S motor.
These measurements can be taken using standard thermometers.

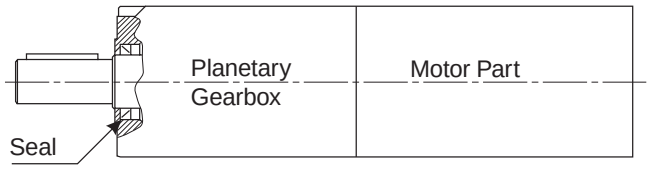
Checking The Motor During Operation

The motor must be kept clean on the outside, and a layer of dirt thicker than 5 mm must never be allowed to form.
Strong solvents should not be used for cleaning, because they can cause the seal (material NBR/FPM) around the drive shaft to swell, potentially increasing the temperature.

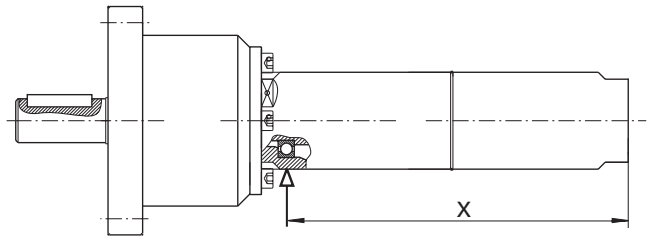
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For The P1V-S012, P1V-S020, P1V-S030 and P1V-S060 Series

The temperature is measured on the metal surface next to the seal around the output shaft on all P1V-S012, P1V-S020, P1V-S030 and P1V-S060 motors



Motors P1V-S020A0011, P1V-S020A0006, P1V-S030A0023 and P1V-S030A0010



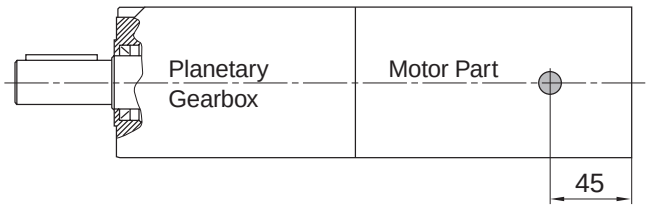
Motor	x [mm]
P1V-S020A0011	133
P1V-S020A0006	133
P1V-S030A0023	146
P1V-S030A0010	147,5

The maximum temperature is reached after approximately 1,5 hours of operation, and the difference in temperature between the motor and the ambient temperature must not exceed 40 °C.

If the temperature difference at the seal of a P1V-S012, P1V-S020, P1V-S030 or P1V-S060 exceeds 40 °C, you should stop the motor immediately and contact Parker Hannifin.

The following applies to the P1V-S120 series:

The temperature is measured on the metal surface at a point 45 mm from the port end of the motor housing, on all P1V-S120.



The maximum temperature is reached after approximately 1,5 hours of operation, and the difference in temperature between the motor and the ambient temperature must not exceed 55 °C.

If the temperature difference at this point on a P1V-S120 exceeds 55 °C, you should stop the motor immediately and contact Parker Hannifin.

Marking of Products

For all P1V-S012, P1V-S020, P1V-S030 and P1V-S060

CE Ex II2 GD c IIC T6 (80°C) X

For the P1V-S120

CE Ex II2 GD c IIC T5 (95°C) X

CE — **C**ommunatuté **E**uropéenne = EU
CE marking shows that as a manufacturer, Parker Hannifin meets the guidelines specified by the EU

Ex — **Ex** means that this product is intended for use in a potentially explosive area

II — stands for the equipment group (I = mines and II = other places liable to be endangered)

2GD — stands for equipment category
2G means the equipment can be used in zones 1 and 2 where there is a risk involving gas, vapour or mist of combustible liquids and **2D** in zones 21 and 22 where there is a risk involving dust .
2GD means the equipment can be used in zones 1, 2, 21 and 22.

c — Safe design (prEN 13463-5)

IIC — Explosion group, P1V-S air motors are tested to the highest standards in terms of test gases, and can be installed in the presence of all gases without restriction.

T6 — If equipment is in temperature class **T6**, the maximum surface temperature must not exceed 85°C. (To guarantee this, the product has been tested to ensure that the maximum is 80°C. This provides a safety margin of 5°K.)

T5 — If equipment is in temperature class **T5**, the maximum surface temperature must not exceed 100°C. (To guarantee this, the product has been tested to ensure that the maximum is 95°C. This provides a safety margin of 5°K.)

(80°C) — Maximum permitted surface temperature on the motor in atmospheres containing potentially explosive dust.

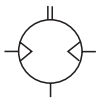
X — Note special conditions

Test certificate number IBExU04ATEXB004 X from IBExU Institut für Sicherheitstechnik GmbH, D-09599 Freiberg, Germany

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NOTE! All technical data is based on a working pressure of 6 bar.





Data For Reversible Air Motor With Keyed Shaft, P1V-S002A Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min. Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.02	1300	650	0.29	0.44	1.7	M5	3	0.16	**P1V-S002A0130**
0.02	950	475	0.40	0.60	1.7	M5	3	0.16	**P1V-S002A0095**

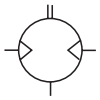
NOTE! Not with vane options C, Z or M.

The P1V-S002A and P1V-S008A require oil mist for lubricating the gearbox.

Installation brackets, see page K33
Dimensions, see page K34
Permitted shaft loadings, see page K58
Service kits, see page K60

NOTE! All technical data is based on a working pressure of 6 bar.





Data For Reversible Air Motor With Keyed Shaft, P1V-S008A Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min. Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	Kg	
0.08	24000	12000	0.06	0.09	3.5	M8x0.75*	4	0.22	**P1V-S008A0Q00**
0.08	7000	3500	0.22	0.33	3.5	M8x0.75*	4	0.22	**P1V-S008A0700**
0.08	1900	950	0.80	1.20	3.5	M8x00.75*	4	0.22	**P1V-S008A0190**
0.08	1300	650	1.20	1.80	3.5	M8x0.75*	4	0.22	**P1V-S008A0130**

* 3 push in nipples (F28PMB6M8SP) for plastic pipe Ø6/4 supplied

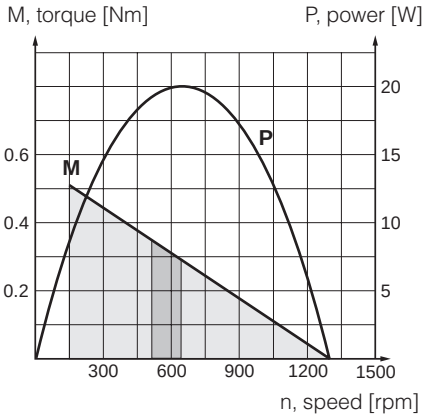
NOTE! Not with vane options C, Z or M.

The P1V-S002A and P1V-S008A require oil mist for lubricating the gearbox.

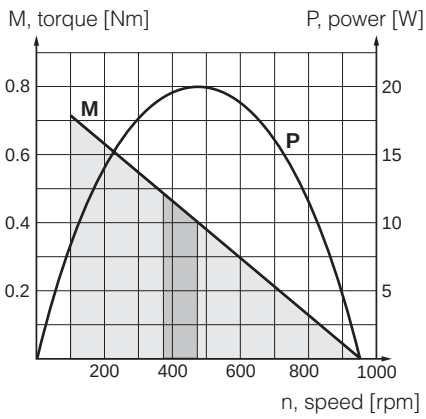
Installation brackets, see page 35
Dimensions, see page K34
Permitted shaft loadings, see page K58
Service kits, see page K60

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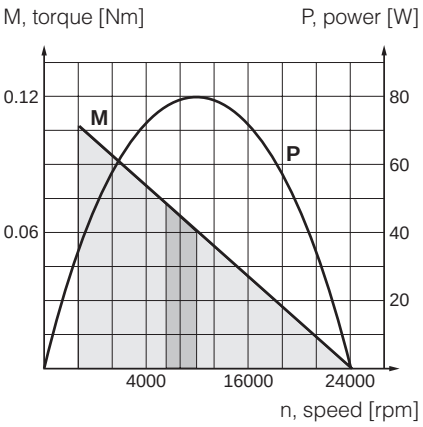
P1V-S002A0130



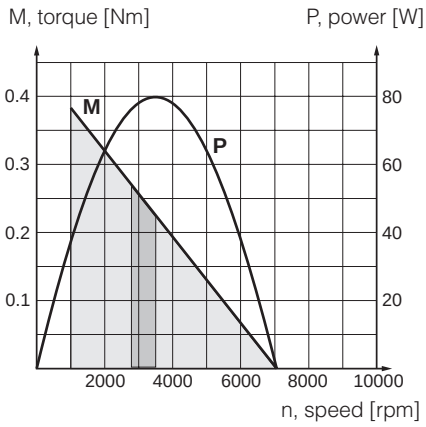
P1V-S002A0095



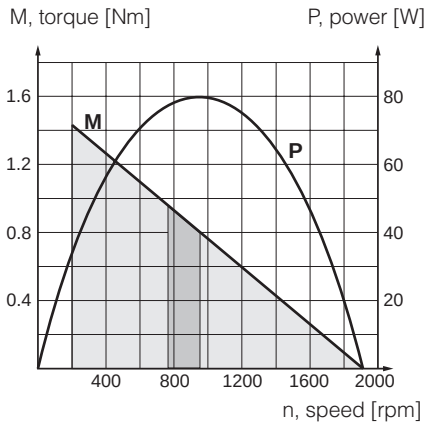
P1V-S008A0N00



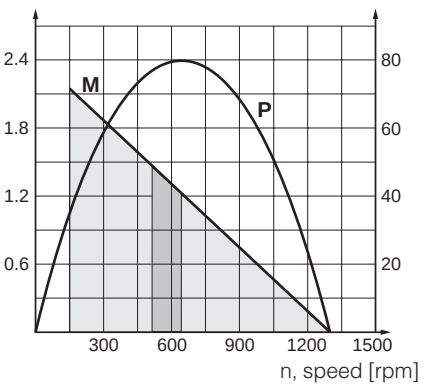
P1V-S008A0700



P1V-S008A0190



P1V-S008A0130



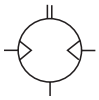
Possible working range of motor.

Optimum working range of motor.
Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

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Wadsworth, Ohio
www.parker.com/pneumatics

NOTE! All technical data is based on a working pressure of 6 bar.





CE Ex II2 GD c IIC T6 (80°C) X

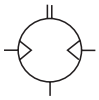
Data For Reversible Air Motor With Keyed Shaft, P1V-S012A Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min. Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.120	22000	11000	0.10	0.15	5.0	G1/8	6	0.350	**P1V-S012A0N00**
0.120	5500	2750	0.42	0.63	5.0	G1/8	6	0.350	**P1V-S012A0550**
0.120	3600	1800	0.64	0.95	5.0	G1/8	6	0.350	**P1V-S012A0360**
0.120	1400	700	1.64	2.40	5.0	G1/8	6	0.400	**P1V-S012A0140**
0.120	900	450	2.54	3.80	5.0	G1/8	6	0.400	**P1V-S012A0090**
0.120	600	300	3.82	5.00*	5.0	G1/8	6	0.400	**P1V-S012A0060**
0.090	100	50	5.00*	5.00*	5.0	G1/8	6	0.450	**P1V-S012A0010**

* Max. permitted torque

In all P1V-S012 motors, torques exceeding 5 Nm may cause damage to the gearbox (e.g. when driving against a fixed stop or large oscillating weight)





CE Ex II2 GD c IIC T6 (80°C) X

Data For Reversible Air Motor With Threaded Shaft, P1V-S012D Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min. Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.120	22000	11000	0.10	0.15	5.0	G1/8	6	0.350	**P1V-S012D0N00**
0.120	5500	2750	0.42	0.63	5.0	G1/8	6	0.350	**P1V-S012D0550**
0.120	3600	1800	0.64	0.95	5.0	G1/8	6	0.350	**P1V-S012D0360**
0.120	1400	700	1.64	2.40	5.0	G1/8	6	0.400	**P1V-S012D0140**
0.120	900	450	2.54	3.80	5.0	G1/8	6	0.400	**P1V-S012D0090**
0.120	600	300	3.82	5.00*	5.0	G1/8	6	0.400	**P1V-S012D0060**
0.090	100	50	5.00*	5.00*	5.0	G1/8	6	0.450	**P1V-S012D0010**

* Max. permitted torque

In all P1V-S012 motors, torques exceeding 5 Nm may cause damage to the gearbox (e.g. when driving against a fixed stop or large oscillating weight)

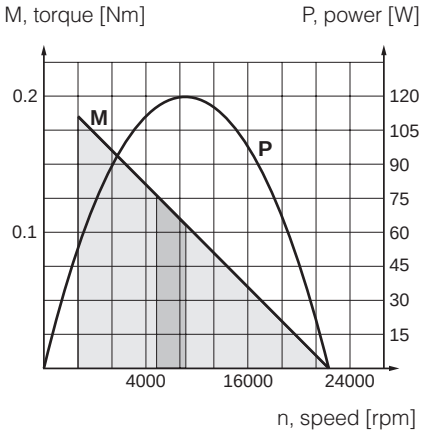
NOTE!

The P1V-S012D with threaded shaft may be reversed, but when operated counterclockwise, there is a risk that the driven unit may disconnect if it is not locked properly.

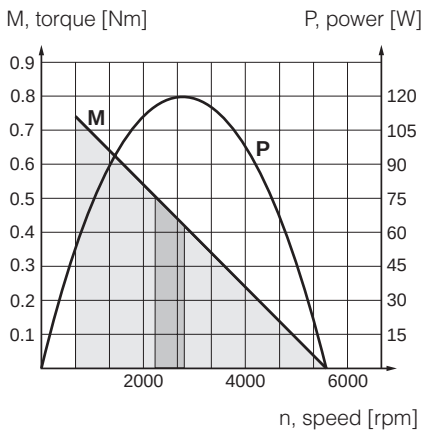
Installation brackets, see page K33
Dimensions, see page K35
Permitted shaft loadings, see page K58
Service kits, see page K60

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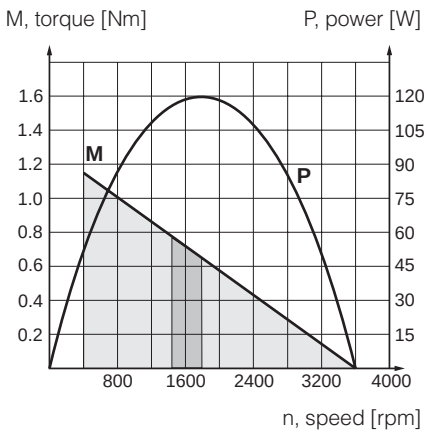
P1V-S012A0N00
P1V-S012D0N00



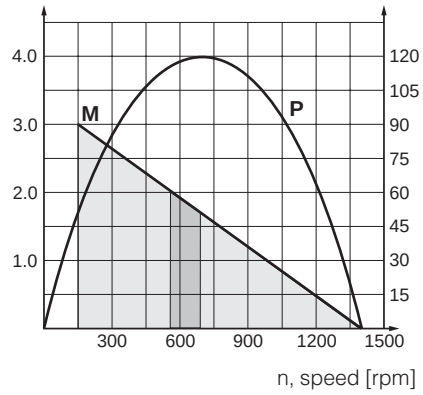
P1V-S012A0550
P1V-S012D0550



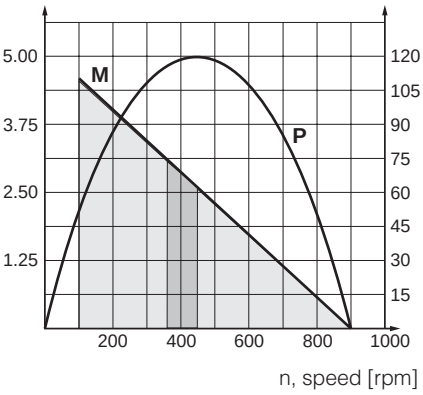
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P1V-S012D0360



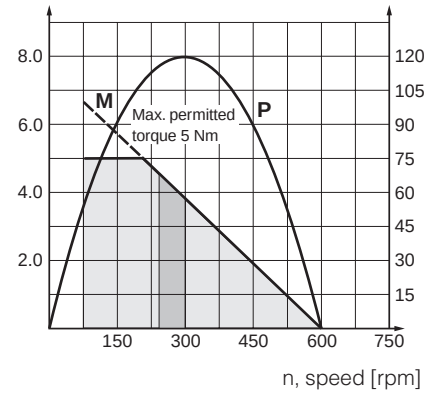
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P1V-S012D0140



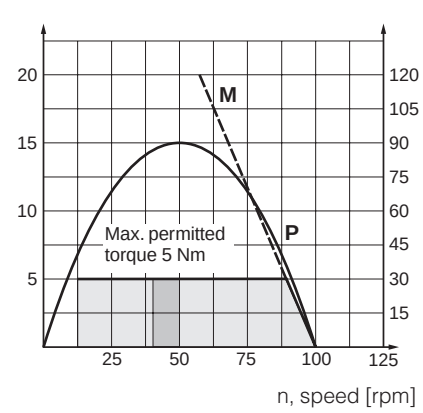
P1V-S012A0090
P1V-S012D0090



P1V-S012A0060
P1V-S012D0060



P1V-S012A0010
P1V-S012D0010



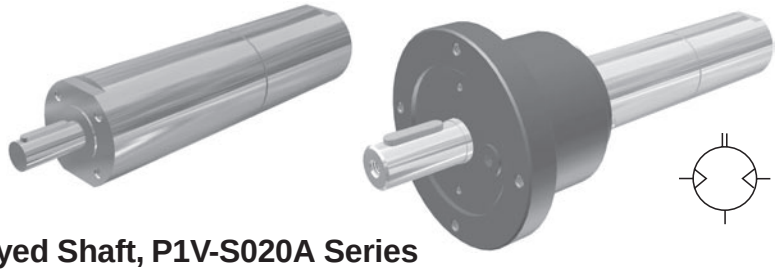
Possible working range of motor.

Optimum working range of motor.
Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

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NOTE! All technical data is based on a working pressure of 6 bar.

CE Ex II2 GD c IIC T6 (80°C) X

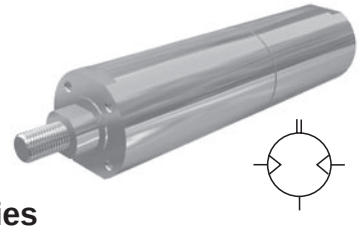


Data For Reversible Air Motor With Keyed Shaft, P1V-S020A Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min. Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.200	14500	7250	0.26	0.40	6.3	G1/8	10	0.700	**P1V-S020A0E50**
0.200	4600	2300	0.80	1.20	6.3	G1/8	10	0.750	**P1V-S020A0460**
0.200	2400	1200	1.60	2.40	6.3	G1/8	10	0.750	**P1V-S020A0240**
0.200	1400	700	2.70	4.10	6.3	G1/8	10	0.850	**P1V-S020A0140**
0.200	700	350	5.40	8.20	6.3	G1/8	10	0.850	**P1V-S020A0070**
0.200	350	160	12.00	18.00	6.3	G1/8	10	0.850	**P1V-S020A0035**
0.100	180	90	10.50	15.00	4.5	G1/8	10	0.850	**P1V-S020A0018**
0.200	110	55	33.00	49.50	6.3	G1/8	10	3.000	**P1V-S020A0011**
0.200	60	30	72.00	108.00*	6.3	G1/8	10	3.000	**P1V-S020A0006**
0.180	50	25	20.00*	20.00*	6.3	G1/8	10	0.950	**P1V-S020A0005**
0.180	20	–	20.00*	20.00*	6.3	G1/8	10	0.950	**P1V-S020A0002**
0.180	10	–	20.00*	20.00*	6.3	G1/8	10	1.050	**P1V-S020A0001**
0.180	5	–	20.00*	20.00*	6.3	G1/8	10	1.050	**P1V-S020A00005**

* Max. permitted torque

CE Ex II2 GD c IIC T6 (80°C) X



Data For Reversible Air Motor With Threaded Shaft, P1V-S020D Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min. Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.200	14500	7250	0.26	0.40	6.3	G1/8	10	0.700	**P1V-S020D0E50**
0.200	4600	2300	0.80	1.20	6.3	G1/8	10	0.750	**P1V-S020D0460**
0.200	2400	1200	1.60	2.40	6.3	G1/8	10	0.750	**P1V-S020D0240**
0.200	1400	700	2.70	4.10	6.3	G1/8	10	0.850	**P1V-S020D0140**
0.200	700	350	5.40	8.20	6.3	G1/8	10	0.850	**P1V-S020D0070**
0.200	350	160	12.00	18.00	6.3	G1/8	10	0.850	**P1V-S020D0035**
0.100	180	90	10.50	15.00	4.5	G1/8	10	0.850	**P1V-S020D0018**
0.180	50	25	20.00*	20.00*	6.3	G1/8	10	0.950	**P1V-S020D0005**

* Max. permitted torque

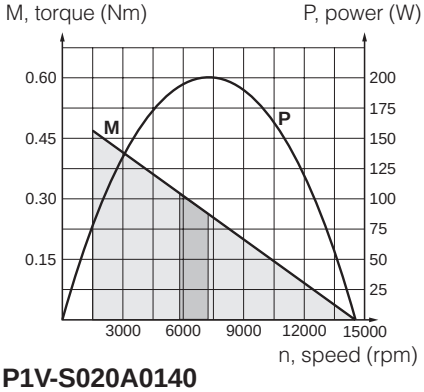
NOTE!

The P1V-S020D with threaded shaft may be reversed, but when operated counterclockwise, there is a risk that the driven unit may disconnect if it is not locked properly.

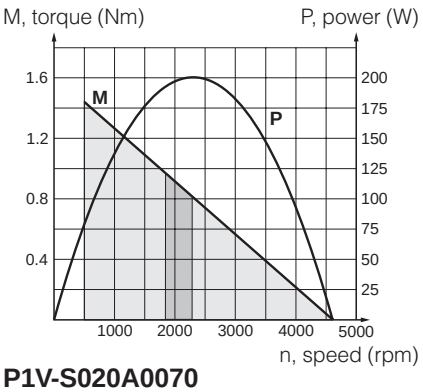
Installation brackets, see page K33
Dimensions, see page K36
Permitted shaft loadings, see page K58
Service kits, see page K60

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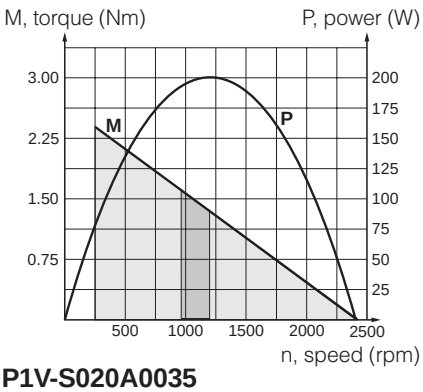
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P1V-S020D0E50



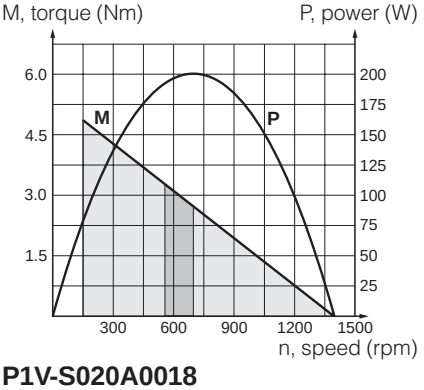
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P1V-S020D0460



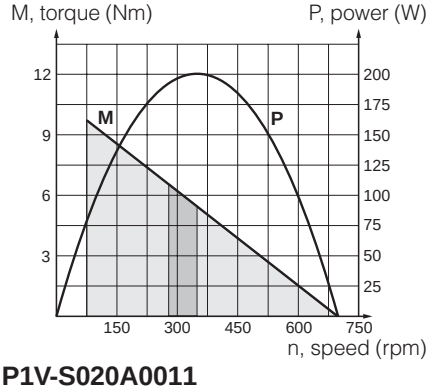
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P1V-S020D0240



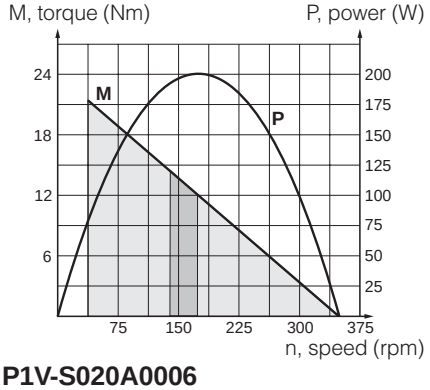
P1V-S020A0140
P1V-S020D0140



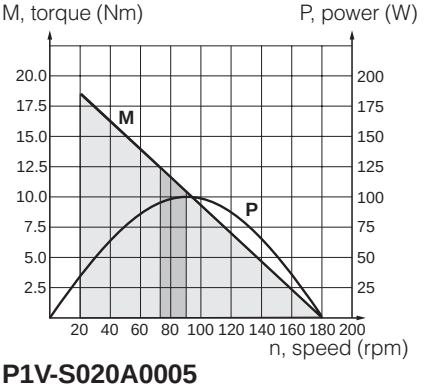
P1V-S020A0070
P1V-S020D0070



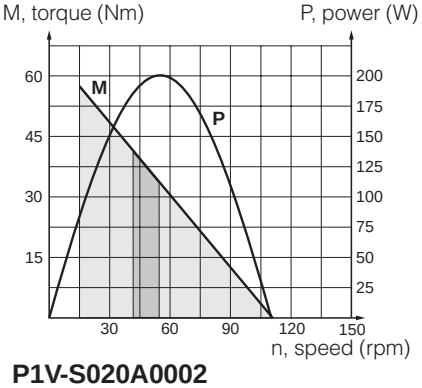
P1V-S020A0035
P1V-S020D0035



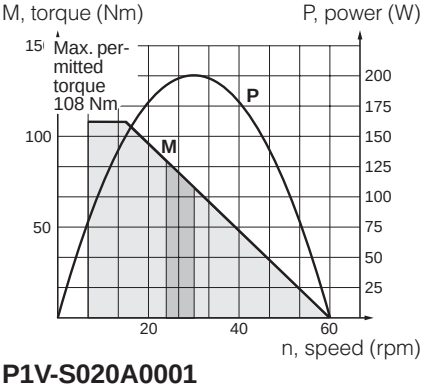
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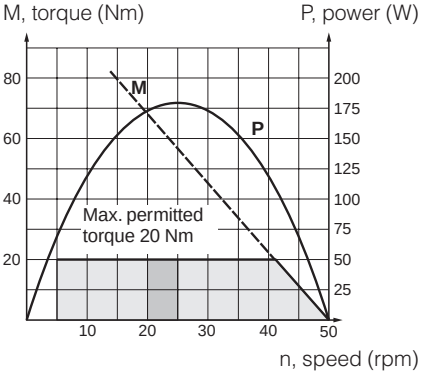
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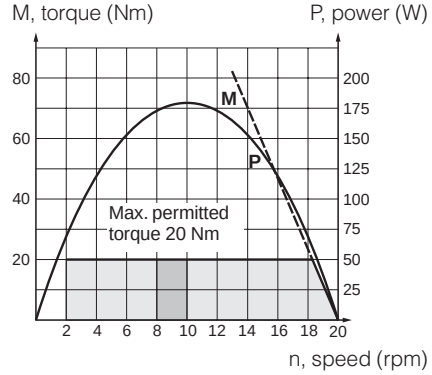
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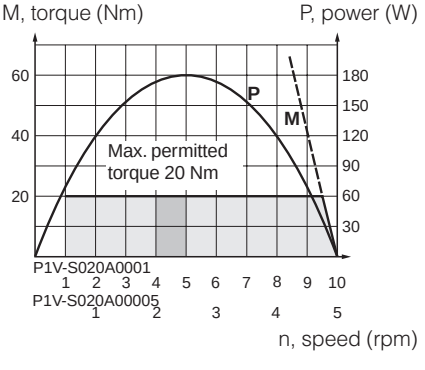
P1V-S020A0005
P1V-S020D0005



P1V-S020A0002



P1V-S020A0001
P1V-S020A00005



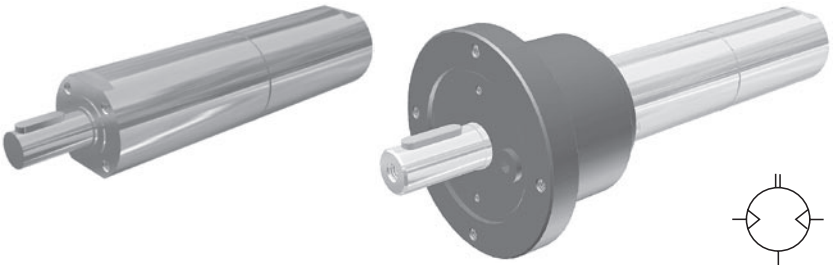
Possible working range of motor.

Optimum working range of motor.
Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

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NOTE! All technical data is based on a working pressure of 6 bar.

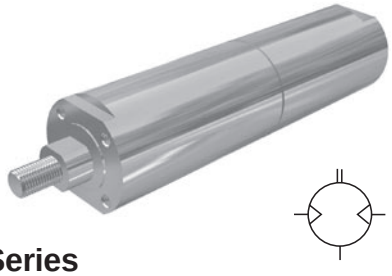
CE Ex II2 GD c IIC T6 (80°C) X



Data For Reversible Air Motor With Keyed Shaft, P1V-S030A Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min. Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.300	14500	7250	0.40	0.60	8.0	G1/4	10	1.000	**P1V-S030A0E50**
0.300	4600	2300	1.20	1.90	8.0	G1/4	10	1.050	**P1V-S030A0460**
0.300	2400	1200	2.40	3.60	8.0	G1/4	10	1.050	**P1V-S030A0240**
0.300	1400	700	4.10	6.10	8.0	G1/4	10	1.100	**P1V-S030A0140**
0.300	600	300	9.60	14.30	8.0	G1/4	10	1.150	**P1V-S030A0060**
0.300	280	140	20.50	26.00	8.0	G1/4	10	1.150	**P1V-S030A0028**
0.300	230	115	24.00	36.00	8.0	G1/4	10	3.300	**P1V-S030A0023**
0.130	180	90	13.80	21.00	4.7	G1/4	10	1.150	**P1V-S030A0018**
0.300	100	50	57.00	85.50	8.0	G1/4	10	3.300	**P1V-S030A0010**
0.280	50	25	36.00*	36.00*	8.0	G1/4	10	1.250	**P1V-S030A0005**

* Max. permitted torque



CE Ex II2 GD c IIC T6 (80°C) X

Data For Reversible Air Motor With Threaded Shaft, P1V-S030D Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min. Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.300	14500	7250	0.40	0.60	8.,0	G1/4	10	1.000	**P1V-S030D0E50**
0.300	4600	2300	1.20	1.90	8.0	G1/4	10	1.050	**P1V-S030D0460**
0.300	2400	1200	2.40	3.60	8.0	G1/4	10	1.050	**P1V-S030D0240**
0.300	1400	700	4.10	6.10	8.0	G1/4	10	1.100	**P1V-S030D0140**
0.300	600	300	9.60	14.30	8.0	G1/4	10	1.150	**P1V-S030D0060**
0.300	280	140	20.50	26.00	8.0	G1/4	10	1.150	**P1V-S030D0028**
0.130	180	90	13.80	21.00	4.7	G1/4	10	1.150	**P1V-S030D0018**
0.280	50	25	36.00*	36.00*	8.0	G1/4	10	1.250	**P1V-S030D0005**

* Max. permitted torque

NOTE!

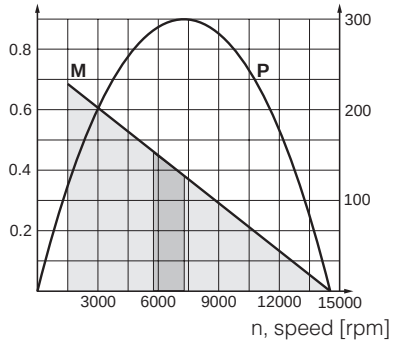
The P1V-S030D with threaded shaft may be reversed, but when operated counterclockwise, there is a risk that the driven unit may disconnect if it is not locked properly.

Installation brackets, see page K33
Dimensions, see page K37
Permitted shaft loadings, see page K58
Service kits, see page K60

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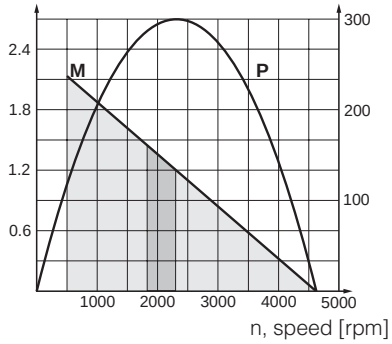
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P1V-S030D0E50

M, torque [Nm] P, power [W]



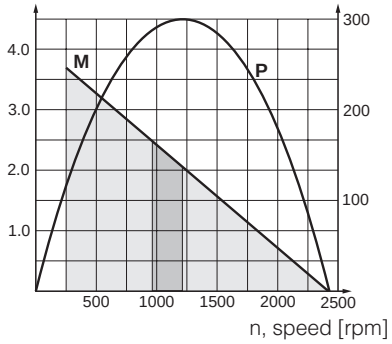
P1V-S030A0460,
P1V-S030D0460

M, torque [Nm] P, power [W]



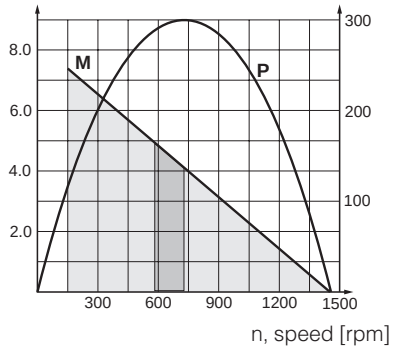
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P1V-S030D0240

M, torque [Nm] P, power [W]



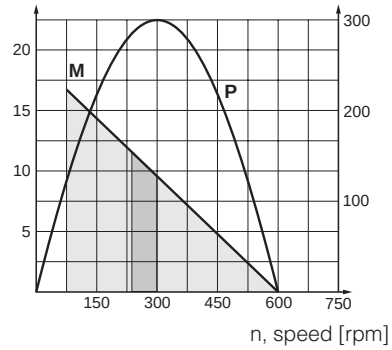
P1V-S030A0140
P1V-S030D0140

M, torque [Nm] P, power [W]



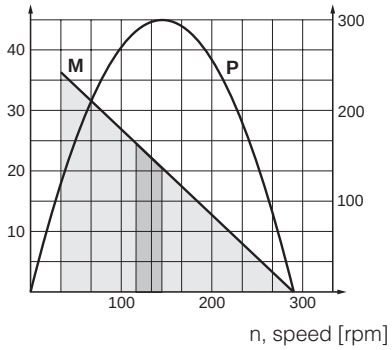
P1V-S030A0060
P1V-S030D0060

M, torque [Nm] P, power [W]



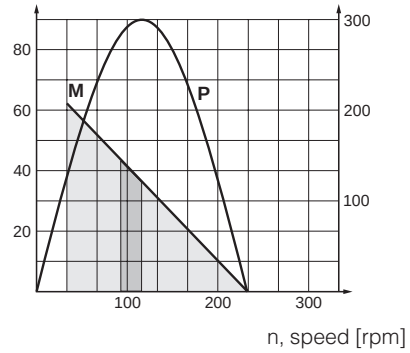
P1V-S030A0028
P1V-S030D0028

M, torque [Nm] P, power [W]



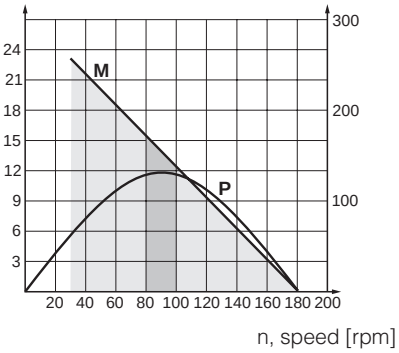
P1V-S030A0023

M, torque [Nm] P, power [W]



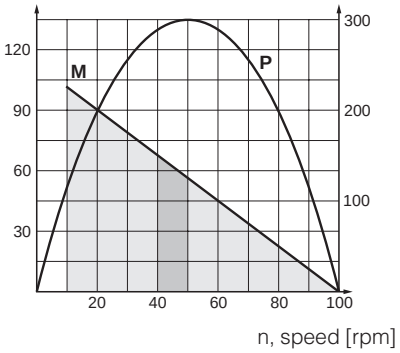
P1V-S030A0018
P1V-S030D0018

M, torque [Nm] P, power [W]



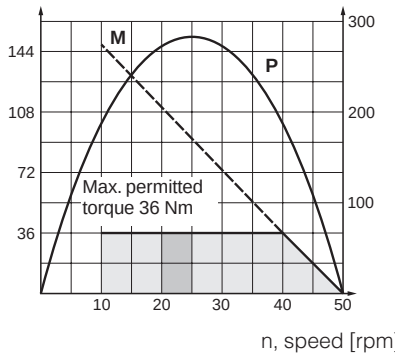
P1V-S030A0010

M, torque [Nm] P, power [W]



P1V-S030A0005
P1V-S030D0005

M, torque [Nm] P, power [W]



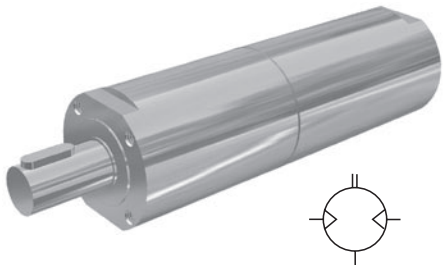
Possible working range of motor.

Optimum working range of motor.
Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

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NOTE! All technical data is based on a working pressure of 6 bar.

CE Ex II2 GD c IIC T6 (80°C) X



Data For Reversible Air Motor With Keyed Shaft, P1V-S060A Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min. Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.600	14000	7000	0.82	1.23	14.5	G3/8	12	2.000	**P1V-S060A0E00**
0.600	4000	2000	2.90	4.30	14.5	G3/8	12	2.100	**P1V-S060A0400**
0.600	2700	1350	4.20	6.40	14.5	G3/8	12	2.100	**P1V-S060A0270**
0.600	1700	850	6.70	10.10	14.5	G3/8	12	2.100	**P1V-S060A0170**
0.600	720	360	15.90	24.00	14.5	G3/8	12	2.200	**P1V-S060A0072**
0.600	480	240	23.90	36.00	14.5	G3/8	12	2.200	**P1V-S060A0048**
0.600	300	150	38.20	57.00	14.5	G3/8	12	2.300	**P1V-S060A0030**
0.300	100	50	60.00*	60.00*	13.0	G3/8	12	2.300	**P1V-S060A0010**

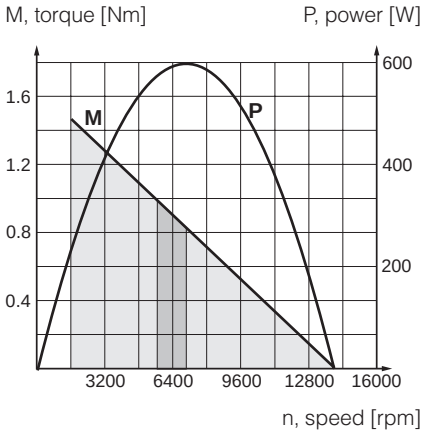
* Max. permitted torque

Installation brackets, see page K33
Dimensions, see page K38
Permitted shaft loadings, see page K58
Service kits, see page K60

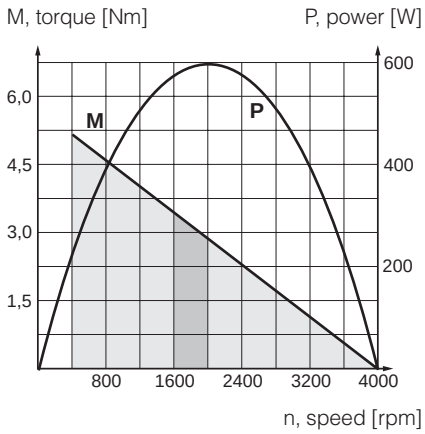
K

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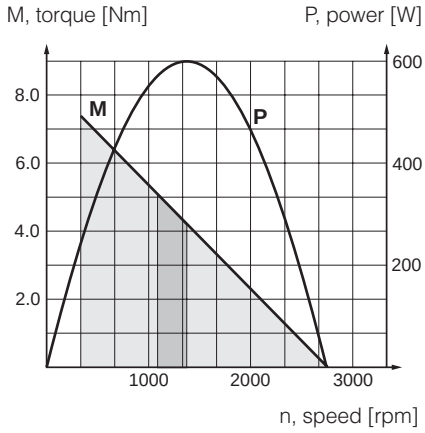
P1V-S060A0E00,



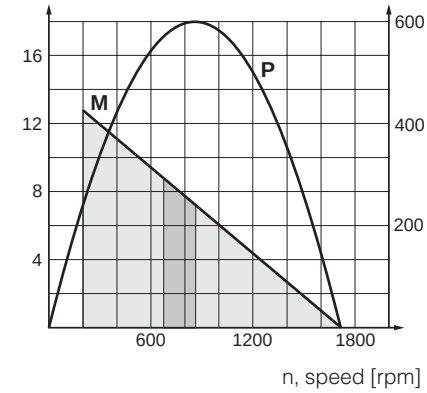
P1V-S060A0400



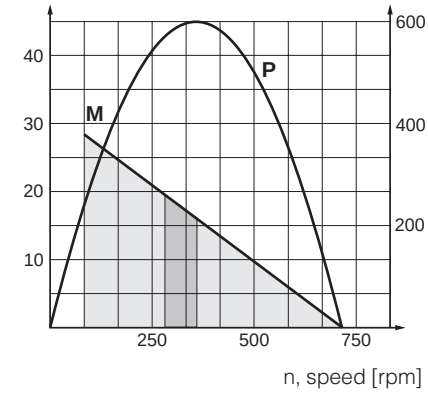
P1V-S060A0270



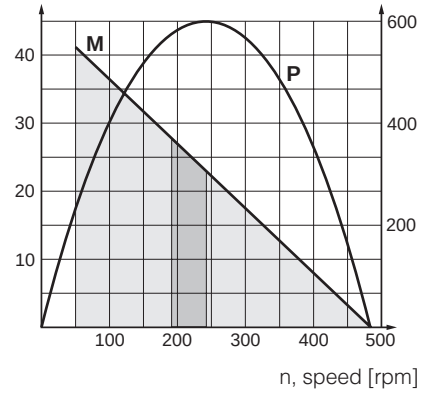
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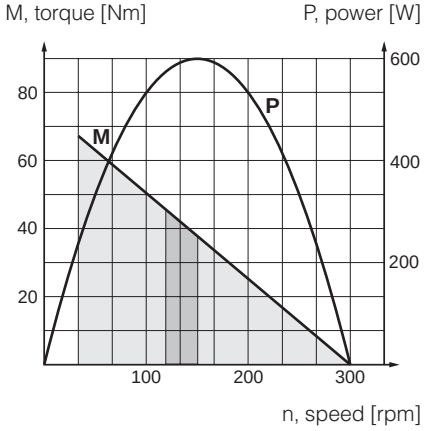
P1V-S060A0072



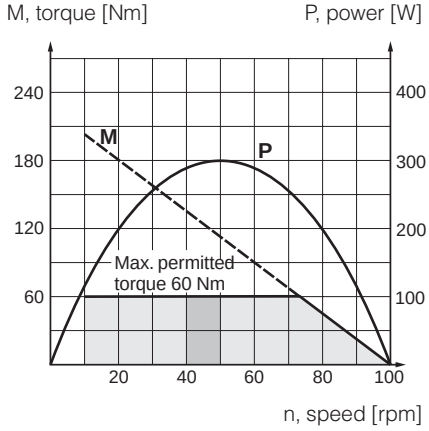
P1V-S060A0048



P1V-S060A0030



P1V-S060A0010



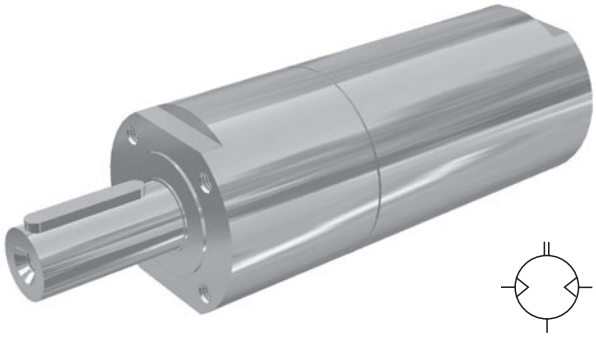
Possible working range of motor.

Optimum working range of motor.
Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

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NOTE! All technical data is based on a working pressure of 6 bar.

CE Ex II2 GD c IIC T5 (95°C) X



Data For Reversible Air Motor With Keyed Shaft, P1V-S120A Series

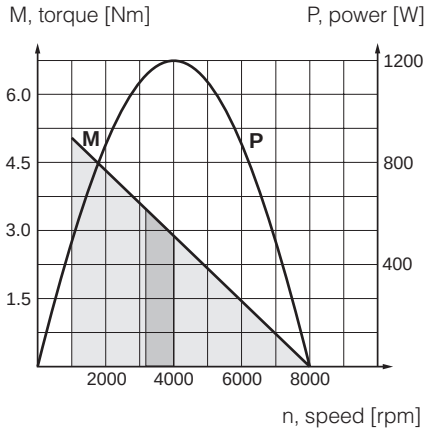
Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
1.200	8000	4000	2.90	4.30	27	G3/4	19	5.5	**P1V-S120A0800**
1.200	2700	1350	8.50	12.70	27	G3/4	19	5.5	**P1V-S120A0270**
1.200	1100	550	21.00	31.00	27	G3/4	19	5.5	**P1V-S120A0110**
1.200	780	390	29.40	44.00	27	G3/4	19	5.6	**P1V-S120A0078**
1.200	320	160	71.60	107.00	27	G3/4	19	5.6	**P1V-S120A0032**
0.700	200	100	66.90	110.00*	19	G3/4	19	5.6	**P1V-S120A0012**

* Max. permitted torque

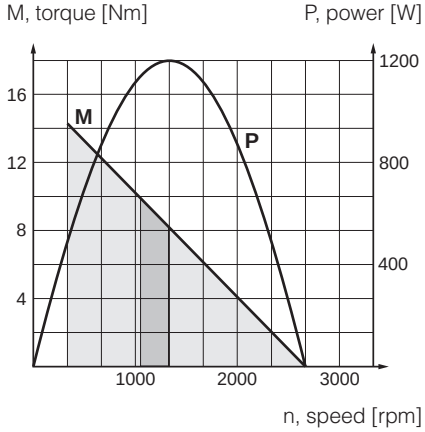
Installation brackets, see page K33
Dimensions, see page K39
Permitted shaft loadings, see page K58
Service kits, see page K60

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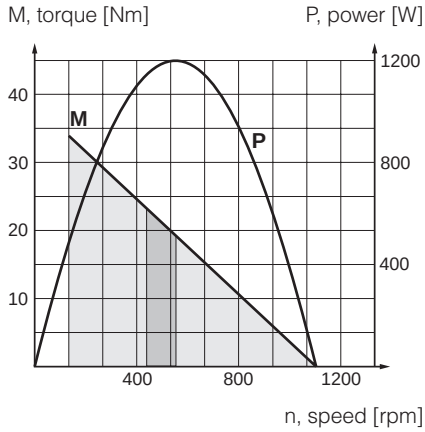
P1V-S120A0800



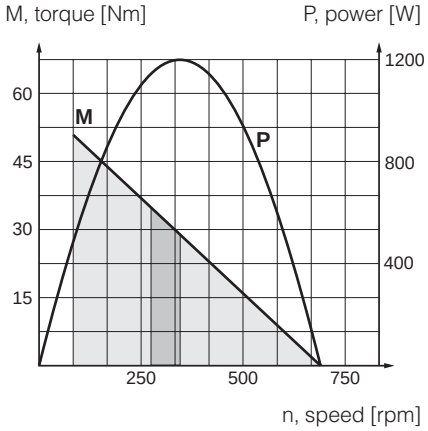
P1V-S120A0270,



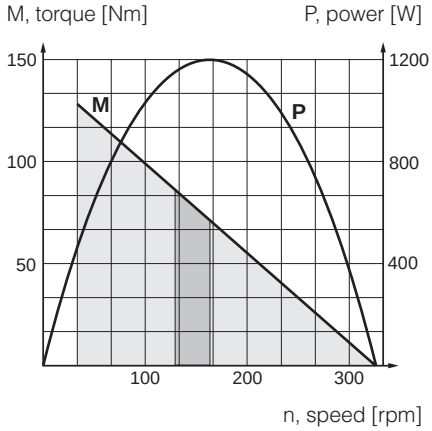
P1V-S120A0110



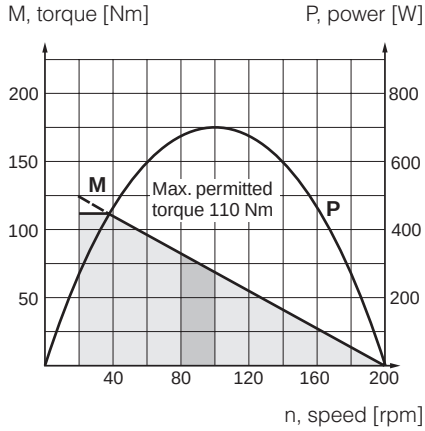
P1V-S120A0078



P1V-S120A0032



P1V-S120A0012

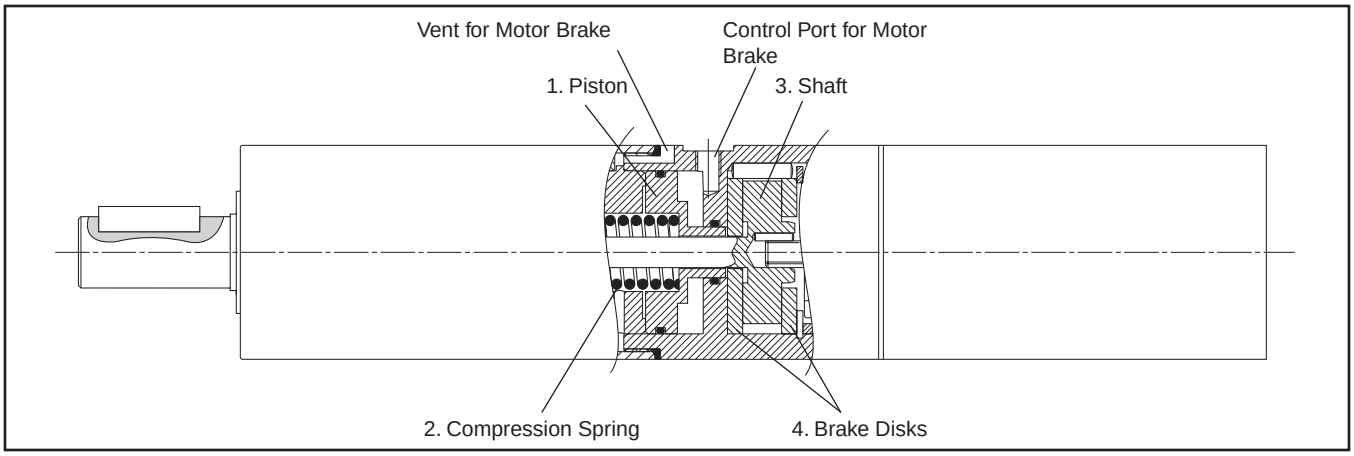


Possible working range of motor.

Optimum working range of motor.
Higher speeds = more vane wear
Lower speeds with high torque = more gearbox wear

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Brake Motor



Brake Motors

Applications

The integrated brake is a spring-loaded disk brake, which is released at a minimum air pressure of 5 bar. The brake is applied in the absence of pressure. As soon as the control port for the brake is placed under pressure, the piston (1) is pressurised and the spring (2) is compressed. The motor can now start and the torque is passed to the shaft (3). The ventilation air from the brake is connected with the atmosphere. In order to brake the motor, the control air to the brake is simply vented. The piston (1) is pushed to the right by the spring (2), and the axle (3) is jammed between the two brake disks (4).

The technology and the size of air motors with integrated running and stationary brake make them ideal applications requiring repeated precise positioning. The motor can also be kept stationary in a specific position, and the stopping time for a rotating weight can be shortened significantly. Another typical application for brake motors is when the output shaft needs to be held in one position when the motor stops delivering torque. The brake can handle more than 1500 braking operations per hour at maximum braking torque.

Disassembly and Reassembly

Detach the connections with the motor and gearbox. Pull off the motor and gearbox part. The brake disks can be lifted off after the lock ring has been removed.

K

Service and Maintenance

After 20 000 braking operations as a stationary brake or 10,000 braking operations as an operating brake, the brake must be disassembled in order to check for wear.

Warning:

If the number of braking operations is exceeded, the degree of wear might be greater than permitted and the braking effect might be lost. If this happens, you simply need to replace the worn brake linings. Tests show that the brake lining needs to be replaced after approx. 90,000 braking cycles.

NOTE!
Brake motors must only ever be supplied with unlubricated air, otherwise there is a risk of oil from the supply air getting into the brake unit, resulting in poor brake performance or no braking effect.

Technical Data

Min braking torque for different motor types

Motor size P1V-S020, 200 Watt

Braking Motor	Motor Max. Torque, Specified Nm	Brake Min Braking Torque, Theoretical Nm	Gearbox Max. Torque, Permitted Nm
P1V-S020A/DDE50	0.52	1.0	1.0
P1V-S020A/DD460	1.6	3.43	3.43
P1V-S020A/DD240	3.2	6.66	6.66
P1V-S020A/DD140	5.4	11.8	11.8
P1V-S020A/DD070	10.8	22.86	14.0
P1V-S020A/DD035	20.0	44.4	20.0
P1V-S020A/DD018	20.0	44.4	20.0
P1V-S020A/D011	66.0	137.2	108.0
P1V-S020A/D006	144.0	266.4	108.0
P1V-S020A/DD005	20.0*	44.4	20.0
P1V-S020A/D002	20.0*	44.4	20.0
P1V-S020A/D001	20.0*	44.4	20.0
P1V-S020A/D0005	20.0*	44.4	20.0

Motor Size P1V-S030, 300 Watt

Braking Motor	Motor Max. Torque, Specified Nm	Brake Min Braking Torque, Theoretical Nm	Gearbox Max. Torque, Permitted Nm
P1V-S030A/DDE50	0.8	1.0	1.0
P1V-S030A/DD460	2.4	3.43	3.43
P1V-S030A/DD240	4.8	6.66	6.66
P1V-S030A/DD140	8.2	11.8	11.8
P1V-S030A/DD060	19.2	20.6	14.0
P1V-S030A/DD028	41.0	40.0	36.0
P1V-S030A/D023	48.0	70.8	108.0
P1V-S030A/D010	114.0	123.6	108.0
P1V-S030A/DD005	36.0*	40.0	36.0

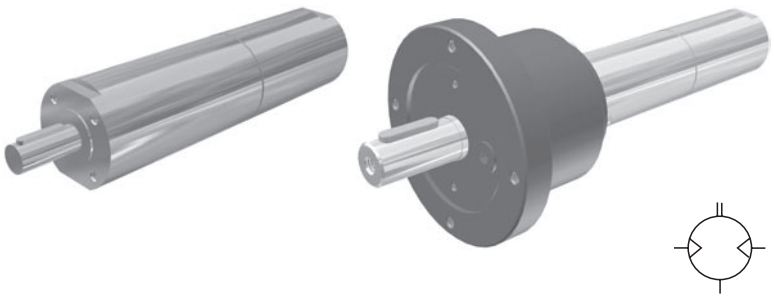
*** Warning:**
The permitted torque for the specific gearbox must not be exceeded!

Brake Release

Minimum pressure for brake release: 5 bar

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NOTE! All technical data is based on a working pressure of 6 bar.



Data For Reversible Brake Motor With Keyed Shaft, P1V-S020AD Series

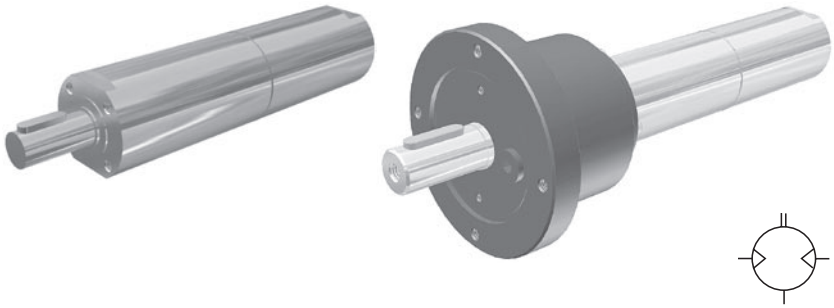
Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.200	14500	7250	0.26	0.40	6.3	G1/8	10	1.000	**P1V-S020ADE50**
0.200	4600	2300	0.80	1.20	6.3	G1/8	10	1.050	**P1V-S020AD460**
0.200	2400	1200	1.60	2.40	6.3	G1/8	10	1.050	**P1V-S020AD240**
0.200	1400	700	2.70	4.10	6.3	G1/8	10	1.150	**P1V-S020AD140**
0.200	700	350	5.40	8.20	6.3	G1/8	10	1.150	**P1V-S020AD070**
0.200	350	160	12.00	18.00	6.3	G1/8	10	1.150	**P1V-S020AD035**
0.100	180	90	10.50	15.00	4.5	G1/8	10	1.150	**P1V-S020AD018**
0.200	110	55	33.00	49.50	6.3	G1/8	10	3.300	**P1V-S020AD011**
0.200	60	30	72.00	108.00*	6.3	G1/8	10	3.300	**P1V-S020AD006**
0.180	50	25	20.00*	20.00*	6.3	G1/8	10	1.250	**P1V-S020AD005**
0.180	20	–	20.00*	20.00*	6.3	G1/8	10	1.250	**P1V-S020AD002**
0.180	10	–	20.00*	20.00*	6.3	G1/8	10	1.350	**P1V-S020AD001**
0.180	5	–	20.00*	20.00*	6.3	G1/8	10	1.350	**P1V-S020AD0005**

* Max. permitted torque

Torque curves, see page K22
Installation brackets, see page K33
Dimensions, see page K40
Permitted shaft loadings, see page K58
Service kits, see page K60

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NOTE! All technical data is based on a working pressure of 6 bar.



Data For Reversible Brake Motor With Keyed Shaft, P1V-S030AD Series

Max. Power	Free Speed	Speed At Max. Power	Torque At Max. Power	Min Start Torque	Air Consumption At Max. Power	Connector	Min Pipe ID	Weight	Order Code
kW	rpm	rpm	Nm	Nm	l/s		mm	kg	
0.300	14500	7250	0.40	0.60	8,0	G1/4	10	1.350	**P1V-S030ADE50**
0.300	4600	2300	1.20	1.90	8,0	G1/4	10	1.400	**P1V-S030AD460**
0.300	2400	1200	2.40	3.60	8,0	G1/4	10	1.400	**P1V-S030AD240**
0.300	1400	700	4.10	6.10	8,0	G1/4	10	1.450	**P1V-S030AD140**
0.300	600	300	9.60	14.30	8,0	G1/4	10	1.500	**P1V-S030AD060**
0.300	280	140	20.50	26.00	8,0	G1/4	10	1.500	**P1V-S030AD028**
0.300	230	115	24.00	36.00	8,0	G1/4	10	3.650	**P1V-S030AD023**
0.300	100	50	57.00	85.50	8,0	G1/4	10	3.650	**P1V-S030AD010**
0.280	50	25	36.00*	36.00*	8,0	G1/4	10	1.600	**P1V-S030AD005**

* Max. permitted torque

K

Torque curves, see page K24
Installation brackets, see page K33
Dimensions, see page K40
Permitted shaft loadings, see page K58
Service kits, see page K60

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Order Key

P 1 V - S **4** **0 1 2** **B**

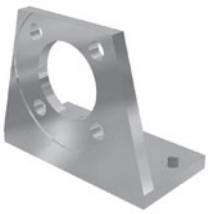
	Air Motor Range
P1V-S	Stainless

	Accessories
4	Bracket

	Motor Size
002	20 W
008	80 W
012	120 W
020	200 W
030	300 W
060	600 W
120	1200 W

	Bracket
B	Flange Bracket
F	Foot Bracket
C	Foot Bracket, Large

Installation Brackets for P1V-S

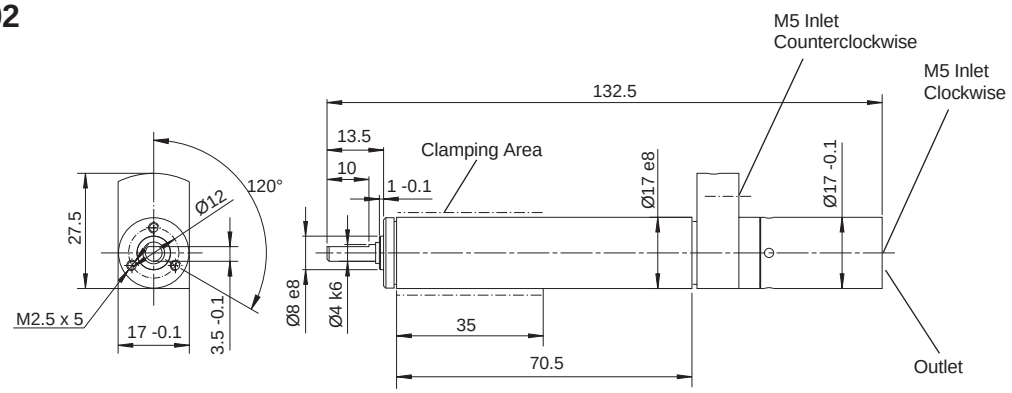
Type	For Air Motor	For Drilling Motor	Weight Kg	Order Code
Flange Bracket				
	P1V-S002		0.04	**P1V-S4002B**
	P1V-S008	P1V-S008	0.04	**P1V-S4008B**
	P1V-S012		0.05	**P1V-S4012B**
	P1V-S020	P1V-S025	0.09	**P1V-S4020B**
	P1V-S030	P1V-S040	0.12	**P1V-S4030B**
	P1V-S060		0.25	**P1V-S4060B**
	P1V-S120		0.60	**P1V-S4120B**
Foot Bracket				
	P1V-S008	P1V-S008	0.08	**P1V-S4008F**
	P1V-S012		0.09	**P1V-S4012F**
	P1V-S020	P1V-S025	0.11	**P1V-S4020F**
	P1V-S020A0011 P1V-S020A0006 P1V-S030A0023 P1V-S030A0010		0.55	**P1V-S4020C**
	P1V-S030	P1V-S040	0.11	**P1V-S4030F**
	P1V-S060		0.30	**P1V-S4060F**
	P1V-S120		0.80	**P1V-S4120F**

All brackets supplied with fastening screws for the motor.

Dimensions, see pages K34 to K39

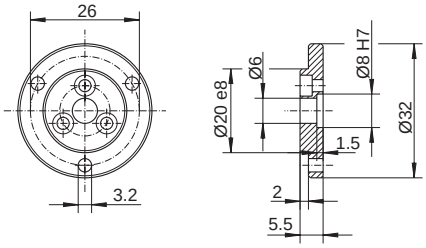
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Motor P1V-S002



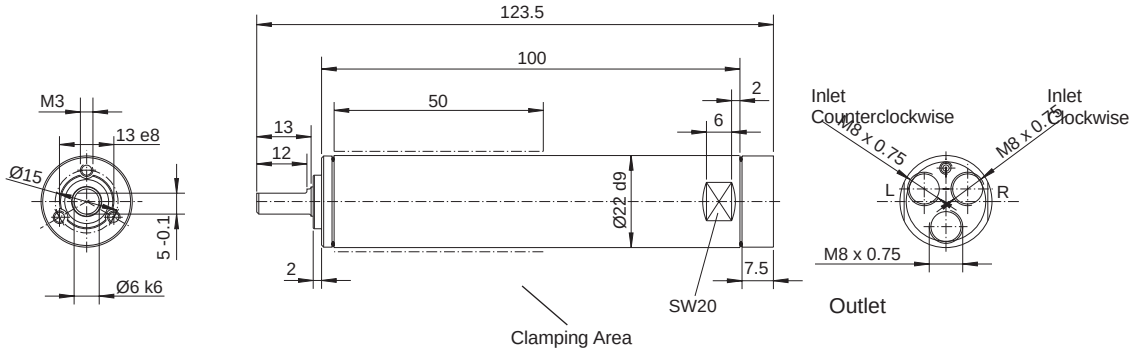
Flange Bracket for Motor P1V-S002

P1V-S4002B



Dimensions

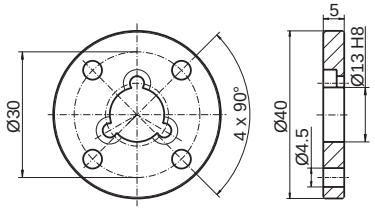
Motor P1V-S008



K

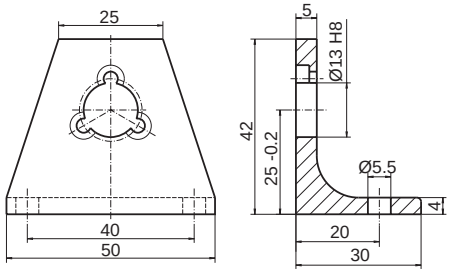
Flange Bracket for Motor P1V-S008

P1V-S4008B



Foot Bracket for Motor P1V-S008

P1V-S4008F

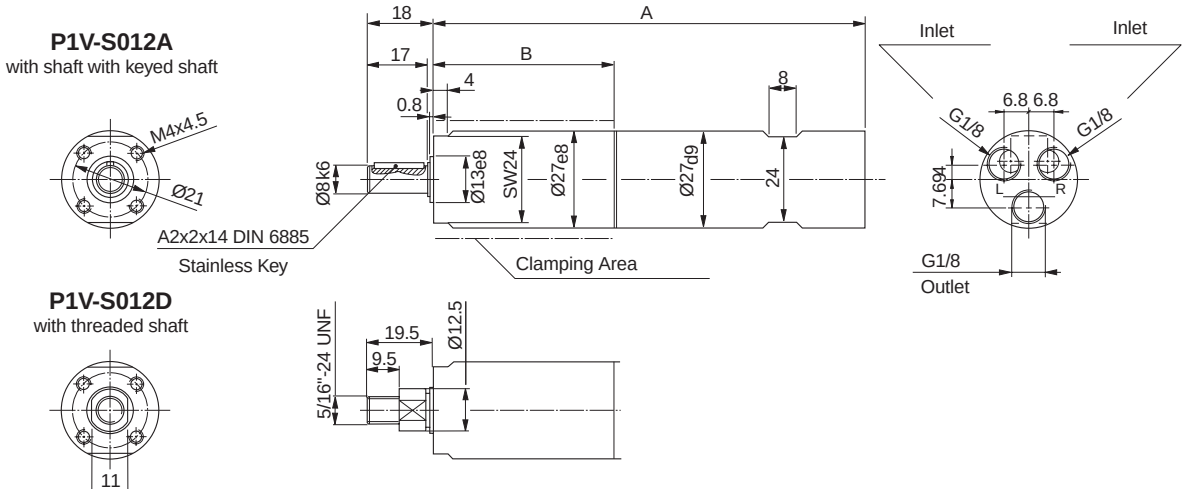


CAD drawings on the Internet
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AirCad™ Drawing Library

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Pneumatic Division
Wadsworth, Ohio
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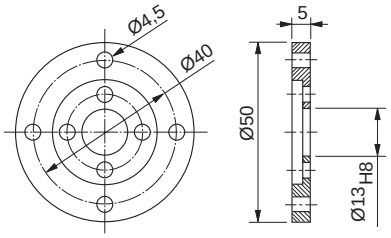
Motor P1V-S012



	A	B
P1V-S012A0N00, P1V-S012D0N00	117.0	46.5
P1V-S012A0550, P1V-S012D0550	117.0	46.5
P1V-S012A0360, P1V-S012D0360	117.0	46.5
P1V-S012A0140, P1V-S012D0140	129.5	59.0
P1V-S012A0090, P1V-S012D0090	129.5	59.0
P1V-S012A0060, P1V-S012D0060	129.5	59.0
P1V-S012A0010, P1V-S012D0010	142.0	71.5

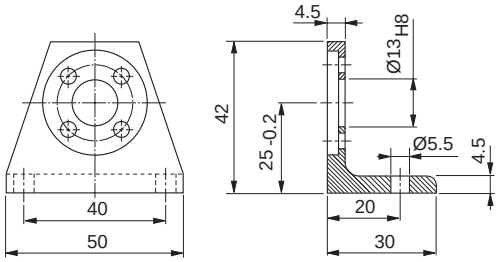
Flange Bracket for Motor P1V-S012

P1V-S4012B



Foot Bracket for Motor P1V-S012

P1V-S4012F



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AirCad™ Drawing Library

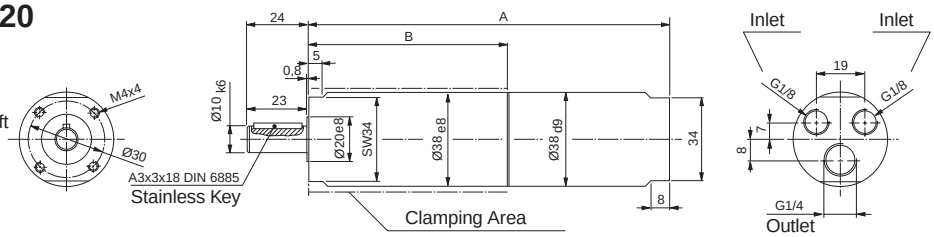
K

Air Motors

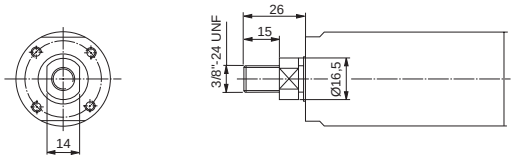
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Pneumatic Division
Wadsworth, Ohio
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Motor P1V-S020

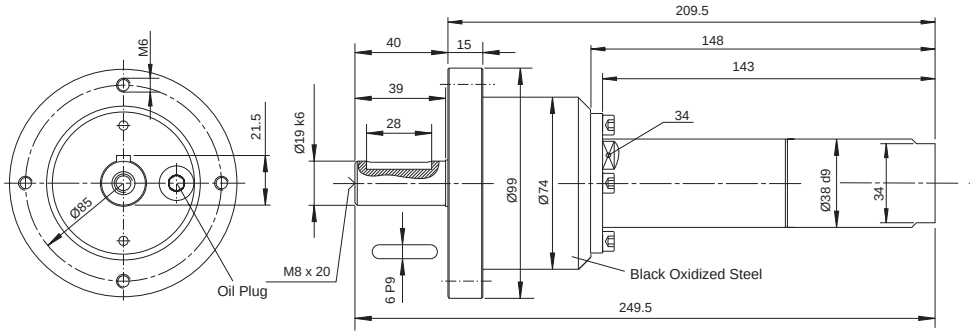
P1V-S020A
with shaft with keyed shaft



P1V-S020D
with threaded shaft



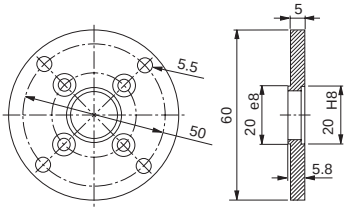
P1V-S020A0011
P1V-S020A0006



	A	B
P1V-S020A0E50, P1V-S020D0E50	127	63.5
P1V-S020A0460, P1V-S020D0460	127	63.5
P1V-S020A0240, P1V-S020D0240	127	63.5
P1V-S020A0140, P1V-S020D0140	143	79.5
P1V-S020A0070, P1V-S020D0070	143	79.5
P1V-S020A0035, P1V-S020D0035	143	79.5
P1V-S020A0018, P1V-S020D0018	143	79.5
P1V-S020A0005, P1V-S020D0005	159	95.5
P1V-S020A0002	159	95.5
P1V-S020A0001	175	111.5
P1V-S020A00005	175	111.5

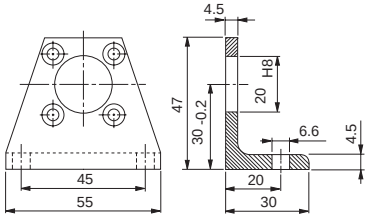
Flange Bracket for Motor P1V-S020

P1V-S4020B



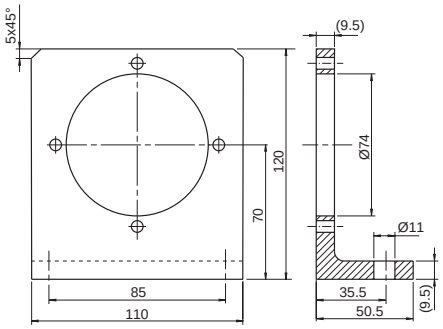
Foot Bracket for Motor P1V-S020

P1V-S4020F



Foot Bracket for Motor P1V-S020A0011 and P1V-S020A0006

P1V-S4020C



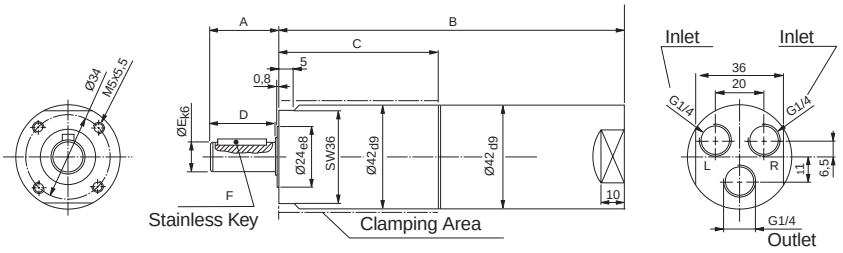
CAD drawings on the Internet
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AirCad™ Drawing Library

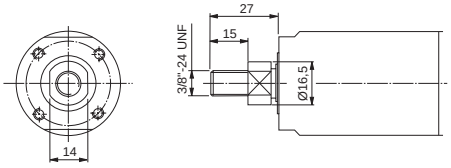
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Pneumatic Division
Wadsworth, Ohio
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Motor P1V-S030

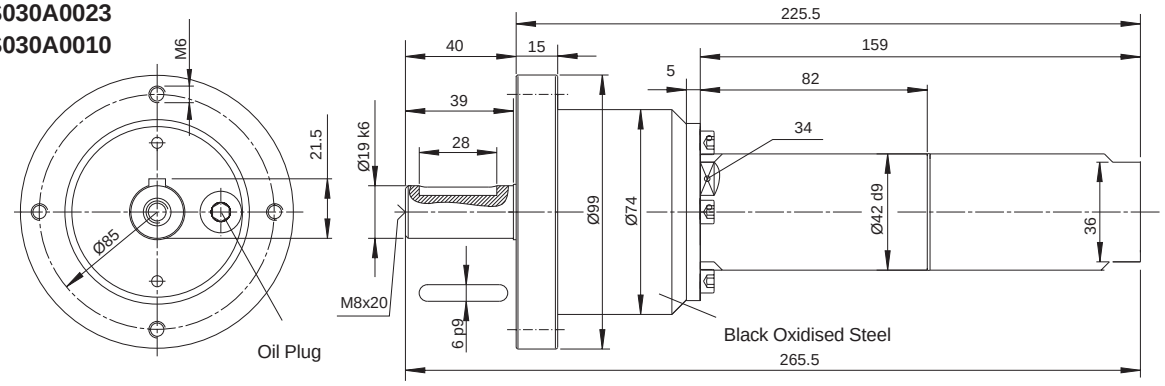
P1V-S030A
with shaft with keyed shaft



P1V-S030D
with threaded shaft



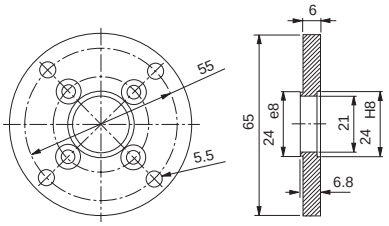
P1V-S030A0023
P1V-S030A0010



	A	B	C	D	E	F
P1V-S030A0E50, P1V-S030D0E50	28.5	143	66	27	12	A4x4x20 DIN 6885
P1V-S030A0460, P1V-S030D0460	28.5	143	66	27	12	A4x4x20 DIN 6885
P1V-S030A0240, P1V-S030D0240	28.5	143	66	27	12	A4x4x20 DIN 6885
P1V-S030A0140, P1V-S030D0140	28.5	159	82	27	12	A4x4x20 DIN 6885
P1V-S030A0060, P1V-S030D0060	32.0	159	82	30	14	A5x5x20 DIN 6885
P1V-S030A0028, P1V-S030D0028	32.0	159	82	30	14	A5x5x20 DIN 6885
P1V-S030A0018, P1V-S030D0018	32.0	159	82	30	14	A5x5x20 DIN 6885
P1V-S030A0005, P1V-S030D0005	32.0	164	82	30	14	A5x5x20 DIN 6885

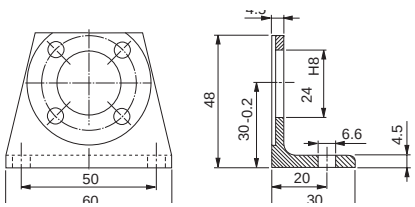
Flange Bracket for Motor P1V-S030

P1V-S4030B



Foot Bracket for Motor P1V-S030

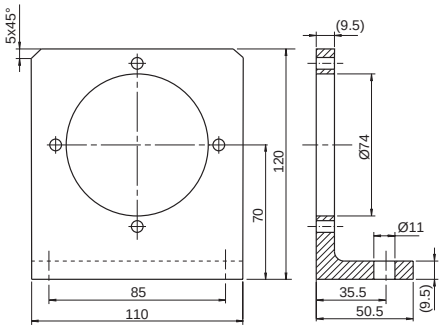
P1V-S4030F



Foot Bracket for Motor

P1V-S030A0023 and P1V-S030A0010

P1V-S4020C



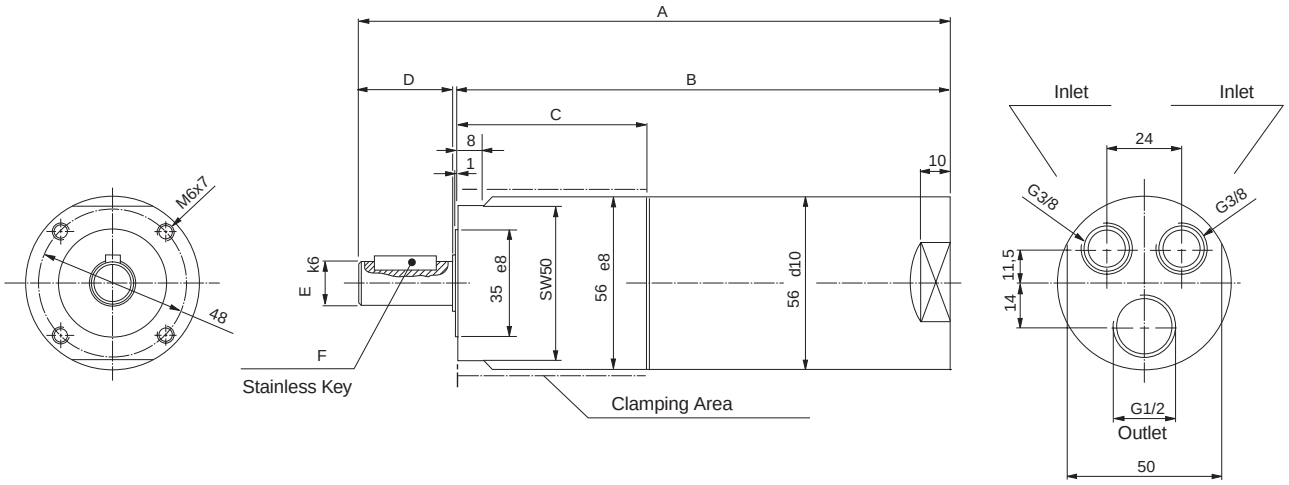
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AirCad™ Drawing Library

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Air Motors

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Pneumatic Division
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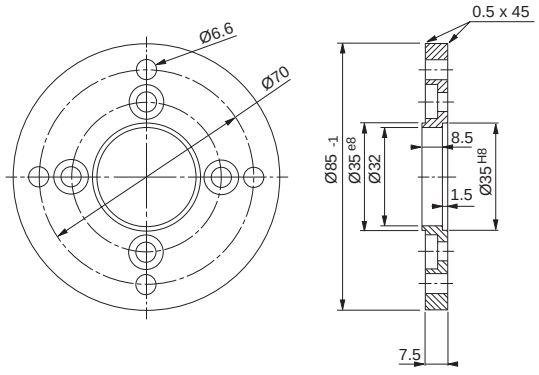
Motor P1V-S060



	A	B	C	D	E	F
P1V-S060A0E00	194	162	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0400	194	162	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0270	194	162	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0170	194	162	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0072	212	180	62,4	30	14	A5x5x20 DIN 6885
P1V-S060A0048	212	180	80,4	30	19	A6x6x22 DIN 6885
P1V-S060A0030	217	180	80,4	35	19	A6x6x22 DIN 6885
P1V-S060A0010	217	180	80,4	35	19	A6x6x22 DIN 6885

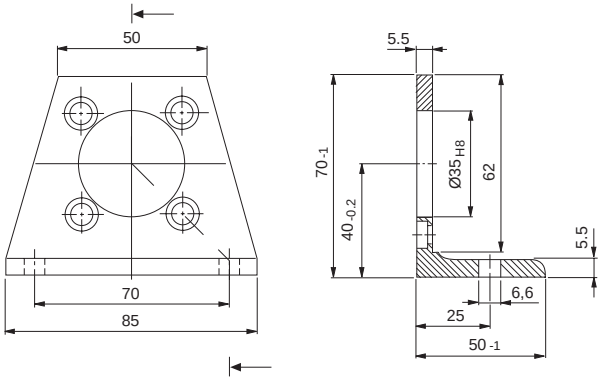
Flange Bracket for Motor P1V-S060

P1V-S4060B



Foot Bracket for Motor P1V-S060

P1V-S4060F



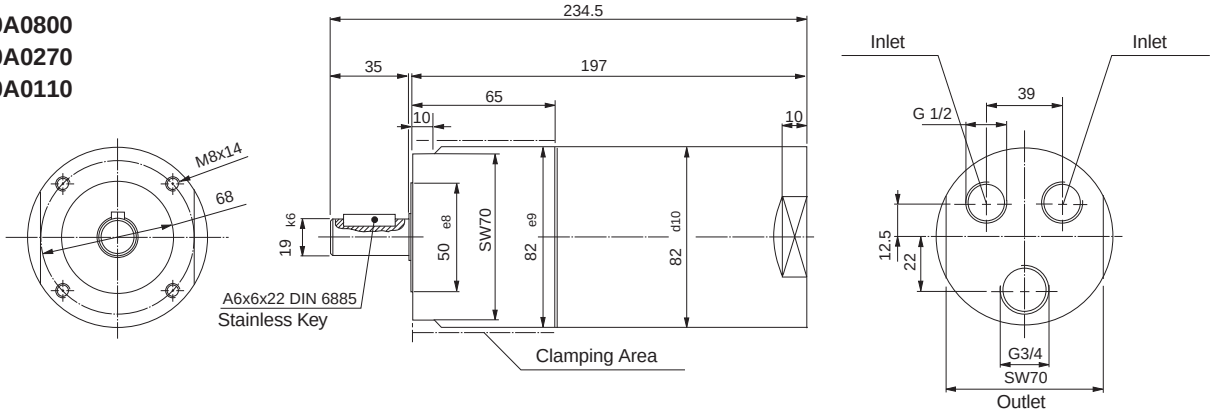
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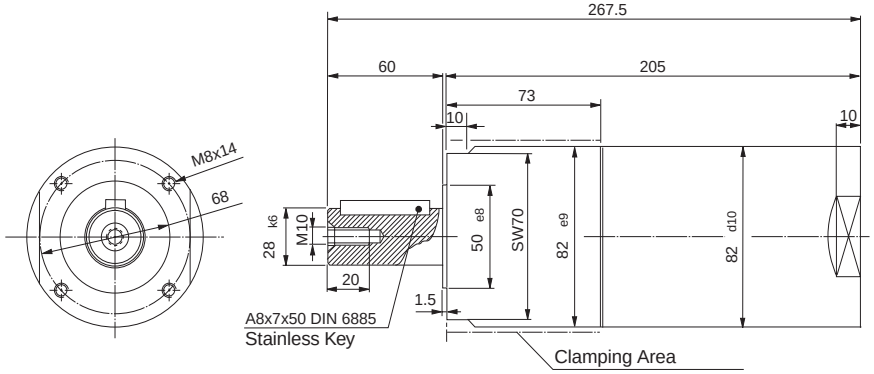
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Motor P1V-S120

P1V-S120A0800
P1V-S120A0270
P1V-S120A0110

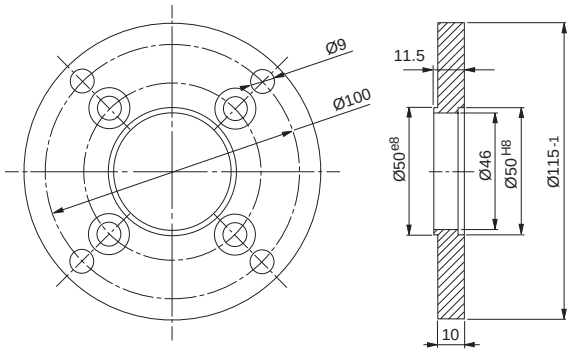


P1V-S120A0078
P1V-S120A0032
P1V-S120A0012



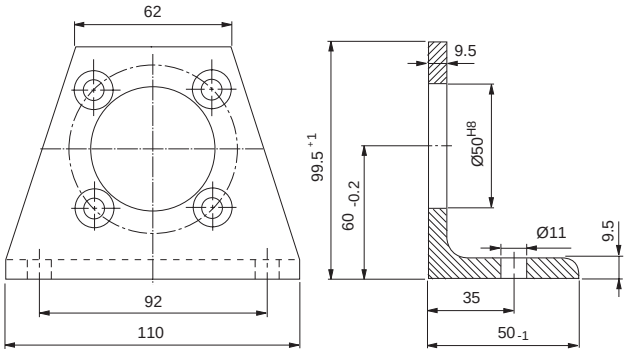
Flange Bracket for Motor P1V-S120

P1V-S4120B



Foot Bracket for Motor P1V-S120

P1V-S4120F



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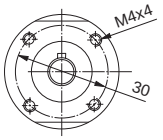
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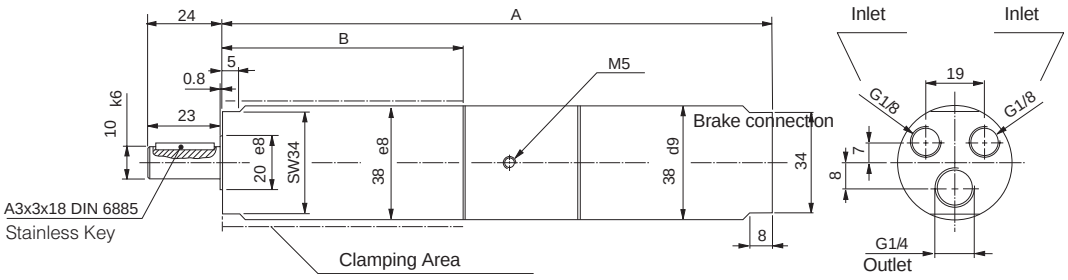
Air Motors

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Brake Motor P1V-S020

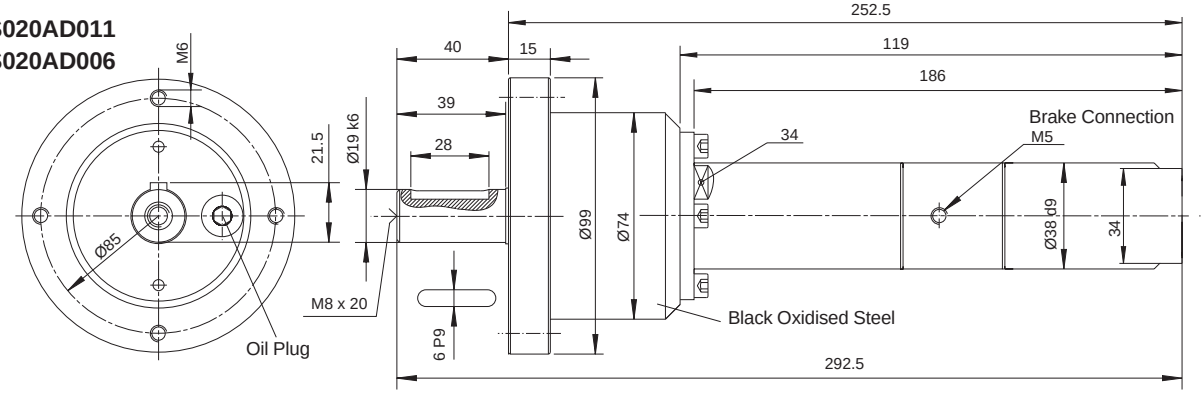
P1V-S020AD
with shaft with keyed shaft





P1V-S020DD
with threaded shaft

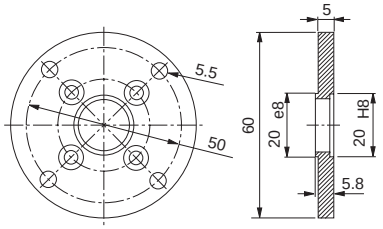
P1V-S020AD011
P1V-S020AD006



	A	B
P1V-S020ADE50	170	63.5
P1V-S020AD460	170	63.5
P1V-S020AD240	170	63.5
P1V-S020AD140	186	79.5
P1V-S020AD070	186	79.5
P1V-S020AD035	186	79.5
P1V-S020AD018	186	79.5
P1V-S020AD005	202	95.5
P1V-S020AD002	202	95.5
P1V-S020AD001	218	111.5
P1V-S020AD0005	218	111.5

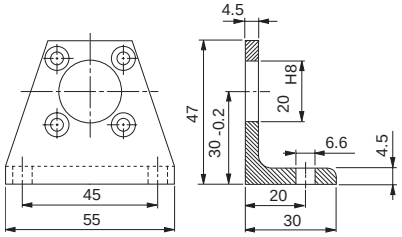
Flange Bracket for Motor P1V-S020

P1V-S4020B



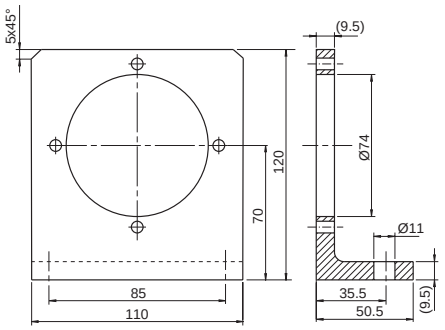
Foot Bracket for Motor P1V-S020

P1V-S4020F



Foot Bracket for Motor P1V-S020AD0011 and P1V-S020AD0006

P1V-S4020C



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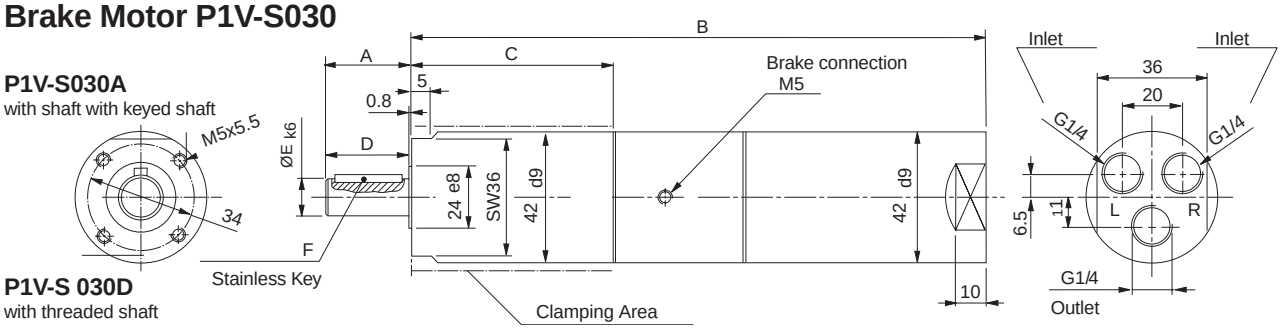
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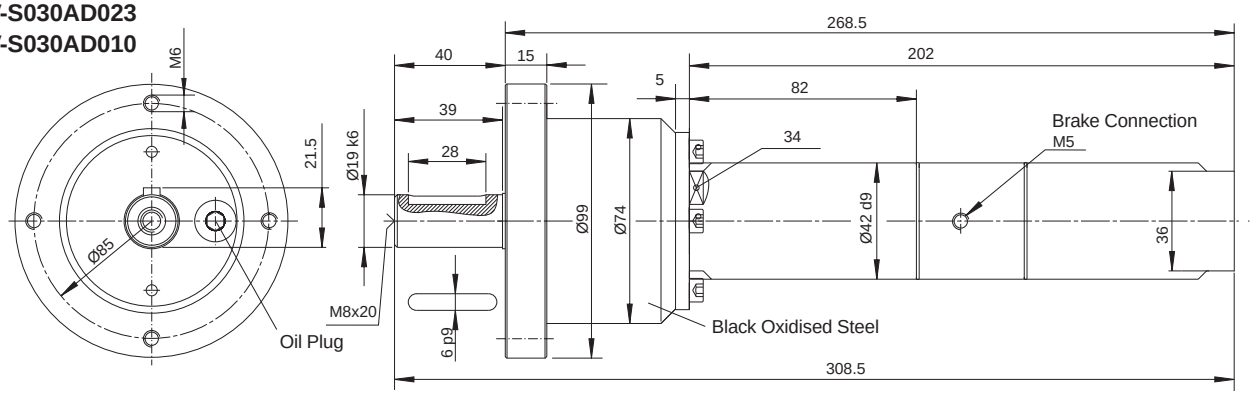
Brake Motor P1V-S030

P1V-S030A
with shaft with keyed shaft

P1V-S 030D
with threaded shaft



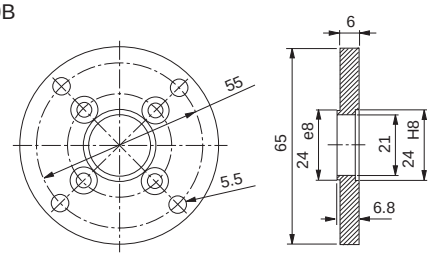
P1V-S030AD023
P1V-S030AD010



	A	B	C	D	E	F
P1V-S030ADE50	28.5	186	66	27	12	A4x4x20 DIN 6885
P1V-S030AD460	28.5	186	66	27	12	A4x4x20 DIN 6885
P1V-S030AD240	28.5	186	66	27	12	A4x4x20 DIN 6885
P1V-S030AD140	28.5	202	82	27	12	A4x4x20 DIN 6885
P1V-S030AD060	32.0	202	82	30	14	A5x5x20 DIN 6885
P1V-S030AD028	32.0	202	82	30	14	A5x5x20 DIN 6885

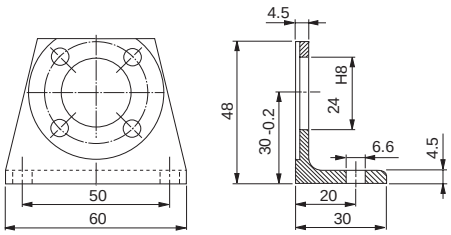
Flange Bracket for Motor P1V-S030

P1V-S4030B



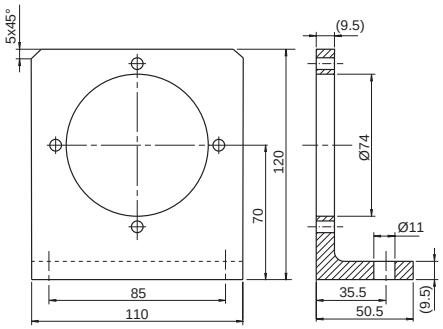
Foot bracket for motor P1V-S030

P1V-S4030F



Foot Bracket for Motor P1V-S030AD0023 and P1V-S030AD0010

P1V-S4020C



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AirCad™ Drawing Library

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Air Motors

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Features

A large number of drilling motors, milling motors and grinding motors have been developed using the P1V-S as the base motor in order to make it easier to install air motors in machining applications. These motors are all equipped with standard vanes for intermittent lubrication-free operation, although it is recommended to use oil mist if you are planning to operate them for extended periods.

NOTE! These motors are not made of 100% stainless steel.

Drilling motors are available with power ratings of 80, 170, 250 and 400 Watts, and several different speeds for the machining of a range of materials. They can be fitted with collet chucks, drill chucks and quick-release chucks. Many of them also have accessories allowing the exhaust air to be removed.

The milling motor, with a power rating of 400 Watts, runs at a relatively high speed, and is fitted with a collet chuck for a shaft diameter of 8 mm. It is equipped with strong bearings able to handle greater shear forces on the spindle.

The grinding motor, with a power rating of 200 Watts, is fitted with a collet chuck for a shaft diameter of 8 mm and runs at a relatively high speed. It is equipped with strong bearings able to handle greater shear forces on the spindle.

The design principle of the 90 Watt grinding motor is different from the others. The turbine principle means that high speeds are possible without the need for lubrication.

Feed Movement in Drilling, Milling and Grinding Motors

A slow and even feed movement is necessary in machining applications. During drilling, the feed must not uncontrollably speed up once the drill breaks through the material. One good way of solving the problem is to use a pneumatic cylinder for the feed, which is able to provide force during drilling and a rapid approach before the actual drilling phase. Feed during the drilling phase is controlled using a hydraulic brake cylinder (HYDROCHECK) fitted in parallel with the pneumatic cylinder. This provides even, slow and safe feed movement, without the risk of the uncontrolled feed described above.

Technical Data:

Working pressure:	Max. 7 bar
Working temperature:	-30 °C to +100 °C
Medium:	40 µm filtered oil mist (unlubricated for grinding motor P1V-S009)
Other technical data	
See table for each motor	

Material Specification

Drilling Motors P1V-S008N, P1V-S025N/M, P1V-S040M, Milling Motor P1V-S040N and Grinding Motor P1V-S020N

Housing	Stainless steel, X12Cr13
Shaft, collet chuck	Hardened steel (not stainless)
Shaft for drill chuck	Hardened and tempered steel (not stainless)

Drilling Motors P1V-S017N/M and Grinding Motor P1V-S009N

Housing	High grade steel (not stainless)
Shaft, collet chuck	Hardened steel (not stainless)
Shaft for drill chuck	Hardened and tempered steel (not stainless)
All	
Internal parts	High grade steel (not stainless)
Accessories	Surface treated steel, plastic aluminium

Order Key

P 1 V - S 0 1 7 N 0 Q 0 0

	Motor Size
008	80 W
009	90 W
017	170 W
025	250 W
030	300 W
040	400 W

	Function
M	B10 / B12 Shaft
N	Collet Chuck

	Free Speed per min
035 … **999**	350 … 9990
A00	10000
H00	17000
L00	20000
Q00	24000
X00	30000
A000	100000

	Air Motor Range
P1V-S	Drilling, Milling and gGrinding Motors

Possible Combinations
Please refer to pages K43 to K50.

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Standard Speeds for HSS Spiral Drills

Average Speed Material	Drilling Ømm									
	1	2	3	4	5	6	7	8	9	10
35 m/min Unalloyed Steel up to 500 N/mm²	11000	5500	3700	2800	2200	1900	1600	1400	1200	1100
28 m/min Unalloyed Steel from 500 to 700 N/mm²	8800	4400	3000	2200	1800	1500	1300	1100	975	880
25 m/min Unalloyed Steel over 700 N/mm²	7800	3900	2600	2000	1600	1300	1100	975	865	780
14 m/min Alloyed Steel from 700 to 900 N/mm²	4400	2200	1500	1100	880	735	630	550	490	440
11 m/min Alloyed Steel from 900 to 1100 N/mm²	3400	1700	1100	850	680	570	485	425	380	340
7 m/min Stainless Steel	2200	1100	730	550	440	365	315	275	245	220
22 m/min Cast Iron up to 180 N/mm²	7000	3500	2300	1700	1400	1200	1000	875	780	700
12 m/min Cast Iron over 180 N/mm²	3800	1900	1300	950	760	630	540	475	420	380
50 m/min Copper, Red Metal, Bronze, Brass	16000	8000	5300	4000	3200	2700	2300	2000	1800	1600
90 m/min Rough Light-alloy Metal, Screw Brass[2]	28000	14000	9000	7000	5600	4800	4000	3500	3100	2800
165 m/min Hardened Light-alloy Meta	52000	26000	17300	13000	10400	8700	7400	6500	5800	5200
210 m/min Magnesium Alloy[1]	66000	33000	22000	16500	13200	11000	9400	8300	7400	6600

1 Speeds for processing two-component plastics, cardboard or plastic-coated fabrics plaster, HSS drills must not be used - use a high-speed steel drill fitted with a hard metal K10 instead

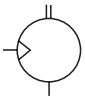
2 Double the values for thermoplastics

Drilling Motor P1V-S008N

Our smallest and most versatile drilling motor for small-scale drilling operations.

The standard collet chuck is for 3 mm shaft diameter.
For other diameters, select a different collet chuck as an accessory.
The motor has a port for a 6 mm hose to remove the exhaust air to a silencer.





Data for Drilling Motor P1V-S008N

Max. Power	Free Speed	Version	Drilling in Steel	Drilling in Aluminium	Air Consumption at Max.. Power	Conn.	Min Pipe ID	Weight	Order Code
kW	rpm	mm	mm	l/s			mm	Kg	
0.080	24000	Collet Chuck 3 mm	—	3	3.8	M8 x 0.75*	4	0.20	**P1V-S008N0Q00**
0.080	7000	Collet Chuck 3 mm	3	3	3.8	M8 x 0.75*	4	0.20	**P1V-S008N0700**
0.080	1900	Collet Chuck 3 mm	3	3	3.8	M8 x 0.75*	4	0.22	**P1V-S008N0190**
0.080	1300	Collet Chuck 3 mm	3	3	3.8	M8 x 0.75*	4	0.22	**P1V-S008N0130**

* 2 push in nipples (F28PMB6M8SP) for plastic pipe Ø6/4 supplied

Accessories for Drilling Motor P1V-S008N

Collet Chucks	Order Code
Collet Chuck Ø2 mm	**P1V-6/314693**
Collet Chuck Ø3 mm	**Standard**
Collet Chuck Ø3/32"	**P1V-6/314694**
Collet Chuck Ø1/8"	**P1V-6/314407**

NOTE! All technical data is based on a working pressure of 6 bar.

Installation brackets, see page K33
Dimensions, see page K51
Permitted shaft loadings, see page K59
Service kits, see page K62

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Drilling Motor P1V-S017N

A small drilling motor for small-scale, lighter drilling operations.

The standard collet chuck is for 6 mm shaft diameter.
For other diameters, select a different collet chuck as an accessory.

The motor has a built-in silencer for exhaust air. If lower noise levels are required,
or if you want the exhaust air to be collected, the relevant accessories are available.



Data for Drilling Motor P1V-S017N

Max. Power	Free Speed	Version	Drilling in Steel	Drilling in Aluminium	Air Consumption at Max.. Power	Conn.	Min Pipe ID	Weight	Order Code
kW	rpm	mm	mm	l/s			mm	Kg	
0.170	24000	Collet Chuck 6 mm	—	4	5.0	G1/4o	6	0.38	**P1V-S017N0Q00**
0.170	6000	Collet Chuck 6 mm	3	5	5.0	G1/4o	6	0.38	**P1V-S017N0600**
0.170	4000	Collet Chuck 6 mm	4	6	5.0	G1/4o	6	0.38	**P1V-S017N0400**
0.170	1500	Collet Chuck 6 mm	4	6	5.0	G1/4o	6	0.38	**P1V-S017N0150**
0.170	1000	Collet Chuck 6 mm	4	6	5.0	G1/4o	6	0.38	**P1V-S017N0100**
0.170	660	Collet Chuck 6 mm	4	6	5.0	G1/4o	6	0.38	**P1V-S017N0066**

Accessories for Drilling Motor P1V-S017N

Collet Chucks	Order Code
Collet Chuck Ø3 mm	**P1V-6/312681**
Collet Chuck Ø4 mm	**P1V-6/312684**
Collet Chuck Ø5 mm	**P1V-6/312686**
Collet Chuck Ø6 mm	**Standard**
Collet Chuck Ø1/8"	**P1V-6/312682**
Collet chuck Ø1/4"	**P1V-6/312689**
Other Accessories	
Outlet Hose	**P1V-6/806112**
Seal for Outlet Hose	**P1V-6/823221**
Outlet Connection Parallel	**P1V-6/302923A**

NOTE! All technical data is based on a working pressure of 6 bar.

Dimensions, see page K51
Permitted shaft loadings, see page K59
Service kits, see page K62

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Drilling Motor P1V-S017M

A small drilling motor for small-scale, lighter drilling operations.

Select drill chucks as accessories.

The motor has a built-in silencer for exhaust air. If lower noise levels are required,
or if you want the exhaust air to be collected, the relevant accessories are available.



Data for Drilling Motor P1V-S017N

Max. Power	Free Speed	Version	Drilling in Steel	Drilling in Aluminium	Air Consumption at Max. power	Conn.	Min Pipe ID	Weight	Order Code
kW	rpm	mm	mm	l/s			mm	Kg	
0.170	6000	For Drill Chuck B10	3	5	5.0	G1/4o	6	0.38	**P1V-S017M0600**
0.170	4000	For Drill Chuck B10	4	6	5.0	G1/4o	6	0.38	**P1V-S017M0400**
0.170	1500	For Drill Chuck B10	4	6	5.0	G1/4o	6	0.38	**P1V-S017M0150**
0.170	1500	For Drill Chuck B10	4	6	5.0	G1/4o	6	0.38	**P1V-S017M0100**
0.170	660	For Drill Chuck B10	4	6	5.0	G1/4o	6	0.38	**P1V-S017M0066**

Accessories for Drilling Motor P1V-S017M

Standard Drill Chuck	Order Code
Diameters 0.5 – 6 mm/B10	**P1V-6/804655**
Other Accessories	
Outlet Hose	**P1V-6/806112**
Seal for Outlet Hose	**P1V-6/823221**
Outlet Connection Parallel	**P1V-6/302923A**

NOTE! All technical data is based on a working pressure of 6 bar.

Dimensions, see page K52
Permitted shaft loadings, see page K59
Service kits, see page K62

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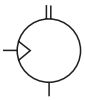
Drilling Motor P1V-S025N

A small drilling motor for moderately heavy drilling operations.

The standard collet chuck is for 6 mm shaft diameter.
For other diameters, select a different collet chuck as an accessory.

The motor has a built-in silencer for exhaust air. If lower noise levels are required,
or if you want the exhaust air to be collected, the relevant accessories are available.





Data for Drilling Motor P1V-S025N

Max. Power	Free Speed	Version	Drilling in Steel	Drilling in Aluminium	Air Consumption at Max. Power	Conn.	Min Pipe ID	Weight	Order Code
kW	rpm	mm	mm	l/s			mm	Kg	
0.250	17000	Collet Chuck 6 mm	—	6	6.3	G1/4o	6	0.80	**P1V-S025N0H00**
0.250	4800	Collet Chuck 6 mm	4	6	6.3	G1/4o	6	0.80	**P1V-S025N0480**
0.250	2500	Collet Chuck 6 mm	6	6	6.3	G1/4o	6	0.80	**P1V-S025N0250**
0.250	1400	Collet Chuck 6 mm	6	6	6.3	G1/4o	6	0.80	**P1V-S025N0140**
0.250	700	Collet Chuck 6 mm	6	—	6.3	G1/4o	6	0.80	**P1V-S025N0070**
0.250	350	Collet Chuck 6 mm	6	—	6.3	G1/4o	6	0.80	**P1V-S025N0035**

Accessories for Drilling Motor P1V-S025N

Collet Chucks	Order Code
Collet Chuck Ø3 mm	**P1V-6/312681**
Collet Chuck Ø4 mm	**P1V-6/312684**
Collet Chuck Ø5 mm	**P1V-6/312686**
Collet Chuck Ø6 mm	**Standard**
Collet Chuck Ø1/8"	**P1V-6/312682**
Collet Chuck Ø1/4"	**P1V-6/312689**
Other Accessories	
Outlet Connection Straight	**P1V-6/313179A**
Outlet Hose Ø23 x 28 mm 0.75 m long	**P1V-6/806110**
Outlet Connection Parallel	**P1V-6/388378A**

NOTE! All technical data is based on a working pressure of 6 bar.

Installation brackets, see page K33
Dimensions, see page K53
Permitted shaft loadings, see page K59
Service kits, see page K62

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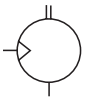
Drilling Motor P1V-S025M

A small drilling motor for moderately heavy drilling operations.

Select drill chucks or quick-release chucks as accessories as necessary.

The motor has a built-in silencer for exhaust air. If lower noise levels are required,
or if you want the exhaust air to be collected, the relevant accessories are available.





Data for Drilling Motor P1V-S025N

Max. Power	Free Speed	Version	Drilling in Steel	Drilling in Aluminium	Air Consumption at Max. Power	Conn.	Min Pipe ID	Weight	Order Code
kW	rpm	mm	mm	l/s			mm	Kg	
0.250	17000	For Drill Chuck B12	—	6	6.3	G1/4o	6	0.80	**P1V-S025M0H00**
0.250	4800	For Drill Chuck B12	4	6	6.3	G1/4o	6	0.80	**P1V-S025M0480**
0.250	2500	For Drill Chuck B12	6	8	6.3	G1/4o	6	0.80	**P1V-S025M0250**
0.250	1400	For Drill Chuck B12	8	10	6.3	G1/4o	6	0.80	**P1V-S025M0140**
0.250	700	For Drill Chuck B12	10	—	6.3	G1/4o	6	0.80	**P1V-S025M0070**
0.250	350	For Drill Chuck B12	10	—	6.3	G1/4o	6	0.80	**P1V-S025M0035**

Accessories for Drilling Motor P1V-S025M

Name	Order Code
Standard Drill Chuck Diameters 0.8 – 10 mm/B12	**P1V-6/804650**
Quick-release Chuck Diameters 0.5 – 8 mm/B12	**P1V-6/804661**
Other Accessories	
Outlet Connection Straight	**P1V-6/3131179A**
Outlet Hose Ø23 x 28 mm 0,75 m long	**P1V-6/806110**
Outlet Connection Parallel	**P1V-6/388378A**

NOTE! All technical data is based on a working pressure of 6 bar.

Installation brackets, see page K33
Dimensions, see page K53
Permitted shaft loadings, see page K59
Service kits, see page K62

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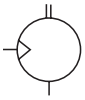
Drilling Motor P1V-S040M

Our large drilling motor is used for small-scale heavy drilling operations
requiring considerable feed force.

Select drill chucks or quick-release chucks as accessories as necessary.

The motor has a built-in silencer for exhaust air. If lower noise levels are required,
or if you want the exhaust air to be collected, the relevant accessories are available.





Data for Drilling Motor P1V-S040M

Max. Power	Free Speed	Version	Drilling in Steel	Drilling in Aluminium	Air Consumption at Max. Power	Conn.	Min Pipe ID	Weight	Order Code
kW	rpm	mm	mm	l/s			mm	Kg	
0.400	17000	For Drill Chuck B12	—	6	8.0	G1/4o	6	0.80	**P1V-S040M0H00**
0.400	4800	For Drill Chuck B12	4	6	8.0	G1/4o	6	0.80	**P1V-S040M0480**
0.400	2500	For Drill Chuck B12	6	8	8.0	G1/4o	6	0.80	**P1V-S040M0250**
0.400	1400	For Drill Chuck B12	6	10	8.0	G1/4o	6	0.80	**P1V-S040M0140**

Accessories for Drilling Motor P1V-S040M

Name	Order Code
Standard Drill Chuck Diameters 0,8 – 10 mm/B12	**P1V-6/804650**
Quick-release Chuck Diameters 0,5 – 8 mm/B12 (Cannot be used for Drilling Motor P1V-S040M0H00)	**P1V-6/804661**
Other Accessories Outlet Connection Straight	**P1V-6/3131179A**
Outlet Hose Ø23 x 28 mm 0,75 m long	**P1V-6/806110**
Outlet Connection Parallel	**P1V-6/388378A**

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NOTE! All technical data is based on a working pressure of 6 bar.

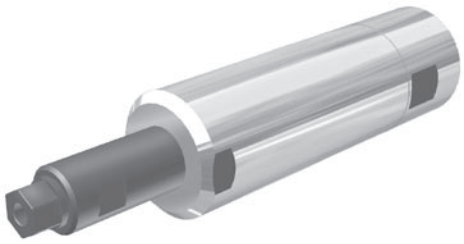
Installation brackets, see page K33
Dimensions, see page K53
Permitted shaft loadings, see page K59
Service kits, see page K62

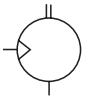
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Milling motor P1V-S040N

This motor was designed for milling plastic components, but it can also be used for milling other materials.

The motor has a built-in silencer for exhaust air. If lower noise levels are required,
or if you want the exhaust air to be collected, the relevant accessories are available.





Data for Drilling Motor P1V-S040N

Max. Power	Free Speed	Version	Drilling in Steel	Drilling in Aluminium	Air Consumption at Max. Power	Conn.	Min Pipe ID	Weight	Order Code
kW	rpm	mm	mm	l/s			mm	Kg	
0.400	20000	Collet Chuck 8 mm	8	10	5.0	G1/4o	6	0.80	**P1V-S040N0H00**

Accessories for Drilling Motor P1V-S040N

Collet Chucks	Order Code
Collet Chuck Ø3 mm	**P1V-6/312690**
Collet Chuck Ø4 mm	**P1V-6/312692**
Collet Chuck Ø5 mm	**P1V-6/312693**
Collet Chuck Ø6 mm	**P1V-6/312694**
Collet Chuck Ø8 mm	**Standard**
Collet Chuck Ø1/8"	**P1V-6/312691**
Collet Chuck Ø1/4"	**P1V-6/312695**
Other Accessories	
Outlet Connection Straight	**P1V-6/313179A**
Outlet Hose Ø23 x 28 mm 0.75 m long	**P1V-6/806110**
Outlet Connection Parallel	**P1V-6/388378A**

NOTE! All technical data is based on a working pressure of 6 bar.

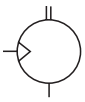
Dimensions, see page K54
Permitted shaft loadings, see page K59
Service kits, see page K62

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Grinding Motor P1V-S009N

The grinding motor is used for small-scale point grinding and small-scale milling where
the high speed is an advantage. It has proved to be very useful for drilling small holes
and milling thin slits in PCBs in the electronics industry.
In this application, the high speed means that the holes and slits are free of
burrs on the underside.





Data for Grinding Motor P1V-S009N

Max. Power	Free Speed	Version	Point Grinding Diameter Max.	Milling Diameter Max.	Air Consumption at Max. Power	Conn.	Min Pipe ID	Weight	Order Code
kW	rpm	mm	mm	l/s			mm	Kg	
0.090	100000	Collet Chuck 3 mm	5	3	2.0	Pipe 6/4	4	0.3	**P1V-S009N0A000**

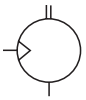
NOTE! All technical data is based on a working pressure of 6 bar.

Dimensions, see page K54
Permitted shaft loadings, see page K59

Grinding motor P1V-S020N

This grinding motor is used when larger-scale point grinding is required.
The motor can also be used for light milling operations.
The motor has a built-in silencer for exhaust air.





Data for Grinding Motor P1V-S020N

Max. Power	Free Speed	Version	Point Grinding Diameter Max.	Milling Diameter Max.	Air Consumption at Max. Power	Conn.	Min Pipe ID	Weight	Order Code
kW	rpm	mm	mm	l/s			mm	Kg	
0.200	30000	Collet Chuck 6 mm	25	10	6.3	G1/40	6	0.5	**P1V-S020N0X00**

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Accessories for Grinding Motor P1V-S020N

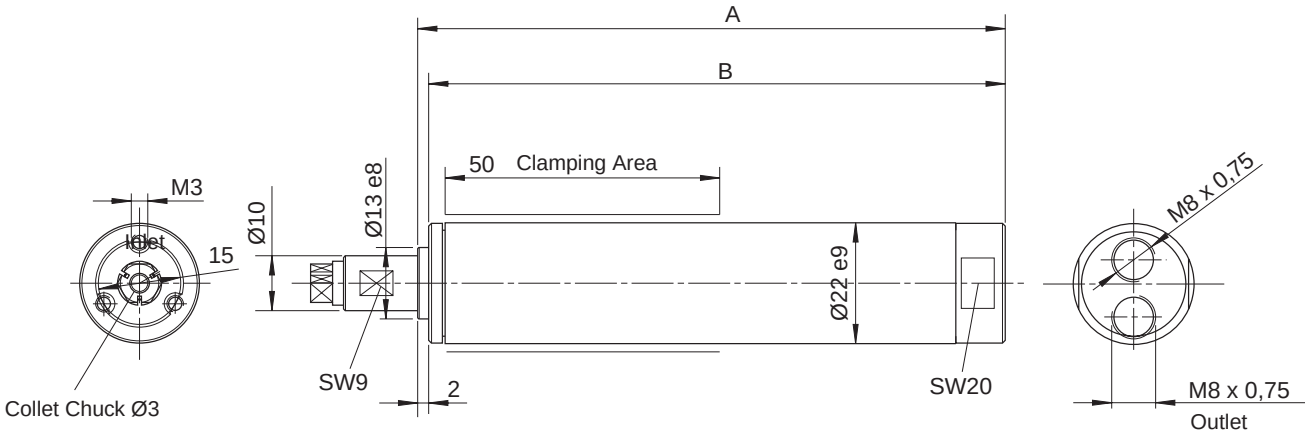
Collet Chucks	Order Code
Collet Chuck Ø3 mm	**P1V-6/312681**
Collet Chuck Ø4 mm	**P1V-6/312684**
Collet Chuck Ø5 mm	**P1V-6/312686**
Collet Chuck Ø6 mm	**Standard**
Collet Chuck Ø1/8"	**P1V-6/312682**
Collet Chuck Ø1/4"	**P1V-6/312689**

NOTE! All technical data is based on a working pressure of 6 bar.

Dimensions, see page K54
Permitted shaft loadings, see page K59
Service kits, see page K62

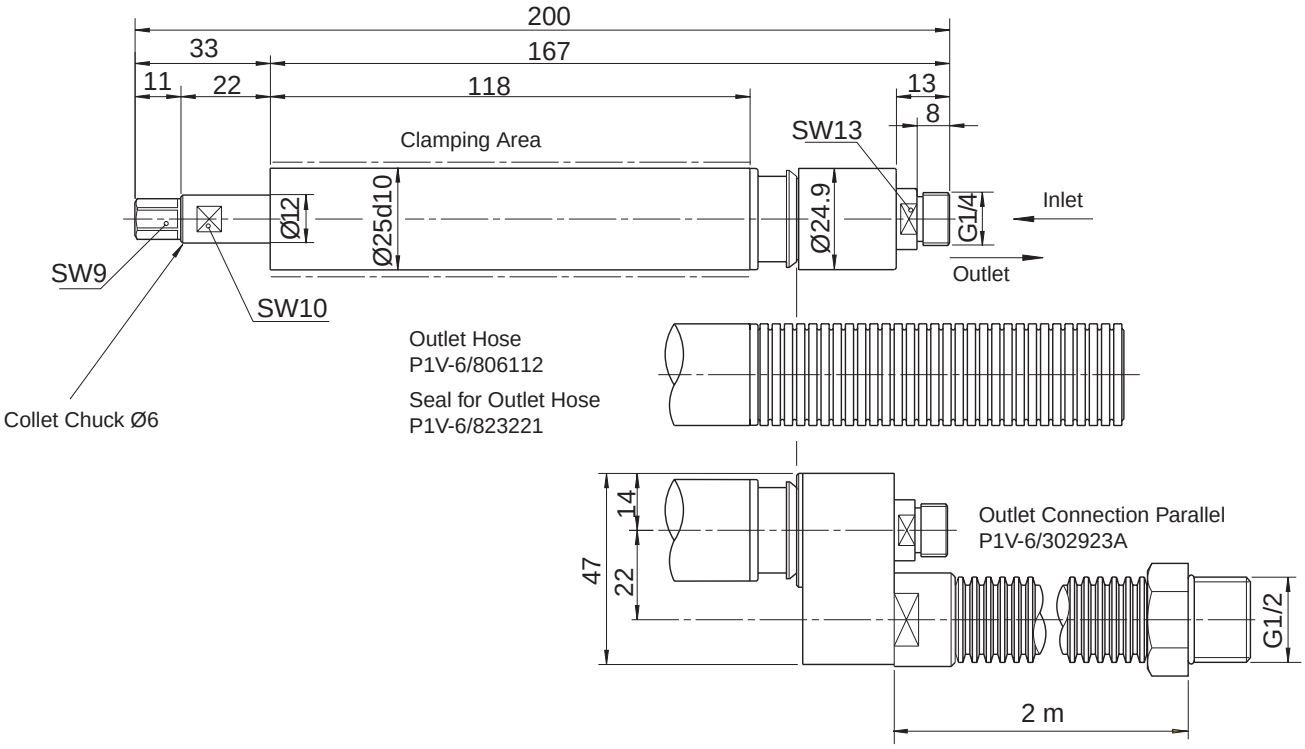
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Drilling Motor P1V-S008N



	A	B
P1V-S008N0Q00, P1V-S008N0700	98	96
P1V-S008N0190, P1V-S008N0130	107	105

Drilling Motor P1V-S017N

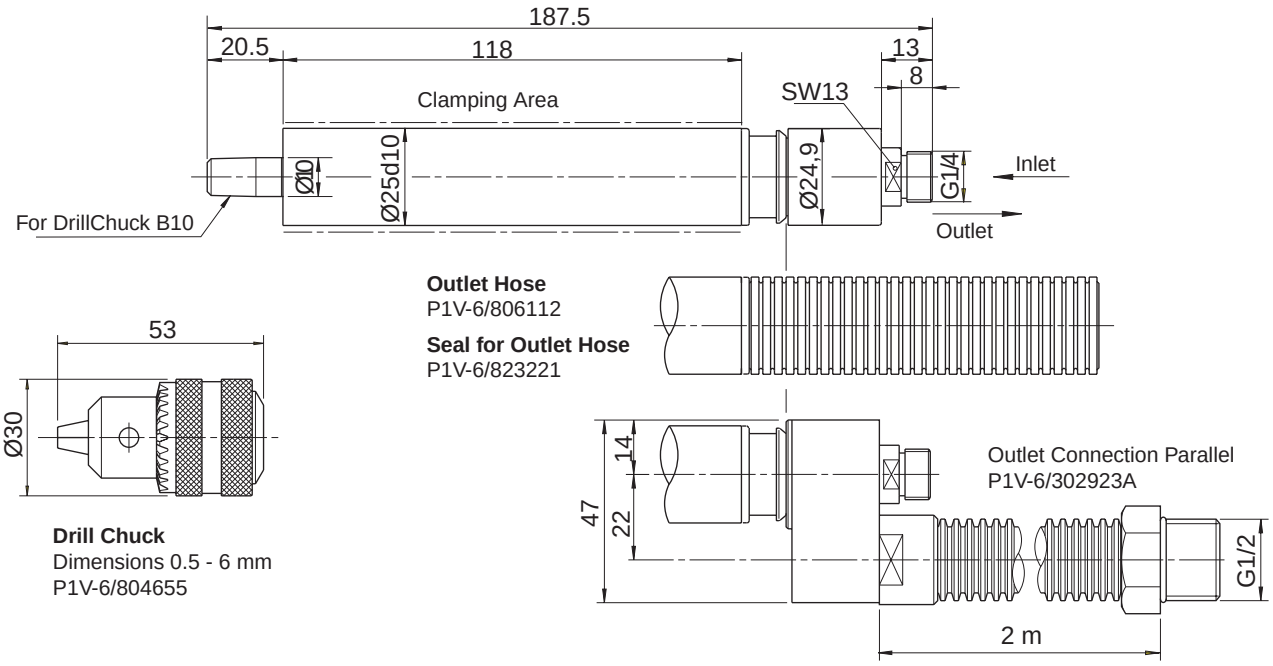


CAD drawings on the Internet
Our home page www.parker.com/euro_pneumatic includes the AirCad Drawing Library with 2D and 3D drawings for the main versions.

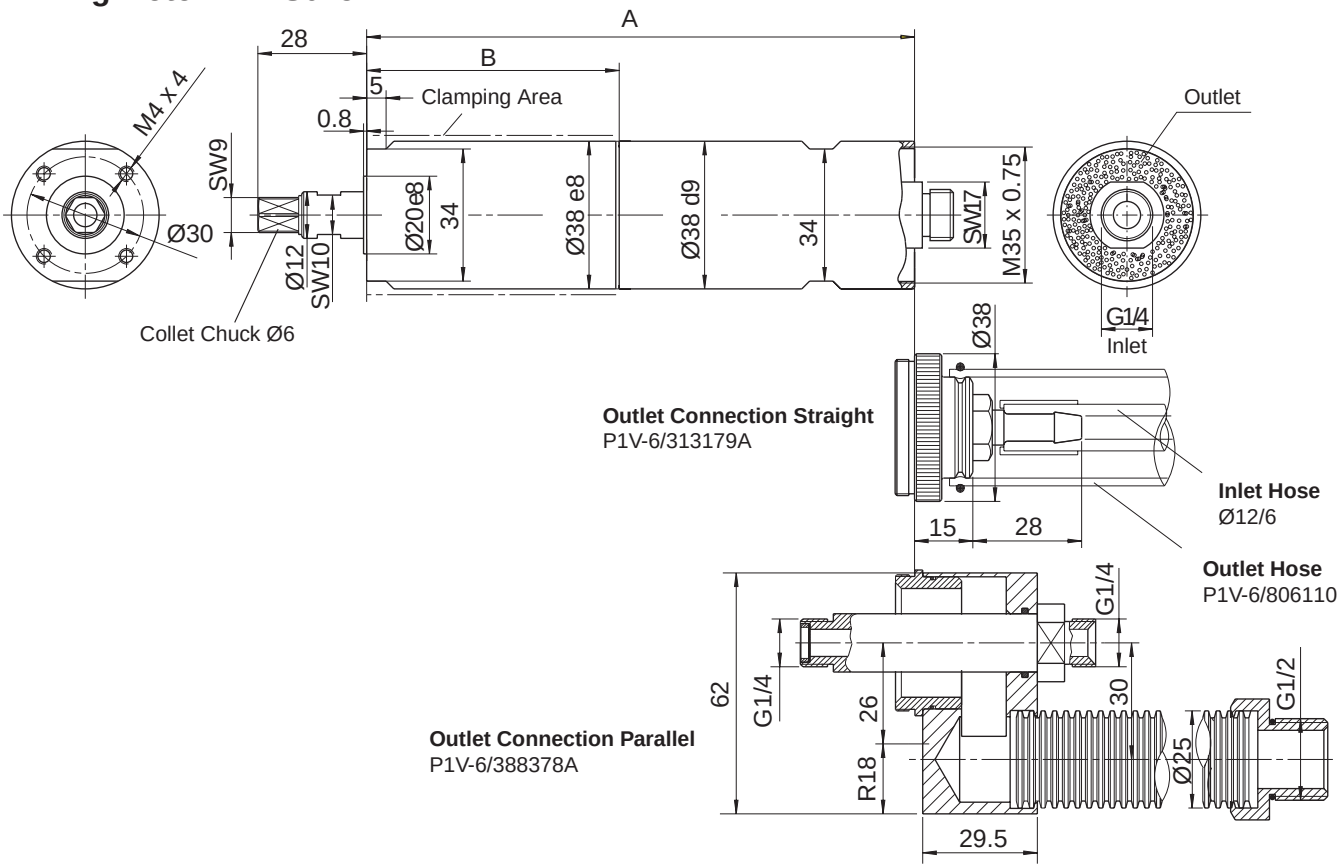
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Drilling Motor P1V-S017M



Drilling Motor P1V-S025N



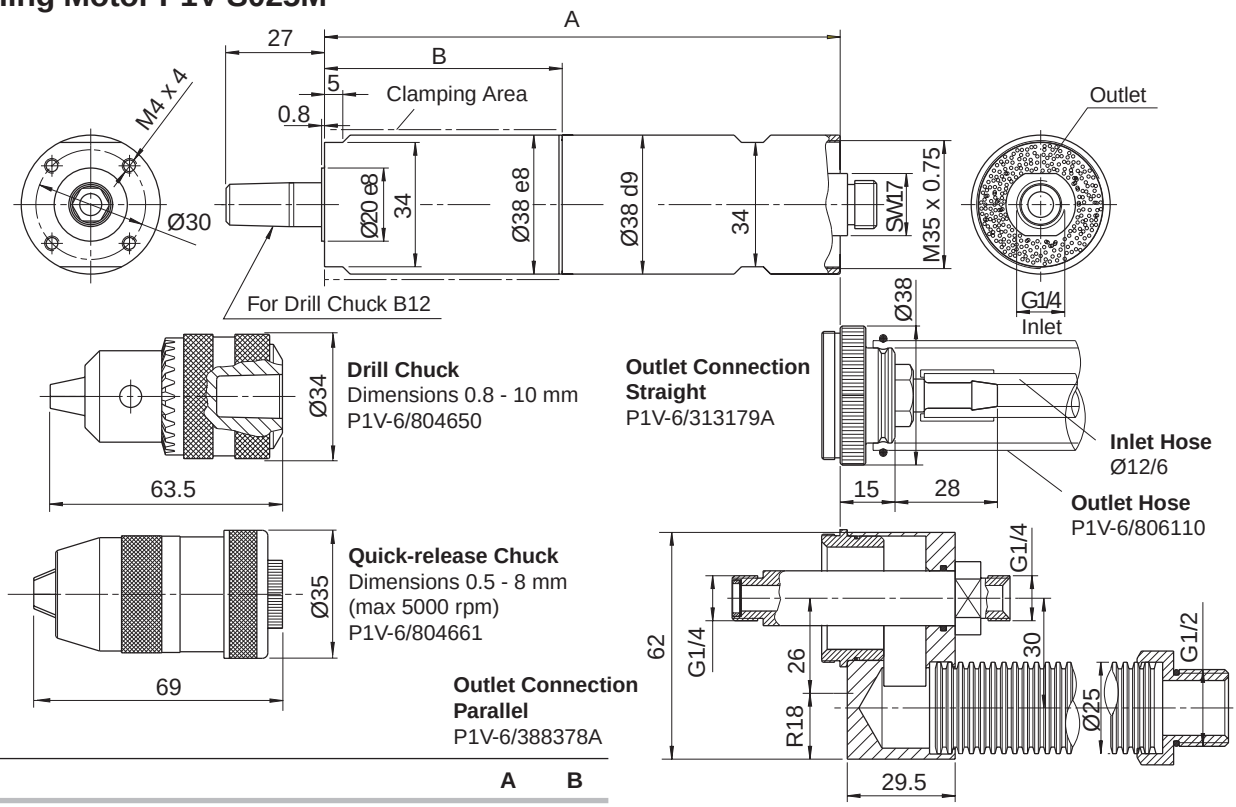
	A	B
P1V-S025N0H00, P1V-S025N0480, P1V-S025N0250	141	65
P1V-S025N0H00, P1V-S025N0480, P1V-S025N0250	157	81

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AirCad™ Drawing Library

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Drilling Motor P1V-S025M



Drill Chuck
Dimensions 0.8 - 10 mm
P1V-6/804650

Quick-release Chuck
Dimensions 0.5 - 8 mm
(max 5000 rpm)
P1V-6/804661

Outlet Connection Straight
P1V-6/313179A

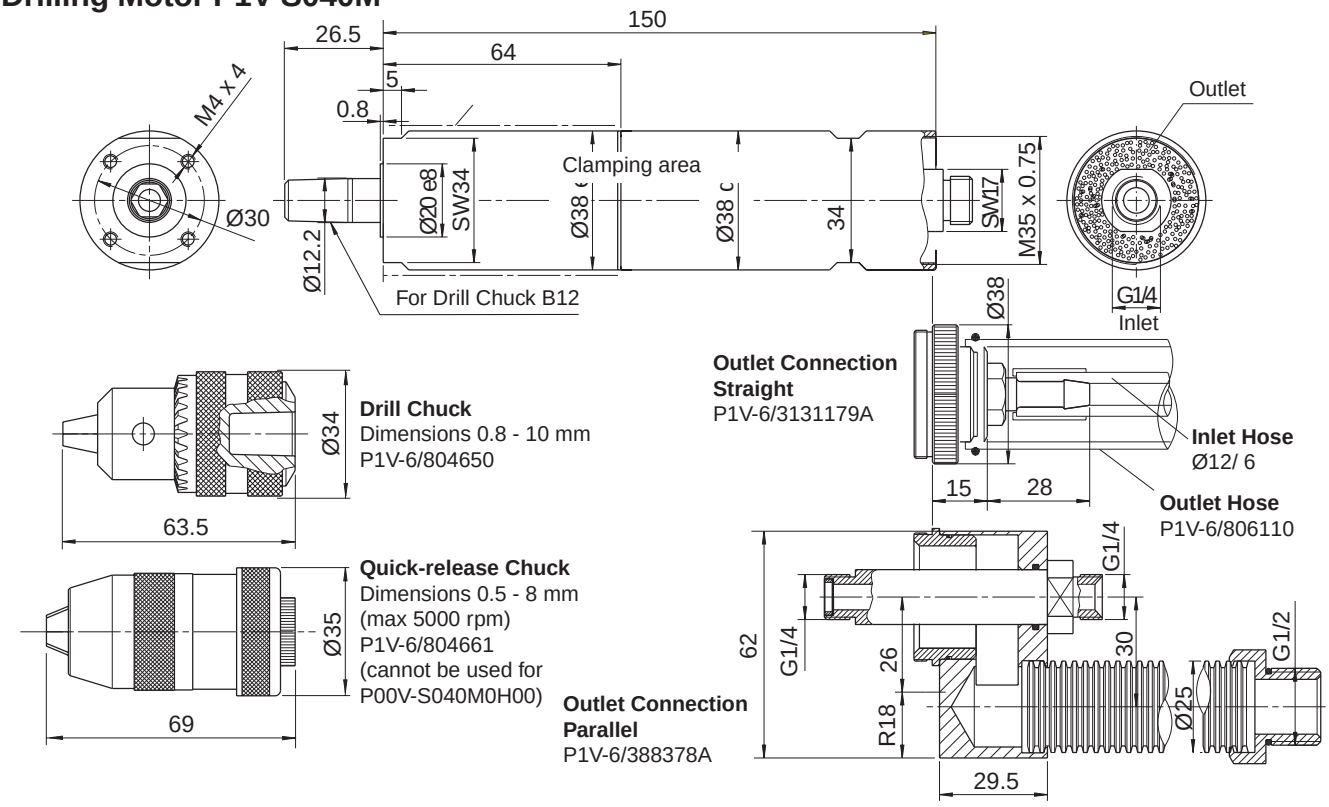
Outlet Connection Parallel
P1V-6/388378A

Inlet Hose
Ø12/6

Outlet Hose
P1V-6/806110

	A	B
P1V-S025M0H00, P1V-S025M0480, P1V-S025M0250	141	65
P1V-S025M0140, P1V-S025M0070, P1V-S025M0035	157	81

Drilling Motor P1V-S040M



Drill Chuck
Dimensions 0.8 - 10 mm
P1V-6/804650

Quick-release Chuck
Dimensions 0.5 - 8 mm
(max 5000 rpm)
P1V-6/804661
(cannot be used for P00V-S040M0H00)

Outlet Connection Straight
P1V-6/3131179A

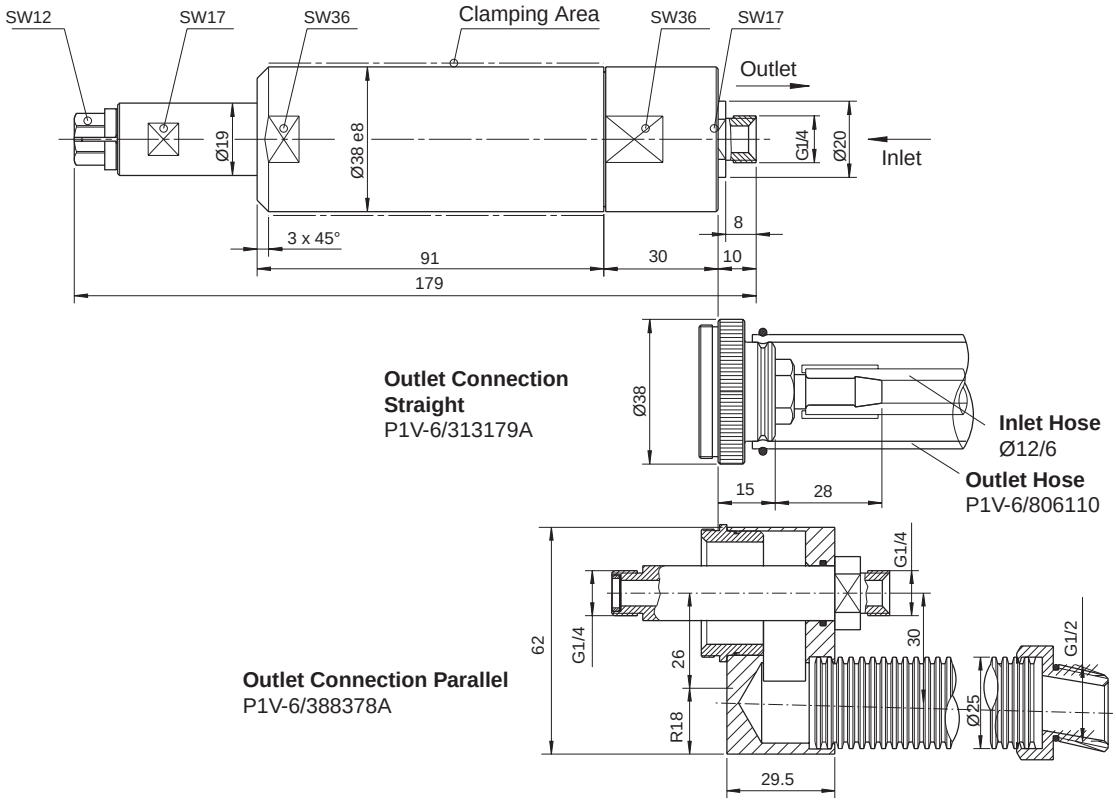
Outlet Connection Parallel
P1V-6/388378A

Inlet Hose
Ø12/ 6

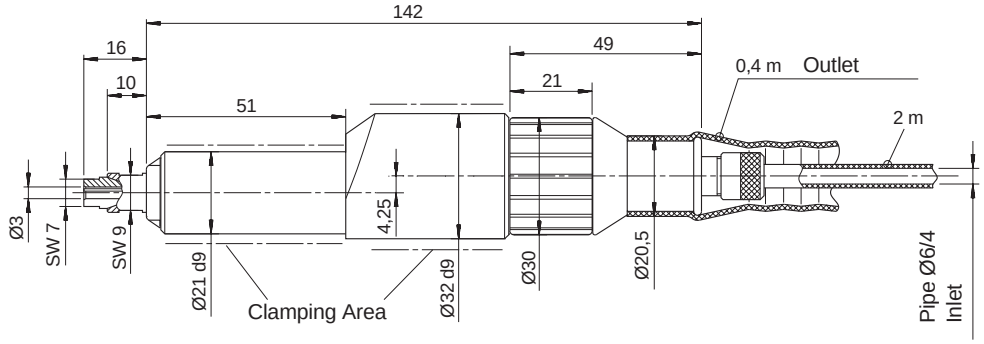
Outlet Hose
P1V-6/806110

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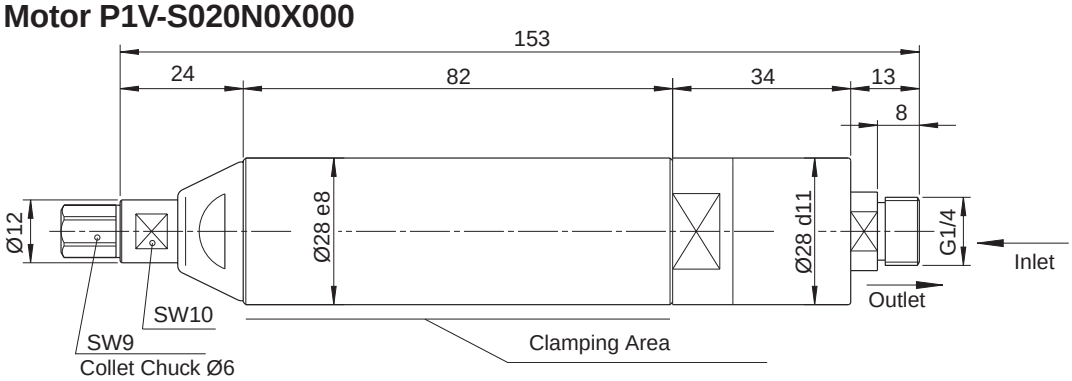
Milling Motor P1V-S040N



Grinding Motor P1V-S009N0A000



Grinding Motor P1V-S020N0X000



CAD drawings on the Internet
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AirCad™ Drawing Library

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Theoretical calculations

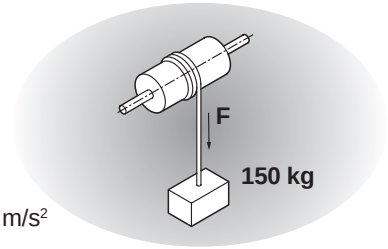
This section provides you with the background you need in order to select the right air motor for common applications. The first four parts explain the direct physical relationships between:

Force - Torque - Speed - Power Requirement

Before selecting an air motor, you need to know the torque required by the application at the necessary speed. Sometimes, the torque and the speed are not known but the power requirement and the speed of movement are. You can use the following formulas to calculate the speed and torque.

Power

The power requirement is always calculated in N.



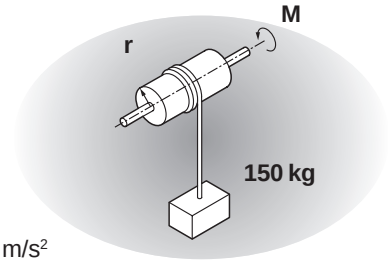
Formula:
$F = m \times g$

F = power in N
m = mass in kg
g = gravitation (9.81) in m/s^2

In this example, the mass is 150 kg
F = 150 x 9.81 N
F = 1470 N

Torque

Torque is the force applied to produce rotational motion (rotational force) or the force applied in the opposite direction. It is the product of the rotational force F and the distance from the pivot point (radius or moment arm)



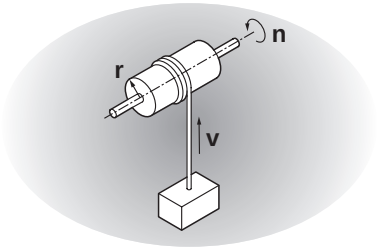
Formula:
$M = m \times g \times r$

M = torque in Nm
m = mass in kg
g = gravitation (9.81) in m/s^2
r = radius or moment arm in m

In this example, the drum diameter is 300 mm, which means the radius r = 0,15 m, and the mass is 150kg.
M = 150 x 9,81 x 0.15 Nm
M = 221 Nm

Speed

The required motor speed can be calculated if the speed of movement and the radius (diameter) are known.



$n = v \times 60/(2 \times \pi \times r)$

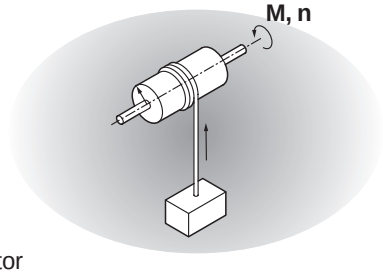
n = motor speed in rpm
v = speed of movement in m/sec
r = radius in m
π = constant (3.14)

In this example, the speed of movement is 1.5 m/s and the drum diameter is 300 m (radius r = 0.15 m)

n = 1.5 x 60/(2 x π x 0.15) rpm
n = 96 rpm

Power Requirement

The power requirement can be calculated if the motor speed and torque are known.



$P = M \times n/9550$

P = power in kW
M = torque in Nm
n = rpm
9550 = conversion factor

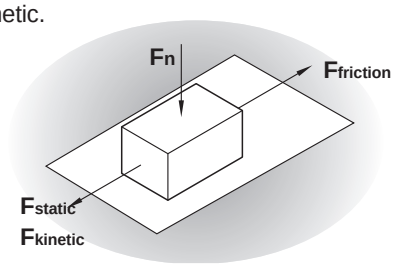
In this example, a torque of 1.25 Nm is required at a speed of 1500 rpm.
P = 1.25 x 1500/9550
P = 0.196 kW or approx. 200 Watt

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Frictional Forces Between Two Objects

A frictional force always occurs between two objects with surfaces in contact with each other. It is always exerted against the direction of movement.

The frictional force is either static or kinetic. When selecting an air motor, we need to consider the larger of the two forces, static or kinetic.



The size of the static frictional force or the kinetic frictional force is the product of the normal force F_n and the coefficient of static friction (μ_0), or the product of the normal force F_n and the coefficient of kinetic friction (μ).
The size of the contact surface between the objects is irrelevant.

Formula:

$F_{static} = F_n \times \mu_0$
$F_{kinetic} = F_n \times \mu$

$F_n = m \times g$

F_{static} = static friction in N
$F_{kinetic}$ = kinetic friction in N
F_n = force from object in N
m = mass in kg
g = gravitation (9.81) in m/s^2

Material		Coefficient of Static Friction μ_0	
		Dry	Lubricated
Bronze	Bronze	0.28	0.11
Bronze	Grey Iron	0.28	0.16
Grey Iron	Grey Iron	—	0.16
Steel	Bronze	0.27	0.11
Steel	Ice	0.027	—
Steel	Grey Iron	0.20	0.10
Steel	Steel	0.15	0.10
Steel	White Metal	—	—
Wood	Ice	—	—
Wood	Wood	0.65	0.16
Leather	Grey Iron	0.55	0.22
Brake Lining	Steel	—	—
Steel	Nylon (polyamide)	—	—

Material		Coefficient of Static Friction μ_0	
		Dry	Lubricated
Bronze	Bronze	0.2	0.06
Bronze	Grey Iron	0.21	0.08
Grey Iron	Grey Iron	—	0.12
Steel	Bronze	0.18	0.07
Steel	Ice	0.014	—
Steel	Grey Iron	0.16	0.05
Steel	Steel	0.10	0.05
Steel	White Metal	0.20	0.04
Wood	Ice	0.035	—
Wood	Wood	0.35	0.05
Leather	Grey Iron	0.28	0.12
Brake Lining	Steel	0.55	0.40
Steel	Nylon (polyamide)	0.5	0.10

Example: A steel component with a weight of 500 kg is to be pulled across bronze plate without lubrication. What will the frictional force be when the component moves?

$F_{static} = F_n \times \mu_0$

$F_{kinetic} = F_n \times \mu$

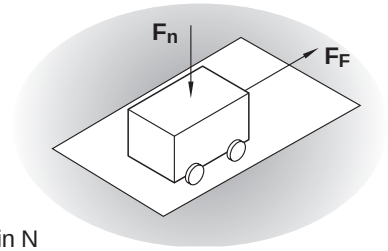
$F_{static} = 500 \times 9.81 \times 0.27 = 1324$ N

$F_{kinetic} = 500 \times 9.81 \times 0.18 = 883$ N

The static frictional force should always be compared with the force provided by the motor when it starts.

Kinetic Resistance

Kinetic resistance is a term expressing the total resistance, consisting of rolling resistance and the frictional force in the bearing.



Formula:

$F_F = \mu_F \times F_n$

F_F = kinetic resistance in N
μ_F = coefficient of kinetic resistance
F_n = force from object in N

Coefficient of Kinetic Resistance:

Object	Coefficient of Kinetic Resistance
Railway vehicle on steel rails	0.0015 to 0.0030
Vehicle with rubber wheel on asphalt	0.015 to 0.03

Example:

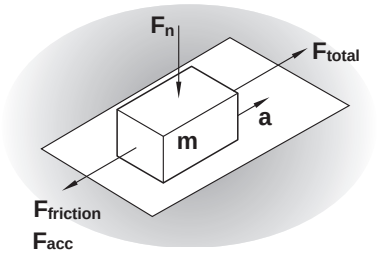
A railway carriage with a weight of 2 tons is to move over flat rails. What will the kinetic resistance be?

$F_F = \mu_F \times F_n$
$F_F = 0.0030 \times 2 \times 1000 \times 9.81$
$F_F = 4.86$ N

K

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Moving a component over a base, with friction between them



The force required to move the component consists of two parts - a frictional force to move the component over the base, and an acceleration force

$F_{tot} = F_{friction} + F_{acc}$

$F_{acc} = m \times a$

$F_{tot} = F_{friction} + m \times a$

F_{tot} = the total force required in order to move the object in N

$F_{friction}$ = frictional force in N (either F_{static} or $F_{kinetic}$ depending on which is the greater force)

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A steel component weighing 500 kg is to be pulled over a dry steel plate with an acceleration of 0.1 m/s^2. What is the total force required to produce this movement?

$F_{tot} = F_{kinetic} + F_{acc}$

$F_{tot} = F_{kinetic} + m \times a$

$F_{tot} = Fn \times u + m \times a$

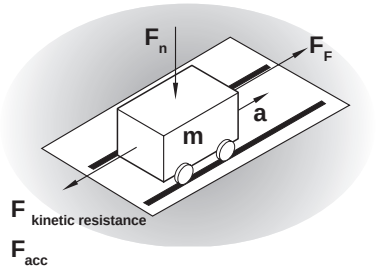
$F_{tot} = 500 \times 9{,}81 \times 0.15 + 500 \times 0.1$

$F_{tot} = 735.75 + 50$

$F_{tot} = 785.75$ N

Answer: A force of 780 N is required to produce this movement.

Moving a carriage over rails, with kinetic resistance between them



The force required to move the component consists of two parts - a kinetic resistance to move the component over the base, and an acceleration force

$F_{tot} = F_{kinetic\ resistance} + F_{acc}$

$F_{acc} = m \times a$

$F_{tot} = F_{kinetic\ resistance} + m \times a$

F_{tot} = the total force required in order to move the object in N

$F_{kinetic\ resistance}$ = total kinetic resistance in N

F_{acc} = acceleration force in N

m = mass in kg

a = acceleration in m/s^2

A carriage weighing 2500 kg is to be pulled over steel rails with an acceleration of 0,2 m/s^2. What is the total force required to produce this movement?

$F_{tot} = F_{kinetic\ resistance} + F_{acc}$

$F_{tot} = u_F \times F_N + m \times a$

$F_{tot} = 0.0030 \times 2500 \times 9.81 + 2500 \times 0.2$

$F_{tot} = 6.1 + 500$

$F_{tot} = 506$ N

Answer: A force of 510 N is required to produce this movement.

In Practice

These calculations only produce values as they would be under optimum conditions. There must be no inclines in either direction. In applications using carriages, the rails must be perfectly flat without any inclines, the wheels must be perfectly round and there must be nothing on the rails (grains of sand, etc.). There must also be no effects from wind, etc.
In addition, there is always uncertainty with regard to the compressed air supply. How can we guarantee a pressure of 6 bar to the inlet port of the air motor?

Tip: calculate the required theoretical values for the air motor and assume a safety factor of 10 for the frictional force or kinetic resistance, and add this to the acceleration force. If the motor proves to be too powerful in practice, the supply air can always be regulated by throttling or pressure regulation. If you select a motor that is not powerful enough, on the other hand, the only option is to replace it.

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Permitted Shaft Loadings

Air and Brakemotors

Max. permitted load on output shaft for motors (based on 10,000,000 rpm at input shaft with 90 % probable service life for ball bearings).

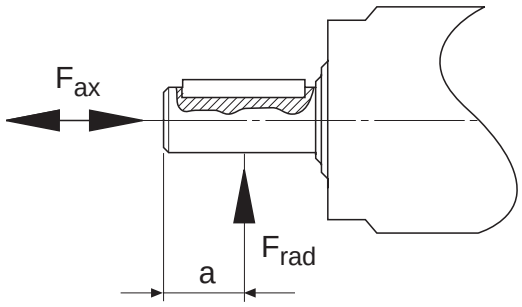


Fig 1: Load on output shaft for basic motor with keyed shaft.

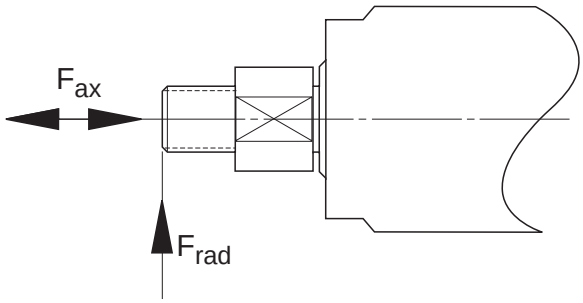


Fig. 2: Load on output shaft for basic motor with threaded shaft.

Keyed Shaft

Order Code	F_{ax} (N)	F_{rad} (N)	a (mm)
P1V-S002A	140	180	6
P1V-S008A	200	220	7
P1V-S012A	380	160	9
P1V-S020A	570	720	12
P1V-S020A0011	1100	1200	22
P1V-S020A0006	1100	1200	22
P1V-S030A0023	1100	1200	22
P1V-S030A0010	1100	1200	22
P1V-S030A0E50	570	1130	14
P1V-S030A0460	570	1130	14
P1V-S030A0240	570	1130	14
P1V-S030A0140	570	1130	14
P1V-S030A0060	790	1070	15
P1V-S030A0028	790	1070	15
P1V-S030A0018	790	1070	15
P1V-S030A0005	790	1070	15
P1V-S060A0E00	1110	1300	15
P1V-S060A0400	1110	1300	15
P1V-S060A0270	1110	1300	15
P1V-S060A0170	1110	1300	15
P1V-S060A0072	1110	1300	15
P1V-S060A0048	1130	2090	18
P1V-S060A0030	1130	2090	18
P1V-S060A0010	1130	2090	18
P1V-S120A0800	2330	2260	18
P1V-S120A0270	2330	2260	18
P1V-S120A0110	2330	2260	18
P1V-S120A0078	2330	2700	30
P1V-S120A0032	2330	2700	30
P1V-S120A0012	2330	2700	30

Threaded Shaft

Order Code	F_{ax} (N)	F_{rad} (N)
P1V-S012D	380	110
P1V-S020D	570	450
P1V-S030D0E50	570	860
P1V-S030D0460	570	860
P1V-S030D0240	570	860
P1V-S030D0140	570	860
P1V-S030D0060	790	820
P1V-S030D0028	790	820
P1V-S030D0018	790	820
P1V-S030D0005	790	820

F_{rad} = Radial loading (N)
F_{ax} = Axial loading (N)

K

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Permitted Shaft Loadings

Drilling, Milling and Grinding Motors

Max. permitted load on output shaft for motors (based on 10,000,000 rpm at input shaft with 90 % probable service life for ball bearings).

Drilling Motors with Collet Chuck

Order Code	F_{ax} (N)	F_{rad} (N)	a (mm)
P1V-S008N	200	75	25
P1V-S017N	380	50	25
P1V-S025N	750	260	25

Drilling Motors with Drill Chuck

Order Code	F_{ax} (N)	F_{rad} (N)	a (mm)
P1V-S017M	380	35	60
P1V-S025M	380	150	70
P1V-S040M	750	150	70

Milling Motor

Order Code	F_{ax} (N)	F_{rad} (N)	a (mm)
P1V-S040N*	30	250	25

Grinding Motors

Order Code	F_{ax} (N)	F_{rad} (N)	a (mm)
P1V-S009N*	2	10	25
P1V-S020N*	16	70	25

F_{rad} = Radial loading (N)
F_{ax} = Axial loading (N)

* For the milling motor and grinding motor, these loadings are calculated for 1000 hours of operation

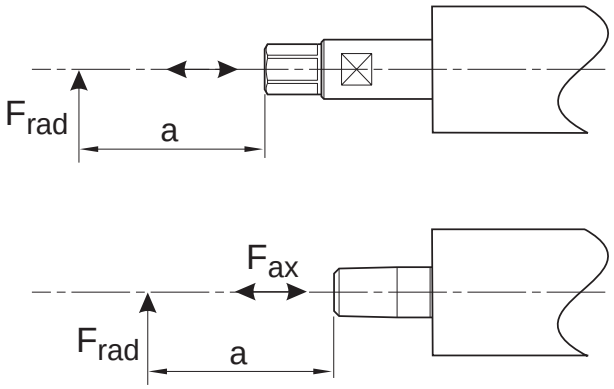
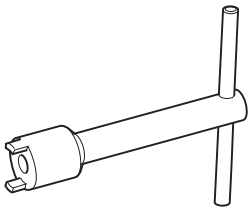


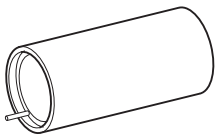
Fig 3: Load on output shaft for drilling, milling and grinding motors.

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Service Kits for P1V-S Motors

The following kits are available for the basic motors, consisting of vanes, (springs), silencers, O-rings, seals and 50 g of grease: (USDA-H1 approved):





Installation Tools

For Motor	Order Code
P1V-S012	**8204160049**

For Motor	Order Code
P1V-S020, P1V-S030	**8204160112**





Service Kit, Vanes for Intermittent Lubrication-free Operation

For Motor	Order Code
P1V-S002A	**P1V-6/446083A**
P1V-S008A	**P1V-6/446084A**
P1V-S012A/D0 (to serial no 948688)	**9121720601**
P1V-S012A/D0 (from serial no 948689)	**9121720636**
P1V-S020A/D0	**9121720602**
P1V-S030A/D0	**9121720603**
P1V-S060A0E00	**9121720604**
P1V-S060A0400	**9121720604**
P1V-S060A0270	**9121720604**
P1V-S060A0170	**9121720604**
P1V-S060A0072	**9121720604**
P1V-S060A0048	**9121720605**
P1V-S060A0030	**9121720605**
P1V-S060A0010	**9121720605**
P1V-S120A0800	**9121720606**
P1V-S120A0270	**9121720606**
P1V-S120A0110	**9121720606**
P1V-S120A0078	**9121720607**
P1V-S120A0032	**9121720607**
P1V-S120A0012	**9121720607**

Service Kit, Vanes for Continuous Lubrication-free Operation, Option "C"

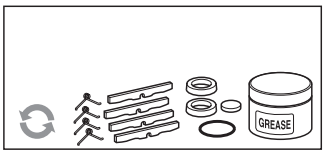
For Motor	Order Code
P1V-S012A/DC (to serial no 948688)	**9121720608**
P1V-S012A/DC (from serial no 948689)	**9121720637**
P1V-S020A/DC	**9121720609**
P1V-S030A/DC	**9121720610**
P1V-S060ACE00	**9121720611**
P1V-S060AC400	**9121720611**
P1V-S060AC270	**9121720611**
P1V-S060AC170	**9121720611**
P1V-S060AC072	**9121720611**
P1V-S060AC048	**9121720612**
P1V-S060AC030	**9121720612**
P1V-S060AC010	**9121720612**
P1V-S120AC800	**9121720613**
P1V-S120AC270	**9121720613**
P1V-S120AC110	**9121720613**
P1V-S120AC078	**9121720614**
P1V-S120AC032	**9121720614**
P1V-S120AC012	**9121720614**

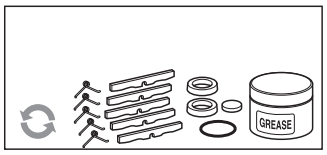
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Service Kits for P1V-S Motors

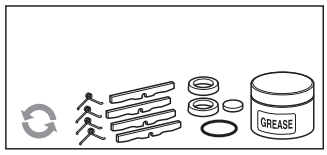
The following kits are available for the basic motors, consisting of vanes, (springs), silencers, O-rings, seals and 50 g of grease: (USDA-H1 approved):

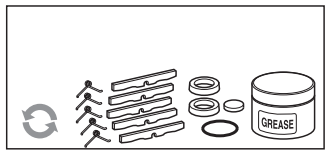




Service Kit, Spring-loaded Vanes for Intermittent Lubrication-free Operation, Option "Z"

For Motor	Order Code
P1V-S012A/DZ (to serial no 948688)	**9121720615**
P1V-S012A/DZ (from serial no 948689)	**9121720638**
P1V-S020A/DZ	**9121720616**
P1V-S030A/DZ	**9121720617**
P1V-S060AZE00	**9121720618**
P1V-S060AZ400	**9121720618**
P1V-S060AZ270	**9121720618**
P1V-S060AZ170	**9121720618**
P1V-S060AZ072	**9121720618**
P1V-S060AZ048	**9121720619**
P1V-S060AZ030	**9121720619**
P1V-S060AZ010	**9121720619**
P1V-S120AZ800	**9121720620**
P1V-S120AZ270	**9121720620**
P1V-S120AZ110	**9121720620**
P1V-S120AZ078	**9121720621**
P1V-S120AZ032	**9121720621**
P1V-S120AZ012	**9121720621**





Service Kit, Spring-loaded Vanes for Continuous Lubrication-free Operation, Option "M"

For Motor	Order Code
P1V-S012A/DM (to serial no 948688)	**9121720622**
P1V-S012A/DM (from serial no 948689)	**9121720639**
P1V-S020A/DM	**9121720623**
P1V-S030A/DM	**9121720624**
P1V-S060AME00	**9121720625**
P1V-S060AM400	**9121720625**
P1V-S060AM270	**9121720625**
P1V-S060AM170	**9121720625**
P1V-S060AM072	**9121720625**
P1V-S060AM048	**9121720626**
P1V-S060AM030	**9121720626**
P1V-S060AM010	**9121720626**
P1V-S120AM800	**9121720627**
P1V-S120AM270	**9121720627**
P1V-S120AM110	**9121720627**
P1V-S120AM078	**9121720628**
P1V-S120AM032	**9121720628**
P1V-S120AM012	**9121720628**

Service Kit for Brake Module for Brake Motors

For Motor	Order Code
P1V-S020AD and P1V-S030AD	**P1V-6/446096A**

Comment: To perform a full service on a brake motor, you will need a normal service kit as well as a service kit for the brake module

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Service Kits for Drilling, Milling and Grinding Motors

The following kits are available for the motors, consisting of vanes, (springs), silencers, O-rings, seals and 50 g of grease: (USDA-H1 approved):



Service Kits

For Motor	Order Code
P1V-S008N	**P1V-6/446085A**
P1V-S017N/M	**P1V-6/446086A**
P1V-S025N/M	**P1V-6/446087A**
P1V-S040M	**P1V-6/446088A**

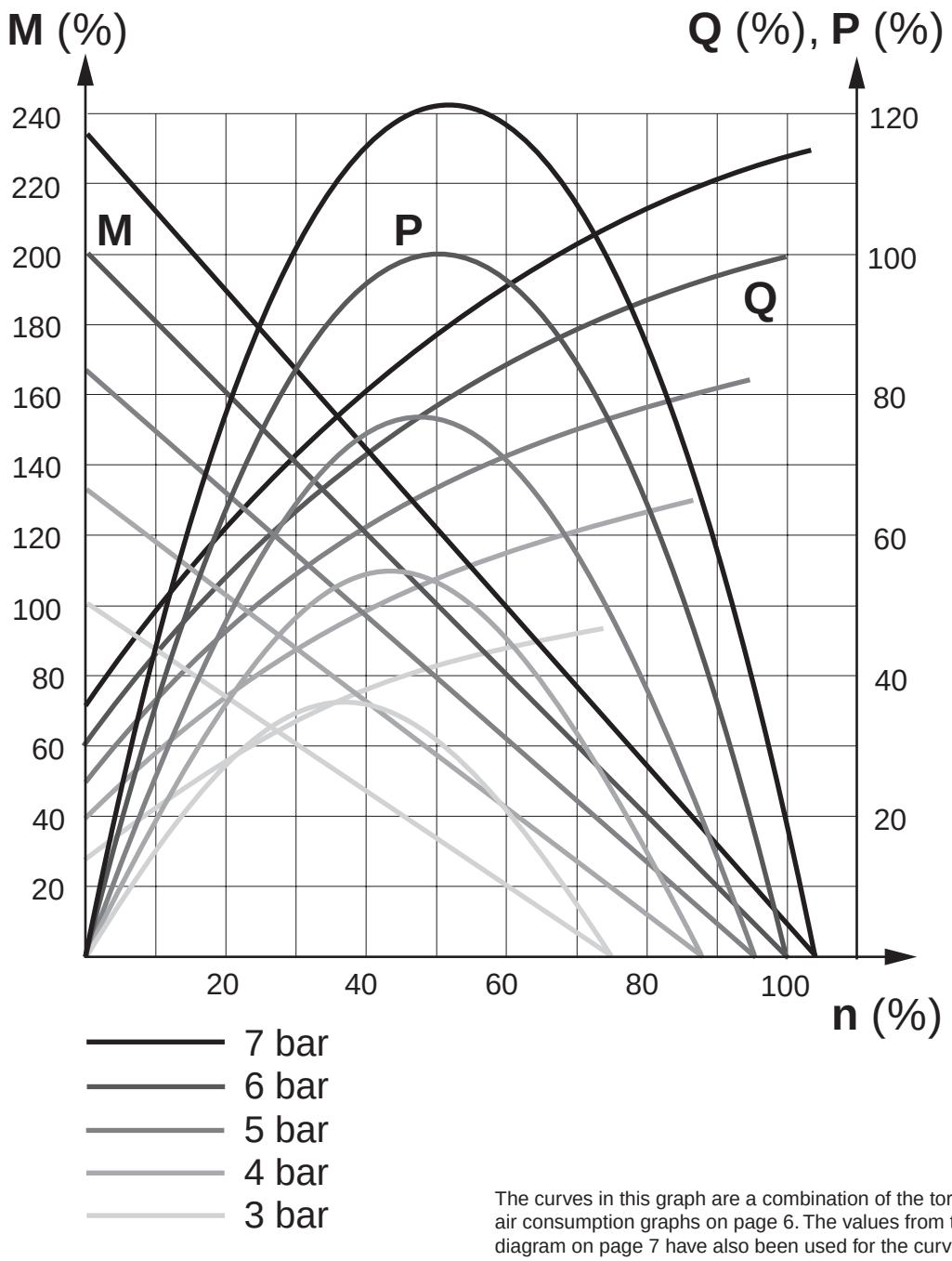
For Motor	Order Code
P1V-S040N	**P1V-6/446088A**

For Motor	Order Code
P1V-S020N	**P1V-6/446090A**

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Torque, Power and Air Consumption Graphs



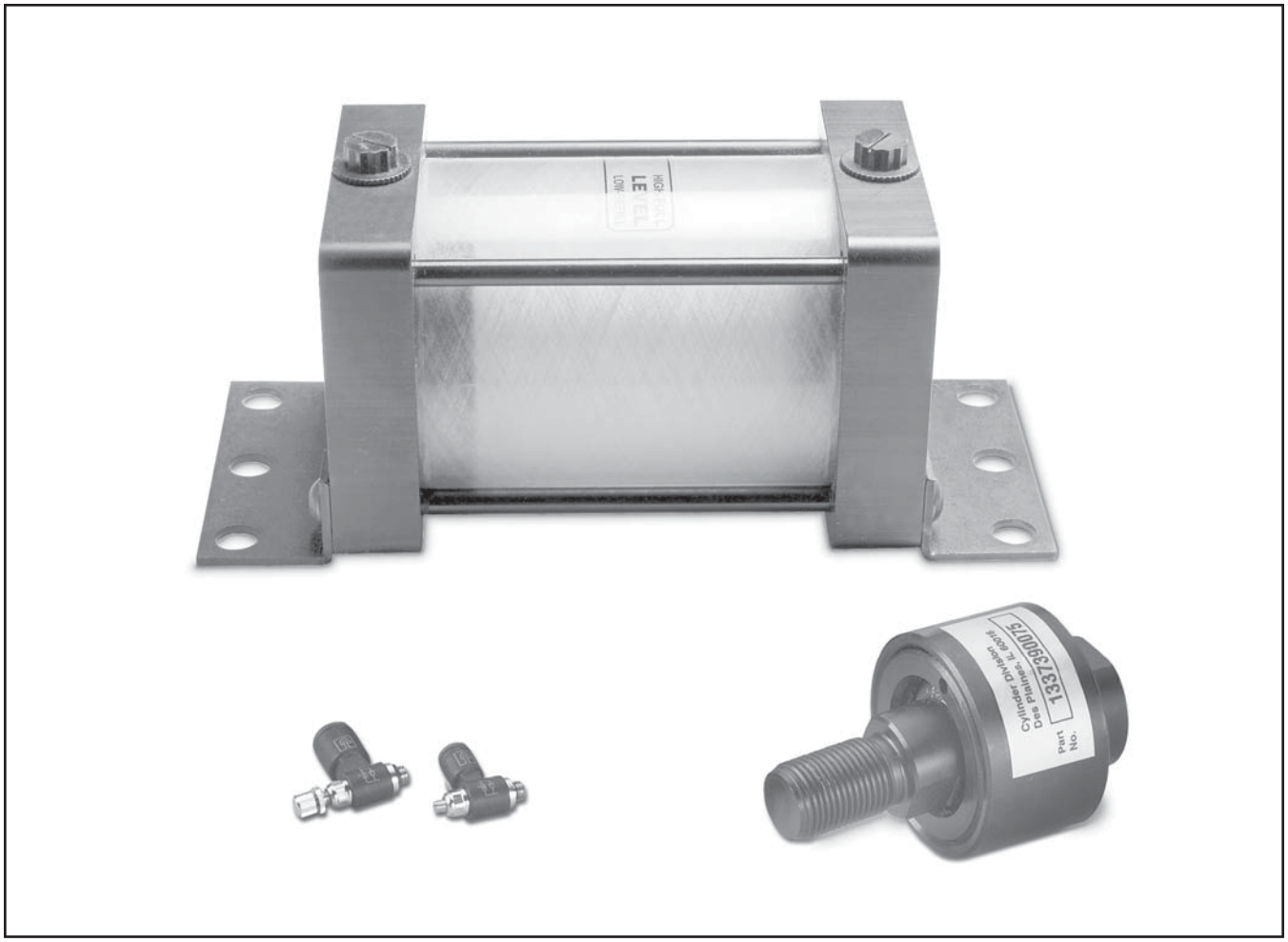
The curves in this graph are a combination of the torque, power and air consumption graphs on page 6. The values from the correction diagram on page 7 have also been used for the curves for the different pressure values. The graph also shows that is it very important to ensure that the pressure supplied to the inlet port of the motor is correct, in order to allow the motor to work at maximum capacity. If the valve supplying a large motor is too small, or if the supply line is underspecified, the pressure at the inlet port may be so low that the motor is unable to do its work. One solution would be to upgrade the valve and supply system, or alternatively you could replace the motor with a smaller motor with lower air consumption. The result would be increased pressure at the inlet port, which means that the smaller motor could carry out the necessary work. However, you may need to select a smaller motor with a lower free speed in order to obtain sufficient torque at the outgoing shaft.

P = power	**Q = air consumption**
M = torque	**n = speed**

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Complementary Products

Section L



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Section L – Complementary Products

Linear Alignment Couplers

- 12 Different Thread Sizes
- Reduce Wear on Cylinder by Reducing Side Load
- Simplifies Cylinder Installation
- 6° of Total Movement

Flow Controls

- **Microlok Flow Controls**
  - Miniature Right Angle Design
  - 2 Choices of Knobs
  - 3 Different Port Sizes
- **Brass Flow Controls**
  - Rugged Brass Construction
  - 3 Different Types of Connections
  - 4 Different Port Sizes
- **Blocking Valves**
  - 4 Different Port Sizes
  - 3 Types of Connections
  - Install Directly into Actuator Ports
  - Inexpensive Way to Obtain Position and Jogging Functions

4TK Series Air Oil Tanks

- 6 Standard Bore Sizes
- Lightweight Aluminum / Fiberglass Design
- 2 Fluid Flow Baffles Reduce Agitation and Aeration
- 8 Standard Mounting Styles

PRL Series – Stand Alone Rod-Lock

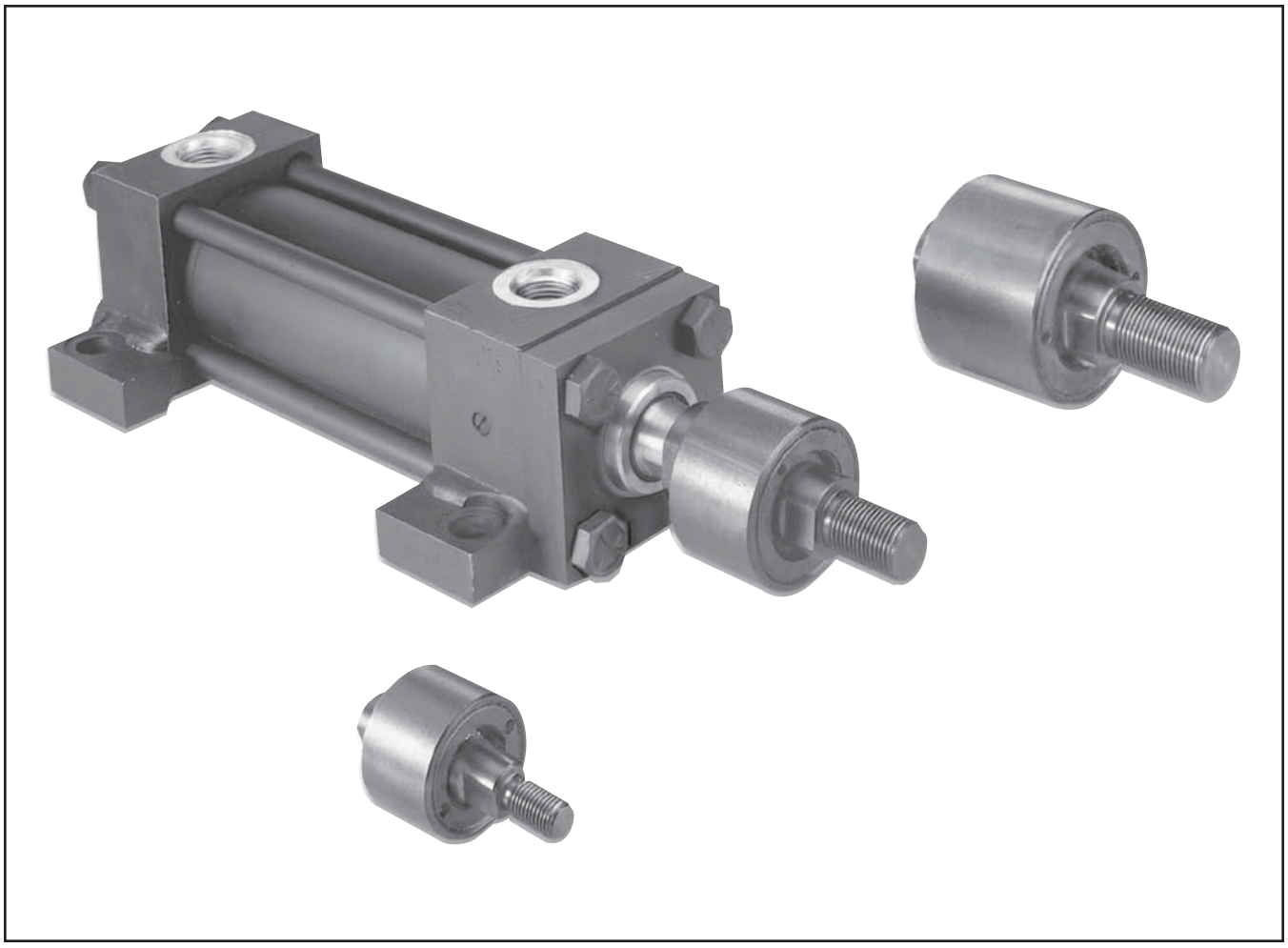
- 5 Different Sizes
- Large Holding Forces
- 2 Different Mounting Styles
- Case-hardened Rod Material Available

Transition Kits

- Plate Kits – Attach Component to Slide / Guided Cylinder
- Coupler Kits – Attach Component to Rotary Actuator

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Linear Alignment Couplers



Contents

Linear Alignment Couplers L4

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C085

Linear Alignment Couplers are available in 12 standard thread sizes...

Cost Saving Features and Benefits Include...

- Maximum reliability for trouble-free operation, long life and lower operating costs
- Increased cylinder life by reducing wear on piston and rod bearings
- Stainless steel versions available. Please consult factory.
- Simplifying cylinder installation and reducing assembly costs
- Increase rod bearing and rod seal life for lower maintenance costs

Alignment Coupler

See Table 1 for Part Numbers and Dimensions

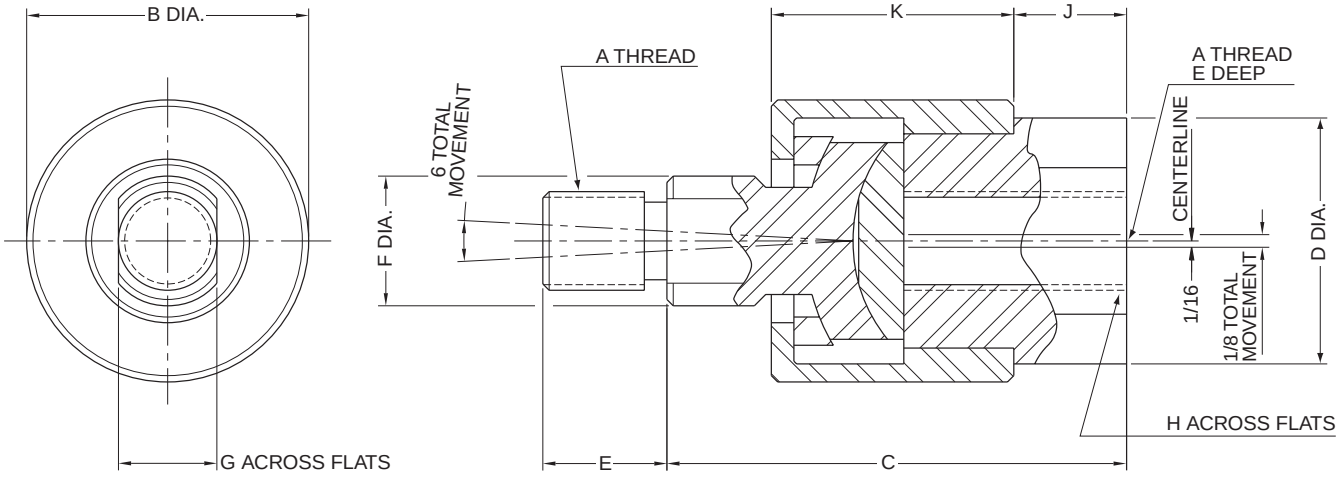


Table 1 — Part Numbers and Dimensions

Part No.	A	B	C	D	E	F	G	H	J	K	Max. Pull Load (lbs.)	Approx. Weight (lbs.)
1347570031	5/16 -24	1-1/8	1-3/4	15/16	1/2	1/2	3/8	3/4	3/8	15/16	1200	0.35
1347570038	3/8 -24	1-1/8	1-3/4	15/16	1/2	1/2	3/8	3/4	3/8	15/16	2425	0.35
1347570044	7/16 -20	1-3/8	2	1-1/8	3/4	5/8	1/2	7/8	3/8	1-3/32	3250	0.55
1347570050	1/2 -20	1-3/8	2	1-1/8	3/4	5/8	1/2	7/8	3/8	1-3/32	4450	0.55
1347570063	5/8 -18	1-3/8	2	1-1/8	3/4	5/8	1/2	7/8	3/8	1-3/32	6800	0.55
1347570075	3/4 -16	2	2-5/16	1-5/8	1-1/8	1-5/16	3/4	1-5/16	7/16	1-9/32	9050	1.4
1347570088	7/8 -14	2	2-5/16	1-5/8	1-1/8	1-5/16	3/4	1-5/16	7/16	1-9/32	14450	1.4
1347570100	1-14	3-1/8	3	2-3/8	1-5/8	1-7/16	1-1/4	1-7/8	3/4	1-25/32	19425	4.8
1347570125	1-1/4 -12	3-1/8	3	2-3/8	1-5/8	1-7/16	1-1/4	1-7/8	3/4	1-25/32	30500	4.8
1337390125	1-1/4 -12	3-1/2	4	2	2	1-1/2	1-1/4	1-11/16	3/4	2-1/2	30500	6.9
1337390150	1-1/2 -12	4	4-3/8	2-1/4	2-1/4	1-3/4	1-1/2	1-15/16	7/8	2-3/4	45750	9.8
1337390175	1-3/4 -12	4	4-3/8	2-1/4	2-1/4	1-3/4	1-1/2	1-15/16	7/8	2-3/4	58350	9.8
1337390188	1-7/8 -12	5	5-5/8	3	3	2-1/4	1-15/16	2-5/8	1-3/8	3-3/8	67550	19.8

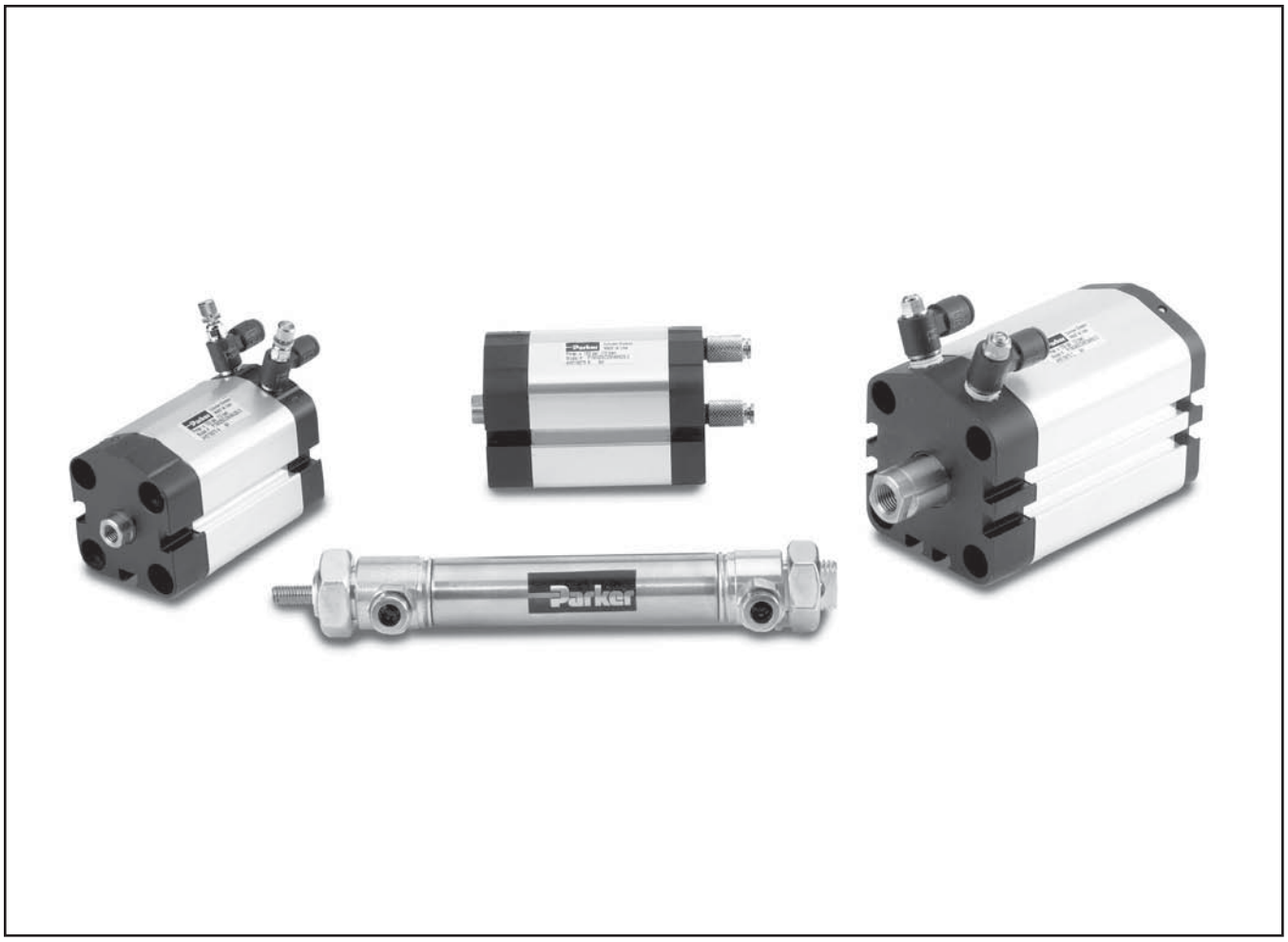
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How to Order Linear Alignment Couplers
When ordering a cylinder with a threaded male rod end, specify the coupler of equal thread size by part number as listed in Table 1, i.e.; Piston Rod “KK” or “CC” dimension is 3/4" - 16", specify coupler part number 1347570075.

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Flow Controls

Right Angle Flow Controls and Port Accessories



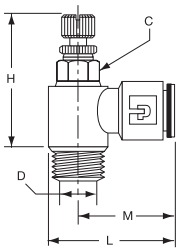
Contents

Microlok Flow Controls L6
Brass Flow Controls L7
Blocking Valves L8

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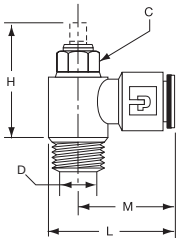
Miniature Exhaust Flow Control

Part Number	Tube Size	Thread Size	C Hex mm	H Closed	H Open	L	M	Flow Dia. D
0876300100	5/32	10-32	6	0.925	1.023	0.846	0.669	0.080
0876300200	5/32	1/8	7	1.000	1.083	0.935	0.708	0.100
0876300300	1/4	10-32	6	0.925	1.023	0.885	0.708	0.080
0876300400	1/4	1/8	7	1.000	1.083	0.957	0.730	0.100
0876300500	1/4	1/4	8	1.083	1.180	1.013	0.748	0.160



Knobless Miniature Exhaust Flow Control

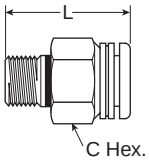
Part Number	Tube Size	Thread Size	C Hex mm	H Closed	H Open	L	M	Flow Dia. D
0876310100	5/32	10-32	6	0.650	0.787	0.846	0.669	0.080
0876310200	1/4	1/8	7	0.708	0.860	0.956	0.730	0.100
0876310300	1/4	1/4	8	0.826	0.964	1.013	0.748	0.160



Global Connect Fittings

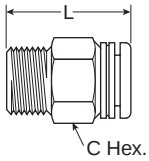
68GC Male Connector

Part No.	Tube Size	Pipe Thread	C Hex.	L
68GC-2-0	1/8	10-32	1/2	0.925
68GC-5/32-0	5/32	10-32	1/2	0.913
68GC-3-0	3/16	10-32	9/16	0.898
68GC-4-0	1/4	10-32	9/16	0.898

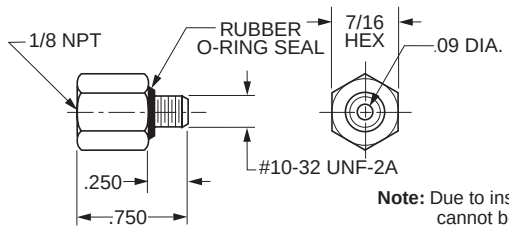


W68GC Male Connector

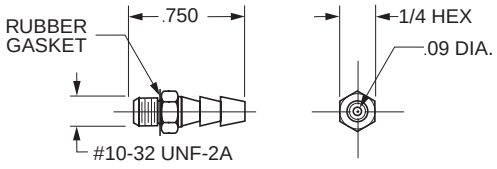
Part No.	Tube Size	Pipe Thread	C Hex.	L
W68GC-2-1	1/8	1/16	1/2	0.945
W68GC-2-2	1/8	1/8	1/2	0.945
W68GC-2-4	1/8	1/4	9/16	1.150
W68GC-5/32-1	5/32	1/16	1/2	0.937
W68GC-5/32-2	5/32	1/8	1/2	0.937
W68GC-5/32-4	5/32	1/4	9/16	1.142
W68GC-3-2	3/16	1/8	9/16	0.980
W68GC-3-4	3/16	1/4	9/16	1.181
W68GC-4-1	1/4	1/16	9/16	1.134
W68GC-4-2	1/4	1/8	9/16	0.980
W68GC-4-4	1/4	1/4	9/16	1.181
W68GC-4-6	1/4	3/8	13/16	1.185



#10-32 to 1/8-27 Port Adapter
P.N. 1442840000



1/4" O.D. Hose Barbed Fittings
P.N. L06998 0000 (Pkg. of 10)



Note: Due to insufficient port depth, port adapter fitting cannot be used for head end ports of 9/16" bore cylinders. Use barbed fitting.

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C085

The Right Angle Flow Control is an ideal solution to cylinder speed control where space is at a premium. Costly fittings, connections and piping expenses can be eliminated because the valve can rotate 360°, the piping alignment can be in any direction. It then locks into place. The 1/8" model can be rotated after final assembly.

Install by threading male end directly into cylinder port. The free-flow and metered-flow direction is automatically predetermined. Free-flow direction is into cylinder and metered-flow is out of the cylinder. Flow is adjusted with an Allen wrench and locked with nut.

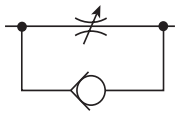
Right Angle Flow Control also available with Prestolok fittings on inlet port to accommodate 5/32 - 3/8 tube sizes. This allows for quick connection and eliminates need for separate tube fitting.

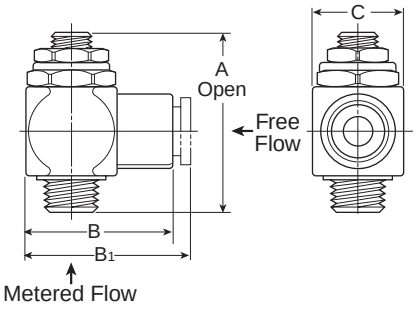


Threaded Inlet



Prestolok Inlet Fitting





Specifications

Body: Brass

Plunger: Brass and Acetal

Seals: Buna N

Temperature Range: 0°F to 140°F (–18°C to 60°C)

Pressure Rating: 125 PSIG (8.6 Bar) max.

Model Selection and Dimensions

Model Number	Male Thread (NPT)	Female Thread (NPT)	A		B		C		Weight		C_V	
Threaded Inlet			**Inch**	**mm**	**Inch**	**mm**	**Inch**	**mm**	**oz.**	**kg**	**Adjusted Flow**	**Free Flow**
032510125	1/8	1/8	1.74	44	1.18	30	.67	17	2.0	0.9	0.26	0.20
032510250	1/4	1/4	1.99	51	1.40	36	.91	23	4.5	2.0	0.75	0.68
032510375	3/8	3/8	2.28	58	1.71	43	1.06	27	7.0	3.2	0.84	0.72
032510500	1/2	1/2	2.69	68	1.98	53	1.26	32	11.0	5.0	1.64	1.41
With Prestolok Fittings	**Thread (NPT)**	**Tube Size (OD)**	**A**		**B_1**		**C**		**Weight**		**C_V**	
			Inch	**mm**	**Inch**	**mm**	**Inch**	**mm**	**oz.**	**kg**	**Adjusted Flow**	**Free Flow**
032511215	1/8	5/32	1.74	44	1.18	30	.67	17	2.0	0.9	0.19	0.16
032511225	1/8	1/4	1.74	44	1.18	30	.67	17	2.0	0.9	0.28	0.22
032512525	1/4	1/4	1.99	51	1.40	36	.91	23	4.5	2.0	0.51	0.44
032512538	1/4	3/8	1.99	51	1.40	36	.91	23	4.5	2.0	0.62	0.53
032513838	3/8	3/8	2.28	58	1.71	43	1.06	27	7.0	3.2	0.78	0.65

⚠ **CAUTION:** If it is possible that the ambient temperature may fall below freezing, the medium must be moisture-free to prevent internal damage or unpredictable behavior.

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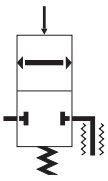
C085

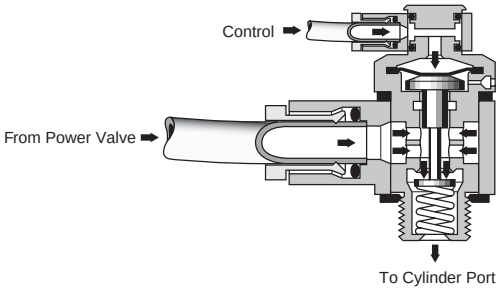
Blocking valves are designed for precise, repeatable stopping of moving cylinders or to maintain the position of a cylinder in the event of an air pilot signal loss. Blockers are used for positioning and jogging purposes.

A blocking valve has a spring loaded poppet which normally prevents flow through the valve in both directions. When an air pilot control signal (see pilot pressure chart below for required pilot signal pressure) is applied to the top of the valve, the poppet opens and allows the valve to flow in both directions like a standard fitting. When the pilot signal is removed, the poppet springs shut and prevents air from entering or leaving cylinder, thus stopping cylinder travel.

Blocking valves are designed to be installed directly into actuator ports (up to 5" bore cylinders).







Specifications

Operating Pressure: 0 to 145 PSI (0 to 10 Bar)

Temperature Range: 5°F to 140°F (-15°C to 60°C)

Maximum Operating Frequency: 10 Hz

Life Expectancy: 10 million cycles @ 90 PSIG, 68°F, dry filtered air and 1 Hz operating frequency

Materials: Zinc alloy body; brass mounting screw and threads

Pilot Pressure (PSI)

Operating Pressure	Cylinder Port Size							
	1/8"		1/4"		3/8"		1/2"	
	Pilot	Depilot	Pilot	Depilot	Pilot	Depilot	Pilot	Depilot
30	34	22	34	22	36	21	45	26
60	40	26	40	26	40	25	50	31
90	45	31	45	31	45	30	54	35
115	50	35	50	35	50	34	59	41

Model Selection

With Instant Tube Fittings

Cylinder Port	Tube Size (OD)	Pilot Tube (OD)	Part Number	Flow (C_V)	Wt. (oz)
1/8"	1/4"	5/32"	**PWBA3468**	0.78	5.1
1/4"	1/4"	5/32"	**PWBA3469**	1.02	5.3
3/8"	3/8"	5/32"	**PWBA3493**	1.67	6.3
1/2"	1/2"	5/32"	**PWBA3412**	2.12	17.5

With NPT Threaded Connections & Tube Pilot Port

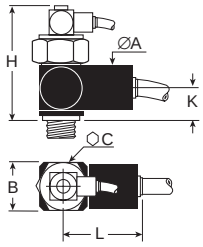
Cylinder Port	Female Port	Pilot Port	Part Number	Flow (C_V)	Wt. (oz)
1/8"	1/8"	5/32"*	**PWBA3888**	0.78	6.2
1/4"	1/4"	5/32"*	**PWBA3899**	1.02	6.2
3/8"	3/8"	10-32	**PWBA3833**	1.67	6.7
1/2"	1/2"	10-32	**PWBA3822**	2.12	16.8

With NPT Threaded Connections & Pilot Port

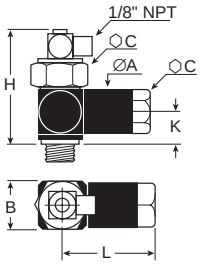
Cylinder Port	Female Port	Pilot Port	Part Number	Flow (C_V)	Wt. (oz)
1/8"	1/8"	1/8"	**PWBA38887**	0.78	6.2
1/4"	1/4"	1/8"	**PWBA38997**	1.02	6.2
3/8"	3/8"	1/8"	**PWBA38337**	1.67	6.7
1/2"	1/2"	1/8"	**PWBA38227**	2.12	16.8

*Instant tube connection

Dimensions



PWBA34XX



PWBA38XXX

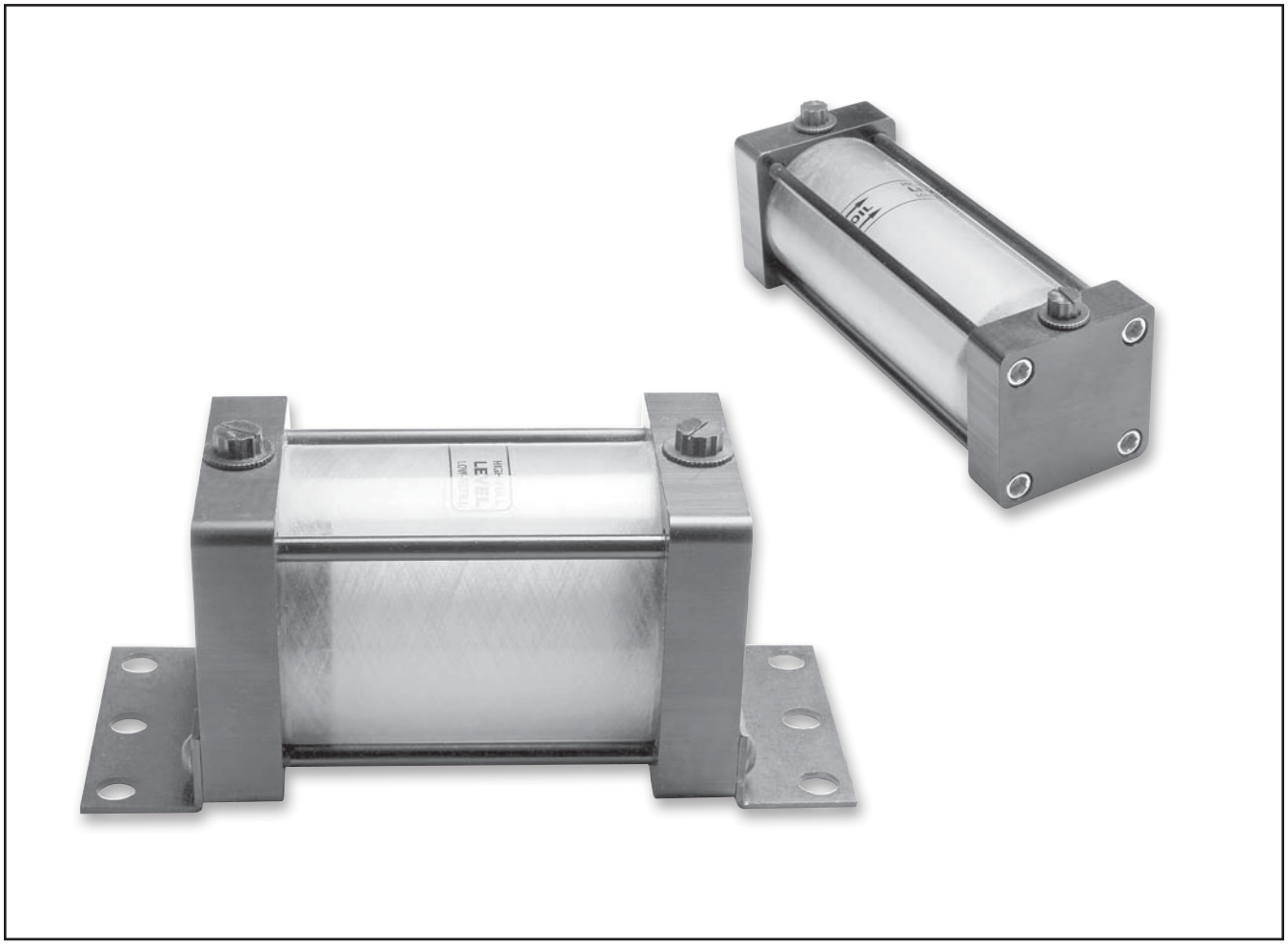
Cyl. Port Size	A Dia.	B	C Hex	H	K	L	L1
1/8"	22 (0.90)	21 (0.86)	15/16"	59 (2.41)	19.5 (0.80)	39 (1.59)	43.5 (1.78)
1/4"	22 (0.90)	21 (0.86)	15/16"	53 (2.16)	13.5 (0.55)	39 (1.59)	43.5 (1.78)
3/8"	27 (1.10)	28 (1.14)	15/16"	53 (2.16)	14 (0.57)	50 (2.04)	55.5 (2.27)
1/2"	31 (1.27)	33 (1.35)	1-1/4"	66 (2.69)	24 (0.98)	66 (2.69)	63 (2.57)

Dimensions in mm (inch)

L

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4TK Series
Air-Oil Tanks



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Air-Oil Tanks – For Smoother Hydraulic Flow

Parker Air-Oil tanks provide a means to convert shop air pressure into hydraulic pressure. Compressed air is applied directly to the oil in the air-oil tank to convert it into hydraulic pressure. The hydraulic pressure is at a 1-to-1 ratio, i.e. 80 psi air produces 80 psi hydraulic pressure.

All Parker Air-Oil tanks have a fiberglass tube which shows the proper oil level. They also contain two fluid flow baffles. The top baffle disperses the incoming air over the surface of the oil in such a way to avoid agitation and aeration. The bottom baffle insures a smooth flow pattern that minimizes oil turbulence and eliminates swirling, funneling or splashing which in turn could cause oil aeration or the oil to be blown from the tank into the exhaust air.

Air-Oil tanks are used to smooth out the cylinder piston rod travel and to prevent chatter. They are mainly used in slow speed circuits. Since each tank is designed for a specific port size, increasing the port size in a tank to lower the fluid velocity is not recommended. A tank with a larger port size should be selected.

Fluid velocity in or out of the tank through standard ports should be less than 6 feet per second to prevent aeration of the oil. To limit the fluid velocity, flow controls should be applied to the air side of the tank to restrict the exhaust. Metered-in flow controls on the air side may aid in the reduction of aeration. Additional flow controls on the oil side may aid in controlling the actuator motion.

In a basic air-oil circuit the advance tank is connected to the cap end port of a hydraulic cylinder and the return tank to the head end port. Shop air is applied alternately to the two tanks through a 4-way air control valve. The oil in the advance tank is forced into the cap end of the cylinder to cause the piston rod to extend. At the same time, oil from the head end port is forced into the return tank, the air side of which is open to exhaust. To return the cylinder to retract position, air pressure is applied to the oil in the return tank.

How to Select

Step 1: Determine the volume (cu. in.) of fluid required to fill the work cylinder at full stroke by taking the bore area times the stroke length.

Step 2: Select the proper tank bore height from the chart. Since there are usually several combinations with similar capacities, select the one having a rated capacity closest to but slightly greater than your volume requirements. Generally, the most economical choice is a higher tank with a smaller bore.

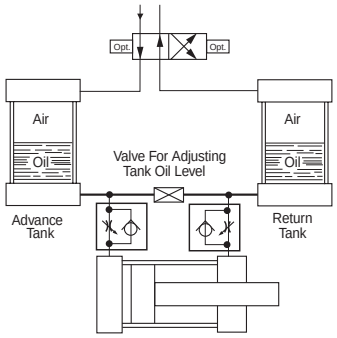


Table A Rated Capacities - Cubic Inches (in³)

Bore	Usable Tank Volume (Cu. In.) per Internal Height of Tank											
	4	6	8	10	12	14	16	18	20	24	28	32
2-1/2	9	17	27	35	44	52	62	70	79	97	115	132
3-1/4	16	30	46	60	76	91	107	121	137	167	198	228
4	18	33	58	73	98	120	144	166	191	237	283	330
5	29	53	92	116	155	189	228	261	300	373	446	519
6	42	77	133	168	224	273	329	378	434	539	645	750
8	75	137	237	300	400	487	587	675	775	963	1150	1338

Model Code and Ordering Information

Example: 4.00CB4TKU 6.000

4.00 — **Tank Diameter (inches)**

2.50
3.25
4.00
5.00
6.00
8.00

CB — **Tank Mounting Style**

TEF	Sleeve Nut with Side Tap
TE	Sleeve Nut
TB	Tie Rods Extended, Air End
TC	Tie Rods Extended, Oil End
TD	Tie Rods Extended, Both Ends
C	Side Lug (3MA Style)
CB	Side End Angles
NB	Base Bar

4TK

U — **Ports**

U	NPTF

6.000 — **Tank Height***

Internal height in inches

* Less than 4 Inches, Consult Factory

Note: Standard air-oil tanks are designed for use with petroleum base hydraulic oil. If other fluids will be used, please consult the factory. For larger than 8" Bore Sizes consult factory.

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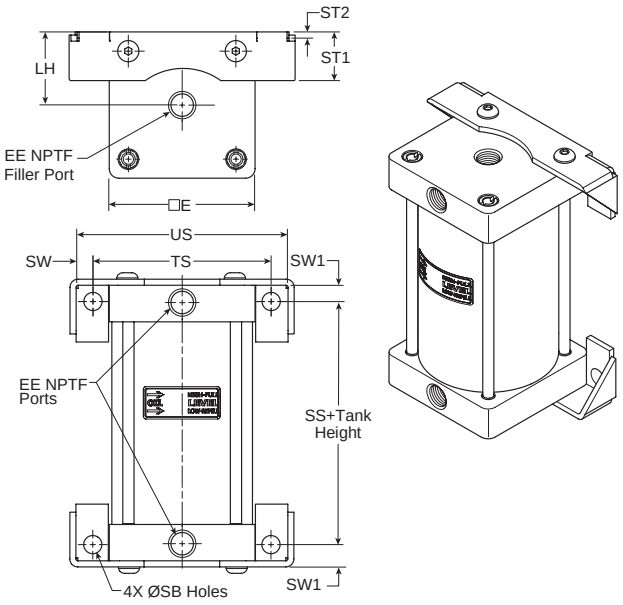
C086

Specifications

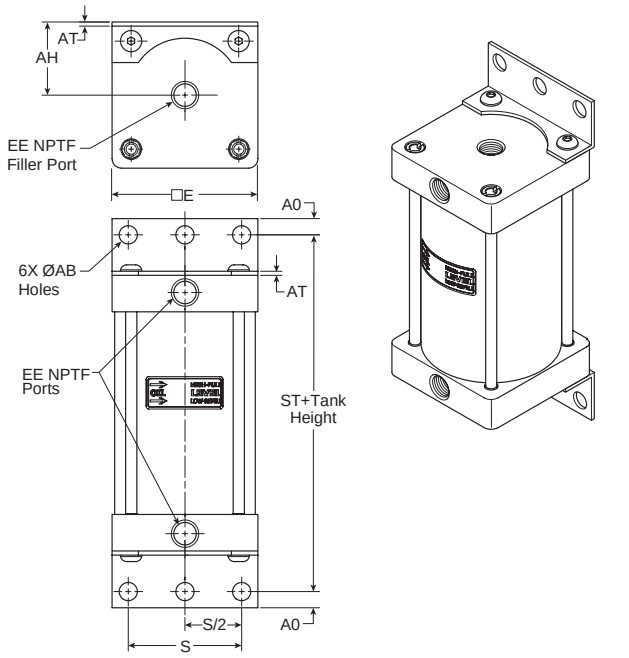
- Standard Bore Sizes 2-1/2" - 8"
- Operating Pressure 250 PSI Maximum
- Operating Temperature 165°F Maximum
- Lightweight Aluminum / Fiberglass Design
- Larger Bore Sizes Available Upon Request

Mounting Dimensions

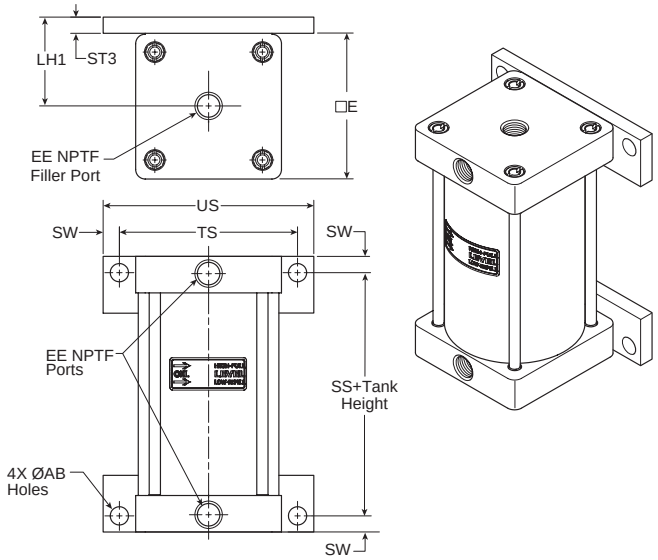
Mounting Style C
Side Lug (3MA Style)



Mounting Style CB
Side End Angles



Mounting Style NB
Base Bar



4TK Series Dimensions - Styles C, CB and NB

Bore	AB	AH	AO	AT	E	EE	LH	LH1	S	SB	ST1	ST2	ST3	SW	SW1	TS	US	Add Tank Height	
																		SS	ST
2-1/2	0.44	1.63	0.38	0.13	3.00	3/8	1.49	1.87	2.25	0.44	1.34	0.12	0.38	0.38	0.50	3.75	4.50	1.25	4.00
3-1/4	0.56	1.94	0.50	0.13	3.75	1/2	1.68	2.37	2.75	0.56	1.50	0.19	0.50	0.50	0.69	4.75	5.75	1.50	5.00
4	0.56	2.25	0.50	0.13	4.50	1/2	2.24	2.74	3.50	0.56	1.50	0.19	0.50	0.50	0.69	5.50	6.50	1.50	5.00
5 *	0.69	2.75	0.63	0.19	5.50	1/2	2.74	-	4.25	0.81	1.50	0.25	-	0.69	0.94	6.88	8.25	1.13	5.75
6 * †	0.81	3.25	0.63	0.19	6.50	3/4	-	-	5.25	-	-	-	-	-	-	-	-	-	5.75
8 * †	0.81	4.25	0.69	0.25	8.50	3/4	-	-	7.13	-	-	-	-	-	-	-	-	-	6.63

* Mounting Style NB Available in 2-1/2" - 4" Bore only.

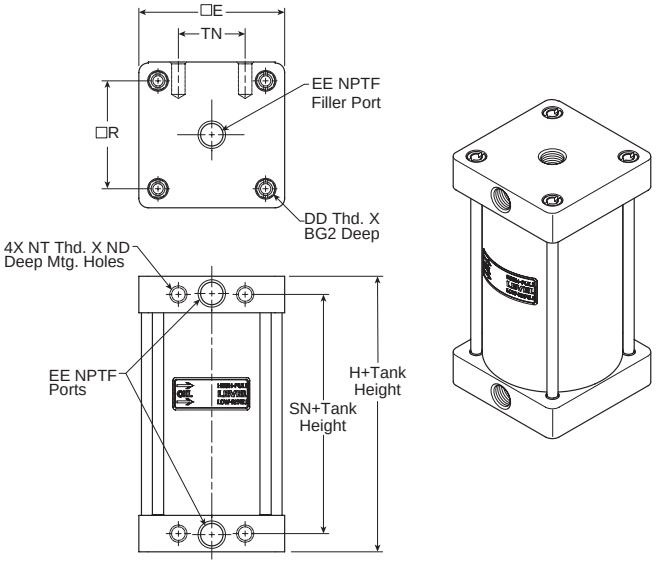
† Mounting Style C available in 2-1/2" - 5" bore only.

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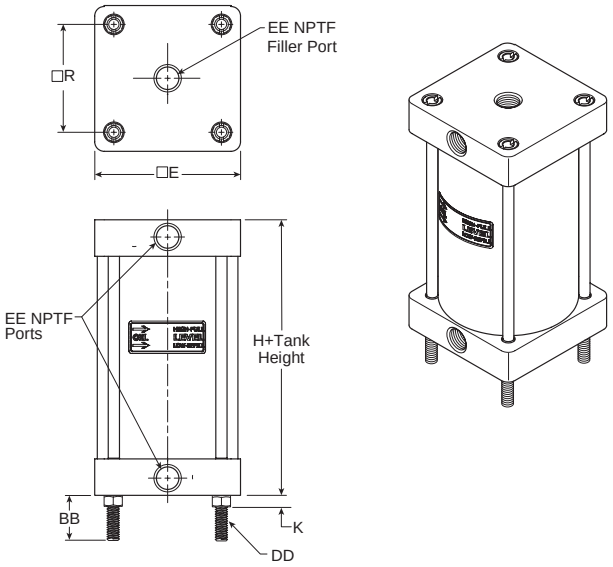
Mounting Dimensions

Mounting Style TEF
Sleeve Nut - With Side Tap

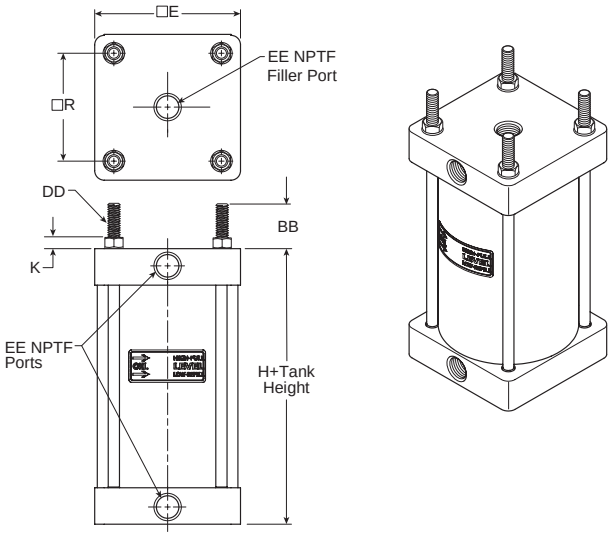
Mounting Style TE
Sleeve Nut



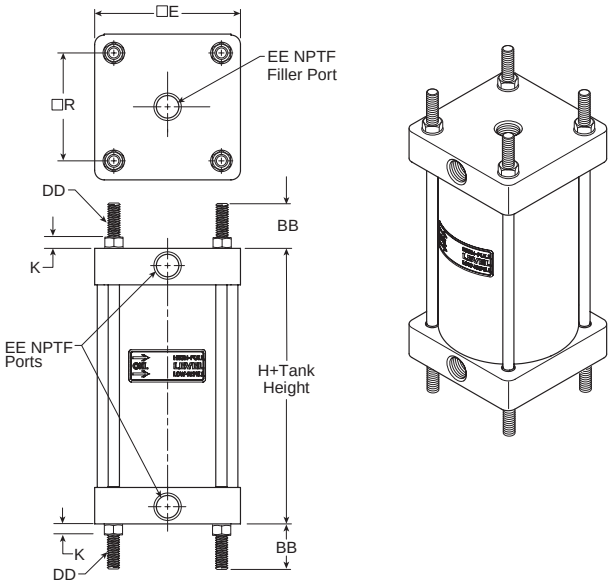
Mounting Style TC
Tie Rods Extended - Oil End



Mounting Style TB
Tie Rods Extended - Air End



Mounting Style TD
Tie Rods Extended - Both Ends



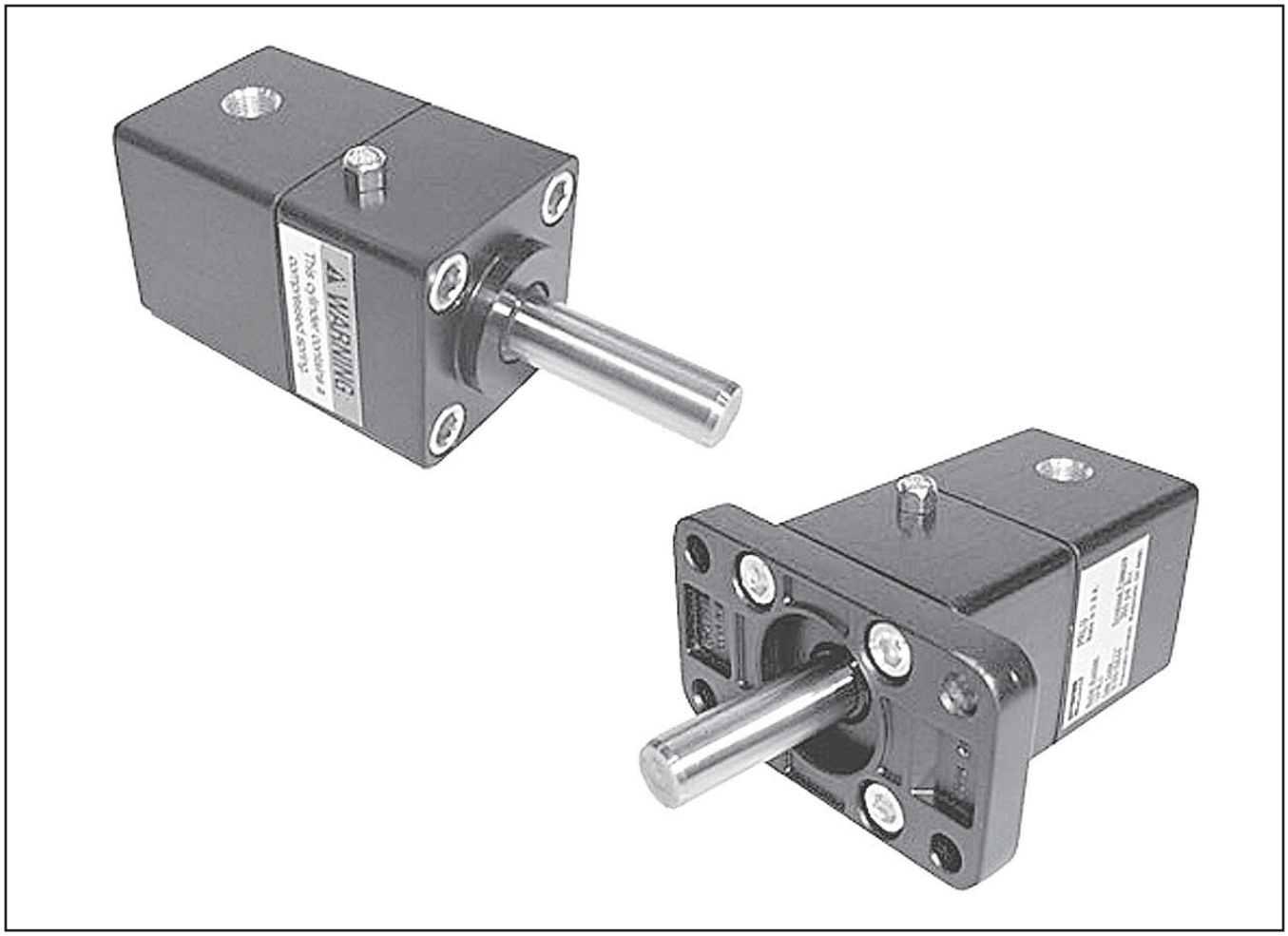
4TK Series Dimensions - Styles TEF, TE, TB, TC, and TD

Bore	BB	BG2	DD	E	EE	K	ND	NT	R	TN	Add Tank Height H	Add Tank Height SN
2-1/2	1.12	0.39	5/16-24	3.00	3/8	0.32	0.63	3/8-16	2.19	1.25	2.00	1.13
3-1/4	1.38	0.47	3/8-24	3.75	1/2	0.38	0.75	1/2-13	2.76	1.50	2.50	1.38
4	1.38	0.47	3/8-24	4.50	1/2	0.38	0.75	1/2-13	3.32	2.06	2.50	1.38
5	1.81	0.50	1/2-20	5.50	1/2	0.44	0.94	5/8-11	4.10	2.69	3.00	1.88
6	1.81	0.50	1/2-20	6.50	3/4	0.44	1.13	3/4-10	4.88	3.25	3.00	1.63
8	2.32	0.63	5/8-18	8.50	3/4	0.56	1.13	3/4-10	6.44	4.50	3.00	1.63

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PRL Series

Stand Alone Rod Lock Device



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C086

The PRL Series rod lock is used in applications where the locking of linear travel is required. It is commonly used in workholding applications and for locking tools and fixtures in the event of air pressure or electrical control failure.

Application

- **Clamping:** Without an appropriate air signal to the rod lock pressure port, the rod lock clamps to the precision metric rod and prevents rod movement in the axial direction.
- **Delatching:** When 4 Bar (58 PSI) of air pressure is applied to the port, the rod lock releases and allows free movement of the rod. This will be required for installation.
- **Locking Direction:** The rod lock is designed specifically to prevent rod movement in the *axial* direction only. It is **not** recommended for locking *rotary* rod motion.
- **Rod Material:** The Series PRL rod lock is a precision locking device, therefore strict rod tolerances and rod material specifications are required to ensure safe and proper operation. Minimum requirements for the rod material include a chrome plated surface finish of 10 microinches or less and a surface hardness of 52 Rc. Rod material may be ordered separately in custom lengths. See next page for how to order.
- **Environment:** The rod lock is recommended for use in dry, clean conditions. Please take precautions to prevent moisture from entering the pressure port or the exhaust port of the locking device.

Technical Data

Working medium	Dry, filtered compressed air
Working pressure	Max. 10 Bar (145 PSI)
Working temperature	-20° to +80°C (-4°F to +176°F)
Locking pressure	4 Bar (58 PSI) ±10%

Holding Forces

Model	Holding Force	
	Pounds (lbs.)	Newtons (N)
12PRL*	123	550
16PRL*	193	860
20PRL*	481	2140
25PRL*	1211	5390
32PRL*	1894	8425

* Character reserved for port style

There should be no relative motion between the rod and the Rod Lock Device when the locking device is activated. The locking device is not intended to brake a movement in repeated sequences.

Considerations for Rod Sizing

When applying a rod lock device, it is important to consider the loading forces which will be imposed on the rod in the axial direction.

For applications where the rod lock and its associated load impose a **compressive** force on the rod, please consider the axial compression force and rod length to select the appropriate rod diameter for preventing rod buckling.

In situations where the rod lock and its associated load place the rod in **tension**, please take care to securely fasten the rod ends to the machine member.

Ordering Information

Example: 25PRLU

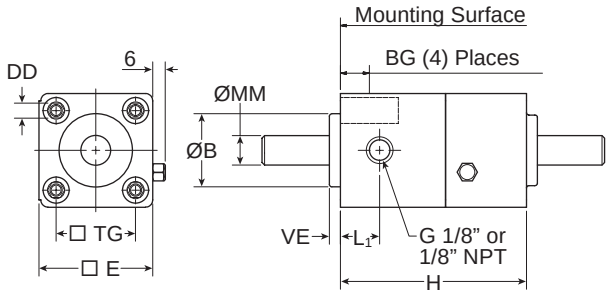
25	PRL	U	
Rod Diameter		**Ports**	**Ports**
Specify 12, 16, 20, 25 or 32 (mm)		**U** NPTF **R** BSPP	**S** Specials Leave blank if no specials

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Basic Rod Lock



Rod Lock with Flange Mount

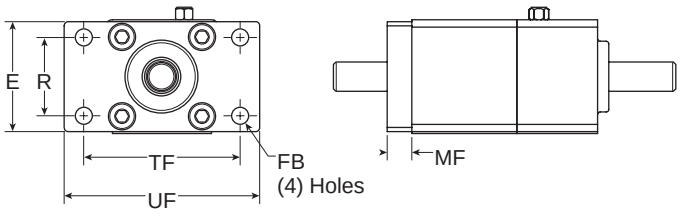


Table 1 – Mounting Dimensions

Part	Rod Dia. MM	B D11	BG	DD	E	FB	H	L_1	MF	R	TF	TG	UF	VE
12PRL*	12.00 (-.04)	30	16	M6	46.5	7	76	16	10	32	64	32.5	80	4.5
16PRL*	16.00 (-.04)	35	16	M6	51	9	81.1	16	10	36	72	38	92	4.5
20PRL*	20.00 (-.04)	45	16	M8	76	9	100.8	26	12	50	100	56.5	129	5
25PRL*	25.00 (-.04)	55	16	M10	114.5	14	146	50	16	75	150	89	186	4
32PRL*	32.00 (-.04)	60	20	M12	140	16	165.2	60	20	90	180	110	220	6

* Character reserved for port style

Flange Mounting Kit

Mounting kits are available separately from the rod lock device. Please use the following part numbers to order. Mounting fasteners are included with the kits.

Model	Flange Mount
12PRL*	L075370032
16PRL*	L075370040
20PRL*	L075370063
25PRL*	L075370100
32PRL*	L075370125

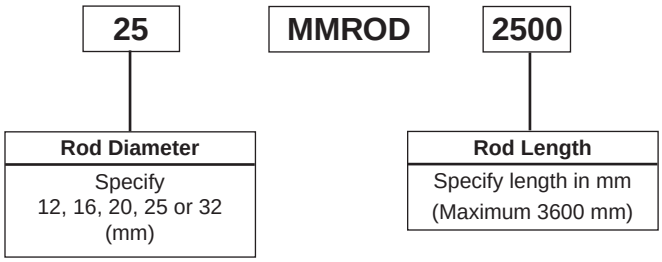
* Character reserved for port style

Metric Rod Material

Rods will be supplied in the specified length with chamfered ends. Please note, the rod material is case hardened and requires annealing prior to machining. Parker is pleased to quote custom machined rods per customer supplied drawings.

⚠ **Caution:** Using piston rod material which does not meet the tolerance and finished conditions as listed on the previous page may prevent the locking device from properly holding the intended load.

How to Order
Example: 25MMROD2500

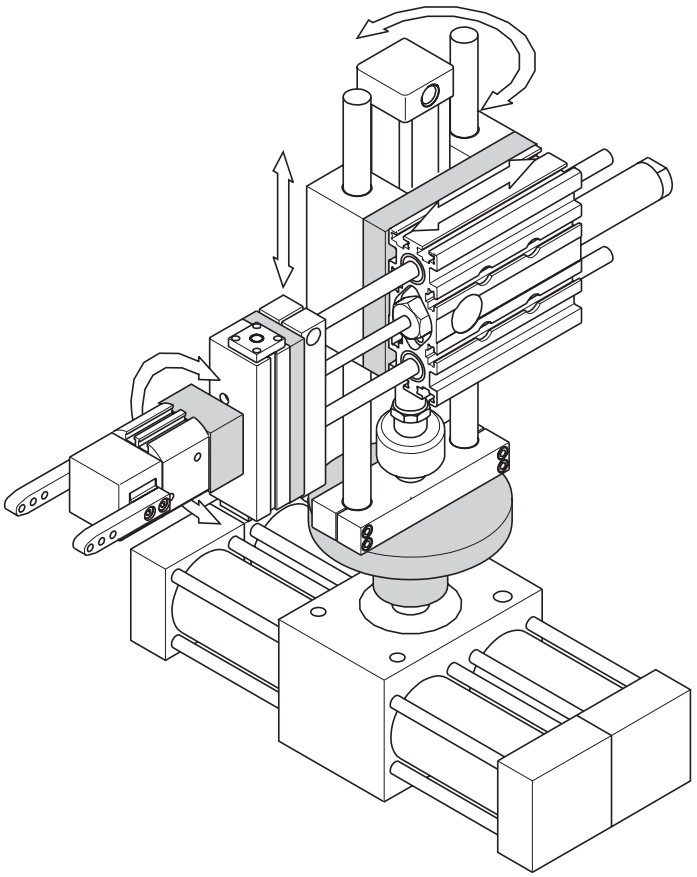


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Transition Kits for Automation Components



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Transition Plates
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Transition Couplers
Used to attach a component to a rotary actuator ... L21-L22

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Step 1
Establish the Primary and Secondary Units

The **Primary Unit** is established when the transition plate is mounted to the ***dynamic*** portion of the unit, i.e. tool plate, saddle on slides or shaft on rotary actuators.
The **Secondary Unit** is established when the transition plate is mounted to the ***stationary*** portion of the unit, i.e. body mounts.

Step 2
Properly Size All Components

For sizing of components, refer to the appropriate individual product section in this catalog. Remember to add the entire weight (component + tooling + transition plate + part, etc.) of the secondary unit when determining the size of the primary unit.

Step 3
Determine the Orientation Desired

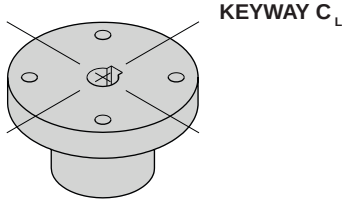
Secondary units can be mounted in various orientations. From the orientation tables on the following pages, select the one that best illustrates your application.

Step 4
Determine the Keyhole Orientation (Rotary Components Only)

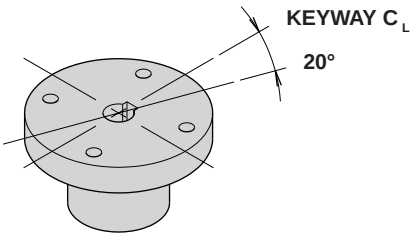
A hole pattern centerline the same as the keyway is standard. The hole pattern centerline can be rotated clockwise to keyway in increments of 5°. Square hole patterns may be rotated up to 85°. Rectangular hole patterns may be rotated up to 175°. See examples below.

Examples:

HOLE PATTERN CENTERLINE
SAME AS KEYWAY



HOLE PATTERN CENTERLINE
20° CLOCKWISE TO KEYWAY



Step 5
Consult Applications Department to Design Your Kit

Based on the information gathered above, the Applications Department will select the transition kit to fit your requirements.

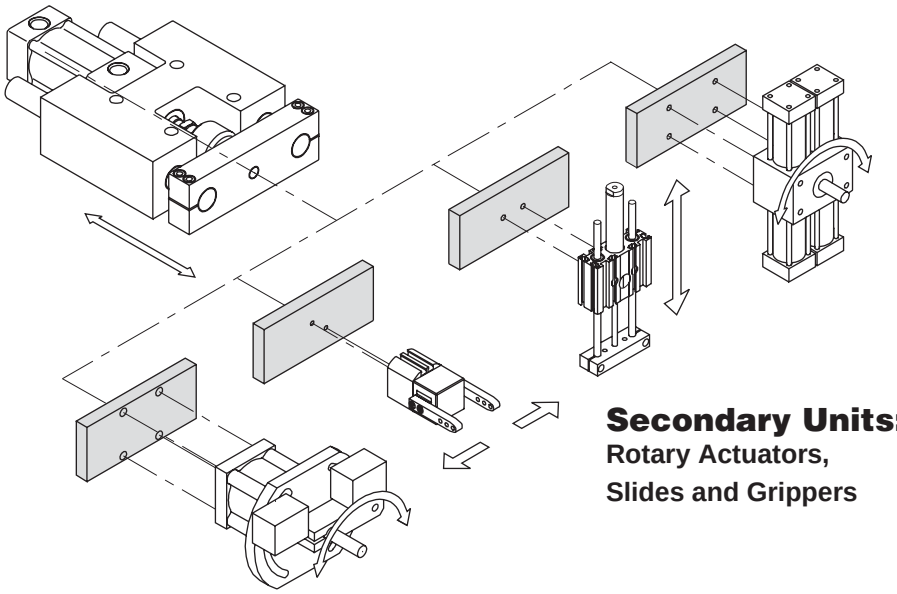
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Transition Plate Kits

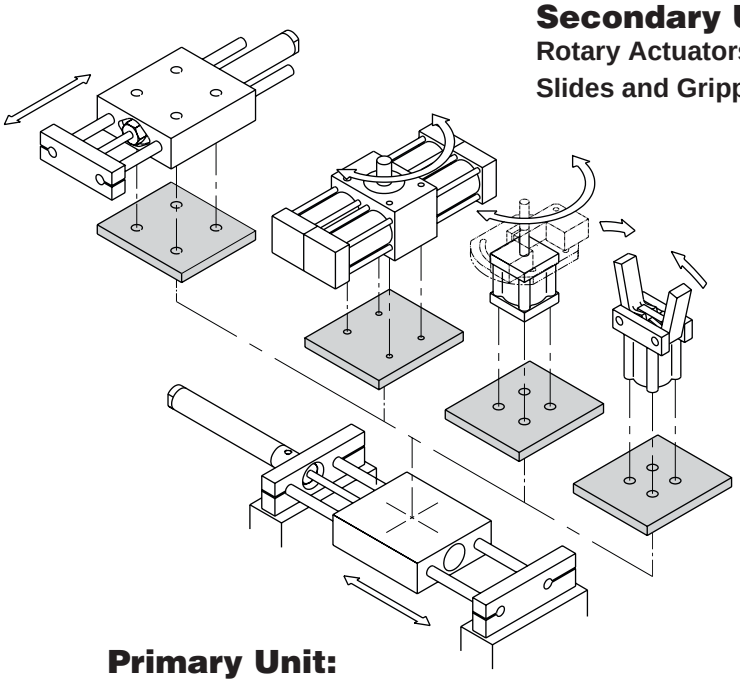
Connect Components to Thrust, Reach or Base Slides

Primary Unit:
Thrust and Reach Slides



Secondary Units:
Rotary Actuators,
Slides and Grippers

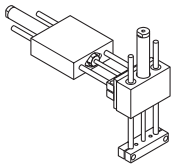
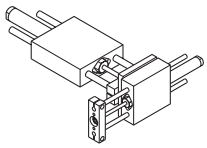
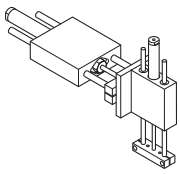
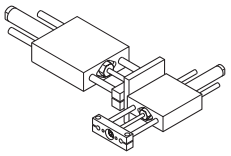
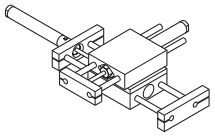
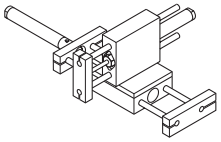
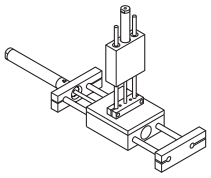
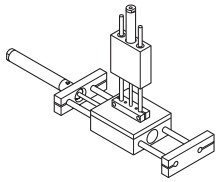
Secondary Units:
Rotary Actuators,
Slides and Grippers



Primary Unit:
Base Slides

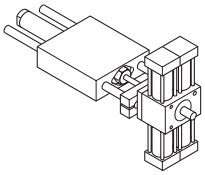
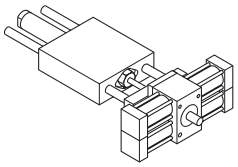
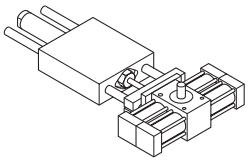
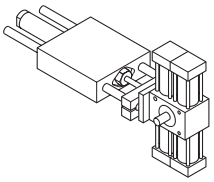
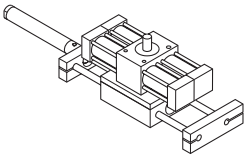
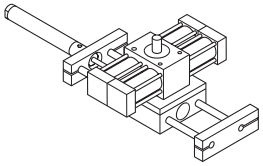
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Mounting Slide to Slide

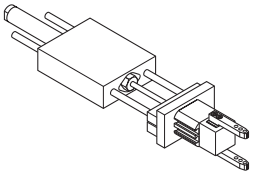
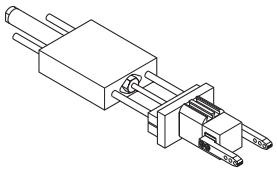
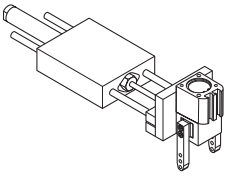
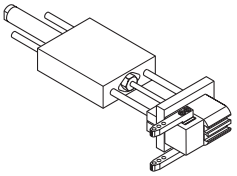
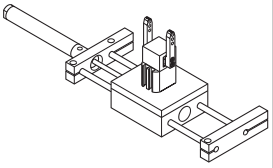
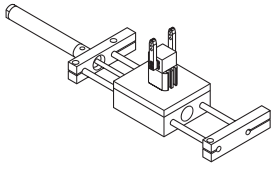
PRIMARY SERIES	ORIENTATION			
	1	2	3	4
P5L P5E HBT/HBR XLT/XLR				
P5L* HBB XLB				

* **Note:** P5L Series units connect without transition plates in Orientation 1, where the thrust or reach version is mounted to a base slide version.

Mounting Rotary Actuator to Slide

PRIMARY SERIES	ORIENTATION			
	1	2	3	4
P5L P5E HBT/HBR XLT/XLR				
P5L HBB XLB				

Mounting Gripper to Slide

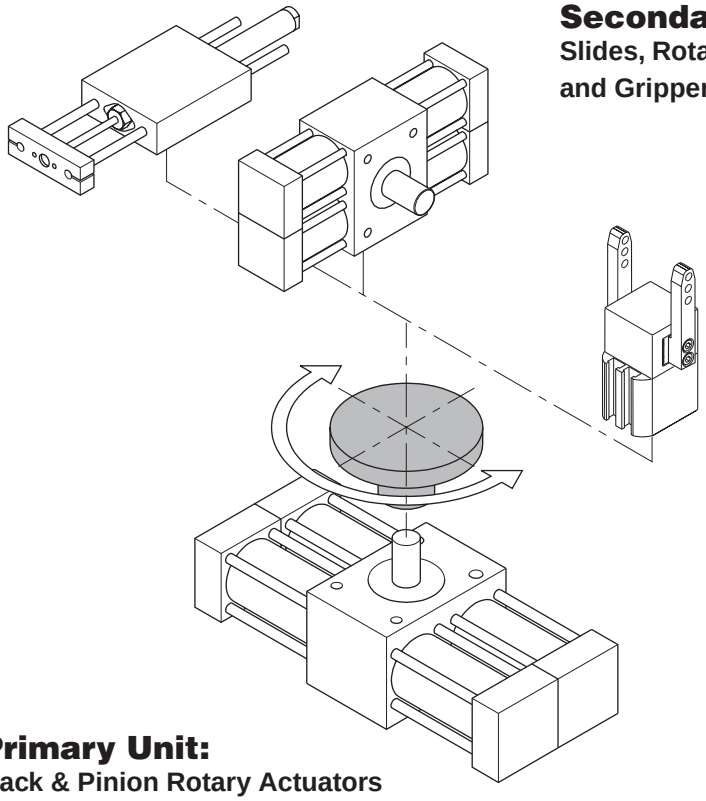
PRIMARY SERIES	ORIENTATION			
	1	2	3	4
P5L HBC HBT/HBR P5E XLT/XLR				
P5L HBB XLB				

L

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Transition Couplers

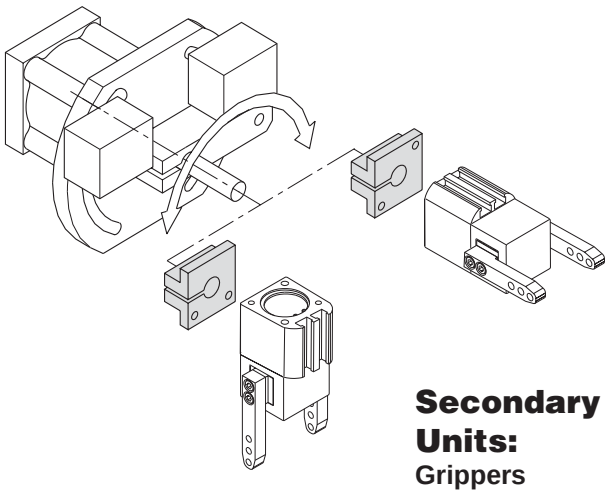
Connect Components to Rotary Actuators



Secondary Units:
Slides, Rotary Actuators and Grippers

Primary Unit:
Rack & Pinion Rotary Actuators

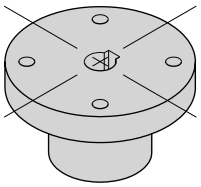
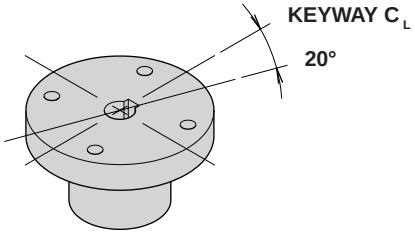
Primary Unit:
Vane Actuators

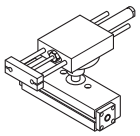
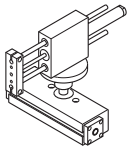
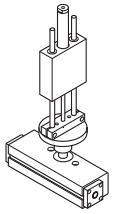
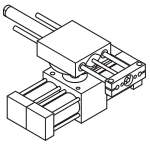
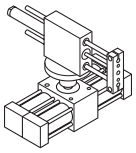
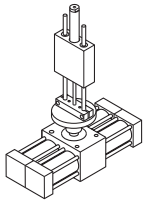


Secondary Units:
Grippers

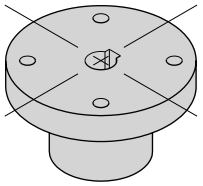
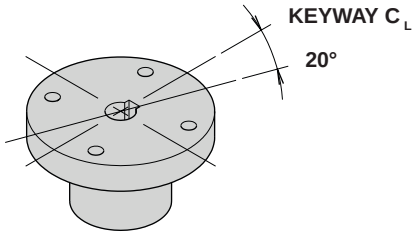
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Mounting Slide to Rotary Actuator

HOLE PATTERN CENTERLINE SAME AS KEYWAY	HOLE PATTERN CENTERLINE 20° CLOCKWISE TO KEYWAY
	

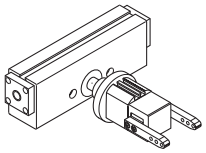
PRIMARY SERIES	ORIENTATION		
	1	2	3
XR			
PTR			

Mounting Gripper to Rotary Actuator

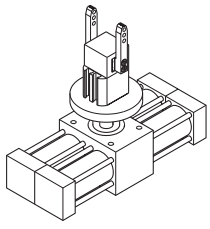
HOLE PATTERN CENTERLINE SAME AS KEYWAY	HOLE PATTERN CENTERLINE 20° CLOCKWISE TO KEYWAY
	

Standard Orientation

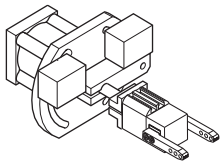
Standard orientation for each series is shown below. PV & WR Series coupler can accommodate two positions of the gripper. See drawing on previous page.



XR Series



PTR Series



PV & WR Series

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Electronic Sensors

Solid State, Reed and Proximity Sensors

Section M



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RC Series Sensors M14
PRN Series M15-M16
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PNP Solid State Sensor Selection Guide

Series		Bore Size or Type	3m Flying Leads	10m Flying Leads	8mm Quick Connect*	8mm Quick Connect w/ 1 m Lead*	12mm Quick Connect*	Bracket	Sensor Page #	Bracket Page #
Compact Cylinders	**P1M** Standard Sensor	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	P1M Right Angle Sensor	All	P8S-SPELXD	P8S-SPETXD	P8S-SPTHXD	N/A	N/A	N/A	M10	—
	LPM	9/16"	L076990000 [2]	N/A	L07699000C	N/A	N/A	N/A	M13	—
		3/4" - 1-1/8"	L077000000 [2]	N/A	L07700000C	N/A	N/A	N/A	M13	—
		1-1/2" - 2"	L077010000 [2]	N/A	L07701000C	N/A	N/A	N/A	M13	—
		2-1/2" - 4"	L077020000 [2]	N/A	L07702000C	N/A	N/A	N/A	M13	—
Round Body Cylinders	**P1L**	20 - 25mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC01	M5	M9
		32 - 63mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC02	M5	M9
		80 - 100mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC03	M5	M9
	SRM/SRDM	9/16" - 3/4"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC01	M5	M9
		1-1/16" - 2-1/2"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC02	M5	M9
	P	1-1/8" - 2-1/2"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC02	M5	M9
		3" - 4"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC03	M5	M9
Tie Rod Cylinders	**3MA/4MA** Standard Sensor	1-1/2" - 5"	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	M9
	3MA/4MA	6" - 8"						P8S-TMA0X	M5	M9
	3MA/4MA Mini-Global Sensor	1-1/8" - 5"	P8S-MPFLX	P8S-MPFTX	P8S-MPSHX	N/A	N/A	P8S-TMA0Z	M7	M9
ISO Cylinders	**P1A** Standard Sensor	10-25mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC01	M5	M9
	P1A Right Angle Sensor	10mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2CCC	M11	M11
		12mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2DCC	M11	M11
		16mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2FCC	M11	M11
		20mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2HCC	M11	M11
		25mm	P1A-2XMK [1]	N/A	N/A	N/A	N/A	P1A-2JCC	M11	M11
	P1D Standard & Clean Profiles	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	P1D Standard Profile Mini Sensors	All	P8S-MPFLX	P8S-MPFTX	P8S-MPSHX	N/A	N/A	N/A	M7	—
	P1D Tie Rod Version	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMA0X	M5	M9
Rodless Cylinders	**P1X**	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMA0Y	M5	—
	P1Z	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	RC	All	L074820000 [3]	N/A	L07482000C	N/A	N/A	N/A	M14	—
Guided Cylinders	**P5T**	Flush Mount	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
		Right Angle	P8S-SPELXD	P8S-SPETXD	P8S-SPTHXD	N/A	N/A	N/A	M10	—
	P5T2	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	P5E	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	HB	All	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	N/A	M5	—
	P5L	20 - 25mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC01	M5	M9
		32 - 63mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC02	M5	M9
		80 - 100mm	P8S-GPFLX	P8S-GPFTX	P8S-GPSHX	P8S-GPSCX	P8S-GPMHX	P8S-TMC03	M5	M9
Rotary Actuators	**PV WR XR**	Normally Open	SMH-1P [2]	N/A	SMH-1PC	N/A	N/A	N/A	M17	—
		Normally Closed	SMC-1P [2]	N/A	SMC-1PC	N/A	N/A	N/A	M17	—
	PRN(A)	All	N/A	N/A	N/A	N/A	N/A	N/A	—	—
	PTR	10, 15	SWH-1P [3]	N/A	SWH-1PC	N/A	N/A	Included	M19	—
		20, 25, 32	SWH-2P [3]	N/A	SWH-2PC	N/A	N/A	Included	M19	—

1 Flying leads are 2 meters in length
2 Flying Leads are 1.5 meters in length
3 Flying leads are 1 meter in length

Note: See page M21 for Weld Immune Sensors and pages M24-M26 for NAMUR Intrinsically Safe Sensors.
* See page M22 for cord sets.

M

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Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

NPN Solid State Sensor Selection Guide

Series		Bore Size or Type	3m Flying Leads	10m Flying Leads	8mm Quick Connect*	8mm Quick Connect w/ 1m Lead*	12mm Quick Connect*	Bracket	Sensor Page #	Bracket Page #
Compact Cylinders	**P1M** Standard Sensor	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	P1M Right Angle Sensor	All	P8S-SNELX	P8S-SNETX	P8S-SNTHX	N/A	N/A	N/A	M10	—
	LPM	9/16"	L076950000 [2]	N/A	L07695000C	N/A	N/A	N/A	M13	—
		3/4" - 1-1/8"	L076960000 [2]	N/A	L07696000C	N/A	N/A	N/A	M13	—
		1-1/2" - 2"	L076970000 [2]	N/A	L07697000C	N/A	N/A	N/A	M13	—
		2-1/2" - 4"	L076980000 [2]	N/A	L07698000C	N/A	N/A	N/A	M13	—
Round Body Cylinders	**P1L**	20 - 25mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC01	M5	M9
		32 - 63mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC02	M5	M9
		80 - 100mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC03	M5	M9
	SRM/SRDM	9/16" - 3/4"	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC01	M5	M9
		1-1/16" - 2-1/2"	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC02	M5	M9
	P	1-1/8" - 2-1/2"	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC02	M5	M9
		3" - 4"	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC03	M5	M9
Tie Rod Cylinders	**3MA/4MA** Standard Sensor	1-1/2" - 5"	P8S-GNFLX	P8S-GPNFTX	P8S-GNSHX	P8S-GPNSCX	P8S-GNMHX	N/A	M5	M9
	3MA/4MA	6" - 8"						P8S-TMA0X	M5	M9
	3MA/4MA Mini-Global Sensor	1-1/8" - 5"	P8S-MNFLX	P8S-MNFTX	P8S-MNSHX	N/A	N/A	P8S-TMA0Z	M7	M9
ISO Cylinders	**P1A** Standard Sensor	10-25mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC01	M5	M9
	P1A Right Angle Sensor	10mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2CCC	M11	M11
		12mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2DCC	M11	M11
		16mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2FCC	M11	M11
		20mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2HCC	M11	M11
		25mm Bore	P1A-2XLK [1]	N/A	N/A	N/A	N/A	P1A-2JCC	M11	M11
	P1D Standard & Clean Profiles	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	P1D Standard Profile Mini Sensors	All	P8S-MNFLX	P8S-MNFTX	P8S-MNSHX	N/A	N/A	N/A	M7	—
	P1D Tie Rod Version	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMA0X	M5	M9
Rodless Cylinders	**P1X**	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMA0Y	M5	—
	P1Z	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	RC	All	L074810000 [3]	N/A	L07481000C	N/A	N/A	N/A	M14	—
Guided Cylinders	**P5T**	Flush Mount	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
		Right Angle	P8S-SNELX	P8S-SNETX	P8S-SNTHX	N/A	N/A	N/A	M10	—
	P5T2	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	P5E	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	HB	All	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	N/A	M5	—
	P5L	20 - 25mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC01	M5	M9
		32 - 63mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC02	M5	M9
		80 - 100mm	P8S-GNFLX	P8S-GNFTX	P8S-GNSHX	P8S-GNSCX	P8S-GNMHX	P8S-TMC03	M5	M9
Rotary Actuators	**PV WR XR**	Normally Open	SMH-1N [2]	N/A	SMH-1NC	N/A	N/A	N/A	M17	—
		Normally Closed	SMC-1N [2]	N/A	SMC-1NC	N/A	N/A	N/A	M17	—
	PRN(A)	All	See pages M15-M16							
	PTR	10, 15	SWH-1N [3]	N/A	SWH-1NC	N/A	N/A	Included	M19	—
		20, 25, 32	SWH-2N [3]	N/A	SWH-2NC	N/A	N/A	Included	M19	—

1 Flying leads are 2 meters in length
2 Flying Leads are 1.5 meters in length
3 Flying leads are 1 meter in length

Note: See page M21 for Weld Immune Sensors and pages M24-M26 for NAMUR Intrinsically Safe Sensors.
* See page M22 for cord sets.

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Reed Sensor Selection Guide

Series		Bore Size or Type	3m Flying Leads	10m Flying Leads	8mm Quick Connect*	8 mm Quick Connect w/ 1 m Lead*	12mm Quick Connect*	Bracket	Sensor Page #	Bracket Page #
Compact Cylinders	**P1M** Standard Sensor	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
	P1M Right Angle Sensor	All	P8S-SRELX	P8S-SRETX	P8S-SRTHX	N/A	N/A	N/A	M10	—
	LPM	9/16"	L077030000 [1]	N/A	L07703000C	N/A	N/A	N/A	M13	—
		3/4" - 1-1/8"	L077040000 [1]	N/A	L07704000C	N/A	N/A	N/A	M13	—
		1-1/2" - 2"	L077050000 [1]	N/A	L07705000C	N/A	N/A	N/A	M13	—
		2-1/2" - 4"	L077060000 [1]	N/A	L07706000C	N/A	N/A	N/A	M13	—
Round Body Cylinders	**P1L**	20 - 25mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC01	M6	M9
		32 - 63mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC02	M6	M9
		80 - 100mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC03	M6	M9
	SRM/SRDM	9/16" - 3/4"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC01	M6	M9
		1-1/16" - 2-1/2"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC02	M6	M9
	P	1-1/8" - 2-1/2"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC02	M6	M9
		3" - 4"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC03	M6	M9
Tie Rod Cylinders	**3MA/4MA** Standard Sensor	1-1/2" - 5"	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	M9
	3MA/4MA	6" - 8"						P8S-TMA0X	M6	M9
	3MA/4MA Mini-Global Sensor	1-1/8" - 5"	P8S-MRFLX	P8S-MRFTX	P8S-MRSHX	N/A	N/A	P8S-TMA0Z	M8	M9
ISO Cylinders	**P1A** Standard Sensor	10-25mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC01	M6	M9
	P1A Right Angle Sensor	10mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	—
		12mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	—
		16mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	—
		20mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	—
		25mm Bore	N/A	N/A	N/A	N/A	N/A	N/A	—	
	P1D Standard & Clean Profiles	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
	P1D Standard Profile Mini Sensors	All	P8S-MRFLX	P8S-MRFTX	P8S-MRSHX	N/A	N/A	N/A	M8	—
	P1D Tie Rod Version	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMA0X	M6	M9
Rodless Cylinders	**P1X**	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMA0Y	M6	—
	P1Z	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
	RC	All	L074800000 [2]	N/A	L07480000C	N/A	N/A	N/A	M14	—
Guided Cylinders	**P5T**	Flush Mount	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
		Right Angle	P8S-SRELX	P8S-SRETX	P8S-SRTHX	N/A	N/A	N/A	M10	—
	P5T2	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—-
	P5E	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
	HB	All	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	N/A	M6	—
	P5L	20 - 25mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC01	M6	M9
		32 - 63mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC02	M6	M9
		80 - 100mm	P8S-GRFLX	P8S-GRFTX	P8S-GRSHX	P8S-GRSCX	P8S-GRMHX	P8S-TMC03	M6	M9
Rotary Actuators	**PV WR XR**	N.O. High Amp	SMR-1 [1]	N/A	SMR-1C	N/A	N/A	N/A	M18	—
		N.O. Low Amp	SMR-1L [1]	N/A	SMR-1LC	N/A	N/A	N/A	M18	—
		N.C. Low Amp	SMD-1L [1]	N/A	SMD-1LC	N/A	N/A	N/A	M18	—
	PRN	50 - 800	See Model Code						M16	—
	PTR	10, 15	SWR-1 [2]	N/A	SWR-1C	N/A	N/A	Included	M20	—
		20, 25, 32	SWR-2 [2]	N/A	SWR-2C	N/A	N/A	Included	M20	—

1 Flying Leads are 1.5 meters in length
2 Flying leads are 1 meter in length

Note: See page M21 for Weld Immune Sensors and pages M24-M26 for NAMUR Intrinsically Safe Sensors.
* See page M22 for cord sets.

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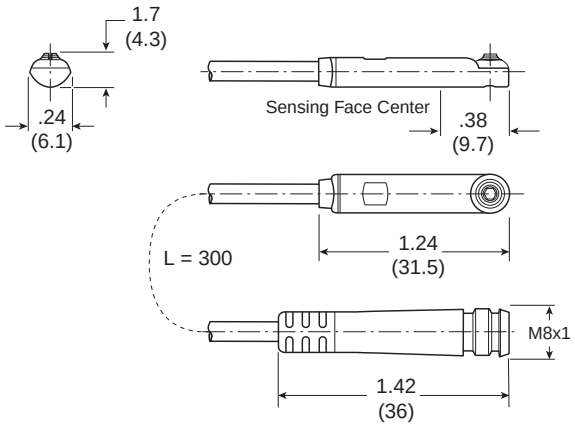
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Wadsworth, Ohio
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Global Drop-In Solid State Sensors

Wiring	PNP Sensor	NPN Sensor	PNP Sensor ATEX Certified
3m Flying Leads	P8S-GPFLX	P8S-GNFLX	P8S-GPFLX/EX
10m Flying Leads	P8S-GPFTX	P8S-GNFTX	N/A
0.3m Lead with 8mm Connector	P8S-GPSHX	P8S-GNSHX	
0.3m Lead with 12mm Connector	P8S-GPMHX	P8S-GNMHX	
1m Lead with 8mm Connector	P8S-GPSCX	P8S-GNSCX	

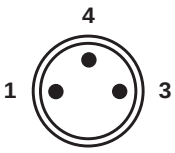
Specifications

Switch Classification	Standard PNP or NPN	ATEX Certified PNP
Type	Electronic	
Output Function	Normally Open	
Sensor Output	PNP/NPN	PNP
Operating Voltage	10 - 30VDC	180 - 30VDC
Continuous Current	100 mA max.	70 mA max.
Response Sensitivity	28 Gauss min.	
Switching Frequency	1 KHz	
Power Consumption	10 mA max.	
Voltage Drop	2.5 VDC max.	
Ripple	10% of Operating Voltage	
Hysteresis	1.5 mm max.	
Repeatability	0.1 mm max.	
EMC	EN 60 947-5-2	
Short-circuit Protection	Yes	
Power-up Pulse Suppression	Yes	
Reverse Polarity Protection	Yes	
Enclosure Rating	IP 68	
Shock and Vibration Stress	30g, 11 ms, 10 to 55 Hz, 1 mm	
Operating Temperature Range	-25°C to +75°C (-13°F to 167°F)	-20°C to +45°C (-4°F to 113°F)
Housing Material	PA 12, Black	
Connector Cable	PVC	
Connector	PUR	—
Approval for ATEX	—	3D/3G

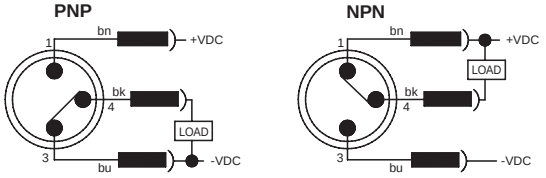


SOLID STATE SENSOR – WIRING CONNECTION

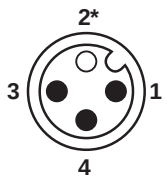
Flying Lead or 8 mm Connector (shown)



Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
4	Black	Output signal (N.O.)
3	Blue	-VDC

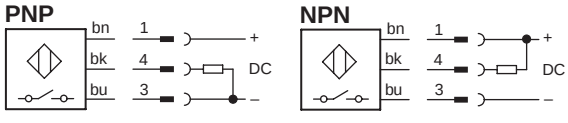


12 mm Connector



* Pin 2 not present.

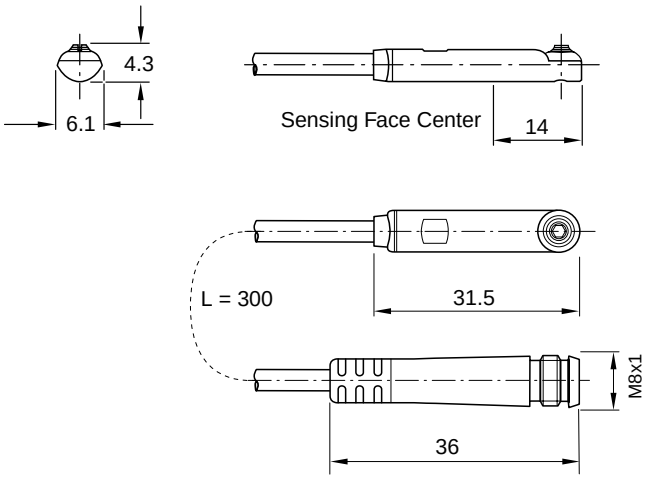
Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
4	Black	Output Signal (N.O.)
2*	White	Not Used
3	Blue	-VDC



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Global Drop-In Reed Sensors

Wiring	Reed Sensor
3m Flying Leads	P8S-GRFLX
10m Flying Leads	P8S-GRFTX
0.3m Lead with 8mm Connector	P8S-GRSHX
0.3m Lead with 12mm Connector	P8S-GRMHX
1m Lead with 8mm Connector	P8S-GRSCX



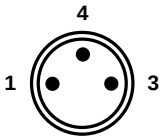
Specifications

Type ..... 2-Wire Reed
Output Function ..... Normally Open
Operating Voltage ..... 10 - 120 VAC*
10 - 30 VDC
Switching Power ..... 6 W/VA
Continuous Current ..... 100 mA max.
Response Sensitivity ..... 30 Gauss min.
Switching Frequency ..... 400 Hz
Voltage Drop ..... 2.5 V max.
Ripple ..... 10% of Operating Voltage
Hysteresis ..... 1.5 mm max.
Repeatability ..... 0.2 mm max.
EMC ..... EN 60 947-5-2
Reverse Polarity Protection ..... Yes
Enclosure Rating ..... IP 68
Shock and Vibration Stress ..... 30g, 11 ms, 10 to 55 Hz, 1 mm
Operating Temperature Range .... -25°C to +75°C (-13°F to 167°F)
Housing Material ..... PA 12, Black
Connector Cable ..... PVC
Connector ..... PUR cable with 8 or
12 mm connector

*8mm connector rated for 50 VAC max.

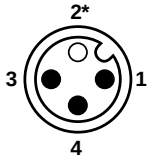
REED SENSOR - WIRING CONNECTION

Flying Lead or 8 mm Connector



Pin	Wire	Function
1	Brown	Operating Voltage (+V)
4	Black	Not Used
3	Blue	Output Signal (-V or Ground)

12 mm Connector



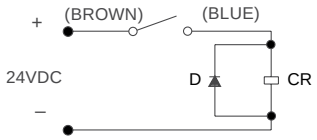
* Pin 2 not present.

Pin	Wire	Function
1	Brown	Operating Voltage (+V)
2*	White	Not Used
3	Blue	Output Signal (-V or Ground)
4	Black	Not Used

Circuit for Switching Contact Protection (For Inductive Loads, e.g. Solenoids, Relays)

(Required for proper operation 24V DC)

Put Diode parallel to load (CR) following polarity as shown below.



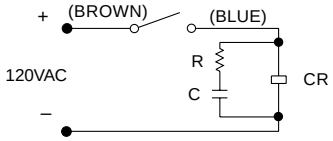
D: Diode: select a Diode with the breakdown voltage and current rating according to the load.

Typical Example – 100 Volt, 1 Amp Diode
CR: Relay coil (under 0.5W coil rating)

(Recommended for longer life 120 VAC)

Put a resistor and capacitor in parallel with the load (CR). Select the resistor and capacitor according to the load.

Typical Example:
CR: Relay coil (under 2W coil rating)
R: Resistor 1 KΩ - 5 KΩ, 1/4 W
C: Capacitor 0.1 ΩF, 600 V



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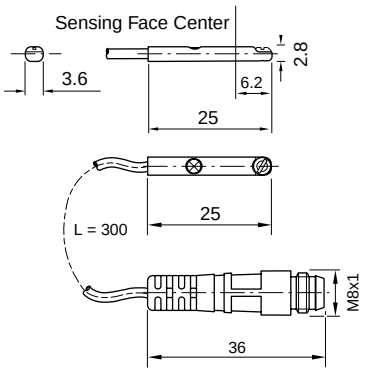
⚠ Caution

– Use an ampmeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.
– **NOTE:** When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.
– Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.
– The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.
– Use relay coils for reed sensor contact protection.
– The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.
– Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that R (ohms) >E/0.3.

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Pneumatic Division
Wadsworth, Ohio
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Mini-Global Drop-In Solid State Sensors

Wiring	PNP Sensor	NPN Sensor
3m Flying Leads	P8S-MPFLX	P8S-MNFLX
10m Flying Leads	P8S-MPFTX	P8S-MNFTX
0.3m Lead with 8mm Connector	P8S-MPSHX	P8S-MNSHX

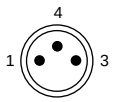


Solid State Sensor

SPECIFICATIONS

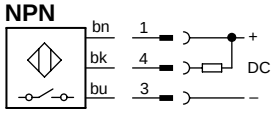
Type ..... Electronic
Output Function ..... Normally Open
Sensor Output ..... PNP or NPN
Operating Voltage ..... 10 - 30VDC
Continuous Current ..... ≤ 70 mA
Response Sensitivity ..... ≤ 48 Gauss
Switching Frequency ..... 1000 Hz
Power Consumption ..... ≤ 8 mA without load
Voltage Drop ..... ≤ 2.5 VDC
Ripple ..... 10% of Operating Voltage
Hysteresis ..... ≤ 15 Gauss
Repeatability ..... ≤ ±0.1 mm
EMC ..... EN 60 947-5-2
Short-circuit Protection ..... Yes
Power-up Pulse Suppression ..... No
Reverse Polarity Protection ..... Yes
Enclosure Rating ..... IP 67
Shock and Vibration Stress ..... 30g, 11 ms, 10 to 55 Hz, 1 mm
Operating Temperature Range ..... -25°C to +75°C (-13°F to 167°F)
Housing Material ..... PA 12
Connector Cable ..... PUR 3 x 0.09mm²
Connector ..... PUR cable w/8mm connector

WIRING CONNECTION

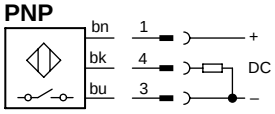


Pin	Wire	Function
1	Brown	+VDC
4	Black	NO
3	Blue	- VDC

NPN



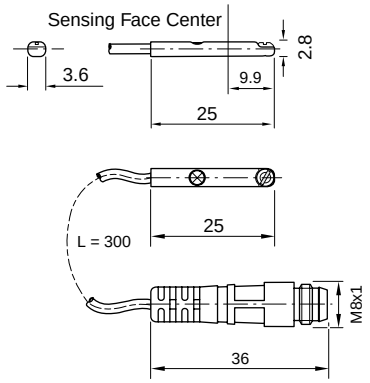
PNP



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Mini-Global Drop-In Reed Sensors

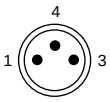
Wiring	Reed Sensor
3m Flying Leads	P8S-MRFLX
10m Flying Leads	P8S-MRFTX
0.3m Lead with 8mm Connector	P8S-MRSHX



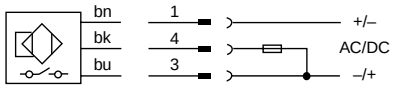
Specifications

Type ..... 3-Wire Reed
Output Function ..... Normally Open
Operating Voltage ..... 10 - 30 VAC, 10 - 30 VDC
Switching Power ..... 10 W/VA
Continuous Current ..... ≤ 500 mA max.
Response Sensitivity ..... ≤ 48 Gauss
Switching Frequency ..... 500 Hz
Hysteresis ..... ≤ 7 Gauss
Repeatability ..... ≤ 0.1 mm
EMC ..... EN 60 947-5-2 / EN 40 050
Enclosure Rating ..... IP 67
Shock and Vibration Stress ..... 30g, 11 ms, 10 to 55 Hz, 1 mm
Operating Temperature Range ..... -25°C to +75°C (-13°F to 167°F)
Housing Material ..... PA 12
Connector Cable ..... PUR 3 x 0.09 mm^2
Connector ..... PUR cable w/8mm connector

WIRING CONNECTION



Pin	Wire	Function
1	Brown	Operating Voltage (+V)
4	Black	Output signal
3	Blue	Ground (-V)



⚠ Caution

– Use an ampmeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.

– **NOTE:** When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.

– Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.

– The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.

– Use relay coils for reed sensor contact protection.

– The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.

– Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that R (ohms) >E/0.3.

M

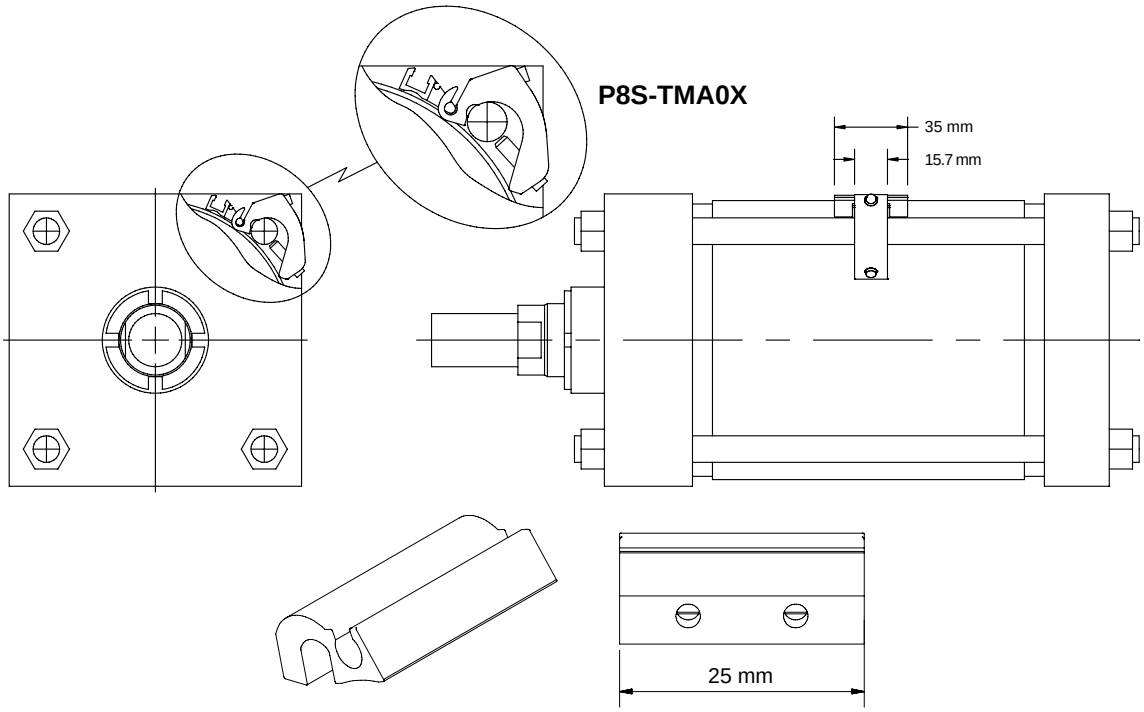
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Tie Rod Bracket Assembly Part Number and Dimensions

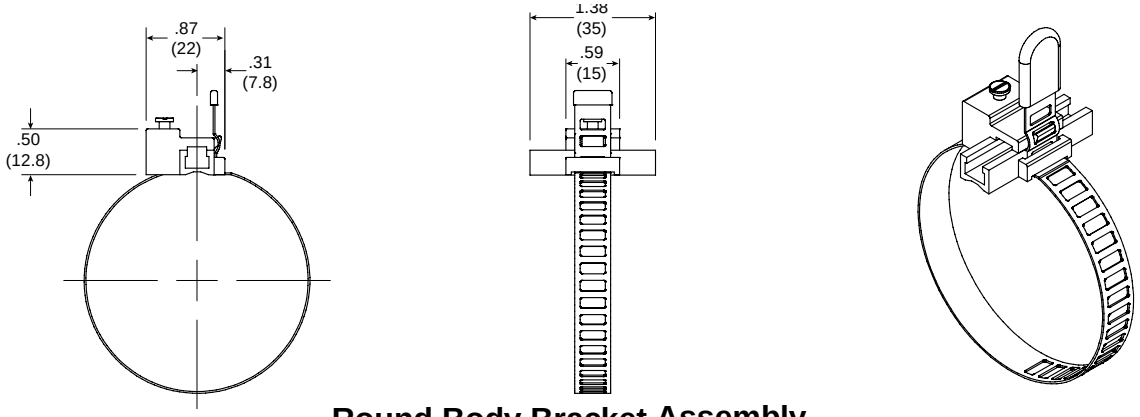
Tie Rod Bracket Assembly is necessary for Global and Mini-Global Sensor installation on all tie rod construction cylinders. This includes all Intermediate Trunnion mounts (Style DD or MT4); some 1-1/8" bore 3MA Series mounts; and all 6"-8" bore Sensors and bracket assemblies must be ordered separately.

Part number P8S-TMA0X fits 1-1/2" to 8" bores and 32-200mm bores for Global Sensors
Part number P8S-TMA0Z fits 1-1/8" bore for Mini-Global Sensors

P8S-TMA0X



P8S-TMA0Z



Round Body Bracket Assembly Part Numbers

Sensors and Brackets must be ordered separately.

Bore Size	Round Body Bracket
9/16" - 1-1/16"	P8S-TMC01
20 - 25mm	P8S-TMC01
1-1/8" - 2-1/2"	P8S-TMC02
32 - 63mm	P8S-TMC02
3" - 4"	P8S-TMC03
80 - 100mm	P8S-TMC03

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C086/A074

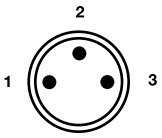
Right Angle Solid State Sensors CE

Specifications

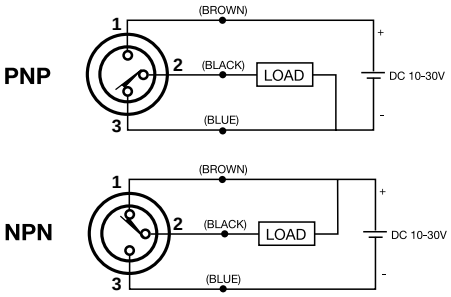
Type.....Electronic
Output Function.....Normally Open
Switching Output .....PNP/NPN
Operating Voltage .....10 - 30VDC
Continuous Current .....≤ 150 mA
Response Sensitivity .....30 Gauss min.
Switching Frequency 5kHz
Power Consumption .....15 mA
Voltage Drop.....≤ 2 VDC
Ripple .....≤ 10% of Operating Voltage
Delay Time (24V).....Approx. 20 ms
Time Delay before Availability.....≤ 2 ms
Hysteresis.....≤ 1.5 mm
Repeatability.....≤ 0.2 mm
EMC.....EN 60 947-5-2
Short-circuit Protection.....Yes
Power-up Pulse Suppression .....Yes
Reverse Polarity Protection .....Yes
Enclosure Rating .....IP 67 DIN 40050
Shock and Vibration Stress .....30g, 11ms, 10 to 55 Hz, 1 mm
Ambient Temperature Range.....-25°C to +75°C (-13°F to 167°F)
Housing Material.....PA 12, Black
Connector Cable.....PVC
Connector.....PUR cable w/8 mm connector

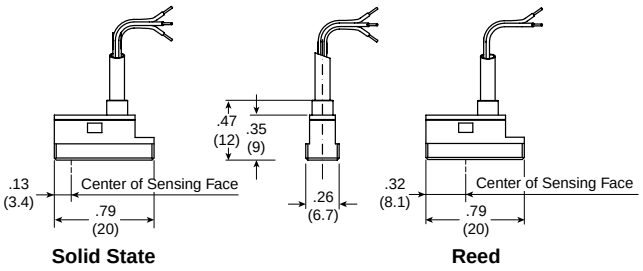
Wiring	PNP Sensors	NPN Sensors
0.2m Lead with 8mm Connector	P8S-SPTHXD	P8S-SNTHX
3m Flying Leads	P8S-SPELXD	P8S-SNELX
10m Flying Leads	P8S-SPETXD	P8S-SNETX

Wiring Connection



Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
2	Black	Output signal (N.O.)
3	Blue	-VDC





Right Angle Reed Sensors CE

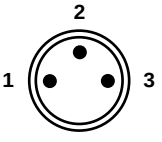
Specifications

Type.....2-Wire Reed
Output Function.....Normally Open
Output Voltage .....10 - 110* VAC, 10 - 30 VDC
Continuous Current .....≤ 100 mA
Response Sensitivity .....30 Gauss min.
Switching Frequency .....400 Hz
Voltage Drop.....≤ 3 V
Ripple .....≤ 10% of Operating Voltage
Time Delay (24V).....Approx. 20 ms
Hysteresis.....≤ 1.0 mm
Repeatability.....≤ 0.2 mm
EMC.....EN 60 947-5-2
Reverse Polarity Protection .....Yes
Enclosure Rating .....IP 67
Shock and Vibration Stress .....30g, 11ms, 10 to 55 Hz, 1 mm
Ambient Temperature Range.....-25°C to +75°C (-13°F to 167°F)
Housing Material.....PA 12, Black
Connector Cable.....PVC
Connector.....PUR cable w/8 mm connector

*8mm connector rated for 50 VAC max.

Wiring	Reed Sensors
0.2m Lead with 8mm Connector	P8S-SRTHX
3m Flying Leads	P8S-SRELX
10m Flying Leads	P8S-SRETX

Wiring Connection



Pin	Wire	Function
1	Brown	Operating Voltage (+V)
3	Black	Not Used
2	Blue	Output Signal (-V or Ground)

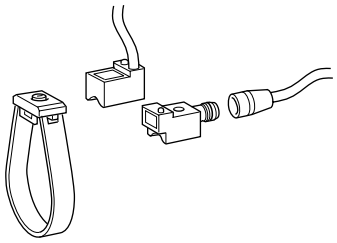
M

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C086

Solid State Sensors

These sensors are of solid-state type, with no moving parts. Short-circuit and transient protection is incorporated as standard. The integral electronics make these sensors suitable for applications with very high switching frequencies.

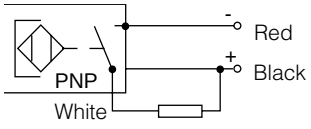


Specifications

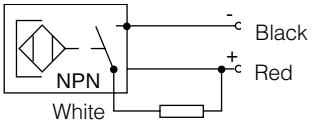
Design	Hall element
Output	PNP resp. NPN, N.O.
Voltage range	10-30 VDC
Max permissible ripple	10%
Max voltage drop	0.5 V at 100 mA
Max load current, P1A-2XMK, LK	150 mA
P1A-2XHK, EK, JH, FH	100 mA
Max breaking power (resistive)	6 W
Internal consumption	<30 mA at 30 V
Min actuating distance	5 mm
Hysteresis	1.1 - 1.3 mm
Repeatability accuracy	±0.1 mm
Max on/off switching frequency	1 kHz
Max on/off switching time	0.8/3.0 ms
Encapsulation, P1A-2XJH, FH	IP 65
Encapsulation, P1A-2XHK, EK, MK, LK	IP 67
Temperature range	–10 °C to +60 °C (14°F to 140°F)
Indication	LED
Shock resistance	40 g
Material, housing	Polyamid 11
Material, mould	Epoxy
Cable	PVC 3x0,15 mm²
Cable incl. female part connector	PVC 3x0,15 mm²
Connector	8 mm snap on
Mounting	Mounting yoke
Material, mounting	Acetal/Stainless steel
Material, screw	Stainless steel

Solid State Sensor Wiring

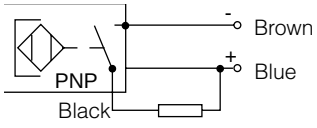
P1A-2XMK



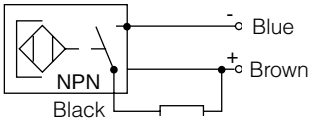
P1A-2XLK



P1A-2XHK,P1A-2XJH



P1A-2XEK, P1A-2XFH



Electronic Sensors

Part Number	Output	Cable Length	Weight (lb)
P1A-2XMK, Rt. Angle	PNP, N.O.	2 m	0.09
P1A-2XLK, Rt. Angle	NPN, N.O.	2 m	0.09
P1A-2XHK	PNP, N.O.	2 m	0.022
P1A-2XEK	NPN, N.O.	2 m	0.022
P1A-2XJH	PNP, N.O.	*	0.033
P1A-2XFH	NPN, N.O.	*	0.033

Mounting Brackets

Part Number	Fits Cylinder Bore Size	Weight (lb)
P1A-2CCC	10mm	0.01
P1A-2DCC	12mm	0.01
P1A-2FCC	16mm	0.0176
P1A-2HCC	20mm	0.0176
P1A-2JCC	25mm	0.022

Cable for Sensors

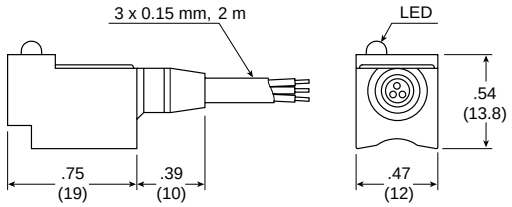
Part Number	Cable Length	Weight (lb)
9126344341**	3 m	0.12
9126344342**	10 m	0.4

* Cable ordered separately

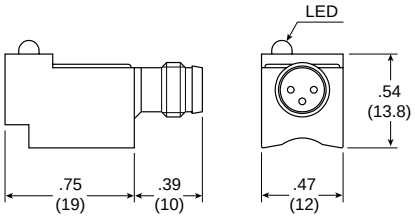
** Cable includes female part connector for sensor

Dimensions

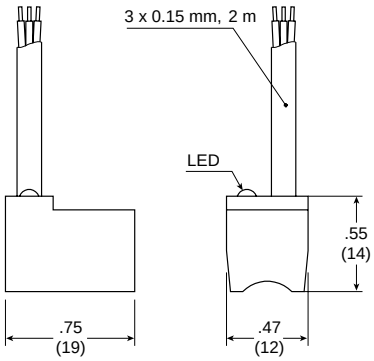
P1A-2XHK and P1A-2XEK



P1A-2XJH and P1A-2XFH



P1A-2XMK and P1A-2XLK

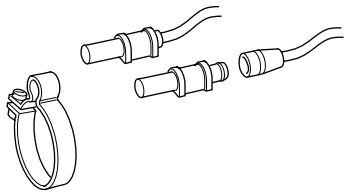


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C086

Reed Sensors

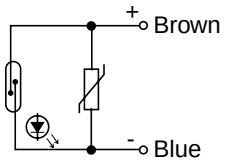
The reed sensors incorporate a well-proven, universal-voltage, compact reed switch element; making them suitable for a wide range of applications. They can work with electronic control systems or conventional relay systems.



Specifications

Design	Reed
Output	Making (N.O.)
Voltage range, P1A-2XRL	110 VAC/VDC
Voltage range, P1A-2XSH	60 VAC/VDC
Max voltage drop	2.8 V
Max load current	180 mA
Max breaking power (resistive)	10 W
Min actuating distance	5 mm
Hysteresis	2 mm
Repeatability accuracy	±0.2 mm
Max on/off switching frequency	500 Hz
Max on/off switching time	1 ms
Encapsulation, P1A-2XRL	IP 67
Encapsulation, P1A-2XSH	IP 65
Temperature range	–30 °C to +80 °C (22°F to 176°F)
Indication	LED
Shock resistance	30 g
Material, housing	Nylon 66
Material, mould	Epoxy
Cable	PVC 2x0.2 mm^2
Cable incl. female part connector	PVC 2x0.2 mm^2
Mounting	Mounting yoke
Material, mounting	Stainless steel
Material, screw	Stainless steel
Connector	8 mm snap on

Reed Sensor Wiring



Electronic Sensors

Part Number	Output	Cable Length	Weight (lb)
P1A-2XRL	Making (N.O.)	3m	0.12
P1A-2XSH	Making (N.O.)	*	0.004

Mounting Brackets

Part Number	Fits Cylinder Bore Size	Weight (lb)
P1A-2CCB	10mm	0.004
P1A-2DCB	12mm	0.005
P1A-2FCB	16mm	0.006
P1A-2HCB	20mm	0.009
P1A-2JCB	25mm	0.010

Cable for Sensors

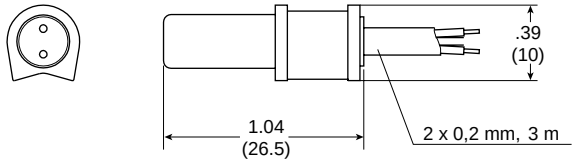
Part Number	Cable Length	Weight (lb)
9126344341**	3 m	0.12
9126344342**	10 m	0.4

* Cable ordered separately

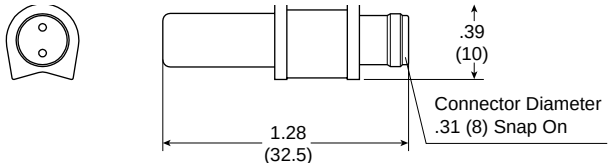
** Cable includes female part connector for sensor

Dimensions

P1A-2XRL



P1A-2XSH



M

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Part Numbers*

Bore	Reed (Low AMP)	NPN Sinking	PNP Sourcing
9/16"	L077030000	L076950000	L076990000
3/4", 1-1/8"	L077040000	L076960000	L077000000
1-1/2", 2"	L077050000	L076970000	L077010000
2-1/2", 3", 4"	L077060000	L076980000	L077020000

* For sensors with an 8mm connector, replace the last digit with a 'C'. For example: L07696000C.

Specifications

Solid State Sensors (NPN/PNP)

Switching Logic..... N.O. NPN (Sinking)
N.O. PNP (Sourcing)
Supply Voltage Range ..... 5 - 30 VDC
On-State Voltage Drop..... 1.5 V max. at 100 mA
Current Output Range ..... 100 mA
Burden Current..... 7 mA at 12 V 14 mA at 24 V
Leakage Current..... 0.01 mA
LED Function..... NPN: Red (Target Present)
PNP: Green (Target Present)
Minimum Current to Light LED ..... 1 mA
Operating Temperature..... 14° to 158°F (-10° to 70°C)
Storage Temperature ..... -4° to 176°F (-20° to 80°C)
Enclosure Protection ..... IEC standard IP 67 NEMA 6P
Lead Wire ..... 3 conductor, 24 gauge
Lead Wire Length ..... 59 inches, 1.5 meter
Color of Cable..... Black
Switching Response..... Max. 1k Hz
Shock Resistance..... 50 G (490 m/s^2)
Vibration Resistance..... Double Amplitude 1.5 mm
(Frequency 10 to 55 Hz
1 scanning, 1 minute)

Reed Sensor (Low AMP)

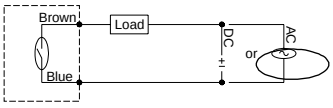
Switching Logic..... N.O. SPST (Form A)
Supply Voltage Range ..... 3 - 125 V AC/DC
On-State Voltage Drop..... 1.8V max. at 20 mA DC
Power Rating*..... 5 W (2.5 W) 5 VA (2.5 VA)
Switching Current Range* ..... 5-40 mA (5-20 mA)
Leakage Current..... 0
LED Function..... Red (Target Present)
Minimum Current to Light LED ..... 3 mA
Operating Temperature..... 14° to 158°F (-10° to 70°C)
Storage Temperature..... -4° to 176°F (-20° to 80°C)
Enclosure Protection ..... IEC standard IP 67 NEMA 6P
Lead Wire ..... 2 conductor, 24 gauge
Lead Wire Length ..... 59 inches, 1.5 meter
Color of Cable..... Gray
Switching Response..... Max. 300 Hz
Shock Resistance..... 30 G (300 m/s^2)
Vibration Resistance..... Double Amplitude 1.5 mm
(Frequency 10 to 55 Hz
1 scanning, 1 minute)

*Number in parentheses pertains to inductive loads.

Circuits

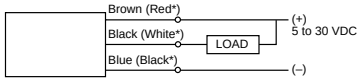
Reed Sensor

NOTE: Polarity must be observed for DC operation only.



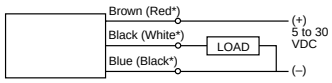
NPN Sensor – Sinking Output

Color of Cable.....Black
"On" State Voltage Drop..... 1.5V Maximum



PNP Sensor – Sourcing Output

Color of Cable.....Black
"On" State Voltage Drop..... 1.5V Maximum

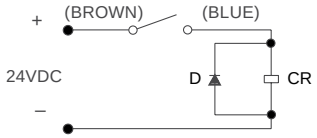


*Wire colors in parentheses pertain to sensors manufactured before 10/15/93.

Circuit for Switching Contact Protection (Inductive Loads) – for Reed Sensor Only

(Required for proper operation 24V DC)

Put Diode parallel to load (CR) following polarity as shown below.



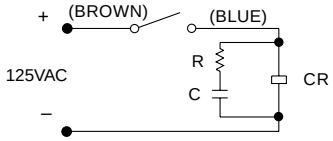
D: Diode: select a Diode with the breakdown voltage and current rating according to the load.

Typical Example – 100 Volt, 1 Amp Diode
CR: Relay coil (under 0.5W coil rating)

(Recommended for longer life 125 VAC)

Put a resistor and capacitor in parallel with the load (CR). Select the resistor and capacitor according to the load.

Typical Example:
CR: Relay coil (under 2W coil rating)
R: Resistor 1 KΩ – 5 KΩ, 1/4 W
C: Capacitor 0.1 μF, 600 V



⚠ Caution

- Use an ampmeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.
- **NOTE:** When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.
- Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.
- The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.
- Current capabilities are relative to operational temperatures.
- Use relay coils for reed sensor contact protection.
- The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.
- Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that R (ohms) >E/0.3.

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C347

Solid State Sensors

Part Numbers	**L074810000 NPN Sinking** **L074820000 PNP Sourcing**
Switching Logic	NPN or PNP
Supply Voltage Range	10-30 VDC
On-State Voltage Drop	See Circuits Below
Current Output Range	Up to 100 mA at 12 VDC Up to 200 mA at 24 VDC
Burden Current	7 mA at 12 VDC 16 mA at 24 VDC
Leakage Current	10µA
LED Function	Red, Target Present
Minimum Current to Light LED	1 mA
Operating Temperature	14° to 140°F (-10° to 60°C)
Storage Temperature	-4° to 158°F (-20° to 70°C)
Enclosure Protection	Nema 6, IEC IP67
Lead Wire	3 conductor, 24 Gauge
Lead Wire Length	39 Inches, 1 Meter
Color of Cable	See Below
Switching Response	1000 Hz Maximum

Reed Sensors

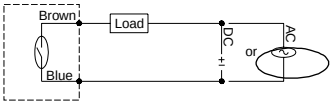
Part Number	**L074800000**
Switching Logic	Normally open, SPST (Form A)
Supply Voltage Range	85 to 125 VAC or 5-30 VDC[1]
On-State Voltage Drop	1.7 V Maximum
Power Rating	10 Watts (Resistive) 5 Watts (Capacitive)
Switching Current Range	30 mA to 200 mA (Resistive) 30 mA to 100 mA (Capacitive)
Leakage Current	0
LED Function	Red, Target Present
Minimum Current to Light LED	18 mA
Operating Temperature	14° to 140°F (-10° to 60°C)
Storage Temperature	-4° to 140°F (-20° to 60°C)
Enclosure Protection	Nema 6, IEC IP67
Lead Wire	2 conductor, 24 Gauge
Lead Wire Length	39 Inches, 1 Meter
Color of Cable	Black
Switching Response	300 Hz Maximum
Shock Resistance	30g
Vibration Resistance	10-55 Hz, 1.5 mm, Double Amplitude

[1]Polarity is restricted to DC operation: (+) to Brown (White*) (-) to Blue (Black*)
If these connections are reversed the contacts will close, but the LED will not light.

Circuits

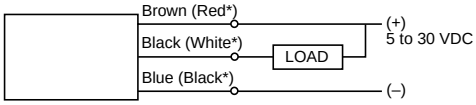
Reed Sensor

Part No..... L074800000
NOTE: Polarity must be observed for DC operation only.



NPN Sensor – Sinking Output

Part No..... L074810000
Color of Cable.....Black
"On" State Voltage Drop.....0.7V Maximum



PNP Sensor – Sourcing Output

Part No..... L074820000
Color of Cable.....Gray
"On" State Voltage Drop..... 0.2V Maximum

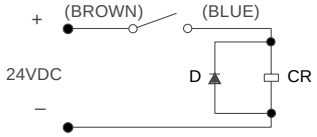


*Wire colors in parentheses pertain to sensors manufactured before 10/15/93.

Circuit for Switching Contact Protection (Inductive Loads)

(Required for proper operation 24V DC)

Put Diode parallel to load (CR) following polarity as shown below.



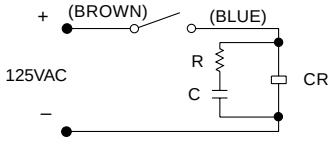
D: Diode: select a Diode with the breakdown voltage and current rating according to the load.

Typical Example—100 Volt, 1 Amp Diode
CR: Relay coil (under 0.5W coil rating)

(Recommended for longer life 125 VAC)

Put a resistor and capacitor in parallel with the load (CR). Select the resistor and capacitor according to the load.

Typical Example:
CR: Relay coil (under 2W coil rating)
R: Resistor 1 KΩ – 5 KΩ, 1/4 W
C: Capacitor 0.1 µF, 600 V



M

⚠ Caution

– Use an ampmeter to test reed sensor current. Testing devices such as incandescent light bulbs may subject the reed sensor to high in-rush loads.

– NOTE: When checking an unpowered reed sensor for continuity with a digital ohmmeter the resistance reading will change from infinity to a very large resistance (2 M ohm) when the sensor is activated. This is due to the presence of a diode in the reed sensor.

– Anti-magnetic shielding is recommended for reed sensors exposed to high external RF or magnetic fields.

– The magnetic field strength of the piston magnet is designed to operate with our sensors. Other manufacturers' sensors may not operate correctly in conjunction with these magnets.

– Current capabilities are relative to operational temperatures.

– Use relay coils for reed sensor contact protection.

– The operation of some 120 VAC PLC's (especially some older Allen-Bradley PLC's) can overload the reed sensor. The sensor may fail to release after the piston magnet has passed. This problem may be corrected by the placement of a 700 to 1K OHM resistor between the sensor and the PLC input terminal. Consult the manufacturer of the PLC for appropriate circuit.

– Sensors with long wire leads (greater than 15 feet) can cause capacitance build-up and sticking will result. Attach a resistor in series with the reed sensor (the resistor should be installed as close as possible to the sensor). The resistor should be selected such that R (ohms) >E/0.3.

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A076

Fixed Position Sensor

Specifications

Part Number ..... See Model Code
Type of Sensor ..... Solid State
Application ..... Relay, PLC, IC Circuit
Output Method ..... NPN
Load Voltage ..... 5 to 30VDC
Load Current ..... 5 to 200 mA
Max. Power Consumption of Switch Control ..... Max. 200 mA at 24V
Max. Leak Current ..... Max. 10 µA
Internal Voltage Drop ..... 1.5VDC or Less
Mean Response Time ..... 1 ms
Shock Resistance ..... 490 m/s²
Ambient Temperature ..... 5 to 60°C
Enclosure Rating IP67
Hysteresis ..... Approximately 2°
Response Range ..... 15° +/- 7°
Lead Wire Length ..... 1 meter

Model Code and Ordering Information

Example: SR20 - 180 - 90

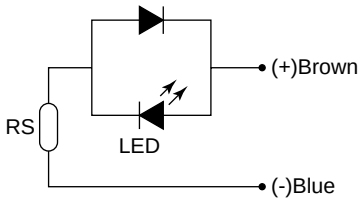
SR **20** – **180** – **90**

Size
3
10
20
30

Rotation	
090	90°
100	100°
180	180°
270	270°

Reference Point	
45	45°
90	90°

MA-2



Variable Position Sensor

Specifications

Type of Sensor ..... Solid State
Application ..... Relay, PLC, IC Circuit
Output Method ..... NPN
Load Voltage ..... 5 to 30VDC
Load Current ..... 5 to 200 mA
Max. Power Consumption of Switch Control ..... Max. 200 mA at 24V
Max. Leak Current ..... Max. 10 µA
Internal Voltage Drop 1.5VDC
Mean Response Time ..... 1 ms
Shock Resistance ..... 490 m/s²
Ambient Temperature ..... 5 to 60°C
Enclosure Rating IP67
Hysteresis ..... Approximately 2°
Response Range ..... 23° +/- 7°
Lead Wire Length ..... 1 meter

Size	Part Number
1	FR-1PRN
3	FR-3PRN
10	FR-10PRN
20	FR-20PRN
30	FR-30PRN

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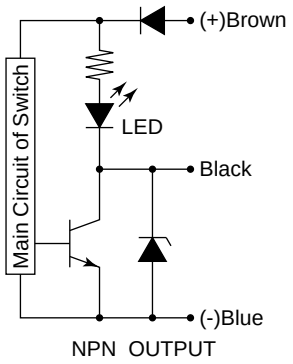
A076

Solid State Sensors

Specifications

Application ..... Relay, PLC, IC Circuit
Output Method ..... NPN
Load Voltage ..... 5 to 30VDC
Load Current ..... 5 to 200 mA
Max. Power Consumption of Switch Control ..... Max. 20 mA at 24V
Max. Leak Current ..... Max. 10 µA
Internal Voltage Drop ..... 1.5V or Less
Mean Response Time ..... 1 ms
Shock Resistance ..... 490 m/s²
Ambient Temperature ..... 5 to 60°C
Enclosure Rating IP67
Indicator Light ..... Red LED
Lead Wire Length ..... 1 meter

MG2



NPN OUTPUT

Model Code and Ordering Information

Example: FM50 - 90 - 45 - MA2

FM **50** – **90** – **45** – **MA** **2**

Size
50
150
300
800

Rotation	
090	90°
180	180°
270	270°

Reference Point	
45	45°
90	90°

Sensor Type	
MA	Reed
MG	Solid State

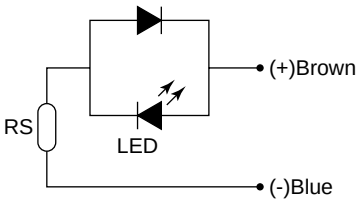
Number Sensors	
2	Standard

Reed Sensors

Specifications

Output Method ..... NPN
Load Current ..... 5 to 45 mA
Internal Voltage Drop ..... 2V or Less
Mean Response Time ..... 1.0 ms
Shock Resistance ..... 294 m/s²
Ambient Temperature ..... 5 to 60°C
Indicator Light ..... Red LED
Lead Wire Length ..... 1 meter

MA-2

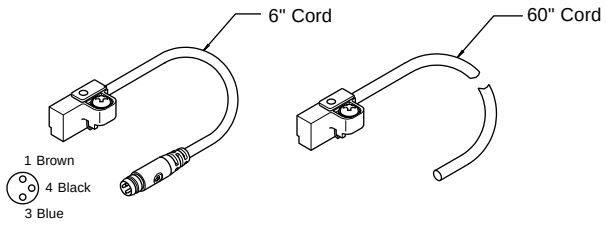


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Solid State (Hall Effect) Sensors

Part Numbers

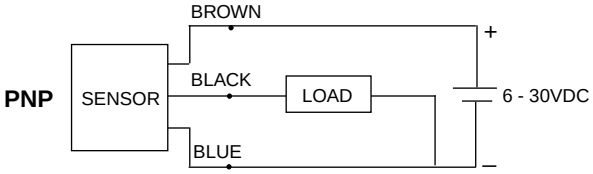
Part No.	Type	LED Color	Logic	Cable/Connector
SMH-1P	N.O.	Green	PNP	1.5m Black with Leads
SMH-1N	N.O.	Red	NPN	
SMC-1P	N.C.	Yellow	PNP	
SMC-1N	N.C.	White/Red	NPN	
SMH-1PC	N.O.	Green	PNP	0.15m Black with Connector
SMH-1NC	N.O.	Red	NPN	
SMC-1PC	N.C.	Yellow	PNP	
SMC-1NC	N.C.	White/Red	NPN	

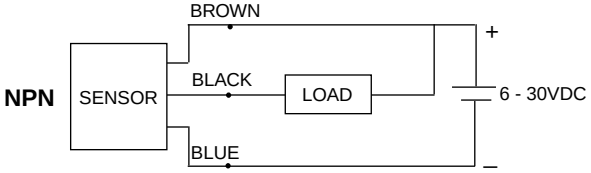


Specifications

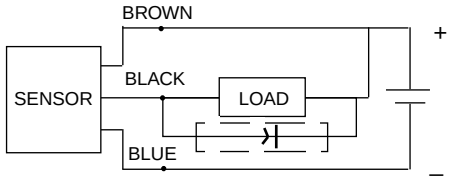
Type ..... Solid State Type (PNP or NPN)
Switching Logic..... Normally Open or Normally Closed
Supply Voltage Range ..... 6 - 30 VDC
Max. Switch Current ..... 150 mA
Current Consumption ..... 7 mA at 12 VDC, 14 mA at 24 VDC
Switching Response..... 500 Hz Maximum
Residual Voltage..... 0.8 V Maximum (150 mA)
Leakage Current..... 10 uA Maximum
Insulation Resistance ..... 100 M ohm min.
Min. Current for LED..... 1mA
Operating Temperature..... -10° to 85°C (14° to 185°F)**
Lead Termination..... 1500 mm (60 in) or 150 mm (6 in) with connector
Enclosure Rating IP67
Shock Resistance..... 50 G's, 490 m/sec^2

WIRING CONNECTION





PROTECTION CIRCUIT*



* When connecting an inductive load (relay, solenoid valve, etc.), a protection circuit is recommended. Use a 100V, 1A diode. (NPN connection shown.)

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A076

Reed Sensors

Reed sensors are available in a normally open or normally closed configuration. The low amp sensor is suitable for connection to PLCs or other low current devices. The high amp sensor can be used to drive sequencers, relays, coils, or other devices directly.

SMR-1L or SMD-1L Low Amp Reed Sensor Specifications

Switching Logic..... Normally Open (SMR-1L)
Normally Closed (SMD-1L)
Voltage Rating ..... 85-125 VAC or
6-30 VDC* (N.O.)
6-30 VAC, 6-30 VDC* (N.C.)
Power Rating:
AC or DC Resistive Load..... 10 watts (N.O.)
AC or DC Inductive Load..... 5 watts (N.O.)
AC or DC ..... 3 watts (N.C.)
Switching Current Range:
Resistive Load (PC, Sequencer) .... 5-40 mA (N.O.),
5-25 mA (N.C.)
Inductive Load (Relay)..... 5-25 mA
Minimum Current for LED..... 5 mA
Switching Response..... 300 Hz (N.O.), 200 Hz (N.C.)
Breakdown Voltage..... 200 VDC
Contact Resistance ..... 100 M ohm min.
Operating Temperature..... -10° to 85°C (14° to 185°F)
Lead Termination..... 1.5m (60 in) or
0.15m (6 in) with connector
Enclosure Rating IP67
Shock Resistance..... 30 G's, 300 m/sec^2

SMR-1 High Amp Reed Sensor Specifications

Switching Logic..... Normally Open
Voltage Rating ..... 85-125 VAC or 5-30 VDC*
Power Rating:
AC or DC Resistive Load..... 10 watts
AC or DC Inductive Load..... 5 watts
Switching Current Range:
Resistive Load (PC, Sequencer) .... 30-300 mA
Inductive Load (Relay)..... 30-100 mA
Minimum Current for LED..... 18 mA
Switching Response..... 300 Hz Maximum
Breakdown Voltage..... 200 VDC
Contact Resistance ..... 100 M ohm min.
Operating Temperature..... -10° to 85°C (14° to 185°F)
Lead Termination..... 1.5m (60 in) or
0.15m (6 in) with connector
Enclosure Rating IP67
Shock Resistance..... 30 G's, 300 m/sec^2

* Polarity is restricted for DC operation
(+) to Brown
(-) to Blue
If these connections are reversed the contacts will close, but the LED will not light.

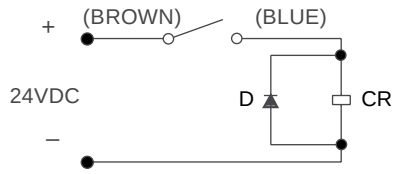
Note: Care must be taken not to exceed the Power Rating of the sensor while still observing the voltage and current limitations.

Part Numbers

Part No.	Type	LED Color	Rating	Cable/Connector
SMR-1	N.O.	Green	High Amp	1.5m Gray with Leads
SMR-1L	N.O.	Red	Low Amp	
SMD-1L	N.C.	Yellow	Low Amp	
SMR-1C	N.O.	Green	High Amp	0.15m Gray with Connector
SMR-1LC	N.O.	Red	Low Amp	
SMD-1LD	N.C.	Yellow	Low Amp	

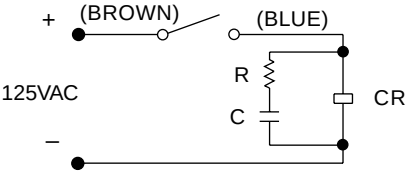
Integral Circuit for Switching Contact Protection

(Required for proper operation 24V DC)
Put Diode parallel to load (CR) with polarity as shown below.



D: Diode: select a Diode with the breakdown voltage and current rating according to the load.
CR: Relay coil (under 0.5 W coil rating)

(Recommended for longer sensor life 125V AC)
Put resistor and capacitor parallel to load (CR).



CR: Relay coil (under 2 W coil ratings)
R: Resistor under 1 K ohm
C: Capacitor 0.1 µF

M

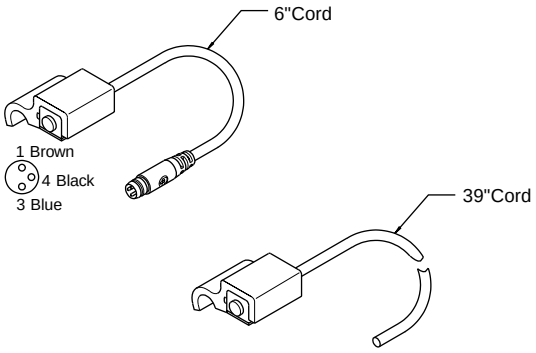
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Solid State (Hall Effect) Sensors

Part Numbers

PTR Model	PNP		NPN	
	With 6" Male Quick Connect	With 39" Potted-in Leads	With 6" Male Quick Connect	With 39" Potted-in Leads
10	SWH-1PC	SWH-1P	SWH-1NC	SWH-1N
15	SWH-1PC	SWH-1P	SWH-1NC	SWH-1N
20	SWH-2PC	SWH-2P	SWH-2NC	SWH-2N
25	SWH-2PC	SWH-2P	SWH-2NC	SWH-2N
32	SWH-2PC	SWH-2P	SWH-2NC	SWH-2N

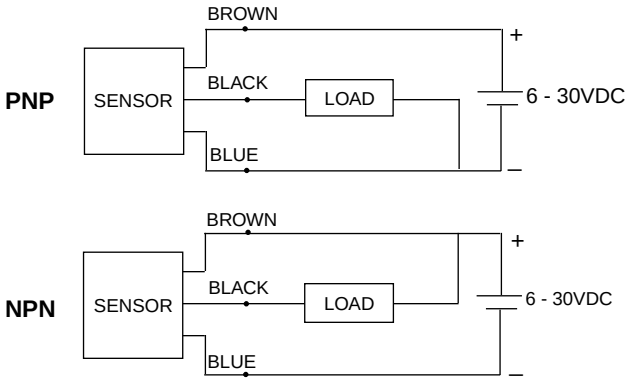
Note: Sensors with male quick connect option require female cordsets to be ordered separately. See page M22.



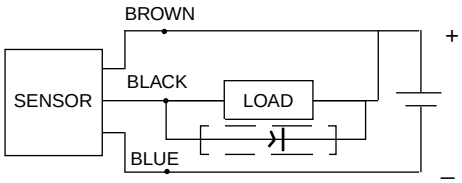
Specifications

Type ..... Solid State (PNP or NPN)
Switching Logic..... Normally Open
Supply Voltage Range ... 6 - 30VDC
Current Output Range ... Up to 100 mA at 5 VDC, Up to 200 mA at 12 VDC and 24 VDC
Current Consumption .... 7 mA at 5 VDC, 15 mA at 12 VDC, and 30 mA at 24 VDC
Switching Response ..... 1000 Hz Maximum
Residual Voltage..... 1.5V Maximum
Leakage Current..... 10uA Maximum
Breakdown Voltage..... 1.8kVACrms for 1 sec., lead to case
Min. Current for LED..... 1mA
Operating Temperature.. 14 to 140°F (-10 to 60°C)
Enclosure Rating ..... Meets IEC IP67, fully encapsulated
Lead Wire ..... 3 conductor, 24 gauge
Lead Wire Length ..... 39 in (1 m)
Vibration Resistance..... 10-55 Hz, 1.5mm double amplitude

WIRING CONNECTION



PROTECTION CIRCUIT*



* When connecting an inductive load (relay, solenoid valve, etc.), a protection circuit is recommended. Use a 100V, 1A diode. (NPN connection shown.)

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Reed Sensors

Part Numbers

PTR Model	With 6" Male Quick Connect	With 39" Potted-in Leads
10	SWR-1C	SWR-1
15	SWR-1C	SWR-1
20	SWR-2C	SWR-2
25	SWR-2C	SWR-2
32	SWR-2C	SWR-2

Sensors with male quick connect option require female cordsets to be ordered separately.
See page M22.

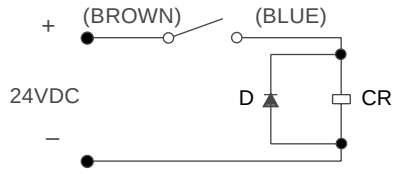
Specifications

Switching Logic.....Normally Open
Voltage Rating .....85-125 VAC or 6-30 VDC*
Power Rating .....10 Watts AC or DC/ Resistive Load
5 Watts AC or DC/Inductive Load
Switching Current Range...10-200 mA/Resistive Load (PC, Sequencer)
10-100 mA/Inductive Load (Relay)
Switching Response.....300 Hz Maximum
Breakdown Voltage.....1.8kVACrms for 1 sec., lead to case
Min. Current for LED.....18mA
Operating Temperature.....14 to 140°F (-10 to 60°C)
Enclosure Rating .....Meets IEC IP67, fully encapsulated
Lead Wire .....2 conductor, 22 Gauge
Lead Wire Length .....39 in (1 m)
Vibration Resistance.....10-55 Hz, 1.5mm double amplitude

* Polarity is restricted for DC operation
(+) to White
(-) to Black
If these connections are reversed the contacts will close, but the LED will not light.

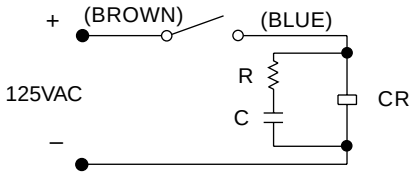
PROTECTION CIRCUIT (INDUCTIVE LOADS)

(Required for proper operation 24VDC)
Select a diode with a breakdown voltage and current rating according to the load (CR). Place a diode in parallel to the load with the polarity as indicated:



CR: Relay coil (under 0.5W coil rating)

(Recommended for longer sensor life 125VAC)
Select a resistor and capacitor according to the load (CR). Place a resistor and capacitor in parallel to the load:



CR: Relay coil (under 2W coil rating)
R: Resistor under 1 K ohm
C: Capacitor 0.1 µF

M

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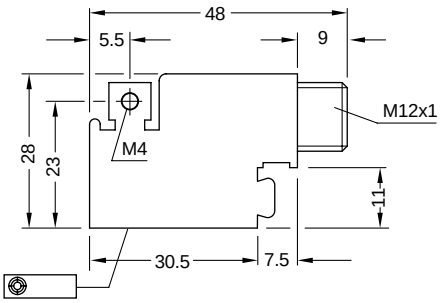
Weld Immune Sensors CE

- Weld immune in all welding applications (AC, DC and medium frequency welding).
- Sensor locks the output during the welding process; when welding process stops, the sensor updates the output accordingly.
- NOTE: Tie rod construction of the P1D Series can be ordered directly in the model code (please see page C8).

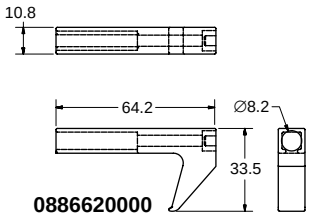
Part Number	Description
0886600000	Weld Immune Sensor
0886620000	Tie Rod Bracket Kit

Specifications

Type	Electronic
Output function	Normally Open
Switching Output	PNP (3-Wire)
Operating voltage	10-30 VDC
Response sensitivity	≤ 30 Gauss
Switching frequency	40 Hz
Residual ripple	≤ 10% of Supply Voltage
Voltage drop	≤ 2 VDC
Power consumption, attenuated	≤ 32mA
Power consumption, unattenuated	≤ 18mA
Continuous current	≤ 300mA
Hysteresis	≤ 1.5mm
Repeatability	≤ 0.1mm
EMC	EN 60 947-5-2
Wire break protection	Yes
Short circuit protected	Yes
Reverse polarity protected	Yes
Power-up pulse suppression	Yes
Enclosure rating	IP67
Shock/vibration stress	30 g, 11ms, 10-55 Hz, 1mm
Operating temperature	-25°C to +75°C (-13°F to +167°F)
Housing material	Die-cast zinc with PTFE coating
LEDs	Status Indicator (yellow) Function Indicator (green)
Connector	M12 connector

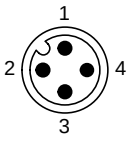


0886600000

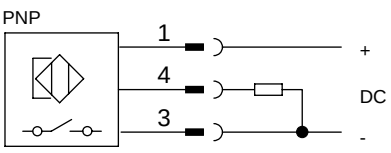


0886620000

Wiring Connection



Pin	Function
1	Operating Voltage (+VDC)
4	Output Signal (N.O.)
3	-VDC
2	Not used



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C086/A074/A076

8mm Cordset with Female Quick Connect

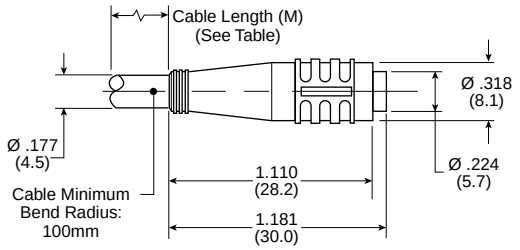
A female connector is available for all sensors with the male 8mm quick connect option. The male plug will accept a snap-on or threaded connector. Cordset part numbers are listed below:

Cable Length	Threaded Connector	Snap On Connector
5 meters	086620T005	086620S005
2 meters	086620T002	086620S002

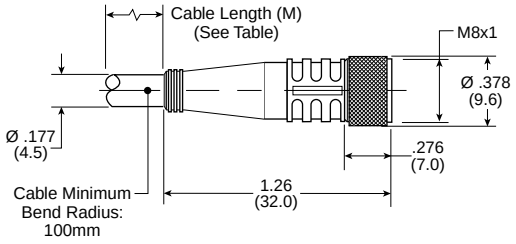
Cordset Specifications

Connector ..... Oil resistant polyurethane body material, PA 6 (Nylon) contact carrier, spacings to VDE 0110 Group C, (150 AC/DC)
Contacts ..... Gold plated beryllium copper, machined from solid stock
Coupling Method ..... Snap-Lock or chrome plated brass nut
Cord Construction ..... Oil resistant black PUR jacket, non-wicking, non-hygroscopic, 300V. Cable end is stripped and tinned.
Conductors ..... Extra high flex stranding, PVC insulation
Temperature ..... -40 to 194°F (-40 to 90°C)
Protection ..... NEMA 1, 3, 4, 6P and IEC 1P67
Cable Length ..... 6.56 ft (2m) or 16.4 ft (5m)

Snap-On Straight Connector



Threaded Straight Connector



12mm Cordset with Female Quick Connect

M12 Straight Connector	
Cable Length	**Part Number**
5 meters	9126487205
2 meters	9126487202

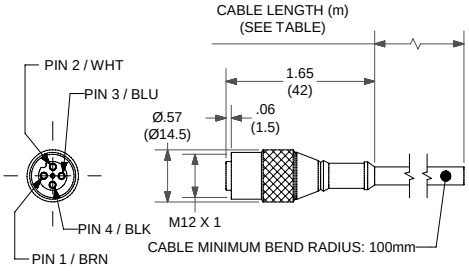
A female connector is available for all sensors with the male 12mm quick connect option. The cordsets are available with a right angle or straight connector. Cordset part numbers are listed above.

Cordset Specifications

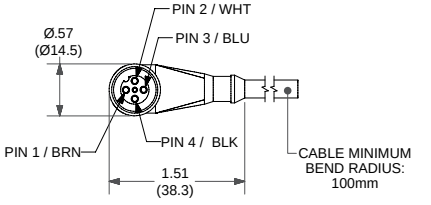
Connector ..... Polyvinylchloride (PVC) body material, PVC contact carrier, spacing to VDE 0110 Group C, (250VAC / 300VDC)
Contacts ..... Gold Plated Copper Tin (CuSn), stamped from stock.
Coupling Method ..... Threaded nut: Chrome plated brass.
Cord Construction..... PVC non-wicking, non-hygroscopic, 250VAC / 300VDC. Cable end is stripped.
Conductors ..... Extra high flex stranding with PVC insulation
Temperature ..... -13°F to 158°F (-25°C to 70°C)
Protection ..... NEMA 1, 3, 4, 6P and IEC 1P67
Cable Length ..... 6.56 ft (2m) or 16.4 ft (5m)

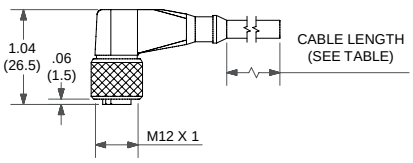
M12 Right Angle Connector	
Cable Length	**Part Number**
5 meters	9126487305
2 meters	9126487302

Straight Connector



Right Angle Connector





M

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Connection Block Valvetronic 110

The Valvetronic 110 is a connection block that can be used for collecting signals from sensors at various points on a machine and connecting them to the control system via a multicore cable. Valvetronic 110 can also be used for central connection of the multi-core cable to the outputs of a control system, and can be laid to a machine where the output signals can be connected. The connection block has ten 8 mm snap-in connectors and a multi-core cable which is available in lengths of 3 or 10 m. The connections on the block are numbered from 1 to 10. Blanking plugs are available for unused connections, as labels for marking the connections of each block.



Technical Data

Connections

Ten 3-pole numbered 8 mm round snap-in female contacts



Input block
Pin 1 Common, +24 VDC
Pin 2 Input signal
Pin 3 Common, 0V



Output block
Pin 1 Common, GND
Pin 2 Output signal
Pin 3 Common, 0V

Electrical Data

Voltage..... 24 VDC (max. 60 V AC/75 V DC)
Insulation group..... according to DIN 0110 class C
Load..... max. 1 A per connection
total max. 3 A

Cable

Length..... 3 m or 10 m
Type of cable LifYY11Y
Conductor..... 12
Area..... 0.34 mm^2
Color marking ..... According to DIN 47 100

Mechanical Data

Enclosure..... IP 67, DIN 40050 with fitted contacts and/or blanking plugs.
Temperature ..... –20 °C to +70 °C

Material

Body ..... PA 6,6 VD according to UL 94
Contact holder ..... PBTP
Snap-in ring ..... LDPE
Moulding mass ..... Epoxy
Seal ..... NBR
Screws..... Plated steel

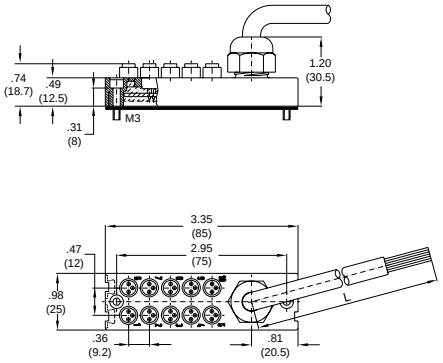
Industrial Durability

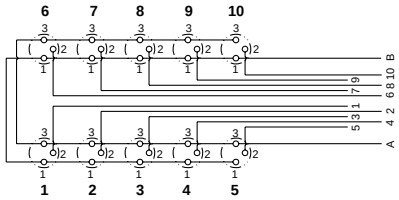
Good chemical and oil resistance. Tests should be performed in aggressive environments.

Ordering Information

Part Number	Designation	Weight kg
9121719001	Connection block Valvetronic 110 with 3 m cable	0.32
9121719002	Connection block Valvetronic 110 with 10 m cable	0.95
9121719003	Blanking plugs (pack of 10) Use blanking plugs to close unused connections.	0.02
9121719004	Labels (pack of 10) White labels to insert in grooves on the side of the connection	0.02

Dimensions and Wiring Diagrams





Conductor	Color	Input	Output
1	Pink	Signal 1	Signal 1
2	Grey	Signal 2	Signal 2
3	Yellow	Signal 3	Signal 3
4	Green	Signal 4	Signal 4
5	White	Signal 5	Signal 5
6	Red	Signal 6	Signal 6
7	Black	Signal 7	Signal 7
8	Violet	Signal 8	Signal 8
9	Grey-Pink	Signal 9	Signal 9
10	Red-Blue	Signal 10	Signal 10
A	Blue	0 V	0 V
B	Brown	+24 V	PE

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C086

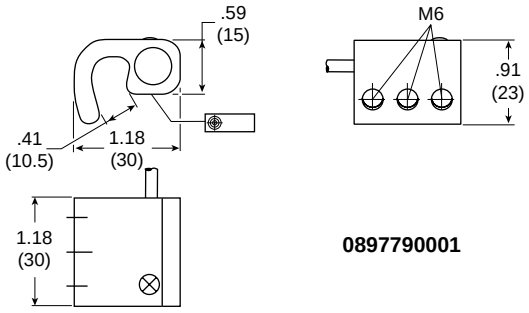
NAMUR Intrinsically Safe Sensors

For Tie Rod Style Cylinders

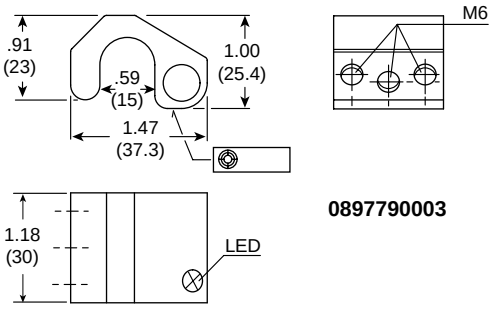
Part Number	Sensor Description
089779001	Fits 1-1/8" to 4" bore and 32-100mm bore (2m flying lead)
089779002	Fits 1-1/8" to 4" bore and 32-100mm bore (12mm connector)
089779003	Fits 5" to 6" bore and 125-160mm bore (2m flying lead)
089779004	Fits 5" to 6" bore and 125-160mm bore (12mm connector)
089779005	Fits 8" bore and 200mm bore (2m flying lead)
089779006	Fits 8" bore and 200mm bore (12mm connector)

Specifications

Electrical configuration ..... NAMUR 2-Wire
Output function ..... NAMUR
Supply voltage ..... 5-25 VDC
Response sensitivity ..... ≤ 30 Gauss
Switching frequency ..... 5 kHz
Switching output ..... Control current dependent on switching
Residual ripple ..... ≤ 5% of Supply Voltage
Power consumption, attenuated ..... ≥ 2.5mA
Power consumption, unattenuated . ≤ 1mA
Internal capacitance ..... ≤ 15nF
Internal inductance ..... ≤ 25 µH
Cable resistance ..... ≤ 50 Ohm
Hysteresis ..... ≤ 1mm
Repeatability ..... ≤ 0.1mm
EMC ..... EN 60 947-5-6
Short circuit protected ..... Yes
Reverse polarity protected ..... Yes
Enclosure rating IP67
Shock/vibration stress ..... 30 g, 11ms, 10-55 Hz, 1mm
Operating temperature ..... -25ºC to +70ºC (-13ºF to +158ºF)
Housing material ..... aluminum, plastic
Connector cable ..... PVC with Flying Leads (shown)
Connector (option) ..... M12 connector
Classification ..... TÜV 99 ATEX 1398 II 2G EEx ib IIC T6



0897790001

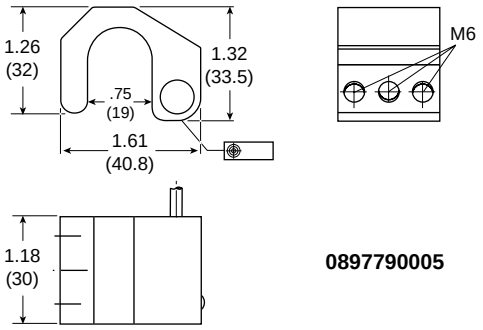


0897790003

Data for Connecting Power Supplies or other approved isolating amplifiers:

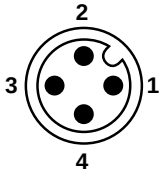
Short circuit current 1_{Kmax} ..... ≤ 30mA
No load voltage ..... ≤ 16VDC
Power loss ..... ≤ 75mW

Note: Intrinsically safe solutions must include a NAMUR Power Supply

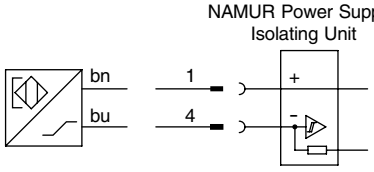


0897790005

Wiring Connection



Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
4	Blue	-VDC
2		Not Used
3		Not Used



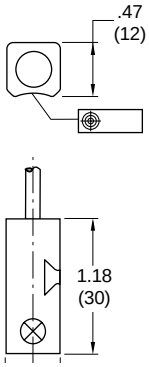
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C086

NAMUR Intrinsically Safe Sensors

For Round Body Cylinders

Part Number	Description
0897790007	NAMUR Sensor for round body cylinder
0897800001	Bracket for 18-29mm (0.71"-1.14") outer diameter
0897800002	Bracket for 28-39mm (1.10"-1.54") outer diameter
0897800003	Bracket for 38-49mm (1.50"-1.93") outer diameter
0897800004	Bracket for 48-59mm (1.89"-2.32") outer diameter
0897800005	Bracket for 58-69mm (2.28"-2.72") outer diameter
0897800006	Bracket for 68-79mm (2.68"-3.11") outer diameter
0897800007	Bracket for 88-99mm (3.46"-3.90") outer diameter
0897800008	Bracket for 98-109mm (3.86"-4.29") outer diameter



0897790007

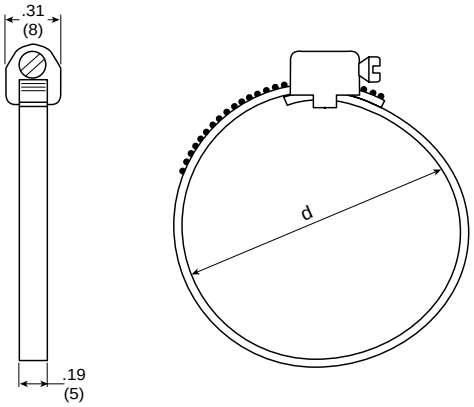
Specifications

Electrical configuration ..... NAMUR 2-Wire
Output function ..... NAMUR
Supply voltage ..... 5-25 VDC
Response sensitivity ..... ≤ 30 Gauss
Switching frequency ..... 5 kHz
Switching output ..... Control current dependent on switching
Residual ripple ..... ≤ 5% of Supply Voltage
Power consumption, attenuated ..... ≥ 2.5mA
Power consumption, unattenuated .... ≤ 1mA
Internal capacitance ..... ≤ 15nF
Internal inductance ..... ≤ 25 µH
Cable resistance ..... ≤ 50 Ohm
Hysteresis ..... ≤ 1mm
Repeatability ..... ≤ 0.1mm
EMC ..... EN 60 947-5-6
Short circuit protected ..... Yes
Reverse polarity protected ..... Yes
Enclosure rating IP67
Shock/vibration stress ..... 30 g, 11ms, 10-55 Hz, 1mm
Operating temperature ..... -25ºC to +70ºC (-13ºF to +158ºF)
Housing material ..... aluminum, plastic
Connector cable ..... PVC with Flying Leads (shown)
Classification ..... TÜV 99 ATEX 1398 II 2G EEx ib IIC T6

Data for Connecting Power Supplies or other approved isolating amplifiers:

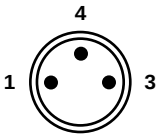
Short circuit current 1_{Kmax} ..... ≤ 30mA
No load voltage ..... ≤ 16VDC
Power loss ..... ≤ 75mW

Note: Intrinsically safe solutions must include a NAMUR Power Supply

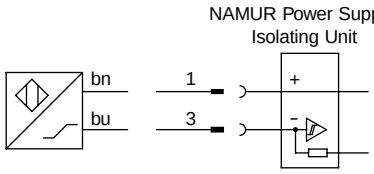


Round Body Brackets

Wiring Connection



Pin	Wire	Function
1	Brown	Operating Voltage (+VDC)
3	Blue	-VDC
4		Not Used



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C086

NAMUR Sensor Power Supply

CE

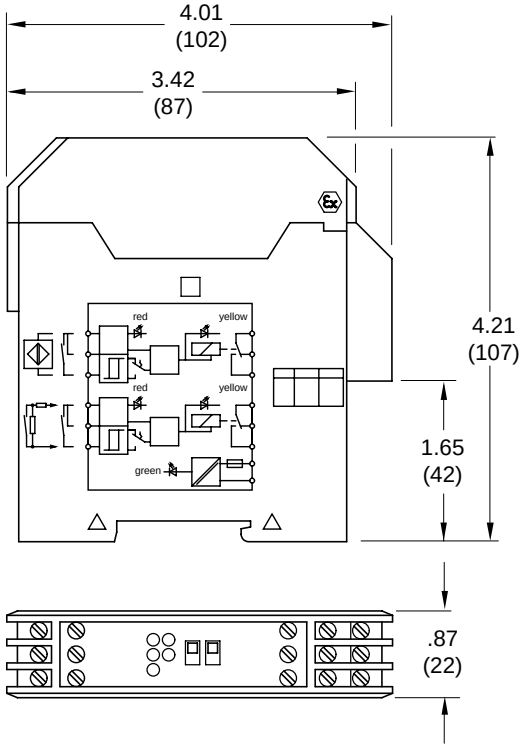
For All NAMUR Sensors

Part Number	Supply Voltage
0897810001	115VAC
0897810002	230VAC
0897810003	24VDC

- Reliable DC-decoupling between input, output and supply voltage in accordance with VDE 0100 Part 410
- 2-channel with one relay output SPDT respectively
- Intrinsically safe inputs complying with [EEx 1a] IIC
- Housing with snap fastening for support rail DIN 46277

Specifications

Supply voltage ..... 115 VAC (p/n 0897810001)
230 VAC (p/n 0897810002)
24 VDC (p/n 0897810003)
Mains frequency ..... 48-62 Hz
Switching frequency ..... ≤ 20 Hz
Power consumption per channel .... Approximately 1.5 VA
Approximately 0.7 W only for p/n 0897810003
Inputs..... 2 sensors
No load voltage..... 8.5 VDC
Short circuit current ..... ≥ 6mA
Permissible external capacitance ... ≤ 567nF
Permissible external inductance ..... ≤ 5 mH
Switching outputs ..... 1 relay per input: SPDT
Switching voltage..... ≤ 250 VAC
Switching current..... ≤ 5 A
Switching output ..... ≤ 100 VA
Permit ..... PTB no. Ex-95.C.2003X
VDE protection class I
Enclosure rating..... IP20
Operating temperature ..... -25ºC to +60ºC (-13ºF to +140ºF)
Approximate weight ..... 250g (8.8 oz.)
Housing material..... Plastic



M

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C052

Ordering Information

Sensor Type	Inductive Proximity			Non-contacting Magnetically Actuated	
Style	**EPS-7**	**EPS-5**	**EPS-6**	**CLS-1**	**CLS-4**
Sensor Part Number	148897****	146617****	148896****	148275****	149109****
6' Cable	0853550006	0853550006	0859170006	0853550006	—
12' Cable	0853550012	0853550012	0859170012	0853550012	—
6' Cable, Right Angle	0875470006	0875470006	—	0875470006	—

**** Part Number Suffix: **** 4-digit suffix indicates probe length: 0125=1.25", 0206=2.06", 0288=2.875", 0456=4.562"

Specifications

Style	**EPS-7**	**EPS-5**	**EPS-6**	**CLS-1**	**CLS-4**
Code Designator	H	R	D	F	B
Sensor Type	Inductive proximity	Inductive proximity	Inductive Proximity	Non-contacting magnetically actuated	Non-contacting magnetically actuated
Description	Economical, General Purpose, 2 wire device, primarily for AC applications, not suitable for 24 VDC applications. Use EPS-5 only for automotive industry customers who specify them.		Economical, General Purpose, 3 wire, DC sensor, dual output: sinking and sourcing	Functional replacement for AB (Mechanical) Limit Switches in many applications, or where customer needs NC contacts, zero leakage, zero voltage drop, higher or lower load current than EPS-style.	Functional replacement for AB (Mechanical) Limit Switches in many High Temperature applications, or where customer needs NC contacts, zero leakage, zero voltage drop, higher or lower load current than EPS-style.
Supply Voltage	20 to 250 VAC/DC	20 to 230 VAC/DC	10 to 30 VDC	24 to 240 VAC/DC	24 to 240 VAC/DC
Load Current, min	8 mA	5 mA	NA	NA	NA
Load Current, max	300 mA	500 mA	200 mA	4 AMPS @ 120 VAC 3 AMPS @ 24 VDC	4 AMPS @ 120 VAC 3 AMPS @ 24 VDC
Leakage Current:	1.7 mA, max.	1.7 mA, max.	10 micro amps max.	—	—
Voltage Drop	7 V, max.	10 V, max	2 VDC max.	NA	NA
Operating Temperature	-14° to +158° F	-4° to +158° F	-14° to +158° F	-40°F to +221° F	-40° F to +400° F
Connection	3-pin mini	3-pin mini	5-pin mini	3-pin mini	144" PTFE Coated Flying Leads with 1/2" conduit hub
Enclosure Rating	IEC IP67	NEMA 4, 6, 12, 13	IEC IP67	NEMA 1, 2, 3, 4, 4x, 5, 6, 6P, 11, 12, 12K, 13	NEMA 1, 2, 3, 4, 4x, 5
LED indication	Yes	Yes	Yes	No	No
Short Circuit Protection	Yes	Yes	Yes	No	No
Weld Field Immunity	Yes	Yes	Yes	Yes	Yes
Output	2 wire, Normally Open with leakage current	2 wire, Normally Open with leakage current	Dual output: DC Sinking and DC Sourcing, user selectable via wiring	SPDT (Single Pole Double Throw), Normally Open/Normally Closed, Form C	SPDT (Single Pole Double Throw), Normally Open/Normally Closed, Form C
Approvals/Marks	CE, UL, CSA	UL	CE, UL, CSA	UL or CSA	UL or CSA
Make/Break Location	0.125" from end of stroke, typical. Tolerance is 0/-0.125"				
Wiring Instructions	Pin 1: AC Ground (Green)	Pin 1: AC Ground (Green)	Pin 1) +10 to 30 VDC (White)	Pin 1: Common (Green)	Common: (Black)
	Pin 2: Output (Black)	Pin 2: Output (Black)	Pin 2) Sourcing Output (Red)	Pin 2: Normally Closed (Black)	Normally Open: (Blue)
	Pin 3: AC Line (White)	Pin 3: AC Line (White)	Pin 3) Grounded (not connected or required)	Pin 3: Normally Open (White)	Normally Closed: (Red)
			Pin 4) Sinking Output (Orange)		
			Pin 5) DC Common (Black)		

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Series and Parallel Wiring

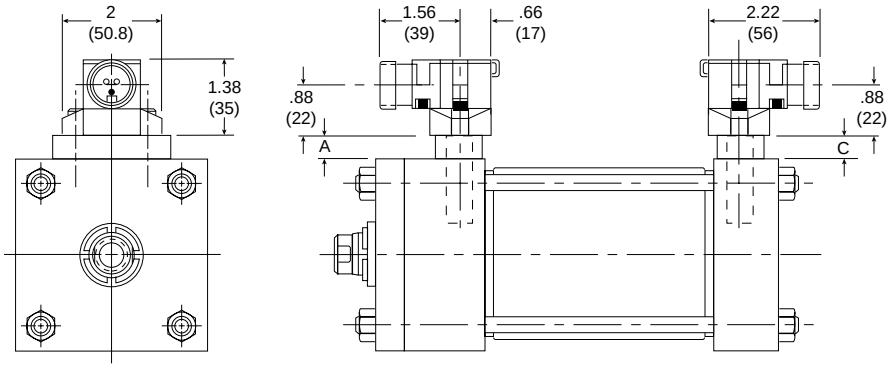
When Parker EPS-5, 6 or 7 proximity sensors are used as inputs to programmable controllers, the preferred practice is to connect each sensor to a separate input channel of the PC. Series or parallel operations may then be accomplished by the internal PC programming.

Parker EPS-5, 6 or 7 sensors may be hard wired for series operation, but the voltage drop through the sensors (see specifications) must not reduce the available voltage below what is needed to actuate the load.

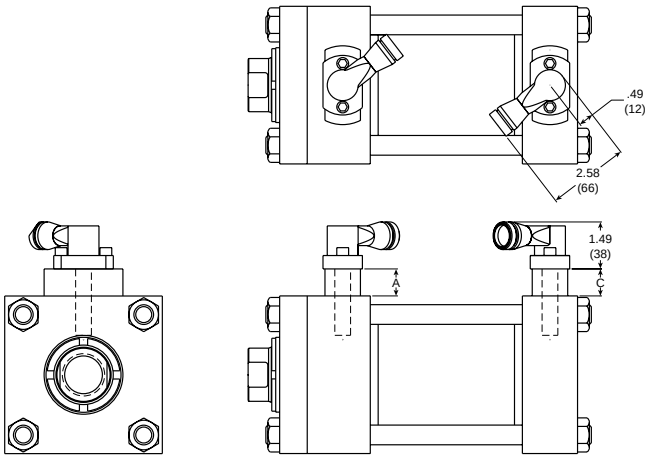
Parker EPS-5, 6 or 7 sensors may also be hard wired for parallel operation. However, the leakage current of each sensor will pass through the load. The total of all leakage currents must not exceed the current required to actuate the load. In most cases, the use of two or more EPS-5, 6 or 7 sensors in parallel will require the use of a bypass (shunt) resistor.

EPS-5
Automotive Applications

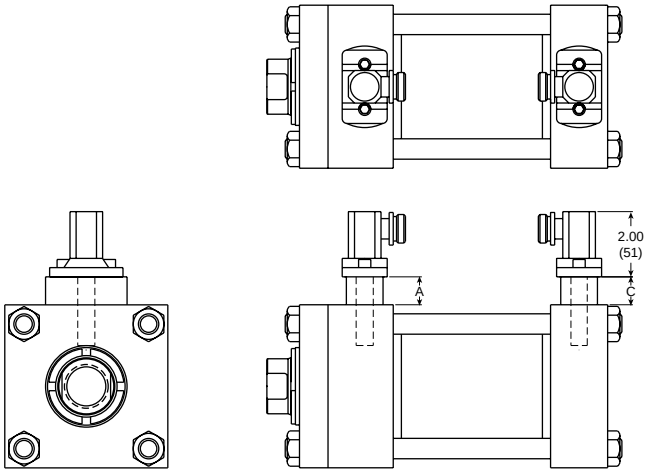
(Meets some Automotive Manufacturer's Specifications)



EPS-7 & EPS-6 Sensors



CLS-1 & 4 Sensors

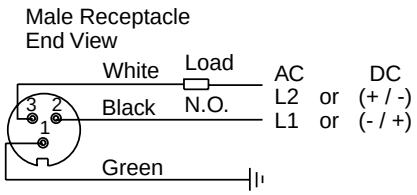


Series	A max.	C max.
2A, 4MA, 4MAJ	1.55"	1.30"

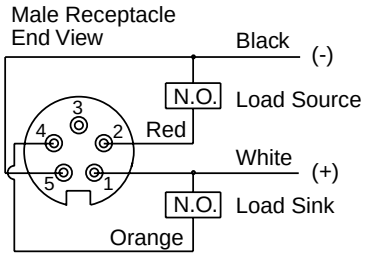
For exact dimensions, see Bulletin 0840-G-E1

Connector Pin Numbering

3-Pin Mini



5-Pin Mini



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How to Specify EPS Sensors

Parker EPS proximity sensors may be ordered on 2A, 2AN, 4MA and 4MAJ Series cylinders as follows:

1) Complete the basic cylinder model number.
2) Place an “S” in the model number to denote sensors and/or special features.
3) Mounting styles D, DB, JB, or HB should be used with caution because of possible mounting interferences. Consult bulletin 0840-G-E1 for additional information.
4) Special modifications to cylinders other than sensors must have a written description.
5) Specify letter prefix “H” for EPS-7, “D” for EPS-6, “R” for EPS-5, “F” for CLS-1, or “B” for CLS-4, then fill in the four fields specifying port location, sensor orientation and actuation point for both head and cap. If only one sensor is used, place “XXXX” in the unused fields.

   Example = H13CGG-XXXX denotes a sensor on the head end only, EPS-7

   Example = BXXXX-42BGG denotes a sensor on the cap end only, CLS-4

Head End

R	1	3	A	GG
Specify: R = EPS-5 H = EPS-7 D = EPS-6 F = CLS-1 B = CLS-4 N = Prep for sensors only	Port Location See Figure 1.	Sensor Location See Figure 1.	Sensor Orientation See Figure 2 for EPS-7 and EPS-6 only.	Actuation Point GG = End of Stroke See Bulletin 0840-G-E1 for stroke remaining.

Cap End

4	2	B	GG
Port Location See Figure 1.	Sensor Location See Figure 1.	Sensor Orientation See Figure 2 for EPS-7 and EPS-6 only.	Actuation Point GG = End of Stroke See Bulletin 0840-G-E1 for stroke remaining.

Note: All specified sensor and port locations are as seen from rod end of cylinder.
*EPS-5 sensors will be oriented so that the connectors face each other.
**Consult the Wadsworth, Ohio facility for this option with 4MA and 4MAJ Series cylinders.

Figure 1

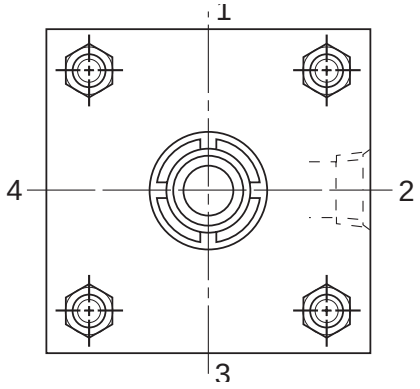
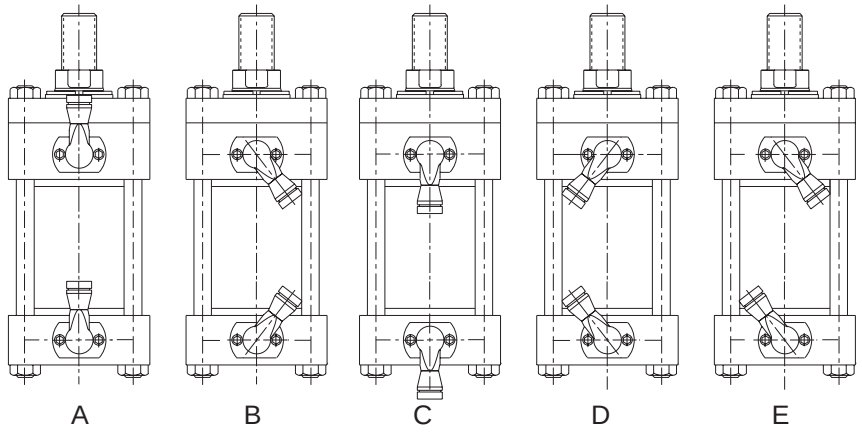


Figure 2



Example:
4.00 CJ4MAUS14AC 12.000
S = H13CGG-13CGG

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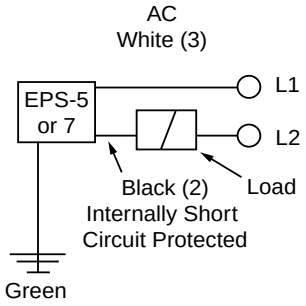
EPS-5 & EPS-7

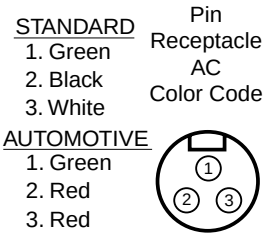
Connectors

The male quick disconnect on the Parker EPS-5 or 7 is a Brad Harrison 40909 connector.

Female connects must be purchased with one of the following cable lengths.

Cable Length	Parker Part Number	
	Automotive	Standard
3'	085356003	0853550003
6'	085356006	0853550006
9'	085356009	—
12'	0853560012	0853550012





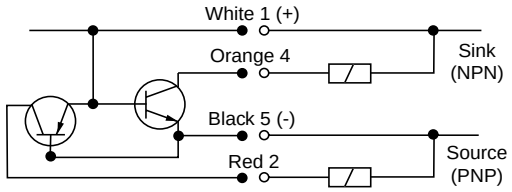
EPS-6

Connectors

The male quick disconnect on the Parker EPS-6 is a Brad Harrison 41310 connector.

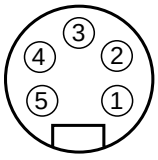
Plug Pin and Cable Identification

1) +10 to 30 VDC (White)
2) Source (Red)
3) Grounded not connected nor required
4) Sink (Orange)
5) Common (Black)



LED Function	"Ready"	"Target"
Power Applied (No Target)	ON	OFF
Target Present	OFF	ON
Short Circuit Condition	FLASH	FLASH

Cable Length	Parker Part Number
3	0859170003
6	0859170006
12	0859170012



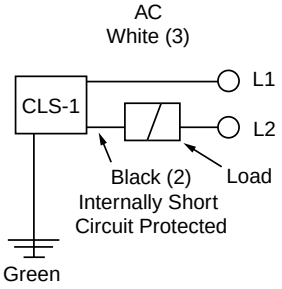
CLS

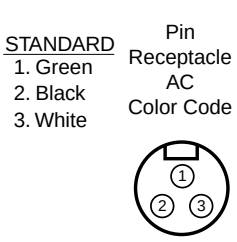
Connectors

The male quick disconnect on the Parker CLS-1 is a Brad Harrison 40909 connector.

Female connects must be purchased with one of the following cable lengths.

Cable Length	Parker Part Number
3'	0853550003
6'	0853550006
9'	—
12'	0853550012





The connection for the CLS-4 are 144" PTFE insulated flying leads with 1/2" conduit hub. 3-wire: Common (black), Normally open (blue), and Normally closed (red).

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Proximity Sensors

The inductive type proximity sensor provides end of rotation indication. The non-contact probe senses the presence of the ferrous cushion spear and has no springs, plungers, cams or dynamic seals that can wear out or go out of adjustment. The sensor is solid state and meets NEMA 3, 4, & 13 specifications. For ease of wiring, the connector housing is rotatable through 360°. To rotate, lift the cover latch, position, and release.

A standard proximity sensor controls 20-230 VAC/DC loads from 5 to 500 mA. The low 1.7 mA off-state leakage current can allow use for direct PLC input. The standard short circuit protection (SCP) protects the sensor from a short in the load or line upon sensing such a condition (5 amp or greater current) by assuming a non-conductive mode. The fault condition must be corrected and the power removed to reset the sensor preventing automatic restarts.

The low voltage DC sensor is also available for use with 10-30 VDC. This sensor is in a non-rotatable housing, but does incorporate the short circuit protection.

Both sensors are equipped with two LEDs, “Ready” and “Target”. The “Ready” LED is lit when power is applied and the cushion spear is not present. The “Target” LED will light and the “Ready” LED will go out when the sensor is closed, indicating the presence of the cushion spear. Both LEDs flashing indicates a short circuit condition.

For Low Voltage DC Sensor (10-30 VDC) information, please refer to pages H27 and H30.

For High Voltage Sensor (20-230 VAC/DC) information, please refer to pages H27 and H30.

Notes:

1. Available with or without cushions.
2. Not available with stroke adjusters.
3. Pressure rating: 3000 PSI
4. Operating temperature: -4°F to 150°F
5. Specify sensor type, orientation and voltage when ordering.
6. The low voltage DC sensor is available in non-rotatable style only, consult representative for further information.

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Inductive Proximity Sensors – 8mm Barrel Type

Proximity sensors are normally ordered with the unit as part of the model number. Use these part numbers for replacement parts only.

Part Numbers

Series	PNP		NPN	
	Quick* Connect	Flying Leads	Quick ** Connect	Flying Leads
HB	B8830-P	913090000	B8830-N	913090100
P5L	B8830-P	913090000	B8830-N	913090100
WR	B8830-P	913090000	B8830-N	913090100

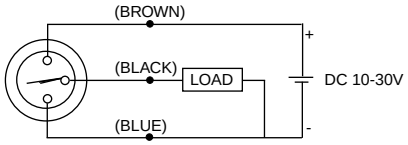
* Order cordset B8757-P separately.

** Order cordset B8757-N separately.

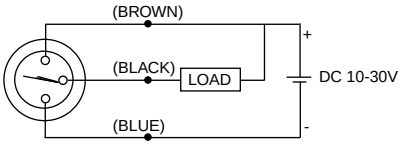
Electrical Specifications

Voltage..... 10-30 VDC (3 wire) PNP or NPN
No Load Current..... 5.5-9.5 mA
Continuous Current 150mA
Switching Speed..... 8 ms
Switch Frequency ..... 5000 Hz
Switching Distance ..... Aluminum = 0.016 in (0.4mm)
Brass = 0.028 in (0.7 mm)
Steel = 0.039 in (1.0 mm)
Overload Protection..... Triggered at 170mA
Reverse Polarity Protection ..... Incorporated
Temp. Range..... -13 to 158°F (-25 to 70°C)
Enclosure Rating ..... Meets NEMA 1,3,4,6,13 and IEC IP67, fully encapsulated

PNP WIRING CONNECTION

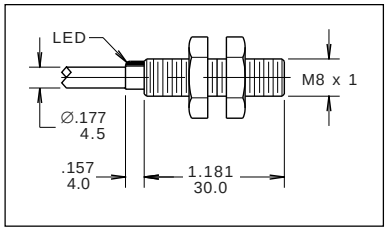


NPN WIRING CONNECTION



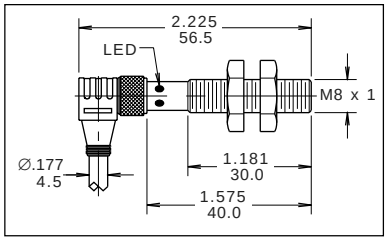
POTTED-IN SENSOR

Lead type sensor with 20 ft. (6m) cord length



PLUG-IN SENSOR

A threaded right angle cordset must be ordered separately. The cordset contains two LEDs: 1 - power, 2 - target indication. Cordset length is 20 ft. (6m).



M

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Industrial Shock Absorbers

Section N



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- Sizing Examples N8-N11
- Installation Examples N12-N13
- Model Rating Charts N14-N15

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Shock Absorber Selection – Adjustable, Miniature
- MA35 - MA900 ..... N24-N25

Magnum Series Shocks
- MC, MA, ML 33 - 64 ..... N26-N34

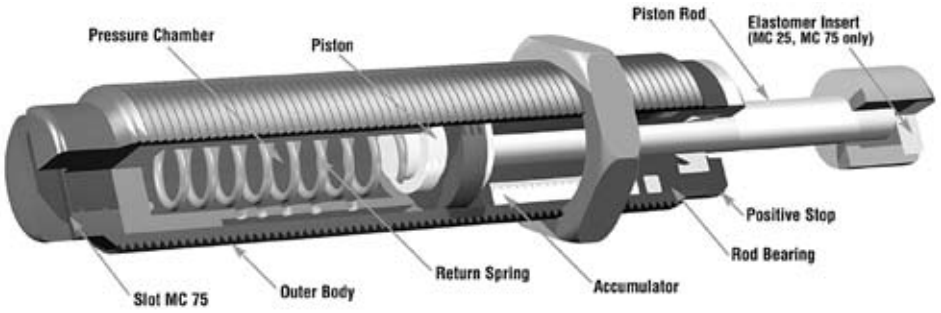
Large Bore Shock Absorbers
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- CA Series 2" - 4" Bore, Self Compensated and Adjustable N38-N45

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- Magnum Series Shocks N50-N52
- Air Oil Tanks N53

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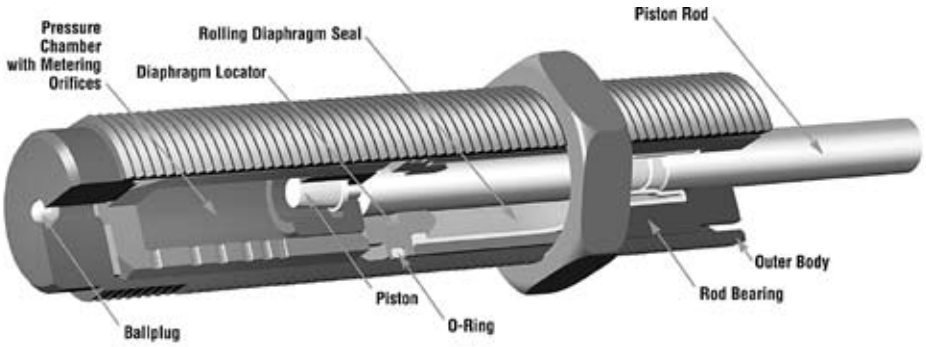
Miniature Shock Absorbers MC 9 to MC 75

Self-Compensating



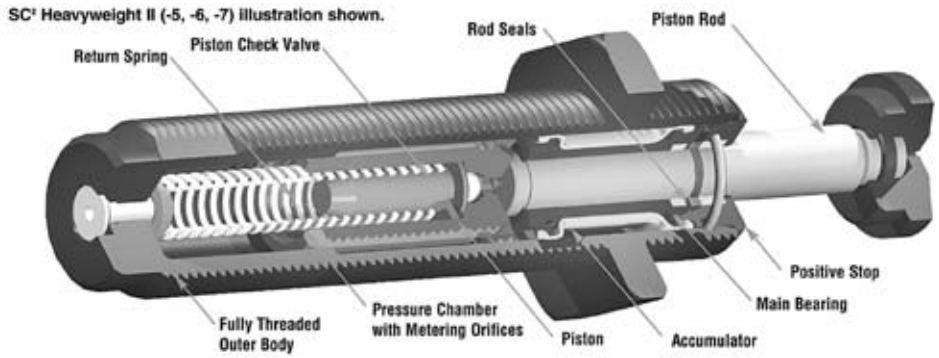
Miniature Shock Absorbers MC 150, MC 225 and MC 600

Self-Compensating



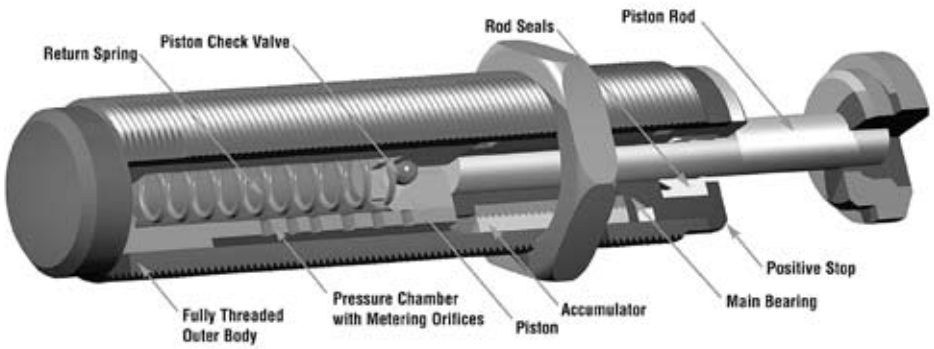
Heavyweight Shock Absorbers SC 300 and SC 650

Soft Contact and Self-Compensating



Miniature Shock Absorbers SC 190 to SC 925

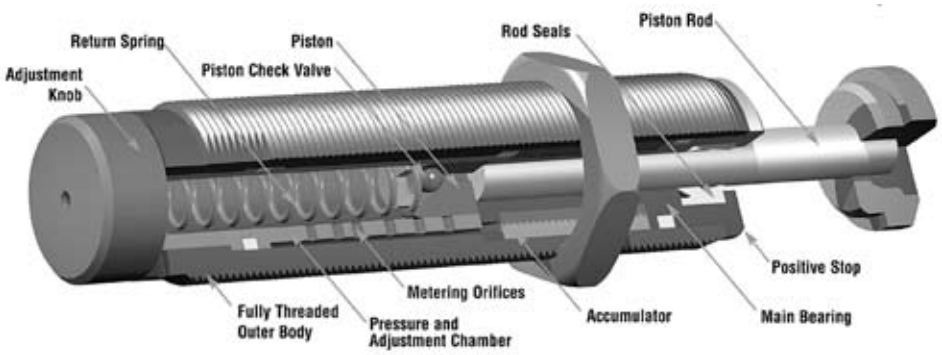
Soft Contact and Self-Compensating



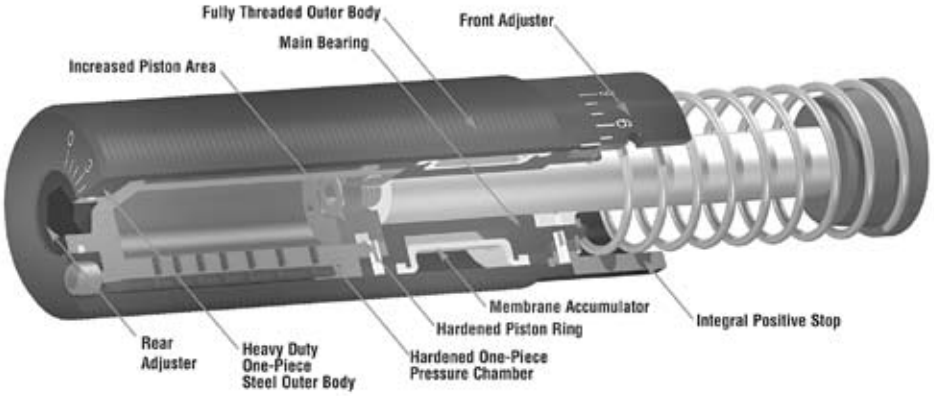
N

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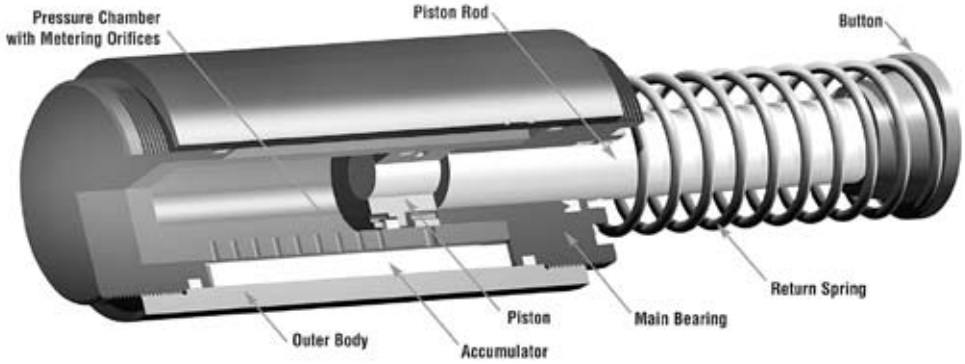
MA Series 225-900 Shock Absorbers (Miniature Adjustable) *Adjustable*



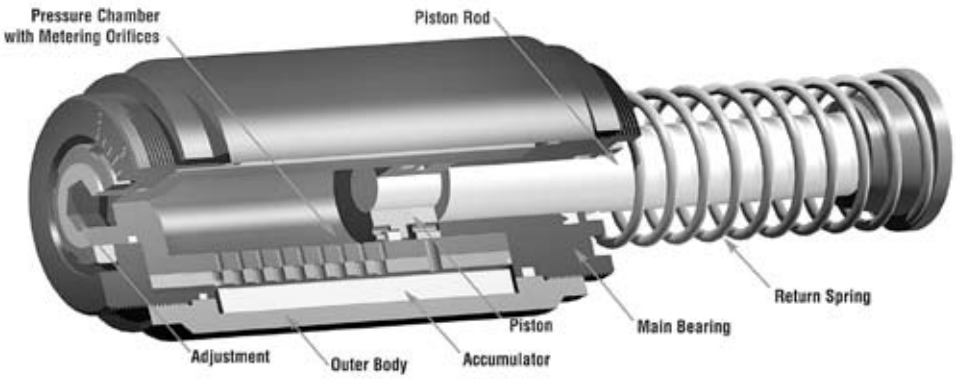
Magnum Series MA and ML 33 to 64 *Adjustable*



Heavy Industrial Shock Absorbers CA to CA 4 *Self-Compensating*

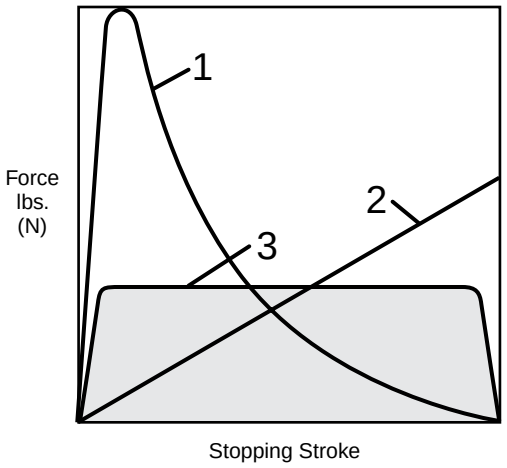


Heavy Industrial Shock Absorbers A2 to A3 *Adjustable*



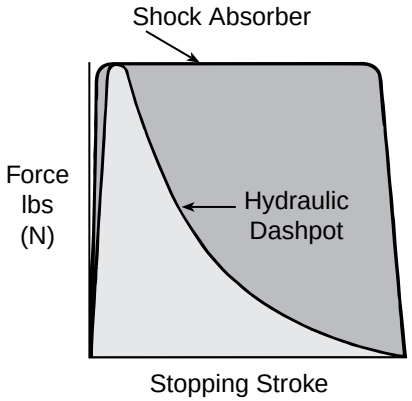
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Comparison



1. **Cylinder Cushions and Dashpots (High stopping force at start of the stroke).**
   With only one metering orifice, the moving load is abruptly slowed down at the start of the stroke. The braking force rises to a very high peak at the start of the stroke (giving high shock loads) and then falls away rapidly.
2. **Springs and Rubber Bumpers (High stopping forces at end of stroke).**
   The moving load is slowed down by a constantly rising reaction force up to the point of full compression. These devices store energy rather than dissipate it, which causes the load to bounce back.
3. **Industrial Shock Absorbers (Uniform stopping force through the entire stroke).** The moving load is smoothly and gently brought to rest by a constant resisting force throughout the entire shock absorber stroke. The load is decelerated with the lowest possible force, in the shortest possible time, eliminating damaging force peaks and shock damage to machines and equipment. This is a linear deceleration force stroke curve and is the curve provided by industrial shock absorbers.

Energy Capacity

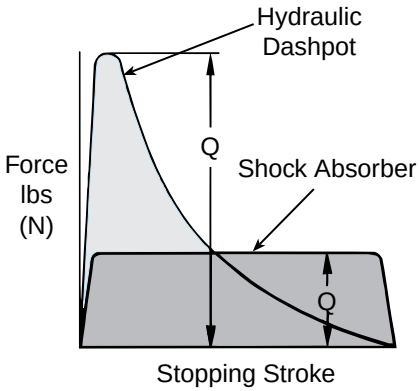


Premise:
Same maximum reaction force.

Result:
The shock absorber can absorb considerably more energy (represented by the area under the curve.)

Benefit:
By installing a shock absorber production rates can be more than doubled without increasing deceleration forces or reaction forces on the machine.

Reaction Force
(stopping force)

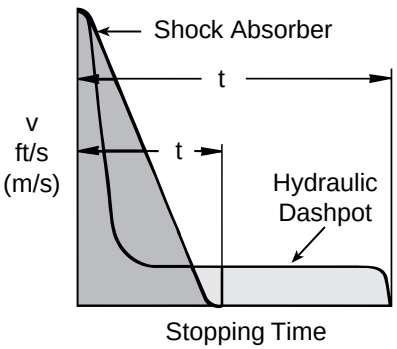


Premise:
Same energy absorption (area under the curve).

Result:
The reaction force transmitted by the shock absorber is very much lower.

Benefit:
By installing the shock absorber the machine wear and maintenance can be drastically reduced.

Stopping Time



Premise:
Same energy absorption.

Result:
The shock absorber stops the moving load in a much shorter time.

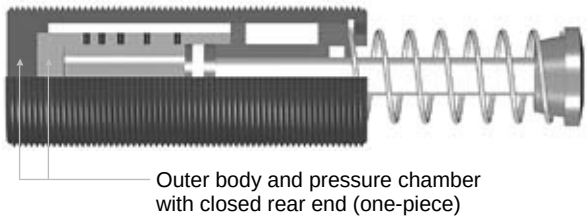
Benefit:
By installing a shock absorber cycle times are reduced giving much higher production rates.

N

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The use of one piece / closed end bodies and inner pressure chambers provides an extremely strong construction, which can withstand much higher internal pressures and overload forces without mechanical damage. Consider what happens if the shock absorber is accidentally overloaded or in the unlikely event of partial oil loss due to excessive seal wear or damage. Compare the internal design used by Parker with that of some of its competitors:

Parker Shock Absorber

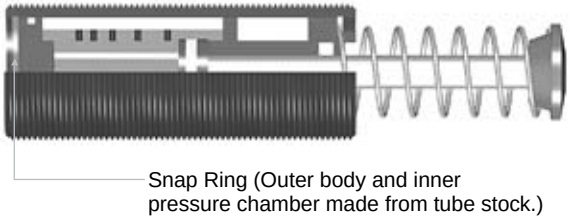


Parker builds its shock absorbers with closed end/one piece bodies and inner pressure chambers, which greatly reduces the chance of sudden failure, or machine damage in the event of an overload.

What happens with an overload or gradual oil loss?
Harder bottoming out force becomes apparent.
The shock absorber continues to work and can be replaced then or at the end of the shift.

Corrective Action:
Remove and replace the shock absorber. Refill with fresh oil or repair.

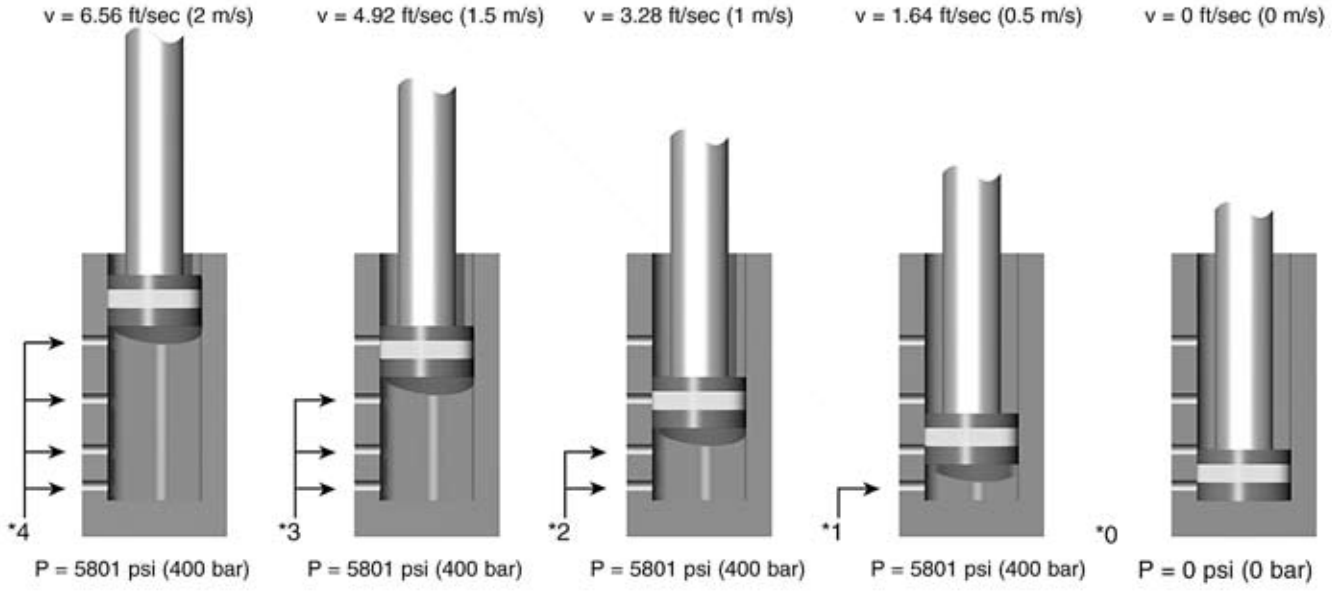
Other Shock Absorber



Some other manufacturers use bodies and inner pressure chambers made from tube stock. The internal parts are held in by a snap ring etc. which then takes all the load and can fail suddenly and catastrophically.

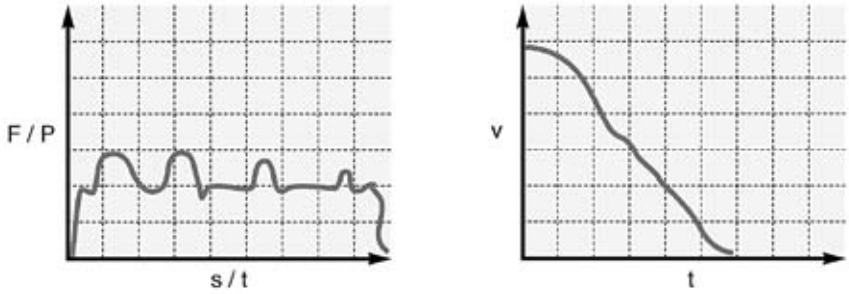
What happens with an overload or gradual oil loss?
The snap ring breaks or is extruded due to excessive force.
Machine damage!! Equipment Stops!!
Production Halted!! Emergency Repair!!

Corrective Action:
Remove and replace the shock absorber with new one (repair not possible).



* As a moving load impacts the shock absorber, the piston travels through stroke and forces hydraulic fluid through the multi-orifice inner tube. The total orifice area decreases at a rate consistent with the decay of impact velocity, resulting in true linear deceleration.

F = Force lbs (N)
P = Internal pressure psi (bar)
s = Stroke in (m)
t = Deceleration time (s)
v = Velocity ft/s (m/s)



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Effective weight is an important factor in selecting shock absorbers. A shock absorber “sees” the impact of an object in terms of weight and velocity only; it does not ”see” any propelling force. The effective weight can be thought of as the weight that the shock absorber “sees” on impact. Effective weight includes the effect of the propelling force on the performance of the shock absorber.

Failing to consider the effective weight may result in improper selection and poor performance of the shock absorber. Under extreme conditions, an effective weight that is too low may result in high forces at the start of stroke (high on-set force). However, an effective weight that is too high for the shock absorber may cause high forces at the end of stroke (high set-down force).

Consider the following examples:

1.) A 5 lb (2.27 kg) weight travelling at 25 ft/sec (7.62 m/s) has 625 lbs (71 Nm) of kinetic energy (**Figure A**). On this basis alone, an MA 3325 would be selected. However, because there is no propelling force, the calculated effective weight is five pounds – which is below the effective weight range of the standard MA 3325. This is a high on-set force at the start of the stroke (**Figure B**). The solution is to use a specially-orificed shock absorber to handle the load.

2.) A weight of 50 lbs (22.68 kg) has an impact velocity of 0.5 ft/sec (0.15 m/s) with a propelling force of 800 lbs (111N) (**Figure C**). The total impact energy is 802.5 inch-pounds. Again, an MA 3325 would be selected based just on the energy. The effective weight is calculated to be 16,050 pounds (7,280 kg). This is well above the range of the standard MA 3325. If this shock absorber is used, high-set-down forces will result (**Figure D**). In this case, the solution is to use a ML 3325, which is designed to work in low-velocity, high-effective weight applications.

Computer-Aided Simulation

By combining application data with a shock absorbers design parameters, Parker engineers can create a picture of how the shock will perform when impacted by the application load. Peak reaction force, peak deceleration (G’s), time through stroke, and velocity decay are identified with extreme accuracy. The user benefits by having the guesswork taken out of sizing decisions and by knowing before installation how his shock problem will be solved.

Figure A

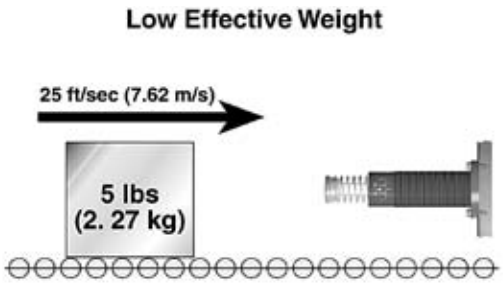


Figure B

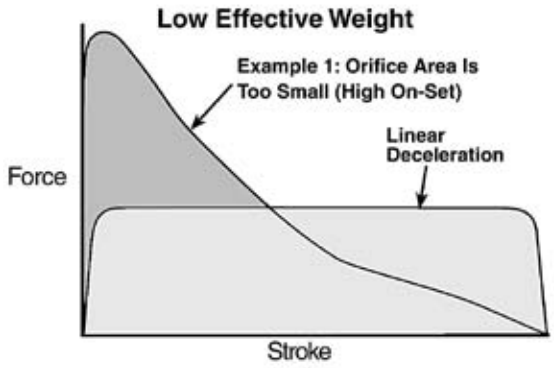


Figure C

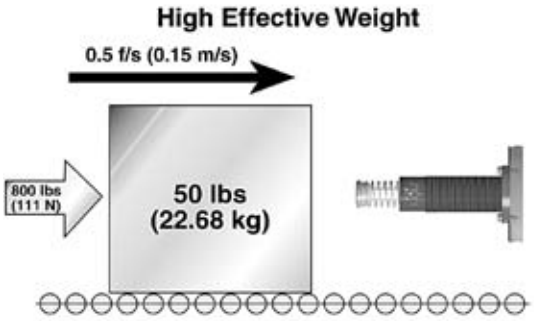
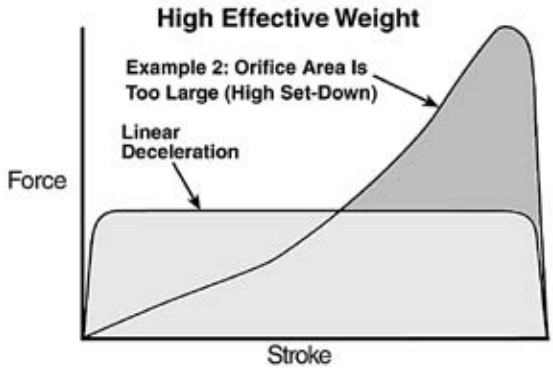


Figure D



N

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Self-Compensating Shock Absorbers

In cases where non-adjustability is beneficial but the features of an adjustable shock absorber are required, self-compensating shocks meet both needs. With a range of effective weight, a self-compensating shock absorber will provide acceptable deceleration under changing energy conditions.

The orifice profile, designed by a computer that constantly arranges the size and location of each orifice while inputting changing effective weights, neutralizes the effect of changing fluid coefficients, weight, velocity, temperature and fluid compressibility.

Figure A

A linear decelerator by definition decelerates a moving weight at a linear or constant rate of deceleration. The adjustable shock absorber is able to provide linear deceleration when operated within its energy capacity and effective weight range by dialing in the required orifice area. The resulting force-stroke curve (**Figure A**) shows optimum (lowest) stopping force.

Figure B

Figure B shows the force-stroke of a self-compensating shock absorber stopping a weight at the low end of its effective weight range. Note how the reaction forces are no longer constant but are still acceptable. The curve is skewed slightly higher at the beginning of the stroke and dips lower at the end.

Figure C

Figure C is a force-stroke curve of the same self-compensating shock absorber in Figure B but at the high end of its effective weight range. The energy curve is now skewed upward at the end of stroke and still yields acceptable deceleration.

Figure D

Figure D is a family of force-stroke curves:

a. Adjustable shock absorber properly tuned, or hydro shock perfectly matched.

b. Self-compensating shock absorber at the low end of its effective weight range.

c. Self-compensating shock absorber at the high end of its effective weight range.

d. Adjustable closed down, or hydro shock not matched (dashpot effect).

Figure A

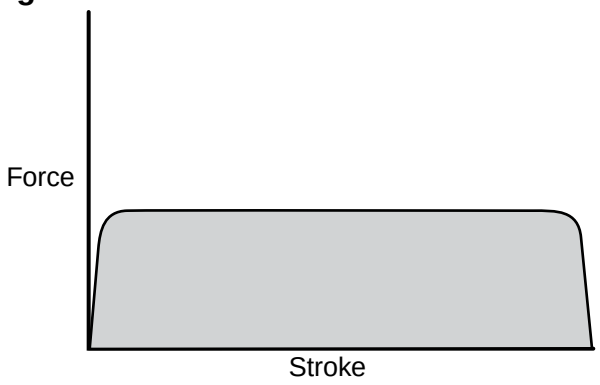


Figure B

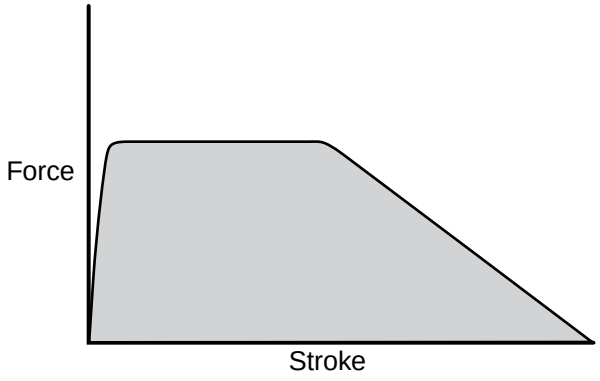


Figure C

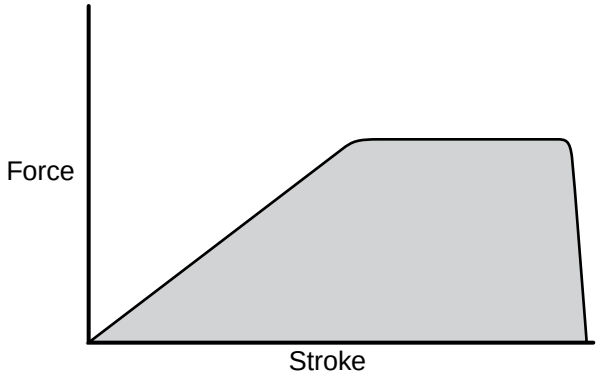
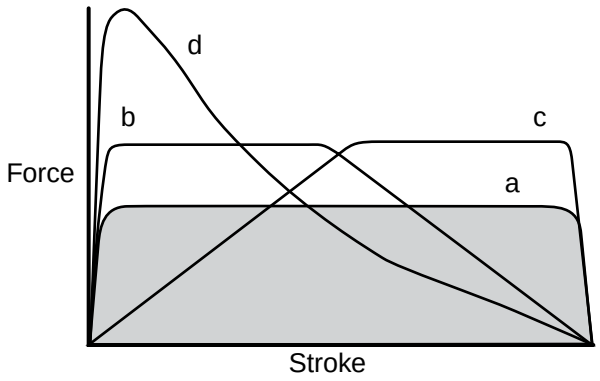


Figure D

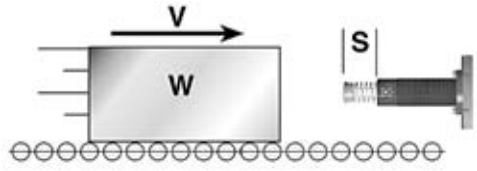


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W =	Moving Weight	(lbs)	Hp =	Motor Power	(horsepower)	E_1 =	Kinetic Energy	(in lbs)
V =	Impact Velocity	(ft/sec)	Mu =	Coefficient of Friction		E_2 =	Propelling Force Energy	(in lbs)
Fp =	Known Propelling Force	(lbs)	C =	Cycles per Hour	(/hour)	E_3 =	Energy per Cycle	(in lbs)
B =	Propelling Cylinder Bore	(inches)	s =	Stroke Length of Shock Absorber	(inches)	E_4 =	Energy per hour	(in lbs/hour)
R =	Propelling Cylinder Rod	(inches)	F =	Propelling Force at Shock Absorber	(lbs)	We =	Effective Weight	(lbs)
P =	Air Pressure	(psi)						

H1 Weight with No Propelling Force

Examples: Crash Testers, Emergency Stops



FORMULA

$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

EXAMPLE

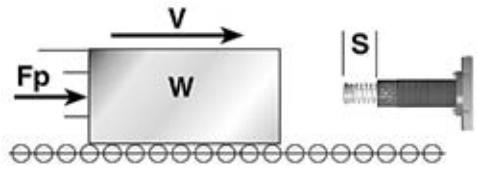
W = 500 lbs
V = 3 ft/sec
Fp = 0
C = 500/hour

$E_1 = (0.186) \bullet (500) \bullet (3^2) = 837$ in lbs
$E_2 = (0) \bullet (1) = 0$ in lbs
$E_3 = 900 + 0 = 837$ in lbs
$E_4 = (837) \bullet (500) = 418{,}500$ in lbs/h
$We = 837 / (0.186) \bullet (3^2) = 500$ lbs

H1 - Select from Model Rating Chart: MC 3325-3 or MA 3325

H2 Weight with Propelling Force

Transfer Devices, Safety Doors, Cutting Shears



$F = Fp$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

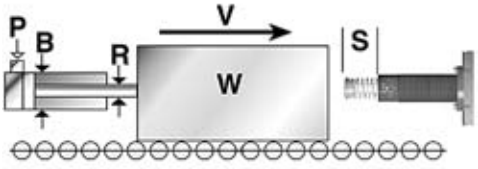
W = 14 lbs
V = 2.2 ft/sec
Fp = 30 lbs
C = 100/hour
s = 0.4 inches

$F = 30$ = 30 lbs
$E_1 = (0.186) \bullet (14) \bullet (2.2^2)$ = 12.6 in lbs
$E_2 = (30) \bullet (0.4)$ = 12 in lbs
$E_3 = 12.6 + 12$ = 24.6 in lbs
$E_4 = (24.6) \bullet (100)$ = 2,460 in lbs/h
$We = 24.6 / (0.186) \bullet (2.2^2)$ = 27.3 lbs

H2 - Select from Model Rating Chart: MC 75-3

H3 Weight with Propelling Cylinder

Pick-and Place Units, Linear Slides, Robotics



Note: R = 0 when using a rodless cylinder or a cylinder working in extension.

$F = 0.785 \bullet (B^2 - R^2) \bullet (P)$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

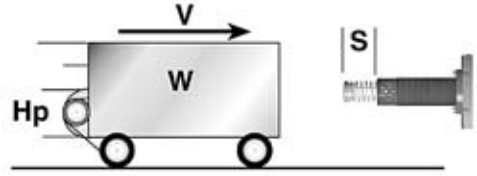
W = 120 lbs
V = 2 ft/sec
B = 1.5 inches
R = 0 inches
P = 60 psi
C = 60/hour
s = 0.75 inches

$F = 0.785 \bullet (1.5^2 - 0^2) \bullet 60$ = 106 lbs
$E_1 = (0.186) \bullet (120) \bullet (2^2)$ = 89.3 in lbs
$E_2 = (106) \bullet (0.75)$ = 79.5 in lbs
$E_3 = 89.3 + 79.5$ = 168.8 in lbs
$E_4 = (168.8) \bullet (60)$ = 10,128 in lbs/h
$We = 168.8 / (0.186) \bullet (2^2)$ = 226.9 lbs

H3 - Select from Model Rating Chart: MA 225 or SC 300-4

H4 Weight with Motor Drive

Lift Trucks, Stacker Units, Overhead Cranes



$F = (550) \bullet (ST) \bullet (Hp) / V$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

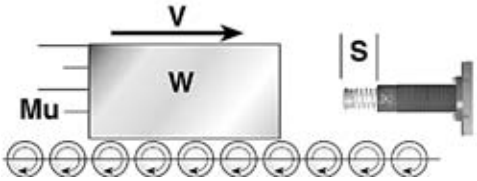
W = 2,100 lbs
V = 1 ft/sec
Hp = 2 hp
ST = 2.5
C = 20/hour
s = 2 inches

$F = (550) \bullet (2.5) \bullet (2) / 1$ = 2,750 lbs
$E_1 = (0.186) \bullet (2{,}100) \bullet (1^2)$ = 390.6 in lbs
$E_2 = (2{,}750) \bullet (2)$ = 5,500 in lbs
$E_3 = 390.6 + 5{,}500$ = 5,890.6 in lbs
$E_4 = (5{,}890.6) \bullet (20)$ = 117,812 in lbs/h
$We = 5{,}890.6 / (0.186) \bullet (1^2)$ = 31,670 lbs

H4 - Select from Model Rating Chart: ML 6450 or MC 6450-4

H5 Weight on Power Rollers/Conveyor

Pallet Line, Friction Conveyor Belt, Steel Tube Transfer



$F = (W) \bullet (Mu)$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

W = 250 lbs
V = 2.5 ft/sec
Mu = 0.2
C = 180/hour
s = 1 inch

$F = (250) \bullet (0.2)$ = 50 lbs
$E_1 = (0.186) \bullet (250) \bullet (2.5^2)$ = 290.6 in lbs
$E_2 = (50) \bullet (1)$ = 50 in lbs
$E_3 = 290.6 + 50$ = 340.6 in lbs
$E_4 = (340.6) \bullet (180)$ = 61,308 in lbs/h
$We = 340.6 / (0.186) \bullet (2.5^2)$ = 293 lbs

H5- Select from Model Rating Chart: MA 600 or SC 650-3

N

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Inclined and Vertical Sizing Examples
Linear Decelerators

W = Moving Weight (lbs)
V = Impact Velocity (ft/sec)
Fp = Known Propelling Force (lbs)
M = Total Distance Moved by Weight (inches)
D = Distance Moved by Weight to Shock (inches)
A = Angle of Inclined Plane (°)
W_{CW} = Counter Weight (lbs)
C = Cycles per Hour (/hour)
s = Stroke Length of Shock Absorber (inches)
F = Propelling Force at Shock Absorber (lbs)
E_1 = Kinetic Energy (in lbs)
E_2 = Propelling Force Energy (in lbs)
E_3 = Energy per Cycle (in lbs)
E_4 = Energy per hour (in lbs/hour)
We = Effective Weight (lbs)

V1 Weight, Vertical Free Fall

Examples: Elevator Emergency Stops, Flying Shears, Test Equipment

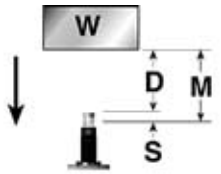
FORMULA

$D = \frac{(M) - (s)}{}$
$V = \sqrt{(5.4)•(D)•SIN(A)}$
$F = (W)•SIN(A)$
$E_1 = (0.186)•(W)•(V^2)$
$E_2 = (F)•(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)•(C)$
$We = E_3 / (0.186)•(V^2)$

EXAMPLE

W = 200 lbs
M = 18 inches
C = 60/hour
s = 3 inches

$D = \frac{(18) - (3)}{} = 15$ inches
$V = \sqrt{(5.4)•(15)} = 9$ ft/sec
$F = 200 = 200$ lbs
$E_1 = (0.186)•(200)•(9^2) = 3{,}013.2$ in lbs
$E_2 = (200)•(3) = 600$ in lbs
$E_3 = 3{,}013.2 + 600 = 3{,}613.2$ in lbs
$E_4 = (3{,}013.2)•(60) = 216{,}792$ in lbs/h
$We = 3{,}013.2 / (0.186)•(9^2) = 239.8$ lbs



V1 - Select from Model Rating Chart: MA 4575

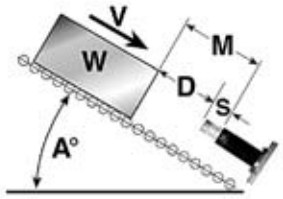
V2 Weight Sliding Down Incline

Inclined Non-Powered Conveyor, Package Chute, Parts Transfer Ramp

$D = \frac{(M) - (s)}{}$
$V = \sqrt{(5.4)•(D)•SIN(A)}$
$F = (W)•SIN(A)$
$E_1 = (0.186)•(W)•(V^2)$
$E_2 = (F)•(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)•(C)$
$We = E_3 / (0.186)•(V^2)$

W = 1,000 lbs
M = 15 inches
A = 30°
C = 190/hour
s = 2 inches

$D = \frac{(15) - (2)}{} = 13$ inches
$V = \sqrt{(5.4)•(13)•SIN(30)} = 5.9$ ft/sec
$F = 500 = 500$ lbs
$E_1 = (0.186)•(1{,}000)•(5.9^2) = 6{,}474.7$ in lbs
$E_2 = (500)•(2) = 1{,}000$ in lbs
$E_3 = 6{,}474.7 + 1{,}000 = 7{,}474.7$ in lbs
$E_4 = (7{,}474.7)•(190) = 1{,}420{,}193$ in lbs/h
$We = 7{,}474.7 / (0.186)•(5.9^2) = 1{,}154.5$ lbs



V2 - Select from Model Rating Chart: MCA 6450-1 or -2

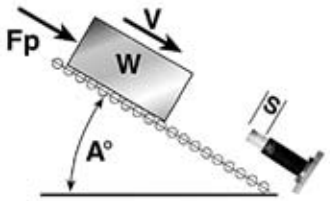
V3 Down Incline with Propelling Force

Inclined Conveyor Belt, High Speed Safety Doors

$F = (W)•SIN(A)+(Fp)$
$E_1 = (0.186)•(W)•(V^2)$
$E_2 = (F)•(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)•(C)$
$We = E_3 / (0.186)•(V^2)$

W = 100 lbs
V = 2 ft/sec
Fp = 50 lbs
A = 15°
C = 30/hour
s = 0.5 inches

$F = (100)•SIN(15)+(50) = 75.9$
$E_1 = (0.186)•(100)•(2^2) = 74.4$ lbs
$E_2 = (75.9)•(0.5) = 38$ in lbs
$E_3 = 74.4 + 38 = 112.4$ in lbs
$E_4 = (112.4)•(30) = 3{,}370.5$ in lbs
$We = 112.4 / (0.186)•(2^2) = 151.1$ lbs



V3 - Select from Model Rating Chart: MC 150H

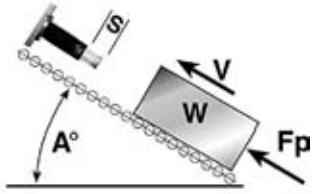
V4 Up Incline with Propelling Force

Elevator, Inclined Power Conveyor

$F = (Fp)-(W)•SIN(A)$
$E_1 = (0.186)•(W)•(V^2)$
$E_2 = (F)•(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)•(C)$
$We = E_3 / (0.186)•(V^2)$

W = 450 lbs
V = 1 ft/sec
Fp = 600 lbs
A = 90°
C = 60/hour
s = 1 inch

$F = (600)-(450)•SIN(90) = 150$ lbs
$E_1 = (0.186)•(450)•(1^2) = 83.7$ in lbs
$E_2 = (150)•(1) = 150$ in lbs
$E_3 = 90 + 150 = 234$ in lbs
$E_4 = (240)•(60) = 14{,}022$ in lbs/h
$We = 240 / (0.2)•(1^2) = 1{,}258.1$ lbs



V4 - Select from Model Rating Chart: MA 600 or SC 650-4

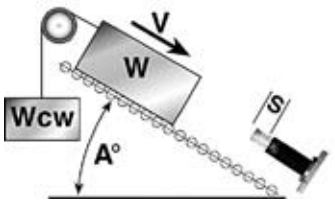
V5 Down Incline with Counter Weight

Lifting Door with Counter Balance

$F = (W)•SIN(A)-W_{CW}$
$E_1 = (0.186)•(W)•(V^2)$
$E_2 = (F)•(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)•(C)$
$We = E_3 / (0.186)•(V^2)$

W = 1,500 lbs
V = 0.5 ft/sec
A = 45°
W_{CW} = 500 lbs
C = 1/hour
s = 1 inch

$F = (1{,}500)•SIN(45)-500 = 560.7$ lbs
$E_1 = (0.186)•(1{,}500)•(0.5^2) = 69.8$ in lbs
$E_2 = (560.7)•(1) = 560.7$ in lbs
$E_3 = 69.8 + 560.7 = 630.5$ in lbs
$E_4 = (636)•(1) = 630.5$ in lbs/h
$We = 630.5 / (0.186)•(0.5^2) = 13{,}559.1$ lbs



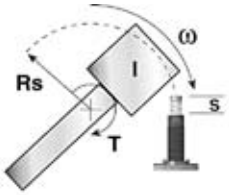
V5 - Select from Model Rating Chart: ML 3325

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W = Moving Weight	(lbs)	T = Propelling Torque	(lbs-in)	C = Cycles per Hour	(/hour)
V = Impact Velocity	(ft/sec)	Rs = Mounting Radius of the Shock	(inches)	E_1 = Kinetic Energy	(in lbs)
Wa = Apparent Weight at Shock Absorber	(lbs)	Rt = Radius to Edge of Turntable	(inches)	E_2 = Propelling Force Energy	(in lbs)
ω = Angular Velocity	(°/sec)	s = Stroke Length of Shock Absorber	(inches)	E_3 = Energy per Cycle	(in lbs)
I = Moment of Inertia	(lb-ft-sec²)	H = Thickness of Object	(inches)	E_4 = Energy per hour	(in lbs/hour)
k = Radius of Gyration	(inches)	L = Length of Object	(inches)	We = Effective Weight	(lbs)

R1 Moment of Inertia, Horizontal Plane

Examples: Swing Bridges, Radar Antenna



FORMULA

$Wa = (4637 \bullet I)/Rs^2$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

EXAMPLE

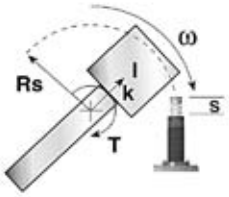
I = 3,930 lb-ft-sec2
ω = 172°/sec
T = 480,000 lbs-in
Rs = 40 inches
C = 30/hour
s = 6 inches

$Wa = (4{,}637 \bullet 3{,}930)/(40^2) = 11{,}390$ lbs
$V = (40) \bullet (172)/688 = 10$ ft/sec
$F = 480{,}000/40 = 12{,}000$ lbs
$E_1 = (0.186) \bullet (11{,}390) \bullet (10^2) = 211{,}854$ in lbs
$E_2 = (12{,}000) \bullet (6) = 72{,}000$ in lbs
$E_3 = 211{,}854 + 72{,}000 = 283{,}854$ in lbs
$E_4 = (283{,}854) \bullet (30) = 8{,}515{,}620$ in lbs/h
$We = 283{,}854 / (0.186) \bullet (10^2) = 15{,}260.9$ lbs

R1 - Select from Model Rating Chart: CA 4 x 6-3

R2 Radius of Gyration, Horizontal Plane

Examples: Packaging Equipment, Pick-and-Place Robots



$Wa = (W) \bullet (k^2)/(Rs^2)$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

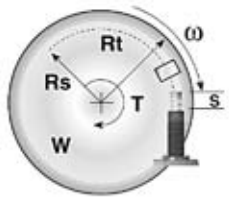
W = 300 lbs
k = 2.5 inches
ω = 180°/sec
T = 9,000 lbs-in
Rs = 25 inches
C = 1,200/hour
s = 1 inch

$Wa = (300) \bullet (2.5^2))/(25^2) = 3$ lbs
$V = (25) \bullet (180)/688 = 6.54$ ft/sec
$F = 9{,}000/25 = 360$ lbs
$E_1 = (0.186) \bullet (3) \bullet (6.54^2) = 23.87$ in lbs
$E_2 = (360) \bullet (1) = 360$ in lbs
$E_3 = 23.87 + 360 = 383.87$ in lbs
$E_4 = (383.87) \bullet (1{,}200) = 460{,}644$ in lbs/h
$We = 383.87 / (0.186) \bullet (6.54^2) = 48.20$ lbs

R2 - Select from Model Rating Chart: MC 3325-1 or MA 3325

R3 Index Table

Examples: Index Table, Rotating Work Station



$Wa = (W \bullet Rt^2)/(2 \bullet Rs^2)$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

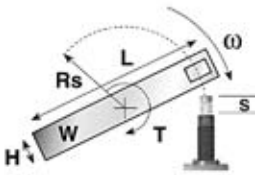
W = 195 lbs
Rt = 20 inches
ω = 85°/sec
T = 1,700 lbs-in
Rs = 15 inches
C = 60/hour
s = .75 inches

$Wa = (195 \bullet 20^2))/(2 \bullet 15^2) = 173.3$ lbs
$V = (15) \bullet (85)/688 = 1.85$ ft/sec
$F = 1{,}700/15 = 113.3$ lbs
$E_1 = (0.186) \bullet (173.3) \bullet (1.85^2) = 110.3$ in lbs
$E_2 = (113.3) \bullet (0.75) = 85$ in lbs
$E_3 = 110.3 + 85 = 195.3$ in lbs
$E_4 = (195.3) \bullet (60) = 11{,}718$ in lbs/h
$We = 195.3 / (0.186) \bullet (1.85^2) = 306.8$ lbs

R3 - Select from Model Rating Chart: SC 300-4 or MC 225H

R4 Turnover

Examples: Roll-Over Device, Paint Booths, Crate Handling



$Wa = (W) \bullet (H^2+L^2)/12 \bullet (Rs^2)$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

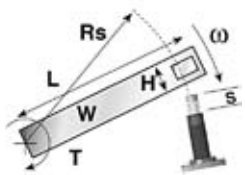
W = 150 lbs
L = 38 inches
H = 1 inch
ω = 70°/sec
T = 15,000 lbs-in
Rs = 12 inches
C = 500/hour
s = 1 inch

$Wa = (150) \bullet (1^2+38^2)/(12 \bullet (12^2) = 125.43$ lbs
$V = (12) \bullet (70)/688 = 1.22$ ft/sec
$F = 15{,}000/12 = 1{,}250$ lbs
$E_1 = (0.186) \bullet (125.43) \bullet (1.22^2) = 34.72$ in lbs
$E_2 = (1{,}250) \bullet (1) = 1{,}250$ in lbs
$E_3 = 37.34 + 1{,}250 = 1{,}284.72$ in lbs
$E_4 = (1{,}287) \bullet (500) = 642{,}362$ in lbs/h
$We = 1{,}287 / (0.186) \bullet (1.22^2) = 4{,}640.6$ lbs

R4 - Select from Model Rating Chart: MC 4525-4 or MA 4525

R5 Uniform Bar, Horizontal Plane

Examples: Swinging Beam, Robotic Arm



$Wa = (W) \bullet (H^2+4 \bullet L^2)/12 \bullet (Rs^2)$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / (0.186) \bullet (V^2)$

W = 75 lbs
L = 30 inches
H = 2 inches
ω = 180°/sec
T = 9,000 lbs-in
Rs = 15 inches
C = 100/hour
s = 1 inch

$Wa = (75) \bullet (2^2+4 \bullet 30^2)/12 \bullet (15^2) = 100.1$ lbs
$V = (15) \bullet (180)/688 = 3.92$ ft/sec
$F = 9{,}000/15 = 600$ lbs
$E_1 = (0.186) \bullet (100.1) \bullet (3.92^2) = 286.1$ in lbs
$E_2 = (600) \bullet (1) = 600$ in lbs
$E_3 = 307.64 + 600 = 886.1$ in lbs
$E_4 = (886.1) \bullet (100) = 88{,}610$ in lbs/h
$We = 886.1 / (0.186) \bullet (3.92^2) = 310$ lbs

R5- Select from Model Rating Chart: MC 4525-2 or MA 4525

N

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W = Moving Weight (lbs)
H = Thickness of Door or Arm (inches)
L = Length of Door or Arm (inches)
d = Distance from Pivot to c of g (inches)
Rs = Mounting Radius of Shock Absorbers (inches)
ω = Rotational Speed of Weight (°/sec)
T = Propelling Torque (lbs in)
θ = Angle from the Vertical (°)
C = Cycles per Hour (/hour)
s = Stroke Length of Shock Absorber (inches)
F = Propelling Force at Shock Absorber (lbs)
E_1 = Kinetic Energy (in lbs)
E_2 = Propelling Force Energy (in lbs)
E_3 = Energy per Cycle (in lbs)
E_4 = Energy per hour (in lbs/hour)
We = Effective Weight (lbs)

R6 Uniform Bar, Vertical Plane

Examples: Cross-Conveyor Transfer, Gantry Walkway

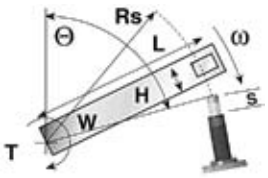
FORMULA

$Wa = (W)\bullet(H^2+4\bullet L^2)/12\bullet(Rs^2)$
$V = (Rs)\bullet(\omega)/688$
$F = [T+.5\bullet L\bullet W\bullet SIN(\theta)]/Rs$
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$
$E_2 = (F)\bullet(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)\bullet(C)$
$We = E_3 / (0.186)\bullet(V^2)$

EXAMPLE

W = 5 lbs
H = .25 inches
L = 6 inches
θ = 87.6°
ω = 360°/sec
T = 20 lbs-in
Rs = 6 inches
C = 1,800/hour
s = .25 inches

$Wa = (5)\bullet(.25^2+4\bullet 6^2)/12\bullet(6^2)$ = 1.7 lbs
$V = (6)\bullet(360)/688$ = 3.1 ft/sec
$F = [20+.5\bullet 6\bullet 5\bullet SIN(87.6)]/6$ = 5.8 lbs
$E_1 = (0.186)\bullet(1.7)\bullet(3.1^2)$ = 3.0 in lbs
$E_2 = (5.8)\bullet(.25)$ = 1.5 in lbs
$E_3 = 3.3 + 1.5$ = 4.8 in lbs
$E_4 = (4.5)\bullet(1,800)$ = 8,100 in lbs/h
$We = 4.5 / (0.186)\bullet(3.1^2)$ = 2.5 lbs



R6 - Select from Model Rating Chart: MC 25L

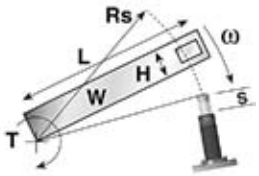
R7 Door, Horizontal Plane

Examples: Cabinet Doors, Machine Enclosures

$Wa = (W)\bullet(H^2+L^2)/(3\bullet Rs^2)$
$V = (Rs)\bullet(\omega)/688$
$F = t/Rs$
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$
$E_2 = (F)\bullet(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)\bullet(C)$
$We = E_3 / (0.186)\bullet(V^2)$

W = 120 lbs
H = 1 inch
L = 42 inches
ω = 60°/sec
T = 1,800 lbs-in
Rs = 10 inches
C = 4/hour
s = .5 inches

$Wa = (120)\bullet(1^2+42^2)/(3\bullet 10^2)$ = 706 lbs
$V = (10)\bullet(60)/688$ = .9 ft/sec
$F = 1,800/10$ = 180 lbs
$E_1 = (0.186)\bullet(706)\bullet(.9^2)$ = 106.4 in lbs
$E_2 = (180)\bullet(.5)$ = 90 in lbs
$E_3 = 106.4 + 90$ = 196.4 in lbs
$E_4 = (196.4)\bullet(4)$ = 785 in lbs/h
$We = 196.4 / (0.186)\bullet(.9^2)$ = 1,303.6 lbs



R7 - Select from Model Rating Chart: MC 225H2

R8 Door, Vertical Plane

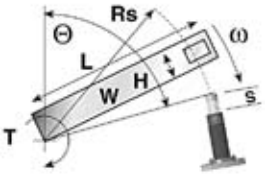
Examples: Hatches, Lids, Hoods

$Wa = (W)\bullet(H^2+L^2)/(3\bullet Rs^2)$
$V = (Rs)\bullet(\omega)/688$
$F^* = [T+.5\bullet L\bullet W\bullet SIN(\theta)]/Rs$
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$
$E_2 = (F)\bullet(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)\bullet(C)$
$We = E_3 / (0.186)\bullet(V^2)$

*Force is approximate

W = 60 lbs
H = 1 inch
L = 10 inches
θ = 150°
ω = 200°/sec
T = 45 lbs-in
Rs = 10 inches
C = 1,900/hour
s = .63 inches

$Wa = (60)\bullet(1^2+10^2)/(3\bullet 10^2)$ = 20.2 lbs
$V = (10)\bullet(200)/688$ = 2.9 ft/sec
$F = [45+.5\bullet 10\bullet 60\bullet SIN(150)]/10$ = 19.5 lbs
$E_1 = (0.186)\bullet(20.2)\bullet(2.9^2)$ = 31.6 in lbs
$E_2 = (19.5)\bullet(0.63)$ = 12.3 in lbs
$E_3 = 34 + 12.3$ = 43.9 in lbs
$E_4 = (43.9)\bullet(1,900)$ = 83,382 in lbs/h
$We = 43.9 / (0.186)\bullet(2.9^2)$ = 28.1 lbs



R8 - Select from Model Rating Chart: SC 190-2

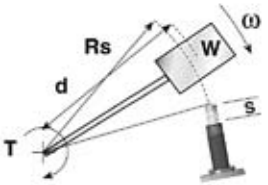
R9 Weight at Radius, Horizontal Plane

Examples: Circuit Breakers, Swinging Gates

$Wa = (W)\bullet(d^2)/(Rs^2)$
$V = (Rs)\bullet(\omega)/688$
$F = T/Rs$
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$
$E_2 = (F)\bullet(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)\bullet(C)$
$We = E_3 / (0.186)\bullet(V^2)$

W = 40 lbs
d = 8 inches
ω = 110°/sec
T = 150 lbs-in
Rs = 7 inches
C = 1,500/hour
s = .5 inches

$Wa = (40)\bullet(8^2)/(7^2)$ = 52 lbs
$V = (7)\bullet(110)/688$ = 1.1 ft/sec
$F = 150/7$ = 21 lbs
$E_1 = (0.186)\bullet(52)\bullet(1.1^2)$ = 11.7 in lbs
$E_2 = (21)\bullet(.5)$ = 10.5 in lbs
$E_3 = 11.7 + 10.5$ = 22.2 in lbs
$E_4 = (22.2)\bullet(1,500)$ = 33,300 in lbs/h
$We = 22.2 / (0.186)\bullet(1.1^2)$ = 98.6 lbs



R9 - Select from Model Rating Chart: MC 150H

R10 Weight at Radius, Vertical Plane

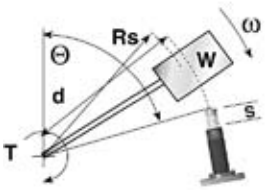
Examples, Impact Testers, Pendulums

$Wa = (W)\bullet(d^2)/(Rs^2)$
$V = (Rs)\bullet(\omega)/688$
$F^* = [T+W\bullet d\bullet SIN(\theta)]/Rs$
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$
$E_2 = (F)\bullet(s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3)\bullet(C)$
$We = E_3 / (0.186)\bullet(V^2)$

*Force is approximate

W = 40 lbs
d = 8 inches
θ = 90°
ω = 110°/sec
T = 150 lbs-in
Rs = 7 inches
C = 1,500/hour
s = .5 inches

$Wa = (40)\bullet(8^2)/(7^2)$ = 52 lbs
$V = (7)\bullet(110)/688$ = 1.1 ft/sec
$F = [150+40\bullet 8\bullet SIN(90)]/7$ = 67 lbs
$E_1 = (0.186)\bullet(52)\bullet(1.1^2)$ = 11.7 in lbs
$E_2 = (67)\bullet(.5)$ = 33.5 in lbs
$E_3 = 11.7 + 33.5$ = 45.2 in lbs
$E_4 = (45.2)\bullet(1,500)$ = 67,800 in lbs/h
$We = 45.2 / (1.1^2)$ = 200.8 lbs



R10- Select from Model Rating Chart: MC 150H

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1 Shock Absorbers for Pneumatic Cylinders

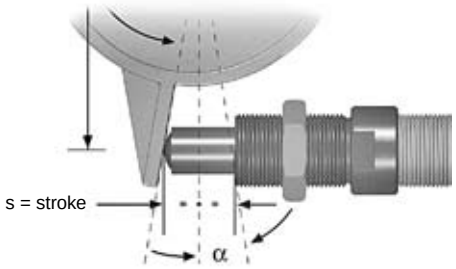
For:
- optimum deceleration
- higher speeds
- smaller cylinders
- reduced air consumption
- smaller valves and pipework

Example: MA 3350 M-Z
-Z = cylinder mounting



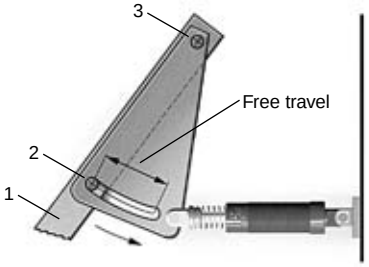
With heavy loads or high velocities normal cylinder cushions are often overloaded. This causes shock loading leading to premature cylinder failure or excessive maintenance.
Using oversized cylinders to withstand this shock loading is not the best solution since this considerably increases air consumption and costs.

2 Side Load Adapter for High Side Load Angles



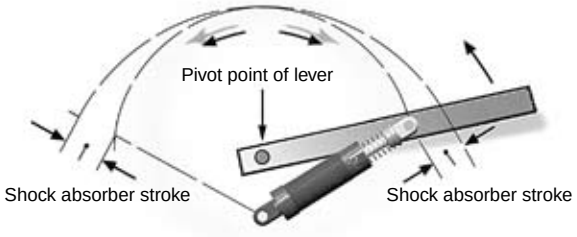
The side loading is removed from the shock absorber piston rod leading to considerably longer life. Wherever possible mount shock absorber so that impacting face is perpendicular to shock absorber axis half way through stroke.
See pages N48 and N49 for more details.

3 Undamped Free Travel with Damped End Extension



The lever 1 swings with the pin 2 in a slotted hole around pivot point 3. The lever is smoothly decelerated at the extreme end of its travel.

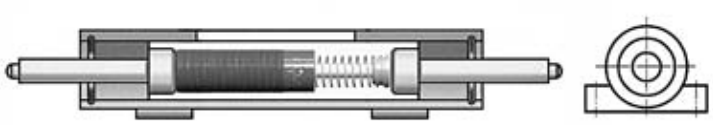
4 One Shock Absorber for Both Ends of Travel



It is possible to use only one shock absorber for both end positions by using different pivot points as shown.

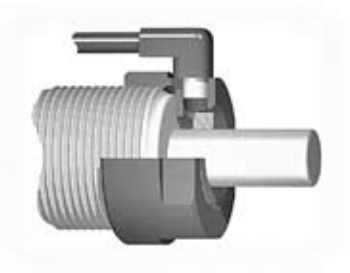
Tip: Leave approx.0.06 in (1.5 mm) of shock absorber stroke free at each end of travel.

5 Double Acting Shock Absorber



With a little additional work a normal unidirectional shock absorber can be converted to work in 2 directions by using a mechanism as shown.

6 Air Bleed Collar



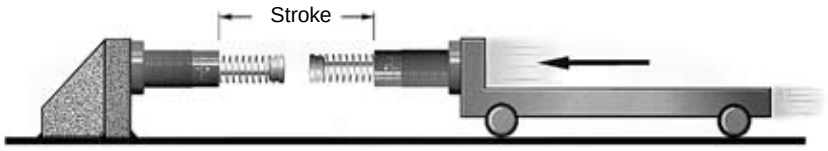
By using this air bleed collar the operating lifetime of shock absorbers in aggressive environments can be considerably increased. The adapter protects the shock absorber seals from cutting fluids, cleaning agents, cooking oils etc. by using a low pressure air bleed.

Available for select shock absorbers.

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7 Double Stroke Length



50% lower reaction force (Q) 50% lower deceleration (a)

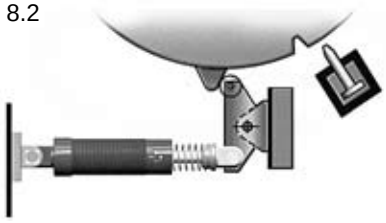
By driving 2 shock absorbers against one another 'nose-to-nose', the effective stroke length can be doubled.

8 Ride Over Latch

8.1



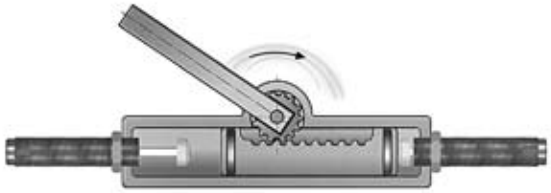
8.2



8.1 The latch absorbs the kinetic energy so that the object contacts the fixed stop gently.

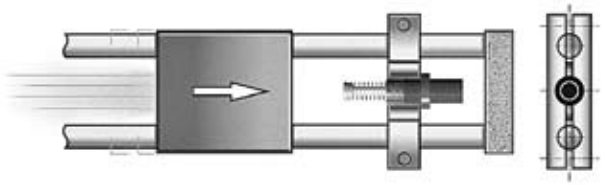
8.2 The latch absorbs the rotational energy of the turntable etc. The turntable can then be held in the datum position with a lock bolt or similar device.

9 Rotary Actuator or Rack and Pinion Drive



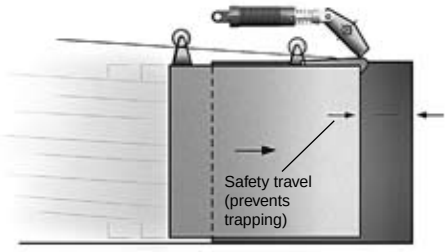
The use of shock absorbers allows higher operating speeds and weights as well as protecting the drive mechanism and housing from shock loads.

10 Adjustable Stop Clamp e.g. for Handling Equipment



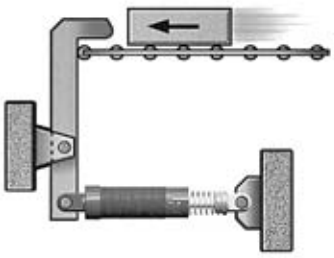
The gentle deceleration of shock absorbers makes the use of adjustable stop clamps possible and removes any chance of the clamp slipping. The kinetic energy is completely removed before the mechanical stop is reached thus making high index speeds possible.

11 Ride-Over Latch e.g. Fire Door



The fire door travels quickly until it reaches the lever. It is then gently decelerated by the lever mounted shock absorber and closes without shock or danger to personnel.

12 Increasing Stroke Length Mechanically



By means of a lever the effective stroke length can be increased and mounting space to the left reduced.

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Industrial Shock Absorbers are rated by capacity for the purpose of selecting the proper unit for an application's energy requirements. Ratings are determined by the effective weight that the shock absorber can stop and the energy it can absorb per cycle and per hour. These ratings relate to the mechanical and thermal capacity of a shock absorber because the mechanical energy is converted to heat and dissipated.

Self-Compensating Models

Model Number	Stroke inches 1 inch = 25.4 mm	E3 Max Energy per Cycle, inch lbs 1 in lb = .11 Nm	We Effective Weight lbs, 1 lb = .45 kg	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = .11 Nm/hour			Product Catalog Page
				Self-Contained	A/O Tank	A/O Re-circulating	
MC 9-1	0.20	9	1.35-7.0	18,000	N/A	N/A	N16
MC 9-2	0.20	9	1.75-9.0	18,000			N16
MC 10L	0.20	4	0.75-6.0	35,000	N/A	N/A	N16
MC 10H	0.20	7	1.5-11	35,000			N16
MC 25L	0.25	20	1.5-5	120,000			N16
MC 25	0.25	20	4-12	120,000	N/A	N/A	N16
MC 25H	0.25	20	10-30	120,000			N16
MC 75-1	0.40	75	0.5-2.5	250,000			N16
MC 75-2	0.40	75	2-14	250,000	N/A	N/A	N16
MC 75-3	0.40	75	6-80	250,000			N16
MC 150	0.50	150	2-22	300,000			N18
MC 150H	0.50	150	20-200	300,000	N/A	N/A	N18
MC 150H2	0.50	150	150-450	300,000			N18
MC 225	0.50	225	5-55	400,000			N18
MC 225H	0.50	225	50-500	400,000	N/A	N/A	N18
MC 225H2	0.50	225	400-2,000	400,000			N18
MC 600	1.00	600	20-300	600,000			N18
MC 600H	1.00	600	250-2,500	600,000	N/A	N/A	N18
MC 600H2	1.00	600	880-5,000	600,000			N18
SC 190-1	0.63	225	3-15	300,000			N20
SC 190-2	0.63	225	8-40	300,000	N/A	N/A	N20
SC 190-3	0.63	225	20-100	300,000			N20
SC 190-4	0.63	225	50-225	300,000			N20
SC 300-1	0.75	300	3-18	400,000			N20
SC 300-2	0.75	300	10-60	400,000			N20
SC 300-3	0.75	300	30-180	400,000			N20
SC 300-4	0.75	300	70-450	400,000			N20
SC 300-5	0.59	650	25-100	400,000	N/A	N/A	N22
SC 300-6	0.59	650	75-300	400,000			N22
SC 300-7	0.59	650	200-400	400,000			N22
SC 300-8	0.59	620	300-1,500	400,000			N22
SC 300-9	0.59	620	700-4,300	400,000			N22
SC 650-1	1.00	650	17-100	600,000			N20
SC 650-2	1.00	650	50-300	600,000			N20
SC 650-3	1.00	650	150-900	600,000			N20
SC 650-4	1.00	650	450-2,600	600,000			N20
SC 650-5	0.91	1,860	50-250	600,000	N/A	N/A	N22
SC 650-6	0.91	1,860	200-800	600,000			N22
SC 650-7	0.91	1,860	700-2,400	600,000			N22
SC 650-8	0.91	1,860	1,700-5,800	600,000			N22
SC 650-9	0.91	1,860	4,000-14,000	600,000			N22
SC 925-1	1.58	975	30-200	800,000			N20
SC 925-2	1.58	975	90-600	800,000	N/A	N/A	N20
SC 925-3	1.58	975	250-1,600	800,000			N20
SC 925-4	1.58	975	750-4,600	800,000			N20
MC 3325-1 MC 3325-2 MC 3325-3 MC 3325-4	0.91	1,350	20-80 68-272 230-920 780-3,120	670,000	1,100,000	1,500,000	N26, N28
MC 3350-1 MC 3350-2 MC 3350-3 MC 3350-4	1.91	2,700	40-160 136-544 460-1,840 1,560-6,240	760,000	1,200,000	1,600,000	N26,N 28
MC 3625-1 MC 3625-2 MC 3625-3 MC 3625-4	0.91	1,350	20-80 68-272 230-920 780-3,120	670,000	1,100,000	1,500,000	N26, N28
MC 3650-1 MC 3650-2 MC 3650-3 MC 3650-4	1.91	2,700	40-160 136-544 460-1,840 1,560-6,240	760,000	1,200,000	1,600,000	N26, N28
MC 4525-1 MC 4525-2 MC 4525-3 MC 4525-4	0.91	3,000	50-200 170-680 575-2,300 1,950-7,800	950,000	1,400,000	1,700,000	N26, N30
MC 4550-1 MC 4550-2 MC 4550-3 MC 4550-4	1.91	6,000	100-400 340-1,360 1,150-4,600 3,900-15,600	1,000,000	1,700,000	2,200,000	N26, N30
MC 4575-1 MC 4575-2 MC 4575-3 MC 4575-4	2.91	9,000	150-600 510-2,040 1,730-6,920 5,850-23,400	1,300,000	2,000,000	2,500,000	N22, N30
MC 6450-1 MC 6450-2 MC 6450-3 MC 6450-4	1.91	15,000	300-1,200 1,020-4,080 3,460-13,840 11,700-46,800	1,300,000	2,600,000	3,400,000	N26, N32
MC 64100-1 MC 64100-2 MC 64100-3 MC 64100-4	3.91	30,000	600-2,400 2,040-8,160 6,920-27,680 23,400-93,600	1,700,000	3,400,000	4,400,000	N26, N32
MC 64150-1 MC 64150-2 MC 64150-3 MC 64150-4	5.91	45,000	900-3,600 3,060-12,240 10,380-41,520 35,100-140,400	2,200,000	4,400,000	5,700,000	N26, N32

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Self-Compensating Models Continued

Model Number	Stroke inches 1 inch = 25.4 mm	E3 Max Energy per Cycle, inch lbs 1 in lb = .11 Nm	We Effective Weight lbs, 1 lb = .45 kg	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = .11 Nm/hour			Product Catalog Page
				Self-Contained	A/O Tank	A/O Re-circulating	
CA 2x2-1 CA 2x2-2 CA 2x2-3 CA 2x2-4	2.00	32,000	1,600-4,800 4,000-12,000 10,000-30,000 25,000-75,000	9,600,000	12,000,000	15,600,000	N38, N40
CA 2x4-1 CA 2x4-2 CA 2x4-3 CA 2x4-4	4.00	64,000	3.200-9.600 8,000-24,000 20,000-60,000 50,000-150,000	12,000,000	15,000,000	19,500,000	N38, N40
CA 2x6-1 CA 2x6-2 CA 2x6-3 CA 2x6-4	6.00	96,000	4.800-14,400 12,000-36,000 30,000-90,000 75,000-225,000	14,400,000	18,000,000	23,500,000	N38, N40
CA 2x8-1 CA 2x8-2 CA 2x8-3 CA 2x8-4	8.00	128,000	6,400-19,200 16,000-48,000 40,000-120,000 100,000-300,000	16,800,000	21,000,000	27,000,000	N38, N40
CA 2x10-1 CA 2x10-2 CA 2x10-3 CA 2x10-4	10.00	160,000	8,000-24,000 20,000-60,000 50,000-150,000 125,000-375,000	19,200,000	24,000,000	31,000,000	N38, N40
CA 3x5-1 CA 3x5-2 CA 3x5-3 CA 3x5-4	5.00	125,000	6,400-19,200 16,000-48,000 40,000-120,000 100,000-300,000	20,000,000	25,000,000	32,500,000	N38, N40
CA 3x8-1 CA 3x8-2 CA 3x8-3 CA 3x8-4	8.00	200,000	10,240-30,720 25,600-76,800 64,000-192,000 160,000-480,000	32,000,000	40,000,000	52,000,000	N38, N40
CA 3x12-1 CA 3x12-2 CA 3x12-3 CA 3x12-4	12.00	300,000	15,360-46,080 38,400-115,200 96,000-288,000 240,000-720,000	48,000,000	60,000,000	78,000,000	N38, N40
CA 4x6-3 CA 4x6-5 CA 4x6-7	6.00 6.00 6.00	420,000 420,000 420,000	8,000-19,000 19,000-41,000 41,000-94,000	27,000,000 27,000,000 27,000,000	45,000,000 45,000,000 45,000,000	58,000,000 58,000,000 58,000,000	N38, N44 N38, N44 N38, N44
CA 4x8-3 CA 4x8-5 CA 4x8-7	8.00 8.00 8.00	560,000 560,000 560,000	11,000-25,000 25,000-55,000 55,000-125,000	30,000,000 30,000,000 30,000,000	50,000,000 50,000,000 50,000,000	65,000,000 65,000,000 65,000,000	N38, N44 N38, N44 N38, N44
CA 4x16-3 CA 4x16-5 CA 4x16-7	16.00 16.00 16.00	1,120,000 1,120,000 1,120,000	22,000-50,000 50,000-110,000 110,000-250,000	50,000,000 50,000,000 50,000,000	85,000,000 85,000,000 85,000,000	110,000,000 110,000,000 110,000,000	N38, N44 N38, N44 N38, N44

Adjustable Models

MA 35 MA 150 MA 225 MA 600	0.40 0.50 0.75 1.00	35 150 225 600	13-125 2-200 5-500 20-3,000	53,000 300,000 400,000 600,000	N/A	N/A	N24 N24 N24 N24
MA 900 MA 3325 MA 3350	1.58 0.91 1.91	900 1,500 3,000	30-4,500 20-3,800 28-5,400	800,000 670,000 760,000	1,100,000 1,200,000	1,500,000 1,600,000	N24 N27 N27
MA 3625 MA 3650	0.91 1.91	1,500 3,000	20-3,800 28-5,400	670,000 760,000	1,100,000 1,200,000	1,500,000 1,600,000	N27 N27
MA 4525 MA 4550 MA 4575	0.91 1.91 2.91	3,450 6,900 10,350	95-22,000 150-32,000 155-33,000	950,000 1,000,000 1,300,000	1,400,000 1,700,000 2,000,000	1,700,000 2,200,000 2,500,000	N27, N30 N27, N30 N27, N30
MA 6450 MA 64100 MA 64150	1.91 3.91 5.91	18,000 36,000 54,000	480-110,000 600-115,000 730-175,000	1,300,000 1,700,000 2,200,000	2,600,000 3,400,000 4,400,000	3,400,000 4,400,000 5,700,000	N27, N32 N27, N32 N27, N32
1-1/2x2 1-1/2x3-1/2 1-1/2x5 1-1/2x6-1/2	2.00 3.50 5.00 6.50	16,000 28,000 40,000 52,000	430-70,000 480-80,000 500-90,000 680-100,000	3,200,000 5,600,000 8,000,000 10,400,000	4,000,000 7,000,000 10,000,000 13,000,000	5,200,000 9,100,000 13,000,000 17,000,000	N36 N36 N36 N36
A 2x2 A 2x4 A 2x6 A 2x8 A 2x10	2.00 4.00 6.00 8.00 10.00	32,000 80,000 120,000 170,000 210,000	560-170,000 510-160,000 570-190,000 580-200,000 720-250,000	9,600,000 12,000,000 14,400,000 16,800,000 19,200,000	12,000,000 15,000,000 18,000,000 21,000,000 24,000,000	15,600,000 19,500,000 23,500,000 27,000,000 31,000,000	N39, N40 N39, N40 N39, N40 N39, N40 N39, N40
A 3x5 A 3x8 A 3x12	5.00 8.00 12.00	140,000 250,000 390,000	1,050-340,000 1,200-400,000 1,350-450,000	20,000,000 32,000,000 48,000,000	25,000,000 40,000,000 60,000,000	32,500,000 52,000,000 78,000,000	N39, N40 N39, N40 N39, N40

Low Velocity Adjustable Models

ML 3325 ML 3350	0.91 1.91	1,500 3,000	.05-1.5 .05-1.5	670,000 760,000	1,100,000 1,200,000	1,500,000 1,600,000	N27 N27
ML 3625 ML 3650	0.91 1.91	1,500 3,000	.05-1.5 .05-1.5	670,000 760,000	1,100,000 1,200,000	1,500,000 1,600,000	N27 N27
ML 4525 ML 4550	0.91 1.91	3,450 6,900	.05-1.5 .05-1.5	950,000 1,000,000	1,400,000 1,700,000	1,700,000 2,200,000	N27, N30 N27, N30
ML 6425 ML 6450	0.91 1.91	9,000 18,000	.05-1.5 .05-1.5	1,100,000 1,300,000	2,200,000 2,600,000	2,900,000 3,400,000	N27, N32 N27, N32

Parker Hannifin Corporation
Pneumatic Division
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Miniature Shock Absorbers MC 9 to MC 75
Self-Compensating



Miniature Shock Absorbers
are self-contained hydraulic units. The MC 9 to MC 75 model range has a very short overall length and low return force. Its small size allows for high energy absorption in confined spaces, while the wide effective weight ranges accommodate a variety of load conditions. With threaded outer bodies and multiple accessories, MC models can be mounted in numerous configurations.

Applications include: small linear slides, material handling and packaging equipment, small robotics, office and medical equipment, as well as instrumentation.

Ordering Information

MC 75 -1

MC Series

Model Number

9
10
25
75

Mounting Thread

MC9
M M6 x 1.0 metric

MC 10
M M8 x 1.0 metric
E M8 x 0.75 metric

MC 25
Standard (UNEF)
M Metric

MC 75
Standard (UNF)
M Metric

Effective Weight

MC9
-1 Light
-2 Medium

MC 10
L Light Range
H Heavy Range

MC 25
L Light Range
Standard Range
H Heavy Range

MC75
-1 Light
-2 Medium
-3 Heavy

Button Options

MC 9 and 10
Standard No Button
-B Delrin Button

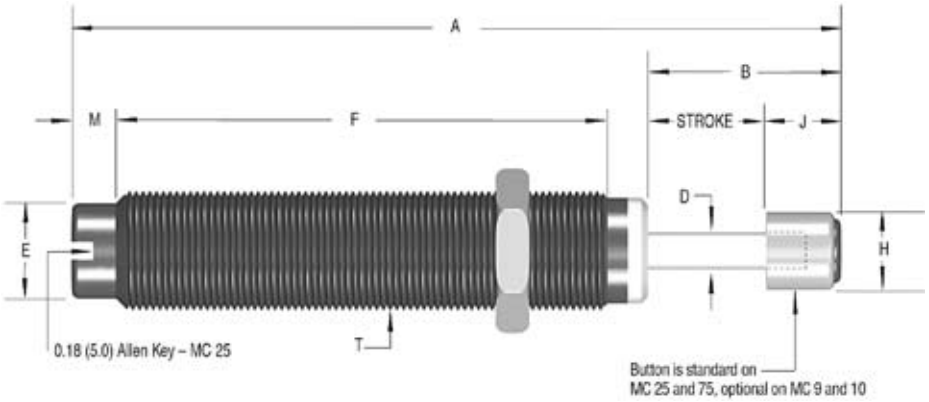
MC 25 and 75
Standard with Button
-NB *No button, short rod
-880 No button, standard rod

*Consult factory for dimensional details.

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Miniature Shock Absorbers MC 9 to MC 75
Self-Compensating



Dimensions IN INCHES (MILLIMETERS)

Model	Stroke	A	B	C	D	E	F	H	J	M	T	EE	FF
MC 9M	.20 (5.0)	1.42 (36.0)	.40 (10.0)	N/A	.08 (2.0)	.20 (5.0)	.83 (21.1)	.19 (4.7)	.20 (5.0)	.10 (2.5)	M6x0.5	N/A	N/A
MC 10E **MC 10M**	.20 (5.0)	1.52 (38.6)	.40 (10.0)	N/A	.08 (2.0)	.25 (6.4)	.83 (21.1)	.19 (4.7)	.20 (5.0)	.19 (4.8)	M8x0.75 M8x1	N/A	N/A
MC 25 **MC 25M**	.26 (6.6)	2.27 (57.7)	.57 (14.5)	N/A	.13 (3.3)	.33 (8.4)	1.3 (33.0)	.30 (7.6)	.32 (8.1)	.20 (5.0)	3/8-32 UNEF M10x1	N/A	N/A
MC 75 **MC 75M**	.40 (10.2)	2.76 (70.1)	.72 (18.1)	N/A	.13 (3.3)	.41 (10.4)	1.74 (44.2)	.30 (7.6)	.32 (8.1)	.18 (4.6)	1/2-20 UNF M12x1	N/A	N/A

Specifications

Model	We Effective Weight lbs	(kg)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
MC 9M-1 **MC 9M-2**	1.35 - 7.0 1.75 - 9.0	(0.6 - 3.2) (0.8 - 4.1)	9.0 (1.0)	18,000 (2,000)	0.31 - 0.85 (1.38-3.78)	0.30	0.01 (0.004)
MC 10L **MC 10H**	0.75 - 6.0 1.5 - 11	(0.34 - 3) (0.68 - 5)	4.0 (0.45) 7.0 (0.79)	35,000 (3,950)	0.5 - 1.0 (2.22 - 4.45)	0.20	.02 (0.01)
MC 25L **MC 25** **MC 25H**	1.5 - 5.0 4 - 12 10 - 30	(0.70 - 2) (2 - 5) (5 - 14)	20 (2)	120,000 (13,550)	0.8 - 1.7 (3.56 - 7.56)	0.20	.06 (0.03)
MC 75-1 **MC 75-2** **MC 75-3**	.5 - 2.5 2 - 14 6 - 80	(0.23 - 1) (0.91 - 6) (3 - 36)	75 (8)	250,000 (28,240)	1.0 - 2.5 (4.45 - 11.12)	0.30	.09 (0.04)

Technical Data

Impact velocity range:
MC 9: 0.5 to 6 ft/sec (0.15 to 1.8 m/sec)
MC 10: 0.5 to 5 ft/sec (0.15 to 1.5 m/sec)
MC 25: 0.5 to 8 ft/sec (0.15 to 2.4 m/sec)
MC 75: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)

Operating temperature:
MC 9 and MC 10: 14° to 158°F (-10° to 70°C)
MC 25: 32° to 150°F (0° to 66°C)
MC 75: 32° to 150°F (0° to 66°C)

Mechanical stop: Integral mechanical stop built into front of units.

Oil type: Silicone

Materials: Steel body with black oxide finish.
Hardened stainless steel piston rod.

Technical data applies to standard and metric threaded models.
Maximum side load depends on application. For additional information contact The Actuator Division.

Lock nut included with each shock absorber.

Note: All dimensions and tolerance values listed in this catalog are nominal and subject to change without notice.

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Miniature Shock Absorbers MC 150 to MC 600
Self-Compensating



Miniature Shock Absorbers

MC 150 to MC 600 model range, feature a hermetically sealed rolling diaphragm seal system that provides the highest possible cycle lifetime and an extremely low rod return force. These models can be directly mounted into the end cover of pneumatic cylinders to provide superior damping compared to normal cylinder cushions. Use of the optional stop collar is recommended to provide a positive mechanical stop. By adding the optional side load adapter (metric threaded models only), it is possible to accept side loads up to 25° from the axis.

Applications for the durable MC Series include: material handling, medium robotics, machine tools, pick and place systems, as well as packaging equipment.

Ordering Information

MC 225 _ _ _

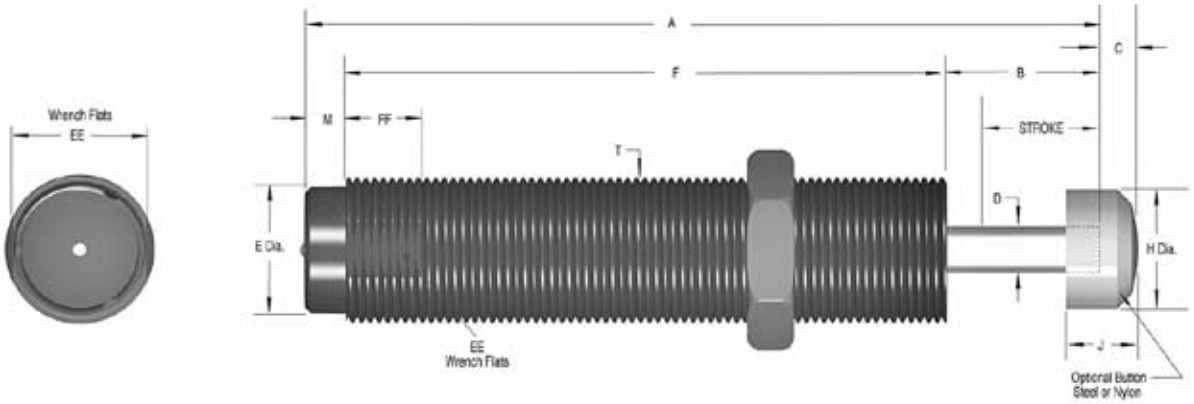
MC Series	Model Number	Mounting Thread	Effective Weight	Button Options
	150	Standard (UNF)	**MC 150, 225, 600**	Standard No Button
	255	M Metric	Standard Range	-B Nylon Button
	600	ME* Fine Metric	H Heavy Range	-BS Steel Button
		ML** Coarse Metric	H2 Extra Heavy Range	

**MC 150 only*
***MC 600 only*

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Wadsworth, Ohio
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Miniature Shock Absorbers MC 150 to MC 600
Self-Compensating



Dimensions IN INCHES (MILLIMETERS)

Model	Stroke	A	B	C	D	E	F	H	J	M	T	EE	FF
MC 150 **MC 150M** **MC 150ME**	.50 (12.8)	3.41 (86.6)	.69 (17.5)	.18 (4.6)	.19 (4.8)	.46 (11.6)	2.44 (62.0)	.47 (11.9)	.39 (9.9)	.28 (7.1)	9/16-18 UNF M14x1.5 M14x1	.500 (12.0)	.50 (12.7)
MC 225 **MC 225M** **MC 225ME**	.50 (12.8)	3.81 (96.8)	.69 (17.5)	.16 (4.1)	.25 (6.4)	.66 (16.7)	2.84 (72.1)	.66 (16.8)	.36 (9.1)	.28 (7.1)	3/4-16 UNF M20x1.5 M20x1	.687 (18.0)	.50 (12.7)
MC 600 **MC 600M** **MC 600ML**	1.00 (25.4)	5.58 (141.8)	1.24 (31.6)	.23 (5.8)	.31 (7.9)	.87 (22.0)	4.06 (103.1)	.89 (22.6)	.47 (11.9)	.28 (7.1)	1-12 UNF M25x1.5 M27x3	.875 (23.0)	.50 (12.7)

Specifications

Model	We Effective Weight lbs	We Effective Weight (kg)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
MC 150 **MC 150H** **MC 150H2**	2 - 22 20 - 200 150 - 450	(0.91 - 10) (9 - 91) (68 - 204)	150 (17) (280)* (32)*	300,000 (33,890)	0.70 - 1.20 (3.11 - 5.34)	0.40	.12 (0.05)
MC 225 **MC 225H** **MC 225H2**	5 - 55 50 - 500 400 - 2,000	(2 - 25) (23 - 227) (181 - 907)	225 (25) (380)* (43)*	400,000 (45,190)	1.00 - 1.50 (4.45 - 6.67)	0.30	.34 (0.15)
MC 600 **MC 600H** **MC 600H2**	20 - 300 250 - 2,500 880 - 5,000	(9 - 136) (113 - 1,134) (399 - 2,268)	600 (88) (1,300)* (147)*	600,000 (67,790)	1.00 - 2.00 (4.45 - 8.90)	0.60	.57 (0.26)

**Hydro shock energy ratings. Consult factory.*

Technical Data

Impact velocity range: 0.26 to 19.7 ft/sec (0.08 to 6 m/sec)

Operating temperature: 32° to 150°F (0° to 66°C)

Mechanical stop: Must be provided 0.02 to 0.04 inch (0.5 to 1 mm) before end of stroke.

Oil type: Silicone

Materials: Steel body with black oxide finish. Hardened stainless steel piston rod. Rolling seal EPDM (note: seal not compatible with petroleum based fluids) If unit to be used in contact with such fluids specify neoprene rolling seal. Consider the SC² Series as an alternative.

To prevent damage to the rolling seal in MC 150, 225 and 600 models, do not twist or turn the piston rod.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact The Actuator Division.

Lock nut included with each shock absorber.

Note: MC 150 to MC 600 models may be mounted into pressure chambers of pneumatic actuators.

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

SC² Series SC 190 to SC 925
Soft Contact and Self-Compensating



SC² Series Miniature Shock Absorbers provide dual performance benefits. They offer **soft contact deceleration** where initial impact reaction forces are very low, with the advantages of **self-compensation** to react to changing energy conditions, without adjustment. They have long stroke lengths, **SC² 925 with 1.58 inch (40 mm) superstroke**, to provide smooth deceleration and low reaction forces.

With the addition of the **optional side load adapter** (SC² 190M, 300M, and 650M models only), SC² Series shock absorbers can handle side loads up to 25°. SC² Series shock absorbers are fully interchangeable with the adjustable MA range.

Applications include: material handling, medium robotics, machine tools, pick and place systems, rodless cylinders and packaging equipment.

Ordering Information

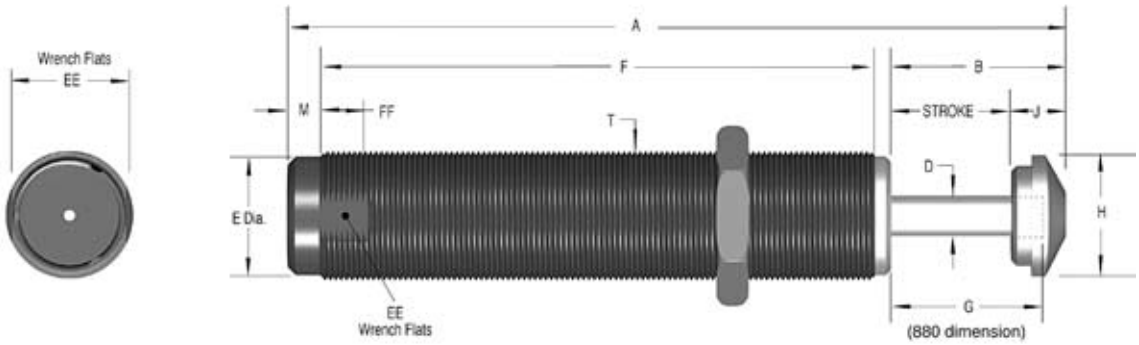
SC 300 -1 ____

SC² Series	Model Capacity	Mounting Thread	Effective Weight	Button Options
Soft Contact Self-Compensating	190 300 650 925	- Standard (UNF) M Metric	-1 Ultra Light -2 Light -3 Medium -4 Heavy	- Standard with Button -NB No Button, Short Rod -880 No Button, Standard Rod

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Parker Hannifin Corporation
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SC² Series SC 190 to SC 925
Soft Contact and Self-Compensating



Dimensions IN INCHES (MILLIMETERS)

Model	Stroke	A	B	D	E	F	G	H	J	M	T	EE	FF
SC 190 **SC 190M**	.63 (16.0)	4.50 (114.3)	1.06 (26.9)	.16 (4.1)	.46 (11.7)	3.00 (76.2)	.88 (22.4)	.47 (11.9)	.43 (11.0)	.28 (7.1)	9/16-18 UNF M14x1.5	1/2 (12.0)	.50 (12.7)
SC 300 **SC 300M**	.75 (19.1)	4.62 (117.5)	1.18 (30.0)	.19 (4.8)	.66 (16.8)	3.09 (78.5)	1.00 (25.4)	.66 (16.8)	.43 (11.0)	.28 (7.1)	3/4-16 UNF M20x1.5	11/16 (18.0)	.50 (12.7)
SC 650 **SC 650M**	1.00 (25.4)	5.62 (142.6)	1.43 (36.3)	.25 (6.3)	.87 (22.1)	3.83 (97.3)	1.25 (31.8)	.90 (22.9)	.43 (11.0)	.28 (7.1)	1-12 UNF M25x1.5	7/8 (23.0)	.50 (12.7)
SC 925 **SC 925M**	1.58 (40.0)	7.44 (189.1)	2.01 (51.1)	.25 (6.3)	.87 (22.1)	5.1 (129.5)	1.82 (46.4)	.90 (22.9)	.43 (11.0)	.28 (7.1)	1-12 UNF M25x1.5	7/8 (23.0)	.50 (12.7)

Specifications

Model	Soft Contact We Effective Weight lbs (kg)	Self-Compensating We Effective Weight lbs (kg)	E3 Energy per Cycle in lbs (Nm)	E4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SC 190-1 **SC 190-2** **SC 190-3** **SC 190-4**	5 - 13 (2 - 6) 12 - 38 (5 - 18) 30 - 90 (14 - 41) 75 - 200 (34 - 91)	3 - 15 (1.4 - 7) 8 - 40 (4 - 18) 20 - 100 (9 - 45) 50 - 225 (23 - 102)	225 (25) *300 (33)	300,000 (34,000)	0.90 - 1.90 (4.00 - 8.95)	0.25	0.18 (0.08)
SC 300-1 **SC 300-2** **SC 300-3** **SC 300-4**	5 - 15 (2 - 7) 15 - 50 (7 - 23) 50 - 150 (23 - 68) 150 - 400 (68 - 181)	3 - 18 (1.4 - 8) 10 - 60 (5 - 27) 30 - 180 (14 - 82) 70 - 450 (32 - 204)	300 (33) *500 (56)	400,000 (45,000)	1.05 - 2.15 (4.67 - 9.56)	0.10	0.25 (0.11)
SC 650-1 **SC 650-2** **SC 650-3** **SC 650-4**	24 - 80 (11 - 36) 75 - 250 (34 - 113) 240 - 800 (109 - 363) 800 - 2400 (363 - 1089)	17 - 100 (8 - 45) 50 - 300 (23 - 136) 150 - 900 (68 - 408) 450 - 2600 (204 - 1180)	650 (73) *1,000 (113)	600,000 (68,000)	2.40 - 6.87 (10.67 - 30.55)	0.20	0.67 (0.31)
SC 925-1 **SC 925-2** **SC 925-3** **SC 925-4**	50 - 160 (22 - 72) 130 - 460 (59 - 208) 400 - 1,350 (181 - 612) 1200 - 4300 (544 - 1952)	30 - 200 (14 - 90) 90 - 600 (40 - 272) 250 - 1,600 (113 - 726) 750 - 4600 (340 - 2088)	975 (110) *1,700 (192)	800,000 (90,000)	2.40 - 7.40 (10.67 - 30.55)	0.40	0.87 (0.39)

Technical Data

Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)

Operating temperature: 32° to 150°F (0° to 66°C)

Mechanical stop: Integral mechanical stop built into front of units.

Oil type: #5

Materials: Steel body with black oxide finish. Hardened stainless steel piston rod.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact The Actuator Division.

Lock nut included with each shock absorber.

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

SC² Heavyweight Series SC 300 to SC 650
Soft Contact and Self-Compensating



SC² 300 and SC² 650 Heavyweight Series Shock Absorbers deliver up to 950% of the effective weight capacity and 280% of the energy absorption capability of standard models. These durable units are ideal for decelerating heavy weights moving at low velocities. The Heavyweight Series design combines the piston and the inner tube into a single component, the piston tube. It acts as both the pressure creating and pressure controlling device.

SC² 300 and SC² 650 Heavyweight II Series Shock Absorbers offer effective weight ranges and dramatic increases in energy absorption capability, for handling a wider range of applications.

These revolutionary shock absorbers provide dual performance benefits. They offer **soft contact** deceleration where initial impact reaction forces are very low with the advantages of **self-compensation** to cope with changing input energy conditions without adjustment.

Applications include: rotary actuators, rodless cylinders, conveyors, pick and place operations, slides as well as operations turning heavy weights at slow speeds.

Ordering Information

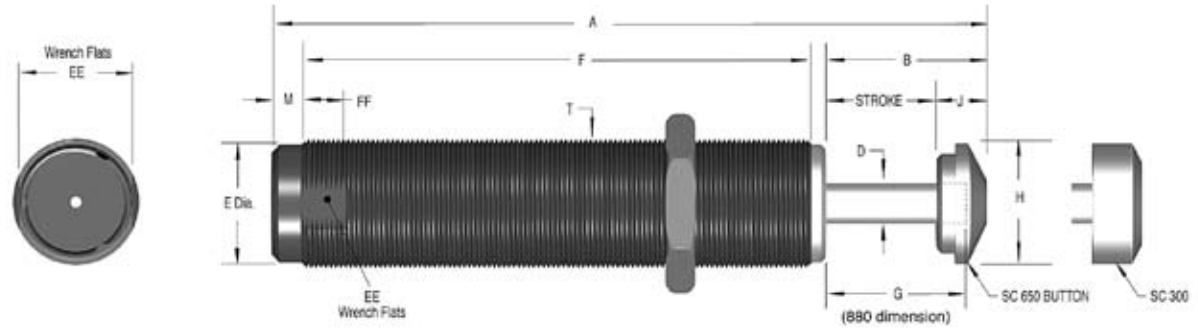
SC 300 - 5

SC² Series	Model Capacity	Mounting Thread	Effective Weight	Button Options
Soft Contact	300	- Standard (UNF)	-5 Heavy	- Standard with Button
Self-Compensating	650	M Metric	-6 Heavy Plus	-NB No Button, Short Rod
			-7 Heavy Duty	-880 No Button, Standard Rod
			-8 Extra Heavy	
			-9 Ultra Heavy	

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SC² Heavyweight Series SC 300 to SC 650
Soft Contact and Self-Compensating



Heavyweight Series Dimensions IN INCHES (MILLIMETERS)

Model	Stroke	A	B	D	E	F	G	H	J	M	T	EE	FF
SC 300-5 **SC 300-6** **SC 300-7** **SC 300-8** **SC 300-9** **SC 300M-5** **SC 300M-6** **SC 300M-7** **SC 300M-8** **SC 300M-9**	.59 (15.0)	4.15 (105.4)	1.02 (25.9)	.25 (6.4)	.66 (16.8)	2.78 (70.6)	.84 (21.3)	.67 (17.0)	.43 (11.0)	.28 (7.1)	3/4-16 UNF M20x1.5	11/16 (17.5)	.50 (12.7)
SC 650-5 **SC 650-6** **SC 650-7** **SC 650-8** **SC 650-9** **SC 650M-5** **SC 650M-6** **SC 650M-7** **SC 650M-8** **SC 650M-9**	.91 (23.1)	5.51 (140.0)	1.33 (33.8)	.38 (9.6)	.87 (22.1)	3.83 (97.3)	1.16 (29.5)	.88 (22.4)	.43 (11.0)	.28 (7.1)	1-12 UNF M25x1.5	7/8 (22.2)	.50 (12.7)

Specifications

Model	Soft Contact We Effective Weight lbs (kg)	Self-Compensating We Effective Weight lbs (kg)	E3 Energy per Cycle in lbs (Nm)	E4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SC 300-5 **SC 300-6** **SC 300-7**	38 - 90 (17 - 41) 115 - 270 (52 - 123) 300 - 360 (136 - 163)	25 - 100 (11 - 45) 75 - 300 (34 - 136) 200 - 400 (91 - 181)	650 (73)	400,000 (45,194)	1.70 - 4.00 (7.56 - 17.79)	0.20	0.33 (0.15)
SC 300-8 **SC 300-9**	450 - 1,350 (204 - 612) 1,050 - 3,900 (476 - 1,769)	300 - 1,500 (136 - 680) 700 - 4,300 (318 - 1,950)	620 (70)	400,000 (45,194)	1.70 - 4.00 (7.56 - 17.79)	0.20	0.33 (0.15)
SC 650-5 **SC 650-6** **SC 650-7**	75 - 225 (34 - 102) 300 - 720 (136 - 327) 1,050 - 2,150 (476 - 975)	50 - 250 (23 - 113) 200 - 800 (91 -363) 700 - 2,400 (317 - 1,089)	1,860 (210)	600,000 (67,791)	2.40 - 7.30 (10.68 - 32.99)	0.30	0.76 (0.34)
SC 650-8 **SC 650-9**	2,500 - 5,200 (1,134 - 2,359) 6,000 - 12,500 (2,722 - 5,670)	1,700 - 5,800 (771 - 2,631) 4,000 - 14,000 (1,814 - 6,350)	1,860 (210)	600,000 (67,791)	2.40 - 7.30 (10.68 - 32.47)	0.30	0.76 (0.34)

Technical Data

Impact velocity range: .30 to 12.0 ft/sec (0.09 to 3.66 m/sec)

Operating temperature: 32° to 150°F (0° to 66°C)

Mechanical stop: Integral mechanical stop built into front of units.

Oil type: #5

Materials: Steel body with black oxide finish. Hardened stainless steel piston rod.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact The Actuator Division.

Lock nut included with each shock absorber.

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Miniature Shock Absorbers MA 35 to MA 900
Adjustable



MA Series miniature shock absorbers offer a compact design with true linear deceleration, and are adjustable over a wide range of conditions.
If your preference is a fully adjustable shock absorber rather than a self-compensating model on your application, then the MA Series provides a directly interchangeable alternative.

These adjustable models feature long stroke lengths, **MA 900 with 1.58 inch (40 mm) superstroke**, to provide smooth deceleration and low reaction forces. The MA 150 incorporates the proven rolling diaphragm seal (used on the MC 150 to MC 600 range) and shares all the advantages of that technology.

Applications include: material handling, medium robotics, pick and place systems, machine tool and packaging equipment.

Ordering Information

MA 225 -

MA Series

MA = Miniature Adjustable

Model Number

35
150
225
600
900

Mounting Thread

Standard (UNF)
M Metric
ME Fine Metric (MA 150 only)

Button Options

MA 35
Standard with Button
-NB No Button, Short Rod

MA 150
Standard No Button
-B Nylon Button
-BS Steel Button

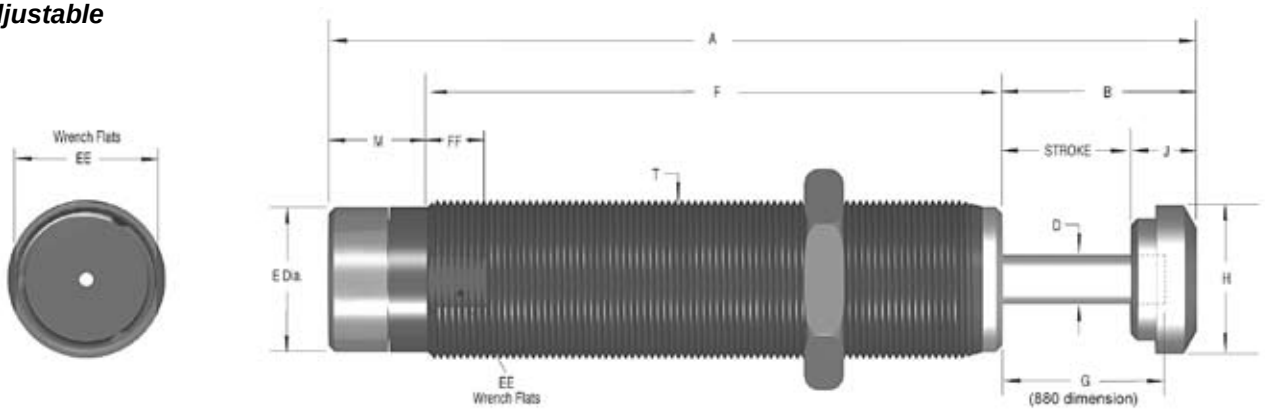
MA225-900
Standard Steel Button
-NB No Button, Short Rod
-880 No Button, Standard Rod

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Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Miniature Shock Absorbers MA 35 to MA 900

Adjustable



Dimensions **IN INCHES (MILLIMETERS)**

Model	Stroke	A	B	D	E	F	G	H	J	M	T	EE	FF
MA 35 **MA 35M**	.40 (10.1)	3.31 (84.1)	.72 (18.3)	.13 (3.3)	.42 (10.6)	2.41 (61.2)	N/A	.30 (7.6)	.32 (8.0)	.18 (4.6)	1/2-20 UNF M12x1	N/A	N/A
MA 150 **MA 150M** **MA 150ME**	.49 (12.4)	3.64 (92.5)	.92 (23.4)	.19 (4.8)	.46 (11.6)	2.44 (62.0)	.69 (17.5)	.47 (11.9)	.43 (11.0)	.28 (7.1)	9/16 -18 UNF M14x1.5 M14x1	.49 (12.7)	.50 (12.7)
MA 225 **MA 225M**	.75 (19.1)	4.67 (118.6)	1.18 (30.0)	.19 (4.8)	.66 (16.8)	2.94 (74.7)	1.00 (25.3)	.66 (16.8)	.43 (11.0)	.55 (14.0)	3/4-16 UNF M20x1.5	11/16 (18.0)	.50 (12.7)
MA 600 **MA 600M**	1.00 (25.4)	5.62 (142.6)	1.43 (36.3)	.25 (6.3)	.88 (22.4)	3.54 (90.0)	1.25 (31.8)	.90 (22.9)	.43 (11.0)	.65 (16.5)	1-12 UNF M25x1.5	7/8 (23.0)	.50 (12.7)
MA 900 **MA 900M**	1.58 (40.0)	7.44 (189.0)	2.01 (51.1)	.25 (6.3)	.88 (22.4)	4.78 (121.4)	1.85 (46.4)	.90 (22.9)	.43 (11.0)	.65 (16.5)	1-12 UNF M25x1.5	7/8 (23.0)	.50 (12.7)

Specifications

Model	We Effective Weight lbs (kg)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
MA 35	13 - 125 (6 - 57)	35 (4)	53,000 (5,988)	1.20 - 2.60 (5.33 - 11.56)	.17	.10 (0.04)
MA 150	2 - 200 (0.91 - 91)	150 (17)	300,000 (33,890)	0.70 - 1.20 (3.12 - 5.34)	.40	.12 (0.05)
MA 225	5 - 500 (2 - 227)	225 (25)	400,000 (45,190)	1.05 - 2.15 (4.67 - 9.56)	.10	.28 (0.13)
MA 600	20 - 3,000 (9 - 1,361)	600 (68)	600,000 (67,790)	2.40 - 6.87 (10.67 - 30.56)	.20	.67 (0.30)
MA 900	30 - 4,500 (14 - 2,041)	900 (102)	800,000 (90,380)	2.40 - 7.40 (10.67 - 32.92)	.40	.87 (0.39)

Technical Data

Impact velocity range

MA 35: 3.3 ft/sec (1.0 m/sec)

MA 150, 225, 600, 900: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)

Operating Temperature: 32° to 150°F (0° to 66°C)

Mechanical Stop

MA 35: Integral

MA 150: Must be provided 0.02 to 0.04 inch (0.5 to 1 mm) before end of each stroke.

MA 225, 600, 900: Integral mechanical stop built into front of units.

Oil type

MA 35: #5

MA 150: Silicone

MA 225, 600, 900: ATF

Materials: Steel body with black oxide finish. Hardened stainless steel piston rod.

Adjustment: On models MA 35 up to MA 150: by turning the adjustment screw at rear. On the larger sizes: by turning the adjustment knob against the scale marked 0 to 9. After installation, cycle the machine a few times and turn the adjustment knob until optimum deceleration is achieved (i.e. smooth deceleration throughout stroke).

Hard impact at start of stroke-turn adjuster toward 9.

Hard set-down at end of stroke-turn adjuster toward 0.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact The Actuator Division.

Note: MA 150 models may be mounted into pressure chambers of pneumatic actuators.

Lock nut included with each shock absorber.

MA 35 and MA 150 models can be utilized as velocity controls.

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Magnum Series MC 33 to MC 64
Self-Compensating



Parker presents the ultimate in industrial shock absorber design...the Magnum Series. These versatile performers offer you the capability to mount shock absorbers that contain the highest energy capacity ratings in the industry. **Up to 150% of the energy per cycle** of previous models in the same package size, means increased safety factors in a wider range of applications.

Up to 390% of the effective weight capacity of previous models, may allow a smaller, lower priced shock absorber to be mounted, to meet your application requirements.

All Magnum Series shock absorbers are **fully threaded** for ease of installation. **Incorporation of high strength materials** along with an **integral stop collar** translates to extended shock absorber life and cost savings for you.

Applications include: automotive manufacturing and production equipment, large robotics, heavy conveyors, packaging and glass bottling equipment, rotary actuators, theme park rides, and lumber industry equipment.

Technical Data

Impact velocity range:
MC Models: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec)

Operating Temperature: 10° to 150°F (-12° to 66°C)

Oil type: ATF

Materials: Steel with black oxide finish. Piston rod high tensile steel, hardened and chrome plated. Rod end button hardened steel with black oxide finish. Zinc plated return spring. For optimum heat dissipation, **do not** paint shock absorber.

Technical data applies to standard and metric threaded models.

Lock nut included with each shock absorber.

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Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
www.parker.com/pneumatics

Magnum Series MA and ML 33 to 64
Adjustable

Magnum Series adjustable shock absorbers feature the latest seal technology, **a hardened piston ring, pressure chamber and outer body** for increased operating life. Additionally, these rugged units offer the unique feature of **front or rear adjustment** along with a fully threaded outer body for ease of installation.

Magnum Series adjustable shock absorbers are **directly interchangeable** with obsolete primary series and competitor models.

Along with the self-compensating models, the adjustable range offers unprecedented increases in energy and effective weight capacity.

Applications are the same as self-compensating models.



Technical Data

Impact velocity range
MA Models: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec)
ML Models: 0.06 to 1.5 ft/sec (0.02 to 0.46 m/sec)

Operating Temperature: 10° to 150°F (-12° to 66°C)

Oil type: ATF

Materials: Steel with black oxide finish. Piston rod high tensile steel, hardened and chrome plated. Rod end button hardened steel with black oxide finish. Zinc plated return spring. For optimum heat dissipation, **do not** paint shock absorber.

Adjustment: After installation of the Magnum Series shock absorber, cycle the machine a number of times. Turn the front stop collar or the rear adjuster against the scale marked 0 to 9 until optimum deceleration is achieved (i.e. smooth deceleration throughout the stroke).

Hard impact at start of stroke-turn adjuster toward 9.

Hard set-down at end of stroke-turn adjuster toward 0.

Technical data applies to standard and metric threaded models.

The Actuator Division recommends that side load not exceed 5°. Maximum side load depends on application.
For additional information consult The Actuator Division.

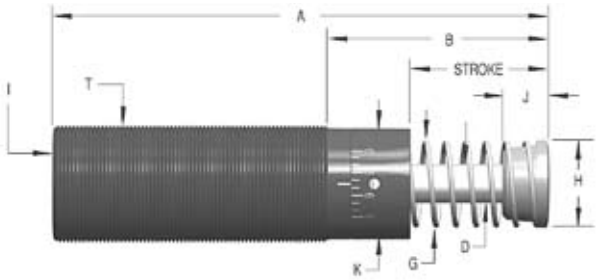
Lock nut included with each shock absorber.

Parker Hannifin Corporation
Pneumatic Division
Wadsworth, Ohio
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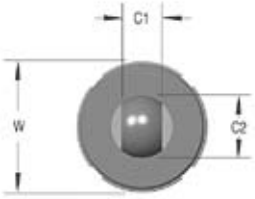
Magnum Series MC/MA/ML 33 and 36
Self-Compensating and Adjustable

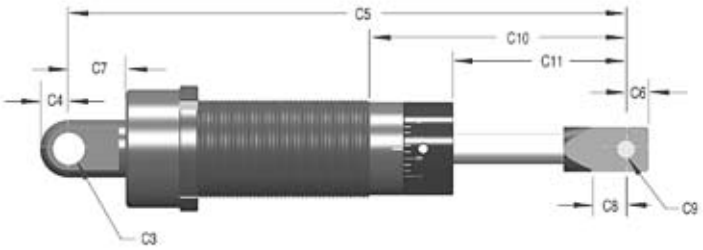
Primary Mount

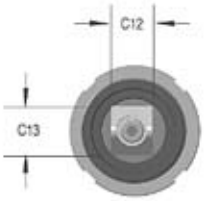




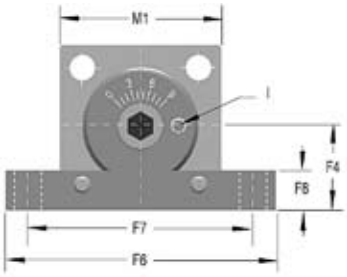
Clevis Mount

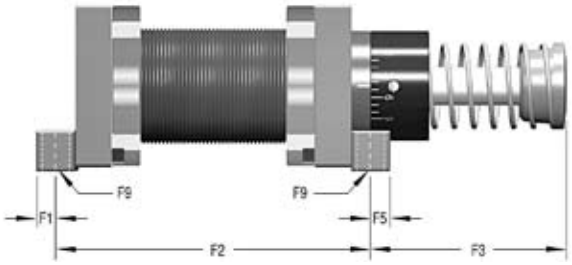






Side-Foot Mount





33 Model Dimensions **IN INCHES (MILLIMETERS)**

Model	Stroke	A	B	D	G	H	I*	J	K	T	W	C1	C2	C3	C4
MC, MA, ML 3325	0.91 (23.1)	5.44 (138.1)	2.19 (55.6)	0.375 (9.5)	0.99 (25.1)	1.00 (25.4)	1/8 NPT MALE	0.75 (19.1)	1.15 (29.2)	1-1/4-12 M33x1.5	1.50 (38.10)	0.50 (12.7)	0.76 (19.3)	.2505 (6.40)	0.32 (8.1)
MC, MA, ML 3350	1.91 (48.5)	7.44 (189)	3.19 (81)								1.56 (39.71)				

Model	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	F1	F2	F3	F4	F5
MC, MA, ML 3325	6.58 (167)	0.25 (6.4)	0.48 (12.2)	0.50 (12.7)	.2505 (6.4)	2.64 (67.1)	1.36 (34.5)	0.50 (12.7)	0.75 (19.1)	N/A	0.25 (6.4)	3.75 (95.3)	1.94 (49.3)	0.87 (22.1)	0.25 (6.4)
MC, MA, ML 3350	8.58 (217.8)					3.64 (92.5)	2.36 (60)					4.75 (120.7)	2.94 (74.7)		

Model	F6	F7	F8	F9
MC, MA, ML 3325 MC, MA, ML 3350	2.75 (69.9)	2.37 (60)	0.50 (12.7)	0.23 (5.9)

*** For models MAA and MAS 33 the 1/8-27 male fitting is shipped with the shock. MAA and MAS 45 and 64 have pipe plugs.**

Note: For models MAA, MLA and MCA indicate P for the side port option when ordering clevis mount.

Note: M 36 and 1-3/8 thread is optional.

Note: A side port can be adapted to Magnum Series 33 MAA, MLA and MCA models and is a special adder item. A side port adapter ring is molded onto the outer tube and increases the overall diameter by 0.25 inches (6.3 mm) in the area of the ring. The side port centerline is located 0.81 inches (20.7 mm) from the front of the outer tube. Add (-P) to the model ordering code if a side port is desired, see page N34.

Note: Poly pad available on 33 models only – part no. 250-0011.

Lock nut included with each shock absorber. See page N51 for dimensions.

Note: All dimensions and tolerance values listed in this catalog are nominal and subject to change without prior notice.

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Magnum Series MC/MA/ML 33 and 36
Self-Compensating and Adjustable

36 Model Dimensions IN INCHES (MILLIMETERS)

Model	Stroke	A	B	D	G	H	I*	J	K	T	W	C1	C2	C3	C4
MC, MA, ML 3625	0.91 (23.1)	5.44 (138.1)	2.19 (55.6)	0.375 (9.5)	0.99 (25.1)	1.00 (25.4)	1/8 NPT MALE	0.75 (19.1)	1.15 (29.2)	1-3/8-12 M36x1.5	1.75 (44.5)	N/A	N/A	N/A	N/A
MC, MA, ML 3650	1.91 (48.5)	7.44 (189)	3.19 (81)												

Model	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	F1	F2	F3	F4	F5
MC, MA, ML 3625 MC, MA, ML 3650	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Model	F6	F7	F8	F9
MC, MA, ML 3625 MC, MA, ML 3650	N/A	N/A	N/A	N/A

Specifications...MC Series, Self-Compensating

Model	We Effective Weight lbs (kg)		E3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E4			Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
				Internal Accumulator (Self-Contained)	External Accumulator (A/O Tank)	External Accumulator (Re-circulating)			
MC 3325-1	20-80	(9-36)	1,350 (153)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.00 (0.45)
MC 3325-2	68-272	(31-123)							
MC 3325-3	230-920	(104-417)							
MC 3325-4	780-3,120	(354-1,415)							
MC 3350-1	40-160	(18-73)	2,700 (305)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.2 (0.54)
MC 3350-2	136-544	(62-247)							
MC 3350-3	460-1,840	(209-835)							
MC 3350-4	1,560-6,240	(708-2,830)							
MC 3625-1	20-80	(9-36)	1,350 (153)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.23 (0.56)
MC 3625-2	68-272	(31-123)							
MC 3625-3	230-920	(104-417)							
MC 3625-4	780-3,120	(354-1,415)							
MC 3650-1	40-160	(18-73)	2,700 (305)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.51 (0.68)
MC 3650-2	136-544	(62-247)							
MC 3650-3	460-1,840	(209-835)							
MC 3650-4	1,560-6,240	(708-2,830)							

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec)

Specifications...MA Series, Adjustable

MA 3325	20-3,800	(9-1,724)	1,500 (169)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.0 (0.45)
MA 3350	28-5,400	(13-2,449)	3,000 (339)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.2 (0.54)
MA 3625	20-3,800	(9-1,724)	1,500 (169)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.23 (0.56)
MA 3650	28-5,400	(13-2,449)	3,000 (339)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.51 (0.68)

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec)

Specifications...ML Series, Low Velocity Adjustable

ML 3325			1,500 (169)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.0 (0.45)
ML 3350			3,000 (339)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.2 (0.54)
ML 3625			1,500 (169)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.23 (0.56)
ML 3650			3,000 (339)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.51 (0.68)

Impact velocity range: 0.06 to 1.5 ft/sec (0.02 to 0.46 m/sec)

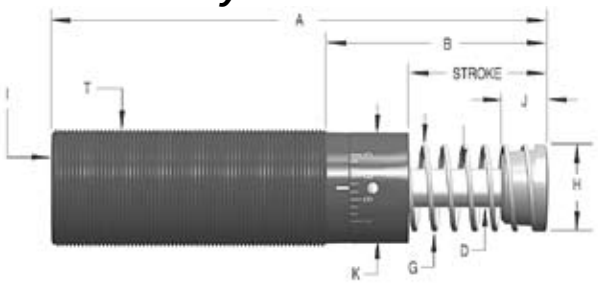
Note: Side load not to exceed 5°. Maximum side load depends on application.

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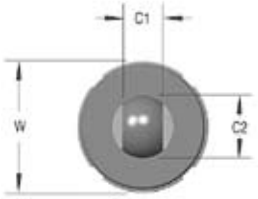
Magnum Series MC/MA/ML 45
Self-Compensating and Adjustable

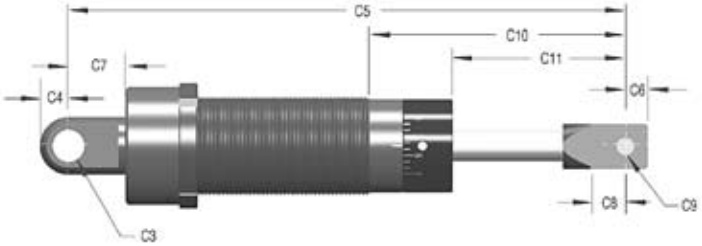
Primary Mount

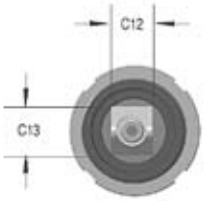




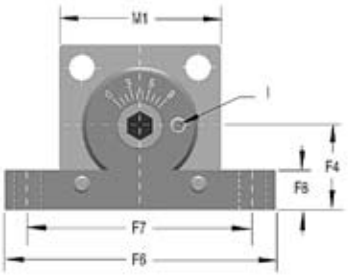
Clevis Mount

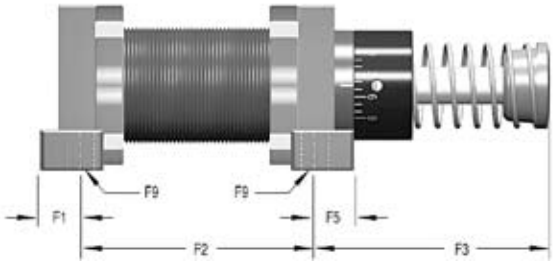






Side-Foot Mount





45 Model Dimensions **IN INCHES (MILLIMETERS)**

Model	Stroke	A	B	D	G	H	I*	J	K	T	W	C1	C2	C3	C4
MC, MA, ML 4525	0.91 (23.1)	5.69 (144.5)	1.97 (50)												
MC, MA, ML 4550	1.91 (48.5)	7.69 (195.3)	2.97 (75.4)	0.50 (12.7)	1.36 (34.5)	1.38 (34.9)	1/8 NPT	0.87 (22.1)	1.65 (41.9)	1-3/4-12 M45x1.5	2.25 (57.20)	0.75 (19.1)	1.00 (25.4)	.5005 (12.7)	0.50 (12.7)
MC, MA 4575	2.91 (73.9)	9.69 (246.1)	3.97 (100.8)												

Model	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	F1	F2	F3	F4	F5
MC, MA, ML 4525	7.85 (199.4)					2.57 (65.3)	1.51 (38.4)					3.50 (88.9)	1.94 (49.3)		
MC, MA, ML 4550	9.85 (250.2)	0.50 (12.7)	1.06 (26.9)	0.69 (17.5)	.3755 (9.6)	3.57 (90.7)	2.51 (63.8)	1.00 (25.4)	1.00 (25.4)	.505 (12.8)	0.50 (12.7)	4.38 (111.8)	3.06 (77.7)	1.16 (29.5)	0.37 (9.5)
MC, MA, ML 4575	11.85 (301)					4.57 (116.1)	3.51 (89.2)					5.38 (237.8)	4.06 (103.1)		

Model	F6	F7	F8	F9
MC, MA, ML 4525 MC, MA, ML 4550 MC, MA 4575	3.75 (95.3)	3.00 (76.2)	0.56 (14.2)	0.35 (8.9)

***For models MAA and MAS 33 the 1/8-27 male fitting is shipped with the shock. MAA and MAS 45 and 64 have pipe plugs.**

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Magnum Series MC/MA/ML 45
Self-Compensating and Adjustable

Specifications...MC Series, Self-Compensating									
Model	**We Effective Weight lbs (kg)**		**E3 Energy per Cycle in lbs (Nm)**	**Energy per Hour in lbs/hour (Nm/hour) E4**			**Return Force lbs (N)**	**Return Time sec**	**Shipping Weight lbs (kg)**
				Internal Accumulator (Self-Contained)	**External Accumulator (A/O Tank)**	**External Accumulator (Re-circulating)**			
MC 4525-1	50-200	(23-91)							
MC 4525-2	170-680	(77-300)	3,000	950,000	1,400,000	1,700,000	15.1-22.8	0.03	2.5
MC 4525-3	575-2,300	(261-1,043)	(339)	(107,000)	(158,000)	(192,000)	(67-101)		(1.13)
MC 4525-4	1,950-7,800	(885-3,538)							
MC 4550-1	100-400	(45-181)							
MC 4550-2	340-1,360	(154-617)	6,000	1,000,000	1,700,000	2,200,000	15.1-32.2	0.08	3.0
MC 4550-3	1,150-4,600	(522-2,087)	(678)	(112,000)	(192,000)	(248,000)	(67-143)		(1.36)
MC 4550-4	3,900-15,600	(1,769-7,076)							
MC 4575-1	150-600	(136-544)							
MC 4575-2	510-2,040	(231-925)	9,000	1,300,000	2,000,000	2,500,000	11.7-40.3	0.11	3.5
MC 4575-3	1,730-6,920	(785-3,139)	(1,017)	(146,000)	(225,000)	(282,000)	(52-179)		(1.59)
MC 4575-4	5,850-23,400	(2,654-10,614)							

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec)

Specifications...MA Series, Adjustable									
MA 4525	95-22,000	(43-9,979)	3,450 (390)	950,000 (107,000)	1,400,000 (158,000)	1,700,000 (192,000)	15.1-22.8 (67-101)	0.03	2.5 (1.13)
MA 4550	150-32,000	(68-14,515)	6,900 (780)	1,000,000 (112,000)	1,700,000 (192,000)	2,200,000 (248,000)	15.1-32.2 (67-143)	0.08	3.0 (1.36)
MA 4575	155-33,000	(70-14,968)	10,350 (1,169)	1,300,000 (146,000)	2,000,000 (225,000)	2,500,000 (282,000)	11.7-40.3 (52-179)	0.11	3.5 (1.59)

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec)

Specifications...ML Series, Low Velocity Adjustable									
ML 4525	N/A	N/A	3,450 (390)	950,000 (107,000)	1,400,000 (158,000)	1,700,000 (192,000)	15.1-22.8 (67-98)	0.03	2.5 (1.13)
ML 4550	N/A	N/A	6,900 (780)	1,000,000 (112,000)	1,700,000 (192,000)	2,200,000 (248,000)	15.1-32.2 (67-143)	0.08	3.0 (1.36)

Impact velocity range: 0.06 to 1.5 ft/sec (0.02 to 0.46 m/sec)

Note: A side port can be adapted to Magnum Series 45 MAA, MLA and MCA models and is a special adder item. A side port adapter ring is molded onto the outer tube and increases the overall diameter by 0.5 inches (12.7 mm) in the area of the ring. The side port centerline is located 1.04 inches (26.4 mm) from the front of the outer tube. Add (-P) to the model ordering code if a side port is desired, see page N34.

Note: Side load not to exceed 5°. Maximum side load depends on application.

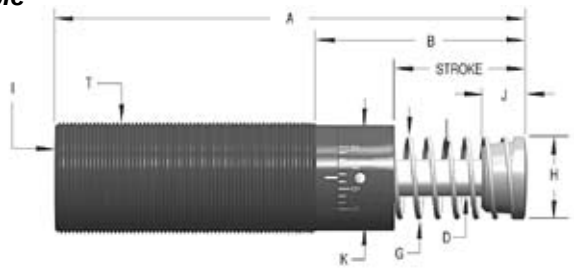
Lock nut included with each shock absorber. See page N 51 for dimensions.

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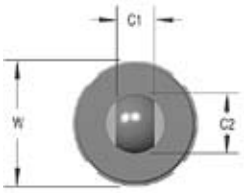
Magnum Series MC/MA/ML 64
Self-Compensating and Adjustable

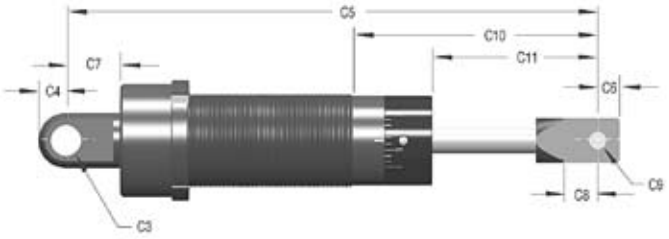
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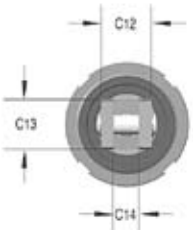




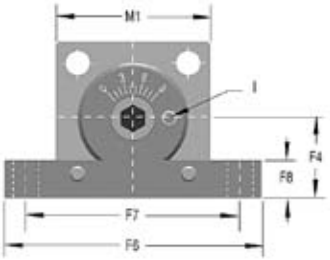
Clevis Mount

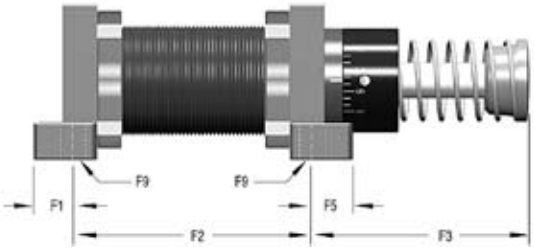






Side-Foot Mount





64 Model Dimensions **IN INCHES (MILLIMETERS)**

Model	Stroke	A	B	D	G	H	I*	J	K	T	W	C1	C2	C3	C4
ML 6425	0.91 (23.1)	6.85 (174)	2.35 (59.7)												
MC, MA, ML 6450	1.91 (48.6)	8.85 (224.8)	3.35 (85.1)												
MC, MA 64100	3.91 (99.4)	12.85 (326.4)	5.35 (135.9)	0.75 (19.1)	1.86 (47.2)	1.90 (48.3)	1/4 NPT	1.06 (26.9)	2.37 (60.2)	2-1/2-12 M64x2	3.00 (76.20)	1.25 (31.8)	1.50 (38.1)	.7505 (19.1)	0.75 (19.1)
MC, MA 64150	5.91 (150.1)	17.73 (450.4)	8.23 (209)		2.31 (58.7)	2.38 (60.3)		1.25 (31.8)							
MCA, MAA 64150	5.91 (150.1)	17.60 (447)	8.10 (205.7)		N/A	1.90 (48.3)		1.06 (26.9)			N/A	N/A	N/A	N/A	N/A

Model	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	F1	F2	F3	F4	F5
ML 6425	10.12 (257.1)					3.75 (95.2)	2.31 (58.7)					4.00 (101.6)	2.56 (65.0)		
MC, MA, ML 6450	12.12 (307.9)					4.75 (120.7)	3.31 (84.1)					5.00 (127.00)	3.56 (90.4)		
MC, MA 64100	16.12 (409.5)	0.63 (16.0)	1.29 (32.8)	1.40 (35.6)	.7505 (19.1)	6.75 (171.5)	5.31 (134.9)	1.50 (38.1)	1.25 (31.8)	.625 (15.9)	0.69 (17.5)	7.00 (177.8)	5.56 (141.2)	1.78 (45.2)	0.69 (17.5)
MC, MA 64150	20.87 (530.1)					9.50 (241.3)	8.06 (204.7)					9.00 (228.6)	8.44 (214.4)		
MCA, MAA 64150	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				8.31 (211.1)		

Model	F6	F7	F8	F9
ML 6425 **MC, MA, ML 6450** **MC, MA 64100** **MC, MA 64150** **MCA, MAA 64150**	5.62 (142.8)	4.88 (124.0)	0.75 (19.1)	0.42 (10.7)

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Magnum Series MC/MA/ML 64
Self-Compensating and Adjustable

Specifications...MC Series, Self-Compensating

Model	We Effective Weight Cycle lbs (kg)		E3 Energy per Accumulator in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E4 Internal Accumulator (Self-Contained)	E4 External Accumulator (A/O Tank)	E4 External Force (Re-circulating)	Return Time lbs (N)	Return Weight sec	Shipping lbs (kg)
MC 6450-1	300-1,200	(136-544)							
MC 6450-2	1,020-4,080	(463-1,851)	15,000	1,300,000	2,600,000	3,400,000	20.1-34.9	0.12	6.4
MC 6450-3	3,460-13,840	(1,569-6,278)	(1,695)	(146,000)	(293,000)	(384,000)	(89-155)		(2.90)
MC 6450-4	11,700-46,800	(5,307-21,228)							
MC 64100-1	600-2,400	(272-1,089)							
MC 64100-2	2,040-8,160	(925-3,701)	30,000	1,700,000	3,400,000	4,400,000	23.5-61	0.34	8.15
MC 64100-3	6,920-27,680	(3,139-12,556)	(3,390)	(192,000)	(384,000)	(497,000)	(104-271)		(3.70)
MC 64100-4	23,400-93,600	(10,614-42,457)							
MC 64150-1	900-3,600	(408-1,633)							
MC 64150-2	3,060-12,240	(1,388-5,552)	45,000	2,200,000	4,400,000	5,700,000	16.9-82.2	0.48	11.25
MC 64150-3	10,380-41,520	(4,708-18,833)	(5,084)	(248,000)	(497,000)	(644,000)	(75-366)		(5.10)
MC 64150-4	35,100-140,400	(15,921-63,685)							

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec).

Specifications...MA Series, Adjustable

MA 6450	480-110,000	(218-49,895)	18,000 (2,034)	1,300,000 (146,000)	2,600,000 (293,000)	3,400,000 (384,000)	20.1-34.9 (69-155)	0.12	6.4 (2.90)
MA 64100	600-115,000	(272-52,163)	36,000 (4,067)	1,700,000 (192,000)	3,400,000 (384,000)	4,400,000 (497,000)	23.5-61 (104-271)	0.34	8.15 (3.70)
MA 64150	730-175,000	(331-79,379)	54,000 (6,101)	2,200,000 (248,000)	4,400,000 (497,000)	5,700,000 (644,000)	16.9-82.2 (75-366)	0.48	11.25 (5.10)

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec).

Specifications...ML Series, Low Velocity Adjustable

ML 6425	N/A	N/A	9,000 (1,017)	1,100,000 (124,000)	2,200,000 (248,000)	2,900,000 (328,000)	26.7-34.9 (119-155)	0.06	5.5 (2.49)
ML 6450	N/A	N/A	18,000 (2,034)	1,300,000 (146,000)	2,600,000 (293,000)	3,400,000 (384,000)	20.1-34.9 (89-155)	0.12	6.4 (2.90)

Impact velocity range: 0.06 to 1.5 ft/sec (0.02 to 0.46 m/sec).

***For models MAA and MAS 33 the 1/8-27 male fitting is shipped with the shock. MAA and MAS 45 and 64 have pipe plugs.**

Note: A side port can be adapted to Magnum Series 64 MAA, MLA and MCA models and is a special adder item. A side port adapter ring is molded onto the outer tube and increases the overall diameter by 0.5 inches (12.7 mm) in the area of the ring. The side port centerline is located 1.47 inches (37.3 mm) from the front of the outer tube. Add (-P) to the model ordering code if a side port is desired, see page N34.

Note: MA and MC 64150 models include an integral, non-removable stop block, not a stop collar. Adjustable models can be adjusted from front or rear.

Note: MAA and MCA 64150 models include a stop collar, 0.75 inches (19 mm) longer than the standard 64 model stop collar.

Note: For models MAA, MLA and MCA indicate P for the side port option when ordering clevis mount.

Note: 64150 models do not include a stop collar. Adjustable models can still be adjusted from front or rear.

Note: Side load not to exceed 5°. Maximum side load depends on application.

Lock nut included with each shock absorber. See page N51 for dimensions.

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Ordering Information

MC Series, Self-Compensating

MC 3325 - 1 C

Return Method and Accumulator Style

MC = Self-Contained Spring Return, Internal Accumulator
MCA = Air Return, External Accumulator
MCS = Spring Return, External Accumulator
MCN = Self Return (Clevis), Internal Accumulator

Model Number

3325	4525	6450
3350	4550	64100
3625	4575	64150
3650		

Mounting Thread

- Standard
M Metric

Effective Weight

-1 Light Range
-2 Medium Range
-3 Heavy Range
-4 Heavier Range

Mounting Options

Standard Mount
Flanged Stop Collar
Rectangular Flange*
Square Flange*
-C Clevis Mount**
-S Side-Foot Mount**
-P Side Port
-Z Within Air Cylinder

* Welded versions available upon request.
**Not available on MC 3625 and 3650 models.

MA Series, Adjustable

MA 3325 - C

Return Method and Accumulator Style

MA = Self-Contained Spring Return, Internal Accumulator
MAA = Air Return, External Accumulator
MAS = Spring Return, External Accumulator
MAN = Self Return (Clevis), Internal Accumulator

Model Number

3325	4525	6450
3350	4550	64100
3625	4575	64150
3650		

Mounting Thread

- Standard
M Metric

Mounting Options

Standard Mount
Flanged Stop Collar
Rectangular Flange*
Square Flange*
-C Clevis Mount**
-S Side-Foot Mount**
-P Side Port
-Z Within Air Cylinder

* Welded versions available upon request.
**Not available on MA 3625 and 3650 models.

ML Series, Low Velocity Adjustable

ML 3325 - C

Return Method and Accumulator Style

ML = Self-Contained Spring Return, Internal Accumulator
MLA = Air Return, External Accumulator
MLS = Spring Return, External Accumulator
MLN = Self Return (Clevis), Internal Accumulator

Model Number

3325	4525	6425
3350	4550	6450
3625		
3650		

Mounting Thread

- Standard
M Metric

Mounting Options

Standard Mount
Flanged Stop Collar
Rectangular Flange*
Square Flange*
-C Clevis Mount**
-S Side-Foot Mount**
-P Side Port
-Z Within Air Cylinder

* Welded versions available upon request.
**Not available on ML 3625 and 3650 models.

Note: Poly pad available on 33 models only...part no. 250-0011.

Note: Flanges and flanged stop collars are packaged separately from shock absorbers.

N

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1-1/2" Bore Series
Adjustable



1-1/2" bore series shock absorbers are designed for the toughest environments. These durable adjustable models provide outstanding deceleration over a wide range of effective weight conditions. Large energy capacities stop heavy loads set into motion by high propelling forces, without damage.

Applications include: Automotive manufacturing and production equipment, large robotics, heavy conveyors, foundries and steel industry equipment.

Technical Data

Impact velocity range: 0.5 to 15 ft/sec (0.15 to 4.5 m/sec)

Operating temperature: 10° to 150° F (-12° to 66° C)

Mechanical stop: Must be provided .09 inch (2.3 mm) before end of stroke.

Oil type: American 46

Materials: Steel body with black oxide finish. Piston rod high tensile steel, hardened and chrome plated. Return spring zinc plated.

Adjustment: After installation of the shock absorber, cycle the machine a number of times. Turn the adjustment ring against the scale marked 0 to 9, until optimum deceleration is achieved (i.e. smooth deceleration throughout the stroke).

Hard impact at the start of stroke-turn adjuster toward 9.

Hard set-down at the end of stroke-turn adjuster toward 0.

Poly pad: Optional

Specifications

Model	We Effective Weight lbs (kg)	E3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E4		Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
			Internal Accumulator (Self-Contained)	External Accumulator (A/O Tank)			
1-1/2 x 2	430-70,000 (195 - 31,750)	16,000 (1,800)	3,200,000 (361,550)	4,000,000 (451,900)	34.9 - 47.6 (155 - 210)	.10	16.4 (7.44)
1-1/2 x 3-1/2	480 - 80,000 (218 - 36,280)	28,000 (3,160)	5,600,000 (632,700)	7,000,000 (790,890)	25.4 - 47.6 (113-210)	.25	19.4 (8.80)
1-1/2 x 5	500 - 90,000 (227 - 40,800)	40,000 (4,500)	8,000,000 (903,870)	10,000,000 (1,129,840)	20.7 - 52.5 (92 - 230)	.40	22.7 (10.30)
1-1/2 x 6-1/2	680-100,000 (308 - 45,350)	52,000 (5,870)	10,400,000 (1,175,000)	13,000,000 (1,468,800)	20.7 - 97.4 (92 - 430)	.40	25.0 (11.34)

Ordering Information

A 1-1/2 x 6-1/2 - F

Return Method and Accumulator Style
- A = Spring Return, Internal Accumulator
- AA = Air Return, External Accumulator
- SA = Spring Return, External Accumulator
- NA = Self (Clevis) Return, Internal Accumulator

Bore Size
- 1-1/2

Stroke Length
- 2
- 3-1/2
- 5
- 6-1/2

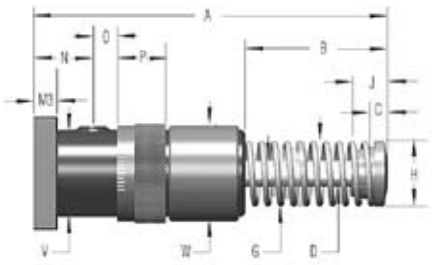
Mounting Style
- -F Front Flange
- -R Rear Flange
- -RF Front Rectangular Flange
- -RR Rear Rectangular Flange
- -S Side Foot Mount
- -C Clevis Mount

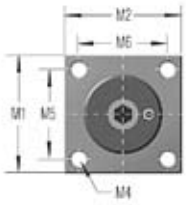
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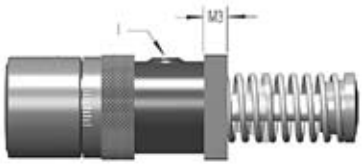
1-1/2" Bore Series
Adjustable

Rear Flange

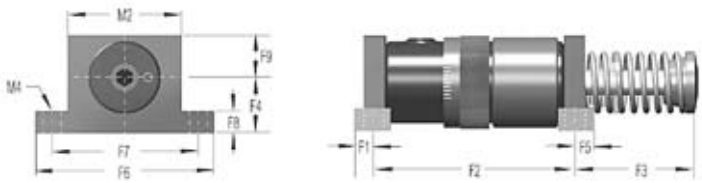




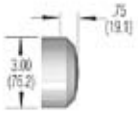
Front Flange



Side-Foot Mount

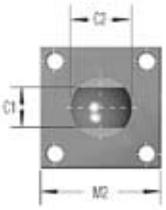


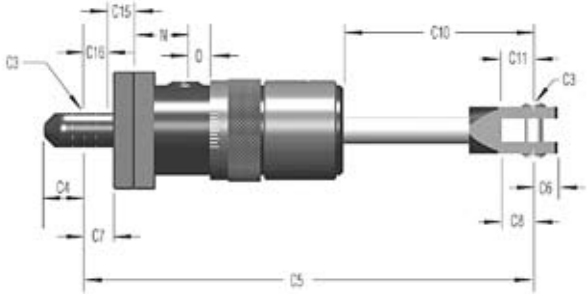
Poly Pad

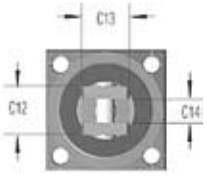


Part No. 250-0003

Clevis Mount







1-1/2" Bore Series Dimensions **IN INCHES (MILLIMETERS)**

Size	Stroke	A	B	C	D	G	H	I	J	N	O	P	V	W	C1	C2	C3	C4	C5	C6	C7
1-1/2 x 2	2.00 (50.8)	9.69 (246.1)	4.13 (104.8)	0.81 (20.6)	1.00 (25.4)	2.69 (68.3)	2.75 (69.9)	1/2 NPT	1.38 (35.1)	1.38 (35.0)	0.28 (7.1)	1.25 (31.8)	3.00 (76.2)	4.00 (101.6)	1.25 (31.8)	1.50 (38.1)	0.7525 (19.11)	0.75 (19.1)	12.94 (328.6)	0.63 (16.0)	1.25 (31.8)
1-1/2 x 3-1/2	3.50 (88.9)	12.69 (322.3)	5.63 (142.9)							2.00 (50.8)	0.28 (7.1)								15.97 (405.6)		
1-1/2 x 5	5.00 (127.0)	15.69 (398.5)	7.13 (181.0)							2.00 (50.8)	1.03 (26.2)								18.97 (481.8)		
1-1/2 x 6-1/2	6.50 (165.1)	19.44 (493.7)	9.38 (238.1)							2.00 (50.8)	1.78 (45.2)								22.72 (577.1)		

Size	C8	C10	C11	C12	C13	C14	C15	C16	F1	F2	F3	F4	F5	F6	F7	F8	F9	M1	M2	M3	M4	M5	M6
1-1/2 x 2	1.41 (35.7)	5.41 (137.3)	1.40 (35.6)	1.50 (38.1)	1.25 (31.8)	5/8	0.94 (23.9)	1.06 (27.0)	0.63 (15.9)	**5.18 (131.6)	**4.31 (109.5)	2.00 (50.8)	0.63 (16.0)	6.50 (165.1)	5.50 (139.7)	0.75 (19.1)	2.03 (51.6)	4.00 (101.6) *	4.00 (101.6)	0.75 (19.0)	0.53 (13.5)	3.00 (76.2) *	3.00 (76.2)
1-1/2 x 3-1/2		6.91 (175.4)								6.69 (169.9)	5.81 (147.6)												
1-1/2 x 5		8.41 (213.5)								8.19 (208.0)	7.31 (185.7)												
1-1/2 x 6-1/2		10.66 (270.7)								9.69 (246.1)	9.56 (242.8)							5.00 (127.0)				4.00 (101.6)	

*Rectangular flange dimension

**Note: 1-1/2 x 2 shock absorbers available with side-foot mount in AA and SA models only.

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Heavy Industrial Shock Absorbers CA 2 to CA 4
Self-Compensating



CA 2, CA 3 and 4" Bore Series of self-compensating shock absorbers are designed for extremely heavy duty applications and provide smooth deceleration under changing conditions. High energy capacities combined with wide effective weight ranges qualify these units to perform in the most demanding environments.

The new **CA 2 offers up to 170% of the energy per cycle capacity** of former models. The rugged new **CA 3 offers up to 125% of the energy capacity** of former models. You can select the correct model for your application by utilizing the PARKERSIZE INDUSTRIAL SHOCK ABSORBER SIZING PROGRAM or the capacity charts. Replacing existing shock absorbers with the new CA Series is easy-just provide us the type and adjustment setting of your existing units and we will, do the rest. These dependable units are available self-contained or for use with an external air/oil tank.

Applications include: foundry, steel, marine, lumber and other heavy equipment industries.

Technical Data

Impact velocity range: 1 to 16.5 ft/sec (0.30 to 5 m/sec)

Operating Temperature: 10° to 150°F (-12° to 66°C)

Mechanical stop:
2", 3" bore: Must be provided .09 inch (2.3 mm) before end of stroke.

4" bore: Must be provided .09 inch (2.3mm) before end of stroke.

Oil type: ATF

Materials: Steel body with black oxide finish. Piston rod high tensile steel, hardened and chrome plated. Return spring zinc plated.

Note: See pages N44 and N45 for CA 4" Bore dimensions and specifications.

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Heavy Industrial Shock Absorbers A 2 and A 3
Adjustable

A2 and A3 Series adjustable shock absorbers are capable of decelerating heavy duty loads. These reliable units replace the former 2" and 3" large bore adjustable shock absorbers.

Energy capacity ratings are 228% of former models. In addition, effective weight ranges have increased dramatically, resulting in the capability of handling a wider range of applications and increases in velocity. The units are easily adjusted by means of a 5/16 inch (8 mm) hex socket adjuster located at the bottom of the outer body. These dependable shock absorbers are maintenance free and are available self-contained or for use with an external air/oil tank.

Features include a considerably reduced outer diameter, internal accumulator and threaded mounting brackets, easily adaptable to the front or rear of the outer body.

Applications include: foundry, steel, marine, lumber, and other heavy equipment industries.



Technical Data

Impact velocity range: 0.33 to 16.5 ft/sec (0.1 to 5 m/sec)

Operating temperature: 10° to 150° F (-12° to 66° C)

Mechanical stop: Must be provided .09 inch (2.3 mm) before end of stroke.

Oil type: ATF

Materials: Steel body with black oxide finish. Piston rod high tensile steel, hardened and chrome plated. Return spring zinc plated. To avoid reducing heat dissipation, do not paint.

Adjustment: After installation of the shock absorber, cycle the machine a number of times. Turn the hex socket adjuster against the scale marked 0 to 9, until optimum deceleration is achieved (i.e. smooth deceleration throughout the stroke).

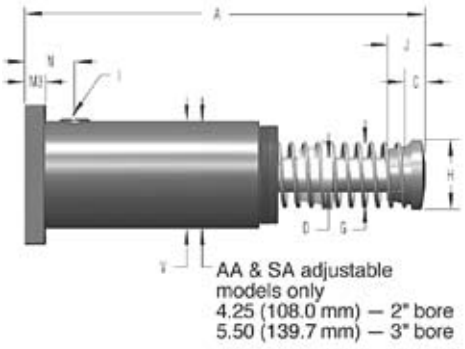
Hard impact at the start of stroke-turn adjuster toward 9.

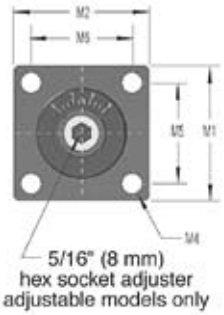
Hard set-down at the end of stroke-turn adjuster toward 0.

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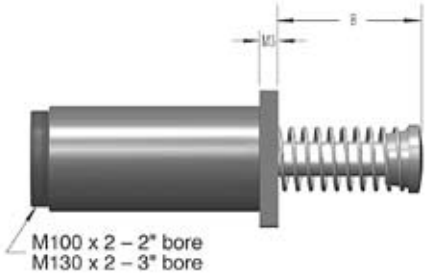
CA and A 2", 3" Bore Series – Heavy Duty Models
(CA) Self-Compensating and (A) Adjustable

Rear Flange

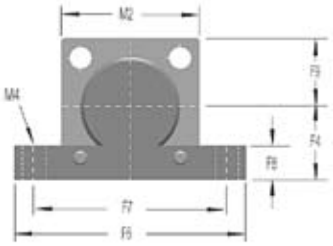


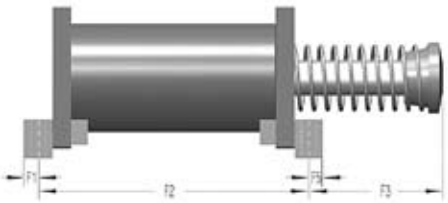


Front Flange

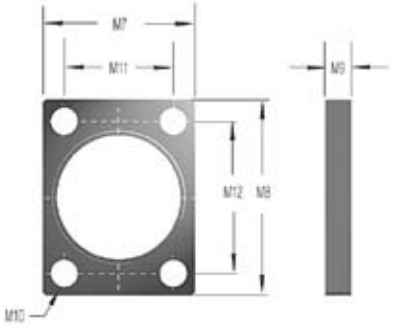


2" Bore Foot Mount

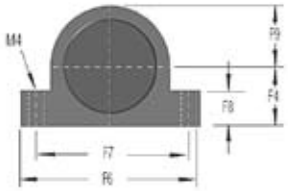


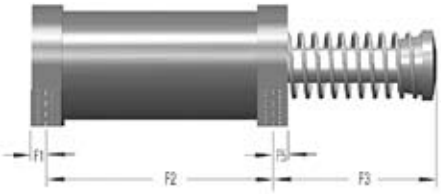


Rectangular Flange

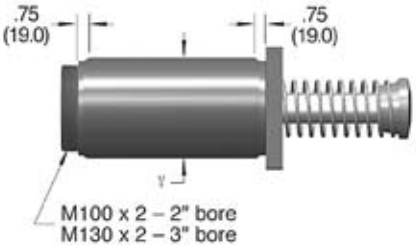


3" Bore Foot Mount

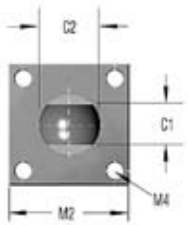


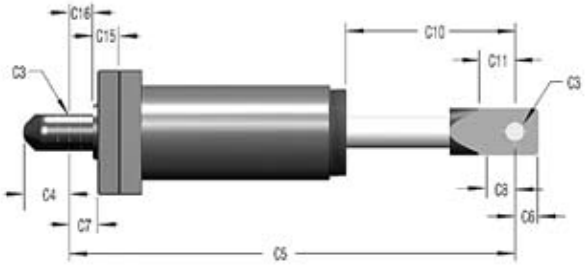


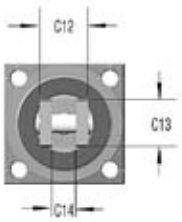
(A) Adjustable
2" & 3" Bore Models



Clevis Mount







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CA and A 2", 3" Bore Series – Heavy Duty Models
(CA) Self-Compensating and (A) Adjustable

Dimensions IN INCHES (MILLIMETERS) **Self Compensating and Adjustable Models**

Size	Stroke	A	B	C	D	G	H	I	J	N	V	C1	C2	C3	C4	C5	C6	C7	C8	C10	C11
CA 2x2 A 2x2	2.00 (50.8)	12.31 (312.7)	4.31 (109.5)	0.82 (20.8)		3.06 (77.7)	2.75 (69.9)		1.38 (35.1)							17.00 (431.8)				6.05 (153.7)	2.06 (52.3)
CA 2x4 A 2x4	4.00 (101.6)	16.31 (414.0)	6.31 (160.3)	0.82 (20.8)		3.06 (77.7)	2.75 (69.9)		1.38 (35.1)		CA 4.25 (108.0)					21.00 (533.4)				8.05 (204.4)	2.06 (52.3)
CA 2x6 A 2x6	6.00 (152.4)	20.31 (515.9)	8.31 (211.1)	0.82 (20.8)	1.38 (35.1)	3.63 (92.2)	2.75 (69.9)	3/4 NPT	1.38 (35.1)	3.50 (88.9)		1.50 (38.1)	2.25 (57.2)	1.005 (25.5)	1.00 (25.4)	25.00 (635)	1.00 (25.4)	2.00 (50.8)	1.50 (38.1)	10.05 (255.2)	2.06 (52.3)
CA 2x8 A 2x8	8.00 (203.2)	25.31 (642.9)	11.31 (287.3)	1.82 (46.2)		4.00 (101.6)	3.63 (92.2)		2.38 (60.5)		A* 4.63 (118.0)					29.00 (736.6)				12.05 (306.1)	0.75 (19)
CA 2x10 A 2x10	10.00 (254)	29.31 (744.5)	13.31 (338.1)	1.82 (46.2)		4.50 (114.3)	4.25 (108.0)		2.38 (60.5)							33.00 (838.2)				14.05 (356.9)	1.06 (26.9)
CA 3x5 A 3x5	5.00 (127)	19.25 (489.0)	8.25 (209.6)			4.75 (120.7)					CA 5.50 (139.7)					23.00 (584.2)				9.05 (229.9)	
CA 3x8 A 3x8	8.00 (203.2)	25.25 (641.4)	11.25 (285.8)	2.00 (50.8)	1.75 (44.5)	4.75 (120.7)	4.38 (111.3)	3/4 NPT	2.75 (69.9)	3.13 (79.5)	A*	1.50 (38.1)	2.25 (57.2)	1.01 (25.5)	1.00 (25.4)	29.00 (736.6)	1.00 (25.4)	2.00 (50.8)	1.50 (38.1)	12.05 (306.1)	1.12 (28.4)
CA 3x12 A 3x12	12.00 (304.8)	35.03 (889.8)	17.03 (432.6)			4.84 (122.9)					6.00 (152.4)					38.78 (985)				17.83 (452.9)	

Size	Stroke	C12	C13	C14	C15	C16	F1	F2	F3	F4	F5	F6	F7	F8	F9	M1	M2	M3	M4	M5	M6
CA 2x2 A 2x2	2.00 (50.8)							9.5 (241.3)	3.44 (87.4)												
CA 2x4 A 2x4	4.00 (101.6)							11.5 (292.1)	5.44 (138.2)												
CA 2x6 A 2x6	6.00 (152.4)	3.5 (88.9)	2.00 (50.8)	1.50 (38.1)	1.25 (31.8)	1.75 (44.5)	0.63 (16.0)	13.5 (342.9)	7.44 (189.0)	3.13 (79.5)	0.63 (16.0)	8.00 (203.2)	6.50 (165.1)	1.50 (38.1)	2.75 (69.9)	5.50 (139.7)	5.50 (139.7)	0.75 (19.1)	0.66 (16.8)	4.38 (111.3)	4.38 (111.3)
CA 2x8 A 2x8	8.00 (203.2)							15.5 (393.7)	10.44 (265.2)												
CA 2x10 A 2x10	10.00 (254)							17.5 (444.5)	12.44 (316.0)												
CA 3x5 A 3x5	5.00 (127)							10.25 (260.4)	8.50 (215.9)												
CA 3x8 A 3x8	8.00 (203.2)	3.5 (88.9)	2.00 (50.8)	1.50 (38.1)	1.25 (31.8)	1.75 (44.5)	1.00 (25.4)	13.25 (336.6)	11.50 (292.1)	3.15 (80.0)	1.00 (25.4)	10.00 (254.0)	8.50 (215.9)	1.73 (43.9)	3.15 (80.0)	6.00 (152.4)	6.50 (165.1)	1.00 (25.4)	0.66 (16.8)	4.88 (124.0)	5.38 (136.7)
CA 3x12 A 3x12	12.00 (304.8)							17.25 (438.2)	17.28 (438.9)												

Size	M7	M8	M9	M10	M11	M12	
CA 3 A 3	Rectangular Flange	6.50 (165.1)	8.00 (203.2)	1.00 (25.4)	0.78 (19.8)	4.50 (114.3)	6.50 (165.1)

*See rear flange illustration on page N44 for AA and SA model dimensions.

Specifications...Self-Compensating Models

Model	We Effective Weight lbs (kg)		E3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E4 Internal Accumulator (Self-Contained)	E4 External Accumulator (A/O Tank)	E4 A/O Tank (Re-circulating)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
	CA 2 x 2-1	1,600-4,800	(726-2,177)						
CA 2 x 2-2	4,000-12,000	(1,814-5,443)	32,000	9,600,000	12,000,000	15,600,000	48-63	0.25	28.2
CA 2 x 2-3	10,000-30,000	(4,536-13,608)	(3,616)	(1,084,650)	(1,355,820)	(1,762,564)	(214-280)		(12.79)
	CA 2 x 2-4	25,000-75,000	(11,340-34,019)						
	CA 2 x 4-1	3,200-9,600	(1,452-4,354)						
CA 2 x 4-2	8,000-24,000	(3,629-10,886)	64,000	12,000,000	15,000,000	19,500,000	34-63	0.50	32.6
CA 2 x 4-3	20,000-60,000	(9,072-27,216)	(7,231)	(1,355,820)	(1,694,770)	(2,203,200)	(151-280)		(14.79)
CA 2 x 4-4	50,000-150,000	(22,680-68,039)							
CA 2 x 6-1	4,800-14,400	(2,117-6,532)							
CA 2 x 6-2	12,000-36,000	(5,443-16,329)	96,000	14,400,000	18,000,000	23,500,000	34-90	0.60	37.2
CA 2 x 6-3	30,000-90,000	(13,608-40,823)	(10,847)	(1,626,980)	(2,033,730)	(2,655,140)	(151-400)		(16.87)
CA 2 x 6-4	75,000-225,000	(34,019-102,058)							

Note: All dimensions and tolerance values listed in this catalog are nominal and subject to change without prior notice.

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CA and A 2", 3" Bore Series – Heavy Duty Models
(CA) Self-Compensating and (A) Adjustable

Specifications (continued)...Self-Compensating Models

Model	We Effective Weight lbs (kg)		E3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E4 Internal Accumulator (Self-Contained)	E4 External Accumulator (A/O Tank)	E4 A/O Tank (Re-circulating)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
	CA 2 x 8-1	6,400-19,200	(2,903-8,709)						
CA 2 x 8-2	16,000-48,000	(7,257-21,772)	128,000	16,800,000	21,000,000	27,000,000	51-144	0.70	42.6
CA 2 x 8-3	40,000-120,000	(18,144-54,431)	(14,462)	(1,898,150)	(2,372,680)	(3,050,590)	(227-641)		(19.32)
	CA 2 x 8-4	100,000-300,000	(45,359-136,708)						
	CA 2 x 10-1	8,000-24,000	(3,629-10,886)						
CA 2 x 10-2	20,000-60,000	(9,072-27,216)	160,000	19,200,000	24,000,000	31,000,000	35-101	0.80	50.2
CA 2 x 10-3	50,000-150,000	(22,680-68,039)	(18,078)	(2,169,310)	(2,711,640)	(3,502,530)	(156-449)		(22.77)
CA 2 x 10-4	125,000-375,000	(56,700-170,097)							
CA 3 x 5-1	6,400-19,200	(2,903-8,709)							
CA 3 x 5-2	16,000-48,000	(7,257-21,772)	125,000	20,000,000	25,000,000	32,500,000	59-156	0.60	63.8
CA 3 x 5-3	40,000-120,000	(18,144-54,431)	(14,123)	(2,259,700)	(2,824,620)	(3,672,010)	(262-694)		(28.94)
CA 3 x 5-4	100,000-300,000	(45,359-136,078)							
CA 3 x 8-1	10,240-30,720	(4,645-13,934)							
CA 3 x 8-2	25,600-76,800	(11,612-34,836)	200,000	32,000,000	40,000,000	52,000,000	62-162	0.80	73.6
CA 3 x 8-3	64,000-192,000	(29,030-87,090)	(22,597)	(3,615,520)	(4,519,390)	(5,875,210)	(275-721)		(33.38)
CA 3 x 8-4	160,000-480,000	(72,575-217,724)							
CA 3 x 12-1	15,360-46,080	(6,967-20,902)							
CA 3 x 12-2	38,400-115,200	(17,418-52,254)	300,000	48,000,000	60,000,000	78,000,000	60-160	1.20	89.4
CA 3 x 12-3	96,000-288,000	(43,545-130,635)	(33,896)	(5,423,270)	(6,779,090)	(8,812,820)	(267-712)		(40.55)
CA 3 x 12-4	240,000-720,000	(108,862-326,587)							

Specifications...Adjustable Models

Model	We Effective Weight lbs (kg)		E3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E4 Internal Accumulator (Self-Contained)	E4 External Accumulator (A/O Tank)	E4 A/O Tank (Re-circulating)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
A 2 x 2	560-170,000	(254-77,111)	32,000 (3,616)	9,600,000 (1,084,650)	12,000,000 (1,355,820)	15,600,000 (1,762,564)	48-63 (214-280)	0.25	31.5 (14.29)
A 2 x 4	510-160,000	(231-72,576)	80,000 (9,039)	12,000,000 (1,355,820)	15,000,000 (1,694,770)	19,500,000 (2,203,200)	34-63 (151-280)	0.50	36.9 (16.74)
A 2 x 6	570-190,000	(259-86,183)	120,000 (13,558)	14,400,000 (1,626,980)	18,000,000 (2,033,730)	23,500,000 (2,655,140)	34-90 (151-400)	0.60	42.6 (19.32)
A 2 x 8	580-200,000	(263-90,719)	170,000 (19,207)	16,800,000 (1,898,150)	21,000,000 (2,372,680)	27,000,000 (3,050,590)	51-144 (227-641)	0.70	49.1 (22.27)
A 2 x 10	720-250,000	(3279-113,399)	210,000 (23,727)	19,200,000 (2,169,310)	24,000,000 (2,711,640)	31,000,000 (3,502,530)	35-101 (156-449)	0.80	57.8 (26.22)
A 3 x 5	1,050-340,000	(476-154,223)	140,000 (15,818)	20,000,000 (2,259,700)	25,000,000 (2,824,620)	32,500,000 (3,672,010)	59-156 (262-694)	0.60	72.1 (32.70)
A 3 x 8	1,200-400,000	(544-181,439)	250,000 (28,246)	32,000,000 (3,615,520)	40,000,000 (4,519,390)	52,000,000 (5,875,210)	62-162 (275-721)	0.80	84.9 (38.51)
A 3 x 12	1,350-450,000	(612-204,119)	390,000 (44,064)	48,000,000 (5,423,270)	60,000,000 (6,779,090)	78,000,000 (8,812,820)	60-160 (267-712)	1.20	105.0 (47.63)

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CA and A 2", 3" Bore Series – Heavy Duty Models
(CA) Self-Compensating and (A) Adjustable

Ordering Information – Self Compensating Models

CA 2 x 8 R - 3

Return Method and Accumulator Style	Bore Size	Stroke Length	Mounting Style	Effective Weight
CA = Spring Return, Internal Accumulator	2	2 8	-F Front Flange	-1 Light
CAA = Air Return, External Accumulator	3	4 10	-R Rear Flange	-2 Medium Light
CSA = Spring Return, External Accumulator		5 12	-RF Rectangular Front Flange	-3 Medium Heavy
CNA = Self (Clevis) Return, Internal Accumulator		6	-RR Rectangular Rear Flange	-4 Heavy
			-S Side Foot Mount	
			-C Clevis Mount	

Ordering Information – Adjustable Models

A 2 x 8 - R

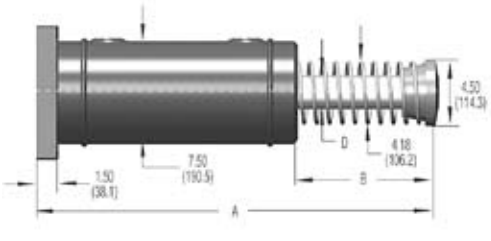
Return Method and Accumulator Style	Bore Size	Stroke Length	Mounting Style
A = Spring Return, Internal Accumulator	2	2 8	-F Front Flange
AA = Air Return, External Accumulator	3	4 10	-R Rear Flange
SA = Spring Return, External Accumulator		5 12	-RF Rectangular Front Flange
NA = Self (Clevis) Return, Internal Accumulator		6	-RR Rectangular Rear Flange
			-S Side Foot Mount
			-C Clevis Mount

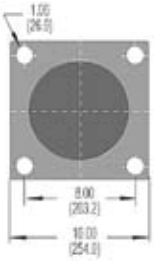
Note: A no button option is available on the 3" Bore only as a special.

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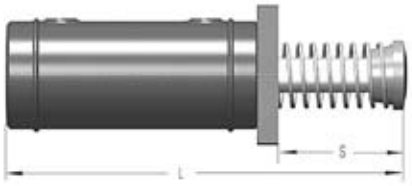
CA 4” Bore Series – Heavy Duty Models
Self-Compensating

Rear Flange

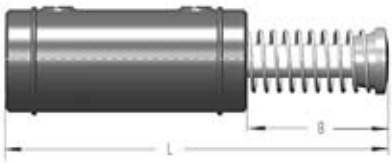


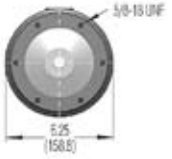


Front Flange

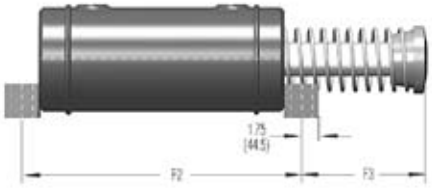


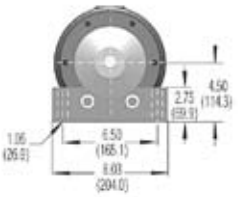
Standard Mount



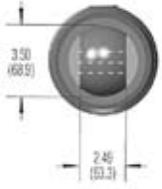


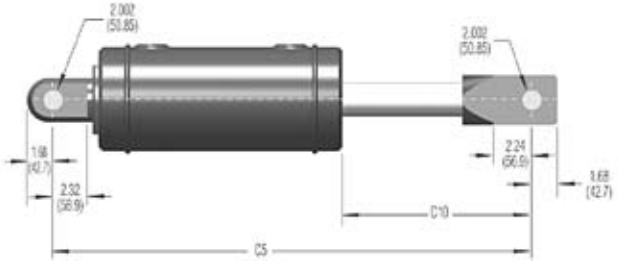
Side-Foot Mount

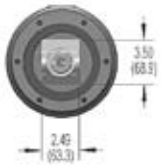




Clevis Mount







Technical Data

Impact velocity range: 1 to 16.5 ft/sec (0.30 to 5 m/sec)

Operating Temperature: 10° to 150°F (-12° to 66°C)

Mechanical stop:
2”, 3” bore: Must be provided .09 inch (2.3 mm) before end of stroke.

Oil type: ATF

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CA 4" Bore Series – Heavy Duty Models
Self-Compensating

Dimensions **IN INCHES (MILLIMETERS)**

Size	Stroke	A	B	D	H	L	S	C5	C10	F2	F3
CA 4 x 6	6.00 (152.4)	28.21 (716.5)	10.96 (278.4)	2.12 (53.8)	4.50 (114.3)	26.71 (678.4)	9.46 (240.3)	33.03 (839.0)	12.90 (327.7)	17.50 (447.5)	10.90 (256.3)
CSA 4 x 6											
CAA 4 x 6		26.21 (665.7)	8.96 (227.6)			24.71 (678.4)	7.46 (188.0)	31.03 (788.2)	10.90 (276.9)		8.09 (205.5)
CNA 4 x 6		N/A	N/A			N/A	N/A			N/A	N/A
CA 4 x 8	8.00 (203.2)	32.31 (818.1)	12.96 (329.2)	2.12 (53.8)	4.50 (114.3)	30.71 (780.0)	11.46 (291.1)	37.03 (940.6)	14.90 (378.5)	19.50 (495.3)	12.09 (307.1)
CSA 4 x 8											
CAA 4 x 8		30.21 (767.3)	10.96 (278.4)			28.71 (729.2)	9.46 (240.3)	35.03 (889.8)	12.90 (327.7)		10.09 (256.3)
CNA 4 x 8		N/A	N/A			N/A	N/A			N/A	N/A
CA 4 x 16	16.00 (406.4)	51.21 (1,300.7)	23.96 (608.6)	2.50 (63.5)	5.00 (127.0)	49.71 (1,262.6)	22.46 (570.5)	56.03 (1,423.2)	25.90 (657.9)	27.50 (698.5)	23.09 (586.5)
CSA 4 x 16											
CAA 4 x 16		46.21 (1,173.7)	18.96 (481.6)			44.71 (1,135.6)	17.46 (443.5)	51.03 (1,296.2)	20.90 (530.9)		18.09 (459.5)
CNA 4 x 16		N/A	N/A			N/A	N/A			N/A	N/A

Specifications

Model	We Effective Weight lbs (kg)		E3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E4		Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
				Internal Accumulator (Self-Contained)	External Accumulator (A/O Tank)			
4 x 6-3	8,000-19,000	(3,600-8,600)	420,000 (47,500)	27,000,000 (3,000,000)	45,000,000 (5,100,000)	108-222 (480-1,000)	Consult Factory	132 (60)
4 x 6-5	19,000-41,000	(8,600-18,600)						
4 x 6-7	41,000-94,000	(18,600-42,700)						
4 x 8-3	11,000-25,000	(5,000-11,400)	560,000 (63,300)	30,000,000 (3,400,000)	50,000,000 (5,600,000)	71-222 (310-1,000)	Consult Factory	150 (68)
4 x 8-5	25,000-55,000	(11,400-25,000)						
4 x 8-7	55,000-125,000	(25,000-57,000)						
4 x 16-3	22,000-50,000	(10,000-23,000)	1,120,000 (126,500)	50,000,000 (5,600,000)	85,000,000 (9,600,000)	Consult Factory	Consult Factory	321 (146)
4 x 16-5	50,000-110,000	(23,000-50,000)						
4 x 16-7	110,000-250,000	(50,000-114,000)						

Ordering Information

CA 4 x 8 R - 5

Return Method and Accumulator Style

CA = Spring Return, Internal Accumulator
CAA = Air Return, External Accumulator
CSA = Spring Return, External Accumulator
CNA = Self (Clevis) Return, Internal Accumulator

Bore Size

4

Stroke Length

6
8
16

Mounting Style

-F Front Flange
-R Rear Flange
-RP Rear Standard
-FP Front Standard
-FRP Front and Rear Standard
-S Side Foot Mount
-C Clevis Mount

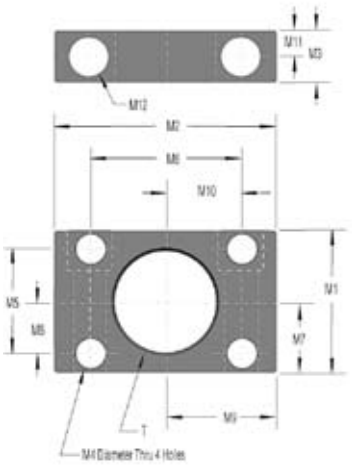
Effective Weight

-3 Light
-5 Medium
-7 Heavy

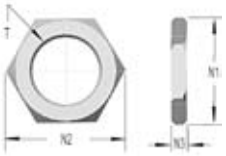
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Miniature Shock Absorber Accessories
Mounting Blocks

Mounting Block

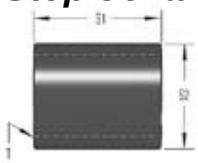


Lock Nut



One lock nut included with each shock absorber where appropriate.

Stop Collar



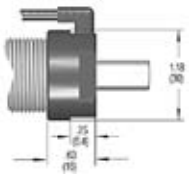


Side load adapters are available for select models, see pages N48 and N49.

Mounting Block IN INCHES (MILLIMETERS)															**Lock Nut**				**Stop Collar**		
Used With	**Part #**	**T**	**M1**	**M2**	**M3**	**M4**	**M5**	**M6**	**M7**	**M8**	**M9**	**M10**	**M11**	**M12**	**Part #**	**N1**	**N2**	**N3**	**Part #**	**S1**	**S2**
MC 10E **MC 10M**	**N/A**	M8x0.75 M8x1													**250-0362** **250-0482**	.43 (11)	.49 (12.5)	.12 (3.0)	**N/A**		
MC 25	**250-0306**	3/8-32 UNF	1.00 (25.4)	1.50 (38.1)	.56 (14.2)	See DIM M12	0 (0)	1.00 (25.4)	.50 (12.7)	0 (0)	.75 (19.1)	.50 (12.7)	.28 (7.1)	.18 Dia. Thru .31 C'Bore x .20 Deep #8-32 Soc. Hd. Screw	**250-0404**	.50 (12.7)	.56 (14.2)	.09 (2.3)	**250-0406**	.81 (20.6)	.56 (14.2)
MC 25M	**250-0307**	M10x1												(4.5) Dia. Thru (8) C'Bore x (5) Deep M4x7 Soc. Hd Screw	**250-0315**	.55 (14.0)	.59 (15.0)	.12 (3.0)	**250-0408**	.79 (20.0)	.56 (14.3)
MA 35 **MC 75**	**250-0308**	1/2-20 UNF	1.00 (25.4)	1.50 (38.1)	.56 (14.2)	See DIM M12	0 (0)	1.00 (25.4)	.50 (12.7)	0 (0)	.75 (19.1)	.50 (12.7)	.28 (7.1)	.18 Dia. Thru .31 C'Bore x .20 Deep #8-32 Soc. Hd. Screw	**250-0405**	.62 (16.5)	.70 (17.8)	.13 (3.3)	**250-0407**	.81 (20.6)	.62 (15.7)
MA 35M **MC 75M**	**250-0309**	M12x1												(4.5) Dia. Thru (8) C'Bore x (5) Deep M4x7 Soc. Hd Screw	**250-0317**	.55 (14.0)	.63 (16.0)	.16 (4.0)	**250-0409**	.79 (20.0)	.63 (16.0)
MA 150 **MC 150** **SC 190**	**250-0318**	9/16-18 UNF	1.37 (34.8)	1.81 (46.0)	.62 (15.7)	.22 (5.6)	1.00 (25.4)	1.38 (35.1)	.69 (17.5)	.50 (12.7)	.91 (23.1)	.69 (17.5)	.31 (7.9)	.21 Dia. Thru .32 C'Bore x .32 Deep #10-32 Soc. Hd. Screw	**250-0231**	.88 (22.4)	1.00 (25.4)	.31 (7.9)	**250-0271**	.75 (19.1)	.69 (17.5)
MA 150M **MC 150M** **SC 190M**	**250-0352**	M14x1.5	1.10 (28.0)	1.77 (45.0)	.63 (16.0)	.18 (4.5)	0 (0)	1.38 (35.0)	.55 (14.0)	0 (0)	.89 (22.5)	.69 (17.5)	.31 (7.9)	(4.5) Dia. Thru (8) C'Bore x (5) Deep M4x7 Soc. Hd Screw	**250-0233**	.67 (17.0)	.77 (19.6)	.20 (5.0)	**250-0272**	.79 (20.0)	.69 (17.5)
MC 225 **MA 225** **MVC 225** **SC 300**	**250-0401**	3/4-16 UNF	1.50 (38.1)	2.00 (50.8)	.62 (15.7)	.22 (5.6)	1.12 (28.4)	1.50 (38.1)	.75 (19.1)	.56 (14.2)	1.00 (25.4)	.75 (19.1)	.31 (7.9)	.22 Dia. Thru .33 C'Bore x .45 Deep #10-32 Soc. Hd. Screw	**250-0399**	1.00 (25.4)	1.15 (29.2)	.25 (6.4)	**250-0403**	1.25 (38.1)	1.00 (25.4)
MC 225M **MA 225M** **MVC 225M** **SC 300M**	**250-0353**	M20x1.5	1.38 (35.0)	1.85 (47.0)	.63 (16.0)	.22 (5.6)	1.00 (25.4)	1.38 (35.0)	.69 (17.5)	.50 (12.7)	.93 (23.5)	.69 (17.5)	.31 (7.9)	(5.5) Dia. Thru (10) C'Bore x (10) Deep M5x8 Soc. Hd Screw	**250-0207**	.94 (24.0)	1.10 (28.0)	.24 (6.0)	**250-0410**	.98 (25.0)	.98 (25.0)
MC 600 **MA 600** **MVC 600** **SC 650** **MA 900** **MVC 900** **SC 925**	**250-0402**	1-12 UNF	1.50 (38.1)	2.00 (50.8)	.62 (15.7)	.22 (5.6)	1.12 (28.4)	1.50 (38.1)	.75 (19.1)	.56 (14.2)	1.00 (25.4)	.75 (19.1)	.31 (7.9)	.22 Dia. Thru .33 C'Bore x .45 Deep #10-32 Soc. Hd. Screw	**250-0400**	1.25 (31.8)	1.44 (36.6)	.25 (6.4)	**250-0275**	1.75 (44.5)	1.25 (31.8)
MC600ML	**N/A**														**250-0239**	1.25 (31.8)	1.44 (36.6)	.31 (7.9)	**250-0263**	1.77 (45.0)	1.26 (32.0)
MC 600M **MA 600M** **MVC 600M** **SC 650M** **MA 900M** **MVC 900M** **SC 925M**	**250-0044**	M25x1.5	1.38 (35.0)	1.85 (47.0)	.63 (16.0)	.22 (5.6)	1.00 (25.4)	1.38 (35.0)	.69 (17.5)	.50 (12.7)	.93 (23.5)	.69 (17.5)	.31 (7.9)	(5.5) Dia. Thru (10) C'Bore x (10) Deep M5x8 Soc. Hd Screw	**250-0040**	1.18 (30.0)	1.36 (34.6)	.31 (7.9)	**250-0276**	1.77 (45.0)	1.26 (32.0)

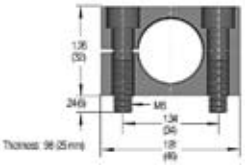
Air Bleed Collar

Used With	Model	Part#
MC 150 M	SP-14	10781-000
MC 225 M	SP-20	10782-000
MC 600 M	SP-25	10783-000



Clamp

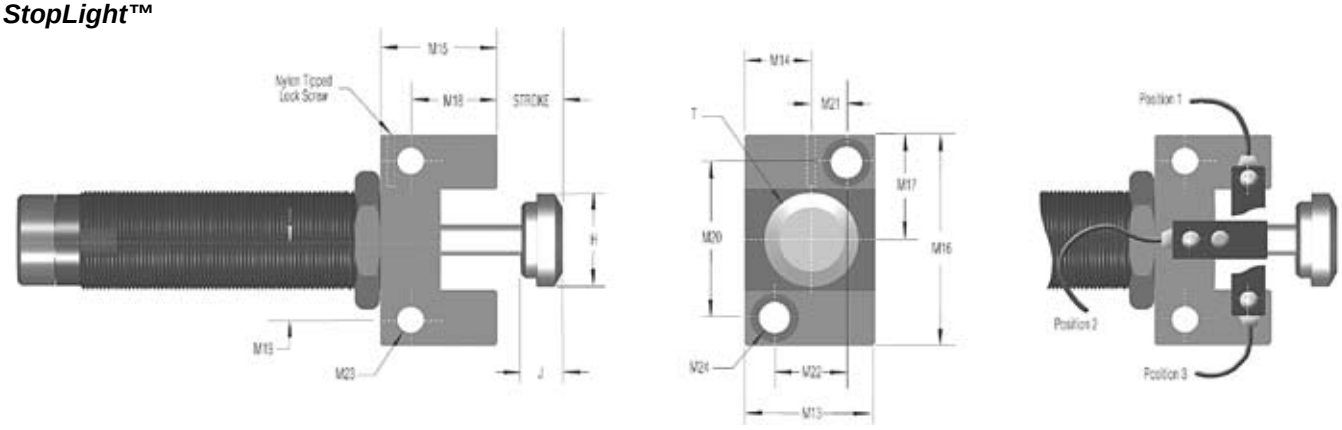
Used With	Model	Part#
MC 600 M	MB-25	10780-000



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Miniature Shock Absorber Accessories
StopLight™



Mounting Block IN INCHES (MILLIMETERS)

Used With	Part #	T	H	J	M 13	M 14	M 15	M 16	M 17	M 18	M 19	M 20	M 21	M 22	M 23	M 24
MA 150 MC 150* SC 190	**250-0377**	9/16-18 UNF	.47 (11.9)	.43 (10.9)	.75 (19.0)	.38 (22.3)	.88 (22.3)	1.25 (31.8)	.63 (15.9)	.57 (14.5)	.44 (11.1)	.88 (22.2)	.19 (4.7)	.38 (9.5)	.180 (4.6)	.315 (8.0)
MC 150M* SC 190M	**250-0378**	M14x1.5														
MC 225* MA 225 MVC 225 SC 300	**250-0379**	3/4-16 UNF	.66 (16.8)	.43 (10.9)	.94 (23.8)	.47 (11.9)	.94 (23.8)	1.56 (39.6)	.78 (19.8)	.63 (16.0)	.55 (14.0)	1.10 (28.0)	.24 (6.0)	.47 (12.0)	.216 (5.5)	.394 (10.0)
MC 225M MA 225M MVC 225M SC 300M	**250-0380**	M20x1.5														
MC 600* MA 600 MVC 600 MA 900 MVC 900 SC 650 SC 925	**250-0381**	1-12 UNF	.90 (22.9)	.43 (10.9)	1.18 (30.0)	.59 (15.0)	1.00 (25.4)	1.75 (44.5)	.88 (22.3)	.63 (16.0)	.63 (16.0)	1.26 (32.0)	.31 (8.0)	.63 (16.0)	.216 (5.5)	.394 (10.0)
MC 600M* MA 600M MVC 600M MA 900M MVC 900M SC 650M SC 925M	**250-0382**	M25x1.5														

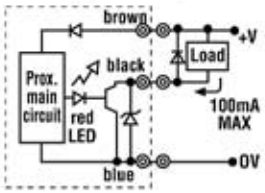
StopLight™ Switches are available in both NPN and PNP styles. Part numbers are 250-3 NPN and 250-3 PNP, respectively. The switches can be used with any StopLight mounting blocks.

** A complete StopLight assembly includes mounting block, proximity switch and steel button. Use the table below to order MC Series buttons. Steel buttons are an integral part of series MA and SC² and MVC units. Shock absorbers are ordered separately.*

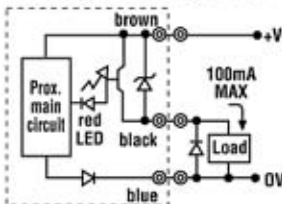
Model	Steel Button Part #
MA 150	250-0383
MC 150, MC 150M	250-0111
MC 225, MC 225M	250-0112
MC 600, MC 600M	250-0113

Specifications

250-3 NPN
NPN-type Proximity Switch



250-3 PNP
PNP-type Proximity Switch



Supply Voltage:	10 to 27 VDC Ripple p to p 10% max
Current Consumption:	15mA max (at 24 VDC)
Control Output:	• 3-Wire Output: 100mA max • Voltage Impression: 30 VDC max • Residual Voltage: 1 VDC max
Operator Indicator:	Red LED. Power off = dark. Stand By = Dim Light. Detection = Bright Light.
Operating Temperature:	14° to 140° F, -10° to 60° C (At holding: 86° to 176° F; 30° to 80° C)
Humidity:	45 to 85% RH (At holding: 35 to 95% RH)
Variation Due To	±20% max of detecting distance at 68° F (20° C)
Temperature Fluctuation:	with a temperature range of 14° to 140° F (-10° to 60° C)
Variation Due To	±5% max of detecting distance at 12/24/VDC
Voltage Fluctuation:	when operated within 10 to 27 VDC
Residual Voltage:	1V max (Load current at 100mA)
Insulation Resistance:	10M Ω min (at 500 VDC)
Dielectric Resistance:	1,000VAC 50/60Hz for 1 minute
Degree of Protection:	IP67 (IEC144)

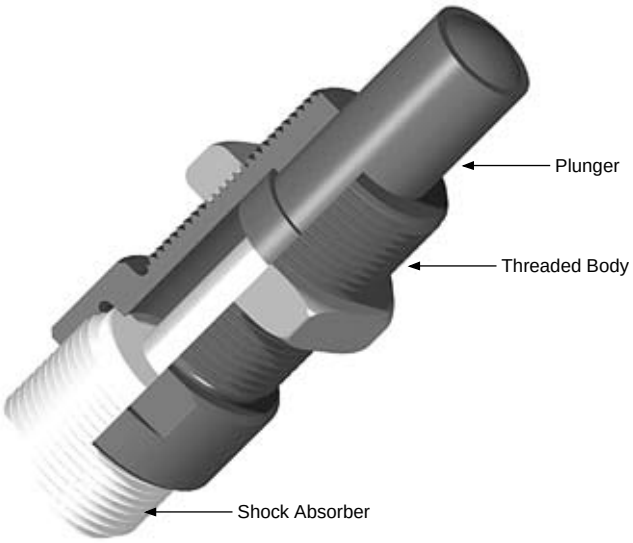
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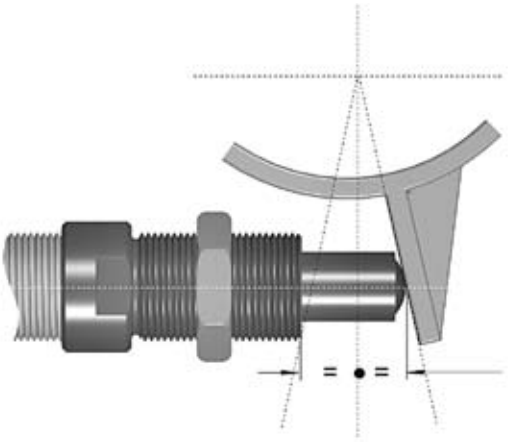
Miniature Shock Absorber Side Load Adapters
For Side Load in Excess of 3°

With side load impact angles of more than 3° the operating lifetime of the shock absorber reduces rapidly due to increased wear of the rod bearings. The optional side load adapter provides a long lasting solution.

Material: Threaded body and plunger, hardened high tensile steel







Problem: Rotary motion of the striking surface creates side load, which develops a bending moment on the piston rod. This can bend the rod in some cases. In all cases, side load will reduce seal and bearing life.

Solution: Use side load adapter.

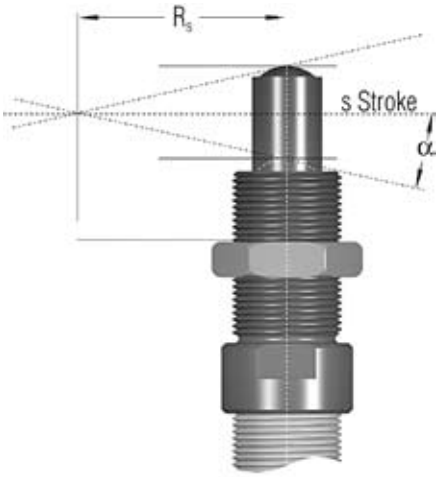
Formula: $\alpha = \tan^{-1}\left(\frac{s}{2 \bullet Rs}\right)$ $R_{smin} = \frac{s}{2 \bullet \tan\alpha max}$

Example: s = **.98** (25mm) α max = **25**° (adapter 250-0560)

R_s = **3.94** (100mm) $R_{smin} = \frac{.98}{2 \bullet \tan 25}$

$\alpha = \tan^{-1}\left(\frac{.98}{2 \bullet 3.94}\right)$ R_{smin} = **1.05** (27mm)

$\alpha = (7.09)°$

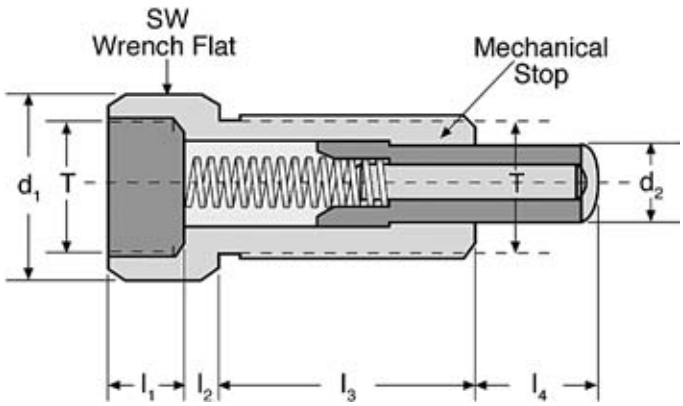


α	=	angle of impact
α max	=	maximum angle of impact
s	=	stroke
R_s	=	radius
R_{smin}	=	minimum r

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Miniature Shock Absorber Side Load Adapters



Dimensions IN INCHES (MILLIMETERS)

MC, MVC Series Model	SC Series Model	MA Series Model	Side Load Adapter	T	d_1	d_2	l_1	l_2	l_3	l_4	SW	Maximum Side Load (α)
MC 150M	**N/A**	**MA 150M**	**250-0558**	M14 x 1.5	0.70 (18)	0.35 (9)	0.31 (8)	0.15 (4)	0.78 (20)	0.49 (12.5)	0.62 (16)	25°
MC 225M	**N/A**	**N/A**	**250-0559**	M20 x 1.5	0.94 (24)	0.47 (12)	0.39 (10)	0.15 (4)	0.78 (20)	0.49 (12.5)	0.86 (22)	25°
MC 600M	**N/A**	**N/A**	**250-0560**	M25 x 1.5	1.18 (30)	0.62 (16)	0.39 (10)	0.23 (6)	1.50 (38)	0.98 (25)	1.06 (27)	25°
N/A	**SC190M-880***	**N/A**	**250-0080**	M14 x 1.5	0.70 (18)	0.35 (9)	0.39 (10)	0.15 (4)	1.02 (26)	0.62 (16)	0.62 (16)	25°
MVC 225M -880*	**SC 300M -880***	**MA 225M -880***	**250-0081**	M20 x 1.5	0.94 (24)	0.47 (12)	0.39 (10)	0.15 (4)	1.25 (32)	0.75 (19)	0.86 (22)	25°
MVC 600M -880*	**SC 650M -880***	**MA 600M -880***	**250-0082**	M25 x 1.5	1.18 (30)	0.62 (16)	0.39 (10)	0.23 (6)	1.50 (38)	0.98 (25)	1.06 (27)	25°

* The -880 = No button, standard rod

Note: Side load not to exceed 5". Maximum side load depends on application, shock absorber model, and stroke length.

Note: The side load adapter can only be installed on select metric shock absorbers without rod end button.

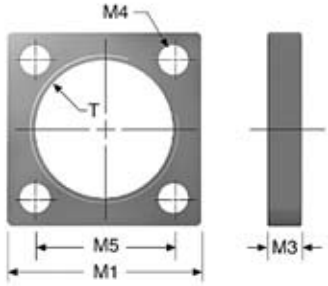
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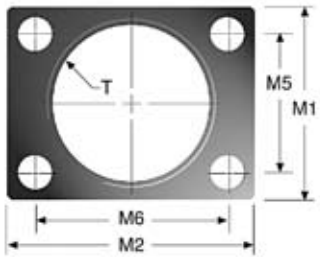
Square and Rectangular Flanges IN INCHES (MILLIMETERS)

Used With	Square Flange	Rect Flange	T	M1	M2	M3	M4	M5	M6
MA 33 ML 33 MC 33		250-0016	1-1/4-12 UNF	1.50 (38.1)	2.00 (50.8)	0.38 (9.5)	.219 (5.6)	1.12 (28.4)	1.62 (41.2)
MA 33M ML 33M MC 33M	N/A	250-0293	M33x1.5	1.62 (41.1)	2.12 (53.8)	0.38 (9.5)	.278 (7.1)	1.10 (28.0)	1.65 (42.0)
MA 36 ML 36 MC 36		250-0633	1-3/8-12 UNF	1.75 (44.4)	2.00 (50.8)	0.38 (9.5)	.219 (5.6)	1.12 (28.4)	1.62 (41.2)
MA 36M ML 36M MC 36M	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MA 45 ML 45 MC 45	250-0023	250-0024	1-3/4-12 UN	2.25 (57.2)	3.00 (76.2)	0.50 (12.7)	0.34 (8.7)	1.62 (41.2)	2.38 (60.5)
MA 45M ML 45M MC 45M	250-0298	250-0299	M45x1.5	2.25 (57.2)	3.00 (76.2)	0.50 (12.7)	0.35 (8.8)	1.62 (41.2)	2.38 (60.5)
MA 64 ML 64 MC 64	250-0028	N/A	2-1/2-12 UN	3.50 (88.9)	N/A	0.62 (15.9)	0.41 (10.4)	2.75 (69.6)	N/A
MA 64M ML 64M MC 64M	250-0302	N/A	M64x2	3.50 (88.9)	N/A	0.62 (15.9)	0.41 (10.4)	2.75 (69.6)	N/A

Square Flange

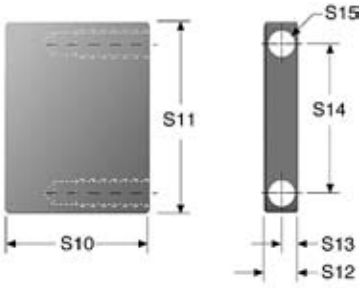


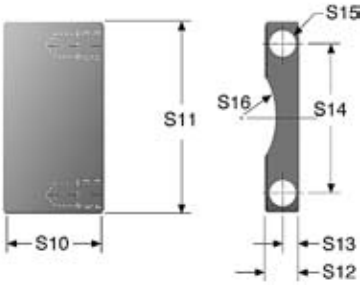
Rectangular Flange



Stop Bars IN INCHES (MILLIMETERS)

Used With	Part #	S10	S11	S12	S13	S14	S15	S16
MA 33 ML 33 MC 33	250-0426	1.28 (32.5)	1.50 (38.1)	0.38 (9.7)	0.19 (4.8)	1.12 (28.4)	10-32 UNF	N/A
MA 33M ML 33M MC 33M	250-0427	1.28 (32.5)	1.50 (38.1)	0.38 (9.7)	0.19 (4.8)	1.12 (28.4)	M5x0.8	N/A
MA 36 ML 36 MC 36	250-0426	1.28 (32.5)	1.50 (38.1)	0.38 (9.7)	0.19 (4.8)	1.12 (28.4)	10-32 UNF	N/A
MA 36M ML 36M MC 36M	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MA 45 ML 45 MC 45	250-0428	1.03 (26.2)	2.25 (57.2)	0.63 (16.0)	0.31 (7.9)	1.62 (41.3)	5/16-24 UNF	N/A
MA 45M ML 45M MC 45M	250-0639	1.03 (26.2)	2.25 (57.2)	0.63 (16.0)	0.31 (7.9)	1.62 (41.3)	M8x1.25	N/A
MA 6450 MA 64100 ML 6425 ML 6450 MC 6450 MC 64100	250-0430	1.44 (36.5)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	3/8-24 UNF	1.37 (34.8)
MA 6450M MA 64100M ML 6425M ML 6450M MC 6450M MC 64100M	250-0640	1.44 (36.5)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	M10x1.5	1.37 (34.8)
MA 64150 MC 64150	250-0432	2.31 (57.7)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	3/8-24 UNF	1.37 (34.8)
MA 64150M MC 64150M	250-0641	2.31 (57.7)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	M10x1.5	1.37 (34.8)
MAA 64150 MCA 64150	250-0435	2.18 (55.4)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	3/8-24 UNF	1.37 (34.8)
MAA 64150M MCA 64150M	250-0649	2.18 (55.4)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	M10x1.5	1.37 (34.8)





Hard metric stop bars available upon request.

Stop bars come in pairs, two bars per package.

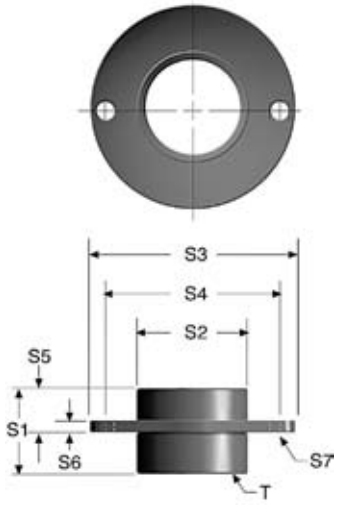
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Magnum Series Group Accessories

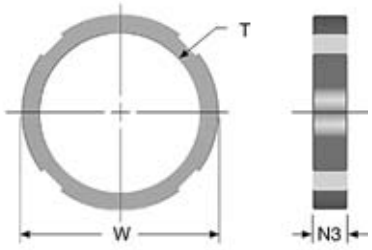
Flanged Stop Collars IN INCHES (MILLIMETERS)

Used With	Part #	T	S1	S2	S3	S4	S5	S6	S7
MA 33 ML 33 MC 33	250-0070	1-1/4-12 UNF	2.00 (50.8)	1.50 (38.1)	2.50 (63.5)	2.00 (50.8)	0.88 (22.4)	0.25 (6.4)	0.282 (7.16)
MA 33M ML 33M MC 33M	250-0071	M33x1.5	2.00 (50.8)	1.50 (38.1)	2.50 (63.5)	2.00 (50.8)	0.88 (22.4)	0.25 (6.4)	0.282 (7.16)
MA 36 ML 36 MC 36	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MA 36M ML 36M MC 36M									
MA 45 ML 45 MC 45	250-0072	1-3/4-12 UN	1.85 (47.0)	2.25 (57.2)	3.25 (82.6)	2.75 (69.6)	0.88 (22.4)	0.25 (6.4)	0.282 (7.16)
MA 45M ML 45M MC 45M	250-0073	M45x1.5	1.85 (47.0)	2.25 (57.2)	3.25 (82.6)	2.75 (69.9)	0.88 (22.4)	0.25 (6.4)	0.282 (7.16)
MA 6450 MA 64100 ML 6425 ML 6450 MC 6450 MC 64100	250-0074	2-1/2-12 UN	2.25 (57.2)	3.00 (76.2)	4.25 (108.0)	3.50 (88.9)	1.00 (25.4)	0.38 (9.7)	0.282 (7.16)
MA 6450M MA 64100M ML 6425M ML 6450M MC 6450M MC 64100M	250-0075	M64x2	2.25 (57.2)	3.00 (76.2)	4.25 (108.0)	3.50 (88.9)	1.00 (25.4)	0.38 (9.7)	0.282 (7.16)
MA 64150 MC 64150	250-0076	2-1/2-12 UN	3.13 (79.4)	3.00 (76.2)	4.25 (108.0)	3.50 (88.9)	1.00 (25.4)	0.38 (9.7)	0.282 (7.16)
MA 64150M MC 64150M	250-0077	M64x2	3.13 (79.4)	3.00 (76.2)	4.25 (108.0)	3.50 (88.9)	1.00 (25.4)	0.38 (9.7)	0.282 (7.16)

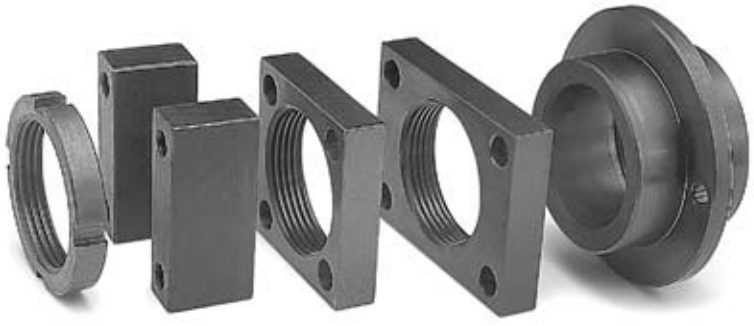


Lock Nuts IN INCHES (MILLIMETERS)

Used With	Part #	T	W	N3
MA 33 ML 33 MC 33	250-0038	1-1/4-12 UN	1.50 (38.1)	0.25 (6.4)
MA 33M ML 33M MC 33M	250-0292	M33x1.5	1.56 (39.6)	0.25 (6.4)
MA 36 ML 36 MC 36	250-0631	1-3/8-12 UNF	1.75 (44.5)	0.25 (6.4)
MA 36M ML 36M MC 36M	250-0537	M36x1.5	1.75 (44.5)	0.25 (6.4)
MA 45 ML 45 MC 45	250-0041	1-3/4-12 UN	2.25 (57.2)	0.37 (9.4)
MA 45M ML 45M MC 45M	250-0297	M45x1.5	2.25 (57.2)	0.37 (9.4)
MA 64 ML 64 MC 64	250-0042	2-1/2-12 UN	3.00 (76.2)	0.37 (9.4)
MA 64M ML 64M MC 64M	250-0301	M64x2	3.00 (76.2)	0.37 (9.4)



One lock nut included with each shock absorber where appropriate.



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Side-Foot Mount Assembly



Side-Foot Mount Assembly			
Used With	**Part #**	**Used With**	**Part #**
MA 33 **ML 33** **MC 33**	250-0015	**MA 6450** **MA 64100** **ML 6425** **ML 6450** **MC 6450** **MC 64100**	250-0300
MA 33M **ML 33M** **MC 33M**	250-0294		
MA 36 **ML 36** **MC 36**	N/A	**MA 6450M** **MA 64100M** **ML 6425M** **ML 6450M** **MC 6450M** **MC 64100M**	250-0304
MA 36M **ML 36M** **MC 36M**	N/A		
MA 45 **ML 45** **MC 45**	250-0025	**MA 64150** **MC 64150**	250-0030
MA 45M **ML 45M** **MC 45M**	250-0300	**MA 64150M** **MC 64150M**	250-0304

Note: See pages 28, 30 and 32 for Mega Series side-foot mount drawings and dimensions.

Clevis Mount Assembly



Clevis Mount Assembly			
Used With	**Part #**	**Used With**	**Part #**
MA 33 **ML 33** **MC 33** **MAS** **MLS** **MCS**	250-0225	**ML 6425** **ML 6425M**	250-0625 250-0626
MA 33M **ML 33M** **MC 33M** **MAS 33M** **MLS 33M** **MCS 33M**	250-0323	**MA 6450** **ML 6450** **MC 6450**	250-0625
		MA 6450M **ML 6450M** **MC 6450M**	250-0626
		MA 64100 **MC 64100**	250-0625
MAN 33 **MLN 33** **MCN 33** **MAA 33** **MLA 33** **MCA 33**	250-0018	**MA 64100M** **MC 64100M**	250-0626
		MAN 64150 **MCN 64150** **MAA 64150** **MCA 64150**	250-0625
MAN 33M **MLN 33M** **MCN 33M** **MAA 33M** **MLA 33M** **MCA 33M**	250-0322	**MAN 64150M** **MCN 64150M** **MAA 64150M** **MCA 64150M**	250-0626
		MA 64150 **MCA 64150** **MAS 64150** **MCS 64150**	250-0627
MA 45 **ML 45** **MC 45**	250-0324		
MA 45M **ML 45M** **MC 45M**	250-0325	**MA 64150M** **MCA 64150M** **MAS 64150M** **MCS 64150M**	250-0628

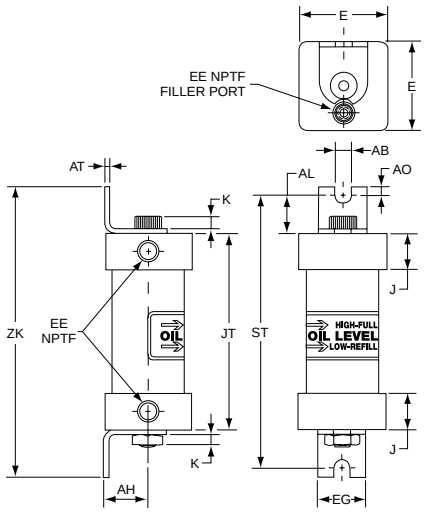
Note: See pages 28, 30 and 32 for Mega Series clevis mount drawings and dimensions.

N

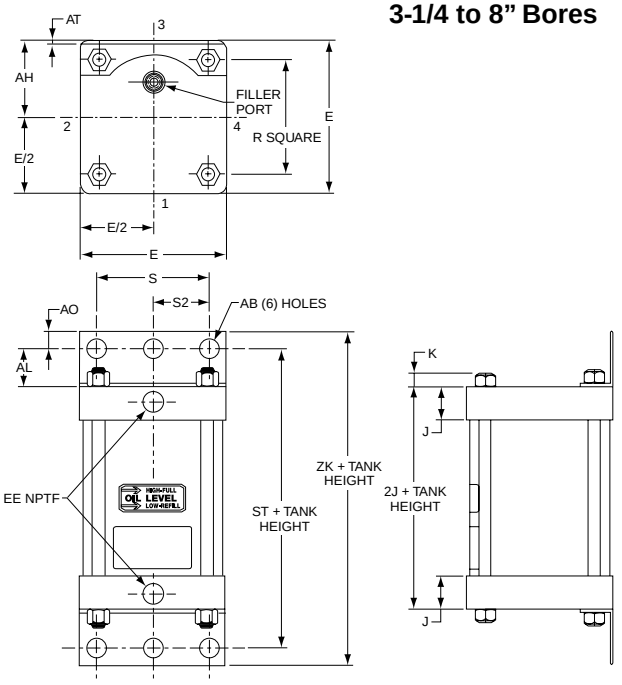
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Wadsworth, Ohio
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Air-Oil Tanks

1-1/4" Bore

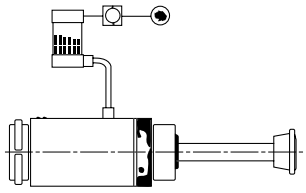


3-1/4 to 8" Bores

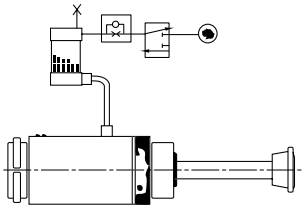


Dimensions															
Bore Size	**E**	**J**	**K**	**R**	**S**	**AB**	**AH**	**AL**	**AO**	**AT**	**EE**	**ST**	**ZK**	**EG**	**JT**
1 1/4	1 27/32	3/4	1/4	–	–	11/32	29/32	25.32	3/16	31/32	1/8	5 5/8	6	1	4 1/16
3 1/4	3 3/4	1 3/16	3/16	2.76	2 3/4	9/16	1 15/16	1 1/4	1/2	1/8	1/2	5	6	–	–
6	6 1/2	1.41	7/16	4.88	5 1/4	13/16	3 1/4	1 3/8	5/8	3/16	3/4	5 3/4	7	–	–
8	8 1/2	1.44	9/16	6.44	7 1/8	13/16	4 1/4	1 13/16	11/16	1/4	3/4	6 5/8	8	–	–

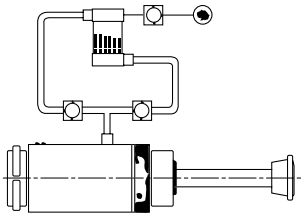
Mounting and Circuits



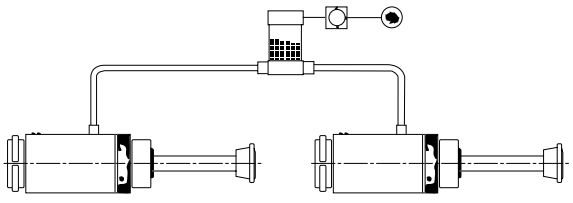
1. The piston rod is immediately returned to its extended position after completing the stroke.



2. The piston rod remains it its retracted position until it is signaled to return. Special bleed-down type check valve is required for this circuit.



3. A recirculating cooling circuit allows warm oil to return to the tank while cool oil refills the shock absorber. A recirculating cooling circuit substantially increases the shock absorber's hourly energy capacity.



4. When connecting more than one shock absorber to an Air-Oil Tank, use caution in selecting the proper reservoir capacity. For two shock absorbers, the next largest Air-Oil Tank Size is usually adequate.

Capacity (Maximum)				
Model	**Oil Temp (°F)**	**Max. Pressure (psi)**	**Capacity (cubic inches)**	**Recommended shock absorber size**
1.25CB3TKU x 2.00	200	100	2.4	MC 3325 MC 3350
3.25CB3TKU x 5.00	200	100	41.4	MC 4525 MC 64150
6.00CB3TKU x 9.00	200	100	254.5	1-1/2 x 5 - 3 x 12
8.00CB3TKU x 15.00	200	100	754	4 x 6 - 4 x 16
8.00 CB3TKUS x 15.00 *S = 1 1/2 NPTF ports in cap face*	200	100	754	4 x 6 - 4 x 16

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Fax Forms, Safety Guide, Offer of Sale

Section P

Contents

Application Fax Forms
- Pneumatic Cylinders P2
- Guided Cylinders P3
- Rotary Actuators P4
- Pneumatic Grippers P5

Safety Guide P8-P9

Offer of Sale P10

P

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Fax completed form to 330-334-3335 or email to actuatorsales@parker.com.

CONTACT INFORMATION:

Name _____ **Phone** _____

Company _____ **email** _____

City, State, Zip _____

APPLICATION SKETCH

Please include the critical dimensions in your sketch.

In order to achieve the best solution, it is important that you provide as much information as possible.

For other considerations, please use another sheet of paper.

OPERATING ENVIRONMENT

Media (check one)
___ Air ___ Oil
___ Other _____

Pressure
Min. _____
Max. _____

Temperature
Ambient _____
Fluid _____

Conditions
___ Std. Factory ___ Chemical
___ Corrosive ___ Outdoor
___ Other _____

TECHNICAL SPECIFICATIONS

Mounting/Cylinder Orientation
Style (refer to catalog) _____
___ Vertical ___ Rod Up ___ Rod Down
___ Horizontal
Degrees from Vertical _____

Port Type
Head: ___ NPTF ___ BSPP ___ SAE
Cap: ___ NPTF ___ BSPP ___ SAE
Position # (refer to catalog) _____
Other _____

Cushions
Head: ___ Yes ___ No
Cap: ___ Yes ___ No
Position # (refer to catalog) _____

Magnetic Piston ___ Yes ___ No

LOAD INFORMATION

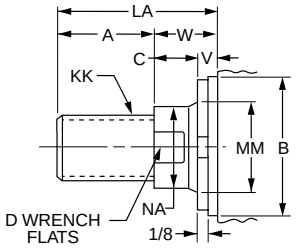
Push (lbs) _____
Pull (lbs) _____
Known Side Load (lbs) _____

Extend Speed (inches/sec) _____
Retract Speed (inches/sec) _____

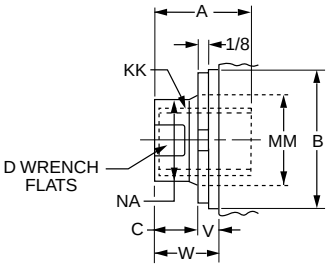
Dwell Time _____
Cycles/Min _____

ROD END DETAILS

Male



Female



If rod end is different from above, please submit sketch. Piston rod diameter and rod end threads vary with the application. Please supply the dimensions below.

Male Rod End
KK = _____
A = _____
LA or LAF = _____

Female Rod End
KK = _____
A = _____
W or WF = _____

Check One	Rod End Connection	Case
	Fixed and rigidly guided	
	Pivoted and rigidly guided	
	Supported but not rigidly guided	
	Pivoted and rigidly guided	
	Pivoted and rigidly guided	
	Pivoted and rigidly guided	

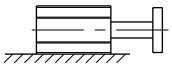
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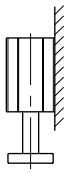
EXAMPLES

ORIENTATION

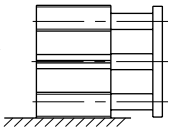
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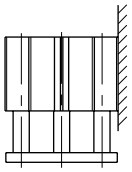
B



C

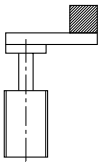


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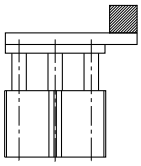


VERTICAL LOAD

E

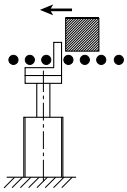


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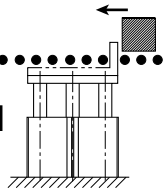


LOAD STOPPING

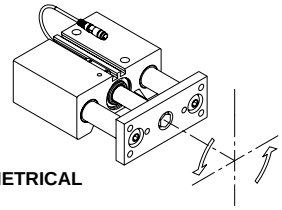
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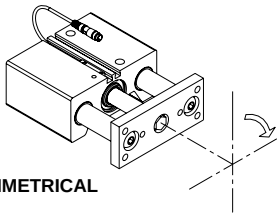
H



TORSIONAL REQUIREMENTS



SYMMETRICAL



ASYMMETRICAL

Fax completed form to 330-334-3335 or email to actuator sales @parker.com.

CONTACT INFORMATION:

Name _____**Phone** _____

Company _____**email** _____

City, State, Zip _____

APPLICATION SKETCH

Please include the critical dimensions in your sketch.

In order to achieve the best solution, it is important that you provide as much information as possible.

APPLICATION DETAILS

1. **Application Type:** Using the examples on the left, circle the letter that most closely matches your application.
   A B C D E F G H
2. **Required stroke** (mm): _____
3. **Force Requirements** (lbs):
   Extend _____ Retract _____
4. **Side Loading** (lbs): _____
5. **Load Stopping:**
   Weight (lbs) _____ Velocity (in/sec) _____
6. **Torques** (lb-in): _____
7. **Torsional Requirements** (check one):
   _____ Symmetrical _____ Asymmetrical
8. **Cycle Times:**
   a. Duty Cycles (cycles/hr) _____
   b. Extend Time _____
   c. Retract Time _____
   d. Dwell Time _____

ENVIRONMENTAL CONDITIONS

1. **Operating Temperature:**
   Max _____ Min _____
2. **Contamination** (check one):
   _____ Particle _____ Liquid

Other Special Considerations for the Application:

_____

_____

_____

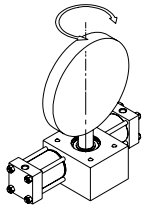
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EXAMPLES

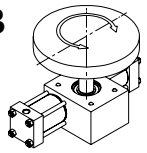
ROTATE THIN DISK

A



End mounted on center

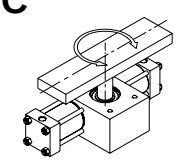
B



Mounted on center

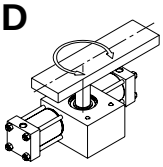
ROTATE THIN RECTANGULAR PLATE

C



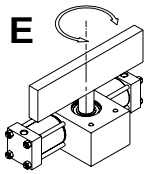
Mounted on center

D



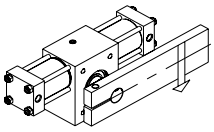
Mounted off center

E



End mounted on center

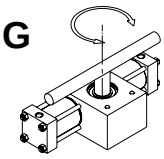
F



Point load

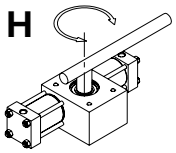
ROTATE SLENDER ROD

G



Mounted on center

H



Mounted off center

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CONTACT INFORMATION:

Name _____ **Phone** _____

Company _____ **email** _____

City, State, Zip _____

APPLICATION SKETCH

Please include the critical dimensions in your sketch.

In order to achieve the best solution, it is important that you provide as much information as possible.

ENVIRONMENTAL CONDITIONS

1. **Operating Temperature:** Max _____ Min _____
2. **Contamination:** Particle _____ Liquid _____

APPLICATION DETAILS

1. **Type of Actuator** (check one):

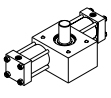


____ Vane ____ Rack & Pinion

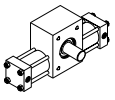


2. **Type of Application**
   (circle letter of example at left that most closely represents your application):
   A B C D E F G H
3. **Torque Requirements** (lb-in or Nm), if known: _____
4. **Operating Media:** ____ Air ____Oil
5. **Operating Pressure** (psi): _____
6. **Required Rotation** (in degrees): _____
7. **Rotation Time** (seconds to complete rotation in one direction): _____
8. **Is Rotation Adjustment Needed?**
   ___ No ___Yes If yes, how much? _____
9. **Weight of object being rotated** (lbs): _____
   a. Will external stops be utilized? ____ No ____ Yes
   b. Will the actuator be used to decelerate or stop the load? ____ No ____ Yes
10. **Shaft Orientation** (circle one):

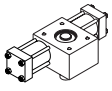
UP



SIDE



DOWN



11. **Distance from center of shaft to center of load** (inches): _____
12. **Shaft** (check one): ___ Male ___ Female
13. **Options** (check one): ___ Shocks ___ Cushions ___ Bumpers
14. **Sensing (check one):** ___ Proximity ___ Hall Effect ___ Reed

Other Considerations:

_____

_____

_____

_____

_____

_____

_____

_____

_____

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Fax completed form to 330-334-3335 or email to actuatorsales@parker.com.

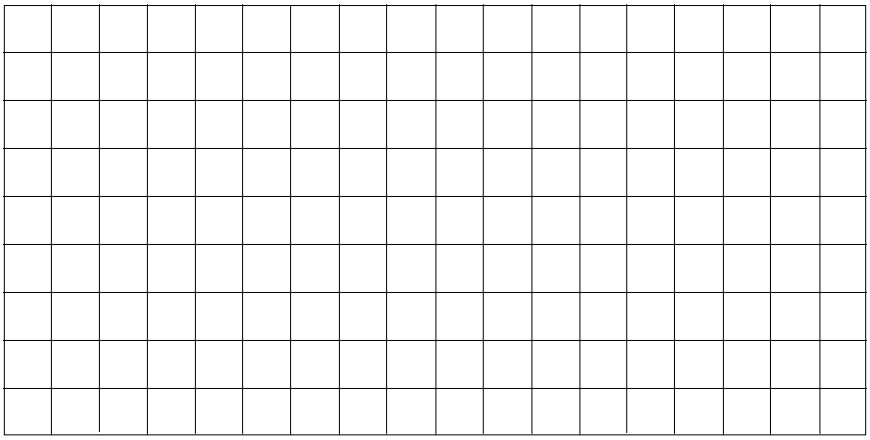
CONTACT INFORMATION:

Name _____ **Phone** _____

Company _____ **email** _____

City, State, Zip _____

APPLICATION SKETCH



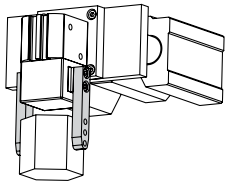
Please include the critical dimensions in your sketch.

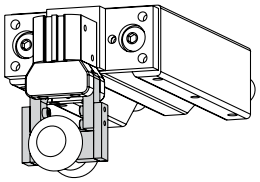
In order to achieve the best solution, it is important that you provide as much information as possible.

FINGERS

1. **Type of Fingers** (check one):

____ Friction ____ Encompassing





2. **Gripper Stroke** _____
3. **Length of Fingers** _____

WORKPIECE DATA

1. **Weight of workpiece:** _____
2. **Workpiece hardness:** _____
3. **Workpiece temperature:** _____
4. **Workpiece positioning tolerance:** _____
5. **Workpiece shape** (illustrate in the space below):

GRIPPER SENSING AND CONTROLS

1. **Type of position sensors:** _____
2. **Number of sensors:** _____
3. **Flow controls*:** _____

**Flow controls are recommended on angular grippers.*

OTHER GRIPPER OPTIONS (check)

___ Spring Close ___ Spring Assist ___ Spring Open

___ Non-Synchronous Fingers ___ Clean Room ___ Dust

ENVIRONMENTAL CONDITIONS

1. **Operating Temperature:**
   Max _____ Min _____
2. **Contamination** (check one):
   ___ Particle ___ Liquid
   Type: _____

ACTUATOR INFORMATION

1. **Type of actuator** the gripper is mounted to:
   _____
2. **Maximum Acceleration:** _____
3. **Supply Air Pressure:** _____
4. **Any External Forces** (check one)?
   ____ Yes ____ No
   If yes, please describe: _____
   _____

OTHER SPECIAL CONSIDERATIONS

_____

_____

_____

_____

_____

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Safety Guide for Selecting and Using Hydraulic, Pneumatic Cylinders and Their Accessories

WARNING: ⚠ FAILURE OF THE CYLINDER, ITS PARTS, ITS MOUNTING, ITS CONNECTIONS TO OTHER OBJECTS, OR ITS CONTROLS CAN RESULT IN:

- **Unanticipated or uncontrolled movement of the cylinder or objects connected to it.**
- **Falling of the cylinder or objects held up by it.**
- **Fluid escaping from the cylinder, potentially at high velocity.**

THESE EVENTS COULD CAUSE DEATH OR PERSONAL INJURY BY, FOR EXAMPLE, PERSONS FALLING FROM HIGH LOCATIONS, BEING CRUSHED OR STRUCK BY HEAVY OR FAST MOVING OBJECTS, BEING PUSHED INTO DANGEROUS EQUIPMENT OR SITUATIONS, OR SLIPPING ON ESCAPED FLUID.

Before selecting or using Parker (The Company) cylinders or related accessories, it is important that you read, understand and follow the following safety information. Training is advised before selecting and using The Company's products.

1.0 General Instructions

1.1 Scope – This safety guide provides instructions for selecting and using (including assembling, installing, and maintaining) cylinder products. This safety guide is a supplement to and is to be used with the specific Company publications for the specific cylinder products that are being considered for use.

1.2 Fail Safe – Cylinder products can and do fail without warning for many reasons. All systems and equipment should be designed in a fail-safe mode so that if the failure of a cylinder product occurs people and property won't be endangered.

1.3 Distribution – Provide a free copy of this safety guide to each person responsible for selecting or using cylinder products. Do not select or use The Company's cylinders without thoroughly reading and understanding this safety guide as well as the specific Company publications for the products considered or selected.

1.4 User Responsibility – Due to very wide variety of cylinder applications and cylinder operating conditions, The Company does not warrant that any particular cylinder is suitable for any specific application. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The hydraulic and pneumatic cylinders outlined in this catalog are designed to The Company's design guidelines and do not necessarily meet the design guideline of other agencies such as American Bureau of Shipping, ASME Pressure Vessel Code etc. The user, through its own
analysis and testing, is solely responsible for:

- Making the final selection of the cylinders and related accessories.
- Determining if the cylinders are required to meet specific design requirements as required by the Agency(s) or industry standards covering the design of the user's equipment.
- Assuring that the user's requirements are met, OSHA requirements are met, and safety guidelines from the applicable agencies such as but not limited to ANSI are followed and that the use presents no health or safety hazards.
- Providing all appropriate health and safety warnings on the equipment on which the cylinders are used.

1.5 Additional Questions – Call the appropriate Company technical service department if you have any questions or require any additional information. See the Company publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2.0 Cylinder and Accessories Selection

2.1 Seals – Part of the process of selecting a cylinder is the selection of seal compounds. Before making this selection, consult the "seal information page(s)" of the publication for the series of cylinders of interest.

The application of cylinders may allow fluids such as cutting fluids, wash down fluids etc. to come in contact with the external area of the cylinder. These fluids may attack the piston rod wiper and or the primary seal and must be taken into account when selecting and specifying seal compounds.

Dynamic seals will wear. The rate of wear will depend on many operating factors. Wear can be rapid if a cylinder is mis-aligned or if the cylinder has been improperly serviced. The user must take seal wear into consideration in the application of cylinders.

2.2 Piston Rods – Possible consequences of piston rod failure or separation of the piston rod from the piston include, but are not limited to are:

- Piston rod and or attached load thrown off at high speed.
- High velocity fluid discharge.
- Piston rod extending when pressure is applied in the piston retract mode.

Piston rods or machine members attached to the piston rod may move suddenly and without warning as a consequence of other conditions occurring to the machine such as, but not limited to:

- Unexpected detachment of the machine member from the piston rod.
- Failure of the pressurized fluid delivery system (hoses, fittings, valves, pumps, compressors) which maintain cylinder position.
- Catastrophic cylinder seal failure leading to sudden loss of pressurized fluid.
- Failure of the machine control system.

Follow the recommendations of the "Piston Rod Selection Chart and Data" in the publication for the series of cylinders of interest. The suggested piston rod diameter in these charts must be followed in order to avoid piston rod buckling.

Piston rods are not normally designed to absorb bending moments or loads which are perpendicular to the axis of piston rod motion. These additional loads can cause the piston rod to fail. If these types of additional loads are expected to be imposed on the piston rod, their magnitude should be made known to our engineering department.

The cylinder user should always make sure that the piston rod is securely attached to the machine member.

On occasion cylinders are ordered with double rods (a piston rod extended from both ends of the cylinder). In some cases a stop is threaded on to one of the piston rods and used as an external stroke adjuster. On occasions spacers are attached to the machine member connected to the piston rod and also used as a stroke adjuster. In both cases the stops will create a pinch point and the user should consider appropriate use of guards. If these external stops are not perpendicular to the mating contact surface, or if debris is trapped between the contact surfaces, a bending moment will be placed on the piston rod, which can lead to piston rod failure. An external stop will also negate the effect of cushioning and will subject the piston rod to impact loading. Those two (2) conditions can cause piston rod failure. Internal stroke adjusters are available with and without cushions. The use of external stroke adjusters should be reviewed with our engineering department.

The piston rod to piston and the stud to piston rod threaded connections are secured with an anaerobic adhesive. The strength of the adhesive decreases with increasing temperature. Cylinders which can be exposed to temperatures above +250°F (+121°C) are to be ordered with a non studded piston rod and a pinned piston to rod joint.

2.3 Cushions – Cushions should be considered for cylinder applications when the piston velocity is expected to be over 4 inches/second.

Cylinder cushions are normally designed to absorb the energy of a linear applied load. A rotating mass has considerably more energy than the same mass moving in a linear mode. Cushioning for a rotating mass application should be review by our engineering department.

2.4 Cylinder Mountings – Some cylinder mounting configurations may have certain limitations such as but not limited to minimum stroke for side or foot mounting cylinders or pressure de-ratings for certain mounts. Carefully review the catalog for these types of restrictions.

Always mount cylinders using the largest possible high tensile alloy steel socket head cap screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

2.5 Port Fittings – Hydraulic cylinders applied with meter out or deceleration circuits are subject to intensified pressure at piston rod end.

The rod end pressure is approximately equal to:

$$\frac{\text{operating pressure x effective cap end area}}{\text{effective rod end piston area}}$$

Contact your connector supplier for the pressure rating of individual connectors.

3.0 Cylinder and Accessories Installation and Mounting

3.1 Installation

3.1.1 – Cleanliness is an important consideration, and cylinders are shipped with the ports plugged to protect them from contaminants entering the ports. These plugs should not be removed until the piping is to be installed. Before making the connection to the cylinder ports, piping should be thoroughly cleaned to remove all chips or burrs which might have resulted from threading or flaring operations.

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3.1.2 – Cylinders operating in an environment where air drying materials are present such as fast-drying chemicals, paint, or weld splatter, or other hazardous conditions such as excessive heat, should have shields installed to prevent damage to the piston rod and piston rod seals.

3.1.3 – Proper alignment of the cylinder piston rod and its mating component on the machine should be checked in both the extended and retracted positions. Improper alignment will result in excessive rod gland and/or cylinder bore wear. On fixed mounting cylinders attaching the piston rod while the rod is retracted will help in achieving proper alignment.

3.1.4 – Sometimes it may be necessary to rotate the piston rod in order to thread the piston rod into the machine member. This operation must always be done with zero pressure being applied to either side of the piston. Failure to follow this procedure may result in loosening the piston to rod-threaded connection. In some rare cases the turning of the piston rod may rotate a threaded piston rod gland and loosen it from the
cylinder head. Confirm that this condition is not occurring. If it does, re-tighten the piston rod gland firmly against the cylinder head.

For double rod cylinders it is also important that when attaching or detaching the piston rod from the machine member that the torque be applied to the piston rod end of the cylinder that is directly attaching to the machine member with the opposite end unrestrained. If the design of the machine is such that only the rod end of the cylinder opposite to where the rod attaches to the machine member can be rotated, consult the factory for further instructions.

3.2 Mounting Recommendations

3.2.1 – Always mount cylinders using the largest possible high tensile alloy steel socket head screws that can fit in the cylinder mounting holes and torque them to the manufacturer's recommendations for their size.

3.2.2 – Side-Mounted Cylinders – In addition to the mounting bolts, cylinders of this type should be equipped with thrust keys or dowel pins located so as to resist the major load.

3.2.3 – Tie Rod Mounting – Cylinders with tie rod mountings are recommended for applications where mounting space is limited. The standard tie rod extension is shown as BB in dimension tables. Longer or shorter extensions can be supplied. Nuts used for this mounting style should be torqued to the same value as the tie rods for that bore size.

3.2.4 – Flange Mount Cylinders – The controlled diameter of the rod gland extension on head end flange mount cylinders can be used as a pilot to locate the cylinders in relation to the machine. After alignment has been obtained, the flanges may be drilled for pins or dowels to prevent shifting.

3.2.5 – Trunnion Mountings – Cylinders require lubricated bearing blocks with minimum bearing clearances. Bearing blocks should be carefully aligned and rigidly mounted so the trunnions will not be subjected to bending moments. The rod end should also be pivoted with the pivot pin in line and parallel to axis of the trunnion pins.

3.2.6 – Clevis Mountings – Cylinders should be pivoted at both ends with centerline of pins parallel to each other. After cylinder is mounted, be sure to check to assure that the cylinder is free to swing through its working arc without interference from other machine parts.

4.0 Cylinder and Accessories Maintenance, Troubleshooting and Replacement

4.1 Storage – At times cylinders are delivered before a customer is ready to install them and must be stored for a period of time. When storage is required the following procedures are recommended.

4.1.1 – Store the cylinders in an indoor area which has a dry, clean and noncorrosive atmosphere. Take care to protect the cylinder from both internal corrosion and external damage.

4.1.2 – Whenever possible cylinders should be stored in a vertical position (piston rod up). This will minimize corrosion due to possible condensation which could occur inside the cylinder. This will also minimize seal damage.

4.1.3 – Port protector plugs should be left in the cylinder until the time of installation.

4.1.4 – If a cylinder is stored full of hydraulic fluid, expansion of the fluid due to temperature changes must be considered. Installing a check valve with free flow out of the cylinder is one method.

4.1.5 – When cylinders are mounted on equipment that is stored outside for extended periods, exposed unpainted surfaces, e.g. piston rod, must be coated with a rust-inhibiting compound to prevent corrosion.

4.2 Cylinder Trouble Shooting

4.2.1 – **External Leakage**

4.2.1.1 – Rod seal leakage can generally be traced to worn or damaged seals. Examine the piston rod for dents, gouges or score marks, and replace piston rod if surface is rough.

Rod seal leakage could also be traced to gland wear. If clearance is excessive, replace rod bushing and seal. Rod seal leakage can also be traced to seal deterioration. If seals are soft or gummy or brittle, check compatibility of seal material with lubricant used if air cylinder, or operating fluid if hydraulic cylinder. Replace with seal material, which is compatible with these fluids. If the seals are hard or have lost elasticity, it is usually due to exposure to temperatures in excess of 165°F. (+74°C). Shield the cylinder from the heat source to limit temperature to 350°F. (+177°C.) and replace with fluorocarbon seals.

4.2.1.2 – Cylinder body seal leak can generally be traced to loose tie rods. Torque the tie rods to manufacturer's recommendation for that bore size.

Excessive pressure can also result in cylinder body seal leak. Determine maximum pressure to rated limits. Replace seals and retorque tie rods as in paragraph above. Excessive pressure can also result in cylinder body seal leak. Determine if the pressure rating of the cylinder has been exceeded. If so, bring the operating pressure down to the rating of the cylinder and have the tie rods replaced.

Pinched or extruded cylinder body seal will also result in a leak. Replace cylinder body seal and retorque as in paragraph above.

Cylinder body seal leakage due to loss of radial squeeze which shows up in the form of flat spots or due to wear on the O.D. or I.D. – Either of these are symptoms of normal wear due to high cycle rate or length of service. Replace seals as per paragraph above.

4.2.2 – **Internal Leakage**

4.2.2.1 – Piston seal leak (by-pass) 1 to 3 cubic inches per minute leakage is considered normal for piston ring construction. Virtually no static leak with lipseal type seals on piston should be expected. Piston seal wear is a usual cause of piston seal leakage. Replace seals as required.

4.2.2.2 – With lipseal type piston seals excessive back pressure due to over-adjustment of speed control valves could be a direct cause of rapid seal wear. Contamination in a hydraulic system can result in a scored cylinder bore, resulting in rapid seal wear. In either case, replace piston seals as required.

4.2.2.3 – What appears to be piston seal leak, evidenced by the fact that the cylinder drifts, is not always traceable to the piston. To make sure, it is suggested that one side of the cylinder piston be pressurized and the fluid line at the opposite port be disconnected. Observe leakage. If none is evident, seek the cause of cylinder drift in other component parts in the circuit.

4.2.3 – **Cylinder Fails to Move the Load**

4.2.3.1 – Pneumatic or hydraulic pressure is too low. Check the pressure at the cylinder to make sure it is to circuit requirements.

4.2.3.2 – Piston Seal Leak – Operate the valve to cycle the cylinder and observe fluid flow at valve exhaust ports at end of cylinder stroke. Replace piston seals if flow is excessive.

4.2.3.3 – Cylinder is undersized for the load – Replace cylinder with one of a larger bore size.

4.3 Erratic or Chatter Operation

4.3.1 – Excessive friction at rod gland or piston bearing due to load misalignment – Correct cylinder-to-load alignment.

4.3.2 – Cylinder sized too close to load requirements – Reduce load or install larger cylinder.

4.3.3 – Erratic operation could be traced to the difference between static and kinetic friction. Install speed control valves to provide a back pressure to control the stroke.

4.4 Cylinder Modifications, Repairs, or Failed Component – Cylinders as shipped from the factory are not to be disassembled and or modified. If cylinders require modifications, these modifications must be done at company locations or by The Company's certified facilities. The Cylinder Division Engineering Department must be notified in the event of a mechanical fracture or permanent deformation of any cylinder component (excluding seals). This includes a broken piston rod, tie rod, mounting accessory or any other cylinder component. The notification should include all operation and application details. This information will be used to provide an engineered repair that will prevent recurrence of the failure.

It is allowed to disassemble cylinders for the purpose of replacing seals or seal assemblies. However, this work must be done by strictly following all the instructions provided with the seal kits.

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Offer of Sale

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1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer. Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from the Company. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED.**

NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGN OR SPECIFICATIONS.

5. Limitation of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitations, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer, or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets (hereinafter "Intellectual Property Rights"). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgements resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter "Events of Force Majeure"). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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