



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



## P1/PD Series Medium Pressure Axial Piston Pumps

Variable Displacement  
Catalog HY28-2665-01/P1/EN  
Effective: January 30, 2014



ENGINEERING YOUR SUCCESS.

# Contents

|                                     |    |
|-------------------------------------|----|
| General Information .....           | 1  |
| Ordering Information .....          |    |
| P1/PD 018 .....                     | 2  |
| P1/PD 028 .....                     | 3  |
| P1/PD 045 .....                     | 4  |
| P1/PD 060 .....                     | 5  |
| P1/PD 075 .....                     | 6  |
| P1/PD 100 .....                     | 7  |
| P1/PD 140 .....                     | 8  |
| Technical Data .....                | 9  |
| Control Options .....               | 10 |
| P1 Performance Data .....           |    |
| Typical Pump Outlet Flow .....      | 18 |
| Typical Overall Efficiency .....    | 20 |
| Typical Shaft Input Power .....     | 22 |
| Typical Noise Characteristics ..... | 25 |
| Typical Shaft Bearing Life .....    | 27 |
| PD Performance Data .....           |    |
| Typical Pump Outlet Flow .....      | 29 |
| Typical Overall Efficiency .....    | 31 |
| Typical Shaft Input Power .....     | 33 |
| Typical Noise Characteristics ..... | 36 |
| Typical Shaft Bearing Life .....    | 38 |
| Dimensions .....                    |    |
| P1/PD 018 .....                     | 40 |
| P1/PD 028 .....                     | 44 |
| P1/PD 045 .....                     | 50 |
| P1/PD 060 .....                     | 56 |
| P1/PD 075 .....                     | 62 |
| P1/PD 100 .....                     | 68 |
| P1/PD 140 .....                     | 74 |
| Shaft Torque Ratings .....          | 79 |
| Controls .....                      | 80 |
| Electronic Connectors .....         | 91 |
| Installation Information .....      | 92 |
| Content Index .....                 | 93 |
| Offer of Sale .....                 | 94 |



## WARNING - USER RESPONSIBILITY

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

## OFFER OF SALE

The items described in this document are hereby offered for sale by Parker-Hannifin Corporation, its subsidiaries or its authorized distributor. This offer and its acceptance are governed by the provisions stated in the detailed "Offer of Sale" elsewhere in this document.

## General Information

### Description

- Variable displacement, axial piston pump for open-circuit applications
- Medium pressure, continuous operation at pressures up to 280 bar
- High drive speed models for mobile markets and low noise models for industrial markets
- Quiet and efficient control capability

### Benefits

- Compact overall package size
- Quiet operation
- Low flow ripple to further reduce noise
- Elastomer seals that eliminate gaskets and external leakage
- High operating efficiency for lower power consumption and reduced heat generation
- Simple hydraulic controls with “no-leak” adjustments
- SAE and ISO standard mounting flanges and ports
- Long life, tapered-roller shaft bearings
- Long life, low friction, hydrostatically balanced swash plate saddle bearings
- Full power through-drive capability
- End or side inlet and outlet ports
- Case drain ports for horizontal or vertical, shaft-up mounting
- Optional minimum and maximum displacement adjustments
- Easy to service

P1 Series



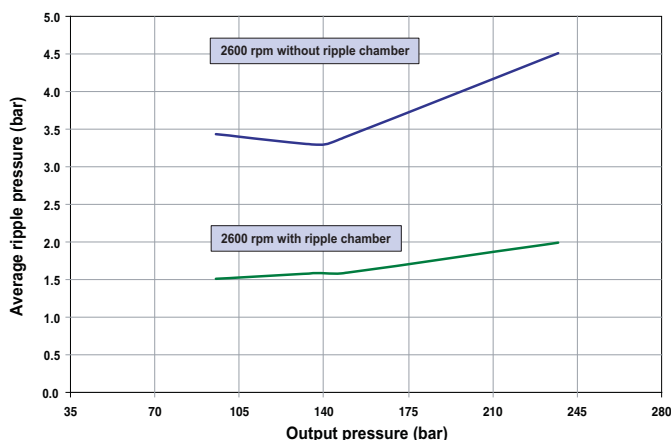
PD Series

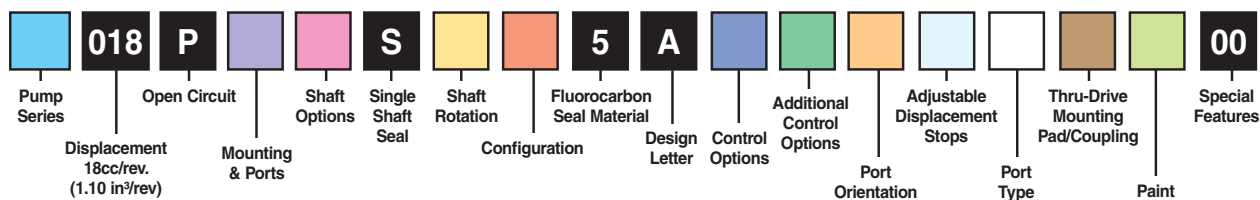


### Ripple Chamber Technology

The chart refers to the “Ripple Chamber “ technology engineered into the P1/PD 18, 28 and 45 Series, side ported pumps. The ripple chamber reduces pressure pulsations (called ripple) at the outlet of the pump by 40-60%. This leads to a significant reduction in overall system noise, without the added expense of noise dampening components.

P1 045 Pressure Ripple, Average of 3 pumps





| Pump Series |            |
|-------------|------------|
| P1          | Mobile     |
| PD          | Industrial |

| Mounting & Ports |                                                          |
|------------------|----------------------------------------------------------|
| S                | SAE A Pilot SAE Threaded Work Ports with SAE Aux Ports   |
| A                | SAE A Pilot Metric Work Ports with BSPP Aux Ports        |
| M                | ISO - 80mm Pilot Metric Work Ports with Metric Aux Ports |
| B                | ISO - 80mm Pilot Metric Work Ports with BSPP Aux Ports   |

| Shaft Options |                                  |
|---------------|----------------------------------|
| 01            | Splined shaft - SAE 19-4 11T     |
| 02            | Keyed shaft - SAE 19-1 .75" Dia. |
| 04            | ISO keyed 20MM Dia.              |
| 06            | Splined shaft - SAE A 9T*        |

\*Not available with Thru-Drive

| Shaft Rotation |                  |
|----------------|------------------|
| R              | Clockwise        |
| L              | Counterclockwise |

| Configuration |                 |
|---------------|-----------------|
| M             | Mobile (P1)     |
| S             | Industrial (PD) |

| Control Options |                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------|
| C0              | Pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)                                                               |
| C1              | Pressure limiter 290.08 - 1160.30 PSI (20 - 80 bar)                                                                 |
| L0              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)         |
| L2              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar) |
| AN*             | Pilot operated pressure limiter with ISO4401 interface & SAE 4 Vent Port                                            |
| AM              | Pilot operated pressure limiter with mechanical adjustment and SAE 4 Vent Port                                      |
| AE              | Pilot operated pressure limiter with mechanical and electrical adjustment 12 VDC                                    |
| AF              | Pilot operated pressure limiter with mechanical and electrical adjustment 24 VDC                                    |
| ##              | See chart below for electronic control options                                                                      |

\*Not functional control as such

| Additional Control Options |                        |
|----------------------------|------------------------|
| 0                          | No other options       |
| 2                          | Displacement sensor ** |

\*\* mandatory with "W\*\*\*", "X\*\*\*", "Y\*\*\*", "Z\*\*\*" "D\*" and "Y"

| Port Orientation |                                 |
|------------------|---------------------------------|
| E                | End Ports                       |
| R                | Side ported with ripple chamber |
| T                | Side ported with Thru-Drive     |

| Adjustable Displacement Stops |                                                  |
|-------------------------------|--------------------------------------------------|
| 0                             | None                                             |
| 1*                            | Adjustable maximum displacement stop             |
| 2*                            | Adjustable minimum displacement stop             |
| 3*                            | Adjustable maximum and minimum displacement stop |

\*Not available with Thru-Drive

| Port Type |                |
|-----------|----------------|
| 0         | Flange Ports*  |
| 2         | Threaded Ports |

\*With Thru-Drive Only

| Thru-Drive Mounting Pad/Coupling |                                   |
|----------------------------------|-----------------------------------|
| 0                                | No Thru-Drive                     |
| A                                | SAE 82-2(A), 16(A), 9T coupling   |
| H                                | SAE 82-2(A), 19(--), 11T coupling |

| Paint |             |
|-------|-------------|
| 00    | No Paint    |
| PB    | Black Paint |

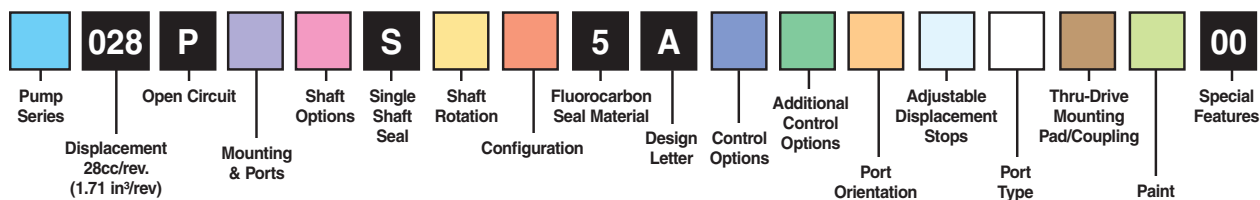
| Electronic Control Options |   |
|----------------------------|---|
| #                          | # |

|   |                                                |
|---|------------------------------------------------|
| 0 | No ECU                                         |
| D | Proportional displacement control              |
| Y | Proportional pressure and displacement control |

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| P | Electronic valve with zero displacement default                                              |
| T | Electronic valve with max displacement default                                               |
| S | Electronic valve with zero displacement default and hydromechanical Pmax                     |
| U | Electronic valve with max displacement default and hydromechanical Pmax                      |
| W | Electronic valve with zero displacement default (CANBUS compatible)                          |
| Y | Electronic valve with max displacement default (CANBUS compatible)                           |
| X | Electronic valve with zero displacement default and hydromechanical Pmax (CANBUS compatible) |
| Z | Electronic valve with max displacement default and hydromechanical Pmax (CANBUS compatible)  |

\*\*\* W, X, Y and Z only available with "D\*" and "Y"





| Pump Series |            |
|-------------|------------|
| P1          | Mobile     |
| PD          | Industrial |

| Mounting & Ports |                                                         |
|------------------|---------------------------------------------------------|
| S                | SAE B Pilot SAE Work Ports with SAE Aux Ports           |
| A                | SAE B Pilot Metric Work Ports with BSPP Aux Ports       |
| M                | ISO - 100MM Pilot Metric Work Ports with Aux Ports      |
| B                | ISO - 100MM Pilot Metric Work Ports with BSPP Aux Ports |

| Shaft Options |                               |
|---------------|-------------------------------|
| 01            | Splined shaft - SAE B-B 15T   |
| 02            | Keyed shaft - SAE B-B 1" Dia. |
| 04            | ISO keyed 25MM Dia.           |
| 08            | Splined shaft - SAE B 13T     |

| Shaft Rotation |                  |
|----------------|------------------|
| R              | Clockwise        |
| L              | Counterclockwise |

| Configuration |                 |
|---------------|-----------------|
| M             | Mobile (P1)     |
| S             | Industrial (PD) |

| Control Options |                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------|
| C0              | Pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)                                                               |
| C1              | Pressure limiter 290.08 - 1160.30 PSI (20 - 80 bar)                                                                 |
| L0              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)         |
| L2              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar) |
| AN*             | Pilot operated pressure limiter with ISO4401 interface & SAE 4 Vent Port                                            |
| AM              | Pilot operated pressure limiter with mechanical adjustment and SAE 4 Vent Port                                      |
| AE              | Pilot operated pressure limiter with mechanical and electrical adjustment 12 VDC                                    |
| AF              | Pilot operated pressure limiter with mechanical and electrical adjustment 24 VDC                                    |
| ##              | See chart below for electronic control options                                                                      |

\*Not functional control as such

| Additional Control Options |                        |
|----------------------------|------------------------|
| 0                          | No other options       |
| 2                          | Displacement sensor ** |

\*\* mandatory with "W\*\*\*", "X\*\*\*", "Y\*\*\*", "Z\*\*\*" "D\*" and "Y\*"

| Port Orientation |                                 |
|------------------|---------------------------------|
| E                | End Ports                       |
| R                | Side ported with ripple chamber |
| T                | Side ported with through drive  |

| Adjustable Displacement Stops*<br>(For E & R Port Orientation Only) |                                                  |
|---------------------------------------------------------------------|--------------------------------------------------|
| 0                                                                   | None                                             |
| 1*                                                                  | Adjustable maximum displacement stop             |
| 2*                                                                  | Adjustable minimum displacement stop             |
| 3*                                                                  | Adjustable maximum and minimum displacement stop |

\*Not available with Thru-Drive

| Port Type |                |
|-----------|----------------|
| 0         | Flange Ports   |
| 2         | Threaded Ports |

| Thru-Drive Mounting Pad/Coupling |                                       |
|----------------------------------|---------------------------------------|
| 0                                | No Thru-Drive                         |
| A                                | SAE 82-2 (A), 16 (A), 9T coupling     |
| H                                | SAE 82-2 (A), 19 (-), 11T coupling    |
| B                                | SAE 101-2 (B), 22 (B), 13T coupling   |
| Q                                | SAE 101-2 (B), 25 (B-B), 15T coupling |

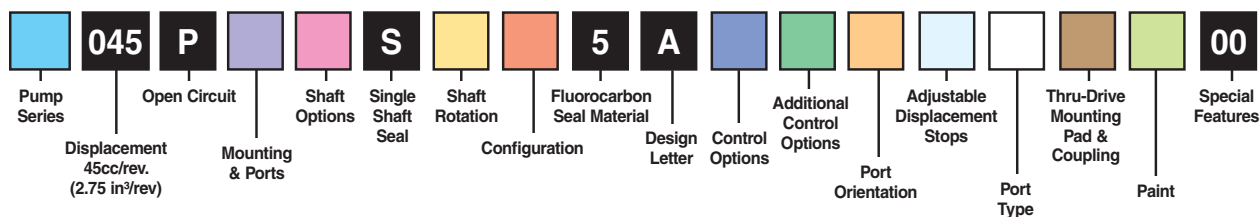
| Paint |             |
|-------|-------------|
| 00    | No Paint    |
| PB    | Black Paint |

| Electronic Control Options |   |
|----------------------------|---|
| #                          | # |

|   |                                                |
|---|------------------------------------------------|
| 0 | No ECU                                         |
| D | Proportional displacement control              |
| Y | Proportional pressure and displacement control |

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| P | Electronic valve with zero displacement default                                              |
| T | Electronic valve with max displacement default                                               |
| S | Electronic valve with zero displacement default and hydromechanical Pmax                     |
| U | Electronic valve with max displacement default and hydromechanical Pmax                      |
| W | Electronic valve with zero displacement default (CANBUS compatible)                          |
| Y | Electronic valve with max displacement default (CANBUS compatible)                           |
| X | Electronic valve with zero displacement default and hydromechanical Pmax (CANBUS compatible) |
| Z | Electronic valve with max displacement default and hydromechanical Pmax (CANBUS compatible)  |

\*\*\* W, X, Y and Z only available with "D\*" and "Y\*"



| Pump Series |            |
|-------------|------------|
| P1          | Mobile     |
| PD          | Industrial |

| Mounting & Ports |                                                                                  |
|------------------|----------------------------------------------------------------------------------|
| S                | SAE B Pilot with SAE Threaded or Flange Work Ports with SAE Aux Ports            |
| A                | SAE B Pilot with Metric Threaded or Metric Flange Work Ports with BSPP Aux Ports |
| M                | ISO - 100MM Pilot Metric Threaded or Metric Flange Work Ports with Aux Ports     |
| B                | ISO - 100MM Pilot Metric Threaded or Metric Flange Work Ports with Aux Ports     |

| Shaft Options |                               |
|---------------|-------------------------------|
| 01            | Splined shaft - SAE B-B 15T   |
| 02            | Keyed shaft - SAE B-B 1" Dia. |
| 04            | ISO keyed 25MM Dia.           |
| 08            | Splined shaft - SAE B 13T     |

| Shaft Rotation |                  |
|----------------|------------------|
| R              | Clockwise        |
| L              | Counterclockwise |

| Configuration |                                          |
|---------------|------------------------------------------|
| M             | Mobile (P1)                              |
| S             | Industrial (PD)                          |
| U             | Universal (SAE Mounting Option, S, Only) |

| Control Options |                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------|
| C0              | Pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)                                                               |
| C1              | Pressure limiter 290.08 - 1160.30 PSI (20 - 80 bar)                                                                 |
| L0              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)         |
| L2              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar) |
| AN*             | Pilot operated pressure limiter with ISO4401 interface & SAE 4 Vent Port                                            |
| AL              | Pilot operated pressure limiter with Load sensing (only available with "T" Torque Limiter option, i.e. "ALT ")      |
| AM              | Pilot operated pressure limiter with mechanical adjustment and SAE 4 Vent Port                                      |
| AE              | Pilot operated pressure limiter with mechanical and electrical adjustment 12 VDC                                    |
| AF              | Pilot operated pressure limiter with mechanical and electrical adjustment 24 VDC                                    |
| ##              | See chart below for electronic control options                                                                      |

\*Not functional control as such

| Additional Control Options |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| 0                          | No other options                                                |
| 2                          | Displacement sensor **                                          |
| T                          | Torque Limiter Control (Used with AM, AN or AL control options) |

\*\* mandatory with "W\*\*\*", "X\*\*\*", "Y\*\*\*", "Z\*\*\*" and "Y\*\*\*"

| Port Orientation |                                 |
|------------------|---------------------------------|
| E                | End Ports                       |
| R                | Side ported with ripple chamber |
| T                | Side ported with through drive  |

| Adjustable Displacement Stops* (For E & R Port Orientation Only) |                                                  |
|------------------------------------------------------------------|--------------------------------------------------|
| 0                                                                | None                                             |
| 1*                                                               | Adjustable maximum displacement stop             |
| 2*                                                               | Adjustable minimum displacement stop             |
| 3*                                                               | Adjustable maximum and minimum displacement stop |

\*Not available with Thru-Drive

| Port Type |                |
|-----------|----------------|
| 0         | Flange Ports   |
| 2         | Threaded Ports |

| Thru-Drive Mounting Pad/Coupling |                                       |
|----------------------------------|---------------------------------------|
| 0                                | No Thru-Drive                         |
| A                                | SAE 82-2 (A), 16 (A), 9T coupling     |
| H                                | SAE 82-2 (A), 19 (-), 11T coupling    |
| B                                | SAE 101-2 (B), 22 (B), 13T coupling   |
| Q                                | SAE 101-2 (B), 25 (B-B), 15T coupling |

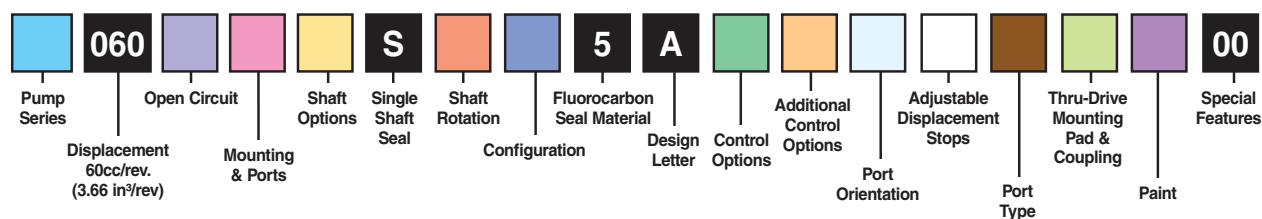
| Paint |             |
|-------|-------------|
| 00    | No Paint    |
| PB    | Black Paint |

| Electronic Control Options |   |
|----------------------------|---|
| #                          | # |

|   |                                                |
|---|------------------------------------------------|
| 0 | No ECU                                         |
| D | Proportional displacement control              |
| Y | Proportional pressure and displacement control |

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| P | Electronic valve with zero displacement default                                              |
| T | Electronic valve with max displacement default                                               |
| S | Electronic valve with zero displacement default and hydromechanical Pmax                     |
| U | Electronic valve with max displacement default and hydromechanical Pmax                      |
| W | Electronic valve with zero displacement default (CANBUS compatible)                          |
| Y | Electronic valve with max displacement default (CANBUS compatible)                           |
| X | Electronic valve with zero displacement default and hydromechanical Pmax (CANBUS compatible) |
| Z | Electronic valve with max displacement default and hydromechanical Pmax (CANBUS compatible)  |

\*\*\* W, X, Y and Z only available with "D\*" and "Y"



| Pump Series |            |
|-------------|------------|
| P1          | Mobile     |
| PD          | Industrial |

| Open Circuit |                                   |
|--------------|-----------------------------------|
| P            | Open Circuit (One Side of Center) |
| X            | Open Circuit (100% over Center)   |

| Mounting & Ports |                                                                        |
|------------------|------------------------------------------------------------------------|
| S                | SAE C Pilot SAE Flange Connection Ports with SAE Aux Ports             |
| A                | SAE C Pilot Metric Flange Connection Ports with BSPP Aux Ports         |
| M                | ISO - 125MM Pilot Metric Flange Connection Ports with Metric Aux Ports |
| B                | ISO - 125MM Pilot, Metric Flange Connection Ports with BSPP Aux Ports  |
| C                | SAE C 2-Bolt Pilot SAE Flange Connection Ports with SAE Aux Ports      |
| D                | SAE C 2-Bolt Pilot SAE Flange Connection Ports with BSPP Aux Ports     |

| Shaft Options |                                       |
|---------------|---------------------------------------|
| 01            | Splined shaft - SAE C 14T             |
| 02            | Keyed shaft - SAE C 32-1 KEY          |
| 04            | Keyed shaft - ISO / DIN KEY 32MM Dia. |

| Shaft Rotation |                  |
|----------------|------------------|
| R              | Clockwise        |
| L              | Counterclockwise |

| Configuration |                 |
|---------------|-----------------|
| M             | Mobile (P1)     |
| S             | Industrial (PD) |
| U             | Universal       |

| Control Options |                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------|
| C0              | Pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)                                                               |
| C1              | Pressure limiter 290.08 - 1160.30 PSI (20 - 80 bar)                                                                 |
| L0              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)         |
| L2              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar) |
| AN*             | Pilot operated pressure limiter with ISO4401 interface & SAE 4 Vent Port                                            |
| AL              | Pilot operated pressure limiter with Load sensing (only available with "T" Torque Limiter option, i.e. "ALT ")      |
| AM              | Pilot operated pressure limiter with mechanical adjustment and SAE 4 Vent Port                                      |
| AE              | Pilot operated pressure limiter with mechanical and electrical adjustment 12 VDC                                    |
| AF              | Pilot operated pressure limiter with mechanical and electrical adjustment 24 VDC                                    |
| ##              | See chart below for electronic control options                                                                      |

\*Not functional control as such

| Additional Control Options |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| 0                          | No other options                                                |
| 2                          | Displacement sensor **                                          |
| T                          | Torque Limiter Control (Used with AM, AN or AL control options) |

\*\* mandatory with "W\*\*\*", "X\*\*\*", "Y\*\*\*", "Z\*\*\*" "D" and "Y"

| Port Orientation |                            |
|------------------|----------------------------|
| E                | End Ports                  |
| S                | Side Ports                 |
| T                | Side Ports with Thru-Drive |

| Adjustable Displacement Stops* (For E & S Port Orientation Only) |                                                  |
|------------------------------------------------------------------|--------------------------------------------------|
| 0                                                                | None                                             |
| 1*                                                               | Adjustable maximum displacement stop             |
| 2*                                                               | Adjustable minimum displacement stop             |
| 3*                                                               | Adjustable maximum and minimum displacement stop |

\*Not available with Thru-Drive

| Port Type |                                                                      |
|-----------|----------------------------------------------------------------------|
| 0         | Flange Ports                                                         |
| 2         | SAE Threaded Ports (Available only on "E" port and "S" or "C" mount) |
| 4         | BSPP Threaded Ports (Available only on "E" port and "D" mount)       |

| Thru-Drive Mounting Pad/Coupling |                                                           |
|----------------------------------|-----------------------------------------------------------|
| 0                                | No Thru-Drive                                             |
| A                                | SAE 82-2 (A), 16 (A), 9T coupling                         |
| H                                | SAE 82-2 (A), 19 (-), 11T coupling                        |
| B                                | SAE 101-2 (B), 22 (B), 13T coupling                       |
| Q                                | SAE 101-2 (B), 25 (B-B), 15T coupling                     |
| J                                | SAE 101-2 (B), rotated 45 degrees, 22 (B), 13T coupling   |
| K                                | SAE 101-2 (B), rotated 45 degrees, 25 (B-B), 15T coupling |
| C                                | SAE 127-4 (C), 32 (C), 14T coupling                       |

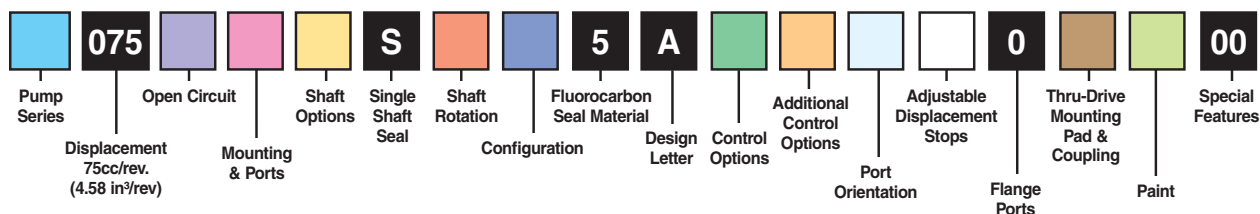
| Paint |             |
|-------|-------------|
| 00    | No Paint    |
| PB    | Black Paint |

| Electronic Control Options |   |
|----------------------------|---|
| #                          | # |

|   |                                   |
|---|-----------------------------------|
| 0 | No ECU                            |
| D | Proportional displacement control |
| Y | Proportional pressure control     |

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| P | Electronic valve with zero displacement default                                              |
| T | Electronic valve with max displacement default                                               |
| S | Electronic valve with zero displacement default and hydromechanical Pmax                     |
| U | Electronic valve with max displacement default and hydromechanical Pmax                      |
| W | Electronic valve with zero displacement default (CANBUS compatible)                          |
| Y | Electronic valve with max displacement default (CANBUS compatible)                           |
| X | Electronic valve with zero displacement default and hydromechanical Pmax (CANBUS compatible) |
| Z | Electronic valve with max displacement default and hydromechanical Pmax (CANBUS compatible)  |

\*\*\* W, X, Y and Z only available with "D" and "Y"



| Pump Series |            |
|-------------|------------|
| P1          | Mobile     |
| PD          | Industrial |

| Open Circuit |                                   |
|--------------|-----------------------------------|
| P            | Open Circuit (One Side of Center) |
| X            | Open Circuit (100% over Center)   |

| Mounting & Ports |                                                                        |
|------------------|------------------------------------------------------------------------|
| S                | SAE C Pilot SAE Flange Connection Ports with SAE Aux Ports             |
| A                | SAE C Pilot Metric Flange Connection Ports with BSPP Aux Ports         |
| M                | ISO - 125MM Pilot Metric Flange Connection Ports with Metric Aux Ports |
| B                | ISO - 125MM Pilot, Metric Flange Connection Ports with BSPP Aux Ports  |
| C                | SAE C 2-Bolt Pilot SAE Flange Connection Ports with SAE Aux Ports      |
| D                | SAE C 2-Bolt Pilot SAE Flange Connection Ports with BSPP Aux Ports     |

| Shaft Options |                                       |
|---------------|---------------------------------------|
| 01            | Splined shaft - SAE C 14T             |
| 02            | Keyed shaft - SAE C 32-1 KEY          |
| 04            | Keyed shaft - ISO / DIN KEY 32MM Dia. |

| Shaft Rotation |                  |
|----------------|------------------|
| R              | Clockwise        |
| L              | Counterclockwise |

| Configuration |                 |
|---------------|-----------------|
| M             | Mobile (P1)     |
| S             | Industrial (PD) |
| U             | Universal       |

| Control Options |                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------|
| C0              | Pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)                                                               |
| C1              | Pressure limiter 290.08 - 1160.30 PSI (20 - 80 bar)                                                                 |
| L0              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)         |
| L2              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar) |
| AN*             | Pilot operated pressure limiter with ISO4401 interface & SAE 4 Vent Port                                            |
| AM              | Pilot operated pressure limiter with mechanical adjustment and SAE 4 Vent Port                                      |
| AE              | Pilot operated pressure limiter with mechanical and electrical adjustment 12 VDC                                    |
| AF              | Pilot operated pressure limiter with mechanical and electrical adjustment 24 VDC                                    |
| ##              | See chart below for electronic control options                                                                      |

\*Not functional control as such

| Additional Control Options |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| 0                          | No other options                                                |
| 2                          | Displacement sensor **                                          |
| T                          | Torque Limiter Control (Used with AM, AN or L0 control options) |

\*\* mandatory with "W\*\*\*", "X\*\*\*", "Y\*\*\*", "Z\*\*\*" and "D\*\*\*"

| Port Orientation |                            |
|------------------|----------------------------|
| E                | End Ports                  |
| S                | Side Ports                 |
| T                | Side Ports with Thru-Drive |

| Adjustable Displacement Stops* (For E & S Port Orientation Only) |                                                  |
|------------------------------------------------------------------|--------------------------------------------------|
| 0                                                                | None                                             |
| 1*                                                               | Adjustable maximum displacement stop             |
| 2*                                                               | Adjustable minimum displacement stop             |
| 3*                                                               | Adjustable maximum and minimum displacement stop |

\*Not available with Thru-Drive

| Thru-Drive Mounting Pad/Coupling |                                                           |
|----------------------------------|-----------------------------------------------------------|
| 0                                | No Thru-Drive                                             |
| A                                | SAE 82-2 (A), 16 (A), 9T coupling                         |
| H                                | SAE 82-2 (A), 19 (-), 11T coupling                        |
| B                                | SAE 101-2 (B), 22 (B), 13T coupling                       |
| Q                                | SAE 101-2 (B), 25 (B-B), 15T coupling                     |
| J                                | SAE 101-2 (B), rotated 45 degrees, 22 (B), 13T coupling   |
| K                                | SAE 101-2 (B), rotated 45 degrees, 25 (B-B), 15T coupling |
| C                                | SAE 127-4 (C), 32 (C), 14T coupling                       |

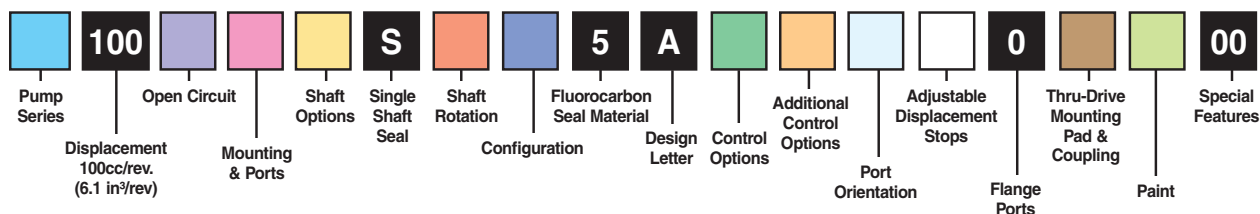
| Paint |             |
|-------|-------------|
| 00    | No Paint    |
| PB    | Black Paint |

| Electronic Control Options |   |
|----------------------------|---|
| #                          | # |

|   |                                   |
|---|-----------------------------------|
| 0 | No ECU                            |
| D | Proportional displacement control |
| Y | Proportional pressure control     |

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| P | Electronic valve with zero displacement default                                              |
| T | Electronic valve with max displacement default                                               |
| S | Electronic valve with zero displacement default and hydromechanical Pmax                     |
| U | Electronic valve with max displacement default and hydromechanical Pmax                      |
| W | Electronic valve with zero displacement default (CANBUS compatible)                          |
| Y | Electronic valve with max displacement default (CANBUS compatible)                           |
| X | Electronic valve with zero displacement default and hydromechanical Pmax (CANBUS compatible) |
| Z | Electronic valve with max displacement default and hydromechanical Pmax (CANBUS compatible)  |

\*\*\* W, X, Y and Z only available with "D" and "Y"



| Pump Series |            |
|-------------|------------|
| P1          | Mobile     |
| PD          | Industrial |

| Open Circuit |                                   |
|--------------|-----------------------------------|
| P            | Open Circuit (One Side of Center) |
| X            | Open Circuit (100% over Center)   |

| Mounting & Ports |                                                                        |
|------------------|------------------------------------------------------------------------|
| S                | SAE C Pilot SAE Flange Connection Ports with SAE Aux Ports             |
| A                | SAE C Pilot Metric Flange Connection Ports with BSPP Aux Ports         |
| M                | ISO - 125MM Pilot Metric Flange Connection Ports with Metric Aux Ports |
| B                | ISO - 125MM Pilot, Metric Flange Connection Ports with BSPP Aux Ports  |

| Shaft Options |                                   |
|---------------|-----------------------------------|
| 01            | Splined shaft - SAE C-C 17T       |
| 02            | Keyed shaft - SAE C-C 38-1        |
| 04            | Keyed shaft - ISO / DIN 40MM Dia. |
| 06            | Splined shaft - SAE C 14T         |

| Shaft Rotation |                  |
|----------------|------------------|
| R              | Clockwise        |
| L              | Counterclockwise |

| Configuration |                 |
|---------------|-----------------|
| M             | Mobile (P1)     |
| S             | Industrial (PD) |
| U             | Universal       |

| Control Options |                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------|
| C0              | Pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)                                                               |
| C1              | Pressure limiter 290.08 - 1160.30 PSI (20 - 80 bar)                                                                 |
| L0              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)         |
| L2              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar) |
| AN*             | Pilot operated pressure limiter with ISO4401 interface & SAE 4 Vent Port                                            |
| AM              | Pilot operated pressure limiter with mechanical adjustment and SAE 4 Vent Port                                      |
| AE              | Pilot operated pressure limiter with mechanical and electrical adjustment 12 VDC                                    |
| AF              | Pilot operated pressure limiter with mechanical and electrical adjustment 24 VDC                                    |
| ##              | See chart below for electronic control options                                                                      |

\*Not functional control as such

| Additional Control Options |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| 0                          | No other options                                                |
| 2                          | Displacement sensor **                                          |
| T                          | Torque Limiter Control (Used with AM, AN or L0 control options) |

\*\* mandatory with "W\*\*\*", "X\*\*\*", "Y\*\*\*", "Z\*\*\*" and "D\*\*\*" and "Y\*\*\*"

| Port Orientation |                            |
|------------------|----------------------------|
| E                | End Ports                  |
| S                | Side Ports                 |
| T                | Side Ports with Thru-Drive |

| Adjustable Displacement Stops* (For E & S Port Orientation Only) |                                                  |
|------------------------------------------------------------------|--------------------------------------------------|
| 0                                                                | None                                             |
| 1*                                                               | Adjustable maximum displacement stop             |
| 2*                                                               | Adjustable minimum displacement stop             |
| 3*                                                               | Adjustable maximum and minimum displacement stop |

\*Not available with Thru-Drive

| Thru-Drive Mounting Pad/Coupling |                                                           |
|----------------------------------|-----------------------------------------------------------|
| 0                                | No Thru-Drive                                             |
| A                                | SAE 82-2 (A), 16 (A), 9T coupling                         |
| H                                | SAE 82-2 (A), 19 (-), 11T coupling                        |
| B                                | SAE 101-2 (B), 22 (B), 13T coupling                       |
| Q                                | SAE 101-2 (B), 25 (B-B), 15T coupling                     |
| J                                | SAE 101-2 (B), rotated 45 degrees, 22 (B), 13T coupling   |
| K                                | SAE 101-2 (B), rotated 45 degrees, 25 (B-B), 15T coupling |
| C                                | SAE 127-4 (C), 32 (C), 14T coupling                       |
| N                                | SAE 127-4 (C), 38 (C-C), 17T coupling                     |

| Paint |             |
|-------|-------------|
| 00    | No Paint    |
| PB    | Black Paint |

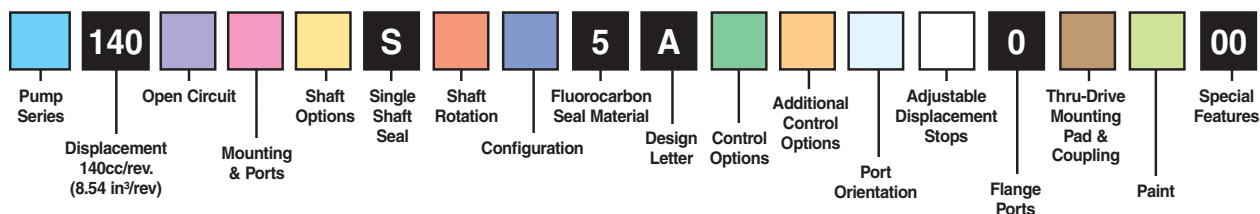
| Electronic Control Options |   |
|----------------------------|---|
| #                          | # |

|   |                                   |
|---|-----------------------------------|
| 0 | No ECU                            |
| D | Proportional displacement control |
| Y | Proportional pressure control     |

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| P | Electronic valve with zero displacement default                                              |
| T | Electronic valve with max displacement default                                               |
| S | Electronic valve with zero displacement default and hydromechanical Pmax                     |
| U | Electronic valve with max displacement default and hydromechanical Pmax                      |
| W | Electronic valve with zero displacement default (CANBUS compatible)                          |
| Y | Electronic valve with max displacement default (CANBUS compatible)                           |
| X | Electronic valve with zero displacement default and hydromechanical Pmax (CANBUS compatible) |
| Z | Electronic valve with max displacement default and hydromechanical Pmax (CANBUS compatible)  |

\*\*\* W, X, Y and Z only available with "D\*" and "Y"





| Pump Series |            |
|-------------|------------|
| P1          | Mobile     |
| PD          | Industrial |

| Open Circuit |                                   |
|--------------|-----------------------------------|
| P            | Open Circuit (One Side of Center) |
| X            | Open Circuit (100% over Center)   |

| Mounting & Ports |                                                                        |
|------------------|------------------------------------------------------------------------|
| S                | SAE D Pilot SAE Flange Connection Ports with SAE Aux Ports             |
| A                | SAE D Pilot BSPP Flange Connection Ports with BSPP Aux Ports           |
| M                | ISO - 180MM Pilot Metric Flange Connection Ports with Metric Aux Ports |
| B                | ISO - 180MM Pilot Metric Flange Connection Ports with BSPP Aux Ports   |

| Shaft Options |                                   |
|---------------|-----------------------------------|
| 01            | Splined shaft - SAE D 13T         |
| 02            | Keyed shaft - SAE D 44-1          |
| 04            | Keyed shaft - ISO / DIN 50MM Dia. |

| Shaft Rotation |                  |
|----------------|------------------|
| R              | Clockwise        |
| L              | Counterclockwise |

| Configuration |                 |
|---------------|-----------------|
| M             | Mobile (P1)     |
| S             | Industrial (PD) |
| U             | Universal       |

| Control Options |                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------|
| C0              | Pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)                                                               |
| C1              | Pressure limiter 290.08 - 1160.30 PSI (20 - 80 bar)                                                                 |
| L0              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar)         |
| L2              | Load sensing 145.04-435.11 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 1160.30 - 4061.05 PSI (80 - 280 bar) |
| AN*             | Pilot operated pressure limiter with ISO4401 interface & SAE 4 Vent Port                                            |
| AM              | Pilot operated pressure limiter with mechanical adjustment and SAE 4 Vent Port                                      |
| AE              | Pilot operated pressure limiter with mechanical and electrical adjustment 12 VDC                                    |
| AF              | Pilot operated pressure limiter with mechanical and electrical adjustment 24 VDC                                    |
| ##              | See chart below for electronic control options                                                                      |

\*Not functional control as such

| Additional Control Options |                                                                 |
|----------------------------|-----------------------------------------------------------------|
| 0                          | No other options                                                |
| 2                          | Displacement sensor **                                          |
| T                          | Torque Limiter Control (Used with AM, AN or L0 control options) |

\*\* mandatory with "W\*\*\*", "X\*\*\*", "Y\*\*\*", "Z\*\*\*" "D\*" and "Y"

| Port Orientation |                            |
|------------------|----------------------------|
| E                | End Ports                  |
| S                | Side Ports                 |
| T                | Side Ports with Thru-Drive |

| Adjustable Displacement Stops* (For E & S Port Orientation Only) |                                                  |
|------------------------------------------------------------------|--------------------------------------------------|
| 0                                                                | None                                             |
| 1*                                                               | Adjustable maximum displacement stop             |
| 2*                                                               | Adjustable minimum displacement stop             |
| 3*                                                               | Adjustable maximum and minimum displacement stop |

\*Not available with Thru-Drive

| Thru-Drive Mounting Pad/Coupling |                                                           |
|----------------------------------|-----------------------------------------------------------|
| 0                                | No Thru-Drive                                             |
| A                                | SAE 82-2 (A), 16 (A), 9T coupling                         |
| B                                | SAE 101-2 (B), 22 (B), 11T coupling                       |
| Q                                | SAE 101-2 (B), 25 (B-B), 13T coupling                     |
| J                                | SAE 101-2 (B), rotated 45 degrees, 22 (B), 15T coupling   |
| K                                | SAE 101-2 (B), rotated 45 degrees, 25 (B-B), 13T coupling |
| C                                | SAE 127-4 (C), 32 (C), 14T coupling                       |
| N                                | SAE 127-4 (C), 38 (C-C), 17T coupling                     |
| D                                | SAE 152-4 (D), 44 (D), 13T coupling                       |

| Paint |             |
|-------|-------------|
| 00    | No Paint    |
| PB    | Black Paint |

| Electronic Control Options |   |
|----------------------------|---|
| #                          | # |

|   |                                   |
|---|-----------------------------------|
| 0 | No ECU                            |
| D | Proportional displacement control |
| Y | Proportional pressure control     |

|   |                                                                                              |
|---|----------------------------------------------------------------------------------------------|
| P | Electronic valve with zero displacement default                                              |
| T | Electronic valve with max displacement default                                               |
| S | Electronic valve with zero displacement default and hydromechanical Pmax                     |
| U | Electronic valve with max displacement default and hydromechanical Pmax                      |
| W | Electronic valve with zero displacement default (CANBUS compatible)                          |
| Y | Electronic valve with max displacement default (CANBUS compatible)                           |
| X | Electronic valve with zero displacement default and hydromechanical Pmax (CANBUS compatible) |
| Z | Electronic valve with max displacement default and hydromechanical Pmax (CANBUS compatible)  |

\*\*\* W, X, Y and Z only available with "D\*" and "Y"

## Technical Data

| Model                                                    | P1/PD 018                                                             | P1/PD 028         | P1/PD 045         | P1/PD 060              | P1/PD 075  | P1/PD 100  | P1/PD 140   |
|----------------------------------------------------------|-----------------------------------------------------------------------|-------------------|-------------------|------------------------|------------|------------|-------------|
| Maximum Displacement, cm <sup>3</sup> /rev<br>cu.in./rev | 18<br>1.10                                                            | 28<br>1.71        | 45<br>2.75        | 60<br>3.66             | 75<br>4.58 | 100<br>6.1 | 140<br>8.54 |
| Outlet Pressure – Continuous, bar<br>psi                 | 280<br>4000                                                           |                   |                   |                        |            |            |             |
| Intermittent*, bar<br>psi                                | 320<br>4500                                                           |                   |                   |                        |            |            |             |
| Peak, bar<br>psi                                         | 350<br>5000                                                           |                   |                   |                        |            |            |             |
| P1 Maximum Speed (1.3 bar abs inlet), rpm                | 3600                                                                  | 3400              | 3100              | 2800                   | 2700       | 2500       | 2400        |
| P1 (1.0 bar abs inlet), rpm                              | 3300                                                                  | 3200              | 2800              | 2500                   | 2400       | 2100       | 2100        |
| P1 (0.8 bar abs inlet), rpm                              | 2900                                                                  | 2900              | 2400              | 2200                   | 2100       | 1900       | 1800        |
| PD Maximum Speed (1.0 bar abs inlet), rpm                | 1800                                                                  |                   |                   |                        |            |            |             |
| PD (0.8 bar abs inlet), rpm                              | 1800                                                                  |                   |                   |                        |            |            |             |
| Minimum Speed, rpm                                       | 600                                                                   |                   |                   |                        |            |            |             |
| Inlet Pressure – Maximum, bar<br>psi                     | 10 (gage)<br>145                                                      |                   |                   |                        |            |            |             |
| Rated, bar<br>psia                                       | 1.0 absolute (0.0 gage)<br>14.5                                       |                   |                   |                        |            |            |             |
| Minimum, bar<br>psia                                     | 0.8 absolute (-0.2 gage)<br>11.6                                      |                   |                   |                        |            |            |             |
| Case Pressure – Peak, bar                                | 4.0 absolute (3.0 gage)<br>and less than 0.5 bar above inlet pressure |                   |                   |                        |            |            |             |
| Rated, bar                                               | 2.0 absolute (1.0 gage)<br>and less than 0.5 bar above inlet pressure |                   |                   |                        |            |            |             |
| Fluid Temperature Range, °C<br>°F                        | -40 to +95<br>-40 to +203                                             |                   |                   |                        |            |            |             |
| Fluid Viscosity – Rated, cSt                             | 6 to 160                                                              |                   |                   |                        |            |            |             |
| Max. Intermittent, cSt                                   | 5000 (for cold starting)                                              |                   |                   |                        |            |            |             |
| Min. Intermittent, cSt                                   | 5                                                                     |                   |                   |                        |            |            |             |
| Fluid Contamination – Rated, ISO                         | 20/18/14                                                              |                   |                   |                        |            |            |             |
| Maximum, ISO                                             | 21/19/16                                                              |                   |                   |                        |            |            |             |
| SAE Mounting – Flange                                    | 82-2 (A)                                                              | 101-2 (B)         | 101-2 (B)         | 127-2 (C) or 127-4 (C) |            | 127-4 (C)  | 152-4 (D)   |
| ISO Mounting - Flange                                    | 80 mm                                                                 | 100 mm            | 100 mm            | 125 mm                 | 125 mm     | 125 mm     | 180 mm      |
| SAE Keyed Shafts                                         | 19-1, A                                                               | 25-1, BB          | 25-1, BB          | 32-1, C                | 32-1, C    | 38-1, CC   | 44-1, D     |
| ISO Keyed Shafts                                         | 20 mm                                                                 | 25 mm             | 25 mm             | 32 mm                  | 32 mm      | 40 mm      | 50 mm       |
| SAE Spline Shafts                                        | 9T, A<br>11T, A                                                       | 13T, B<br>15T, BB | 13T, B<br>15T, BB | 14T, C                 | 14T, C     | 17T, CC    | 13T, D      |
| Weight – End Port, kg (lb)                               | 13.4 (29.5)                                                           | 17.7 (39.0)       | 23 (50)           | 29 (64)                | 30 (66)    | 51 (112)   | 66 (145)    |
| Side Port, kg (lb)                                       | 14.2 (31.3)                                                           | 18.1 (40.0)       | 24 (52)           | 30 (67)                | 31 (68)    | 53 (117)   | 67 (147)    |
| Thru-Drive, kg (lb)                                      | —                                                                     | —                 | 27 (59)           | 34 (75)                | 35 (77)    | 55 (121)   | 82 (180)    |
| Moment of Inertia kg·mm <sup>2</sup>                     | 760                                                                   | 1555              | 3208              | 4548                   | 5041       | 12027      | 21400       |
| Moment of Inertia Thru-Drive kg·mm <sup>2</sup>          | 793                                                                   | 1618              | 3268              | 4687                   | 5207       | 12402      | 22343       |

\*Intermittent pressure is defined as less than 10% of operation time, not exceeding 6 successive seconds.

## Typical Control Response Times\*

| Control Description        | Pump Operating Condition     | Typical Control Response Time (ms) |     |     |     |     |     |     |
|----------------------------|------------------------------|------------------------------------|-----|-----|-----|-----|-----|-----|
|                            |                              | 018                                | 028 | 045 | 060 | 075 | 100 | 140 |
| "C" Pressure Limiter       | Maximum Displacement to Zero | 25                                 | 25  | 25  | 37  | 21  | 26  | 30  |
|                            | Zero Displacement to Maximum | 80                                 | 80  | 106 | 119 | 89  | 108 | 125 |
| "L" Load Sensing           | Maximum Displacement to Zero | 40                                 | 40  | 30  | 54  | 40  | 43  | 45  |
|                            | Zero Displacement to Maximum | 70                                 | 70  | 120 | 186 | 97  | 189 | 280 |
| "A" Pilot Operated Control | Maximum Displacement to Zero | 25                                 | 25  | 46  | 43  | 37  | 39  | 40  |
|                            | Zero Displacement to Maximum | 80                                 | 80  | 131 | 125 | 115 | 123 | 130 |

\* Based on NFPA testing standards

### For max volume stops:

#### Pump Size % Stroke reduction per turn

|       |      |       |     |
|-------|------|-------|-----|
| P*060 | 6.76 | P*018 | 9   |
| P*075 | 6.2  | P*028 | 8.2 |
| P*100 | 5.5  | P*045 | 7.5 |
| P*140 | 4.8  |       |     |

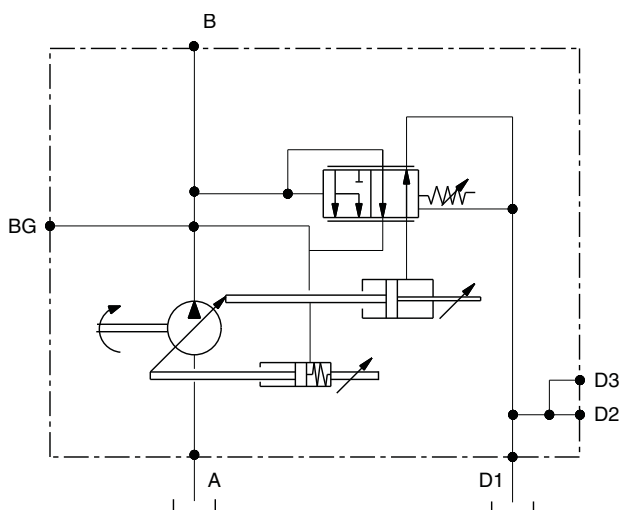
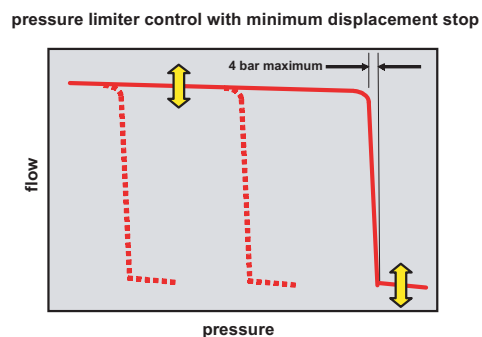
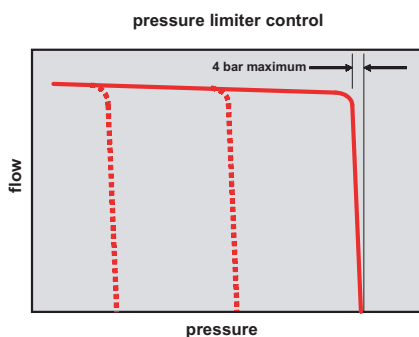
### Control Adjustment Sensitivity:

- Load Sense 28 Bar/Turn
- Pressure Compensator 80 to 280 bar range (C0) = 40 Bar/Turn
- Pressure Compensator 20 to 80 bar range (C1) = 18.6 Bar/Turn
- A Compensator 100 Bar/Turn
- A Compensator Differential 20 Bar/Turn

## Control Option “C” Pressure Limiter Control

The pressure limiter control is used to limit the maximum system pressure. The control acts such that full pump displacement is achieved unless the system valve restricts the output flow or the load pressure reaches the maximum setting of the control. If pump flow is restricted by the system valve, the pump will provide only the flow demanded,

but at the maximum pressure setting of the compensator control. If the outlet flow is completely blocked, the pump will destruct to zero displacement and maintain the pressure at the setting of the compensator spring.



### **Pressure Limiter Control with Optional Maximum & Minimum Displacement Adjustments**

(A minimum displacement stop requires  
the use of a system relief valve.)

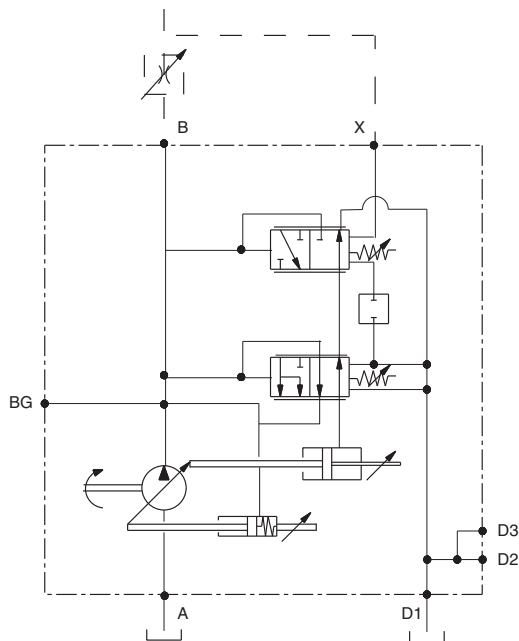
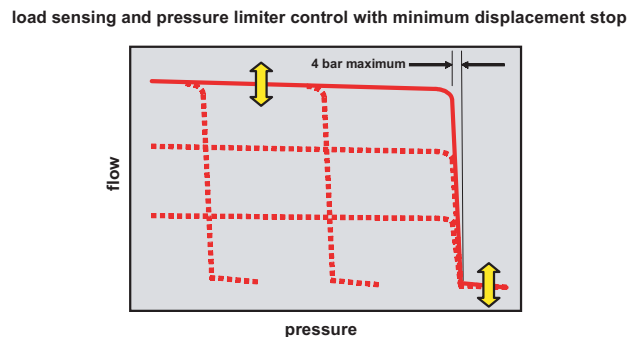
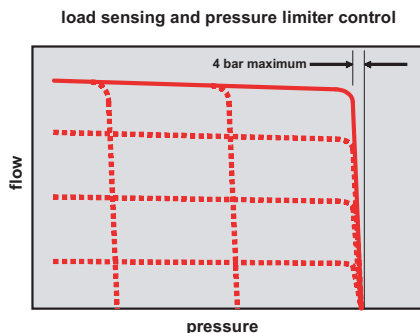
Refer to page 9 for typical control characteristics.

## Control Option “L”

### Load Sensing and Pressure Limiter Control

These controls feature load sensing and maximum pressure compensation. Load sense controls are used to match pump flow and pressure to system demands, thus minimizing losses due to wasted horsepower. The pump automatically adjusts for changes in drive speed and load pressures to match the pump output flow to the load requirement. Since

the pump load sense control will maintain a constant pressure drop across the main system throttling valve, the flow rate will remain constant, independent of changes in load pressure and pump shaft speed.



### Load Sensing and Pressure Limiter Control with Optional Minimum & Maximum Displacement Adjustments

(A minimum displacement stop requires  
the use of a system relief valve.)

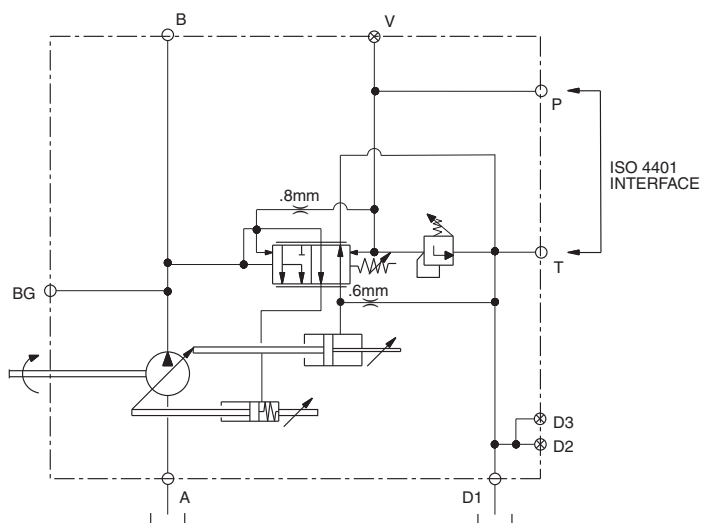
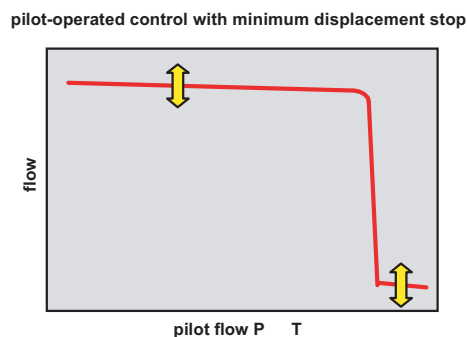
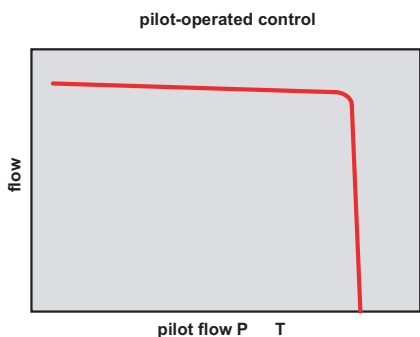
Refer to page 9 for typical control characteristics.

## Control Options “AN”

### Pilot Operated Control with ISO 4401 NG6 Interface for Customer Added Pressure Limiter

This control is a standard pressure compensator, but with a NG6 ( D03) valve interface. This interface allows the integral mounting of valves to achieve a variety of pressure control circuits, as well as pump standby mode.

( Caution : Pumps shipped with the “AN” control need to have a valve mounted to the NG6 interface for operation. This is not a functional control as shipped, but is intended for customers that desire to mount accessory valves for pressure control to in place of plumbing the control valves externally.)



### “AN” with Optional Minimum & Maximum Displacement Adjustments

(A minimum displacement stop requires  
the use of a system relief valve.)

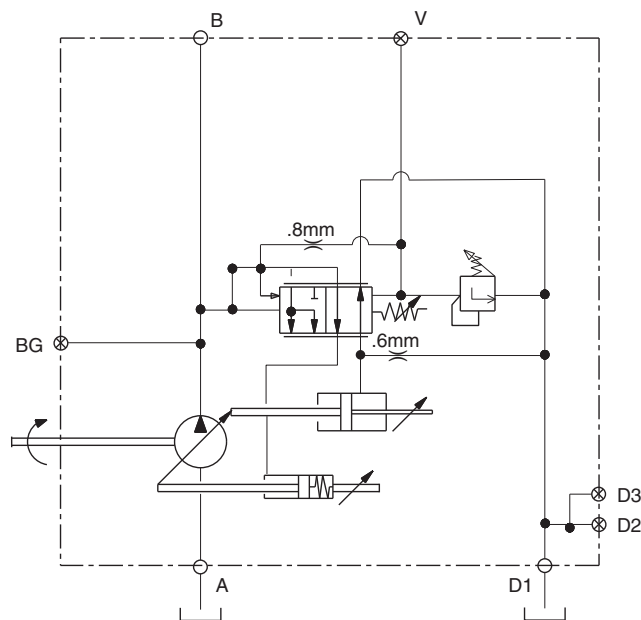
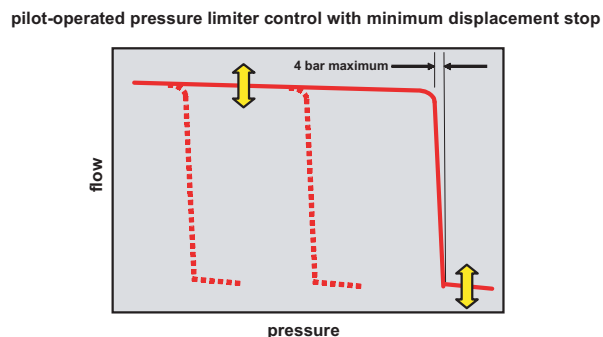
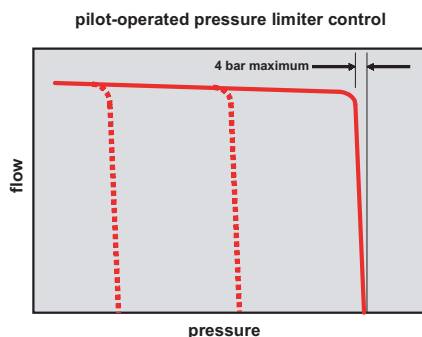
Refer to page 9 for typical control characteristics.

## Control Options “AM”

### Pilot Operated Pressure Limiter Control with Vent Port V

This control allows the pump pressure compensator setting to be adjusted from a remote relief valve. The control acts such that full pump displacement is achieved unless the system valve restricts the output flow or the load pressure reaches the maximum setting of the control. If pump flow is restricted by the system valve, the pump will provide only the flow

demanded, but at the maximum pressure setting of the compensator control. If the outlet flow is completely blocked, the pump will destroke to zero displacement and maintain the pressure at the setting of the remote relief valve.



### “AM” with Optional Minimum & Maximum Displacement Adjustments

(A minimum displacement stop requires  
the use of a system relief valve.)

Refer to page 9 for typical control characteristics.



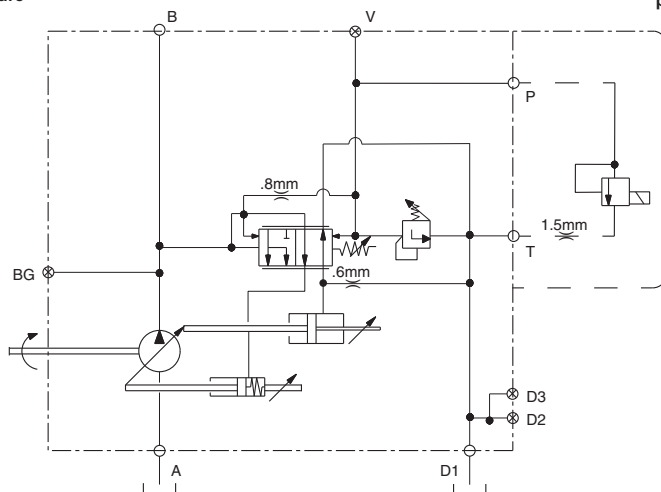
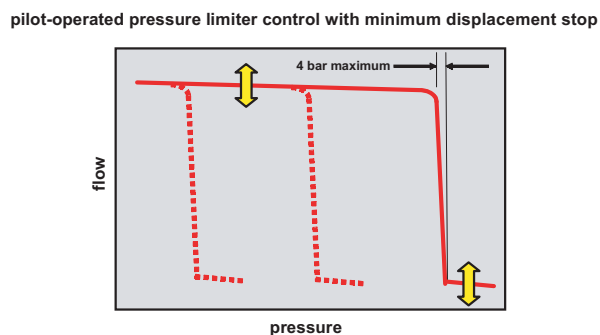
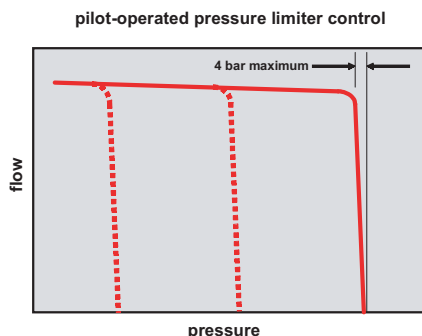
## Control Options “AE” and “AF” Pilot Operated Pressure Limiter Control with Proportional Electronic Adjustment

This control allows the pump pressure compensator setting to be adjusted by an on-board 4VP0150G-24B1C1 (24V) or RE06M35W2N1KWYG087 (12V) proportional, electronic relief valve. The control acts such that full pump displacement is achieved unless the system valve restricts the output flow or the load pressure reaches the maximum setting of the control. If pump flow is restricted by the system valve, the pump will provide only the flow demanded, but at the maximum pressure setting of the compensator control. If the outlet flow is completely blocked, the pump will destroke to zero displacement and maintain the pressure at the setting of the relief valve.

**The following are recommended to drive the proportional valve on the AE or AF pump:**

| Parker Part# | Description                           |
|--------------|---------------------------------------|
| 027-22071-0  | Dual Driver Module (12/24V)           |
| 027-22067-0  | Plug-Top-Driver 12V (0-10V command)   |
| 027-22066-0  | Plug-Top-Driver 24V (0-10V command)   |
| 701-00600-8  | Proportional Amplifier 12V (Eurocard) |
| 701-00601-8  | Proportional Amplifier 24V (Eurocard) |
| EX00-S05     | Eurocard Holder                       |

Note: Consult Factory for more driver options and information.



### “AE” and “AF” with Optional Minimum & Maximum Displacement Adjustments

(A minimum displacement stop requires the use of a system relief valve.)

AE denotes the 12vdc solenoid.

AF denotes the 24vdc solenoid.

Refer to page 9 for typical control characteristics.

## Torque Limiting Control with Maximum Pressure Limiter AMT, ALT, LOT

These controls provide the benefit of pressure limiting control, plus the ability to limit the input torque the pump will draw. These controls are beneficial when the power available from the prime mover for the hydraulics is limited; or the application power demand has both high flow/low pressure and low flow/high pressure duty cycles.

**“AMT” Control** ( Available on P’045, P’060, P’075, P’100, P’140 Models)

The “AMT” combines the functions of a pressure limiter and a torque limiter control. The pressure limiter function can also be controlled remotely by connecting the vent port to an external pilot relief valve. The pump will maintain maximum displacement until the torque limiter setting is reached, and then the pump will maintain the input torque at the pre-selected setting. If the system pressure reaches the pressure compensator setting, then the pump flow will be lowered to the level needed to maintain the maximum pressure setting.

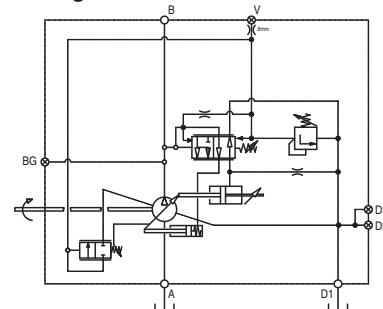
**“ALT” Control** ( Available on P’045, P’060 Models)

The “ALT” combines the functions of a pressure limiter, load sense and torque limiter control. The pressure limiter function limits the maximum pump outlet pressure. The load sense control function requires the vent port to be connected to the highest load pressure via a load sense signal line. The control will match pump output flow and pressure to the system demand, thus minimizing horsepower losses. The pump will operate in a load sense mode until the torque limiter setting is reached, and then the pump will maintain the input torque at the pre-selected setting. If the system pressure reaches the pressure compensator setting, then the pump flow will be lowered to the level needed to maintain the maximum pressure setting.

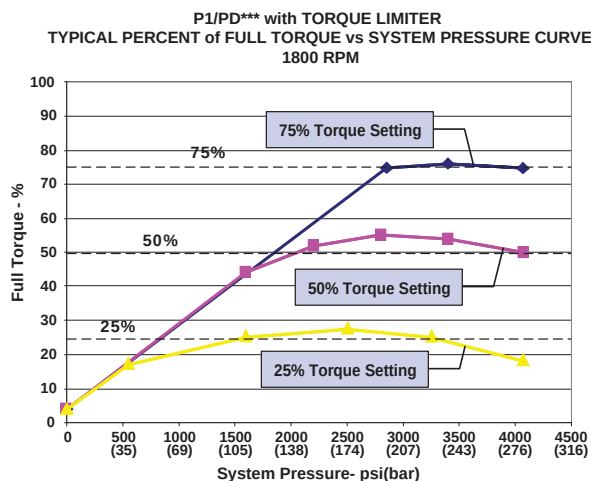
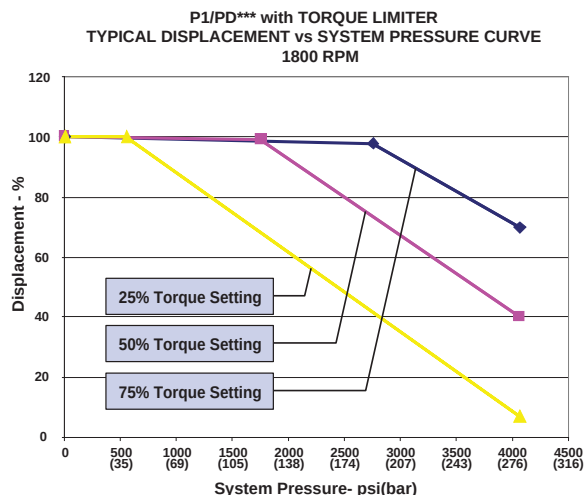
**“LOT” Control** ( Available on P’075, P’100, P’140 Models)

The “LOT” combines the functions of a pressure limiter, load sense and torque limiter control. This high performance control features

separate load sense and pressure limiter spools which results in optimal flow versus pressure characteristics, and more productivity for the application. The load sense control function requires the signal port to be connected to the highest load pressure via a load sense signal line. The control will match pump output flow and pressure to the system demand, thus minimizing horsepower losses. The pump will operate in a load sense mode until the torque limiter setting is reached, and then the pump will maintain the input torque at the pre-selected setting. If the system pressure reaches the pressure compensator setting, then the pump flow will be lowered to the level needed to maintain the maximum pressure setting.



**Torque Limiter  
AMT Shown**



## Electronic Control Options

These controls are electronic displacement and pressure controls with or without an adjustable hydromechanical pressure limiter.

The control will provide precisely the flow specified per a displacement input command and maintain that flow level until a new displacement command level is received, or until the pressure command overrides to limit system pressure.

A minimum of 25 bar servo pressure is required to control the pump. To control the pump at system pressure below 25 bar, either a sequence valve in the pressure line or an external servo source is required. Without adequate servo pressure, the pump is biased on stroke.

**Cables are not included with the pump but needed when ECU is purchased:**

12-pin connector cable needed

6-pin connector cable needed

Com cable assembly

Hydromechanical Pmax compensator can be adjusted with the same sensitivity as C0 and C1 control.

Parameters adjustment, calibration info and Interface between ECU and Pump are described in the "Electronic Controls - Graphical User Interface"

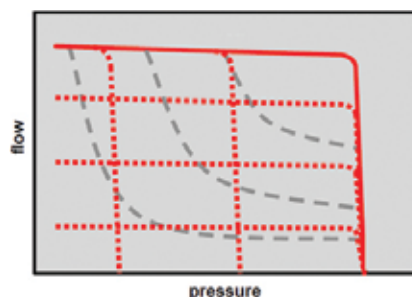
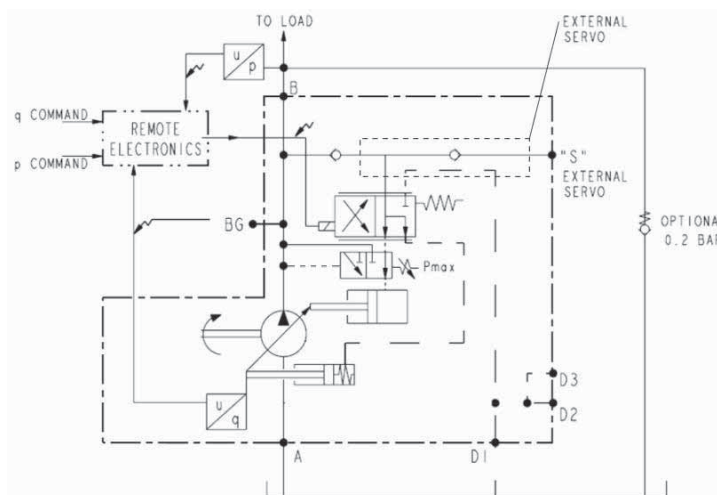
## Typical Control Response Times

|                              | Response time (ms) |    |    |    |    |     |     |
|------------------------------|--------------------|----|----|----|----|-----|-----|
| Displacement (cc)            | 18                 | 28 | 45 | 60 | 75 | 100 | 140 |
| Maximum displacement to zero | 40                 | 40 | 43 | 63 | 96 | 101 | 109 |
| Zero displacement to Maximum | 35                 | 35 | 36 | 52 | 72 | 77  | 84  |

A driver control module can be provided with the pump either with analog or CANBUS control capability. Additionally preset control values can be selected via a RS232/USB connection using GUI software available on Parker Hannifin's website.

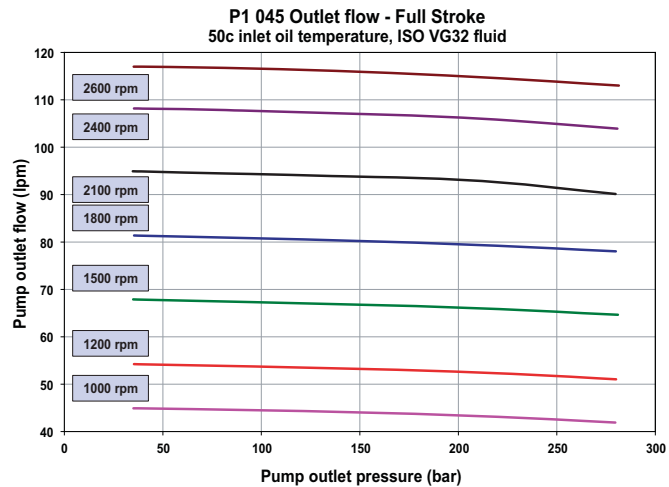
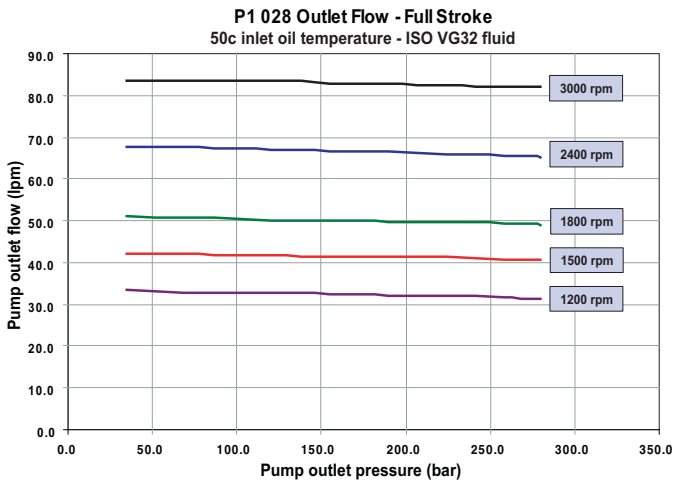
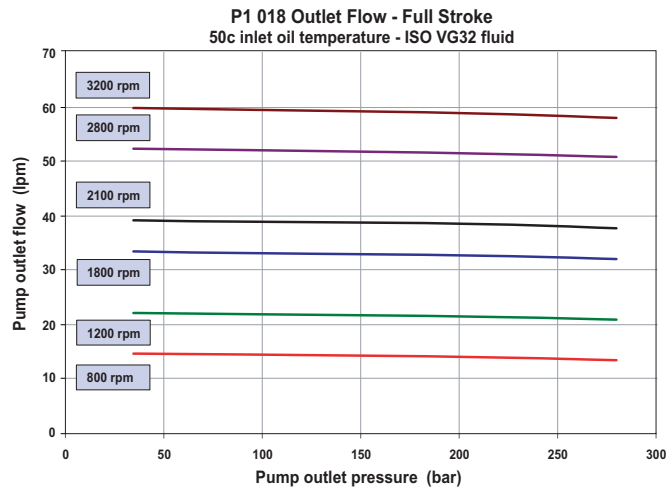
The mechanical pressure limiter will override the electronic inputs and limit pump outlet pressure to the preset level.

Using electronic control, the pump can be used in overcenter condition. (Energy recovery is one example of application for this)

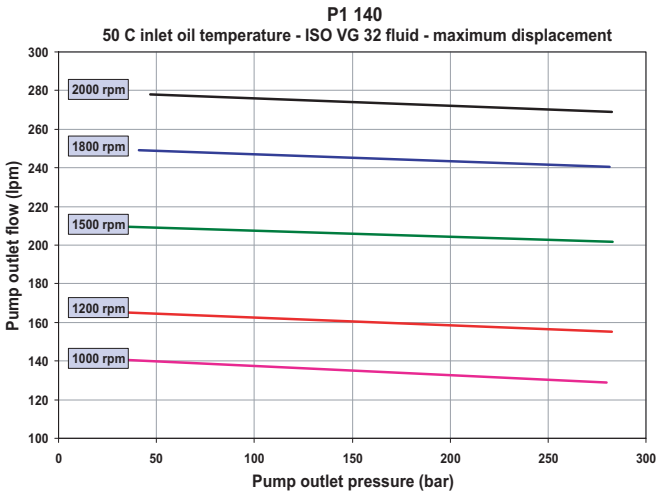
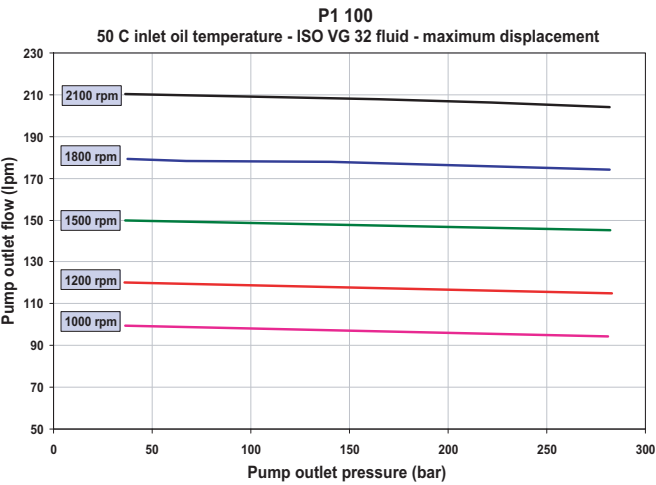
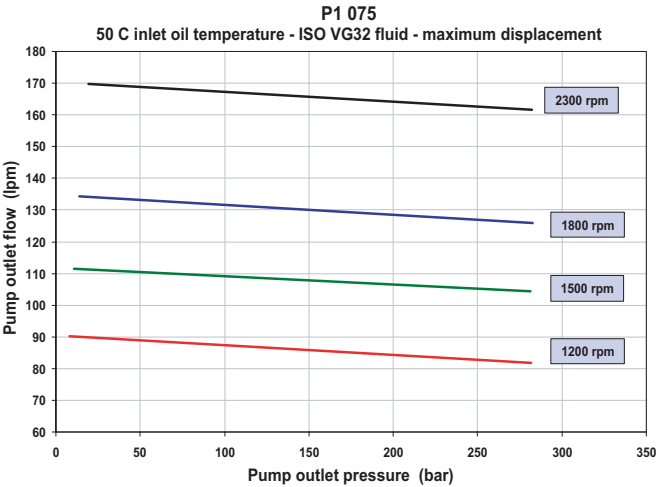
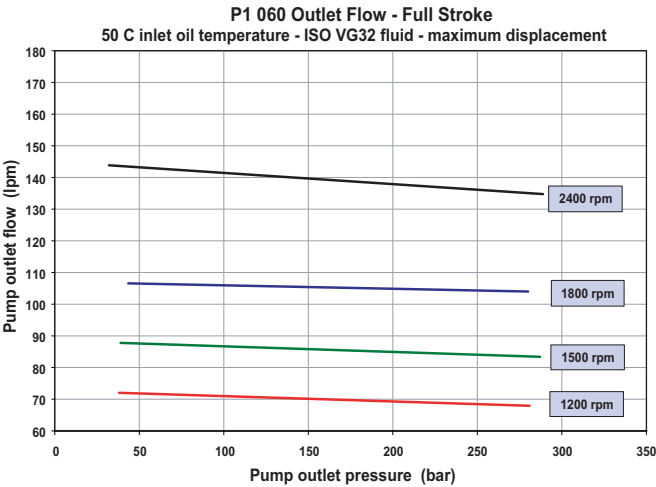


[illegible]

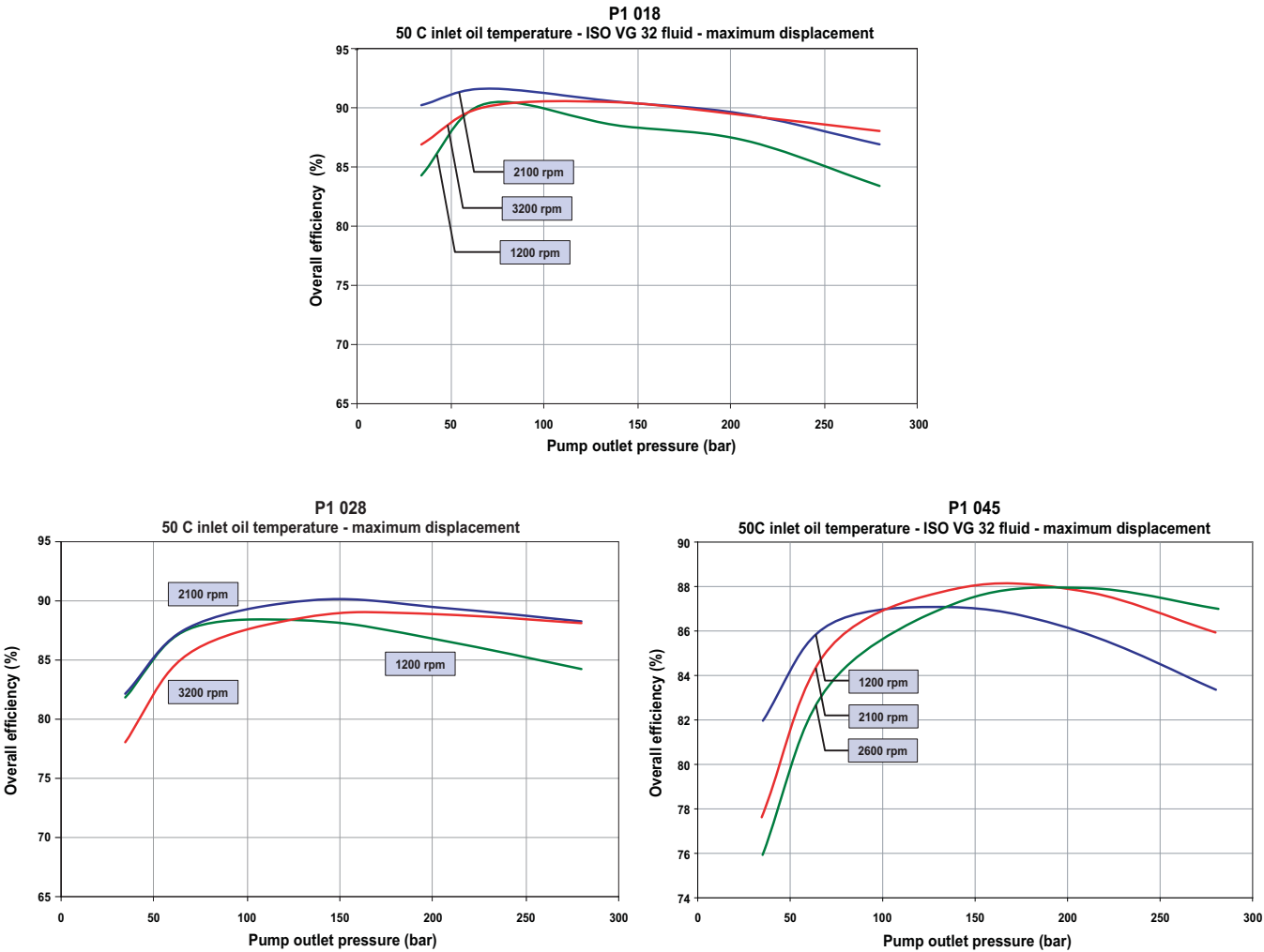
P1 Series Typical Pump Outlet Flow



P1 Series Typical Pump Outlet Flow

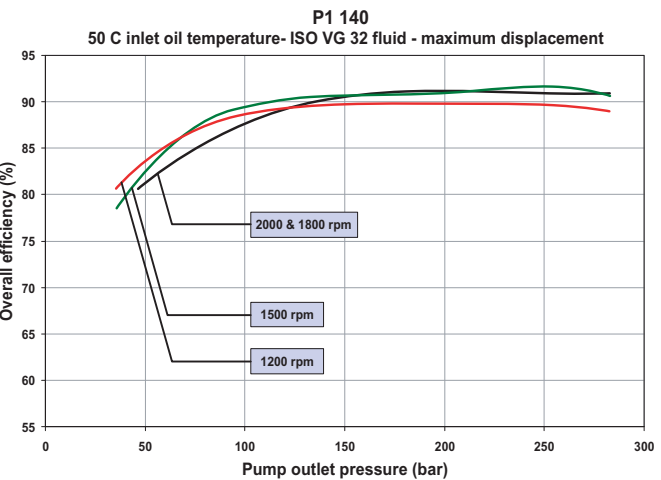
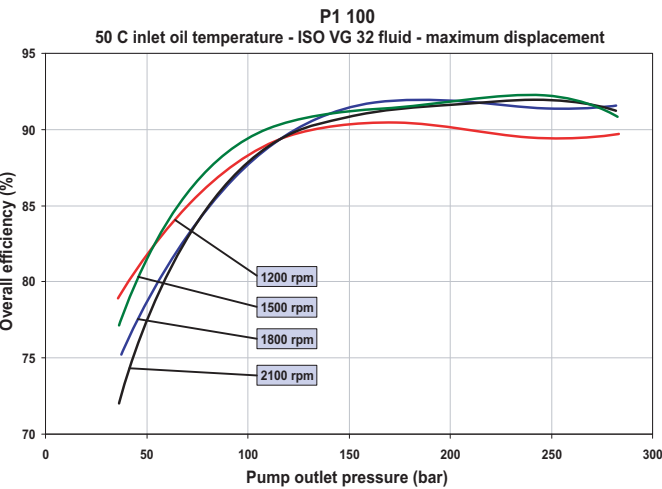
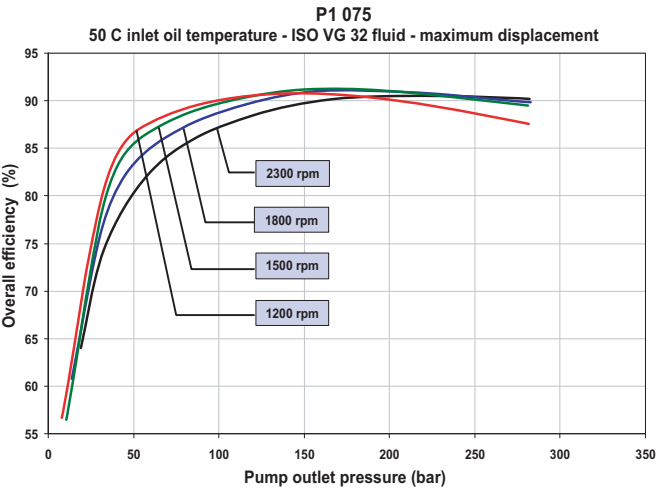
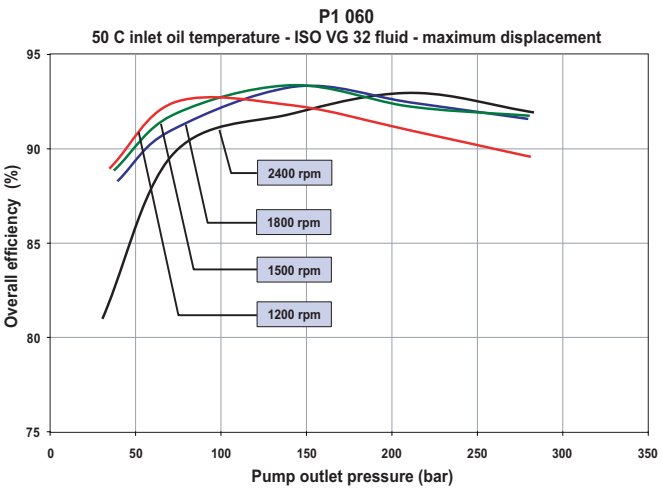


P1 Series Typical Overall Efficiency

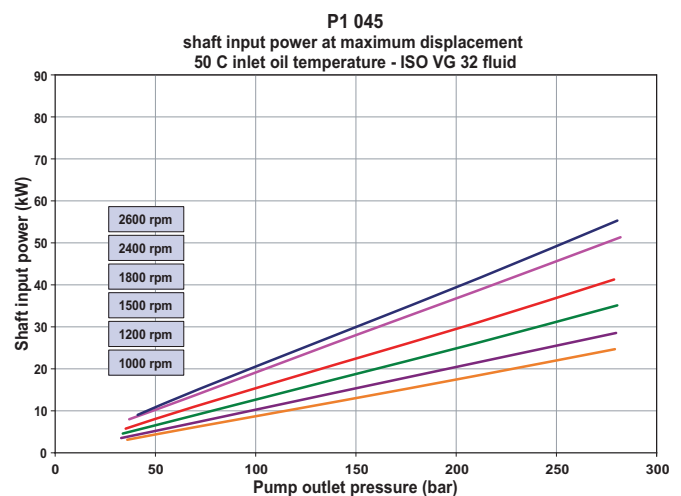
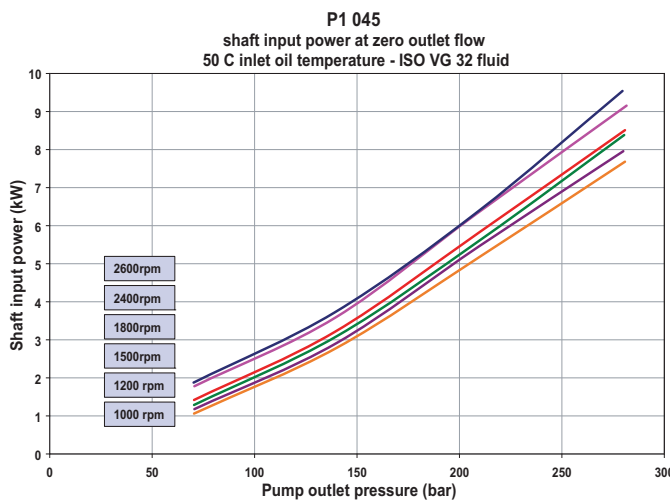
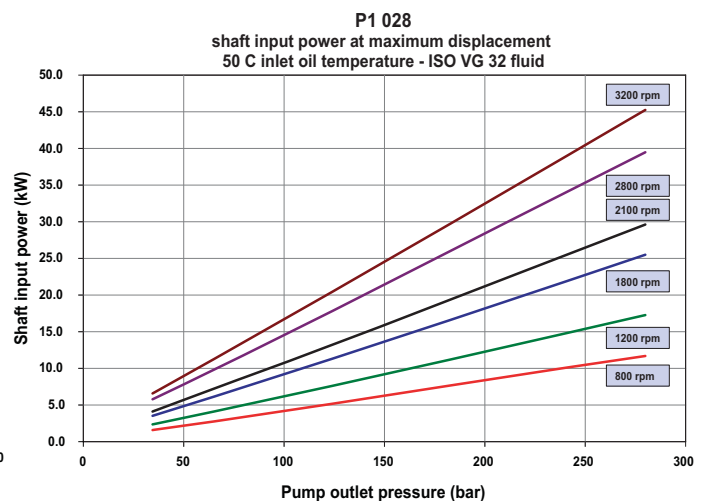
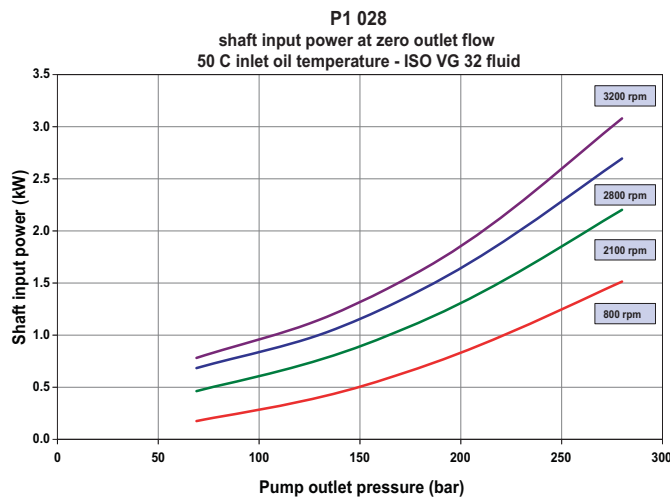
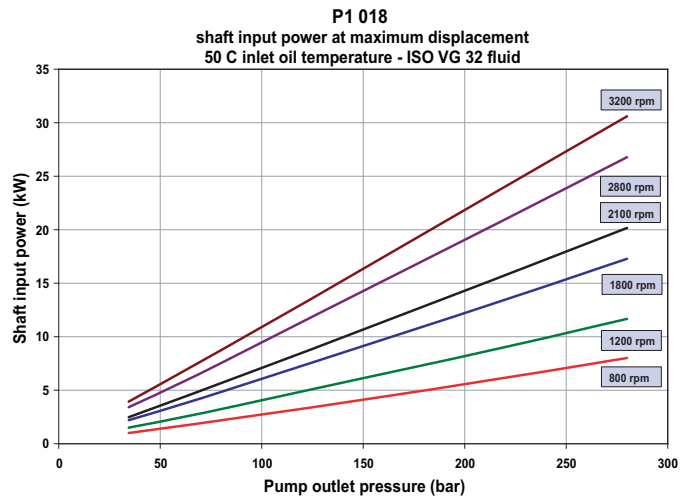
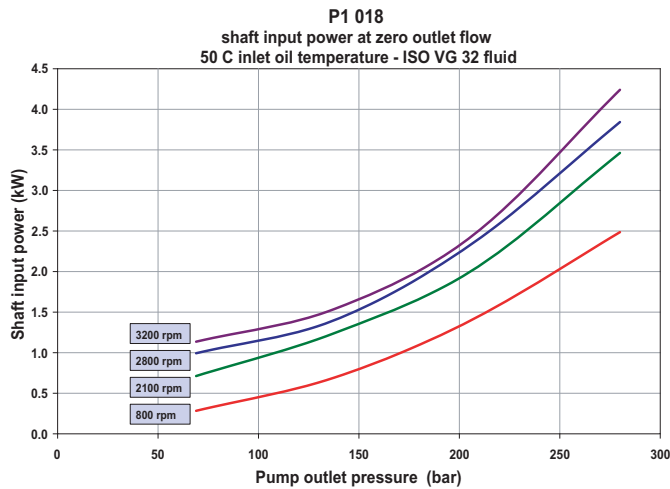




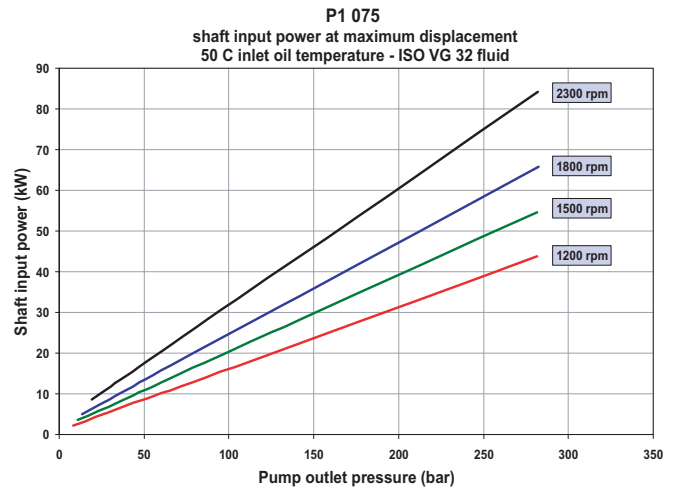
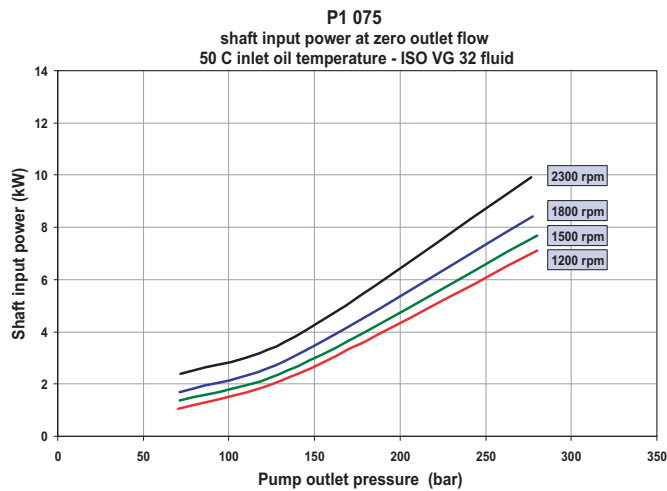
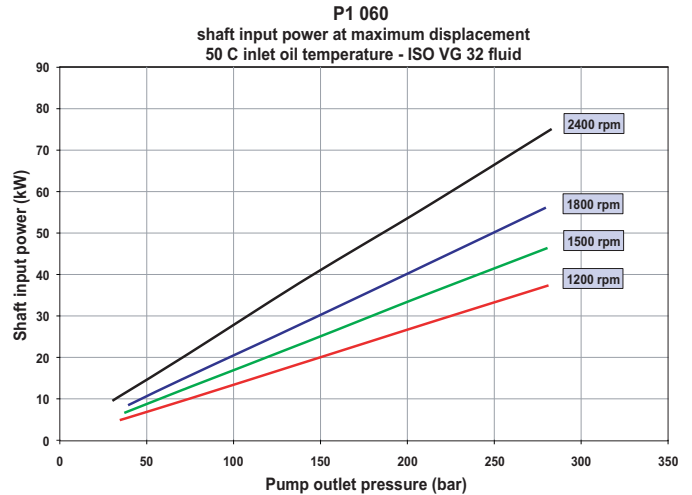
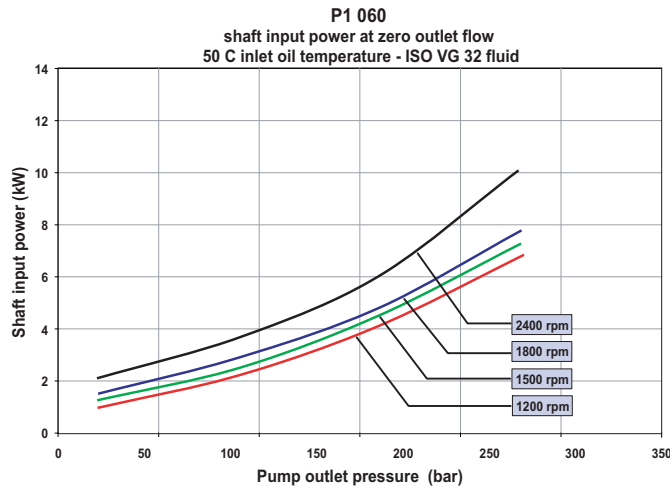
P1 Series Typical Overall Efficiency



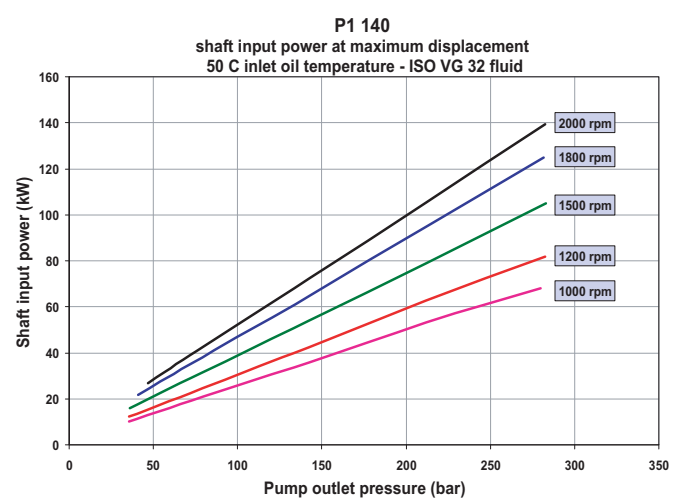
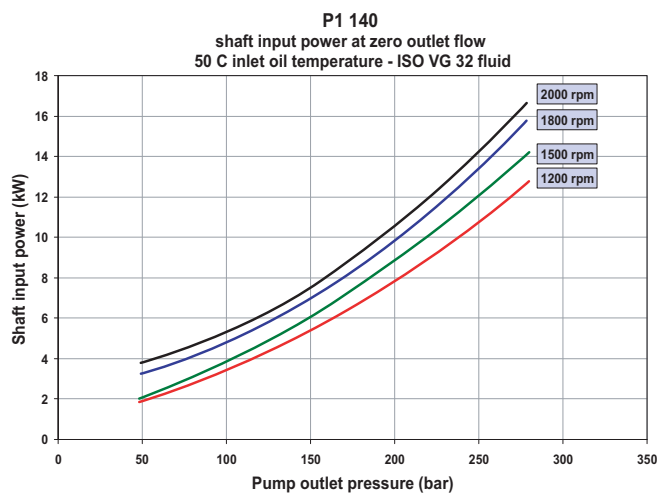
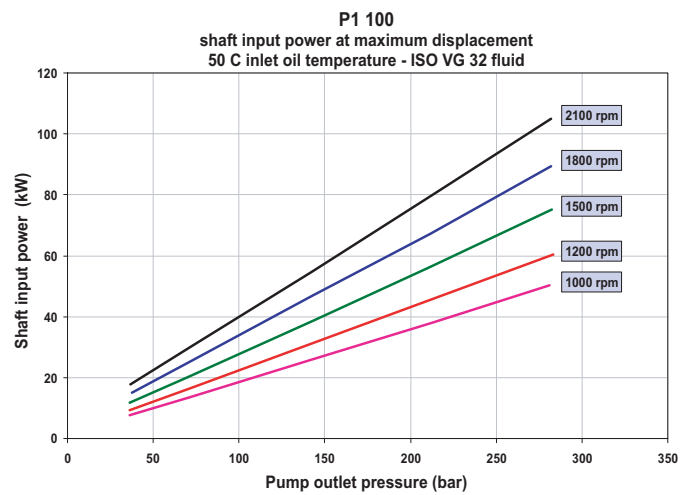
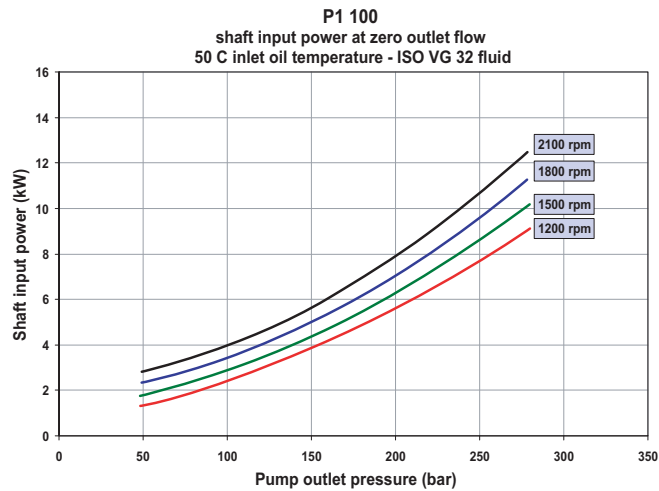
## P1 Series Typical Shaft Input Power



## P1 Series Typical Shaft Input Power

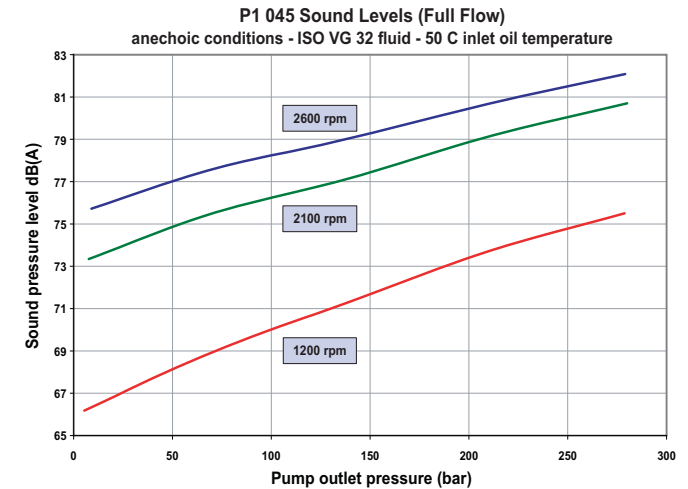
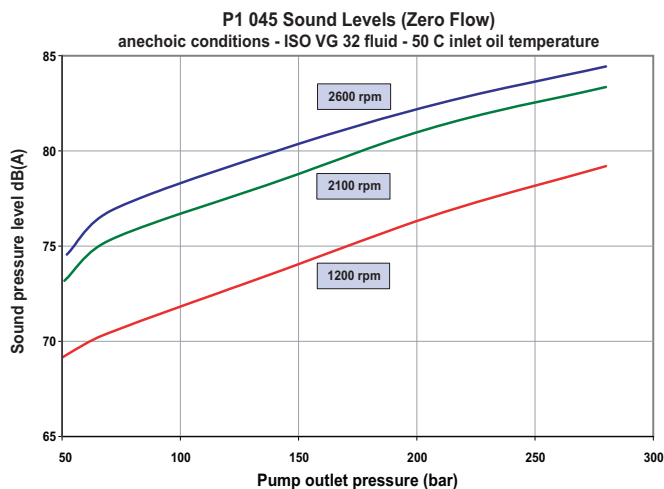
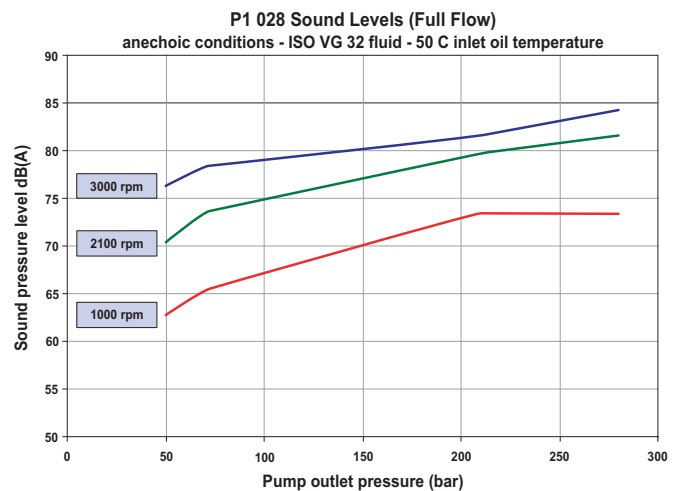
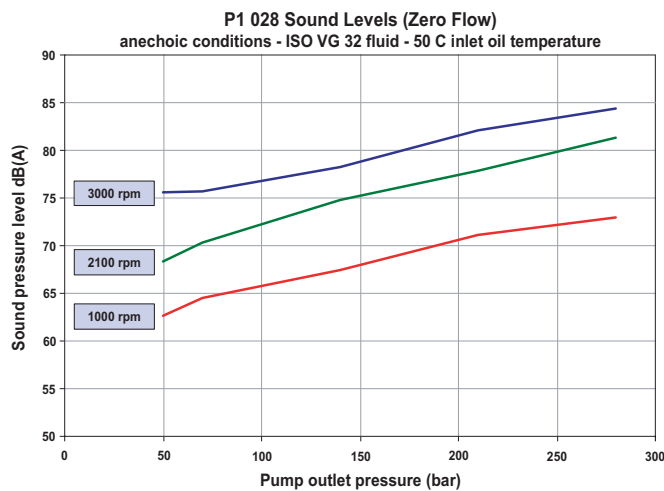
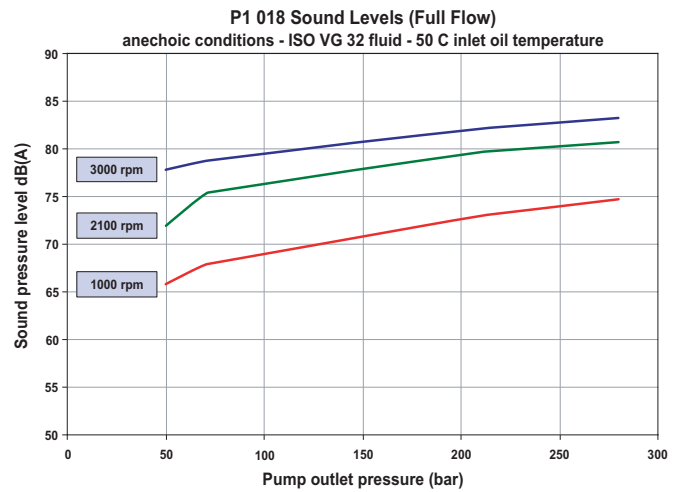
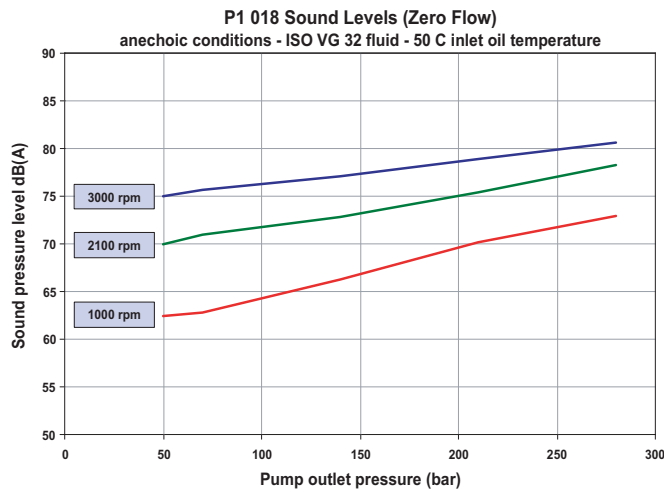


## P1 Series Typical Shaft Input Power



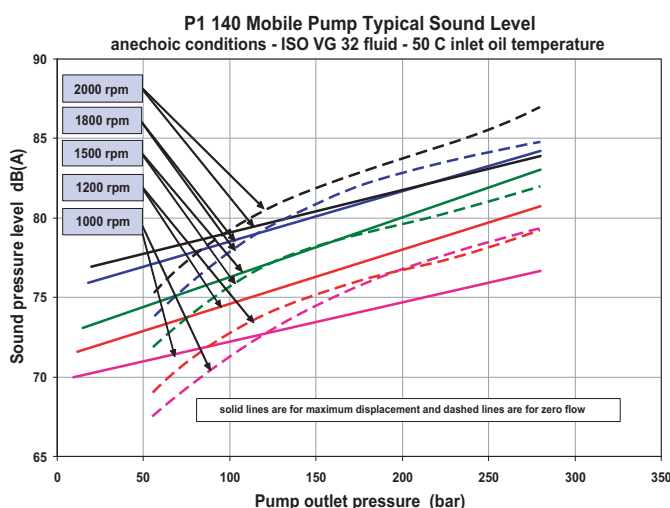
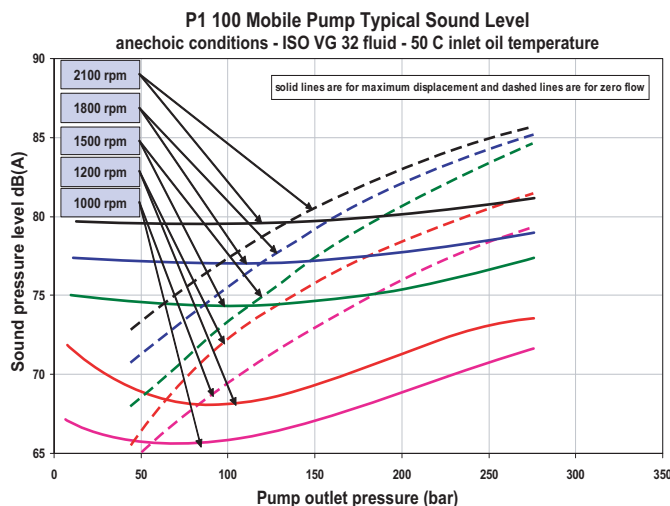
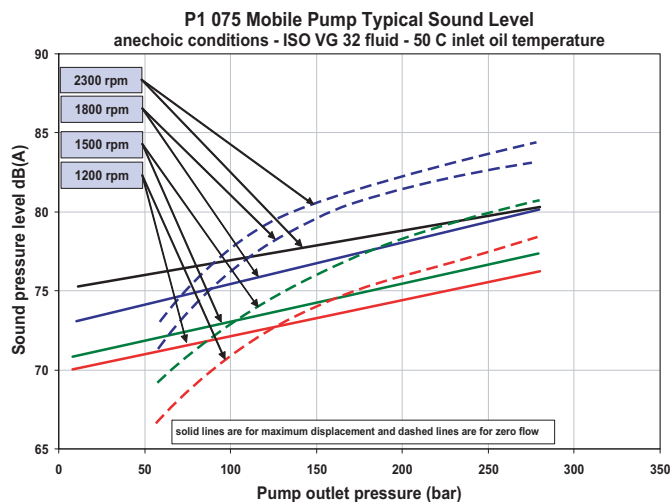
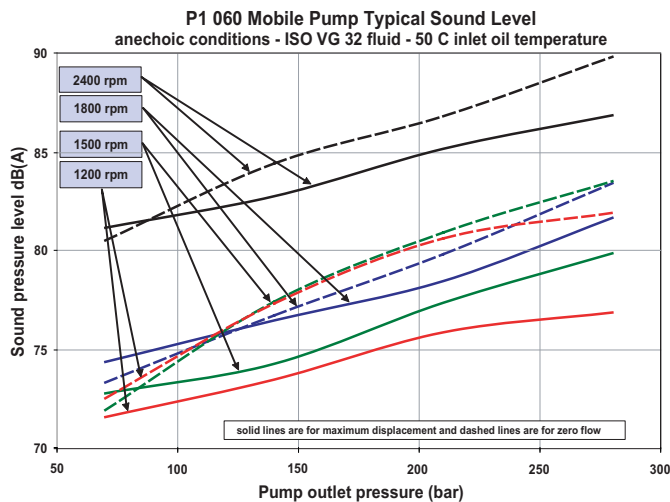
## P1 Series Typical Noise Characteristics

(These are anechoic sound pressure readings)

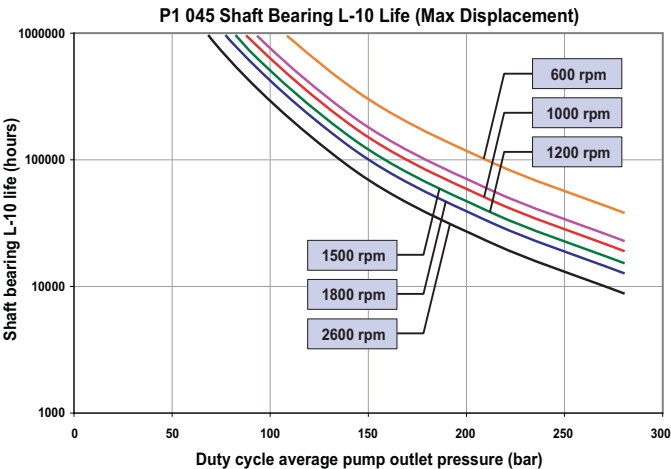
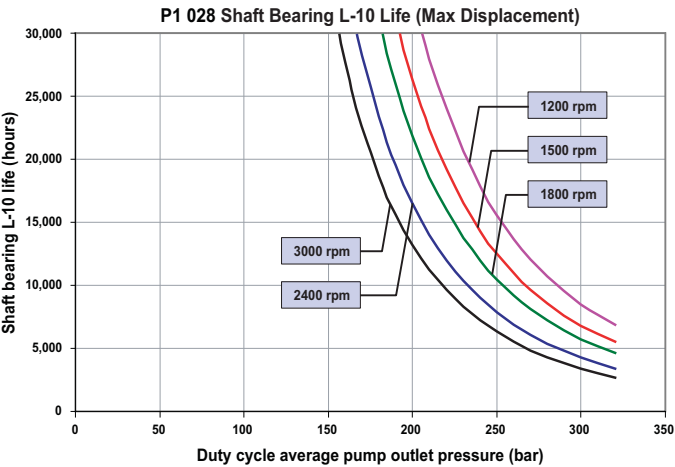
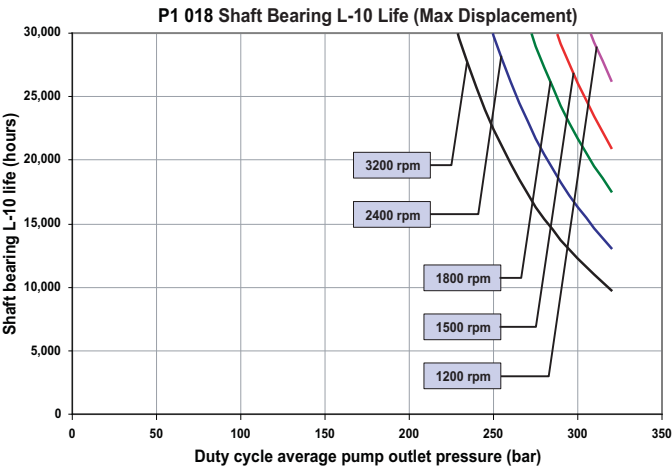


## P1 Series Typical Noise Characteristics

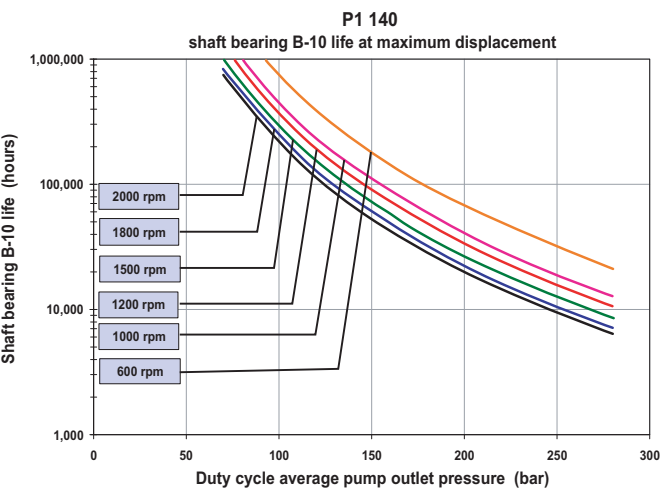
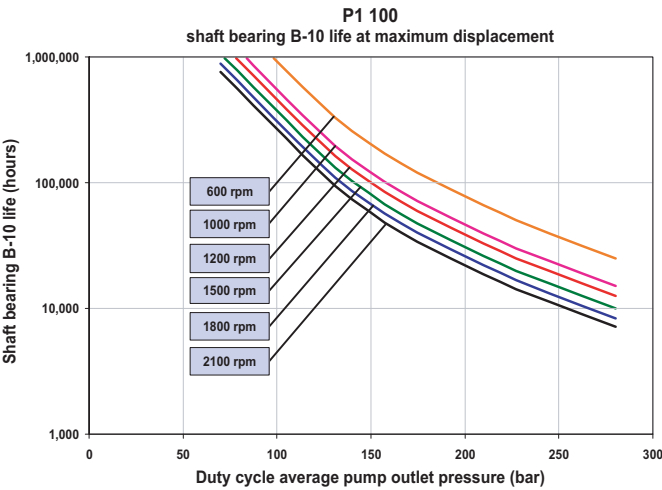
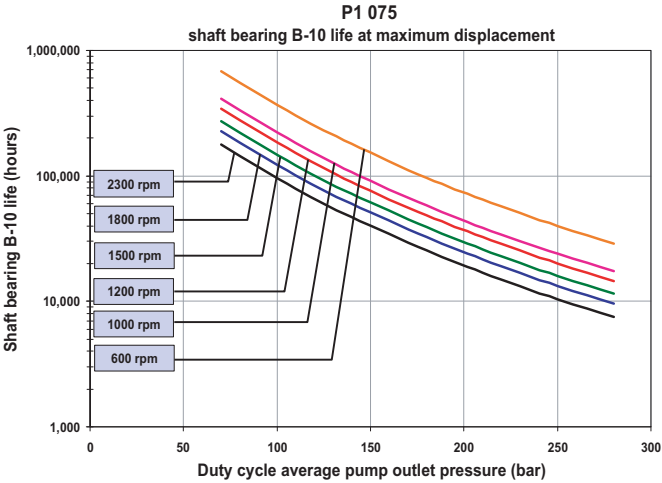
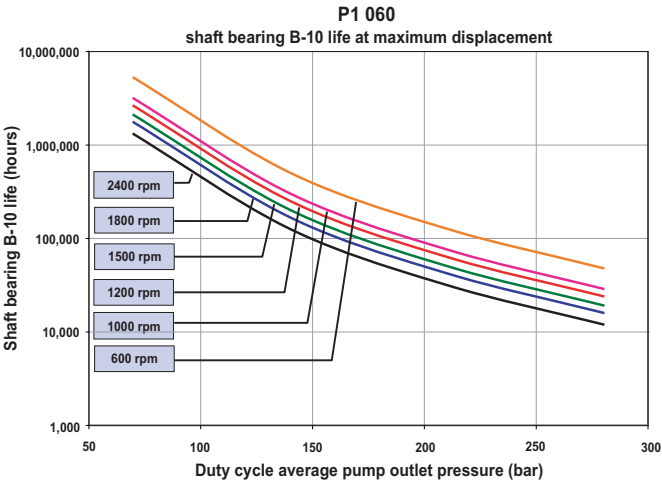
(These are anechoic sound pressure readings)



P1 Series Typical Shaft Bearing Life

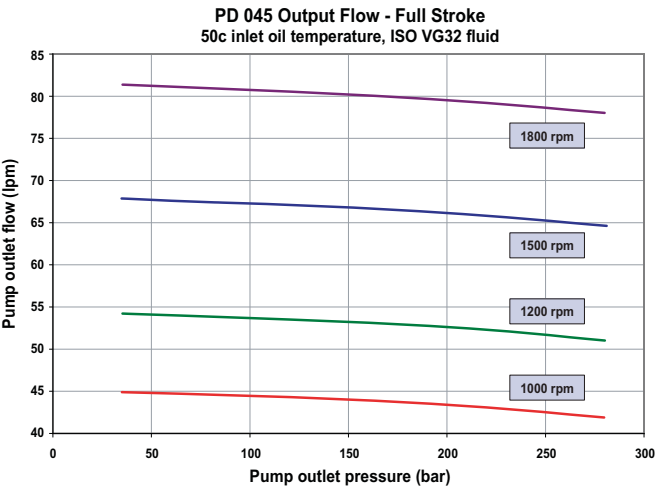
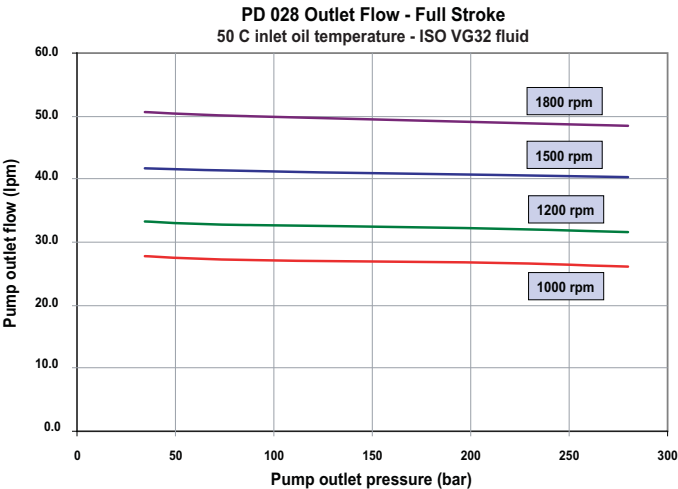
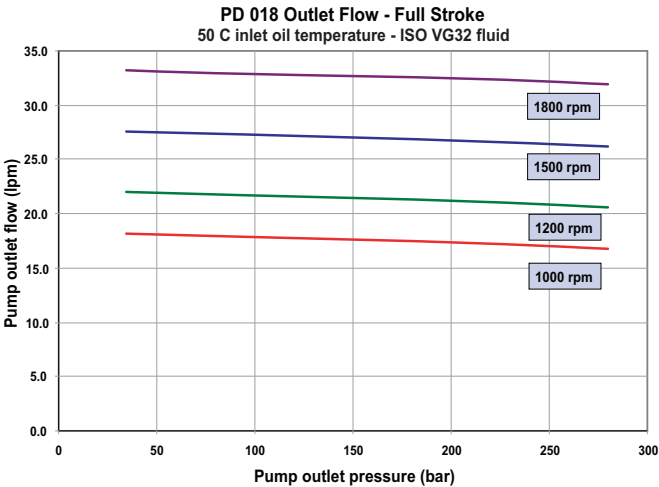


P1 Series Typical Shaft Bearing Life

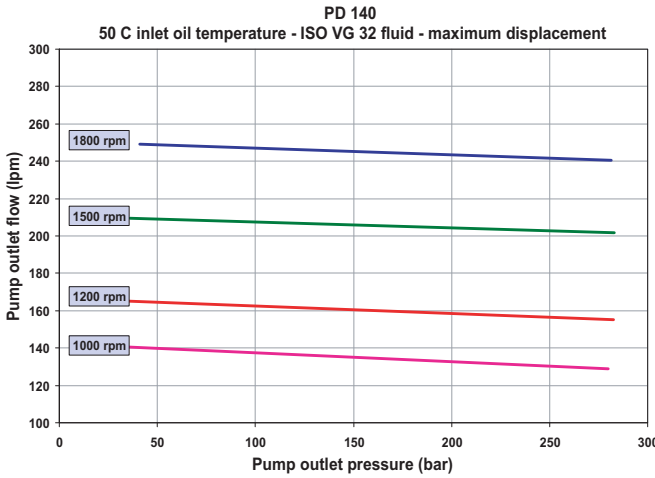
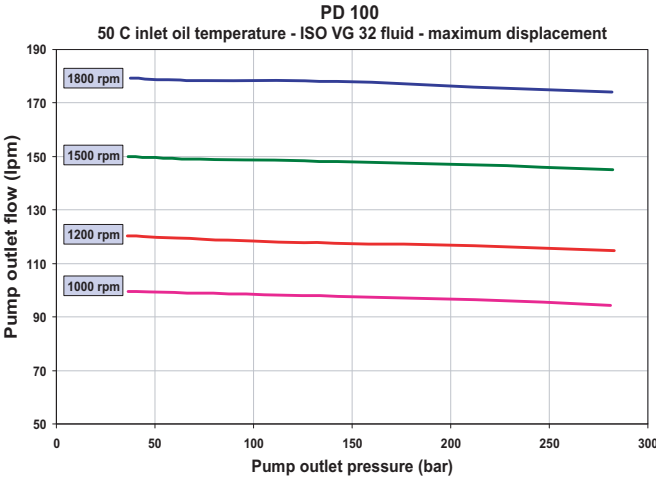
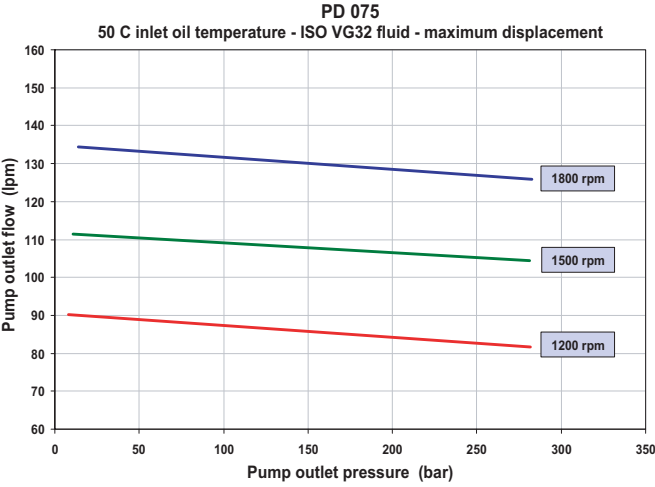
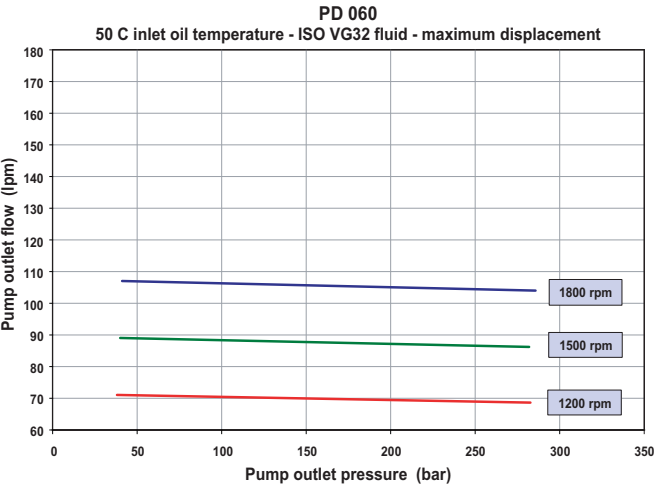




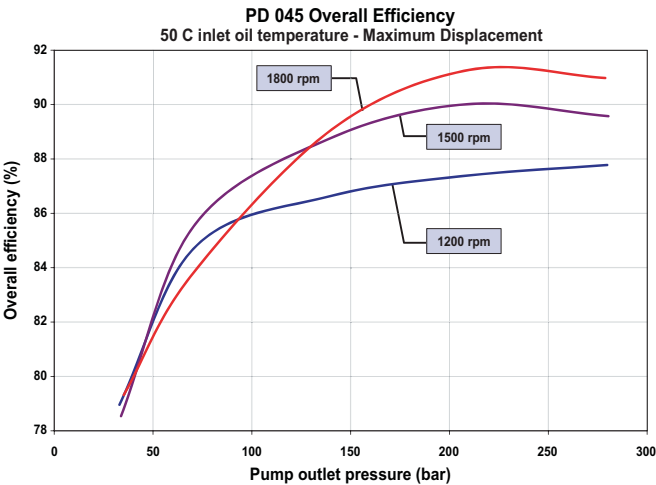
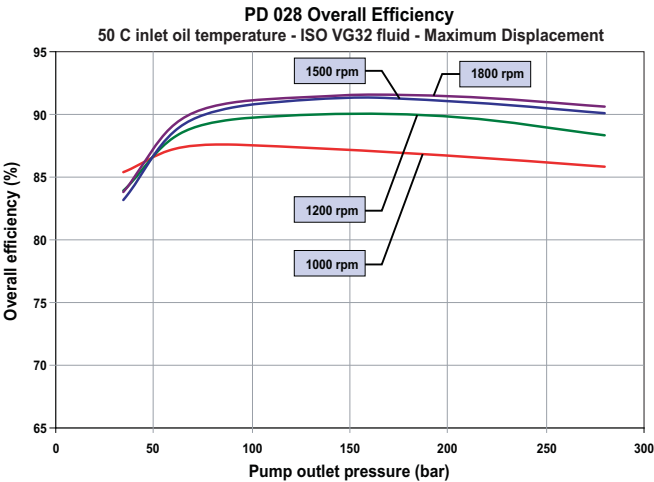
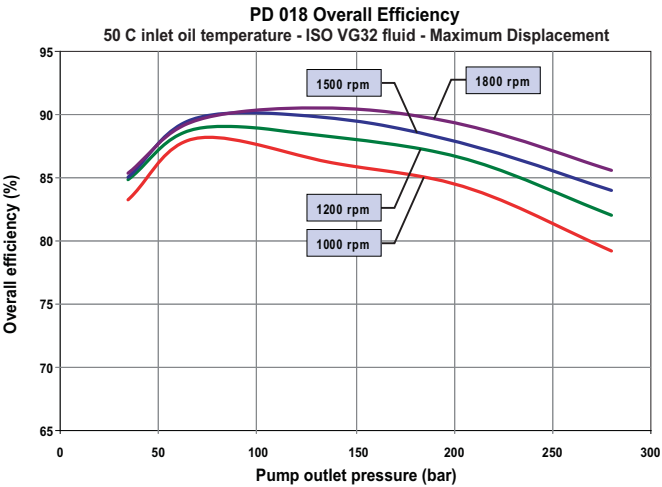
PD Series Typical Pump Outlet Flow



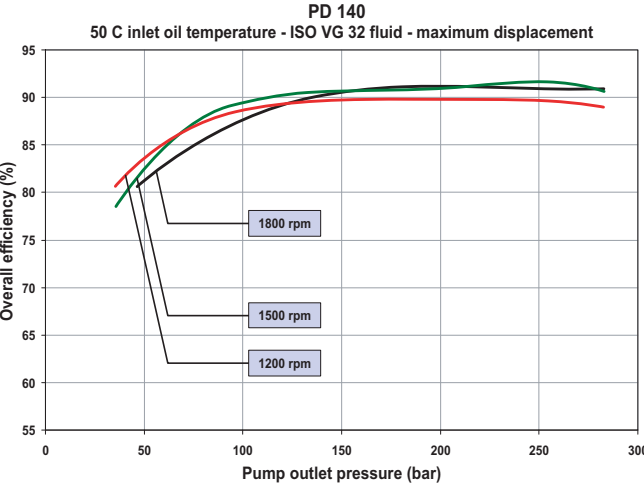
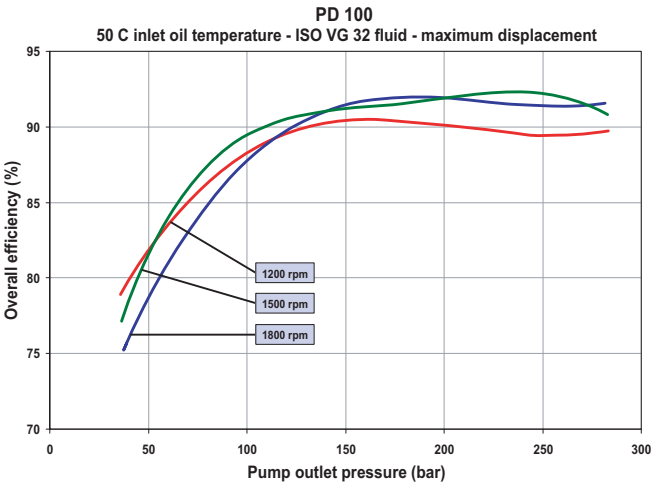
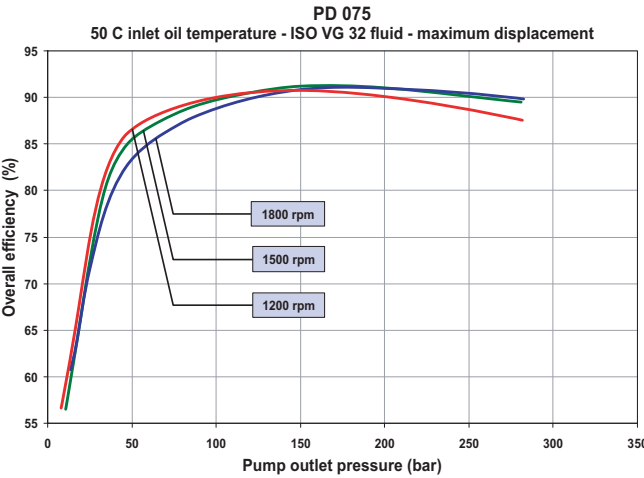
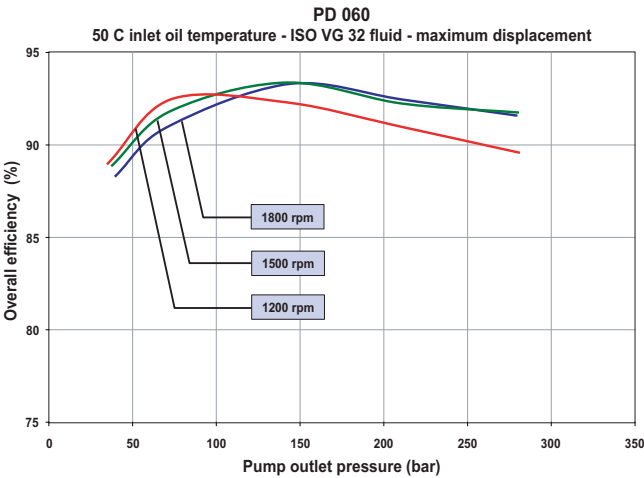
PD Series Typical Pump Outlet Flow



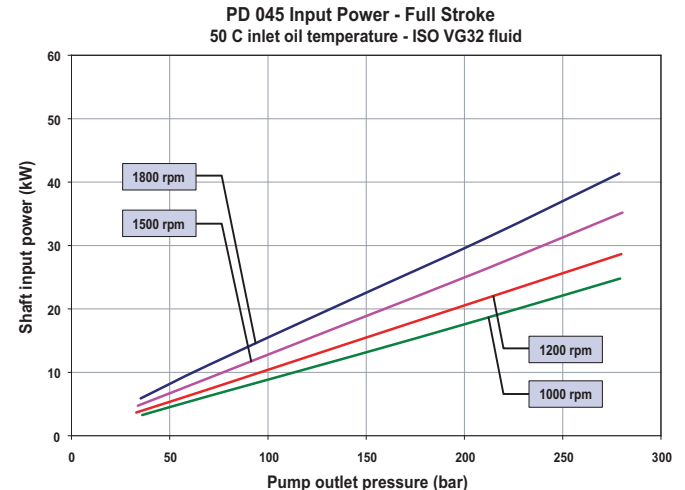
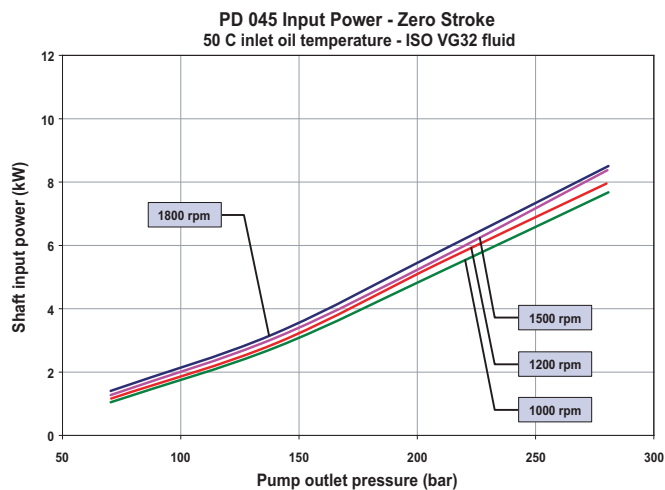
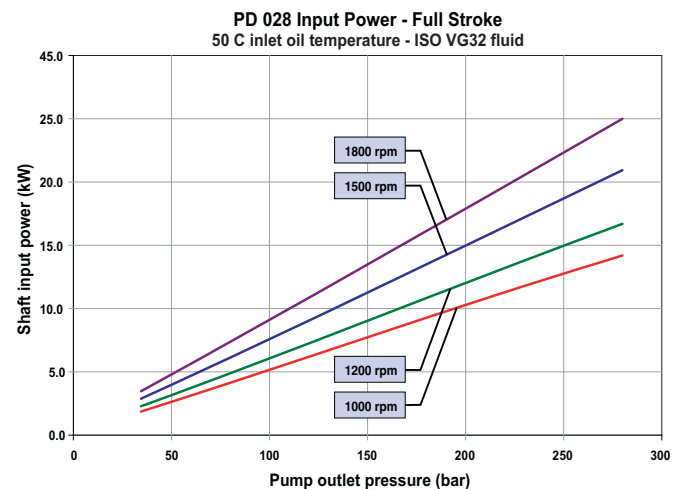
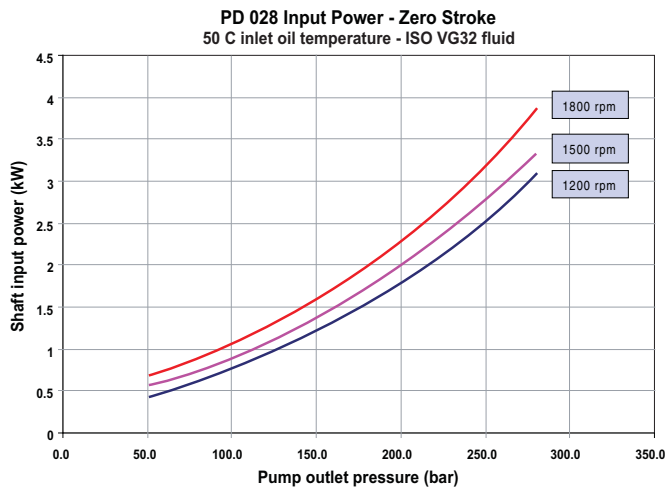
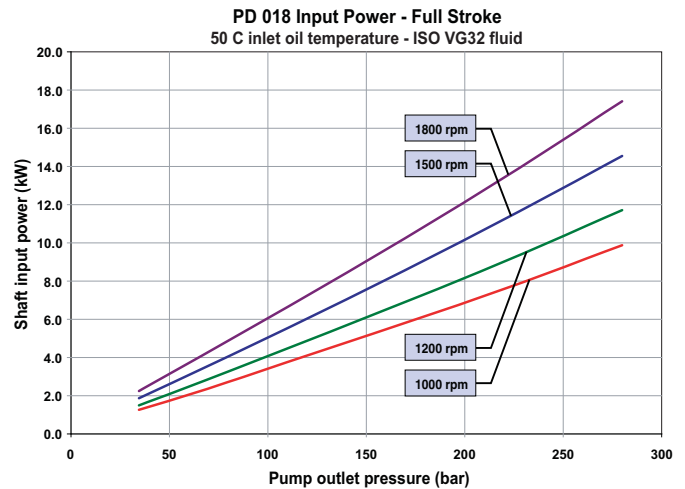
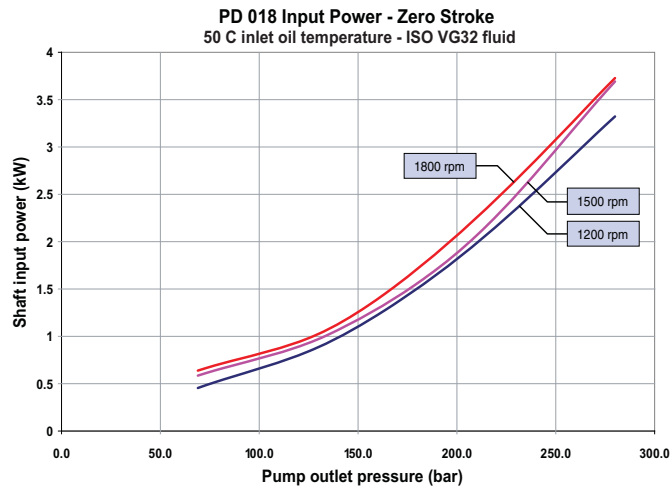
PD Series Typical Overall Efficiency



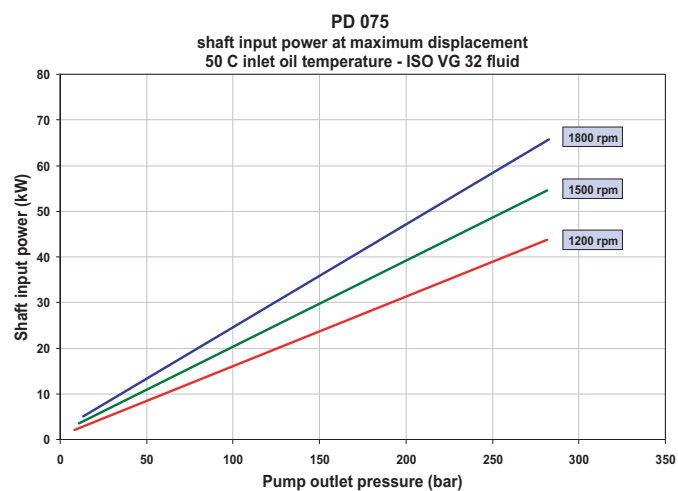
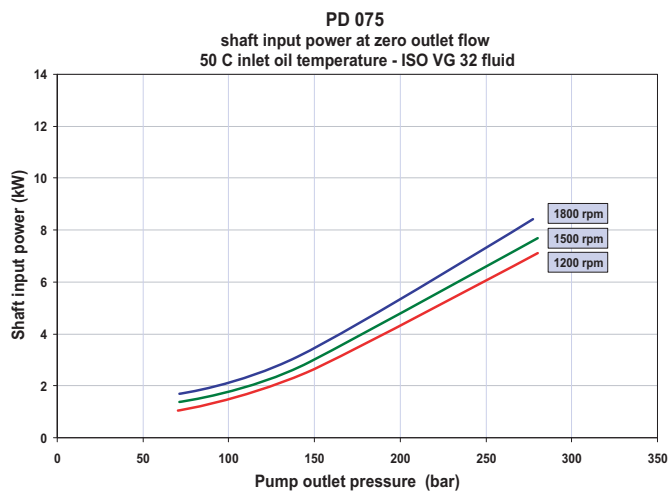
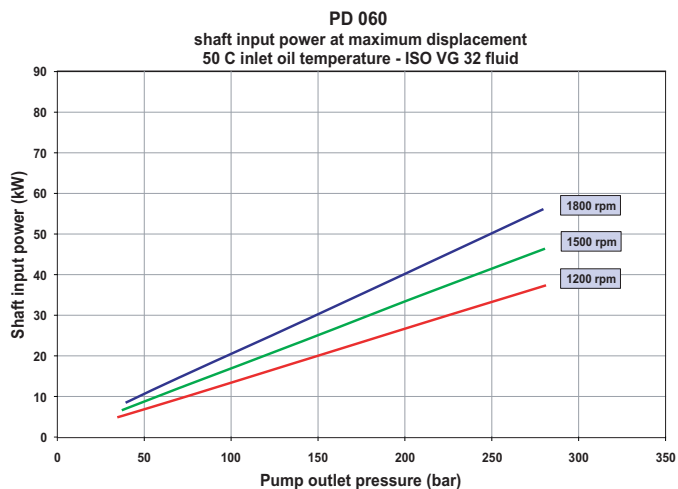
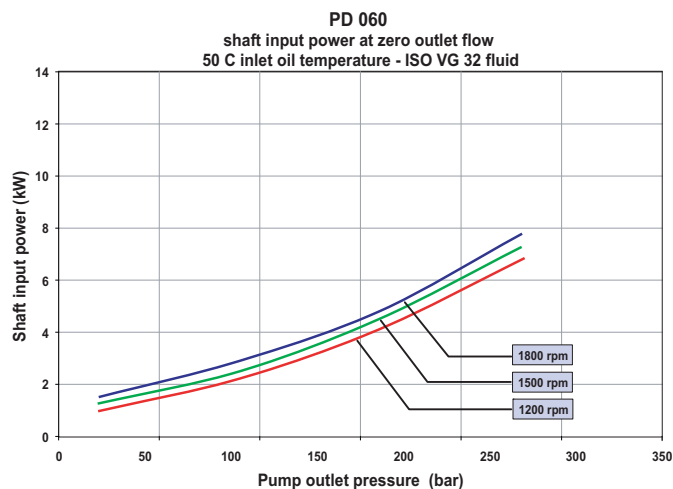
PD Series Typical Overall Efficiency



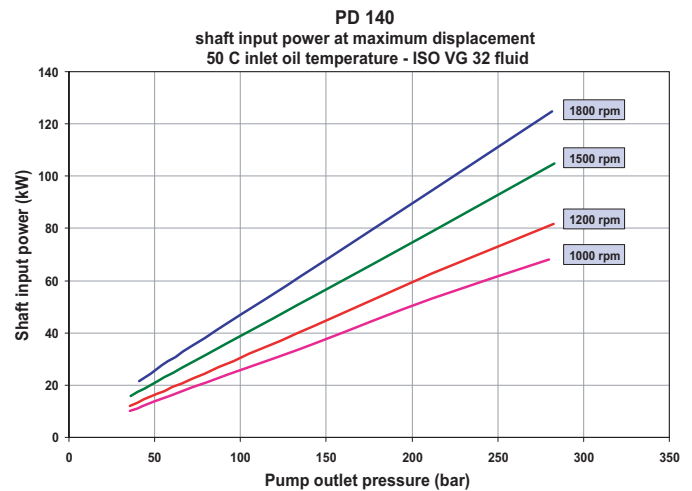
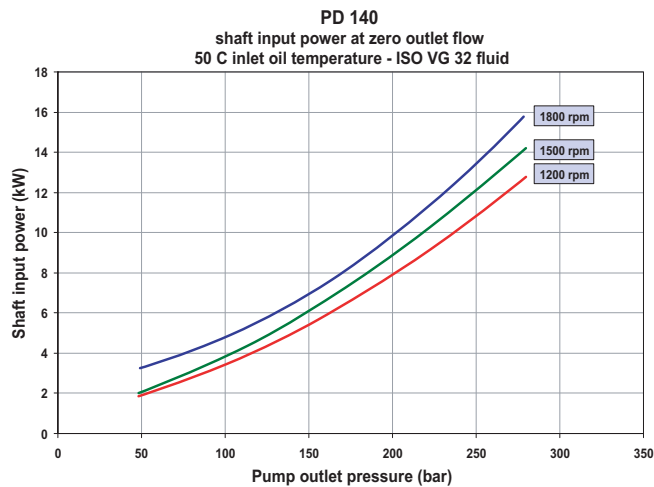
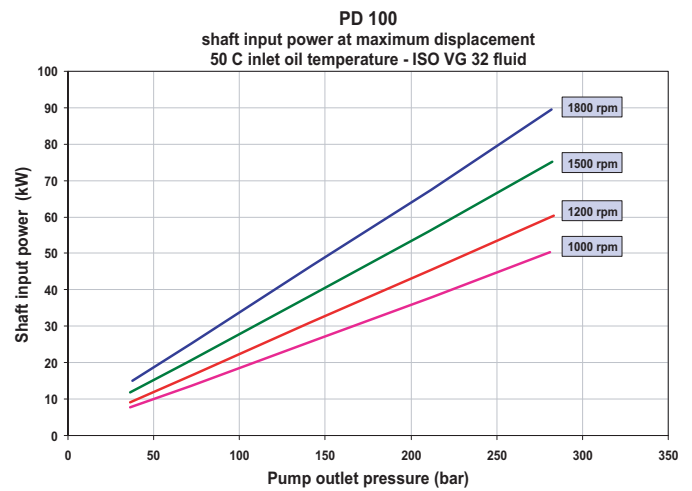
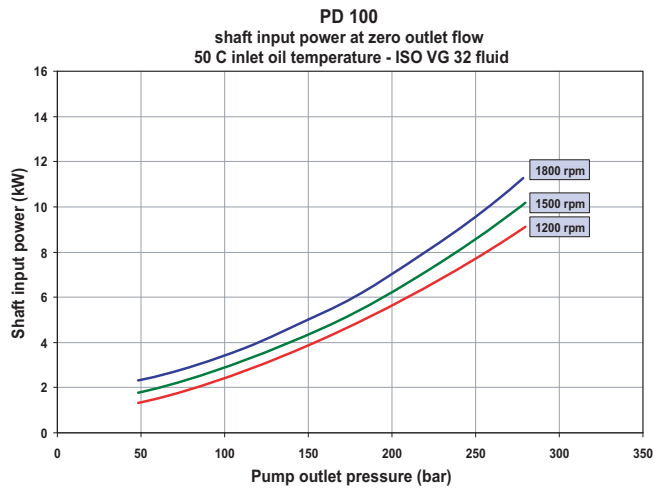
## PD Series Typical Shaft Input Power



## PD Series Typical Shaft Input Power

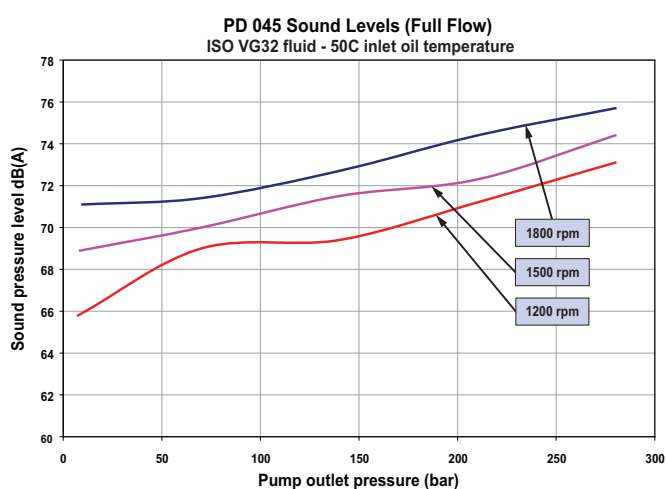
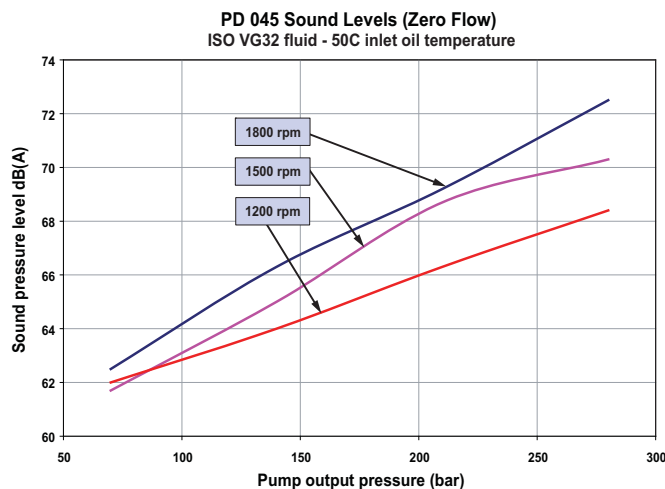
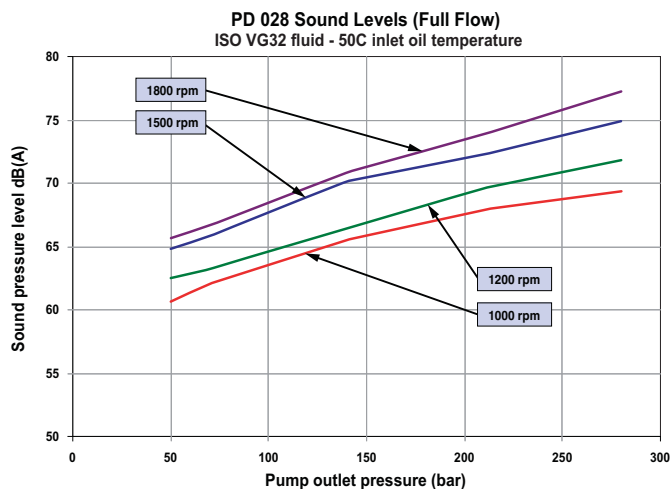
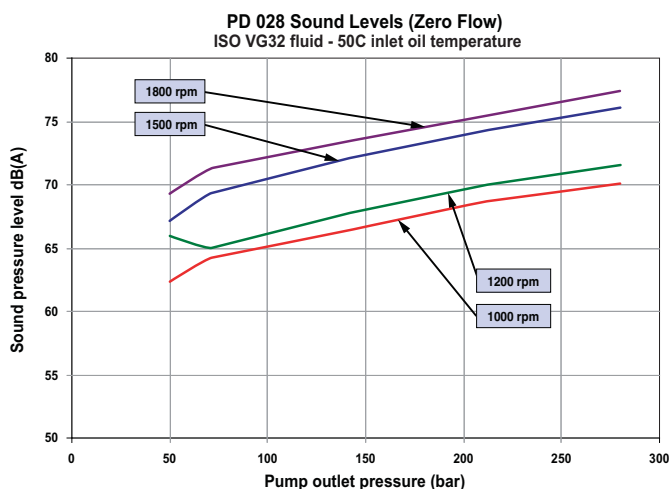
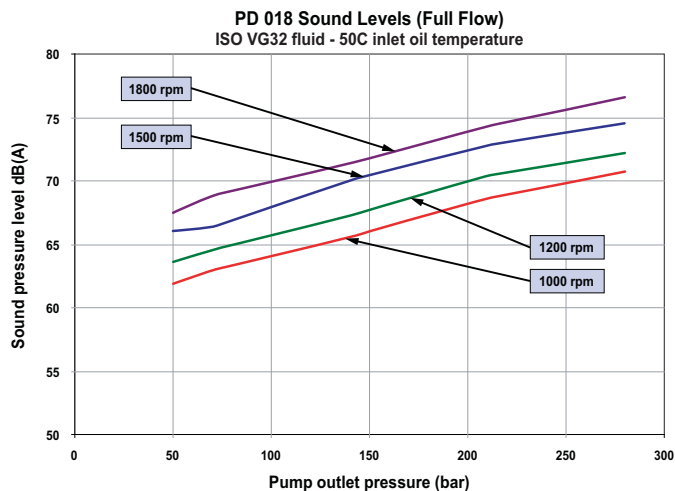
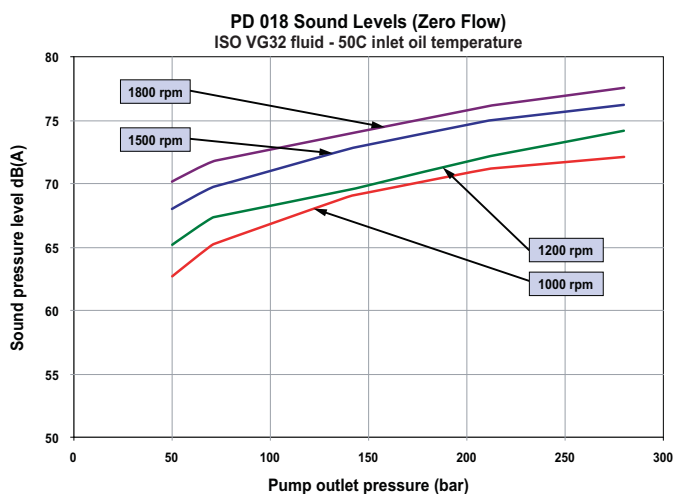


## PD Series Typical Shaft Input Power



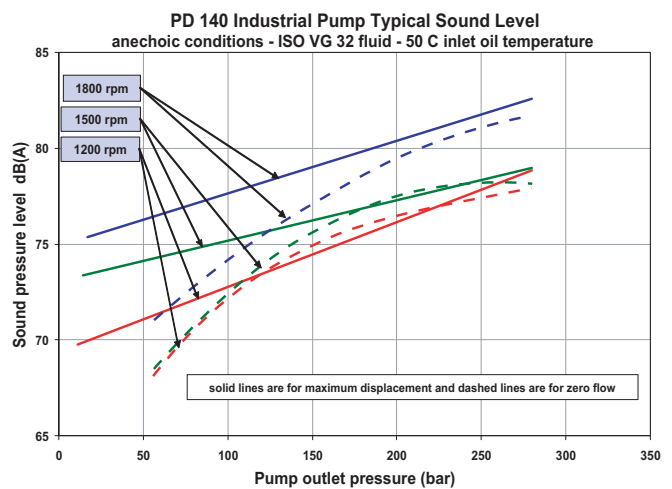
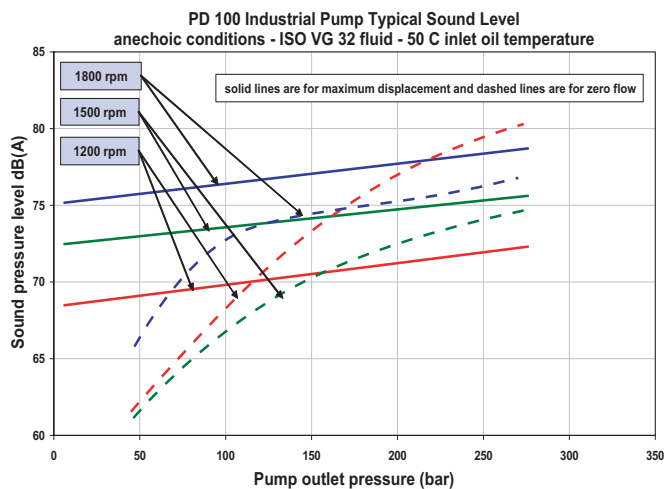
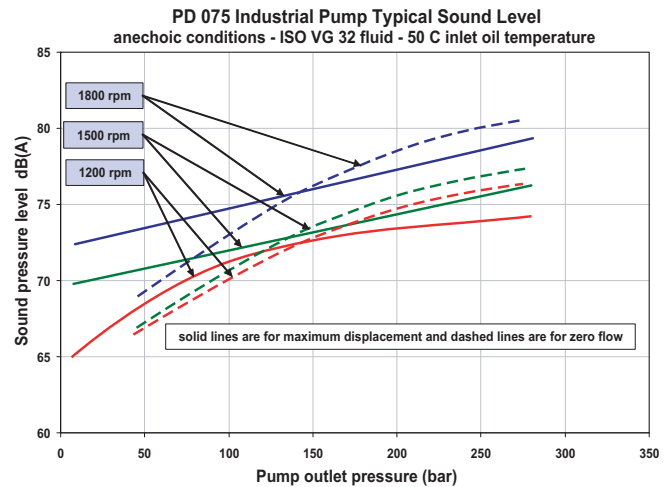
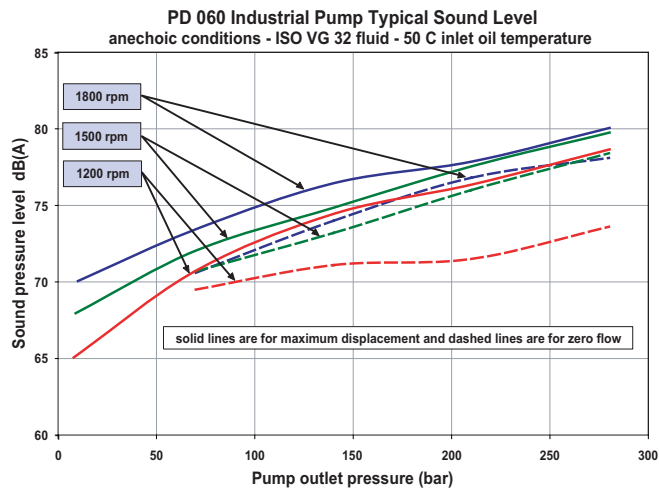
## PD Series Typical Noise Characteristics

(These are anechoic sound pressure readings)

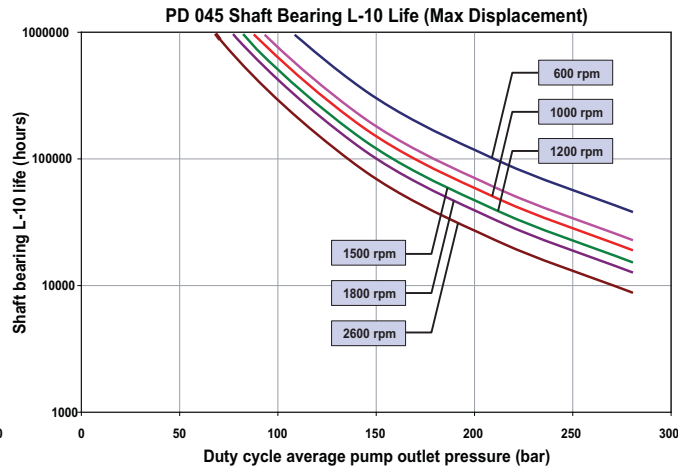
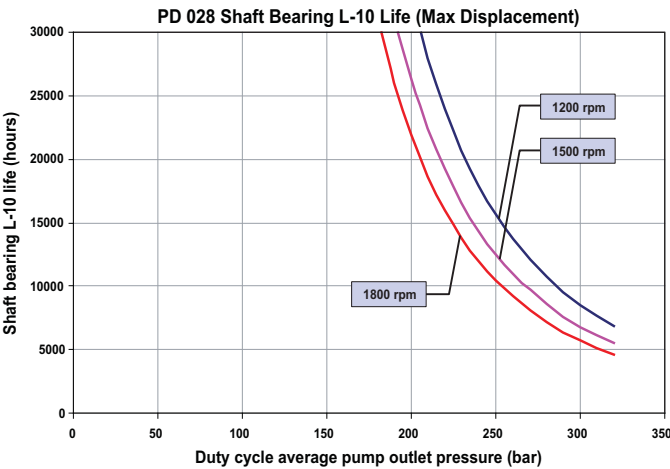
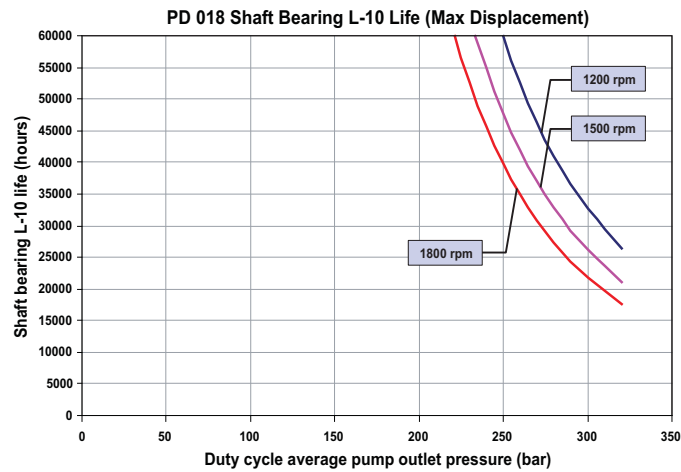




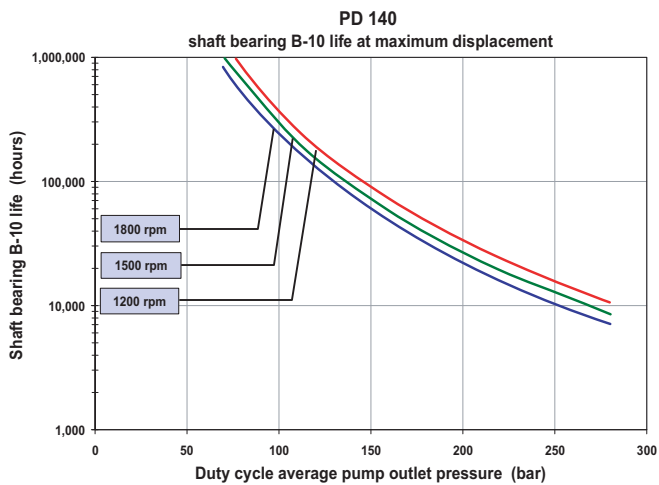
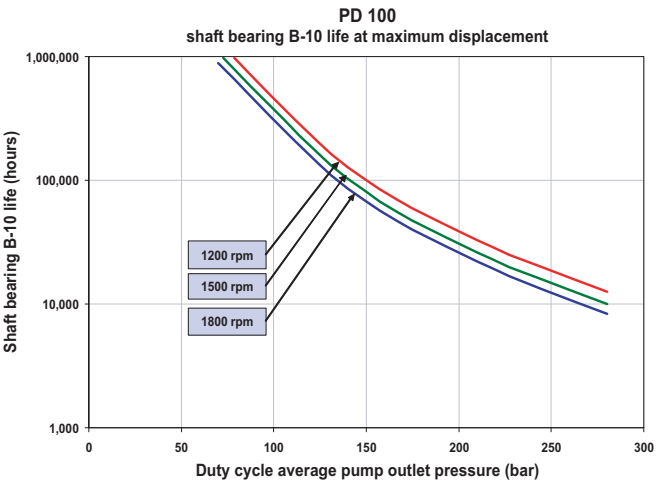
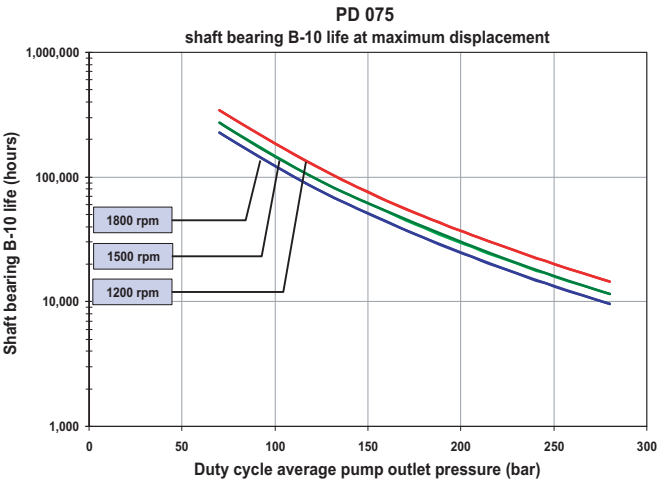
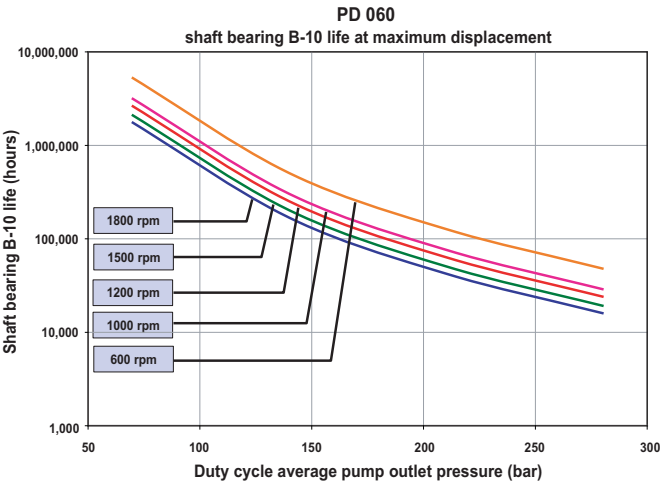
**PD Series Typical Noise Characteristics**  
(These are anechoic sound pressure readings)



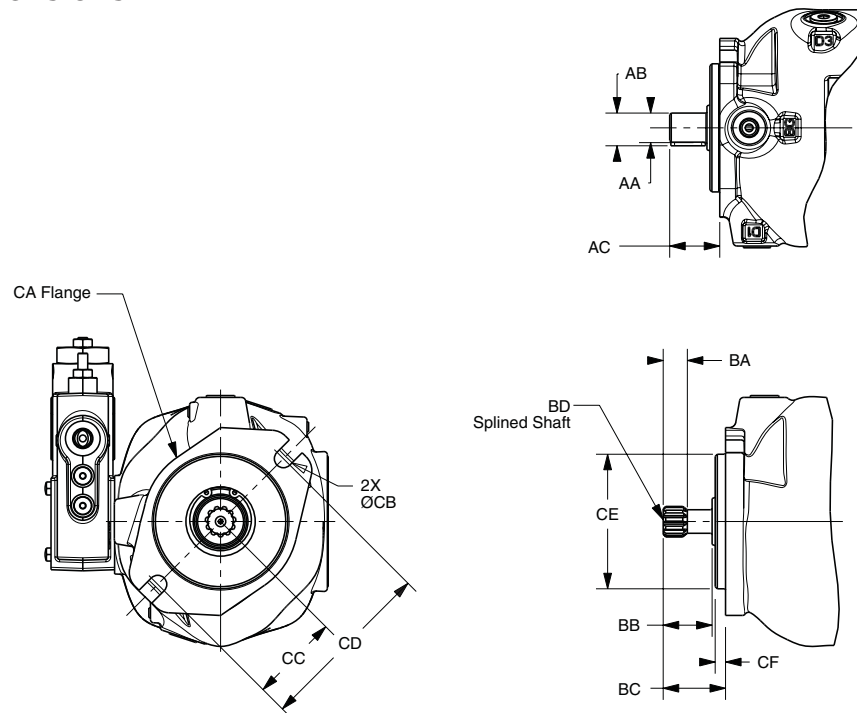
PD Series Typical Shaft Bearing Life



PD Series Typical Shaft Bearing Life

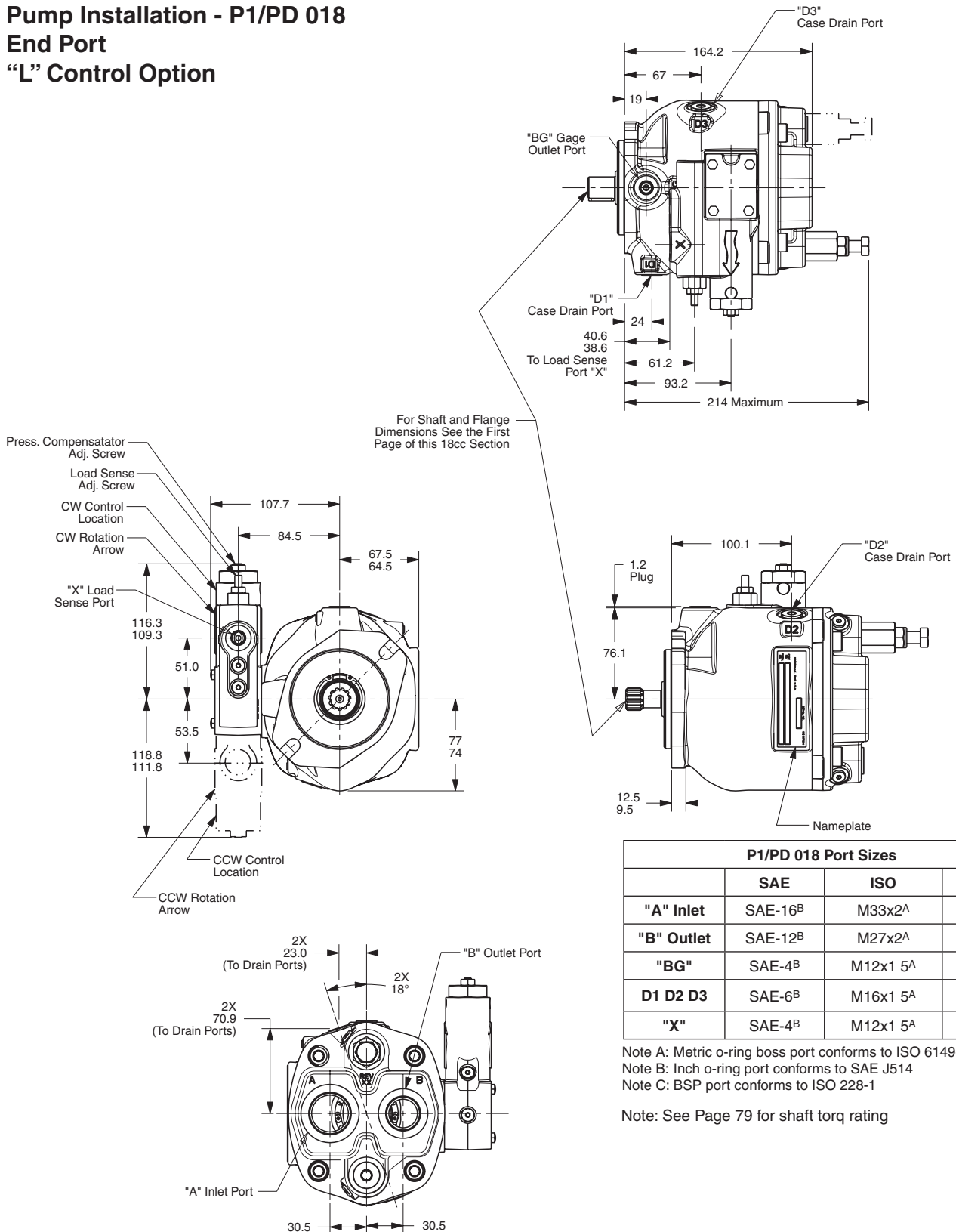


**Pump Installation - P1/PD 018**  
**Input Shaft Dimensions**

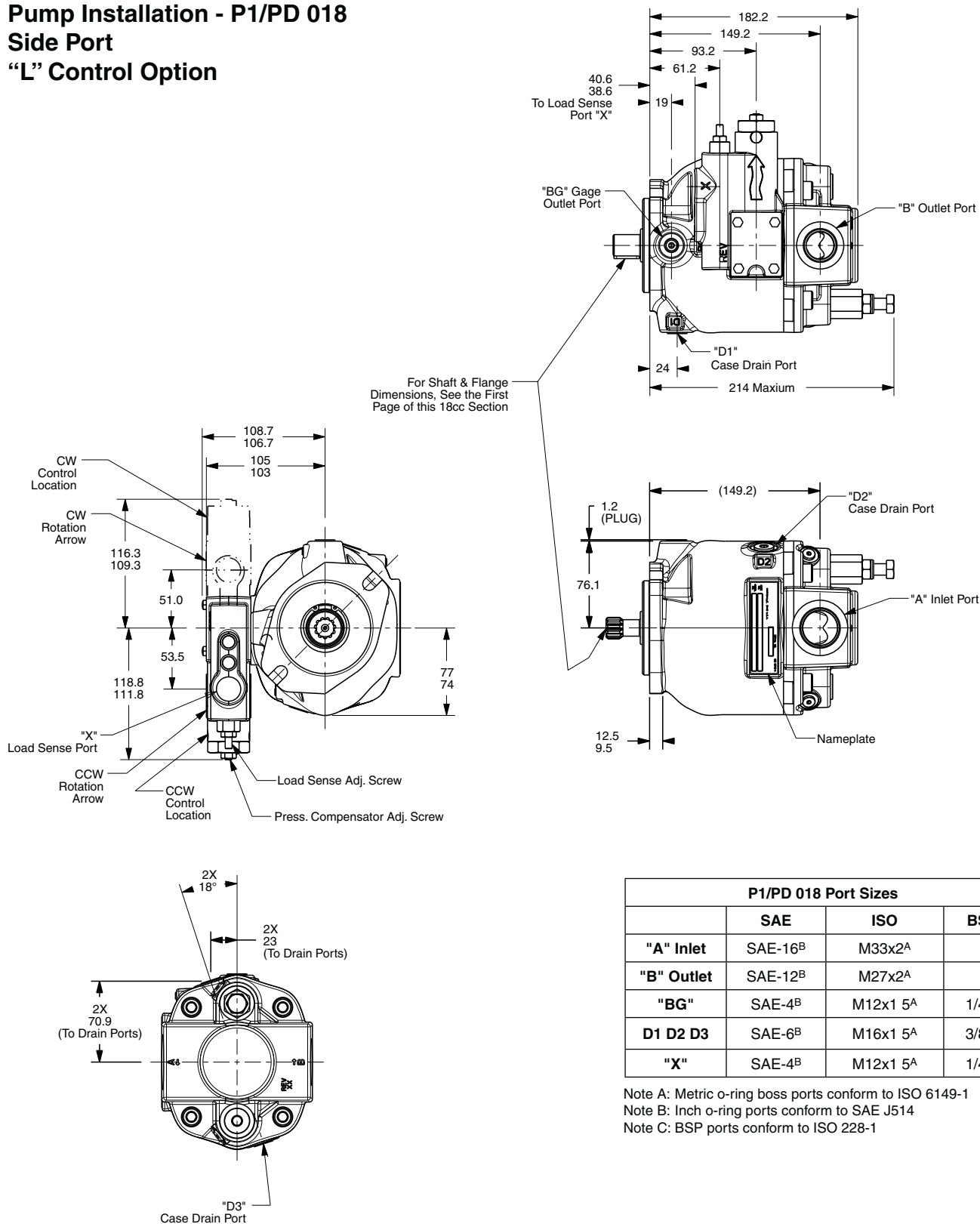


| P1/PD 018 | ISO Key (Code 04)                 | SAE (Code 01 or 02)                                                                                                                                                                                           |
|-----------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AA        | 20.00/19.97                       | 19.05/19.02                                                                                                                                                                                                   |
| AB        | 28.03/28.00                       | 21.13/21.10                                                                                                                                                                                                   |
| AC        | 44.3/43.7                         | 32.8/31.2                                                                                                                                                                                                     |
| AD        | ISO E20N                          | SAE J744 19-1                                                                                                                                                                                                 |
| BA        | N/A                               | 14.82                                                                                                                                                                                                         |
| BB        | N/A                               | 30.00                                                                                                                                                                                                         |
| BC        | N/A                               | 38.7/37.7                                                                                                                                                                                                     |
| BD        | N/A                               | SPLINE: SAE J744<br>SAE 19-4 INVOLUTE SPLINE DATA<br>CLASS 7 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 11<br>PITCH - 16/32<br>PRESSURE ANGLE - 30<br>MAJOR DIAMETER - 19.05/18.49 MM<br>PITCH DIAMETER - 17.463 |
| CA        | ISO 3019-2 100A2                  | SAE J744: JUN96 82-2 (A)                                                                                                                                                                                      |
| CB        | 11.21/10.99                       | 11.21/10.99                                                                                                                                                                                                   |
| CC        | 54.5                              | 53.2                                                                                                                                                                                                          |
| CD        | 109                               | 106.4                                                                                                                                                                                                         |
| CE        | 80.00/79.95<br>ISO 3019-2:2001(E) | 82.55/82.50<br>SAE J744                                                                                                                                                                                       |
| CF        | 7.50/7.00                         | 6.4/6.0                                                                                                                                                                                                       |
| Key Width | 6.00                              | 4.76                                                                                                                                                                                                          |

**Pump Installation - P1/PD 018**  
**End Port**  
**"L" Control Option**



**Pump Installation - P1/PD 018**  
**Side Port**  
**"L" Control Option**



| P1/PD 018 Port Sizes |                     |                      |                   |
|----------------------|---------------------|----------------------|-------------------|
|                      | SAE                 | ISO                  | BSP               |
| "A" Inlet            | SAE-16 <sup>B</sup> | M33x2 <sup>A</sup>   | -                 |
| "B" Outlet           | SAE-12 <sup>B</sup> | M27x2 <sup>A</sup>   | -                 |
| "BG"                 | SAE-4 <sup>B</sup>  | M12x1 5 <sup>A</sup> | 1/4" <sup>C</sup> |
| D1 D2 D3             | SAE-6 <sup>B</sup>  | M16x1 5 <sup>A</sup> | 3/8" <sup>C</sup> |
| "X"                  | SAE-4 <sup>B</sup>  | M12x1 5 <sup>A</sup> | 1/4" <sup>C</sup> |

Note A: Metric o-ring boss ports conform to ISO 6149-1

Note B: Inch o-ring ports conform to SAE J514

Note C: BSP ports conform to ISO 228-1

## Pump Installation - P1/PD 018

### Side Ports with Thru-Drive

### "L" Control Option

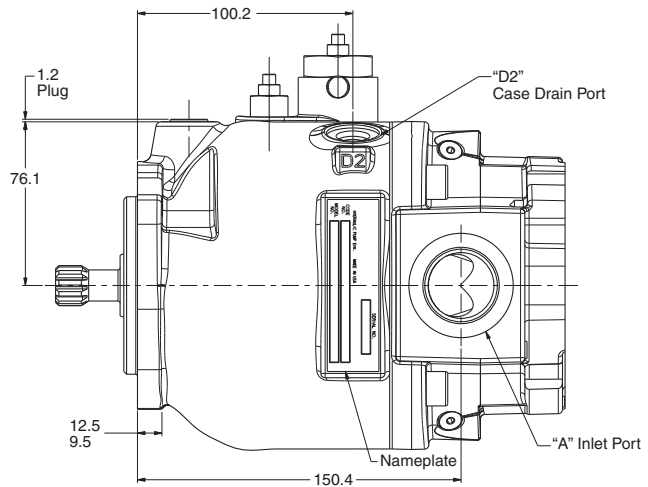
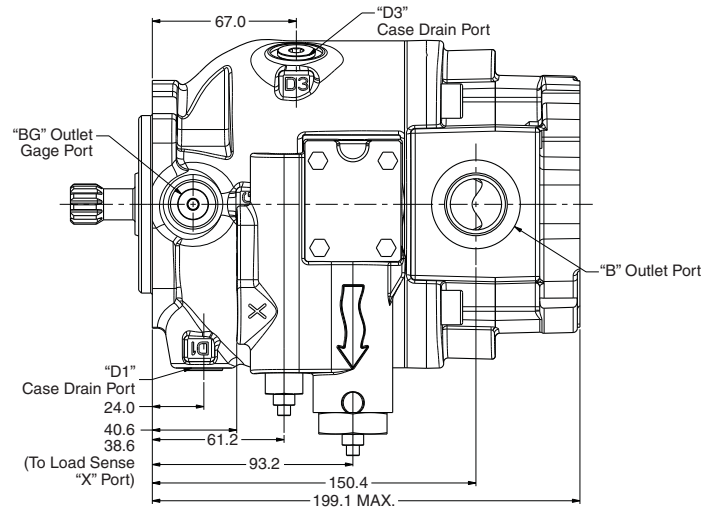
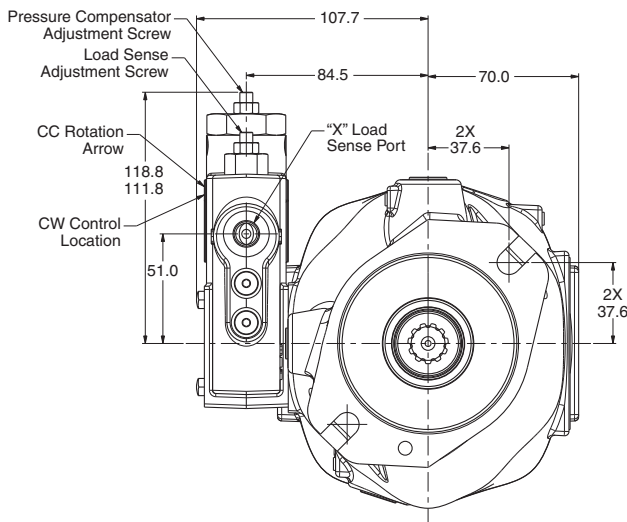
| P1/PD 018 Port Sizes |                     |                      |                   |
|----------------------|---------------------|----------------------|-------------------|
|                      | SAE                 | ISO                  | BSP               |
| "A" Inlet            | SAE-16 <sup>B</sup> | M33x2 <sup>A</sup>   | -                 |
| "B" Outlet           | SAE-12 <sup>B</sup> | M27x2 <sup>A</sup>   | -                 |
| "BG"                 | SAE-4 <sup>B</sup>  | M12x1 5 <sup>A</sup> | 1/4" <sup>C</sup> |
| D1 D2 D3             | SAE-6 <sup>B</sup>  | M16x1 5 <sup>A</sup> | 3/8" <sup>C</sup> |
| "X"                  | SAE-4 <sup>B</sup>  | M12x1 5 <sup>A</sup> | 1/4" <sup>C</sup> |

Note A: Metric o-ring boss port conforms to ISO 6149-1

Note B: Inch o-ring port conforms to SAE J514

Note C: BSP port conforms to ISO 228-1

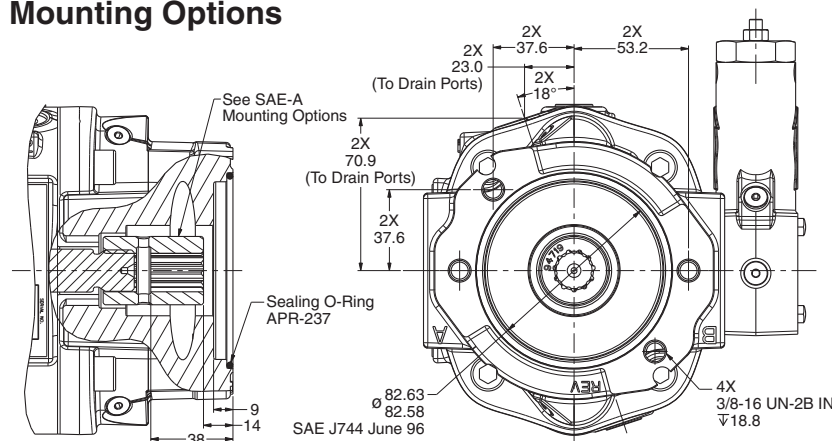
Note: See Page 79 for shaft torq rating



## Pump Installation - P1/PD 018

### Side Ports with Thru-Drive

### Mounting Options



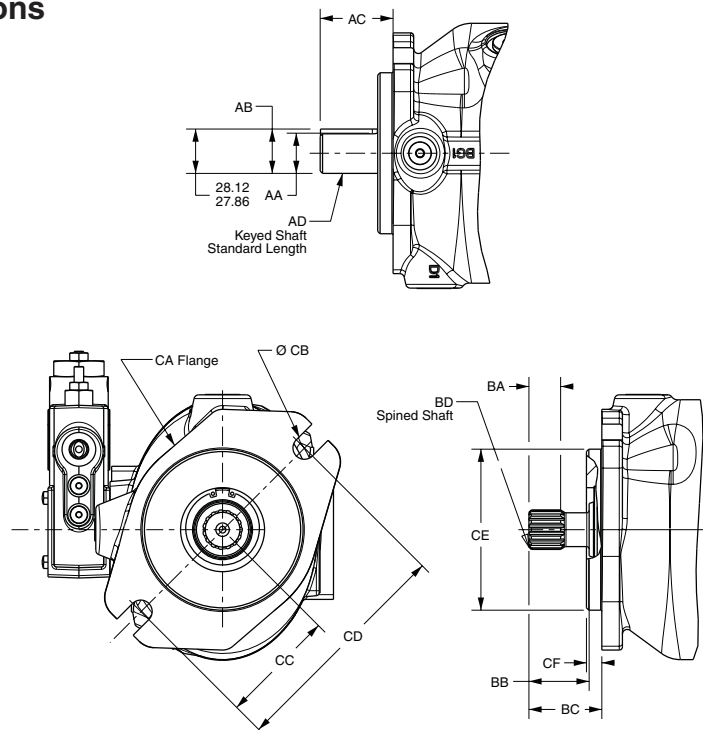
| SAE-A Mounting Options Information |                                   |
|------------------------------------|-----------------------------------|
| Model Number T0"A                  | Model Number T0"H                 |
| Spline: ANSI B92.1 1996            | Spline: ANSI B92.1 1996           |
| SAE 16-4 (A) Involute Spline Data  | SAE 19-4 Involute Spline Data     |
| Class 5 Flat Root Side Fit         | Class 5 Flat Root Side Fit        |
| Number of Teeth - 9                | Number of Teeth - 11              |
| Pitch - 16/32                      | Pitch - 16/32                     |
| Pressure Angle - 30                | Pressure Angle - 30               |
| Minor Diameter - 0.514/0.509 in    | Minor Diameter - 0.6356/0.6306 in |
| Pitch Diameter - 0.5625 in ref     | Pitch Diameter - 0.6875 in ref    |

SECTION B-B

VIEW SHOWING SAE "A"  
MOUNTING PAD

## Pump Installation - P1/PD 028

### Input Shaft Dimensions



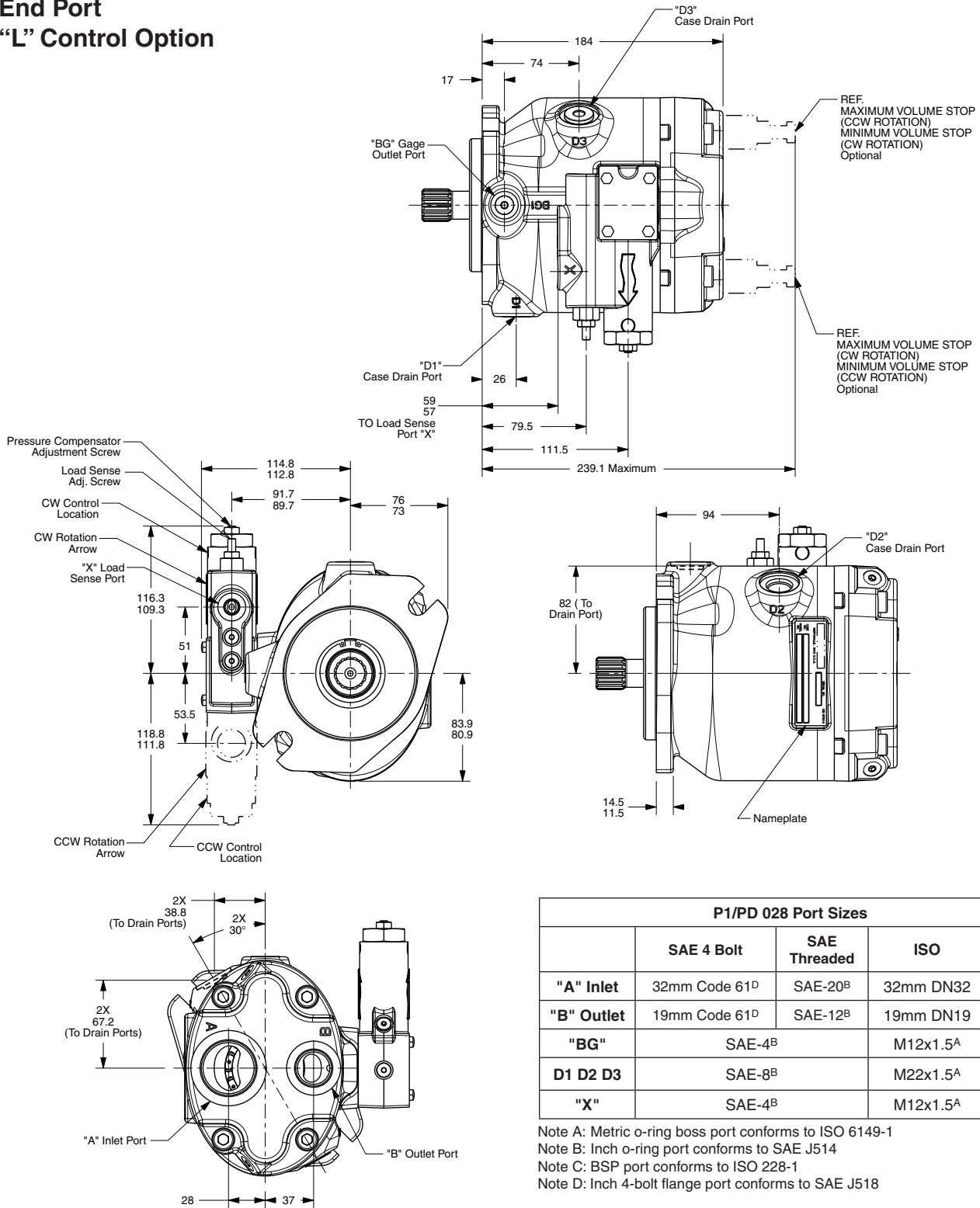
| P1/PD 028 | ISO (Code 04)                      | SAE (Code 01 or 02)                                                                                                                                                                                               | SAE (Code 08)                                                                                                                                                                                                             |
|-----------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AA        | 25.013/24.992                      | 25.40/25.35                                                                                                                                                                                                       | N/A                                                                                                                                                                                                                       |
| AB        | 28.13/27.87                        | 28.23/27.97                                                                                                                                                                                                       | N/A                                                                                                                                                                                                                       |
| AC        | 45.80/44.20                        | 46.3/45.7                                                                                                                                                                                                         | N/A                                                                                                                                                                                                                       |
| AD        | ISO E25N                           | SAE J744 25-1 (B-B)                                                                                                                                                                                               | N/A                                                                                                                                                                                                                       |
| BA        | N/A                                | 20.00                                                                                                                                                                                                             | 15.00                                                                                                                                                                                                                     |
| BB        | N/A                                | 38.00                                                                                                                                                                                                             | 33.00                                                                                                                                                                                                                     |
| BC        | N/A                                | 46.8/45.2                                                                                                                                                                                                         | 41.20                                                                                                                                                                                                                     |
| BD        | N/A                                | SPLINE: SAE J744<br>SAE 25-4 INVOLUTE SPLINE DATA<br>CLASS 7 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 15<br>PITCH - 16/32<br>PRESSURE ANGLE - 30<br>MAJOR DIAMETER - 25.40 / 25.273 MM<br>PITCH DIAMETER - 23.8125 | SPLINE: SAE ASA-B 1960<br>SAE 22-4 (B) INVOLUTE SPLINE DATA<br>CLASS 7 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 13<br>PITCH - 16/32<br>PRESSURE ANGLE - 30<br>MAJOR DIAMETER - 22.22 / 22.66 MM<br>PITCH DIAMETER - 20.638 |
| CA        | ISO 3019-2: 100A2                  | SAE J744: JUN96 101-2 (B)                                                                                                                                                                                         | SAE J744: JUN96 101-2 (B)                                                                                                                                                                                                 |
| CB        | 13.77/13.50                        | 14.65 / 14.27                                                                                                                                                                                                     | 14.65 / 14.27                                                                                                                                                                                                             |
| CC        | 70                                 | 73                                                                                                                                                                                                                | 73                                                                                                                                                                                                                        |
| CD        | 140                                | 146.0                                                                                                                                                                                                             | 146.0                                                                                                                                                                                                                     |
| CE        | 100.00/99.95 ISO<br>3019-2:2001(E) | 101.60/101.55<br>SAE J744                                                                                                                                                                                         | 101.60/101.55                                                                                                                                                                                                             |
| CF        | 9.50/9.00                          | 9.7/9.19                                                                                                                                                                                                          | 9.7/9.19                                                                                                                                                                                                                  |
| Key Width | 8.00                               | 6.35                                                                                                                                                                                                              | N/A                                                                                                                                                                                                                       |



## Pump Installation - P1/PD 028

### End Port

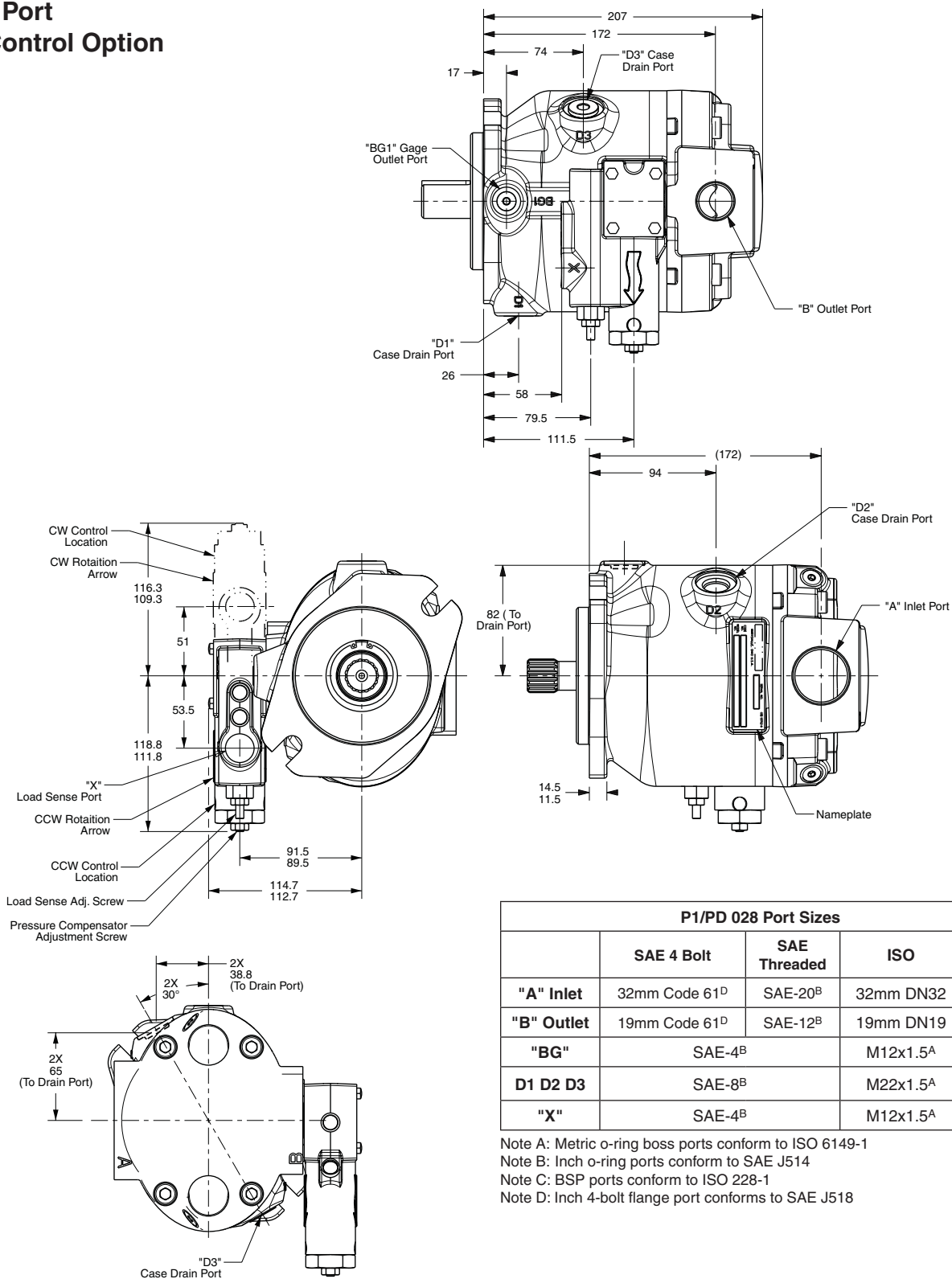
#### “L” Control Option



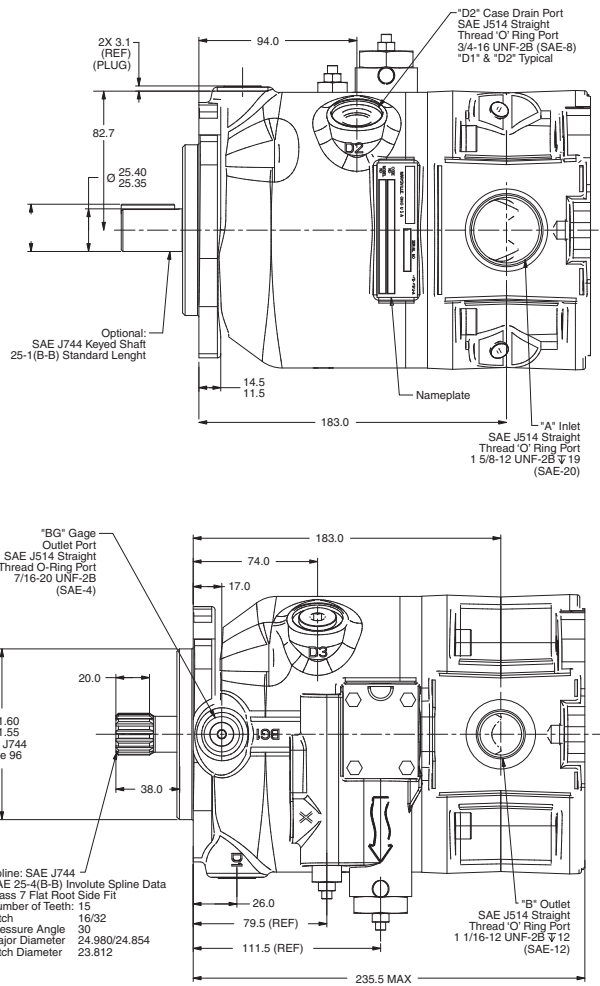
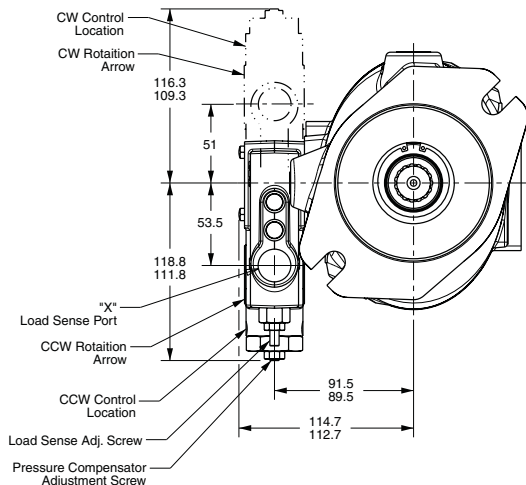
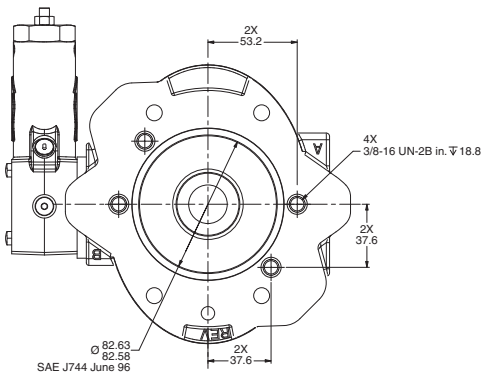
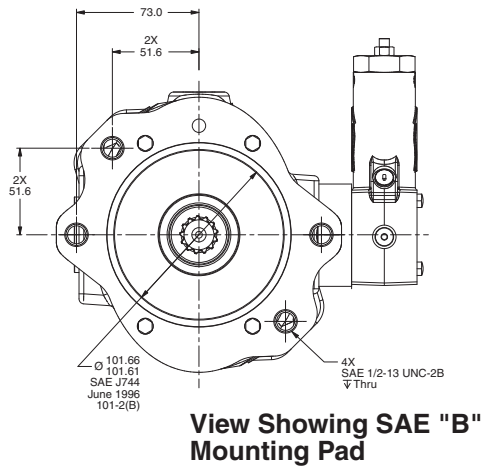
## Pump Installation - P1/PD 028

### Side Port

### “L” Control Option



**Pump Installation - P1/PD 028**  
**Side Ports with Thru-Drive**  
**"L" Control Option**



| P1/PD 028 Port Sizes |                           |                     |                      |                   |
|----------------------|---------------------------|---------------------|----------------------|-------------------|
|                      | SAE 4 Bolt                | SAE Threaded        | ISO                  | BSP               |
| "A" Inlet            | 32mm Code 61 <sup>D</sup> | SAE-20 <sup>B</sup> | 32mm DN32            | -                 |
| "B" Outlet           | 19mm Code 61 <sup>D</sup> | SAE-12 <sup>B</sup> | 19mm DN19            | -                 |
| "BG"                 | SAE-4 <sup>B</sup>        |                     | M12x1.5 <sup>A</sup> | 1/4" <sup>C</sup> |
| D1 D2 D3             | SAE-8 <sup>B</sup>        |                     | M22x1.5 <sup>A</sup> | 1/2" <sup>C</sup> |
| "X"                  | SAE-4 <sup>B</sup>        |                     | M12x1.5 <sup>A</sup> | 1/4" <sup>C</sup> |

Note A: Metric o-ring boss ports conform to ISO 6149-1

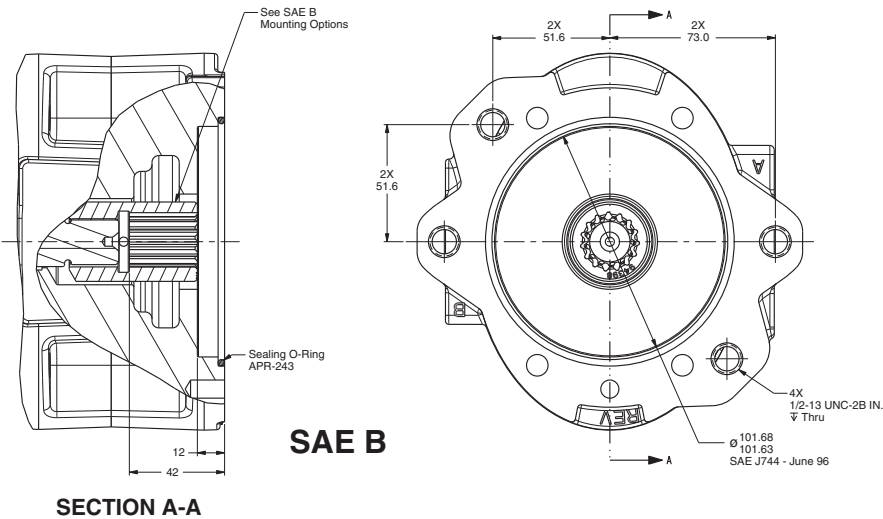
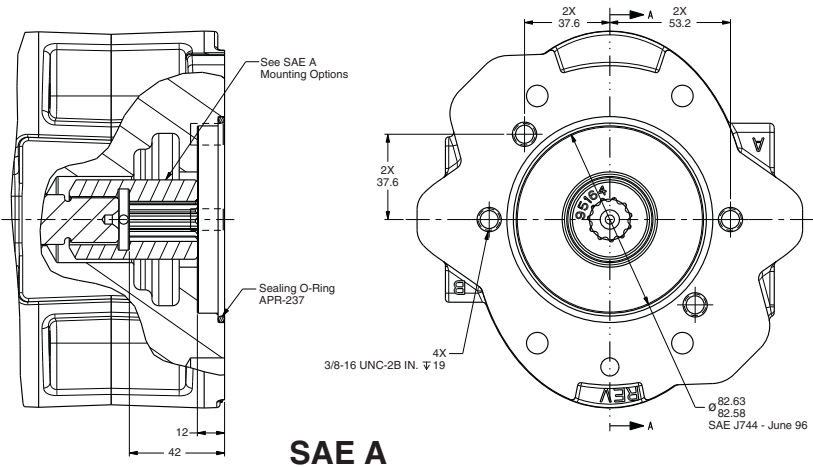
Note B: Inch o-ring ports conform to SAE J514

Note C: BSP ports conform to ISO 228-1

Note D: Inch 4-bolt flange port conforms to SAE J518

Note: See Page 79 for shaft torq rating

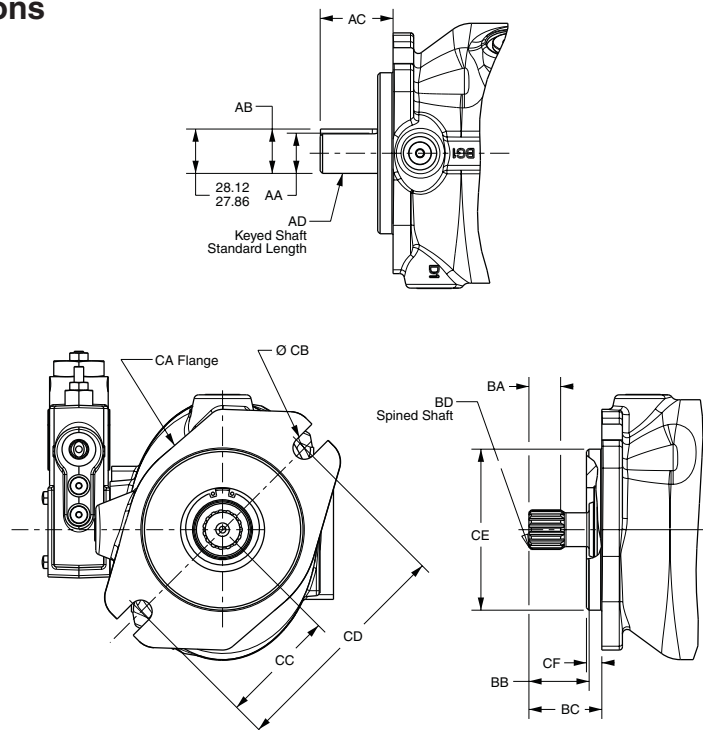
**Pump Installation - P1/PD 028**  
**Side Ports with Thru-Drive**  
**Mounting Options**



| SAE-A Mounting Options Information                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Model Number T0*A<br>Spline: ANSI B92.1 1996<br>SAE 16-4 (A) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 9<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.514/0.509 in<br>Pitch Diameter - 0.5625 in ref  | Model Number T0*H<br>Spline: ANSI B92.1 1996<br>SAE 19-4 Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 11<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.6356/0.6306 in<br>Pitch Diameter - 0.6875 in ref     |
| SAE-B Mounting Options Information                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                        |
| Model Number T0*B<br>Spline: ANSI B92.1 1996<br>SAE 22-4 (B) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 13<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.759/0.754 in<br>Pitch Diameter - 0.8125 in ref | Model Number T0*Q<br>Spline: ANSI B92.1 1996<br>SAE 25-4 (B-B) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 15<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.877/0.882 in<br>Pitch Diameter - 0.9375 in ref |

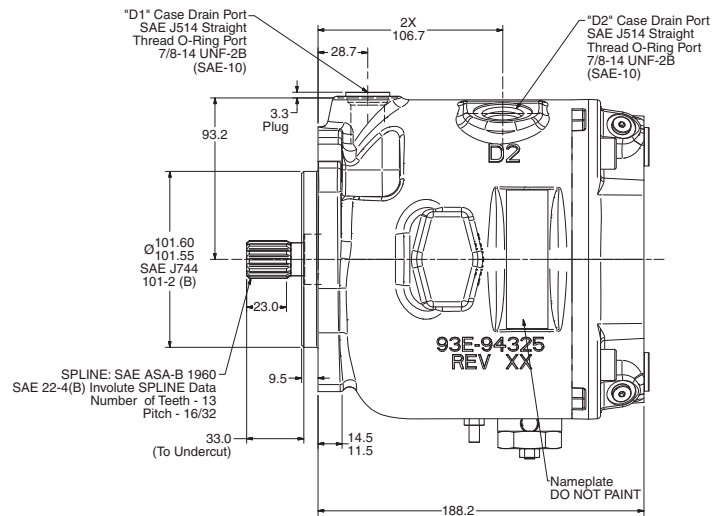
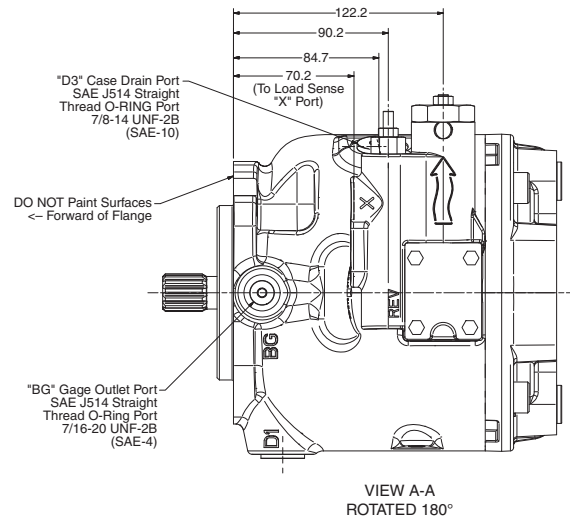
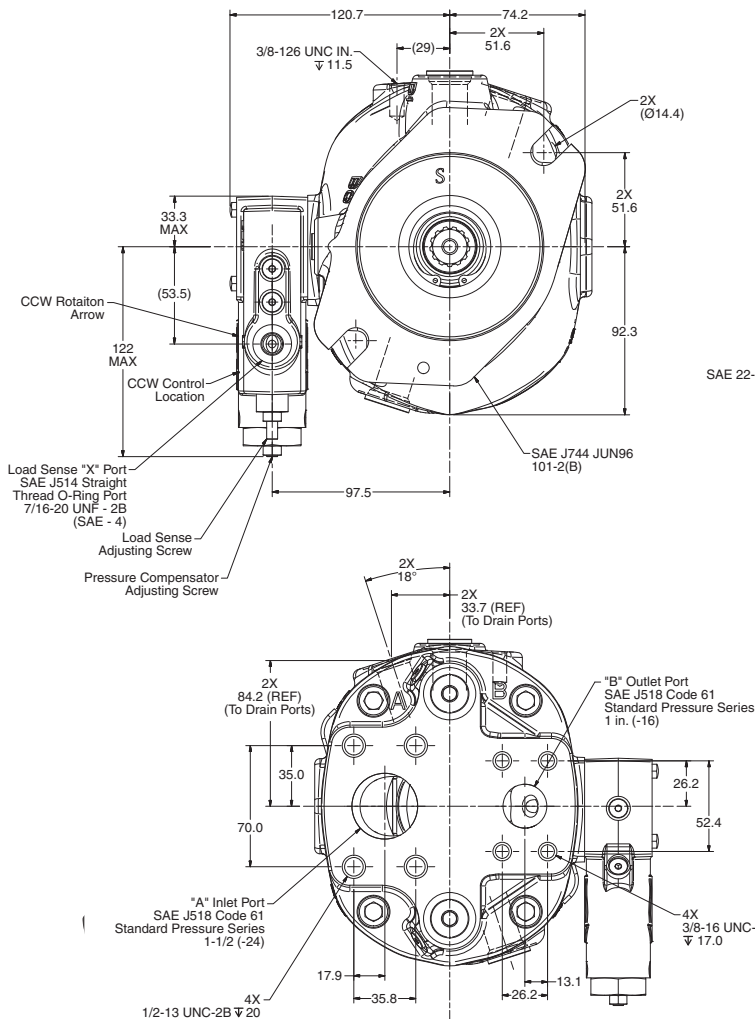
[illegible]

**Pump Installation - P1/PD 045  
Input Shaft Dimensions**



| P1/PD 045 | ISO (Code 04)                      | SAE (Code 01 or 02)                                                                                                                                                                                               | SAE (Code 08)                                                                                                                                                                                                             |
|-----------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AA        | 25.013/24.992                      | 25.40/25.35                                                                                                                                                                                                       | N/A                                                                                                                                                                                                                       |
| AB        | 28.13/27.87                        | 28.23/27.97                                                                                                                                                                                                       | N/A                                                                                                                                                                                                                       |
| AC        | 45.80/44.20                        | 46.3/45.7                                                                                                                                                                                                         | N/A                                                                                                                                                                                                                       |
| AD        | ISO E25N                           | SAE J744 25-1 (B-B)                                                                                                                                                                                               | N/A                                                                                                                                                                                                                       |
| BA        | N/A                                | 31.50                                                                                                                                                                                                             | 15.00                                                                                                                                                                                                                     |
| BB        | N/A                                | 38.00                                                                                                                                                                                                             | 33.00                                                                                                                                                                                                                     |
| BC        | N/A                                | 46.8/45.2                                                                                                                                                                                                         | 41.20                                                                                                                                                                                                                     |
| BD        | N/A                                | SPLINE: SAE J744<br>SAE 25-4 INVOLUTE SPLINE DATA<br>CLASS 7 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 15<br>PITCH - 16/32<br>PRESSURE ANGLE - 30<br>MAJOR DIAMETER - 25.40 / 25.273 MM<br>PITCH DIAMETER - 23.8125 | SPLINE: SAE ASA-B 1960<br>SAE 22-4 (B) INVOLUTE SPLINE DATA<br>CLASS 7 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 13<br>PITCH - 16/32<br>PRESSURE ANGLE - 30<br>MAJOR DIAMETER - 22.22 / 22.66 MM<br>PITCH DIAMETER - 20.638 |
| CA        | ISO 3019-2: 100A2                  | SAE J744: JUN96101-2 (B)                                                                                                                                                                                          | SAE J744: JUN96 101-2 (B)                                                                                                                                                                                                 |
| CB        | 13.77/13.50                        | 14.65 / 14.27                                                                                                                                                                                                     | 14.65 / 14.27                                                                                                                                                                                                             |
| CC        | 70                                 | 73                                                                                                                                                                                                                | 73                                                                                                                                                                                                                        |
| CD        | 140                                | 146.0                                                                                                                                                                                                             | 146.0                                                                                                                                                                                                                     |
| CE        | 100.00/99.95 ISO<br>3019-2:2001(E) | 101.60/101.55<br>SAE J744                                                                                                                                                                                         | 101.60/101.55                                                                                                                                                                                                             |
| CF        | 9.50/9.00                          | 9.7/9.19                                                                                                                                                                                                          | 9.7/9.19                                                                                                                                                                                                                  |
| Key Width | 8.00                               | 6.35                                                                                                                                                                                                              | N/A                                                                                                                                                                                                                       |

**Pump Installation - P1/PD 045**  
**End Port**  
**"L" Control Option**



| P1/PD 045 Port Sizes |                           |              |                        |                   |
|----------------------|---------------------------|--------------|------------------------|-------------------|
|                      | SAE 4 Bolt                | SAE Threaded | ISO                    | BSP               |
| "A" Inlet            | 38mm Code 61 <sup>D</sup> | SAE-24       | 38mm DN38              | -                 |
| "B" Outlet           | 25mm Code 61              | SAE-16       | 25mm DN25 <sup>E</sup> | -                 |
| "BG"                 | SAE-4 <sup>B</sup>        |              | M12x1.5 <sup>A</sup>   | 1/4" <sup>C</sup> |
| D1 D2 D3             | SAE-10 <sup>B</sup>       |              | M22x1.5 <sup>A</sup>   | 1/2" <sup>C</sup> |
| "X"                  | SAE-4 <sup>B</sup>        |              | M12x1.5 <sup>A</sup>   | 1/4" <sup>C</sup> |

Note A: Metric o-ring boss port conforms to ISO 6149-1

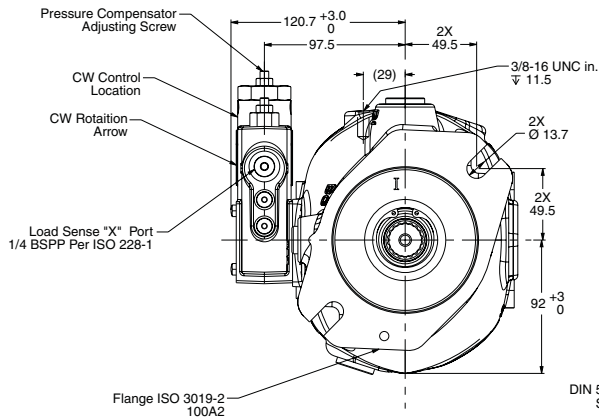
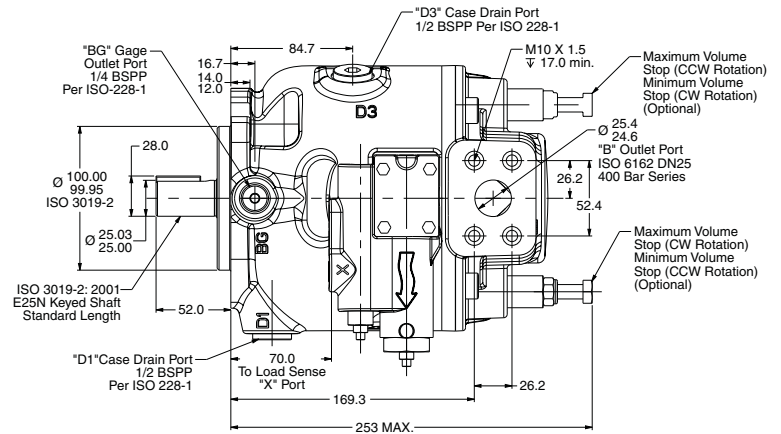
Note B: Inch o-ring port conforms to SAE J514

Note C: BSPP port conforms to ISO 228-1

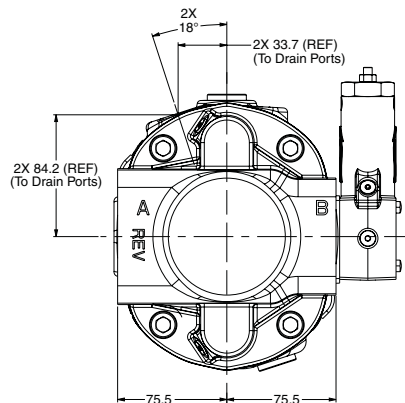
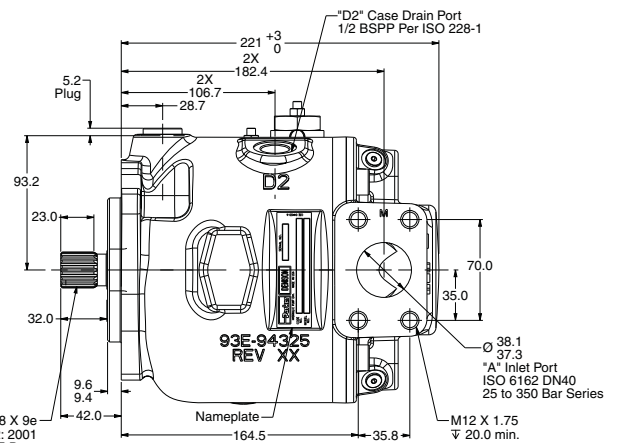
Note D: Inch 4-bolt flange port conforms to SAE J518

Note E: Metric 4-bolt flange port conforms to ISO 6162

**Pump Installation - P1/PD 045**  
**Side Port**  
**"L" Control Option**



DIN 5480 W25 X 1.25 X 30 X 18 X 9e  
SPLINE: E25N ISO 3019-2: 2001  
Metric Involute SPLINE Data  
Flat Root Side Fit  
Number of Teeth - 18  
Module - 1.25  
Pressure Angle - 30  
Major Diameter - 24.75  
Pitch Diameter - 22.50  
Tooth Thickness - 2.613



| P1/PD 045 Port Sizes |                           |              |                        |                   |
|----------------------|---------------------------|--------------|------------------------|-------------------|
|                      | SAE 4 Bolt                | SAE Threaded | ISO                    | BSP               |
| "A" Inlet            | 38mm Code 61 <sup>D</sup> | SAE-24       | 38mm DN38              | -                 |
| "B" Outlet           | 25mm Code 61              | SAE-16       | 25mm DN25 <sup>E</sup> | -                 |
| "BG"                 | SAE-4 <sup>B</sup>        |              | M12x1.5 <sup>A</sup>   | 1/4" <sup>C</sup> |
| D1 D2 D3             | SAE-10 <sup>B</sup>       |              | M22x1.5 <sup>A</sup>   | 1/2" <sup>C</sup> |
| "X"                  | SAE-4 <sup>B</sup>        |              | M12x1.5 <sup>A</sup>   | 1/4" <sup>C</sup> |

Note A: Metric o-ring boss port conforms to ISO 6149-1

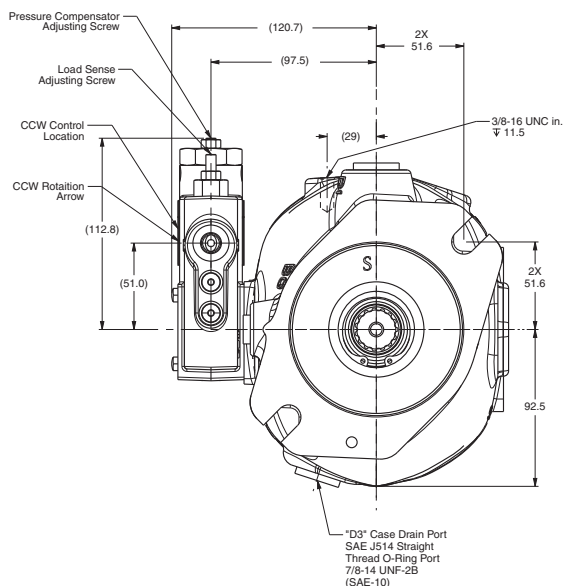
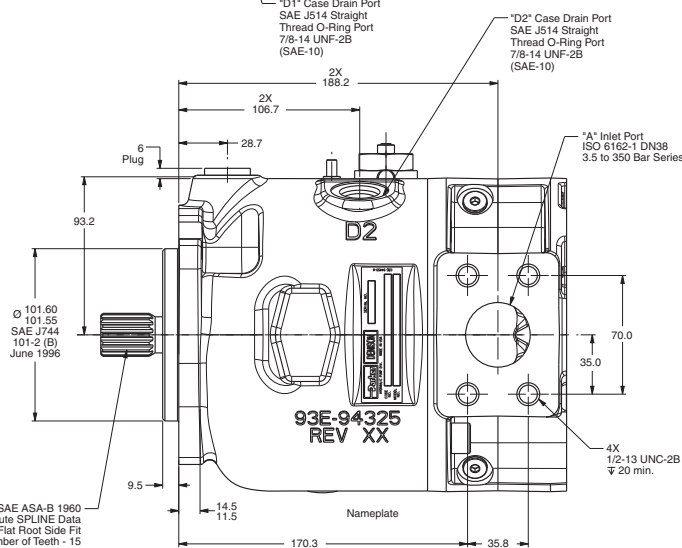
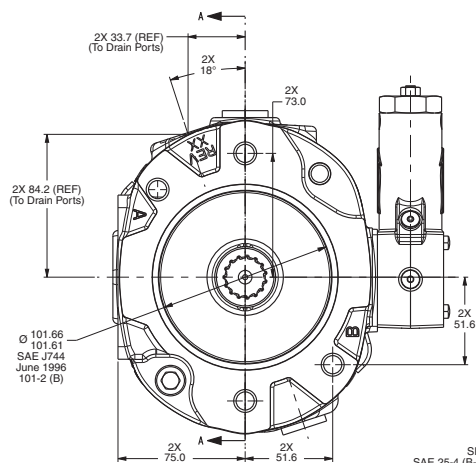
Note B: Inch o-ring port conforms to SAE J514

Note C: BSPP port conforms to ISO 228-1

Note D: Inch 4-bolt flange port conforms to SAE J518

Note E: Metric 4-bolt flange port conforms to ISO 6162

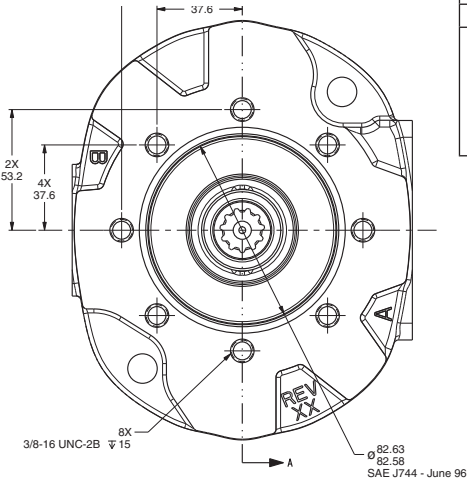
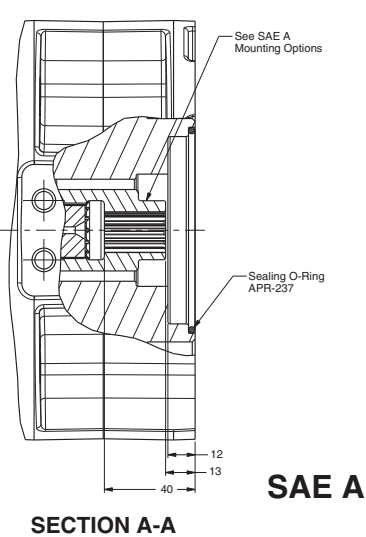


[illegible]

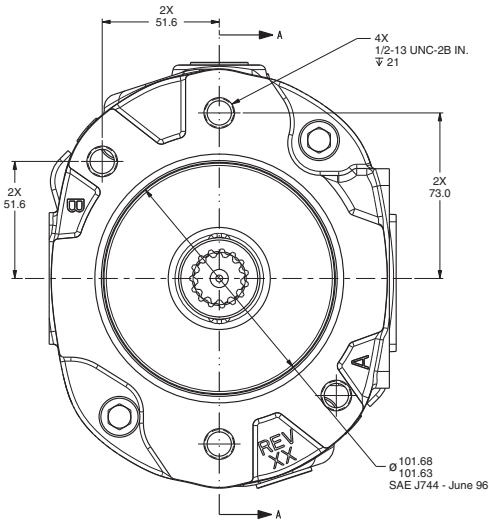
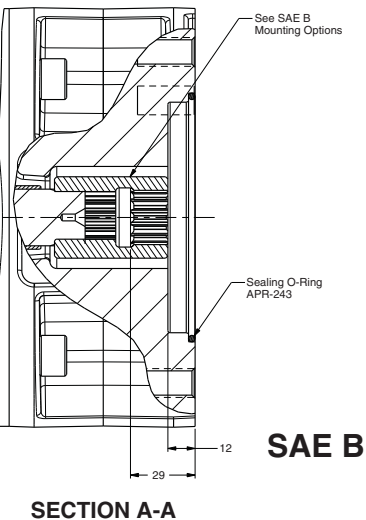
| P1/PD 045 Port Sizes |                           |              |                        |       |
|----------------------|---------------------------|--------------|------------------------|-------|
|                      | SAE 4 Bolt                | SAE Threaded | ISO                    | BSP   |
| "A" Inlet            | 38mm Code 61 <sup>D</sup> | SAE-24       | 38mm DN38              | -     |
| "B" Outlet           | 25mm Code 61              | SAE-16       | 25mm DN25 <sup>E</sup> | -     |
| "BG"                 | SAE-4 <sup>B</sup>        |              | M12x1.5 <sup>A</sup>   | 1/4"C |
| D1 D2 D3             | SAE-10 <sup>B</sup>       |              | M22x1.5 <sup>A</sup>   | 1/2"C |
| "X"                  | SAE-4 <sup>B</sup>        |              | M12x1.5 <sup>A</sup>   | 1/4"C |

Note: See Page 79 for shaft torq rating

Pump Installation - P1/PD 045  
Side Ports with Thru-Drive  
Mounting Options

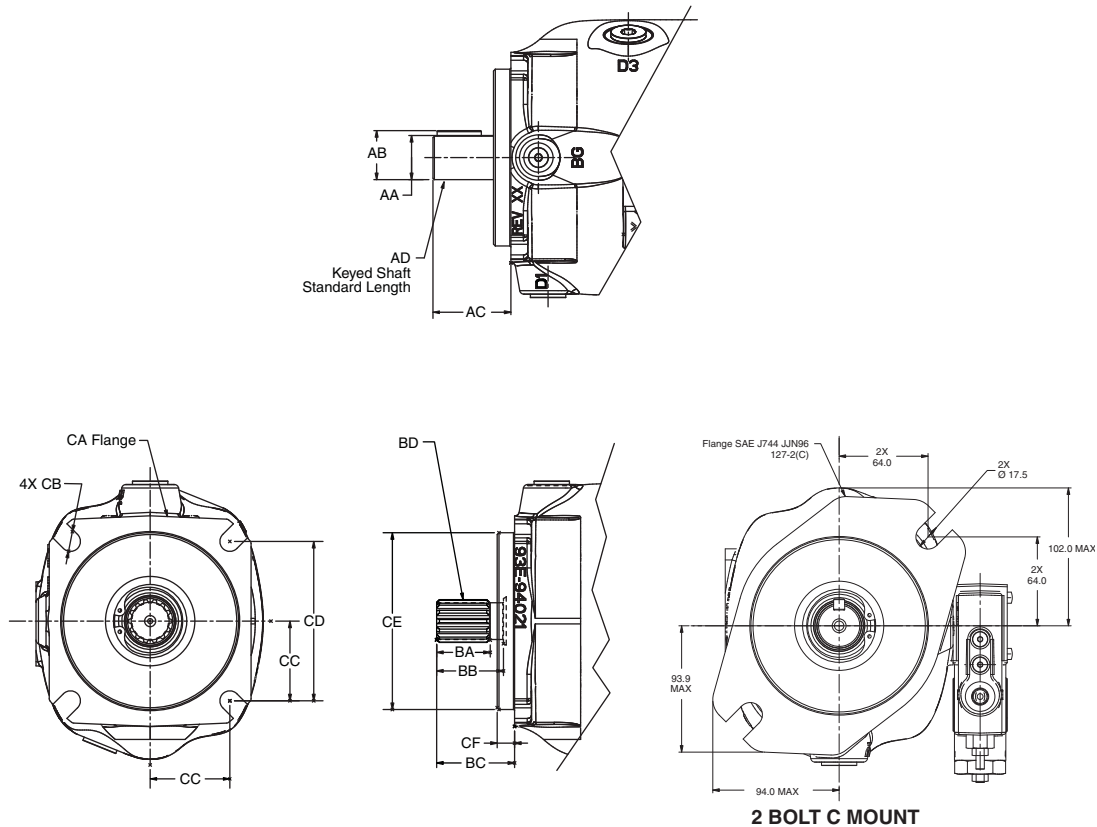


| SAE-A Mounting Options Information                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Model Number T0*A<br>Spline: ANSI B92.1 1996<br>SAE 16-4 (A) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 9<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.514/0.509 in<br>Pitch Diameter - 0.5625 in ref  | Model Number T0*H<br>Spline: ANSI B92.1 1996<br>SAE 19-4 Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 11<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.6356/0.6306 in<br>Pitch Diameter - 0.6875 in ref     |
| SAE-B Mounting Options Information                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                        |
| Model Number T0*B<br>Spline: ANSI B92.1 1996<br>SAE 22-4 (B) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 13<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.759/0.754 in<br>Pitch Diameter - 0.8125 in ref | Model Number T0*Q<br>Spline: ANSI B92.1 1996<br>SAE 25-4 (B-B) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 15<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.877/0.882 in<br>Pitch Diameter - 0.9375 in ref |



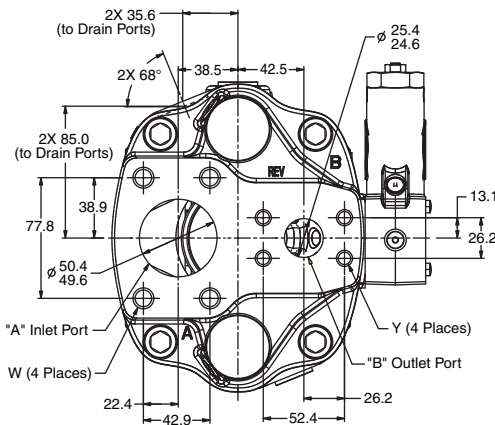
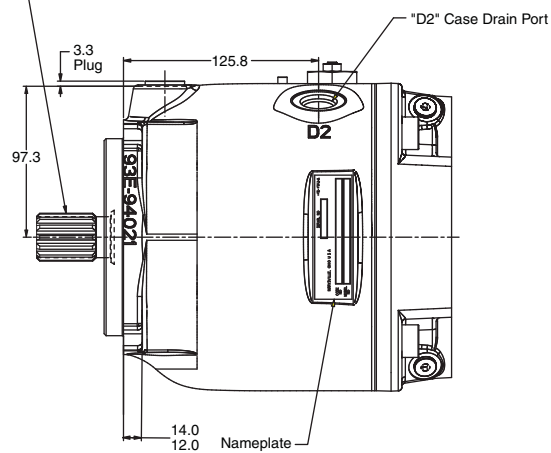
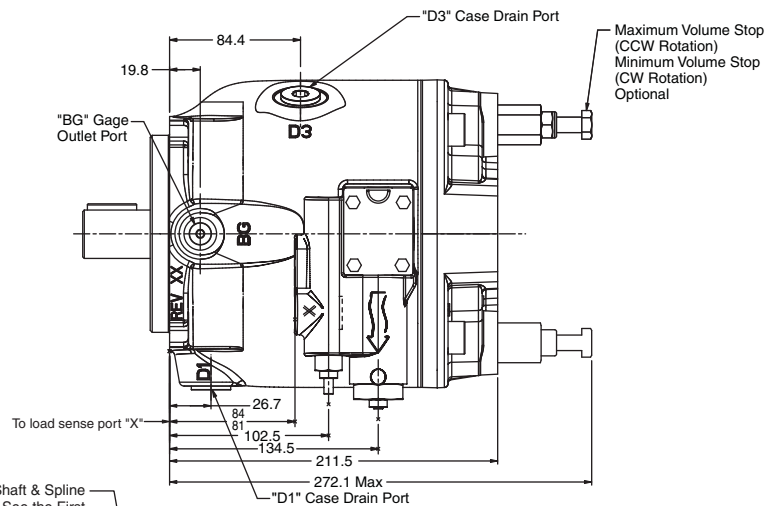
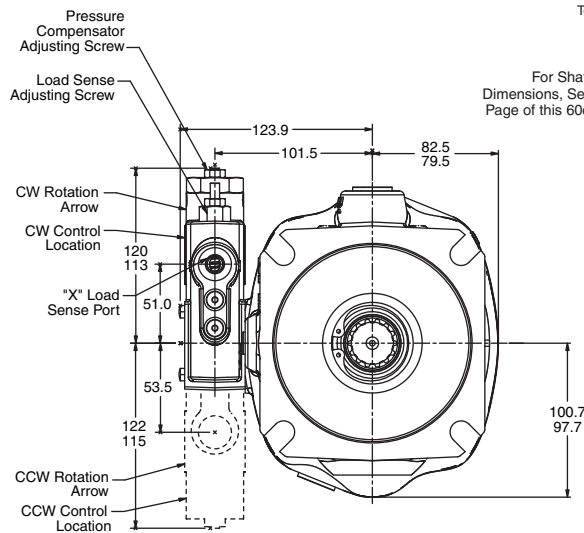
[illegible]

**Pump Installation - P1/PD 060**  
**Input Shaft Dimensions**



| P1/PD 060 | ISO (Code 04)            | SAE (Code 01 or 02)                                                                                                                                                                                                    |
|-----------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AA        | 32.021/32.002            | 31.75/31.70                                                                                                                                                                                                            |
| AB        | 35.00/34.71              | 35.33/35.02                                                                                                                                                                                                            |
| AC        | 68.8/67.2                | 56.8/55.2                                                                                                                                                                                                              |
| AD        | ISO E32N                 | SAE J744 32.1 C                                                                                                                                                                                                        |
| BA        | N/A                      | 38.00                                                                                                                                                                                                                  |
| BB        | N/A                      | 48.00                                                                                                                                                                                                                  |
| BC        | N/A                      | 56.8/55.2                                                                                                                                                                                                              |
| BD        | N/A                      | SPLINE: SAE ASA-B 1960<br>SAE 32-4C INVOLUTE SPLINE DATA<br>CLASS 2 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 14<br>PITCH - 12/24<br>PRESSURE ANGLE - 30<br>MAJOR DIAMETER - 1.2268/1.4763 IN<br>PITCH DIAMETER - 1.1666 |
| CA        | ISO 3019/202991 125B4SW  | SAE J744 JUN96 127-4 C                                                                                                                                                                                                 |
| CB        | 13.77/13.50              | 14.4 DIA.                                                                                                                                                                                                              |
| CC        | 56.6                     | 57.2                                                                                                                                                                                                                   |
| CD        | 113.2 SQUARE             | 114.5 SQUARE                                                                                                                                                                                                           |
| CE        | 125.00/124.94 ISO 3019/2 | 127.00/126.95 SAE J744                                                                                                                                                                                                 |
| CF        | 9.5/9.0                  | 12.7/12.2                                                                                                                                                                                                              |
| Key Width | 10.00                    | 7.94                                                                                                                                                                                                                   |

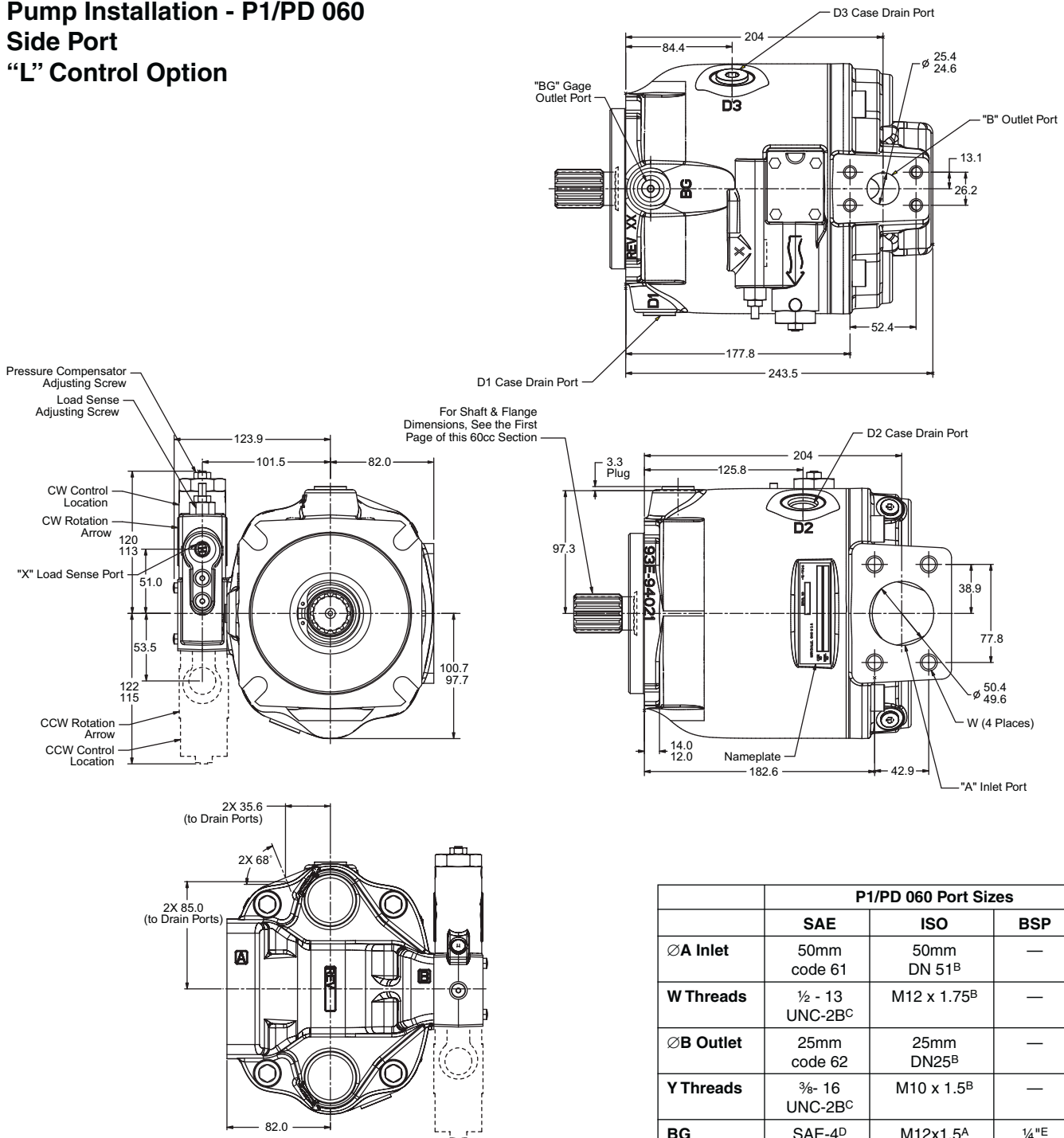
**Pump Installation - P1/PD 060**  
**End Port**  
**"L" Control Option**



|           | P1/PD 060 Port Sizes          |                            |                 |
|-----------|-------------------------------|----------------------------|-----------------|
|           | SAE                           | ISO                        | BSP             |
| ØA Inlet  | 50mm<br>code 62               | 50mm<br>DN 51 <sup>B</sup> | —               |
| W Threads | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet | 25mm<br>code 62               | 25mm<br>DN25 <sup>B</sup>  | —               |
| Y Threads | ¾ - 16<br>UNC-2B <sup>C</sup> | M10 x 1.5 <sup>B</sup>     | —               |
| BG        | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3  | SAE-10 <sup>D</sup>           | M22x1.5 <sup>A</sup>       | ¾" <sup>E</sup> |
| X         | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1  
Note B: Metric 4-bolt flange port conforms to ISO 6162  
Note C: Inch 4-bolt flange port conforms to SAE J518  
Note D: Inch o-ring boss port conforms to SAE J514  
Note E: BSP boss port conforms to ISO 228-1

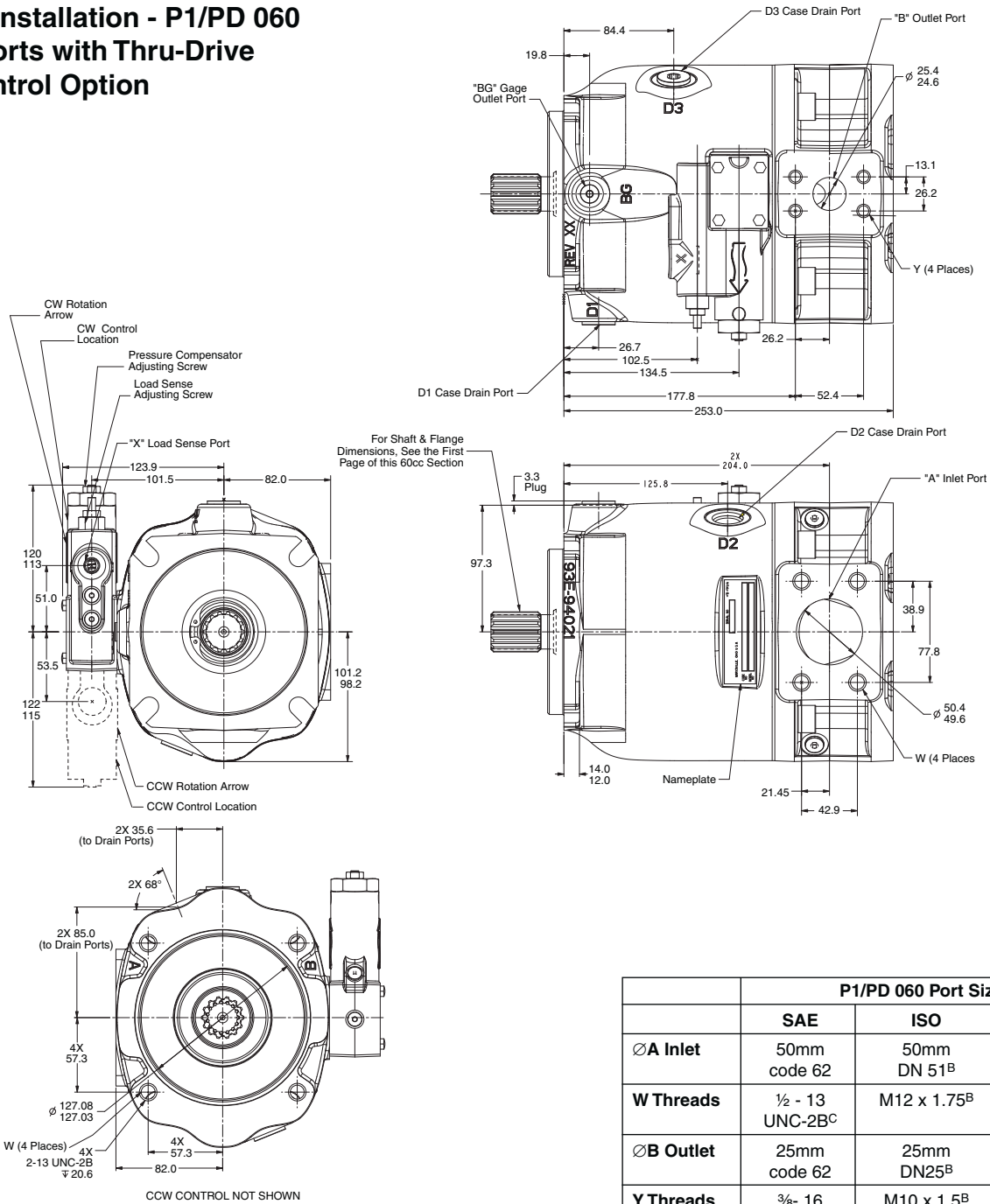
**Pump Installation - P1/PD 060**  
**Side Port**  
**"L" Control Option**



| P1/PD 060 Port Sizes |                               |                            |                 |
|----------------------|-------------------------------|----------------------------|-----------------|
|                      | SAE                           | ISO                        | BSP             |
| ØA Inlet             | 50mm<br>code 61               | 50mm<br>DN 51 <sup>B</sup> | —               |
| W Threads            | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet            | 25mm<br>code 62               | 25mm<br>DN25 <sup>B</sup>  | —               |
| Y Threads            | ¾ - 16<br>UNC-2B <sup>C</sup> | M10 x 1.5 <sup>B</sup>     | —               |
| BG                   | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3             | SAE-10 <sup>D</sup>           | M22x1.5 <sup>A</sup>       | ¾" <sup>E</sup> |
| X                    | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1  
 Note B: Metric 4-bolt flange port conforms to ISO 6162  
 Note C: Inch 4-bolt flange port conforms to SAE J518  
 Note D: Inch o-ring boss port conforms to SAE J514  
 Note E: BSP boss port conforms to ISO 228-1

**Pump Installation - P1/PD 060**  
**Side Ports with Thru-Drive**  
**“L” Control Option**



|           | P1/PD 060 Port Sizes          |                            |                 |
|-----------|-------------------------------|----------------------------|-----------------|
|           | SAE                           | ISO                        | BSP             |
| ØA Inlet  | 50mm<br>code 62               | 50mm<br>DN 51 <sup>B</sup> | —               |
| W Threads | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet | 25mm<br>code 62               | 25mm<br>DN25 <sup>B</sup>  | —               |
| Y Threads | ¾ - 16<br>UNC-2B <sup>C</sup> | M10 x 1.5 <sup>B</sup>     | —               |
| BG        | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3  | SAE-10 <sup>D</sup>           | M22x1.5 <sup>A</sup>       | ¾" <sup>E</sup> |
| X         | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1

Note B: Metric 4-bolt flange port conforms to ISO 6162

Note C: Inch 4-bolt flange port conforms to SAE J518

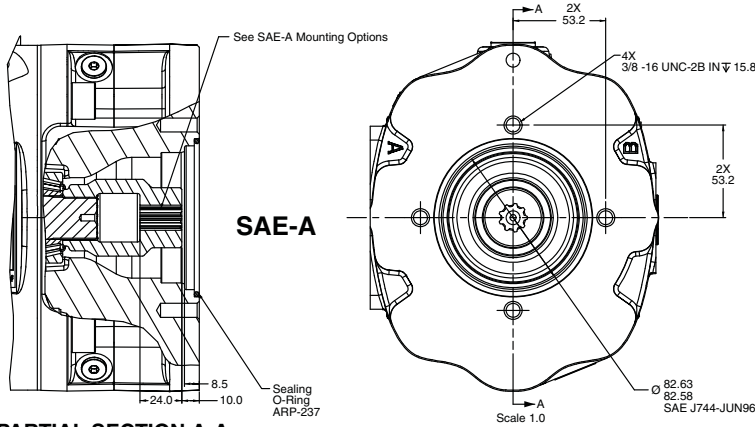
Note D: Inch o-ring boss port conforms to SAE J514

Note E: BSP boss port conforms to ISO 228-1

Note: See Page 79 for shaft torq rating



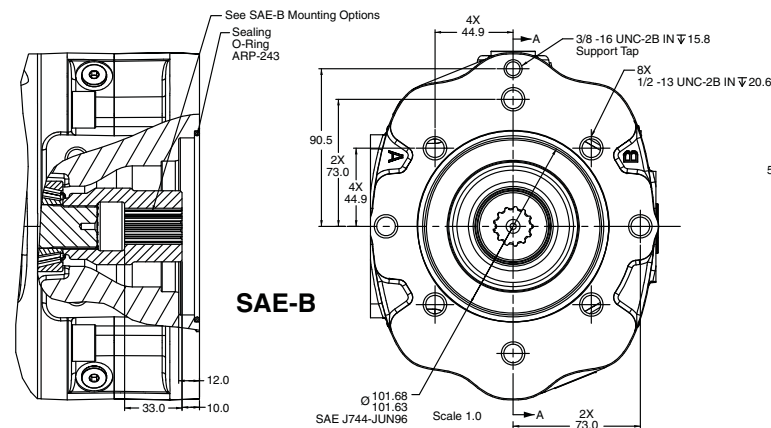
**Pump Installation - P1/PD 060**  
**Side Ports with Thru-Drive**  
**Mounting Options**



**PARTIAL SECTION A-A**

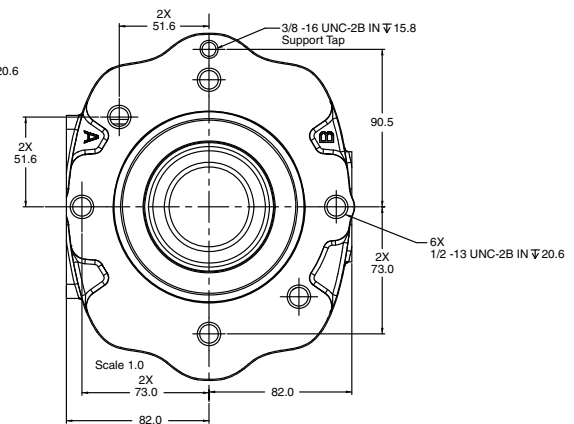
**SAE 16-4 (A) (T0\*A) & SAE 19-4 (T0\*H)**  
**VERTICAL OR HORIZONTAL 2 BOLT**

| SAE A Mounting Options Information                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Model Number T0*A<br>Spline: ANSI B92.1 1996<br>SAE 16-4 (A) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 9<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.514/0.509 in<br>Pitch Diameter - 0.5625 in ref         | Model Number T0*H<br>Spline: ANSI B92.1 1996<br>SAE 19-4 Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 11<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.6356/0.6306 in<br>Pitch Diameter - 0.6875 in ref            |
| SAE B Mounting Options Information                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                               |
| Model Number T0*B & T0*J<br>Spline: ANSI B92.1 1996<br>SAE 22-4 (B) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 13<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.759/0.754 in<br>Pitch Diameter - 0.8125 in ref | Model Number T0*Q & T0*K<br>Spline: ANSI B92.1 1996<br>SAE 25-4 (B-B) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 15<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.877/0.882 in<br>Pitch Diameter - 0.9375 in ref |
| SAE C Mounting Options Information                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                               |
| Model Number T0*C<br>Spline: ANSI B92.1 1996<br>SAE 32-4 (C) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 14                                                                                                                     | Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 1.087/1.092 in<br>Pitch Diameter - 1.1667 in ref                                                                                                                                                     |

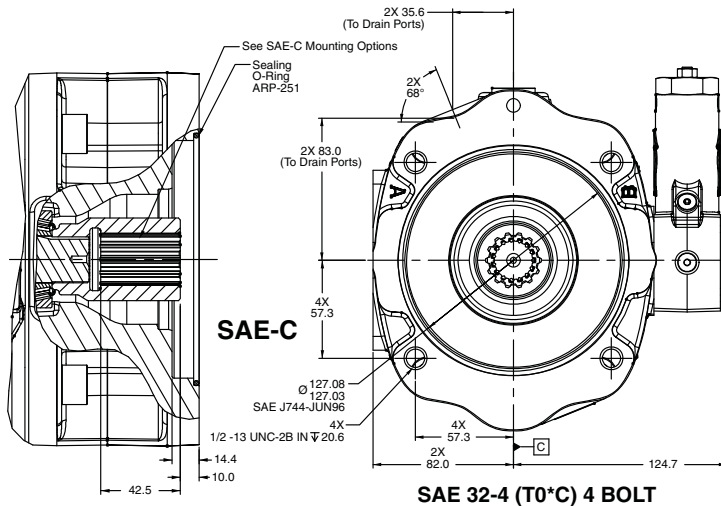


**PARTIAL SECTION A-A**

**SAE 22-4 (B) (T0\*B) & SAE 25-4 (B-B) (T0\*Q)**  
**4 BOLT & VERTICAL OR HORIZONTAL 2 BOLT**



**SAE 22-4 (B) (T0\*J) & SAE 25-4 (B-B) (T0\*K)**  
**2 BOLT DIAGONAL & VERTICAL OR HORIZONTAL 2 BOLT**



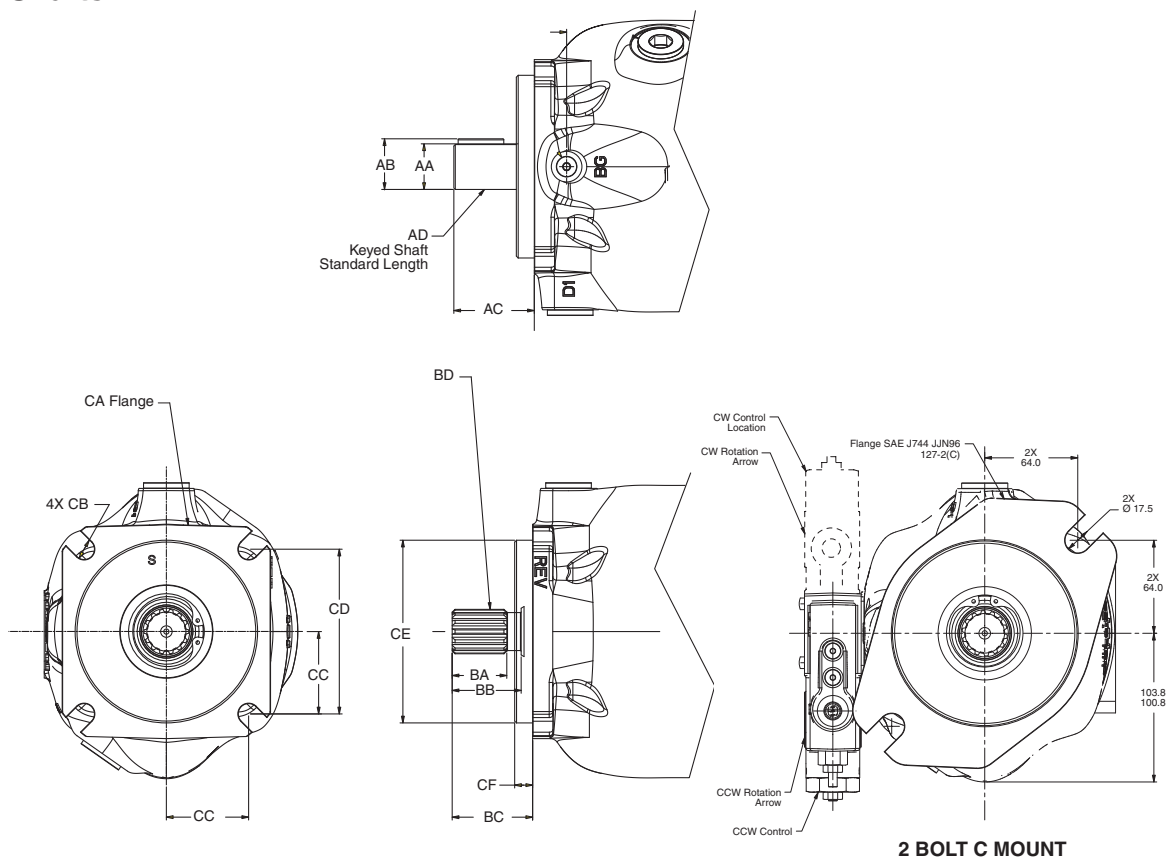
**PARTIAL SECTION A-A**

**SAE 32-4 (T0\*C) 4 BOLT**



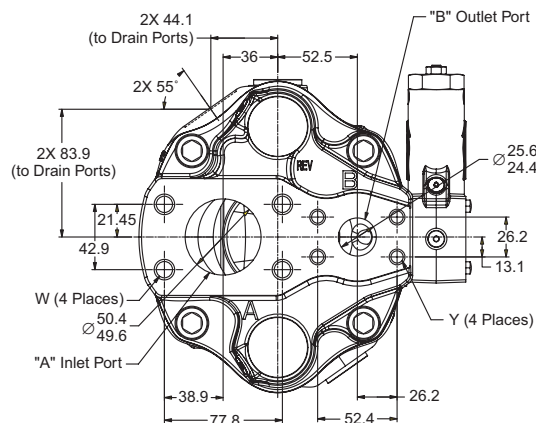
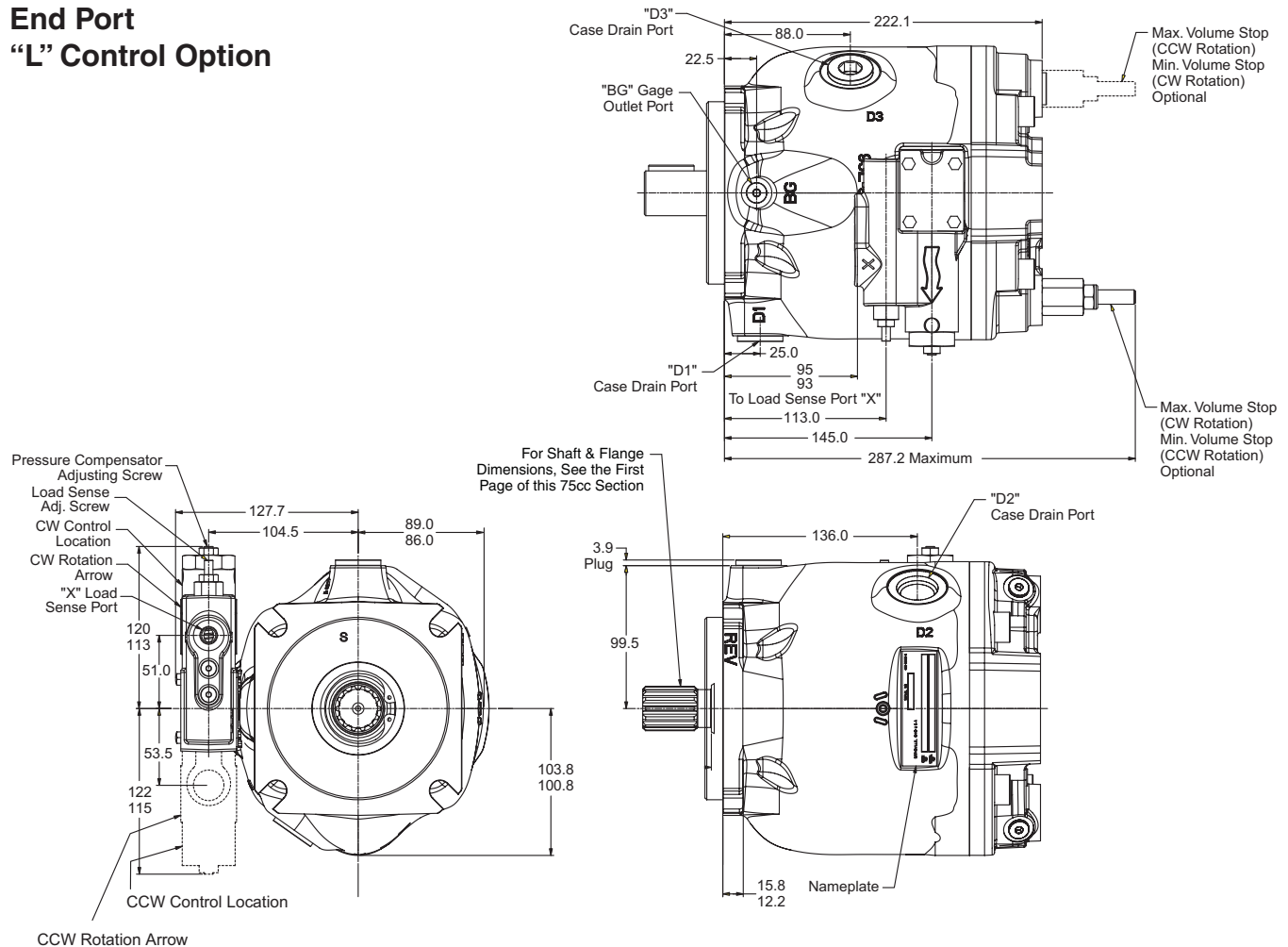
[illegible]

## Pump Installation - P1/PD 075 Input Shafts



| P1/PD 075 | ISO (Code 04)            | SAE (Code 01 or 02)                                                                                                                                                                                                       |
|-----------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AA        | 32.021/32.002            | 31.75/31.70                                                                                                                                                                                                               |
| AB        | 35.00/34.71              | 35.33/35.02                                                                                                                                                                                                               |
| AC        | 68.8/67.2                | 56.8/55.2                                                                                                                                                                                                                 |
| AD        | ISO E32N                 | SAE J744 32.1 C                                                                                                                                                                                                           |
| BA        | N/A                      | 38.00                                                                                                                                                                                                                     |
| BB        | N/A                      | 48.00                                                                                                                                                                                                                     |
| BC        | N/A                      | 56.8/55.2                                                                                                                                                                                                                 |
| BD        | N/A                      | SPLINE: SAE ASA-B 1960<br>SAE 32-4 (C) INVOLUTE SPLINE DATA<br>CLASS 2 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 14<br>PITCH - 12/24<br>PRESSURE ANGLE - 30<br>MAJOR DIAMETER - 1.2268/1.4763 IN<br>PITCH DIAMETER - 1.1666 |
| CA        | ISO 3019/202991 125B4SW  | SAE J744 JUN96 127-4 C                                                                                                                                                                                                    |
| CB        | 13.77/13.50              | 14.4 DIA.                                                                                                                                                                                                                 |
| CC        | 56.6                     | 57.2                                                                                                                                                                                                                      |
| CD        | 113.2 SQUARE             | 114.5 SQUARE                                                                                                                                                                                                              |
| CE        | 125.00/124.94 ISO 3019/2 | 127.00/126.95 SAE J744                                                                                                                                                                                                    |
| CF        | 9.5/9.0                  | 12.7/12.2                                                                                                                                                                                                                 |
| Key Width | 10.00                    | 7.94                                                                                                                                                                                                                      |

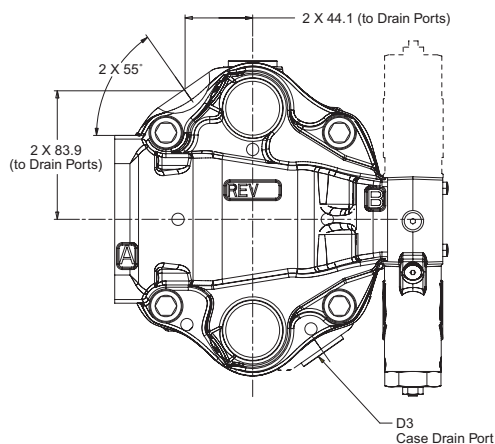
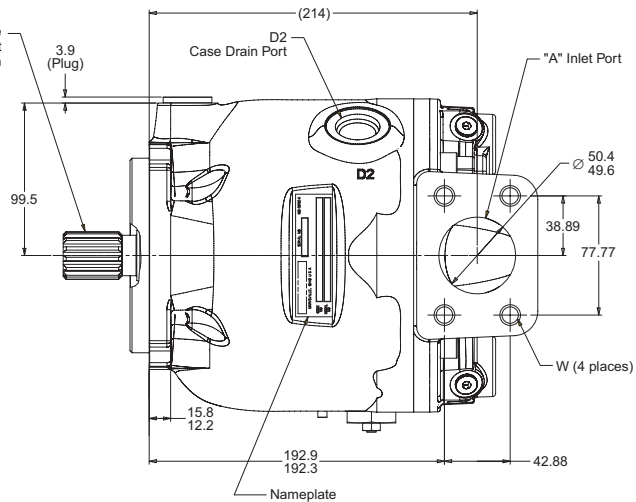
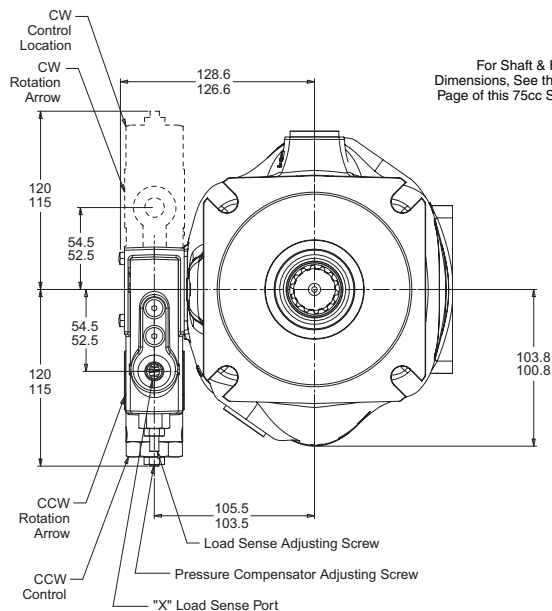
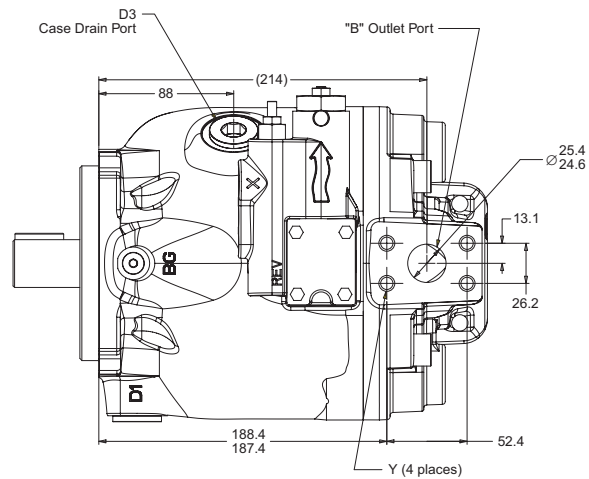
**Pump Installation - P1/PD 075**  
**End Port**  
**"L" Control Option**



| P1/PD 075 Port Sizes |                               |                            |                 |
|----------------------|-------------------------------|----------------------------|-----------------|
|                      | SAE                           | ISO                        | BSP             |
| ØA Inlet             | 50mm<br>code 61 <sup>C</sup>  | 50mm<br>DN 51 <sup>B</sup> | —               |
| W Threads            | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet            | 25mm<br>code 61 <sup>C</sup>  | 25mm<br>DN25 <sup>B</sup>  | —               |
| Y Threads            | ¾ - 16<br>UNC-2B <sup>C</sup> | M10 x 1.5 <sup>B</sup>     | —               |
| BG                   | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3             | SAE-12 <sup>D</sup>           | M27x2 <sup>A</sup>         | ¾" <sup>E</sup> |
| X                    | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1  
 Note B: Metric 4-bolt flange port conforms to ISO 6162  
 Note C: Inch 4-bolt flange port conforms to SAE J518  
 Note D: Inch o-ring boss port conforms to SAE J514  
 Note E: BSP boss port conforms to ISO 228-1

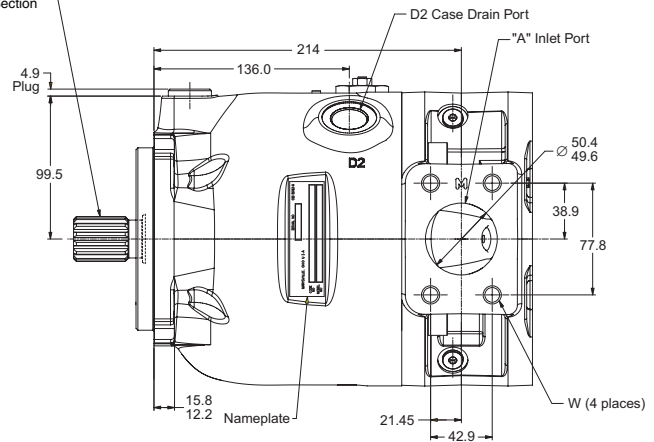
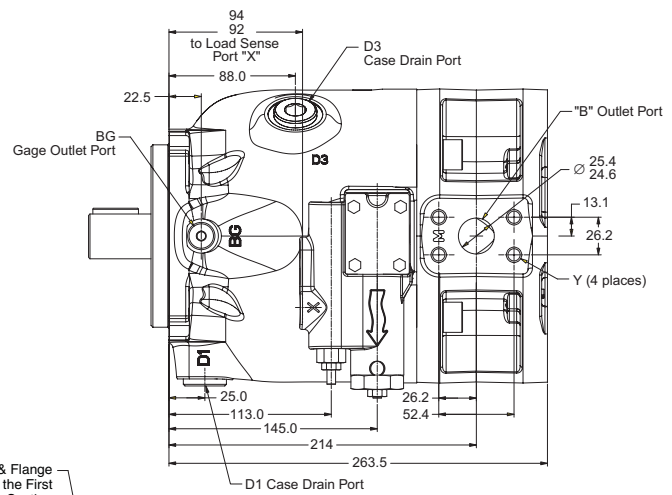
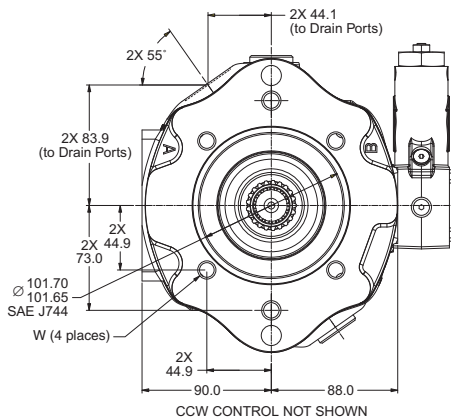
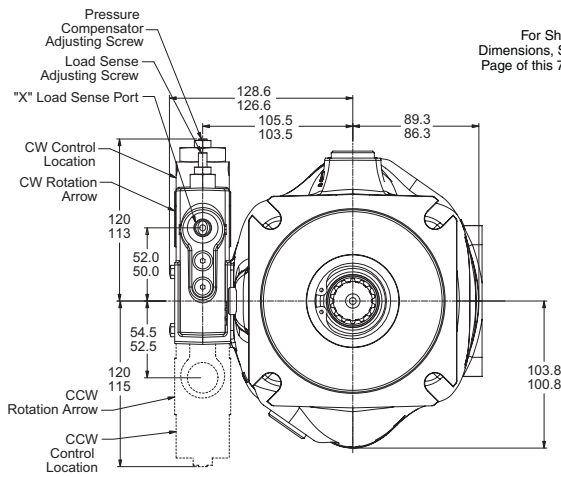
**Pump Installation - P1/PD 075**  
**Side Port**  
**“L” Control Option**



| P1/PD 075 Port Sizes |                               |                            |                 |
|----------------------|-------------------------------|----------------------------|-----------------|
|                      | SAE                           | ISO                        | BSP             |
| ØA Inlet             | 50mm<br>code 61 <sup>C</sup>  | 50mm<br>DN 51 <sup>B</sup> | —               |
| W Threads            | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet            | 25mm<br>code 61 <sup>C</sup>  | 25mm<br>DN25 <sup>B</sup>  | —               |
| Y Threads            | ¾ - 16<br>UNC-2B <sup>C</sup> | M10 x 1.5 <sup>B</sup>     | —               |
| BG                   | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3             | SAE-12 <sup>D</sup>           | M27x2 <sup>A</sup>         | ¾" <sup>E</sup> |
| X                    | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1  
 Note B: Metric 4-bolt flange port conforms to ISO 6162  
 Note C: Inch 4-bolt flange port conforms to SAE J518  
 Note D: Inch o-ring boss port conforms to SAE J514  
 Note E: BSP boss port conforms to ISO 228-1

**Pump Installation - P1/PD 075**  
**Side Ports with Thru-Drive**  
**"L" Control Option**



| P1/PD 075 Port Sizes |                               |                            |                 |
|----------------------|-------------------------------|----------------------------|-----------------|
|                      | SAE                           | ISO                        | BSP             |
| ØA Inlet             | 50mm<br>code 61 <sup>C</sup>  | 50mm<br>DN 51 <sup>B</sup> | —               |
| W Threads            | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet            | 25mm<br>code 61 <sup>C</sup>  | 25mm<br>DN25 <sup>B</sup>  | —               |
| Y Threads            | ¾ - 16<br>UNC-2B <sup>C</sup> | M10 x 1.5 <sup>B</sup>     | —               |
| BG                   | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3             | SAE-12 <sup>D</sup>           | M27x2 <sup>A</sup>         | ¾" <sup>E</sup> |
| X                    | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1

Note B: Metric 4-bolt flange port conforms to ISO 6162

Note C: Inch 4-bolt flange port conforms to SAE J518

Note D: Inch o-ring boss port conforms to SAE J514

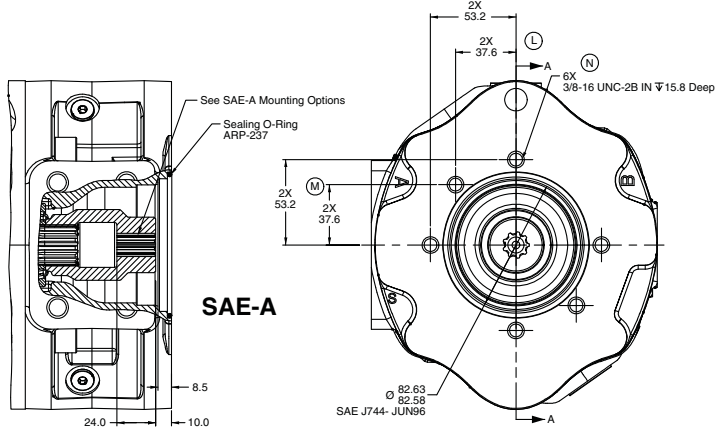
Note E: BSP boss port conforms to ISO 228-1

Note: See Page 79 for shaft torq rating

## Pump Installation - P1/PD 075

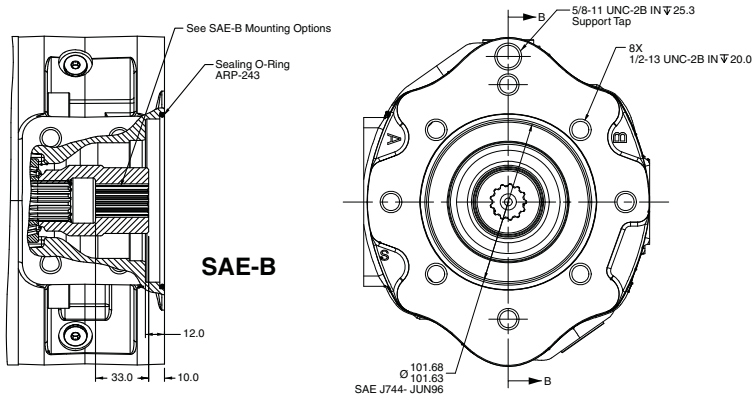
### Side Ports with Thru-Drive

### Mounting Options



**SAE-A**

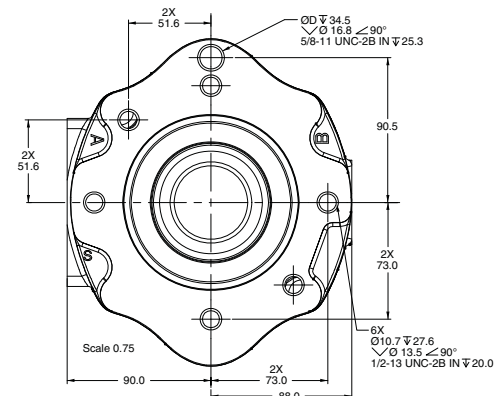
**SECTION A-A**  
**SAE 16-4 (A) (T0\*A) & SAE 19-4 (T0\*H)**  
**2 BOLT DIAGONAL & VERTICAL OR HORIZONTAL 2 BOLT**



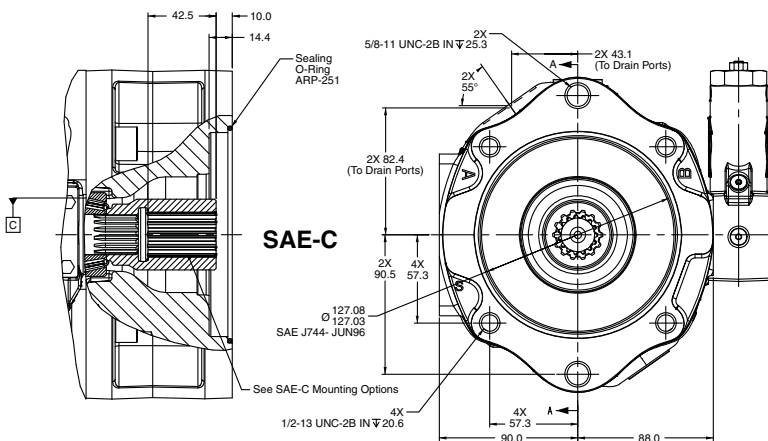
**SAE-B**

**SECTION B-B**  
**SAE 22-4 (B) (T0\*B) & SAE 25-4 (B-B) (T0\*Q)**  
**4 BOLT & VERTICAL OR HORIZONTAL 2 BOLT**

| SAE-A Mounting Options Information                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Model Number T0*A<br>Spline: ANSI B92.1 1996<br>SAE 16-4 (A) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 9<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.514/0.509 in<br>Pitch Diameter - 0.5625 in ref         | Model Number T0*H<br>Spline: ANSI B92.1 1996<br>SAE 19-4 Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 11<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.6356/0.6306 in<br>Pitch Diameter - 0.6875 in ref            |
| SAE-B Mounting Options Information                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                               |
| Model Number T0*B & T0*J<br>Spline: ANSI B92.1 1996<br>SAE 22-4 (B) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 13<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.759/0.754 in<br>Pitch Diameter - 0.8125 in ref | Model Number T0*Q & T0*K<br>Spline: ANSI B92.1 1996<br>SAE 25-4 (B-B) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 15<br>Pitch - 16/32<br>Pressure Angle - 30<br>Minor Diameter - 0.877/0.882 in<br>Pitch Diameter - 0.9375 in ref |
| SAE-C Mounting Options Information                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                               |
| Model Number T0*C<br>Spline: ANSI B92.1 1996<br>SAE 32-4 (C) Involute Spline Data<br>Class 5 Flat Root Side Fit<br>Number of Teeth - 14                                                                                                                     | Pitch - 12/24<br>Pressure Angle - 30<br>Minor Diameter - 1.087/1.092 in<br>Pitch Diameter - 1.1667 in ref                                                                                                                                                     |



**SAE 22-4 (B) (T0\*J) & SAE 25-4 (B-B) (T0\*K)**  
**2 BOLT DIAGONAL & VERTICAL**  
**OR HORIZONTAL 2 BOLT**

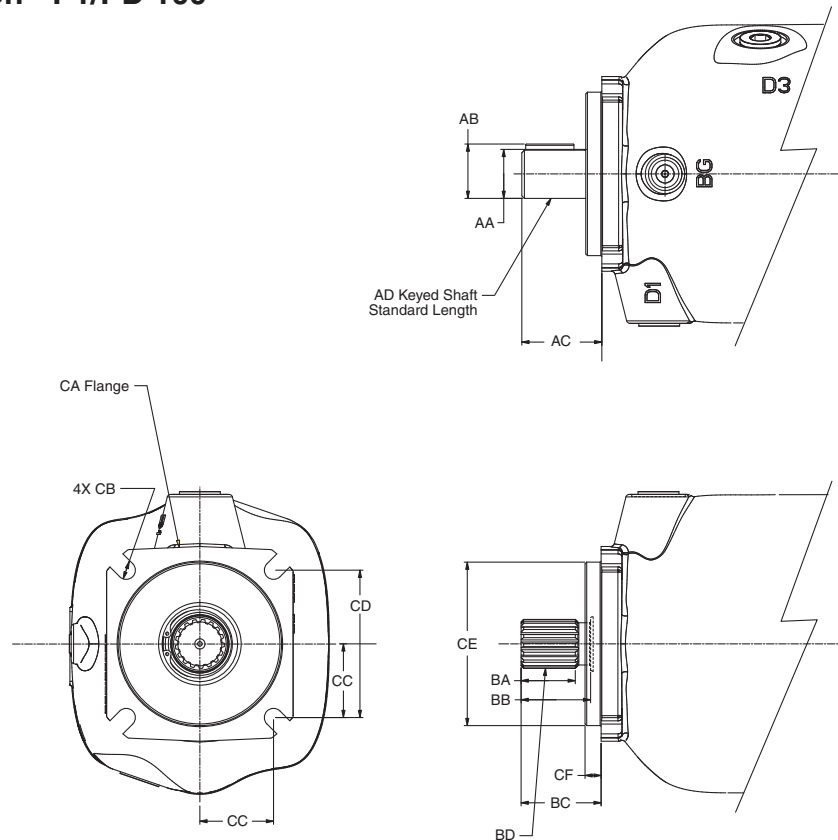


**SAE-C**

**PARTIAL SECTION A-A**  
**SAE 32-4 (T0\*C) 4 BOLT**

[illegible]

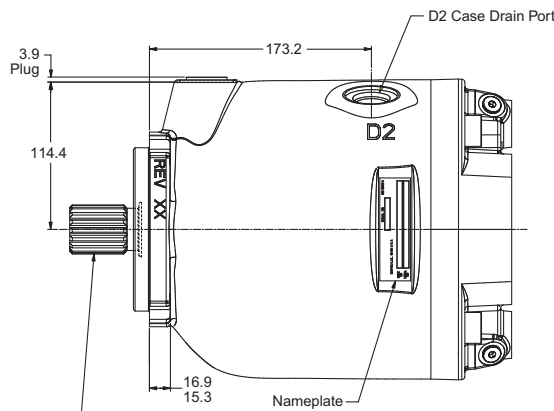
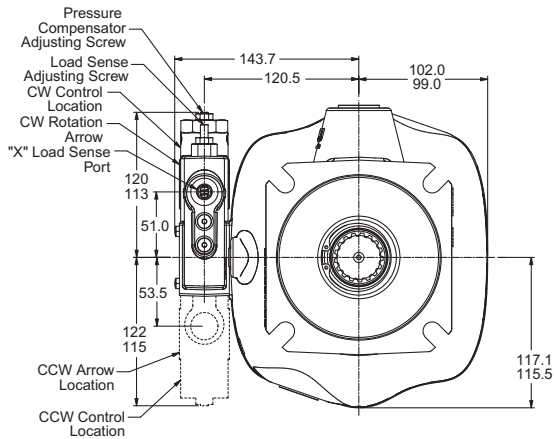
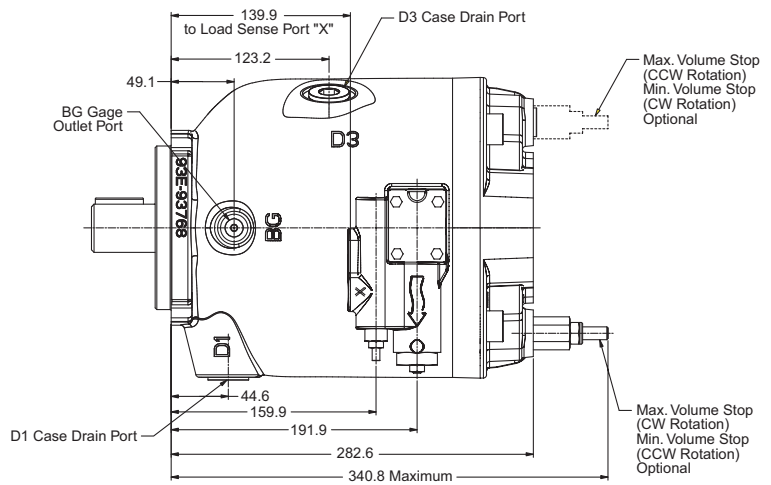
**Pump Installation - P1/PD 100  
Input Shafts**



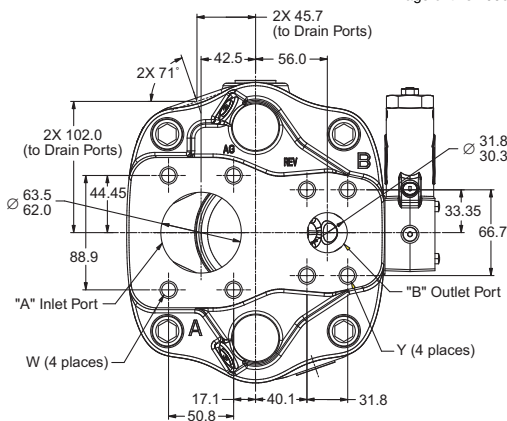
| P1/PD 100 | ISO (Code 04)            | SAE (Code 01 or 02)                                                                                                                                                                                                         | SAE (Code 06)                                                                                                                                                                                                            |
|-----------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AA        | 40.021/40.002            | 38.10/38.05                                                                                                                                                                                                                 | N/A                                                                                                                                                                                                                      |
| AB        | 43.00/42.71              | 42.35/42.17                                                                                                                                                                                                                 | N/A                                                                                                                                                                                                                      |
| AC        | 92.8/91.2                | 62.8/61.2                                                                                                                                                                                                                   | N/A                                                                                                                                                                                                                      |
| AD        | ISO E40N                 | SAE J744 38.1(C-C)                                                                                                                                                                                                          | N/A                                                                                                                                                                                                                      |
| BA        | N/A                      | 42.10                                                                                                                                                                                                                       | 38.10                                                                                                                                                                                                                    |
| BB        | N/A                      | 54.00                                                                                                                                                                                                                       | 48.00                                                                                                                                                                                                                    |
| BC        | N/A                      | 62.8/61.2                                                                                                                                                                                                                   | 56.8/55.2                                                                                                                                                                                                                |
| BD        | N/A                      | SPLINE: SAE ASA-B 1960<br>SAE 38-4 (C-C) INVOLUTE SPLINE DATA<br>CLASS 2 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 17<br>PITCH - 12/24<br>PRESSURE ANGLE - 30<br>MAJOR DIAMETER - 1.4793/1.4763 IN<br>PITCH DIAMETER - 1.4167 | SPLINE: SAE ASA-B 1960<br>SAE 32-4 (C) INVOLUTE SPLINE DATA<br>CLASS 2 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 14<br>PITCH - 12/24<br>PRESSURE ANGLE - 30<br>MINOR DIAMETER - 1.2293/1.2243 IN<br>PITCH DIAMETER - 1.667 |
| CA        | ISO 3019/2-2001 125B2SW  | SAE J744 JUN96 127-4 C                                                                                                                                                                                                      | SAE J744 JUN96 127-4 C                                                                                                                                                                                                   |
| CB        | 13.77/13.50              | 14.4 DIA.                                                                                                                                                                                                                   | 14.4 DIA.                                                                                                                                                                                                                |
| CC        | 56.6                     | 57.2                                                                                                                                                                                                                        | 57.2                                                                                                                                                                                                                     |
| CD        | 113.2 SQUARE             | 114.5 SQUARE                                                                                                                                                                                                                | 114.5 SQUARE                                                                                                                                                                                                             |
| CE        | 125.00/124.94 ISO 3019/2 | 127.00/126.95 SAE J744                                                                                                                                                                                                      | 127.00/126.95 SAE J744                                                                                                                                                                                                   |
| CF        | 9.5/9.0                  | 12.7/12.2                                                                                                                                                                                                                   | 12.7/12.2                                                                                                                                                                                                                |
| Key Width | 12.00                    | 9.52                                                                                                                                                                                                                        | N/A                                                                                                                                                                                                                      |



**Pump Installation - P1/PD 100**  
**End Ports**  
**“L” Control Option**



For Shaft & Flange  
Dimensions, See the First  
Page of this 100cc Section

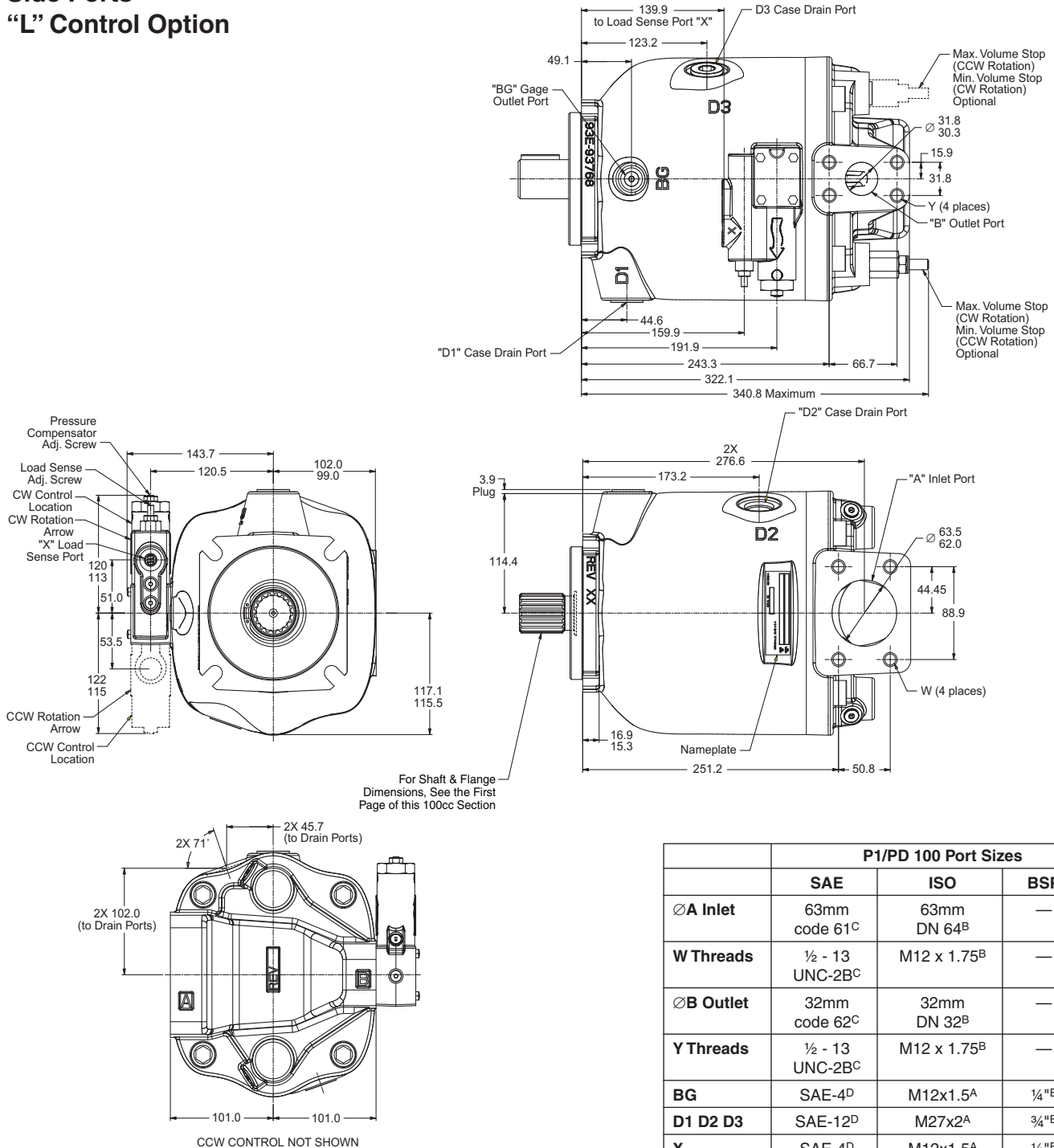


| P1/PD 100 Port Sizes |                               |                            |                 |
|----------------------|-------------------------------|----------------------------|-----------------|
|                      | SAE                           | ISO                        | BSP             |
| ØA Inlet             | 63mm<br>code 61 <sup>C</sup>  | 63mm<br>DN 64 <sup>B</sup> | —               |
| W Threads            | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet            | 32mm<br>code 62 <sup>C</sup>  | 32mm<br>DN 32 <sup>B</sup> | —               |
| Y Threads            | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| BG                   | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3             | SAE-12 <sup>D</sup>           | M27x2 <sup>A</sup>         | ¾" <sup>E</sup> |
| X                    | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1  
Note B: Metric 4-bolt flange port conforms to ISO 6162  
Note C: Inch 4-bolt flange port conforms to SAE J518  
Note D: Inch o-ring boss port conforms to SAE J514  
Note E: BSP boss port conforms to ISO 228-1

**Pump Installation - P1/PD 100**  
**Side Ports**  
**"L" Control Option**

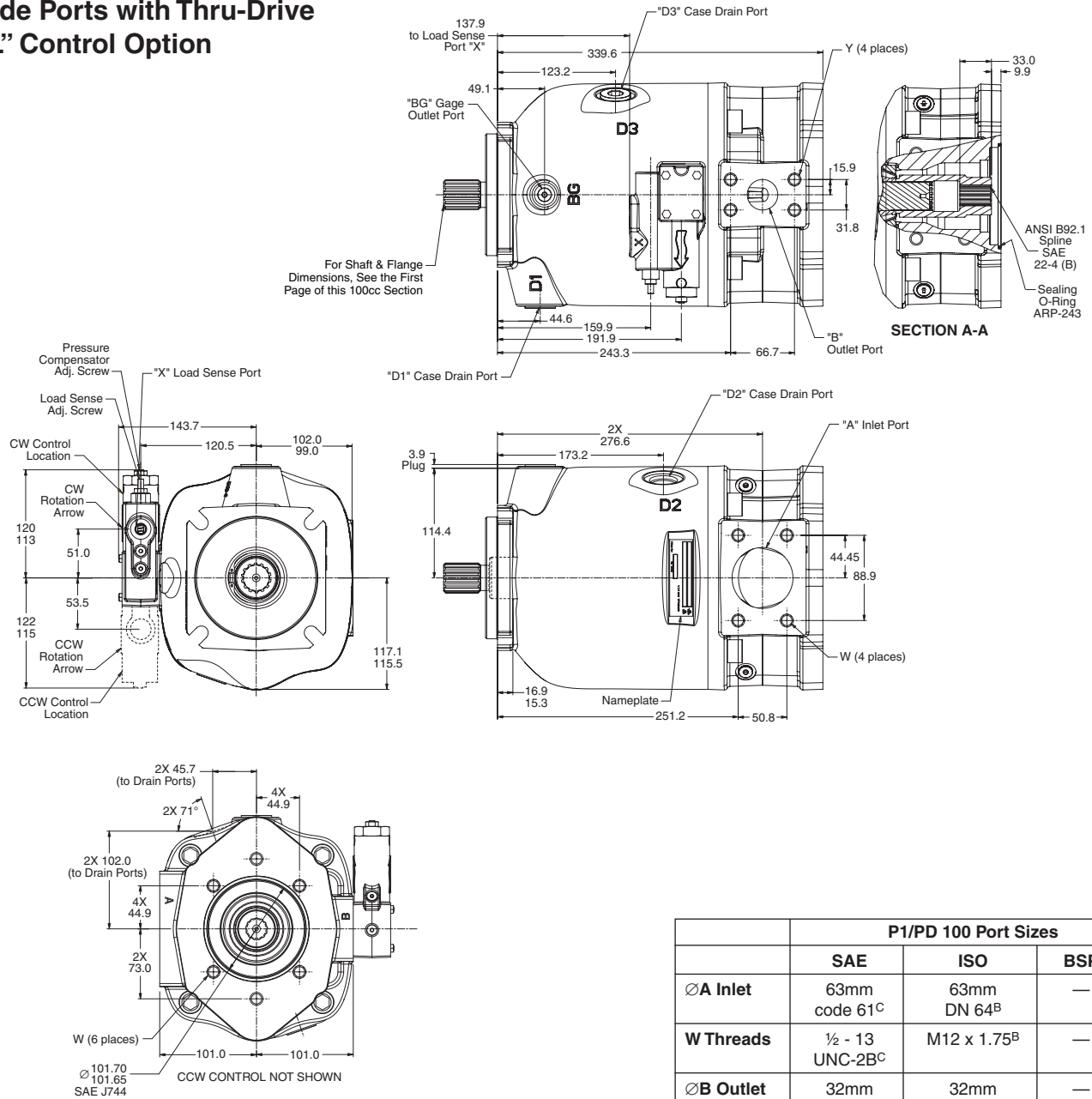
**"L" Control Option**



|           | P1/PD 100 Port Sizes          |                            |                 |
|-----------|-------------------------------|----------------------------|-----------------|
|           | SAE                           | ISO                        | BSP             |
| ØA Inlet  | 63mm<br>code 61 <sup>C</sup>  | 63mm<br>DN 64 <sup>B</sup> | —               |
| W Threads | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet | 32mm<br>code 62 <sup>C</sup>  | 32mm<br>DN 32 <sup>B</sup> | —               |
| Y Threads | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| BG        | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3  | SAE-12 <sup>D</sup>           | M27x2 <sup>A</sup>         | ¾" <sup>E</sup> |
| X         | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1  
 Note B: Metric 4-bolt flange port conforms to ISO 6162  
 Note C: Inch 4-bolt flange port conforms to SAE J518  
 Note D: Inch o-ring boss port conforms to SAE J514  
 Note E: BSP boss port conforms to ISO 228-1

**Pump Installation - P1/PD 100**  
**Side Ports with Thru-Drive**  
**"L" Control Option**



|           | P1/PD 100 Port Sizes          |                            |                 |
|-----------|-------------------------------|----------------------------|-----------------|
|           | SAE                           | ISO                        | BSP             |
| ØA Inlet  | 63mm<br>code 61 <sup>C</sup>  | 63mm<br>DN 64 <sup>B</sup> | —               |
| W Threads | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet | 32mm<br>code 62 <sup>C</sup>  | 32mm<br>DN 32 <sup>B</sup> | —               |
| Y Threads | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| BG        | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3  | SAE-12 <sup>D</sup>           | M27x2 <sup>A</sup>         | ¾" <sup>E</sup> |
| X         | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1  
 Note B: Metric 4-bolt flange port conforms to ISO 6162  
 Note C: Inch 4-bolt flange port conforms to SAE J518  
 Note D: Inch o-ring boss port conforms to SAE J514  
 Note E: BSP boss port conforms to ISO 228-1

Note: See Page 79 for shaft torq rating

36.5  
10.5

See SAE-A Mounting Options

2X 45.7  
(To Drain Ports)

2X 53.2  
4X 37.6

2X 71.1

2X 102.0  
(To Drain Ports)

4X 37.6

2X 25.2

2X 53.2

Sealing O-Ring  
ARP-237

**SAE-A**

82.63  
Ø 82.58  
SAE J744

8X  
SAE 3/8-16 UNC-2B IN 20.0

**SECTION A-A**

102.0 102.0

| SAE-A Mounting Options Information                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Model Number T0*A<br/>                     Spline: ANSI B92.1 1996<br/>                     SAE 16-4 (A) Involute Spline Data<br/>                     Class 5 Flat Root Side Fit<br/>                     Number of Teeth - 9<br/>                     Pitch - 16/32<br/>                     Pressure Angle - 30<br/>                     Minor Diameter - 0.514/0.509 in<br/>                     Pitch Diameter - 0.5625 in ref</p>             | <p>Model Number T0*H<br/>                     Spline: ANSI B92.1 1996<br/>                     SAE 19-4 Involute Spline Data<br/>                     Class 5 Flat Root Side Fit<br/>                     Number of Teeth - 11<br/>                     Pitch - 16/32<br/>                     Pressure Angle - 30<br/>                     Minor Diameter - 0.6356/0.6306 in<br/>                     Pitch Diameter - 0.6875 in ref</p>                |
| SAE-B Mounting Options Information                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>Model Number T0*B &amp; T0*J<br/>                     Spline: ANSI B92.1 1996<br/>                     SAE 22-4 (B) Involute Spline Data<br/>                     Class 5 Flat Root Side Fit<br/>                     Number of Teeth - 13<br/>                     Pitch - 16/32<br/>                     Pressure Angle - 30<br/>                     Minor Diameter - 0.759/0.754 in<br/>                     Pitch Diameter - 0.8125 in ref</p> | <p>Model Number T0*Q &amp; T0*K<br/>                     Spline: ANSI B92.1 1996<br/>                     SAE 25-4 (B-B) Involute Spline Data<br/>                     Class 5 Flat Root Side Fit<br/>                     Number of Teeth - 15<br/>                     Pitch - 16/32<br/>                     Pressure Angle - 30<br/>                     Minor Diameter - 0.877/0.882 in<br/>                     Pitch Diameter - 0.9375 in ref</p> |
| SAE-C Mounting Options Information                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>Model Number T0*C<br/>                     Spline: ANSI B92.1 1996<br/>                     SAE 32-4 (C) Involute Spline Data<br/>                     Class 5 Flat Root Side Fit<br/>                     Number of Teeth - 14<br/>                     Pitch - 12/24<br/>                     Pressure Angle - 30<br/>                     Minor Diameter - 1.067/1.020 in<br/>                     Pitch Diameter - 1.0687 in ref</p>            | <p>Model Number T0*N<br/>                     Spline: ANSI B92.1 1996<br/>                     SAE 38-4 (C-C) Involute Spline Data<br/>                     Class 5 Flat Root Side Fit<br/>                     Number of Teeth - 17<br/>                     Pitch - 12/24<br/>                     Pressure Angle - 30<br/>                     Minor Diameter - 1.334/1.339 in<br/>                     Pitch Diameter - 1.416 in ref</p>             |

43.5

10.5

Sealing O-Ring  
ARP-243  
See SAE-B Mounting Options

5/8-11 UNC-2B in  $\nabla 25.3$   
Support Tap

4X  
44.9

90.5

2X  
73.0

4X  
44.9

SAE-B

101.68  
101.63  
SAE J744

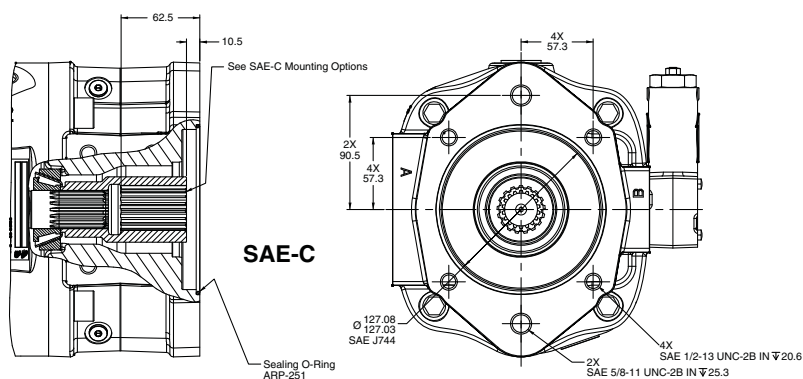
6X  
SAE 1/2-13 UNC-2B in  $\nabla 25.4$

101.7  
 $\nabla 13.5$   
1/2-13 UNC-2B

### SECTION B-B

**SAE 22-4 (B) (T0\*B) & SAE 25-4 (B-B) (T0\*Q)**  
**4 BOLT & VERTICAL OR HORIZONTAL 2 BOLT**

**SAE 22-4 (B) (T0\*J) & SAE 25-4 (B-B) (T0\*K)  
2 BOLT DIAGONAL & VERTICAL  
OR HORIZONTAL 2 BOLT**

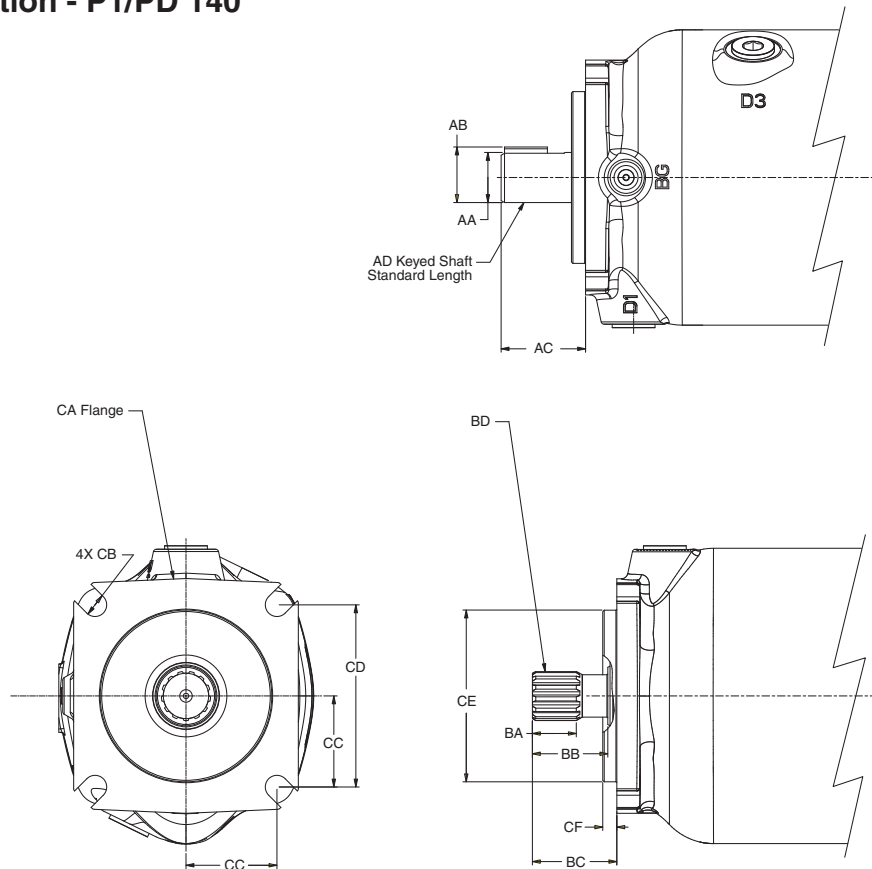


### SECTION C-C

**SAE 32-4 (C) (T0°C) & SAE 38-4 (C-C) (T0°N)  
4 BOLT & 2 BOLT VERTICAL**

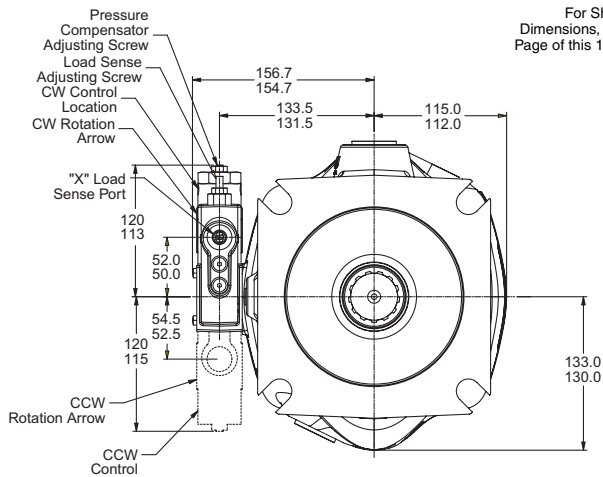
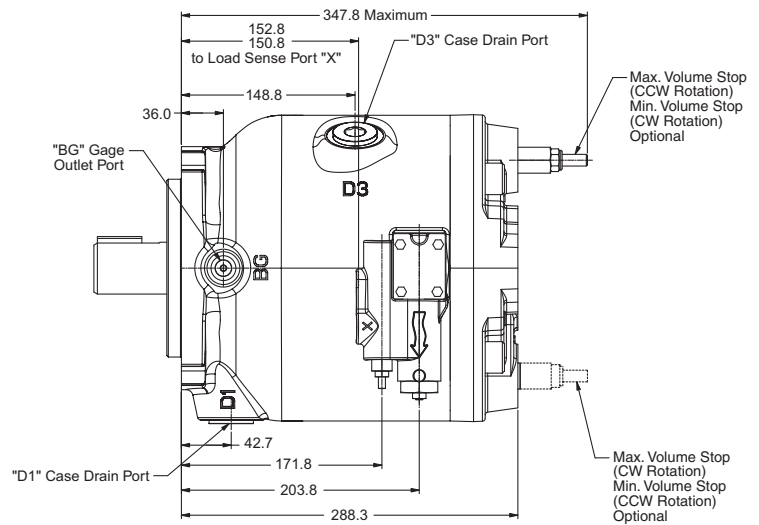
[illegible]

**Pump Installation - P1/PD 140**  
**Input Shafts**

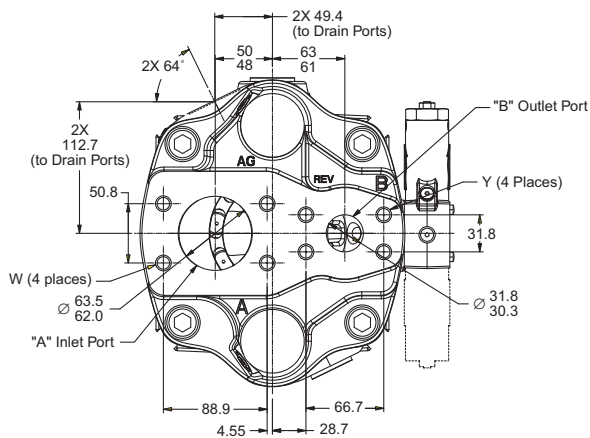
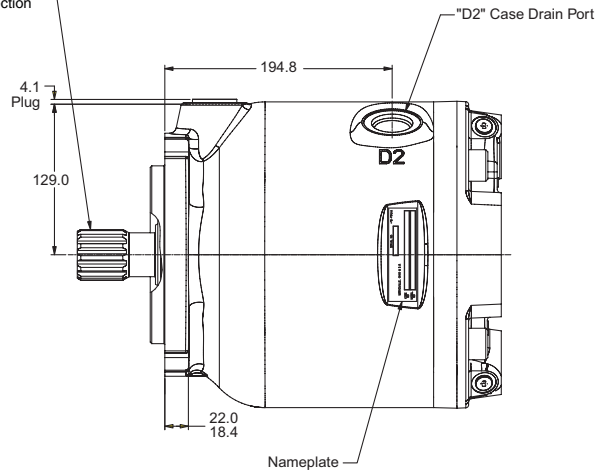


| P1/PD 140 | ISO (Code 04)            | SAE (Code 01 or 02)                                                                                                                                                                                                      |
|-----------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ØAA       | 50.027/50.002            | 44.45/44.40                                                                                                                                                                                                              |
| AB        | 53.50/53.21              | 49.43/49.17                                                                                                                                                                                                              |
| AC        | 92.8/91.2                | 75.8/74.2                                                                                                                                                                                                                |
| AD        | ISO E50N                 | SAE J744 44-1(D)                                                                                                                                                                                                         |
| BA        | N/A                      | 39.00                                                                                                                                                                                                                    |
| BB        | N/A                      | 67.00                                                                                                                                                                                                                    |
| BC        | N/A                      | 75.8/74.2                                                                                                                                                                                                                |
| BD        | N/A                      | SPLINE: SAE J498-B 1969<br>SAE 44-4(D) INVOLUTE SPLINE DATA<br>CLASS 2 FLAT ROOT SIDE FIT<br>NUMBER OF TEETH - 13<br>PITCH - 8/16<br>PRESSURE ANGLE - 30<br>MAJOR DIAMETER - 1.7210/1.7160 IN<br>PITCH DIAMETER - 1.6265 |
| CA        | ISO 3019/2-2001 180B4SW  | SAE J744 JUN96 152-4(D)                                                                                                                                                                                                  |
| CB        | 18.20/17.80              | 20.9/20.5 DIA.                                                                                                                                                                                                           |
| CC        | 79.2                     | 80.8                                                                                                                                                                                                                     |
| CD        | 158.4 SQUARE             | 161.6 SQUARE                                                                                                                                                                                                             |
| CE        | 180.00/179.95 ISO 3019/2 | 152.40/152.35 SAE J744                                                                                                                                                                                                   |
| CF        | 9.5/9.0                  | 12.7/12.2                                                                                                                                                                                                                |
| Key Width | 14.00                    | 11.11                                                                                                                                                                                                                    |

**Pump Installation - P1/PD 140**  
**End Ports**  
**"L" Control Option**



For Shaft & Flange Dimensions, See the First Page of this 140cc Section



| P1/PD 140 Port Sizes |                               |                            |                 |
|----------------------|-------------------------------|----------------------------|-----------------|
|                      | SAE                           | ISO                        | BSP             |
| ØA Inlet             | 63mm<br>code 61 <sup>C</sup>  | 63mm<br>DN 64 <sup>B</sup> | —               |
| W Threads            | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet            | 32mm<br>code 62 <sup>C</sup>  | 32mm<br>DN 32 <sup>B</sup> | —               |
| Y Threads            | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| BG                   | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3             | SAE-16 <sup>D</sup>           | M33x2 <sup>A</sup>         | 1" <sup>E</sup> |
| X                    | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1

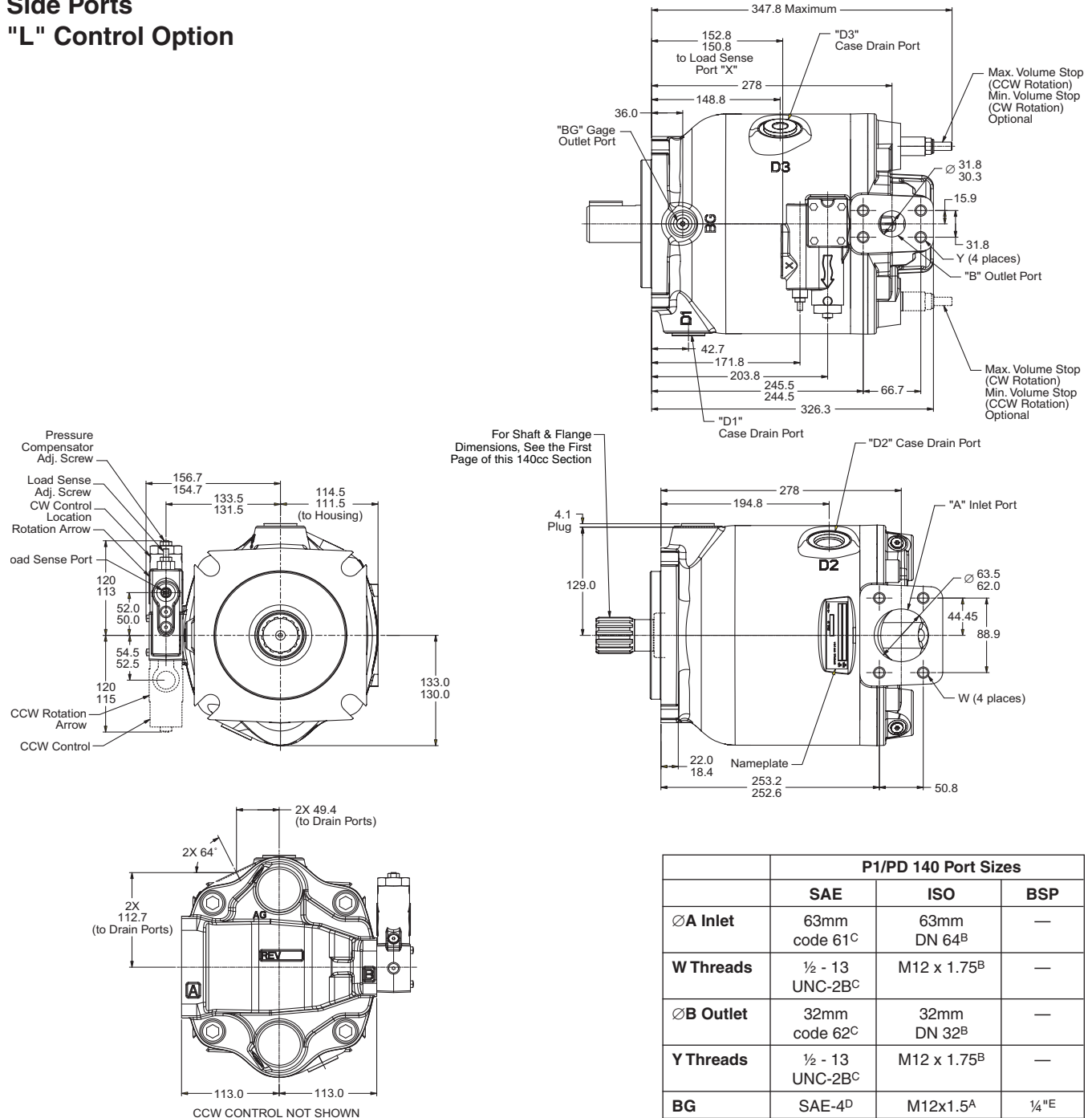
Note B: Metric 4-bolt flange port conforms to ISO 6162

Note C: Inch 4-bolt flange port conforms to SAE J518

Note D: Inch o-ring boss port conforms to SAE J514

Note E: BSP boss port conforms to ISO 228-1

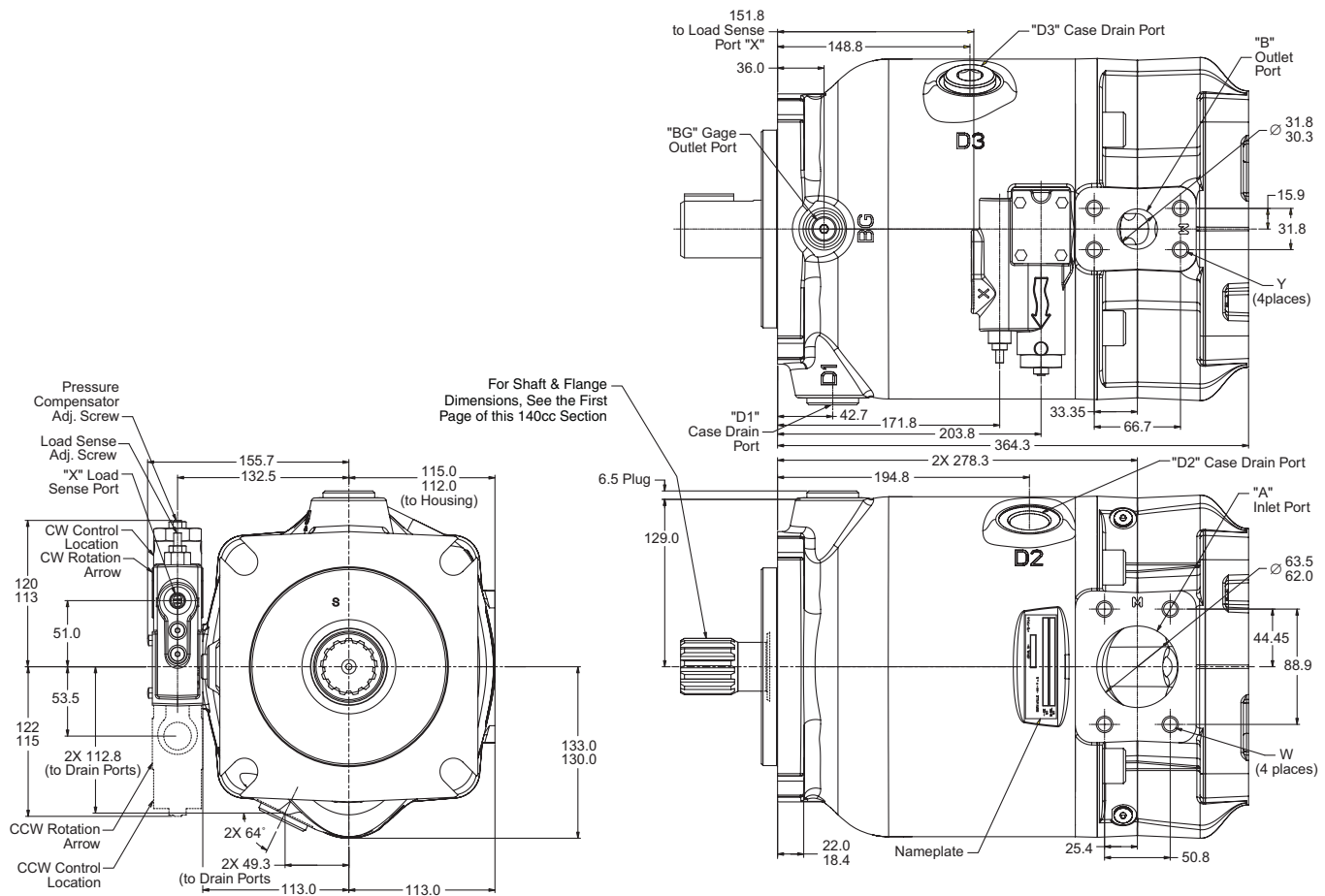
**Pump Installation - P1/PD 140**  
**Side Ports**  
**"L" Control Option**



Note A: Metric o-ring boss port conform to ISO 6149-1  
Note B: Metric 4-bolt flange port conforms to ISO 6162  
Note C: Inch 4-bolt flange port conforms to SAE J518  
Note D: Inch o-ring boss port conforms to SAE J514  
Note E: BSP boss port conforms to ISO 228-1



**Pump Installation - P1/PD 140**  
**Side Ports with Thru-Drive**  
**"L" Control Option**



|           | P1/PD 140 Port Sizes          |                            |                 |
|-----------|-------------------------------|----------------------------|-----------------|
|           | SAE                           | ISO                        | BSP             |
| ØA Inlet  | 63mm<br>code 61 <sup>C</sup>  | 63mm<br>DN 64 <sup>B</sup> | —               |
| W Threads | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| ØB Outlet | 32mm<br>code 62 <sup>C</sup>  | 32mm<br>DN 32 <sup>B</sup> | —               |
| Y Threads | ½ - 13<br>UNC-2B <sup>C</sup> | M12 x 1.75 <sup>B</sup>    | —               |
| BG        | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |
| D1 D2 D3  | SAE-16 <sup>D</sup>           | M33x2 <sup>A</sup>         | 1" <sup>E</sup> |
| X         | SAE-4 <sup>D</sup>            | M12x1.5 <sup>A</sup>       | ¼" <sup>E</sup> |

Note A: Metric o-ring boss port conform to ISO 6149-1

Note B: Metric 4-bolt flange port conforms to ISO 6162

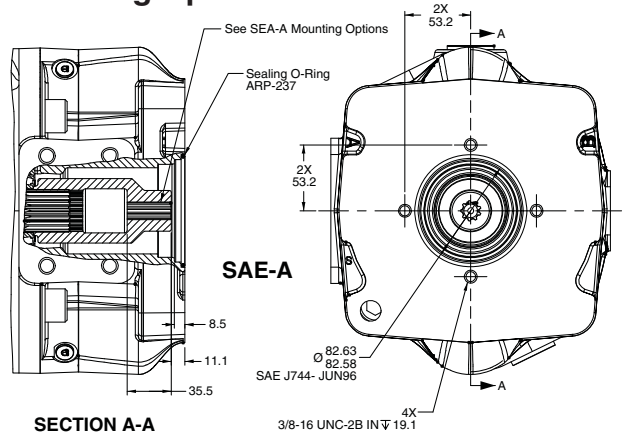
Note C: Inch 4-bolt flange port conforms to SAE J518

Note D: Inch o-ring boss port conforms to SAE J514

Note E: BSP boss port conforms to ISO 228-1

Note: See Page 79 for shaft torq rating

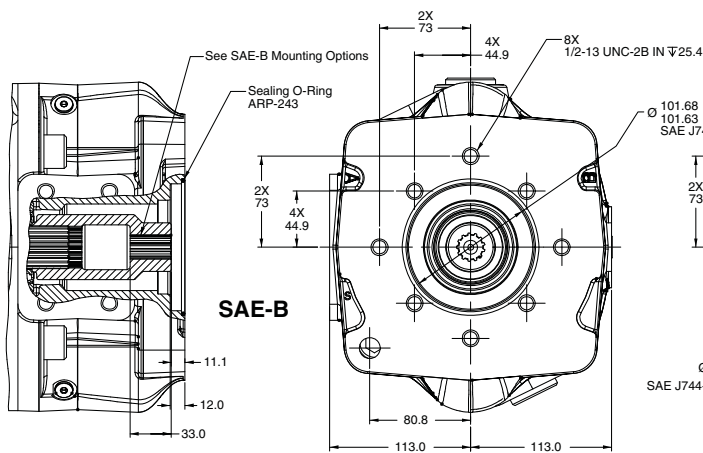
# Pump Installation - P1/PD 140 Side Ports with Thru-Drive Mounting Options



**SAE-A**

**SECTION A-A**

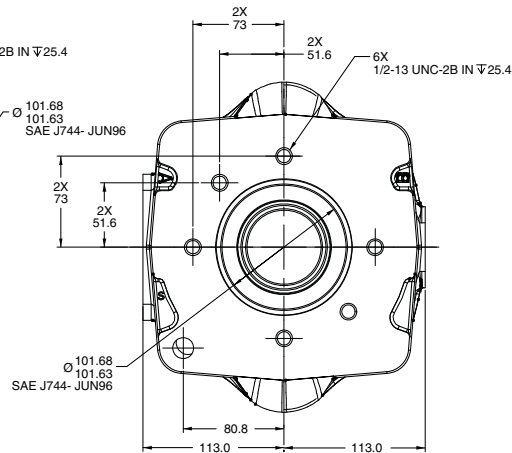
**SAE 16-4 (A) (T0\*A)  
VERTICAL OR HORIZONTAL 2 BOLT**



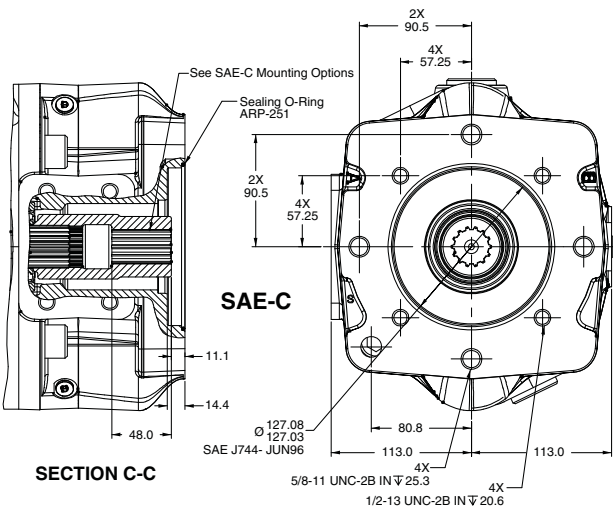
**SAE-B**

**SECTION B-B**

**SAE 22-4 (B) (T0\*B) & SAE 25-4 (B-B) (T0\*Q)  
4 BOLT AND VERTICAL OR HORIZONTAL 2 BOLT**



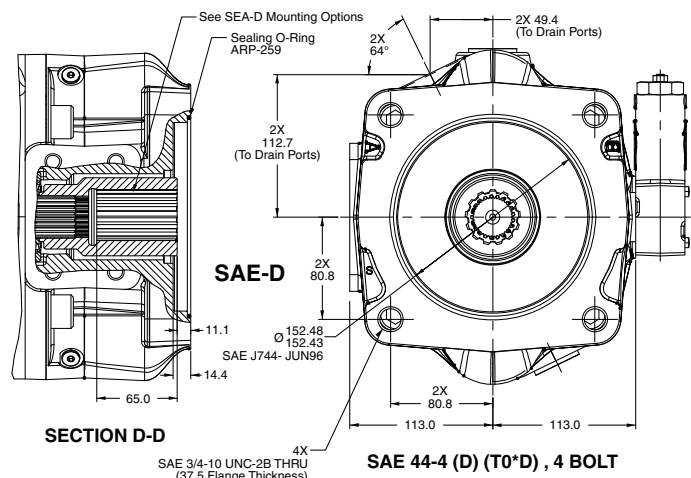
**SAE 22-2 (B) (T0\*J) & SAE 25-2 (B-B) (T0\*K)  
2 BOLT, HORIZONTAL, VERTICAL & DIAGONAL**



**SAE-C**

**SECTION C-C**

**SAE 32-4 (C) (T0\*C) & SAE 38-4 (C-C) (T0\*N)  
4 BOLT & 2 BOLT HORIZONTAL & VERTICAL**



**SAE-D**

**SECTION D-D**

**SAE 44-4 (D) (T0\*D) , 4 BOLT**

## SAE-A Mounting Options Information

Model Number T0\*A  
Spline: ANSI B92.1 1996  
SAE 16-4 (A) Involute Spline Data  
Class 5 Flat Root Side Fit  
Number of Teeth - 9  
Pitch - 16/32  
Pressure Angle - 30  
Minor Diameter - 0.514/0.509 in  
Pitch Diameter - 0.5625 in ref

## SAE-B Mounting Options Information

Model Number T0\*B & T0\*J  
Spline: ANSI B92.1 1996  
SAE 22-4 (B) Involute Spline Data  
Class 5 Flat Root Side Fit  
Number of Teeth - 13  
Pitch - 16/32  
Pressure Angle - 30  
Minor Diameter - 0.759/0.754 in  
Pitch Diameter - 0.8125 in ref

Model Number T0\*Q & T0\*K  
Spline: ANSI B92.1 1996  
SAE 25-4 (B-B) Involute Spline Data  
Class 5 Flat Root Side Fit  
Number of Teeth - 15  
Pitch - 16/32  
Pressure Angle - 30  
Minor Diameter - 0.877/0.882 in  
Pitch Diameter - 0.9375 in ref

## SAE-C Mounting Options Information

Model Number T0\*C  
Spline: ANSI B92.1 1996  
SAE 32-4 (C) Involute Spline Data  
Class 5 Flat Root Side Fit  
Number of Teeth - 14  
Pitch - 12/24  
Pressure Angle - 30  
Minor Diameter - 1.0870/10.920 in  
Pitch Diameter - 1.0667 in ref

Model Number T0\*N  
Spline: ANSI B92.1 1996  
SAE 38-4 (C-C) Involute Spline Data  
Class 5 Flat Root Side Fit  
Number of Teeth - 17  
Pitch - 12/24  
Pressure Angle - 30  
Minor Diameter - 1.334/1.339 in  
Pitch Diameter - 1.4166 in ref

## SAE-D Mounting Options Information

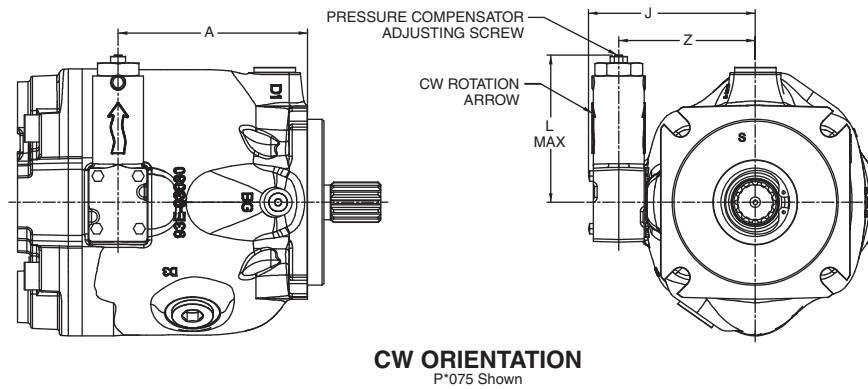
Model Number T0\*D  
Spline: ANSI B92.1 1996  
SAE 44-4 (D) Involute Spline Data  
Class 5 Flat Root Side Fit  
Number of Teeth - 13  
Pitch - 8/16  
Pressure Angle - 30  
Minor Diameter - 1.5110/1.5060 in  
Pitch Diameter - 1.6250 in ref

| Shaft Code | 18                       | 28                    | 45                    | 60                   | 75                   | 100                  | 140                 |
|------------|--------------------------|-----------------------|-----------------------|----------------------|----------------------|----------------------|---------------------|
| 01         | Spline - SAE 19-4 11T    | Spline - SAE B-B 15T  | Spline - SAE B-B 15T  | Spline - SAE C 14T   | Spline - SAE C 14T   | Spline - SAE C-C 17T | Spline - SAE D 13T  |
| 02         | Key - SAE 19-1 .75" Dia. | Key - SAE B-B 1" Dia. | Key - SAE B-B 1" Dia. | Key - SAE C 32-1 KEY | Key - SAE C 32-1 KEY | Key - SAE C-C 38-1   | Key - SAE D 44-1    |
| 04         | ISO keyed 20MM Dia.      | ISO keyed 25MM Dia.   | ISO keyed 25MM Dia.   | ISO keyed 32MM Dia.  | ISO keyed 32MM Dia.  | ISO keyed 40MM Dia.  | ISO keyed 50MM Dia. |
| 06         | Spline - SAE A 9T        |                       |                       |                      |                      | Spline - SAE C 14T   |                     |
| 08         |                          | Spline - SAE B 13T    | Spline - SAE B 13T    |                      |                      |                      |                     |

|                                                              |    | Displacement cc (cu.in) |           |           |           |           |           |            |      |
|--------------------------------------------------------------|----|-------------------------|-----------|-----------|-----------|-----------|-----------|------------|------|
|                                                              |    | 18 (1.1)                | 28 (1.71) | 45 (2.75) | 60 (3.66) | 75 (4.58) | 100 (6.1) | 140 (8.54) |      |
| Maximum torque at maximum displacement and maximum pressure* |    | N.m                     | 79        | 122       | 198       | 263       | 329       | 439        | 614  |
|                                                              |    | ft.lbs                  | 58        | 90        | 146       | 194       | 243       | 324        | 453  |
| Maximum Input shaft torque                                   | 01 | N.m                     | 134       | 337       | 337       | 641       | 641       | 1217       | 1701 |
|                                                              |    | ft.lbs                  | 99        | 249       | 249       | 473       | 473       | 898        | 1255 |
|                                                              | 02 | N.m                     | 130       | 357       | 357       | 559       | 665       | 1134       | 1732 |
|                                                              |    | ft.lbs                  | 96        | 264       | 264       | 413       | 491       | 837        | 1278 |
|                                                              | 04 | N.m                     | 113       | 337       | 337       | 576       | 576       | 1157       | 1708 |
|                                                              |    | ft.lbs                  | 84        | 249       | 249       | 425       | 425       | 854        | 1260 |
|                                                              | 06 | N.m                     | 58        |           |           |           |           | 641        |      |
|                                                              |    | ft.lbs                  | 43        |           |           |           |           | 473        |      |
|                                                              | 08 | N.m                     |           | 209       | 209       |           |           |            |      |
|                                                              |    | ft.lbs                  |           | 155       | 155       |           |           |            |      |
| Maximum through-drive shaft torque                           |    | N.m                     | 134       | 210       | 293       | 318       | 329       | 538        | 760  |
|                                                              |    | ft.lbs                  | 99        | 155       | 217       | 235       | 243       | 397        | 561  |

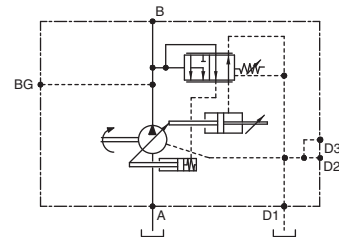
\*efficiency not considered

**C\*\* Control  
Pressure Limiter**

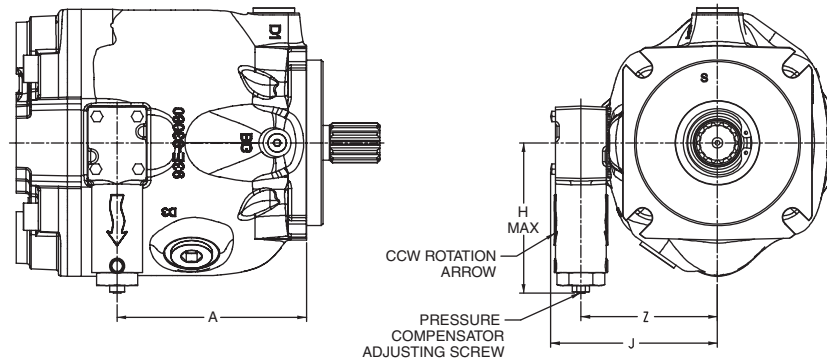


**C\*\* CONTROL**

| ADJUSTMENT SENSITIVITY |                   |
|------------------------|-------------------|
| C00                    | 40 Bar per Turn   |
| C10                    | 18.6 Bar per Turn |



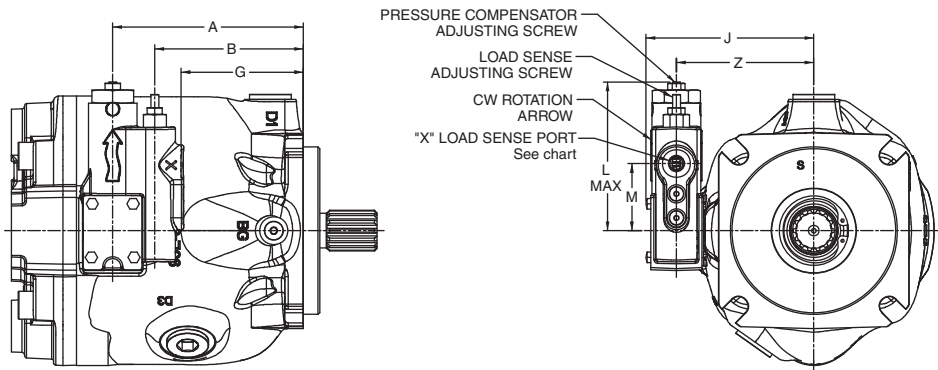
**CCW ORIENTATION**  
P\*075 Shown



**Dimensions**

| Model | A     | H Max | J     | L Max | Z     |
|-------|-------|-------|-------|-------|-------|
| P*018 | 93.2  | 119   | 106.3 | 116   | 81.3  |
| P*028 | 111.5 | 119   | 112.7 | 116   | 91    |
| P*045 | 122   | 122   | 120.7 | 120   | 97.5  |
| P*060 | 134.5 | 122   | 124.7 | 120   | 101.5 |
| P*075 | 145.0 | 122   | 127.7 | 120   | 104.5 |
| P*100 | 191.9 | 122   | 143.7 | 120   | 120.5 |
| P*140 | 203.8 | 122   | 155.7 | 120   | 132.5 |

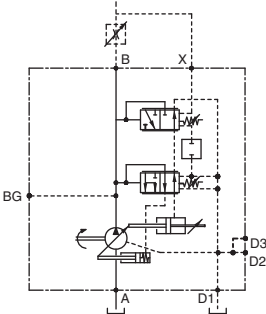
L\*\* Control  
Load Sensing with Pressure Limiter



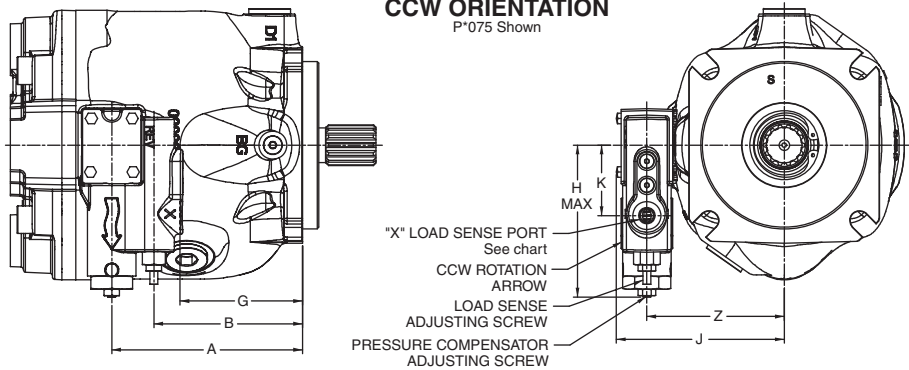
CW ORIENTATION  
P\*075 Shown

L\*\* CONTROL

| ADJUSTMENT SENSITIVITY  |                 |
|-------------------------|-----------------|
| Load Sense              | 28 Bar per Turn |
| Pressure Compensator L0 | 40 Bar per Turn |



CCW ORIENTATION  
P\*075 Shown



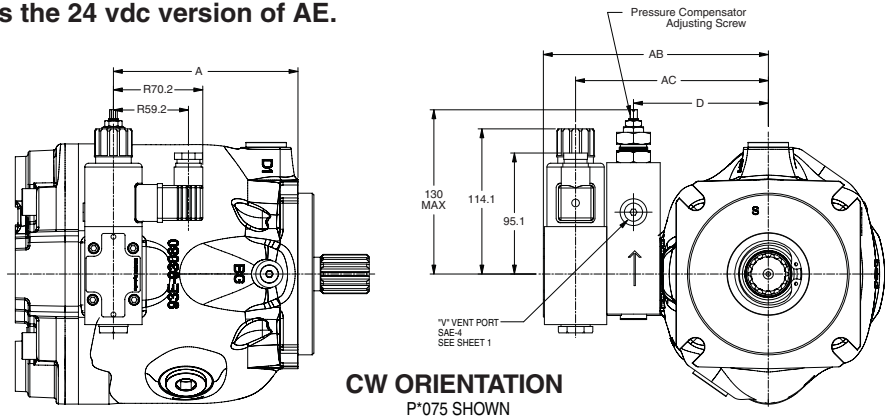
| LOAD SENSE PORT "X" |                                                                |
|---------------------|----------------------------------------------------------------|
| P****PS             | SAE J514 Straight Thread O-Ring Port<br>7/16-20 UNF-2B (SAE-4) |
| P****PA             | 1/4" BSPP per ISO 228-1                                        |
| P****PB             | 1/4" BSPP per ISO 228-1                                        |
| P****PM             | M12 x 1.5-6H per ISO 6149-1                                    |

Dimensions

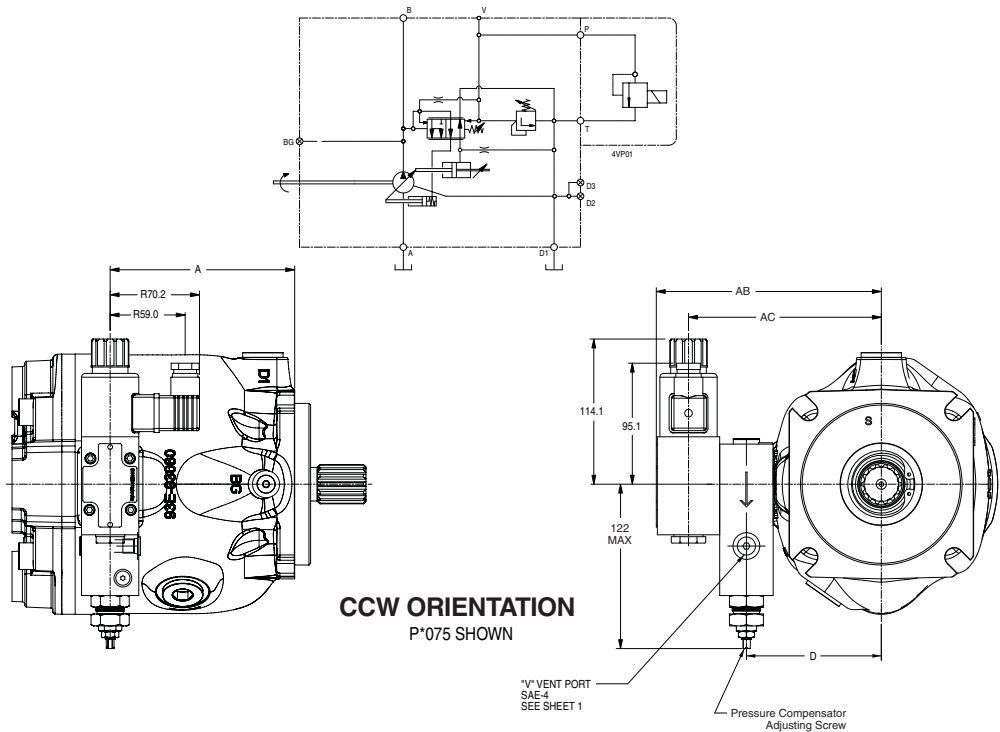
| Model | A     | B     | G     | H Max | J     | K    | L Max | M    | Z     |
|-------|-------|-------|-------|-------|-------|------|-------|------|-------|
| P*018 | 93.2  | 61.2  | 41.2  | 119   | 107.7 | 53.5 | 116   | 51.0 | 84.5  |
| P*028 | 111.5 | 79.5  | 59.5  | 119   | 113.8 | 53.5 | 116   | 51.0 | 90.7  |
| P*045 | 122   | 90    | 70.2  | 122   | 120.7 | 53.5 | 120   | 51.0 | 97.5  |
| P*060 | 134.5 | 102.5 | 82.5  | 122   | 124.7 | 53.5 | 120   | 51.0 | 101.5 |
| P*075 | 145.0 | 113.0 | 93.0  | 122   | 127.7 | 53.5 | 120   | 51.0 | 104.5 |
| P*100 | 191.9 | 159.9 | 139.9 | 122   | 143.7 | 53.5 | 120   | 51.0 | 120.5 |
| P*140 | 203.8 | 171.8 | 151.8 | 122   | 155.7 | 53.5 | 120   | 51.0 | 132.5 |

**AE or AF Control**

AE is a pilot operated pressure limiter control with proportional electronic adjustment and is a 12 volt dc option. AF is the 24 vdc version of AE.



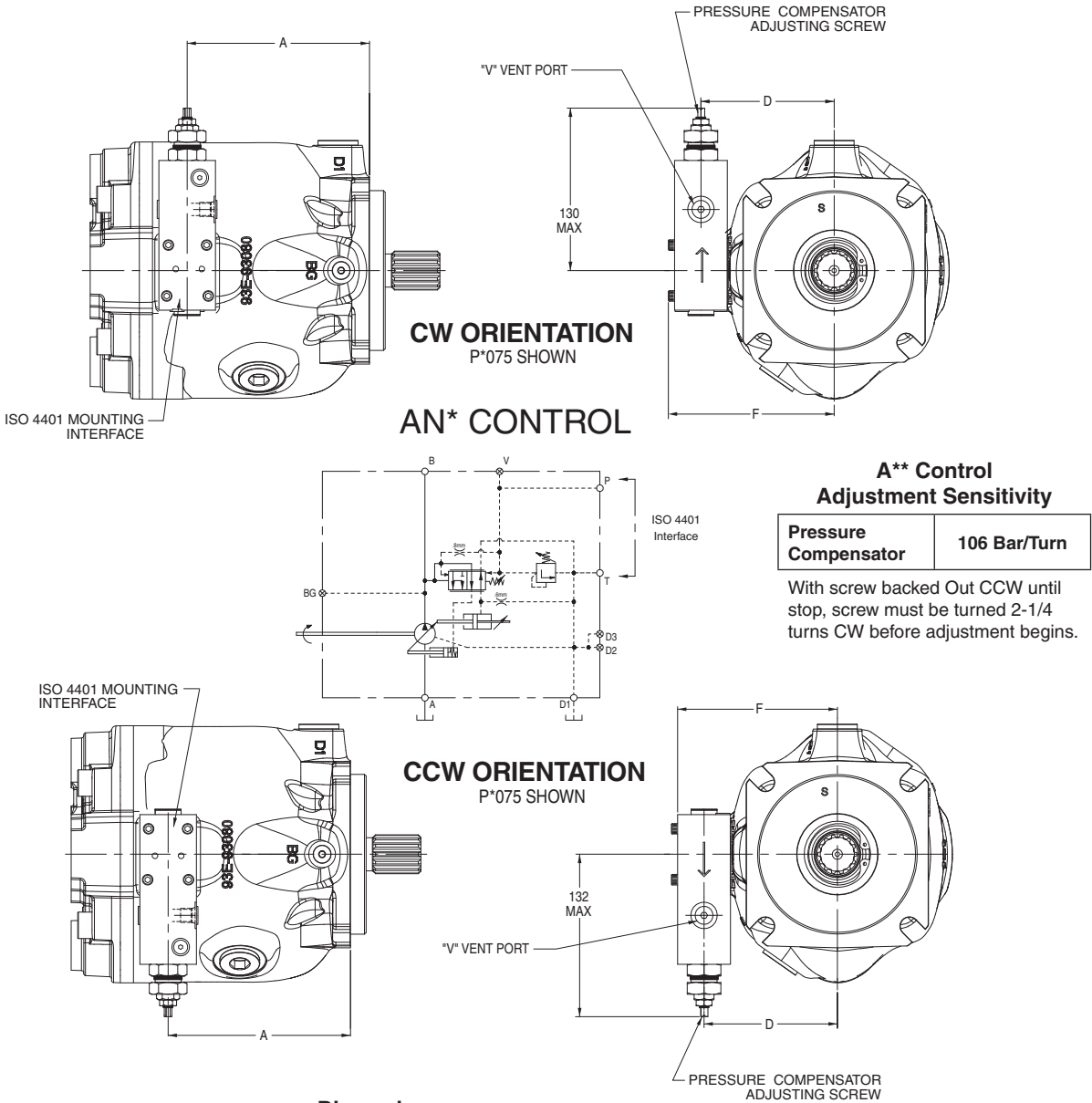
**AE\* or AF\* CONTROL**



**Dimensions**

| Model | A     | D     | AB    | AC    |
|-------|-------|-------|-------|-------|
| P*018 | 93.2  | 84.5  | 156.8 | 131.5 |
| P*028 | 111.5 | 93.0  | 163.8 | 138.5 |
| P*045 | 122.0 | 99.0  | 169.8 | 144.5 |
| P*060 | 134.5 | 103.0 | 173.8 | 148.5 |
| P*075 | 145.0 | 106.0 | 176.8 | 151.5 |
| P*100 | 191.9 | 122.0 | 192.8 | 167.5 |
| P*140 | 203.8 | 134.0 | 204.8 | 179.5 |

**AN Control**  
Pilot operated control with ISO-4401 (NG 6)  
interface and shipping cover.

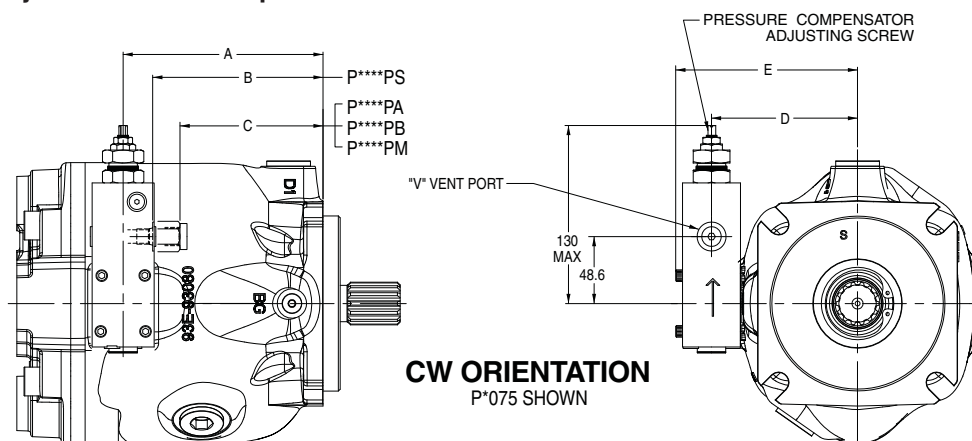


**Dimensions**

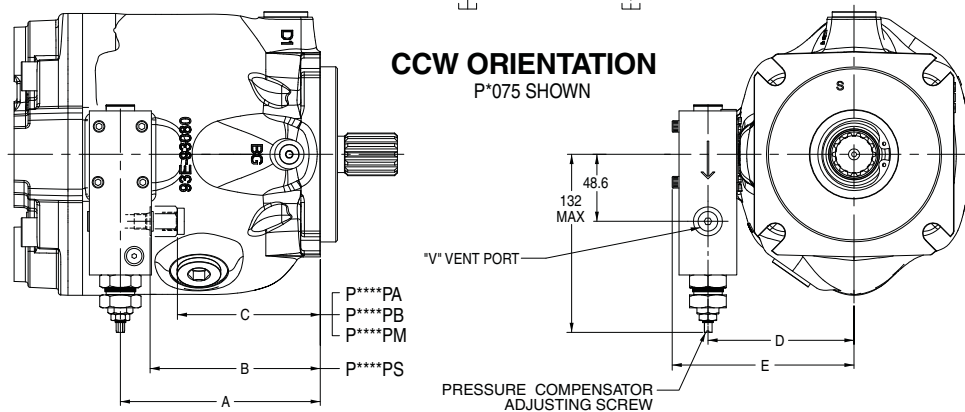
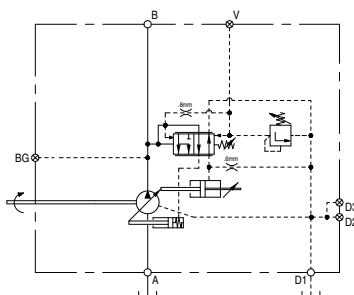
| Model | A     | D     | F     |
|-------|-------|-------|-------|
| P*018 | 93.2  | 85.0  | 103.7 |
| P*028 | 111.5 | 93.0  | 111.7 |
| P*045 | 122.2 | 99.0  | 125.0 |
| P*060 | 134.5 | 103.0 | 129.0 |
| P*075 | 145.0 | 106.0 | 132.0 |
| P*100 | 191.9 | 122.0 | 148.0 |
| P*140 | 203.8 | 134.0 | 160.0 |

## AM Control

Pilot operated pressure limiter control with mechanical adjustment and vent port.



## AM\* CONTROL



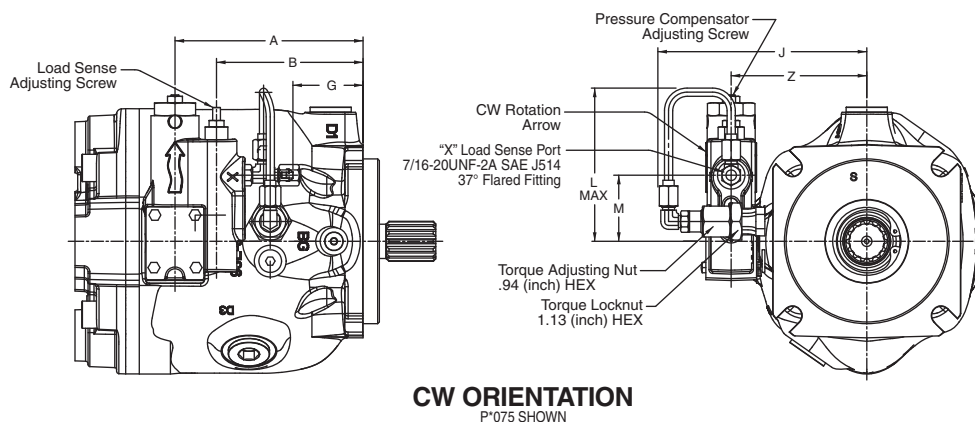
## Dimensions

| Model | A     | B     | C     | D     | E     |
|-------|-------|-------|-------|-------|-------|
| P*018 | 93.2  | 71.8  | 91.6  | 85.0  | 108.7 |
| P*028 | 111.5 | 90.0  | 109.8 | 93.0  | 116.7 |
| P*045 | 122.2 | 106.4 | 86.6  | 99.0  | 125.0 |
| P*060 | 134.5 | 118.7 | 98.9  | 103.0 | 129.0 |
| P*075 | 145.0 | 129.2 | 109.4 | 106.0 | 132.0 |
| P*100 | 191.9 | 176.3 | 156.5 | 122.0 | 148.0 |
| P*140 | 203.8 | 187.0 | 167.2 | 134.0 | 160.0 |

|         | "V" Vent Port                                            |
|---------|----------------------------------------------------------|
| P****PS | SAE J514 STR. THD. O-Ring Port<br>7/16-20 UNF-2B (SAE-4) |
| P****PA | 1/4" BSPP Per ISO 228-1                                  |
| P****PB |                                                          |
| P****PM | M12 X 1.5-6H Per ISO 6149-1                              |

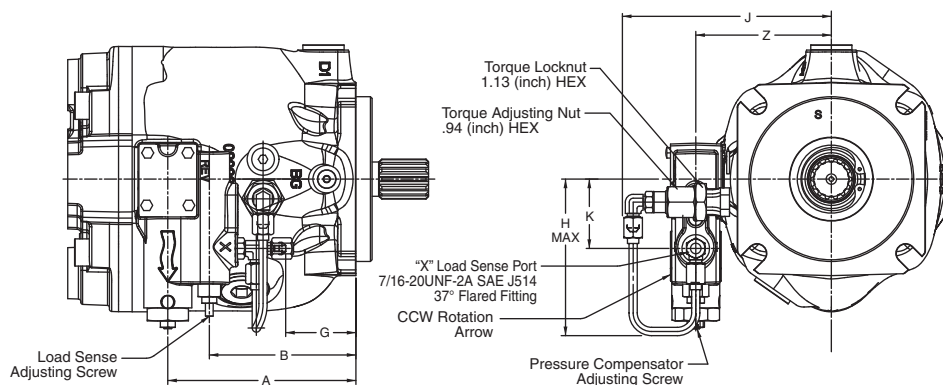
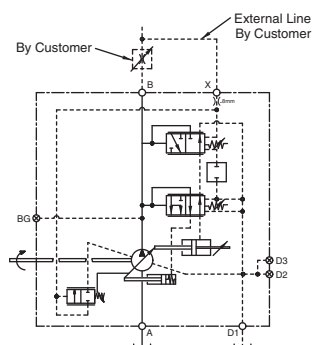


**Torque Limiter LOT Control**  
**Load Sensing with Torque Limiter**  
**"LOT" P\*075**



**L\*T Control**

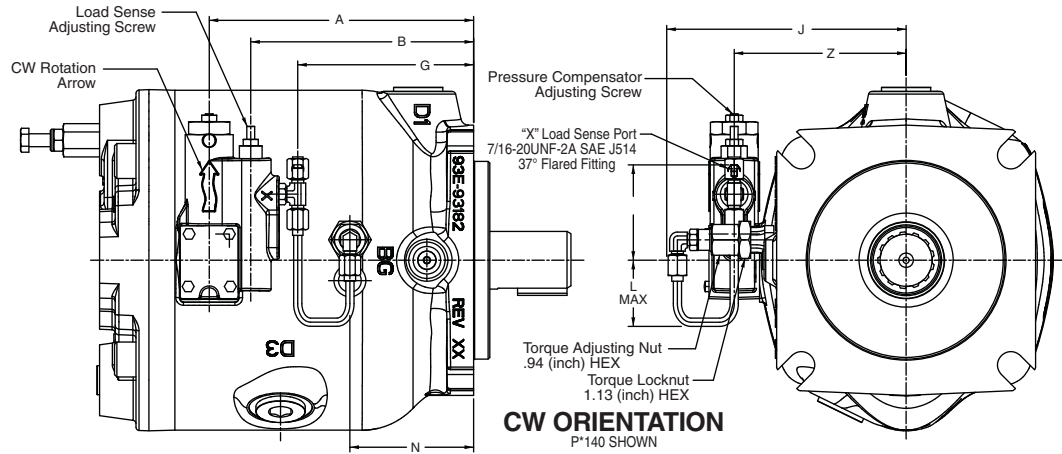
| Adjustment Sensitivity  |                 |
|-------------------------|-----------------|
| Load Sense              | 28 BAR per turn |
| Pressure Compensator L0 | 40 BAR per turn |



**Dimensions**

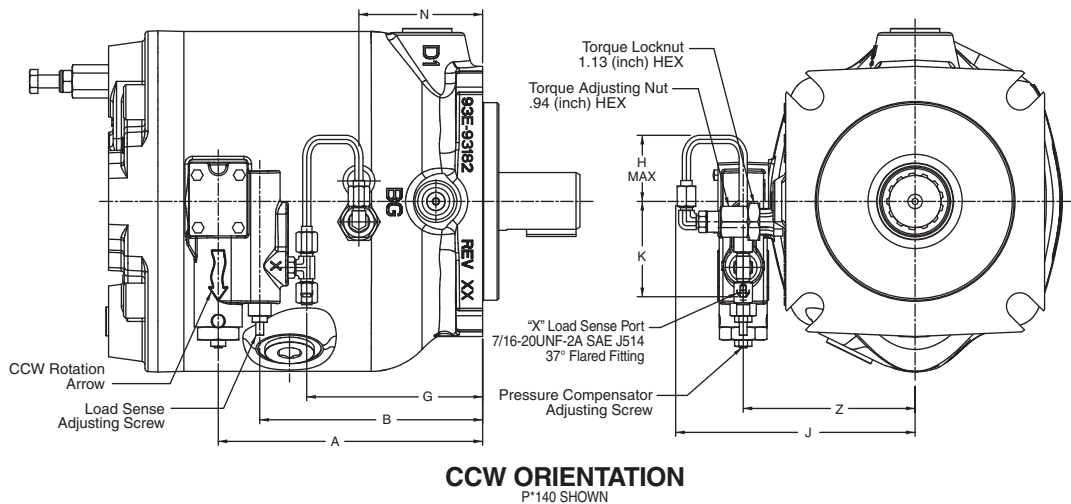
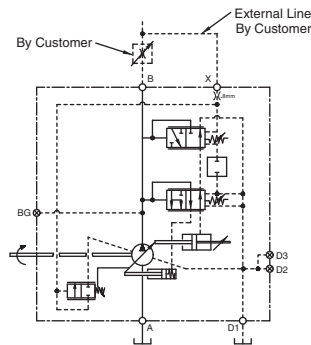
| Model | A     | B     | G    | H Max | J     | K    | L Max | M    | Z     |
|-------|-------|-------|------|-------|-------|------|-------|------|-------|
| P*075 | 145.0 | 113.0 | 54.1 | 122   | 161.0 | 53.5 | 119   | 51.0 | 104.5 |

Torque Limiter L0T Control  
Load Sensing with Torque Limiter  
"L0T" P\*0100 & P\*140



L\*T Control

| Adjustment Sensitivity  |                 |
|-------------------------|-----------------|
| Load Sense              | 28 BAR per turn |
| Pressure Compensator L0 | 40 BAR per turn |



Dimensions

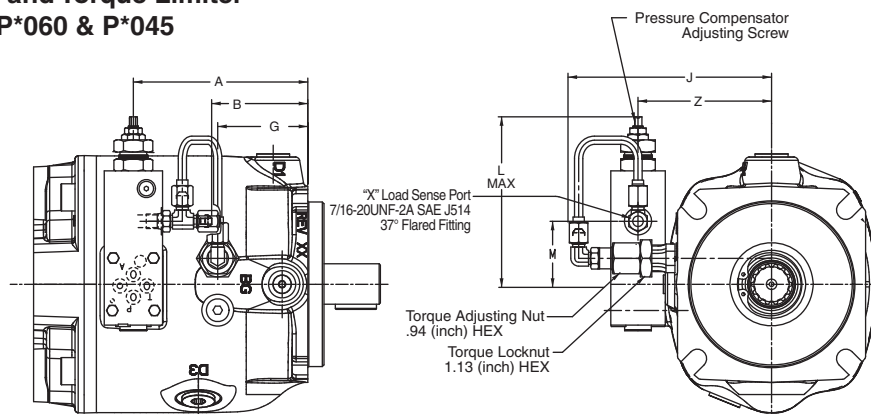
| Model | A     | B     | G     | H Max | J     | K    | L Max | M    | N     | Z     |
|-------|-------|-------|-------|-------|-------|------|-------|------|-------|-------|
| P*100 | 191.9 | 150.9 | 123.6 | 51.0  | 172.5 | 76.1 | 51.0  | 73.5 | 102.5 | 120.5 |
| P*140 | 203.8 | 171.8 | 135.5 | 51.0  | 184.5 | 76.1 | 51.0  | 73.5 | 95.4  | 132.5 |

## Torque Limiter AMT and ALT Control

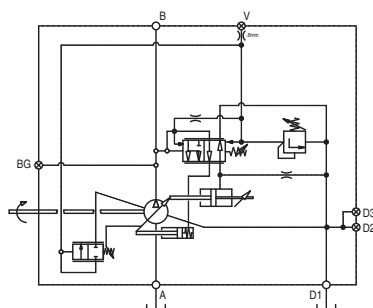
"AMT" Pressure Compensator with Torque Limiter

"ALT" Load Sense and Torque Limiter

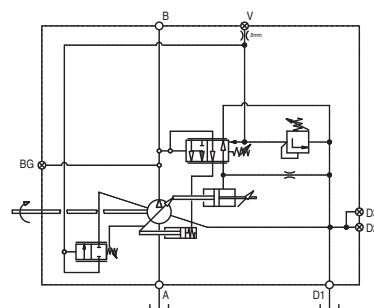
"AMT" and "ALT" P\*060 & P\*045



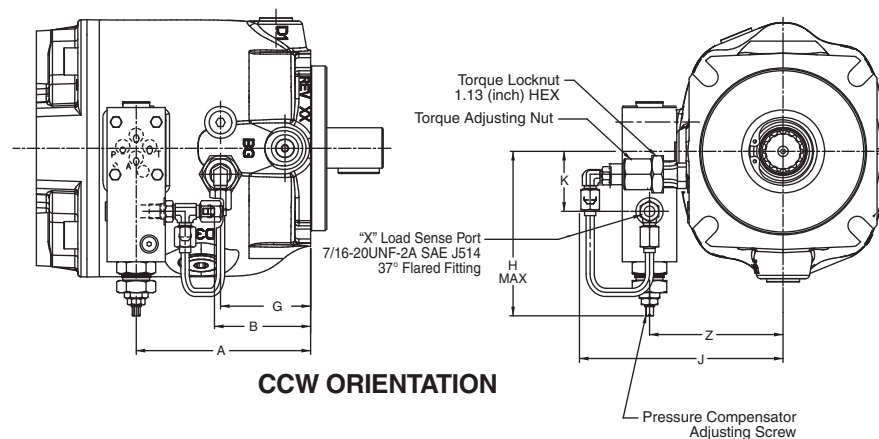
**CW ORIENTATION**  
P\*060 SHOWN



**"AMT" CONTROL**



**"ALT" CONTROL**

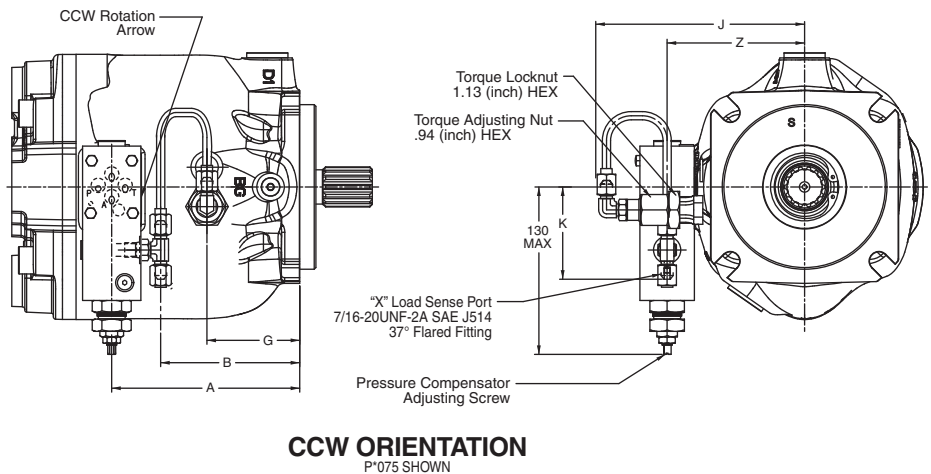
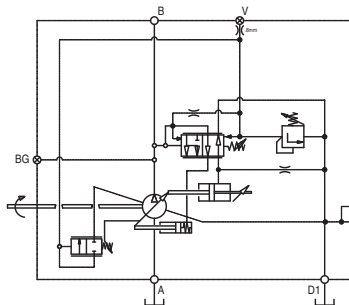
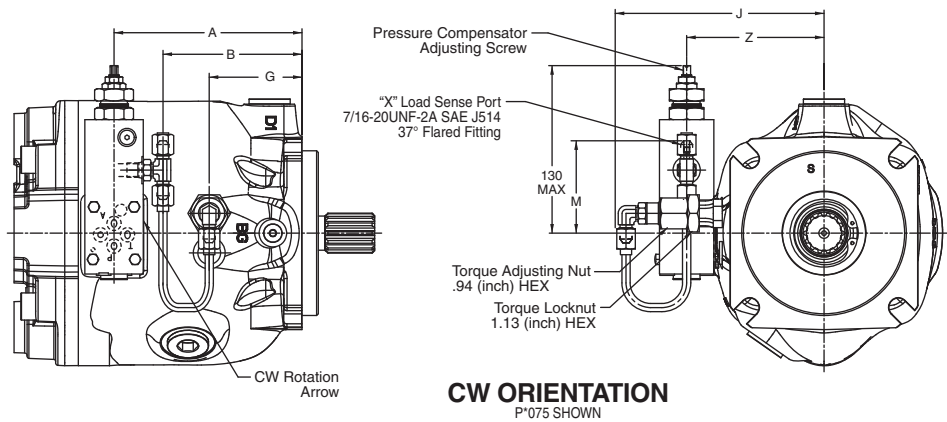


**CCW ORIENTATION**

### Dimensions

| Model | A     | B    | G     | H Max | J     | K    | L Max | M    | Z     |
|-------|-------|------|-------|-------|-------|------|-------|------|-------|
| P*045 | 134.5 | 74.1 | 69.5  | 122   | 157.0 | 48.6 | 132   | 48.6 | 103.0 |
| P*060 | 122.2 | 61.8 | 64.95 | 122   | 145.0 | 48.6 | 132   | 48.6 | 99.0  |

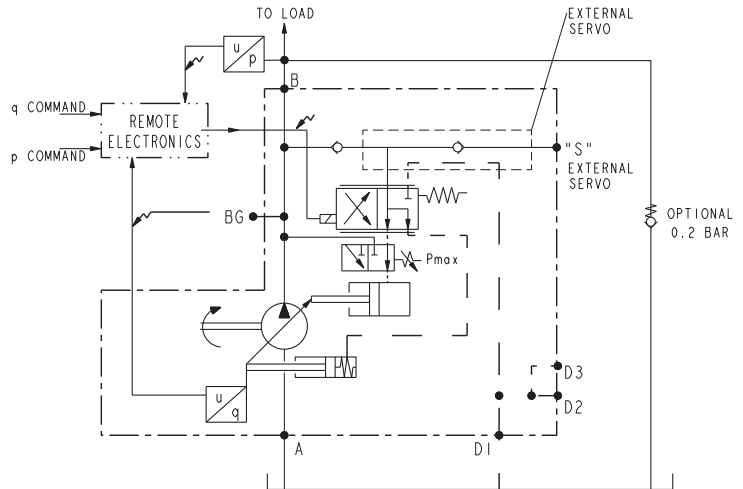
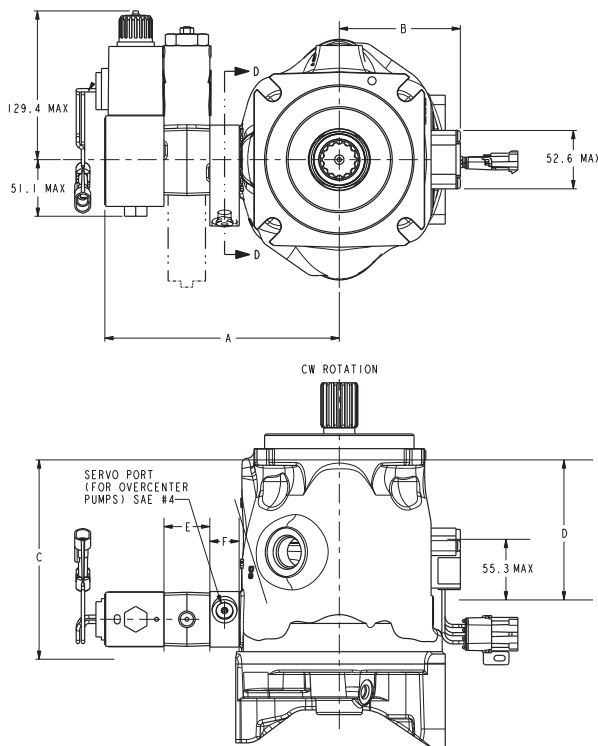
**Torque Limiter AMT Control**  
**Pressure Compensator with Torque Limiter**  
**"AMT" P\*075, P\*100 & P\*140**



**Dimensions**

| Model | A     | B     | F   | G     | H Max | J     | K    | L Max | M    | Z     |
|-------|-------|-------|-----|-------|-------|-------|------|-------|------|-------|
| P*075 | 145.0 | 113.0 | 127 | 71.6  | 122   | 161.0 | 71.1 | 130   | 71.1 | 104.5 |
| P*100 | 191.9 | 154.1 | 143 | 102.5 | 122   | 175.5 | 71.1 | 130   | 71.1 | 122.0 |
| P*140 | 203.8 | 166.0 | 155 | 95.4  | 122   | 184.5 | 71.1 | 130   | 71.1 | 134.0 |

## Electronic Control Options



Dimensions in the table below are shown for pump with servo, hydromechanical compensator Pmax and Electronic valve.

| Displacement (cc) | 18    | 28    | 45    | 60    | 75    | 100   | 140   |
|-------------------|-------|-------|-------|-------|-------|-------|-------|
| A max             | 179.2 | 188.2 | 195.2 | 199.2 | 202.2 | 218.2 | 230.2 |
| B max             | 84.8  | 91.8  | 98.9  | 103.4 | 106   | 124.4 | 132.4 |
| C max             | 116.1 | 137.5 | 148.2 | 160.5 | 122.8 | 155.9 | 151.2 |
| D max             | 101.2 | 111.1 | 115.0 | 119.0 | 171.4 | 218.3 | 230.2 |

Hydromechanical Pmax thickness (E)= 39mm

Servo body thickness (F)= 25mm - S2E-19182-5.

## General Information

Temperature: -40C to +85C  
Protection: Outdoor Use IP65  
Supply: 9 to 36 VDC  
Data Interface Type:  
CANJ1939

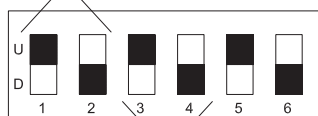
## 12 Pin Connector

| PIN | Designation          | Type           | Signal                 |
|-----|----------------------|----------------|------------------------|
| 1   | Coil High            | Input / Output | PWM                    |
| 2   | Power                | Input          | +9 to 36VDC            |
| 3   | Pump Enable          | Input          | +9 to 36VDC            |
| 4   | Source               | Output         | +5VDC                  |
| 5*  | Displacement Command | Input          | 0 to 5VDC or 4 to 20mA |
| 6*  | Pressure Command     | Input          | 0 to 5VDC or 4 to 20mA |
| 7*  | Torque Command       | Input          | 0 to 5VDC              |
| 8   | Pressure Signal      | Input          | 0 to 5VDC              |
| 9   | Displacement Signal  | Input          | 0 to 5VDC              |
| 10  | Signal Ground        | Input          | 0 VDC                  |
| 11  | Power Ground         | Input          | 0 VDC                  |
| 12  | Coil Low             | Input / Output | PWM                    |

\*10k ohm's minimum resistor suggested

## Enlarged view of the Dip Switches Configuration

Displacement command  
1 up 2 down = 0-5 VDC command  
1 down 2 up = 4-20 mA command



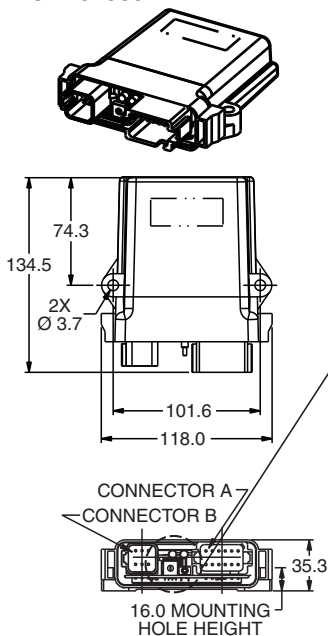
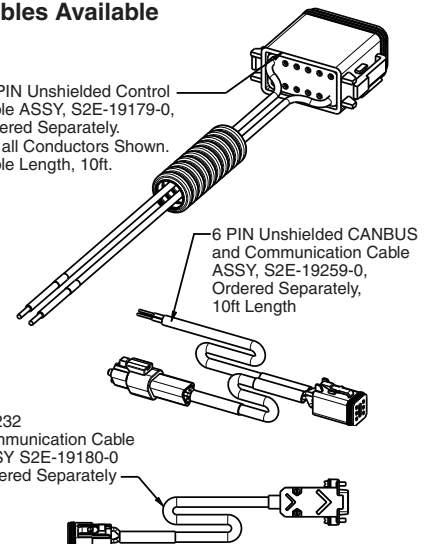
Pressure command  
3 up 4 down = 0-5 VDC command  
3 down 4 up = 4-20 mA command

## 6 Pin Connector

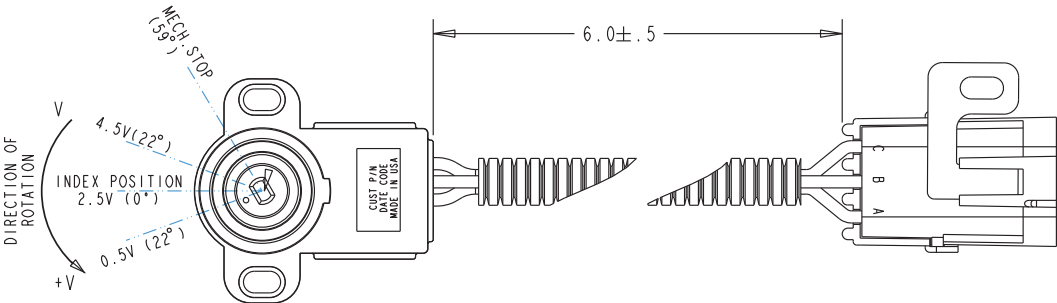
| PIN | Designation    | Type           | Signal |
|-----|----------------|----------------|--------|
| 1   | RS232 Receive  | Input / Output | -      |
| 2   | RS232 Ground   | Output         | -      |
| 3   | CANBUS Low     | Input / Output | -      |
| 4   | CANBUS High    | Input / Output | -      |
| 5   | Chassis Ground | Output         | 0VDC   |
| 6   | RS232 Transmit | Input          | -      |

## Cables Available

12 PIN Unshielded Control Cable ASSY, S2E-19179-0, Ordered Separately. Not all Conductors Shown. Cable Length, 10ft.



Electronic Control Options (Continued)  
Displacement Sensor Information



Sensor Wiring

| Wire color | Pin # | Signal    |
|------------|-------|-----------|
| Red        | C     | +5VDC     |
| Black      | A     | 0VDC      |
| Blue       | B     | 0 to 5VDC |

For CW:

Full stroke = 0.9VDC

Zero stroke = 2.5VDC

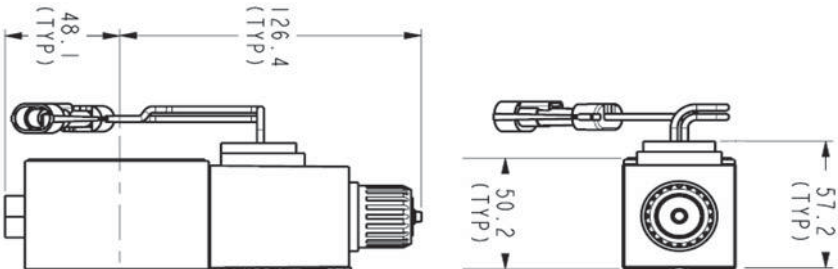
100% overcenter = 4.1VDC

For CCW

Full stroke = 4.1VDC

100% overcenter = 0.9VDC

Directional Proportional Valve Info



Valve Wiring

| Wire color | Pin # | Signal   |
|------------|-------|----------|
| Yellow     | A     | PWM High |
| Black      | B     | PWM Low  |

Valve mounts same direction regardless of rotation.

Valve Description

|                        |                      | Pump Direction of Rotation |                       |
|------------------------|----------------------|----------------------------|-----------------------|
|                        |                      | CW                         | CCW                   |
| Valve Default Position | "0" displacement     | D1FWA89HCVMB0020X6323      | D1FWB90HCVMB0020X6323 |
|                        | Maximum displacement | D1FWA90HCVMB0020X6323      | D1FWB89HCVMB0020X6323 |

Technical specification:

- Minimum holding current of 1.2 to 1.6A is required to the proportional valve at all times. (at metering edge)
- Depending on your application requirement, the accuracy around of the 1.5A maybe not be critical. (i.e for fan drive, a accuracy of +/-0.5A seems to be enough)
- Maximum current allowed to the valve is 2.5A  
1A valve available upon request

- Standard 4-Ohm Coil 9 Volt
- PWM frequency requirement is 100 to 250Hz
- Superimposed dither amplitude of +/- 200mA has given good results
- Controllers used with this valve need to have capability for proportional and integral control

Connectors

Sealed METRI-PACK 150 series connectors and locks used on RDEC-Valve



|        |               |          |                         |
|--------|---------------|----------|-------------------------|
| Item : | Parker        | OEM-No.  | Description             |
| A:     | S2E-19196-OK  | 12052641 | Female Connector Kit    |
| C:     | (on the coil) | 12162000 | Make Connector Assembly |

Weather Pack connectors for swash angle-sensor



|        |                 |          |                      |
|--------|-----------------|----------|----------------------|
| Item : | Parker          | OEM-No.  | Description          |
| E:     | S2E-19190-OK    | 12015793 | Female Connector Kit |
| F:     | (on the sensor) | 12010717 | Make Connector       |

Deutsh Connectors for Pressure Transducer

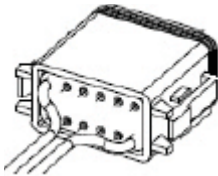
Item included on S2E-19191-0 kit  
DT06-4S Qty 1 – Connector  
0462-201-16141 Qty 3 – Sockets  
W4S Qty 1 – Wedgelock  
114017 Qty 1 – Cavity Plug

Communications Port



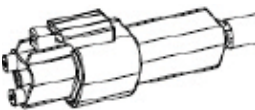
Item included on S2E-19259-0 cable assembly  
DT06-S6-C015 Qty 1 – Connector  
462-201-16141 Qty 6 – Sockets  
W6C Qty 1 – Orange Wedgelock

Pump Control Port



Item included on S2E-19179-0 cable assembly  
DT06-12SA Qty 1 – Connector  
0462-201-16141 Qty 12 – Pins  
W12S Qty 1 – Wedgelock

RS232 Communications Cable Connection



Item included on S2E-19259-0 cable assembly  
DT06-3P-C015 Qty 1 – Connector  
0460-202-16141 Qty 2 – Pins  
W3P Qty 1 – Wedgelock



## MOUNTING

These pumps are designed to operate in any position. The pump shaft must be in alignment with the shaft of the source driver and should be checked with a dial indicator. The mating pilot bore and coupling must be concentric. This concentricity is particularly important if the shaft is rigidly connected to the driven load without a flexible coupling.

## SHAFT INFORMATION

**Splined:** The shafts will accept a maximum misalignment of 0.15mm, 0.005 inch, total indicator reading. Angular misalignment at the external and internal spline axis must be less than  $\pm 0.002$  mm per mm of shaft radius,  $\pm 0.002$  inches per inch of shaft radius. The coupling interface must be lubricated. PARKER recommends lithium molydisulfide or similar grease. The internal coupling should be hardened to Rc 27-34 and must conform to SAE-J498c, class 5 flat root side fit.

**Keyed:** High strength heat treated keys must be used. Replacement keys must be hardened to 27-34 Rc. The key corners must be chamfered 0.81-1.0 mm, 0.032"-0.040", at 45° to clear radii that exist in the keyway.

## SIDE LOAD CAPABILITY

The P1/PD series is designed for inline-drive. Side loading on the shaft is not recommended. If this is unavoidable consult your nearest PARKER representative.

## FLUID CONNECTIONS

Connect inlet and outlet lines to the port block of the pump. The maximum case pressure is 2 bar (30 psi) continuous, 4 bar (60 psi) intermittent. The case pressure must never exceed inlet pressure by more than .5 bar (7 psi). When connecting case drain line make certain that drain plumbing passes above highest point of the pump before passing to the reservoir. The case leakage line must be of sufficient size to prevent back pressure in excess of 2 bar (30 psi) and returned to the reservoir below the surface of the oil as far from the supply inlet as possible. All fluid lines, whether pipe, tubing, or hose must be adequate size and strength to assure free flow through the pump. An undersize inlet line will prevent the pump from operating properly at full rated speed. An undersize outlet line will cause back pressure and cause heat generation and increased noise. Flexible hose lines are recommended. If rigid piping is used, the workmanship must be accurate to eliminate strain on the pump port block or to the fluid connections. Sharp bends in the lines must be eliminated wherever possible. All system piping must be cleaned and flushed before installing pump. Make sure the entire hydraulic system is free of dirt, lint, scale, or other foreign material.

**Caution:** Do not use galvanized pipe. Galvanized coating can flake off with continued use.

## SYSTEM RELIEF VALVES

Although the P1/PD series pumps have very fast off-stroke compensator response, system relief valves are recommended in all cases for safety considerations.

## RECOMMENDED FLUIDS

The fluid recommended for use in these pumps has a petroleum base and contains agents which provide oxidation inhibition and anti-rust, anti-foam and de-aerating properties as described in PARKER standard HF-1. Where anti-wear additive fluids are specified, see PARKER standard HF-0.

## VISCOSITY INDEX

90 V. I. minimum. Higher values extend the range of operating temperature but may reduce the service life of the fluid.

## TEMPERATURE

Determined by the viscosity characteristics of the fluid used. Because high temperatures degrade seals, reduce the service life of the fluid and create hazards, fluid temperature should not exceed 110°C (230°F) at the case drain.

## MAINTENANCE

The pump is self-lubricating and preventative maintenance is limited to keeping system fluid clean by changing filters frequently. Keep all fittings and screws tight. Do not operate at pressures and speeds in excess of the recommended limit. If the pump does not operate properly, check the troubleshooting chart before attempting to overhaul the unit. Overhauling may be accomplished by referring to the disassembly, rework limits of wear parts, and assembly procedures as provided in this service manual.

## FLUID CLEANLINESS

Fluid must be cleaned before and continuously during operation, by filters that maintain a cleanliness level of ISO 20/18/14. Better cleanliness levels will significantly extend the life of the components. As contaminant generation may vary with each application, each must be analyzed to determine proper filtration to maintain the required cleanliness level.



Mar 1st, 2012 - New ordering code format

Jul 1st, 2012 - Addition of electronic controls

Apr 1st, 2013 - Addition of P1/PD018 thru drive  
- Miscellaneous drawings updates  
- Shaft torque rating consolidation  
- Electrical connector information

Jan 30th, 2014 - P1045 - All drawings updated

## Offer of Sale

The items described in this document and other documents and descriptions provided by Parker Hannifin Corporation, Hydraulics Group, and its authorized distributors ("Seller") are hereby offered for sale at prices to be established by Seller. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any item described in its document, when communicated to Seller verbally, or in writing, shall constitute acceptance of this offer. All goods or work described will be referred to as "Products".

**1. Terms and Conditions.** Seller's willingness to offer Products, or accept an order for Products, to or from Buyer is expressly conditioned on Buyer's assent to these Terms and Conditions and to the terms and conditions found on-line at [www.parker.com/saleterms/](http://www.parker.com/saleterms/). Seller objects to any contrary or additional term or condition of Buyer's order or any other document issued by Buyer.

**2. Price Adjustments; Payments.** Prices stated on the reverse side or preceding pages of this document are valid for 30 days. After 30 days, Seller may change prices to reflect any increase in its costs resulting from state, federal or local legislation, price increases from its suppliers, or any change in the rate, charge, or classification of any carrier. The prices stated on the reverse or preceding pages of this document do not include any sales, use, or other taxes unless so stated specifically. Unless otherwise specified by Seller, all prices are F.O.B. Seller's facility, and payment is due 30 days from the date of invoice. After 30 days, Buyer shall pay interest on any unpaid invoices at the rate of 1.5% per month or the maximum allowable rate under applicable law.

**3. Delivery Dates; Title and Risk; Shipment.** All delivery dates are approximate and Seller shall not be responsible for any damages resulting from any delay. Regardless of the manner of shipment, title to any products and risk of loss or damage shall pass to Buyer upon tender to the carrier at Seller's facility (i.e., when it's on the truck, it's yours). Unless otherwise stated, Seller may exercise its judgment in choosing the carrier and means of delivery. No deferment of shipment at Buyer's request beyond the respective dates indicated will be made except on terms that will indemnify, defend and hold Seller harmless against all loss and additional expense. Buyer shall be responsible for any additional shipping charges incurred by Seller due to Buyer's changes in shipping, product specifications or in accordance with Section 13, herein.

**4. Warranty.** Seller warrants that the Products sold hereunder shall be free from defects in material or workmanship for a period of eighteen months from the date of delivery to Buyer. The prices charged for Seller's products are based upon the exclusive limited warranty stated above, and upon the following disclaimer: **DISCLAIMER OF WARRANTY: THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO PRODUCTS PROVIDED HEREUNDER. SELLER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS AND IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

**5. Claims; Commencement of Actions.** Buyer shall promptly inspect all Products upon delivery. No claims for shortages will be allowed unless reported to the Seller within 10 days of delivery. No other claims against Seller will be allowed unless asserted in writing within 60 days after delivery or, in the case of an alleged breach of warranty, within 30 days after the date within the warranty period on which the defect is or should have been discovered by Buyer. Any action based upon breach of this agreement or upon any other claim arising out of this sale (other than an action by Seller for any amount due to Seller from Buyer) must be commenced within thirteen months from the date of tender of delivery by Seller or, for a cause of action based upon an alleged breach of warranty, within thirteen months from the date within the warranty period on which the defect is or should have been discovered by Buyer.

**6. LIMITATION OF LIABILITY.** UPON NOTIFICATION, SELLER WILL, AT ITS OPTION, REPAIR OR REPLACE A DEFECTIVE PRODUCT, OR REFUND THE PURCHASE PRICE. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR AS THE RESULT OF, THE SALE, DELIVERY, NON-DELIVERY, SERVICING, USE OR LOSS OF USE OF THE PRODUCTS OR ANY PART THEREOF, OR FOR ANY CHARGES OR EXPENSES OF ANY NATURE INCURRED WITHOUT SELLER'S WRITTEN CONSENT, EVEN IF SELLER HAS BEEN NEGLIGENT, WHETHER IN CONTRACT, TORT OR OTHER LEGAL THEORY. IN NO EVENT SHALL SELLER'S LIABILITY UNDER ANY CLAIM MADE BY BUYER EXCEED THE PURCHASE PRICE OF THE PRODUCTS.

**7. Contingencies.** Seller shall not be liable for any default or delay in performance if caused by circumstances beyond the reasonable control of Seller.

**8. User Responsibility.** The user, through its own analysis and testing, is solely responsible for making the final selection of the system and Product and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application and follow applicable industry standards and Product information. If Seller provides Product or system options, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the Products or systems.

**9. Loss to 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 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.

**10. Special Tooling.** A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture Products. 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 Products, 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.

**11. Buyer's Obligation; Rights of Seller.** To secure payment of all sums due or otherwise, Seller shall retain a security interest in the goods delivered and this agreement shall be deemed a Security Agreement under the Uniform Commercial Code. Buyer authorizes Seller as its attorney to execute and file on Buyer's behalf all documents Seller deems necessary to perfect its security interest. Seller shall have a security interest in, and lien upon, any property of Buyer in Seller's possession as security for the payment of any amounts owed to Seller by Buyer.

**12. Improper Use and Indemnity.** Buyer shall indemnify, defend, and hold Seller harmless from any claim, liability, damages, lawsuits, and costs (including attorney fees), whether for personal injury, property damage, patent, trademark or copyright infringement or any other claim, brought by or incurred by Buyer, Buyer's employees, or any other person, arising out of: (a) improper selection, improper application or other misuse of Products purchased by Buyer from Seller; (b) any act or omission, negligent or otherwise, of Buyer; (c) Seller's use of patterns, plans, drawings, or specifications furnished by Buyer to manufacture Product; or (d) Buyer's failure to comply with these terms and conditions. Seller shall not indemnify Buyer under any circumstance except as otherwise provided.

**13. Cancellations and Changes.** Orders shall not be subject to cancellation or change by Buyer for any reason, except with Seller's written consent and upon terms that will indemnify, defend and hold Seller harmless against all direct, incidental and consequential loss or damage. Seller may change product features, specifications, designs and availability with notice to Buyer.

**14. Limitation on Assignment.** Buyer may not assign its rights or obligations under this agreement without the prior written consent of Seller.

**15. Entire Agreement.** This agreement contains the entire agreement between the Buyer and Seller and constitutes the final, complete and exclusive expression of the terms of the agreement. All prior or contemporaneous written or oral agreements or negotiations with respect to the subject matter are herein merged.

**16. Waiver and Severability.** Failure to enforce any provision of this agreement will not waive that provision nor will any such failure prejudice Seller's right to enforce that provision in the future. Invalidation of any provision of this agreement by legislation or other rule of law shall not invalidate any other provision herein. The remaining provisions of this agreement will remain in full force and effect.

**17. Termination.** This agreement may be terminated by Seller for any reason and at any time by giving Buyer thirty (30) days written notice of termination. In addition, Seller may by written notice immediately terminate this agreement for the following: (a) Buyer commits a breach of any provision of this agreement (b) the appointment of a trustee, receiver or custodian for all or any part of Buyer's property (c) the filing of a petition for relief in bankruptcy of the other Party on its own behalf, or by a third party (d) an assignment for the benefit of creditors, or (e) the dissolution or liquidation of the Buyer.

**18. Governing Law.** This agreement and the sale and delivery of all Products hereunder shall be deemed to have taken place in and shall be governed and construed in accordance with the laws of the State of Ohio, as applicable to contracts executed and wholly performed therein and without regard to conflicts of laws principles. Buyer irrevocably agrees and consents to the exclusive jurisdiction and venue of the courts of Cuyahoga County, Ohio with respect to any dispute, controversy or claim arising out of or relating to this agreement. Disputes between the parties shall not be settled by arbitration unless, after a dispute has arisen, both parties expressly agree in writing to arbitrate the dispute.

**19. 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 Section. Seller will defend and indemnify Buyer against allegations of infringement of U.S. patents, U.S. trademarks, copyrights, trade dress and trade secrets ("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 a Product sold pursuant to this Agreement 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 a Product 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 the Product, replace or modify the Product so as to make it noninfringing, or offer to accept return of the Product 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 Products 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 Product sold hereunder. The foregoing provisions of this Section shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

**20. Taxes.** Unless otherwise indicated, 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 Products.

**21. Equal Opportunity Clause.** For the performance of government contracts and where dollar value of the Products exceed \$10,000, the equal employment opportunity clauses in Executive Order 11246, VEVRAA, and 41 C.F.R. §§ 60-1.4(a), 60-741.5(a), and 60-250.4, are hereby incorporated.



# Extensive Hydraulic Product Offering

---

## Accumulators



Piston, bladder and diaphragm type accumulators, gas bottles and KleenVent reservoir isolators.

[www.parker.com/accumulator](http://www.parker.com/accumulator)

## Compact Hydraulics



Self-contained with a motor, gear pump, reservoir, internal valving, load hold checks and relief valves.

[www.parker.com/oildyne](http://www.parker.com/oildyne)

## Cylinders



Standard and custom hydraulic cylinders for industrial and mobile applications.

[www.parker.com/hydcyl](http://www.parker.com/hydcyl)

## Electronics/Remote Controls



Parker's unique IQAN approach combines sturdy, well-tested hardware with intelligent, flexible computing power.

[www.parker.com/iqan](http://www.parker.com/iqan)

## Filtration



Pressure and return line filters enhances machine life, reduces maintenance and lowers costs.

[www.parker.com/hydraulicfilter](http://www.parker.com/hydraulicfilter)

## Integrated Hydraulic Circuits



Solutions for complex circuits that include threaded cartridge valves integrated into a single manifold.

[www.parker.com/hcs](http://www.parker.com/hcs)

## Motors



Full line of high and low speed motors provides power up to 15,000 in-lbs of torque.

[www.parker.com/pumpmotor](http://www.parker.com/pumpmotor)

## Power Take Off



Parker Chelsea leads the industry for engineering, innovation and performance in auxiliary power systems.

[www.parker.com/chelsea](http://www.parker.com/chelsea)

## Power Units



The most complete line of standard, pre-engineered, cataloged hydraulic power units in the industry.

[www.parker.com/pumpmotor](http://www.parker.com/pumpmotor)

## Pumps



Broad line of energy-efficient hydraulic pumps that includes piston, vane and gear pumps.

[www.parker.com/mobpump](http://www.parker.com/mobpump)

## Rotary Actuator



Industry leader in the design and manufacture of hydraulic rack and pinion, and vane style rotary actuators.

[www.parker.com/actuator](http://www.parker.com/actuator)

## Valves and Controls



Hydraulic valves for virtually every hydraulic equipment application, from simple to precise control.

[www.parker.com/hydraulicvalve](http://www.parker.com/hydraulicvalve)



Parker Hannifin Corporation  
**Hydraulic Pump Division**  
14249 Industrial Parkway  
Marysville, OH 43040 USA  
phone 937 644 4435  
fax 937 642 3639  
[www.parker.com](http://www.parker.com)