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**hydraulics**  
pneumatics  
process control  
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## P1/PD Series Medium Pressure Axial Piston Pumps

Variable Displacement  
Catalog HY28-2665-01/P1/EN  
Effective: August 1, 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

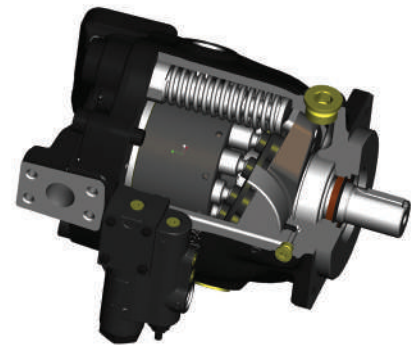
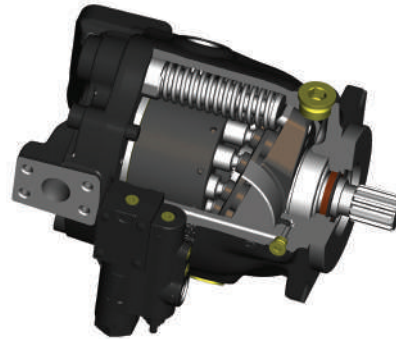
**Benefits**

- 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**



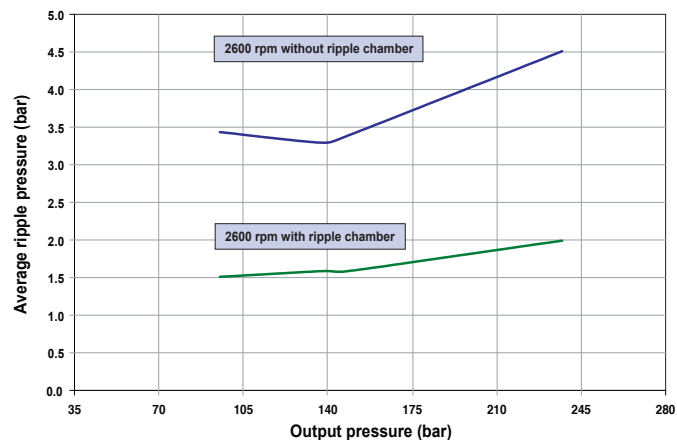
**PD Series**

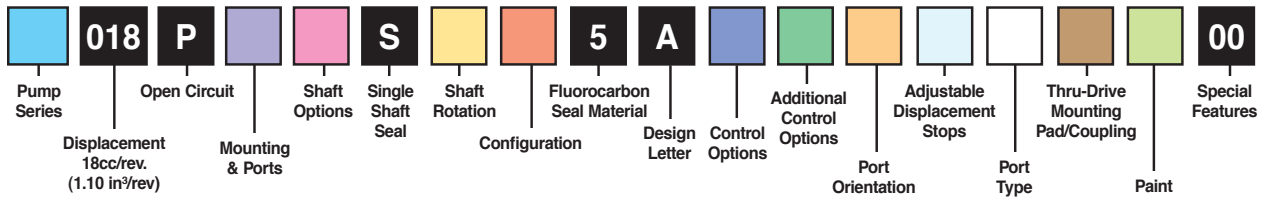


**Ripple Chamber Technology**

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 942-4061 PSI (65-280 bar)
C1	Pressure limiter 290-1160 PSI (20-80 bar)
L0	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with pressure limiter 942-4061 PSI (65-280 bar)
L2	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 942-4061 PSI (65-280 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

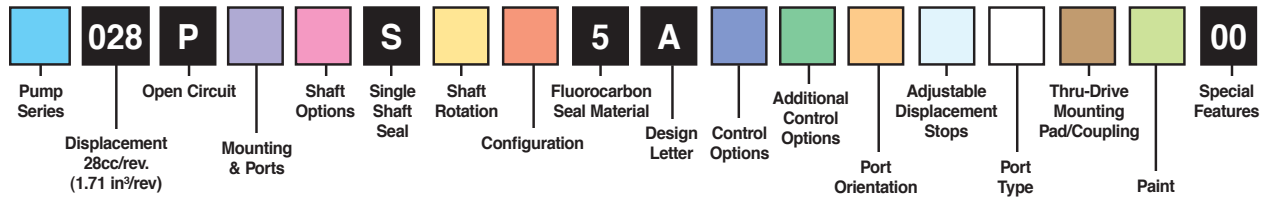
Electronic Control Options	
#	#

0	No ECU - 9VDC valve
M	No ECU - 24VDC valve
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)
X	Electronic valve with max displacement default (CANBUS compatible)
Y	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 942 - 4061 PSI (65 - 280 bar)
C1	Pressure limiter 290 - 1160 PSI (20 - 80 bar)
L0	Load sensing 145 - 435 PSI ΔP (10 - 30 bar ΔP) with pressure limiter 942 - 4061 PSI (65 - 280 bar)
L2	Load sensing 145 - 435 PSI ΔP (10 - 30 bar ΔP) with bleed & pressure limiter 942 - 4061 PSI (65 - 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* (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

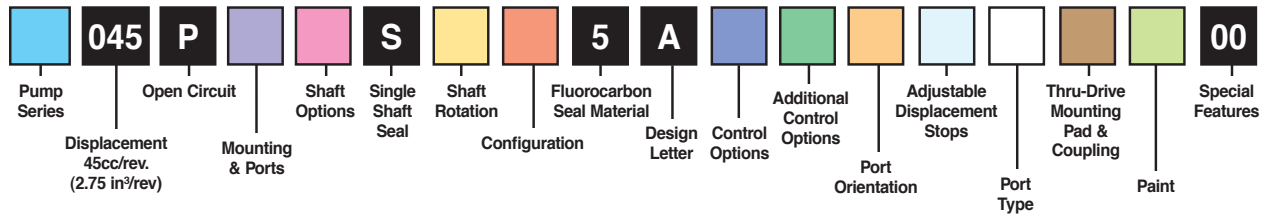
Paint	
00	No Paint
PB	Black Paint

Electronic Control Options	
#	#

0	No ECU - 9 VDC valve
M	No ECU - 24 VDC valve
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	Spined shaft - SAE B-B 15T
02	Keyed shaft - SAE B-B 1" Dia.
04	ISO keyed 25MM Dia.
08	Spined 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 942 - 4061 PSI (65 - 280 bar)
C1	Pressure limiter 290 - 1160 PSI (20 - 80 bar)
L0	Load sensing 145 - 435 PSI ΔP (10-30 bar ΔP) with pressure limiter 942 - 4061 PSI (65 - 280 bar)
L2	Load sensing 145 - 435 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 942 - 4061 PSI (65 - 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
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

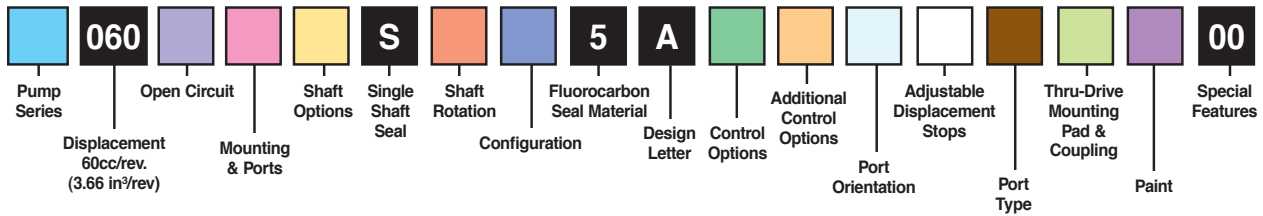
Paint	
00	No Paint
PB	Black Paint

Electronic Control Options	
#	#

0	No ECU - 9 VDC valve
M	No ECU - 24 VDC valve
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 942-4061 PSI (65 - 280 bar)
C1	Pressure limiter 290 - 1160 PSI (20 - 80 bar)
L0	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with pressure limiter 942-4061 PSI (65-280 bar)
L2	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 942-4061 PSI (65-280 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"

Electronic Control Options	
#	#

0	No ECU - 9 VDC valve
M	No ECU - 24 VDC valve
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"

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

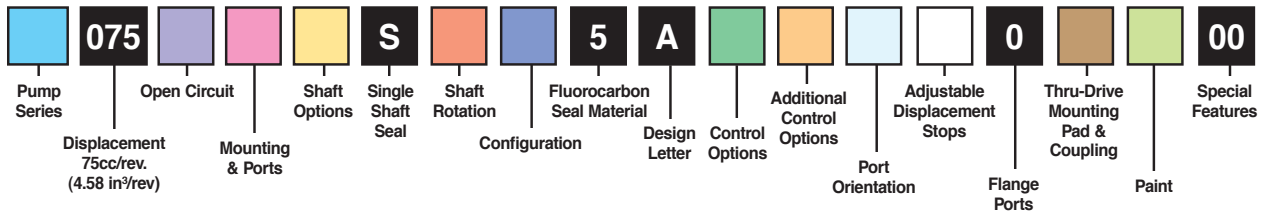
Adjustable Displacement Stops* (For E & S Port Orientation Only)	
0	None
1*	Adjustable maximum displacement stop
2*	Adjustable minimum displacement stop
3*	Adjustable maximum and minimum displacement stop

\*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



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	Spined 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 942-4061 PSI (65-280 bar)
C1	Pressure limiter 290-1160 PSI (20-80 bar)
L0	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with pressure limiter 942-4061 PSI (65-280 bar)
L2	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 942-4061 PSI (65-280 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, L0 or L2 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
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

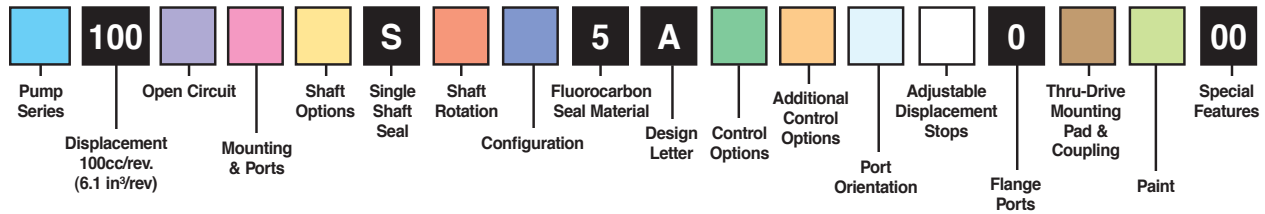
Electronic Control Options	
#	#

0	No ECU - 9 VDC valve
M	No ECU - 24 VDC valve
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	Spined shaft - SAE C-C 17T
02	Keyed shaft - SAE C-C 38-1
04	Keyed shaft - ISO / DIN 40MM Dia.
06	Spined shaft - SAE C 14T

Shaft Rotation	
R	Clockwise
L	Counterclockwise

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

Control Options	
C0	Pressure limiter 942-4061 PSI (65-280 bar)
C1	Pressure limiter 290-1160 PSI (20-80 bar)
L0	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with pressure limiter 942-4061 PSI (65-280 bar)
L2	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 942-4061 PSI (65-280 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, L0 or L2 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
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

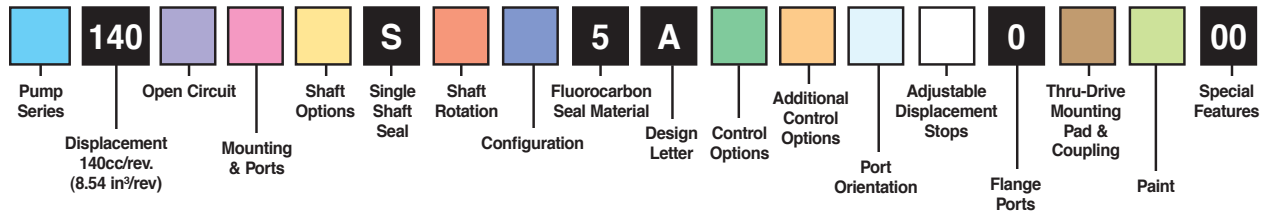
Paint	
00	No Paint
PB	Black Paint

Electronic Control Options	
#	#

0	No ECU - 9 VDC valve
M	No ECU - 24 VDC valve
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 942-4061 PSI (65-280 bar)
C1	Pressure limiter 290-1160 PSI (20-80 bar)
L0	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with pressure limiter 942-4061 PSI (65-280 bar)
L2	Load sensing 145-435 PSI ΔP (10-30 bar ΔP) with bleed & pressure limiter 942-4061 PSI (65-280 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, L0 or L2 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
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), 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 - 9 VDC valve
M	No ECU - 24 VDC valve
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 cu.in./rev	18 1.10	28 1.71	45 2.75	60 3.66	75 4.58	100 6.1	140 8.54
Outlet Pressure – Continuous, bar psi	280 4000						
Intermittent*, bar psi	320 4500						
Peak, bar psi	350 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 psi	10 (gage) 145						
Rated, bar psia	1.0 absolute (0.0 gage) 14.5						
Minimum, bar psia	0.8 absolute (-0.2 gage) 11.6						
Case Pressure – Peak, bar	4.0 absolute (3.0 gage) and less than 0.5 bar above inlet pressure						
Rated, bar	2.0 absolute (1.0 gage) and less than 0.5 bar above inlet pressure						
Fluid Temperature Range, °C °F	-40 to +95 -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	180 mm	
SAE Keyed Shafts	19-1, A	25-1, BB	25-1, BB	32-1, C	32-1, C	44-1, D	
ISO Keyed Shafts	20 mm	25 mm	25 mm	32 mm	32 mm	50 mm	
SAE Spline Shafts	9T, A 11T, A	13T, B 15T, BB	13T, B 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)	17.8 (39.8)	18.1 (40.0)	24 (52)	30 (67)	31 (68)	53 (117)	67 (147)
Thru-Drive, kg (lb)	19.6 (43.9)	22.5 (50.4)	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 Reponse 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		

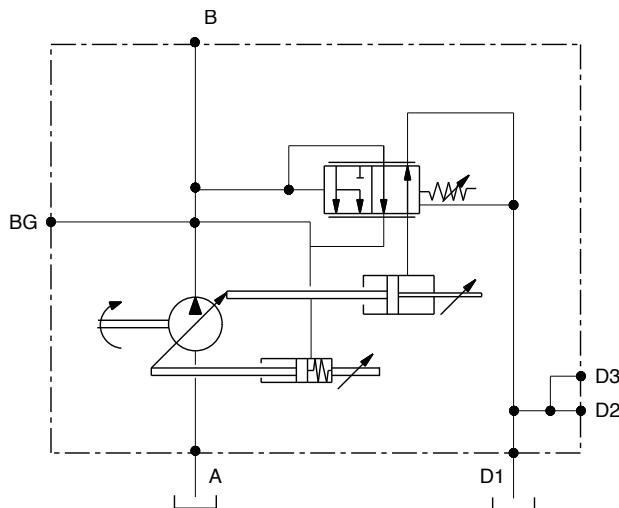
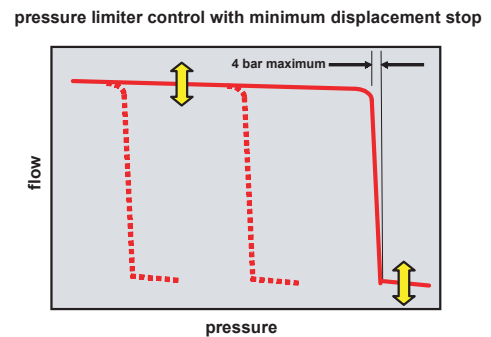
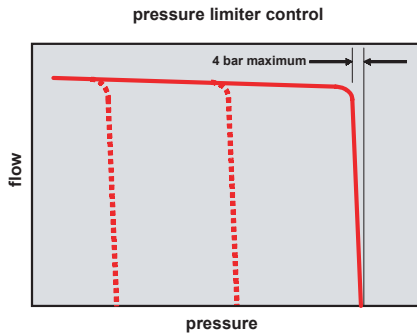
**Control Adjustment Sensitivity:**

- 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 de-stroke 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.)

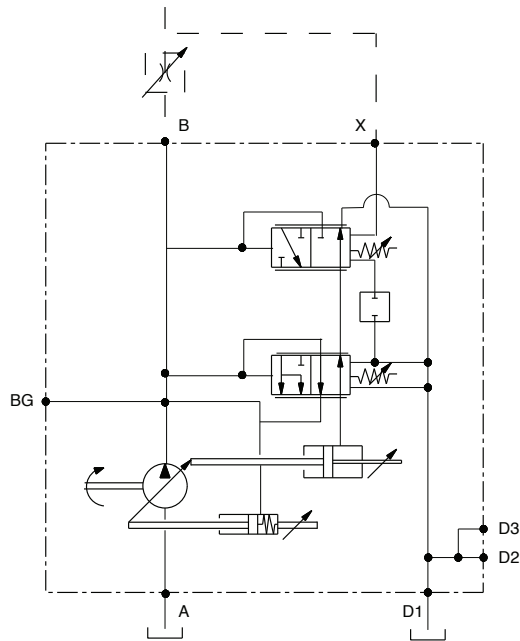
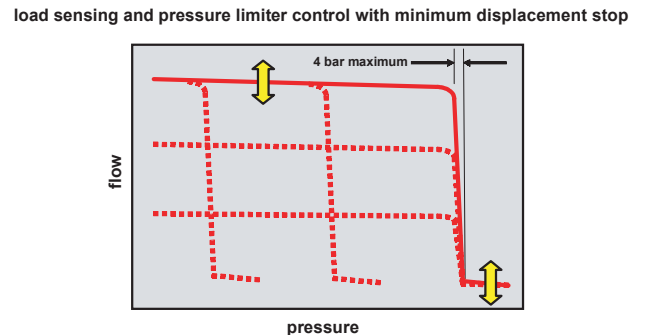
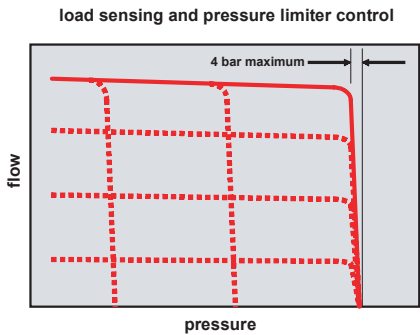
Refer to page 9 for typical control characteristics.



**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**

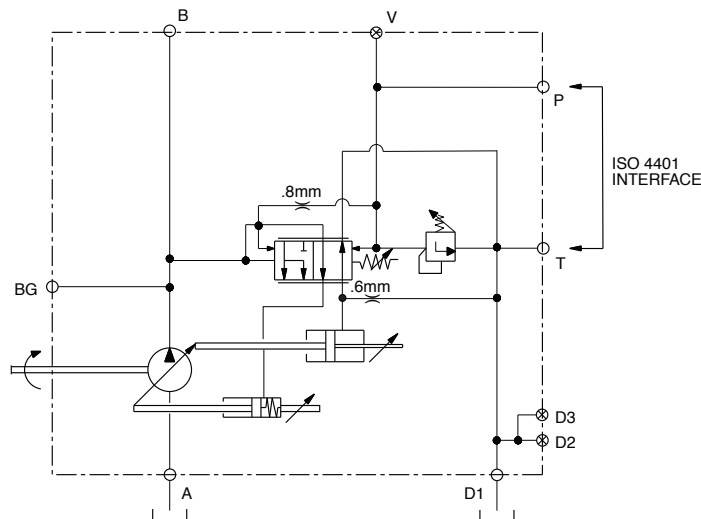
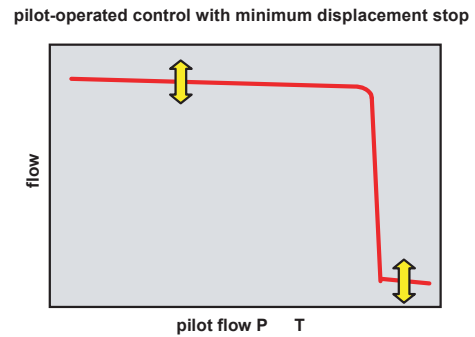
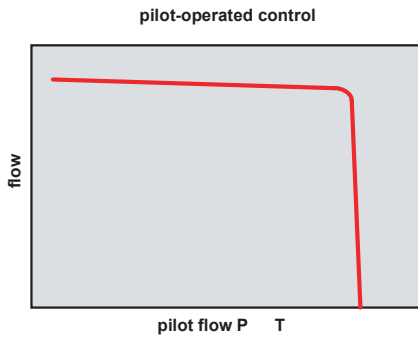
(A minimum displacement stop requires the use of a system relief valve.)

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.)



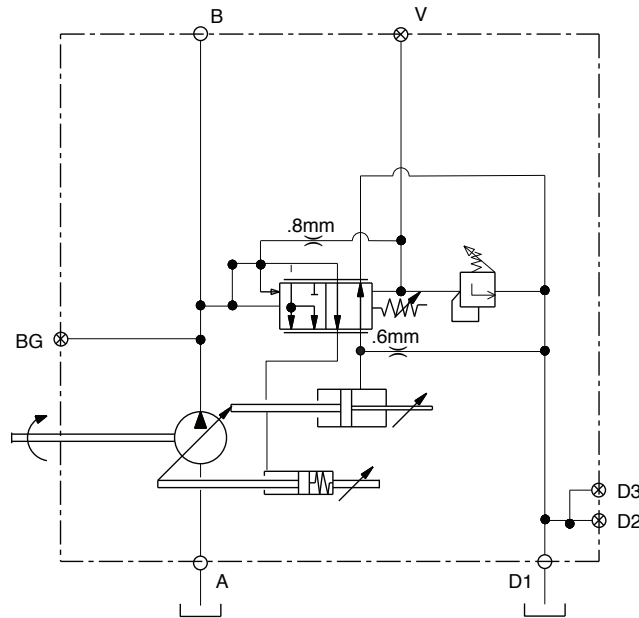
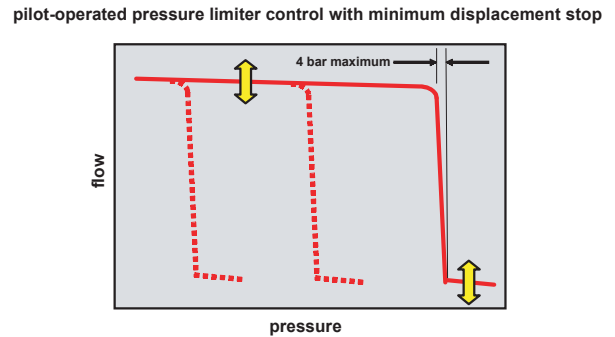
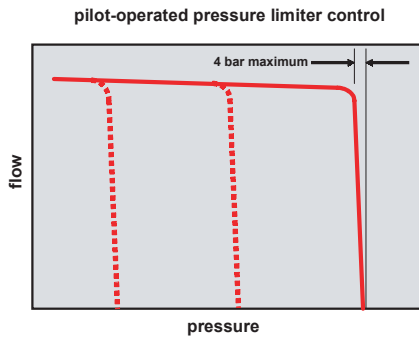
**“AN”**  
**with Optional Minimum & Maximum**  
**Displacement Adjustments**  
(A minimum displacement stop requires the use of a system relief valve.)

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 decrease 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.

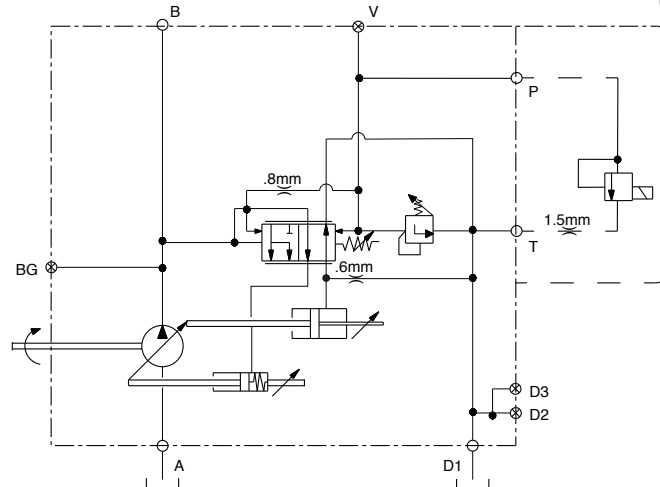
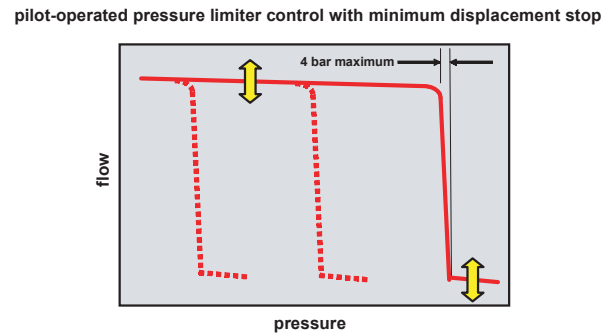
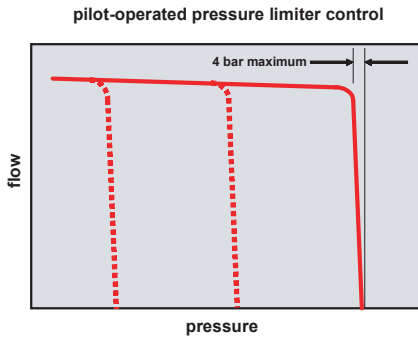
**Control Options “AE” and “AF”  
 Pilot Operated Pressure Limiter Control with  
 Proportional Electronic Adjustment**

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 P1045, P1060, P1075, P1100, P1140 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.

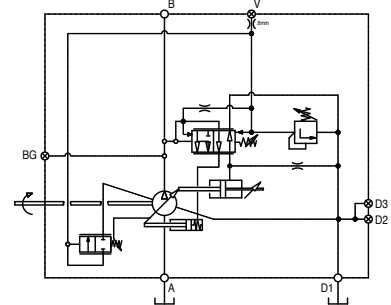
“ALT” Control ( Available on P1045, P1060 Models)

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.

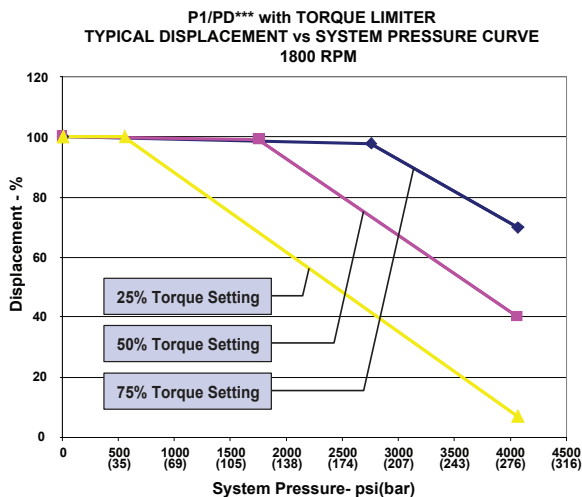
“LOT” Control ( Available on P1075, P1100, P1140 Models)

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 proportional displacement and pressure controls with or without an adjustable hydromechanical pressure limiter.\*

*\*Pumps without pressure limiter should be designed in a circuit with other means of pressure relief.*

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.

**Options are available for the sequence valve:**

R5S which is a standard product from our Hydraulic Valve Division

IC-6481 (3/4" flange), IC-6482 (1" flange), IC-6483 (1-1/4" flange) manifold with cartridge solution from Hydraulic Cartridge Systems Division

**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"

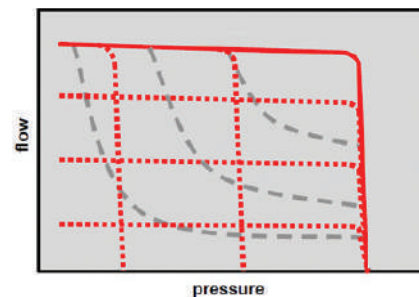
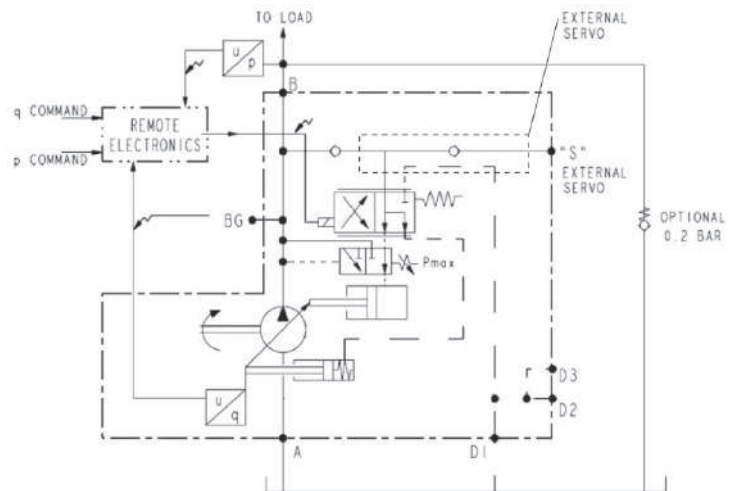
**Typical Control Response Times**

Displacement (cc)	Response time (ms)						
	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 website.

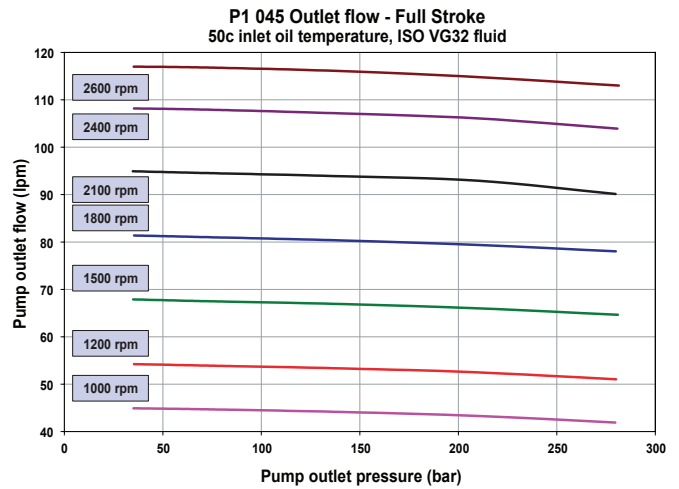
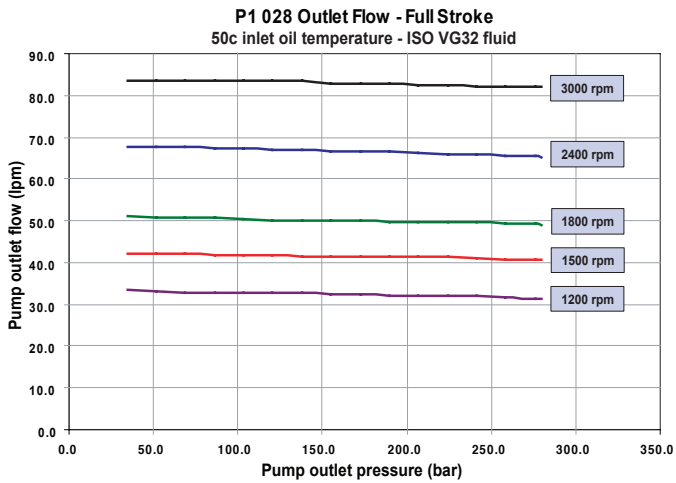
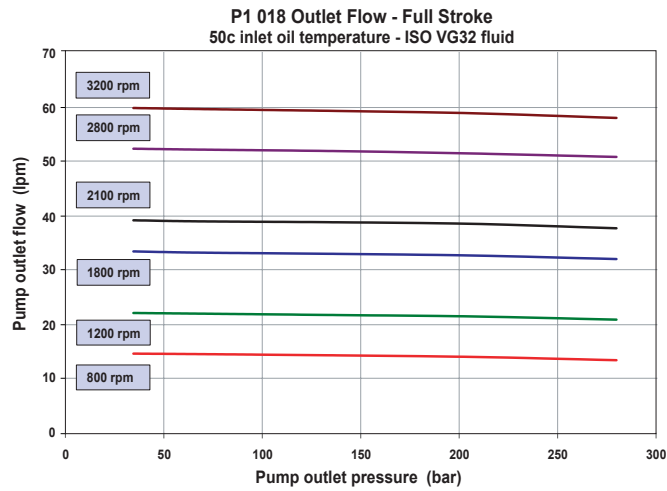
The mechanical pressure limiter will override the electronic inputs and limit pump outlet pressure to the preset level.

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

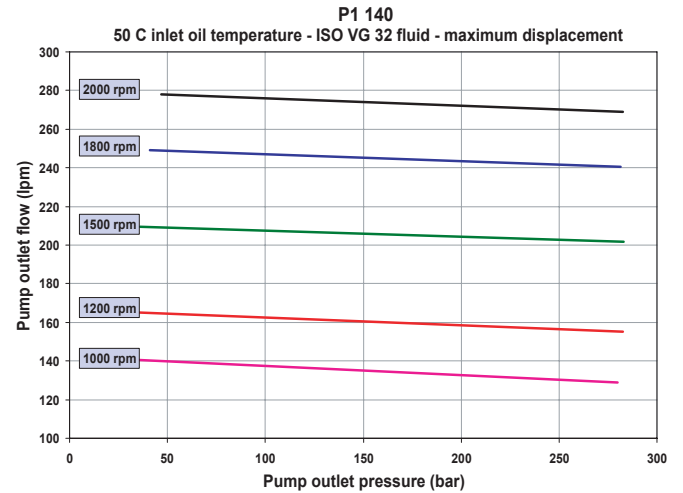
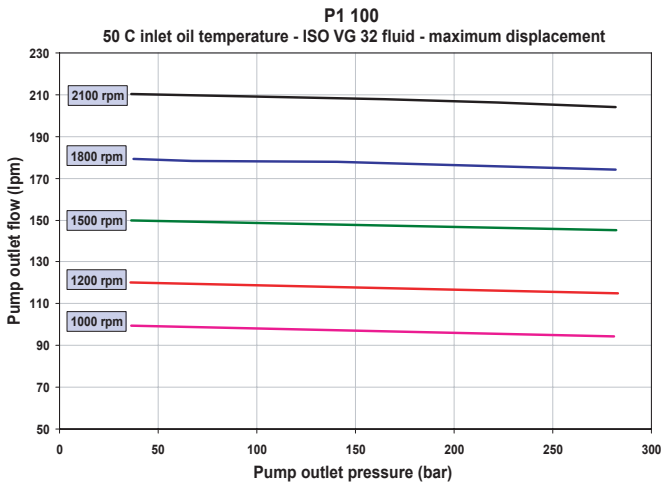
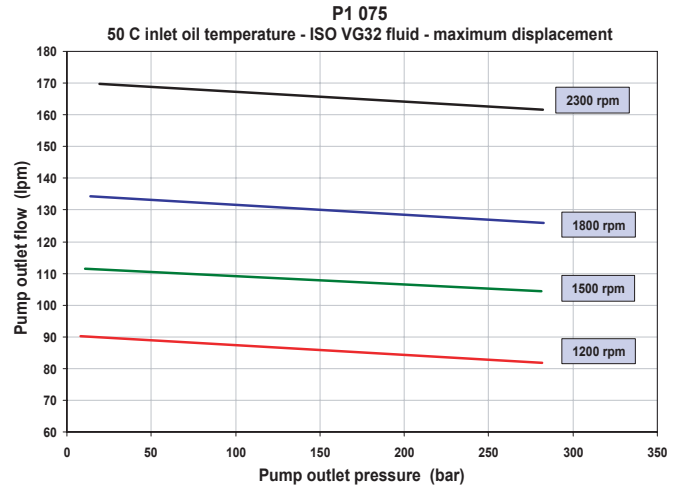
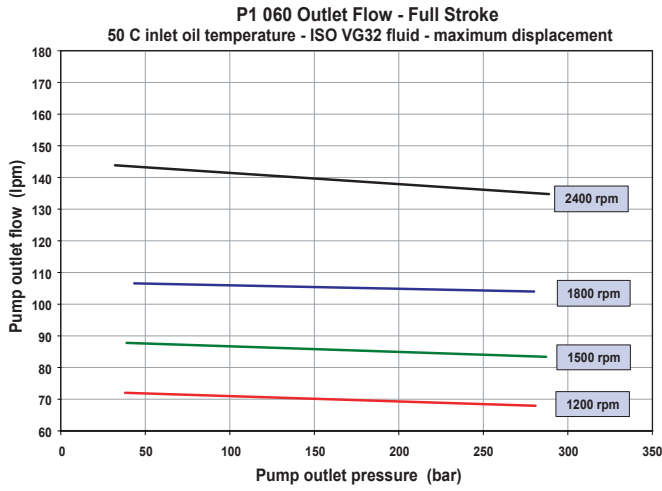




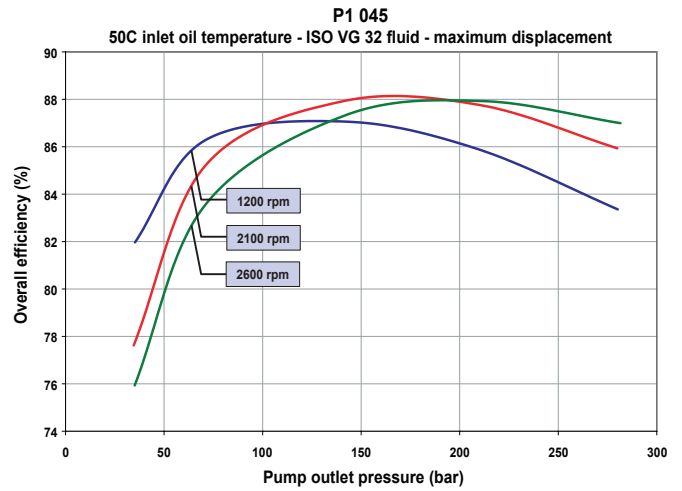
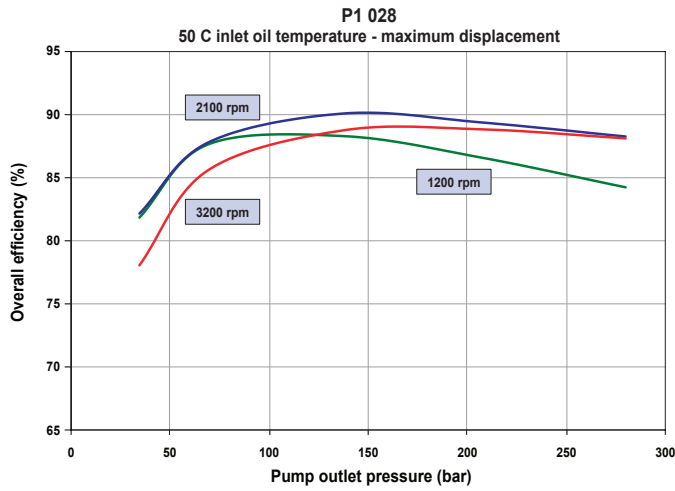
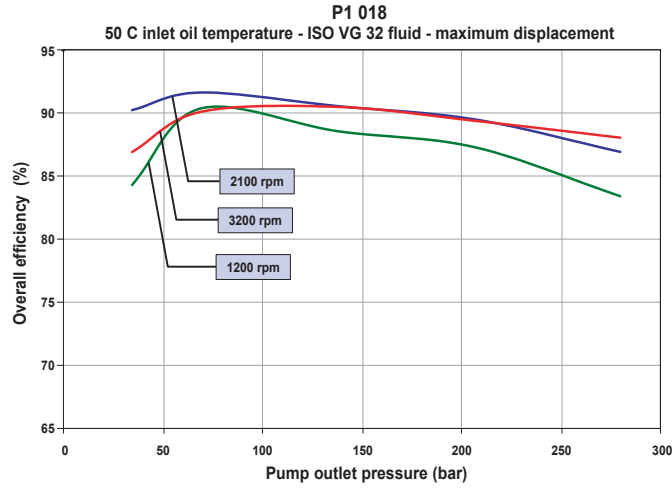
**P1 Series Typical Pump Outlet Flow**



**P1 Series Typical Pump Outlet Flow**

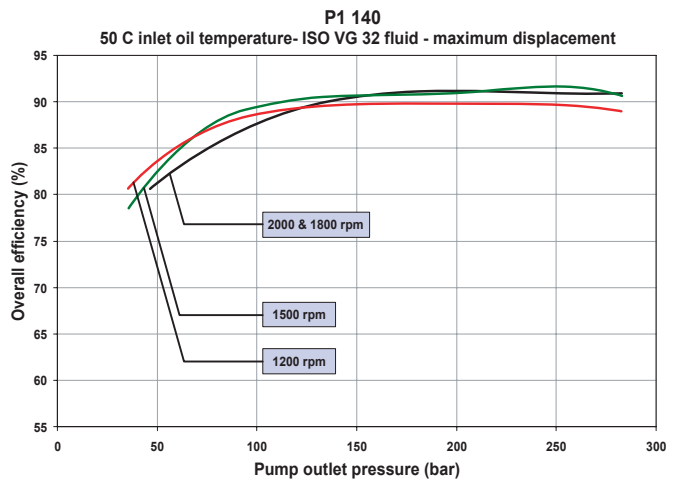
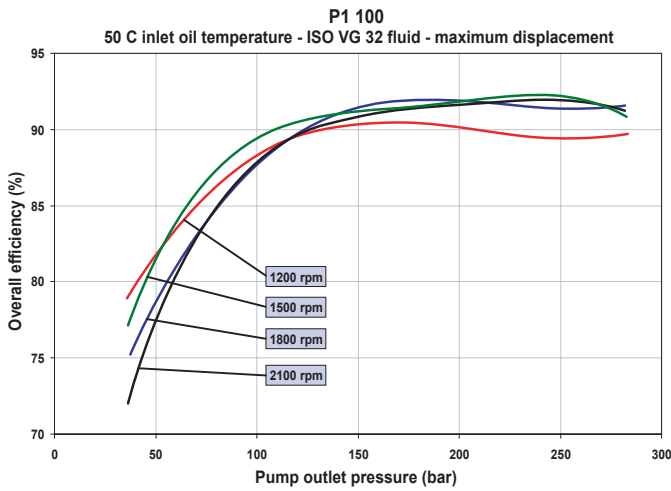
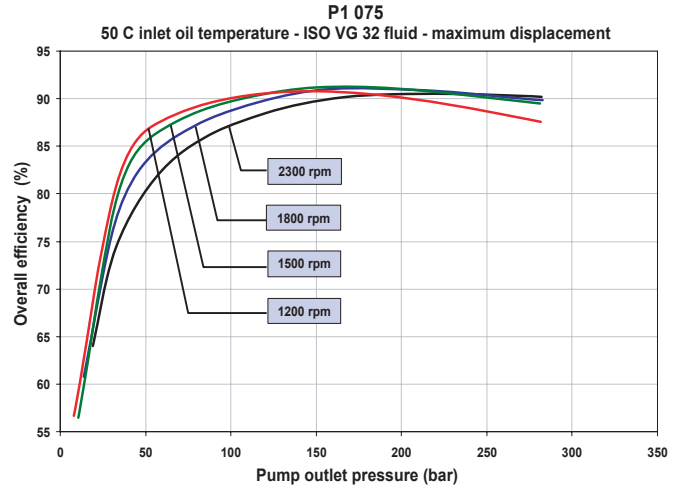
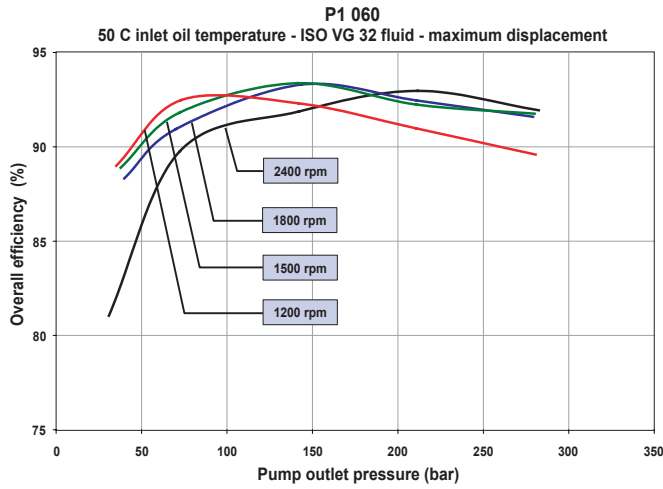


**P1 Series Typical Overall Efficiency**

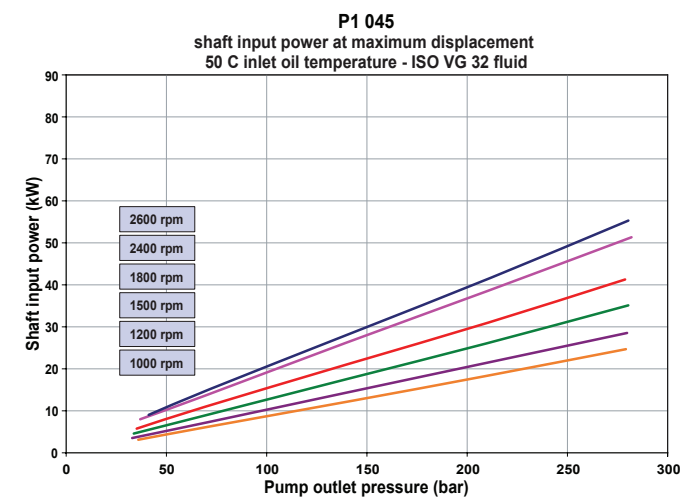
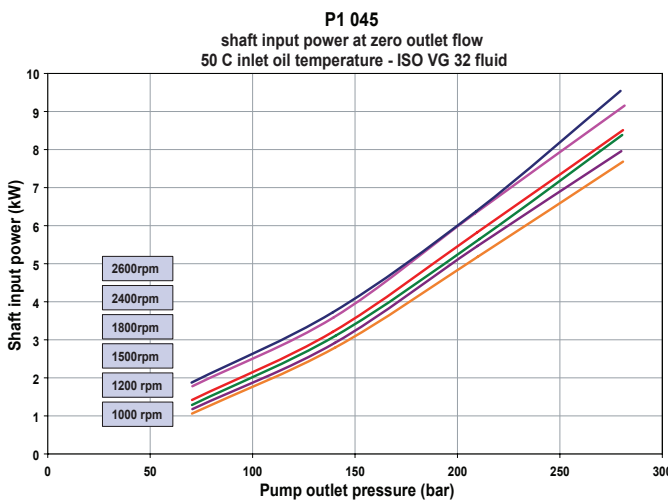
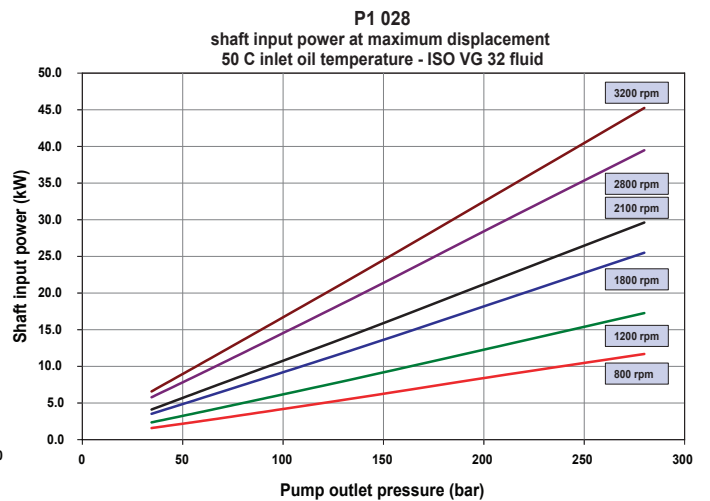
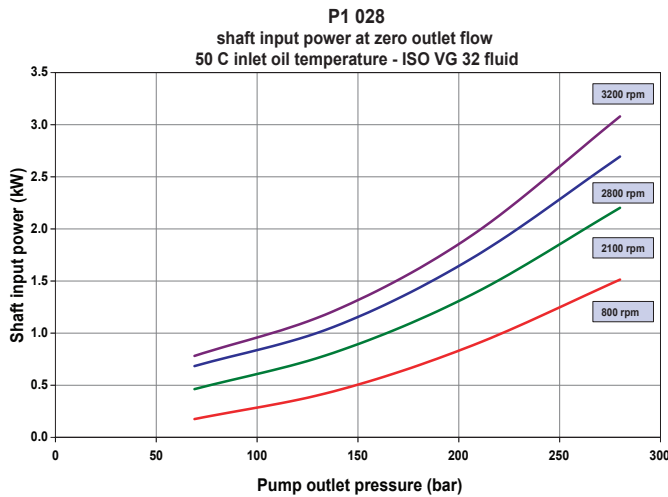
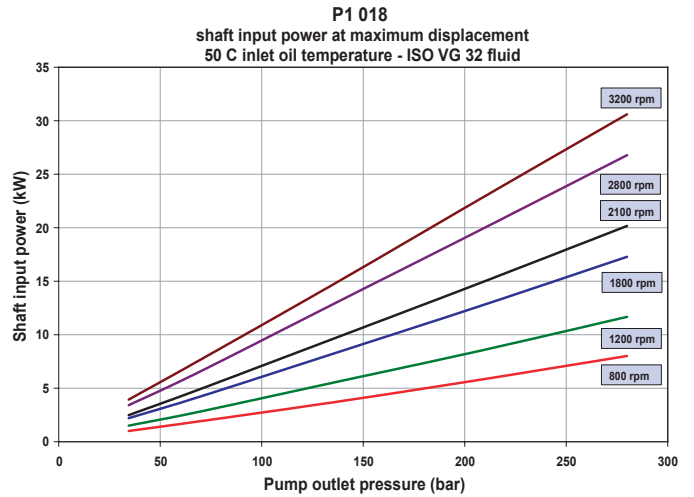
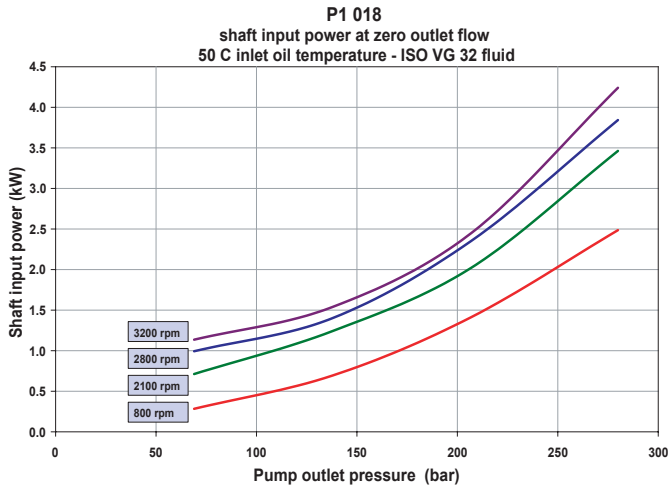




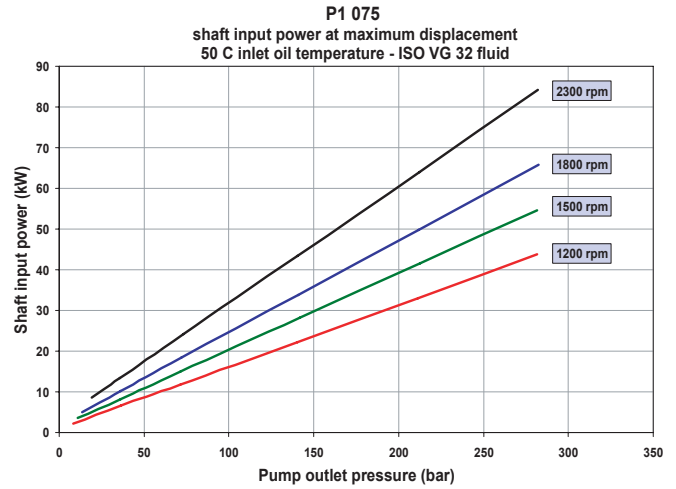
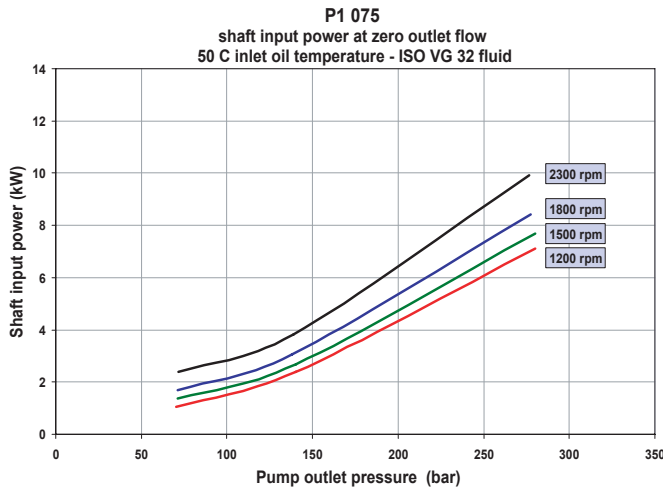
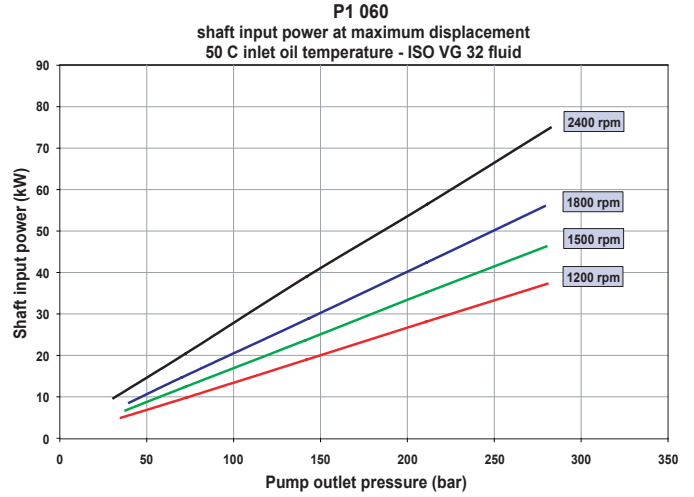
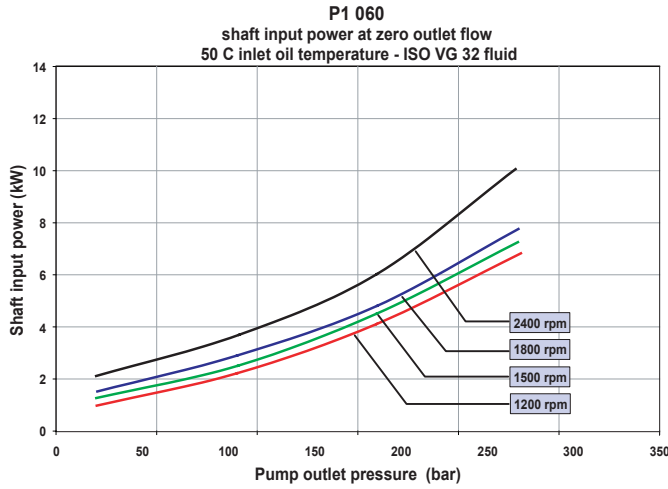
**P1 Series Typical Overall Efficiency**



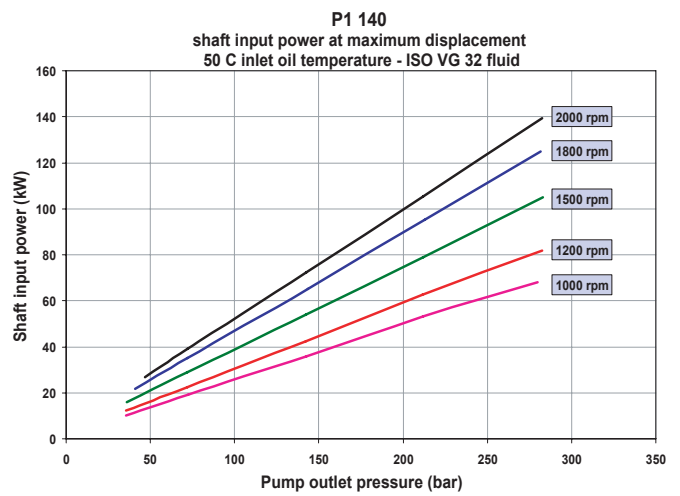
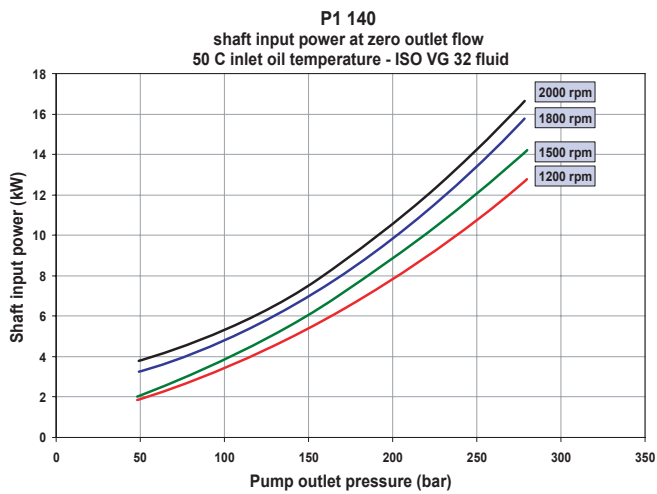
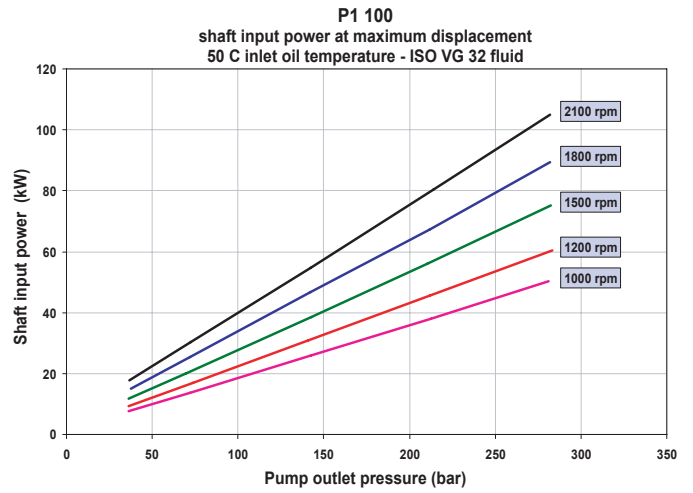
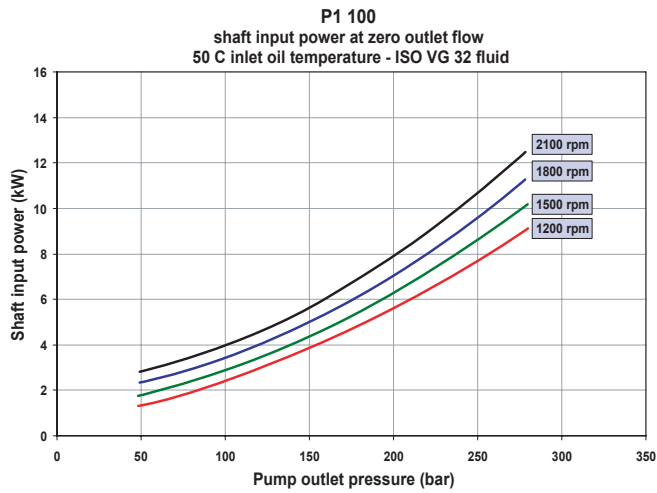
**P1 Series Typical Shaft Input Power**



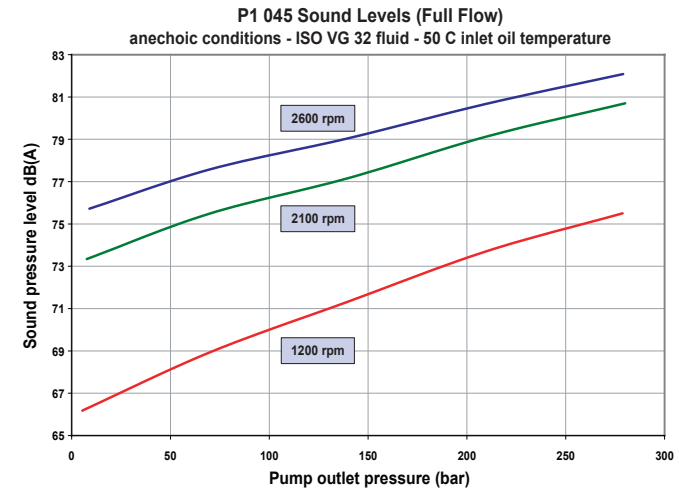
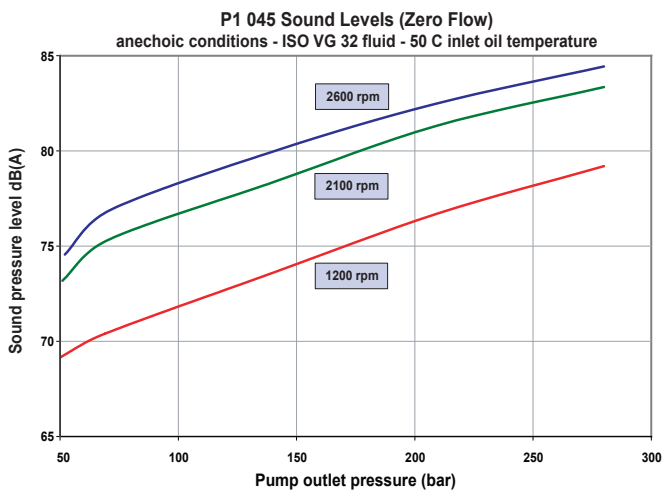
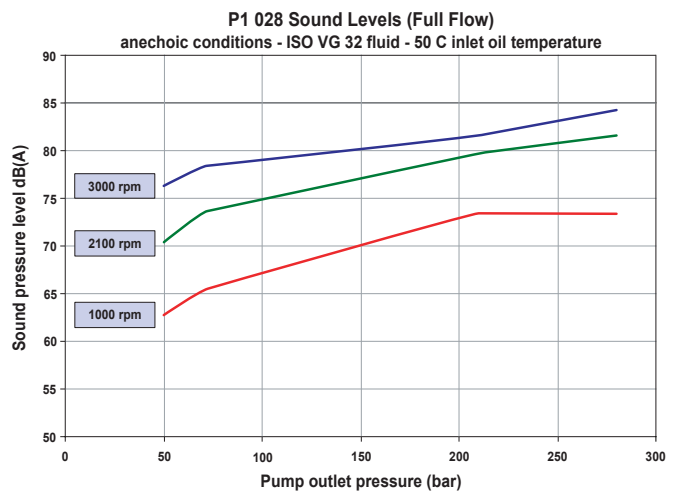
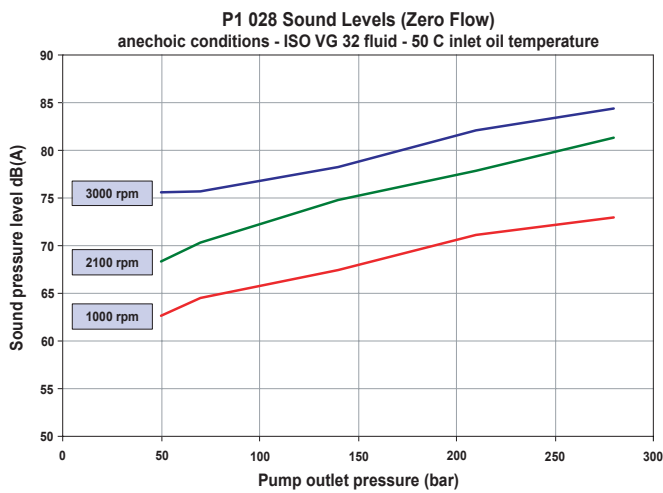
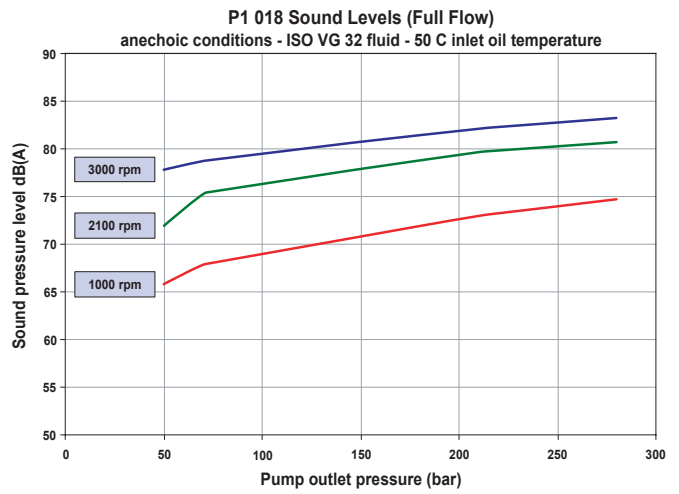
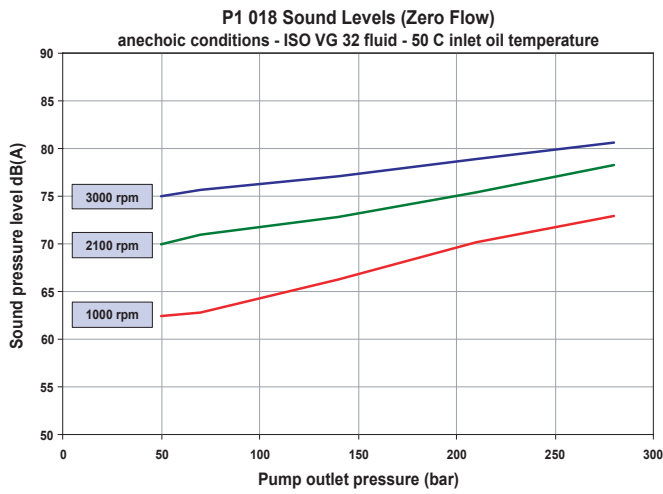
**P1 Series Typical Shaft Input Power**



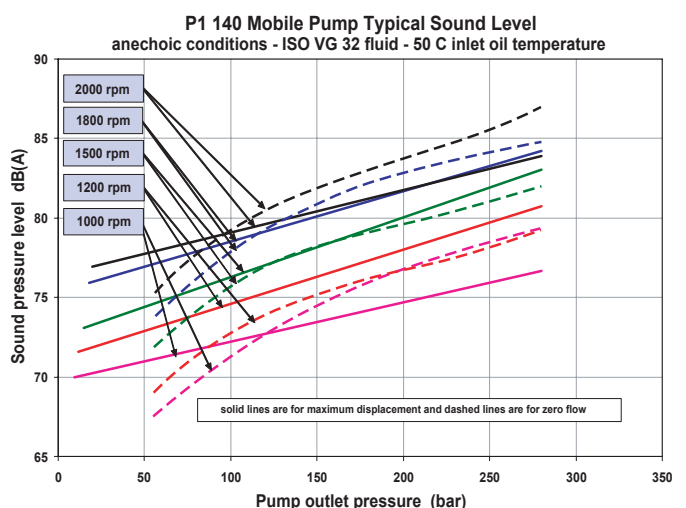
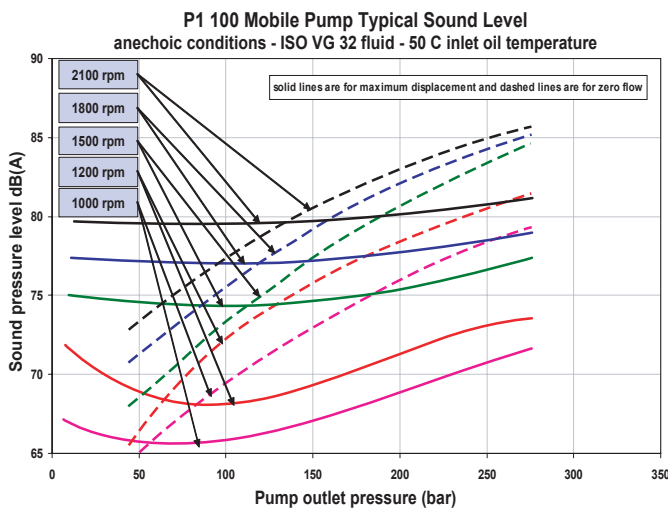
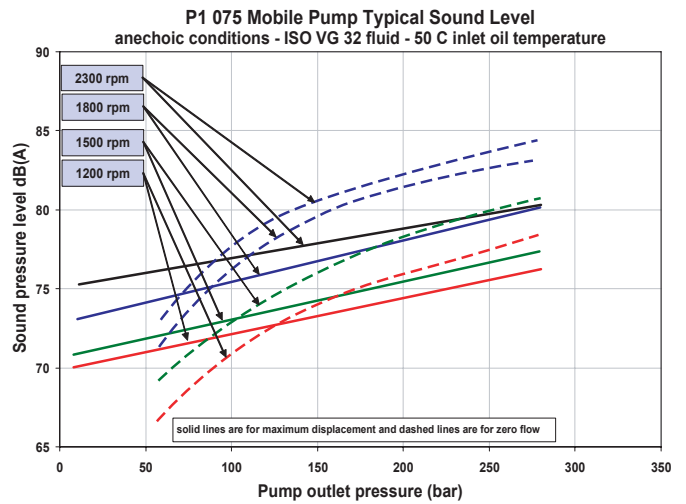
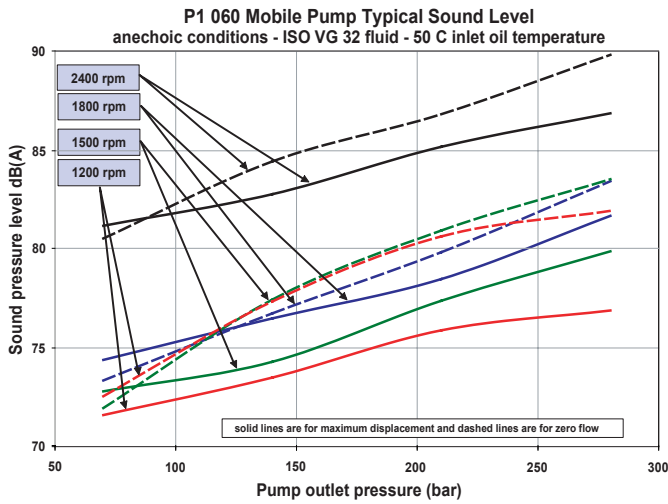
**P1 Series Typical Shaft Input Power**



**P1 Series Typical Noise Characteristics**  
 (These are anechoic sound pressure readings)

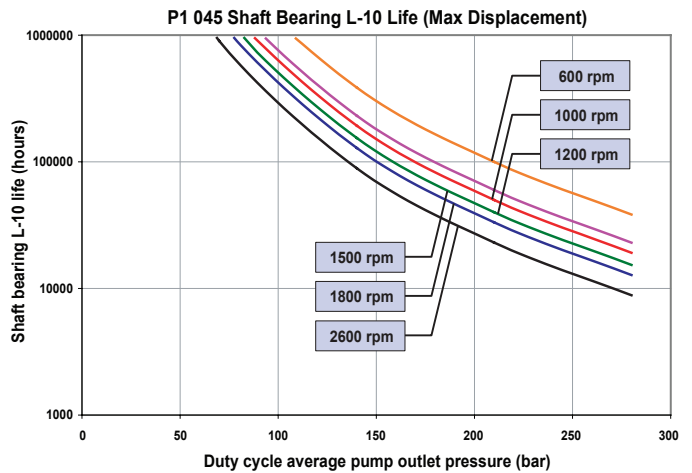
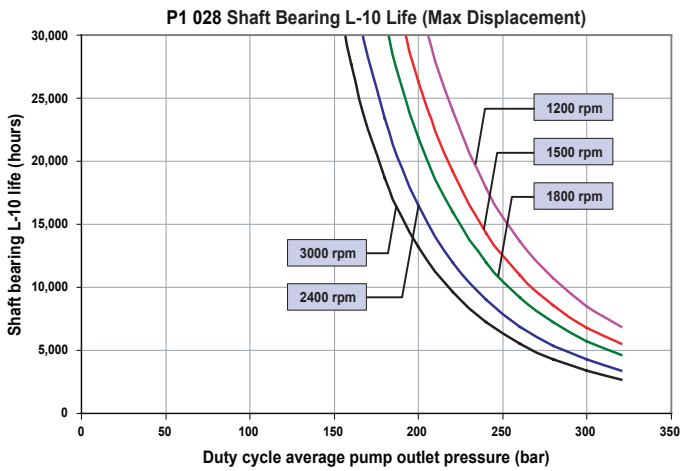
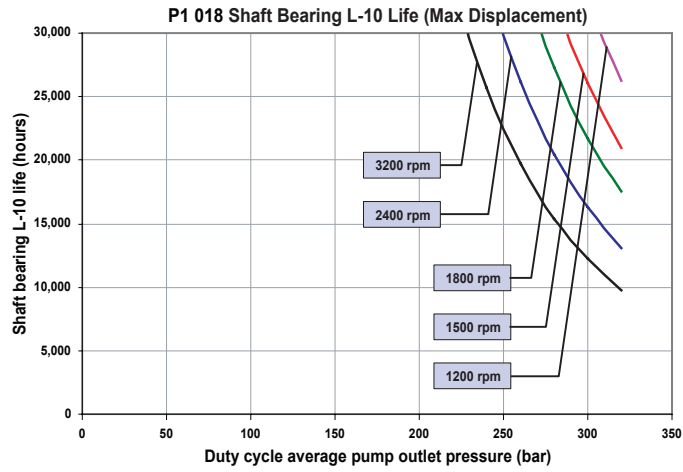


**P1 Series Typical Noise Characteristics**  
 (These are anechoic sound pressure readings)

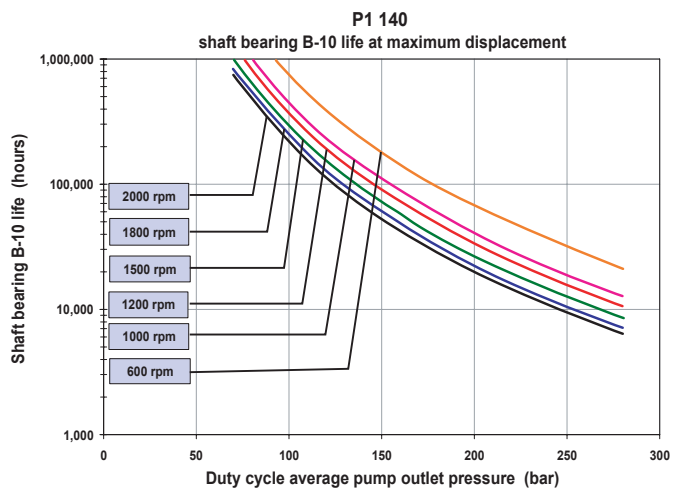
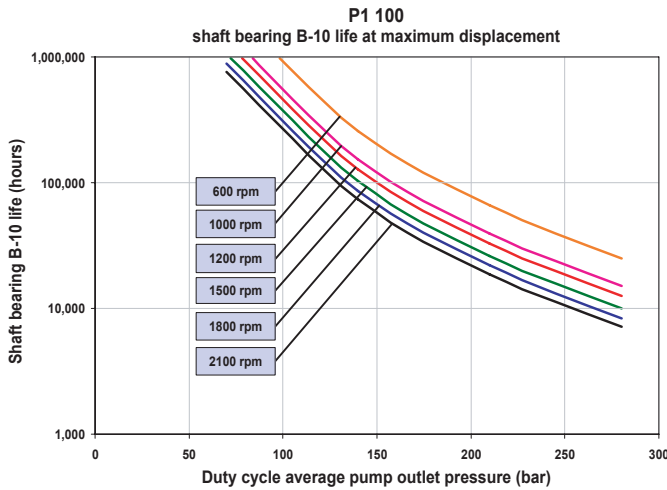
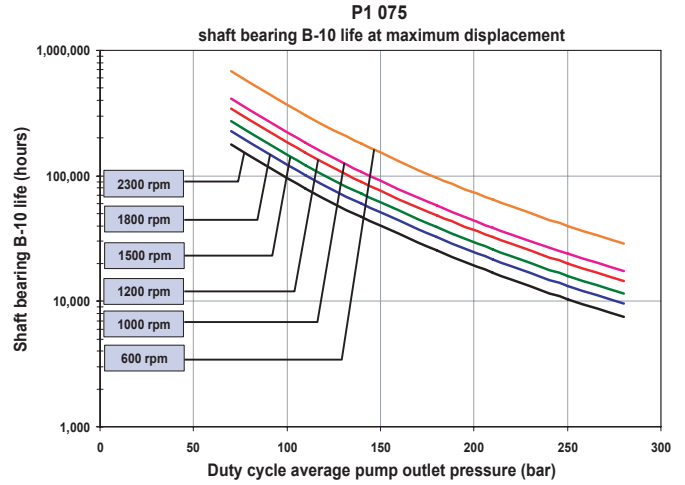
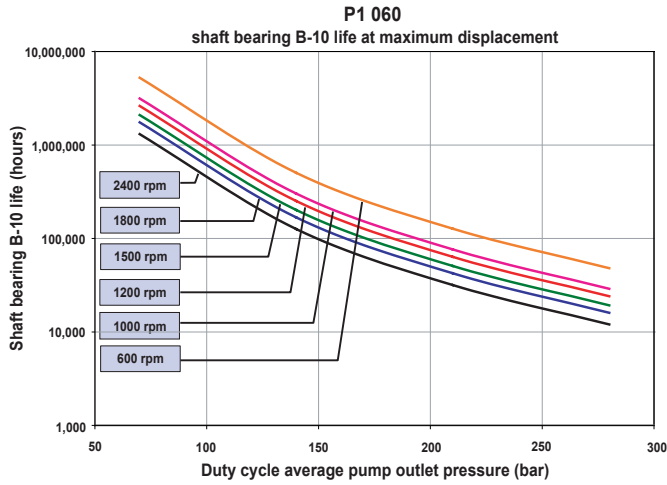




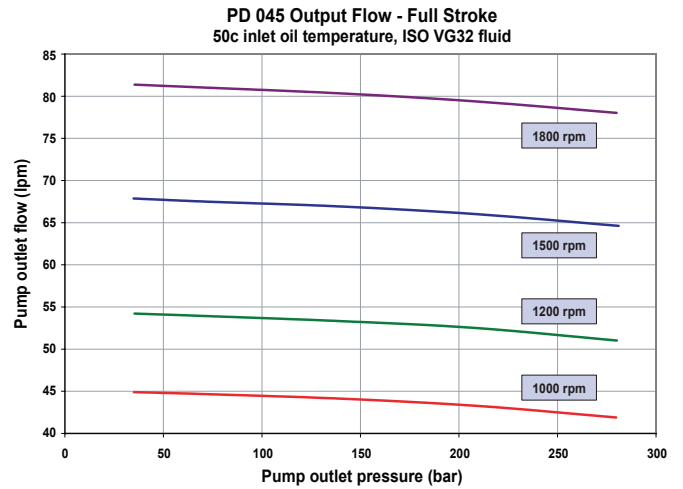
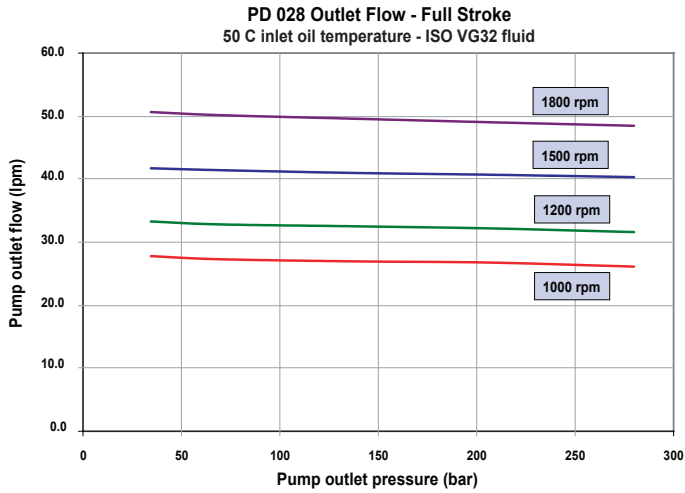
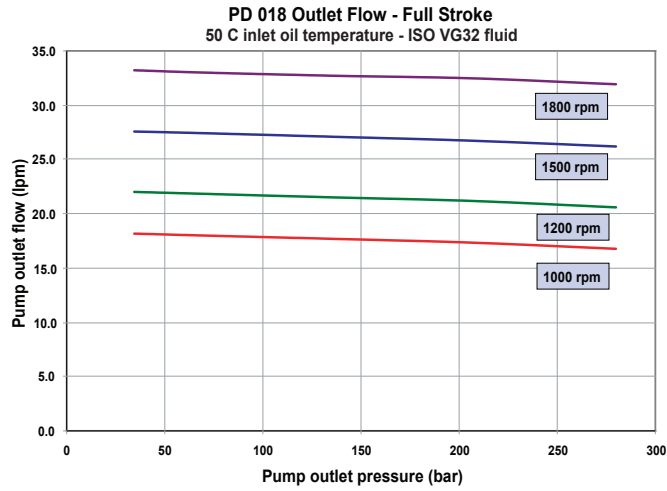
**P1 Series Typical Shaft Bearing Life**



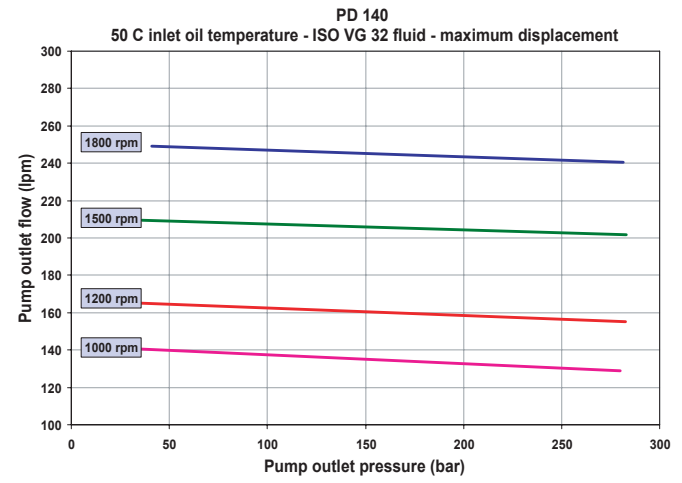
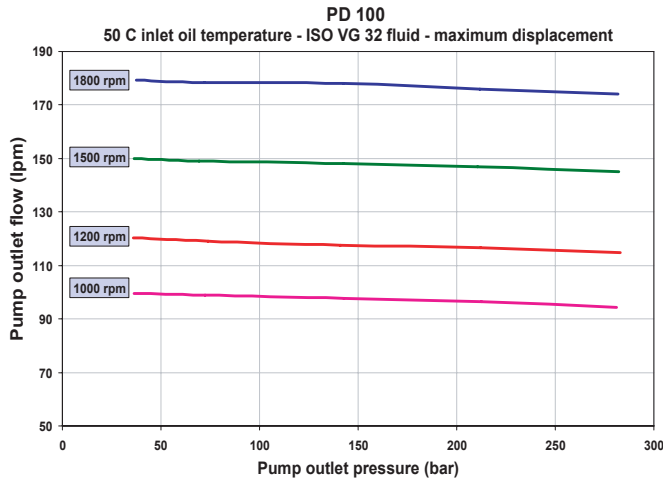
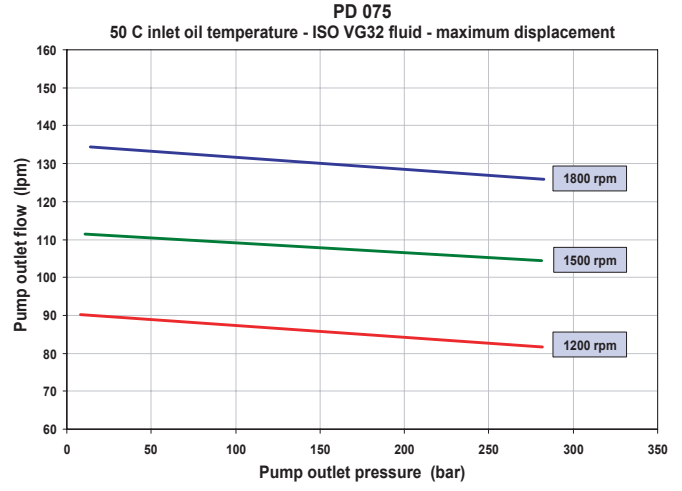
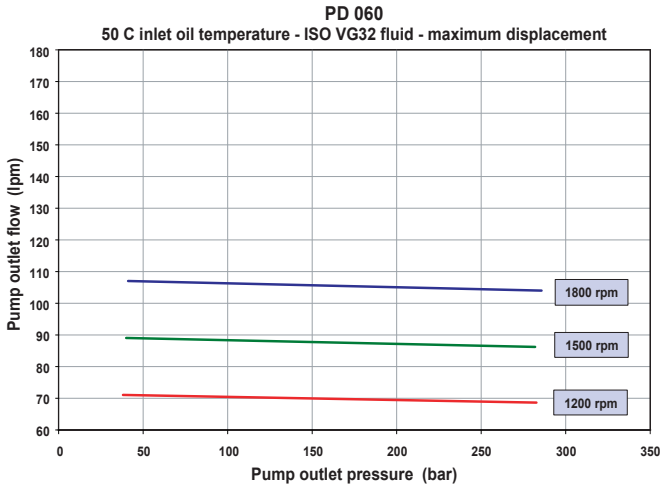
**P1 Series Typical Shaft Bearing Life**



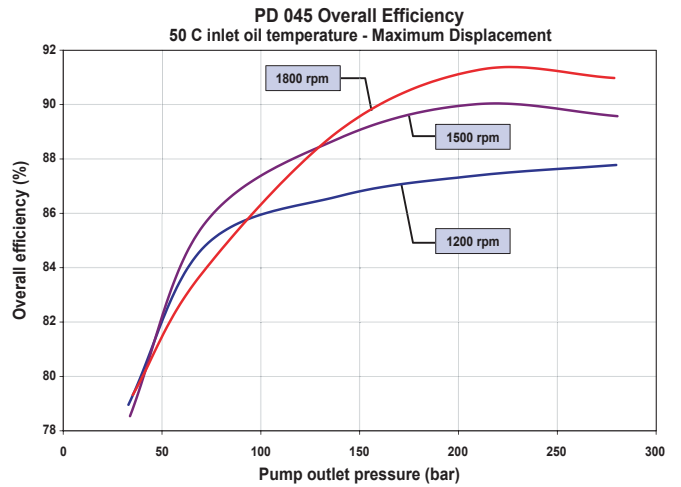
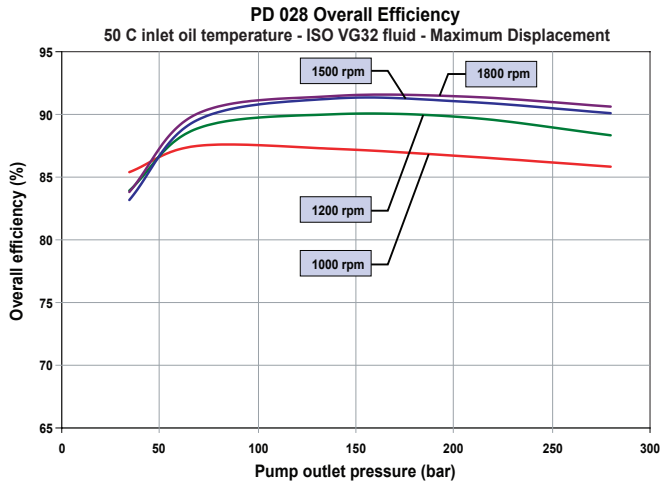
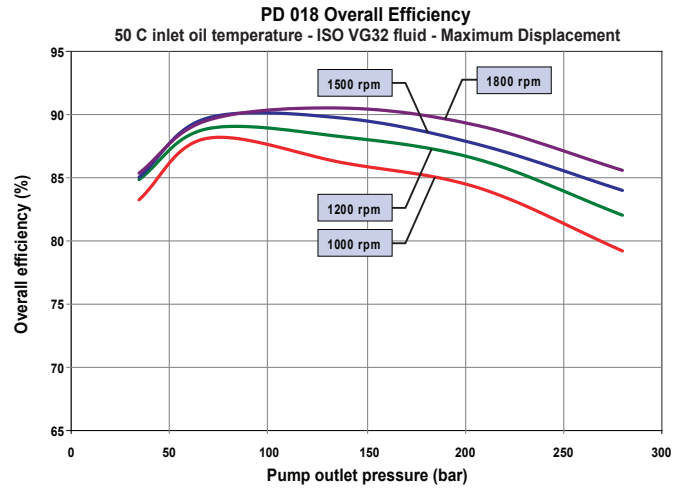
**PD Series Typical Pump Outlet Flow**



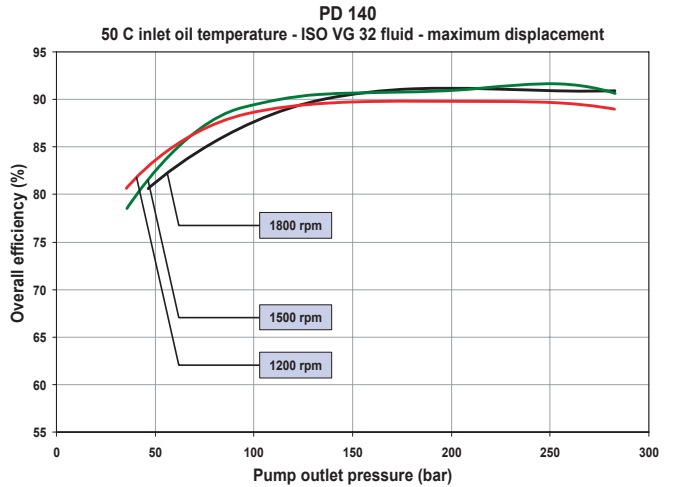
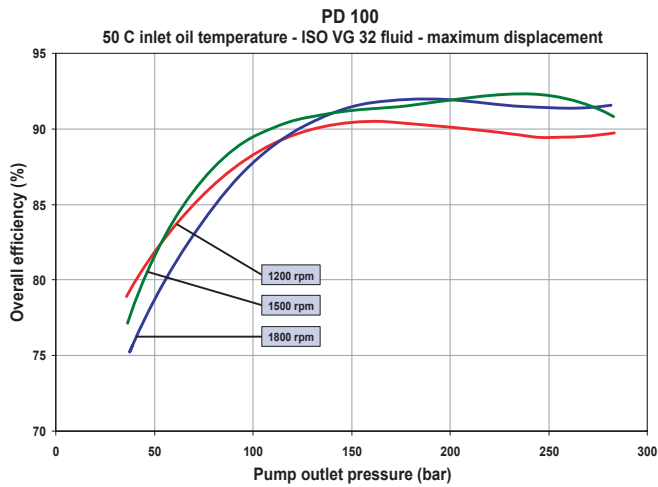
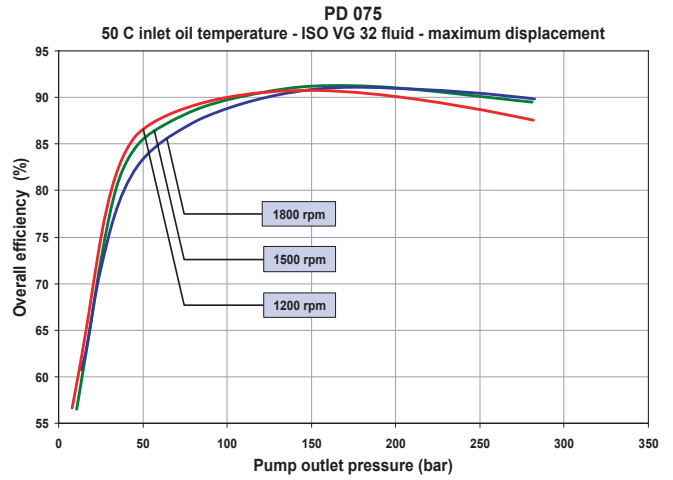
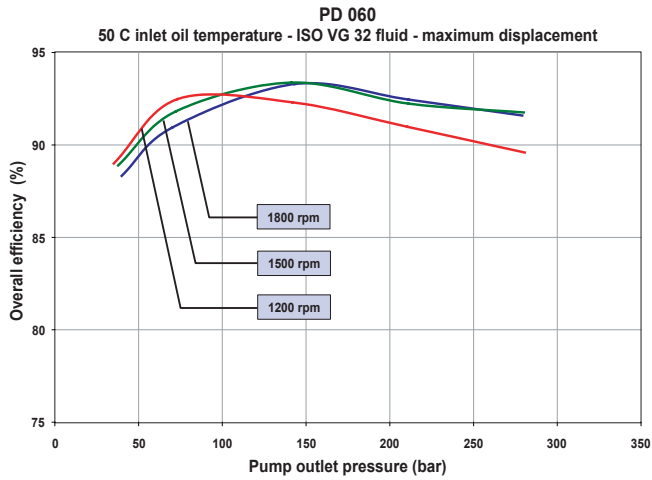
**PD Series Typical Pump Outlet Flow**



**PD Series Typical Overall Efficiency**

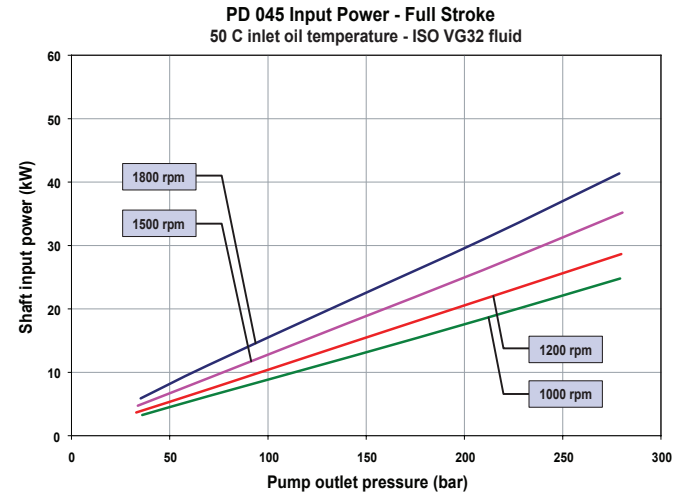
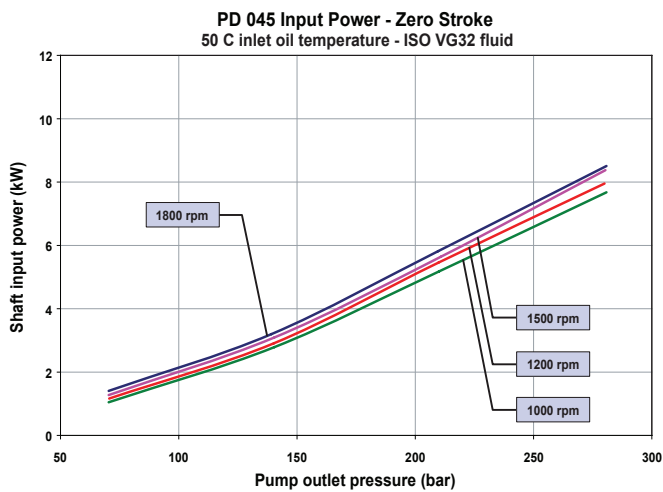
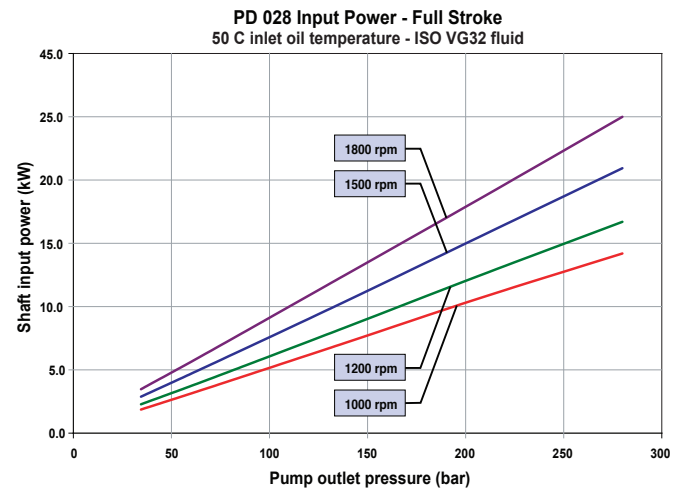
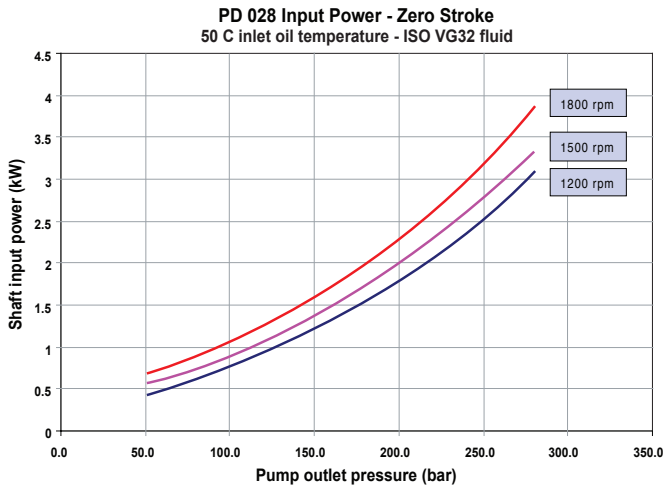
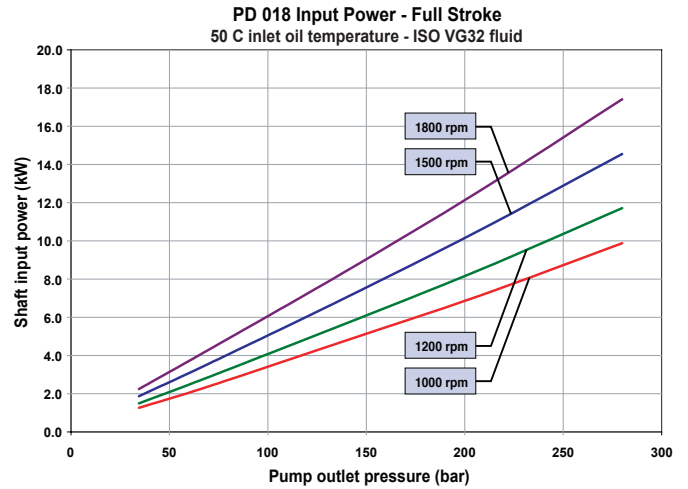
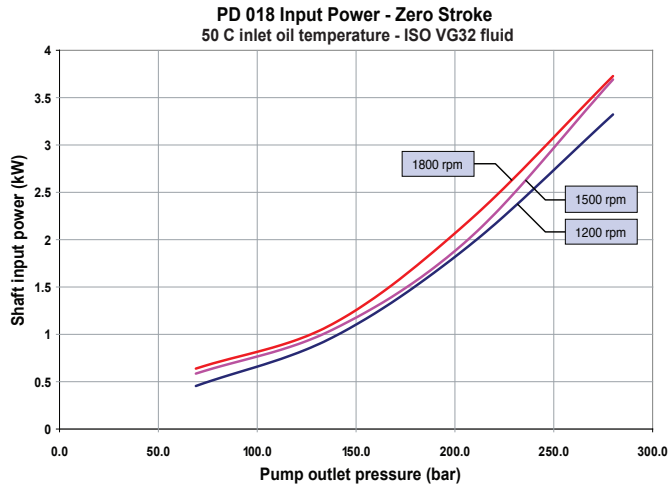


**PD Series Typical Overall Efficiency**

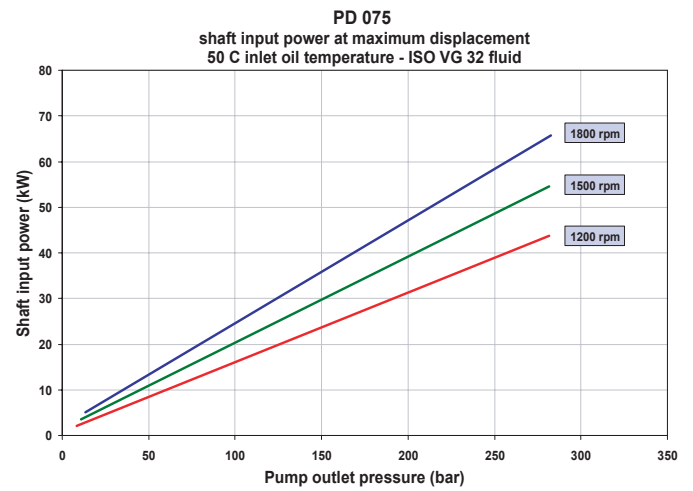
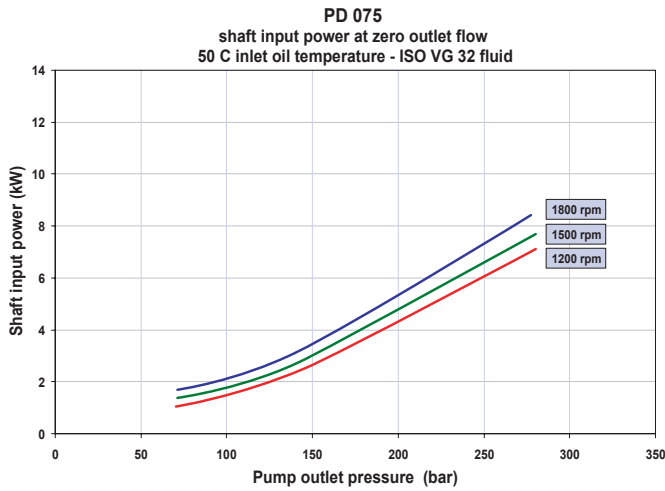
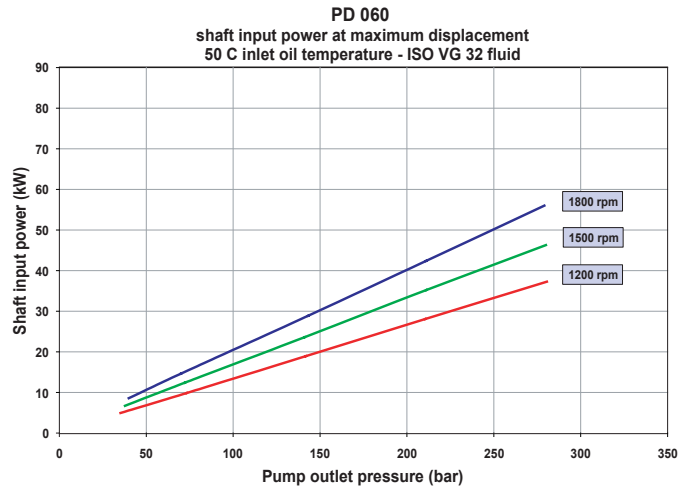
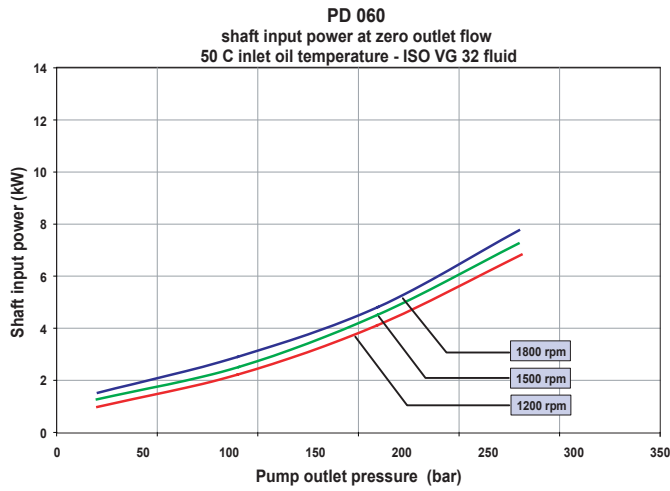




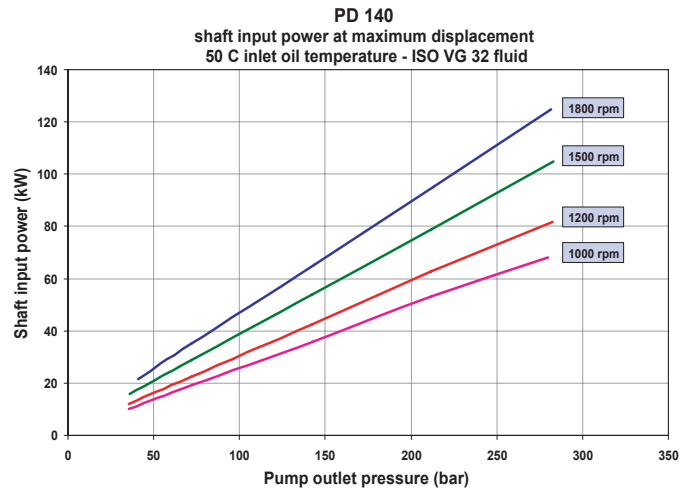
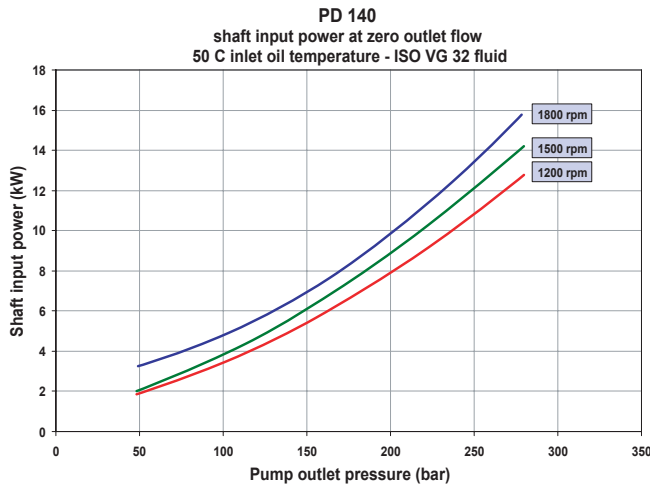
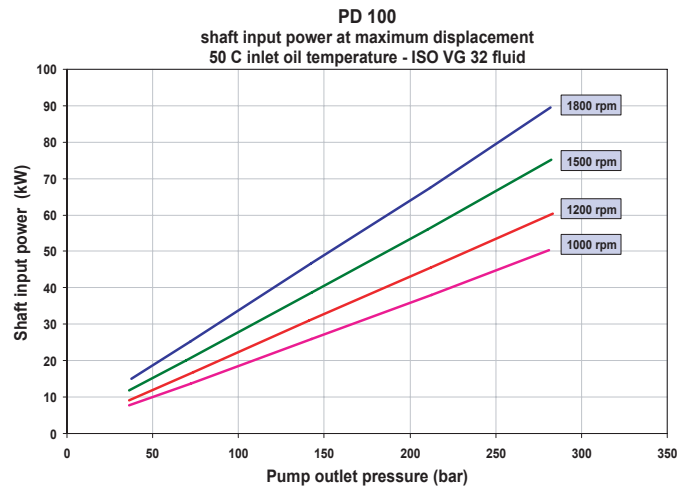
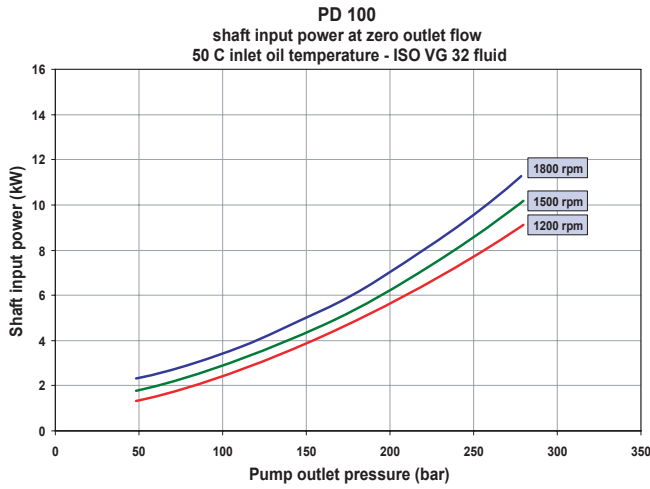
**PD Series Typical Shaft Input Power**



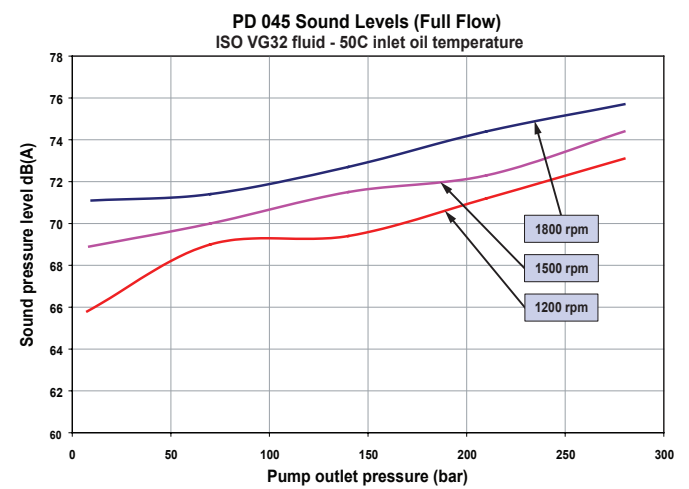
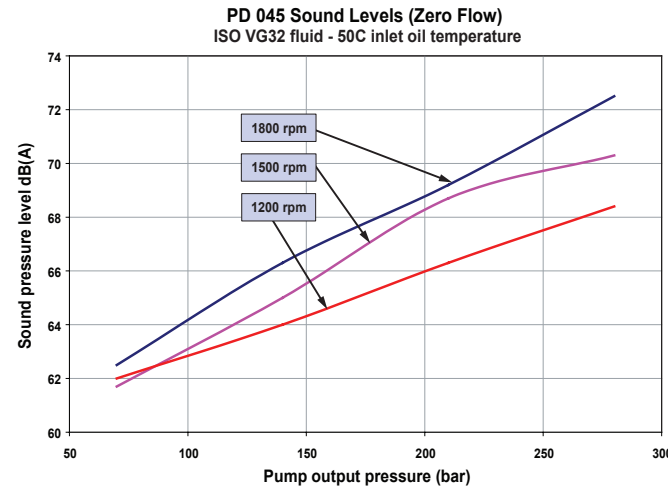
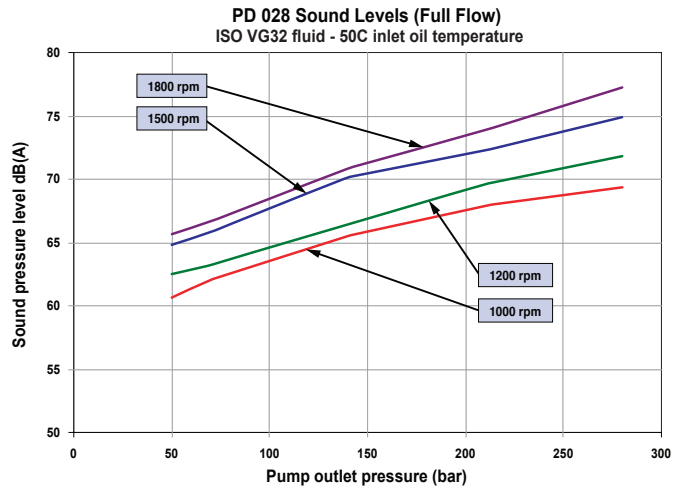
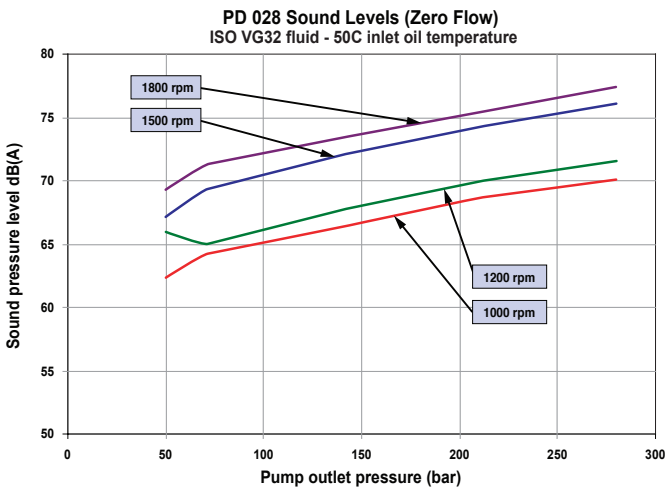
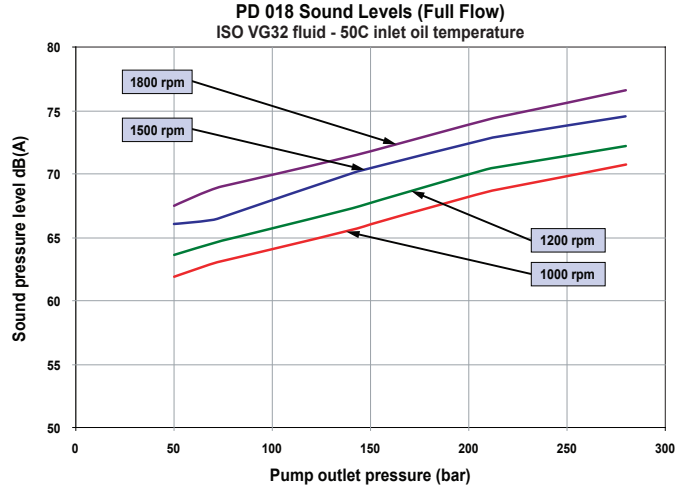
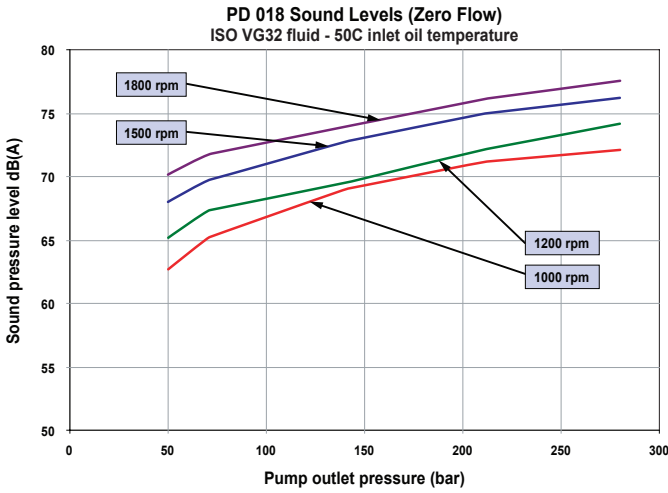
**PD Series Typical Shaft Input Power**



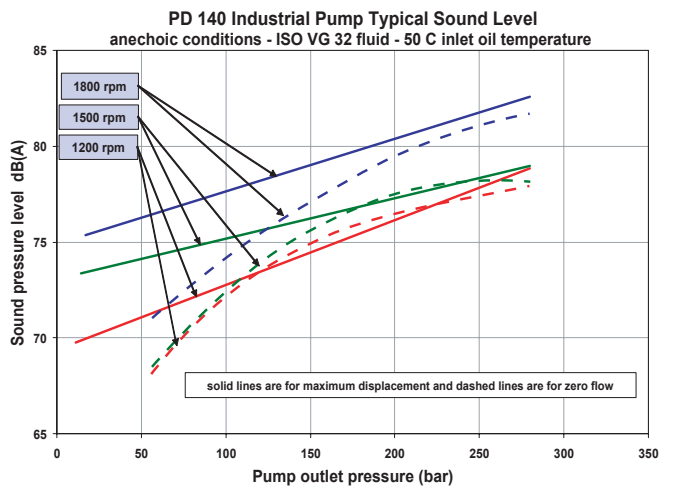
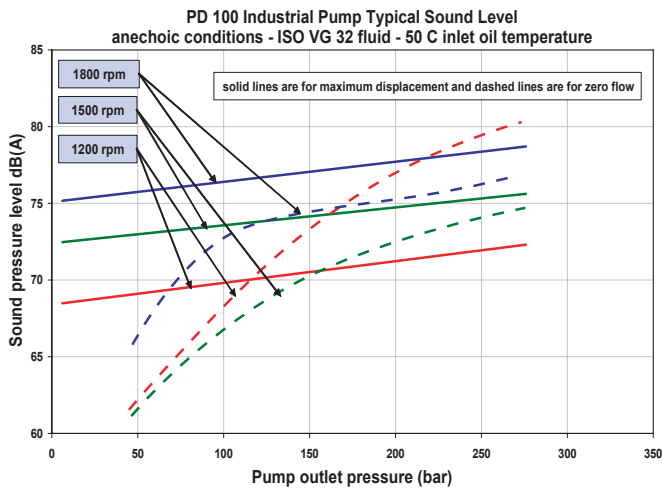
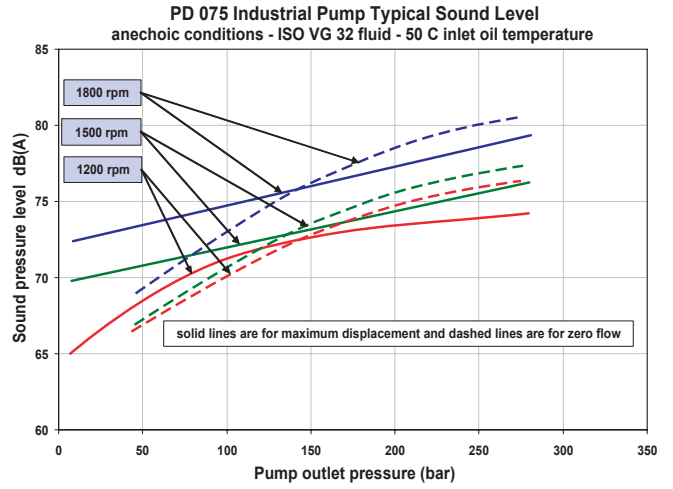
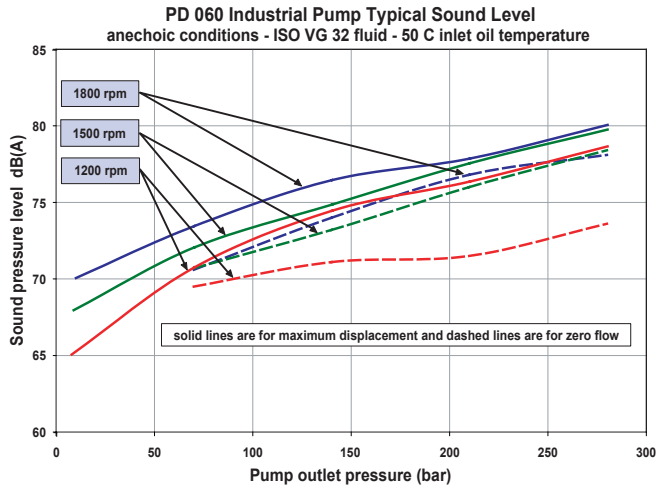
**PD Series Typical Shaft Input Power**



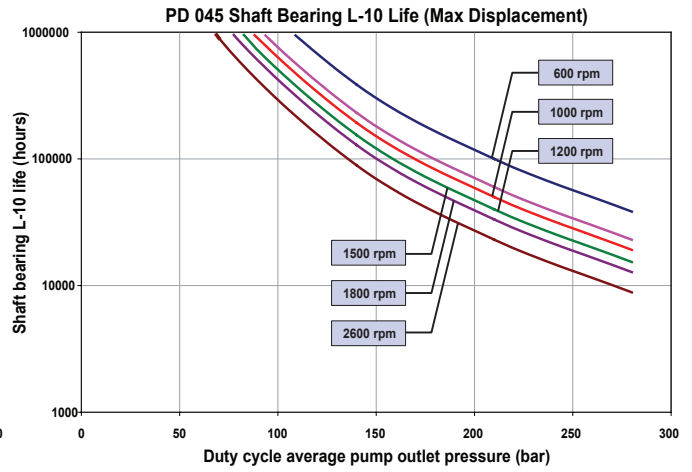
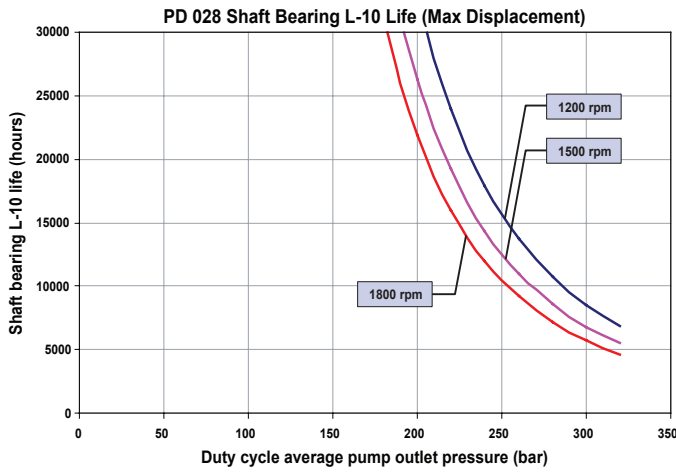
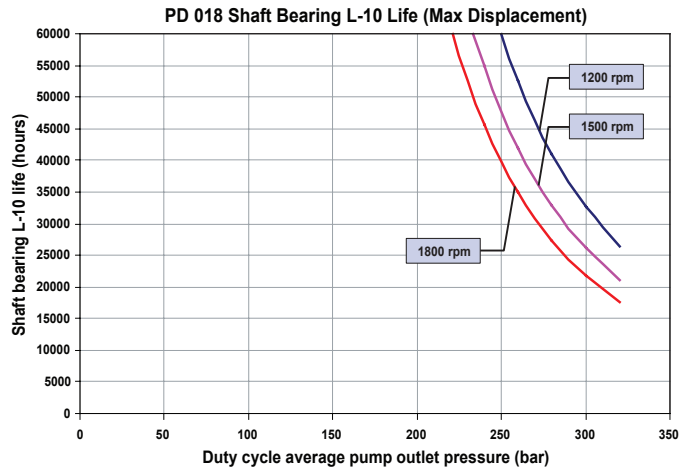
**PD Series Typical Noise Characteristics**  
 (These are anechoic sound pressure readings)



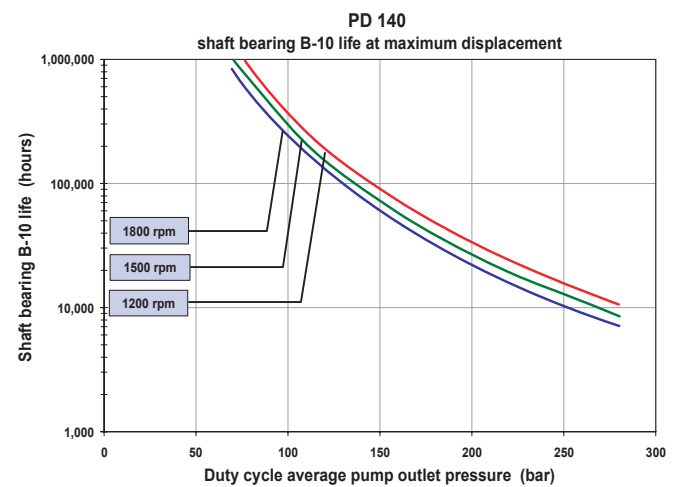
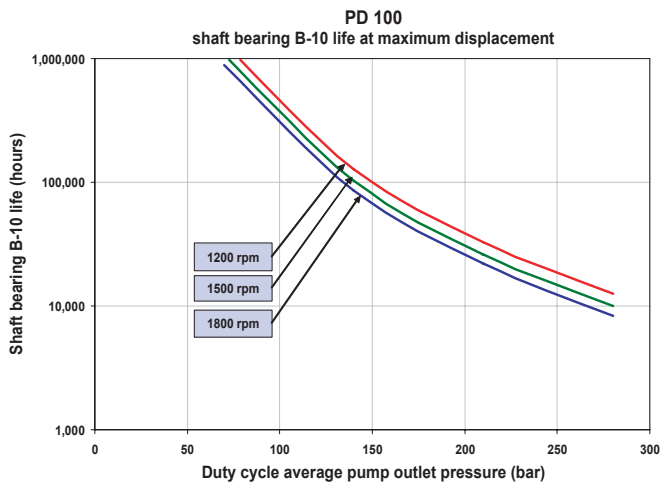
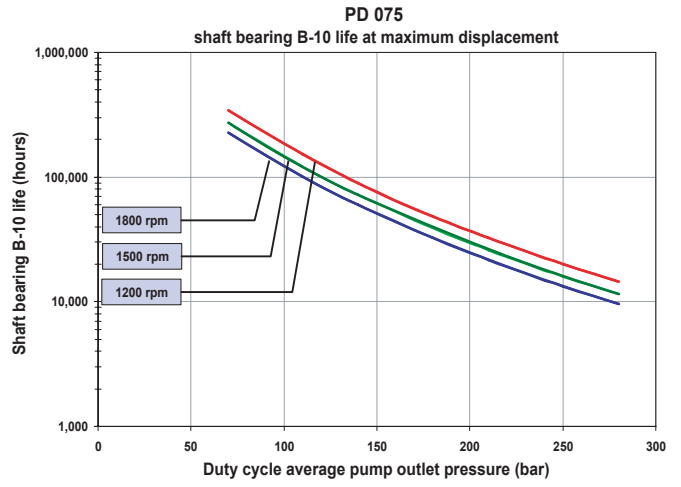
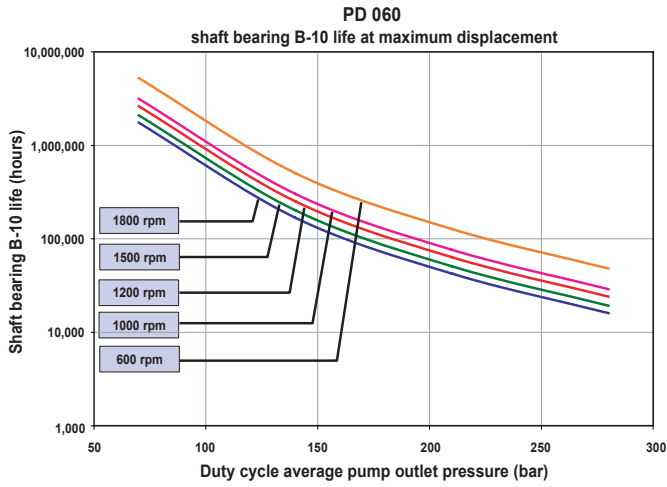
**PD Series Typical Noise Characteristics**  
 (These are anechoic sound pressure readings)



**PD Series Typical Shaft Bearing Life**

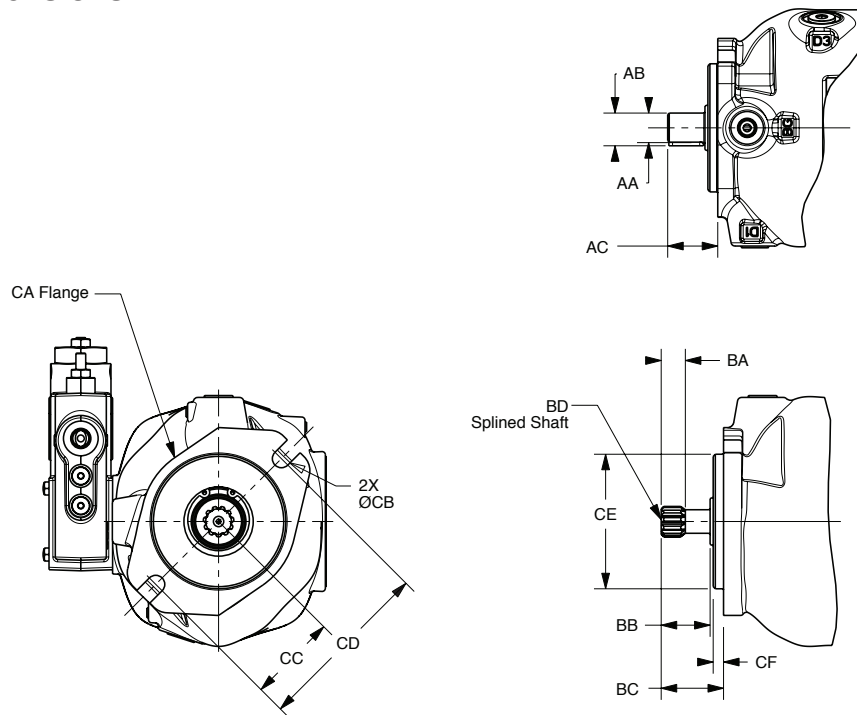


**PD Series Typical Shaft Bearing Life**



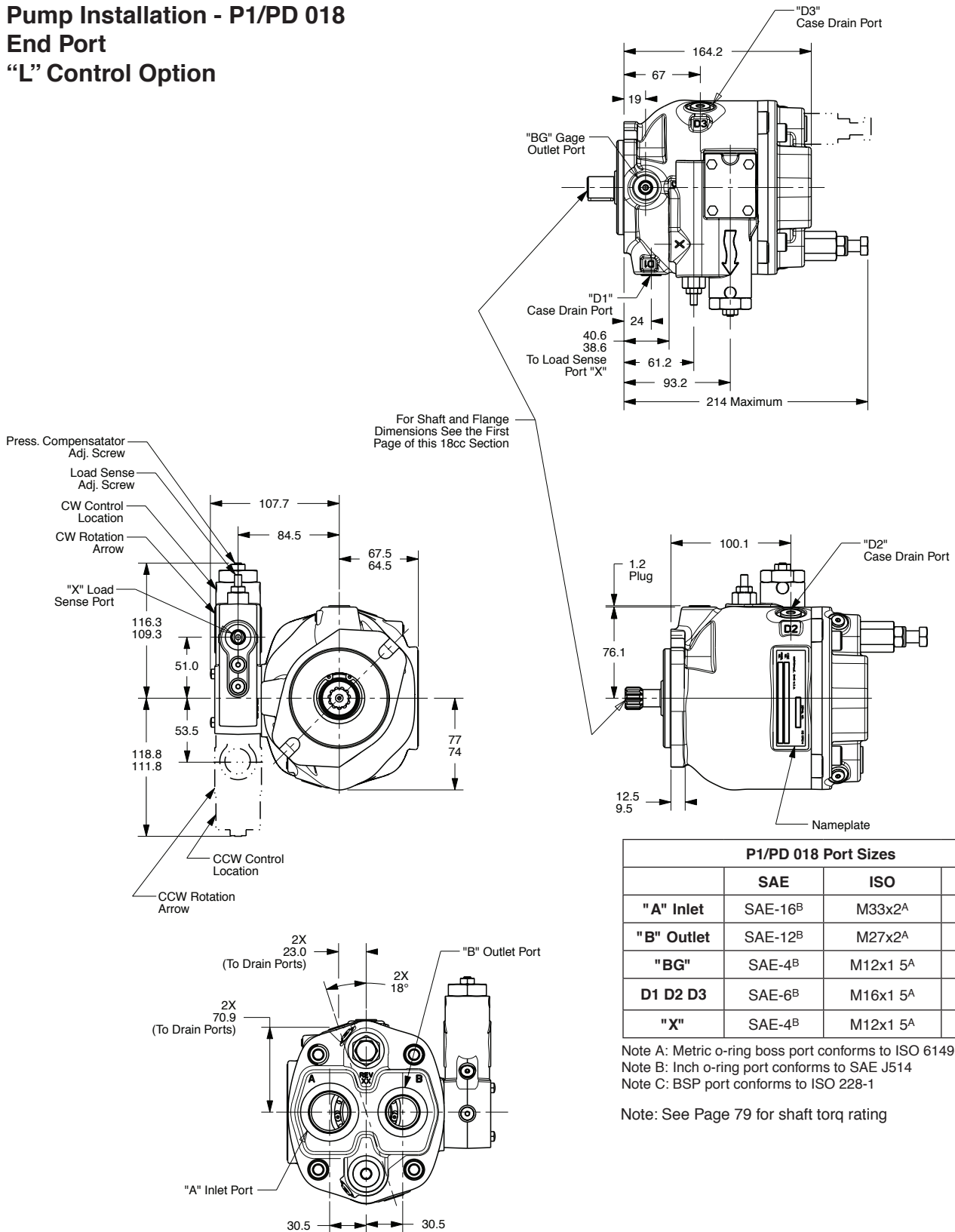


**Pump Installation - P1/PD 018  
Input Shaft Dimensions**



P1/PD 018	ISO Key (Code 04)	SAE (Code 01 or 02)
AA	20.013/19.992	19.05/19.02
AB	22.61/22.32	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 SAE 19-4 INVOLUTE SPLINE DATA CLASS 7 FLAT ROOT SIDE FIT NUMBER OF TEETH - 11 PITCH - 16/32 PRESSURE ANGLE - 30 MAJOR DIAMETER - 19.05/18.49 MM 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 ISO 3019-2:2001(E)	82.55/82.50 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**



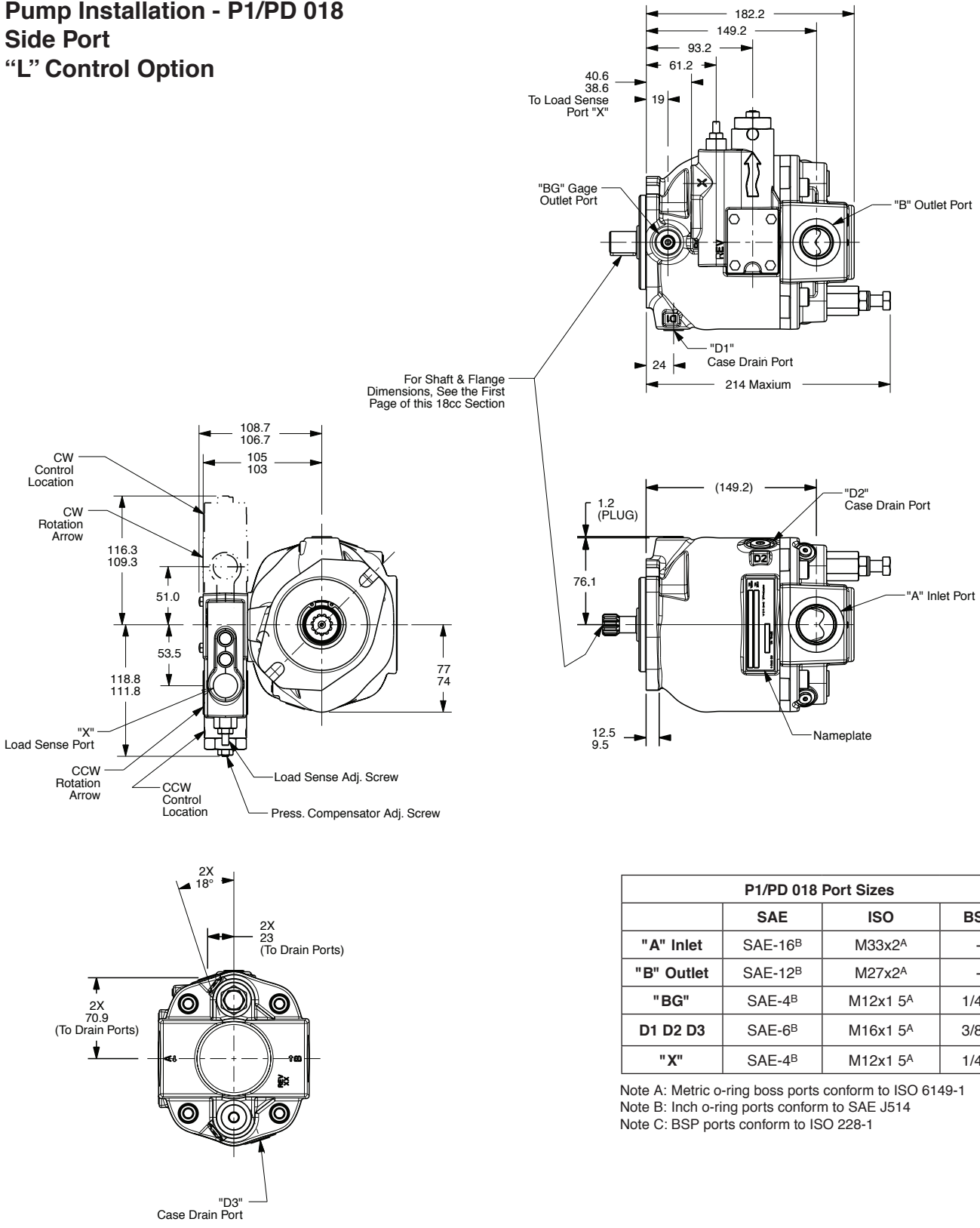
P1/PD 018 Port Sizes			
	SAE	ISO	BSP
"A" Inlet	SAE-16 <sup>B</sup>	M33x2 <sup>A</sup>	-
"B" Outlet	SAE-12 <sup>B</sup>	M27x2 <sup>A</sup>	-
"BG"	SAE-4 <sup>B</sup>	M12x1 5 <sup>A</sup>	1/4" <sup>C</sup>
D1 D2 D3	SAE-6 <sup>B</sup>	M16x1 5 <sup>A</sup>	3/8" <sup>C</sup>
"X"	SAE-4 <sup>B</sup>	M12x1 5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

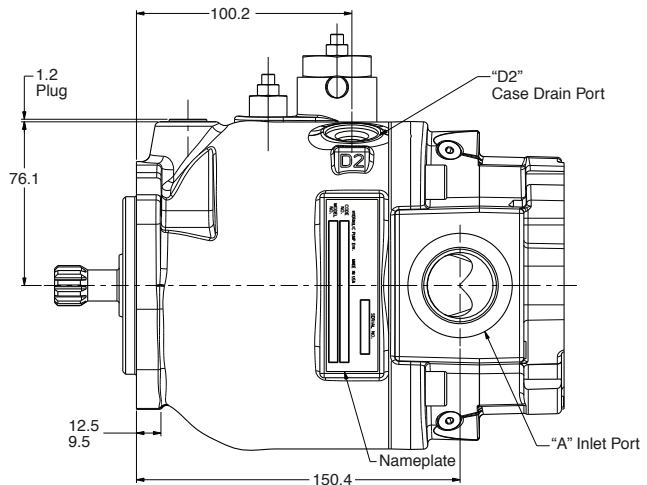
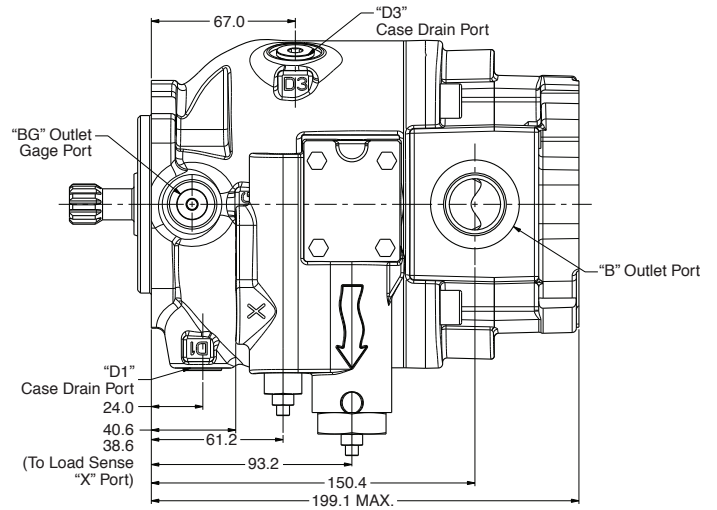
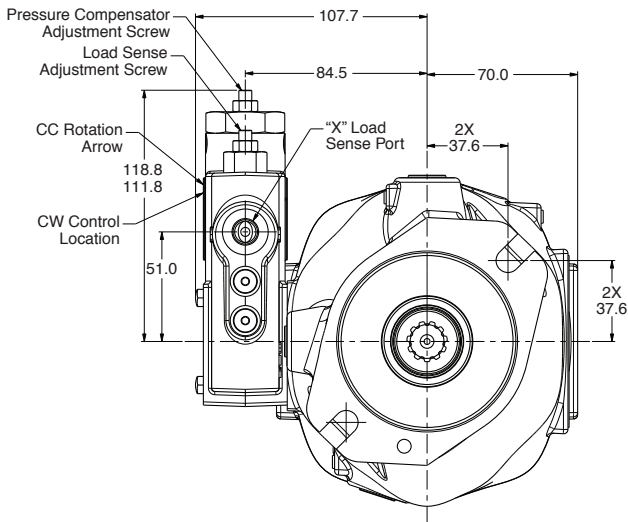


**Pump Installation - P1/PD 018  
 Side Ports with Thru-Drive  
 "L" Control Option**

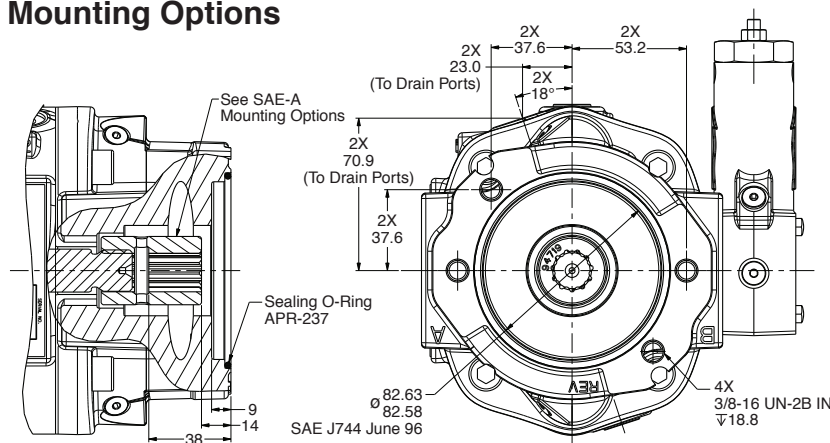
P1/PD 018 Port Sizes			
	SAE	ISO	BSP
"A" Inlet	SAE-16 <sup>B</sup>	M33x2 <sup>A</sup>	-
"B" Outlet	SAE-12 <sup>B</sup>	M27x2 <sup>A</sup>	-
"BG"	SAE-4 <sup>B</sup>	M12x1 5 <sup>A</sup>	1/4" <sup>C</sup>
D1 D2 D3	SAE-6 <sup>B</sup>	M16x1 5 <sup>A</sup>	3/8" <sup>C</sup>
"X"	SAE-4 <sup>B</sup>	M12x1 5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

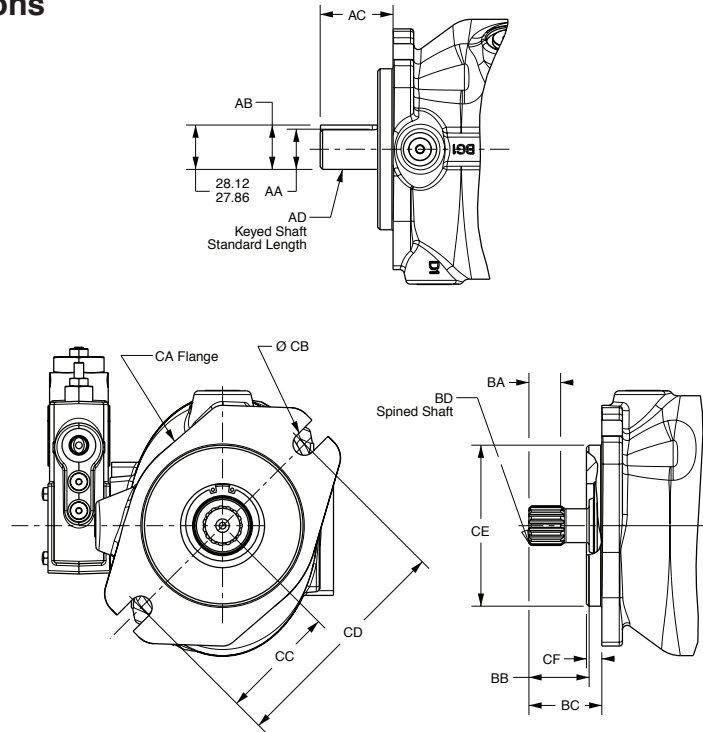


SAE-A Mounting Options Information	
Model Number T0"A	Model Number T0"H
Spline: ANSI B92.1 1996	Spline: ANSI B92.1 1996
SAE 16-4 (A) Involute Spline Data	SAE 19-4 Involute Spline Data
Class 5 Flat Root Side Fit	Class 5 Flat Root Side Fit
Number of Teeth - 9	Number of Teeth - 11
Pitch - 16/32	Pitch - 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

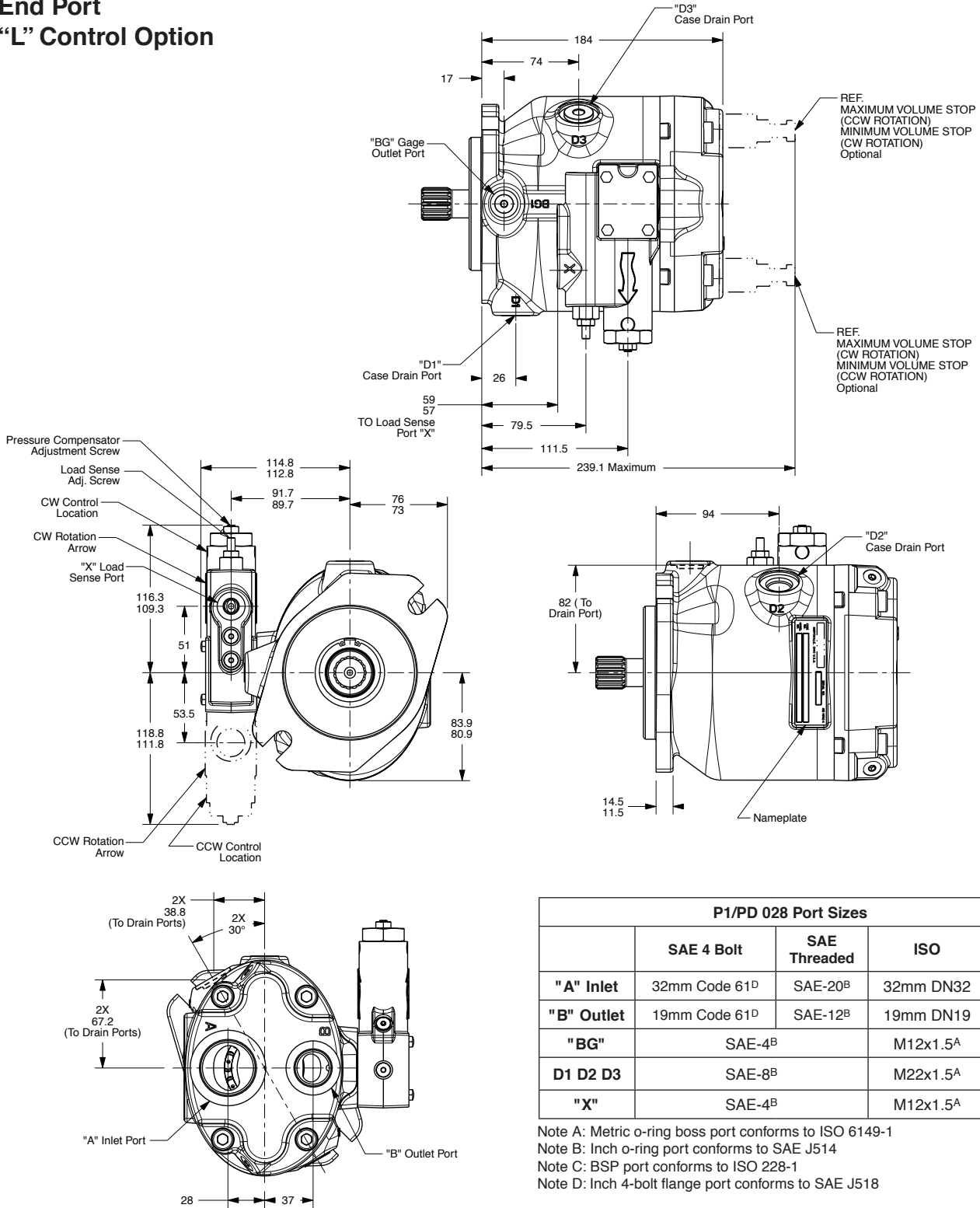
VIEW SHOWING SAE "A"  
 MOUNTING PAD

**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 SAE 25-4 INVOLUTE SPLINE DATA CLASS 7 FLAT ROOT SIDE FIT NUMBER OF TEETH - 15 PITCH - 16/32 PRESSURE ANGLE - 30 MAJOR DIAMETER - 25.40 / 25.273 MM PITCH DIAMETER - 23.8125	SPLINE: SAE ASA-B 1960 SAE 22-4 (B) INVOLUTE SPLINE DATA CLASS 7 FLAT ROOT SIDE FIT NUMBER OF TEETH - 13 PITCH - 16/32 PRESSURE ANGLE - 30 MAJOR DIAMETER - 22.22 / 22.66 MM 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 3019-2:2001(E)	101.60/101.55 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

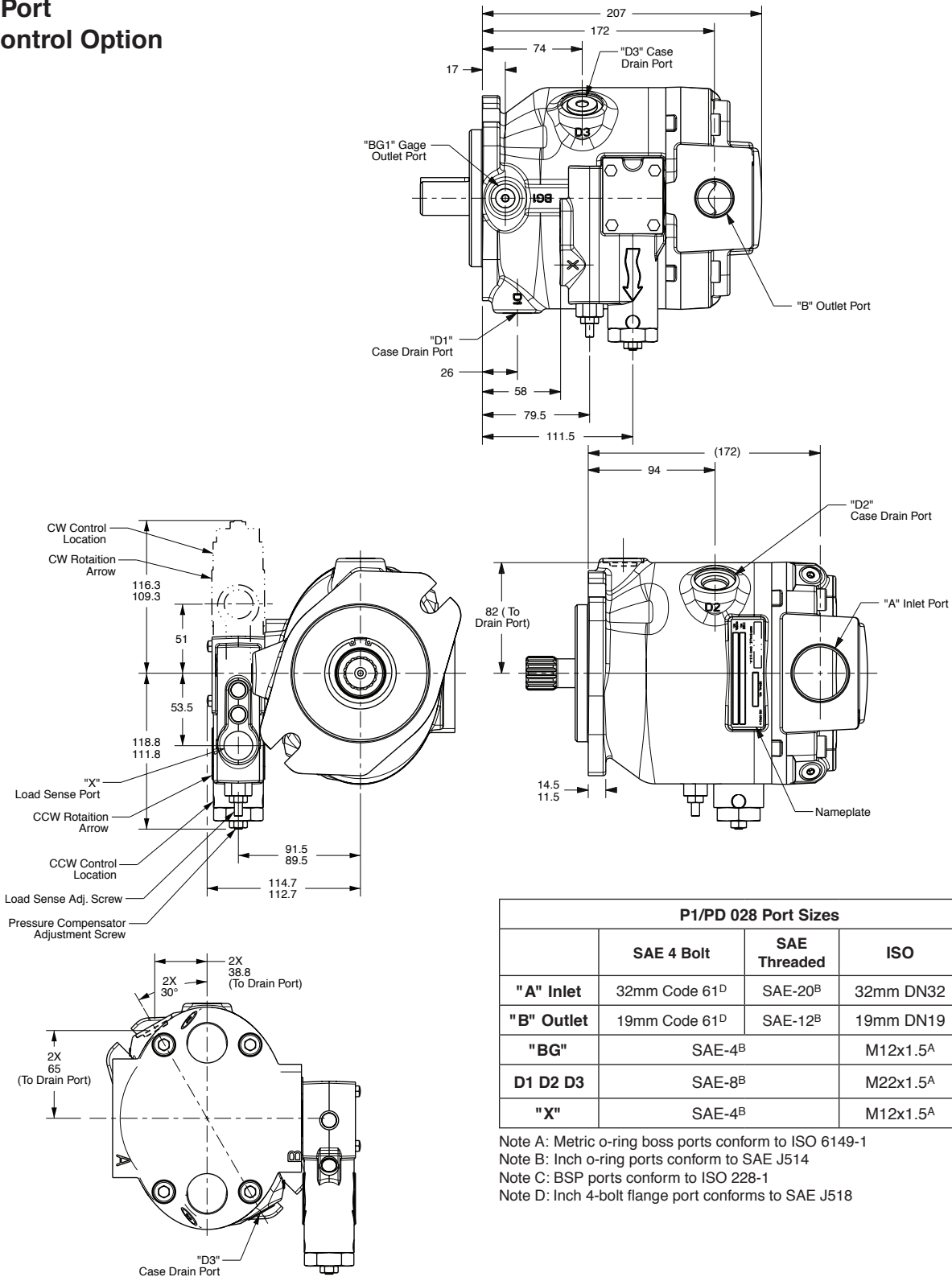
**Pump Installation - P1/PD 028  
End Port  
"L" Control Option**



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

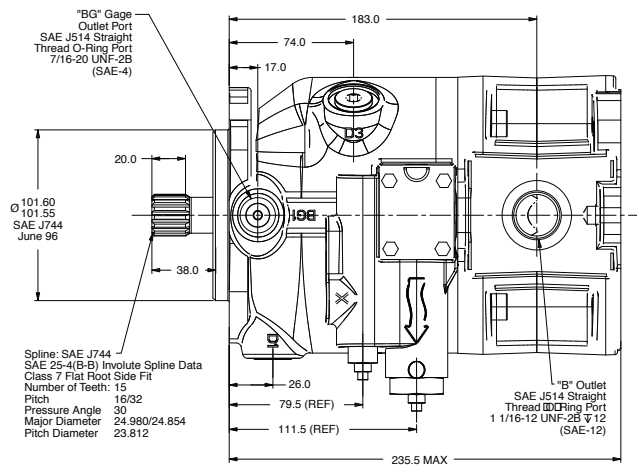
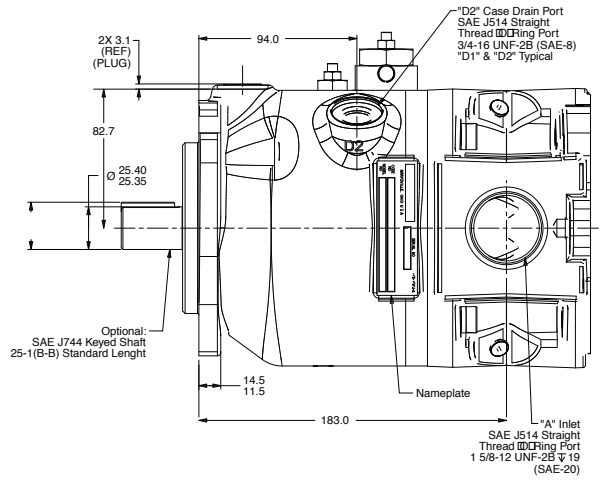
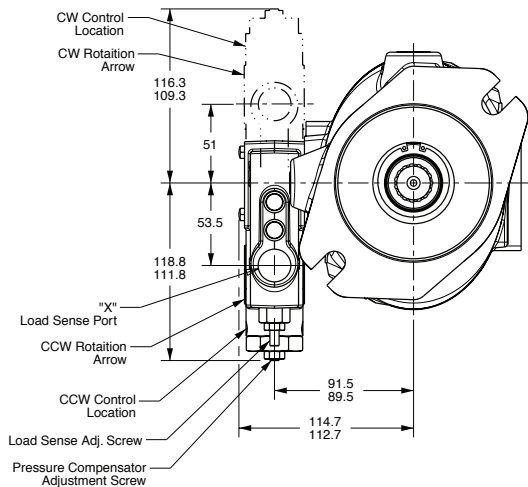
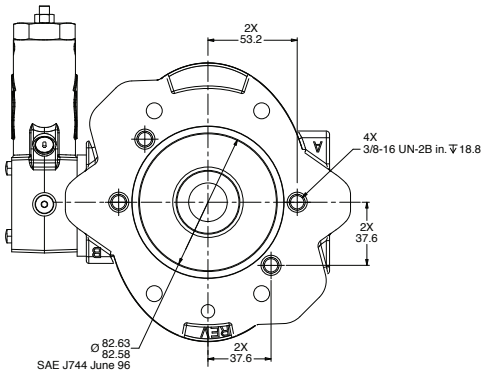
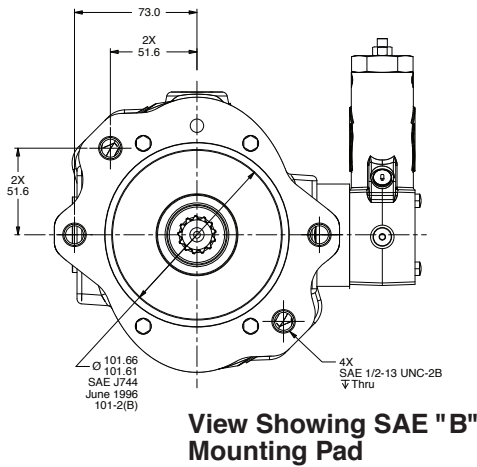
**Pump Installation - P1/PD 028  
Side Port  
“L” Control Option**



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

**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

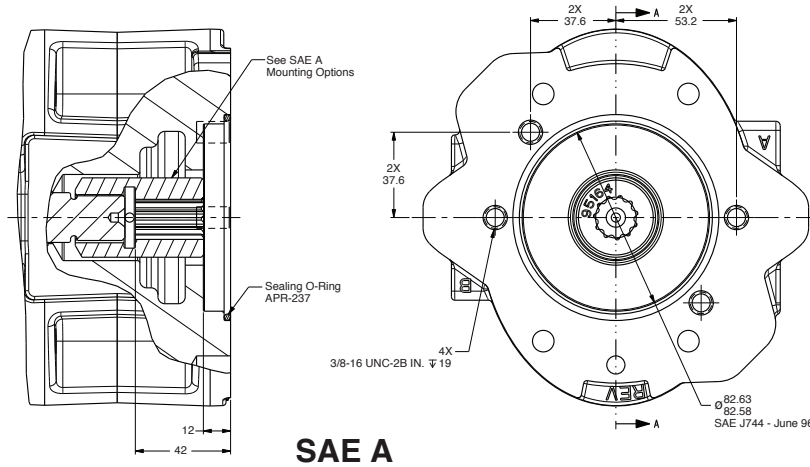
Note D: Inch 4-bolt flange port conforms to SAE J518

Note: See Page 79 for shaft torq rating

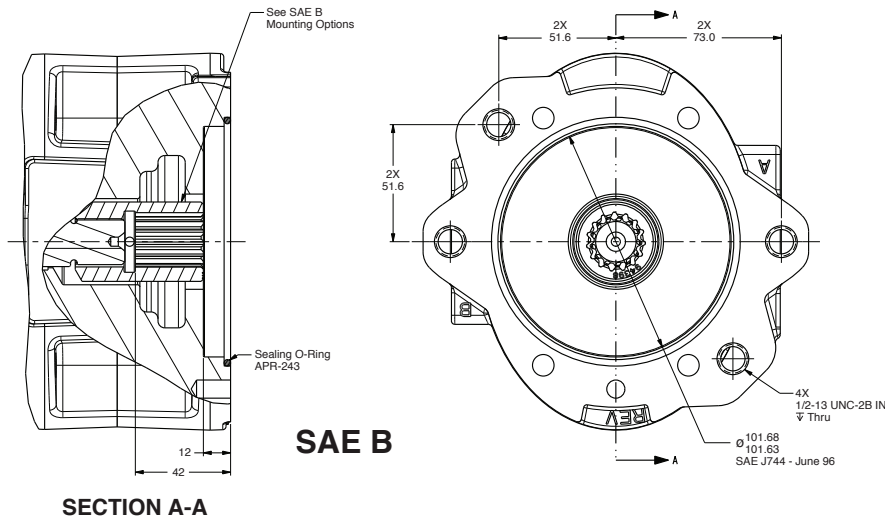


**Pump Installation - P1/PD 028  
Side Ports with Thru-Drive  
Mounting Options**

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



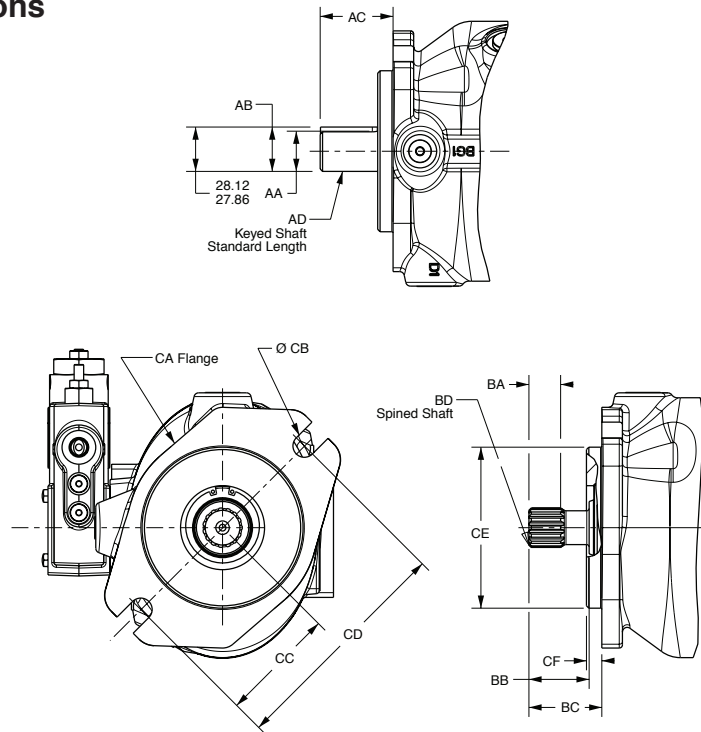
**SAE A**



**SAE B**

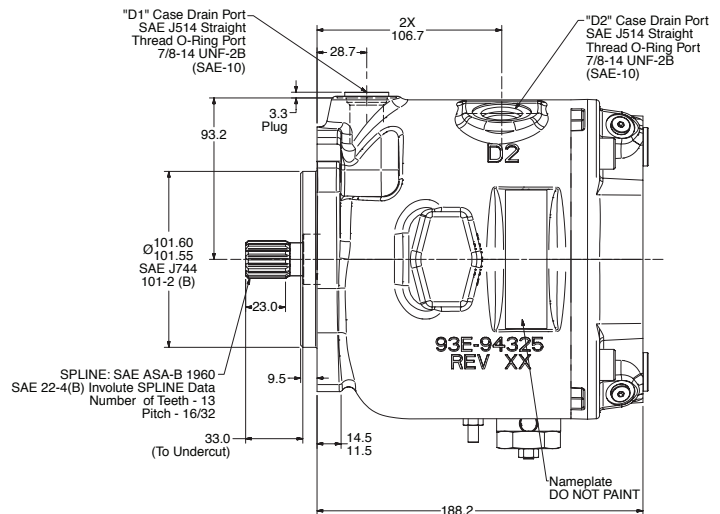
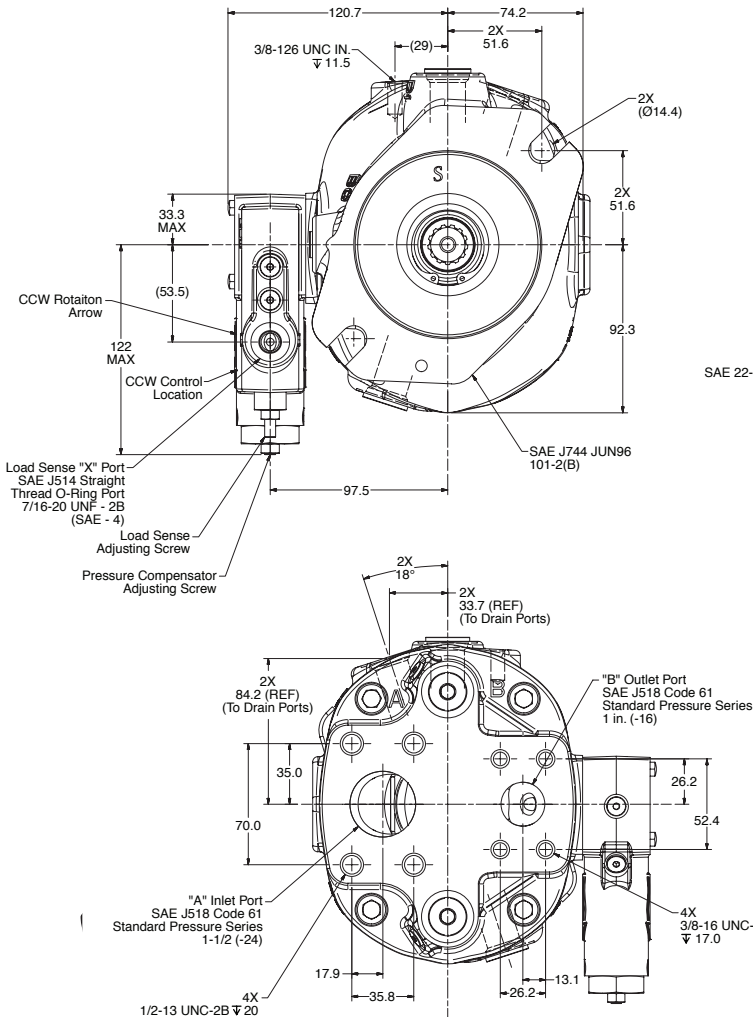
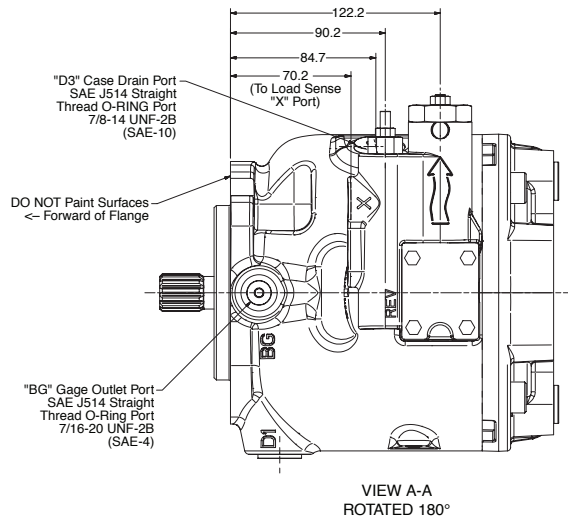


**Pump Installation - P1/PD 045  
Input Shaft Dimensions**



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 SAE 25-4 INVOLUTE SPLINE DATA CLASS 7 FLAT ROOT SIDE FIT NUMBER OF TEETH - 15 PITCH - 16/32 PRESSURE ANGLE - 30 MAJOR DIAMETER - 25.40 / 25.273 MM PITCH DIAMETER - 23.8125	SPLINE: SAE ASA-B 1960 SAE 22-4 (B) INVOLUTE SPLINE DATA CLASS 7 FLAT ROOT SIDE FIT NUMBER OF TEETH - 13 PITCH - 16/32 PRESSURE ANGLE - 30 MAJOR DIAMETER - 22.22 / 22.66 MM 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 3019-2:2001(E)	101.60/101.55 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

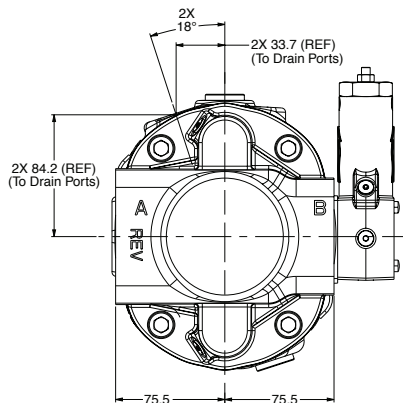
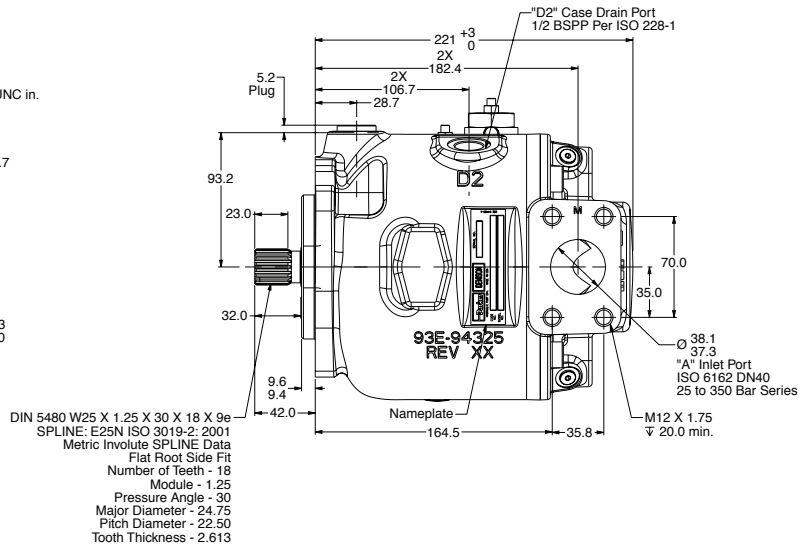
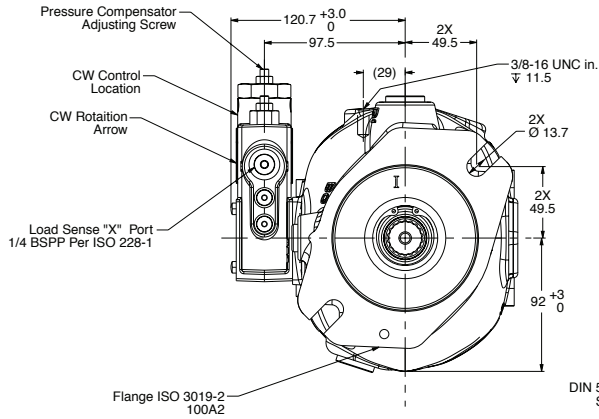
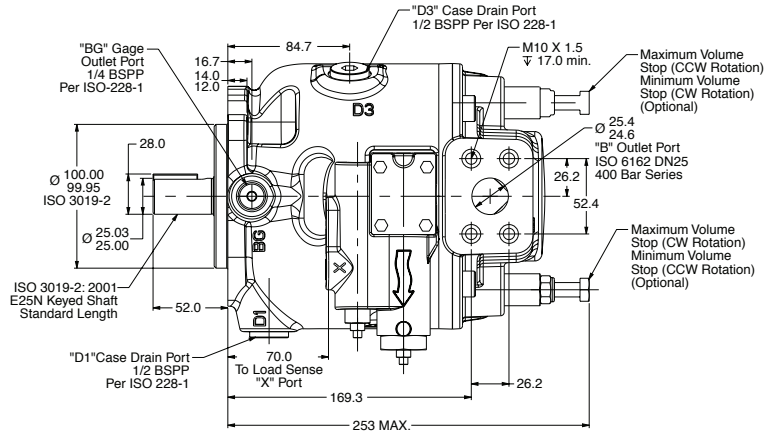
**Pump Installation - P1/PD 045  
End Port  
“L” Control Option**



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**



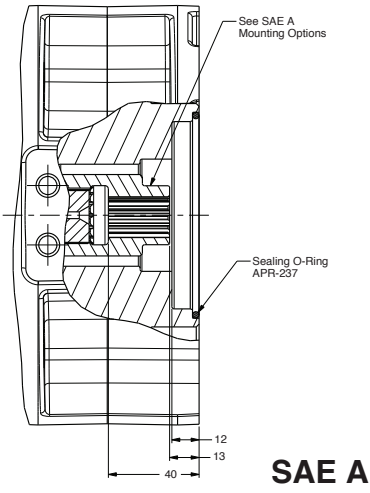
P1/PD 045 Port Sizes				
	SAE 4 Bolt	SAE Threaded	ISO	BSP
"A" Inlet	38mm Code 61 <sup>D</sup>	SAE-24	38mm DN38	-
"B" Outlet	25mm Code 61	SAE-16	25mm DN25 <sup>E</sup>	-
"BG"	SAE-4 <sup>B</sup>		M12x1.5 <sup>A</sup>	1/4" <sup>C</sup>
D1 D2 D3	SAE-10 <sup>B</sup>		M22x1.5 <sup>A</sup>	1/2" <sup>C</sup>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

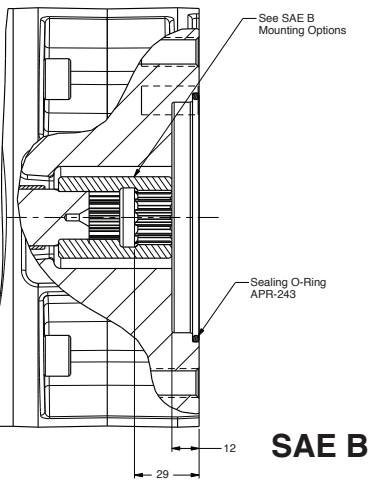
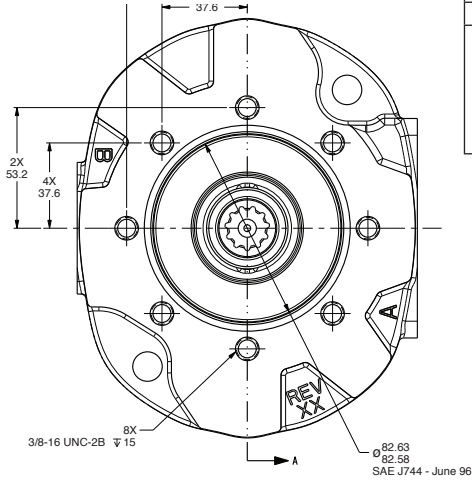


**Pump Installation - P1/PD 045  
Side Ports with Thru-Drive  
Mounting Options**

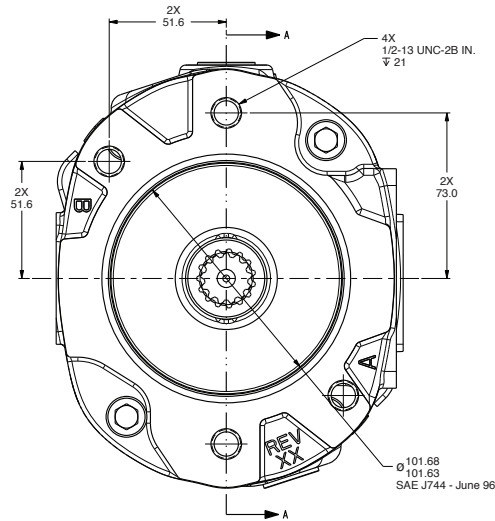
SAE-A Mounting Options Information	
Model Number T0*A Spline: ANSI B92.1 1996 SAE 16-4 (A) Involute Spline Data Class 5 Flat Root Side Fit Number of Teeth - 9 Pitch - 16/32 Pressure Angle - 30 Minor Diameter - 0.514/0.509 in Pitch Diameter - 0.5625 in ref	Model Number T0*H Spline: ANSI B92.1 1996 SAE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



SECTION A-A



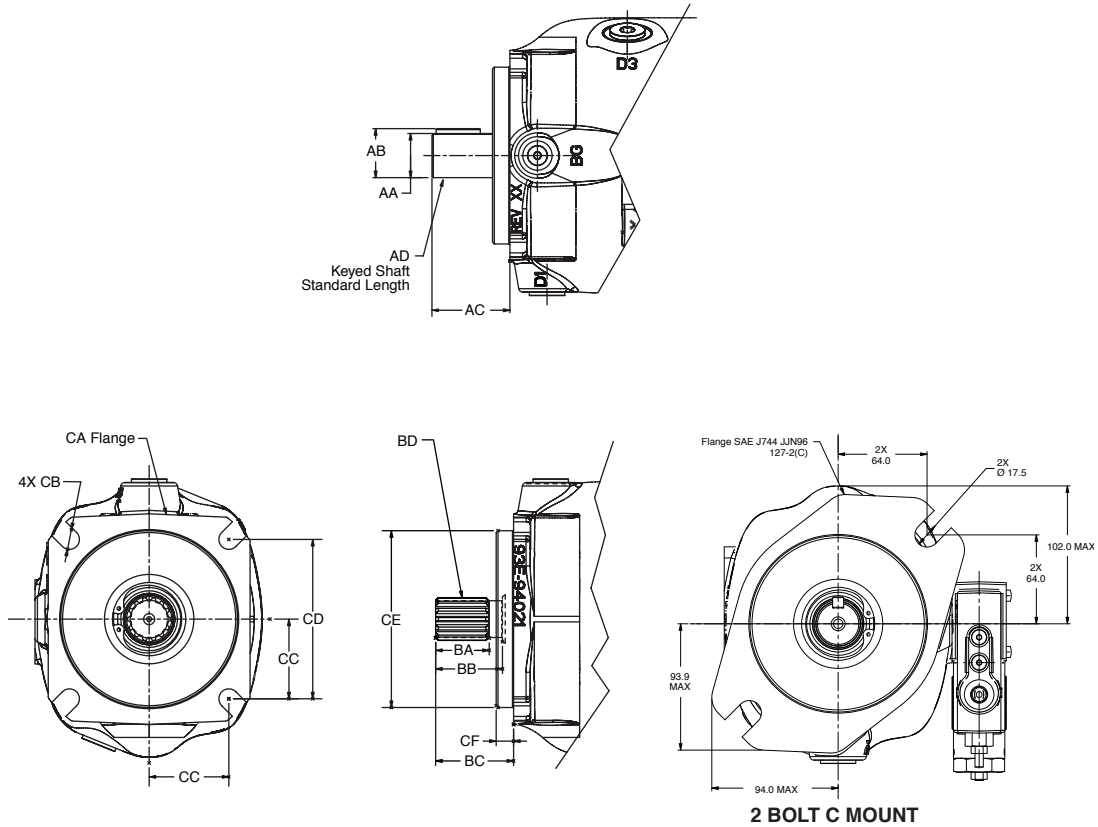
SECTION A-A





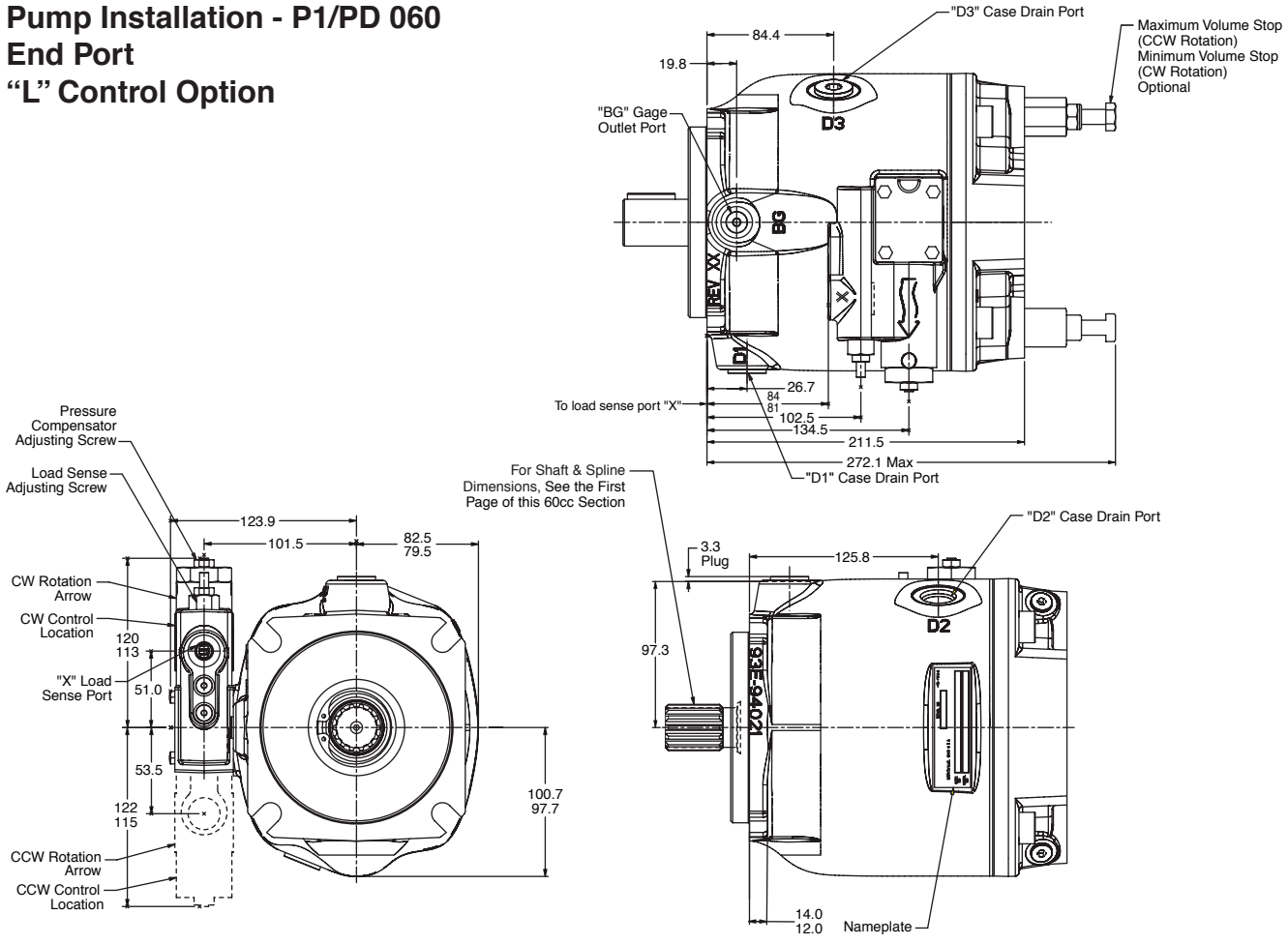


**Pump Installation - P1/PD 060  
Input Shaft Dimensions**



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 SAE 32-4C INVOLUTE SPLINE DATA CLASS 2 FLAT ROOT SIDE FIT NUMBER OF TEETH - 14 PITCH - 12/24 PRESSURE ANGLE - 30 MAJOR DIAMETER - 1.2268/1.4763 IN 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**

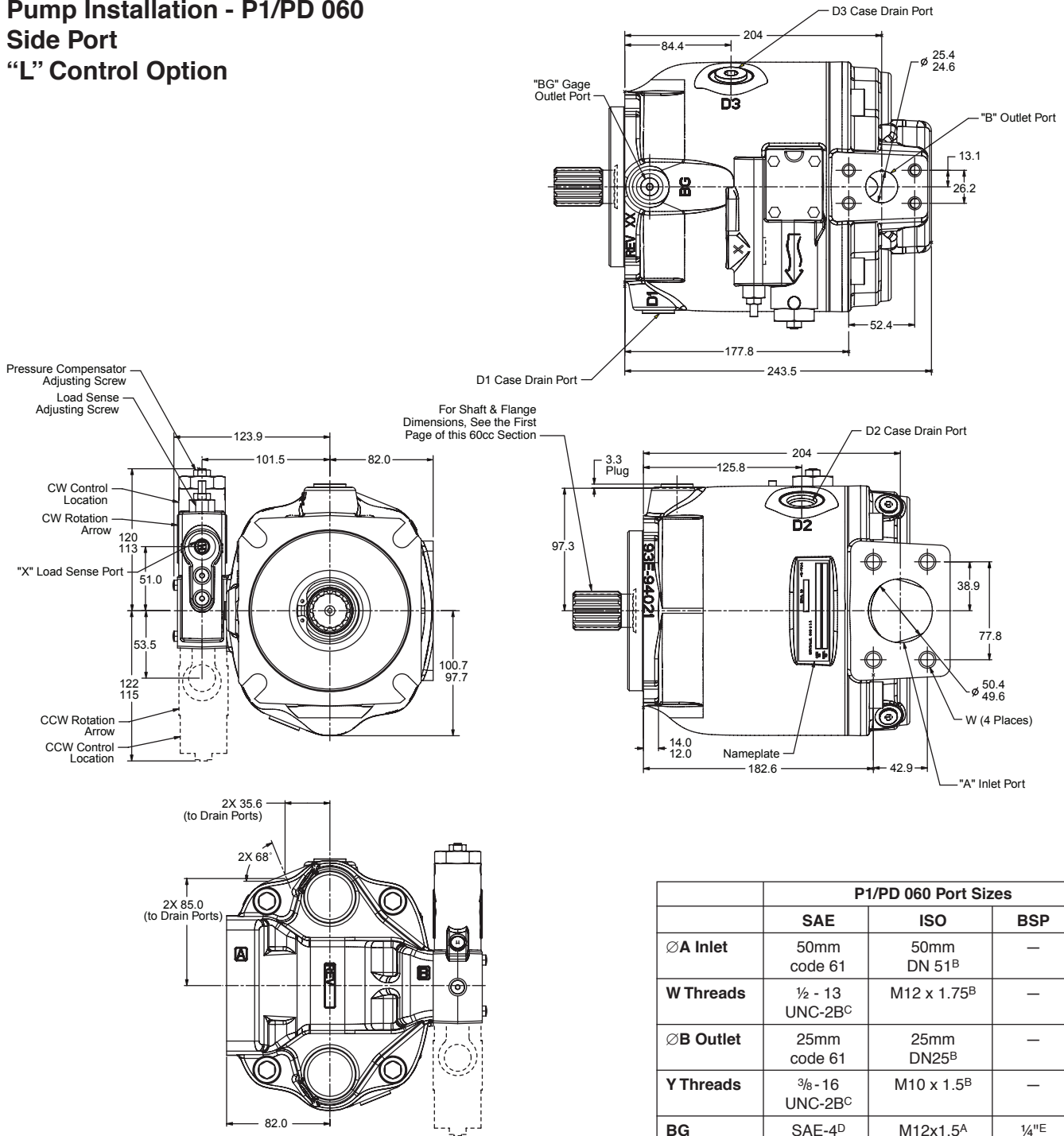


	P1/PD 060 Port Sizes		
	SAE	ISO	BSP
∅A Inlet	50mm code 61	50mm DN 51 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅B Outlet	25mm code 61	25mm DN25 <sup>B</sup>	—
Y Threads	¾ - 16 UNC-2B <sup>C</sup>	M10 x 1.5 <sup>B</sup>	—
BG	SAE-4 <sup>D</sup>	M12x1.5 <sup>A</sup>	¼" <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**

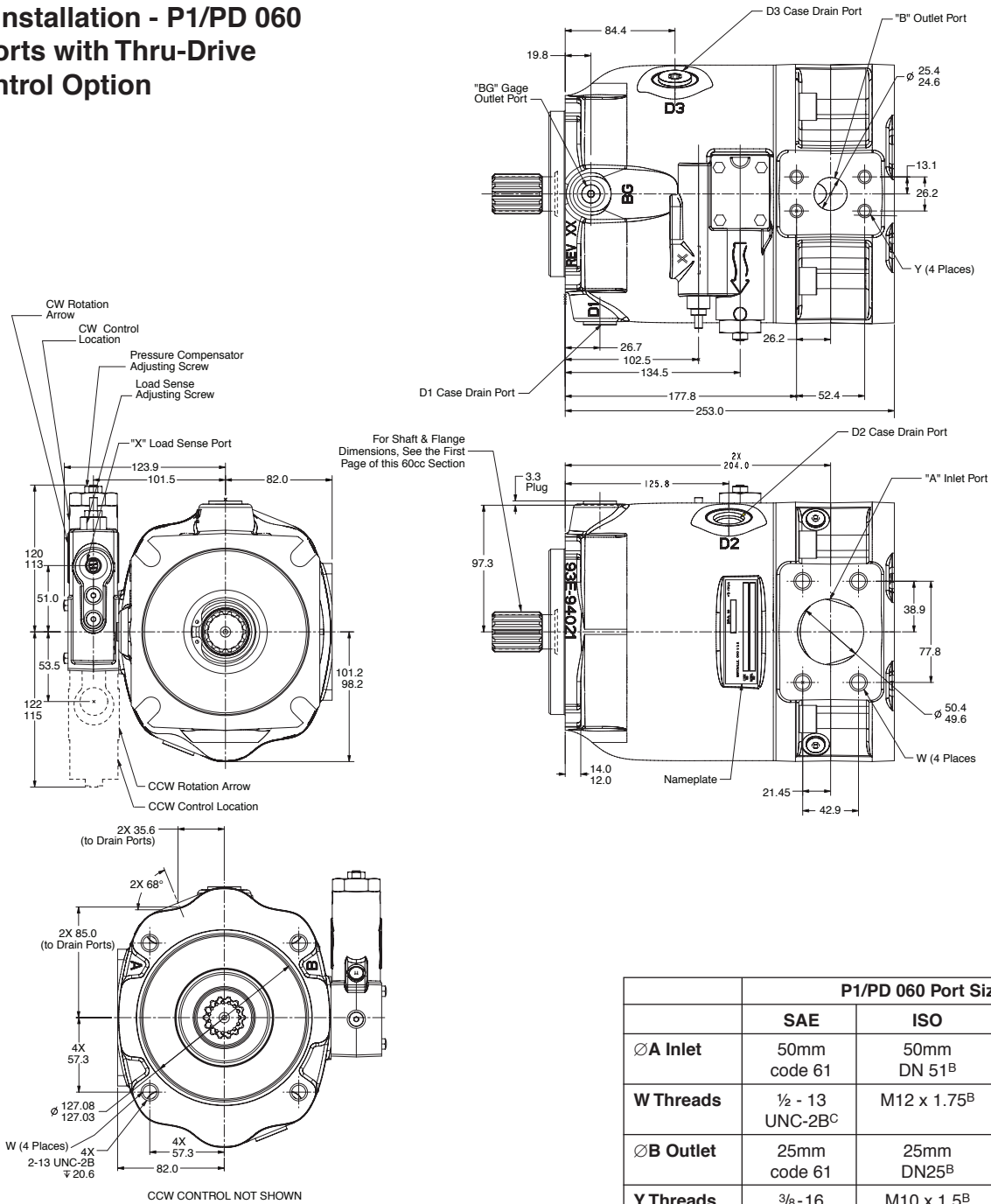


P1/PD 060 Port Sizes			
	SAE	ISO	BSP
∅ A Inlet	50mm code 61	50mm DN 51 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅ B Outlet	25mm code 61	25mm DN25 <sup>B</sup>	—
Y Threads	¾ - 16 UNC-2B <sup>C</sup>	M10 x 1.5 <sup>B</sup>	—
BG	SAE-4 <sup>D</sup>	M12x1.5 <sup>A</sup>	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**



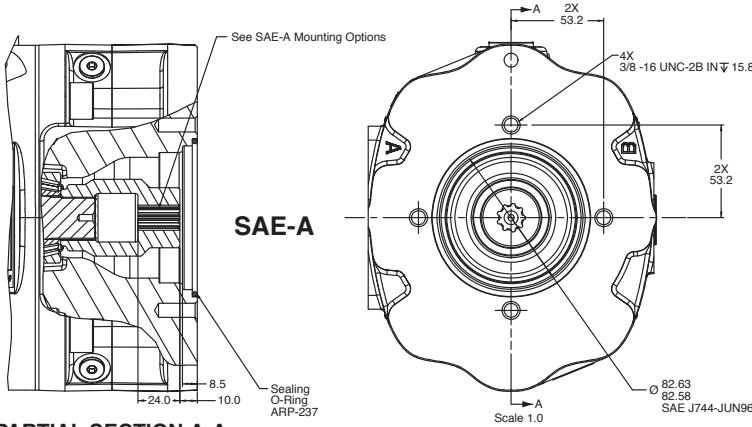
	P1/PD 060 Port Sizes		
	SAE	ISO	BSP
∅A Inlet	50mm code 61	50mm DN 51 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅B Outlet	25mm code 61	25mm DN25 <sup>B</sup>	—
Y Threads	¾ - 16 UNC-2B <sup>C</sup>	M10 x 1.5 <sup>B</sup>	—
BG	SAE-4 <sup>D</sup>	M12x1.5 <sup>A</sup>	¼" <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

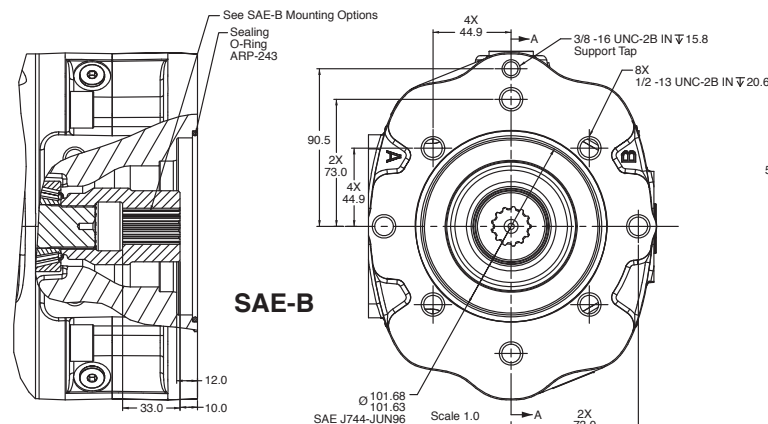
Note: See Page 79 for shaft torq rating

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

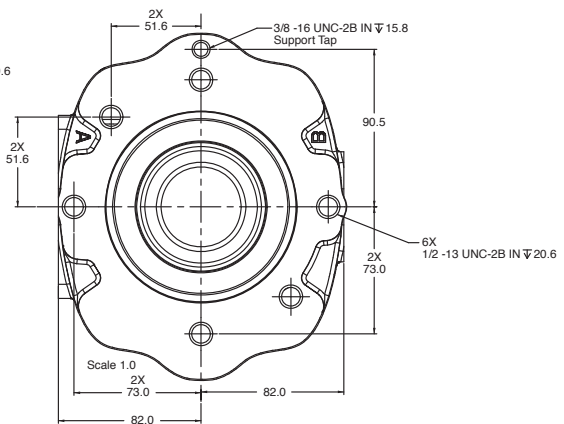
SAE A Mounting Options Information	
Model Number T0*A Spline: ANSI B92.1 1996 SAE 16-4 (A) Involute Spline Data Class 5 Flat Root Side Fit Number of Teeth - 9 Pitch - 16/32 Pressure Angle - 30 Minor Diameter - 0.514/0.509 in Pitch Diameter - 0.5625 in ref	Model Number T0*H Spline: ANSI B92.1 1996 SAE 19-4 Involute Spline Data Class 5 Flat Root Side Fit Number of Teeth - 11 Pitch - 16/32 Pressure Angle - 30 Minor Diameter - 0.6356/0.6306 in Pitch Diameter - 0.6875 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 - 16/32 Pressure Angle - 30 Minor Diameter - 1.087/1.092 in Pitch Diameter - 1.1667 in ref



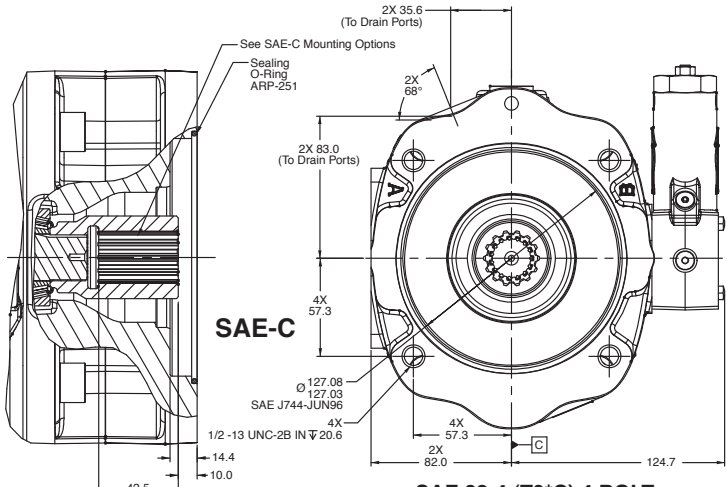
**PARTIAL SECTION A-A**  
**SAE 16-4 (A) (T0\*A) & SAE 19-4 (T0\*H)**  
**VERTICAL OR HORIZONTAL 2 BOLT**



**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**



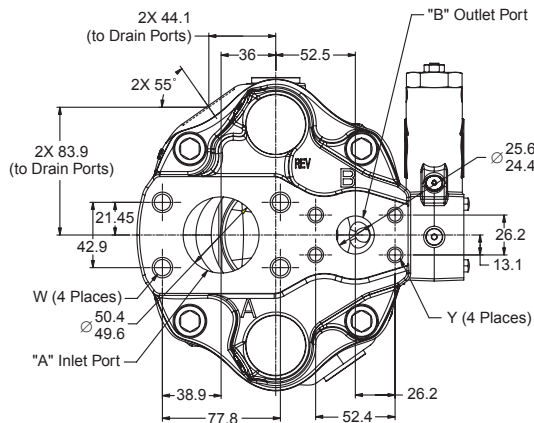
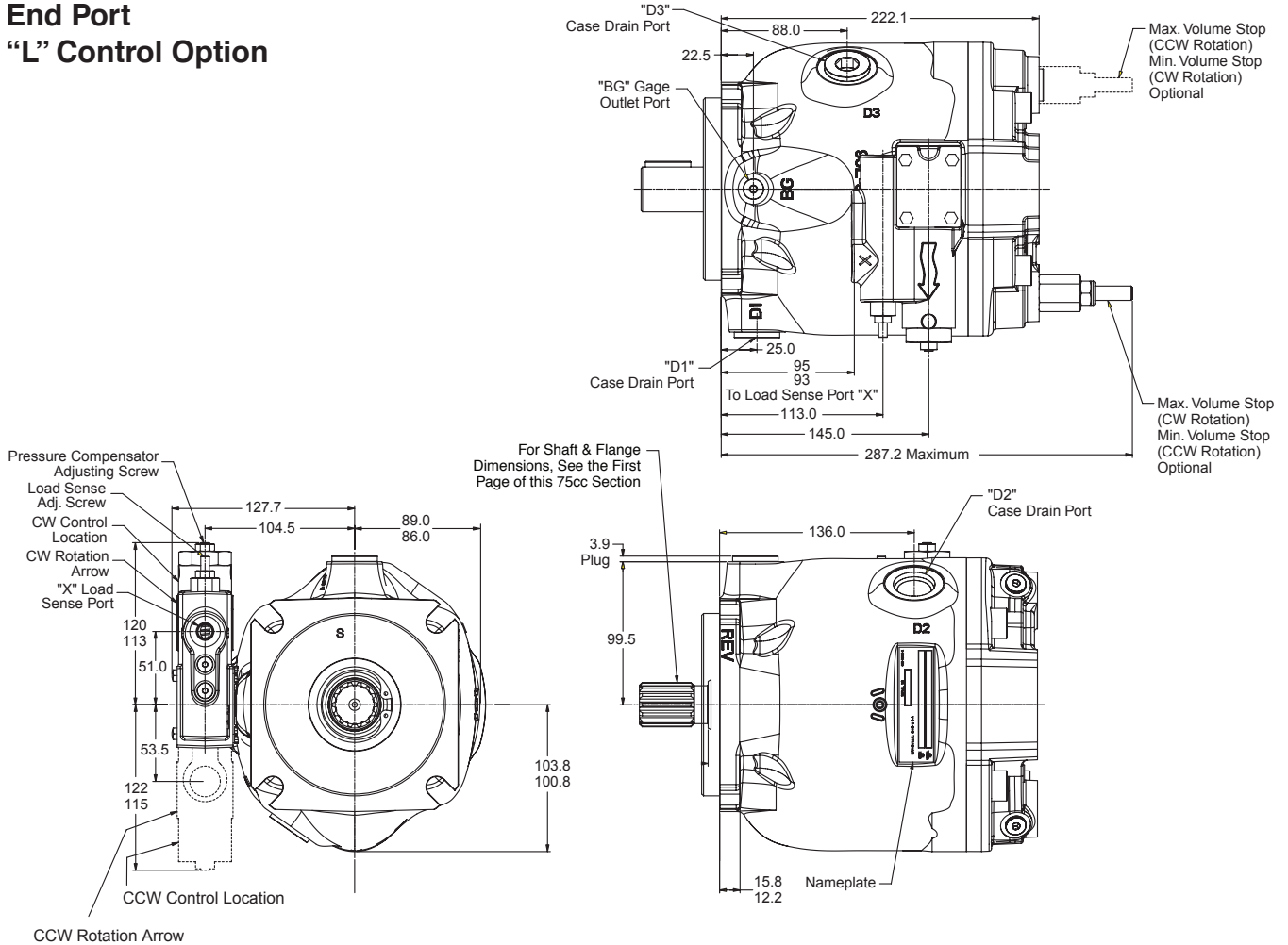
**PARTIAL SECTION A-A**  
**SAE 32-4 (T0\*C) 4 BOLT**







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

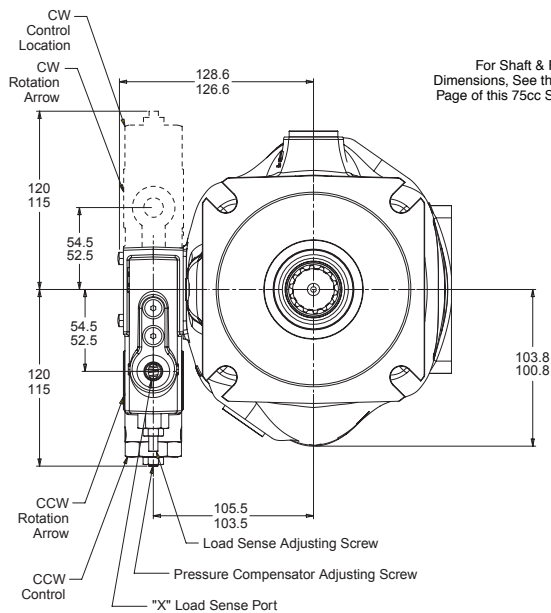
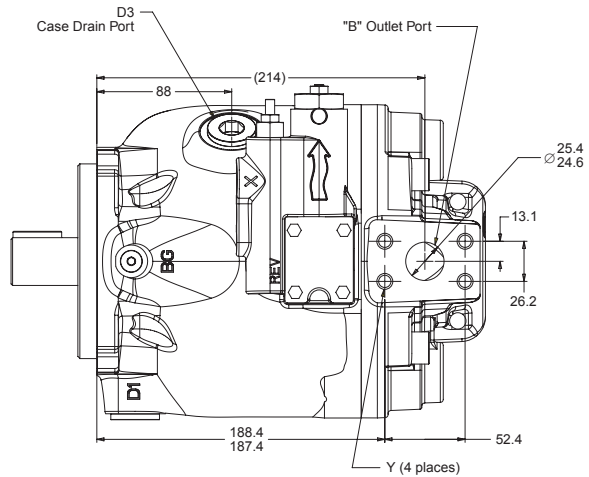


	P1/PD 075 Port Sizes		
	SAE	ISO	BSP
∅A Inlet	50mm code 61 <sup>C</sup>	50mm DN 51 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅B Outlet	25mm code 61 <sup>C</sup>	25mm DN25 <sup>B</sup>	—
Y Threads	¾ - 16 UNC-2B <sup>C</sup>	M10 x 1.5 <sup>B</sup>	—
BG	SAE-4 <sup>D</sup>	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>

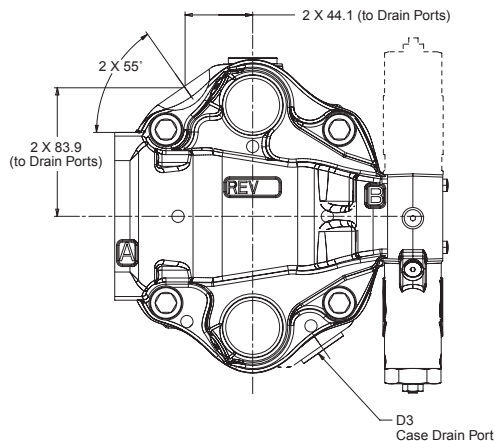
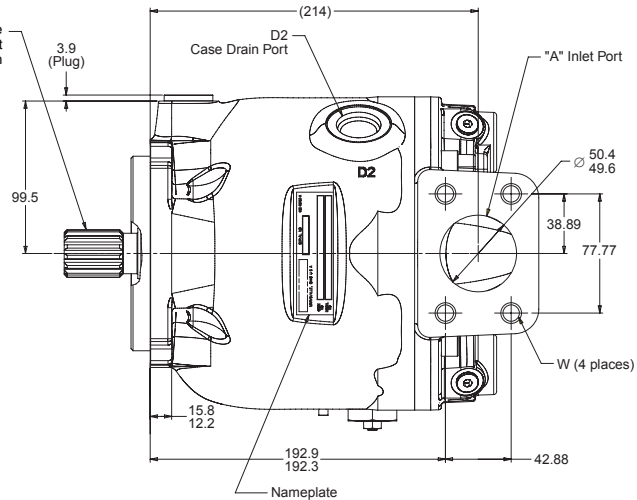
Note A: Metric o-ring boss port conform to ISO 6149-1  
Note B: Metric 4-bolt flange port conforms to ISO 6162  
Note C: Inch 4-bolt flange port conforms to SAE J518  
Note D: Inch o-ring boss port conforms to SAE J514  
Note E: BSP boss port conforms to ISO 228-1



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



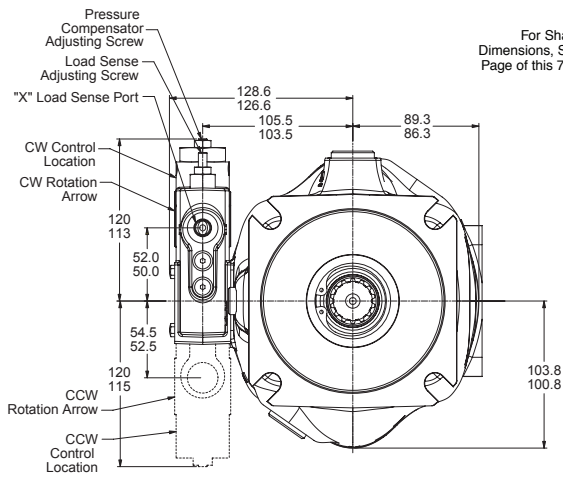
For Shaft & Flange  
Dimensions, See the First  
Page of this 75cc Section



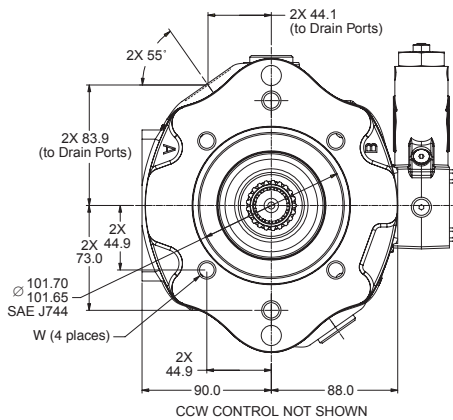
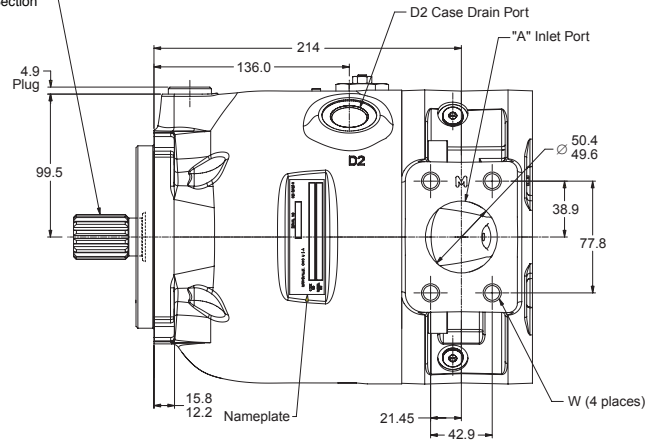
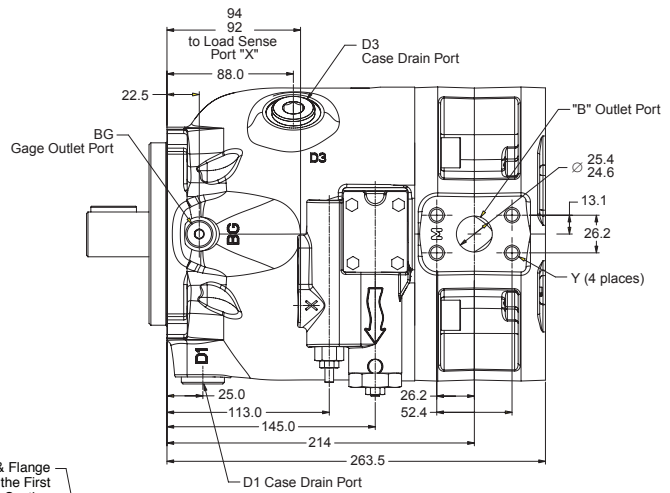
P1/PD 075 Port Sizes			
	SAE	ISO	BSP
<b>A Inlet</b>	50mm code 61 <sup>C</sup>	50mm DN 51 <sup>B</sup>	—
<b>W Threads</b>	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
<b>B Outlet</b>	25mm code 61 <sup>C</sup>	25mm DN25 <sup>B</sup>	—
<b>Y Threads</b>	¾ - 16 UNC-2B <sup>C</sup>	M10 x 1.5 <sup>B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



For Shaft & Flange Dimensions, See the First Page of this 75cc Section



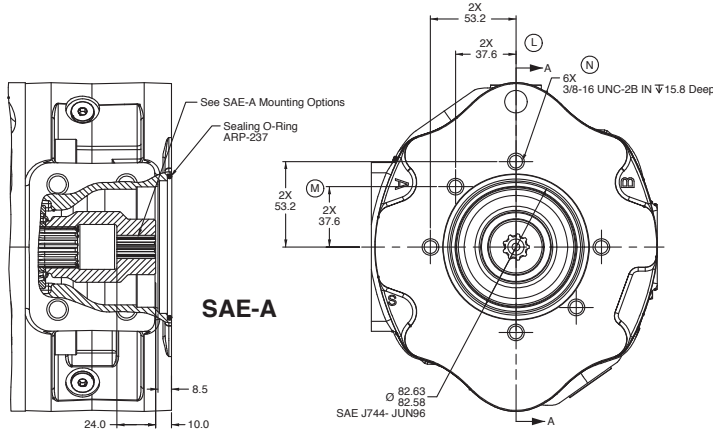
	P1/PD 075 Port Sizes		
	SAE	ISO	BSP
∅A Inlet	50mm code 61 <sup>C</sup>	50mm DN 51 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅B Outlet	25mm code 61 <sup>C</sup>	25mm DN25 <sup>B</sup>	—
Y Threads	¾ - 16 UNC-2B <sup>C</sup>	M10 x 1.5 <sup>B</sup>	—
BG	SAE-4 <sup>D</sup>	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

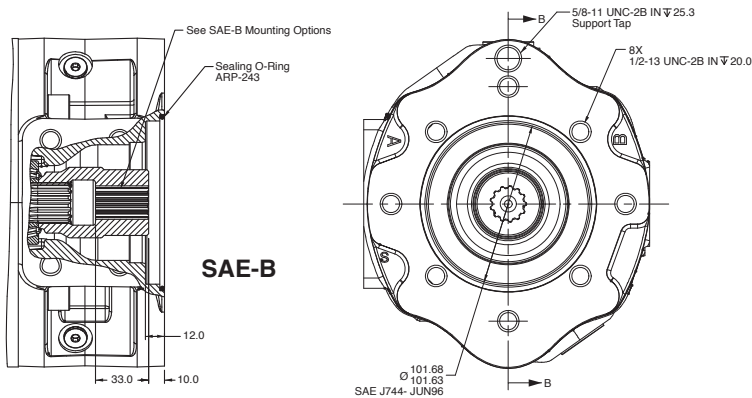
Note: See Page 79 for shaft torq rating

**Pump Installation - P1/PD 075  
 Side Ports with Thru-Drive  
 Mounting Options**

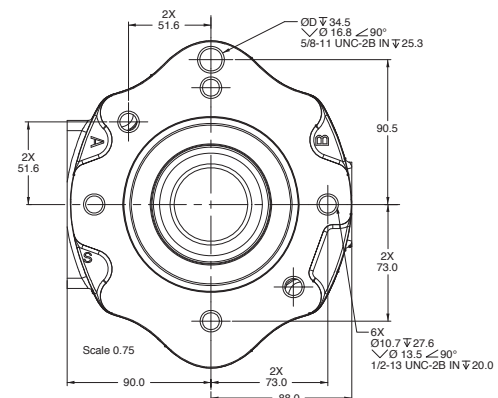
SAE-A Mounting Options Information	
Model Number T0*A Spline: ANSI B92.1 1996 SAE 16-4 (A) Involute Spline Data Class 5 Flat Root Side Fit Number of Teeth - 9 Pitch - 16/32 Pressure Angle - 30 Minor Diameter - 0.514/0.509 in Pitch Diameter - 0.5625 in ref	Model Number T0*H Spline: ANSI B92.1 1996 SAE 19-4 Involute Spline Data Class 5 Flat Root Side Fit Number of Teeth - 11 Pitch - 16/32 Pressure Angle - 30 Minor Diameter - 0.6356/0.6306 in Pitch Diameter - 0.6875 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 - 1.087/1.092 in Pitch Diameter - 1.1667 in ref



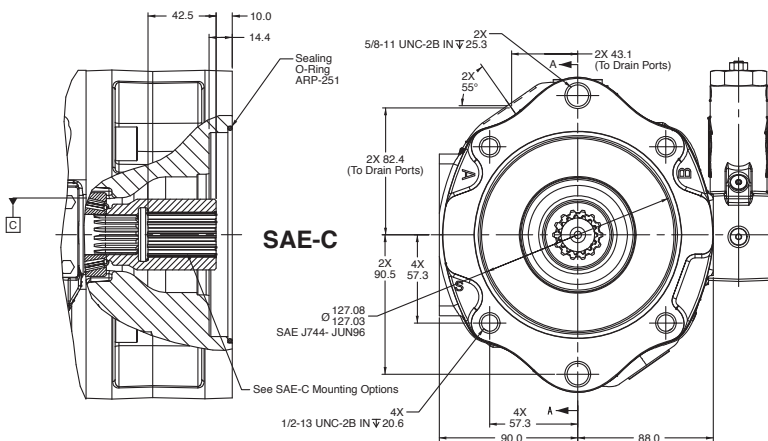
**SECTION A-A**  
**SAE 16-4 (A) (T0\*A) & SAE 19-4 (T0\*H)**  
**2 BOLT DIAGONAL & VERTICAL OR HORIZONTAL 2 BOLT**



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



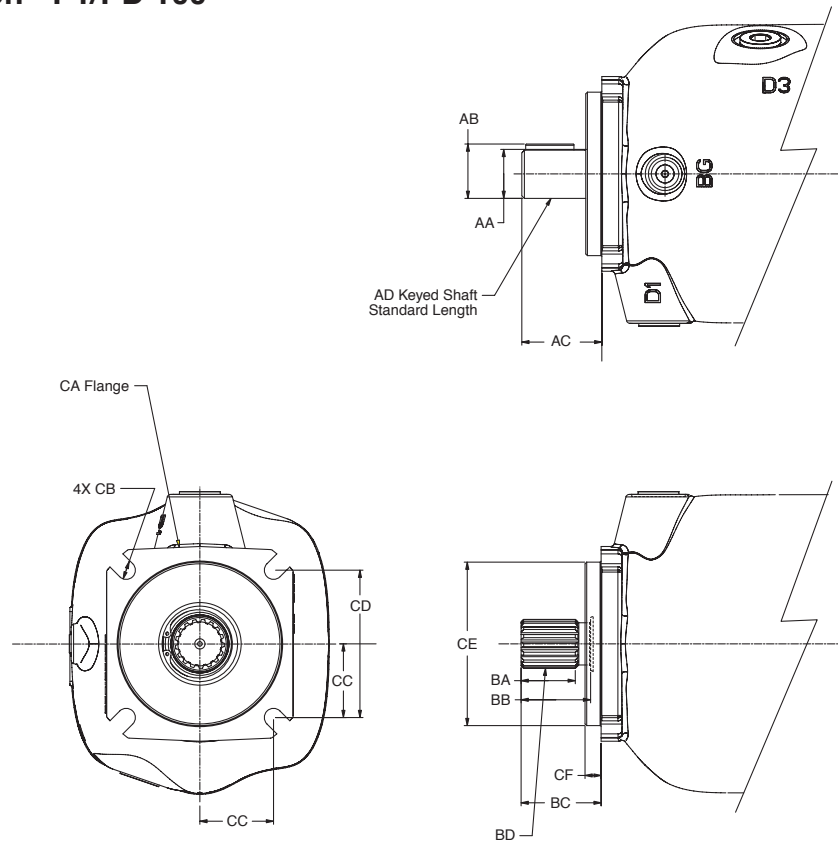
**SAE 22-4 (B) (T0\*J) & SAE 25-4 (B-B) (T0\*K)**  
**2 BOLT DIAGONAL & VERTICAL  
 OR HORIZONTAL 2 BOLT**



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

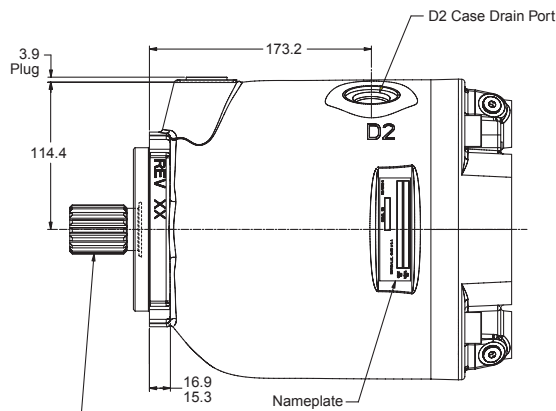
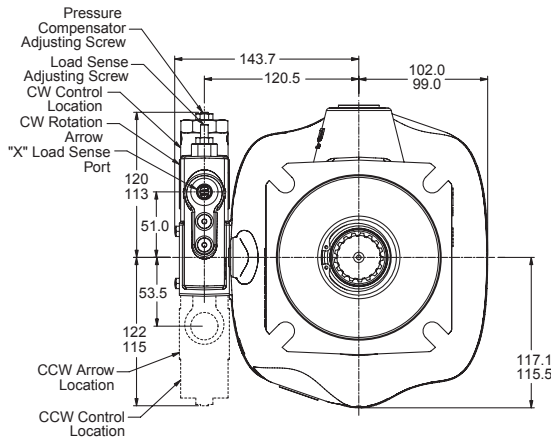
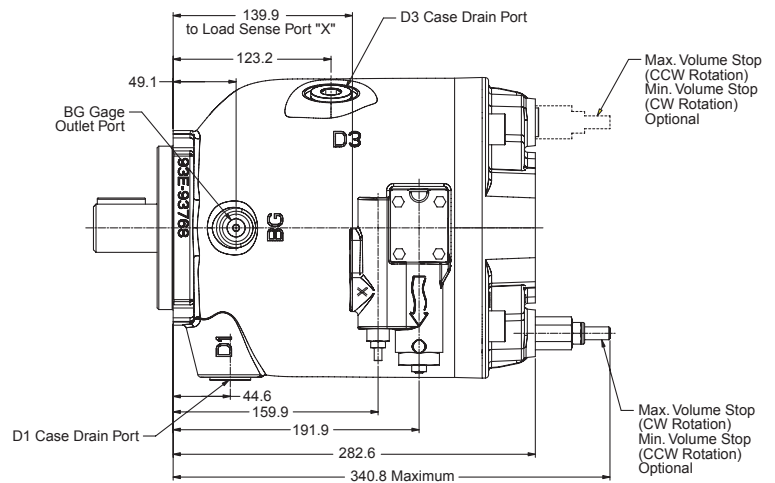


**Pump Installation - P1/PD 100  
Input Shafts**

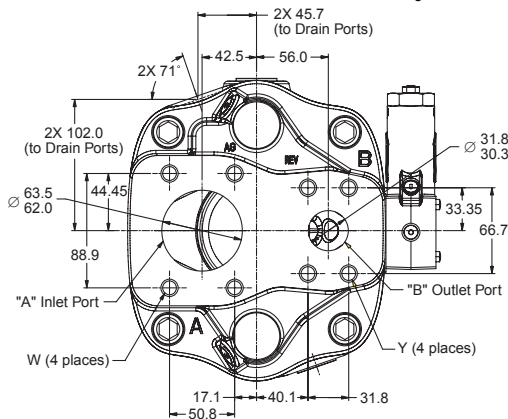


P1/PD 100	ISO (Code 04)	SAE (Code 01 or 02)	SAE (Code 06)
AA	40.021/40.002	38.10/38.05	N/A
AB	43.00/42.71	42.35/42.17	N/A
AC	92.8/91.2	62.8/61.2	N/A
AD	ISO E40N	SAE J744 38.1(C-C)	N/A
BA	N/A	42.10	38.10
BB	N/A	54.00	48.00
BC	N/A	62.8/61.2	56.8/55.2
BD	N/A	SPLINE: SAE ASA-B 1960 SAE 38-4 (C-C) INVOLUTE SPLINE DATA CLASS 2 FLAT ROOT SIDE FIT NUMBER OF TEETH - 17 PITCH - 12/24 PRESSURE ANGLE - 30 MAJOR DIAMETER - 1.4793/1.4763 IN PITCH DIAMETER - 1.4167	SPLINE: SAE ASA-B 1960 SAE 32-4 (C) INVOLUTE SPLINE DATA CLASS 2 FLAT ROOT SIDE FIT NUMBER OF TEETH - 14 PITCH - 12/24 PRESSURE ANGLE - 30 MINOR DIAMETER - 1.2293/1.2243 IN 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**



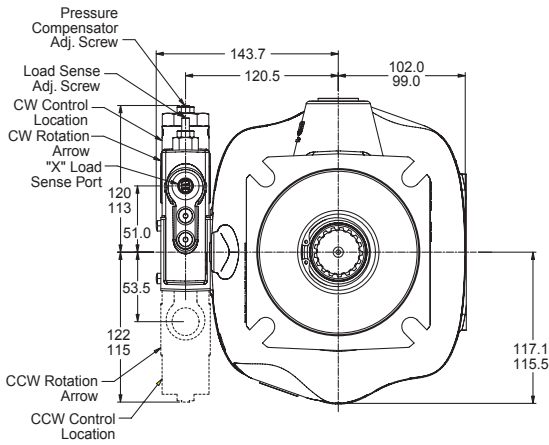
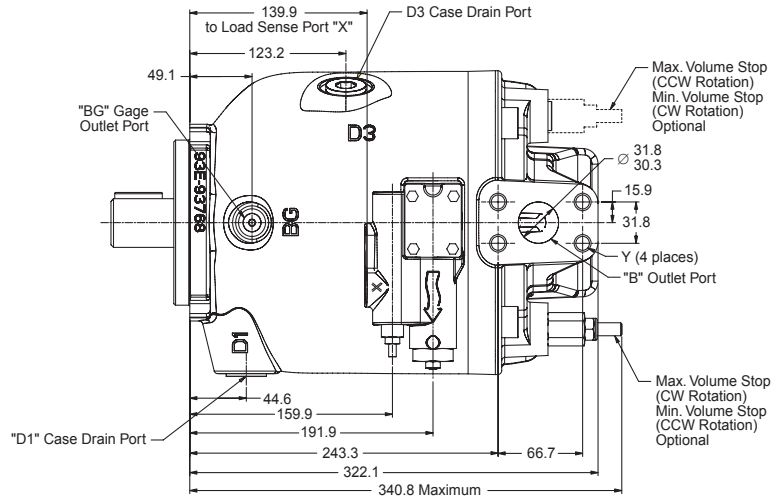
For Shaft & Flange Dimensions, See the First Page of this 100cc Section



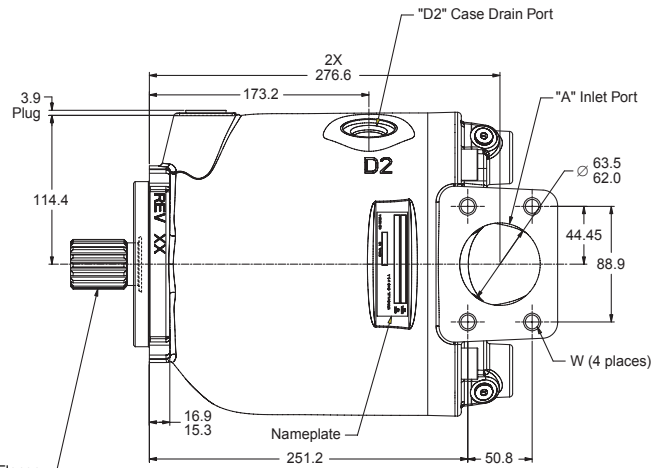
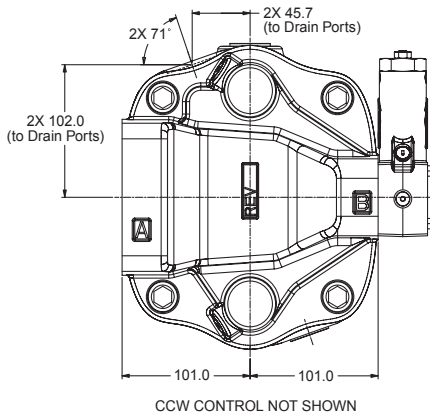
P1/PD 100 Port Sizes			
	SAE	ISO	BSP
∅A Inlet	63mm code 61 <sup>C</sup>	63mm DN 64 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅B Outlet	32mm code 62 <sup>C</sup>	32mm DN 32 <sup>B</sup>	—
Y Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
BG	SAE-4 <sup>D</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**



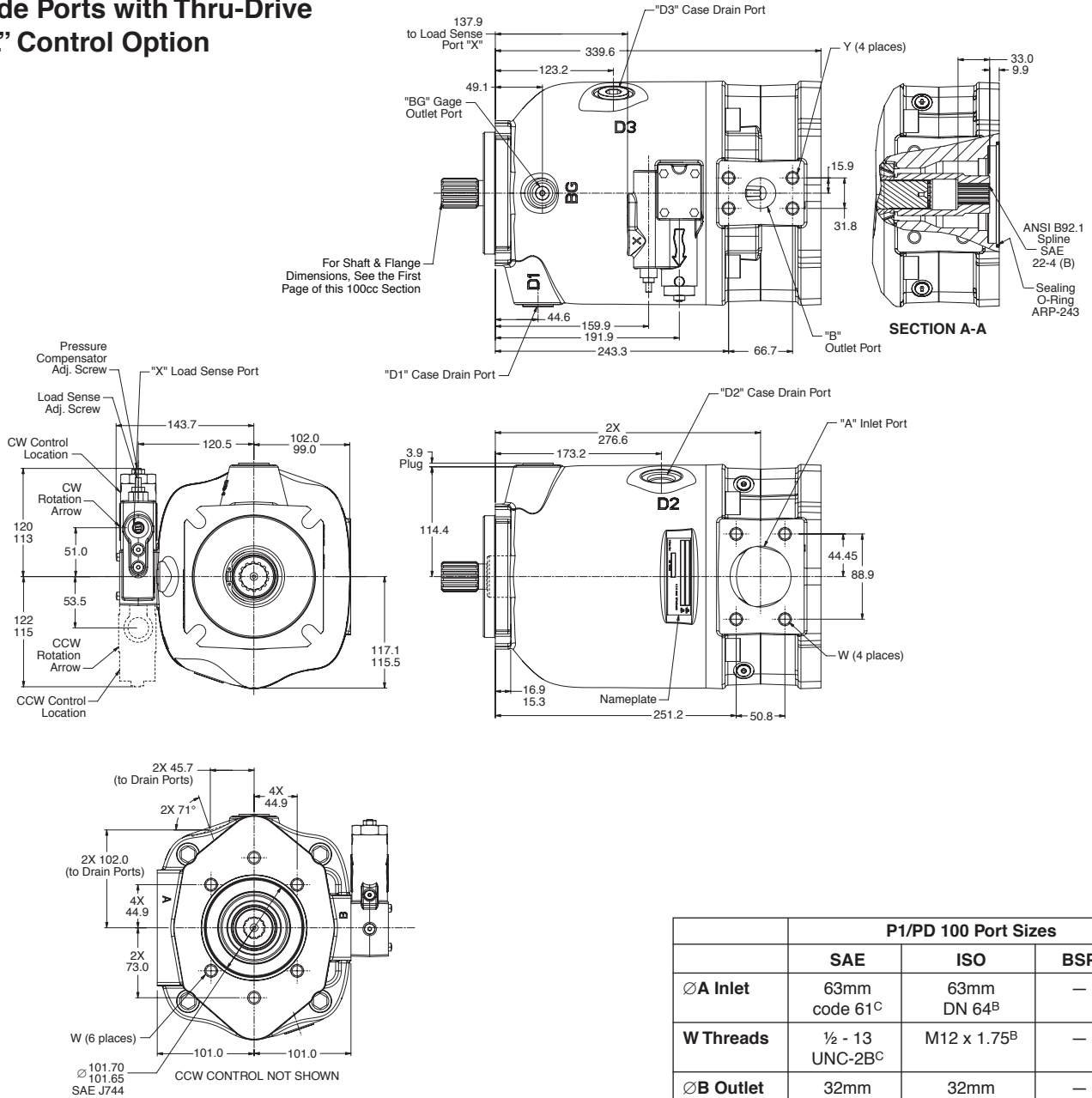
For Shaft & Flange Dimensions, See the First Page of this 100cc Section



P1/PD 100 Port Sizes			
	SAE	ISO	BSP
∅A Inlet	63mm code 61 <sup>C</sup>	63mm DN 64 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅B Outlet	32mm code 62 <sup>C</sup>	32mm DN 32 <sup>B</sup>	—
Y Threads	½ - 13 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>

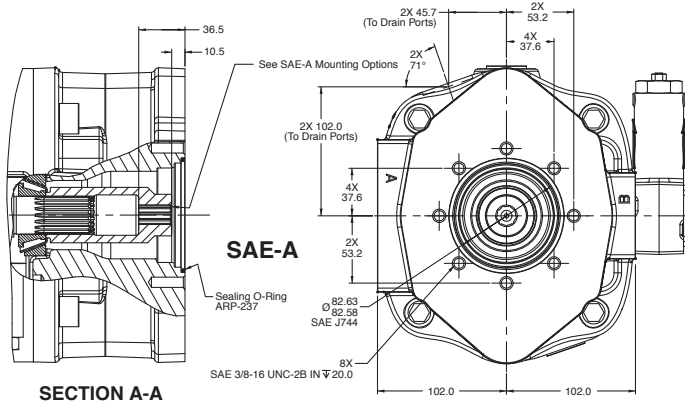
Note A: Metric o-ring boss port conform to ISO 6149-1  
Note B: Metric 4-bolt flange port conforms to ISO 6162  
Note C: Inch 4-bolt flange port conforms to SAE J518  
Note D: Inch o-ring boss port conforms to SAE J514  
Note E: BSP boss port conforms to ISO 228-1

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





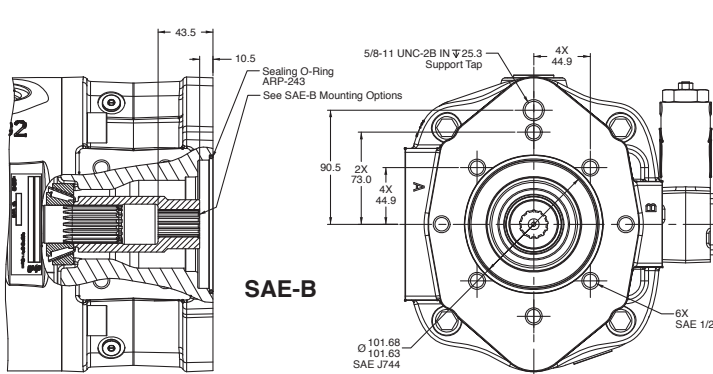
**Pump Installation - P1/PD 100  
 Side Ports with Thru-Drive  
 Mounting Options**



**SECTION A-A**

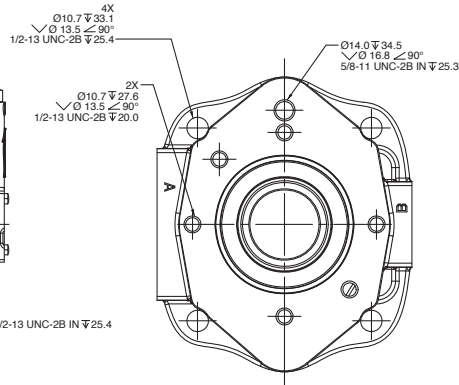
**SAE 16-4 (A) (T0\*A) & SAE 19-4 (T0\*H)  
 2 BOLT DIAGONAL & VERTICAL OR HORIZONTAL 2 BOLT**

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	Model Number T0*H Spline: ANSI B92.1 1996 SAE 19-4 Involute Spline Data Class 5 Flat Root Side Fit Number of Teeth - 11 Pitch - 16/32 Pressure Angle - 30 Minor Diameter - 0.6356/0.6306 in Pitch Diameter - 0.6875 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 - 1.0670/10.920 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

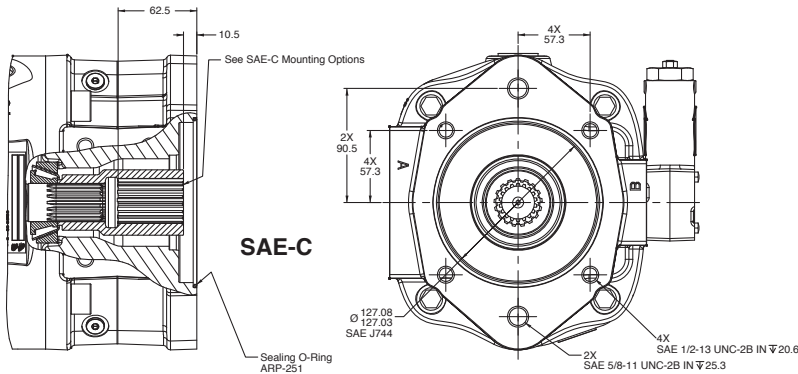


**SECTION B-B**

**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**

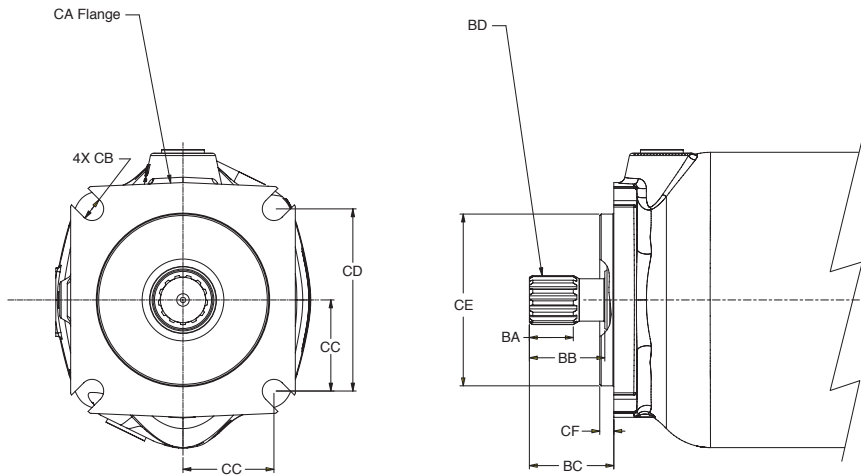
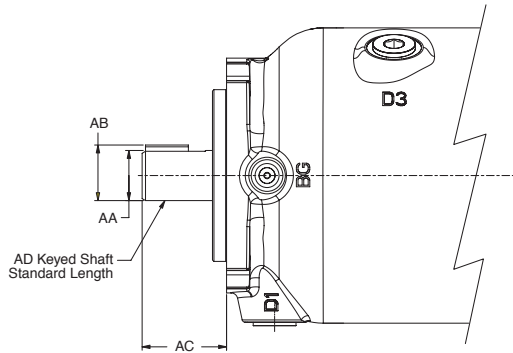


**SECTION C-C**

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

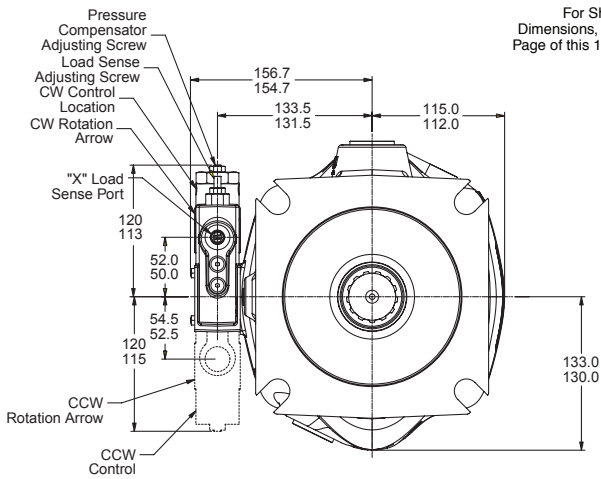
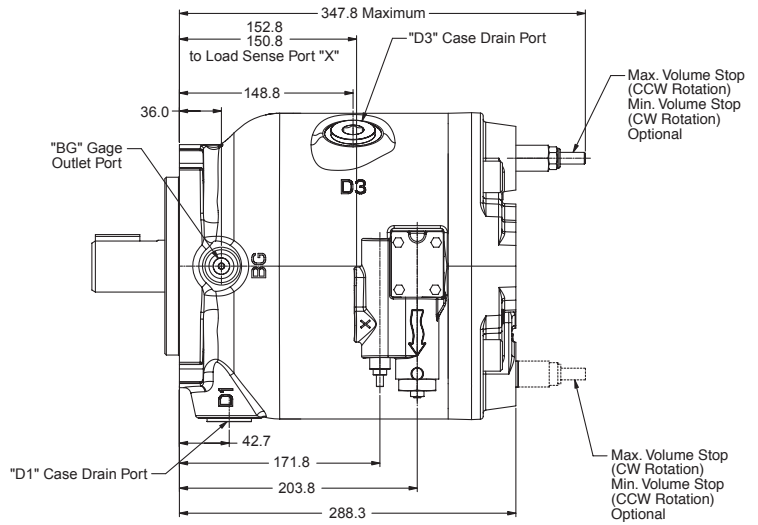


**Pump Installation - P1/PD 140  
Input Shafts**

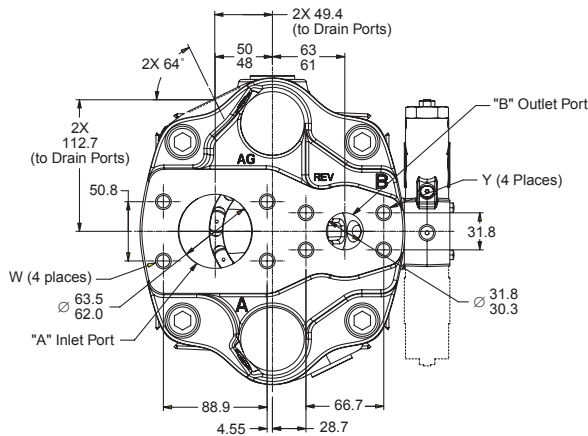
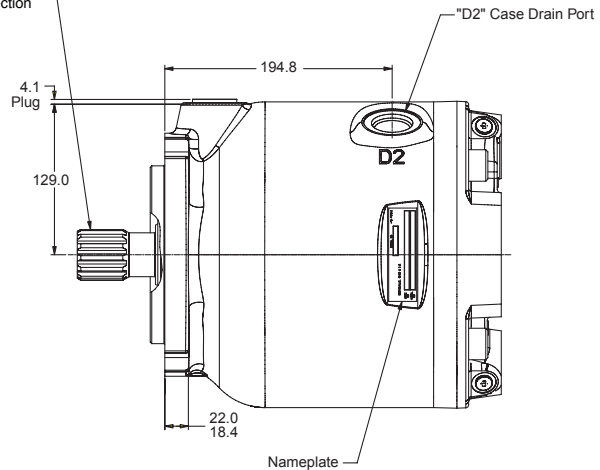


P1/PD 140	ISO (Code 04)	SAE (Code 01 or 02)
ØAA	50.027/50.002	44.45/44.40
AB	53.50/53.21	49.43/49.17
AC	92.8/91.2	75.8/74.2
AD	ISO E50N	SAE J744 44-1(D)
BA	N/A	39.00
BB	N/A	67.00
BC	N/A	75.8/74.2
BD	N/A	SPLINE: SAE J498-B 1969 SAE 44-4(D) INVOLUTE SPLINE DATA CLASS 2 FLAT ROOT SIDE FIT NUMBER OF TEETH - 13 PITCH - 8/16 PRESSURE ANGLE - 30 MAJOR DIAMETER - 1.7210/1.7160 IN 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

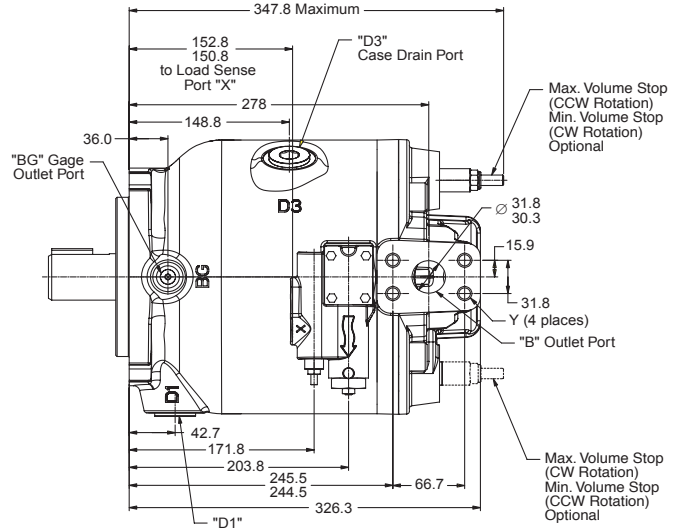
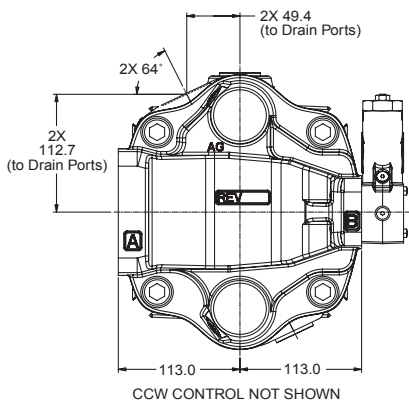
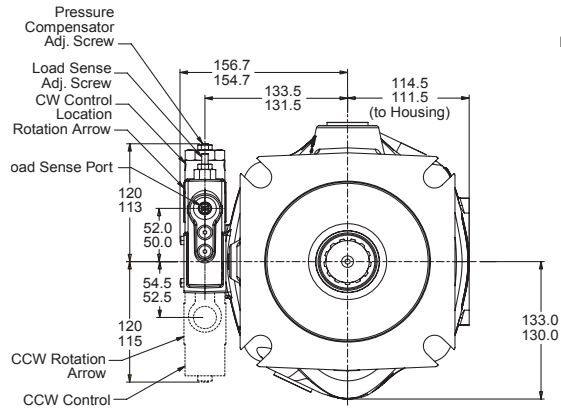


P1/PD 140 Port Sizes			
	SAE	ISO	BSP
∅A Inlet	63mm code 61 <sup>C</sup>	63mm DN 64 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅B Outlet	32mm code 62 <sup>C</sup>	32mm DN 32 <sup>B</sup>	—
Y Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
BG	SAE-4 <sup>D</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>

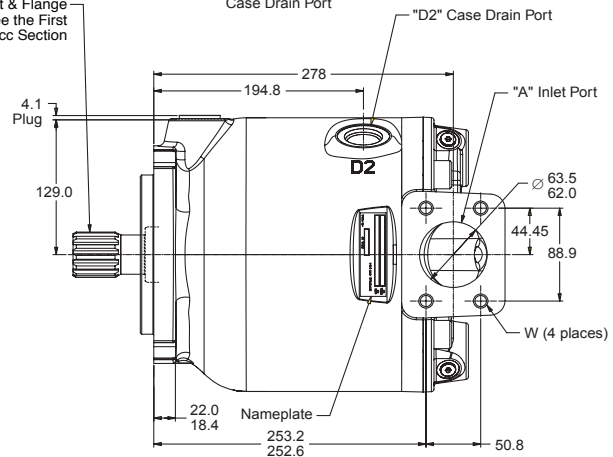
Note A: Metric o-ring boss port conform to ISO 6149-1  
Note B: Metric 4-bolt flange port conforms to ISO 6162  
Note C: Inch 4-bolt flange port conforms to SAE J518  
Note D: Inch o-ring boss port conforms to SAE J514  
Note E: BSP boss port conforms to ISO 228-1

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

**"L" Control Option**



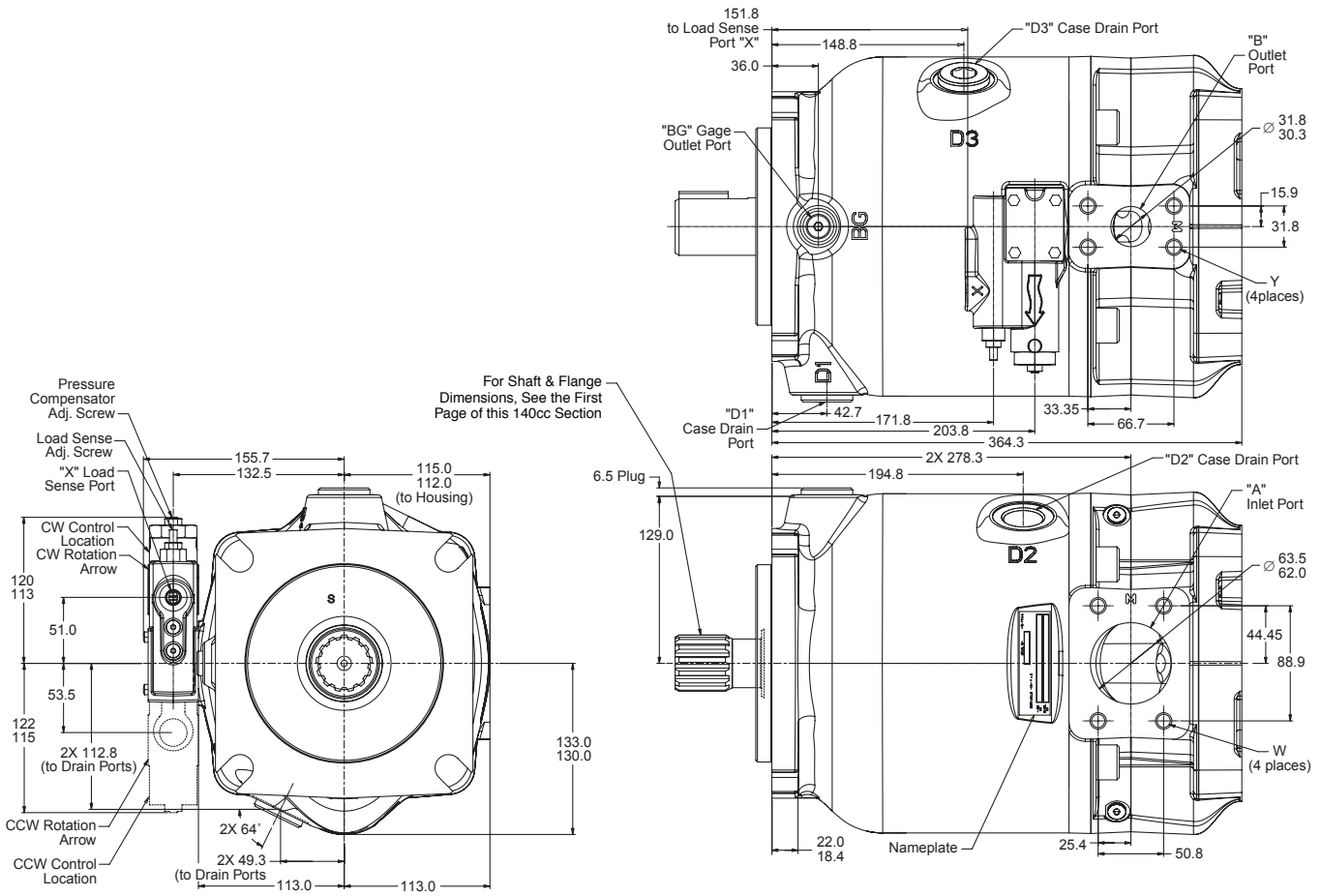
For Shaft & Flange Dimensions, See the First Page of this 140cc Section



P1/PD 140 Port Sizes			
	SAE	ISO	BSP
∅A Inlet	63mm code 61 <sup>C</sup>	63mm DN 64 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅B Outlet	32mm code 62 <sup>C</sup>	32mm DN 32 <sup>B</sup>	—
Y Threads	½ - 13 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 with Thru-Drive  
"L" Control Option**

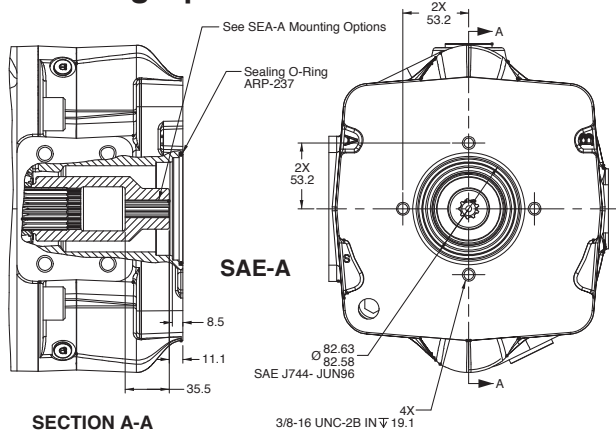


	P1/PD 140 Port Sizes		
	SAE	ISO	BSP
∅A Inlet	63mm code 61 <sup>C</sup>	63mm DN 64 <sup>B</sup>	—
W Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
∅B Outlet	32mm code 62 <sup>C</sup>	32mm DN 32 <sup>B</sup>	—
Y Threads	½ - 13 UNC-2B <sup>C</sup>	M12 x 1.75 <sup>B</sup>	—
BG	SAE-4 <sup>D</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**



**SECTION A-A**

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

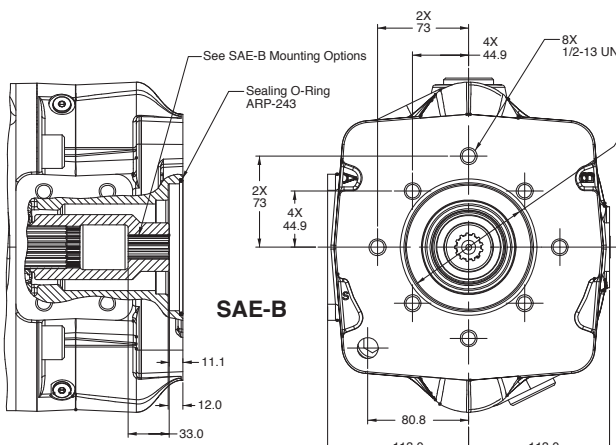
Model Number T0\*C  
Spline: ANSI B92.1 1996  
SAE 32-4 (C) Involute Spline Data  
Class 5 Flat Root Side Fit  
Number of Teeth - 14  
Pitch - 12/24  
Pressure Angle - 30  
Minor Diameter - 1.0870/10.920 in  
Pitch Diameter - 1.0667 in ref

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**

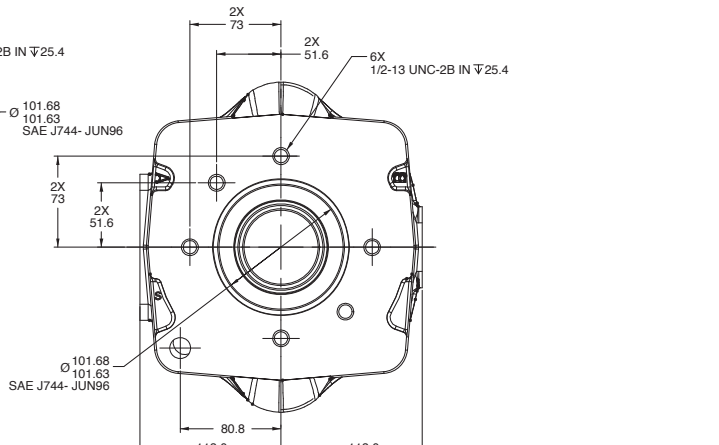
Model Number T0\*D  
Spline: ANSI B92.1 1996  
SAE 44-4 (D) Involute Spline Data  
Class 5 Flat Root Side Fit  
Number of Teeth - 13

Pitch - 8/16  
Pressure Angle - 30  
Minor Diameter - 1.5110/1.5060 in  
Pitch Diameter - 1.6250 in ref

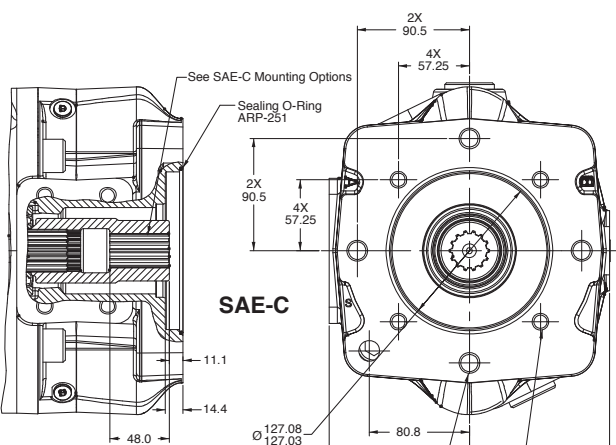


**SECTION B-B**

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

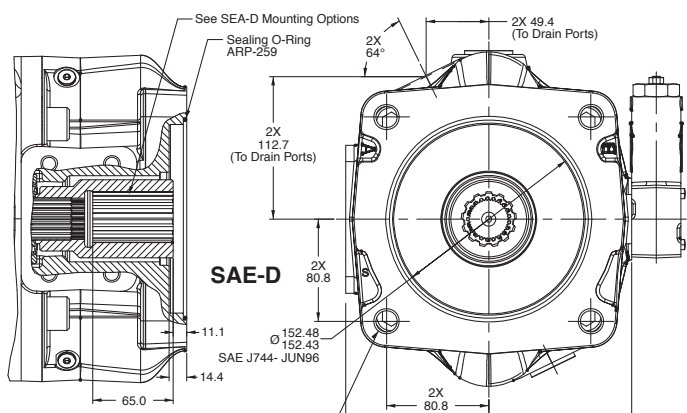


**SAE 22-2 (B) (T0\*J) & SAE 25-2 (B-B) (T0\*K)  
2 BOLT, HORIZONTAL, VERTICAL & DIAGONAL**



**SECTION C-C**

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



**SECTION D-D**

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



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				

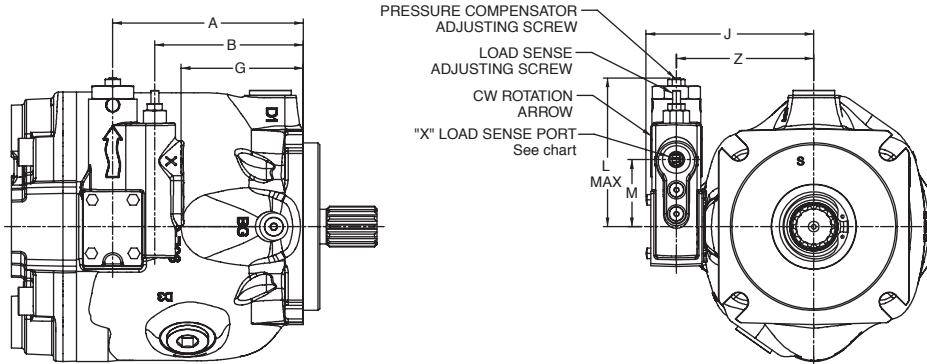
		Displacement cc (cu.in)							
		18 (1.1)	28 (1.71)	45 (2.75)	60 (3.66)	75 (4.58)	100 (6.1)	140 (8.54)	
Maximum torque at maximum displacement and maximum pressure*	N.m	79	122	198	263	329	439	614	
	ft.lbs	58	90	146	194	243	324	453	
Maximum Input shaft torque	01	N.m	134	337	337	641	641	1217	1701
		ft.lbs	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





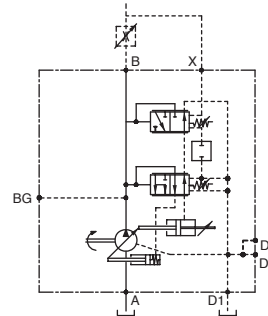
**L\*\* Control**  
**Load Sensing with Pressure Limiter**



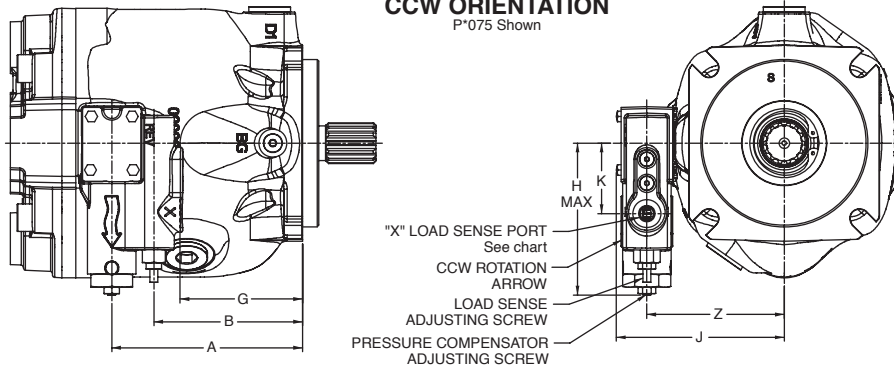
**CW ORIENTATION**  
P\*075 Shown

**L\*\* CONTROL**

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



**CCW ORIENTATION**  
P\*075 Shown



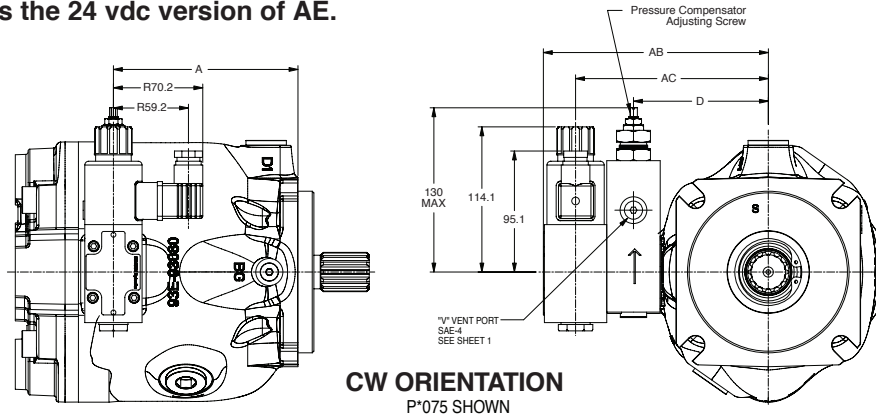
LOAD SENSE PORT "X"	
P****PS	SAE J514 Straight Thread O-Ring Port 7/16-20 UNF-2B (SAE-4)
P****PA	1/4" BSPP per ISO 228-1
P****PB	1/4" BSPP per ISO 228-1
P****PM	M12 x 1.5-6H per ISO 6149-1

**Dimensions**

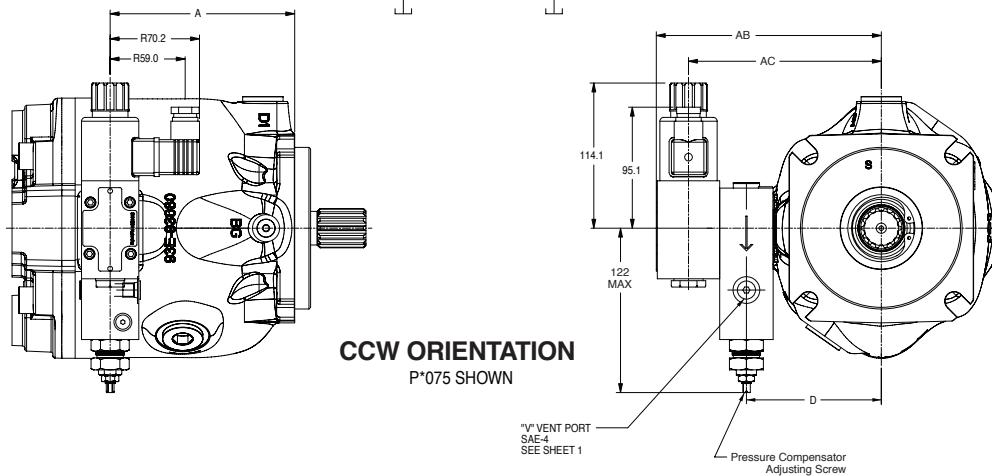
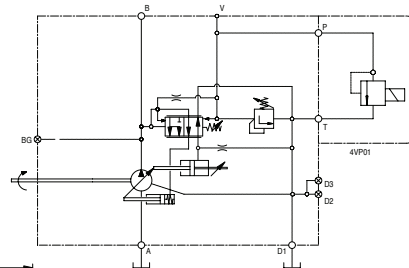
Model	A	B	G	H Max	J	K	L Max	M	Z
P*018	93.2	61.2	41.2	119	107.7	53.5	116	51.0	84.5
P*028	111.5	79.5	59.5	119	113.8	53.5	116	51.0	90.7
P*045	122	90	70.2	122	120.7	53.5	120	51.0	97.5
P*060	134.5	102.5	82.5	122	124.7	53.5	120	51.0	101.5
P*075	145.0	113.0	93.0	122	127.7	53.5	120	51.0	104.5
P*100	191.9	159.9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



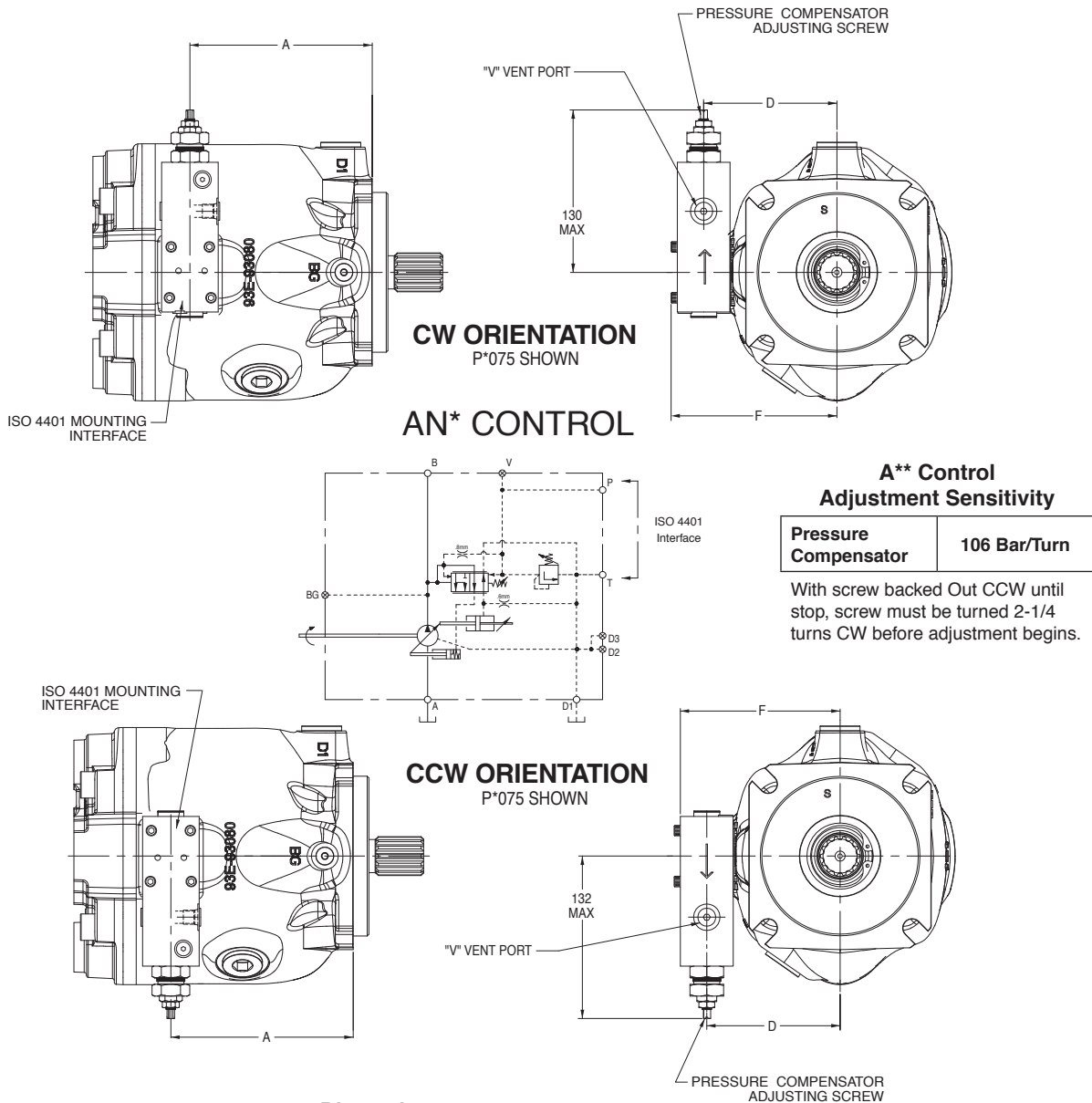
**AE\* or AF\* CONTROL**



**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.

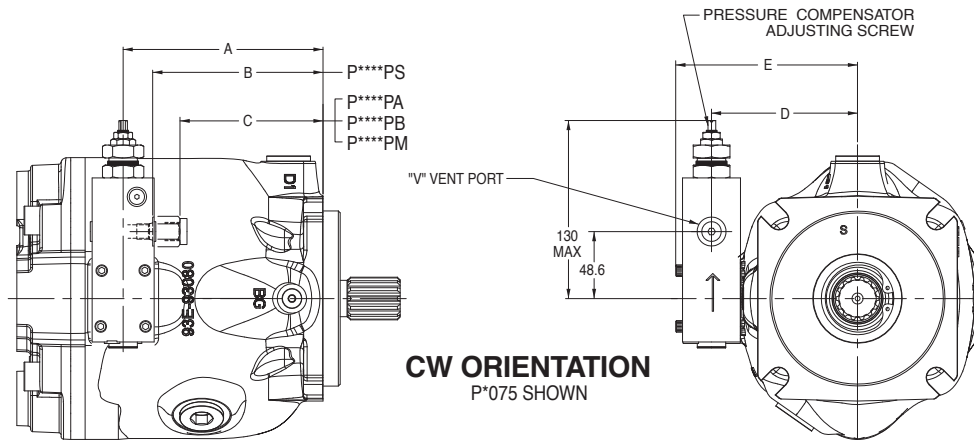


**Dimensions**

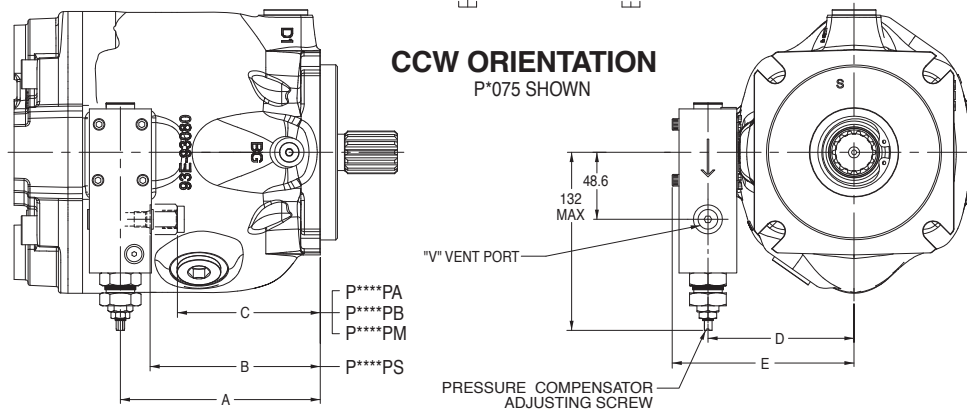
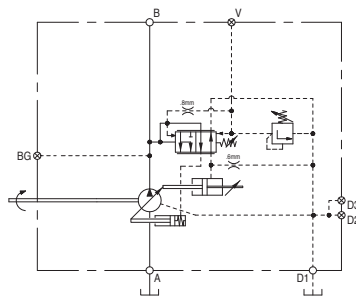
Model	A	D	F
P*018	93.2	85.0	103.7
P*028	111.5	93.0	111.7
P*045	122.2	99.0	125.0
P*060	134.5	103.0	129.0
P*075	145.0	106.0	132.0
P*100	191.9	122.0	148.0
P*140	203.8	134.0	160.0

**AM Control**

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



**AM\* CONTROL**

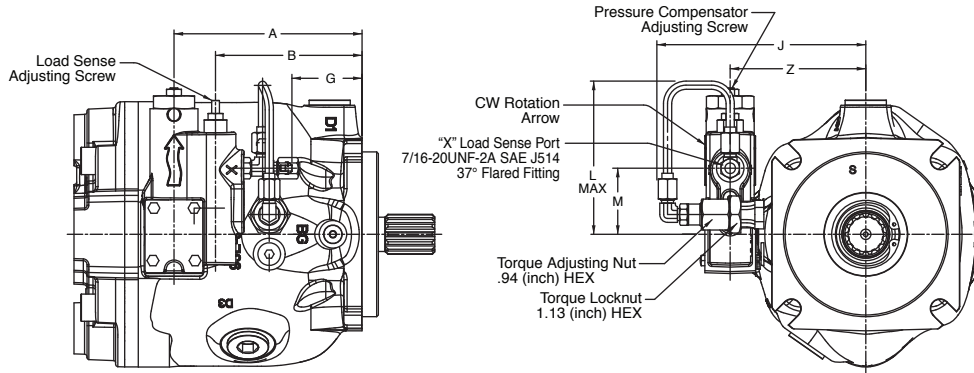


**Dimensions**

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 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

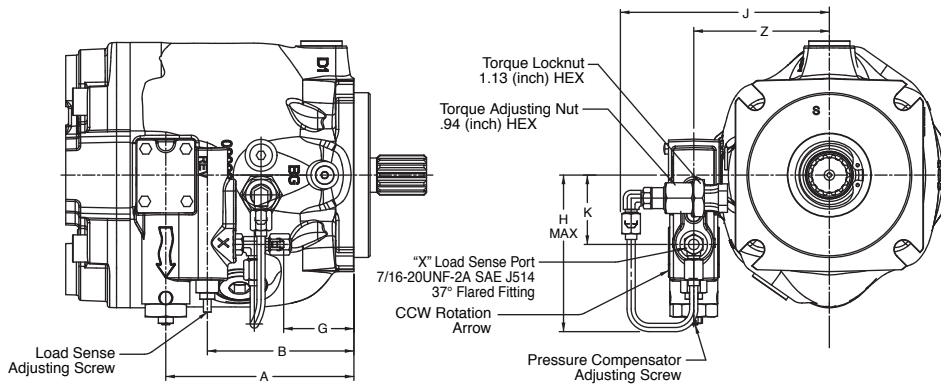
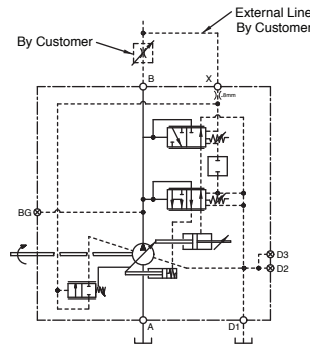
**Torque Limiter L0T Control  
Load Sensing with Torque Limiter  
"L0T" P\*075**



**CW ORIENTATION**  
P\*075 SHOWN

**L\*T Control**

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

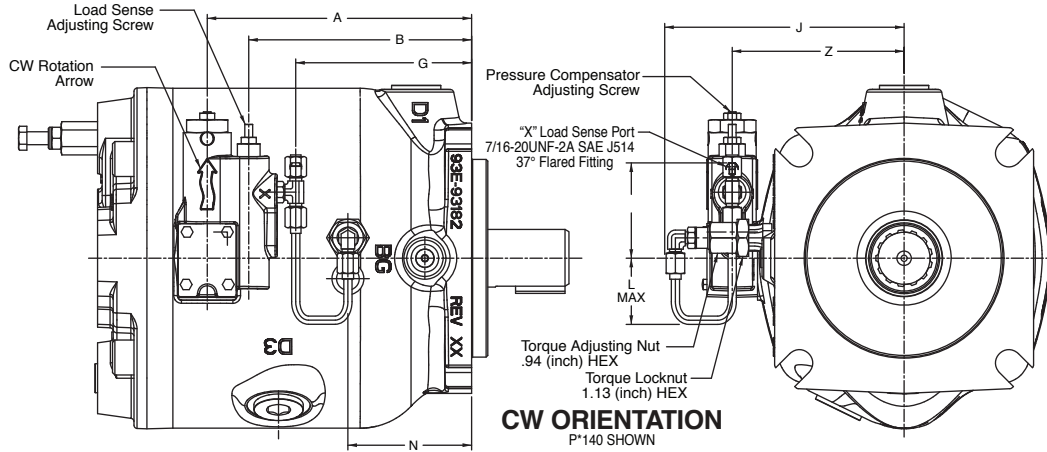


**CCW ORIENTATION**  
P\*075 SHOWN

**Dimensions**

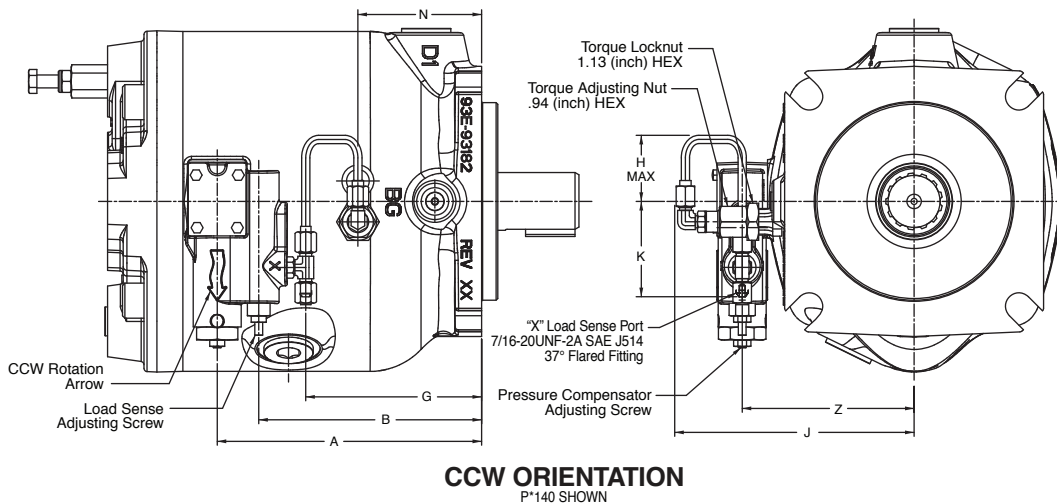
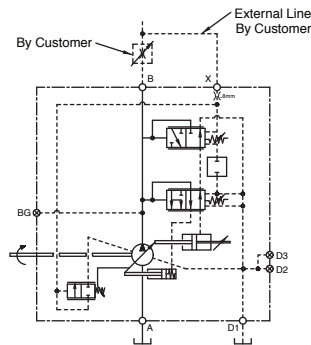
Model	A	B	G	H Max	J	K	L Max	M	Z
P*075	145.0	113.0	54.1	122	161.0	53.5	119	51.0	104.5

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



**L\*T Control**

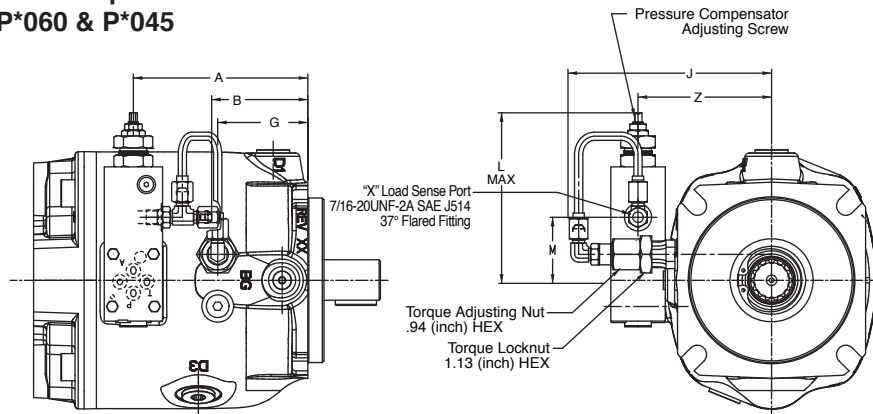
Adjustment Sensitivity	
Load Sense	28 BAR per turn
Pressure Compensator L0	40 BAR per turn



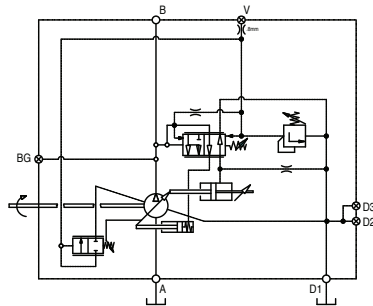
**Dimensions**

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

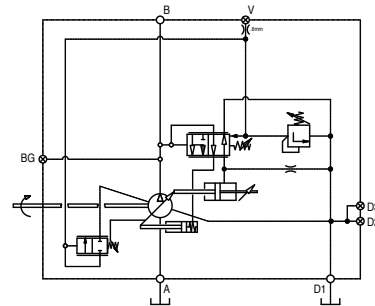
**Torque Limiter AMT and ALT Control**  
**"AMT" Pressure Compensator with Torque Limiter**  
**"ALT" Load Sense and Torque Limiter**  
**"AMT" and "ALT" P\*060 & P\*045**



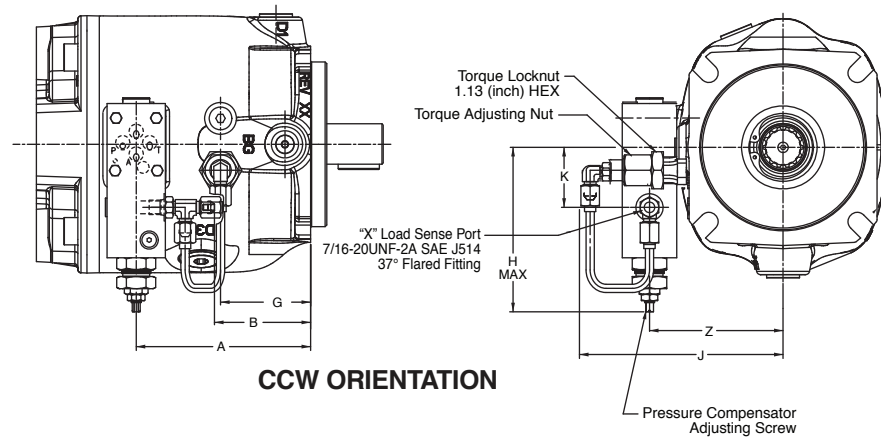
**CW ORIENTATION**  
P\*060 SHOWN



**"AMT" CONTROL**



**"ALT" CONTROL**



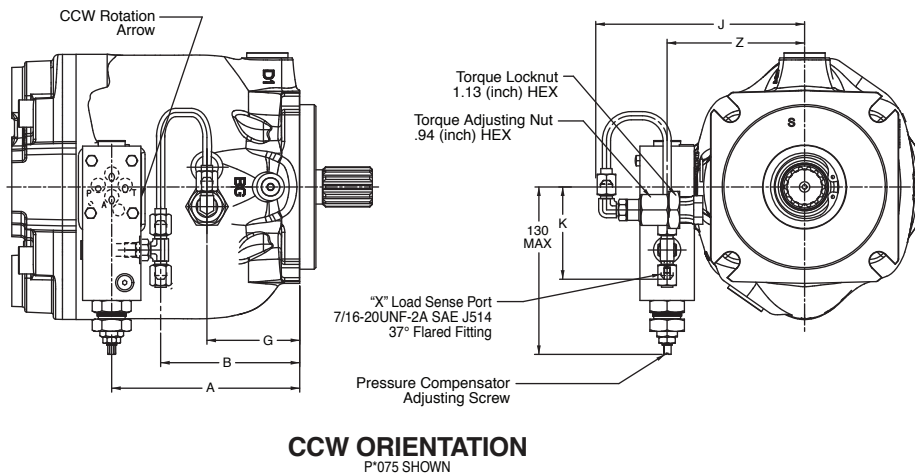
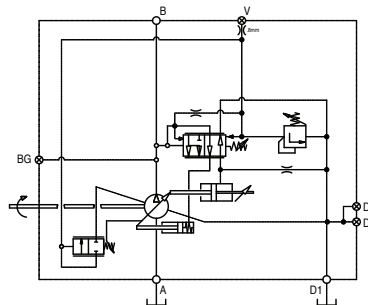
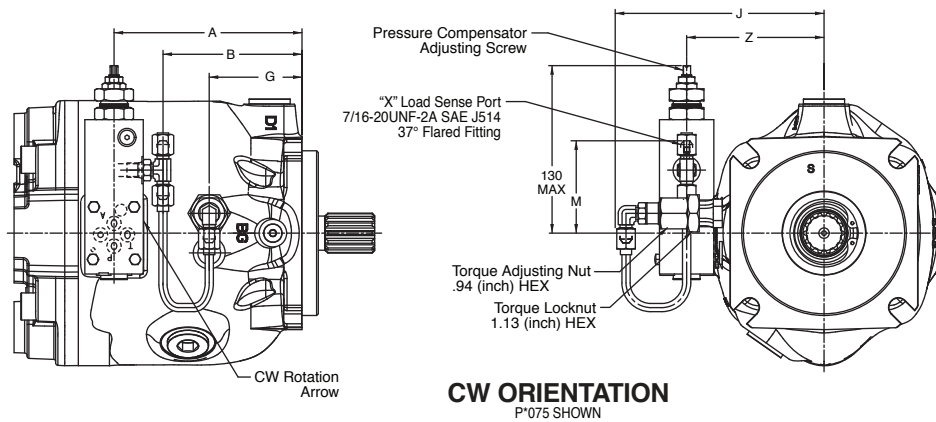
**CCW ORIENTATION**

**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



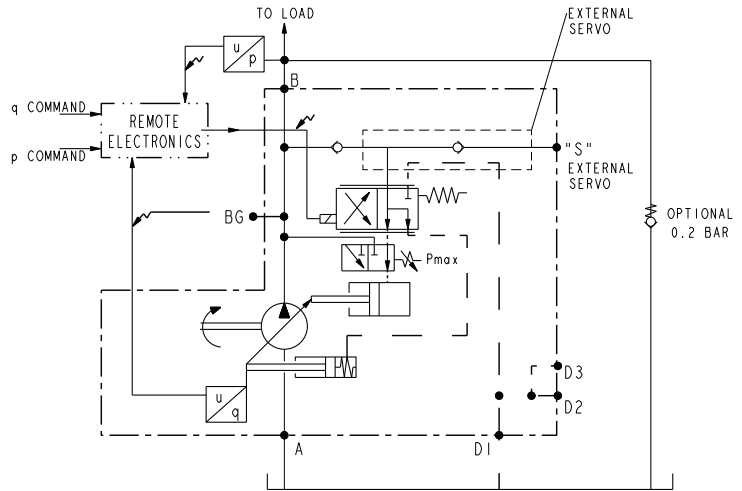
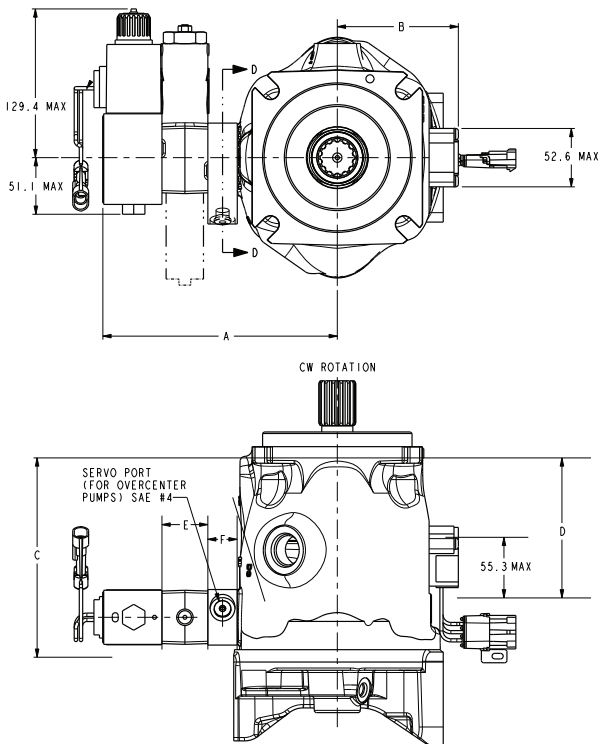
**Torque Limiter AMT Control  
Pressure Compensator with Torque Limiter  
"AMT" P\*075, P\*100 & P\*140**



**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**



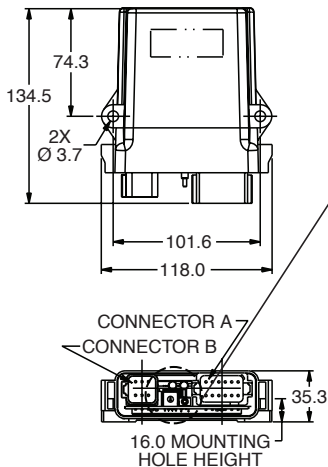
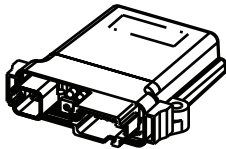
Dimensions in the table below are shown for pump with servo, hydromechanical compensator Pmax and Electronic valve.

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

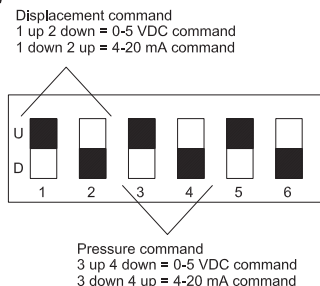


**12 Pin Connector**

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

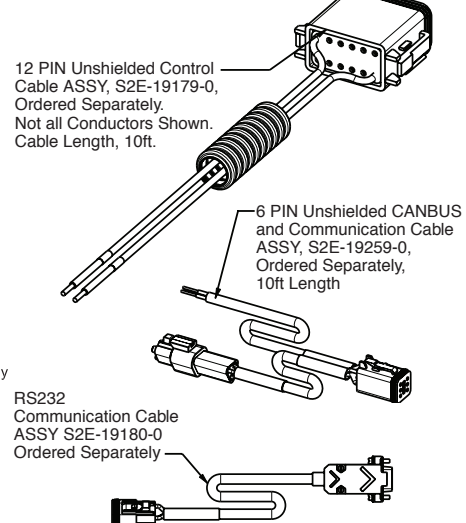
**Enlarged view of the Dip Switches Configuration**



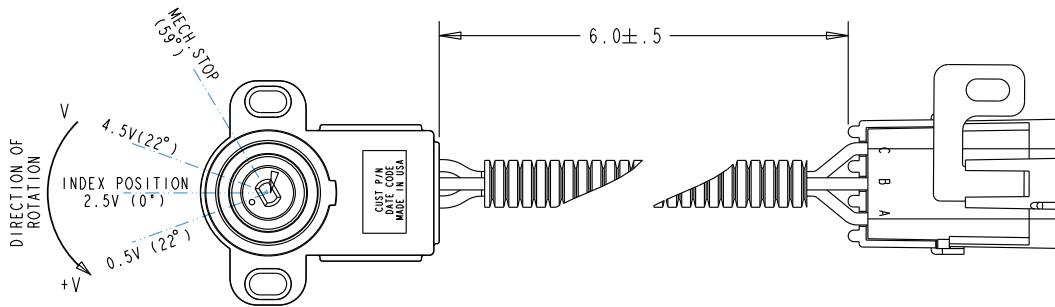
**6 Pin Connector**

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**



**Electronic Control Options (Continued)  
Displacement Sensor Information**



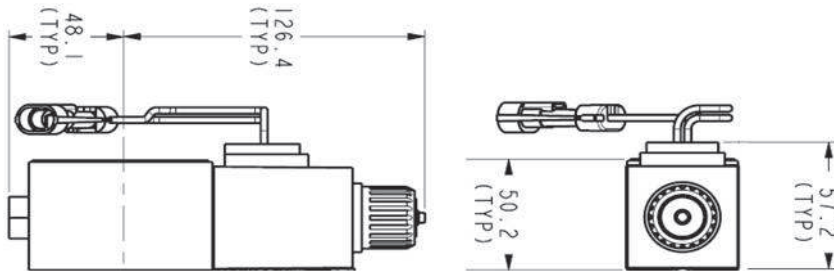
**Sensor Wiring**

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	Default Position	Pump Direction of Rotation	
		CW	CCW
9 VDC valve	"0" displacement	D1FWA89HCVMB0020X6323	D1FWB90HCVMB0020X6323
	Maximum displacement	D1FWA90HCVMB0020X6323	D1FWB89HCVMB0020X6323
24 VDC valve	"0" displacement	D1FWA89HCVJB020XB1132	D1FWB90HCVJB020XB1132
	Maximum displacement	D1FWA90HCVJB020XB1132	D1FWB89HCVJB020XB1132

**Technical specification:**

- Minimum holding current of 1.2 to 1.6A is required to the proportional valve at all times (at metering edge for 9 VDC valve)
- Superimposed dither amplitude of +/- 200mA has given good results (for 9 VDC valve)
- PWM frequency requirement is 100 to 250Hz (for 9 VDC valve)

- When ECU is supplied, pump uses 9 VDC valve
- 9 VDC (4-ohm) or 24 VDC (24-ohm) available
- Coils  
9 VDC – 1210694  
24 VDC – 121-98336-0



**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

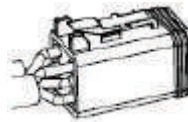


Item :	Parker	OEM-No.	Description
E:	S2E-19190-OK	12015793	Female Connector Kit
F:	(on the sensor)	12010717	Make Connector

**Deutsh Connectors for Pressure Transducer**

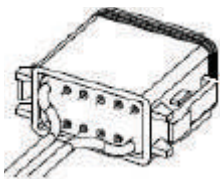
Item included on S2E-19191-0 kit  
 DT06-4S Qty 1 – Connector  
 0462-201-16141 Qty 3 – Sockets  
 W4S Qty 1 – Wedgelock  
 114017 Qty 1 – Cavity Plug

**Communications Port**



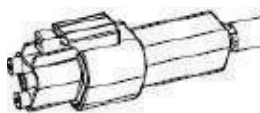
Item included on S2E-19259-0 cable assembly  
 DT06-S6-C015 Qty 1 – Connector  
 462-201-16141 Qty 6 – Sockets  
 W6C Qty 1 – Orange Wedgelock

**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

Aug 1st, 2014 - Add 1A valve to standard options  
- Miscellaneous minor updates



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**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.

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**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, VEVRRA, and 41 C.F.R. §§ 60-1.4(a), 60-741.5(a), and 60-250.4, are hereby incorporated.



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