P1 Series
Axial Piston Pumps
Variable Displacement

Catalog HY28-2664/NA,EU

HINWEIS ⚠ WARNING

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Hydraulic Pump Division
Marysville, Ohio USA

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
- 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 cam 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
- optional case-to-inlet check valve to extend shaft seal life
- easy to service

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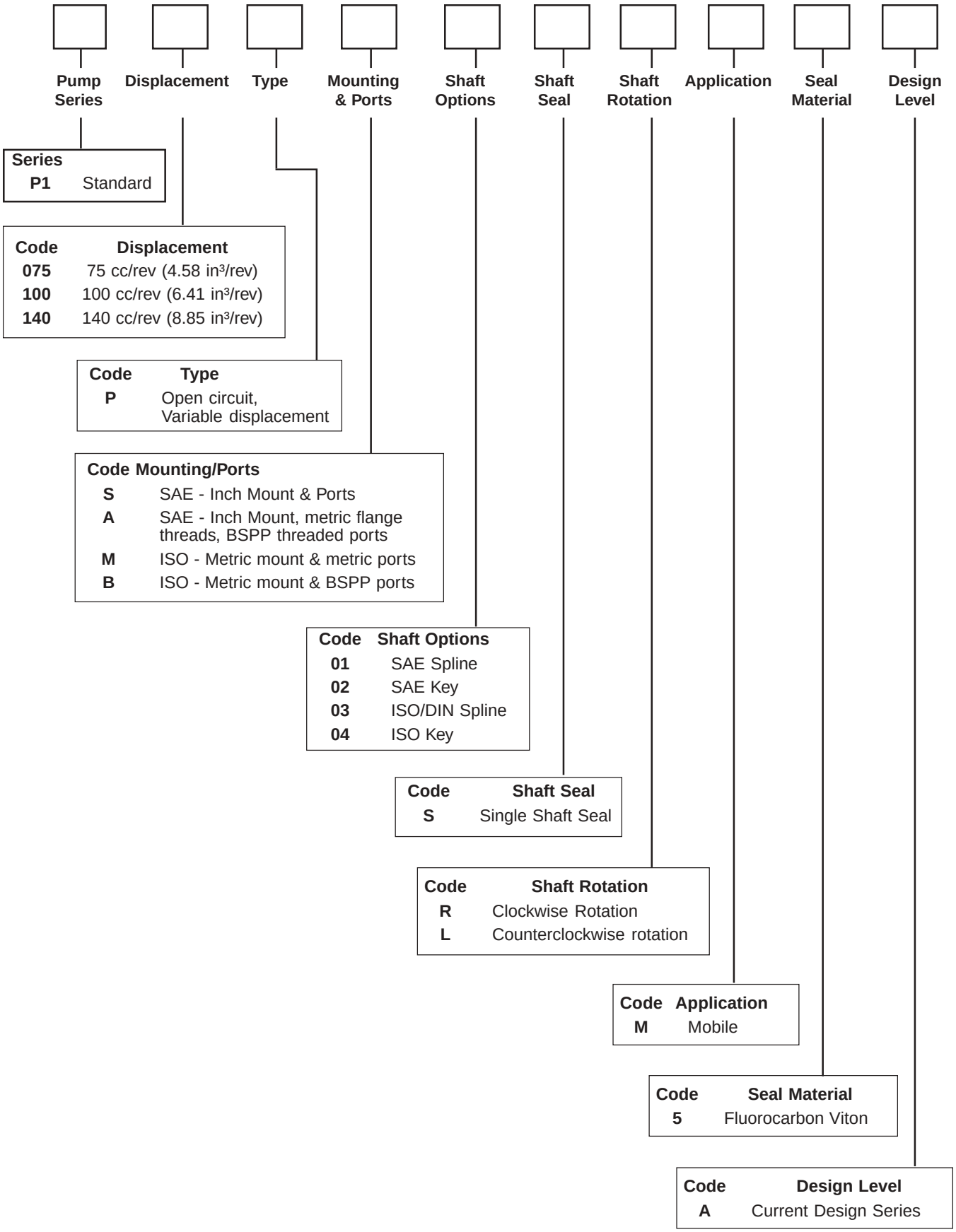

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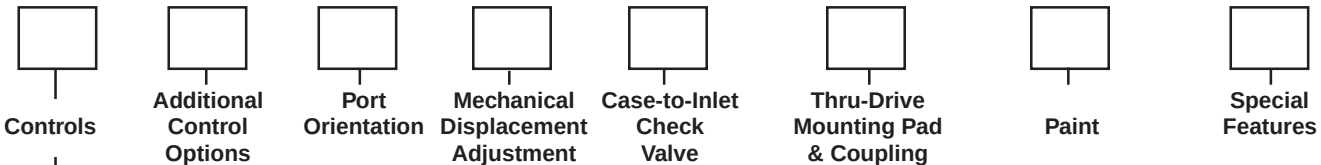

Code	Paint
00	No Paint
PB	Black Paint

Code	Thru-Drive Mounting Pad/Coupling
0	None
A*	SAE 82-2 (A) & 16 (A) Coupling
H*	SAE 82-2 (A) & 19 (--) Coupling
B*	SAE 101-2 (B) & 22 (B) Coupling
Q*	SAE 101-2 (B) & 25 (B-B) Coupling
C*	SAE 127-4 (C) & 32 (C) Coupling
N**	SAE 127-4 (C) & 38 (C-C) Coupling
D***	SAE 152-4 (D) & 44 (D&E) Coupling
R*	ISO 80A2 & K20N coupling
S*	ISO 100A2 & K20N coupling
T*	ISO 100A2 & K25N coupling
V*	ISO 125B4 & K32N coupling
W**	ISO 125B4 & K40N coupling
X***	ISO 180B4 & K50N coupling

*Available on 075 thru 140 models.
** Available on 100 thru 140 models.
*** Available on 140 models.

Code	Case-to-Inlet Check Valve
0	No
1	Yes

Code	Special Features
00	No Special Features
M2	Special Modification

Code	Mechanical Displacement Adjustment
0	None
1	Adjustable Maximum Displacement (not available on thru-drive)
2	Adjustable Minimum Displacement (not available on thru-drive)
3	Adjustable Maximum & Minimum Displacement (not available on thru-drive)

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

Code	Additional Control Options
0	None

Code	Controls
C0	Pressure Limiter, 80-280 bar Adjustment Range
C1	Pressure Limiter, 20-80 bar Adjustment Range
L0	Load sensing, 10-30 bar ΔP and Pressure Limiter 80-280 bar
L1	Load sensing, 10-30 bar ΔP and Pressure Limiter 20-80 bar
RN	Pilot Operated Control with ISO-4401 (NG 6) Interface and Shipping Cover
RH	Pilot Operated Control with Vent Port
RM	Pilot Operated Pressure Limiter Control with Mechanical Adjustment and Vent Port
RE	Pilot Operated Pressure Limiter Control with Proportional Electronic Adjustment

[3]See previous page for information and examples.

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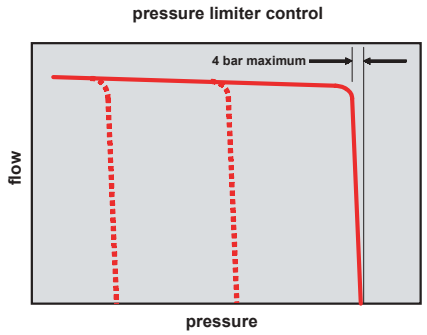
Technical Data

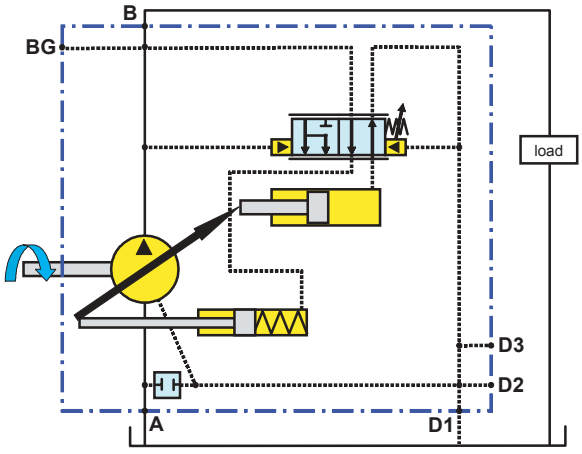
Model	P1075	P1100	P1140
Maximum Displacement, cm^3/rev cu.in./rev	75 4.58	100 6.01	140 8.54
Outlet Pressure – Continuous, bar psi	280 4000		
Intermittent*, bar psi	320 4500		
Peak, bar psi	350 5000		
Maximum Speed – Boosted Inlet, rpm	2700	2500	2400
(1.0 bar abs inlet), rpm	2300	2100	2000
(0.8 bar abs inlet), rpm	1900	1700	1600
Minimum Speed, rpm	600		
Inlet Pressure – Maximum, bar psi	10 145		
Rated, bar psi	1.0 absolute (0.0 gage)		
Minimum, bar psi	0.8 absolute (-0.2 gage)		
Case Pressure – Peak, bar	0.4 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	18/14		
Maximum, ISO	19/16		
SAE Mounting – Flange, SAE	127-4 (C)		152-4 (D)
Key Shaft, SAE	32-1 (C)	38-1 (C-C)	44-1 (D)
Spline Shaft, SAE	14T–12/24P	17T-12/24P	13T-8/16P
Weight – End Port, kg lb	30 66	53 117	66 145
Side Port, kg lb	31 68	55 121	67 972
Thru-Drive, kg lb	35 77	51 112	82 180

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

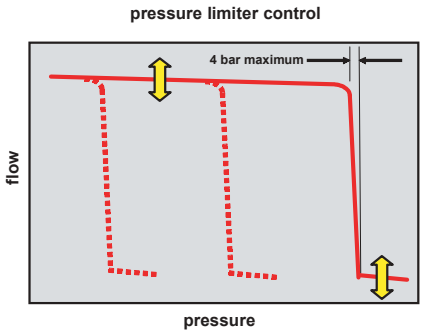
Control Option “C”
Pressure Limiter Control

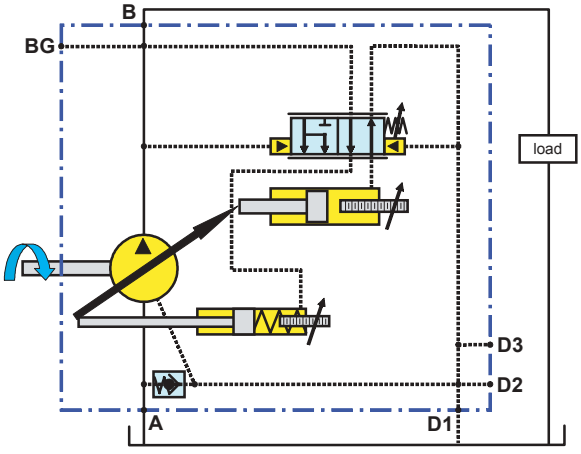
The pressure limiter control is used to limit the maximum system pressure. The control acts such that full pump displacement is achieved unless the system valve restricts the output flow or the load pressure reaches the maximum setting of the control. If pump flow is restricted by the system valve, the 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 destroke to zero displacement and maintain the pressure at the setting of the compensator spring.





Pressure Limiter Control





Pressure Limiter Control
with Optional Maximum & Minimum Displacement Adjustments and Case-to-Inlet Check Valve

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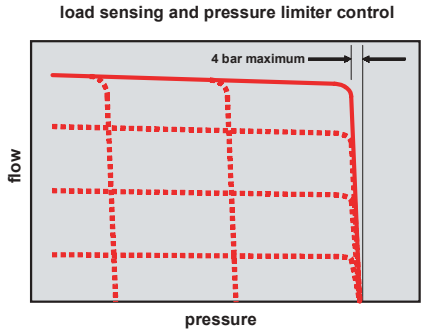
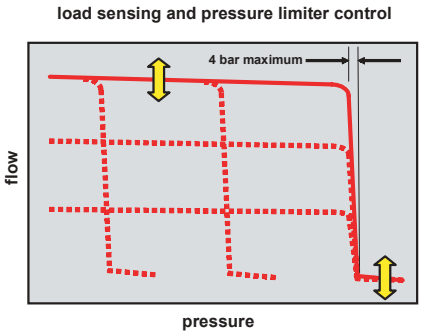
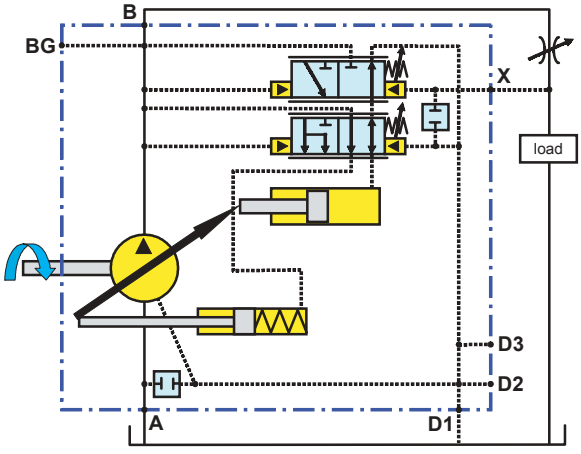
Control Option “L”
Load Sensing and Pressure Limiter Control

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.

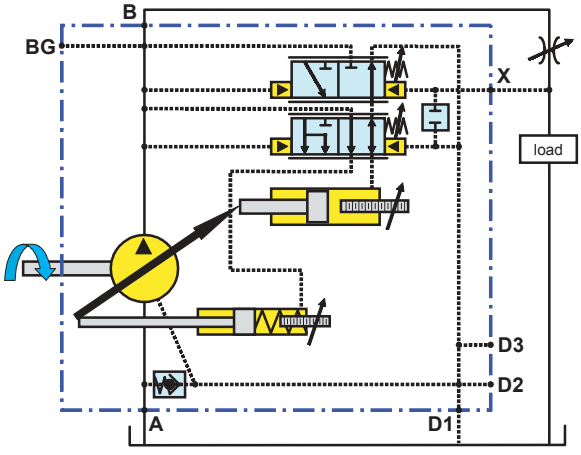




schematic diagram



Load Sensing and Pressure Limiter Control



Load Sensing and Pressure Limiter Control
with Optional Minimum & Maximum Displacement Adjustments and Case-to-Inlet Check Valve

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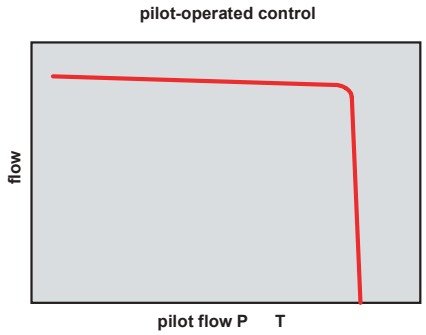
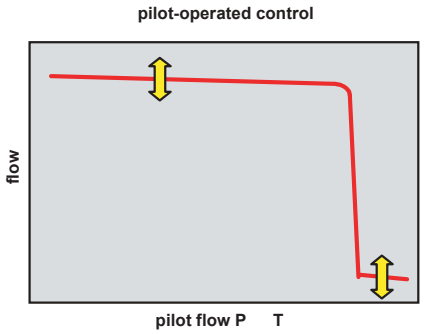
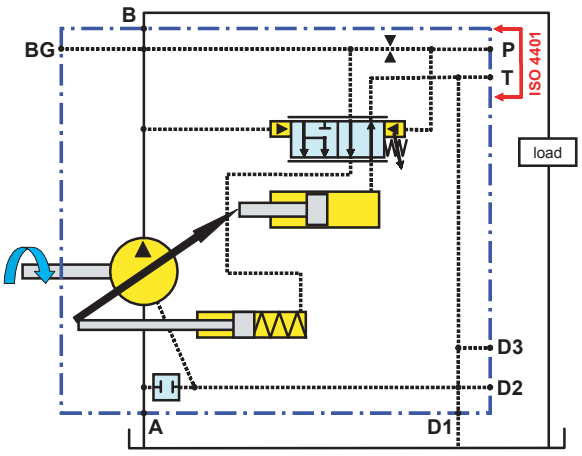
Control Options “RN”

Pilot Operated Control with ISO 4401 NG6 Interface

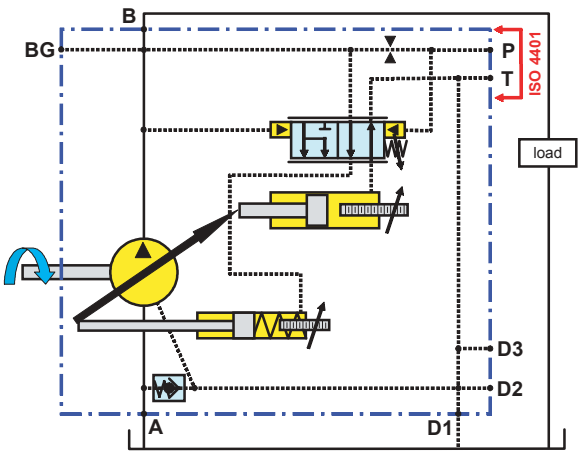
This control allows the pump pressure compensator setting to be adjusted from a remote relief valve. The control acts such that full pump displacement is achieved unless the system valve restricts the output flow or the load pressure reaches the maximum setting of the control. If pump flow is restricted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







“RN”
Pilot Operated Control with ISO 4401 NG6 Interface



“RN”
with Optional Minimum & Maximum Displacement Adjustments and Case-to-Inlet Check Valve

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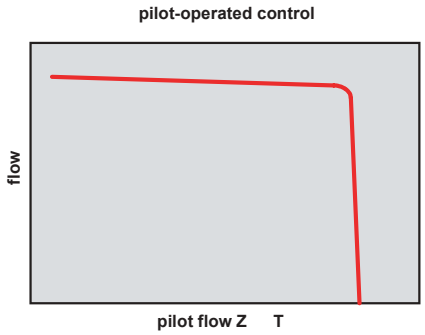
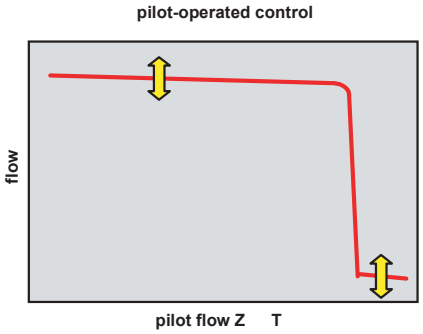
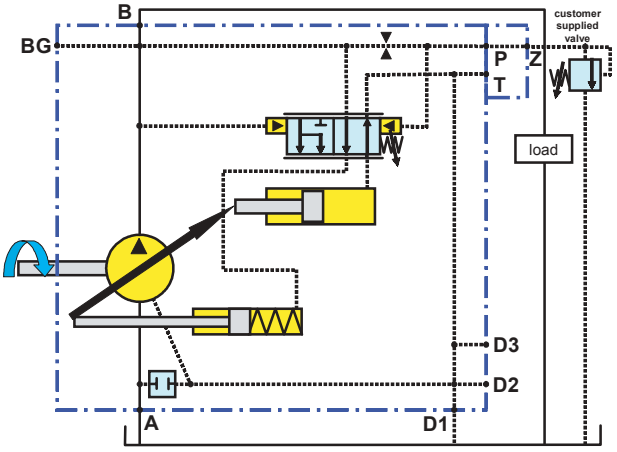
Control Options “RH”

Pilot Operated Control with Remote Control Port Z

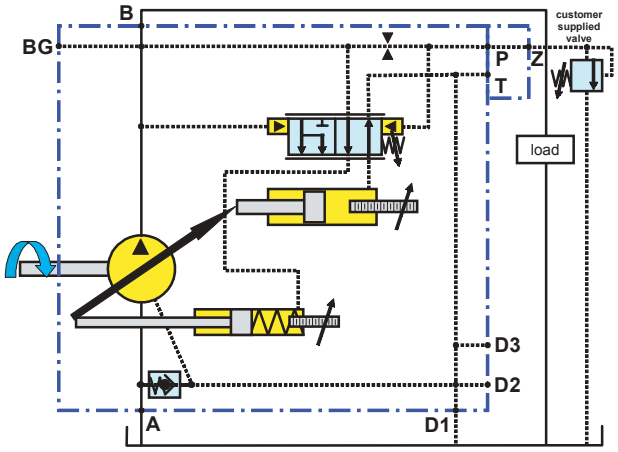
This control allows the pump pressure compensator setting to be adjusted from a remote relief valve. The control acts such that full pump displacement is achieved unless the system valve restricts the output flow or the load pressure reaches the maximum setting of the control. If pump flow is restricted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







“RH”
Pilot Operated



“RH”
with Optional Minimum & Maximum Displacement Adjustments and Case-to-Inlet Check Valve

* See following pages for typical control characteristics

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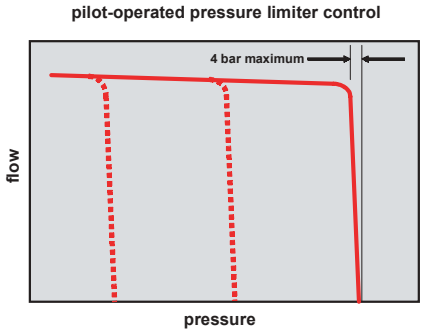
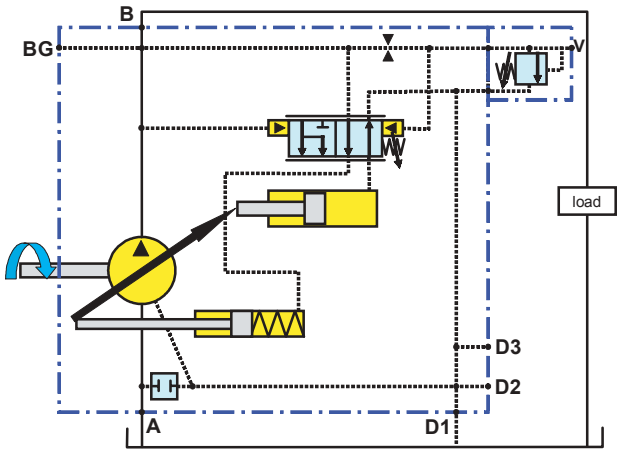
Control Options “RM”

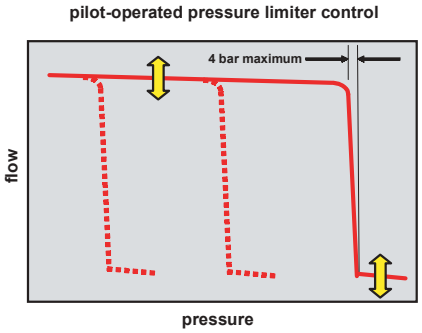
Pilot Operated Pressure Limiter Control with Vent Port V

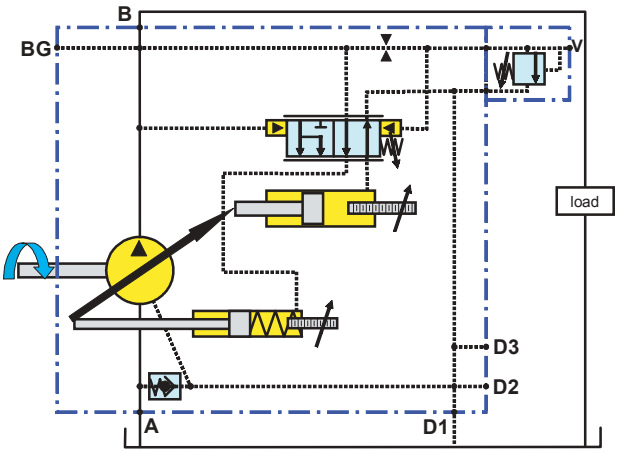
This control allows the pump pressure compensator setting to be adjusted from a remote relief valve. The control acts such that full pump displacement is achieved unless the system valve restricts the output flow or the load pressure reaches the maximum setting of the control. If pump flow is restricted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





“RM”
Pilot Operated Pressure Control





“RM”
with Optional Minimum & Maximum Displacement Adjustments and Case-to-Inlet Check Valve

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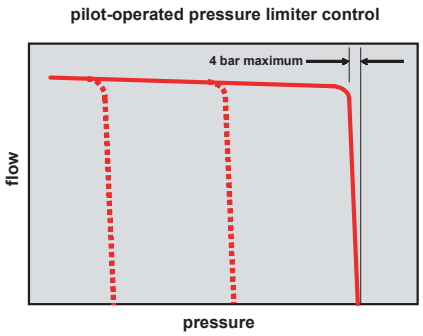
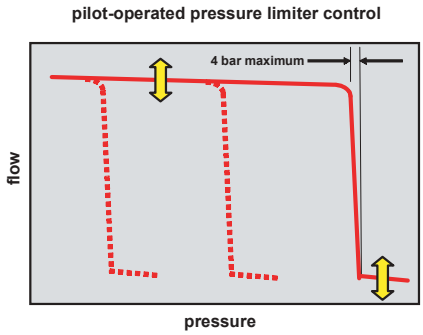
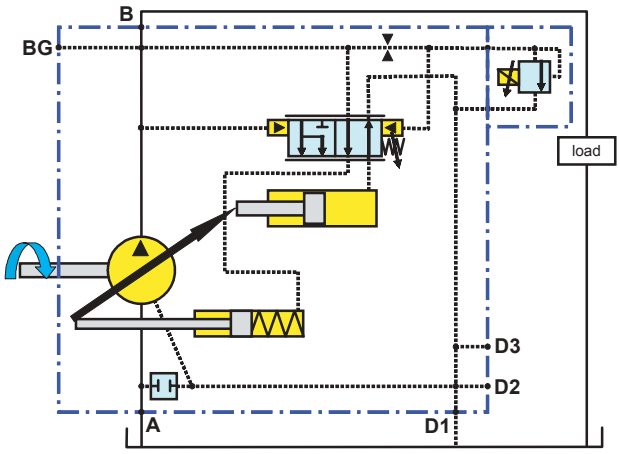
Control Options “RE”

Pilot Operated Pressure Limiter Control with Proportional Electronic Adjustment

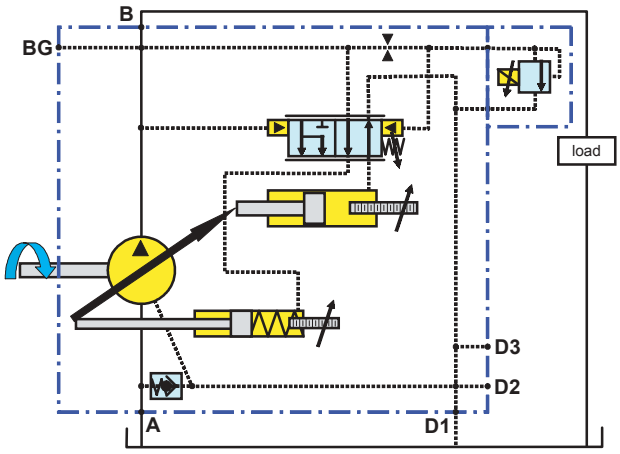
This control allows the pump pressure compensator setting to be adjusted from a remote relief valve. The control acts such that full pump displacement is achieved unless the system valve restricts the output flow or the load pressure reaches the maximum setting of the control. If pump flow is restricted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







“RE”
Pilot Operated Pressure Limiter Control with Proportional Electcronic Adjustment



“RE”
with Optional Minimum & Maximum Displacement Adjustments and Case-to-Inlet Check Valve

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Typical Control Reponse Time

Control Description	Pump Operating Condition	Typical Control Response Time (ms)		
		075	100	140
”C” Pressure Limiter	Maximum Displacement to Zero Zero Displacement to Maximum	21 89	26 108	30 125
”L” Load Sensing	Maximum Displacement to Zero Zero Displacement to Maximum	40 97	43 189	45 280
”R” Pilot Operated Control	Maximum Displacement to Zero Zero Displacement to Maximum	37 115	39 123	40 130

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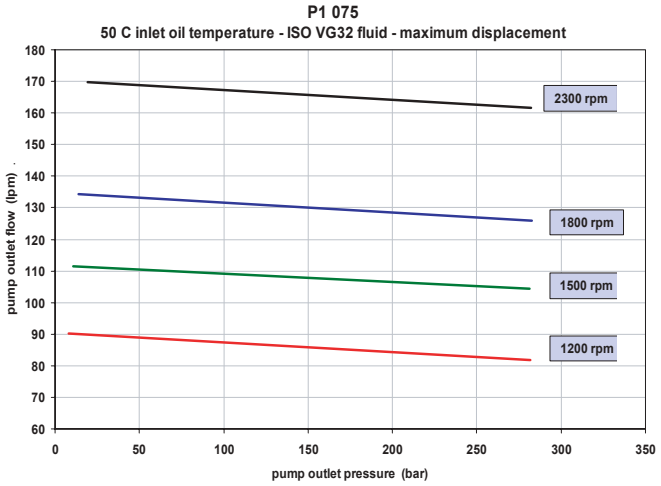
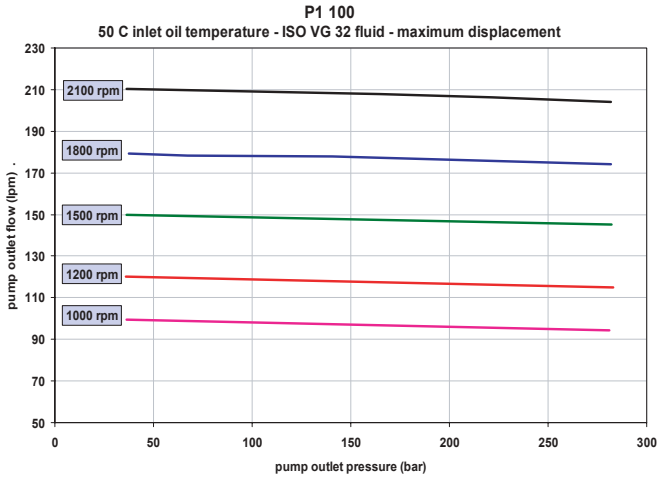
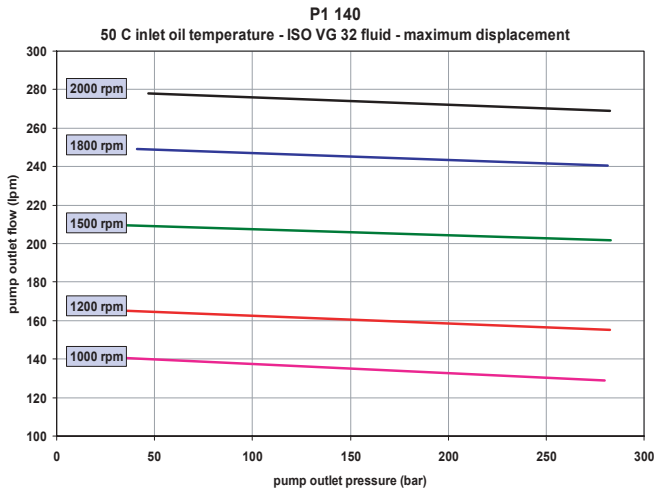
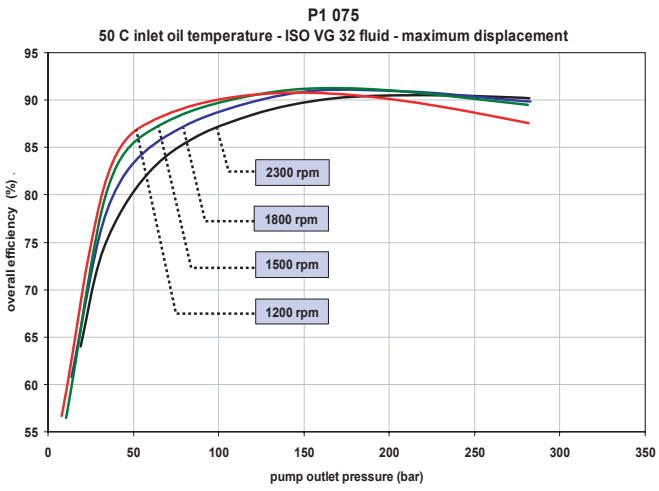
P1 Series Pump Outlet Flow

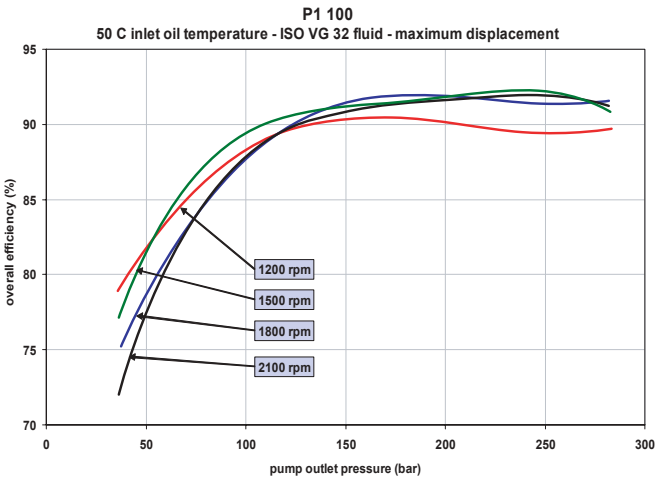


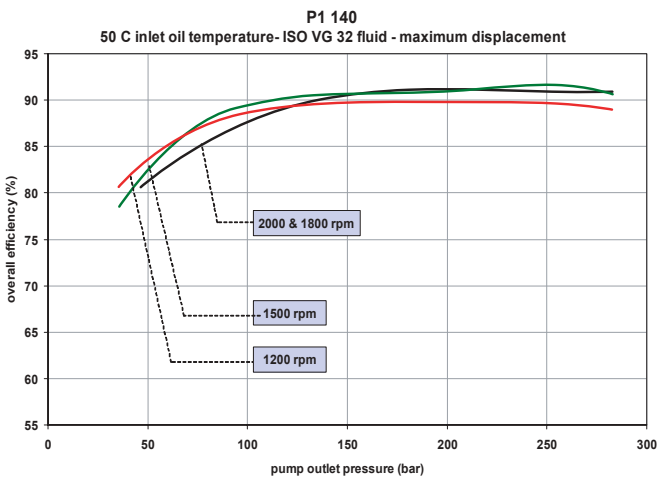




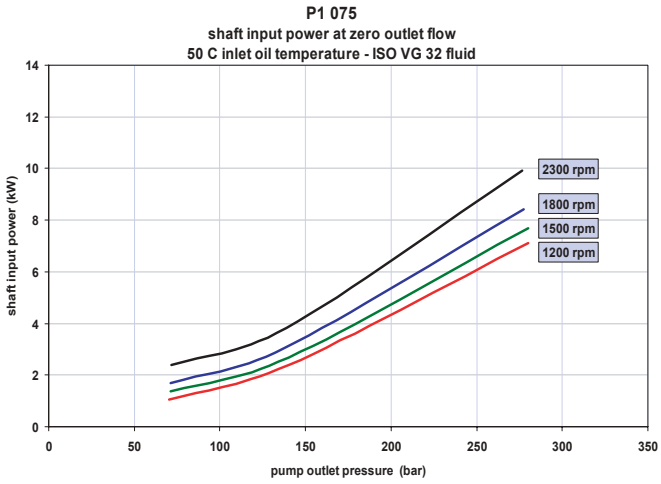
P1 Series Overall Efficiency

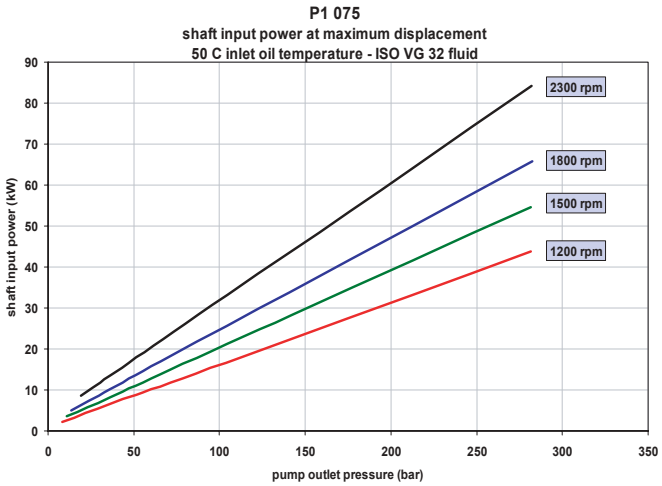


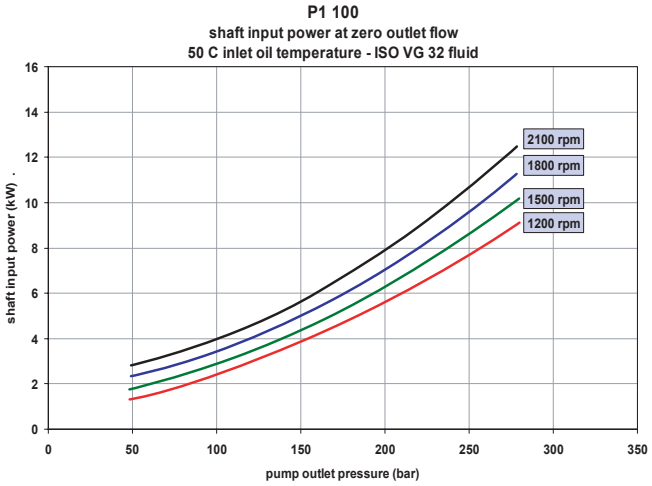


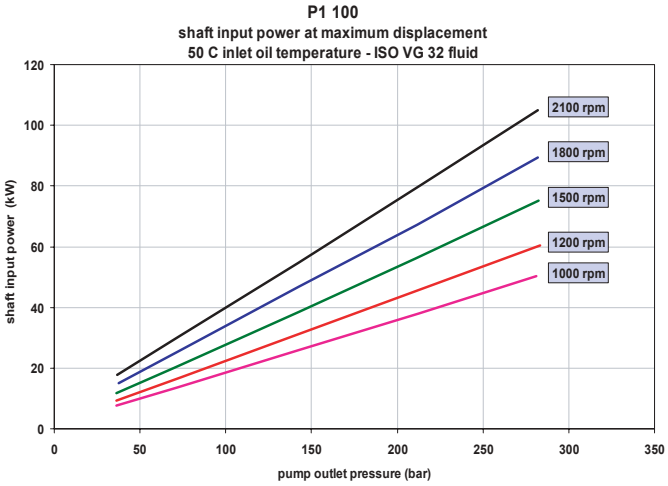


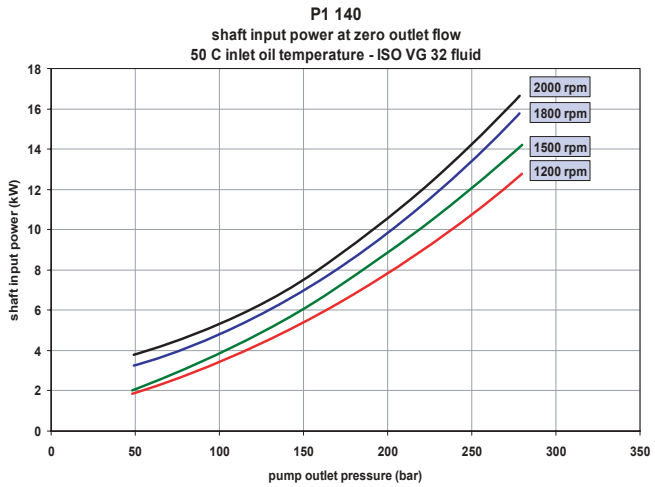
P1 Series Shaft Input Power

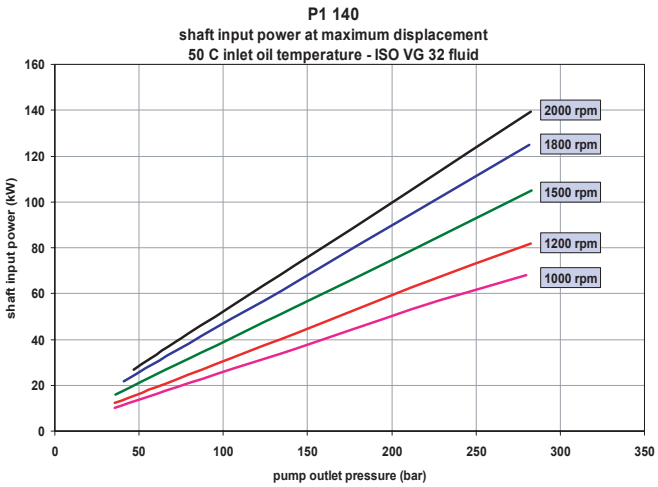












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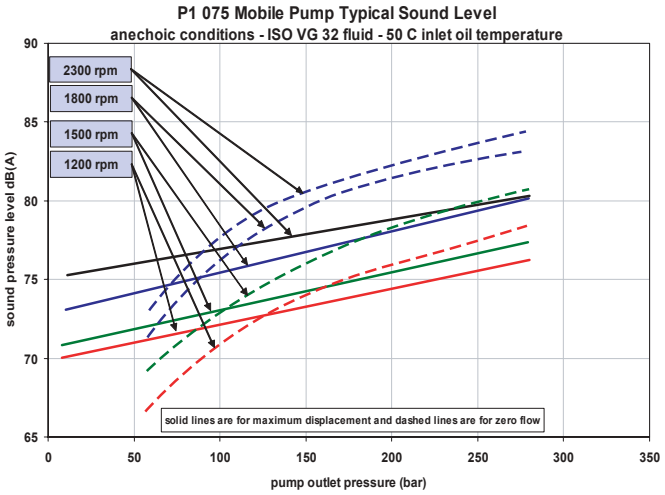
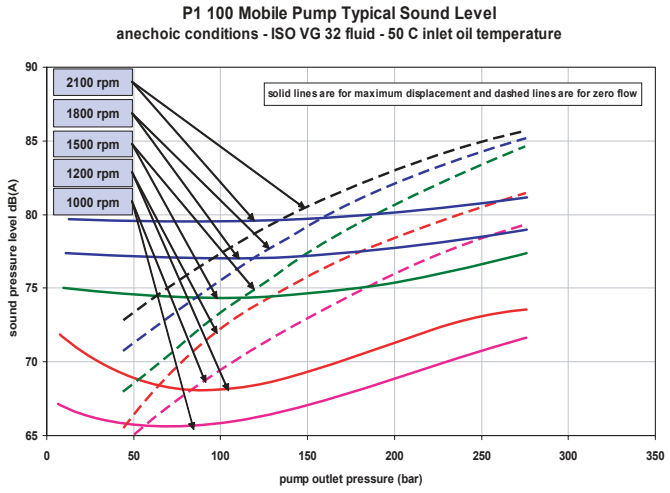
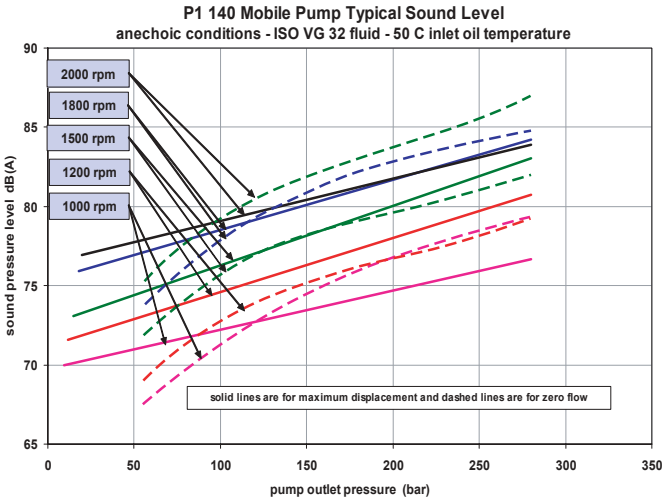
P1 Series Typical Noise Characteristics

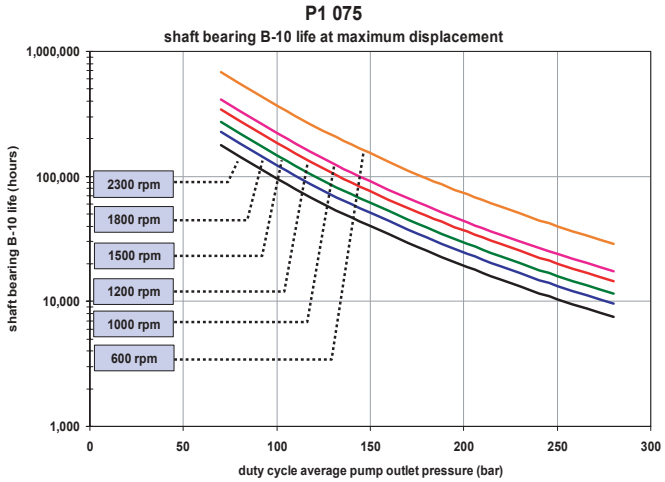
(These are anechoic sound pressure readings.)

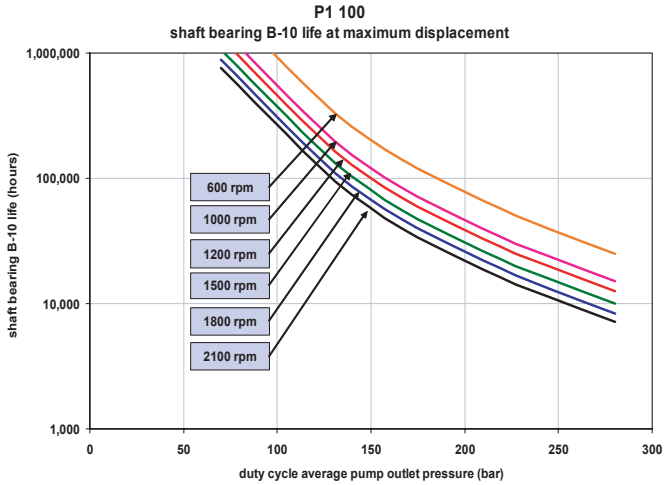


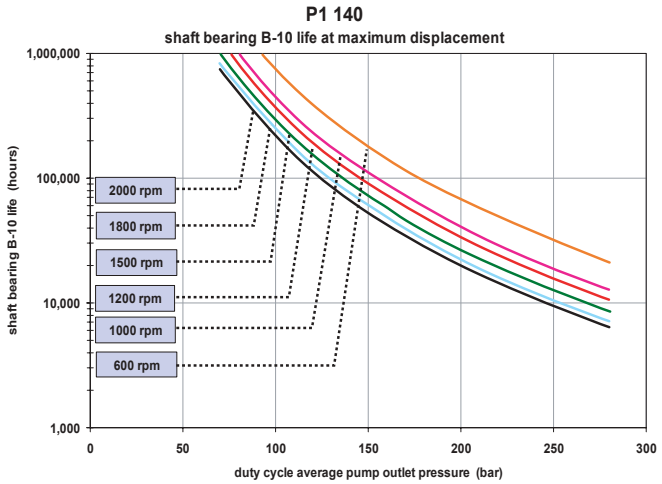




P1 Series Shaft Bearing Life







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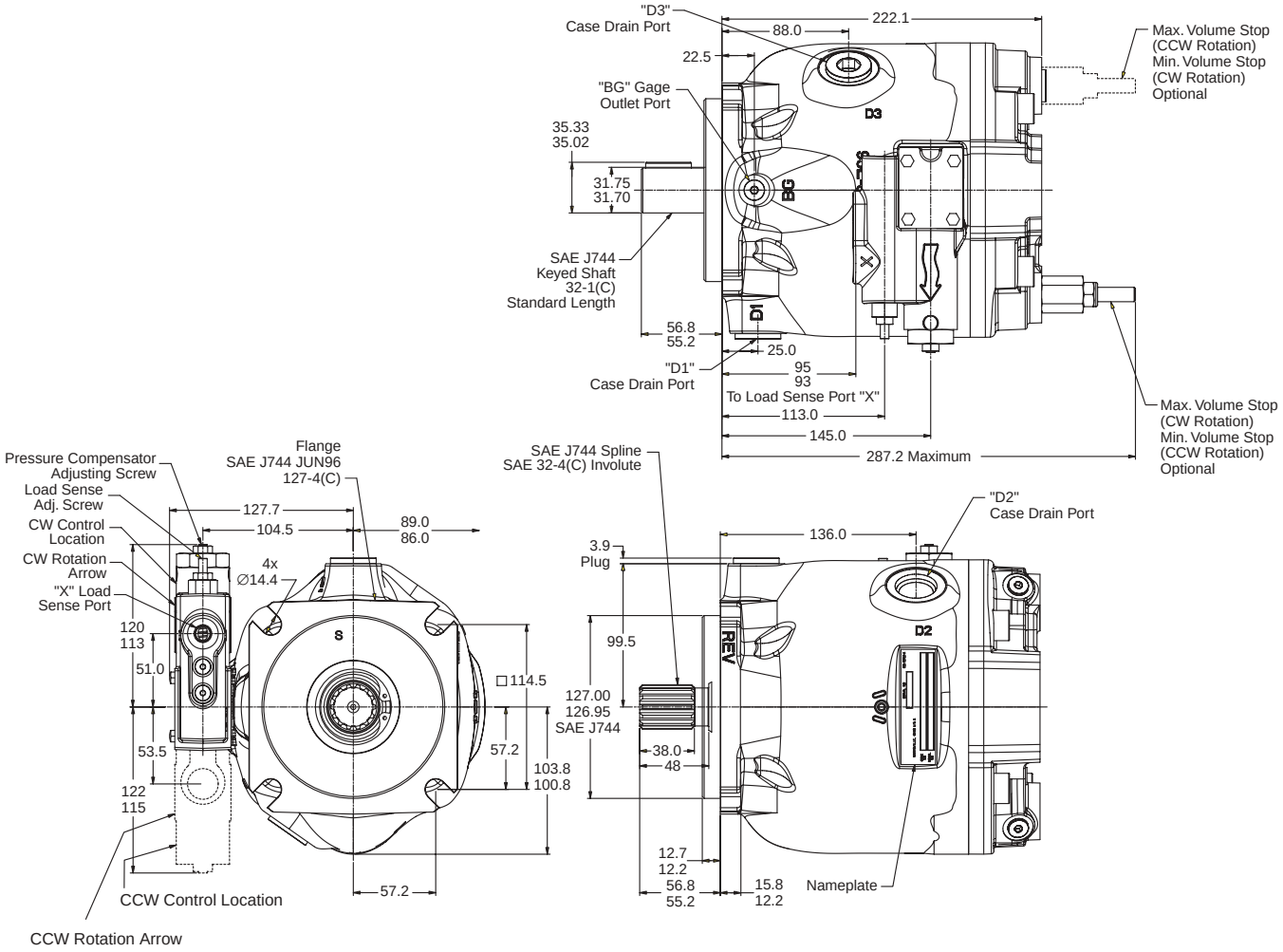
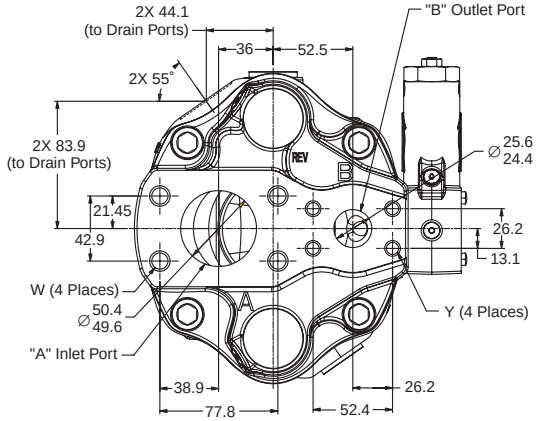
Marysville, Ohio USA

Pump Installation - P1075
End Port
"L" Control Option





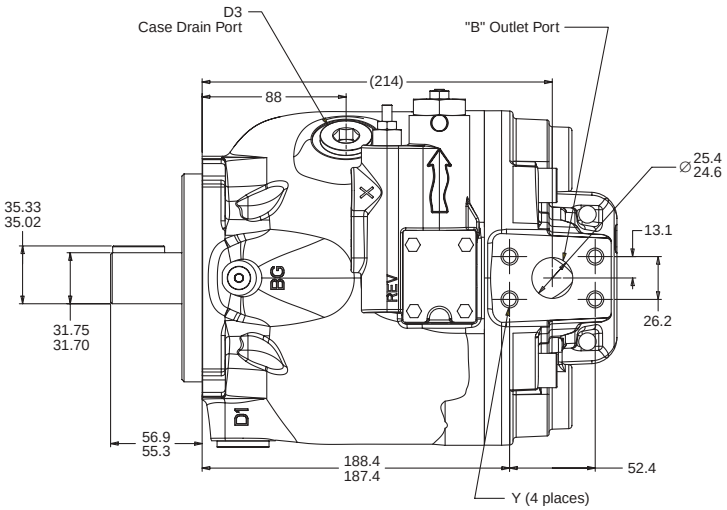
CCW Pump will have inlet and outlet gauge ports reversed.

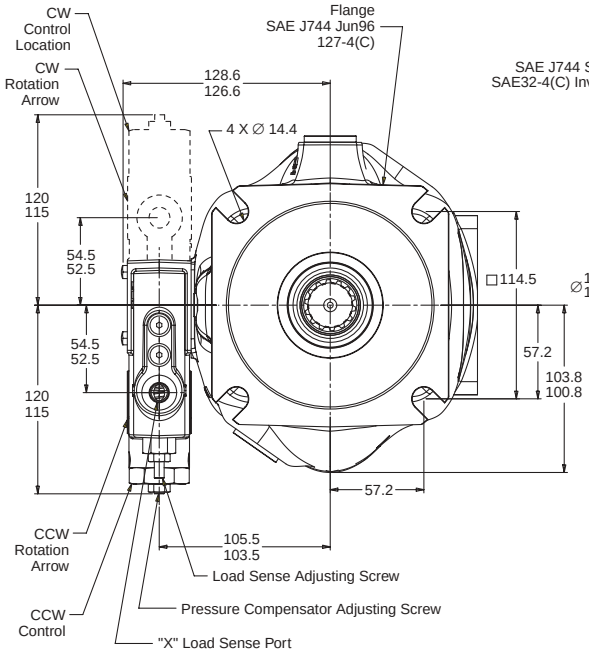
	P1075 Port Sizes		
	SAE	**ISO**	**BSP**
ØA Inlet	50mm code 61[C]	50mm DN 51[B]	—
W Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
ØB Outlet	25mm code 61[C]	25mm DN25[B]	—
Y Threads	⅜- 16 UNC-2B[C]	M10 x 1.5[B]	—
BG	SAE-4[D]	M12x1.5[A]	¼"[E]
D1 D2 D3	SAE-12[D]	M27x2[A]	¾"[E]
X	SAE-4[D]	M12x1.5[A]	¼"[E]

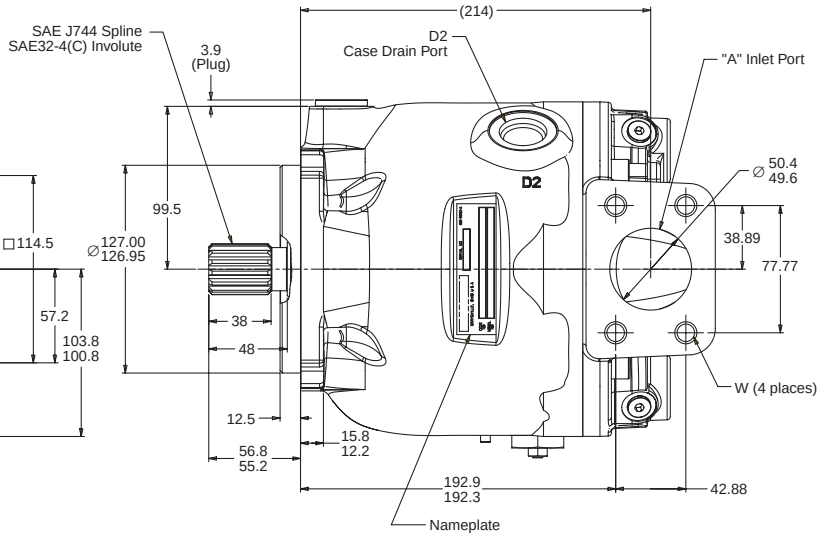
Note A: Metric o-ring boss port conform to ISO 6149-1
Note B: Metric 4-bolt flange port conforms to ISO 6162
Note C: Inch 4-bolt flange port conforms to SAE J518
Note D: Inch o-ring boss port conforms to SAE J514
Note E: BSP boss port conforms to ISO 228-1

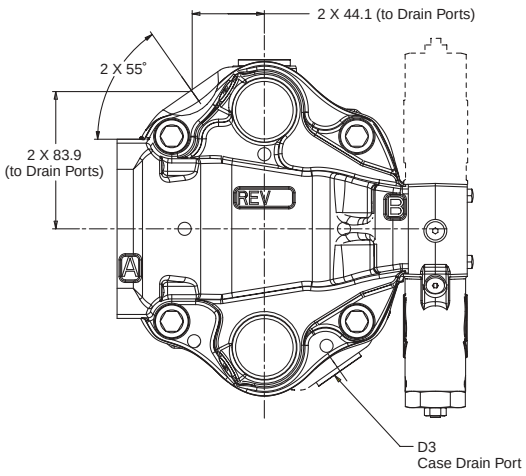
Parker Hannifin Corporation
Hydraulic Pump Division
Marysville, Ohio USA

Pump Installation - P1075
Side Port
"L" Control Option





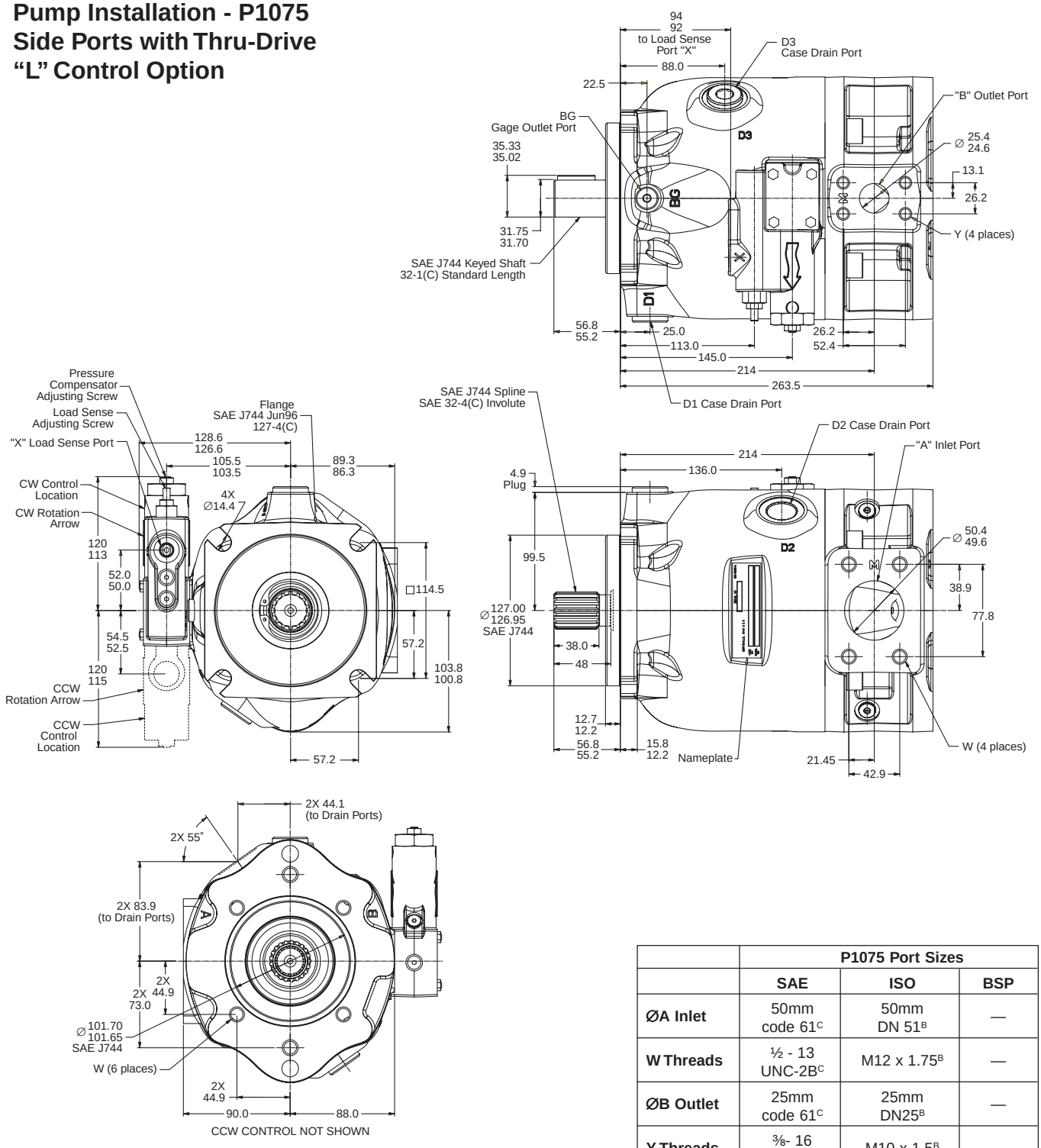




	P1075 Port Sizes		
	SAE	**ISO**	**BSP**
ØA Inlet	50mm code 61[C]	50mm DN 51[B]	—
W Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
ØB Outlet	25mm code 61[C]	25mm DN25[B]	—
Y Threads	⅜- 16 UNC-2B[C]	M10 x 1.5[B]	—
BG	SAE-4[D]	M12x1.5[A]	¼"[E]
D1 D2 D3	SAE-12[D]	M27x2[A]	¾"[E]
X	SAE-4[D]	M12x1.5[A]	¼"[E]

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 - P1075
Side Ports with Thru-Drive
"L" Control Option



Shaft Location	P1075 Shaft Size & Type	Shaft Torque Capacity (Nm)
Input End	SAE C 32-1 Key	562
	SAE C 14T Spline	915
	ISO E32N Key	576
	ISO 14T Spline	915
Thru-Drive End	Spline Coupling	458

	P1075 Port Sizes		
	SAE	ISO	BSP
ØA Inlet	50mm code 61[C]	50mm DN 51[B]	—
W Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
ØB Outlet	25mm code 61[C]	25mm DN25[B]	—
Y Threads	⅜- 16 UNC-2B[C]	M10 x 1.5[B]	—
BG	SAE-4[D]	M12x1.5[A]	¼"[E]
D1 D2 D3	SAE-12[D]	M27x2[A]	¾"[E]
X	SAE-4[D]	M12x1.5[A]	¼"[E]

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

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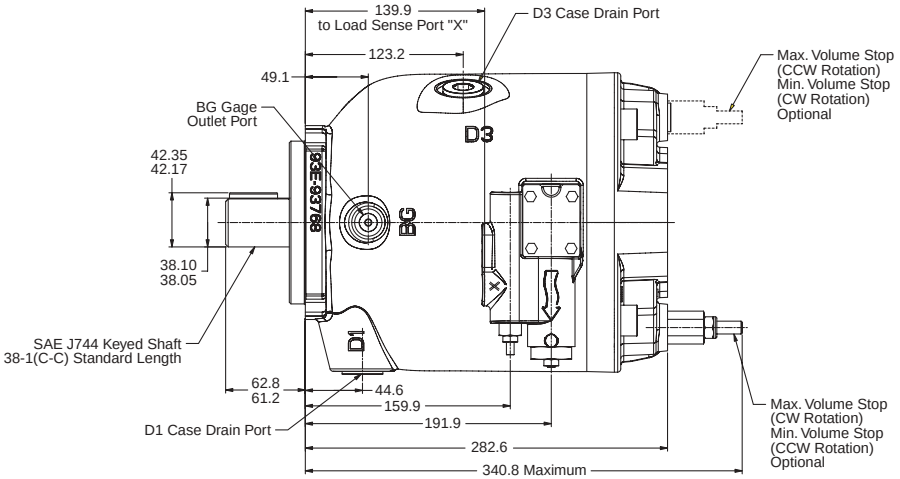
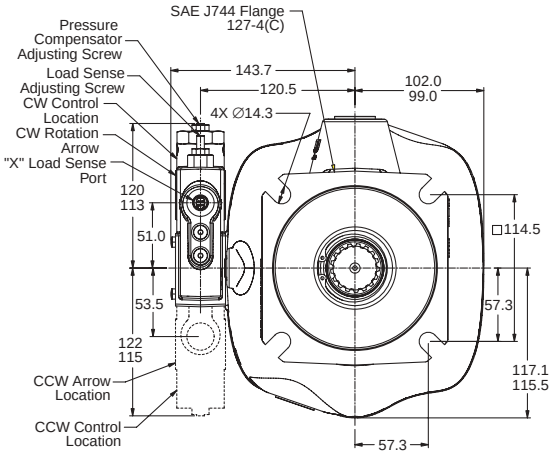
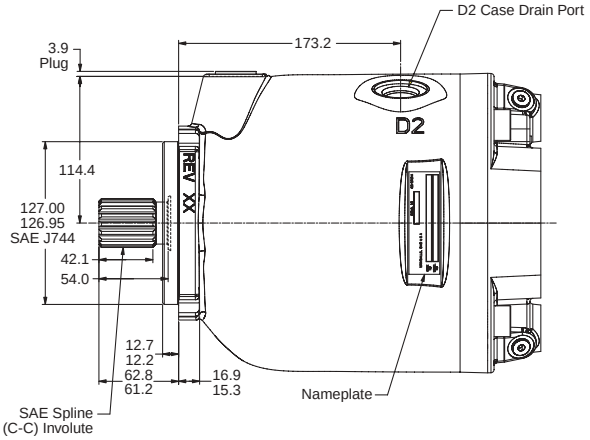
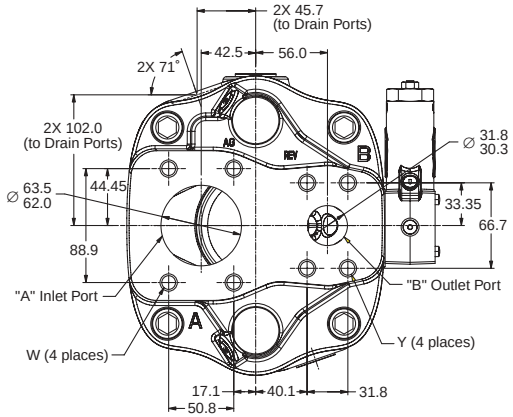
Marysville, Ohio USA

Pump Installation - P1100
End Ports
"L" Control Option









	P1100 Port Sizes		
	SAE	**ISO**	**BSP**
ØA Inlet	63mm code 61[C]	63mm DN 64[B]	—
W Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
ØB Outlet	32mm code 62[C]	32mm DN 32[B]	—
Y Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
BG	SAE-4[D]	M12x1.5[A]	¼"[E]
D1 D2 D3	SAE-12[D]	M27x2[A]	¾"[E]
X	SAE-4[D]	M12x1.5[A]	¼"[E]

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

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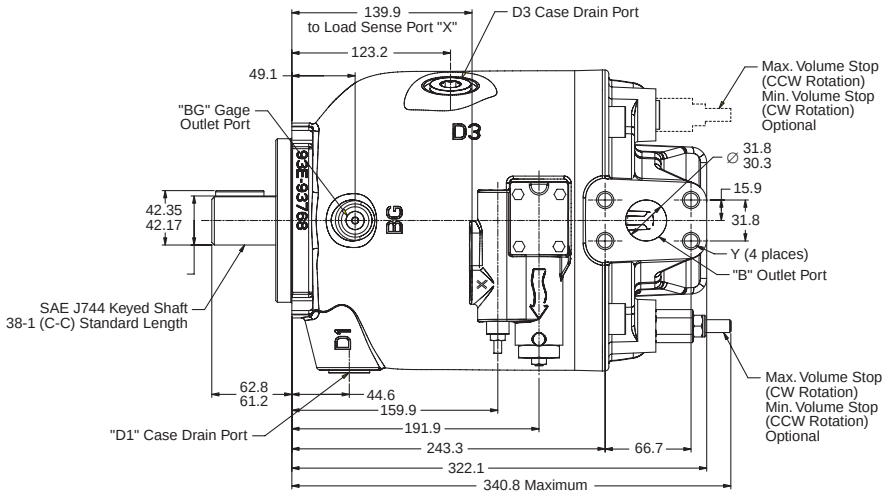
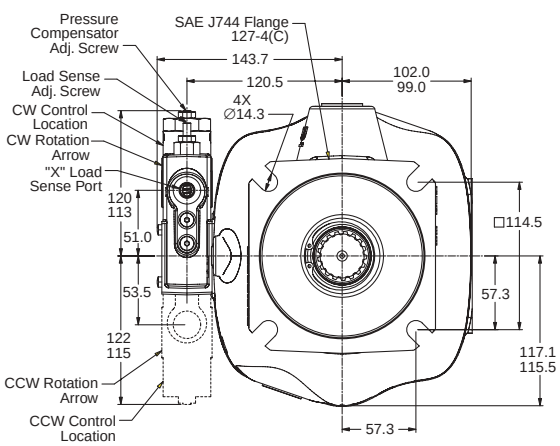
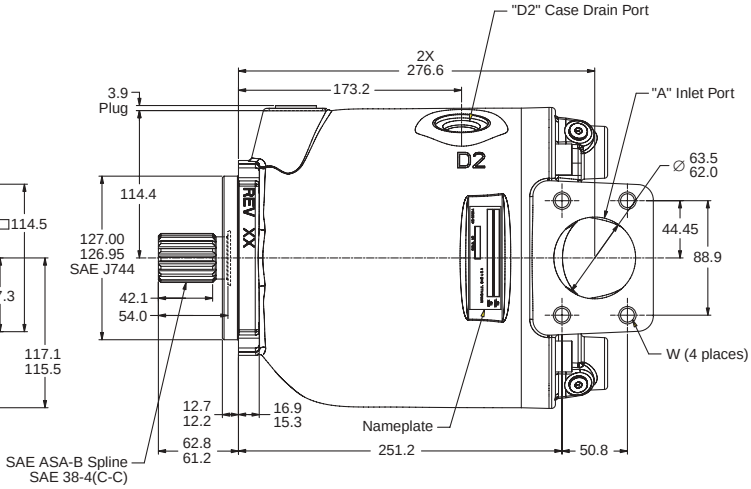
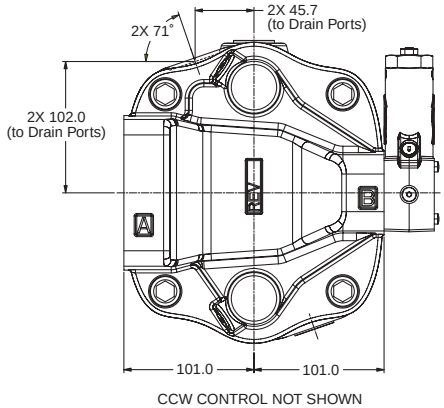
Pump Installation - P1100
Side Ports
"L" Control Option









CCW CONTROL NOT SHOWN

	P1100 Port Sizes		
	SAE	**ISO**	**BSP**
ØA Inlet	63mm code 61[C]	63mm DN 64[B]	—
W Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
ØB Outlet	32mm code 62[C]	32mm DN 32[B]	—
Y Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
BG	SAE-4[D]	M12x1.5[A]	¼"[E]
D1 D2 D3	SAE-12[D]	M27x2[A]	¾"[E]
X	SAE-4[D]	M12x1.5[A]	¼"[E]

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

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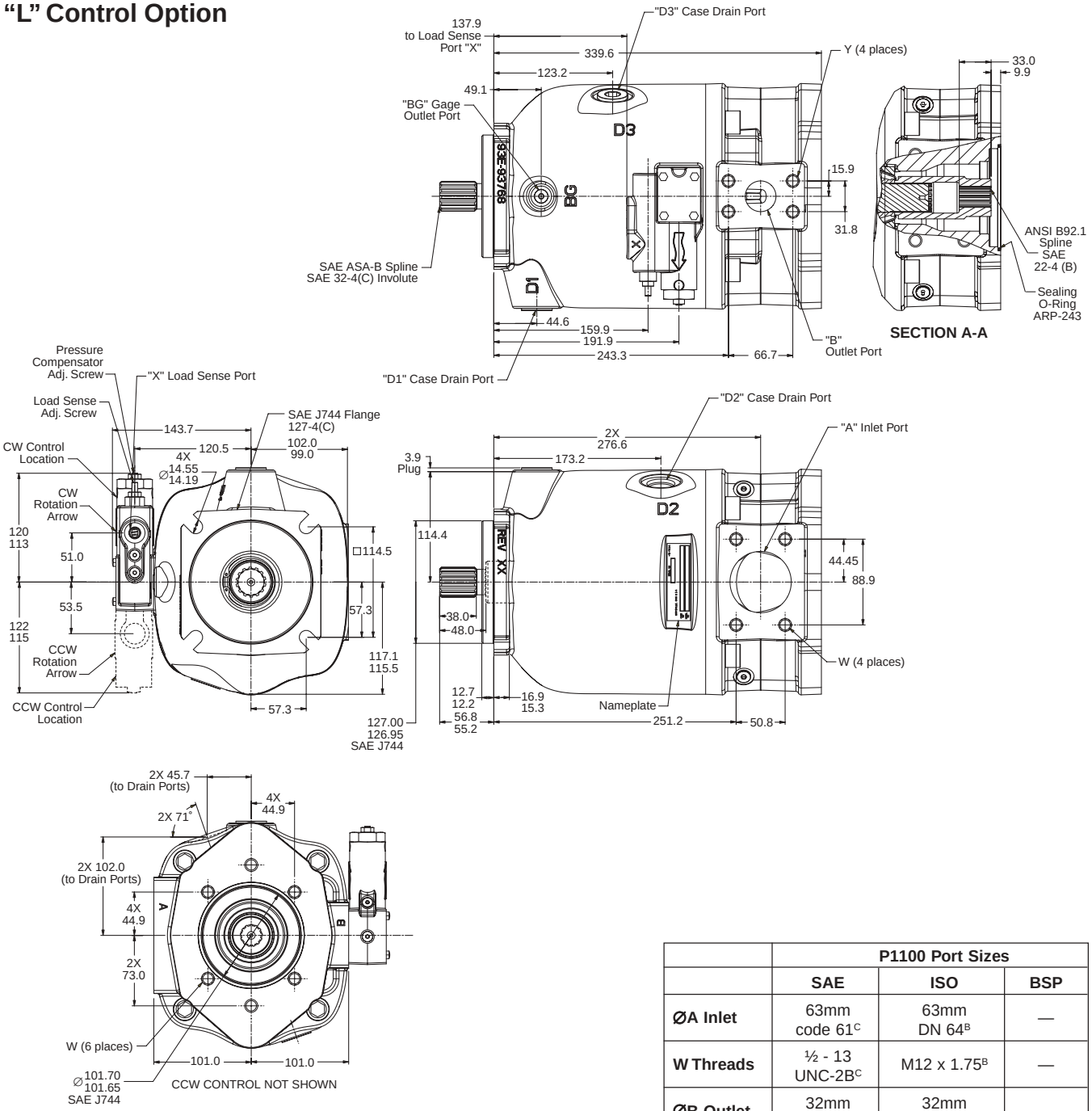
Hydraulic Pump Division
Marysville, Ohio USA

Pump Installation - P1100
Side Ports with Thru-Drive
"L" Control Option



Shaft Location	P1100 Shaft Size & Type	Shaft Torque Capacity (Nm)
Input End	SAE C-C 38-1 Key	980
	SAE C-C 17T Spline	1220
	ISO E40N Key	1157
	ISO 18T Spline	1220
Thru-Drive End	Spline Coupling	610

	P1100 Port Sizes		
	SAE	**ISO**	**BSP**
ØA Inlet	63mm code 61[C]	63mm DN 64[B]	—
W Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
ØB Outlet	32mm code 62[C]	32mm DN 32[B]	—
Y Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
BG	SAE-4[D]	M12x1.5[A]	¼"[E]
D1 D2 D3	SAE-12[D]	M27x2[A]	¾"[E]
X	SAE-4[D]	M12x1.5[A]	¼"[E]

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

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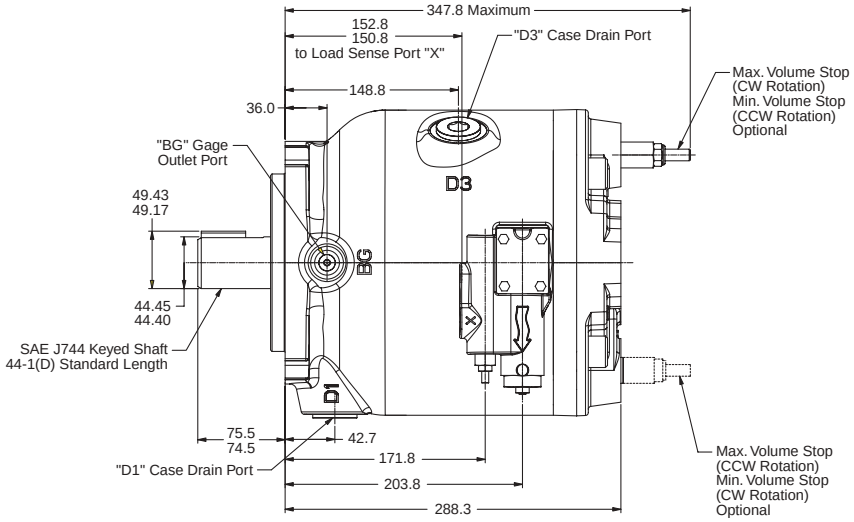
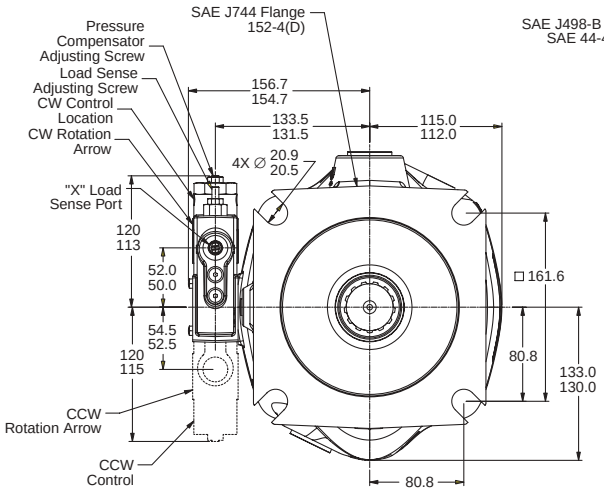
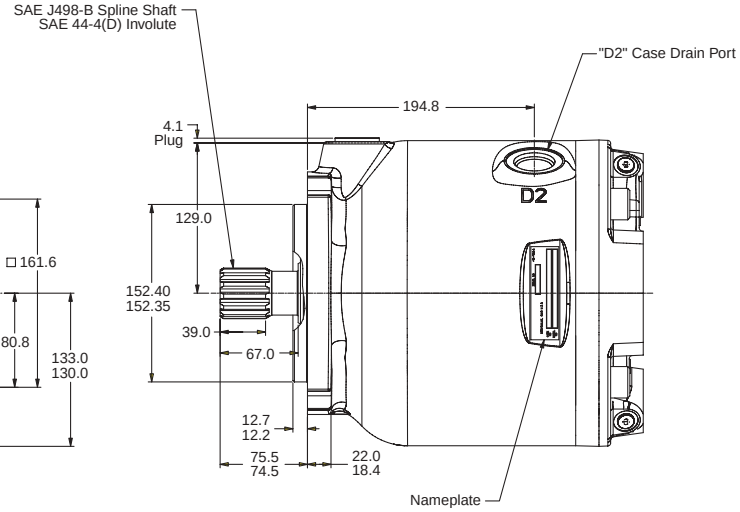
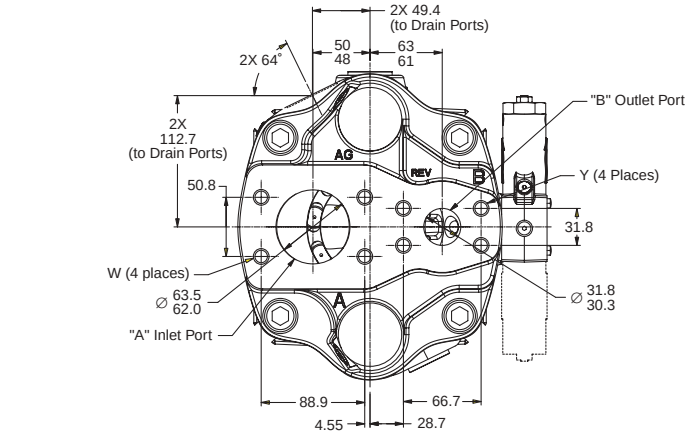
Pump Installation - P1140
End Ports
"L" Control Option









	P1140 Port Sizes		
	SAE	**ISO**	**BSP**
ØA Inlet	63mm code 61[C]	63mm DN 64[B]	—
W Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
ØB Outlet	32mm code 62[C]	32mm DN 32[B]	—
Y Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
BG	SAE-4[D]	M12x1.5[A]	¼"[E]
D1 D2 D3	SAE-16[D]	M33x2[A]	1"[E]
X	SAE-4[D]	M12x1.5[A]	¼"[E]

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

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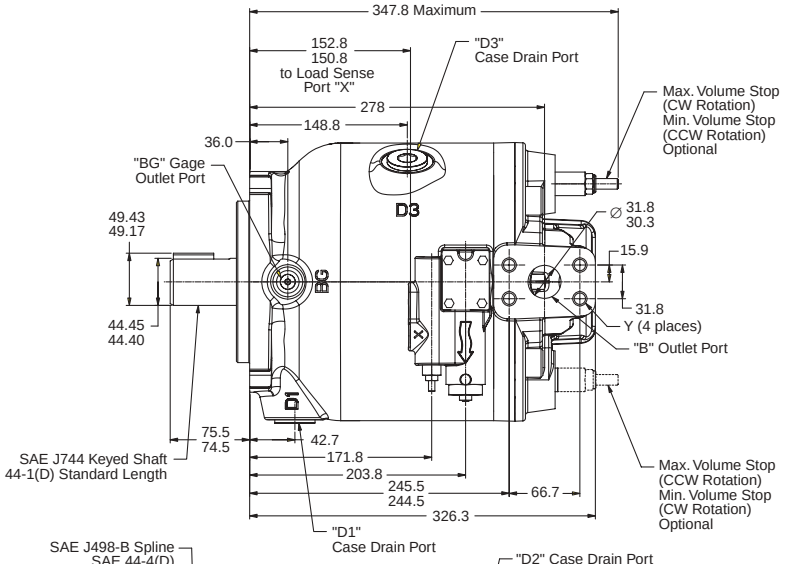
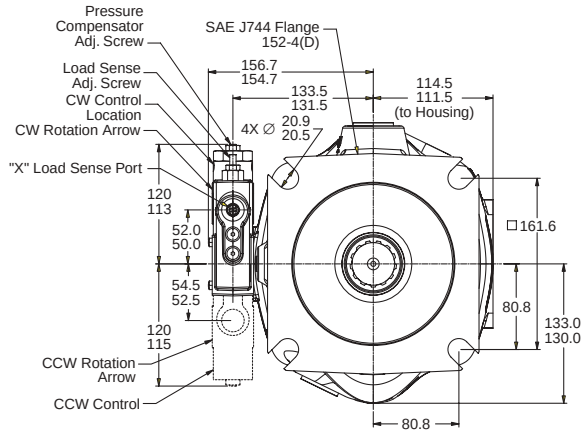
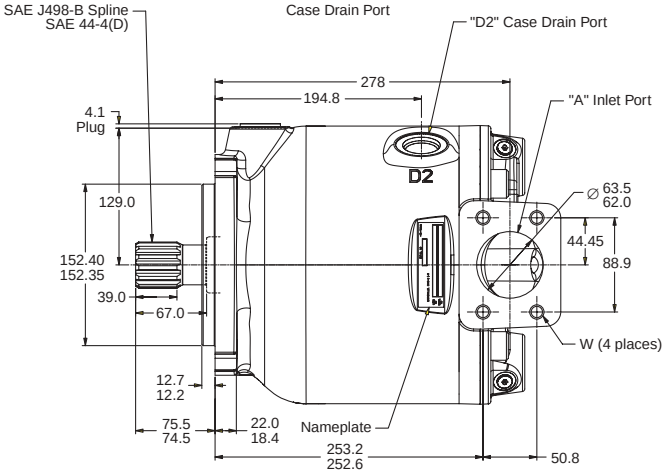
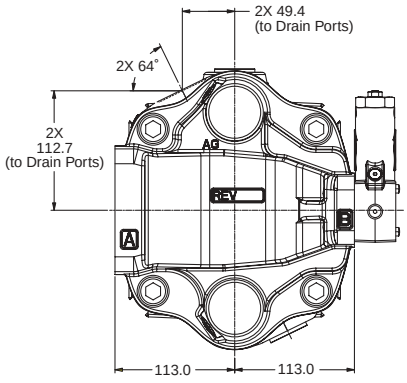
Pump Installation - P1140
Side Ports
"L" Control Option









CCW CONTROL NOT SHOWN

	P1140 Port Sizes		
	SAE	**ISO**	**BSP**
ØA Inlet	63mm code 61[C]	63mm DN 64[B]	—
W Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
ØB Outlet	32mm code 62[C]	32mm DN 32[B]	—
Y Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
BG	SAE-4[D]	M12x1.5[A]	¼"[E]
D1 D2 D3	SAE-16[D]	M33x2[A]	1"[E]
X	SAE-4[D]	M12x1.5[A]	¼"[E]

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

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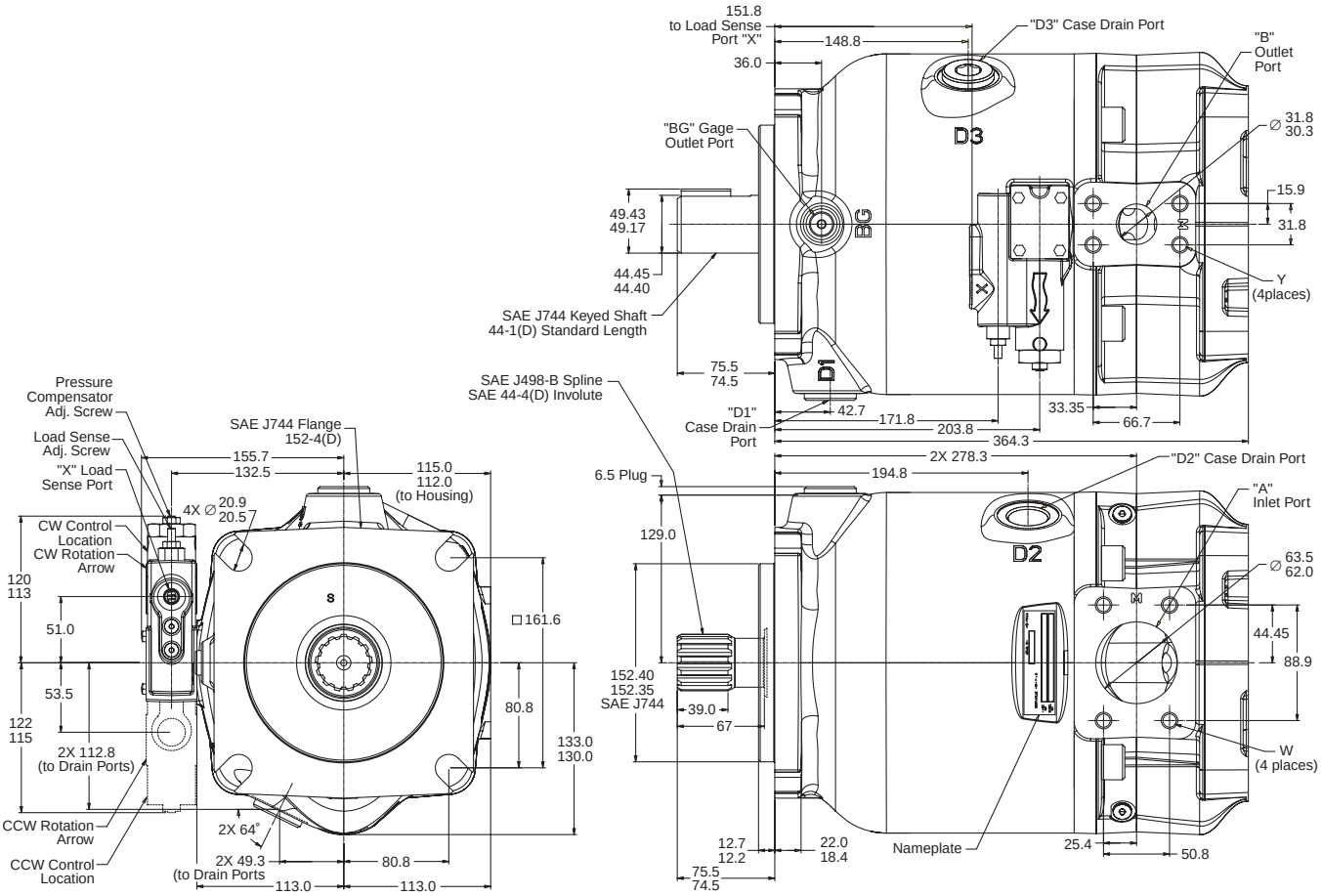
Hydraulic Pump Division
Marysville, Ohio USA

Pump Installation - P1140
Side Ports with Thru-Drive
"L" Control Option



Shaft Location	P1140 Shaft Size & Type	Shaft Torque Capacity (Nm)
Input End	SAE D 44-1 Key	1708
	SAE D 13T Spline	1708
	ISO E50N Key	1708
	ISO 24T Spline	1708
Thru-Drive End	Spline Coupling	854

	P1140 Port Sizes		
	SAE	**ISO**	**BSP**
ØA Inlet	63mm code 61[C]	63mm DN 64[B]	—
W Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
ØB Outlet	32mm code 62[C]	32mm DN 32[B]	—
Y Threads	½ - 13 UNC-2B[C]	M12 x 1.75[B]	—
BG	SAE-4[D]	M12x1.5[A]	¼"[E]
D1 D2 D3	SAE-16[D]	M33x2[A]	1"[E]
X	SAE-4[D]	M12x1.5[A]	¼"[E]

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

Parker Hannifin Corporation
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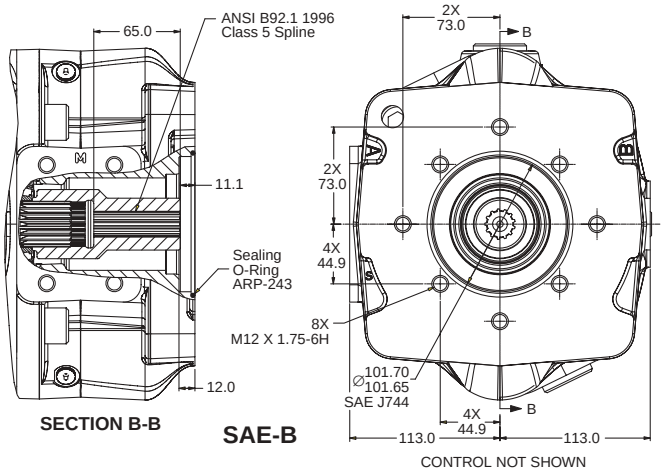
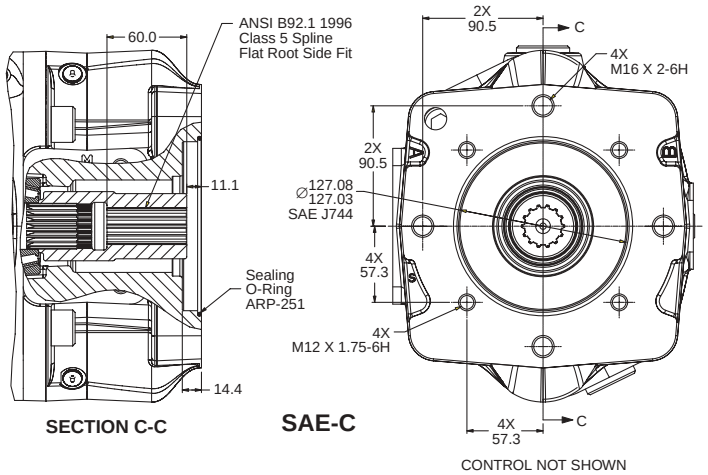
Marysville, Ohio USA

Pump Installation - P1140
Side Ports with Thru-Drive
Mounting Options





Offer of Sale

The items described in this document and other documents or descriptions provided by Parker Hannifin Corporation, its subsidiaries and its authorized distributors are hereby offered for sale at prices to be established by Parker Hannifin Corporation, its subsidiaries and its authorized distributors. This offer and its acceptance by any customer ("Buyer") shall be governed by all of the following Terms and Conditions. Buyer's order for any such items, when communicated to Parker Hannifin Corporation, its subsidiary or an authorized distributor ("Seller") verbally or in writing, shall constitute acceptance of this offer.

1. Terms and Conditions of Sale: All descriptions, quotations, proposals, offers, acknowledgments, acceptances and sales of Seller's products are subject to and shall be governed exclusively by the terms and conditions stated herein. Buyer's acceptance of any offer to sell is limited to these terms and conditions. Any terms or conditions in addition to, or inconsistent with those stated herein, proposed by Buyer in any acceptance of an offer by Seller, are hereby objected to. No such additional, different or inconsistent terms and conditions shall become part of the contract between Buyer and Seller unless expressly accepted in writing by Seller. Seller's acceptance of any offer to purchase by Buyer is expressly conditional upon Buyer's assent to all the terms and conditions stated herein, including any terms in addition to, or inconsistent with those contained in Buyer's offer, Acceptance of Seller's products shall in all events constitute such assent.

2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer's receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller's plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller's delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

4. Warranty: Seller warrants that the items sold hereunder shall be free from defects in material or workmanship for a period of 18 months from date of shipment from Parker Hannifin Corporation. **THIS WARRANTY COMPRISES THE SOLE AND ENTIRE WARRANTY PERTAINING TO ITEMS PROVIDED HEREUNDER. SELLER MAKES NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION OF ANY KIND WHATSOEVER. ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO, MERCHANTABILITY AND FITNESS FOR PURPOSE, WHETHER EXPRESS, IMPLIED, OR ARISING BY OPERATION OF LAW, TRADE USAGE, OR COURSE OF DEALING ARE HEREBY DISCLAIMED.**

NOTWITHSTANDING THE FOREGOING, THERE ARE NO WARRANTIES WHATSOEVER ON ITEMS BUILT OR ACQUIRED WHOLLY OR PARTIALLY, TO BUYER'S DESIGNS OR SPECIFICATIONS.

5. Limitation Of Remedy: SELLER'S LIABILITY ARISING FROM OR IN ANY WAY CONNECTED WITH THE ITEMS SOLD OR THIS CONTRACT SHALL BE LIMITED EXCLUSIVELY TO REPAIR OR REPLACEMENT OF THE ITEMS SOLD OR REFUND OF THE PURCHASE PRICE PAID BY BUYER, AT SELLER'S SOLE OPTION. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER, INCLUDING BUT NOT LIMITED TO LOST PROFITS ARISING FROM OR IN ANY WAY CONNECTED WITH THIS AGREEMENT OR ITEMS SOLD HEREUNDER, WHETHER ALLEGED TO ARISE FROM BREACH OF CONTRACT, EXPRESS OR IMPLIED WARRANTY, OR IN TORT, INCLUDING WITHOUT LIMITATION, NEGLIGENCE, FAILURE TO WARN OR STRICT LIABILITY.

6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller's discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller's property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus belonging to Seller which is utilized in the manufacture of the items sold hereunder, even if such apparatus has been specially converted or adapted for such manufacture and notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer's Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items which become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property, Seller shall not be responsible for any loss or damage to such property while it is in Seller's possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller shall have no liability for infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter 'Intellectual Property Rights'). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in an action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Seller's obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller's sole and exclusive liability and Buyer's sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller's obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter 'Events of Force Majeure'). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller's control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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Parker Hannifin Corporation

About Parker Hannifin Corporation

Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,000 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic, and electromechanical motion-control solutions. Our Company has the largest distribution network in its field, with over 7,500 distributors serving more than 400,000 customers worldwide.

Parker's Charter

To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

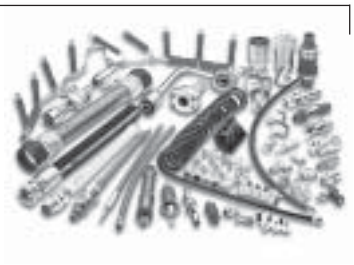
Product Information

North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling the Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7537). In Europe, call 00800-C-PARKER-H (00800-2727-5374).

The Aerospace Group is a leader in the development, design, manufacture and servicing of control systems and components for aerospace and related high-technology markets, while achieving growth through premier customer service.

The Climate & Industrial Controls Group designs, manufactures and markets system-control and fluid-handling components and systems to refrigeration, air-conditioning and industrial customers worldwide.

The Fluid Connectors Group designs, manufactures and markets rigid and flexible connectors, and associated products used in pneumatic and fluid systems.

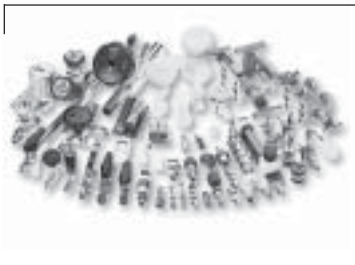


The Seal Group designs, manufactures and distributes industrial and commercial sealing devices and related products by providing superior quality and total customer satisfaction.

The Hydraulics Group designs, produces and markets a full spectrum of hydraulic components and systems to builders and users of industrial and mobile machinery and equipment.

The Filtration Group designs, manufactures and markets quality filtration and clarification products, providing customers with the best value, quality, technical support, and global availability.

The Automation Group is a leading supplier of pneumatic and electromechanical components and systems to automation customers worldwide.



The Instrumentation Group is a global leader in the design, manufacture and distribution of high-quality critical flow components for worldwide process instrumentation, ultra-high-purity, medical and analytical applications.

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