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Introduction

420 Series Mobile Piston Pump

The Danfoss X20 portfolio of open-circuit piston pumps is built to maximize machine performance and productivity. With sophisticated controls that enhance system efficiency and a compact design that delivers incredible power, the X20 portfolio empowers mobile machine operators to do more work in less time using less fuel.

Sophisticated controls that improve performance while optimizing efficiency.

Excellent pressure responsiveness – The X20 portfolio delivers the fastest response and recovery times in the open-circuit piston segment, helping customers get the job done faster .

Low standby pressure – The X20 portfolio can maintain low margin pressure (~150 psi) with exceptional stability, reducing heat generation and helping to eliminate wasted energy.

Stable fan drive functionality – Danfoss’s fan drive control reaches desired speed more quickly and remains stable once there, reducing energy-wasting oscillation.

Advanced electronic controls – The cold start and fan drive controls are Pro-FX Ready, meaning they can be easily configured with pre-programmed development tools and controlled electronically for maximum flexibility and precision.

Winning load sense combination – X20 works in conjunction with Danfoss’s CLS Load Sense Sectional Mobile Valve, providing OEMs one resource for their machine’s load sense needs.

Compact design that enables greater flexibility and cost savings.

Simplified pump architecture – The X20 pump has 25% fewer components than traditional pumps, reducing the number of leak points and simplifying maintenance.

Compact package size –The X20 portfolio’s small size satisfies Tier 4 requirements and provides more flexibility when designing the engine compartment.

More horsepower –The compact rotating group delivers a remarkable amount of horsepower, improving productivity without using more fuel.

One-piece housing – Single-piece pump housing removes leak points and makes maintenance faster and easier versus more complicated multi-piece housings.

Multiple options that make it easy to specify exactly what you need.

Variety of control options – Including pressure control, load sense, cold start, torque control, remote pressure control, inverse proportional pressure control, proportional pressure control, electronic displacement control, and swash sensor feedback, giving you more ways to design more efficient, productive machines.

Several displacement options – With seven displacement options, there’s an X20 pump to fit virtually any mobile application need.

Danfoss’s 420 Series is available with displacements of 41cc, 49cc, 62cc, and 80cc for operating speeds at 2,650 rpm. A strong, field-proven rotating group allows the pumps to handle pressures to 280 bar (4060 psi) continuous and 320 bar (4600 psi) intermittent.



The combination of high load capacity bearings and a stiff drive shaft help provide a pump B10 bearing life of up to 10,280 hours at rated mobile conditions, reducing operating costs and extending operating life.

Variety of mounting options – The X20 portfolio is available with both SAE and ISO mounting flange configurations, can be side- or rear-ported, and offers multiple drain ports to help overcome any installation challenges.

Exceptional quality that provides remarkable reliability.

Unique control piston design – Single-acting control piston with special coating helps minimize friction, increasing operating life .

Bronze piston shoes –Bronze piston shoes are robust against contamination should particles enter the fluid, enhancing system performance and component service life.

High-load bearings – Larger, more durable bearings resist wear and deliver industry-leading bearing life.

3-year manufacturer’s warranty – Danfoss’s warranty terms provide peace of mind for three full years, helping you get through your warranty period with complete confidence.

Global network of Danfoss-certified experts for end-to-end support.

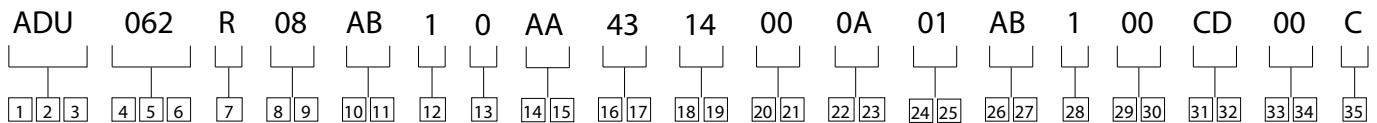
More partners in more regions – Growing network of Danfoss distributors around the world ensures there’s local service and support anywhere you need it.

World-class system design and assembly – Our expert distribution partners can help with everything from specifying to prototyping and assembly to commissioning, so you can focus on other areas of your business.

Danfoss-standardized practices and processes – Danfoss employs a unique system of tools and processes, known as the Danfoss Business System, to ensure quality development and delivery of the 220 X20 product. These tools and process include such known methods as Design for Six Sigma, Lean Manufacturing and ISO certification.

Model codes

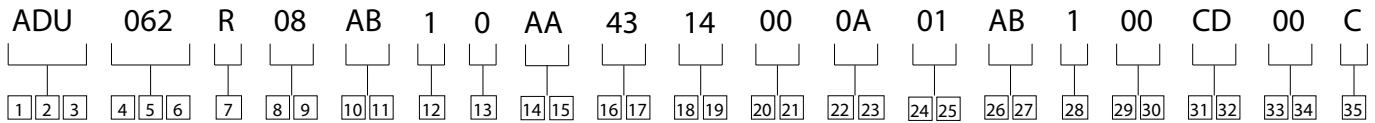
420 Mobile Piston Pump



1 2 3	Pump series	13	Diagnostic pressure ports not available on thru-drive units
ADU –	420 Series open circuit piston pump	0 –	No diagnostic pressure ports
4 5 6	Pump displacement	1 –	#6 SAE o-ring - plugged (rear ports only)
041 –	41.0 cm ³ /r [2 .50 in ³ /r]	2 –	M14 metric o-ring - plugged (rear ports only)
049 –	49.2 cm ³ /r [3 .00 in ³ /r]	3 –	#4 SAE o-ring - plugged (side ports only)
062 –	62.3 cm ³ /r [3 .80 in ³ /r]	4 –	M12 metric o-ring - plugged (side ports only)
080 –	80.0 cm ³ /r [4 .88 in ³ /r]	14 15	Controller type
7	Input shaft rotation	AA –	Pressure flow compensator with #4 SAE o-ring load sense port (left side)
L –	Left hand	AB –	Pressure flow compensator with M12 metric o-ring load sense port (left side)
R –	Right hand	AC –	Pressure compensator only
8 9	Front mount and shaft	AH –	Pressure flow compensator with torque control #4 SAE o-ring load sense port (left side)
01 –	2 Bolt B, 22.2 mm (0 .875in.) Dia. keyed shaft	AJ –	Pressure flow compensator with torque control M12 metric o-ring load sense port (left side)
02 –	2 Bolt B, 25.4 mm (1 .00in.) Dia. keyed shaft	AK –	pressure compensator with torque control
03 –	2 Bolt B, 22.22 mm (.875in.) Dia. tapered keyed shaft	AP –	Remote pressure control M12 metric o-ring port, left side
05 –	2 Bolt B, 13 tooth 16/32 spline	AT –	Pressure and flow compensator with electronic displacement control - EP type
08 –	2 Bolt B, 15 tooth 16/32 spline	AV –	EH Inverse proportional pressure control (vertical mounting)
32 –	2/4 Bolt C, 14 tooth 12/24 spline	AW –	Remote pressure control with .4375-20 SAE o-ring port, left side
33 –	2/4 Bolt C, 31.8 mm (1.25in) Dia . keyed shaft	AY –	Pressure and flow compensator with electronic displacement control - EPD type
34 –	2 Bolt B, 15 tooth 16/32 sled runner spline	16 17	Pressure compensator setting*
35 –	2 Bolt B, 14 tooth 12/24 spline	28 –	207-214 bar [3000-3100 lbf/in ²]
38 –	2/4 Bolt C, 31.75 mm (1.25) Dia . tapered keyed shaft	35 –	241-248 bar [3500-3600 lbf/in ²]
10 11	Main ports size & location	43 –	276-283 bar [4000-4100 lbf/in ²]
AA –	Rear ports suction - 2" (code 61); Pressure - 1" (code 61)	18 19	Flow compensator / remote pressure control setting*
AB –	Side ports suction - 2" (code 61); Pressure - 1" (code 61)	00 –	No flow compensator setting
AC –	Rear ports suction - 2" (code 61) with M12 threads; Pressure - 1" (code 61) with M10 threads.	14 –	12-15 bar [180-220 lbf/in ²]
AD –	Side ports suction - 2" (code 61) with M12 threads; Pressure - 1" (code 61) with M10 threads.	24 –	23-26 bar [330-370 lbf/in ²]
AE –	Rear ports suction - SAE o-ring port; Pressure - UN-2B SAE o-ring port (ADU041, ADU049 & ADU062 only)	¹	* Additional settings available by request
AF –	Side ports suction - #24 SAE o-ring; Pressure - #16 SAE o-ring (ADU041 and ADU049 only)	²	# - Recommend RPC pressure settings 10-21 bar (140-350 psi)
AG –	Rear ports suction - M48 metric o-ring; Pressure - M33 metric o-ring (ADU041 & ADU049 Only)		
AH –	Side ports suction - M48 metric o-ring; Pressure - M33 metric o-ring (ADU041 & ADU049 only)		
AK –	Rear ports suction - 2" (code 61); Pressure - #16 SAE o-ring (ADU062 only)		
12	Case drain ports		
1 –	#12 SAE o-ring - top		
2 –	#12 SAE o-ring - bottom		
3 –	M27 x 2 o-ring - top		
4 –	M27 o-ring - bottom		
5 –	#12 SAE o-ring - left side (swash sensor boss)		

Model codes

420 Mobile Piston Pump



20 21	Torque control setting	26 27	Auxiliary (rear) mount & output shaft
00 –	No torque control	00 –	No auxiliary mounting features
AA –	40 Nm [350 in-lbs] (41,49)	AB –	SAE A 2 Bolt, 11T 16/32 Spline
AB –	51 Nm [450 in-lbs] (41,49)	AC –	SAE B 2 Bolt, 13T 16/32 Spline
AC –	62 Nm [550 in-lbs] (41,49,62)	AD –	SAE B 2 Bolt, 15T 16/32 Spline
AD –	73 Nm [650 in-lbs] (41,49,62,80)	AE –	SAE A 2 Bolt, 9T 16/32 Spline
AE –	85 Nm [750 in-lbs] (41,49,62,80)		
AF –	96 Nm [850 in-lbs] (41,49,62,80)	28	Shaft seal
AG –	107 Nm [950 in-lbs] (41,49,62,80)	0 –	No shaft seal
AH –	119 Nm [1050 in-lbs] (49,62,80)	1 –	Standard polyacrylate shaft seal
AJ –	130 Nm [1150 in-lbs] (49,62,80)	2 –	Viton shaft seal
AK –	141 Nm [1250 in-lbs] (49,62,80)	3† –	Double, two-way shaft seal, Viton with VHO filter
AL –	153 Nm [1350 in-lbs] (62,80)	4 –	Nitrile shaft seal
AM –	164 Nm [1450 in-lbs] (62,80)	5 –	Single viton shaft seal in 2/4 Bolt C mount pump housing
AN –	175 Nm [1550 in-lbs] (62,80)		
AP –	186 Nm [1650 in-lbs] (62,80)	29 30	Pump special features
AR –	198 Nm [1750 in-lbs] (62,80)	00 –	No special features
AT –	209 Nm [1850 in-lbs] (62,80)	AA –	Auxiliary mounting cover plate
AU –	220 Nm [1950 in-lbs] (80)	AB –	Swash position sensor
		AC –	Shaft speed sensor
22 23	Control special features	AD –	Modified end cover, corner removed
00 –	Control special features	AE –	Support Studs (1/2-13 UNC-2B x 117.8 (4.64) long in top two end cover/housing bolt locations
0A –	Bleed down orifice	AG –	Swash position sensor and shaft speed sensor
0B –	24V Cold start valve		
0D –	12V Cold start valve	31 32	Paint
0S –	12V DC solenoid AMP Jr connector (used with EH inverse proportional pressure control)	00 –	No paint
0T –	24V DC solenoid AMP Jr connector (used with EH inverse proportional pressure control)	CD –	Blue primer
0U –	12V DC solenoid deutsch connector (used with EH inverse proportional pressure control)	0B –	Black
0V –	24V DC Solenoid deutsch connector (used with EH inverse proportional pressure control)		
		33 34	Identification/packaging
24 25	Maximum displacement option*	00 –	Standard Danfoss identification box packaging
01 –	Standard displacement (as given in code title)	0J –	ATEX certification
02 –	External manual stroke adjustment set at max		
		35	Design level
		C –	Third design

1 * Additional settings available by request, including fixed displacement stops.

2 † Not available on SAE B mount

Specifications and performance

420 Mobile Piston Pump

General performance specifications

		Units	ADU041	ADU049	ADU062	ADU080	
Displacement		cc/r (in ³ /r)	41.0 (2.50)	49.2 (3.00)	62.3 (3.80)	80.0 (4.88)	
Mounting	2 Bolt B, 2 Bolt C, 2/4 Bolt C						
Pressure	Continuous	bar (psi)	280 (4060)	280 (4060)	280 (4060)	210 (3050)	
	Intermittent		320 (4600)	320 (4600)	320 (4600)	230 (3335)	
	Peak ³		350 (5000)	350 (5000)	350 (5000)	250 (3625)	
Speed ⁴	At 1 bar abs (0 psig)	rpm	2650	2650	2600	2500	
	At .85 bar abs (5 in.Hg)		2450	2450	2400	2200	
	At 2 bar abs (15 psig)		2950	2950	2800	2800	
	Max (standby)		3600	3600	3600	3600	
	Min		600	600	600	600	
Power	Max (theoretical)	kW (hp)	50.7 (68.0)	60.8 (81.5)	75.6 (101.3)	61.7 (82.7)	
	Standby		.98 (1.3)	.98 (1.3)	1.1 (1.5)	1.4 (1.9)	
Torque	Max (theoretical)	Nm (lb-ft)	183 (135)	219 (162)	278 (205)	268 (198)	
Weight	Single Seal ¹	kg (lbm)	22.9 (50.4)	22.9 (50.4)	23.8 (52.4)	24.2 (53.4)	
	Dual Seal ¹		24.1 (53.1)	24.1 (53.1)	25.0 (55.1)	25.4 (56.1)	
Bearing life ⁵	At 140 bar (2030 psi)	B10 Hours	103,650	55,580	33,500	17,150	
	At 210 bar (3045 psi)		26,830	14,380	8,670	4,440	
	At 280 bar (4060 psi)		10,280	5,510	3,320	N/A	
Mass moment of inertia			Nm-sec ²	.0033	.0033	.0046	.0058
			(lb-in-sec ²)	(.0288)	(.0288)	(.0403)	(.0517)

1 Standard SAE B non-through drive.

2 Less than 10% of duty cycle.

3 Momentary system pressure spikes only.

4 Ratings based on Flange ports. Note: Tube ports are not available on the 62cc and 80cc displacements.

5 Bearing life ratings at rated speed - 1 bar abs (0 psig) inlet.

Inlet pressure, case pressure, and operating temperature requirements

Inlet pressure			Case pressure			Operating temperature		
Rated	Minimum	Maximum	Maximum continuous	Maximum intermittent	Peak	Rated	Minimum temperature	Maximum intermittent
bar abs (psig)	bar abs (in. Hg)	bar abs (psig)	bar abs (psig)	bar abs (psig)	bar abs (psig)	°C (°F)	°C (°F)	°C (°F)
1.0 (0)	0.85 (5)	4.4 (50)	1.3 (5)	3.1 (30)	6.2 (75)	93 (200)	-37 (-35)	104 (220)

Hydraulic fluids

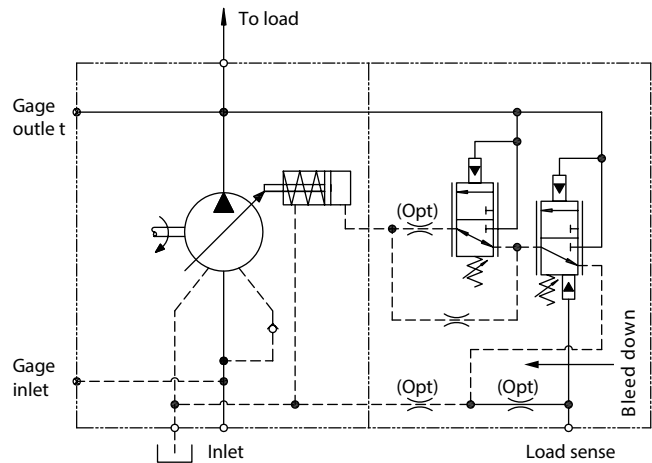
Fluid	Recommended operating viscosity range cSt (SUS)	Maximum continuous cSt (SUS)	Maximum viscosity at startup cSt (SUS)	Minimum viscosity @ max. temperature of 93°C (200°F) cSt (SUS)	Minimum intermittent cSt (SUS)
Use antiwear hydraulic oil, or automotive type crankcase oil (designations SC, SD, SE or SF) per SAE J183 FEB80	16 to 40 (80 to 188)	430 (1192)	2100 (9720)	10 (59)	6 (46)

For more information, see Danfoss publication 579. For operation on other alternative or environmentally friendly fluids, please contact your Danfoss representative.

Control options

Pressure & Flow (Load Sense) Compensator

The pump will provide flow & pressure matching of pump output to system load demand, maximizing efficiency and improving load metering characteristics of any directional control valve installed between the pump and the load. Load sensing ensures that the pump always provides only the amount of flow needed by the load. The pump operating pressure adjusts to the load pressure plus a pressure differential required for the load sense margin. When the system is not demanding flow, the load sense control will operate in low pressure zero flow, energy saving stand-by mode. The differential pressure is the difference between the pressure inlet and service port of a proportionally controlled directional valve, or a load sensing directional control valve. See the model code for differential pressure settings for load sensing. If the load pressure exceeds the system pressure setting, the pressure compensator reduces pump displacement. The load sensing line must be as short as possible and can also be used for remote pressure control or unloading of the pump pressure. For remote pressure control purposes, it is recommended that you contact your Danfoss Representative for the correct configuration of the control.



Warning:

1. When adjusting the pressure compensator, install a 0 to 350 bar (0 to 5000 psi) gage in the outlet gage port and limit the pressure setting to the continuous rated pressure for the pump displacement. It is possible to adjust the pressure compensator beyond the rated pressure of the pump. Doing so, may void the warranty of the pump.
2. Danfoss recommends use of relief valve in all systems.

Pressure limit settings

The pressure compensator uses two springs to cover the full pressure range of the X20 pumps.

Spring 1 = < 140 bar (2050 psi)

Spring 2 = 145 - 280 bar (2100 - 4060 psi)

Flow compensator (load sense) settings

There are two springs used to cover the load sense adjustment range of this control. Available load sense range is

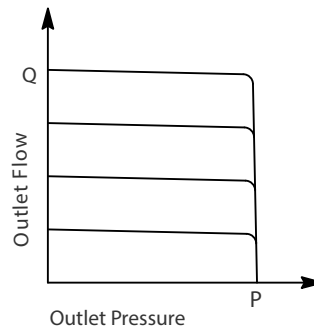
Spring 1 = < 20 bar (290 psi)

Spring 2 = 22- 42 bar (319- 609 psi).

Dynamic response per SAE J745 (using swash plate position)

	Response (off stroke) msec	Recovery (on stroke) msec	Load sense recovery msec
ADU041	20	75	90
ADU049	20	75	90
ADU062	25	90	115
ADU080	26	75	115

Typical operating curve



Control options

Pressure Compensator

The pump will provide a continuously modulated flow to meet changing load demands at a pre-adjusted compensator pressure. At pressures below the compensator setting, the pump will operate at maximum displacement. See model code position 16,17 for compensator pressure ranges.

Warning

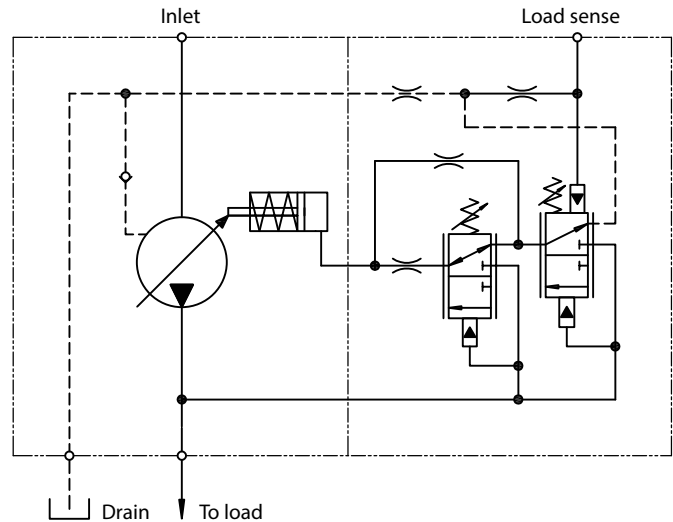
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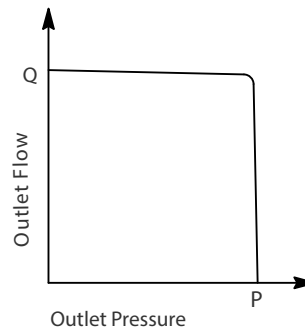
Spring 2 = 145 - 280 bar (2100 - 4060 psi)



Dynamic response per SAE J745 (using swash plate position)

	Response (off stroke) msec	Recovery (on stroke) msec
ADU041	20	75
ADU049	20	75
ADU062	25	90
ADU080	26	75

Pressure cut-off characteristics of pressure compensator control at 49°C (120°F), static conditions.



Control options

Torque Control

The torque control limits the torque input to the pump preventing the engine from stalling while also optimizing the use of the engine power.

When combined with Pressure Compensator Control and/or Load Sense, it will allow the pump to remain inside the power envelope of the Pressure Flow curve. When the combination of pump flow and outlet pressure moves outside the envelop the pump displacement will automatically be reduced.

This maximum setting is easily calculated using the following steps:

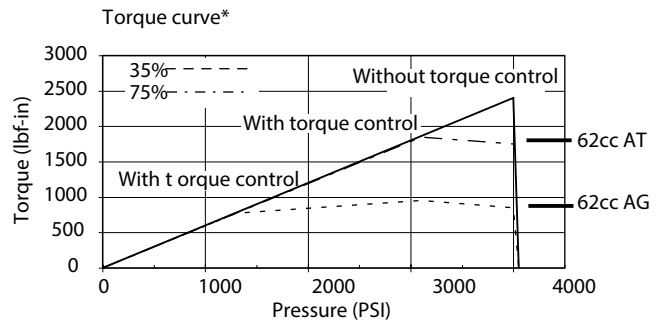
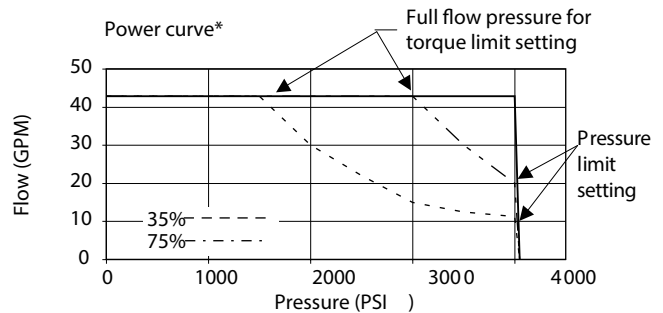
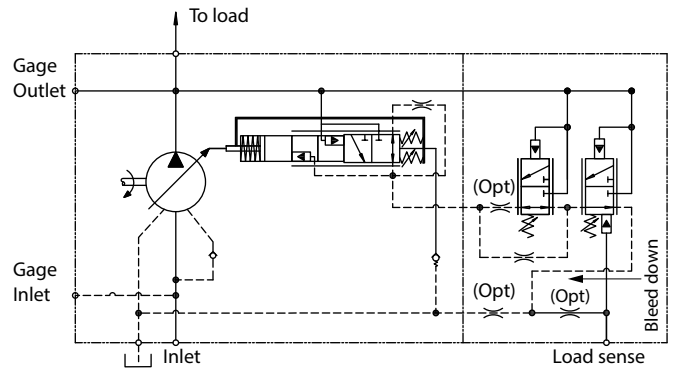
- Select the 420 pump displacement you intend to use
- Identify the available engine horsepower (HP) and speed (rpm)
- Calculate the torque limit required by the system using the equations shown
- Select the MAX torque setting from the table shown

$$\text{Torque (in-lbs)} = \frac{\text{Horsepower (HP)} \times 63025}{\text{Engine RPM}}$$

$$\text{Torque (Nm)} = \frac{\text{Horsepower (KW)} \times 9550}{\text{Engine RPM}}$$

Code	Torque setting	41cc	49cc	62cc	80cc
AA	40 Nm (350 in-lbs)	✓	✓	—	—
AB	51 Nm (450 in-lbs)	✓	✓	—	—
AC	62 Nm (550 in-lbs)	✓	✓	✓	—
AD	73 Nm (650 in-lbs)	✓	✓	✓	✓
AE	85 Nm (750 in-lbs)	✓	✓	✓	✓
AF	96 Nm (850 in-lbs)	✓	✓	✓	✓
AG*	107 Nm (950 in-lbs)	✓	✓	✓	✓
AH	119 Nm (1050 in-lbs)	—	✓	✓	✓
AJ	130 Nm (1150 in-lbs)	—	✓	✓	✓
AK	141 Nm (1250 in-lbs)	—	✓	✓	✓
AL	153 Nm (1350 in-lbs)	—	—	✓	✓
AM	164 Nm (1450 in-lbs)	—	—	✓	✓
AN	175 Nm (1550 in-lbs)	—	—	✓	✓
AP	186 Nm (1650 in-lbs)	—	—	✓	✓
AR	198 Nm (1750 in-lbs)	—	—	✓	✓
AT*	209 Nm (1850 in-lbs)	—	—	✓	✓
AU	220 Nm (1950 in-lbs)	—	—	✓	✓

* reference 62cc



Control options

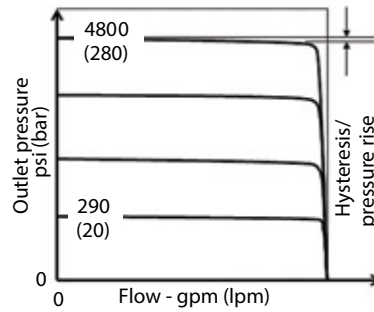
Remote Pressure Control (RPC)

Remote relief valve is to be connected to pilot port "J" through necessary external piping. Standard differential pressure of 20 bar is set at RPC spool. The required outlet pressure (below 280 bar) can be set by adjusting remote relief valve setting. Once pressure reaches preset value, flow across remote relief valve starts, this results in RPC spool movement due to pressure imbalance. This will de-stroke the pump to maintain the set pressure.

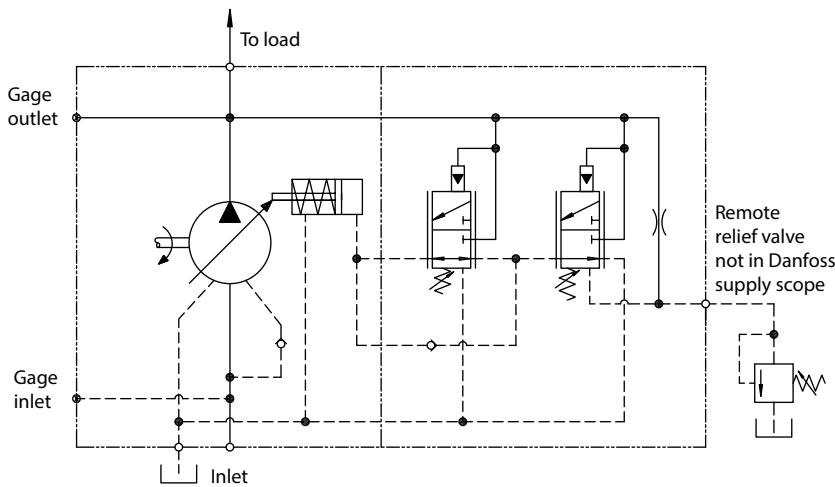
Secondary pressure compensator is provided to limit the max pressure setting as a fail safe measure. The delta pressure is factory set which can not be changed.

Note-

- Flow compensator is not available with RPC.
- Flow compensator/ Remote pressure control setting should be selected within range of 10-24 bar (140-350 psi).
- Remote relief valve is not included in supply scope of the pump.
- If the remote line is connected directly to tank, the flow compensator setting selected in the model code will be the minimum pressure setting.



Delta pressure setting at control valve - bar (psi)	14 - 24 (200 - 350)
Control fluid consumption - lpm (gpm)	4.5 (1.2) max.
Recommended flow rating of remote relief valve- lpm (gpm)	3 - 5 (0.8 - 1.32)
Recommended Danfoss Relief Valve part number	RV5-10-S-0-50



Control options

Electronic Displacement Control (EDC)

Pump displacement can be controlled infinitely, as per the current signal provided to the solenoid control valve.

signal to vary the pump displacement. This control has a proportional characteristic i.e. with increasing current signal, the displacement increases proportionately.

This control is with manual override. Based on fail safe condition there are two types:

- Min type (EP): Return to min displacement in case of power loss
- Max type (EPD): Return to max displacement in case of power loss

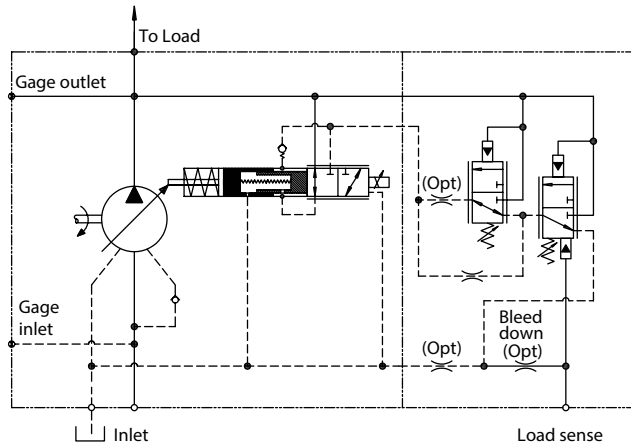
Warning:

- When adjusting the pressure limiter, install a 0 to 350 bar (0 to 5000 psi) gage in the outlet gage port and limit the pressure setting to the continuous rated pressure for the pump displacement. It is possible to adjust the pressure compensator beyond the rated pressure of the pump. Doing so, may void the warranty of the pump.
- Danfoss recommends use of relief valve in all systems.

Pressure limit settings

The EDC can operate between 20 bar (290 psi) and 280 bar (4060 psi).

EP type



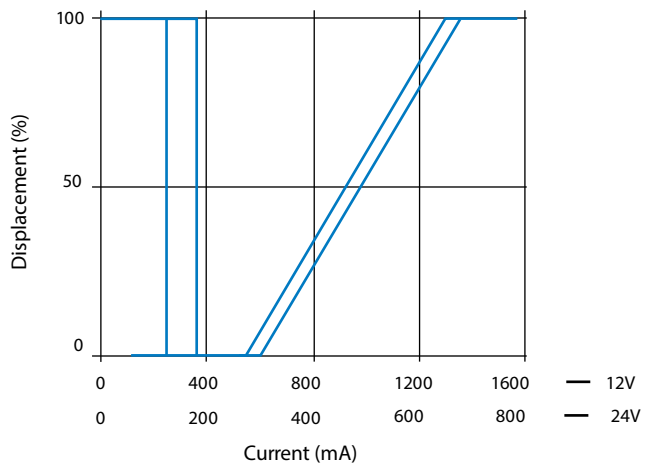
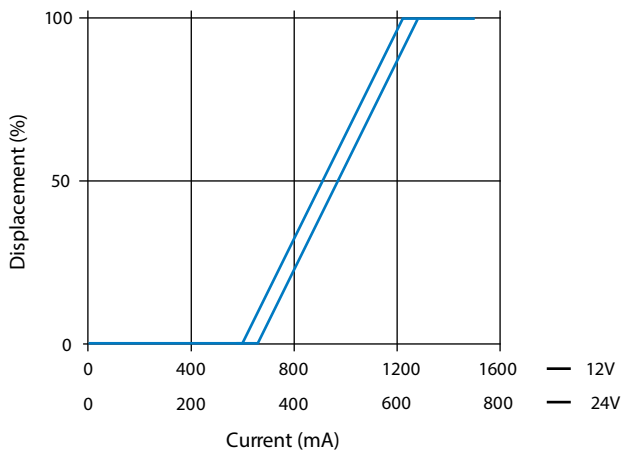
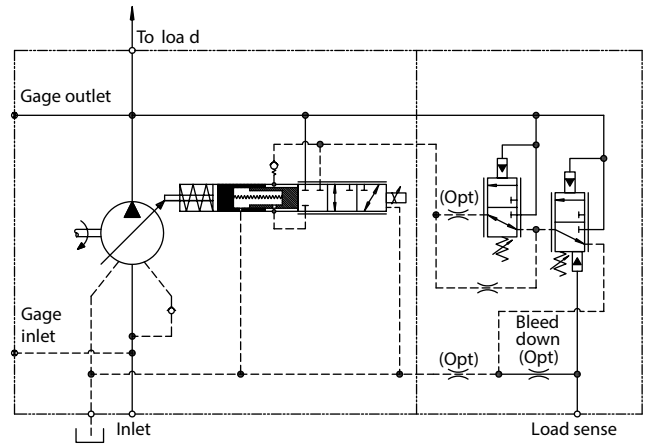
Electrical data

	12 V DC	24 V DC
Voltage	12 V DC	24 V DC
Max Current	1500 mA	750 mA
R20, Resistance(ohm)	5.19 +/- 0.52%	20.8 +/- 2.08
Type of Control	Current	Current
Recommended PWM Frequency	250 Hz	250 Hz
Dither Frequency	75 Hz	75 Hz
Dither Amplitude	300 mA	300 mA
Duty Cycle	100%	100%
Insulation material	Class H, 180 deg C	Class H, 180 deg C
Protection Class	IP69K	IP69K
Connector	Deutsch	Deutsch
Operating Temperature	-40 deg C; 85 deg C	-40 deg C; 85 deg C

This control has manual override. Hysteresis less than 5%. For cold start function,

Control type	Supply current (mA)	
	12V	24V
EP	0	0
EPD	480	240

EPD type



Control options

EH Inverse Proportional Pressure Control (IPPC)

The EH Inverse Proportional Pressure control allows for stepless variation of the max pump output pressure, as per the current signal provided to the control valve solenoid.

The integrated pump control makes use of an external current signal to vary the pump output pressure

This control has an inverse proportional characteristic i.e. with increasing current signal, the max output pressure is proportionately reduced.

Warning:

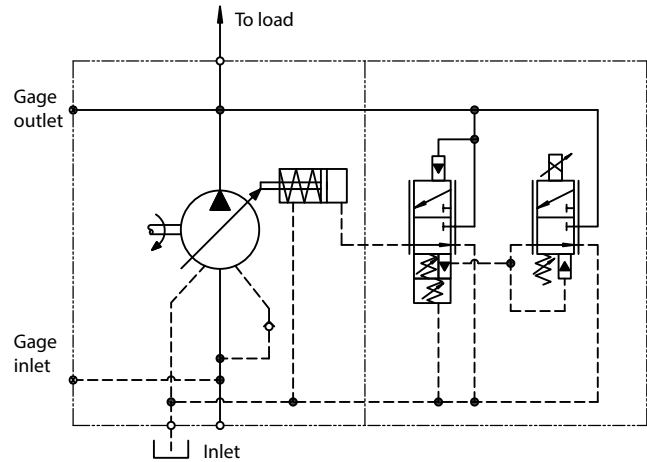
- When adjusting the pressure limiter, install a 0 to 350 bar (0 to 5000 psi) gage in the outlet gage port and limit the pressure setting to the continuous rated pressure for the pump displacement. It is possible to adjust the pressure compensator beyond the rated pressure of the pump. Doing so, may void the warranty of the pump.
- Danfoss recommends use of relief valve in all systems.

Pressure limit settings

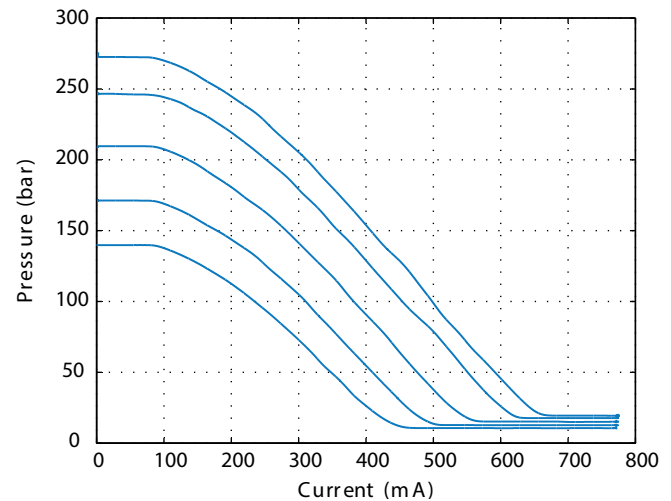
The minimum is 110 bar and max pressure can be set from 140 bar (2050 psi) to 280 bar (4060 psi).

Electrical data

Voltage	12 V	24 V
Max Current	1500 mA	750 mA
R20, Resistance (ohm)	5.3 +/- 5%	21.2 +/- 5%
Type of Control	Current	Current
Recommended PWM Frequency	100 Hz	100 Hz
Duty Cycle	100%	100%
Insulation material	Class H, 180 deg C	Class H, 180 deg C
Protection Class	IP6K6/IP69K	IP6K6/IP69K
Connector	AMP Junior Power Timer/ Deutsch	AMP Junior Power Timer/ Deutsch
	Connector DT04-2P	Connector DT04-2P
Operating Temperature	-30 deg C; 105 deg C	-30 deg C; 105 deg C



Typ. Current vs pressure characteristics of IPPC at 1800 rpm at various max pressure settings at 49 deg C (120deg F), static conditions.

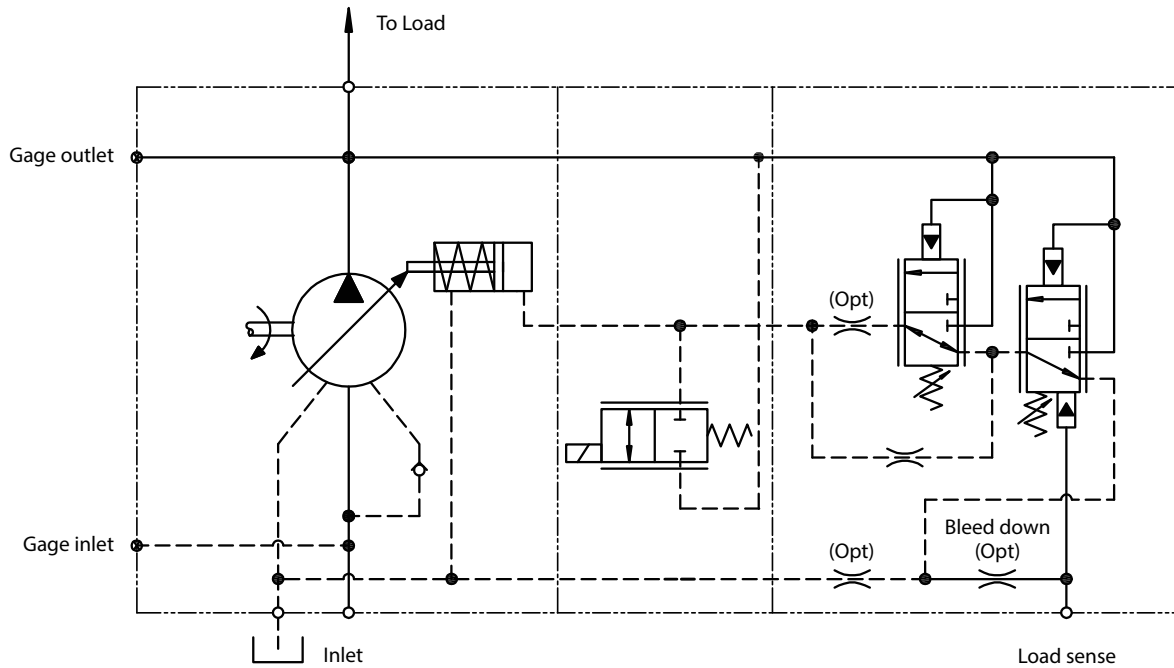


Control options

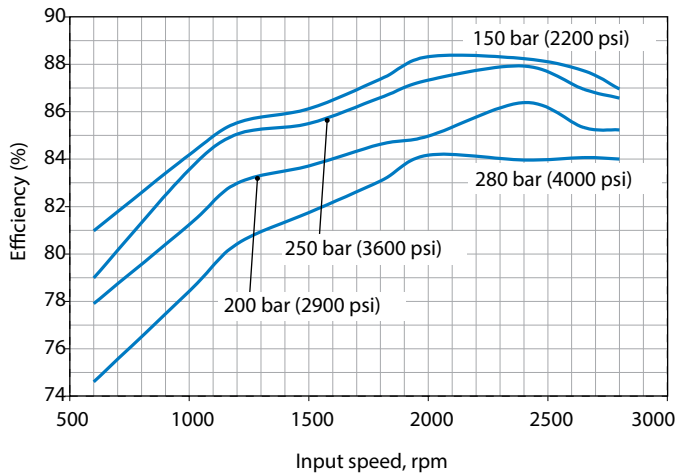
Electronic De-stroke (Cold Start) Valve

The 620 Electronic Destroke Valve reduces pump start-up torque by directing outlet pressure to the control piston.

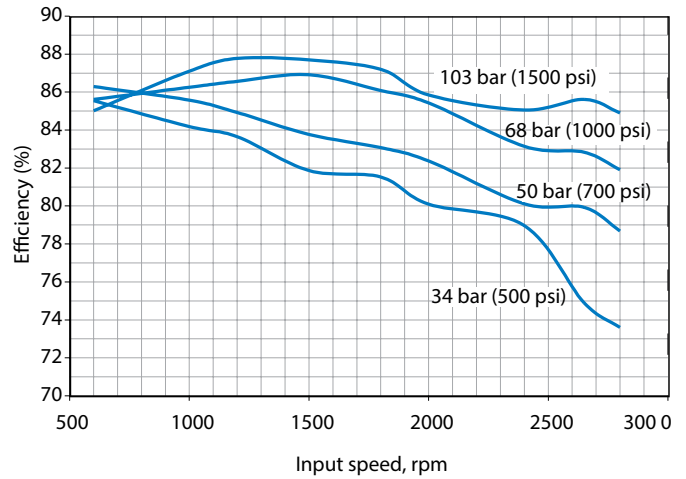
It is primarily used in cold weather applications and includes a 12 or 24 VDC directional control valve mounted between the pump housing and compensator. Refer model code position 22,23 - control special features for available connector options



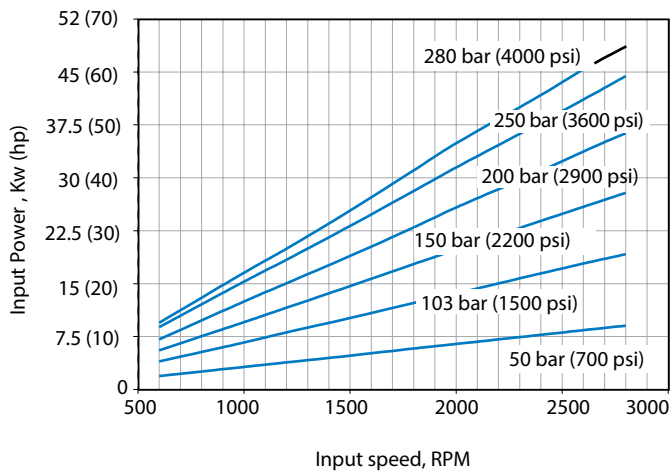
Overall efficiency versus speed @ 49° C (120° F), Full Flow, and 1.0 bar (0 psi) Inlet



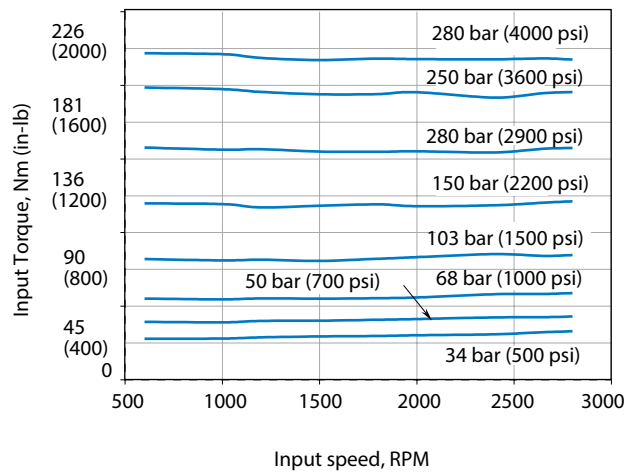
Overall efficiency versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) Inlet



Input power versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



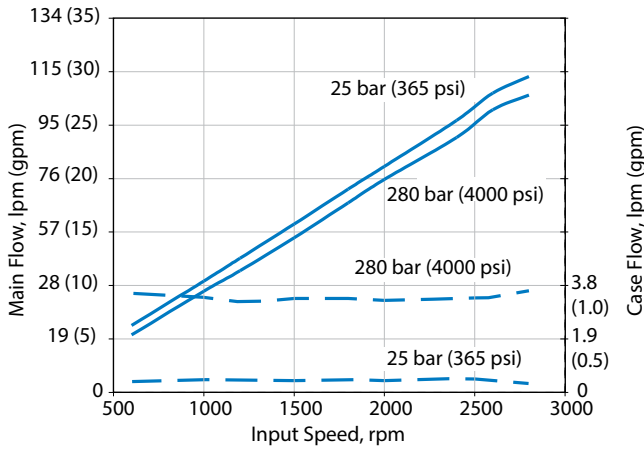
Input torque versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



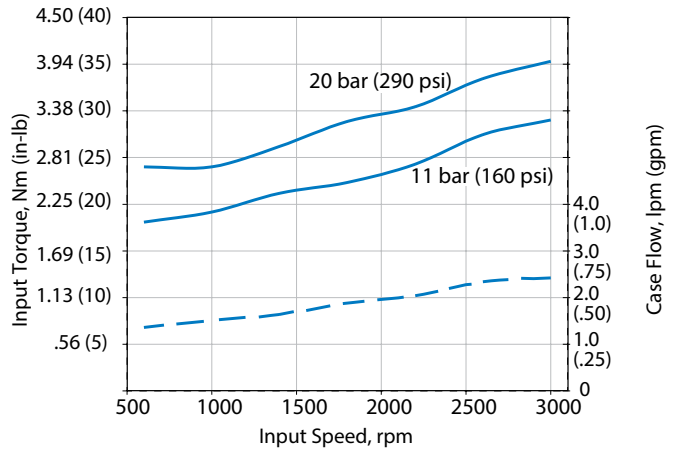
Performance

ADU041

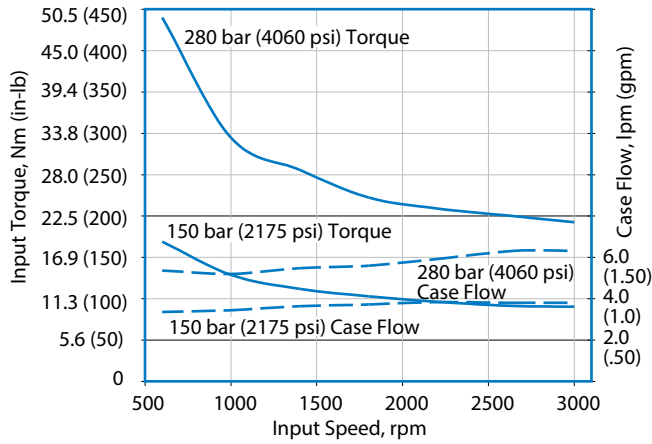
Delivery and case flow versus speed @ 49° C (120° F)



Input torque and case flow stand-by @ 49° C (120° F)



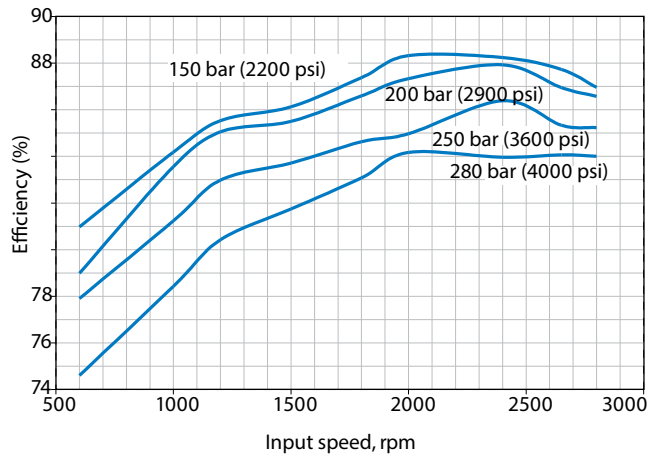
Input torque and case flow cut-off @ 49° C (120° F)



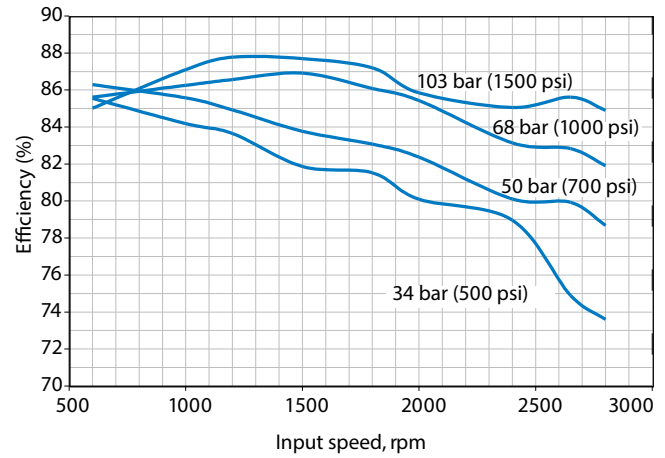
Performance

ADU049

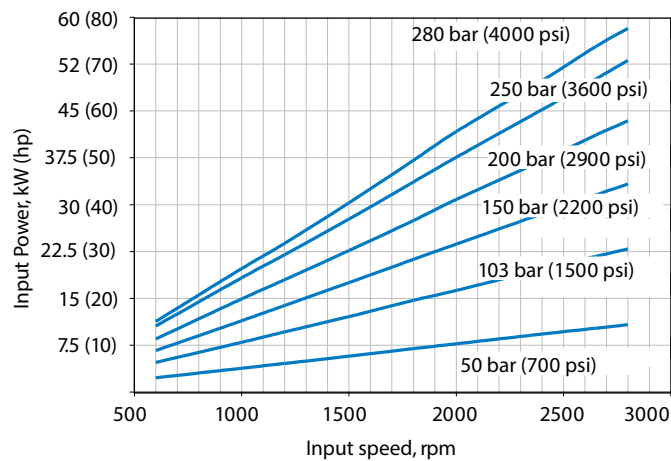
Overall efficiency versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



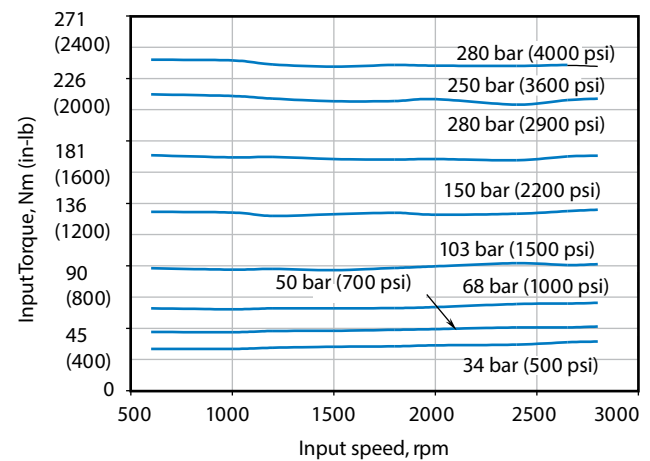
Overall efficiency versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



Input power versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



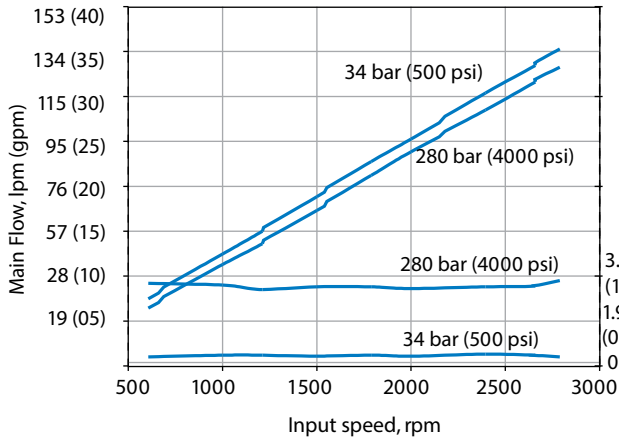
Input torque versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



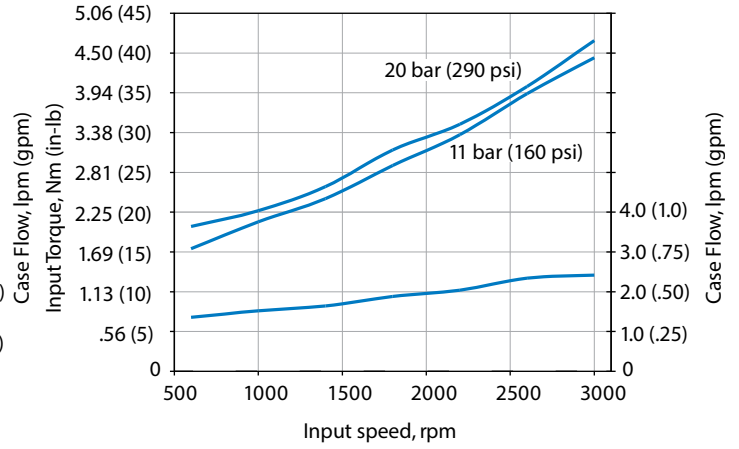
Performance

ADU049

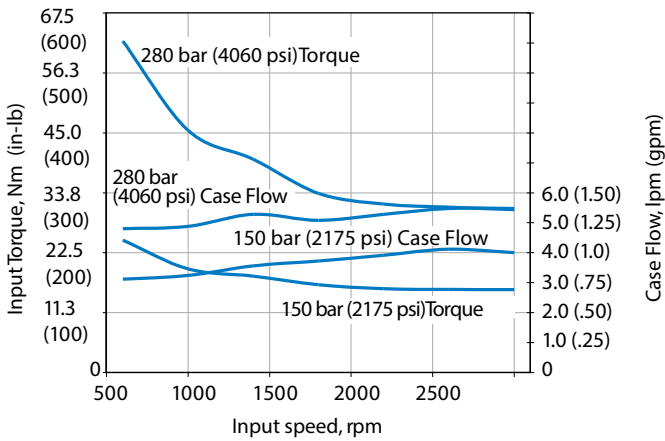
Delivery and case flow versus speed @ 49° C (120° F)



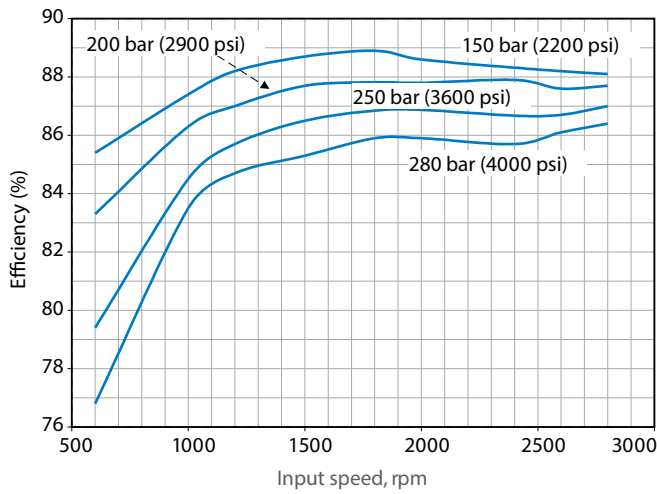
Input torque and case flow stand-by @ 49° C (120° F)



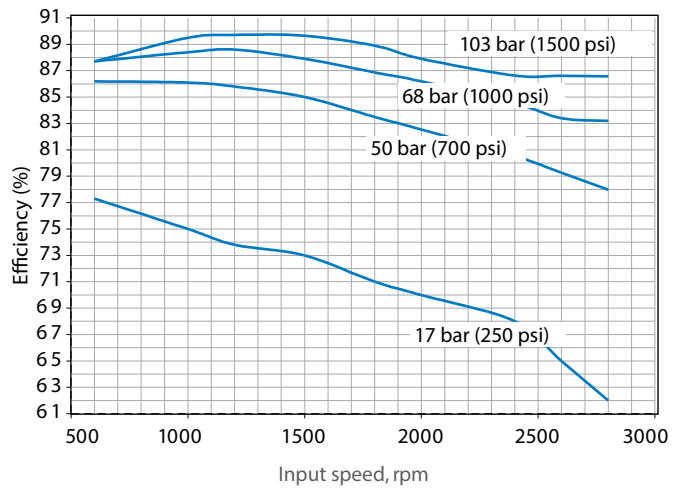
Input torque and case flow cut-off @ 49° C (120° F)



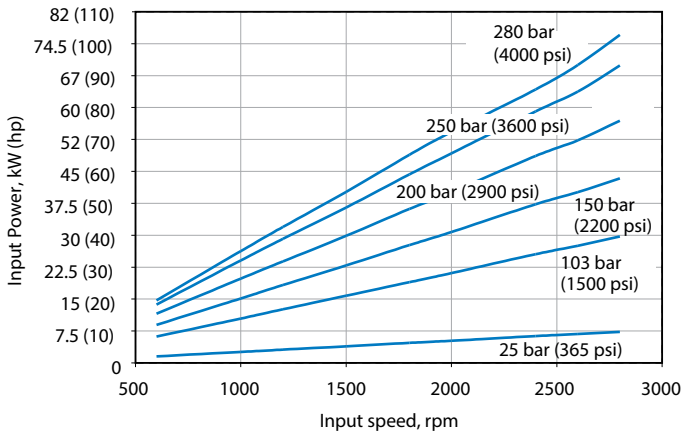
Overall efficiency versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



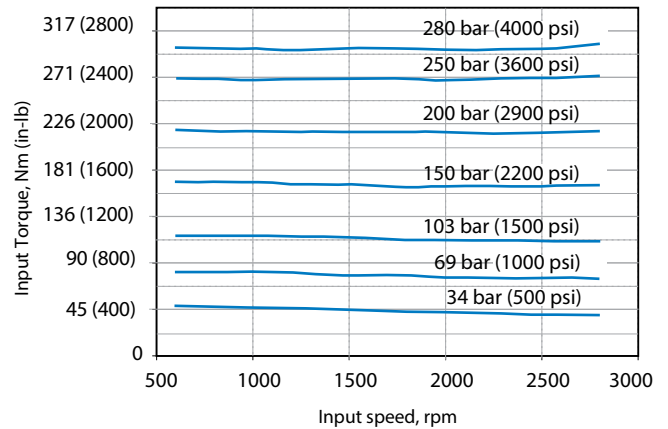
Overall efficiency versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



Input power versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



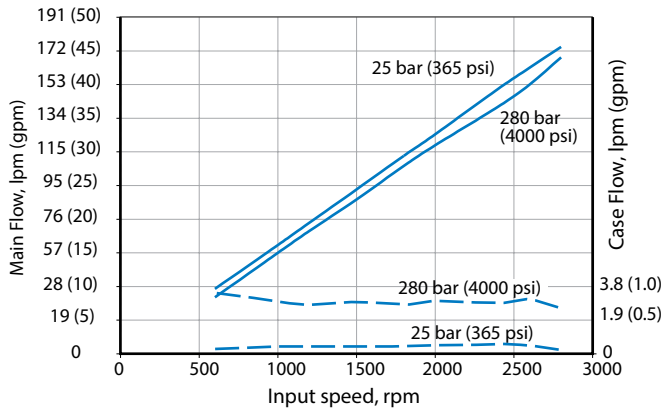
Input torque versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



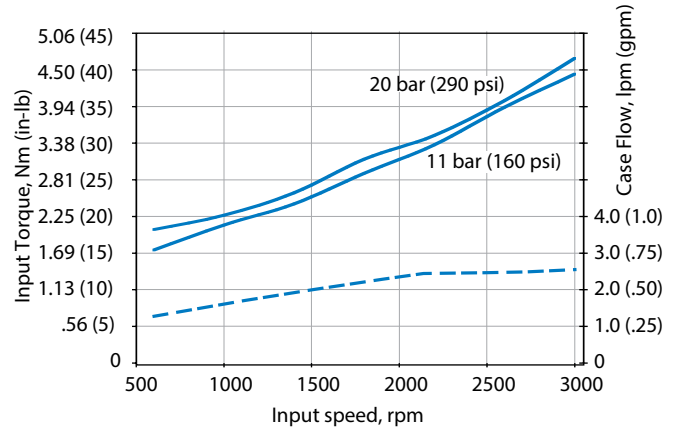
Performance

ADU062

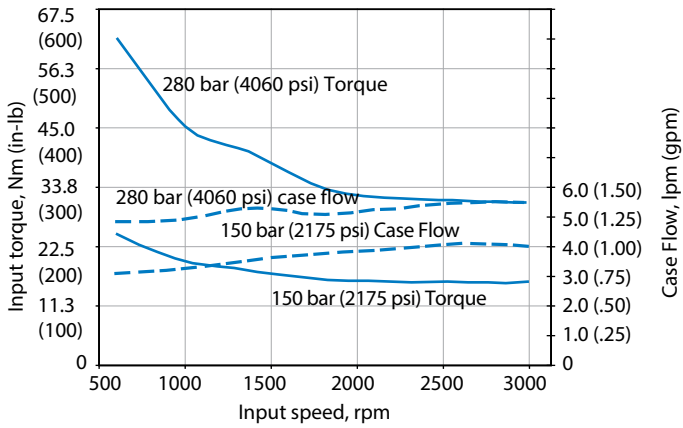
Delivery and case flow versus speed @ 49° C (120° F)



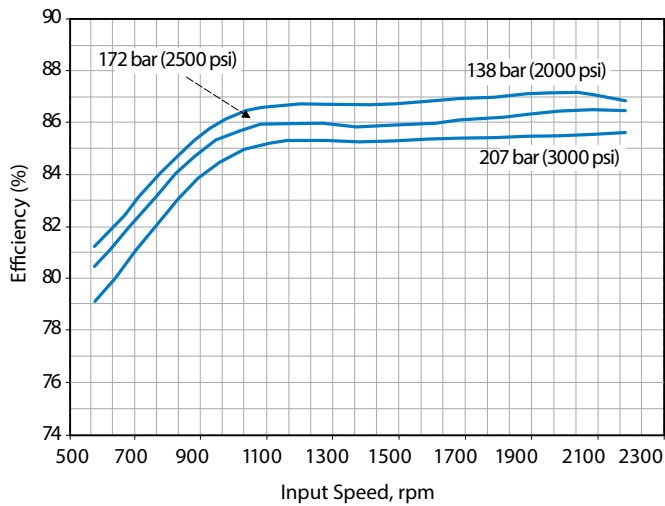
Input torque and case flow stand-by @ 49° C (120° F)



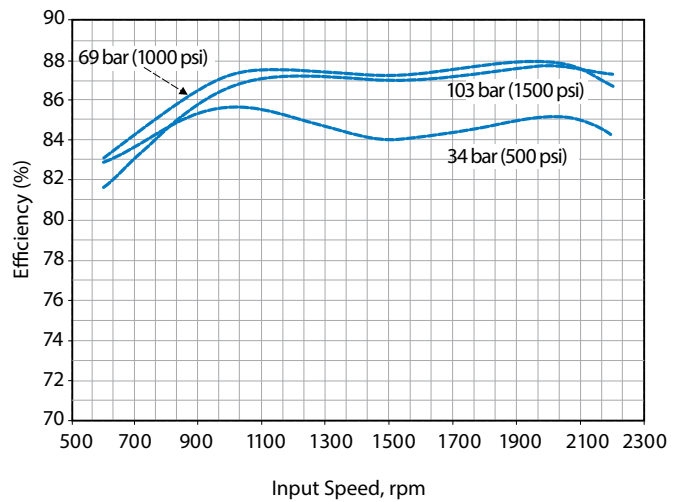
Input torque and case flow cut-off @ 49° C (120° F)



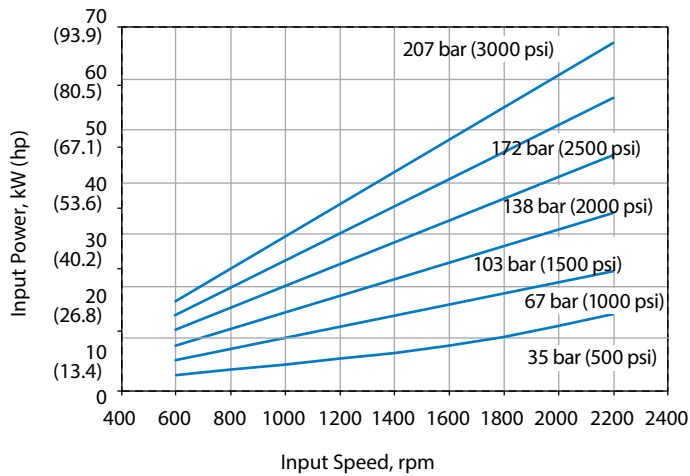
Input power versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



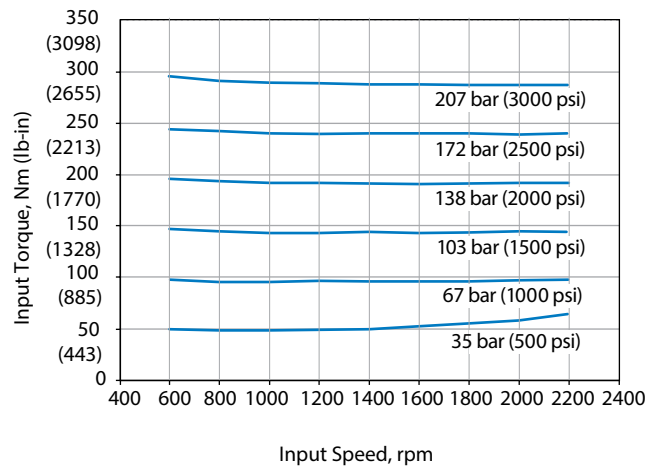
Overall efficiency versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



Input power versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



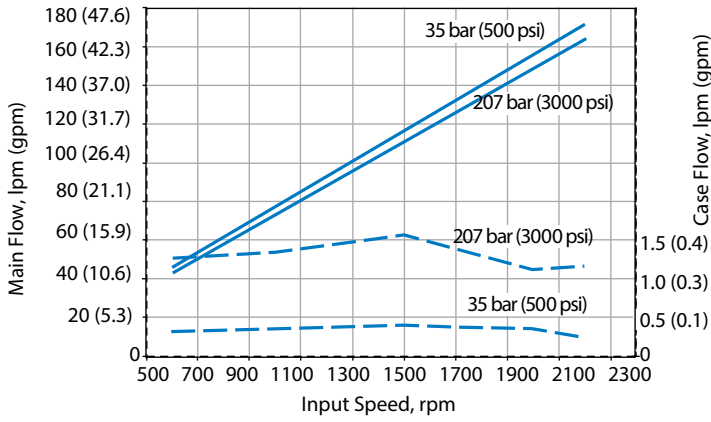
Input torque versus speed @ 49° C (120° F), full flow, and 1.0 bar (0 psi) inlet



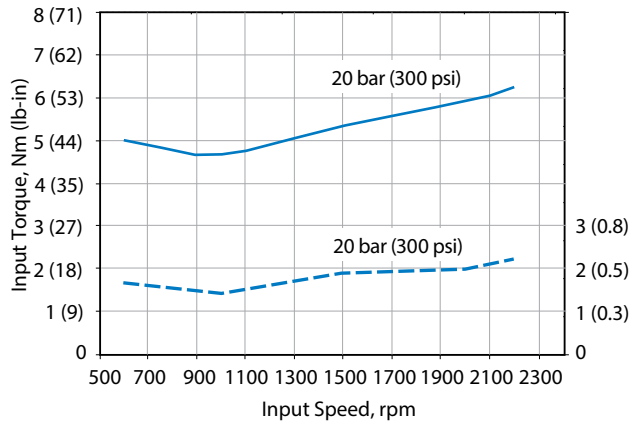
Performance

ADU080

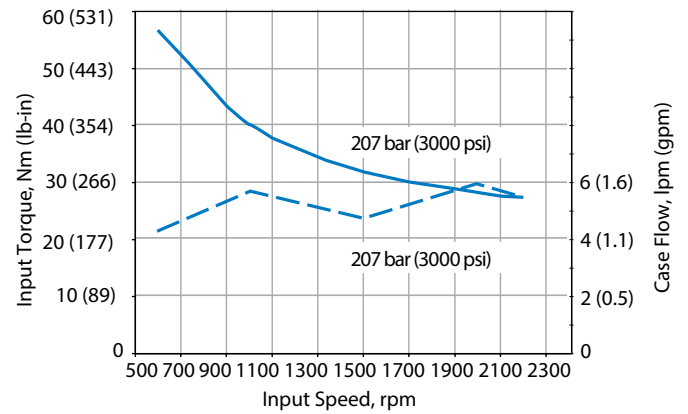
Delivery and case flow versus speed @ 49° C (120° F)



Input torque and case flow stand-by @ 49° C (120° F)



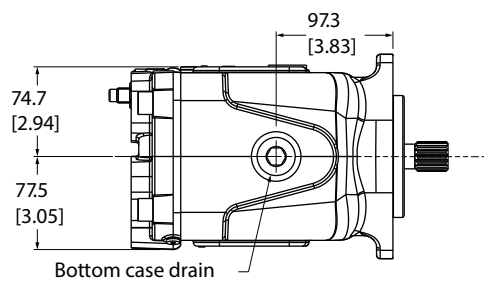
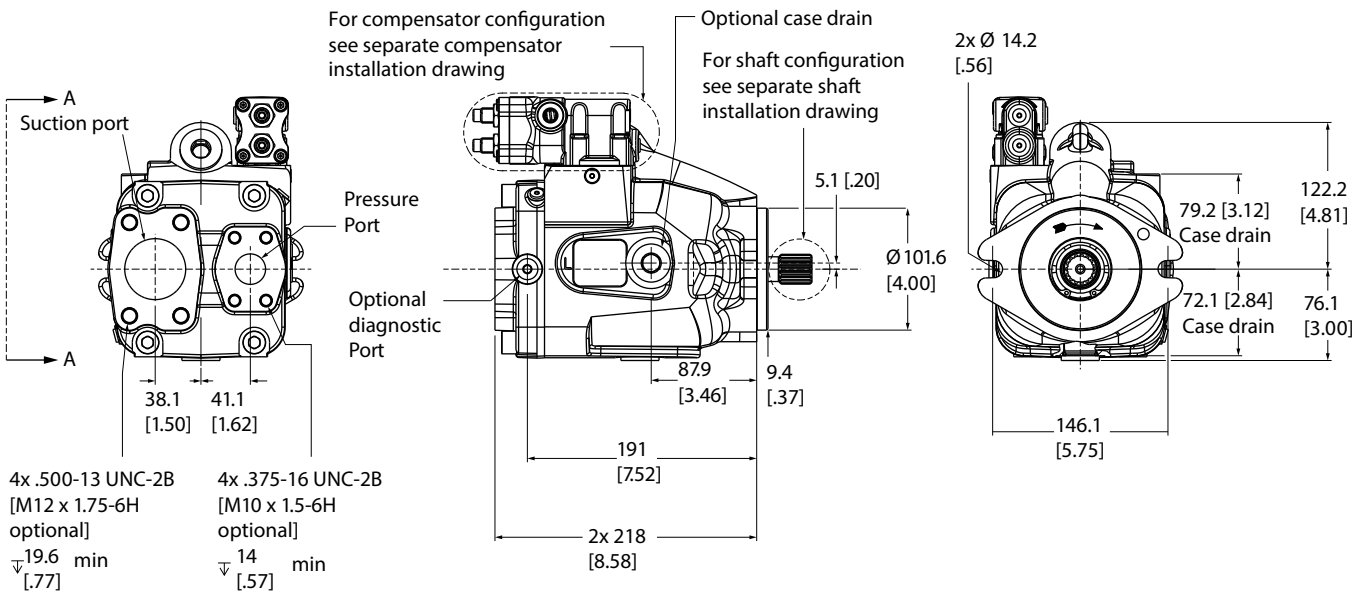
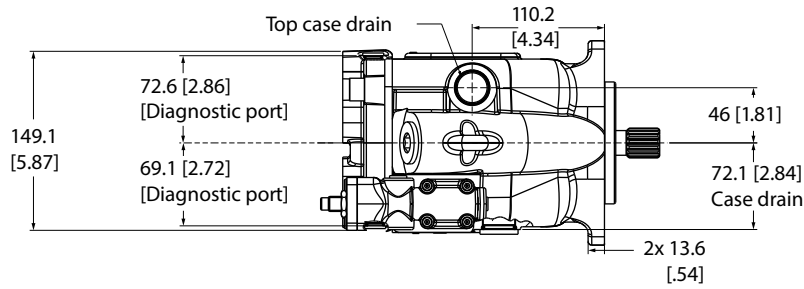
Input torque and case flow cut-off @ 49° C (120° F)



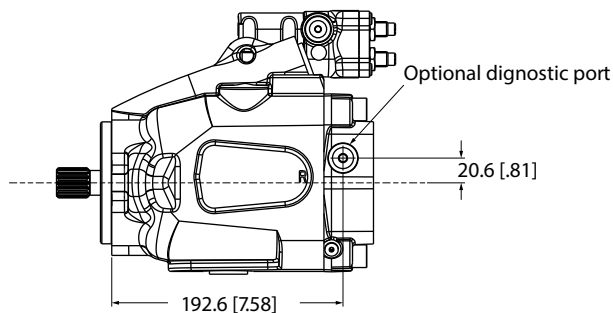
Pump installation

B-Mount - rear-ported

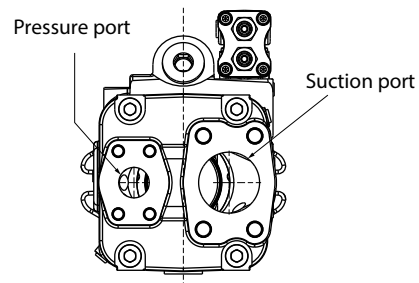
RH Rotation



View A-A



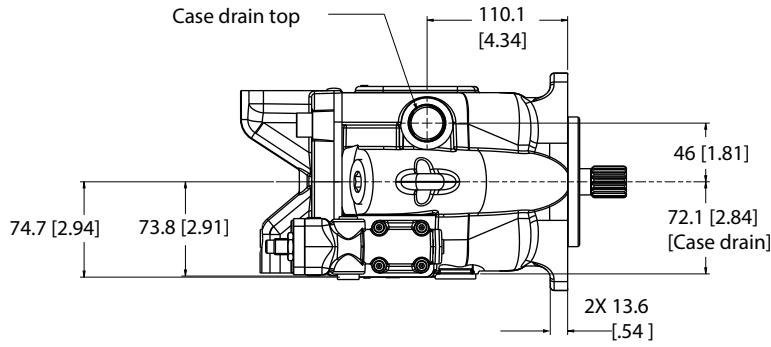
LH Rotation



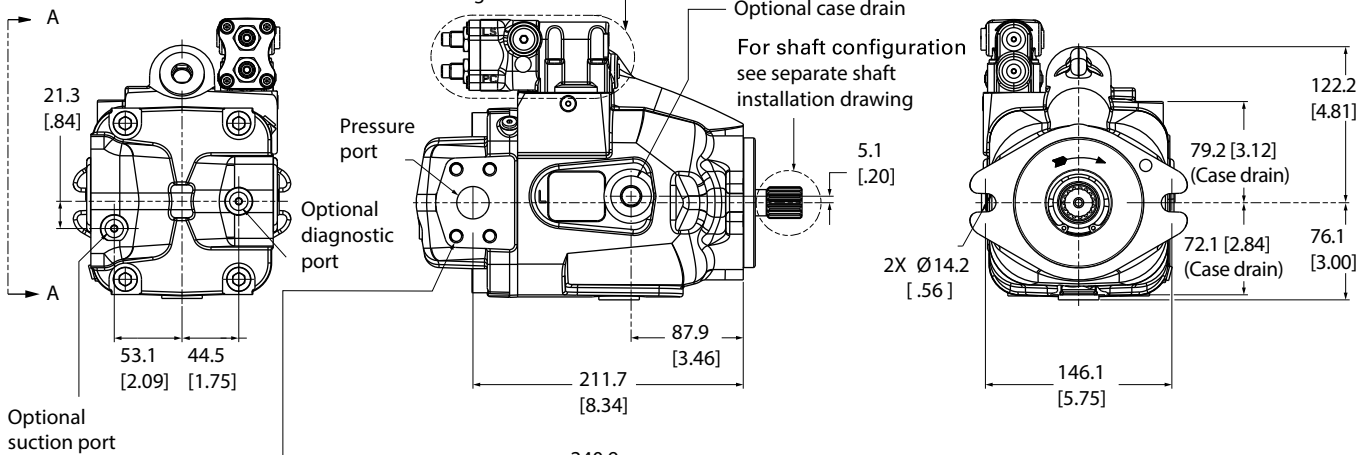
Pump installation

B-Mount - side-ported

RH Rotation



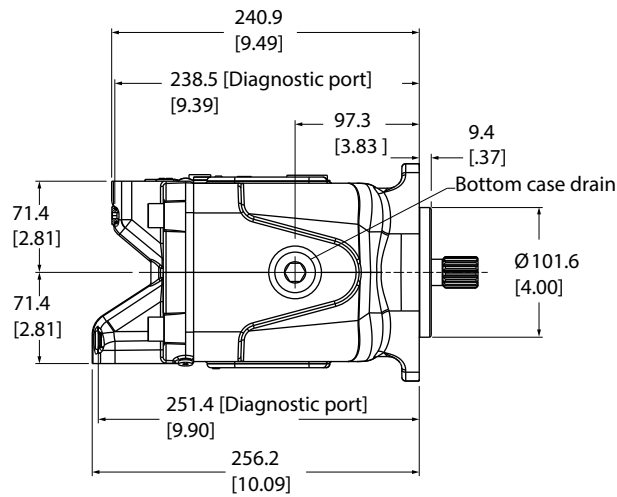
For compensator configuration see separate compensator installation drawing



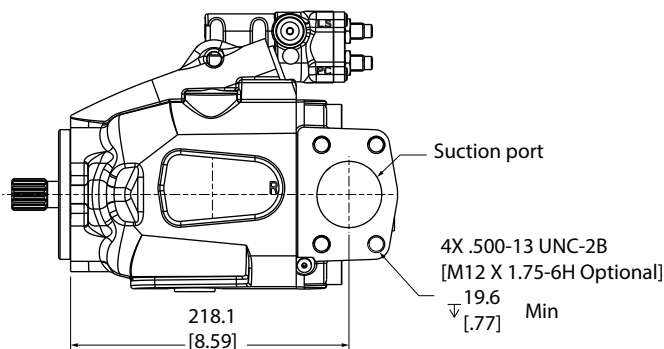
Optional case drain
For shaft configuration see separate shaft installation drawing

Optional suction port

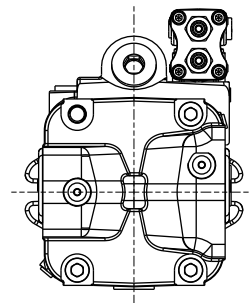
4X .375-16 UNC-2B
[M10 X 1.5-6H Optional]
∇ 14 Min
[.55]



View A-A



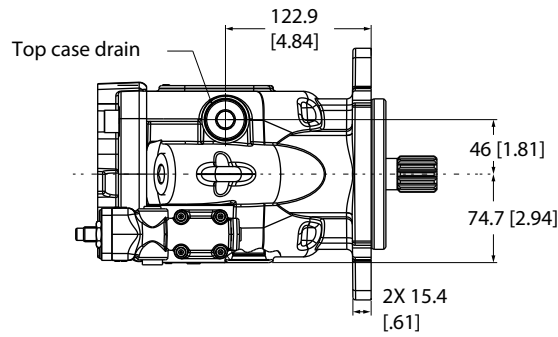
LH Rotation



Pump installation

C-Mount - rear-ported

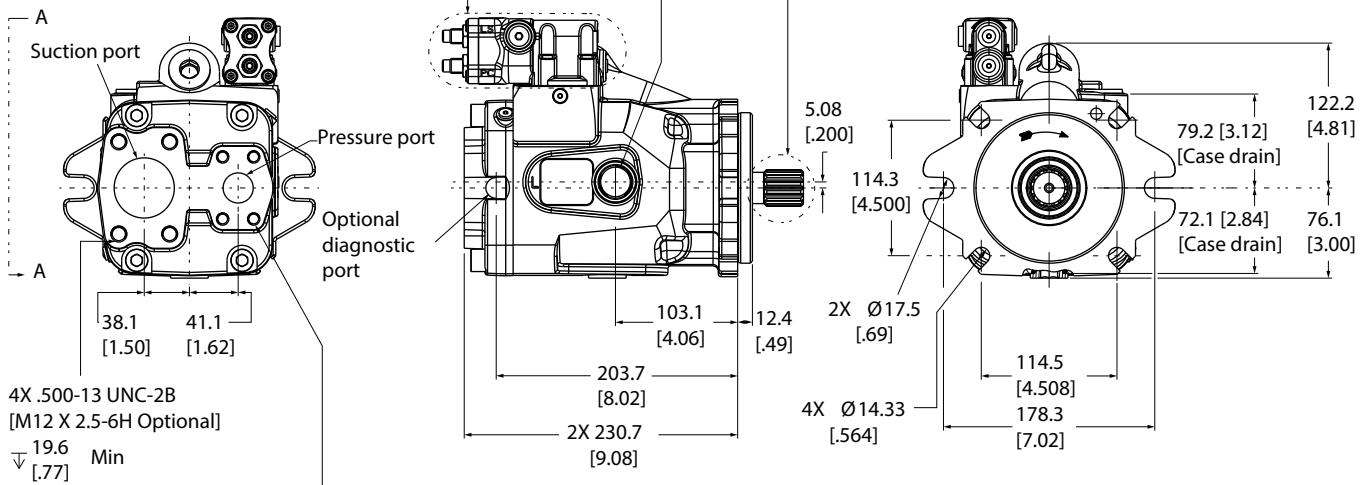
RH Rotation



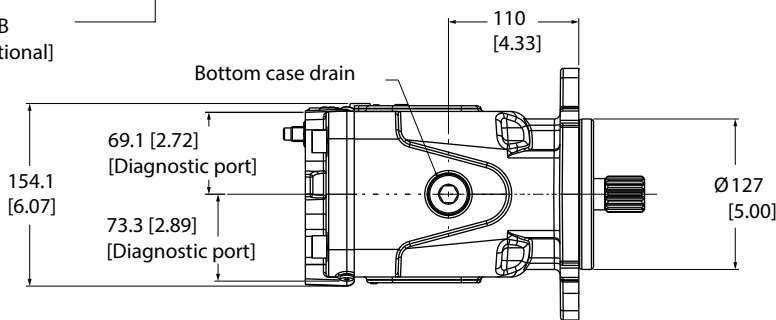
For compensator configuration see separate compensator installation drawing

Optional case drain

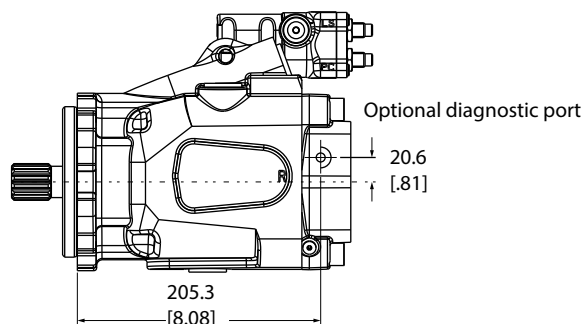
For shaft configuration see separate shaft installation drawing



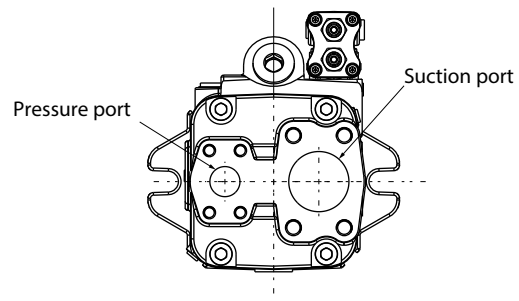
4X .500-13 UNC-2B [M12 X 2.5-6H Optional]
19.6 Min [77]
4X .375-16 UNC-2B [M10 X 1.5-6H Optional]
14 Min [57]



View A-A



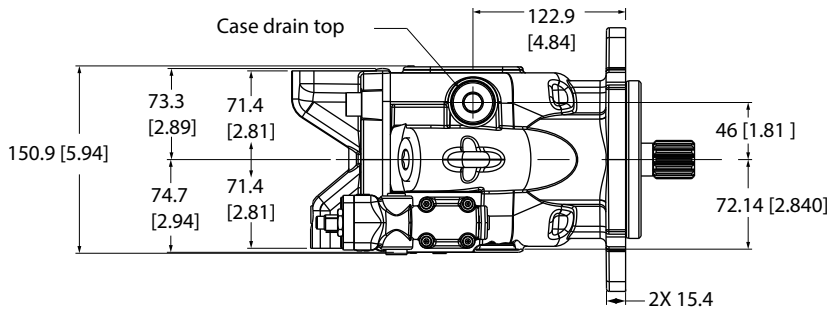
LH Rotation



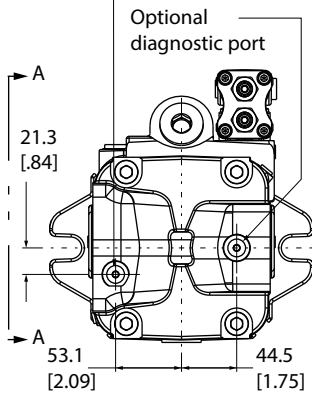
Pump installation

C-Mount - side-ported

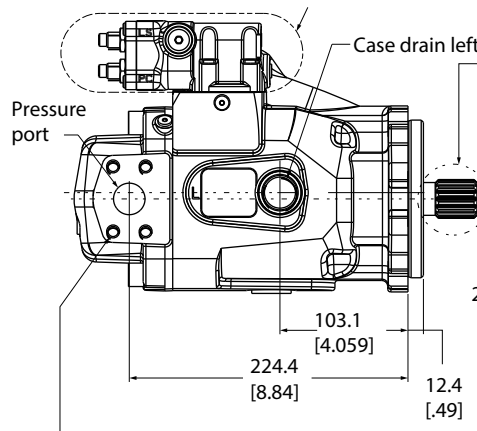
RH Rotation



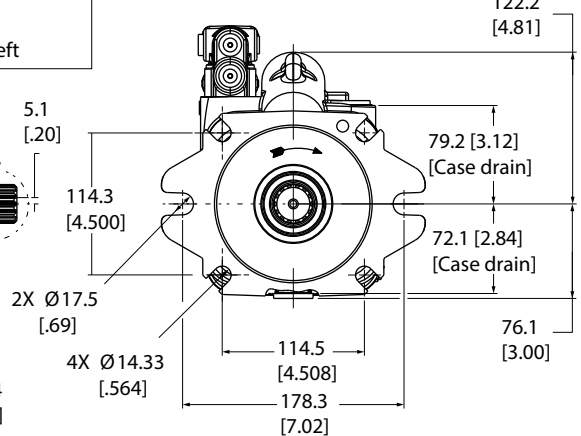
Optional suction port



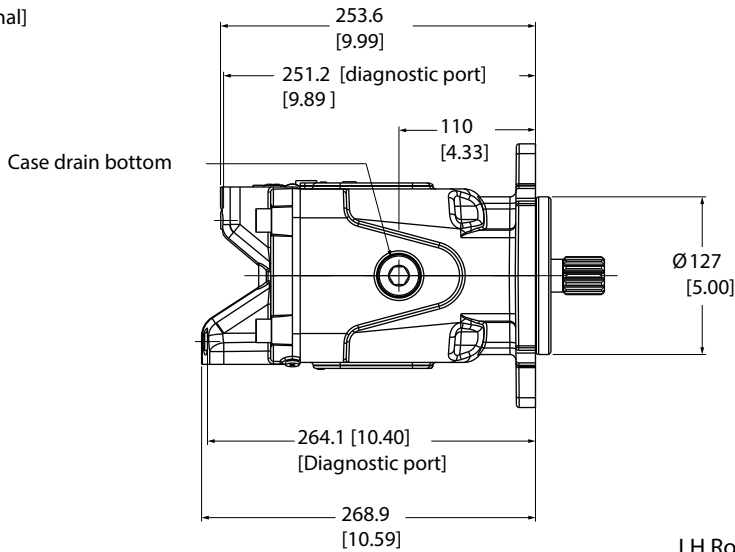
For compensator configuration see separate compensator installation drawing



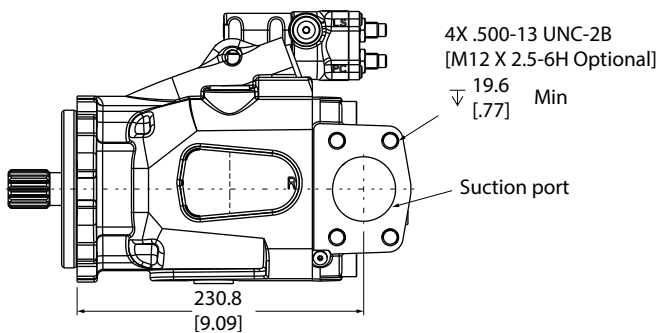
For shaft configuration see separate shaft installation drawing



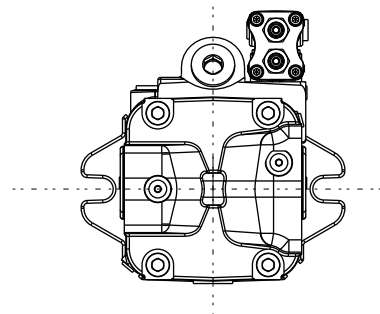
4X .375-16 UNC-2B
[M10 X 1.5-6H Optional]
14
▽ [.57] Min



View A-A



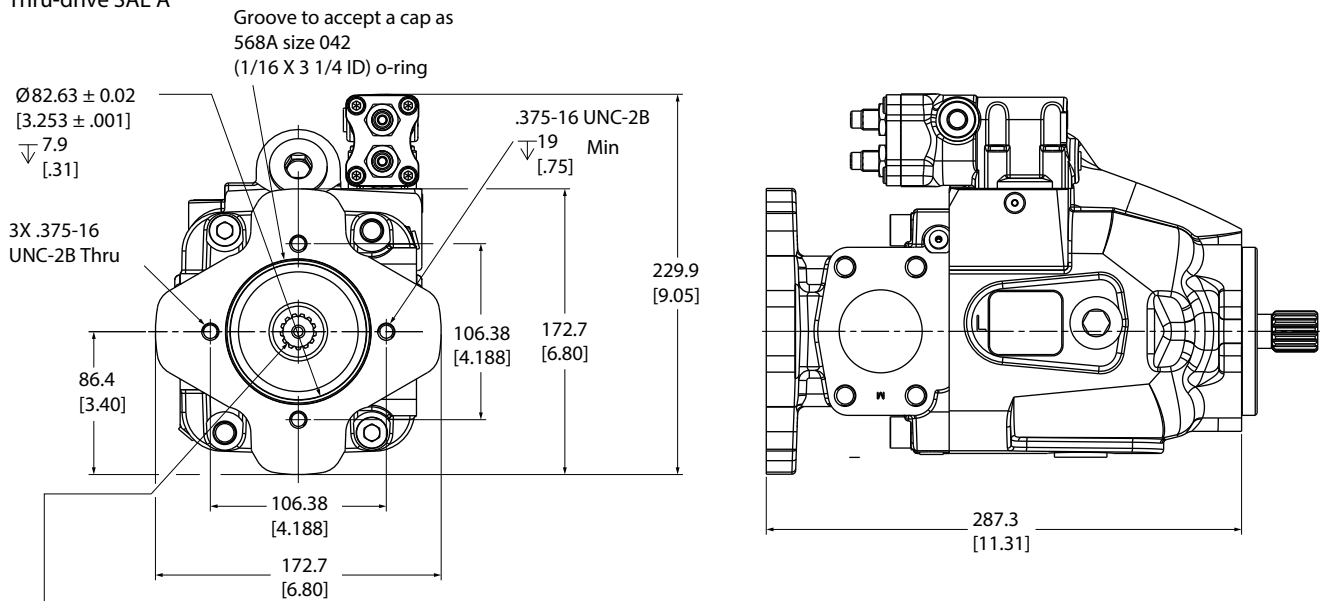
LH Rotation



Pump installation

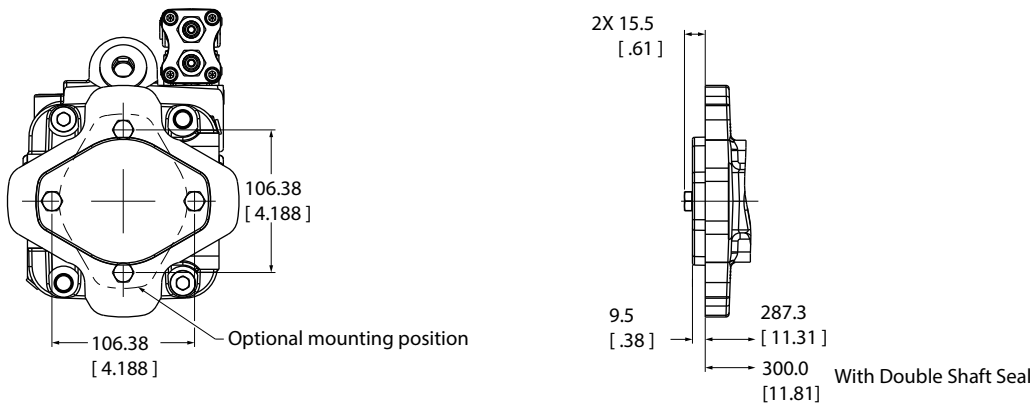
Thru-Drive SAE A

Thru-drive SAE A



For output shaft configuration see separate output shaft installation drawing

SAE A Thru-drive cover plate installation



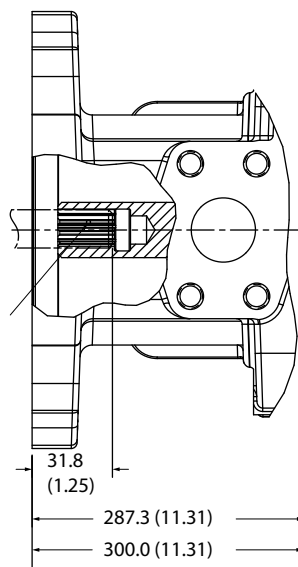
Output shaft installation

9T spline
 Maximum torque 75 Nm
 (660 in-lbf)

$\varnothing 16.54$ (.651) 9 tooth 30° flat root side fit 16/32 class 5 internal spline per ANSI B92.1

Accepts 9 tooth 30° flat root side fit 16/32 external splines per SAE J498B class 1 or ANSI B92.1 class 5 with 31.8 (1.25) extension from mounting flange

Additional units driven by this spline must not require more than 74.6 N-m (55 Lbf-ft) of torque



With double shaft seal and C-mount

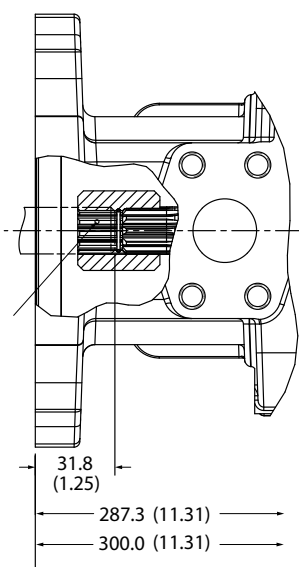
Output shaft installation

11T spline
 Maximum torque 119 Nm
 (1056 in-lbf)

$\varnothing 19.33$ (.761) 11 tooth 30° flat root side fit 16/32 class 1 internal spline per SAE J498B

Accepts 11 tooth 30° flat root side fit 16/32 external splines per SAE J498B class 1 or ANSI B92.1 class 5 with 31.8 (1.25) extension from mounting flange

Additional units driven by this spline must not require more than 118.6 N-m (88 Lbf-ft) of torque



With double shaft seal and C-mount

Pump installation

Thru-Drive SAE B

Thru-drive SAE B

Ø101.68 ± 0.02
[4.003 ± .001]

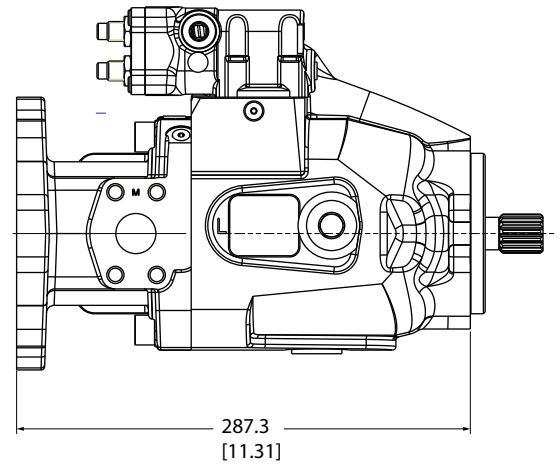
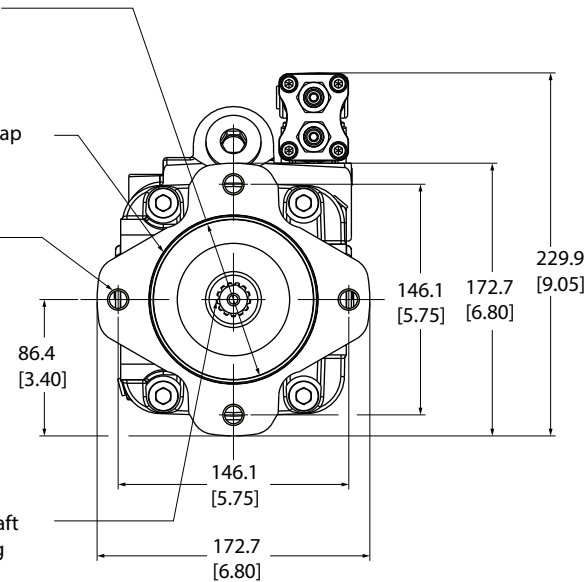
10.4
↓
[.41]

Groove to accept a cap
as 568A size 045
(1/16 X 4 ID) O-Ring

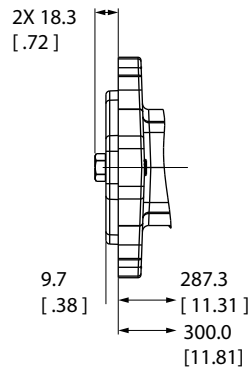
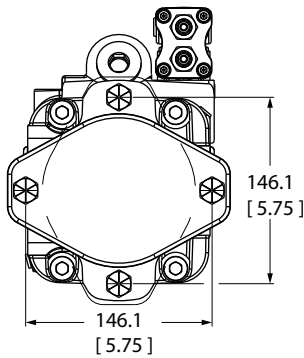
4X .500-13
UNC-2B Thru

86.4
[3.40]

For output shaft
configuration see
separate output shaft
installation drawing



SAE B thru-drive cover plate installation



Double shaft seal c-mount

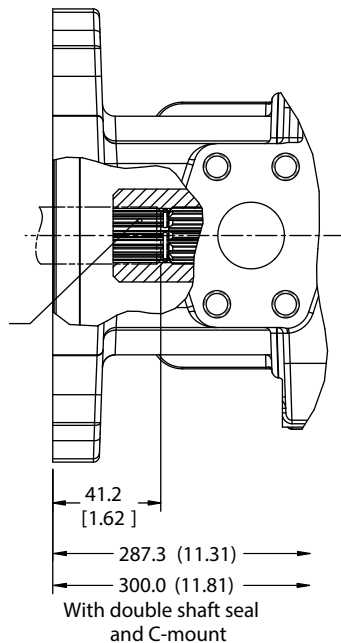
Output shaft installation

13T spline

Maximum torque 209 Nm
(1850 in-lbf)

Ø22.5 (.886) 13 tooth 30° flat
root side fit 16/32 class 1
internal spline per SAE J498B

Accepts 13 tooth 30° flat root
side fit 16/32 external splines
per SAE J498B class 1 or ANSI
B92.1 class 5 with 41.2 (1.62)
extension from mounting flange



With double shaft seal
and C-mount

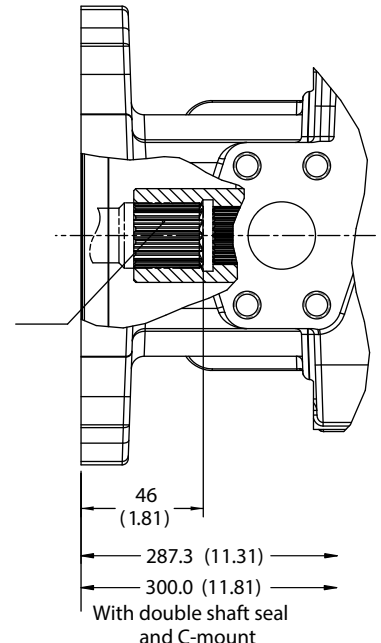
Output shaft installation

13T spline

Maximum torque 337 Nm
(2987 in-lbf)

Ø25.5 (1.006) 15 tooth 30° flat
root side fit 16/32 internal
spline per ASA B5.15-1960

Accepts 15 tooth 30° flat root
side fit 16/32 external splines
per SAE J498B class 1 or ANSI
B92.1 class 5 with 46 (1.81)
extension from mounting flange

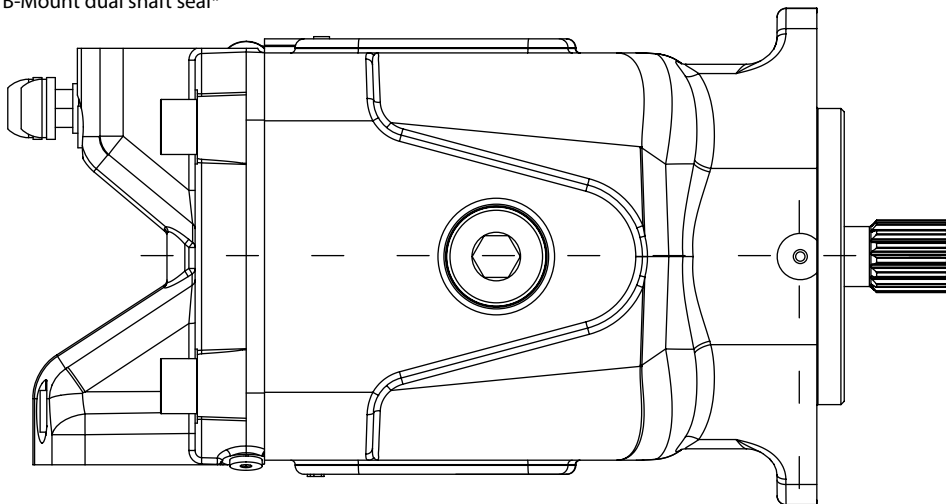


With double shaft seal
and C-mount

Pump installation

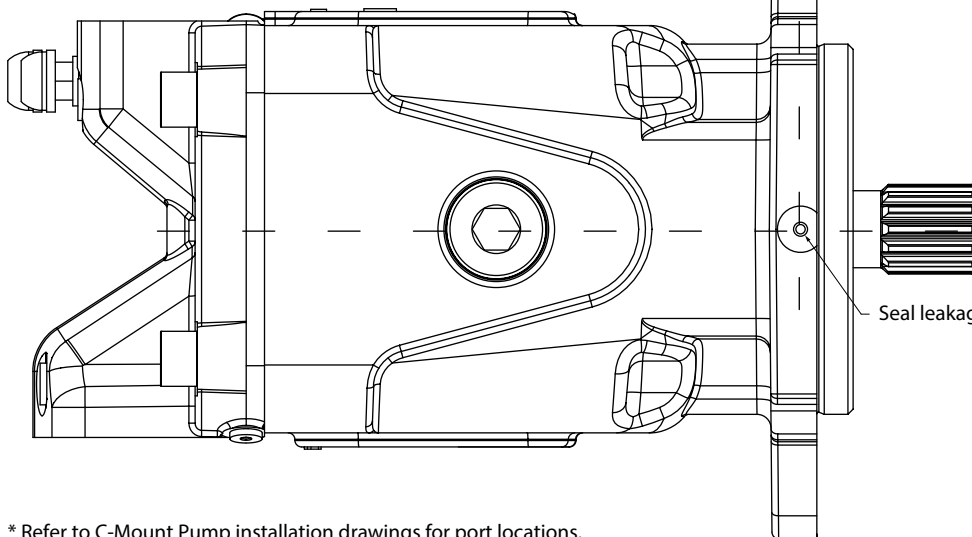
Dual shaft seal option

B-Mount dual shaft seal*

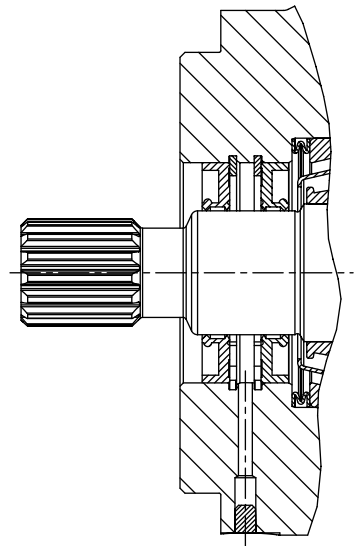


5.7 (.22)

C-Mount dual shaft seal*



Seal leakage drain (VHO filter optional)

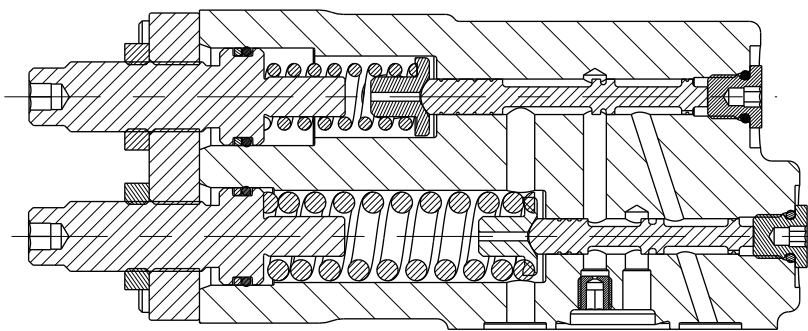
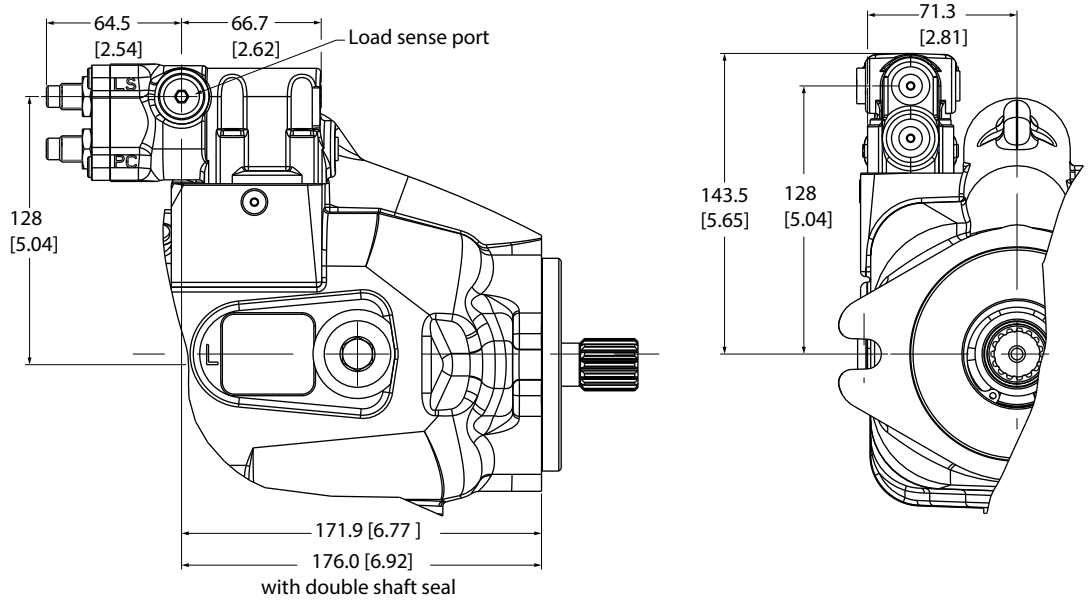


Cross section of dual shaft seal assembly

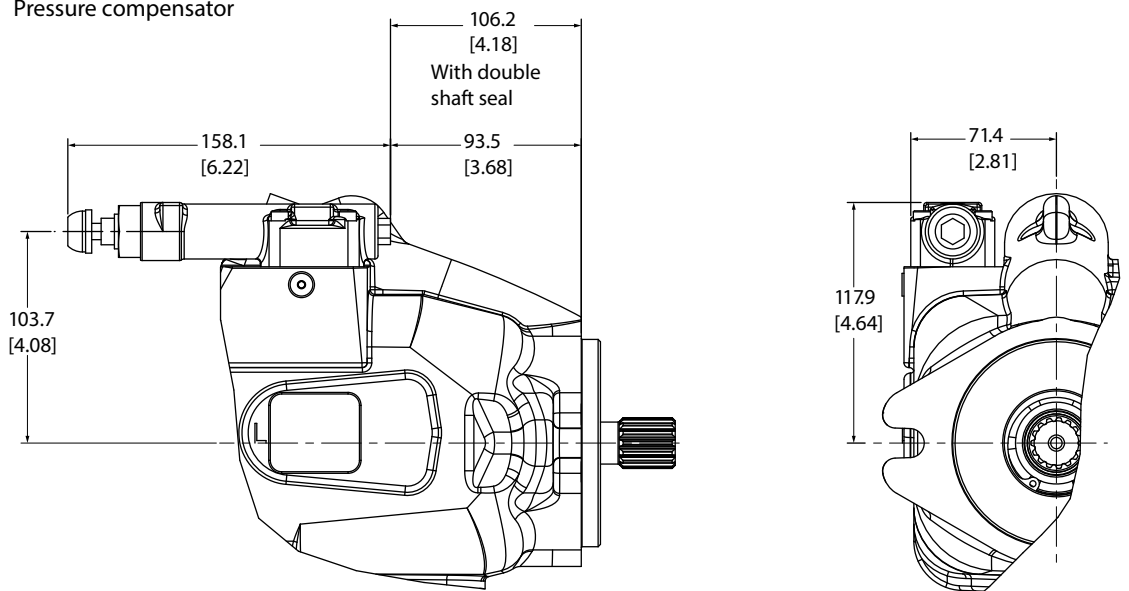
* Refer to C-Mount Pump installation drawings for port locations.

Control installation

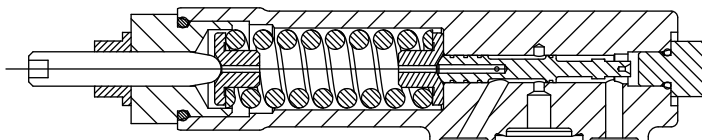
Pressure & Flow (Load Sense) Compensator



Pressure compensator

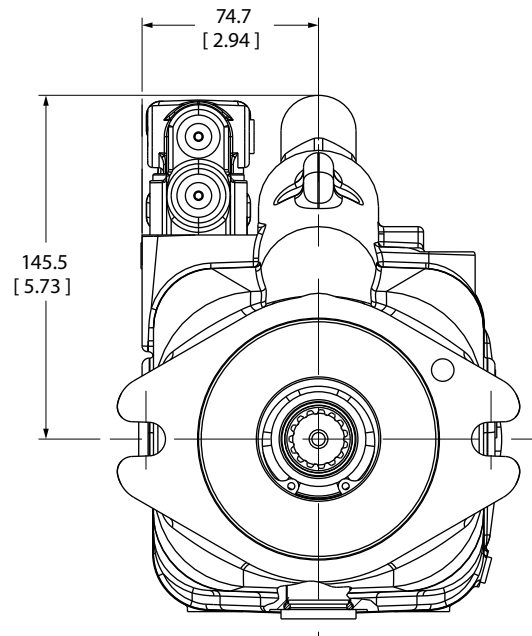
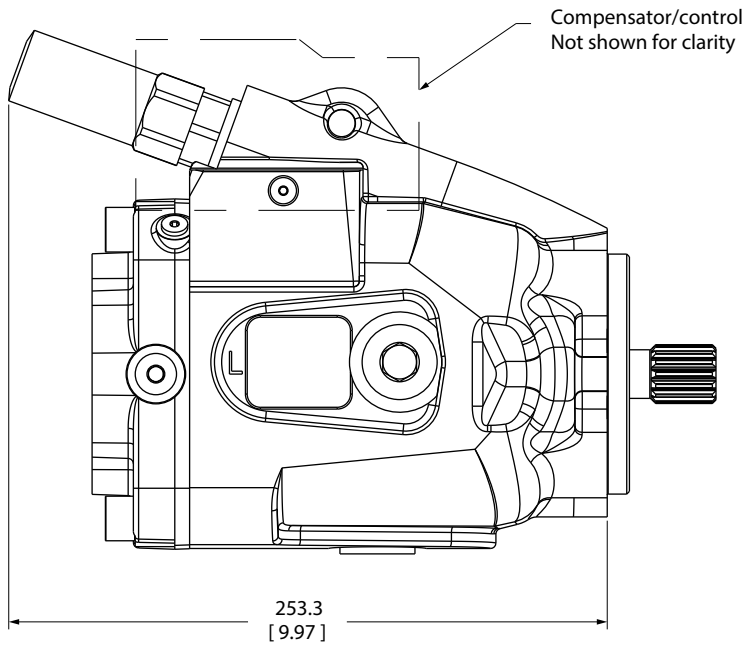


Section A-A



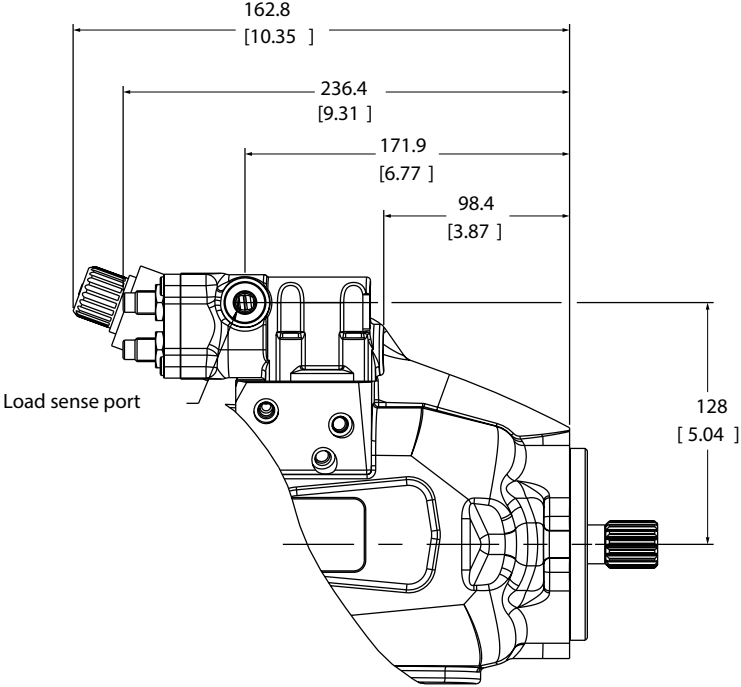
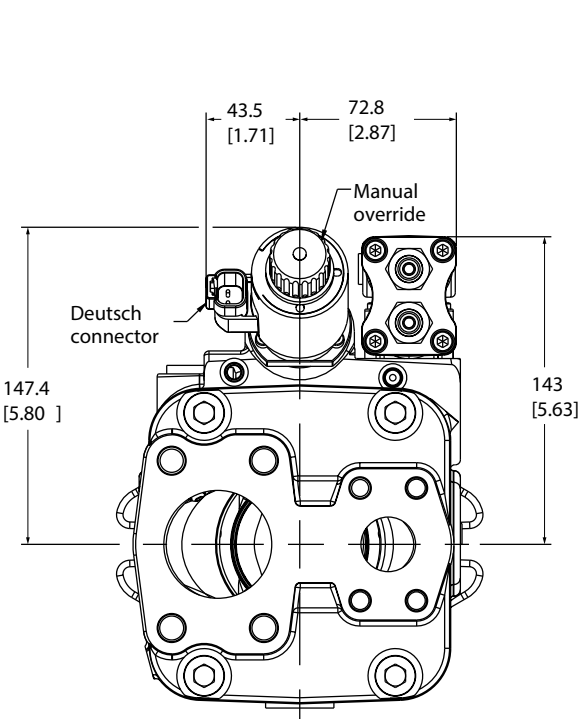
Control installation

Torque Control



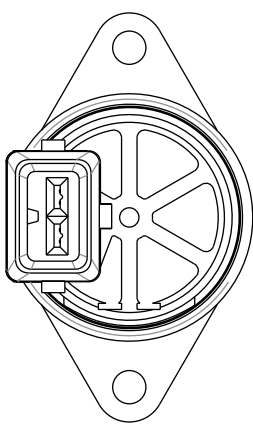
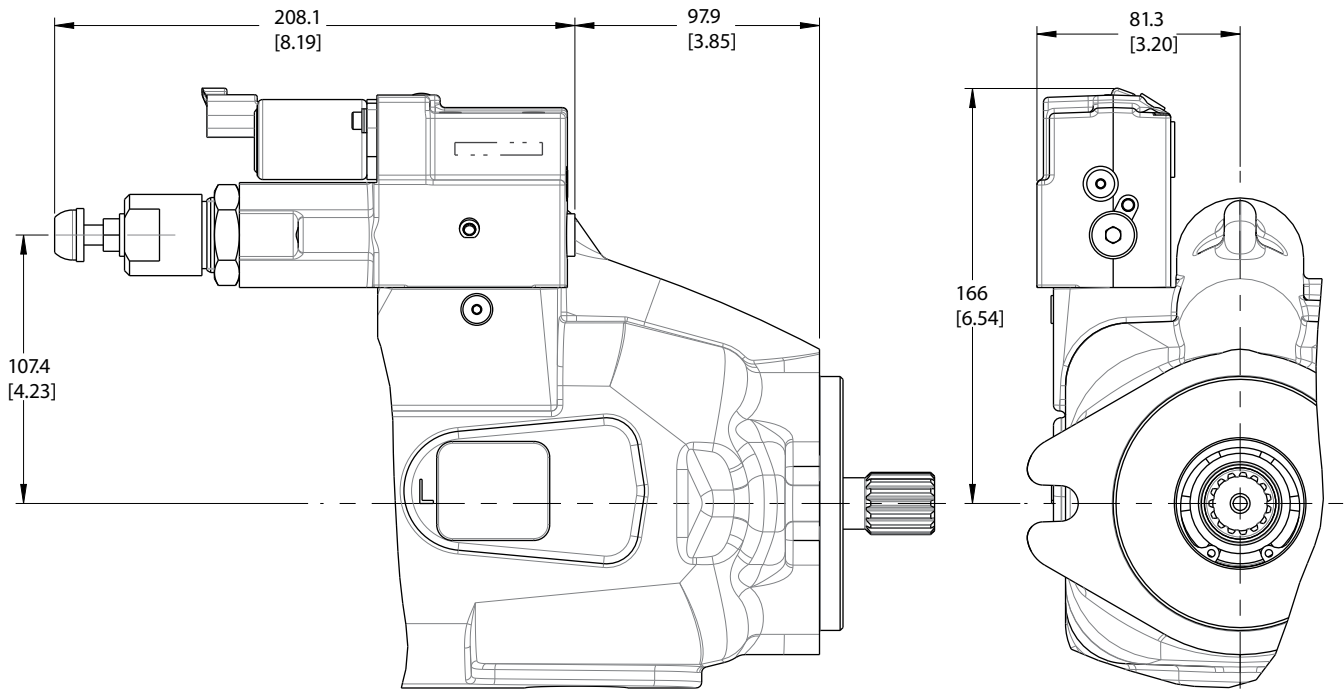
Control installation

Electronic Displacement Control (EDC)

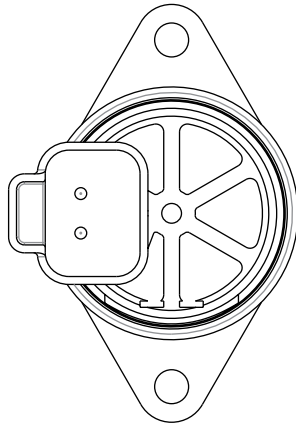


Control installation

EH Inverse Proportional Pressure Control (IPPC)



AMP connector

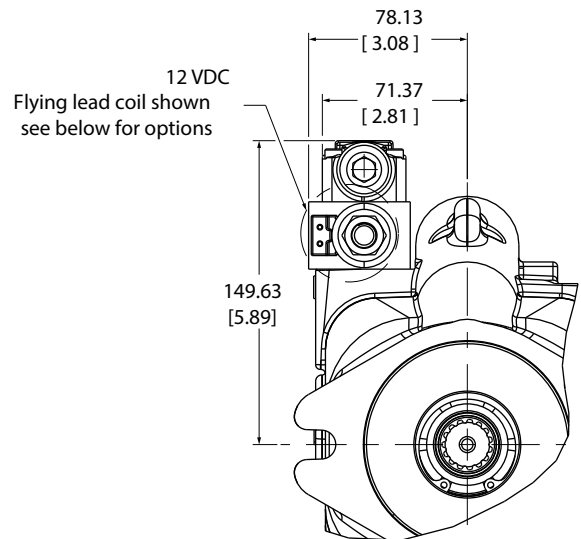
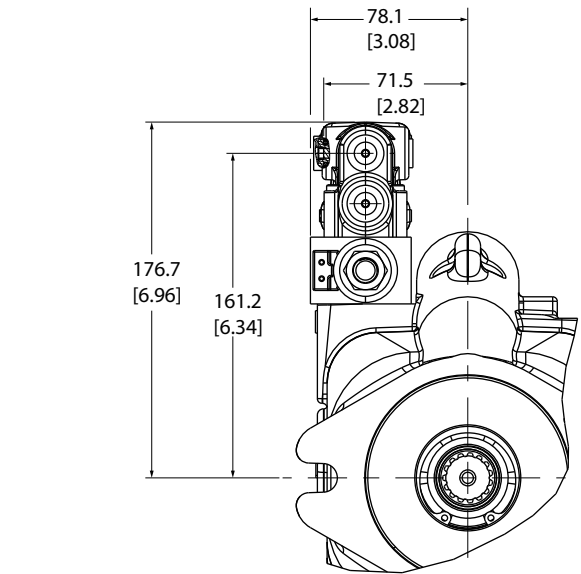
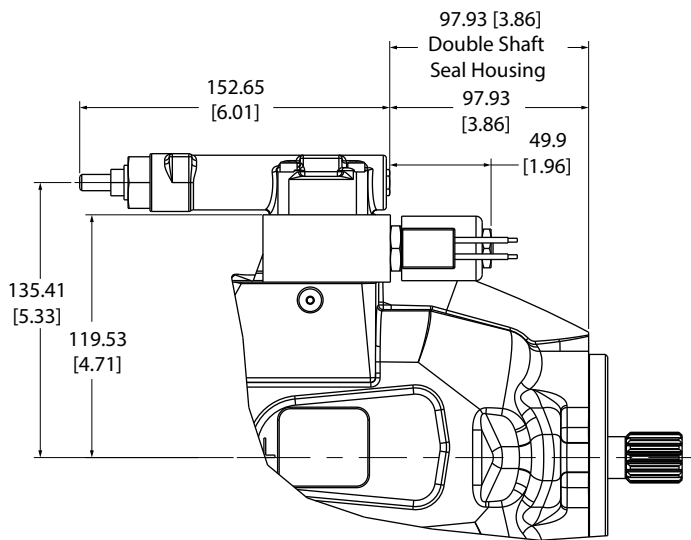
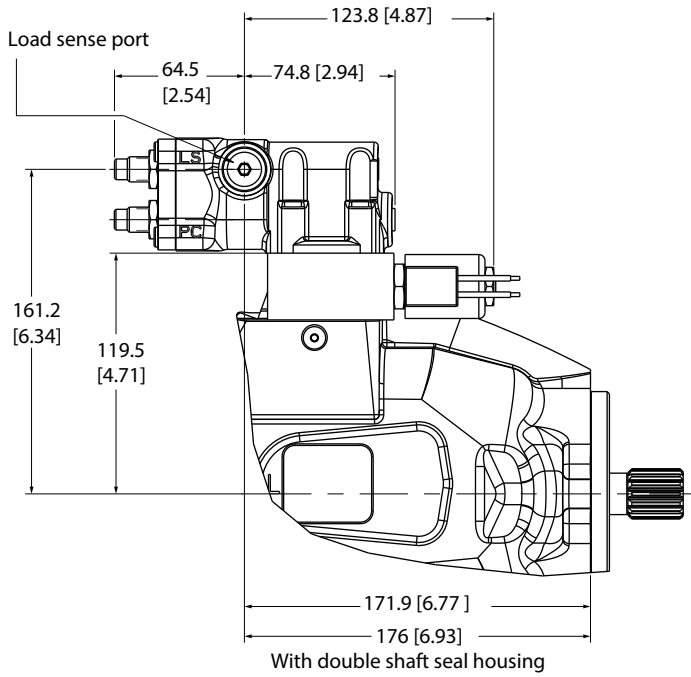


Deutsch connector

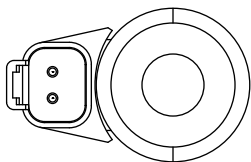
Control installation

Electronic De-stroke (Cold Start) Valve

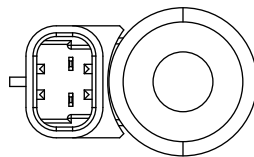
Cold start valve



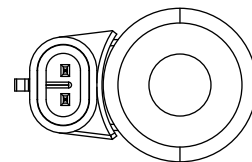
Optional connectors



Deutsch option



Metri-pack 280 option

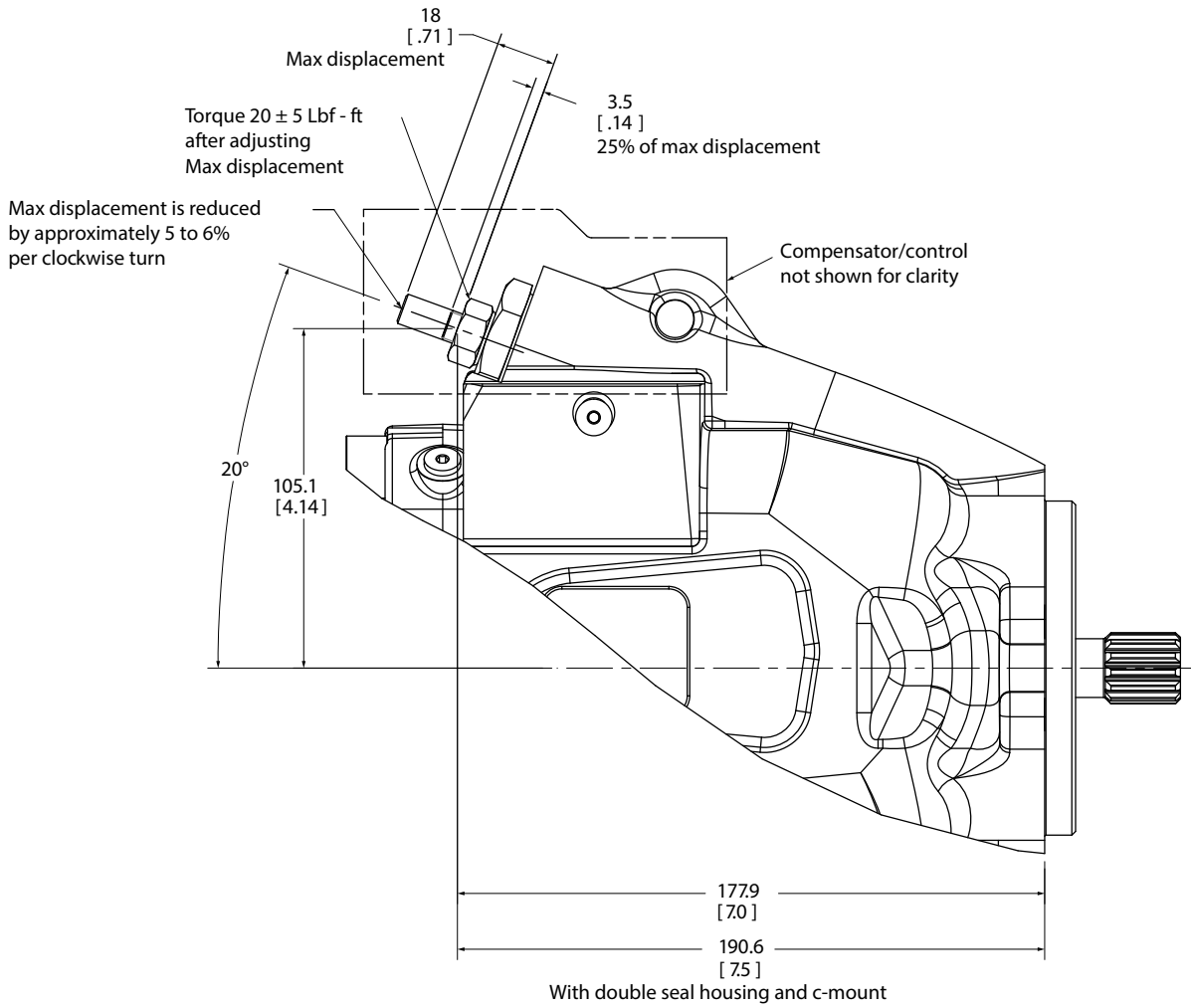


Metri-pack 150 option

Control installation

External Manual Stroke Adjustment

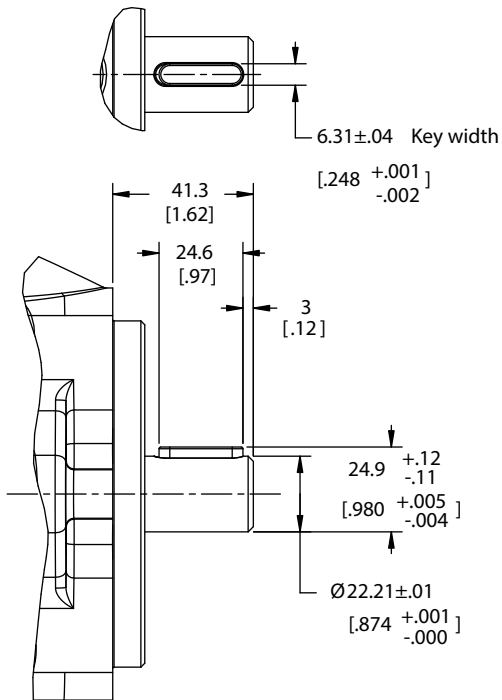
Maximum stroke limiter



Input shaft options

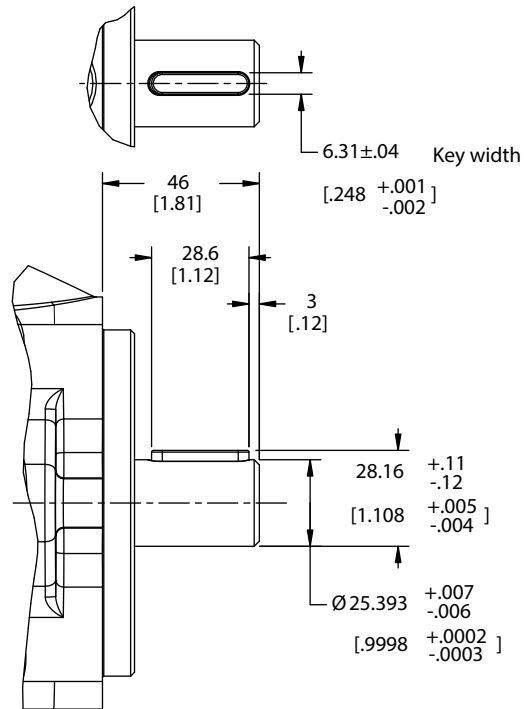
01 Code

Maximum torque 209 Nm (1850 in-lbf)



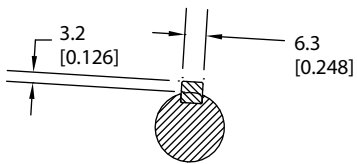
02 Code

Maximum torque 337 Nm (2987 in-lbf)

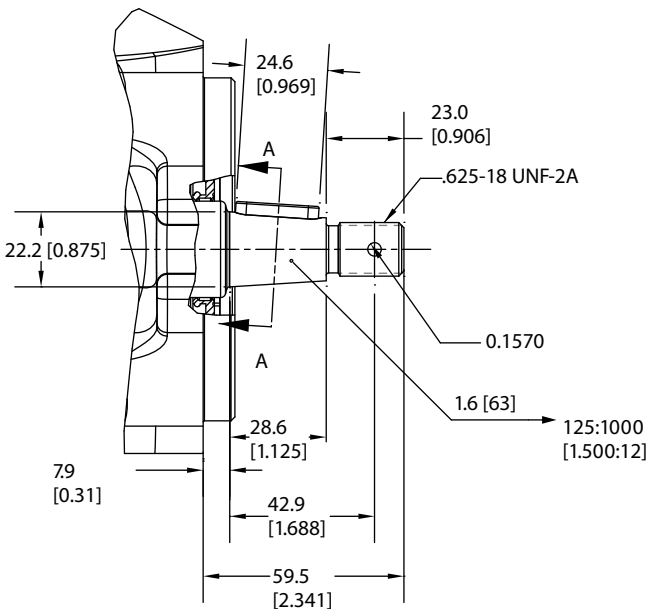


03 Code

Maximum torque 209 Nm (1850 in-lbf)

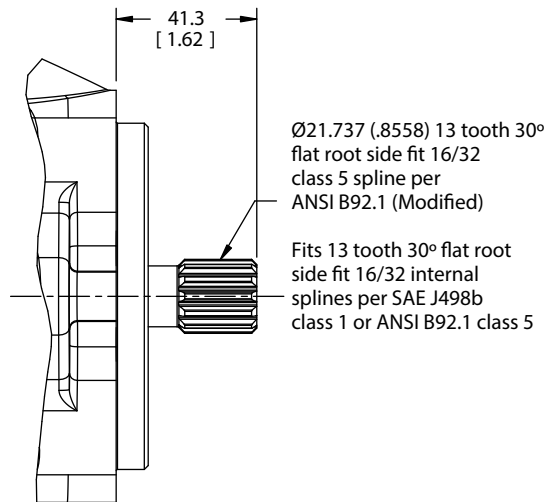


Section A-A



05 Code

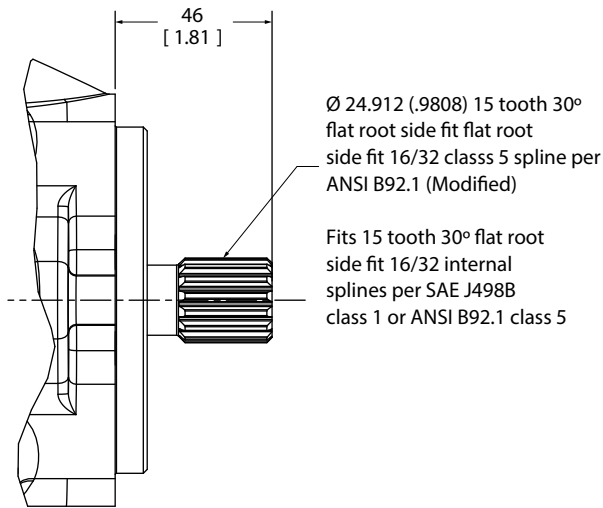
Maximum torque 307 Nm (2717 in-lbf)



Input shaft options

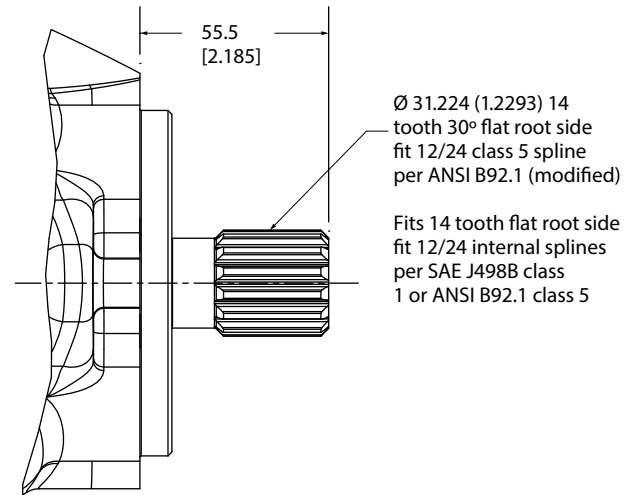
08 Code

Maximum torque 397 Nm (3514 in-lbf)



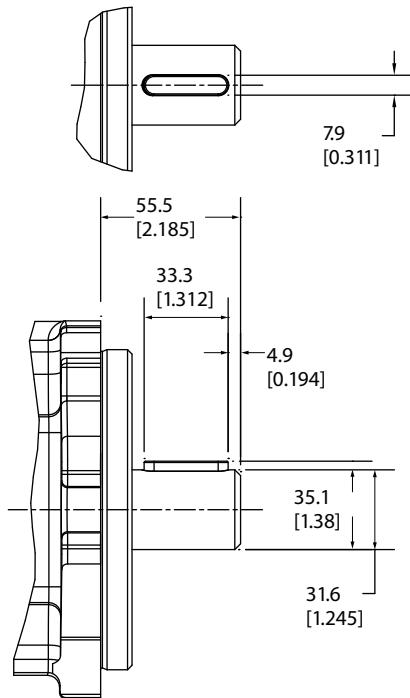
32 Code

Maximum torque 640 Nm (5660 in-lbf)



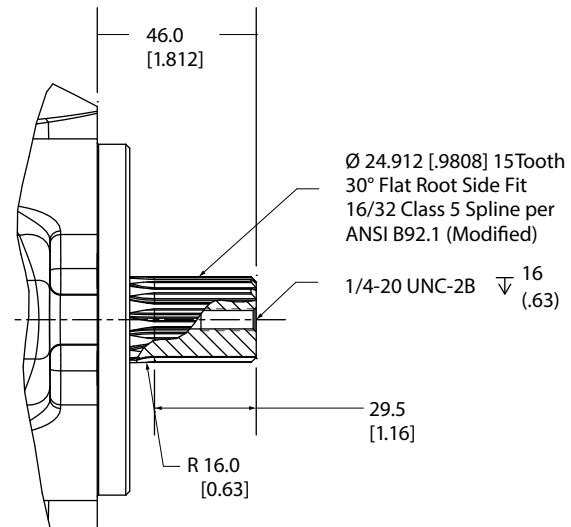
33 Code

Maximum torque 450 Nm (3980 in-lbf)



34 Code

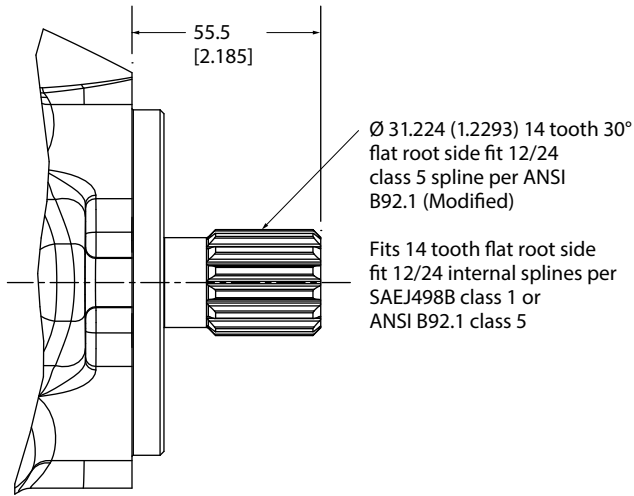
Maximum torque 397 Nm (3514 in-lbf)



Input shaft options

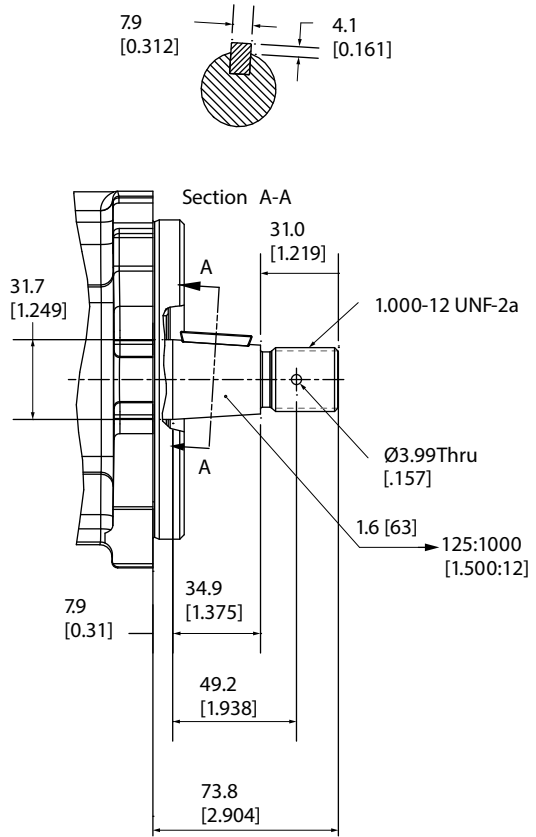
35 Code

Maximum torque 640 Nm (5660 in-lbf)

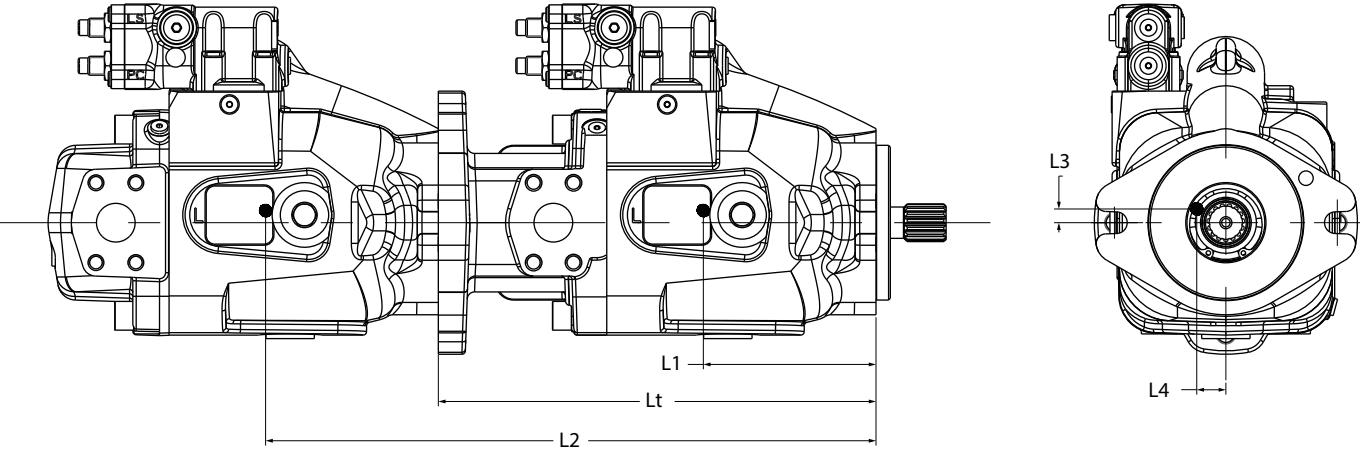


38 Code

Maximum torque 450 Nm (3980 in-lbf)



Center of gravity



	Rear Port			Side Port			Thru-Drive			Length	Dual Seal
	Lcg	L3	L4	Lcg	L3	L4	Lcg	L3	L4	Lt	Lds
ADU041	109.6 (4.31)	9.6 (0.38)	2.9 (0.11)	114.7 (4.51)	9.2 (0.36)	2.4 (0.10)	131.5 (5.18)	8.2 (0.32)	2.1 (0.08)	287.3 (11.31)	13.0 (0.50)
ADU049	109.6 (4.31)	9.6 (0.38)	2.9 (0.11)	114.7 (4.51)	9.2 (0.36)	2.4 (0.10)	131.5 (5.18)	8.2 (0.32)	2.1 (0.08)	287.3 (11.31)	13.0 (0.50)
ADU062	109.9 (4.32)	9.4 (0.37)	2.9 (0.11)	114.9 (4.52)	9.0 (0.35)	2.4 (0.10)	131.3 (5.17)	8.0 (0.31)	2.1 (0.08)	287.3 (11.31)	13.0 (0.50)
ADU080	109.9 (4.32)	9.4 (0.37)	2.9 (0.11)	114.9 (4.52)	9.0 (0.35)	2.4 (0.10)	131.3 (5.17)	8.0 (0.31)	2.1 (0.08)	287.3 (11.31)	13.0 (0.50)

Examples: Calculation L1 and L2

Tandem ADU062 Thru-drive with ADU041 rear ported

$$L_1 = L_{cg} = 131.3\text{mm} \text{ (5.17 inches)}$$

$$L_2 = L_t + L_{cg} = 287.3\text{mm} + 109.6\text{mm} = 396.9\text{mm} \text{ (15.6 inches)}$$

Tandem dual seal ADU049 Thru-drive with ADU049 side ported

$$L_1 = L_{cg} + L_{ds} = 131.5\text{mm} + 13\text{mm} = 144.5\text{mm} \text{ (5.69 inches)}$$

$$L_2 = L_t + L_{ds} + L_{cg} = 287.3\text{mm} + 13\text{mm} + 114.7\text{mm} = 415\text{mm} \text{ (16.34 inches)}$$

Tandem pump applications

Danfoss recommends that tandem pump applications be provided with additional support to limit overhung loading of the mounting flange. The thru-drive alternate attachment points on the rear flange may be used with a customer designed support.

Installation and start-up

Warning: Care should be taken that mechanical and hydraulic resonances are avoided in the application of the pump. Such resonances can seriously compromise the life and/or safe operation of the pump.

Drive data

Mounting attitude should be horizontal using the appropriate case drain ports to ensure that the case remains full of fluid at all times. Consult your local Danfoss Representative if a different arrangement is required.

In those cases where geometric tolerances of mounting are critical, or where specific tolerance ranges are required and not specified, consult Danfoss Engineering for specific limits.

Direction of shaft rotation, viewed from the prime mover end, must be as indicated in the model designation on the pump – either right hand (clockwise) or left hand (counterclockwise).

Direct coaxial drive through a flexible coupling is recommended. If drives imposing radial shaft loads are considered, please consult your Danfoss Representative.

Start-up procedure

Make sure the reservoir and circuit are clean and free of dirt/debris prior to filling with hydraulic fluid.

Fill the reservoir with filtered oil and fill to a level sufficient enough to prevent vortexing at the suction connection to pump inlet. It is good practice to clean the system by flushing and filtering, using an external slave pump.

Caution: Before the pump is started, fill the case through the uppermost drain port with hydraulic fluid of the type to be used. The case drain line must be connected directly to the reservoir and must terminate below the oil level.

Once the pump is started, it should prime within a few seconds. If the pump does not prime, check to make sure that there are no restrictions between the reservoir and the inlet to the pump, and that the pump is being rotated in the proper direction, and that there are no air leaks in the inlet line and connections. Also check to make sure that trapped air can escape at the pump outlet.

After the pump is primed, tighten the loose outlet connections, then operate for five to ten minutes (unloaded) to remove all trapped air from the circuit.

If the reservoir has a sight gage, make sure the fluid is clear – not milky.

Fluid cleanliness

The 420 Series pumps are rated in anti-wear petroleum fluids with a contamination level of 21/18/13 per ISO 4406. Operation in fluids with levels more contaminated than this is not recommended. Fluids other than petroleum, severe service cycles, or temperature extremes are cause for adjustment of these codes. Please contact your Danfoss Representative for specific duty cycle recommendation.

Danfoss 420 Series pumps, as with any variable displacement piston pumps, will operate with apparent satisfaction in fluids up to the rating specified here. Experience has shown however, that pump and hydraulic system life is not optimized with high fluid contamination levels (high ISO cleanliness codes).

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials, and additives for protection against wear of components, elevated viscosity and inclusion of air .

Essential information on the correct methods for treating hydraulic fluid is included in Danfoss publication 561 – “Danfoss Guide to Systemic Contamination Control” – available from your local Danfoss distributor. In this publication, filtration and cleanliness levels for extending the life of axial piston pumps and other system components are listed. Included is an excellent discussion of the selection of products needed to control fluid condition .

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Danfoss Power Solutions (US) Company
2800 East 13th Street
Ames, IA 50010, USA
Phone: +1 515 239 6000

Danfoss Power Solutions GmbH & Co. OHG
Krokamp 35
D-24539 Neumünster, Germany
Phone: +49 4321 871 0

Danfoss Power Solutions ApS
Nordborgvej 81
DK-6430 Nordborg, Denmark
Phone: +45 7488 2222

Danfoss Power Solutions Trading (Shanghai) Co., Ltd.
Building #22, No. 1000 Jin Hai Rd
Jin Qiao, Pudong New District
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Phone: +86 21 2080 6201

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