

No. 11-866
Revised June, 1997

Eaton®
Heavy Duty Hydrostatic Transmissions



Models 33 through 76
Hydrostatic Transmissions

We Manufacture

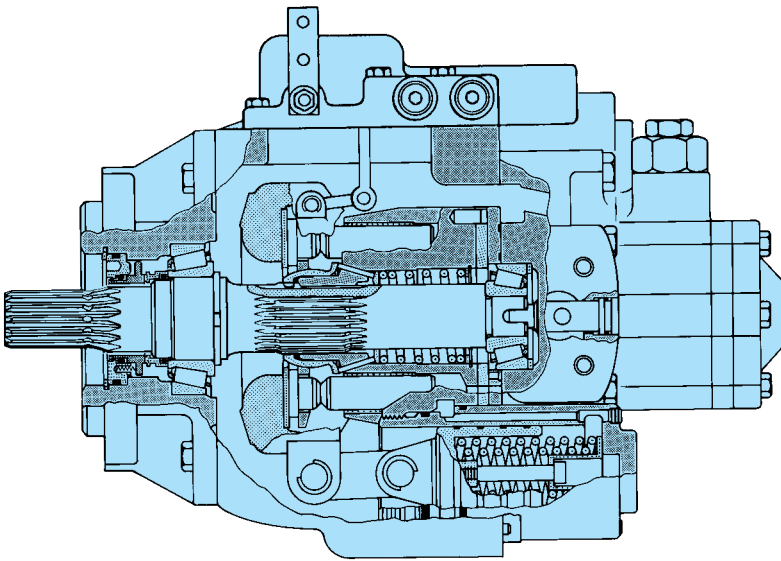
Solutions

Hydraulics

Specialty Hydraulic Components

Heavy Duty Features/Benefits

- **6000 PSI Pressure Rating**
 - **Speeds to 4510 RPM**
 - **10,000 Hour B10 Bearing Design Life**
 - **3 Year Warranty**



Variable Pump

Advanced cylinder barrel design – permits high speed and pressure.

Fixed clearance slipper hold down – on Models 33 through 64 allows operation at high speed and reduces friction. Model 76 is a ball guide unit.

Pistons – have long engagement with cylinder bore resulting in low leakage.

Hydraulic servo control – provides low effort operation with low control pressure. Large servo pistons hold swashplate position and provide damping.

Large case drain ports – minimize case back pressure.

Drive shafts – a wide variety of options are available to suit every need.

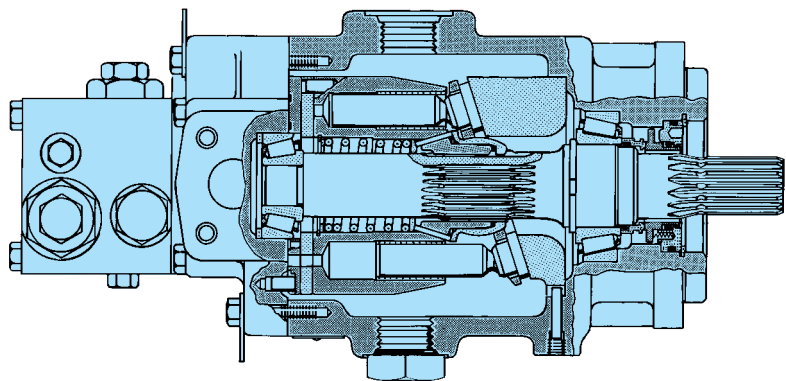
High strength swashplates on variable pumps and motors – resist deflection under high load.

High strength cast iron housings – provide greater noise damping and wall strength.

High flow check valves in pumps – keep the system primed with minimal pressure drop.

Charge pumps on pumps – gerotor type, several displacement options are available to suit the needs of every application. All cast iron construction.

Cartridge shaft seal – lends itself to easy serviceability. Mechanical face seal design tolerates high speed and high case pressures.



Fixed Motor

Heavy Duty Features/Benefits

Bi-metal bearing plate – has steel for high speed and pressure. Bronze provides greater bearing properties.

Valve plate – hardened steel for long life.

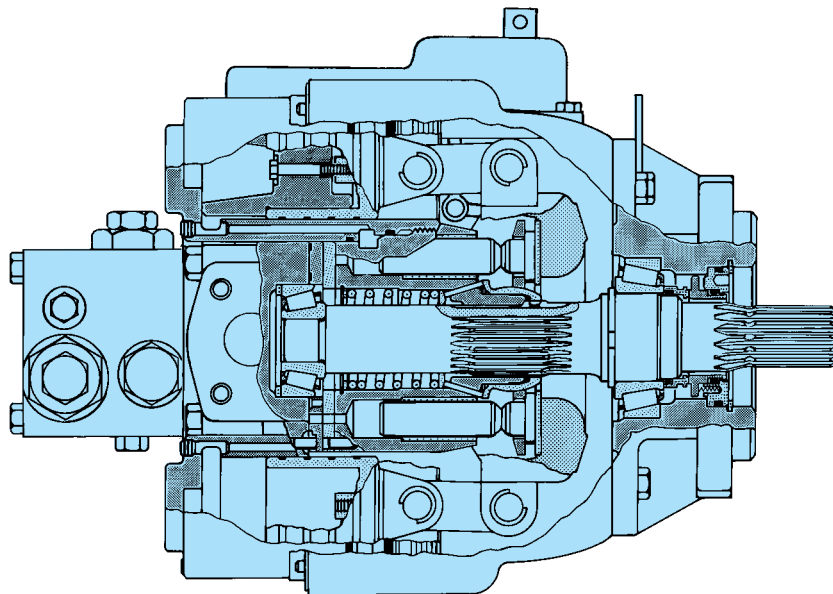
End cover – large passages minimizes losses. Both side and rear ports are available on Models 33 through 64 fixed motors.

C-Pad rear mount – available on Models 33 through 64 variable pumps for tandem units or for a through shaft.

Relief valves – pilot operated cartridge and fast acting direct types available.

Controls – a wide variety of control options are available for pumps and motors to meet application needs.

Ports – SAE code 61 and code 62 as well as o-ring boss ports are available.



Variable Motor

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Pump Performance

Pump Performance

Model		33	39	46	54	64	76
Displacement	in ³ /rev	3.32	3.89	4.60	5.44	6.44	7.62
	cm ³ /rev	54,4	63,7	75,3	89,1	105,5	124,8
Maximum Shaft Speed*	RPM @ 18°	4510**	4160	4160	3720	3720	2775
Peak Pressure***	PSI [bar]	6000 [415]	6000 [415]	6000 [415]	6000 [415]	6000 [415]	6000 [415]
Output Flow	GPM @ 3500 PSI	61.5	67.3	79.2	84.1	99.1	87.9
	LPM @ 241 bar	233	255	300	318	375	333
Input Torque	lb-in @ 3500 PSI	2049	2346	2786	3285	3900	4552
	Nm @ 241 bar	232	265	315	371	441	514

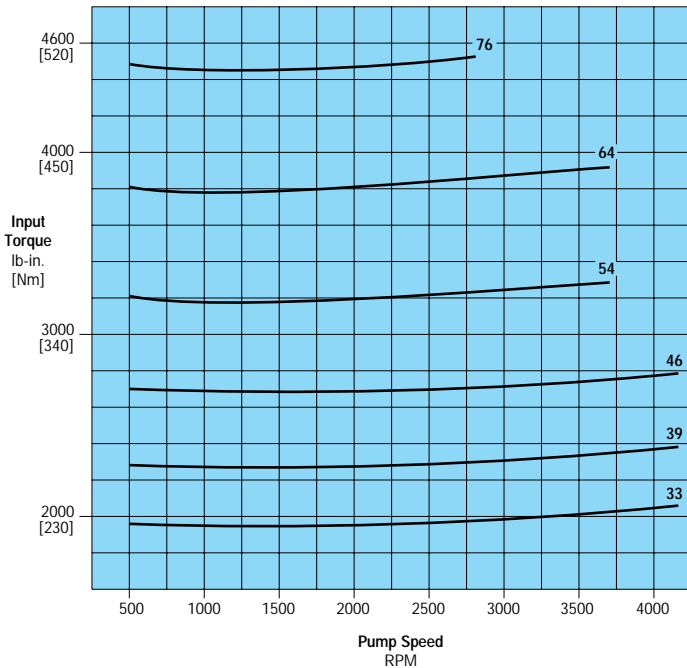
Pump performance calculated at 96% efficiency.

* The maximum pump shaft speed may be limited by the charge pump speed rating.

** The maximum swashplate angle on model 33 pumps is 15.5°.

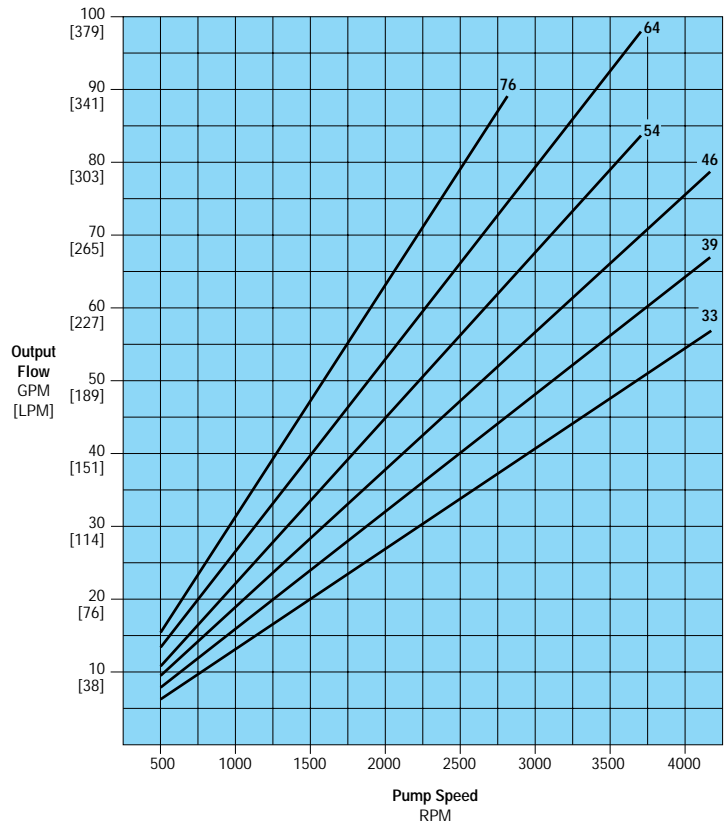
*** Peak pressure should not exceed 1% of operating time.

Input Torque vs Speed



System Pressure 3500 psi [240 bar]
 Charge Pressure 220 psi [15 bar]
 Oil Viscosity 60 SUS
 Temperature 180° F [82° C]

Output Flow vs Speed



Motor Performance

Motor Performance

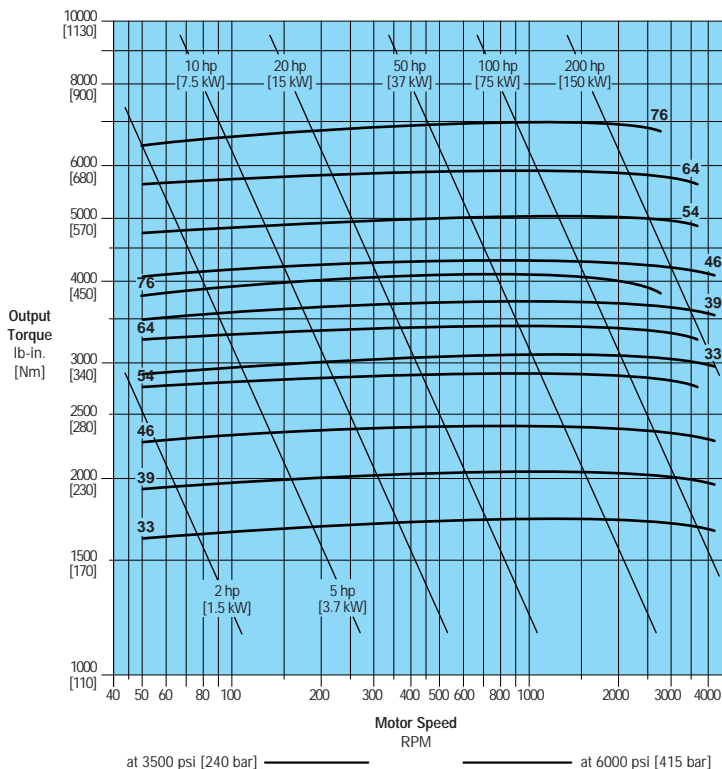
Model		33	39	46	54	64	76
Displacement	in ³ /rev	3.32	3.89	4.60	5.44	6.44	7.62
	cm ³ /rev	54,4	63,7	75,3	89,1	105,5	124,8
Maximum Shaft Speed	RPM @ 18°	4510*	4160	4160	3720	3720	2775
	RPM @ 10°	5380~	5380~	5380~	4810~	4810~	3425~
Maximum Output Torque †	lb-in	2959	3511	4149	4916	5807	6911
	Nm	334	397	469	556	656	781

* The maximum washplate angle on model 33 motors is 15.5°.

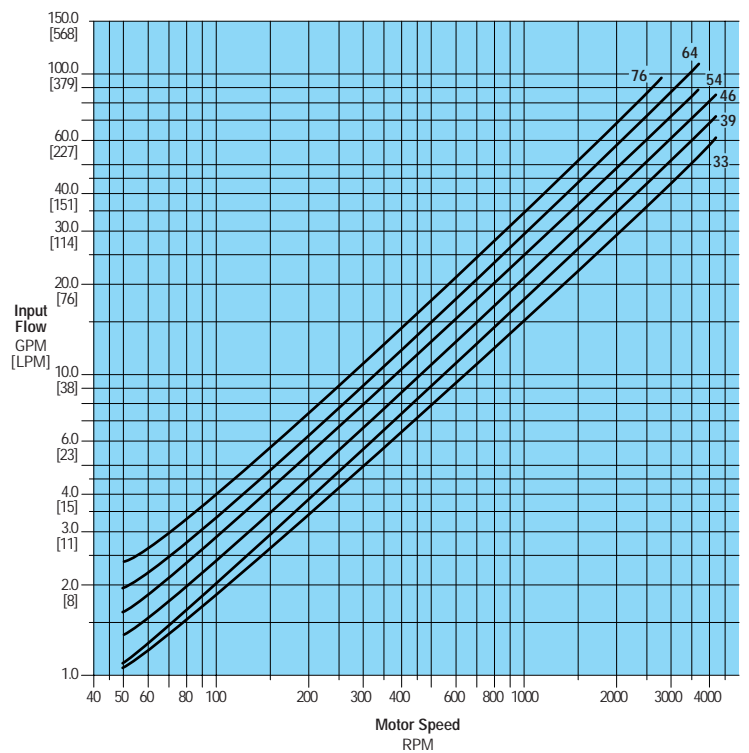
~ These shaft speeds require maximum charge pressure relief: 340 psi [23 bar] pump and 280 psi [19 bar] motor.

† Maximum output torque is measured at 6000 psi [415 bar].

Output Torque vs Speed



Input Flow vs Speed



System Pressure 3500 psi [240 bar]
 Charge Pressure 220 psi [15 bar]
 Oil Viscosity 60 SUS
 Temperature 180° F [82° C]

Note: Operating the motor below 50 RPM is not recommended.

Charge Pump Performance

Eaton offers a choice of four charge pump displacements to go with their heavy duty transmission line: .85, 1.28, 1.70, and 2.12 in³/rev [13,9; 21,0; 27,8; 34,7 cm³/rev]. These charge pumps are available with one or more of the following options:

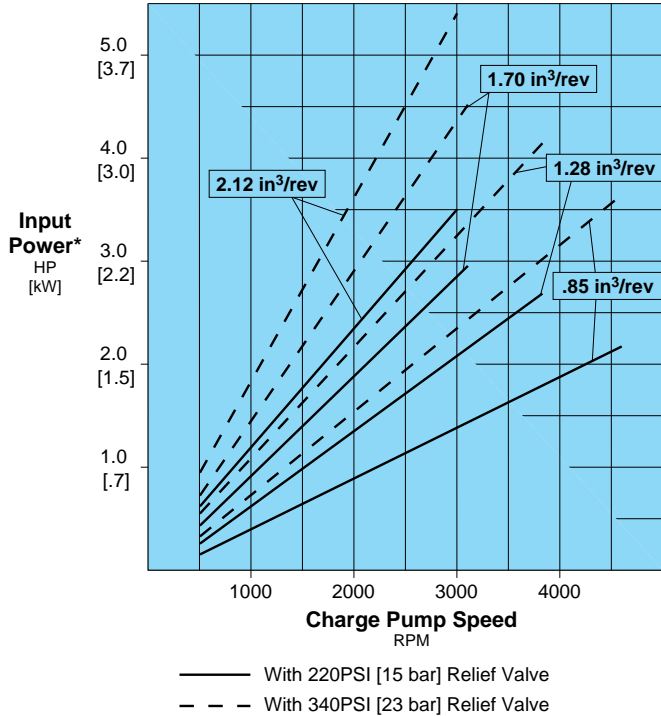
- a pressure sensing port
- remote pressure side filter ports
- a spin-on pressure side filter
- mounting flanges for auxiliary pumps

Charge Pump Performance

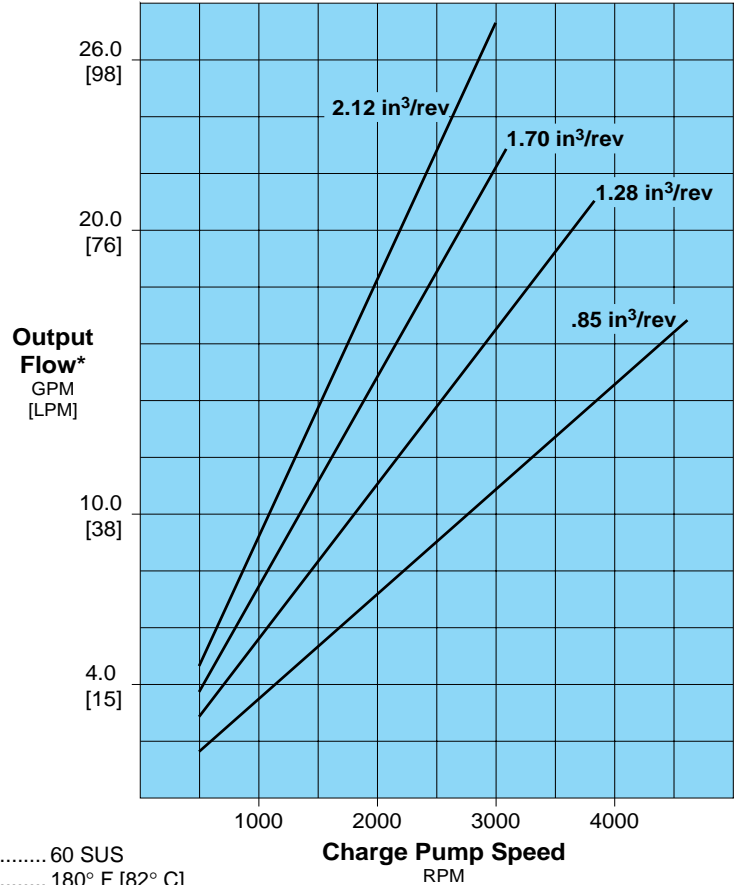
Displacement	in ³ /rev	.85	1.28	1.70	2.12
	cm ³ /rev	13,9	21,0	27,9	34,7
Maximum Shaft Speed	RPM	4600	3800	3100	3000
Output Flow @ Maximum Speed*	GPM	16.9	21.0	22.8	27.5
	LPM	64,0	79,5	86,3	104,2
Input Power @ 220 PSI [15 bar] and Maximum Speed*	HP	2.17	2.70	2.93	3.54
	kW	1,62	2,01	2,18	2,64

*Theoretical Values

Charge Pump Power vs Speed



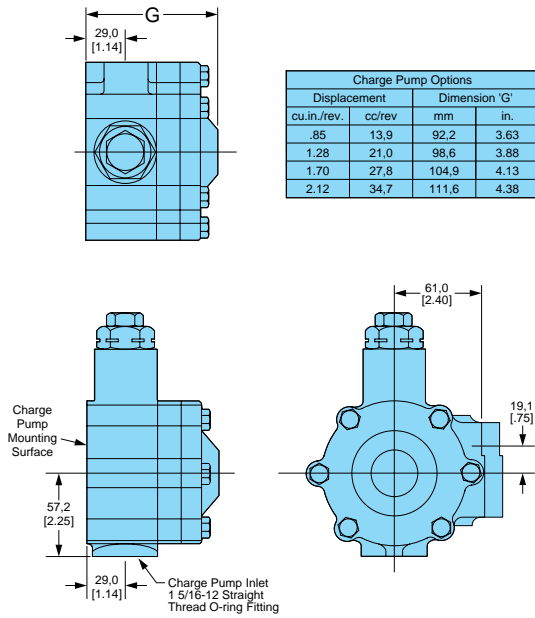
Charge Pump Flow vs Speed



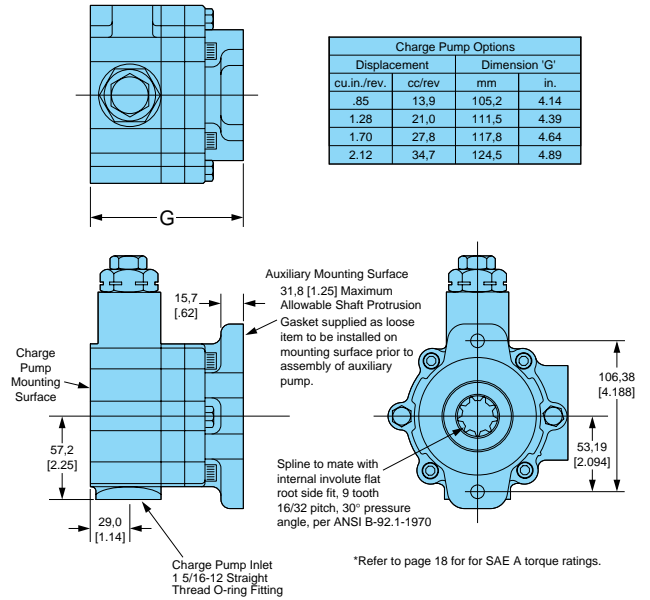
Oil Viscosity 60 SUS
 Temperature 180° F [82° C]
 * Theoretical Values

Charge Pump Dimensions

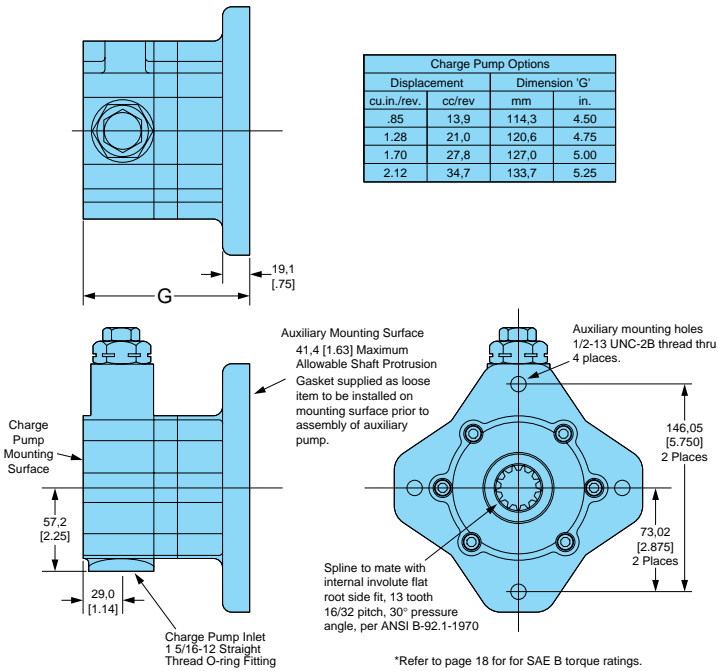
Charge Pump with Auxiliary Pressure Port



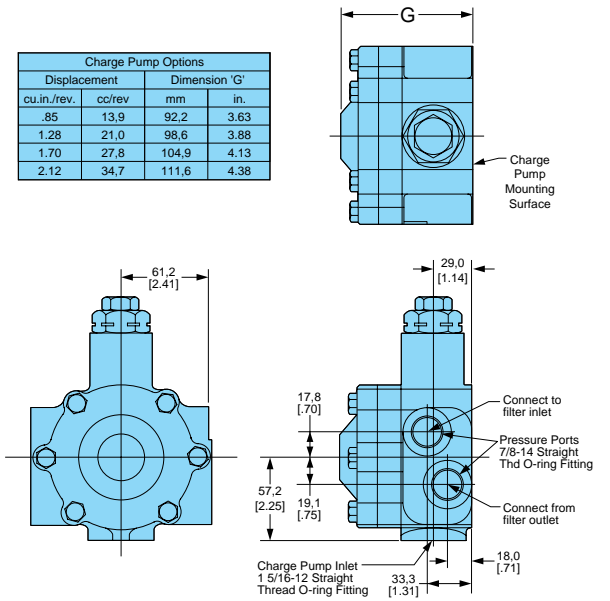
Charge Pump with SAE A Auxiliary Mount



Charge Pump with SAE B Auxiliary Mount

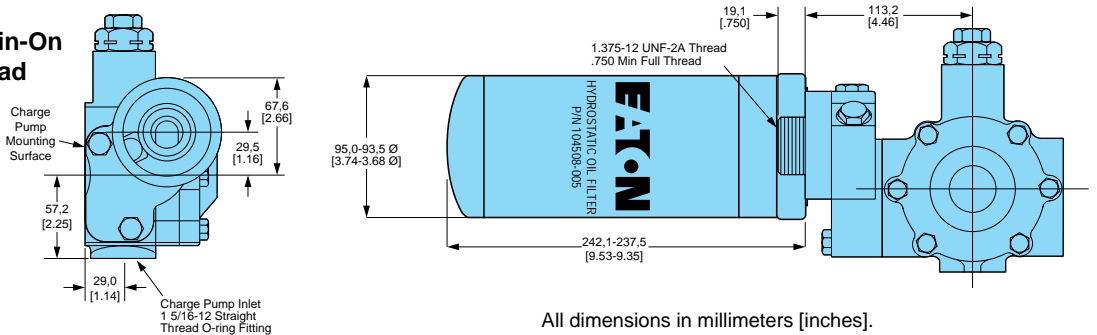


Charge Pump with Remote Filter Ports



Charge Pump with Spin-On Pressure Side Filter Pad

*Note: This option supplied with filter.



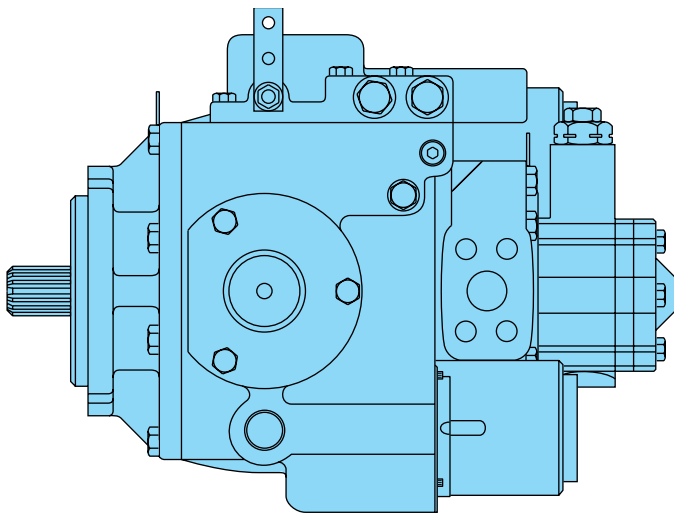
All dimensions in millimeters [inches].

Heavy Duty Hydrostatic Transmissions

Eaton heavy duty hydrostatic transmissions are self-lubricating, sealed systems that transfer power to remote locations without a mechanical power train. This feature allows greater design flexibility in locating power train components.

Eaton hydrostatic transmissions offer infinitely variable output speeds from zero to maximum, in both forward and reverse. This allows the operator to exactly match engine power to load conditions and thus optimize performance, productivity and fuel economy.

Eaton hydrostatic transmissions are currently used on agricultural combines, transit mixer drum drives, timber harvesters, construction equipment, farm tractors, saw mills, mining equipment and many other applications.

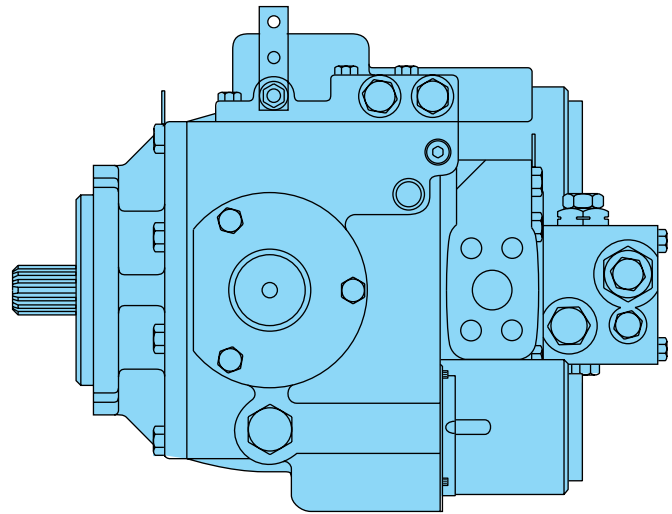


Variable Pump

Eaton heavy duty variable pumps

The Eaton heavy duty variable displacement pump contains a rotating cylinder barrel and pistons. The displacement control directs control pressure to the two servo pistons that position the swashplate. The variable pump is powered into stroke and springs, on the servo pistons, bring it out of stroke. The swashplate pivots on tapered roller bearings. A bolt-on charge pump, with a cartridge type charge pressure relief valve, is available in four displacements.

One lever controls direction, varies speed and provides dynamic braking. This ease of operation, in conjunction with a wide variety of control options, allows Eaton hydrostatic transmissions to be readily adapted to many applications.

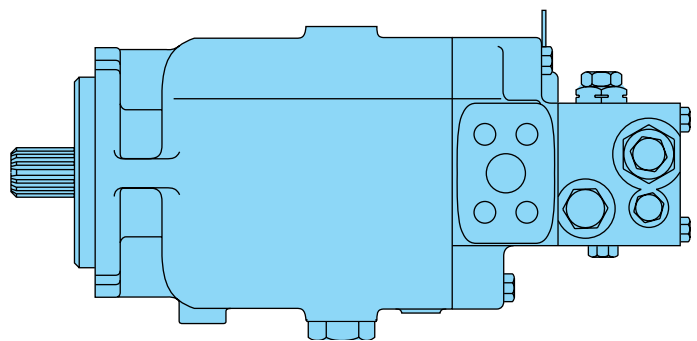


Variable Motor

Eaton heavy duty motors

The Eaton heavy duty motors contains a rotating cylinder barrel and pistons. The variable motor has two internal servo pistons that control the movement of the swashplate which pivots on tapered roller bearings. The variable motor provides a broader speed range and allows the use of a smaller displacement pump.

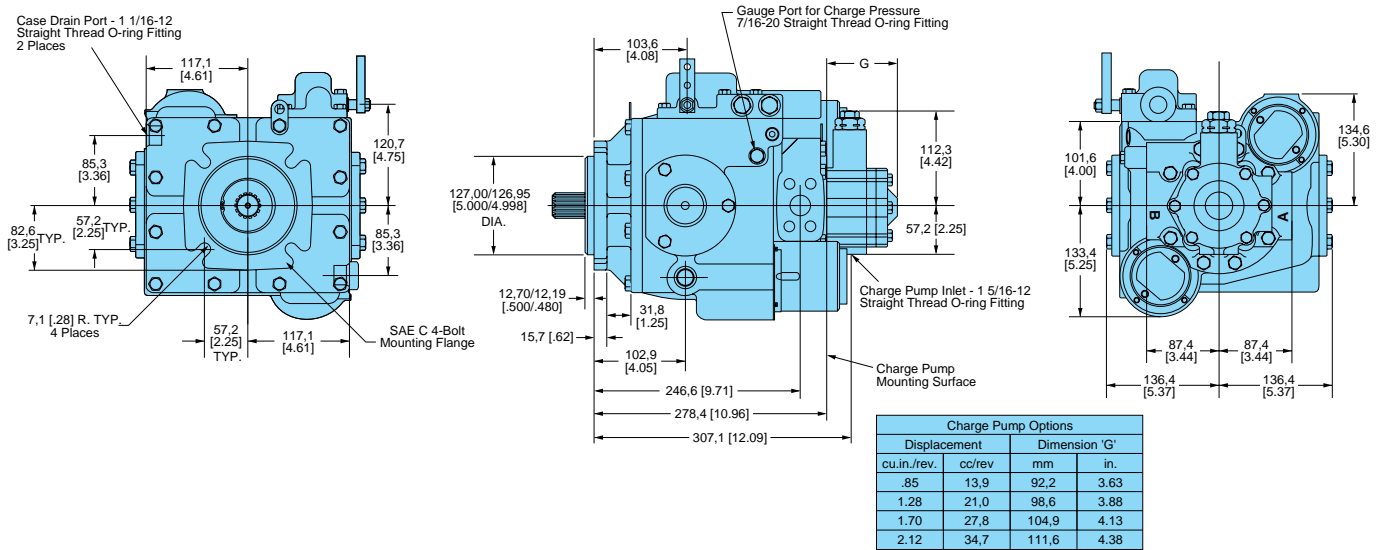
The end covers, on both the fixed and variable motors, are standard with a bolt-on valve block. The valve block contains two high pressure relief valves, a shuttle valve, and a charge pressure relief valve. The high pressure relief valves limit the closed loop pressure by cross porting when the pressure limit is reached. The shuttle valve and charge pressure relief valve direct charge flow into the motor housing for flushing and cooling.



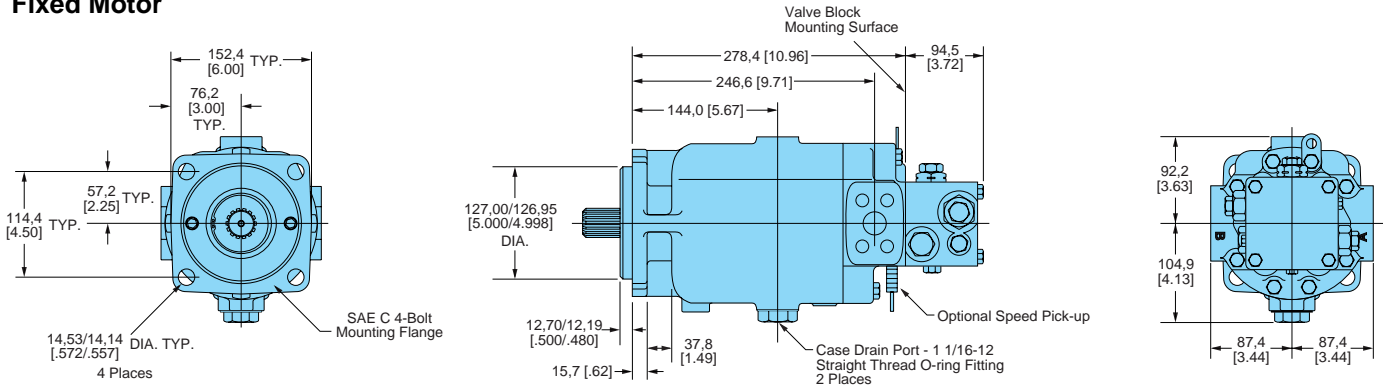
Fixed Motor

Models 33, 39, and 46 Dimensions

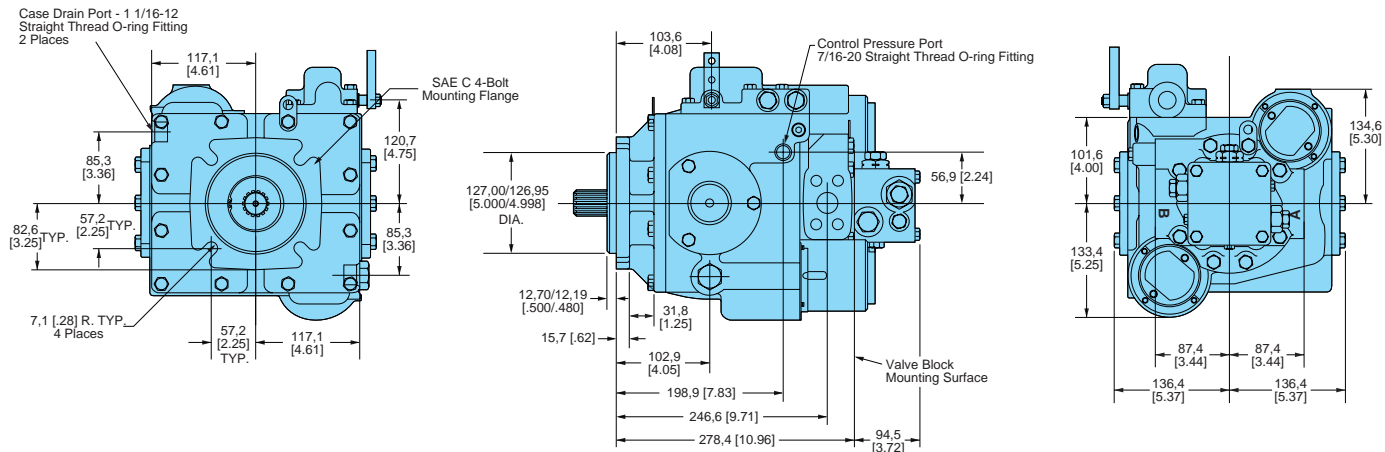
Variable Pump



Fixed Motor



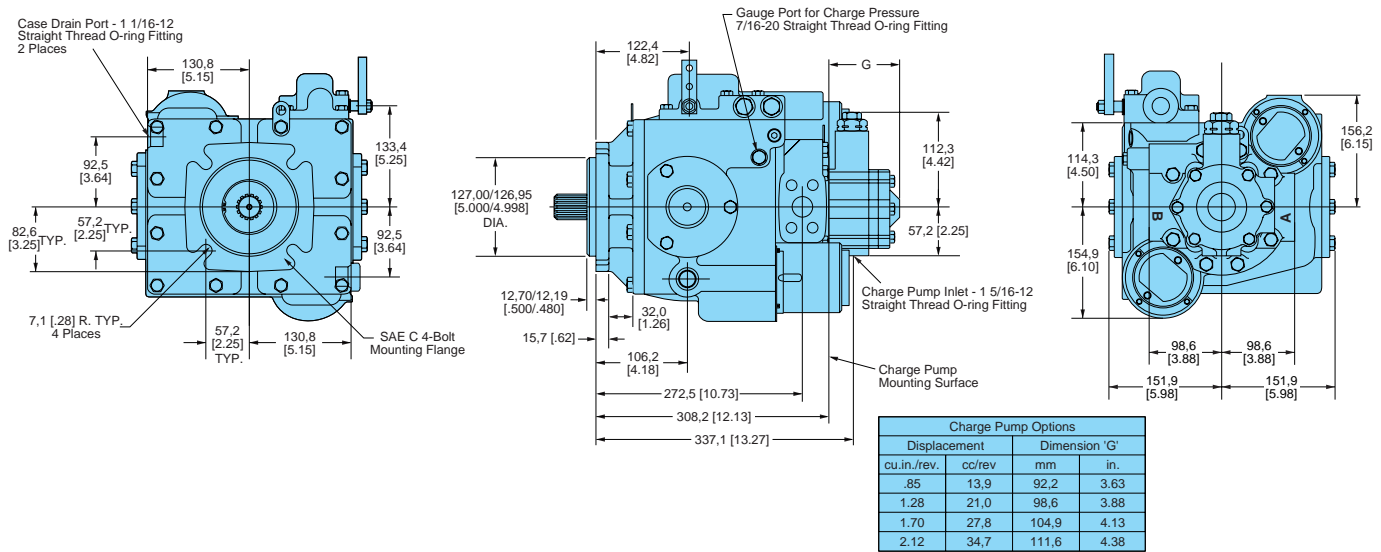
Variable Motor



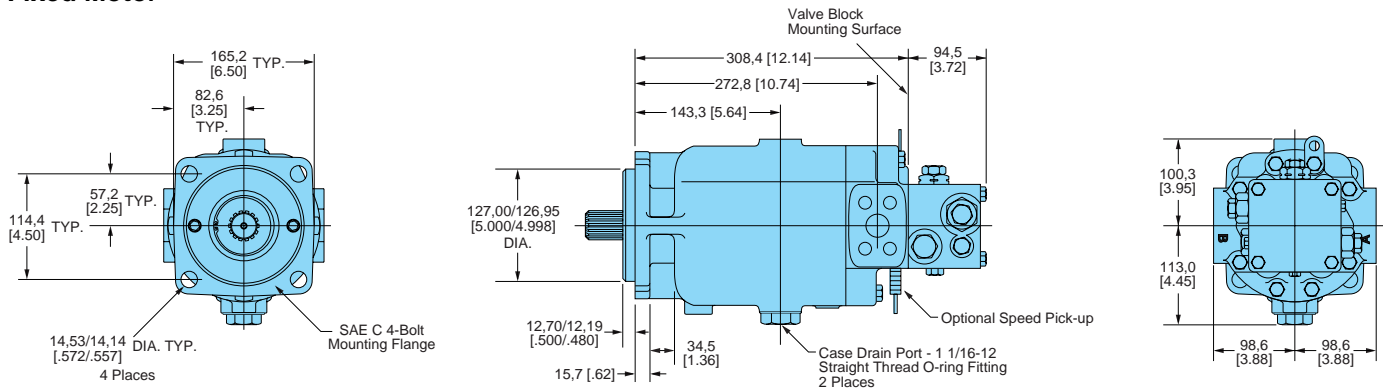
Notes: All dimensions are given in millimeters [inches].
 The variable pumps and motors are shown with standard controls. Installation drawings of other controls are available from your Eaton representative. Optional controls are shown on page 23.
 The variable pumps are shown with standard charge pumps. Installation drawings of other charge pumps are available from your Eaton representative.
 The lever on the standard control has linkage connection holes at 1 and 2 inch radii from the control shaft center. Detailed drawings of available shafts and ports are shown on page 21.

Models 54 and 64 Dimensions

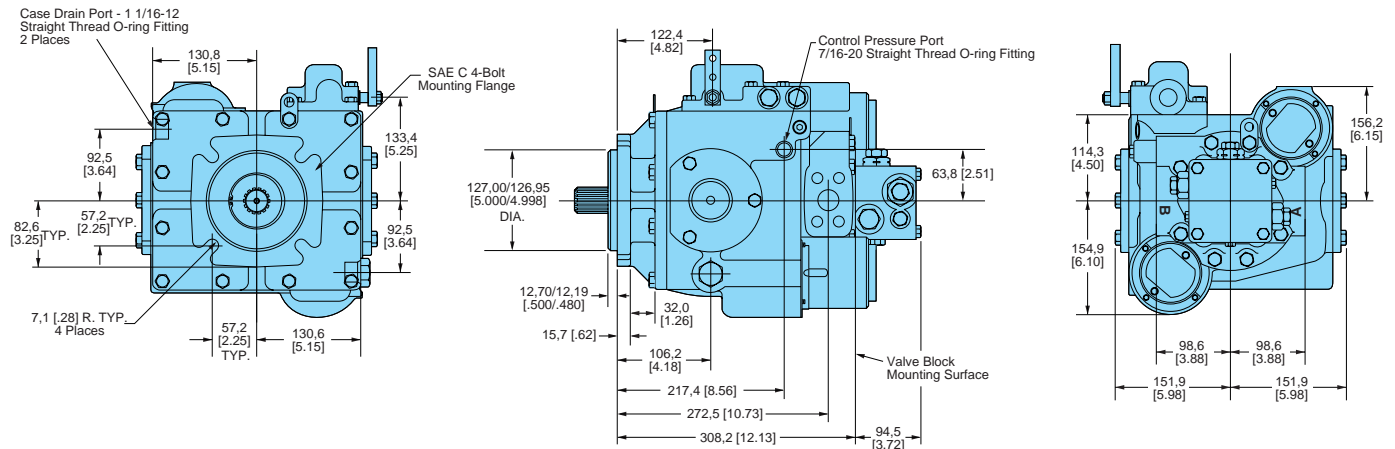
Variable Pump



Fixed Motor

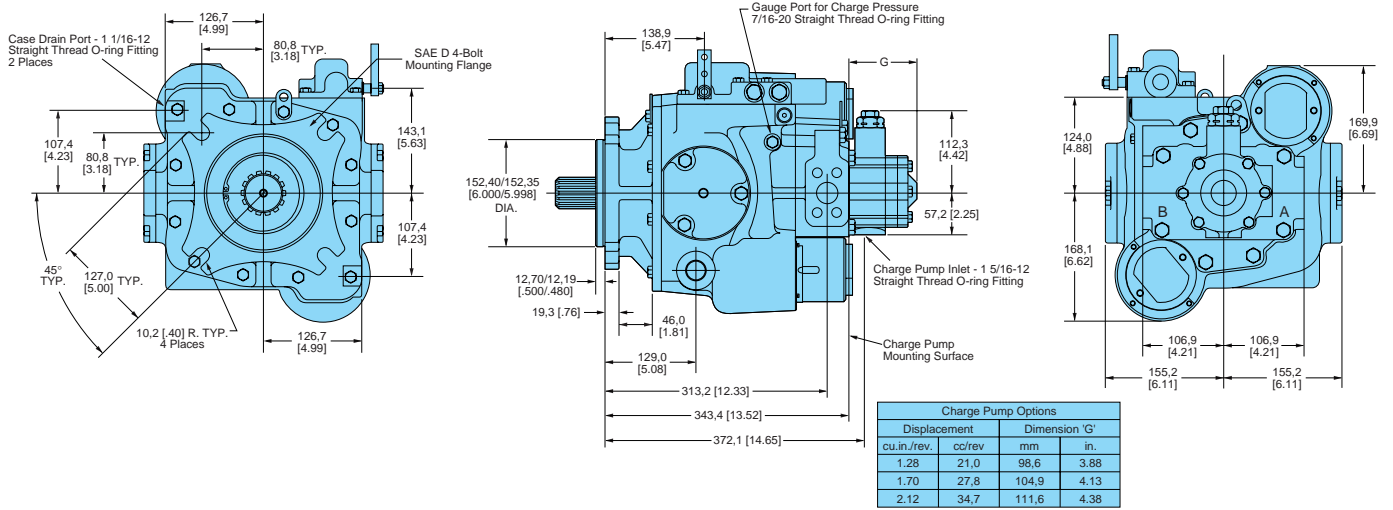


Variable Motor

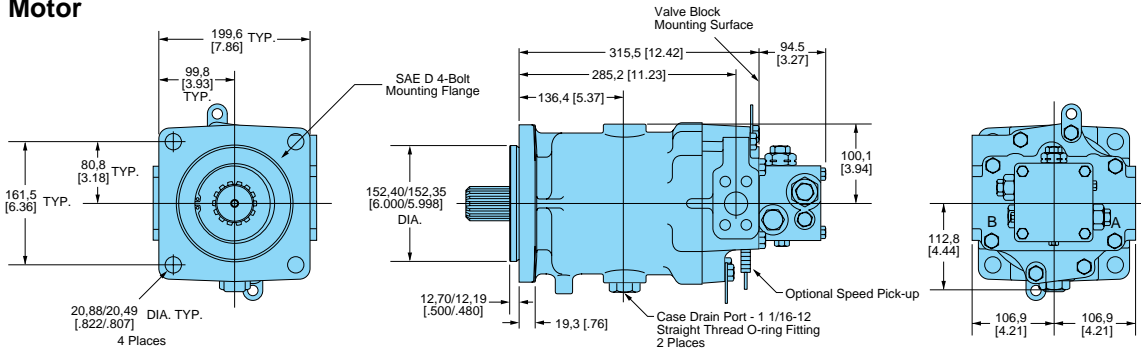


Model 76 Dimensions

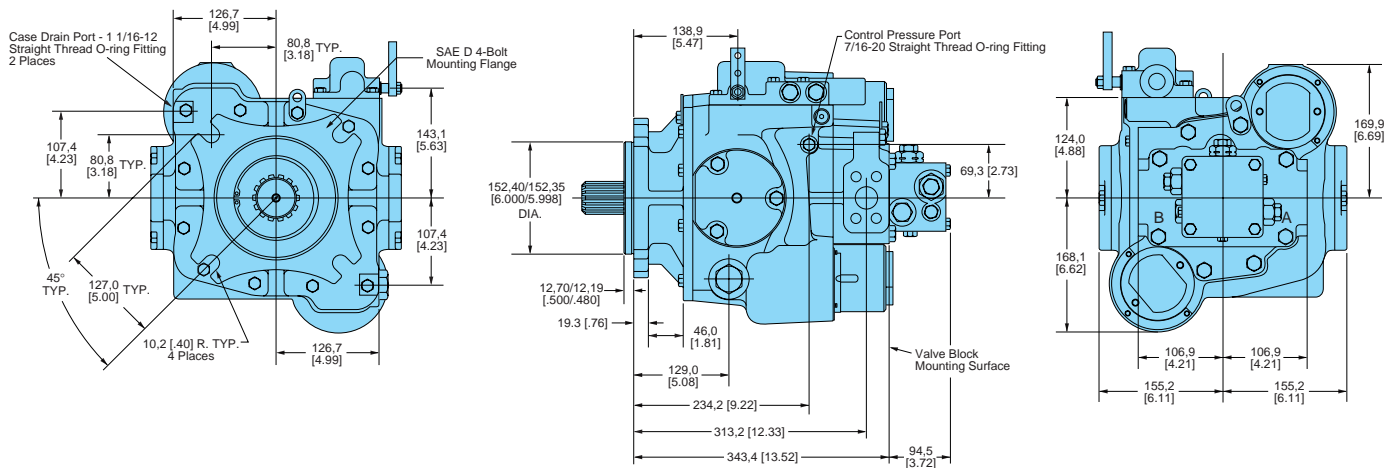
Variable Pump



Fixed Motor



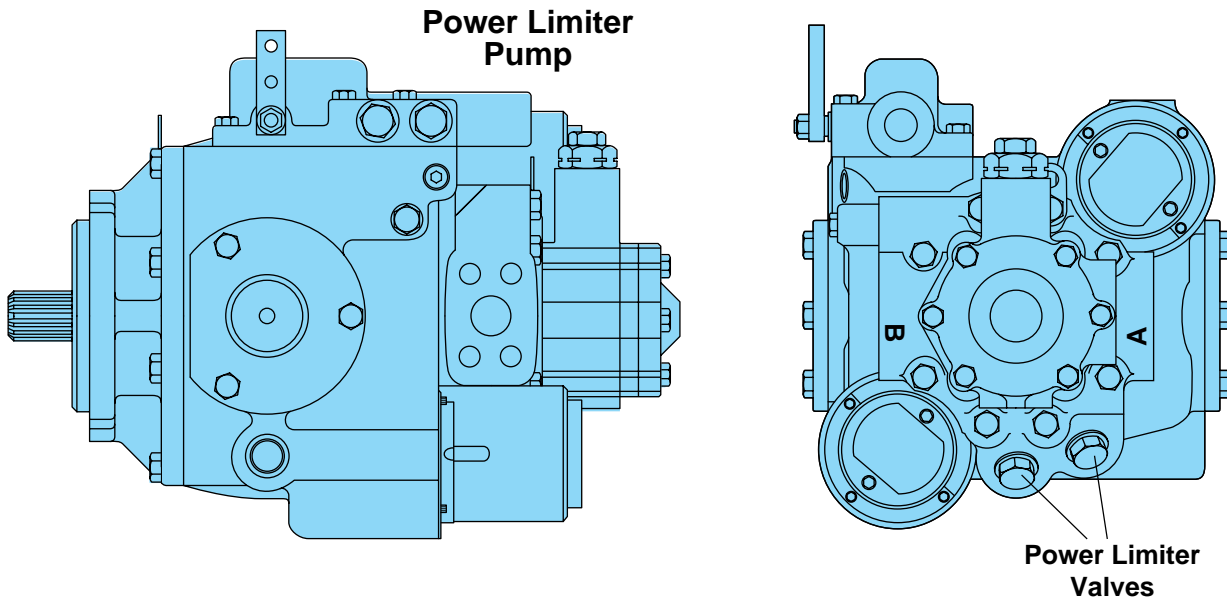
Variable Motor



Heavy Duty Component Approximate Weights lb [Kg]

Model	Variable Pump	Fixed Motor	Variable Motor
33	138 [62,6]	83 [37,6]	140 [63,5]
39	138 [62,6]	83 [37,6]	140 [63,5]
46	138 [62,6]	83 [37,6]	140 [63,5]
54	188 [85,3]	106 [48,1]	190 [86,2]
64	188 [85,3]	106 [48,1]	190 [86,2]
76	226 [101,7]	121 [54,5]	228 [102,6]

Power Limiter Pumps and Integral Shuttle Valve Motors Models 33 through 64



Power Limiter Valve Operation*

Power limiter valves (PLV) are high pressure relief valves built into the pump's end cover. When pressure in the high pressure loop gets too high, the PLV opens to the pump case. Besides an immediate drop in the loop high pressure, the open PLV also causes control pressure to drop. This in turn allows the centering springs on the servo pistons to bring the pump out of stroke until the pressure drops to the relief valve setting and the PLV closes.

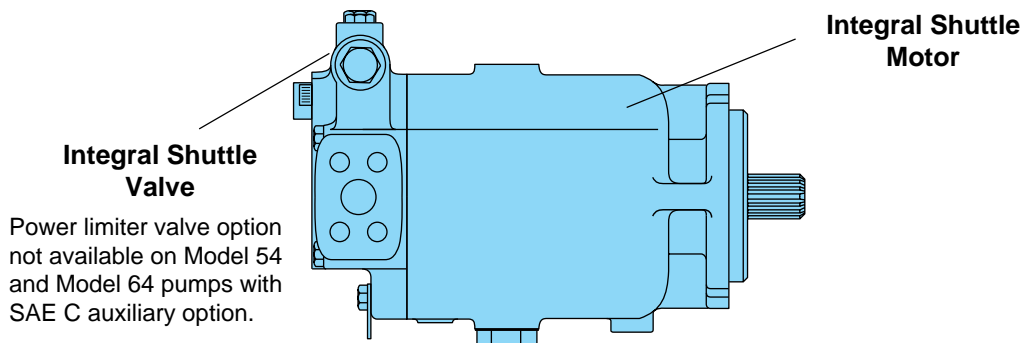
The PLV will also act as a check valve to prevent cavitation in the event of a rapid pressure rise and hose expansion.

A motor with integral shuttle valve is used in conjunction with the power limiter valve pump.

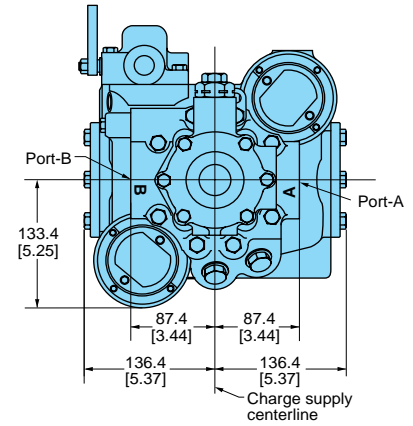
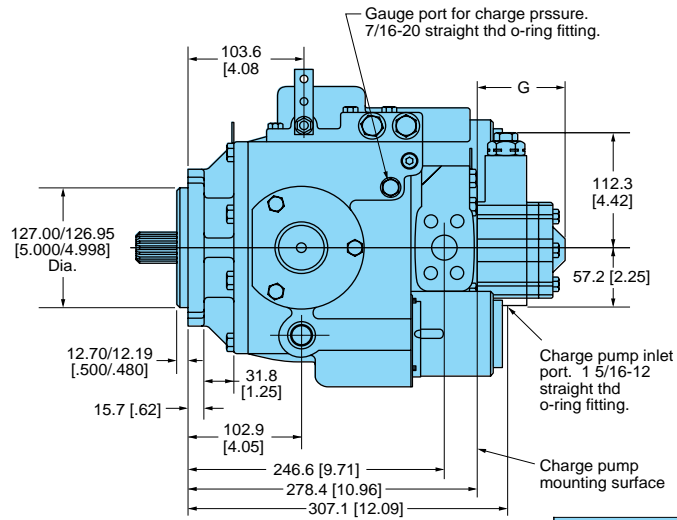
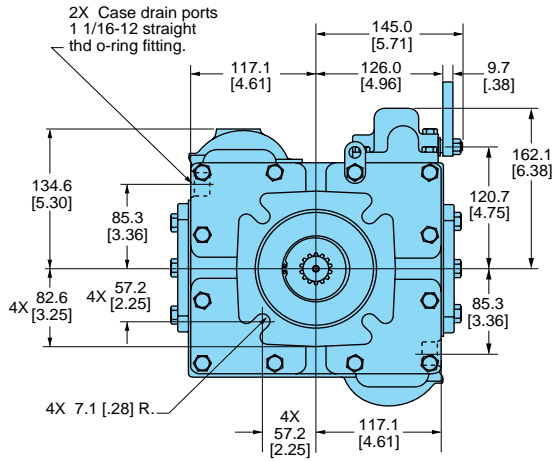
* Note: Power limiter valves are not recommended for applications with large overrunning loads.

Feature/Benefits

- The motor is shorter and lighter allowing it to fit in tighter spaces.
- The motor's integral shuttle valve and low pressure relief assure good loop flushing.
- The motor is available with side ports, end ports, or both allowing maximum mounting flexibility.
- The power limiter valves (PLV) are quick, direct acting relief valves that prevent high pressure spikes.
- The power limiter pump is ideally suited for use with motors that do not have valve blocks because it eliminates the need for a remote valve block.

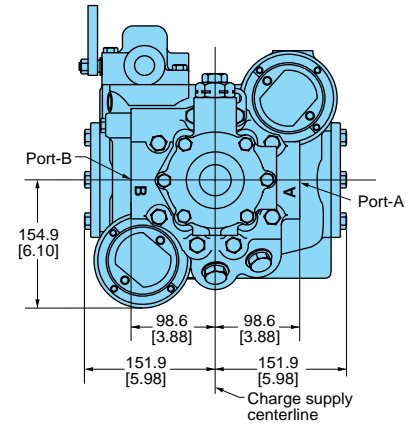
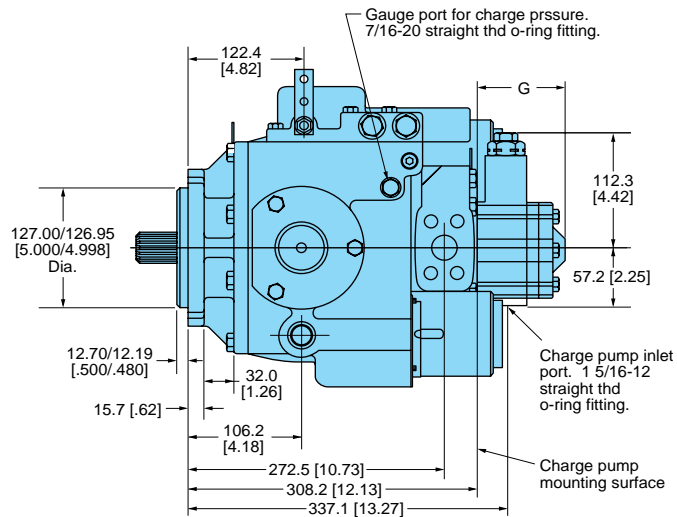
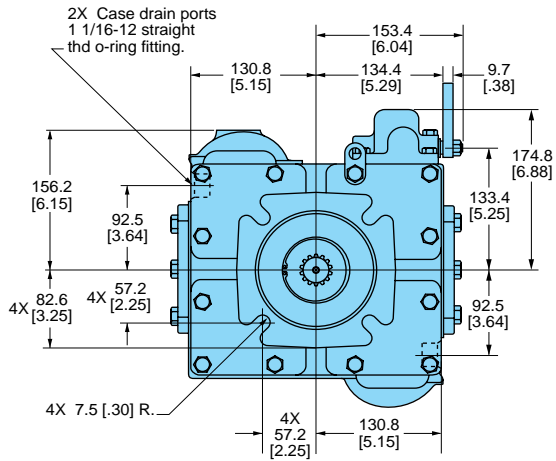


Models 33, 39, and 46 Power Limiter Pumps

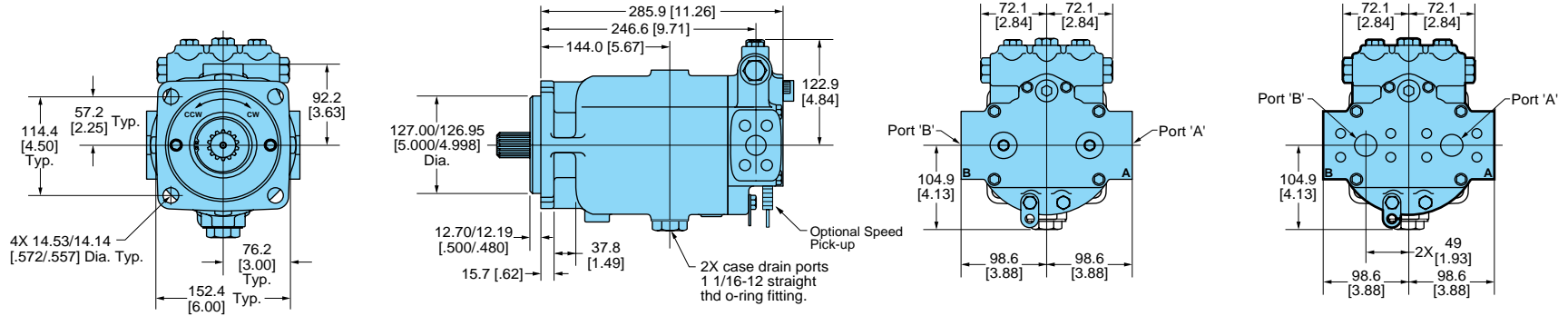


Charge Pump Options			
Displacement		Dimension 'G'	
cu.in./rev.	cc/rev	mm	in.
.85	13.9	92.2	3.63
1.28	21.0	98.6	3.88
1.70	27.8	104.9	4.13
2.12	34.7	111.6	4.38

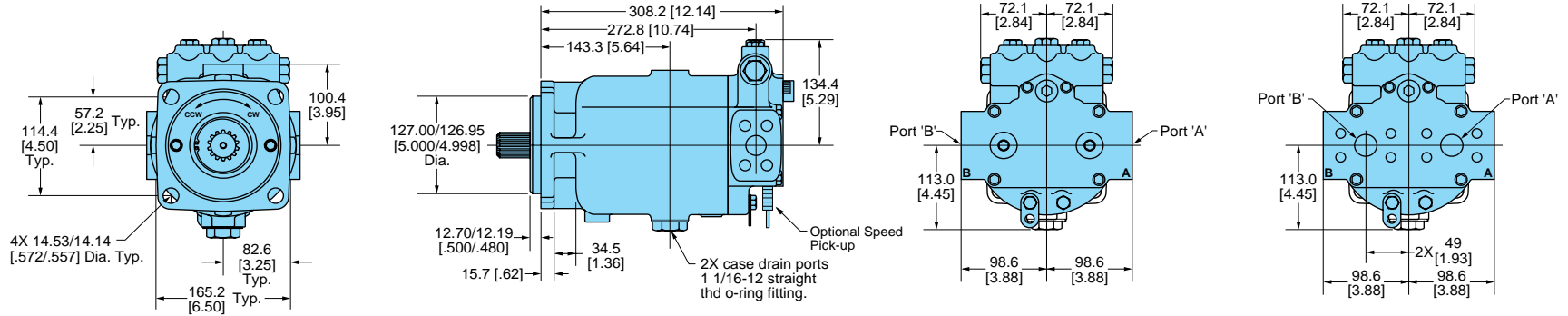
Models 54 and 64 Power Limiter Pumps



Models 33, 39, and 46 Integral Shuttle Motors



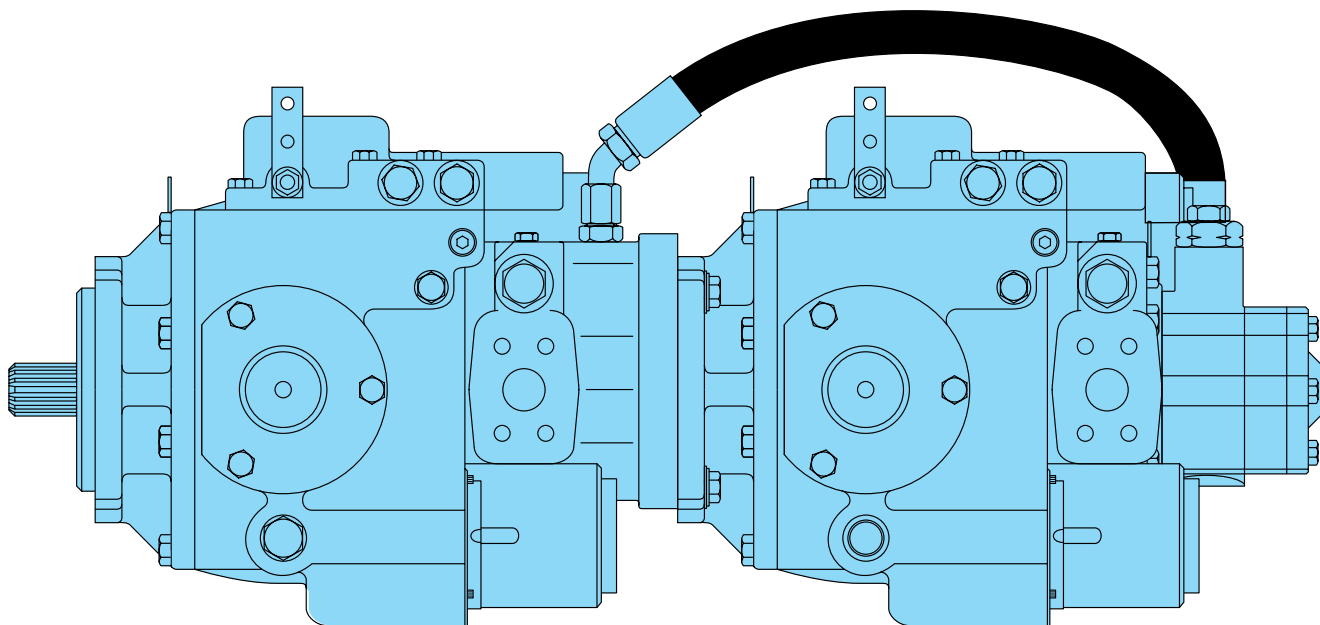
Models 54 and 64 Integral Shuttle Motors



PL Pump and IS Motor Approximate Weights lb [Kg]		
Model	PL Pump	IS Motor
33	138 [62,6]	70 [31,8]
39	138 [62,6]	70 [31,8]
46	138 [62,6]	70 [31,8]
54	188 [85,3]	93 [42,2]
64	188 [85,3]	93 [42,2]

Notes: All dimensions are given in millimeters [inches].
 The variable pumps are shown with standard controls. Installation drawings of other controls are available from your Eaton representative. Optional controls are shown on page 23.
 The variable pumps are shown with standard charge pumps. Installation drawings of other charge pumps are available from your Eaton representative.
 The lever on the standard pump control has linkage connection holes at 1 and 2 inch radii from the control shaft center.
 Detailed drawings of available shafts and ports are shown on page 21.

Heavy Duty Tandem Pumps Models 33 through 64



Tandem Pump Applications

Tandem pumps are most typically used in applications where two independent sources of hydraulic power are required while taking advantage of using only one power source to drive the two pumps. This saves on the expense of driving two pumps by eliminating the split drive gear box or eliminating another power source such as a second engine or motor. Tandem pumps can be used on machines such as track drive equipment where independent power is required at each track. Speed and power can be controlled to each side of the vehicle for steering and vehicle speed control both in forward and reverse directions.

Tandem pumps can also be used to create the equivalent flow of one larger displacement pump by combining the flows of the two pumps. This is an economic advantage over using a single large displacement pump.

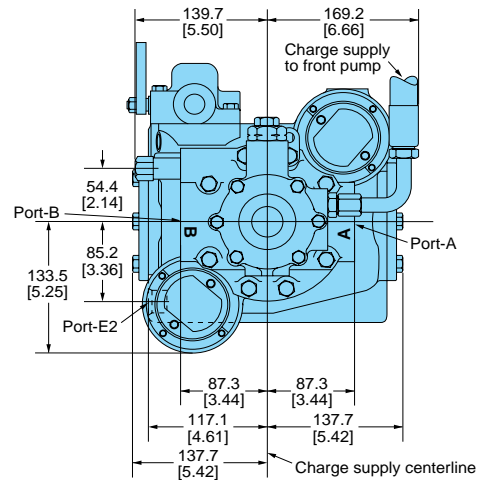
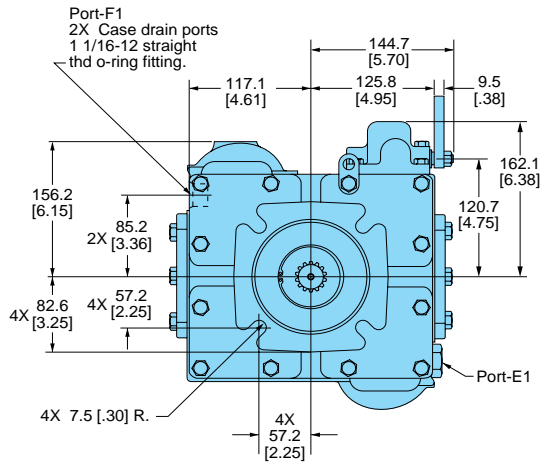
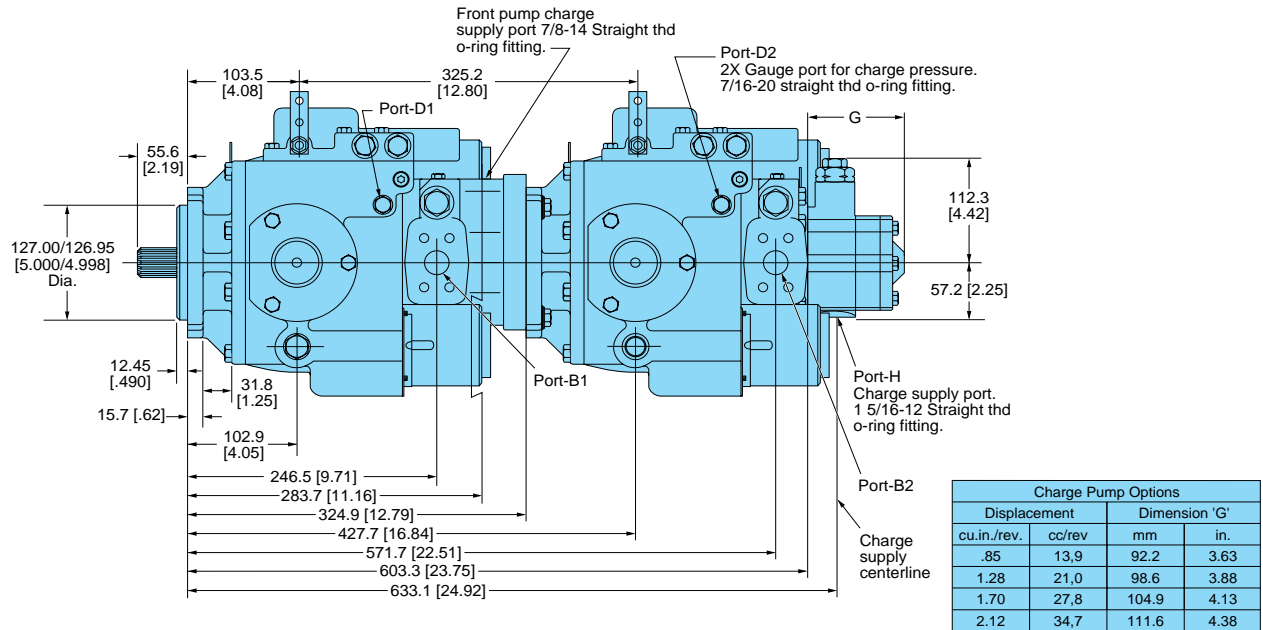
Tandem pumps may also be used in industrial, construction or mining applications where several sources of hydraulic power are required while taking advantage of using only one power source to drive the two pumps.

Features/Benefits

- Pumps mounted in tandem save the expense of a pump drive.
- Tandem pumps, in some applications, are required because of space limitations.
- The rear pump may be the same displacement or smaller than the front pump.
- A tandem pump may be used as an economical alternative for a larger displacement pump by combining the flow of both pumps. For example, combining the flows of two 6.4 in³/rev pumps connected in tandem provides the flow equivalent to a 12.8 in³/rev pump.
- Charge pumps with SAE A or SAE B auxiliary mounts are available.
- Pump has standard SAE C flange mount.
- Rear pump can be the same displacement or smaller than front pump.

Tandem Dimensions

Models 33, 39, and 46 Tandem Pumps



Notes: All dimensions are given in millimeters [inches].

The variable pumps are shown with standard controls. Installation drawings of other controls are available from your Eaton representative. Optional controls are shown on page 23.

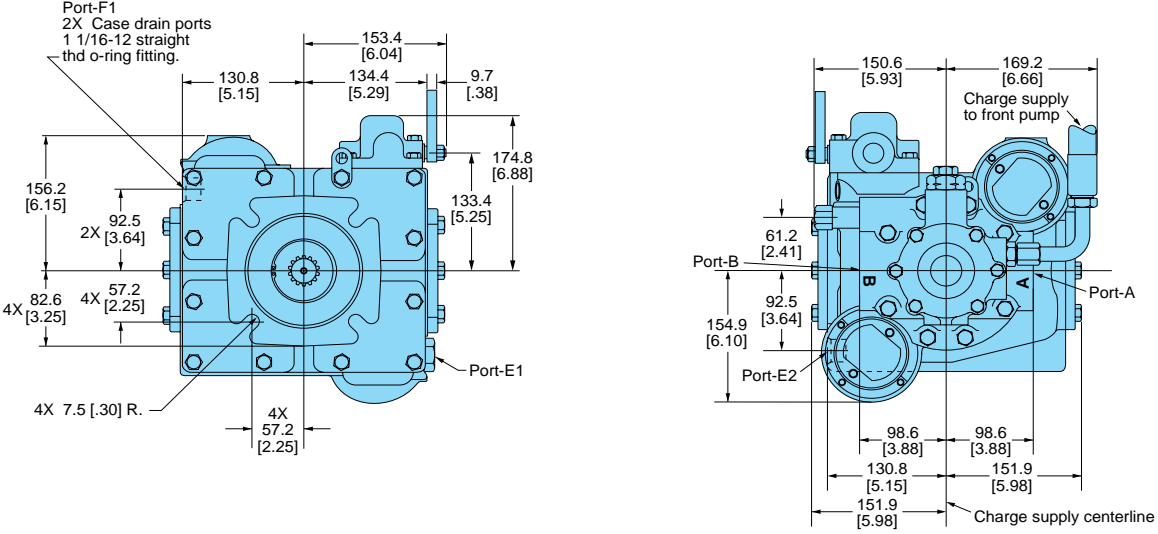
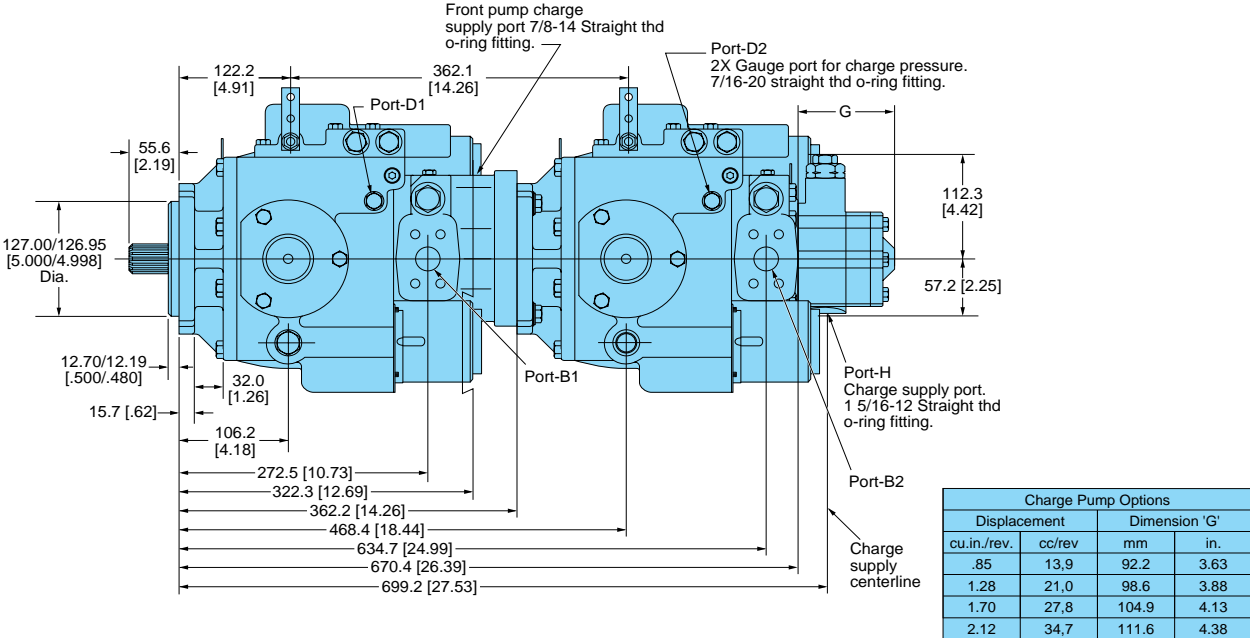
The variable pumps are shown with standard charge pumps. Installation drawings of other charge pumps are available from your Eaton representative.

The lever on the standard pump control has linkage connection holes at 1 and 2 inch radii from the control shaft center.

Detailed drawings of available shafts and ports are shown on page 21.

Tandem Dimensions

Models 54 and 64 Tandem Pumps



Tandem Pump Approximate Weights

Front Pump	Rear Pump	Weight lb [kg]
Model 33 - 46	Model 33 - 46	276 [125.2]
Model 54 - 64	Model 54 - 64	376 [170.6]
Model 54 - 64	Model 33 - 46	326 [147.9]

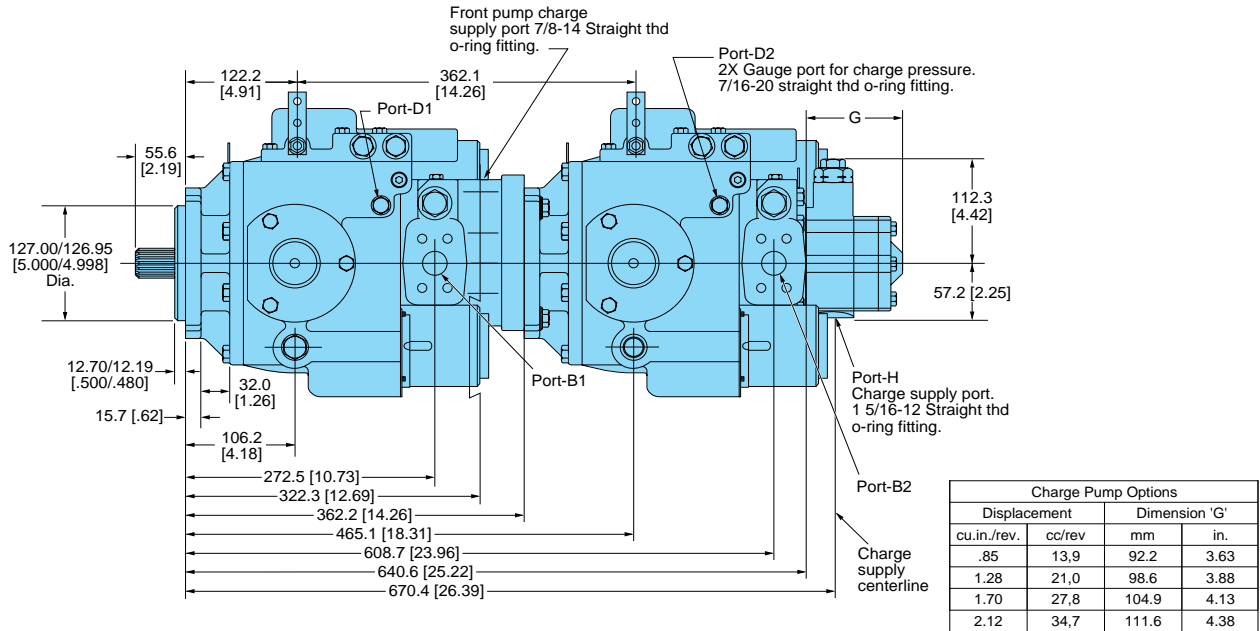
Tandem Pump Application Information

Some tandem applications require larger displacement charge pumps.

Refer to the Heavy Duty Application manual (no. 5-401) for more information on heavy duty pump and motor applications.

Tandem Application Information

Tandems, Model 54 or 64 Front Pump with Model 33, 39, or 46 Rear Pump



Maximum Shaft Torque Limitations

The total input torque, as well as, the torque at each of the drive shaft coupling points must be considered in a tandem pump system.

Torque calculation formulas and the maximum allowable shaft torque limits, for each shaft coupling point in the tandem pump, are given below.

For longest shaft life, use the largest shaft possible.

Shaft Coupling Point

	lb-in.	Nm
Input Shaft Models 54 – 64	11150	1260
Input Shaft Models 33 – 46	8550	966
Front/Rear Pump Coupler	6600	746
Charge Pump	2050	232
B-Pad Auxiliary Pump	1852	209
A-Pad Auxiliary Pump	517	58

Shaft Torque Formulas

$$\text{Max. Aux Pump Torque} = \frac{(\text{Max Displ}_{\text{aux pmp}})(\text{Max Pressure}_{\text{aux pmp}})}{(6.28)(.9)}$$

$$\text{Max. Chg Pump Torque} = \frac{(\text{Max Displ}_{\text{chg pmp}})(\text{Max Pressure}_{\text{chg pmp}})}{(6.28)(.9)} + \text{Max. Aux Pump Torque}$$

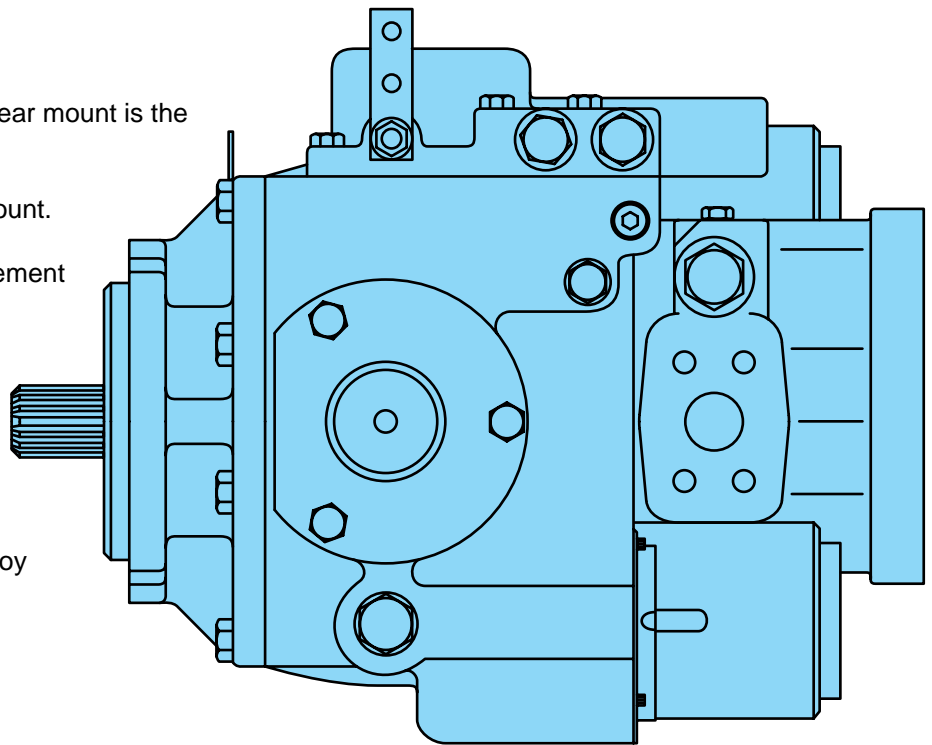
$$\text{Max. Front/Rear Pump Coupler Torque} = \frac{(\text{Max Displ}_{\text{pmp 2}})(\text{Max Pressure}_{\text{pmp 2}})}{(6.28)(.9)} + \text{Max. Chg Pump Torque}$$

$$\text{Max. Input Shaft Torque} = \frac{(\text{Max Displ}_{\text{pmp 1}})(\text{Max Pressure}_{\text{pmp 1}})}{(6.28)(.9)} + \text{Max. Front/Rear Pump Coupler Torque}$$

Heavy Duty Pumps with C-Pad Rear Mount Models 33 through 64

Features/Benefits

- The heavy duty pump with a C-Pad rear mount is the front half of the tandem unit.
- Pump has standard SAE C flange mount.
- Rear pump can be the same displacement or smaller than front pump
- The rear mount accepts a standard SAE C flange.
- This pump is ideal for applications that require two different pumps. Road rollers and some construction equipment are applications that employ two different pumps.



Application Information

Maximum Shaft Torque Limitations

The total input torque, as well as, the torque at the drive shaft coupling point must be considered when the pump with the SAE C rear mount is used. Maximum torque values and formulas are given on page 18.

Pumps with SAE C Rear Mount

A 14 tooth, 12/24 pitch, internal spline coupling (Part No. 105853) is required between front and rear pump. A coupling is provided with each SAE C Pump. Optional couplings with 21 tooth, 16/32 pitch; and 23 tooth, 16/32 pitch, are also available.

Pump requires remote charge pump and charge pressure relief. (Charge pressure relief may be built into pump.)

Refer to the Heavy Duty Application manual (no. 5-401) for more information on heavy duty pump and motor applications.

Rear Pump Mounting Information

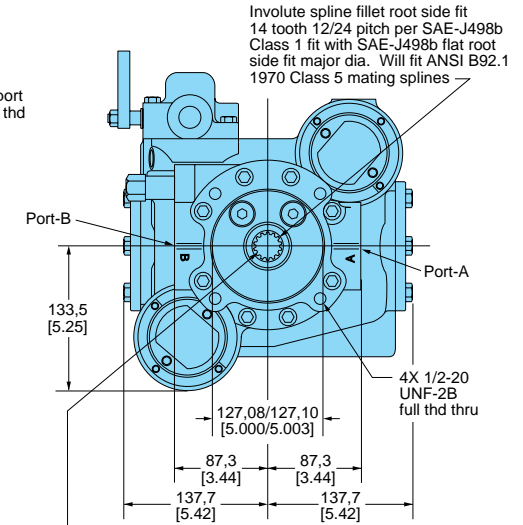
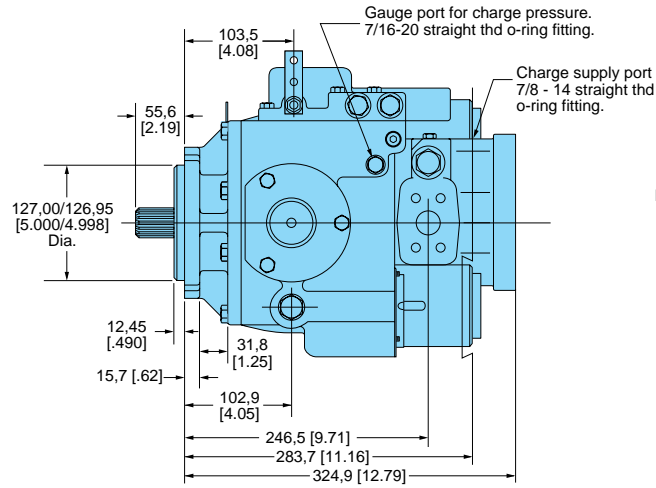
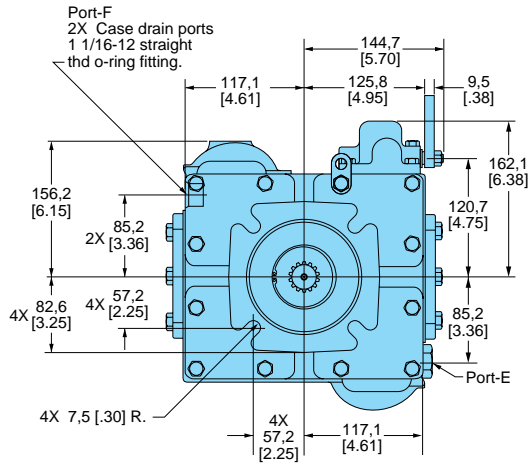
When an Eaton heavy duty pump is used as the rear pump, remove its shaft seal so part of the case flow will flow past the bearing into the front pump. It is also necessary to connect the rear pump's upper case drain port to the front pump's lower case drain port, otherwise high case pressures may result.

In all cases, check case pressures and ensure that they do not exceed 40 PSI [3 bar].

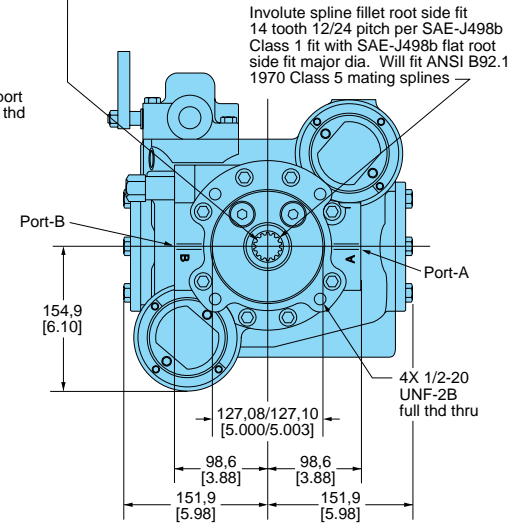
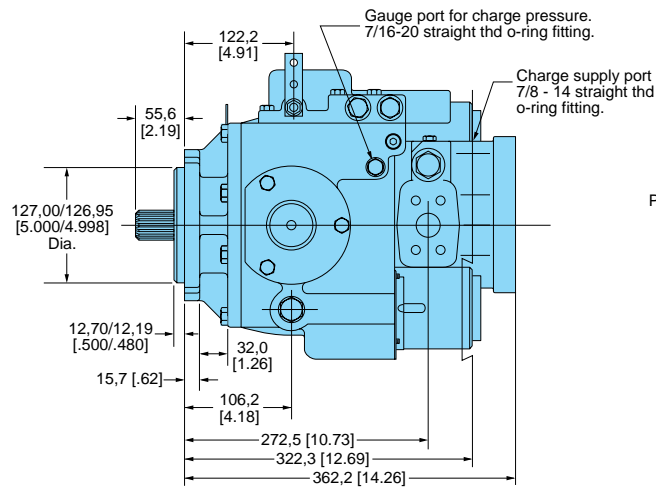
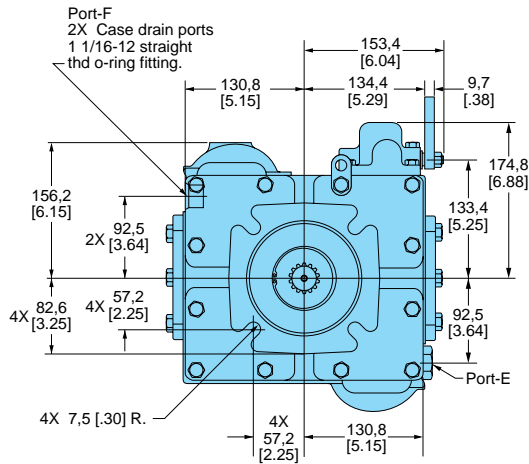
Heavy Duty Application manual (no. 5-401) gives more information on proper case flow routing.

See previous page for shaft torque ratings.

Models 33, 39, and 46 Pumps with C-Pad Rear Mount



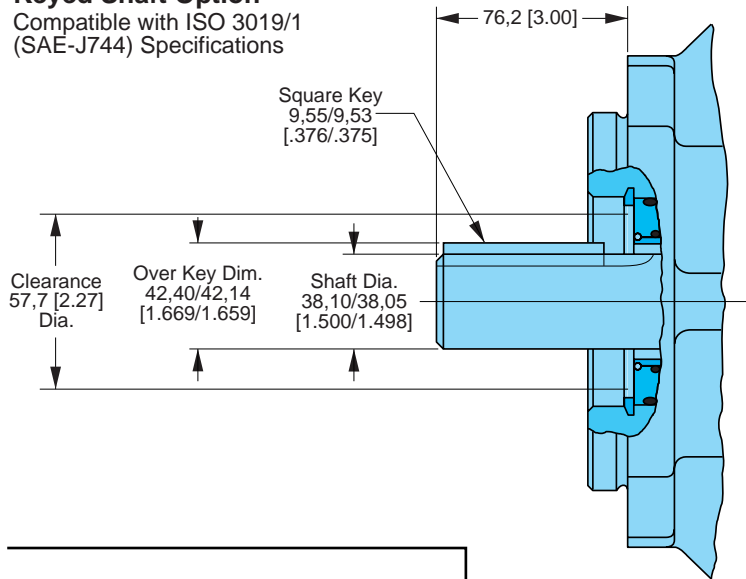
Models 54 and 64 Pumps with C-Pad Rear Mount



Notes: All dimensions are given in millimeters [inches].
 The variable pumps are shown with standard controls. Installation drawings of other controls are available from your Eaton representative. Optional controls are shown on page 23.
 The lever on the standard pump control has linkage connection holes at 1 and 2 inch radii from the control shaft center.
 Detailed drawings of available shafts and ports are shown on page 21.

Keyed Shaft Option

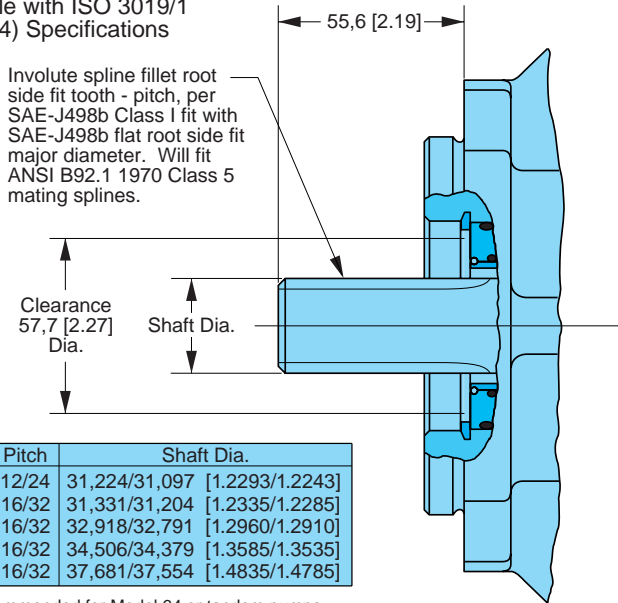
Compatible with ISO 3019/1
(SAE-J744) Specifications



Splined Shaft Options

Compatible with ISO 3019/1
(SAE-J744) Specifications

Involute spline fillet root side fit tooth - pitch, per SAE-J498b Class I fit with SAE-J498b flat root side fit major diameter. Will fit ANSI B92.1 1970 Class 5 mating splines.



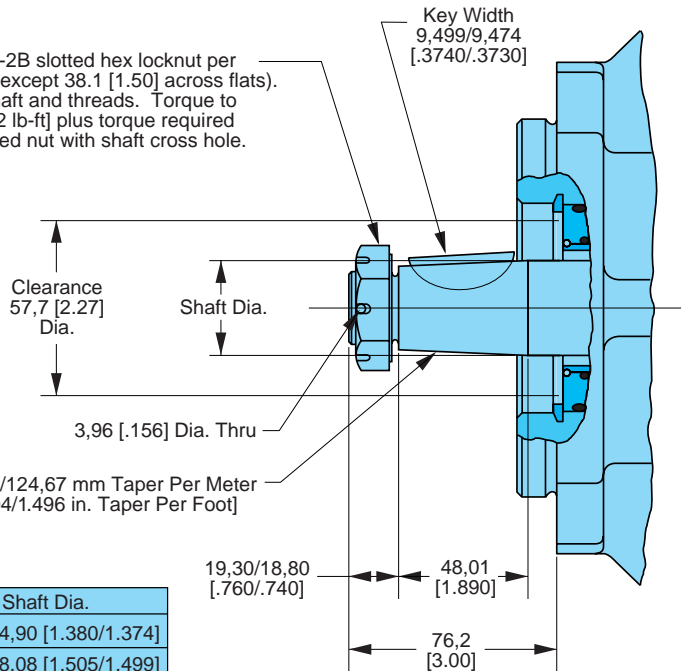
Tooth	Pitch	Shaft Dia.
14*	12/24	31,224/31,097 [1.2293/1.2243]
19	16/32	31,331/31,204 [1.2335/1.2285]
20	16/32	32,918/32,791 [1.2960/1.2910]
21	16/32	34,506/34,379 [1.3585/1.3535]
23	16/32	37,681/37,554 [1.4835/1.4785]

* Not recommended for Model 64 or tandem pumps.

Tapered Shaft Options

Compatible with ISO 3019/1
(SAE-J744) Specifications

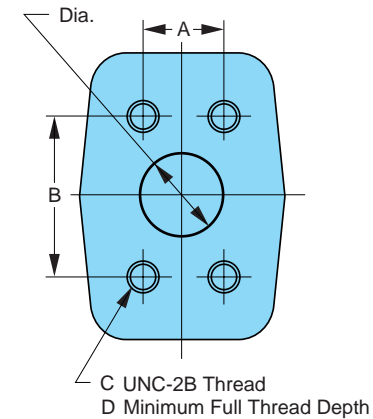
1"-20 UNEF-2B slotted hex locknut per SAE J-501 (except 38.1 [1.50] across flats). Lubricate shaft and threads. Torque to 178 Nm [132 lb-ft] plus torque required to align slotted nut with shaft cross hole.



Shaft Dia.
35,05/34,90 [1.380/1.374]
38,23/38,08 [1.505/1.499]

Split Flange Port Options

Per SAE-J518 Specifications

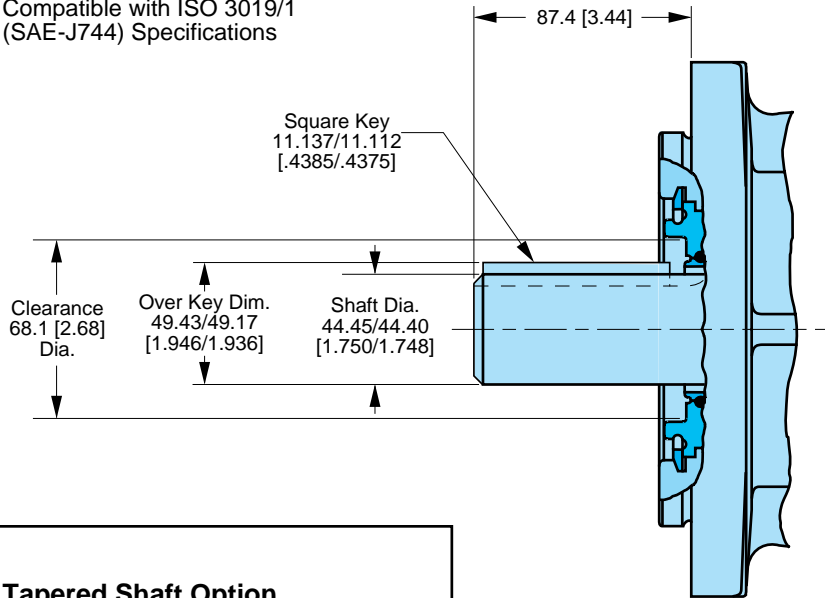


Code	Dia.	A	B	C	D
61	25,4 [1.00]	26,19 [1.031]	52,37 [2.062]	3/8-16	22,4 [.88]
62	25,4 [1.00]	27,76 [1.093]	57,15 [2.250]	7/16-14	27,0 [1.06]

All dimensions given in millimeters [inches].

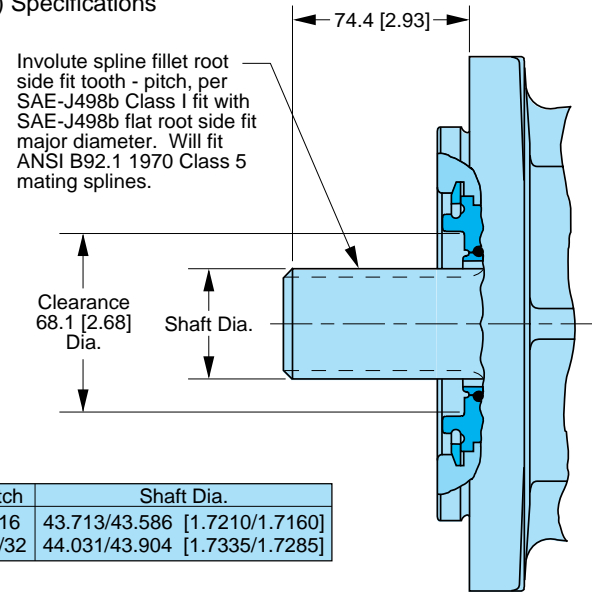
Keyed Shaft Option

Compatible with ISO 3019/1 (SAE-J744) Specifications



Splined Shaft Options

Compatible with ISO 3019/1 (SAE-J744) Specifications

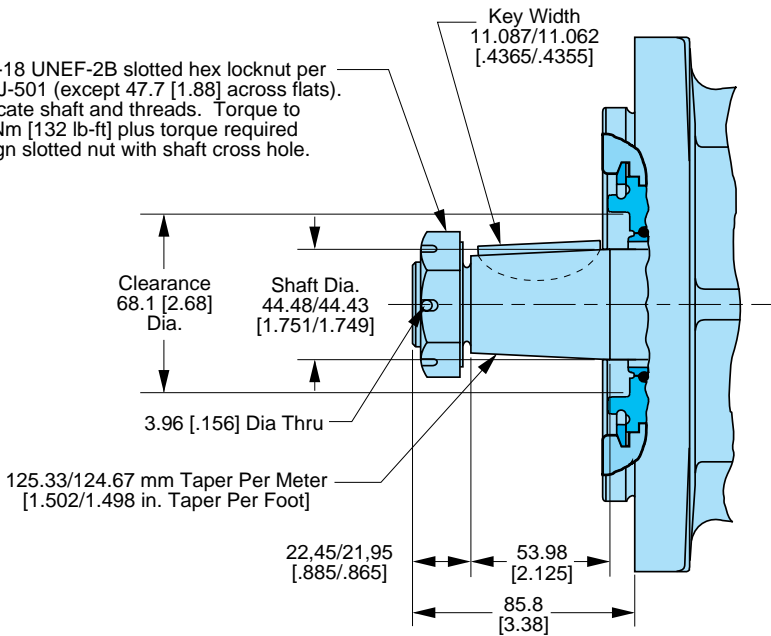


Tooth	Pitch	Shaft Dia.
13	8/16	43.713/43.586 [1.7210/1.7160]
27	16/32	44.031/43.904 [1.7335/1.7285]

Tapered Shaft Option

Compatible with ISO 3019/1 (SAE-J744) Specifications

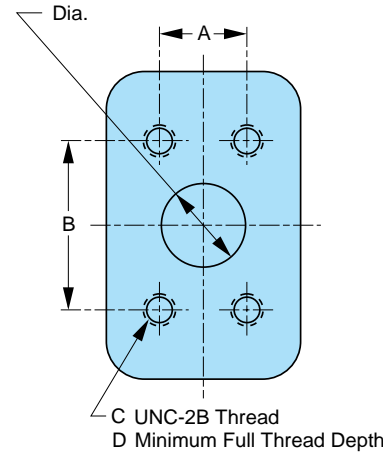
1 1/4-18 UNEF-2B slotted hex locknut per SAE J-501 (except 47.7 [1.88] across flats). Lubricate shaft and threads. Torque to 178 Nm [132 lb-ft] plus torque required to align slotted nut with shaft cross hole.



All dimensions given in millimeters [inches].

Split Flange Port Options

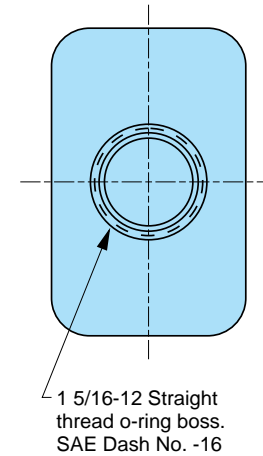
Per SAE-J518 Specifications



Code	Dia.	A	B	C	D
61	25.4 [1.00]	26.19 [1.031]	52.37 [2.062]	3/8-16	22.4 [.88]
62	25.4 [1.00]	27.76 [1.093]	57.15 [2.250]	7/16-14	27.0 [1.06]

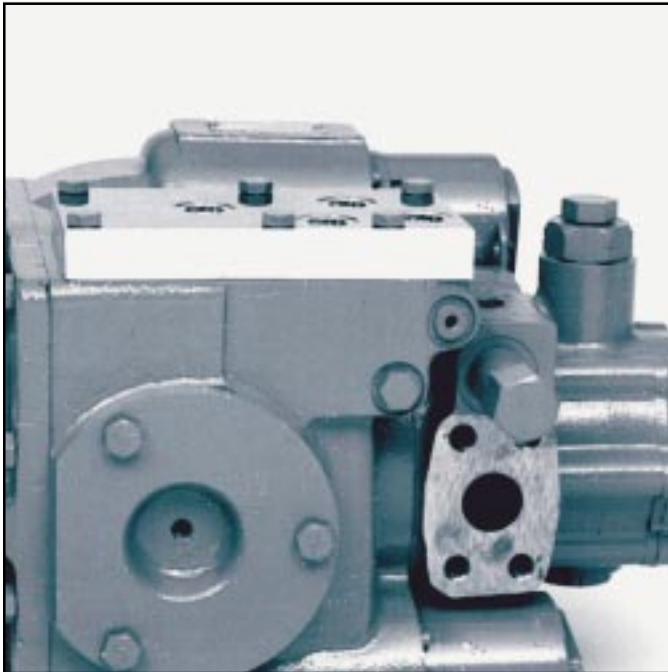
O-ring Port Option

Per SAE-J514 Specifications



Pump Controls

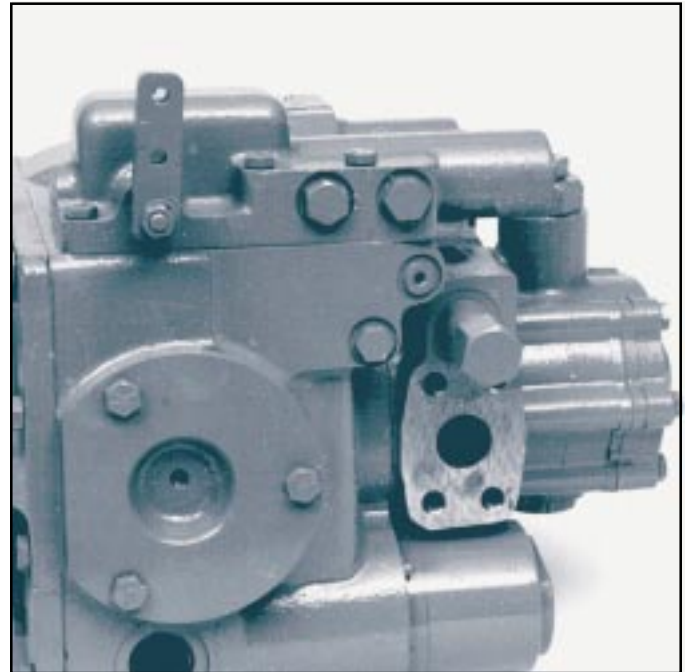
Port Plate



The port plate is the simplest control option available. It fits all Eaton heavy duty pumps and motors.

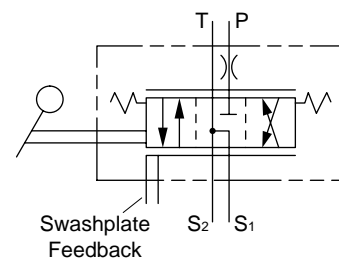
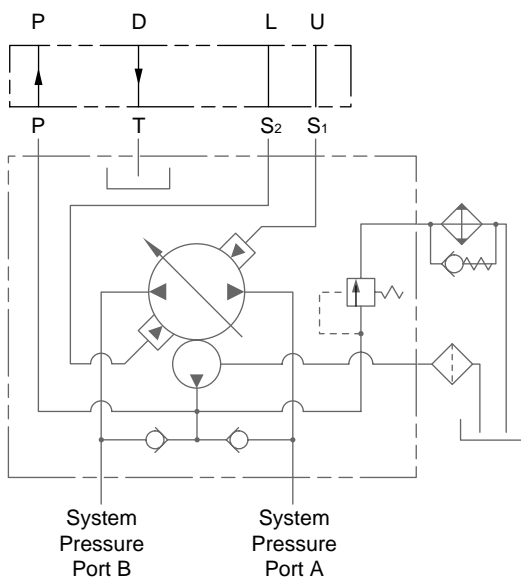
The port plate is commonly used as a slave control that receives commands from other controls in the same system.

Standard Variable Pump Control



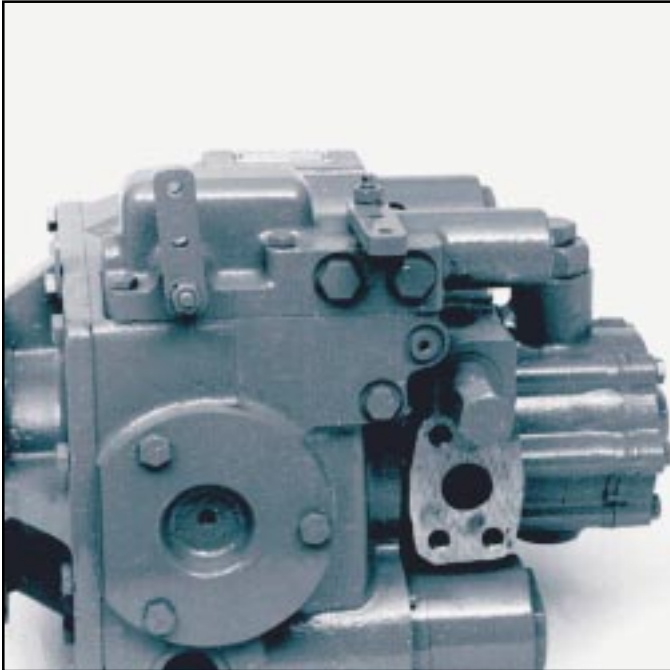
The standard variable pump control is the most common type of control used on heavy duty hydrostatic variable displacement pumps. It is normally actuated by direct mechanical linkages or cables.

A wide band neutral zone controller is available. It expands the center lever position where the pump output is zero flow.



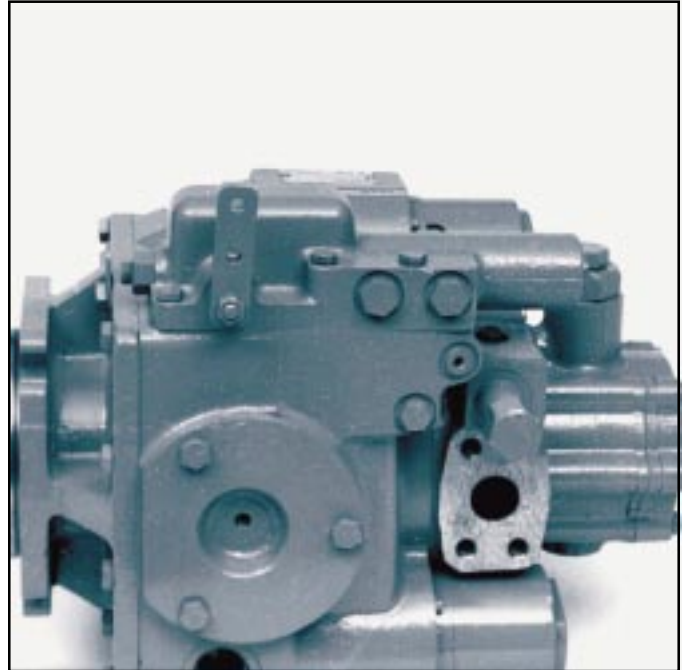
Pump Controls

Standard Control with Inching Valve

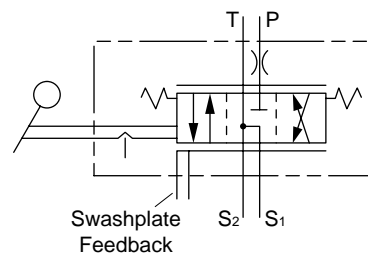
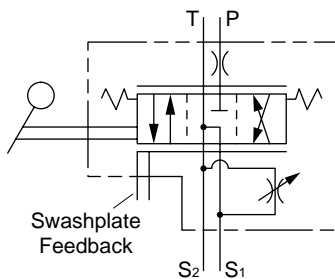


The inching valve is an option that is used in conjunction with the standard variable pump control. This control option would typically be used on a vehicle propel transmission. When the inching valve is operated with a foot pedal it functions like a clutch. A metering orifice in the inching valve's rotary spool cross ports the servo pressure lines providing the operator with smooth acceleration and deceleration.

Standard Control with Neutral Detent

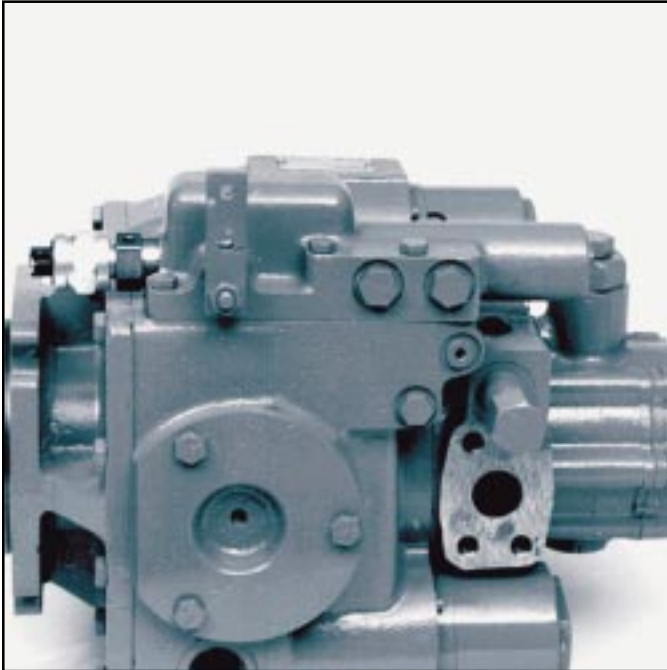


The neutral detent feature on the standard control valve provides a more positive feel when finding neutral. This control is a good choice for transmissions that have long control linkages or cables with varying amounts of free play.

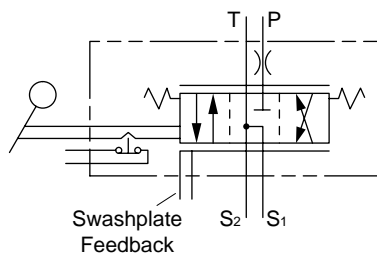


Pump Controls

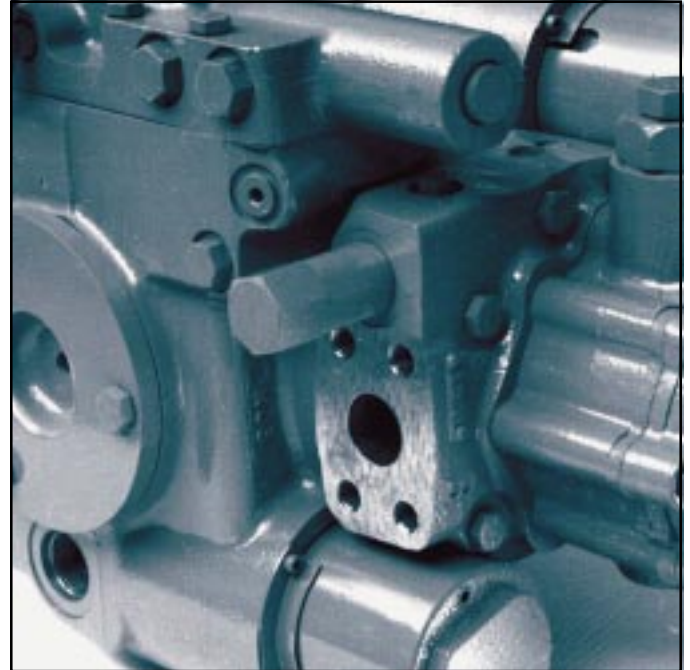
Standard Control with Neutral Lock-out



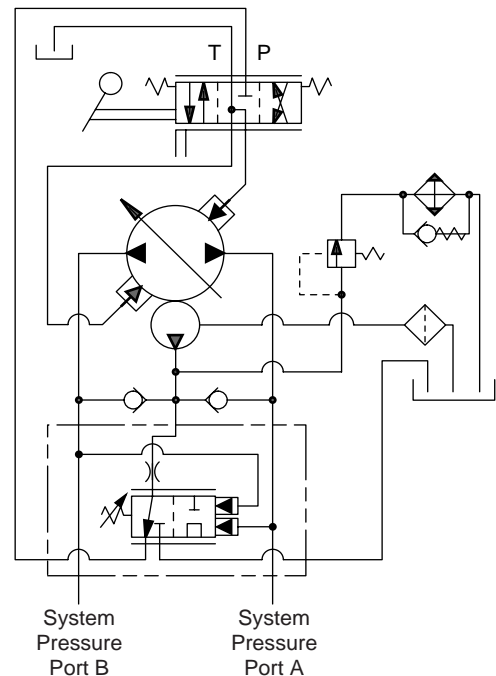
The neutral lock-out feature is an electrical switch that is closed when the transmission is in neutral. This switch can be used to prevent the activation of certain functions that require the pump to be in neutral. The lock-out feature is commonly used to prevent starting the prime mover or activating auxiliary functions. The electrical switch is available as normally open or normally closed.



Internal Pressure Override Control (IPOR)

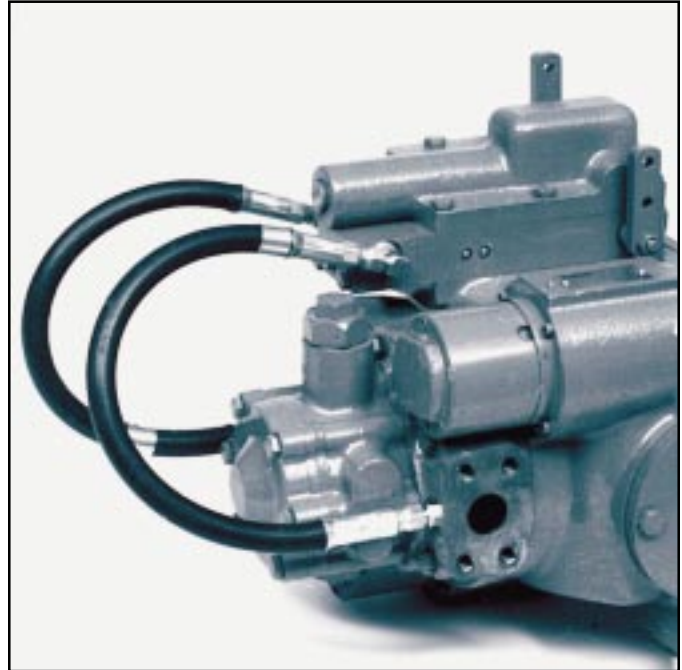


The internal pressure override (IPOR) protects the transmission from running at overload conditions for extended periods. It senses system pressure and allows the pump to destroke if pressures exceed a preset limit. The override pressure setting is shim adjustable. Since the IPOR is built into the pump end cover it is not a field conversion option.

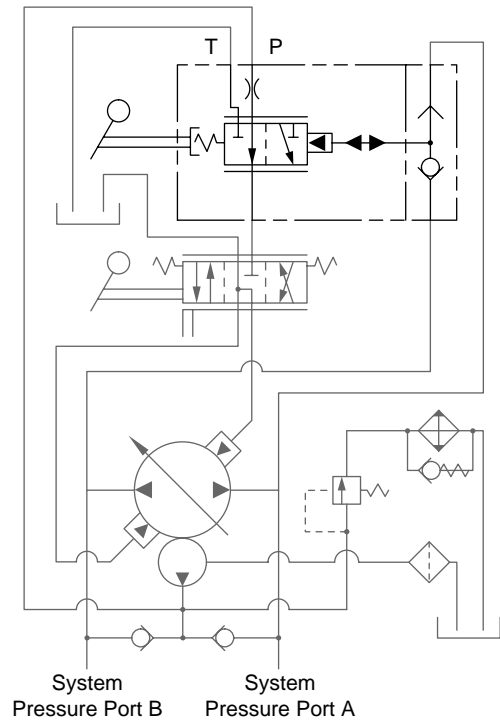


Pump Controls

Remote Pressure Override

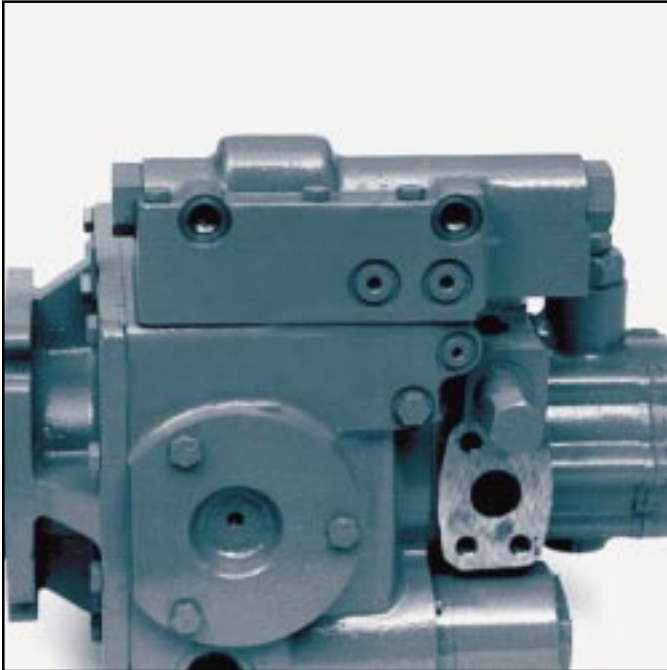


The remote pressure override control provides a means to remotely adjust the pressure setting of the pressure override valve. This control may be used in applications requiring variable system pressure protection to prevent overloads and excessive heat generation. This valve operates similarly to the IPOR control.



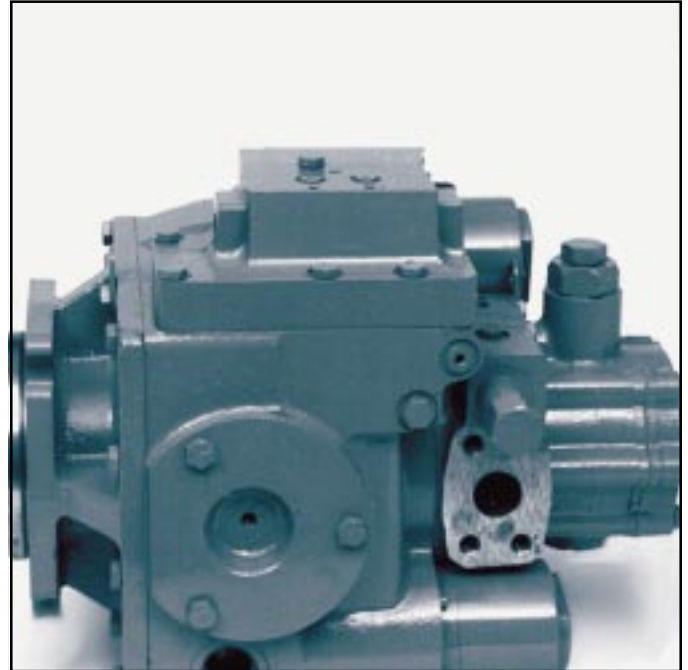
Pump Controls

Hydraulic Remote Control Pump Control

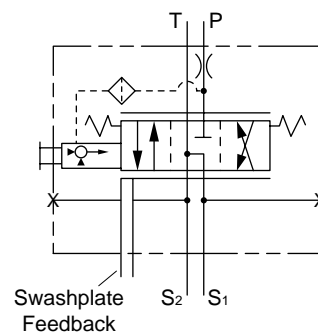
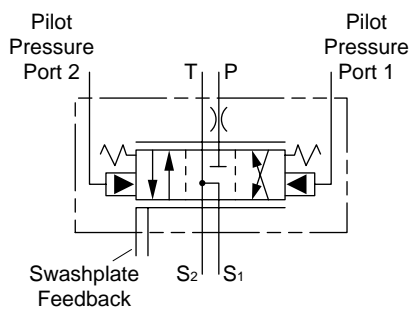


The hydraulic remote control uses a remote pilot pressure signal to move the control spool. This control can be used where cables or mechanical linkages are not feasible.

Electronic Control (ESC)

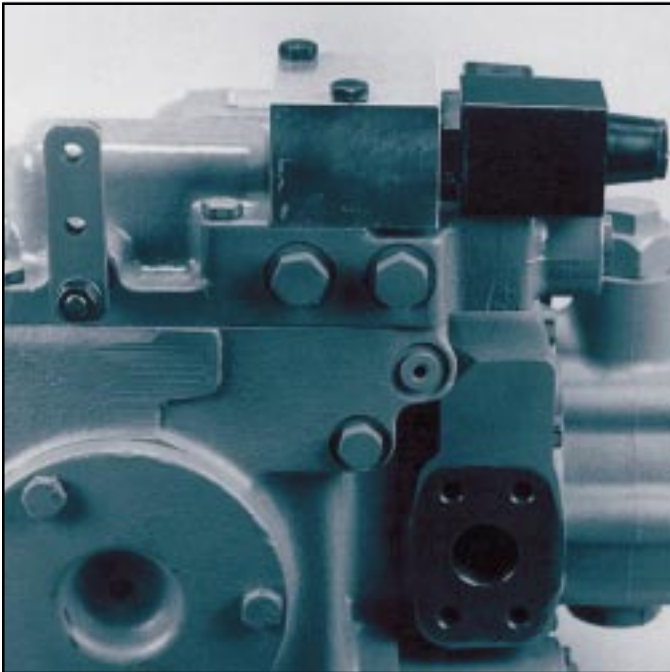


The electronic control (ESC) uses an electrical signal to change the displacement of the variable pump. The input signal may be manually or automatically controlled. The ESC requires a 0 to 100 milliamperes signal.



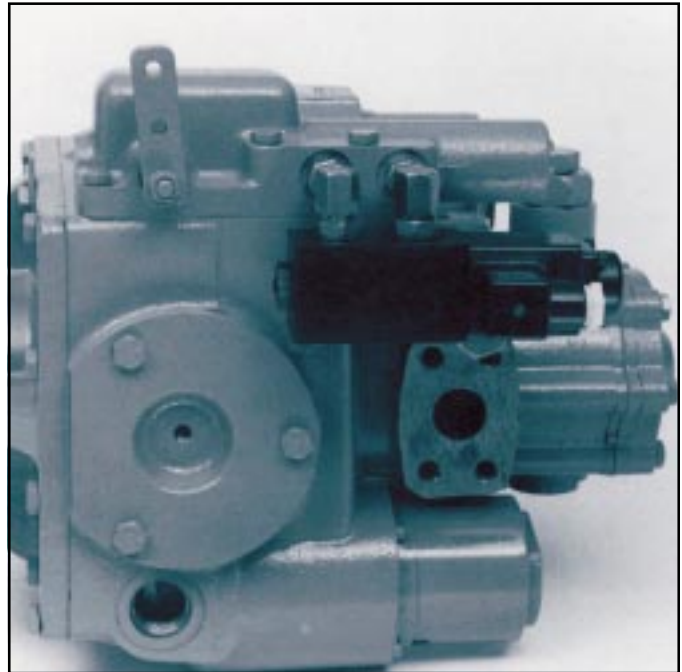
Pump Controls

Destroke Control



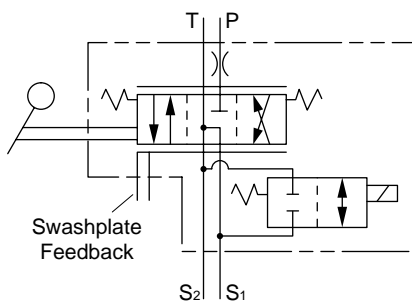
The heavy duty Destroke Control is a solenoid valve mounted on the standard variable pump control. When energized, the valve cross-ports control pressure allowing centering springs to bring the pump out of stroke. It can be energized with a single switch, push-button, or dead man's switch. The solenoid coil is available in 12 volt or 24 volt DC and normally open and normally closed configurations.

Destroke Solenoid



The heavy duty Destroke Solenoid is available to field convert the standard variable pump control into a destroke control.

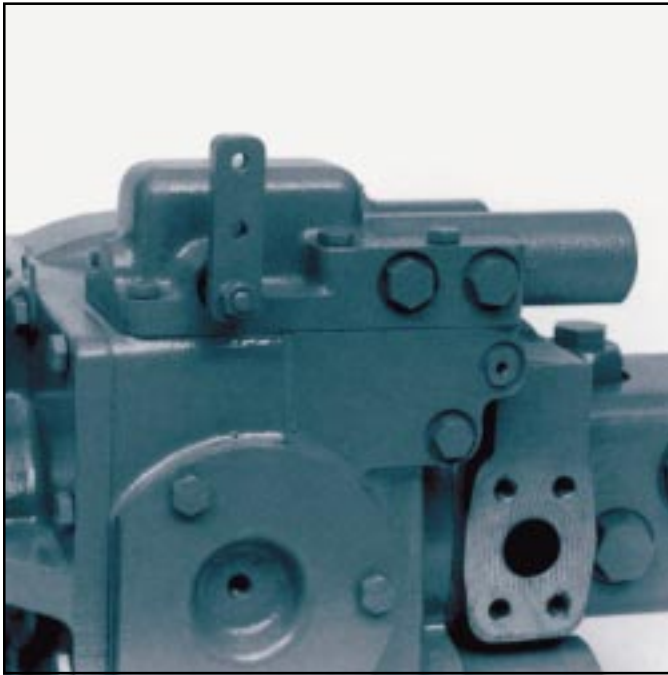
An Anti-Stall Electronics Module is available to drive a normally closed destroke valve. The electronic circuit monitors engine speed. When engine speed drops the anti-stall electronic reduce the pump's displacement.



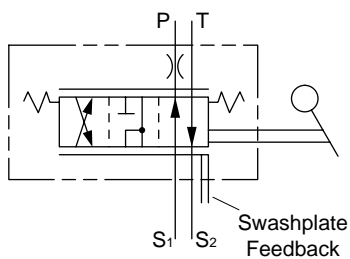
Anti-Stall Electronics Module

Variable Motor Controls

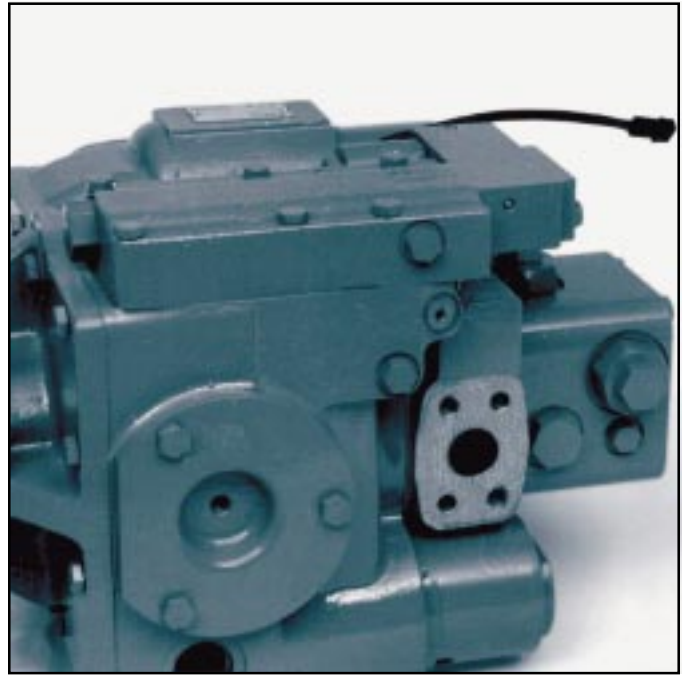
Manual Control



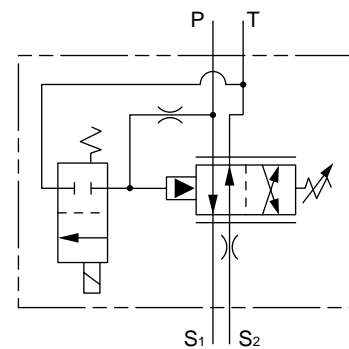
The manual displacement control for variable motors permits remote control of motor displacement using mechanical links or cables. The control operates similarly to the pump manual control, except the motor is biased to maximum displacement when the control handle is in a "neutral" position. Motor displacement may be controlled between maximum and minimum by moving the control lever.



Stroking Valve Control

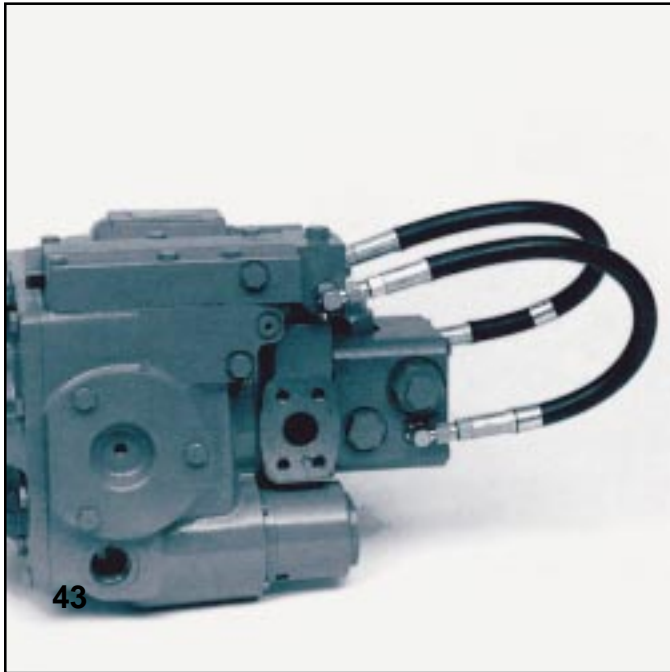


The variable motor stroking control provides a means of controlling motor displacement remotely via an electrical signal. When no electrical signal is supplied to the solenoid valve, the motor will be commanded to maximum displacement to provide maximum torque. Conversely, providing an electrical signal to the solenoid valve will command minimum displacement for maximum output speed. The control is available in 12 volt and 24 volt DC configurations.



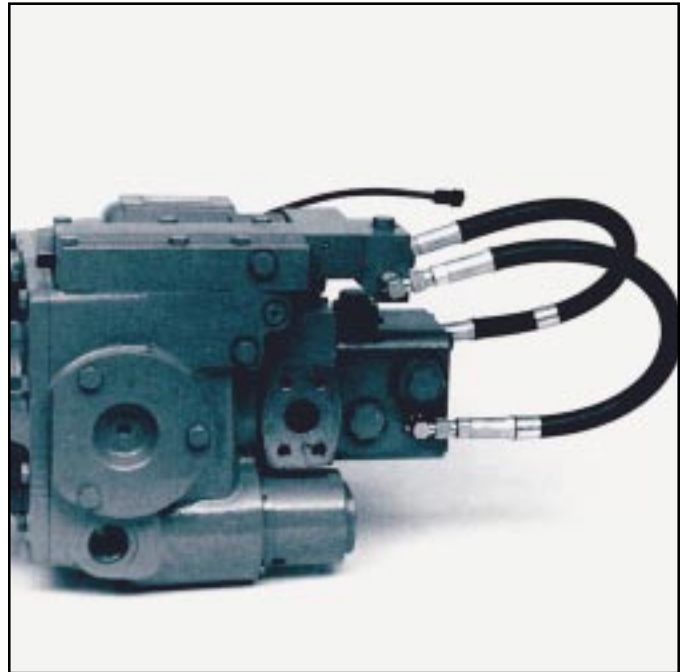
Variable Motor Controls

Pressure Response Control

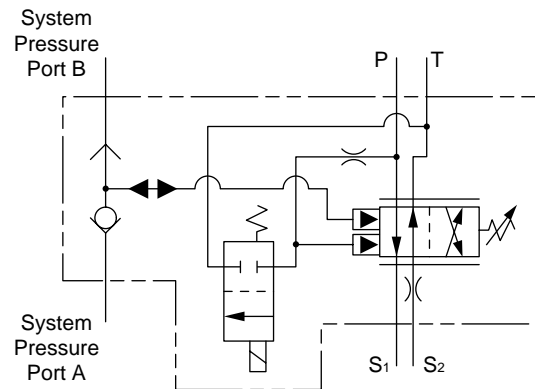
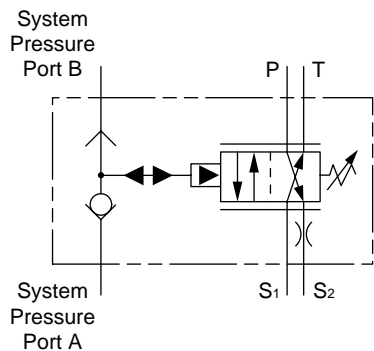


The variable motor pressure response control automatically adjusts motor displacement to meet torque requirements by sensing system pressure. The motor is biased to minimum displacement until system pressure reaches the pressure response setting. The control will then increase motor displacement to maintain the control pressure setting until maximum motor displacement is reached or the load on the system is reduced.

Pressure Response Control with Stroking Valve

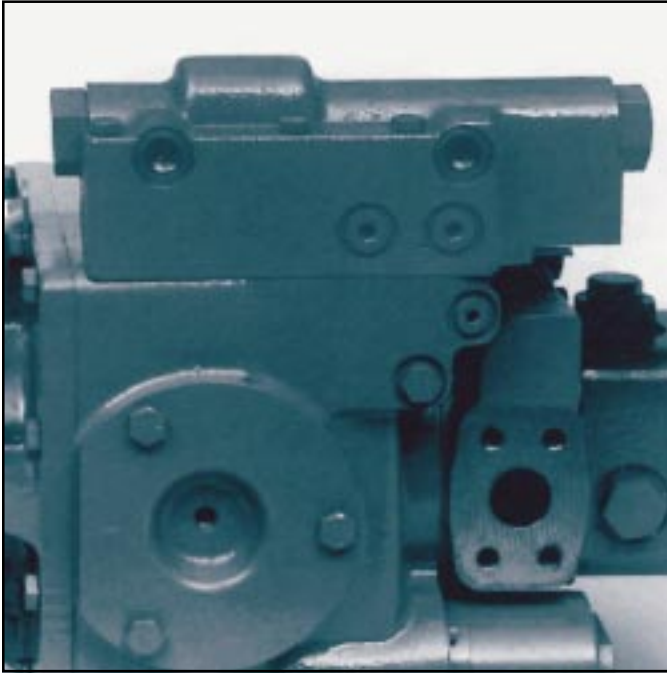


This control valve is a combination of the pressure response control and the stroking valve. With the stroking valve solenoid energized it works like the variable motor pressure response control. De-energize the stroking valve solenoid and the motor goes to full stroke. The control is available in 12 volt and 24 volt configurations.

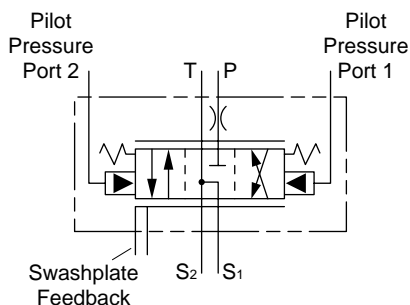


Variable Motor Controls

Hydraulic Remote Control Variable Motor Control



The hydraulic remote control uses a remote pilot pressure to move the control spool. There are two versions of the control available for variable motors. The first version contains a feedback linkage that biases the motor to minimum angle when the pilot pressure is below the control range. The second version contains a feedback linkage that biases the motor to full displacement when the pilot pressure is below the control range. This version permits the use of a single pilot signal to control the displacement of both the pump and motor. The operating pressure ranges of the hydraulic remote controls on pump and motor are selected such that the pump reaches full displacement before the pilot signal begins to reduce the displacement of the variable motor. This system provides infinitely variable speed control range and maximum motor output torque at lower speeds.





Eaton Corporation is a global manufacturer of highly engineered products that serve industrial, vehicle, construction, commercial and semiconductor markets. Principal products include electrical power distribution and control equipment, truck drivetrain systems, engine components, hydraulic products, ion implanters and a wide variety of controls. Headquartered in Cleveland, the company has 49,000 employees and 143 manufacturing sites in 26 countries around the world. Sales for 1997 were \$7.6 billion.

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