Eaton®
Medium Duty Piston Pump

Variable Displacement Piston Pump

Manual Controlled

Model 70160
20,3 cm³/r [1.24 in³/r]
23,6 cm³/r [1.44 in³/r]

Model 70360
40,6 cm³/r [2.48 in³/r]
49,2 cm³/r [3.00 in³/r]

Servo Controlled

Model 72400
40,6 cm³/r [2.48 in³/r]
49,2 cm³/r [3.00 in³/r]
Experienced system design engineers - Systems-based solutions to all your hydraulic needs.

Global manufacturing capability - Manufacturing plants and joint ventures in the U.S., Europe, Japan and China.

Global sales support - Sales offices in the U.S., Scotland, Germany, Singapore, China and Korea.

World’s largest distributor network - Over 100 distributors in 50 different countries.

Reliable, robust products - Field-proven leader in the hydraulics industry.

Exceptional product quality - All products manufactured in ISO 9001-certified sites.
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Introduction

Variable displacement piston pumps are used in closed loop systems either as a single or tandem pump. Oil is circulated by the pump to the motor and then returned directly back to the pump. A charge supply is used to supplement the closed loop system with oil. The charge supply may be supplied by an internal charge pump (standard) or an external source.

Typical Applications

Harvester Equipment
- Combines
- Fruit or Vegetable Pickers
- Swathers

Forestry Equipment
- Log Skidders
- Bark Removers
- Limb Removers

Construction Equipment
- Trenchers
- Skid Loaders
- Utility Vehicles
- Sweepers

Turf Care Equipment
- Mowers
- Loaders

Industrial Equipment
- Lift Trucks
- Sissor lifts

Paving Equipment
- Rollers
- Packers
Section 1  

Model 70160  

Manual Controlled  

20,3 cm³/r [1.24 in³/r]  

23,6 cm³/r [1.44 in³/r]  

Displacement
Model 70160 Features
Model 70160 Features

A. Input Shaft and Mounting
   • Shaft options
   • SAE "A" Mounting Flange
   • Tandem Capability
B. Housing
   • Compact
   • Lightweight, Die Cast Aluminum
C. Endcover
   • Opposite Side Porting and Same Side Porting Available.
D. Charge Pump Housing w/ Auxiliary Mount
E. Bearings
F. Swashplate
G. Seals
H. Rotating Group
   • 20,3 cm³/r [1.24 in³/r] Displacement
   • 23,6 cm³/r [1.44 in³/r] Displacement
I. Valve Plate
J. Bypass Valve
   • Option for cross porting a closed loop hydraulic circuit — used to move a disabled machine a limited distance.
K. Internal High Pressure Relief Valves
   • Prevents excessive pressure
L. Gerotor Charge Pump
   • Two sizes available.
      6,9 cm³/r [.42 in³/r]
      13,8 cm³/r [.84 in³/r]
M. Auxiliary Pump Drive
N. Auxiliary Port
   • For pressure check port or remote charge pressure port.
O. Control Shaft
   • Positioned on left or right side of pump.
P. Cover Plate
Q. Mounting Bracket
   • For support of rear unit of tandem pump.
   This bracket must be attached to the engine flywheel housing on the bulkhead used to mount the front unit of a tandem pump.
R. Low Pressure Relief Valve
S. Swashplate Insert

Front View
Model 70160
Assembly Installation Drawings

Opposite Side Porting, with internal Charge

---

<table>
<thead>
<tr>
<th>Port ID</th>
<th>Type of Port</th>
<th>Size and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Main Port</td>
<td>1-1/16 - 12 UN-2B SAE O-ring</td>
</tr>
<tr>
<td>B</td>
<td>Main Port</td>
<td>1-1/16 - 12 UN-2B SAE O-ring</td>
</tr>
<tr>
<td>C1</td>
<td>Auxiliary Port Top - Front or Bypass Valve</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C2</td>
<td>Auxiliary Port Top - Rear</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C4</td>
<td>Auxiliary Port Side - Left Side</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C5</td>
<td>Auxiliary Port Side - Right Side</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>D1</td>
<td>Drain Port - Top</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>D2</td>
<td>Drain Port - Bottom</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>D3</td>
<td>Thru Drain - Rear</td>
<td>9.27 [.365] Dia.</td>
</tr>
<tr>
<td>D4</td>
<td>Thru Drain - Front</td>
<td>9.55 [.376] Dia.</td>
</tr>
<tr>
<td>S</td>
<td>Charge Suction Port</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
</tbody>
</table>

---

Dimensions are in mm [in] unless noted otherwise.
Model 70160
Assembly Installation Drawings

Opposite Side Porting
Note: External charge pump required.

Same Side Porting
Note: External charge pump required.
Model 70160 Specifications

Model 70160 Specifications - Piston Pump

<table>
<thead>
<tr>
<th>Specification</th>
<th>20,3 cm³/r [1.24 in³/r]</th>
<th>23,6 cm³/r [1.44 in³/r]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Displacement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Mounting Flange</td>
<td>SAE &quot;A&quot;</td>
<td>SAE &quot;A&quot;</td>
</tr>
<tr>
<td>Flow @ Rated Speed &amp; PSI</td>
<td>64.3 l/min [17 gal/min]</td>
<td>75.7 l/min [20 gal/min]</td>
</tr>
<tr>
<td>Maximum Rated Speed</td>
<td>3600 RPM</td>
<td>3600 RPM</td>
</tr>
<tr>
<td>Continuous Rated Pressure</td>
<td>210 bar [3000 PSI]</td>
<td>210 bar [3000 PSI]</td>
</tr>
<tr>
<td>Maximum Intermittent Pressure</td>
<td>345 bar [5000 PSI]</td>
<td>345 bar [5000 PSI]</td>
</tr>
<tr>
<td>Continuous Allowable Case Pressure</td>
<td>2 bar [25 PSI]</td>
<td>2 bar [25 PSI]</td>
</tr>
<tr>
<td>Maximum Case Drain Temperature</td>
<td>107° C [225° F]</td>
<td>107° C [225° F]</td>
</tr>
<tr>
<td>Weight Per Single Pump</td>
<td>12.7 kg [28 lbs]</td>
<td>12.7 kg [28 lbs]</td>
</tr>
</tbody>
</table>

Specifications - Internal Gerotor Charge Pump

Displacement Options

<table>
<thead>
<tr>
<th>Displacement Options</th>
<th>6.9 cm³/r [0.42 in³/r]</th>
<th>13.8 cm³/r [0.84 in³/r]</th>
</tr>
</thead>
</table>

Operating Pressure Range (std.) .......................... 7 to 10 bar [100 to 150 PSI]
Maximum Charge Inlet Vacuum ............................ 0.80 bar Abs. [11.6 PSI Abs.]

Charge Pump Performance - Flow vs Speed

The chart at right is representative of a 6.9 cm³/r [0.42 in³/r] cm³/r and 13.4 (0.84 in³/r) displacement charge pumps. The test was run at 250 psi and an oil temperature of 60°C [150°F] with 13 cSt [68 SUS] viscosity.
Medium Duty Piston Pump

Model 70160 Performance Data

The charts below are representative of a 20,3 cm³/r [1.24 in³/r] Variable Displacement Piston Pump. The tests were run at an oil temperature of 82°C [180°F] with viscosity 7 - 9 cSt [50 - 54 SUS] and the pump at maximum displacement.

The charts below are representative of a 23,6 cm³/r [1.44 in³/r] Variable Displacement Piston Pump. The tests were run at an oil temperature of 82°C [180°F] with viscosity 7 - 9 cSt [50 - 54 SUS] and the pump at maximum displacement.
# Model 70160 Code

The Model 70160 Variable Displacement Piston Pumps are specified by the following model code. Once a pump is built from the model code, a product number will be assigned to that configuration. Make sure all positions are selected within the 32 digit code for each pump.

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit Front</th>
<th>Tandem Unit Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Position 1, 2, 3 - Code Title</strong></td>
<td>ADB</td>
<td>Std.</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 4, 5 - Displacement</strong></td>
<td>12 = 20.3 cm³/r [1.24 in³/r]; Rotating Kit - Standard</td>
<td>12</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>14 = 23.6 cm³/r [1.44 in³/r]; Rotating Kit - Standard</td>
<td>14</td>
<td>Std.</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 6 - Input Shaft Rotation</strong></td>
<td>R = Righthand Rotation (CW)</td>
<td>R</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>L = Lefthand Rotation (CCW)</td>
<td>L</td>
<td>Std.</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 7 - Valve Plate</strong></td>
<td>1 = Type 1</td>
<td>1</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 8 - Input Shaft (see page 16 for details)</strong></td>
<td>A = 13 Tooth 16/62 Pitch Spline, Shaft Extension 41.1 [1.62]</td>
<td>A</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>C = 35 Tooth 48/96 Pitch Spline, Shaft Extension 32.0 [1.26]</td>
<td>C</td>
<td>NA</td>
<td>NA</td>
<td>Std.</td>
</tr>
<tr>
<td>F = Straight Shaft Dia. 22.2 [0.875], Keyway 6.35 [0.25] x 25.9 [1.02], Shaft Extension 41.1 [1.62] (Key Included)</td>
<td>F</td>
<td>Opt.</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td><strong>Position 9 - Control Shaft and Location</strong></td>
<td>L = Left Side</td>
<td>L</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>R = Right Side</td>
<td>R</td>
<td>Std.</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 10 - Control Shaft</strong></td>
<td>D = with 15.7 [0.62] square arm, with bolt groove; 113 [4.45] from unit centerline to control shaft end.</td>
<td>D</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 11 - Main Ports (A and B) Location (see page 14 for port location)</strong></td>
<td>1 = Opposite Sides</td>
<td>1</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 12 - Main Ports (A and B) Size</strong></td>
<td>1 = 1- 1/16 -12 UN-2B Port, SAE Straight Thread O-ring Ports</td>
<td>1</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 13, 14 - Relief Valve Setting for Main Ports</strong></td>
<td>(Select a setting for port “A” in position 10 and port “B” in position 11.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T = 344 bar [5000 PSI]</td>
<td>T</td>
<td>Std.</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 15 - Charge Displacement, Suction Port (S) (see page 17 for port location)</strong></td>
<td>0 = No Charge</td>
<td>0</td>
<td>Opt.</td>
<td>Std.</td>
</tr>
<tr>
<td>1 = 6.9 cm³/r [0.42 in³/r]; 3/4 - 16 UNF-2B SAE o-ring port for suction inlet (right side CCW, Left side CW)</td>
<td>1</td>
<td>Std.</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>3 = 13.8 cm³/r [0.84 in³/r]; 3/4 - 16 UNF-2B SAE o-ring port for suction inlet (right side CCW, Left side CW)</td>
<td>3</td>
<td>Opt.</td>
<td>NA</td>
<td>Std.</td>
</tr>
<tr>
<td><strong>Position 16 - Charge Relief Setting and Routing</strong></td>
<td>0 = No (requires external relief set between 6.89 bar [100 lb/in²] and 20.68 bar [300 lb/in²])</td>
<td>0</td>
<td>Opt.</td>
<td>Std.</td>
</tr>
<tr>
<td>A = 6.89-10.34 bar [100-150 PSI]; Relieved to case</td>
<td>A</td>
<td>Std.</td>
<td>NA</td>
<td>Std.</td>
</tr>
<tr>
<td>F = 6.89-10.34 bar [100-150 PSI]; Recirculated</td>
<td>F</td>
<td>Std.</td>
<td>NA</td>
<td>Std.</td>
</tr>
</tbody>
</table>

Dimensions are in mm [in] unless noted otherwise.
Model 70160 Code (continued)

Position 17 - Charge Special Feature
0 = No Special Feature ......................................................... 0 Std. Std. Std.

Position 18 - Auxiliary Rear Mount and Output Shaft (see page 15 for details)
A = With Integral Charge: Horizontal 2-Bolt "A" SAE J744 Flange 82-2:
Accepts 9 tooth internal 16/32 pitch spline with 31.7 [1.25] shaft extension ............................................................ A Std. NA Std.
B = No Integral Charge: Horizontal or Vertical 2-Bolt "A" SAE J744 Flange 82-2:
C = No Integral Charge: Horizontal or Vertical 2-Bolt "A" SAE J744 Flange 82-2:
D = No Integral Charge: Horizontal or Vertical 2-Bolt "A" SAE J744 Flange 82-2:
E = No Integral Charge: Horizontal or Vertical 2-Bolt "A" SAE J744 Flange 82-2:

Position 19, 20 - Special Features Auxiliary Mounting
00 = No Special Features ........................................................... 00 Std. Std. Std.

Position 21 - Auxiliary Port Top-Front (C1) or Bypass Valve (see page 17 for port location)
0 = None ................................................................................ 0 Std. Std. Std.

Position 22 - Auxiliary Port Top-Rear (C2) (see page 17 for port location)
1 = 3/4 -16 UNF-2B SAE o-ring port ................................................................. 1 Std. Std. Std.

Position 23 - Auxiliary Port Side (C4 or C5) (Integral Charge Only) (see page 17 for port location)
0 = None ................................................................................ 0 Opt. NA Opt.

Position 24 - Case Drain (D1 and D2) (see page 17 for port location)

Position 25 - Thru Drain Front (D4) (see page 17 for port location)

Position 26 - Additional Functions
0 = None ................................................................................ 0 Std. Std. Std.

Position 27, 28 - Special Features
00 = None ................................................................................ 00 Std. Std. Std.

Position 29, 30 - Paint
0A = Primer, Red Oxide ........................................................................ 0A Std. Std. Std.

Position 31 - Identification
0 = Eaton Identification Label ........................................................................ 0 Std. Std. Std.

Position 32 - Design Code
C = C ................................................................................ C Std. Std. Std.
# Model 70160

## Input Shafts

### Code Position 8

<table>
<thead>
<tr>
<th>Code</th>
<th>Input Shafts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>13 Tooth</td>
</tr>
<tr>
<td>C</td>
<td>35 Tooth</td>
</tr>
<tr>
<td>F</td>
<td>Straight Keyed</td>
</tr>
</tbody>
</table>

### Code Position 8 Table

<table>
<thead>
<tr>
<th>Code</th>
<th>Dimension</th>
<th>Input Torque</th>
<th>Shaft Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td>16/32 Pitch 30 Degree Involute Flat Root, Class 1 Side Fit Spline, SAE J498b</td>
</tr>
<tr>
<td>A</td>
<td>13 Tooth</td>
<td>209.3 N•m [1852 lbf•in]</td>
<td>Used for tandem connection only.</td>
</tr>
<tr>
<td>C</td>
<td>35 Tooth</td>
<td>209.3 N•m [1852 lbf•in]</td>
<td>48/96 Pitch 45 Degree Involute Fillet Root, Class 1 Side Fit Spline, SAE J498b</td>
</tr>
<tr>
<td>F</td>
<td>Straight Keyed</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Torque Note:

The combined torque required for multiple pumps must not exceed the torque rating of the input drive shaft of the front piston pump. Consult an Eaton representative and/or Eaton engineering on side load recommendations.

---

**Dimensions are in mm [in] unless noted otherwise.**
Model 70160
Auxiliary Rear Mounts & Output Shafts

Code Position 18

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>9 Tooth</td>
<td>11 Tooth</td>
<td>9 Tooth</td>
<td>35 Tooth</td>
<td>9 Tooth</td>
</tr>
<tr>
<td>Shaft Diametrical Pitch</td>
<td>16/32 Pitch Int.</td>
<td>16/32 Pitch Ext.</td>
<td>16/32 Pitch Int.</td>
<td>48/96 Pitch Ext.</td>
<td>20/40 Pitch Ext.</td>
</tr>
<tr>
<td>Auxiliary Mount SAE &quot;A&quot; 2 Bolt</td>
<td>SAE J744</td>
<td>SAE J744</td>
<td>SAE J744</td>
<td>SAE J744</td>
<td>SAE J744</td>
</tr>
<tr>
<td>Charge Pump</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Maximum Torque</td>
<td>54 N•m [480 lb•in]</td>
<td>119 N•m [1050 lb•in]</td>
<td>76 N•m [672 lb•in]</td>
<td>Used for tandem connection only.</td>
<td>76 N•m [672 lb•in]</td>
</tr>
<tr>
<td>Coupler Required; In code position 19, 20 select ....</td>
<td>No</td>
<td>Yes, Code 'AD'</td>
<td>Yes, Code 'AB'</td>
<td>Yes, Code 'AE'</td>
<td>Yes, Code 'AC'</td>
</tr>
</tbody>
</table>

Auxiliary "A" Mount with Charge Pump

Auxiliary Pump Shaft Extension (see table)

Auxiliary "A" Mount without Charge Pump

Auxiliary Pump Shaft Extension (see table)

<table>
<thead>
<tr>
<th>Code Position 19 &amp; 20</th>
<th>Type</th>
<th>Diameter</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>9T</td>
<td>28.45</td>
<td>[1.12] Dia.</td>
</tr>
<tr>
<td>AD</td>
<td>11T</td>
<td>31.8</td>
<td>[1.25] Dia.</td>
</tr>
<tr>
<td>AE</td>
<td>35T</td>
<td>28.45</td>
<td>[1.12] Dia.</td>
</tr>
</tbody>
</table>

Dimensions are in mm [in] unless noted otherwise.
Model 70160
Bracket and Cover Plate

Code
Position 19, 20
Bracket

Code "AF" Bracket
Center Line of Drive Shaft
(Shown in Rear View for Detail)

Dimensions are in mm [in] unless noted otherwise.

This bracket is to be used for additional mounting support. The two bolt 'A' mount is not sufficient to support the complete tandem unit.

With Charge Pump
197,9 [7.79]

Without Charge Pump
164,1 [6.46]

This bracket is to be used for additional mounting support. The two bolt 'A' mount is not sufficient to support the complete tandem unit.

With Charge Pump
197,9 [7.79]

Without Charge Pump
164,1 [6.46]

Center Line of Drive Shaft
(Shown in Rear View for Detail)

Code "AG" Bracket

With Charge Pump
197,9 [7.79]

Without Charge Pump
164,1 [6.46]

Cover Plate

Code Position 19,20
Fits SAE "A" auxiliary mounting flange in place of auxiliary pump.

Cover Plate Kit #70142-915 includes cover plate, cap screws (2) and o-ring.

With Charge Pump
197,9 [7.79]

Without Charge Pump
164,1 [6.46]

Code "AA"

Dimensions are in mm [in] unless noted otherwise.

Holes (2) for 9,53 [.375] Dia. Bolt

106,35 [4.187]

82,55±0.03 [3.250±.001] Dia.
**Model 70160 Port Locations**

**Code**
**Position 21 through 25**

**Pump**
**With Integral Charge**

**Pump**
**Without Integral Charge**

<table>
<thead>
<tr>
<th>Port ID</th>
<th>Type of Port</th>
<th>Size and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Main Port</td>
<td>1-1/16 -12 UN-2B SAE O-ring</td>
</tr>
<tr>
<td>B</td>
<td>Main Port</td>
<td>1-1/16 -12 UN-2B SAE O-ring</td>
</tr>
<tr>
<td>C1</td>
<td>Auxiliary Port Top - Front or Bypass Valve</td>
<td>3/4 -16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C2</td>
<td>Auxiliary Port Top - Rear</td>
<td>3/4 -16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C3</td>
<td>Auxiliary Port Side - Left Side</td>
<td>3/4 -16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C4</td>
<td>Auxiliary Port Side - Right Side</td>
<td>3/4 -16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C5</td>
<td>Auxiliary Port Side - Right Side</td>
<td>3/4 -16 UNF-2B SAE O-ring</td>
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<tr>
<td>D1</td>
<td>Drain Port - Top</td>
<td>3/4 -16 UNF-2B SAE O-ring</td>
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<tr>
<td>D2</td>
<td>Drain Port - Bottom</td>
<td>3/4 -16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>D3</td>
<td>Thru Drain - Rear</td>
<td>9.27 [.365] Dia.</td>
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<tr>
<td>D4</td>
<td>Thru Drain - Front</td>
<td>9.55 [.376] Dia.</td>
</tr>
<tr>
<td>S</td>
<td>Charge Suction Port</td>
<td>3/4 -16 UNF-2B SAE O-ring</td>
</tr>
</tbody>
</table>
Model 70160 and 70142 Dimension Comparison

Model 70160
Opposite Side Porting, with internal Charge

Model 70142
Opposite Side Porting, with internal Charge

<table>
<thead>
<tr>
<th>Model 70160</th>
<th>Model 70142</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>214.8 [8.46]</td>
</tr>
<tr>
<td>B</td>
<td>69.8 [2.75]</td>
</tr>
<tr>
<td>C</td>
<td>82.52 [3.249]</td>
</tr>
<tr>
<td>D</td>
<td>113 [4.45]</td>
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<tr>
<td>E</td>
<td>62 [2.44]</td>
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<tr>
<td>F</td>
<td>79.8 [3.14]</td>
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<tr>
<td>G</td>
<td>72.9 [2.87]</td>
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<tr>
<td>H</td>
<td>15.7 [.62]</td>
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<tr>
<td>I</td>
<td>103.9 [4.09]</td>
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<tr>
<td>J</td>
<td>149.8 [5.90]</td>
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<td>K</td>
<td>191.4 [7.54]</td>
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<tr>
<td>L</td>
<td>106.6 [4.19]</td>
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<tr>
<td>M</td>
<td>53.2 [2.09]</td>
</tr>
<tr>
<td>N</td>
<td>104.6 [4.12]</td>
</tr>
<tr>
<td>O</td>
<td>9.5 [.375] Ø Bolt Slot</td>
</tr>
<tr>
<td>P</td>
<td>84.1 [3.31]</td>
</tr>
</tbody>
</table>

Opposite Side Porting, with internal Charge
Medium Duty Piston Pump

1.24 in³/r Displacement Frame Size

Key Improvements

- **Redesigned Trunnion Bearing & Covers**
  - Changed from needle to tapered roller bearings
  - Improved thrust load capabilities
  - Minimizes section seal leaks
  - Facilitates assembly and disassembly

- **Swash Plate**
  - Material changed to reduce transmitted noise and vibration
  - Incorporates a thrust plate to improve serviceability

- **Main Housing & Mounting Flange**
  - Mounting flange rotated 90 degrees to facilitate larger trunnion bearings
  - Stiffer mounting flange to minimize requirement for additional mounting brackets
  - Larger case drain for higher flow capacity
  - Top & Bottom case drain locations minimize entrapped air and reduces risks of cavitation

- **Input Control Shaft & Seals**
  - Redesigned to ease customer assembly of control linkages
  - Square input shaft to reduce wear between linkage and input shaft
  - Annular groove in input shaft to facilitate retention of linkage to the input shaft
  - Changed from o-ring to lip seal to reduce effects of environmental contamination

- **Computer Generated Valve Plate Designs**
  - Reduces noise and improved sound quality
  - Designs tailored to meet customer control and noise requirements

- **Improved Rotating Group**
  - Improved neutral centering characteristics
Section 2

Model 70360

Manual Controlled

40,6 cm³/r [2.48 in³/r]
49,2 cm³/r [3.00 in³/r]

Displacement
Medium Duty Piston Pump

Features

Pressure Port

Charge Port

Pressure Port

Drain Port

Rotation CW or CCW

Right side

Left side

Features
Features

Model 70360

A. Input Shaft and Mounting
• Auxiliary or tandem mount capability.
• Numerous shaft options.
• SAE "B" or "B-B" Mount (2 Bolt).

B. Housing
• Compact and lightweight package size.
• Durable, sturdy design.

C. Endcover
• Opposite side porting and same side porting w/ auxiliary mount

D. Charge Pump Housing

E. Bearings

F. Swashplate

G. Seals

H. Rotating Group
• 40.6 cm³/r [2.48 in³/r] Displacement
• 49.2 cm³/r [3.00 in³/r] Displacement

I. Valve Plate

J. Bypass Valve
• Cross ports the closed loop hydraulic circuit
  - used to move a disabled machine a limited distance.

K. Internal High Pressure Relief Valves
• Prevents excessive pressure

L. Gerotor Charge Pump
• Two sizes available
  • 6.9 cm³/r [.42 in³/r]
  • 13.8 cm³/r [.84 in³/r]

M. Auxiliary Pump Mounting Flange (Rear)
• SAE 'A' or 'B'

N. Auxiliary Port
• For Pressure check port or remote charge pressure port.

O. Control Shaft (Square Std.)
• Position on left or right side of pump.

P. Cover Plate
Model 70360
Typical Installation Drawings

Opposite Side Porting, with internal charge pump. Used as a single pump or on rear of multiple units.

Note: The Charge Pump for a single pump is normally a 6.9 cm³/r [.42 in³/r] displacement and for a tandem unit is a 13.8 cm³/r [.84 in³/r] displacement.

Right-hand (CW) Rotation Shown
All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Dimensions are in millimeters [inches], unless otherwise specified.

Opposite Side Porting, with internal charge pump. Used as a single pump or on rear of multiple units.

Note: The Charge Pump for a single pump is normally a 6.9 cm³/r [.42 in³/r] displacement and for a tandem unit is a 13.8 cm³/r [.84 in³/r] displacement.

Right-hand (CW) Rotation Shown
All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Dimensions are in millimeters [inches], unless otherwise specified.
Medium Duty Piston Pump

Model 70360
Tandem Assembly Installation Drawings

Opposite Side Porting, and Rear SAE "B" Auxiliary Mounting Flange.
(External Charge Pump Required)

Right-hand (CW) Rotation Shown
All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Dimensions are in millimeters [inches], unless otherwise specified.
## Model 70360 Specifications - Piston Pump

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Displacement</td>
<td>40,6 cm³/r [2.48 in³/r]</td>
</tr>
<tr>
<td>Input Mounting Flange</td>
<td>SAE &quot;B&quot; or &quot;BB&quot;</td>
</tr>
<tr>
<td>Flow @ Rated Speed &amp; PSI</td>
<td>140 l/min [37.0 gal/min]</td>
</tr>
<tr>
<td>Maximum Rated Speed</td>
<td>3600 RPM</td>
</tr>
<tr>
<td>Continuous Rated Pressure</td>
<td>210 bar [3000 PSI]</td>
</tr>
<tr>
<td>Maximum Intermittent Pressure</td>
<td>345 bar [5000 PSI]</td>
</tr>
<tr>
<td>Continuous Allowable</td>
<td></td>
</tr>
<tr>
<td>Case Pressure</td>
<td>2 bar [25 PSI]</td>
</tr>
<tr>
<td>Maximum Case Drain</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>107°C [225°F]</td>
</tr>
<tr>
<td>Weight per single pump</td>
<td>14,1 to 15,9 kg [31 to 35 lbs]</td>
</tr>
</tbody>
</table>

## Specification - Internal Gerotor Charge Pump

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement Options</td>
<td></td>
</tr>
<tr>
<td>6.9 cm³/r [.42 in³/r]</td>
<td></td>
</tr>
<tr>
<td>13.8 cm³/r [.84 in³/r]</td>
<td></td>
</tr>
<tr>
<td>Operating Pressure Range (std.)</td>
<td>7 to 10 bar [100 to 150 PSI]</td>
</tr>
<tr>
<td>Maximum Charge Inlet Vacuum</td>
<td>0.80 bar Abs. [6 inHg]</td>
</tr>
</tbody>
</table>
Model 70360 Features & Benefits

- **Customized Valve Plate Designs & Porting**
  - Reduces noise and swashplate moments.

- **Tapered Trunnion Bearing Arrangement**
  - Reduces noise and vibration.
  - Improves neutral return thrust load capabilities.

- **Strengthened Mounting Flange**
  - Reduces customer requirements for additional support brackets.

- **Square Input Control Shaft**
  - Eases the assembly of customer installed control lever and reduces wear on control shaft and control lever.

- **Improved Swashplate Design**
  - Reduces noise, and vibration.

### Lower Swashplate Moments

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Modified Valve Plate</td>
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<tr>
<td>Standard Valve Plate</td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>

- **10% Swashplate Angle**
- **95% Swashplate Angle**

### Performance Data

The charts below are representative of a single 40.6 cm³/r [2.48 in³/r] Variable Displacement Piston Pump. The tests were run at an oil temperature of 82°C [180°F] with viscosity at 9 - 12 cSt [54-66 SUS] and the pump at maximum displacement.
## Model 70360 Code

### Ordering Instructions

The Model 70360 piston pumps are specified by using the following model code system tailoring the pump configuration to the requirement. Once a pump is built from the model code, a product number will be assigned to that configuration and the pump identified.

Make sure all positions are selected within the 25 digit code for each pump order. Also state if the pumps making up a tandem are required to be mounted together or separately.

### Code Example:

<table>
<thead>
<tr>
<th>Position</th>
<th>ACV</th>
<th>20</th>
<th>R</th>
<th>A</th>
<th>B</th>
<th>1</th>
<th>T</th>
<th>T</th>
<th>A1</th>
<th>C</th>
<th>1</th>
<th>11</th>
<th>1</th>
<th>0</th>
<th>00</th>
<th>CD</th>
<th>0</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Position 1, 2, 3 - Code Title

**ACV** = Series 360 Manually Variable Displacement Axial Piston pump with SAE J744 Flange 101-2 (2 Bolt “B”)

### Position 4, 5 - Displacement and Valve Plate

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Std</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>30</td>
<td>Std</td>
<td>Std</td>
<td>Std</td>
</tr>
</tbody>
</table>

### Position 6 - Input Shaft Rotation

- All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

### Position 7 - Input Shaft

- **A** = 15 Tooth external spline, 16/32 pitch; 24,981 [0.9835] Major Dia.; 46 [1.81] Shaft extension
- **B** = 41 Tooth external spline, 48/96 pitch; 22.2 [0.875] Major Dia.; 24.4 [0.96] Shaft extension
- **C** = 13 Tooth external spline, 16/32 pitch; 21.81 [0.8585] Major Dia.; 41.1 [1.62] Shaft extension
- **D** = 125 :1 Taper; 25.4 [1.00] Diameter; 6.1 [0.25] W x 19.8 [0.78] L keyway; 3/8 - 24 UNF -2B Thread; 35.1 [1.38] Shaft extension
- **E** = Straight 22.2 [0.875] Diameter; 6.3 [0.25] W x 24.6 [0.97] L key; 41.3 [1.62] Shaft extension
- **G** = Straight 25.4 [1.00] Dia.; 6.1 [0.25] x 28.4 [1.12] L key; 46.0 [1.81] Shaft extension

### Position 8 - Control Shaft and Location

- **J** = Right; 19 [0.748] Square Shaft with bolt groove; 128 [5.04] from centerline to control shaft end
- **K** = Left; 19 [0.748] Square Shaft with bolt groove; 128 [5.04] from centerline to control shaft end

### Position 9 - Main Ports (A and B), Size and Location

- **1** = 1 - 1/16 - 12 SAE Straight Thread, Opposite Sides
- **2** = 1 - 1/16 - 12 SAE Straight Thread, Same Side (without internal charge pump)

### Position 10, 11 - Relief Valve Setting for Main Ports

(Select a Setting for port A in position 10 and port B in position 11)

- **G** = Check Valve Only
- **B** = 138 bar (2000 PSI)
- **E** = 173 bar (2500 PSI)
- **H** = 207 bar (3000 PSI)
- **L** = 241 bar (3500 PSI)
- **N** = 276 bar (4000 PSI)
- **Q** = 310 bar (4500 PSI)
- **T** = 344 bar (5000 PSI)

### Position 12, 13 - Auxiliary Mount and Output Shaft (rear)

- **A1** = SAE J744 flange 82-2 (2 Bolt A); Accepts 9 Tooth 16/32 DP spline with 31.7 [1.25] shaft extension (No coupler required)
- **A2** = SAE J744 flange 82-2 (2 Bolt A) with cover plate; Accepts 9 Tooth 16/32 DP spline with 31.7 [1.25] shaft extension (No coupler required)
- **A3** = SAE J744 flange 82-2 (2 Bolt A); Accepts 11 Tooth 16/32 DP spline with 31.7 [1.25] shaft extension (coupler required)
- **A4** = SAE J744 flange 82-2 (2 Bolt A) with cover plate; Accepts 11 Tooth 16/32 DP spline with 31.7 [1.25] shaft extension (coupler required)
- **B2** = SAE J744 flange 101-2 (2 Bolt B); Accepts 13 Tooth 16/32 DP spline with 41.1 [1.62] shaft extension (coupler required)
- **B4** = Vertical Accepts a SAE J744 flange 101-2 (2 Bolt B); Accepts 41 Tooth 48/96 DP spline with 24.9 [0.98] shaft extension (coupler required)
## Model 70360 Code

### Position 14 - Auxiliary Port and Bypass Valve

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>Opt</td>
<td>NA</td>
</tr>
<tr>
<td>A</td>
<td>Opt</td>
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<td>Opt</td>
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<td>F</td>
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<td>Opt</td>
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<tr>
<td>G</td>
<td>Opt Std</td>
<td>Opt</td>
</tr>
<tr>
<td>H</td>
<td>Opt</td>
<td>NA Opt</td>
</tr>
<tr>
<td>J</td>
<td>Opt</td>
<td>Opt</td>
</tr>
<tr>
<td>K</td>
<td>Opt</td>
<td>NA Opt</td>
</tr>
<tr>
<td>L</td>
<td>Opt</td>
<td>NA Opt</td>
</tr>
<tr>
<td>M</td>
<td>Opt NA Opt</td>
<td>NA</td>
</tr>
<tr>
<td>N</td>
<td>Opt NA Opt</td>
<td>Opt</td>
</tr>
</tbody>
</table>

#### No Bypass Valve Installed
- B = No auxiliary port.
- A = 3/4 - 16 UNF - 2B SAE O-ring port, Top (C1)
- B = 3/4 - 16 UNF - 2B SAE O-ring port, Top w/ hex plug (C1)
- F = 3/4 - 16 UNF - 2B SAE O-ring port, Top w/ hex plug (C1); Rear (C3)
- G = 3/4 - 16 UNF - 2B SAE O-ring port, Top w/ hex plug (C1); Rear-Left 45° (C4)
- H = 3/4 - 16 UNF - 2B SAE O-ring port, Top w/ hex socket plug (C1); Rear (C3)
- J = 3/4 - 16 UNF - 2B SAE O-ring port, Top w/ hex socket plug (C1); Rear- Left 45° (C4)
- K = 3/4 - 16 UNF - 2B SAE O-ring port, Top (C1); Rear - Left 45° w/ hex plug (C4)
- L = 3/4 - 16 UNF - 2B SAE O-ring port, Top (C1); Rear w/ hex socket plug (C3)
- M = 3/4 - 16 UNF - 2B SAE O-ring port, Rear (C3)
- N = 3/4 - 16 UNF - 2B SAE O-ring port, Top (C1), Top - Rearward w/ hex socket plug (C2), Left side w/ hex socket plug (C6), Right side w/ hex socket plug (C7)
- P = 3/4 - 16 UNF - 2B SAE O-ring port, Top w/ hex plug (C1), Rear - Right 45° (C5)
- V = 3/4 - 16 UNF - 2B SAE O-ring port, Top w/ hex plug (C1), Top - Rearward (C2)

### Bypass Valve installed in Top port (C1)
- C = 3/4 - 16 UNF - 2B SAE O-ring port, Top rearward (C2)
- E = 3/4 - 16 UNF - 2B SAE O-ring port, Top (C1); Rear left 45° (C4)
- R = 3/4 - 16 UNF - 2B SAE O-ring port, Rear (C3)
- S = 3/4 - 16 UNF - 2B SAE O-ring port, Top w/ hex plug (C2)
- T = 3/4 - 16 UNF - 2B SAE O-ring port, Top - Rearward (C2), Left side w/ hex socket plug (C6), Right side w/ hex socket plug (C7)

### Bypass Valve installed in rear port (C3)
- D = 3/4 - 16 UNF - 2B SAE O-ring port, Top (C1)
- U = 3/4 - 16 UNF - 2B SAE O-ring port, Top (C1)

### Position 15 - Charge Pump
- O = No charge Pump
- 1 = 6,9 cm³/r [0.42 in³/r]; 3/4-16 UNF - 2B SAE O-ring port for suction inlet (S)
- 2 = 13,8 cm³/r [0.84 in³/r]; 3/4-16 UNF - 2B SAE O-ring port for suction inlet (S)

### Position 16, 17 - Charge Pump Relief Setting and Routing
- 00 = None
- 01 = No charge relief (Requires external relief set between 6,89 bar [100 PSI] 17,24 bar [250 PSI])

### For Units with Charge Pump
- 11 = 6,89-10,34 bar [100-150 PSI]; Recirculated
- 12 = 10,34-13,79 bar [150-200 PSI]; Recirculated
- 13 = 13,79-17,24 bar [200-250 PSI]; Recirculated
- 14 = 17,24-20,68 bar [250-300 PSI]; Recirculated

### For Units without Charge Pump
- 21 = 6,89-10,34 bar [100-150 PSI]; Relieved to case
- 22 = 10,34-13,79 bar [150-200 PSI]; Relieved to case
- 23 = 13,79-17,24 bar [200-250 PSI]; Relieved to case

### Position 18 - Drain Port Size and Location
- 0 = None
- 1 = 3/4-16 UNF-2B SAE o-ring port, Top (D1); Bottom plugged (D2)

### Position 19 - Additional Functions
- 0 = None
- 0A = Fluorocarbon Rubber Drive shaft seal and control shaft seal
- 0C = Bottom Mounting Bracket with 13,7 [0.54] diameter hole
- 0D = Coupling and O-ring included for rear mount

### Position 20, 21 - Special Features
- 00 = None
- 0A = Primer
- 0B = Black

### Position 22, 23 - Paint
- 0A = Primer
- 0B = Black

### Position 24 - Identification
- 0 = Standard (Nameplate)

### Position 25 - Design Code
- A = A
Medium Duty Piston Pump

70360
Input Shafts

Code Position 7

Shaft A
Maximum Input Torque
338 N·m [2987 lbf-in]

Shaft B
Maximum Input Torque
316 N·m [2800 lbf-in]

Shaft C
Maximum Input Torque
209 N·m [1852 lbf-in]

Shaft D
Maximum Input Torque
338 N·m [2987 lbf-in]

Shaft E
Maximum Input Torque
209 N·m [1852 lbf-in]

Shaft F
Maximum Input Torque
209 N·m [1852 lbf-in]

Shaft G
Maximum Input Torque
338 N·m [2987 lbf-in]

Dimensions are in millimeters [inches], unless otherwise specified.

Torque Note:
The combined torque required to turn multiple pumps must not exceed the torque rating of the input drive shaft of the front piston pump.
Consult an Eaton representative and/or Eaton engineering on side load recommendations.
Medium Duty Piston Pump

70360
Auxiliary Mounts & Output Shafts

Code Position 12 and 13

Torque limit on internal rear spline of piston pump with internal charge pump must not exceed 54 N•m [480 lbf•in]. Piston pump without internal charge pump must not exceed 76 N•m [672 lbf•in]

(Used on piston pump with internal charge pump)
Maximum Torque
119 N•m [1050 lbf•in]

(Used on piston pump without internal charge pump)

(Used for Tandem Connections)
Maximum Torque
316 N•m [2,800 lbf•in]

Cover Plate
Fits "A" SAE Auxiliary Mounting Flange. Cover Plate Kit #70142-915: Includes plate, cap screws (2), and o-ring

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.
Medium Duty Piston Pump

70360 Port Locations

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.

Opposite Side Porting
(Selected in Position 9)

Same Side Porting
(Selected in Position 9)

This unit will accept another unit with an SAE "A" auxiliary mounting flange and a 15.2 [0.62], 9 tooth, 16/32 DP 30 involute flat root, Class 1, side fit spline SAE J498b.

Additional units driven by this spline must not require more than 76 N m [672 lbf in] of torque.

This unit will accept another unit with an SAE "A" auxiliary mounting flange and a 15.2 [0.62], 9 tooth, 16/32 DP 30 involute flat root, Class 1, side fit spline SAE J498b.

Additional units driven by this spline must not require more than 76 N m [672 lbf in] of torque.

Mounting Bracket
Used to support tandem with opposite side porting.
Customer supplied bracket must be mounted to the same engine or bulk head mount as front pump.
Medium Duty Piston Pump

70360 Port Locations

Code Position 12 and 13

Opposite Side Porting
(Selected in Position 9)

<table>
<thead>
<tr>
<th>Port ID</th>
<th>Type of Port</th>
<th>Location and Size Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Main Port</td>
<td>1-1/16 - 12 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>B</td>
<td>Main Port</td>
<td>1-1/16 - 12 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C1</td>
<td>Auxiliary Port Front or Bypass Valve</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C2</td>
<td>Auxiliary Port Rear</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C3</td>
<td>Auxiliary Port Rear - Left Side</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C4</td>
<td>Auxiliary Port Rear - Right Side</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>D1</td>
<td>Drain Port - Top</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>D2</td>
<td>Drain Port - Bottom</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>D3</td>
<td>Thru Drain - Rear</td>
<td>6.95 [0.27] Dia.</td>
</tr>
<tr>
<td>D4</td>
<td>Thru Drain - Front</td>
<td>6.95 [0.27] Dia.</td>
</tr>
<tr>
<td>S</td>
<td>Charge Suction Port</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
</tbody>
</table>

Same Side Porting
(Selected in Position 9)

Will accept a Ø 22.23 [0.875] 41 tooth 48/96 DP 45 involute fillet root, Class 1 side fit spline. Accepts a SAE J498b with a 24.9 [0.98] shaft extension.

Mounting Hole Supports 4 x 7/16 - 14 UNC-2B 18.8 [0.74] deep. Customer supplied bracket must be mounted to the same engine or bulk head mount as front pump.

Front of Flange 167.5 [6.60] 217.0 [8.54]
Section 3

Model 72400

Servo Controlled

40,6 cm³/r [2.48 in³/r]
49,2 cm³/r [3.00 in³/r]

Displacement
Features

Model 72400

A. Housing
- Compact package size.
- Durable cast iron design.
- Multiple drain options.
- Quiet operation.

B. Endcover

C. Charge Pump Adapter

D. Manual Displacement Servo Control Valve
- Low operator effort.
- Modular design.

E. Input Shaft and Mounting
- SAE "B" or "B-B" Mount (2 Bolt)
- Numerous shaft options.

F. Seals

G. Bearings

H. Swashplate Cradle

I. Swashplate Bushing

J. Swashplate

K. Rotating Group
- 40.6 cm³/r [2.48 in³/r] Displacement
- 49.2 cm³/r [3.00 in³/r] Displacement

L. Valve plate
- Improved serviceability.

M. Servo Piston Assembly

N. Bypass Valve
- Cross ports the closed loop hydraulic circuit - used to move a disabled machine a limited distance.

O. Internal High Pressure Relief Valves
- Prevents excessive pressure.

P. Gerotor Charge Pump
- Two sizes available
  - 6.9 cm³/r [.42 in³/r]
  - 13.8 cm³/r [.84 in³/r]

Q. Auxiliary Pump Mounting Flange (Rear)
- SAE "A" or "B"

R. Case Drain Port

S. Auxiliary Port
- For pressure check port or remote charge pressure port.

T. Control Lever

U. Control Orifices
- Controls rate of change of displacement.

V. Main System Ports
Model 72400

Medium Duty Piston Pump

Installation Drawing - Model 72400 Servo Controlled Single Piston Pump

This unit will accept another unit with an SAE "A" Auxiliary Mounting Flange and 15.7 [.62] Dia. 9 Tooth, 16/32 DP 30 involute flat root, class 1, side fit spline SAE J498b. Additional units driven by this spline must not require more than 54 N-m [480 lbf-in] of torque.

Dimensions are in mm [in] unless noted otherwise.
Description of Unit on Opposite Page:
Righthand (CW) Rotation
Input Shaft: 15 tooth
Output Shaft: 9 tooth
Auxiliary Rear Mounting: SAE "A" Series 82-2
Charge Pump: 6.9 cm³/r [.42 in³/r] disp. with Inlet Port 1 - 5/16-12 UN-2B, SAE O-ring Port
Charge Pump Relief Setting: 17 to 21 bar [250 to 300 PSI], relieved to case.
Auxiliary Port: 3/4-16 UNF-2B, SAE O-ring Port, plugged on both sides.
Drain Port: 1 - 1/16-12 UN-2B, SAE O-ring Port, on right side and rear flange drained into housing
Main Ports: 1 - 5/16-12 UN-2B, SAE O-ring Port, same side on right
Relief Valves: Available in a range of settings to 379 bar [5500 PSI]
Additional Functions: Bypass Valve
Control Assembly: Manual with no additional features
Supply Orifice: .71 mm [.028 in]
Paint: Black

Additional options are available by using the Model Code and Details.

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.
Assembly Dimensions - Model 72400 Servo Controlled Front Piston Pump of Tandem Pumps

Lever Position vs. Pressurized Port
Right Hand (CW) Rotation
- Lever position 'A' --- Port (A) is Pressurized
- Lever position 'B' --- Port (B) is Pressurized
Left Hand (CCW) Rotation
- Lever position 'A' --- Port (B) is Pressurized
- Lever position 'B' --- Port (A) is Pressurized

Dimensions are in mm unless noted otherwise.
Description of Unit on Opposite Page:

- Righthand (CW) Rotation
- Input Shaft: 15 tooth
- Output Shaft: 41 tooth
- Auxiliary Rear Mounting: SAE 2 bolt "B" Series 101-2
- Charge Pump: Not included
- Auxiliary Port: 3/4-16 UNF-2B SAE O-ring Port on right side
- Drain Port: 1 - 1/16-12 UN-2B SAE O-ring Port on right side and rear flange drained into housing
- Main Ports: 1 - 5/16-12 UN-2B SAE O-ring Port on same side (left side of pump)
- Relief Valves: Available in a range of settings to 379 bar [5500 PSI]
- Additional Functions: Bypass Valve
- Control Assembly: Manual with no additional features
- Supply Orifice: .71 mm [.028 in]
- Paint: Black

Additional options are available by using the Model Code and Details.

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.
Model 72400

Assembly Dimensions - Model 72400 Servo Controlled Rear Piston Pump of Tandem Pumps

Medium Duty Piston Pump

Lever Position vs. Pressurized Port
Righthand (CW) Rotation
Lever position "A"--- Port (A) is Pressurized
Lever position "B"--- Port (B) is Pressurized
Lefthand (CCW) Rotation
Lever position "A"--- Port (B) is Pressurized
Lever position "B"--- Port (A) is Pressurized

Righthand (CW) Rotation Shown
Dimensions are in mm [in] unless noted otherwise.

This unit will accept another unit with an SAE "A" Auxiliary Mounting Flange and 15.7 [.62] Dia. 9 Tooth, 16/32 DP 30 Involute Flat Root, Class 1, side fit spline SAE J498b. Additional units driven by this spline Must not require more than 54 N-m [480 lbf-in] of torque.

Charging line and fittings to be supplied by customer to front pump.

Auxiliary Port (C2) for Charge to Front Pump
3/4-16 UN-2B SAE O-ring Port

Lever Position "A"

Levers Position "B"

Drain Port (D1) (plugged)
1 - 1/16-12 UN-2B SAE O-ring Port

Mounting Slots for 12.7 [.5] Dia. Bolts, 2 Slots

Alternate Location for Drain Port (D2) (Plugged)

Alternate location for Auxiliary Port (C1)

Charge Inlet Port (S) for Lefthand (CCW) Rotation
1 - 5/16-12 UN-2B SAE 0-ring Port

Main Port (A) in Lever Position "A"
1 - 1/16-12 UN-2B SAE 0-ring port

Mounting Hole for tandem support 3/8 - 16 UNC-2B, 10.7 [.42] deep Two Holes (one on each side)

Relief Valve for Port (A)

Drain (D3) To Housing

Bypass Valve

Relief Valve for Port (B)

.375-16 UNC-2B 19.4 [.77] deep 2 Places

Lever Position vs. Pressurized Port

Lever position "A"--- Port (A) is Pressurized
Lever position "B"--- Port (B) is Pressurized

Dimensions are in mm [in] unless noted otherwise.

Mounting Slots for 12.7 [.5] Dia. Bolts, 2 Slots

Main Port (B) in Lever Position "B"
1 - 1/16-12 UN-2B SAE 0-ring Port

Alternate Location for Auxiliary Port (C1)

Alternate location for Drain Port (D1) (Plugged)

Charge Inlet Port (S) for Righthand (CW) Rotation
1 - 5/16-12 UN-2B SAE 0-ring Port

Relief Valve for Port (B)

106.38 [4.188]

19,4 [.77] deep 2 Places

125,7 [4.95]

12,4 [.49]

Levers Position "B"

Drain Port (D2) (plugged)
1 - 1/16-12 UN-2B SAE O-ring Port

Mounting "B" Dia. 6.8 [27] Dia.

6,8 [27] Dia.

Lever Position "A"

Levers Position "B"

19,0 [.75]

0 32

32 9,7 [3.8]

7,9 [.31] Dia.

82.65/82.60 [3.254/3.252] Dia.

245,5 [9.66] 274,7 [10.82]

22,4 [.88] Dia. 41 Tooth 48/96 DP 45 Involute Fillet Root Class 1 Side Fit Spline

Thru Drain (D4) Thru Drain

88,9 [3.50] 20,3 [.80]

20,3 [.80] 146,3 [5.76]
Medium Duty Piston Pump

Model 72400 Servo Controlled
Rear Piston Pump of Tandem Pumps

Description of Unit on Opposite Page:

Righthand (CW) Rotation
Input Shaft: 41 tooth
Output Shaft: 9 tooth
Auxiliary Rear Mounting: SAE "A" Series 82-2 w/mounting support hole
Charge Pump: 13.8 cm³/r [0.84 in³/r] disp. with inlet Port, 1 - 5/16-12 UN-2B SAE O-ring Port
Charge Pump Relief Setting: 17 to 21 bar [250 to 300 PSI], Relieved to Case.
Auxiliary Port: 3/4-16 UNF-2B SAE O-ring Port on right side
Drain Port: 1 - 1/16-12 UN-2B SAE O-ring Port on both sides, plugged, and drain hole thru housing to front pump.
Main Ports: 1 - 5/16-12 UN-2B SAE O-ring Port same side on left
Relief Valves: Available in a range of settings to 379 bar [5500 PSI]
Additional Functions: Bypass Valve
Control Assembly: Manual with no additional features
Supply Orifice: .71 mm [.028 in]
Paint: Black

Additional options are available by using the Model Code and Details.

All left (CCW) or right (CW) directions given are viewed from the input shaft end of the pump.
Model 72400
Features, Benefits & Specifications

Features
- Modular design
- Duralble cast iron housing
- Multiple drain options
- SAE "B" or "B-B" Mount (2 Bolt) Flange
- Numerous shaft options
- Auxiliary or tandem mount capability
- Charge pump
- Control options

Benefits
- Compact package size
- Quiet operation
- Low operating effort
- Improved serviceability

Model 72400
Specifications - Piston Pump

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Displacement</td>
<td>40,6 cm³/r [2.48 in³/r]</td>
</tr>
<tr>
<td>Input Mounting Flange</td>
<td>SAE &quot;B&quot; or &quot;BB&quot;</td>
</tr>
<tr>
<td>Flow @ Rated Speed &amp; PSI</td>
<td>140 l/min [37.0 gal/min]</td>
</tr>
<tr>
<td>Maximum Rated Speed</td>
<td>3600 RPM</td>
</tr>
<tr>
<td>Continuous Rated Pressure</td>
<td>210 bar [3000 PSI]</td>
</tr>
<tr>
<td>Maximum Intermittent Pressure</td>
<td>379 bar [5500 PSI]</td>
</tr>
<tr>
<td>Continuous Allowable</td>
<td></td>
</tr>
<tr>
<td>Case Pressure</td>
<td>2 bar [25 PSI]</td>
</tr>
<tr>
<td>Maximum Case Drain</td>
<td>107°C [225°F]</td>
</tr>
<tr>
<td>Weight per single pump</td>
<td>27 to 28 kg [59 to 62 lbs]</td>
</tr>
</tbody>
</table>

Specifications - Internal Gerotor Charge Pump

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement Options</td>
<td>6,9 cm³/r [.42 in³/r]</td>
</tr>
<tr>
<td>Operating Pressure Range (std.)</td>
<td>17 to 21 bar [250 to 300 PSI]</td>
</tr>
<tr>
<td>Maximum Charge Inlet Vacuum</td>
<td>0,80 bar Abs. [6 inHg]</td>
</tr>
</tbody>
</table>
Medium Duty Piston Pump

Model 72400 Performance Data

The charts below are representative of a single 40.6 cm³/r [2.48 in³/r] Variable Displacement Piston Pump. The tests were run at an oil temperature of 82°C [180°F] with viscosity at 9 - 12 cSt [54 - 66 SUS] and the pump at maximum displacement.
**Medium Duty Piston Pump**

**Model Code for the 72400 Piston Pumps**

**Ordering Instructions**

The Model 72400 Servo Controlled piston pumps are selected by using the following Model Code System tailoring the pump configuration to the requirement. Once a pump is built from the model code, a product number will be assigned to that configuration and the pump identified.

Make sure all positions are selected within the 27-digit code for each pump ordered.

<table>
<thead>
<tr>
<th>Code Example:</th>
<th>Position:</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAD R A A A 1 3 E 1 T T A M O 0 0 A 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td>1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27</td>
</tr>
</tbody>
</table>

**Position 1, 2, 3 - Code Title**

- AAD = 40.6 cm³/r [2.48 in³/r] Servo Controlled Variable Displacement Pump
- AAE = 40.6 cm³/r [2.48 in³/r] Servo Controlled Variable Displacement Pump (Tandem Front Pump)
- AAF = 40.6 cm³/r [2.48 in³/r] Servo Controlled Variable Displacement Pump (Tandem Rear Pump)
- AGC = 49.2 cm³/r [3.00 in³/r] Servo Controlled Variable Displacement Pump
- AGH = 49.2 cm³/r [3.00 in³/r] Servo Controlled Variable Displacement Pump (Tandem Front Pump)
- ACJ = 49.2 cm³/r [3.00 in³/r] Servo Controlled Variable Displacement Pump (Tandem Rear Pump)

**Position 4 - Input Shaft Rotation**

| R = Righthand Rotation (CW) |
| L = Left-hand Rotation (CCW) |

**Position 5 - Input Shaft**

- A = 15 Tooth, 16/32 External Spline, 46 [1.81] Shaft Extension ................................................................. A
- B = 41 Tooth, 48/96 External Spline, 24.4 [.96] Shaft Extension ................................................................. B
- C = 13 Tooth, 16/32 External Spline, 41.1 [1.62] Shaft Extension ................................................................. C

**Position 6 - Output Shaft**

- A = 9 Tooth, 16/32 Internal Spline, Accepts 31.8 [1.25] Shaft Extension (for SAE "A" mount only) .............. A
- B = 41 Tooth, 48/96 External Spline, Accepts 24.4 [.96] Shaft Extension (for SAE "B" mount only) .............. B
- F = 11 Tooth, 16/32 Internal Spline, Accepts 31.8 [1.25] Shaft Extension (for SAE "A" mount only) .............. F
- J = 11 Tooth, 16/32 External Spline, Accepts 31.8 [1.25] Shaft Extension (for SAE "B" mount only) .............. J

(To be used with 36.8 [1.45] spacer) ................................................. J

**Position 7 - Auxiliary Rear Mounting**

- A = "A" SAE Flange Series 82-2 ................................................................. A
- B = 2 Bolt "B" SAE Flange Series 101-2 .................................................... B
- C = "A" SAE Flange Series 82-2 w/ Cover Plate ............................................. C
- D = "A" SAE Flange Series 82-2 w/ Cover Plate and Mounting Support Holes ............................................. D
- E = "A" SAE Flange Series 82-2 w/ Mounting Support Holes .......................... E
- F = 2 Bolt "B" SAE Flange Series 101-2 w/ Mounting Support Holes ............. F

**Position 8 - Charge Pump**

- 0 = No charge pump ................................................................. 0
- 1 = 6.9 cm³/r [.42 in³/r] disp. w/1-5/16 - 12 UN-2B SAE O-ring straight thread inlet port (S) ............... 1
- 2 = 13.8 cm³/r [.84 in³/r] disp. w/1-5/16 - 12 UN-2B SAE O-ring straight thread inlet port (S) ............... 2

**Position 9 - Charge Pump Relief Setting and Routing**

- 0 = No charge pump ................................................................. 0
- 1 = 17 - 21 bar [250-300 PSI] (Relieved to Case) ........................................ 1
- 2 = 17 - 21 bar [250-300 PSI], 1- 5/16 - 12 UN-2B SAE O-ring straight thread outlet port (C3), ................................. 2
- 3 = 7/8-14 UNF-2B SAE O-ring straight thread return port (C4), ................................. 3

**Position 10 - Auxiliary Port, Size and Location**

- D = On both sides w/ left side plugged (housing), 3/4 - 16 UNF-2B SAE O-ring straight thread port .......... D
- E = On both sides and both plugged (housing), 3/4 - 16 UNF-2B SAE O-ring straight thread port ............ E

**Position 11 - Drain Port Size and Location**

- D = On both sides w/ right side plugged & rear flange drained into housing, ................................. D
- E = On both sides w/ left side plugged & rear flange drained into housing, ................................. E
- M = On both sides w/ left side plugged & thru drain into mount (front), ................................. M
- S = On both sides w/ both sides plugged & thru drain into mount (front), ................................. S

**Position 12 - Main Ports, Size and Location**

- 1 = 1- 5/16 - 12 UN-2B O-ring straight thread port, Same Side (Right Side) .............................................. 1
- 2 = 1- 5/16 - 12 UN-2B O-ring straight thread port, Same Side (Left Side) .............................................. 2

**Position 13, 14 - Relief Valve Setting for Main Ports**

## Model Code for the 72400 Piston Pumps

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>Std. Std.</td>
<td>Std. Std.</td>
</tr>
</tbody>
</table>

### Position 15 - Additional Functions

- **O** = No Additional Functions
- **A** = Bypass Valve

### Position 16, 17 - Control Assembly

#### Manual Control
- **MO** = No Additional Features
- **MA** = Neutral Lockout Switch (Includes Wide Band Neutral)
- **MB** = Neutral Detent (Includes Wide Band Neutral)
- **MC** = Wide Band Neutral

#### Port Plate
- **P0** = No Additional Features

#### Hydraulic Remote Control
- **HA** = 5-15 bar (72-217 PSI) Pilot Pressure range, 2X Port .4375-20 UNF-2B SAE O-ring Port

#### Electrohydraulic Control
- **EC** = Electronic Proportional Control 12 Vdc without Electronic Driver
- **ED** = Electronic Proportional Control 24 Vdc without Electronic Driver
- **EE** = Electronic Proportional Control 12/24 Vdc and Electronic Driver

#### Electrohydraulic Control (continued)
- **EG** = Electronic Proportional Control 12/24 Vdc and Electronic Driver with 4 to 20 mA Command Input
- **EL** = Electronic Proportional Control 12 Vdc and Electronic Driver with ± 100 mA Command Input

#### Solenoid Operated
- **SA** = 3 pos (FNR) 12 Vdc solenoids with Weather Pack Connectors (locations at port S1 and S2)
- **SB** = 2 pos 12 Vdc solenoid with Weather Pack Connectors (location at port S1)
- **SC** = 2 pos 12 Vdc solenoid with Weather Pack Connectors (location at port S2)

### Position 18 - Destroke Valve
- **0** = Not required
- **1** = with 12 VDC Coil and Weather Pack Connector
- **2** = with 24 VDC Coil and Weather Pack Connector
- **3** = with 12 VDC Coil and DIN 43650 Connector
- **4** = with 24 VDC Coil and DIN 43650 Connector

### Position 19 - Supply Orifice (location p)
- **0** = No Supply Orifice
- **A** = 0.71 mm (.028 in)
- **B** = 0.81 mm (.032 in)
- **C** = 0.91 mm (.036 in)
- **D** = 1.02 mm (.040 in)
- **E** = 1.12 mm (.044 in)
- **F** = 1.32 mm (.052 in)
- **G** = 1.45 mm (.057 in)
- **H** = 1.65 mm (.065 in)
- **J** = 1.85 mm (.073 in)

### Position 20 - Control Orifice (location S1 & S2)
- **0** = No Control Orifice
- **A** = 0.71 mm (.028 in)
- **B** = 0.81 mm (.032 in)
- **C** = 0.91 mm (.036 in)
- **D** = 1.02 mm (.040 in)
- **E** = 1.12 mm (.044 in)
- **F** = 1.32 mm (.052 in)
- **G** = 1.45 mm (.057 in)

### Position 21 - Special Control Option

#### Manual Control (only)
- **0** = No Special Control Options (Standard Control Lever Position)

### Position 22, 23 - Paint
- **0A** = Primer
- **0B** = Black

### Position 24, 25 - Special Features
- **00** = No Special Features
- **BB** = Adjustable Displacement Limiter, Both Sides

### Position 26 - Identification
- **0** = Standard

### Position 27 - Design Code
- **D** = Eaton - assigned design code
72400
Input Shafts
Code Position 5

Torque Note:
The combined torque required to turn multiple pumps must not exceed the torque rating of the input drive
shaft of the front piston pump.
Consult an Eaton representative and/or Eaton engineering on side load recommendations.

Ordering Note: Input and output shafts (code position 5 & 6) must be selected in relationship
to pump code (position 1, 2, & 3).

Dimensions are in millimeters [inches], unless otherwise specified.
Medium Duty Piston Pump

72400

Output Shafts - Code Position 6


Shaft A

Torque limit on internal rear spline of piston pump with internal charge pump must not exceed 54 N-m [480 lbf-in]. Piston pump without internal charge pump must not exceed 76 N-m [672 lbf-in].

Shaft F

Maximum Torque 119 N-m [1050 lbf-in]

Shaft J

Maximum Torque 119 N-m [1050 lbf-in]

Shaft L

Maximum Torque 209 N-m [1852 lbf-in]

Shaft B

Maximum Torque 316 N-m [2,800 lbf-in]

41 Tooth for tandem connections on rear of front pump.

Tandem Servo Piston Pump SAE "B" Mounting Kit #72400-902: Includes 41T coupling, o-ring, cap screws (2), and washer.
Medium Duty Piston Pump

72400

Auxiliary Rear Mounting

Code Position 7

Dimensions are in millimeters [inches], unless otherwise specified.

2 Bolt "A" Auxiliary Mounting Flange
(Rear of Single or Tandem Rear Pump)

2 Bolt "B" Auxiliary Mounting Flange
(Rear of Front Pump)

Thru Drain

Mounting Hole for tandem support
3/8-16 UNC-2B, 10.7 [.42] deep
Holes (2) (one on each side)
Customer supplied bracket must be mounted to the same engine or bulk head mount as front pump.

Cover Plate
Fits "A" SAE Auxiliary Mounting Flange.
Cover Plate Kit #70142-915: Includes plate, cap screws (2), and o-ring.

82.65/82.60

Groove to Accept an ARP 042
[1/16 X 3-1/4 ID] O-Ring

106.38
[4.188]

.375-16 UNC-2B
18.3 [.72] deep
Minimum Full Thread, 2 Places

101.70/101.65

Mounting Hole for tandem support
3/8-16 UNC-2B, 10.7 [.42] deep
Holes (2) (one on each side)
Customer supplied bracket must be mounted to the same engine or bulk head mount as front pump.

9,53 [.375] Dia. Bolt

82.63±.03
[3.250±.001] Dia.

9,53 [.375] Dia.

Holes (2) for 9.53 [.375] Dia. Bolt

106.35
[4.187]

69.8 [2.75]

134,4 [5.29]

7,9 [.31]

198,5 [7.82]

Cover Plate
Fits "A" SAE Auxiliary Mounting Flange.
Cover Plate Kit #70142-915: Includes plate, cap screws (2), and o-ring.

113

146.1 [5.75]

104 [.41]

106.38 [4.188]

106.35 [4.187]
Charge Outlet Port Location

The charge outlet and return port is located in the charge pump housing, opposite of the suction port and charge relief valve.

For further detail on port relationship to rotation and position, refer to installation drawings.

All left (CCW) or right (CW) directions given are viewed looking at the input shaft end of the pump.
Medium Duty Piston Pump

72400

Auxiliary and Drain Port Locations

Code Position 10 and 11

(For dimensions, refer to Installation drawings.)

All left (CCW) or right (CW) directions given are viewed looking at the input shaft end of the pump.

*NOTE: Auxiliary port required in rear and front pump of tandem to provide charge flow and pressure to front pump.
72400
Main Ports and Relief Valve Location

Code Position 12, 13, and 14

(For dimensions, refer to installation drawings.)

Charge pump position must stay in relationship to backplate as pictured below.

*Righthand Rotation (CW)

*Left hand Rotation (CCW)

*All left (CCW) or right (CW) directions given are viewed looking at the input shaft end of the pump.
72400

Additional Functions

Code Position 15
(For dimensions, refer to installation drawings.)

**Bypass Valve**

Opens the closed loop hydraulic circuit, allowing limited movement of a machine.

Minimum required control-pressure is 17 bar [250 PSI]

Righthand (CW) Input Rotation
- Pressure to Control Port 1
- Pressure to Control Port 2

Lefthand (CCW) Input Rotation
- Pressure to Control Port 1
- Pressure to Control Port 2

**Port Plate Control**

**Code Position 16, 17, and 18**

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

Order #72400-900 kit for Bypass Valve separately.

Dimensions are in millimeters [inches], unless otherwise specified.
**Manual Control**

**Code Position 16,17, and 18**

*Neutral Detent Feature*
The neutral detent provides a positive, centered feeling to the handle, signaling the operator when the pump is in neutral position.

*Neutral Lockout Feature*
The neutral lockout switch consists of an electrical switch installed on the controller. This switch closes at the neutral position of the input lever and opens if lever is rotated either direction. The electronic "lockout" prevents the operator from starting any auxiliary functions unless the pump is in neutral position.

*Destroke Valve Feature*
The destroke valve provides an emergency return to neutral and must be energized in order for the pump to stroke. If at any time power is interrupted to the solenoid, the pump will destroke to neutral.

---

**Medium Duty Piston Pump**

**Model 72400**

**Dimensions are in millimeters [inches], unless otherwise specified.**

---

**Control Lever Travel**

<table>
<thead>
<tr>
<th></th>
<th>Standard Band</th>
<th>Wide Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neutral Zone</td>
<td>2.5°</td>
<td>4.0°</td>
</tr>
<tr>
<td>Max. Disp.</td>
<td>25.5°</td>
<td>25.5°</td>
</tr>
<tr>
<td>Maximum Over Travel</td>
<td>4.0°</td>
<td>2.5°</td>
</tr>
</tbody>
</table>

---

**Neutral Lockout Switch**

5 amp. @ 12 VDC, 3 amp. @ 24 VDC

---

**Destroke Valve**

---

**Neutral Detent**

to face of pump flange.

---

**Mating connector must meet DIN 43650 specification such as Hirschman connector #931-236-100 with seal #731-531-002, or equivalent. Eaton P/N 103330-XXX**

---

**Weather Pack Connector provided on solenoid:**

- Body #12010973 (black)
- Terminal #12033674 (2)
- Seal #12010293 (2)
- *Terminal #12089188 (2) *
- *Seal #12010293 (2) *
- *May vary due to wire gauge used.*
Medium Duty Piston Pump

72400

Hydraulic Remote Control

Code Position 16,17

Hydraulic Remote Control Conversion Kit

Order Part Number 72400-919

Includes: Control sub-assembly (1pc), Socket head cap screws (6 pc), Control housing gasket (1pc)

NOTE
1 Right Hand (Clockwise) Rotation
   Pilot Press Port -1 Pressurized...flow From System Press Port -B
   Pilot Press Port -2 Pressurized...flow From System Press Port -A
Left Hand (Counter Clockwise) Rotation
   Pilot Press Port -1 Pressurized...flow From System Press Port -A
   Pilot Press Port -2 Pressurized...flow From System Press Port -B
2 Nominal Threshold Pressure ............ 5 bar [72.5 PSI]
   Nominal Max Displacement Pressure .... 15 bar [217.6 PSI]
72400 Electronic Proportional Displacement Control

Code Position 16,17

The Electronic Proportional (EP) displacement control is ideal for applications requiring electronic pump displacement control. The EP displacement control provides the flexibility of three command input choices. Control components include a proportional solenoid actuated valve assembly and an electronic solenoid driver module mounted on the pump. The control driver module converts a command input signal to a proportional current output to the proportional solenoids resulting in a proportional pump displacement.

The EP displacement control has been designed to withstand the rigors of off-highway equipment environmental conditions.

EP Displacement Control Features

- Ease of installation
- Automotive style environmentally sealed Metri-Pack connectors
- Operates from 12 or 24 Vdc power supply
- External fuse (customer supplied): 3A for 12 Vdc system, 1A for 24 Vdc system
- Three choices for command input signal
- Operating temperature range -40° C to +85° C
- Control driver module encapsulated for environmental protection
- Closed loop current control compensates for resistance change of the proportional solenoids due to temperature variations
- Return to neutral for loss of power, or loss of command input signal
- Mechanical feedback of swashplate position for closed loop control
- External neutral adjustment
- Manual override capability
- Control drive module qualification per SAE J1455, SAE J1113, CISPR 25

Control Driver Module Qualification
(Contact Eaton for Specific Levels)

- SAE J1455 - Recommended Environmental Practices for Electronic Equipment Design
  - Humidity/Temperature Extreme Cycling
  - Salt Spray
  - Splash & Immersion
  - Steam Cleaning/High Pressure Wash
  - Vibration
  - Mechanical Shock
  - Temperature Cycling
  - Load Dump Transients
  - Inductive Load Switching Transients
- SAE J1113 - Electromagnetic Susceptibility Measurement Procedures for Vehicle Components
  - EMI/EMC - Conducted & Radiated Immunity
  - EMI /EMC - Conducted & Radiated Emissions
Medium Duty Piston Pump

72400

Electronic Proportional Displacement Control

Code Position 16,17  (EE, EG, EL) Cont.

Interface Schematic

**Command Input Signal Connector**

<table>
<thead>
<tr>
<th>Command Input Signal</th>
<th>Pins</th>
<th>Wire Color</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 6 Vdc Potentiometric</td>
<td>A</td>
<td>Black</td>
<td>Ref Low - 1 Vdc</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Green</td>
<td>Command (wiper)</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Red</td>
<td>Ref Hi - 6 Vdc</td>
</tr>
<tr>
<td>± 20 mA Current loop (4-20 mA)</td>
<td>A</td>
<td>Orange</td>
<td>Loop Return</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>White</td>
<td>Loop In</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>No Connection Required*</td>
<td></td>
</tr>
<tr>
<td>± 100 mA differential</td>
<td>A</td>
<td>Blue</td>
<td>Loop Return</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>White</td>
<td>Loop In</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>No Connection Required*</td>
<td></td>
</tr>
</tbody>
</table>

Note: Customer supplies:
1A fuse for 24Vdc system
2A fuse for 12Vdc system

* Mating connector kit 990762-000 contains plug to be used to seal mating end connector.

Solenoid Actuated Valve Assembly

Proportional Solenoid #1

S1  P  S2

Feedback Link

Proportional Solenoid #2

Mechanical Swashplate Feedback

** Command Input Signal Connector

* Mating connector kit 990762-000 contains plug to be used to seal mating end connector.
**Medium Duty Piston Pump**

**72400**

**Electronic Proportional Displacement Control**

**Code Position 16,17**

(EE, EG, EL) Cont.

**Mating Connector Kit:** Eaton P/N 990762-000*

- **Recommended:** Wire Size 16-18 AWG, Cable Dia. 2.03 - 2.80 mm
- **Kit includes:**
  - Mating Connectors for 2-pin Power Supply Connector, 3-pin Command Input Signal Connector

*Delphi/Packard

**Mating Connector Part Numbers:**

- **Recommended:** Wire Size 16-18 AWG, Cable Dia. 2.03 - 2.80 mm
- **Reference Source:** Pioneer-Standard Electronics 1-800 257-6613

1) **Power Supply 2-pin connector**
   - Connector P/N 1205 2641
   - Terminal P/N 1204 8074
   - TPA P/N 1205 2634
   - Cable Seal 1204 8086

2) **Command Input Signal 3 Pin Connector**
   - Connector P/N 1211 0293
   - Terminal P/N 1204 8074
   - TPA P/N 1205 2845
   - Cable Seal 1204 8086

---

**Note:** In order to assure the most reliable installation and operation of any electronic control, proper installation methods should be followed with respect to interconnection wiring harness, command signal devices, fusing, and input power switching. Proper care should be taken to prevent damage to all electrical and electronic components due to abrasion, moving objects, heat, moisture or other environmental hazards. For safety critical applications, Eaton recommends that a switch be installed in line with (+ Battery) power to the module so that power may quickly be disconnected in case of emergency. A 2 ampere slow blow fuse should always be installed in the + battery line. It is recommended that during initial start-up and checkout, the machine be placed on jack stands to prevent inadvertent movement of the machine.

---

**Command Input Signal**

<table>
<thead>
<tr>
<th>Command Input Signal</th>
<th>A (max)</th>
<th>B (min)</th>
<th>C (min)</th>
<th>D (min)</th>
<th>E (max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 6 Vdc</td>
<td>1.5 Vdc</td>
<td>3.3 Vdc</td>
<td>3.5 Vdc</td>
<td>3.7 Vdc</td>
<td>5.5 Vdc</td>
</tr>
<tr>
<td>4-20 mA*</td>
<td>-20 mA</td>
<td>-4.5 mA</td>
<td>0 mA</td>
<td>+4.5 mA</td>
<td>+20 mA</td>
</tr>
<tr>
<td>±100 mA</td>
<td>-100 mA</td>
<td>-7.5 mA</td>
<td>0 mA</td>
<td>+7.5 mA</td>
<td>+100 mA</td>
</tr>
</tbody>
</table>

*Note: The +20 mA command input signal configuration operates the pumps in one direction. The customer has to change the polarity on the -20 mA signal to operate the pump in the opposite direction.
Solenoid Operated Control Code Position 16,17

Schematic Code SA

Schematic Code SB

Schematic Code SC

Note: Solenoid Coil Specifications
Voltage: 12 Vdc
Watts: 20 (Nominal)

Weather Pack Connector
Packard P/N 12015792
Terminal Packard
P/N 12034051
Mating Connector
Packard P/N 12010973

Code SA
Drawing Shown.

Code SB
Drawing Shown.
The SC Code has Solenoid in place of plug and plug in place of Solenoid.
72400 Adjustable Displacement Limiter

Code Position 24, 25 and Selection BB

- Externally Adjustable Displacement
- Settings are Maximum Displacement of the Pump to Zero
- Independent Adjustment for Both Main Ports
- Field Adjustable
- Available in Kit Form (see page 62)

All factory units shipped with adjustable stops are set at maximum pump displacement. See re-adjustment instructions below.

To Calculate Displacement Required
The displacement required divided by displacement of one turn of set screw equals the number of turns of set screw to obtain displacement.

Example for 3.00 in$^3$/r re-adjustment:

$$2.0 \text{ in}^3/\text{r} \div 0.2854 \text{ in}^3/\text{r} = 7 \text{ turns of set screw}$$

<table>
<thead>
<tr>
<th>Displacement per Turn</th>
<th>Displacement per Turn</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.48 in$^3$/r Pump Displacement @ Full Cam</td>
<td>2.48 in$^3$/r Pump Displacement @ Full Cam</td>
</tr>
<tr>
<td><strong>Turns of Set Screw</strong></td>
<td><strong>Item #81 Stop</strong></td>
</tr>
<tr>
<td>2</td>
<td>.47 in$^3$/r</td>
</tr>
<tr>
<td>3</td>
<td>.71 in$^3$/r</td>
</tr>
<tr>
<td>4</td>
<td>.94 in$^3$/r</td>
</tr>
<tr>
<td>5</td>
<td>1.18 in$^3$/r</td>
</tr>
<tr>
<td>7</td>
<td>1.65 in$^3$/r</td>
</tr>
<tr>
<td>8</td>
<td>1.89 in$^3$/r</td>
</tr>
<tr>
<td>9</td>
<td>2.12 in$^3$/r</td>
</tr>
<tr>
<td>10</td>
<td>2.36 in$^3$/r</td>
</tr>
<tr>
<td>10.5</td>
<td>2.48 in$^3$/r</td>
</tr>
<tr>
<td>11</td>
<td>N/A</td>
</tr>
<tr>
<td>12</td>
<td>N/A</td>
</tr>
<tr>
<td>12.3</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Metric Conversion: Displacement in$^3$/r $\times 16.387 = \text{cm}^3$/r

To Re-Adjust Displacement

1. Loosen nut on adjustable set screw #81 servo stop. Screw stop in until it touches the servo piston. Back the screw out (number of turns required) to obtain the flow required. Refer to chart for displacements. Lock adjustment with nut. Torque nut 8 to 11 N·m [68 to 96 lbf·in].

2. Loosen nut on adjustable set screw #74 servo stop. Screw stop in until it touches the servo piston. Back the screw out (number of turns required) to obtain the flow required. Refer to chart for displacements. Lock adjustment in place with nut. Torque nut 17 to 18 N·m [150 to 160 lbf·in].
Medium Duty Piston Pump

72400 Adjustable Displacement Limiter Kits

Field Installed Kits
One side ............... Kit #72400-938
Two sides ............ Kit #72400-940

Disassembly

1. Remove the four cap screws (Item #7) and washers (Item #61) retaining the existing cover plate (Item #11) opposite neutral set screw.
2. After removing existing cover plate (Item #11) and cover gasket, measure the distance from the servo piston to the surface of housing for reference for neutral setting.
3. Remove neutral setting nut (Item #2).
4. Remove the four cap screws retaining the existing cover plate (Item #17).
5. The cover plate (Item #17) is screwed onto the servo piston bolt. When removing the cover plate, count the amount of turns it takes to remove cover for reassembly. Also remove existing gasket (Item #12).

<table>
<thead>
<tr>
<th>Adjustable Servo Stop Kit Parts</th>
<th>Kit #72400-938</th>
<th>Kit #72400-940</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item #</td>
<td>Qty.</td>
<td>Qty.</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>74</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>80</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>81</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>82</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Installing Servo Stops

1. Place new gasket (Item #12) onto the housing on the neutral setting screw side of the servo piston. Hold in position with a small amount of petroleum jelly.
2. Screw new cover plate (Item #17) onto servo piston bolt the same number of turns as it took to remove it. Install the four cap screws (Item #7) and washers (Item #61) to retain cover plate. Torque 4.5 to 5.4 N·m [40 to 48 lbf·in].
3. Install seal washer (Item #6), washer (Item #60) and jam nut (Item #2). Torque nut 17 to 18 N·m [150 to 160 lbf-in]. At this time, check the distance from the servo piston to housing surface on opposite side. It should be the same as previously measured at disassembly. If not the same, loosen jam nut and with a hex key wrench, adjust and re-torque nut.
4. Install new cover plate (Item #11) and retain with four cap screws (Item #7) and washers (Item #61). Torque 4.5 to 5.4 N·m [40 to 48 lbf·in].
5. Insert adjustable servo stop set screw (Item #81) in until it touches the servo piston. Back the screw out to obtain the flow required. Refer to chart for displacements. Lock adjustment into place with seal washer (Item #83), washer (Item #82), and jam nut (Item #81). Torque nut 8 to 11 N·m [68 to 96 lbf-in].
6. Insert adjustable servo stop set screw (Item #74) in until it touches the servo piston. Back the screw out to obtain the flow required. Refer to chart for displacements. Lock adjustment into place with seal washer (Item #6), washer (Item #60), and jam nut (Item #2). Torque nut 17 to 18 N·m [150 to 160 lbf-in].
# 72400

## Supply and Control Orifice

### Code Position 19 and 20

![Diagram of Medium Duty Piston Pump]

**Calculated Time from Neutral to Full Stroke (seconds)**

<table>
<thead>
<tr>
<th>Supply Orifice Size mm [in]</th>
<th>0.71 [0.028]</th>
<th>0.81 [0.032]</th>
<th>0.91 [0.036]</th>
<th>1.02 [0.040]</th>
<th>1.12 [0.044]</th>
<th>1.32 [0.052]</th>
<th>1.45 [0.057]</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.71 [0.028]</td>
<td>1.245</td>
<td>1.148</td>
<td>1.085</td>
<td>1.043</td>
<td>1.015</td>
<td>0.983</td>
<td>0.972</td>
<td>0.946</td>
</tr>
<tr>
<td>0.81 [0.032]</td>
<td>1.199</td>
<td>1.089</td>
<td>1.013</td>
<td>0.961</td>
<td>0.925</td>
<td>0.881</td>
<td>0.866</td>
<td>0.828</td>
</tr>
<tr>
<td>0.91 [0.036]</td>
<td>1.173</td>
<td>1.053</td>
<td>0.968</td>
<td>0.907</td>
<td>0.863</td>
<td>0.808</td>
<td>0.788</td>
<td>0.736</td>
</tr>
<tr>
<td>1.02 [0.040]</td>
<td>1.157</td>
<td>1.031</td>
<td>0.939</td>
<td>0.871</td>
<td>0.821</td>
<td>0.756</td>
<td>0.731</td>
<td>0.662</td>
</tr>
<tr>
<td>1.12 [0.044]</td>
<td>1.147</td>
<td>1.017</td>
<td>0.920</td>
<td>0.847</td>
<td>0.792</td>
<td>0.718</td>
<td>0.688</td>
<td>0.602</td>
</tr>
<tr>
<td>1.32 [0.052]</td>
<td>1.136</td>
<td>1.001</td>
<td>0.899</td>
<td>0.820</td>
<td>0.758</td>
<td>0.670</td>
<td>0.633</td>
<td>0.510</td>
</tr>
<tr>
<td>1.45 [0.057]</td>
<td>1.133</td>
<td>0.996</td>
<td>0.892</td>
<td>0.810</td>
<td>0.745</td>
<td>0.652</td>
<td>0.611</td>
<td>0.465</td>
</tr>
<tr>
<td>1.65 [0.065]</td>
<td>1.129</td>
<td>0.991</td>
<td>0.885</td>
<td>0.801</td>
<td>0.734</td>
<td>0.634</td>
<td>0.589</td>
<td>0.408</td>
</tr>
<tr>
<td>1.85 [0.073]</td>
<td>1.128</td>
<td>0.988</td>
<td>0.881</td>
<td>0.796</td>
<td>0.727</td>
<td>0.624</td>
<td>0.576</td>
<td>0.364</td>
</tr>
<tr>
<td>None</td>
<td>1.125</td>
<td>0.984</td>
<td>0.875</td>
<td>0.787</td>
<td>0.716</td>
<td>0.606</td>
<td>0.553</td>
<td>0.138</td>
</tr>
</tbody>
</table>

Note: Proper orifice selection must be determined by actual testing.
Medium Duty Piston Pump

Component Selection

The long service life of Eaton hydrostatic transmissions is largely dependent on the proper selection and installation of the components necessary for transmission operation. The following components are necessary for transmission operation:

1. Variable Displacement Pump
2. Fixed or Variable Displacement Motor
3. Reservoir
4. Filter
5. Charge Pump Inlet Line
6. Pump and Motor Case Drain Lines
7. High Pressure Lines
8. Heat Exchanger
9. Heat Exchanger Bypass Valve
10. Reservoir Return Line

1. Variable Displacement Pump
Eaton hydrostatic variable displacement pumps are an axial piston design. They are equipped with standard SAE mounts, shafts and port connections.

2. Fixed or Variable Displacement Motor
Eaton hydrostatic motors are an axial piston design. They are equipped with standard SAE mounts, shafts and port connections.

3. Reservoir
The reservoir is an important part of the hydrostatic transmission system. It should provide adequate oil storage and allow easy oil maintenance.

The reservoir must hold enough oil to provide a continuous oil supply to the charge pump inlet. It must also have enough room for the hydraulic oil to expand as the system warms up. Consider charge pump flow when sizing the reservoir: One half (.5) minute times (X) the maximum charge pump flow should be the minimum oil volume in the reservoir. Maintaining this oil volume will give the oil a minimum of thirty (30) seconds in the reservoir. This will allow any entrained air to escape and contamination to settle out of the oil.

To allow for oil expansion, the reservoir’s total volume should be at least six tenths (.6) minute times (X) the maximum charge pump flow.

The reservoir’s internal structure should cut down turbulence and prevent oil aeration.

The line returning flow to the reservoir should be fitted with a diffuser to slow the incoming oil to 1 to 1.2 meters [3-4 feet] per second to help reduce turbulence. The return flow line should also be positioned so that returning oil enters the reservoir below the liquid surface. This will help reduce aeration and foaming of the oil.

The reservoir should have baffles between the return line and suction line. Baffles prevent return flow from immediately reentering the pump.

A sixty mesh screen placed across the suction chamber of the reservoir will act as a bubble separator. The screen should be placed at a 30° angle to the horizon.

The entrance to the suction line should be located well below the fluid surface so there is no chance of air being drawn into the charge pump inlet. However, the suction line entrance should not be located on the bottom of the reservoir where there may be a buildup of sediment. The suction line entrance should be flared and covered with a screen.

The reservoir should be easily accessible. The fill port should be designed to minimize the possibility of contamination during filling and to help prevent over filling. There should be a drain plug at the lowest point of the reservoir and it should also have a clean-out and inspection cover so the reservoir can be thoroughly cleaned after prolonged use. A vented reservoir should have a breather cap with a micronic filter.

Sealed reservoirs must be used at altitudes above 2500 feet. These reservoirs should be fitted with a two-way micronic filter pressure cap to allow for fluid expansion and contraction.

In both cases the caps must be designed to prevent water from entering the reservoir during bad weather or machine washing.

A hydrostatic transmission with a well designed reservoir will run quieter, stay cleaner and last longer.

4. Filter
A filter must be used to keep the hydraulic fluid clean. Either a suction filter or a pressure side filter may be used. The filter must be a no-bypass type. System oil particle levels should not exceed ISO 18/13. Refer to Eaton Hydraulic Fluid Recommendations.

Recommended beta ratios for each filter type are listed below:

- Suction Filter $\beta_{10} = 1.5$ to $2.0$
- Pressure Side Filter $\beta_{10} = 10$ to $20$

When a suction filter is used, its flow capacity must be large enough to prevent an excessive pressure drop between the reservoir and charge pump inlet. The pressure at the charge pump inlet port must not be less than 0.80 bar absolute [6 in. Hg.] at normal continuous operating temperatures.

5. Charge Pump Inlet Line
The inlet line to the charge pump should be large enough to
minimum. It is best to keep fluid velocities below 1.25 meters [4 feet] per second.
Fluid and temperature compatibility must be considered when selecting the inlet line.

6. Pump and Motor Case Drain
The case drain lines should be large enough to limit the pump and motor case pressures (Medium Duty to 2 bar [25 PSI]) at normal operating temperatures. Fluid and temperature compatibility must also be considered when selecting the case drain lines.

7. High Pressure Lines
The high pressure lines that connect the pump and motor must be able to withstand the pressures generated in the high pressure loop.

8. Heat Exchanger
Use of a heat exchanger is dependent on the transmission’s duty cycle and on machine layout. The normal continuous operating fluid temperature measured in the pump and motor cases should not exceed 80½°C [180½°F] for most hydraulic fluids. The maximum fluid temperature should not exceed 107½°C [225½°F].
The heat exchanger should be sized to dissipate 25% of the maximum input power available to the transmission. It must also be sized to prevent the case pressures in the pump and motor from getting too high. Medium duty case pressure up to 2 bar [25 psi], at normal operating temperatures, are acceptable.

9. Heat Exchanger Bypass Valve
The heat exchanger bypass valve is a pressure and/or temperature valve in parallel with the heat exchanger. Its purpose is to prevent case pressures from getting too high. The heat exchanger bypass valve opens when the oil is thick, especially during cold starts.

10. Reservoir Return Line
The same general requirements that apply to case drain lines apply to the reservoir return line.

Installation Requirements
The mounting orientation of pumps and motors is unrestricted provided the case drain of the pump and motor remain full.
Position the case drain such that it assures an oil level at or above unit center line at start-up. The case drain line that carries the flow leaving the pump or motor should be connected to the highest

Open Loop Circuits
Eaton pumps and motors may be used in open loop circuits under certain operating conditions. Consult your Eaton representative for details.
Medium Duty Piston Pump

Hydraulic Fluid Recommendations

Introduction
The ability of Eaton hydrostatic components to provide the desired performance and life expectancy depends largely on the fluid used. The purpose of this document is to provide readers with the knowledge required to select the appropriate fluids for use in systems that employ Eaton hydrostatic components.

One of the most important characteristics to consider when choosing a fluid to be used in a hydraulic system is viscosity. Viscosity choice is always a compromise; the fluid must be thin enough to flow easily but thick enough to seal and maintain a lubricating film between bearing and sealing surfaces. Viscosity requirements for Eaton’s Heavy Duty Hydrostatic product line are specified later in this document.

Viscosity and Temperature
Fluid temperature affects viscosity. In general, as the fluid warms it gets thinner and its viscosity decreases. The opposite is true when fluid cools. When choosing a fluid, it is important to consider the start-up and operating temperatures of the hydrostatic system. Generally, the fluid is thick when the hydraulic system is started. With movement, the fluid warms to a point where the cooling system begins to operate. From then on, the fluid is maintained at the temperature for which the hydrostatic system was designed. In actual applications this sequence varies; hydrostatic systems are used in many environments from very cold to very hot. Cooling systems also vary from very elaborate to very simple, so ambient temperature may affect operating temperature. Equipment manufacturers who use Eaton hydrostatic components in their products should anticipate temperature in their designs and make the appropriate fluid recommendations to their customers.

In general, an ISO viscosity grade 68 fluid is recommended for operation in cold to moderate climates. An ISO viscosity grade 100 fluid is recommended for operation in moderate to hot climates.

Cleanliness
Cleanliness of the fluid in a hydrostatic system is extremely important. Eaton recommends that the fluid used in its hydrostatic components be maintained at ISO Cleanliness Code 18/13 per SAE J1165. This code allows a maximum of 2500 particles per milliliter greater than 5 µm and a maximum of 80 particles per milliliter greater than 15 µm. When components with different cleanliness requirements are used in the same system, the cleanest standard should be applied. OEM’s and distributors who use Eaton hydrostatic components in their products should provide for these requirements in their designs. A reputable filter supplier can supply filter information.

Fluid Maintenance
Maintaining correct fluid viscosity and cleanliness level is essential for all hydrostatic systems. Since Eaton hydrostatic components are used in a wide variety of applications it is impossible for Eaton to publish a fluid maintenance schedule that would cover every situation. Field testing and monitoring are the only ways to get accurate measurements of system cleanliness. OEM’s and distributors who use Eaton hydrostatic components should test and establish fluid maintenance schedules for their products. These maintenance schedules should be designed to meet the viscosity and cleanliness requirements laid out in this document.

Fluid Selection
Premium grade petroleum based hydraulic fluids will provide the best performance in Eaton hydrostatic components. These fluids typically contain additives that are beneficial to hydrostatic systems. Eaton recommends fluids that contain anti-wear agents, rust inhibitors, anti-foaming agents, and oxidation inhibitors. Premium grade petroleum based hydraulic fluids carry an ISO VG rating.
## Medium Duty Piston Pump

### Hydraulic Fluid Recommendations

<table>
<thead>
<tr>
<th>Product Line</th>
<th>Minimum</th>
<th>Optimum Range</th>
<th>Maximum</th>
<th>ISO Cleanliness Requirements</th>
<th>Comments</th>
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<tr>
<td>Heavy Duty Piston Pumps and Motors</td>
<td>45 SUS [6 cSt]</td>
<td>60 - 180 SUS [10 - 39 cSt]</td>
<td>10,000 SUS [2158 cSt]</td>
<td>18/13</td>
<td></td>
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<tr>
<td>Medium Duty Piston Pumps and Motors Charged Systems</td>
<td>45 SUS [6 cSt]</td>
<td>60 - 180 SUS [10 - 39 cSt]</td>
<td>10,000 SUS [2158 cSt]</td>
<td>18/13</td>
<td></td>
</tr>
<tr>
<td>Medium Duty Piston Pumps and Motors Non-charged Systems</td>
<td>60 SUS [10 cSt]</td>
<td>60 - 180 SUS [10 - 39 cSt]</td>
<td>2,000 SUS [432 cSt]</td>
<td>18/13</td>
<td></td>
</tr>
<tr>
<td>Light Duty Transaxles, Transmissions, Pumps and Series 1150 Transaxles</td>
<td>60 SUS [10 cSt]</td>
<td>80 - 180 SUS [16 - 39 cSt]</td>
<td>10,000 SUS [2158 cSt]</td>
<td>18/13</td>
<td>Automotive multi-viscosity oils and ATF are not recommended</td>
</tr>
<tr>
<td>Series 2030 Motor Axles</td>
<td>70 SUS [13 cSt]</td>
<td>100 - 200 SUS [20 - 43 cSt]</td>
<td>10,000 SUS [2158 cSt]</td>
<td>18/13</td>
<td>Automotive multi-viscosity oils and ATF are not recommended</td>
</tr>
<tr>
<td>Char-Lynn J, R, and S Series Motors, and Disc Valve Motors</td>
<td>70 SUS [13 cSt]</td>
<td>100 - 200 SUS [20 - 43 cSt]</td>
<td>10,000 SUS [2158 cSt]</td>
<td>18/13</td>
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<tr>
<td>Char-Lynn A Series and H Series Motors</td>
<td>100 SUS [20 cSt]</td>
<td>100 - 200 SUS [20 - 43 cSt]</td>
<td>10,000 SUS [2158 cSt]</td>
<td>18/13</td>
<td></td>
</tr>
<tr>
<td>Char-Lynn Steering Control Units, Priority and Control Valves</td>
<td>55 SUS [9 cSt]</td>
<td>100 - 200 SUS [20 - 43 cSt]</td>
<td>10,000 SUS [2158 cSt]</td>
<td>18/13</td>
<td>When emergency manual steering is required, maximum viscosity is 2,000 SUS [450 cSt]</td>
</tr>
<tr>
<td>Gear Pumps and Motors, and Cylinders</td>
<td>45 SUS [6 cSt]</td>
<td>60 - 200 SUS [10 - 43 cSt]</td>
<td>10,000 SUS [2158 cSt]</td>
<td>18/13</td>
<td></td>
</tr>
</tbody>
</table>

*MINIMUM VISCOSITY APPLIES AT INTERMITTENT CONDITION OF 10% OF EVERY MINUTE.*

### Additional Notes:

- Fluids too thick to flow in cold weather start-ups will cause pump cavitation and possible damage. Motor cavitation is not a problem during cold start-ups, except for two speed motors. Thick oil can cause high case pressures which in turn cause shaft seal problems.
- When choosing a hydraulic fluid, all the components in the system must be considered and the optimum viscosity range adjusted accordingly. For example, when a medium duty piston pump is combined with a Disk Valve Motor the optimum viscosity range becomes 100 - 180 SUS [20 - 39 cSt] and viscosity should never fall below 70 SUS [13 cSt].
- If the natural color of the fluid has become black it is possible that an overheating problem exists.
- If the fluid becomes milky, water contamination may be a problem.
- Take fluid level reading when the system is cold.
- Contact your Eaton representative if you have specific questions about the fluid requirements of Eaton hydraulic components.
Information contained in this catalog is accurate as of the publication date and is subject to change without notice. Performance values are typical values. Customers are responsible for selecting products for their applications using normal engineering methods.

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