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

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

J Valve Plate

K Bypass Valve
   • Option for cross porting a closed loop hydraulic circuit — used to move a disabled machine a limited distance.

L Internal High Pressure Relief Valves
   • Prevents excessive pressure

M Gerotor Charge Pump
   • Two sizes available.
     6,9 cm³/r [.42 in³/r]
     13,8 cm³/r [.84 in³/r]

N Auxiliary Pump Drive

P Auxiliary Port
   • For pressure check port or remote charge pressure port.

R Control Shaft
   • Positioned on left or right side of pump.

S “A” Pad Rear Cover Plate

T 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.

U Low Pressure Relief Valve

V Swashplate Insert
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</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SAE O-ring</td>
</tr>
<tr>
<td>B</td>
<td>Main Port</td>
<td>1-1/16 - 12 UN-2B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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>9.27 [.365] 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.

CAUTION THIS BYPASS VALVE IS TO BE USED IN CASE OF EMERGENCY ONLY EXCESS TOWING MAY DAMAGE HYDRAULIC SYSTEM. BEFORE TOWING VEHICLE TURN VALVE 90 TO DE-CLUTCH, DO NOT TURN WHILE MACHINE IS RUNNING.

CHARGE PRESSURE INLET PORT (C2) (AUXILIARY PORT - REAR)

PORT TOP REAR (C1) (AUXILIARY PORT - BYPASS VALVE OPTIONAL) (PLUG OPTIONAL) (NO PORT OPTIONAL)

FOR CONTROL SHAFT CONFIGURATION SEE MODEL CODE

FOR INPUT SHAFT CONFIGURATION SEE MODEL CODE

FOR CONTROL SHAFT CONFIGURATION SEE MODEL CODE

FOR INPUT SHAFT CONFIGURATION SEE MODEL CODE

DRAIN PORT (D1) (TOP) 3/4-16 UNC-2B SAE O RING PORT (PLUG OPTIONAL)

DRAIN PORT (D2) (BOTTOM) 3/4-16 UNC-2B SAE O RING PORT (PLUG OPTIONAL)

DRAIN INTO REAR AUXILIARY FLANGE (OPTIONAL)

GROOVE TO ACCEPT 1/16 X 3 1/4 ID O RING FOR OUTPUT SHAFT CONFIGURATION SEE MODEL CODE

FOR SHAFT CONFIGURATION SEE MODEL CODE

Note: External charge pump required.
Model 70160 Specifications

Model 70160
Specifications - Piston Pump

<table>
<thead>
<tr>
<th>Specification</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Displacement</td>
<td>20,3 cm³/r [1.24 in³/r]</td>
<td>23,6 cm³/r [1.44 in³/r]</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</td>
<td>107°C [225°F]</td>
<td>107°C [225°F]</td>
</tr>
<tr>
<td>Weight Per Single Pump</td>
<td>9,5 kg [21 lbs]</td>
<td>9,5 kg [21 lbs]</td>
</tr>
</tbody>
</table>

Specifications - Integral Gerotor Charge Pump

| Displacement Options                 | 6,9 cm³/r [0.42 in³/r] | 13,8 cm³/r [0.84 in³/r] |
| Operating Pressure Range (std.)      | 7 to 10 bar [100 to 150 PSI] | 7 to 10 bar [100 to 150 PSI] |
| Maximum Charge Inlet Vacuum          | 0.80 bar Abs. [11.6 PSI Abs.] | 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 cm³/r [0.84 in³/r] displacement charge pumps. The test was run at an oil temperature of 60°C [150°F] with viscosity 13 cSt [65 SUS].
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.

### Code Example:

<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>1</td>
<td>ADB</td>
<td>Std.</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>Std.</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>3</td>
<td>R</td>
<td>Std.</td>
<td>Std.</td>
<td>Std.</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>Std.</td>
<td>Std.</td>
<td>Std.</td>
</tr>
</tbody>
</table>

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

**ADB** = Series 160 Manually Variable Displacement Axial Piston Pump with SAE J744 Flange B2-2 (2 Bolt A)

### Positions 4, 5 - Displacement

- **12** = 20.3 cm³/r [1.24 in³/r]
- **14** = 23.6 cm³/r [1.44 in³/r]

### Position 6 - Input Shaft Rotation

- **R** = Righthand Rotation (CW)
- **L** = Leffthand Rotation (CCW)

### Position 7 - Valve Plate

- **1** = Type 1

### Position 8 - Input Shaft (see page 16 for details)

- **A** = 13 Tooth 16/32 Pitch Spline, Shaft Extension 41.1 [1.62]
- **C** = 35 Tooth 48/96 Pitch Spline, Shaft Extension 32.0 [1.26]
- **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)
- **L** = Lefthand Rotation (CCW)

### Position 9 - Control Shaft and Location

- **L** = Left Side
- **R** = Right Side

### Position 10 - Control Shaft

- **D** = with 15.7 [0.62] square arm, with bolt groove; 113 [4.45] from unit centerline to control shaft end

### Position 11 - Main Ports (A and B) Location (see page 14 for port location)

- **1** = Opposite Sides
- **2** = Same Side (without internal charge pump)

### Position 12 - Main Ports (A and B) Size

- **1** = 1-1/16 -12 UN-2B Port, SAE Straight Thread O-ring Ports

### Positions 13, 14 - Relief Valve Setting for Main Ports

(Select a setting for port “A” in position 10 and port “B” in position 11.)

- **0** = No Relief, Check Valve Assembly Only
- **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)
- **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)

### Position 15 - Charge Displacement, Suction Port (S) (see page 17 for port location)

- **0** = No Charge
- **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)
- **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)

### Position 16 - Charge Relief Setting and Routing

(Does not require external relief set between 6.89 bar [100 lbf/in²] and 20.68 bar [300 lbf/in²])

- **0** = No
- **A** = 6.89-10.34 bar [100-150 PSI]; Relieved to case
- **B** = 10.34-13.79 bar [150-200 PSI]; Relieved to case
- **C** = 13.79-17.24 bar [200-250 PSI]; Relieved to case
- **D** = 17.24-24.68 bar [250-350 PSI]; Relieved to case
- **E** = 20.68-24.13 bar [300-350 PSI]; Recirculated
- **F** = 6.89-10.34 bar [100-150 PSI]; Recirculated
- **G** = 10.34-13.79 bar [150-200 PSI]; Recirculated
- **H** = 13.79-17.24 bar [200-250 PSI]; Recirculated
- **J** = 17.24-20.68 bar [250-350 PSI]; Recirculated
- **K** = 20.68-24.13 bar [300-350 PSI]; Recirculated

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

### Position 17 - Charge Special Feature
- 0 = No Special Feature

### Position 18 - Auxiliary Rear Mount and Output Shaft
- **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
- **B** = No Integral Charge: Horizontal or Vertical 2-Bolt "A" SAE J744 Flange 82-2; Accepts 11 tooth external 16/32 pitch spline with 31.7 [1.25] shaft extension (Coupler required)
- **C** = No Integral Charge: Horizontal or Vertical 2-Bolt "A" SAE J744 Flange 82-2; Accepts 9 tooth external 16/32 pitch spline with 31.7 [1.25] shaft extension (Coupler required)
- **D** = No Integral Charge: Horizontal or Vertical 2-Bolt "A" SAE J744 Flange 82-2; Accepts 35 tooth external 48/96 pitch spline with 32 [1.26] shaft extension (Coupler required)
- **E** = No Integral Charge: Horizontal or Vertical 2-Bolt "A" SAE J744 Flange 82-2; Accepts 9 tooth external 20/40 pitch spline with 31.7 [1.25] shaft extension (Coupler required)

### Position 19, 20 - Special Features Auxiliary Mounting
- **00** = No Special Features
- **AA** = Supply Cover Plate for 2-Bolt "A" SAE J744 Flange 82-2
- **AB** = Supply Shaft Coupler 9 tooth 16/32 pitch
- **AC** = Supply Shaft Coupler 11 tooth 16/32 pitch
- **AD** = Supply Shaft Coupler 13 tooth 48/96 pitch
- **AF** = Bottom Mounting Bracket (632), Square Shaped
- **AG** = Bottom Mounting Bracket (709), V Shaped
- **AH** = Auxiliary Mounting Holes, 2 holes. 375-16 UNC-2B thread, 15 [.59] min full thread, both sides
- **AJ** = Auxiliary Mounting Holes, 2 holes. 375-16 UNC-2B thread, 15 [.59] min full thread, both sides (9T coupler and Mounting Holes)....

### Position 21 - Auxiliary Port Top-Front (C1) or Bypass Valve
- **0** = None
- **1** = 3/4"-16 UNF-2B SAE o-ring port
- **2** = 3/4"-16 UNF-2B SAE o-ring port plugged
- **3** = Bypass Valve Installed

### Position 22 - Auxiliary Port Top-Rear (C2)
- **1** = 3/4"-16 UNF-2B SAE o-ring port
- **2** = 3/4"-16 UNF-2B SAE o-ring port plugged

### Position 23 - Auxiliary Port Side (C4 or C5)
- **0** = None
- **1** = 3/4"-16 UNF-2B SAE o-ring port (right side CW, left side CCW)

### Position 24 - Case Drain (D1 and D2)
- **A** = 3/4"-16 UNF-2B SAE o-ring port D1-top (D2-bottom plugged)
- **B** = 3/4"-16 UNF-2B SAE o-ring port D2-bottom (D1-top plugged)
- **C** = 3/4"-16 UNF-2B SAE o-ring port (D1-top plugged and D2-bottom plugged)
- **D** = 3/4"-16 UNF-2B SAE o-ring port (D1-top and D2-bottom open)

### Position 25 - Thru Drain (D3 and D4)
- **0** = None
- **A** = 365 Dia. D3-rear
- **B** = 376 Dia. D4-front
- **C** = 365 Dia. D3-rear and .376 Dia. D4-front

### Position 26 - Additional Functions
- **0** = None

### Position 27, 28 - Special Features
- **00** = None
- **0A** = Fluorocarbon rubber drive shaft seal

### Position 29, 30 - Paint
- **0A** = Primer, Red Oxide
- **0B** = Black
- **0C** = Primer, Blue

### Position 31 - Identification
- **0** = Standard: Nameplate

### Position 32 - Design Code
- **C** = 0
Model 70160
Input Shafts

Code Position 8

Dimensions are in mm [in] unless noted otherwise.

<table>
<thead>
<tr>
<th>Code</th>
<th>Input Shafts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>13 Tooth</td>
</tr>
<tr>
<td>A Dimension</td>
<td>41.1 [1.62]</td>
</tr>
<tr>
<td>B Dimension</td>
<td>21.810 [.8585]</td>
</tr>
<tr>
<td>Maximum Input Torque</td>
<td>209.3 N•m [1852 lbf•in]</td>
</tr>
<tr>
<td>Shaft Specifications</td>
<td>16/32 Pitch 30 Degree Involute Flat Root, Class 1 Side Fit Spline, SAE J498b</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.
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 “A” 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 lbf•in]</td>
<td>119 N•m [1050 lbf•in]</td>
<td>76 N•m [672 lbf•in]</td>
<td>Used for tandem connection only</td>
<td>76 N•m [672 lbf•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)**

**Coupler**

---

<table>
<thead>
<tr>
<th>Code</th>
<th>Diameter</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC</td>
<td>28.45 [1.12] Dia.</td>
<td>34.29 [1.35]</td>
</tr>
<tr>
<td>AD</td>
<td>31.8 [1.25] Dia.</td>
<td>38.9 [1.531]</td>
</tr>
<tr>
<td>AE</td>
<td>28.45 [1.12] Dia.</td>
<td>37.9 [1.49]</td>
</tr>
</tbody>
</table>

Dimensions are in mm ["] unless noted otherwise.

15
Model 70160
Bracket and Cover Plate

Code Position 19, 20
Bracket

Code "AF" Bracket

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

For Units with Integral Charge Pump Only

Front Flange of rear pump

Without Charge Pump

164,1 [6.46]

197,9 [7.79]

With Charge Pump

Code "AG" Bracket

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

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.

Code "AA"

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

106,35 [4.187]

82,55±0,03 [3.250±.001] Dia.

Dimensions are in mm [in] unless noted otherwise.
Pump 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 - Rear</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C2</td>
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<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
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<td>C3</td>
<td>Auxiliary Port Top - Left Side</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
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<td>C4</td>
<td>Auxiliary Port Top - Right Side</td>
<td>3/4 - 16 UNF-2B SAE O-ring</td>
</tr>
<tr>
<td>C5</td>
<td>Auxiliary Port Top - Rear</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>9.27 [.365] 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 integral 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>
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<tr>
<td>D</td>
<td>113.0 [4.45 ]</td>
</tr>
<tr>
<td>E</td>
<td>62.0 [2.44 ]</td>
</tr>
<tr>
<td>F</td>
<td>79.8 [3.14 ]</td>
</tr>
<tr>
<td>G</td>
<td>72.9 [2.87 ]</td>
</tr>
<tr>
<td>H</td>
<td>15.7 [ .62 ]</td>
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<tr>
<td>J</td>
<td>103.9 [4.09 ]</td>
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<tr>
<td>K</td>
<td>149.8 [5.90 ]</td>
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<tr>
<td>L</td>
<td>191.4 [7.54 ]</td>
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<tr>
<td>M</td>
<td>106.6 [4.19 ]</td>
</tr>
<tr>
<td>N</td>
<td>53.2 [2.09 ]</td>
</tr>
<tr>
<td>P</td>
<td>106.2 [4.18 ]</td>
</tr>
<tr>
<td>R</td>
<td>11.2 [ .44 ]</td>
</tr>
<tr>
<td>S</td>
<td>84.1 [3.31 ]</td>
</tr>
</tbody>
</table>

Model 70142
Opposite Side Porting, with integral Charge

Bolt Slot Bolt Slot

77.7 [3.06]
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
  - 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

• 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

Rotation CW or CCW

Pressure Port

Charge Port

Pressure Port

Drain Port

Rotation CW or CCW

Right side

Left side
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
Medium Duty Piston Pump

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 [0.42 in³/r] displacement and for a tandem unit is a 13.8 cm³/r [0.84 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 Case Pressure</td>
<td>2 bar [25 PSI]</td>
</tr>
<tr>
<td>Maximum Case Drain 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>

#### Specifications - Internal Gerotor Charge Pump

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</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>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

#### Specifications - Piston Pump

- **Maximum Displacement**: 40.6 cm³/r [2.48 in³/r]
- **Input Mounting Flange**: SAE "B" or "BB"
- **Flow @ Rated Speed & PSI**: 140 l/min [37.0 gal/min]
- **Maximum Rated Speed**: 3600 RPM
- **Continuous Rated Pressure**: 210 bar [3000 PSI]
- **Maximum Intermittent Pressure**: 345 bar [5000 PSI]
- **Continuous Allowable Case Pressure**: 2 bar [25 PSI]
- **Maximum Case Drain Temperature**: 107°C [225°F]
- **Weight per single pump**: 14.1 to 15.9 kg [31 to 35 lbs]

### Specifications - Internal Gerotor Charge Pump

- **Displacement Options**: 6.9 cm³/r [.42 in³/r] 13.8 cm³/r [.84 in³/r]
- **Operating Pressure Range (std.)**: 7 to 10 bar [100 to 150 PSI]
- **Maximum Charge Inlet Vacuum**: 0.80 bar Abs. [6 inHg]
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.

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.

**Lower Swashplate Moments**

<table>
<thead>
<tr>
<th>System Pressure - bar [PSI]</th>
<th>Modified Valve Plate</th>
<th>Standard Valve Plate</th>
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<td>35 [500]</td>
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<td></td>
</tr>
<tr>
<td>70 [1000]</td>
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</tr>
<tr>
<td>100 [1500]</td>
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<td></td>
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<tr>
<td>140 [2000]</td>
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<tr>
<td>170 [2500]</td>
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<tr>
<td>210 [3000]</td>
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<tr>
<td>240 [3500]</td>
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**Outlet Flow**

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**Input Power**

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</tbody>
</table>
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></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>
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<th>CD</th>
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<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
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<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
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<td>Single Unit</td>
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<td>Std</td>
<td>Std</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tandem Unit</td>
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<td>Std</td>
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<td></td>
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</tr>
<tr>
<td>Rear</td>
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<td></td>
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<td></td>
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</tr>
</tbody>
</table>

Positions 1, 2, 3 - Code Title
ACV = Series 360 Manually Variable Displacement Axial Piston pump with SAE J744 Flange 101-2 (2 Bolt “B”)

Positions 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 = 40.6 cm³/r (2.48 in³/r); Rotating Kit - Standard; Valve Plate - Type 1</td>
<td>Std</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>30 = 49.2 cm³/r (3.00 in³/r); Rotating Kit - Standard; Valve Plate - Type 1</td>
<td>Std</td>
<td>Std</td>
<td>Std</td>
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</tbody>
</table>

Position 6 - Input Shaft Rotation

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>L = Left (CCW)</td>
<td>Std</td>
<td>Std</td>
<td>Std</td>
</tr>
<tr>
<td>R = Right (CW)</td>
<td>Std</td>
<td>Std</td>
<td>Std</td>
</tr>
</tbody>
</table>

Position 7 - Input Shaft

| A = 15 Tooth external spline, 16/32 pitch; 24.981 [0.9835] Major Dia.; 46 [1.81] Shaft extension | A | Std | Std | NA |
| B = 41 Tooth external spline, 48/96 pitch; 22.2 [0.875] Major Dia.; 24.4 [0.96] Shaft extension | B | NA | NA | Std |
| C = 13 Tooth external spline, 16/32 pitch; 21.81 [0.8585] Major Dia.; 41.1 [1.62] Shaft extension | C | Opt | NA | NA |
| 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 | E | Opt | NA | NA |
| G = Straight 25.4 [1.00] Dia.; 6.1 [0.25] x 28.4 [1.12] L key, 46.0 [1.81] Shaft extension | G | Opt | NA | NA |

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

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

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

Positions 10, 11 - Relief Valve Setting for Main Ports

| 0 = Check Valve Only | 0 | Opt | Opt | Opt |
| E = 173 bar [2500 PSI] | E | Opt | Opt | Opt |
| H = 207 bar [3000 PSI] | H | Opt | Opt | Opt |
| L = 241 bar [3500 PSI] | L | Opt | Opt | Opt |
| N = 276 bar [4000 PSI] | N | Opt | Opt | Opt |
| Q = 310 bar [4500 PSI] | Q | Opt | Opt | Opt |
| T = 344 bar [5000 PSI] | T | Std | Std | Std |

Positions 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) | A1 | Std | Opt | Std |
| 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) | A2 | Opt | NA | Opt |
| 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) | A3 | Opt | NA | Opt |
| 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) | A4 | Opt | NA | Opt |
| B2 = SAE J744 flange 101-2 (2 Bolt B); Accepts 13 Tooth 16/32 DP spline  
| 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) | B4 | NA | Std | Opt |
### Position 14 - Auxiliary Port and Bypass Valve

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Front</th>
<th>Tandem Front</th>
<th>Tandem Rear</th>
</tr>
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<tbody>
<tr>
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<td>Opt NA NA</td>
<td>Opt NA NA</td>
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<tr>
<td>A</td>
<td>Opt NA NA</td>
<td>Opt NA Opt</td>
<td>Std NA Std</td>
</tr>
<tr>
<td>B</td>
<td>Opt NA NA</td>
<td>Opt NA Opt</td>
<td>Std NA Std</td>
</tr>
<tr>
<td>F</td>
<td>Opt NA Opt</td>
<td>Opt NA Opt</td>
<td>Std NA Std</td>
</tr>
<tr>
<td>G</td>
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<td>Opt Std Opt</td>
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<tr>
<td>T</td>
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<td>Opt NA Opt</td>
<td>Std NA Std</td>
</tr>
</tbody>
</table>

### Position 15 - Charge Pump

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Front</th>
<th>Tandem Front</th>
<th>Tandem Rear</th>
</tr>
</thead>
<tbody>
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<td>2</td>
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<td>Std NA Std</td>
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</table>

### Position 16, 17 - Charge Pump Relief Setting and Routing

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Front</th>
<th>Tandem Front</th>
<th>Tandem Rear</th>
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<tbody>
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<td>Opt Std Opt</td>
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</table>

### Position 18 - Drain Port Size and Location

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Front</th>
<th>Tandem Front</th>
<th>Tandem Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NA NA Std</td>
<td>Std Std Opt</td>
<td>Opt Opt Opt</td>
</tr>
<tr>
<td>1</td>
<td>Std Std Opt</td>
<td>Opt Opt Opt</td>
<td>Opt Opt Opt</td>
</tr>
</tbody>
</table>

### Position 19 - Additional Functions

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Front</th>
<th>Tandem Front</th>
<th>Tandem Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
</tr>
</tbody>
</table>

### Position 20, 21 - Special Features

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Front</th>
<th>Tandem Front</th>
<th>Tandem Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
</tr>
<tr>
<td>0C</td>
<td>NA NA Std</td>
<td>Std Std Opt</td>
<td>Opt Opt Opt</td>
</tr>
</tbody>
</table>

### Position 22, 23 - Paint

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Front</th>
<th>Tandem Front</th>
<th>Tandem Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>0A</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
</tr>
<tr>
<td>0B</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
</tr>
</tbody>
</table>

### Position 24 - Identification

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Front</th>
<th>Tandem Front</th>
<th>Tandem Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
</tr>
</tbody>
</table>

### Position 25 - Design Code

<table>
<thead>
<tr>
<th>Code</th>
<th>Single Front</th>
<th>Tandem Front</th>
<th>Tandem Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
<td>Std Std Std</td>
</tr>
</tbody>
</table>

NA = Not Available  
Std. = Standard  
Opt. = Optional
Medium Duty Piston Pump

70360
Input Shafts

Code Position 7

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

24.981 [.9835] Dia., 15 Tooth
16/32 DP 30 Involute
Flat Root, Class 1
Side Fit Spline, SAE J498b

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

22.23 [.875] Dia., 41 Tooth
48/96 DP 45 Involute
Fillet Root, Class 1
Side Fit Spline

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

22.22 [.875] Dia., 13 Tooth
16/32 DP 30 Involute
Flat Root, Class 1
Side Fit Spline, SAE J498b

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

25.43/25.37 Dia. [.999/.994]
6.4 [.25] W x 28.4 [1.12]
Lg. Key
3/8 - 24UNF-2B
19 [.75] Deep
38.15/38.05 taper per 304.8 mm
[1.502/1.498 taper per foot]

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

6.4 [.25] x 24.6 [.97]
Keyway
25.06/24.82 Dia. [.987/.977]

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

25.06/24.82 Dia. [.987/.977]
6.4 [.25] W x 28.4 [1.12]
Lg. Key
3/8 - 24UNF-2B
19 [.75] Deep
38.15/38.05 taper per 304.8 mm
[1.502/1.498 taper per foot]

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

22.23/22.20 Dia. [.875/.874]
6.4 [.25] [.97]
Lg. Key

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.

Dimensions are in millimeters [inches], unless otherwise specified.
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 without internal charge pump)

(Used on piston pump with internal charge pump)

**Maximum Torque**

119 N•m [1050 lbf•in]

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

(Used for Tandem Connections)

**Maximum Torque**

316 N•m [2,800 lbf•in]

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

82.63±.03 [3.250±.001] Dia.

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.

Code Position 12 and 13

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.
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>Size and Description</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 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 Rear 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 [0.365] Dia.</td>
</tr>
<tr>
<td>D4</td>
<td>Thru Drain - Front</td>
<td>9.55 [0.376] 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>

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 J408b with a 24.9 [0.98] shaft extension.

Front of Flange
167.5 [6.60]
217.0 [8.54]

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.
Section 3

Model 72400

Servo Controlled

40.6 cm$^3$/r [2.48 in$^3$/r]
49.2 cm$^3$/r [3.00 in$^3$/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
Medium Duty Piston Pump

View "A - A"

Left Side

Right Side

CW or CCW
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.
This unit will accept another unit with an SAE "B" Auxiliary Mounting Flange and a 22.4 [.88] Dia. 41 Tooth, 48/96 DP 45 involute fillet root, class 1, side fit spline. Maximum Torque 316.4 N·m [2800 lbf·in]

Dimensions are in mm [in] unless noted otherwise.
Medium Duty Piston Pump

Model 72400 Servo Controlled
Front Piston Pump of Tandem Pumps

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.
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 [.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
- Durable 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 operator effort
- Improved serviceability

### Model 72400 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>379 bar [5500 PSI]</td>
</tr>
<tr>
<td>Continuous Allowable Case Pressure</td>
<td>2 bar [25 PSI]</td>
</tr>
<tr>
<td>Maximum Case Drain Temperature</td>
<td>107°C [225°F]</td>
</tr>
<tr>
<td>Weight per single pump (aprox.)</td>
<td>27 to 28 kg [59 to 62 lbs]</td>
</tr>
</tbody>
</table>

### Model 72400 Specifications - Internal Gerotor Charge Pump

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</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>

### Specifications
- Piston Pump
- Maximum Displacement: 40,6 cm³/r [2.48 in³/r]
- Input Mounting Flange: SAE "B" or "BB"
- Flow @ Rated Speed & PSI: 140 l/min [37.0 gal/min]
- Maximum Rated Speed: 3600 RPM
- Continuous Rated Pressure: 210 bar [3000 PSI]
- Maximum Intermittent Pressure: 379 bar [5500 PSI]
- Continuous Allowable Case Pressure: 2 bar [25 PSI]
- Maximum Case Drain Temperature: 107°C [225°F]
- Weight per single pump (aprox.): 27 to 28 kg [59 to 62 lbs]

### Specifications - Internal Gerotor Charge Pump
- Displacement Options: 6,9 cm³/r [.42 in³/r], 13,8 cm³/r [.84 in³/r]
- Operating Pressure Range (std.): 17 to 21 bar [250 to 300 PSI]
- Maximum Charge Inlet Vacuum: 0,80 bar Abs. [6 inHg]
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.
# 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>Positions 1, 2, 3 - Code Title</th>
<th>Code Example:</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAD = 40.6 cm³/r [2.48 in³/r] Servo Controlled Variable Displacement Pump</td>
<td>A A D R A A A A 1 3 E 1 T T A M O 0 0 A 0 0 0 A 0 0 0 0</td>
</tr>
<tr>
<td>AAE = 40.6 cm³/r [2.48 in³/r] Servo Controlled Variable Displacement Pump (Tandem Front Pump)</td>
<td></td>
</tr>
<tr>
<td>AAF = 40.6 cm³/r [2.48 in³/r] Servo Controlled Variable Displacement Pump (Tandem Rear Pump)</td>
<td></td>
</tr>
<tr>
<td>ACG = 49.2 cm³/r [3.00 in³/r] Servo Controlled Variable Displacement Pump</td>
<td></td>
</tr>
<tr>
<td>ACH = 49.2 cm³/r [3.00 in³/r] Servo Controlled Variable Displacement Pump (Tandem Front Pump)</td>
<td></td>
</tr>
<tr>
<td>ACJ = 49.2 cm³/r [3.00 in³/r] Servo Controlled Variable Displacement Pump (Tandem Rear Pump)</td>
<td></td>
</tr>
</tbody>
</table>

## Position 4 - Input Shaft Rotation

<table>
<thead>
<tr>
<th>R = Righthand Rotation (CW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L = Lefthand Rotation (CW)</td>
</tr>
</tbody>
</table>

## Position 5 - Input Shaft

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>A = 15 Tooth, 16/32 External Spline, 46 [1.81] Shaft Extension</td>
<td>Std.</td>
<td>Std.</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B = 41 Tooth, 48/96 External Spline, 24,4 [0.96] Shaft Extension</td>
<td>NA</td>
<td>NA</td>
<td>Std.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E = 25,4 [1.00] Dia. Str., 6,4 [0.25] x 28,4 [1.12] keyway, 46 [1.81] Shaft Extension (Key Included)</td>
<td>Opt.</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Position 6 - Output Shaft

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>A = 9 Tooth, 16/32 Internal Spline, Accepts 31,8 [1.25] Shaft Extension (for SAE &quot;A&quot; mount only)</td>
<td>Std.</td>
<td>NA</td>
<td>Std.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B = 41 Tooth, 48/96 External Spline, Accepts 24,4 [0.96] Shaft Extension (for SAE &quot;B&quot; mount only)</td>
<td>NA</td>
<td>Std.</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Position 7 - Auxiliary Rear Mounting

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>A = &quot;A&quot; SAE Flange Series 82-2</td>
<td>Std.</td>
<td>NA</td>
<td>Opt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E = &quot;A&quot; SAE Flange Series 82-2 w/ Mounting Support Holes</td>
<td>Opt.</td>
<td>NA</td>
<td>Std.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Position 8 - Charge Pump

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 = 6,3 cm³/r [.42 in³/r] disp. w/1-5/16 - 12 UN-2B SAE O-ring straight thread inlet port (S)</td>
<td>Opt.</td>
<td>Std.</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 = 13,8 cm³/r [.84 in³/r] disp. w/1-5/16 - 12 UN-2B SAE O-ring straight thread inlet port (S)</td>
<td>Opt.</td>
<td>NA</td>
<td>Std.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Position 9 - Charge Pump Relief Setting and Routing

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 = 17 - 21 bar [250-300 PSI] (Relieved to Case)</td>
<td>Opt.</td>
<td>Std.</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Position 10 - Auxiliary Port, Size and Location (left C1 and right C2)

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>D = On both sides w/ left side plugged (housing), 3/4 - 16 UNF-2B SAE O-ring straight thread port</td>
<td>Opt.</td>
<td>Std.</td>
<td>Std.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E = On both sides and both plugged (housing), 3/4 - 16 UNF-2B SAE O-ring straight thread port</td>
<td>Opt.</td>
<td>NA</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Position 11 - Drain Port Size and Location (left D1 and right D2)

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>D = On both sides w/ right side plugged &amp; rear flange drained into housing, 1-1/16 - 12 UN-2B SAE O-ring straight thread port</td>
<td>Opt.</td>
<td>Opt.</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E = On both Sides w/ left side plugged &amp; rear flange drained into housing, 1-1/16 - 12 UN-2B SAE O-ring straight thread port</td>
<td>Std.</td>
<td>Std.</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M = On both sides w/ left side plugged &amp; thru drain into mount (front), 1-1/16 - 12 UN-2B SAE O-ring straight thread port</td>
<td>NA</td>
<td>NA</td>
<td>Opt.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S = On both sides w/ both sides plugged &amp; thru drain into mount (front), 1-1/16 - 12 UN-2B SAE O-ring straight thread port</td>
<td>NA</td>
<td>NA</td>
<td>Std.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Position 12 - Main Ports, Size and Location (port A and B)

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
<tbody>
<tr>
<td>J = 1 - 5/16 - 12 UN-2B O-ring straight thread port, Same Side (Left Side)</td>
<td>Opt.</td>
<td>Std.</td>
<td>Std.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Positions 13, 14 - Relief Valve Setting for Main Ports

<table>
<thead>
<tr>
<th>Position</th>
<th>Code</th>
<th>Single Unit</th>
<th>Tandem Unit</th>
<th>Front</th>
<th>Rear</th>
</tr>
</thead>
</table>
## Model Code for the 72400 Piston Pumps

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

### Position 15 - Additional Functions


### Positions 16, 17 - Control Assembly

**Manual Control**

- **M0 = 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 0-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**

**Solenoيد 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 (NA for pumps w/ destroke)**
- **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]** (NA for pumps w/ destroke)
- **H = 1.65 mm [.065 in]** (NA for pumps w/ destroke)
- **J = 1.85 mm [.073 in]** (NA for pumps w/ destroke)

**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]**
- **H = 1.65 mm [.065 in]**
- **J = 1.85 mm [.073 in]**

**Position 21 - Special Control Option**

- **0 = No Special Control Options (Standard Control Lever Position)**
- **OA = Primer**
- **OB = Black**

**Positions 22, 23 - Paint**

- **OA = Primer**
- **OB = Black**

**Positions 24, 25 - Special Features**

- **00 = No Special Features**
- **BB = Adjustable Displacement Limiter, Both Sides**

**Position 26 - Identification**

- **0 = Standard**
- **D = Eaton - assigned design code**
72400
Input Shafts
Code Position 5

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

**Shaft A**
- Maximum Input Torque: 338 N·m [2987 lbf-in]
- 24,981 [.9835] Dia., 15 Tooth
- 16/32 DP 30° Involute
- Flat Root, Class 1
- Side Fit Spline, SAE J498b

**Shaft B**
- Maximum Input Torque: 316 N·m [2800 lbf-in]
- 22,23 [.875] Dia., 41 Tooth
- 48/96 DP 45° Involute
- Fillet Root, Class 1
- Side Fit Spline

**Shaft C**
- Maximum Input Torque: 209 N·m [1852 lbf-in]
- 22,22 [.875] Dia., 13 Tooth
- 16/32 DP 30° Involute
- Flat Root, Class 1
- Side Fit Spline, SAE J498b

**Shaft D**
- Maximum Input Torque: 338 N·m [2987 lbf-in]
- 6,4 [.25] W × 28,4 [1.12] Lg. Key

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

**Shaft E**
- Used for Tandem connection only
- 24,4 [.96] Dia.

**Shaft F**
- 19,8 [.78] Dia.
- 3,33/3,18 [.131/.125] Dia.
- 25,43/25,37 Dia.
- 3/8 - 24UNF-2B
- 19 [.75] Deep
- 38,15/38,05 taper per 304,8 mm [1.502/1.498 taper per foot]

**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).
Medium Duty Piston Pump

72400

Output Shafts - Code Position 6


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].


Position 6
Shaft F

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

Without internal charge


Position 6
Shaft L

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

Without internal charge


Position 6
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

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

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

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.

Groove to Accept an ARP 045
[1/16 X 4 ID] O-Ring

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.

Groove to Accept an ARP 045
[1/16 X 3-1/4 ID] O-Ring

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

Dimensions are in millimeters [inches], unless otherwise specified.
72400 Charge Pump Routing and Location
Code Position 9

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.
**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.

---

**Drain Locations in Rear of Pumps**

**"A" Pad**
- Single pump or rear pump of tandem.

**"B" Pad**
- Front pump of tandem.

**Auxiliary Flange Drain**
- To main housing of servo piston pump.

**Thru Drain into Auxiliary Flange**
- To rear pump of tandem.

**Side and Front of Pump**

**Port (A)**

**Port (B)**

**Left Side Drain Port Plugged**

**Left Side Auxiliary Port* Plugged**

**Right Side Drain and Auxiliary Port* Location**

**Thru Drain into Auxiliary Mounting Pad of Front Pump**
- (Tandem Rear Pump Housing Only)

*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)*

[Diagram showing the configuration of ports and valves for righthand rotation (CW).]

*Lefthand Rotation (CCW)*

[Diagram showing the configuration of ports and valves for lefthand rotation (CCW).]

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

Bypass Valve

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.

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

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

Output Flow
Port (B)
Port (A)

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

Output Flow
Port (A)
Port (B)

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

**72400**

**Manual Control**

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

**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 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.

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

**Destroke Valve**

<table>
<thead>
<tr>
<th></th>
<th>153.9 [6.06]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump End View</td>
<td></td>
</tr>
</tbody>
</table>

**Neutral Lockout Switch**

<table>
<thead>
<tr>
<th></th>
<th>5 amp. @ 12 VDC, 3 amp. @ 24 VDC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Top View</td>
<td></td>
</tr>
</tbody>
</table>

**Neutral Detent**

<table>
<thead>
<tr>
<th></th>
<th>122.2 [4.81]</th>
</tr>
</thead>
<tbody>
<tr>
<td>to face of pump flange.</td>
<td></td>
</tr>
</tbody>
</table>

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)

*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)
Medium Duty Piston Pump

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.
**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>

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

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

---

Model 72400

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>

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

---

Solenoid Actuated Valve Assembly
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-StandardElectronics 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</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.
72400
Solenoid Operated Control
Code Position 16,17

Schematic Code SA

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

Schematic Code SB

Schematic Code SC

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

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 #61) 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].

### Adjustable Servo Stop Kit Parts

<table>
<thead>
<tr>
<th>Item #</th>
<th>Part Number</th>
<th>Description</th>
<th>Kit #72400-938 Qty.</th>
<th>Kit #72400-940 Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>16024-6</td>
<td>Jam Nut</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>16254-6</td>
<td>Seal Washer</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>72400-651</td>
<td>Cover Plate</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>72400-621</td>
<td>Cover Gasket</td>
<td>1</td>
<td>2</td>
</tr>
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<td>17</td>
<td>72400-771</td>
<td>Cover Plate</td>
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<tr>
<td>60</td>
<td>16254-26</td>
<td>Washer</td>
<td>1</td>
<td>2</td>
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<tr>
<td>74</td>
<td>16139-624</td>
<td>Set Screw</td>
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<td>1</td>
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<tr>
<td>80</td>
<td>16022-4</td>
<td>Jam Nut</td>
<td>1</td>
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<td>81</td>
<td>16139-424</td>
<td>Set Screw</td>
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<td>82</td>
<td>16254-24</td>
<td>Washer</td>
<td>1</td>
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<td>83</td>
<td>16254-4</td>
<td>Seal Washer</td>
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</table>
72400

Supply and Control Orifice

Code Position 19 and 20

Control Orifice
Location (s1)

Supply Orifice
Location (P)

Calculated Time from Neutral to Full Stroke (seconds)

<table>
<thead>
<tr>
<th>Control 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>
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</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>
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<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>
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<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>
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<td>1.12 [0.044]</td>
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<td>1.017</td>
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<td>0.847</td>
<td>0.792</td>
<td>0.718</td>
<td>0.688</td>
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<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>
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<tr>
<td>1.45 [0.057]</td>
<td>1.133</td>
<td>0.996</td>
<td>0.892</td>
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<td>0.745</td>
<td>0.652</td>
<td>0.611</td>
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<tr>
<td>1.65 [0.065]</td>
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<td>0.885</td>
<td>0.801</td>
<td>0.734</td>
<td>0.634</td>
<td>0.589</td>
<td>0.408</td>
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<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>
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<tr>
<td>None</td>
<td>1.125</td>
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<td>0.787</td>
<td>0.716</td>
<td>0.606</td>
<td>0.553</td>
<td>0.138</td>
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</tbody>
</table>

Note: Proper orifice selection must be determined by actual testing.
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 overfilling. 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 keep the pressure drop between the reservoir and charge pump inlet within the limits described in the filter section. Fittings will increase the pressure drop, so their number should be kept to a...
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 80°C [180°F] for most hydraulic fluids. The maximum fluid temperature should not exceed 107°C [225°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

drain port on each of the units. This assures that the pump and motor cases remain full.

The combined torque required to turn two or more pumps must not exceed the torque rating of the input drive shaft of the front piston pump.

Installer to provide centering and a secure neutral for pump swashplate control shaft.

An external support is recommended for all tandems.

Open Loop Circuits

Eaton pumps and motors may be used in open loop circuits under certain operating conditions. Consult your Eaton representative for details.
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.
## Hydraulic Fluid Recommendations

<table>
<thead>
<tr>
<th>Viscosity Requirements</th>
<th>Minimum</th>
<th>Optimum Range</th>
<th>Maximum</th>
<th>ISO Cleanliness Requirements</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Heavy Duty Piston Pumps and Motors</strong></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><strong>Medium Duty Piston Pumps and Motors</strong></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><strong>Charged Systems</strong></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><strong>Light Duty Transaxles, Transmissions, Pumps and Series 1150 Transaxles</strong></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>
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<tr>
<td><strong>Series 2030 Motor Axles</strong></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><strong>Char-Lynn J, R, and S Series Motors, and Disc Valve Motors</strong></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><strong>Char-Lynn A Series and H Series Motors</strong></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>
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<tr>
<td><strong>Char-Lynn Steering Control Units, Priority and Control Valves</strong></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>
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<tr>
<td><strong>Gear Pumps and Motors, and Cylinders</strong></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>
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</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.