Eaton®
Heavy Duty Hydrostatic Transmissions

Models 33 through 76
Hydrostatic Transmissions

We Manufacture
Solutions
Heavy Duty Features/Benefits

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

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

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

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

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

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

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

Advanced cylinder barrel design – permits high speed and pressure.

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

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

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

Large case drain ports – minimize case back pressure.
Heavy Duty Features/Benefits

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

Valve plate – hardened steel for long life.

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

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

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

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

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

Table of Contents

Pump Performance ................................................................. 4
Motor Performance .............................................................. 5
Charge Pump Performance .................................................... 6
Heavy Duty Hydrostatic Transmissions .................................. 6
Power Limiter Pumps and Integral Shuttle Motors ................. 12
Heavy Duty Tandem Pumps ................................................... 15
Heavy Duty Pumps with C-Pad Rear Mount ......................... 19
Shaft and Port Options ........................................................ 21
Pump Controls .................................................................... 23
Motor Controls ................................................................... 29
## Pump Performance

<table>
<thead>
<tr>
<th>Model</th>
<th>33</th>
<th>39</th>
<th>46</th>
<th>54</th>
<th>64</th>
<th>76</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displacement</td>
<td>in³/rev</td>
<td>3.32</td>
<td>3.89</td>
<td>4.60</td>
<td>5.44</td>
<td>6.44</td>
</tr>
<tr>
<td></td>
<td>cm³/rev</td>
<td>54.4</td>
<td>63.7</td>
<td>75.3</td>
<td>89.1</td>
<td>105.5</td>
</tr>
<tr>
<td>Maximum Shaft Speed*</td>
<td>RPM @ 18°</td>
<td>4510**</td>
<td>4160</td>
<td>4160</td>
<td>3720</td>
<td>3720</td>
</tr>
<tr>
<td>Output Flow</td>
<td>GPM @ 3500 PSI</td>
<td>61.5</td>
<td>67.3</td>
<td>79.2</td>
<td>84.1</td>
<td>99.1</td>
</tr>
<tr>
<td></td>
<td>LPM @ 241 bar</td>
<td>233</td>
<td>255</td>
<td>300</td>
<td>318</td>
<td>375</td>
</tr>
<tr>
<td>Input Torque</td>
<td>lb-in @ 3500 PSI</td>
<td>2049</td>
<td>2346</td>
<td>2786</td>
<td>3285</td>
<td>3900</td>
</tr>
<tr>
<td></td>
<td>Nm @ 241 bar</td>
<td>232</td>
<td>265</td>
<td>315</td>
<td>371</td>
<td>441</td>
</tr>
</tbody>
</table>

Pump performance calculated at 96% efficiency.

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

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

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

### Pump Performance Graphs

**Input Torque vs Speed**

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

**Output Flow vs Speed**

- System Pressure: 3500 psi [240 bar]
**Motor Performance**

<table>
<thead>
<tr>
<th>Model</th>
<th>33</th>
<th>39</th>
<th>46</th>
<th>54</th>
<th>64</th>
<th>76</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Displacement</strong></td>
<td>in³/rev</td>
<td>3.32</td>
<td>3.89</td>
<td>4.60</td>
<td>5.44</td>
<td>6.44</td>
</tr>
<tr>
<td></td>
<td>cm³/rev</td>
<td>54.4</td>
<td>63.7</td>
<td>75.3</td>
<td>89.1</td>
<td>105.5</td>
</tr>
<tr>
<td><strong>Maximum Shaft Speed</strong></td>
<td>RPM @ 18°</td>
<td>4510°</td>
<td>4160°</td>
<td>4160°</td>
<td>3720°</td>
<td>3720°</td>
</tr>
<tr>
<td></td>
<td>RPM @ 10°</td>
<td>5380°</td>
<td>5380°</td>
<td>5380°</td>
<td>4810°</td>
<td>4810°</td>
</tr>
<tr>
<td><strong>Maximum Output Torque †</strong></td>
<td>lb-in</td>
<td>2959</td>
<td>3511</td>
<td>4149</td>
<td>4916</td>
<td>5807</td>
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<tr>
<td></td>
<td>Nm</td>
<td>334</td>
<td>397</td>
<td>469</td>
<td>556</td>
<td>656</td>
</tr>
</tbody>
</table>

* The maximum swashplate angle on model 33 motors is 15.5°.
† These shaft speeds require maximum charge pressure relief: 340 psi [23 bar] pump and 280 psi [19 bar] motor.

**Output Torque vs Speed**

**Input Flow vs Speed**

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

**Note:** Operating the motor below 50 RPM is not recommended.
Eaton offers a choice of four charge pump displacements to go with their heavy duty transmission line: .85, 1.28, 1.70, and 2.12 in³/rev [13.9; 21.0; 27.8; 34.7 cm³/rev]. These charge pumps are available with one or more of the following options:

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

### Charge Pump Performance

<table>
<thead>
<tr>
<th>Displacement</th>
<th>in³/rev</th>
<th>.85</th>
<th>1.28</th>
<th>1.70</th>
<th>2.12</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm³/rev</td>
<td></td>
<td>13.9</td>
<td>21.0</td>
<td>27.9</td>
<td>34.7</td>
</tr>
<tr>
<td>Maximum Shaft Speed</td>
<td>RPM</td>
<td>4600</td>
<td>3800</td>
<td>3100</td>
<td>3000</td>
</tr>
<tr>
<td>Output Flow</td>
<td>GPM</td>
<td>16.9</td>
<td>21.0</td>
<td>22.8</td>
<td>27.5</td>
</tr>
<tr>
<td>Maximum Speed*</td>
<td>LPM</td>
<td>64.0</td>
<td>79.5</td>
<td>86.3</td>
<td>104.2</td>
</tr>
<tr>
<td>Input Power @ 220 PSI [15 bar] and Maximum Speed*</td>
<td>HP</td>
<td>2.17</td>
<td>2.70</td>
<td>2.93</td>
<td>3.54</td>
</tr>
<tr>
<td></td>
<td>kW</td>
<td>1.62</td>
<td>2.01</td>
<td>2.18</td>
<td>2.64</td>
</tr>
</tbody>
</table>

*Theoretical Values

---

**Charge Pump Power vs Speed**

**Charge Pump Flow vs Speed**

* Oil Viscosity .................. 60 SUS
* Temperature ................... 180°F [82°C]
* Theoretical Values
Charge Pump Dimensions

**Charge Pump with Auxiliary Pressure Port**

Charge Pump Options

<table>
<thead>
<tr>
<th>Displacement</th>
<th>Dimension 'D'</th>
</tr>
</thead>
<tbody>
<tr>
<td>cu.in./rev.</td>
<td>mm</td>
</tr>
<tr>
<td>in.</td>
<td>in.</td>
</tr>
<tr>
<td>0.85</td>
<td>13.9</td>
</tr>
<tr>
<td>1.28</td>
<td>21.8</td>
</tr>
<tr>
<td>1.70</td>
<td>27.8</td>
</tr>
<tr>
<td>2.12</td>
<td>34.7</td>
</tr>
</tbody>
</table>

**Charge Pump Inlet**

1 5/16-12 Straight Thread O-ring Fitting

**Auxiliary Mounting Surface**

41.4 [1.63] Maximum Allowable Shaft Protrusion

Gasket supplied as loose item to be installed on mounting surface prior to assembly of auxiliary pump.

Spline to mate with internal involute flat root side fit, 13 tooth 16/32 pitch, 30° pressure angle, per ANSI B-92.1-1970

*Refer to page 18 for SAE A torque ratings.

**Charge Pump with SAE A Auxiliary Mount**

Charge Pump Options

<table>
<thead>
<tr>
<th>Displacement</th>
<th>Dimension 'D'</th>
</tr>
</thead>
<tbody>
<tr>
<td>cu.in./rev.</td>
<td>mm</td>
</tr>
<tr>
<td>in.</td>
<td>in.</td>
</tr>
<tr>
<td>0.85</td>
<td>13.9</td>
</tr>
<tr>
<td>1.28</td>
<td>21.8</td>
</tr>
<tr>
<td>1.70</td>
<td>27.8</td>
</tr>
<tr>
<td>2.12</td>
<td>34.7</td>
</tr>
</tbody>
</table>

**Charge Pump Inlet**

1 5/16-12 Straight Thread O-ring Fitting

**Auxiliary Mounting Surface**

57.2 [2.25] Maximum Allowable Shaft Protrusion

Gasket supplied as loose item to be installed on mounting surface prior to assembly of auxiliary pump.

Spline to mate with internal involute flat root side fit, 9 tooth 16/32 pitch, 30° pressure angle, per ANSI B-92.1-1970

*Refer to page 18 for SAE A torque ratings.

**Charge Pump with SAE B Auxiliary Mount**

Charge Pump Options

<table>
<thead>
<tr>
<th>Displacement</th>
<th>Dimension 'D'</th>
</tr>
</thead>
<tbody>
<tr>
<td>cu.in./rev.</td>
<td>mm</td>
</tr>
<tr>
<td>in.</td>
<td>in.</td>
</tr>
<tr>
<td>1.375</td>
<td>35.3</td>
</tr>
<tr>
<td>3.50</td>
<td>88.9</td>
</tr>
</tbody>
</table>

**Charge Pump Inlet**

1 5/16-12 Straight Thread O-ring Fitting

**Auxiliary Mounting Surface**

57.2 [2.25] Maximum Allowable Shaft Protrusion

Gasket supplied as loose item to be installed on mounting surface prior to assembly of auxiliary pump.

Spline to mate with internal involute flat root side fit, 13 tooth 16/32 pitch, 30° pressure angle, per ANSI B-92.1-1970

*Refer to page 18 for SAE B torque ratings.

**Charge Pump with Remote Filter Ports**

Charge Pump Options

<table>
<thead>
<tr>
<th>Displacement</th>
<th>Dimension 'D'</th>
</tr>
</thead>
<tbody>
<tr>
<td>cu.in./rev.</td>
<td>mm</td>
</tr>
<tr>
<td>in.</td>
<td>in.</td>
</tr>
<tr>
<td>0.85</td>
<td>13.9</td>
</tr>
<tr>
<td>1.28</td>
<td>21.8</td>
</tr>
<tr>
<td>1.70</td>
<td>27.8</td>
</tr>
<tr>
<td>2.12</td>
<td>34.7</td>
</tr>
</tbody>
</table>

**Charge Pump Inlet**

1 5/16-12 Straight Thread O-ring Fitting

**Auxiliary Mounting Surface**

57.2 [2.25] Maximum Allowable Shaft Protrusion

Gasket supplied as loose item to be installed on mounting surface prior to assembly of auxiliary pump.

Spline to mate with internal involute flat root side fit, 9 tooth 16/32 pitch, 30° pressure angle, per ANSI B-92.1-1970

*Refer to page 18 for SAE A torque ratings.

**Charge Pump with Spin-On Pressure Side Filter Pad**

*Note: This option supplied with filter.

Charge Pump Options

<table>
<thead>
<tr>
<th>Displacement</th>
<th>Dimension 'D'</th>
</tr>
</thead>
<tbody>
<tr>
<td>cu.in./rev.</td>
<td>mm</td>
</tr>
<tr>
<td>in.</td>
<td>in.</td>
</tr>
<tr>
<td>0.85</td>
<td>13.9</td>
</tr>
<tr>
<td>1.28</td>
<td>21.8</td>
</tr>
<tr>
<td>1.70</td>
<td>27.8</td>
</tr>
<tr>
<td>2.12</td>
<td>34.7</td>
</tr>
</tbody>
</table>

**Charge Pump Inlet**

1 5/16-12 Straight Thread O-ring Fitting

**Pressure Side Filter Pad**

3.50 [0.14] Maximum Allowable Shaft Protrusion

Gasket supplied as loose item to be installed on mounting surface prior to assembly of auxiliary pump.

Spline to mate with internal involute flat root side fit, 13 tooth 16/32 pitch, 30° pressure angle, per ANSI B-92.1-1970

*Refer to page 18 for SAE B torque ratings.

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

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

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

Eaton heavy duty variable pumps

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

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

Eaton heavy duty motors

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

The end covers, on both the fixed and variable motors, are standard with a bolt-on valve block. The valve block contains two high pressure relief valves, a shuttle valve, and a charge pressure relief valve. The high pressure relief valves limit the closed loop pressure by cross porting when the pressure limit is reached. The shuttle valve and charge pressure relief valve direct charge flow into the motor housing for flushing and cooling.
Models 33, 39, and 46 Dimensions

Notes: All dimensions are given in millimeters [inches]. The variable pumps and motors are shown with standard controls. Installation drawings of other controls are available from your Eaton representative. Optional controls are shown on page 23. The variable pumps are shown with standard charge pumps. Installation drawings of other charge pumps are available from your Eaton representative. The lever on the standard control has linkage connection holes at 1 and 2 inch radii from the control shaft center. Detailed drawings of available shafts and ports are shown on page 21.
Models 54 and 64 Dimensions

Variable Pump

Fixed Motor

Variable Motor
### Model 76 Dimensions

#### Variable Pump

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
<th>Approximate Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case Drain Port - 1 1/16-12 Straight Thread O-ring Fitting</td>
<td>107.4 (4.25)</td>
<td>33 lb [15.0 Kg]</td>
</tr>
<tr>
<td></td>
<td>127.0 (5.00)</td>
<td>46 lb [20.9 Kg]</td>
</tr>
<tr>
<td></td>
<td>126.7 (4.99)</td>
<td>54 lb [24.4 Kg]</td>
</tr>
<tr>
<td></td>
<td>126.7 (4.99)</td>
<td>64 lb [29.0 Kg]</td>
</tr>
<tr>
<td></td>
<td>126.7 (4.99)</td>
<td>76 lb [34.5 Kg]</td>
</tr>
<tr>
<td>Model 76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAE D 4-Bolt Mounting Flange</td>
<td>08.0 (0.31)</td>
<td>138 lb [62.6 Kg]</td>
</tr>
<tr>
<td></td>
<td>10.2 (0.40)</td>
<td>188 lb [85.3 Kg]</td>
</tr>
<tr>
<td></td>
<td>126.7 (4.99)</td>
<td>226 lb [101.7 Kg]</td>
</tr>
</tbody>
</table>

#### Fixed Motor

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
<th>Approximate Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case Drain Port - 1 1/16-12 Straight Thread O-ring Fitting</td>
<td>161.5 (6.36)</td>
<td>33 lb [15.0 Kg]</td>
</tr>
<tr>
<td></td>
<td>199.6 (7.86)</td>
<td>46 lb [20.9 Kg]</td>
</tr>
<tr>
<td></td>
<td>199.6 (7.86)</td>
<td>54 lb [24.4 Kg]</td>
</tr>
<tr>
<td></td>
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<td>64 lb [29.0 Kg]</td>
</tr>
<tr>
<td></td>
<td>199.6 (7.86)</td>
<td>76 lb [34.5 Kg]</td>
</tr>
<tr>
<td>Model 76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAE D 4-Bolt Mounting Flange</td>
<td>08.0 (0.31)</td>
<td>138 lb [62.6 Kg]</td>
</tr>
<tr>
<td></td>
<td>08.0 (0.31)</td>
<td>188 lb [85.3 Kg]</td>
</tr>
<tr>
<td></td>
<td>126.7 (4.99)</td>
<td>226 lb [101.7 Kg]</td>
</tr>
</tbody>
</table>

#### Variable Motor

<table>
<thead>
<tr>
<th>Component</th>
<th>Dimensions</th>
<th>Approximate Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case Drain Port - 1 1/16-12 Straight Thread O-ring Fitting</td>
<td>102.4 (4.02)</td>
<td>33 lb [15.0 Kg]</td>
</tr>
<tr>
<td></td>
<td>126.7 (4.99)</td>
<td>46 lb [20.9 Kg]</td>
</tr>
<tr>
<td></td>
<td>126.7 (4.99)</td>
<td>54 lb [24.4 Kg]</td>
</tr>
<tr>
<td></td>
<td>126.7 (4.99)</td>
<td>64 lb [29.0 Kg]</td>
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<td>76 lb [34.5 Kg]</td>
</tr>
<tr>
<td>Model 76</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAE D 4-Bolt Mounting Flange</td>
<td>08.0 (0.31)</td>
<td>138 lb [62.6 Kg]</td>
</tr>
<tr>
<td></td>
<td>10.2 (0.40)</td>
<td>188 lb [85.3 Kg]</td>
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#### Heavy Duty Component Approximate Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>Variable Pump</th>
<th>Fixed Motor</th>
<th>Variable Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>138 [62.6]</td>
<td>83 [37.6]</td>
<td>140 [63.5]</td>
</tr>
<tr>
<td>46</td>
<td>138 [62.6]</td>
<td>83 [37.6]</td>
<td>140 [63.5]</td>
</tr>
<tr>
<td>54</td>
<td>188 [85.3]</td>
<td>106 [48.1]</td>
<td>190 [86.2]</td>
</tr>
<tr>
<td>64</td>
<td>188 [85.3]</td>
<td>106 [48.1]</td>
<td>190 [86.2]</td>
</tr>
<tr>
<td>76</td>
<td>226 [101.7]</td>
<td>121 [54.5]</td>
<td>228 [102.6]</td>
</tr>
</tbody>
</table>
Power Limiter Pumps and Integral Shuttle Valve Motors
Models 33 through 64

Power Limiter Valve Operation*

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

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

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

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

Feature/Benefits

- The motor is shorter and lighter allowing it to fit in tighter spaces.
- The motor’s integral shuttle valve and low pressure relief assure good loop flushing.
- The motor is available with side ports, end ports, or both allowing maximum mounting flexibility.
- The power limiter valves (PLV) are quick, direct acting relief valves that prevent high pressure spikes.
- The power limiter pump is ideally suited for use with motors that do not have valve blocks because it eliminates the need for a remote valve block.
Models 33, 39, and 46 Power Limiter Pumps

Models 54 and 64 Power Limiter Pumps

Power Limiter Pump Dimensions
Models 33, 39, and 46 Integral Shuttle Motors

Models 54 and 64 Integral Shuttle Motors

PL Pump and IS Motor Approximate Weights

<table>
<thead>
<tr>
<th>Model</th>
<th>PL Pump [lb]</th>
<th>IS Motor [Kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>138 [62.6]</td>
<td>70 [31.8]</td>
</tr>
<tr>
<td>39</td>
<td>138 [62.6]</td>
<td>70 [31.8]</td>
</tr>
<tr>
<td>46</td>
<td>138 [62.6]</td>
<td>70 [31.8]</td>
</tr>
<tr>
<td>54</td>
<td>188 [85.3]</td>
<td>93 [42.2]</td>
</tr>
<tr>
<td>64</td>
<td>188 [85.3]</td>
<td>93 [42.2]</td>
</tr>
</tbody>
</table>

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

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

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

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

Features/Benefits

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

Models 33, 39, and 46 Tandem Pumps

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

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

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

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

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

<table>
<thead>
<tr>
<th>Charge Pump Options</th>
<th>Displacement</th>
<th>Dimension 'G'</th>
</tr>
</thead>
<tbody>
<tr>
<td>cu.in./rev.</td>
<td>cc/rev</td>
<td>mm</td>
</tr>
<tr>
<td>0.85</td>
<td>13.9</td>
<td>92.2</td>
</tr>
<tr>
<td>1.28</td>
<td>21.0</td>
<td>98.6</td>
</tr>
<tr>
<td>1.70</td>
<td>27.8</td>
<td>104.9</td>
</tr>
<tr>
<td>2.12</td>
<td>34.7</td>
<td>111.6</td>
</tr>
</tbody>
</table>

Charge supply centerline
**Tandem Dimensions**

**Models 54 and 64 Tandem Pumps**

**Tandem Pump Approximate Weights**

<table>
<thead>
<tr>
<th>Front Pump</th>
<th>Rear Pump</th>
<th>Weight lb [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 33 - 46</td>
<td>Model 33 - 46</td>
<td>276 [125.2]</td>
</tr>
<tr>
<td>Model 54 - 64</td>
<td>Model 54 - 64</td>
<td>376 [170.6]</td>
</tr>
<tr>
<td>Model 54 - 64</td>
<td>Model 33 - 46</td>
<td>326 [147.9]</td>
</tr>
</tbody>
</table>

**Tandem Pump Application Information**

Some tandem applications require larger displacement charge pumps.

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

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

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

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

For longest shaft life, use the largest shaft possible.

---

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

---

**Shaft Torque Formulas**

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

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

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

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

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

Application Information

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

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

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

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

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

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

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

See previous page for shaft torque ratings.
Models 33, 39, and 46 Pumps with C-Pad Rear Mount

Port-F
2X Case drain ports
1 1/16-12 straight
thd o-ring fitting.

Port-B
4X 7.5 [.30] R.
4X 57.2 [2.25]
4X 57.2 [2.25]

Port-E
133.5 [5.25]
154.9 [6.09]
165.2 [6.50]
127.08/127.10 [5.000/5.003]

Optional couplings with
21 tooth 16/32 pitch and
23 tooth 16/32 pitch also available.

Involute spline fillet root side fit
14 tooth 12/24 pitch per SAE-J498b
Class 1 fit with SAE-J498b flat root
side fit major dia. Will fit ANSI B92.1
1970 Class 5 mating splines

Diag. 127.00/126.95 [5.000/4.996]

Gauge port for charge pressure.
7/16-20 straight thd o-ring fitting.

Charge supply port
7/8 - 14 straight thd o-ring fitting.

Notes: All dimensions are given in millimeters [inches].
The variable pumps are shown with standard controls. Installation drawings of other controls are available from your Eaton representative. Optional controls are shown on page 23.
The lever on the standard pump control has linkage connection holes at 1 and 2 inch radii from the control shaft center.
Detailed drawings of available shafts and ports are shown on page 21.
**Keyed Shaft Option**
Compatible with ISO 3019/1 (SAE-J744) Specifications

- **Square Key**
  - 9.55/9.53 mm  [.376/375]

- **Shaft Dia.**
  - 38.10/38.05 mm  [1.500/1.498]

- **Over Key Dim.**
  - 42.40/42.14 mm  [1.669/1.659]

- **Shaft Dia.**
  - 76.2 mm  [3.00]

---

**Splined Shaft Options**
Compatible with ISO 3019/1 (SAE-J744) Specifications

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

- **Clearance**
  - 57.7 mm  [2.27]

- **Shaft Dia.**
  - 55.6 mm  [2.19]

---

**Tapered Shaft Options**
Compatible with ISO 3019/1 (SAE-J744) Specifications

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

- **Shaft Dia.**
  - 35.05/34.90 mm  [1.380/1.374]
  - 38.23/38.08 mm  [1.505/1.499]

- **Clearance**
  - 57.7 mm  [2.27]

- **Shaft Dia.**
  - 19.30/18.80 mm  [0.760/0.740]

- **Shaft Dia. Thru**
  - 48.01 mm  [1.890]

- **Shaft Dia.**
  - 76.2 mm  [3.00]

---

**Splined Shaft Options**
Compatible with ISO 3019/1 (SAE-J744) Specifications

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

- **Clearance**
  - 57.7 mm  [2.27]

- **Shaft Dia.**
  - 55.6 mm  [2.19]

---

**Split Flange Port Options**
Per SAE-J518 Specifications

- **Code**
  - D

- **Dia.**
  - 61
  - 62

- **A**
  - 25.4 [1.00]
  - 25.4 [1.00]

- **B**
  - 26.19 [1.031]
  - 27.76 [1.093]

- **C**
  - 52.37 [2.062]
  - 57.15 [2.250]

- **D**
  - 38-16
  - 7/16-14

**Key Width**
9.499/9.474 [.3740/.3730]

---

All dimensions given in millimeters [inches].
**Keyed Shaft Option**
Compatible with ISO 3019/1 (SAE-J744) Specifications

- Square Key: 11.137/11.112 [0.4385/.4375]
- Key Width: 11.087/11.062 [0.4365/.4355]

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

**Tapered Shaft Option**
Compatible with ISO 3019/1 (SAE-J744) Specifications

- Over Key Dim.: 49.43/49.17 [1.946/1.936]
- Shaft Dia.: 44.45/44.40 [1.750/1.748]
- Key Width: 11.087/11.062 [0.4365/.4355]

125.33/124.67 mm Taper Per Meter [1.502'/1.496 in. Taper Per Foot]

**Splined Shaft Options**
Compatible with ISO 3019/1 (SAE-J744) Specifications

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

- Shaft Dia.: 74.4 [2.93]
- Tooth: 13, 27
- Pitch: 8/16, 16/32
- Pitch: 43.713/43.586, 44.031/43.904 [1.7210/1.7160, 1.7335/1.7285]

**Split Flange Port Options**
Per SAE-J518 Specifications

- Code: 61, 62
- Dia.: 25.4 [1.00], 25.4 [1.00]
- A: 26.19 [1.031], 27.76 [1.093]
- B: 52.37 [2.062], 57.15 [2.250]
- C: 3.8-16, 7/16-14
- D: 22.4 [.88], 27.0 [1.06]

**O-ring Port Option**
Per SAE-J514 Specifications

- Code: 61, 62
- Dia.: 25.4 [1.00], 25.4 [1.00]
- A: 26.19 [1.031], 27.76 [1.093]
- B: 52.37 [2.062], 57.15 [2.250]
- C: 3.8-16, 7/16-14
- D: 22.4 [.88], 27.0 [1.06]

All dimensions given in millimeters [inches].
The port plate is the simplest control option available. It fits all Eaton heavy duty pumps and motors.

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

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

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

Standard Control with Inching Valve

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

Standard Control with Neutral Detent

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

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

Internal Pressure Override Control (IPOR)

The internal pressure override (IPOR) protects the transmission from running at overload conditions for extended periods. It senses system pressure and allows the pump to destroke if pressures exceed a preset limit. The override pressure setting is shim adjustable. Since the IPOR is built into the pump end cover it is not a field conversion option.
The remote pressure override control provides a means to remotely adjust the pressure setting of the pressure override valve. This control may be used in applications requiring variable system pressure protection to prevent overloads and excessive heat generation. This valve operates similarly to the IPOR control.
Hydraulic Remote Control
Pump Control

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

Electronic Control (ESC)

The electronic control (ESC) uses an electrical signal to change the displacement of the variable pump. The input signal may be manually or automatically controlled. The ESC requires a 0 to 100 milliampere signal.
The heavy duty Destroke Control is a solenoid valve mounted on the standard variable pump control. When energized, the valve cross-ports control pressure allowing centering springs to bring the pump out of stroke. It can be energized with a single switch, push-button, or dead man's switch. The solenoid coil is available in 12 volt or 24 volt DC and normally open and normally closed configurations.

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

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

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

**Stroking Valve Control**

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

Pressure Response Control

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

Pressure Response Control with Stroking Valve

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

Hydraulic Remote Control
Variable Motor Control

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