Series PV
Variable Volume
Piston Pumps

Catalog HY13-2600-600-3/US
### Quick Reference Data Chart

<table>
<thead>
<tr>
<th>Pump Model</th>
<th>Displacement cc/rev (In³/rev)</th>
<th>Pump Delivery @ (7 bar) 100 PSI in LPM (GPM)</th>
<th>*Approx. Noise Levels dB(A) @ Full Flow and 1500 RPM</th>
<th>Power at 1800 RPM, Max. Displacement &amp; 345 bar (5000 PSI)</th>
<th>Max. Operating Speed (RPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1200 RPM</td>
<td>1800 RPM</td>
<td>70 bar (1000 PSI)</td>
<td>207 bar (3000 PSI)</td>
</tr>
<tr>
<td>PV016</td>
<td>16 (.98)</td>
<td>19.2 (5.1)</td>
<td>28.8 (7.6)</td>
<td>56</td>
<td>60</td>
</tr>
<tr>
<td>PV020</td>
<td>20 (1.2)</td>
<td>24.0 (6.3)</td>
<td>36.0 (9.5)</td>
<td>56</td>
<td>60</td>
</tr>
<tr>
<td>PV023</td>
<td>23 (1.4)</td>
<td>27.6 (7.3)</td>
<td>41.4 (10.9)</td>
<td>56</td>
<td>60</td>
</tr>
<tr>
<td>PV032</td>
<td>32 (1.9)</td>
<td>38.4 (10.1)</td>
<td>57.6 (15.2)</td>
<td>59</td>
<td>62</td>
</tr>
<tr>
<td>PV040</td>
<td>40 (2.4)</td>
<td>48.0 (12.7)</td>
<td>72.0 (19.0)</td>
<td>59</td>
<td>62</td>
</tr>
<tr>
<td>PV046</td>
<td>46 (2.8)</td>
<td>55.2 (14.6)</td>
<td>82.8 (21.9)</td>
<td>59</td>
<td>62</td>
</tr>
<tr>
<td>PV063</td>
<td>63 (3.8)</td>
<td>75.6 (20.0)</td>
<td>113.4 (30.0)</td>
<td>66</td>
<td>70</td>
</tr>
<tr>
<td>PV080</td>
<td>80 (4.8)</td>
<td>96.0 (25.4)</td>
<td>144.0 (38.0)</td>
<td>66</td>
<td>70</td>
</tr>
<tr>
<td>PV092</td>
<td>92 (5.6)</td>
<td>110.4 (29.2)</td>
<td>165.6 (43.8)</td>
<td>66</td>
<td>70</td>
</tr>
<tr>
<td>PV140</td>
<td>140 (8.5)</td>
<td>168.0 (44.4)</td>
<td>252.1 (66.6)</td>
<td>70</td>
<td>74</td>
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<tr>
<td>PV180</td>
<td>180 (10.9)</td>
<td>216.0 (57.1)</td>
<td>324.0 (85.6)</td>
<td>71</td>
<td>75</td>
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<tr>
<td>PV270</td>
<td>270 (16.5)</td>
<td>324.0 (85.6)</td>
<td>486.0 (128.4)</td>
<td>77</td>
<td>79</td>
</tr>
</tbody>
</table>

*The noise level values are based on anechoic room measurements at a distance of 1 meter in accordance with DIN 45645.*
General Description

All control of the pump outlet flow is achieved by the proper positioning of the swash plate. Control is accomplished when the bore area forces of the servo piston acting on one end of the swash plate working against the combined effects of the bias spring, and the rod area forces of the servo piston acting on the other end.

As the shaft in the figure below is rotated by a prime mover, it in turn rotates the cylinder barrel. As the cylinder barrel rotates, it drives the pumping pistons in a circular path with the piston slippers supported hydrostatically against the angled swash plate. In one-half of the revolution, the pumping pistons are forced away from the port plate drawing in fluid, and in the other half of the revolution, the pumping pistons are forced toward the port plate driving out fluid.

The volume of fluid the pump will displace in one revolution of the shaft is dependent upon the area of the pumping piston, the number of pumping pistons and the angle of the swash plate. The swash plate is shown at maximum angle and will produce maximum displacement. As the swash plate is moved toward a vertical position (perpendicular to shaft centerline), the displacement will decrease until it reaches the vertical position and displacement is zero.
Variable Volume Piston Pumps

Pressure and Load Sensing Compensators

Standard pressure compensator code F*S
The standard pressure compensator adjusts the pump displacement according to the actual need of the system in order to keep the pressure constant.
As long as the system pressure at outlet port P is lower than the set pressure (set as spring preload of the compensator spring) the working port A of the compensator valve is connected to the case drain and the piston area is unloaded. Bias spring and system pressure on the annulus area keep the pump at full displacement.
When the system pressure reaches the set pressure the compensator valve spool connects port P1 to A and builds up a pressure at the servo piston resulting in a downstroking of the pump. The displacement of the pump is controlled in order to match the flow requirement of the system.

Remote pressure compensator code FR1
Version FR1 of the remote pressure compensator provides on its top side an interface NG6, DIN 24340 (CETOP 03 at RP35H, NFPA D03).
This interface allows a direct mounting of a pilot valve. Besides manual or electrohydraulic operated valves it is also possible to mount complete multiple pressure circuits directly on the compensator body. Parker offers a variety of these compensator accessories ready to install. See page 38 of this catalog.
All remote pressure compensators have a factory setting of 15 bar (217 PSI) differential pressure. With this setting, the controlled pressure at the pump outlet is higher than the pressure controlled by the standard pressure compensator code F*S.

Shown is load sensing compensator code FF1 with an NG6 interface on top of the control valve. That allows direct mounting of a pilot valve for pressure compensation. This version includes the pilot orifice. Due to the interaction of flow and pressure compensation this package is not the "ideal" control characteristic. The deviation is caused by the pilot valves characteristic.
Hydraulic-mechanical horsepower compensator

The hydraulic-mechanical horsepower compensator consists of a modified remote pressure compensator (Code *L*) and a pilot valve. This pilot valve is integrated into the pump and is adjusted by a cam sleeve. The cam sleeve has a contour that is designed and machined for the individual displacement and the nominal horsepower setting.

At a large displacement the opening pressure (given by the cam sleeve diameter) is lower than at small displacements. This makes the pump compensate along a constant horsepower (torque) curve.

For all nominal powers of standard electric motors Parker offers a dedicated cam sleeve. The exchange of this cam sleeve (e.g.: to change horsepower setting) can easily be done without disassembly of the pump.

On top of that an adjustment of the horsepower setting can be done within certain limits by adjusting the preload of the pilot control cartridge spring. That allows an adjustment of a constant horsepower setting for other than the nominal speeds (1500 RPM) or for other horsepowers.

The ordering code for the horsepower option is as follows:

- **Code B** = 5 HP etc. up to
- **Code 3** = 200 HP

The second digit designates the pilot flow source:

- **Code L** internal pilot pressure, remote pressure function.

The third digit designates the possibility to adjust the overriding pressure compensation:

- **Code A** comes with a top side NG6/D03 interface on the control valve to mount any suitable pilot valve or Parker pump accessories.

- **Code C** includes a pilot valve for manual pressure adjustment. Max. setting: 350 bar (5075 PSI).

[Diagram of hydraulic-mechanical horsepower compensator]
Variable Volume Piston Pumps

Noise Levels

PV016 - PV023

PV032 - PV046

PV063 - PV092

PV140

PV180

PV270

Typical sound level for single pumps, measured in unechoic chamber according to DIN 45 635, part 1 and 26. microphone distance 1 m. speed: n = 1500 min⁻¹.

All data measured with mineral oil viscosity 30 mm²/s (cSt) at 50°C.
Operating noise of pumps
The normal operating noise of a pump and consequently the operating noise of the entire hydraulic system is largely determined by where and how the pump is mounted and how it is connected to the downstream hydraulic system. Also size, style and installation of the hydraulic tubing have a major influence on the overall noise emitted by a hydraulic system.

Noise reduction measures
Talking about operating noise of a hydraulic pump, primary and secondary pump noise has to be taken into consideration.

Primary pump noise is caused by vibrations of the pump body due to internal alternating forces stressing the body structure. Flexible elements help to prevent pump body vibration being transmitted to other construction elements, where possible amplification may occur. Such elements can be:
- Bell housing with elastic dampening flange with vulcanized labyrinth (1)
- Floating and flexible coupling (2)
- Damping rails (3) or silent blocks for mounting the electric motor or the foot mounting flange
- Flexible tube connections (compensators) or hoses on inlet, outlet and drain port of the pump.
- Exclusive use of gas tight tube fittings for inlet connections to avoid ingress of air causing cavitation and excessive noise.

Secondary pump noise is caused by vibration induced into all connected hydraulic components by the flow and pressure pulsation of the pump. This secondary noise adds typical 7 - 10 dBA to the noise of a pump measured in the sound chamber according to DIN 45 635. Therefore pipework, its mounting and the mounting of all hydraulic components like pressure filters and control elements has a major influence to the overall system noise level.

Pulsation reduction with precompression volume: the PV is equipped with a new technology for flow ripple reduction. This method reduces the pulsation at the pump outlet by 40 - 60 %. That leads to a significant reduction of the overall system noise without additional cost and without additional components (silencers etc.). The typical reduction reaches 2 - 4 dBA. That means: with a pump of the PV series the secondary noise adds only some 5 - 7 dBA to the pump noise instead of the usually found 7 - 10 dBA.

Figure 2 compares the measured pulsation of a system with 6 pumps of 180 cm³/rev each.

Other measures
Small diameter tubes do not only cause high flow speeds, turbulences inside the tubes and cavitation in the pump, they also produce noise. Only correctly sized connections of the largest possible diameter according to the port size of the pump should be used.
Performance Information
Series PV, Pressure Compensated, Variable Volume, Piston Pumps

Features
- High Strength Cast-Iron Housing for high reliability and quiet operation
- Modular Controls for field convertability
- Large Control Piston for fast response
- Thru-Shaft Option with 100% thru torque capability
- Multiple Pressure Control with valves mounted directly on pump
- Pre-Compression chamber to minimize over-all system noise

Controls
- Pressure Compensation
- Remote Pressure Compensation
- Load Sensing
- Adjustable Maximum Volume Stop
- Electrohydraulic Pressure
- Dual and Tri-Pressure Control
- Low Pressure Standby
- Horsepower Limiting

Schematic Symbol
(Basic Pump)

Specifications
Pressure Ratings: 5000 PSI (350 bar) Continuous
6000 PSI (420 bar) Peak

Speed Ratings: 600 to 2750 RPM

Inlet Condition: 230 PSI (16 bar)
Maximum Inlet Charge
5 In. Hg. Max. Vacuum at 1800 RPM

Case Drain Conditions:
7 PSI (0.5 bar) Maximum

Operating Temp. Range: -40°F to 160°F
(-40°C to 70°C)

Housing Material: Cast Iron

Filtration: Maintain SAE Class 4 (ISO 16/13)

Mounting: SAE “B” 4-Bolt Flange

Quick Reference Data Chart

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<thead>
<tr>
<th>Pump Model</th>
<th>Displacement cc/rev (in³/rev)</th>
<th>Pump Delivery @ 7 bar (100 PSI) in LPM (GPM)</th>
<th>*Approx. Noise Levels dB(A) @ Full Flow and 1500 RPM</th>
<th>Input Power At 1800 RPM, Max. Displacement &amp; 343 bar (5000 PSI)</th>
<th>Max. Operating Speed (RPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV016</td>
<td>16 (.98)</td>
<td>19.2 (5.1) 28.8 (7.6)</td>
<td>56 60 68</td>
<td>18.5 kw (24.8 hp)</td>
<td>2750</td>
</tr>
<tr>
<td>PV020</td>
<td>20 (1.2)</td>
<td>24.0 (6.3) 36.0 (9.5)</td>
<td>56 60 68</td>
<td>23.4 kw (31.4 hp)</td>
<td>2750</td>
</tr>
<tr>
<td>PV023</td>
<td>23 (1.4)</td>
<td>27.6 (7.3) 41.4 (10.9)</td>
<td>56 60 68</td>
<td>25.1 kw (33.6 hp)</td>
<td>2750</td>
</tr>
</tbody>
</table>

* The noise level values are based on anechoic room measurements at a distance of 1 meter in accordance with DIN 45645.
NOTE: The efficiencies and data in the graphs are good only for pumps running at speeds shown and stroked to maximum. To calculate approximate horsepower for the other conditions, use the following formula:

$$HP = \left[ \frac{Q \times (PSI)}{1714} \right] + (CHp)$$

Actual GPM is directly proportional to drive speed and maximum volume setting. Flow loss, however, is a function of pressure only.

WHERE:

- $Q$ = Actual Output Flow in GPM
- $PSI$ = Pressure At Pump Outlet
- $CHp$ = Input Horsepower @ Full compensation @ 1800 RPM (from graph read at operating pressure)
Variable Volume Piston Pumps
Series PV 016/020/023

Technical Information

Parker Hannifin Corporation
Hydraulic Pump/Motor Division
Greeneville, Tennessee

Catalog HY13-1552-001/NA,EU

Variable Volume Piston Pumps
Catalog HY13-1552-001/NA,EU

Hydraulics A122

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>ØC</th>
</tr>
</thead>
<tbody>
<tr>
<td>D,E</td>
<td>4.0&quot;</td>
<td>.37&quot;</td>
<td>5.0&quot;</td>
</tr>
<tr>
<td>K,L</td>
<td>100mm</td>
<td>9mm</td>
<td>125mm</td>
</tr>
</tbody>
</table>

Adjustable Vol. Stop
1.5 cc/rev Per Rev.

mounting hole for horse
power compensator pilot
or displacement feedback
LVDT

drain port: G1/2
optional M22 x 1.5;
ISO 6149-1 (thread options
7 and 8) or 7/8-14 UNF
(thread option 3)

Optional Drain or Gage Port
(see below for sizes)

197.5 (7.78)

max. 212 (8.35)

View X
Shown with standard pressure compensator

<table>
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</tr>
<tr>
<td>K,L</td>
<td>100mm</td>
<td>9mm</td>
</tr>
</tbody>
</table>

shaft option "K"
(Ø25mm Ref)
8mm x 7mm key
Max Torque =
300 Nm (2655 In-Lbs)

flushing port; G 3/8
optional M 18 x 1.5; ISO 6149-1
(thread options 7 and 8)
or 3/4 - 16 UNF (thread option)
Variable Volume Piston Pumps
Series PV 016/020/023

Technical Information

Inlet:
Option 3 & 7
1-1/4" 4 Bolt Flange
7/16-14 UNC-2B Threads

Option 1 & 8
32mm 4 Bolt Flange
M10 Threads
Standard Pressure Series
(Code 61)

Outlet:
Option 3 & 7
3/4" 4 Bolt Flange
3/8-16 UNC-2B Threads

Option 1 & 8
19mm 4 Bolt Flange
M10 Threads
High Pressure Series (Code 62)

Shaft Option "D"
(SAE "BB")
Max Torque= 300 Nm (2655 In-Lbs)

Shaft Option "E"
(SAE "BB")
15 Teeth 16/32 Pitch
30° Involute Spline
Max Torque= 300 Nm (2655 In-Lbs)

Shaft Option "L"
W25mm x 1.5mm x 15mm x 8f
DIN 5480
Max Torque = 405 Nm (3584 In-Lbs)
Thru-Shaft Load Limitations

The maximum allowable torque of the individual shaft must not be exceeded. For 2-pump combinations there is no problem because the PV series offers 100% thru torque capabilities. For 3-pump combinations or more the limit torque could be reached or exceeded. Therefore it is necessary to calculate the torque factor and compare the sum of each pumps torque factor to the table to make sure it does not exceed the torque limit factor.

Thru-Shaft Options

```
<table>
<thead>
<tr>
<th>Pump</th>
<th>Shaft</th>
<th>Torque Limit Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV016-023</td>
<td>D</td>
<td>17700</td>
</tr>
<tr>
<td></td>
<td>E</td>
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<tr>
<td></td>
<td>K</td>
<td>17700</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>20130</td>
</tr>
</tbody>
</table>
```

Required: Sum of all calculated torque factors must be <torque limit factor.

Torque factor of any pump = Pressure (bar) x Displacement (cc/rev)

```
<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E*</th>
<th>F</th>
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<tbody>
<tr>
<td>A7</td>
<td>Ø3.25&quot;</td>
<td>4.188&quot;</td>
<td>-</td>
<td>3/8&quot;-16</td>
<td>SAE &quot;A&quot; 9T 16/32 DP SPLINE</td>
<td>-</td>
</tr>
<tr>
<td>B3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.536&quot;</td>
<td>-</td>
<td>SAE &quot;B&quot; 13T 16/32 DP SPLINE</td>
<td>1/2&quot;-13</td>
</tr>
<tr>
<td>J3</td>
<td>Ø100mm</td>
<td>-</td>
<td>44mm</td>
<td>-</td>
<td>W25 X 1.5 X 8f SPLINE</td>
<td>M10</td>
</tr>
<tr>
<td>W3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.536&quot;</td>
<td>-</td>
<td>SAE &quot;BB&quot; 15T 16/32 DP SPLINE</td>
<td>1/2&quot;-13</td>
</tr>
<tr>
<td>Y7</td>
<td>Ø2.00&quot;</td>
<td>3.250&quot;</td>
<td>-</td>
<td>5/16-18</td>
<td>SAE &quot;AA&quot; 1/2&quot; KEYED</td>
<td>-</td>
</tr>
</tbody>
</table>
```

*Coupling included with pump when ordered from Greeneville, TN.
Variable Volume Piston Pumps
Series PV 016/020/023

Ordering Information

- **Code**: PV
  - **Displacement**: CM<sub>3/REV</sub> (In<sup>3/rev.</sup>)
  - 016: 16 (.98)
  - 020: 20 (1.2)
  - 023: 23 (1.4)

- **Code**: Rotation
  - R: CW
  - L: CCW

- **Code**: Pump Variations
  - 1: Standard
  - 9*: Reduced Stroke

- **Code**: Multiple Pumps
  - Omit: Single
  - Factory mounted to rear of another pump

- **Code**: Shaft & Mounting
  - D: 1" Keyed (SAE BB)
  - E: 1ST Spline (SAE BB)
  - K: 25mm Keyed
  - L: W25 x 1.5 x 15 x 8f Spline DIN 5480

- **Code**: Thru-Shaft Option
  - T1: Thru-Shaft Capable, Single Pump w/Cover
  - Y7: 2 Bolt SAE "AA" Pilot 2.00/SAE "AA" 1/2" Keyed
  - B3: 4 Bolt SAE "B" Pilot 4.00/SAE "B" 13T 16/32 DP
  - J3*: 4 Bolt 100mm Pilot/W25x1.5x15x8f Spline DIN 5480
  - W3: 4 Bolt SAE "B" Pilot 4.00/SAE "BB" 15T 16/32 DP

- **Code**: threads
  - 1: BSPP Metric
  - 3: UNF UNC
  - 7: ISO 6149 UNC
  - 8: ISO 6149 Metric

- **Code**: Control Options
  - F: Standard Pressure Compensator
    - Adjustment Type: Screw With Nut
    - Pressure Range: 70-350 bar (1015-5075 PSI)
  - F: Remote/Load Sense Compensator
    - Control Port: NG6/Cetop3 (D1VW) Pattern *
    - NG6 with Pressure Valve Mnt’d**
    - Compensator Control Type: Remote Pressure
  - L: Horsepower Compensator Control
    - Input Horsepower at 1800 RPM
      - 5.0 (175 in-lb Torque)
      - 7.5 (262 in-lb Torque)
      - 10.0 (350 in-lb Torque)
      - 15.0 (525 in-lb Torque)
      - 20.0 (700 in-lb Torque)

- **Code**: Seals
  - N: Nitrile
  - V: Fluorocarbon

- **Code**: Painting
  - Omit: No Paint
  - Single: Paint

- **Code**: Multiple Pumps
  - Omit: Single Pump
  - Pump Factory Mounted On Rear

*Must be used with port/thread option 1.

*Maximum pressure adjustment not included, but recommended. (See PVAC Section)
** Valve to be mounted at factory must be ordered as a separate line item. Consult factory. See PVAC section for pressure valve options.
Performance Information
Series PV, Pressure Compensated, Variable Volume, Piston Pumps

Features
- High Strength Cast-Iron Housing for high reliability and quiet operation
- Modular Controls for field convertability
- Large Control Piston for fast response
- Thru-Shaft Option with 100% thru torque capability
- Multiple Pressure Control with valves mounted directly on pump
- Pre-Compression chamber built in to minimize overall system noise

Controls
- Pressure Compensation
- Remote Pressure Compensation
- Load Sensing
- Adjustable Maximum Volume Stop
- Electrohydraulic Pressure
- Dual and Tri-Pressure Control
- Low Pressure Standby
- Horsepower Limiting

Schematic Symbol
(Basic Pump)

Installation Data
See Installation Information on page A156 of this catalog for specific recommendations pertaining to a system cleanliness, fluids, start-up, inlet conditions, shaft alignment, drain line restrictions and other important factors relative to the proper installation and use of these products.

Specifications
Pressure Ratings: 5000 PSI (350 bar) Continuous
6000 PSI (420 bar) Peak

Speed Ratings: 600 to 2400 RPM

Inlet Condition: 230 PSI (16 bar)
Maximum Inlet Charge
5 In. Hg. Max. Vacuum at 1800 RPM

Case Drain Conditions: 7 PSI (0.5 bar) Maximum

Operating Conditions: -40°F to 160°F

Temp. Range: (-40°C to 70°C)

Housing Material: Cast Iron

Filtration: Maintain SAE Class 4 (ISO 16/13)

Mounting: SAE “C” 4-Bolt Flange

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<th>Max. Operating Speed (RPM)</th>
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<tbody>
<tr>
<td>PV032</td>
<td>32 (1.9)</td>
<td>38.4 (10.1) 57.6 (15.2) 59 62 69</td>
<td>35.1 kw (47.0 hp)</td>
<td>2400</td>
<td></td>
</tr>
<tr>
<td>PV040</td>
<td>40 (2.4)</td>
<td>48.0 (12.7) 72.0 (19.0) 59 62 69</td>
<td>46.5 kw (62.4 hp)</td>
<td>2400</td>
<td></td>
</tr>
<tr>
<td>PV046</td>
<td>46 (2.8)</td>
<td>55.2 (14.6) 82.8 (21.9) 59 62 69</td>
<td>50.2 kw (67.3 hp)</td>
<td>2400</td>
<td></td>
</tr>
</tbody>
</table>

* The noise level values are based on anechoic room measurements at a distance of 1 meter in accordance with DIN 45645.
NOTE: The efficiencies and data in the graphs are good only for pumps running at speeds shown and stroked to maximum. To calculate approximate horsepower for the other conditions, use the following formula:

$$\text{HP} = \left[ \frac{Q \times (\text{PSI})}{1714} \right] + (\text{CHp})$$

Actual GPM is directly proportional to drive speed and maximum volume setting. Flow loss, however, is a function of pressure only.

WHERE:

- $Q$ = Actual Output Flow in GPM
- PSI = Pressure At Pump Outlet
- CHp = Input Horsepower @ Full compensation @ 1800 RPM (from graph read at operating pressure)
Variable Volume Piston Pumps
Catalog HY13-1552-001/NA,EU

Technical Information

Variable Volume Piston Pumps
Series PV 032/040/046

Parker Hannifin Corporation
Hydraulic Pump/Motor Division
Greeneville, Tennessee

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<th>Code</th>
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<tr>
<td>D,E</td>
<td>5.0</td>
<td>.50</td>
<td>6.37</td>
</tr>
<tr>
<td>K,L</td>
<td>125</td>
<td>9</td>
<td>160</td>
</tr>
</tbody>
</table>

Adjustable Vol. Stop
2.2 cc/rev Per Rev.

gage port G1/4
optional M 12 x 1.5; ISO 6149-1
7/16 - 20 UNF (threads option 3)

shaft Option "K"
(Ø32mm ref)
10mm x 8mm Key
Max Torque= 570 Nm (5045 in-lbs)

flushing port G1/2
optional M 22 x 1.5; ISO 6149-1
threads options 7 and 8
or 7/8 - 14 UNF (threads option 3)
Variable Volume Piston Pumps
Series PV 032/040/046

Technical Information

Catalog HY13-1552-001/NA,EU

Inlet:
Option 3 & 7
1-1/2" 4 Bolt Flange
1/2-13 UNC-2B Threads
Option 1 & 8
35mm 4 Bolt Flange
M12 Threads
Standard Pressure Series (Code 61)

Outlet:
Option 3 & 7
1" 4 Bolt Flange
7/16-14 UNC-2B Threads
Option 1 & 8
25mm 4 Bolt Flange
M12 Threads
High Pressure Series (Code 62)

Shaft Option "D"
(SAE "C")
Max Torque= 550 Nm (4868 In-Lbs)

Shaft Option "E"
(SAE "C")
14 Teeth 12/24 Pitch
30° Involute Spline
Max Torque= 610 Nm (5399 In-Lbs)

Shaft Option "L"
W32mm x 1.5mm x 20mm x 8f
DIN 5480
Max Torque = 675 Nm (5974 In-Lbs)
Thru-Shaft Load Limitations

The maximum allowable torque of the individual shaft must not be exceeded. For 2-pump combinations there is no problem because the PV series offers 100% thru torque capabilities. For 3-pump combinations or more the limit torque could be reached or exceeded. Therefore it is necessary to calculate the torque factor and compare the sum of each pumps torque factor to the table to make sure it does not exceed the torque limit factor.

<table>
<thead>
<tr>
<th>Pump</th>
<th>Shaft</th>
<th>Torque Limit Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV032-046</td>
<td>D</td>
<td>32680</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>36380</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>33810</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>40250</td>
</tr>
</tbody>
</table>

Required: Sum of all calculated torque factors must be <torque limit factor.

Torque factor of any pump = Pressure (bar) x Displacement (cc/rev)

---

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E*</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>A7</td>
<td>Ø3.25&quot;</td>
<td>4.188&quot;</td>
<td>-</td>
<td>3/8&quot;-16</td>
<td>SAE &quot;A&quot; 9T 16/32 DP Spline</td>
<td>-</td>
<td>1.93&quot;</td>
<td>10.27&quot;</td>
</tr>
<tr>
<td>B3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.536&quot;</td>
<td>-</td>
<td>SAE &quot;B&quot; 13T 16/32 DP Spline</td>
<td>1/2&quot;-13</td>
<td>1.93&quot;</td>
<td>10.27&quot;</td>
</tr>
<tr>
<td>B7</td>
<td>Ø4.00&quot;</td>
<td>5.750&quot;</td>
<td>-</td>
<td>1/2&quot;-13</td>
<td>SAE &quot;B&quot; 13T 16/32 DP Spline</td>
<td>-</td>
<td>1.93&quot;</td>
<td>10.27&quot;</td>
</tr>
<tr>
<td>W3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.530&quot;</td>
<td>-</td>
<td>SAE &quot;BB&quot; 15T 16/32 DP Spline</td>
<td>1/2&quot;-13</td>
<td>1.93&quot;</td>
<td>10.27&quot;</td>
</tr>
<tr>
<td>W7</td>
<td>Ø4.00&quot;</td>
<td>5.750&quot;</td>
<td>-</td>
<td>1/2&quot;-13</td>
<td>SAE &quot;BB&quot; 15T 16/32 DP Spline</td>
<td>-</td>
<td>1.93&quot;</td>
<td>10.27&quot;</td>
</tr>
<tr>
<td>C3</td>
<td>Ø5.00&quot;</td>
<td>-</td>
<td>4.508&quot;</td>
<td>-</td>
<td>SAE &quot;C&quot; 14T 12/24 DP Spline</td>
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<td>2.52&quot;</td>
<td>10.87&quot;</td>
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<tr>
<td>J3</td>
<td>Ø100mm</td>
<td>-</td>
<td>44mm</td>
<td>-</td>
<td>W25 x 1.5 x 15 x 8I Spline</td>
<td>M10</td>
<td>1.93&quot;</td>
<td>10.27&quot;</td>
</tr>
<tr>
<td>K3</td>
<td>Ø125mm</td>
<td>-</td>
<td>57mm</td>
<td>-</td>
<td>W32 x 1.5 x 20 x 8I Spline</td>
<td>M12</td>
<td>1.93&quot;</td>
<td>10.27&quot;</td>
</tr>
</tbody>
</table>

*Coupling included with pump if ordered from Greeneville, TN
## Ordering Information

**Variable Volume Piston Pumps**

### Series PV 032/040/046

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
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<tbody>
<tr>
<td>Omit</td>
<td>Single</td>
<td>032</td>
<td>Series PV 032</td>
<td>R</td>
<td>CW</td>
<td>N</td>
<td>Nitrile</td>
<td>Omit</td>
<td>No Paint</td>
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<tr>
<td></td>
<td></td>
<td>040</td>
<td>Series PV 040</td>
<td>L</td>
<td>CCW</td>
<td>N</td>
<td>Nitrile</td>
<td></td>
<td>Paint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>046</td>
<td>Series PV 046</td>
<td></td>
<td></td>
<td>V</td>
<td>Fluorocarbon</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Code

- **PV**: Multiple Pumps
- **CM/REV (in³/rev.)**: Code Pump Variations
- **Rotation**: Rotation
- **Seals**: Code Seals
- **Painting**: Code Painting

### Code

- **32**: Standard
- **40**: Reduced Stroke

### Multiple Pumps

- **Fout**
- **N**: Single
- **P**: Factory mounted to rear of another pump

### Pump Variations

- **1**: Standard
- **9**: Reduced Stroke

### Shaft & Mounting

- **D**: 1-1/4" Keyed (SAE C)
- **E**: 14T Spline (SAE C)
- **K**: 32mm Keyed
- **L**: W32 x 1.5 x 20 x 8" Spline DIN 5480

### Thru-Shaft Option

- **T1**: Thru-Shaft Capable, Single Pump w/Cover
- **A7**: 2 Bolt SAE "A" Pilot Ø3.25/SAE "A" 9T 16/32 DP Spline
- **B3**: 4 Bolt SAE "B" Pilot Ø4.00/SAE "B" 13T 16/32 DP Spline
- **W3**: 4 Bolt SAE "B" Pilot Ø4.00/SAE "BB" 15T 16/32 DP Spline
- **B7**: 2 Bolt SAE "B" Pilot Ø4.00/SAE "B" 13T 16/32 DP Spline
- **C3**: 4 Bolt SAE "C" Pilot Ø5.00/SAE "C" 14T 12/24 DP Spline
- **J3**: 4 Bolt 100mm Pilot /W25x1.5x15x8/ Spline DIN 5480
- **K3**: 4 Bolt 125mm Pilot /W32x1.5x20x8/ Spline DIN 5480

### Control Options

- **F**: Standard Pressure Compensator
- **S**: Remote/Load Sense Compensator
- **L**: Horsepower Compensator

### Code

- **Adjustment Type**: Screw With Nut
- **Pressure Range**: 70-350 bar (1015-5075 PSI)
- **Control Port**: NG6/D03 Pattern Only*
- **Control Type**: Remote Compensator
- **Horsepower at 1800 RPM**: 10.0 (350 in-lb)

### *Notes*

- *Must be used with port/thread option 1
- **Maximum pressure adjustment for pump not included, but necessary.** See PVAC section for pressure valve options.
- **Valve to be mounted at factory must be ordered as a separate line item. Consult factory.** See PVAC section for pressure valve options.
Performance Information
Series PV, Pressure Compensated, Variable Volume, Piston Pumps

Features
- High Strength Cast-Iron Housing for high reliability and quiet operation
- Modular Controls for field convertability
- Large Control Piston for fast response
- Thru-Shaft Option with 100% thru torque capability
- Multiple Pressure Control with valves mounted directly on pump
- Pre-Compression chamber to minimize overall system noise

Controls
- Pressure Compensation
- Remote Pressure Compensation
- Load Sensing
- Adjustable Maximum Volume Stop
- Electrohydraulic Pressure Control
- Dual and Tri-Pressure
- Low Pressure Standby
- Horsepower Limiting

Schematic Symbol
(Basic Pump)

Installation Data
See Installation Information on page A156 of this catalog for specific recommendations pertaining to system cleanliness, fluids, start-up, inlet conditions, shaft alignment, drain line restrictions and other important factors relative to the proper installation and use of these products.

Specifications

<table>
<thead>
<tr>
<th>Pressure Ratings:</th>
<th>5000 PSI (350 bar) Continuous</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6000 PSI (420 bar) Peak</td>
</tr>
<tr>
<td>Speed Ratings:</td>
<td>600 to 2400 RPM (PV063)</td>
</tr>
<tr>
<td></td>
<td>600 to 2300 RPM (PV080)</td>
</tr>
<tr>
<td></td>
<td>600 to 2200 RPM (PV092)</td>
</tr>
<tr>
<td>Inlet Conditions:</td>
<td>230 PSI (16 bar) Maximum</td>
</tr>
<tr>
<td></td>
<td>5 In. Hg. Max. Vacuum at</td>
</tr>
<tr>
<td></td>
<td>1800 RPM</td>
</tr>
<tr>
<td>Case Drain</td>
<td>7 PSI (0.5 bar) Maximum</td>
</tr>
<tr>
<td>Conditions:</td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>-40°F to 160°F</td>
</tr>
<tr>
<td>Temp. Range:</td>
<td>(-40°C to 70°C)</td>
</tr>
<tr>
<td>Housing Material:</td>
<td>Cast Iron</td>
</tr>
<tr>
<td>Filtration:</td>
<td>Maintain SAE Class 4 (ISO 16/13)</td>
</tr>
<tr>
<td>Mounting:</td>
<td>SAE “D” 4-Bolt Flange</td>
</tr>
</tbody>
</table>

Quick Reference Data Chart

<table>
<thead>
<tr>
<th>Pump Model</th>
<th>Displacement cc/rev (in³/rev)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV063</td>
<td>63 (3.8)</td>
</tr>
<tr>
<td>PV080</td>
<td>80 (4.8)</td>
</tr>
<tr>
<td>PV092</td>
<td>92 (5.6)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pump Delivery @ 7 bar (100 PSI) in LPM (GPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200 RPM</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>PV063</td>
</tr>
<tr>
<td>PV080</td>
</tr>
<tr>
<td>PV092</td>
</tr>
</tbody>
</table>

* Approx. Noise Levels dB(A) @ Full Flow and 1500 RPM

<table>
<thead>
<tr>
<th>70 bar (1000 PSI)</th>
<th>207 bar (3000 PSI)</th>
<th>343 bar (5000 PSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>66</td>
<td>70</td>
<td>74</td>
</tr>
<tr>
<td>66</td>
<td>70</td>
<td>74</td>
</tr>
<tr>
<td>66</td>
<td>70</td>
<td>74</td>
</tr>
</tbody>
</table>

Input Power At 1800 RPM, Max. Displacement & Max. Operating Speed (RPM)

<table>
<thead>
<tr>
<th>70 bar (1000 PSI)</th>
<th>207 bar (3000 PSI)</th>
<th>343 bar (5000 PSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>70.1 kw (94.0 hp)</td>
<td>89.2 kw (119.6 hp)</td>
<td>136.8 kw (183.5 hp)</td>
</tr>
<tr>
<td>2400</td>
<td>2300</td>
<td>2200</td>
</tr>
</tbody>
</table>

* The noise level values are based on anechoic room measurements at a distance of 1 meter in accordance with DIN 45645.
Performance Curves

Fluid: Standard Hydraulic Oil 100 SSU @ 120°F (49°C)

**PV063 @ 1200 RPM**

- Output flow (gpm)
- Vol. efficiency
- Overall efficiency
- Input power at full flow
- Input power at deadhead

**PV063 @ 1800 RPM**

- Output flow (gpm)
- Vol. efficiency
- Overall efficiency
- Input power at full flow
- Input power at deadhead

**PV080 @ 1200 RPM**

- Output flow (gpm)
- Vol. efficiency
- Overall efficiency
- Input power at full flow
- Input power at deadhead

**PV080 @ 1800 RPM**

- Output flow (gpm)
- Vol. efficiency
- Overall efficiency
- Input power at full flow
- Input power at deadhead

**PV092 @ 1200 RPM**

- Output flow (gpm)
- Vol. efficiency
- Overall efficiency
- Input power at full flow
- Input power at deadhead

**PV092 @ 1800 RPM**

- Output flow (gpm)
- Vol. efficiency
- Overall efficiency
- Input power at full flow
- Input power at deadhead

**NOTE:** The efficiencies and data in the graphs are good only for pumps running at speeds shown and stroked to maximum. To calculate approximate horsepower for the other conditions, use the following formula:

\[
HP = \left[\frac{Q \times (PSI)}{1714}\right] + (CHp)
\]

Actual GPM is directly proportional to drive speed and maximum volume setting. Flow loss, however, is a function of pressure only.

**WHERE:**

- \(Q\) = Actual Output Flow in GPM
- \(PSI\) = Pressure At Pump Outlet
- \(CHp\) = Input Horsepower @ Full compensation @ 1800 RPM (from graph read at operating pressure)
Variable Volume Piston Pumps
Catalog HY13-1552-001/NA,EU
Technical Information

Variable Volume Piston Pumps
Series PV 063/080/092

Flush port L3: G1/2
optional M22 x 1.5; ISO 6149-1
(threads options 7 and 8) or 7/8-14 UNF
(thread option 3)

80.8 (3.18)
161.6 (6.36)

"ØD"-4 PLCS

Flush port L3: G1/2
optional M22 x 1.5; ISO 6149-1
(threads options 7 and 8) or 7/8-14 UNF
(thread option 3)

Shown with standard pressure compensator

Adjustable Vol. Stop
3.4 cc/rev Per Rev.

gage port; G1/4
optional M12 x 1.5; ISO 6149-1
(threads options 7 and 8) or 7/16-20 UNF
(thread option 3)

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>ØC</th>
<th>ØD</th>
</tr>
</thead>
<tbody>
<tr>
<td>D,E</td>
<td>6.00&quot;</td>
<td>.50&quot;</td>
<td>9.00&quot;</td>
<td>.81&quot;</td>
</tr>
<tr>
<td>K,L</td>
<td>160mm</td>
<td>9mm</td>
<td>200mm</td>
<td>18mm</td>
</tr>
</tbody>
</table>

Shaft Option "K"
(Ø40mm Ref)
12mm x 8mm key
Max Torque = 1150 Nm (10,178 In-Lbs)

Optional Drain or Gage Port
(see below for sizes)
drain port: G3/4
optional M27 x 2; ISO 6149-1 (thread options 7 and 8) or 1 1/16-12 UNF (thread option 3)

Mounting hole for horsepower compensator pilot or displacement feedback LVDT

View X
Variable Volume Piston Pumps
Series PV 063/080/092

Technical Information

Inlet:
Option 3 & 7
2" 4 Bolt Flange
1/2-13 UNC-2B Threads
Option 1 & 8
50mm 4 Bolt Flange
M12 Threads
Standard Pressure Series
(Code 61)

Outlet:
Option 3 & 7
1-1/4" 4 Bolt Flange
1/2-13 UNC-2B Threads
Option 1 & 8
32mm 4 Bolt Flange
M12 Threads
High Pressure Series (Code 62)

Shaft Option "D"
(SAE "D")
Max Torque = 1320 Nm (11,683 In-Lbs)

Shaft Option "E"
(SAE "D")
13 Tooth, 18/16 DP
Flat Root, Side Fit
Max Torque = 1218 Nm (15,080 In-Lbs)

Shaft Option "L"
W40mm x 1.5mm x 25mm x 8f
DIN 5480
Max Torque = 1400 Nm (12,391 In-Lbs)
Thru-Shaft Options

Thru-Shaft Load Limitations

The maximum allowable torque of the individual shaft must not be exceeded. For 2-pump combinations there is no problem because the PV series offers 100% thru torque capabilities. For 3-pump combinations or more the limit torque could be reached or exceeded. Therefore it is necessary to calculate the torque factor and compare the sum of each pump's torque factor to the table to make sure it does not exceed the torque limit factor.

<table>
<thead>
<tr>
<th>Pump</th>
<th>Shaft</th>
<th>Torque Limit Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV063-092</td>
<td>D</td>
<td>77280</td>
</tr>
<tr>
<td></td>
<td>E</td>
<td>72450</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>67620</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>83720</td>
</tr>
</tbody>
</table>

Required: Sum of all calculated torque factors must be < torque limit factor.

Torque factor of any pump = Pressure (bar) x Displacement (cc/rev)

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E*</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>A7</td>
<td>Ø3.25&quot;</td>
<td>4.188&quot;</td>
<td>-</td>
<td>3/8-16</td>
<td>SAE &quot;A&quot; 9T 16/32 DP SPLINE</td>
<td>-</td>
<td>2.28&quot;</td>
<td>12.83&quot;</td>
</tr>
<tr>
<td>B3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.536&quot;</td>
<td>-</td>
<td>SAE &quot;B&quot; 13T 16/32 DP SPLINE</td>
<td>1/2-13</td>
<td>2.28&quot;</td>
<td>12.83&quot;</td>
</tr>
<tr>
<td>B7</td>
<td>Ø4.00&quot;</td>
<td>5.750&quot;</td>
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<td>1/2-13</td>
<td>SAE &quot;B&quot; 13T 16/32 DP SPLINE</td>
<td>-</td>
<td>2.28&quot;</td>
<td>12.83&quot;</td>
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<tr>
<td>C3</td>
<td>Ø5.00&quot;</td>
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<td>4.500&quot;</td>
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<td>SAE &quot;C&quot; 14T 12/24 DP SPLINE</td>
<td>1/2-13</td>
<td>2.28&quot;</td>
<td>12.83&quot;</td>
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<tr>
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<td>5/8-11</td>
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<td>2.28&quot;</td>
<td>12.83&quot;</td>
</tr>
<tr>
<td>J3</td>
<td>Ø100mm</td>
<td>-</td>
<td>44mm</td>
<td>-</td>
<td>W25 x 1.5 x 15 x 8f SPLINE</td>
<td>M10</td>
<td>2.28&quot;</td>
<td>12.83&quot;</td>
</tr>
<tr>
<td>K3</td>
<td>Ø125mm</td>
<td>-</td>
<td>56mm</td>
<td>-</td>
<td>W32 x 1.5 x 20 x 8f SPLINE</td>
<td>M12</td>
<td>2.28&quot;</td>
<td>12.83&quot;</td>
</tr>
<tr>
<td>L3</td>
<td>Ø160mm</td>
<td>-</td>
<td>71mm</td>
<td>-</td>
<td>W40 x 1.5 x 25 x 8f SPLINE</td>
<td>M16</td>
<td>2.28&quot;</td>
<td>12.83&quot;</td>
</tr>
<tr>
<td>W3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.530&quot;</td>
<td>-</td>
<td>SAE &quot;BB&quot; 15T 16/32 DP SPLINE</td>
<td>1/2-13</td>
<td>2.28&quot;</td>
<td>12.83&quot;</td>
</tr>
<tr>
<td>W7</td>
<td>Ø4.00&quot;</td>
<td>5.750&quot;</td>
<td>-</td>
<td>1/2-13</td>
<td>SAE &quot;BB&quot; 15T 16/32 DP SPLINE</td>
<td>-</td>
<td>2.28&quot;</td>
<td>12.83&quot;</td>
</tr>
</tbody>
</table>

*Coupling included with pump if ordered from Greeneville, TN
Variable Volume Piston Pumps

Series PV 063/080/092

Ordering Information

Code | Shaft | Pilot |
--- | --- | --- |
D | 1-3/4" Keyed (SAE D) | 4 Bolt SAE "D"
E | 17T Spline (SAE CC) | 4 Bolt SAE "D"
K | 40mm Keyed | 4 Bolt 160mm
L | W40 x 1.5 x 25 x 8f Spline DIN 5480 | 4 Bolt 160mm

Code | Thru-Shaft Option |
--- | --- |
T1 | Thru-Shaft Capable/Single Pump w/Cover
A7 | 2 Bolt SAE "A" Pilot 03.250/SAE "A" 9T 16/32 DP Spline
B3 | 4 Bolt SAE "B" Pilot 04.00/SAE "B" 13T 16/32 DP Spline
B7 | 2 Bolt SAE "B" Pilot 04.00/SAE "B" 13T 16/32 DP Spline
C3 | 4 Bolt SAE "C" Pilot 05.00/SAE "C" 14T 12/24 DP Spline
C7 | 2 Bolt SAE "C" Pilot 05.00/SAE "C" 14T 12/24 DP Spline
D3 | 4 Bolt SAE "D" Pilot 06.00/SAE "D" 13T 8/16 DP Spline
J3* | 4 Bolt 100mm Pilot /W25x1.5x15x6f Spline DIN 5480
K3* | 4 Bolt 125mm Pilot /W32x1.5x20x8f Spline DIN 5480
L3* | 4 Bolt 160mm Pilot /W40x1.5x25x8f Spline DIN 5480
W3 | 4 Bolt SAE "B" Pilot 4.00/SAE "BB" 15T 16/32 DP Spline
W7 | 2 Bolt SAE "B" Pilot 4.00/SAE "BB" 15T 16/32 DP Spline

*Must be used with port/thread option 1

Code | Port* | Threads** |
--- | --- | --- |
1 | BSPP | Metric
3 | UNF | UNC
7 | ISO 6149 | UNC
8 | ISO 6149 | Metric

*As viewed from shaft end.

Code | Rotation*
--- | ---
R | CW
L | CCW

Code | Multiple Pumps
--- | ---
Omit | Single

Code | Control Options
--- | ---
F | Standard Pressure Compensator
   S | Adjustment Type
   | Screw With Nut
   | Pressure Range
   | 70-350 bar (1015-5075 PSI)
   | 40-210 bar (580-3050 PSI)
   | 10-140 bar (150-2050 PSI)
F | Remote/Load Sense Compensator
   W | Control Port
   | NG6/Cetop3 (D1VW) Pattern *
   | NG6 with Pressure Valve Mnt'd**
   | Compensator Control Type
   | Remote Pressure
   | Load Sensing
   | Input Horsepower at 1800 RPM
   | 20.0 (700 in-lb Torque)
   | 25.0 (875 in-lb Torque)
   | 30.0 (1050 in-lb Torque)
   | 35.0 (1225 in-lb Torque)
   | 50.0 (1750 in-lb Torque)
   | 60.0 (2100 in-lb Torque)
   | 75.0 (2625 in-lb Torque)

*Maximum pressure adjustment not included, but recommended. (See PVAC Section)
** Valve to be mounted at factory must be ordered as a separate line item. Consult factory. See PVAC section for pressure valve options.
Performance Information
Series PV 140/180 Pressure Compensated, Variable Volume, Piston Pumps

Features
- High Strength Cast-Iron Housing for reliable and quiet operation
- Modular Controls for field convertibility
- Large Control Piston for smooth/fast response
- Multiple Pressure Control with valves mounted directly on pump
- Pre-Compression chamber to minimize over-all system noise

Controls
- Pressure Compensation
- Remote Pressure Compensation
- Load Sensing
- Adjustable Maximum Volume Stop
- Electrohydraulic Pressure
- Dual and Tri-Pressure Control
- Low Pressure Standby
- Horsepower Limiting

Schematic Symbol
(Basic Pump)

Installation Data
See Installation Information on page A156 of this catalog for specific recommendations pertaining to system cleanliness, fluids, start-up, inlet conditions, shaft alignment, drain line restrictions and other important factors relative to the proper installation and use of these products.

Specifications
Pressure Ratings: 5000 PSI (350 bar) Continuous
6000 PSI (420 bar) Peak

Speed Ratings: 750 to 2200 RPM

Inlet Condition: 725 PSI (50 bar) Maximum
3 In-Hg Vacuum at 1500 RPM
0 In-Hg Vacuum at 1800 RPM

Case Drain Conditions:
7 PSI (.5 bar) Maximum

Operating Temp. Range: -40°F to 160°F
(-40°C to 70°C)

Housing Material: Cast Iron

Filtration: Maintain SAE Class 4 (ISO 16/13)

Mounting: SAE “D” 4-Bolt Flange

Quick Reference Data Chart

<table>
<thead>
<tr>
<th>Pump Model</th>
<th>Displacement cc/rev (in³/rev)</th>
<th>Pump Delivery @ 7 bar (100 PSI) in LPM (GPM)</th>
<th>Approx. Noise Levels dB(A)</th>
<th>Input Power At 1800 RPM, Max. Displacement &amp; 343 bar (5000 PSI)</th>
<th>Max Operating Speed (RPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV140</td>
<td>140 (8.59)</td>
<td>168 (44.4)</td>
<td>70</td>
<td>149.4 kw (200.4 hp)</td>
<td>2400</td>
</tr>
<tr>
<td>PV180</td>
<td>180 (10.98)</td>
<td>216 (57.1)</td>
<td>71</td>
<td>210.3 kw (282.0 hp)</td>
<td>2200</td>
</tr>
</tbody>
</table>

* The noise level values are based on anechoic room measurements at a distance of 1 meter in accordance with DIN 45645.
Performance Curves

Fluid: Standard Hydraulic Oil 100 SSU @ 120°F (49°C)

PV140 @ 1200 RPM

PV140 @ 1800 RPM

PV180 @ 1200 RPM

PV180 @ 1800 RPM

NOTE: The efficiencies and data in the graphs are good only for pumps running at speeds shown and stroked to maximum. To calculate approximate horsepower for the other conditions, use the following formula:

\[
HP = \left[ \frac{Q \times (PSI)}{1714} \right] + (CHp)
\]

WHERE:

- \( Q \) = Actual Output Flow in GPM
- \( PSI \) = Pressure At Pump Outlet
- \( CHp \) = Input Horsepower @ Full compensation @ 1800 RPM (from graph read at operating pressure)

Actual GPM is directly proportional to drive speed and maximum volume setting. Flow loss, however, is a function of pressure only.
Variable Volume Piston Pumps
Series PV 140/180

Technical Information

Catalog HY13-1552-001/NA,EU
Hydraulic Pump/Motor Division
Greeneville, Tennessee

Variable Volume Piston Pumps

View X

Flush port: G3/4
Optional M 27 x 2; ISO 6149-1
(threads options 7 and 8)
or 1 1/16-12 UNF (threads option 3)

Gage port; G1/4
Optional M 12 x 1.5; ISO 6149-1
(threads options 7 and 8)
7/16 - 20 UNF (threads option 3)

Pressure port: 295 (11.6)
Suction port: 305 (12.0)

Code | A | B | ØC | ØD
--- | --- | --- | --- | ---
D,E | 6.00" | .50" | 9.00" | .81"
K,L | 160mm | 9mm | 200mm | 18mm

Adjustable Vol. Stop
8.4 cc/rev Per Rev.

Gage port: G1/4
Optional M 12 x 1.5; ISO 6149-1
(threads options 7 and 8)
7/16 - 20 UNF (threads option 3)

Mounting hole for horsepower compensator
Pilot or LVDT for displacement feedback

Drain port: G1
Optional M33 x 2; ISO 6149-1
(threads options 7 and 8)
or 1 5/16 - 12 UNF (threads option 3)
Variable Volume Piston Pumps
Series PV 140/180

Inlet:
Option 3 & 7
2-1/2" 4 Bolt Flange
1/2-13 UNC-2B Threads
Option 1 & 8
63mm 4 Bolt Flange
M16 Threads
Standard Pressure Series
(Code 61)

Outlet:
Option 3 & 7
1-1/4" 4 Bolt Flange
1/2-13 UNC-2B Threads
Option 1 & 8
32mm 4 Bolt Flange
M12 Threads
High Pressure Series (Code 62)

Shaft Option "D"
(SAE "F")
Max Torque= 2000 Nm (17,701 In-Lbs)

Shaft Option "E"
(SAE "F")
15 Teeth, 8/16 Pitch
30° Involute Spline
Max Torque = 2680 Nm (23,720 In-Lbs)

Shaft Option "F"
(SAE "D")
Max Torque= 1320 Nm (11,683 In-Lbs)

Shaft Option "L"
W50mm x 2mm x 24mm x 9g
DIN 5480
Max Torque = 2650 Nm (23,454 In-Lbs)

Shaft Option "G"
(SAE "D")
13 Teeth 8/16 Pitch
30° Involute Spline
Max Torque = 1640 Nm (14,515 In-Lbs)
Thru-Shaft Options

Thru-Shaft Load Limitations

The maximum allowable torque of the individual shaft must not be exceeded. For 2-pump combinations there is no problem because the PV series offers 100% thru torque capabilities. For 3-pump combinations or more the limit torque could be reached or exceeded. Therefore it is necessary to calculate the torque factor and compare the sum of each pumps torque factor to the table to make sure it does not exceed the torque limit factor.

**Torque factor of any pump** = Pressure (bar) x Displacement (cc/rev)

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E*</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>A7</td>
<td>Ø3.25&quot;</td>
<td>4.188&quot;</td>
<td>-</td>
<td>3/8-16</td>
<td>SAE &quot;A&quot; 13T 16/32 DPSPLINE</td>
<td>-</td>
</tr>
<tr>
<td>B3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.536&quot;</td>
<td>-</td>
<td>SAE &quot;B&quot; 13T 16/32 DP SPLINE</td>
<td>1/2-13</td>
</tr>
<tr>
<td>B7</td>
<td>Ø4.00&quot;</td>
<td>5.750&quot;</td>
<td>-</td>
<td>1/2-13</td>
<td>SAE &quot;B&quot; 13T 16/32 DP SPLINE</td>
<td>-</td>
</tr>
<tr>
<td>C3</td>
<td>Ø5.00&quot;</td>
<td>-</td>
<td>4.508&quot;</td>
<td>-</td>
<td>SAE &quot;C&quot; 14T 12/24 DP SPLINE</td>
<td>1/2-13</td>
</tr>
<tr>
<td>D3</td>
<td>Ø6.00&quot;</td>
<td>-</td>
<td>6.364&quot;</td>
<td>-</td>
<td>SAE &quot;CC&quot; 13T 8/16 DP SPLINE</td>
<td>5/8-11</td>
</tr>
<tr>
<td>D7</td>
<td>Ø6.00&quot;</td>
<td>9.000&quot;</td>
<td>-</td>
<td>5/8-11</td>
<td>SAE &quot;D&quot; 13T 8/16 DP SPLINE</td>
<td>-</td>
</tr>
<tr>
<td>J3</td>
<td>Ø100mm</td>
<td>-</td>
<td>44mm</td>
<td>-</td>
<td>W25 x 1.5 x 15 x 8f SPLINE</td>
<td>M10</td>
</tr>
<tr>
<td>K3</td>
<td>Ø125mm</td>
<td>-</td>
<td>56mm</td>
<td>-</td>
<td>W32 x 1.5 x 20 x 8f SPLINE</td>
<td>M12</td>
</tr>
<tr>
<td>L2</td>
<td>Ø160mm</td>
<td>-</td>
<td>71mm</td>
<td>-</td>
<td>W50 x 2 x 24 x 9g SPLINE</td>
<td>M12</td>
</tr>
<tr>
<td>L3</td>
<td>Ø160mm</td>
<td>-</td>
<td>71mm</td>
<td>-</td>
<td>W40 x 1.5 x 25 x 8f SPLINE</td>
<td>M17</td>
</tr>
<tr>
<td>W3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.536&quot;</td>
<td>-</td>
<td>SAE &quot;BB&quot; 15T 16/32 DP SPLINE</td>
<td>1/2-13</td>
</tr>
<tr>
<td>W7</td>
<td>Ø4.00&quot;</td>
<td>5.750&quot;</td>
<td>-</td>
<td>1/2-13</td>
<td>SAE &quot;BB&quot; 15T 16/32 DP SPLINE</td>
<td>-</td>
</tr>
<tr>
<td>Z3</td>
<td>Ø6.00&quot;</td>
<td>-</td>
<td>6.364&quot;</td>
<td>-</td>
<td>SAE &quot;F&quot; 15T 8/16 DP SPLINE</td>
<td>5/8-11</td>
</tr>
</tbody>
</table>

*Coupling included when ordered from Greeneville, TN

**Pump** PV140-180

<table>
<thead>
<tr>
<th>Pump</th>
<th>Shaft</th>
<th>Torque Limit Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>-</td>
<td>118400</td>
</tr>
<tr>
<td>E</td>
<td>-</td>
<td>158760</td>
</tr>
<tr>
<td>F</td>
<td>-</td>
<td>78750</td>
</tr>
<tr>
<td>G</td>
<td>-</td>
<td>97650</td>
</tr>
<tr>
<td>K</td>
<td>-</td>
<td>113400</td>
</tr>
<tr>
<td>L</td>
<td>-</td>
<td>157500</td>
</tr>
</tbody>
</table>
### Variable Volume Piston Pumps

#### Ordering Information

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Shaft Diameter (Keyed)</th>
<th>Pilot Diameter (SAE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>2&quot; Keyed (SAE F)</td>
<td>4 Bolt SA1E &quot;D&quot;</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>15T Spline (SAE F)</td>
<td>4 Bolt SA1E &quot;D&quot;</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>1.3/4&quot; Keyed (SAE D)</td>
<td>4 Bolt SA1E &quot;D&quot;</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>13T Spline (SAE D)</td>
<td>4 Bolt SA1E &quot;D&quot;</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>50mm Keyed</td>
<td>4 Bolt 160mm</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>W50 x 2 x 24 x 9g Spline DIN 5480</td>
<td>4 Bolt 160mm</td>
<td></td>
</tr>
</tbody>
</table>

#### Control Options

<table>
<thead>
<tr>
<th>Code</th>
<th>Thru-Shaft Option</th>
<th>Control Type</th>
<th>Pressure Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Thru-Shaft Capable, Single Pump w/Cover</td>
<td>Standard Pressure Compensator</td>
<td>70-350 bar (1015-5075 PSI)</td>
</tr>
<tr>
<td>A7</td>
<td>2 Bolt SA1E &quot;A&quot; Pilot</td>
<td>Remote Compensator</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>B3</td>
<td>4 Bolt SA1E &quot;B&quot; Pilot</td>
<td>Load Sensing Compensator</td>
<td>100-300 bar (1450-4500 PSI)</td>
</tr>
<tr>
<td>B7</td>
<td>2 Bolt SA1E &quot;B&quot; Pilot</td>
<td>Horsepower Compensator</td>
<td>100-300 bar (1450-4500 PSI)</td>
</tr>
<tr>
<td>C3</td>
<td>4 Bolt SA1E &quot;C&quot; Pilot</td>
<td>NG6/Cetop3 Pattern</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>C7</td>
<td>2 Bolt SA1E &quot;C&quot; Pilot</td>
<td>NG6 with Pressure Valve Mounted</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>D3</td>
<td>4 Bolt SA1E &quot;D&quot; Pilot</td>
<td>NG6 with Pressure Valve Mounted</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>D7</td>
<td>2 Bolt SA1E &quot;D&quot; Pilot</td>
<td>NG6 with Pressure Valve Mounted</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>J3</td>
<td>4 Bolt 100mm Pilot</td>
<td>NG6/Cetop3 DIVW Pattern</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>K3</td>
<td>4 Bolt 125mm Pilot</td>
<td>NG6 with PVAC1PCS5 Valve Mounted</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>L2</td>
<td>4 Bolt 160mm Pilot</td>
<td>NG6 with Pressure Valve Mounted</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>L3</td>
<td>4 Bolt 160mm Pilot</td>
<td>NG6 with Pressure Valve Mounted</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>W3</td>
<td>4 Bolt SA1E &quot;B&quot; Pilot</td>
<td>30.0 (1050 in-lb Torque)</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>W7</td>
<td>2 Bolt SA1E &quot;B&quot; Pilot</td>
<td>35.0 (1225 in-lb Torque)</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>Z3</td>
<td>4 Bolt SA1E &quot;D&quot; Pilot</td>
<td>50.0 (1750 in-lb Torque)</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
<tr>
<td>Z7</td>
<td>2 Bolt SA1E &quot;D&quot; Pilot</td>
<td>60.0 (2100 in-lb Torque)</td>
<td>10-140 bar (150-2050 PSI)</td>
</tr>
</tbody>
</table>

*Must be used with port/thread option 1

#### Codes

- **Code Seals**: N Nitrile, V Fluorocarbon, W Waterbased Fluids
- **Code Rotation**: R CW, L CCW
- **Code Rotation**: As viewed from shaft end.
- **Code Multiple Pumps**: Omit Single Pump
- **Code Multiple Pumps**: Pump Factory Mounted On Rear

#### Pump Variations

- **1**: Standard
- **9**: Reduced Stroke

#### Code Control Options

- **F**: Standard Pressure Compensator
  - **Adjustment Type**: Screw With Nut
  - **Pressure Range**: 70-350 bar (1015-5075 PSI)
- **F**: Remote Pressure Compensator
  - **Control Port**: NG6/Cetop3 Pattern
  - **Control Type**: Remote Compensator
- **L**: Horsepower Compensator
  - **Control Port**: NG6/Cetop3 DIVW Pattern
  - **HP setting at 1800 RPM**: 30.0 (1050 in-lb Torque)

* Maximum pressure adjustment not included, but recommended. (See PVAC Section)

** Valve to be mounted at factory must be ordered as a separate line item. Consult factory. See PVAC section for pressure valve options.
Performance Information
Series PV270 Pressure Compensated, Variable Volume, Piston Pumps

Features
- High Strength Cast-Iron Housing for reliable and quiet operation
- Modular Controls for field convertibility
- Large Control Piston for smooth/fast response
- Multiple Pressure Control with valves mounted directly on pump
- Pre-Compression chamber to minimize over-all system noise.

Controls
- Pressure Compensation
- Remote Pressure Compensation
- Load Sensing
- Adjustable Maximum Volume Control
- Electrohydraulic Pressure Control
- Dual and Tri-Pressure
- Low Pressure Standby
- Horsepower Limiting

Specifications
Pressure Ratings: 5000 PSI (350 bar) Continuous
6000 PSI (420 bar) Peak

Speed Ratings: 750 to 1800 RPM

Inlet Condition: 725 PSI (50 bar) Maximum
3 In-Hg Vacuum at 1500 RPM
0 In-Hg Vacuum at 1800 RPM

Case Drain Conditions: 7 PSI (.5 bar) Maximum

Operating Temp. Range: -40°F to 160°F
(-40°C to 70°C)

Housing Material: Cast Iron

Filtration: Maintain SAE Class 4 (ISO 16/13)

Mounting: SAE “E” 4-Bolt Flange

Quick Reference Data Chart

<table>
<thead>
<tr>
<th>Pump Model</th>
<th>Displacement cc/rev (in³/rev)</th>
<th>Pump Delivery @ 7 bar (100 PSI) in LPM (GPM)</th>
<th>*Approx. Noise Levels dB(A) @ Full Flow and 1500 RPM</th>
<th>Input Power At 1800 RPM, Max. Displacement &amp; 343 bar (5000 PSI)</th>
<th>Max Operating Speed (RPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV270</td>
<td>270 (16.5)</td>
<td>324 (85.6) 486 (128.4)</td>
<td>77 79 81</td>
<td>298 kw (400 hp)</td>
<td>1800</td>
</tr>
</tbody>
</table>

* The noise level values are based on anechoic room measurements at a distance of 1 meter in accordance with DIN 45645.
Performance Curves

Fluid: Standard Hydraulic Oil 100 SSU @ 120°F (49°C)

NOTE: The efficiencies and data in the graphs are good only for pumps running at speeds shown and stroked to maximum. To calculate approximate horsepower for the other conditions, use the following formula:

\[ HP = \frac{Q \times (PSI)}{1714} + (CHp) \]

WHERE:
- \( Q \) = Actual Output Flow in GPM
- \( PSI \) = Pressure At Pump Outlet
- \( CHp \) = Input Horsepower @ Full compensation @ 1800 RPM (from graph read at operating pressure)

Actual GPM is directly proportional to drive speed and maximum volume setting. Flow loss, however, is a function of pressure only.
Variable Volume Piston Pumps
Series PV270

Technical Information

Parker Hannifin Corporation
Hydraulic Pump/Motor Division
Greeneville, Tennessee

Catalog HY13-1552-001/NA,EU

Variable Volume Piston Pumps
Catalog HY13-1552-001/NA,EU

Hydraulics A146

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>ØC</th>
<th>ØD</th>
</tr>
</thead>
<tbody>
<tr>
<td>D,E</td>
<td>6.50&quot;</td>
<td>.50&quot;</td>
<td>12.50&quot;</td>
<td>.81&quot;</td>
</tr>
<tr>
<td>K,L</td>
<td>200mm</td>
<td>9mm</td>
<td>250mm</td>
<td>22mm</td>
</tr>
</tbody>
</table>

Adjustable Vol. Stop
10.2 cc/rev Per Rev.

Mounting hole for horse-power pilot or LVDT for

displacement feedback

Optional drainage or gage port

(see below for size)

Drain port: G 1 1/4

Optional M42 x 2; ISO 6149-1

(threads option 7 and 8)

or 1 5/8-12 UNF (threads option 3)

G 1 1/4

Optional M42 x 2; ISO 6149-1

(threads option 7 and 8)

or 1 5/8-12 UNF (threads option 3)

Flush port; G 3/4

Optional M 27 x 2; ISO 6149-1

(threads option 7 and 8)

or 1 1/16 - 12 UNF

(threads option 3)

Shaft Option "K"

(Ø65mm Ref)

18mm x 11mm key

Max Torque = 2850 Nm (25,225 In-Lbs)

"ØD" - 4 PLCS

"ØC"

Shaft Option "K"

(Ø65mm Ref)

18mm x 11mm key

Max Torque = 2850 Nm (25,225 In-Lbs)

Flush port; G 3/4

Optional M 27 x 2; ISO 6149-1

(threads option 7 and 8)

or 1 1/16 - 12 UNF

(threads option 3)
Variable Volume Piston Pumps
Series PV270

Inlet:
Option 3 & 7
3-1/2" 4 Bolt Flange
5.8-11 UNC-2B Threads
Option 1 & 8
88mm 4 Bolt Flange
M16 Threads
Standard Pressure Series
(Code 61)

Outlet:
Option 3 & 7
1-1/2" 4 Bolt Flange
5/8-11 UNC-2B Threads
Option 1 & 8
38mm 4 Bolt Flange
M16 Threads
High Pressure Series (Code 62)

Shaft Option "L"
W60mm x 2mm x 28mm x 9g
DIN 5480
Max Torque = 3980 Nm (35,226 In-Lbs)

Shaft Option "D"
Max Torque= 2000 Nm (17,701 In-Lbs)

Shaft Option "E"
(SAE FF)
15 Teeth 8/16 Pitch
30° Involute Spline
Max Torque= 2680 Nm (23,720 In-Lbs)
Thru-Shaft Load Limitations

The maximum allowable torque of the individual shaft must not be exceeded. For 2-pump combinations there is no problem because the PV series offers 100% thru torque capabilities. For 3-pump combinations or more the limit torque could be reached or exceeded. Therefore it is necessary to calculate the torque factor and compare the sum of each pump’s torque factor to the table to make sure it does not exceed the torque limit factor.

<table>
<thead>
<tr>
<th>Code</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E*</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>A7</td>
<td>Ø3.25&quot;</td>
<td>4.188&quot;</td>
<td>-</td>
<td>3/8-16</td>
<td>SAE &quot;A&quot; 9T 16/32 DPSPLINE</td>
<td>-</td>
</tr>
<tr>
<td>B3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.536&quot;</td>
<td>-</td>
<td>SAE &quot;B&quot; 13T 16/32 DP SPLINE</td>
<td>1/2-13</td>
</tr>
<tr>
<td>B7</td>
<td>Ø4.00&quot;</td>
<td>5.750&quot;</td>
<td>-</td>
<td>1/2-13</td>
<td>SAE &quot;B&quot; 13T 16/32 DP SPLINE</td>
<td>-</td>
</tr>
<tr>
<td>C3</td>
<td>Ø5.00&quot;</td>
<td>-</td>
<td>4.508&quot;</td>
<td>-</td>
<td>SAE &quot;C&quot; 14T 12/24 DP SPLINE</td>
<td>1/2-13</td>
</tr>
<tr>
<td>C7</td>
<td>Ø5.00&quot;</td>
<td>7.125&quot;</td>
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<td>5/8-11</td>
<td>SAE &quot;C&quot; 14T 12/24 DP SPLINE</td>
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</tr>
<tr>
<td>D3</td>
<td>Ø6.00&quot;</td>
<td>-</td>
<td>6.364&quot;</td>
<td>-</td>
<td>SAE &quot;CC&quot; 13T 8/16 DP SPLINE</td>
<td>5/8-11</td>
</tr>
<tr>
<td>D7</td>
<td>Ø6.00&quot;</td>
<td>9.000&quot;</td>
<td>-</td>
<td>5/8-11</td>
<td>SAE &quot;D&quot; 13T 8/16 DP SPLINE</td>
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</tr>
<tr>
<td>E3</td>
<td>Ø6.50&quot;</td>
<td>-</td>
<td>8.839&quot;</td>
<td>-</td>
<td>SAE &quot;F&quot; 15T 8/16 DP SPLINE</td>
<td>3/4-10</td>
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<tr>
<td>J3</td>
<td>Ø100mm</td>
<td>44mm</td>
<td>-</td>
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<td>W25 x 1.5 x 15 x 8f SPLINE</td>
<td>M10</td>
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<tr>
<td>K3</td>
<td>Ø125mm</td>
<td>56mm</td>
<td>-</td>
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<td>W32 x 1.5 x 20 x 8f SPLINE</td>
<td>M12</td>
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<tr>
<td>L2</td>
<td>Ø160mm</td>
<td>71mm</td>
<td>-</td>
<td>-</td>
<td>W50 x 2 x 24 x 9g SPLINE</td>
<td>M12</td>
</tr>
<tr>
<td>L3</td>
<td>Ø160mm</td>
<td>71mm</td>
<td>-</td>
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<td>W40 x 1.5 x 25 x 8f SPLINE</td>
<td>M17</td>
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<tr>
<td>M3</td>
<td>Ø200mm</td>
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<td>W60 x 2 x 28 x 9g SPLINE</td>
<td>M20</td>
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<tr>
<td>W3</td>
<td>Ø4.00&quot;</td>
<td>-</td>
<td>3.536&quot;</td>
<td>-</td>
<td>SAE &quot;BB&quot; 15T 16/32 DP SPLINE</td>
<td>1/2-13</td>
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<td>Ø4.00&quot;</td>
<td>5.750&quot;</td>
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<td>1/2-13</td>
<td>SAE &quot;BB&quot; 15T 16/32 DP SPLINE</td>
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<td>Ø6.00&quot;</td>
<td>-</td>
<td>6.364&quot;</td>
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<td>SAE &quot;F&quot; 15T 8/16 DP SPLINE</td>
<td>5/8-11</td>
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<tr>
<td>Z7</td>
<td>Ø6.00&quot;</td>
<td>9.000&quot;</td>
<td>-</td>
<td>5/8-11</td>
<td>SAE &quot;F&quot; 15T 8/16 DP SPLINE</td>
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</table>

*Coupling included when ordered from Greeneville, TN

Required: Sum of all calculated torque factors must be <torque limit factor.

Torque factor of any pump = Pressure x Displacement (cc/rev) bar
Variable Volume Piston Pumps
Series PV270

Ordering Information

Code  | Shaft  | Pilot
---   | ---    | ---
D     | 2\" SAE Keyed | 4 Bolt SAE "E"
E     | 15T Spline (SAE "F") | 4 Bolt SAE "E"
K     | 65mm Keyed | 4 Bolt 200mm
L     | W60 x 2 x 28 x 9g Spline DIN 5480 | 4 Bolt 200mm

Code  | Thru-Shaft Option
---   | ---
T1    | Thru-Shaft Capable/ Single Pump w/Cover
A3    | 4 Bolt SAE "A" Pilot Ø3.25/SAE "A" 9T 16/32 DP Spline
B3    | 4 Bolt SAE "B" Pilot Ø4.00/SAE "B" 13T 16/32 DP Spline
B7    | 2 Bolt SAE "B" Pilot Ø4.00/SAE "B" 13T 16/32 DP Spline
C3    | 4 Bolt SAE "C" Pilot Ø5.00/SAE "C" 14T 12/24 DP Spline
C7    | 2 Bolt SAE "C" Pilot Ø5.00/SAE "C" 14T 12/24 DP Spline
D3    | 4 Bolt SAE "D" Pilot Ø6.00/SAE "D" 13T 8/16 DP Spline
D7    | 2 Bolt SAE "D" Pilot Ø6.00/SAE "D" 13T 8/16 DP Spline
E3    | 4 Bolt SAE "E" Pilot Ø6.50/SAE "F" 15T 8/16 DP Spline
J3*   | 4 Bolt 100mm Pilot /W25 x 1.5x15x8f Spline DIN 5480
K3*   | 4 Bolt 125mm Pilot /W32 x 1.5x20x8f Spline DIN 5480
L2*   | 4 Bolt 160mm Pilot /W50 x 2x24x9g Spline DIN 5480
L3*   | 4 Bolt 160mm Pilot /W40 x 1.5x25x8f Spline DIN 5480
M3*   | 4 Bolt 200mm Pilot /W60 x 2x28x9f Spline DIN 5480
W3    | 4 Bolt SAE "B" Pilot 4.00/SAE "BB" 15T 16/32 DP Spline
W7    | 2 Bolt SAE "B" Pilot 4.00/SAE "BB" 15T 16/32 DP Spline
Z3    | 4 Bolt SAE "D" Pilot 6.00/SAE "F" 15T 8/16 DP Spline
Z7    | 2 Bolt SAE "D" Pilot 6.00/SAE "F" 15T 8/16 DP Spline

*Must be used with port/thread option 1

Parker Hannifin Corporation
Hydraulic Pump/Motor Division
Greeneville, Tennessee

A149
### Variable Volume Piston Pumps

#### General PV Series

<table>
<thead>
<tr>
<th>Control Options</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PVAC1PC</strong>&lt;sup&gt;S&lt;/sup&gt;</td>
<td>Pressure Compensator Adjustment (Included on *LC Option Only)</td>
</tr>
<tr>
<td><strong>PVCL</strong>&lt;sup&gt;LA**&lt;/sup&gt;</td>
<td>Pilot Valve for Horsepower Control (Fine Tuning)</td>
</tr>
</tbody>
</table>

#### Standard Pressure Compensator Option
- **FDS, FHS, and FWS**

#### Horsepower Compensator
- **'LC and 'LZ**
  - Note: See page 38 for compensator accessories when ordering the 'LZ option.

#### Load Sense Compensator Option
- **FF1 and FFZ**
  - Remote Pressure Compensator Option **FR1 and FRZ**
    - Note: See page 38 for compensator accessories when ordering the FFZ or FRZ option.
  - Caution: FF1 & FR1 control options do not have a pump max pressure limiter (compensator) installed. Do not attempt to operate pump without installing a compensator control.

#### Remote Signal Port
- **SAE-4** (7/16-20UNF)
  - Optional 1/4 BSPP

---

Parker Hannifin Corporation
Hydraulic Pump/Motor Division
Greeneville, Tennessee

A150
Variable Volume Piston Pumps
General PV Series

<table>
<thead>
<tr>
<th>Code</th>
<th>Accessory Valves</th>
<th>Adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1P</td>
<td>Max. Pressure Limit</td>
<td></td>
</tr>
<tr>
<td>2P</td>
<td>Two Pressure with DCV</td>
<td></td>
</tr>
<tr>
<td>1E</td>
<td>One Pressure and Vent with DCV</td>
<td></td>
</tr>
<tr>
<td>2E</td>
<td>2 pressure + low pressure stand-by electrical selection (energize for L.P. stand-by)</td>
<td></td>
</tr>
<tr>
<td>2M</td>
<td>2 pressure + low pressure stand-by electrical selection (deenergize for L.P. stand-by)</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Valves will include bolts for mounting.

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**Dimensions**

**PVAC1P**
Pressure relief valve mounted on compensator type R or F

**PVAC2P**
2-pressure relief valve, electrical selection, mounted on compensator type R or F

**PVAC1E**
Pressure relief valve, electrical unloading, mounted on compensator type R or F

**PVAC2E**/2M
2-pressure relief valve, electrical selection and unloading, mounted on compensator type R or F
Variable Volume Piston Pumps
Series PV

Ordering Examples
1. PV pump with remote pressure control, relief valve with 2 pressure stages, electrical pressure selection, nitrile seals, 24 VDC solenoid, plug to DIN 46350 accessories fitted:
   PV******FRZ
   PVAC2PCMNSJP

2. Same pump accessories not fitted:
   PV******FR1
   PVAC2PCMNSJP

3. Usable for horsepower control.

Symbols
PVAC1P*
PVAC2P*

PVAC1E*
PVAC2E

PVAC2M

see above ordering example No. 1
Cross reference ordering codes Parker series PV and Parker series PV plus

<table>
<thead>
<tr>
<th>PV</th>
<th>Description</th>
<th>Remark</th>
<th>PVplus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Field 1 Pump type</td>
<td>Field 1</td>
<td>PV</td>
</tr>
<tr>
<td>PV</td>
<td>Axial piston pump, open circuit, swashplate type, variable displacement</td>
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<td></td>
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<table>
<thead>
<tr>
<th>PV</th>
<th>Description</th>
<th>Remark</th>
<th>Field 2 Nominal size, displacement</th>
<th>Field 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>016</td>
<td>16 cm³/rev displacement</td>
<td>016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>020</td>
<td>20 cm³/rev displacement</td>
<td>020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>023</td>
<td>23 cm³/rev displacement</td>
<td>023</td>
<td></td>
<td></td>
</tr>
<tr>
<td>028</td>
<td>28 cm³/rev displacement</td>
<td>no longer available, in future series PVM up to 250 bar</td>
<td>028</td>
<td></td>
</tr>
<tr>
<td>032</td>
<td>32 cm³/rev displacement</td>
<td>032</td>
<td></td>
<td></td>
</tr>
<tr>
<td>040</td>
<td>40 cm³/rev displacement</td>
<td>040</td>
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<td>046</td>
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<td>063</td>
<td>63 cm³/rev displacement</td>
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<td>080</td>
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<td>250 cm³/rev displacement</td>
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<thead>
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<th>PVplus</th>
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<tbody>
<tr>
<td></td>
<td>Field 3 Rotation</td>
<td>Field 3</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>clockwise (looking on shaft)</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>counter-clockwise (looking on shaft)</td>
<td>L</td>
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<table>
<thead>
<tr>
<th>PV</th>
<th>Description</th>
<th>Remark</th>
<th>Field 4 Variation</th>
<th>Field 4</th>
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<tr>
<td>1</td>
<td>standard</td>
<td>1</td>
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<td></td>
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<tr>
<td>9</td>
<td>displacement adjusted</td>
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<table>
<thead>
<tr>
<th>PV</th>
<th>Description</th>
<th>Remark</th>
<th>Field 5 Mounting interface, shaft</th>
<th>Field 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>SAE, 2/4-hole, keyed shaft</td>
<td>4 Bolt SAE Pilot, SAE Keyed Shaft</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>SAE, 2/4-hole, splined shaft</td>
<td>4 Bolt SAE Pilot, SAE Spline Shaft</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>SAE, 4-hole, splined shaft, second pump</td>
<td>no longer available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>SAE, 4-hole, keyed shaft</td>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>SAE, 4-hole, splined shaft</td>
<td>E</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>metric, splined shaft, second pump</td>
<td>no longer available</td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>metric, keyed shaft</td>
<td>K</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>metric, splined shaft</td>
<td>L</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>PV</th>
<th>Description</th>
<th>Remark</th>
<th>PVplus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Field 6 Was: displacement adjustment</td>
<td>Now: ports, threads</td>
<td>Field 6</td>
</tr>
<tr>
<td>1</td>
<td>with displacement adjustment</td>
<td>metric, BSPP</td>
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<tr>
<td></td>
<td></td>
<td>SAE, UNF</td>
<td>3</td>
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<tr>
<td></td>
<td></td>
<td>SAE, ISO 6149</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>metric, ISO 6149</td>
<td>8</td>
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Code example PV:
code field no.:
# Variable Volume Piston Pumps

## Direct Comparison

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<tbody>
<tr>
<td>PV</td>
<td>046</td>
<td>R</td>
<td>1</td>
<td>A</td>
<td>5</td>
<td>6</td>
<td>T</td>
<td>1</td>
<td>N</td>
<td>9</td>
<td>PWS</td>
<td>XX</td>
<td>YY</td>
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<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
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### PV Description

**PVplus**

**Field**

**Remark**

<table>
<thead>
<tr>
<th>PV</th>
<th>Thru drive and Second Pump Option</th>
<th><strong>PVplus</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Thru shaft Capable with Cover</td>
<td>Field 7</td>
</tr>
<tr>
<td>7</td>
<td>2 Bolt SAE &quot;A&quot; Pilot 3.25&quot;/SAE &quot;A&quot; 9T Spline Coupler</td>
<td>A 4</td>
</tr>
<tr>
<td>7</td>
<td>4 Bolt SAE &quot;B&quot; Pilot 4.00&quot;/SAE &quot;B&quot; 13T Spline Coupler</td>
<td>B 3</td>
</tr>
<tr>
<td>8</td>
<td>2 Bolt SAE &quot;B&quot; Pilot 4.00&quot;/SAE &quot;B&quot; 13T Spline Coupler</td>
<td>B 7</td>
</tr>
<tr>
<td>7</td>
<td>4 Bolt SAE &quot;C&quot; Pilot 5.00&quot;/SAE &quot;C&quot; 14T Spline Coupler</td>
<td>C 3</td>
</tr>
<tr>
<td>8</td>
<td>2 Bolt SAE &quot;C&quot; Pilot 5.00&quot;/SAE &quot;C&quot; 14T Spline Coupler</td>
<td>C 7</td>
</tr>
<tr>
<td>H</td>
<td>4 Bolt 80mm Pilot/W 81 DIN 5480 Coupler</td>
<td>H 3</td>
</tr>
<tr>
<td>J</td>
<td>4 Bolt 100mm Pilot/W 81 DIN 5480 Coupler</td>
<td>J 3</td>
</tr>
<tr>
<td>K</td>
<td>4 Bolt 125mm Pilot/W 81 DIN 5480 Coupler</td>
<td>K 3</td>
</tr>
<tr>
<td>W</td>
<td>4 Bolt SAE &quot;B&quot; Pilot 4.00&quot;/SAE &quot;BB&quot; 15T Spline Coupler</td>
<td>W 3</td>
</tr>
<tr>
<td>W</td>
<td>2 Bolt SAE &quot;B&quot; Pilot 4.00&quot;/SAE &quot;BB&quot; 15T Spline Coupler</td>
<td>W 7</td>
</tr>
<tr>
<td>Y</td>
<td>2 Bolt SAE &quot;A&quot; Pilot 2.00&quot;/SAE &quot;A&quot; 9T Spline</td>
<td>Y 7</td>
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</table>

### PV Description

**PVplus**

**Field**

**Remark**

<table>
<thead>
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<th>PV</th>
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<tbody>
<tr>
<td>N</td>
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<tr>
<td>V</td>
<td>FPM</td>
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<td>V</td>
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### PV Description

**PVplus**

**Field**

**Remark**

<table>
<thead>
<tr>
<th>PV</th>
<th>Description</th>
<th>Remark</th>
<th>PVplus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S</strong></td>
<td>standard pressure compensator</td>
<td>only fast response option available</td>
<td>F<strong>S</strong></td>
</tr>
<tr>
<td><strong>RC</strong></td>
<td>remote pressure compensator</td>
<td>only fast response option available</td>
<td>F<strong>RC</strong></td>
</tr>
<tr>
<td><strong>R1</strong></td>
<td>remote pressure compensator with D03 interface</td>
<td>only fast response option available</td>
<td>F<strong>R1</strong></td>
</tr>
<tr>
<td><strong>F1</strong></td>
<td>load-sensing compensator with D03 interface</td>
<td>only fast response option available</td>
<td>F<strong>F1</strong></td>
</tr>
<tr>
<td><strong>L</strong></td>
<td>horse power compensator</td>
<td>no longer for load sensing</td>
<td><strong>L</strong></td>
</tr>
</tbody>
</table>

### PV Description

**PVplus**

**Field**

**Remark**

<table>
<thead>
<tr>
<th>PV</th>
<th>Description</th>
<th>Remark</th>
<th>PVplus</th>
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</thead>
<tbody>
<tr>
<td>not required on order</td>
<td>Design series pump</td>
<td>Field 11</td>
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### PV Description

**PVplus**

**Field**

**Remark**

<table>
<thead>
<tr>
<th>PV</th>
<th>Description</th>
<th>Remark</th>
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</thead>
<tbody>
<tr>
<td>not required on order</td>
<td>Design series compensator</td>
<td>Field 12</td>
<td></td>
</tr>
</tbody>
</table>

*Consult Factory for assistance in crossing over PV model codes that are not shown.*

---

**Cross reference ordering codes Parker series PV and Parker series PV plus**

*Not available with size 1
**Size 2 or larger
***Not available with size 1 and 2
****Only available with 032 and larger
#Only available with size 1

---

**Parker Hannifin Corporation**

Hydraulic Pump/Motor Division

Greeneville, Tennessee
Differences in dimensions
*Dimensional Differences only evident in PV140, 180 & 270.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>PV130, PV180</th>
<th>PV140, PV180</th>
<th>PV250</th>
<th>PV270</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z, metric (mm)</td>
<td>Ø160</td>
<td>Ø 160</td>
<td>Ø 200</td>
<td>Ø 200</td>
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<tr>
<td>D, metr., key (mm)</td>
<td>Ø 50</td>
<td>Ø 50</td>
<td>Ø 65</td>
<td>Ø 65</td>
</tr>
<tr>
<td>D, metr., spline</td>
<td>W50x1.25x38</td>
<td>W50x2x24</td>
<td>W62x1.25x48</td>
<td>W60x2x28</td>
</tr>
<tr>
<td>Z, SAE (in)</td>
<td>Ø 152.4</td>
<td>Ø 152.4</td>
<td>Ø 165.1</td>
<td>Ø 165.1</td>
</tr>
<tr>
<td>D, SAE, key (in)</td>
<td>Ø 50.8</td>
<td>Ø 50.8</td>
<td>Ø 50.8</td>
<td>Ø 50.8</td>
</tr>
<tr>
<td>D, SAE, spline (in)</td>
<td>15T8/16DP</td>
<td>15T8/16DP</td>
<td>15T8/16DP</td>
<td>15T8/16DP</td>
</tr>
<tr>
<td>B (mm)</td>
<td>200</td>
<td>200</td>
<td>330</td>
<td>250</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Series</th>
<th>Model</th>
<th>Displacement cc/rev (in³/rev)</th>
<th>Mass kg (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PV016</td>
<td>16 (.98)</td>
<td>19 (42)</td>
</tr>
<tr>
<td></td>
<td>PV020</td>
<td>20 (1.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PV023</td>
<td>23 (1.4)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PV032</td>
<td>32 (1.9)</td>
<td>30 (66)</td>
</tr>
<tr>
<td></td>
<td>PV040</td>
<td>40 (2.4)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PV046</td>
<td>46 (2.8)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PV063</td>
<td>63 (3.8)</td>
<td>60 (132)</td>
</tr>
<tr>
<td></td>
<td>PV080</td>
<td>80 (4.8)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PV092</td>
<td>92 (5.6)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>PV140</td>
<td>140 (8.5)</td>
<td>90 (198)</td>
</tr>
<tr>
<td></td>
<td>PV180</td>
<td>180 (10.9)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>PV270</td>
<td>270 (16.5)</td>
<td>172 (379)</td>
</tr>
</tbody>
</table>
Use of Relief Valve
The use of a relief valve, while not mandatory is recommended in the main circuit to suppress hydraulic shock loads and adds additional system protection.

Fluid Recommendations
Premium quality hydraulic oil with a viscosity range between 150-250 SSU (30-50 cst.) at 100°F (38°C). Normal operating viscosity range between 80-1000 SSU (17-180 cst.). Maximum start-up viscosity is 4000 SSU (1000cst.).

Note: Consult Parker when exceeding 160°F (71°C) operation. Oil should have maximum anti-wear properties, rust and oxidation treatment.

Filtration
For maximum pump and system component life, the system should be protected from contamination at a level not to exceed 125 particles greater than 10 microns per milliliter of fluid. (SAE Class 4/ISO 16/13.) Due to the nature of variable displacement pumps, variations in pump inlet conditions, fluid acceleration losses, system aeration, and duty cycle we do not recommend suction line filters. We do recommend the use of a properly sized, in-tank, suction strainer. Contact your Parker representative for assistance.

Start-Up
On initial start-up, the pump case must be filled with fluid. Pressure adjustments should be reduced and the circuit should be open to permit priming.

Special Installations
Consult your Parker representative for any application requiring the following:

Pressure above rated, drive speed above maximum, indirect drive, fluid other than petroleum oil, fluid temperature above 160°F (71°C)

Shaft Rotation and Line Up
Pump and motor shaft alignment must be within .010 TIR maximum, using a standard floating coupling. Please follow coupling manufacturer's recommended installation instructions to prevent end thrust on pump shaft. Turn pump to assure freedom of rotation. Pump and motor must be on a rigid base.

The coupling should be sized to absorb the peak horsepower developed.

Installation and Mounting
When mounting a PV Series Pump, the "case drain" must be on top of the pump. The "case drain" should be a separate line unrestricted to the reservoir and extend below the oil level as far from the inlet as possible. The "case drain" line must not exceed 10 PSI (.69 bar) back pressure.

The "case drain" line should be as large in diameter as possible and as short in length as possible. Suggested maximum line length is 10 ft.

Check that the driving motor rotates in the same direction as indicated by the rotation arrow on the pump.
Variable Volume Piston Pumps
Series PV

Wear protection, wear reduction

Wear protection resp. wear reduction

In hydraulic components there are many gliding contacts partly under high (side) loads. Beside the correct viscosity, which on one hand is responsible for the required supply of lubricating fluid to the gap, on the other hand assures a stable lubricating film, the wear reduction capability of the hydraulic fluid is of major importance.

The describing parameter, the, "Schadenskraftstufe" (load carrying capability), is determined in the FZG-normal test A/8, 3/90 according to DIN 51354 part 2 (gear transmission test rig, 12 defined load steps at 90° C start temperature and 8,3 m/s circumferance speed).

Depending on the nominal working pressure the following FZG Numbers is recommended!

<table>
<thead>
<tr>
<th>nominal pressure bar (PSI)</th>
<th>FZG</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 - 125 (1160 - 1812)</td>
<td>≥ 5</td>
</tr>
<tr>
<td>125 - 200 (1812 - 2900)</td>
<td>5 - 6</td>
</tr>
<tr>
<td>200 - 250 (2900 - 3625)</td>
<td>7 - 9</td>
</tr>
<tr>
<td>250 - 320 (3625 - 4641)</td>
<td>≥ 10</td>
</tr>
<tr>
<td>&gt; 320 (4641)</td>
<td>≥ 12</td>
</tr>
</tbody>
</table>

Max pressure limit: 1.25 x nominal pressure

Mineral oils are offered according to DIN 51524 in different fluid types:

- HL-fluids according to DIN 51524 part 2, normal working load conditions, FZG 6-10.

- HLP-fluids according to DIN 51524 part 3, higher working load conditions, FZG > 10.

Modern HLP-fluids today usually come with a FZG >12. They are equipped with wear prohibiting additives, which ensure a high safety of operation under severe working conditions.