PGP 500 Series
PGM 500 Series
Single or Multiple Aluminum Pumps and Motors

Catalog HY09-0500/US

- Single or Multiple Pumps and Motors
- Continuous Pressures to 4000 psi
- Pump Flows to 37 gpm
- Motors with outputs to over 60 Hp
- Displacement range: 2 - 52cc (.12 - 3.17 cir)
Heavy-Duty Aluminum Pumps and Motors
PGP/PGM 500 Series

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- Consistent quality
- Technical innovation
- Premier customer service

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We manufacture hydraulic components for a wide range of industries including:
- Material Handling
- Construction
- Turf Care
- Forestry
- Agriculture
- Industrial

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## Pump/Motor Products

**PGP/PGM 505**
- Flows to 8 gpm
- Continuous pressures to 4000 psi
- Speeds to 4000 rpm
- Wide variety of integral valve options
- Single and bi-rotational motors
- Flow dividers

**PGP/PGM 511**
- Flows to 19 gpm
- Continuous pressures to 4000 psi
- Speeds to 4000 rpm
- Wide variety of integral valve options
- Single and bi-rotational motors
- Flow dividers

**PGP/PGM 517**
- Flows to 37 gpm
- Continuous pressures to 3600 psi
- Speeds to 3400 rpm
- Wide variety of integral valve options
- Single and bi-rotational motors
- Flow dividers
PGP/PGM 500 Series

- High Performance
- High Efficiency
- High Pressure Operation

PGP/PGM 500 series gear pumps/motors are an advanced performance version of the international “bushing block” style pumps. PGP/PGM 500 series pumps/motors offer superior performance, high efficiency and low noise operation at high operating pressures. They are produced in three frame sizes (PGP/PGM 505, PGP/PGM 511, PGP/PGM 517) with displacements ranging from 2 to 52 cm³ (0.12 to 3.17 in³/rev). A wide variety of standard options are available to meet specific application requirements worldwide.

Advantages

- Up to 275 bar (4000 psi) continuous operation
  High strength materials and large journal diameters provide low bearing loads for high pressure operation.
- Low noise
  PGP/PGM 505 and 517 - 13 tooth gear profile,
  PGP/PGM 511 – 12 tooth gear profile and optimized flow metering provide reduced pressure pulsation and exceptionally quiet operation.

Charateristics

<table>
<thead>
<tr>
<th>Product Features</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Type</td>
<td>Heavy-duty, aluminum, external gear</td>
</tr>
<tr>
<td>Mounting</td>
<td>SAE, rectangular, thru-bolt, and application specific</td>
</tr>
<tr>
<td>Ports</td>
<td>SAE/metric split flange, metric and others</td>
</tr>
<tr>
<td>Shaft Style</td>
<td>SAE splined, keyed, tapered, tang and specials</td>
</tr>
<tr>
<td>Speed</td>
<td>500 - 4000 rpm, see tables on pages 5, 11 and 20.</td>
</tr>
<tr>
<td>Theoretical Displ.</td>
<td>See tables on pages 5, 11 and 20.</td>
</tr>
<tr>
<td>Drive</td>
<td>Drive direct with flexible coupling is recommended.</td>
</tr>
<tr>
<td>Axial / Radial Load</td>
<td>Units subject to axial or radial loads should be specified with an outboard bearing. Please contact Product Support for assistance.</td>
</tr>
<tr>
<td>Inlet Pressure</td>
<td>Operating range - 0.8 to 2 bar (12-29 psig). Minimum inlet pressure 0.5 bar (7.25 psig).</td>
</tr>
<tr>
<td>Outlet Pressure</td>
<td>See tables on pages 5, 11 and 20.</td>
</tr>
<tr>
<td>Fluids</td>
<td>Mineral oil, fire resistant fluids: - water-oil emulsions 60/40, HFB - water-glycol, HFC - phosphate-esters, HFD</td>
</tr>
<tr>
<td>Fluid Temperature</td>
<td>Range of operating temperature -15 to +80°C (5 to 176°F). Max. permissible operating pressure dependent on fluid temperature. Temperature for cold start -20 to -15°C (-4 to 5°F) at speed ≤1500 rpm. Max. permissible operating pressure dependent on fluid temperature.</td>
</tr>
<tr>
<td>Fluid Viscosity</td>
<td>Range of operating viscosity 8 to 1000 mm²/s max. Permissible operating pressure dependent on viscosity. Viscosity range for cold start 1000 to 2000 centistokes at operating pressure ≤10 bar (145 psi) and speed ≤1500 rpm.</td>
</tr>
<tr>
<td>Range of Ambient Temperature</td>
<td>-40°C to +70°C (-40°F to 158°F)</td>
</tr>
<tr>
<td>Filtration</td>
<td>According to ISO 4406 Cl. 16/13</td>
</tr>
<tr>
<td>Direction of Rotation (looking at the driveshaft)</td>
<td>Clockwise, counter-clockwise or birotational. Note: Drive pump or motor only in indicated direction of rotation.</td>
</tr>
<tr>
<td>Multiple Pump Assemblies</td>
<td>- Available in two, three or four section configurations. - Max. shaft loading must conform to the limitations shown in the shaft loading rating tables on pages 8,15 and 24 in this catalog. - Max. load is determined by adding the torque values for each pumping section that will be simultaneously loaded.</td>
</tr>
<tr>
<td>Separate or Common Inlet Capability</td>
<td>Separate inlet configuration: - Each gear housing has individual inlet and outlet ports. Common inlet configuration: - Two gear sets share a common inlet. - Inlet port can be in either section.</td>
</tr>
</tbody>
</table>

---

**Advantages**

- **High efficiency**
  Pressure balanced bearing blocks assure maximum efficiency under all operating conditions.
- **Application flexibility**
  International mounts and connections, integrated valve capabilities and common inlet multiple pump configurations provide unmatched design and application versatility.
### PGP/PGM 505 Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
<th>0020</th>
<th>0030</th>
<th>0040</th>
<th>0050</th>
<th>0060</th>
<th>0070</th>
<th>0080</th>
<th>0090</th>
<th>1000</th>
<th>1010</th>
<th>1020</th>
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<tbody>
<tr>
<td>Displacements</td>
<td>cm³/rev</td>
<td>2.0</td>
<td>3.0</td>
<td>4.0</td>
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<td>8.0</td>
<td>9.0</td>
<td>10.0</td>
<td>11.0</td>
<td>12.0</td>
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<td></td>
<td>in³/rev</td>
<td>0.12</td>
<td>0.18</td>
<td>0.24</td>
<td>0.31</td>
<td>0.37</td>
<td>0.43</td>
<td>0.49</td>
<td>0.55</td>
<td>0.61</td>
<td>0.67</td>
<td>0.73</td>
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<td>Continuous Pressure</td>
<td>bar</td>
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<td>3988</td>
<td>3988</td>
<td>3625</td>
<td>3625</td>
<td>3190</td>
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<td>Intermittent Pressure</td>
<td>bar</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
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<td>4350</td>
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<td>3988</td>
<td>3988</td>
<td>3190</td>
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<td>Minimum Speed @ Max. Outlet Pressure</td>
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<td>500</td>
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<td>500</td>
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<tr>
<td>Maximum Speed @ 0 Inlet &amp; Max. Outlet Pressure</td>
<td>rpm</td>
<td>4000</td>
<td>4000</td>
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<td>4000</td>
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<td>3600</td>
<td>2900</td>
<td>2900</td>
<td>2400</td>
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<tr>
<td>Pump Input Power @ 1500 rpm</td>
<td>kW</td>
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<td>2.3</td>
<td>3.0</td>
<td>3.8</td>
<td>4.5</td>
<td>5.3</td>
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<td>6.9</td>
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<td>HP</td>
<td>2.68</td>
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<td>4.02</td>
<td>5.10</td>
<td>6.03</td>
<td>7.11</td>
<td>8.05</td>
<td>8.72</td>
<td>9.25</td>
<td>10.19</td>
<td>11.26</td>
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<td>Dimension &quot;L&quot;</td>
<td>mm</td>
<td>38.4</td>
<td>41.1</td>
<td>43.8</td>
<td>46.5</td>
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<td>51.8</td>
<td>54.5</td>
<td>57.0</td>
<td>59.8</td>
<td>62.5</td>
<td>65.2</td>
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<tr>
<td></td>
<td>in</td>
<td>1.51</td>
<td>1.62</td>
<td>1.72</td>
<td>1.83</td>
<td>1.93</td>
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<td>2.15</td>
<td>2.24</td>
<td>2.35</td>
<td>2.46</td>
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<tr>
<td>Approximate Weight 1)</td>
<td>kg</td>
<td>1.72</td>
<td>2.22</td>
<td>2.27</td>
<td>2.32</td>
<td>2.38</td>
<td>2.43</td>
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<td>2.53</td>
<td>2.58</td>
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<td></td>
<td>LB</td>
<td>3.80</td>
<td>4.91</td>
<td>5.02</td>
<td>5.13</td>
<td>5.26</td>
<td>5.37</td>
<td>5.48</td>
<td>5.59</td>
<td>5.70</td>
<td>5.81</td>
<td>5.92</td>
</tr>
</tbody>
</table>

1) Single pump with Shaft End Cover D3 and non ported Port End Cover.

### PGP/PGM 505 Dimensions

#### Single Unit PGP/PGM 505

![Single Unit PGP/PGM 505 Diagram]

#### Single Unit PGP/PGM 505 with rear ports

![Single Unit PGP/PGM 505 with rear ports Diagram]

#### Tandem Unit PGP/PGM 505

![Tandem Unit PGP/PGM 505 Diagram]

**NOTE:**
- Dimension "F" see shaft end covers on page 6
- Dimension "L" see table above

**Notes:**
- 1. Dimensions are in millimeters.
- 2. Dimensions are nominal except where noted.
- 3. Subscript and/or superscript numbers are tolerances.
- 4. To convert from millimeters to inches, divide millimeters by 25.4.
PGP/PGM 505 Shaft End Covers

Code A1

Code H1

Code D2

Code H2

Code D3

Notes: 1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.
PGP/PGM 505 Porting

**Code D**
SAE straight thread
See table below for specific port dimensions.

![Diagram of Code D](image)

**Code K5**
4-Bolt flange

![Diagram of Code K5](image)

Notes:
1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.

### PGP/PGM 505

<table>
<thead>
<tr>
<th>Code</th>
<th>G1</th>
<th>G2</th>
<th>T1</th>
<th>Ø D</th>
<th>S</th>
<th>Ø B</th>
<th>T2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread</td>
<td>Dimensions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td>9/16&quot;-18 UNF</td>
<td>12.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D3</td>
<td>3/4&quot;-16 UNF</td>
<td>14.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D4</td>
<td>7/8&quot;-14 UNF</td>
<td>16.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>D5</td>
<td>1 1/16&quot;-12 UN</td>
<td>19.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K5</td>
<td>1/4&quot;-20 UNC</td>
<td>25.15</td>
<td>14.2</td>
<td>13.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Heavy-Duty Aluminum Pumps and Motors
PGP/PGM 500 Series

PGP/PGM 505 Drive Shaft

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Style</th>
<th>Torque Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>9T, 16/32 Pitch, SAE “A”</td>
<td>Spline</td>
<td>108Nm/954 in-lb</td>
</tr>
<tr>
<td>J1</td>
<td>Ø 12.7,3.2 Key, No thread, 38L</td>
<td>Parallel</td>
<td>43Nm/380in-lb</td>
</tr>
<tr>
<td>K1</td>
<td>Ø 15.88, 4.0 Key, No Thread, 32L, SAE “A”</td>
<td>Parallel</td>
<td>85Nm/751in-lb</td>
</tr>
<tr>
<td>Q1</td>
<td>Ø 12.70, 2.4 Key, M 8x1.25, 7.6L</td>
<td>1.8 Taper</td>
<td>43Nm/380in-lb</td>
</tr>
<tr>
<td>Q2</td>
<td>Ø 14.25, 3.0 Key, M 10x1, 5.5L</td>
<td>1.8 Taper</td>
<td>68Nm/600in-lb</td>
</tr>
<tr>
<td>V4</td>
<td>11x2.8,1/4UNF</td>
<td>Tang</td>
<td>44Nm/389in-lb</td>
</tr>
</tbody>
</table>

When applying a multiple section pump, the maximum drive shaft load is determined by adding the torque values for each pumping section that will be simultaneously loaded.

Notes:
1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.

Torque [in-lb] = \( \frac{\text{Displacement} [\text{in}^3/\text{rev}] \times \text{Pressure} [\text{psi}]}{5.72} \)

Torque [Nm] = \( \frac{\text{Displacement} [\text{cc/rev}] \times \text{Pressure} [\text{bar}]}{57.2} \)
**PGP/PGM 505 - 3.0 CC**
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

**PGP/PGM 505 - 6.0 CC**
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

**PGP/PGM 505 - 10.0 CC**
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

**PGP/PGM 505 - 12.0 CC**
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

Performance data shown is based upon a series of laboratory tests and is not representative of any one unit.
Heavy-Duty Aluminum Pumps and Motors
PGP/PGM 500 Series

PGP/PGM 505 How to Specify

Box 1 Pump/Motor
- P: Pump
- M: Motor

Boxes 2,15 Unit
- A: Single unit Standard Motor w/o checks
- B: Multiple unit Standard Motor w/ two checks
- C: Standard Motor w/one anti cavitation check (ACC)
- M: Single distributor unit
- N: Multiple distributor unit

Boxes 3,16 Displacement
- 0020: 2.0 ccm
- 0030: 3.0 ccm
- 0040: 4.0 ccm
- 0050: 5.0 ccm
- 0060: 6.0 ccm
- 0070: 7.0 ccm
- 0080: 8.0 ccm
- 0100: 10.0 ccm
- 0110: 11.0 ccm
- 0120: 12.0 ccm

Boxes 4 Rotation
- C: Clockwise
- A: Counter clockwise
- B: Bi-directional

Box 5 Shaft
- A1: 9T, 16/32 Pitch, 32L, SAE "A" spline
- A2: 9T, 20/40 Pitch, 27L, SAE "AA" spline
- J1: Ø12.7, 3.2 Key, no thread, 38L, parallel
- K1: Ø15.88, 4.0 Key, no thread, 32L, SAE "A", parallel
- Q1: Ø12.7, 7.6L, 2.4 Key, M8x1.25, taper 1:8
- Q2: Ø14.25, 5.5L, 3.0 Key, M10x1, taper 1:8
- V4: 11x2.8, 1/4UNF for flange code A1, tang drive

Box 6 Shaft End Covers
- A1: 50.8x50.8 - Ø45.25 4bolt square flange
- D2: 56.0x73.0 - Ø30.0 rectangular
- D3: 71.4x96.0 - Ø36.47 rectangular
- H1: 82.5 - Ø50.8 SAE "A-A" 2bolt flange
- H2: 106.4 - Ø82.55 SAE "A" 2bolt flange

Boxes 7,17 Shaft Seal
- X: No seal
- N: NBR
- V: FPM, FKM
- M: Double NBR
- W: Double FPM

NOTES:
1. Only coded for the last section.
2. Only for motors
3. For further "B" triple unit repeat displacement, shaft seal between sections, side suction port, side pressure port, rear suction port, rear pressure port.
4. Dimensions are in millimeters except where noted.

Example:
- Gear Design: P505
- Box 1 (P505)
- Box 2 (P505)
- Box 3 (P505)
- Box 4 (P505)
- Box 5 (P505)
- Box 6 (P505)
- Box 7 (P505)
- Box 8 (P505)
- Box 9 (P505)
- Box 10 (P505)
- Box 11 (P505)
- Box 12 (P505)
- Box 13 (P505)
- Box 14 (P505)
- Box 15 (P505)
- Box 16 (P505)
- Box 17 (P505)
- Box 18 (P505)
- Box 19 (P505)
- Box 20 (P505)
- Box 21 (P505)
- Box 22 (P505)

Boxes 8,9,10,11,18,19,20,21 Port Options
- B1: No ports
- D2: 9/16" - 18 UNF thread
- D3: 3/4" - 16 UNF thread
- D4*: 7/8" - 14 UNF thread
- K5*: 14.2mm, 25.15, 1/4" - 20UNC, square flange
- *Not usable for rear ports

Box 12 Motor Drain Option
- B1: No drain
- A: 7/16"-20 UNF thread
- C: 9/16"-18 UNF thread

Box 13 Drain Position
- 2: Drain on bottom
- 3: Drain on top
- 4: Rear drain

Box 14 Section Connection
- S: Separate inlets
- C: Common inlets
# PGP/PGM 511 Specifications

### PGP/PGM 511 Dimensions

#### Single Unit PGP/PGM 511

<table>
<thead>
<tr>
<th>Description</th>
<th>Code</th>
<th>0060</th>
<th>0070</th>
<th>0080</th>
<th>0100</th>
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<tr>
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<td>Maximum Speed @ 0 Inlet &amp; Max. Outlet Pressure</td>
<td>rpm</td>
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<td>4000</td>
<td>4000</td>
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<td>Pump Input Power @ Max. Pressure and 1500 rpm</td>
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</table>

1) Single pump with Shaft End Cover Q1 and non ported Port End Cover.

### PGP/PGM 511 with rear ports

#### Tandem Unit PGP/PGM 511

**NOTE:**
- Dimension "F" see shaft end covers on page 12
- Dimension "L" see table above

**Notes:**
1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.
Heavy-Duty Aluminum Pumps and Motors
PGP/PGM 500 Series

PGP/PGM 511 Shaft End Covers

Code D3

Code H3

Code D4

Code Q1

Code H2

Code Q3

Notes: 1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.
PGP/PGM 511 Porting

**Code D**
SAE straight thread
See table at right for specific port dimensions.

**Code H**
ISO metric straight
See table at right for specific port dimensions.

<table>
<thead>
<tr>
<th>Code</th>
<th>G1 Thread</th>
<th>T1 Dimensions</th>
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<tbody>
<tr>
<td>D2</td>
<td>9/16&quot;-18 UNF</td>
<td>12.7</td>
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<tr>
<td>D3</td>
<td>3/4&quot;-16 UNF</td>
<td>14.3</td>
</tr>
<tr>
<td>D4</td>
<td>7/8&quot;-14 UNF</td>
<td>16.7</td>
</tr>
<tr>
<td>D5</td>
<td>1 1/16&quot;-12 UN</td>
<td>19.0</td>
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<tr>
<td>D6</td>
<td>1 5/16&quot;-12 UN</td>
<td>19.0</td>
</tr>
<tr>
<td>D7</td>
<td>1 5/8&quot;-12 UN</td>
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<tr>
<td>D8</td>
<td>1 7/8&quot;-12 UN</td>
<td>19.0</td>
</tr>
<tr>
<td>H1</td>
<td>M 14x1.5</td>
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</tr>
<tr>
<td>H2</td>
<td>M 16x1.5</td>
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<tr>
<td>H3</td>
<td>M 18x1.5</td>
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<tr>
<td>H4</td>
<td>M 22x1.5</td>
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<tr>
<td>H6</td>
<td>M 27x2</td>
<td>19.0</td>
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<tr>
<td>H8</td>
<td>M 33x2</td>
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<table>
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<th>Code</th>
<th>G2 Thread</th>
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<th>C</th>
<th>W</th>
<th>T2</th>
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<tr>
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<td>5/16&quot;-18 UNC</td>
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<td>38.10</td>
<td>17.48</td>
<td>15.0</td>
</tr>
<tr>
<td>N2</td>
<td>3/8&quot;-16 UNC</td>
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<td>22.23</td>
<td>14.0</td>
</tr>
<tr>
<td>N3</td>
<td>3/8&quot;-16 UNC</td>
<td>25.4</td>
<td>52.37</td>
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<td>20.6</td>
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<tr>
<td>N4</td>
<td>7/16&quot;-14 UNC</td>
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<td>58.72</td>
<td>30.17</td>
<td>20.6</td>
</tr>
<tr>
<td>P1</td>
<td>M 8x1.25</td>
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<td>38.10</td>
<td>17.48</td>
<td>15.0</td>
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<td>P2</td>
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<td>20.6</td>
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<td>26.19</td>
<td>21.4</td>
</tr>
<tr>
<td>P4</td>
<td>M 10x1.50</td>
<td>31.8</td>
<td>58.72</td>
<td>30.17</td>
<td>20.6</td>
</tr>
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<td>P5</td>
<td>M 12x1.75</td>
<td>38.1</td>
<td>69.82</td>
<td>35.71</td>
<td>20.6</td>
</tr>
</tbody>
</table>

Notes: 1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.
PGP/PGM 511 Drive Shaft

**Code A1**
- Spline SAE "A" 9T - 16/32 Pitch
- Flat root side fit

**Code C1**
- Spline SAE 13-4 11T - 16/32 Pitch
- Flat root side fit

**Code B1**
- Spline SAE 16-4 10T - 16/32 Pitch
- Flat root side fit

**Code C2**
- Spline SAE 13-4 11T - 16/32 Pitch
- Flat root side fit

**Code B2**
- Spline SAE 16-4 10T - 16/32 Pitch
- Flat root side fit

**Code K1**
- Square key 4x4x19

**Code K4**
- Square key 4x4x19

**Notes:**
1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.
### PGP/PGM 511 Drive Shaft

#### Code L1

![Diagram of Code L1](image1)

- **Square key**: 4.8x4.8x22.2
- **Spring washer, Nut**

#### Code L6

![Diagram of Code L6](image2)

- **Square key**: 4.8x4.8x22.2

#### Code R1

![Diagram of Code R1](image3)

- **Woodruff Key**: 4x8.5 DIN 5888
- **Taper**: 1:8

#### Code V5

![Diagram of Code V5](image4)

- **Tandem pump Connecting Shaft**

### PGP/PGM 511 - Shaft Load Capacity

<table>
<thead>
<tr>
<th>Code</th>
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<th>Torque Rating</th>
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<td>Spline</td>
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<tr>
<td>B1</td>
<td>10T, 16/32 Pitch, 32L, SAE “A”</td>
<td>Spline</td>
<td>124Nm/1095in-lb</td>
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<tr>
<td>B2</td>
<td>10T, 16/32 Pitch, 38.2L, SAE “A”</td>
<td>Spline</td>
<td>124Nm/1095in-lb</td>
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<tr>
<td>C1</td>
<td>11T, 16/32 Pitch, 38.2L, SAE 19-4</td>
<td>Spline</td>
<td>184Nm/1625in-lb</td>
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<tr>
<td>C2</td>
<td>11T, 16/32 Pitch, 38.2L, SAE 19-4</td>
<td>Spline</td>
<td>184Nm/1625in-lb</td>
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<tr>
<td>K1</td>
<td>Ø 15.88 4.0 Key, no thread, 32L, SAE “A”</td>
<td>Parallel</td>
<td>75Nm/662in-lb</td>
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<td>K4</td>
<td>Ø 15.88, 3.95 Key, no thread, 58.7L</td>
<td>Parallel</td>
<td>75Nm/662in-lb</td>
</tr>
<tr>
<td>L1</td>
<td>Ø 17.46, 4.8 Key, 7/16UNF ext., 44.2L</td>
<td>Parallel</td>
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<td>L6</td>
<td>Ø 19.05, 4.8 Key, no thread, 32L, SAE 19-1</td>
<td>Parallel</td>
<td>145Nm/1280in-lb</td>
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<tr>
<td>R1</td>
<td>Ø 15.9, 43.8L, 4.0 Key, ¼UNF, SAE “A”</td>
<td>1:8 Taper</td>
<td>156Nm/1377in-lb</td>
</tr>
<tr>
<td>V5</td>
<td>8x6.6 Short Shaft</td>
<td>Tang Drive</td>
<td>60Nm/530in-lb</td>
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<tr>
<td></td>
<td>Tandem pump Connecting Shaft</td>
<td>Spline</td>
<td>110Nm/971in-lb</td>
</tr>
</tbody>
</table>

**Notes:**
1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.

When applying a multiple section pump, the maximum drive shaft load is determined by adding the torque values for each pumping section that will be simultaneously loaded.

**Torque [in-lb]** = \[
\frac{\text{Displacement [in}^3/\text{rev}] \times \text{Pressure [psi]}}{5.72}
\]

**Torque [Nm]** = \[
\frac{\text{Displacement [cc/rev] \times \text{Pressure [bar]}}}{57.2}
\]
Heavy-Duty Aluminum Pumps and Motors
PGP/PGM 500 Series

PGP/PGM 511 - 6.0 CC
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

PGP/PGM 511 - 10.0 CC
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

Performance data shown is based upon a series of laboratory tests and is not representative of any one unit.
### PGP/PGM 511 How to Specify

#### Boxes 3,16 Displacement

<table>
<thead>
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<tr>
<td>0310</td>
<td>31.0</td>
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</table>

#### Box 4 Rotation

- **A**: Counter clockwise
- **C**: Clockwise
- **B**: Bi-directional

#### Box 5 Shaft

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>A1</td>
<td>9T, 16/32 Pitch, 32L, SAE &quot;A&quot; spline</td>
</tr>
<tr>
<td>B1</td>
<td>10T, 16/32 Pitch, 32L spline</td>
</tr>
<tr>
<td>B2</td>
<td>10T, 16/32 Pitch, 38.2L spline</td>
</tr>
<tr>
<td>C1</td>
<td>11T, 16/32 Pitch, 38.2L, SAE 19-4 spline</td>
</tr>
<tr>
<td>C2</td>
<td>11T, 16/32 Pitch, 32.2L, SAE 19-4 spline</td>
</tr>
<tr>
<td>K1</td>
<td>Ø15.88, 4.0 Key, no thread, 32L, SAE &quot;A&quot;, parallel</td>
</tr>
<tr>
<td>K4</td>
<td>Ø15.88, 4.0 Key, no thread, 58.7L, parallel</td>
</tr>
<tr>
<td>L1</td>
<td>Ø17.46, 4.8 Key, 7/16&quot; UNF ext., 44.7L, parallel</td>
</tr>
<tr>
<td>L6</td>
<td>Ø19.05, 4.8 Key, no thread, 32L, parallel</td>
</tr>
<tr>
<td>R1</td>
<td>Ø15.9, 8.0L, 4.0 Key, 1/2&quot; UNF, SAE &quot;A&quot;, taper 1.8</td>
</tr>
<tr>
<td>V5</td>
<td>8x6.5 short shaft, tang drive</td>
</tr>
</tbody>
</table>

#### NOTES:

1. Only coded for the last section.
2. Only for motors
3. For further "B" triple unit repeat displacement, shaft seal between sections, side suction port, side pressure port, rear suction port, rear pressure port.
# PGP/PGM 511 How to Specify

## Boxes 6, Shaft End Covers
- **D3**: 71.4x96.0 - Ø36.47 rectangular
- **D4**: 72.0x100.0 - Ø80 rectangular
- **H2**: 106.4 - Ø82.55 SAE "A" 2bolt flange
- **H3**: 146.1 - Ø101.6 SAE "B" 2bolt flange
- **Q1**: 60.0x60.0 - Ø52.0 w/o seal, O’ thrubolt flange
- **Q2**: 60.0x60.0 - Ø52.0 w/ seal, O’ thrubolt flange
- **Q3**: 60.0x60.0 - Ø52.0 w/o seal, O’ thrubolt flange
- **Q4**: 60.0x60.0 - Ø52.0 w/ seal, O’ thrubolt flange
- **J5**: H2 with slots, spec 2b bolt
- **F3**: 71.4x96.0 - Ø36.47 rect., w. OBB and cont. drive shaft
- **F4**: 72.0x100.0 - Ø80.0 rect., w. OBB and cont. drive shaft
- **L2**: 106.4 - Ø82.55 SAE "A" 2bolt, w. OBB + cont. drive shaft
- **L3**: 146.1 - Ø101.6 SAE "B" 2bolt, w. OBB + cont. drive shaft
- **L5**: 106.4 - Ø82.55 SAE "A" 2bolt, w. OBB + int. drive shaft
- **L6**: 146.1 - Ø101.6 SAE "B" 2bolt, w. OBB + int. drive shaft

## Boxes 8, 9, 10, 11, 18, 19, 20, 21, Port Options
- **Box Options**
  - **D1**: No ports
  - **D2**: 9/16” - 18 UNF thread
  - **D3**: 3/4” - 16 UNF thread
  - **D4**: 7/8” - 14 UNF thread
  - **D5**: 1 1/16” - 12UN thread
  - **D6**: 1 5/16” - 12 UN thread
  - **D7**: 1 5/8” - 12 UN thread
  - **D8**: 1 7/8” - 12 UN thread
  - **H1**: M 14x1.5 thread
  - **H2**: M 16x1.5 thread
  - **H3**: M 18x1.5 thread
  - **H4**: M 22x1.5 thread
  - **H5**: M 27x2 thread
  - **H6**: M 33x2 thread
  - **Q1**: 60.0x60.0 - Ø52.0 w/o seal, O’ thrubolt flange
  - **Q2**: 60.0x60.0 - Ø52.0 w/ seal, O’ thrubolt flange
  - **Q3**: 60.0x60.0 - Ø52.0 w/o seal, O’ thrubolt flange
  - **Q4**: 60.0x60.0 - Ø52.0 w/ seal, O’ thrubolt flange
  - **J5**: H2 with slots, spec 2b bolt
  - **F3**: 71.4x96.0 - Ø36.47 rect., w. OBB and cont. drive shaft
  - **F4**: 72.0x100.0 - Ø80.0 rect., w. OBB and cont. drive shaft
  - **L2**: 106.4 - Ø82.55 SAE "A" 2bolt, w. OBB + cont. drive shaft
  - **L3**: 146.1 - Ø101.6 SAE "B" 2bolt, w. OBB + cont. drive shaft
  - **L5**: 106.4 - Ø82.55 SAE "A" 2bolt, w. OBB + int. drive shaft
  - **L6**: 146.1 - Ø101.6 SAE "B" 2bolt, w. OBB + int. drive shaft

## Boxes 12, Motor Drain Option
- **B1**: No drain
- **B2**: 9/16 - 18 UNF thread
- **B3**: 3/4 - 16 UNF thread
- **B4**: 7/8 - 14 UNF thread
- **B5**: 1 1/16 - 12 UN thread
- **B6**: 1 5/16 - 12 UN thread
- **B7**: 1 5/8 - 12 UN thread
- **B8**: 1 7/8 - 12 UN thread

## Box 13, Drain Position
- **2** Drain on bottom
- **3** Drain on top
- **4** Rear drain
- **5** Drain right view on drive shaft
- **6** Drain left view on drive shaft

## Box 14, Section Connection
- **S** Separate inlets
- **C** Common inlets

## Notes
1. Only coded for the last section.
2. Only for motors
3. For further "B" triple unit repeat displacement, shaft seal between sections, side suction port, side pressure port, rear suction port, rear pressure port.
**Heavy-Duty Aluminum Pumps and Motors**

**PGP/PGM 500 Series**

**PGP/PGM 517 Specifications**

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<th>Description Code</th>
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<td>19</td>
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<td>38</td>
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<td>in³/rev</td>
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<td>Continuous Pressure bar</td>
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<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>250</td>
<td>220</td>
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<td>psi</td>
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<td>3625</td>
<td>3625</td>
<td>3625</td>
<td>3625</td>
<td>3625</td>
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<td>Intermittent Pressure bar</td>
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<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
<td>275</td>
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<td>255</td>
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<td>3988</td>
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<td>3988</td>
<td>3698</td>
<td>3190</td>
<td>3118</td>
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<tr>
<td>Minimum Speed @ Max. Outlet Pressure rpm</td>
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<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Maximum Speed @ 0 Inlet &amp; Max. Outlet Pressure rpm</td>
<td>3400</td>
<td>3400</td>
<td>3300</td>
<td>3300</td>
<td>3100</td>
<td>3100</td>
<td>3000</td>
<td>3000</td>
<td>2800</td>
<td>2600</td>
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<tr>
<td>Pump Input Power @ Max. Pressure and 1500 rpm kW</td>
<td>9.6</td>
<td>11</td>
<td>13.1</td>
<td>15.8</td>
<td>17.2</td>
<td>19.3</td>
<td>22.7</td>
<td>24.6</td>
<td>26.1</td>
<td>27</td>
<td>28.6</td>
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<td>HP</td>
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<td>32.99</td>
<td>35.00</td>
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<tr>
<td>Dimension “L” mm</td>
<td>68.3</td>
<td>70.3</td>
<td>73.3</td>
<td>77.4</td>
<td>79.4</td>
<td>82.4</td>
<td>87.5</td>
<td>90.5</td>
<td>92.5</td>
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<tr>
<td>in</td>
<td>2.69</td>
<td>2.77</td>
<td>2.89</td>
<td>3.05</td>
<td>3.13</td>
<td>3.24</td>
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<td>3.56</td>
<td>3.64</td>
<td>3.88</td>
<td>4.20</td>
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<tr>
<td>Approximate Weight* kg</td>
<td>7.92</td>
<td>8</td>
<td>8.12</td>
<td>8.29</td>
<td>8.37</td>
<td>8.5</td>
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<td>LB</td>
<td>17.50</td>
<td>17.68</td>
<td>17.95</td>
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<td>18.50</td>
<td>18.79</td>
<td>19.23</td>
<td>19.51</td>
<td>19.69</td>
<td>20.24</td>
<td>20.97</td>
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</tr>
</tbody>
</table>

*Single pump with Shaft End Cover H3 and non ported Port End Cover.

**PGP/PGM 517 Dimensions**

**Single Unit PGP/PGM 517**

**Single Unit PGP/PGM 517 with rear ports**

**Tandem Unit PGP/PGM 517**

**NOTE:**
- Dimension "F" see shaft end covers on page 21
- Dimension "L" see table above

**Notes:**
1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.
PGP/PGM 517 Shaft End Covers

Code D5

Code H2/L2

Code D6

Code H3

Code D7

Notes: 1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.
PGP/PGM 517 Porting

Code D
SAE straight thread
See table below for specific port dimensions.

<table>
<thead>
<tr>
<th>Code</th>
<th>G1</th>
<th>T1</th>
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</thead>
<tbody>
<tr>
<td>D2</td>
<td>9/16&quot;-18 UNF</td>
<td>12.7</td>
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<tr>
<td>D3</td>
<td>3/4&quot;-16 UNF</td>
<td>14.3</td>
</tr>
<tr>
<td>D4</td>
<td>7/8&quot;-14 UNF</td>
<td>16.7</td>
</tr>
<tr>
<td>D5</td>
<td>1 1/16&quot;-12 UN</td>
<td>19.0</td>
</tr>
<tr>
<td>D6</td>
<td>1 5/16&quot;-12 UN</td>
<td>19.0</td>
</tr>
<tr>
<td>D7</td>
<td>1 5/8&quot;-12 UN</td>
<td>19.0</td>
</tr>
<tr>
<td>D8</td>
<td>1 7/8&quot;-12 UN</td>
<td>19.0</td>
</tr>
</tbody>
</table>

Code N
SAE split flange
See table below for specific port dimensions.

Code P
SAE split flange metric thread
See table below for specific port dimensions.

<table>
<thead>
<tr>
<th>Code</th>
<th>Ø B</th>
<th>C</th>
<th>W</th>
<th>T2</th>
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</thead>
<tbody>
<tr>
<td>N1</td>
<td>5/16&quot;-18 UNC</td>
<td>12.7</td>
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<tr>
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<td>3/8&quot;-16 UNC</td>
<td>19.0</td>
<td>47.63</td>
<td>22.23</td>
</tr>
<tr>
<td>N3</td>
<td>7/16&quot;-14 UNC</td>
<td>25.4</td>
<td>52.37</td>
<td>26.19</td>
</tr>
<tr>
<td>N4</td>
<td>1/2&quot;-13 UNC</td>
<td>31.8</td>
<td>58.72</td>
<td>30.17</td>
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<tr>
<td>N5</td>
<td>M 8x1.25</td>
<td>38.1</td>
<td>69.82</td>
<td>35.71</td>
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<tr>
<td>P1</td>
<td>M 10x1.50</td>
<td>12.7</td>
<td>38.10</td>
<td>17.48</td>
</tr>
<tr>
<td>P2</td>
<td>M 10x1.50</td>
<td>19.0</td>
<td>47.63</td>
<td>22.23</td>
</tr>
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<td>P3</td>
<td>M 12x1.75</td>
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<td>52.37</td>
<td>26.19</td>
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<tr>
<td>P4</td>
<td>M 12x1.75</td>
<td>31.8</td>
<td>58.72</td>
<td>30.17</td>
</tr>
<tr>
<td>P5</td>
<td>M 12x1.75</td>
<td>38.1</td>
<td>69.82</td>
<td>35.71</td>
</tr>
</tbody>
</table>

Notes: 1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches,
   divide millimeters by 25.4.
PGP/PGM 517 Drive Shaft

Code D1

- Spline SAE “B”
- 13T - 16/32 pitch
- Flat root side fit

Code E1

- Spline SAE “B-B”
- 15T - 16/32 pitch
- Flat root side fit

Code M1

- Square key
- 6.3x6.3x25.4

Code M2

- Square key
- 6.3x6.3x31.7

Notes:
1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.
Heavy-Duty Aluminum Pumps and Motors
PGP/PGM 500 Series

PGP/PGM 517 Drive Shaft

Code T1

![Diagram of Drive Shaft T1 with dimensions and components]

Notes: 1. Dimensions are in millimeters.
2. Dimensions are nominal except where noted.
3. Subscript and/or superscript numbers are tolerances.
4. To convert from millimeters to inches, divide millimeters by 25.4.

PGP/PGM 517 - Shaft Load Capacity

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Style</th>
<th>Torque Rating</th>
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</thead>
<tbody>
<tr>
<td>D1</td>
<td>13T, 16/32 Pitch, 41.2L, SAE &quot;B&quot;</td>
<td>Spline</td>
<td>345Nm/3046in-lb</td>
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<tr>
<td>E1</td>
<td>15T, 16/32 Pitch, 46L, SAE &quot;B-B&quot;</td>
<td>Spline</td>
<td>530Nm/4680in-lb</td>
</tr>
<tr>
<td>M1</td>
<td>Ø 22.2, 6.3 Key, no thread, 41.2L, SAE &quot;B&quot;</td>
<td>Parallel</td>
<td>251Nm/2216in-lb</td>
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<tr>
<td>M2</td>
<td>Ø 25.4, 6.3 Key, no thread, 46L, SAE &quot;B-B&quot;</td>
<td>Parallel</td>
<td>395Nm/3488in-lb</td>
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<tr>
<td>T1</td>
<td>Ø 21.59, 46.5L, 4.0 Key, M14x1.5, 1:8 Taper</td>
<td>Spline</td>
<td>228Nm/2013in-lb</td>
</tr>
</tbody>
</table>

When applying a multiple section pump, the maximum drive shaft load is determined by adding the torque values for each pumping section that will be simultaneously loaded.

\[
\text{Torque [in-lb]} = \frac{\text{Displacement [in}^3/\text{rev}] \times \text{Pressure [psi]}}{5.72}
\]

\[
\text{Torque [Nm]} = \frac{\text{Displacement [cc/rev] \times \text{Pressure [bar]}}}{57.2}
\]
Heavy-Duty Aluminum Pumps and Motors
PGP/PGM 500 Series

PGP/PGM 517 - 14.0 CC
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

PGP/PGM 517 - 25.0 CC
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

PGP/PGM 517 - 44.0 CC
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

PGP/PGM 517 - 52.0 CC
Fluid Temperature = 45± 2°C
Viscosity = 36mm²/s
Inlet Pressure = 0.9 + 0.1 bar absolute

Performance data shown is based upon a series of laboratory tests and is not representative of any one unit.
**Heavy-Duty Aluminum Pumps and Motors**

**PGP/PGM 517 How to Specify**

<table>
<thead>
<tr>
<th>Gear Design</th>
<th>Box 1 Pump/Motor</th>
<th>Box 2 Shaft</th>
<th>Box 3 Shaft End Covers</th>
<th>Box 4 Rotation</th>
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</thead>
<tbody>
<tr>
<td>PG</td>
<td>Pump</td>
<td>D1</td>
<td>D5</td>
<td>C</td>
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<tr>
<td></td>
<td>M Motor</td>
<td>E1</td>
<td>D6</td>
<td>A</td>
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<td>(1)</td>
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<td>D7</td>
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<td>H2</td>
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<td>T1</td>
<td>H3</td>
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**Notes:**
1. Only coded for the last section.
2. Only for motors
3. For further "B" triple unit repeat displacement, shaft seal between sections. side suction port, side pressure port, rear suction port, rear pressure port.

**Boxes 8,9,10,11,18,19,20,21 Port Options**

<table>
<thead>
<tr>
<th>Port Options</th>
<th>B1 No ports</th>
<th>D3 3/4&quot; - 16 UNF thread</th>
<th>D4 7/8&quot; - 14 UNF thread</th>
<th>D5 1 1/16&quot; - 12UN thread</th>
<th>D6 1 5/16&quot; - 12 UN thread</th>
<th>D7* 1 5/8&quot; - 12 UN thread</th>
<th>D8* 1 7/8&quot; - 12 UN thread</th>
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**Boxes 3,16 Displacement**

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<td>0190</td>
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**Boxes 7,17 Shaft Seal**

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<td>W</td>
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**Boxes 12 Motor Drain Option**

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</tr>
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<td>P</td>
<td>M12x1.5 metric thread</td>
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**Boxes 13 Drain Position**

<table>
<thead>
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<th>2</th>
<th>Drain on bottom</th>
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<tbody>
<tr>
<td>3</td>
<td>Drain on top</td>
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<tr>
<td>4</td>
<td>Rear drain</td>
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**Boxes 14 Section Connection**

<table>
<thead>
<tr>
<th>S</th>
<th>Separate inlets</th>
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<tr>
<td>C</td>
<td>Common inlets</td>
</tr>
</tbody>
</table>

---

**Side Suction Port**

**Side Pressure Port**

**Rear Suction Port**

**Rear Pressure Port**

---

**PGP/PGM 500 Series**

---

**Tandem Connection**

---

**Example:**

---

**Notes:**

---

**Flow divider**

---

**SAE "B" spline**

---

**SAE "B-B" spline**

---

**SAE "B" spline**

---

**SAE "B"-B" spline**

---

**SAE "A" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

---

**SAE "B-B" 2bolt flange**

---

**SAE "B" 2bolt flange**

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Integral Valve Options and Market Experience

This appendix provides overviews of the valves currently offered as well as options that are available from the wide range of Parker gear pumps and motors. Many valves are already in production for OEM customers on specific pumps or motors, while others have been supplied for prototype evaluation. A few valves are derivatives of valves already in production and can be produced for OEM customers. Parker’s integral valve program was developed in response to requests from our OEM customers to reduce the number and total cost of components on their machines. We addressed this challenge by integrating the valves required for machine functions into our hydraulic pumps and motors. This integration has reduced the number of purchased components, eliminated many of the hydraulic hoses and associated fittings (and potential leak points), and reduced assembly labor costs on the production line.

| Applications:                      | Implement Pumps (Single) | Implement Pumps (Tandem) | Two Stage Pumps | Fan Drive Pumps | Fan Drive Pumps | Pilot Operated Relief Valves | Load Sensing Relief Valves | Unloaders for Tandem Pumps | Load Sense Prioritize Relief Valves | Load Sensing Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Prioritize Relief Valves | Load Sense Priorize...
List of available pump combinations - PGP 505, PGP 511 and PGP 517

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<td>PGP 511</td>
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<td>PGP 517</td>
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Nomograph for Pipe Velocity

\[ d \text{ [mm]} = \sqrt{\frac{400 \times Q \text{ [l/min]}}{6 \times 10^3 v \text{ [m/s]}}} \]
### Integral Valve Options - PGP 505, PGP 511 and PGP 517

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### Pressure Relief Valve - PGP 505, PGP 511 and PGP 517

**Non adjustable, internal vent**

**Adjustable, internal vent**

**Non adjustable, external tank port**

**Adjustable, external tank port**

**Variations:** PGP 505, PGP 511 and PGP 517
- Non adjustable, internal vent
- Non adjustable, external tank port
- Adjustable, internal vent
- Adjustable, external tank port
Load-Sense Pressure-Relief Valve - PGP 511 and PGP 517

Variations:
- **PGP 511**
  - Integral with pump ....................... 70 l/min
  - With solenoid unloading
- **PGP 517**
  - Integral with pump, 100 l/min
  - With solenoid unloading

Press. Range:
- Stand-by pressure setting ............. 5 bar
- Max. setting ................................ 250 bar

Max. Flow:
- PGP 511 ...................................... 70 l/min
- PGP 517 .................................... 100 l/min

Comments:
The Load-Sense feature allows the gear pump and integral valve to be used with load-sense directional valves. This feature also allows remote adjustment of the pump pressure up to the limit set by the internal pilot relief. Conversion to the pilot-operated relief valve is achieved by plugging the Load-Sense (LS) port. The pump body requires an outlet port. This pump and valve assembly can also be used with a small, external, direct-acting relief valve for remote pressure control of the pump.

Solenoid Unloading Pressure Relief Valve - PGP 511 and PGP 517

Variations:
- **PGP 511 and PGP 517**
  - Specify voltage and whether N/O or NC

Press. Range:
- Stand-by pressure setting ............. 5 bar
- Max. setting ................................ 250 bar

Max. Flow:
- PGP 511 ...................................... 70 l/min
- PGP 517 .................................... 100 l/min

Comments:
This valve utilizes the same casting, main spool and pilot relief as the Load-Sense, Pressure-Relief Valve. A small, solenoid-operated, cartridge valve vents the internal pilot flow to the pump inlet to unload the main spool. The outlet port is in the pump body and the excess flow (EF) is connected to the reservoir via the heat exchanger and/or the return-line filter.
Unloading Relief Valve, Pressure-Operated - PGP 511 and PGP 517

Variations: PGP 511 and PGP 517
Port mounted, integral with pump

Press. Range:
Stand-by pressure setting ............. 5 bar
Max. setting .................................. 250 bar
Min setting .................................. 55 bar

Max. Flow: ........................................... 80 l/min

Comments:
This valve permits pressure unloading of the first section in the tandem. The valve may also be remote mounted for use with tandem or dual pumps. The flow from port P1 is typically combined with the flow from port P2. This valve is often used on construction machinery, such as backhoe loaders, wheel loaders and cranes. Its purpose is to provide high flow (from both sections of the tandem) at low or medium pressures and high pressure with reduced flow (from the rear section only). This allows maximum productivity of the machine in relation to the power available to the pump.

Unloading Relief Valve, Solenoid-Operated - PGP 511 and PGP 517

Variations: PGP 511 and PGP 517
Port mounted, integral with pump

Press. Range:
Stand-by pressure setting ............. 5 bar
Max. setting .................................. 250 bar
Min setting .................................. 55 bar

Max. Flow: ........................................... 80 l/min

Comments:
This valve permits pressure or solenoid unloading of the first section in a tandem. The valve may also be remote mounted for use with tandem or dual pumps. The flow from port P1 is typically combined with the flow from port P2. This valve is often used on construction machinery, such as backhoe loaders, wheel loaders and cranes. Its purpose is to provide high flow (from both sections of the tandem) at low or medium pressures and high pressure with reduced flow (from the rear section only). This allows maximum productivity of the machine in relation to the power available to the pump.
Priority Flow Divider - PGP511 and PGP517

Variations:

PGP 511 and PGP 517

Rear Mounted Versions:
- Without priority relief; With full flow priority relief (not shown) With pilot priority relief valve
- PGP 511 and PGP 517
- Port Mounted Version:
  - Without priority relief

Press. Range:
- Priority Port Min. setting .............. 35 bar
- Priority Port Max. setting .............. 210 bar
- Extended Flow Max. equal to max. rating of pump

Max. Flow:
- Valve for PGP 511 & Port Mounted Version
  - Priority Flow Max. .................. 32 l/min
  - Extended Flow Max. ................ 70 l/min
  - Max. input flow ..................... 70 l/min

PGP 517 Valve
- Priority Flow Max. .................. 45 l/min
- Extended Flow Max. ................ 100 l/min
- Max. input flow ..................... 100 l/min

Comments:
The Priority Flow Divider provides constant and specified flow for power steering or other priority functions. The balance of flow produced by the pump is available from the excess flow (EF) port for additional functions, such as open-center, directional-control valves, fan drives, etc.

Load-Sense Priority Valve - PGP 511 and PGP 517

Variations:

PGP511 and PGP517

Rear Mounted Versions:
- Without relief, static LS signal;
  - With pilot relief, dynamic LS signal
- With relief, dynamic LS signal

PGP 511 and PGP 517

Port Mounted Version:
- Without relief, static LS signal;
- Without relief, dynamic LS signal

Press. Range:
- Priority Port Min. setting .............. 35 bar
- Priority Port Max. setting .............. 210 bar
- Extended Flow Max. equal to max. rating of pump

Max. Flow:
- PGP 511 Valve & Port Mounted Version
  - Priority Flow Max. .................. 32 l/min
  - Extended Flow Max. ................ 70 l/min
  - Max. input flow ..................... 70 l/min

PGP 517 Valve
- Priority Flow Max. .................. 45 l/min
- Extended Flow Max. ................ 100 l/min
- Max. input flow ..................... 100 l/min

Comments:
The Load-Sense Priority Valve provides priority flow on demand, typically for load-sense power steering. The balance of the flow produced by the pump is available from the excess flow (EF) port for additional functions, such as open-center directional-control valves, fan drives, etc. When the power steering is idle, full pump flow is available for these functions. The selection of the pilot relief and the static or dynamic signal is dependent on the characteristics of the steering unit.
Two - Stage Pump - PGP 505, PGP 511 and PGP 517

Variations: PGP 505, PGP 511 and PGP 517
- With internal vent to inlet
- With external tank port
Note: Specify solenoid voltage

Comments:
The Parker Two-Stage or High-Low Pump is a tandem unit with equal or dissimilar displacements. A two-position/two-way valve in the rear cover allows for rear pump unloading. This pump is applied when the prime mover (engine or electric motor) has limited power. When high pressure is required, the rear section is unloaded to the pump inlet or the tank. When high flow is required at low or medium pressure, the flow of both sections is combined at the outlet port P. In both cases, the displacements and pressure selected are to be within the power limits of the prime mover.

Note: When the internal vent to the inlet is selected, caution is suggested to prevent extended periods of operation in the unloaded position. The heat generated may lower the fluid viscosity below the minimums required for the pump, which could possibly damage it.

Single Accumulator Charge Valve - PGP 511

Variations: PGP 511
- Integral with pump ........................ 70 l/min

Press. Range: A1, G Ports Min. setting .......... 35 bar
- A1, G Ports Max. setting ............ 210 bar
- Extended Flow Max. equal to max. rating of pump

Max. Flow: PGP 511 Valve
- Charge Flow Max. ........................ 32 l/min
- Extended Flow Max. ...................... 70 l/min
- Max. Input Flow .......................... 70 l/min

Comments:
The Single Accumulator Charge Valve (SACV) provides priority flow to charge the accumulator for vehicle brakes or any application, which requires stored hydraulic energy. The SACV has an integral, differential, pilot-relief valve to provide a wide variety of cut-in/cut-out pressure ratios. Typical ratios are 80%, 70%, 60% and 50%. Custom ratios are available for OEM applications as are a variety of port locations and sizes. The balance of the pump flow at the excess flow (EF) port is available for an open-circuit, directional-control valve, a fan drive, or other ancillary functions.
Dual Accumulator Charge Valve - PGP 511

Variations: PGP 511 Integral with pump ..... 70 l/min
Press. Range: A1, A2, G Ports Min. setting ........ 35 bar
A1, A2 G Ports Max. setting ...... 210 bar
Extended Flow Max. equal to max. rating of pump
Max. Flow: PGP 511 Valve
Charge Flow Max. ....................... 32 l/min
Extended Flow Max. .................... 70 l/min
Max. Input Flow ......................... 70 l/min

Comments:
The Dual Accumulator Charge Valve provides priority flow to charge two accumulators for dual-circuit vehicle brakes or for any application, which requires stored hydraulic energy. This valve has an integral, differential, pilot-relief valve to provide a wide variety of cut-in/cut-out pressure ratios. Typical ratios are 80%, 70%, 60% and 50%. Custom ratios are available for OEM applications. An inverse shuttle spool isolates the two circuits so that pressure and oil volume are maintained in one circuit, should the other experience a break in the hydraulic line. A variety of port locations and sizes are available.

Steering & Accumulator Charge (STAC) Valve

Variations: Stand Alone (Line-mounted)
Single or dual accumulator charge circuit
(Dual circuit schematic shown)
Press. Range: A1, A2, Port Min. setting ........... 35 bar
A1, A2, Port Max. setting ........ 210 bar
Priority Port Max. setting ........ 210 bar
Extended Flow Max. equal to max. rating of pump
Steering stand-by pressure up to ................. 20 bar
Rated Flows: Total Charge Flow up to ............. 60 l/min depending on stand-by pressure
Priority Port .................................. 45 l/min
Extended Flow Max. .......................... 100 l/min
Max. Input Flow ............................. 100 l/min

Comments:
The combined LS Priority Valve and Accumulator Charge Valve provide equal priority flow to the load-sense power steering and to charge one or more accumulators for the hydraulic vehicle brakes. Excess pump flow is available from the EF port for the implement hydraulics, fan drives or other services. The accumulator charge function has an integral, differential, pilot-relief valve to provide a wide variety of cut-in/cut-out pressure ratios. Typical ratios are 80%, 70%, 60% and 50%. Custom ratios are available for OEM applications. Steering relief pressure (at port P) must be equal to or greater than maximum charge cut-out pressure. Valve is available with inverse shuttle for dual-circuit braking systems (above schematic) or without inverse shuttle for single-braking systems.
Motors - PGM 505, PGM 511 and PGM 517

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<tr>
<th>Valve type</th>
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<tr>
<td>Check Valve and Restrictor</td>
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</table>

Single Pressure-Relief Valve - PGM 505 and PGM 517

Variations: PGM 505 and PGM 511 with Integral
- With internal or external drain
- Adjustable and non adjustable

Press. Range:
- Min. setting .................................. 25 bar
- Max. setting .................................. 250 bar

Comments:
This integral relief valve protects the motor from over-pressurization. It can also be used in series with the main system relief valve to limit the pressure differential and output torque of the motor.

Single Pressure-Relief Valve with Anti-Cavitation - PGM 511 and PGM 517

Variations: PGM 511
- Non adjustable, with reverse flow check
- With internal or external drain

PGM 517
- Adjustable, with reverse flow check
- With internal or external drain

Press. Range:
- Min. setting .................................. 25 bar
- Max. setting .................................. 250 bar

Applications:
- Compressor drives, fan drives, mower blade drives and water pump drives

Comments:
This integral relief valve protects the motor from over-pressurization. It can also be used in series with the main system relief valve to limit the pressure differential and output torque of the motor. The check valve allows the motor and driven load to "spool down" when the fluid supply is shut off or reduced, due to engine speed fluctuations. In series operation, the check valve permits the motor to come to a controlled stop, if the outlet flow is suddenly blocked. This check valve reduces the risk of damaging the motor or blowing a hydraulic line. Motors fitted with this valve are available with side or rear-facing ports.
Cross-Port Pressure-Relief Valve - PGM 511

Variations: PGM 511
Adjustable with shims
With internal or external drain

Press. Range: Max. setting ......................... 250 bar
Max. Flow: ..................................................... 30 l/min
Applications: Mower reel drives and all low-medium power reversible drives

Comments:
This valve provides integral, cross-port relief to protect the motor from over-pressurization and to limit torque in both directions of rotation. It can also be used in series with other motors downstream, when using an external drain case. By adding or removing shims it is possible to limit change to the factory-set pressure. In order to minimize overall length of the unit, side ports are standard.

Cross-Port Pressure-Relief Valve with Anti-Cavitation - PGM 511

Variations: PGM 511
Non adjustable, with reverse flow check
With internal or external drain

Press. Range: Min setting ......................... 25 bar
Max. setting ......................... 250 bar
Applications: Mower blade drives, water pump drives and reversible hydrostatic transmissions

Comments:
Motors fitted with this relief valve may be applied in series or in a hydrostatic transmission. The relief valve provides a limit to the pressure differential and the output torque. The check valves allow flow to return to the inlet of the motor to prevent cavitation. It is available with side, rear, or a combination of side and rear ports.

Cross-Port Pressure-Relief Valve with Anti-Cavitation - PGM 511

Variations: PGM 511
Non adjustable, with reverse flow check
With internal or external drain

Press. Range: Min setting ......................... 25 bar
Max. setting ......................... 250 bar
Applications: Mower blade drives, water pump drives, reversible hydrostatic transmissions, vibration drives on vibratory rollers and winches

Comments:
This motor has a cross-port relief valve and anti-cavitation check valves in the case drain passages. Motors with this configuration are suitable for open-circuit applications with closed-center valves and hydrostatic transmissions. When the motor and load are limited by the relief valve, the anti-cavitation checks allow internal leakage to be returned to the inlet side of the motor. For winches, make-up flow at low pressure is introduced into the case.
Brake Valve - PGM 511

Variations: PGM 511
- Adjustable with shims
- With internal or external drain

Press. Range: Max. setting ............................... 250 bar
Max. Flow: ..................................................... 30 l/min
Applications: Mower blade drives, winch drives, and blower drives

Comments:
Parker motors are available with brake valves to provide controlled braking of the motor and load. The pressure setting of the valve and the stored energy in the load will jointly determine the time to stop the motor. Brake valves must be used with the appropriate, directional-control valves, which are usually closed-center valves rather than motor spools.

Solenoid Unloading Pressure-Relief Valve for Motors - PGM 511

Variations: PGM 511
- With internal return for single motor operation
- With tank port for series motor operation
- Specify solenoid voltage, whether N/O or N/C

Press. Range: Stand-by pressure differential ...... 5 bar
Max. setting .......................................... 250 bar
Max. Flow: PGM 511 ..................................... 70 l/min

Comments:
A small, solenoid-operated cartridge valve, similar to those used on the PGP511 and PGP517 vents the internal pilot to the motor outlet to unload the main spool. The outlet port is connected to the tank via the filter and the heat exchanger (if installed). The motor control can be set to provide low-speed operation, rather than coming to a full stop. This allows for a quiet fan start from approximately 100 rpm. The solenoid in the valve is available for normally-open or normally-closed operation. The anti-cavitation check valve allows motor spool-down, when the engine is shut down while the fan is running.

Check Valve and Restrictor - PGM 511

Variations: PGM 511
- Metered flow from motor outlet to inlet

Press. Range: Max. setting ............................... 250 bar
Max. Flow: ..................................................... 30 l/min
Applications: Mower blade drives, winch drives, and blower drives

Comments:
The Check Valve and Restrictor are used to control pressure spikes between motors in a series circuit. The check valve allows the motor and driven load to “spool-down” when the fluid supply is shut off or reduced due to engine speed fluctuations. In series operation, the check valve permits the motor to come to a controlled stop, if the outlet flow is suddenly blocked. This check valve reduces the risk of damaging the motor or blowing a hydraulic line. The restrictor permits operation in reverse for cleaning debris or backlapping of the cutters.
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2. Payment: Payment shall be made by Buyer net 30 days from the date of delivery of the items purchased hereunder. Amounts not timely paid shall bear interest at the maximum rate permitted by law for each month or portion thereof that the Buyer is late in making payment. Any claims by Buyer for omissions or shortages in a shipment shall be waived unless Seller receives notice thereof within 30 days after Buyer’s receipt of the shipment.

3. Delivery: Unless otherwise provided on the face hereof, delivery shall be made F.O.B. Seller’s plant. Regardless of the method of delivery, however, risk of loss shall pass to Buyer upon Seller’s delivery to a carrier. Any delivery dates shown are approximate only and Seller shall have no liability for any delays in delivery.

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6. Changes, Reschedules and Cancellations: Buyer may request to modify the designs or specifications for the items sold hereunder as well as the quantities and delivery dates thereof, or may request to cancel all or part of this order, however, no such requested modification or cancellation shall become part of the contract between Buyer and Seller unless accepted by Seller in a written amendment to this Agreement. Acceptance of any such requested modification or cancellation shall be at Seller’s discretion, and shall be upon such terms and conditions as Seller may require.

7. Special Tooling: A tooling charge may be imposed for any special tooling, including without limitation, dies, fixtures, molds and patterns, acquired to manufacture items sold pursuant to this contract. Such special tooling shall be and remain Seller’s property notwithstanding payment of any charges by Buyer. In no event will Buyer acquire any interest in apparatus beyond said tooling which is utilized in the notwithstanding any charges paid by Buyer. Unless otherwise agreed, Seller shall have the right to alter, discard or otherwise dispose of any special tooling or other property in its sole discretion at any time.

8. Buyer’s Property: Any designs, tools, patterns, materials, drawings, confidential information or equipment furnished by Buyer or any other items in any way connected with the items sold hereunder, may become Buyer's property, may be considered obsolete and may be destroyed by Seller after two (2) consecutive years have elapsed without Buyer placing an order for the items which are manufactured using such property. Seller shall not be responsible for any loss or damage to such property while it is in Seller’s possession or control.

9. Taxes: Unless otherwise indicated on the face hereof, all prices and charges are exclusive of excise, sales, use, property, occupational or like taxes which may be imposed by any taxing authority upon the manufacture, sale or delivery of the items sold hereunder. If any such taxes must be paid by Seller or if Seller is liable for the collection of such tax, the amount thereof shall be in addition to the amounts for the items sold. Buyer agrees to pay all such taxes or to reimburse Seller therefore upon receipt of its invoice. If Buyer claims exemption from any sales, use or other tax imposed by any taxing authority, Buyer shall save Seller harmless from and against any such tax, together with any interest or penalties thereon which may be assessed if the items are held to be taxable.

10. Indemnity For Infringement of Intellectual Property Rights: Seller’s obligation to defend and indemnify Buyer against allegations of infringement of any patents, trademarks, copyrights, trade dress, trade secrets or similar rights except as provided in this Part 10. Seller will defend and indemnify Buyer against allegations of infringement of U.S. Patents, U.S. Trademarks, copyrights, trade dress and trade secrets (hereinafter ‘Intellectual Property Rights’). Seller will defend at its expense and will pay the cost of any settlement or damages awarded in any action brought against Buyer based on an allegation that an item sold pursuant to this contract infringes the Intellectual Property Rights of a third party. Buyer’s obligation to defend and indemnify Buyer is contingent on Buyer notifying Seller within ten (10) days after Buyer becomes aware of such allegations of infringement, and Seller having sole control over the defense of any allegations or actions including all negotiations for settlement or compromise. If an item sold hereunder is subject to a claim that it infringes the Intellectual Property Rights of a third party, Seller may, at its sole expense and option, procure for Buyer the right to continue using said item, replace or modify said item so as to make it noninfringing, or offer to accept return of said item and return the purchase price less a reasonable allowance for depreciation. Notwithstanding the foregoing, Seller shall have no liability for claims of infringement based on information provided by Buyer, or directed to items delivered hereunder for which the designs are specified in whole or part by Buyer, or infringements resulting from the modification, combination or use in a system of any item sold hereunder. The foregoing provisions of this Part 10 shall constitute Seller’s sole and exclusive liability and Buyer’s sole and exclusive remedy for infringement of Intellectual Property Rights.

If a claim is based on information provided by Buyer or if the design for an item delivered hereunder is specified in whole or in part by Buyer, Buyer shall defend and indemnify Seller for all costs, expenses or judgments resulting from any claim that such item infringes any patent, trademark, copyright, trade dress, trade secret or any similar right.

11. Force Majeure: Seller does not assume the risk of and shall not be liable for delay or failure to perform any of Seller’s obligations by reason of circumstances beyond the reasonable control of Seller (hereinafter ‘Events of Force Majeure’). Events of Force Majeure shall include without limitation, accidents, acts of God, strikes or labor disputes, acts, laws, rules or regulations of any government or government agency, fires, floods, delays or failures in delivery of carriers or suppliers, shortages of materials and any other cause beyond Seller’s control.

12. Entire Agreement/Governing Law: The terms and conditions set forth herein, together with any amendments, modifications and any different terms or conditions expressly accepted by Seller in writing, shall constitute the entire Agreement concerning the items sold, and there are no oral or other representations or agreements which pertain thereto. This Agreement shall be governed in all respects by the law of the State of Ohio. No actions arising out of the sale of the items sold hereunder or this Agreement may be brought by either party more than two (2) years after the cause of action accrues.

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About Parker Hannifin Corporation
Parker Hannifin is a leading global motion-control company dedicated to delivering premier customer service. A Fortune 500 corporation listed on the New York Stock Exchange (PH), our components and systems comprise over 1,400 product lines that control motion in some 1,000 industrial and aerospace markets. Parker is the only manufacturer to offer its customers a choice of hydraulic, pneumatic, and electromechanical motion-control solutions. Our Company has the largest distribution network in its field, with over 7,500 distributors serving more than 350,000 customers worldwide.

Parker's Charter
To be a leading worldwide manufacturer of components and systems for the builders and users of durable goods. More specifically, we will design, market and manufacture products controlling motion, flow and pressure. We will achieve profitable growth through premier customer service.

Product Information
North American customers seeking product information, the location of a nearby distributor, or repair services will receive prompt attention by calling the Parker Product Information Center at our toll-free number: 1-800-C-PARKER (1-800-272-7587). In the UK, a similar service is available by calling 0500-103-203.