Fixed & variable displacement high pressure single & tandem piston pumps
350 bar (5000 psi)

PV / PF / TPF / TPV – 30 Design (Open Loop)
130 cm³/r (7.9 in³/r)
180 cm³/r (11 in³/r)
250 cm³/r (15.2 in³/r)
360 cm³/r (22 in³/r)
500 cm³/r (30.5 in³/r)
750 cm³/r (46 in³/r)
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Introduction

- Axial piston pumps with swash plate design for reliable operation and long life.
- Rotating and pressure loaded parts are pressure balanced.
- Oversize shaft bearings.
- Thru drive enables multiple pump installation from a single shaft. Tandem pumps are also available.
- Fast response times.
- Open loop with high suction speed.
- “Building block” design gives these pumps a wide range of applications.

Typical section, pressure compensated pump
### Model Codes

- **Seals**
  - Blank – Nitrile
  - F3 – Viton

- **Type**
  - PF – Fixed displacement
  - PV – Variable displacement
  - TPF – Tandem Fixed displacement
  - TPV – Tandem Variable displacement

- **Displacement**
  - **PF/PV Models**
    - 250 – 250.0 cm³/r (15.2 in³/r)
    - 360 – 360.0 cm³/r (22 in³/r)
    - 500 – 500.0 cm³/r (30 in³/r)
    - 750 – 750.0 cm³/r (46 in³/r)
  - **TPF/TPV Models**
    - 130 – 130.0 cm³/r (7.93 in³/r) TPV only
    - 180 – 180.0 cm³/r (11.0 in³/r) TPV only
    - 250 – 250.0 cm³/r (15.2 in³/r)
    - 360 – 360.0 cm³/r (22 in³/r)
    - 500 – 500.0 cm³/r (30 in³/r)

- **Build**
  - M – ISO Metric

- **Mounting Flange**
  - **PF/PV Models**
    - 7 – ISO3019/2-200B4HW
    - 8 – ISO3019/2-250B4HW
    - 9 – ISO315-8 hole
    - 10 – ISO400-8 hole
  - **TPF/TPV Models**
    - 7 – ISO3019/2-200B4HW
    - 8 – ISO3019/2-250B4HW
    - 9 – ISO315-8 hole

- **Direction of rotation**
  - R – Clockwise (std)
  - L – Counterclockwise

- **Displacement Adjustment Stop**
  - **PV & TPV models only**
    - 1 – Maximum displacement stop
    - 2 – No displacement (std)
    - 3 – Minimum displacement stop
    - 4 – Maximum & minimum displacement stop

- **Thru drive**
  - N – No thru drive (std)
  - A – SAE A with std coupling
  - B – SAE B with std coupling
  - C – SAE C with std coupling
  - F – ISO125B4HW with std coupling
  - G – ISO160B4HW with std coupling
  - H – ISO200B4HW with std coupling
  - J – ISO250B4HW with std coupling
  - P – Pilot pump 8cc/r
    - (PV/TPV models only)
  - PP – Double pilot pump 8cc/r
    - (TPV models only)

- **Main Port Options**
  - 1 – SAE ports, Metric bolt holes

- **Main Port Location**
  - R – Radial – side port

- **Drive Shaft End Type**
  - 1 – ISO straight key
  - 2 – ISO spline

- **Drive Shaft Seal**
  - N – No shaft seal
  - S – Single shaft seal (std)
  - D – Double shaft seal

### Control Descriptions

<table>
<thead>
<tr>
<th>Control</th>
<th>Description</th>
<th>PV Displacements</th>
<th>TPV Displacements</th>
</tr>
</thead>
<tbody>
<tr>
<td>DF</td>
<td>Pressure Compensated &amp; Maximum Flow Adjuster</td>
<td>✓ ✓ ✓</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>DP</td>
<td>Proportional to Pilot Pressure</td>
<td>✓ ✓ ✓</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>ES</td>
<td>Displacement Control by Electric Motor</td>
<td>✓</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>LR</td>
<td>Constant Power Control</td>
<td>✓</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>FE</td>
<td>Displacement Control by Adjustment Control</td>
<td>✓</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>HG</td>
<td>Displacement Control by Handwheel Adjuster</td>
<td>✓</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>SM</td>
<td>Displacement Control by Servo Valve</td>
<td>✓</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>SP</td>
<td>Displacement Control by Electro–Hydraulic Proportional Valve</td>
<td>✓ ✓ ✓</td>
<td>✓ ✓ ✓</td>
</tr>
</tbody>
</table>

---

**Yoke Displacement**
- PV / TPV models only
  - 1 – Single side of center “A”
  - 2 – Single side of center “B”
  - 3 – Over center

**Yoke Position Indicator**
- PV models only
  - V – Visual position indicator (std)
  - M – Potentiometer with visual indicator
  - TPV models only
  - L – Position limit switch
  - M – Potentiometer with visual indicator
  - N – No position indicator (std)
  - P – Position potentiometer
  - V – Visual position indicator

**Pump Design**
- 30

**Special Suffix**
- EU11 – Surfaces nickle plated for Skydrol
- EU17 – Surfaces unpainted
- EU19 – Grey primer finish
- EU20 – Paint to customer spec.
- EU22 – Assemble to another unit (std)

**Controls**
- PV / TPV models only
  - Refer to the following pages for control breakdown.

**Control Design**
- PV models only
  - 11
Model Codes

DF Control
Pressure Compensator & Maximum Flow Adjuster
2 – Pilot operated

Maximum Flow Adjustment
F – Screw adjuster

Compensator Pressure Setting
090 – Std setting 90 bar (1300 psi)
xxx – Customer requested setting

Compensator Control
R – Remote connection port only (std.)
F – Screw adjuster on compensator (std.)
K – Electro-proportional relief valve

Pressure Limiting Valve Operator
1 – No solenoid valve (std.)
2 – Solenoid unloading valve

Solenoid Control Voltage
N – No solenoid
A – 110 VAC50Hz
B – 110 VAC50Hz / 120 VAC60 Hz
C – 220 VAC50Hz
D – 220 VAC50Hz / 240 VAC60Hz
G – 12 VDC
H – 24 VDC

Load Sensing
1 – No load sensing (std.)
2 – Load sensing

Example of DF model:
DF 2 F 090 R 1 N 1 11

DP Control
Displacement Control
Proportional to pilot pressure
1 – Mounting interface only (std.)
2 – Pilot relief & remote port
3 – Pilot relief, remote port & proportional relief (1-S/S)
4 – Pilot relief, remote port & proportional relief (2-S/S)

Power Control
N – No power control
A – Adjustable power control

Pressure Limiter
1 – Without pressure limiter (std.)
2 – With pressure limiter

Pressure Limiting Valve Operation
A – Single side of center (std.)
B – Over center

Solenoid Control Voltage
N – No solenoid
A – 110 VAC50Hz
B – 110 VAC50Hz / 120 VAC60 Hz
C – 220 VAC50Hz
D – 220 VAC50Hz / 240 VAC60Hz
G – 12 VDC
H – 24 VDC

Example of DF model:
DP 1 N 1 A N 11

ES Control
Displacement Control by Electric Motor

Response time
8 – Seconds with 50 HZ motor (std.)
20 – Seconds with 50 HZ motor (std.)
40 – Seconds with 50 HZ motor

Position Monitoring
A – 4 limit switches (std.)
B – 8 limit switches
P – 4 limit switches & Potentiometer
P – 8 limit switches & Potentiometer

Motor Type
1 – Std motor with brake IP44 (std.)
2 – Std motor with brake IP65
3 – Motor without brake – hazardous locations

Electric Motor Voltage
E – 230 / 400 V, 50 Hz / 270 / 460 V, 3 Phase (std.)
U – 220 V, 50 Hz – 1 Phase
V – 220 V, 60 Hz – 1 Phase

Example of ES model:
ES 8 A 1 E 11
**Model Codes**

**LR Control**

**Constant Power Control**

<table>
<thead>
<tr>
<th>Power setting in kW @1500 rpm, specify:</th>
</tr>
</thead>
<tbody>
<tr>
<td>018 - 090</td>
</tr>
<tr>
<td>018 - 110</td>
</tr>
<tr>
<td>030 - 160</td>
</tr>
<tr>
<td>045 - 250</td>
</tr>
<tr>
<td>075 - 350</td>
</tr>
</tbody>
</table>

**Pressure Limiter**

- **N** – No pressure limiter (std.)
- **F** – Pressure limiting, screw adjuster
- **K** – Pressure limiting, electric proportional valve

**Load Sensing**

- **1** – No load sensing (std.)
- **2** – Load sensing

*Example of LR model:*

**LR 011 N 1 11**

---

**FE Control**

**Displacement Control by Adjustment Screw**

*Example of FE model:*

**FE 11**

---

**HG Control**

**Displacement Control by Handwheel Adjuster**

*Example of HG model:*

**HG 11**

---

**SM Control**

**Displacement Control by Servo Valve**

**Power control**

- **N** – No power control (std.)
- **A** – With adjustable power control

**Pressure Limiter**

- **1** – Without pressure limiter (std.)
- **2** – With pressure limiter

**Pressure Limiter Valve Operation**

- **A** – Single side of center

**Pilot Oil Filter**

- **V** – Filter with visual indicator (std.)
- **E** – Filter with electrical indicator

*Example of SM model:*

**SM N 1 A V 11**

---

**SP Control**

**Displacement Control by Electro-hydraulic Proportional Valve**

**Proportional Valve**

- **E** – Internal pilot supply
- **L** – External pilot supply

**Pilot Oil Filter**

- **N** – Without filter (std.)
- **V** – Filter with visual dirt indicator
- **E** – Filter with electrical dirt indicator

**Fail Safe Solenoid Valve**

- **1** – Without fail safe valve (std.)
- **2** – With fail safe valve

**Constant Power Valve**

- **N** – No power control (std.)
- **A** – With adjustable power control

**Pressure Limiter**

- **1** – Without pressure limiter (std.)
- **2** – With pressure limiter

**Solenoid Control Voltage**

- **N** – No solenoid
- **A** – 110VAC50Hz
- **B** – 110VAC50Hz / 120VAC60Hz
- **C** – 220VAC50Hz
- **D** – 220VAC50Hz / 240VAC60Hz
- **G** – 12VDC
- **H** – 24VDC

*Example of SP model:*

**SP E 1 N 1 N 1 11**

---

---
## Pump Specifications

### General

<table>
<thead>
<tr>
<th>Model</th>
<th>Units</th>
<th>TPF/TPV 130</th>
<th>TPF/TPV 180</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>Tandem Axial piston pump</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of mounting</td>
<td>Flange or foot-mounting, Tandem version foot-mounting only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe connection SAE flange</td>
<td>B A psi</td>
<td>1 1/2&quot; - 6000</td>
<td>2 1/2&quot; - 500</td>
</tr>
<tr>
<td>Direction of rotation</td>
<td>Clockwise when viewing shaft end of pump. Counterclockwise available on request.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed range</td>
<td>n min r/min</td>
<td>1800</td>
<td>1800</td>
</tr>
<tr>
<td>Installation position</td>
<td>Optional, see mounting information.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>min max °C (°F)</td>
<td>−20 (−4) +50 (122)</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>m³ kg (lbs.)</td>
<td>240 (529) 240 (529)</td>
<td></td>
</tr>
</tbody>
</table>

1. For tandem pumps TPF/TPV 2 each req’d
2. For 1800 rpm only 410 cm³ (250 in³) or 2x 410 cm³ (250 in³)
3. Including servo pistons, without control
4. Input pressure is to be assured by the user for all operating states
5. Pressure can be applied to the pump input but the sum of p₁ and p₂ must not exceed the maximum value of 420 bar (6090 psi)
6. For tandem pumps only with reduced swash angle (<80% of V max), note maximum input torque.
7. Tolerance + 1%
8. With special shaft seal 6 bar (90 psi) absolute
9. Others on request
**Hydraulic characteristics – 130 cm³/rev**

<table>
<thead>
<tr>
<th>Model</th>
<th>Units</th>
<th>130 cm³/rev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pressure (100% duty cycle)</td>
<td>p₁, p₂ max</td>
<td>350 (5000)</td>
</tr>
<tr>
<td>Input pressure</td>
<td>p₁, p₂ max</td>
<td>50 (700)</td>
</tr>
<tr>
<td>Max. pressure (to DIN 24312)</td>
<td>p₂ max</td>
<td>420 (6092)</td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td>p₁, p₂ max</td>
<td>130 cm³/rev</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td></td>
<td>–25 (–13) (on startup) +90 (194)</td>
</tr>
<tr>
<td>Viscosity range for continuous operation</td>
<td></td>
<td>10 (75)</td>
</tr>
<tr>
<td>Max permissible start viscosity</td>
<td></td>
<td>1000</td>
</tr>
<tr>
<td>Filtering</td>
<td></td>
<td>18/15/13</td>
</tr>
<tr>
<td>Max geom. pump capacity</td>
<td>V₉</td>
<td>130 (7.9)</td>
</tr>
<tr>
<td>Max geom. pump flow</td>
<td>Q₉</td>
<td>195 (52)</td>
</tr>
<tr>
<td>Case pressure</td>
<td>pᵥ max</td>
<td>Max. 0,5 bar (7) over p1, max. 4 bar (60) abs.</td>
</tr>
<tr>
<td>Pilot Pump</td>
<td>cm³ (in³) /rev</td>
<td>8 (5.5)</td>
</tr>
</tbody>
</table>

**Drive specifications – 130 cm³/rev**

<table>
<thead>
<tr>
<th>Model</th>
<th>TPF/TPV 130</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum driving torque (p₂ max., η=100%)</td>
<td>2 x 869 (2 x 641)</td>
</tr>
<tr>
<td>Maximum power consumption (p₂ max n=1500, η=100%)</td>
<td>2 x 136,5 (2 x 183)</td>
</tr>
</tbody>
</table>

1. For tandem pumps TPF/TPV 2 each req’d
2. For 1800 rpm only 410 cm³ (250in³ ) or 2x 410 cm³ (250in³ )
3. Including servo pistons, without control
4. Input pressure is to be assured by the user for all operating states
5. Pressure can be applied to the pump input but the sum of p₁ and p₂ must not exceed the maximum value of 420 bar (6090 psi)
6. For tandem pumps only with reduced swash angle (<80% of V₉ max), note maximum input torque.
7. Tolerance + 1%
8. With special shaft seal 6 bar (90 psi) absolute
9. Others on request
### Hydraulic characteristics – 180 cm³/rev

<table>
<thead>
<tr>
<th>Model</th>
<th>Units</th>
<th>130 cm³/rev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pressure (100% duty cycle)</td>
<td>PN</td>
<td>bar (psi)</td>
</tr>
<tr>
<td>Input pressure</td>
<td>P1min</td>
<td>bar (psi)</td>
</tr>
<tr>
<td>Max. pressure (to DIN 24312)</td>
<td>P2max</td>
<td>bar (psi)</td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>min</td>
<td>°C (°F)</td>
</tr>
<tr>
<td>Viscosity range for continuous operation</td>
<td>min</td>
<td>cSt</td>
</tr>
<tr>
<td>Max permissible start viscosity</td>
<td>νmax</td>
<td>cSt</td>
</tr>
<tr>
<td>Filtering</td>
<td>μm</td>
<td>18/15/13</td>
</tr>
<tr>
<td>Max geom. pump capacity = 1500 r/min</td>
<td>Vg</td>
<td>cm³ (in³) /rev</td>
</tr>
<tr>
<td>Max geom. pump flow n=1500 r/min</td>
<td>Qg</td>
<td>l/min (USgpm)</td>
</tr>
<tr>
<td>Case pressure</td>
<td></td>
<td>bar (psi)</td>
</tr>
<tr>
<td>Pilot Pump</td>
<td></td>
<td>cm³ (in³) /rev</td>
</tr>
</tbody>
</table>

### Drive specifications – 180 cm³/rev

<table>
<thead>
<tr>
<th>Model</th>
<th>TPF/TPV 180</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum driving torque (P₂ max., n=1500, (\eta=100%))</td>
<td>Nm (lb.ft.)</td>
</tr>
<tr>
<td>Maximum power consumption (P₂ max, n=1500, (\eta=100%))</td>
<td>kW (hp)</td>
</tr>
</tbody>
</table>

1. For tandem pumps TPF/TPV 2 each req’d
2. For 1800 rpm only 410 cm³ (250 in³) or 2 x 410 cm³ (250 in³)
3. Including servo pistons, without control
4. Input pressure must be assured by the user for all operating states
5. Pressure can be applied to the pump input but the sum of P₁ and P₂ must not exceed the maximum value of 420 bar (6090 psi)
6. For tandem pumps only with reduced swash angle (≤80% of \(V_{max}\)), note maximum input torque.
7. Tolerance +1%
8. With special shaft seal 6 bar (90 psi) absolute
9. Others on request
### Hydraulic characteristics – 250 series

<table>
<thead>
<tr>
<th>Model</th>
<th>Units</th>
<th>PF/PV 250</th>
<th>TPF/TPV 250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pressure (100% duty cycle)</td>
<td>$p_N$ bar (psi)</td>
<td>350 (5000)</td>
<td></td>
</tr>
<tr>
<td>Input pressure</td>
<td>$p_{1\text{min}}$ bar (psi)</td>
<td>1.0 abs $^4$</td>
<td>50 (700)</td>
</tr>
<tr>
<td>Max. pressure (to DIN 24312)</td>
<td>$p_{2\text{max}}$ bar (psi)</td>
<td>420 (6090)</td>
<td></td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>min $^\circ$C max $^\circ$F</td>
<td>$-25 (-13)$ (on startup)</td>
<td>+90 (194)</td>
</tr>
<tr>
<td>Viscosity range for continuous operation</td>
<td>min max cSt</td>
<td>10 75</td>
<td></td>
</tr>
<tr>
<td>Max permissible start viscosity</td>
<td>$\nu_{\text{max}}$ cSt</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Filtering</td>
<td>µm</td>
<td>18/15/13</td>
<td></td>
</tr>
<tr>
<td>Max geom. pump capacity</td>
<td>$n=1500$</td>
<td>$V_g^7$ cm³ (in³)/rev</td>
<td>250 (15.3)</td>
</tr>
<tr>
<td>Max geom. pump flow</td>
<td>$n=1500$</td>
<td>$Q_g^7$ l/min (USgpm)</td>
<td>375 (100)</td>
</tr>
<tr>
<td>Case pressure</td>
<td>$p_{V\text{max}}$ bar (psi)</td>
<td>max. 0.5 (7) over $p_1$, max 4bar (60 abs $^8$)</td>
<td></td>
</tr>
<tr>
<td>Pilot Pump</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Drive specifications – 250 series

<table>
<thead>
<tr>
<th>Model</th>
<th>Units</th>
<th>PF/PV 250</th>
<th>TPF/TPV 250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum driving torque ($p_2$ max., $\eta=100%$)</td>
<td>$M_1$ Nm (lb.ft.)</td>
<td>1670 (1232)</td>
<td>3340 (2463)</td>
</tr>
<tr>
<td>Maximum power consumption ($p_2$ max $n=1500$, $\eta=100%$)</td>
<td>$p_1$ kW (hp)</td>
<td>265 (195)</td>
<td>530 (391)</td>
</tr>
</tbody>
</table>

---

1. For tandem pumps TPF/TPV 2 each req’d
2. For 1800 rpm only 410 cm³ (250in³ ) or 2x 410 cm³ (250in³ )
3. Including servo pistons, without control
4. Input pressure is to be assured by the user for all operating states
5. Pressure can be applied to the pump input but the sum of $p_1$ and $p_2$ must not exceed the maximum value of 420 bar (6090 psi)
6. For tandem pumps only with reduced swash angle (<80% of $V_{\text{max}}$), note maximum input torque.
7. Tolerance + 1%
8. With special shaft seal 6 bar (90 psi) absolute
9. Others on request
**Hydraulic characteristics – 360 series**

<table>
<thead>
<tr>
<th>Model</th>
<th>Units</th>
<th>PF/PV 360</th>
<th>TPF/TPV 360</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pressure (100% duty cycle)</td>
<td>( p_N ) bar (psi)</td>
<td>350 (5000)</td>
<td></td>
</tr>
<tr>
<td>Input pressure</td>
<td>( p_{1\text{min}} ) bar (psi)</td>
<td>1.0 abs 4)</td>
<td>50 (700)</td>
</tr>
<tr>
<td>Max. pressure (to DIN 24312)</td>
<td>( p_{2\text{max}} ) bar (psi)</td>
<td>420 (6090)</td>
<td></td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td></td>
<td></td>
<td>Hydraulic oil according to DIN 51524 part 2. Other fluids available upon request</td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>min</td>
<td>( ^\circ )C ((^\circ )F)</td>
<td>(-25 ) ((-13)) (on startup) (+90 ) (194)</td>
</tr>
<tr>
<td>Viscosity range for continuous operation</td>
<td>min</td>
<td>cSt</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>max</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Max permissible start viscosity</td>
<td>( \nu_{\text{max}} ) cSt</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Filtering</td>
<td>( \mu ) m</td>
<td>18/15/13</td>
<td></td>
</tr>
<tr>
<td>Max geom. pump capacity ( n=1500 \text{ r/min} )</td>
<td>( V_g ) cm(^3) (in(^3))/rev</td>
<td>360 (22)</td>
<td>2 x 360 (2x22)</td>
</tr>
<tr>
<td>Max geom. pump flow ( n=1500 \text{ r/min} )</td>
<td>( Q_g ) l/min (USgpm)</td>
<td>540 (143)</td>
<td>1080 (285)</td>
</tr>
<tr>
<td>Case pressure</td>
<td>( p_{\nu \text{max}} ) bar (psi)</td>
<td>max. 0.5 (7) over ( p_1 ), max 4bar (60) abs 8</td>
<td></td>
</tr>
<tr>
<td>Pilot Pump</td>
<td>cm(^3) (in(^3))/rev</td>
<td>8 (.5) 9)</td>
<td></td>
</tr>
</tbody>
</table>

**Drive specifications – 360 series**

<table>
<thead>
<tr>
<th>Model</th>
<th>PF/PV 360</th>
<th>TPF/TPV 360</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum driving torque ( p_2 \text{ max., } \eta=100% )</td>
<td>( M_1 ) Nm (lb.ft.)</td>
<td>2406 (1775)</td>
</tr>
<tr>
<td>Maximum power consumption ( p_2 \text{ max } n=1500, \eta=100% )</td>
<td>( p_1 ) kW (hp)</td>
<td>378 (507)</td>
</tr>
</tbody>
</table>

1. For tandem pumps TPF/TPV 2 each req’d 
2. For 1800 rpm only 410 cm\(^3\) (250in\(^3\)) or 2x 410 cm\(^3\) (250in\(^3\)) 
3. Including servo pistons, without control 
4. Input pressure is to be assured by the user for all operating states 
5. Pressure can be applied to the pump input but the sum of \( p_1 \) and \( p_2 \) must not exceed the maximum value of 420 bar (6090 psi) 
6. For tandem pumps only with reduced swash angle (<80% of \( V_{\text{max}} \)), note maximum input torque. 
7. Tolerance +1% 
8. With special shaft seal 6 bar (90 psi) absolute 
9. Others on request
### Hydraulic characteristics – 500 series

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>PF/PV 500</th>
<th>TPF/TPV 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pressure (100% duty cycle)</td>
<td>pN</td>
<td>350 (5000)</td>
<td></td>
</tr>
<tr>
<td>Input pressure</td>
<td>p1min</td>
<td>1.0 abs 4)</td>
<td>50 (700)</td>
</tr>
<tr>
<td>Max. pressure (to DIN 24312)</td>
<td>p2max</td>
<td>420 (6090)</td>
<td></td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>min max</td>
<td>–25 (-13) (on startup)</td>
<td>+90 (194)</td>
</tr>
<tr>
<td>Viscosity range for continuous operation</td>
<td>min max</td>
<td>cSt</td>
<td>10 75</td>
</tr>
<tr>
<td>Max permissible start viscosity</td>
<td>ν max</td>
<td>cSt</td>
<td>1000</td>
</tr>
<tr>
<td>Filtering</td>
<td>μm</td>
<td>18/15/13</td>
<td></td>
</tr>
<tr>
<td>Max geom. pump capacity n=1500 r/min</td>
<td>Vg</td>
<td>500 (30) 410 (250)</td>
<td>2 x 500 (30) 2 x 410 (250)</td>
</tr>
<tr>
<td>Max geom. pump flow n=1500 r/min</td>
<td>Qg</td>
<td>750 (198) 738 (195)</td>
<td>1500 (396) 1476 (390)</td>
</tr>
<tr>
<td>Case pressure</td>
<td>pν max</td>
<td>bar (psi)</td>
<td>max 0.5 (7) over p1, max 4bar (60 abs 8)</td>
</tr>
<tr>
<td>Pilot Pump</td>
<td></td>
<td>cm³ (in³)/rev</td>
<td>8 (.5) 9)</td>
</tr>
</tbody>
</table>

### Drive specifications – 500 series

<table>
<thead>
<tr>
<th></th>
<th>Units</th>
<th>PF/PV 500</th>
<th>TPF/TPV 500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum driving torque (p2 max., η=100%)</td>
<td>M1</td>
<td>3360 (2478)</td>
<td>5000 b) (3688)</td>
</tr>
<tr>
<td>Maximum power consumption (p2 max n=1500, η=100%)</td>
<td>p1</td>
<td>525 (704) 860 (1153)</td>
<td></td>
</tr>
</tbody>
</table>

1. For tandem pumps TPF/TPV 2 each req’d
2. For 1800 rpm only 410 cm³ (250in³) or 2x 410 cm³ (250in³)
3. Including servo pistons, without control
4. Input pressure is to be assured by the user for all operating states
5. Pressure can be applied to the pump input but the sum of p1 and p2 must not exceed the maximum value of 420 bar (6090 psi)
6. For tandem pumps only with reduced swash angle (<80% of Vmax), note maximum input torque.
7. Tolerance ± 1%
8. With special shaft seal 6 bar (90 psi) absolute
9. Others on request
Hydraulic characteristics – 750 series

<table>
<thead>
<tr>
<th>Model</th>
<th>Units</th>
<th>PF/PV 750</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal pressure (100% duty cycle)</td>
<td>p\textsubscript{N} bar (psi)</td>
<td>350 (5000)</td>
</tr>
<tr>
<td>Input pressure</td>
<td>p\textsubscript{1\text{min}} bar (psi)</td>
<td>1.0 abs 4)</td>
</tr>
<tr>
<td></td>
<td>p\textsubscript{1\text{max}} bar (psi)</td>
<td>50 (700)</td>
</tr>
<tr>
<td>Max. pressure (to DIN 24312)</td>
<td>p\textsubscript{2\text{max}} bar (psi)</td>
<td>420 (6090)</td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic fluid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydraulic fluid temperature range</td>
<td>min max (^\circ\text{C} (,^\circ\text{F})</td>
<td>–25 (–13) (on startup) +90 (194)</td>
</tr>
<tr>
<td>Viscosity range for continuous operation</td>
<td>min max cSt</td>
<td>10 75</td>
</tr>
<tr>
<td>Max permissible start viscosity</td>
<td>v\textsubscript{\text{max}} cSt</td>
<td>1000</td>
</tr>
<tr>
<td>Filtering</td>
<td>μm</td>
<td>18/15/13</td>
</tr>
<tr>
<td>Max geom. pump capacity n=1200 r/min</td>
<td>V\textsubscript{g} \textsuperscript{7)} cm(^3) (in(^3))/rev</td>
<td>750 (46)</td>
</tr>
<tr>
<td>Max geom. pump flow n=1000 r/min</td>
<td>Q\textsubscript{g} l/min (USgpm)</td>
<td>750 (46) 900 (55)</td>
</tr>
<tr>
<td>Case pressure</td>
<td>pv\textsubscript{max} bar (psi)</td>
<td>max. 0.5 (7) over p\textsubscript{1}, max 4 bar (60) abs 8)</td>
</tr>
<tr>
<td>Pilot Pump</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Drive specifications – 750 series

<table>
<thead>
<tr>
<th>Model</th>
<th>PF/PV 750</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum driving torque (p\textsubscript{2 max,}, \eta=100%)</td>
<td>M\textsubscript{1} Nm (lb.ft.)</td>
</tr>
<tr>
<td>Maximum power consumption (p\textsubscript{2 max n=1200}, \eta=100%)</td>
<td>p\textsubscript{1} kW (hp)</td>
</tr>
</tbody>
</table>

1. For tandem pumps TPF/TPV 2 each req’d
2. For 1800 rpm only 410 cm\(^3\) (250in\(^3\) ) or 2x 410 cm\(^3\) (250in\(^3\) )
3. Including servo pistons, without control
4. Input pressure is to be assured by the user for all operating states
5. Pressure can be applied to the pump input but the sum of p\textsubscript{1} and p\textsubscript{2} must not exceed the maximum value of 420 bar (6090 psi)
6. For tandem pumps only with reduced swash angle (<80% of V\text{max}), note maximum input torque.
7. Tolerance +1%
8. With special shaft seal 6 bar (90 psi) absolute
9. Others on request
Performance Curves – 130 cm³/rev

**Power efficiency performance curve**

- For pumps and motors in tandem operation the characteristic values are as for the individual units.
- Variable tandem units have two controls, i.e. control for each single unit.

**Roller bearing life**

- $L = L_{V\text{max}} \times \frac{10}{V_{V\text{max}}}$ for reduced swash-angle

---

**Double pumps**

- For pumps and motors in tandem operation the characteristic values are as for the individual units.
- Variable tandem units have two controls, i.e. control for each single unit.
Performance Curves – TPV 180 Series

Power efficiency performance curve

Roller bearing life

Double pumps

For pumps and motors in tandem operation the characteristic values are as for the individual units.

Variable tandem units have two controls, i.e. control for each single unit.
Performance Curves – 250 Series

Power/efficiency performance curve

- The specifications for single units are for double pumps and double motors as well.
- A double unit can be used as a pump or motor for one or two circuits. Variable double units have two controls, i.e. one control for each single unit.

Double pumps

- The specifications for single units are for double pumps and double motors as well.
- A double unit can be used as a pump or motor for one or two circuits. Variable double units have two controls, i.e. one control for each single unit.
**Performance Curves – 360 series**

### Power/efficiency performance curve

- **Double pumps**
  - The specifications are the same for single and double units.
  - Only the power at the input shaft is limited to 572 kW (767 hp) \( n = 1500 \) r/min.
  - A double unit can be used as a pump or motor for one or two circuits. Variable double units have two controls, i.e. one control for each single unit.
  - The second pump can be operated at full displacement and pressure according to the specification.

![Diagram](image)

### Roller bearing life

- For reduced swash angle:
  \[
  L_h = L_v \times \frac{V}{V_{\text{max}}}^{10/3}
  \]

![Diagram](image)
Double pumps

- For pumps and motors in tandem operation the characteristic values are as for the individual units. Only the basic power at the drive shaft is limited to 770 kW (1033 hp) (n=1500 r/min) or 925 kW (1240 hp).

- The tandem unit can be used as a pump or motor for one or two circuits. Variable tandem units have two controls, i.e. control for each single unit.
Performance Curves – 750 Series

Power/efficiency performance curve

Roller bearing life

for reduced swash angle:

\[ L_{10} = L_{\text{max}} \times \left( \frac{V}{V_{\text{max}}} \right)^{10/3} \]
Controls

Controls DF, LR

The pump working pressure is constant or it follows a characteristic curve independent of flow demand.

Energy saving hydraulic drives are possible with pressure compensated pumps. The oil flow is adjusted automatically to the actuator.

**DF** The system pressure remains constant for the entire volume flow range. System pressure can be set either manually, hydraulically or electronically using a relay valve or proportional pressure limiting valve.

**LR** The P–Q characteristic curve is a hyperbola. For constant speed the drive torque, i.e. the power used, is held constant.

The power hyperbola can be continuously adjusted between \( P_{\text{min}} \) and \( P_{\text{max}} \). \( P_{\text{min}} \) is given by the power loss of the pump.

**Typical controller action:**

(Closing/opening the directional control valve WV)

\[ Q \rightarrow Q_{\text{max}} \text{ or } Q_{\text{min}} \rightarrow Q_{\text{max}} \]

\[ C_{\text{H}} = 50 \text{mm ID x 2 meters.} \]

All controllers can be combined with one another, for possible variations see the circuit diagrams. The maximum working volume of the pump can be limited mechanically to between 50 and 100%.

**M1** (Nm)

\[
\begin{array}{|c|c|c|c|c|}
\hline
\text{p}_2 \text{ bar} & 0 & 100 & 200 & 300 \\
\text{p}_2 \text{ psi} & 1500 & 2900 & 4350 \\
\hline
\end{array}
\]

Drive torque/power “compensated”

Up control time \( T_{\text{g}} \) (0 → 0.9 y max. 0)

1. pilot operated
2. direct controlled, spring I
3. direct controlled, spring II
4. direct controlled, spring III

Down control time \( T_{\text{g}} \) (0 → 0.9 y max. 0)

5. direct controlled and pilot operated
DF Pressure compensator can be adjusted mechanically.

DF Pressure compensator controlled, control valve adjustable mechanically or electrically.

LR Constant power control with overriding pressure limiter, mechanical or hydraulic setting of pilot valve.
DF
Pressure/flow control

DF LR
Pressure / power / flow control
Controls for Position/Displacement

The displacement of the axial piston unit is proportional to the swash plate angle and can be adjusted by a spring centered servo piston.

The servo piston is controlled by the required input signal with a mechanical, hydraulic or electrical control device.

Economical and energy saving drives can be produced with the “building block” principle for open loop and closed circuits as well.

Controls for limitation of power and maximum pressure are available but not for the ES control.

Note: Setting the pressure compensator or a control for constant power, lower than the adjusted pilot oil pressure \( p_s \text{ min} = 80 \text{ (1160 psi), bar is not possible.} \)
Electric motor displacement control ES

The electronic servo control unit is used for stepless adjustment. It has a three phase electric servo motor, worm gearing and a switch box with 4 and 8 limit switches for 4 or 8 positions. A potentiometer is also available.

The response times from zero to maximum depends on the chosen ratio and the speed of the servo motor (this means that during operation the response times are not variable).

Explosion protection versions are also available...

Servo motor of protection type EEx e II or EEx d II (without brake)

Switch box with relay repeater for protection type EEx i II.

Response time table:

<table>
<thead>
<tr>
<th>50 Hz</th>
<th>Servo motor n [r/min]</th>
<th>P [W]</th>
<th>Total gear ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2800</td>
<td>550</td>
<td>61</td>
</tr>
<tr>
<td>8</td>
<td>1390</td>
<td>250</td>
<td>61</td>
</tr>
<tr>
<td>20</td>
<td>1390</td>
<td>180</td>
<td>152</td>
</tr>
<tr>
<td>40</td>
<td>1390</td>
<td>180</td>
<td>152</td>
</tr>
</tbody>
</table>

Response time from 0 to +Q_{max} or 0 to −Q_{max}
Pressure proportional adjustment DP

The output flow of the pump is proportional to the pilot pressure. Each of the two pilot ports is responsible for an output flow direction.

A separate pilot oil circuit is necessary with $P_{\text{min}} = 80$ bar, $Q_{\text{ST}} = 12$ l/min (3.17 USgpm). From this the control pressure is reduced to the desired set value by means of a suitable circuit. For example with:

- Pressure limiting valve (mechanical or proportional) from $P \rightarrow T$ line and throttle in $P$ line 0.8 $\%$ (0.03 in)
- Pressure reducing valve
- Joystick

The quantity of the pilot oil flow from/to the pilot oil ports $A_{\text{ST}}/B_{\text{ST}}$ is irrelevant. See the SP control for the diameter of the servo piston. Response time is approximately 300 ms from $q$ to $Q_{\text{MAX}}$.

The pressure proportional adjustment can also be supplied with a pressure relief valve (see next page).
Example of application

DP control with power override control (2 quadrants) and with pressure override control (4 quadrants) and pilot oil controlled by joystick...
Electrohydraulic servo adjustment SP

The electro hydraulic displacement control will operate a hydrostatic drive in all four quadrants and work without throttle losses within electrically adjustable limits. This is done by controlling delivery flow with swash plate angle feedback.

All control values are recorded as an electrical signal and lead back to the control card. The proportional valve or the servo valve and servo piston transform the output signal of the control card to the desired setting.

This results in a very precise and dynamic control.

Hysteresis, consistency: approximately 1% of end value.

The SP control can also be combined with hydro-mechanical relief valves for pressure and/or power.

Example of application 1:

SP control with power limitation (2 quadrants) and pressure relief (4 quadrants).
### Proportional valve

<table>
<thead>
<tr>
<th></th>
<th>Nominal flow l/min (USgpm)</th>
<th>at Δp bar (psi)</th>
<th>Control pressure PST min max bar (psi)</th>
<th>Control electronics</th>
<th>Response time 0 ↔ Vmax [ms]</th>
<th>Servo pistons</th>
<th>Size cm³ (in³)</th>
<th>Diameter mm (in)</th>
<th>Stroke mm (in)</th>
<th>Volume cm³ (in³) (per chamber)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medium response</strong></td>
<td>12 (3.17)</td>
<td>10 (150)</td>
<td>60 (870) to 80 (1160)</td>
<td>ER 9</td>
<td>250 to 800</td>
<td></td>
<td>130 (7.9)</td>
<td>60 (2.36)</td>
<td>21 (.83)</td>
<td>59 (3.60)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>180 (11)</td>
<td>60 (2.36)</td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>250 (15.2)</td>
<td>75 (2.95)</td>
<td>18 (.71)</td>
<td>79 (4.82)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>360 (14.2)</td>
<td>75 (2.95)</td>
<td>25 (.98)</td>
<td>110 (6.71)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>500 (30.5)</td>
<td>75 (2.95)</td>
<td>22 (.87)</td>
<td>97 (5.92)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>750 (45.8)</td>
<td>75 (2.95)</td>
<td>30 (1.18)</td>
<td>132 (8.06)</td>
</tr>
<tr>
<td><strong>High response</strong></td>
<td>40 (11) to 80 (21)</td>
<td>70 (1000)</td>
<td>80 (1160) to 100 (1450)</td>
<td>UR 100</td>
<td>40 to 150</td>
<td></td>
<td>130 (7.9)</td>
<td>60 (2.36)</td>
<td>21 (.83)</td>
<td>59 (3.60)</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>180 (11)</td>
<td>60 (2.36)</td>
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<td>59 (3.60)</td>
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<td>75 (2.95)</td>
<td>30 (1.18)</td>
<td>132 (8.06)</td>
</tr>
</tbody>
</table>

### Control Cards Operation

- **ER 9**
  - control of swash angle (digital) for proportional valves with 2 solenoids.

- **UR 100**
  - Digital controller for display of the following functions by modification of the software:
    - control of swash plate angle.
    - control of swash plate angle with electronic pressure and power limitation.
    - Speed controller with pump adjustment.

- Digital controller for secondary unit with constant pressure network (secondary control).

- Speed control for secondary unit with constant pressure network (secondary control).

SP control option: hazardous location.
**Electrohydraulic displacement control SM**

- Servo control with integrated mechanical feedback of swash plate position.
- No electronic control card necessary
- Input signal $0 \pm 50$ or $0 \pm 100$ mA
- Hysteresis, repeatability: 8% of end value
- Also available in explosion proof class EEx i II version for hazardous duty.

![Diagram of Electrohydraulic Displacement Control SM]
Installation Dimensions – TPV 130 series

TPV 130
Dimensions mm (in.)

Control | Direction of rotation | Input to +V_max | Output B | Output A
---|---|---|---|---
A | Right hand | System pressure port SAE 1 1/4", 6000 psi | B | A
B | | Suction port SAE 2 1/2", 500 psi | | |
(L1) | | Drain port 1 5/16"–12UNF–2B according to mounting/position | | |
L2 | | Drain port G1 /use upper port | | |
(L3) | | Ventilation port for vertical mounting G3/8 (shaft upwards) | | |
(L3.1) | | Port G1/4 | | |
L5 | | Oil filling plug 1 1/16–12UNF–2B | | |
(L8) | | Air bleeding port G1/4 | | |
(MA) | | Gauge port system pressure G1/4 | | |
(ML) | | Gauge port of case pressure G1/4 | | |
XA | | Control port G1/4 | | |

Splined shaft dimensions, see below

Opt. position indicator

Center bore DM20 DIN332
W50x1.25x10a DIN5480

Port B
M16x30deep
50.8 (2.00)

Port A
M16x30deep
50.8 (2.00)
Installation Dimensions – TPV 180 Series

TPV180 – DR4

Dimensions mm (in.)

Control Direction of Input Output
rotation to \( +V_{\text{max}} \)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>
| A | System pressure port SAE 1 1/4", 6000 psi  
B | Suction port SAE 2 1/2", 500 psi  
(L1) Drain port 1 5/16"-12UNF–2B \ according to mounting–position  
L2 | Drain port G1 /use upper port  
(L3) Ventilation port for vertical mounting G3/8 (shaft upwards)  
(L3.1) Port G1/4  
(L5) Oil filling plug 1 1/16–12UNF–2B  
(L8) Air bleeding port G1/4  
(MA) | Gauge port system pressure G1/4  
(ML) | Gauge port of case pressure G1/4  
XA | Control port G1/4

Opt. position indicator

Splined shaft dimensions, see below

Center bore DM20 DIN332

W50x1.25x10a DIN5480
PF250
Dimensions mm (in.)

Center bore
DM20 DIN332

W62x1.25x10a
DIN5480

Control Direction of Input Output
rotation to \( +V_{\text{max}} \) Right hand B A

A System pressure port SAE \( 1 \frac{1}{2} \), 415 bar (6000 psi)
B Inlet connection SAE \( 3 \frac{1}{2} \), 35 bar (500 psi)
L₁ Drain port \( 1 \frac{7}{16} \) - 12 UNF-2B per mounting position use upper port
L₂ Drain port G \( 1 \frac{1}{4} \)” per mounting position use upper port
L₃ Ventilation port for vertical mounting G \( 3 \frac{1}{16} \)” (shaft upwards)
L₅ Oil fill plug
Mₐ Gauge port system pressure G \( 1 \frac{1}{4} \)”
PV250
side ports
Dimensions mm (in.)

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>to +V_{max}</td>
<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

A  System pressure port SAE 1\(1/2\)" G, 415 bar (6000 psi)
B  Inlet connection SAE 3\(1/2\)" G, 35 bar (500 psi)
L_1  Drain port 1\(5/8\)" – 12 UNF – 2B per mounting position use upper port
L_2  Drain port G 1\(1/4\)" G per mounting position use upper port
L_3  Ventilation port for vertical mounting G 3\(1/8\)" G (Shaft upwards)
L_5  Oil fill plug
M_A  Gauge port system pressure G 1\(1/4\)"
Installation Dimensions – 250 series

PV250 - DF2
side ports

Dimensions mm (in.)
1 Pilot valve (2nd stage)
2 Pressure compensator (1st stage)

Control

Direction of rotation

to +V_{max}  Right hand  Input  Output

A  System pressure port SAE 1\(\frac{1}{2}\)”, 415 bar (6000 psi)
B  Inlet connection SAE 3\(\frac{1}{2}\)”, 35 bar (500 psi)
(L1)  Drain port 3\(\frac{3}{8}\)” – 12 UNF – 2B per mounting position use upper port
(L2)  Drain port G 1\(\frac{1}{4}\)” per mounting position use upper port
(L3)  Ventilation port for vertical mounting G 3\(\frac{3}{8}\)” (shaft upwards)
(L5)  Oil fill plug 1\(\frac{1}{16}\)” – 12 UNF – 2B
(L8)  Air bleed port G 1\(\frac{1}{4}\)”
(MA)  Gauge port system pressure G 1\(\frac{1}{4}\)”
(ML)  Gauge port of case pressure G 1\(\frac{1}{4}\)”
(X1)  Gauge port G 1\(\frac{1}{4}\) x 12.5 deep
PV250 - DF2 - - - - - - 8
side ports

Dimensions mm (in.)

1. Pilot valve (2nd stage)
2. Pilot compensator (1st stage)
3. Load sensing valve

Control Direction of Input Output rotation
to +V_{\text{max}} Right hand B A

A System pressure port SAE 1\(1/2\)" , 415 bar (6000 psi)
B Inlet connection SAE 3\(1/2\)" , 35 bar (500 psi)
(L1) Drain port 1\(5/8\)" – 12 UNF – 2B per mounting position use upper port
(L2) Drain port G 11/4" per mounting position use upper port
(L3) Ventilation port for vertical mounting G 3/8" (shaft upwards)
(L6) Oil fill plug 11/16" – 12 UNF – 2B
(L8) Air bleed port G 1/4"
(MA) Gauge port system pressure G 1/4"
(ML) Gauge port of case pressure G 1/4"
(X1) Gauge port G 1/4 x 12.5 deep
(X2) Gauge port G 1/4 x 12.5 deep
Installation Dimensions – 250 series

PV250 - LR side ports
Dimensions mm (in.)
1 Pilot valve (2nd stage)
2 Pilot compensator (1st stage)
3 Power limitation valve

Control Direction of rotation Input Output

to 
+V max Right hand B A

A System pressure port SAE 1 1/2"; 415 bar (6000 psi)
B Inlet connection SAE 3 1/2"; 35 bar (500 psi)
(L1) Drain port 1 5/8" - 12 UNF – 2B per mounting position use upper port
(L2) Drain port G 1 1/4" per mounting position use upper port
(L3) Ventilation port for vertical mounting G 3/8" (Shaft upwards)
(L5) Oil fill plug 1 1/16" – 12 UNF – 2B
(L8) Air bleed port G 1/4"
(MA) Gauge port system pressure G 1/4"
(ML) Gauge port of case pressure G 1/4"
(X1) Gauge port G 1/4" x 12.5 deep
**PV250 - LR - 2**

*Side ports*

Dimensions mm (in.)

1. Pilot valve (2nd stage)
2. Pilot compensator (1st stage)
3. Load sensing valve
4. Power limitation valve

<table>
<thead>
<tr>
<th>Control</th>
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<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>to $+V_{max}$</td>
<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

A  System pressure port SAE 1 1/4", 415 bar (6000 psi)
B  Inlet connection SAE 3 1/2", 35 bar (500 psi)
(L1) Drain port 1 1/4" – 12 UNF – 2B per mounting position use upper port
(L2) Drain port G 1/4" per mounting position use upper port
(L3) Ventilation port for vertical mounting G 3/8" (Shaft upwards)
(L5) Oil fill plug 11/16" – 12 UNF – 2B
(L8) Air bleed port G 1/4"
(MA) Gauge port system pressure G 1/4"
(ML) Gauge port of case pressure G 1/4"
(X1) Gauge port G 1/4" x 12.5 deep
(X2) Gauge port G 1/4" x 12.5 deep
Installation Dimensions – 250 series

**PV250 - SP**

**side ports**

Dimensions mm (in.)

---

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
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</thead>
<tbody>
<tr>
<td>to +V&lt;sub&gt;max&lt;/sub&gt;</td>
<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

A  System pressure port SAE 1 1/2", 415 bar (6000 psi)
B  Inlet connection SAE 3 1/2", 35 bar (500 psi)
(L<sub>1</sub>)  Drain port 1 5/8" – 12 UNF – 2B per mounting position use upper port
L<sub>2</sub>  Drain port G 1 1/4" per mounting position use upper port
(L<sub>3</sub>)  Ventilation port for vertical mounting G 3/8" (Shaft upwards)
(L<sub>3.1</sub>)  Port G 1/4"*  
(L<sub>5</sub>)  Oil fill plug 1 1/16" – 12 UNF – 2B
(L<sub>8</sub>)  Air bleed port G 1/4"
(M<sub>A</sub>)  Gauge port system pressure G 1/4"
(M<sub>L</sub>)  Gauge port of case pressure G 1/4"
(M<sub>St</sub>)  Gauge port pilot pressure G 1/4"
(SS<sub>T</sub>)  Suction port of pilot pump G 3/8"
P<sub>St</sub>  Outlet port of pilot pump G 1/2"
(PSt<sub>1</sub>)  Port of pilot pressure G 1/2" (alternatively PSt1 or PSt1.1)
(PSt<sub>1</sub>)  Port of pilot pressure G 3/8"
XA  Pilot port pressure control G 1/4"

---

A System pressure port SAE 1 1/2", 415 bar (6000 psi)
B Inlet connection SAE 3 1/2", 35 bar (500 psi)
(L<sub>1</sub>)  Drain port 1 5/8" – 12 UNF – 2B per mounting position use upper port
L<sub>2</sub>  Drain port G 1 1/4" per mounting position use upper port
(L<sub>3</sub>)  Ventilation port for vertical mounting G 3/8" (Shaft upwards)
(L<sub>3.1</sub>)  Port G 1/4"  
(L<sub>5</sub>)  Oil fill plug 1 1/16" – 12 UNF – 2B
(L<sub>8</sub>)  Air bleed port G 1/4"
(M<sub>A</sub>)  Gauge port system pressure G 1/4"
(M<sub>L</sub>)  Gauge port of case pressure G 1/4"
(M<sub>St</sub>)  Gauge port pilot pressure G 1/4"
(SS<sub>T</sub>)  Suction port of pilot pump G 3/8"
P<sub>St</sub>  Outlet port of pilot pump G 1/2"
(PSt<sub>1</sub>)  Port of pilot pressure G 1/2" (alternatively PSt1 or PSt1.1)
(PSt<sub>1</sub>)  Port of pilot pressure G 3/8"
XA  Pilot port pressure control G 1/4"
TPF250

Dimensions mm (in.)

Control | Direction of rotation | Input | Output
--- | --- | --- | ---
to $+V_{\text{max}}$ | Right hand | B | A

A | System pressure port SAE $1\frac{1}{2}''$, 415 bar (6000 psi)
B | Inlet connection SAE $3\frac{1}{2}''$, 35 bar (500 psi)
(L1) | Drain port $1\frac{5}{8}'' – 12$ UNF – 2B per mounting position use upper port
(L2) | Drain port G $1\frac{1}{4}'''$ per mounting position use upper port
(L3) | Ventilation port for vertical mounting G $3\frac{3}{8}'''$ (Shaft upwards)
(L8) | Oil fill plug $1\frac{1}{16}''' – 12$ UNF – 2B
(MA) | Air bleed port G $1\frac{1}{4}'''$
(MA) | Gauge port system pressure G $1\frac{1}{4}'''$
**TPV 250**

Dimensions mm (in.)

---

Control | Direction of rotation | Input | Output
---|---|---|---
A | to +V_{max} | Right hand | B

A | System pressure port SAE 1\1/2", 415 bar (6000 psi)
B | Inlet connection SAE 3\1/2", 35 bar (500 psi)
(L1) | Drain port 1\5/8" – 12 UNF – 2B per mounting position use upper port
L2 | Drain port G 1\1/4" per mounting position use upper port
(L3) | Ventilation port for vertical mounting G 3/8" (Shaft upwards)
(L5) | Oil fill plug 1\1/16" – 12 UNF – 2B
(M\_A) | Gauge port system pressure G 1\1/4"
X1 | Pressure Control port G 1\1/4" (piping)
Installation Dimensions – 360 series

PF360
Dimensions mm (in.)

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of</th>
<th>Input</th>
<th>Output</th>
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<tbody>
<tr>
<td>to $V_{max}$</td>
<td>rotation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>System pressure port SAE 1 1/2, 415 bar (6000 psi)</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>Inlet connection SAE 3 1/2, 35 bar (500 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L1</td>
<td>Drain port 1 5/8 - 12 UNF-2B per mounting position use upper port</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>Drain port G 1 1/4 per mounting position use upper port</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>Ventilation port for vertical mounting G 3/8&quot; (shaft upwards)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L5</td>
<td>Oil fill plug 1 11/16 – 12 UNF – 2B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA</td>
<td>Gauge port system pressure G 1 1/4&quot;</td>
<td></td>
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</tr>
</tbody>
</table>
PV360 side ports
Dimensions mm (in.)

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of rotation</th>
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</thead>
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<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

A  System pressure port SAE 1\text{1/2}^\text{in}, 415 bar (6000 psi)
B  Inlet connection SAE 3\text{1/4}^\text{in}, 35 bar (500 psi)
L_1  Drain port 1\text{5/4}^\text{in} – 12 UNF – 2B per mounting position use upper port
L_2  Drain port G 1\text{1/4}^\text{in} per mounting position use upper port
L_3  Ventilation port for vertical mounting G 3/8^\text{in} (Shaft upwards)
L_5  Oil fill plug 11/16 – 12 UNF – 2B
M_A  Gauge port system pressure G 1/4^\text{in}
**PV360 – DF2 side ports**

Dimensions mm (in.)
1  Pilot valve (2nd stage)
2  Pressure compensator (1st stage)

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
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</thead>
<tbody>
<tr>
<td>to $+V_{\text{max}}$</td>
<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

- **A**  System pressure port SAE 1 1/2", 415 bar (6000 psi)
- **B**  Inlet connection SAE 3 1/2", 35 bar (500 psi)
- (L1) Drain port 1 5/8” – 12 UNF – 2B per mounting position use upper port
- (L2) Drain port G 1 1/4” per mounting position use upper port
- (L3) Ventilation port for vertical mounting G 3/8" (Shaft upwards)
- (L5) Oil fill plug 1 1/16” – 12 UNF – 2B
- (L8) Air bleed port G 1 1/4"
- (M_A) Gauge port system pressure G 1/4"
- (M_L) Gauge port case pressure G 1/4"
- (X1) Gauge port G 1/4" x 12.5 deep
Installation Dimensions – 360 series

**PV360 – DF2 - - - - - 8 side ports**

Dimensions mm (in.)

1. Pilot valve (2nd stage)
2. Pressure compensator (1st stage)
3. Load sensing valve

---

**Control**

<table>
<thead>
<tr>
<th>to +V&lt;sub&gt;max&lt;/sub&gt;</th>
<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

A  System pressure port SAE 1 1/2" 415 bar (6000 psi)
B  Inlet connection SAE 3 1/2" 35 bar (500 psi)
(L1) Drain port 1 5/8" – 12 UNF – 2B per mounting position use upper port
(L2) Drain port G 1 1/4" per mounting position use upper port
(L3) Ventilation port for vertical mounting G 3/8" (Shaft upwards)
(L5) Oil fill plug 1 11/16" – 12 UNF – 2B
(L8) Air bleed port G 1/4"
(MA) Gauge port system pressure G 1/4"
(ML) Gauge port case pressure G 1/4"
(X1) Gauge port G 1/4" x 12.5 deep
(X2) Gauge port G 1/4" x 12.5 deep
PV360 – LR side ports

Dimensions mm (in.)
1 Pilot valve (2nd stage)
2 Pressure compensator (1st stage)
3 Power limitation valve

Control Direction of Input Output rotation

to +V_{max} Right hand B A

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>System pressure port SAE 1\frac{1}{2}&quot;&quot;</td>
<td>415 bar (6000 psi)</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Inlet connection SAE 3\frac{1}{2}&quot;&quot;, 35 bar (500 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L1)</td>
<td>Drain port 1\frac{5}{8} – 12 UNF – 2B per mounting position use upper port</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L2)</td>
<td>Drain port G 1\frac{1}{4}&quot; per mounting position use upper port</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L3)</td>
<td>Ventilation port for vertical mounting G 3\frac{3}{8}&quot; (Shaft upwards)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L5)</td>
<td>Oil fill plug 1\frac{1}{16} – 12 UNF – 2B</td>
<td></td>
<td></td>
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<tr>
<td>(ML)</td>
<td>Air bleed port G 1\frac{1}{4}&quot;</td>
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</tr>
</tbody>
</table>
| (MA)    | Gauge port system pressure G 1\frac{1}{4}"
| (X1)    | Gauge port case pressure G 1\frac{1}{4}"
| (X1)    | Gauge port G 1\frac{1}{4}" x 12.5 deep |
Installation Dimensions – 360 series

PV360 – LR - 2
side ports

Dimensions mm (in.)
1 Pilot valve (2nd stage)
2 Pressure compensator
   (1st stage)
3 Load sensing valve
4 Power limitation valve

Control  Direction of rotation  Input  Output

<table>
<thead>
<tr>
<th>to +Vmax</th>
<th>Right hand</th>
<th>B</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>System pressure port SAE 1 1/8&quot;, 415 bar (6000 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Inlet connection SAE 3 1/2&quot;, 35 bar (500 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L1)</td>
<td>Drain port 1 5/8&quot; – 12 UNF – 2B per mounting position use upper port</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>Drain port G 1 1/4&quot; per mounting position use upper port</td>
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</tr>
<tr>
<td>(L3)</td>
<td>Ventilation port for vertical mounting G 3/8&quot; (Shaft upwards)</td>
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<tr>
<td>(L5)</td>
<td>Oil fill plug 1 1/16&quot; – 12 UNF – 2B</td>
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<tr>
<td>(L8)</td>
<td>Air bleed port G 1/4&quot;</td>
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<tr>
<td>(MA)</td>
<td>Gauge port system pressure G 1/4&quot;</td>
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<tr>
<td>(ML)</td>
<td>Gauge port case pressure G 1/4&quot;</td>
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<tr>
<td>(X1)</td>
<td>Gauge port G 1/4&quot; x 12.5 deep</td>
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<tr>
<td>X2</td>
<td>Gauge port G 1/4&quot; x 12.5 deep</td>
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</tbody>
</table>
**PV360 – SP with charge block & charge pump**

Dimensions mm (in.)

---

**Control Direction of rotation**

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>to $+V_{\text{max}}$</td>
<td>Right hand</td>
</tr>
</tbody>
</table>

- **A** System pressure port SAE $1\frac{1}{2}$", 415 bar (6000 psi)
- **B** Inlet connection SAE $3\frac{1}{2}$", 35 bar (500 psi)
- **(L1)** Drain port $1\frac{5}{8}$ – 12 UNF – 2B per mounting position use upper port
- **(L2)** Drain port G $1\frac{1}{4}$" per mounting position use upper port
- **(L3)** Ventilation port for vertical mounting G $3\frac{1}{8}$" (Shaft upwards)
- **(L3.1)** Port G $1\frac{1}{4}$"
- **(L5)** Oil fill plug $1\frac{1}{16}$" – 12 UNF – 2B
- **(M1)** Air bleed port G $1\frac{1}{4}$"
- **(M1A)** Gauge port system pressure G $1\frac{1}{4}$"
- **(M2)** Gauge port of case pressure G $1\frac{1}{4}$"
- **(MSt)** Gauge port pilot pressure G $1\frac{1}{4}$"
- **(SSt)** Suction port of pilot pump G $3\frac{1}{8}$"
- **(PSt)** Outlet port of pilot pump G $1\frac{1}{8}$"
- **(PSt1)** Port of pilot pressure G $1\frac{1}{8}$" (alternatively PSt1 or PSt1.1)
- **(PSt1)** Port of pilot pressure G $3\frac{1}{8}$"
TPF360

Dimensions mm (in.)

A System pressure port SAE $1\frac{1}{2}''$, 415 bar (6000 psi)
B Inlet connection SAE $3\frac{1}{2}''$, 35 bar (500 psi)
(L1) Drain port $1\frac{5}{8}'' - 12$ UNF – 2B per mounting position use upper port
L2 Drain port G $1\frac{1}{4}''$ per mounting position use upper port
(L3) Ventilation port for vertical mounting G $3/8''$ (Shaft upwards)
(L5) Oil fill plug $1\frac{1}{16}'' - 12$ UNF – 2B
(L8) Air bleed port G $1/4''$
(MA) Gauge port system pressure G $1/4''$
TPV360 - DF2
Dimensions mm (in.)

<table>
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<tr>
<th>Control</th>
<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>to $+V_{\text{max}}$</td>
<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

- **A** System pressure port SAE 1\(\frac{1}{2}\)", 415 bar (6000 psi)
- **B** Inlet connection SAE 3\(\frac{1}{2}\)", 35 bar (500 psi)
- **L1** Drain port 1\(\frac{3}{8}\)" – 12 UNF – 2B per mounting position use upper port
- **L2** Drain port G 1\(\frac{1}{4}\)" per mounting position use upper port
- **L3** Ventilation port for vertical mounting G 3\(\frac{3}{8}\)" (Shaft upwards)
- **L5** Oil fill plug 1\(\frac{1}{16}\)" – 12 UNF – 2B
- **MA** Gauge port system pressure G 1\(\frac{1}{4}\)"
Installation Dimensions – 500 series

PF 500
Dimensions mm (in.)

Control | Direction of rotation | Input | Output |
---|---|---|---|
 to +V_{\text{max}} | Right hand | B | A |
A | System pressure port SAE 2", 415 bar (6000 psi) | | |
B | Inlet connection SAE 5", 35 bar (500 psi) | | |
(L1) | Drain port 1\(^{\frac{5}{8}}\)" – 12 UNF – 2B per mounting position use upper port | | |
L2 | Drain port G 1\(^{\frac{1}{2}}\)" per mounting position use upper port | | |
(L3) | Ventilation port for vertical mounting G 1\(^{\frac{1}{4}}\)" (shaft upwards) | | |
(MA) | Gauge port system pressure G 1\(^{\frac{1}{4}}\)" | | |
(...) | Normally plugged | | |
PV 500-DF2

Dimensions mm (in.)
1 – Pilot valve (2nd stage)
2 – Pressure compensator (1st stage)

Control Direction of Input Output rotation

to $+V_{\text{max}}$ Right hand B A

A System pressure port SAE 2", 415 bar (6000 psi)
B Inlet connection SAE 5", 35 bar (500 psi)
(L1) Drain port 1 5/8" – 12 UNF – 2B per mounting position use upper port
L2 Drain port G 1 1/2" per mounting position use upper port
(L3) Ventilation port for vertical mounting G 1/4" (Shaft upwards)
(L5) Oil fill plug G 1 1/2"
(L8) Air bleed port G 1/4"
(ML) Gauge port of case pressure G 1/4"
(MA) Gauge port system pressure G 1/4"
(X1) Gauge port G 1 1/4" x 12.5 deep
(...) Normally plugged
Installation Dimensions – 500 series

**PV 500-DF2 - - - - 8**

Dimensions mm (in.)
1 – Pilot valve (2nd stage)
2 – Pressure compensator (1st stage)
3 – Load sensing valve

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>to +V_{\text{max}}</td>
<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

A System pressure port SAE 2", 415 bar (6000 psi)
B Inlet connection SAE 5", 35 bar (500 psi)
(L₁) Drain port 1\(\frac{1}{4}\) – 12 UNF – 2B per mounting position use upper port
(L₂) Drain port G 1\(\frac{1}{2}\)” per mounting position use upper port
(L₃) Ventilation port for vertical mounting G 1\(\frac{1}{4}\)” (Shaft upwards)
(L₄) Oil fill plug 1\(\frac{1}{2}\)” – 12 UNF – 2B
(L₅) Air bleed port G 1\(\frac{1}{4}\)”
(Mₐ) Gauge port system pressure G 1\(\frac{1}{4}\)”
(Mₗ) Gauge port of case pressure G 1\(\frac{1}{4}\)”
(X₁) Gauge port G 1\(\frac{1}{4}\)” x 12.5 deep
(… Normaly plugged
### Dimensions mm (in.)

1 – Pilot valve (2nd stage)  
2 – Pressure compensator (1st stage)  
3 – Power limitation valve

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of rotation to +V&lt;sub&gt;max&lt;/sub&gt;</th>
<th>Input</th>
<th>Output</th>
</tr>
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<tbody>
<tr>
<td>A</td>
<td>System pressure port SAE 2&quot;, 415 bar (6000 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Inlet connection SAE 5&quot;, 35 bar (500 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L&lt;sub&gt;1&lt;/sub&gt;)</td>
<td>Drain port 13/8 – 12 UNF – 2B per mounting position use upper port</td>
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</tr>
<tr>
<td>L&lt;sub&gt;2&lt;/sub&gt;</td>
<td>Drain port G 11/2&quot; per mounting position use upper port</td>
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<tr>
<td>(L&lt;sub&gt;3&lt;/sub&gt;)</td>
<td>Ventilation port for vertical mounting G 1/4&quot; (Shaft upwards)</td>
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<td></td>
</tr>
<tr>
<td>(L&lt;sub&gt;5&lt;/sub&gt;)</td>
<td>Oil fill plug 11/2&quot; – 12 UNF – 2B</td>
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<td></td>
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<tr>
<td>L8</td>
<td>Air bleed port G 1/4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(MA)</td>
<td>Gauge port system pressure G 1/4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ML)</td>
<td>Gauge port of case pressure G 1/4&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X1</td>
<td>Gauge port G 1/4&quot; x 12.5 deep</td>
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<tr>
<td>(...)</td>
<td>Normally plugged</td>
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</table>
Installation Dimensions – 500 series

**PV 500-LR - 2**

Dimensions mm (in.)

1 – Pilot valve (2nd stage)
2 – Pressure compensator (1st stage)
3 – Load sensing valve
4 – Power limitation valve

---

### Control Direction of rotation

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>to +V&lt;sub&gt;max&lt;/sub&gt;</td>
<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

- **A** System pressure port SAE 2", 415 bar (6000 psi)
- **B** Inlet connection SAE 5", 35 bar (500 psi)
- **(L1)** Drain port 1<sup>5/8</sup>" – 12 UNF – 2B per mounting position use upper port
- **(L2)** Drain port G 1<sup>1/2</sup>" per mounting position use upper port
- **(L3)** Ventilation port for vertical mounting G 1/4" (Shaft upwards)
- **(L5)** Oil fill plug G 1<sup>1/2</sup>"
- **(L8)** Air bleed port G 1/4"
- **(MA)** Gauge port system pressure G 1/4"
- **(ML)** Gauge port of case pressure G 1/4"
- **(X1)** Gauge port G 1/4" x 12.5 deep
- **(X2)** Gauge port G 1/4" x 12.5 deep
PV 500-SP

Dimensions mm (in.)

1 – Proportional control valve
2 – Fail safe valve intermediate plate (optional)
3 – Zero flow stop
4 – Pilot pump (8 ccm)
5 – Adjustment pilot oil relief valve
6 – Feedback potentiometer with visual indicator

Control Direction of Input Output rotation

to +Vmax Right hand B A

A System pressure port SAE 2", 415 bar (6000 psi)
B Inlet connection SAE 5 1/2", 35 bar (500 psi)
(L1) Drain port 1 5/8" – 12 UNF – 2B per mounting position use upper port
(L2) Drain port G 1 1/2" per mounting position use upper port
(L3) Ventilation port for vertical mounting G 1/4" (Shaft upwards)
(L5) Oil fill plug G 1 1/2"
(L8) Air bleed port G 1/4"
(MA) Gauge port system pressure G 1/4"
(ML) Gauge port of case pressure G 1/4"
(MSt) Gauge port pilot pressure G 1/4"
PSt1 Port of pilot pressure G 1/2"
XA Control port G 1/4"
**TPF 500**
Dimensions mm (in.)

<table>
<thead>
<tr>
<th>Control</th>
<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
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<tr>
<td>to $+V_{\text{max}}$</td>
<td>Right hand</td>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>A</td>
<td>System pressure port SAE 2&quot;, 415 bar (6000 psi)</td>
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<td></td>
</tr>
<tr>
<td>B</td>
<td>Inlet connection SAE 5&quot;, 35 bar (500 psi)</td>
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</tr>
<tr>
<td>(L1)</td>
<td>Drain port $\frac{3}{8}$&quot; – 12 UNF – 2B per mounting position use upper port</td>
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<tr>
<td>L2</td>
<td>Drain port G $\frac{1}{2}$&quot; per mounting position use upper port</td>
<td></td>
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<tr>
<td>(L3)</td>
<td>Ventilation port for vertical mounting G $\frac{1}{4}$&quot; (shaft upwards)</td>
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<tr>
<td>(MA)</td>
<td>Gauge port system pressure G $\frac{1}{4}$&quot;</td>
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<tr>
<td>(...)</td>
<td>Normally plugged</td>
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TPV 500-DP

Dimensions mm (in.)

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<th>Direction of rotation</th>
<th>Input</th>
<th>Output</th>
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<td>B</td>
<td>A</td>
</tr>
<tr>
<td>A</td>
<td>System pressure port SAE 2&quot;, 415 bar (6000 psi)</td>
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<td></td>
</tr>
<tr>
<td>B</td>
<td>Inlet connection SAE 5¹/₅&quot;, 35 bar (500 psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L1)</td>
<td>Drain port 1⁵/₆&quot; – 12 UNF – 2B per mounting position use upper port</td>
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</tr>
<tr>
<td>L2</td>
<td>Drain port G 1¹/₂&quot; per mounting position use upper port</td>
<td></td>
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<tr>
<td>(L3)</td>
<td>Ventilation port for vertical mounting G 1/₄&quot; (Shaft upwards)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L5)</td>
<td>Oil fill plug G 1¹/₂&quot;</td>
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<tr>
<td>(L8)</td>
<td>Air bleed port G 1/₄&quot;</td>
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<tr>
<td>(MA)</td>
<td>Gauge port system pressure G 1/₄&quot;</td>
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<tr>
<td>(ML)</td>
<td>Gauge port of case pressure G 1/₄&quot;</td>
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<td>(MSt)</td>
<td>Gauge port pilot pressure G 1/₄&quot;</td>
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<tr>
<td>PST1</td>
<td>Port of pilot pressure G 1/₂&quot;</td>
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<tr>
<td>XA</td>
<td>Control port G 1/₄&quot;</td>
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Installation Dimensions – 750 series

**PF 750**
Dimensions mm (in.)

A  System pressure port SAE 2", 415 bar (6000 psi)
B  Inlet connection SAE 5", 35 bar (500 psi)
(L1)  Drain port 1 5/8”– 12 UNF – 2B per mounting position use upper port
L2  Drain port G 1 1/2” per mounting position use upper port
(L3)  Ventilation port for vertical mounting G 1/4” (shaft upwards)
(MA)  Gauge port system pressure G 1/4”
PV 750
Dimensions mm (in.)

Control | Direction of rotation | Input | Output
---------|-----------------------|-------|-------
to + Vmax | Right hand rotation  | B     | A     
to - Vmax | Right hand rotation  | A     | B     

A System pressure port SAE 2", 6000 psi
B System pressure port SAE 2", 6000 psi
(L1) Drain port 1 5/8"–12UNF–2B ) according to mounting-position
L2 Drain port G 1 1/2 ) use upper port
(L3) Ventilation port for vertical mounting G1/4 (shaft upwards)
(L5) Oil filling plug 1 1/16"–12UNF
(L8) Air bleeding port G1/4
(MA) Gauge port system pressure G1/4
(MB) Gauge port system pressure G1/4
(ML) Gauge port case pressure G1/4
SM Controls
Displacements 130/180

Dimensions in mm (in.)

PV130/180
SMN1A_11

PV130/180
SMN2A_11

PV130/180
SMA2A_11
Installation Dimensions – controls

SP Controls

Displacements 130/180

Dimensions in mm (in.)

PV130/180

SP__A__1

SP__N2__1

PV130/180

SP__N2N1__1

PV130/180

SP2E1___

PV130/180

SP2E2____
SM Controls
Displacements 250 to 750
Dimensions in mm (in.)

<table>
<thead>
<tr>
<th>mm</th>
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<th>B1</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
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<td>230</td>
<td>271</td>
<td>236</td>
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<tr>
<td>360</td>
<td>426</td>
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<td>285</td>
<td>236</td>
<td>135</td>
<td>160</td>
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<tr>
<td>500</td>
<td>541.5</td>
<td>300</td>
<td>330</td>
<td>267.5</td>
<td>172</td>
<td>186</td>
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<td>750</td>
<td>571</td>
<td>307</td>
<td>372</td>
<td>270</td>
<td>172</td>
<td>188.5</td>
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<th>L2</th>
<th>B1</th>
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<td>9.06</td>
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<td>16.8</td>
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<tr>
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<td>12.1</td>
<td>14.6</td>
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</table>
Installation Dimensions – controls

SP Controls  
Displacements 250 to 750

Dimensions in mm (in.)

<table>
<thead>
<tr>
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<th>SP__N2N1_11</th>
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<tbody>
<tr>
<td>view Z</td>
<td>view Y</td>
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<table>
<thead>
<tr>
<th>PV250...750</th>
<th>SP__A__1_11</th>
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<tbody>
<tr>
<td>view Z</td>
<td>view X</td>
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<table>
<thead>
<tr>
<th>PV250...750</th>
<th>SP__A__1_11</th>
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<td>view Z</td>
<td>view X</td>
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<table>
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<th>Dimensions in mm (in.)</th>
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<tr>
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<td>350</td>
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<tr>
<td>450</td>
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<tr>
<td>550</td>
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<td>650</td>
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DP Controls
Displacements 250 to 750

Dimensions in mm (in.)
Installation Dimensions – controls

ES Control
Displacements 130 to 750
Dimensions in mm (in.)

<table>
<thead>
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<th>mm</th>
<th>L1</th>
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<th>B1</th>
<th>H1</th>
<th>H2</th>
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<th>L2</th>
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</table>
PV130 to 750
Dimensions in mm (in.)
SAE“A, B, C” Pump 130 to 750

ISO–125...250 Pump 130 to 750

extra bores for two bolt-flange

<table>
<thead>
<tr>
<th>PV130/180</th>
<th>B1</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>L1</th>
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<tbody>
<tr>
<td>SAE“A”</td>
<td>106 (4.17)</td>
<td>82.55 (3.25)</td>
<td>M10</td>
<td>16/32DP–9T</td>
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<tr>
<td>SAE”B”</td>
<td>146 (5.75)</td>
<td>101.6 (4.00)</td>
<td>M12</td>
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<tr>
<td>SAE”C”</td>
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<td>127 (5.00)</td>
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<td>12/24DP–14T</td>
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<table>
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<tr>
<th>ISO–125</th>
<th>B1</th>
<th>D1</th>
<th>D2</th>
<th>D3 [DIN5480]</th>
<th>D4</th>
<th>H1</th>
<th>L1</th>
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<tbody>
<tr>
<td>BG 130/180</td>
<td>180 (7.09)</td>
<td>125 (4.92)</td>
<td>M16</td>
<td>M40x1.25x10a</td>
<td>M12</td>
<td>160 (6.30)</td>
<td>48 (1.89)</td>
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<tr>
<td>ISO–160</td>
<td>–</td>
<td>160 (6.30)</td>
<td>–</td>
<td>N50x1.25x10a</td>
<td>M16</td>
<td>200 (7.87)</td>
<td>48 (1.89)</td>
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<td>ISO–200</td>
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<td>200 (7.87)</td>
<td>–</td>
<td>N62x1.25x10a</td>
<td>M20</td>
<td>250 (9.84)</td>
<td>92 (3.62)</td>
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<tr>
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<th>D1</th>
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<th>D3</th>
<th>D4</th>
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<th>L1</th>
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<td>180 (7.09)</td>
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<td>M40x1.25x10a</td>
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<td>160 (6.30)</td>
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<td>N50x1.25x10a</td>
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<td>N62x1.25x10a</td>
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<th>D3</th>
<th>D4</th>
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<th>L1</th>
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<tbody>
<tr>
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<td>180 (7.09)</td>
<td>125 (4.92)</td>
<td>M16</td>
<td>M40x1.25x10a</td>
<td>M12</td>
<td>160 (6.30)</td>
<td>75 (2.95)</td>
</tr>
<tr>
<td>ISO–160</td>
<td>–</td>
<td>160 (6.30)</td>
<td>–</td>
<td>N50x1.25x10a</td>
<td>M16</td>
<td>200 (7.87)</td>
<td>75 (2.95)</td>
</tr>
<tr>
<td>ISO–200</td>
<td>–</td>
<td>200 (7.87)</td>
<td>–</td>
<td>N62x1.25x10a</td>
<td>M20</td>
<td>250 (9.84)</td>
<td>75 (2.95)</td>
</tr>
<tr>
<td>ISO–250</td>
<td>–</td>
<td>250 (9.84)</td>
<td>–</td>
<td>N80x3x28x10a</td>
<td>M24</td>
<td>315 (12.4)</td>
<td>75 (2.95)</td>
</tr>
</tbody>
</table>
Application Data

Installation position

Installation position is optional however note bearing lubrication with respect to mounting position.

<table>
<thead>
<tr>
<th>Installation position</th>
<th>Drain piping</th>
<th>Installation position</th>
<th>Drain piping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft horizontal</td>
<td>![Image of shaft horizontal setup]</td>
<td>Shaft pointing downwards</td>
<td>![Image of shaft pointing downwards setup]</td>
</tr>
<tr>
<td></td>
<td>Pump can be rotated freely about the lateral axis</td>
<td>Use ventilation line L₄ (Available upon request). Prime main overflow oil outlet L₂ (L₁) with 0.2 bar (2.9 psi).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use the highest overflow oil outlet, L₁ or L₂</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shaft pointing upwards</td>
<td>![Image of shaft pointing upwards setup]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use ventilation line L₃. Pre load drain port overflow oil outlet L₂ (L₁) with 0.2 bar (2.9 psi).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Swash Plate Angle & Flow Direction

- **CW**
  - Direction of rotation clockwise
- **CCW**
  - Direction of rotation counterclockwise

- **A**
  - Reference point or axis

- **L₁, L₂, L₃, L₄**
  - Labels for various ports or lines in the diagrams

- **PV130...360, PV500...750**
  - Model numbers for the equipment

- **L₈**
  - Additional port or line used as venting port

- **G1/8**
  - Plug size used for internal connection closure

- **Pin no. 40.6082.1014–01**
  - Reference for additional connection or port setup
Case flushing requirements
Case flushing is not necessary for open loop pumps with DR or LR controls.

A check valve must not be used in the drain pipe. The drain pipe must terminate below the oil level in the reservoir.

Case flushing is not necessary for open loop pumps with DF controls if flushing or return oil is drained via the case.

For all other conditions with low pressure <20 bar (<300 psi) and low flow (<10% of Q_max) case flushing is required.

For operation with special fluids HFB and HFC, case flushing is required.

Flushing flow
Flushing flow via the pump case should be >1% of maximum pump flow. Maximum flushing flow depends on case pressure.

Fluids
Pumps in this catalog are primarily designed to operate with conventional petroleum based hydraulic oil. Alternative fluids and restrictions:

NOTE:
1. All maximum speed figures are based on atmospheric pressure (1.0 bar absolute) at pump inlet. This requires an overhead reservoir.
2. All listed ratings are based on the use of a good quality fluid.
3. Alternative fluids have a reduced tolerance for contamination over petroleum base fluids. Good filtration is therefore critical.

Pressure and flow ratings of hydraulic components generally have to be reduced when alternative fluids are used.

Because hydraulic pumps depend on the pumping fluid for dynamic lubrication, it is necessary to alter the ratings in order to retain the durability and operating life that is expected in today's hydraulic systems.

These pumps will provide exceptional life when used with a good quality clean fluid at the pump ratings specified for that fluid.

Fluid maintenance is critical to the durability of all hydraulic components, and particularly so with hydraulic pumps. This becomes even more of a factor when alternative fluids are used. All types of alternative fluids require extensive maintenance in order to maintain proper levels of water content, acidity, viscosity and contamination.

Fluid cleanliness
These pumps are rated for anti-wear petroleum fluids with a contamination level of 18/15/13 (Vickers) or ISO 18/14. Operation in fluids with levels more contaminated than this is not recommended. Fluids other than petroleum, severe service cycles, or temperature extremes are cause for adjustment of these codes. Please contact your Vickers representative for specific duty cycle recommendations.

Vickers pumps, as with any variable displacement piston pumps, will operate with apparent satisfaction in fluids up to the rating specified here. Experience has shown, however, that pump and hydraulic system life is not optimized with high fluid contamination levels (high ISO cleanliness codes).

Proper fluid condition is essential for long and satisfactory life of hydraulic components and systems. Hydraulic fluid must have the correct balance of cleanliness, materials, and additives for protection against wear of components, elevated viscosity, and inclusion of air.

Essential information on the correct methods for treating hydraulic fluid is included in Vickers publication 561 – "Vickers Guide to Systemic Contamination Control" – available from your local Vickers distributor. In this publication, filtration and cleanliness levels for extending the life of axial piston pumps and other system components are listed. Included is an excellent discussion of the selection of products needed to control fluid condition.

Ordering procedure
When ordering please specify full model designations of items required; see “Model codes” section of this catalog.

Note the following:
- Designations of variable displacement pumps must include the supplementary designation of the required control type.

<table>
<thead>
<tr>
<th>Type</th>
<th>FLUIDS Classification</th>
<th>Max. Pressure bar</th>
<th>Max. Speed rpm</th>
<th>Recommended Seal Material</th>
<th>Max. Operation Temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil-in-Water Emulsion</td>
<td>HFAE</td>
<td>Not Rated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water-in-Oil Emulsion</td>
<td>HFB</td>
<td>250</td>
<td>1800</td>
<td>Nitrile</td>
<td>49</td>
</tr>
<tr>
<td>Water Glycol</td>
<td>HFC</td>
<td>250</td>
<td>1800</td>
<td>Nitrile</td>
<td>49</td>
</tr>
<tr>
<td>Phosphate Ester</td>
<td>HFDR</td>
<td>350 / 420</td>
<td>1800</td>
<td>Fluorocarbon</td>
<td>66</td>
</tr>
<tr>
<td>Polyol Ester</td>
<td>HFDU</td>
<td>350 / 420</td>
<td>1800</td>
<td>Fluorocarbon or High ACN Nitrile</td>
<td>66</td>
</tr>
</tbody>
</table>