Axial piston pumps
variable displacement, mechanical controls

PVPC
Variable displacement axial piston pumps with swash plate design suited for high pressure open circuits. They are characterized by low noise emission, short response time and flexible operation thanks to the wide range of mechanical controls, see section [7].

For PVPC pumps with electrohydraulic proportional controls, see tech table AS170.

SAE J744 mounting flange and shaft.

PVPC

<table>
<thead>
<tr>
<th>Max displacement</th>
<th>Max pressure working</th>
<th>Max pressure peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>(cm³/rev)</td>
<td>(bar)</td>
<td>(bar)</td>
</tr>
<tr>
<td>29, 46, 73, 140</td>
<td>280</td>
<td>350</td>
</tr>
<tr>
<td>88</td>
<td>250</td>
<td>315</td>
</tr>
</tbody>
</table>

11 | A160

Table A160-15/E

1 MODEL CODE

PVPC - X2E - C - 4046 / 1 D - X 24DC + / |

Variable displacement axial piston pump

Option for pumps with through shaft (1)
XA = intermediate flange SAE A
XB = intermediate flange SAE B
XC = intermediate flange SAE C
(only for size 5073 and 5090)

Additional suffix for double pumps:
X2E = with a fixed displacement pump type PFE (see tech table A005)

Type of control, see section [7]
C = manual pressure compensator
CH = manual pressure compensator, with venting
R = remote pressure compensator
L = load sensing (pressure & flow)
LW = constant power (combined pressure & flow)

For electrohydraulic proportional controls, see tech table AS170

Size and max displacement (2):
3029 = size 3 - displacement 029 cm³/rev
4046 = size 4 - displacement 046 cm³/rev
5073 = size 5 - displacement 073 cm³/rev
5090 = size 5 - displacement 088 cm³/rev
6140 = size 6 - displacement 140 cm³/rev

Shaft, SAE Standard (3):
1 = keyed
5 = splined

(1) Not available for PVPC--*-6140
(2) Optional intermediate displacements 35 and 53 cm³/rev are available on request
(3) Pumps with ISO 3019/2 mounting flange and shaft (option /M) are available on request
2 GENERAL CHARACTERISTICS

Assembly position - see section 6
Any position. The drain port must be on the top of the pump. Drain line must be separated and unrestricted to the reservoir and extended below the oil level as far from the inlet as possible. Suggested maximum line length is 3 m.

Ambient temperature range
Standard = -25°C ÷ +80°C /PE option -15°C ÷ +80°C

Storage temperature
Standard = -40°C ÷ +50°C /PE option -20°C ÷ +50°C

Surface protection (pump body)
Black painting RAL9005

3 HYDRAULIC CHARACTERISTICS - based on mineral oil ISO VG 46 at 50 °C

<table>
<thead>
<tr>
<th>PVPC size</th>
<th>3029</th>
<th>4046</th>
<th>5073</th>
<th>5090</th>
<th>6140</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max displacement (cm³/rev)</td>
<td>29</td>
<td>46</td>
<td>73</td>
<td>88</td>
<td>140</td>
</tr>
<tr>
<td>Theoretical max flow at 1450 rpm (l/min)</td>
<td>42</td>
<td>66,7</td>
<td>105,8</td>
<td>127,6</td>
<td>203</td>
</tr>
<tr>
<td>Max working pressure / Peak (bar)</td>
<td>280/350</td>
<td>280/350</td>
<td>280/350</td>
<td>250/315</td>
<td>280/350 (1)</td>
</tr>
<tr>
<td>Min/Max inlet pressure (bar abs.)</td>
<td>0,8 / 25</td>
<td>0,8 / 25</td>
<td>0,8 / 25</td>
<td>0,8 / 25</td>
<td>0,8 / 25</td>
</tr>
<tr>
<td>Max pressure on drain port (bar abs.)</td>
<td>1,5</td>
<td>1,5</td>
<td>1,5</td>
<td>1,5</td>
<td>1,5</td>
</tr>
<tr>
<td>Power consumption at 1450 rpm and at max pressure and displacement (Kw)</td>
<td>19,9</td>
<td>31,6</td>
<td>50,1</td>
<td>54,1</td>
<td>122</td>
</tr>
<tr>
<td>Max torque on the shaft (shaft type) (Nm)</td>
<td>Type 1 210</td>
<td>Type 5 270</td>
<td>Type 1 350</td>
<td>Type 5 440</td>
<td>Type 1 670</td>
</tr>
<tr>
<td>Max torque at max working pressure (Nm)</td>
<td>128</td>
<td>203</td>
<td>328</td>
<td>350</td>
<td>780</td>
</tr>
<tr>
<td>Speed rating (rpm)</td>
<td>500 ÷ 3000</td>
<td>500 ÷ 2600</td>
<td>500 ÷ 2600</td>
<td>500 ÷ 2200</td>
<td>500 ÷ 2200</td>
</tr>
<tr>
<td>Body volume (l)</td>
<td>0,7</td>
<td>0,9</td>
<td>1,5</td>
<td>1,5</td>
<td>2,8</td>
</tr>
</tbody>
</table>

(1) The maximum pressure can be increased to 350 bar (working) and 420 (peak) after detailed analysis of the application and of the pump working cycle.

4 ELECTRICAL CHARACTERISTICS - for PVPC-CH

Insulation class
H

Connector protection degree
IP 65

Relative duty factor
100%

Supply voltage tolerance
± 10%

4.1 COIL VOLTAGE - only for CH version
Average values based ambient/coil temperature of 20°C.

<table>
<thead>
<tr>
<th>External supply nominal voltage ±10%</th>
<th>Voltage code</th>
<th>Power consumption</th>
<th>Nominal current</th>
<th>Coil characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIRECT CURRENT</td>
<td>12 DC</td>
<td>12 DC</td>
<td>19,2 W</td>
<td>1,61 A</td>
</tr>
<tr>
<td></td>
<td>24 DC</td>
<td>24 DC</td>
<td></td>
<td>0,80 A</td>
</tr>
</tbody>
</table>

4.2 ELECTRIC CONNECTORS ACCORDING TO DIN 43650 - to be ordered separately

<table>
<thead>
<tr>
<th>Code of connector</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP-666</td>
<td>Connector IP-65</td>
</tr>
<tr>
<td>SP-667</td>
<td>Connector IP-65 but with built-in signal led</td>
</tr>
</tbody>
</table>

5 SEALS AND HYDRAULIC FLUIDS - for other fluids not included in below table, consult our technical office

Seals, recommended fluid temperature
NBR seals (standard) = -25°C ÷ +80°C, with HFC hydraulic fluids = -20°C ÷ +50°C
FKM seals (PE option) = -20°C ÷ +80°C

Recommended viscosity
15-35 mm²/s - max allowed range: min 10 cSt (at 80°C) - max 1500 cSt at cold startup (-25°C)

Max fluid contamination level
ISO4406 class 20/18/13 NAS1638 class 9
ISO4406 class 18/16/11 NAS1638 class 7
see also filter section at www.atos.com or KTF catalog

Hydraulic fluid
Suitable seals type
Classification
Ref. Standard

| Mineral oils | NBR, FKM, HNBR | HL, HLP, HLDP, HVLP, HVLPD | DIN 51524 |
| Flame resistant without water | FKM | HFDU, HFDR (1) |
| Flame resistant with water | NBR, HNBR | HFC (1) |

(1) Max working pressure must be reduced to: 180 bar (working) / 210 bar (peak) for HFC fluid
200 bar (working) / 240 bar (peak) for HFDU and HFDR fluid
6 INSTALLATION POSITION

INSIDE THE TANK
Minimum oil level equal or above the pump mounting surface.
A ≥ 200mm

INSIDE THE TANK
Minimum oil level below the pump mounting surface.
Minimum inlet pressure = 0.8 bar (absolute)
B ≤ 800mm, C= 200mm

OUTSIDE THE TANK, above oil level
Minimum inlet pressure = 0.8 bar absolute
B ≤ 800mm, C= 200mm

OUTSIDE THE TANK, below oil level
C= 200mm

IN: inlet line - D1: drain line - A: minimum distance between inlet and drain line - B+C: permissible suction height - C: inlet line immersion dept

7 MAX PERMISIBLE LOAD ON DRIVE SHAFT

PVPC size | 3029 | 4046 | 5073 | 5090 | 6140
---|---|---|---|---|---
Fax = axial load | N | 1000 | 1500 | 2000 | 2000 | 2000
Frad = radial load | N | 1500 | 1500 | 3000 | 3000 | 3000

Notes: For speeds over 1800 rpm the inlet port must be under oil level with adequate pipes.
Maximum pressure for all models with water glycol fluid is 160 bar, with option /PE is 190 bar.
Max speed with options /PE and for water glycol fluid is 2000/1900/1600/1500 rpm respectively for the four sizes.

8 VARIATION OF MAX SPEED VS INLET PRESSURE

<table>
<thead>
<tr>
<th>Inlet pressure</th>
<th>Displacement %</th>
<th>% variation of the max. speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>bar abs.</td>
<td>65</td>
<td>70</td>
</tr>
<tr>
<td>0.8</td>
<td>120</td>
<td>115</td>
</tr>
<tr>
<td>0.9</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>1.0</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>1.2</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>1.4</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>1.6</td>
<td>120</td>
<td>120</td>
</tr>
<tr>
<td>2.0</td>
<td>120</td>
<td>120</td>
</tr>
</tbody>
</table>

Example
Displacement: 80% - Inlet pressure: 1.0 bar - Speed: 115%
9 MAX DISPLACEMENT SETTING

### PVPC size

<table>
<thead>
<tr>
<th>PVPC size</th>
<th>3029</th>
<th>4046</th>
<th>5073</th>
<th>5090</th>
<th>6140</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max displacement setting range</td>
<td>from to</td>
<td>20,1 ÷ 28,7</td>
<td>31,8 ÷ 45,4</td>
<td>36,8 ÷ 73,6</td>
<td>44,0 ÷ 87,9</td>
</tr>
<tr>
<td>One turn of screw changes pump displacement by approximately</td>
<td>cm³/rev</td>
<td>1.5</td>
<td>2.2</td>
<td>3.2</td>
<td>3.2</td>
</tr>
<tr>
<td>For locking displacement limiter screw</td>
<td>mm</td>
<td>14</td>
<td>14</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>For displacement setting</td>
<td>mm</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Tightening torque</td>
<td>Nm</td>
<td>15 ± 1</td>
<td>15 ± 1</td>
<td>15 ± 1</td>
<td>15 ± 1</td>
</tr>
</tbody>
</table>

10 DIAGRAMS at 1450 rpm (based on mineral oil ISO VG 46 at 50°C)

10.1 Noise level curves

Ambient noise levels measured in compliance with ISO 4412-1 oleohydraulics - Test procedure to define the ambient noise level - Pumps

Shaft speed: 1450 rpm.

- --- = Qmax
- - - - = Qmin

### Diagrams

- **PVPC-3029**
- **PVPC-4046**
- **PVPC-5073 and PVPC-5090**
- **PVPC-6140**
10.2 Operating limits

1 = Volumetric efficiency
2 = Overall efficiency
3 = Flow versus pressure curve
4 = Power consumption with full flow
5 = Power consumption at null flow

<table>
<thead>
<tr>
<th>Pump type</th>
<th>T1 (ms)</th>
<th>T2 (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVPC-*-3029</td>
<td>140</td>
<td>36</td>
</tr>
<tr>
<td>PVPC-*-4046</td>
<td>140</td>
<td>42</td>
</tr>
<tr>
<td>PVPC-*-5073</td>
<td>160</td>
<td>44</td>
</tr>
<tr>
<td>PVPC-*-5090</td>
<td>160</td>
<td>44</td>
</tr>
<tr>
<td>PVPC-*-6140</td>
<td>220</td>
<td>150</td>
</tr>
</tbody>
</table>

10.3 Response times

Response times and pressure peack due to variation 0% to 100% and 100% to 0% of the pump displacement, obtained with an instantaneous opening and shut-off of the delivery line.
**Manual pressure compensator**

The pump displacement is zeroed when the line pressure approaches the setting pressure of the compensator.

**Compensator setting range:**
- 20 ÷ 280 bar for 3029, 4046, 5073, 6140
- 20 ÷ 250 bar for 5090

**Compensator standard setting:**
- 280 bar for 3029, 4046, 5073, 6140
- 250 bar for 5090

**Manual pressure compensator with venting**

As C plus venting function, when a long unloading time is required and heat generation and noise have to be kept at lowest level.

**Venting valve solenoid voltage, see section**
- Venting valve OFF = null displacement
- Venting valve ON = max displacement

**Compensator setting range:**
- 20 ÷ 280 bar for 3029, 4046, 5073
- 20 ÷ 250 bar for 5090, 6140

**Compensator standard setting:**
- 280 bar for 3029, 4046, 5073
- 250 bar for 5090, 6140

**Remote pressure compensator**

As C, but predisposed with X piloting port for connection of a remote pilot relief valve.

**Compensator setting range:**
- 20 ÷ 280 bar for 3029, 4046, 5073
- 20 ÷ 250 bar for 5090, 6140

**Compensator standard setting:**
- 280 bar for 3029, 4046, 5073
- 250 bar for 5090, 6140

**Load sensing**

The pump displacement is automatically adjusted to maintain a constant (load independent) pressure drop across an external throttle. Changing the throttle regulation, the pump flow is consequently adjusted.

Load sensing control always incorporates an hydraulic compensator to limit the maximum pressure.

**Compensator setting range:**
- 20 ÷ 280 bar for 3029, 4046, 5073
- 20 ÷ 250 bar for 5090, 6140

**Compensator standard setting:**
- 280 bar for 3029, 4046, 5073
- 250 bar for 5090, 6140

**Differential pressure setting range:** 10 ÷ 40 bar

**Differential pressure standard setting:** 14 bar

**Constant power**

In order to achieve a constant drive torque with varying operating pressure. The swashing angle and therefore the outlet flow is varied so that the product of flow and pressure remains constant.

For the best regulation, minimum working pressure is 80 bar. While selecting LW control, the required value of power must be communicated with the order (ex. 10 kW at 1450 rpm).
**PORTS DIMENSION**

<table>
<thead>
<tr>
<th>IN</th>
<th>Flange SAE 3000 1 1/4”</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT</td>
<td>Flange SAE 6000 3/4”</td>
</tr>
<tr>
<td>D1, D2</td>
<td>1/2” BSP</td>
</tr>
</tbody>
</table>

① Screw for max displacement setting. In case of double pumps, the screw is not available for version XB

**CODE XA - INTERMEDIATE FLANGE SAE “A” FOR PFE-31**

screw for max displacement setting not available

**CODE XB - INTERMEDIATE FLANGE SAE “B” FOR PFE-41**

Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted
INSTALLATION DIMENSIONS OF PVPC-*-4046: BASIC VERSION “C” CONTROL

PORTS DIMENSION

IN  = Flange SAE 3000 1 1/2"
OUT = Flange SAE 6000 1"
D1, D2 = 1/2" BSPP
① = Screw for max displacement setting

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Mass [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVPC-*-4046</td>
<td></td>
<td>24</td>
</tr>
</tbody>
</table>

SHAIFF TYPE “1”

SAE “BB” SPLINED
15 TEETH 16/32 PITCH
30˚ INVOLUTE SPLINE

SHAIFF TYPE “5”

CODE XA - INTERMEDIATE FLANGE SAE “A” FOR PFE-31

SPLINED
9 TEETH 16/32 PITCH
125 Nm MAX

CODE XB - INTERMEDIATE FLANGE SAE “B” FOR PFE-41

SPLINED
13 TEETH 16/32 PITCH
250 Nm MAX

Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted.
**Ports Dimension**

IN = Flange SAE 3000 2"

OUT = Flange SAE 6000 1 1/4"

D1, D2 = 3/4" BSPP

① = Screw for max displacement setting.

In case of double pump the screw is not available for version XC

**Mass [kg]**

<table>
<thead>
<tr>
<th>Component</th>
<th>Mass [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVPC-*-5073</td>
<td>33</td>
</tr>
<tr>
<td>PVPC-*-5090</td>
<td>33</td>
</tr>
</tbody>
</table>

**Shaft Type “1”**

SAE “C”Splined
14 Teeth 12°44 Pitch
30° Involute Spline

**Shaft Type “5”**

SAE “C”Splined
14 Teeth 12°44 Pitch
30° Involute Spline

**Code XA - Intermediate Flange SAE “A” for PFE-31**

**Code XB - Intermediate Flange SAE “B” for PFE-41**

**Code XC - Intermediate Flange SAE “C” for PFE-51**

Drawing show pumps with clockwise rotation (option D); pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted.
PORTS DIMENSION

IN = Flange SAE 3000 2 1/2"
OUT = Flange SAE 6000 1 1/4"
D1, D2 = 3/4" BSPP
① = Regulation screw for max displacement setting.

<table>
<thead>
<tr>
<th>Mass [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVPC-*-6140</td>
</tr>
</tbody>
</table>

SHAFT TYPE "1"

SAE "D" SPLINED
13 TEETH 8/16 PITCH
30° INVOLUTE SPLINE

SHAFT TYPE "5"

SAE "D" SPLINED
13 TEETH 8/16 PITCH
30° INVOLUTE SPLINE
### INSTALLATION DIMENSIONS OF OTHER CONTROLS

#### 16.1 PVPC size 3, 4 and 5

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Version</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>Mass (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVPC-*-3029</td>
<td>CH</td>
<td>144</td>
<td>111</td>
<td>-</td>
<td>-</td>
<td>102</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>L-R</td>
<td>144</td>
<td>111</td>
<td>100</td>
<td>-</td>
<td>-</td>
<td>19.2</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>144</td>
<td>111</td>
<td>-</td>
<td>211</td>
<td>104</td>
<td>20</td>
</tr>
<tr>
<td>PVPC-*-4046</td>
<td>CH</td>
<td>153</td>
<td>111</td>
<td>-</td>
<td>-</td>
<td>102</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>L-R</td>
<td>153</td>
<td>111</td>
<td>109</td>
<td>-</td>
<td>-</td>
<td>25.2</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>153</td>
<td>111</td>
<td>-</td>
<td>235</td>
<td>111</td>
<td>26</td>
</tr>
<tr>
<td>PVPC-*-5073</td>
<td>CH</td>
<td>166</td>
<td>111</td>
<td>-</td>
<td>-</td>
<td>102</td>
<td>36.9</td>
</tr>
<tr>
<td></td>
<td>L-R</td>
<td>166</td>
<td>111</td>
<td>122</td>
<td>-</td>
<td>-</td>
<td>34.2</td>
</tr>
<tr>
<td></td>
<td>LW</td>
<td>166</td>
<td>111</td>
<td>-</td>
<td>258</td>
<td>120</td>
<td>35</td>
</tr>
</tbody>
</table>

1 = Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement.

In case of double pump the regulation screw is not always available, please contact our technical office.

Drawing shows pumps with clockwise rotation (option D): pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and also the consequently position of the control groups.
(1) Regulation screw for max displacement. Adjustable range 50% to 100% of max displacement.
In case of double pump the regulation screw is not always available, please contact our technical office.
Drawing shows pumps with clockwise rotation (option D); pumps with counterclockwise rotation (option S) will have inlet and outlet ports inverted and also the consequently position of the control groups.

17 RELATED DOCUMENTATION

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A900</td>
<td>Operating and maintenance information for pumps</td>
</tr>
<tr>
<td>K800</td>
<td>Electric and electronic connectors</td>
</tr>
</tbody>
</table>