# INDEX

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</tbody>
</table>

Modification from former edition.
“PH” series gear pumps and motors is an evolution of the “POLARIS” series. “POLARIS PH” has a new body made of cast iron to have higher operating parameters and keep the full POLARIS versatility regarding shafts, flanges, ports and built-in valves. This project is targeted for forklifts, skid steer loaders and all those applications where traditional aluminum pumps are being pushed close to their limits. The possibility to mate the body with the cast iron covers further reduces noise levels, in addition to increasing strength.

**DISPLACEMENTS**
- From 8.26 cm³/rev (0.50 in³/rev)
- To 33.03 cm³/rev (2.01 in³/rev)

**PRESSURE**
- Max. continuous 250 bar (3625 psi)
- Max. intermittent 280 bar (4060 psi)
- Max. peak 300 bar (4350 psi)

**SPEED**
- Max. 3500 min⁻¹

**TYPICAL APPLICATIONS**
- Building & Construction
- Material Handling
- Agriculture
- Forestry
- Turf care & Mowers
- Fan Drive

---

High versatility due to Polaris 20 family components
- Inlet & outlet optimization - High speed
- Combination in multiple pumps
- Built-in valves simplify circuit design

High working pressure also for high displacements
- Long service life
- Low noise version available
- High volumetric efficiency also at high temperature

---

DCAT034-ID02 3
INSTRUCTIONS

INSTALLATION

Pump
The direction of rotation of single-rotation pumps must be the same as that of the drive shaft. Check that the coupling flange correctly aligns the transmission shaft and the pump shaft. Flexible couplings should be used (never rigid fittings) which will not generate an axial or radial load on the pump shaft.

Motor
The direction of rotation of single-rotation motors must match circuit connections. Check that the coupling flange correctly aligns the transmission shaft and the motor shaft. Flexible couplings should be used (never rigid fittings) which will not generate an axial or radial load on the motor shaft.

TANK
Tank capacity must be sufficient for the system's operating conditions (~3 times the amount of oil in circulation) to avoid overheating of the fluid. A heat exchanger should be installed if necessary. The intake and return lines in the tank must be spaced apart (by inserting a vertical divider) to prevent the return-line oil from being taken up again immediately.

LINES
The lines must have a major diameter which is at least as large as the diameter of pump or motor ports, and must be perfectly sealed. To reduce loss of power, the lines should be as short as possible, reducing the sources of hydraulic resistance (elbow, throttling, gate valves, etc.) to a minimum. A length of flexible tubing is recommended to reduce the transmission of vibrations. All return lines must end below the minimum oil level, to prevent foaming. Before connecting the lines, remove any plugs and make sure that the lines are perfectly clean.

HYDRAULIC FLUID
Use hydraulic fluid conforming to viscosity data as specified in the first pages of the catalogue. Avoid using mixtures of different oils which could result in decomposition and reduction of the oil's lubricating power.

FILTERS
We recommend filtering the entire system flow. Filters on suction and return line must be fitted in according to the contamination class as indicated in the first pages of the catalogue. Casappa recommends to use its own production filters:

STORAGE
The storage must be in a dry environment. Max storage time in ideal conditions is 24 months. The ideal storage temperature is between 5 °C (41 °F) and 20 °C (68 °F). No problem in case of temperature between -40 °C (-40 °F) and 50 °C (122 °F). Below -40 °C (-40 °F) please consult our pre-sales department.

STARTING UP
Check that all circuit connections are tight and that the entire system is completely clean. Insert the oil in the tank, using a filter. Bleed the circuit to assist in filling. Set the pressure relief valves to the lowest possible setting. Turn on the system for a few moments at minimum speed, then bleed the circuit again and check the level of oil in the tank. If the difference between pump or motor temperature and fluid temperature exceeds 10 °C (50 °F), rapidly switch the system on and off to heat it up gradually. Then gradually increase the pressure and speed of rotation until the pre-set operating levels as specified in the catalogue are attained.

COLD START
Cold start is meant short term and low idle. During cold start of the machine the following limits can be applied:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum inlet pressure</td>
<td>0.5 bar abs. (7 psi)</td>
</tr>
<tr>
<td>Max drain pressure / Max delivery pressure</td>
<td>+ 50% of standard values</td>
</tr>
<tr>
<td>Minimum temperature</td>
<td>-40 °C (-40 °F)</td>
</tr>
<tr>
<td>Max oil viscosity</td>
<td>2000 mm²/s (cSt) [9100 SSU]</td>
</tr>
</tbody>
</table>

If the ambient temperature is lower than -20 °C (-4 °F) the system speed and pressure must be limited until the hydraulic oil temperature exceeds -20 °C (-4 °F).

PERIODICAL CHECKS - MAINTENANCE
Keep the outside surface clean especially in the area of the drive shaft seal. In fact, abrasive powder can accelerate wear on the seal and cause leakage. Replace filters regularly to keep the fluid clean. The oil level must be checked and oil replaced periodically depending on the system's operating conditions.
## FEATURES

| Construction | Heavy duty external gear pumps and motors 3-piece construction |
| Mounting | EUROPEAN - SAE - GERMAN standard flanges |
| Ports | Threaded or split flange |
| Direction of rotation (looking on drive shaft) | Anti-clockwise (S) - clockwise (D) - reversible external drain (R - L) reversible internal drain (B) |
| Inlet pressure range for pumps | 0,7 ÷ 3 bar abs. (10 ÷ 44 psi) If p > 1,5 bar abs. (22 psi) specific shaft sealing have to be applied. Please consult our pre-sales department. |
| Max back pressure for single rotation motors | 5 bar (73 psi) continuous @ min. speed 350 min⁻¹ 1 bar (14.5 psi) continuous @ max. speed (see page 7) |
| Max drain line pressure on reversible rotation motors | 5 bar (73 psi) continuous @ min. speed 350 min⁻¹ 1 bar (14.5 psi) continuous @ max. speed (see page 7) |
| Max back pressure on in series motors | 150 bar (2175 psi) |
| Fluid temperature range | See table (1) |
| Fluid | Mineral oil based hydraulic fluids to ISO/DIN. For other fluids please consult our pre-sales department |
| Viscosity range | From 12 to 100 mm²/s (cSt) [60 to 456 SSU] recommended Up to 750 mm²/s (cSt) [3410 SSU] permitted |
| Filtering requirement and recommended fluid contamination | See table (2) page 6 |

---

### Tab. 1

<table>
<thead>
<tr>
<th>Type</th>
<th>Fluid composition</th>
<th>Max pressure bar (psi)</th>
<th>Max speed min⁻¹</th>
<th>Temperature - °C (°F)</th>
<th>Seals (●)</th>
<th>Shaft seals option (◆)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO/DIN</td>
<td>Mineral oil based hydraulic fluid to ISO/DIN</td>
<td>See page 7</td>
<td>See page 7</td>
<td>-25 (-13) 80 (176) 100 (212)</td>
<td>N</td>
<td>D C1</td>
</tr>
<tr>
<td>ISO/DIN</td>
<td>Mineral oil based hydraulic fluid to ISO/DIN</td>
<td>See page 7</td>
<td>See page 7</td>
<td>-25 (-13) 110 (230) 125 (257)</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>ISO/DIN</td>
<td>Mineral oil based hydraulic fluid to ISO/DIN</td>
<td>See page 7</td>
<td>See page 7</td>
<td>-25 (-13) 110 (230) 125 (257)</td>
<td>T-PV</td>
<td></td>
</tr>
</tbody>
</table>

(●) N = Buna NBR (standard) - V = Viton-FKM - T-PV = Hydrogenated buna HNBR seals with Viton-FKM shaft seals

---

### Symbols

- D (●) shaft seals with wiper seal
- C1 (◆) High pressure special shaft seal

---

- Single rotation pumps
  - Max drain line pressure: 0,5 bar (7 psi)
- Single rotation motors
  - Max drain line pressure: 5 bar (73 psi) @ 350 min⁻¹
- Reversible rotation pumps and motors
  - Max drain line pressure: 10 bar (145 psi) @ 350 min⁻¹
FEATURES

Filtration

Tab. 2

<table>
<thead>
<tr>
<th>Working pressure bar (psi)</th>
<th>( \Delta p &lt; 140 )</th>
<th>( 140 &lt; \Delta p &lt; 210 )</th>
<th>( \Delta p &gt; 210 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contamination class NAS 1638</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Contamination class ISO 4406</td>
<td>21/19/16</td>
<td>20/18/15</td>
<td>19/17/14</td>
</tr>
<tr>
<td>Achieved with filter ( \beta_{10} ) (c) ( \geq 200 ) ISO 16889</td>
<td>-</td>
<td>10 ( \mu )m</td>
<td>10 ( \mu )m</td>
</tr>
<tr>
<td>Achieved with filter ( \beta_{25} ) (c) ( \geq 200 ) ISO 16889</td>
<td>25 ( \mu )m</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Casappa recommends to use its own production filters:

Anti-clockwise rotation

Pressure definition

\( p_1 \), Constant operating pressure
\( p_2 \), System pressure (relief valve setting)
\( p_3 \), Peak of pressure

The peak of pressure is the max pressure allowed and it corresponds to the overshoot of the relief valve.

Please note that both relief valve setting and overshoot must be lower than their limits.
If the relief setting is compliant but the overshoot is higher than the limit, the relief setting must be decreased until the overshoot is compliant to Casappa limit.

For high frequency applications please consult our pre-sales department.
FEATURES

<table>
<thead>
<tr>
<th>Pump type PHP</th>
<th>Displacement</th>
<th>Max. pressure</th>
<th>Max. speed</th>
<th>Min. speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH. 20•8</td>
<td>8.26 (0.50)</td>
<td>250 (3600)</td>
<td>280 (4060)</td>
<td>300 (4350)</td>
</tr>
<tr>
<td>PH. 20•10.5</td>
<td>10.9 (0.66)</td>
<td>250 (3600)</td>
<td>280 (4060)</td>
<td>300 (4350)</td>
</tr>
<tr>
<td>PH. 20•11.2</td>
<td>11.23 (0.69)</td>
<td>250 (3600)</td>
<td>280 (4060)</td>
<td>300 (4350)</td>
</tr>
<tr>
<td>PH. 20•14</td>
<td>14.53 (0.89)</td>
<td>250 (3600)</td>
<td>280 (4060)</td>
<td>300 (4350)</td>
</tr>
<tr>
<td>PH. 20•16</td>
<td>16.85 (16.85)</td>
<td>250 (3600)</td>
<td>280 (4060)</td>
<td>300 (4350)</td>
</tr>
<tr>
<td>PH. 20•18</td>
<td>1.12 (18.29)</td>
<td>250 (3600)</td>
<td>280 (4060)</td>
<td>300 (4350)</td>
</tr>
<tr>
<td>PH. 20•19</td>
<td>19.09 (1.16)</td>
<td>250 (3600)</td>
<td>280 (4060)</td>
<td>300 (4350)</td>
</tr>
<tr>
<td>PH. 20•20</td>
<td>21.14 (1.29)</td>
<td>250 (3600)</td>
<td>280 (4060)</td>
<td>300 (4350)</td>
</tr>
<tr>
<td>PH. 20•23</td>
<td>23.32 (1.42)</td>
<td>250 (3600)</td>
<td>280 (4060)</td>
<td>300 (4350)</td>
</tr>
<tr>
<td>PH. 20•24.5</td>
<td>24.84 (1.52)</td>
<td>230 (3335)</td>
<td>260 (3770)</td>
<td>280 (4060)</td>
</tr>
<tr>
<td>PH. 20•25</td>
<td>26.42 (1.61)</td>
<td>230 (3335)</td>
<td>260 (3770)</td>
<td>280 (4060)</td>
</tr>
<tr>
<td>PH. 20•27.8</td>
<td>28.21 (1.72)</td>
<td>200 (2900)</td>
<td>230 (3335)</td>
<td>250 (3625)</td>
</tr>
<tr>
<td>PH. 20•31.5</td>
<td>33.03 (2.01)</td>
<td>200 (2900)</td>
<td>230 (3335)</td>
<td>250 (3625)</td>
</tr>
</tbody>
</table>

Pressure values in the table refer to side ports unidirectional pumps and motors.
For reversible pumps and motors, max pressures are 250 bar (3600 psi) excepted those with lower pressure values.
For different configurations and working conditions please consult our pre-sales department.

Pump type PHP
Motor type PHM

<table>
<thead>
<tr>
<th>Displacement</th>
<th>Max. pressure</th>
<th>Max. speed</th>
<th>Min. speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>cm³/rev (in³/rev)</td>
<td>bar (psi)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P₁</td>
<td>P₂</td>
<td>P₃</td>
<td></td>
</tr>
<tr>
<td>Q</td>
<td>1000</td>
<td>62.83</td>
<td></td>
</tr>
</tbody>
</table>

Efficiencies

<table>
<thead>
<tr>
<th>Volumetric efficiency</th>
<th>Hydro-mechanical efficiency</th>
<th>Overall efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>ηᵥ (V, Δp, n)</td>
<td>(≈ 0.97)</td>
<td>(≈ 0.85)</td>
</tr>
<tr>
<td>ηhm (V, Δp, n)</td>
<td>(≈ 0.88)</td>
<td>(≈ 0.82)</td>
</tr>
<tr>
<td>ηₜ = ηᵥ • ηhm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DESIGN CALCULATIONS FOR PUMP

Q = Qₜheor. • ηᵥ [l/min]

DESIGN CALCULATIONS FOR MOTOR

Q = Qₜheor. [l/min]

Pressure values in the table refer to side ports unidirectional pumps and motors.
For different configurations and working conditions please consult our pre-sales department.
Each curve has been obtained at 50°C (122 °F), using oil with viscosity 46 cSt (210 SSU) at 40°C (104 °F) and at these pressures.

- **PH. 20•8**
  - 20 bar (290 psi)
  - 250 bar (3625 psi)

- **PH. 20•11,2**
  - 20 bar (290 psi)
  - 250 bar (3625 psi)

- **PH. 20•16**
  - 250 bar (3625 psi)

- **PH. 20•19**
  - 20 bar (290 psi)
  - 250 bar (3625 psi)

- **PH. 20•23**
  - 20 bar (290 psi)
  - 250 bar (3625 psi)

- **PH. 20•25**
  - 20 bar (290 psi)
  - 230 bar (3335 psi)

- **PH. 20•31,5**
  - 20 bar (290 psi)
  - 200 bar (2900 psi)
GEAR PUMPS PERFORMANCE CURVES

PHP 20•16

- Pressure [bar] vs. Power [kW] for different speeds [n [min^-1]]
- Values range from 50 bar (725 psi) to 250 bar (3625 psi)
- Power levels range from 5 (133) kW to 75 (664) kW

PHP 20•18

- Pressure [bar] vs. Motor Torque [Nm] for different speeds [n [min^-1]]
- Values range from 50 bar (725 psi) to 250 bar (3625 psi)
- Torque levels range from 0 to 25 (61) Nm

PHP 20•19

- Pressure [bar] vs. Flow Rate [l/min] for different speeds [n [min^-1]]
- Values range from 50 bar (725 psi) to 250 bar (3625 psi)
- Flow rates range from 0 to 100 (885) l/min

PHP 20•20

- Pressure [bar] vs. Fluid Flow Rate [l/min] for different speeds [n [min^-1]]
- Values range from 50 bar (725 psi) to 250 bar (3625 psi)
- Flow rates range from 0 to 100 (885) l/min

04/01.2019
GEAR PUMPS PERFORMANCE CURVES

PHP 20•31,5

P [kW] - [(HP)]

n [min⁻¹]

M [Nm] - [(lbf in)]

100 bar (1450 psi)
150 bar (2175 psi)
200 bar (2900 psi)
50 bar (725 psi)

50 bar (725 psi)
100 bar (1450 psi)
150 bar (2175 psi)
200 bar (2900 psi)

50 bar (725 psi)
100 bar (1450 psi)
150 bar (2175 psi)
200 bar (2900 psi)

50 bar (725 psi)
100 bar (1450 psi)
150 bar (2175 psi)
200 bar (2900 psi)

50 bar (725 psi)
100 bar (1450 psi)
150 bar (2175 psi)
200 bar (2900 psi)

50 bar (725 psi)
100 bar (1450 psi)
150 bar (2175 psi)
200 bar (2900 psi)

50 bar (725 psi)
100 bar (1450 psi)
150 bar (2175 psi)
200 bar (2900 psi)

50 bar (725 psi)
100 bar (1450 psi)
150 bar (2175 psi)
200 bar (2900 psi)
Each curve has been obtained at 50°C (122 °F), using oil with viscosity 46 cSt (210 SSU) at 40°C (104 °F) and at these pressures.

| PHM. 20•8  | 20 bar (290 psi) | 250 bar (3625 psi) |
| PHM. 20•11,2 | 20 bar (290 psi) | 250 bar (3625 psi) |
| PHM. 20•16  | 20 bar (290 psi) | 250 bar (3625 psi) |
| PHM. 20•19  | 20 bar (290 psi) | 250 bar (3625 psi) |
| PHM. 20•23  | 20 bar (290 psi) | 250 bar (3625 psi) |
| PHM. 20•25  | 20 bar (290 psi) | 230 bar (3335 psi) |
| PHM. 20•31,5 | 20 bar (290 psi) | 200 bar (2900 psi) |
| PHM. 20•10,5 | 20 bar (290 psi) | 250 bar (3625 psi) |
| PHM. 20•14  | 20 bar (290 psi) | 250 bar (3625 psi) |
| PHM. 20•18  | 20 bar (290 psi) | 250 bar (3625 psi) |
| PHM. 20•20  | 20 bar (290 psi) | 250 bar (3625 psi) |
| PHM. 20•24,5 | 20 bar (290 psi) | 230 bar (3335 psi) |
| PHM. 20•27,8 | 20 bar (290 psi) | 200 bar (2900 psi) |
GEAR MOTORS PERFORMANCE CURVES

PHM 20•8

PHM 20•10,5

PHM 20•11,2

PHM 20•14
GEAR MOTORS PERFORMANCE CURVES

PHM 20•23

PHM 20•24,5

PHM 20•25

PHM 20•27,8

01/06.2009
### POLARIS PH

**SINGLE UNITS DIMENSIONS - SIDE PORTS**

For single rotation S - D, reversible B and R the rear cover is available in cast iron and aluminium. For reversible rotation L the rear cover is in aluminium only.

#### Drive shafts: page 31 ÷ 33

Mounting flange: for X dimension see page 34 ÷ 37

 Ports availability: European, Split, Gas, SAE and German. See page 38

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**Drive shafts:**

<table>
<thead>
<tr>
<th>Pump type</th>
<th>Motor type</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (mm)</th>
<th>D (mm)</th>
<th>E (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH. 20•8</td>
<td>Ø</td>
<td>80,1 (3.15)</td>
<td>32,5 (1.28)</td>
<td>24 (0.94)</td>
<td>92,5 (3.64)</td>
<td>41,5 (1.63)</td>
</tr>
<tr>
<td>PH. 20•10,5</td>
<td>Ø</td>
<td>84,1 (3.31)</td>
<td>36,5 (1.44)</td>
<td>24 (0.94)</td>
<td>96,5 (3.80)</td>
<td>41,5 (1.63)</td>
</tr>
<tr>
<td>PH. 20•11,2</td>
<td>Ø</td>
<td>84,6 (3.33)</td>
<td>37 (1.46)</td>
<td>24 (0.94)</td>
<td>97 (3.82)</td>
<td>41,5 (1.63)</td>
</tr>
<tr>
<td>PH. 20•14</td>
<td>Ø</td>
<td>89,6 (3.53)</td>
<td>42 (1.65)</td>
<td>24 (0.94)</td>
<td>102 (4.02)</td>
<td>41,5 (1.63)</td>
</tr>
<tr>
<td>PH. 20•16</td>
<td>Ø</td>
<td>93 (3.66)</td>
<td>34,7 (1.37)</td>
<td>34,7 (1.37)</td>
<td>105,4 (4.15)</td>
<td>52,2 (2.06)</td>
</tr>
<tr>
<td>PH. 20•18</td>
<td>Ø</td>
<td>95,3 (3.75)</td>
<td>47,5 (1.87)</td>
<td>24,2 (0.95)</td>
<td>107,7 (4.24)</td>
<td>41,7 (1.64)</td>
</tr>
<tr>
<td>PH. 20•19</td>
<td>Ø</td>
<td>96,4 (3.80)</td>
<td>36,4 (1.43)</td>
<td>36,4 (1.43)</td>
<td>108,8 (4.28)</td>
<td>53,9 (2.12)</td>
</tr>
<tr>
<td>PH. 20•20</td>
<td>Ø</td>
<td>99,6 (3.92)</td>
<td>38 (1.50)</td>
<td>38 (1.50)</td>
<td>112 (4.41)</td>
<td>55,5 (2.19)</td>
</tr>
<tr>
<td>PH. 20•23</td>
<td>Ø</td>
<td>102,8 (4.05)</td>
<td>39,6 (1.56)</td>
<td>39,6 (1.56)</td>
<td>115,2 (4.54)</td>
<td>57,1 (2.25)</td>
</tr>
<tr>
<td>PH. 20•24,5</td>
<td>Ø</td>
<td>105,2 (4.14)</td>
<td>40,8 (1.61)</td>
<td>40,8 (1.61)</td>
<td>117,6 (4.63)</td>
<td>58,3 (2.30)</td>
</tr>
<tr>
<td>PH. 20•25</td>
<td>Ø</td>
<td>107,6 (4.24)</td>
<td>42 (1.65)</td>
<td>42 (1.65)</td>
<td>120 (4.72)</td>
<td>59,5 (2.34)</td>
</tr>
<tr>
<td>PH. 20•27,8</td>
<td>Ø</td>
<td>110,2 (4.34)</td>
<td>43,3 (1.70)</td>
<td>43,3 (1.70)</td>
<td>122,6 (4.83)</td>
<td>60,8 (2.39)</td>
</tr>
<tr>
<td>PH. 20•31,5</td>
<td>Ø</td>
<td>117,6 (4.63)</td>
<td>47 (1.85)</td>
<td>47 (1.85)</td>
<td>130 (5.12)</td>
<td>64,5 (2.54)</td>
</tr>
</tbody>
</table>

Reversible L drain port position:

- L = Side
- * = Bottom

---

Replaces: 03/05/2012

04/01/2019

DCAT034-ID02
Reversibility: R Single rotation S - D and Reversible B

Rear cover in aluminium only.

Reversible L drain port position:

$\ast$ = Bottom

### Pump type Motor type

<table>
<thead>
<tr>
<th>Pump Type</th>
<th>Motor type</th>
<th>A (mm)</th>
<th>B (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH. 20•8</td>
<td></td>
<td>92.5 (3.64)</td>
<td>74 (.91)</td>
</tr>
<tr>
<td>PH. 20•10,5</td>
<td></td>
<td>96.5 (3.80)</td>
<td>78 (3.07)</td>
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<tr>
<td>PH. 20•11,2</td>
<td></td>
<td>97 (3.82)</td>
<td>78.5 (3.09)</td>
</tr>
<tr>
<td>PH. 20•14</td>
<td></td>
<td>102 (4.02)</td>
<td>83.5 (3.29)</td>
</tr>
<tr>
<td>PH. 20•16</td>
<td></td>
<td>105.4 (4.15)</td>
<td>86.9 (3.42)</td>
</tr>
<tr>
<td>PH. 20•18</td>
<td></td>
<td>107.7 (4.24)</td>
<td>89.2 (3.51)</td>
</tr>
<tr>
<td>PH. 20•19</td>
<td></td>
<td>108.8 (4.28)</td>
<td>90.2 (3.56)</td>
</tr>
<tr>
<td>PH. 20•20</td>
<td></td>
<td>112 (4.41)</td>
<td>93.5 (3.68)</td>
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<tr>
<td>PH. 20•23</td>
<td></td>
<td>115.2 (4.54)</td>
<td>96.7 (3.81)</td>
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<td>117.6 (4.63)</td>
<td>99.1 (3.90)</td>
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<tr>
<td>PH. 20•25</td>
<td></td>
<td>120 (4.72)</td>
<td>101.5 (4.00)</td>
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<tr>
<td>PH. 20•27,8</td>
<td></td>
<td>122.6 (4.83)</td>
<td>104.1 (4.10)</td>
</tr>
<tr>
<td>PH. 20•31,5</td>
<td></td>
<td>130 (5.19)</td>
<td>111.5 (4.39)</td>
</tr>
</tbody>
</table>
MULTIPLE PUMPS

POLARIS PH series pumps can be coupled together in combination. Where the input power requirements of each section varies, that with the greater requirement must be at the drive shaft end, and progressively smaller to the rear.

Features and performances are the same as the corresponding single pumps, but pressures must be limited by the transmissible torque of the drive and connecting shafts. To have appropriate data, use the formula below.

The maximum rotational speed is the one of the lowest rated speed of the single units incorporated.

Available with common inlet and separated stages. For more information please consult our pre-sales department.

<table>
<thead>
<tr>
<th>M</th>
<th>Nm (lbf in)</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>cm³/rev (in³/rev)</td>
<td>Displacement</td>
</tr>
<tr>
<td>Δp</td>
<td>bar (psi)</td>
<td>Pressure</td>
</tr>
</tbody>
</table>

\[ \eta_{hm} = \eta_{hm}(V, \Delta p, n) \approx 0.88 \]

Hydro-mechanical efficiency

\[ M = \frac{M_{\text{ theor.}}}{\eta_{hm}} \] \quad [Nm]

\[ M_{\text{ theor.}} = \frac{\Delta p \text{ (bar)} \times V \text{ (cm}^3/\text{rev)}}{62.83} \] \quad [Nm]

Note

The torque absorbed from the shaft of the first pump results from the sum of the torques of all the single stages. The achieved value must not exceed the maximum torque limit given for the shaft of the first pump.
Reduced inlets provide overall systems savings by reducing the cost of redundant inlet hose and fittings. For other combinations please consult our pre-sales department.

**MULTIPLE PUMPS COMBINATION**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHP 20/20</td>
<td>STANDARD VERSION</td>
<td>S6</td>
</tr>
<tr>
<td>PHP 20/20</td>
<td>COMMON INLET VERSION</td>
<td>S7</td>
</tr>
</tbody>
</table>

**Common Inlet Standard Version**

Front  
Rear  

86 MAX 110 Nm (974 lbf in)

**Separated Stages Version**

Front  
Rear  

86 MAX 110 Nm (974 lbf in)
MULTIPLE PUMPS COMBINATION

**PHP 20/PLP20**  STANDARD VERSION  S6
**PHP 20/PLP20**  COMMON INLET VERSION  S7

**Honda**

- **Front**
- **Rear**

86  MAX 110 Nm (974 lbf in)

**PHP 20/PLP20**  SEPARATED STAGES VERSION  Z6

**Front**

86  MAX 110 Nm (974 lbf in)

**PHP 20/PLP10**  STANDARD VERSION  S6
**PHP 20/PLP10**  COMMON INLET VERSION  T7

**Front**

51  MAX 30 Nm (266 lbf in)
MULTIPLE PUMPS COMBINATION

PHP 20/PLP10  SEPARATED STAGES VERSION Z6

Front

Rear

51  MAX 30 Nm (266 lbf in)

01/06.2009
Polaris PH

MULTIPLE PUMPS DIMENSIONS

Drive shafts: page 31 ÷ 33
Mounting flange: for X dimension see page 34 ÷ 37
Ports availability: European, Split, Gas, SAE and German. See page 38

Rear cover in cast iron and aluminium.

<table>
<thead>
<tr>
<th>Pump type</th>
<th>A (mm)</th>
<th>B (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH. 20•8</td>
<td>32.5 (1.28)</td>
<td>24 (0.94)</td>
</tr>
<tr>
<td>PH. 20•10,5</td>
<td>36.5 (1.44)</td>
<td>24 (0.94)</td>
</tr>
<tr>
<td>PH. 20•11,2</td>
<td>37 (1.46)</td>
<td>24 (0.94)</td>
</tr>
<tr>
<td>PH. 20•14</td>
<td>42 (1.65)</td>
<td>24 (0.94)</td>
</tr>
<tr>
<td>PH. 20•16</td>
<td>34.7 (1.37)</td>
<td>34.7 (1.37)</td>
</tr>
<tr>
<td>PH. 20•18</td>
<td>47.5 (1.88)</td>
<td>24.2 (0.95)</td>
</tr>
<tr>
<td>PH. 20•19</td>
<td>36.4 (1.43)</td>
<td>36.4 (1.43)</td>
</tr>
<tr>
<td>PH. 20•20</td>
<td>38 (1.50)</td>
<td>38 (1.50)</td>
</tr>
<tr>
<td>PH. 20•23</td>
<td>39.6 (1.56)</td>
<td>39.6 (1.56)</td>
</tr>
<tr>
<td>PH. 20•24,5</td>
<td>40.8 (1.61)</td>
<td>40.8 (1.61)</td>
</tr>
<tr>
<td>PH. 20•25</td>
<td>42 (1.65)</td>
<td>42 (1.65)</td>
</tr>
<tr>
<td>PH. 20•27,8</td>
<td>43.3 (1.70)</td>
<td>43.3 (1.70)</td>
</tr>
<tr>
<td>PH. 20•31,5</td>
<td>47 (1.85)</td>
<td>47 (1.85)</td>
</tr>
</tbody>
</table>
POLARIS PH MULTIPLE PUMPS DIMENSIONS

Drive shafts: page 31 ÷ 33
Mounting flange: for X dimension see
page 34 ÷ 37

Ports availability: European, Split, Gas,
SAE and German. See page 38

Rear cover in cast iron and aluminium.

<table>
<thead>
<tr>
<th>Pump type</th>
<th>A (mm)</th>
<th>A (inch)</th>
<th>B (mm)</th>
<th>B (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH. 20•8</td>
<td>32,5</td>
<td>1.28</td>
<td>24</td>
<td>0.94</td>
</tr>
<tr>
<td>PH. 20•10,5</td>
<td>36,5</td>
<td>1.44</td>
<td>24</td>
<td>0.94</td>
</tr>
<tr>
<td>PH. 20•11,2</td>
<td>37</td>
<td>1.47</td>
<td>24</td>
<td>0.94</td>
</tr>
<tr>
<td>PH. 20•14</td>
<td>42</td>
<td>1.65</td>
<td>24</td>
<td>0.94</td>
</tr>
<tr>
<td>PH. 20•16</td>
<td>34,7</td>
<td>1.37</td>
<td>34,7</td>
<td>1.37</td>
</tr>
<tr>
<td>PH. 20•18</td>
<td>47,5</td>
<td>1.87</td>
<td>24,2</td>
<td>0.95</td>
</tr>
<tr>
<td>PH. 20•19</td>
<td>36,4</td>
<td>1.43</td>
<td>36,4</td>
<td>1.43</td>
</tr>
<tr>
<td>PH. 20•20</td>
<td>38</td>
<td>1.50</td>
<td>38</td>
<td>1.50</td>
</tr>
<tr>
<td>PH. 20•23</td>
<td>39,6</td>
<td>1.56</td>
<td>39,6</td>
<td>1.56</td>
</tr>
<tr>
<td>PH. 20•24,5</td>
<td>40,8</td>
<td>1.61</td>
<td>40,8</td>
<td>1.61</td>
</tr>
<tr>
<td>PH. 20•25</td>
<td>42</td>
<td>1.65</td>
<td>42</td>
<td>1.65</td>
</tr>
<tr>
<td>PH. 20•27,8</td>
<td>43,3</td>
<td>1.70</td>
<td>43,3</td>
<td>1.70</td>
</tr>
<tr>
<td>PH. 20•31,5</td>
<td>47</td>
<td>1.85</td>
<td>47</td>
<td>1.85</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pump type</th>
<th>C (mm)</th>
<th>C (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLP 10•1</td>
<td>17,6</td>
<td>0.69</td>
</tr>
<tr>
<td>PLP 10•1,5</td>
<td>18,4</td>
<td>0.72</td>
</tr>
<tr>
<td>PLP 10•2</td>
<td>19,2</td>
<td>0.76</td>
</tr>
<tr>
<td>PLP 10•2,5</td>
<td>20</td>
<td>0.79</td>
</tr>
<tr>
<td>PLP 10•3,15</td>
<td>21</td>
<td>0.83</td>
</tr>
<tr>
<td>PLP 10•4</td>
<td>22,4</td>
<td>0.88</td>
</tr>
<tr>
<td>PLP 10•5</td>
<td>24</td>
<td>0.94</td>
</tr>
<tr>
<td>PLP 10•5,8</td>
<td>25,3</td>
<td>1.00</td>
</tr>
<tr>
<td>PLP 10•6,3</td>
<td>26</td>
<td>1.02</td>
</tr>
<tr>
<td>PLP 10•8</td>
<td>28,7</td>
<td>1.13</td>
</tr>
<tr>
<td>PLP 20•10</td>
<td>32</td>
<td>1.26</td>
</tr>
</tbody>
</table>
OUTBOARD BEARING OPTIONS

For each version, the possible combination between drive shafts and mounting flanges are shown on pages 34 ÷ 37. For the outboard bearing life expectancy, diagrams providing approximate selection data will be found on subsequent pages. For particular applications please consult our pre-sales department.

VERSION 0

Version for applications without radial and axial load on the drive shaft.

VERSION W8

VERSION 4

VERSION 5

VERSION 6

VERSION 7

VERSION 8

VERSION 9

01/06.2009
X = Distance of the radial load result from the mounting flange [mm (in)].

Each curve has been obtained at:
- Lubricant oil ISO VG 46
- Temperature 60 °C (140 °F)
- Without axial load
- Contamination level according ISO 281: β₁₀(C) = 200
- Reliability level of the calculation 90%

Example

<table>
<thead>
<tr>
<th>Fr Radial load</th>
<th>1900 N (427.5 lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>20 mm (0.79 in)</td>
</tr>
<tr>
<td>Speed</td>
<td>2000 min⁻¹</td>
</tr>
</tbody>
</table>

Values shown in the diagrams are indicative only. For more information please consult our pre-sales department.
X = Distance of the radial load result from the mounting flange [mm (in)].

Each curve has been obtained at:
- Lubricant grease
- Temperature 60 °C (140 °F)
- Without axial load
- Contamination level according ISO 281: β12(C) = 200
- Reliability level of the calculation 90%

**Example**

<table>
<thead>
<tr>
<th>Fr Radial load</th>
<th>1700 N (382.5 lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>20 mm (0.79 in)</td>
</tr>
<tr>
<td>Speed</td>
<td>2000 min⁻¹</td>
</tr>
<tr>
<td>Rated fatigue life</td>
<td>≈ 2100 h</td>
</tr>
</tbody>
</table>

Values shown in the diagrams are indicative only. For more information please consult our pre-sales department.
X = Distance of the radial load result from the mounting flange [mm (in)].

Each curve has been obtained at:
- Lubricant oil ISO VG 46
- Temperature 60 °C (140 °F)
- Without axial load
- Contamination level according ISO 281: β12(C) = 200
- Reliability level of the calculation 90%

Example

<table>
<thead>
<tr>
<th>Fr Radial load</th>
<th>850 N (191.3 lbf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>20 mm (0.79 in)</td>
</tr>
<tr>
<td>Speed</td>
<td>2000 min⁻¹</td>
</tr>
<tr>
<td>Rated fatigue life</td>
<td>≈ 2100 h</td>
</tr>
</tbody>
</table>

Values shown in the diagrams are indicative only. For more information please consult our pre-sales department.
X = Distance of the radial load result from the mounting flange [mm (in)].

Each curve has been obtained at:
- Lubricant grease
- Temperature 60 °C (140 °F)
- Without axial load
- Contamination level according ISO 281: \( \beta_{12}(C) = 200 \)
- Reliability level of the calculation 90%

**Example**

Fr Radial load 1900 N (427.5 lbf)
X 20 mm (0.79 in)
Speed 2000 min\(^{-1}\)
Rated fatigue life \(= 4600\ h\)

Values shown in the diagrams are indicative only. For more information please consult our pre-sales department.
DRIVE SHAFTS

EUROPEAN TAPERED 1:8  82
Not available with size:
20•24,5
Mounting face refer to flange code E2

GERMAN TAPERED 1:5  54
Not available with size:
20•24,5
Mounting face refer to flange code B2

GERMAN TAPERED 1:5  55
Only for version 5, 9 and W8 with outboard bearing
Mounting face refer to flange code B2

STRAIGHT  46
Not available with size:
20•10,5 - 20•18 - 20•19 - 20•23 - 20•24,5 - 20•27,8
Mounting face refer to flange code E2

SAE “A” SPLINE  03
Mounting face refer to flange code S9

SPLINE  01
Mounting face refer to flange code S9
DRIVE SHAFTS

SAE SPLINE 07
Mounting face refer to flange code S9

SAE “A” STRAIGHT 31
Not available with size:
20•24.5 - 20•27.8
Mounting face refer to flange code S9

SAE “B” SPLINE 04
Mounting face refer to flange code S5

SAE “B” STRAIGHT 32
Not available with size:
20•24.5
Mounting face refer to flange code S5

Replaces: 01/06/2009

Ext. Involute Spline ASME B92.1
with major diameter modified
11 teeth; 16/32 Pitch; 30°
Flat Root; Side-T; Class 5

Ext. Involute Spline SAE J498B
with major diameter modified
13 teeth; 16/32 Pitch; 30°
Flat Root; Side-T; Class 1
**DRIVE SHAFTS**

**DIN 5482 SPLINE**

- **12**
- Mounting face refer to flange code **B2**

**STRAIGHT**

- **B1**
- Only for version 8 and 5 with outboard bearing
- Mounting face refer to flange code **E2**

**TANG**

- **95**
- Not available with size:
- **20•24.5**
- Mounting face refer to flange code **B6**
MOUNTING FLANGES AND TABLE OF COMPATIBILITY

EUROPEAN E2
Material: cast iron and aluminium

<table>
<thead>
<tr>
<th>VERSIONS</th>
<th>X (mm (in))</th>
<th>82</th>
<th>46</th>
<th>B1</th>
<th>03</th>
<th>04</th>
<th>07</th>
<th>12</th>
<th>31</th>
<th>48</th>
<th>49</th>
<th>50</th>
<th>54</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18 (0.71)</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>4</td>
<td>55,4 (2.18)</td>
<td>#</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>43,6 (1.72)</td>
<td>#</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>55,4 (2.18)</td>
<td>#</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>59,4 (2.34)</td>
<td>#</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>59,4 (2.34)</td>
<td>#</td>
<td></td>
<td></td>
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<td></td>
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</table>

# Standard combination
X Available combination

GERMAN B2
Material: cast iron and aluminium

<table>
<thead>
<tr>
<th>VERSIONS</th>
<th>X (mm (in))</th>
<th>12</th>
<th>54</th>
<th>55</th>
<th>01</th>
<th>03</th>
<th>31</th>
<th>46</th>
<th>49</th>
<th>82</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18,8 (0.74)</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>44,4 (1.75)</td>
<td>#</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>59,4 (2.34)</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

# Standard combination
X Available combination

DRIVE SHAFTS
See page 31 ÷ 33

01/06.2009
MOUNTING FLANGES AND TABLE OF COMPATIBILITY

GERMAN 2 BOLTS B4
Material: cast iron and aluminium

<table>
<thead>
<tr>
<th>Versions</th>
<th>X mm (in)</th>
<th>54</th>
<th>03</th>
<th>12</th>
<th>31</th>
<th>49</th>
<th>82</th>
</tr>
</thead>
<tbody>
<tr>
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<td>16 (0.63)</td>
<td>#</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>41.6 (1.64)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</table>

# Standard combination
X Available combination

GERMAN 2 BOLTS B5
Material: cast iron and aluminium

<table>
<thead>
<tr>
<th>Versions</th>
<th>X mm (in)</th>
<th>54</th>
<th>03</th>
<th>12</th>
<th>31</th>
<th>49</th>
<th>82</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>16 (0.63)</td>
<td>#</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>5</td>
<td>41.6 (1.64)</td>
<td>X</td>
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<td>X</td>
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</table>

# Standard combination
X Available combination
MOUNTING FLANGES AND TABLE OF COMPATIBILITY

GERMAN 4 BOLTS  
B6  
Material: cast iron and aluminium

<table>
<thead>
<tr>
<th>VERSIONS</th>
<th>X</th>
<th>95</th>
<th>07</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>See page 26</td>
<td>mm (in)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>17.7 (0.70)</td>
<td>#</td>
<td>X</td>
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<tr>
<td>5</td>
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# Standard combination  
X Available combination

SAE “A” 2 BOLTS  
S9  
Material: cast iron and aluminium

<table>
<thead>
<tr>
<th>VERSIONS</th>
<th>X</th>
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<td></td>
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<tr>
<td>0</td>
<td>20 (0.79)</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>X</td>
<td>#</td>
<td>X</td>
<td>#</td>
<td>#</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>5</td>
<td>45.6 (1.80)</td>
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<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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</tr>
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</table>

# Standard combination  
X Available combination

Through hole

DRIVE SHAFTS  
See page 32 ÷ 33

DRIVE SHAFTS  
See page 31 ÷ 33
### SAE “B” 2 BOLTS

**S5**

Material: cast iron

### DRIVE SHAFTS

See page 32

<table>
<thead>
<tr>
<th>VERSIONS</th>
<th>X</th>
<th>04</th>
<th>32</th>
<th>49</th>
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<tbody>
<tr>
<td>See page 26</td>
<td>mm (in)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>0</td>
<td>20 (0.79)</td>
<td>#</td>
<td>#</td>
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<td>5</td>
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# Standard combination

X Available combination

### GERMAN

**W8**

Material: cast iron

### DRIVE SHAFTS

See page 31

<table>
<thead>
<tr>
<th>VERSIONS</th>
<th>X</th>
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<tr>
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<td>mm (in)</td>
<td>#</td>
</tr>
<tr>
<td>W8</td>
<td>49.8 (1.96)</td>
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# Standard combination

X Available combination
## PORTS POSITION AND TYPE

### SIDE PORTS

<table>
<thead>
<tr>
<th>PORTS TYPE</th>
<th>European</th>
<th>Split SSM</th>
<th>Split SSS</th>
<th>Gas BSPP</th>
<th>SAE ODT</th>
<th>German</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump type</td>
<td>IN</td>
<td>OUT</td>
<td>IN</td>
<td>OUT</td>
<td>IN</td>
<td>OUT</td>
</tr>
<tr>
<td>Motor type</td>
<td>OUT</td>
<td>IN</td>
<td>OUT</td>
<td>IN</td>
<td>OUT</td>
<td>IN</td>
</tr>
<tr>
<td>PHP 20•8</td>
<td>EA</td>
<td>EA</td>
<td>MA</td>
<td>MA</td>
<td>SA</td>
<td>SA</td>
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<tr>
<td>PHP 20•10,5</td>
<td>EA</td>
<td>EA</td>
<td>MA</td>
<td>MA</td>
<td>SA</td>
<td>SA</td>
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<tr>
<td>PHP 20•11,2</td>
<td>EA</td>
<td>EA</td>
<td>MA</td>
<td>MA</td>
<td>SA</td>
<td>SA</td>
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<tr>
<td>PHP 20•14</td>
<td>EB</td>
<td>EA</td>
<td>MB</td>
<td>MA</td>
<td>SB</td>
<td>SB</td>
</tr>
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<td>PHP 20•16</td>
<td>EB</td>
<td>EA</td>
<td>MB</td>
<td>MA</td>
<td>SB</td>
<td>SB</td>
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<tr>
<td>PHP 20•18</td>
<td>EB</td>
<td>EA</td>
<td>MB</td>
<td>MA</td>
<td>SB</td>
<td>SB</td>
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<tr>
<td>PHP 20•19</td>
<td>EB</td>
<td>EA</td>
<td>MB</td>
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<td>SB</td>
<td>SB</td>
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<td>PHP 20•20</td>
<td>EB</td>
<td>EA</td>
<td>MB</td>
<td>MA</td>
<td>SB</td>
<td>SB</td>
</tr>
<tr>
<td>PHP 20•23</td>
<td>EB</td>
<td>EA</td>
<td>MC</td>
<td>MB</td>
<td>SC</td>
<td>SB</td>
</tr>
<tr>
<td>PHP 20•24,5</td>
<td>EB</td>
<td>EA</td>
<td>MC</td>
<td>MB</td>
<td>SC</td>
<td>SB</td>
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<tr>
<td>PHP 20•25</td>
<td>EB</td>
<td>EA</td>
<td>MC</td>
<td>MB</td>
<td>SC</td>
<td>SB</td>
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<tr>
<td>PHP 20•27,8</td>
<td>EB</td>
<td>EA</td>
<td>MC</td>
<td>MB</td>
<td>SC</td>
<td>SB</td>
</tr>
<tr>
<td>PHP 20•31,5</td>
<td>EB</td>
<td>EA</td>
<td>MC</td>
<td>MB</td>
<td>SC</td>
<td>SB</td>
</tr>
</tbody>
</table>

Different inlet and outlet ports are available.
For more information please consult our pre-sales department.

## EXTERNAL DRAIN PORTS

### SIDE PORTS

<table>
<thead>
<tr>
<th>IN/OUT PORTS TYPE</th>
<th>German</th>
<th>European</th>
<th>Split SSM</th>
<th>Split SSS</th>
<th>Gas BSPP</th>
<th>SAE ODT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHP 20</td>
<td>TA</td>
<td>GB</td>
<td>GB</td>
<td>03</td>
<td>GB</td>
<td>03</td>
</tr>
</tbody>
</table>

Dimensions on page 42
PORT SIZES

- Tightening torque for low pressure side port.
- Tightening torque for high pressure side port.

For reversible rotation, please consult only the tightening torque for high pressure side port.

**EUROPEAN FLANGED PORTS - 4 Bolts**

Metric thread ISO 60° conforms to ISO/R 262

<table>
<thead>
<tr>
<th>CODE</th>
<th>A (mm) (in)</th>
<th>B (mm) (in)</th>
<th>C (Thread Depth) mm (in)</th>
<th>Nm (Nm (lbf in))</th>
<th>Nm (Nm (lbf in))</th>
</tr>
</thead>
<tbody>
<tr>
<td>EA</td>
<td>13 (0.51)</td>
<td>30 (1.18)</td>
<td>M 6 (13 (0.51))</td>
<td>8 +0.5</td>
<td>8 +0.5</td>
</tr>
<tr>
<td>EB</td>
<td>19 (0.75)</td>
<td>40 (1.57)</td>
<td>M 8 (14 (0.55))</td>
<td>15 +1</td>
<td>20 +1</td>
</tr>
</tbody>
</table>

**SAE FLANGED PORTS J518 - Standard pressure series 3000 PSI**

Metric thread ISO 60° conforms to ISO/R 262

<table>
<thead>
<tr>
<th>CODE</th>
<th>A (mm) (in)</th>
<th>B (mm) (in)</th>
<th>C (mm) (in)</th>
<th>D (Thread Depth) mm (in)</th>
<th>Nm (Nm (lbf in))</th>
<th>Nm (Nm (lbf in))</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA</td>
<td>12.5 (0.49)</td>
<td>38.1 (1.50)</td>
<td>17.5 (0.69)</td>
<td>M 8 (14 (0.55))</td>
<td>15 +1</td>
<td>15 +1</td>
</tr>
<tr>
<td>MB</td>
<td>19 (0.75)</td>
<td>47.6 (1.87)</td>
<td>22.2 (0.87)</td>
<td>M 10 (14 (0.55))</td>
<td>20 +1</td>
<td>25 +1</td>
</tr>
<tr>
<td>MC</td>
<td>25.4 (1.00)</td>
<td>52.4 (2.06)</td>
<td>26.2 (1.03)</td>
<td>M 10 (14 (0.55))</td>
<td>20 +1</td>
<td>25 +1</td>
</tr>
</tbody>
</table>
PORT SIZES

Tightening torque for low pressure side port.

Tightening torque for high pressure side port.

For reversible rotation, please consult only the tightening torque for high pressure side port.

SAE FLANGED PORTS J518 - Standard pressure series 3000 PSI

American straight thread UNC-UNF 60° conforms to ANSI B 1.1

<table>
<thead>
<tr>
<th>CODE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Thread Depth mm (in)</th>
<th>紧</th>
<th>紧</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA</td>
<td>12.5 (0.49)</td>
<td>38.1 (1.50)</td>
<td>17.5 (0.69)</td>
<td>5/16-18 UNC-2B</td>
<td>14 (0.55)</td>
<td>15 †</td>
<td>20 †</td>
</tr>
<tr>
<td>SB</td>
<td>19 (0.75)</td>
<td>47.6 (1.87)</td>
<td>22.2 (0.87)</td>
<td>3/8 - 16 UNC-2B</td>
<td>14 (0.55)</td>
<td>20 †</td>
<td>25 †</td>
</tr>
<tr>
<td>SC</td>
<td>25.4 (1.00)</td>
<td>52.4 (2.06)</td>
<td>26.2 (1.03)</td>
<td>3/8 - 16 UNC-2B</td>
<td>14 (0.55)</td>
<td>20 †</td>
<td>25 †</td>
</tr>
</tbody>
</table>

GAS STRAIGHT THREAD PORTS

British standard pipe parallel (55°) conforms to UNI-ISO 228

<table>
<thead>
<tr>
<th>CODE</th>
<th>Nominal size</th>
<th>A</th>
<th>Ø B</th>
<th>Ø C</th>
<th>D</th>
<th>E</th>
<th>紧</th>
</tr>
</thead>
<tbody>
<tr>
<td>GD</td>
<td>1/2&quot; G 1/2</td>
<td>—</td>
<td>19 (0.75)</td>
<td>17 (0.67)</td>
<td>—</td>
<td>20 †</td>
<td>50 †</td>
</tr>
<tr>
<td>GE</td>
<td>3/4&quot; G 3/4</td>
<td>—</td>
<td>24.5 (0.96)</td>
<td>18 (0.71)</td>
<td>—</td>
<td>30 †</td>
<td>90 †</td>
</tr>
<tr>
<td>GF</td>
<td>1&quot; G 1</td>
<td>—</td>
<td>30.5 (1.20)</td>
<td>18 (0.71)</td>
<td>—</td>
<td>50 †</td>
<td>130 †</td>
</tr>
</tbody>
</table>

Tightening torque for low pressure side port.

Tightening torque for high pressure side port.

For reversible rotation, please consult only the tightening torque for high pressure side port.
**PORT SIZES**

- Tightening torque for low pressure side port.
- Tightening torque for high pressure side port.
- For reversible rotation, please consult only the tightening torque for high pressure side port.

**SAE STRAIGHT THREAD PORTS J514**

American straight thread UNC-UNF 60° conforms to ANSI B 1.1

<table>
<thead>
<tr>
<th>CODE</th>
<th>Nominal size</th>
<th>Ø B (mm/in)</th>
<th>Ø C (mm/in)</th>
<th>D (mm/in)</th>
<th>E (mm/in)</th>
<th>Nm (lbf in)</th>
<th>Nm (lbf in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC</td>
<td>5/8” 7/8” - 14 UNF - 2B</td>
<td>35 (1.38)</td>
<td>20.5 (0.81)</td>
<td>17 (0.67)</td>
<td>0.5 (0.02)</td>
<td>30 (266 ÷ 288)</td>
<td>70 (620 ÷ 664)</td>
</tr>
<tr>
<td>OD</td>
<td>3/4” 1 1/16” - 12 UNF - 2B</td>
<td>42 (1.65)</td>
<td>24.8 (0.98)</td>
<td>20 (0.79)</td>
<td>0.5 (0.02)</td>
<td>40 (354 ÷ 376)</td>
<td>120 (1062 ÷ 1151)</td>
</tr>
<tr>
<td>OF</td>
<td>1” 1 5/16” - 12 UNF - 2B</td>
<td>49 (1.93)</td>
<td>30.5 (1.20)</td>
<td>20 (0.79)</td>
<td>0.5 (0.02)</td>
<td>60 (531 ÷ 575)</td>
<td>170 (1505 ÷ 1593)</td>
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</table>

**GERMAN FLANGED PORTS - 4 Bolts**

Metric thread ISO 60° conforms to ISO/R 262

<table>
<thead>
<tr>
<th>CODE</th>
<th>A (mm)</th>
<th>B (mm)</th>
<th>C (Thread Depth mm)</th>
<th>Nm (lbf in)</th>
<th>Nm (lbf in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/06.2009</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>15 (0.60)</td>
<td>35 (1.38)</td>
<td>M 6 12 (0.47)</td>
<td>8 (71 ÷ 75)</td>
<td>8 (71 ÷ 75)</td>
</tr>
<tr>
<td>BE</td>
<td>20 (0.79)</td>
<td>40 (1.57)</td>
<td>M 6 12 (0.47)</td>
<td>8 (71 ÷ 75)</td>
<td>8 (71 ÷ 75)</td>
</tr>
</tbody>
</table>
Polaris PH

DRAIN PORT SIZES

 Tightening torque for low pressure side port.

GAS STRAIGHT THREAD PORTS BSPP
British standard pipe parallel (55°) conforms to UNI - ISO 228

<table>
<thead>
<tr>
<th>CODE</th>
<th>Nominal size</th>
<th>Ø B</th>
<th>Ø C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB</td>
<td>1/4&quot; G 1/4</td>
<td>21,5 (0.85)</td>
<td>12 (0.47)</td>
<td>15 (0.59)</td>
<td>1,5 (0.06)</td>
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</table>

METRIC STRAIGHT THREAD PORTS ISO 6149 METRIC
Metric thread ISO 60° conforms to ISO/R 262

<table>
<thead>
<tr>
<th>CODE</th>
<th>Ø B</th>
<th>Ø C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA</td>
<td>22 (0.87)</td>
<td>9 (0.35)</td>
<td>13 (0.51)</td>
<td>0,5 (0.02)</td>
</tr>
</tbody>
</table>

SAE STRAIGHT THREAD PORTS J514 ODT
American straight thread UNC-UNF 60° conforms to ANSI B 1.1

<table>
<thead>
<tr>
<th>CODE</th>
<th>Ø B</th>
<th>Ø C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>03</td>
<td>21 (0.83)</td>
<td>9,5 (0.37)</td>
<td>14 (0.55)</td>
<td>1 (0.04)</td>
</tr>
</tbody>
</table>
VALVE OPTIONS

PRIORITY VALVE

P1  Constant delivery and internal recirculation of excess flow.

P2  Constant delivery at controlled pressure. Internal recirculation of excess flow and drain valve.

P3  Constant delivery at controlled pressure. Excess flow and drain valve must be connected to tank.

P4  Constant delivery and excess flow can both be used under load.

P5T Constant delivery at controlled pressure with drain valve connected to tank. Excess flow can be used under load.

MAX PRESSURE RELIEF VALVE

VPEF.. Fixed setting with external drain.

VPIF.. Fixed setting with internal drain.

VPER.. Adjustable setting with external drain.

VPIR.. Adjustable setting with internal drain.

LOAD SENSING VALVE

... Static.

... Dynamic.

... Dynamic with relief valve fitted on the main line.

... Dynamic with relief valve fitted on controlled line.

CHECK VALVE

V8 Anti-cavitation valve.

For more information please consult our built-in valves technical catalogue and our pre-sales department.
### HOW TO ORDER - SINGLE UNITS

<table>
<thead>
<tr>
<th>1</th>
<th>Type</th>
<th>Pump type</th>
<th>Motor type</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.26 cm³/rev (0.50 in³/rev)</td>
<td>PHP 20•8</td>
<td>PHM 20•8</td>
<td></td>
</tr>
<tr>
<td>10.9 cm³/rev (0.66 in³/rev)</td>
<td>PHP 20•10,5</td>
<td>PHM 20•10,5</td>
<td></td>
</tr>
<tr>
<td>11.23 cm³/rev (0.68 in³/rev)</td>
<td>PHP 20•11,2</td>
<td>PHM 20•11,2</td>
<td></td>
</tr>
<tr>
<td>14.53 cm³/rev (0.88 in³/rev)</td>
<td>PHP 20•14</td>
<td>PHM 20•14</td>
<td></td>
</tr>
<tr>
<td>16.85 cm³/rev (1.02 in³/rev)</td>
<td>PHP 20•16</td>
<td>PHM 20•16</td>
<td></td>
</tr>
<tr>
<td>18.29 cm³/rev (1.11 in³/rev)</td>
<td>PHP 20•18</td>
<td>PHM 20•18</td>
<td></td>
</tr>
<tr>
<td>19.09 cm³/rev (1.16 in³/rev)</td>
<td>PHP 20•19</td>
<td>PHM 20•19</td>
<td></td>
</tr>
<tr>
<td>21.14 cm³/rev (1.29 in³/rev)</td>
<td>PHP 20•20</td>
<td>PHM 20•20</td>
<td></td>
</tr>
<tr>
<td>23.32 cm³/rev (1.42 in³/rev)</td>
<td>PHP 20•23</td>
<td>PHM 20•23</td>
<td></td>
</tr>
<tr>
<td>24.84 cm³/rev (1.52 in³/rev)</td>
<td>PHP 20•24,5</td>
<td>PHM 20•24,5</td>
<td></td>
</tr>
<tr>
<td>26.42 cm³/rev (1.61 in³/rev)</td>
<td>PHP 20•25</td>
<td>PHM 20•25</td>
<td></td>
</tr>
<tr>
<td>28.21 cm³/rev (1.72 in³/rev)</td>
<td>PHP 20•27,8</td>
<td>PHM 20•27,8</td>
<td></td>
</tr>
<tr>
<td>33.03 cm³/rev (2.01 in³/rev)</td>
<td>PHP 20•31,5</td>
<td>PHM 20•31,5</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Rotation</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>Left</td>
<td>S</td>
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</tr>
<tr>
<td>Right</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Reversible rear external drain</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Reversible side external drain</td>
<td>L</td>
<td></td>
</tr>
<tr>
<td>Reversible internal drain</td>
<td>B</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>3</th>
<th>Outboard bearing options</th>
<th>Code</th>
</tr>
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<td>B1</td>
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<td>K</td>
<td>IN rear / OUT side</td>
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### HOW TO ORDER - SINGLE UNITS - GERMAN FLANGED PORTS

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### HOW TO ORDER - SINGLE UNITS - EUROPEAN FLANGED PORTS

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<tr>
<td>MB/MA</td>
<td>PHP 20</td>
<td>14-16-18-19-20</td>
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<td>MC/MC</td>
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<tr>
<td>MB/MC</td>
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### HOW TO ORDER - SINGLE UNITS - SAE FLANGED PORTS (SSM)

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<td>MB/MA</td>
<td>PHP 20</td>
<td>14-16-18-19-20</td>
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<td>MC/MC</td>
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<tr>
<td>MB/MC</td>
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HOW TO ORDER - SINGLE UNITS

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<tr>
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<td>PHM 20</td>
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IN/OUT GERMAN FLANGED PORTS

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IN/OUT SAE FLANGED PORTS (SSS)

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IN/OUT GAS STRAIGHT THREAD PORTS (BSPP)

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IN/OUT SAE STRAIGHT THREAD PORTS (ODT)

<table>
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</tr>
<tr>
<td>03</td>
<td>PHP 20</td>
</tr>
<tr>
<td></td>
<td>PHM 20</td>
</tr>
</tbody>
</table>

Seals (a)

- Buna (standard) N
- Viton V

Mounting flange and rear cover options (b)

- Cast iron mounting flange and rear cover (standard - no code)
- Aluminium mounting flange and cast iron rear cover E
- Cast iron mounting flange and aluminium rear cover L
- Aluminium mounting flange and rear cover EL

Shaft seal options

- Standard shaft seal with wiper seal D
- High pressure special shaft seal H
- High pressure special shaft seal with wiper seal C

Drain port position - Rev. rotation L

- Side drain with side port position L
- Side drain with bottom port position *
# HOW TO ORDER - POLARIS PHP 20 DOUBLE PUMPS

<table>
<thead>
<tr>
<th>1</th>
<th>Type</th>
<th>Pump type</th>
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<tbody>
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<td>8,26 cm³/rev (0.50 in³/rev)</td>
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<td>PHP 20*8</td>
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<td>10,9 cm³/rev (0.66 in³/rev)</td>
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<td>PHP 20*10,5</td>
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<td>11,23 cm³/rev (0.68 in³/rev)</td>
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<td>PHP 20*11,2</td>
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<td>14,53 cm³/rev (0.88 in³/rev)</td>
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<td>PHP 20*14</td>
</tr>
<tr>
<td>16,85 cm³/rev (1.02 in³/rev)</td>
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<td>PHP 20*16</td>
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<tr>
<td>18,29 cm³/rev (1.11 in³/rev)</td>
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<td>PHP 20*18</td>
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<tr>
<td>19,09 cm³/rev (1.16 in³/rev)</td>
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<td>PHP 20*19</td>
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<tr>
<td>21,14 cm³/rev (1.29 in³/rev)</td>
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<td>23,32 cm³/rev (1.42 in³/rev)</td>
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<td>24,84 cm³/rev (1.52 in³/rev)</td>
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<td>26,42 cm³/rev (1.61 in³/rev)</td>
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<td>28,21 cm³/rev (1.72 in³/rev)</td>
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<table>
<thead>
<tr>
<th>2</th>
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<th>Code</th>
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<tbody>
<tr>
<td>European tapered 1:8</td>
<td>82</td>
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</tr>
<tr>
<td>German tapered 1:5</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>German tapered 1:5</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Straight</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>SAE &quot;A&quot; spline (9 teeth)</td>
<td>03</td>
<td></td>
</tr>
<tr>
<td>SAE spline (10 teeth)</td>
<td>01</td>
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</tr>
<tr>
<td>SAE &quot;A&quot; spline (11 teeth)</td>
<td>07</td>
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</tr>
<tr>
<td>SAE &quot;A&quot; straight</td>
<td>31</td>
<td></td>
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<tr>
<td>Straight</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Straight</td>
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<tr>
<td>SAE &quot;B&quot; spline</td>
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<tr>
<td>SAE &quot;B&quot; straight</td>
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<tr>
<td>DIN 54 82 spline</td>
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</tr>
<tr>
<td>Straight (only for version 6)</td>
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<tr>
<td>Straight (only for version 8)</td>
<td>81</td>
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<tr>
<th>3</th>
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<tr>
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<td>E2</td>
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<tr>
<td>German</td>
<td>B2</td>
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<tr>
<td>German 2 bolt</td>
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<td>German 2 bolt</td>
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The document includes tables and sections for ordering double pumps, detailing various types, drive shafts, and mounting flanges. It also specifies different ports configurations and their corresponding codes.
## HOW TO ORDER - POLARIS PHP 20 DOUBLE PUMPS

<table>
<thead>
<tr>
<th>Code</th>
<th>Combination type</th>
<th>Rotation</th>
<th>Outboard bearing options</th>
<th>Shaft arrangement</th>
<th>Mounting flange and rear cover options (a)</th>
<th>Seals (b)</th>
<th>Shaft seal options</th>
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<tbody>
<tr>
<td>S6</td>
<td>Standard</td>
<td>Left</td>
<td>Without outboard bearing (standard)</td>
<td>FS</td>
<td>Cast iron mounting flange and rear cover (standard)</td>
<td>N</td>
<td>D</td>
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<td>S7</td>
<td>Common inlet</td>
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<td>V</td>
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<td>Z6</td>
<td>Separate stages</td>
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</table>

(a) Mounting flange material on page 34 ÷ 37
Rear cover material on page 24
(b) Choose the seals according to the temperature shown on page 5
# HOW TO ORDER - POLARIS PHP 20 DOUBLE PUMPS DIFFERENT GROUPS

## PHP 20/PLP 20

<p>| | | | | | | | | | | | | |</p>
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## PHP 20/PLP 10

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</tbody>
</table>

---

1. **Type (a)**
   - The same of double pumps PHP 20/20

2. **Drive shaft**
   - The same of double pumps PHP 20/20

3. **Mounting flange**
   - The same of double pumps PHP 20/20

4. **Ports position**
   - Side:
     - L

5. **Ports IN/OUT**
   - The same of double pumps PHP 20/20

6. **Combination type**
   - Code:
     - PHP 20/PLP 20 Standard - No code: S6
     - PHP 20/PLP 20 Common inlet: S7
     - PHP 20/PLP 20 Separate stages: Z6
     - PHP 20/PLP 10 Standard - No code: T6
     - PHP 20/PLP 10 Common inlet: T7
     - PHP 20/PLP 10 Separate stages: Z6

7. **Rotation**
   - The same of double pumps PHP 20/20

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<table>
<thead>
<tr>
<th></th>
<th>Code</th>
<th>Outboard bearing options</th>
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<table>
<thead>
<tr>
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<th>Code</th>
<th>Shaft arrangement</th>
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<tbody>
<tr>
<td>9</td>
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<td>Female spline</td>
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<table>
<thead>
<tr>
<th></th>
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<th>Mounting flange and rear cover options (b)</th>
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<tbody>
<tr>
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<td>Cast iron mounting flange and rear cover (standard) - no code</td>
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<td>Aluminium mounting flange and cast iron rear cover</td>
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</tr>
<tr>
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<td></td>
<td>Cast iron mounting flange and aluminium rear cover</td>
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</tr>
<tr>
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<td>Aluminium mounting flange and rear cover</td>
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<td>The same of double pumps PHP 20/20</td>
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<th>Shaft seal options</th>
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(a) For PLP 20 and PLP 10 features please consult the proper technical catalogue
(b) Mounting flange material on page 34 ÷ 37
Rear cover material on page 24 ÷ 25
Our policy is one of continuous improvement in product. Specification of items may, therefore, be changed without notice.