AP312HP Gear Pumps
Single and multiple cast iron gear pumps
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</table>
1  General information

The product range of Bucher Hydraulics SpA includes single pumps 05-100-212-212HP-250HP-300-312HP (corresponding with the common group denominations: 05-1-2-2.5-3) and several combinations of double pumps, triple pumps, and so on, that can be assembled together according to versions of displacement, flanging, and auxiliary valves.

Bucher Hydraulics SpA has supplied a wide range of external gear pumps and motors to industrial and mobile applications since many years.

Bucher’s external gear pumps are widely used in modern hydraulic system to obtain high performances, long life service and low purchase and maintenance costs.

Thanks to the positive field experiences recorded on the group 2 (AP212HP) and group 2.5 (AP250HP) cast iron pump and motor series, Bucher Hydraulics has completed its product range introducing the new AP312HP cast iron pump group 3. The new pump has been developed with modern and robust design concepts.

Main applications and benefits

- Robust design in compact dimensions
- Teeth design optimisation oriented to reduce pressure pulsation
- Reduced noise and vibration
- Reduced number of components - reduced weight
- Double shaft seals - More shaft protection and long life without external leakage
- HNBR seals
- Wide fluid temperature range admitted
- High volumetric and mechanical efficiencies
- Single or multistage possible configurations
- Strong splined shaft multistage connections
- AP212 aluminium / AP212HP cast iron rear interface
- Bucher validation method: long life expectancy

Strong “2 pieces” structure, big shafts diameter as well as high quality materials, allows to the AP312HP to reach very high quality and performance levels, in order to fulfill the most innovative types of machines and applications.

Bucher designed this new pump with support bearings mounted in the cast iron body and covers. Tandem and triple pumps are also available with direct connections between the shafts.

AP312HP is specifically developed for wheel loaders, excavators and telehandlers applications.

Bucher Hydraulics has so achieved this state of the art by constantly improving its design, control and manufacturing techniques aligned with the latest technological developments, while simultaneously enhancing its Quality System ensuring that every single product offers the same high standards.
1.1 External gear pumps components and construction / benefits

A. Cast iron front cover: the standard front-cover design can be fitted to two different pump interfaces
B. Cast iron main pump body: wide range of displacements obtainable with two different basic bodies both with back cover integrated. Rear ports on request.
C. HNBR seal material instead of NBR
D. Double HNBR shaft seals
E. Strong pressure-balance plate instead of aluminium. Balancing area and intermediate notches optimised
F. Large-diameter bearings, fitted both in front cover and body
G. Large number of teeth, tooth profile optimised, larger shaft diameter

**BENEFITS**

- A B Flexibility/smaller number of components
- A B D Reduced risk of external leakage
- A B E High efficiencies/pressure limits
- A B E Long life expectancy
- C D Wider temperature range
- E G Lower pressure ripple
- E G Noise/vibration reduction
- E F G Higher load capacity and transmissible torque
- E F G Low friction and high mechanical efficiency
- E F G Higher max. pressure limit

The front mounting flange and the body/backcover are made of high-strength cast iron to give thermal stability, resistance to contamination and the strength necessary for persistently high levels of performance and life, needed in demanding heavy duty applications. Body/back cover integrated, larger shaft diameter, large-diameter bearing and bronze trust plate have been optimized to provide heavy duty, high pressure limits, high efficiencies and long life expectancy. Noise and vibration reduction due to the large number of teeth. The bearings are located in the front mounting flange, in the body/back cover and, for multiple pumps, in the body pumps.
### 1.2 Technical data

<table>
<thead>
<tr>
<th>Features</th>
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<tbody>
<tr>
<td>Operating fluid temperature range (mineral oil):</td>
<td>NBR</td>
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<tr>
<td></td>
<td>HNBR</td>
</tr>
<tr>
<td></td>
<td>FPM (VITON)</td>
</tr>
<tr>
<td></td>
<td>-15 / +80 °C (peak: -20 / +90 °C)</td>
</tr>
<tr>
<td></td>
<td>-20 / +90 °C (peak: -30 / +110 °C)</td>
</tr>
<tr>
<td></td>
<td>-5 / +100 °C (peak: -10 / +110 °C)</td>
</tr>
<tr>
<td>Recommended fluids</td>
<td>hydraulic mineral oil-based</td>
</tr>
<tr>
<td>Viscosity range:</td>
<td>Recommended</td>
</tr>
<tr>
<td></td>
<td>Permitted for starting</td>
</tr>
<tr>
<td></td>
<td>20-120 mm²/s (cSt)</td>
</tr>
<tr>
<td></td>
<td>up to 700 mm²/s (cSt)</td>
</tr>
<tr>
<td></td>
<td>2000 mm²/s (cSt)</td>
</tr>
<tr>
<td>Cleanliness:</td>
<td>recommended for operating pressure &gt; 170 bar</td>
</tr>
<tr>
<td></td>
<td>recommended for operating pressure &lt; 170 bar</td>
</tr>
<tr>
<td></td>
<td>21/18/15 ISO 4406</td>
</tr>
<tr>
<td></td>
<td>22/19/16 ISO 4406</td>
</tr>
<tr>
<td>Standard seals material (valves not included)</td>
<td>NBR + HNBR standard (ISO1629)</td>
</tr>
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</table>

**Extreme working limit values cannot be combined**

<table>
<thead>
<tr>
<th>Type</th>
<th>Displacement</th>
<th>Pressure</th>
<th>Min speed</th>
<th>Max speed**</th>
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<tr>
<td></td>
<td>cm³/rev</td>
<td>P1</td>
<td>P3</td>
<td>rpm</td>
</tr>
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<td>Cu.In.P.R.</td>
<td>bar</td>
<td>bar</td>
<td>P.S.I.</td>
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<tr>
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<tr>
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<td>4300</td>
<td>4600</td>
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<td>290</td>
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<td>500</td>
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<td>4100</td>
<td>4400</td>
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<td>280</td>
<td>300</td>
<td>500</td>
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<tr>
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<td>3.32</td>
<td>4000</td>
<td>4300</td>
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<td>63</td>
<td>63.1</td>
<td>240</td>
<td>260</td>
<td>500</td>
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<tr>
<td></td>
<td>3.85</td>
<td>3400</td>
<td>3700</td>
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</tr>
<tr>
<td>75</td>
<td>75.3</td>
<td>240</td>
<td>260</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>4.60</td>
<td>3400</td>
<td>3700</td>
<td></td>
</tr>
</tbody>
</table>

** IMPORTANT!: The max admitted speed is referred to single pump/single inlet configuration. In case of multiple pumps with common suction line, a speed reduction must be considered.**

** IMPORTANT!: The pressure values are referred to unidirectional pumps, single versions only.**

Please consult Bucher Hydraulics if even one of the operating limits indicated in the table (temperature, pressure, rpm) is exceeded, as well as in the case of two or more maximum values at the same time, or for applications with particularly heavy-duty cycles.
1.3 Pressure
Pressure levels:
P1 = continuous pressure
P3 = peak pressure
The recommended oil speed in the pressure pipes is:
v = 2 to 5 m/s

1.4 Suction
The absolute suction pressure must be \( P_{in} \geq 0.75 \text{ bar} \) (11 PSI); therefore, the following must be avoided:
- large height differences between pump and tank
- long stretches of piping
- special features such as:
  - bends
  - reductions in diameter
  - quick couplings
  - etc.

It is also advisable to choose a filter of a suitable size to minimise any pressure drop and to take measures to prevent gradual clogging over time.

1.5 General precaution
In addition to the recommendations regarding fluids, filtration, coupling, etc., we suggest the following:
- Always check the rotation direction of the pump’s drive shaft; it must be compatible with the rotation direction of the pump itself.
- Be particularly careful in cleaning and make sure, when connecting the suction and pressure piping, that no chips, rag threads, teflon tape, etc. get into the pump circulation system.
- Check the tightness of the suction and pressure fittings, the correct positioning of the O-Ring, and make sure there is no dirt between the flange and the pump body.
- The first pump start-up can be facilitated by manually filling the suction piping and the pump itself with oil. To facilitate air bleeding, start the pump with the circuit not pressurised.
- To ensure the best heat distribution inside the tank, make sure the return pipe is not too close to the pump’s suction piping. The pipings themselves should be below oil tank level to prevent the formation of foam.
- Do not subject the pumps to operating conditions different from those indicated on section 1.2; for extreme operations, always contact our Sales Department.
- In the event of pump painting, do not use solvents or paints that are incompatible with the material of the seals. Do not bake paint with excessively high temperatures. Do not paint over the product identification plate.

1.5.1 Hydraulic fluid
The main function of the fluid used in hydraulic systems is to transfer energy but it performs also other important functions: protect the components from corrosion, lubricate the pump moving parts, remove particles and heat from the system.

In order to ensure proper operation and long life of the system it is important to choose the correct hydraulic fluid with proper additives.
Bucher Hydraulics recommends to use a mineral based oil responding to ISO 6743/4 requirements, only.

The system should be operated only with hydraulic oil containing anti-foaming and antioxidant additives. Before using other types of fluid, please contact our Sales Dept, since they can cause serious damage to the directional valve components and jeopardize the correct function of the system.
Never use fluids different from those indicated in section 1.2 and do not use fluids incompatible with the pump seals (i.e. HNBR)
1.5.2 Filtration

In order to ensure proper operation and long life of the pump components it is extremely important to provide a proper and effective filtration of the hydraulic fluid. It is advisable to follow filter manufacturers instruction and recommendations. The fineness of the filter should be selected in order to guarantee that a contamination levels indicated on section 1.2. When the high reliability of the system is an important requirement, a pressure filter must be used. In these cases it is also advisable to use a pressure filter with by-pass and indicator.

The size of the return filters must suit the maximum return flow whereas the size of the pressure filters must suit the maximum pump flow. It is advisable to fit filters with pressure gauge or dirt indicator in order to make it possible to verify the filter condition. Particular attention has to be paid to the cleaning of the machine hydraulic circuit and its components before the first run-in, since the presence of foreign materials could cause damages even if a proper filtration is provided.

In order to obtain the best performance of the system we recommend to strictly follow the conditions advised here above, failing which warranty shall be void.

1.5.3 Directives and standards

Atex


Bucher Hydraulics S.p.A. is certified for research, development and production of directional control valves, gear pumps and motors, power units, electro pumps, cartridge valves and integrated manifolds for hydraulic applications.

1.6 Identifying the rotation direction

The rotation direction of a gear pump is identified by looking at the pump from the front and with the drive gear turned upwards (see figures below).

Pumps with clockwise rotation (D) have a drive gear which turns clockwise, with the suction port on the left and the pressure port on the right.

Pumps with counterclockwise rotation (S) have a drive gear which turns counterclockwise, with the suction port on the right and the pressure port on the left. The figure also shows the pressure flow inside the pumps as the oil is transferred from the suction port to the pressure port.

Pumps with a unidirectional rotation (D or S) have the denomination AP.
1.7 Formulas to determine main gear pump operate parameters

The following parameters are defined:

\[ V_c = \text{(cm}^3/\text{rev)} \text{ pump displacement; } \]
\[ n = \text{(rev/min)} \text{ no. of rpms of the drive shaft; } \]
\[ Q = \text{(l/min)} \text{ flow rate; } \]
\[ p = \text{(bar)} \text{ operating pressure; } \]
\[ T = \text{(Nm)} \text{ drive torque; } \]
\[ N = \text{(kW)} \text{ Absorbed power; } \]
\[ \eta_v = \text{(\%)} \text{ volumetric efficiency; } \]
\[ \eta_m = \text{(\%)} \text{ mechanical efficiency; } \]
\[ \eta_t = \text{(\%)} \text{ total efficiency } \]

\[ Q = \frac{V_c \cdot n}{100000} \cdot \eta_v \]
\[ T = 1.59 \cdot \frac{p \cdot V_c}{\eta_m} \]
\[ N = \frac{Q \cdot p}{6 \cdot \eta_t} \]

Example

\[ \text{AP312HP/15 Vc = 40 cm}^3/\text{r } n = 1500 \text{ r/min } p = 200 \text{ bar } \eta_v = 94\% \text{ } \eta_m = 90\% \text{ } \eta_t = 84.6\% \]

\[ Q = \frac{40 \cdot 1500}{100000} = 94 = 56.4 \text{ l/min.} \]
\[ T = 1.59 \cdot \frac{200 \cdot 40}{90} = 141.3 \text{ Nm} \]
\[ N = \frac{56.4 \cdot 200}{6 \cdot 84.6} = 22.22 \text{ kW} \]

2 Overview standard pump configurations

This pump configuration are considered as "standard".

| 13 teeth | S38B2S | S38B8G | S38B8S |
| 15 teeth | S58B2S | S58B8G | S58B8S |
| 14 teeth | S48C2S | S48C8G | S48C8S |
| Straight keyed Ø 25.4 mm | C18B2S | C18B8G | C18B8S |
| Straight keyed Ø 22.225 mm | C28B2S | C28B8G | C28B8S |
| Tapered 1:8 | C81P2P | C81P8G |

Example

In the next pages, front, body/rear cover, and seals materials are listed for each pump series.

For ordering purposes, it is enough to outline the complete pump description (for example: AP312HP/40 S38B2S).

In case of a different configuration request (or a combination of different features, such as port threads, front flange materials, etc.), the description configurator shown in section 3.1 can be easily used.
2.1 Standard components configuration

<table>
<thead>
<tr>
<th>Drive shaft</th>
<th>Cast iron flange</th>
<th>Cast iron body/back cover</th>
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<td>13 teeth external spline</td>
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<tr>
<td>SAE J 498-13T</td>
<td>S3</td>
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<tr>
<td>16/32 DP</td>
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<td>Tmax= 270 Nm</td>
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<tr>
<td>15 teeth external spline</td>
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<tr>
<td>16/32 DP</td>
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<td>Tmax= 460 Nm</td>
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<td>8S</td>
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</table>
Unpainted pumps are Bucher Hydraulics standard; should a painted component be required, this feature must be specified in its purchase order.
Pump description example:

AP312HP/40_S_S38B2S

Pump size
Displacement
Series
Rotation (S= Left-hand rotation, D= Right-hand rotation)

* For S3- S5 dimensions see 3.2
### Table

<table>
<thead>
<tr>
<th>Type</th>
<th>A mm</th>
<th>A inch</th>
<th>B mm</th>
<th>B inch</th>
<th>BSPP</th>
<th>Pressure</th>
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<tr>
<td>40</td>
<td>132</td>
<td>5.20</td>
<td>87.8</td>
<td>3.46</td>
<td>1/4&quot; BSP</td>
<td>1&quot; BSP</td>
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<td>45</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>140.8</td>
<td>5.54</td>
<td>96.6</td>
<td>3.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>146.2</td>
<td>5.76</td>
<td>102</td>
<td>4.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>153.8</td>
<td>6.06</td>
<td>109.6</td>
<td>4.31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pump description example:**

`AP312HP/63_D_S38B8G`

- **Pump size**
- **Displacement**
- **Series**
- **Rotation (S= Left-hand rotation, D= Right-hand rotation)**

*For S3- S5 dimensions see 3.2*
### Pump description example:

```
AP312HP/63_D_S38B8S
```

**Pump size**
- Displacement

**Series**
- Rotation (S= Left-hand rotation, D= Right-hand rotation)

### Table of Pump Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>A (mm)</th>
<th>A (inch)</th>
<th>B (mm)</th>
<th>B (inch)</th>
<th>Suction UNF</th>
<th>Pressure UNF</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>132</td>
<td>5.20</td>
<td>87.8</td>
<td>3.46</td>
<td>1.5/8&quot; - 12 UNF-2B (SAE20)</td>
<td>1.5/16&quot; - 12 UNF-2B (SAE16)</td>
</tr>
<tr>
<td>45</td>
<td>135</td>
<td>5.31</td>
<td>90.8</td>
<td>3.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>140.8</td>
<td>5.54</td>
<td>96.6</td>
<td>3.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>146.2</td>
<td>5.76</td>
<td>102</td>
<td>4.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>153.8</td>
<td>6.06</td>
<td>109.6</td>
<td>4.31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* For S3- S5 dimensions see 3.2
## Pump Description Example:

Pump description example: 

\[ \text{AP312HP/40\_S\_S48C2S} \]

**Displacement**

**Rotation (S= Left-hand rotation, D= Right-hand rotation)**

---

* For S4 dimensions see 3.2
### Pump Description:

**For S4 dimensions see 3.2**

<table>
<thead>
<tr>
<th>Type</th>
<th>A (mm)</th>
<th>A (inch)</th>
<th>B (mm)</th>
<th>B (inch)</th>
<th>Suction</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>135</td>
<td>5.31</td>
<td>90.8</td>
<td>3.57</td>
<td>BSPP</td>
<td>BSPP</td>
</tr>
<tr>
<td>45</td>
<td>138</td>
<td>5.43</td>
<td>93.8</td>
<td>3.69</td>
<td>BSPP</td>
<td>BSPP</td>
</tr>
<tr>
<td>54</td>
<td>143.8</td>
<td>5.66</td>
<td>99.6</td>
<td>3.92</td>
<td>1 1/4&quot; BSP</td>
<td>1&quot; BSP</td>
</tr>
<tr>
<td>63</td>
<td>149.2</td>
<td>5.87</td>
<td>105</td>
<td>4.13</td>
<td>BSPP</td>
<td>BSPP</td>
</tr>
<tr>
<td>75</td>
<td>156.8</td>
<td>6.17</td>
<td>112.6</td>
<td>4.43</td>
<td>BSPP</td>
<td>BSPP</td>
</tr>
</tbody>
</table>

**Pump Description Example:**

`AP312HP/63_D_S48C8G`

- **Pump size**
- **Displacement**
- **Series**
- **Rotation (S= Left-hand rotation, D= Right-hand rotation)**
S48C8S

For S4 dimensions see 3.2
Pump description example:

```
Pump size  | Displacement  | Series  | Rotation (S= Left-hand rotation, D= Right-hand rotation)
```

For C1- C2 dimensions see 3.2
### Pump Description Example

AP312HP/63_D_C28B8G

- **Pump size**
- **Displacement**
- **Series**
- **Rotation (S= Left-hand rotation, D= Right-hand rotation)**

---

### Table: Pump Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>A (mm)</th>
<th>A (inch)</th>
<th>B (mm)</th>
<th>B (inch)</th>
<th>Suction BSPP</th>
<th>Pressure BSPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>132</td>
<td>5.20</td>
<td>87.8</td>
<td>3.46</td>
<td>1 1/4&quot; BSP</td>
<td>1&quot; BSP</td>
</tr>
<tr>
<td>45</td>
<td>135</td>
<td>5.31</td>
<td>90.8</td>
<td>3.57</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>140.8</td>
<td>5.54</td>
<td>96.6</td>
<td>3.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>146.2</td>
<td>5.76</td>
<td>102</td>
<td>4.02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>153.8</td>
<td>6.06</td>
<td>109.6</td>
<td>4.31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*For C1- C2 dimensions see 3.2*
Pump description example:

AP312HP/63_D_C28B8S

Pump size
Displacement
Series
Rotation (S= Left-hand rotation, D= Right-hand rotation)

* For C1- C2 dimensions see 3.2
T max= 230 Nm

<table>
<thead>
<tr>
<th>Type</th>
<th>A mm</th>
<th>A inch</th>
<th>B mm</th>
<th>B inch</th>
<th>Suction d</th>
<th>D</th>
<th>F</th>
<th>Pressure d</th>
<th>D</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>144.2</td>
<td>5.68</td>
<td>100.1</td>
<td>3.94</td>
<td>27</td>
<td>1.06</td>
<td>51</td>
<td>2.00</td>
<td>M10x1.5</td>
<td>19</td>
</tr>
<tr>
<td>63</td>
<td>149.63</td>
<td>5.89</td>
<td>105.53</td>
<td>4.15</td>
<td>33</td>
<td>1.22</td>
<td>62</td>
<td>2.43</td>
<td>M12x1.75</td>
<td>27</td>
</tr>
<tr>
<td>75</td>
<td>157.23</td>
<td>6.19</td>
<td>113.13</td>
<td>4.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pump description example:

AP312HP/63_D_C81P2P
Pump size
Displacement
Rotation (S= Left-hand rotation, D= Right-hand rotation)
\[ T_{\text{max}} = 230 \text{ Nm} \]

<table>
<thead>
<tr>
<th>Type</th>
<th>A (mm)</th>
<th>A (inch)</th>
<th>B (mm)</th>
<th>B (inch)</th>
<th>Suction BSPP</th>
<th>Pressure BSPP</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>144.2</td>
<td>5.68</td>
<td>100.1</td>
<td>3.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>149.63</td>
<td>5.89</td>
<td>105.53</td>
<td>4.15</td>
<td>1 1/4&quot; BSP</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>157.23</td>
<td>6.19</td>
<td>113.13</td>
<td>4.45</td>
<td></td>
<td>1&quot; BSP</td>
</tr>
</tbody>
</table>

Pump description example:

\[ \text{AP312HP/63\_D\_C81P8G} \]

- **Pump size**
- **Displacement**
- **Series**
- **Rotation** (S= Left-hand rotation, D= Right-hand rotation)
In this section, a single AP312HP pump can be configured and customized.

AP312HP wide availability of covers, bodies and gears provides great flexibility to AP312HP pump range and allows several different pump configurations.

In order to simplify the selection of the desired pump combination, a 'configurator form' is available and, by filling it out, it will guide you in the pump creation process.
3.1 Single pump customised versions order example

| A | P | 3 | 1 | 2 | H | P | / | 4 | 0 | - | S | - | S | 3 | 8 | B | 8 | G | A | - | * |

**Function**
AP= single gear pump - unidirectional

**Series**
312HP

**Displacement**
40= 40.2 cm³/rev
45= 45 cm³/rev
54= 54.4 cm³/rev
63= 63.1 cm³/rev
75= 75.3 cm³/rev

**Rotation**
S = Left-hand rotation
D = Right-hand rotation

**Shaft end code**
see section 3.2

**Front cover type**
see section 3.3.1

**Type of ports code**
see section 3.3.2

**Inlet/outlet port size code combination**
see section 3.3.2

**BHRE section:**
Version - Progressive number (omitted)

Unpainted pumps are Bucher Hydraulics standard; should a painted component be required, this feature must be specified in its purchase order.
### 3.2 Shaft end code

<table>
<thead>
<tr>
<th>Shaft end shape</th>
<th>Shaft end ordering code</th>
<th>Max torque</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="13 teeth external spline" /></td>
<td>S3</td>
<td>T max = 270 Nm</td>
</tr>
<tr>
<td><img src="image" alt="15 teeth external spline" /></td>
<td>S5</td>
<td>T max = 460 Nm</td>
</tr>
<tr>
<td><img src="image" alt="14 teeth external spline" /></td>
<td>S4</td>
<td>T max = 950 Nm</td>
</tr>
<tr>
<td><img src="image" alt="Straight keyed" /></td>
<td>C1</td>
<td>T max = 280 Nm</td>
</tr>
<tr>
<td>Shaft end shape</td>
<td>Shaft end ordering code</td>
<td>Max torque</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Straight keyed</td>
<td>C2</td>
<td>T max = 185 Nm</td>
</tr>
<tr>
<td>Ø 22.225 mm - 0.875 inches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C8</td>
<td></td>
<td>T max = 230 Nm</td>
</tr>
<tr>
<td>Tapered shaft 1:8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.3 Front cover/mounting flange

#### 3.3.1 Front cover type

<table>
<thead>
<tr>
<th>Type</th>
<th>Cast iron</th>
<th>Ordering code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAE-B</strong></td>
<td>Shape</td>
<td>Ordering code</td>
</tr>
<tr>
<td>(Ø 101.6 mm - 4 inches)</td>
<td><img src="image" alt="SAE-B shape" /></td>
<td>8B</td>
</tr>
<tr>
<td>with HNBR seals (shaft seals and O-ring)</td>
<td><img src="image" alt="HNBR seals" /></td>
<td></td>
</tr>
<tr>
<td><strong>SAE-C</strong></td>
<td>Shape</td>
<td>Ordering code</td>
</tr>
<tr>
<td>(Ø 127 mm - 5 inches)</td>
<td><img src="image" alt="SAE-C shape" /></td>
<td>8C</td>
</tr>
<tr>
<td>with HNBR seals (shaft seals and O-ring)</td>
<td><img src="image" alt="HNBR seals" /></td>
<td></td>
</tr>
<tr>
<td>European rectangular</td>
<td><img src="image" alt="European shape" /></td>
<td>1P</td>
</tr>
<tr>
<td>(Ø 50.8 mm - 2 inches)</td>
<td><img src="image" alt="HNBR seals" /></td>
<td></td>
</tr>
<tr>
<td>with HNBR seals (shaft seals and O-ring)</td>
<td><img src="image" alt="HNBR seals" /></td>
<td></td>
</tr>
</tbody>
</table>

### Dimensions

**SAE-B**
- Ø 101.6 mm - 4 inches
- 17.4 \* 8.39 \* 3.77 \* 1.65 \* 0.37 \* 3.86

**SAE-C**
- Ø 127 mm - 5 inches
- 21.3 \* 8.39 \* 3.77 \* 1.95 \* 0.5 \* 4.89

**European**
- Ø 50.8 mm - 2 inches
- 50 \* 5 \* 20 \* 0.20 \* 1.97 \* 6.28
### 3.3.2 Port types

<table>
<thead>
<tr>
<th>Port type</th>
<th>Ordering code</th>
<th>Displacement</th>
<th>Dimension (mm - inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(SAE-B, SAE-C, EU)</td>
<td>8G</td>
<td>40-45-54</td>
<td>1 1/4&quot; BSP</td>
</tr>
<tr>
<td>BSP ports</td>
<td></td>
<td>63-75</td>
<td>1&quot; BSP</td>
</tr>
<tr>
<td>1 1/4&quot; BSP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1&quot; BSP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**IMPORTANT!** Tightening torques depends on several different factors including lubrication, coating and surfaces finish. The fitting manufacturer shall be consulted.

In the interest of safety, only fittings with STRAIGHT THREAD ENDS should be used (e.g. DIN3852). Fittings with TAPERED THREAD ENDS (e.g. DIN 3852 form C) should never be used, as they can cause deformation and cracks in the valve body.

Our warranty conditions will not be valid in case tapered fittings are used.

The work port adaptors have to be fastened respecting the tightening torque values indicated.
### Port type (SAE-B, SAE-C, EU) | Ordering code | Displacement | Dimension (mm - inches)  |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Suction</td>
<td>Pressure</td>
</tr>
<tr>
<td>SAE threaded ports UNF</td>
<td>8S</td>
<td>40-45-54-63-75</td>
<td>1 5/8''-12 UNF-2B (SAE20)</td>
</tr>
</tbody>
</table>

### 1 5/8''-12 UNF-2B (SAE20)

![Diagram](image1)

- Suction: Ø38
- Pressure: Ø60
- Length: 0.5
- Width: 1.50
- Diameter: 2.36
- Thickness: 0.94

### 1 5/16''-12 UNF-2B (SAE16)

![Diagram](image2)

- Suction: Ø50
- Pressure: Ø30
- Length: 0.94
- Width: 1.97
- Diameter: 1.18
- Thickness: 0.02

### Port type (SAE-B, SAE-C, EU) | Ordering code | Displacement | Dimension (mm - inches)  |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Suction</td>
<td>Pressure</td>
</tr>
<tr>
<td>European 4 bolts flanged</td>
<td>2P</td>
<td>54-63</td>
<td>19 - 0.78 (d)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>75</td>
<td>27 - 1.06 (d)</td>
</tr>
</tbody>
</table>

### 33/62

![Diagram](image3)

- Suction: Ø62
- Pressure: Ø51
- Length: 25+5
- Width: 0.87
- Diameter: 2.4
- Thickness: 0.71

### 27/51

![Diagram](image4)

- Suction: Ø33
- Pressure: Ø51
- Length: 37
- Width: 1.30
- Diameter: 1.06
- Thickness: 0.71

### 19/40

![Diagram](image5)

- Suction: Ø40
- Pressure: Ø51
- Length: 37
- Width: 1.30
- Diameter: 1.06
- Thickness: 0.71

---

**IMPORTANT!** Tightening torques depends on several different factors including lubrication, coating and surfaces finish. The fitting manufacturer shall be consulted.
### Port type
These flanges are available for SAE-B and SAE-C body type, only. NOT available for European version.

<table>
<thead>
<tr>
<th>Ordering code</th>
<th>Displacement</th>
<th>Suction</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>30.17</td>
<td>58.72</td>
<td>M10 x1.5</td>
</tr>
<tr>
<td>45-54</td>
<td>35.71</td>
<td>69.85</td>
<td>M12 x1.75</td>
</tr>
<tr>
<td>63-75</td>
<td>63-75</td>
<td>63-75</td>
<td>M12 x1.75</td>
</tr>
</tbody>
</table>

#### Dimension (mm - inches)

<table>
<thead>
<tr>
<th>Port type</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 1/4&quot;</td>
<td>A</td>
</tr>
<tr>
<td>1&quot;</td>
<td>B</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>C</td>
</tr>
</tbody>
</table>

#### Other ports
9

If the requested port type is not included in the previous versions, please indicate number “9” and specify the details in the request note.

### 3.4 Single pump dimensions
BÜCHER hydraulics

Pump with SAE-B front cover

<table>
<thead>
<tr>
<th>Pump size</th>
<th>A (mm)</th>
<th>A (inch)</th>
<th>B (mm)</th>
<th>B (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP312HP/40</td>
<td>132</td>
<td>5.20</td>
<td>87.8</td>
<td>3.46</td>
</tr>
<tr>
<td>AP312HP/45</td>
<td>135</td>
<td>5.31</td>
<td>90.8</td>
<td>3.57</td>
</tr>
<tr>
<td>AP312HP/54</td>
<td>140.8</td>
<td>5.54</td>
<td>96.6</td>
<td>3.79</td>
</tr>
<tr>
<td>AP312HP/63</td>
<td>146.2</td>
<td>5.76</td>
<td>102</td>
<td>4.02</td>
</tr>
<tr>
<td>AP312HP/75</td>
<td>153.8</td>
<td>6.06</td>
<td>109.6</td>
<td>4.31</td>
</tr>
</tbody>
</table>

Pump with SAE-C front cover

<table>
<thead>
<tr>
<th>Pump size</th>
<th>A (mm)</th>
<th>A (inch)</th>
<th>B (mm)</th>
<th>B (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP312HP/40</td>
<td>135</td>
<td>5.31</td>
<td>90.8</td>
<td>3.57</td>
</tr>
<tr>
<td>AP312HP/45</td>
<td>138</td>
<td>5.43</td>
<td>93.8</td>
<td>3.69</td>
</tr>
<tr>
<td>AP312HP/54</td>
<td>143.8</td>
<td>5.66</td>
<td>99.6</td>
<td>3.92</td>
</tr>
<tr>
<td>AP312HP/63</td>
<td>149.2</td>
<td>5.87</td>
<td>105</td>
<td>4.13</td>
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<tr>
<td>AP312HP/75</td>
<td>156.8</td>
<td>6.17</td>
<td>112.6</td>
<td>4.43</td>
</tr>
</tbody>
</table>
Pump with European body and front cover

<table>
<thead>
<tr>
<th>Type</th>
<th>A (mm)</th>
<th>A (inch)</th>
<th>B (mm)</th>
<th>B (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP312HP/40</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>AP312HP/45</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
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<td>5.89</td>
<td>105.53</td>
<td>4.15</td>
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<tr>
<td>AP312HP/75</td>
<td>157.23</td>
<td>6.19</td>
<td>113.13</td>
<td>4.45</td>
</tr>
</tbody>
</table>
4 Multiple gear pumps

4.1 Multiple gear pumps: AP312HP+AP312HP standard cast iron versions
(SAE-B and SAE-C versions only)

Standard versions means separated inlet/outlet side ports, without shaft seal between pump stages

4.1.1 Drive torque calculation example

\[
T_{\text{max}} = 1.59 \cdot \frac{p_1 \cdot V_{c1}}{\eta_{m1}} + 1.59 \cdot \frac{p_2 \cdot V_{c2}}{\eta_{m2}}
\]

Example: AP312HP/75 + AP312HP/54

\[
T_{\text{max}} = 1.59 \cdot \frac{75 \cdot 200}{90} + 1.59 \cdot \frac{54 \cdot 100}{90} = 265 + 95.4 = 360.4 \text{ Nm}
\]

\[T_{\text{max}} = 360.4 \leq 460 \text{ Nm (splined 15T)}\]

\[T_2 = 95.4 \leq T_{\text{max}} 200 \text{ Nm}\]
4.1.2 Tandem pumps dimensions

<table>
<thead>
<tr>
<th>Pump size</th>
<th>B</th>
<th>C</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>inch</td>
<td>mm</td>
</tr>
<tr>
<td>AP312HP/63</td>
<td>55.5</td>
<td>2.19</td>
<td>67.5</td>
</tr>
<tr>
<td>AP312HP/75</td>
<td>63.1</td>
<td>2.48</td>
<td>67.5</td>
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</table>

<table>
<thead>
<tr>
<th>Front cover dimensions</th>
<th>SAE-B</th>
<th>SAE-C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>inch</td>
</tr>
<tr>
<td>Z</td>
<td>46.5</td>
<td>1.83</td>
</tr>
</tbody>
</table>

For other covers dimensions see 3.3.1
### 4.1.3 Dimensions example

![Diagram of dimensions example](image)

Example AP312HP/75+AP312HP/54 (SAE-B front cover):

- **Total length**: $271.4 = (Z + B + C + B + E) = 46.5 + 63.1 + 67.5 + 50.1 + 44.2$
- **Port position**: $227.2 = (Z + B + C + B) = 46.5 + 63.1 + 67.5 + 50.1$
  - $109.6 = (Z + B) = 46.5 + 63.1$

### 4.1.4 How to order tandem pumps AP312HP+AP312HP standard cast iron versions

<table>
<thead>
<tr>
<th>1st PUMP</th>
<th>2nd PUMP</th>
<th>1st BODY</th>
<th>2nd BODY</th>
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<tr>
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<table>
<thead>
<tr>
<th>1</th>
<th><strong>Function</strong></th>
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<tr>
<td>Function</td>
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<th>2</th>
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<td>Series</td>
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<tr>
<th>3</th>
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<tr>
<td>Displacement</td>
<td>40 = 40.2 cm³/rev</td>
</tr>
<tr>
<td></td>
<td>45 = 45 cm³/rev</td>
</tr>
<tr>
<td></td>
<td>54 = 54.4 cm³/rev</td>
</tr>
<tr>
<td></td>
<td>63 = 63.1 cm³/rev</td>
</tr>
<tr>
<td></td>
<td>75 = 75.3 cm³/rev</td>
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<table>
<thead>
<tr>
<th>4</th>
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<td>S = left-hand rotation</td>
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<td>D = Right-hand rotation</td>
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<table>
<thead>
<tr>
<th>5</th>
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<td>see section 3.4.1</td>
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</tbody>
</table>

<table>
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<th><strong>Type of ports code</strong></th>
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<td>Type of ports code</td>
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</tbody>
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<table>
<thead>
<tr>
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<th><strong>Inlet/outlet port size code combination</strong></th>
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<td>Inlet/outlet port size code combination</td>
<td>see section 3.3.2</td>
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</table>

<table>
<thead>
<tr>
<th>9</th>
<th><strong>BHRE section</strong></th>
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<tbody>
<tr>
<td>BHRE section</td>
<td>Version - Progressive number (omitted)</td>
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</tbody>
</table>

Unpainted pumps are Bucher Hydraulics standard; should a painted component be required, this feature must be specified in its purchase order.
4.2 Multiple gear pumps: AP312HP+AP212HP standard cast iron versions

(Tandem pumps combination of group 3 with group 2 are possible for SAE-B, SAE-C and European versions, too)

Standard versions means separated inlet/outlet side ports, without shaft seal between pump stages

4.2.1 Drive torque calculation example

\[
T_{\text{max}} = T_1 + T_2 \quad \text{<see section 3.2>}
\]

Drive gear 1st pump

\[
T_{\text{max}} = 1.59 \cdot \frac{p_1 \cdot V_{c1}}{\eta_{m1}} + 1.59 \cdot \frac{p_2 \cdot V_{c2}}{\eta_{m2}}
\]

1st body

\[
T_{\text{max}} = 200 \text{ Nm}
\]

Drive gear 2nd pump

2nd body pump

AP212HP (Cast Iron)

Example: AP312HP/45 + AP212HP/15

\[
T_{\text{max}} = 1.59 \cdot \frac{45 \cdot 200}{90} + 1.59 \cdot \frac{15 \cdot 100}{90} = 159 + 26.5 = 185.5 \text{ Nm}
\]

\[
T_{\text{max}} = 185.5 \leq 230 \text{ Nm (splined 13T)}
\]

\[
T_2 = 26.5 \leq T_{\text{max}} 200 \text{ Nm}
\]
### 4.2.2 Tandem pumps dimensions

#### Pump size

<table>
<thead>
<tr>
<th>Pump size</th>
<th>SAE-B, SAE-C</th>
<th>B (mm)</th>
<th>B (inch)</th>
<th>D (mm)</th>
<th>D (inch)</th>
<th>Pump size</th>
<th>European version</th>
<th>B (mm)</th>
<th>B (inch)</th>
<th>D (mm)</th>
<th>D (inch)</th>
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</thead>
<tbody>
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<td></td>
<td></td>
</tr>
<tr>
<td>AP312HP/45</td>
<td></td>
<td>44.3</td>
<td>1.74</td>
<td>37.5</td>
<td>1.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP312HP/54</td>
<td></td>
<td>50.1</td>
<td>1.97</td>
<td>37.5</td>
<td>1.48</td>
<td>AP312HP/54</td>
<td>50.1</td>
<td>1.97</td>
<td>37.5</td>
<td>1.48</td>
<td></td>
</tr>
<tr>
<td>AP312HP/63</td>
<td></td>
<td>55.5</td>
<td>2.19</td>
<td>37.5</td>
<td>1.48</td>
<td>AP312HP/63</td>
<td>55.5</td>
<td>2.19</td>
<td>37.5</td>
<td>1.48</td>
<td></td>
</tr>
<tr>
<td>AP312HP/75</td>
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<td>63.1</td>
<td>2.48</td>
<td>37.5</td>
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<td>2.48</td>
<td>37.5</td>
<td>1.48</td>
<td></td>
</tr>
</tbody>
</table>

#### Front cover dimensions

<table>
<thead>
<tr>
<th></th>
<th>SAE-B</th>
<th></th>
<th></th>
<th>SAE-C</th>
<th></th>
<th></th>
<th>European</th>
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<tbody>
<tr>
<td></td>
<td>mm</td>
<td>inch</td>
<td>mm</td>
<td>inch</td>
<td>mm</td>
<td>inch</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>46.5</td>
<td>1.83</td>
<td>49.5</td>
<td>1.95</td>
<td>50</td>
<td>1.97</td>
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</tbody>
</table>

For other covers dimensions see 3.3.1

#### Pump size

<table>
<thead>
<tr>
<th>Pump size</th>
<th>F (mm)</th>
<th>F (inch)</th>
<th>G (mm)</th>
<th>G (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP212HP/15</td>
<td>38.3</td>
<td>1.51</td>
<td>48.3</td>
<td>1.90</td>
</tr>
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<td>AP212HP/19</td>
<td>41.3</td>
<td>1.63</td>
<td>51.3</td>
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<td>AP212HP/22</td>
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<td>1.71</td>
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<td>AP212HP/26</td>
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<td>1.83</td>
<td>56.55</td>
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<td>58.55</td>
<td>2.31</td>
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<td>AP212HP/33</td>
<td>51.55</td>
<td>2.03</td>
<td>61.55</td>
<td>2.42</td>
</tr>
</tbody>
</table>
4.2.3 Dimensions example

Example AP312HP/45+AP212HP/15 (SAE-B front cover):

Total length: $214.9 = (Z+B+D+F+G) = 46.5 + 44.3 + 37.5 + 38.3 + 48.3$

Port position: $166.6 = (Z+B+D+F) = 46.5 + 44.3 + 37.5 + 38.3$

$90.8 = (Z+B) = 46.5 + 44.3$
4.2.4 How to order tandem pumps AP312HP+AP212HP standard cast iron versions

<table>
<thead>
<tr>
<th>1st PUMP</th>
<th>2nd PUMP</th>
<th>1st BODY</th>
<th>2nd BODY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>A</td>
<td>P</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

1. **Function**
   - AP = single gear pump - unidirectional

2. **Series**
   - 312HP

3. **Displacement**
   - 40= 40.2 cm³/rev
   - 45= 45 cm³/rev
   - 54= 54.4 cm³/rev
   - 63= 63.1 cm³/rev
   - 75= 75.3 cm³/rev

4. **Rotation**
   - S = left-hand rotation
   - D = Right-hand rotation

5. **Shaft end code**
   - see section 3.2

6. **Front cover type**
   - see section 3.4.1

7. **Type of ports code**
   - see section 3.3.2

8. **Inlet/outlet port size code combination**
   - see section 3.3.2

9. **BHRE section:**
   - Version - Progressive number (omitted)

---

**AP212HP**

22. **Series**
   - 212HP (Cast iron)

23. **Displacement**
   - 212HP
   - 15= 15.1 cm³/rev
   - 19= 19.2 cm³/rev
   - 22= 22.2 cm³/rev
   - 26= 26.2 cm³/rev
   - 29= 28.9 cm³/rev
   - 33= 33 cm³/rev

24. **Version**
   - Omitted if 12 teeth standard
   - LN= 12 teeth Low Noise version

27. **Type of ports code**
   - see section 3.5 AP212HP Catalogue

28. **Inlet/outlet port size code combination**
   - see section 3.5 AP212HP Catalogue

29. **Body material + seal material code**
   - see section 3.5.1 AP212HP Catalogue

30. **Back cover type / Valve setting value**
   - see section 3.6 AP212HP Catalogue

---

Unpainted pumps are Bucher Hydraulics standard; should a painted component be required, this feature must be specified in its purchase order.
4.3 Multiple gear pumps: AP312HP+AP212 cast iron + aluminium versions

(Tandem pumps combination of group 3 with group 2 are possible for SAE-B, SAE-C and European versions, too)

Standard versions means separated inlet/outlet side ports, without shaft seal between pump stages

4.3.1 Drive torque calculation example

\[
T_{\text{max}} = T_1 + T_2
\]

\[
T_{\text{max}} = 200 \text{ Nm}
\]

Example: AP312HP/45 + AP212/15

\[
T_{\text{max}} = 1.59 \cdot \left( \frac{p_1 \cdot V_{c1}}{\eta_{m1}} + 1.59 \cdot \frac{p_2 \cdot V_{c2}}{\eta_{m2}} \right)
\]

\[
T_{\text{max}} = 1.59 \cdot \left( \frac{45 \cdot 200}{90} + 1.59 \cdot \frac{15 \cdot 100}{90} \right) = 159 + 26.5 = 185.5 \text{ Nm}
\]

\[
T_{\text{max}} = 185.5 \leq 230 \text{ Nm (splined 13T)}
\]

\[
T_2 = 26.5 \leq T_{\text{max}} 200 \text{ Nm}
\]
4.3.2  Tandem pumps dimensions

<table>
<thead>
<tr>
<th>Pump size</th>
<th>SAE-B, SAE-C</th>
<th>B (mm)</th>
<th>inch</th>
<th>D (mm)</th>
<th>inch</th>
<th>Pump size</th>
<th>European version</th>
<th>B (mm)</th>
<th>inch</th>
<th>D (mm)</th>
<th>inch</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP312HP/40</td>
<td></td>
<td>41.3</td>
<td>1.63</td>
<td>37.5</td>
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Front cover dimensions

<table>
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<tr>
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<th>European</th>
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<tr>
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<td>Z</td>
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</table>

For other covers dimensions see 3.3.1

<table>
<thead>
<tr>
<th>Pump size AP212 aluminium</th>
<th>F (mm)</th>
<th>inch</th>
<th>G (mm)</th>
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<td>2.15</td>
</tr>
<tr>
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<td>1.60</td>
<td>62.9</td>
<td>2.48</td>
</tr>
</tbody>
</table>
4.3.3 Dimensions example

Example AP312HP/45+AP212/15 SAE-B:

Total length: 214.9 = (Z+B+D+F+G) = 46.5 + 44.3 + 37.5 + 32.3 + 54.6
Port position: 160.6 = (Z+B+D+F) = 46.5 + 44.3 + 37.5 + 32.3
90.8 = (Z+B) = 46.5 + 44.3
4.3.4 How to order triple pumps AP312HP+AP212 cast iron + aluminium versions

<table>
<thead>
<tr>
<th>1st PUMP</th>
<th>2nd PUMP</th>
<th>1st BODY</th>
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</tr>
</thead>
<tbody>
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</tbody>
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1. **Function**
   - AP = single gear pump - unidirectional

2. **Series**
   - 312HP

3. **Displacement**
   - 40 = 40.2 cm³/rev
   - 45 = 45 cm³/rev
   - 54 = 54.4 cm³/rev
   - 63 = 63.1 cm³/rev
   - 75 = 75.3 cm³/rev

4. **Rotation**
   - S = left-hand rotation
   - D = right-hand rotation

5. **Shaft end code**
   - see section 3.2

6. **Front cover type**
   - see section 3.4.1

7. **Type of ports code**
   - see section 3.3.2

8. **Inlet/outlet port size code combination**
   - see section 3.3.2

9. **BHRE section**: Version - Progressive number (omitted)

---

**AP212**

22. **Series**
   - 212 (Aluminium)

23. **Displacement**
   - 212
     - 4.5 = 4.4 cm³/rev
     - 6.5 = 6.4 cm³/rev
     - 8.5 = 8.4 cm³/rev
     - 11 = 11.1 cm³/rev
     - 15 = 15.1 cm³/rev
     - 19 = 19.2 cm³/rev
     - 22 = 22.2 cm³/rev
     - 26 = 26.2 cm³/rev

24. **Version**
   - Omitted if 12 teeth standard
   - LN = 12 teeth Low Noise version

27. **Type of ports code**
   - see section 3.5 AP212 Catalogue

28. **Inlet/outlet port size code combination**
   - see section 3.5 AP212 Catalogue

29. **Body material + seal material code**
   - see section 3.5.1 AP212 Catalogue

30. **Back cover type / Valve setting value**
    - see section 3.6 AP212 Catalogue

Unpainted pumps are Bucher Hydraulics standard; should a painted component be required, this feature must be specified in its purchase order.
4.4 Multiple gear pumps: AP312HP+AP312HP+AP212HP cast iron versions

(AP312HP: SAE-B and SAE-C versions only)

Standard versions means separated inlet/outlet side ports, without shaft seal among pump stages

4.4.1 Drive torque calculation example

\[
T_{\text{max}} = 1.59 \cdot \frac{p_1 \cdot V_{c1}}{\eta_{m1}} + 1.59 \cdot \frac{p_2 \cdot V_{c2}}{\eta_{m2}} + 1.59 \cdot \frac{p_3 \cdot V_{c3}}{\eta_{m3}}
\]

Example: AP312HP/75 + AP312HP/54 + AP212HP/15

\[
T_{\text{max}} = 1.59 \cdot \frac{75 \cdot 210}{90} + 1.59 \cdot \frac{54 \cdot 150}{90} + 1.59 \cdot \frac{15 \cdot 120}{90} = 278.25 + 143.1 + 31.8 = 453.15 \text{ Nm}
\]

\[
T_{\max} = 453.15 \leq 950 \text{ Nm (splined 14T)}
\]

\[
T_2 = 174.9 \leq T_{\text{max}} \leq 200 \text{ Nm} \quad T_3 = 31.8 \leq T_{\text{max}} \leq 200 \text{ Nm}
\]
4.4.2 Triple/multiple pumps dimensions

<table>
<thead>
<tr>
<th>Pump size</th>
<th>B (mm)</th>
<th>B (inch)</th>
<th>C (mm)</th>
<th>C (inch)</th>
<th>D (mm)</th>
<th>D (inch)</th>
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</thead>
<tbody>
<tr>
<td>AP312HP/40</td>
<td>41.3</td>
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<td>-</td>
<td>37.5</td>
<td>1.48</td>
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<tr>
<td>AP312HP/54</td>
<td>50.1</td>
<td>1.97</td>
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<td>-</td>
<td>37.5</td>
<td>1.48</td>
</tr>
<tr>
<td>AP312HP/63</td>
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<td>67.5</td>
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For other covers dimensions see 3.3.1

<table>
<thead>
<tr>
<th>Front cover dimensions</th>
<th>SAE-B</th>
<th>SAE-C</th>
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<tr>
<td>Z</td>
<td>mm</td>
<td>inch</td>
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<td>46.5</td>
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<td>49.5</td>
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Pump size AP212HP

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<th>G (mm)</th>
<th>G (inch)</th>
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<td>61.55</td>
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</table>
4.4.3 Dimensions example

Example AP312HP/75+AP312HP/54+AP212HP/15 SAE-C:

Total length: 354.3 = (Z+B+C+B+D+F+G) = 49.5 + 63.1 + 67.5 + 50.1 + 37.5 + 38.3 + 48.3
Port position: 306 = (Z+B+C+B+D+F) = 49.5 + 63.1 + 67.5 + 50.1 + 37.5 + 38.3
230.2 = (Z+B+C+B) = 49.5 + 63.1 + 67.5 + 50.1
112.6 = (Z+B) = 49.5 + 63.1
4.4.4 How to order triple pumps AP312HP+AP312HP+AP212HP cast iron versions

<table>
<thead>
<tr>
<th>1st PUMP</th>
<th>2nd PUMP</th>
<th>3rd PUMP</th>
<th>1st BODY</th>
<th>2nd BODY</th>
<th>3rd BODY</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**1. Function**
- AP= single gear pump - unidirectional

**2. Series**
- 312HP

**3. Displacement**
- 40= 40.2 cm³/rev
- 45= 45 cm³/rev
- 54= 54.4 cm³/rev
- 63= 63.1 cm³/rev
- 75= 75.3 cm³/rev

**4. Rotation**
- S = left-hand rotation
- D = right-hand rotation

**5. Shaft end code**
- see section 3.2

**6. Front cover type**
- see section 3.4.1

**7. Type of ports code**
- see section 3.3.2

**8. Inlet/outlet port size code combination**
- see section 3.3.2

**9. BHRE section :**
- Version - Progressive number (omitted)

---

**AP212HP**

**22. Series**
- 212HP (Cast iron)

**23. Displacement**
- 212HP
  - 15= 15.1 cm³/rev
  - 19= 19.2 cm³/rev
  - 22= 22.2 cm³/rev
  - 26= 26.2 cm³/rev
  - 29= 28.9 cm³/rev
  - 33= 33 cm³/rev

**24. Version**
- Omitted if 12 teeth standard
- LN= 12 teeth Low Noise version

**27. Type of ports code**
- see section 3.5 AP212HP Catalogue

**28. Inlet/outlet port size code combination**
- see section 3.5 AP212HP Catalogue

**29. Body material + seal material code**
- see section 3.5.1 AP212HP Catalogue

**30. Back cover type / Valve setting value**
- see section 3.6 AP212HP Catalogue

Unpainted pumps are Bucher Hydraulics standard; should a painted component be required, this feature must be specified in its purchase order.
4.5 Multiple gear pumps: AP312HP+AP312HP+AP212 cast iron + aluminium versions
(AP312HP: SAE-B and SAE-C versions only)
Standard versions means separated inlet/outlet side ports, without shaft seal among pump stages

4.5.1 Drive torque calculation example

\[
T_{\text{max}} = T_1 + T_2 + T_3
\]

\[
= 1.59 \cdot \frac{p_1 \cdot V_{c1}}{\eta_{m1}} + 1.59 \cdot \frac{p_2 \cdot V_{c2}}{\eta_{m2}} + 1.59 \cdot \frac{p_3 \cdot V_{c3}}{\eta_{m3}}
\]

Example: AP312HP/75 + AP312HP/54 + AP212/15

\[
p_1 = 210 \text{ bar} \quad p_2 = 150 \text{ bar} \quad p_3 = 120 \text{ bar}
\]

\[
M = 210 \quad M = 150 \quad M = 120
\]

\[
T_{\text{max}} = 1.59 \cdot \frac{75 \cdot 210}{90} + 1.59 \cdot \frac{54 \cdot 150}{90} + 1.59 \cdot \frac{15 \cdot 120}{90} = 278.25 + 143.1 + 31.8 = 453.15 \text{ Nm}
\]

\[
T_{\text{max}} = 444.15 \leq 950 \text{ Nm (splined 14T)}
\]

\[
T_2 = 174.9 \leq T_{\text{max}} 200 \text{ Nm} \quad T_3 = 31.8 \leq T_{\text{max}} 200 \text{ Nm}
\]

Further information regarding group 2 pumps: see dedicated “AP212 Gear Pumps” catalogue

Common suction versions available on request.
Please contact our Sales Department.
4.5.2 Triple/multiple pumps dimensions

<table>
<thead>
<tr>
<th>Pump size</th>
<th>B (mm)</th>
<th>B (inch)</th>
<th>C (mm)</th>
<th>C (inch)</th>
<th>D (mm)</th>
<th>D (inch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP312HP/40</td>
<td>41.3</td>
<td>1.63</td>
<td>-</td>
<td>-</td>
<td>37.5</td>
<td>1.48</td>
</tr>
<tr>
<td>AP312HP/45</td>
<td>44.3</td>
<td>1.74</td>
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<td>-</td>
<td>37.5</td>
<td>1.48</td>
</tr>
<tr>
<td>AP312HP/54</td>
<td>50.1</td>
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<td>-</td>
<td>37.5</td>
<td>1.48</td>
</tr>
<tr>
<td>AP312HP/63</td>
<td>55.5</td>
<td>2.19</td>
<td>67.5</td>
<td>2.66</td>
<td>37.5</td>
<td>1.48</td>
</tr>
<tr>
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<td>63.1</td>
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<td>67.5</td>
<td>2.66</td>
<td>37.5</td>
<td>1.48</td>
</tr>
</tbody>
</table>

Front cover
dimensions

<table>
<thead>
<tr>
<th></th>
<th>SAE-B</th>
<th>SAE-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>mm</td>
<td>inch</td>
</tr>
<tr>
<td></td>
<td>46.5</td>
<td>1.83</td>
</tr>
</tbody>
</table>

For other covers dimensions see 3.3.1

<table>
<thead>
<tr>
<th>Pump size</th>
<th>F (mm)</th>
<th>F (inch)</th>
<th>G (mm)</th>
<th>G (inch)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>AP212/26</td>
<td>40.6</td>
<td>1.60</td>
<td>62.9</td>
<td>2.48</td>
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</tbody>
</table>
4.5.3 Dimensions example

Example AP312HP/75+AP312HP/54+AP212/15 SAE-C:

Total length: \(354.6 = (Z + B + C + B + D + F + G) = 49.5 + 63.1 + 67.5 + 50.1 + 37.5 + 32.3 + 54.6\)

Port position: \(300 = (Z + B + C + B + D + F) = 49.5 + 63.1 + 67.5 + 50.1 + 37.5 + 32.3\)

\[230.2 = (Z + B + C + B) = 49.5 + 63.1 + 67.5 + 50.1\]

\[112.6 = (Z + B) = 49.5 + 63.1\]
4.5.4 How to order triple pumps AP312HP+AP312HP+AP212 cast iron + aluminium versions

<table>
<thead>
<tr>
<th>1st PUMP</th>
<th>2nd PUMP</th>
<th>3rd PUMP</th>
<th>1st BODY</th>
<th>2nd BODY</th>
<th>3rd BODY</th>
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</thead>
<tbody>
<tr>
<td>1st BODY</td>
<td>2nd BODY</td>
<td>3rd BODY</td>
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<tr>
<td>A P 3 1 2 H P</td>
<td>/ 7 5</td>
<td>- 5 4 - 2 1 2 / 1 5</td>
<td>- S - S 4 8 C 2 S C - 2 S B - 2 B N</td>
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<td></td>
</tr>
</tbody>
</table>

1. **Function**
   - AP= single gear pump - unidirectional

2. **Series**
   - 312HP

3. **Displacement**
   - 40= 40.2 cm³/rev
   - 45= 45 cm³/rev
   - 54= 54.4 cm³/rev
   - 63= 63.1 cm³/rev
   - 75= 75.3 cm³/rev

4. **Rotation**
   - S = left-hand rotation
   - D = Right-hand rotation

5. **Shaft end code**
   - see section 3.2

6. **Front cover type**
   - see section 3.4.1

7. **Type of ports code**
   - see section 3.3.2

8. **Inlet/outlet port size code combination**
   - see section 3.3.2

9. **BHRE section**
   - Version - Progressive number (omitted)

---

**AP212**

22. **Series**
   - 212 (Aluminium)

23. **Displacement**
   - 212
   - 4.5= 4.4 cm³/rev
   - 6.5= 6.4 cm³/rev
   - 8.5= 8.4 cm³/rev
   - 11= 11.1 cm³/rev
   - 15= 15.1 cm³/rev
   - 19= 19.2 cm³/rev
   - 22= 22.2 cm³/rev
   - 26= 26.2 cm³/rev

24. **Version**
   - Omitted if 12 teeth standard
   - LN= 12 teeth Low Noise version

27. **Type of ports code**
   - see section 3.5 AP212 Catalogue

28. **Inlet/outlet port size code combination**
   - see section 3.5 AP212 Catalogue

29. **Body material + seal material code**
   - see section 3.5.1 AP212 Catalogue

30. **Back cover type / Valve setting value**
   - see section 3.6 AP212 Catalogue

Unpainted pumps are Bucher Hydraulics standard; should a painted component be required, this feature must be specified in its purchase order.
# 5 Product identification plate

1: Rotation (D= Clockwise rotation - S= Counterclockwise rotation) 
2: Manufacturing year and month 
3: Progressive identification no. (optional) 
4: Bucher Hydraulics S.p.A. product code 
5: Description

<table>
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<th>Manufacturing month</th>
<th>Manufacturing year 2017</th>
<th>Manufacturing year 2018</th>
<th>Manufacturing year 2019</th>
<th>Manufacturing year 2020</th>
<th>Manufacturing year 2021</th>
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6 Application form

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### External gear pump general data

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<th>Continuous work pressure (bar)</th>
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<table>
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<th>Single pump (cm³/rev)</th>
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<thead>
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<td>without</td>
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<th>Back cover type/circuit</th>
<th>Axial load (N)</th>
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</table>

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<thead>
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<table>
<thead>
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<th>Cycles per year</th>
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### Additional notes: