IPH
High-Pressure Internal Gear Pumps
Technical Data Sheet
Design and Function

Function

Rotation of the gears within the pump draws in the pressure fluid (usually hydraulic oil) into the space between the pinion and internal gear. The two smooth running gears help to ensure excellent intake behavior.

In the radial direction, the gear chambers are sealed by gear meshing and the filler piece. In the axial direction, the axial plates seal the pressure chamber with the minimal possible gap. This design minimizes volume losses and increases efficiency. When the gears rotate, the pinion teeth enter the gaps between the internal gear teeth and displace the pressure fluid.

Calculations

\[
Q = V_{\text{th}} \cdot n \cdot \eta_v \cdot 10^{-3} \, [l/min]
\]

\[
P = \frac{Q \cdot \Delta p}{600 \cdot \eta_g} \, [kW]
\]

- \(V_{\text{th}}\): Pump volume per revolution [cm³]
- \(n\): Speed [min⁻¹]
- \(\eta_v\): Volumetric efficiency
- \(\eta_g\): Overall efficiency
- \(\Delta p\): Differential pressure [bar]
Technical data

Design
Internal gear pump with radial and axial sealing gap compensation

Type
IPH

Mounting types
SAE-hole flange; ISO 3019/1

Line mounting
SAE-suction and pressure flange J 518 C Code 61

Rotation direction
clockwise or counterclockwise

Mounting position
any

Shaft load
For details of radial and axial drive shaft loads, please contact your Voith representative

Input pressure
0.8 … 3 bar absolute pressure (at start briefly 0.6 … 3 bar)

Pressure fluid
HLP mineral oils DIN 51524, part 2 or 3

Viscosity range of the pressure fluid
10 … 300 mm²s⁻¹ (cSt)

Permissible start viscosity
Max. 2000 mm²s⁻¹ (cSt)

Permissible temperature of the pressure fluid
-20 ... +80 °C

Necessary purity of the pressure fluid in accordance with NAS 1638 Class 8

Filtration
Filtration quotient min. $\beta_{10} \geq 75$, recommended $\beta_{10} \geq 100$ (longer service life)

Permissible ambient temperature
-10 ... +60 °C

Characteristics

<table>
<thead>
<tr>
<th>Type, size-delivery</th>
<th>Displacement per revolution [cm³]</th>
<th>Speed min. [min⁻¹]</th>
<th>Speed max. [min⁻¹]</th>
<th>Delivery at 1500 min⁻¹ [l/min]</th>
<th>Continuous pressure [bar]</th>
<th>Peak pressure [bar]</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPH 4 – 20</td>
<td>20.7</td>
<td>300</td>
<td>3000</td>
<td>31.0</td>
<td>300</td>
<td>330</td>
</tr>
<tr>
<td>IPH 4 – 25</td>
<td>25.7</td>
<td>300</td>
<td>3000</td>
<td>38.6</td>
<td>250</td>
<td>315</td>
</tr>
<tr>
<td>IPH 4 – 32</td>
<td>32.3</td>
<td>300</td>
<td>3000</td>
<td>48.5</td>
<td>250</td>
<td>300</td>
</tr>
<tr>
<td>IPH 5 – 40</td>
<td>40.8</td>
<td>300</td>
<td>3000</td>
<td>61.2</td>
<td>300</td>
<td>330</td>
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<td>IPH 5 – 50</td>
<td>50.3</td>
<td>300</td>
<td>3000</td>
<td>75.4</td>
<td>250</td>
<td>315</td>
</tr>
<tr>
<td>IPH 5 – 64</td>
<td>63.9</td>
<td>300</td>
<td>3000</td>
<td>95.8</td>
<td>250</td>
<td>300</td>
</tr>
<tr>
<td>IPH 6 – 80</td>
<td>81.3</td>
<td>300</td>
<td>2500</td>
<td>121.9</td>
<td>300</td>
<td>330</td>
</tr>
<tr>
<td>IPH 6 – 100</td>
<td>101.6</td>
<td>300</td>
<td>2500</td>
<td>152.4</td>
<td>250</td>
<td>315</td>
</tr>
<tr>
<td>IPH 6 – 125</td>
<td>125.6</td>
<td>300</td>
<td>2500</td>
<td>188.8</td>
<td>250</td>
<td>300</td>
</tr>
</tbody>
</table>

The values given apply for:

• Pumping of mineral oils with a viscosity of 20…40 mm²s⁻¹
• An input pressure of 0.8…3.0 bar absolute

Notes:

• Peak pressures apply for 15% of operating time and a maximum cycle time of 1 minute
• Please enquire about pressures lower than $n_{min}$
• Due to production tolerances, the pump volume may be approx. 1.5 % lower
IPH Standard design 4, Rotation and Dimensions

Clockwise rotation (cw)

Counter-clockwise rotation (ccw)

The plug screw must be closed during operation. Ensure the M10x1 plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm.

Depending on the pump position, filling or ventilation is possible with the M10x1 plug screw prior to commissioning.

Delivery Q

Efficiency $\eta_v$ and $\eta_g$

Note:
Measurement taken in a low-noise room.
In an anechoic room, the measurements are approx. 5 dB(A) lower.

Measurement conditions:
Speed: 1500 min⁻¹ / Viscosity of pressure fluid: 46 mm²s⁻¹ / Operating temperature: 40 °C
**IPH standard design 4, Designs**

<table>
<thead>
<tr>
<th>Type</th>
<th>Pump sizes</th>
<th>Rotation, suction connection</th>
<th>Mounting flange</th>
<th>Shaft end</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPH 4</td>
<td>20</td>
<td>Clockwise rotation, radial suction port</td>
<td>SAE-2-hole-flange, dimensions on left</td>
<td>Parallel shaft with keyway connection, dimensions on left</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Variants**

- **Counterclockwise rotation, radial suction port**
  - Involute gearing with SAE-2-hole-flange
  - ANSI B92.1a
  - 13T
  - 16/32 DP 30°

- **Involute gearing with SAE-4-hole-flange**
  - ANSI B92.1a
  - 13T
  - 16/32 DP 30°

---

**Input power P**

**Airborne noise level (Measurement site 1 m axial)**

**Characteristic curves:**
- IPH 4 – 20
- IPH 4 – 25
- IPH 4 – 32
IPH Standard design 5, Rotation and Dimensions

Clockwise rotation (cw)

<table>
<thead>
<tr>
<th>Type / Delivery</th>
<th>Dimensions and Weight</th>
<th>SAE-Flange-No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>c</td>
<td>e</td>
</tr>
<tr>
<td>IPH 5 – 40</td>
<td>138</td>
<td>35</td>
</tr>
<tr>
<td>IPH 5 – 50</td>
<td>145</td>
<td>35</td>
</tr>
<tr>
<td>IPH 5 – 64</td>
<td>155</td>
<td>35</td>
</tr>
</tbody>
</table>

* The plug screw must be closed during operation. Ensure the M10x1 plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm.

Depending on the pump position, filling or ventilation is possible with the M10x1 plug screw prior to commissioning.

Permitted input torques:
- Input shaft A: 800 Nm
- Secondary shaft B: 540 Nm

Efficiency $\eta_v$ and $\eta_g$

Note:
- Measurement taken in a low-noise room.
- In an anechoic room, the measurements are approx. 5 dB(A) lower.

Measurement conditions:
- Speed: 1500 min⁻¹
- Viscosity of pressure fluid: 46 mm²/s
- Operating temperature: 40 °C
### IPH standard design 5, Designs

<table>
<thead>
<tr>
<th>Type</th>
<th>Pump sizes</th>
<th>Rotation, suction connection</th>
<th>Mounting flange</th>
<th>Shaft end</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPH 5</td>
<td>40</td>
<td>Clockwise rotation, radial suction port</td>
<td>SAE-2-hole-flange, dimensions on left</td>
<td>Parallel shaft with keyway connection, dimensions on left</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td></td>
<td>SAE-2-hole-flange, dimensions on left</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td></td>
<td>SAE-2-hole-flange, dimensions on left</td>
<td>1</td>
</tr>
</tbody>
</table>

### Variants

<table>
<thead>
<tr>
<th>Counterclockwise rotation, radial suction port</th>
<th>Involute gearing with SAE-2-hole-flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAE-4-hole-flange</td>
<td>ANSI B92.1a 14T 12/24 DP 30°</td>
</tr>
<tr>
<td>Involute gearing with SAE-4-hole-flange</td>
<td>ANSI B92.1a 14T 12/24 DP 30°</td>
</tr>
</tbody>
</table>

### Input power P

![Input power P graph]

### Airborne noise level (Measurement site 1 m axial)

![Airborne noise level graph]

**Characteristic curves:**
- **IPH 5 – 40**
- **IPH 5 – 50**
- **IPH 5 – 64**
IPH Standard design 6, Rotation and Dimensions

Clockwise rotation (cw)

Counter-clockwise rotation (ccw)

Permitted input torques:
- Input shaft A: 1350 Nm
- Secondary shaft B: 800 Nm

<table>
<thead>
<tr>
<th>Type / Delivery</th>
<th>c</th>
<th>e</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>k</th>
<th>l</th>
<th>m</th>
<th>Dimensions and Weight</th>
<th>SAE-Flange-No.</th>
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</thead>
<tbody>
<tr>
<td>IPH 6 – 80</td>
<td>171</td>
<td>49</td>
<td>32.5</td>
<td>50</td>
<td>77.8</td>
<td>42.9</td>
<td>M12 x 23</td>
<td>50.5</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>IPH 6 – 100</td>
<td>181</td>
<td>49</td>
<td>36</td>
<td>50</td>
<td>77.8</td>
<td>42.9</td>
<td>M12 x 23</td>
<td>54</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>IPH 6 – 125</td>
<td>193</td>
<td>47</td>
<td>39</td>
<td>50</td>
<td>77.8</td>
<td>42.9</td>
<td>M12 x 23</td>
<td>58</td>
<td>14</td>
<td>15</td>
</tr>
</tbody>
</table>

* The plug screw must be closed during operation. Ensure the M10x1 plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm. Depending on the pump position, filling or ventilation is possible with the M10x1 plug screw prior to commissioning.

Delivery Q

![Graph showing Delivery Q vs. Operating pressure p in bar]

Note:
- Measurement taken in a low-noise room.
- In an anechoic room, the measurements are approx. 5 dB(A) lower.

Efficiency $\eta_v$ and $\eta_g$

![Graph showing Efficiency $\eta_v$ and $\eta_g$ vs. Operating pressure p in bar]

Measurement conditions:
- Speed: 1500 min⁻¹ / Viscosity of pressure fluid: 46 mm²s⁻¹ / Operating temperature: 40 °C
### IPH standard design 6, Designs

<table>
<thead>
<tr>
<th>Type</th>
<th>Pump sizes</th>
<th>Rotation, suction connection</th>
<th>Mounting flange</th>
<th>Shaft end</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPH 6</td>
<td>80</td>
<td>Clockwise rotation, radial suction port</td>
<td>1 SAE-2-hole-flange, dimensions on left</td>
<td>0 Parallel shaft with keyway connection, dimensions on left</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>125</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Variants

- **Counterclockwise rotation, radial suction port**

#### Input power P

- **Operating pressure p in bar**
- **Power P in kW**

#### Airborne noise level (Measurement site 1 m axial)

- **Operating pressure p in bar**
- **Airborne noise level in dB(A)**

**Characteristic curves:**
- IPH 6 – 80
- IPH 6 – 100
- IPH 6 – 125
### Suction and pressure flanges SAE J 518 C code 61, single-piece

<table>
<thead>
<tr>
<th>SAE-flange-No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E(^\text{2)})</th>
<th>i</th>
<th>k</th>
<th>S(^\text{°})</th>
<th>max. pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Thread</td>
<td>[mm]</td>
<td>[mm]</td>
<td>[mm]</td>
<td>Seal ring</td>
<td>[mm]</td>
<td>[mm]</td>
<td>Thread</td>
<td>[bar]</td>
</tr>
<tr>
<td>10</td>
<td>G ½</td>
<td>46</td>
<td>54</td>
<td>36</td>
<td>18.66 – 3.53</td>
<td>38.1</td>
<td>17.5</td>
<td>M 8</td>
<td>345</td>
</tr>
<tr>
<td>11</td>
<td>G ¾</td>
<td>50</td>
<td>65</td>
<td>36</td>
<td>24.99 – 3.53</td>
<td>47.6</td>
<td>22.3</td>
<td>M 10</td>
<td>345</td>
</tr>
<tr>
<td>12</td>
<td>G 1</td>
<td>55</td>
<td>70</td>
<td>38</td>
<td>32.92 – 3.53</td>
<td>52.4</td>
<td>26.2</td>
<td>M 10</td>
<td>345</td>
</tr>
<tr>
<td>13</td>
<td>G 1-¼</td>
<td>68</td>
<td>79</td>
<td>41</td>
<td>37.69 – 3.53</td>
<td>58.7</td>
<td>30.2</td>
<td>M 10</td>
<td>276</td>
</tr>
<tr>
<td>14(^\text{3)}</td>
<td>G 1-½</td>
<td>82</td>
<td>98</td>
<td>50</td>
<td>47.22 – 3.53</td>
<td>69.9</td>
<td>35.7</td>
<td>M 12</td>
<td>345(^\text{3)}</td>
</tr>
<tr>
<td>15</td>
<td>G 1½</td>
<td>78</td>
<td>93</td>
<td>45</td>
<td>47.22 – 3.53</td>
<td>69.9</td>
<td>35.7</td>
<td>M 12</td>
<td>207</td>
</tr>
<tr>
<td>16</td>
<td>G 2</td>
<td>90</td>
<td>102</td>
<td>45</td>
<td>56.74 – 3.53</td>
<td>77.8</td>
<td>42.9</td>
<td>M 12</td>
<td>207</td>
</tr>
<tr>
<td>17</td>
<td>G 2-½</td>
<td>105</td>
<td>114</td>
<td>50</td>
<td>69.44 – 3.53</td>
<td>88.9</td>
<td>50.8</td>
<td>M 12</td>
<td>172</td>
</tr>
<tr>
<td>18</td>
<td>G 3</td>
<td>124</td>
<td>134</td>
<td>50</td>
<td>85.32 – 3.53</td>
<td>106.4</td>
<td>61.9</td>
<td>M 16</td>
<td>138</td>
</tr>
<tr>
<td>19</td>
<td>G 4</td>
<td>146</td>
<td>162</td>
<td>48</td>
<td>110.72 – 3.53</td>
<td>130.2</td>
<td>77.8</td>
<td>M 16</td>
<td>34</td>
</tr>
</tbody>
</table>

\(^1\) Round seal ring (O-ring) ISO-R 1629 NBR
\(^2\) Machine screw EN ISO 4762
\(^3\) Special design, deviating from SAE J 518 C code 61
Multi-flow pumps, pump combinations, pump combinations in order of type and size

Combinations of IPC pumps

- IPC pumps of identical or different sizes can be combined to form multi-flow pumps.
- All sizes with each displacement are available as two or three-flow pumps; four-flow pumps must be designed by Voith.
- The pumps are arranged in increasing order according to size and delivery.

Combination of IPC/IP... pumps

- It is possible to combine IPC pumps with other Voith pump series (e.g. high-pressure pumps IPV or low-pressure pumps IPN).
- The pumps are arranged by type and size, as shown in the illustration above.
- If identical types or identical sizes follow each other, the pump with the higher pump flow is placed closer to the drive.

Selection

1. Identify the pressure ranges and then choose the appropriate pump series.
2. Identify the deliveries, and then select the appropriate size(s).
3. Define the sequence of the pumps.
4. Check the torque.
5. Determine the direction of rotation and suction.
6. Specify the mounting flange and shaft end.

Connection, assembly

- As a rule, multi-flow pumps are mounted to the drive using a flange. All information on flange designs and shaft ends is contained in the relevant pump series catalog.
- For further relevant information, such as how to determine the adapter housing, see brochure No. G 1714 (Voith Multi-Flow Pumps).
## Designs

<table>
<thead>
<tr>
<th>Rotation and suction</th>
<th>Mounting flange</th>
<th>Shaft end</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>clockwise (cw)</strong></td>
<td><img src="clockwise_diagram" alt="Diagram" /></td>
<td>1 8 6</td>
</tr>
<tr>
<td><strong>counterclockwise (ccw)</strong></td>
<td><img src="counterclockwise_diagram" alt="Diagram" /></td>
<td>1 6 1 0</td>
</tr>
<tr>
<td><strong>Special design</strong></td>
<td><img src="special_design_1" alt="Diagram" /></td>
<td>3 8</td>
</tr>
<tr>
<td><strong>Special design</strong></td>
<td><img src="special_design_2" alt="Diagram" /></td>
<td>3 9</td>
</tr>
</tbody>
</table>

For designs and dimensions, see catalog for the relevant pump series.

For designs and dimensions, see catalog for the relevant pump series.

- Special design 4 9
- Special design 0 SAE-2-hole-flange
- Special design 1 SAE-4-hole-flange
**Type code**

<table>
<thead>
<tr>
<th>IPH</th>
<th>5 –</th>
<th>50</th>
<th>1</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
</table>

**Shaft end**
- 0 Splined gear shaft ANSI B92.1a
- 1 Parallel shaft with keyway

**Mounting flange**
- 0 SAE-2-hole
- 1 SAE-4-hole

**Rotation, suction port**
- 1 Clockwise rotation, radial suction port
- 6 Counterclockwise rotation, radial suction port
- 4 Clockwise rotation, special design
- 9 Counterclockwise rotation, special design

**Delivery**

<table>
<thead>
<tr>
<th>Sizes</th>
<th>Available deliveries</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>20 25 32</td>
</tr>
<tr>
<td>5</td>
<td>40 50 64</td>
</tr>
<tr>
<td>6</td>
<td>80 100 125</td>
</tr>
</tbody>
</table>

**Sizes**
- 4
- 5
- 6

**Type of internal gear pump**