IPVA High-pressure Internal Gear Pumps
Technical Data Sheet
Function

By rotation of the gears inside the pump, the pressure fluid (usually hydraulic oil) is drawn into the cavity between the pinion and internal gear. Optimized cross-sectional areas on suction side as well as on pressure side allow operation over a wide range of speed.

In the radial direction, the gear chambers are closed 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.
Technical Data

Design
Internal gear pump with radial and axial sealing gap compensation

Type
IPVA

Mounting types
SAE hole flange; ISO 3019/1

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

Sense of rotation
Right hand rotation

Mounting position
any

Shaft load
For details of radial and axial drive shaft loads please contact your Voith Turbo H + L Hydraulic representative

Input pressure
0.8...3 bar absolute pressure

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

Viscosity range of the pressure fluid
10...300 mm²/s-1 (cSt)

Permissible start viscosity
max. 2 000 mm²/s⁻¹ (cSt)

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

Required purity of the pressure fluid according to NAS 1638
Class 19 / 17 / 14 (ISO 4406), Class 8 (NAS 1638)

Filtration
Filtration quotient min. $\beta_{20} \geq 75$, recommended $\beta_{10} \geq 100$ (longer life)

Permissible ambient temperature
-20 ... + 60 °C

Calculations

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

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

$V_{g \text{ th}}$
Pump volume per revolution [cm³]

$n$
Speed [min⁻¹]

$\eta_v$
Volumetric efficiency

$\eta_g$
Overall efficiency

$\Delta p$
Differential pressure [bar]
### Characteristics

<table>
<thead>
<tr>
<th>Type, size delivery</th>
<th>Displacement per revolution</th>
<th>Speed</th>
<th>Delivery</th>
<th>Pressures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[cm³]</td>
<td>[min⁻¹]</td>
<td>[min⁻¹]</td>
<td>at 1500 min⁻¹</td>
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<tr>
<td>IPVA 3 – 3.5</td>
<td>3.6</td>
<td>400</td>
<td>3600</td>
<td>5.4</td>
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<tr>
<td>IPVA 3 – 5</td>
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<td>400</td>
<td>3000</td>
<td>49.6</td>
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<td>400</td>
<td>2800</td>
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<td>400</td>
<td>2200</td>
<td>97.3</td>
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<td>400</td>
<td>1800</td>
<td>189.3</td>
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</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 with a maximum cycle time of 1 minute.
- Please inquire about peak pressures at non-standard speeds.
- Due to production tolerances, the pump volume may be reduced by up to 1.5%.
IPVA 3, Rotation and Dimensions

**Type / Delivery**

<table>
<thead>
<tr>
<th>Type / Delivery</th>
<th>c [mm]</th>
<th>g [mm]</th>
<th>h [mm]</th>
<th>i [mm]</th>
<th>k [mm]</th>
<th>l [mm]</th>
<th>r [mm]</th>
<th>v [mm]</th>
<th>w [mm]</th>
<th>SAE Flange No.</th>
<th>Thread [mm]</th>
<th>Thread [mm]</th>
<th>Weight [kg]</th>
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<tbody>
<tr>
<td>IPVA 3 – 3.5</td>
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<td>9</td>
<td>14</td>
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<td>17.5</td>
<td>M8 x 13</td>
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<td>38.1</td>
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<td>M8 x 13</td>
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<td>IPVA 3 – 6.3</td>
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<td>19</td>
<td>47.6</td>
<td>22.3</td>
<td>M10 x 15</td>
<td>38.1</td>
<td>17.5</td>
<td>M8 x 13</td>
<td>3.8</td>
<td>10</td>
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<td>IPVA 3 – 8</td>
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<td>IPVA 3 – 10</td>
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<td>M10 x 15</td>
<td>38.1</td>
<td>17.5</td>
<td>M8 x 13</td>
<td>4.2</td>
<td>10</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

**IPVA 3, Design**

**Rotation**

- **Standard**
  - Rotation clockwise
  - SAE 2-hole flange
  - Parallel shaft with keyway connection

**Mounting flange**

**Shaft end**
### IPVA 4, Rotation and Dimensions

<table>
<thead>
<tr>
<th>Type / Delivery</th>
<th>c</th>
<th>g</th>
<th>h</th>
<th>i</th>
<th>k</th>
<th>l</th>
<th>r</th>
<th>v</th>
<th>w</th>
<th>Weight</th>
<th>SAE Flange No.</th>
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</thead>
<tbody>
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<td>13</td>
<td>23</td>
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<td>26.2</td>
<td>M10 x 15</td>
<td>38.1</td>
<td>17.5</td>
<td>M8 x 13</td>
<td>7.1</td>
<td>10</td>
</tr>
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<td>IPVA 4 – 16</td>
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<td>25</td>
<td>52.4</td>
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<td>M10 x 15</td>
<td>38.1</td>
<td>17.5</td>
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<td>7.3</td>
<td>10</td>
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<td>27</td>
<td>58.7</td>
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<td>M10 x 15</td>
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<td>22.3</td>
<td>M10 x 15</td>
<td>7.9</td>
<td>11</td>
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<td>IPVA 4 – 25</td>
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<td>30</td>
<td>58.7</td>
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<td>M10 x 15</td>
<td>47.6</td>
<td>22.3</td>
<td>M10 x 15</td>
<td>8.3</td>
<td>11</td>
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<td>IPVA 4 – 32</td>
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<td>18</td>
<td>32</td>
<td>58.7</td>
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<td>M10 x 15</td>
<td>47.6</td>
<td>22.3</td>
<td>M10 x 15</td>
<td>9.1</td>
<td>11</td>
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### IPVA 4, Design

<table>
<thead>
<tr>
<th>Rotation</th>
<th>Mounting flange</th>
<th>Shaft end</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation clockwise</td>
<td>SAE 2-hole flange</td>
<td>Parallel shaft with keyway connection</td>
</tr>
</tbody>
</table>

![Pressure port (P)](image1)

![Suction port (S)](image2)
## IPVA 5, Rotation and Dimensions

### Dimensions and Weight

<table>
<thead>
<tr>
<th>Type / Delivery</th>
<th>c [mm]</th>
<th>g [mm]</th>
<th>h [mm]</th>
<th>i [mm]</th>
<th>k [mm]</th>
<th>l [mm]</th>
<th>r [mm]</th>
<th>v [mm]</th>
<th>w [mm]</th>
<th>Thread</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPVA 5 – 32</td>
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<td>18</td>
<td>32</td>
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<td>M10 x 15</td>
<td>47.6</td>
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<td>M10 x15</td>
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<td>IPVA 5 – 40</td>
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<td>IPVA 5 – 50</td>
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<td>40</td>
<td>69.9</td>
<td>35.7</td>
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<td>52.4</td>
<td>26.2</td>
<td>M10 x15</td>
<td>15.9</td>
<td>12</td>
</tr>
<tr>
<td>IPVA 5 – 64</td>
<td>89</td>
<td>23</td>
<td>40</td>
<td>69.9</td>
<td>35.7</td>
<td>M12 x 20</td>
<td>52.4</td>
<td>26.2</td>
<td>M10 x16</td>
<td>17.3</td>
<td>12</td>
</tr>
</tbody>
</table>

| SAE Flange No. |  |  |  |  |  |  |  |  |  |  |  |

## IPVA 5, Design

### Rotation

- Rotation clockwise

### Mounting flange

- SAE 2-hole flange

### Shaft end

- Parallel shaft with keyway connection
IPVA 6, Rotation and Dimensions

**Type / Delivery**

<table>
<thead>
<tr>
<th>Dimensions and Weight</th>
<th>SAE Flange No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>c [mm]</td>
<td>g [mm]</td>
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<tr>
<td>IPVA 6 – 64</td>
<td>80</td>
</tr>
<tr>
<td>IPVA 6 – 80</td>
<td>88</td>
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<tr>
<td>IPVA 6 – 100</td>
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<tr>
<td>IPVA 6 – 125</td>
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</tbody>
</table>

**IPVA 6, Design**

**Rotation**

**Mounting flange**

**Shaft end**

Standard

- Rotation clockwise
- SAE 2-hole flange
- Parallel shaft with keyway connection
Measurement Values - Airborne Noise Level, Efficiency

**IPVA 3 – Airborne noise level (measuring location 1 m axial)**

![Graph showing IPVA 3 airborne noise level vs. operating pressure with characteristic curves for different ipva values.

**IPVA 3 – Efficiency η_v and η_g**

![Graph showing IPVA 3 efficiency vs. operating pressure with characteristic curves for different ipva values.

**IPVA 4 – Airborne noise level (measuring location 1 m axial)**

![Graph showing IPVA 4 airborne noise level vs. operating pressure with characteristic curves for different ipva values.

**IPVA 4 – Efficiency η_v and η_g**

![Graph showing IPVA 4 efficiency vs. operating pressure with characteristic curves for different ipva values.

Characteristic curves:
- IPVA 3 – 10
- IPVA 3 – 8
- IPVA 3 – 6.3
- IPVA 3 – 5
- IPVA 3 – 3.5
- IPVA 4 – 32
- IPVA 4 – 25
- IPVA 4 – 20
- IPVA 4 – 16
- IPVA 4 – 13
Measurement Values - Airborne Noise Level, Efficiency

**IPVA 5 – Airborne noise level (measuring location 1 m axial)**

Characteristic curves:
- IPVA 5 – 64
- IPVA 5 – 50
- IPVA 5 – 40
- IPVA 5 – 32

**IPVA 5 – Efficiency $\eta_v$ and $\eta_g$**

Measurement Conditions:
- Speed: 1,500 rpm
- Viscosity of pressure fluid: 46 mm²/s
- Operating temperature: 40 °C

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

**IPVA 6 – Airborne noise level (measuring location 1 m axial)**

Characteristic curves:
- IPVA 6 – 125
- IPVA 6 – 100
- IPVA 6 – 80
- IPVA 6 – 64

**IPVA 6 – Efficiency $\eta_v$ and $\eta_g$**
### SAE-Flange, SAE J 518 C Code 61, single-piece

![Diagram of SAE Flange](image)

Wrench torque for screws according to ISO 6162

1) Round seal ring (O-Ring) ISO-R 1629 NBR
2) Screw EN ISO 4762
3) Special design, deviation from SAE J 518 C Code 61

<table>
<thead>
<tr>
<th>SAE flange no.</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
<th>D [mm]</th>
<th>E (^1) [mm]</th>
<th>i [mm]</th>
<th>k [mm]</th>
<th>S (^2) [mm]</th>
<th>max. pressure [bar]</th>
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</thead>
<tbody>
<tr>
<td>10</td>
<td>G (\frac{1}{2})</td>
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<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>
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<td>11</td>
<td>G (\frac{3}{4})</td>
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<td>36</td>
<td>24.99 – 3.53</td>
<td>47.6</td>
<td>22.3</td>
<td>M 10</td>
<td>345</td>
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<tr>
<td>12</td>
<td>G 1</td>
<td>55</td>
<td>70</td>
<td>38</td>
<td>32.92 – 3.53</td>
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<td>M 10</td>
<td>345</td>
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<tr>
<td>13</td>
<td>G 1-(\frac{1}{4})</td>
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<td>79</td>
<td>41</td>
<td>37.69 – 3.53</td>
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<td>30.2</td>
<td>M 10</td>
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<tr>
<td>14(^3)</td>
<td>G 1-(\frac{1}{2})</td>
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<td>98</td>
<td>50</td>
<td>47.22 – 3.53</td>
<td>79.9</td>
<td>35.7</td>
<td>M 12</td>
<td>345(^3)</td>
</tr>
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<td>15</td>
<td>G 2</td>
<td>90</td>
<td>102</td>
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<tr>
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<td>134</td>
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<td>18</td>
<td>G 4</td>
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<td>162</td>
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<td>77.8</td>
<td>M 16</td>
<td>34</td>
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</table>
Multi-flow Pumps, Pump Combinations, Sequence in order of type and size

- IPVA, IPCA, IPK pumps of identical or different sizes can be combined in multiflow pumps.
- All sizes of the relevant pump volume are available as two- or three-flow pumps; four-flow pumps must be designed by Voith Turbo H + L Hydraulic.
- The pumps are arranged in increasing order according to frame size and delivery.

**Pump Combinations**

**Selection**

1. Determine pressure ranges and define the appropriate pump serie(s).
2. Determine pump volume and select the appropriate size.
3. Define sequence of the pumps.
4. Check the torques.

**Mounting, Assembly**

- Multi-flow pumps are generally mounted to the drive by means of a flange.

**Designs**

<table>
<thead>
<tr>
<th>Rotation and suction</th>
<th>Mounting flange</th>
<th>Shaft end</th>
</tr>
</thead>
<tbody>
<tr>
<td>clockwise (cw)</td>
<td>0 SAE-2-hole-flange</td>
<td>1</td>
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<td>1</td>
<td></td>
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<tr>
<td>Special design</td>
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</table>

- Multi-flow pumps are generally mounted to the drive by means of a flange.
### Type Code

**Shaft end**
1 Parallel shaft with keyway

**Mounting flange**
0 SAE 2-hole
7 SAE 2-hole, variant

**Rotation, suction port**
1 Clockwise rotation, radial suction port radial

**Delivery**

<table>
<thead>
<tr>
<th>Size</th>
<th>3</th>
<th>3.5</th>
<th>5</th>
<th>6.3</th>
<th>8</th>
<th>10</th>
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<tr>
<td>3</td>
<td>4</td>
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<td>16</td>
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<td>25</td>
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<td>5</td>
<td>32</td>
<td>40</td>
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<td>64</td>
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<td>5</td>
<td>6</td>
<td>64</td>
<td>80</td>
<td>100</td>
<td>125</td>
<td></td>
</tr>
</tbody>
</table>

**Type Code for Multiple Flow Capable Variants**

Following multiple flow capable pump stage of the same size, freely selectable delivery volumes

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**IPVA 3 - 3.5 1 0 1**

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**IPVA 4/ - 20/ 1 7 1**

Following multiple flow capable predetermined pump stage of the same or smaller size, freely selectable delivery volumes
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Legally binding language version of document: german.