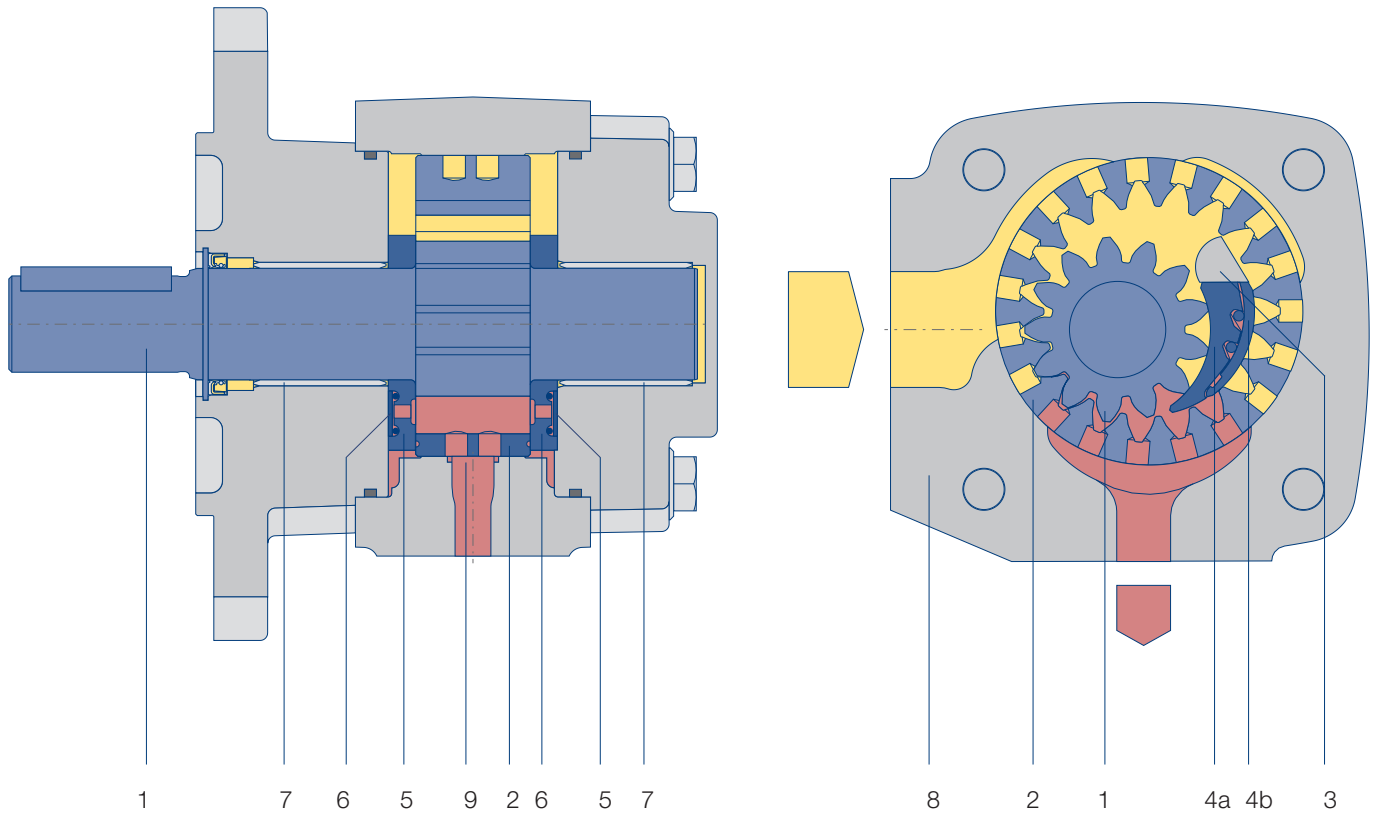






- |                           |                       |
|---------------------------|-----------------------|
| 1 Pinion shaft            | 6 Axial pressure area |
| 2 Internal gear           | 7 Plain bearings      |
| 3 Filler pin              | 8 Housing             |
| 4a Filler segment carrier | 9 Hydrostatic bearing |
| 4b Filler sealing segment |                       |
| 5 Axial disc              |                       |

- Suction chamber
- Pressure chamber

## 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                                                        | IPCAP                                                                                                            |
| 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 (at start up for short time 0.6 bar)                                               |
| Pressure fluid                                              | HLP mineral oils DIN 51524, part 2 or 3                                                                          |
| Viscosity range of the pressure fluid                       | 10...300 mm <sup>2</sup> s <sup>-1</sup> (cSt), up to n=1800 min <sup>-1</sup>                                   |
| Permissible start viscosity                                 | 10 ... 100 mm <sup>2</sup> s <sup>-1</sup> (cSt), up to n <sub>max</sub>                                         |
| Permissible temperature of the pressure fluid               | -10 ... + 80 °C                                                                                                  |
| Required purity of the pressure fluid according to NAS 1638 | Class 20 / 18 / 15 (ISO 4406), Class 9 (NAS 1638)                                                                |
| Filtration                                                  | Filtration quotient min. $\beta_{20} \geq 75$ , recommended $\beta_{10} \geq 100$ (longer life)                  |
| Permissible ambient temperature                             | -10 ... + 60 °C                                                                                                  |

## Calculations

|            |                                                                  |
|------------|------------------------------------------------------------------|
| Pump flow  | $Q = V_{gth} \cdot n \cdot \eta_v \cdot 10^{-3} \text{ [l/min]}$ |
| Power      | $P = \frac{Q \cdot \Delta p}{600 \cdot \eta_g} \text{ [kW]}$     |
| $V_{gth}$  | Pump volume per revolution [cm <sup>3</sup> ]                    |
| n          | Speed [min <sup>-1</sup> ]                                       |
| $\eta_v$   | Volumetric efficiency                                            |
| $\eta_g$   | Overall efficiency                                               |
| $\Delta p$ | Differential pressure [bar]                                      |

## Characteristic Values

|                      | Displacement<br>per revolution | Speed                |                      | Delivery at<br>1500 min <sup>-1</sup> | Continuous<br>pressure | Peak pressure<br>at 1500 min <sup>-1</sup> | Moment of<br>inertia  |
|----------------------|--------------------------------|----------------------|----------------------|---------------------------------------|------------------------|--------------------------------------------|-----------------------|
|                      |                                | min.                 | max.                 |                                       |                        |                                            |                       |
|                      | [cm <sup>3</sup> ]             | [min <sup>-1</sup> ] | [min <sup>-1</sup> ] | [l/min]                               | [bar]                  | [bar]                                      | [kg cm <sup>2</sup> ] |
| <b>IPCAP 3 – 3.5</b> | 3.6                            | 400                  | 3600                 | 5.4                                   | 210                    | 250                                        | 0.34                  |
| IPCAP 3 – 5          | 5.2                            | 400                  | 3600                 | 7.8                                   | 210                    | 250                                        | 0.42                  |
| IPCAP 3 – 6.3        | 6.4                            | 400                  | 3600                 | 9.6                                   | 210                    | 250                                        | 0.49                  |
| IPCAP 3 – 8          | 8.2                            | 400                  | 3600                 | 12.3                                  | 210                    | 250                                        | 0.58                  |
| IPCAP 3 – 10         | 10.2                           | 400                  | 3600                 | 15.3                                  | 210                    | 250                                        | 0.70                  |
| <b>IPCAP 4 – 13</b>  | 13.3                           | 400                  | 3600                 | 19.9                                  | 210                    | 250                                        | 2.25                  |
| IPCAP 4 – 16         | 15.8                           | 400                  | 3600                 | 23.7                                  | 210                    | 250                                        | 2.64                  |
| IPCAP 4 – 20         | 20.7                           | 400                  | 3600                 | 31.0                                  | 210                    | 250                                        | 3.29                  |
| IPCAP 4 – 25         | 25.4                           | 400                  | 3600                 | 38.1                                  | 210                    | 250                                        | 3.70                  |
| IPCAP 4 – 32         | 32.6                           | 400                  | 3600                 | 48.9                                  | 210                    | 250                                        | 4.44                  |
| <b>IPCAP 5 – 40</b>  | 41.0                           | 400                  | 3000                 | 61.5                                  | 210                    | 250                                        | 10.20                 |
| IPCAP 5 – 50         | 50.3                           | 400                  | 3000                 | 75.4                                  | 210                    | 250                                        | 11.60                 |
| IPCAP 5 – 64         | 64.9                           | 400                  | 3000                 | 97.3                                  | 210                    | 250                                        | 14.40                 |

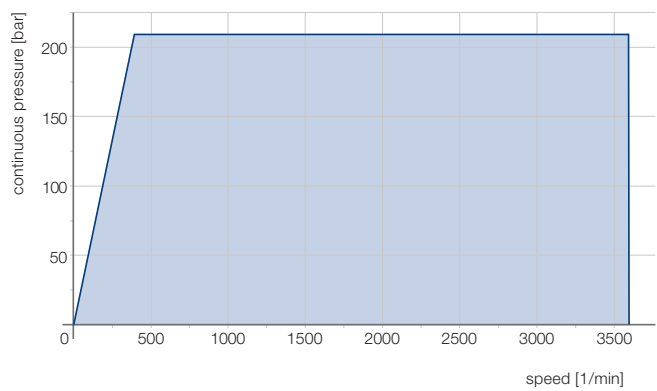
The values given apply for:

- Pumping of mineral oils with a viscosity of 20...40 mm<sup>2</sup>s<sup>-1</sup>
- An input pressure of 0.8...3.0 bar absolute

Notes:

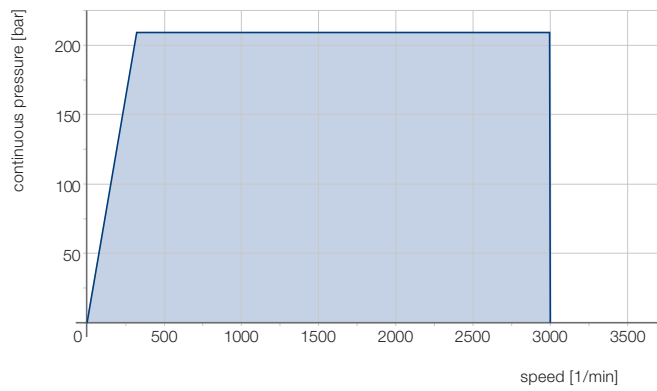
- Peak pressures apply for 15% of operating time with a maximum cycle time of 1 minute.
- Please consult us about peak pressures at non-standard speeds.
- Due to production tolerances, the pump volume may be reduced by up to 1.5%.
- **The values for min. and max. speed are dependent on pressure!**
- Please see exact dates on the diagrams from the following pages. At speeds below 400 1/min the pressure must be reduced according to the curve. At high speeds, this may be the case.
- The pump can be temporarily operating below the specified minimum speed in pressure-hold function. The holding time and the rotational speed required for this purpose is obtained in dependence of the viscosity and of the operating pressure levels. For design details, please contact the Voith Turbo H + L Hydraulic technical sales team.

Diagram IPCAP 3, IPCAP 4 - Continuous pressure depending on the speed

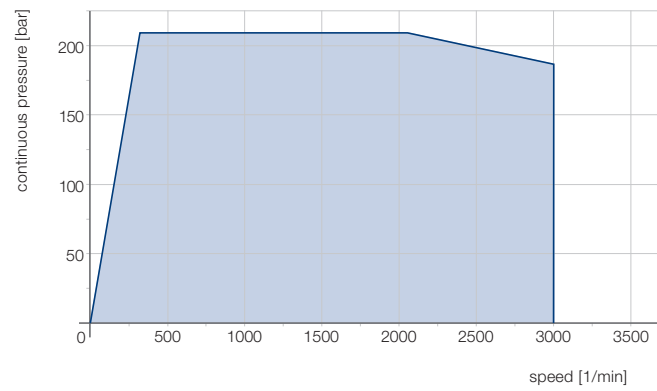


Characteristic curve:  
— IPCAP 3 – 3.5; IPCAP 3 – 5; IPCAP 3 – 6.3; IPCAP 3 – 8; IPCAP 3 – 10  
IPCAP 4 – 13; IPCAP 4 – 16; IPCAP 4 – 20; IPCAP 4 – 25; IPCAP 4 – 32

Diagram IPCAP 5 - Continuous pressure depending on the speed



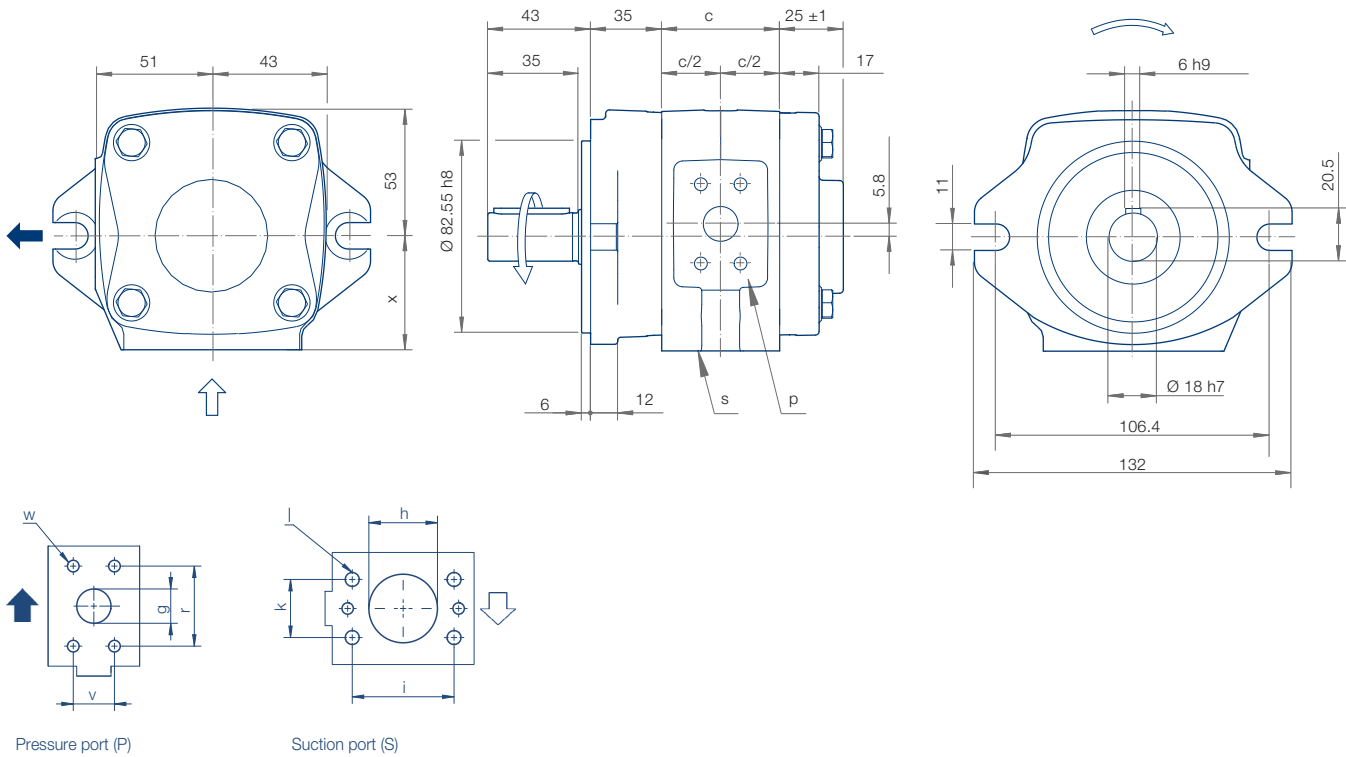
Characteristic curve:  
— IPCAP 5 – 32; IPCAP 5 – 40; IPCAP 5 – 50



Characteristic curve:  
— IPCAP 5 – 64

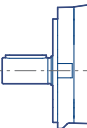
■ range of continuous pump operation

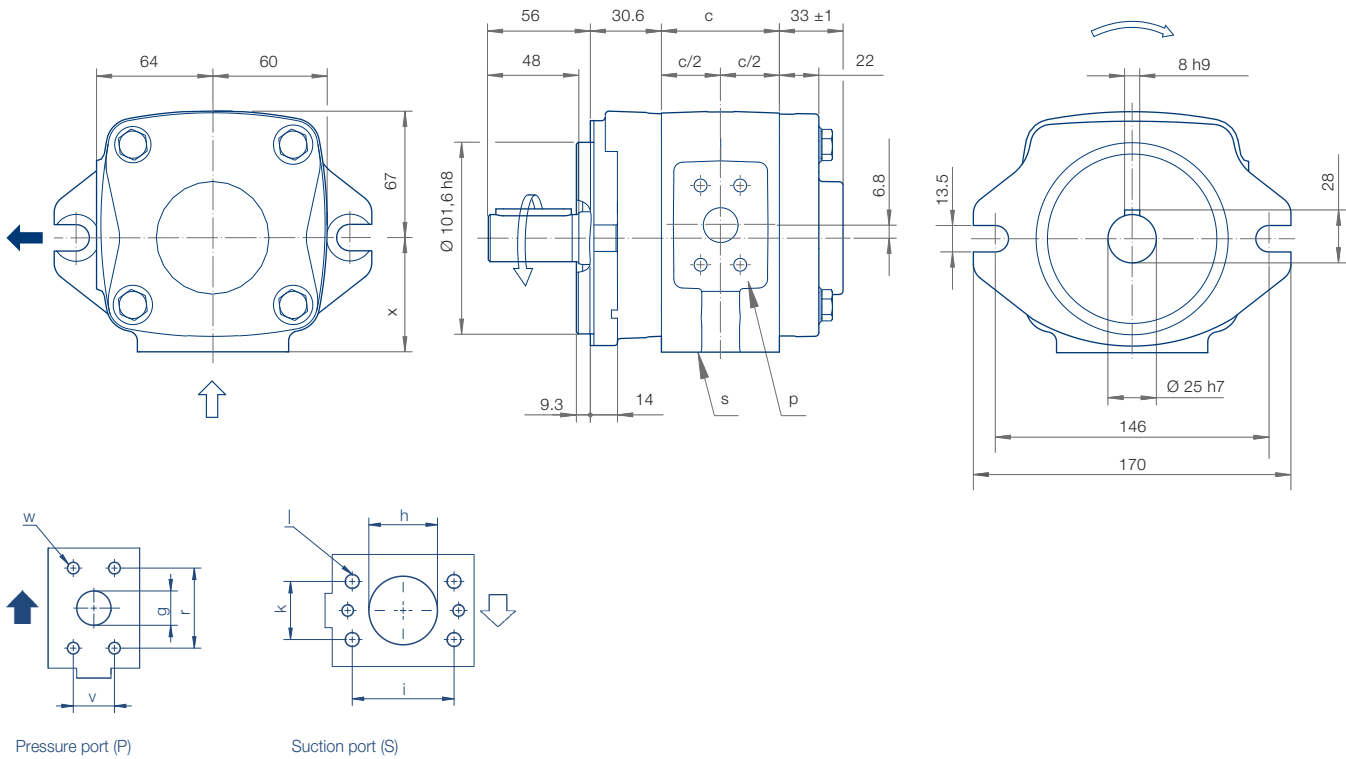
IPCAP Size 3, Rotation and Dimensions



| Type/<br>Delivery | Dimensions |      |      |      |      |      |        |      |      |        | Weight<br>[kg] | SAE-Flange-No. |    |
|-------------------|------------|------|------|------|------|------|--------|------|------|--------|----------------|----------------|----|
|                   | c          | x    | g    | h    | i    | k    | l      | r    | v    | w      |                | 10             | 11 |
|                   | [mm]       | [mm] | [mm] | [mm] | [mm] | [mm] | Thread | [mm] | [mm] | Thread |                |                |    |
| IPCAP 3 – 3.5     | 35         | 47.2 | 9    | 15   | 38.1 | 17.5 | M8x13  | 38.1 | 17.5 | M8x15  | 2.6            | 10             | 10 |
| IPCAP 3 – 5       | 39         | 47.2 | 11   | 15   | 38.1 | 17.5 | M8x13  | 38.1 | 17.5 | M8x15  | 2.8            | 10             | 10 |
| IPCAP 3 – 6.3     | 42         | 50.2 | 11   | 20   | 47.6 | 22.3 | M10x15 | 38.1 | 17.5 | M8x15  | 2.9            | 10             | 11 |
| IPCAP 3 – 8       | 46.5       | 50.2 | 13   | 25   | 52.4 | 26.2 | M10x15 | 38.1 | 17.5 | M8x15  | 3.0            | 10             | 12 |
| IPCAP 3 – 10      | 51.5       | 51.2 | 13   | 25   | 52.4 | 26.2 | M10x15 | 38.1 | 17.5 | M8x15  | 3.1            | 10             | 12 |

IPCAP 3, Design

| Rotation                                                                              | Mounting flange                                                                       | Shaft end                                                                               |
|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Standard                                                                              |                                                                                       |                                                                                         |
| Rotation clockwise                                                                    | SAE 2-hole flange                                                                     | Parallel shaft with keyway connection                                                   |
|  1 |  0 |  1 |



| Type/<br>Delivery | Dimensions |      |      |      |      |      |        |      |      |        | Weight | SAE-Flange-No. |    |
|-------------------|------------|------|------|------|------|------|--------|------|------|--------|--------|----------------|----|
|                   | c          | x    | g    | h    | i    | k    | l      | r    | v    | w      | [kg]   |                |    |
|                   | [mm]       | [mm] | [mm] | [mm] | [mm] | [mm] | Thread | [mm] | [mm] | Thread |        |                |    |
| IPCAP 4 – 13      | 48.5       | 57.2 | 14   | 25   | 52.4 | 26.2 | M10x15 | 38.1 | 17.5 | M8x15  | 5.5    | 10             | 12 |
| IPCAP 4 – 16      | 52.5       | 57.2 | 18   | 30   | 58.7 | 30.2 | M10x15 | 47.6 | 22.3 | M10x15 | 5.7    | 11             | 13 |
| IPCAP 4 – 20      | 58         | 57.2 | 18   | 30   | 58.7 | 30.2 | M10x15 | 47.6 | 22.3 | M10x15 | 6.0    | 11             | 13 |
| IPCAP 4 – 25      | 64         | 63.2 | 18   | 40   | 69.9 | 35.7 | M12x20 | 47.6 | 22.3 | M10x15 | 6.2    | 11             | 30 |
| IPCAP 4 – 32      | 73         | 63.2 | 18   | 40   | 69.9 | 35.7 | M12x20 | 47.6 | 22.3 | M10x15 | 6.7    | 11             | 30 |

IPCAP 4, Design

Rotation

Mounting flange

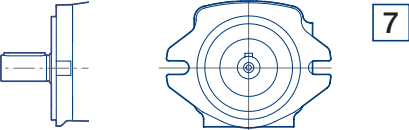
Shaft end

Standard

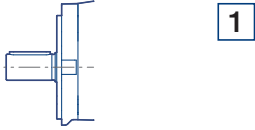
Rotation clockwise

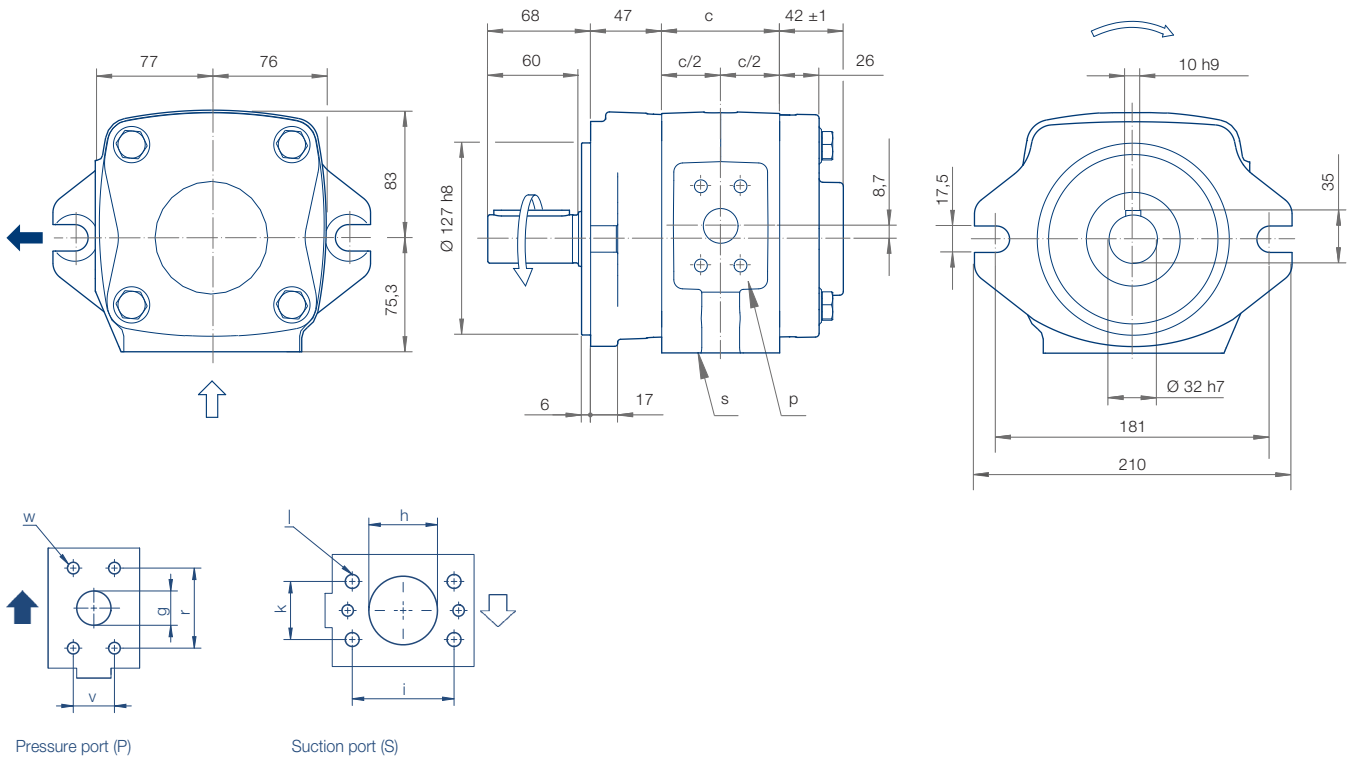


SAE 2-hole flange



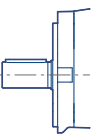
Parallel shaft with keyway connection



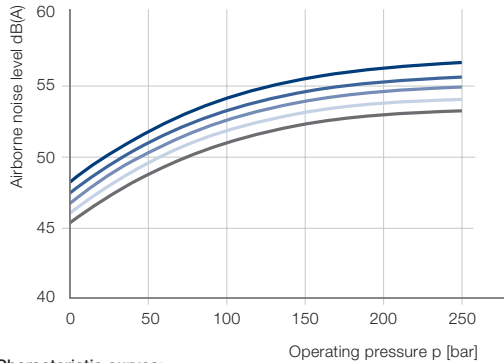


| Type/<br>Delivery | Dimensions |      |      |      |      |        |      |      |        | Weight<br>[kg] | SAE-Flange-No.                                                                        |                                                                                       |
|-------------------|------------|------|------|------|------|--------|------|------|--------|----------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                   | $c$        | $g$  | $h$  | $i$  | $k$  | $l$    | $r$  | $v$  | $w$    |                |  |  |
|                   | [mm]       | [mm] | [mm] | [mm] | [mm] | Thread | [mm] | [mm] | Thread |                |                                                                                       |                                                                                       |
| IPCAP 5 – 40      | 71         | 19   | 40   | 69.9 | 35.7 | M12x20 | 52.4 | 26.2 | M10x15 | 11.6           | 12                                                                                    | 30                                                                                    |
| IPCAP 5 – 50      | 78         | 23   | 45   | 77.8 | 42.9 | M12x20 | 52.4 | 26.2 | M10x15 | 12.2           | 12                                                                                    | 15                                                                                    |
| IPCAP 5 – 64      | 89         | 23   | 45   | 77.8 | 42.9 | M12x20 | 52.4 | 26.2 | M10x15 | 13.1           | 12                                                                                    | 15                                                                                    |

IPCAP 5, Design

| Rotation                                                                                     | Mounting flange                                                                              | Shaft end                                                                                      |
|----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Standard                                                                                     |                                                                                              |                                                                                                |
| Rotation clockwise                                                                           | SAE 2-hole flange                                                                            | Parallel shaft with keyway connection                                                          |
|  <b>1</b> |  <b>0</b> |  <b>1</b> |

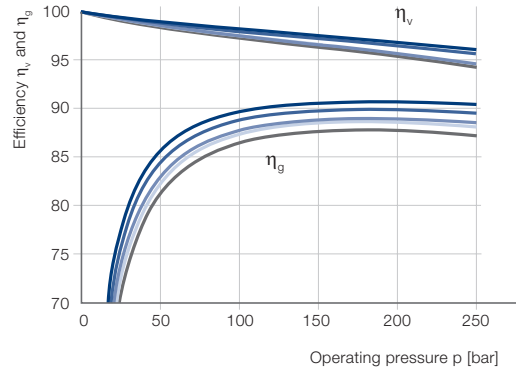
### IPCAP 3 – Airborne noise level (measuring location 1 m axial)



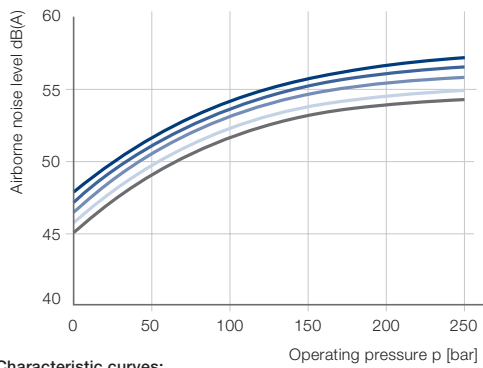
Characteristic curves:

— IPCAP 3 – 10 — IPCAP 3 – 8 — IPCAP 3 – 6.3 — IPCAP 3 – 5 — IPCAP 3 – 3.5

### IPCAP 3 – Efficiency $\eta_v$ and $\eta_g$



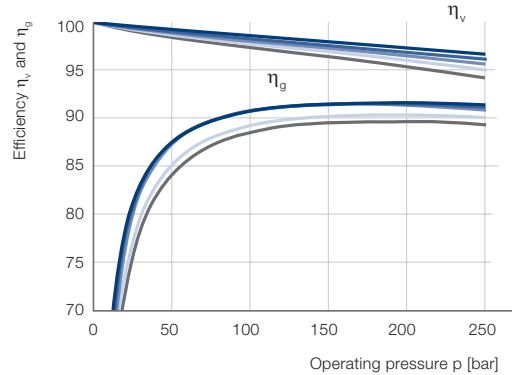
### IPCAP 4 – Airborne noise level (measuring location 1 m axial)



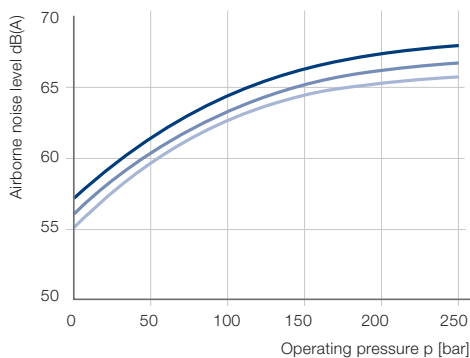
Characteristic curves:

— IPCAP 4 – 32 — IPCAP 4 – 25 — IPCAP 4 – 20 — IPCAP 4 – 16 — IPCAP 4 – 13

### IPCAP 4 – Efficiency $\eta_v$ and $\eta_g$



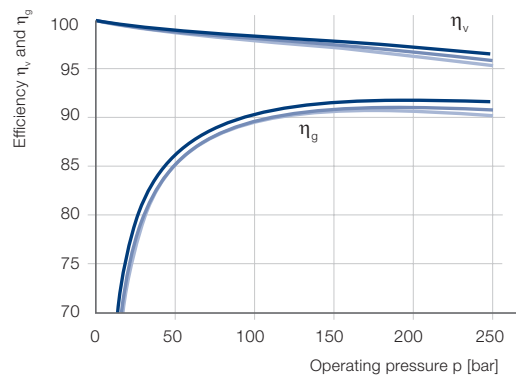
### IPCAP 5 – Airborne noise level (measuring location 1 m axial)



Characteristic curves:

— IPCAP 5 – 64 — IPCAP 5 – 50 — IPCAP 5 – 40

### IPCAP 5 – Efficiency $\eta_v$ and $\eta_g$



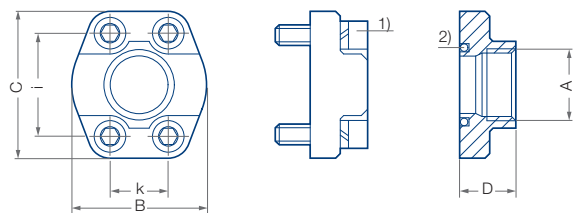
#### Measurement Conditions:

Speed: 1.500 rpm / Viscosity of pressure fluid:  $46 \text{ mm}^2\text{s}^{-1}$  / Operating temperature:  $40^\circ\text{C}$

#### Note:

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

## SAE-Flange, SAE J 518 C Code 61, single-piece



Wrench torque for screws according to ISO 6162

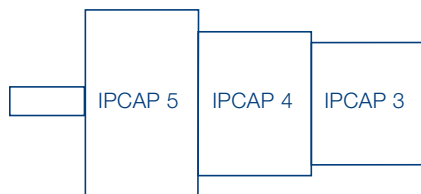
<sup>1)</sup> Round seal ring (O-Ring) ISO-R 1629 NBR

<sup>2)</sup> Screw EN ISO 4762

<sup>3)</sup> Special design, deviation from SAE J 518 C Code 61

| SAE flange no.   | A       | B    | C    | D    | E <sup>1)</sup> | i     | k    | S <sup>2)</sup> | max. pressure     |
|------------------|---------|------|------|------|-----------------|-------|------|-----------------|-------------------|
|                  | thread  | [mm] | [mm] | [mm] | seal ring       | [mm]  | [mm] | thread          | [bar]             |
| 10               | G 1/2   | 46   | 54   | 36   | 18.66 – 3.53    | 38.1  | 17.5 | M 8             | 345               |
| 11               | G 3/4   | 50   | 65   | 36   | 24.99 – 3.53    | 47.6  | 22.3 | M 10            | 345               |
| 12               | G 1     | 55   | 70   | 38   | 32.92 – 3.53    | 52.4  | 26.2 | M 10            | 345               |
| 13               | G 1-1/4 | 68   | 79   | 41   | 37.69 – 3.53    | 58.7  | 30.2 | M 10            | 276               |
| 14 <sup>3)</sup> | G 1-1/2 | 82   | 98   | 50   | 47.22 – 3.53    | 69.9  | 35.7 | M 12            | 345 <sup>3)</sup> |
| 30               | G 1-1/2 | 78   | 93   | 45   | 47.22 – 3.53    | 69.9  | 35.7 | M 12            | 207               |
| 15               | G 2     | 90   | 102  | 45   | 56.74 – 3.53    | 77.8  | 42.9 | M 12            | 207               |
| 16               | G 2-1/2 | 105  | 114  | 50   | 69.44 – 3.53    | 88.9  | 50.8 | M 12            | 172               |
| 17               | G 3     | 124  | 134  | 50   | 85.32 – 3.53    | 106.4 | 61.9 | M 16            | 138               |
| 18               | G 4     | 146  | 162  | 48   | 110.72 – 3.53   | 130.2 | 77.8 | M 16            | 34                |

## Multi-flow Pumps, Pump Combinations, Pump Combinations in Order of Type and Size



### Pump combinations

- IPCAP 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.

### 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

| Rotation and suction                                                                             | Mounting flange                                                                   | Shaft end                                                                             |
|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| clockwise (cw)  |                                                                                   |                                                                                       |
|  1              |  |  1 |
|  1              | 0 SAE-2-hole-flange                                                               |                                                                                       |
|                                                                                                  | 7 SAE-2-hole-flange (variant)                                                     |                                                                                       |
| Special design 4                                                                                 |                                                                                   |                                                                                       |

Type Code

IPCAP 3 - 3.5 1 0 1

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

| Size | Delivery |    |     |    |    |
|------|----------|----|-----|----|----|
| 3    | 3.5      | 5  | 6.3 | 8  | 10 |
| 4    | 13       | 16 | 20  | 25 | 32 |
| 5    | 40       | 50 | 64  |    |    |

Size

Type

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Legally binding language version of document: german.

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