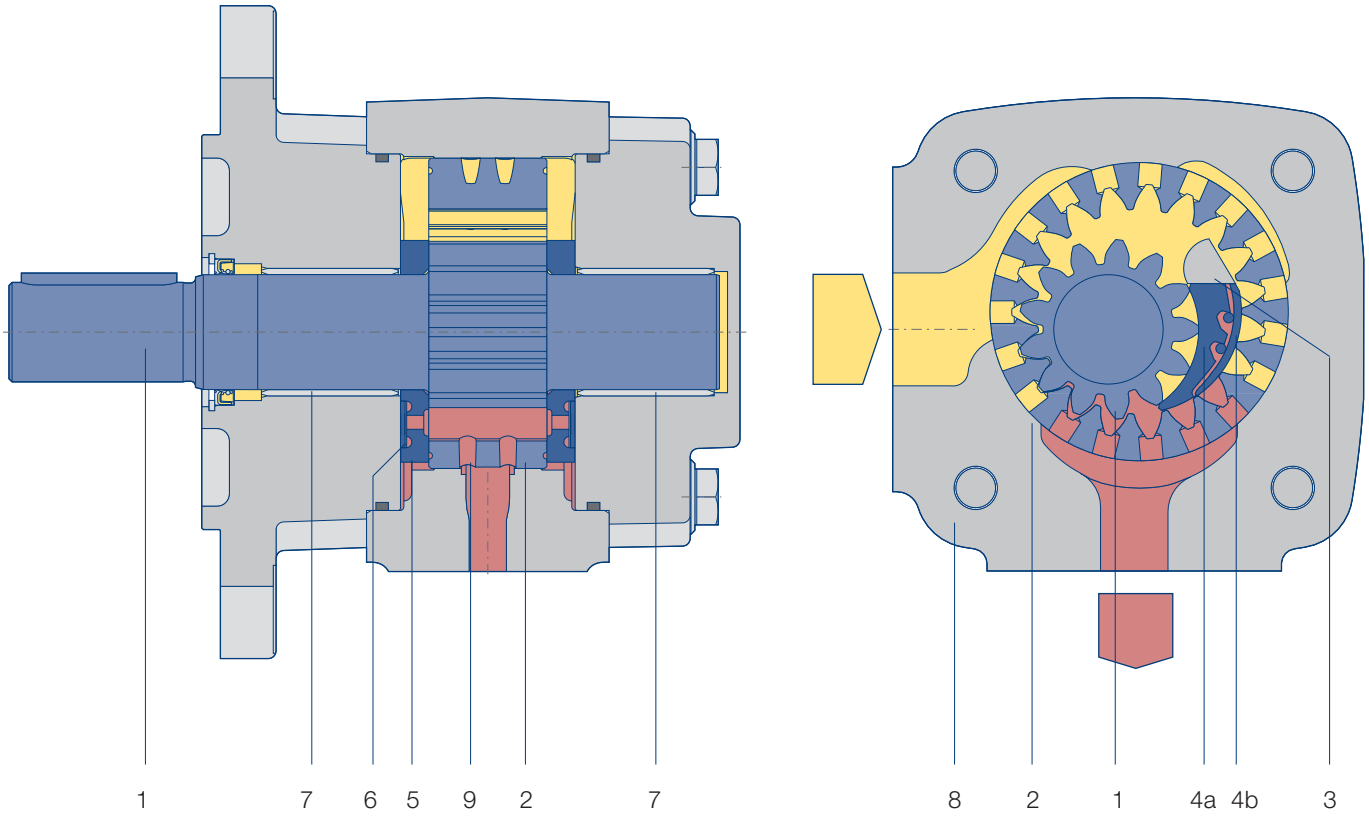
VOITH

IPVAP High-pressure Internal Gear Pumps for Variable Speed Drives

Technical Data Sheet

Function



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

Suction chamber
Pressure chamber

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	IPVAP
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^2s^{-1} (cSt), up to n=1800 RPM 0 ... 100 mm^2s^{-1} (cSt), up to n_{max}
Permissible start viscosity	max. 2 000 mm^2s^{-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	$Q = V_{g\,th} \cdot n \cdot \eta_v \cdot 10^{-3}$ [l / min]
Power	$P = \frac{Q \cdot \Delta p}{600 \cdot \eta_g}$ [kW]
$V_{g\,th}$	Pump volume per revolution [cm^3]
n	Speed [min^{-1}]
η_v	Volumetric efficiency
η_g	Overall efficiency
Δp	Differential pressure [bar]

Characteristics

Type, size – delivery	Displacement per revolution	Speed		Delivery	Pressures		
		min.	max.	at 1500 min^{-1}	Continuous pressure	Peak pressure at 1 500 min^{-1}	Moment of inertia
	[cm^3]	[min^{-1}]	[min^{-1}]	[l/min]	[bar]	[bar]	[kg cm^2]
IPVAP 3 – 3.5	3.6	400	3 600	5.4	300	320	0.34
IPVAP 3 – 5	5.2	400	3 600	7.8	300	320	0.42
IPVAP 3 – 6.3	6.4	400	3 600	9.6	300	320	0.49
IPVAP 3 – 8	8.2	400	3 600	12.3	300	320	0.58
IPVAP 3 – 10	10.2	400	3 600	15.3	300	320	0.70
IPVAP 4 – 13	13.3	400	3 600	19.9	300	320	2.25
IPVAP 4 – 16	15.8	400	3 600	23.7	300	320	2.64
IPVAP 4 – 20	20.7	400	3 600	31.0	300	320	3.29
IPVAP 4 – 25	25.4	400	3 600	38.1	300	320	3.70
IPVAP 4 – 32	32.6	400	3 600	48.9	250	280	4.44
IPVAP 5 – 32	33.1	400	3 000	49.6	300	320	8.62
IPVAP 5 – 40	41.0	400	3 000	61.5	300	320	10.20
IPVAP 5 – 50	50.3	400	3 000	75.4	280	315	11.60
IPVAP 5 – 64	64.9	400	3 000	97.3	230	250	14.40
IPVAP 6 – 64	64.1	400	2 600	96.1	300	320	25.73
IPVAP 6 – 80	80.7	400	2 600	121.0	280	315	30.90
IPVAP 6 – 100	101.3	400	2 600	151.9	250	300	36.10
IPVAP 6 – 125	126.2	400	2 600	189.3	210	250	43.70

The values given apply for:

- Pumping of mineral oils with a viscosity of 20…40 mm^{2}s-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%.
- The maximum speed depends on the pressure.
- **The speed range 0-400 min^{-1} depends on the pressure.** Please find data on the diagrams on the following pages.

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

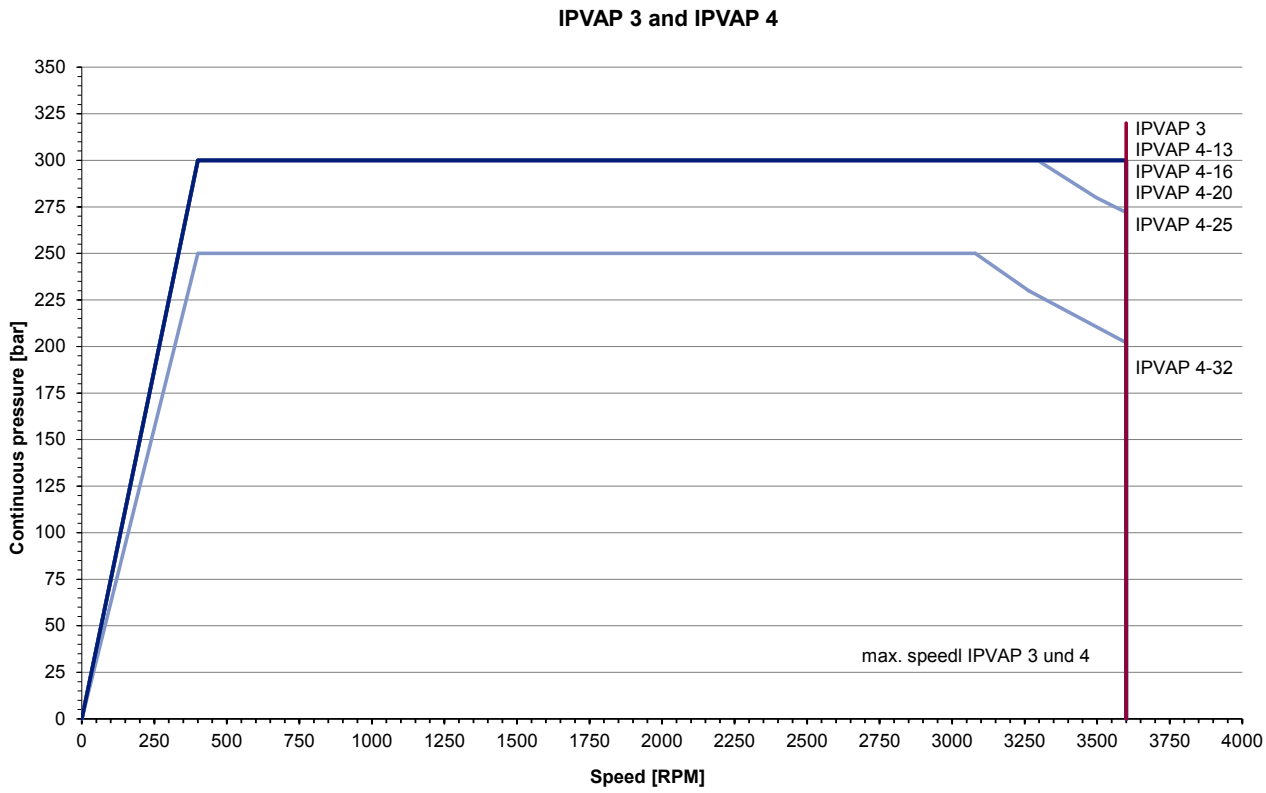


Diagram IPVAP 5 - Continuous pressure depending on the speed

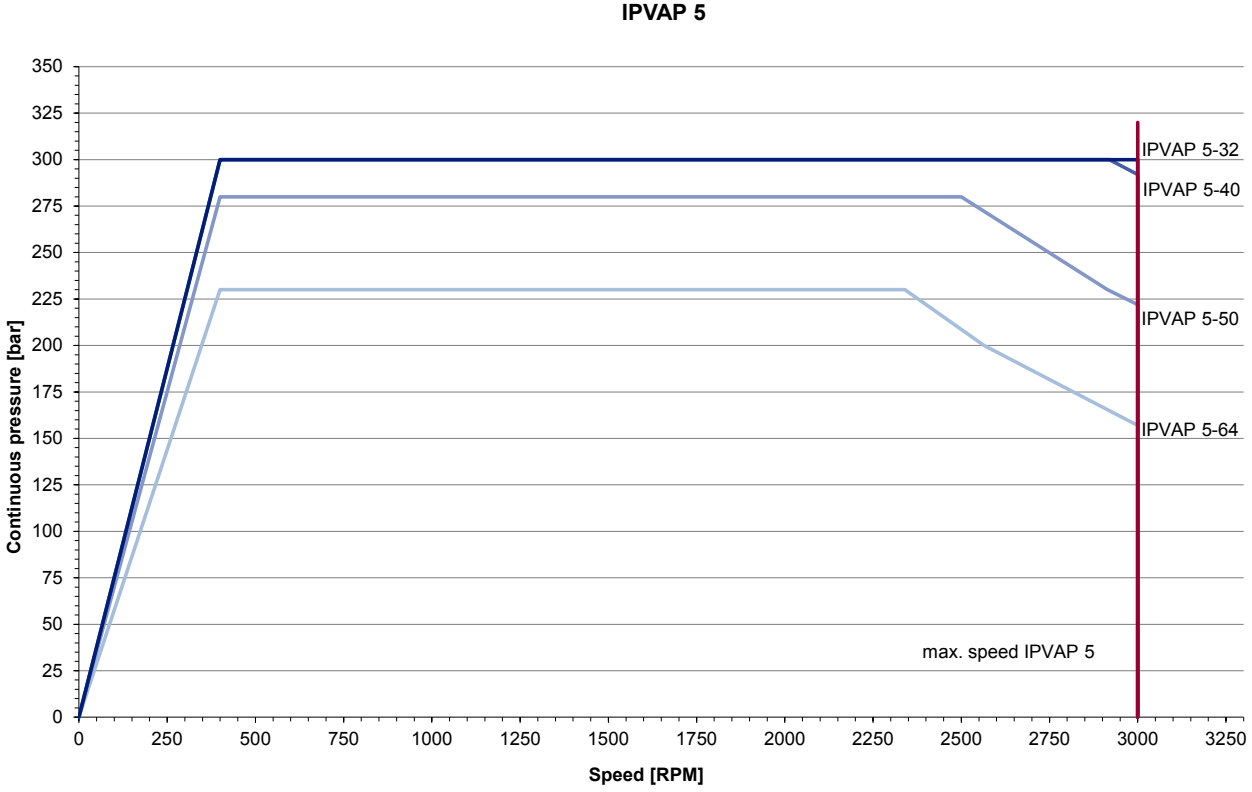
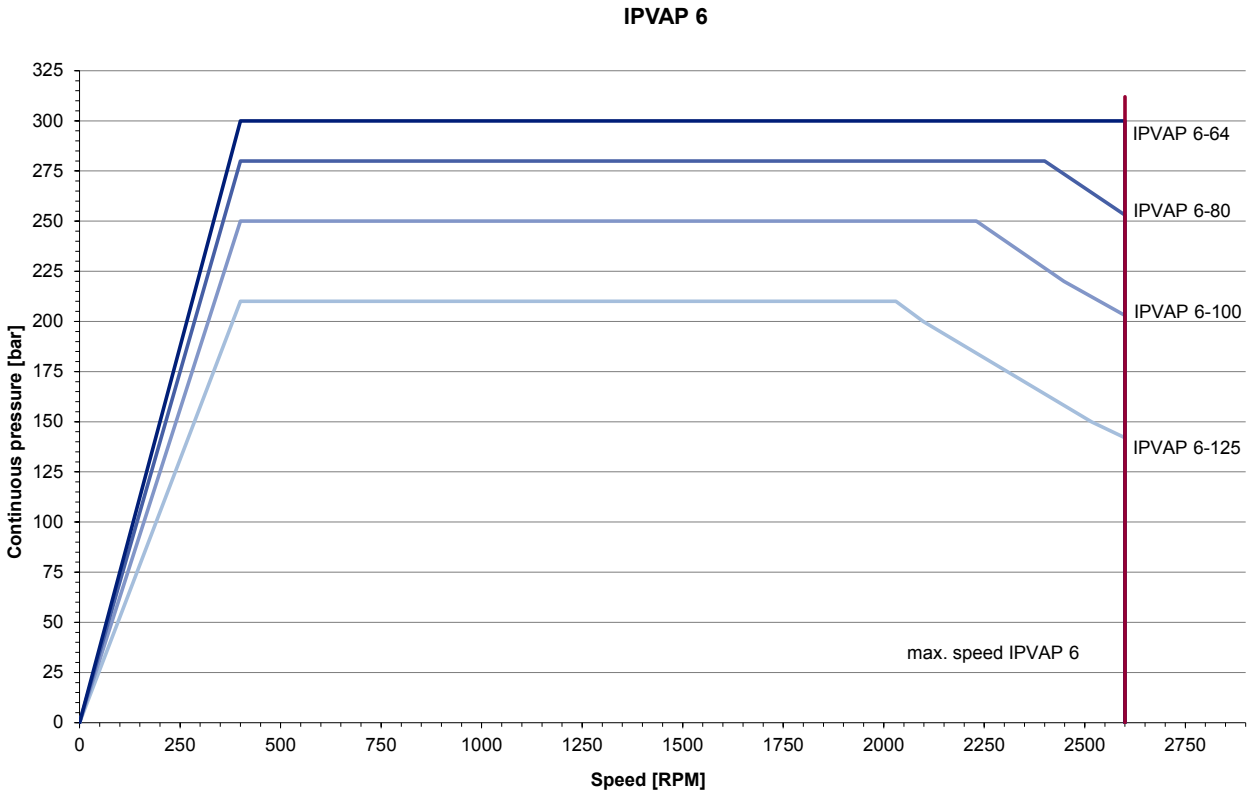
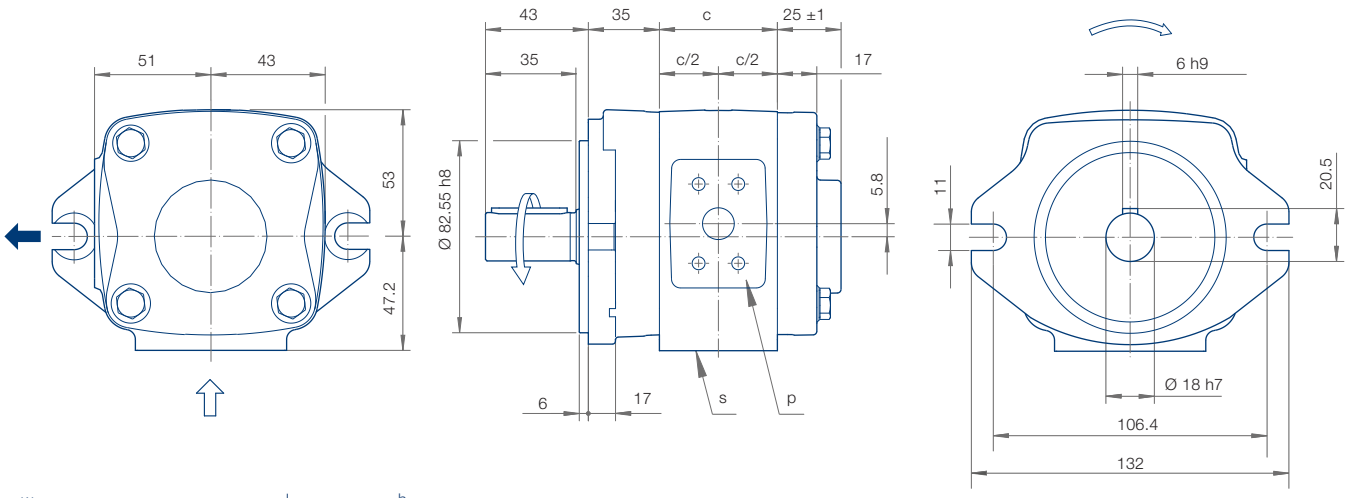
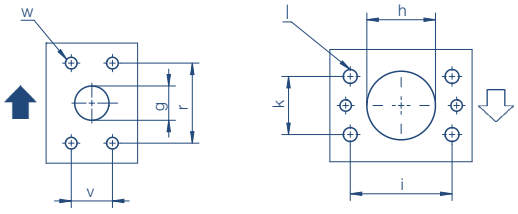


Diagram IPVAP 6 - Continuous pressure depending on the speed



IPVAP 3, Rotation and Dimensions



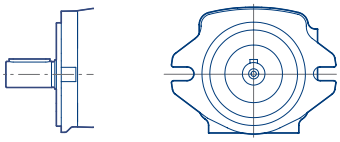
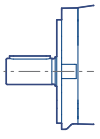


Pressure port (P)

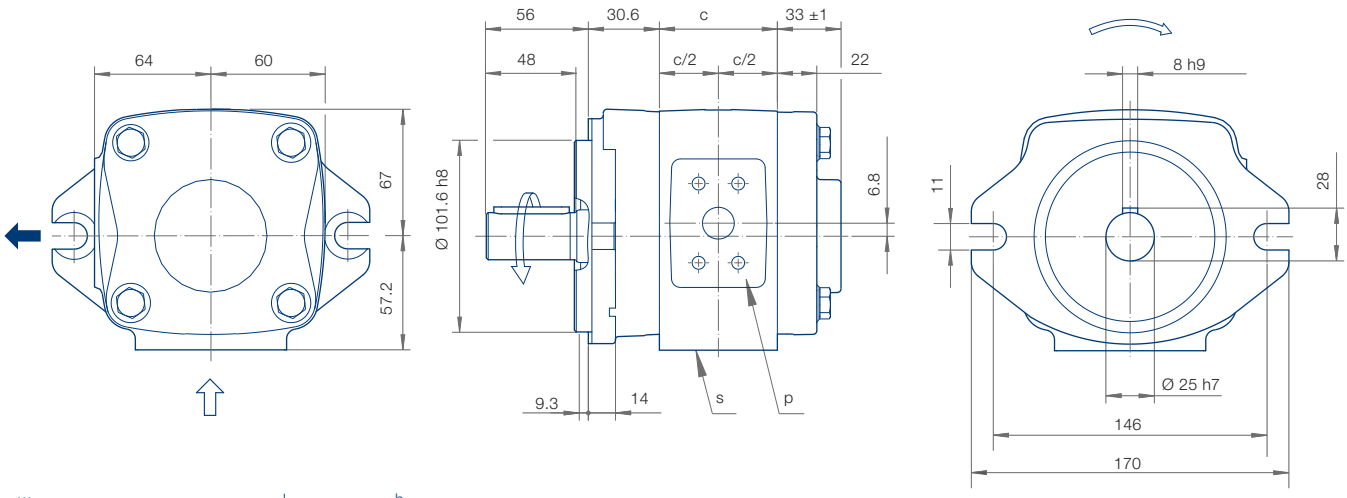
Suction port (S)

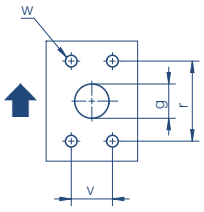
Type / Delivery	Dimensions and Weight										SAE Flange No.	
	c	g	h	i	k	l	r	v	w	Weight	↑	↓
	[mm]	[mm]	[mm]	[mm]	[mm]	Thread	[mm]	[mm]	Thread	[kg]		
IPVAP 3 – 3.5	35	9	14	38.1	17.5	M8x13	38.1	17.5	M8x13	3.4	10	10
IPVAP 3 – 5	39	11	14	38.1	17.5	M8x13	38.1	17.5	M8x13	3.6	10	10
IPVAP 3 – 6.3	42	11	19	47.6	22.3	M10x15	38.1	17.5	M8x13	3.8	10	11
IPVAP 3 – 8	46.5	13	19	47.6	22.3	M10x15	38.1	17.5	M8x13	4.0	10	11
IPVAP 3 – 10	51.5	13	21	52.4	26.2	M10x15	38.1	17.5	M8x13	4.2	10	12

IPVAP 3, Design

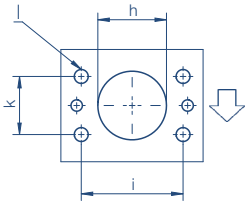
Rotation	Mounting flange	Shaft end
Standard		
Rotation clockwise	SAE 2-hole flange	Parallel shaft with keyway connection
 **1**	 **0**	 **1**

IPVAP 4, Rotation and Dimensions





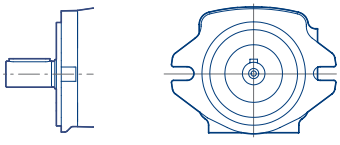
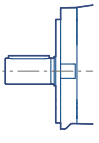
Pressure port (P)



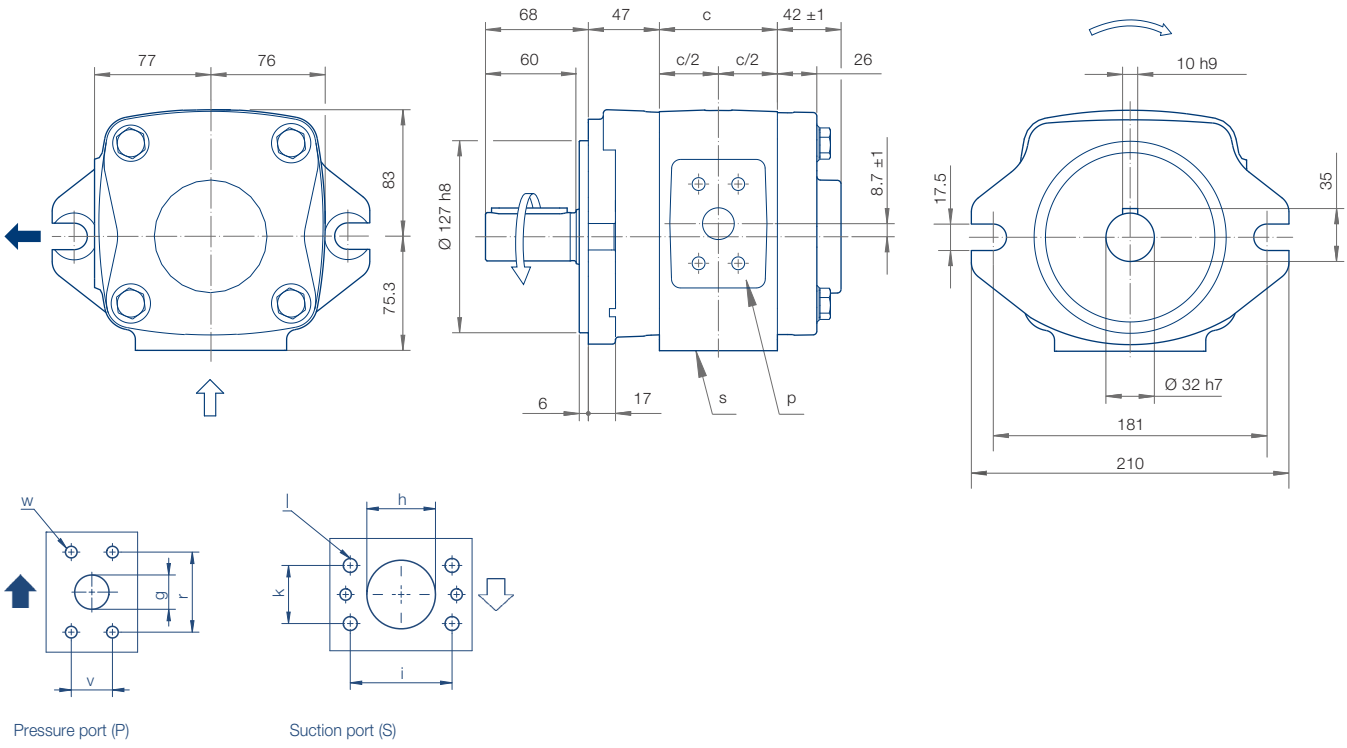
Suction port (S)

Type / Delivery	Dimensions and Weight										SAE Flange No.	
	c	g	h	i	k	l	r	v	w	Weight	↑	↓
	[mm]	[mm]	[mm]	[mm]	[mm]	Thread	[mm]	[mm]	Thread	[kg]		
IPVAP 4 – 13	48.5	13	23	52.4	26.2	M10 x 15	38.1	17.5	M8 x 13	7.1	10	12
IPVAP 4 – 16	52.5	14	25	52.4	26.2	M10 x 15	38.1	17.5	M8 x 13	7.3	10	12
IPVAP 4 – 20	58	18	27	58.7	30.2	M10 x 15	47.6	22.3	M10 x 15	7.9	11	13
IPVAP 4 – 25	64	18	30	58.7	30.2	M10 x 15	47.6	22.3	M10 x 15	8.3	11	13
IPVAP 4 – 32	73	18	32	58.7	30.2	M10 x 15	47.6	22.3	M10 x 15	9.1	11	13

IPVAP 4, Design

Rotation	Mounting flange	Shaft end
Standard		
Rotation clockwise	SAE 2-hole flange	Parallel shaft with keyway connection
 1	 7	 1

IPVAP 5, Rotation and Dimensions

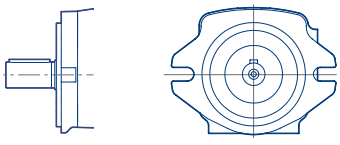
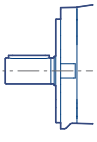


Pressure port (P)

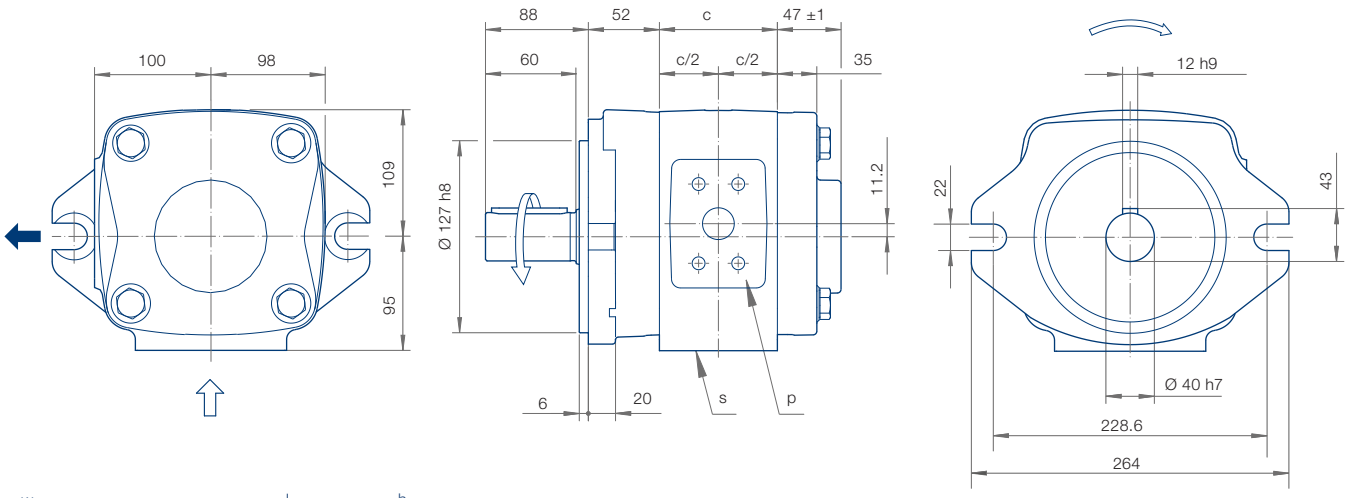
Suction port (S)

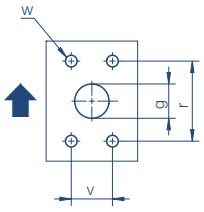
Type / Delivery	Dimensions and Weight										SAE Flange No.	
	c	g	h	i	k	l	r	v	w	Weight	↑	↓
	[mm]	[mm]	[mm]	[mm]	[mm]	Thread	[mm]	[mm]	Thread	[kg]		
IPVAP 5 – 32	65	18	32	58.7	30.2	M10 x 15	47.6	22.3	M10 x 15	13.0	11	13
IPVAP 5 – 40	71	19	35	69.9	35.7	M12 x 20	52.4	26.2	M10 x 15	14.1	12	30
IPVAP 5 – 50	78	21	40	69.9	35.7	M12 x 20	52.4	26.2	M10 x 15	15.9	12	30
IPVAP 5 – 64	89	23	40	69.9	35.7	M12 x 20	52.4	26.2	M10 x 16	17.3	12	30

IPVAP 5, Design

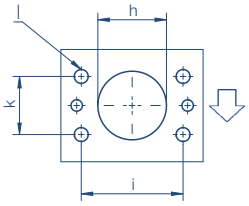
Rotation	Mounting flange	Shaft end
Standard		
Rotation clockwise	SAE 2-hole flange	Parallel shaft with keyway connection
 1	 0	 1

IPVAP 6, Rotation and Dimensions





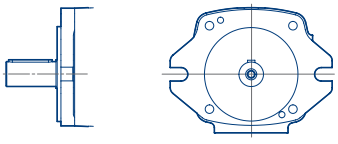
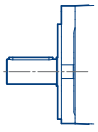
Pressure port (P)



Suction port (S)

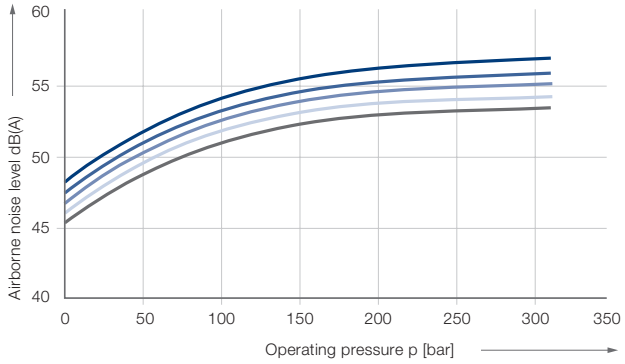
Type / Delivery	Dimensions and Weight										SAE Flange No.	
	c	g	h	i	k	l	r	v	w	Weight	↑	↓
	[mm]	[mm]	[mm]	[mm]	[mm]	Thread	[mm]	[mm]	Thread	[kg]		
IPVAP 6 – 64	80	23	40	69.9	35.7	M12 x 20	52.4	26.2	M10 x 15	26.3	12	30
IPVAP 6 – 80	88	23	45	77.8	42.9	M12 x 20	69.9	35.7	M12 x 20	27.9	14	15
IPVAP 6 – 100	98	27	50	77.8	42.9	M12 x 20	69.9	35.7	M12 x 20	31.2	14	15
IPVAP 6 – 125	110	30	50	77.8	42.9	M12 x 20	69.9	35.7	M12 x 20	34.0	14	15

IPVAP 6, Design

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

Measurement Values - Airborne Noise Level, Efficiency

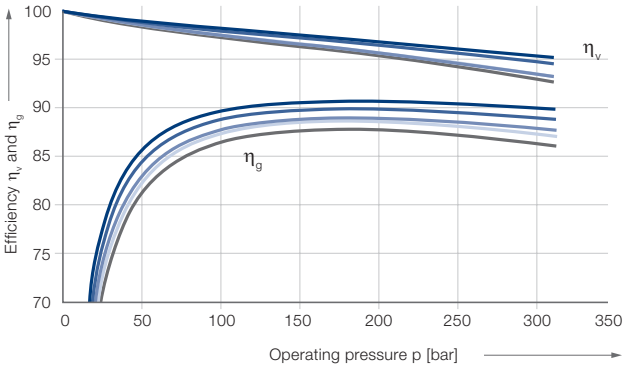
IPVAP 3 – Airborne noise level (measuring location 1 m axial)



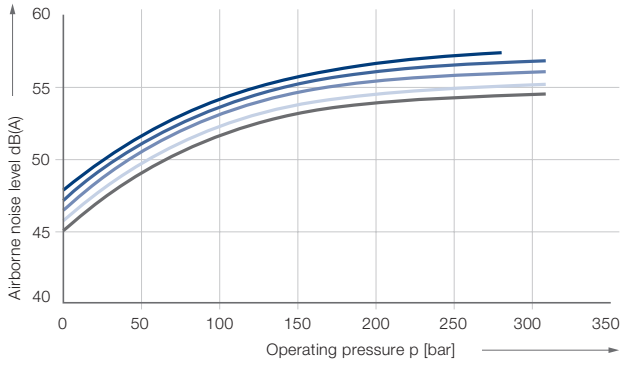
Characteristic curves:

IPVAP 3 – 10 IPVAP 3 – 8 IPVAP 3 – 6.3
IPVAP 3 – 5 IPVAP 3 – 3.5

IPVAP 3 – Efficiency η_v and η_g



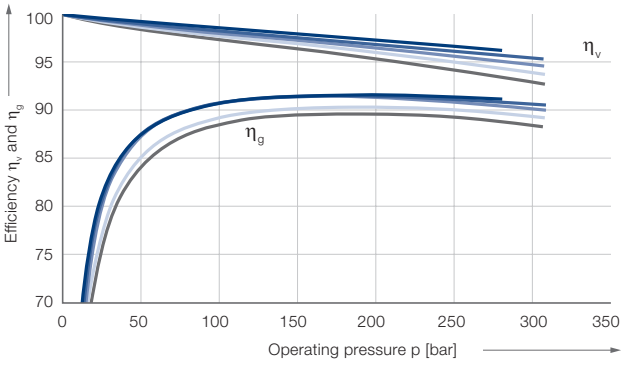
IPVAP 4 – Airborne noise level (measuring location 1 m axial)



Characteristic curves:

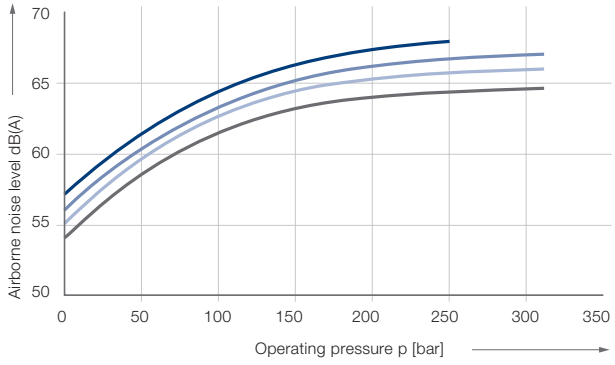
IPVAP 4 – 32 IPVAP 4 – 25 IPVAP 4 – 20
IPVAP 4 – 16 IPVAP 4 – 13

IPVAP 4 – Efficiency η_v and η_g



Measurement Values - Airborne Noise Level, Efficiency

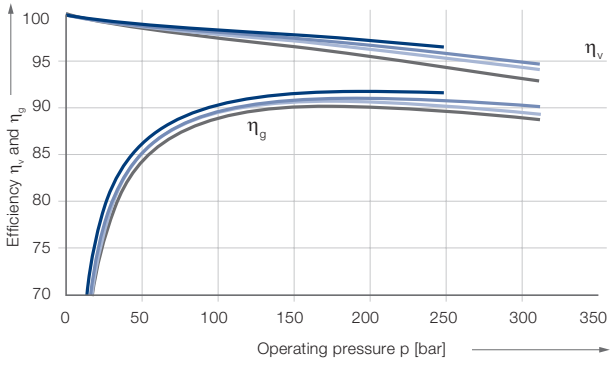
IPVAP 5 – Airborne noise level (measuring location 1 m axial)



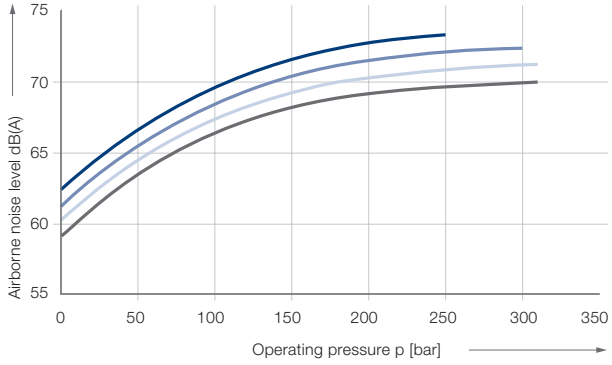
Characteristic curves:

IPVAP 5 – 64 IPVAP 5 – 50 IPVAP 5 – 40 IPVAP 5 – 32

IPVAP 5 – Efficiency η_v and η_g



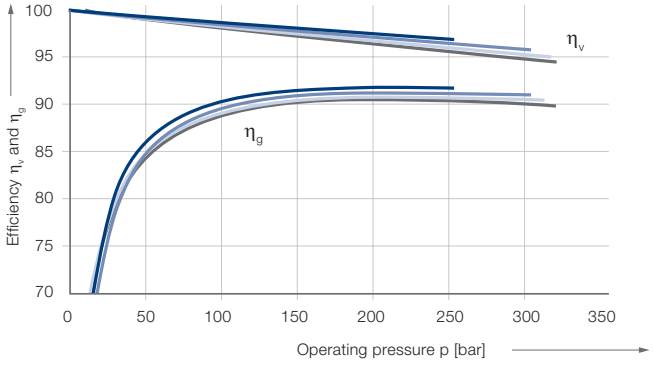
IPVAP 6 – Airborne noise level (measuring location 1 m axial)



Characteristic curves:

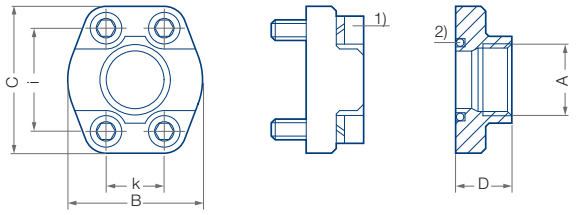
IPVAP 6 – 125 IPVAP 6 – 100 IPVAP 6 – 80 IPVA 6 – 64

IPVAP 6 – Efficiency η_v and η_g



Measurement Conditions:
Speed: 1.500 rpm / Viscosity of pressure fluid: 46 mm^2s^{-1} / Operating temperature: 40 °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

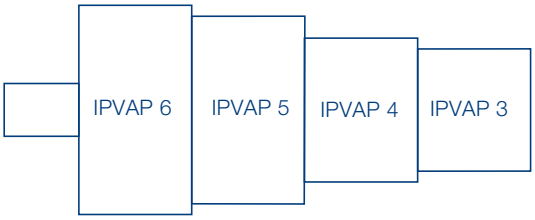


Wrench torque for screws according to ISO 6162

[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

SAE flange no.	A	B	C	D	E[1]	i	k	S[2]	max. pressure
	thread	[mm]	[mm]	[mm]	seal ring	[mm]	[mm]	thread	[bar]
10	G ½	46	54	36	18.66 – 3.53	38.1	17.5	M 8	345
11	G ¾	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 1-¼	68	79	41	37.69 – 3.53	58.7	30.2	M 10	276
14[3]	G 1-½	82	98	50	47.22 – 3.53	79.9	35.7	M 12	345[3]
30	G 1-½	78	93	45	47.22 – 3.53	79.9	35.7	M 12	207
15	G 2	90	102	45	56.74 – 3.53	77.8	42.9	M 12	207
16	G 2-½	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

- IPVAP 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.

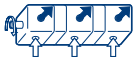
Mounting, assembly

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

Rotation and suction

clockwise (cw)

1



1

Special design 4

Mounting flange

0 SAE-2-hole-flange

7 SAE-2-hole-flange (variant)

Shaft end

1

Type Code

IPVAP 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	32	40	50	64	
6	64	80	100	125	

Size

Type

Type Code for Multiple Flow Capable Variants

IPVAP 4/ - 20/ 1 7 1

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

IPVAP 4/3 - 20/ 1 7 1

following multiple flow capable predetermined pump stage of the same or smaller size, freely selectable delivery volumes

90104-IPVAP-DSH-EN-1602 | VTHL | Dimensions and illustrations non-committal, subject to change.

This is a translated document. Original language: german.
Legally binding language version of document: german.

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