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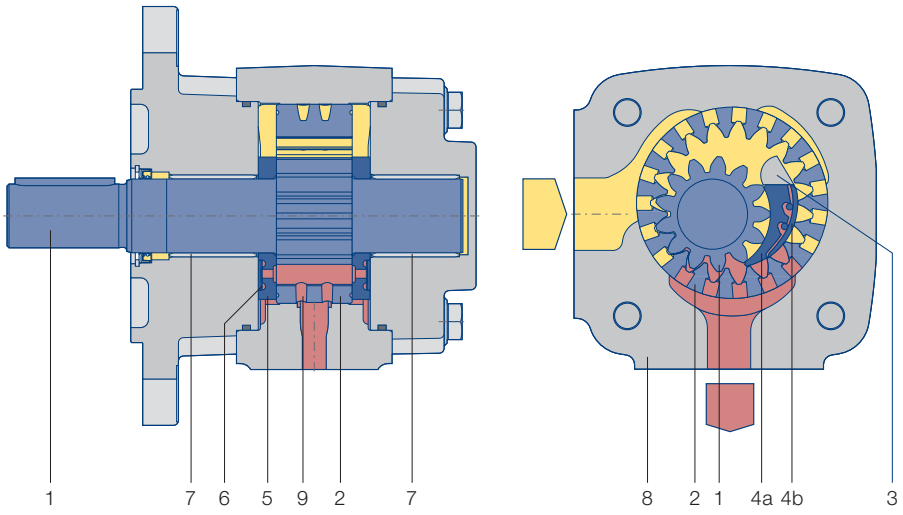
IPVAP high-pressure internal gear pumps for variable speed drives

Technical data sheet

Advantages

+ Very good controllability and pressure hold function
+ Very good pulsation behavior
+ Very high overall efficiency
+ Low noise emission
+ Multiple flow capable

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.

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 [cm³]
n	Speed [rpm]
η_v	Volumetric efficiency
η_g	Overall efficiency
Δp	Differential pressure [bar]

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 please contact your J.M. Voith SE & Co. KG 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 mm^2s^{-1} (cSt), up to n = 1800 rpm 0 … 100 mm^2s^{-1} (cSt), up to n_{max}
Permissible start viscosity	max. 2000 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

Characteristics

Type, Size – delivery	Displacement per revolution [cm³]	Speed min. [rpm]	Speed max. [rpm]	Delivery at 1500 rpm [l/min]	Continuous pressure [bar]	Peak pressure at 1 500 rpm [bar]	Moment of inertia [kg cm²]
IPVAP 3 – 3.5	3.6	400	3600	5.4	300	320	0.34
IPVAP 3 – 5	5.2	400	3600	7.8	300	320	0.42
IPVAP 3 – 6.3	6.4	400	3600	9.6	300	320	0.49
IPVAP 3 – 8	8.2	400	3600	12.3	300	320	0.58
IPVAP 3 – 10	10.2	400	3600	15.3	300	320	0.70
IPVAP 4 – 13	13.3	400	3600	19.9	300	320	2.25
IPVAP 4 – 16	15.8	400	3400	23.7	300	320	2.64
IPVAP 4 – 20	20.7	400	3200	31.0	300	320	3.29
IPVAP 4 – 25	25.4	400	3000	38.1	300	320	3.70
IPVAP 4 – 32	32.6	400	2800	48.9	250	280	4.44
IPVAP 5 – 32	33.1	400	3000	49.6	300	320	8.62
IPVAP 5 – 40	41.0	400	2800	61.5	300	320	10.20
IPVAP 5 – 50	50.3	400	2500	75.4	280	315	11.60
IPVAP 5 – 64	64.9	400	2200	97.3	230	250	14.40
IPVAP 6 – 64	64.1	400	2600	96.1	300	320	25.73
IPVAP 6 – 80	80.7	400	2400	121.0	280	315	30.90
IPVAP 6 – 100	101.3	400	2100	151.9	250	300	36.10
IPVAP 6 – 125	126.2	400	1800	189.3	210	250	43.70

The values given apply for

- Pumping of mineral oils with a viscosity of 20…40 mm^2s^{-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 %.

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

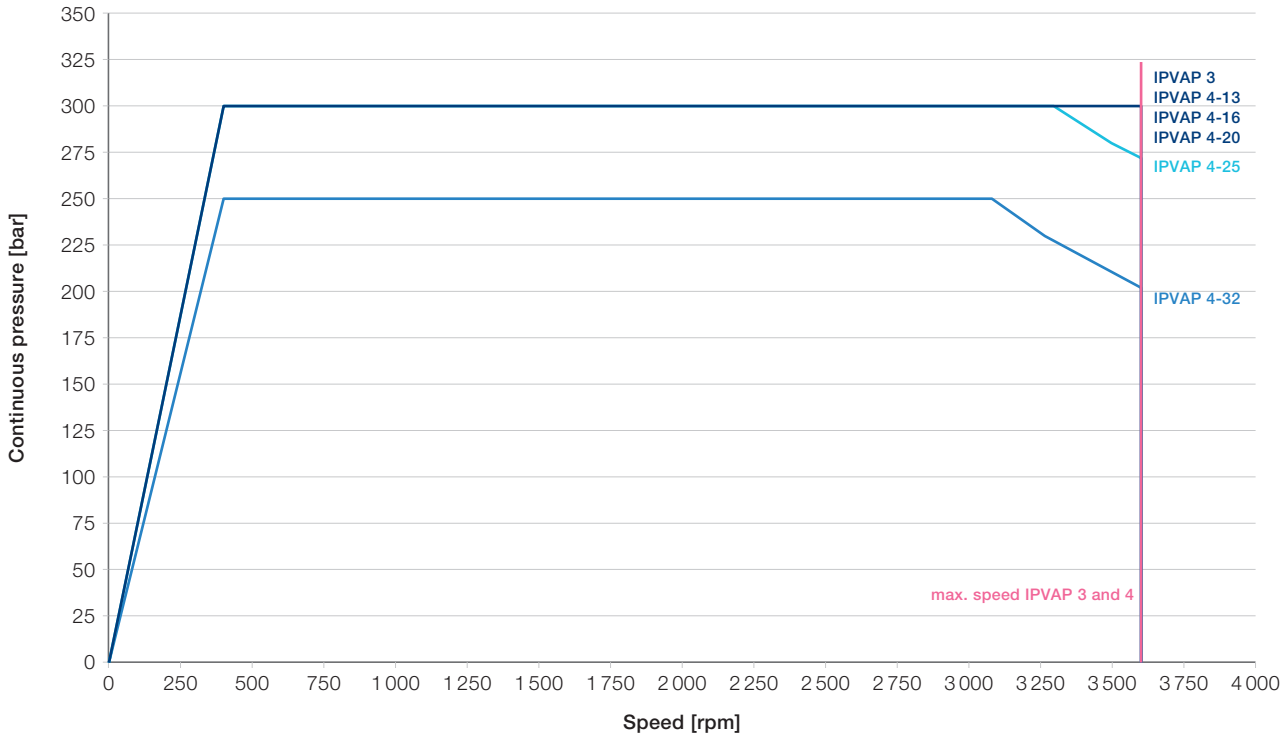


Diagram IPVAP 5 – Continuous pressure depending on the speed

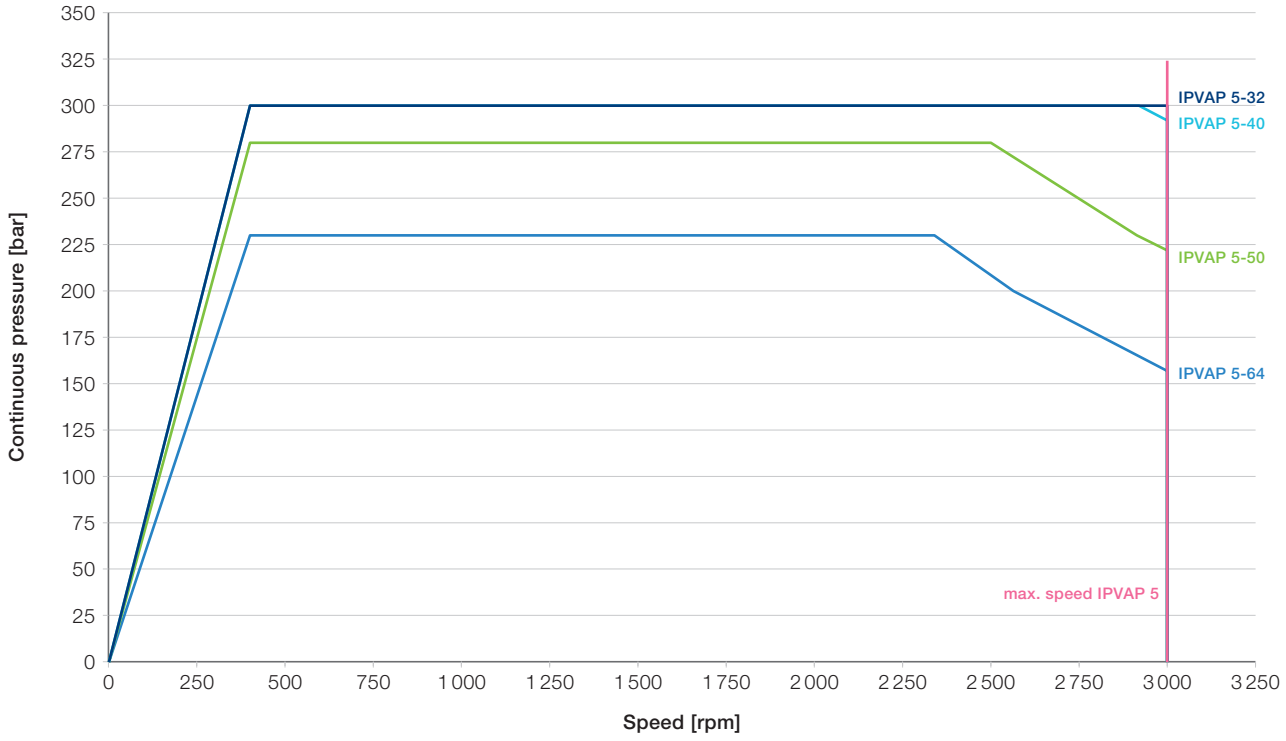
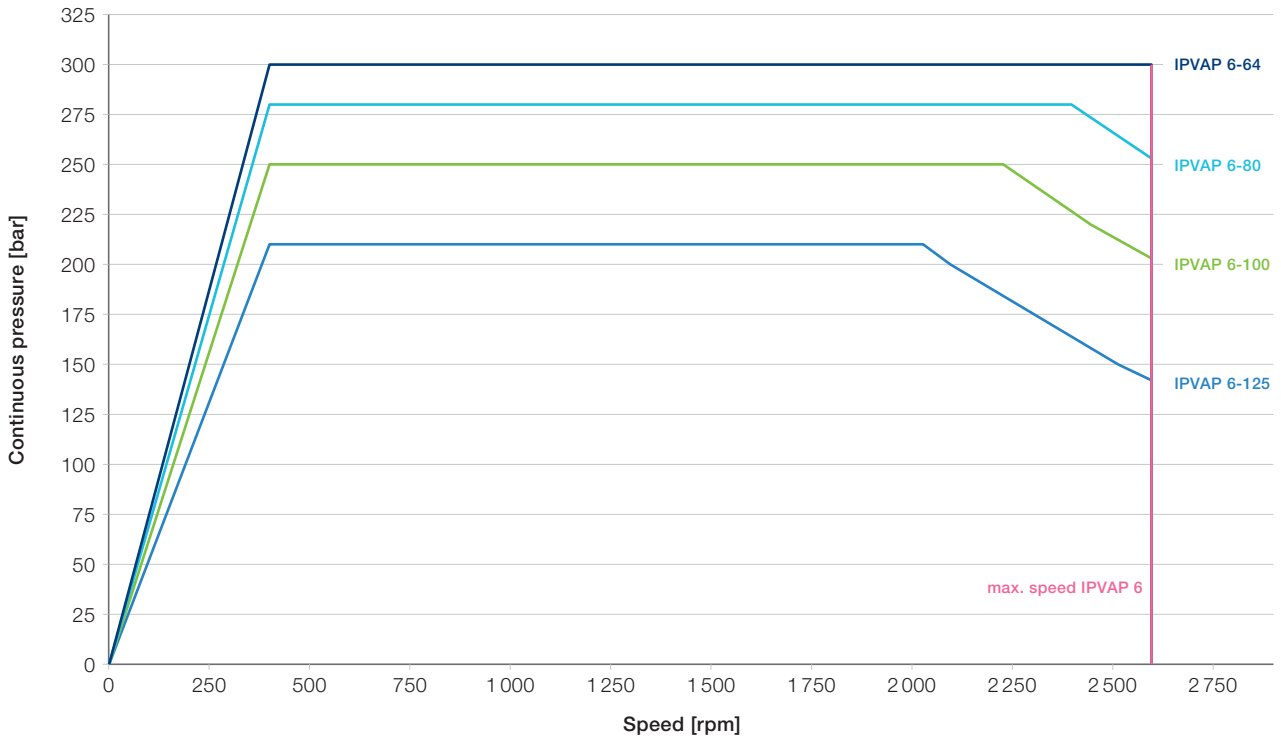
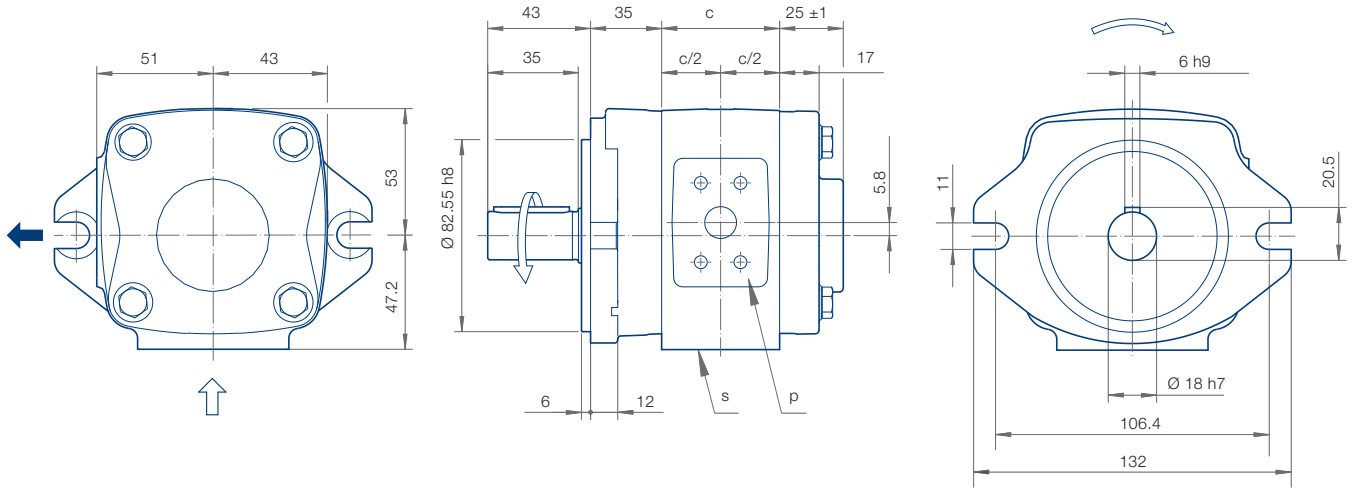


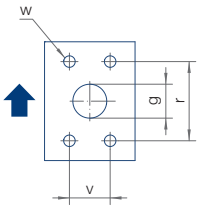
Diagram IPVAP 6 – Continuous pressure depending on the speed



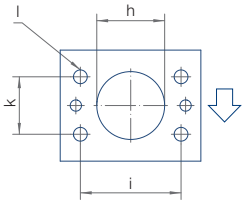
IPVAP 3. rotation and dimensions



Pressure port (P)

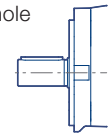
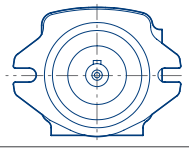
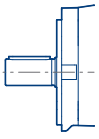


Suction port (S)

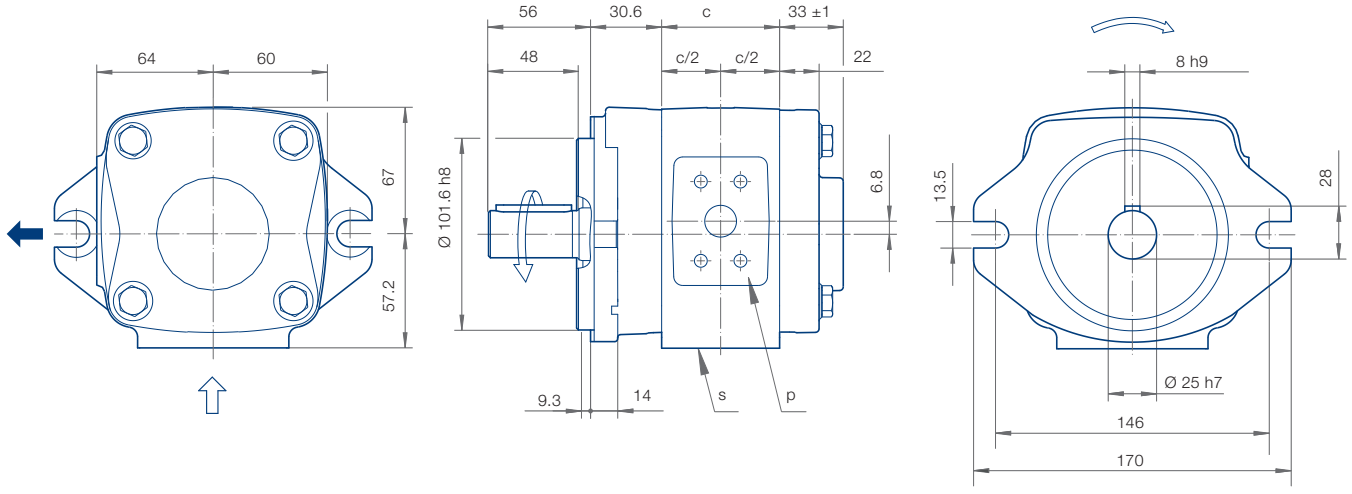


Type / Delivery	c [mm]	g [mm]	h [mm]	i [mm]	k [mm]	l Thread	r [mm]	v [mm]	w Thread	Weight [kg]	SAE Flange No. ↑	SAE Flange No. ↓
IPVAP 3 – 3.5	35	9	14	38.1	17.5	M8x13	38.1	17.5	M8x13	3.4	10	10
IPVAP 3 – 5	39	11	14	38.1	17.5	M8x13	38.1	17.5	M8x13	3.6	10	10
IPVAP 3 – 6.3	42	11	19	47.6	22.3	M10x15	38.1	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

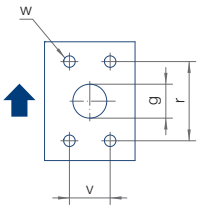
IPVAP 3, design

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

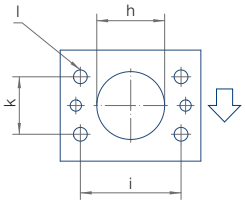
IPVAP 4. rotation and dimensions



Pressure port (P)

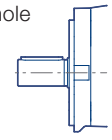
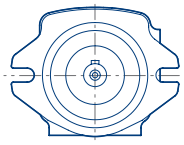
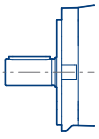


Suction port (S)

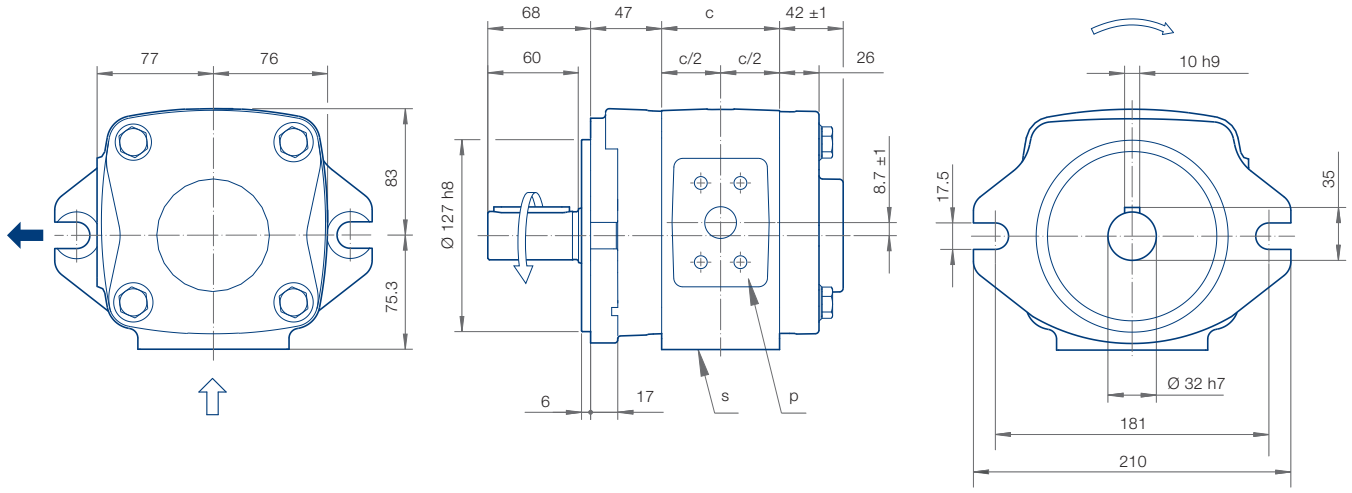


Type / Delivery	c [mm]	g [mm]	h [mm]	i [mm]	k [mm]	l Thread	r [mm]	v [mm]	w Thread	Weight [kg]	SAE Flange No. ↑	SAE Flange No. ↓
IPVAP 4 – 13	48.5	13	23	52.4	26.2	M10x15	38.1	17.5	M8x13	7.1	10	12
IPVAP 4 – 16	52.5	14	25	52.4	26.2	M10x15	38.1	17.5	M8x13	7.3	10	12
IPVAP 4 – 20	58	18	27	58.7	30.2	M10x15	47.6	22.3	M10x15	7.9	11	13
IPVAP 4 – 25	64	18	30	58.7	30.2	M10x15	47.6	22.3	M10x15	8.3	11	13
IPVAP 4 – 32	73	18	32	58.7	30.2	M10x15	47.6	22.3	M10x15	9.1	11	13

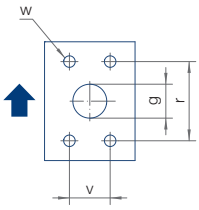
IPVAP 4, design

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

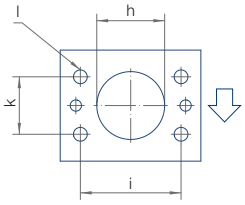
IPVAP 5. rotation and dimensions



Pressure port (P)

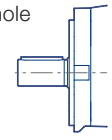
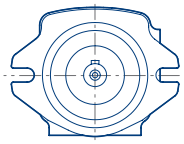
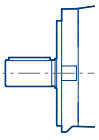


Suction port (S)

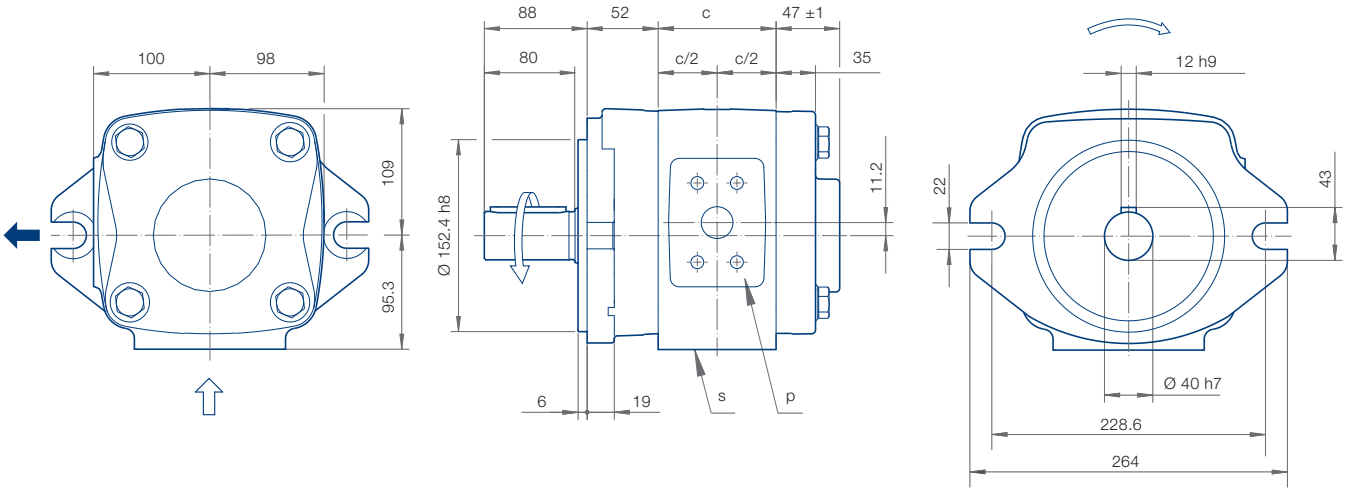


Type / Delivery	c [mm]	g [mm]	h [mm]	i [mm]	k [mm]	l Thread	r [mm]	v [mm]	w Thread	Weight [kg]	SAE Flange No. ⇧	SAE Flange No. ⇩
IPVAP 5 – 32	65	18	32	58.7	30.2	M10x15	47.6	22.3	M10x15	13.0	11	13
IPVAP 5 – 40	71	19	35	69.9	35.7	M12x20	52.4	26.2	M10x15	14.1	12	30
IPVAP 5 – 50	78	21	40	69.9	35.7	M12x20	52.4	26.2	M10x15	15.9	12	30
IPVAP 5 – 64	89	23	40	69.9	35.7	M12x20	52.4	26.2	M10x15	17.3	12	30

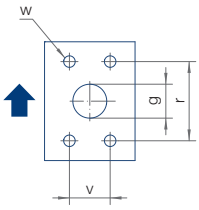
IPVAP 5, design

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

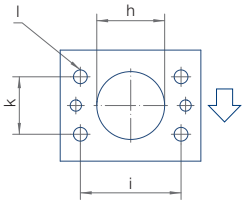
IPVAP 6. rotation and dimensions



Pressure port (P)

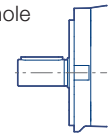
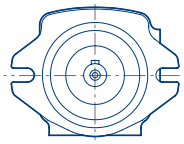
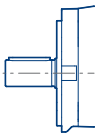


Suction port (S)



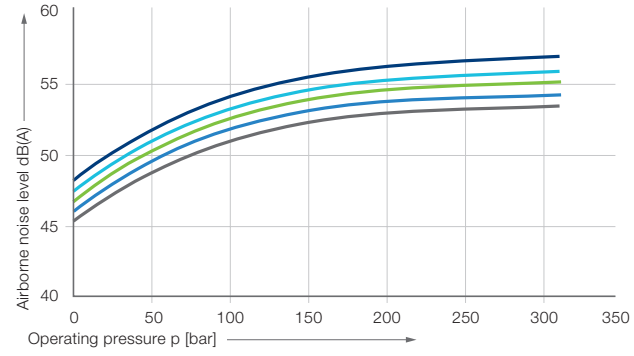
Type / Delivery	c [mm]	g [mm]	h [mm]	i [mm]	k [mm]	l Thread	r [mm]	v [mm]	w Thread	Weight [kg]	SAE Flange No. ⇧	SAE Flange No. ⇩
IPVAP 6 – 64	80	23	40	69.9	35.7	M12 x 20	52.4	26.2	M10 x 15	26.3	12	30
IPVAP 6 – 80	88	23	45	77.8	42.9	M12 x 20	69.9	35.7	M12 x 20	27.9	14	15
IPVAP 6 – 100	98	27	50	77.8	42.9	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	 1	SAE 2-hole flange		 0	Parallel shaft with keyway connection	 1

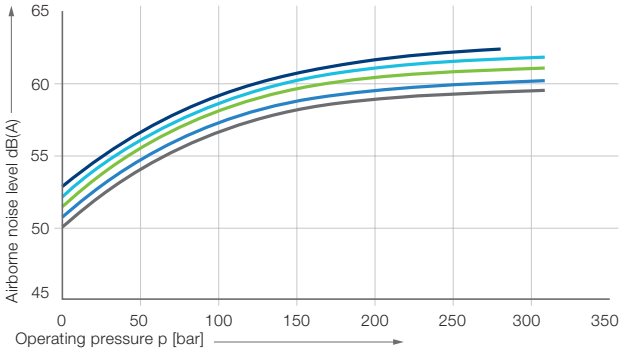
Measurement values – Airborne noise level (measuring location 1 m axial)

IPVAP 3



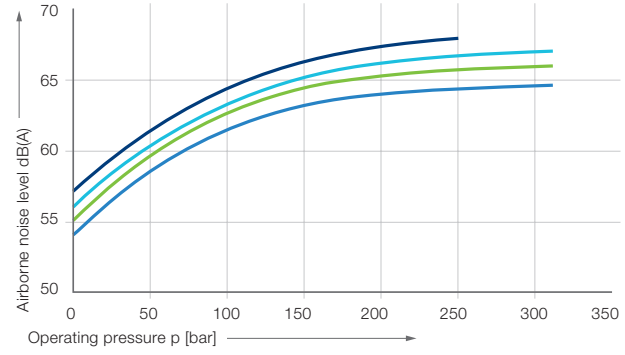
IPVAP 3 – 10 IPVAP 3 – 6.3 IPVAP 3 – 3.5
IPVAP 3 – 8 IPVAP 3 – 5

IPVAP 4



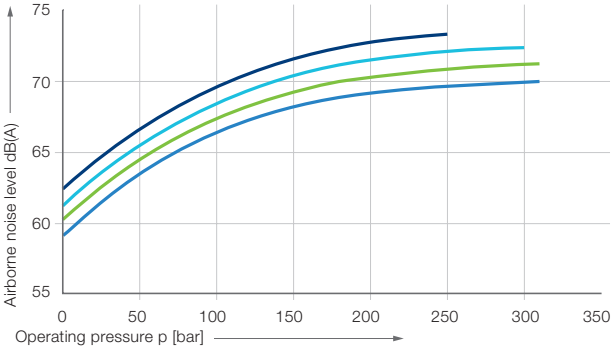
IPVAP 4 – 32 IPVAP 4 – 20 IPVAP 4 – 13
IPVAP 4 – 25 IPVAP 4 – 16

IPVAP 5



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

IPVAP 6



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

Measurement conditions

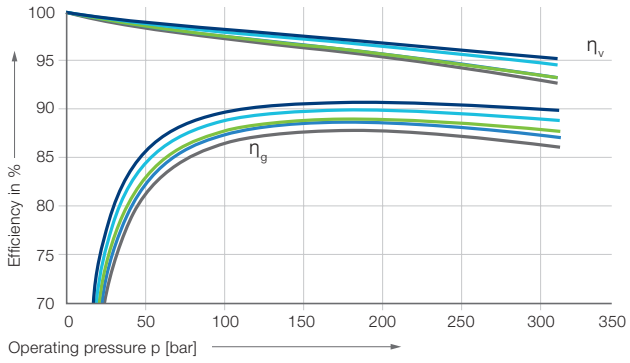
- Speed: 1500 rpm
- Viscosity of pressure fluid: 46 mm^2s^{-1}
- Operating temperature: 40 °C

Note

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

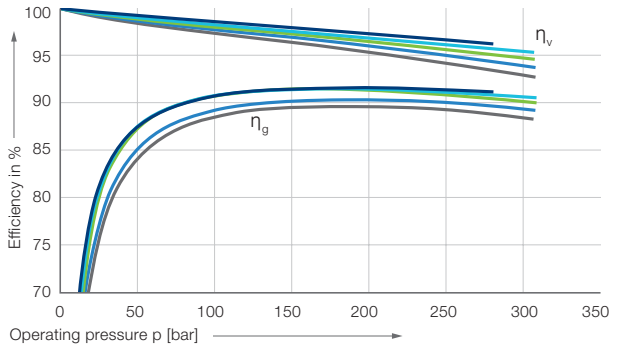
Measurement values – Efficiency η_v and η_g

IPVAP 3



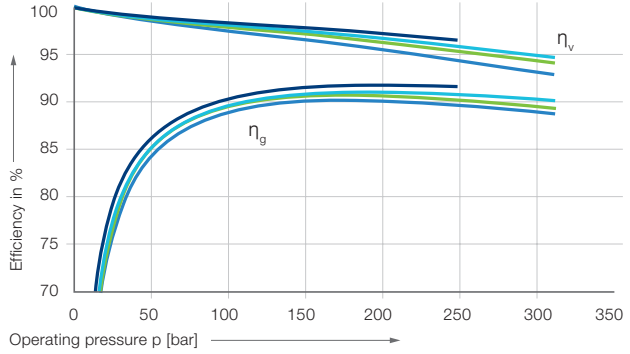
IPVAP 3 – 10 IPVAP 3 – 6.3 IPVAP 3 – 3.5
IPVAP 3 – 8 IPVAP 3 – 5

IPVAP 4



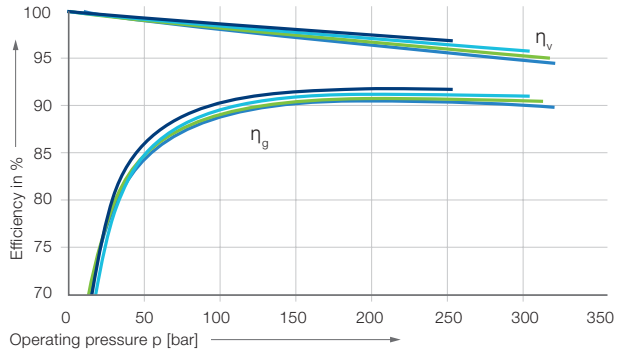
IPVAP 4 – 32 IPVAP 4 – 20 IPVAP 4 – 13
IPVAP 4 – 25 IPVAP 4 – 16

IPVAP 5



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

IPVAP 6

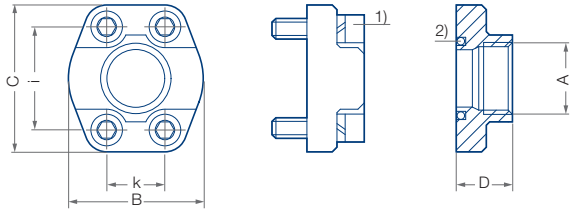


IPVAP 6 – 125 IPVAP 6 – 80
IPVAP 6 – 100 IPVAP 6 – 64

Measurement conditions

- Speed: 1500 rpm
- Viscosity of pressure fluid: 46 mm^2s^{-1}
- Operating temperature: 40 °C

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



Wrench torque for screws according to ISO 6162

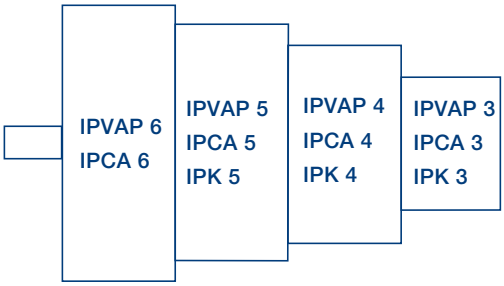
[1] Round seal ring (O-Ring) ISO-R 1629 NBR

[2] Screw EN ISO 4762

[3] Special design, deviation from SAE J 518 C Code 61

SAE flange no.	A Thread	B [mm]	C [mm]	D [mm]	E[1] Seal ring	i [mm]	k [mm]	S[2] Thread	max. pressure [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	M10	345
12	G 1	55	70	38	32.92 – 3.53	52.4	26.2	M10	345
13	G 1-¼	68	79	41	37.69 – 3.53	58.7	30.2	M10	276
14[3]	G 1-½	82	98	50	47.22 – 3.53	69.9	35.7	M12	345[3]
30	G 1-½	78	93	45	47.22 – 3.53	69.9	35.7	M12	207
15	G 2	90	102	45	56.74 – 3.53	77.8	42.9	M12	207
16	G 2-½	105	114	50	69.44 – 3.53	88.9	50.8	M12	172
17	G 3	124	134	50	85.32 – 3.53	106.4	61.9	M16	138
18	G 4	146	162	48	110.72 – 3.53	130.2	77.8	M16	34

Multi-flow pumps, pump combinations, sequence in order of type and size



Pump combinations

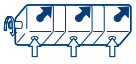
- IPVAP and IPCAP pumps of identical or different sizes can be combined in multiflow pumps.
- All sizes of the relevant pump volume are available as two- or three-flow pumps; four-flow pumps must be designed by J.M. Voith SE & Co. KG
- The pumps are arranged in increasing order according to frame size 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		Mounting flange	Shaft end
clockwise (cw)			
	1		
	1	0 SAE-2-hole-flange	1
		SAE-2-hole-flange (variant)	
Special design	4	7	

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

Site	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 of internal gear pump

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

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