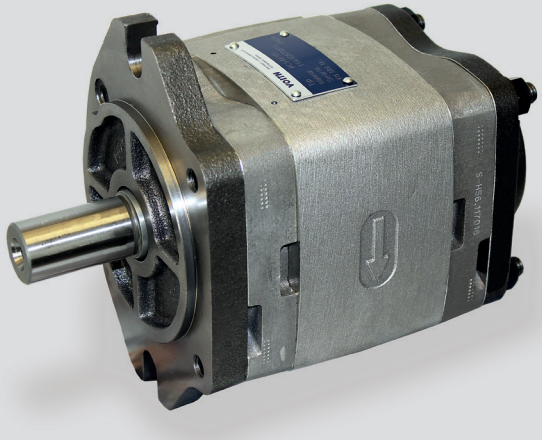
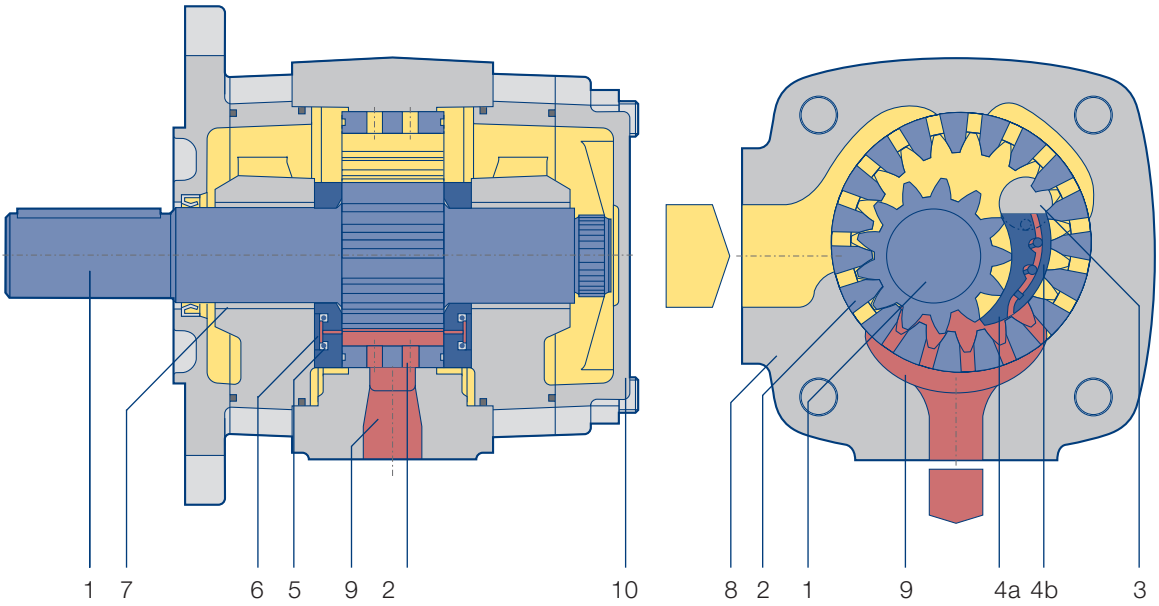
VOITH

IPC Medium-Pressure Internal Gear Pumps

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 relieved bearing
10 End cover with bleeder screw

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	IPC
Mounting types	SAE hole flange; ISO 3019/1 or VDMA hole flange; ISO 3019/2
Pipe connection	SAE suction and pressure flange J 518 C code 61
Rotation	clockwise and counterclockwise
Mounting position	any
Shaft load	For details of radial and axial drive shaft loads, please contact your Voith Turbo representative.
Input pressure	0.8 … 3 bar absolute pressure (at start for short time 0.6 bar)
Pressure fluid	HLP mineral oil according to DIN 51524, part 2 or 3
Viscosity range of the pressure fluid	10 ... 300 mm^2s^{-1} (cSt)
Permissible start viscosity	max. 2 000 mm^2s^{-1} (cSt)
Permissible temperature of the pressure fluid	-10 ... + 80 °C
Necessary purity of the pressure fluid	Class 20 / 18 / 15 (ISO 4406), Class 8 (NAS 1638)
Filtration	Filtration quotient min. $\beta_{20} \geq 75$, recommended $\beta_{10} \geq 100$, (longer service life)
Permissible ambient temperature	-10 ... + 60 °C

Calculations

Delivery	$Q = V_{g\,th} \cdot n \cdot \eta_v \cdot 10^{-3}$ [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

	Displacement per revolution	Speed		Delivery at 1500 min^{-1}	Continuous pressure	Peak pressure at 1 500 min^{-1}	Moment of inertia
		min.	max.				
	[cm^3]	[min^{-1}]	[min^{-1}]	[l/min]	[bar]	[bar]	[kg cm^2]
IPC 3 – 3.5	3.6	400	3600	5.4	210	250	0.34
IPC 3 – 5	5.2	400	3600	7.8	210	250	0.42
IPC 3 – 6.3	6.4	400	3600	9.6	210	250	0.49
IPC 3 – 8	8.2	400	3600	12.3	210	250	0.58
IPC 3 – 10	10.2	400	3600	15.3	210	250	0.70
IPC 4 – 13	13.3	400	3600	19.9	210	250	2.25
IPC 4 – 16	15.8	400	3400	23.7	210	250	2.64
IPC 4 – 20	20.7	400	3200	31.0	210	250	3.29
IPC 4 – 25	25.4	400	3000	38.1	210	250	3.70
IPC 4 – 32	32.6	400	2800	48.9	210	250	4.44
IPC 5 – 40	41.0	400	2800	61.5	210	250	10.20
IPC 5 – 50	50.3	400	2600	75.4	210	250	11.60
IPC 5 – 64	64.9	400	2600	97.3	210	250	14.40
IPC 6 – 80	80.7	400	2400	121.0	210	250	30.90
IPC 6 – 100	101.3	400	2200	151.9	210	250	36.10
IPC 6 – 125	126.2	400	2200	189.3	210	250	43.70
IPC 7 – 160	160.8	400	2000	241.2	210	250	102.60
IPC 7 – 200	202.7	400	1800	304.0	210	250	119.00
IPC 7 – 250	251.7	400	1800	377.5	210	250	144.50

The values given apply for:

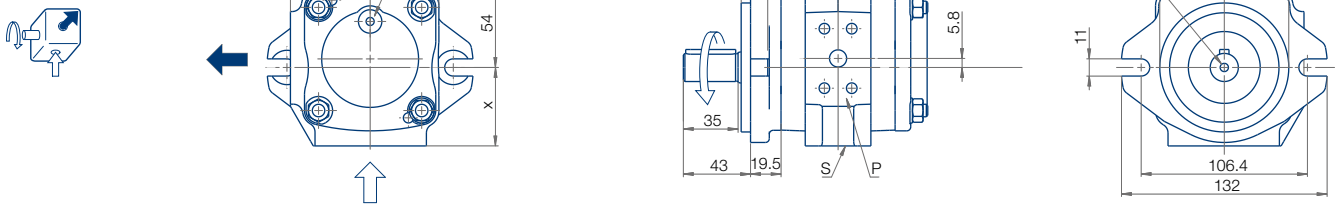
- Pumping of mineral oils with a viscosity of 20 … 40 $mm^2 s^{-1}$
- An input pressure of 0.8...3.0 bar absolute

Notes:

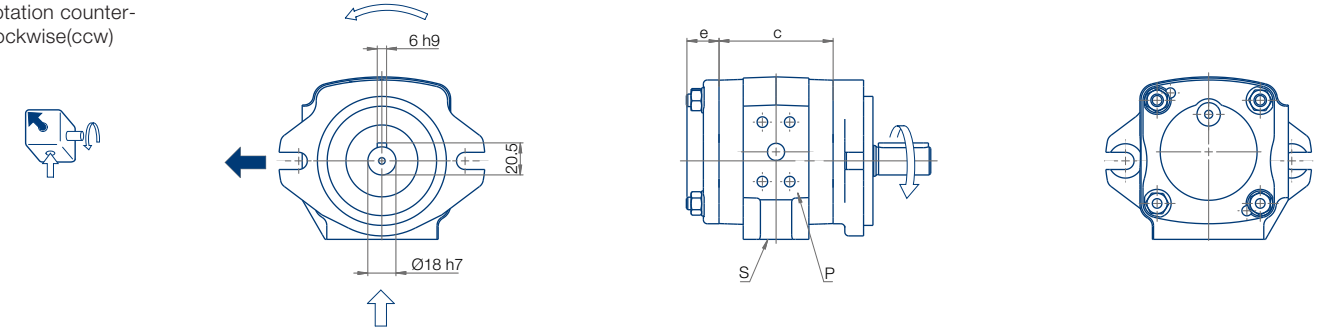
- Peak pressures apply for 15% of operating time and
- a maximum cycle time of 1 minute
- Please enquire about pressures lower than n_{min}
- Due to production tolerances, the pump volume may
- be approx. 1.5 % lower.

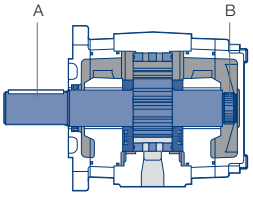
IPC 3, Rotation and Dimensions (mounting flange 0, shaft end 1)

Rotation clockwise (cw)



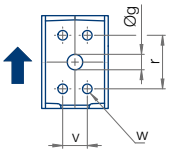
Rotation counter-clockwise(ccw)



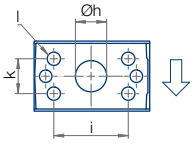


Allowed input torques:
Input shaft A: 160 Nm
Secondary shaft B: 80 Nm

Pressure port (P)



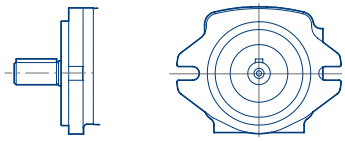
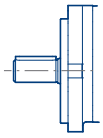
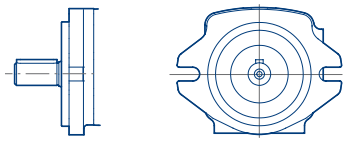
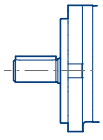
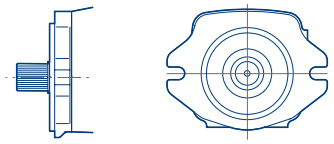
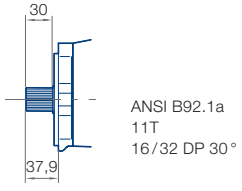
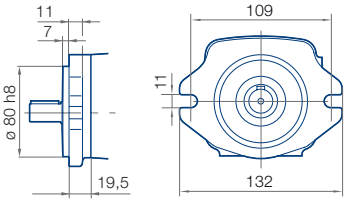
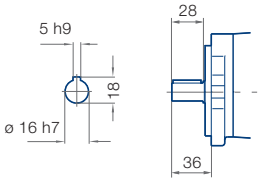
Suction port (S)



Type / Delivery	Dimensions											Weight	SAE Flange No.	
	c	x	e	g	h	i	k	l	r	v	w		↑	↓
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Thread	[mm]	[mm]	Thread	[kg]		
IPC 3 – 3.5	66	47.2	20.5	9	15	38.1	17.5	M8 x 13	38.1	17.5	M8 x 15	3.4	10	10
IPC 3 – 5	70	47.2	20.5	11	15	38.1	17.5	M8 x 13	38.1	17.5	M8 x 15	3.6	10	10
IPC 3 – 6.3	73	50.2	20.5	11	20	47.6	22.3	M10 x 15	38.1	17.5	M8 x 15	3.8	10	11
IPC 3 – 8	77.5	50.2	20.5	13	25	52.4	26.2	M10 x 15	38.1	17.5	M8 x 15	4.0	10	12
IPC 3 – 10	82.5	51.5	20.5	13	25	52.4	26.2	M10 x 15	38.1	17.5	M8 x 15	4.2	10	12

* Ensure the M10x1plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm during pumping operation. Dependent on the pump position, filling or ventilation is possible here prior to commissioning.

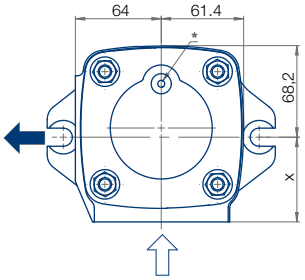
IPC 3, Design ans Dimensions

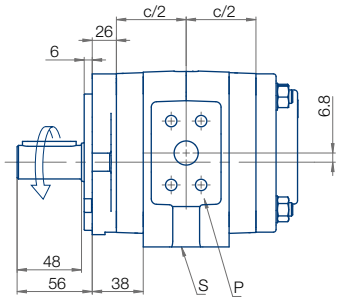
Rotation, Suction port	Mounting flange	Shaft end
Standard		
Rotation clockwise, suction port pump  **1**	SAE-2-hole flange  **0**	Keyway connection  **1**
Variant		
Rotation counterclockwise, suction port pump  **6**	SAE-2-hole flange  **0**	Keyway connection  **1**
Rotation clockwise*, suction port pump  **1** Rotation counterclockwise*, suction port pump  **6**	SAE-2-hole flange  **0**	Involute gearing  **0**
	VDMA-2-hole flange  **4**	Keyway connection  **1**

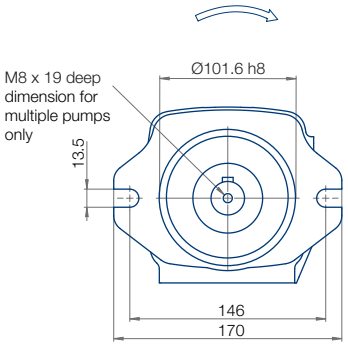
* Direction of rotation free selectable in the illustrated mounting flange / shaft end combination.

IPC 4, Rotation and Dimensions (mounting flange 7, shaft end 1)

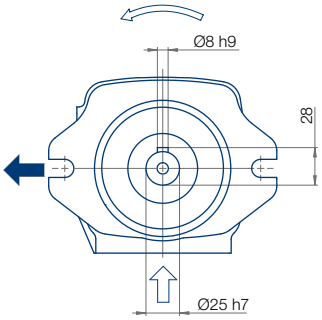
Rotation clockwise (cw)

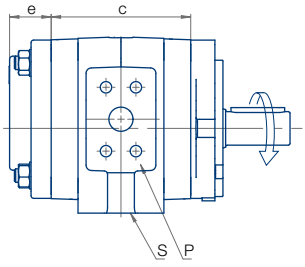


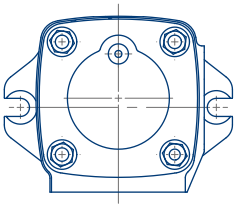


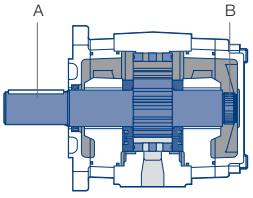


Rotation counter-clockwise(ccw)



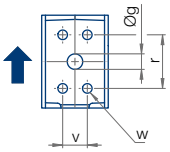




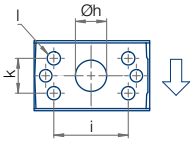


Allowed input torques:
Input shaft A: 335 Nm
Secondary shaft B: 190 Nm

Pressure port (P)



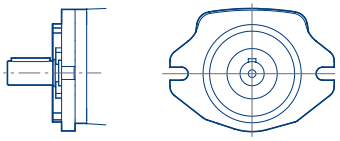
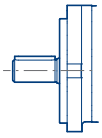
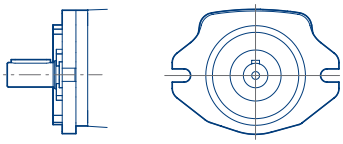
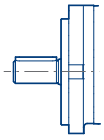
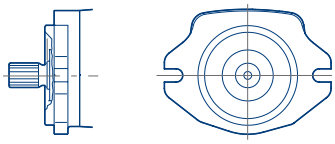
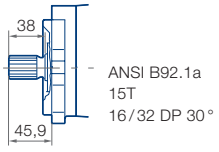
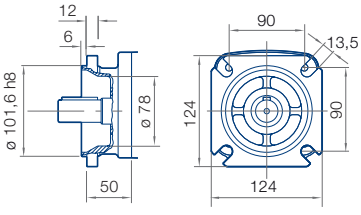
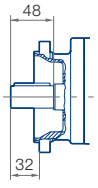
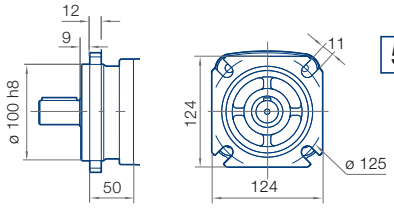
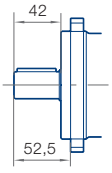
Suction port (S)



Type / Delivery	Dimensions											Weight	SAE Flange No.	
	c	x	e	g	h	i	k	l	r	v	w		↑	↓
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Thread	[mm]	[mm]	Thread	[kg]		
IPC 4 – 13	88.5	57.2	31	14	25	52.4	26.2	M10x15	38.1	17.5	M8x13	7.8	10	12
IPC 4 – 16	92.5	57.2	31	18	30	58.7	30.2	M10x15	47.6	22.3	M10x15	8.1	11	13
IPC 4 – 20	98	57.2	31	18	30	58.7	30.2	M10x15	47.6	22.3	M10x15	8.4	11	13
IPC 4 – 25	104	63.2	31	18	40	69.9	35.7	M12x20	47.6	22.3	M10x15	8.6	11	30
IPC 4 – 32	113	63.2	31	18	40	69.9	35.7	M12x20	47.6	22.3	M10x15	9.2	11	30

* Ensure the M10x1plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm during pumping operation. Dependent on the pump position, filling or ventilation is possible here prior to commissioning.

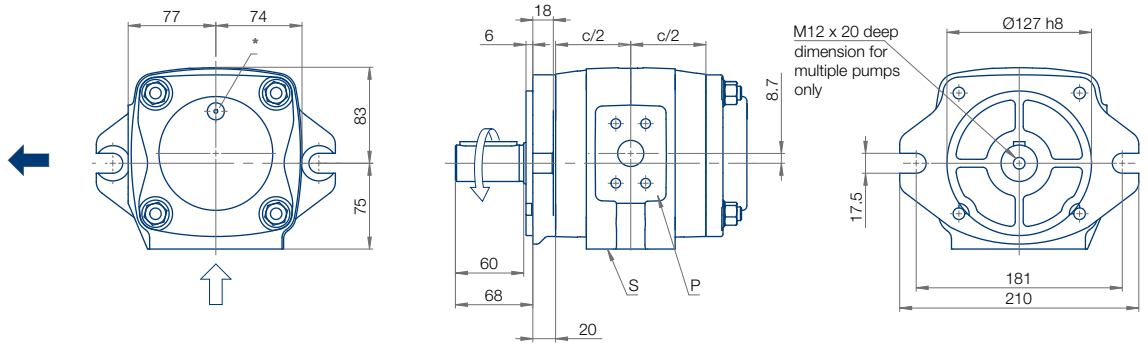
IPC 4, Design ans Dimensions

Rotation, Suction port	Mounting flange	Shaft end
Standard		
Rotation clockwise, suction port pump  **1**	SAE-2-hole flange  **7**	Keyway connection  **1**
Variant		
Rotation counterclockwise, suction port pump  **6**	SAE-2-hole flange  **7**	Keyway connection  **1**
Rotation clockwise*, suction port pump  **1**	SAE-2-hole flange  **7**	Involute gearing  **0**
Rotation counterclockwise*, suction port pump  **6**	SAE-4-hole flange  **1**	Keyway connection  **1**
	VDMA-4-hole flange  **5**	Keyway connection  **1**

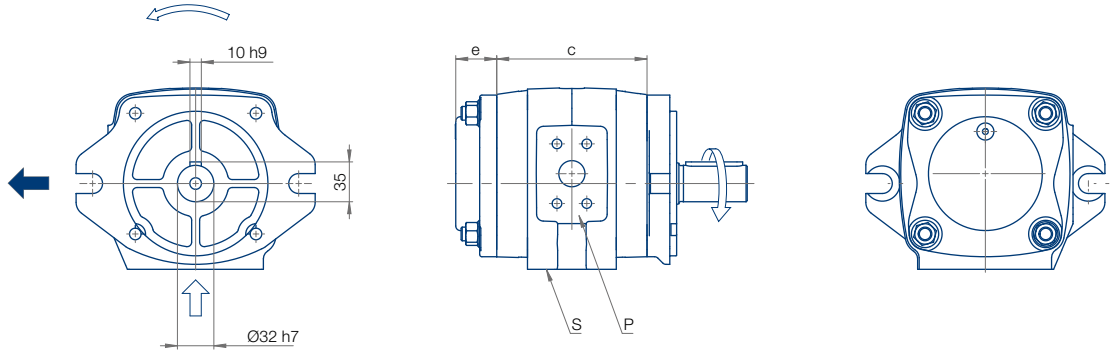
* Direction of rotation free selectable in the illustrated mounting flange / shaft end combination.

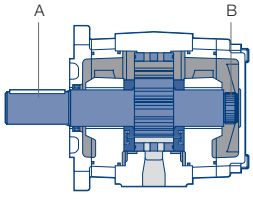
IPC 5, Rotation and Dimensions (mounting flange 0, shaft end 1)

Rotation clockwise (cw)



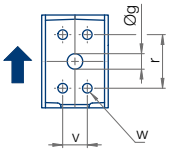
Rotation counter-clockwise(ccw)



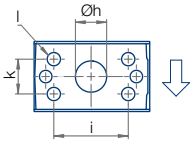


Allowed input torques:
Input shaft A: 605 Nm
Secondary shaft B: 400 Nm

Pressure port (P)



Suction port (S)

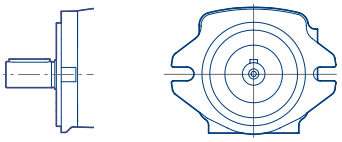
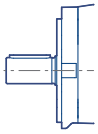
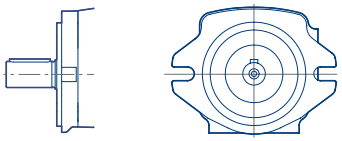
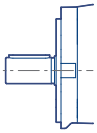
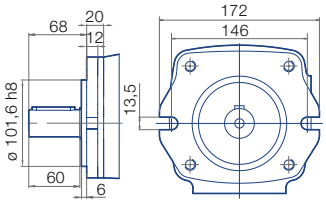
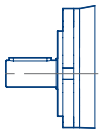
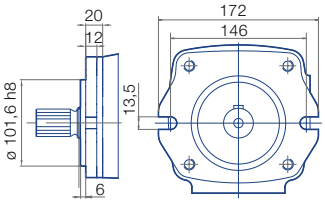
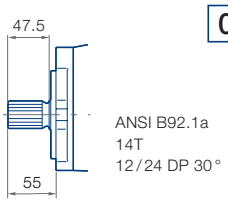
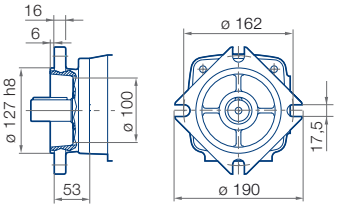
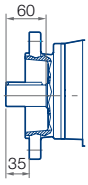
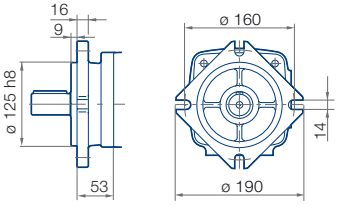
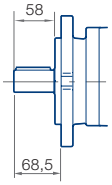


Type / Delivery	Dimensions										Weight	SAE Flange No.	
	c	e	g	h	i	k	l	r	v	w		↑	↓
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Thread	[mm]	[mm]	Thread	[kg]		
IPC 5 – 40	125	36	19	35	69.9	35.7	M12 x 20	52.4	26.2	M10 x 15	13.4	12	30
IPC 5 – 50	132	36	21	40	77.8	42.9	M12 x 20	52.4	26.2	M10 x 15	14.1	12	15
IPC 5 – 64	143	36	23	40	77.8	42.9	M12 x 20	52.4	26.2	M10 x 15	14.8	12	15

* Ensure the M10x1plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm during pumping operation. Dependent on the pump position, filling or ventilation is possible here prior to commissioning.

Note! In case of oil-immersed installation of the oil pump flange variant 0 can not be used. For this special case, the flange version 7 will be used.

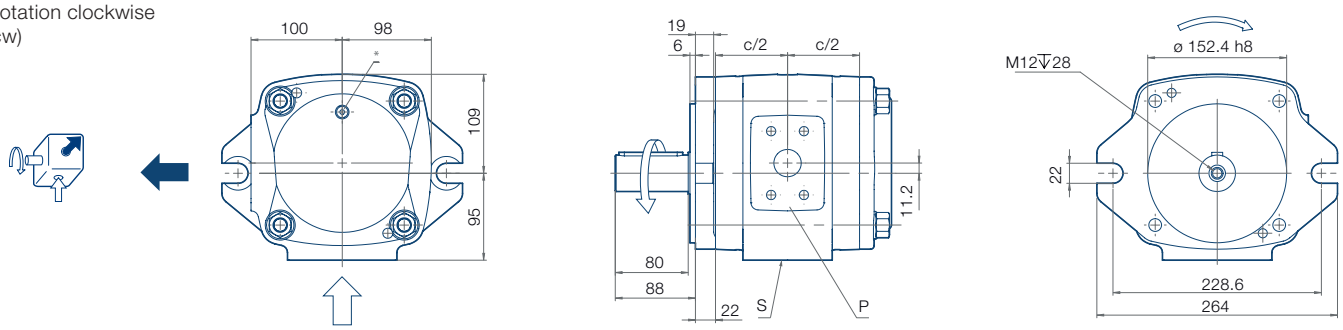
IPC 5, Design ans Dimensions

Rotation, Suction port	Mounting flange	Shaft end
Standard		
Rotation clockwise, Suction port pump  **1**	SAE-2-hole flange  **0**	Keyway connection  **1**
Variant		
Rotation counterclockwise, suction port pump  **6**	SAE-2-hole flange  **0**	Keyway connection  **1**
Rotation clockwise*, suction port pump  **1**	SAE-2-hole flange  **7**	Keyway connection  **1**
sotation counterclockwise*, Suction port pump  **6**	SAE-2-hole flange  **7**	Involute gearing  **0**
	SAE-4-hole flange  **1**	Keyway connection  **1**
	VDMA-4-hole flange  **5**	Keyway connection  **1**

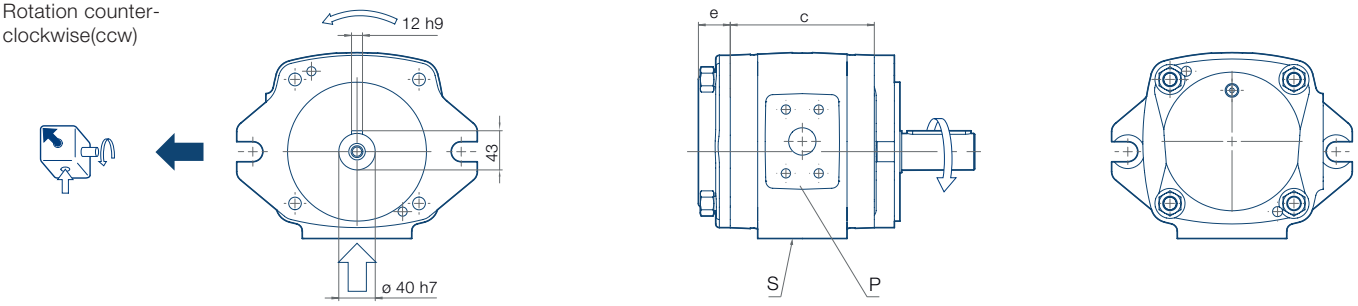
* Direction of rotation free selectable in the illustrated mounting flange / shaft end combination.

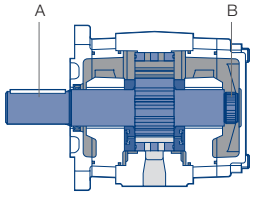
IPC 6, Rotation and Dimensions (mounting flange 0, shaft end 1)

Rotation clockwise (cw)



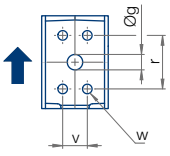
Rotation counter-clockwise(ccw)



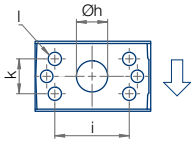


Allowed input torques:
Input shaft A: 1 050 Nm
Secondary shaft B: 780 Nm

Pressure port (P)



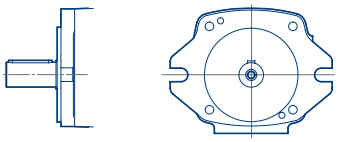
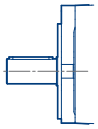
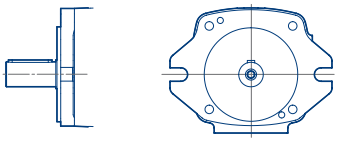
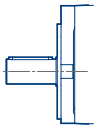
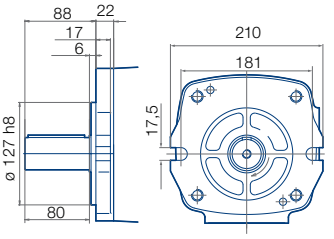
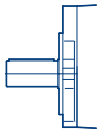
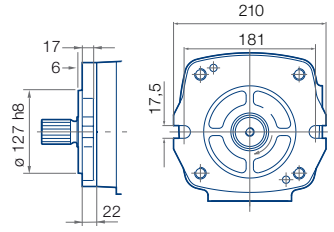
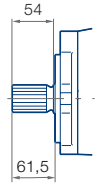
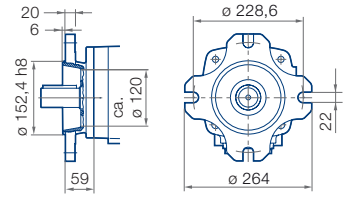
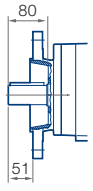
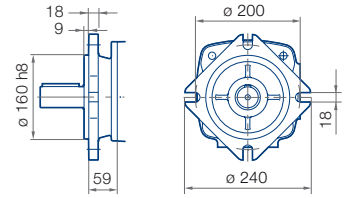
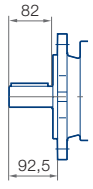
Suction port (S)



Type / Delivery	Dimensions										Weight	SAE Flange No.	
	c	e	g	h	i	k	l	r	v	w		↑	↓
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Thread	[mm]	[mm]	Thread	[kg]		
IPC 6 – 80	148	35	23	45	77.8	42.9	M12 x 20	69.9	36	M12 x 20	30.7	14	15
IPC 6 – 100	158	35	27	50	77.8	42.9	M12 x 20	69.9	36	M12 x 20	32.6	14	15
IPC 6 – 125	170	40	30	50	77.8	42.9	M12 x 20	69.9	36	M12 x 20	35.0	14	15

* Ensure the M10x1plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm during pumping operation. Dependent on the pump position, filling or ventilation is possible here prior to commissioning.

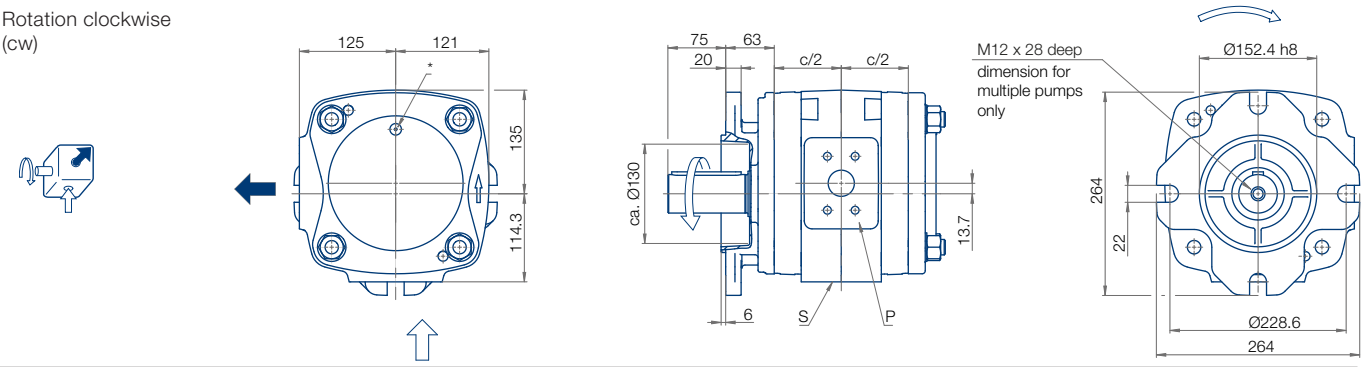
IPC 6, Design ans Dimensions

Rotation, Suction port	Mounting flange	Shaft end
Standard		
Rotation clockwise, suction port pump  **1**	SAE-2-hole flange  **0**	Keyway connection  **1**
Variant		
Rotation counterclockwise, suction port pump  **6**	SAE-2-hole flange  **0**	Keyway connection  **1**
Rotation clockwise*, suction port pump  **1** Rotation counterclockwise*, suction port pump  **6**	SAE-2-hole flange  **7**	Keyway connection  **1**
	SAE-2-hole flange  **7**	Involute gearing  ANSI B92.1a 17T 12 / 24 DP 30 ° **0**
	SAE-4-hole flange  **1**	Keyway connection  **1**
	VDMA-4-hole flange  **5**	Keyway connection  **1**

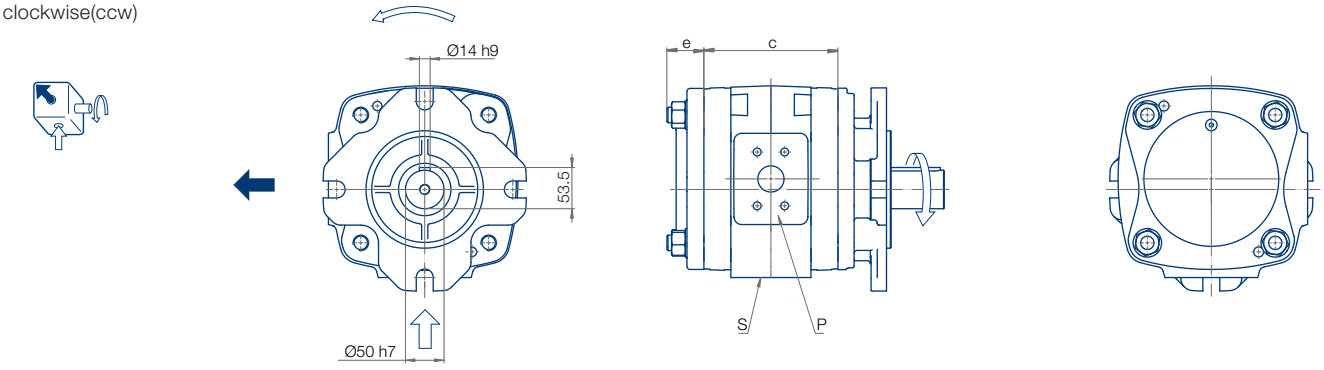
* Direction of rotation free selectable in the illustrated mounting flange / shaft end combination.

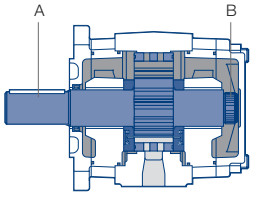
IPC 7, Rotation and Dimensions (mounting flange 0, shaft end 1)

Rotation clockwise (cw)



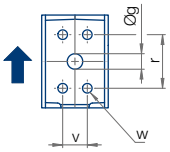
Rotation counter-clockwise(ccw)



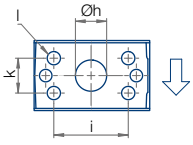


Allowed input torques:
Input shaft A: 1 960 Nm
Secondary shaft B: 1 200 Nm

Pressure port (P)



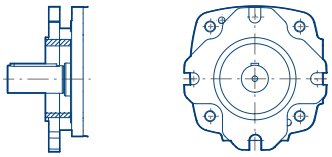
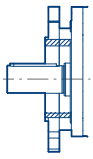
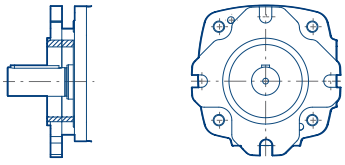
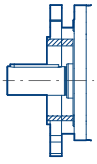
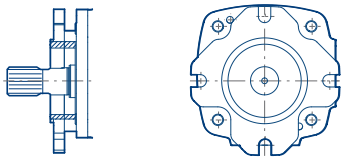
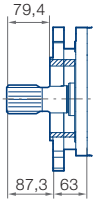
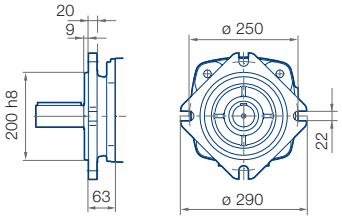
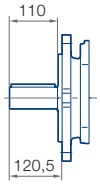
Suction port (S)



Type / Delivery	Dimensions										Weight	SAE Flange No.	
	c	e	g	h	i	k	l	r	v	w		⬆	⇩
	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]	Thread	[mm]	[mm]	Thread	[kg]		
IPC 7 – 160	162	48	30	56	88.9	50.8	M12 x 20	69.9	35.7	M12 x 20	50.0	14	16
IPC 7 – 200	174	46	34	62	88.9	50.8	M12 x 20	69.9	35.7	M12 x 20	54.0	14	16
IPC 7 – 250	188	42	38	72	106.3	61.9	M16 x 25	69.9	35.7	M12 x 20	59.0	14	17

* Ensure the M10x1plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm during pumping operation. Dependent on the pump position, filling or ventilation is possible here prior to commissioning.

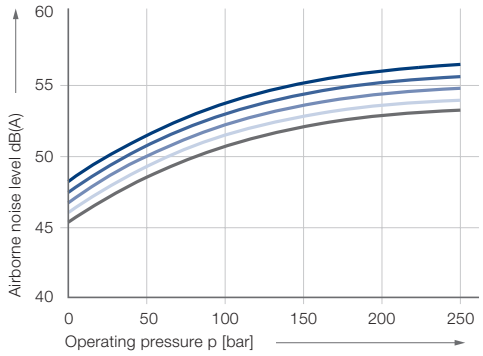
IPC 7, Design ans Dimensions

Rotation, Suction port	Mounting flange	Shaft end
Standard		
Rotation clockwise, suction port pump  **1**	SAE 4-hole flange  **1**	Keyway connection  **1**
Variant		
Rotation counterclockwise, suction port pump  **6**	SAE 4-hole flange  **1**	Keyway connection  **1**
Rotation clockwise*, suction port pump  **1** Rotation counterclockwise*, suction port pump  **6**	SAE 4-hole flange  **1**	Involute gearing  **0** ANSI B92.1a 15T 8/16 DP 30°
	VDMA 2-hole flange  **5**	Keyway connection  **1**

* Direction of rotation free selectable in the illustrated mounting flange / shaft end combination.

Measurements - Airborne noise level, Efficiency

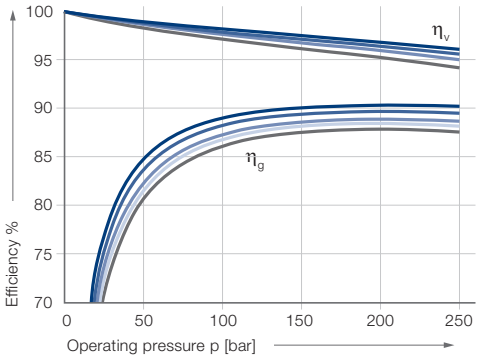
IPC 3 – Airborne noise level (measuring location 1 m axial)



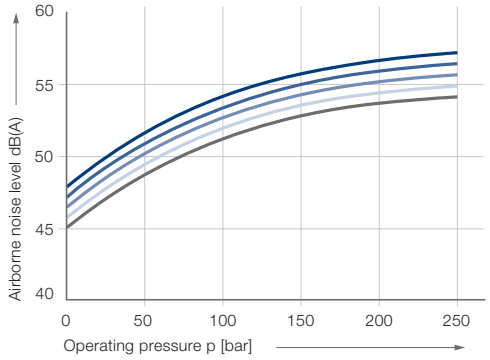
Characteristic curves:

IPC 3 – 10 IPC 3 – 8 IPC 3 – 6.3 IPC 3 – 5 IPC 3 – 3.5

IPC 3 – Efficiency η_v and η_g



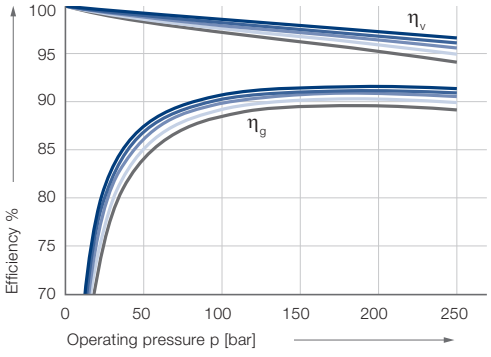
IPC 4 – Airborne noise level (measuring location 1 m axial)



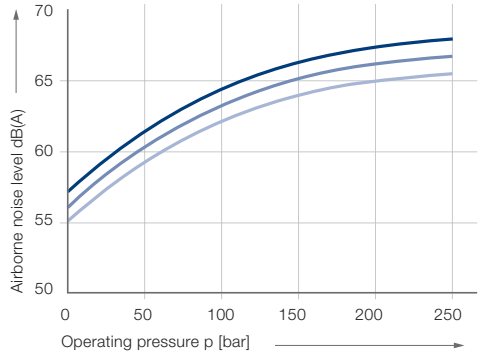
Characteristic curves:

IPC 4 – 32 IPC 4 – 25 IPC 4 – 20 IPC 4 – 16 IPC 4 – 13

IPC 4 – Efficiency η_v and η_g



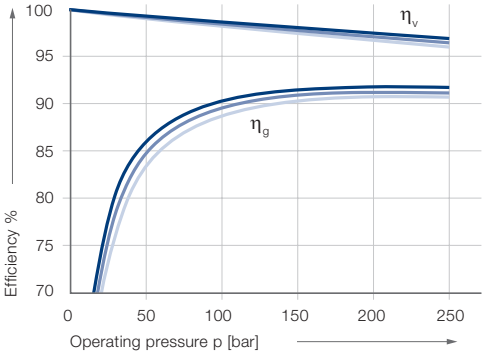
IPC 5 – Airborne noise level (measuring location 1 m axial)



Characteristic curves:

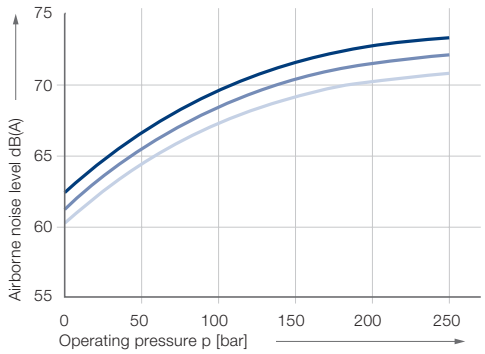
IPC 5 – 64 IPC 5 – 50 IPC 5 – 40

IPC 5 – Efficiency η_v and η_g



Measurements - Airborne noise level, Efficiency

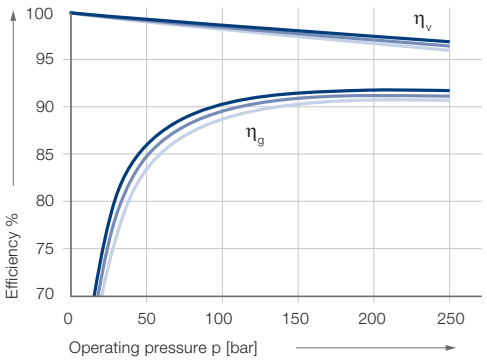
IPC 6 – Airborne noise level (measuring location 1 m axial)



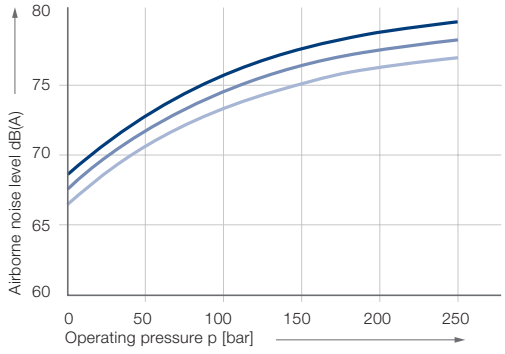
Characteristic curves:

IPC 6 – 125 IPC 6 – 100 IPC 6 – 80

IPC 6 – Efficiency η_v and η_g



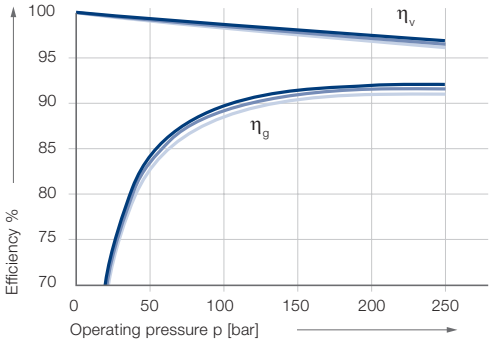
IPC 7 – Airborne noise level (measuring location 1 m axial)



Characteristic curves:

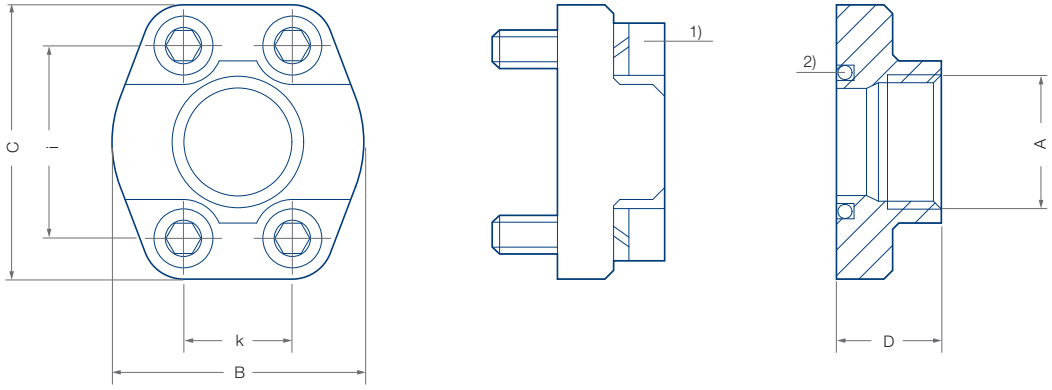
IPC 7 – 250 IPC 7 – 200 IPC 7 – 160

IPC 7 – Efficiency η_v and η_g



Measurement conditions:
Speed: 1500 min^{-1} / 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

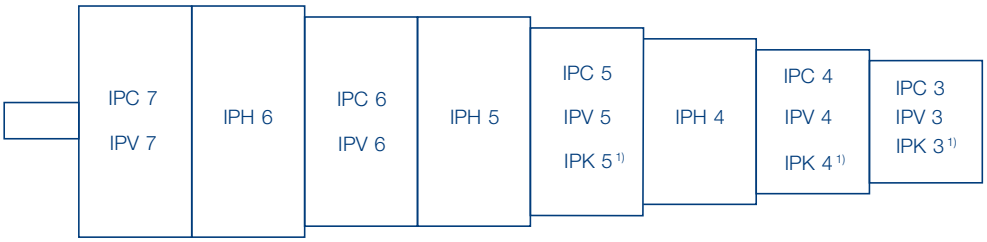


SAE flange no.	A	B	C	D	E[1]	i	k	S[2]	max. pressure
	thread	[mm]	[mm]	[mm]	seal ring	[mm]	[mm]	thread	[bar]
10	G ½	46	54	36	18.66 – 3.53	38.1	17.5	M 8	345
11	G ¾	50	65	36	24.99 – 3.53	47.6	22.3	M 10	345
12	G 1	55	70	38	32.92 – 3.53	52.4	26.2	M 10	345
13	G 1-¼	68	79	41	37.69 – 3.53	58.7	30.2	M 10	276
14[3]	G 1-½	82	98	50	47.22 – 3.53	69.9	35.7	M 12	345[3]
30	G 1-½	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 2-½	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

Wrench torque for screws according to ISO 6162

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

Multiple-Flow Pumps, Pump Combinations in order of type and size



1) Following an IPK pump it is not possible to fit a a pump of the series IPV, IPC or IPH.

Combinations of IPC pumps

- IPC 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.

Combinations of IPC/IP...-pumps

- It is possible to combine IPC pumps with other Voith Turbo H + L Hydraulic pump series (e.g. high-pressure pumps or low-pressure pumps).
- The pumps are arranged by types and sizes 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. Determine pressure ranges and define the appropriate pump serie(s).
2. Determine pump volume and select the appropriate size(s).
3. Define sequence of the pumps.
4. Check the torques.
5. Determine rotation and suction.
6. Specify mounting flange and shaft end.

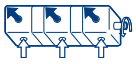
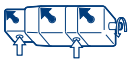
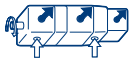
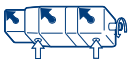
Mounting, assembly

- Multi-flow pumps are generally mounted to the drive by means of a flange. All information about the flange design and shaft end is found in the technical data sheet of the relevant pump series.
- For more information, for example about definition of the adapter housings, refer to brochure G 1714 (Voith multi-flow pump).

Designs

Rotation and suction

clockwise (cw) counterclockwise (ccw)

	2	7	
	1	6	
	2	7	
	1	6	
	3	8	
	3	8	
special design	4	9	special design

Mounting flange

0	1
4	5
7	

Designs and dimensions, please use technical data sheet of the relevant pump series.

- 0 SAE 2-hole flange
- 1 SAE 4-hole flange
- 4 VDMA-2-Loch-Flansch
- 5 VDMA 2-hole flange
- 7 SAE 2-hole flange (Variante)

Shaft end

1	0

Type Code

IPC 3 - 3.5 1 0 1

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

Mounting flange
0 SAE-2-hole
1 SAE-4-hole
4 VDMA-2-hole
5 VDMA-4-hole
7 SAE-2-hole, variant

Rotation, Suction port
1 Clockwise rotation, suction port pump
6 Counterclockwise rotation, suction port pump
4 Clockwise rotation, special design
9 Counterclockwise, special design

Delivery

size	avalaible delivery				
3	3.5	5	6.3	8	10
4	13	16	20	25	32
5	40	50	64		
6	80	100	125		
7	160	200	250		

Size

Type

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