

IPN Catalog

Low-pressure internal gear pumps



Benefits that impress

Internal gear pumps from Voith Turbo are working reliably in hundreds of thousands of machines around the world. Sophisticated technology, robust design and cost-efficient operation have convinced thousands of customers to trust Voith. Based on that trust, we have become the world market leader for high-pressure internal gear pumps with gap compensation.

Features that count

The market requires hydraulic pumps with compact dimensions, low operating noise levels, minimal pressure and volume pulsation, whilst at the same time being highly efficient. Voith Turbo has met these demands by developing IPN pumps based on the Superlip® principle. An innovative gap compensation between internal gear and pinion, as well as a volume-optimized involute gearing make a major contribution to meeting these requirements.

Machines that run

Rarely seen, but hard at work in countless machines, Voith Turbo internal gear pumps reliably provide high pressures. They are mainly used in the plastic and sheet-metal processing sectors, presses as well as conveying and lifting equipment. The pumps are also in demand for shipbuilding, municipal vehicles, power plants and special machine building.

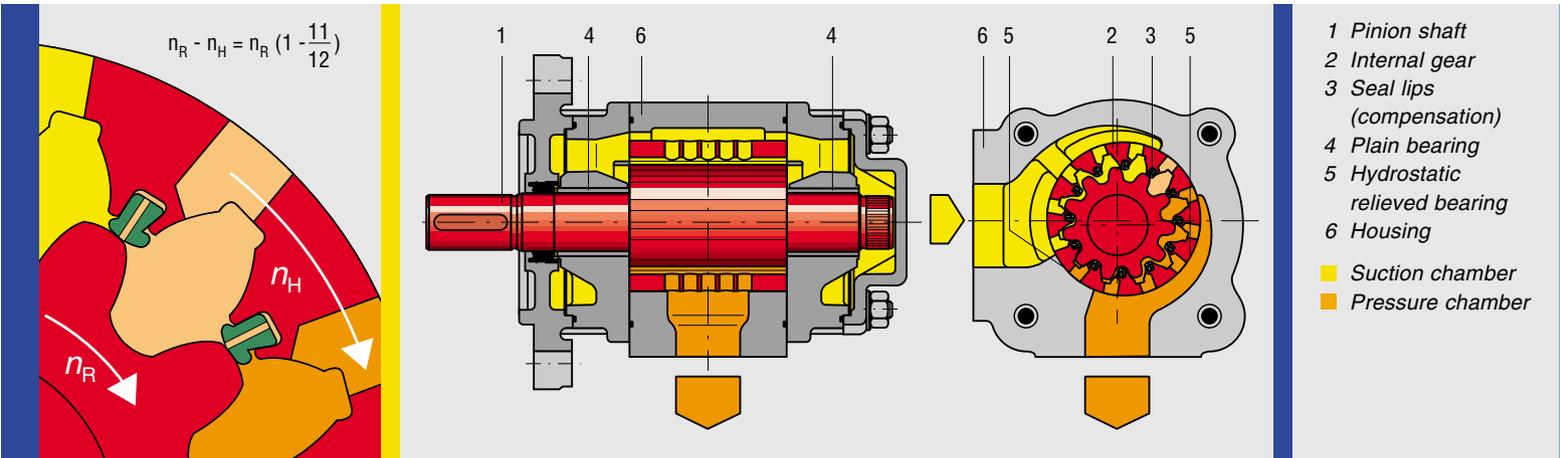
Contents



Pressure cast machine, pump with variable pump flow thanks to drive speed control

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Design and function



- 1 Pinion shaft
 - 2 Internal gear
 - 3 Seal lips (compensation)
 - 4 Plain bearing
 - 5 Hydrostatic relieved bearing
 - 6 Housing
- Suction chamber
■ Pressure chamber

Design features

- Internal gear principle
- Sleeve bearing
- Radial gap compensation with Voith Superlip principle
- Volume-optimized involute gearing

Product characteristics

- Long service life
- High volumetric efficiency
- High overall efficiency
- Very low flow and pressure pulsation
- Low noise levels
- Compact dimensions
- Low weight
- Wide speed range
- Excellent suction properties
- Large viscosity range
- Simple maintenance
- Multiple pumps and pump combinations possible
- Suitable for variable-speed drives (variable volume flow)
- Motor operation possible (energy recovery)

Function

When the gears rotate through an angle of 180° in the pump, the gear chamber opens and draws in the pressure fluid (as a rule, hydraulic oil) into the cavity between the pinion and the internal gear.

The gear chambers are sealed in a radial direction by gear meshing and by the seal lips and pinion head.

This design minimizes volume losses and increases efficiency.

When the gears rotate a further 180° the pinion teeth enter the gaps between the internal gear teeth and displace the pressure fluid.

Combinations

IPN pumps can be combined to form dual or multi-flow pumps. Combinations with other Voith Turbo pump series are also possible. Used in conjunction with pumps from the medium and high-pressure series, Voith equipment can handle a wide range of potential applications.

For further information on possible combinations, see page 14 and our brochure No. G1714 (Voith multi-flow pumps).

Combinations with third-party products are generally possible. We'll be happy to discuss your needs.

Variable volume flow

We supply complete hydraulic units with IPN pumps, asynchronous motors and frequency converters (EPA/EPAF system) to generate variable volume flows. For further information, see our brochure No. G1420 (Voith EPA System).

Performance data

Technical data

Design	Internal gear pump with radial gap compensation (Voith Superlip principle)
Type	IPN
Mounting types	SAE hole flange; ISO 3019/1 or VDMA hole flange; ISO 3019/2
Line mounting	SAE suction and pressure flange J 518 C code 61
Rotation direction	clockwise or anti-clockwise
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, briefly 0.6...3 bar)
Pressure fluid	HLP mineral oils DIN 51524, part 2 or 3
Viscosity range of the pressure fluid	10...300 mm ² s ⁻¹ (cSt)
Permissible start viscosity	max. 2000 mm ² s ⁻¹ (cSt)
Permissible temperature of the pressure fluid	-20...+80 °C
Necessary purity of the pressure fluid in accordance with NAS 1638	Class 8
Filtration	Filtration quota 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						
Type, size – delivery	Displacement per revolution [cm ³]	Speed		Delivery at 1500 min ⁻¹ [l/min]	Pressures within the range n _{min} ...n _{max}	
		min. [min ⁻¹]	max. [min ⁻¹]		Continuous pressure [bar]	Peak pressure [bar]
	IPN 4 – 32	32.1	400	3600	48.1	100
IPN 4 – 40	40.1	400	3600	60.1	80	100
IPN 4 – 50	50.2	400	3600	75.3	63	80
IPN 5 – 64	64.2	400	2500	96.3	100	125
IPN 5 – 80	79.9	400	2500	119.8	80	100
IPN 5 – 100	100.2	400	2500	150.3	63	80
IPN 6 – 125	125.0	400	2000	187.5	100	125
IPN 6 – 160	159.9	400	2000	239.8	80	100
IPN 6 – 200	199.7	400	2000	299.5	63	80

The values given apply for:

- Pumping of mineral oils with a viscosity of 20...40 mm²s⁻¹
- An input pressure of 0.8...3.0 bar

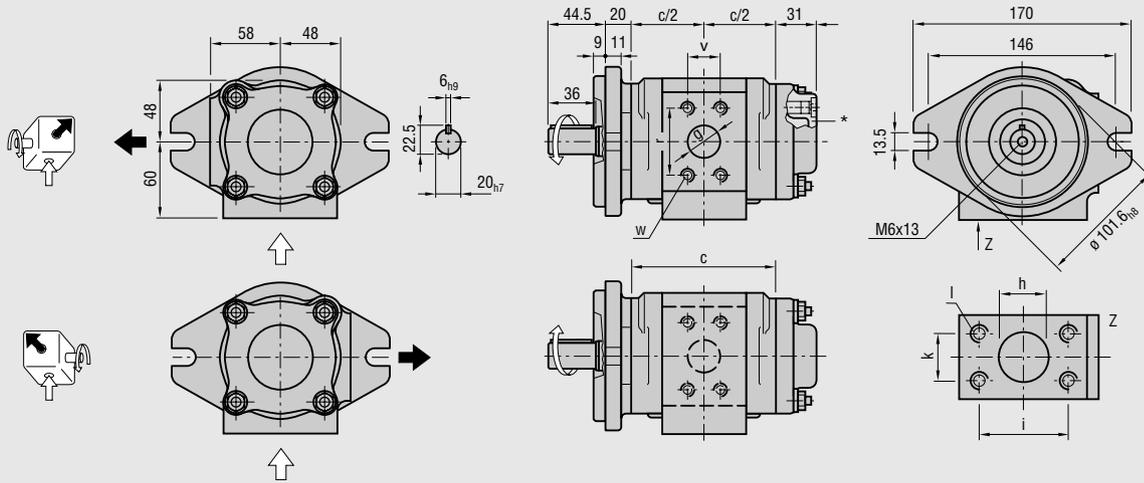
Notes:

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

IPN 4

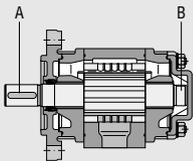
Standard design

Design and dimensions



* Ensure the M10x1 plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm during pumping operation. Depending on the pump position, filling or ventilation is possible here prior to commissioning.

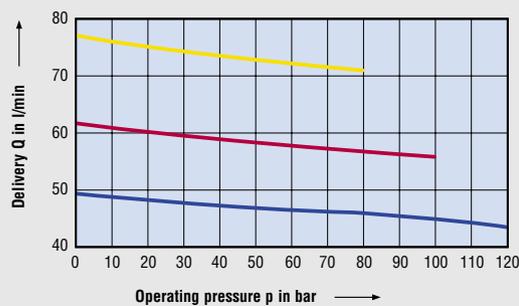
Design	Dimensions									Weight m [kg]	SAE flange no.	
	c [mm]	g [mm]	h [mm]	i [mm]	k [mm]	l thread	r [mm]	v [mm]	w thread		▲	▼
IPN 4 – 32	100.5	23	32	58.7	30.2	M10x15	52.4	26.2	M10x15	6.1	12	13
IPN 4 – 40	113.5	25	38	70	36	M12x20	52.4	26.2	M10x15	7.0	12	30
IPN 4 – 50	130	30	40	70	36	M12x20	58.7	30.2	M10x15	8.1	13	30



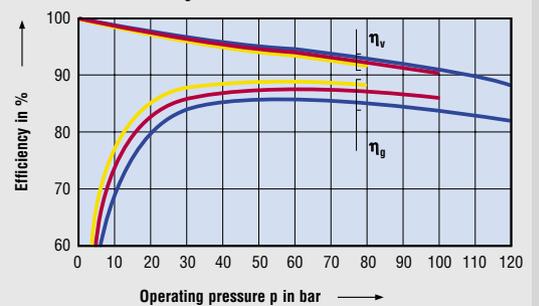
Allowed input torques:

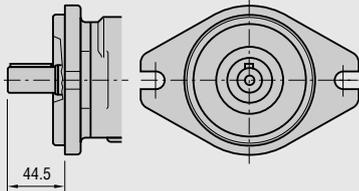
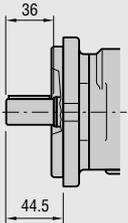
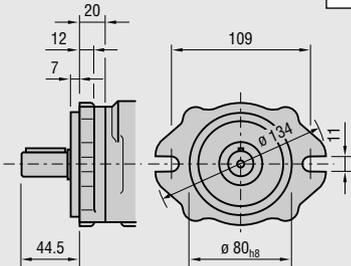
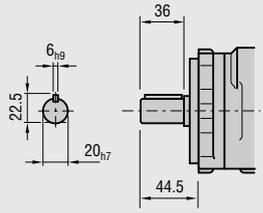
Input shaft A: 160 Nm
Secondary shaft B: 100 Nm

Delivery Q



Efficiency η_v and η_o

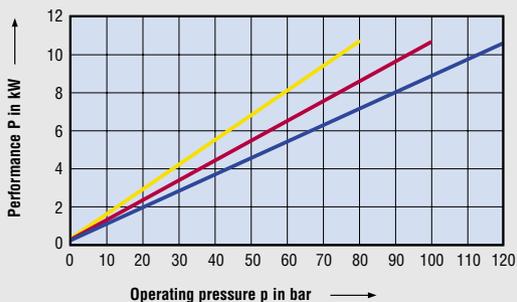


Type	Pump sizes	Rotation, suction connection	Mounting flange	Shaft end
IPN 4	32	Standard		
		Clockwise rotation, radial suction port	SAE 2-hole flange, dimensions on left	Parallel shaft with keyway connection, dimensions on left
	40			
	50			
		Variants		
		Anti-clockwise rotation, radial suction port		Involute gearing with 2-hole SAE flange
				ANSI B92.1a 13T 16/32 DP 30°
			VDMA 2-hole flange	
				

Designation according to type code

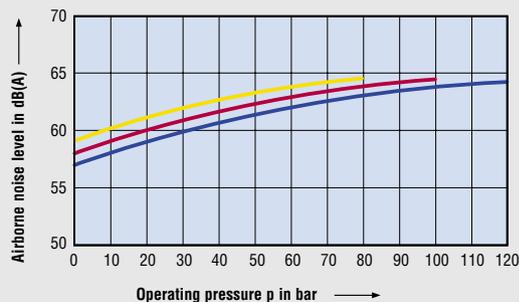
Type code/order designation, see page 13

Input power P



Airborne noise level

Measurement site 1 m axial



Measurement conditions:

Speed: 1500 min⁻¹
 Viscosity of pressure fluid: 46 mm²s⁻¹
 Operating temperature: 40 °C

Characteristic curves:

- IPN 4 – 32
- IPN 4 – 40
- IPN 4 – 50

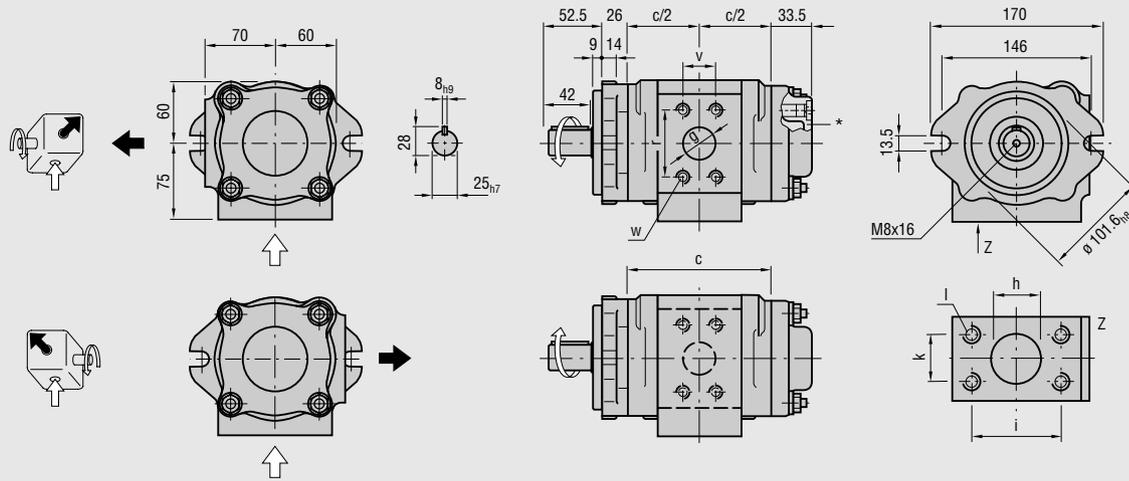
Note: Measurement taken in a low-noise room.

In an anechoic room, the measurements lie approx. 5 dB(A) lower.

IPN 5

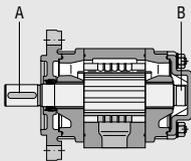
Standard design

Design and dimensions



* Ensure the M10x1 plug screw hexagon socket SW5, is tightened to a torque of 10 Nm during pumping operation. Depending on the pump position, filling or ventilation is possible here prior to commissioning.

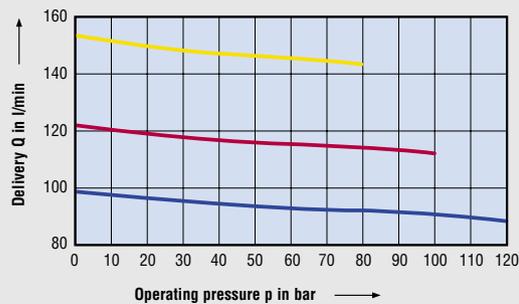
Design	Dimensions									Weight m [kg]	SAE flange no.	
	c [mm]	g [mm]	h [mm]	i [mm]	k [mm]	l thread	r [mm]	v [mm]	w thread		▲	▼
IPN 5 – 64	119.5	30	40	70	36	M12x20	58.7	30.2	M10x15	11.3	13	30
IPN 5 – 80	135	32	50	77.8	42.9	M12x20	58.7	30.2	M10x15	12.7	13	15
IPN 5 – 100	155	38	50	77.8	42.9	M12x20	70	36	M12x20	14.7	30	15



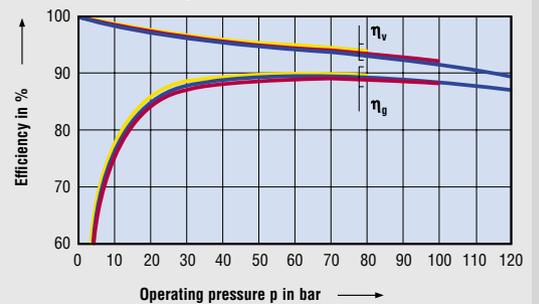
Allowed input torques:

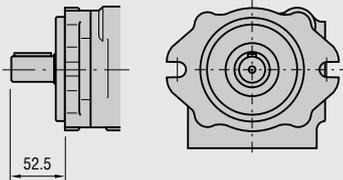
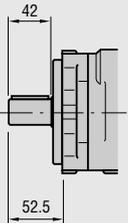
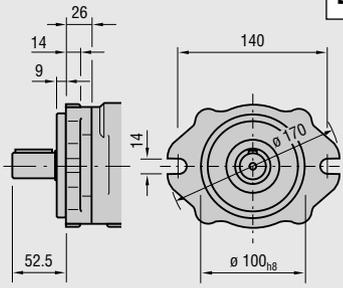
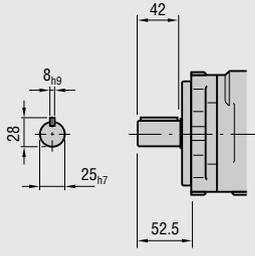
Drive shaft A: 295 Nm
Secondary shaft B: 200 Nm

Delivery Q



Efficiency η_v and η_g

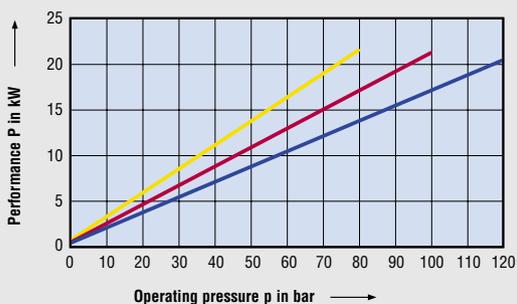


Type	Pump sizes	Rotation, suction connection	Mounting flange	Shaft end
IPN 5	64	Standard		
		Clockwise rotation, radial suction port	SAE 2-hole flange, dimensions on left	Parallel shaft with keyway connection, dimensions on left
	80			
	100			
		Variants		
		Anti-clockwise rotation, radial suction port		Involute gearing with 2-hole SAE flange
				ANSI B92.1a 15T 16/32 DP 30°
			VDMA 2-hole flange	
				

Designation according to type code

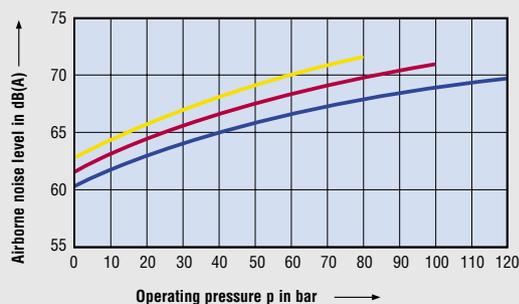
Type code/order designation, see page 13

Input power P



Airborne noise level

Measurement site 1 m axial



Measurement conditions:

Speed: 1500 min⁻¹
 Viscosity of pressure fluid: 46 mm²s⁻¹
 Operating temperature: 40 °C

Characteristic curves:

- IPN 5 – 64
- IPN 5 – 80
- IPN 5 – 100

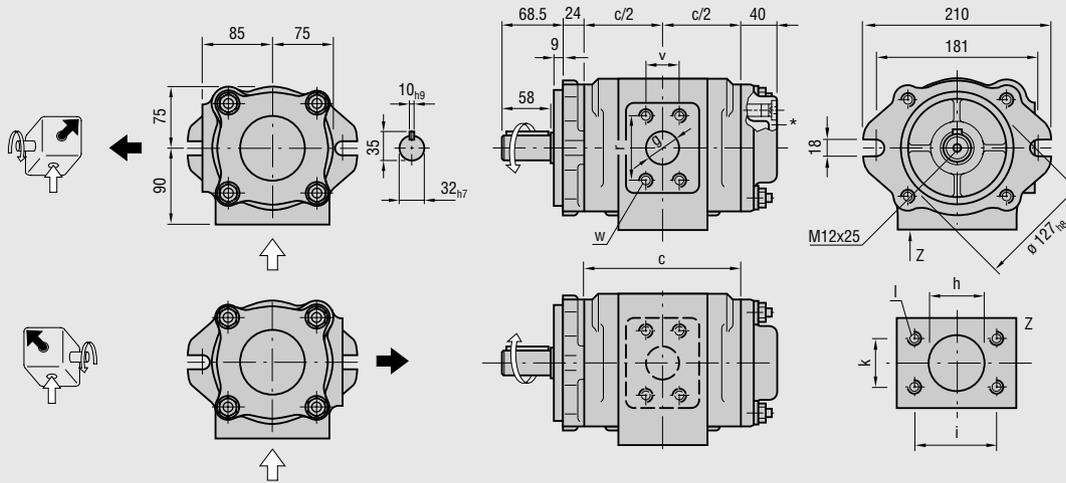
Note: Measurement taken in a low-noise room.

In an anechoic room the measured values lie approx. 5 dB(A) lower.

IPN 6

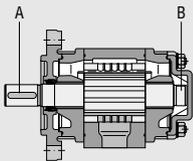
Standard design

Design and dimensions



* Ensure the M10x1 plug screw, hexagon socket SW5, is tightened to a torque of 10 Nm during pumping operation. Depending on the pump position, filling or ventilation is possible here prior to commissioning.

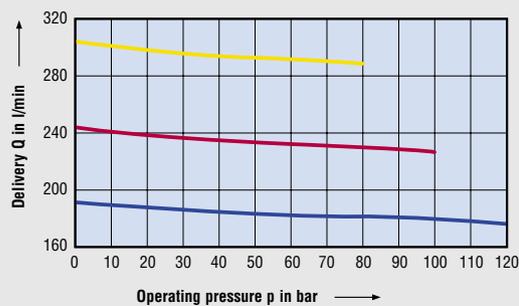
Design	Dimensions									Weight m [kg]	SAE flange no.	
	c [mm]	g [mm]	h [mm]	i [mm]	k [mm]	l thread	r [mm]	v [mm]	w thread		▲	▼
IPN 6 – 125	151	38	50	77.8	42.9	M12x20	70	36	M12x20	19.5	30	15
IPN 6 – 160	172.5	40	62	89	50.8	M12x20	70	36	M12x20	22.1	30	16
IPN 6 – 200	197	45	72	106.3	62	M16x25	77.8	42.9	M12x20	25.2	15	17



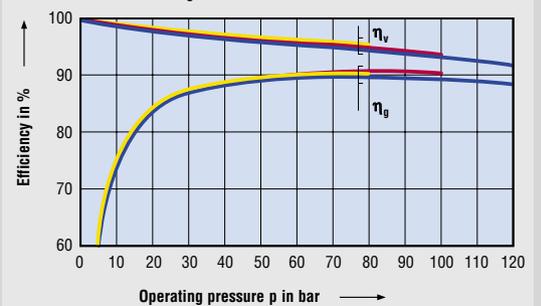
Allowed input torques:

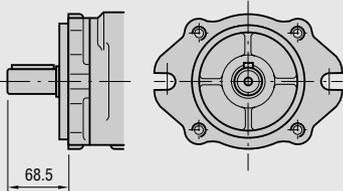
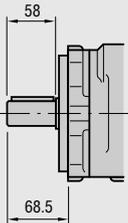
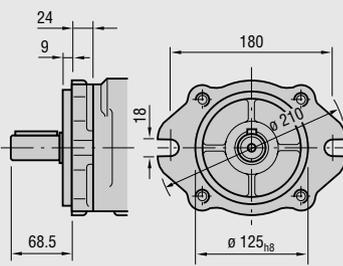
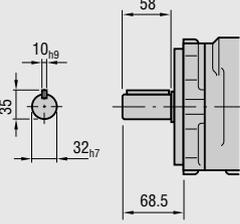
Input shaft A: 605 Nm
Secondary shaft B: 400 Nm

Delivery Q



Efficiency η_v and η_g

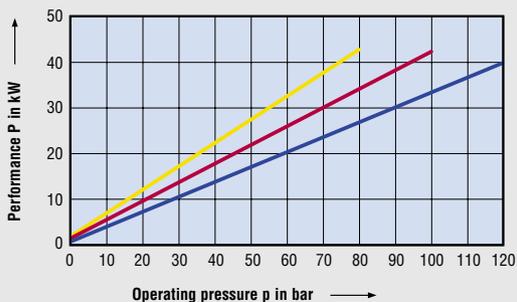


Type	Pump sizes	Rotation, suction connection	Mounting flange	Shaft end
IPN 6	125 160 200	Standard		
		Clockwise rotation, radial suction port	SAE 2-hole flange, dimensions on left	Parallel shaft with keyway connection, dimensions on left
				
Variants				
		Anti-clockwise rotation, radial suction port		Involute gearing with 2-hole SAE flange
				ANSI B92.1a 14T 12/24 DP 30°
			VDMA 2-hole flange	
				

Designation according to type code

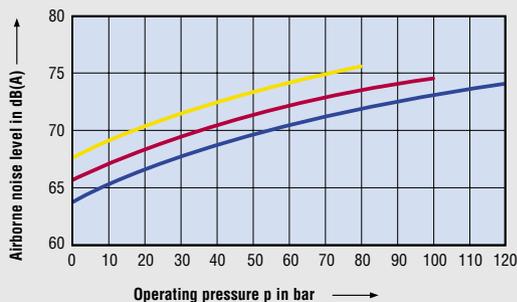
Type code/order designation, see page 13

Input power P



Airborne noise level

Measurement site 1 m axial



Measurement conditions:

Speed: 1500 min⁻¹
 Viscosity of pressure fluid: 46 mm²s⁻¹
 Operating temperature: 40 °C

Characteristic curves:

- IPN 6 – 125
- IPN 6 – 160
- IPN 6 – 200

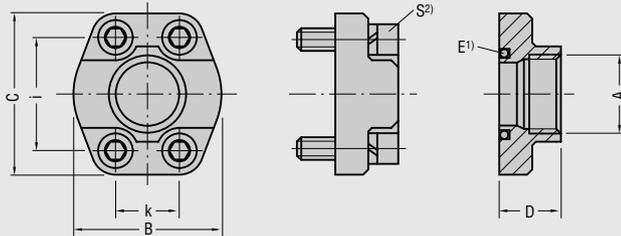
Note: Measurement taken in a low-noise room.

In an anechoic room the measured values lie approx. 5 dB(A) lower.

SAE suction and pressure flanges

according to SAE J 518 C code 61

SAE flange, 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 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	22.2	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 ³⁾	G 1-1/2	82	98	50	47.22 – 3.53	70	36	M 12	345 ³⁾
30	G 1-1/2	78	93	45	47.22 – 3.53	70	36	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	89	50.8	M 12	172
17	G 3	124	134	50	85.32 – 3.53	106.3	62	M 16	138
18	G 4	146	162	48	110.72 – 3.53	130	77.8	M 16	34

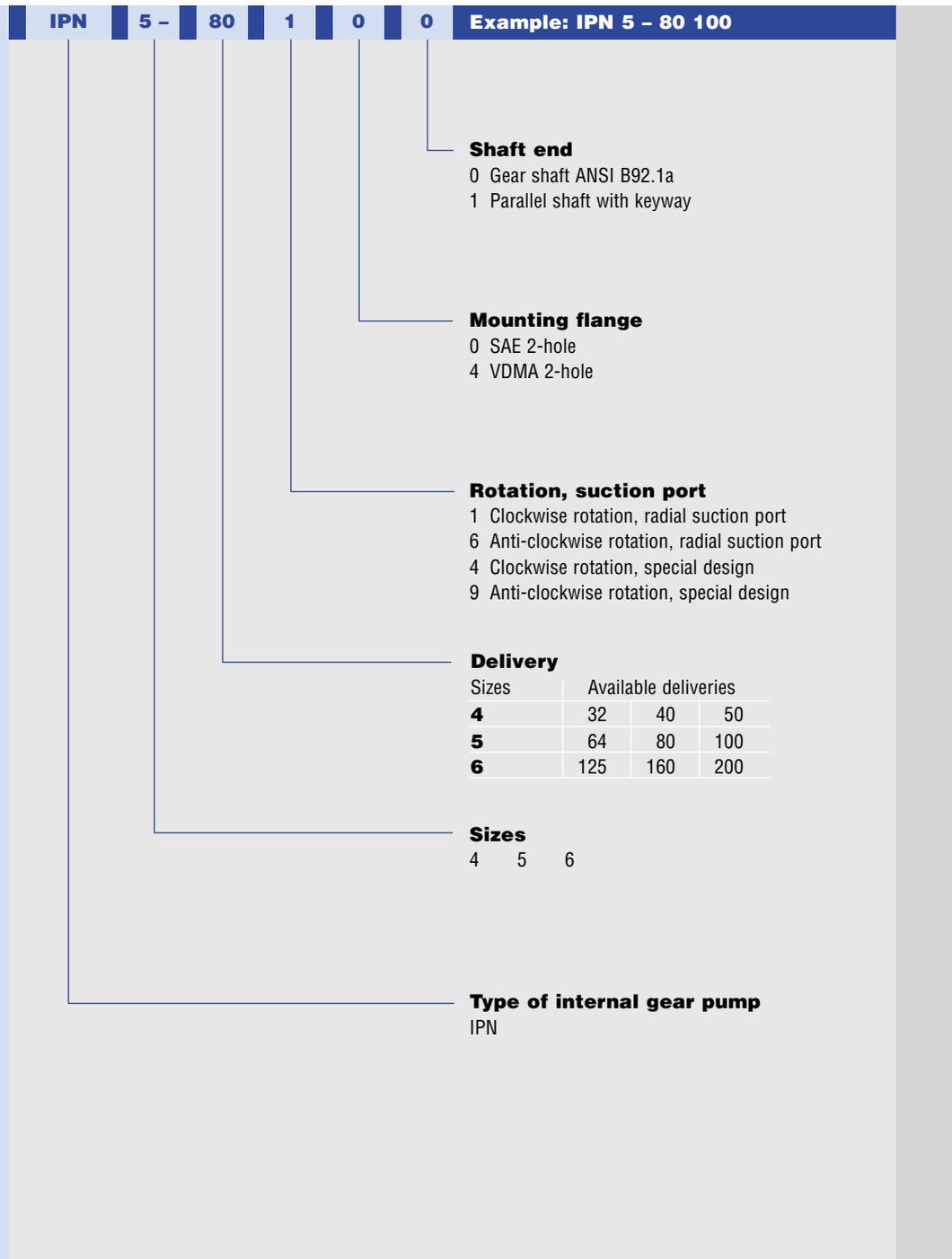
¹⁾ Round seal ring (O-ring) ISO-R 1629 NBR

²⁾ Machine head screw EN ISO 4762

³⁾ Special design, deviating from SAE J 518 C code 61

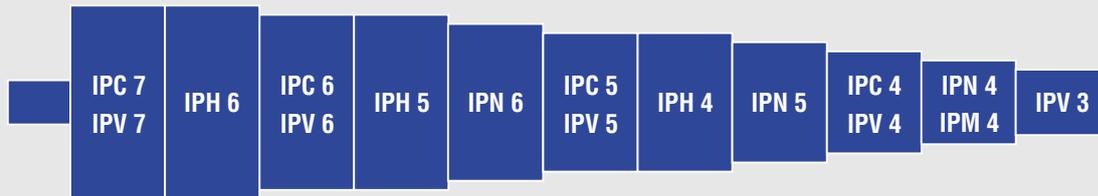
Type code

Order designation



Multi-flow pumps

Pump combinations



Pump combinations in order of type and size

Combinations of IPN pumps

- IPN pumps of the same or different sizes can be combined to form multi-flow pumps.
- All sizes with the respective pump volumes are available as two or three-flow pumps; four-flow pumps must be designed by Voith Turbo.
- The pumps are arranged in increasing order according to size and delivery.

Combination of IPN/IP... pumps

- It is possible to combine IPN pumps with other Voith Turbo pump series (e.g. medium-pressure pumps IPC or high-pressure pumps IPV).
- The pumps are arranged by type and size, 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.

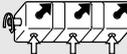
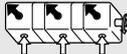
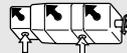
Selection

1. Determine the pressure ranges and then choose the appropriate pump series.
2. Determine the deliveries, and then select the appropriate size(s).
3. Define the sequence of the pumps.
4. Check the torque.
5. Determine the direction of rotation and suction.
6. Specify the mounting flange and shaft end.

Connection, assembly

- As a rule, multi-flow pumps are mounted to the drive using a flange. All information on flange designs and shaft ends is contained in the relevant pump series catalog.
- For further relevant information, such as how to determine the adapter housing, see brochure No. G 1714 (Voith Multi-flow Pumps).

Designs

Rotation and suction	Mounting flange	Shaft end
<p>clockwise   anti-clockwise</p>  <div style="display: inline-block; vertical-align: middle; margin: 0 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">6</div> </div> 	  	 
 <div style="display: inline-block; vertical-align: middle; margin: 0 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">6</div> </div> 	<div style="display: inline-block; vertical-align: middle; margin: 0 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">0</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">1</div> </div>	<div style="display: inline-block; vertical-align: middle; margin: 0 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">1</div> <div style="border: 1px solid black; padding: 2px 5px;">0</div> </div>
 <div style="display: inline-block; vertical-align: middle; margin: 0 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">3</div> <div style="border: 1px solid black; padding: 2px 5px;">8</div> </div> 	<div style="display: inline-block; vertical-align: middle; margin: 0 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">4</div> <div style="border: 1px solid black; padding: 2px 5px;">5</div> <div style="border: 1px solid black; padding: 2px 5px;">5</div> </div>	
 <div style="display: inline-block; vertical-align: middle; margin: 0 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">3</div> <div style="border: 1px solid black; padding: 2px 5px;">8</div> </div> 	<p>For designs and dimensions, see catalog of the relevant pump series.</p>	<p>For designs and dimensions, see catalog of the relevant pump series.</p>
<p>Special design</p> <div style="display: inline-block; vertical-align: middle; margin: 0 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">4</div> <div style="border: 1px solid black; padding: 2px 5px;">9</div> </div> <p>Special design</p>	<div style="border: 1px solid black; padding: 2px 5px; display: inline-block; margin-bottom: 5px;">0</div> SAE 2- hole flange <div style="border: 1px solid black; padding: 2px 5px; display: inline-block; margin-bottom: 5px;">1</div> SAE 4-hole flange <div style="border: 1px solid black; padding: 2px 5px; display: inline-block; margin-bottom: 5px;">4</div> VDMA 2-hole flange <div style="border: 1px solid black; padding: 2px 5px; display: inline-block; margin-bottom: 5px;">5</div> VDMA 4-hole flange <div style="border: 1px solid black; padding: 2px 5px; display: inline-block; margin-bottom: 5px;">7</div> SAE 2-hole flange (variant)	

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