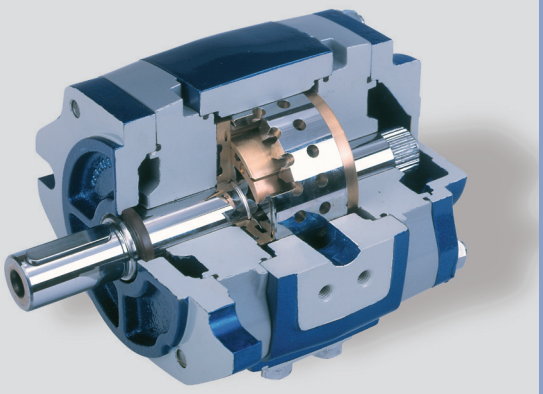
Voith Turbo

VOITH

Internal Gear Pumps
IPH – IPC – IPV(S) – IPVP – IPVA – IPN(E) – IPM(E)



Operating instructions | 2012-01

hydraulic

If you have any questions about our products, please contact us with the serial number and the model number at:

Voith Turbo H + L Hydraulic GmbH & Co. KG
Service Department
Schuckertstr. 15
71277 Rutesheim
Germany

Additional contact information:

Fon +49 7152 992 3
Fax +49 7152 992 400
E-Mail vthl.service@voith.com
Internet www.voithturbo.com

Voith Turbo H + L Hydraulic GmbH & Co. KG
Schuckertstr. 15
D-71277 Rutesheim
E-Mail: sales-rut@voith.com

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1 Quick start guide

1.1 Description, use

All Voith internal gear pumps are delivered with a quick start guide. The guide describes how to commission the internal gear pump correctly on initial start-up.
The quick start guide is no replacement for the main comprehensive operating instructions, and should instead be used solely as a supplement.

The quick start guide comprises two DIN A4 pages only, and is written in German and English. Other languages are available on request.

1.2 Quick start guide Voith Internal gear pumps

Before installing and commissioning the internal gear pumps, you must have first read and understood the operating instructions.

Important notes:

- Assembly and commissioning must only be carried out by trained personnel who have been briefed on the system.
- The pumps must only be operated with the permitted data.
- The hydraulic system must be depressurized before any work is carried out on the pumps.
- Safety guards must be attached, and the existing safety guards must not be removed.
- Always ensure all fastening screws are correctly attached, and if necessary check the correct tightening torque.
- The general safety and accident prevention guidelines must be observed.

General:

- The pumps delivered by us are assembled in accordance with the current drawings and bills of material. No alterations of any kind are allowed, otherwise this will void the warranty.
- Repairs may only be made by the manufacturer or authorized dealers and outlets. No guarantee will be accepted for repairs made by the customer.

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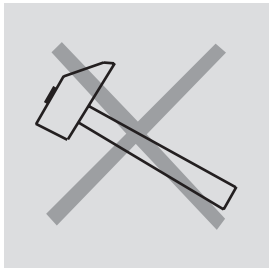
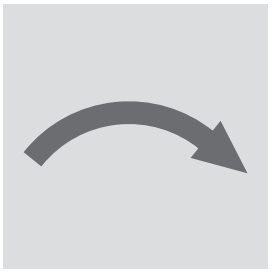
Preparation

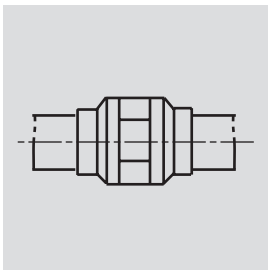
- Assemble the coupling parts without unnecessary force (i.e. without knocks or pressing). Use the thread tapped hole in the shaft end.



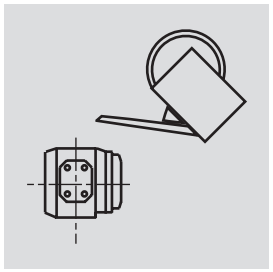
- Check that the direction of rotation of the drive and the pump match.
  Note the arrow indicating the direction of rotation on the pump housing or the rating plate.



- Attach the pump and ensure there are no axial or transverse forces acting on the drive (coupling direction).



- Remove the core plugs on the pump.
- Prefill the pump with operating fluid via the suction port.
- Relieve the delivery pipe, set the directional control valve and/or pressure limiting valve to unpressurized circulation (note the charging pressure through any existing check valves).
- Pipelines must be leak-proof.
- Delivery pipes must not be filled with operating fluid.



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Commissioning

- Starting up the electric motor in inch mode.
- Check the direction of rotation.
- Bleed the delivery pipe, e.g. via the measuring connection, until operating fluid is discharged free of bubbles. The required operating pressure may now be set, but not before.
- With a preloading valve of >1 bar, the system must be bled between the pump and the preloading valve.
- If the suction port is situated below and the oil level is below the pump, take special care during the bleed process!
- The system is only bled when there are no jarring noises and there is no foam build-up in the tank.
- The pump can now be loaded with the operating pressure.
- With a positive oil inlet, the pump must be bled via the bleeder screw in the end cover. Opening the bleeder screw allows the air to be bled out of the pump (while the pump is shut down).
- The pump must not be operated with an opened bleeder screw. Operating the pump while the bleeder screws are open will damage the pump.

If these points are ignored, the pump could be damaged.

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2 About this guide

These operating instructions describe how to install and operate the internal gear pumps in a normal atmosphere, or with operating fluid.

If used in an area at risk of explosions, please follow the necessary standards, e.g. ATEX.

Before using internal gear pumps, ensure you have carefully read and understood the operating instructions. By using the operating instructions, you will become familiar with basic operations involving the internal gear pump, from installation through to recycling.

These instructions contain important notes about operating the pump safely and correctly. Following this information will help:

- avoid danger
- reduce repair costs and downtime
- increase the reliability and service life of the pump

In addition to the operating instructions, you must observe the

- local laws, ordinances, guidelines, and standards,
- local regulations for accident prevention and environmental protection,
- operating instructions of the system or machine in which the pump is used

A copy of the operating instructions must be available to operating personnel at all times.

The operating instructions for internal gear pumps are a component of the manual for the overall system.

2.1 Product observation

Voith is legally obligated to observe our products, even after their delivery.

Please inform us about anything that may be of interest to us.

Specifically, this includes:

- altered operating data
- experiences with the pump
- any recurring malfunctions
- damage to the pump
- difficulties with the operating instructions

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2.2 Other documentation

In addition to these instructions, other documentation on the internal gear pumps is also available. These documents are an integral addition to the operating instructions under the terms of EC Directive 2006/42/EG.

You can request these documents from Voith Turbo H + L Hydraulic:

- Planning, installing, and commissioning Voith internal gear pumps
- Internal gear pump catalogs
- General conditions of delivery
- ATEX
- Risk assessment report in accordance with EN 13463 (positive list) relating to pump type IP** by VOITH TURBO for use in explosive atmospheres, e I/II M2/2GD ck IIB (T4)
  Extract from operating instructions relevant to explosion protection in respect of type IP*** explosion-protected pumps
- Declaration of conformity: ExGuide 04 ATEX 021

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2.3 Symbols used

The symbols in the operating instructions should help you use the operating instructions and device both quickly and safely.

2.3.1 General symbols

Advanced Organizer
The Advanced Organizer provides concise information about the contents in the subsequent chapter.

Note
Application notes and other useful information.

Handling steps
The defined sequence of the handling steps makes it easier to use the pump correctly and safely.

1.
2.
3.

Result
The result of a sequence of handling steps are described here.

✓

List
Indicates individual list elements.

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2.3.2 Safety symbols

The safety symbol graphically represents a source of danger. The safety symbols in the working range of the machine/system and the entire technical documentation corresponds to the coordinated standard EN 61310 section 2: Safety of machines – displaying, identifying, and operating, or EC Directive 92/58/EEC (minimum requirements for health and/or safety signs at work).

Warning symbols

Warning about a general danger	This warning symbol is placed before activities which can lead to multiple sources of danger.	
Warning of hazardous electrical voltage	This warning symbol is placed before activities where there is a risk of electric shock, with potentially fatal consequences.	
Warning about hot surface	This warning symbol is placed before activities where there is danger of hot surfaces.	
Warning about the risk of crushing	This warning symbol is placed before activities where there is a risk of being crushed, with potentially fatal consequences.	
Warning about hand injuries	This warning symbol is placed before activities where there is a risk of hand injury.	
Warning about danger due to rotating parts	This warning symbol is placed before activities where there is danger of rotating machine parts.	
Warning about danger due to suspended loads	This warning symbol is placed before activities where there is danger of swinging loads.	

3 General safety regulations

This section contains basic safety regulations for operating internal gear pumps.

Always follow the safety regulations!

3.1 Designated use

The internal gear pumps are compliant with the latest developments in science and technology and the applicable safety regulations at the time of initial manufacture, in the context of designated use. Neither foreseeable misuse nor additional dangers can be structurally avoided without restricting the designated functionality.
Danger can be avoided by following special warning notices in the technical documentation.

3.1.1 Applications

The internal gear pumps are designed and built solely in order to generate pressure fluid volume flow with a specified pressure.

Internal gear pumps are designed for use

- as a drive in hydraulic systems as control elements,
- and in tool machines as cooling lubricant pumps IPME.

Pressure fluids

In addition to hydraulic oils with a mineral oil base, environmentally-friendly fluids and other special fluids also act as pressure fluids. For more information, see chapter 6 “Pressure fluids”.

Operate the internal gear pumps in accordance with the technical documentation.
The manufacturer shall not be liable for any damage resulting from improper use. The operator assumes all risk.

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3.1.2 Foreseeable misuse or improper handling

In the case of foreseeable misuse or improper handling of the internal gear pump, the declaration of incorporation from the manufacturer shall no longer be valid, and the operating license shall also expire automatically. Foreseeable misuse or improper handling are:

- Use of non-approved pressure fluids (see chapter 6 “Pressure fluids”).
- Exceeding the permitted operating data, e.g. input torques.
- Exceeding or undershooting the permitted driver speed.
- Failing to observe the regulations of the manufacturer regarding operation, maintenance, and servicing as listed in the operating instructions.
- Carrying out work on the pumps by a specialist who is not approved or specially trained by the manufacturer.
- Arbitrary alterations and modifications that affect the safety of pumps and the system.
- Operating the pumps in non-approved areas and overload conditions.
- Neglecting the specified maintenance work, and failing to observe the maintenance and inspection intervals.
- Failing to make measurements and perform tests for early detection of damage.
- Incorrectly performed maintenance or repair work.

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3.1.3 Other dangers

Before beginning design and planning, the remaining dangers associated with internal gear pumps were analyzed and assessed.
Remaining dangers that are unavoidable due to design during the overall life cycle of the pumps are:
- Danger to life
- Risk of injury
- Health hazard
- Environmental risk
- Physical damage to the pump
- Physical damage to other material assets

Any existing remaining dangers are avoided by the practical implementation and observation of:
- special warning notices in the operating instructions
- the general safety information in the operating instructions
- the operating instructions of the operator

Danger to life

Danger to life of persons can arise on the pumps due to:
- misuse
- improper handling
- transport
- defective or damaged mechanical components

Risk of injury

Risk of injury to persons can arise on the pumps due to:
- improper handling
- transport
- defective or damaged mechanical components
- falling or tipping pumps

Health hazard

Danger to the health of persons can arise on the pumps due to:
- fluids, cleaning and preservation media

Environmental risk

Risk to the environment can arise on the pumps due to:
- improper handling
- leaks
- improper disposal of the pressure fluids, cleaning and preservation media

Physical damage to the internal gear pumps

Physical damage to the internal gear pumps can arise due to:
- improper handling
- failing to observe the operating and maintenance requirements
- improper operating materials

Physical damage to other material assets

Physical damage to other material assets in the operating range of the pumps can arise due to:
- improper handling

3.2 Personnel – Qualification and obligations

All work carried out on internal gear pumps must be carried out by specially authorized personnel.

Authorized personnel must
- be 18 years of age
- have read and understood the chapter entitled “General safety regulations”
- practically apply and implement the contents of the chapter entitled “General safety regulations”
- possess the physical and mental capabilities for carrying out their responsibilities, tasks, and activities on the pumps
- be trained and instructed in accordance with their responsibilities, tasks, and activities on the pumps
- be familiar with and be able to use the components of the hydraulic system and their functionality have understood
- and be able to practically implement the technical documentation regarding their responsibilities, tasks, and activities on the pumps
- be familiar with and be able to use the components of the hydraulic system and their functionality

Authorized personnel are
- responsible for preventing unauthorized operation of the pump
- obligated to comply with the applicable accident prevention regulations obligated to wear personal protective equipment
- obligated to keep unauthorized personnel out of the danger zone associated with the pump

The authorized personnel are responsible for
- confirming the safety and notice symbols on the pumps are in good legible condition
- carrying out repairs only following consultation with the manufacturer
- making sure that the pumps are protected from unauthorized use
- ensuring the pumps are only operated when they are fully functional and safe for operation
- ensuring they have the necessary training for internal gear pumps and hydraulic systems

3.3 Personal protective equipment

The following personal protective equipment must be worn/used for all activities involving the internal gear pumps described in these operating instructions:

- Protective gloves
- Hand protection cream
- Protective shoes
- Safety helmet (as needed)
- Hearing protection (as needed)

3.4 Spare parts

Spare parts must meet the technical specifications of Voith Turbo. This is guaranteed with genuine spare parts as they are subjected to constant quality control in accordance with DIN ISO 9001 or EN 29001. Third-party spare parts may in some cases alter the specified structural characteristics of the machine and lead to significant deficiencies beyond the control of Voith Turbo H + L Hydraulic.

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3.5 General safety information

Protect the pumps from dirt and contaminants during operation.		**Protection**
Lift and transport the internal gear pumps with sufficiently dimensioned	transport aids.	**Transport**
Place the internal gear pumps on a sufficiently sturdy floor on a wooden base.	Pay attention to the center of gravity (axis of travel) when assembling combination pumps.	**Assembly**
Check the functionality and operating safety of the pump, the overall system, and in particular, the overpressure control valve and safety valve before each start-up.	Before restarting a shutdown system again, remedy the cause of the shut down (i.e. maintenance work, emergency stop). Only start up a fully functioning and operationally safe pump/system.	**Commissioning**
Only use the safety equipment settings as defined in the machine manufacturer's operating instructions.	Do not make any alterations to tested, approved, and sealed safety and overpressure valves.	**Safety equipment**
Only run a fully functional and securely operating pump/system. Shut down the pump immediately when abnormal operating conditions or malfunctions occur. Report abnormal operating conditions or malfunctions immediately. Risk of burns: during normal operation, surface temperatures of ≥ 60°C are possible. In the event of unpermitted overloads, even higher temperatures can occur. Noise is produced when the pump is operated. If required, protective measures	may be necessary at the machine or via PPE. Fluids are generally flammable. Beware of the risk of fire and explosion! Pressure fluids are generally poisonous, irritating, and/or will burn. Avoid contact with the skin and eyes. Discharged pressure fluids (even small leaks) may leave an oily coating. Danger of slipping or falling!	**Operation**
Do not clean the pumps while in operation.	Follow the cleaning intervals.	**Cleaning**

Maintenance

Do not perform any maintenance or service work while the pump is in operation. The maintenance intervals in these operating instructions must be maintained. Only the maintenance work described in these instructions may be carried out by the operator service personnel.

All other maintenance work (particularly pump overhauls) may only be performed by the manufacturer service personnel or by personnel trained by the manufacturer.

Repairs

Do not perform any repair work while the pump is in operation.
Carry out repairs only following consultation with the manufacturer.

Use suitable tools for the maintenance work. Expert maintenance or repairs can only be guaranteed by the manufacturer or authorized companies.

Shutdown/disassembly

Unusable internal gear pumps should be sent for recycling in accordance with the

local environmental protection guidelines.

Documentation

A copy of these operating instructions must be available to authorized personnel at all times.

These instructions must always be kept with the operating instructions to be created by the operator.

Environmental protection

Send the packaging material for recycling in accordance with regulations for environmental protection applicable at the site of use.

Recycle used or residual operating materials in accordance with the regulations applicable at the site of use.

3.6 Safety information and warning notices

Special safety information may be necessary for certain work. This safety information can be found in the operating instructions for the respective activity.

They are clearly highlighted with a warning symbol. Different signal words are used depending on the degree of danger.

Signal word	Used for	Potential consequences if safety information is not followed:
DANGER	Personal injury (immediate threat of danger)	Serious injury!
WARNING	Personal injury (a potentially dangerous situation)	Serious injury!
CAUTION	Personal injury	Slight or minor injury
	Physical damage	Material damage to the system or the surroundings

4 EU directives, regulations, and standards

In this section, you will find a list of the applicable directives, regulations, and standards.

4.1 EU directives

The following EU directives have been followed, and should be taken into account when using the product:

2006/42/EC of May 17, 2006 on machinery

4.2 Standards (ISO, EN, DIN)

The following standards have been followed, and should be taken into account when using the product:

	Number	Designation
1	DIN ISO 12100-1	Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology.
2	DIN ISO 12100-2	Safety of machinery – Basic concepts, general principles for design – Part 2: Technical guidelines and specifications.
3	ISO 4413	Hydraulic fluid power – General rules and safety requirements for systems and their components
4	DIN ISO 62079	Preparation of instructions, structuring and content

Tab. 4.2: Standards

5 Voith internal gear pumps

This section contains a description of the components and functionality of internal gear pumps.

a

5.1 Design and functionality

5.1.1 Sickle principle

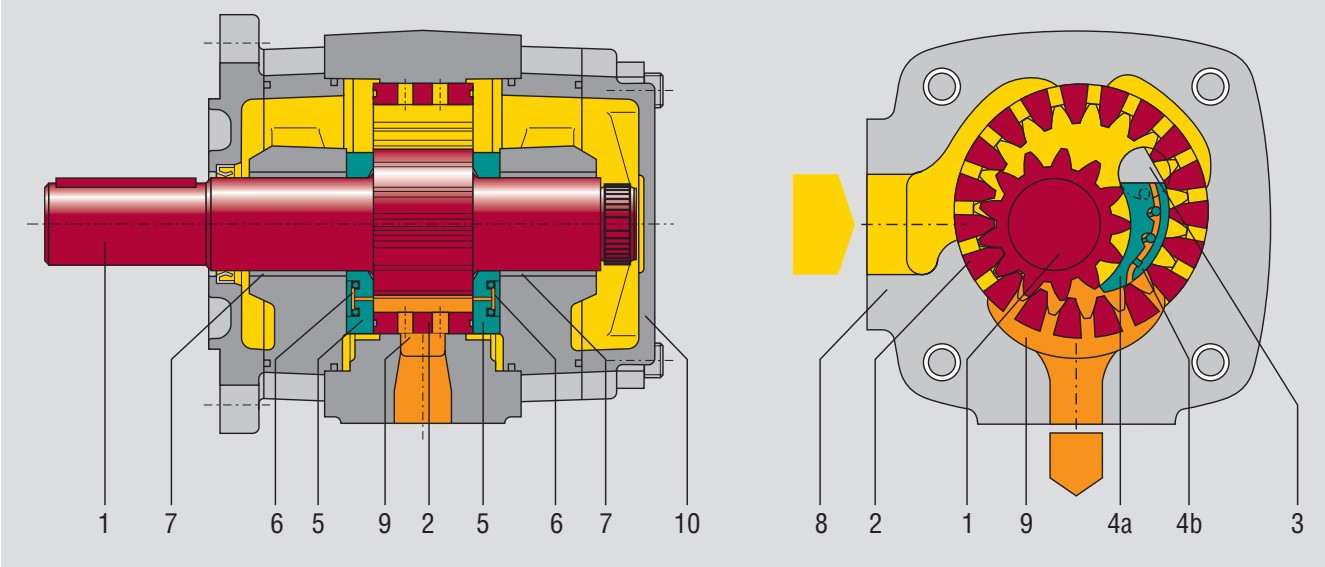

Fig. 5.1.1: Components of internal gear pump with sickle principle

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
10 End cover with bleeder screw

When the gears rotate in the pump the pressure fluid (as a rule hydraulic oil) is drawn into the cavity between the pinion and internal gear. The two smoothly running gears help to ensure excellent intake behavior.
In the radial direction, the gear chambers are sealed by gear meshing and/or 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. When the gears rotate, the pinion teeth enter the gaps between the internal gear teeth and displace the pressure fluid.
Individual pumps suck via the radial suction port on the pump housing. With two-flow and multi-flow pumps, suction is generally possible via the suction port on the interim housing. For low-noise operation of the pumps, the low pump flow and pressure pulsation usually help.

5.1.2 Superlip principle

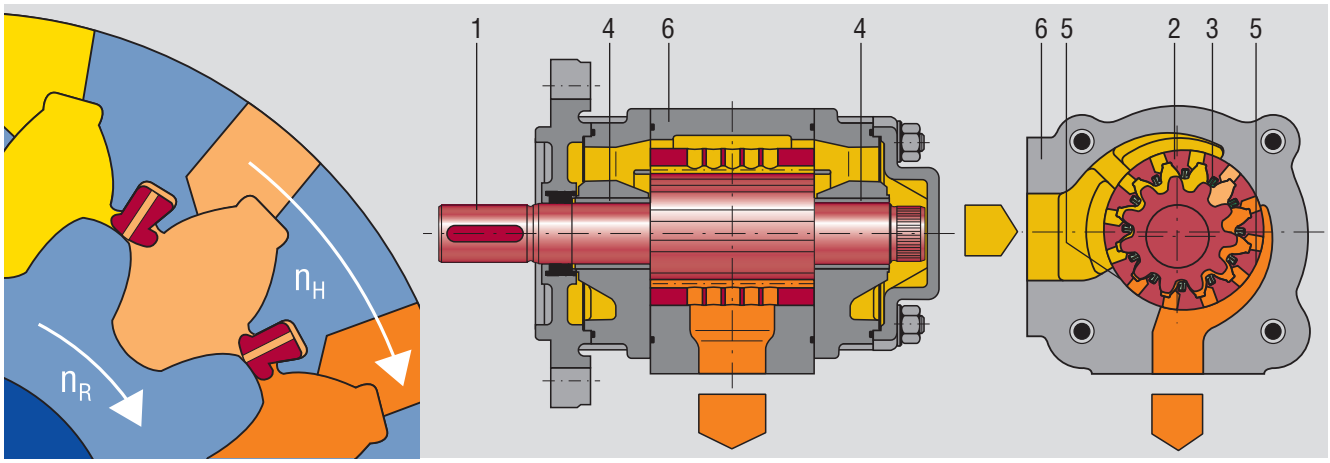

Fig. 5.1.2: Components of internal gear pump with superlip principle

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

Rotation of the gears through 180° in the pump draws in the pressure fluid (as a rule hydraulic oil) into the cavity between the pinion and internal gear by opening the gear chambers.
The gear chambers are sealed in a radial direction by gear meshing and by the sealing lips and the 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.

5.2 Technical data

For the technical data of the individual internal gear pumps, please see the following tables.

Peak pressures apply to 15% of operating time and a maximum cycle time of one minute.

Basic type	Designation	Speed range		Continuous pressure	Peak pressure	Input pressure	Start-up viscosity	Viscosity range		Ambient temperature	Delivery fluid temperature	Permissible contamination volume	Catalog	Comments
		rpm		bar	bar	bar (abs,)	mm²/s	mm²/s		°C	°C	$ß_{20}$ / $ß_{10}$		
		min	max		[2]			min	max					
Low pressure	IPN 4-32	400	3,600	100	125	0.8 – 3.0	2,000	10	300	-10 – +60	+20 – +80	75 / 100	G1418	Superlip
	IPN 4-40	400	3,600	80	100	0.8 – 3.0	2,000	10	300	-10 – +60	+20 – +80	75 / 100	G1418	
	IPN 4-50	400	3,600	63	80	0.8 – 3.0	2,000	10	300	-10 – +60	+20 – +80	75 / 100	G1418	
	IPN 5-64	400	2,500	100	125	0.8 – 3.0	2,000	10	300	-10 – +60	+20 – +80	75 / 100	G1418	
	IPN 5-80	400	2,500	80	100	0.8 – 3.0	2,000	10	300	-10 – +60	+20 – +80	75 / 100	G1418	
	IPN 5-100	400	2,500	63	80	0.8 – 3.0	2,000	10	300	-10 – +60	+20 – +80	75 / 100	G1418	
	IPN 6-125	400	2,000	100	125	0.8 – 3.0	2,000	10	300	-10 – +60	+20 – +80	75 / 100	G1418	
	IPN 6-160	400	2,000	80	100	0.8 – 3.0	2,000	10	300	-10 – +60	+20 – +80	75 / 100	G1418	
	IPN 6-200	400	2,000	63	80	0.8 – 3.0	2,000	10	300	-10 – +60	+20 – +80	75 / 100	G1418	
	[2] Peak pressures apply to 15% of operating time at a maximum cycle time of 1 minute													

Tab. 5.2.1: Technical data IPN

Basic type	Designation	Speed range		Continuous pressure	Peak pressure	Input pressure	Start-up viscosity	Viscosity range		Ambient temperature	Delivery fluid temperature	Permissible contamination volume	Catalog	Comments
		rpm		bar	bar	bar (abs.)	mm²/s	mm²/s		°C	°C	$ß_{20}$ / $ß_{10}$		
		min	max		[2]			min	max					
Low, medium pressure	IPNE 4-32	400	3,600	60	x	0.8 – 5.0	2,000	1	300	-10 – +60	+20 – +80	75 / 100	G1788	Special fluids
	IPNE 4-40	400	3,600	50	x	0.8 – 5.0	2,000	1	300	-10 – +60	+20 – +80	75 / 100	G1788	
	IPNE 4-50	400	3,600	40	x	0.8 – 5.0	2,000	1	300	-10 – +60	+20 – +80	75 / 100	G1788	
	IPNE 5-64	400	2,500	60	x	0.8 – 5.0	2,000	1	300	-10 – +60	+20 – +80	75 / 100	G1788	
	IPNE 5-80	400	2,500	50	x	0.8 – 5.0	2,000	1	300	-10 – +60	+20 – +80	75 / 100	G1788	
	IPNE 5-100	400	2,500	40	x	0.8 – 5.0	2,000	1	300	-10 – +60	+20 – +80	75 / 100	G1788	
	IPNE 6-125	400	2,000	60	x	0.8 – 5.0	2,000	1	300	-10 – +60	+20 – +80	75 / 100	G1788	
	IPNE 6-160	400	2,000	50	x	0.8 – 5.0	2,000	1	300	-10 – +60	+20 – +80	75 / 100	G1788	
	IPNE 6-200	400	2,000	40	x	0.8 – 5.0	2,000	1	300	-10 – +60	+20 – +80	75 / 100	G1788	
	IPME 4-13	400	3,600	100	125	0.8 – 5.0	2,000	1	300	-10 – +60	0 – +80	40 mg/l, particles < 30 µm		Cooling lubricant
	IPME 5-25	400	3,000	100	125	0.8 – 5.0	2,000	1	300	-10 – +60	0 – +80			
	IPME 6-50	400	2,600	100	125	0.8 – 5.0	2,000	1	300	-10 – +60	0 – +80			
	[2] Peak pressures apply to 15% of operating time at a maximum cycle time of 1 minute													

Tab. 5.2.2: Technical data IPNE/IPME

Basic type	Designation	Speed range		Continuous pressure	Peak pressure	Input pressure	Start-up viscosity	Viscosity range		Ambient temperature	Delivery fluid temperature	Permissible contamination volume	Catalog	Comments
		rpm		bar	bar	bar (abs.)	mm^2/s	mm^2/s		°C	°C	$ß_{20} / ß_{10}$		
		min	max		[2]			min	max					
Medium pressure	IPC 4-20	400	3,200	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 4-25	400	3,000	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 4-32	400	3,000	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 5-40	400	2,800	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 5-50	400	2,600	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 5-64	400	2,600	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 6-80	400	2,400	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 6-100	400	2,200	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 6-125	400	2,200	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 7-160	400	2,000	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 7-200	400	1,800	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	IPC 7-250	400	1,800	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1209	
	[2] Peak pressures apply to 15% of operating time at a maximum cycle time of 1 minute													

Tab. 5.2.3: Technical data IPC

Basic type	Designation	Speed range		Continuous pressure	Peak pressure	Input pressure	Start-up viscosity	Viscosity range		Ambient temperature	Delivery fluid temperature	Permissible contamination volume	Catalog	Comments
		rpm		bar	bar	bar (abs.)	mm²/s	mm²/s		°C	°C	$ß_{20}$ / $ß_{10}$		
		min	max		[2]			min	max					
Mitteldruck	IPM 4-6.5	400	3,000	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 4-8	400	3,000	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 4-10	400	3,000	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 4-13	400	3,000	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 4-16	400	3,000	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 4-20	400	3,000	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 5-25	400	3,000	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 5-32	400	3,000	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 5-40	400	2,800	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 6-50	400	2,600	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 6-64	400	2,400	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	IPM 6-80	400	2,400	175	210	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100		
	[2] Peak pressures apply to 15% of operating time at a maximum cycle time of 1 minute													

Tab. 5.2.4: Technical data IPM

Basic type	Designation	Speed range		Continuous pressure	Peak pressure	Input pressure	Start-up viscosity	Viscosity range		Ambient temperature	Delivery fluid temperature	Permissible contamination volume	Catalog	Comments
		rpm		bar	bar	bar (abs.)	mm²/s	mm²/s		°C	°C	$ß_{20}$ / $ß_{10}$		
		min	max		[2]			min	max					
High pressure	IPV 3-3,5	400	3,600	330	345	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 3-5	400	3,600	330	345	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 3-6,3	400	3,600	330	345	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 3-8	400	3,600	330	345	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 3-10	400	3,600	330	345	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 4-13	400	3,600	330	345	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 4-16	400	3,400	330	345	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 4-20	400	3,200	330	345	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 4-25	400	3,000	300	330	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 4-32	400	2,800	250	280	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 5-32	400	3,000	315	315	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 5-40	400	2,800	315	315	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 5-50	400	2,500	280	280	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 5-64	400	2,200	230	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 6-64	400	2,600	300	300	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 6-80	400	2,400	280	280	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 6-100	400	2,100	250	270	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 6-125	400	1,800	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 7-125	400	2,200	300	300	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 7-160	400	2,000	280	280	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 7-200	400	1,800	250	270	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	
	IPV 7-250	400	1,800	210	250	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1485	

[2] Peak pressures apply to 15% of operating time at a maximum cycle time of 1 minute

Tab. 5.2.5: Technical data IPV

Basic type	Designation	Speed range		Continuous pressure	Peak pressure	Input pressure	Start-up viscosity	Viscosity range		Ambient temperature	Delivery fluid temperature	Permissible contamination volume	Catalog	Comments
		rpm		bar	bar	bar (abs.)	mm²/s	mm²/s		°C	°C	$ß_{20}$ / $ß_{10}$		
		min[1]	max[1][3]		[2]			min	max[4]					
High pressure variable speed	IPVP 3-3,5	200	3,600	330		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 3-5	200	3,600	330		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 3-6,3	200	3,600	330		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 3-8	200	3,600	330		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 3-10	200	3,600	330		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 4-13	200	3,600	330		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 4-16	200	3,600	330		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 4-20	200	3,600	330		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 4-25	200	3,600	300		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 4-32	200	3,600	250		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 5-32	200	3,000	315		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 5-40	200	3,000	315		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 5-50	200	3,000	280		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 5-64	200	3,000	230		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 6-64	200	2,600	300		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 6-80	200	2,600	280		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 6-100	200	2,600	250		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 6-125	200	2,600	210		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 7-125	200	2,500	300		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 7-160	200	2,500	280		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 7-200	200	2,500	250		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVP 7-250	200	2,500	210		0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		

[1] with the corresponding reduced pressure, see the diagram "Pressure depending on the speed"

[2] if necessary, please request data from Voith Turbo H+L

[3] Values are valid at a viscosity of 46 cSt and an absolute inlet pressure of 0.8 to 3 bar

[4] 300 cSt possible at speeds of up to 1,800 rpm, 100 cSt possible at speeds of 1,800 rpm to 3,000 rpm

Tab. 5.2.6: Technical data IPVP

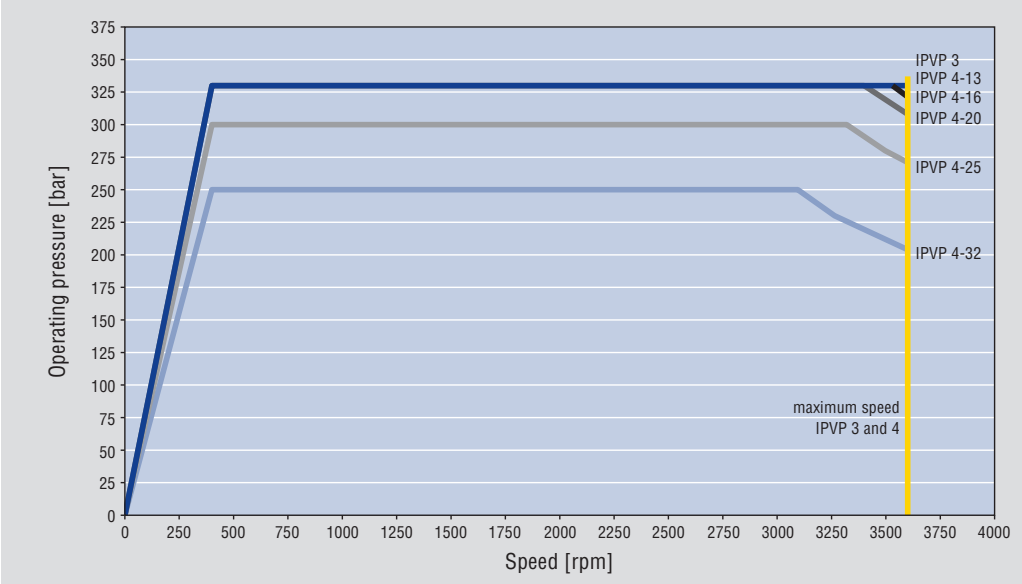

Diagram 5.2.6.1: IPVP 3 and 4 – Pressure depending on speed (continuous operation)

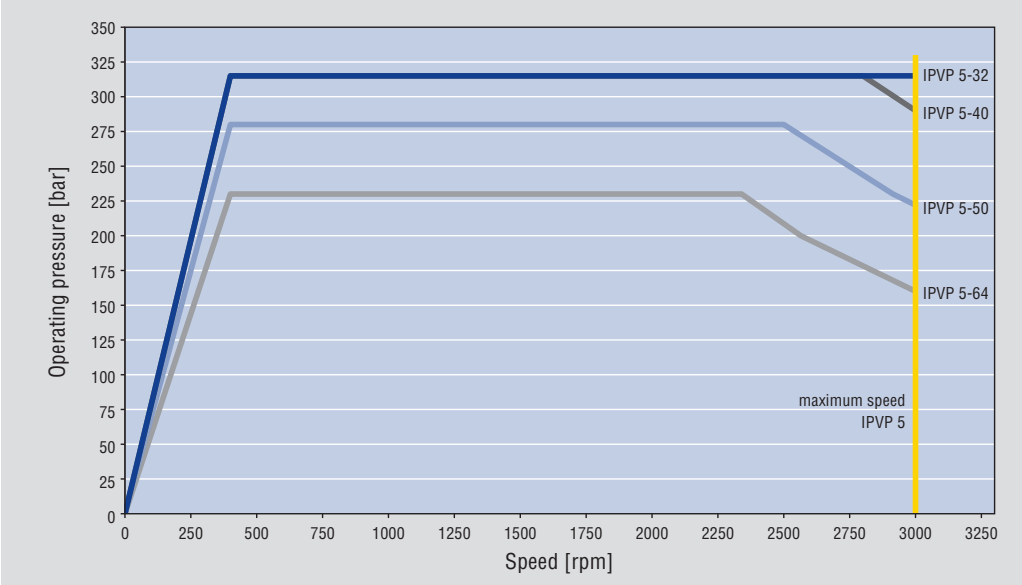

Diagram 5.2.6.3: IPVP 6 – Pressure depending on speed (continuous operation)

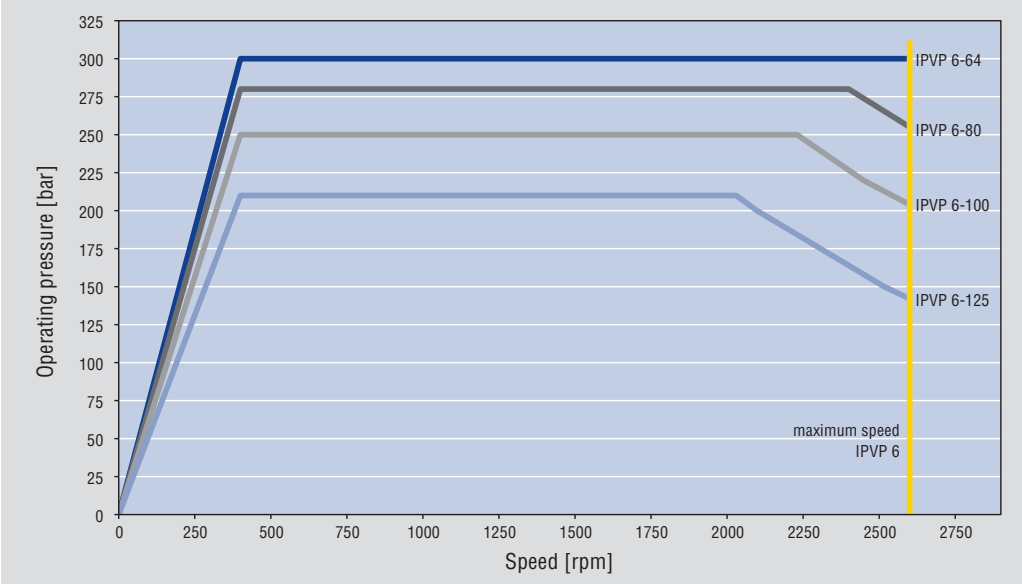

Diagram 5.2.6.2: IPVP 5 – Pressure depending on speed (continuous operation))

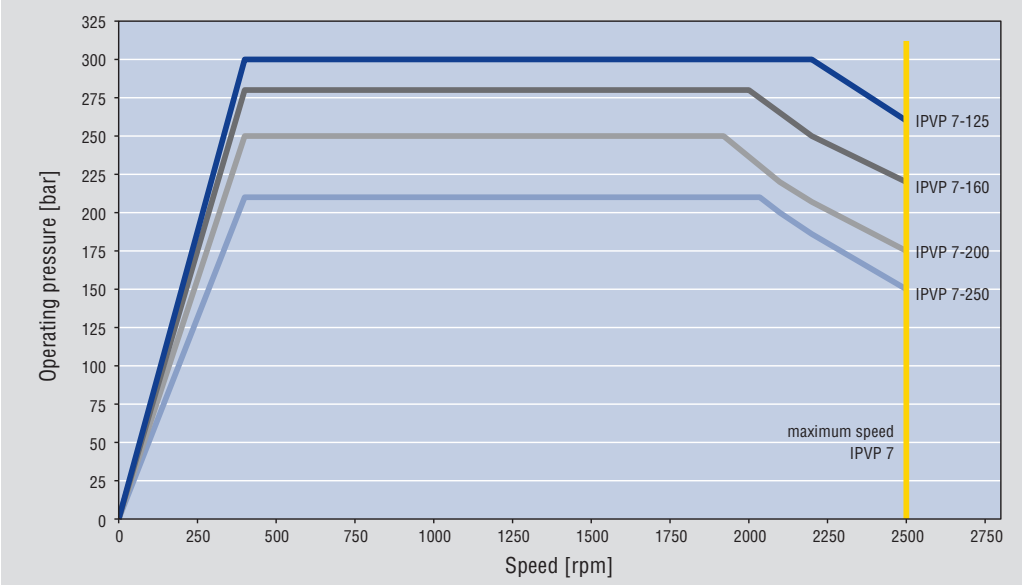

Diagram 5.2.6.4: IPVP 7 – Pressure depending on speed (continuous operation)

Basic type	Designation	Speed range		Continuous pressure	Peak pressure	Input pressure	Start-up viscosity	Viscosity range		Ambient temperature	Delivery fluid temperature	Permissible contamination volume	Catalog	Comments
		rpm		bar	bar	bar (abs.)	mm²/s	mm²/s		°C	°C	$ß_{20}$ / $ß_{10}$		
		min[1]	max[1][3]		[2]			min	max[4]					
High pressure variable speed	IPVAP 3-3,5	100	3,600	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 3-5	100	3,600	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 3-6,3	100	3,600	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 3-8	100	3,600	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 3-10	100	3,600	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 4-13	100	3,600	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 4-16	100	3,600	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 4-20	100	3,600	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 4-25	100	3,600	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 4-32	100	3,600	250	280	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 5-32	100	3,000	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 5-40	100	3,000	300	320	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 5-50	100	3,000	280	315	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		
	IPVAP 5-64	100	3,000	230	250	0.8 – 3.0	2,000	10	300	-20 – +60	-20 – +80	75 / 100		

[1] with the corresponding reduced pressure, see the diagram “Pressure depending on the speed”

[2] if necessary, please request data from Voith Turbo H+L

[3] Values are valid at a viscosity of 46 cSt and an absolute inlet pressure of 0.8 to 3 bar

[4] 300 cSt possible at speeds of up to 1,800 rpm, 100 cSt possible at speeds of 1,800 rpm to 3,000 rpm

Tab. 5.2.7: Technical data IPVAP

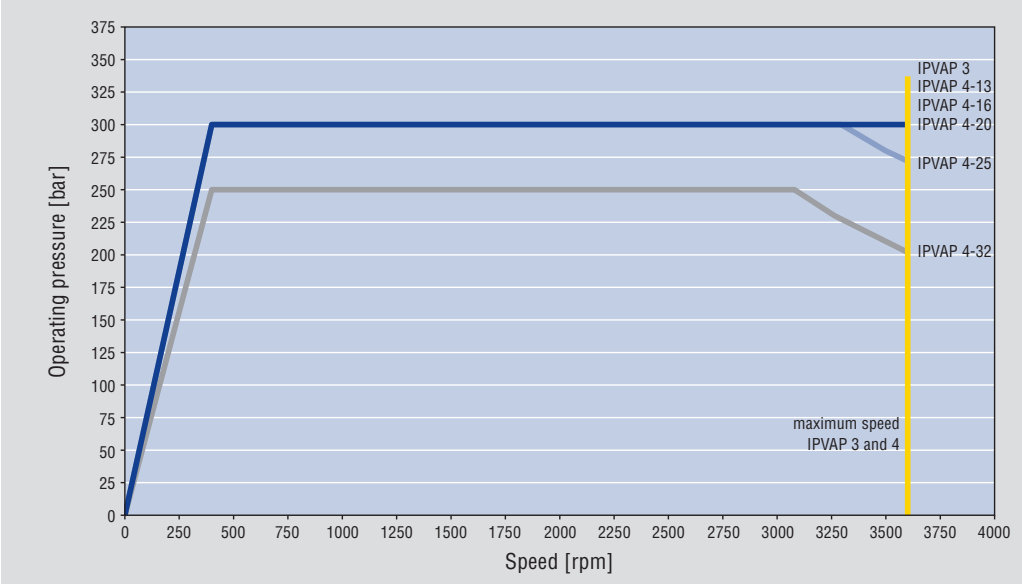

Diagram 5.2.7.1: IPVAP 3 and 4 – Pressure depending on speed (continuous operation)

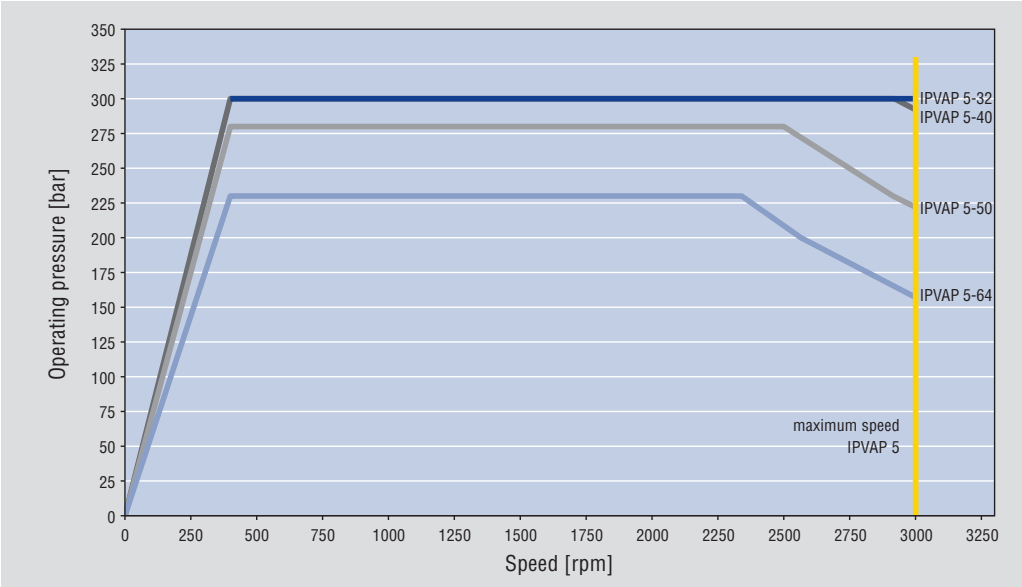

Diagram 5.2.7.2: IPVAP 5 – Pressure depending on speed (continuous operation)

Basic type	Designation	Speed range		Continuous pressure	Peak pressure	Input pressure	Start-up viscosity	Viscosity range		Ambient temperature	Delivery fluid temperature	Permissible contamination volume	Catalog	Comments
		rpm		bar	bar	bar (abs.)	mm²/s	mm²/s		°C	°C	$ß_{20}$ / $ß_{10}$		
		min	max		[2]			min	max					
High pressure	IPVS 3-3,5	400	3,600	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 3-5	400	3,600	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 3-6,3	400	3,600	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 3-8	400	3,600	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 3-10	400	3,600	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 4-13	400	3,600	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 4-16	400	3,400	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 4-20	400	3,200	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 4-25	400	3,000	315	380	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 4-32	400	2,800	280	330	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 5-32	400	3,000	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 5-40	400	2,800	330	380	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 5-50	400	2,500	300	345	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 5-64	400	2,200	265	300	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 6-64	400	2,600	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 6-80	400	2,400	330	380	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 6-100	400	2,100	300	345	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 6-125	400	1,800	265	300	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 7-125	400	2,200	345	420	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 7-160	400	2,000	330	380	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 7-200	400	1,800	300	345	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	
	IPVS 7-250	400	1,800	265	300	0.8 – 3.0	2,000	20	300	-10 – +60	-20 – +80	75 / 100	G2128	

[2] Peak pressures apply to 15% of operating time at a maximum cycle time of 1 minute

Tab. 5.2.8: Technical data IPVS

Basic type	Designation	Speed range		Continuous pressure	Peak pressure	Input pressure	Start-up viscosity	Viscosity range		Ambient temperature	Delivery fluid temperature	Permissible contamination volume	Catalog	Comments
		rpm		bar	bar	bar (abs.)	mm²/s	mm²/s		°C	°C	$ß_{20}$ / $ß_{10}$		
		min	max		[2]			min	max					
High pressure	IPH 4-20	300	3,000	300	330	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1890	
	IPH 4-25	300	3,000	250	315	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1890	
	IPH 4-32	300	3,000	250	300	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1890	
	IPH 5-40	300	3,000	300	330	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1890	
	IPH 5-50	300	3,000	250	315	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1890	
	IPH 5-64	300	3,000	250	300	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1890	
	IPH 6-80	300	2,500	300	330	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1890	
	IPH 6-100	300	2,500	250	315	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1890	
	IPH 6-125	300	2,500	250	300	0.8 – 3.0	2,000	10	300	-10 – +60	-20 – +80	75 / 100	G1890	
	[2] Peak pressures apply to 15% of operating time at a maximum cycle time of 1 minute													

Tab. 5.2.9: Technical data IPH

6 Pressure fluids

This section describes the requirements for pressure fluids.

Note the other information in the general oil recommendations (doc. no. 250.006051)

Operating pump combinations with different pressure fluids is only possible in a few exceptions.

Please request further information from Voith Turbo H + L Hydraulic!

Pressure fluids	Requirements	Operating fluid temperature	Viscosity [4]	Limitation [5]
Mineral oil	DIN 51524 20-80°C Teil 2 und 3 [3]	The best operating temperatures are between 40°C and 60°C.	See the technical data on page 24 ff.	No
HFA (Oil/water emulsion, oil percentage 20%)	DIN EN ISO 12922 [1]		Due to the very low viscosity values, this group can only be used under certain conditions.	Yes
HFB (Oil/water emulsion, oil percentage 40%)	DIN EN ISO 12922 [1]			Yes
HFC	DIN EN ISO 12922 [2]			No
HFD	No release!			
Biodegradable	Release by Voith Turbo H + L Hydraulic is required in all cases!			
Petroleum/petroleum-similar fluids	Release by Voith Turbo H + L Hydraulic is required in all cases!			

Tab. 6.1: Requirements

[1] Release by Voith Turbo H + L Hydraulic is required!

[2] Approved HFC fluids:

Mobil Hydrofluid	HFC	Fyrguard
Brenntag Hydrolube	30 B	Other HFC fluids may be permissible upon consultation with Voith Turbo H + L Hydraulic
Hydrotherm	36	
Ecubsol Widroflamm	5.5, 36	
Nafic		

[3] Never mix different oil types or oils from different manufacturers without checking for compatibility. We always recommend discussing any such matters with the manufacturer or supplier.

[4] When selecting the operating fluid viscosity, always consider the operating fluid temperatures by adhering to the permissible viscosity values.

[5] “No” indicates that the fluid can be used within the technical data. “Yes” indicates that the operating data must be reduced compared to the technical data.

Pressure fluids	Performance reduction	Suction speed	Abs. suction pressure	Temperature	Permissible contamination volume	Warm-up time
		m/s	bar	max °C	$ß_{20}/ß_{10}$	minutes
HFA	20% [2]	1	0,8	50	75 /100	No
HFB	80%	1	0,8	50	75 /100	No
HFC	Ja [3]	1	0,8	50	75 /100	30 – 60 [1]

Tab. 6.2: Limitations

[1] Warm-up in depressurized state. Before operating, rinse the pumps with HFC fluid because mineral oil is used for preservation.

[2] IPME pumps can be loaded with HFA fluids at the permitted IPME operating pressures.

[3] IPVS pumps may only be loaded with the permissible IPV operating pressures.

With a vacuum suction filter, use a pressure gauge with pressure deactivation.

7 Packaging, transport

This section provides information about the packaging for delivering pumps, and about the transportation of pumps.

The internal gear pumps and pump combinations are delivered ready to install. Sealing elements on the suction and discharge ports need to be removed.

7.1 Packaging

Delivery of pumps:

- Pumps and pump combinations of up to 30 kg in the carton
- Pumps and pump combinations of up to 30 kg in the carton on a pallet
- Pumps and pump combinations where the size or the volume / quantity exceeds the cardboard boxes used are packed in crates
- For overseas shipments, anti-rust side-gusseted bags are used in the cartons/crates
- All sealed pumps and pump combinations are wrapped and packaged with oiled paper. Pumps and pump combinations that are open on one side are packaged in plastic bags
- All pumps and pump combinations are wrapped in cushioning paper to protect against knocks and bumps

7.2 Delivery

Inspect the delivery:

- Check packaging for transport damage
- Inspect pump for damage
- Check completeness of delivery

Report complaints to the manufacturer, and any damage to the forwarding agent!

7.3 Transport

This section describes how to transport internal gear pumps (weighing more than 20 kg) with a crane.

Transport the pumps in the packaging as far as the installation site (e.g. fork-lift truck, pallet jack, etc.)

Do not use loops to lift and transport the pumps!

Lift the internal gear pump as follows:
1. Fit the steel ring screws (DIN 580) with plastic shims.

2. Screw the steel ring screws into the internal thread of the pressure flange.

The plastic shims prevent damage to the sealing surface of the pressure flange.

Fig. 7.1: Steel ring screw with plastic shim

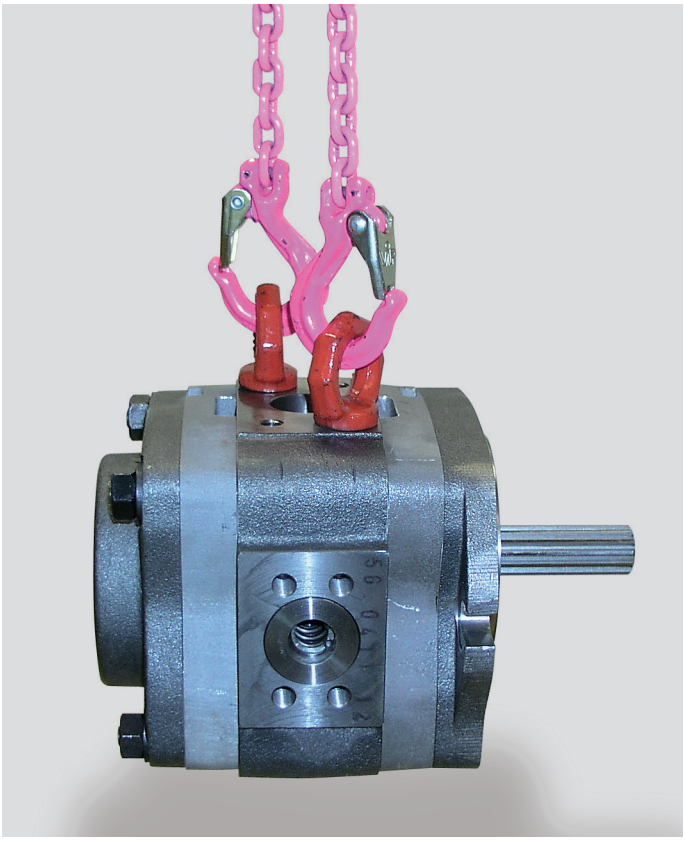

Fig. 7.2: Screw in ring screws

DANGER!

Falling loads can result in serious injury or death!

- The internal gear pumps must only be hung at the designated suspending points!
- Only use suitable lifting gear that meets the safety requirements!
- Never walk or move underneath swinging loads!
- Tighten the steel ring screws into the flange thread as far as possible for transportation, otherwise the thread may break free!

3. Only attach jack, crane, or cable hooks with spring clips to the ring screws for transporting the pump.

DANGER!

A swinging pump could cause serious injury or death from squashing. Ensure hands and feet do not become trapped when pumps are lowered!

- Weights of up to approx. 200 kg possible, depending on the design.
- Note the new center of gravity.
- Secure pump combinations against swinging/slipping/tipping.
- Secure the pump/lifting gear with appropriate measures!
- Wear safety gloves and safety shoes!

4. Secure the pump to prevent it from swinging during transport.
5. Only raise the pump as high as necessary for transportation.

Transport the pump to the installation site.

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Do not scratch the rating plate when setting down the pump; remove if necessary.

Pump combinations

When transporting combination pumps, note the center of gravity. Screw steel ring screws into pressure flange threads set as far apart as possible.

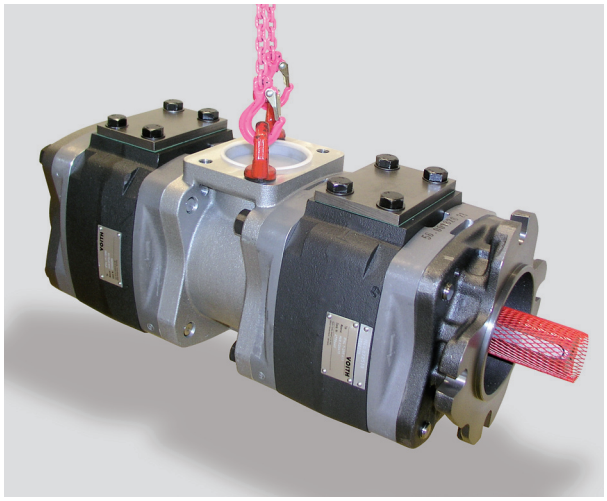

Fig. 7.3: Hanging a pump combination on to ring screws

Using shaft threads

The drive shaft inside thread can be used to transport individual pumps. Thread sizes for screwing in the steel ring screws in accordance with DIN:

Avoid heavy knocks or impacts on the housing of the hanging pump as these could damage the axial gasket.

Drive shaft internal thread of the Voith internal gear pump

Size	IPC/V	IPH	IPN/M
3	M5x17	-	-
4	M8x19	M8x19	M6x16
5	M12x28	M12x28	M8x19
6	M12x28	M12x28	M12x28
7	M12x28	-	-

Tab. 7.1: Drive shaft internal thread

8 Storage, preservation

This section provides information about the correct storage and preservation of internal gear pumps for long-term storage.

8.1 Storage

The packaging is only intended for shipment and short-term storage.

Please note the following in the event of long-term storage:

- Store the internal gear pumps in dry, frost-free rooms with minimum temperature fluctuations. The relative humidity must be a maximum of 70%.
- Store pumps on suitable shelves with sufficient space for checks and follow-up treatment (for example, anticorrosion agents).
- Check metallic blank parts (drive shafts, flange seal surfaces) every six weeks for corrosion, if necessary, treat with anticorrosion agents (e.g. “Tectyl 511”).
- After 18 months of storage, the pump must be checked by a trained expert or by Voith Turbo before installation (Aging process of the valve seals).

8.2 Preservation

Specify the storage time on the pump purchase order!
The following storage times are possible.

Storage up to one year

Series internal gear pumps can be stored for up to one year after delivery without requiring any special measures.

Prerequisite: The pressure and suction ports of the pump must be sealed with sealing plugs.

Storage up to two years

The pump is sprayed with Tectyl, and then shrink-wrapped in a plastic sleeve after adding drying agents (e.g. kieselgur padding or similar). This protection lasts for two years.

Storage up to four years

The item is also rinsed with a low-viscosity hydraulic oil, for example ISO VG 22, before being sprayed and shrink-wrapped in plastic.

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9 Assembly

This section contains a description for installing the internal gear pumps.

9.1 Assembly of pump and motor

If any assembly points differ from this description, please contact Voith Turbo H + L Hydraulic.

The hydraulic system must be depressurized before any work is carried out on the pumps.

During assembly, ensure that:

- the pump and motor shafts are aligned
- sufficient couplings are used (elastic or curved tooth couplings), that the coupling is correctly positioned
- the pump drive is free of axial and transverse forces. A drive via the gears, belt, or chains without attachment bearings is only possible in limited cases, and requires the approval of Voith Turbo H + L Hydraulic
- the pump is not put under any strain as a result of uneven pump alignment
- there are no strains as a result of incorrectly assembled pipelines
- the coupling parts are assembled without knocks or pressing.

Voith internal gear pumps can be designed either with left-hand rotation or right-hand rotation. The rotation is marked on the pump housing with an arrow. The rotation of the drive must match the rotation information for the internal gear pump.

The pump shaft contains an assembly thread (see page 41) as standard.

9.2 Installing the pump

9.2.1 Installation position

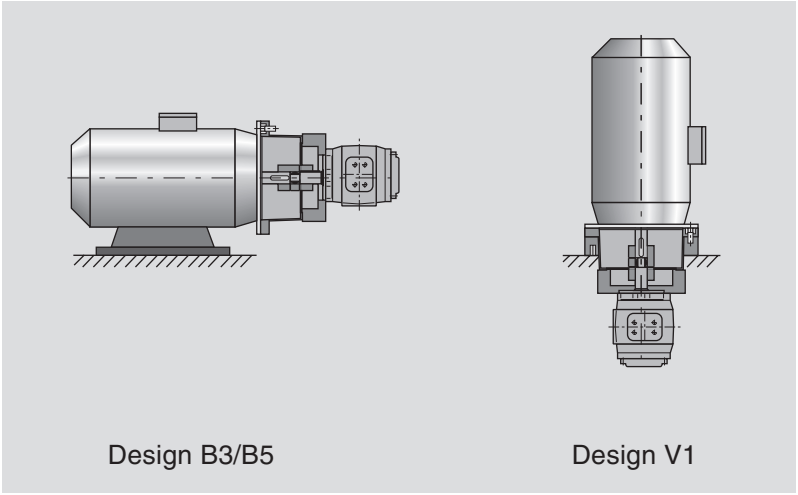

Fig. 9.1: Examples of designs and installation positions

The Voith internal gear pump can be installed in any position. If using the appropriate seal flange, it can even be installed horizontally in the tank. Regardless of this, the motor manufacturer's regulations on the installation position of the electric motor must be observed.

Pump combinations must be installed without voltage. There must be no forces acting on the flange connections of the pump housing.

9.2.2 Initial preparations

The suction side (large cross-section) and the pressure side (small cross-section) of the pump are each sealed with plastic plugs. Remove the plastic plugs!

CAUTION

The pump still contains mineral oil from the test run.

- The information in the manufacturer's safety data sheets must strictly be observed!
- Mineral oil must be disposed of in accordance with regulations.
- Clean the internal gear pump if the pressure fluid is not allowed to be mixed with mineral oil.

9.2.3 Assembly steps

Electric motor and Voith pumps are provided with axle internal threads to facilitate the installation of the clutch!

The screw connections at sucking and pressure flanges are to be tightened with the torque according to DIN ISO 6162.

All bolt connectionsare to be tightened with torque in accordance with DIN EN 20898.

1. Position the pump motor at the prepared installation location, and screw down.
2. Connect the motor to the electricity.
3. Check the direction of rotation.

DANGER

Alternating current (400 V AC) can cause serious injury and even death.

Note the safety guidelines
Before starting work:
- Disconnect
- Take measures to prevent reactivation
- Ensure there is no voltage
- Ground and short circuit
- Cover or enclose any live nearby objects

4. Disconnect the motor.
5. Slide the half-coupling of the motor onto the shaft.
6. Screw the pump carrier housing to the carrier flange of the electric motor.
7. Raise the “pump” half-coupling onto the drive shaft while maintaining the correct distance (clearance) between the half-couplings in accordance with the manufacturer’s instructions.
8. Lift the pump/pump combination with the jack or equipment, position on the pump carrier flange, and push together
9. Turn the coupling on the pump in combination with the motor coupling.
10. Remove the pump to secure the two coupling halves.

Make sure there are no axial or transverse forces on the pump drive. When assembling the coupling and pump carrier, note the conditions of the respective manufacturer

11. Tighten the hexagon socket set screws.
12. Push the pump back in.
13. Screw down the pump/pump carrier.
14. For pump combinations that require support: screw on the ready-to-install support with the pump and platform (see chapter 17.5).

The pump is electronically and mechanically connected, and must be bled during commissioning.

9.2.4 Pipelines and flange

- Pipelines must be installed without voltage! If necessary, pipelines may have to be supported or hung.
- Carefully clean the pipelines and screws before assembly.
- Suction pipings must be sealed.

Air that has been drawn in can lead to malfunctions and damage the pump.

The sealant must not come into contact with the pressure fluid or the radial shaft sealing ring.

- When using hydraulic pipes, note the relevant DIN standards, and the manufacturer's guidelines.
- Only use flanges approved by Voith Turbo H + L Hydraulic. (pump catalog)
- With no voltage applied, tighten the flange on the connection face of the pump using the screws and torques indicated.
- Secure the pipelines to the flange or the pump without voltage.

10 Operational testing and commissioning

This section describes measures which must be observed during the commissioning of internal gear pumps.

DANGER

Pump drives can cause serious injury and death due to rotating parts!

- Never commission pumps without protective covers on the drives, even in test runs!

10.1 Checking the direction of rotation

The rotation of the drive must match the rotation information for the internal gear pump.

10.2 Speed

10.2.1 Performance pump

Voith pumps can be operated in the permitted speed range with no restrictions on the permitted pressures.

For the permitted speed range, see chapter 5.2.

When operating pump combinations with different series or sizes, note the permitted speeds of the individual pump stages. The lowest speed value applies to the overall

10.2.2 Variable-speed pump (IPVP, IPVA)

Using the pressure retaining function, the minimum speed can briefly fall below the values indicated in chapter 5.

The speed must be selected based on the pressure (see chapter 5)

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10.3 Filling / bleeding the pump

DANGER

Pressure fluids may contain hazardous substances and additives!

- Follow the notes in the manufacturers' safety data sheets!
- If necessary, use protective gloves or other personal protective equipment.
- The responsible personnel must be familiar with the instructions for handling this media as well as measures for first aid in the event of an accident.

Before initial start-up, the pump should be filled with pressure fluid and bled.

Pump installation below the pressure fluid level:

1. Open the shutoff valves in the suction piping.
2. Open the bleeder screws on the end cover. If connected to a pump from a different manufacturer, open the bleeder screw on the intermediate housing.
3. Close the bleeder screw again as soon as oil is discharged.

Pump installation above the pressure fluid level:

1. If the suction piping connection is above or to the side, fill the pump with oil through this opening as much as possible.

Bleeder screws must only be opened in order to bleed the system, and must be closed before starting and operating the pump.

Operating the pump while the bleeder screws are open will damage the pump.

10.4 Bleeding the system

The pump must be able to start up in a depressurized state, i.e. without back pressure. If any resistance, for example a check valve, with a charging pressure of >1 bar is included in the delivery pipe, the pipe must be bled between the pump pressure connection and this resistance. A measuring connection or a suitable bleed valve can be used.

With the attached Voith pressure limiting valve, the plug screw (MP) can be bled. When activating the electric motor, open the MP pipe of the pump stage valve. After the bleeding process is complete, seal the pipe again.

During the first commissioning, the delivery pipe must be bled!

If the suction port is situated below and the pressure fluid level is below the pump, take special care during the bleed process!

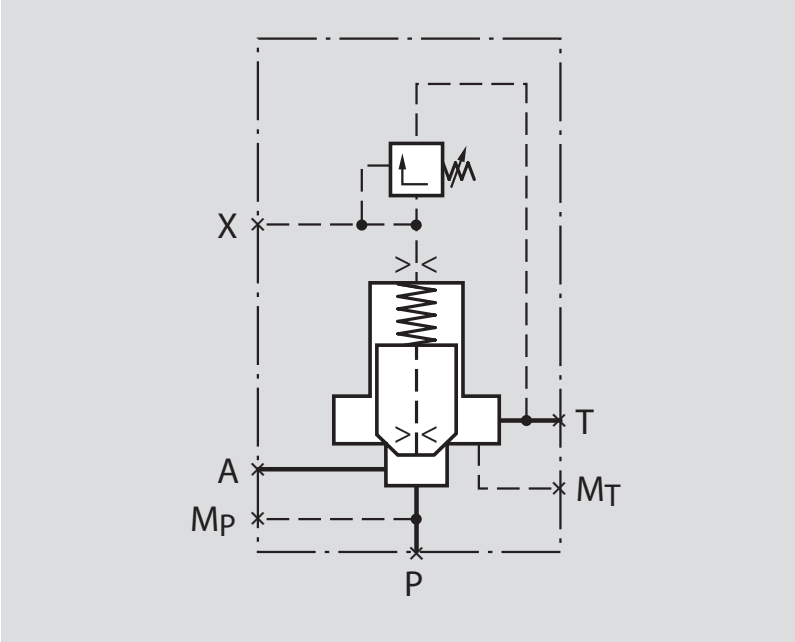

Fig. 10.1: Wiring diagram of the pressure limiting valve

10.5 Commissioning the pump

After the bleeding process, the pump should remain depressurized until the system is fully bled. Then load the pump with the projected pressure, and secure the pressure limiting valve so that it cannot be adjusted.

The system is sufficiently bled when there are no jarring noises and there is no foam build-up in the return line to the tank.

If there is no pressure build-up for approx. 30 to 60 seconds (⩽ 2 bar circulating pressure), switch off the motor and check the direction of rotation!

DANGER

Highly pressurized fluids!!

When operating with HFC fluid, ensure a warm-up time of 30 to 60 minutes.

- Check the filter and oil temperature after a few hours of operation.

11 Voith internal gear pumps in operation

This section describes indications of pump wear, and the measures necessary to fix them.

Voith internal gear pumps have gap compensation with a very high volumetric efficiency level. Under normal operating conditions and in accordance with the permitted technical data, and regular and careful checking of the pressure fluid, Voith IP pumps offer excellent service life.

11.1 Operating data

Protect the pumps during operation by effectively filtering the pressure fluid to prevent any foreign bodies entering the system (see chapter 17.8)!

11.1.1 Factors that influence the loss of pressure in the suction piping during operation

If the input pressure falls below the pressure specified in chapter 5.2, check the following points:

- the flow speed in the suction piping (speed changes)
- the suction height (level difference changes between the oil level and pump)
- the suction filter (increased filter contamination)
- the oil viscosity (oil temperature changes)
- the suction cross-section (if necessary, the suction valve opening, and whether the valve was fully open)

11.1.2 Suction pressure

During operation with mineral oil, the input pressure in the suction nozzle of the pump must be between 0.8 and 3 bar (measured as the absolute pressure). During start-up mode, an absolute pressure of up to 0.6 bar is permitted temporarily.

In the suction piping, the flow speed of 1 m/s (in suction mode) or 1.5 m/s (inlet with slight over-pressure of up to 3 bar max.) must not be exceeded! Risk of cavitation!

The flow speed is only intended as a reference guide. The key factor is the suction pressure!

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11.1.3 Pressure side

In the delivery pipe, we recommend a maximum flow speed of 6 m/s (loss of pressure!).

11.1.4 Suction pressure

In the return piping, we recommend a maximum flow speed of 3 m/s. The return fluid must not be sucked directly back in by the pump under any circumstances, i.e. the largest possible distance must be maintained between the suction piping and the return piping. To prevent the oil from foaming, the return fluid outlet must be at least 50 mm (or three times the nominal diameter of the return piping) below the lowest possible oil level.

11.1.5 Reverse mode on variable-speed pumps (IPVP, IPVA)

In the case of variable-speed drives, it is possible to switch the rotation of the pump during operation.

Please note that, regardless of the direction of rotation, the pressure must only ever be generated on the pressure side (small cross-section); pressure is not allowed on the suction side (large cross-section).

In reverse mode, i.e. against the standard direction of rotation, a controlled loss of pressure is possible by allowing the oil to flow through the pump from the pressure side to the suction side. With this function, make sure the system is preloaded on the pressure side. The charging pressure required depends on the speed and motor acceleration.

If you have any questions regarding the charging pressures, the maximum accelerations, and the speeds in reverse mode, please contact Voith Turbo H+L Hydraulic.

12 Shutting down

This section describes how to shut down the pumps.

Removing the pressure load

Before shutting down the pump, remove the pressure load.

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13 Disassembly

This section describes how to disassemble the complete pump and separate the pump/motor.

a

Disassembly steps

Before starting work in the control cabinet, remove the pump safety devices and attach an instruction plate indicating that work is in progress!

DANGER

Contact with live pipes can lead to serious injury and death.

Note the safety guidelines
Before starting work:

- Disconnect
- Secure against reactivation
- Ensure there is no voltage
- Ground and short circuit
- Cover or enclose any live nearby objects

DANGER

After shutting down the system, all external parts on the pump housing and all connected pipelines will be hot! Risk of burns!

- Allow the system and pump housing to cool down
- Wear protective gloves

✓

1. Close the pressure and suction valves.
2. Position drain trays below the pump to collect pressure media.
3. Unscrew the pipelines on the pump, and place plastic plugs in the pump connection openings.
4. In the case of pump combinations with support: Unscrew the support for the pump and platform.
5. Hang, support, etc. the pump on the jack.
6. Loosen the connection between the pump and pump carriers fully.
7. Remove the pump from the pump housing, and loosen hexagon socket set screws in the half-couplings.
8. Remove the “pump” half-coupling from the drive shaft.
9. Loosen the screw connection between the pump carrier and the motor flange fully, and remove the pump carrier housing.
10. If necessary, remove the half-coupling of the motor.
11. Open the motor connection box, disconnect the connecting cable.
12. Loosen the pump motor screw fitting at the installation site. Hang the motor on the jack and lower.

The pump and motor are disassembled for transport.

14 Disposal / Recycling

This section describes how to dispose of and recycle pumps.

Pumps and pump parts that are no longer used should be collected for proper recycling of the various materials.

Dispose of pressure fluids in accordance with regulations, and note the safety data sheets!

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15 Maintenance

This section describes the maintenance of pumps.

Maintenance and repair work on the pump must only be carried out by authorized Voith personnel. To ensure trouble-free operation of the pump, make sure that the permitted operating conditions are maintained. In particular, ensure that the oil is clean and the permitted temperature range is adhered to.

The operator should create a maintenance plan for the entire system. The maintenance criteria and intervals are defined by the operator.

If a hydraulic system malfunctions during operation, there are various signs that indicate the hydraulic pump is starting to wear:

- Increase in input power
- Increase in pump operating noise
- Increase in cycle time / decrease in operating speed
- Loss of pressure before reaching the consumer
- Increase in the pressure fluid temperature difference between entering and exiting the pump with a fixed cooling water quantity
- Increase in the difference between the pump housing temperature and operating fluid inlet temperature

We recommend replacing the seals after a maximum operating time of 5 years.

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16 Faults and solutions

This section describes faults and the measures necessary to fix them.

Identify and resolve the cause of the fault before recommissioning!

Operating fault	Possible cause	Solution
The pump has no suction.	The plugs on the pump suction nozzle have not been removed.	Remove the plugs.
	Wrong direction of rotation by pump and drive motor.	Check the direction of rotation, and switch around.
	Oil level too low (suction piping above operating fluid level).	Add oil.
	Suction piping above the permitted minimum operating fluid level.	Extend the suction piping.
	The suction piping is not sealed.	Seal the pipe, tighten the screw fitting.
	The delivery pipe is blocked or preloaded by a valve, meaning the pump can no longer expel air.	Re-position the valve: switch to depressurized circulation or bleed the pump on the pressure side.
	The viscosity of the pressure fluid is too high.	Use the pressure fluid in accordance with the permitted viscosity values.
	The pressure is too low in the suction piping, the flow resistance is too high.	Enlarge the suction cross-section, clean the suction filter, correct the suction pipe, reduce the suction height, reduce the suction length.

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Operating fault	Possible cause	Solution
The pump is working, but there is no build-up of pressure.	Air is feeding into the suction piping.	see chapter 11 Check the direction of rotation, and switch around if necessary. Enlarge the suction cross-section, clean the suction filter, correct the suction pipe, reduce the suction height, reduce the suction length.
	The pressure valve does not close as a result of dirt or wear on seal.	Clean the pressure valve and/or replace defective parts.
	The directional control valve is set to: depressurized circulation.	Set the valve to the correct working setting; in the case of solenoid valves, check the electrical connection.
	There is a crack in the piping.	Repair the damage.
	The pump is heavily worn.	Have the pump repaired by the manufacturer.
The pump has stopped pumping even though the drive is intact.	The pump shaft has sheared off.	Have the pump repaired by the manufacturer.
	The coupling is destroyed.	Replace the coupling and install in accordance with the instructions.
	The suction piping is not sealed.	Seal the pipe, tighten the screw fitting.
	The oil level in the container has fallen below the suction minimum.	Top off the pressure fluid Top off the oil Extend the suction piping.
The pump is too loud.	The pump sucks in air.	see chapter 11 Check the direction of rotation, and switch around if necessary. Enlarge the suction cross-section, clean the suction filter, correct the suction pipe, reduce the suction height, reduce the suction length.
	The shaft seal is defective.	Have the pump repaired by the manufacturer.
	Cavitation in the pump.	see chapter 11 Check the direction of rotation, and switch around if necessary. Enlarge the suction cross-section, clean the suction filter, correct the suction pipe, reduce the suction height, reduce the suction length.
	The coupling is defective.	Replace the coupling and install in accordance with the instructions.
	The pump is defective.	Have the pump repaired by the manufacturer.

Tab. 16.1: Operating faults and solutions table

17 Pump combination planning

This section describes how to plan pump combinations.

17.1 Planning information

When using Voith internal gear pumps, please note the following information. This will help avoid later problems with functions or operation.

Note:

Voith internal gear pumps feature self-suction and can be arranged both above and below the tank level.

17.1.1 Design and principle of operation of the Voith internal gear pumps

The designs and principles of operation of the various Voith internal gear pumps are described in detail in the gear pump catalogs.

17.1.2 Key data of the Voith internal gear pumps

The curves and technical data in the catalogs are valid under the conditions described. If the pumps are used under other operating conditions such as temperature, pressure fluid, viscosity, pressure, or speed, please request the data from Voith Turbo. During the planning phase, take into account the actual operating conditions and the limitations of the pressure fluid (see chapter 6). The internal gear pumps do not have any integrated pressure limits. This must be ensured on the system (for example, above a Voith DBV).

17.1.3 Drive motor

When designing the drive motor, note the actual load data by taking into account the corresponding effectiveness level.

17.1.4 Coupling

Torsionally flexible couplings are suitable for high-performance drives. When used in variable-speed drives (servo pump), we recommend fixed shaft couplings with frictionally-engaged power transfer and minimal inertia. The permitted remaining imbalance as specified by the manufacturer must not be exceeded.

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17.1.5 Noise emissions of the Voith internal gear pumps

The values listed in the catalogs for the sound pressure level are measured in accordance with DIN 45 635, Sheet 26, i.e., only the sound emissions of the pump are given. Environmental influences such as the installation site, design of the overall system (reflective surfaces), piping, etc. are not taken into account.

Sound level measurements

The sound pressure curves given were determined using series pumps in the Voith sound measuring room (low-noise room).
Compared with the measurements in an anechoic room in accordance with DIN 45 635, the results in the Voith sound measuring room were 5 dB(A) higher.

Due to the low delivery and pressure pulsation of the Voith internal gear pumps, the stimulation of pipelines, machine parts, containers, and valves is very low. With non-standard installation and piping conditions, the sound pressure level of the system may be 5 to 10 dB(A) above the value for the pump.

Voith internal gear pumps feature self-suction and can be arranged both above and below the tank level.

17.2 Pump combinations

Voith internal gear pumps of the same size or different sizes can be combined to create multi-flow pumps.

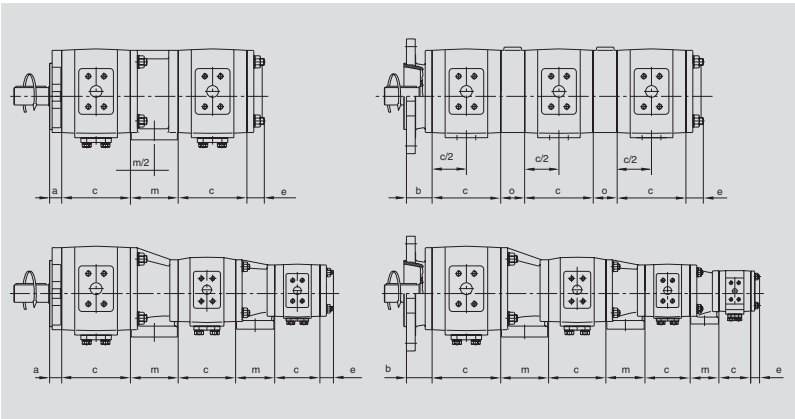


Fig. 17.1: Examples of pump combinations

Note:

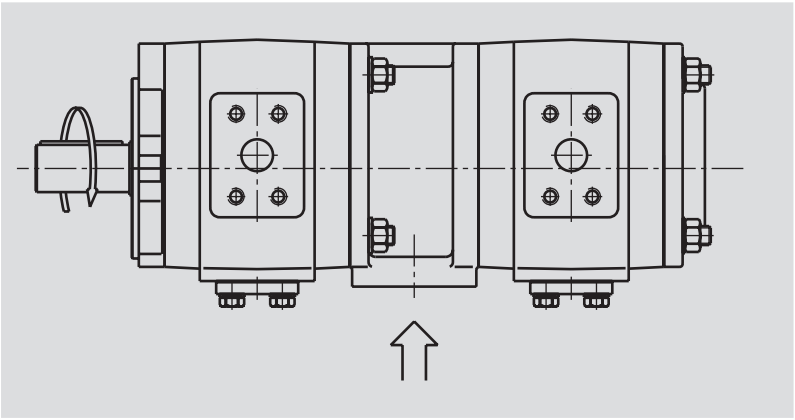
- Apart from a few exceptions, it is not possible to operate pump combinations with different operating media because the suction areas of the respective pump stages are linked to each other. Designs with suction areas that are sealed off from each other are possible.

Please contact Voith Turbo H + L Hydraulic.

- Pumps of the same or different sizes can be combined to form double pumps without restricting their maximum permitted pressures.
- Triple or quadruple pumps are possible.
- On the attachment pumps (secondary pumps) to the main pump, the drive shaft is always geared. The individual drive shafts are connected via geared couplings that are lubricated by the pressure fluid.
- The individual pump stages are each fastened to the previous pump via the intermediate housing.

Designs:

Intermediate housing with suction port:



Two pumps suck via one shared connection. The suction ports of the respective individual pumps are sealed with a blank cover.

Intermediate housing without suction port:
The pumps each suck via the suction port of the respective individual pump.

17.3 Torque

Pressure limiting valve

Note that the setting of the pressure limiting valve, the permitted peak pressure of the pump is not exceeded (see chapter 5.2).

Voith pressure limiting valves (type DBV) are delivered with a pressure setting of approx. Δp = 3 – 6 bar.

Excessively high

The torque that is generated between the individual delivery stages of triple and quadruple pumps can achieve excessively high values that can damage the pump if left unattended!

Total is permitted

The total torque of the individual pump stages must not exceed the permitted values (see chapter 17.4)!

Reduce pressure

In view of this, in the event of multi-stage pumps, it may be necessary to reduce the generated torque by using a pressure limiter in the respective pump stages. Check and calculate the torques as follows:

17.3.1 Calculating the torque of a hydraulic pump

$$M_d = \frac{V_{gth} \times \Delta p}{2 \times \pi \times 10}$$

M_d = input torque in Nm
V_{gth} = pump volume in cm^3/rpm
Δp p = pressure in bar

17.3.2 Calculating the overall torque of a multi-stage pump

$$M_{dges} = M_{dA} + M_{dB} + M_{dC} + \ldots$$

M_{dA} = A-pump input torque (1st pump)
M_{dB} = B-pump input torque (2nd pump)
M_{dC} = C-pump input torque (3rd pump)

17.3.3 Calculating the torque on the secondary shafts (coupling sleeves)

For the maximum permitted torque on the respective secondary shaft, see chapter 17.4.

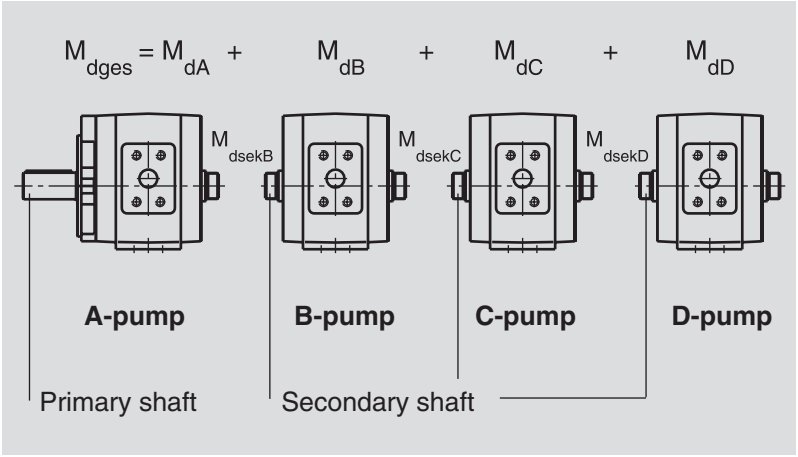


Fig. 17.2: Calculating the torque for secondary shafts

Torque on the secondary shaft of the B- or C-pump:

$$M_{dsekB} = M_{dB} + M_{dC} + M_{dD}$$

$$M_{dsekC} = M_{dC} + M_{dD}$$

If the calculations show that the permitted values have been exceeded, check whether the maximum possible pressures occur at the same time.
If simultaneous loads cannot be avoided, there are two options:

- reduce the pressures until the permitted torque values are not exceeded

or

- replace an overloaded pump stage with one that can take higher pressures

Please contact Voith Turbo H + L Hydraulic.

17.4 Permitted input torques for Voith internal gear pumps

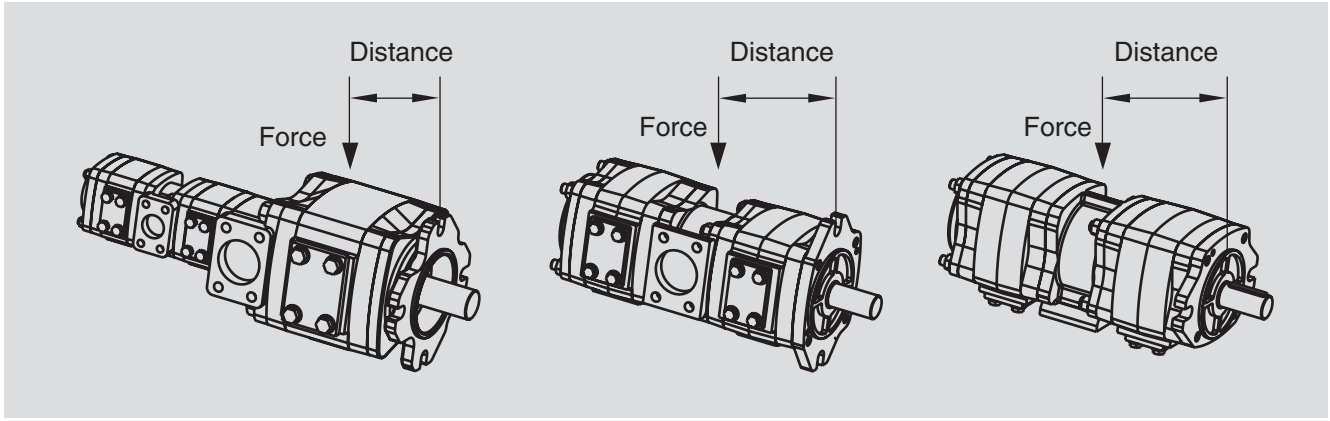
	Permitted input torque M_d in Nm	
Type	**Primary shaft**	**Secondary shaft**
IPH4	450	300
IPH5	800	540
IPH6	1,350	800
IPV(S)(P)(A) 3	160	80
IPV(S)(P)(A) 4	335	190
IPV(S)(P)(A) 5	605	400
IPV(S)(P)(A) 6	1,050	780
IPV(S)(P)(A) 7	1,960	1,200
IPC 4	335	190
IPC 5	605	400
IPC 6	1,050	780
IPC 7	1,960	1,200
IPN(E) 4	160	100
IPN(E) 5	295	200
IPN(E) 6	605	400
IPM(E) 4	160	100
IPM(E) 5	295	200
IPM(E) 6	605	400

Tab. 17.4: Permitted input torques

17.5 Support for pump combinations

Always install pump combinations in environments without any voltage. The pipe flange must be connected without pulling, pushing, or other strong forces and in a voltage-free environment. During operation, the pump carrier also assumes the torque forces generated by the pump drive. The table below shows the maximum permitted torque on the mounting flange with static load and horizontal installation. If these values are exceeded, fit a suitable pump support.

For any other types of installation, or in the event of dynamic forces, contact Voith Turbo H + L Hydraulic.



Primary pump	Four-hole flange	Two-hole flange vertical	Two-hole flange horizontal
	Permitted static torque in Nm		
IPC 4	120	100	75
IPC 5	240	200	108
IPC 6	420	350	140
IPC 7	900	-	-
IPH 4	120	100	75
IPH 5	420	350	140
IPH 6	1080	700	140
IPN 4	-	70	68
IPN 5	-	150	86
IPN 6	-	300	108
IPV(S)(P)(A) 3	-	25	20
IPV(S)(P)(A) 4	120	100	75
IPV(S)(P)(A) 5	240	200	108
IPV(S)(P)(A) 6	420	350	140
IPV(S)(P)(A) 7	900	-	-

Tab. 17.5: Permitted torque on the mounting flange, horizontal installation position

17.6 Pipelines

Use seamless precision steel pipes in accordance with DIN 2391 and removable pipe connections.

Pressure in the suction nozzle

The permitted pressure values at the suction nozzle of the pump must be maintained (see chapter 5.2).

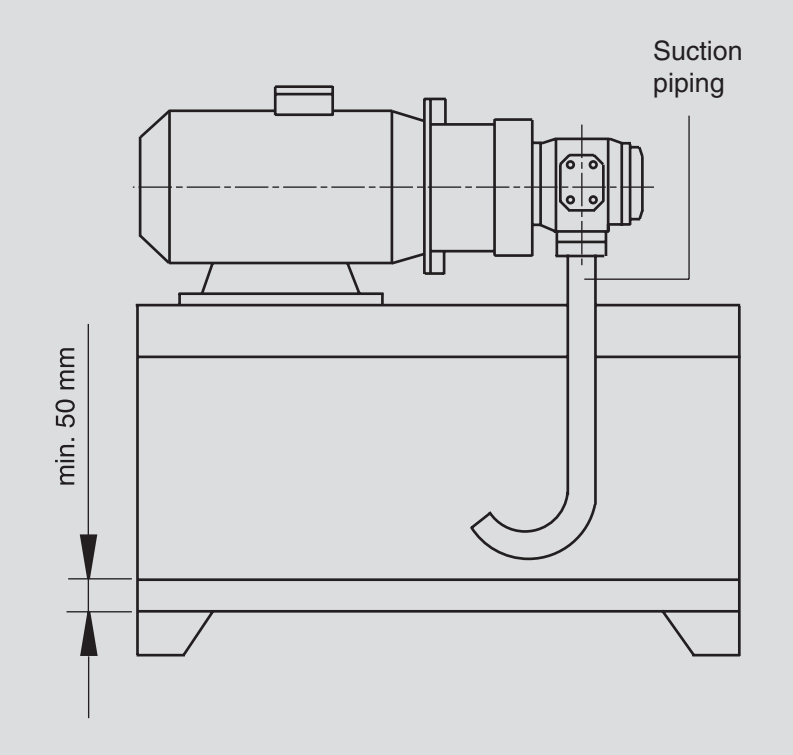


Fig. 17.5: Configuration of the pump suction piping

If the suction cross-section needs to be adjusted in the suction nozzle (e.g. in the case of higher viscosity) in order to achieve the permitted pressure, this must be carried out immediately before the suction flange.

Flow speed

Configure the suction piping cross-section as follows:

- Flow speed 1 m/s (in suction mode) (cavitation!)
- Flow speed 1.5 m/s (inlet with slight overpressure)

Note the permitted input pressures in chapter 5.2.

Suction piping

Arrange the suction piping so that

- the pump cannot empty when the system is shut down,
- the suction opening of the suction piping must be at least 50 mm (or three times the nominal diameter) below the lowest oil level,
- the pipe ends 50 mm above the container floor.

The return fluid must not be sucked in directly by the pump itself.

Ensure the greatest possible distance between the suction piping and return piping.

17.6.1 Factors that influence the loss in pressure in the suction piping

Check the following factors if the loss of pressure falls below the permitted input pressure (see chapter 5.2):

- flow speed in the suction piping (note speed!)
- suction height (difference between oil level and pump)
- any existing filters
- oil viscosity
- suction cross-section
- length of the suction piping
- number and shape of direction changes in the suction piping

17.7 Oil reservoir

This section briefly describes the requirements for pressure fluid circulation tank.

- The required pressure fluid quantity must correspond to at least twice (in intermittent mode and during long cool-down phases) to five times the pump delivery volume per minute.
- The pressure fluid has to cool down, if the permissible temperature of the pump or pressure fluid may be exceeded. (see chapters 5.2 and 6)
- The container must be fitted with a ventilation filter and a strainer in the filler aperture.
- The container must be thoroughly cleaned before filling with oil.
- If containers are painted, oil-resistant paint must be used.
- Ensure that there is a sufficient baffle plate between the drawn-in pressure fluid and the return piping in order to separate the air from the oil (separating plate).

17.8 Filtration

This section provides information about the filter elements to be used.

A vital prerequisite in ensuring a long service life and trouble-free operation of the hydraulic system is careful filtration of the pressure fluid.

Contamination level:

- Max. permitted contamination in the pressure fluid:
  according to NAS 1638 class 8.
  according to ISO 4406 code 19/17/14.
- To ensure a longer service life, we recommend filter
  according to NAS 1638 class 7 or above
  nach ISO 4406 Code 18/16/13.
- We recommend a filter with a minimum retention rate of $ß_{10} > 100$.

Note:

- The filter or filter elements must be maintained on a regular basis and replaced if necessary.
- To monitor correct functionality, the filters must be fitted with an optical, or better an electrical contamination display.

18 Declaration on the installation of an incomplete machine

Voith Turbo H+L Hydraulic GmbH & Co. KG
Schuckertstr. 15
71277 Rutesheim, Germany

The incomplete machine (referred to herein as the “Product”):

Internal gear pump: Series IPH, IPC, IPV(S), IPV(A)P, IPVA, IPN(E), IPM(E)

complies with the following directive or standards:

2006/42/EC of May 17, 2006 on machinery
ISO 4413 General rules and safety requirements for hydraulic systems
DIN EN ISO 9001 Quality management (for production)

Following a justified request, the specific technical documents can be presented to the individual state bodies of the EU. The documents are normally stored on data carriers or provided electronically.

Authorized to compile technical documentation: Bert Brahmer

The product may only be commissioned once it has been established that the machine in which the Product was installed meets the Directive 2006/42/EC of the European Parliament and Council of May 17, 2006.

Rutesheim, September 21, 2011

Name, signature	Function
Bert Brahmer	Managing Director

19 Keyword index

Voith Turbo H + L Hydraulic GmbH & Co. KG
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Voith Turbo H + L Hydraulic GmbH & Co. KG
Schuckertstraße 15
71277 Rutesheim, Germany
Tel. +49 (0)7152/992-3
Fax +49 (0)7152/992-400
sales-rut@voith.com
www.voithturbo.com

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