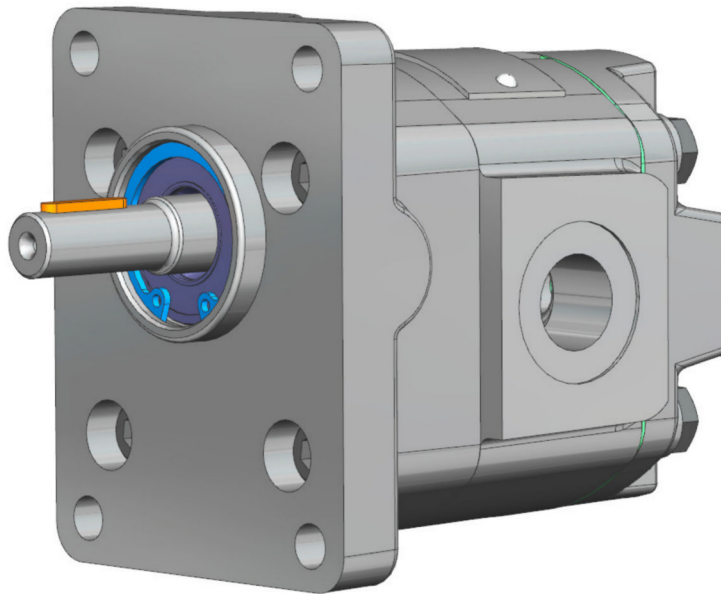


# D.0025460002

## Operating instructions (Translation)



Gear pump KF 0/.

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## 1 General

### 1.1 About the documentation

These operating instructions describe the installation, operation and maintenance of the following device:

**Gear pump KF 0/.**

The device is manufactured in different versions. Information about the version concerned in the individual case can be found on the device's type plate.

These operating instructions are a component of the device and must be kept accessible for the personnel near the device at all times.

If you have any questions about these operating instructions, please contact the manufacturer.

### 1.2 Manufacturer's address

KRACHT GmbH  
Gewerbestraße 20  
DE 58791 Werdohl  
phone: +49 2392 935-0  
fax: +49 2392 935-209  
email: [info@kracht.eu](mailto:info@kracht.eu)  
web: [www.kracht.eu](http://www.kracht.eu)

### 1.3 Applicable documents

1. KTR Kupplungstechnik GmbH, DE 48407 Rheine
  - KTR-N 40210: Coupling operating/assembly instruction Rotex

Excerpts from these documents are included in these operating instructions.

If required, the original documents can be requested from the respective manufacturer.

## 1.4 Symbolism



### DANGER

Identification of an immediate hazard, which would result in death or severe bodily injury if not avoided.



### WARNING

Identification of a potential medium risk hazard, which would lead to death or severe bodily injury if not avoided.



### CAUTION

Identification of a low risk hazard, which could lead to minor or medium bodily injury if not avoided.



### NOTICE

Flagging of notices to prevent property damage.



Identification of basic safety instructions. Non-compliance can lead to hazards for people and the device.



Flagging of special user tips and other especially useful or important information.

## 2 Safety

### 2.1 Intended use

1. The device has been designed for operation with fluid. Dry operation is not permitted.
2. The device may be operated in filled condition only.  
The medium must be compatible with the materials used in the device. The chemical competence is necessary for this. Be careful with ethylene oxide or other cathalytic or exothermic or self-decomposing materials. Please consult the manufacturer in cases of doubt.
3. The device may be operated only in usual industrial atmospheres. If there are any aggressive substances in the air, always ask the manufacturer.
4. Operation of the device is only permissible when complying with the operating instructions and applicable documents.  
Deviating operating conditions require the express approval of the manufacturer.
5. In case of any use of the device not according to specification, any warranty is voided.

### 2.2 Personnel qualification and training

The staff designated to assemble, operate and service the device must be properly qualified. This can be through training or specific instruction. Personnel must be familiar with the contents of this operating instructions.



Read the operating instructions thoroughly before use.

### 2.3 Basic safety instructions



1. Comply with existing regulations on accident prevention and safety at work along with any possible internal operator regulations.
2. Pay attention to the greatest possible cleanliness.
3. Wear suitable personal protection equipment.
4. Do not remove, make illegible or obliterate type plates or other references on the device.
5. Do not make any technical changes on the device.
6. Maintain and clean the device regularly.
7. Use spare parts approved by the manufacturer only.

## 2.4 Basic hazards



### DANGER

#### **Hazardous fluids!**

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.



### DANGER

#### **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

1. Before all work, ensure that existing drives are voltage-free and pressure-free.
2. Securely prevent restarting during all work.



### DANGER

#### **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

1. Take measures against accidental touching of rotating parts.



### WARNING

#### **Rotating parts!**

Danger of injury from flying parts.

1. Enclose rotating parts so as to avoid any danger from flying parts in the event of breakage or malfunction.



### WARNING

#### **Failure of load-carrying parts due to overload!**

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.



## WARNING

### **Failure of load-carrying parts due to overload!**

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Use only connections and lines approved for the expected pressure range.
2. Securely prevent exceeding the permissible pressure, e.g. by using pressure relief valves or rupture discs.
3. Design pipework so that no tensions, e.g. caused by changes in length due to fluctuations in temperature, are transmitted to the device.



## WARNING

### **Failure of load-carrying parts due to overload!**

Danger of injury from flying parts.

Danger of injury from spurting fluids.

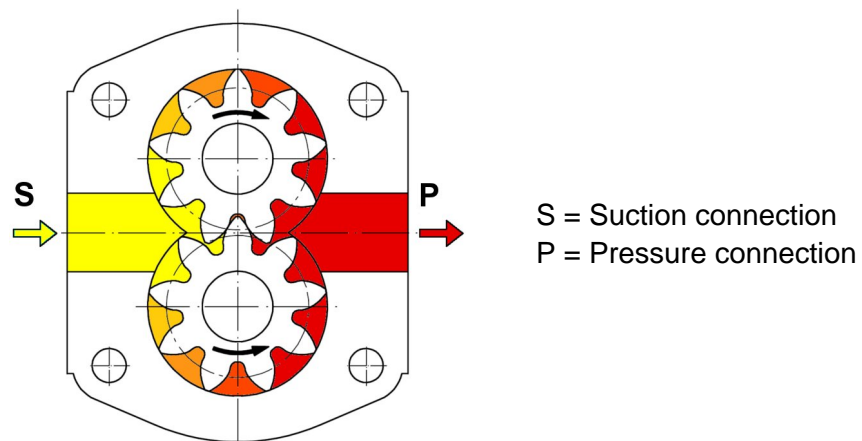
1. Do not operate the device against closed shut-off devices.
2. Do not operate the device in the false direction of rotation.



### 3 Device description

#### 3.1 Functional principle

KF/KFF series pumps are external gear pump types that work according to the positive displacement principle.



When rotated, two gearwheels meshing together produce a volume enlargement as a result of the opening of the tooth spaces on the suction side (S), so that medium can flow in and so that a corresponding volume is displaced simultaneously by immersion of the teeth into the filled tooth spaces on the pressure side (P). Fluid transport takes place through entrainment in the tooth gaps along the wall of the wheel chamber. The so-called geometric flow rate  $V_g$  is being displaced per wheel rotation. A value that is stated in technical documents as rated volume  $V_{gn}$  to specify the pump size.

The actually delivered amount of liquid does not correspond with the theoretical value, it is being reduced through losses due to the necessary tolerances. The losses are less the lower the operating pressure and the higher the viscosity of the medium.

Gear pumps are self-priming within wide limits. The displacement cycle describe initially takes place without exhibiting appreciable pressure build-up. Only after setting external loads, for example, through delivery heights, flow resistances, line elements, etc. will the required working pressure arise to overcome these resistances.

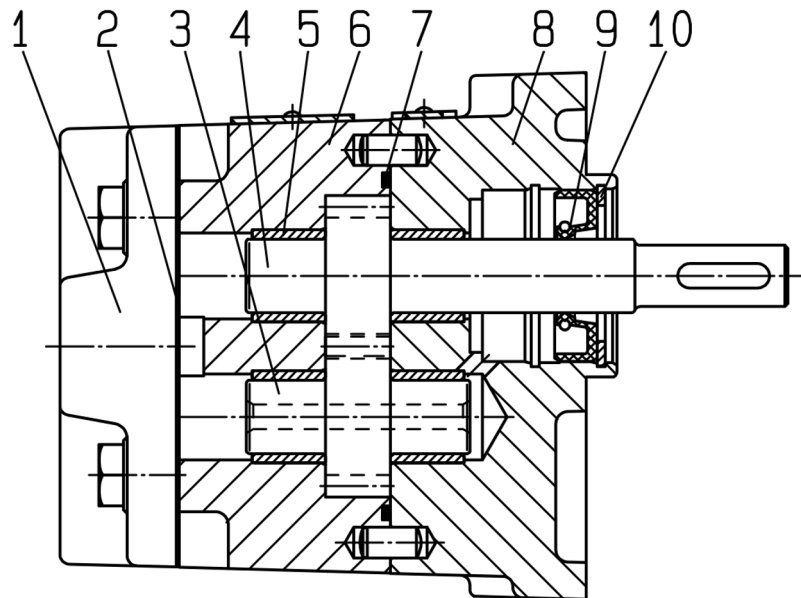
As usual with non-axial play compensated pumps, the lateral clearance between gear and front face has been set in such a way that the maximum allowable operating pressure is managed in an adequate and secure way.

Bearing and shaft seal of the device are lubricated by the media. The device's operating life will be reduced if the medium contains abrasive ingredients.

The shaft seal chamber is connected to the device's suction side. The pressure occurring at the shaft seal therefore corresponds to the pressure at the

suction connection of the device. The permissible pressure is determined by the type of sealing.

## 3.2 Basic design



### Explanation

- |                       |   |
|-----------------------|---|
| 1. End cover          | 7. O-Ring   |
| 2. Gasket             | 8. Flange cover                                       |
| 3. Driven shaft       | 9. Shaft seal   |
| 4. Driving shaft      | (see <a href="#">section 3.5.2 "Representation"</a> ) |
| 5. Plain bearing bush | 10. Retaining ring                                    |
| 6. Housing            |   |

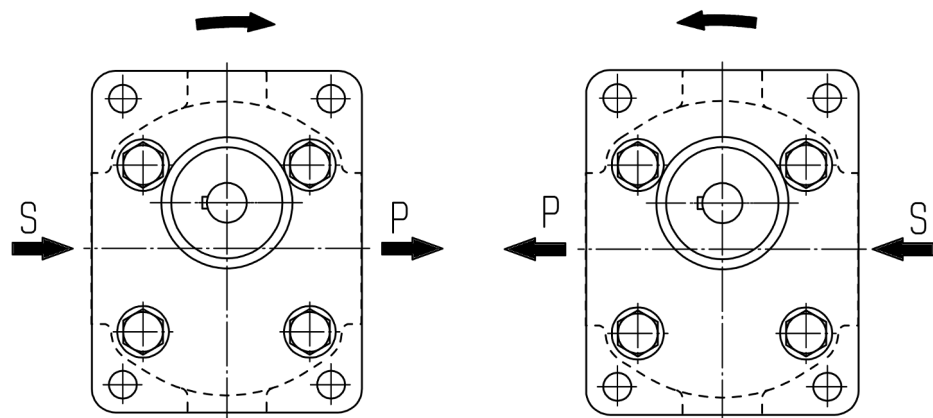
### 3.3 Rotation and delivery direction

The following definition applies with respect to the rotation and delivery direction of external gear pumps for pump connections positioned below the drive shaft:

Looking at the pump shaft end, the pumping flow is from left to right when the shaft is moving clockwise.

Looking at the pump shaft end, the pumping flow is from right to left when the shaft is moving counter-clockwise.

**Gear pump with end cover**



S = Suction connection

P = Pressure connection

The direction of rotation is indicated by the bent arrow.

The flow direction is indicated by the straight arrows.

## 3.4 Type key

Ordering example KF 0													
KF 0/	0,5	S	1	0	K	P	0	A	0	D	L	1	/100
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.

Explanation of type key KF 0				
1.	Product name			
2.	Nominal size (Rated volume)			
	V <sub>gn</sub>	0.5; 0.8; 1; 1.6; 2; 2.5; 3; 4		
3.	Flange mounting cover			
	S	KF 0		
4.	Direction of rotation			
	1	Clockwise	2	Counterclockwise
5.	Outboard flange			
	0	Without mounting angle	F	Mounting angle
6.	Construction of housing			
	K	Housing with threaded connection		
7.	Shaft end			
	P	Cylindrical shaft end without outboard bearing		
8.	2nd shaft end			
	0	Without 2nd shaft end		
9.	End cover			
	A	For direction of rotation 1 or 2		
10.	Design serial number (specified by manufacturer)			
11.	Housing material			
	D	EN-GJL-250 (GG-25)		
12.	Gears version			
	L	Spur gearing		
13.	Seal			
	1	Rotary shaft seal NBR	2	Rotary shaft seal FKM
	32	Rotary shaft seal PTFE		
14.	Special number for special versions			
	See <a href="#">section 3.5 “Important special numbers”</a>			

### 3.5 Important special numbers

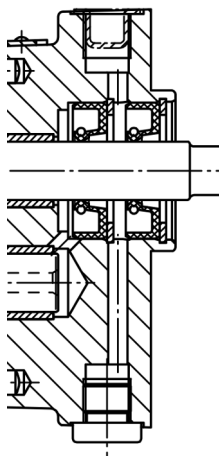
#### 3.5.1 Description

Special number	Description
<b>44</b>	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Double rotary shaft seal</li> <li>Connection borehole G1/8 (for Quench) <sup>(1)</sup> <ul style="list-style-type: none"> <li>Quenching connection on top: open</li> <li>Quench connection bottom: sealed</li> </ul> </li> </ul>
<b>74</b>	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Double rotary shaft seal (for vacuum operation)</li> <li>Connection borehole G1/8 (for Quench) <sup>(1)</sup> <ul style="list-style-type: none"> <li>Quenching connection on top: open</li> <li>Quench connection bottom: sealed</li> </ul> </li> </ul>
<b>100</b>	<ul style="list-style-type: none"> <li>Wear protection coating on gear and plain bearing bush (Standard)</li> <li>Rotary shaft seal</li> </ul>
<b>107</b>	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Double rotary shaft seal</li> <li>Connection borehole G1/8 (for Quench) <sup>(1)</sup> <ul style="list-style-type: none"> <li>Quenching connection on top: open</li> <li>Quench connection bottom: open</li> </ul> </li> </ul>
<b>127</b>	<ul style="list-style-type: none"> <li>like special number 44</li> <li>Housing connection: KF 0/0,5 - KF 0/1,0: Whitworth pipe thread G1/2</li> </ul>
<b>133</b>	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Double rotary shaft seal</li> <li>Connection borehole G1/8 (for Quench) <sup>(1)</sup> <ul style="list-style-type: none"> <li>Quenching connection on top: open</li> <li>Quench connection bottom: sealed</li> </ul> </li> <li>Direction inlet port/outlet port</li> </ul>
<b>169</b>	<ul style="list-style-type: none"> <li>like special number 44</li> <li>Gears: Tool steel (1.2343) - nitrided</li> </ul>
<b>170</b>	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Rotary shaft seal BABSL</li> <li>Flange cover: nitrocarburized</li> </ul>
<b>180</b>	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Rotary shaft seal mounted in rear installation space</li> </ul>
<b>195</b>	<ul style="list-style-type: none"> <li>like special number 44</li> <li>Gears: Tool steel (1.2343) - nitrided</li> </ul>

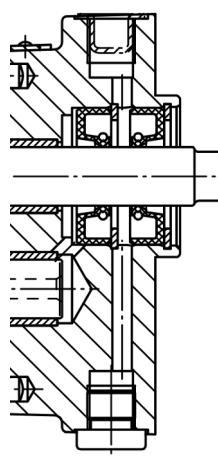
Special number	Description
	Reduced lateral clearance
202	<ul style="list-style-type: none"> <li>like special number 107</li> <li>Reduced lateral clearance</li> </ul>
208	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Double rotary shaft seal</li> </ul> Grease filling between the rotary shaft seals Flange cover: nitrocarburized
212	<ul style="list-style-type: none"> <li>like special number 44</li> <li>Gears: Tool steel (1.2343) - nitrided</li> </ul> enclosure/flange cover: nitrocarburized
219	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Rotary shaft seal BABSL (for vacuum operation)</li> </ul>
240	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Double rotary shaft seal BABSL</li> </ul> Connection borehole G1/8 (for Quench) <sup>(1)</sup> <ul style="list-style-type: none"> <li>Quenching connection on top: open</li> <li>Quench connection bottom: open</li> </ul>
245	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Double rotary shaft seal (BAUMX7)</li> </ul> Grease filling between the rotary shaft seals Connection borehole G1/8 (for Quench) <sup>(1)</sup> <ul style="list-style-type: none"> <li>Quenching connection on top: open</li> <li>Quench connection bottom: sealed</li> </ul> Housing connection: KF 0/0,5 - KF 0/1,0: Whitworth pipe thread G1/2
257	<ul style="list-style-type: none"> <li>like special number 44</li> <li>enclosure/flange cover: nitrocarburized</li> </ul> Reduced lateral clearance
311	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Double rotary shaft seal BABSL (for vacuum operation)</li> </ul> Connection borehole G1/8 (for Quench) <sup>(1)</sup> <ul style="list-style-type: none"> <li>Quenching connection on top: open</li> <li>Quench connection bottom: open</li> </ul>
312	<ul style="list-style-type: none"> <li>like special number 107</li> <li>O-rings: FFKM</li> </ul>
315	<ul style="list-style-type: none"> <li>like special number 100</li> <li>Rotary shaft seal</li> </ul> Reduced lateral clearance

Special number	Description
<b>403</b>	<ul style="list-style-type: none"> <li>like special number 44</li> <li>enclosure/flange cover/Gears: Anti-stick coating</li> </ul>
<b>423</b>	<ul style="list-style-type: none"> <li>like special number 107</li> <li>Gears: Tool steel (1.2343) - nitrided</li> <li>enclosure/flange cover: EN-GJS 60-3</li> <li>Reduced lateral clearance</li> </ul>
(1) See <a href="#">section 3.6 "Quench"</a>	

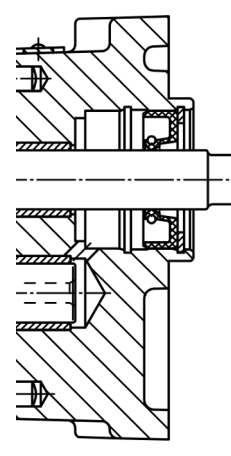
### 3.5.2 Representation



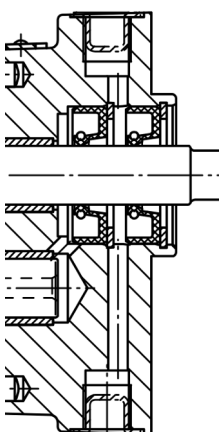
Special number:  
44; 127; 169; 195; 212; 423



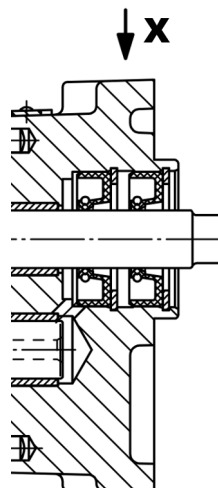
Special number:  
74



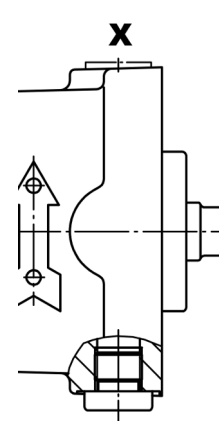
Special number:  
100 (Standard)  
315

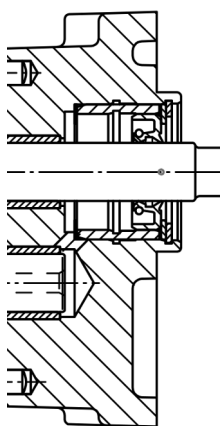


Special number:  
107; 202; 257; 312; 403

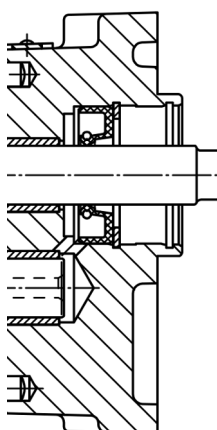


Special number:  
133

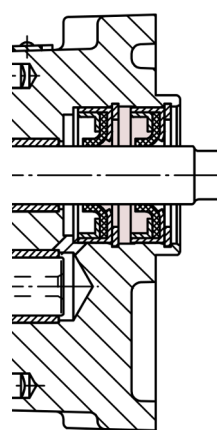




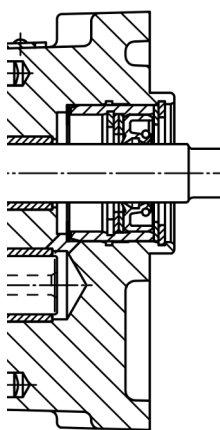
*Special number:*  
170



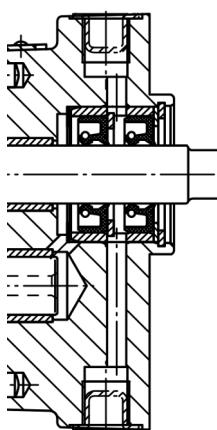
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180



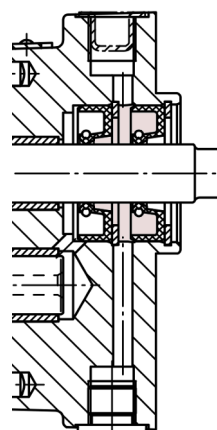
*Special number:*  
208



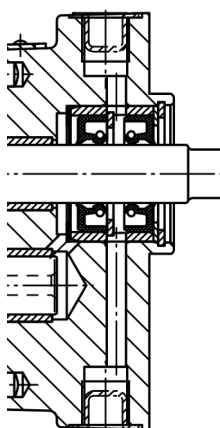
*Special number:*  
219



*Special number:*  
240



*Special number:*  
245



*Special number:*  
311



### 3.6 Quench

Versions with quench are used when absolute leak tightness is required on the shaft seal, e.g. when pumping media

- which cures upon contact with air.
- which crystallises upon contact with air humidity.
- the leakage of which must not be released into the environment.
- are under vacuum and their seal shall be gastight.

Select the mounting position so that the connection for the quench faces up.

## 4 Technical data

### 4.1 General

General information KF 0/.		
Design		External gear pump
Housing connection <sup>(1)</sup>	KF 0/0.5 - KF 0/1.0	Whitworth pipe thread G3/8
	KF 0/1.6 - KF 0/4.0	Whitworth pipe thread G1/2
Overview nominal size	Nominal size V <sub>gn</sub>	Geom. displacement V <sub>g</sub> [cm³/rev.]
	0.5	0.5
	0.8	0.8
	1.0	1.0
	1.6	1.6
	2.0	2.0
	2.5	2.5
	3.0	3.0
	4.0	4.0
Mounting position	KF 0/. without fluid buffer	Any <sup>(2)</sup>
	KF 0/. with fluid buffer	Shaft end horizontal, fluid buffer connection top
Speed	n <sub>max.</sub>	3000 rpm See <a href="#">section 4.2 “Viscosity - Rotation speed assignment”</a>
Operating pressure	p <sub>e</sub>	See <a href="#">section 4.3 “Operating pressure”</a>
	p <sub>b</sub>	
Viscosity	v <sub>min</sub>	10 mm²/s
	v <sub>max</sub>	20000 mm²/s
Fluid temperature	ϑ <sub>m</sub>	See <a href="#">section 4.4 “Permissible temperature range”</a>
Ambient temperature	ϑ <sub>u</sub>	
Material		See <a href="#">section 4.5 “Material data”</a>
Weight		See <a href="#">section 4.6 “Weight”</a>

General information KF 0/.	
<b>Permissible media</b>	Lubricating fluids without abrasive components. Because of the coated gear parts and bearing bushes even filled up to a specified grain size and handness of the filled material can be conveyed. (Petrols, solvents, etc. are not permissible.)
<sup>(1)</sup> <i>Pipe thread: ISO 228-1</i> <sup>(2)</sup> <i>A reduced service life must be expected for the shaft seal in the case of vertical installation (shaft end top).</i>	

## 4.2 Viscosity - Rotation speed assignment

Kinematic viscosity $\nu$ [mm <sup>2</sup> /s]										
≤ 100	200	300	500	1000	2000	3000	5000	10000	15000	20000
3600	2900	2300	1800	1500	950	750	650	500	400	≤ 350
Recommended rpm $n_{\max}$ [rpm]										



Select the speed of rotation so that complete filling of the pump is ensured. This is given if the pressure on the suction side does not fall below the permissible pressure  $p_{e \min}$ .

## 4.3 Operating pressure

Nominal size $V_{gn}$	Operating pressure <sup>(1)</sup>					
	Suction side		Pressure side <sup>(3)</sup> $p_{b \max}$ [bar] (Operating pressure)			
	$p_{e \min}$ [bar abs.]	$p_{e \max}$ [bar]	Viscosity			
			10 mm <sup>2</sup> /s	30 mm <sup>2</sup> /s	100 mm <sup>2</sup> /s	≥ 500 mm <sup>2</sup> /s
0.5	0.6 <sup>(2)</sup>	2	10	30	50	60
0.8			15	40	60	70
1.0			15	40	60	70
1.6			20	60	80	100
2.0			20	60	80	100
2.5			30	60	100	120
3.0			30	60	100	120
4.0			40	80	120	120

<sup>(1)</sup> bar abs.: absolute pressure, bar: relative pressure

<sup>(2)</sup> Start-up condition: 0.4 bar absolute (max. 30 minutes)

<sup>(3)</sup> The values apply for a speed range of 1000 rpm - 3000 rpm. Reduce the maximum working pressures at speeds < 1000 rpm.

## 4.4 Permissible temperature range

Sealing material	Fluid temperature $\vartheta_m$ <sup>(1)</sup>	
	$\vartheta_{m \min}$ [°C]	$\vartheta_{m \max}$ [°C]
NBR	-20	90
FKM		150
PTFE / FEP with FKM-core		200

<sup>(1)</sup> Comply with media-specific properties.

Sealing material	Ambient temperature $\vartheta_u$	
	$\vartheta_{u \min}$ [°C]	$\vartheta_{u \max}$ [°C]
NBR	-20	60
FKM		
PTFE / FEP with FKM-core		

#### 4.5 Material data

Seal type	enclosure/flange cover/End cover	Gears	Storage	Shaft seal	Other seals
1	EN-GJL-250 (GG-25)	Case-hardened steel (1.7139)	44SMn28 (1.0762) with SiC deposits	NBR	NBR, C4409
2				FKM	FKM, C4409
32				PTFE	FEP with FKM-core, C4409

#### 4.6 Weight

Nominal size $V_{gn}$	Gear pump with end cover [kg]
0.5	2.2
0.8	
1.0	
1.6	
2.0	
2.5	
3.0	
4.0	

#### 4.7 Dimensions

Dimensions of the device can be found in the relevant technical data sheets.

## 5 Transport and storage

### 5.1 General

- After receipt, check the device for transport damages.
- If transport damage is noticed, report this immediately to the manufacturer and the carrier. The device must then be replaced or repaired.
- Dispose of packing material and used parts in accordance with the local stipulations.

### 5.2 Storage

The device's function is tested in the plant with mineral hydraulic oil. Then all connections are closed. The remaining residual oil preserves the interior parts for up to 6 months.

Metallic exposed exterior parts are protected against corrosion by suitable conservation measures, also up to 6 months.

In case of storage, a dry, dust-free and low-vibration environment is to be ensured. The device is to be protected against influences from weather, moisture and strong fluctuations of temperature. The recommended storage conditions are to be adhered to.

Below the permissible ambient temperature  $\vartheta_u$  elastomer seals lose their elasticity and mechanical loading capacity, since the glass transition temperature is fallen below. This procedure is reversible. A force action on the device is to be avoided in case of storage below the permissible ambient temperature  $\vartheta_u$ .

Devices with EPDM seals are not mineral-oil resistant and are not tested for their function. There is no preservation of the interior parts. If the device is not taken into operation immediately, all corrosion-prone surfaces are to be protected by suitable conservation measures. The same applies for devices which are not tested for other reasons.

When storing for a long period of time (> 6 months), treat all surfaces at risk of corrosion again with suitable preserving agents.

If high air humidity or aggressive atmospheres are expected, take additional corrosion-preventing measures.



Storage in corrosion protection bags (VCI) maximum of 6 months.

**NOTICE****Corrosion/chemical impact**

Improper storage can render the device useless.

1. Protect endangered surfaces by means of suitable conservation measures.
2. Comply with recommended storage conditions.

**Recommended storage conditions**

1. Storage temperature: 5 °C - 25 °C
2. Relative air humidity: < 70 %
3. Protect elastomer parts from light, especially direct sunlight.
4. Protect elastomer parts from oxygen and ozone.
5. Comply with maximum storage times of elastomeric parts:
  - 5 Years: AU (Polyurethane rubber)
  - 7 Years: NBR, HNBR, CR
  - 10 Years: EPM, EPDM, FEP/PTFE, FEP, FKM, FFKM, VMQ, FVMQ

## 6 Installation

### 6.1 Safety instructions for installation



#### DANGER

##### **Hazardous fluids!**

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.



#### DANGER

##### **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

1. Before all work, ensure that existing drives are voltage-free and pressure-free.
2. Securely prevent restarting during all work.



#### DANGER

##### **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

1. Take measures against accidental touching of rotating parts.



#### WARNING

##### **Rotating parts!**

Danger of injury from flying parts.

1. Enclose rotating parts so as to avoid any danger from flying parts in the event of breakage or malfunction.



#### WARNING

##### **Unshielded gearwheels!**

Gearwheels can trap and crush fingers and hands.

1. Do not engage gearwheels.



**WARNING****Failure of load-carrying parts due to overload!**

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.

## 6.2 Noise reduction

**Measures for noise reduction**

1. Use suction and pressure hoses.
2. Use bell housings with high damping properties (plastic or cast iron).
3. Use of damping rings and damping rods for separation of structure-borne noise.

## 6.3 Mechanical installation

### 6.3.1 Preparation

- Check the device for transport damage and dirt.
- Check the device for freedom of movement.
- Remove existing preservatives.
  - Use only those cleaning agents that are compatible with the materials used in the device.
  - Do not use cleaning wool.
- Compare the environmental and ambient conditions at the place of installation to the permissible conditions.
  - Ensure a sufficiently stable and level foundation.
  - Expose the device only to small vibrations, see IEC 60034-14.
  - Secure sufficient access for maintenance and repair.

## 6.3.2 Pumps with free shaft end

The prerequisite for trouble-free operation is suitable load transmission between the pump and the drive. By default a torsionally flexible claw coupling Type "R" is used for this.

- Pre-mount coupling parts as per manufacturer's specifications.



Torsionally flexible claw coupling type "R.": See [section 6.3.3 "Coupling Type "R.""](#)

- Position the pumps and the drive with respect to each other.
  - Comply with the permissible mounting position.
  - Comply with the permissible direction of rotation.



Rotation and delivery direction: See [chapter 3 "Device description"](#)

- Tighten all fastening screws with the specified torque.  
(Tightening torque  $M_A = 4,6 \text{ Nm}$  - Counter-thread: Aluminium).  
(Tightening torque  $M_A = 10 \text{ Nm}$  - Counter-thread: Cast iron/Steel).
  - Keep to the permissible displacement values of the coupling.
  - Rule out any distortion of the device.
  - Pay attention to sufficient screw-in depth of the fastening screws.
- For devices without shaft seals, ensure that the leak oil from the shaft sealing chamber is specifically drained off and cannot get into the environment.
- Make sure no foreign bodies can get into the device.
- Take measures against accidental touching of rotating parts.
- Take measures against accidental touching of hot surfaces ( $> 60 \text{ °C}$ ).
- On devices with quench, mount a tank for the liquid seal.
  - Mount the tank above the device.
  - The connection on the device must point upward.
  - Checking the fluid level must be possible at any time.

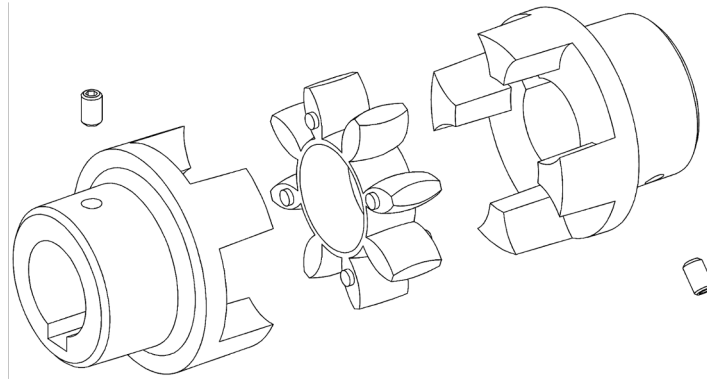


A second port on the unit enables purging of the quench chamber and draining of the liquid seal.

### 6.3.3 Coupling Type "R."

Claw couplings Type "R." are torsionally flexible and transmit the torque positive. They are fail-safe. The vibrations and impacts that occur during operation are effectively dampened and reduced.

#### Claw coupling Type "R."



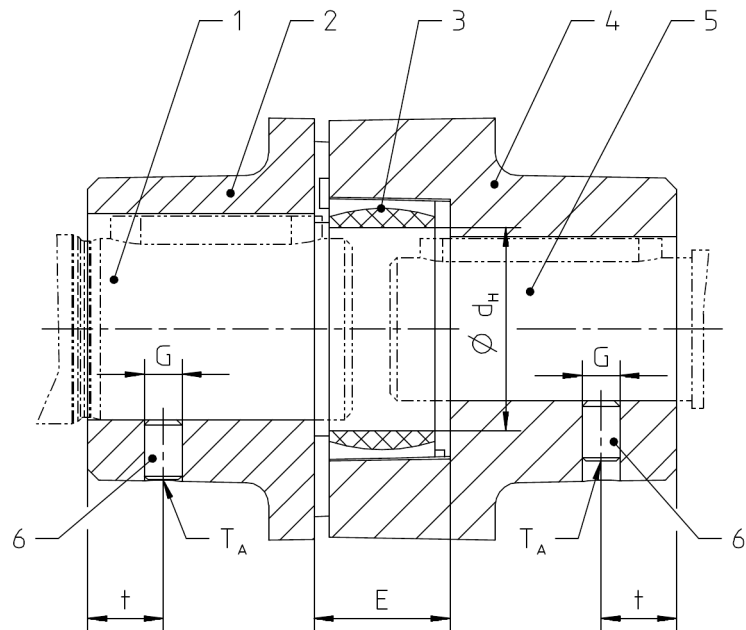
#### NOTICE

##### **Coupling breakage or increased wear**

An overload can lead to premature failure of the coupling.

1. Ensure safe dimensioning when designing the coupling. Take vibrations, torque peaks and temperatures into account.

## Assembly data



## Explanation

- |                               |   |
|-------------------------------|---|
| 1. Shaft projects into spider | 4. Coupling halve                               |
| 2. Coupling halve             | 5. Shaft with parallel key projects into spider |
| 3. Spider                     | 6. Setscrew                                     |

When installing the coupling, maintain the "E" gap dimension so that the spider remains free during operation. If the shaft diameters are less than (also with parallel key) the dimension  $d_H$  of the spider, the shaft ends can protrude out into the spider.

Coupling size <sup>(1)</sup>	14	19	24
	-	19/24	24/28
Coupling clearance E [mm]	13	16	18
$d_H$ [mm]	10	18	27
G	M4	M5	M5
t [mm]	5	10	10
Tightening torque $T_A$ [Nm]	1.5	2	2

<sup>(1)</sup> Example: R.19-Z25/14-Z25/19 or R.19/24-Z25/14-Z25/24.



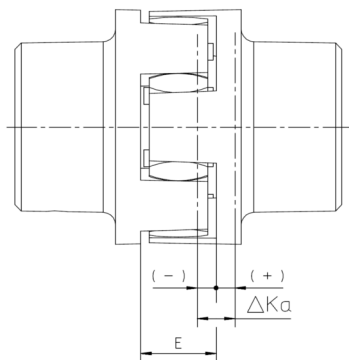
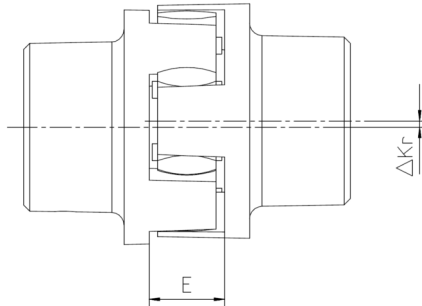
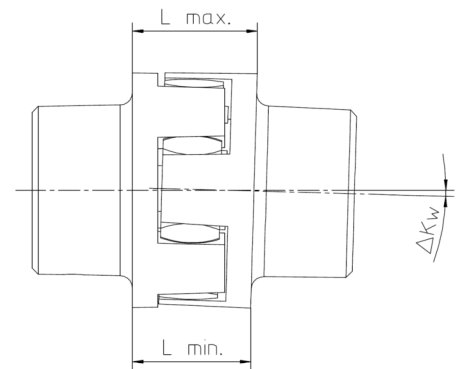
For assembly, the coupling halves can be heated to approx. 80 °C and pushed onto the shaft ends while warm.

**CAUTION****Hot surfaces!**

Burn injury to skin if touched.

1. Wear protective gloves at temperatures  $\geq 48^\circ\text{C}$ .

- Mount the coupling halves on the shaft ends but avoid impacts on the components.
- Position the coupling halves on the shaft ends so that in later operation the "E" gap dimension is maintained.
- Secure the coupling halves by tightening the setscrews.
- Insert the spider in a coupling half.

**Displacement values****Axial displacement** $\Delta K_a$ **Radial displacement** $\Delta K_r$ **Angular displacement** $\Delta K_w/\Delta K_L$ 

$$\Delta K_L \triangleq L_{\max} - L_{\min}$$

Coupling size		14	19	24
		-	19/24	24/28
Coupling clearance E [mm]		13	16	18
$\Delta K_a$ [mm]		+1.0	+1.2	+1.4
		-0.5	-0.5	-0.5
$\Delta K_r$ [mm]	1500 rpm	0.11	0.13	0.15
	3000 rpm	0.08	0.09	0.1
$\Delta K_w$ [Degree]	1500 rpm	1.1	1.1	0.8
	3000 rpm	1.0	1.0	0.7
$\Delta K_L$ [mm]	1500 rpm	0.57	0.77	0.77
	3000 rpm	0.52	0.7	0.67

## Displacement combinations

Examples for displacement combinations shown in the photo opposite:

*Example 1:*

$$\Delta K_r = 30 \%$$

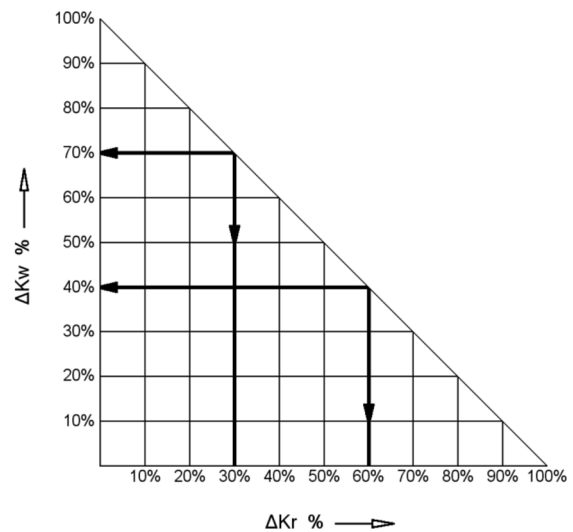
$$\Delta K_w = 70 \%$$

*Example 2:*

$$\Delta K_r = 60 \%$$

$$\Delta K_w = 40 \%$$

$$\Delta K_r + \Delta K_w \leq 100 \%$$



## 6.4 Connection lines

### 6.4.1 General



### WARNING

#### Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Use only connections and lines approved for the expected pressure range.
2. Securely prevent exceeding the permissible pressure, e.g. by using pressure relief valves or rupture discs.
3. Design pipework so that no tensions, e.g. caused by changes in length due to fluctuations in temperature, are transmitted to the device.



#### Additional connections

1. Provide measurement connections for pressure and temperature as close as possible to device.
2. If necessary, provide a facility to fill or empty the device and the line system.
3. If necessary, provide a facility to vent the device and the line system.

### 6.4.2 Suction line

A less than optimally planned suction line can lead to increased noise emission, cavitation as well as reduction of the delivery rate (caused by not complete filling of the pump).

When designing the line, take the following points into consideration:

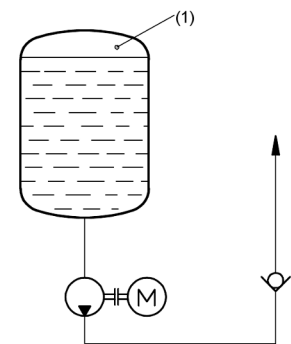
- The suction line must be piped as short as possible and in a straight line.
- Stipulate the nominal width of the suction line so that the permissible operating pressure  $p_{e\ min}$  is not exceeded on the suction side.
- Avoid large suction heights.
- Avoid additional pressure loss through line resistances such as fittings, screwed connections, formed parts or suction filters/suction baskets.  
Ensure that all technically required suction filters/suction baskets are appropriately dimensioned.
- Make sure there is sufficient clearance of the suction port to the bottom and walls of the media container.
- Make sure that the suction opening lies underneath the lowest fluid level in all operating situations.
- When hose lines are used, ensure sufficient stability of the hoses so that they cannot become constricted through the sucking action.
- Comply with the recommended flow velocity in the suction line (max. 1.5 m/s).

#### Suction line at vacuum operation

If suction from a tank under vacuum is desired, the pump must be arranged approx. 1 m below the tank. The suction line must run in a straight line and without any resistances.

The tank may be subjected to vacuum only then when the pipework and the pump have been filled with liquid.

For this application, only pumps suitable for vacuum operation may be used.



(1) Vacuum



#### NOTICE

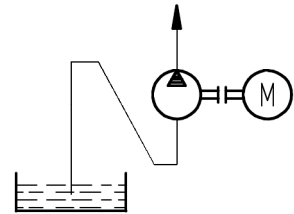
##### Cavitation damage

Undercutting the permissible suction port pressure results in cavitation.

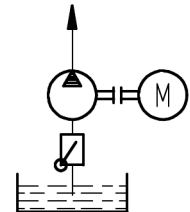
1. Design the suction line so that the pressure arising in operation on the suction side is always higher than the vapour pressure of the pumped medium. At the same time, comply with the installation altitude of the device above mean sea level.
2. For aqueous fluids, mount the device underneath the fluid level, set the operating temperature to 50 °C and limit the speed to 1500 rpm.

## Prevention of suction problems

If there is a possibility that the suction line can run dry if the pump stops, piping the suction line as siphon is an option to avoid suction problems. This way, the pump will remain permanently filled after initial commissioning.



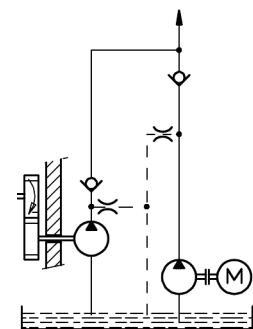
It is appropriate to employ a foot valve or a non-return valve in case of longer suction lines that can run dry while the pump is at rest. These must have been designed for use in suction lines and should offer as low a flow resistance as possible.



During operation of a pump that has to pump media via a non-return valve in a pressurized circuit (e.g. reserve pump in a lubricant circuit), suction problems can occur if the suction line is filled with air.

In this case the pressure pipe must be bled directly upstream of the non-return valve.

If no vent nozzle is used, the volume of the pressure pipe between the pump and the non-return valve must be at least 75 % of the suction line volume.



## 6.4.3 Pressure line

When designing the line, take the following points into consideration:

- Select the nominal width of the pressure line so that the maximum permissible pressures are not exceeded.
- If necessary, provide a vent nozzle to prevent suction problems.

## 6.4.4 Mounting Connection lines



Position of the device connections: See [chapter 3 "Device description"](#)

- Clean all lines.
  - Do not use cleaning wool.
  - Pickle and flush welded pipes.
- Remove the protective plugs.
- Mount the lines.
  - Comply with the manufacturer's information.
  - Do not use any sealing materials such as hemp, Teflon tape or putty.



## 6.5 Change of the direction of rotation

For pump types KF 0/. ..1 .. and KF 0/. ..2 .. a change of the direction of rotation is only possible by converting.

The manufacturer normally carries out the conversion work and the customer should do this only in exceptional cases. Please consult the manufacturer about this.



### DANGER

#### Rotating parts!

Danger of death due to body parts, hair or clothing getting trapped or entangled.

1. Before all work, ensure that existing drives are voltage-free and pressure-free.
2. Securely prevent restarting during all work.



### WARNING

#### Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.

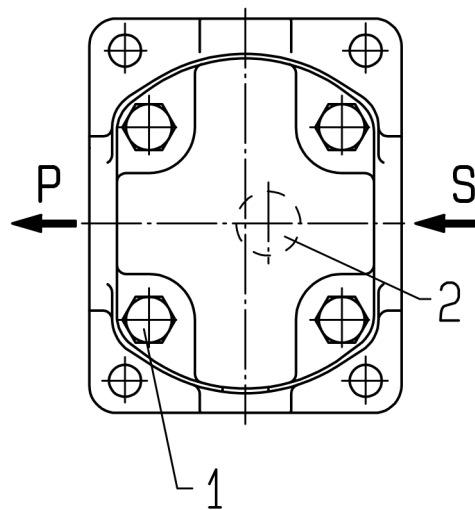


### NOTICE

#### Leaks or increased wear

Damaged sealing surfaces or supports lead to lack of sealing and/or faults in later operation.

1. When assembling or disassembling housing components, be sure not to damage the bearings, e.g. by tilting.
2. When disassembling housing components, do not use screwdrivers or the like as a lever to separate the joints.
3. Do not remove, damage or jam seals.



S = Suction connection

1. Fastening screws

P = Pressure connection

2. Leak oil hole

When reversing the gear pump's direction of rotation turn the end cover 180°.

- Loose fastening screws.
- Remove the end cover from the pump housing and reassemble rotated by 180°.
- Tighten fastening screws (Tightening torque  $M_A = 10 \text{ Nm}$ ).

**When checking, pay attention to the following point:**

- The leak oil hole in the end cover must be placed on the inlet port of the pump.

## 7 Operation start-up

### 7.1 Safety instructions for start-up



#### **DANGER**

##### **Hazardous fluids!**

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.



#### **WARNING**

##### **Failure of load-carrying parts due to overload!**

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Do not operate the device against closed shut-off devices.
2. Do not operate the device in the false direction of rotation.



#### **CAUTION**

##### **Hot surfaces!**

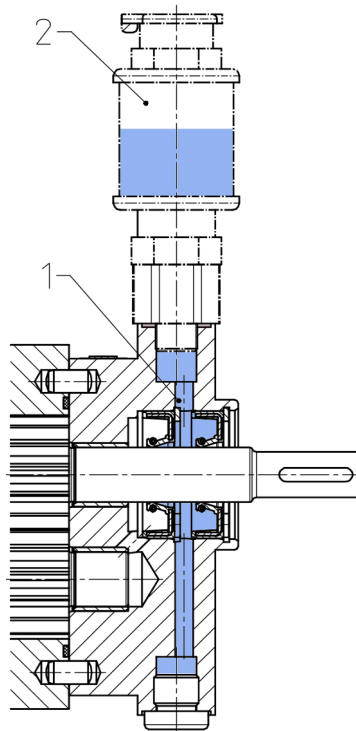
Burn injury to skin if touched.

1. Wear protective gloves at temperatures  $\geq 48^{\circ}\text{C}$ .

### 7.2 Preparation

- Before starting the system make sure that a sufficient quantity of the operating fluid is extant to avoid dry running.  
Take this into consideration especially with high output volumes.
- Check all fastening screws on the device.
- Fill pump and the suction line with medium.

## 7.3 Filling the quench chamber



1. Quench chamber
2. Container for quench-liquid (Accessories)

- For versions with quench, fill the quench chamber with a suitable quench liquid.
  - The filling is implemented through the tank provided for that.
  - Fill fluid until the quench chamber is completely full and the tank is half full.
- Do not apply pressure or vacuum to the quench chamber.



### NOTICE

#### Seal failure due to dry run

A lack of quench liquid can lead to a failure of the seal.

1. Do not put pumps without quench liquid into operation.



A second port on the unit enables purging of the quench chamber and draining of the liquid seal.

## 7.4 Further operation start-up

- Open existing shut-off elements upstream and downstream of the device.
- Adjust pressure relief valves in the system installed for lowest opening pressure.
- Allow the device start without or with a low pressure load (jog mode).
  - Flow should have developed after 30 s at the latest.
- Run the device for a few minutes depressurised or with low pressure.
- Vent the system at the highest possible point.
- Gradually increase the pressure load up to the desired operating pressure.
- Operate the system for so long until the final operating state is achieved.
- Check the operating data such as:
  - Discharge flow
  - Operating pressure (as close as possible to device)
  - Fluid temperature (as close as possible to device)
  - Device temperature (in particular in the area of the bearing points)
  - ...
- Document the operating data of the initial start-up for later comparison.
- Check the level of the operating medium in the system.
- Check the filling level of the liquid seal (if existing).
- Check the device for leaks.
- Check all threaded connections for leaks and retighten if necessary.



In order to ensure a constant and reliable function of the device, an initial maintenance of the device is recommended after several hours warm-up time (max. 24 h). Faults can thus be identified at an early stage.

## 8 Removal

### 8.1 Safety instructions for removal



#### DANGER

##### **Hazardous fluids!**

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.



#### DANGER

##### **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

1. Before all work, ensure that existing drives are voltage-free and pressure-free.
2. Securely prevent restarting during all work.



#### WARNING

##### **Unshielded gearwheels!**

Gearwheels can trap and crush fingers and hands.

1. Do not engage gearwheels.



#### WARNING

##### **Failure of load-carrying parts due to overload!**

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.



#### CAUTION

##### **Hot surfaces!**

Burn injury to skin if touched.

1. At temperatures  $\geq 48^{\circ}\text{C}$  the device must be allowed to cool down first.



#### NOTICE

**Blocking of the device through hardening medium**

Hardening medium can mechanically jam the device and make it unusable.

1. Clean device immediately after operating with a hardening medium.

## 8.2 Removal

- Depressurise and de-energize the system.
- Close existing shut-off elements upstream and downstream of the device.
- Open existing drain elements and loosen connection lines. Collect and dispose of discharging medium so that no hazard arises for persons or environment.
- Dismantle the device.
- Clean the device.
- Close the device connections and lines to prevent dirt penetration.

## 9 Maintenance

### 9.1 Safety instructions for maintenance



#### DANGER

##### **Hazardous fluids!**

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.



#### DANGER

##### **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

1. Before all work, ensure that existing drives are voltage-free and pressure-free.
2. Securely prevent restarting during all work.



#### WARNING

##### **Failure of load-carrying parts due to overload!**

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.



#### CAUTION

##### **Hot surfaces!**

Burn injury to skin if touched.

1. At temperatures  $\geq 48^{\circ}\text{C}$  the device must be allowed to cool down first.



## 9.2 Maintenance work



### Checking and documentation of the operating data

Regular checking and documentation of all operating data such as pressure, temperature, current consumption, degree of filter soiling, etc. contributes to early problem detection.

- Perform maintenance according to specification.
- Replace defective and worn components.
- If required, request spare parts lists and assembly drawings from the manufacturer.
- Document the type and scope of the maintenance work along with the operating data.
- Compare the operating data with the values of the first commissioning. Determine the cause in case of major non-compliances (> 10 %).
- Dispose of packing material and used parts in accordance with the local stipulations.



### Barriers and instructions

All barriers and warning signs removed during this must be attached to their original position on completing maintenance and/or repairs.

## 9.3 Maintenance instructions

The following information provides recommendations on maintenance work and maintenance intervals for the device being used.

Depending on the actually occurring loads in operation, the type, scope and interval of the maintenance work can deviate from the recommendations. The equipment builder/operator shall write an obligatory maintenance plan.



Within the framework of preventive maintenance, it is appropriate to replace wear parts before reaching the wear limit.

With corresponding expertise and sufficient equipment, the replacement can be carried out by the equipment builder/operator. Please consult the manufacturer about this.



### Warranty

In case of improper implementation, any warranty is voided.

Maintenance recommendationsGear pump			
Interval	Maintenance work	Employ-ees	Duration approx.[h]
<b>Firstly: after max. 24 h</b>	Inspection:Discharge flow	1	1
	Inspection:Operating pressure		
	Inspection:Fluid temperature		
	Inspection:Device temperature		
	Inspection:Condition of operating fluid		
<b>Daily</b>	Audiometric monitoring:Unusual noise	1	0.1
	Cleaning: Remove dust deposits and dirt with a moist cloth		
	Visual inspection:Leakages		
	Visual inspection:Filling level of liquid seal(if existing)		
<b>3000 Operating hours</b>	Inspection:Discharge flow	1	1
	Inspection:Operating pressure		
	Inspection:Fluid temperature		
	Inspection:Device temperature		
	Inspection:Condition of operating fluid		
<b>6000 Operating hours</b>	Visual inspection:Condition of gears	1	2
	Visual inspection:Condition of housing parts		
	Visual inspection:Condition of shaft seal		
<b>As required</b>	Replace: Shaft seal	1	2
	Replace: Other seals		

## 10 Repairs

### 10.1 Safety instructions for repair



#### DANGER

**Hazardous fluids!**

Danger of death when handling hazardous fluids.

1. Comply with the safety data sheets and regulations on handling hazardous fluids.
2. Collect and dispose of hazardous fluids so that no hazards arise for people or the environment.



#### DANGER

**Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

1. Before all work, ensure that existing drives are voltage-free and pressure-free.
2. Securely prevent restarting during all work.



#### WARNING

**Failure of load-carrying parts due to overload!**

Danger of injury from flying parts.

Danger of injury from spurting fluids.

1. Depressurise the device and all connection lines before doing any work.
2. Securely prevent the restoration of pressure while working on the device.



#### CAUTION

**Hot surfaces!**

Burn injury to skin if touched.

1. At temperatures  $\geq 48^{\circ}\text{C}$  the device must be allowed to cool down first.

## 10.2 General

### The repairs covers:

1. Troubleshooting  
Determination of damage, pinpointing and localisation of the damage cause.
2. Elimination of damage  
Elimination of the primary causes and replacement or repair of defective components. The repair is generally made by the manufacturer.

### Repairs by manufacturer

- Before returning the device, fill in the *return notification* form. The form can be filled in online and is available as a pdf file download.



#### Device contains hazardous material

If the device was operated with dangerous liquids, it must be cleaned before the return. If this should not be possible, the safety data sheet of the hazardous material is to be provided beforehand.

### Repair by equipment builder/operator

If corresponding expertise and sufficient equipment is available, the equipment builder/operator can also make the repairs. Please consult the manufacturer about this.

- If required, request spare parts lists and assembly drawings from the manufacturer.
- Use spare parts approved by the manufacturer only.
- Dispose of packing material and used parts in accordance with the local stipulations.



#### Warranty

In case of improper implementation, any warranty is voided.



#### Barriers and instructions

All barriers and warning signs removed during this must be attached to their original position on completing maintenance and/or repairs.

### 10.3 Detecting and eliminating failures

Failure		Potential causes	Possible measures
1.1	<b>Increased noise</b> <i>Pump cavitation</i>	Excessive negative pressure (not complete filling of the pump)	Check suction line design Use noise-optimised pump
		Suction line plugged	Clean the suction line
		Suction filter plugged or too small	Clean suction filter or use a larger filter
			Replace filter element
		Suction basket plugged or too small	Clean intake strainer or dimension larger
		Fluid temperature too low	Adjust the temperature of medium
1.2	<b>Increased noise</b> <i>Foaming or air in medium</i>	Pump sucks air	Check oil level in the tank
			Check suction line
			Check the shaft seal
		Shaft seal defective	Replace shaft seal
		Suction connection leaking	Retighten or replace threaded connections
			Replace seals
		System not vented	Vent system
		Return line ends above the fluid level	Extend return line
1.3	<b>Increased noise</b> <i>Mechanical vibrations</i>	Incorrectly aligned and/or loose coupling	Correct the alignment of the coupling and secure the coupling halves
		Incorrectly and/or insufficient line fastening	Fixate lines with suitable fastening material (e.g. pipe clamps)
		Wobbling pressure relief valve (if existing)	Increase valve opening pressure
		Not a noise-reducing setup	Use dampers

Failure		Potential causes	Possible measures
2	Pump does not suck	Dry run	Fill pump and the suction line with medium.
		Minimum filling level in the supply tank undercut	Top up medium
		False direction of rotation of the pump	Correct the direction of rotation
		Closed shut-off element in the suction line	Open the shut-off element
		Suction line plugged	Clean the suction line
		The air in the suction line cannot be compressed in the pressure line	Reduce the start-up pressure
			Vent the pressure line
			Increase volume of the pressure line
		Speed of the pump is too low	Check the pump design
			During frequency inverter operation: Check the operation/line frequency
		Geodetic suction head too high	Check installation location
			Provide pre-filling pump

Failure		Potential causes	Possible measures
3	<b>Insufficient pressure Insufficient pumping flow rate</b>	Excessive negative pressure (not complete filling of the pump)	Check suction line design
		Viscosity too high	Provide pre-filling pump
		Speed of the pump is too low	Check the pump design
			During frequency inverter operation: Check the operation/line frequency
		Throttled shut-off element in the suction line	Open the shut-off element
		Suction line plugged	Clean the suction line
		Suction filter plugged or too small	Clean suction filter or use a larger filter
			Replace filter element
		Suction bascket plugged or too small	Clean intake strainer or dimension larger
		Constant triggering of pressure relief valve (if existing)	Increase valve opening pressure
		Pump sucks air	Check oil level in the tank
			Check suction line
			Check the shaft seal
		Wear	Replace the device
4	<b>Excessive operating temperature</b>	Cooling and heat dissipation insufficient	Increase the cooling capacity
		Not sufficient oil in the system	Check the container layout
		Excess fluid is being delivered into the supply tank via pressure relief valve under load	Check the pump design
5	<b>Impermissible pump heating</b>	Constant triggering of a directly attached pressure relief valve (if existing)	Increase valve opening pressure
		Pressure too high in association with a media viscosity that is too low	Check the system design
		Speed too fast in connection with media viscosity that is too high	Check the system design
		Gland lid overtightened (for gland seal)	Unscrew gland lid and readjust leakage
		Suction pressure too high	Reduce the pressure
		Wear	Replace the device

Failure		Potential causes	Possible measures
6	<b>Leakages</b> <i>Seal failure</i>	Poor maintenance	Comply with maintenance plan Replace seals
		Mechanical damage	Replace seals
		Thermal overload	Check the operating datas Replace seals
		Pressure too high	Check the operating datas Replace seals
		Gas content in medium too high	Check the operating datas Replace seals
		Corrosion/chemical impact	Check the material compatibility Replace seals
		Wrong direction of rotation	Correct the direction of rotation Replace seals
		Contaminated medium	Provide filtration Replace seals
		Gland lid not sufficiently tightened (for gland seal)	Retighten gland lid
		Loose threaded connections	Retighten or replace threaded connections
7.1	<b>Coupling</b> <i>Coupling wear</i>	Alignment error	Correct the alignment of the coupling and secure the coupling halves
		Spider overloaded	Check the operating datas Use harder spider
7.2	<b>Coupling</b> <i>Cam break</i>	Spider wear Torque transmission due to metal contact	Adapt maintenance intervals Replace coupling
7.3	<b>Coupling</b> <i>Premature spider wear</i>	Alignment error	Correct the alignment of the coupling and secure the coupling halves Replace spider
		Spider failure due to chemical corrosion	Check the material compatibility Replace spider



Failure		Potential causes	Possible measures
8	Motor protection switch tripped	Driving power too low	Check the drive design
		Motor incorrectly connected	Check motor connection
		Phase failure	Check feed/supply
		Current consumption too high	Check the operating datas
			Check direction of rotation
	Motor circuit breaker incor- rectly designed	Check the operating datas	
Consult the manufacturer for all unidentifiable failures.			