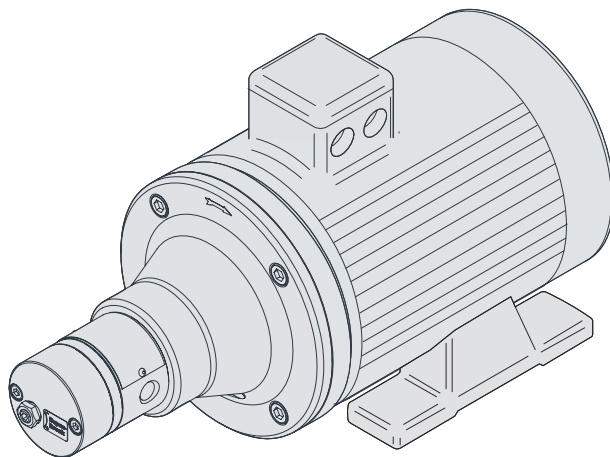


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**SCHERZINGER**  
PUMP TECHNOLOGY

**Pump type**  
**3000 1B/ M..., 3000 2B/ M..., 3000**  
**3B/ M...**



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Date: 20.06.2007  
Author: Thomas King  
Checked: Dieter Ebner

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**1. General**

This operating manual contains basic instructions to be followed during installation, operation and maintenance. It is therefore essential that this operating manual is read prior to assembly and initial operation by the fitter and the relevant specialist staff / operator, and must be readily available at the site where the machine is used at all times.

In addition to the operating manual for the pump, the operating manual for the drive must also be available and must have been read and understood.

All figures in rectangular brackets “[ ]” after individual pump parts refer to the item numbers in the parts lists featured in the section 9.1.

**1.1. Use**

The pumps described in this operating instructions are suitable for pumping liquids that do not have a corrosive or aggressive effect on the pump design materials used (section 1.3). Any liquid to be pumped is hereinafter referred to simply as the "fluid" or "liquid".

If you require further information that is beyond the scope of this operating instructions, please contact Scherzinger Pump Technology. If you require help, please specify precisely the pump type and series number for which you require the information. The pump type (Typ), year of manufacture (Bj) and serial number (Nr.) can be found on the pump name plate.

**1.2. Product information**

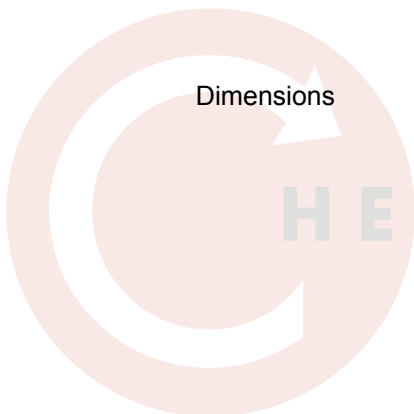
This operating manual applies to pumps of type 3000 1B/ M..., 3000 2B/ M..., 3000 3B/ M... with effect from April 2003, manufactured by Ernst Scherzinger GmbH & Co KG, 78120 Furtwangen, Germany.

The pumps are numbered consecutively. The number index (serial numbers) start at zero each year.

The issue date and version number of the operating manual can be seen on the cover sheet of the operating manual as well as on the footers.

**1.3. Pump data**

Max. differential pressure increase	10 bars
Max. system pressure (pressure side)	30 bars
Max. negative suction pressure	0.8 bars (pump internals wetted)
Operating temperature	-20 to 130°C with PEEK gears / bearings -20 to 70°C with PTFE gears / bearings
Viscosity range	0.5 to 2000 mm <sup>2</sup> /s
Range of speed	0 to 4000 RPM
Sound pressure level	< 50 dB(A), speed 2500 RPM, operating pressure 2 bars operating temperature 20°C pumped liquid 1 mm <sup>2</sup> /s, non-lubricating see appropriate data sheets for 3000 1B/ M..., 3000 2B/ M..., 3000 3B/ M... type



Dimensions

HEART OF HIGHTECH

Max. possible speeds depending on the viscosity of the liquid:

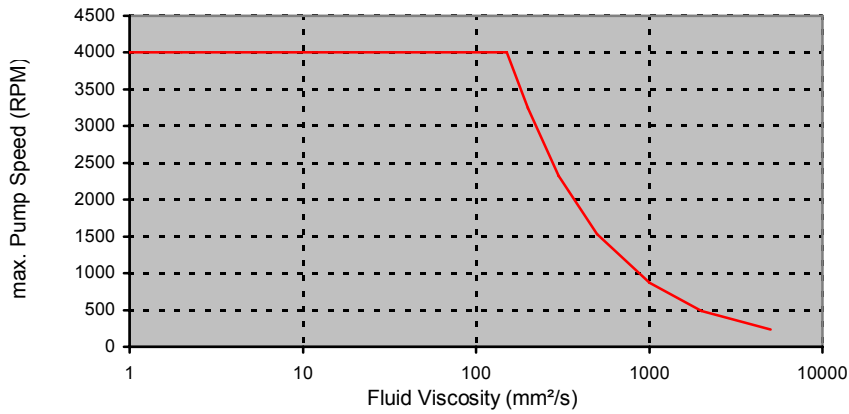


Chart 1.1

Flow rate depending on pump pressure for pump type 3000 1B, viscosity 1mm<sup>2</sup>/s:

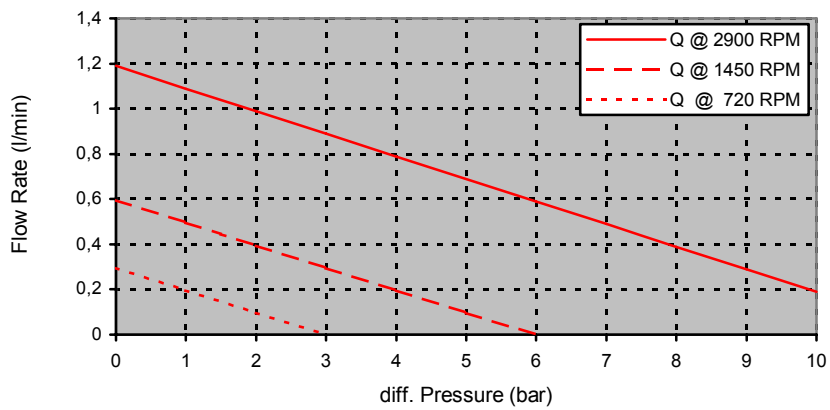


Chart 1.2

Flow rate depending on pump pressure for pump type 3000 2B, viscosity 1mm<sup>2</sup>/s:

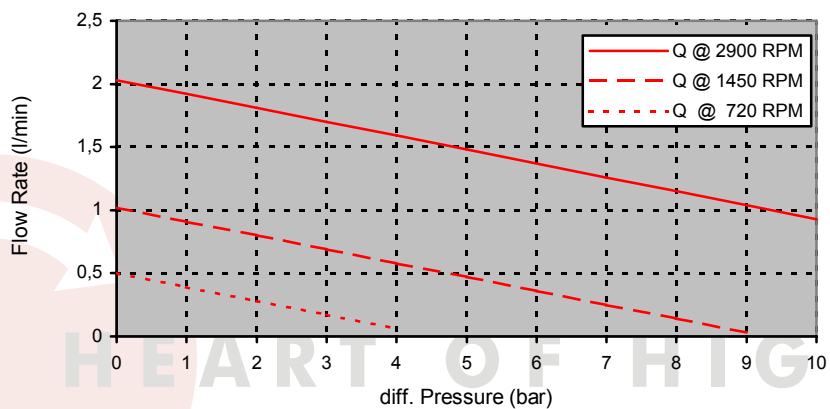


Chart 1.3

Flow rate depending on pump pressure for pump type 3000 3B, viscosity 1mm<sup>2</sup>/s:

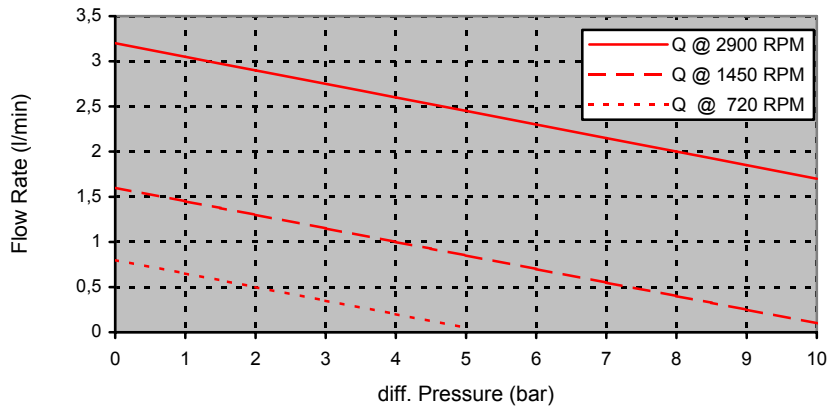


Chart 1.4

Parts in contact with the liquid:

Housing parts [1], [2], [3],[20]:

Shafts [4],[5]

Gears [6],[7], bearings [8]

Seals [10],[16],[17]

Spring [14]

Pumped liquid

1.4571 (SS 316)

1.4571 (SS 316)

PEEK mod,

PTFE 25% carbon in type /TE

PTFE

1.4568 (SS 316)

see resistance list for the materials mentioned above



In the event of one or more of the critical values specified in this section being exceeded ask the manufacturer whether he can approve these operating conditions. If not, the pump must be modified to suit the application, or the pump, or the system into which the pump is integrated, may be damaged or destroyed and represent a danger to life.

#### 1.4. Overseas offices

A list of addresses showing our offices worldwide is available. This can be requested from the manufacturer or found on the Internet at [www.scherzinger.de](http://www.scherzinger.de). For the most part, these are sales branches, although some also carry out repairs and servicing, but the majority of this work is implemented at the main factory in Furtwangen, Germany.



**2. Safety**

Comply with the general safety instructions listed in this Safety section and also with the special safety instructions listed under the other main sections.

**2.1. Labelling of instructions in the operating manual**

The safety instructions contained in this operating manual that may create danger if not complied with are specially labelled as follows



Non-compliance poses danger to life and limb.



Non-compliance poses danger of electrical shock.



These instructions must be complied with at all times for explosion protection.



Non-compliance poses a risk to the machines.

Be aware of the name plate mounted directly on the pump and always maintain it in a fully legible condition.

**2.2. Staff qualification and training**

The operational, servicing, maintenance and assembly staff must have the necessary qualifications to carry out these tasks. The area of responsibility, duties and supervision of the staff must be carefully controlled by the operating company. In the event that the personnel do not possess the necessary skills and knowledge, then they are to be trained and instructed accordingly. Furthermore, the operating company must ensure that the contents of the operating manual are understood fully by the personnel.

**2.3. Dangers of non-compliance with safety instructions**

Disregarding safety instructions can pose a risk to life and limb, the environment and the pump itself. Disregarding safety instructions may invalidate any claims for compensation.

In particular, for example, non-compliance may result in danger of the following:

- Failure of important functions of the pump
- Failure of the specified methods for servicing and maintenance
- Danger to persons by electrical, mechanical and chemical effects
- Danger to the environment caused by the leaking of hazardous substances

**2.4. Working safely**

The safety instructions specified in this operating manual, existing national regulations on the prevention of accidents and any other internal working, operating and safety regulations issued by the operating company are to be complied with.

**2.5. Safety instructions for the operating company**

Hot or cold parts representing a danger are to be designed in such a way as to prevent accidental contact.

Leakages of hazardous substances being handled (e.g. explosive, toxic or hot materials) must be conducted away so that no danger to persons or the environment arises. Legal regulations are to be observed.

Dangers from electrical energy are to be eliminated (for details on this refer, e.g., to the VDE and local power company regulations).

**2.6. Safety instructions for servicing, maintenance, inspection and assembly work**

The operating company shall ensure that all servicing, maintenance and assembly work is carried out by authorised and qualified specialist personnel who are sufficiently informed as a result of thoroughly studying the operating manual.



- Work on the pump is only to be carried out when the pump is at a standstill.
- Pumps or pumping systems handling fluids that are detrimental to health must be decontaminated.
- Upon completion of the work, all safety and protective devices must immediately be refitted and made operational.
- The points listed in the section on Starting operation must be observed before restarting.

**2.7. Unauthorised conversion and production of replacement parts**

Conversion or modification of the pumps shall only be permitted following consultation with the manufacturer. Original replacement parts and accessories approved by the manufacturer have a safety role. The manufacturer could refuse liability for any consequences arising from the use of other parts.

**2.8. Improper modes of operation**

The operational safety of the machine supplied is only ensured if it is used properly in accordance with Section 1 - General - of the operating manual. The limiting values specified on the data sheet and in Section 1.3 must not be exceeded under any circumstances.



### 3. Transportation and interim storage

#### 3.1. Shipment of the pumps and protection measures

The pumps are dispatched from the factory in such a way that they are protected against shock and impact. In addition, inlets and outlets are closed using protective plugs. This is necessary to prevent any remaining fluid located in the pump as the residue from a test run from leaking out and the connection threads are protected. Any risk of foreign bodies getting into the unit is eliminated.

#### 3.2. Transport

We guarantee that the pumps are in perfect condition at the time of delivery and are dispatched in suitable packaging. Upon receipt, you must inspect the pumps immediately for any transportation damage. If you notice any damage, report it immediately to the carrier and Scherzinger Pump Technology.

#### 3.3. Interim storage

The following points must be noted for storing the pumps:

- Do not store the pumps in wet or damp rooms.
- Leave protective plugs screwed in or insert them yourself.
- Corrosion protection measures must be implemented for metal blank parts if storage is to be for longer than 6 months.
- The storage rooms must not contain any ozone-generating devices, such as e.g. fluorescent lights, mercury vapour lamps and high-voltage electrical devices.
- It must be ensured that condensation cannot occur. The relative air humidity should be below 65%.

#### 3.4. Conservation for storage after operation

The pump must be prepared for storage in a way appropriate to the liquid being pumped. When liquid without toxic or aggressive additives are being pumped, a brief flush with water at low speed without differential pressure increase will suffice.

When toxic or aggressive liquids are being pumped however, the pump must be cleaned so as to enable any subsequent maintenance work to be carried out without any risk to the health of the personnel carrying out the work. Flush the pump on medium speed with a neutralising liquid. Then any parts that are not fully cleaned by the flushing process are to be disassembled and cleaned by hand. Particular attention is to be paid to the magnetic coupling and the pressure relieve valve (if applicable).

**WARNING**

Where curing liquids (e.g. varnish) have been pumped, in order to ensure that the pump is in good working order for the next time it is used, complete disassembly and cleaning of the individual parts of the pump will be necessary. For cleaning use conventional cleaning products or solvents (see resistance). Following reassembly, the pump should once again be flushed with water on medium pump speed.

Comply with regulations when handling substances hazardous to health!



#### 3.5. Factory returns

When sending the pump back to the manufacturer for repair or maintenance, you must fully complete the safety data sheet attached to this operating manual and enclose it with the unit. Otherwise, the repair work cannot be carried out!

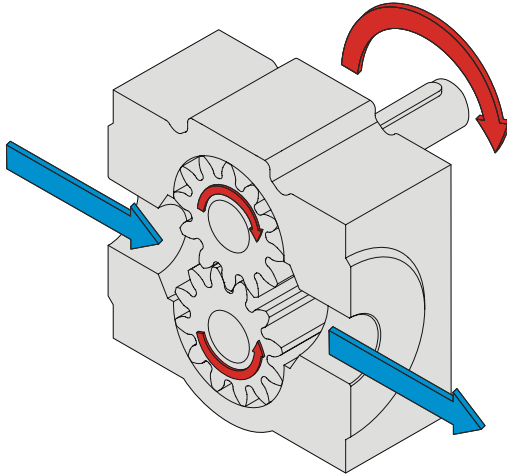




## 4. Description of the pump

### 4.1. Principle of the gear pump

The pumping effect of a gear pump is created by the contra-rotation of two gears within a pump housing. The gears are attached to two shafts, which, in turn, are supported on bearings in the pump housing and cover. One of the two gears is driven by means of a shaft, the second gear is driven by the gears meshing. The opening up of the tooth spaces creates a negative pressure which sucks the liquid into the pump and transports it between the tooth spaces and the wall of the pump housing. In the section where the gears engage with one another, the liquid is squeezed out through the tooth spaces and into the outlet. Thus the liquid can also be pumped against a positive pressure.



Picture 4.1 – Funktional principle of the gear pump

### 4.2. Design of the pump head

#### 4.2.1. Basic principle

The pump head design, comprising three housing parts, casing [1], cylinder [3] and cover [2], enables quick, easy and economical maintenance and servicing of the unit. The cylinder and the cover [2] are attached to the casing with two screws [21.1]. Two parallel pins [11] determine the exact position. A sealing ring [10] is fitted between the casing and the cylinder, and between the cylinder and the cover. The gears [6], [7] pressed onto the shafts [4], [5] are supported axially and radially in the casing and cover. The shaft bearings in the casing and the cover are sleeve bearings [8]. The rotary motion of the drive unit to the pump is transferred to the drive shaft [4] with drive gear [6] by means of a magnetic coupling [18].

Scherzinger 3000 series laboratory pump heads are available in three different pump sizes (pump size /1B to pump size /3B). The theoretical pump data is:

Pump head	Displacement	Q <sub>th</sub> @ 1450 RPM	Q <sub>th</sub> @ 2900 RPM
1B	0.4cm <sup>3</sup> /U	0.58 l/min	1.16 l/min
2B	0.7cm <sup>3</sup> /U	1.02 l/min	2.04 l/min
3B	1.2cm <sup>3</sup> /U	1.74 l/min	3.48 l/min

Table 4.1 – Pump data

#### 4.2.2. Pressure relief valve

The pressure relief valve (bypass valve) serves to limit pressure. The setting range is between 0 and 10 bars.

When the valve responds, the liquid reliefs back internally from the pressure side to the suction side thereby preventing any damage within the system or to the pump head.

For adjusting the valve see section 6.3.

**4.2.3. Magnetic coupling**

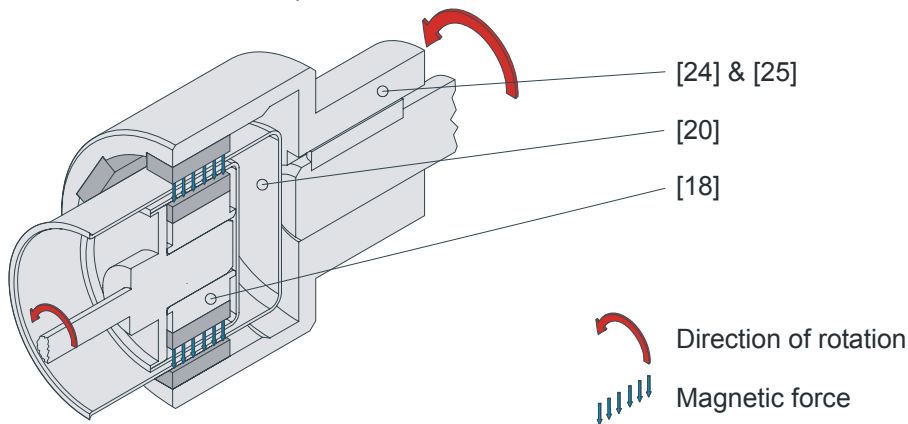
The magnetic coupling gives the pump head a hermetic seal. In other words, the end of the rotating shaft does not project out of the pump head. Leakage caused by wear and tear is eliminated as the O-rings [10] only have to provide a static seal.

The required torque is transmitted through a non-magnetic partition wall (can [20]) to the hub of the magnetic coupling [18] by means of six alternately magnetised magnets on the inner circumference in the magnetic coupling cover. Six magnets are similarly arranged, alternately polarised on the outer circumference.

The magnetic coupling also serves as an overload protection device for the pressure relief valve in order to prevent damage to the pump head under higher pressures. As soon as the maximum transferable torque is exceeded, the magnetic field is broken and the drive continues to run almost without resistance; the system starts into a steady rattle and the pump head stops. Pumping ceases.

**WARNING**

Operating times exceeding 2 minutes in uncoupled mode result in the magnets heating up. The magnets can become demagnetised: the required torque and therefore the achievable pressure increase are reduced. Operation in this mode is to be avoided.



Picture 4.2 - Magnetic coupling



## 5. Setting up / installation

### 5.1. Information about the operating location

Sufficient room for maintenance and servicing works must be ensured when selecting the operating location. It should be possible to remove and re-install the pump without difficulty.

**WARNING**

Do not install in aggressive atmospheres.

### 5.2. Electrical drive

The Pump described in this operating manual will be supplied assembled to an electrical motor (/M...) or without electrical motor (/ZK...) IEC Frame Size 63 with IMB14 (C-120) adapter flange. Shaft must be Ø11x 23mm.

**WARNING**

Please do not exceed the maximum allowable speed range and the maximum allowable rated speed based on the fluid viscosity (section 1.3).

In final installation, pay particular attention to the position of the Plug Screw [30]. It must always face down!



Close attention should be paid to the explosion protection class of the pump and the explosion protection class of all installed components. The nameplates on the individual components shall be definitive in this regard. For use within hazardous areas, the lowest explosion protection class of all the components used shall always apply.



Ground the complete motor/pump unit. There is a grounding terminal in the terminal box of the drive. As long as the drive is in metallic contact with the pump, this will suffice as grounding. When mounting the motor, do not introduce any insulating elements between the pump adapter and the motor. The threaded connection between the pump / motor and base plate must be made from electroconductive material (e.g. steel).



Only carry out assembly work with the power supply switched off.

**WARNING**

Never install a motor pump in a constricted installation location without sufficient ventilation as the motor may be poorly cooled and could overheat.

The electrical connection of the motors must be implemented in accordance with the guidelines issued by the VDE and/or the local power supply company. The operating manual supplied with the motors must also be complied with.

Due to the large variety of the available electrical drives, a detailed description of the motor in this operating instructions is not possible. Please regard the attached drive documentation.

### 5.3. First set up



You must check not only the type of protection class of the pump, but also the type of protection class of all attached components. The name plates of the individual components are important. The type of protection for the component with the lowest protection class always applies for the operation in potentially explosive atmospheres.

Before starting, carry out a visual check for transport damage on the pump delivered by us (see Section 3).

Then check on the basis of the following points whether the delivered pump type is suitable:

- Corrosion behaviour of the liquid
- Viscosity of the liquid
- Liquid to be pumped
- Pump performance (flow rate)
- Model type and design
- Direction of rotation and/or position of suction/pressure sides
- Temperature range



If you note any differences between the pump design you require in your system and the pump delivered by us, please contact us immediately. Do not operate the pump before checking with us.

**WARNING**

Screw the drive pump units only on to the mounts provided. The installation location must be level. Level out any unevenness near the attachment points using suitable supports so that the four support points are at the same level.



It is important that the set direction of rotation of the drive correctly relates to the desired pumping direction. If the direction of rotation is changed then so will the direction of pumping. The pump itself is designed to operate independently of the direction of rotation. This means that the pump is not very likely to suffer damage. However, considerable damage to the system and danger to the operating personnel could result if the pump is operated with the wrong direction of rotation.



A drop test in accordance with DIN EN 13463-1, Section 13.3.2.1 is not carried out. Protect the pump as much as possible against shocks and impacts. In fact a shock or impact has an effect on the pump's function but not on the explosion protection.

#### 5.4. Connection Piping

Prior to connecting the suction and discharge pipes, check that the connection threads of the pipework match those of the pump.

**WARNING**

No stress or torque shall be exerted on the pump from the connection pipes and it may be necessary to support the connection pipes directly in front of the pump ports. Similarly, no force arising from thermal expansion shall be exerted on the pump.

The connection pipelines must be of adequate size. We recommend that they are not smaller than the nominal size of the pump connections. On the suction side a nominal size bigger than the nominal size of the suction connection of the pump is recommended. The approximate values for the maximum flow velocities in the pipes are:

	up to 200 mm <sup>2</sup> /s	up to 600 mm <sup>2</sup> /s	up to 2000 mm <sup>2</sup> /s
<b>Suction pipe</b>	1.5m/s	0.5m/s	0.2m/s
<b>Pressure pipe</b>	3.0m/s	1.0m/s	0.5m/s

Table 5.1 - Recommended flow velocities

**WARNING**

To protect the pump from damage caused by solids in the liquid, we recommend a 50-micron filter in the suction piping. Be sure the filter does not cause a serious pressure drop.

Suction piping should be as straight and direct as possible to the pump with a minimum number of elbows. We recommend using long radius elbow type.

The suction pipe should have a continuous rise to the pump. If it is necessary to install rising and descending pipe systems, there must be a provision to purge air at the highest points of the piping.

**WARNING**

Once the pipes have been fitted, check that they are free from deposits, swarf or similar impurities, as possible damage to the pump may result when the unit is put into operation.

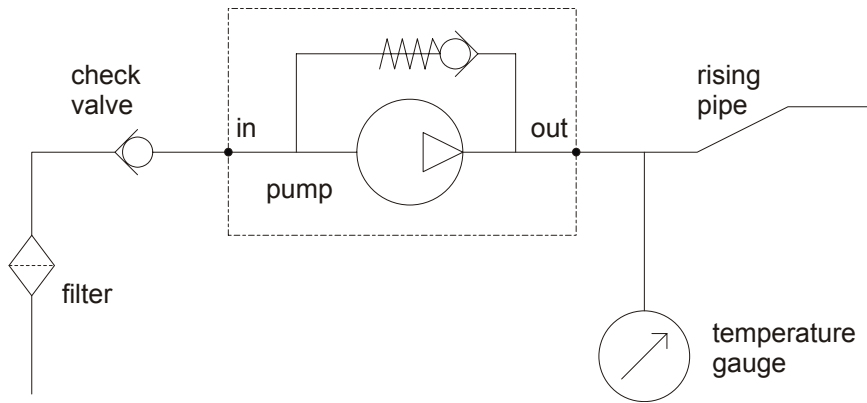
**WARNING**

Ensure that all pipes, fittings and screw joints are perfectly sealed. If this is not the case, gas may enter the pump on the suction side. The pump may no longer provide adequate suction. The liquid may escape on the pressure side. If a suction height of 3 m is reached, the installation of a check valve in the suction pipe is recommended. The valve ensures that no liquid flows back through the pump and that the suction pipe does not empty when the pump is switched off.

The pipe directly downstream of the pressure side should be laid with a rising gradient, at least for a short distance.

Please note that with this installation situation, the inlet pressure is equal to the outlet pressure when the pump is at a standstill. Please note the maximum system pressure on the pressure side (refer to Section 1.3).

For installation in potentially explosive atmospheres the following installation is recommended:



Picture 5.1 – Pipework installation

Noise insulation measures may be required on the pipework.

If the pump is not to be used in potentially explosive atmospheres, it may be helpful to install shut-off valves upstream and downstream of the pump. This would allow the pump to be removed without having to drain the pipe system.



## 6. Start up / shut down

### 6.1. Preparation for operation

Following complete installation, check the pump and peripherals again by answering the following list of questions:

- Can the pump be rotated by hand (e.g. when turning the motor fan)?
- Have you connected the suction and pressure sides correctly?
- Does the drive direction of rotation agree with that of the pump?
- Are the butterfly valves, gate valves and other valves in their correct positions?
- Has the pipe system been checked for leaks?
- Is it possible to stop the pump by an emergency switch in case of malfunction?
- Is there sufficient and the correct liquid in the tank?
- If the temperature difference between pump and liquid is greater than 50°C, the pump must be tempered before starting!



Assembly work is only to be carried out with the drive unit switched off.

### 6.2. Starting operation

- Clean and disinfect the pump and pipe system if necessary.
- In order not to contaminate the liquid, it is recommended that a flushing process of at least 5 minutes is implemented with the liquid and at the appropriate pump speed to remove all test liquid residues from the pump.
- Adjust the pressure relief valve in accordance to section 6.3
- Dry running time should not exceed 30 seconds.



The ignition temperature of the pumped liquid must be at least 50K above the maximum permissible surface temperature.

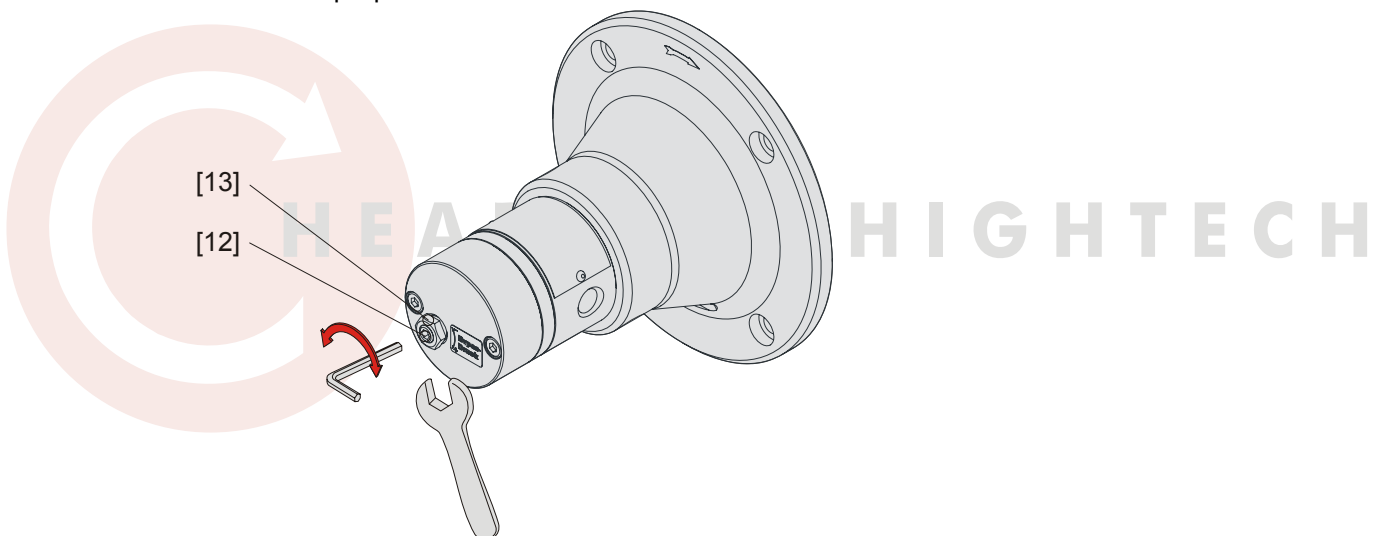
### 6.3. Adjusting the Pressure Relief Valve

Using the integral Pressure Relief Valve, it is possible to adjust a relative pressure rise to a specific value.

Proper working order of the Pressure Relief Valve will be tested in the factory during the pump test run. The pressure relief valve setting is only set at the factory when specifically requested.

The Pressure Relief Valve is adjusted while the pump is running. The pressure rise must be measured between inlet and outlet side of the piping system. Ensure that the correct general conditions (hereinafter operating conditions) exist when adjusting the valve:

- Pumped Liquid
- Temperature
- System Pressure
- Pump Speed



Picture 6.1 – Adjusting the relief valve

To adjust the Pressure Relief Valve proceed as follows:

- Loosen the Clamping Screw [13] by one quarter turn
- Adjust the valve by turning the Pressure Relief Valve Screw [12]
- To the left (counter-clockwise) ► reduces opening pressure
- To the right (clockwise) ► increases opening pressure
- Tighten the Clamping Screw [13] again



The pressure Relief Valve Screw [12] may only be unscrewed until it sits flush with the Clamping Screw [13]. A loose Clamping Screw [13] may result in small quantities of leaked fluid escaping at the pressure Relief Valve.



The pressure relief valve only serves as short-term overload protection. Longer opening times may pose a danger of the pump head being damaged or ruined as a result of overheating. The surface temperature may exceed critical levels (see Section 6.4).

The pressure relief valve is only a safety valve to protect the pump and the system. If you need a exact adjustment of the output pressure use a precise pressure regulation valve. The integrated pressure relief valve and as result the output pressure may oscillate.

### 6.4. Monitoring

The operator is exclusively responsible for the realization of the monitoring measures.



We recommend, for pressure monitoring purposes, that a pressure monitoring device is installed on the suction side (depending on the operating conditions – inlet pressure or vacuum) and that a pressure measuring device that meets the operating requirements is installed on the pressure side. Stay within the parameters of the pump data given in Section 1.3, otherwise the pump may become damaged.



If you operate the pump against a closed system, the pump will heat up (see Chart 6.2 – Temperature rise). Measurements show a surface temperature rise of 30 K within 15 minutes (pump speed 2900 RPM, relief pressure 7 bar, blocked pressure piping). Under these operating conditions, the surface temperature must be monitored. Shut down the pump at least 30 K below the max. allowed surface temperature, because the temperature can rise delayed even after shut down.

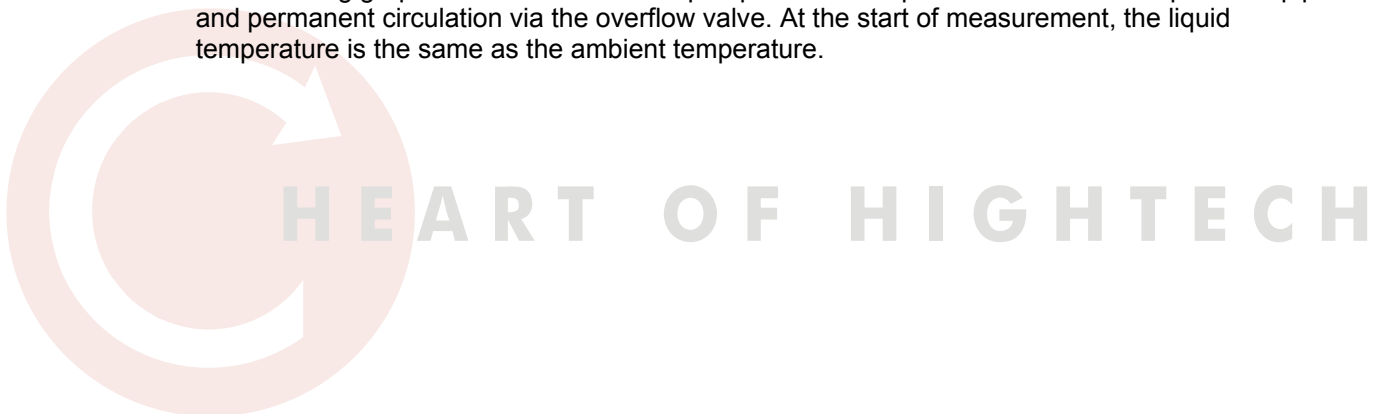
In case of the use of a temperature sensor, the valid switch of temperatures are as follows:

Temperature class	T1*	T2*	T3*	T4	T5	T6
maximum liquid temperature	405°C	255°C	155°C	90°C	55°C	40°C

Table 6.1

\* the pump is not intended for use with liquid temperatures above 130°C for PEEK gears and 70°C for PTFE gears and such operation may cause irreparable damage to the pump.

The following graph shows the rise of the pump surface temperature with a closed pressure pipe and permanent circulation via the overflow valve. At the start of measurement, the liquid temperature is the same as the ambient temperature.



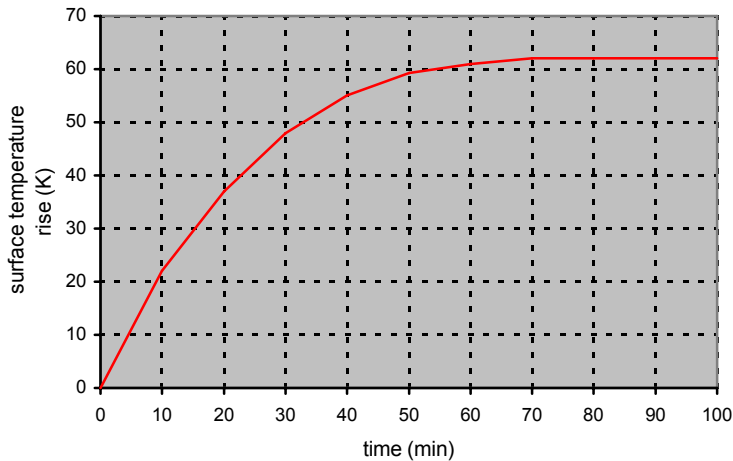


Chart 6.2 – Temperature rise

Where the ambient temperature is higher than the liquid temperature, the surface temperature increase can be even greater!



For early detection of a leakage in the magnetic coupling area, you must:

- after use
- once a month

unscrew the plug screw [30] and check if leaked fluid has collected in the flange [27]. If it has, you must switch the pump off immediately and eliminate the leak. (⚠ Risk of injury: in the event of leaks, hot, toxic or corrosive fluids may be discharged – wear suitable protective gloves). After completing the check, put the plug screw back together with the seal. A pump without a plug screw may not be used in II 2 D hazardous areas!



Remove dust from the pump surface, drive and connecting pipes regularly to avoid the formation of a dust nest which could be an ignition source. The cleaning frequency is determined by the rate of dust accumulation.



Monitor the noise level of the magnetic coupling. In the event of grinding sounds, turn the pump off immediately. Inspect the pump for wear and tear. Metallic parts rubbing together can cause overheating or sparking.

Dry-run protection does not have to be provided for the pump. Lengthy dry-run periods cause irreparable damage to the pump but do not affect its use in II 2 D G - areas.

If the pump is not fitted with an integrated overflow valve, we recommend using an external overflow valve.



If you operate the magnetic coupling in uncoupled mode for long periods of time, the surface temperature of the pump will rise. It may then exceed critical levels. The graph afterwards shows the rise of the pump surface temperature when the pump is blocked.

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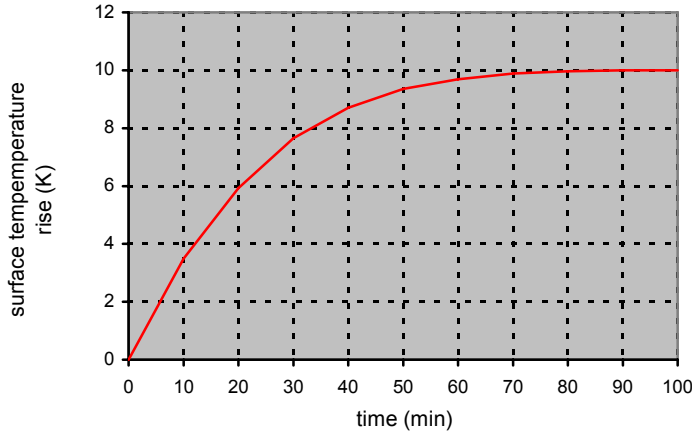


Chart 6.3 – surface temperature rise with blocked pump

**6.5. Shut down**



Make sure that there is no potentially explosive atmosphere.

- If possible, reduce the speed of the drive unit to 1500 RPM max.
- Empty the pump as much as possible by reducing the back pressure to 0 bar and opening the suction pipe to atmosphere, so that the ambient air can be sucked in (⚠ not if there is system pressure, vacuum or reacting liquid).
- Ensure that dry-run times do not exceed 30 seconds.
- When liquids which could be hazardous to health have been pumped, rinse the pump head out thoroughly with a suitable cleaning or neutralizing solution for several minutes.
- Finally, the pump head should be rinsed again with water.

If present, close the shut-off valves upstream and downstream of the pump. Close the shut-off valves only, if the pump will stand still for a longer period of time (for automatic equipment, only when the whole system is taken out of operation).

**6.6. Removal from the system**

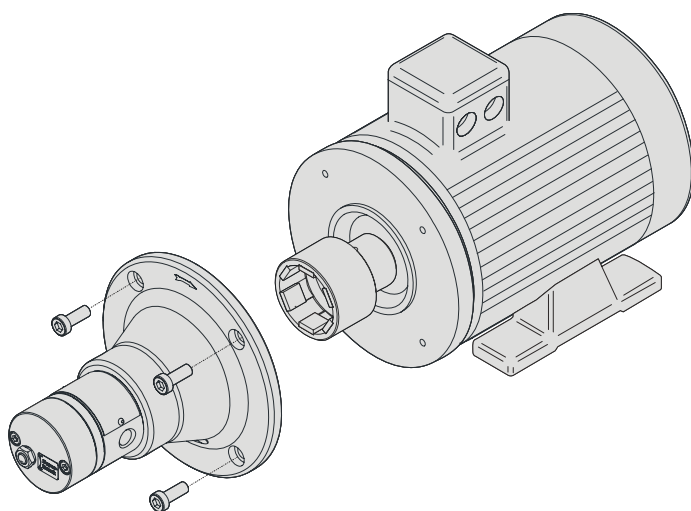


Switch the drive unit off! Check that the steps described in Section 6.5 have already been completed.

Remove the connection pipes.

Unscrew the four fixing screws on the flange [27]. The pump head is still held in place by the magnetic force of the magnetic coupling. Pull it straight forward away from the motor. ⚠ Risk of injury!





Picture 6.4 – Removal from the motor



## 7. Servicing

### 7.1. General information

For servicing, it must be ensured that the pump has been rinsed out with safe liquid. If the pump has been operated with hazardous fluids, servicing should be carried out with the appropriate protective measures.

If the pump is being returned to the manufacturer for repairs or servicing, the clearance certificate is to be completed fully and enclosed with the pump upon dispatch. Pumps sent for repair without a clearance certificate will not be accepted.

### 7.2. Servicing

The pump is not subject to any routine service schedule. A service/clean is required when

- The pump is put into storage,
- The pump is switched off for an indefinite period,
- The pump no longer achieves the benchmark data indicated in Section 1.3
- Different fluids are being pumped,
- Leaks occur in the pump.

See also Section 3.3 and Section 6.4.

### 7.3. Disassembly and Reassembly

**WARNING**

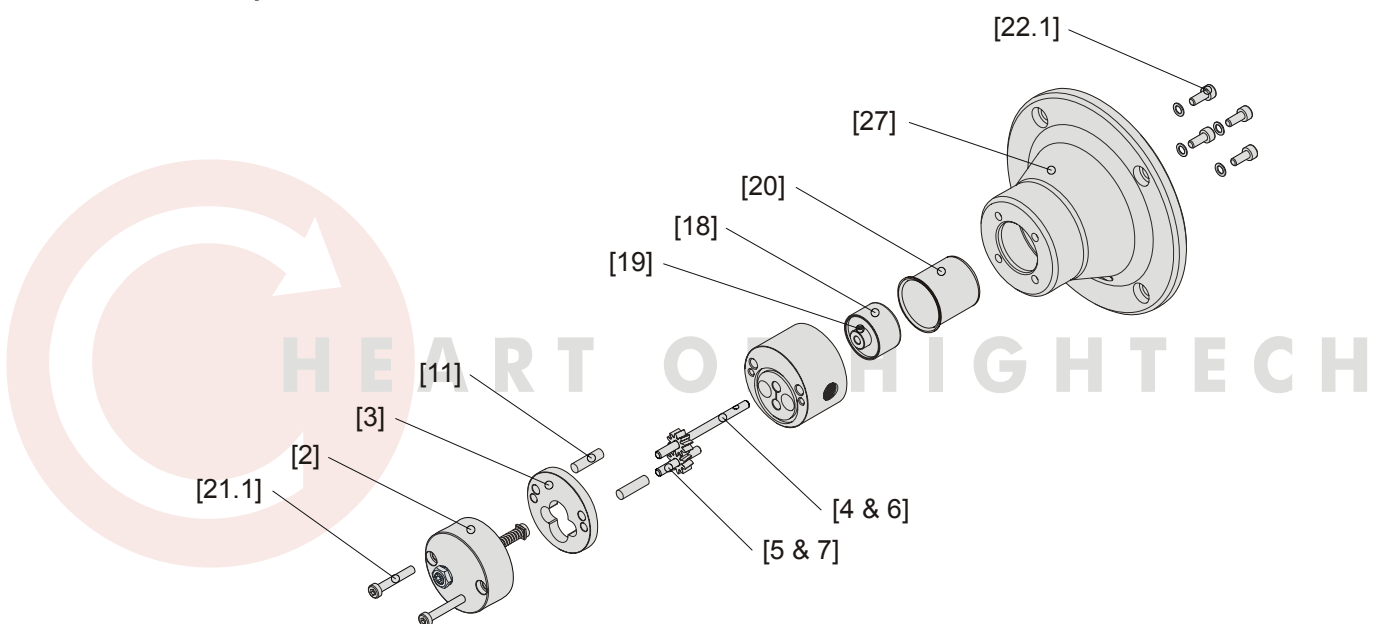
Particular care is to be taken to ensure that all O-rings are replaced upon reassembly as part of any maintenance work that involves dismantling the pump head. Otherwise complete leakage prevention cannot be guaranteed.

#### 7.3.1. Assembly Equipment

The following are required for maintenance and assembly work:

- 3mm AF socket head screwdriver with handle
- Flat-head screwdriver 7mm blade width, 1.2mm blade thickness
- 10 AF box wrench or engineer's wrench
- Internal puller for bearing bushes (inside diameter 4mm)
- Press-fit insertion die (external diameter 5 to 5.4mm)
- Torque screwdriver (50-500 Ncm)

#### 7.3.2. Pump Bodies



Picture 7.1 – Pump body

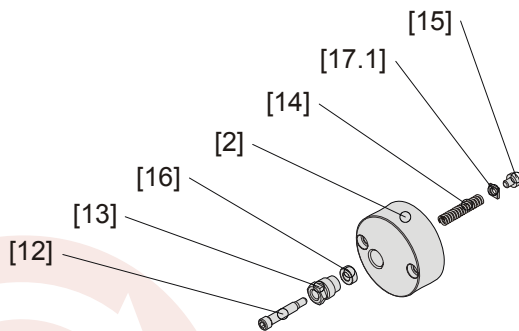
#### **Disassembly**

- Remove the pump head from the drive unit (acc. section 6.6).
- Place the pump head in front of you with the adapter flange [27] facing upwards.
- Unscrew and remove the four hex head cap screws [22.1].
- Pull the adapter flange [27] upwards.
- Pull the stationary cup [20] upwards.
- Unscrew the grub screw [19] by one turn.
- Pull the magnetic coupling hub [18] upwards.
- Hold the pump head in front of you with the now free shaft end facing downwards.
- Unscrew and remove the two hex head cap screws [21.1] countersunk on the end face.
- Pull the pump cover [2] carefully.
- Now the cylinder [3], parallel pins [11], drive shaft [4] with gear [6] and idler shaft [5] with gear [7] can be removed.

**Reassembly**

- Hold the casing [1] flat side up.
- Insert the drive shaft [4] (longer shaft) into the central pillow block of the casing [1] (longer shaft end downwards).
- Insert the idler shaft [5] into the second sleeve bearing.
- Insert parallel pins [11].
- Attach the cylinder [3].
- Carefully place the cover [2] on the parallel pins [11] without damaging the gears with parts of the pressure relief valve [15], [17.1], [14]!
- Screw in the hex head cap screws [21.1] and tighten with a torque of 220 Ncm.
- Turn the pump over. It is now lying with the free shaft end facing upwards in front of you.
- Put the magnetic coupling hub [18] onto the drive shaft [4].
- Tighten up the grub screw [19] with a torque of approx. 50 Ncm. Ensure here that the grub screw reaches into the notch of the drive shaft [4].
- Put on the stationary cup [20].
- Place the four flat-head screws [22.1] into the holes on the adapter flange [27].
- Put the adapter flange [27] on.
- Screw in all four hex head cap screws [21.1] and then tighten on alternate sides with a torque of 220 Ncm.

**7.3.3. Pressure relief valve**



Picture 7.2 – Pressure relief valve

**Disassembly**

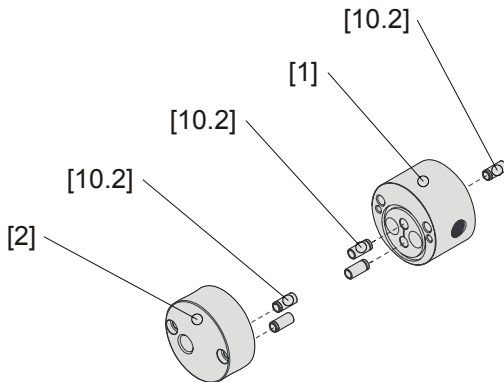
- Dismantle the pump as described in Section 7.3.2
- Pick up the cover [2].
- Remove the compression spring [14] from the pressure relief valve screw [12].
- Unscrew the clamping screw [13] by one quarter turn with the engineer's wrench.
- Unscrew the pressure relief valve screw [12] until it is no longer engaged in the thread then pull it out by hand.
- Unscrew the clamping screw [13].

**Reassembly**

- Screw the clamping screw [13] in by hand.
- Screw in the pressure relief valve screw [12] until it sits flush with the clamping screw.

- Tighten the clamping screw [13] gently with the engineer's wrench.
- Put the compression spring [14] onto the pressure relief valve screw [12].
- Proceed according to the reassembly instructions in Section 7.3.2.

**7.3.4. Shaft bearings**



Picture 7.3 – Shaft bearings

**Disassembly**

- Dismantle the pump as described in Section 7.3.2
- Remove the compression spring [14] from the pressure adjusting screw [12].
- Using the Internal puller, carefully remove the two bearing bushes [8] from the cover [2].
- Using the Internal puller, the three bearing bushes [8] are carefully removed from both sides of the casing [1].

**WARNING**

Take care not to damage the pump body or sealing surfaces of the pump head when removing.

**Reassembly**

- Press the two new bearing bushes [8] with the centring shoulder in front, into the cover 0.2-0.3mm apart using the press-fit insertion die.
- Press in the bearing bushes [8] of casing [1] as described in Point 1.
- Put the compression spring [14] onto the pressure relief valve screw [12].\*
- Assemble the pump as described in Section 7.3.2.



## 8. Malfunctions, causes and rectification

### ***The pump is not sucking properly***

#### *Pump is being operated dry*

Pumps in this series are self-priming to 3m when dry. Suction can be improved however if the pump is filled with liquid prior to operation.

#### *Pipework incorrectly designed*

Pipes that are the wrong size can have a serious negative effect on pump suction. The instructions in Section 5.4 - Connection piping - are to be observed.

#### *Pressure pipe is closed*

If a shut-off valve is integrated on the pressure side, ensure that it is open. If there is still air in the pressure pipe, ensure that it can be vented.

#### *Suction pipe is closed*

If a shut-off valve is integrated on the suction side, ensure that it is open.

#### *Pump is worn out*

If the pump no longer sucks although operating conditions remain unchanged and the suction and pressure pipes are open, the pump probably requires maintenance.

#### *Suction pipe leaking*

Ensure that the suction line is absolutely gas tight so that surrounding atmosphere cannot be sucked in.

### ***The pump is not building any pressure or too little pressure***

#### *Internal relief valve open*

Ensure that the relief valve integrated into the pump is closed far enough. See section 6.3 – Adjusting the pressure relief valve.

#### *Pipes closed*

Where there are shut-off valves in the pipes on the pressure or suction side, ensure that these are open.

#### *Magnetic coupling uncoupled*

The uncoupling of the magnetic coupling is accompanied by a rattling / humming noise. The magnetic coupling serves, among other things, as overload protection (see section 4.1.3). For an uncoupling of the magnetic coupling to occur, an operating condition must exist that is (at least temporarily) outside the pump specification. Stop the drive and restart the pump. If the fault occurs again, eliminate the cause. Possible causes could be:

- differential pressure too high
- liquid viscosity too high
- dirt in the pump

#### *Liquid viscosity too low*

The efficiency of the pump is dependent on the viscosity (consistency of the liquid). If the viscosity (arising from the particular liquid or too high a temperature) decreases too much, this can cause a drop in flow rate.

#### *Pump is worn out*

If none of the points described above apply, or if the pump capacity falls without any change in the operating conditions, then it is likely that the pump requires maintenance. Please contact the manufacturer.

### ***The pump is making noises***

#### *Magnetic coupling uncoupled*

The uncoupling of the magnetic coupling is accompanied by a rattling / humming noise. The magnetic coupling serves, among other things, as overload protection (see section 4.1.3). For an uncoupling of the magnetic coupling to occur, an operating condition must exist that is (at least temporarily) outside the pump specification. Stop the drive and restart the pump. If the fault occurs again, eliminate the cause. Possible causes could be:

- differential pressure too high

- liquid viscosity too high
- dirt in the pump

#### *Cavitation operation*

**WARNING**

As a result of the combination of inlet pressure, suction height and vapour pressure of the liquid, vapour bubbles form in the suction area of the pump. These implode again on the pressure side and lead to increased wear on the pump. This working point can be avoided by changing the operating conditions.

#### **The pump is getting hot**

*It is possible that this is a normal operating mode*

Please check first whether this is normal heating caused by the liquid being conveyed. After a short time of operation, the pump surface assumes the temperature of the liquid.

#### *Permanent internal relief (not type 3020)*

If the differential pressure between inlet and outlet exceeds the adjusted relief valve opening pressure, the internal relief valve opens and liquid is permanently circulated in the pump head (see section 6.3). This leads to a temperature rise of the pump head.

#### *Dry operation*

**WARNING**

Operation without liquid can cause irreparable damage to the pump and should therefore be avoided.

#### **Grinding noises**



If scraping sounds can be heard, This is an indication of wear in the pump. The pump must not be further operated under any circumstances. Stop the drive immediately. A repair is urgently required.



9. Spare parts

9.1. Spare part lists

Pumps 3000 1B/ ZK..., 3000 2B/ ZK..., 3000 3B/ ZK...

Item	Quantity	Description	Pump					
			3000/1B/ZK...		3000/2B/ZK...		3000/3B/ZK...	
				/TE		/TE		/TE
1	1	Casing	3000-001.01		3000-001.01		3000-001.31	
2	1	Cover	3000-002.01		3000-002.01		3000-002.01	
3	1	Cylinder	3000-004.11		3000-004.21		3000-004.31	
4	1	Drive shaft	3000-005.11		3000-005.21		3000-005.31	
5	1	Idler shaft	3000-006.10		3000-006.20		3000-006.30	
6	1	Drive gear	3000-007.10	3000-007.11	3000-007.20	3000-007.21	3000-007.30	3000-007.31
7	1	Idler gear	3000-008.10	3000-008.11	3000-008.20	3000-008.21	3000-008.30	3000-008.31
8	5	Sleeve bearing	3000-010.00	3000-010.01	3000-010.00	3000-010.01	3000-010.00	3000-010.01
9	1	Woodruff key	9250-018.00		9250-018.00		9250-018.00	
10	3	O-ring	ID: 718 121		ID: 718 121		ID: 718 121	
11	2	Pin	ID: 701 163		ID: 701 176		ID: 701 262	
12	1	Pressure relief valve screw	9250-093.10		9250-093.20		9250-093.30	
13	1	Clamping screw	9250-096.00		9250-096.00		9250-096.00	
			ID: 021 197		ID: 021 197		ID: 021 197	
14	1	Valve spring	ID: 713 006		ID: 713 006		ID: 713 006	
15	1	Valve piston	9250-054.01		9250-054.01		9250-054.01	
16	1	Sealing ring	9250-078.00		9250-078.00		9250-078.00	
17.1	1	Valve disc	9250-116.00		9250-116.00		9250-116.00	
18	1	Magnetic coupling hub	9250-124.20K		9250-124.20K		9250-124.20K	
19	1	Grub screw	ID: 702 280		ID: 702 280		ID: 702 280	
20	1	Cup	9250-145.30		9250-145.30		9250-145.30	
21.1	2	Hex head cap screw	ID: 702 522		ID: 702 000		ID: 702 658	
22.1	4	Hex head cap screw	ID: 702 651		ID: 702 651		ID: 702 651	
23.1	4	Lock washer	ID: 712041		ID: 712041		ID: 712041	
24	1	Magnetic coupling cover	9250-125.00		9250-125.00		9250-125.00	
25	6	Magnetic plates	ID: 700006		ID: 700006		ID: 700006	
26	1	Grub screw	ID: 702218		ID: 702218		ID: 702218	
27	1	Adapter flange	9250-122.01		9250-122.01		9250-122.01	
			ID: 021 285		ID: 021 285		ID: 021 285	
28	2	Pin	NI	9252-023.00	NI	9252-023.00	NI	9252-023.00
29	1	Sealing ring	ID: 704 504		ID: 704 504		ID: 704 504	
30	1	Plug screw	ID: 702 2034		ID: 702 2034		ID: 702 2034	

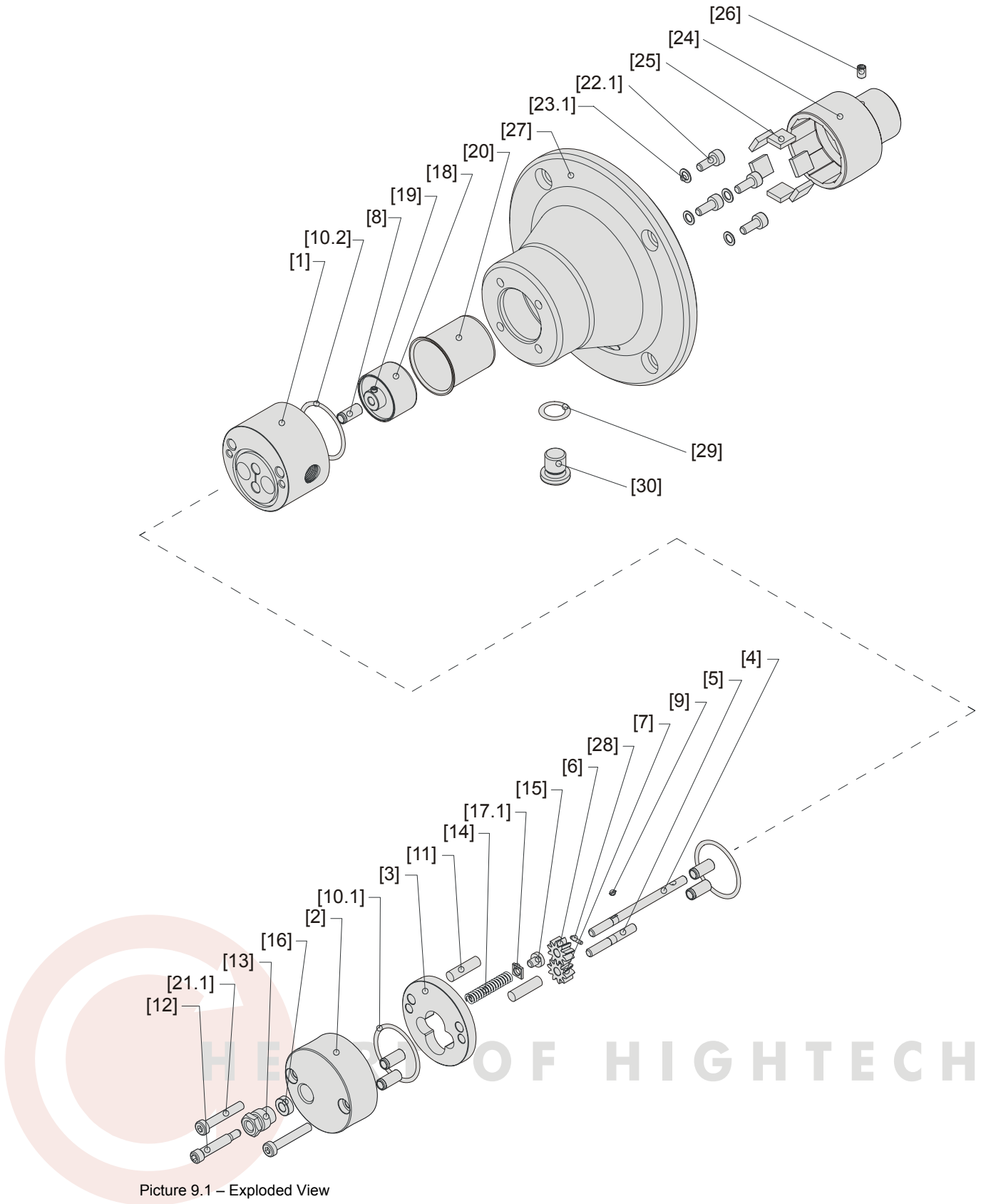
NI: not included with the pump

Table 9.1 – Spare parts list

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9.2. Exploded view



Picture 9.1 – Exploded View

**10. Safety data sheet**

The pump and accessories sent to us for inspection and/or repair accompanied by this clearance certificate,

Type	Pump number	Delivered
------	-------------	-----------

Reason for repair

Reason (continued)

- have not been used with hazardous liquids
- have come into contact with liquids requiring special labelling or with liquids polluted by hazardous substances.

Specify last liquid pumped

Prior to dispatch / delivery, the pump was emptied carefully and cleaned thoroughly inside and out. The cleaning process was conducted in accordance with the appropriate operating manual.

- Special safety precautions are not necessary for subsequent handling.
- The following safety precautions are necessary with regard to flushing liquid and disposal:

---



---



---

We confirm that the details given above are correct and complete and that the goods were dispatched in accordance with applicable legal provisions.

Company	Name
Street	Position
City	Phone
Country	Fax
Date	Company stamp / signature

For safety reasons pumps supplied without this completed safety data sheet cannot be inspected or repaired.

**11. Declaration of Conformity ATEX 95 with the provisions of Directive 94/9/EC**

In accordance with EU Directive 94/9/EC dated 23 March 1994, and the legislation arising from its implementation, the manufacturer:

Pumpenfabrik Ernst Scherzinger GmbH & Co. KG  
Bregstraße 23-25  
D – 78120 Furtwangen

declares that the explosion protected product, described in the operating and safety instructions:

Type:

**Gear pump**

Series:

**3000 1B/ M..., 3000 2B/ M..., 3000 3B/ M...**

is a device in the sense of Article 1, (3) a) of Directive 94/9/EC, and complies with the essential safety and health requirements as per Appendix II of Directive 94/9/EC and the following harmonised directives:

DIN EN 13463-1  
E DIN EN 13463-5

The specified pump type falls into the explosion protection design classification "c". An ignition hazard assessment is available. The pump carries the identification:

CE  II 2GD c X

The technical documentation, in compliance with Article 8, (1) b) ii) of the directive 94/9/EC, in combination with Appendix VIII, has been deposited with the following named body:

Deutsche Montan Technologie GmbH  
Dinnendahlstraße 9  
D - 44809 Bochum

Furtwangen, 20.06.2007

  
(Dipl.-Ing. Erich Willimsky)  
Managing Director

**12. Declaration of Conformity with the Provisions of Directive 98/37/EC**

In accordance with EU Directive 98/37/EC, Appendix II, dated 22. June 1998, the manufacturer:

Pumpenfabrik Ernst Scherzinger GmbH & Co. KG  
Bregstraße 23-25  
D – 78120 Furtwangen

declares that the product:

Type:

**Gear Pump**

Series:

**3000 1B/ M..., 3000 2B/ M..., 3000 3B/ M...**

is supplied with an electric drive unit and therefore complies with the provisions of Directive 98/37/EC, Appendix 1, No.1.

Applicable directives below:

98/37/EC	Machinery directive
93/44/EEC	Low voltage directive
89/336/EEC	Electromagnetic compability (EMV Directive)
94/9/EC	Explosion protection (ATEX 95)

The following harmonised standards were applied:

EN ISO 12100 T1	EN 294	EN 809
EN ISO 12100 T2	EN 563	EN 60204 T1

Applicable national standards and specifications:

Accident prevention regulations

Furtwangen, 20.06.2007

  
(Dipl.-Ing. Erich Willimsky)  
Managing Director









## HEART OF HIGHTECH

house address

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Pumpenfabrik Ernst Scherzinger GmbH & Co.KG  
Bregstrasse 23 – 25  
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