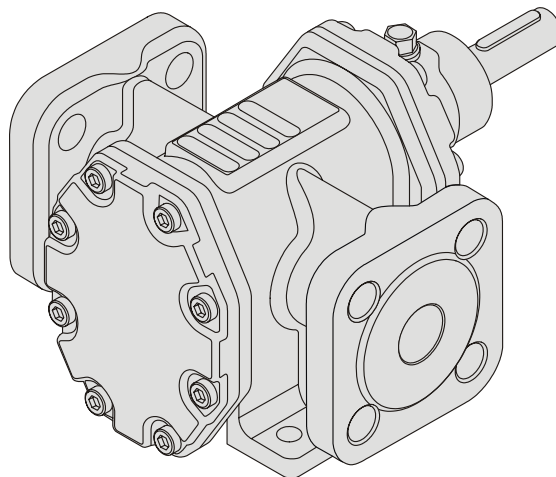




## Process Gear Pumps

Series 35000 - 35350



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Version: 1.1

Date: 17.08.2004  
Author: Thomas King

Checked: Dieter Ebner

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## 1. General

This operating manual contains basic information for the pumps specified in Section 1.3, which must be complied with during installation, operation, servicing and maintenance. It is therefore essential that this operating manual is read prior to installation and commissioning by the fitters and the responsible technicians/operators, and must always be available at the operating location of the machine.

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.

### 1.1. Use



The process pumps described in this operating manual are suitable for pumping lubricating and non-lubricating liquids that do not have a corrosive or aggressive effect on the pump materials used (Section 1.3). Any liquid to be pumped is hereinafter referred to simply as the "liquid".

If you require further information that is beyond the scope of this operating manual, 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 name plate.

### 1.2. Product information

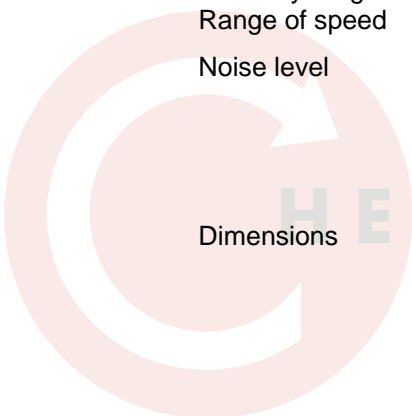
This operating manual applies to pumps of types 35000, 35100, 35300, 35050, 35150, 35350, 35000..MK, 35100..MK, 35300..MK, 35050..MK, 35150..MK and 35350..MK with and without motor from year of manufacture 2003, manufactured by Ernst Scherzinger GmbH & Co KG, 78120 Furtwangen, Germany.

The pumps are numbered consecutively. The title page of this operating manual displays the issue date and the operating manual edition.

The motor pumps described in this operating manual conform to the applicable EU standards and are permitted to bear the CE mark.

### 1.3. Pump data

Max. differential pressure increase		10 bars
Max. system pressure (pressure side)		16 bars
Max. negative suction pressure		-0.4 bar
Max. pressure in heating jacket	25 bars	
Operating temperature		-30 to 200 °C with W88 gears -10 to 50°C with PTFE gears
Viscosity range		1.0 to 20,000 mPas (mm <sup>2</sup> /s)
Range of speed		0 to 1800 1/min
Noise level	< 75 dB(A),	Speed 1750 1/min Operating pressure 2 bars; Operating temperature 20°C; Pump liquid 1 mm <sup>2</sup> /s; non-lubricating
Dimensions		see appropriate data sheets



Flow rate of pump series 35000 / 35050 in litres per minute (l/min)

Speed	Differential pressure (bar)										
	0	1	2	3	4	5	6	7	8	9	10
400 1/min	4.7	4.2	3.7	3.2	2.7	2.2	1.7	1.2			
690 1/min	8.1	7.6	7.1	6.6	6.1	5.6	5.1	4.6	4.1	3.6	3.1
930 1/min	11	10.5	10	9.5	9	8.5	8	7.5	7	6.5	6
1400 1/min	16.5	16	15.5	15	14.5	14	13.5	13	12.5	12	11.5

Table 1.1

Flow rate of pump series 35100 / 35150 in litres per minute (l/min)

Speed	Differential pressure (bar)										
	0	1	2	3	4	5	6	7	8	9	10
400 1/min	10.9	10.2	9.5	8.8	8.1	7.4	6.7	6	5.3	4.6	3.9
690 1/min	18.7	17	17.3	16.6	15.9	15.2	14.5	13.8	13.1	12.4	11.7
930 1/min	25.2	24.5	23.8	23.1	22.4	21.7	21	20.3	19.6	18.9	18.2
1400 1/min	38	37.3	36.6	35.9	35.2	34.5	33.8	33.1	32.4	31.7	31

Table 1.2

Flow rate of pump series 35300 / 35350 in litres per minute (l/min)

Speed	Differential pressure (bar)										
	0	1	2	3	4	5	6	7	8	9	10
400 1/min	25	23	21	19	17	15	13	11	9	7	5
690 1/min	43	41	39	37	35	33	31	29	27	25	23
930 1/min	58	56	54	52	50	48	46	44	42	40	38
1400 1/min	87	85	83	81	79	77	75	73	71	69	67

Table 1.3

the above tables apply for

- 0 bar negative suction pressure
- 20°C liquid temperature
- 5mm<sup>2</sup>/s liquid viscosity

Relationship of the maximum permissible speed to the viscosity of the liquid

Viscosity (mPas)	1	3	10	30	100	300	1,000	3,000	10,000	30,000	100,000
Max. speed (1/min)	1800	1800	1800	1800	1800	1800	1800	1000	350	140	20

Table 1.4

Parts in contact with the liquid	Casing parts and shafts	1.4581 (SS316) Hastelloy C4 only in conj. with c), d) or e)
	Gears optionally	a) Drive gear W88      Idler gear W88 b) Drive gear W88      Idler gear PTFE c) Drive gear PTFE      Idler gear PTFE d) Drive gear HC4      Idler gear HC4 e) Drive gear HC4      Idler gear PTFE
	Shaft bearings optionally	f) Graphite bearing g) Silicon carbide / tungsten carbide
	Shaft seals optionally	• Stuffing box packing • Single mechanical seal



	<ul style="list-style-type: none"><li>• Double mechanical seal</li><li>• Magnetic coupling only in conj. with g)</li></ul>
Pump media	See resistance list for the materials mentioned above
Drive	Foot pumps are supplied without electrical drives. Motor-driven pumps (with magnetic coupling) and foot pumps, mounted on a base plate, can be fitted with almost any commercially available standard motor (230V single phase, 400V three phase, Ex motors, 50/60Hz).

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, then the pump must be modified to suit the application, otherwise the pump, or the system into which the pump is integrated, may become damaged or destroyed.

#### 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.



## 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. 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 media 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 media 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 liquid 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 shaft seal.



Where curing media (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 (Section 7.4) 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.

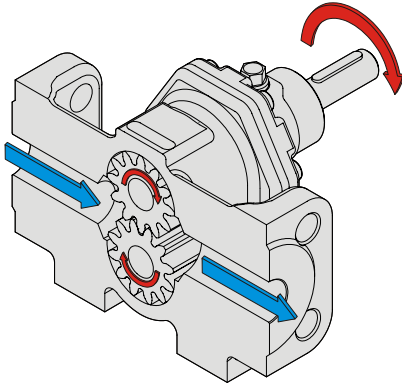
**WARNING**

Comply with regulations when handling substances hazardous to health!



**4. Description of the pump**

**4.1. Principle of a 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.

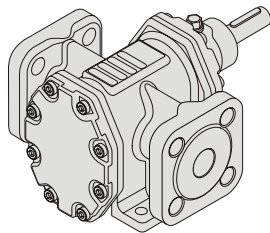
**4.2. Design of a process pump**

**4.2.1. Basic principle**

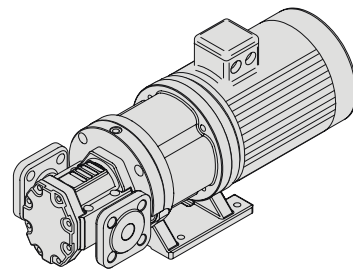
The robust design of the pump, consisting of a casing and two covers, enables rapid, simple and economic servicing and maintenance of the unit. The covers are attached to the casing by eight screws. Each cover has a O - ring between it and the casing. The shafts with their pressed-on gears are supported axially and radially by sleeve bearings. The rotation of the drive unit on the pump head is transferred if using a mechanical seal or stuffing box packing through a compensation coupling, or, where there is the need for absolute security against leakage, through a magnetic coupling to the drive shaft and drive gear.

Scherzinger 35000 series process pumps are available in three different pump sizes (pump size 350XX, 351XX, 353XX) with and without heating jacket and with free shaft end as a foot pump. The gear pumps are also available as magnetic coupling versions with an adapter connection to a suitable electric motor. This version is only available without a heating jacket.

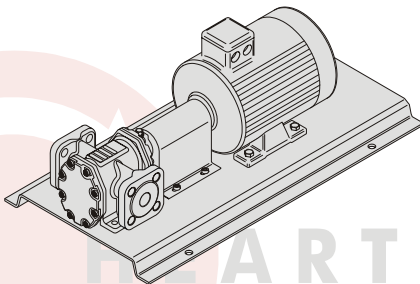
Pump capacities are given in the pump data, Section 1.3.



35000 with single mechanical seal



35000 with magnetic coupling

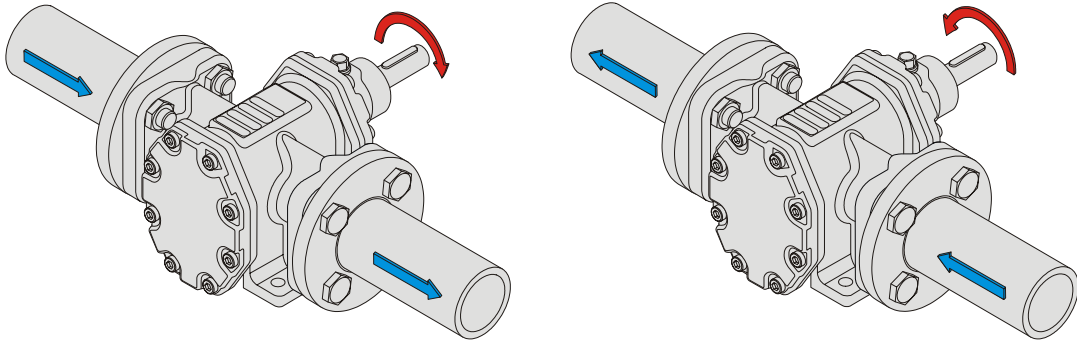


35000 with mechanical seal on base plate

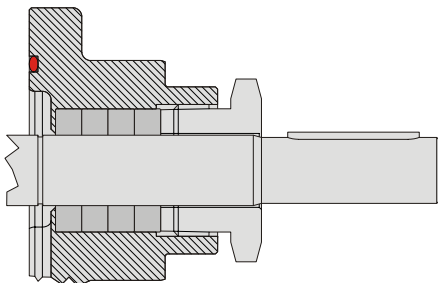
HEART OF HIGHTECH

**4.2.2. Flow directions**

All the pumps in this series operate independently of the direction of rotation; i.e. the direction of rotation is fully variable. However, a change of direction of rotation results in a changeover of the suction and pressure sides. The following typical illustration applies for all seal types.



**4.2.3. Stuffing box packing**

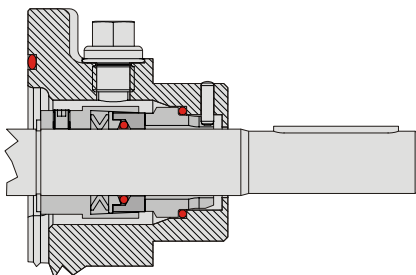


The Stuffing box packing is made from soft but wear-resistant sealing material with good sliding properties. The sealing ring is compressed into the space provided for it in the pump cover by means of a tightening screw and so is pressed against the cover and the drive shaft. This type of seal is used mainly with higher viscosity media (>1,000 mm<sup>2</sup>/s). When it wears to the extent that the liquid leaks out, it can simply be retightened.



Pumps with stuffing box packing cannot be used in potentially explosive atmospheres because of the large amount of heat they generate from friction.

**4.2.4. Single mechanical seal**



The installed mechanical seals function independently of the direction of rotation and are unbalanced. Standard products use synthetic carbon and 99.5% aluminium oxide for the seal faces. PTFE covered FEP O rings for the stationary seals and 1.4571 stainless steel for the spring and construction materials of the pump. Many other materials can be used.

A mechanical seal must be continuously moistened with liquid so that dry running and the consequent destruction of the seal faces through overheating are avoided. Some of the liquid circulates in the pump between the shaft bearings, shaft and the sealing space and lubricates and cools the mechanical seal located there. In normal circumstances, this internal circulation of the liquid is sufficient for lubrication and cooling.

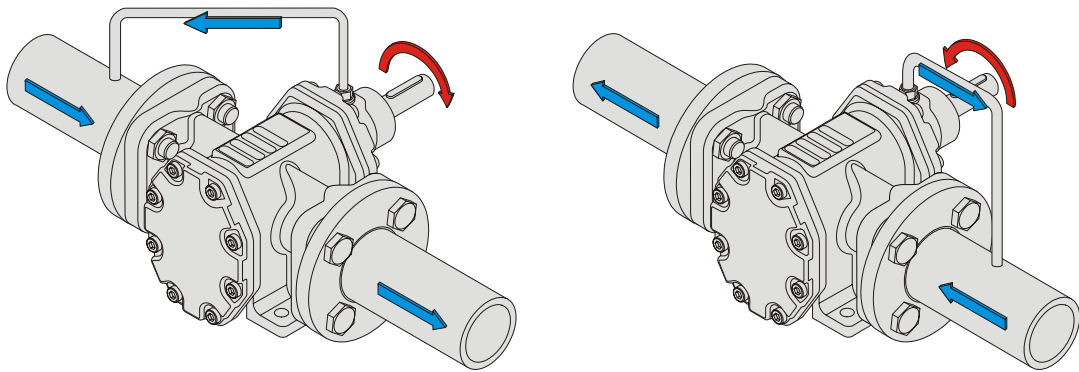


Mechanical seals are not to be used in continuous operation with media with viscosities greater than 3500 mPas in the mechanical seal area.

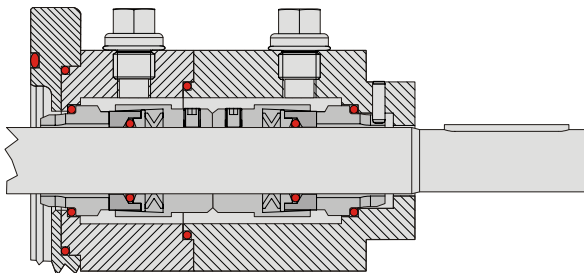


In the event that the pumps are installed in potentially explosive atmospheres, their safety must be ensured by the provision of a more extensive forced circulation system. This can be done by connecting the quench connection in the area of the seal externally to the suction side of the pump. In addition, the temperature of the liquid on the pressure side must be monitored. The values given in Table 6.3 apply.

HEART OF HIGHTECH



**4.2.5. Double mechanical seal**



In the version with a double mechanical seal, two single mechanical seals are installed back to back. Standard products use synthetic carbon and 99.5% aluminium oxide for the seal faces. PTFE covered FEP O - rings for the stationary seals and 1.4571 stainless steel for the spring and construction materials of the pump. Many other materials can be used.

**WARNING**

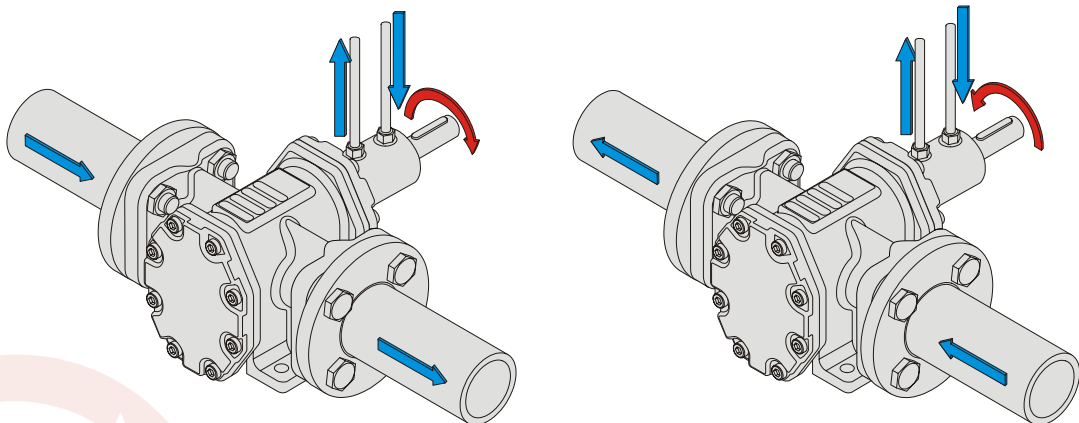
Always operate double mechanical seals only in conjunction with a suitable seal supply system to ensure that there is always an adequate circulation of liquid for lubrication and cooling. The parameters for the seal supply system must be within the following values:

- Flow: 1 to 6 l/min
- System pressure: max. 16 bars
- Temperature: -30°C to 200°C
- Viscosity: max. 3500 mPas



Observe the requirements of the specification and operating manual for the seal supply system.

The connection to the seal supply system must be as shown in the following illustrations:



In potentially explosive atmospheres, the flow through the seal supply system must always be monitored. Failure of the seal supply system leads to overheating of the seals and exceeding of the maximum permissible surface temperature.

**4.2.6. Magnetic coupling**

The magnetic coupling gives the pump a hermetic seal. In other words, the end of the rotating shaft does not project out of the pump. Leakage caused by wear of the shaft seal cannot occur, as only a static seal is provided.



The required torque is transmitted through a non-magnetic partition wall (stationary cup) to the hub of the magnetic coupling by means of several alternately magnetised magnets on the inner circumference in the magnetic coupling cover. The same number of magnets are similarly arranged, alternately polarised on the outer circumference.

The magnetic coupling also serves as an overload protection device in order to prevent damage to the pump 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 stops, whilst the drive continues to run. Pumping ceases.

There are always eddy currents in the split case induced by the rotating magnetic field. The following table shows the losses due to eddy currents for the various coupling types. This power loss is all converted to heat in the area of the stationary cup.

Speed	35000 stainless steel (7 Nm)	35100 stainless steel (14 Nm)	35000 Hastelloy (7 Nm)	35100 Hastelloy (14 Nm)
300 1/min	27 W	54 W	15 W	31 W
600 1/min	54 W	108 W	31 W	61 W
900 1/min	82 W	163 W	46 W	92 W
1200 1/min	108 W	217 W	61 W	123 W
1500 1/min	135 W	271 W	77 W	153 W
1800 1/min	163 W	325 W	92 W	184 W

Table 4.1

A large proportion of the heat is taken away by the internal circulation of the liquid and the outside surfaces of the magnetic coupling and pump. The residual heat remains in the area of the magnetic coupling.



In the uncoupled condition the pump is only to be run for a maximum of 30 seconds. Longer running times will overheat and destroy the magnetic coupling.



Do not operate the pump in the uncoupled condition in a potentially explosive atmosphere. The complete drive output of the motor will be converted into heat and overheat the coupling within a few seconds. The maximum permissible surface temperature could be exceeded, giving rise to a potential danger of ignition. When being operated in a potentially explosive area, the flow through the pump must be monitored. If the flow falters it is highly probable that the magnetic drive has uncoupled. The drive must be brought to a standstill immediately (see Section 6.4).



## 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. First set up

#### 5.2.1. Checks before set up starts



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 3.2).

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



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 pumps / 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. If you do not align the pump properly it can cause stresses that could damage the pump or motor, or at the least affect the functioning.



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.



The wrong direction of rotation could empty the pump. The resulting dry running does not constitute proper use and must be avoided in potentially explosive atmospheres at all costs.

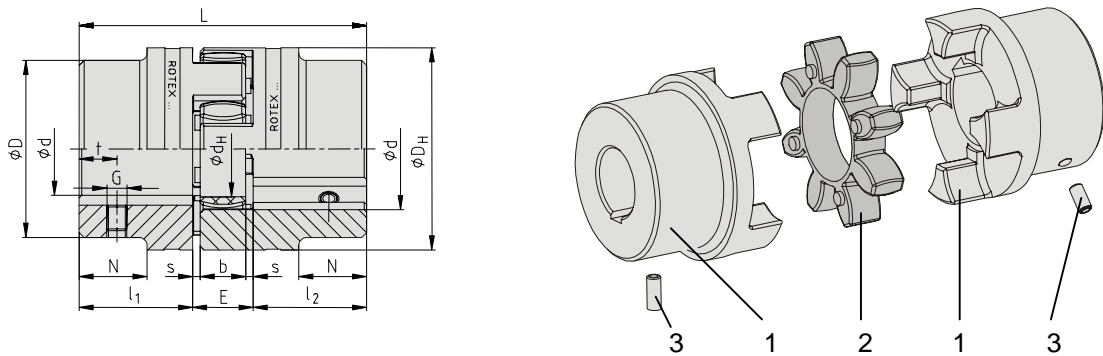
#### 5.2.2. Elastic mechanical shaft couplings

Pumps on base plates with motors are supplied with the correctly installed shaft coupling from the factory. No adjustment is necessary for the first set up. Setting of the coupling should only be carried out as part of or after servicing work.



The supplied coupling in accordance with EU Directive 94/9/EC is in three parts. The pump may be used in potentially explosive atmospheres only in conjunction with the supplied coupling.

HEART OF HIGHTECH



ROTEX® Size	Shaft OD d (min- max)	Dimensions [mm]										
		General									Locking thread	
		L	l <sub>1</sub> ; l <sub>2</sub>	E	b	s	DH	dH	D	N	G	t
19	0 - 25	66	25	16	12	2	40	18	40	-	M5	10
24	0 - 35	78	30	18	14	2	55	27	55	-	M5	10
28	0 - 40	90	35	20	15	2.5	65	30	65	-	M8	15
38	38 - 45	164	70	24	18	3	80	38	78	62	M8	15

Table 5.1

Mounting the coupling:

- Push the hubs [1] on to the shafts of the drive and the pump.
- Set the E-dimension by axially moving the hubs on the shafts.
- Secure the hubs by tightening the set screws [3] DIN 916.

Ensure, when mounting, that the E-dimension is maintained so that the coupling sleeve can move axially in operation.

Ensure that sufficient distance is retained axially to the fixed components of the pump, motor and coupling guard. We recommend a minimum distance of 5 mm.



If the use is in potentially explosive atmospheres, the screws and set screws used to hold the hub must be additionally secured against self-loosening, e.g. by bonding with Loctite (liquid strength) or similar means of thread locking.

### 5.2.3. Electrical drives



When mounting the motor do not introduce any insulating elements between the pump adapter and the motor. The threaded connection between the pump and motor must be made from electroconductive material (e.g. steel).



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 the local power supply company. The operating manual supplied with the motors must also be complied with.



Earth the motor using the terminal provided.

To achieve the highest possible torque, particularly under heavy motor loads, three phase motors should be connected in a delta circuit (check available mains voltage).

### 5.2.4. Connection pipes

Prior to connecting the suction and pressure pipes, check that the connection flanges 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. They shall not be smaller than the nominal size of the pump connections. On the suction side, one nominal size bigger than the nominal size of the suction connection on 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 5.2

**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 the piping rising and descending, 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 otherwise damage to the pump may result when the unit is put into operation.



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 will no longer suck properly. The liquid may escape on the pressure side. Dry running may lead to heat build-up or spark generation in the pump.

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.



Gear pumps must not be operated against a closed valve or a system that is closed on the discharge side, as this could lead to the build up of hazardous pressure rise. A pressure relief device must always be installed (e.g. a pressure relief valve). If it can happen that the pump must work against a closed system, a relief valve must be installed directly downstream of the pump on the discharge side. The return pipe must not be directly fed to the suction side but must return to the tank.



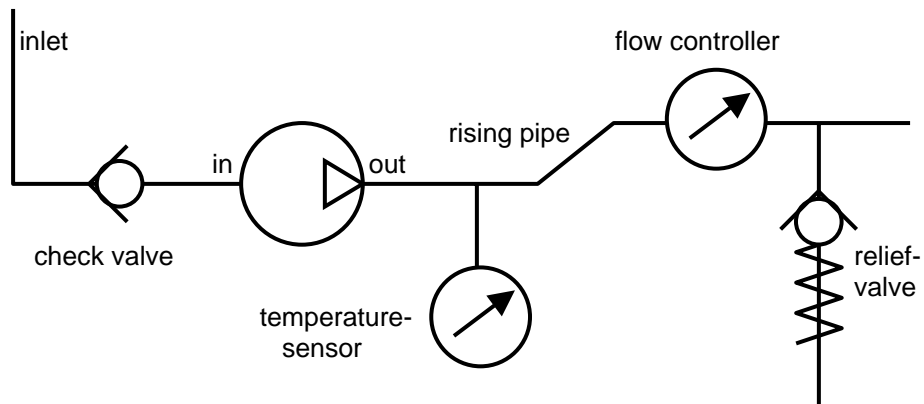
If the pump is used in a potentially explosive atmosphere, you should install a check valve in the suction line immediately upstream of the pump, which will prevent the pump from emptying during standstills and dry running upon starting up again. The pipe directly downstream of the pressure side should 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 max. system pressure on the pressure side (refer to Section 1.3).





For installation in potentially explosive atmospheres the following applies:



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 using 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 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!

### 6.2. Starting operation

- Clean 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.
- 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.



If the pump is used in potentially explosive atmospheres, it must not run dry. The pump and all pipes must be filled with liquid before starting.



Open all slides and butterfly valves in the pipe system. The pump must not pump from a closed suction pipe or against a closed system!

Pre-heat pumps with the heating jacket before start up. The pre-heating time depends on the material properties of the pumped liquid. The pre-heating must always ensure that all the parts of the pump to be in contact with the liquid have reached the operating temperature. We recommend a pre-heating time of 2 to 3 hours.

### 6.3. Restarting after dry running



After a **brief** period of dry running (it is assumed that the pump is still undamaged), you must ensure that the pump is allowed to cool to a temperature below its permissible surface temperature. The pump and pipelines must be completely deaerated.



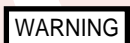
Re-starting after a **longer** period of dry running does not constitute proper use. The pump must be removed from the system, checked for damage and any damaged parts must be replaced.

The pump may only be operated again after it has been completely filled and the electrical earth restored.

### 6.4. Monitoring



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.



The liquid temperature should be monitored on the pressure side. The pump may develop leaks or be destroyed if the permissible temperature range of the seal materials is not observed (see Section 1.3).



If pumps with **magnetic couplings** or pumps with **single mechanical seals** are used in potentially explosive atmospheres, particular consideration must be paid to the heat transferred into the liquid and the increase in temperature of the pump surface in the area of the shaft seal. To avoid exceeding a critical surface temperature, the temperature of the liquid must be monitored directly at the pump discharge. The surface temperature to be expected depends greatly on the thermal capacity of the liquid and the ambient temperature. Approximate values are given in Tables 6.1 to 6.4

Here is an example showing how the maximum permissible liquid temperature can be calculated:

Pump: 35100 ZFMKSC/M1.5  
 Pump speed: 1450 1/min  
 Liquid: ethanol, specific thermal capacity: 2.43 kJ/(Kg\*K)  
 Atmosphere: ethylene ether (temperature class T4)  
 Ambient temperature: 35°C

The maximum permissible temperature of the liquid at the pump discharge would be 90°C (see Table 6.3). If this liquid temperature is exceeded, the pump must be immediately brought to a standstill.

Maximum permissible surface temperatures for pumps with magnetic couplings for pump sizes 35000 ZFMKSC/M... , 35000 ZFMKK/M..., 35000 ZMKSC/M... made from stainless steel:

Pumps speed	specific thermal capacity of the liquid (kJ/kg*K)	Maximum pressure side liquid temperature for use in temperature class (Temperature class of the gas or vapour)				
		T1, T2	T3	T4	T5	T6
< 600 1/min	< 1	200°C	162 °C	97 °C	62 °C	47 °C
	< 2	200°C	165 °C	100 °C	65 °C	50 °C
	< 4	200°C	167 °C	102 °C	67 °C	52 °C
	> 4	200°C	168 °C	103 °C	68 °C	53 °C
< 1200 1/min	< 1	200°C	154 °C	89 °C	54 °C	39 °C
	< 2	200°C	159 °C	94 °C	59 °C	44 °C
	< 4	200°C	164 °C	99 °C	64 °C	49 °C
	> 4	200°C	167 °C	102 °C	67 °C	52 °C
< 1800 1/min	< 1	200°C	138 °C	73 °C	38 °C	23 °C
	< 2	200°C	149 °C	84 °C	49 °C	34 °C
	< 4	200°C	158 °C	93 °C	58 °C	43 °C
	> 4	200°C	164 °C	99 °C	64 °C	49 °C

Table 6.1

Maximum permissible surface temperatures for pumps with magnetic couplings for pump sizes 35000 ZFMKSC/M... , 35000 ZFMKK/M..., 35000 ZMKSC/M... made from Hastelloy C4:



Pumps speed	specific thermal capacity of the liquid (kJ/kg*K)	Maximum pressure side liquid temperature for use in temperature class (Temperature class of the gas or vapour)				
		T1, T2	T3	T4	T5	T6
< 600 1/min	< 1	200°C	166 °C	101 °C	66 °C	51 °C
	< 2	200°C	167 °C	102 °C	67 °C	52 °C
	< 4	200°C	168 °C	103 °C	68 °C	53 °C
	> 4	200°C	169 °C	104 °C	69 °C	54 °C
< 1200 1/min	< 1	200°C	162 °C	97 °C	62 °C	47 °C
	< 2	200°C	165 °C	100 °C	65 °C	50 °C
	< 4	200°C	167 °C	102 °C	67 °C	52 °C
	> 4	200°C	168 °C	103 °C	68 °C	53 °C
< 1800 1/min	< 1	200°C	154 °C	89 °C	54 °C	39 °C
	< 2	200°C	159 °C	94 °C	59 °C	44 °C
	< 4	200°C	164 °C	99 °C	64 °C	49 °C
	> 4	200°C	167 °C	102 °C	67 °C	52 °C

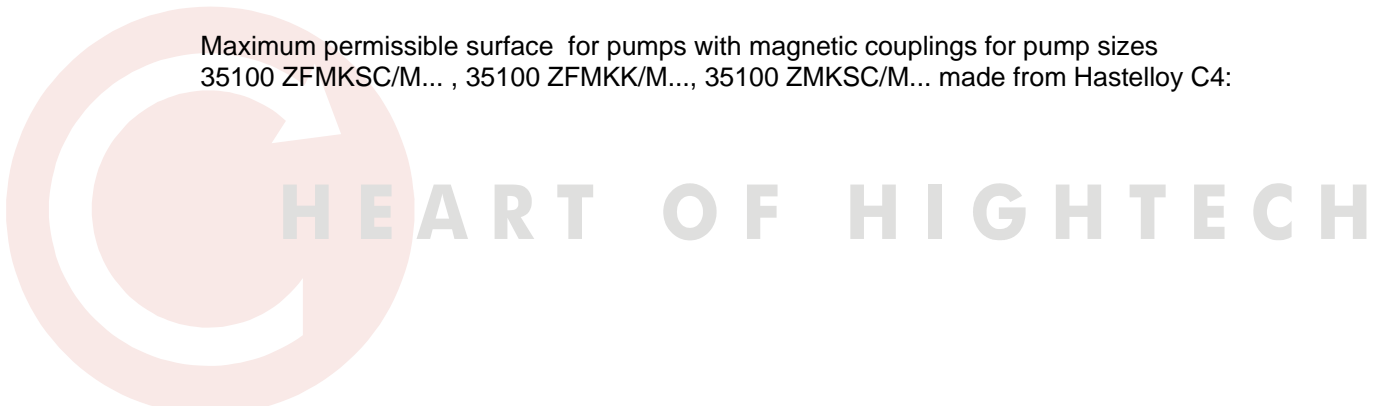
Table 6.2

Maximum permissible surface for pumps with magnetic couplings for pump sizes 35100 ZFMKSC/M... , 35100 ZFMKK/M..., 35100 ZMKSC/M... made from stainless steel and pumps with single mechanical seal for pump sizes 350x0 GLRD ..., 351x0 GLRD..., 353x0 GLRD... made from stainless steel and Hastelloy C4:

Pumps speed	specific thermal capacity of the liquid (kJ/kg*K)	Maximum pressure side liquid temperature for use in temperature class (Temperature class of the gas or vapour)				
		T1, T2	T3	T4	T5	T6
< 600 1/min	< 1	200°C	154 °C	89 °C	54 °C	39 °C
	< 2	200°C	159 °C	94 °C	59 °C	44 °C
	< 4	200°C	164 °C	99 °C	64 °C	49 °C
	> 4	200°C	167 °C	102 °C	67 °C	52 °C
< 1200 1/min	< 1	200°C	138 °C	73 °C	38 °C	23 °C
	< 2	200°C	149 °C	84 °C	49 °C	34 °C
	< 4	200°C	158 °C	93 °C	58 °C	43 °C
	> 4	200°C	164 °C	99 °C	64 °C	49 °C
< 1800 1/min	< 1	200°C	105 °C	40 °C	5 °C	-10 °C
	< 2	200°C	127 °C	62 °C	27 °C	12 °C
	< 4	200°C	145 °C	80 °C	45 °C	30 °C
	> 4	200°C	157 °C	92 °C	57 °C	42 °C

Table 6.3

Maximum permissible surface for pumps with magnetic couplings for pump sizes 35100 ZFMKSC/M... , 35100 ZFMKK/M..., 35100 ZMKSC/M... made from Hastelloy C4:



Pumps speed	specific thermal capacity of the liquid (kJ/kg·K)	Maximum pressure side liquid temperature for use in temperature class (Temperature class of the gas or vapour)				
		T1, T2	T3	T4	T5	T6
< 600 1/min	< 1	200°C	162 °C	97 °C	62 °C	47 °C
	< 2	200°C	165 °C	100 °C	65 °C	50 °C
	< 4	200°C	167 °C	102 °C	67 °C	52 °C
	> 4	200°C	168 °C	103 °C	68 °C	53 °C
< 1200 1/min	< 1	200°C	154 °C	89 °C	54 °C	39 °C
	< 2	200°C	159 °C	94 °C	59 °C	44 °C
	< 4	200°C	164 °C	99 °C	64 °C	49 °C
	> 4	200°C	167 °C	102 °C	67 °C	52 °C
< 1800 1/min	< 1	200°C	138 °C	73 °C	38 °C	23 °C
	< 2	200°C	149 °C	84 °C	49 °C	34 °C
	< 4	200°C	158 °C	93 °C	58 °C	43 °C
	> 4	200°C	164 °C	99 °C	64 °C	49 °C

Table 6.4



If you are using a pump with a single or double mechanical seal, the discharge side liquid temperature must be at least 30°C less than the permissible surface temperature of the temperature class in which the pump is installed.



Liquid temperatures above the permissible temperatures for the materials (see Section 1.3) does not constitute proper use and must be avoided.



Remove accumulated dust from the surface of the pump, drive and connected pipes regularly to avoid the formation of dust nests, which could act as an ignition source. The cleaning frequency is determined by the rate of dust accumulation.

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



If the pump is used in a potentially explosive atmosphere, a flow controller must be installed directly downstream of the pump. The flow controller must not create a noticeable back pressure in case of damage. A float or flat-type flow meter is preferred. If the delivery rate of the gear pump falls to 20% of the theoretical flow rate, the pump must be stopped immediately. This is an obvious sign of wear. The pump must be stopped immediately. The value of 20% of the theoretical flow rate can be calculated as follows:

$$Q_{\text{theo20}} = \frac{V_{\text{gP}} \cdot n}{5000}$$

$Q_{\text{theo20}}$ : 20% of the theoretical flow rate in lpm

$n$ : Drive speed in rpm

$V_{\text{gP}}$ : Pump displacement (see following table)



	Displacement $v_{gP}$	Volumetric flow rate (min. always to be achieved) e.g. at the following speeds:		
		730 1/min	970 1/min	1450 1/min
<b>Pump size 35000/35050</b>	11.2 cm <sup>3</sup> /U	1.3 l/min	3.2 l/min	3.3 l/min
<b>Pump size 35100/35150</b>	24.8 cm <sup>3</sup> /U	3.6 l/min	4.8 l/min	7.2 l/min
<b>Pump size 35300/35350</b>	60.7 cm <sup>3</sup> /U	8.8 l/min	11.8 l/min	17.6 l/min

Table 6.5



Take note of the advice relating to seals in Sections 4.2.3 to 4.2.6.

**6.5.**

**Shut down**



Make sure that there is no potentially explosive atmosphere.

When liquids which could be hazardous to health have been pumped, flush the pump thoroughly with a suitable cleaning or neutralising solution (do not use a corrosive liquid) for several minutes.

After any cleaning has been completed, the pump should be flushed again with water.

Switch off the drive unit.

Shut off the heating circuit for the heating jacket.

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).

If the standstill is to be a long one, drain the pump completely.

**6.6.**

**Removal from the system**



Make sure that the steps described in Section 6.5 have been carried out.

- Check that there is no pressure at the inlet and outlet or in the heating circuit.
- Drain the pump completely.
- Drain the heating circuit completely.
- Disconnect the drive unit from the electricity supply.
- Remove the connections to the pump and the heating jacket.
- If necessary, clean the pump as described in Section 3.4.



## 7. Maintenance

### 7.1. General information



Regular servicing as described in Section 7.3 must be carried out. Servicing is also required when

- the pump is to be stored,
- the pump is to be unused for an indeterminate period,
- the pump no longer meets the key data described in Section 1.3,
- a different liquid is to be conveyed,
- leakage occurs in the pump,
- a malfunction as described in Section 8 occurs.



We recommend that repair work is to be carried out by the manufacturer at the factory. Ensure that the pump is flushed with a safe liquid before maintenance work is carried out (refer to Section 3.4). The accompanying clearance certificate must be filled out completely before shipping the pump. Defective pumps without clearance certificates will not be accepted.

### 7.2. Preparation



Ensure that the entire drive train is secured against unintended start-up before mounting or servicing the pump. Serious injury can be caused by rotating parts. It is essential to read and comply with the safety instructions below.

Switch off the drive unit.

Secure the drive unit against unintended start-up, e.g. by mounting warning signs on the switch-on point, or removing the fuse from the power supply.

Do not reach into the working area of the coupling when it is still in operation.

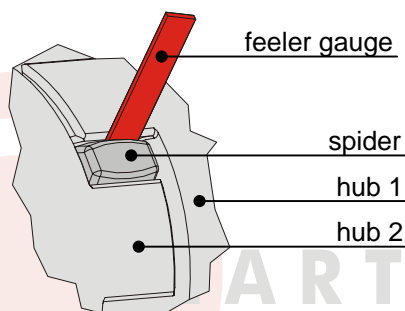
Ensure that the pump is flushed with a safe liquid before any servicing work. If the pump has been operated with a liquid hazardous to health, servicing must be implemented with appropriate safety measures.

### 7.3. Coupling

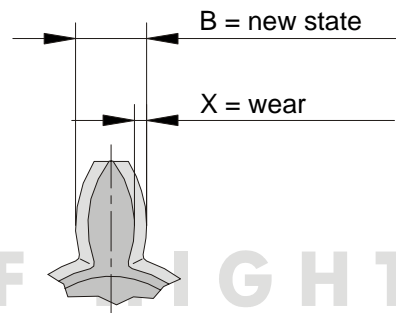


A checking of the circumferential backlash and a visual check of the flexible spider must be effected after 2,000 operating hours for the first time, after 3 months at the latest. If you note an unconsiderable or no wear at the spider after this first inspection, the further inspections can be effected, in case of the same operating parameters, respectively after 4,000 operating hours or after 12 months at the latest.

If you note a considerable wear during the first inspection, so that a change of the spider would be recommended, please find out the cause according to the table „Breakdowns“, as far as possible. The maintenance intervals must be adjusted according to the changed operating parameters.



Checking the limit of wear



Wear of the spider

The elastic spider must be replaced when X exceeds the figures in table 7.1.

When the replacement limits will be reached depends on the operating conditions and operating parameters.

ROTEX® Size	Wear limits (friction) $X_{max.}$ [mm]
19	3
24	3
28	3
38	3

Table 7.1

#### 7.4. Stuffing box packing

If a pump with a stuffing box packing type of seal develops a leak during operation, the stuffing box packing can simply be recompressed by tightening the tightening screw. Just turn the tightening screw clockwise with an open spanner until the fluid stops leaking out.



Tighten the tightening screw no further than is required to stop the leak of fluid. Any tighter and the pump may overheat.

If the pump can no longer be stopped from leaking by retightening, the stuffing box packing must be replaced. For more details refer to the servicing manual.

#### 7.5. Mechanical seal



When you replace the mechanical seals, you must leave the parallel pins [9] in position. If they are not pressed in properly they can rub on the shaft and therefore present the danger of ignition.

#### 7.6. Disassembly and reassembly



Particular care is to be taken to ensure that all O-rings and flat seals are replaced upon reassembly as part of any servicing work that involves dismantling the pump. Otherwise, complete leakage prevention cannot be guaranteed. Absolute cleanliness of the workplace is essential for this task, as any dirt could threaten the proper functioning of the pump.

Grease the cover screws (16 No.) when assembling the pump, otherwise they could become stuck in the threads and make disassembly more difficult next time.

We recommend that servicing is always carried out in the manufacturers factory. If you wish to service or repair the pump yourself, please observe the provisions of the relevant servicing manuals.





## 8. Malfunions, causes and rectification

### (I) The pump is not sucking properly

#### (a) Pipework incorrectly designed

Pipes that are the wrong size can have a serious negative effect on pump suction. The instructions in Section 5.2 - Connection pipes - are to be observed.

#### (b) 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.

#### (c) Suction pipe is closed

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

#### (d) 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.

#### (e) Suction pipe leaking

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

### (II) The pump builds up too little or no pressure

#### (a) Pipes closed

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

#### (b) 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.

#### (c) 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.

#### (d) Coupling defective

Replace damaged coupling components. A damaged coupling is always a sign of overload. Rectify the cause of the overload.

### (III) The pump is making noises



If vibration, grinding or scratching noises can be heard, stop the drive immediately. The malfunction must be rectified immediately. Possible causes are:

#### (a) Extreme wear in the pump

The pump must not be operated in this condition. The pump requires maintenance.

#### (b) Cavitation operation

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.

#### (c) Coupling wear

Check the wear limits of the coupling, see Section 7.3. If coupling wear is too high, replace the worn parts, as overheating can pose an ignition danger.

*(d) Pump with magnetic coupling rattles*

The magnetic coupling is uncoupled. Stop the drive and start it again. If the pump does not engage again, check the operating parameters.

**(IV) The pump is getting hot**

*(a) 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.

*(b) Grinding noises*

If scratching noises can be heard, this indicates wear in the pump. The pump must not be operated in this condition. Stop the drive immediately. A repair is urgently required.

*(c) Pump is worn out*

If the flow rate drops over time, but the pump is still building pressure, it is likely that wear is present. Please contact the manufacturer regarding repairs.

**(V) Fluid is escaping from the shaft end**

*(a) Pump with stuffing box packing*

The shaft seal has become slightly worn during operation. Adjust it in accordance with Section 7.4.

*(b) Pump with single mechanical seals*

A slight leakage of one drop per day is permissible. If the pump has a higher leakage rate the mechanical seal must be replaced.



## 9. Spare parts lists

### 9.1. Process pumps with magnetic coupling

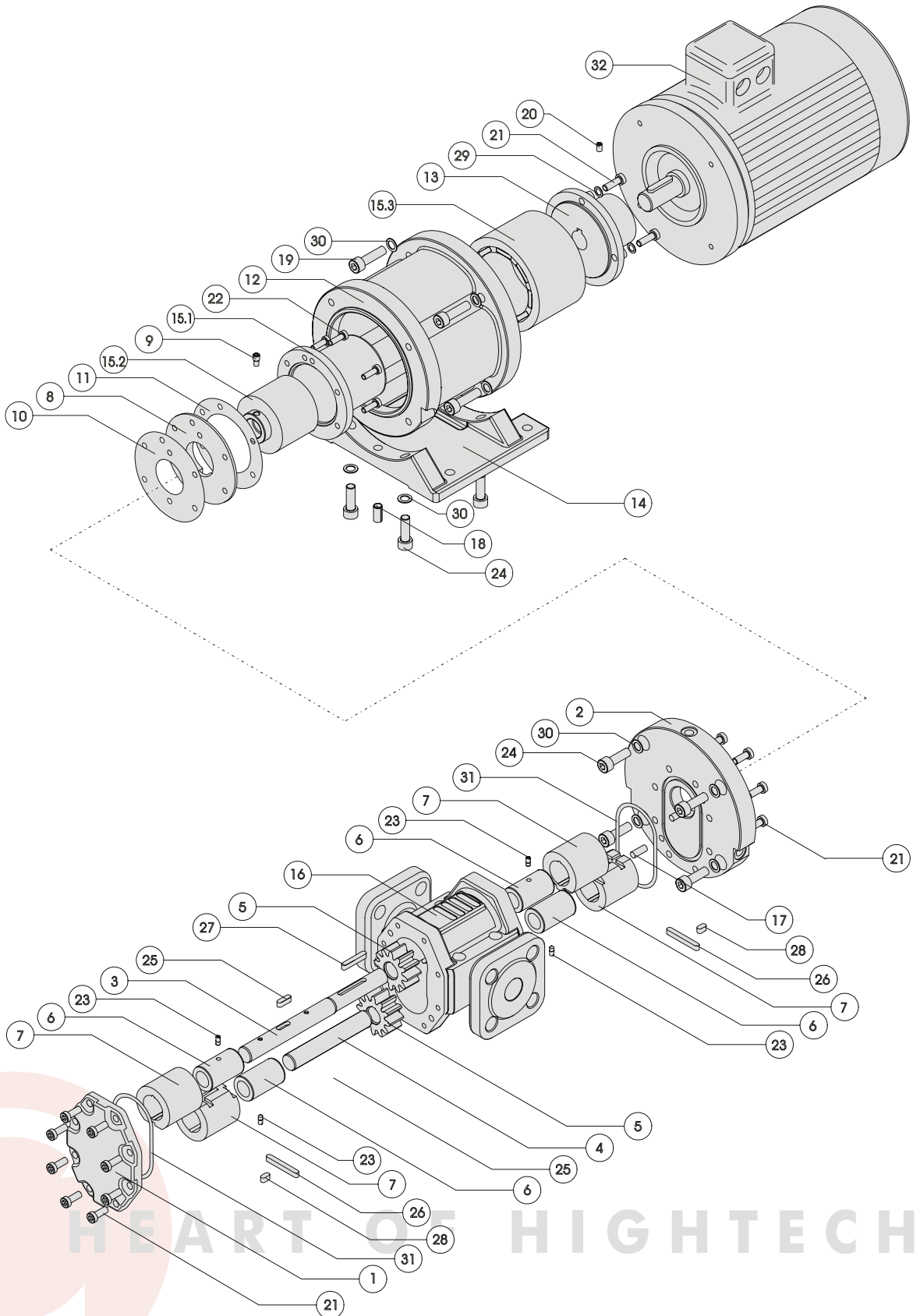
#### 9.1.1. Spare parts list

			35000 ZFMKSC/M055	35100 ZMKSC/M1.1	35000 ZFMKSC/M055 HC4	35100 ZMKSC/M1.1 HC4
			35000 ZFMKSC/M075	35100 ZMKSC/M1.5	35000 ZFMKSC/M075 HC4	35100 ZMKSC/M1.5 HC4
Item	Description	Number	Drawing No.	Drawing No.	Drawing No.	Drawing No.
1	Cover	1	35000-002.01	35000-002.01	35011-002.01	35011-002.01
2	Cover	1	35000-002.10	35000-002.10	35011-002.10	35011-002.10
3	Drive shaft	1	35000-005.10	35100-005.10	35011-005.10	35111-005.10
4	Idler shaft	1	35000-006.00	35100-006.00	35011-006.00	35111-006.00
5	Gear	2	35000-007.00	35100-007.00	35000-007.01/-007.02	35100-007.01/-007.02
6	Sleeve bearing	4	35000-010.02	35100-010.02	35000-010.02	35100-010.02
7	Bearing insert	4	35000-010.04	35100-010.04	35000-010.04	35100-010.04
8	Centring washer	1	35000-012.00	35000-012.00	35011-012.00	35011-012.00
9	Set screw	1	35000-024.00	35000-024.00	35011-024.00	35011-024.00
10	Flat seal	1	35000-066.00	35000-066.00	35000-066.00	35000-066.00
11	Flat seal	1	35000-066.01	35000-066.01	35000-066.01	35000-066.01
12	Adapter flange	1	35000-122.00	35000-122.00	35000-122.00	35000-122.01
13	Motor coupling hub	1	35000-125.00	35000-125.01	35000-125.00	35000-125.00
14	Mounting base plate	1	35000-139.00	N/A	35000-139.00	N/A
15.1	Stationary cup	1	35000-145.00	35000-145.00	35011-145.00	35011-145.00
15.2	Magnetic coupling hub	1	35000-124.00K	35000-124.10K	35011-124.00K	35011-124.10K
15.2	Magnetic coupling	1	35000-126.00K	35000-126.10K	35000-126.00K	35000-126.10K
16	Casing	1	35050-001.00	35050-001.00	35051-001.00	35051-001.00
17	Parallel Pin	2	701094	701094	701094	701094
18	Spring Pin	1	701228	N/A	701228	N/A
19	Hex head cap screw	4	702054	702054	702054	702054
20	Set screw	1	702220	702220	702220	702220
21	Hex head cap screw	20	702233	702233	702233	702233
22	Hex head cap screw	6	702248	702248	702248	702248
23	Headless screw	4	702261	702261	702333	702333
24	Hex head cap screw	8	702606	702606 (4x)	702606	702606 (4x)
25	Feather key	2	707060	702062	707080	707083
26	Feather key	2	707061	707061	707081	707081
27	Feather key	1	707062	707062	707083	707083
28	Feather key	2	707079	707079	707082	707082
29	Circlip	4	712043	712043	712043	712043
30	Circlip	8	712053	712053	712053	712053
31	O-ring	2	718154	718154	718154	718154
32	Motor	1	As ordered	As ordered	As ordered	As ordered

Table 9.1

HEART OF HIGHTECH

9.1.2. Exploded view



**9.2. Stainless steel and Hastelloy foot pumps**

**9.2.1. Spare parts list – Stainless steel**

			35000 () / 35050 ()				35100 () / 35150 ()				35300 () / 35350 ()			
Seal types ...			S		GLRD		S		GLRD		S		GLRD	
Bearing types ...			K	SC	K	SC	K	SC	K	SC	K	SC	K	SC
Item	Description	No.												
1	Casing ()	1	35000-001.00				35000-001.00				35300-001.00			
1.1	Casing ()	1	35050-001.00K				35050-001.00K				35350-001.00K			
2	Cover	1	35000-002.00				35000-002.00				35300-002.00			
2.1	Cover	1			35000-002.02				35000-002.02				35300-002.02	
2.2	Cover	1	35000-002.01				35000-002.01				35300-002.01			
3	Drive shaft	1	35000-005.00				35000-005.00				35300-005.00			
4	Idler shaft	1	35000-006.00				35000-006.00				35300-006.00			
51)	Gear W		35000-007.00				35100-007.00				35300-007.00			
	Gear T		35000-007.01				35100-007.01				35300-007.01			
	Gear H		35000-007.02				35100-007.02				35300-007.02			
6	Bearing insert	4	35000 - 010.00		35000 - 010.00		35100 - 010.00		35100 - 010.00		35300 - 010.00		35300 - 010.00	
6.1	Sleeve bearing	4		35000 - 010.02		35000 - 010.02		35100 - 010.02		35100 - 010.02		35300 - 010.02		35300 - 010.02
6.2	Bearing insert	4		35000 - 010.04		35000 - 010.04		35100 - 010.04		35100 - 010.04		35300 - 010.04		35300 - 010.04
7	Cap nut	1	35000-095.00				35000-095.00				35300-095.00			
8	Parallel pin	2	701094				701094				701095			
9	Parallel pin				701096				701096				701096	
10	Hex head cap screw	16	702233				702233				702264			
11	Plug screw	1			702255				702255				702255	
12	Headless screw	4		702261		702261		702261		702261		702262		702262
13	Sealing ring	1	704544				704544				704544			
14	Feather key	2	707060				707062				707064			
15	Feather key	2	707061				707061				707061			
16	Feather key	1	707062				707062				707064			
17	Feather key	2	707079				707079				707085			
18	Mechanical seal	1			708038				708038				708038	
19	Stuffing box packing	5	708047				708047				708036 (4x)			
20	Retaining ring	1			712064				712064				712065	
21	O-ring	2	718154				718154				718161			

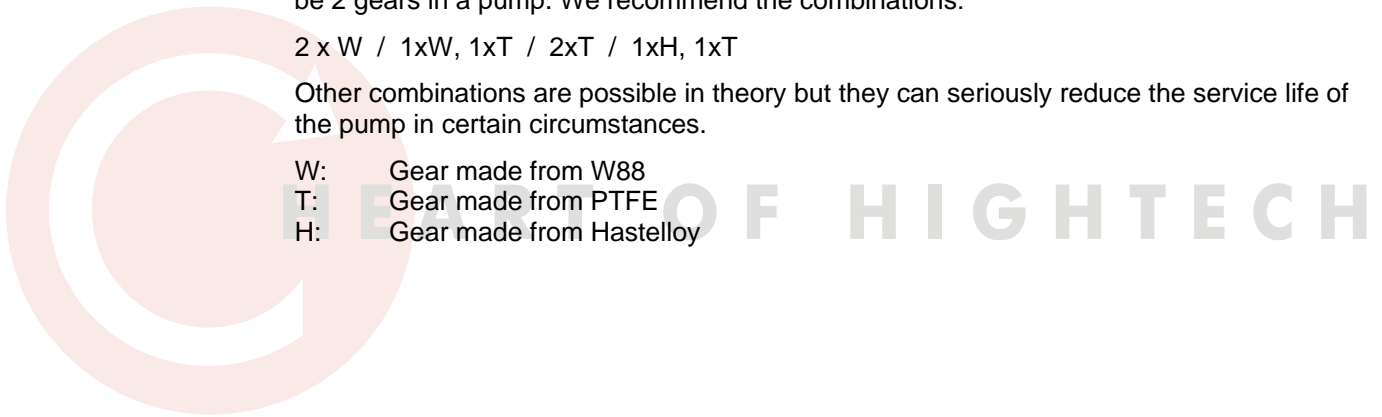
Table 9.2

1) Gears made from different materials can be used in any combination. There must always be 2 gears in a pump. We recommend the combinations:

2 x W / 1xW, 1xT / 2xT / 1xH, 1xT

Other combinations are possible in theory but they can seriously reduce the service life of the pump in certain circumstances.

W: Gear made from W88  
 T: Gear made from PTFE  
 H: Gear made from Hastelloy



9.2.2. Spare parts list - Hastelloy C4 Pumps

			35000 HC4 () / 35050 HC4 ()				35100 HC4 () / 35150 HC4 ()				35300 HC4 () / 35350 HC4 ()			
Seal types ...			S		GLRD		S		GLRD		S		GLRD	
Bearing types ...			K	SC	K	SC	K	SC	K	SC	K	SC	K	SC
Item	Description	No.												
1	Casing ()	1	35011-001.00				35011-001.00				35311-001.00			
1.1	Casing ()	1	35051-001.00K				35051-001.00K				35351-001.00K			
2	Cover	1	35011-002.00				35011-002.00				35311-002.00			
2.1	Cover	1			35011-002.02				35011-002.02				35311-002.02	
2.2	Cover	1	35011-002.01				35011-002.01				35311-002.01			
3	Drive shaft	1	35011-005.00				35011-005.00				35311-005.00			
4	Idler shaft	1	35011-006.00				35011-006.00				35311-006.00			
51)	Gear W		35000-007.00				35100-007.00				35300-007.00			
	Gear T		35000-007.01				35100-007.01				35300-007.01			
	Gear H		35000-007.02				35100-007.02				35300-007.02			
6	Bearing insert	4	35000 - 010.00		35000 - 010.00		35100 - 010.00		35100 - 010.00		35300 - 010.00		35300 - 010.00	
6.1	Sleeve Bearing	4		35000 - 010.02		35000 - 010.02		35100 - 010.02		35100 - 010.02		35300 - 010.02		35300 - 010.02
6.2	Bearing insert	4		35000 - 010.04		35000 - 010.04		35100 - 010.04		35100 - 010.04		35300 - 010.04		35300 - 010.04
7	Cap Nut	1	35011-095.00				35011-095.00				35311-095.00			
8	Parallel pin	2	701094				701094				701095			
9	Parallel pin		701096				701096				701096			
10	Hex head cap screw	16	702233				702233				702264			
11	Plug screw	1	702394				702394				702394			
12	Headless screw	4		702333		702333		702333		702333		on request		on request
13	Sealing ring	1	704544				704544				704544			
14	Feather key	2	707080				707083				on request			
15	Feather key	2	707081				707081				on request			
16	Feather key	1	707083				707083				on request			
17	Feather key	2	707082				707082				on request			
18	Mechanical seal	1	708147				708147				on request			
19	Stuffing box packing	5	708047				708047				708036 (4x)			
20	Retaining ring	1	N/A				N/A				N/A			
21	O-ring	2	718154				718154				718161			

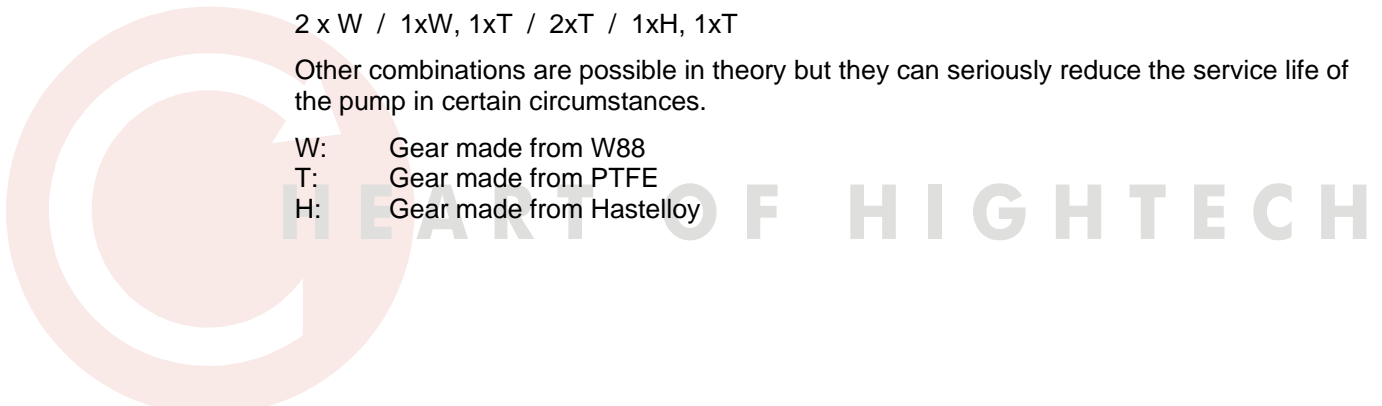
Table 9.3

1) Gears made from different materials can be used in any combination. There must always be 2 gears in a pump. We recommend the combinations:

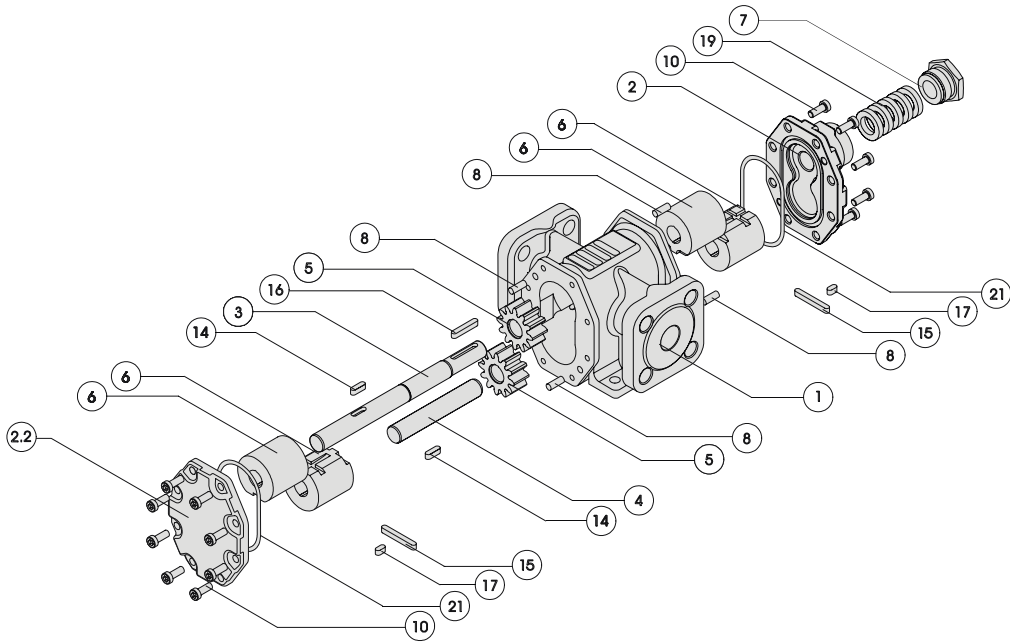
2 x W / 1xW, 1xT / 2xT / 1xH, 1xT

Other combinations are possible in theory but they can seriously reduce the service life of the pump in certain circumstances.

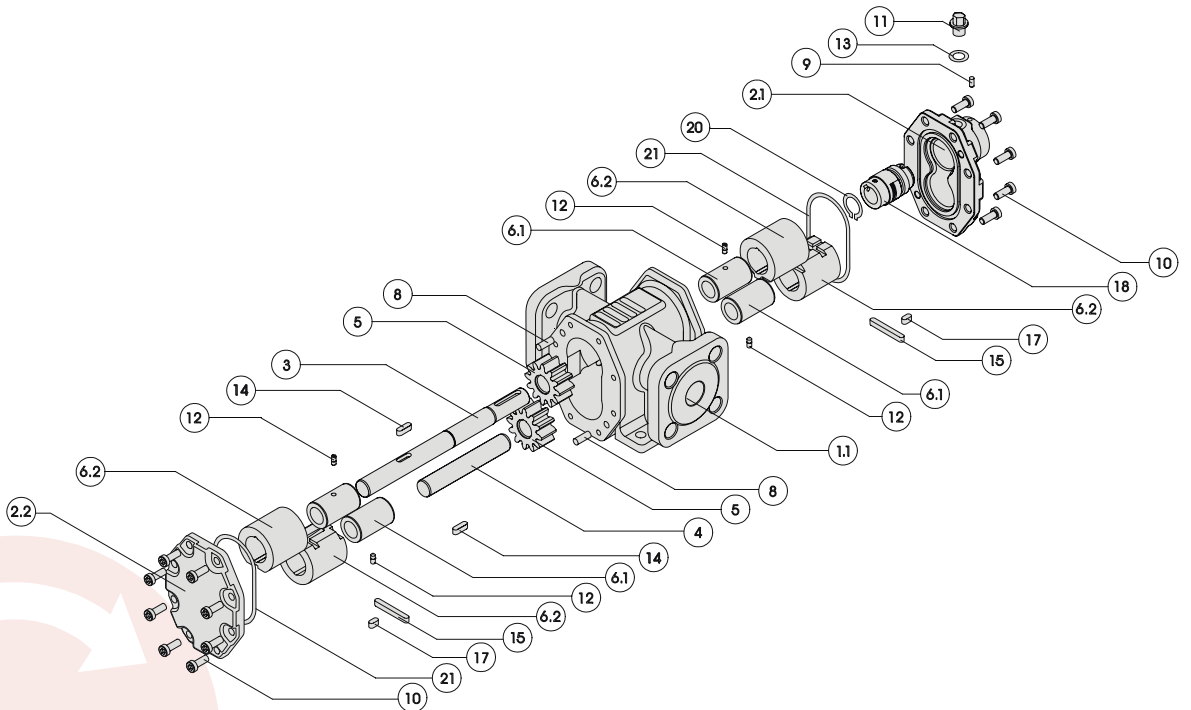
W: Gear made from W88  
T: Gear made from PTFE  
H: Gear made from Hastelloy



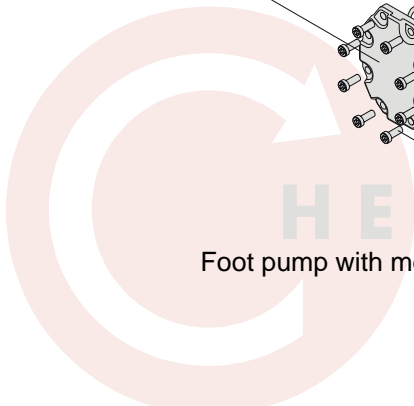
9.2.3. Exploded view



Foot pump with Stuffing box packing and graphite sleeve bearings (35xxx S K)



Foot pump with mechanical seal and ceramic sleeve bearings (35xxx GLRD SC)



HEART OF HIGHTECH

### Cearance Certificate

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

HEART OF HIGHTECH

For safety reasons pumps supplied without this completed safety data sheet cannot be inspected or re-paired.



**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:

**Process gear pump**

Series:

**35000 - 35300 ZFMK...      35000 - 35300 ZMK...**  
**35000 - 35350 GLRD ...    35000 - 35350 DGLRD ...**

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:



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, 29 September 2003

(Dipl.-Ing. Erich Willmsky)  
Managing Director

## Declaration of Conformity (Machinery Directive) 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 pumps:

Type:

**Process gear pump**

Series:

**35000 - 35350 with drive**

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 compatibility (EMC Directive)
94/9/EC	Explosion protection (ATEX 95)

Applicable harmonised standards below:

EN ISO 12100 T1	EN 294	EN 809	DIN EN 13463-1
EN ISO 12100 T2	EN 563	EN 60 204 T1	E DIN EN 13463-5

Applicable national technical standards and specifications:

Accident prevention regulations

Furtwangen, 29 September 2003

  
(Dipl.-Ing. Erich Willimsky)  
Managing Director

## Manufacturer's Declaration of Conformity with the Provisions of Directive 98/37/EC

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

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

declares that the pumps:

Type:

**Process gear pump**

Series:

**35000 - 35350 without drive**

in the model supplied by us without a drive engine, is intended for installation in a machine or for assembly with other machines for a machine/system, and that operation thereof is prohibited until such time as it has been established, that the machine/system into which this pump is to be installed, or with which this pump is to be assembled, complies with the provisions of Directive 98/37/EC.

The following harmonised standards were applied:

EN ISO 12100 T1  
EN ISO 12100 T2

EN 294  
EN 563

EN 809

DIN EN 13463-1  
E DIN EN 13463-5

Furtwangen, 29 September 2003

  
(Dipl.-Ing. Erich Willimsky)  
Managing Director



**HEART OF HIGHTECH**

**Scherzinger Pump Technology  
Bregstrasse 23 – 25  
78120 Furtwangen  
Germany**

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web: [www.scherzinger.de](http://www.scherzinger.de)  
email: [info@schertzinger.de](mailto:info@schertzinger.de)**