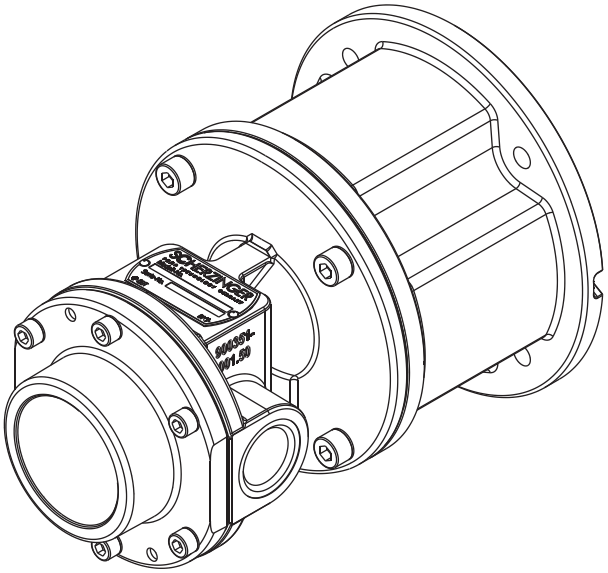
OPERATING INSTRUCTIONS

SCHERZINGER
PUMP TECHNOLOGY

Pump type
41 FA.../ZK.../EX – 552 FA.../ZK.../EX
41 FA.../M.../EX – 552 FA.../M.../EX



Version: 4.2 English
Date: 08.01.2017
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0. Table of Contents

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 41 - 552 FA.../ZK.../EX 41 - 552 FA.../M.../EX with effect from April 2003, manufactured by Scherzinger Pumpen 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. pressure rise	pump size 41, 42 – 30 bar at min. 0,18kW pump size 51, 52 – 30 bar at min. 0,25kW pump size 76, 77 – 30 bar at min. 0,37 kW pump size 101, 102 – 25 bar at min. 0,55 kW pump size 151, 152 – 20 bar at min. 0,55 kW pump size 251, 252 – 20 bar at min. 1,1 kW pump size 351, 352 – 20 bar at min. 1,5 kW pump size 451, 452 – 15 bar at min. 2,2 kW pump size 551, 552 – 10 bar ati min. 3,0 kW
max. inlet pressure	0,5 bar
max. suction pressure	-0,3 bar (with lip seal ring, single lip) -0,8 bar (41 – 77: with lip seal ring, double lip 101 – 551 with two lip seal rings)
operating temperature	-20 bis 80°C (seal material NBR) -20 bis 160°C (seal material FPM) -20 bis 160°C (seal material PTFE) -20 bis 60°C (seal material EPDM)
viscosity rang	2 to 10.000 mm^2/s
speed range	0 to 1750 RPM
noise pressure level	< 77 dB(A), pump speed 1400 RPM, operating pressure 20 bar operating temperature 20°C fluid viscosity 100 mm^2/s, lubricating characteristics
dimensions	see appropriate data sheets 41 - 552 FA.../ZK.../EX 41 - 552 FA.../M.../EX

max. possible pump speed depending on fluid viscosity:

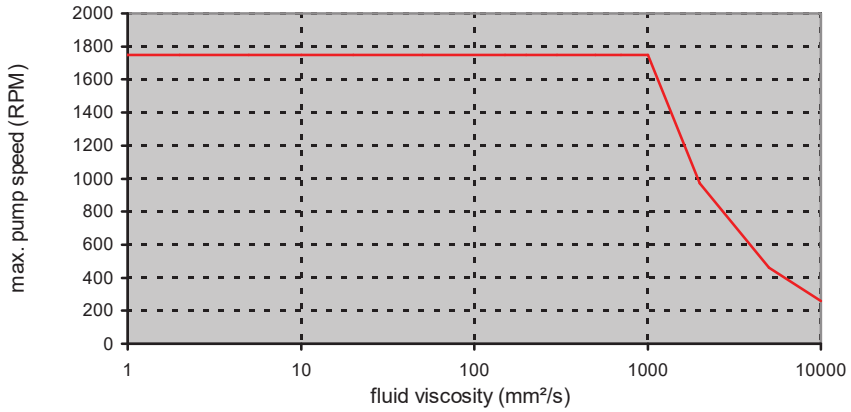


Chart 1.1

pump size 41, 42 – flow rate depending on speed:

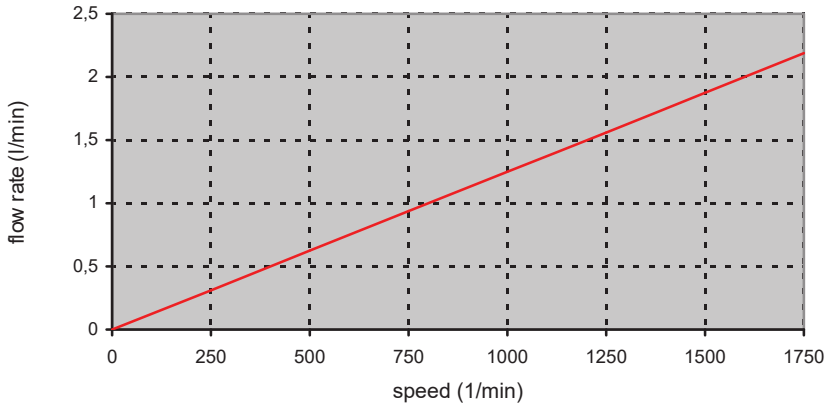


Chart 1.2

pump size 51, 52 – flow rate depending on speed:

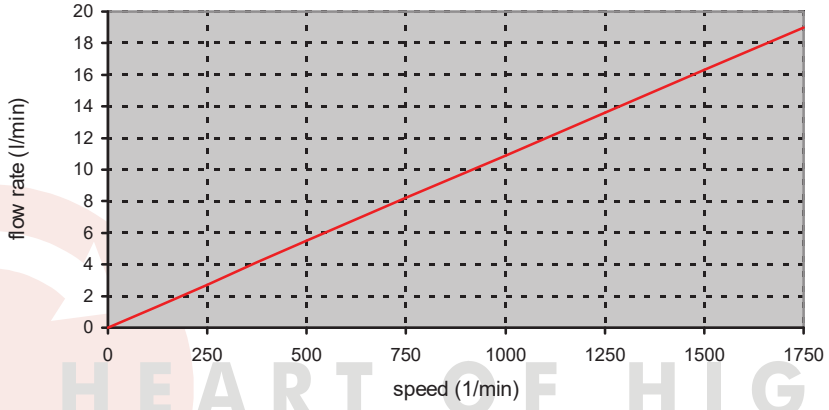


Chart 1.3

pump size 76, 77 - flow rate depending on speed:

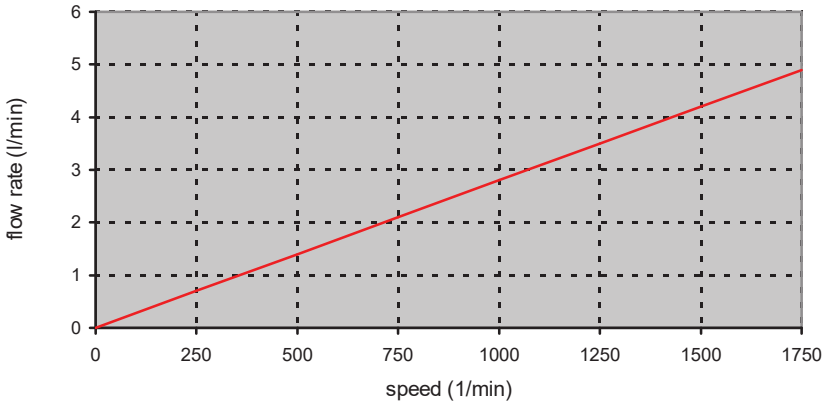


Chart 1.4

pump size 101, 102 - flow rate depending on speed:

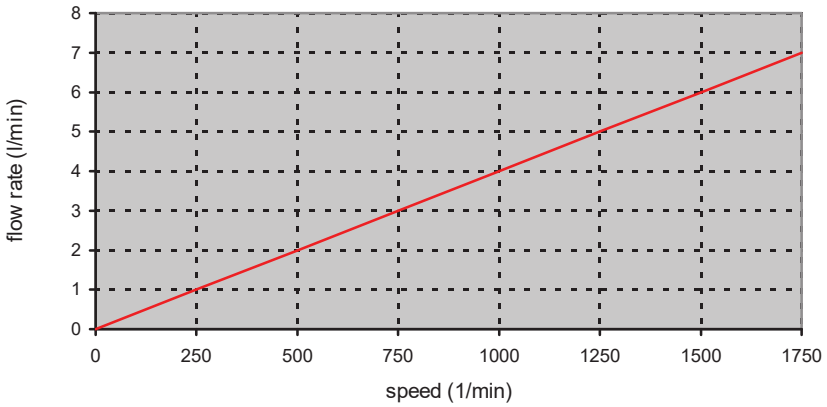


Chart 1.5

pump size 151, 152 - flow rate depending on speed:

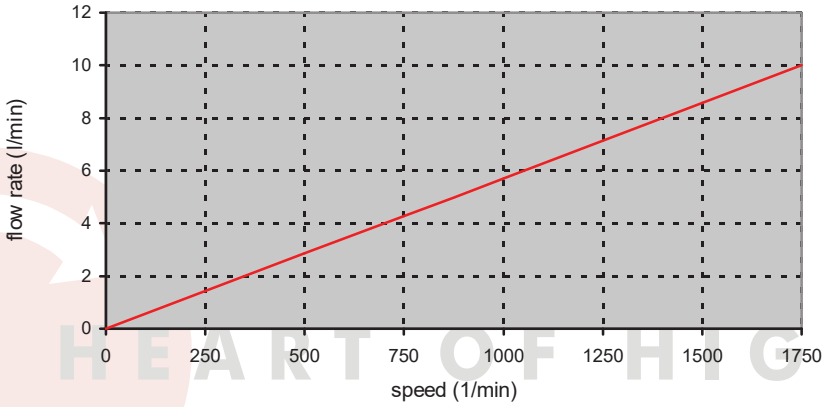


Chart 1.6

pump size 251, 252 - flow rate depending on speed:

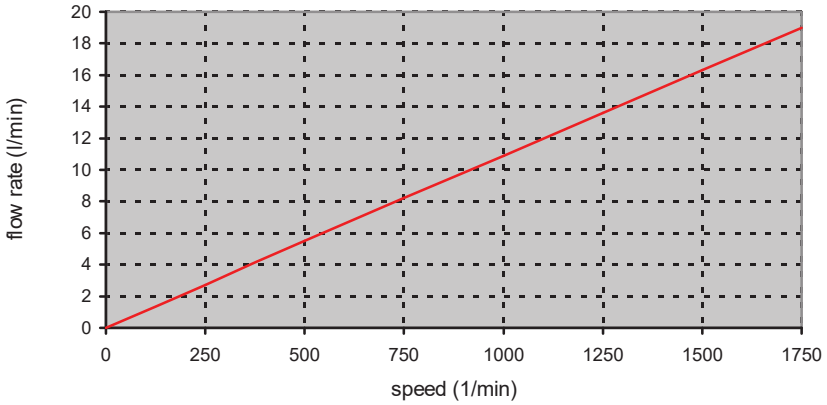


Chart 1.7

pump size 351,352 - flow rate depending on speed:

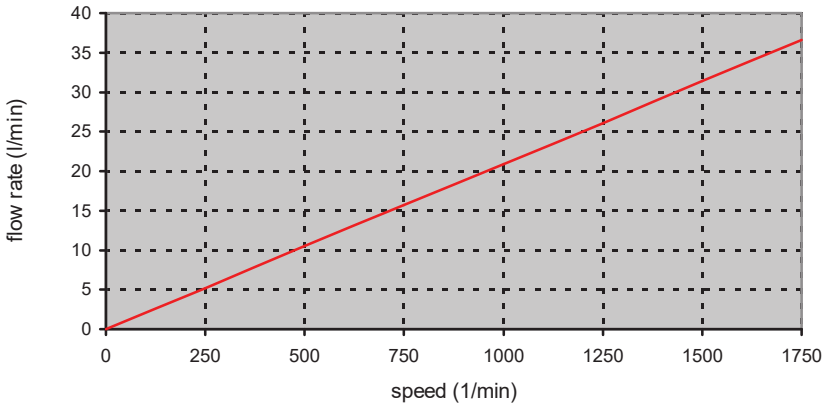


Chart 1.8

pump size 451, 452 - flow rate depending on speed:

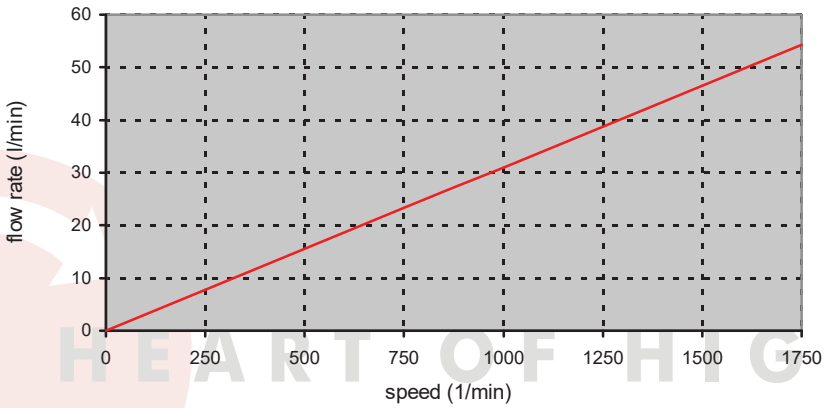


Chart 1.9

pump size 551, 552 - flow rate depending on speed:

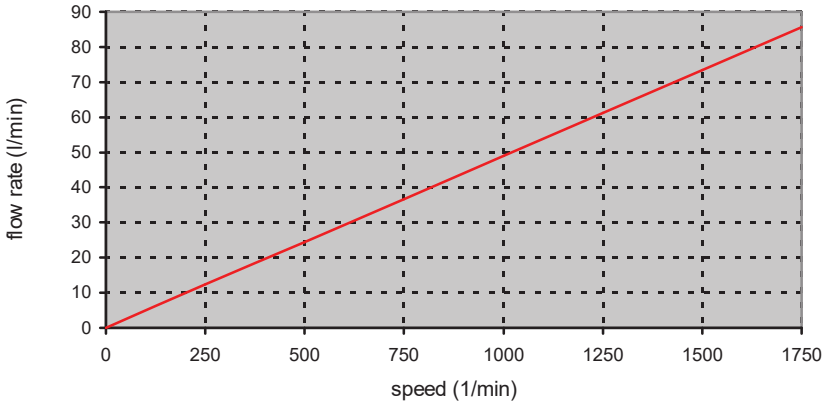


Chart 1.10

Parts in contact with the fluid:

Casings [2], [3]:	cast iron EN-GJL-250 (5.1301)
Shafts [4],[5]	case hardened steel
Gears [4],[5]:	case hardened steel
Seals [14],[15]:	lip seal rings, O-rings, available in - NBR - Viton - PTFE/Graphite - EPDM
Sleeve bushings in [2],[3]:	cast iron, optional DU – sleeve bushings
Pumped fluids	See resistance tables 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 can be found on the Internet under **www.scherzinger.de**. For the most part, these are sales branches, although some also carry out repairs and servicing. The majority of the work is however 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 included 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, 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.

If dust deposits are dangerous for the operation, they have to be removed regularly.

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.
- It has to be assured that the pump is not disassembled in explosive atmospheres. Please provide for ventilation, inerting or take the pump into an ex-free zone.
- Upon completion of the work, all safety and protective devices must immediately be refitted and made operational.
- The points listed in the section 6.2 - 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 corrosion by painting or applied oil. The pumps are additionally protected against shock and impact. Furthermore, inlets and outlets are closed using protective plugs. This is necessary to prevent any remaining fluid inside 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

To avoid transportation damage, protect the shipping package at all times from shocks and impacts.

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

For shut-down and removing the pump from installation see sections 6.5 and 6.6.

The pump must be prepared for storage in a way appropriate to the liquid being pumped. When liquids without toxic additives are being pumped, a brief flush with oil (e.g. Shell GF 68) without differential pressure rise will suffice.

When toxic liquids are being pumped however, the pump must be cleaned in order 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 conserving oil (s.a.). 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 pressure relieve valve (if applicable).

Where curing liquids (e.g. varnish) have been pumped, a complete disassembly and cleaning of the individual parts of the pump will be necessary. Do not use corrosive agents. For cleaning use conventional cleaning products or solvents (see resistance). When reassembling, always use new seals. To ensure that the pump is in good working order for the next use, the pump parts should be treated with a conserving oil before reassembly.

Comply with regulations when handling substances hazardous to health!

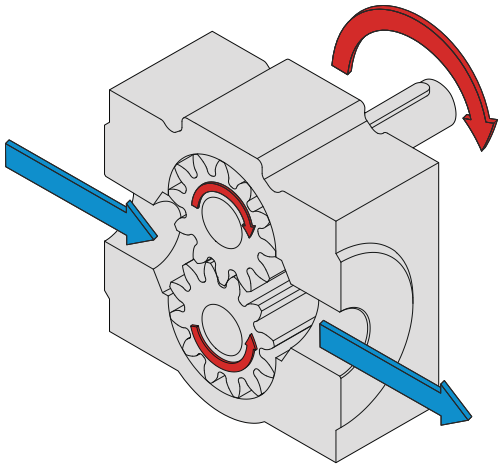
3.5. Factory returns

When sending the pump back to the manufacturer for repair or maintenance, you must fully complete the safety data sheet in section 10 of 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 – Functional principle of the gear pump

4.2. Design of the Pump

4.2.1. Basic Construction

The construction of the pump consisting of two housing parts, casing [2] and cover [3], enables easy quick and economical maintenance and servicing. The casing [2] and the cover [3] are screwed to one another with four or six screws [9]. The exact position is determined by two centering bushes [7]. A seal [15] is mounted between the casing and the cover. The gears pressed onto the shafts [4], [5] are axially and radially mounted in the casing and the cover. Slide bearings are used as shaft bearing in the casing. The drive shaft is sealed to the outwards with one or two rotary shaft seal(s) [14].

4.2.2. Pumping direction / Rotating direction

Each pump size is available as left or right rotating design.

The rotating direction is indicated by the type designation on the name plate:

- ... FA/ZK...– rotates to the right
- ... FAL/ZK – rotates to the left

Looking at the shaft end, the pumping direction is defined as follows:

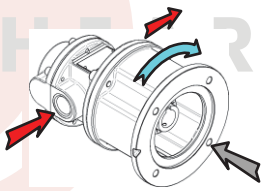
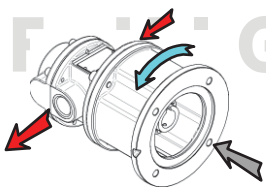
	
right rotating (clockwise), suction side on the left, pressure side on the right, design… FA/ZK..	left rotating (counterclockwise), suction side on the right, pressure side on the left.. design …FAL/ZK…

Figure 4.2 – Pumping directions

The blue arrows indicate the rotation direction. The red arrows indicate the pumping direction.

The pump may not be operated in the opposite direction of the indicated rotating & pumping direction. Following malfunctions can be expected in case of disgegard:

- the pump empties the pipe system and runs dry
- pressure is impinged on the shaft sealing and the pump starts leaking
- The shaft sealing is pushed out of the casing and is then pressed against the coupling. The frictional heat causes intensive heating of the pump.

4.2.3. Rotary shaft seal

The drive shaft is sealed to the outwards with rotary shaft seals. The standard pumps are equipped with a single-acting rotary shaft seal.

For special operating conditions (e.g. suction height > 3m, high media viscosity or inlet pressure up to 0.8 bar), or vertical installation, an improved sealing is necessary, which is either a double lip sealing ring or two rotary shaft seals mounted against one another. In this case, the hollow space between the sealing lips is filled with grease which is suitable for the purpose of use.

A dry run test of the inner rotary shaft seal according to EN ISO 80079-37:2016, chapter 5.3.3, appendix B was not carried out as there was no refillable lubricant. The sealing is constantly lubricated by the medium. Dry run must be avoided (see chapter 5.7.2).

In extreme cases, the outer rotary shaft seal will transfer only 5 Watt into the pump shaft during dry run. This local warming is transferred through the gear into the medium and to the ambient air. This temperature increase is much smaller than the increase caused by the frictional losses in bearings and medium. A critical warming is not to be expected.

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.

Do not install in aggressive atmospheres.

5.2. Electrical drive

The pumps described in this operating manual are delivered without electrical drive. The drive must comply with the IEC mounting type IMB34. Usable motors:

Pump type 41, 42, 51, 52, 76, 77:

- frame size 63, shaft Ø11x 23mm, flange Ø120
- frame size 71, shaft Ø14x 30mm, flange Ø140

Pump type 101, 102, 151, 152:

- frame size 71, shaft Ø14x 30mm, flange Ø140
- frame size 80, shaft Ø19x 40mm, flange Ø160

Pump type 251, 252:

- frame size 71, shaft Ø14x 30mm, flange Ø140
- frame size 80, shaft Ø19x 40mm, flange Ø160
- frame size 90, shaft Ø24x 50mm, flange Ø160

Pump type 351, 352:

- frame size 80, shaft Ø19x 40mm, flange Ø160
- frame size 90, shaft Ø24x 50mm, flange Ø160

Pump type 451, 452, 551, 552:

- frame size 80, shaft Ø19x 40mm, flange Ø160
- frame size 90, shaft Ø24x 50mm, flange Ø160
- frame size 100, shaft Ø28x 60mm, flange Ø160
- frame size 112, shaft Ø28x 60mm, flange Ø160

WARNING

Do not exceed the maximum allowed speed limit and the maximum allowed speed depending on the media viscosity (section 1.3).

Use the grounding terminal of the drive to ground the motor/pump unit.

Carry out the assembly work only if the drive unit is switched off.

WARNING

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

The electrical connection of the motors must be carried out in accordance with the guidelines of the VDE and/or the local power supply company.

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

5.3. Initial installation

First, carry out a visual inspection of the delivered pump for transport damages (see section 3).

Then check by the following points whether the delivered pump type is suitable:

- corrosion behavior of the medium
- viscosity of the medium
- type of medium to be pumped
- pump capacity (flow rate)
- type and design
- direction of rotation or position of suction/pressure sides

- temperature range

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

5.3.1. Mounting the motor to the adaptor pump

The supplied coupling consists of three parts, in accordance with the Directive 2014/34/EU. The pump can be operated in the potentially explosive zones only if connected with the provided coupling. Depending on the type, different couplings can be used, but the coupling part at the pump is already mounted in the correct position. Possible coupling types:

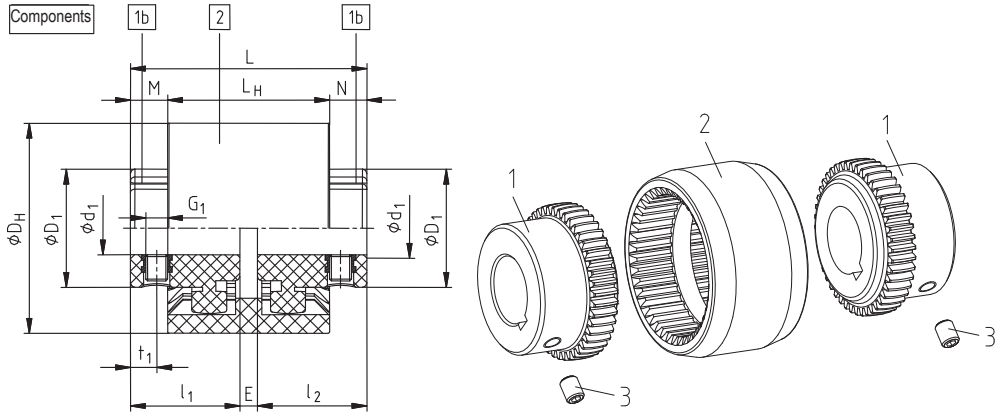


Figure 5.1 - BoWex® junior M coupling (3-piece)

BoWex® Size	finished bores [mm]		set screw thread [mm]			Dimensions [mm]					
	hub Part 1b d_1	d_1	G_1	t_1	T_A [Nm]	D_H	l_1; l_2	E	M; N	L	L_H
14	Ø10	25	M5	6	1.4	40	23	4	6.5	50	37
	Ø12, Ø14	26									
19	Ø16	30	M5	6	1.4	48	25	4	8.5	54	37
24	Ø18	36	M5	6	1.4	52	26	4	7.5	56	41

Table 5.1 – Bowex coupling

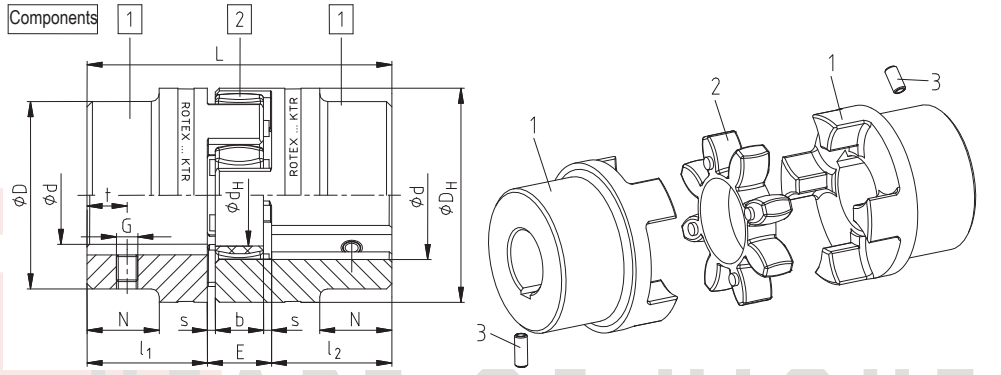


Figure 5.2 - Rotex coupling

ROTEX® Size	Dimensions [mm]										
	finished bore d (min-max)	General								set screw thread	
		L	l_1; l_2	E	b	s	D_H	D_H	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

Table 5.2 – Rotex coupling

Mounting the coupling:

- Slide the hubs onto the drive shaft
- Move the hubs on the drive shaft in axial direction to adjust the E-dimension
- Tighten the set screws (ISO 4029) with knife edge seal to secure the hubs.

During installation, make sure to maintain the E-dimension (see Table 5.1 5.1 and Table 5.25.2), so that the coupling sleeve will remain axially mobile during operation.

Make sure that in axial direction there is enough clearance to the fixed parts of the pump and of the motor, respectively. A minimum distance of 5mm is recommended.

In addition, secure the screws and set screws fixing the hub against self-loosening. For example, use (medium strength) Loctite as adhesive.

During motor installation, no insulating elements may be mounted between the pump support and the motor. The connecting screws between pump and motor must be made of electroconductive material (e.g. steel).

5.3.2. Installation of the complete unit

Observe the ignition protection of the pump as well as the ignition protection of all mounted components. The name plates of the individual components are decisive. It is always the lowest ignition protection of all used components which applies when operating in potentially explosive zones.

WARNING

Screw the pumps / pump units only on to the provided base. The installation location must be even. Level out any unevenness near the mounting points using suitable supports, so that the four support points are on the same level.

It is important that the set rotation direction of the drive generates the desired pumping direction (see chapter 4.2.2). The pump can only be operated in the defined rotating direction. Operation in the wrong rotating direction can cause considerable damage to the pump and to the system and can be dangerous for the operating personnel.

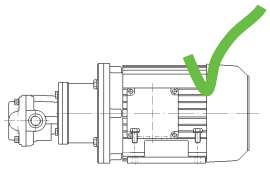
The wrong rotating direction can empty the pump. The resulting dry run is not according to specification and must be avoided in potentially explosive zones at all costs.

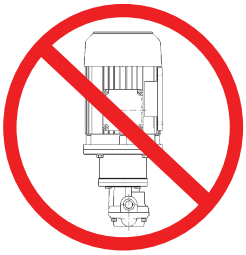
A drop test in accordance with EN ISO 80079-36:2016, section 8.3.2 was not carried out. As far as possible, protect the pump against vibrations and impacts. Strong vibrations or impacts affect the pump's function and the explosion protection.

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

WARNING

Contact the manufacturer before installing the motor pump vertically with the pump head at the bottom. If installed improperly, the shaft sealing may fail prematurely. However, special constructional measures can prevent the shaft sealing from failing prematurely.





5.4. Connecting Pipes

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

WARNING No stress or torque from the connecting pipes may be exerted on the pump and a support of the connecting pipes directly in front of the pump may be necessary. Also, no force caused by the thermal expansion may be exerted on the pump.

The connecting pipes must be of adequate size. They should not be smaller than the nominal size of the pump connections. On the suction side, we recommend using a nominal size bigger than the nominal size of the suction connection of the pump. The standard values for the maximum flow velocities in the pipes are:

	up to 200 mPa·s	up to 600 mPa·s	up to 2000 mPa·s
Suction pipe	1.5m/s	0.5m/s	0.2m/s
Pressure pipe	3.0m/s	1.0m/s	0.5m/s

Table 5.3 - Recommended flow velocities

WARNING To protect the pump from damage caused by impurities, use a 50µ-micron filter in the suction piping. Because of its inner resistance, it must be sufficiently dimensioned, otherwise it affects the suction capability of the pump.

The necessary pipe bendings should have the largest possible radius. Avoid sharp-angled elbows, where possible.

If possible, install the suction pipe either rising or descending all the way to the pump. If it is necessary to install pipes that rise and descend, provide a bleeding device at the highest points of the piping.

WARNING After installing the pipes, check if they are free from deposits, swarf or other impurities, otherwise the pump could be damaged during the start.

Ensure that all pipes, fittings and screw joints are sealed properly, otherwise gas may enter the pump on the suction side. The pump no longer provides suction. The medium may leak on the pressure side. The dry run can cause heating or sparking in the pump.

We recommend installing a foot valve in the suction pipe for suction heights of 3m and more. The valve ensures that no medium flows back through the pump and that the suction pipe is not emptied after switching off the pump.

We recommend installing a non-return valve into the suction pipe directly upstream of the pump to avoid dry run of the pump during standstill and restart. Likewise a short piece of the pipeline directly behind the pump nozzle on the pressure side should be installed with an incline.

Please note that if installed in this way, the inlet and outlet pressure are equal during pump standstill. Please observe the maximum system pressure at the pressure side (see section 1.3).

Noise insulation elements may be necessary for the pipeline.

If the pump is not to be used in potentially explosive zones, it may be helpful to install slide valves upstream and downstream of the pump. This would allow the removal of the pump without emptying the pipe system.

If it is possible that the pump operates against a blocked system, an overflow valve should be mounted directly downstream of the pump on the pressure side. In this case, the return pipe may not be directed straight to the suction side, but must return to the supply tank.

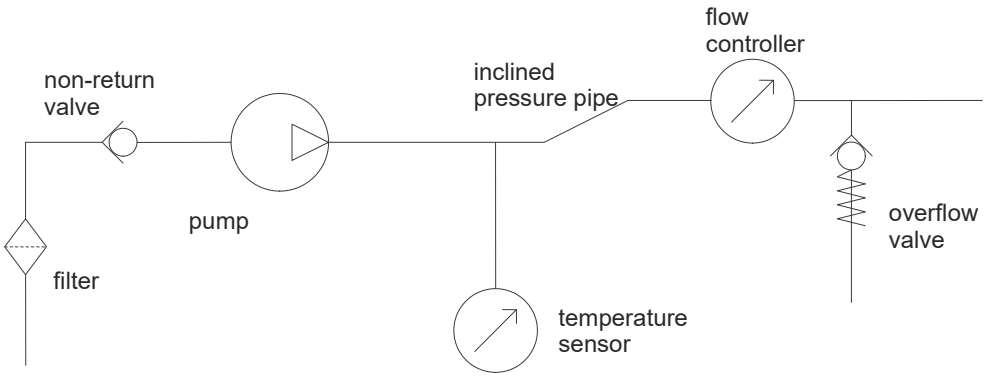


Figure 5.3 – Recommended installation of the pump

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)?
- Are suction and pressure sides connected correctly?
- Does the drive direction of rotation correspond to the rotation direction 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 to avoid contamination of 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 is not allowed. Fill pump and piping before start-up with fluid.

The ignition temperature of the pumped liquid must be at least 50K above the maximum permissible surface temperature according NEC 500.

Open all gate and butterfly valves. The pump must not operate against a closed system.

6.2.1. Restart after dry running

After a short period of dry running (<30 seconds – assuming the pump has taken no damage) make sure the pump has cooled down to a temperature below the allowed surface temperature.

After long periods of dry running (>30 Seconds) a restart is not allowed. Disassemble the pump to check it has taken damage. Replace damaged parts.

Restart is only allowed after deaeration of pump and piping system and reconnection of the grounding.

6.3. Adjustments

Adjustments are not necessary.

6.4. Monitoring

WARNING

For pressure monitoring, we recommend installing a pressure monitoring device on the suction side (depending on the operating conditions – inlet pressure or vacuum) and a pressure measuring device on the pressure side which meets the operating requirements. The pump can be damaged if it is not run according to the operational data defined in section 1.3.

WARNING

The temperatures of the media should be monitored on the pressure side. The pump may start to leak if not run within the specified temperature range of the sealing materials (see section 1.3).

Regularly remove dust from the pump surface, drive and connecting pipes to avoid the formation of an ignition source. The cleaning intervals are determined by the dust accumulation.

Control the running noise of the pump. If grinding sounds are audible, switch the pump off immediately! Check the pump for wear. Grinding metallic parts can cause overheating or sparking.

During operation in Ex zones, at least one of the following three monitoring methods must be used:

Flow Control

Install a flow meter directly upstream of the pump (Figure 5.3). If damaged, the flow meter may not cause any noticeable backflow. Float-type flow meters or flap-type flow meters are preferred. Immediately switch off the gear pump if its output volume drops below 20% of the theoretical flow rate. The theoretical flow rate can be calculated as follows:

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

Q_{theo20}: 20% of the theoretical output volume in l/min

n: drive speed in rpm

v_{gP}: pump-specific displacement volume (see Table 6.16.1)

	displacement volume v_{gP}	Lowest allowable delivery flow e.g. for the following speeds: 730 rpm	970 rpm	1450 rpm
Frame size 41, 42	1.25	0.18 l/min	0.24 l/min	0.36 l/min
Frame size 51, 52	2.07	0.3 l/min	0.4 l/min	0.6 l/min
Frame size 76, 77	2.78	0,4 l/min	0.54 l/min	0.8 l/min
Frame size 101, 102	4.04	0.58 l/min	0.78 l/min	1.2 l/min
Frame size 151, 152	5.71	0.83 l/min	1.1 l/min	1.6 l/min
Frame size 251, 252	10.9	1,6 l/min	2.1 l/min	3.2 l/min
Frame size 351, 352	20.92	3.0 l/min	4.1 l/min	6.1 l/min
Frame size 451, 452	30.7	4.5 l/min	6.0 l/min	8.9 l/min
Frame size 551, 552	48.6	7.1 l/min	9.4 l/min	14.1 l/min

Table 6.1

Surface Temperature Control

During operation in potentially explosive zones, special attention must be paid to the rise of the pump surface temperature. The surface temperature of the pump can be monitored to prevent the surface temperature from rising above a critical level. Because the surface temperature can increase even if the pump is off, it must be switched off at an early stage. The temperature at the pump cover face may not exceed the following values of the specified temperature classes:

temperature range	T1 – T2	T3	T4	T5	T6
max. surface temperature	not allowed*	155°C*	90°C*	55°C	40°C

Media Temperature Control

During operation in potentially explosive zones, special attention must be paid to the heat input into the medium. The media temperature at the pump outlet can be monitored to prevent the surface temperature from rising above a critical level. Because the surface temperature can increase even if the pump is off, it must be switched off at an early stage to prevent the media temperature and, in consequence, the surface temperature from rising above a critical level. If the specified maximum media temperature is exceeded, the pump must be switched off immediately:

temperature range	T1 – T2	T3	T4	T5*	T6*
max. surface temperature	not allowed*	160°C*	100°C*	65°C*	50°C*

* Media temperatures higher than specified can damage the respective sealing materials (see chapter 1.3).

6.5. Decommissioning

Make sure that there is no potentially explosive atmosphere around the pump.

- If possible, reduce the speed of the drive unit to max. 1500 rpm.
- Empty the pump as far as possible by reducing the counterpressure to 0 bar and by opening the suction pipe, so that ambient air can be sucked in (not if system pressure or vacuum are active, or if there are any reacting media).⚠
- Ensure that the dry run time is no longer than 30 seconds.
- If the pumped media are hazardous to health, rinse the pump with suitable cleaning or neutralization solution (do not use media that could cause material corrosion) for several minutes.
- Then the pump should be purged once more with lubricating oil (e.g. Shell GF 68).

Close the stop valves (if available) upstream and downstream of the pump. Only close the stop valves if the pump will be in standstill for a longer period of time (for automatic systems, only if the complete system is taken out of operation).

6.6. Dismounting the Pump from the System

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

Disconnect the electrical connections.

Disconnect the pipe connections.

7. Servicing

7.1. General information

We recommend that repair work is to be carried out by the manufacturer at the factory. 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.

Make sure, that the pump drive is switched off and protect it from accidentally switching on (e.g. by removing the fuse from the power supply).

7.2. Servicing

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.

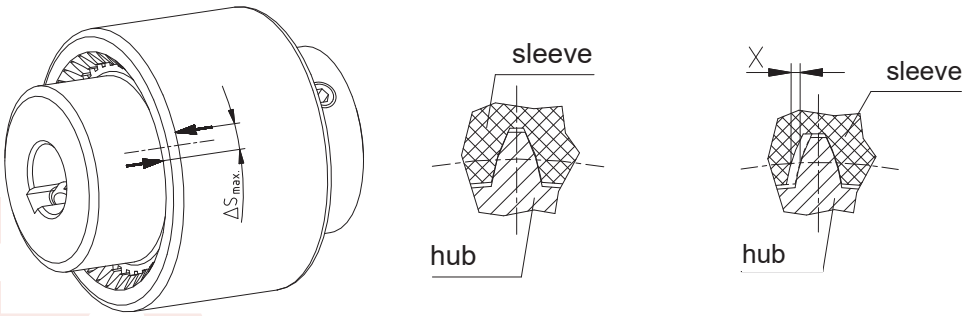
See also Section 3.3 and Section 6.5.

7.3. Coupling

After taking the coupling into operation, the first torsional backlash test and visual inspection of the flexible gear rim of the coupling should be carried out after 2000 operating hours, 3 months at the latest. If during this first check minor or no wear of the gear rim is detected and if the operating parameters stay unchanged, the further inspection intervals should be observed respectively after 4000 operating hours, 12 months at the latest. If during the first inspection major wear is detected, to a point where replacing the gear rim seems appropriate, the cause of the wear should be determined if possible. In this case the maintenance intervals need to be adapted to the changed operating parameters.

7.3.1. BOWEX junior M

The play between hub toothing and plastic toothing needs to be checked via torsional backlash test, with separate tests for drive side and power takeoff side, respectively.



Designation of sleeve and hub | unused sleeve | wearing of the sleeve

Figure 7.1

The abrasion/wear can reach $\mathbf{X_{max.}}$ of the initial tooth size before the plastic sleeves need to be replaced.

BoWex® Size	Wear limits per hub	
	Abrasion $X_{max.}$ [mm]	torsional backlash $\Delta S_{max.}$ [mm]
14	0.8	1.3
19	0,8	1,4
24	1.0	1.5

If the torsional backlash reaches $\mathbf{\Delta S_{max.}}$ replace the plastic sleeve immediately regardless of the inspection intervals.

Drive side

- Turn the hub against the drive's direction of rotation. When doing so, the sleeve may not slide from the wear position in axial direction.
- Apply designation on sleeve and hub (see Figure 7.1 7.1).
- Turn the hub in the drive's direction of rotation and measure the $\Delta S_{max.}$ torsional backlash.
- If the torsional backlash reaches $\Delta S_{max.}$, replace the plastic sleeve.

Power takeoff side

- Turn the hub in the drive's direction of rotation. When doing so, the sleeve may not slide from the wear position in axial direction.
- Apply designation on sleeve and hub (see Figure 7.17.1).
- Turn the hub against the drive's direction of rotation and measure the $\Delta S_{max.}$ torsional backlash.
- If the torsional backlash reaches $\Delta S_{max.}$, replace the plastic sleeve.

Replacing the plastic sleeves is necessary if torsional backlash ≥ $\Delta S_{max.}$ [mm] / abrasion ≥ $X_{max.}$ [mm].

Whether replacement is necessary depends on the operating conditions and given operating parameters.

7.3.2. Rotex Coupling

Whether the backlash is larger than X mm, the flexible gear rim must be replaced.

If replacement is necessary depends on the operating conditions and given operating parameters.

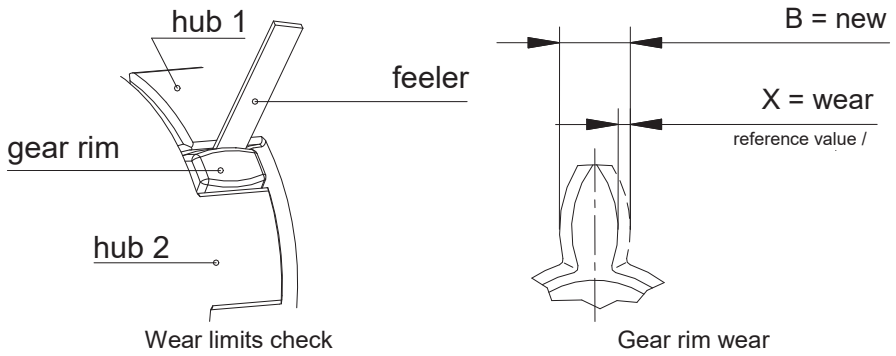


Figure 7.2

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

8. Malfunctions, Causes and Toubleshooting

The pump is not sucking properly

The pump runs dry

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

Pipework with incorrect dimensions

Incorrectly dimensioned pipes can have a negative effect on the pump suction capacity. See notes in section 5.4. - Take the connection pipes into account.

Pressure pipe closed

If a shut-off valve is installed 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 closed

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

Pump worn out

If the pump does not suck under unchanged operating conditions and the suction and pressure pipes are free the pump requires servicing.

Leak in the suction pipe

Ensure that the suction pipe is absolutely gas tight so that the ambient atmosphere cannot be sucked in.

Coupling damaged / worn out

Check the flexible coupling and replace if necessary.

The pump will not build up pressure or the pressure is insufficient

Pipe closed

If shut-off valves are installed in the pipes on pressure or suction side ensure that these are open.

Insufficient viscosity of the media

The efficiency of the pump depends on the viscosity (consistency) of the media. The flow rate can decrease if the viscosity (due to the consistency of the media or too high temperatures) decreases too much.

Coupling damaged / worn out

Check the flexible coupling and replace if necessary.

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 the pump probably requires servicing. Please contact the manufacturer.

Pump is making noises

Grinding noises

If grinding noises are audible it is a sign of wear in the pump. Under no conditions should the pump continue to be operated. Stop the drive immediately. Repair is urgently required.

Cavitation operation

As a result of the combination of inlet pressure, suction height and vapor pressure of the liquid, vapor bubbles develop in the suction area of the pump. These reimplode on the pressure side and cause the increased wearing of the pump. This working point can be avoided by changing the operating conditions.

Coupling wear

Check the wear limits of the flexible coupling according to section 7.3 and replace worn out parts if necessary.

The pump is heating up

Standard operation?

Please check whether this is normal heating caused by the pumped medium. After a short time the pump surface adopts to the temperature of the medium.

Dry run

Do not operate without medium. Even a short dry run

- can damage the pump
- or cause the pump to overheat and can be a potential source of ignition

Stop the pump immediately.

Pump wear

If the flow rate decreases gradually but the pump still builds up pressure it is a sign of wear. Please contact the manufacturer to request repair work.

Liquid leaks out

Medium leaks out at the shaft end

The rotary shaft seal is damaged. Have the pump repaired as soon as possible.

9. Spare Parts

9.1. Spare Part Lists

In case of spare parts order, please state the exact pump designation, serial number and year of manufacture, This information can be seen on the name plate.

Pump sizes 41, 51, 52, 76, 77, 351, 352, 451, 452, 551, 552:

		Qty	material	Remarks
1	name plate	1		
2	pump body	1	cast iron	
3	cover	1	cast iron	
4	drive shaft with gear	1	steel	hardened
5	idler shaft with gear	1	steel	hardened
6	pump adapter	1	cast iron	
7	fixing pin	2	steel	
8	pin	2	steel	
9	hex head cap screw	4	steel	
10	circlip	4	steel	
11	hex head cap screw	6	steel	
13	feather key	1	steel	
14	lip seal ring	1	NBR	alt. Viton, EPDM, PTFE/Graphite
15	O – Ring	1	NBR	alt. Viton, EPDM, PTFE
16	coupling	1		according ATEX II 2G c T4

Table 9.1 – Spare part list

Pump sizes 101, 102, 151, 152, 251, 252

		Anzahl	Werkstoff	Bemerkung
1	name plate	1		
2	pump body	1	cast iron	
3	cover	1	cast iron	
4	drive shaft with gear	1	steel	hardened
5	idler shaft with gear	1	steel	hardened
6	pump adapter	1	cast iron	
7	ring dowel	2	steel	
8	pin	2	steel	
9	hex head cap screw	4	steel	
10	circlip	4	steel	
11	hex head cap screw	6	steel	
12	lock washer	4	steel	
13	feather key	1	steel	
14	lip seal ring	1	NBR	alt. Viton, EPDM, PTFE/Graphite
15	O – Ring	1	NBR	alt. Viton, EPDM, PTFE
16	coupling	1		according ATEX II 2G c T4

Table 9.2 - Spare part list

9.2. Exploded View

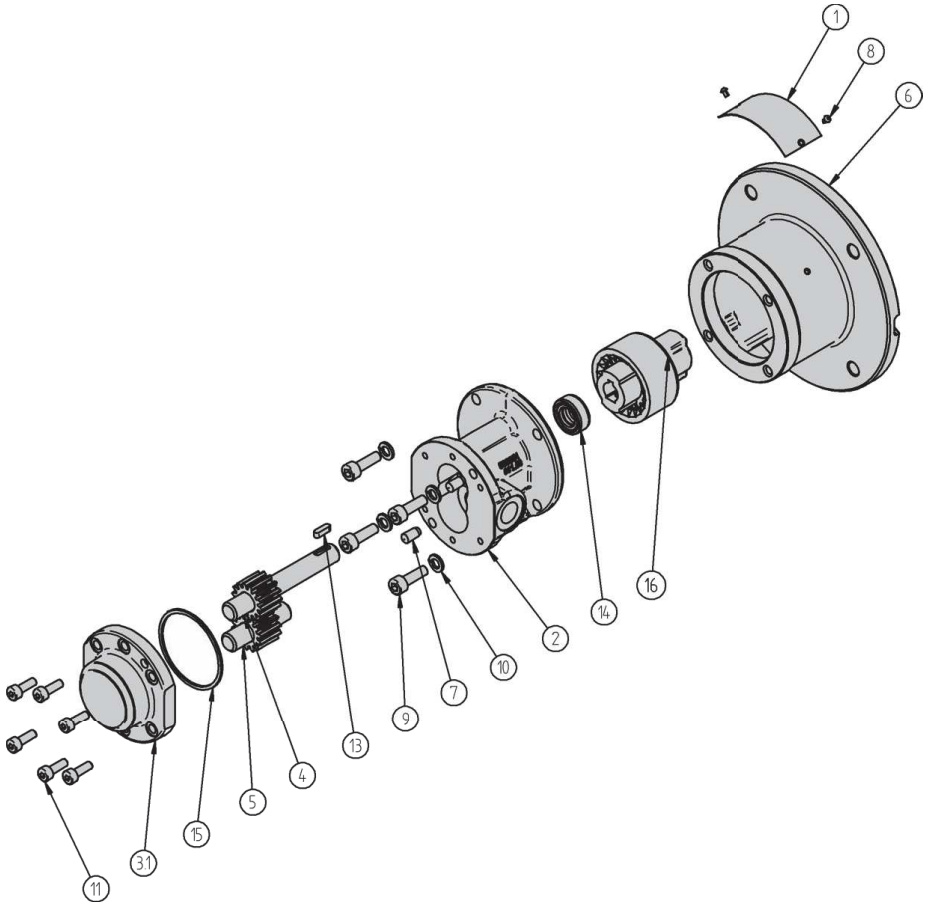


Figure 9.1 - Exploded view of the gear pumps with the frame sizes 41, 51, 52, 76, 77, 351, 352, 451, 452, 551, 552

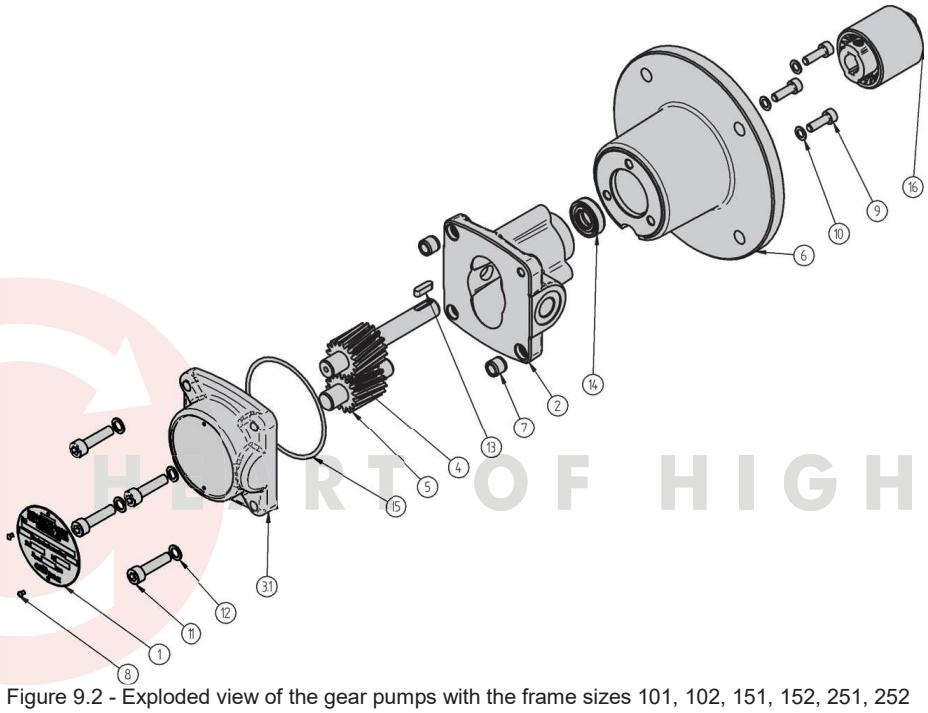


Figure 9.2 - Exploded view of the gear pumps with the frame sizes 101, 102, 151, 152, 251, 252

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)

O have not been used with hazardous liquids
O 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.

O Special safety precautions are not necessary for subsequent handling.
O 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 as per Directive 2014/34/EU

Declaration of Conformity
As per Directive 2014/34/EU (ATEX)

In accordance with the EG Directive 2014/34/EU of February 26, 2014 and with the legal provisions issued for its implementation, the manufacturer declares:

Scherzinger Pumpen GmbH & Co. KG

Bregstraße 23 - 25
78120 Furtwangen / Deutschland

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

Gear Pump

51 FA…/ZK…/EX – 552 FA…/ZK…/EX
51 FA…/M…/EX – 552 FA…/M…/EX

is a device within the meaning of Article 1, (1) a) of Directive 2014/34/EU and complies with the essential health and safety requirements set out in Annex II of Directive 2014/34/EU and the following harmonized directives:

DIN EN ISO 80079-36:2016-12

DIN EN ISO 800079-37:2016-12

DIN EN 1127-1:2019

The pump type mentioned corresponds to the type of protection constructive safety “c”. An ignition hazard assessment is available. The pump bears the Labeling:

CE Ex

II 2G Ex h IIC T6 … T3 Gb X

II 2D Ex h IIIC T85°C … 200°C Db X

In accordance with Article 13, (1) b) ii) of Directive 2014/34/EU, in conjunction with Annex VIII, the technical documentation is deposited with a body notified by the European Commission.

The person responsible for documentation: Matthias Derse Furtwangen, Monday, December 16, 2024

Dipl.-Ing., MBA Matthias Derse
CEO

12. Declaration of Conformity as per Directive 2006/42/EG (Machinery Directive)

Declaration of Conformity
As per Directive 2006/42/EG

In accordance with EC Directive 2006/42/EC, Appendix II A, dated May 17, 2006, the manufacturer declares:

Scherzinger Pumpen GmbH & Co. KG

Bregstraße 23 - 25
78120 Furtwangen / Deutschland

that the product:

Gear Pump

51 FA…/ZK…/EX – 552 FA…/ZK…/EX
51 FA…/M…/EX – 552 FA…/M…/EX

is supplied with an electric drive unit and therefore complies with the provisions of Directive 2006/42/EC, Annex I, No. 1.

The following harmonized standards are applied:

EN ISO 12100:2011
EN ISO 13857:2020
EN ISO 13732-1:2008
EN 809:1998+A1:2009 +
AC:2010EN 60204-1:2019

The following guidelines have been applied:

2006/42/EG Machinery Directive
2014/30/EU Electromagnetic compatibility (EMC Directive)
2014/34/EU Explosion protection directive (ATEX)

National technical standards and specifications applied:

Accident prevention regulations

The person responsible for documentation: Matthias Derse Furtwangen,

Monday, December 16, 2024

Dipl.-Ing., MBA Matthias Derse
CEO

13. CE conformity notes relating to fitting a motor/drive

Information on CE conformity in accordance with 2014/34/EU (ATEX Directive) and 2006/42/EC (Machinery Directive) of pumps/motor units when the motor/drive is fitted by the customer (dealer/operator)

We hereby confirm the CE conformity of our pump unit provided that the following criteria relating to intended use are satisfied as described in the operating instructions:

- The drive delivers sufficient performance and design data in terms of the required delivery volume and pressure
- The motor is only fitted with the appropriate interim flange (motor lantern) provided by Scherzinger and a suitable coupling. These parts must not be reworked.
- The required flange and motor shaft dimension must match the specified motor size
- The motor must have been fitted correctly in accordance with the Scherzinger operating instructions
- Correct use of an explosion-protective drive in terms of the necessary type of ignition, dust and water protection (IP), speed (number of pins) and connected loads. Operation with a frequency converter is only permitted in the scenarios described in the operating instructions.
- Motor conformity in accordance with currently valid CE/Machinery Directives
- Guaranteed grounding

Any reseller or dealer who connects the pump with a motor unit and markets it as a complete unit must meet all the requirements of 2014/34/EU, especially Article 13 (conformity assessment procedure). In such cases, the reseller or dealer then becomes the manufacturer.

The company (operator) which undertakes installation/assembly and starts up the device is responsible for the overall conformity of the pump/motor unit in the sense of German Health and Safety at Work Regulations (BetrSichV).

Furtwangen, January 8, 2018

(Dipl.-Ing., MBA Matthias Derse)
Managing Director

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