INSTALLATION AND OPERATING MANUAL

Translation of the original manual

Series RMI

Sealless Chemical Magnetic Drive Pump

Bearing lubrication: Grease or oil bath

Bearing pedestal group: 1

Keep for future use!

This operating manual must be strictly observed before transport, installation, operation and maintenance

9430-001-en Revision 04 Edition 01/2023

RICHTER
Process Pumps & Valves

List of Contents

Relevant documents

- Data sheet
- Works certificate
- Sectional drawing

  RMI long life grease lubrication 9430-00-3000
  RMI Oil bath lubrication 9430-00-3001
- Installation drawing
- Performance curves
- Spare parts list
- Operating manual and declaration of conformity motor *
- Operating manual and declaration of conformity coupling *
- Supplementary Installation and Operating Manual, „ heating jacket “ 9000B001-en *

* if contained in the scope of delivery

Appendix to the operating manual:

- Operational limits 9430-00-3030
- Declaration of conformity with ATEX
- Declaration of conformity without ATEX
- Form for Safety Information Concerning the Contamination QM 0912-16-2001_en

On request :

- Magnetic drive data Richter TIS 0543-03-0001
- Nozzle forces Richter TIS 0541-02-0006
- Publication: "Centrifugal Pump Operation without NPSH Problems"
- Publication "Safe Operation of Magnetic Drive Pumps“

1 Technical data

Manufacturer :

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Authorised person acc. to machinery directive 2006/42/EG: Gregor Kleining

Designation :

Single-stage, plastic-lined, magnetic drive chemical centrifugal pump, series RMI, long life grease lubrication and oil bath lubrication

Horizontal design, sealless, free of eddy currents

Technical specifications DIN EN ISO 15783 and DIN EN ISO 5199 .

Connecting dimensions to ISO 2858 / DIN EN 22858

Flange connecting dimensions: DIN EN 1092-2, type B (ISO 7005-2, type B) PN 16 and PN 20 (Class 150)

ATEX Directive 2014/34/EU

Machine Directive 2006/42/EC

Materials :

Pressurized parts:
Ductile cast iron ASTM A 1049 / EN-JS 395
Wetted parts:
PFA, PTFE, SSiC
and see data sheet.

Flow rate : up to 120 m^3/h (at 2900 min^{-1})
up to 130 m^3/h (at 3500 min^{-1})

Delivery head : up to 70 m LC (at 2900/min^{-1})
up to 100 m LC (at 3500 min^{-1})

Housing discharge pressure:

max. 16 bar, (12 bar at –10 °C down to –30 °C)
optional 20 bar (16 bar at –10 °C down to –30 °C)

Temperature range : -30 °C to 150 °C

Temperature classes as per ATEX :

see Section 2.6.7.

Admissible ambient conditions for pumps acc. to directive 2014/34/EU (ATEX) :

Ambient temperature range: – 20 °C to + 60 °C

Ambient pressure range: 0,8 bar_{abs} to 1,1 bar_{abs}

Noise capacity level : L_{WA} = ≤ 70 dB
acc. to DIN EN ISO 9614-2

Sizes :

Group 1.1	Group 1.2	Group 1.3
40-25-125	40-25-160	50-32-200
50-32-125	50-32-160	65-40-200
	80-50-160	80-50-200
	80-65-160	

Weight : See data sheet

Dimensions : See installation drawing

1.1 Tightening torques

Screws greased, tighten in diametrically opposite sequence

Housing screws 901/3

Size	No. x size	Tightening torque	
		PN 16	PN 20
[mm]	[DIN/ISO]	[Nm]	
40-25-125	8 x M12	28	33
50-32-125	8 x M12	28	33
40-25-160	8 x M12	40	47
50-32-160	8 x M12	40	47
80-50-160	8 x M12	40	47
80-65-160	8 x M12	40	47
50-32-200	12 x M12	40	47
65-40-200	12 x M12	40	47
80-50-200	12 x M12	40	47

Pipe screws, flanges to DIN/ISO

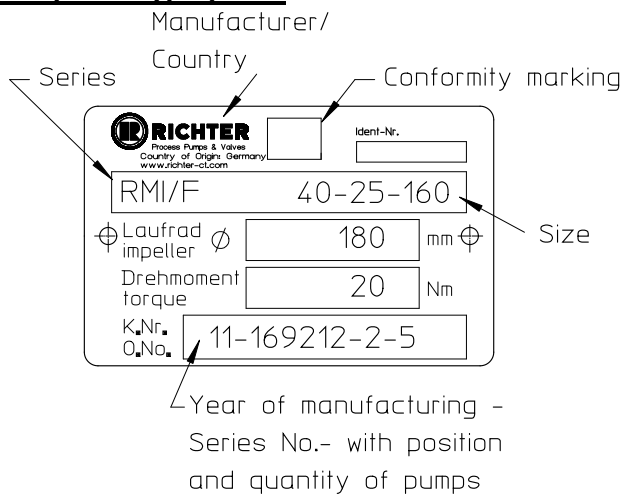
DN	No. x size		Tightening torque	
	PN 16	PN 20	PN 16	PN 20
[mm]	[DIN/ISO]		[Nm]	
25	4 x M12	4 x M14	10	8
32	4 x M16	4 x M14	15	12
40	4 x M16	4 x M14	20	15
50	4 x M16	4 x M16	26	25
65	4 x M16	4 x M16	40	30
80	8 x M16	4 x M16	25	45

1.2 Type plate, dry-running, ATEX and housing markings

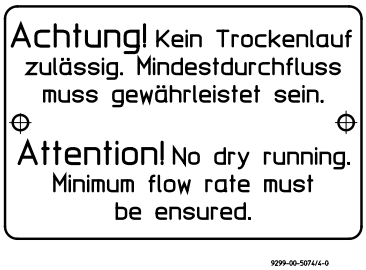
The stainless steel type plate is firmly riveted to the housing:

If the operator attaches his identification, it must be ensured that the pump matches the application in question.

Example of type plate:



Dry-running:



ATEX marking:

Legend:

Ex :	ATEX markings
Equipment group II:	Equipment group for use in potentially explosive dust and gas atmospheres
2/2 GD:	category 2 inside and outside (Zone 1 for gas (G); Zone 21 for dust (D))
X:	Special operating conditions (see operating instructions)
Ex h:	Non-electrical equipment
IIC:	Explosion group IIC for gas
IIIC:	Explosion group IIC for dust
T4… T3:	Temperature range class for gas
T135°C… T200°C:	Temperature range class for dust
Gb:	Equipment protection level (EPL) for gas (Zone 1)
Db:	Equipment protection level (EPL) for dust (Zone 21)

Housing identification:

The following are visible on the housing according to DIN EN 19:

- Flange nom. size
- Rated pressure
- Body material
- Manufacturer's identification
- Melt number/Foundry identification
- Foundry date

1.3 Spare parts

Spare parts for two years of continuous operation in accordance with DIN 24296 and in consultation with the manufacturer.

2 Safety

This operating manual contains fundamental information which is to be observed during installation, operation and maintenance.
It must be read before installation and commissioning!
This operating manual must always be available at the place of use of the machine/plant.
Observe the safety notes in all the chapters.
Installation, operation and maintenance are to be performed by qualified staff.
The area of responsibility, authority and supervision of the staff must be exactly regulated by the customer.
If the staff does not have the necessary expertise, they are to be trained and instructed.
If necessary, this can be provided by the manufacturer/supplier on behalf of the machine operator.

General hazard symbol! People may be put at risk.

Safety symbol! The pump and its function may be put at risk if this safety symbol is not observed.

EU marking! Explosion-protected equipment must be identified for work in potentially explosive areas.

Warning of a magnetic field!

Warning of electric power!

This warning sign must be used if people with a pacemaker are at risk, e.g. from a strong magnetic field.

It is imperative to observe signs attached directly to the pump / unit, e.g.:

- Direction of rotation arrow
- Warning against dry-running
- Type plate

and they are to be kept legible.
Non-observance of the notes on safety may result in the loss of any and all claims for damages.
Non-observance may involve the following hazards:

- Failure of important functions of the machine/plant.
- Failure of electronic equipment and measuring instruments due to magnetic fields.
- Risk to people and their personal property from magnetic fields.
- Risk to people from electric, mechanical and chemical effects.
- Risks to the environment through leaks of hazardous substances.

If the unit is used in potentially explosive areas, special attention is to be paid to the sections identified with "Ex" in this operating manual.

2.1 Intended use

Richter pumps of the series RMI are plastic-lined magnetic drive centrifugal pumps for the leak-free conveyance of aggressive, toxic, pure and inflammable liquids. The pump is equipped with a permanent magnetic synchronous drive.

- Only operate the pump / the unit in a technically perfect condition.
- Only use the pump with the media described in the data sheet.
- Vertical installation of the pumps is only possible with pumps with grease-lubricated rolling bearings. Please consult the manufacturer.

The observance of the specified physical limits is important for perfect functioning and safe operation, especially with regard to explosion protection to prevent potential sources of ignition (see **Section 2.6**):

- Avoid dry running
- Ensure that the pump is commissioned only with the pumped medium and is not operated without.
- For safe pump operation, we recommend a flow rate between 0.3 and 1.1 Q_{opt}. The maximum operating temperature must never be exceeded. See **Section 2.6.7**. In case of doubt, you must consult the manufacturer.
- The manufacturer must be consulted in the event of entrainment of gas >2% as well as solids in order to avoid a lack of lubrication and dry-running.
- The plant NPSH value (NPSHA) should be 0.5 m higher than the NPSH value of the pump (NPSHR). See also **Section 5.4.1.**

Inadmissible modes of operation, even for brief periods, may result in serious damage to the unit.

In connection with explosion protection, potential sources of ignition (overheating, electrostatic and induced charges, mechanical and electric sparks) may result from these inadmissible modes of operation; their occurrence can only be prevented by adhering to the intended use.

Furthermore, reference is made in this connection to the Directive 1999/92/EG („ATEX 137“) which contains the minimum regulations for improving the occupational health and safety of the workers who may be at risk from an explosive atmosphere.

Do not operate the unit above the values specified in the data sheet for the

- fluid
- flow rate
- speed
- density
- Head
- operating temperature and
- motor rating

Observe the instructions contained in the operating manual or contractual documentation; if necessary, consult the manufacturer.

All important features are documented in the data sheet included in the scope of delivery.

In the event of operating conditions other than those described in the data sheet, the following are to be checked again:

- design of the pump
- design of the accessories
- resistance of the materials.

2.2 Notes on safety for the customer / operator

The following must be observed:

- The notes on safety contained in this operating manual,
- the prevailing regulations on accident prevention,
- in-house work, operating and safety regulations of the customer.
- Protect hot, cold or moving machine parts from being touched on site.
- Do not remove any protective facilities when the machine is in operation.
- Exclude any risks from electricity.
- Remove leaks of hazardous media (e.g. explosive, toxic, hot) so that there is no risk to people and the environment. Observe statutory regulations.
- Provide and use protective equipment for the staff.

Caution when using the units in potentially explosive area!

Prevent inadmissible modes of operation.

2.3 Notes on safety for maintenance

- Strictly, work on the pump/unit may only be performed when it is at a standstill.
- The pump housing must have reached ambient temperature.
- The pump housing must be depressurized and drained.
- It is imperative to observe the procedure for stopping the machine described in this operating manual. See also **Section 6.3**.
- Decontaminate pumps which convey media hazardous to health.
- Immediately after completion of the work, re-install all safety and protective facilities or put them into operation again.
- When installed, the magnetic drives do not represent any risk of environmental impact if the notes on safety are observed (see also **Sections 5.1** and **7.5.2**).

It is imperative to observe the notes on safety in **Section 7.5.2** during dismantling and assembly as well as during transport and storage of magnetic drives as single components.

- Observe the points listed in **Section 6.1** prior to recommissioning.

2.4 Conversion work and production of spare parts by the customer

- Conversion of or changes to the machine are only admissible after consultation with the manufacturer.
- Only use original spare parts or parts approved by the manufacturer.
- The use of other parts may annul the liability for any resultant consequences.

2.5 Improper operation

- The operational safety of the machine supplied is only guaranteed if it is used properly in accordance with **Section 2.1** of this operating manual.
- The operating limits specified in the data sheet must under no circumstances be exceeded.

2.6 Special requirements for explosion protection

If the units are used in potentially explosive areas, the measures and notes in **Sections 2.6.1 to 2.6.9** are imperative to guarantee the explosion protection.

2.6.1 Filling the unit

During pump operation the wetted interior of the pump must always be filled with the liquid medium.

This prevents any explosive atmosphere and the risk of dry-running.

If the customer cannot ensure this, we recommend that appropriate monitoring facilities be provided.

All auxiliary, heating and cooling systems must also be carefully filled.

2.6.2 Special operating conditions

In the standard design the can chamber and the plain bearings are cooled and lubricated by a flushing flow.

Owing to properties of the medium (e.g. sticking due to inadmissible solids entrainment, clogging, gas entrainment etc.) the cooling flow can be interrupted and, as a result, an inadmissible temperature rise may occur. Provide appropriate monitoring facilities. See **Section 5.6**.

For safe pump operation, we recommend a flow rate of 0.3 to 1.1 Q_{opt}. If the pump is operated outside this range, it must be ensured that the max. admissible flow rate according to the pump characteristic curve is not exceeded and that the max. admissible operating temperature according to **Section 2.6.7** is observed.

If the flow rate is too high, the differential pressure upstream and downstream of the plain bearings could fall so much that a lack of lubrication or dry-running may occur.

If the flow rate is too low, the medium may heat up so much owing to the fluid friction that the max. admissible surface temperature of the relevant temperature class is exceeded.

Overloading, overheating, non-observance of the design data or the incorrect selection of the magnetic drive can lead to the decoupling of the inner and outer magnet assemblies. As a result, eddy currents may be induced on the inner and outer magnet assemblies and an inadmissible temperature rise may occur.

The situation is to be remedied by providing appropriate monitoring facilities. See **Section 5.6**.

The plant NPSH value (NPSHA) should be minimum 0.5 m higher than the NPSH value of the pump (NPSHR) to prevent a lack of lubrication or dry-running of the plain bearings.

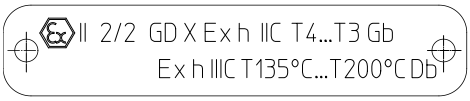
2.6.3 Chargeable liquids

For operation with chargeable liquids with a conductivity < 10^{-8} S/m inert gas must be used for flushing during drain. See also **Section 6.3**.

2.6.4 Identification

The ex identification on the pump relates to the pump section. A separate declaration of conformity must be provided for the shaft coupling and motor and for other attachments as well as corresponding identification.

Example of the identification of the pump section:



For assembling the pump with components which are not explosion-protected (e.g. motor, shaft coupling), it is recommended to mask or remove the "potentially explosive" identification from the pump component and, if necessary, from other accessories.

In this case the declaration of conformity applies without ATEX identification.

For surface temperatures that mainly depend on the operating conditions of the pump, DIN EN ISO 80079-36 Chapter 11.2 f) and g) state that no temperature class or temperature may be specified. In this case, the identification must include temperature range identification (e.g. T4 ... T3 for gas or for dust D135 ° C ... T200 ° C).
The temperature class must be determined by the operator in accordance with **Section 2.6.7** “Temperature Limits”.

2.6.5 Check of the direction of rotation

If there is also a risk of explosion during the installation phase, the check of the direction of rotation must under no circumstances be conducted by briefly switching on the unfilled pump in order to prevent an inadmissible rise in temperature at the plain bearings.

We recommend you to only perform a check of the direction of rotation with the coupling disengaged or with a rotating field instrument. See also **Section 6.1.2.**

2.6.6 Mode of operation of the pump

The pump may only be started with the suction side shut-off element fully opened and the discharge side shut-off element slightly opened. Start-up against a closed check valve is also possible. The discharge side shut-off element is to be regulated to the operating design point directly after run-up.

See also **Section 5.4.1.**

Operation with closed shut-off elements in the suction and/or discharge lines is not permitted!

There is a risk that even after a short time high surface temperatures on the pump housing may occur owing to rapid heating of the liquid in the pump interior.

A rapid rise in the pressure inside the pump involves the risk of overloading to the point of bursting.

The pump must not be in operation in the unfilled or partially filled state (dry running). This results in serious damage to the pump and additional risks to the environment can arise.

Dry-running cannot only occur with an insufficiently filled interior but also in the event of high gas contents in the liquid medium.

Operation of the pump outside the admissible operating range may also lead to dry-running (e.g. due to evaporation in the interior).

2.6.7 Temperature limits

In the normal operating condition the highest temperatures are to be expected at the contact point shaft seal/shaft, on the inner races of the rolling bearings and, at high medium temperatures, on surface of the pump housing.

In the case of media >40° C the surface temperature of the pump housing is generally lower than the temperature of the medium as the plastic lining acts as insulation.

If the pump is heated (e.g. heating jacket), it must be ensured that the temperature classes prescribed in the annex are observed.

The not heated pump surface must have free contact with the environment.

When operating the pump, make sure that an excessive deposit of dust is avoided (possibly regular cleaning). This prevents the pump surface from heating to above the admissible temperature.

Following table below indicates the admissible medium temperature, depending on the pump design, as a function of the temperature class in accordance with DIN EN ISO 80079-36.

Temperature class as per DIN EN ISO 80079-36		Limit value of the pumped liquid temperature
		PFA
T4	135 °C	**125 °C** [1) 2)]
T3	200 °C	**150 °C**

1) Grease lubrication : no restriction.
Oil bath lubrication:
standard design with shaft seal **T3**
labyrinth seal (special design) **T4**
2) The limit values specified for the temperature of the medium at the pump inlet are determined for the most unfavourable case (high speed, low flow, low heat capacity of the medium, large magnetic drive ....). Under favourable operating conditions the limit values specified may be increased by up to 5 K after consultation with the manufacturer.

The plant customer must ensure that the prescribed operating temperature is observed. The maximum admissible temperature of the liquid medium at the pump inlet depends on the temperature class and the selected lining material required in each case.

2.6.8 Maintenance

To achieve safe and reliable operation, it must be ensured in inspections at regular intervals that the unit is properly serviced and kept in technically perfect order.

Example: Functioning of the rolling bearings. The mode of operation and operating conditions largely determine the actual service life that can be attained.

Regular checks of the bearing pedestal area can prevent excessive temperatures due to hot-running rolling bearings, collision of the drive magnet assembly against the lantern or even defective bearing seals. See also **Section 7.2**.

In regard to media containing solids, the maintenance intervals must be set by the operator in accordance with the conditions of operation.

If auxiliary systems (e.g. external flushing, cooling, heating) are installed, a check must be made to see whether monitoring facilities are required to safeguard their operation.

2.6.9 Electric peripheral equipment

Electric peripheral equipment, e.g. pressure, temperature and flow sensors etc. must comply with the prevailing safety requirements and explosion protection provisions.

3 Transport, storage and disposal

The pump or the unit must be transported properly. It must be ensured that during transport the pump/unit remains in the horizontal position and does not slip out of the transport suspension points.

A pump or motor can be suspended from the ring bolt provided for this purpose.

The suspension points are not suitable for transporting a complete unit, i.e. pump with base plate and motor.

In this case, the slinging points for the ropes on the base plate are to be used. See **Fig. 1.**

The slinging ropes must not be attached to free shaft ends or to the ring bolt of the motor.

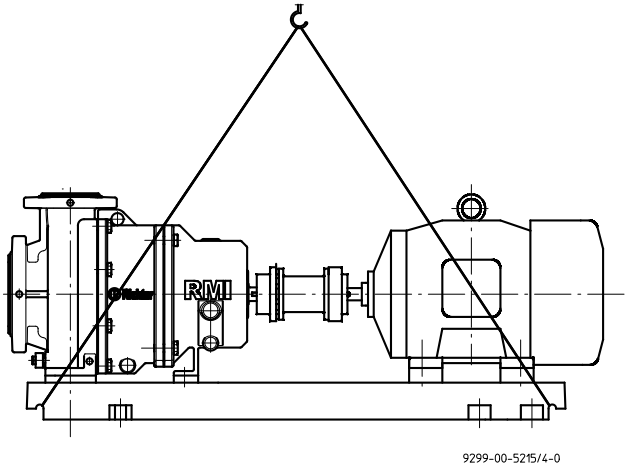


Fig. 1

Directly after receipt of the goods, check the consignment for completeness and any in-transit damage.

Damaged pumps must not be installed in the plant.

When unpacking magnetic drives as single parts, the relevant notes in **Section 7.5.2** must be observed.

Handle goods carefully to prevent damage.

Flange covers serve as protection during transport and must not be removed.

If the unit is not installed immediately after delivery, store them properly.

The pumps be stored in a dry, vibration-free and well-ventilated room at as constant a temperature as possible.

Protect elastomers against UV light.

Generally, a storage period of 10 years do not exceeded. An admissible storage period of 4 years applies to elastomers made of NBR.

If magnetic drives are stored as single parts, the relevant notes in **Section 7.5.2** are to be observed.

In the case of prolonged storage conservation agents on machined component surfaces and packing with a desiccant may be necessary.

3.1 Return consignments

Pumps which have conveyed aggressive or toxic media must be well flushed and cleaned before being returned to the manufacturer's works.

It is imperative to enclose a **safety information sheet / general safety certificate** on the field of application with the return consignment.

Pre-printed forms are enclosed with the installation and operating manual.

Safety precautions and decontamination methods are to be mentioned.

3.2 Disposal

Parts of the pump may be contaminated with medium which is detrimental to health and the environment and therefore cleaning is not sufficient.

Risk of personal injury or damage to the environment due to the medium or oil!

- Wear protective clothing when work is performed on the pump.
- Prior to the disposal of the pump:
  - Collect any medium, oil etc. which has escaped and dispose of it in accordance with the local regulations.
  - Neutralise any medium residues in the pump.
- Separate pump materials (plastics, metals etc.) and dispose of them in accordance with the local regulations.

4 Product description

The housing dimensions, nominal ratings and technical requirements of the pump series RMI correspond to ISO 2858 / DIN EN 22858 / ISO 15783 / DIN ISO 5199. The technical requirements of the VDMA 24279 are satisfied

The sectional drawing shows the design of the pump. See **Section 9**.

All components which come into contact with the medium are either plastic-lined or made of other resistant materials, e.g. silicon carbide.

The housing **100** consists of a metallic shell with a plastic lining.

The shaft spider **338** is pressed into the housing and secured with the anti-torsion inserts **566/1**.

The two bearing bushes **545** are pressed in from the bearing pedestal side and secured with the anti-torsion insert **566/2**.

The distance ring **504/1** is inserted in-between.

The can **159** is made of high-resistance CFK (carbon fibre composite material). It is protected against the corrosive medium by a can insert **158** made of PTFE.

The thrust ring **510/3** is pressed in and locked with the shaft **222** in a form-locking manner against twisting. The shaft **222** is positively mounted in the can insert **158**.

The impeller **230** and the inner magnet assembly **859** are separable and thus can be exchanged independently of one another. Both components are positively connected to one another for force transmission.

The static tightness of the pump is guaranteed by the screw fittings of the bracket **344** and housing **100**. The sealing collar of the wear ring seal **502/1** and the rims of the can unit are clamped between the two components with the required sealing force.

Long life grease lubrication

The bearing pedestal **330** contains grease-lubricated radial ball bearings **321/1** and **321/2**. They are sealed on both sides.

The wavy spring washer **953/1** puts the radial ball bearings **321** under axial pre-load.

Oil bath lubrication:

The bearing pedestal **330** contains radial ball bearings **321/1**, **321/2** which are lubricated by an oil bath.

The wavy spring washer **953/1** puts the radial ball bearings **321** under axial pre-load.

This oil bath is sealed by means of the shaft seals **421/1**, **421/2** and the cover gasket **403**.

The torque is transmitted from the drive shaft **213** through the keys **940/1** to the drive magnet assembly **858**.

This is axially secured with the hex. socket screw **914/1** and the toothed lock washer **936/1**. The magnets are glued in the drive magnet assembly.

In the case of a leakage of the can unit, the closed lamella construction provides a temporary additional protection against media leakage into the atmosphere.

The drain hole in the lantern is closed with the plug **903/5**.

The flushing flow is guided on the outside past the impeller assembly into the can. The flushing flow returns to the housing through flushing bores in the impeller assembly and through the plain bearings.

Further design details are provided in the enclosed drawing. Additional information are provided in the brochure and the product manual.

5 Installation

5.1 Safety regulations

Equipment which is operated in potentially explosive areas must satisfy the explosion protection regulations.

People with a pacemaker are at risk from the strong magnetic field of the magnetic drive. It may be life-threatening for them to stay at a distance of less than 500 mm to the pump.

5.2 Installation of pump/unit

The structural work must be prepared in accordance with the dimensions in the installation drawing.

Method of installation: on a grouted base plate and firm foundation

- Align base plate on the ground foundation.
- Insert foundation bolts and grout base plate.
- Do not tighten the foundation bolts uniformly and firmly until the mortar has set.

Other possibilities of installing the pump are:

- 4-point installation
- 4-point installation with base plate.

As soon as additional installations are mounted, the stability of the entire unit installed without a foundation must be checked.

5.3 Alignment of pump-coupling-motor

The following information is of a general nature. If necessary, special notes of the coupling and motor manufacturer are to be observed.

After attachment of the base plate on the foundation and connection of the pipes, the alignment of the coupling must be carefully checked and, if necessary, the unit re-aligned with the motor.

- A coupling check and possible re-alignment is also necessary if the pump and motor are supplied on a common base plate and aligned.
- Prior to alignment undo the support bracket 183 and then tighten it without stress.
- The pump is to be aligned in all directions using a spirit level (on shaft/discharge nozzle) (admissible position deviation max. 0.2 mm/m).
- A distance depending on the coupling used is to be observed between the pump and motor shafts. See installation drawing.
- Use supports in the direct vicinity of the bolts foundation/base plate.

Ensure that the unit cannot be started during work without the coupling guard.

5.4 Piping

Before the pump is installed, both, the suction and supply lines as well as the discharge line are to be cleaned.

Dirt or damage to the sealing surfaces is best avoided if the flange covers remain on the flanges until just before installation.

Use flange gaskets suitable for the medium.

The screw tightening torques in **Section 1.1** are to be observed for tightening the flange screws.

5.4.1 Nominal size

The operating design point of a centrifugal pump lies at the intersection of the pump curve and the pipe curve, see **Fig. 2**. The pump curve is provided by the pump manufacturer. The pipe curve is determined using diagrams or PC programs.

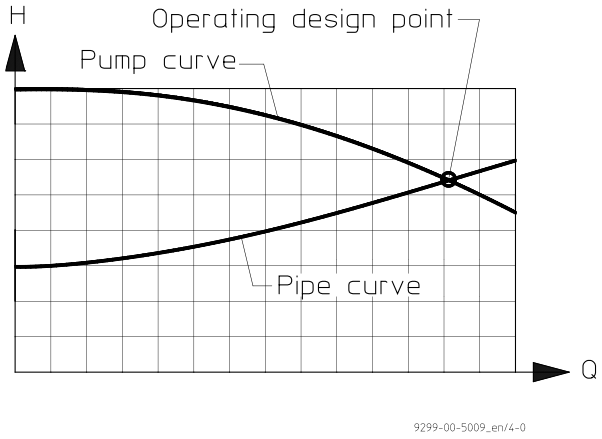


Fig. 2

Under no circumstances can the nominal size of the piping be derived from the connected nominal size of the pump.

The pipe nominal size can also be determined using the flow rate as a rough guide.

$$v\ (m/s) = \frac{Q\ (m^3/s)}{A\ (m^2)}$$

The velocity in the suction line should not exceed 2 m/s and 5 m/s in the discharge line.

When determining the suction line nominal size, the NPSH value (net positive suction head) must also be observed. The **NPSHR** value required for the pump is specified in the data sheet.

The NPSHA value available in the plant should be at least 0.5 m higher than the NPSHR value required for the pump. Otherwise, this will lead to a drop in the delivery head, cavitation or even failure of the pump.

5.4.2 Nozzle loads

The pump can be subjected to nozzle loads acc. to DIN EN ISO 5199. See also TIS 0541-02-0006.

Changes in the length of the piping caused by temperature are to be allowed for by appropriate measures, e.g. the installation of expansion joints.

5.4.3 Suction line

The suction lines must always be laid on a rising gradient towards the pump. Otherwise, gas bubbles may form which considerably reduce the suction line cross section. Eccentric transition elements must be installed between different pipe diameters.

Valves which disrupt the course of flow should not be installed directly upstream of the pump.

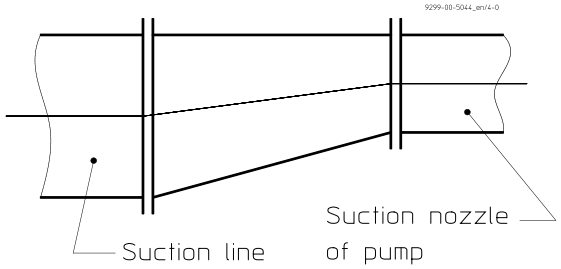


Fig. 3

5.4.4 Supply lines

Supply lines should vent towards the reservoir and are therefore to be laid with a constant downward gradient towards the pump.

Should the piping internals upstream of the pump be horizontal, a low point can, of course, be located upstream of these internals.

From here the pipe is then laid with an upward gradient to the pump so that the gas bubbles which form here can escape through the pump.

Valves which disrupt the course of flow should not be installed directly upstream of the pump.

5.4.5 Discharge line

Do not arrange the shut-off valve directly above the pump but initially provide a transition section.

The discharge nozzle velocity of the medium can – if necessary – be reduced.

5.4.6 Venting and evacuating

Venting can take place into the discharge line or upstream of the discharge valve.

A venting line can also be used as a bypass, drain or flushing line.

The pump housing is fitted with a drain connection as a standard feature. Optionally, the drain bore can be drilled.

See **Fig. 4.**

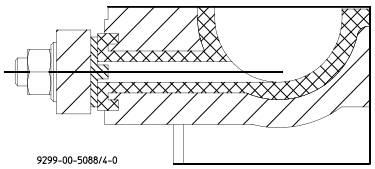


Fig. 4

5.5 Pipe fittings

The following pipe fittings are available from Richter on request:

- Shut-off valves
- Check valves
- Sight glasses
- Priming vessels
- Strainers
- Pressure gauges

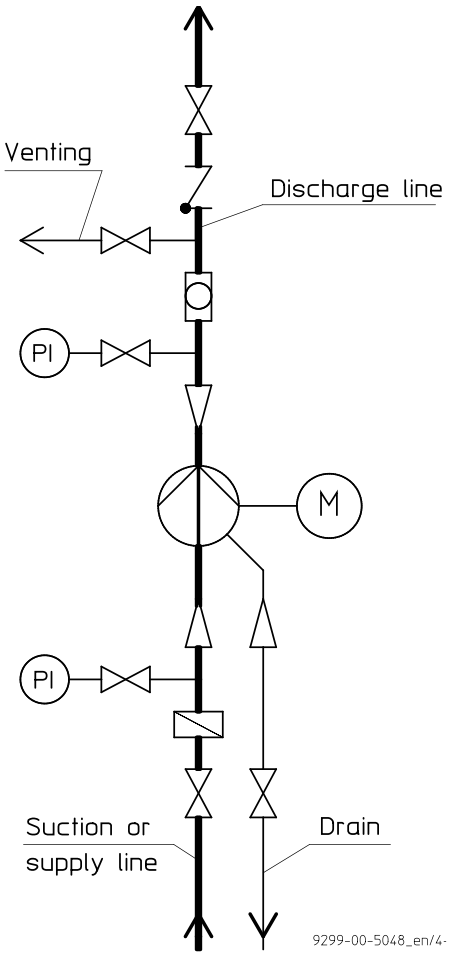


Fig. 5

5.6 Monitoring facilities

Appropriate monitoring facilities are to be recommended, depending on the requirements placed on operational safety and availability of the unit.

Richter provides information on request and can supply:

- Flow meters
- Filling level indicators
- Motor load monitors

You can obtain the publications "Safe Operation of Magnetic Drive Pumps" and "The Operation of Centrifugal Pumps without NPSH Problems" on request.

5.7 Drive

The power consumption of the pump at the operating design point is specified in the data sheet and works certificate. If the operating design point was not known when the pump was dispatched, the power consumption can be read off the appropriate performance curves. The max. density, the max. viscosity and a safety margin are to be allowed for.

Care must be taken when selecting the motor size to ensure that the excess power is not too great but that the requirements acc. to DIN EN ISO 5199 are satisfied. During start-up the magnetic drive could otherwise stop.

The magnetic drive rating at the pump speed is given in the pump data sheet.

If the motor rating exceeds this magnetic drive rating – at pump speed -, it is necessary to check for any stoppage of the magnetic drive.

This also applies if the required drive rating exceeds 80% of the magnetic drive rating – at pump speed.

Consult Richter if necessary.

Different operating data can be achieved without changing the pump through the use of different speeds, e.g. by means of a frequency converter.

The pump with base plate and motor is illustrated in the installation drawing.

The operating manual of the motor manufacturer must be observed.

A motor with a valid ATEX certificate is to be used if employed in zone 1 and 2.

5.8 Coupling

If one coupling half engages with the other, the claw section is normally to be mounted on the drive shaft and the coupling half with the smooth end face on the motor shaft.

Observe the operating manual of the coupling manufacturer.

A coupling with a valid ATEX certificate is to be used if deployed in zone 1 and 2.

Regulations exist, e.g. for the following details:

- Arrangement of the coupling halves
- Max. bore diameter
- Max. transmitted power
- Spacing of the coupling halves
- Maximum values for offset and
- angular misalignment.

Should the pump housing and motor remain on the base plate for repair work, a spacer type coupling is required.

5.9 Final check

Check the alignment of the coupling again in accordance with **Section 5.3**. It must be possible to easily turn the unit at the coupling by hand.

5.10 Coupling guard

The pump may only be operated with a coupling guard in accordance with the accident prevention regulations.

It should be ensured that the coupling protection used either consists of non-sparking material or fulfills the impact resistance test required by DIN EN ISO 80079-36 without any problem.

Richter offers both versions.

The operator must ensure that, after the coupling protection has been mounted, the requirements of the machine guideline are fulfilled.

5.11 Electric connection

The operator is obligated to connect the assembly in accordance with existing regulations (IEC, VDE, etc.).

Only have the electric connection performed by a qualified electrician.

Compare the available mains voltage with the information on the type plate of the motor and select a suitable circuit.

A motor protection device (motor-circuit switch) is urgently recommended.

Danger of explosion if the electrical installation is incorrect.

In potentially explosive areas IEC 60079-14 must also be observed for the electrical installation.

If the pump is mounted on a base plate, ensuring electrical conduction through the use of a chopper disk or contact disk on the housing foot and support bracket.

The assembly must be grounded in accordance with currently effective regulations, for example, on the base plate.

6 Commissioning / Shutdown

6.1 Initial commissioning

Normally, the pumps have already been test-run with water.

Unless special agreements have been reached, there may still be some residual amounts of water in the pump. This must be noted in view of a possible reaction with the medium.

Long life grease lubrication

The rolling bearings are greased for life. Regreasing is not possible and not necessary.

For service lives, see **Section 7.2**.

Oil bath lubrication:

Pour in oil into the bearing pedestal!

For procedure and the oil grade, see **Sections 7.2 and 7.8.5**.

6.1.1 Filling the pump housing

- Check to see whether the screws on the suction flange, discharge flange, housing flange and drain flange are tightened. When retightening the housing screws, make sure that the support bracket is undone. Otherwise, the pump could be deformed.

  For screw tightening torques see **Section 1.1**.
- Open the suction line fully so that the medium can flow into the pump.
- Open the discharge valve so that the air in the pump can escape.
- If air cannot be vented into the discharge line, e.g. a drop in pressure in this line is not permitted, venting must be performed upstream of the discharge valve.
- Monitor the venting operation until no air but only liquid emerges.
- Turn the pump shaft at the coupling several times.
- Monitor the venting operation again until no more air emerges.
- Close the discharge valve again until only the minimum flow rate is obtained after the motor has been started.

6.1.2 Start-up

- Check to see whether the pump shaft can be readily turned by hand.
- Check the direction of rotation of the motor with the coupling disengaged or with a rotary field instrument.
- As viewed from the motor, the direction of rotation of the pump is clockwise. See also the **direction of rotation arrow** of the pump.

The pump must not run dry during the check of the direction of rotation.

- Check alignment of the coupling.
- Mount coupling guard.

The pump must be completely filled with liquid.

The maximum admissible flow rate must not be exceeded.

Otherwise the plain bearings can run dry in both cases.

- Switch the motor on.
- Set the desired flow by opening the discharge valve.

When the motor is running but the pump is not conveying, this means that the magnetic drive has stopped.

- Switch motor off immediately in order to prevent overheating of the magnet assemblies.

Then proceeded as follows:

- Close discharge valve down to the position "minimum flow rate"
- Start motor again.

If the magnetic drive stops again, look for the cause.

6.2 Operating limits

The operating limits of the pump/unit in terms of pressure, temperature, power and speed are entered in the data sheet and it is imperative to observe them!

6.2.1 Abrasive media

If liquids with abrasive constituents are conveyed, increased wear at the pump is to be expected. The inspection intervals are to be reduced compared with the usual times.

6.2.2 Min./max. flow rate

The operating range generally recommended lies at 0.3 Q_{opt} to 1.1 Q_{opt}. Consult the manufacturer for operation outside this range and observe **Section 2.6.2**.

6.3 Shutdown

- Close discharge valve down to the position "minimum flow rate"
- Switch motor off.
- Close discharge valve completely.

Only close the suction line if the pump is to be evacuated or dismantled.

For all work on the machine, make sure that the motor cannot be inadvertently switched on.

If the pump is to be evacuated or flushed, observe the local regulations.

If the pump has been operated with a chargeable liquid, it must be filled with inert gas (e.g. nitrogen) to prevent an explosive atmosphere.

It is recommended to wait one hour before the pump is dismantled from the plant to permit static peak charges to be eliminated.

If the pump is returned to the manufacturer's, clean the pump very thoroughly.

See also **Section 3.1**.

6.4 Restarting

When the pump is restarted, it must be ensured that all the relative steps as described in **Section 6.1** are repeated, depending on the progress of the shutdown operation.

6.5 Improper operations and their consequences (examples)

Inadmissible modes of operation, even for brief periods, may result in serious damage to the unit.

In connection with explosion protection, potential sources of ignition (overheating, electrostatic and induced charges, mechanical and electric sparks) may result from these inadmissible modes of operation; their occurrence can only be prevented by adhering to the intended use.

Operation with magnetic drive stopped:

- If no heat is dissipated, damage to the impeller and drive magnet assembly may occur.Pump is started up without medium :
- The plain bearings in the pump may be destroyed.
- Other pump components may be destroyed due to overheating.

Suction line not opened or not opened fully :

- Pump is cavitating – material damage to pump and plain bearings
- Pump does not attain the required delivery head or flow rate.
- Pump may be destroyed due to overheating.

Discharge valve closed too much :

- Pump may be destroyed due to overheating.
- Axial thrust too great.

Discharge valve opened too much :

- Pump can cavitate. Particularly severe with an empty discharge line.
- Risk of pressure surge.
- Possible damage to the plain bearings.
- Magnetic drive may stop.
- Motor may be overloaded.

Suction valve and discharge valve closed :

- Destruction due to rapid overheating and sharp rise in pressure.

Control of the pump with the suction valve :

- Cavitation – the volume may only be regulated on the discharge side.

Overrun of the admissible gas content:

- The flow may stop.
- Switch pump and vent off for renewed conveyance.
- Make sure that the gas content is not exceeded, as described in the intended use.

7 Maintenance

7.1 Safety related screw connections

After initial loading by the operating pressure and operating temperature the tightening torques of all connection screws must be checked at the following points:

- housing flange
- suction flange
- discharge flange
- draining flange

See also **Section 6.1.1, para. 1**.

Other inspections are to be performed regularly, depending on the operating requirements.

7.2 Bearing pedestal

The temperature of the bearing pedestal is not to exceed more than 70 °C and under no circumstances 80 °C.

At higher temperatures, call in qualified staff without delay. If this is not possible, the pump must be shut down and taken out of service.

In many cases a vibration measurement is recommended to detect bearing wear in good time.

7.2.1 Long life grease lubrication

Grease fill bearings of the series 2RS are installed as standard features. The grease is lithium-saponified. The admissible temperature range is – 30 °C to + 110 °C.

The rolling bearings are designed for an L10 service life of >17,500 hours. **The service life of the grease filling guaranteed by the bearing manufacturers is given in the following table.**

Size	Bearing size > Service life
Group 1.1	6207-2RS / 17,500 hr*
Group 1.2	6207-2RS / 17,500 hr*
Group 1.3	6210-2RS / 17,500 hr*

* at bearing temperature < 50 °C,

at bearing temperature 70 °C approx. 10,000 hr

If the pump is serviced, it is recommended to also replace the bearings as a precaution.

In potentially explosive works it is advisable to monitor the condition of the rolling bearings

7.2.2 Oil bath lubrication

With an expected bearing temperature of about 70°C we recommend a mineral oil with the following characteristics:

Viscosity index : approx. 85

Kinematic viscosity at 40°C :

ca. 40 $\frac{mm^2}{s}$

A fully synthetic gear oil to ISO VG 220 is to be used for temperatures below – 20 °C.

Replacing the bearings: The ball bearings are designed for an L10 service life of >17,500 hours.

We recommend 17.500 working hours respectively every 3 years a change of bearing should be made.

Oil changes: 1x per year at bearing temperatures of about 50 °C.

Every 6 months at bearing temperatures of about 70 °C.

At higher temperatures more frequently in accordance with the regulations.

When the pump is serviced, it is recommended to replace the bearings and shaft seals as a precaution and to pour in fresh oil.

Oil level check: The oil level is to be regularly checked on the constant level oiler **638/1** to ensure safe operation.

It must be ensured that there is always oil in the constant level oiler; it must under no circumstances be completely drained.

A pump with oil sight glass has to have at least as much oil in the pump, that the oil level in the sight glass is visible.

In potentially explosive works it is advisable to monitor the condition of the rolling bearings

If there is a suspicion that splash water could have entered the bearing pedestal, the oil must be replaced immediately. Even small amounts of water in the oil reduce the service life of the rolling bearings to a fraction of the normal service life.

7.3 Cleaning

Care must be taken when cleaning the pump to ensure that it is not exposed to a strong water jet.

The ingress of water into the bearing pedestal will substantially impair ball bearing lubrication.

7.4 Stand-by pumps

If a pump is on stand-by, it is to be started up from time to time. Regularly turn the shaft by hand in the direction of rotation.

This operation is to be performed more often for pumps which are exposed to very strong vibrations from the plant.

When dismantling the pump from the plant, drain it, thoroughly clean it, seal with flange covers and store in accordance with the instructions.

7.5 Notes on dismantling

- All repair and maintenance work is to be performed by skilled staff using appropriate tools and original spare parts.
- Is the necessary documentation available?
- Has the pump been shut down, drained and flushed in accordance with the regulations?

  See also **Section 6.3**.
- If no new assembly is performed immediately after dismantling, the plastic and ceramic components in particular must be stored carefully.
- Dismantling can be checked using the sectional drawing in **Section 9** and the components available.

7.5.1 Protective clothing

Even if the pump has been properly evacuated and flushed, residue of the medium may still remain in the pump, e.g. between sealing surfaces or in the bearing seats or in the can.

Plastic components may absorb medium which gradually emerges from the material after flushing.

Proper protective clothing is to be worn.

Protective clothing is also to be worn even if only the bearing pedestal is to be removed. Medium may penetrated the lantern chamber through the can.

7.5.2 Magnetic fields

Caution ! Strong magnetic fields
Risk during dismantling and in the vicinity of magnetic drives as single parts.

Remove loose parts and other magnetisable metals from the work bench. They could otherwise be attracted: **Risk of accident!**

Place any tools needed at a safe distance.

Keep electronic equipment and measuring instruments at a distance. In cases of doubt consult the equipment manufacturer.

Hold magnetic drives as single parts firmly or secure. Otherwise they could be attracted, for example, by a vice: Risk of accident!

People with an artificial pacemaker
Keep torso at a minimum distance of 500 mm.

For safety's sake, a distance of 6" (150 mm) should be observed for watches, electric data carriers, data carriers with magnetic strips etc.

7.6 Dismantling

There are two possibilities for dismantling:

1. Dismantling the complete pump from the plant.
2. Dismantling the complete slide-in unit as the pump housing can remain in the plant connected to the piping.

If the coupling installed is a spacer-type coupling, the motor can also remain in the plant.

Dismantling of the complete pump is described here.

- Support bracket **183** from the base plate, it is fastened to the bearing pedestal **330** by 2 hex. screws **901/2** and a contact disk **557/2**.
- If the housing **100** remains in the system, leave the wear ring seal **502/1** in the centering to protect the housing sealing surface.

7.6.1 Removing bearing pedestal

- Deposit pump vertically on the workbench with the suction nozzle facing downwards. For this purpose, use a soft, clean and smooth base.
- Undo screws **901/5** from the connection lantern/bearing pedestal.
- Remove bearing pedestal **330** from the centering of the lantern **344.** If necessary, use two levers.
- To overcome the axial magnetic forces, pull the bearing pedestal **330** upwards with a firm jerk.

- Alternatively, the unit can be raised using a crane. A thread is to be provided in the drive shaft to accommodate a crane plug for this purpose.

CAUTION! When pulling out the bearing pedestal, the axial magnetic forces (up to max. 400 N without weight force) **decrease abruptly after being at maximum. Risk of accident!**

The torque of the magnetic coupling is indicated on the nameplate.

7.6.2 Dismantling of drive unit long life grease lubrication

- Undo hex. socket screw **914/5** with toothed lock washer **936/1**.
- Remove drive magnet assembly **858**. If necessary, use a pulling-off device.
- Undo screws **914/6** of the rear bearing cover **361**.
- Remove rear bearing cover **361** and wavy spring washer **953/1**.
- Press drive shaft **213** with the two ball bearings **321/1** and **321/2** out of the bearing pedestal **330** in the direction of the motor.

7.6.3 Dismantling drive unit oil bath lubrication

- Undo hex. socket screw **914/5** with toothed lock washer **936/1**.
- Remove drive magnet assembly **858**. If necessary, use a pulling-off device.
- Drain oil from the screw plug **903/1**.
- Undo screws **914/6** of the rear bearing cover **361**.
- Press drive shaft **213** with the two ball bearings **321/1** and **321/2** out of the bearing pedestal **330** in the direction of the motor.
- Remove from the drive shaft **213** rear bearing cover **361** incl. radial ball bearing **421/1** with cover gasket **403** and wavy spring washer **953/1**.
- Remove rotary shaft seals **421/1** and **421/2** from the bearing pedestal **330** resp. the rear bearing cover **361**.

7.6.4 Dismantling the slide-in unit

- Undo housing screws **901/3**.
- Screw 2 hex. screws **901/3** into the forcing thread of the bracket **344**.
- Press the housing **100** with the aid of these hex. screws out of the bracket **344**.
- Remove bracket **344** upwards.
- lift off can **159** and can insert **158**. As the shaft **222** is introduced tightly into the can insert **158**, this shaft is automatically removed together with the thrust ring **510/3**.

Make sure that no parts of the plain bearing fall. **Risk of breakage!.**

- Remove shaft **222** with thrust ring **510/3** from the can **158**. Place a suitable tool, e.g. scribing iron, behind the thrust ring and pull it off applying force at several positions.
- Raise inner magnet assembly **859** with impeller **230** vertically. The wear ring seal **502/1** is simultaneously removed from the housing **100** at the same time.
- Remove thrust ring **510/2** using a screwdriver.
- Press out the bearing bushes **545** and distance ring **504/1** from the suction side of the impeller. Use a suitable mandrel made of plastic.

  Alternatively, the puller can also be used. See assembly aids in **section 10.2**.
- Remove anti-torsion insert **566/2**.
- The circlip **932/7** must be destroyed to separate the impeller **230** and inner magnet assembly **859**. For this purpose, carefully cut the circlip open with a cutting knife all around the notch.
- Remove the impeller **230** from the seat of the inner magnet assembly **859**. For this purpose, clamp the inner magnet assembly **859** in a vice, being careful not to damage the surfaces, and press the impeller **230** out towards the suction side.

  Alternatively, the disassembling device can also be used. See assembly aids in **section 10.3**.
- Carefully remove the remaining parts of the circlip **932/7**.

7.6.5 Dismantling housing/shaft spider

- Pull shaft spider **338** out of the housing seat.
- Remove the two anti-torsion inserts **566/1**.
- Remove shaft sleeve **523/1** from the shaft spider **338**.

7.6.6 Changing the radial ball bearings only long life grease lubrication

- To change the radial ball bearings **312**, only the bearing pedestal unit can alternatively be removed from the plant.
- Undo support bracket **183** from the base plate.
- Undo screws **901/5** from the connection lantern/bearing pedestal.

- Remove bearing pedestal **330** for the centering of the bracket **344**. If necessary, use two levers.
- To overcome the axial magnetic forces, pull the bearing pedestal **330** with a firm jerk in the direction of the motor.

CAUTION! When pulling out the bearing pedestal, the axial magnetic forces (up to max. 400 N without weight force) **decrease abruptly after being at maximum. (Risk of accident)**

For procedure, see **Section 7.6.2**.

7.7 Notes on assembly

- Use original spare parts. See also **Section 2.4**.
- Do not use any defective parts.
- Apply Anti-Seize special assembly paste (e.g. from Weicon) to the fitting surfaces (not any stainless steel surfaces) and screw thread prior to assembly.
- Check whether all parts fit and only then assemble.
- Important dimensions (centerings, bearing fits or bearing play) are to be checked prior to assembly. If necessary, perform a trial assembly.
- We recommend replacing the cover seal **403** (oil bath lubrication) and shaft sleeve **523/1** during each re-assembly.
- Always replace the circlip **932/7**.
- Remove metallic particles adhering to magnetic components such as the inner magnet assembly **859** and the drive magnet assembly **858** prior to assembly.

  For this purpose simple plasticene can be used.

7.7.1 Table for target dimension Z

The plain bearings require a minimum axial play for perfect functioning. This axial play "Z" must be checked using the drawing **Fig. 6** after completion of assembly.

Size	Dimension Z (mm)
40-25-125	(0.5 - 1.5)
50-32-125	
40-25-160	
50-32-160	
80-50-160	
80-65-160	
50-32-200	
65-40-200	
80-50-200	

Z : Axial clearance of the plain bearings

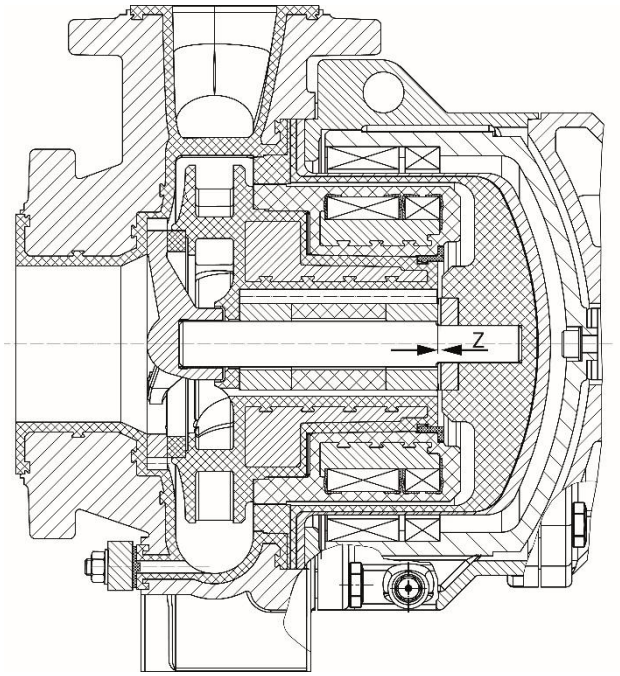


Fig. 6

7.8 Assembly

A complete assembly process is described in the following.

Sub-sections can be deduced from this.

7.8.1 Assembly of housing / shaft spider

- Push or press the shaft spider **338** into the housing **100** together with the two anti-torsion inserts **566/1**.

  Use a suitable plastic tube for pressing.

The pressing force must only be applied over the sliding surface of the shaft spider.
(risk of the silicon carbide breaking)

- Insert shaft sleeve **523/1** into the shaft spider **338**.

7.8.2 Assembly of slide-in unit

- Press the inner magnet assembly **859** onto the impeller **230**. Pay attention to the correct alignment of the driver cams.
- Press the circlip **932/7** into the appropriate groove on the impeller **230** with a suitable plastic tube. Make sure that the click connection of the circlip **932/7** audibly engages to perform its function.
- Press the bearing bush **545/1** into the impeller **230** together with the anti-torsion insert **566/2.**

  Make sure that the anti-torsion insert **566/2** is approx. 2 mm shorter than the plain bearing.
- Insert distance ring **504/1** and then bearing bush **545/2**.
- Carefully press the thrust ring **510/2** into the impeller **230** right to the stop. In doing so, pay attention to the correct position of the anti-rotation grooves relative to the driving props in the impeller **230**.
- Check whether the thrust ring protrudes about 2 mm out of the impeller. See **Fig. 7.**

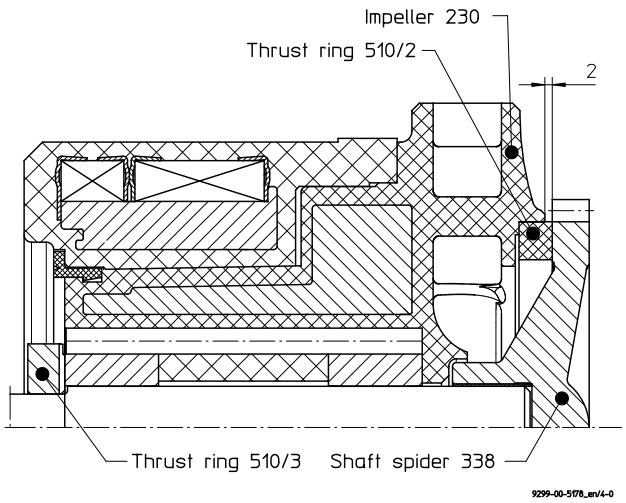


Fig. 7

- Put together can **159** and can insert **158**. For ease of assembly, the can insert **158** can be cooled as required.

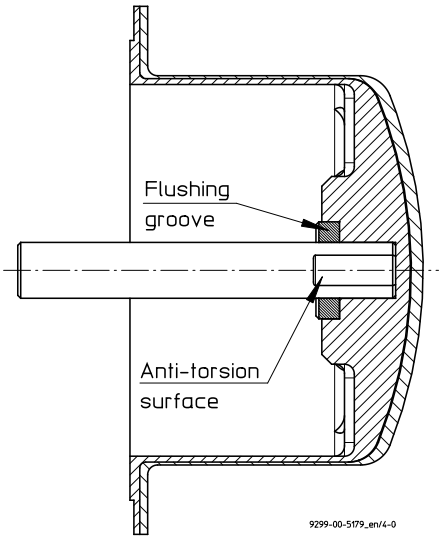


Fig. 8

- Insert the thrust ring **510/3** into the can insert **158**. Make sure that the flushing grooves are directed outwards.
- Press shaft **222** in the can insert **158**.

CAUTION: Align the shaft according to the two flat in the thrust ring (danger of fracture of the silicon carbide)

7.8.3 Assembly of drive unit long life grease lubrication

- Press radial ball bearings **321/1** and **321/2** onto the drive shaft.
- Insert key **940/1** into the drive shaft.
- Push pre-assembled drive shaft into the bearing pedestal **330**.
- Insert wavy spring washer **953/1** into the bearing pedestal **330**.
- Secure rear bearing cover **361** to the bearing pedestal **330** with hex. socket screws **914/6**.

  Tightening torque group 1.1 + 1.2 = 17 Nm
  Tightening torque group 1.3 = 20 Nm
- Check fit of drive magnet assembly **858** / drive shaft **213**.

  Put 1 drop of adhesive on the thread of the drive shaft, e.g. Loctite 243 or an equivalent.

  Only 1 drop of the adhesive should be applied. Otherwise the next dismantling operation will be more difficult or no longer possible without destroying components.
- Mount drive magnet assembly **858** with the flat pivot point aligned with the drive shaft **213**.
- Tighten hex. socket screw **914/5** with toothed lock washer **936/1**.

  Tightening torque group 1.1 + 1.2 = 17 Nm
  Tightening torque group 1.3 = 20 Nm

7.8.4 Assembly of drive unit oil bath lubrication

- Press radial ball bearings **321/1** and **321/2** onto the drive shaft.
- Insert key **940/1** into the drive shaft.
- Insert rotary shaft seal **421/2** into the bearing pedestal **330**.
- Push pre-assembled drive shaft **213** into the bearing pedestal **330**.
- Insert wavy spring washer **953/1** into the bearing pedestal **330**.
- Insert rotary shaft seal **421/1** into the rear bearing cover **361**.
- Secure rear bearing cover **361** with cover gasket **403** to the bearing pedestal **330** with hex. socket screws **914/6**.

  Tightening torque group 1.1 + 1.2 = 17 Nm
  Tightening torque group 1.3 = 20 Nm
- To proceed, see **Chapter 7.8.3**.

7.8.5 Final assembly

- Deposit the housing **100** on a workbench, for example, with the suction nozzle facing downwards. Protect the plastic working strip against damage with a suitable support.
- Place the wear ring seal **502/1** into the centering of the housing **100**.
- Mount pre-assembled slide-in unit concentrically onto the shaft spider **338**.
- Press outer wear ring **502/1** into the housing **100**.
- Insert the preassembled can unit. The rim of the can insert **158** must lie on the wear ring seal **502/1**.

Press shaft 222 carefully through the bearing bushes 545 into the shaft spider 338. (risk of the silicon carbide breaking)

- Mount bracket **344** and tighten hex. screws **901/3** to the required torque, see **Section 1.1**.
- Check whether the rotating unit has the necessary axial play. For this purpose reach through the suction nozzle and move the rotating unit axially. The axial play can be determined through the discharge nozzle. See **Section 7.7.1**.
- Insert another housing seal if the minimum axial play is not reached.
- Insert the pre-assembled drive unit into the centering of the lantern **344**.

When inserting the unit, high axial magnetic forces occur which decrease abruptly after reaching maximum (up to max. 400 N without weight).

Only hold the bearing pedestal in front of the flange (on motor side).
(Risk of injury from being squeezed)

- Alternatively, the unit can be mounted using a crane. A thread is to be provided in the drive shaft to accommodate a crane plug for this purpose.
- Tighten screws **901/5**.

  Tightening torque group 1.1 + 1.2 = 40 Nm
  Tightening torque group 1.3 = 55 Nm
- Check whether the drive shaft can be easily turned.
- Screw the threads for the jacking screw in the lantern with the plug.
- Attach support bracket **183,** align and tighten.

7.8.6 Fill bearing pedestal with oil

Oil quantities:

For group 1.1	appr. 400 ml
For group 1.2	appr. 600 ml
For group 1.3	appr. 1000 ml

Groups see **Section 1**.

Type of oil:

See **Section 7.2.2**.

Procedure for filling with oil:

- Pull the plastic container out of the holder.
- Unscrew the plastic container and fill it with oil.
- Screw the plastic container shut and insert it into the holder.
- If the oil level still drops too far, add oil to the plastic container again.

♦ **Fig.9**

7.9 Tests

On request, the pumps are tested with water at the manufacturer's.

The operating data measured are then documented in a works test certificate.

If, during a test after repairs, discrepancies compared with the works certificate are discovered, the following people can be called in:

1. in-house pump office
2. The manufacturer Richter
   or its local agent

The following conveying data can be checked using the **pump performance curves**:

- Flow rate
- Head
- Power requirement
- NPSHR

8 Malfunctions

Faults may result from inadmissible modes of operation. Such inadmissible modes of operation – even brief ones – may cause serious damage to the unit.

In connection with explosion protection, potential sources of ignition (overheating, electrostatic and induced charges, mechanical and electric sparks) may result from these inadmissible modes of operation; their occurrence can only be prevented by adhering to the intended use.

See also **Section 6.5**.

Should there be any uncertainty about the remedy to be applied, please inquire at the in-house pump office or at the pump manufacturer's.

No delivery :

- Is the pump filled and vented?
- Is the suction line open, vented, cleaned and correctly laid?
- Is the discharge line open, vented, cleaned and correctly laid?
- Is the geodetic head too high?
- Is air being drawn in?
- Has the magnetic drive stopped?

Flow rate too low :

- Have the pump, suction line and discharge line been completely vented, filled and cleaned?
- Have any strainers installed been cleaned?
- Are all shut-off devices open?
- Is the geodetic head too high?
- Is the NPSHA too low or the NPSHR too high?
- Are the pipe resistances too high?
- Is the viscosity too high?
- Is the direction of rotation correct?
- Is the speed too low or the impeller diameter too small?
- Are pump parts worn?
- Gas in the medium?

Flow rate too high :

- Is the geodetic head too low?
- Are the pipe or nozzle resistances too low?
- Is the pump speed too low or the impeller diameter too large?

Delivery pressure too high :

- Is the speed too high or the impeller diameter too large?
- Is the density too high?

Motor consumes too much electricity :

- Is the flow rate, density or viscosity too high?
- Is the speed too high or the impeller diameter too large?
- Is the coupling correctly aligned?
- Can the pump shaft be turned properly?

Pump does not run smoothly or creates noises :

- Is the coupling well aligned?
- Are the coupling elements worn?
- Are the rolling bearings damaged?
- Are parts of the hydraulics damaged?
- Is the flow rate too low or too high?
- Is the impeller balanced?
- Is the pump twisted?
- Is there foreign matter in the pump?

Temperature of the rolling bearings is too high :

- How high is the actual temperature measured?
- How high may it be acc. to the operating manual?
- Is the running-in phase already over?
- Deficient lubricant?
- Overaging / wear?

Leak from the pump :

- Are all screws tightened to the correct tightening torque?
- Were the sealing surfaces assembled in a clean state?
- Have approved gaskets been installed?

9 Sectional drawing

9.1 Legend

100 housing
122 blind cover
158 can insert
159 Can
183 support bracket
213 drive shaft
222 Shaft
230 impeller
319 impeller bearing
includes:
- **504/1** Distance ring
- **545/x** bearing bush
- **566/2** Anti torsion insert

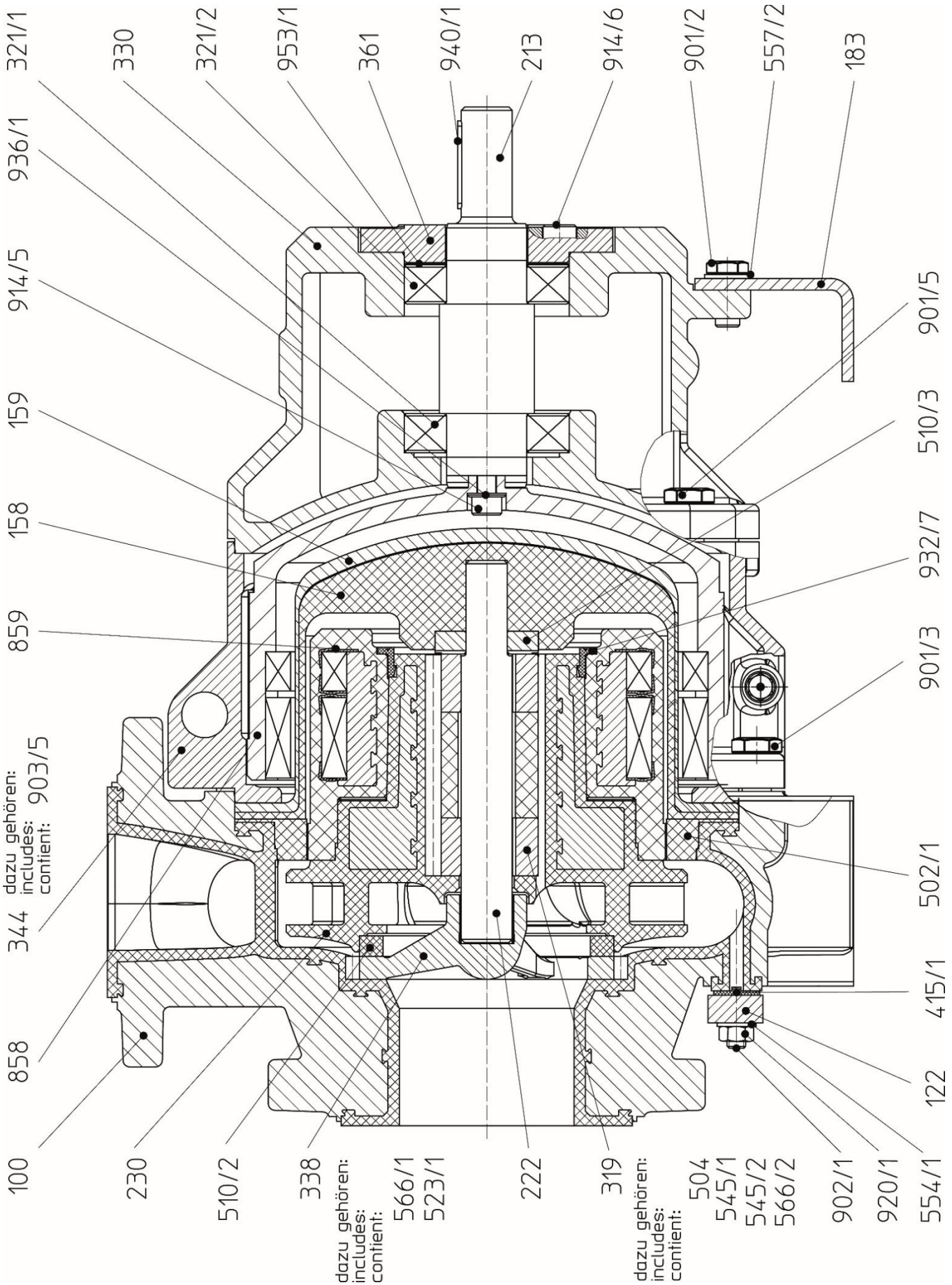
321/x radial ball bearing
330 bearing pedestal
338 Shaft spider
includes:
- **523/1** shaft sleeve
- **566/1** Anti torsion insert

344 bracket
- **903/5** screw plug

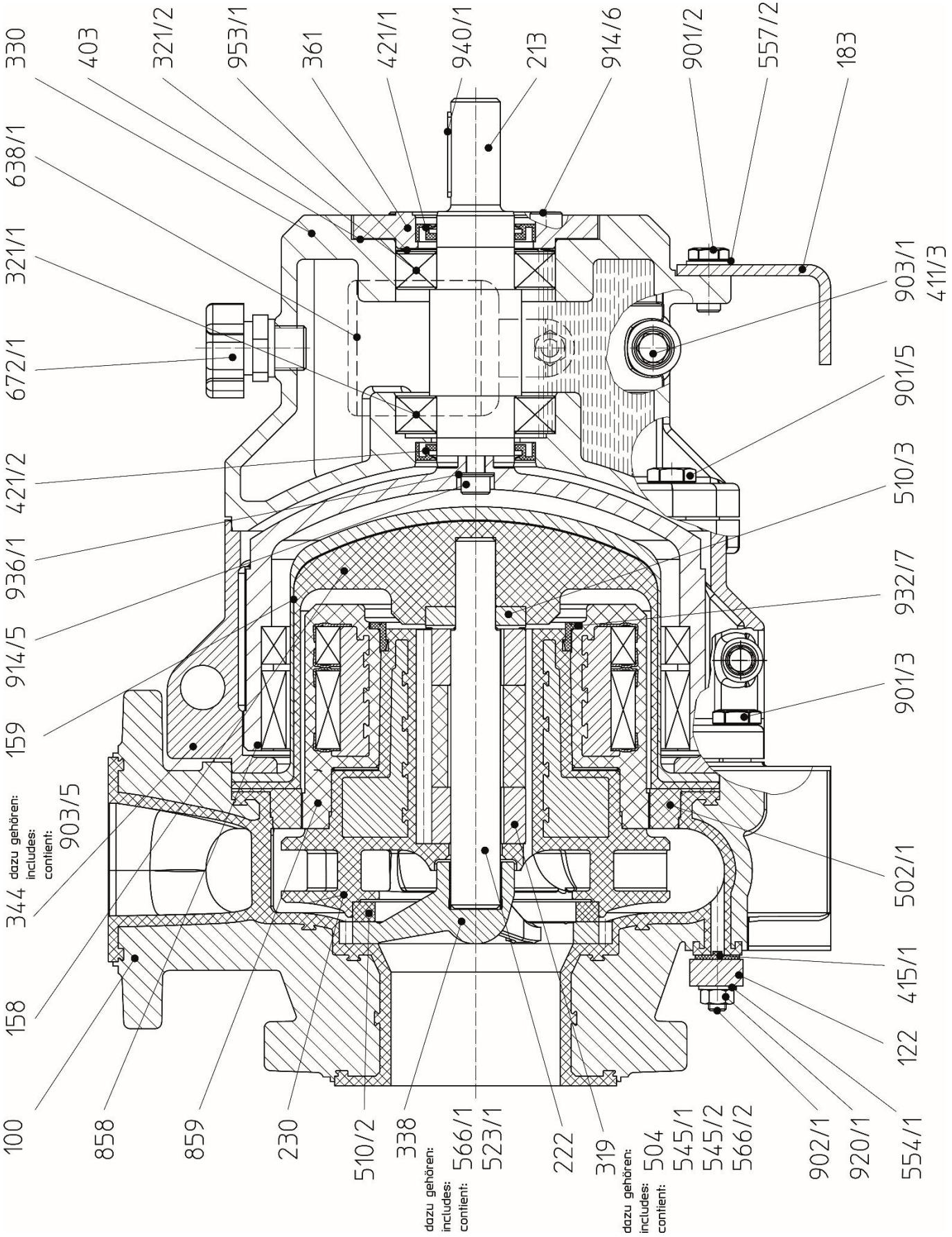
361 rear bearing cover
415/1 centering gasket
502/1 wear ring seal
510/x Thrust ring
554/1 washer
557/2 contact disc
858 drive magnet assembly
859 inner magnet assembly
901/x hex. screw
902/1 stud screw
914/x hex. socket screw
920/1 hex. nut
932/7 Circlip
936/1 toothed lock washer
940/1 key
953/1 Wavy spring washer

Additional for oil bath lubrication
403 cover gasket
411/3 seal ring
421/x Rotary shaft seal
638 Constant level oiler
672/1 venting/filling plug
903/x hex. head screw plug

9.2 Long-life grease lubrication



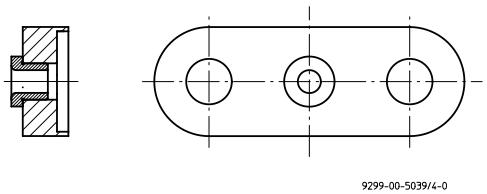
9.3 Oil bath lubrication



10 Assembly aids

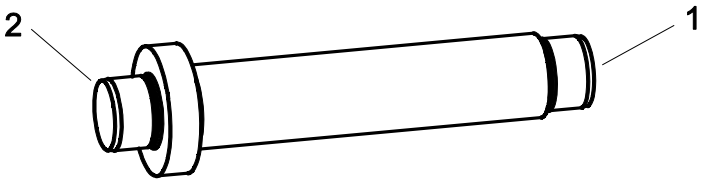
10.1 Boring templates

Pump size	Ident. No.
Group 1	9217-89-1096



10.2 Pull-off device for plain bearing bushes

Pump size	Ident. No.
Group 1.1	9428-81-1087
Group 1.2	9428-81-1085
Group 1.3	9428-81-1086



Product description

If the plain bearing bushes have to be removed, we recommend the use of a special pull-off device. This auxiliary device is specifically designed for the sensitive silicon carbide components.

Application

Remove bearing bush:

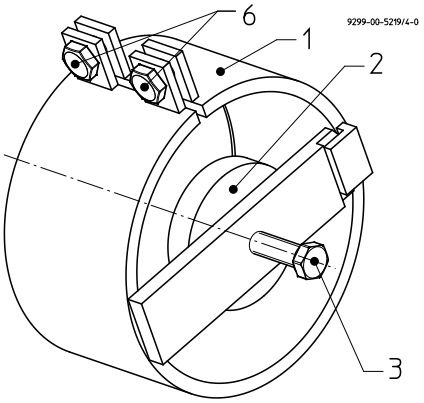
- Push the device with the side (1) from the suction side through the impeller and center it in the bearing bushing.
- With the aid of a press, the bearing bush can now be removed (alternatively by axial striking with a rubber hammer on the end face of the device).

Insert bearing bush:

- Place the bearing bush onto the rotor.
- Slide the device with the side (2) forward from the drive side through the impeller.
- By means of a press, the bearing bush can now be used (alternatively by axial striking with a rubber hammer on the end face of the device).

10.3 Dismantling device impeller-inner magnet assembly

Pump size	Ident. No.
Group 1.1	9427-89-1007
Group 1.2	9427-89-1002
Group 1.3	9427-89-1004



Product description

Used to disassemble rotor and impeller.

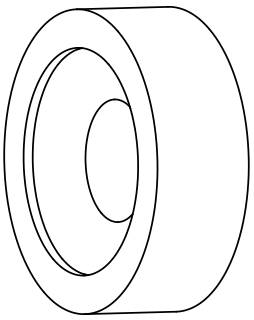
It consists of the clamping tube and the disc for pressing out the impeller.

Application

- Circlip in the turned-in groove of the rotor must be cut open. See Section 7.6.4.
- Press the device with the clamping tube (1) over the rotor.
- Tighten the two hex. screws (6) with approx. 30 Nm.
- Use the hex. screw (3) to turn the plate (2) against the impeller and push it out.

10.4 Insertion tool for shaft spider

Pump size		Ident. No.
Gruppe 1.1	Impeller eye DN 40,50	9428-81-1077
Gruppe 1.2	Impeller eye DN 40,50	9428-81-1055
Gruppe 1.2	Impeller eye DN 80	9428-81-1056
Gruppe 1.3	Impeller eye DN 50	9428-81-1089
Gruppe 1.3	Impeller eye DN 80	9428-81-1057



Product description

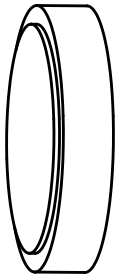
Used to press the shaft spider into the housing.

Application

♦ The shaft spider can be pressed into the housing with the aid of a hand press (alternatively a pillar drill).

10.5 Insertion tool for rotor circlip

Pump size	Ident. No.
Groupe 1.1	9428-81-1076
Groupe 1.2	9428-81-1053
Groupe 1.3	9428-81-1054



Product description

Used to press the circlip for axial securing for connection between impeller and rotor.

Application

♦ The circlip can be pressed into the connection between the impeller and rotor using a hand press (alternatively a pillar drill).

Baureihe/Series/Série

RMI
RMI-B

Ausführung **Magnetkupplungspumpe**

Design **Magnet drive pump**

Construction **Pompe à entraînement magnétique**

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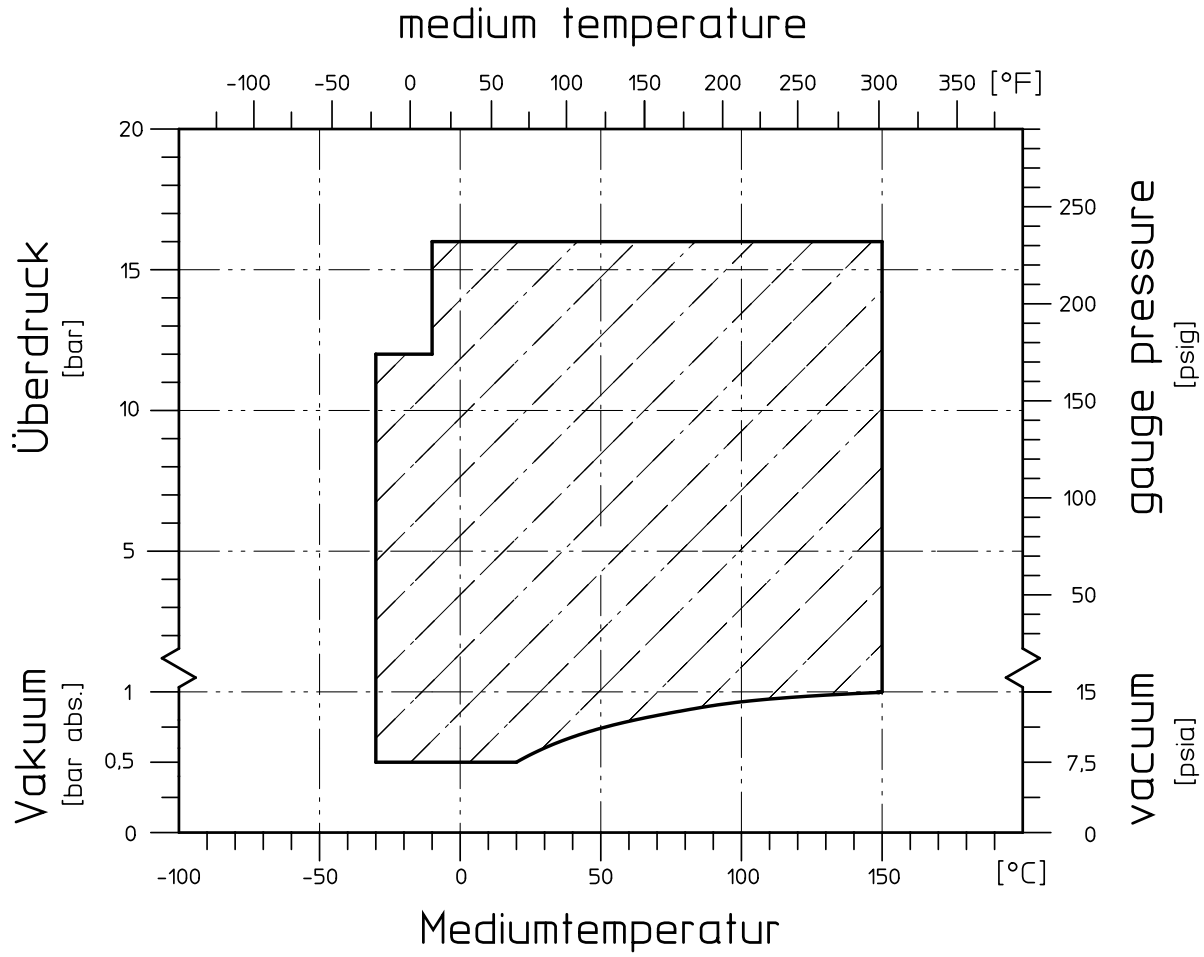
Einsatzgrenzen / operating limits

Druckstufe PN16 (Standard)
pressure rating PN16 (standard)
étage de pression PN16 (standard)



Baureihe/Series/Série

RMI
RMI-B

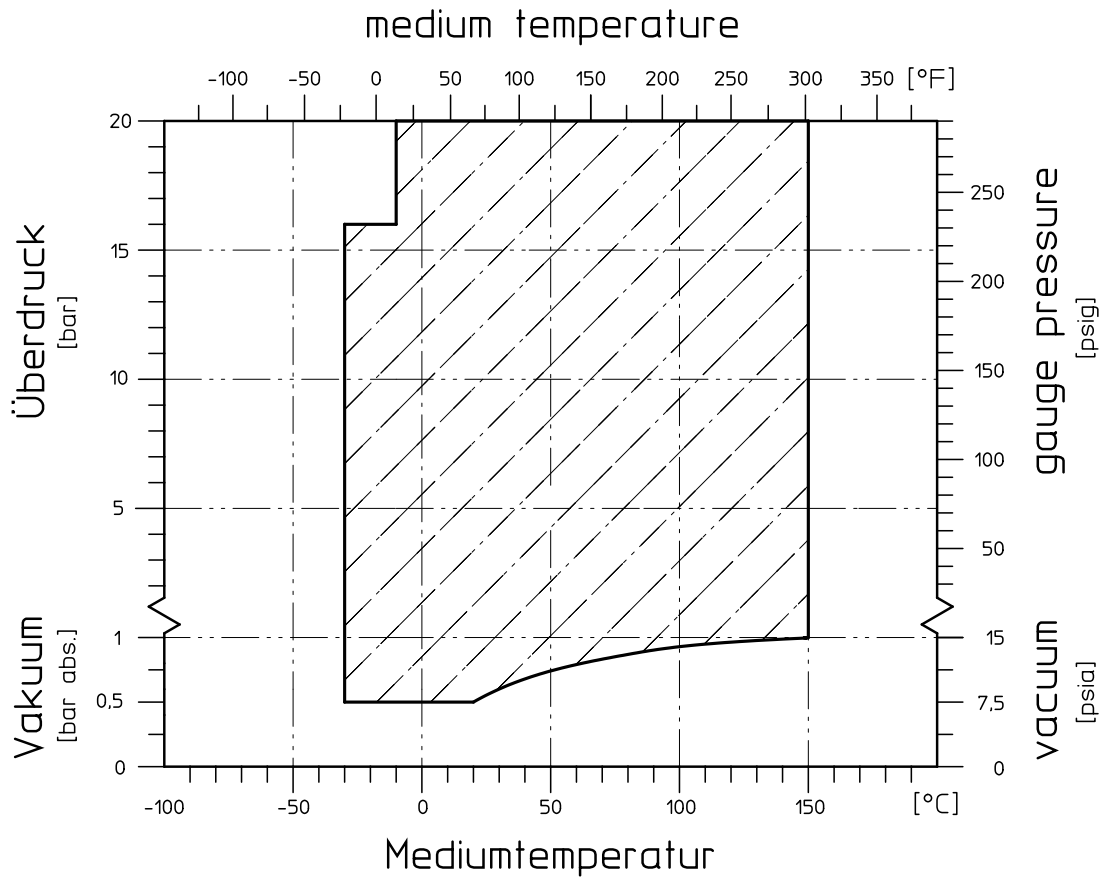
Ausführung **Magnetkupplungspumpe**

Design **Magnet drive pump**

Construction **Pompe à entraînement magnétique**

RICHTER Process Pumps & Valves

Druckstufe PN20 (Optional)
pressure rating PN20 (optional)
étage de pression PN20 (optionnel)



Richter Chemie-Technik GmbH
Otto-Schott-Straße 2
D-47906 Kempen
www.richter-ct.com

RICHTER
Process Pumps & Valves
A Unit of IDEX Corporation

CE Konformitätserklärung nach EN ISO//IEC 17050
Declaration of Conformity according to EN ISO//IEC 17050

Produkt *Product*	Magnetkupplungs-Chemiekreiselpumpe freies Wellenende, Blockausführung **oder** als Aggregat[1)] *Magnetic Drive Chemical Centrifugal Pump* *Bare shaft, block version **or** as unit [1)]*
Baureihe *Series*	MNK, MNK-B, MNK-X, MNK-XB, MNK-S, MNK-SB, MPB, RMI, RMI-B
Seriennummer *Serial number*	ab 01.04.2020 *from 01.04.2020*
EU-Richtlinien *EU-Directive*	2006/42/EG Maschinenrichtlinie, Anhang II, Nr. 1 A 2014/34/EU Explosionsschutzrichtlinie ATEX *2006/42/EC Machinery Directive, Annex II, No. 1 A* *2014/34/EU Equipment explosive atmosphere*
Modul	Interne Fertigungskontrolle *Production Quality Assurance*
Angewandte harmonisierte Normen *Applied harmonised Standards*	DIN EN ISO 12100:2011, DIN EN 809:2012, DIN EN ISO 80079-36-2016 DIN EN ISO 15783:2010, DIN EN ISO 2858:2011

Kennzeichnung	2006/42/EG	*2006/42/EC*	CE
Marking	2014/34/EU	*2014/34/EU*	Ex II 2/2 GD X Ex h IIC T4 ... T3 Gb Ex h IIIC T135°C ... T200°C Db[1)]

Die technische Dokumentation nach Richtlinie 2014/34/EU ist bei der u.a. benannten Stelle hinterlegt.
The technical documentation is filed by below mentioned notified body according to directive 2014/34/EU.
Physikalische-Technische Bundesanstalt (PTB), D-38116 Braunschweig

Baureihe *Series*	Registrier-Nr. *Registered #*	Baureihe *Series*	Registrier-Nr. *Registered #*
MNK	02ATEXD032	MNK-SB	03ATEXD006
MNK-B	03ATEXD006	MPB	03ATEXD068
MNK-X	02ATEXD032	RMI	10ATEX D076
MNKXB	03ATEXD006	RMI-B	10ATEX D076
MNK-S	02ATEXD032		

Das Unternehmen Richter Chemie-Technik GmbH bescheinigt hiermit, dass die o.a. Baureihen die grundsätzlichen Anforderungen der aufgeführten Richtlinien und Normen erfüllt.
Richter Chemie-Technik GmbH confirms that the basic requirements of the above specified directives and standards have been fulfilled.

Bevollmächtigt für die Zusammenstellung der technischen Unterlagen nach 2006/42/EG: G. Kleining
Authorized person compiled the technical files according to 2006/42/EC:

1) Gilt nicht für das Aggregat nach 2014/34/EU
1) Not valid for the unit according to 2014/34/EU

Kempen, 01.02.2023

Barbara Wladarz
Managing Director

i.V. J. Kleining
Gregor Kleining
Director Global Engineering

Richter Chemie-Technik GmbH
Otto-Schott-Straße 2
D-47906 Kempen
www.richter-ct.com

RICHTER
Process Pumps & Valves
A Unit of IDEX Corporation

CE Konformitätserklärung nach EN ISO//IEC 17050
Declaration of Conformity according to EN ISO//IEC 17050

Produkt *Product*	Magnetkupplungs-Chemiekreiselpumpe als Aggregat *Magnetic Drive Chemical Centrifugal Pump* *as unit*
Baureihe *Series*	MNK, MNK-B, MNK-X, MNK-XB, MNK-S, MNK-SB, MPB, RMI, RMI-B
Seriennummer *Serial number*	ab 01.04.2020 *from 01.04.2020*
EU-Richtlinien *EU-Directive*	2006/42/EG Maschinenrichtlinie, Anhang II, Nr. 1 A *2006/42/EC Machinery Directive, Annex II, No. 1 A*
Modul	Interne Fertigungskontrolle *Production Quality Assurance*
Angewandte harmonisierte Normen *Applied harmonised Standards*	DIN EN ISO 12100:2011, DIN EN 809:2012 DIN EN ISO 15783:2010, DIN EN ISO 2858:2011
Kennzeichnung *Marking*	2006/42/EG *2006/42/EC* CE

Das Unternehmen Richter Chemie-Technik GmbH bescheinigt hiermit, dass die o.a. Baureihen die grundsätzlichen Anforderungen der aufgeführten Richtlinien und Normen erfüllt.
Richter Chemie-Technik GmbH confirms that the basic requirements of the above specified directives and standards have been fulfilled.

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Authorized person compiled the technical files according to 2006/42/EC:

Kempen, 01.02.2023

Barbara Wladarz
Managing Director
Quality

i.V. J. Kleining

Gregor Kleining
Director Global Engineering

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D-47906 Kempen
www.richter-ct.com

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UK CA

Konformitätserklärung in Übereinstimmung mit den Leitlinien der britischen Regierung
Declaration of Conformity *in accordance with UK government guidance*

Produkt *Product*	Magnetkupplungs-Chemiekreiselpumpe freies Wellenende, Blockausführung **oder** als Aggregat[1)] *Magnetic Drive Chemical Centrifugal Pump* *Bare shaft, block version **or** as unit [1)]*
Baureihe *Series*	MNK, MNK-B, MNK-X, MNK-XB, MNK-S, MNK-SB, MPB, RMI, RMI-B
Seriennummer *Serial number*	ab/*from* 01.01.2023
UK Gesetzliche Vorschriften *UK Statutory instruments*	2008 No. 1597 Maschinenverordnung 2008 *2016* No. 1107, UKEx 2016 *2008 No. 1597 The Supply of Machinery Regulations 2008* *2016 No. 1107, UKEx 2016*
Modul	Interne Fertigungskontrolle *Production Quality Assurance*
Angewandte technische Spezifikation *Applied Technical Specification*	DIN EN ISO 12100, DIN EN 809, DIN EN ISO 80079-36 DIN EN ISO 15783, DIN EN ISO 2858
Kennzeichnung *Marking*	2008 No. 1597, *2016* No. 1107 *2008 No. 1597, 2016 No. 1107*

UK CA

Ex II 2/2 GD X Ex h IIC T4 ... T3 Gb
Ex h IIIC T135°C ... T200°C Db[1)]

Die technische Dokumentation nach Richtlinie 2014/34/EU ist bei der u.a. benannten Stelle hinterlegt.
The technical documentation is filed by below mentioned notified body according to directive 2014/34/EU.
Physikalische-Technische Bundesanstalt (PTB), D-38116 Braunschweig

Baureihe *Series*	Registrier-Nr. *Registered #*	Baureihe *Series*	Registrier-Nr. *Registered #*
MNK	02ATEXD032	MNK-SB	03ATEXD006
MNK-B	03ATEXD006	MPB	03ATEXD068
MNK-X	02ATEXD032	RMI	10ATEX D076
MNKXB	03ATEXD006	RMI-B	10ATEX D076
MNK-S	02ATEXD032		

Das Unternehmen Richter Chemie-Technik GmbH bescheinigt hiermit, dass die o.a. Baureihen die grundsätzlichen Anforderungen der aufgeführten Richtlinien und Normen erfüllt. Diese Erklärung wird unter der alleinigen Verantwortung des Herstellers abgegeben.

Richter Chemie-Technik GmbH confirms that the basic requirements of the above specified directives and standards have been fulfilled. This declaration is issued under the sole responsibility of the manufacturer.

Bevollmächtigt für die Zusammenstellung der technischen Unterlagen nach 2008 No. 1597: G. Kleining
Authorized person compiled the technical files according to 2008 No. 1597:

1) Gilt nicht für das Aggregat nach *2016* No. 1107
1) Not valid for the unit according to 2016 No. 1107

Kempen, 01.02.2023

Barbara Wladarz
Managing Director

i.V. J. Kleining

Gregor Kleining
Director Global Engineering

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UK CA Konformitätserklärung in Übereinstimmung mit den Leitlinien der britischen Regierung
Declaration of Conformity *in accordance with UK government guidance*

Produkt *Product*	Magnetkupplungs-Chemiekreiselpumpe als Aggregat *Magnetic Drive Chemical Centrifugal Pump* *as unit*
Baureihe *Series*	MNK, MNK-B, MNK-X, MNK-XB, MNK-S, MNK-SB, MPB, RMI, RMI-B
Seriennummer *Serial number*	ab 01.01.2023 *from 01.01.2023*
UK Gesetzliche Vorschriften *UK Statutory instruments*	2008 No. 1597 Maschinenverordnung 2008 *2008 No. 1597 The Supply of Machinery Regulations 2008*
Modul	Interne Fertigungskontrolle *Production Quality Assurance*
Angewandte technische Spezifikation *Applied Technical Specification*	DIN EN ISO 12100:2011, DIN EN 809:2012 DIN EN ISO 15783:2010, DIN EN ISO 2858:2011
Kennzeichnung *Marking*	2008 No. 1597 *2008 No. 1597* UK CA

Das Unternehmen Richter Chemie-Technik GmbH bescheinigt hiermit, dass die o.a. Baureihen die grundsätzlichen Anforderungen der aufgeführten Richtlinien und Normen erfüllt. Diese Erklärung wird unter der alleinigen Verantwortung des Herstellers abgegeben.

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Bevollmächtigt für die Zusammenstellung der technischen Unterlagen nach 2008 No. 1597: G. Kleining
Authorized person compiled the technical files according to 2008 No. 1597:

Kempen, 20.12.2022

Barbara Wladarz
Managing Director

i.V. Kleining
Gregor Kleining
Director Global Engineering

RICHTER
Process Pumps & Valves

IDEX

Richter Chemie-Technik GmbH · Postfach 10 06 09 · D-47883 Kempen

08.01.2015

Declaration of no objection

Dear Sirs,

The compliance with laws for the industrial safety obligates all commercial enterprises to protect their employees and/or humans and environment against harmful effects while handling dangerous materials.
The laws are such as: the Health and Safety at Work Act (ArbStättV), the Ordinance on Harzadous Substances (GefStoffV, BIOSTOFFV), the procedures for the prevention of accidents as well as regulations to environmental protection, e.g. the Waste Management Law (AbfG) and the Water Resources Act (WHG)

An inspection/repair of Richter products and parts will only take place, if the attached explanation is filled out correctly and completely by authorized and qualified technical personnel and is available.

In principle, radioactively loaded devices sent in, are not accepted.

Despite careful draining and cleaning of the devices, safety precautions should be necessary however, the essential information must be given.

The enclosed declaration of no objection is part of the inspection/repair order. Even if this certificate is available, we reserve the right to reject the acceptance of this order for other reasons.

Best regards
RICHTER CHEMIE-TECHNIK GMBH

Richter Chemie-Technik GmbH
Otto-Schott-Straße 2
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USt. Id. Nr. DE 811 127 054

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richter-info@idexcorp.com
www.richter-ct.com

J.P. Morgan AG, Frankfurt/Main · Kto. Nr. 6 161 507 538 (BLZ 501 108 00)
BIC/SWIFT: CHASDEFX · IBAN Code: DE61 5011 0800 6161 5075 38
Sitz der Gesellschaft: Kempen · Amtsgericht Krefeld HRB 9635
Geschäftsführer: Barbara Wladarz, Bret A. Prybylski

Safety Information / Declaration of No Objection Concerning the Contamination of Richter-Pumps, -Valves and Components

1 SCOPE AND PURPOSE

Each entrepreneur (operator) carries the responsibility for the health and safety of his employees. This extends also to the personnel, who implements repairs with the operator or with the contractor.

Enclosed declaration is for the information of the contractor concerning the possible contamination of the pumps, valves and component sent in for repair. On the basis of this information for the contractor is it possible to meet the necessary preventive action during the execution of the repair.

Note: The same regulations apply to repairs **on-site**.

2 PREPARATION OF DISPATCH

Before the dispatch of the aggregates the operator must fill in the following declaration completely and attach it to the shipping documents. The shipping instructions indicated in the respective manual are to be considered, for example:

- Discharge of operational liquids
- remove filter inserts
- lock all openings hermetically
- proper packing
- Dispatch in suitable transport container
- Declaration of the contamination fixed **outside!!** on the packing

Declaration about the Contamination of Richter Pumps, -Valves and Components

RICHTER Process Pumps & Valves

The repair and/or maintenance of pumps, valves and components can only be implemented if a completely filled out declaration is available. If this is not the case, delay of the work will occur. If this declaration is not attached to the devices, which have to be repaired, the transmission can be rejected.

Every aggregate has to have it's own declaration.

This declaration may be filled out and signed only by authorized technical personnel of the operator.

Contractor/dep./institute :	Reason for transmitting ❄ Please mark the applicable
	Repair: o subject to fee o Warranty
Street :	**Austausch:** o subject to fee o Warranty
Postcode, city :	o Exchange/ Replacement already initiated/received
Contact person :	**Return**: o Leasing o Loan o for credit note
Phone : Fax :	
End user :	

A. Details of Richter-product:

Classification:
Article number:
Serial number:

Failure description:

B. Condition of the Richter-product:

	no[1]	yes	no
Was it in operation ?	o	o	
Drained (product/operating supply item) ?		o	o
All openings hermetically locked!		o	
Cleaned ?		o	o
If yes, with which cleaning agent:			
and with which cleaning method:			

Contamination :	**no[1]**	**yes**
toxic	o	o
caustic	o	o
inflammable	o	o
explosive[2]	o	o
mikrobiological[2]	o	o
radioactive[3]		
other pollutant	o	o

[1] if "no", then forward to **D**.

[2] Aggregates, which are contaminated with microbiological or explosive substances, are only accepted with documented evidence of an approved cleaning.

[3] Aggregates, which are contaminated with radioactive substances, are not accepted in principle.

C. Details of the discharged materials (must be filled out imperatively)

1. **With which materials did the aggregate come into contact ?** Trade name and/or chemical designation of operational funds and discharged materials, material properties, e.g. as per safety data sheet (e.g. toxic, inflammable, caustic)

X Trade name:	Chemical designation:
a)	
b)	
c)	
d)	

	no	**yes**
2. **Are the materials specified above harmful to health ?**	o	o
3. **Dangerous decomposition products during thermal load ?**	o	o
If yes, which ones?		

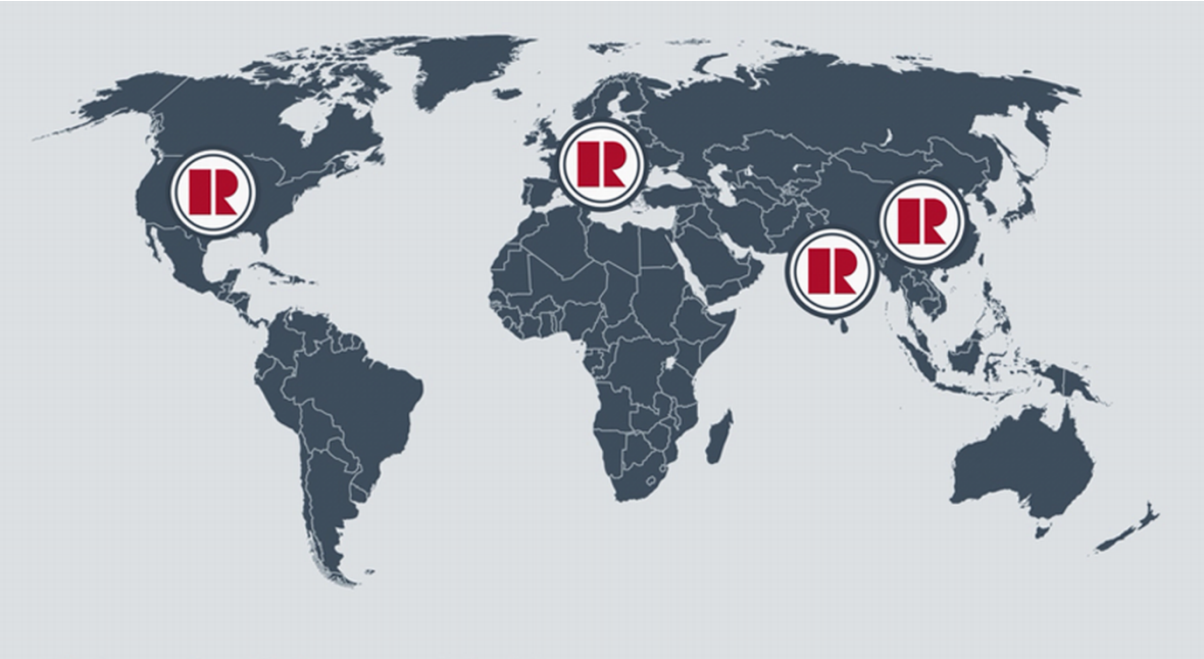
D. Mandatory declaration:

We assure that the data in this explanation are truthful and complete and as a signatory I am able to form an opinion about this. We are aware that we are responsible towards the contractor for damages, which results from incomplete and incorrect data. We commit ourselves to exempt the contractor from claims for damages of thirds resulting from incomplete or incorrect data. We are aware that we are directly responsible towards thirds, irrespective of this declaration, which belongs in particularly to the employees of the contractor consigned with the handling repair of the product.

Name of the authorized person (in block letters): _____

Date _____ Signature _____

Company stamp



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Edition 07/2023
Revision 5.0
9430B001-en

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