

INSTALLATION AND OPERATING MANUAL

Translation of the original manual

Series RMA

Sealless Chemical

Magnetic Drive Pump acc. to ASME

Bearing lubrication: Long life grease and
oil bath

Bearing pedestal group: 1 and 2



Keep for future use!

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

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Relevant documents

- ◆ Data sheet
- ◆ Works certificate
- ◆ Sectional drawing
 - RMA long life grease lubrication 9450-00-3000
 - RMA oil bath lubrication 9450-00-3001
- ◆ Installation drawing
- ◆ Performance curves
- ◆ Spare parts list
- ◆ Operating manual and declaration of conformity motor *
- ◆ Operating manual and declaration of conformity coupling *

* if contained in the scope of delivery

Appendix to the operating manual

- ◆ Operational limits 9450-00-3030
- ◆ 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
- ◆ Publication: "Centrifugal Pump Operation without NSPH 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 RMA, long life grease or oil bath lubrication

Horizontal design, sealless, free of eddy currents

Technical specifications ASME B73.1, ASME B73.3, ISO 15783, ISO 5199 and HI standards .

Connecting dimensions to ASME B73.3

Flange connecting dimensions: ASME B16.5 Class 150

ATEX 95 Directive 2014/34/EU

Machine Directive 2006/42/EC

Materials :

Pressurized parts:

Ductile cast iron ASTM A 395 / EN-JS 1049

Wetted parts:

PFA, PTFE, SSiC
 and see data sheet.

Flow rate : up to 790 USgpm (180m³/h)
 (at 3500 rpm)

Delivery head : up to 525 ft (160m) (at 3500 rpm)

Housing discharge pressure :

max. 275psi (19 bar)

Temperature range :

Operating conditions to standard	
ASME	ISO
-20 °F (-29 °C) up to 302 °F (150 °C)	-30 °C (-22 °F) up to 150 °C (302 °F)

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: 4 °F bis 104 °F,
 - 20 °C bis + 40 °C (higher temperature after consulting the manufacturer)

Ambient pressure range: 11,6 psia – 16 psia
 0,8 bar_{abs} – 1,1 bar_{abs}

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

Sizes :

Group 1	Group 2
1.5"x1"x6"	3"x1.5"x8
3"x1.5"x6"	3"x2"x8"
3"x2"x6"	4"x3"x8"
1.5"x1"x8"	3"x2"x10"
	4"x3"x10"H
	6"x4"x10"

Weight : See data sheet

Dimensions : See installation drawing

1.1 Tightening torques

Screws greased, tighten in diametrically opposite sequence

Housing screws 901/3

Size [inch]	No. x size [ASME]	Tightening torque	
		[in-lbs]	[Nm]
1,5"x1"x6"	8 x 1/2"	415	47
3"x1,5"x6"	8 x 1/2"	415	47
3"x2"x6"	8 x 1/2"	415	47
1,5"x1"x8"	10 x 1/2"	390	44
3"x1,5"x8"	12 x 1/2"	415	47
3"x2"x8"	12 x 1/2"	415	47
4"x3"x8"	12 x 1/2"	415	47
3"x2"x10"	12 x 5/8"	743	84
4"x3"x10"H	12 x 5/8"	743	84
6"x4"x10"	12 x 5/8"	743	84

Pipe screws, flanges to ASME B16.5 Class 150

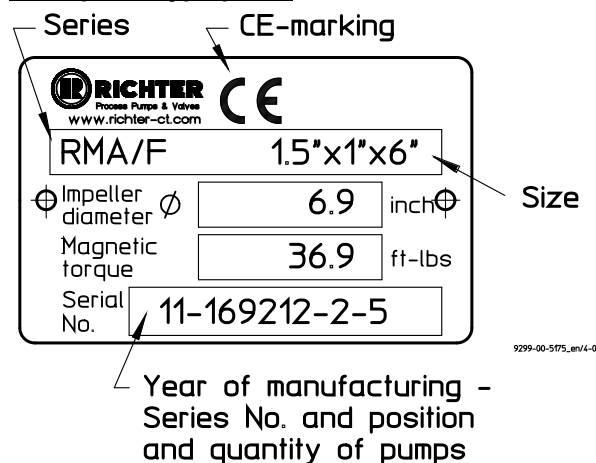
DN [inch]	No. x size [ASME]	Tightening torque	
		[in-lbs]	[Nm]
1"	4 x 1/2"	70	8
1 1/2"	4 x 1/2"	135	15
2"	4 x 5/8"	220	25
3"	4 x 5/8"	400	45
4"	8 x 5/8"	310	35
6"	8 x 5/8"	310	35

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

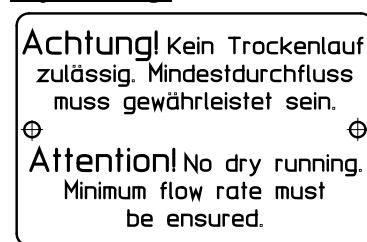
The stainless steel type plate is undetachably riveted to the housing.

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:



Housing identification:

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

- ◆ Nominal size
- ◆ Rated pressure
- ◆ Housing material
- ◆ Manufacturer's identification
- ◆ Melt number/Foundry identification
- ◆ Cast 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
- 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 RMA 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 ball 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.
- ◆ Make sure that the pump is only operated with a medium and not without one.
- ◆ For safe pump operation, we recommend a flow rate which lies between 0.3 and 1.1 Qopt. The maximum operating temperature must never be exceeded. Consult the manufacturer for operation outside this range and observe **Section 2.6.7**.
- ◆ 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**.



Improper 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) can 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 95/C332/06 (ATEX 118a) 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 observe 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.



Also carefully fill auxiliary, heating and cooling systems.

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 also **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 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:



II2GD IIC TX X.

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.

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

At surface temperatures which depend primarily on operating conditions, DIN EN 13463-1 Chapter 9.3 allows no temperature class or temperature to be indicated.

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 ball bearings and, at high medium temperatures, on the surface of the pump housing.

In the case of liquids >40 °C (>104 °F) the surface temperature of the pump housing is generally lower than the temperature of the liquid as the plastic lining has an insulating effect.



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

The non 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.

Table 1 below indicates the admissible medium temperature, depending on the pump design, as a function of the temperature class in accordance with EN 13463-1.

Temperature class acc. to EN 13463-1	Limit value of the temperature of the liquid
	PFA
T6 185 °F (85 °C)	not certified to ATEX
T5 212 °F (100 °C)	
T4 275 °F (135 °C)	125 °C (257 °F) ^{1 2)}
T3 392 °F (200 °C)	150 °C (302 °F)
T2 572 °F (300 °C)	150 °C (302 °F)
T1 842 °F (450 °C)	150 °C (302 °F)

1) Long life grease lubrication : no restriction.

Oil bath lubrication: standard version with shaft seal **T3**
labyrinth seal (special design) **T4**

2) The limit values specified for the temperature of the fluid at the pump inlet are determined for the most unfavourable case (high speed, low flow, low heat capacity of the medium,). 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 ball 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 may prevent excessive temperatures due to hot-running ball bearings, the drive magnet assembly striking the lantern or even defective bearing seals. See **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. cooling, heating) are installed, check to see whether monitoring facilities are required to ensure their function.

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.

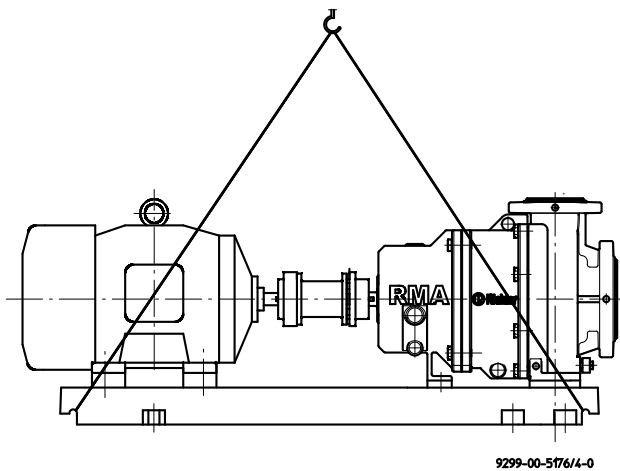


Fig. 1

Directly after receipt of the goods, the consignment must be checked 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, it must be put into proper storage.

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

Elastomers are to be protected against UV light.

In general, a storage period of 10 years should not be 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 measures 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 and 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 RMA correspond to ASME B73.1, ASME B73.3, ISO 15783, ISO 5199. The technical requirements of the VDMA 24279 are satisfied.

The sectional drawings show 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** is inserted in-between.

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

The thrust ring **510/3** is pressed in and has a positive connection with the shaft **222** to prevent it from turning. The shaft **222** is mounted with a positive connection in the can insert **158**.

The impeller **230** and the inner magnet assembly **859** can be separated and can therefore be replaced independently of each other. Both components have a positive connection for power transmission.

The static tightness of the pump is guaranteed by the screw fittings of the bracket **344** and housing **100**. The bearing pedestal gasket **401** and the lips of the can unit are jammed between both 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** guarantees the necessary axial pretension of the radial ball bearings **321**.

Oil bath lubrication:

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

The wavy spring washer **953/1** puts the radial ball bearings under axial pretension.

The oil bath is sealed against the atmosphere by two rotary shaft seals **421/1**, **421/2** and a cover gasket **403**.

The torque is transmitted from the drive shaft **213** through the key **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 into the drive magnet assembly.

In the event of a leak in the can unit, the closed lantern construction offers additional time-limited protection against the medium leaking into the atmosphere.

The drain hole in the lantern is closed with the screw 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 20" (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. 0.08" in/ft (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.

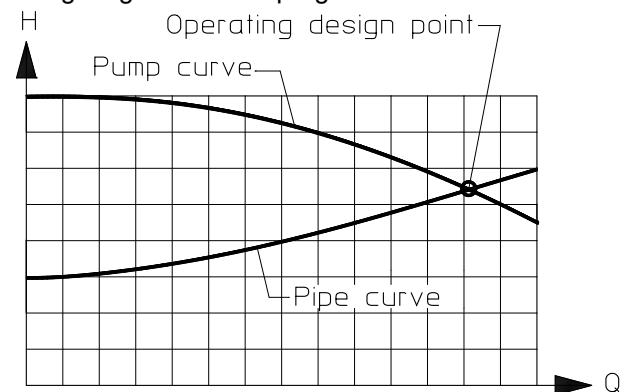
Dirt or damage to the sealing surfaces is best avoided if the flange covers remain on the flanges until just before installation.

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.



9299-00-5009_en/4-0

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.

$$v \text{ (ft/s)} = \frac{Q \text{ (gpm)}}{449 \times A \text{ (ft}^2\text{)}} \quad v \text{ (m/s)} = \frac{Q \text{ (m}^3/\text{s)}}{A \text{ (m}^2\text{)}}$$

The velocity in the suction line should not exceed 6.56 ft/s (2 m/s) and 16.4 ft/s (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 NPSHR available in the plant should be at least 1,64 ft (0,5 m) higher than the NPSHR 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 in accordance with ANSI/HI 9.6.

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.

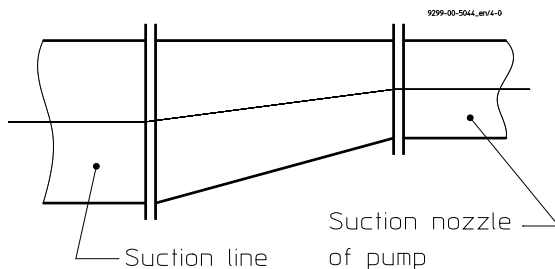


Fig. 3

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**.

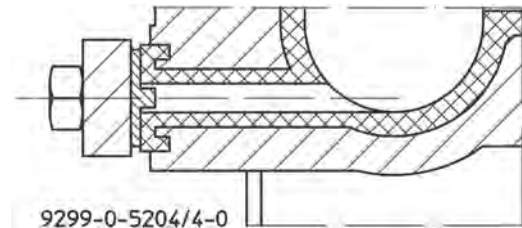


Bild 4

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

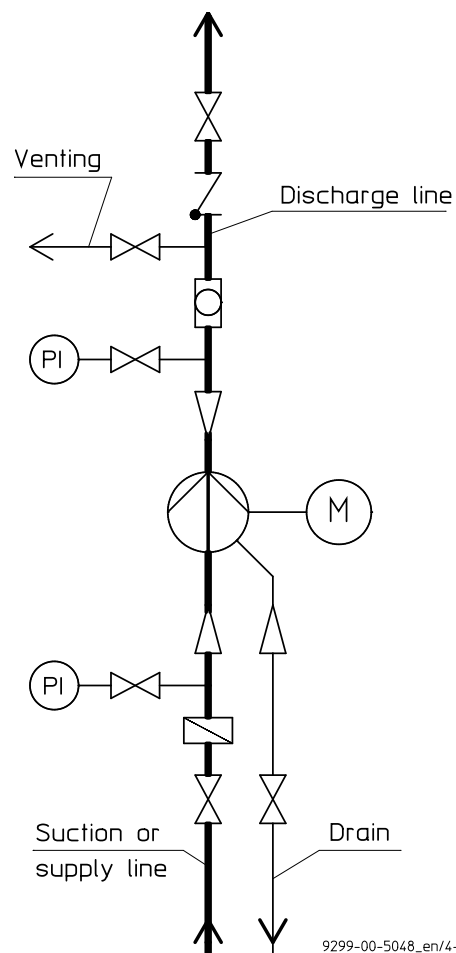


Fig. 5

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 meet requirements acc. to ANSI/HI resp. ISO 5199. During start-up the magnetic drive could otherwise stop.

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

If the motor rating exceeds this magnetic drive rating – at nominal 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 nominal 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**.

Observe the **operating manual of the motor manufacturer**.



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 must be ensured that the coupling guard used is either made of spark-free material or the impact test required by the EN 13463 is satisfied without any reservations.

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 8 (IEC, VDE, etc.).



Allow only a trained electrician to perform the electrical connection.

Compare the existing mains voltage with the indications on the motor's manufacturer's nameplate and choose a suitable circuit.

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



Danger of explosion if the electrical installation is incorrect.



In areas at risk of explosion, 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 toothed lock washer 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 ball 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 proceed 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 should 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.

Siehe auch **Kapitel 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)



Improper 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) can result from these inadmissible modes of operation; their occurrence can only be prevented by adhering to the intended use.

Pump is started up without medium :

- ♦ If no heat is dissipated, damage to the inner and drive magnet assemblies may occur.

Pump is started up without medium :

- ♦ The plain bearing 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 opened too much :

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

Discharge valve closed 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. 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-relevant screw fittings

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, point 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 158 °F (70 °C) and under no circumstances 176 °F (80 °C).

If higher temperatures do occur, 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 ball bearings of the series 2RS are installed as standard features. The grease is lithium-saponified. The admissible temperature range is – 22 °F und 230 °F (- 30 °C und + 110 °C).

The ball 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	6207-2RS / 17500 hr*
Group 2	6210-2RS / 17500 hr*

* at bearing temperature < 122 °F (< 50 °C)
at bearing temperature 158 °F (70 °C) approx. 10000 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 ball bearings.

7.2.2 Oil bath lubrication

We recommend a mineral oil with the following characteristics for an expected bearing temperature up to 158 °F (70 °C).

Viscosity index : appr. 85

Kinematic viscosity at 104 °F (40 °C): appr. 40 $\frac{\text{mm}^2}{\text{s}}$

A fully synthetic gear oil to ISO VG 220 is to be used for temperatures below – 4 °F (– 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 up to 122 °F (50 °C).

Every 6 months at bearing temperatures up to 158 °F (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.



In potentially explosive works it is advisable to monitor the condition of the ball 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 ball bearings to a fraction of the normal service life.

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

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 pacemaker

Keep torso at a minimum distance of **20" (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.

- ♦ Undo the support bracket **183** from the base plate. The bearing pedestal and support bracket are one component in bearing group 1. In bearing group 2 the support bracket **183** is attached with 2 hex. screws **901/2** and contact discs **557/2** to the bearing pedestal. **330**.

If the housing **100** remains in the plant, leave the housing gasket **401** 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 bracket/bearing pedestal.
- ♦ Remove bearing pedestal **330** from the centering of the bracket **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 operating torque of the magnetic coupling installed is specified on the type plate.

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 of 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 seal **421/2** from the bearing pedestal **330** resp. the rear bearing cover **361**.

7.6.4 Dismantling of 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.
- ◆ Raise 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 plain bearing parts fall down. **Risk of breakage!**

- ◆ Remove the shaft **222** and thrust ring **510/3** from the can insert **158**. Insert a suitable tool, e.g. a scribing tool, behind the thrust ring and pull it out by repeatedly inserting the tool.
- ◆ Remove housing gasket **401**.
- ◆ Raise inner magnet assembly **859** vertically with the impeller **230**. The wear ring **502/1** is removed from the housing **100** at the same time.
- ◆ Remove thrust ring **510/2** using a screwdriver.
- ◆ Press the bearing bushes **545** and distance ring off the impeller from the suction side. Use a suitable mandrel made of plastic.
Alternatively, the pull-off device can also be used. See assembly aids in **Chapter 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.
- ◆ Press impeller **230** out of 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 dismantling device can also be used. See assembly aids in **Chapter 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

- ◆ 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** of the connection bracket/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 further procedure, see **Section 7.6.2**.

7.7 Notes on assembly

- ◆ Use original spare parts. See also **Section 2.4**.
- ◆ Do not use 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; perform a trial assembly if required.
- ◆ We recommend that the housing gasket **401**, the cover gasket **403** (oil bath lubrication) and the shaft sleeve **523/1** be replaced during every new assembly.
- ◆ The circlip **932/7** must **always** be replaced.
- ◆ 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.
- ◆ A complete assembly process is described in the following.
Sub-sections can be deduced from this.
See also **Section 7.5**.

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.

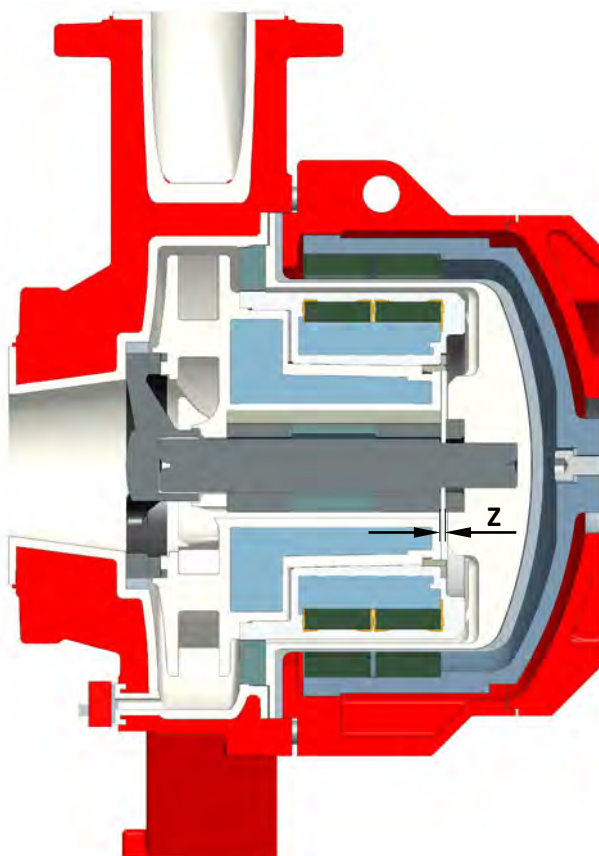


Fig. 6

Size	Dimension Z inch (mm)
1.5"x1"x6"	...0,02 - 0,06 (0,5 - 1,5)
3"x1.5"x6"	
3"x2"x6"	
1.5"x1"x8"	
3"x1.5"x8"	
3"x2"x8"	
4"x3"x8"	
3"x2"x10"	
4"x3"x10"H	
6"x4"x10"	

Z : required axial play of the plain bearings.

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.



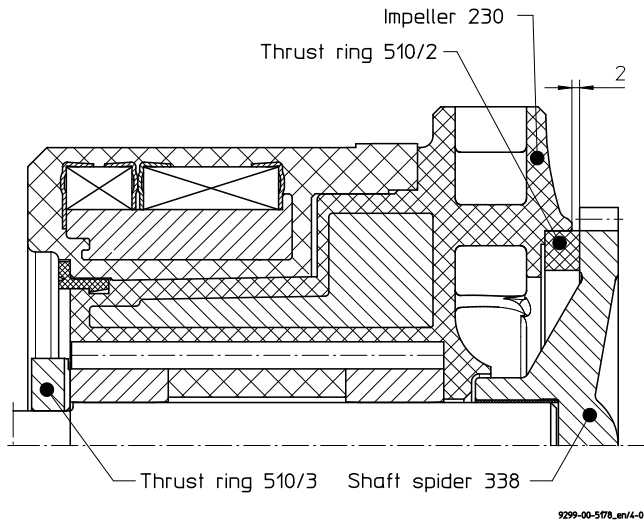
**The pressing force must only be applied over the sliding surface of the shaft spider.
(risk of the silicon carbide breaking)**

- ◆ 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** and then the bearing bush **545/2**.

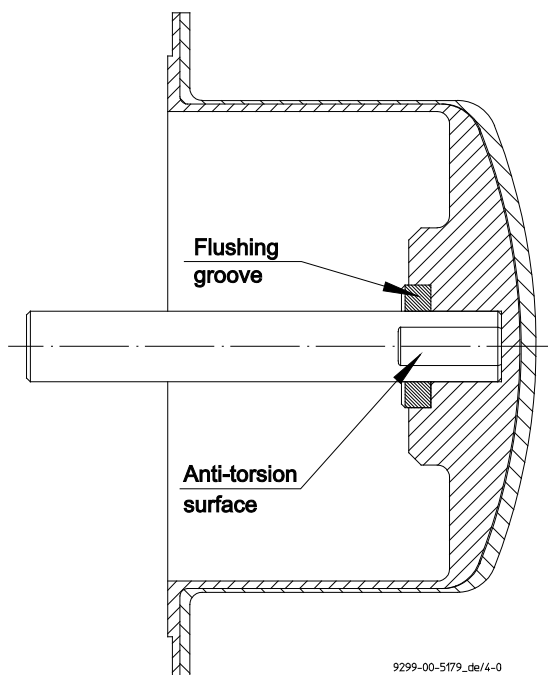
- ♦ Carefully press the thrust ring **510/2** into the impeller **230** right to the stop. When doing so, pay attention to the correct position of the anti-torsion insert grooves in relation to the carrier webs in the impeller **230**.
- ♦ Check whether the thrust ring protrudes about 2 mm out of the impeller. See **Fig. 7**.

**Fig. 7**

- ♦ Join can **159** and can insert **158**. To simplify assembly, the can insert **159** may be cooled if necessary.
- ♦ Insert thrust ring **510/3** into the can insert **158**. While doing so, make sure that the flushing grooves are facing outwards.
- ♦ Press shaft **222** into the can insert **158**.



CAUTION: Align shaft in relation to the flat pivot point in the thrust ring (risk of the silicon carbide breaking)

**Fig. 8**

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 keys **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 = 150 in-lbs (17Nm)
Tightening torque group 2 = 177 in-lbs (20Nm)
- ♦ Check fit of drive magnet assembly **858** / drive shaft **213**.
Put 1 drop of adhesive onto the thread of the drive shaft, e.g. Loctite 243 or equivalent.
Only one drop of the adhesive should be applied. Otherwise, the next dismantling process will be more difficult or no longer possible without causing damage.
- ♦ 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 = 150 in-lbs (17Nm)
Tightening torque group 2 = 265 in-lbs (30Nm)

7.8.4 Assembly of drive unit oil bath lubrication

- ♦ Press radial ball bearings **321/1** and **321/2** onto the drive shaft.
- ♦ Insert keys **940/1** into the drive shaft.
- ♦ Insert rotary shaft seal **421/2** into the bearing pedestal **330**.
- ♦ Push pre-assembled drive shaft 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 = 150 in-lbs (17Nm)
Tightening torque group 2 = 177 in-lbs (20Nm)
- ♦ To proceed, see **Section 7.8.3**.

7.8.5 Final assembly

- ◆ Deposit the housing **100** on a workbench, for example, with the suction nozzle facing downwards. In doing so, protect the plastic sealing strip against damage with a suitable base.
- ◆ Insert housing gasket **401** 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 pre-assembled can unit. The lip of the can insert **158** must rest on the housing gasket **401**.



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**.
- ◆ If the minimum axial play is not attained, insert another housing gasket **401**.
- ◆ Insert pre-assembled drive unit into the centering of the bracket **344**.



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



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 provided in the drive shaft to accommodate a crane lug.
- ◆ Tighten screws **901/5**.
Tightening torque group 1 = 40Nm
Tightening torque group 2 = 55Nm
- ◆ Check whether the drive shaft can be easily turned.
- ◆ Press plugs into the forcing-off bores.
- ◆ Attach support bracket **183** (with bearing pedestal group 2), align and tighten.

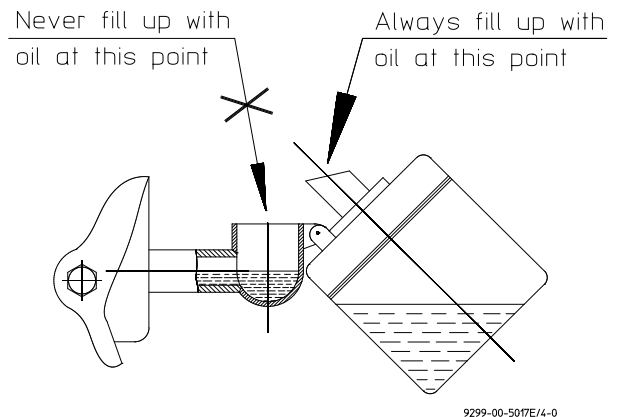
7.8.6 Fill bearing pedestal with oil

Oil quantities:

For group 1 appr. 17 oz (500 ml)
For group 2 appr. 50 oz (1460 ml)

Groups see **Section 1**.

See **Section 7.2.2** for the type of oil.



9299-00-507E/4-0

Fig. 9

Procedure for filling with oil:

- ◆ Tilt constant level oiler **638/1**.
- ◆ Fill the oiler with oil.
- ◆ Swing the constant level oiler into the vertical position.
- ◆ If the oil level still falls too much, pour more oil into the oiler.

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. Improper 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) can 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 ball 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 ball 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 drawings

9.1 Legend

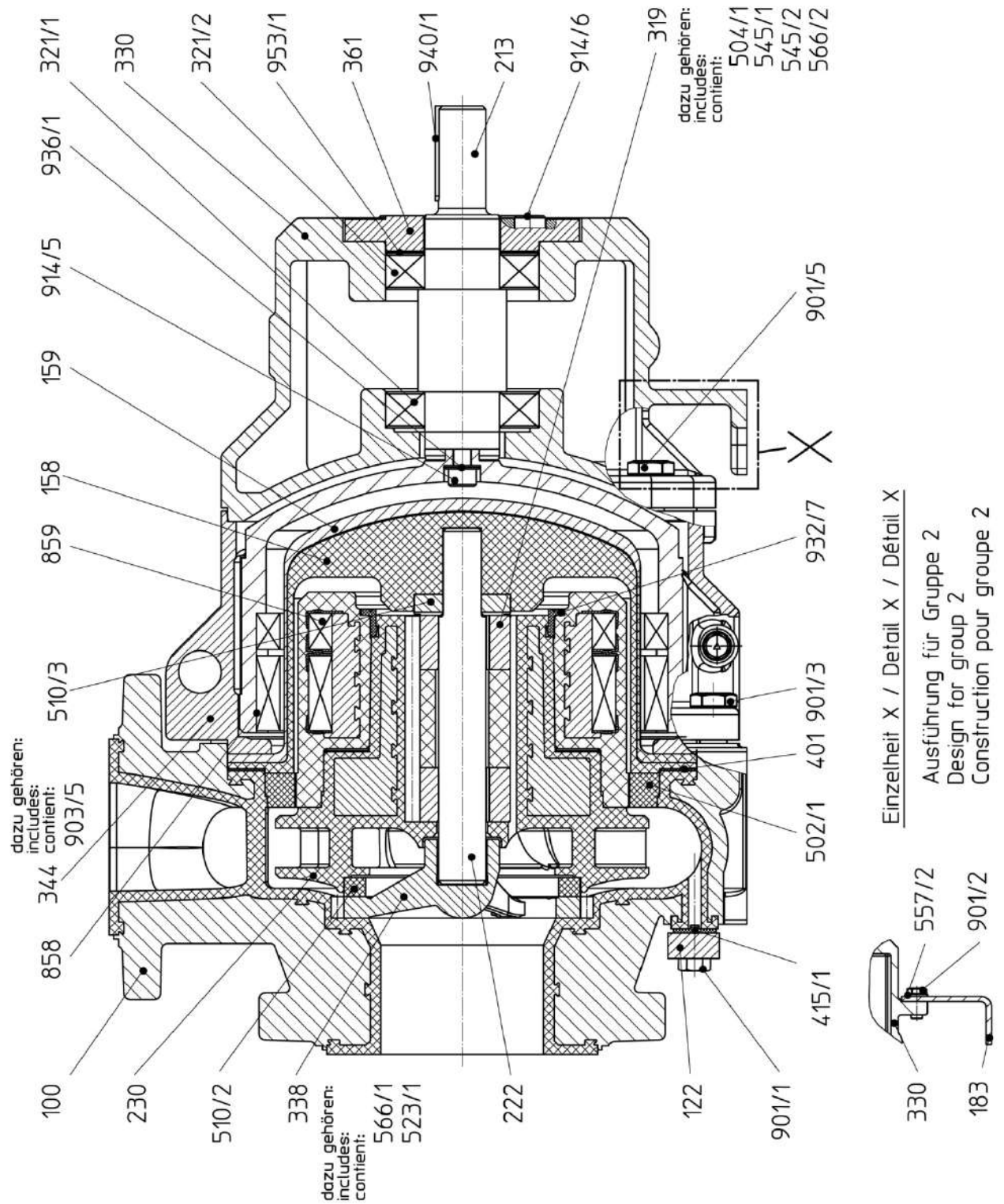
100	casing (housing)
122	blind cover
158	containment shell insert (can insert)
159	containment shell (can)
183	support bracket (group 2)
213	drive shaft
222	shaft
230	impeller
319	impeller bearing
includes	
504/1	distance ring
545/x	bearing bush (plain bearing bush)
566/1	anti-torsion insert
321/x	radial ball bearing
330	bearing pedestal
338	shaft spider
includes	
523/1	shaft sleeve
566/1	anti-torsion insert
344	lantern
903/5	Screw plug
361	rear bearing cover
401	housing gasket
415/1	centering gasket
502/1	solids restriction ring outside
510/x	thrust ring

557/2	contact disc (group 2)
566/x	anti-torsion insert
858	drive magnet assembly
859	inner magnet assembly
901/x	hex. screw
901/2	hex. Screw (gr. 2)
914/x	hex. socket screw
932/7	circlip
936/1	toothed lock washer
940/1	key
953/1	wavy spring washer

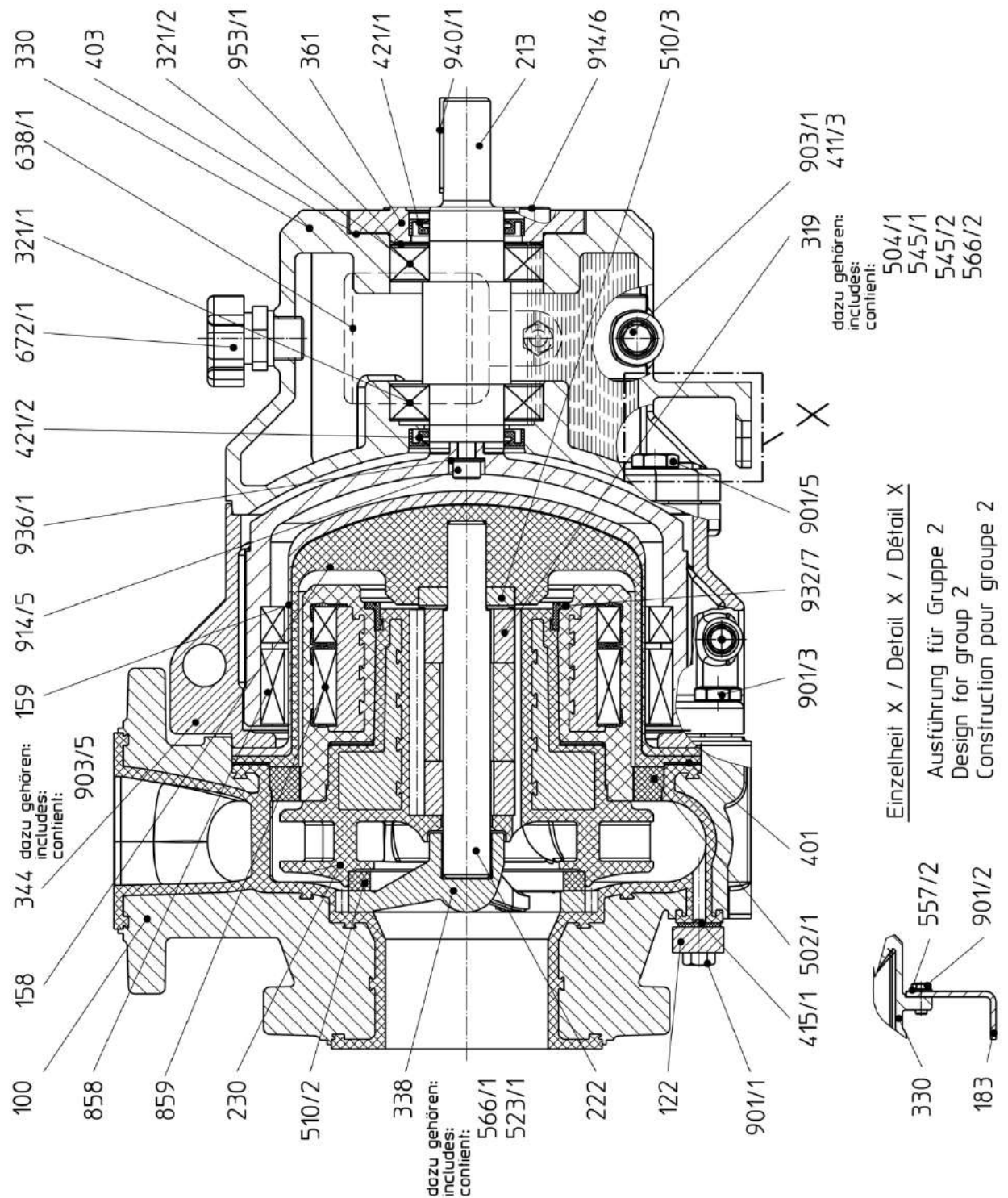
Additional for oil bath lubrication

403	cover gasket
411/3	seal ring
421/x	rotary shaft seal
638/1	constant-level-oiler
672/1	venting/filling plug
903/x	screw plug

9.2 RMA long life grease lubrication



9.3 RMA oil bath lubrication



10 Assembly aids

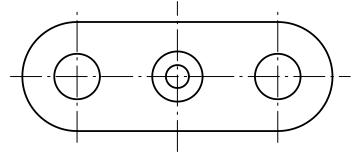
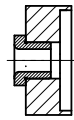
10.1 Boring template for housing drain

Pump size

Group 1+2

Ident. No.

9217-89-1096



9299-00-5039/4-0

10.2 Pull-off device for plain bearing bushes

Pump size

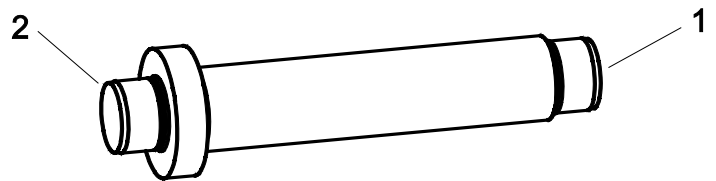
Group 1

Group 2

Ident. No.

9428-81-1085

9428-81-1086



Product description

If the plain bearing bushes are to be replaced, we recommend the use of a special device. This auxiliary device is specifically designed for the sensitive silicon carbide components.

Application

Remove bearing bushes:

- ◆ 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 bushes:

- ◆ 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 inserted (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

Group 1

Group 2

Ident. No.

9427-89-1001

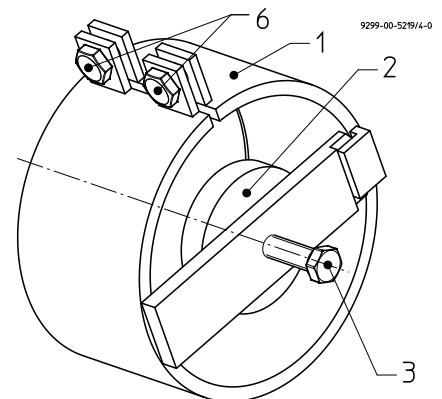
9427-89-1003

Product description

Serves to dismantle the inner magnet assembly and impeller.
Consists of clamping tube and plate for pushing out the impeller.

Application

- ◆ The circlip in the notch must be cut open. See Chapter 7.6.4.
- ◆ Press the device with the clamping tube (1) over the inner magnet assembly.
- ◆ Tighten the two hex. screws (6) with about 30 Nm.
- ◆ Using the hex. screw (3), turn the plate (2) against the impeller and press the impeller off.

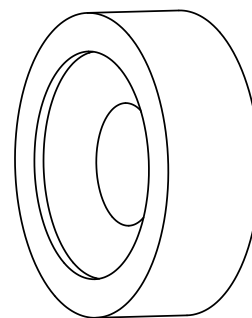


10.4 Insertion tool for shaft spider

Pump size	Ident. No.
Impeller eye 1,5"	9428-81-1055
Impeller eye 3"	9428-81-1056
Impeller eye 3" Gr2	9428-81-1057
Impeller eye 4"	9428-81-1058
Impeller eye 6"	9428-81-1088

Product description

Application

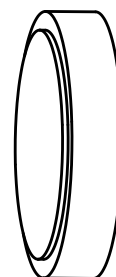


10.5 Insertion tool for rotor circlip

Pump size	Ident. No.
Group 1	9428-81-1053
Group 2	9428-81-1054

Product description

Application



Baureihe/Series/Série

Ausführung

Magnetkupplungspumpe

RMA
RMA-B

Design

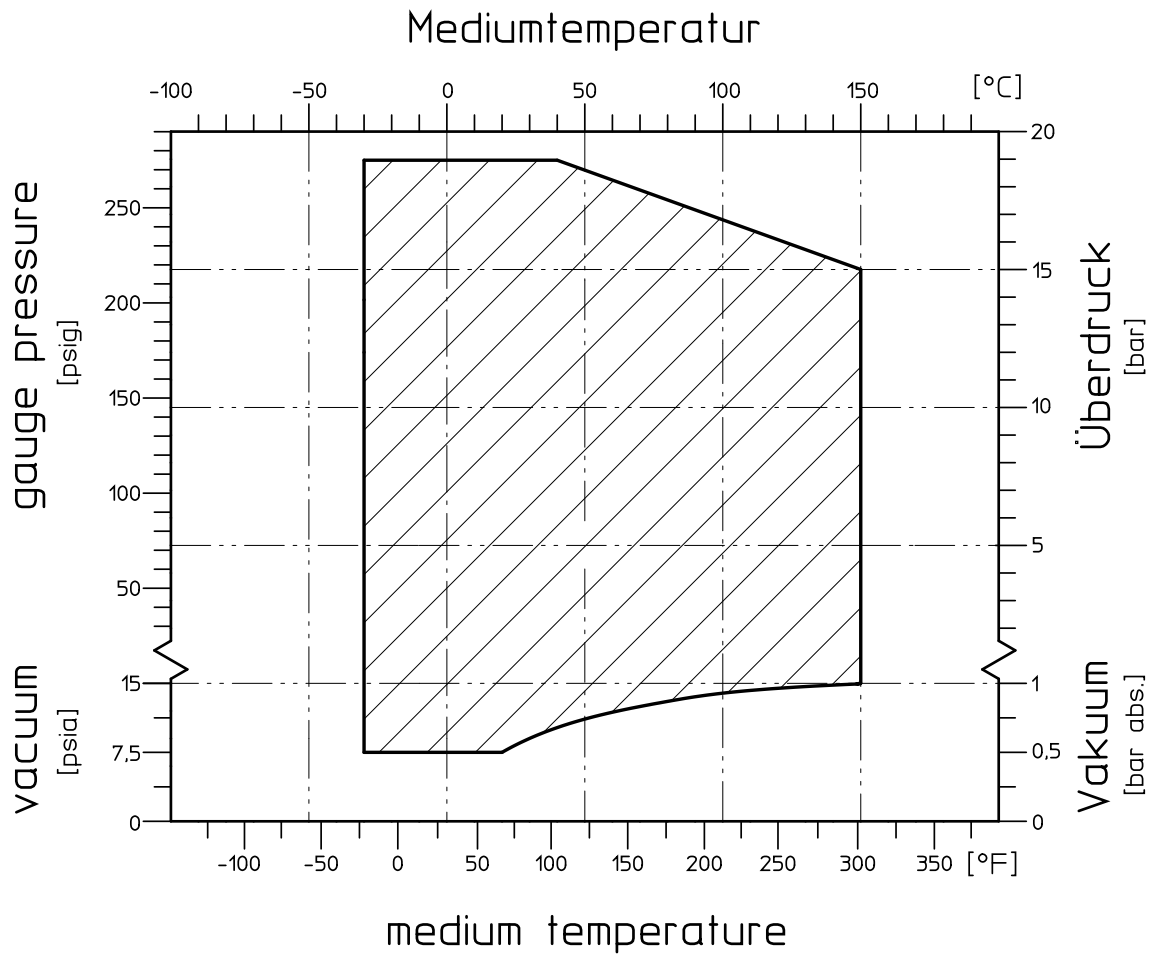
Magnet drive pump

Construction

Pompe à entraînement magnétique



Einsatzgrenzen / operating limits



Modification techniques possibles sans réservations!
Graphique non à l'échelle!
Dimensions variables uniquement revêtues d'une signature!

This leaflet is subject to alteration!
Drawing not to scale!
Certified for construction purposes only when signed!

Technische Änderungen vorbehalten!
Nicht maßstäblich!
Maße nur mit Unterschrift verbindlich!

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

Produkt	Magnetkupplungs-Chemiekreiselpumpe freies Wellenende, Blockausführung oder als Aggregat ¹⁾		
Product	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, MNKA, MNKA-B MPB, MDK, MDK-B, RMA, RMA-B, RMI, RMI-B		
Seriennummer Serial number	ab 29.12.2009 from 29.12.2009		
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, DIN EN 809, DIN EN ISO 5199, ISO 15783, ISO 2858, ASME B73.1, ASME B73.3	Angewandte nicht harmonisierte Normen Applied not harmonised Standards	DIN EN 13463-1 ¹⁾

¹⁾ Die hier und in der Dokumentation zum Produkt genannte Norm DIN EN 13463-1 wurde durch eine neue harmonisierte Ausgabe ersetzt. Der Hersteller hat diese Normen verglichen und erklärt für das Produkt weiterhin die Übereinstimmung mit den Anforderungen der Richtlinie 2014/34/EU, da sich durch den Übergang von der EN 1346-1ff auf die EN ISO 80079-36ff keine wesentliche technische Änderung bezüglich grundlegender Sicherheitsanforderungen ergeben hat und der „Stand der Technik“ weiterhin erfüllt ist. Die „Wesentlichen Gesundheits- und Sicherheitsanforderungen“ der Richtlinie 2014/34/EU werden auch weiterhin erfüllt.

¹⁾ The standard DIN EN 13463-1 mentioned here and in the product documentation has been replaced by a new harmonized edition. The manufacturer has compared these standards and continues to declare that the product complies with the requirements of Directive 2014/34 / EU, as the transition from EN 1346-1ff to EN ISO 80079-36ff does not entail any significant technical change with respect to essential safety requirements has yielded and the "state of the art" is still satisfied. The "Essential Health and Safety Requirements" of Directive 2014/34 / EU will continue to be met.

Kennzeichnung	2006/42/EG	2006/42/EC	 (Ex) II 2 GD IIC TX X ²⁾
Marking	2014/34/EU	2014/34/EU	

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 #	Baureihe Series	Registrier-Nr. Registered #
MNK	02ATEXD032	MNKA	04ATEXD007	RMA	09ATEXD062
MNK-B	03ATEXD006	MNKA-B		RMA-B	09ATEXD062
MNK-X	02ATEXD032	MPB	03ATEXD068	RMI	10ATEX D076
MNKXB	03ATEXD006	MDK	02ATEXD009	RMI-B	10ATEX D076
MNK-S	02ATEXD032	MDK-B	03ATEXD008		
MNK-SB	03ATEXD006				

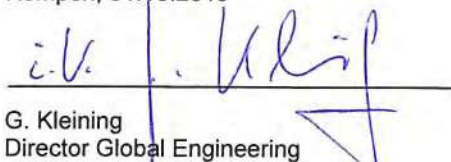
Das Unternehmen Richter Chemie-Technik GmbH bescheinigt hiermit, dass die o.a. Baureihen die grundsätzlichen Anforderungen der aufgeführten Richtlinien und Normen erfüllt.

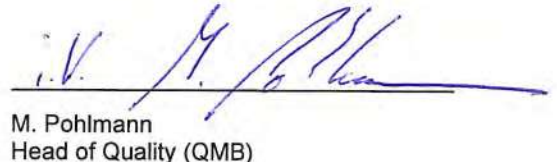
Richter Chemie-Technik GmbH confirms that the basic requirements of the above specified directives and standards have been fulfilled.

Bevollmächtigt für die Zusammenstellung der technischen Unterlagen nach 2006/42/EG: M. Pohlmann
Authorised person compiled the technical files according to 2006/42/EC:

²⁾ Gilt nicht für das Aggregat nach 2014/34/EU
²⁾ Not valid for the unit according to 2014/34/EU

Kempen, 31.10.2019


G. Kleining
Director Global Engineering


M. Pohlmann
Head of Quality (QMB)

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

Produkt <i>Product</i>	Magnetkupplungs-Chemiekreiselpumpe als Aggregat <i>Magnetic Drive Chemical Centrifugal Pump as unit</i>
Baureihe <i>Series</i>	MNK, MNK-B, MNK-X, MNK-XB, MNK-S, MNK-SB, MNKA, MNKA-B MPB, MDK, MDK-B, RMA, RMA-B, RMI, RMI-B
Seriennummer <i>Serial number</i>	ab 29.12.2009 <i>from 29.12.2009</i>
EU-Richtlinien <i>EU-Directive</i>	2006/42/EG Maschinenrichtlinie, Anhang II, Nr. 1 A <i>2006/42/EC Machinery Directive, Annex II, No. 1 A</i>
Modul	Interne Fertigungskontrolle <i>Production Quality Assurance</i>
Angewandte harmonisierte Normen <i>Applied harmonised Standards</i>	DIN EN ISO 12100, DIN EN 809 DIN EN ISO 5199, ISO 15783, ISO 2858 ASME B73.1, ASME B73.3
Kennzeichnung <i>Marking</i>	2006/42/EG 2006/42/EC

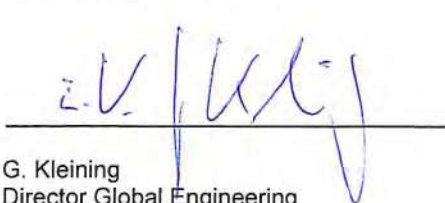
CE

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.

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

M. Pohlmann

Kempen, 23.08.2019


G. Kleining
Director Global Engineering


M. Pohlmann
Head of Quality (QMB)

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

Every aggregate has to have it's own declaration.

Contractor/dep./institute :		Reason for transmitting ☒ Please mark the applicable	
Street :		Repair: ☐ subject to fee ☐ Warranty	
Postcode, city :		Austausch: ☐ subject to fee ☐ Warranty ☐ Exchange/ Replacement already initiated/received	
Contact person :		Return: ☐ Leasing ☐ Loan ☐ 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	Contamination :	no ¹⁾	yes
Was it in operation ?	☐	☐	☒	toxic	☐	☐
Drained (product/operating supply item) ?	☒	☐	☐	caustic	☐	☐
All openings hermetically locked!	☒	☐	☐	flammable	☐	☐
Cleaned ?	☒	☐	☐	explosive ²⁾	☐	☐
If yes, with which cleaning agent:				mikrobiological ²⁾	☐	☐
and with which cleaning method:				radioactive ³⁾	☐	☐
¹⁾ if "no", then forward to D.				other pollutant	☐	☐

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)										
<table style="width: 100%;"> <tr> <td style="width: 35%;">X Trade name:</td> <td style="width: 65%;">Chemical designation:</td> </tr> <tr><td>a)</td><td></td></tr> <tr><td>b)</td><td></td></tr> <tr><td>c)</td><td></td></tr> <tr><td>d)</td><td></td></tr> </table>	X Trade name:	Chemical designation:	a)		b)		c)		d)	
X Trade name:	Chemical designation:									
a)										
b)										
c)										
d)										

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

QM-Nr.: 0912-16-2001 de/4-07

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



Edition 11/2018
Revision 01
9450-050-en

Richter = TM Richter Chemie-Technik GmbH; IDEX = TM IDEX Corporation