# INSTALLATION AND OPERATING MANUAL

Translation of the original manual

## Series MNK

# Sealless Chemical Magnetic Drive Pump

## Bearing lubrication: Long life grease, grease and oil bath

## Bearing pedestal group: 4


**Keep for future use!**

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



**9230-053-en** Revision 11 Edition 07/2010

RICHTER
Process Pumps & Valves

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# Relevant documents

- Data sheet
- Works certificate
- Sectional drawing
  Long life grease lubrication 9230-00-3030
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- Dimensional drawing 9230-00-3034
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**Appendix to the operating manual**

- Operational limits 9230-00-3041
- Declaration of conformity with ATEX
- Declaraton 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“

* if contained in the scope of delivery

# 1 Technical data

**Manufacturer :**

Richter Chemie-Technik GmbH
Otto-Schott-Str. 2
D-47906 Kempen
Telephone: +49 (0) 2152 146-0
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E-Mail: richter-info@idexcorp.com
Internet: http://www.richter-ct.com

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

**Designation :**

Single-stage, plastic-lined, magnetic drive chemical centrifugal pump, series MNK 200-150-315, long life grease, grease and oil bath lubrication.

Heavy-duty horizontal design, sealless, free of eddy currents

Technical specifications to ISO 15783 and DIN 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, PN 25 or flanges drilled to ASME 16.5, Class 150

ATEX 95 Directive 94/9/EC

Machine Directive 2006/42/EC

**Materials :**

Pressure-bearing parts:
ductile cast iron EN-JS 1049 to DIN EN 1563 (0.7043 DIN 1693), carbon fibre composite material

Wetted parts:
PFA, PTFE, PE, SSiC, FFKM,
see also data sheet

**Flow rate :** up to 600 $m^3/h$

**Delivery head :** up to 60 m LC (at 2000 $min^{-1}$)

**Housing discharge pressure :** max. 25 bar
detailed data see operational limits

**Temperature range :** - 60 °C to + 150 °C

Note: Consult the manufacturer for higher pressures and lower or higher temperatures.

**Temperature classes :** see Section 2.6.7.

**Admissible ambient conditions for pumps acc. to directive 94/9/ EG (ATEX 95) :**

**Ambient temperature range:** - 20 °C to + 40 °C
(higher temperature after consulting the manufacturer)
**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:** 200-150-315

**Weight :** See data sheet

**Dimensions :** See installation drawing

## 1.1 Tightening torques

Screws greased, tighten in diametrically opposite sequence

**Housing screws 901/3**

| Housing discharge pressure | No. x size [DIN/ISO] | Tightening torque [Nm] |
|---|---|---|
| PN16 | 16 x M 20 | 125 |
| PN 25 | 16 x M 20 | 170 |
| 150 lbs | 16 x M 20 | 145 |

**Pipe screws**, flanges to DIN/ISO

**PN 16**

| DN [mm] | No. x size [DIN/ISO] | Tightening torque [Nm] | [in-lbs] |
|---|---|---|---|
| 150 | 8 x M 20 | 65 | 575 |
| 200 | 12 x M 20 | 100 | 885 |

**Pipe screws**, flanges to DIN/ISO

**PN 25**

| DN [mm] | No. x size [DIN/ISO] | Tightening torque [Nm] | [in-lbs] |
|---|---|---|---|
| 150 | 8 x M 24 | 100 | 885 |
| 200 | 12 x M 24 | 115 | 1018 |

**Pipe screws**, DIN/ISO flanges drilled to ASME

**150 lbs**

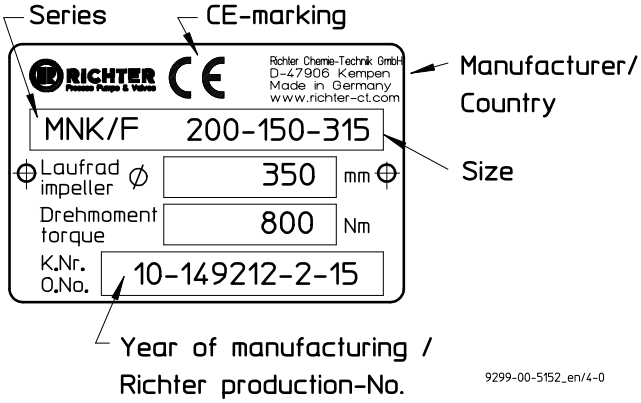
| DN [mm] | DN [inch] | No. x size [ASME] | Tightening torque [Nm] | [in-lbs] |
|---|---|---|---|---|
| 150 | 6“ | 8 x ¾“ | 80 | 708 |
| 200 | 8“ | 8 x ¾“ | 115 | 1018 |

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

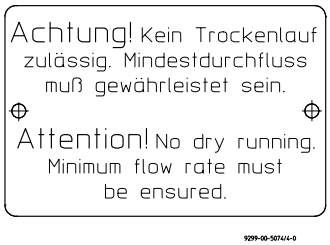
The stainless steel type plate is firmly riveted to the housing:

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:**


**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 Notes on 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.

In addition to the general notes on safety under the main heading “Safety”, special notes on safety are included at other points and must be observed.

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 MNK 200-150-315 is a plastic-lined magnetic drive centrifugal pump for the leak-free conveyance of aggressive, toxic, pure and inflammable liquids.

The pump is equipped with a permanent magnetic synchronous drive.

The pump is intended for horizontal installation.

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**):

- It must be ensured that the pump is always filled with liquid during operation.
- 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.

This unit must not be operated above the values specified in the data sheet as regards the fluid to be conveyed, flow rate, speed, density, delivery head and operating temperature as well as the motor rating.

**The instructions contained in the operating manual or contract documentation must be observed; 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 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.
- Hot or cold machine parts must be protected by the customer against being touched.
- No protective facilities may be removed when the machine is in operation.
- Hazards due to electricity are to be excluded.
- Leaks of hazardous media (e.g. explosive, toxic, hot) must be removed so that no risk arises for people and the environment. The statutory provisions are to be observed.

Caution when using the units in potentially explosive area!
Inadmissible modes of operation must be prevented.

## 2.3 For maintenance

In principle, work on the unit may only be performed when it is at a standstill.

It is imperative to observe the procedure for stopping the machine described in this operating manual. See **Section 6.3**.

Pumps which convey media which are a health hazard must be decontaminated.

Directly on completion of the work all safety and protective facilities must be mounted and activated again.

In the assembled state, if the safety notes (see also **Section 5.1 and 7.5.2**) are observed, the magnetic drives do not cause any risks or have any affect on the environment.

During dismantling and assembly as well as during transport and storage of the magnetic drives as single components, the notes on safety in **Section 7.5.2** must be observed.

The points listed in **Section 6.1** must be followed before 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.

Original spare parts and accessories authorised by the manufacturer serve to enhance safety.

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 version the plain bearings are lubricated and cooled by the internal flushing circuit.

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. Provide 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 evacuation if the lining of the pump is non-conductive. See **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.

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

We would like to point out that the surface temperature of the pump housing is only slightly below the medium temperature.

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.

**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.

Table 1

| Temperature class acc. to EN 13463-1 | | Limit value of the temperature of the liquid | |
|---|---|---|---|
| **Lining material** | | PE | PFA/PTFE |
| **Can material 2)** | | CFK-F | CFK-F |
| **T6** | (85 °C) | **not certified to ATEX** | |
| **T5** | (100 °C) | | |
| **T4** | (135 °C) | 90 °C 1) | 125 °C 1) |
| **T3** | (200 °C) | 90 °C | 150 °C |
| **T2** | (300 °C) | 90 °C | 150 °C |
| **T1** | (450 °C) | 90 °C | 150 °C |

1) Long life grease-lubricated rolling bearings: No restrictions.
Regreasable rolling bearings: Standard design with rotary shaft seal
T4 only applies to operation up to 1750 rpm

2) The can material has been list in the data sheet.

**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

For safe and reliable operation, it must be ensured with regular inspection intervals that the unit is properly serviced and kept in a perfect technical condition.

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 **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 and storage

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 the motor can be suspended from the crane hook lug 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.

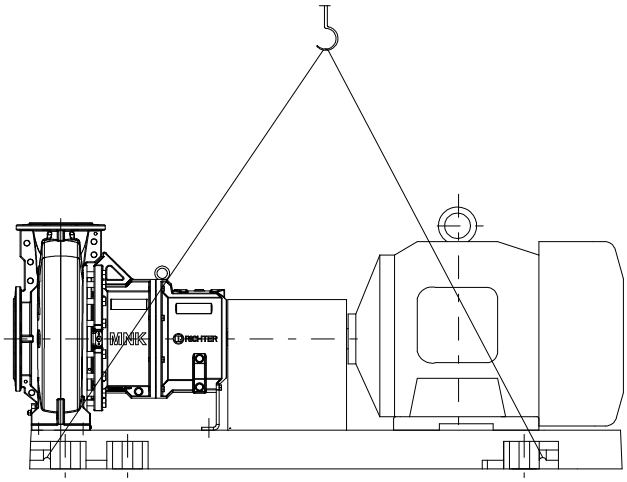


**Fig. 1**

**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.

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 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 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 MNK 200-150-315 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 10.1**.

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 bearing bushes **545** and axial bearing **314** are secured against turning in the plain bearing pedestal.

The bearing sleeves **529/1** are in the impeller, resp. **529/2** in the inner magnet assembly secured against turning.

The bearing bushing **529/2** has an additional form closure in the “lemon shape” along with the anti-twist device. This increases the transmissible torque.

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

The plain bearing pedestal **339** separates the hydraulic section of the pump from the can area. Both chambers are connected by flushing bores in the plain bearing pedestal so that an internal flushing circuit is formed owing to the pressure differences. This circuit serves to flush and cool the plain bearings.

**Only oil bath lubrication**

The bearing pedestal **330** contains radial ball bearings **321/1, 321/2,** which are lubricated by an oil bath. This oil bath is sealed by means of the shaft seals **421/1**, **421/2** and the o-ring **412/1.**

Special designs:

- A vacuum-proof can unit is produced by gluing the can to the can insert.

The can chamber is also vented and evacuated through the bores in the plain bearing pedestal.

Additional information is provided in the brochure.

# 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.

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.

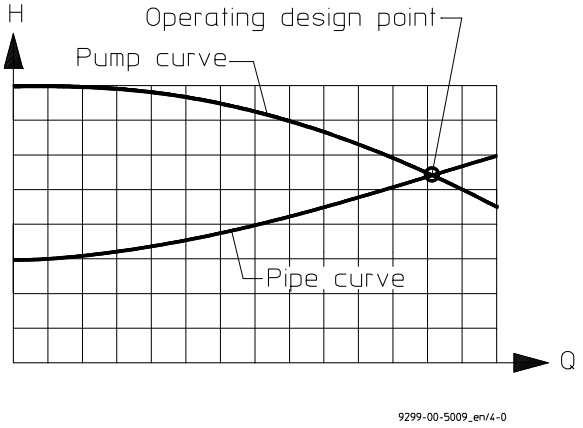



**Fig. 2**

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 2.0 m/s and 5.0 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 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 ISO 5199.

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.

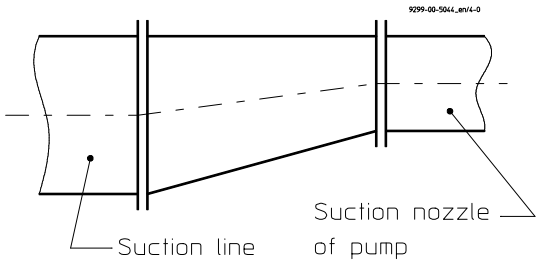



**Fig. 3**

### 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.

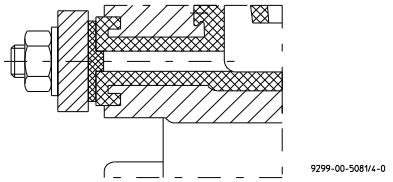



**Fig. 4**

## 5.5 Pipe fittings

The following pipe fittings are available from Richter on request:

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

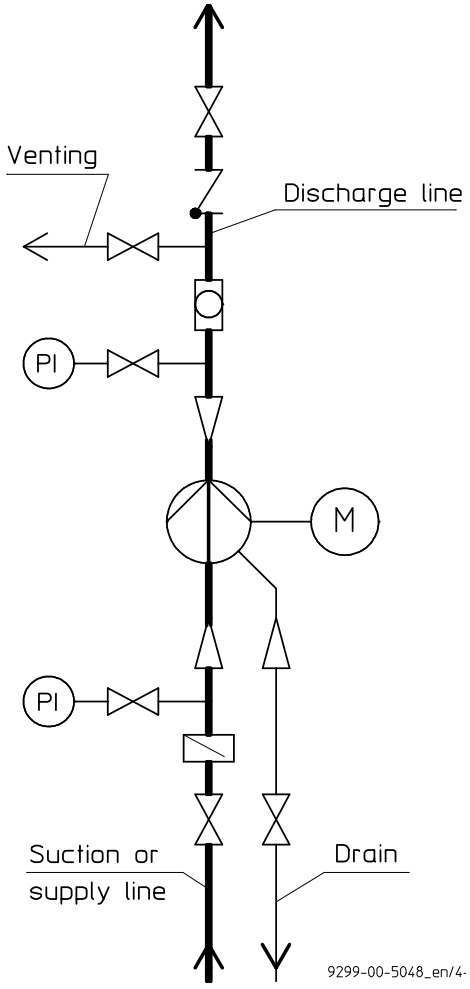



**Fig. 5**

## 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
- Temperature monitors
- Rolling bearing monitors
- Can monitors
- Leak monitors
- SAFERUN® Condition Monitoring System

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. During start-up the magnetic drive could otherwise stop.

The magnetic drive rating at the required 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 pump 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.

## 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 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 made, there could still be residual amounts of water in the pump. This must be noted in view of a possible reaction with the medium.

**Long life grease and grease lubrication**

A difference is made between long-life-grease lubricated and regreasable rolling bearings.

- If there are grease nipples on the bearing pedestal, the rolling bearings must be regreased. See **Section 7.2.2**.
- If there are no grease nipples, the rolling bearings have long-life grease lubrication. Regreasing is not possible and not necessary. See **Section 7.2.1**.

**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 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.

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)

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 :**

- The plain bearing in the pump may be destroyed.
- Other pump components may be destroyed due to overheating.

**Operation with magnetic drive stopped:**

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

**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.

**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 Screw connections of the housing

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

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 it is also recommended to measure vibration in order to detect bearing wear in good time

### 7.2.1 Long-life grease lubricated rolling bearings

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 4 | 6314-2RS / 15000 hr* |

* at bearing temperature <50 °C
at bearing temperature 70 °C approx. 7500 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 Regreasable rolling bearings

Optionally, the bearing pedestal can be provided with regreasable rolling bearings. In this case there are grease nipples on the bearing pedestal by means of which regreasing must be performed both initially and every 5000 hours of operation.

For this purpose we recommend the use of 100 $cm^3$ of SKF lubricating grease type LGWA 2.

Mixing with other lubricants should definitely be avoided.

The bearing service life is >17,500 hours of operation assuing proper lubrication.

### 7.2.3 Oilbath lubrication

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

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 : approx. 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 rolling bearings are designed for an $L_{10}$ 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 50 °C.

Every 6 months at bearing temperatures up tot 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 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.

### 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 or the can insert.

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 150 mm should be observed for watches, electric data carriers, data carriers with magnetic strips etc.

## 7.6 Dismantling

**There are three 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.
3. Dismantling the complete drive unit from the plant. The pump does not need to be drained.

Dismantling of the complete pump is described here.

For the design and individual parts of the pump, see the exploded drawing in **Section 9** and the sectional drawing in **Section 10**.

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

- Undo support bracket **183** from the base plate.
- Undo housing screws **901/3**, **552/3**
- Remove entire slide-in unit.

If the housing **100** remains in the plant, leave the housing gasket **401** in the centering to protect the housing sealing surface.

**Caution!**

When pulling out the slide-in unit, this component must be secured against falling.
The integrated crane hook lug on the lantern can be used for this purpose.
Or use the optionally available sliding and support pedestal. See assembly aids in **Section 11.4**.

Dismantling of the complete pump is described here.

For the design and individual parts of the pump, see the exploded drawing in **Section 9** and the sectional drawing in **Section 10**.

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**Caution!**

When pulling out the slide-in unit, this component must be secured against falling.
The integrated crane hook lug on the lantern can be used for this purpose.
Or use the optionally available sliding and support pedestal. See assembly aids in **Section 11.4**.

The operating torque of the magnetic coupling installed is specified on the **type plate**.

### 7.6.1 Dismantling the slide-in unit

- Transport the slide-in unit using the crane hook lug moulded on the lantern.
  As an adiitonal aid, the ring bolt provided can be screwed into the bearing pedestal flange at 12 o'clock.
  Beforehand, remove the threaded sealing cap.
  As a result, two slinging aids are available.
- Secure slide-in unit on a work bench or a work top.
- Remove attachment screws **901/17** with washers **554/11**.
- Remove threaded sealing cap from the tapped bores of the bearing pedestal flange.
  Insert the two assembly threaded rods M 16 provided.
- Using the flat pivot point on the threaded rods and an open-jaw wrench (size 13), push the slide-in unit out of the lantern chamber. While doing so, turn the threaded rods evenly and alternately.

**Caution! Magnetic forces!**
**Risk of accident !**

- Transport the drive unit using a crane. The ring bolt on the bearing pedestal flange can be used for this purpose.
- Position the rest of the slide-in unit vertically with the impeller facing down.
- Remove screws **901/10** and lift off lantern **344**, can **159** and can insert **158**.
- Clamp the plain bearing pedestal **339** with the sealing surfaces in a vice.

It is imperative to use rubberised clamping jaws so that the plastic sealing surfaces are not damaged.

- Undo impeller **230** and inner magnet assembly **859** by turning them in opposite directions. Right-hand thread!

  Either two strap wrenches or, even better, appropriate special tools (see Assembly aids in **Section 11.3**) are used for this purpose.
  With magnetic drives >400 Nm the use of the special tool is generally recommended.
- Depending on whether the impeller **230** or the inner magnet assembly **859** has been removed from the pump shaft **211**, a section of the pump shaft can be raised or the pump shaft is pulled out of the plain bearing pedestal **339** with the other component.
- This operation must be performed carefully as plain bearing parts made of silicon carbide may be removed unintentionally.

Make sure that no parts of the plain bearing fall. Silicon carbide is easy to break.

- Clamp pump shaft **211** with the flat pivot point in a vice. Use **smooth vice jaws** for this purpose.
- Depending on which component has remained connected to the pump shaft, unscrew the impeller **230** or the inner magnet assembly **859**. A strap wrench or the special tool suitable for the component can be used for this purpose.
- An appropriate Richter jig can be used to remove the bearing bushes **545/1** and **545/2**. See Assembly aids in **Section 11.2**.
- The can **159** and can insert **158** should only be separated if one component has to be replaced. The separation process can be simplified by cooling the unit to approx. 5 °C.
- With a vacuum-tight design it is not possible to separate the can insert as it and the can are glued together.

### 7.6.2 Dismantling the drive unit Long life grease and grease lubrication

- Remove the hex. socket screw **914/5** with the lock washer **934/4** and pull the drive magnet assembly **858** off the drive shaft **213**. For this purpose do not use any magnetisable tools.

**Caution! Magnetic forces!**
**Risk of accident !**

- Remove hex. socket screws **914/6** and pull off the rear bearing cover **361**.
- Remove wavy spring washer **953/1**.
- Pull or push the drive shaft **213** with the rolling bearings **321/1** and **321/2** out of the bearing pedestal **330** in the direction of the motor.
- To change the rolling bearings **321/1** and **321/2**, they have to be pushed off the drive shaft **213.**
- Optional
  The pump can be provided with regreasable bearings. In this case there are rotary shaft seals **421/1** and **421/2** in the bearing pedestal **330** and in the rear bearing cover **361.** See **Section 10.2**.
- The mating surfaces of the rotary shaft seals are made of chromium-oxide-coated steel rings which can be replaced, if necessary, at the works.

### 7.6.3 Dismantling the drive unit Oil bath lubrication

- Remove the hex. socket screw 914/5 with the lock washer 934/4 and pull the drive magnet assembly 858 off the drive shaft 213. For this purpose do not use any magnetisable tools.

**Caution! Magnetic forces! Risk of accident !**

- Remove hex. screw **901/4** and drain oil.
- Remove hex. socket screws 914/6 and pull off the rear bearing cover 361 **with the rotary shaft seal 421/1** and O-ring **412/1**.
- Remove wavy spring washer **953/1**.
- Pull or push the drive shaft 213 with the rolling bearings 321/1 and 321/2 out of the bearing pedestal 330 in the direction of the motor.
- To change the rolling bearings 321/1 and 321/2, they have to be pushed off the drive shaft 213.
- If necessary, press the rotary shaft seals **421/1** and **421/2** out of the bearing pedestal **330** and rear bearing cover **361**.
- The mating running surfaces of the rotary shaft seals are made of chromium-oxide-coated steel rings which can be replaced by the manufacturer if required.
- We recommend you to also replace the rotary shaft seals **421** when the bearings are being replaced.

## 7.7 Notes on assembly

- Use original spare parts. See also **Section 2.4**.
- Do not use defective parts.
- Has the pump been shut down, drained and flushed in accordance with the regulations? See also **Section 6.3**.
- Apply Anti-Seize special assembly paste (e.g. from Weicon) to the fitting surfaces and screw thread prior to assembly.
- The thread in the impeller **230**, the inner magnet assembly **859** and on the pump shaft **211** must not be greased as otherwise no optimum glued connection is possible.
- The bushes **523/1** in the impeller **230** and **523/2** in the inner magnet assembly **859**, the O-rings **412** and the housing gasket **401** as well as the rotary shaft seals **421** should always be replaced.
- Important dimensions on centrings, bearing fits or bearing play must be checked prior to final assembly. If necessary, perform a trial assembly.
- For the design and single components, see exploded drawing in **Section 9** and sectional drawing in **Section 10**.
- Many metallic particles adhering to magnetic components such as the inner magnet assembly **859** and drive magnet assembly **858** must be removed 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.

## 7.8 Assembly

### 7.8.1 Assembly of drive unit Long life grease and grease lubrication

- Press radial ball bearings **321/1** and **321/2** onto the drive shaft.
- Push drive shaft unit into the bearing pedestal **330**, mount wavy spring washer **953/1** and rear bearing cover **361** and tighten all components with the hex. socket screws **914/6**. (Torque 15 Nm)
- Optional
  The drive unit can be provided with rotary shaft seals (**421/1** and **421/2**). (Grease lubrication with regreasable rolling bearings). In this case a rotary shaft seal must be pressed into the bearing pedestal **330** and one into the rear bearing cover **361**.
- Position bearing pedestal unit vertically and secure (e.g. in a vice).
- Secure drive magnet assembly **858** on the drive shaft **213** on the flat pivot point.

**Caution! Magnetic forces! Risk of accident !**

- Insert wavy spring washer **934/4** and tighten the hex. socket screw **914/5** to a torque of 40 Nm. For this purpose, do not use any magnetisable tools if at all possible.

### 7.8.2 Assembly of drive unit Oil bath lubrication

- Screw hex. screw **901/4** into the bearing pedestal **330**.
- Insert rotary shaft seal **421/2** into the bearing pedestal 330.
- Insert rotary shaft seal **421/2** and O-ring 412/1 into the rear bearing cover 161.
- Press rolling bearings 321/1 and 321/2 onto the drive shaft 213.
- Push drive shaft unit into the bearing pedestal 330, mount wavy spring washer 953/1 and rear bearing cover 361 and tighten all components with the hex. socket screws 914/6. (Torque 15 Nm)
- Position bearing pedestal unit vertically and secure (e.g. in a vice).

➢ Secure drive magnet assembly 858 on the drive shaft 213 **on the flat pivot point**.

**Caution! Magnetic forces!**
**Risk of accident !**

➢ Insert wavy spring washer **934/4** and tighten the hex. socket screw **914/5** to a torque of 40 Nm. For this purpose, do not use any magnetisable tools if at all possible.

### 7.8.3 Trial assembly of the slide-in unit

♦ Without adhesive
♦ Without O-rings **412/3, 412/4**
♦ For assembly, see **Section 7.8.3**.
♦ Dismantled trial-assembled unit and perform assembly.

### 7.8.4 Assembly of slide-in unit

♦ With the O-rings **412/3**, **412/4**
♦ With 1 drop of adhesive on each shaft thread, e.g. Loctite 243 from Loctite or an equivalent.
Only one drop of the adhesive is to be applied per thread.
Otherwise the next dismantling operation will be more difficult or no longer possible without destroying components.
♦ The mating surfaces of pump shaft/inner magnet assembly and pump shaft/impeller must be completely clean.
➢ Place impeller **230** with the suction side facing downwards on the work bench.
➢ Press shaft sleeve **523/1** into the impeller **230**.
➢ Insert O-ring **412/3** into the appropriate groove in the impeller **230**.
➢ Check whether the mating surfaces of the pump shaft **211** and impeller **230** are absolutely clean and the thread is burr-free.
➢ Provide one thread turn of the pump shaft **211** with adhesive, e.g. Loctite 243.
➢ Screw pump shaft **211** into the impeller **230.**
➢ Clamp pump shaft **211** with the flat pivot point in a vice. Use **smooth vice jaws** for this purpose.
➢ Tighten the impeller **230** using a strap wrench or appropriate special tool (see **Section 11.3**).
➢ Place the assembled unit in turn, with the suction side of the impeller **230** facing downwards, on the work bench.
➢ Push bearing sleeve **529/1** over the pump shaft **211** and position the flat pivot point in the impeller **230**.
➢ Push the bearing bush **545/1** onto the bearing sleeve **529/1**.
➢ Push axial bearing **314/1** onto the pump shaft **211**.
➢ Move plain bearing pedestal **339** into assembly position using a crane. For this purpose the 4 M10 tapped bores on the motor side can be used as a slinging aid (ring bolt etc.).
➢ Carefully lower the plain bearing pedestal **339** centrally over the pump shaft **211**. Make sure that the positive connections of the axial bearing **314/1** and the bearing bush **545/1** engage properly. If assembly is performed correctly, there is a distance of approx. 3 mm between the impeller **230** and the plain bearing pedestal **339**.
➢ Push the axial bearing **314/2** over the pump shaft **211** and position in the plain bearing pedestal **339**.
➢ Insert bearing bush **545/2** into the plain bearing pedestal **339**.
➢ Press shaft sleeve **523/2** into the inner magnet assembly **859**.
➢ Push O-ring **412/4** over the pump shaft **211**.
➢ Check whether the mating surfaces of the pump shaft **211** and inner magnet assembly **859** are absolutely clean and the thread is burr-free.
➢ Provide one thread turn of the pump shaft **211** with adhesive, e.g. Loctite 243.
➢ Push bearing sleeve **529/2** half its length onto the pump shaft **211**.
➢ Carefully screw inner magnet assembly **859** onto the pump shaft **211**. It is imperative to ensure that the flat pivot point of the bearing sleeve **529/2** engages the positive connection of the inner magnet assembly **859** and thus also turns during the screwing process.
➢ Using a strap wrench or special tool, screw the inner magnet assembly **859** and the impeller **230** firmly together.
➢ The axial play **Z** of the plain bearings is 0.4 to 1.3 mm. See sectional drawing **Section 10.1.**

### 7.8.5 Final assembly

➢ Transport the drive unit using a crane. The ring bolt on the bearing pedestal flange can be used for this purpose.

➢ Screw the two assembly threaded rods M 16 provided into the tapped bores of the bearing pedestal flange.
➢ Press the drive unit into the lantern chamber using the flat pivot point of the threaded rods and an open-jaw wrench (size 13). The threaded rods must be turned evenly and alternately provided can be screwed into the bearing pedestal flange at 12 o'clock.
Beforehand, remove the threaded sealing cap.
As a result, two slinging aids are available.
➢ Push the entire slide-in unit with housing gasket **401** into the housing **100** and screw together with housing screws **901/3** and tightening washers **552/3.**

- When tightening the housing screws **901/3**, make sure that the support bracket **183** is firmly positioned. If necessary, undo support bracket, align and secure again.
  For tightening torques, see **Section 1.1**.

The distances **X** and **Z** are given in the works certificate. See sectional drawing in **Section 10.1**.

The dimensions "**X**" and "**Y**" are always to be checked with the rotating unit against the suction nozzle.

**X**: Distance behind the impeller = 2,9 bis 3,7 mm
**Y**: Distance in front of the impeller = 2,5 bis 3,5 mm

These distances must be observed. The dimension **Y** can be affected by the thickness of the housing gasket.

### 7.8.6 Fill bearing pedestal with oil

**Oil quantities:**

For group 4 approx. 3000 ml

**Type of oil:**

See **Section 7.2.2**.

**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.

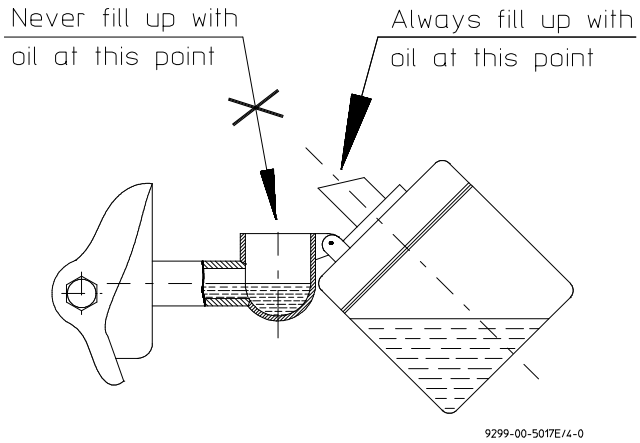



**Fig. 7**

## 7.9 Tests

The pumps are tested with water at the manufacturer's.
The operating data measured are documented in a **works 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 improper 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) 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 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 :

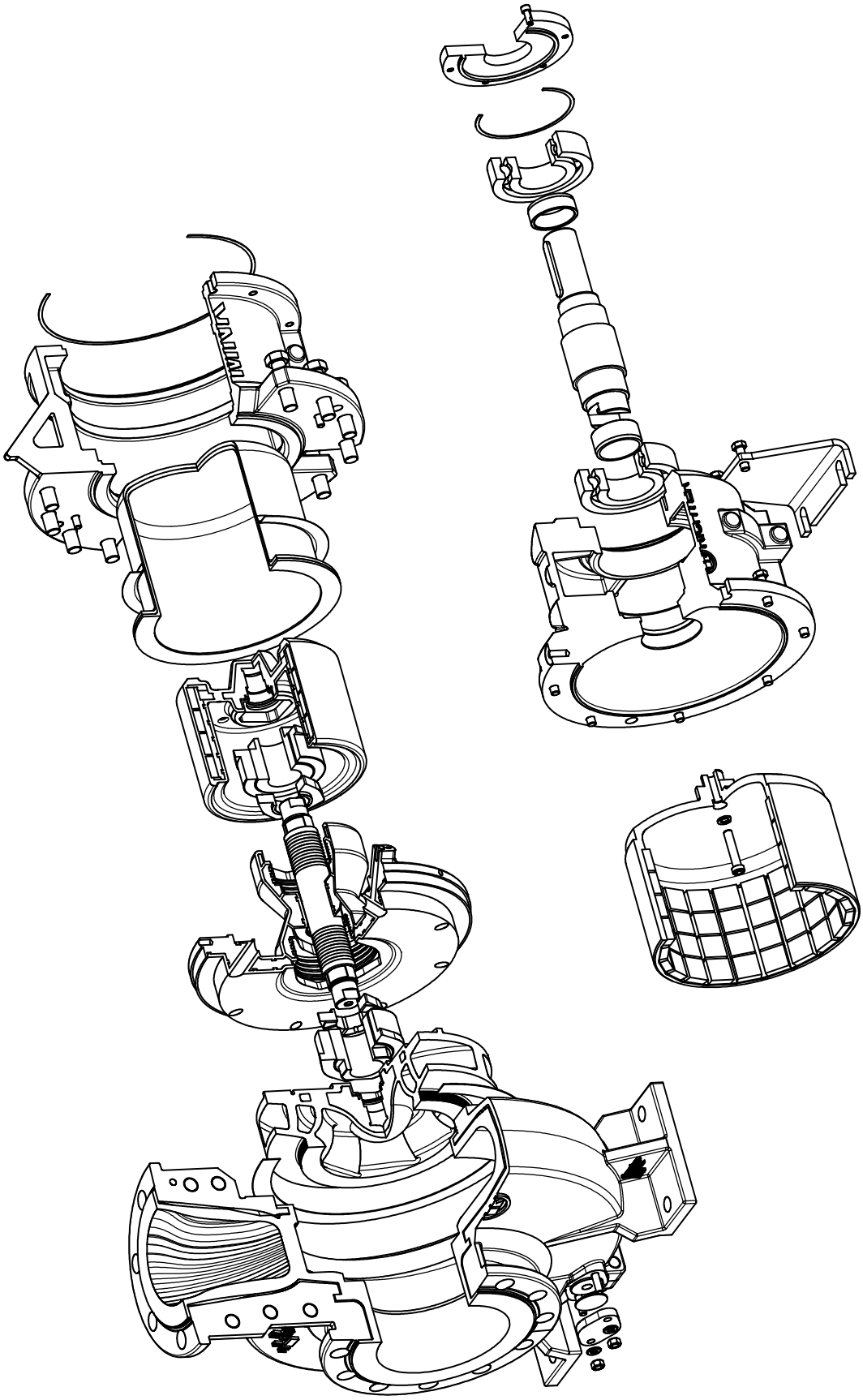
- How high is the actual temperature measured?
- How high may it be acc. to the operating manual?
- Is the running-in phase already over?
- Deficient lubricant?
- Overaging / wear?

### Leak from the pump :

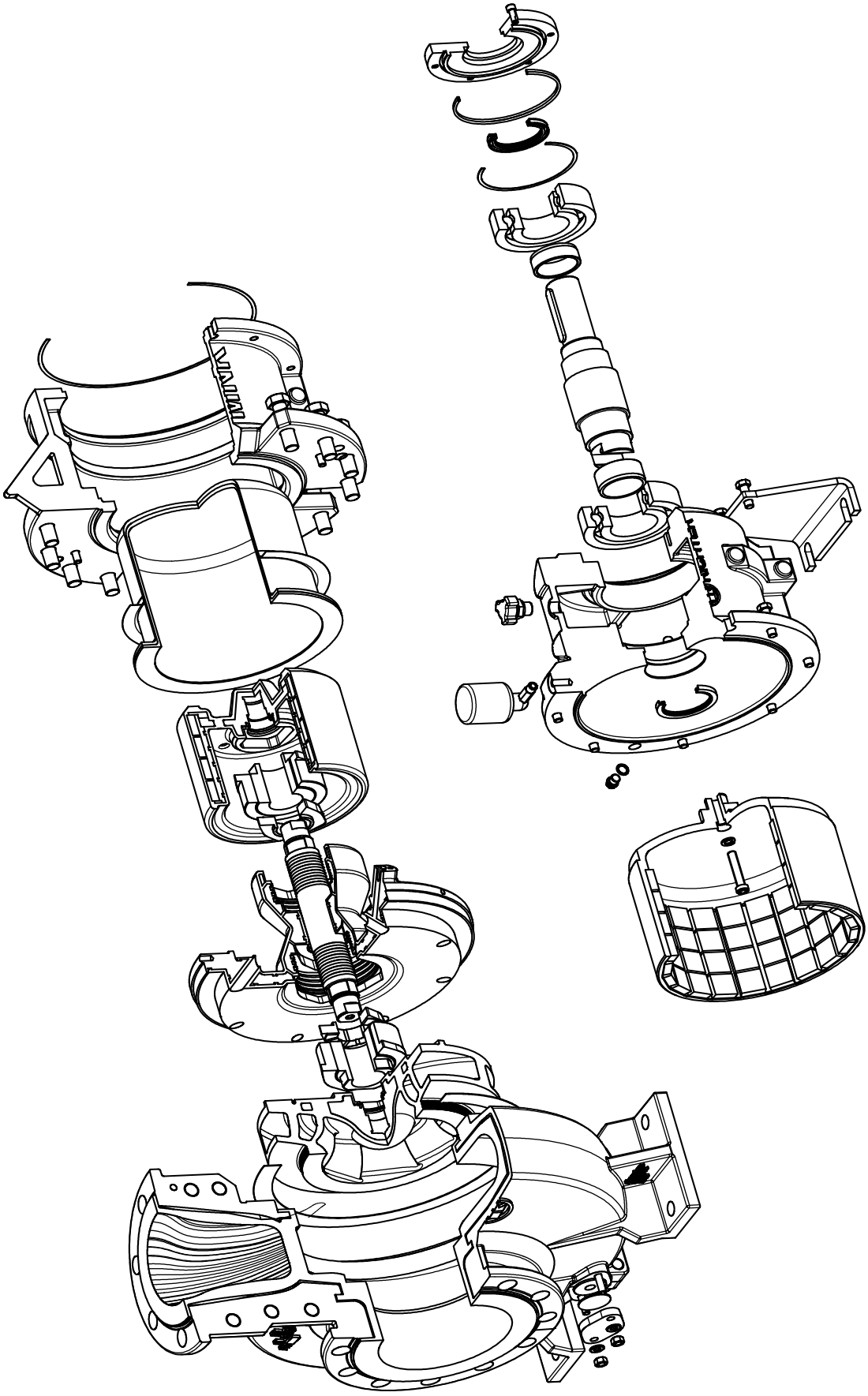
- Are all screws tightened to the correct tightening torque?
- Were the sealing surfaces assembled in a clean state?
- Have approved gaskets been installed?

# 9 Exploded drawing

## 9.1 Long life grease lubrication



## 9.2 Oil bath lubrication



# 10 Sectional drawing

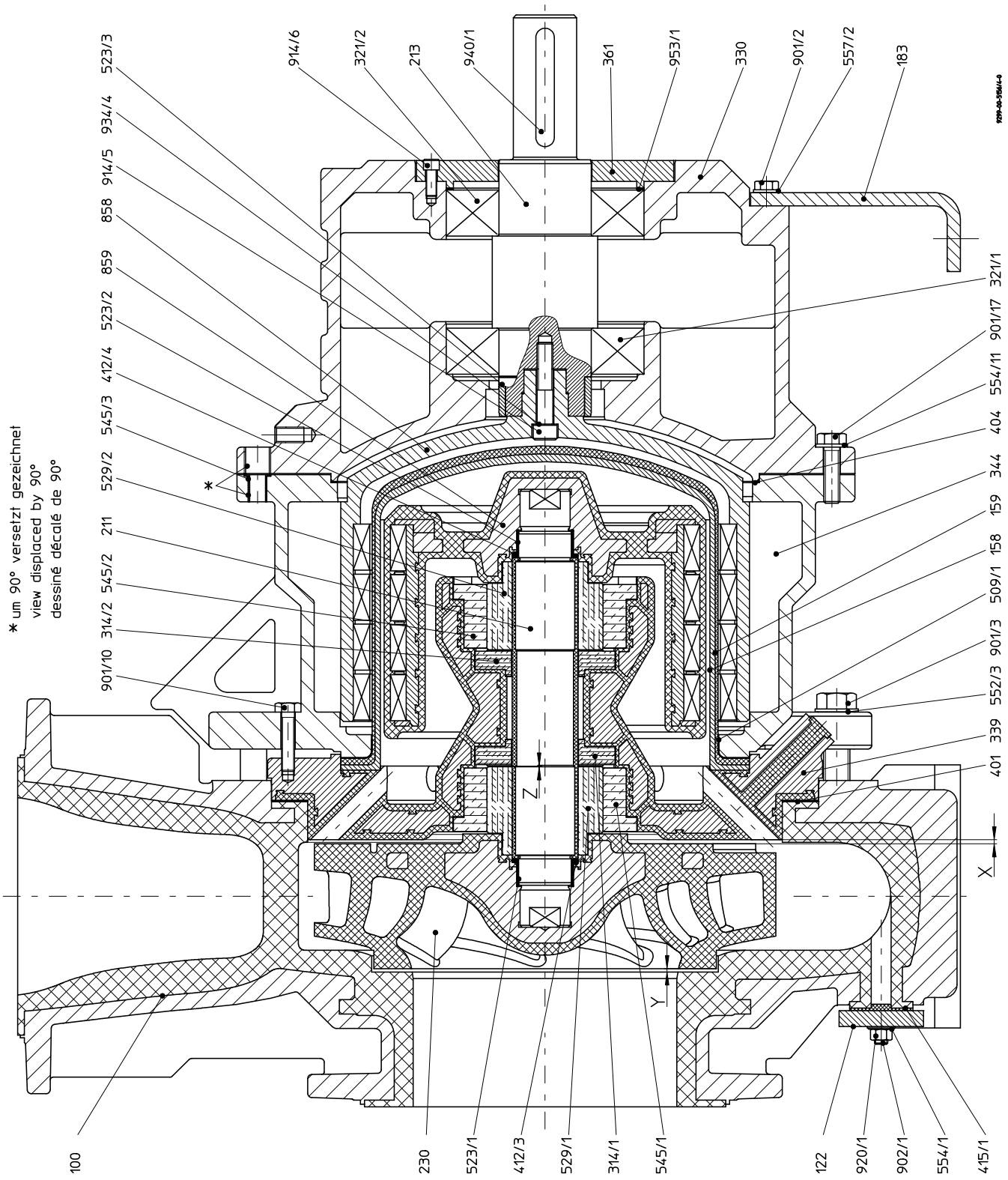
## 10.1 Legend

| | |
|---|---|
| **100** | housing |
| **122** | blind cover |
| **158** | can insert |
| **159** | can |
| **183** | support bracket |
| **211** | pump shaft |
| **213** | drive shaft |
| **230** | impeller |
| **314/x** | axial bearing |
| **321/x** | radial ball bearing |
| **330** | bearing pedestal |
| **339** | plain bearing pedestal |
| **344** | Lantern |
| **361** | rear bearing cover |
| **401** | housing gasket |
| **404** | Bearing pedestal gasket |
| **412/x** | O-ring |
| **415/1** | centering gasket |
| **421/x** | rotary shaft seal |
| **509/1** | intermediate ring |
| **523/x** | shaft sleeve |
| **529/x** | bearing sleeve |
| **545/x** | bearing bush |
| **552/3** | tightening washer |
| **554/x** | washer |
| **557/2** | contact disc |
| **636/x** | lubricating nipple |
| **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 |
| **934/4** | lock washer |
| **940/1** | key |
| **953/1** | Wavy spring washer |

**Additional to Oil bath lubrication**

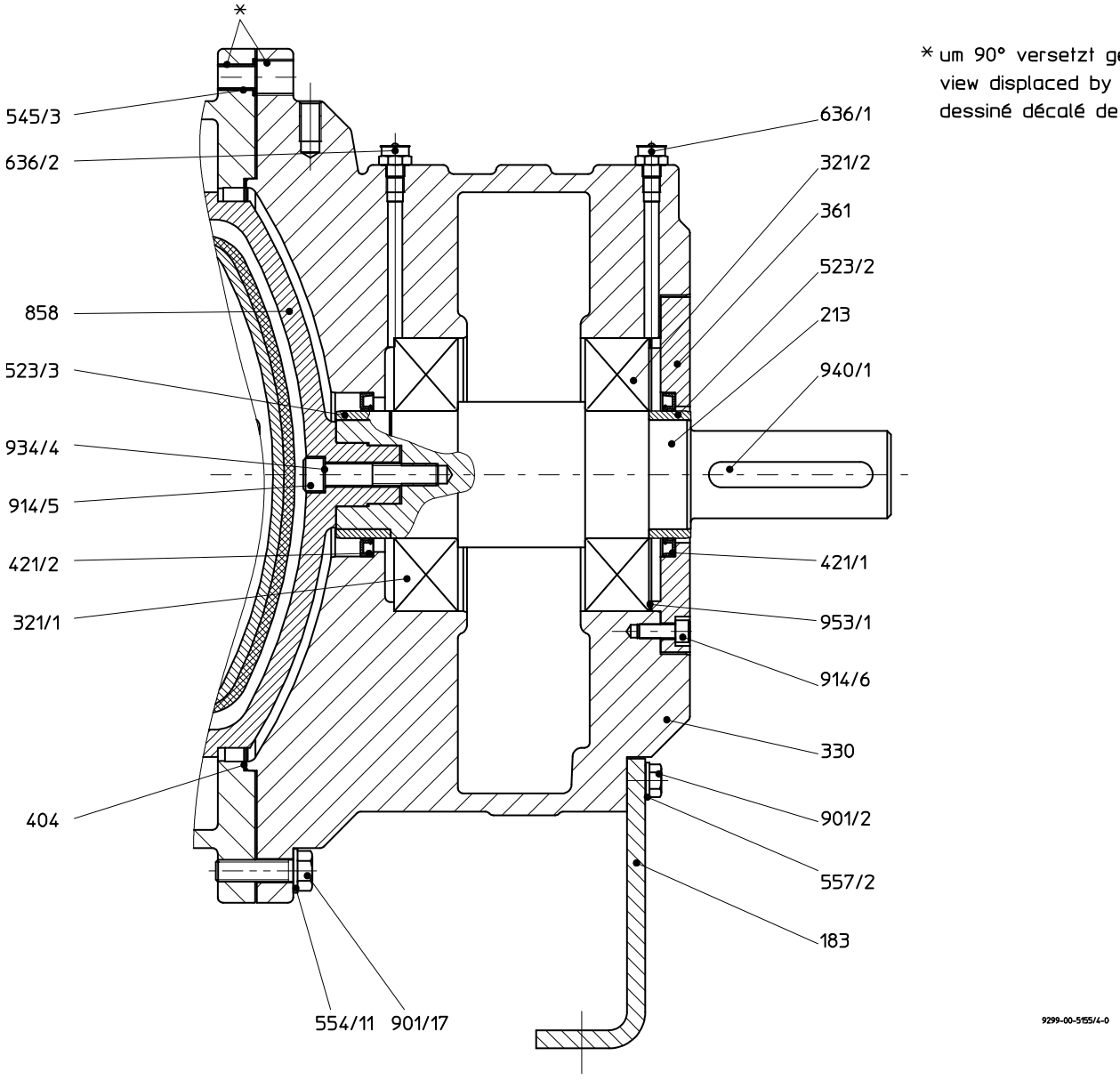
| | |
|---|---|
| **411/1** | seal ring |
| **421/x** | rotary shaft seal |
| **638/1** | constant-level oiler |
| **655/1** | oil drain plug |
| **672/1** | venting/filling plug |

## 10.2 Sectional drawing long life grease lubrication

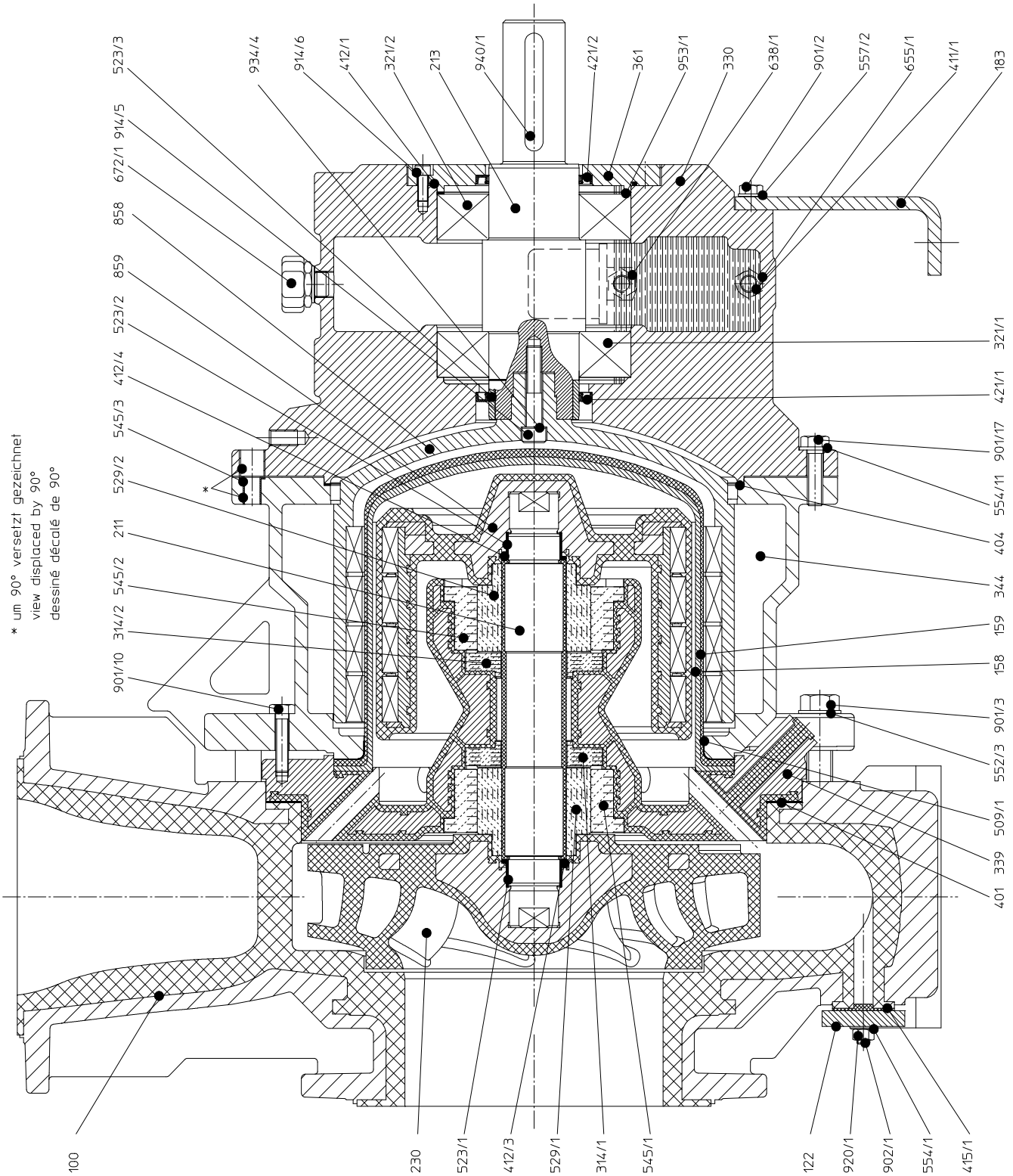



**X, Y and Z see pump work certificate.**

## 10.3 Sectional drawing grease lubrication with regreasable rolling bearings



## 10.4 Sectional drawing SCK oil bath lubrication




X, Y and Z see pump work certificate.

# 11 Assembly aids

## 11.1 Boring template for housing drain

| Pump size | Ident. No. |
|---|---|
| MNK 200-150-315 | 9217-89-1097 |

## 11.2 Pull-off device for plain bearing bushes

| Pump size | Ident. No. |
|---|---|
| MNK 200-150-315 | 9237-89-1138 |

### Product description

If the plain bearing bushes have to be removed from the plain bearing pedestal, we recommend the use of a special pull-off device. It prevents unnecessary damage to the shock-sensitive silicon carbide components through the use of suitable materials.
This device is made of malleable rubber material with a plastic handle (polyethylene).

### Application

Remove plain bearing bush on the inner magnet assembly side:

- Push the device with the rubber part at the front through the plain bearing pedestal from the impeller side.
- Position the two rubber parts centrally on the bearing bush.
- Axially tighten the rubber parts by turning the handle to the right; as a result they expand radially.
- This creates a friction connection between the device and the plain bearing bush which does not damage the material.
- The bearing bush can now be removed by hitting the handle centre axially.

Removing the plain bearing bush on the impeller side:

- Use the device following the same procedure from the inner magnet assembly side.

## 11.3 Universal impeller wrench and universal inner magnet assembly clamping device

| Pump size | Ident. No. | |
|---|---|---|
| MNK 200-150-315 | Impeller wrench | 9237-89-1130 |
| MNK 200-150-315 | Clamping device | 9237-89-1131 |

### Product description

The loosening torque can be up to 800 Nm depending on the magentic drive torque installed. To ensure that the rotating unit can be easily dismantled, we recomend the use of the universal impeller wrench in conjunction with the universal inner magnet assembly clamping device.

**Universal inner magnet assembly clamping device**

It is advisable to secure the clamping device on a work bench with screws M16 using the 4 bores. Two tapped bores M 12 are provided for transport.
The device consists of two non-magnetisable tube halves one of which is welded to the base plate. The other half can be removed by undoing the 4 hex. head screws.

### Application

- Deposit the rotating unit using a crane vertically into the device until the hub of the inner magnet assembly rests on the base plate.
- Then tighten the 4 hex. screws to max. 60 Nm.
  In the case of one and two-row inner magnet assemblies only the two lower screws are to be tightened.
- When the screws are tightened, the inner magnet assembly is clamped so that the impeller can be unscrewed from the rotating unit.

**Universal impeller wrench**
To unscrew the impeller, we recommend the use of the universal impeller wrench. This tool can be used for all impeller diameters from 265 mm to 350 mm.
The tool consists of a self-centring lever system with 7 bolts adapted to suit the vane shape. For weight reasons the outer bolt guide ring is made of aluminium.

### Application

- When mounted on the impeller, the tool is centred in the area of the split ring.
- Push the movable bolts into the vane channels.
  Caution! Introduce the moulded elements of the vane contour appropriately so that damage to the rear of the vanes is avoided.
- Two flat irons with a total lever length of 1000 mm are available to generate the required torque.

## 11.4 Sliding and support pedestal for the slide-in unit

| Pump size | Ident. No. |
|---|---|
| MNK 200-150-315 | 9238-87-1030 |

### Product description

If the pump is removed from the plant without the pump housing for maintenance purposes, the entire slide-in unit must be moved in the direction of the motor.
For this purpose, the rotating unit must be secured against falling owing to its heavy weight.
If it is not possible to use the crane hook lug on the lantern, the lantern must be supported. For this purpose we recommend the use of the sliding and support pedestal.
This device is made of plastic (polyethylene) and is easy to move as a result of the low friction value.

### Application

- Undo and remove the lantern screws **901/3**.
- Push the device to the left or right past the housing foot underneath the lantern flange.
  The flange is then located inside the transverse recess of the device.
- For safety reasons push the two lower hex. screws **901/3** through the device and lantern bores.
  This prevents tipping and lateral displacement..
- Now push the slide-in unit out of the pump housing using the thread provided in the lantern flange.
  The stability of the device must be continuously checked.

Baureihe/Series/Série

# MNK

Ausführung **Magnetkupplungspumpe**

Design **Magnet drive pump**

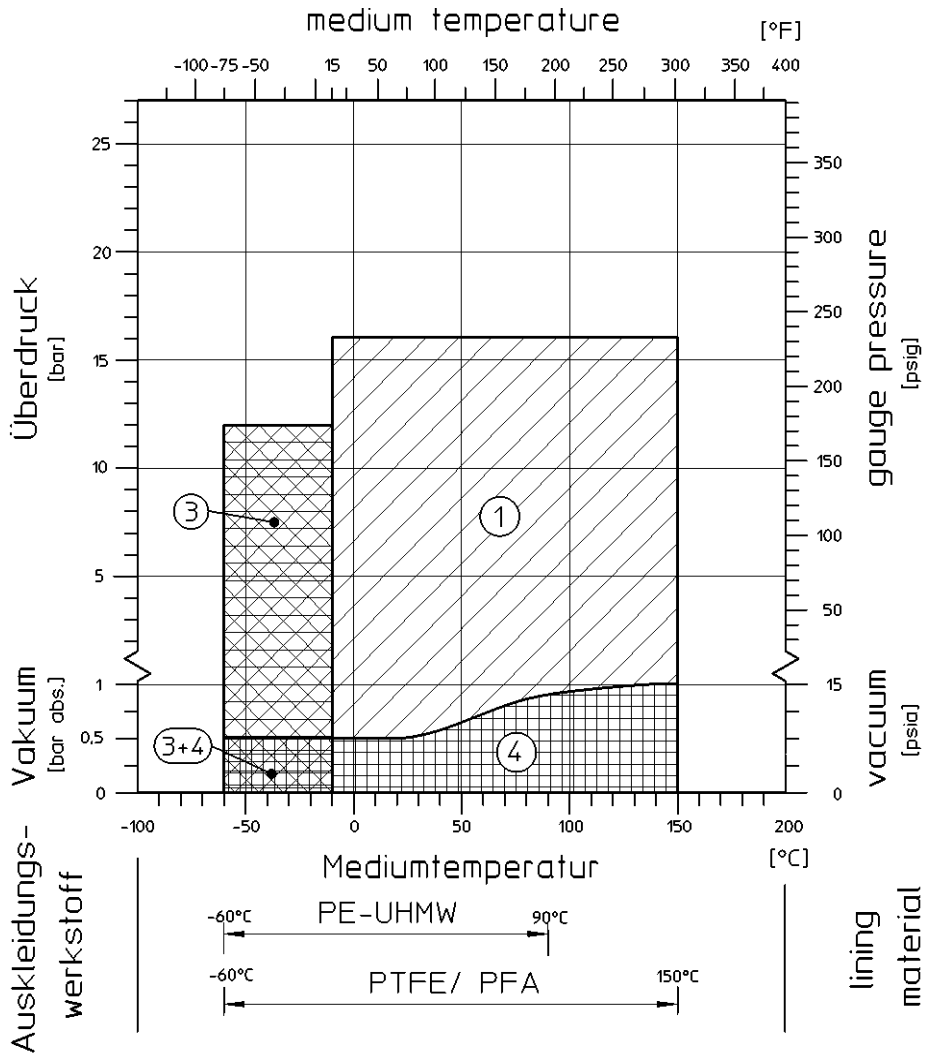
Construction **Pompe à entraînement magnétique**

RICHTER Process Pumps & Valves



## Einsatzgrenzen / operating limits

**Baugröße/ Size: 200-150-315**



Baureihe/Series/Série

**MNK**

Ausführung **Magnetkupplungspumpe**

Design **Magnet drive pump**

Construction **Pompe à entraînement magnétique**

RICHTER Process Pumps & Valves

| | | |
|---|---|---|
| 1 | Standard<br>Bei Einsatz unter ASME-Bedingungen (Sphäroguss nach A395) kann der Standardbereich auf -30°C und 16bar erweitert werden. | Standard<br>Application under ASME-specification (ductile iron acc. to A395) the standard range can be expanded up to -30°C and 16bar. |
| 3 | Tiefere Temperaturen Druckstufe PN 16 | Lower temperatures pressure range PN 16 |
| 4 | Höheres Vakuum bei Pumpenstillstand durch Sonderspalttöpfe | Higher vacuum at pump standstill by special connection of can and inner can |

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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<br>*Product* | Magnetkupplungs-Chemiekreiselpumpe<br>freies Wellenende, Blockausführung oder als Aggregat[1)]<br>*Magnetic Drive Chemical Centrifugal Pump*<br>*Bare shaft, block version or as unit [1)]* |
| Baureihe<br>*Series* | MNK, MNK-B, MNK-X, MNK-XB, MNK-S, MNK-SB, MNKA, MNKA-B<br>MPB, MDK, MDK-B, RMA, RMA-B, RMI, RMI-B |
| EU-Richtlinien<br>*EU-Directive* | 2006/42/EG Maschinenrichtlinie *Machinery Directive*<br>94/9/EG Explosionsschutzrichtlinie ATEX *Equipment explosive atmosphere* |
| Modul | Interne Fertigungskontrolle<br>*Production Quality Assurance* |
| Angewandte harmonisierte Normen<br>*Applied harmonised Standards* | EN 14121<br>EN 809<br>EN 13463-1 |
| Kennzeichnung<br>*Marking* | 2006/42/EG<br>94/9/EG |

CE
Ex II 2 GD IIC TX X[1)]

Die technische Dokumentation nach Richtlinie 94/9EG ist bei der u.a. benannten Stelle hinterlegt.
*The technical documentation is filed by below mentioned notified body according to directive 94/9/EC.*
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 | |
| MNKXB | 03ATEXD006 | MDK | 02ATEXD009 | RMI-B | |
| 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: A. Linges
*Authorised person compiled the technical files according to 2006/42/EG:*

1) Gilt nicht für das Aggregat nach 94/9/EG (ATEX Leitfaden Juni 2009 Abschn. 3.7.5 2.a)
*1) Not valid for the unit according to 94/9/EG (ATEX Guideline June 2009 Paragraph 3.7.5 2.a)*

Kempen, 01.03.2010

G. Kleining
Leiter Forschung & Entwicklung
Manager Research & Development

A. Linges
Leiter Qualitätsmanagement
Quality Manager

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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<br>*Product* | Magnetkupplungs-Chemiekreiselpumpe<br>als Aggregat<br>*Magnetic Drive Chemical Centrifugal Pump*<br>*as unit* |
| Baureihe<br>*Series* | MNK, MNK-B, MNK-X, MNK-XB, MNK-S, MNK-SB, MNKA, MNKA-B<br>MPB, MDK, MDK-B, RMA, RMA-B, RMI, RMI-B |
| EU-Richtlinien<br>*EU-Directive* | 2006/42/EG Maschinenrichtlinie<br>*Machinery Directive* |
| Modul | Interne Fertigungskontrolle<br>*Production Quality Assurance* |
| Angewandte harmonisierte Normen<br>*Applied harmonised Standards* | EN 14121<br>EN 809 |
| Kennzeichnung<br>*Marking* | 2006/42/EG 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: A. Linges
*Authorised person compiled the technical files according to 2006/42/EG:*

Kempen, 01.07.2010

G. Kleining
Leiter Forschung & Entwicklung
Manager Research & Development

A. Linges
Leiter Qualitätsmanagement
Quality Manager

# 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

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:** ☐ subject to fee ☐ Warranty |
| Street : | **Exchange:** ☐ subject to fee ☐ Warranty |
| Postcode, city: | ☐ Exchange/ Replacement already initiated/received |
| Contact person: | **Return**: ☐ Leasing ☐ Loan ☐ for credit note |
| Phone : Fax : | |
| **End user** : | |

**A. Details of Richter-product:**

| | |
|---|---|
| **Classification:** | **Failure description:** |
| **Article number:** | |
| **Serial number:** | **Equipment:** |
| | **Application tool:** |
| | **Application process:** |

| **B. Condition of the Richter-product:** | **no**[1] | **yes** | **no** |
|---|---|---|---|
| Was it in operation ? | ☐ | ☐ → | |
| Drained (product/operating supply item) ? | ↓ | ☐ | ☐ |
| All openings hermetically locked! | | ☐ | |
| Cleaned ? | ↓ | ☐ | ☐ |
| If yes, with which cleaning agent: | | | |
| and with which cleaning method: | | | |

[1] if "no", then forward to **D**. ←

| **Contamination :** | **no**[1] | **yes** |
|---|---|---|
| toxic | ☐ | ☐ |
| caustic | ☐ | ☐ |
| inflammable | ☐ | ☐ |
| explosive[2] | ☐ | ☐ |
| mikrobiological[2] | ☐ | ☐ |
| radioactive [3] | | |
| 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)

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

| | **no** | **yes** |
|---|---|---|
| 2. **Are the materials specified above harmful to health ?** | ☐ | ☐ |
| 3. **Dangerous decomposition products during thermal load ?** | ☐ | ☐ |
| **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

# FAX

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

**Fax No. ()**

**Pages (incl. cover sheet) ()**

**To:**

**()**

| Contact person: | Reference: | Extension: | E-Mail Address: | Date: |
|---|---|---|---|---|
| () | () | - () | () | () |

**Your order No.:** **()**
**Our Kom. No.:** **()** **Serial No.: ()**

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

Enclosures

()