INSTALLATION AND OPERATING MANUAL

Translation of the original manual

Serie MDK

Sealless Chemical Magnetic Drive Pump

Bearing lubrication: Long life grease and oil bath

Bearing pedestal group: 1

Keep for future use!

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

9260-050-en Revision 11 Edition 07/2010

RICHTER
Process Pumps & Valves

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- 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 NPSH Problems"
- Publication "Safe Operation of Magnetic Drive Pumps“

1 Technical data

Manufacturer :

Richter Chemie-Technik GmbH
Otto-Schott-Str. 2
D-47906 Kempen
Telephone: +49 (0) 2152 146-0
Fax: +49 (0) 2152 146-190
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 MDK, long life grease and oil bath lubrication

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 or flanges drilled to ASME B16.5 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, SSiC, FKM/FFKM, PTFE-carbon
and see data sheet.

Flow rate : up to 90 m^3/h (at 2900 min^{-1})

Delivery head : up to 80 m LC (at 2900 1/min)

Housing discharge pressure : max. 16 bar
(12 bar at -10°C to -60°C)

Temperature range : - 60 °C to +120 °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 :

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

Weight : See data sheet

Dimensions : See installation drawing

1.1 Tightening torques

Screws greased, tighten in diametrically opposite sequence

Housing screws 901/3

Size [mm]	No. x size [DIN/ISO]	Tightening torque [Nm]
25-25-125	8 x M 10	35
50-32-125	8 x M 10	35
25-25-160	8 x M 12	40
50-32-160	8 x M 12	40
80-50-160	8 x M 12	40
50-32-200	10x M 12	40
65-40-200	10x M 12	40
80-50-200	10 x M 12	40

Pipe screws, flanges to DIN/ISO

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

Pipe screws, DIN/ISO flanges drilled to ASME

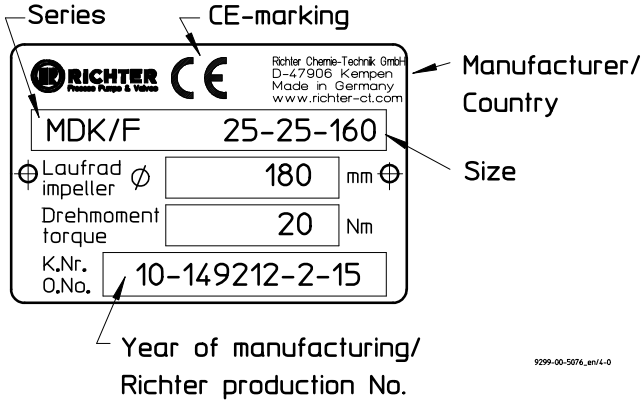
DN		No. x size	Tightening torque	
[mm]	[inch]	[ASME]	[Nm]	[in-lbs]
25	1“	4 x ½“	8	70
32	1¼“	4 x ½“	12	105
40	1½“	4 x ½“	15	135
50	2“	4 x ⅝“	25	220
65	2½“	4 x ⅝“	30	265
80	3“	4 x ⅝“	45	400

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 MDK 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.

Vertical installation of the pumps is only possible with pumps with grease-lubricated rolling bearings or rolling bearings with oil mist lubrication. 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**):

- 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 Q_{opt}. The maximum operating temperature must never be exceeded. See **Section 2.6.7** In case of doubt, you must consult the manufacturer.
- The manufacturer must be consulted in the event of entrainment of gas >2% as well as solids in order to avoid a lack of lubrication and dry-running.
- The plant NPSH value (NPSHA) should be 0.5 m higher than the NPSH value of the pump (NPSHR). See also **Section 5.4.1.**

Inadmissible modes of operation, even for a short period, may result in serious damage to the unit.

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

Furthermore, reference is made in this connection to the Directive 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.

All safety and protective facilities must be remounted or enabled immediately after the end of work.

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

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

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

If the flow rate is too high, the differential pressure upstream and downstream of the plain bearings could fall so much that a lack of lubrication or dry-running may occur.
If the flow rate is too low, the medium may heat up so much owing to the fluid friction that the max. admissible surface temperature of the relevant temperature class is exceeded.
Overloading, overheating, non-observance of the design data or the incorrect selection of the magnetic drive can lead to the decoupling of the inner and outer magnet assemblies. As a result, eddy currents may be induced on the inner and outer magnet assemblies and an inadmissible temperature rise may occur.
The situation is to be remedied by providing appropriate monitoring facilities. See **Section 5.6**.

The plant NPSH value (NPSHA) should be 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 **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 valves in the suction and/or discharge lines is not permitted!

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

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

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

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

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

2.6.7 Temperature limits

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

In the case of liquids >40 °C the surface temperature of the pump housing is generally lower than the temperature of the liquid as the 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 not heated pump surface must have free contact with the environment.

During operation of the pump it must be ensured that excessive deposits of dust are prevented (regular cleaning) in order to prevent the pump surface from heating to above the admissible temperature.

The following table contains the resultant theoretical limit values of the temperature of the liquid medium allowing for the temperature classes according to EN 13463-1.

Temperature class acc. to EN 13463-1	**Limit value of the temperature of the liquid**
	PFA
T6 (85 °C)	**Not certified to ATEX**
T5 (100 °C)	
T4 (135 °C)	120 °C 1)
T3 (200 °C)	120 °C
T2 (300 °C)	120 °C
T1 (450 °C)	120 °C

1) Long life grease lubrication:: **T3**
Oil bath lubrication: **T4** only applies to operation up to and including 50 Hz,
T3 above 50 Hz

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, 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**.

Exception:

The base plate 270 x 500 mm for the sizes 25-25-125 and 50-32-125 (group 1.1) has no rope slinging points. In this case the unit (pump, motor and base plate) is suspended from the crane lugs on the pump and motor.

The slinging ropes must not be attached to free shaft end.

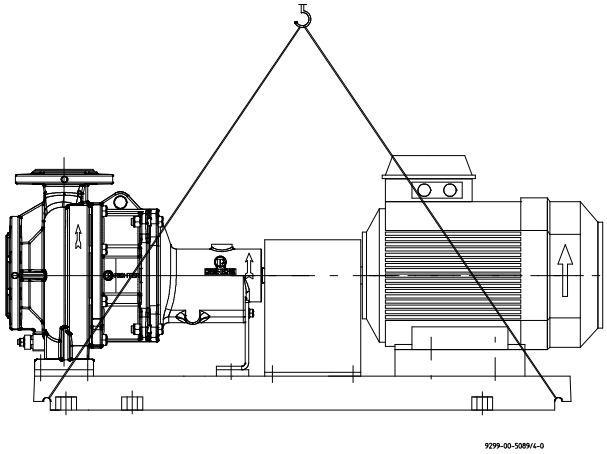


Fig. 1

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.

It 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 or damage to the environment due to the medium or oil!

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

4 Product description

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

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

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

The housing **100** consists of a metal armouring and a plastic lining.

The shaft spider with integral plastic thrust ring **338** is pressed into the housing and secured with the anti-torsion insert **566/1**.

Another design involves a two-piece shaft spider **338** with an inserted thrust ring **510/1** made of a hard material (SSiC).

The impeller assembly **237** contains the impeller and the wetted magnetic drive. The thrust ring **510/2** is pressed in on the suction side.

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 a stable non-metallic fibre composite material and a lining made of resistant plastic. The thrust ring **510/3** is pressed in and secured against turning on the shaft **222.** The shaft is secured against turning in the can.

The can is screwed with the lantern **344** against the housing. The intermediate ring **509/1** made of plastic ensures a uniform contact pressure.

Long life grease lubrication

The bearing pedestal **330** contains grease-lubricated radial ball bearings **321**. They are sealed on both sides.
The wavy spring washer **953/1** puts the radial ball bearings **321** under axial pre-load.
The rotary shaft seal **421/1** protects against corrosion.

Oil bath lubrication

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

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

This oil bath is sealed against the atmosphere by means of two shaft seals **421/1** and one circlip **932/3.**

The torque is transmitted from the drive shaft **213** through the keys **940/2** to the drive magnet assembly **858**.

This assembly is secured axially with the hex. flange nut **926/1**. The magnets are glued into the drive magnet assembly and grouted with artificial resin.
Should the can become defective, the bearing pedestal gasket **404** seals the medium from escaping at least for a short time.
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 is also contained 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.

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 or 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.

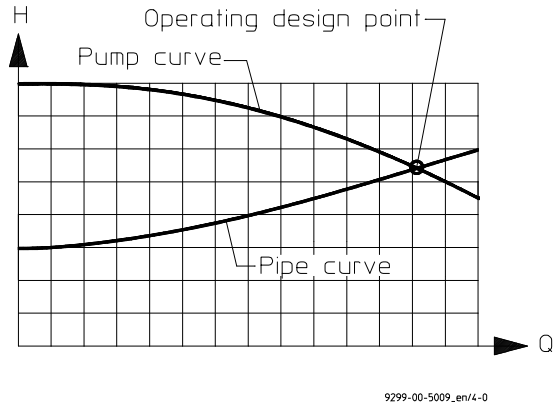


Fig. 2

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.

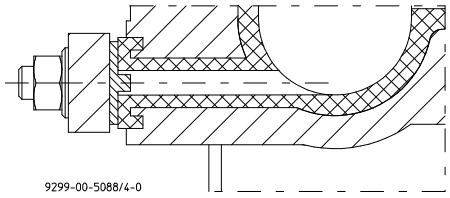


Fig. 4

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.

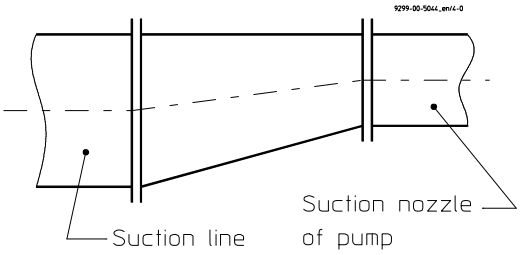


Fig. 3

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 pipe fittings 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 draining

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 enlarged.

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

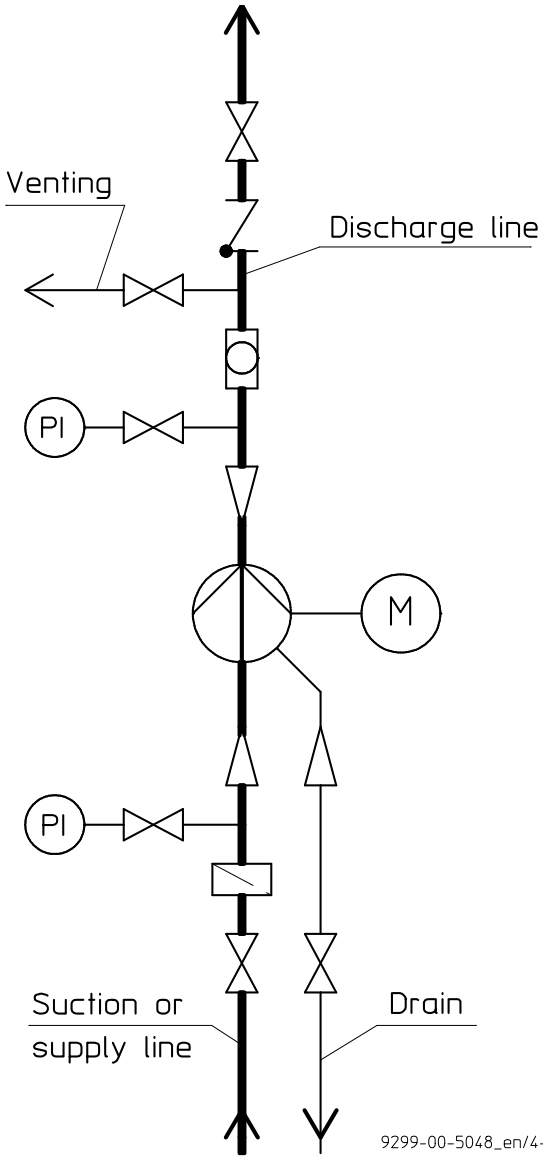


Fig.5

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 Centrifugal 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 nominal speed of 2900 rpm 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**.

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.

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 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

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

Long life grease lubrication

The rolling bearings are greased for life. Regreasing is not possible and not necessary.
For service lives, see **Section 7.2**.

Oil bath lubrication

Pour in oil into the bearing pedestal!

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

6.1.1 Filling the pump housing

- Check to see whether the screws on the suction flange, discharge flange, housing flange and drain flange are tightened. When retightening the housing screws, make sure that the support bracket is undone. Otherwise, the pump could be deformed.
  For screw tightening torques see **Section 1.1**.
- Open the suction line fully so that the medium can flow into the pump.
- Open the discharge valve so that the air in the pump can escape.
- If air cannot be vented into the discharge line, e.g. a drop in pressure in this line is not permitted, venting must be performed upstream of the discharge valve.
- Monitor the venting operation until no air but only liquid emerges.
- Turn the pump shaft at the coupling several times.
- Monitor the venting operation again until no more air emerges.
- Close the discharge valve again until only the minimum flow rate is obtained after the motor has been started.

6.1.2 Start-up

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

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

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

The pump must be completely filled with liquid. The maximum admissible flow rate must not be exceeded.

Otherwise the plain bearings can run dry in both cases.

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

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

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

Then proceeded as follows:

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

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

6.2 Operating limits

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

6.2.1 Abrasive media

If liquids with abrasive constituents are conveyed, increased wear at the pump is to be expected. The inspection intervals 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 drained or dismantled.

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

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

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

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

If the pump is returned to the manufacturer's, clean the pump very thoroughly.
See also **Section 3.1**.

6.4 Restarting

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

6.5 Improper operations and their consequences (examples)

Inadmissible modes of operation, even for a short time, can result in serious damage to the unit.

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

Operation with magnetic drive stopped :

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

Pump is started up without medium :

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

Suction line not opened or not opened fully :

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

Discharge valve closed too much:

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

Discharge valve opened too much:

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

Suction valve and discharge valve closed:

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

Control of the pump with the suction valve :

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

Overrun of the admissible gas content:

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

7 Maintenance

7.1 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
- draining flange

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

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

7.2 Bearing pedestal

7.2.1 Grease lubrication

The temperature of the bearing pedestal must not exceed 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.

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 L_{10} service life of >17,500 hours. **The service life of the grease filling guaranteed by the bearing manufacturers is given in the following table.**

Size	Bearing size > Service life
Group 1.1	6206-2RS / 15000 hr*
Group 1.2	6308-2RS / 15000 hr*
Group 1.3	6308-2RS / 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 Oil bath lubrication

The temperature of the bearing pedestal must not exceed 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.

We recommend a mineral oil with the following characteristics for an expected bearing temperature up to 70 °C:

Viscosity index : appr. 85

Kinematic viscosity at 40 °C: appr. 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 to 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.
If maintenance work is required, it is recommended to also replace the bearings as a precaution.

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 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 taken out of operation, evacuated and flushed correctly? 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.

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 have 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 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.

Dismantling of the complete pump is described here.

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

7.6.1 Removing bearing pedestal

- Undo support bracket **183** from the base plate.
- Undo screws **901/5** and **920/5** from the lantern/bearing pedestal.
- Detach bearing pedestal **330** from the centering of the lantern **344** using 2 levers.
- Remove the bearing pedestal from the lantern with a firm pull.

Caution! Magnetic forces!
Risk of accident !

Axial forces are produced when the plain bearing pedestal is pulled out of the bearing pedestal. These forces diminish again abruptly after it has been removed.

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

7.6.2 Dismantling drive unit

- Undo hex. flange nut **926/1**.
- Remove drive magnet assembly **858** using a pulling-off device.
- Drill 2 holes approx. 4 mm ∅ on opposite sides of the rotary shaft seal **421/1**. Pull rotary shaft seal out of the bearing pedestal with a suitable object, e.g. scribing iron.
- Remove circlip **932/3**.
- Push drive shaft **213** with radial ball bearings **321** in the direction of the motor out of the bearing pedestal.
- Remove wavy spring washer **953/1**.

Only oil bath lubrication

- Remove rotary shaft seal **421/2**..

7.6.3 Dismantling slide-in unit

- Undo housing screws **901/3**.
- Remove lantern **344** with bearing pedestal gasket **404**.
- Pull can **159** with intermediate ring **509/1** up and out. While doing so, the shaft **222** and impeller assembly **237** are also removed.
- Remove housing gasket **401**.
- Pull impeller assembly **237** off the shaft **222**.
- Remove shaft **222** with thrust ring **510/3** from the can. Place a suitable tool, e.g. scribing iron, behind the thrust ring and pull it off applying force at several positions.
- Remove thrust ring **510/2** using a screwdriver. Apply two screwdrivers alternately to the grooves in the impeller assembly **237** and carefully turn.
- Press out the bearing bushes **545** and distance ring **504** from the suction side of the impeller. Use a suitable mandrel made of plastic.
- Remove anti-torsion insert **566/2**.

7.6.3 Dismantling push-in unit

- Undo housing screws **901/3**.
- Remove lantern **344** with bearing pedestal gasket **404**.
- Pull can **159** with intermediate ring **509/1** up and out. While doing so, the shaft **222** and impeller assembly **237** are also removed.
- Remove housing gasket **401**.
- Pull impeller assembly **237** off the shaft **222**.
- Remove shaft **222** with thrust ring **510/3** from the can. Place a suitable tool, e.g. scribing iron, behind the thrust ring and pull it off applying force at several positions.
- Remove thrust ring **510/2** using a screwdriver. Apply two screwdrivers alternately to the grooves in the impeller assembly **237** and carefully turn.
- Press out the bearing bushes **545** and distance ring **504** from the suction side of the impeller. Use a suitable mandrel made of plastic.
- Remove anti-torsion insert **566/2**.

7.6.4 Dismantling housing/shaft spider

- Press shaft spider **338** out of the housing from the suction nozzle side. Use a suitable pipe made of plastic.
- Remove anti-torsion insert **566/1.**
- With the design "shaft spider with thrust ring" the thrust ring **510/1** is pressed into the shaft spider and cannot be removed. If necessary, it must be replaced together with the shaft spider.
- Dismantling can be checked using the sectional drawing in **Section 9.2** and the components available.

7.6.5 Replacing the radial ball bearings

To replace the radial ball bearings **321,** only remove the bearing pedestal from the plant.

See **Section 7.6.1** and **7.6.2**.

Assembly as described in **Section 7.8.3**.

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 of stainless steel parts) and screw thread prior to assembly.
- Install plain bearings in pairs as supplied or stored.
- Check whether all parts fit and then assemble them.
- Important dimensions (centerings, bearing seats, or bearing clearances) are to be checked prior to assembly, e.g. by fitting parts together as a test.
- It is recommended to replace the gaskets **400** (only oil bath lubrication) and **401**, the rotary shaft seals **421** and the wavy spring washer **953/1** during assembly.
- Many metallic particles adhering to magnetic components such as the impeller assembly **237** 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.
- See also **Section 7.5**.

7.7.1 Table for target dimension Z

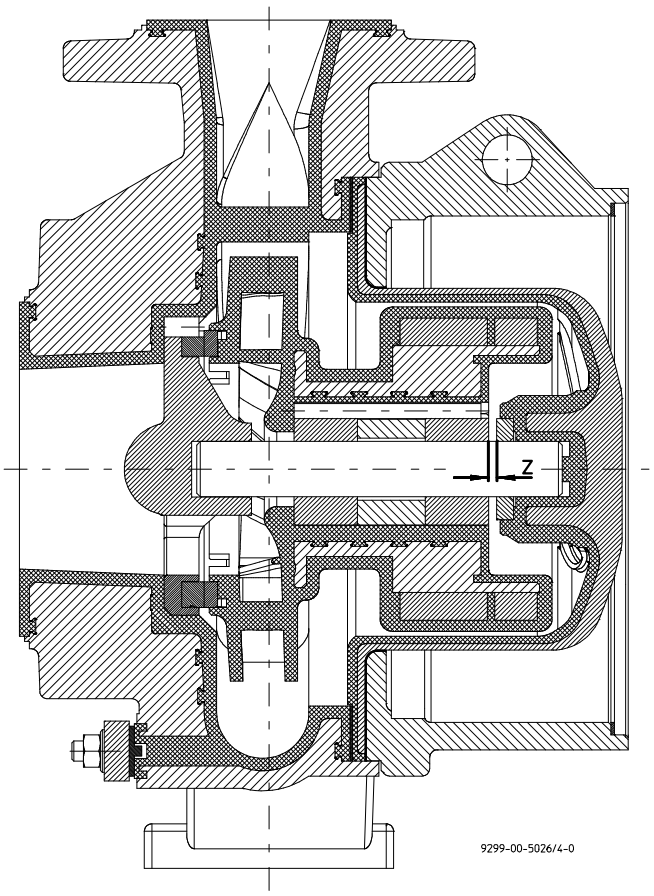


Fig. 6

Size	Dimension Z (mm)
25-25-125	1.35 - 2.8
50-32-125	1.35 - 2.8
25-25-160	1.35 - 2.8
50-32-160	1.35 - 2.8
80-50-160	1.35 - 2.8
50-32-200	1.35 - 2.8
65-40-200	1.35 - 2.8
80-50-200	1.35 - 2.8

Z : Axial play required.

The impeller assembly must, e.g. after assembly, have a minimum axial play. This **axial play Z** can be checked using the drawing **Fig. 6** after assembly.

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

- Introduce anti-torsion insert **566/1** into shaft spider **338**.
- Press shaft spider into the housing using a hand press. Use an appropriate pipe made of plastic
- There are two designs of the shaft spider:
  1. Shaft spider **338** with integral thrust ring.
  2. Two-piece shaft spider **338** with inserted thrust ring **510/1**.
- Make sure that in the case of the two-piece shaft spider the thrust ring points with the lubricating grooves towards the impeller.
- Press in until engagement can be felt.

7.8.2 Assembly of slide-in unit

- Align anti-torsion grooves of the thrust ring **510/2** exactly with the guides of the impeller assembly.
- Carefully press thrust ring **510/2** right into the impeller assembly **237.** When doing so, use a soft intermediate shim.
- Check whether the thrust ring protrudes about 2 mm out of the impeller assembly. See **Fig. 7**.

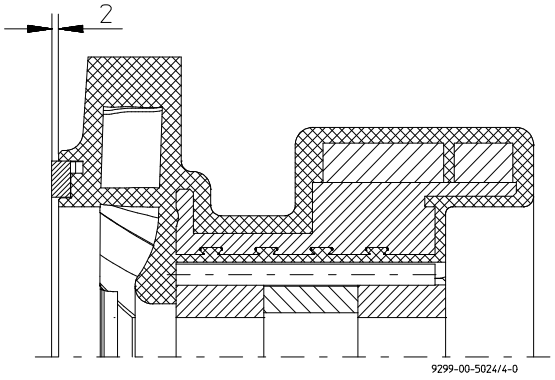


Fig. 7

- Press in bearing bush **545/1** on the suction side together with the anti-torsion insert **566/2**.
- Insert distance ring **504**.
- Press in bearing bush **545/2** on the bearing pedestal side.
- Push thrust ring **510/3** onto the shaft **222**. Make sure that the flushing grooves are in the direction of the housing.
- Press shaft **222** into the can **159**. Pay attention to the anti-torsion surfaces.
- Push intermediate ring **509/1** onto the can. See **Figure 8** next side.

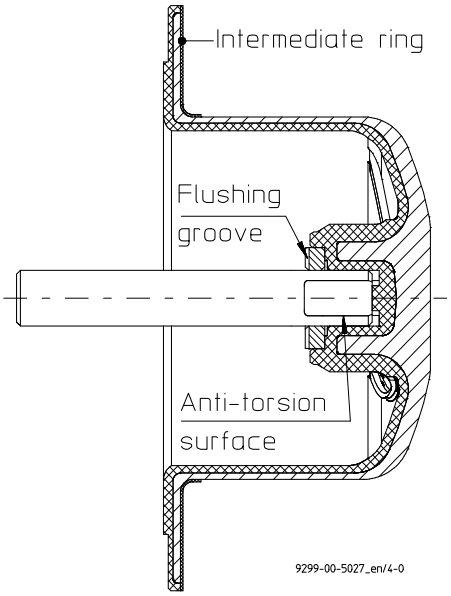


Fig. 8

7.8.3 Assembly of drive unit Long life grease lubrication

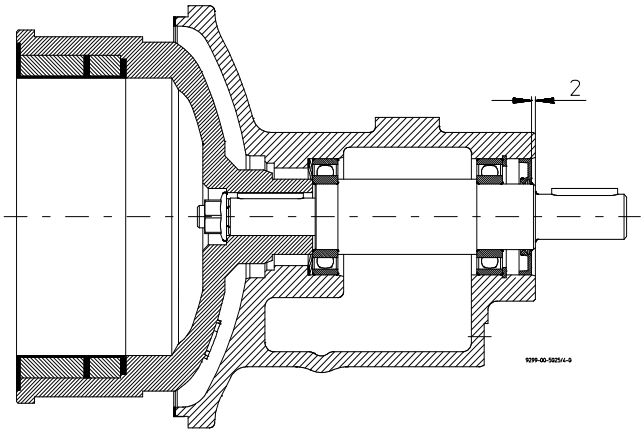


Fig. 9

- Press radial ball bearings **321/1** and **321/2** onto the drive shaft.
- Insert keys **940/1** and **940/2** into the drive shaft.
- Insert wavy spring washer **953/1** into the bearing pedestal.
- Install completely assembled drive shaft from the motor side.
- Insert circlip **932/3**.
- Insert rotary shaft seal **421/1**. Distance to outside edge 2 mm. See **Fig. 9**.
- Install drive magnet assembly **858**.
  Put 1 drop of adhesive on the thread of the drive shaft, e.g. Loctite 243 or an equivalent.

  Only 1 drop of the adhesive should be applied. Otherwise the next dismantling operation will be more difficult or no longer possible without destroying components.
- Screw on hex. flange nut **926/1** and tighten.

7.8.3 Assembly of drive unit Oil bath lubrication

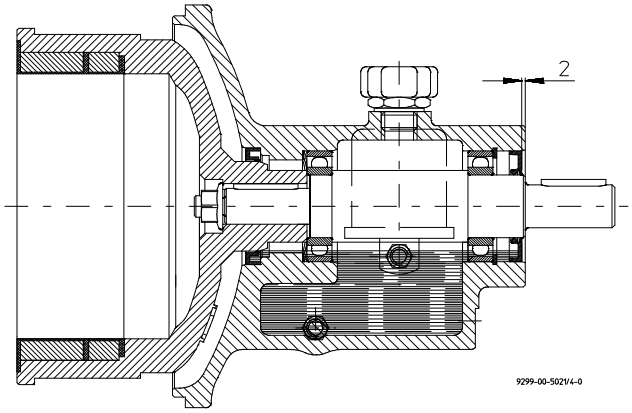


Fig. 10

- Press radial ball bearings **321/2** and **321/1** with flat gasket **400/2** onto the drive shaft.
- Insert keys **940/1** and **940/2** into the drive shaft.
- Insert wavy spring washer **953/1** and flat gasket **400/1** into the bearing pedestal.
- Install completely assembled drive shaft from the motor side.
- Insert circlip **932/3**.
- Insert rotary shaft seal **421/1**. Distance to outside edge 2 mm. See **Fig. 9**.
- Insert rotary shaft seal **421/2**.
- Install drive magnet assembly **858**.
  Put 1 drop of adhesive on the thread of the drive shaft. e.g. Loctite 243 or an equivalent.
  Only one drop of the adhesive should be applied. Otherwise the next dismantling operation will be more difficult or no longer possible without destroying components.
- Screw on hex. flange nut **926/1** and tighten.

7.8.4 Final assembly

- Secure the housing with the suction nozzle on a work bench or worktop. Protect the plastic working strip against damage with a suitable support.
- Insert housing gasket **401** into the housing centering.
- Place entire impeller assembly concentrically onto the shaft spider **338**.
- Mount complete can with shaft.
- Attach lantern. For tightening torques of the housing screws, see **Section 1.1**.
- Check whether the impeller assembly has axial play. Reach through the suction or discharge nozzle and move the impeller assembly axially. See **Section 7.7.1**.
- Insert bearing pedestal gasket **404** into the lantern **344**.
- Introduce drive magnet assembly with the completely assembled bearing pedestal into the lantern.

This again results in **strong axial forces**.

- Tighten lantern screws **901/5, 920/5**.
- Check whether the drive shaft can be easily turned.
- Attach support bracket **183,** align and tighten.

7.8.5 Fill bearing pedestal with oil

Oil quantities:

For group 1.1 ca. 200 ml

For group 1.2 / 1.3 ca. 200 ml

Groups see **Section 1**.

Type of oil

See **Section 7.2.2**.

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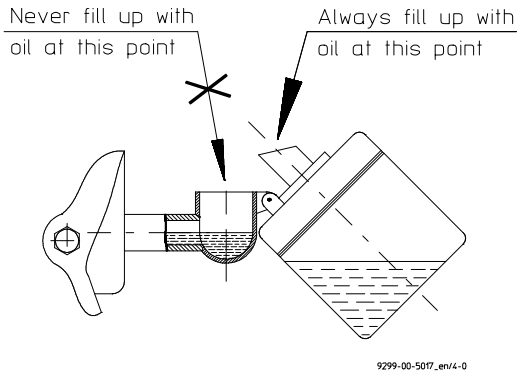


Fig. 11

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 Faults

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

In connection with explosion protection, potential sources of ignition (overheating, electrostatic and induced charges, mechanical and electric sparks) 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 high 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 noise :

- 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?
- Over aging / wear?

Leak from the pump :

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

9 Sectional drawing

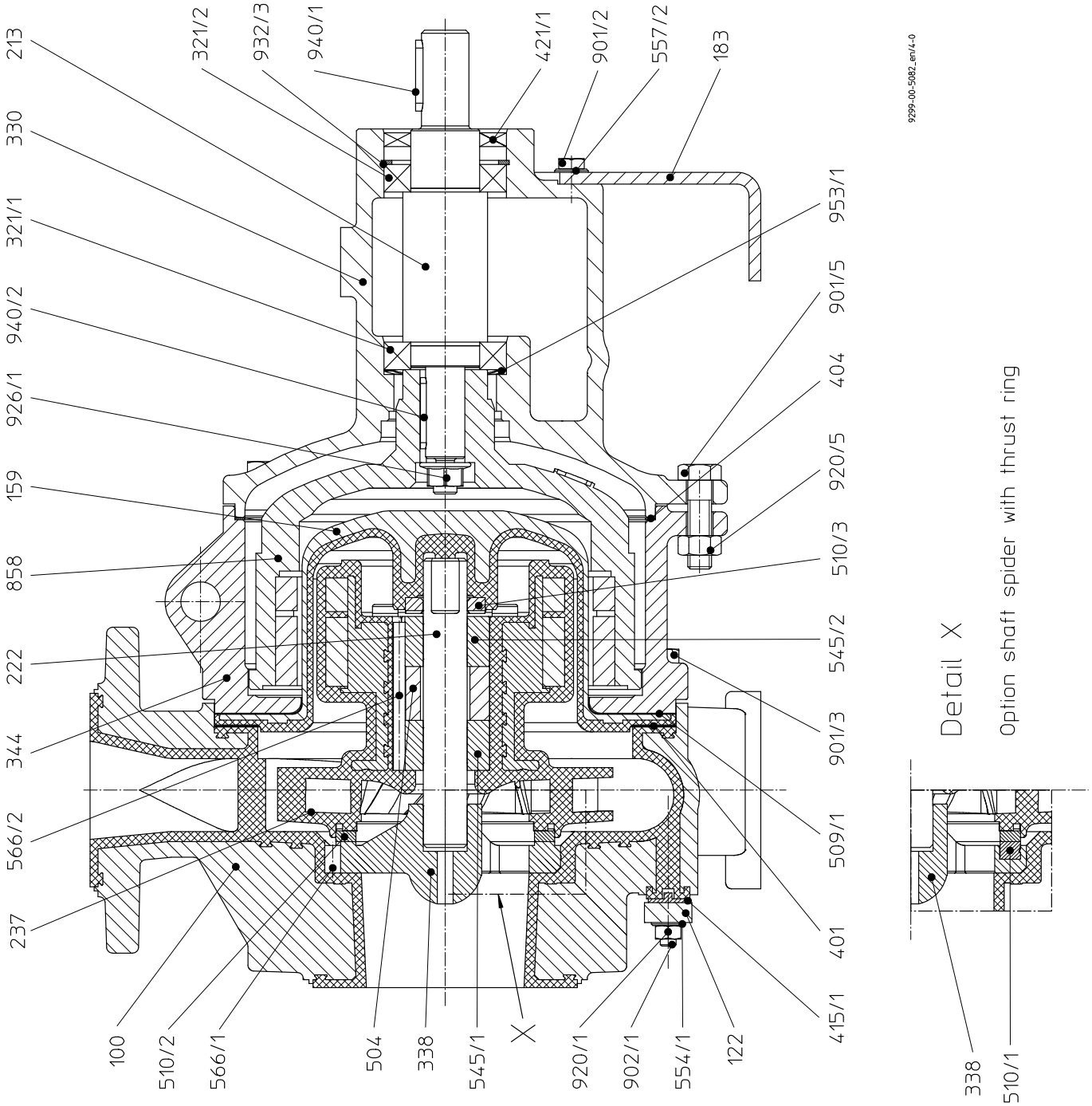
9.1 Legend

100	housing
122	blind cover
159	can
183	support bracket
213	drive shaft
222	shaft
237	impeller assembly
321/x	radial ball bearing
330	bearing pedestal
338	shaft spider
344	lantern
401	housing gasket
404	bearing pedestal gasket
415/1	centering gasket
421/1	rotary shaft seal
504	distance ring
509/1	intermediate ring
510/x	thrust ring
545/x	bearing bush
554/1	washer
557/2	contact disc
566/x	anti torsion insert
858	drive magnet assembly
901/x	hex. screw
902/1	stud screw
920/x	hex. nut
926/1	hex. flange nut
932/3	circlip
940/x	key
953/1	wavy spring washer

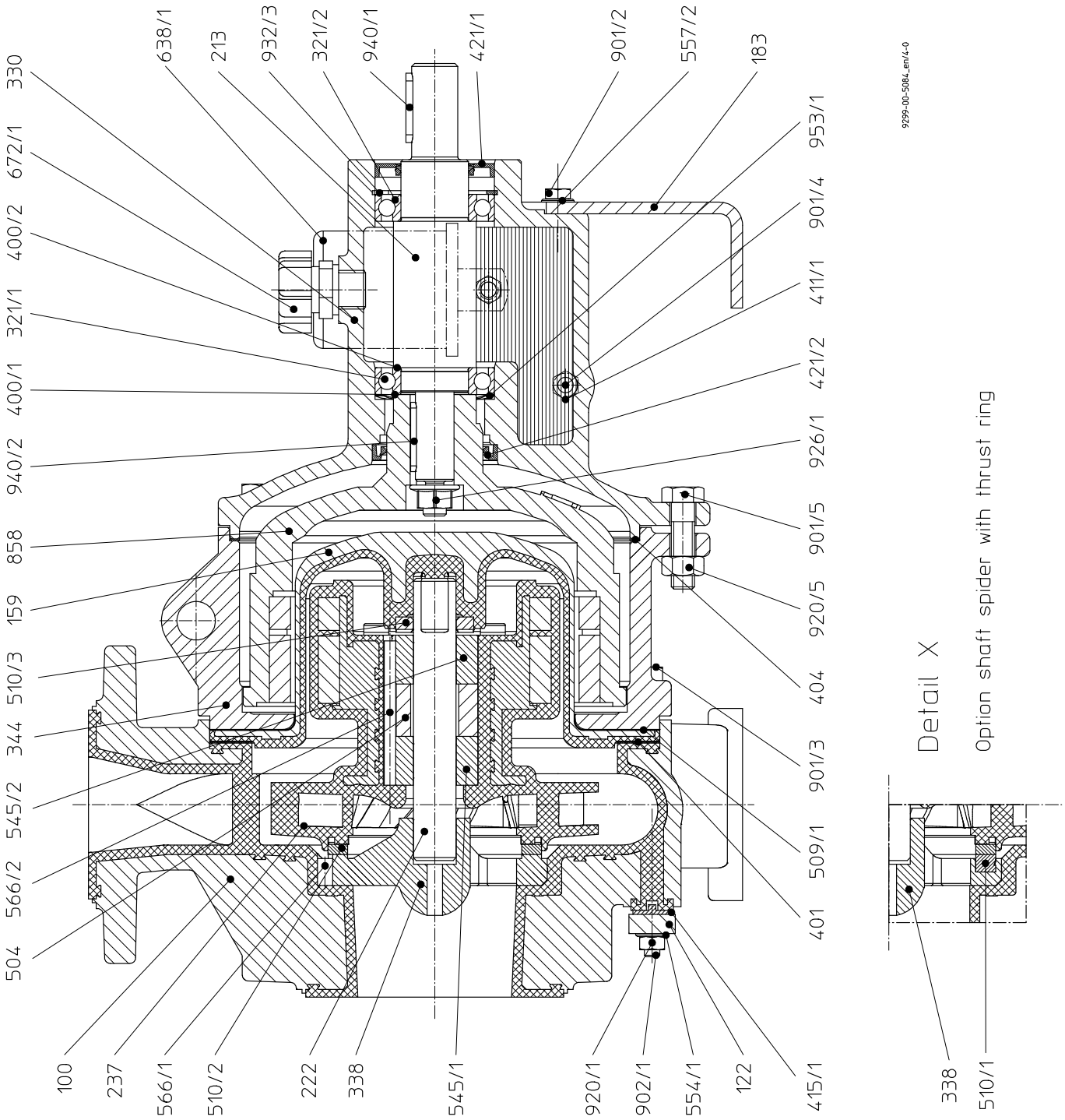
Additional for oil bath lubrication

411/1	seal ring
421/2	rotary shaft seal
638/1	constant level oiler
672/1	venting / filling plug
901/4	hex. screw

9.2 MDK with grease lubrication



9.3 MDK with oil bath lubrication



Baureihe/Series/Série

MDK
MDK-B

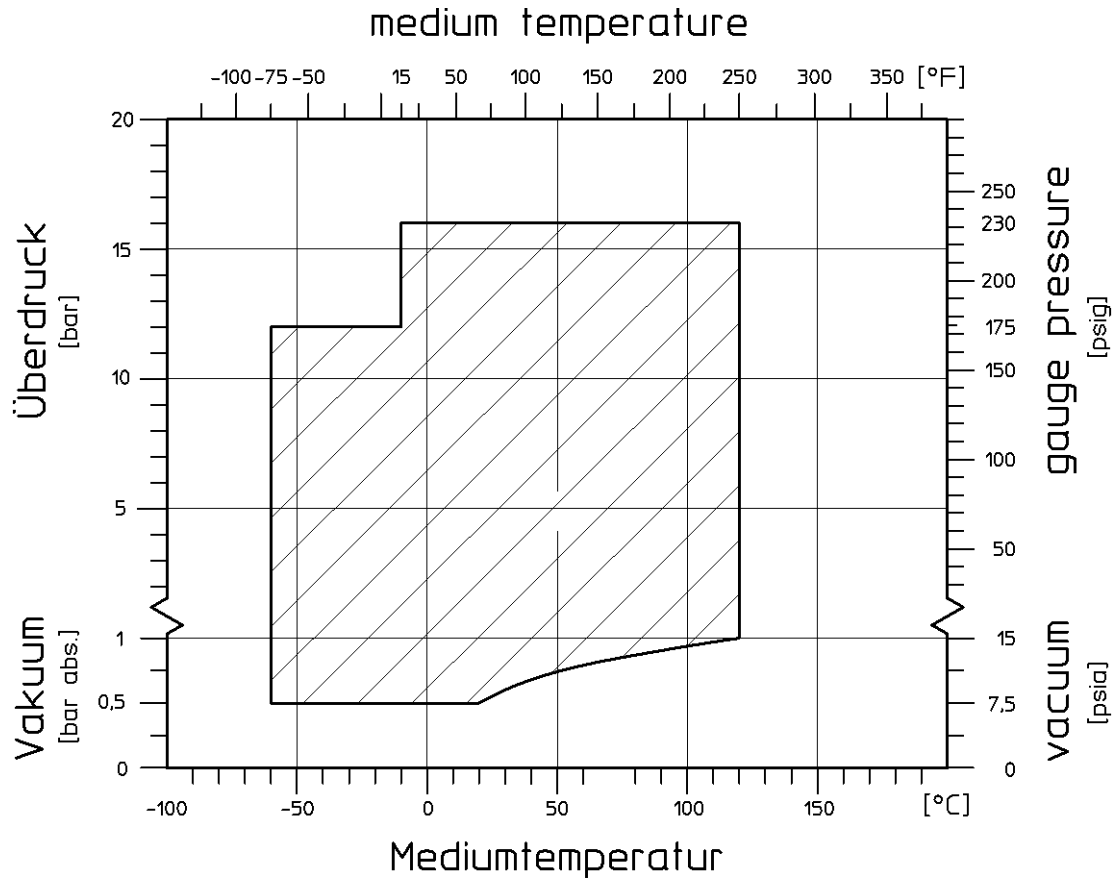
Ausführung **Magnetkupplungspumpe**

Design **Magnet drive pump**

Construction **Pompe à entraînement magnétique**

RICHTER Process Pumps & Valves

Einsatzgrenzen / operating limits



Bemerkung / remark :

Bei Einsatz unter ASME-Bedingungen (Sphäroguss nach A395) kann der Standardbereich auf -30°C und 16bar erweitert werden.

Application under ASME-specification (ductil iron acc. To A395) the standard range can be expanded up to 30°C and 16bar.

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

RICHTER Process Pumps & Valves
A Unit of IDEX Corporation

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

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

Richter Chemie-Technik GmbH
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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 *Product*	Magnetkupplungs-Chemiekreiselpumpe als Aggregat *Magnetic Drive Chemical Centrifugal Pump* *as unit*
Baureihe *Series*	MNK, MNK-B, MNK-X, MNK-XB, MNK-S, MNK-SB, MNKA, MNKA-B MPB, MDK, MDK-B, RMA, RMA-B, RMI, RMI-B
EU-Richtlinien *EU-Directive*	2006/42/EG Maschinenrichtlinie *Machinery Directive*
Modul	Interne Fertigungskontrolle *Production Quality Assurance*
Angewandte harmonisierte Normen *Applied harmonised Standards*	EN 14121 EN 809
Kennzeichnung *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

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