INSTALLATION AND OPERATING MANUAL

Translation of the original manual

Series SCK

Chemical Drive Pump

for Mechanical Seals

Bearing lubrication: Grease and Oil bath

Bearing pedestal group: 1+2+3

Keep for future use!

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

9220-050-en Revision 11 Edition 07/2010

RICHTER
Process Pumps & Valves

List of Contents

Relevant documents

- Data sheet
- Works certificate
- Installation and operating manual for mechanical seals, depending on design:

  External single mechanical seal 9220-060-en

  Stationary single mechanical seal RG-4 9220-061-en

  Stationary single mechanical seal RG-4 quenched 9220-062-en

  Double mechanical seal to DIN EN 12756 9220-063-en

  Stationary double mechanical seal RG-4, liquid sealed 9220-064-en

  Stationary double mechanical seal RG-5, quenched and liquid sealed 9220-065-en
- Supplementary Installation and Operating Manual, vortex pump ***** 9230-061-en
- Supplementary Installation and Operating Manual, „self-priming“ design * 9230-062-en
- Sectional drawing SCK

  Long life grease lubrication

  Group 1 + 2 9220-00-3005

  Group 3 9220-00-3007

  Oil bath lubrication

  Group 1 + 2 9220-00-3006

  Group 3 9220-00-3008
- Installation drawing
- Dimensional drawing SCK 9220-00-3030
- Dimensional drawing drain connection ***** 9220-00-3022
- Dimensional drawing drain connection ***** Size 150-125-315 9220-00-3023
- Dimensional drawing temperature monitor ***** 9220-00-3026
- Performance curves
- Spare parts list
- Operating manual and declaration of conformity motor *
- Operating manual and declaration of conformity coupling *
- Operating manual mechanical seal of the manufacturer

Appendix to the operating manual

- Operational limits see 9200-00-3030
- Declaration of conformity with ATEX
- Declaration of conformity without ATEX
- Form for Safety Information Concerning the Contamination QM 0912-16-2001_en

On request :

- Publication : Mechanical seals for solids-laden and crystallizing media
- Publication : "Centrifugal Pump Operation without NPSH 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
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, chemical centrifugal pump, series SCK, grease and oil bath lubrication, for mechanical seals

Heavy-duty horizontal design

Technical specifications to ISO 15783 and DIN ISO 5199

Connecting dimensions to ISO 2858 / DIN EN 22858

Flange connecting dimensions:
DIN EN 1092-2, shape B (ISO 7005-2, shape 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),
Mechanical seal housing made of stainless steel

Wetted parts:
Lining: PFA, PTFE, PE-UHMW,
anti-static lining (PFA/PTFE conductive)
and see data sheet.

Flow rate: up to 300 m^3/h (at 2900 min^{-1})

Delivery head: up to 110 m LC (at 2900 min^{-1})

Housing discharge pressure: max. 16 bar
detailed data see operational limits

Temperature range : - 60 °C to + 180 °C

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

Temperature classes: see Section 2.6.7

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

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

Size:

Group 1	Group 2	Group 3
25-25-160	80-50-250	125-100-250
50-32-160	80-50-315	150-125-315
80-50-160	125-80-200	
50-32-200	125-100-200	
65-40-200		
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]
25-25-160	6 x M 10	45
50-32-160	6 x M 10	45
80-50-160	6 x M 10	45
50-32-200	8 x M 12	45
65-40-200	8 x M 12	45
80-50-200	8 x M 12	45
80-50-250	8 x M 12	60
80-50-315	12 x M16	95
125-80-200	8 x M 12	60
125-100-200	8 x M 12	60
125-100-250	12 x M 12	60
150-125-315	12 x M 12	60

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
100	8 x M 16	35
125	8 x M 16	45
150	8 x M 20	65

Pipe screws, DIN/ISO flanges drilled to ASME

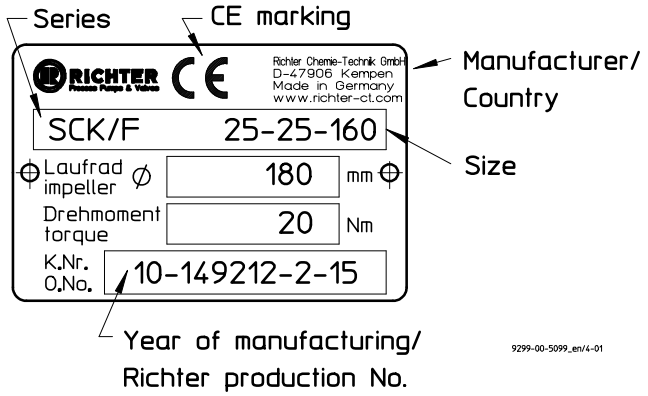
DN		No. x size	Tightening torque	
[mm]	[inch]	[ASME]	[Nm]	in-lbs
25	1“	4 x ½“	8	70
32	1¼“	4 x ½“	12	105
40	1½“	4 x ½“	15	135
50	2“	4 x ⅝“	25	220
65	2½“	4 x ⅝“	30	265
80	3“	4 x ⅝“	45	400
100	4“	8 x ⅝“	35	310
125	5“	8 x ¾“	55	485
150	6“	8 x ¾“	80	710

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:



ATEX marking :

Housing identification :

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

- Nominal size
- Rated pressure
- Housing material
- Manufacturer's identification
- Melt number/Foundry identification
- Cast date

1.3 Spare parts

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

2 Safety

This operating manual contains fundamental information which is to be observed during installation, operation and maintenance.
It must be read before installation and commissioning.

This operating manual must always be available at the place of use of the machine/plant.

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 electric power!

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.
- 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 SCK are plastic-lined centrifugal pumps for the conveyance of aggressive, toxic, pure and inflammable liquids.

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**.

Improper 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 improper 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 operating manual of the mechanical seal manufacturer in particular must be examined with regard to the maximum medium temperature limit and a comparison be made with the medium temperature limits indicated in the table in **Section 2.6.7**.

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! Improper 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.

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

The pump is normally used to convey aggressive and inflammable liquids.

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

If the flow rate is too high, there is a risk that the pressure in the area of the mechanical seal falls until the vapour pressure of the fluid is undershot. As a result, this may lead to dry-running, particularly with the single mechanical seals, involving inadmissible overheating and the destruction of the mechanical seal.

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

Overloading, overheating or non-observance of the design data can result in Improper operation and it is therefore imperative to avoid them.

Help can be provided by appropriate monitoring facilities. See **Section 5.6**.

The plant NPSH value (NPSHA) must be 0.5 m higher than the NPSH value of the pump (NPSHR to prevent damage to the pump).

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 **including mechanical seal**. For classification in a certain temperature class, the data in the operating manuals of the mechanical seal manufacturer and of the pump manufacturer are to be matched for each individual application.
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 mechanical seal.

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 6.1.3**.

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 normal operating mode the highest temperatures are to be expected on the shaft seal (only with oil lubrication), on the inner races of the rolling bearings and at high medium temperatures on the surface of the pump housing.

We would like to point out that, under extreme operating (medium temperature > 160°C) and ambient conditions (ambient temperature >30 °C), temperatures of over 130°C may arise on the surface of the pump housing.

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

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

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

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 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.

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 as per EN 13463-1	Limit value of the temperature of the process liquid	
	PE-UHMW	PFA/PTFE
T6 (85 °C)	**not certified to ATEX**	
T5 (100 °C)		
T4 (135 °C)	90 °C [1)]	130 °C [1)]
T3 (200 °C)	90 °C	180 °C [2)]
T2 (300 °C)	90 °C	180 °C [2)]
T1 (450 °C)	90 °C	180 °C [2)]

Note : If the operating manual of the mechanical seal demands a lower medium temperature than indicated in the above table, this lower medium temperature is decisive.

1) Long life grease lubrication: no restriction.
Oil bath lubrication: standard version with shaft seal **T3**
labyrinth seal (special design) **T4**

2) Consult the manufacturer for higher limit values.

If different temperature classes (e.g. pump T4, mechanical seal T3) arise when one medium is used for pumps and the mechanical seal, the lower temperature class (in the above example T3) applies to the entire pump including the mechanical seal.

Observance of the temperature class T4 with oil bath lubrication is not possible with the standard shaft seal. A labirinth seal must be used instead of the shaft seal for the temperature class T4 and with oil lubricated rolling bearings.

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, or even defective bearing seals. See **Section 7.2**.

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

If auxiliary systems (e.g. cooling, heating) are installed, 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 and disposal

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

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

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

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

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

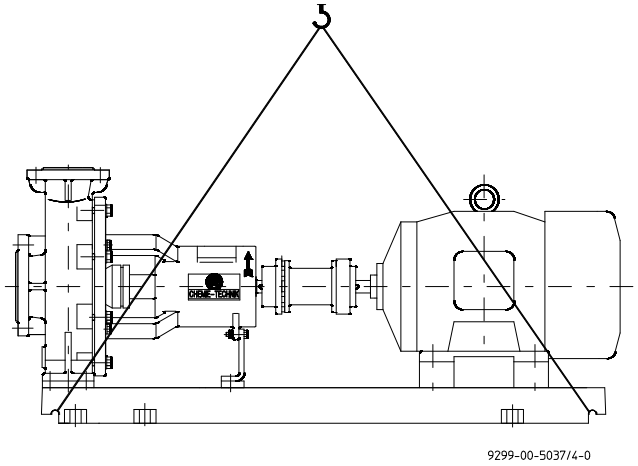


Fig. 1

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

Damaged pumps must not be installed in the plant.

Handle goods carefully to prevent damage.

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

If the unit is not installed immediately after delivery, it must be put into proper storage.

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

Elastomers are to be protected against UV light.
In general, a storage period of 10 years should not be exceeded. An admissible storage period of 4 years applies to elastomers made of NBR.

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 SCK correspond to ISO 2858 / DIN EN 22858 / DIN ISO 5199. The technical requirements of the VDMA 24279 are satisfied.

The sectional drawing shows the design of the pump. See **Section 9.2**.

Additional information for the pump is provided in the **brochure**.

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

The pump consists of the assemblies:
Housing, back plate, impeller, shaft sleeve, bearing pedestal, shaft gasket and mechanical seal (separate manual).

4.1 Housing

The metallic shell gives the plastic lining of the housing **100** the necessary stability.

Optionally, the housing can be fitted with a drain (see **Section 5.4.6**) or heating. This is shown in the data sheet or in a separate technical document.

4.2 Back plate

The **replaceable back plate** is standard. If a vacuum can occur in the pump due to the plant, a so-called "**anchored back plate**" has to be used.

- The replaceable back plate **161** consists of the metallic cover **160**, the back plate insert **168**, a two-piece ring **501** and circlip **932/4**. These parts can also be replaced by the customer.

  The cover **160** is held in the back plate insert **168** by a 2-piece ring **501.** A circlip **932/4** holds the 2-piece ring together. See **Fig. 2**.

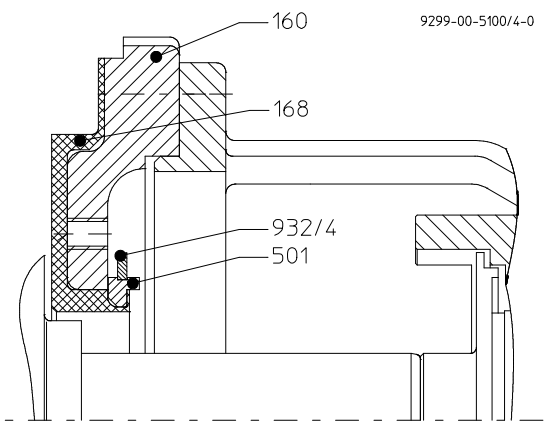


Fig. 2

- It is not possible to replace the plastic lining in the customer's workshop in the case of the anchored back plate **161**. See **Fig. 3**.

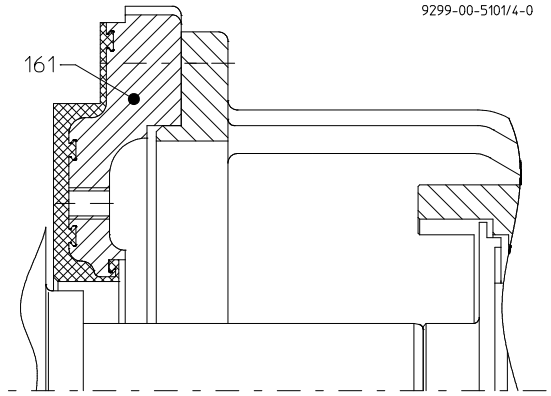


Fig. 3

- There is an anchored back plate **161** for the mechanical seal RG-4. See **Fig. 4**.

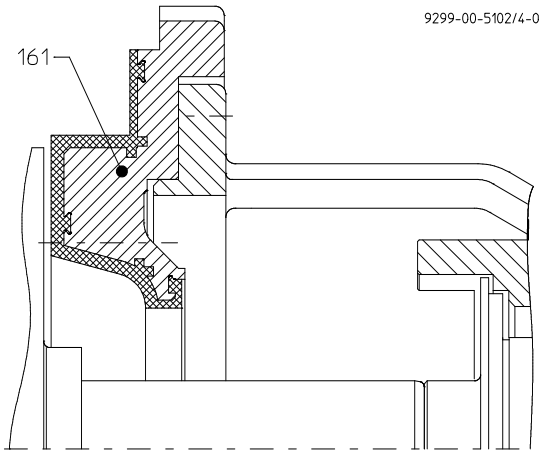


Fig. 4

- For the sizes of group 3 the RG-4 back plate **161** can be replaced and is vacuum-proof. See **Fig. 5**.

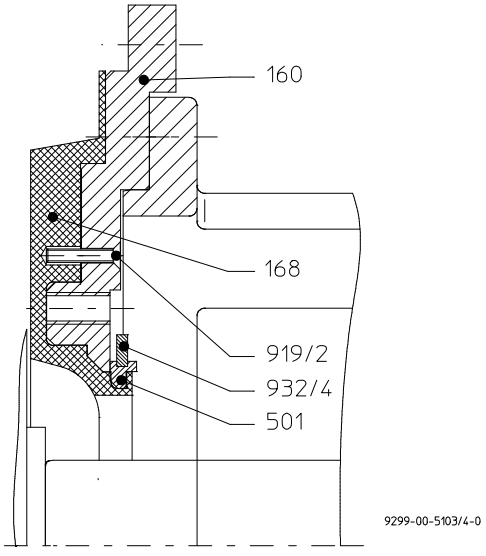


Fig. 5

4.3 Impeller

For strength reasons the impeller **230** has a metallic core inside with which is it screwed onto the shaft **210**. A locking unit **930/1** is installed between the impeller and the shaft in **groups 1 and 2** as an anti-torsion insert. With **group 3** the impeller is self-holding.

4.4 Shaft sleeve

To protect the shaft **210** against corrosion, the section between the impeller and the shaft gasket is protected with a shaft sleeve **524** made of a hard, corrosion-resistant material.
A plastic lining is provided at the bearing points in the shaft sleeve made of non-metallic materials in order to permit a safe transition to the metallic shaft.

4.5 Bearing pedestal

Grease lubrication

The bearing **321/2** on the motor side is designed as a fixed bearing and that on the pump side as a floating bearing **321/1**.

A rear bearing cover **361** is installed on the motor side as additional protection. Grease is provided between the rear bearing cover and the bearing as corrosion protection. An additional seal can be installed.

Oil bath lubrication

The bearing **321/2** on the motor side is designed as a fixed bearing and that on the pump side as a floating bearing **321/1**.
A rear bearing cover 361, which accomodates a rotary shaft seal 421/1 and an O-ring 412/1 for oil sealing, is installed on the motor side..

A so-called labyrinth disc **555** is installed on the pump side.

It has several functions:

- The grease layer protecting the front bearing is held back.
- Any medium emerging from the mechanical seal is kept away from the bearing.
- Cup springs **950/1,** which press the shaft sleeve **524** against the impeller are inserted in order to seal at that location.
- It serves as a running surface when an additional seal ring is installed.

4.6 Mechanical seals

Designs:

- Single mechanical seal
  - external
  - internal
- Single mechanical seal with lip seal and distance sleeve
- Double mechanical seal to DIN EN 12756
- Mechanical seal suitable for solids
- Lip seal

See the relevant installation and operating manuals of Richter or the mechanical seal manufacturer.

5 Installation

5.1 Safety regulations

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

5.2 Installation of pump/unit

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

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

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

Other possibilities of installing the pump are:

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

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

5.3 Alignment of pump-coupling-motor

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

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

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

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

5.4 Piping

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

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

Use flange gaskets suitable for the media.

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. 6**. The pump curve is provided by the pump manufacturer. The pipe curve is determined using diagrams or PC programs.

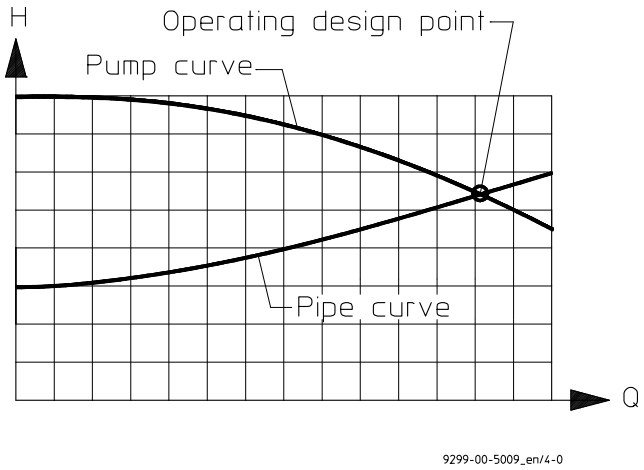


Fig. 6

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 acc. to 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.

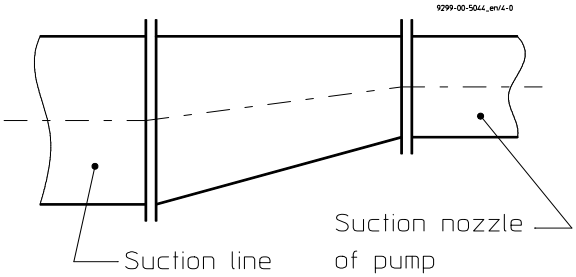


Fig. 7

5.4.4 Supply line

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. Boring template see **Section 10.5**.

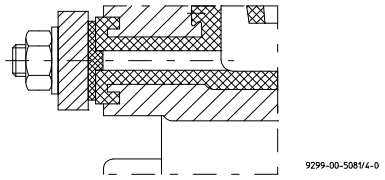


Fig. 8

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

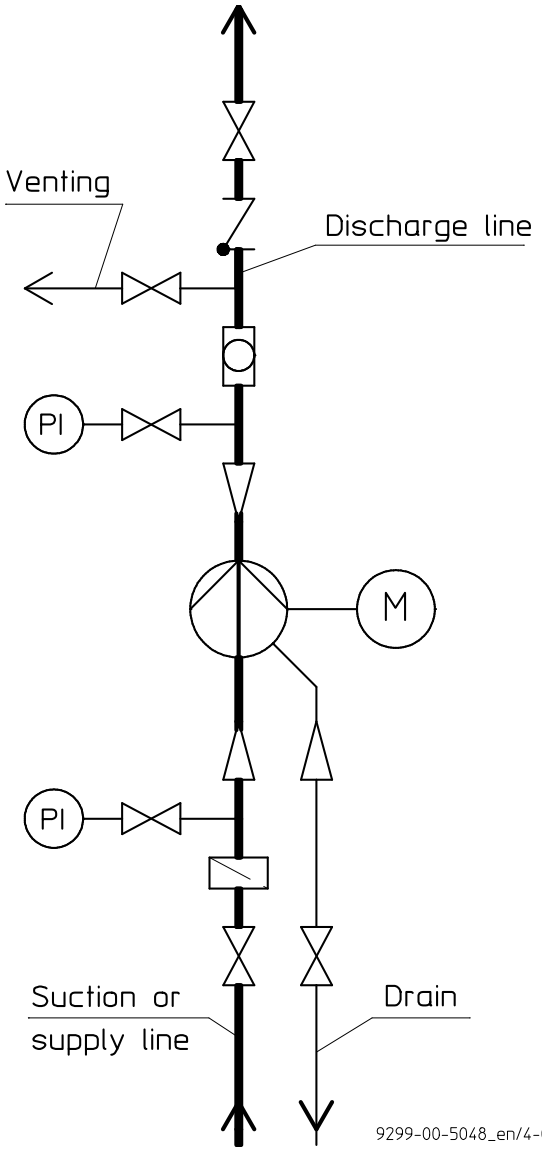


Fig. 9

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
- Leak monitors

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

5.7 Drive

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

Care must be taken when selecting the motor size to ensure that the excess power is not too great but that the requirements acc. to ISO 5199 are satisfied.

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

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.

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 lubrication

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

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

Oil bath lubrication:

Pour in oil into the bearing pedestal!

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

6.1.1 Mechanical seals

The design and material combination are specified in the data sheet.

The proper condition of the components and the protective facilities must be ensured to prevent any risk from escaping medium.

The regulations and recommendations of the mechanical seal manufacturer must always be observed.

See relevant installation and operating manual for the mechanical seal.

6.1.2 Filling the pump housing

- Check to see whether the screws of the mechanical seal and all flange connections 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.
- 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.

6.1.3 Start-up

- Check the direction of rotation of the motor 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.
- If no rotary field instrument is available, the motor can be switched on briefly with the pump filled so that it does not run up. Observe the direction of rotation through the fan hood.

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.

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

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.

These measures are not necessary with pumps with a conductive plastic lining.

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 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 Improper operation; their occurrence can only be prevented by adhering to the intended use.

Pump is started up without medium :

- The mechanical seal 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.
- Excessive shaft deflection with consequences for the mechanical seal.
- Excessive bearing load with consequences for the bearing service life.

Discharge valve opened too much :

- Pump can cavitate. Particularly severe with an empty discharge line.
- Risk of pressure surge.
- 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 :

Pump is cavitating – material damage to pump and plain bearings

The suction valve is closed with the pump at a standstill :

- Possible damage to the mechanical seal because another pump can generate a pressure for which the mechanical seal is not rated.

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.

Pumps with quench or pressurisation system :

Pump is started up without quench or pressurisation system :

- The mechanical seal on the atmosphere side is already destroyed after a few revolutions.

Pump is started up with too low a sealing liquid pressure :

- The process medium can enter the liquid seal system and destroy the metallic parts of the mechanical seal.

Too high pressure of the quench medium :

- The wetted O-ring can be pressed into the process medium.

Sealing liquid consumption too high :

- Is the pump not running smoothly?
- Can a leak be seen on the mechanical seal housing?
  - Does the leak come from a static sealing point?
  - Or from a sliding surface on the atmosphere side?
  - Or from connection points of the supply or discharge lines?
- If no exterior leak is visible, the missing sealing liquid enters the product. Repair the wetted mechanical seal.

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/bearing pedestal
- suction flange
- discharge flange

See also **Section 6.1.2, para. 1**.

Further inspections are to be conducted at regular intervals in line with 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.

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

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

7.2.1 Grease lubrication

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

The rolling bearings are designed for an 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 > Operating time
Group 1	6308-2RS / 15000 h *
Group 2	6311-2RS / 15000 h *
Group 3	6314-2RS / 15000 h *

* 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.

The rolling bearings contain a grease seal as protection against corrosion. The works provides lithium-saponified grease, e.g. SKF, type FL or equivalent.

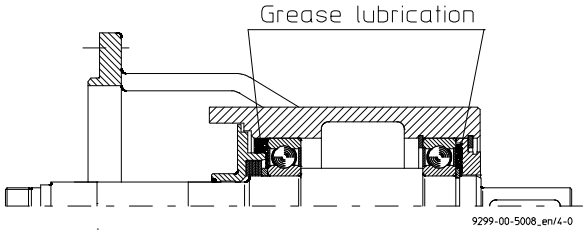


Fig. 10

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

7.2.2 Oil bath lubrication

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

Replacing the bearings: The ball 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 ball bearings

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

If maintenance work is required, it is recommended to also replace the bearings as a precaution and fill in new oil.

7.3 Mechanical seals

The regulations of the mechanical seal manufacturer must always be observed.
See also the relevant supplementary installation and operating manual for mechanical seals.

7.4 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.

7.5 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.

7.6 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.
- The ceramic parts are relatively easy fragile; with the plastic components the soft sealing surfaces in particular are to be protected.
- If the diameter of a plastic impeller is to be reduced, it must be remembered that there is a metallic core in the impeller which is not resistant to the medium. The table of the machined diameters of plastic impellers is to be observed. In case of doubt only machine the area of the vanes.

7.6.1 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 and within the mechanical seal.

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.

7.7 Dismantling

There are two possibilities for dismantling:

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

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

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

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

Dismantling can be checked using the sectional drawing in **Section 9.2** and the components available.

7.7.1 Dismantling the slide-in unit

- Clamp the slide-in unit in the vice.

It is imperative to use clamping jaws with an aluminium surface.

Bearing pedestal group 3:

The labyrinth disc **555** must be secured with two bolts **prior** to the dismantling of the impeller. For this purpose thera are 2 bores Ø5 mm in the bearing pedestal. The mechanical seal is pressure-relieved as a result. See **Fig. 11**.

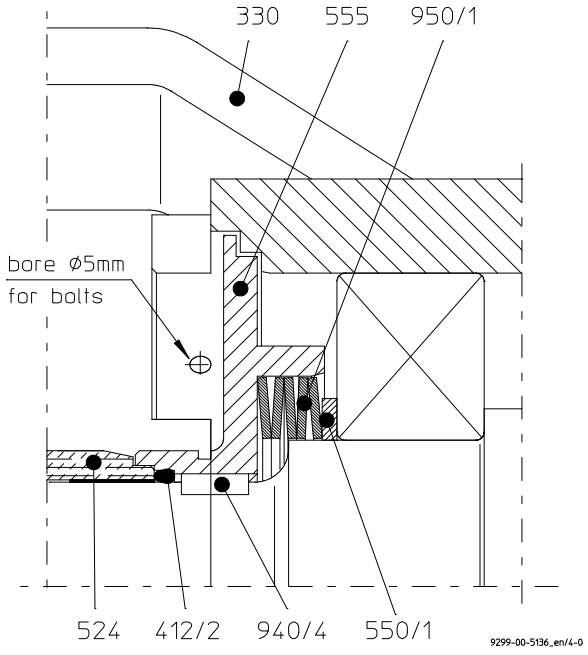


Fig. 11 Long life grease lubrication

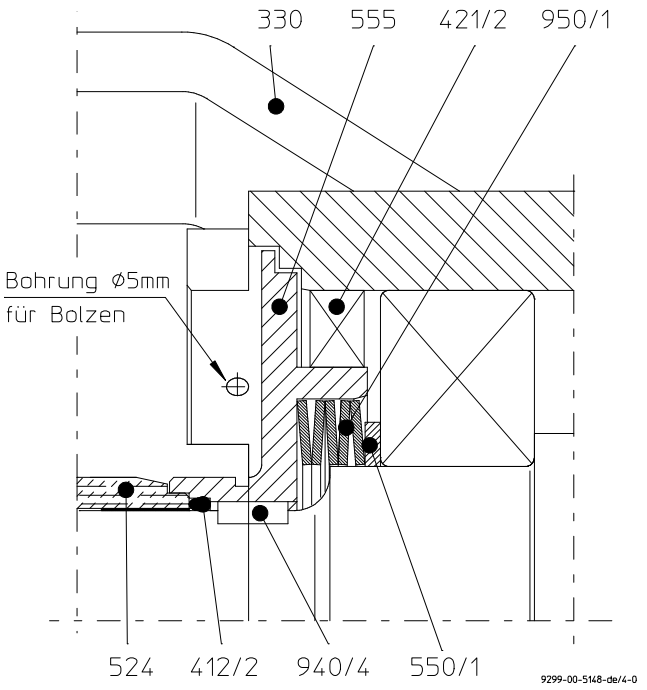


Fig. 11 Oil bath lubrication

- Undo impeller **230** with a strap wrench or assembly wrench. **Right-hand thread!**

  For assembly aid for impeller, see **Section 10.1**.

The impeller is dismantled before or during dismantling of the mechanical seal, depending on the type of mechanical seal.

After removing the impeller **230,** the locking unit **930/1** becomes visible (only with groups 1 + 2).

The one half of the locking unit is generally seated firmly on the impeller and the other half firmly on the shaft.
If these parts are still in good condition, they are best left assembled. If one or both locking unit halves has/have to be removed, it/they may have to be destroyed with a chisel.

7.7.2 Dismantling the mechanical seal

See the supplementary installation and operating manual for the respective mechanical seal version:

External single mechanical seal **9220-060-en**

Stationary single mechanical seal RG-4 **9220-061-en**

Stationary single mechanical seal RG-4 quenched **9220-062-en**

Double mechanical seal to DIN EN 12756 **9220-063-en**

Stationary double mechanical seal RG-4, liquid sealed **9220-064-en**

Stationary double mechanical seal RG-5, quenched and liquid sealed **9220-065-en**

and/or operating manual of the mechanical seal manufacturer.

7.7.3 Dismantling the shaft sleeve

The dismantling of the shaft seal is described in the installation and operating manual of the respective mechanical seal type.

7.7.4 Dismantling the back plate

The dismantling of the housing back plate is described in the installation and operating manual of the mechanical seal type.

- A replaceable back plate **161** can be dismantled after removal of the circlip **932/4** and the 2-piece ring **501**.
- The anchored back plate **161** cannot be dismantled.

7.7.5 Dismantling the bearing pedestal long life grease lubrication

- Bearing pedestal groups 1 and 2:
  Remove O-ring **412/2** and labyrinth disc **555**.
- Bearing pedestal group 3:
  The bolts may only be removed when the labyrinth disc **555** is pressure-relieved.
- Screw assembly aid impeller nut instead of impeller **230** slowly onto the shaft end, press cup springs **950/1** completely together. Remove bolts. Unscrew assembly aid. The labyrinth disc **555** and the O-ring **412/2** can now be removed.
  See **Fig. 11**.
  For assembly aid, see **Section 10.2**.
- Remove cup springs **950/1**.
- Remove disc **550/1**.
- Remove motor-side circlip **932/3** and rear bearing cover **361**; a groove is provided in it to facilitate dismantling.
- Remove circlip **932/2**.
- Remove disc **550/2** (only with bearing pedestal group 3).
- The shaft **210** with the radial ball bearing **321/1** is pressed on a press towards the pump side out of the bearing pedestal.
- The key **940/4** (only with bearing pedestal group 3) can remain in the shaft.
- The shaft **210** with the radial ball bearing **321/1** is pressed on a press towards the pump side out of the bearing pedestal.

7.7.6 Dismantling the bearing pedestal oil bath lubrication

- Drain oil from the hex. screw **901/4**.
- Bearing pedestal groups 1 and 2:
  Remove O-ring **412/2** and labyrinth disc **555**.
- Bearing pedestal group 3:
  The bolts may only be removed when the labyrinth disc **555** is pressure-relieved.
- Screw assembly aid impeller nut instead of impeller **230** slowly onto the shaft end, press cup springs **950/1** completely together. Remove bolts. Unscrew assembly aid. The labyrinth disc **555** and the O-ring **412/2** can now be removed.
  See **Fig. 10**.
  For assembly aid, see **Section 10.2**.
- Remove cup springs **950/1**.
- Remove disc **550/1**.
- Remove rotary shaft seal **421/2** and distance washer **551/1** (not with bearing pedestal group 3) from the bearing pedestal.
- Remove the motor-side circlip **932/3** and rear bearing cover **361** with rotary shaft seal **421/1**; a groove is provided to facilitate dismantling.
- Remove O-ring **412/1**.
- Remove circlip **932/2**.
- Remove disc **550/2** (only with bearing pedestal group 3).
- The key **940/4** (only with bearing pedestal group 3) can remain in the shaft.
- The shaft **210** with the radial ball bearing **321/1** is pressed on a press towards the pump side out of the bearing pedestal.

7.8 Changing the radial ball bearings

7.8.1 Grease lubrication

- Pull radial ball bearing **321/2** out of the bearing pedestal **330**.
- Remove circlip **932/1**.
- Press radial ball bearing **321/1** off the shaft.

Installation:

- Press new radial ball bearing **321/2** onto the shaft **210**.
- Insert circlip **932/1**.
- Force shaft **210** with radial ball bearing into the bearing pedestal **330**.
- Insert disc **550/2** (only in case of bearing pedestal group 3) and circlip **932/2** on the motor side.
- Provide grease seal.
- Mount rear bearing cover **361** and insert circlip **932/3**.
- Mount new radial ball bearing **321/1**.
- Insert disc **550/1**.
- Provide grease seal.
- Insert cup springs **950/1**.
  The cup springs are to be mounted in alternating directions.
  See **Fig. 11** in **Section 7.7.1**.
- Bearing pedestal groups 1 and 2:
  Insert labyrinth disc **555** and O-ring **412/2**.
- Bearing pedestal group 3:
  Insert labyrinth disc **555** and O-ring **412/2**.

Prior to further assembly, make sure that the labyrinth disc is secured by 2 bolts. Screw assembly aid for bearing pedestal group 3 onto the impeller thread, clamp labyrinth disc, insert bolts.
Remove bolts again after assembly of the impeller.

7.8.2 Oil bath lubrication

- Pull radial ball bearing **321/2** out of the bearing pedestal.
- Remove circlip **932/1**.
- Press radial ball bearing **321/1** off the shaft.

Installation:

- Press new radial ball bearing **321/2** onto the shaft **210**.
- Insert circlip **932/1**.
- Force shaft **210** with radial ball bearing into the bearing pedestal **330**.
- Insert disc **550/2** (only in case of bearing pedestal group 3) and circlip **932/2** on the motor side.
- Insert rotary shaft seal **421/1** into the rear bearing cover **361**.
- Mount rear bearing cover **361** with O-ring **412/1** and insert circlip **932/3**.

  Caution! The O-ring must not stick in the groove for the circlip.
- Mount new radial ball bearing **321/1**.
- Insert disc **550/1** and distance washer **551/1** (not with bearing pedestal group 3).
- Insert rotary shaft seal **421/2**.
- Insert cup springs **950/1**.

  The cup springs are to be mounted in alternating directions. See **Fig. 10** in **Section 7.7.1**.
- Bearing pedestal groups 1 and 2:
  Insert labyrinth disc **555** and O-ring **412/2**.
- Bearing pedestal group 3:
  Insert labyrinth disc **555** and O-ring **412/2**.

Prior to further assembly, make sure that the labyrinth disc is secured by 2 bolts. Screw assembly aid for bearing pedestal group 3 onto the impeller thread, clamp labyrinth disc, insert bolts.
Remove bolts again after assembly of the impeller.

7.9 Notes on assembly

- All repair and maintenance work is to be performed by skilled staff using appropriate tools and original spare parts.
- Is the necessary documentation available?
- Do not use any defective parts.
- The recommendations of the mechanical seal manufacturer must always be observed.
- Bearing pedestal group 3:

  Always make sure that during installation of the mechanical seal the labyrinth disc is secured by 2 bolts.

  The bolts must be removed again after installation of the impeller.
- Close-tolerance areas, screws and cup springs are to be treated with a grease to protect against corrosion.
- Grease chambers which serve to protect the bearings must be filled with grease.
- The locking unit **930** must not be greased during assembly.
- The circlips **932/1** and **932/2** for the shaft are a reinforced version.
- Replace all static sealing elements on re-assembly.
- When using a bellows-type mechanical seal whose clamping surface is made of PTFE, it must be ensured that only original shaft sleeves with the greater surface roughness required for this mechanical seal are used.
- Shaft sleeves **524** made of ceramic materials should be able to turn easily on the shaft **210**. If the fitting is too tight, the plastic bearing points in the shaft sleeve are to be reamed.

  If the shaft sleeve only has one leading chamfered edge, it must lie on the side of the cup springs. The surface of the shaft sleeve must be absolutely clean; that also applies to the leading chamfered edge.
- Cup springs are to be installed in alternating directions. See **Fig. 11** in **Section 7.7.1**.
- The impeller **230** is to be mounted until the locking unit **930/1** sits perfectly.
- The **dimension X** specified in the works certificate between impeller **230** and back plate **161** is to be observed. If the actual dimension deviates from the target dimension, an assembly error has been made.
- The **dimension Y** between the impeller and the housing can be influenced by the thickness of the housing gasket **401**. If the pump is used at higher temperatures than originally expected, the **dimension Y** is to be increased according to the works information. Refer also to the Richter works certificate and sectional drawing in **Section 9.2**.
- It must be ensured that the labyrinth disc **555** doe snot hit against the bearing pedestal after assembly.
- Finally, the pump housing is to be subjected to the operating pressure.

7.10 Assembly

Assembly is performed in the reverse sequence to dismantling.

7.10.1 Fill bearing pedestal with oil

Oil quantities:

For group 1 appr. 200 ml
For group 2 appr. 500 ml
For group 3 appr. 650 ml
Groups see **Section 1**.

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

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.

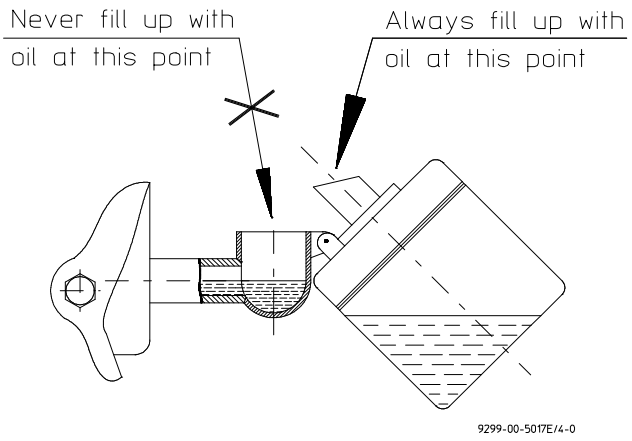


Fig. 12

7.11 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 Faults

Faults may result from Improper 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 Improper 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?

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

Temperature of the rolling bearings is too high :

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

Leak from the pump :

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

9 Sectional drawing

9.1 Legend

100 housing
122 blind cover
160 cover
161 back plate
168 back plate insert
183 support bracket
210 shaft
230 impeller
321/x radial ball bearing
330 bearing pedestal
361 rear bearing pedestal
401 housing gasket
412/1 o-ring
415/1 centering gasket
501 ring, 2-piece
524 shaft sleeve
550/1 disc
550/2 disc
**(only bearing group 3)
551/1 distance washer
*(only bearing group 1 + 2)
552/3 tightening washer
554/x washer
555 labyrinth disc
557/x contact disc
901/x hex. screw
902/1 stud screw
919/1 countersunk screw
(only replaceable back plate for RG-4)
920/x hex. nut
930/1 locking unit
*(only bearing group 1 + 2)
932/x circlip
940/1 key
940/4 key
**(only bearing group 3)
950/1 cup spring

Additional to Oilbath lubrication
411/1 seal ring
412/1 O-Ring
421/x rotary shaft seal
551/1 distance washer
*(only bearing group 1 + 2)
638 constant level oiler
672/1 venting / filling plug
901/4 hex. screw

replaceable back plate (Section 4.2, figure 2)
160 cover
168 back plate insert
501 ring, 2-piece
932/4 circlip

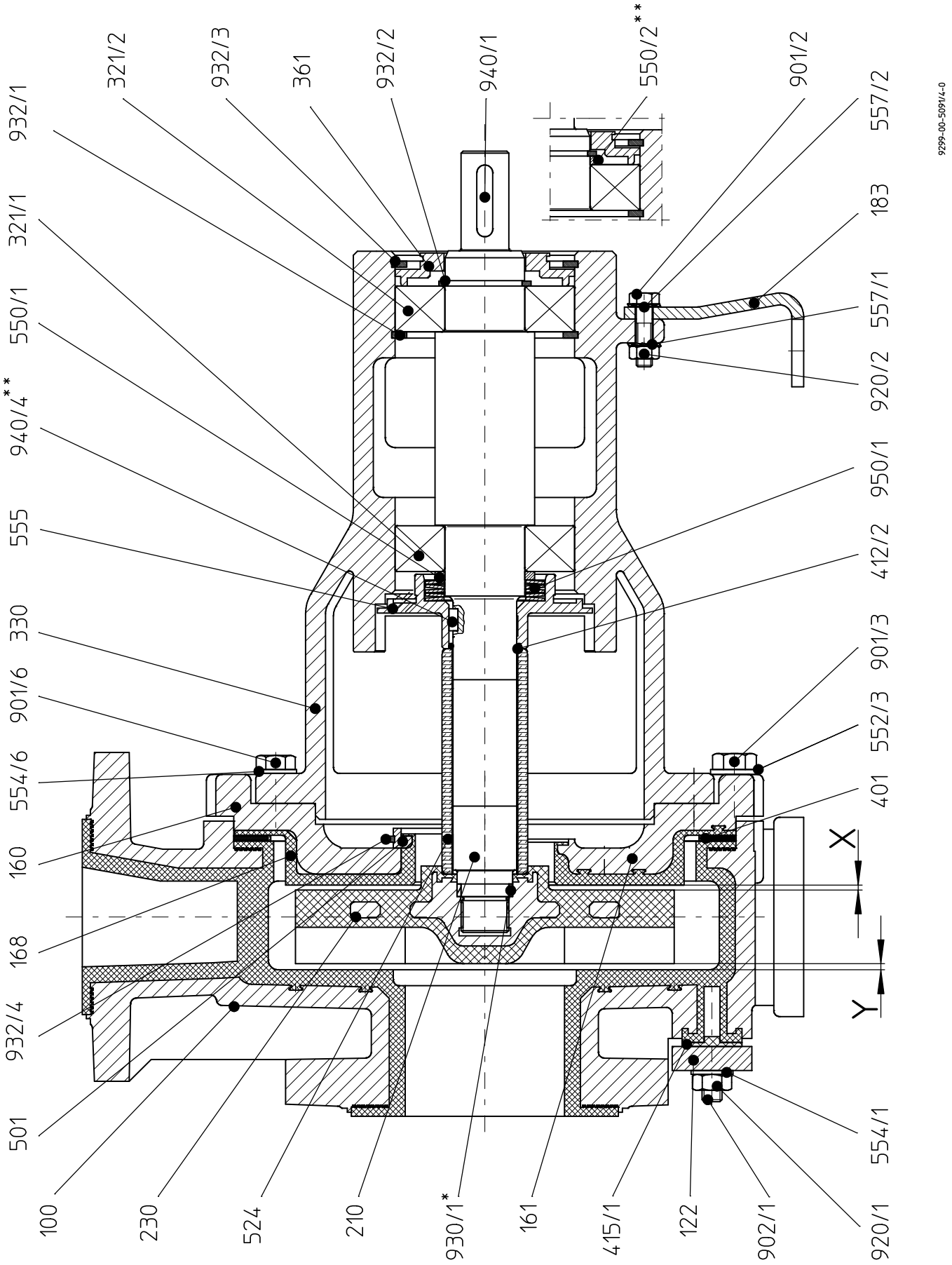
Anchored back plate (Section 4.2, figure 3 and 4)
161 back plate

replaceable back plate RG-4
(only bearing group 3, Section 4.2, figure 5)
160 cover
168 back plate insert
501 ring, 2-piece
919/1 countersunk screw
932/4 circlip

X and **Y** see work's certificate.
Details for bearing group 3 see **Section 7.7.1**

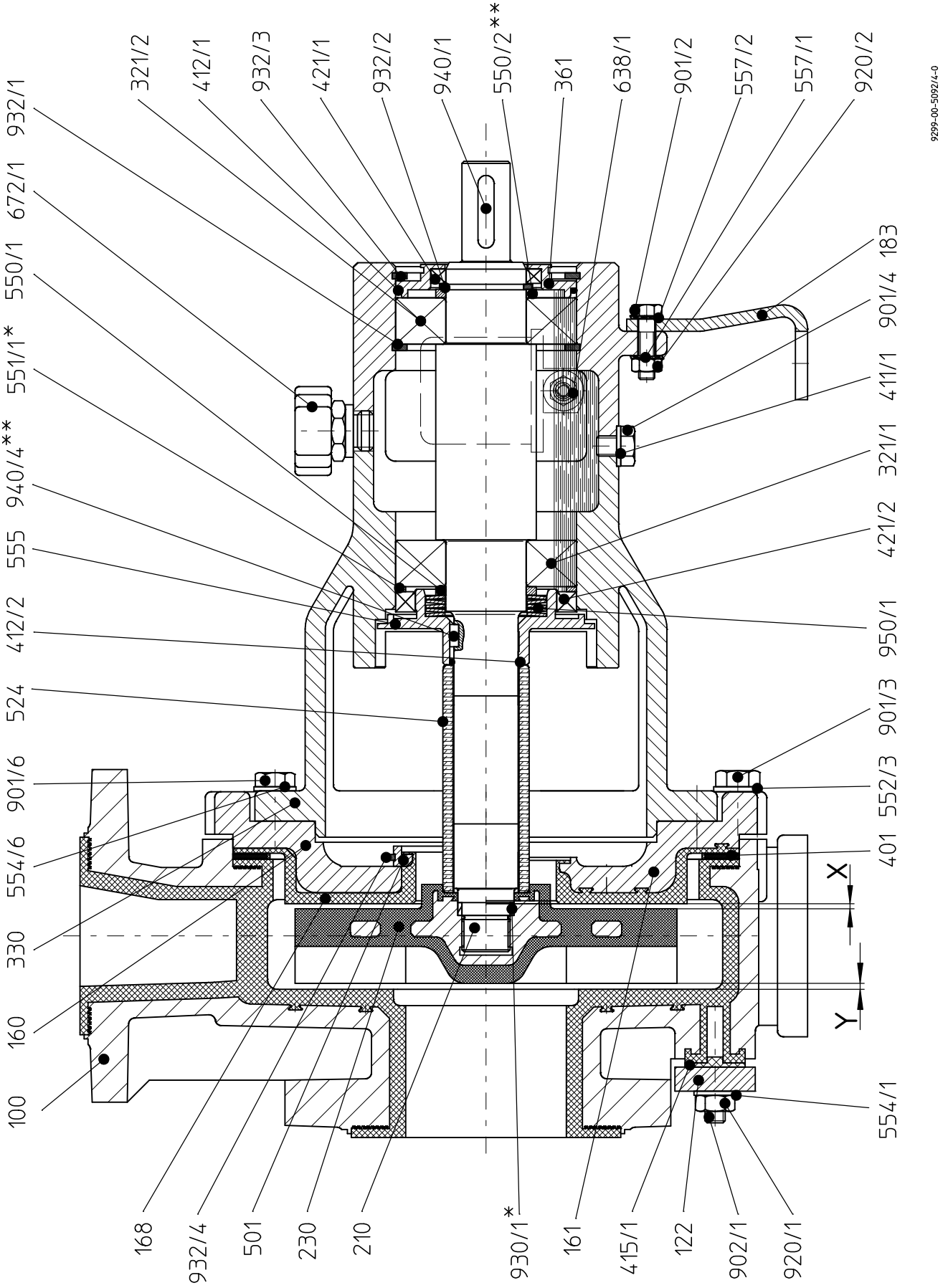
9.2 Sectional drawing SCK long life grease lubrication

Illustration without mechanical seal



9.3 Sectional drawing SCK oil bath lubrication

Illustration without mechanical seal



10 Assembly aids

10.1 Impeller wrench for open impeller SCK

Pump size	No. of vanes	Ident. No.
SCK 40/50-200, 50-250	8	9217-89-1010
SCK 32-160, 50-250	6	9217-89-1011
SCK 25-160	8	9217-89-1012
SCK 32-160	6+8	9217-89-1013
SCK 50-250, 80-200	9	9217-89-1016
SCK 50-315	6	9217-89-1005

Product description

The torque to be transmitted, either during loosening or tightening, is achieved by the fact that the parallel pins of the impeller wrench engage in the spaces in the (open) impeller. The impeller is turned into the position you want by turning the impeller wrench clockwise or counterclockwise.

10.2 Impeller nut for bearing pedestal 3

Product description

The labyrinth disc **555** must be secured with two bolts **prior** to the dismantling or assembly of the impeller. There are 2 bores Ø5mm in the bearing pedestal for this purpose. Screw assembly aid impeller nut instead of the impeller slowly onto the shaft end, press cup springs completely together. Remove bolts, unscrew assembly aid. The labyrinth disc and O-ring can now be removed or inserted.

10.3 Assembly cone for SCK lip rings

Shaft sleeve	Ident. No.
Ø 25 mm	9218-87-1085
Ø 43 mm	9218-87-1088
Ø 53 mm	9218-87-1089

Product description

The assembly cone is mounted on the front end of the shaft sleeve. The lip seal is expanded in its inside diameter due to the gradual incline on the assembly cone so that it can be pushed onto the shaft sleeve without the sealing surfaces being damaged.

10.4 Clamping device for SCK single mechanical seals

Pump size	Ident. No.
SCK group 0, shaft sleeve Ø 25 mm	9217-89-1001
SCK group 1, shaft sleeve Ø 43 mm	9217-89-1003
SCK group 2, shaft sleeve Ø 53 mm	9217-89-1004

Product description

In order to be able to set the check dimension (1 mm), the single mechanical seal clamping device is inserted between the lantern and the single mechanical seal. Owing to the lever action the single mechanical seal is pushed in the axial direction and positioned by means of a cylinder head screw.

10.5 Boring template for housing drain

Pump size	Ident.-No
SCK 80-50-160	9217-89-1095
SCK 25-25-160	9217-89-1096
SCK 50-32-160	
SCK 50-32-200	
SCK 65-40-200	
SCK 80-50-200	
SCK 80-50-250	
SCK 80-50-315	
SCK 125-80-200	
SCK125-100-200	
SCK 125-100-250	
SCK 150-125-315	

Baureihe/Series/Série

SCK
MNK
MNK-B

Ausführung **Magnetkupplungs- und Gleitringdichtungspumpen**

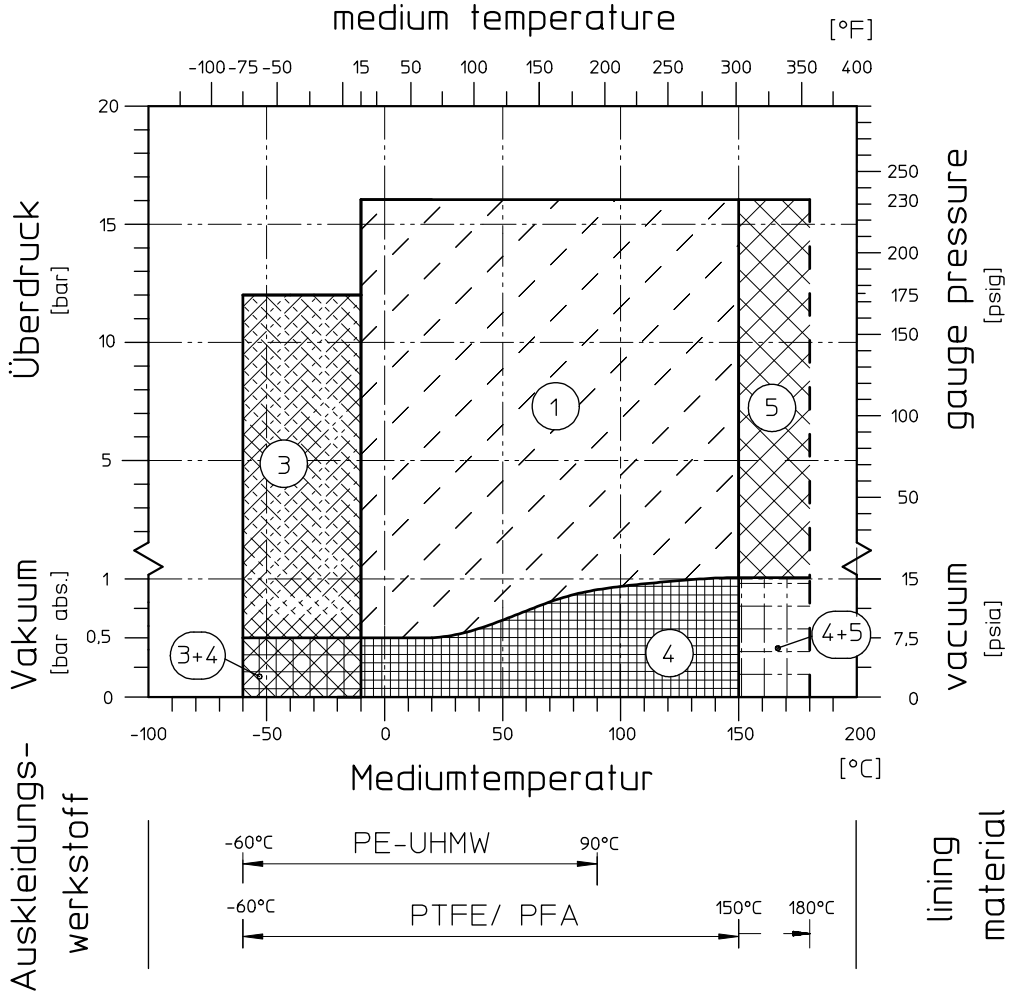
Design **Magnet drive and mechanical seal pumps**

Construction **Pompes à entraînement magnétique en à garniture mécanique**

RICHTER Process Pumps & Valves

Einsatzgrenzen / operating limits

Baugrößen / Size: 25-25-125, 50-32-125, 50-32-200, 65-40-200, 80-50-200 und/and SCK 25-25-100, 80-50-315, 125-100-250, 150-125-315



Baureihe/Series/Série

SCK
MNK
MNK-B

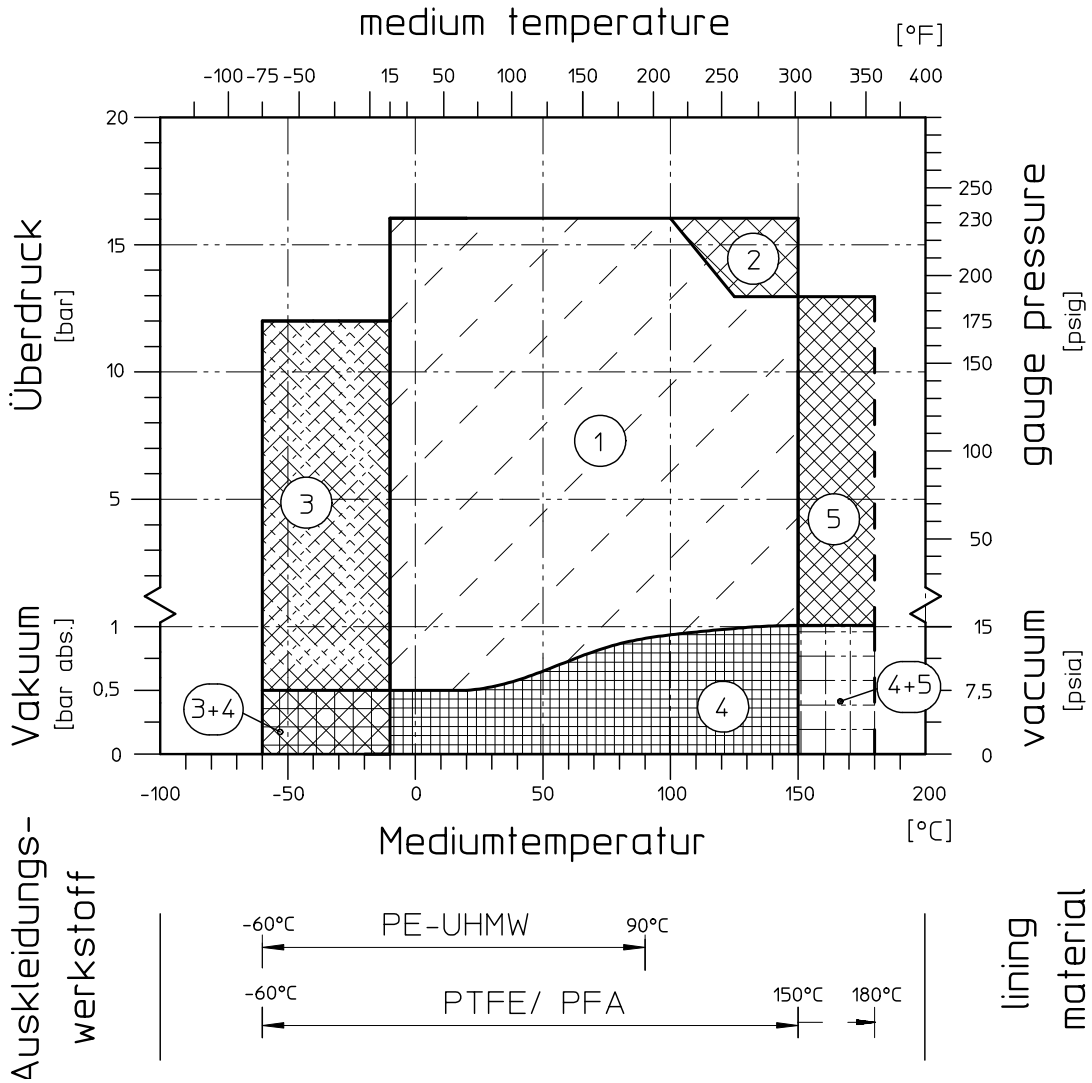
Ausführung **Magnetkupplungs- und Gleitringdichtungspumpen**

Design **Magnet drive and mechanical seal pumps**

Construction **Pompes à entraînement magnétique en à garniture mécanique**

RICHTER Process Pumps & Valves

Baugrößen / Size: 25-25-160, 50-32-160, 80-50-160, 125-80-200, 125-100-200, 80-50-250



Baureihe/Series/Série

SCK
MNK
MNK-B

Ausführung **Magnetkupplungs- und Gleitringdichtungspumpen**

Design **Magnet drive and mechanical seal pumps**

Construction **Pompes à entraînement magnétique en à garniture mécanique**

RICHTER Process Pumps & Valves

1	Standard Bei Einsatz unter ASME-Bedingungen (Sphäroguss nach A395) kann der Standardbereich auf -30 °C und 16 bar erweitert werden.	Standard Application under ASME-specification (ductile iron acc. to A395) the standard range can be expanded up to -30 °C and 16 bar.
2	Höhere Betriebsdrücke durch Druckringe	Higher operating pressure by pressure rings
3	Tiefere Temperaturen durch Sondermaterial	Lower temperatures by special materials
4	Höheres Vakuum bei Pumpenstillstand durch Sonderspalttöpfe	Higher vacuum at pump standstill by special can unit
5	Höhere Temperaturen durch CFK-H Spalttopf	Higher temperatures by can of CFK-H

*SCK: Einsatzgrenzen der Gleitringdichtung beachten!
*SCK: Observe operating limits of the mechanical seal!

MNK-B 25-25-100

Abweichend vom dargestellten Diagramm gelten für die Pumpentypen MNK-B 25-25-100 je nach Gehäusedeckelausführung folgende zulässige Einsatzgrenzen:

- Gehäusedeckel aus 1.4301/PFA - 10 bar bei -60 °C bis 150 °C
- Gehäusedeckel aus CFK/PTFE - 6 bar bei -60 °C bis 150 °C

MNK-B 25-25-100

In contrast to the diagram shown, the following admissible operating limits apply to the pump types MNK-B 25-25-100, depending on the housing cover design:

- Housing cover made of 1.4PFA 10 bar at -60 °C to 150 °C
- Housing cover made of CFRP/PTFE 6 bar at -60 °C to 150 °C

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	Chemiekreiselpumpe für Gleitringdichtungen freies Wellenende oder als Aggregat [1)]
Product	*Chemical Centrifugal Pump for Mechanical Seals* *Bare shaft or as unit [1)]*
Baureihe	SCK, SCK-X, SCK-S
Series	RSA, RSI
EU-Richtlinien	2006/42/EG Maschinenrichtlinie 94/9/EG Explosionsschutzrichtlinie ATEX
EU-Directive	*Machinery Directive* *Equipment explosive atmosphere*
Modul	Interne Fertigungskontrolle *Production Quality Assurance*
Angewandte harmonisierte Normen *Applied harmonised Standards*	EN 14121 EN 809 EN 13463-1

Kennzeichnung	2006/42/EG	2006/42/EC	CE
Marking	94/9/EG	94/9/EC	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 #***
SCK	03ATEXD070	RSA	03ATEXD062
SCK-X	03ATEXD070	RSI	
SCK-S	03ATEXD070		

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
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*	Chemiekreiselpumpe für Gleitringdichtungen als Aggregat *Chemical Centrifugal Pump for Mechanical Seals as unit*
Baureihe *Series*	SCK, SCK-X, SCK-S RSA, RSI
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

Richter Chemie-Technik GmbH
Otto-Schott-Straße 2
D-47906 Kempen
Telefon +49 (0) 21 52 / 146 - 0
Telefax +49 (0) 21 52 / 146 - 190
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

()