SUPPLEMENTARYINSTALLATION AND OPERATING MANUAL

Translation of the original manual

Series MNK-S, MNK-SB, SCK-S

Magnetic Drive and Mechanical Seal Chemical Pumps

"Self-priming" design

Keep for future use!

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

9230-062-en Revision 10 Edition 03/2010

RICHTER
Process Pumps & Valves

List of Contents

Relevant documents

This supplementary installation and operating manual is only valid in conjunction with these installation and operating manuals:

MNK long-life grease and oil bath lubrication **9230-050-en**
MNK-B close-coupled design **9230-055-en**
SCK long-life grease and oil bath lubrication **9220-050-en**

Appendix to the operating manual

- Operational limits 9200-00-3032

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 centrifugal chemical process pump, self-priming design for

Series: MNK-S, long-life grease lubrication
MNK-S, oil bath lubrication
MNK-SB, close-coupled design

SCK-S, long-life grease lubrication
SCK-S, oil bath lubrication

ATEX 95 Directive 94/9/EE

Machine Directive 2006/42/EC

Materials :

Housing, self-priming:

Pump housing	EN JS 1049 / PFA
Volute housing	EN JS 1049 / PFA
Feed elbow	EN JS 1049 / PFA
Draining cover	EN JS 1049 / PFA
Other parts	PTFE, SSiC

Temperature classes :

For tables, see **Section 1.1**

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}

Further technical data are contained in the installation and operating manual of the relevant pump MNK, MNK-B or SCK.

Size: 50-32-160

1.1 Intended use

Richter pumps of the series MNK-S, MNK-SB and SCK-S are plastic-lined centrifugal pumps for the conveyance of aggressive, toxic, pure and inflammable liquids.

The Richter "self-priming" pump housing can be operated in conjunction with **the drive or slide-in unit of an MNK, MNK-B and SCK**.

As the drive side is identical to that of normal-priming pumps, components of such pumps are not described in this manual; reference is made to the appropriate operating manuals.

However, it should be noted that the mechanical seal pump SCK of self-priming design must not be operated with a single mechanical seal as this does not provide optimum sealing owing to the vacuum produced in the pump housing. In this case the well-known quenched or liquid-sealed **double mechanical seals** are to be used.

This operating manual only describes the special features of the self-priming design of the MNK-S, MNK-SB and SCK-S. In the event of overlaps, the statements made in this operating manual take priority over the operating manuals of the normal-priming pumps.

The medium must **not contain any solids** as they collect in the pump housing. If solids are, nevertheless, conveyed, the pump housing must be regularly checked for the aggregation of solids and cleaned from time to time.

The exact operating conditions, insofar as they are specified by the customer, and the machine selected for them are documented in the enclosed **data sheet** including the performance features such as consumption values, weights, materials and emissions.

If the pump is to be used for operating data other than those intended, the customer must carefully examine whether the design of the pump, accessories and materials are suitable for the new application.

in order to ensure the priming capability of the self-priming pump for operating data other than the design operating data, it is recommended to consult Richter.

The observance of the physical limits specified in the respective installation and operating manual is important for perfect functioning and safe operation, especially with regard to explosion protection to prevent potential sources of ignition.

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

In addition, the following applies to the self-priming pumps:

- Gas contents of up to 20% may be entrained. Consult Richter if more than 5% gas contents are conveyed. If gas is entrained in an explosive area, it must be ensured that no explosive atmosphere enters the pump as a result of the gas conveyed.

- Owing to its design the pump can draw in media on its own within certain operating areas.
  It is imperative for the pump to be completely filled prior to self-priming.
  For self-priming in or out of an explosive area it must be ensured that no potentially explosive atmosphere can form. This can be achieved by superimposing the plant with an inert gas (e.g. nitrogen).
- The medium must not exceed the medium temperature specified in the table (see below) or its boiling temperature. This can, for example, be ensured by a temperature monitor.

MNK-S, table 1

Temperature class as per EN 13463-1	Temperature limit of the medium
Lining material	PFA/PTFE
T6 (85 °C)	**not certified to ATEX**
T5 (100 °C)	
T4 (135 °C)	125 °C [1) 2)]
T3 (200 °C)	150 °C
T2 (300 °C)	150 °C
T1 (450 °C)	150 °C

1) Long life grease lubrication : no restriction.
Oil bath lubrication : standard version with shaft seal
T4 is valid only up to and including 50 Hz,
T3 more than 50 Hz
T4 labyrinth seal (special design)

2) The limit values specified for the temperature of the medium at the pump inlet are determined for the most unfavourable case (high speed, low flow, low heat capacity of the medium, ...). Under favourable operating conditions the limit values specified may be increased by up to 5 K after consultation with the manufacturer.

MNK-SB table 2 and 3

The temperature limits of the fluid given in **Table 3** only apply when motors are used where the motor manufacturer permits at least the following temperatures for the motor flange and motor shaft:

Table 2

Temperature class	Motor flange	Motor shaft
T6	70 °C	70 °C
T5	70 °C	80 °C
T4	75 °C	85 °C
T3	80 °C	100 °C
T2	80 °C	100 °C
T1	80 °C	100 °C

At the same time the specified max. admissible ambient temperature of 40 °C must not be exceeded.

Table 3

Temperature class as per EN 13463-1	Temperature limit of the medium
Lining material	PFA/PTFE
T6 (85 °C)	75° C [2)]
T5 (100 °C)	90 °C [2)]
T4 (135 °C)	125 °C [2)]
T3 (200 °C)	150 °C
T2 (300 °C)	150 °C
T1 (450 °C)	150 °C

1) The limit values specified for the temperature of the medium at the pump inlet are determined for the most unfavourable case (high speed, low flow, low heat capacity of the medium, ...). Under favourable operating conditions the limit values specified may be increased by up to 5 K after consultation with the manufacturer.

With motors of the ignition protection class "increased safety" the max. admissible medium temperature is the same as the motor shaft or motor flange temperature specified by the motor manufacturer.

In these cases the max. admissible medium temperature is 20 K above the temperature which may be introduced into the motor.

e.g.: Max. motor shaft temperature: 60°C
Max. motor flange temperature: 65°C

This results in a maximum medium temperature for the pump of **60 °C (60 °C + 20 K)**..

SCK-S, table 4

Temperature class as per EN 13463-1	Temperature limit of the medium
Lining material	PFA/PTFE
T6 (85 °C)	**not certified to ATEX**
T5 (100 °C)	
T4 (135 °C)	130 °C [1)]
T3 (200 °C)	150 °C
T2 (300 °C)	150 °C
T1 (450 °C)	150 °C

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**.

1.2 Tightening torques

Screws lubricated, tighten in diametrically opposite sequence

Volute housing hex. screws 901/22

No. x size	Nm
24 x M 10	40

Feed elbow hex. screws 901/20

No. x size	Nm
8 x M 12	40

Draining cover hex. screws 901/21

No. x size	Nm
8 x M 10	20

Blind cover stud screws 902/1

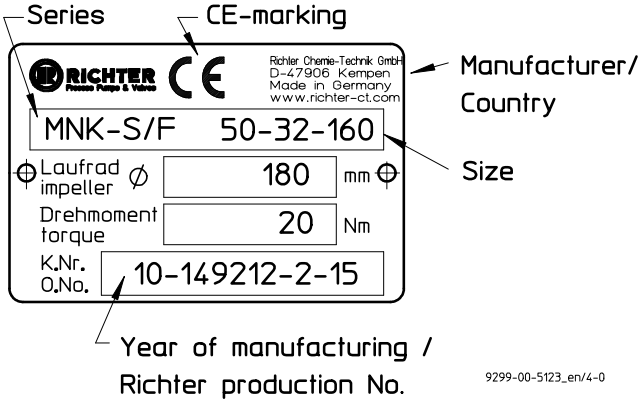
No. x size	Nm
8 x M 10	20

1.3 Type plate

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:



2 Safety, transport, storage and disposal

As regards safety, transport, storage and disposal, the relevant chapters in the adjacent installation and operating manuals apply.

This **supplementary installation and operating manual** is only valid in conjunction with the following installation and operating manuals, depending on the design selected:

MNK long life grease and oil bath lubrication **9230-050-en**

MNK-B close-coupled design **9230-055-en**

SCK long life grease and oil bath lubrication **9220-050-en**

3 Product description

In contrast to normal-priming centrifugal pumps, the self-priming pump is able to vent its suction line itself.

It produces a vacuum in the suction line and so the medium is drawn in until finally the entire suction line is full and conveyance of the medium can commence.

Here, it must be ensured that the maximum **geodetic suction lift** and the maximum **geodetic back pressure** are not exceeded and that the **vapour pressure of the medium** in the pump is not undershot during the venting process.

The housing of the self-priming pump can be seen in the sectional drawing in **Section 8.1**.

3.1 Mode of operation

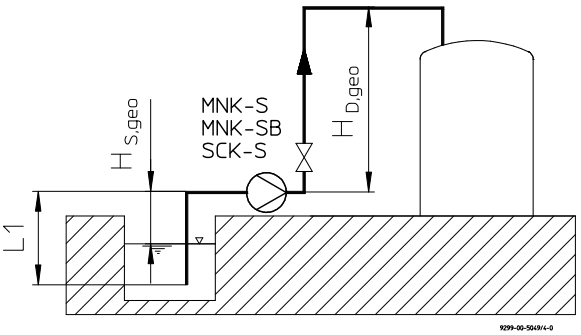
Before it is switched on, the pump must be filled at least up to the lower edge of the suction nozzle.
After the pump has been switched on, the liquid in the feed elbow is conveyed by the impeller through the volute housing into the pump housing.
Driven by the pressure generated by the impeller, the medium is injected from here through the valve seat back into the impeller again.
This jet of medium passes over the inlet openings of the vanes of the rotating impeller and so air pockets are produced by the medium in the vanes. The impeller vanes are thus flushed with medium, which is why this venting principle is also called the **impeller vane flushing method**.

The enclosed air is now transported with the medium by the impeller through the volute housing to the pump housing. Here, the air and medium separate again; the air can escape through the discharge nozzle and the medium can collect at the bottom of the pump housing. In this operating mode no medium is conveyed out of the pump, it circulates in an **internal circuit** and only the drawn-in air leaves the pump through the discharge nozzle.
Once the suction line has been completely drained, conveyance of the medium commences. The suction and discharge nozzles are filled with medium. The pressure generated by the impeller rises as it is now completely filled with medium.

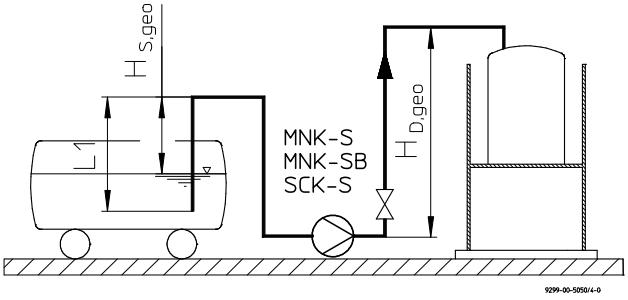
The self-priming pump has already been optimally modified by the manufacturer to suit the operating conditions required. The internal circuit in the pump is maintained throughout conveyance.

3.2 Field of application

The possible applications of the self-priming pump can be divided into two groups, which can be designated "emptying waste-water basins" and "emptying with overflow".



In the case of **emptying waste-water basins** the task of the pump is to convey the medium out of a container which is situated lower than the pump into a collecting container. With the suction line free of medium, the pump must raise the medium by the geodetic suction lift $H_{S,geo}$. This is to be differentiated from the length of the immersion pipe L1.



In the case of **emptying with overflow,** e.g. out of a tank truck into an upright tank, the pump has in general a supply, but the medium in this case must overcome the overflow with the geodetic suction lift $H_{S,geo}$.

When the previously filled pump (see **Section 6.1.1**) is switched on for the first time, the discharge line still contains no medium, i.e. it can be vented without back pressure.
However, once the container on the suction side has been emptied and then the shut-off valve on the discharge side closed and the pump switched off, the pump must overcome in both applications a static medium column, designated by the geodetic back pressure $H_{D,geo}$, each time venting takes place again.

The self-priming pump can only vent up to a certain maximum back pressure. If this pressure is exceeded, a separate pressure-free venting line has to be provided.

The temperature of the medium in the pump increases as a function of the venting time. It must be guaranteed that the vapour pressure of the medium, which increases as the temperature rises, always remains lower than the pressure actually in the suction line.

3.3 Application limits

The application limits of the self-priming pump are governed by the density of the medium.
The following table indicates the maximum possible geodetic suction lift as a function of the density.

Density [kg/dm³]	$H_{s,\,geo}$ max. [m]
1	6
1.1	5.4
1.2	4.7
1.3	4.2
1.4	3.7
1.5	3.3
1.6	2.8
1.7	2.3
1.8	1.9
1.9	1.5
2	1

The **product of the medium density ρ in kg/dm³ and the geodetic back pressure $H_{D,geo}$ in m must not exceed 6 at 1450 and 1750 rpm and not exceed 18 at 2900 and 3500 rpm**.

In order to keep the venting time as short as possible, the temperature rise in the pump as low as possible and therefore the difference to the vapour pressure of the medium as large as possible, the **suction line should be as short as possible**. An adequate difference to the vapour pressure is observed for the particular application for which the pump was supplied.

4 Installation

4.1 Safety requirements

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

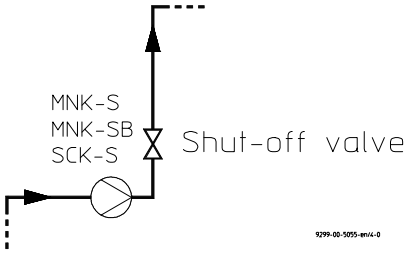
It is imperative to observe the notes on safety contained in the respective installation and operating manual.

With magnetic drive pumps MNK-S, MNK-SB:

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

The following installation instructions are based on the assumption that a shut-off valve is located downstream of the pump as a standard feature.
There are various different installation configurations.

4.1.1 Emptying of waste-water basins



As shown in the diagram, no additional valves are required if it is always ensured that the pump is not siphoned after it is switched off.

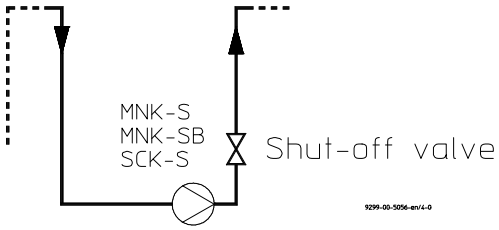
It is siphoned when the discharge line remains open after the pump is switched off and the medium column on the discharge side can flow back through the pump.

Here, too much medium is entrained out of the pump housing and so the pump can no longer be primed when started up again!

The **siphoning of the pump** can be prevented if, after the end of conveyance, the shut-off valve on the discharge side is closed first and then the pump switched off.

It is recommended to switch off the pump before air enters the suction line, i.e. the suction line end should always lie at the low level of the medium.

4.1.2 Emptying with overflow



As the diagram shows, no additional valves are required for the pump for emptying with overflow.
The sequence of activation of the shut-off valve and the start-up of the pump is **arbitrary for the start-up and shutdown operations**.

5 Commissioning / Shutdown

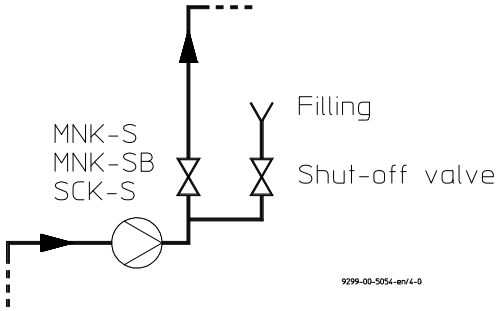
The general commissioning/shutdown procedures are already described in the installation and operating manuals for pumps of the series MNK, MNK-B and SCK. This relates, for example, to work on and inspections of the bearing pedestal, coupling and motor.

5.1 Initial commissioning

Normally, the pumps are subjected to a trial run with water. Unless special agreements have been made, residual amounts of water may still be in the pump. This must be noted in view of a possible reaction with the medium.

5.1.1 Filling the pump housing

Although the self-priming pump is able to vent its suction line itself, the pump housing must, however, be initially **filled with at least 17 litres of liquid**. This amount of medium can be supplied to the pump on initial commissioning by means of a **separate filling connection**, e.g. a Richter 3-way sight glass TSG, installed in the discharge nozzle directly above the pump.



A check must be made to determine whether the suction flange, discharge flange and emptying flange are tightened; the Richter information on screw tightening torques in the operating manuals which also apply is to be observed.

5.1.2 Checking the direction of rotation

With the pump filled, the direction of rotation of the motor is to be checked with a rotary field instrument. If no such instrument is available, switch the motor on briefly and off again so that it does not run up. While doing so, observe the direction of rotation of the fan through the fan hood.

The direction of rotation arrow attached to the pump housing indicates the admissible direction of rotation of the pump.

5.1.3 Start-up

- Any shut-off valve on the suction side is to be opened.
- The recommended shut-off valve on the discharge side **is to be closed**.
- Now the motor can be switched on and then the shut-off valve on the discharge side opened, depending on the flow rate required.

5.2 Shutdown

Close the discharge valve completely.

Switch off the motor.

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

If work is to be carried out on the machine or it is to be dismantled, make sure that the motor cannot be switched on again inadvertently.

If the pump is to be emptied or flushed, the local regulations must be observed. If the pump is to be sent to your own workshops or returned to the manufacturer, it must be cleaned particularly thoroughly.

See also **Section 3.4** in the installation and operating manual of the respective series.

5.3 Restarting

When the pump is being restarted, care must be taken to ensure that all the appropriate steps as described in **Section 5.1** are repeated, depending on the progress of shutdown.

5.4 Improper operations and their consequences

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.

Refer to the relevant operating manual MNK-B, MNK or SCK, depending on the design selected.

Pump is started up without medium:

- Magnetic drive pump: The plain bearings in the pump may be destroyed.
- Mechanical seal pump: The mechanical seal can be destroyed after just a few revolutions.

Suction line not opened or not opened fully:

- Pump suffers cavitation, the result is material damage.
- Pump does not achieve the necessary head or flow rate.
- Pump may be destroyed due to overheating.

Discharge valve closed too much:

- Pump may be destroyed due to overheating.

Discharge valve opened fully:

- Pump can cavitate. Particularly severe with an empty discharge line.
- Risk of pressure surge.
- Mechanical seal pump: Risk of excessive shaft deflection with consequences for the mechanical seal.
- Motor may be overloaded.

Suction valve and discharge valve closed:

- Destruction through rapid overheating and sharp rise in pressure possible.

Control of the pump with suction valve:

- Risk of cavitation. The flow rate is only to 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.

6 Maintenance

6.1 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 5.2**.

Dismantling and assembly of the pump are performed in accordance with the relevant installation and operating manual.

6.2 Slide-in unit

Depending on the slide-in unit, the applicable maintenance and repair instructions of the MNK, MNK-B or SCK are to be observed.

6.3 Emptying

To empty the self-priming pump, the two hex. nuts **920/1** of the blind cover **122** are to be removed and the blind cover **122** dismantled with the centering gasket **415**. The capacity of the pump housing **101** is max. 17 litres. Any medium still remaining in the pipes must also be allowed for. A collecting container of appropriate size is to be provided.

Take care with hazardous media.

As with normal-priming pumps, Richter offers a transition pipe which can be installed instead of the blind cover. In this way the medium can be drained into a closed pipe system without any risk.

6.4 Cleaning

The self-priming pump is not suitable for conveying solids-laden media. Should, nevertheless, solids enter the pump, they settle on the bottom of the pump housing **101**. The draining cover **169** can be taken off and the solids removed, see **Section 6.5.4**.

6.5 Dismantling

6.5.1 Slide-in unit and impeller

If the **slide-in unit including the impeller** is to be dismantled, the pump housing **101** can remain connected to the piping.
If the coupling connected to the motor is a spacer-type coupling, the motor can also remain installed.
Undo the hex. screws between the slide-in unit and the volute housing **102** and pull out the slide-in unit including the impeller.

6.5.2 Volute housing

The volute housing **102** can be removed after the slide-in unit has been dismantled. Then the hex. screws **901/22** connecting the volute housing **102** to the pump housing **101** must be undone. The inlet ring **131** and the stud **560/2** are dismantled at the same time as the volute housing **102**.

6.5.3 Seat

To be able to dismantle the seat **585** and the cap **580**, the pump must first be separated from the suction pipe. The hex. screws **901/20** between the feed elbow **139** and the pump housing **101** must be undone. Now the entire unit comprising the feed elbow **139**, seat **585** and cap **580** can be pulled out. When doing so, turn the feed elbow **139** though 90° so that the entire unit passes through the opening in the pump housing **101**.
Now the seat **585** can be pulled out of the feed elbow **139**. The cap **580** can be unscrewed from the seat **585**.

When assembling this unit, make sure that the seat is not turned in the feed elbow when introducing the feed elbow into the pump housing.

The opening of the seat must face vertically downwards when installed.

6.5.4 Draining cover

The draining cover **169** can be removed after undoing the hex. screws **901/21** connecting it to the pump housing **101**.

6.5.5 Inlet ring

The inlet ring **131** can be removed either during dismantling of the volute housing **102** or after removal of the feed elbow **139**. In the latter case it can be pulled off the volute housing **102** together with the stud **560/2** through the large opening in the pump housing **101**.

6.5.6 Discharge pipe

In order to remove the discharge pipe **711** from the pump, the pipe on the discharge side must be dismantled. The discharge pipe can then be pulled up and out.

6.5.7 Storage of the components

If dismantling is not followed by re-assembly, the plastic and ceramic components in particular are to be carefully stored. The ceramic components are relatively sensitive to breakage; as regards the plastic components, the soft sealing surfaces in particular are to be protected.

6.6 Assembly

For assembly, the instructions on dismantling in **Section 6.5** are to be observed in reverse sequence.

During assembly good mechanical engineering practice is to be observed.

Only original spare parts are to be used.

Close-tolerance areas, screws and cup springs are to be treated with a rust-inhibiting grease.

After the plant has been started up (especially under a temperature load), the tightening torques must be checked and the correct values reset. For tightening torques, see **Section 1.2**.

Under critical application conditions, such as high temperatures and large temperature fluctuations, the tightening torques must be checked at regular intervals.

7 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 5.4**.

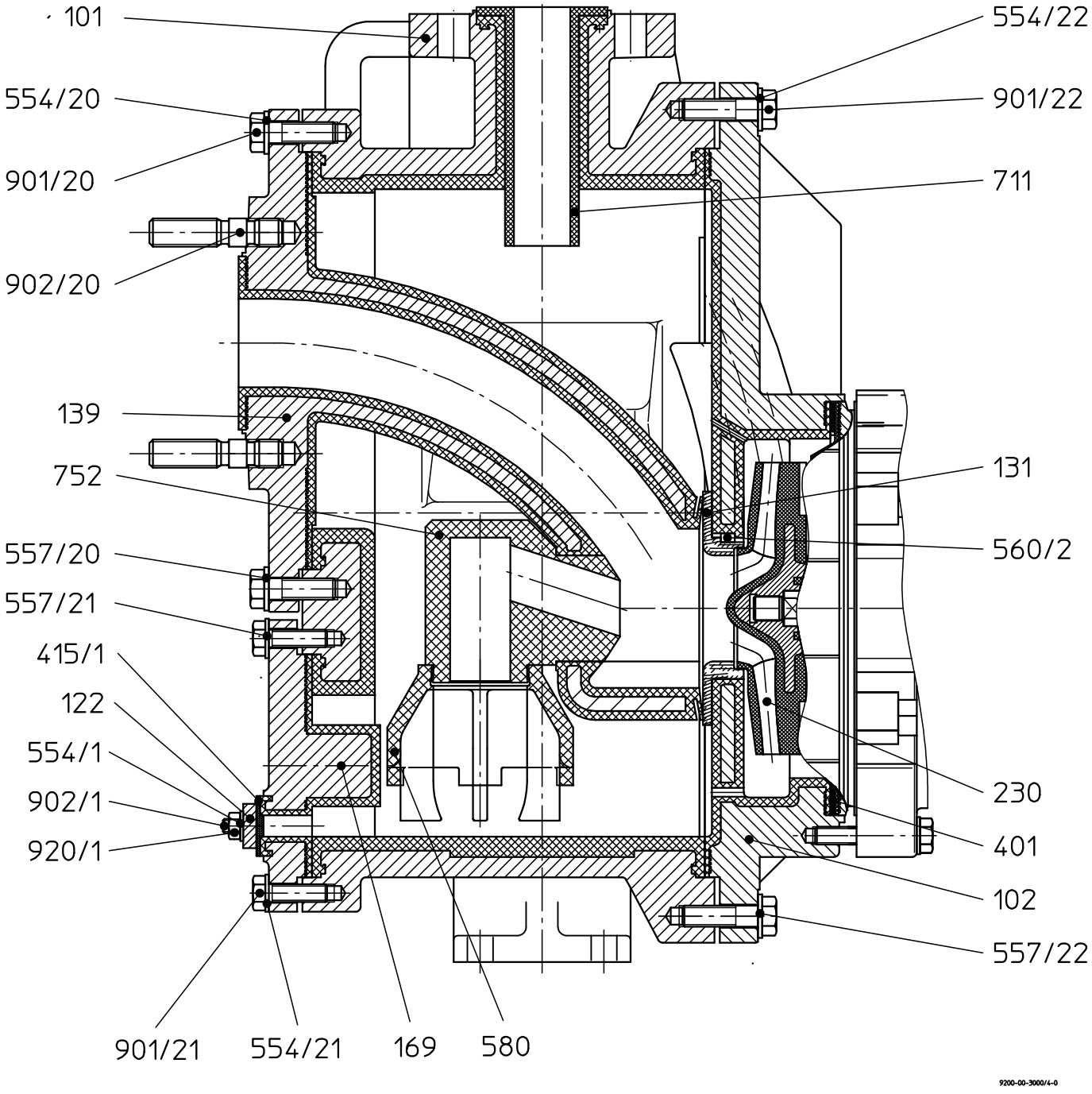
Should there be any uncertainty about the remedy to be applied, please inquire at your in-house pump office or at the pump manufacturer's.
This operating manual only deals with faults which are particularly related to the "self-priming" design.
General troubleshooting notes are contained in the installation and operating manuals of the respective pump types MNK, MNK-B or SCK.

Pump does not prime itself:

- Is the pump filled with at least 17 litres of medium?
- Is the suction line leaking?
- Is any shut-off valve installed in the suction side not fully open or is the cross section of the suction line reduced elsewhere?.
- Have solids collected in the pump housing and are clogging the valve seat?
- Has the medium become too hot and is evaporating in the pump?
- Have the installation and start-up instructions been observed?

8 Sectional drawing self-priming housing

101	pump housing
102	volute housing
122	blind cover
131	inlet ring
139	feed elbow
169	draining cover
230	impeller
401	housing gasket
415	centering gasket
554/x	washer
557/x	contact disc
560	stud
580	priming valve: cap
711	discharge pipe
752	priming valve: seat
901/x	hex. screw
902/x	stud screw
920/1	hex. nut



Baureihe/Series/Série

SCK-S
MNK-S
MNK-SB

Ausführung **Magnetkupplungs- und Gleitringdichtungspumpen**

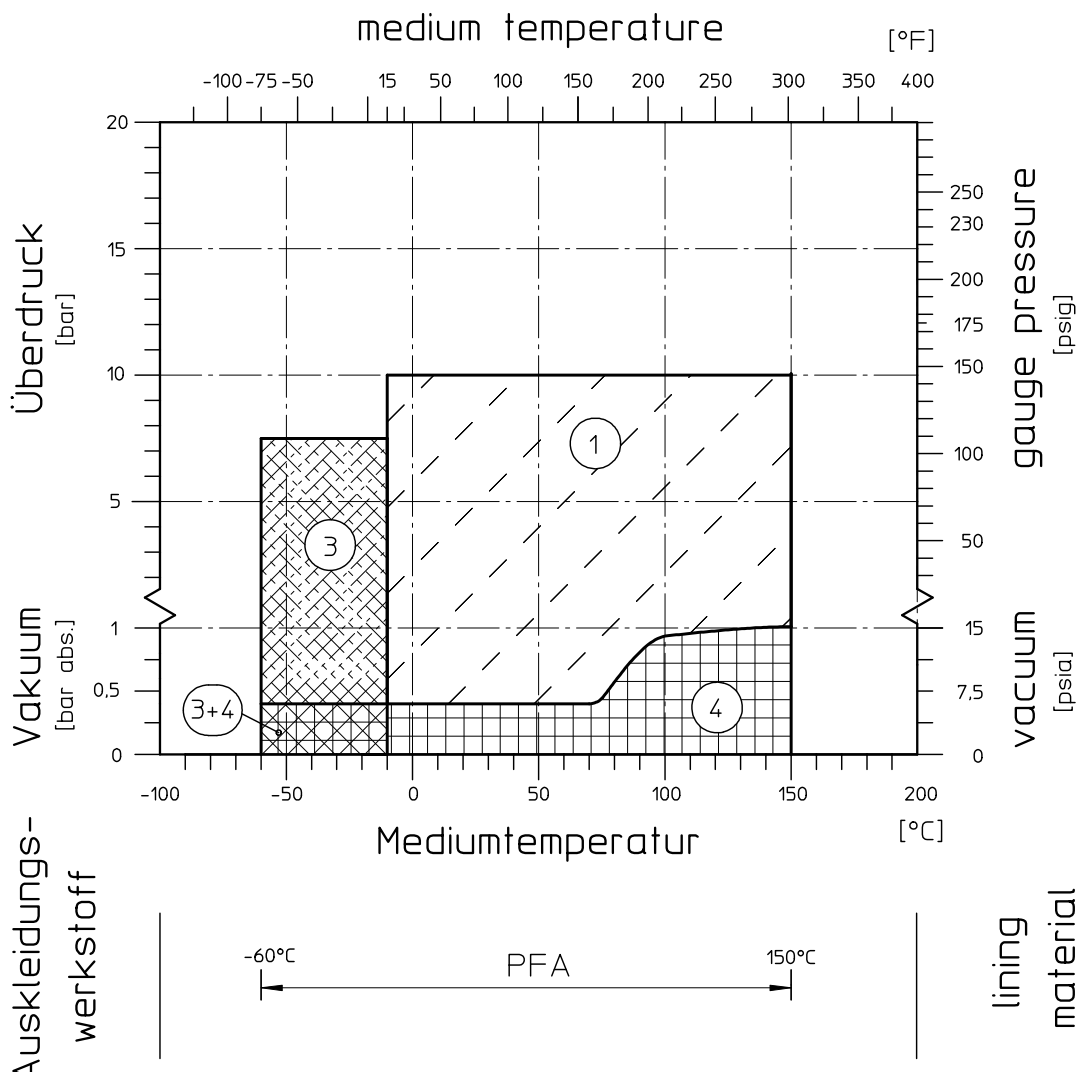
Design **Magnet drive and mechanical seal pumps**

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

RICHTER Process Pumps & Valves

Einsatzgrenzen / operating limits

Baugröße / Size: 50-32-160



SCK-S Einsatzgrenzen der Gleitringdichtung beachten!
Observe the operating limits of the mechanical seal!

Baureihe/Series/Série

SCK-S
MNK-S
MNK-SB

Ausführung **Magnetkupplungs- und Gleitringdichtungspumpen**

Design **Magnet drive and mechanical seal pumps**

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

RICHTER Process Pumps & Valves

Legende:

1 Standard
Bei Einsatz unter ASME-Bedingungen (Sphäroguss nach A395) kann der Standardbereich auf -30 °C und 10 bar erweitert werden.

3 Tiefere Temperaturen durch Sondermaterial

4 Höheres Vakuum bei Pumpenstillstand durch Sonderspalttopfeinheit

Legend:

Standard
Application under ASME-specification (ductile iron acc. to A395) the standard range can be expanded up to -30 °C and 10 bar.

Lower temperatures by special materials

Higher vacuum at pump standstill by special can unit