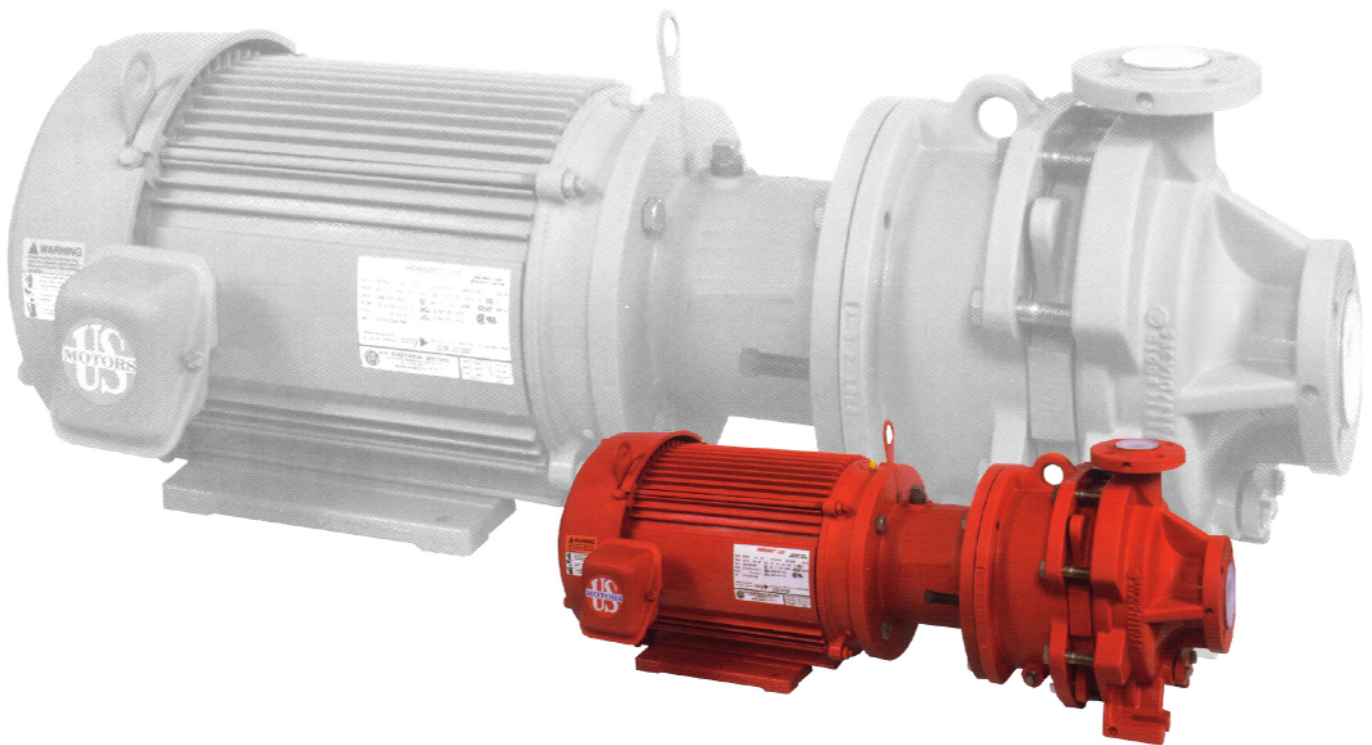


# Sealless Chemical Magnetic Drive Pump

Close-coupled design



Keep for future use!

This operating manual must be strictly observed before transport, installation, commissioning etc in order avoid endangering.

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## Relevant documents

- ◆ Data sheet
- ◆ Works certificate
- ◆ Sectional drawing MNKA-B close-coupled design
  - Group 1+2 9250-00-3004
  - Group 1, motor group 140TC 9250-00-3005
- ◆ Outline drawing 9250-00-3017
- ◆ Drawing removing clearance MNKA, MNKA-B 9250-00-3006
- ◆ Drain connection 9250-00-3007 \*
- ◆ Shock pulse measurement in the rolling bearing 9250-00-3011 \*
- ◆ Plain bearing pedestal with external flushing connection 9250-00-3008 \*
- ◆ Performance curves
- ◆ Spare parts list

\* if contained in the scope of delivery

- ◆ Operating manual motor
- ◆ Declaration of conformity for the entire unit to European Machine Directive 98/37/EC
- ◆ or manufacturer's certificate for the pump, corresponds to the Machine Directive
- ◆ Form for General Safety Certificate QM 0912-16-2001\_en
- ◆ Pump with ATEX :  
Declaration of conformity for the pump to European Directive 94/9/EC

### On request:

- ◆ Product Manual documents can be sent on request, e.g. pressure-temperature diagram, magnet drive data or nozzle forces.
- ◆ Publication: "Centrifugal Pump Operation without NSPH Problems".
- ◆ Publication "Safe Operation of Magnetic Drive Pumps".

## 1 Technical data

### Manufacturer :

Richter Chemie-Technik GmbH  
Otto-Schott-Str. 2  
D-47906 Kempen  
Telephone: +49 (0) 2152 146-0  
Fax: +49 (0) 2152 146-190  
E-Mail: [richter-info@richter-ct.com](mailto:richter-info@richter-ct.com)  
Internet: <http://www.richter-ct.com>

### Designation :

Single-stage, plastic-lined, magnetic drive chemical centrifugal pump, series MNKA-B, close-coupled design

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

Technical specifications and connecting dimensions to ASME B73.3M table 1, ISO 15783, DIN ISO 5199 and „Hydraulic Institute Sealless Pump Standards and referenced standards“

Flange connecting dimensions:  
ASME B16.5, class 150

ATEX 95 European Directive 94/9/EC  
Machine Directive European 98/37/EC

### Materials :

#### Pressure-bearing parts:

ductile cast iron ASTM A395 (EN-JS 1049 to DIN EN 1563), carbon fibre composite material

#### Wetted parts:

PFA, PTFE, SSiC/hard carbon (Option SSiC/SSiC, SSiC with SAFEGLIDE<sup>®</sup> PLUS), FFKM and see data sheet

**Flow rate :** bis 396 USgpm – 60 Hz  
bis 90 m<sup>3</sup>/h (bei 3500 1/min)

**Delivery head :** bis 479 ft – 60 Hz  
bis 146 m FS (bei 3500 1/min)

### Housing discharge pressure:

max. 475 psi (19 bar)  
detailed data see pressure-temperature diagram

### Temperature range:

Standard: - 20 °F to + 300 °F  
- 30 °C to + 150 °C

Option: - 20 °F to + 360 °F  
- 30 °C to + 180 °C

Drive magnet assembly with magnets made of samarium-cobalt (SmCo)

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

**Temperature classes:** see Section 2.5.7

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

**Ambient temperature range:** 4 °F bis 104 °F  
- 20 °C to + 40 °C

(higher temperature after consulting the manufacturer)

**Ambient pressure range:** 11,6 psia – 16 psia  
0,8 barabs to 1,1 barabs

**Weight :** See installation drawing

**Dimensions :** See installation drawing

**Sizes :**

Group 1	Group 2
1.5" x 1" x 6"	3" x 1.5" x 8"
3" x 2" x 6"	2" x 1" x 10"
1.5" x 1" x 8"	

**1.1 Intended use**

ITT Richter pumps of the series MNKA-B (ASME) are sealless, plastic-lined magnetic drive centrifugal pumps for the leak-free conveyance of aggressive, toxic, pure and inflammable liquids.

The pump is equipped with a permanent magnetic synchronous drive.

For vertical installation of the pumps, 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 2.5**):

- ◆ 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<sub>opt</sub>. The maximum operating temperature must never be exceeded. See **Section 2.5.7**. In case of doubt, you must consult the manufacturer.
- ◆ The manufacturer must be consulted in the event of entrainment of gas >2% as well as solids in order to avoid a lack of lubrication and dry-running.
- ◆ The plant NPSH value (NPSHA) should be 0.5 m higher than the NPSH value of the pump (NPSHR). See also **Section 5.4.1**.

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

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

Furthermore, reference is made in this connection to the European Directive 95/C332/06 (ATEX 118a) which contains the minimum regulations for improving the occupational health and safety of the workers who may be at risk from an explosive atmosphere.

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

**The instructions contained in the operating manual or contract documentation must be observed; if necessary consult the manufacturer.**

All important features are documented in the data sheet included in the scope of delivery.

In the event of operating conditions other than those described in the data sheet, the following are to be checked again:

- ◆ design of the pump
- ◆ design of the accessories
- ◆ suitability of the materials.

**1.2 Tightening torques**

Screws greased, tighten in diametrically opposite sequence

**Housing screws 901/3**

Size [inch]	No. x size ASME	Nm	in-lbs
1.5" x 1" x 6"	8 x 1/2"	35	310
3" x 2" x 6"	8 x 1/2"	35	310
1.5" x 1" x 8"	10 x 1/2"	35	310
3" x 1.5" x 8"	12 x 1/2"	30	265
2" x 1" x 10"	12 x 5/8"	45	400

**Pipe screws, flanges to ASME**

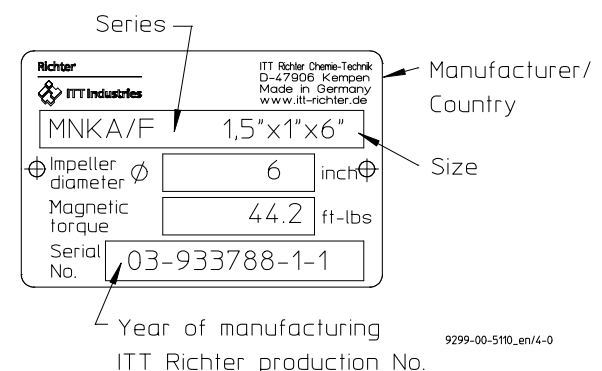
DN [inch]	No. x size ASME	Nm	in-lbs
1"	4 x 1/2"	12	105
1 1/2"	4 x 1/2"	20	135
2"	4 x 5/8"	35	220
3"	4 x 5/8"	40	355

**1.3 Name plate, dry-running, CE and housing (casing) markings**

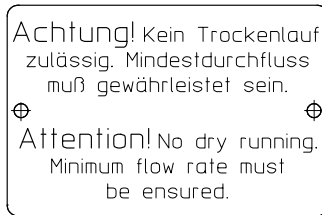
The stainless steel name plate is firmly riveted to the housing (casing):

If the operator attaches his identification, it must be ensured that the pump matches the application in question.

**Example of name plate:**



**Dry-running:**



9299-00-5074/1-0

**CE marking:**

(only for pumps according to ATEX 95)



9299-00-5073/1-0

**Housing identification:**

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

- ◆ Nominal size
- ◆ Rated pressure
- ◆ Housing material
- ◆ Manufacturer's identification
- ◆ Heat number/Foundry identification
- ◆ Foundry date

## 2 Notes on safety

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

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

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

Installation, operation and maintenance are to be performed by qualified staff.

The area of responsibility, authority and supervision of the staff must be exactly regulated by the customer.

If the staff do 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!** Failure to follow this instruction may result in property damage, severe personal injury or death.



**Safety symbol!** The pump and its function may be put at risk if this safety symbol is not observed.



**EU Symbol!** Explosion-protected equipment must be identified for work in explosive atmospheres.



**Warning of a magnetic field!**



**Warning of electric power!**



This warning sign must be used if people with a pacemaker are at risk, e.g. from a strong magnetic field.

It is imperative to observe signs attached directly to the pump / unit, e.g.:

- ◆ Direction of rotation arrow
- ◆ Warning against dry-running

and they are to be kept legible.

**Non-observance of the notes on safety may result in the loss of any and all claims for damages.**

Non-observance may involve the following hazards :

- ◆ Failure of important functions of the machine/plant.
- ◆ Failure of electronic equipment and measuring instruments due to magnetic fields.
- ◆ Risk to people and their personal property from magnetic fields.
- ◆ Risk to people from electric, mechanical and chemical effects.
- ◆ Risks to the environment through leaks of hazardous substances.




**If the unit is used in potentially explosive areas, special attention is to be paid to the sections identified with "Ex" in this operating manual.**

## 2.1 For the customer/operator

The following must be observed:

- ◆ The notes on safety contained in this operating manual,
- ◆ the prevailing regulations on accident prevention,
- ◆ in-house work, operating and safety regulations of the customer.
- ◆ Hot or cold machine parts must be protected by the customer against being touched.
- ◆ No protective facilities may be removed when the machine is in operation.
- ◆ Hazards due to electricity are to be excluded.
- ◆ Leaks of hazardous media (e.g. explosive, toxic, hot) must be removed so that no risk arises for people and the environment. The statutory provisions are to be observed.

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

## 2.2 For maintenance

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

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

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

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

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



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

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

## 2.3 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.

## 2.4 Inadmissible modes of operation


The operational safety of the machine supplied is only guaranteed if it is used properly in accordance with **Section 1.1** of this operating manual.


The operating limits specified in the data sheet must under no circumstances be exceeded.

## 2.5 Explosion protection

If the units are used in potentially explosive areas, the measures and notes in **Sections 2.5.1 to 2.5.9** are imperative to guarantee the explosion protection.

### 2.5.1 Filling the unit


 During pump operation the wetted interior of the pump must always be filled with the fluid. 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.

### 2.5.2 Special operating conditions

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

The cooling flow may be interrupted and an inadmissible rise in temperature may occur due to properties of the liquid (e.g. sticking, possibly by an inadmissible ingress of solids, clogging, ingress of gas etc.). Appropriate monitoring facilities are to be provided. See **Section 5.6**.

For safe pump operation, we recommend a flow rate of 0.3 to 1.1  $Q_{opt}$ . If the pump is operated outside this range, it must be ensured that the max. admissible flow rate according to the pump characteristic curve is not exceeded and that the max. admissible operating temperature according to **Section 2.5.7** is observed.

If the flow rate is too high, the differential pressure upstream and downstream of the plain bearings could fall so much that a lack of lubrication or dry-running may occur.

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

Overloading, overheating, non-observance of the design data or the incorrect selection of the magnetic drive can lead to the decoupling of the inner and outer magnet assemblies. As a result, eddy currents are induced on the inner and outer magnet assemblies and an inadmissible rise in temperature may occur.

The situation is to be remedied by providing appropriate monitoring facilities. See [Section 5.6](#).

The plant NPSH value (NPSHA) should be 1.64 ft (0,5 m) higher than the NPSH value of the pump (NPSHR) to prevent a lack of lubrication or dry-running of the plain bearings.

### 2.5.3 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](#).

### 2.5.4 Identification



The identification on the pump relates to the pump section. A separate declaration of conformity must be provided for the motor and for other attachments as well as corresponding identification.

Example of the identification of the pump section: CE Ex II 2 G/D T1-T... .

The identification indicates the theoretically available range of the temperature classes. The admissible temperature depending on the pump design are derived in accordance with [Section 2.5.7](#). The same applies to the drive.

For an overall unit (pump, coupling, motor) with various temperature classes, the lowest class in each case applies as follows:

**Example 1:** Pump **T3**, motor **T4**

**T3** applies, i.e. the unit may only be used in atmospheres which may ignite at temperatures  $< 392$  °F (200 °C) (+ safety margin). The maximum medium temperature of the pump for this example is 356 °F (180 °C), see table in [Section 2.5.7](#).

**Example 2:** Pump **T4**, Motor **T3**

**T3** applies, i.e. the unit may only be used in atmospheres which may ignite at temperatures  $< 392$  °F (200 °C) (+ safety margin).

### 2.5.5 Check of the direction of rotation



If there is also a risk of explosion during the installation phase, the check of the direction of rotation must under no circumstances be conducted by briefly switching on the unfilled pump in order to prevent an inadmissible rise in temperature at the plain bearings.



We recommend you to only perform a check of the direction of rotation with filled pump and with a rotating field instrument. See also [Section 6.1.2](#).

### 2.5.6 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 (casing) 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 fluid.

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

### 2.5.7 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.

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



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

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



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

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

**Table 1**

Temperature class acc. to EN 13463-1	Limit value of the temperature of the fluid	
	PFA/PTFE	
T6 <sup>1)</sup> (185 °F, 85 °C)	167 °F	75 °C <sup>1)</sup>
T5 <sup>2)</sup> (212 °F, 100 °C)	194 °F	90 °C <sup>1)</sup>
T4 (275 °F, 135 °C)	257 °F	125 °C <sup>1)</sup>
T3 (392 °F, 200 °C)	356 °F	150 °C <sup>2)</sup>
T2 (572 °F, 300 °C)	356 °F	150 °C <sup>2)</sup>
T1 (842 °F, 450 °C)	356 °F	150 °C <sup>2)</sup>

- 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.
- 2) For ambient temperatures lower than 40 °C higher medium temperatures may also be permitted after consultation with the manufacturer.

**The plant customer must ensure that the prescribed operating temperature is observed. The maximum admissible temperature of the liquid medium at the pump inlet depends on the temperature class and the selected lining material required in each case.**



The admissible operating temperature of the pump is indicated in the data sheet.

### 3 Transport and storage



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

A pump or 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.

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

Damaged pumps must not be installed in the plant.



When unpacking magnetic drives as single parts, the relevant notes in **Section 7.5.2** must be observed.

#### 2.5.8 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 ball bearings. The mode of operation and operating conditions largely determine the actual service life that can be attained.

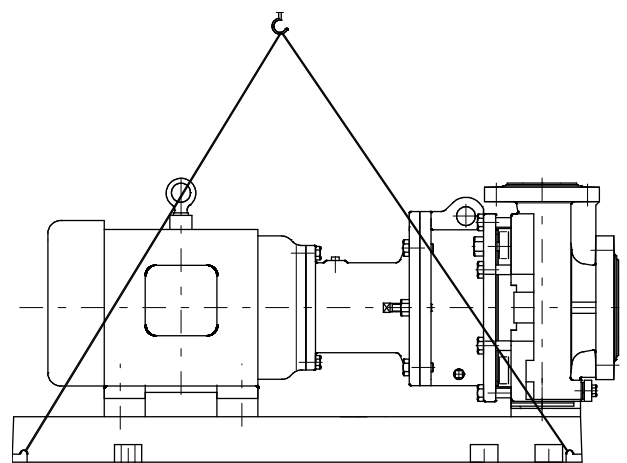
Regular checks of the bearings and their running noise can prevent excess temperatures due to hot-running bearings, collision of the outer magnet assembly against the lantern or even defective bearing seals.

If auxiliary systems (e.g. external flushing, cooling, heating) are installed, a check must be made to see whether monitoring facilities are required to safeguard their operation.

#### 2.5.9 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.



**Fig. 1**

Handle goods carefully to prevent damage.

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

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

It should be stored in a dry, vibration-free room as at constant a temperature as possible.



If magnetic drives are stored as single parts, the relevant notes in **Section 7.5.2** are to be observed.

In the case of **prolonged storage** conservation agents on machined component surfaces and packing with a desiccant may be necessary.

### 3.1 Return consignments



Pumps which have conveyed aggressive or toxic media must be well flushed and cleaned before being returned to the manufacturer's works.

A **General Safety Certificate** on the field of application is to be enclosed with the returned goods.

Pre-printed forms are enclosed with the installation and operating manual.

Safety precautions and decontamination methods are to be mentioned.

## 4 Product description

The housing (casing) dimensions, nominal ratings and technical requirements of the pump series MNKA-B correspond to ASME B73.3M, ISO 15783 / DIN ISO 5199.

The **sectional drawing** shows the design of the pump. See **Section 9.1**.

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

The housing (casing) **100** consists of a metallic shell with a plastic lining.

The bearing bushes **545** are secured against turning in the plain bearing pedestal **339**. The bearing sleeves **529/1** are secured against turning in the impeller **230** or the bearing sleeves **529/1** in the inner magnet assembly **859**.

The distance ring **504** prevents the two bearing sleeves **529/1** and **529/2** from rubbing together during assembly.

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

Special designs:

- ◆ A **vacuum-proof can (containment shell) unit** is produced by gluing the can (containment shell) to the can (containment shell) insert.

The **flushing flow** flows through the bores in the plain bearing pedestal **339** into the can (containment shell) chamber.

From there it is returned into the housing (casing) through the plain bearings.

The can (containment shell) chamber is also **vented** and **evacuated** through the bores in the plain bearing pedestal **339**.

Additional information is provided in the **brochure** and the **Product manual**.

## 5 Installation

### 5.1 Safety regulations



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



People with a pacemaker are at risk from the strong magnetic field of the magnetic drive. It may be life-threatening for them to stay at a distance of less than 20" (500 mm) to the pump.

### 5.2 Installation of pump/unit

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

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

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

### 5.3 Alignment of pump-coupling-motor

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

- Align unit so that it is free of tension and tighten bolts.
- Use supports in the direct vicinity of the bolts foundation/base plate.

## 5.4 Piping

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

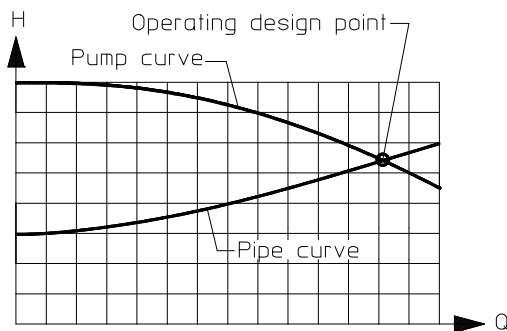
Dirt or damage to the sealing surfaces is best avoided if the flange covers remain on the flanges until just before installation.

Use flange gaskets suitable for the medium.

The screw tightening torques in **Section 1.2** are to be observed for tightening the flange screws.

### 5.4.1 Nominal size

The operating design point of a centrifugal pump lies at the intersection of the pump curve and the pipe curve, see **Fig. 2**. The pump curve is provided by the pump manufacturer. The pipe curve is determined using diagrams or PC programs.



**Fig. 2**

Under no circumstances can the nominal size of the piping be derived from the connected nominal size of the pump.

The pipe nominal size can also be determined using the flow rate as a rough guide.

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

The velocity in the suction line should not exceed 6.56 ft/s (2 m/s) and 16.4 ft/s (5 m/s) in the discharge line.

When determining the suction line nominal size, the NPSH value (net positive suction head) must also be observed. The **NPSHR value** required for the pump is specified in the data sheet.



The NPSHR available in the plant should be at least 1.64 ft (0,5 m) higher than the NPSHR required for the pump. Otherwise, this will lead to a drop in the delivery head, cavitation or even failure of the pump.

### 5.4.2 Nozzle loads

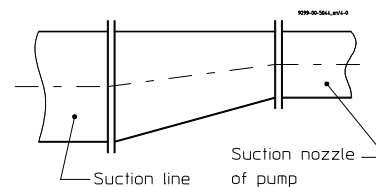
The pump can be subjected to nozzle loads in accordance with ISO 5199. See also **Product manual**.

Changes in the length of the piping caused by temperature are to be allowed for by appropriate measures, e.g. the installation of expansion joints.

### 5.4.3 Suction line

The suction lines must always be laid on a rising gradient towards the pump. Otherwise, gas bubbles may form which considerably reduce the suction line cross section. Eccentric transition elements must be installed between different pipe diameters.

Valves which disrupt the course of flow should not be installed directly upstream of the pump.



**Fig. 3**

### 5.4.4 Supply lines

Supply lines should vent towards the reservoir and are therefore to be laid with a constant downward gradient towards the pump. Should the piping internals upstream of the pump be horizontal, a low point can, of course, be located upstream of these internals. From here the pipe is then laid with an upward gradient to the pump so that the gas bubbles which form here can escape through the pump.

Valves which disrupt the course of flow should not be installed directly upstream of the pump.

### 5.4.5 Discharge line

Do not arrange the shut-off valve directly above the pump but initially provide a transition section.

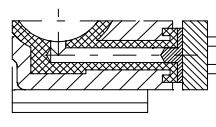
The discharge nozzle velocity of the medium can – if necessary – be reduced.

### 5.4.6 Venting and draining

Venting can take place into the discharge line or upstream of the discharge valve.

A venting line can also be used as a bypass, drain or flushing line.

The pump housing (casing) is fitted with a drain connection as a standard feature. Optionally, the drain bore can be drilled. See **Figure 4**.

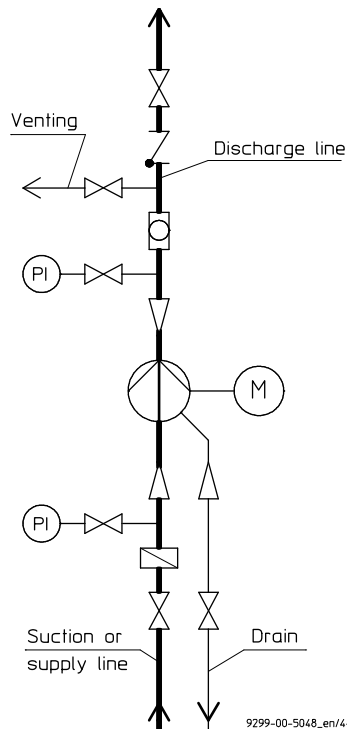


**Fig. 4**

## 5.5 Pipe fittings

The following pipe fittings are available from Richter on request:

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



**Fig. 5**

## 5.6 Monitoring facilities



Appropriate monitoring facilities are to be recommended, depending on the requirements placed on operational safety and availability of the unit.

Richter provides information on request and can supply:

- ◆ Flow meters
- ◆ Filling level indicators
- ◆ Motor load monitors
- ◆ Temperature monitors
- ◆ Can monitors
- ◆ Leak monitors
- ◆ Pump control "Hydrovar" ®
- ◆ Pump management "Pump Smart" ®

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

## 5.7 Drive

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

Care must be taken when selecting the motor size to ensure that the excess power is not too great. During start-up the magnetic drive could otherwise stop.

The magnetic drive rating at the nominal speed of 3500 rpm is given in the pump data sheet.

If the motor power exceeds this rating, it is necessary to check the stoppage of the magnetic drive.

The same also applies if the required drive rating exceeds 80 % of the magnetic drive rating.

Consult ITT Richter if necessary.

Different operating data can be achieved without changing the pump through the use of different speeds, e.g. by means of a frequency converter.

The pump with base plate and motor is illustrated in the **installation drawing**.

The **operating manual of the motor manufacturer** must be observed.



A motor with a valid ATEX certificate is to be used if employed in zone 1 and 2.

## 5.8 Electric connection



Only have the electric connection performed by a qualified electrician. Compare the available mains voltage with the information on the type plate of the motor and select a suitable circuit.

It is urgently recommended to use motor protection facilities (motor protection switch).



In potentially explosive areas IEC 60079-14 must also be observed for the electrical installation.



It must be ensured that the pump is grounded. It must be ensured that the housing **100** is grounded. This can be most easily achieved by using tooth lock washers or contact discs if the substructure itself is grounded.

Otherwise, grounding must be ensured by other means, e.g. cable bridges.

Units supplied by Richter (pump and base plates) are to be grounded using suitable devices on the base plate.




If leakage is detected when pumping hazardous fluids the trip switch must be set to shut down the pump. In order to protect against escape of fluids to atmosphere, the units should be drained as soon as possible. Failure to follow this instructions may result in property damage, sever personal injury, or death.

## 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.

#### 6.1.1 Filling the pump housing (casing)

- Check to see whether the screws on the suction flange, discharge flange, housing (casing) flange and drain flange are tightened. When retightening the housing (casing) screws, make sure that the support bracket is undone. Otherwise, the pump could be deformed. For screw tightening torques see [Section 1.2](#).
- 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.
- Close the discharge valve again until only the minimum flow rate is obtained after the motor has been started. 

#### 6.1.2 Start-up

- Check 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 rotating field instrument is available, the motor may also be activated briefly, with the pump filled, so that it does run up. You can observe the direction of rotation through the fan hood.



The pump must not run dry during the check of the direction of rotation. The pump must be completely filled with liquid. The maximum admissible flow rate must not be exceeded.

Otherwise the plain bearings can run dry in both cases.

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



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

Switch the motor off immediately to prevent overheating of the magnets.

Then proceed as follows:

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

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



Excessive power consumption may cause the magnets to decouple. If this happens the pump must be shutdown immediately and cause corrected prior to restarting. Failure to do this could result in damage to internal parts. Failure to follow this instructions may result in property damage, sever personal injury, or death.

### 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 2.5.2](#).

### 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 Inadmissible modes of operations and their consequences (examples)



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

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

### Pump is started up without medium :

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

### Suction line not opened or not opened fully :

- ◆ Pump suffers cavitation – 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.
- ◆ Axial thrust too great.

### Discharge valve opened too much:

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

### Suction valve and discharge valve closed:

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

### Control of the pump with the suction valve

- ◆ Cavitation – the flow is only to be regulated on the discharge side.

### Operation with magnetic drive stopped :

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

## 7 Maintenance

### 7.1 Screw connections of the housing (casing)

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 (casing) flange
- ◆ suction flange
- ◆ discharge flange

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

### 7.2 Motor

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.

Observe the ATEX notes of the motor manufacturer.

### 7.3 Cleaning

Care must be taken when cleaning the pump to ensure that it is not exposed to a strong water jet. The ingress of water into the bearing pedestal will substantially impair bearing lubrication.

## 7.4 Stand-by pumps

If a pump is on stand-by, it is to be started up from time to time. Regularly turn the shaft by hand in the direction of rotation.

This operation is to be performed more often for pumps which are exposed to very strong vibrations from the plant.

When dismantling the pump from the plant, drain it, thoroughly clean it, seal with flange covers and store in accordance with the instructions.

## 7.5 Notes on dismantling

All repair and maintenance work is to be performed by skilled staff using appropriate tools and original spare parts.

Is the necessary **documentation** available?

Has the pump been taken out of operation, evacuated and flushed correctly?

See also **Section 6.3.**

### 7.5.1 Protective clothing



Even if the pump has been properly evacuated and flushed, residue of the medium may still remain in the pump, e.g. between sealing surfaces or in the bearing seats or in the can (containment shell) or the can (containment shell) insert.

Plastic components may absorb medium which gradually emerges from the material after flushing.



Proper protective clothing is to be worn.

Protective clothing is also to be worn even if only adapter and motor is to be removed. Medium may have penetrated the lantern chamber through the can (containment shell).

### 7.5.2 Magnetic fields



#### Caution ! Strong magnetic fields !

Risk during dismantling and in the vicinity of magnetic drives as single parts.

Remove loose parts and other magnetisable metals from the work bench. They could otherwise be attracted: Risk of accident!

Place any tools needed at a safe distance.

Keep electronic equipment and measuring instruments at a distance. In cases of doubt consult the equipment manufacturer.

Hold magnetic drives as single parts firmly or secure. Otherwise they could be attracted, for example, by a vice: Risk of accident!



People with an artificial pacemaker:  
Keep torso at a **minimum distance of 20" (500 mm).**

Mechanical watches as well as electronic data carriers and digital watches or pocket calculators :

**6" (150 mm) distance.**

Data carriers such as credit cards, cheque cards, ID cards with magnetic strips or magnetic tapes :

**6" (150 mm) distance.**

## 7.6 Dismantling

There are **2 possibilities for dismantling:**

1. Remove the complete pump from the plant.
2. Remove the complete slide-in unit, i.e. the housing (casing) remains in the plant.

The dismantling dimension is 3,78" (96 mm) for group 1 and 5,12" (130 mm) for group 2.  
See drawing 9220-00-3006.

Dismantling of the complete pump is described.

- If the motor group 140TC is used, the adapter **346** has an integrated support bracket which has to be detached from the base plate. With all other motor sizes the motor is bolted to the base plate.
- Undo housing (casing) screws **901/3**.
- Remove housing (casing) **100**.

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

### 7.6.1 Removing the bearing pedestal



#### Caution ! Magnetic forces ! Risk of accident !

High magnetic forces can trap fingers and personal injury.

**Axial forces** are produced when the bearing pedestal **330** is pulled out of the lantern **344**. They diminish again abruptly after it has been pulled out.

The torque of the magnetic drive installed is indicated on the **name plate**.

- Undo screws **901/4** of the lantern/adapter.
- Separate adapter **346** from the lantern **344** using the jacking screws **908/1**.
- Remove flat gasket **400/1**.

### 7.6.2 Dismantling adapter and motor

- Undo hex. socket screw **914/1** with toothed lock washer **936/1** counterclockwise.
- Pull off drive magnet assembly **858**.
- If the adapter is to be separated from the motor, undo hex. screws **901/7**.
- Unscrew screw plug **903/3** out of the adapter **346**.

- Release setscrews **904/1** and **904/2** through this opening.
- Pull out hollow drive shaft **216**.

### 7.6.3 Dismantling the slide-in unit

If the bearing pedestal has not been dismantled:



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

**Axial forces** are produced when the plain bearing pedestal **339** is pulled out of the lantern **344**. They diminish again abruptly after it has been removed.

The torque of the magnetic drive installed is indicated on the **name plate**.

- Undo hex. screws **901/5** lantern/plain bearing pedestal.
- Pull plain bearing pedestal **339** out of the lantern **344**.
- Possibly loosen the centering of the plain bearing pedestal with a rust dissolver and levers.



It is imperative to use clamping jaws with a rubber surface!

- Clamp the metallic surfaces of the plain bearing pedestal **339** in a vice.
- Using a strap wrench or assembly wrench, undo the impeller **230** and inner magnet assembly **859**. **Right-hand thread!**
- Remove inner magnet assembly **859**.
- Remove O-ring **912/3**.
- Pull the bearing sleeve **529/2**, impeller **230**, bearing sleeve **529/1** and distance ring **504** out of the plain bearing pedestal **339** or off the pump shaft.



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



Use isolated gloves when handling hot bearings. Failure to follow this instructions may result in property damage, sever personal injury, or death.

- If the bearing bushes **545** have to be removed from the plain bearing pedestal **339**, a Richter jig is best used for this.
- Store bearing sleeves **529** and bearing bushes **545** in pairs which belong together.
- To dismantle the can (containment shell) **159**, can (containment shell) insert **158**, intermediate ring **509/1**, pull parts out of the lantern **344**.
- Only separate can (containment shell) **159** and can (containment shell) insert **158** if one part has to be replaced. If separation is not possible, the unit must be cooled to approx. 41°F (5°C).
- In the case of a vacuum-tight design the can (containment shell) insert is glued to the can (containment shell). Separation is not possible without destroying the can (containment shell).

- In the case of a can (containment shell) with a can (containment shell) monitor using a flexible p.c. board, dismantling is possible. Reassembly, however, should only be performed at the manufacturer's works.

## 7.7 Notes on assembly

All the details in **Section 7.5**, especially the notes on safety, are to be observed.

Good mechanical engineering practice is to be observed for assembly work.

Use original spare parts. See also **Section 2.3**. Do not use defective parts.

Treat close-tolerance areas (not on stainless steel parts) and screw thread with Anti-Seize-Spezial assembly paste (e.g. Weicon).

The thread in the inner magnet assembly and on the pump shaft must not be greased as otherwise the adhesive does not hold.

Install plain bearings in pairs as supplied or stored.

Check whether all parts fit and then assemble them.

Important dimensions (centerings, bearing seats or bearing clearances) are to be checked prior to assembly, e.g. by fitting parts together as a test.

It is recommended to replace the gaskets **400/1** and **401** during assembly.

Prior to the assembly of parts with magnets, remove any metal particles adhering to them.

A complete assembly process is described in the following.

Sub-sections can be deduced from this.

## 7.8 Assembly

### 7.8.1 Assembly of adapter and motor

- Screw adapter **346** and motor **800/1** together using hex. screws **901/7**.
- Push hollow drive shaft **216** with key **940/3** onto the motor shaft.
- Tighten setscrews **904/1** and **904/2**.
- Screw in screw plug **903/3**.

### 7.8.2 Drive magnet assembly

- Mount drive magnet assembly **858** onto the hollow drive shaft **216** so that the driver cams engage.
- Screw in hex. socket screw **914/1** with tooth lock washer **936/1**. Secure thread with a drop of Loctite, for example. For tightening, a hex. socket key with 120 mm minimum length is required.
- Screw adapter **346** / lantern **344** together with hex. socket screws **901/4**.

### 7.8.3 Assembly of slide-in unit

- Introduce can insert into the can (containment shell). If this is not possible, cool can (containment shell) insert to approx. 41 °F (5 °C).
- Place intermediate ring **509/1** in the bearing pedestal **330**.
- Insert the entire unit into the lantern **344**.

### 7.8.4 Perform trial assembly of the plain bearing pedestal with impeller, inner magnet assembly and plain bearings

- ◆ Without adhesive
- ◆ Without O-ring **412/3**.
- Install bearing bushes **545/1** and **545/2** and press in firmly.
- Push on bearing sleeve **529/1** on the impeller side and install this unit in the plain bearing pedestal **339**. Make sure that the cams of the anti-torsion insert engage properly in the impeller.
- Push distance ring **504** and bearing sleeve **529/2** onto the pump shaft.
- Push inner magnet assembly **859** onto the pump shaft.
- Permit the anti-torsion cams of the pump-side bearing sleeve **529/1** to engage in the grooves of the impeller.
- Screw on inner magnet assembly **859** together with the bearing sleeve and tighten.

### 7.8.5 Checking bearing play Z and impeller distance X

The distances X, Y and Z are indicated in the works certificate. See also drawing in [Section 9.1](#).

X: Distance behind the impeller

Y: Distance in front of the impeller

Z: Axial play of the plain bearings

- ◆ Press inner magnet assembly towards the impeller.
- ◆ Measure distance  $X_1$  behind the impeller.
- ◆ Press impeller towards the motor.
- ◆ Measure distance  $X_2$  behind the impeller.

$$Z = X_1 - X_2$$

Are the values correct?

These values must be checked after final assembly.

### 7.8.6 Final assembly

Dismantle trial assembly for determining the bearing play again and perform the final assembly.

- ◆ With the O-ring **412/3**
- ◆ With the distance ring **504**
- ◆ With 1 drop of adhesive on the shaft thread e.g. Loctite 243 from Loctite or an equivalent.

Only one drop of the adhesive is to be applied per thread.

Otherwise the next dismantling operation will be more difficult or no longer possible without destroying components.

- Install plain bearing pedestal **339** and tighten hex. screws **901/5**.



Strong axial forces are again produced when the completely assembled plain bearing pedestal is inserted into the lantern.

- Push the entire slide-in unit with housing (casing) gasket **401** into the housing (casing) **100** and screw together with hex. screws **901/3**.

When tightening the housing screws **901/3**, make sure that the support bracket of the adapter (with motor group 140TC) is in contact.

For tightening torques, see [Section 1.2](#).

### 7.9 Tests

The pumps are tested with water at the manufacturer's.

The operating data measured are documented in a **works certificate**.

If, during a test after repairs, discrepancies compared with the works certificate are discovered, the following people can be called in:

- 1) in-house pump office
- 2) The manufacturer ITT Richter or its local agent

The following conveying data can be checked using the **pump performance curves**:

- ◆ Flow rate
- ◆ Head
- ◆ Power requirement
- ◆ NPSHR

## 8 Faults



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

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

See also **Section 6.5**.

Should there be any uncertainty about the remedy to be applied, please inquire at the in-house pump office or at the pump manufacturer's.

### No delivery :

- ◆ Is the pump filled and vented?
- ◆ Is the suction line open, vented, cleaned and correctly laid?
- ◆ Is the discharge line open, vented, cleaned and correctly laid?
- ◆ Is the geodetic head too high?
- ◆ Is air being drawn in?
- ◆ Has the magnetic drive stopped?

### Flow rate too low :

- ◆ Have the pump, suction line and discharge line been completely vented, filled and cleaned?
- ◆ Have any strainers installed been cleaned?
- ◆ Are all shut-off devices open?
- ◆ Is the geodetic head too high?
- ◆ Is the NPSHA too low or the NPSHR too high?
- ◆ Are the pipe resistances too high?
- ◆ Is the viscosity too high?
- ◆ Is the direction of rotation correct?
- ◆ Is the speed too low or the impeller diameter too small?
- ◆ Are pump parts worn?
- ◆ Gas in the medium?

### Flow rate too high :

- ◆ Is the geodetic head too low?

- ◆ Are the pipe or nozzle resistances too low?
- ◆ Is the pump speed too low or the impeller diameter too large?

### Delivery pressure too high :

- ◆ Is the speed too high or the impeller diameter too large?
- ◆ Is the density too high?

### Motor consumes too much electricity :

- ◆ Is the flow rate, density or viscosity too high?
- ◆ Is the speed too high or the impeller diameter too large?
- ◆ Is the coupling correctly aligned?
- ◆ Can the pump shaft be turned properly?

### Pump does not run smoothly or creates noises :

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

### Temperature of the ball bearings is too high :

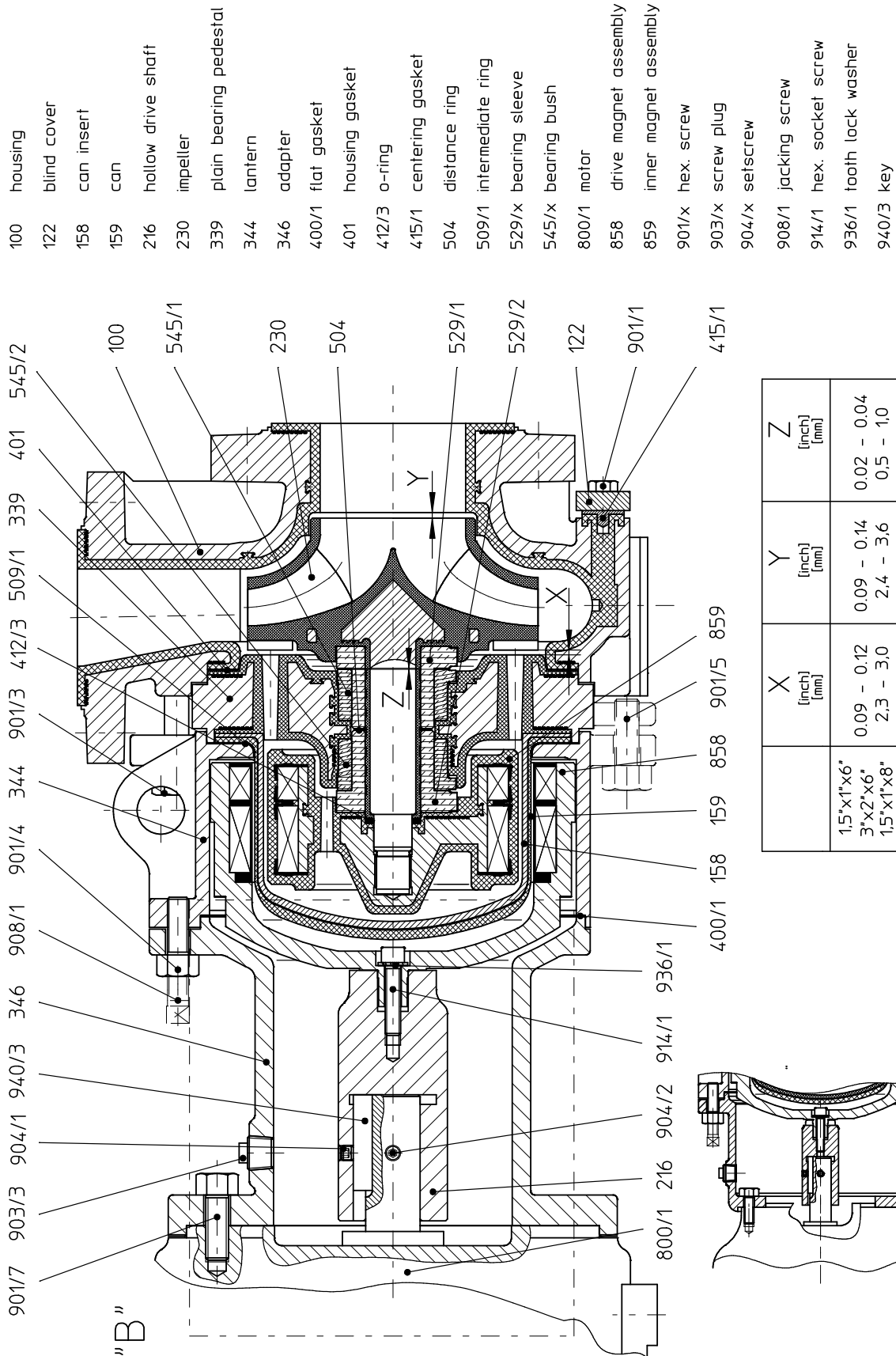
- ◆ How high is the actual temperature measured?
- ◆ How high may it be acc. to the operating manual?
- ◆ Is the running-in phase already over?
- ◆ Deficient lubricant?
- ◆ Overaging / wear?

### Leak from the pump :

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

## 9 Sectional drawing

### 9.1 MNKA-B close-coupled design

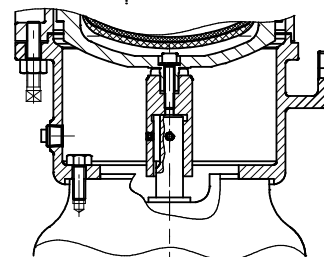


- 100 housing
- 122 blind cover
- 158 can insert
- 159 can
- 216 hollow drive shaft
- 230 impeller
- 339 plain bearing pedestal
- 344 lantern
- 346 adapter
- 400/1 flat gasket
- 401 housing gasket
- 412/3 o-ring
- 415/1 centering gasket
- 504 distance ring
- 509/1 intermediate ring
- 529/x bearing sleeve
- 545/x bearing bush
- 800/1 motor
- 858 drive magnet assembly
- 859 inner magnet assembly
- 901/x hex. screw
- 903/x screw plug
- 904/x setscrew
- 908/1 jacking screw
- 914/1 hex. socket screw
- 936/1 tooth lock washer
- 940/3 key

	X [inch] [mm]	Y [inch] [mm]	Z [inch] [mm]
1.5"x1"x6"	0.09 - 0.12	0.09 - 0.14	0.02 - 0.04
3"x2"x6"	2.3 - 3.0	2.4 - 3.6	0.5 - 1.0
1.5"x1"x8"	0.09 - 0.12	0.09 - 0.14	0.02 - 0.04
3"x1.5"x8"	2.3 - 3.0	2.4 - 3.6	0.5 - 1.0

929-95-506.en110

and see work's certificate



Detail "B"

Group I  
 Motor group 140TC, motor frame 143TC/145TC

## 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



## FAX

**Fax No. ()**

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

**To:**

()

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Date:  
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**Your order No.:** ()

**Our Kom. No.:** ()

**Serial No.:** ()

Dear Sirs,

The compliance with laws for the industrial safety obligates all commercial enterprises to protect their employees and/or humans and environment against harmful effects while handling dangerous materials.

The laws are such as: the Health and Safety at Work Act (ArbStättV), the Ordinance on Harzadous Substances (GefStoffV, BIOSTOFFV), the procedures for the prevention of accidents as well as regulations to environmental protection, e.g. the Waste Management Law (AbfG) and the Water Resources Act (WHG)

An inspection/repair of Richter products and parts will only take place, if the attached explanation is filled out correctly and completely by authorized and qualified technical personnel and is available.

In principle, radioactively loaded devices sent in, are not accepted.

Despite careful draining and cleaning of the devices, safety precautions should be necessary however, the essential information must be given.

The enclosed declaration of no objection is part of the inspection/repair order. Even if this certificate is available, we reserve the right to reject the acceptance of this order for other reasons.

Best regards  
RICHTER CHEMIE-TECHNIK GMBH

Enclosures

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