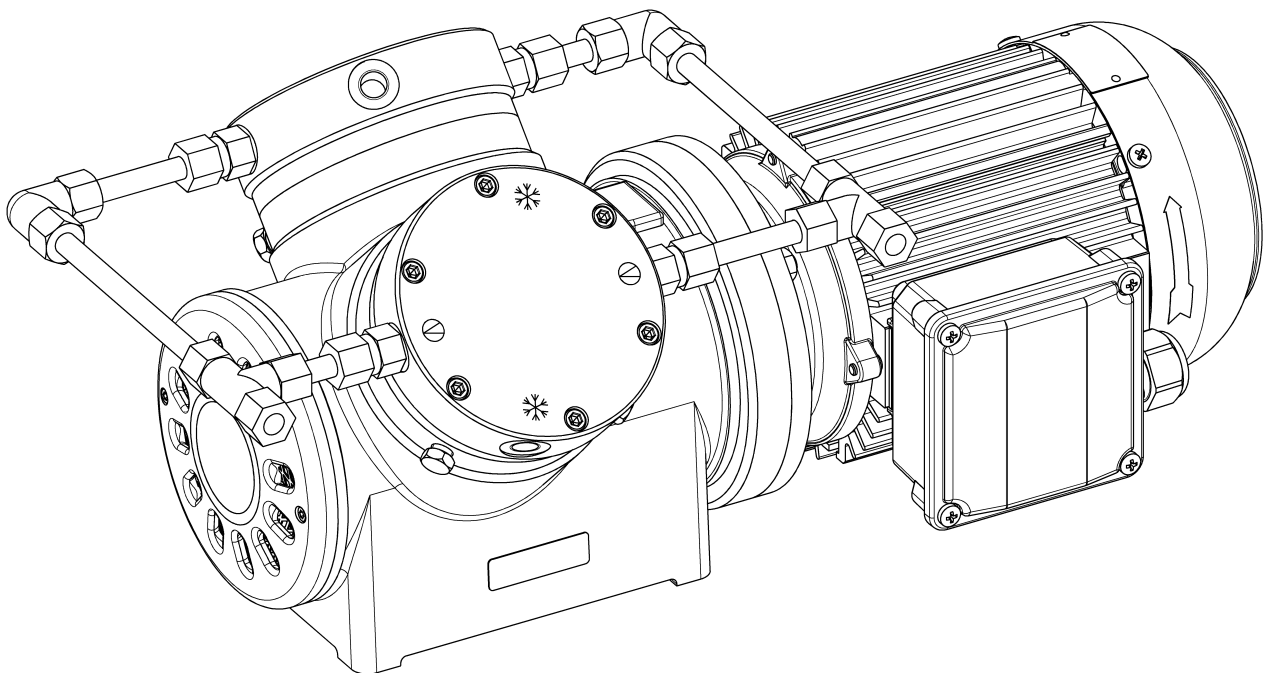


**OEM**

**N143.12, N186.12  
TRANSLATION OF ORIGINAL OPERATING AND  
INSTALLATION INSTRUCTIONS  
ENGLISH**

# DIAPHRAGM PUMP



**Note!**

Before operating the pump and the accessories, please read the operating and installation instructions and pay attention to the safety precautions!

KNF Neuberger GmbH  
Alter Weg 3  
79112 Freiburg  
Germany  
Phone +49-(0)7664/5909-0  
Fax. 07664/5909-99

[www.knf.com](http://www.knf.com)

## Contents

1	About this document .....	3
2	Use .....	4
3	Safety.....	6
4	Technical data .....	8
5	Design and function .....	13
6	Transport .....	17
7	Installation and connection .....	20
8	Operation .....	28
9	Servicing .....	31
10	Troubleshooting .....	38
11	Spare parts and accessories .....	40
12	Returns .....	41
13	Appendix.....	42

# 1 About this document

## 1.1 Using the operating and installation instructions

The operating and installation instructions are part of the pump.

- The individual chapters of these operating and installation instructions make reference to the operating instructions of the motor manufacturer for capacitor and three-phase motors. They are appended to these operating and installation instructions.
- Give the operating and installation instructions to the next owner.
- Keep the operating and installation instructions within reach at all times.

Project pumps For customer-specific project pumps (pump models that begin with "PJ" or "PM"), there may be deviations from the operating and installation instructions.

- For project pumps, also observe the agreed specifications.

## 1.2 Symbols and markings

### Warning notice



A notice that warns you of danger is located here. Possible consequences of a failure to observe the warning notice are specified here. The signal word, e.g., warning, indicates the danger level.

- Measures for avoiding the danger and its consequences are specified here.

### Danger levels

Signal word	Meaning	Consequences if not observed
DANGER	warns of immediate danger	Death or serious injury or serious damage will result.
WARNING	warns of possible danger	Death or serious injury or serious damage are possible.
CAUTION	warns of a possibly dangerous situation	Minor injuries or damage are possible.

Tab. 1

### Other notices and symbols

- An activity to be carried out is specified here (a step).

1. The first step of an activity to be carried out is specified here.



This symbol indicates important information.

## 2 Use

### 2.1 Proper use

The pumps are intended exclusively for transferring gases and vapors.

#### Responsibility of the owner

Operating parameters and conditions

Only install and operate the pumps in accordance with the operating parameters and conditions described in Chapter 4 *Technical data*.

Protect compressors with a pressure relief device between the pressure side of the compressor and the first shut-off valve.

Only fully assembled pumps may be operated.

Make sure that the installation location is dry and that the pump is protected against rain, splash, gushing and drip water as well as from other contaminants.

The tightness of the connections between the pipes of the application and the pump (or the connection of the pump) is to be checked at regular intervals. Leaky connections carry the risk of releasing dangerous gases and vapors from the pump system.

Requirements for the transferred medium

Before transferring a medium, check whether the medium can be transferred danger-free in the specific application.

Before using a medium, check the compatibility of the media-contacting components (see 4 *Technical data*) with the medium.

Risk of dangerous gas mixtures during pump operation if the working diaphragm breaks: Depending on the medium being transferred, breakage of the working diaphragm can result in a dangerous mixture if the medium mixes with the air in the innerspace between the working diaphragm and the safety diaphragm:

- KNF recommends monitoring the innerspace between the working diaphragm and the safety diaphragm (see item 5 in Fig. 4) through the hole(s) in the intermediate ring for a change in pressure. If the pressure changes in the innerspace, the pump is to be stopped immediately.
- After breakage of the working diaphragm, the pump must be stopped immediately. Replace the working diaphragm and safety diaphragm prior to further operation (see Chapter 9 *Servicing*).
- If pressure or output changes without apparent reason, the pump is to be switched off immediately and checked for damage.

Only transfer gases that remain stable under the pressures and temperatures that arise in the pump.

Frequency converter

Pumps with three-phase motor are designed for operation with frequency converter in the speed range 500 – 1500 rpm (50 Hz) or 600 – 1600 rpm (60 Hz) (see also Chapter 7.2 *Electrical connection*).

## 2.2 Improper use

The pumps may not be operated in explosive atmospheres.

The pumps are not suitable for transferring:

- Dusts
- Liquids
- Aerosols
- Biological and microbiological substances
- Fuel
- Explosives and flammable material
- Fibers
- Oxidants
- Food

Pumps that can produce both vacuum as well as overpressure may not be used to simultaneously produce vacuum and operating pressure.

No operating pressure may be applied to the suction side of the pump.

Pumps with capacitor motor are not intended for operation with a frequency converter.

### 3 Safety

**i** Observe the safety notices in chapters *7 Installation and connection* and *8.1 Operation*.

The pumps are built in accordance with the generally recognized rules of technology and the occupational safety and accident prevention regulations. Nevertheless, dangers can arise during their use that lead to injuries to the user or third parties or to damage to the pump or other property.

Only use the pumps in perfect technical condition, for their intended use, safely and aware of the dangers and in observation of the operating and installation instructions.

The components that are to be connected to the pumps must be designed according to the pneumatic data of the pumps.

When connecting the pumps to the electrical mains, observe the corresponding safety rules.

**Personnel** Make sure that only trained and instructed personnel or specially trained personnel work on the pumps. This applies, in particular, to assembly, connection and servicing work.

Make sure that the personnel have read and understood the operating and installation instructions, particularly the chapter on safety.

**Working in a safety conscious manner** Observe the regulations on accident prevention and safety during all work on the pumps and during operation.

The pump heads heat up during operation; therefore avoid contact with them.

Make certain that the pump is disconnected from mains and without power.

Make sure that no dangers arise from flow when gas connections are open, from noises or from hot, corrosive, dangerous and environmentally hazardous gases.

Make sure that an EMC-compliant installation of the pump is ensured at all times and that no dangerous situation can thereby arise.

**Working with hazardous media** Upon breakage of the working diaphragm and/or leaks, the transferred medium mixes with the air in the innerspace between the working diaphragm and the safety diaphragm and/or with the air in the surroundings.

Make sure that a dangerous situation cannot arise as a result.

When transferring hazardous media, observe the safety regulations for the handling of these media.

**Working with combustible media** Note that the pumps are not designed to be explosion-proof.

Make sure that the temperature of the medium is always sufficiently below the ignition temperature of the medium so as to prevent ignition or explosion. This also applies for abnormal operating situations.

Note here that the temperature of the medium increases when the pump compresses the medium.

Therefore, make sure that the temperature of the medium also remains sufficiently below the ignition temperature of the medium even when it is compressed to the maximum permissible operating pressure of the pump. The maximum permissible operating pressure of the pump is stated in the technical specifications (*4 Technical data*).

If applicable, also take into consideration external energy sources (e.g., radiation sources) that could add heat to the medium.

In case of doubt, contact KNF Customer Service.

Environmental protection	Store and dispose of all replacement parts in accordance with environmental regulations. Observe the respective national and international regulations. This applies in particular to parts that are contaminated with toxic substances.
EU/EC directives/standards	<p>With respect to the Machinery Directive 2006/42/EC, the pumps are partly completed machinery and are, therefore, to be regarded as not ready for use. Partly completed machinery may not be commissioned until it has been determined that the machine into which the partly completed machinery is to be installed complies with the provisions of the Machinery Directive 2006/42/EC. The following fundamental requirements of Annex I of Directive 2006/42/EC (general principles) are applied and observed:</p> <ul style="list-style-type: none"> <li>▪ General principles no. 1</li> <li>▪ No. 1.1.2. / 1.1.3. / 1.3.1. / 1.3.3. / 1.3.4. / 1.4.1. / 1.5.1. / 1.5.2. / 1.5.8. / 1.5.9. / 1.7.4. / 1.7.4.1. / 1.7.4.3.</li> </ul> <p>As these partly completed machines are built-in devices, the mains connections and equipment for disconnecting and switching off the partly completed machinery as well as overcurrent and overload protection gear must be considered when mounting.</p> <p>Furthermore, protection against contact with moving and hot parts, if present, must be provided during installation.</p>
	<div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="font-size: 2em; margin-right: 10px;">C E</div> <div> <p>The pumps comply with Directive 2011/65/EC.</p> <p>The following harmonized standards are satisfied:</p> <ul style="list-style-type: none"> <li>▪ DIN EN 60034-1/5/6/9</li> <li>▪ DIN EN 60204-1</li> <li>▪ DIN EN 61000-6-1/2/3/4</li> <li>▪ DIN EN 50581</li> <li>▪ EN 60034-30-1 (only pumps with three-phase motor)</li> </ul> </div> </div>
Customer service and repairs	<p>The pumps are maintenance-free. KNF does, however, recommend periodically inspecting the pumps for noticeable changes to noises and vibrations.</p> <p>Only have repairs to the pumps performed by the responsible KNF Customer Service.</p> <p>Housings with live components may only be opened by specialist personnel.</p> <p>Use only original parts from KNF during servicing work.</p>

## 4 Technical data

### Technical data

#### Pump materials

N143SP.12E

N186.1.2SP.12E

N186.3SP.12E

Assembly	Material SP
Head plate, intermediate plate, intermediate ring	Stainless steel
Working diaphragm	EPDM
Safety diaphragm	EPDM
Reed valves	Stainless steel
Retainer plate	Stainless steel
O-ring	EPDM
Conrod plates (top/bottom)	Aluminum
Connection (only N186)	Stainless steel

Tab. 2

#### Pneumatic values

Parameter	Value	Value	Value
	N143SP.12E	N186.1.2SP.12E	N186.3SP.12E
Max. permissible operating pressure [bar rel*] -Continuous operation	3.0	3.0	0.5
Ultimate vacuum [mbar abs.]	120	120	15
Flow rate at atm. pressure [l/min]**	23	42	23

Tab. 3 \*Bar rel related to 1013 hPa

\*\*Liters in standard state (1013 hPa, 20°C)

#### Pneumatic connections

Pump type	Value
N143.12 N186.3.12	Thread size G 1/4*
N186.1.2.12	For hose Ø 10
Hole for pressure monitoring of the innerspace between working diaphragm and safety diaphragm (see Chapter 7.4 <i>Installing monitoring device and monitoring diaphragm innerspace</i> )	Thread size G 1/8*

Tab. 4 \*Acc. to ISO 228



**Connection for water cooling**

Pump type	Value
N143.12	Thread size G 1/4*
N186.1.2.12	Thread size G 1/4*
N186.3.12	Thread size G 1/4*

Tab. 5 \*Acc. to ISO 228

**Electrical data for pumps with capacitor motor****N143.12**

Parameter	Value	Value	Value	Value
Voltage [V]*	100	115	220	230
Frequency [Hz]*	50/60	60	60	50
Power P <sub>1</sub> [W]	**	450	**	450
Current consumption [A]	**	5.6	**	4.4
Motor protection class	See motor type plate			
Max. permissible mains voltage fluctuations	See operating instructions for motor			

Tab. 6 \*For further voltage and frequency variants, see type plate

\*\*See type plate

**N186.1.2.12**

Parameter	Value	Value	Value	Value
Voltage [V]*	100	115	220	230
Frequency [Hz]*	50/60	60	60	50
Power P <sub>1</sub> [W]	**	**	**	610
Current consumption [A]	**	**	**	5.3
Motor protection class	See motor type plate			
Max. permissible mains voltage fluctuations	See operating instructions for motor			

Tab. 7 \*For further voltage and frequency variants, see type plate

\*\*See type plate

**N186.3.12**

Parameter	Value	Value	Value	Value
Voltage [V]*	100	115	220	230
Frequency [Hz]*	50/60	60	60	50
Power P <sub>1</sub> [W]	**	**	**	470
Current consumption [A]	**	**	**	5
Motor protection class	See motor type plate			
Max. permissible mains voltage fluctuations	See operating instructions for motor			

Tab. 8 \*For further voltage and frequency variants, see type plate

\*\*See type plate

**Electrical data for pumps with three-phase motor**

**N143.12**

Parameter	Value	Value	Value	Value
Voltage [V]*	200/346	277/480	220/380	230/400
Frequency [Hz]*	50/60	60	60	50
Power P <sub>1</sub> [W]	**	**	**	350
Current consumption [A]	**	**	**	3.2/1.85
Motor protection class	See motor type plate			
Max. permissible mains voltage fluctuations	See operating instructions for motor			

Tab. 9 \*For further voltage and frequency variants, see type plate

\*\*See type plate

**N186.1.2.12**

Parameter	Value	Value	Value	Value
Voltage [V]*	200/346	277/480	220/380	230/400
Frequency [Hz]*	50/60	60	60	50
Power P <sub>1</sub> [W]	**	**	**	310
Current consumption [A]	**	**	**	3.3/1.9
Motor protection class	See motor type plate			
Max. permissible mains voltage fluctuations	See operating instructions for motor			

Tab. 10 \*For further voltage and frequency variants, see type plate

\*\*See type plate

**N186.3.12**

Parameter	Value	Value	Value	Value
Voltage [V]*	200/346	277/480	220/380	230/400
Frequency [Hz]*	50/60	60	60	50
Power P <sub>1</sub> [W]	**	**	**	310
Current consumption [A]	**	**	**	3.3/1.9
Motor protection class	See motor type plate			
Max. permissible mains voltage fluctuations	See operating instructions for motor			

Tab. 11 \*For further voltage and frequency variants, see type plate

\*\*See type plate

Thermal switch/PTC thermistor sensor



The motors are equipped as standard with a thermal switch (capacitor motor) or with PTC thermistor sensor (three-phase motor) to monitor against overheating (see operating instructions for the motor).

**Weight**

Pump type	Weight [kg]
N143.12	approx. 24
N186.1.2.12	approx. 29.5
N186.3.12	approx. 29.5

Tab. 12

**Other parameters**

Parameter	Value
Permissible ambient temperature [°C]	+ 5 to + 40
Permissible media temperature [°C]	+ 5 to + 40
Max. surface temperature* [°C]	+ 85
Dimensions N143.12 N186.1.2.12 N186.3.12	See Chapter 7.1 <i>Installing the pump</i> Fig. 11, Fig. 12 and Fig. 13
Gas tightness** of the pump head (leak rate)	< 6 x 10 <sup>-6</sup> mbar l/s***
Highest permissible relative air humidity of the environment	80% for temperatures to 31°C, decreasing linearly to 50% at 40°C
Maximum installation altitude [m above sea level]	See operating instructions for motor
Protection class of pump: N143.12 N186.1.2/.3.12	IP00 IP20

Tab. 13 \*To reduce the surface temperature of the pump heads and to extend the service life of the diaphragm, you can optionally attach a water cooling system (see Chapter 7.5 *Connecting water cooling (optional)*).

\*\*The gas tightness of the pump head is no longer ensured after the pump head is opened or after changing diaphragm and reed valves. A leak test can be used to determine whether the original gas tightness is again achieved.

\*\*\*Values apply for helium leak test

**Additional equipment**

The pump is equipped with a safety diaphragm.

- For explanation on the task and principle, see Chapter 5 *Design and function*.
- For information on installation and connection, see Chapter 7 *Installation and connection*.
- For information operation, see Chapter 8 *Operation*.

## 5 Design and function

### Design

- 1 Pneumatic pump outlet
- 2 Pneumatic pump inlet
- 3 Electrical terminal box
- 4 Motor
- 5 Motor fan cover
- 6 Screw plug of the hole for pressure monitoring of the diaphragm innerspace (2x)
- 7 Connection for water cooling

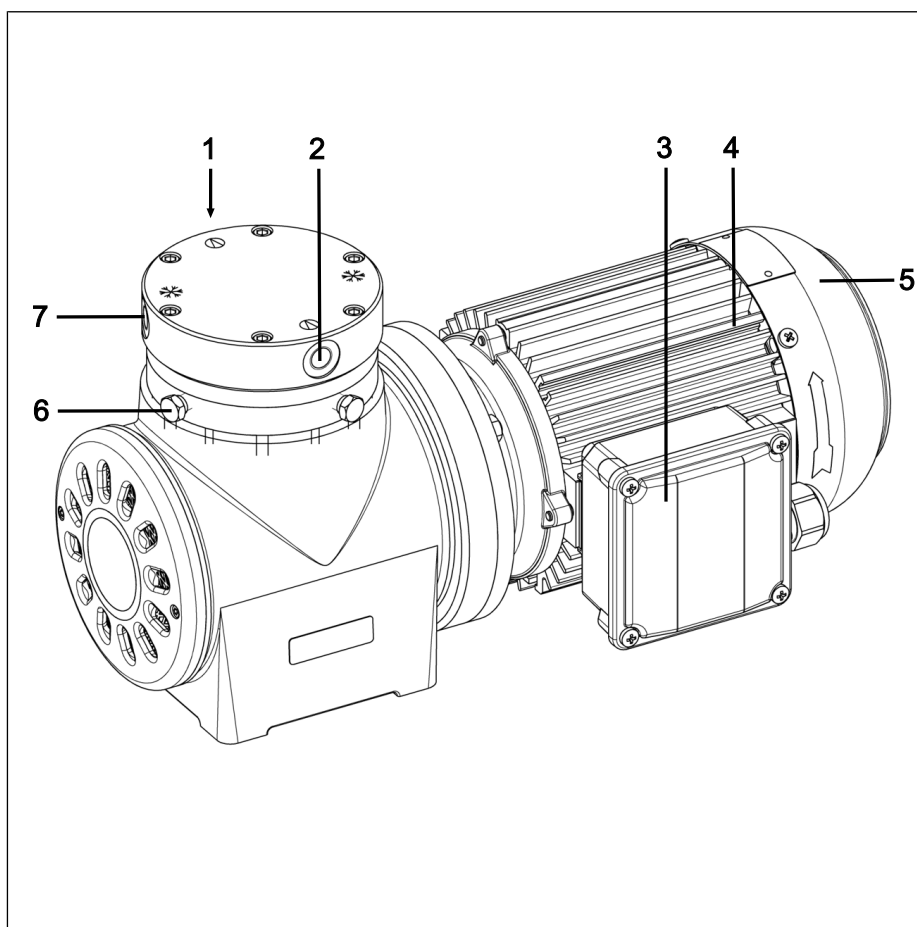


Fig. 1 Design N143.12

- 1 Union nut
- 2 Connection for water cooling
- 3 Pneumatic head connection
- 4 Pneumatic pump inlet
- 5 Motor
- 6 Motor fan cover
- 7 Electrical terminal box
- 8 Screw plug of the hole for pressure monitoring of the diaphragm innerspace (2x per head)
- 9 Pneumatic pump outlet

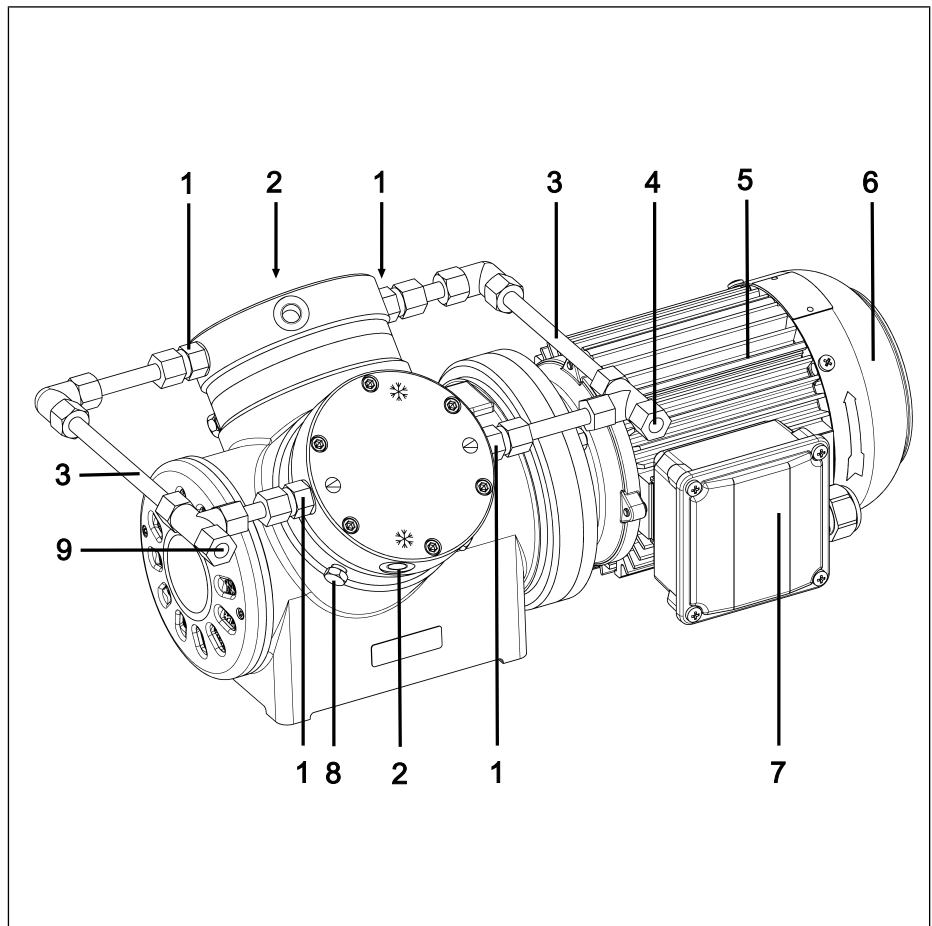


Fig. 2 Design N186.1.2.12

- 1 Pneumatic pump outlet
- 2 Connection for water cooling
- 3 Union nut
- 4 Pneumatic head connection
- 5 Motor
- 6 Motor fan cover
- 7 Electrical terminal box
- 8 Screw plug of the hole for pressure monitoring of the diaphragm innerspace (2x per head)
- 9 Pneumatic pump inlet

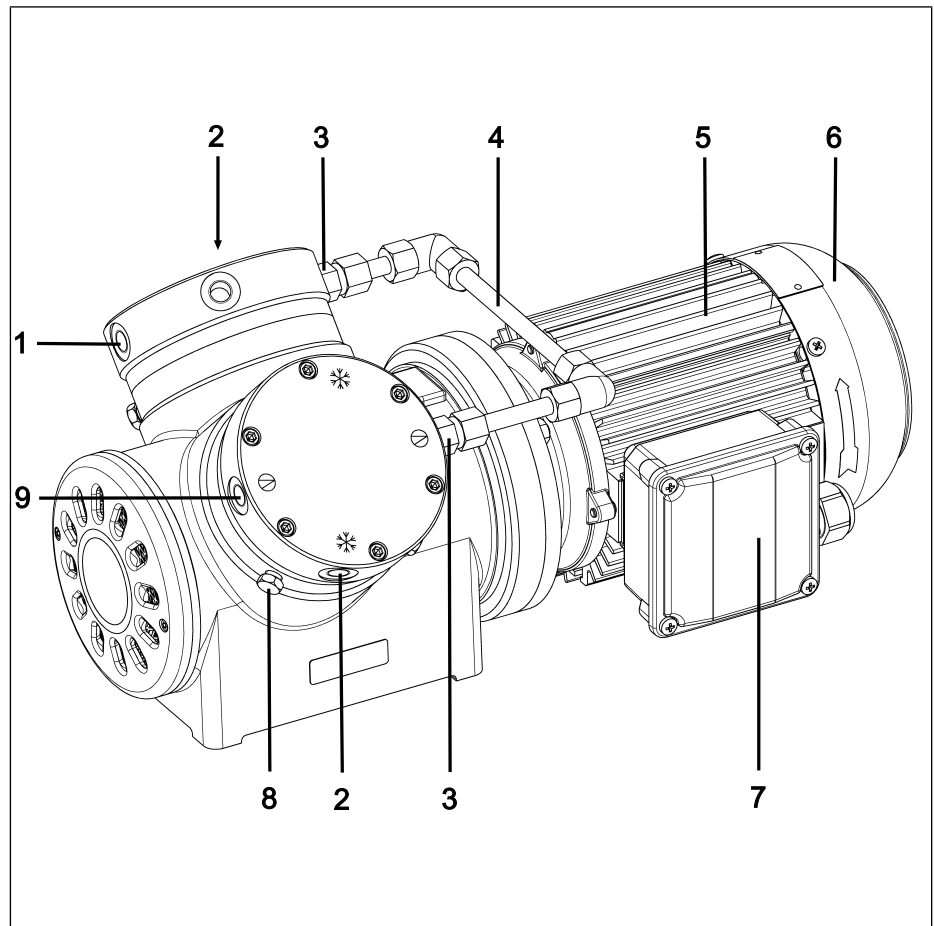
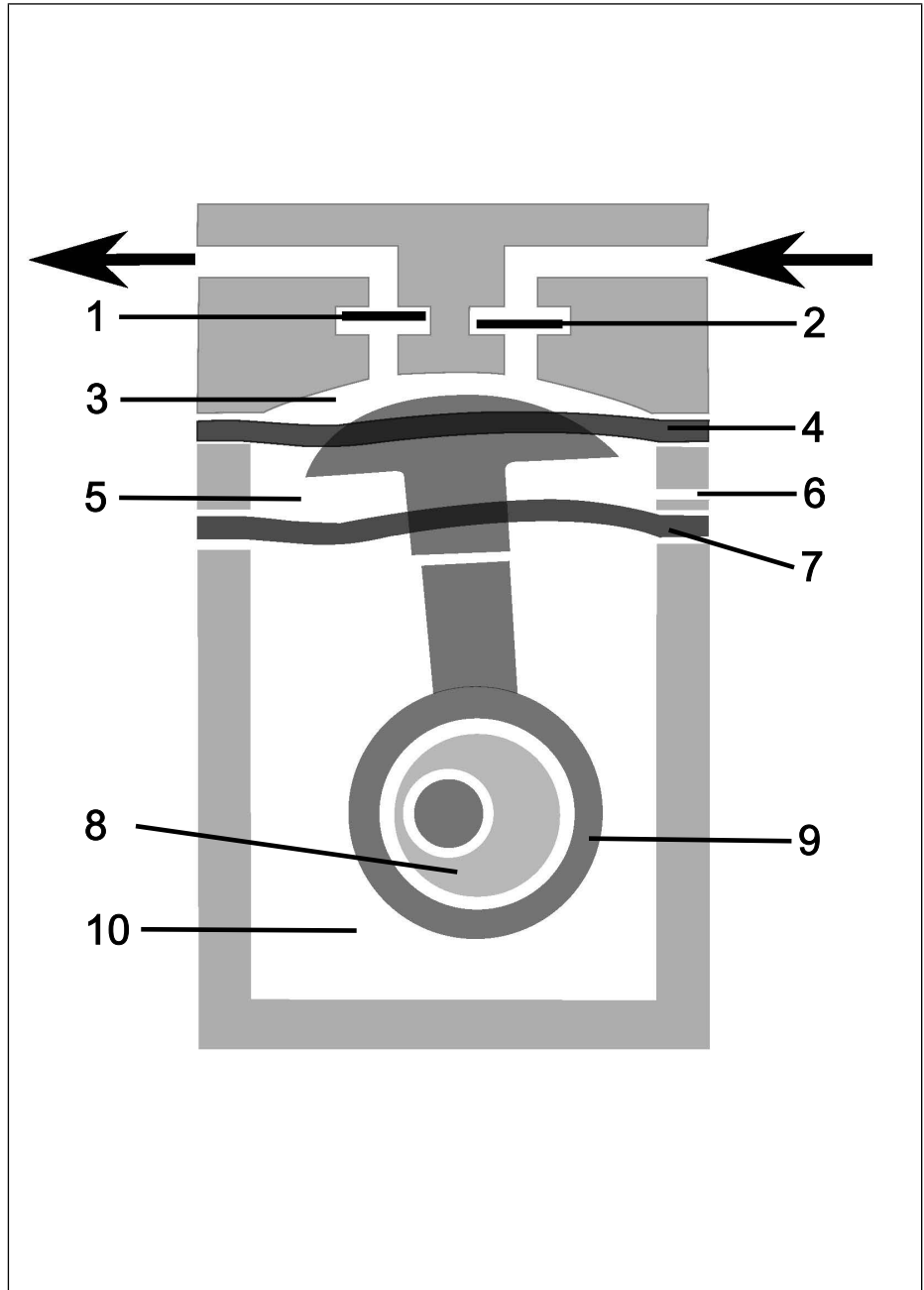


Fig. 3 Design N186.3.12

**Function of double diaphragm pump**

- 1 Outlet valve
- 2 Inlet valve
- 3 Transfer chamber
- 4 Working diaphragm
- 5 Innerspace
- 6 Hole for pressure monitoring of the innerspace (5)
- 7 Safety diaphragm
- 8 Eccentric
- 9 Connecting rod
- 10 Pump drive



*Fig. 4 Function principle of double diaphragm pump*

Double diaphragm pumps transfer, compress (depending on the version) and evacuate gases and vapors.

The elastic working diaphragm (4) is moved up and down by the eccentric (8) and the connecting rod (9). In the downwards stroke, it aspirates the gas to be transferred via the inlet valve (2). In the upwards stroke, the working diaphragm presses the medium out of the pump head via the outlet valve (1). The transfer chamber (3) is hermetically separated from the pump drive (10) by the working diaphragm.

Located below the working diaphragm is a second diaphragm (safety diaphragm (7)), which is under less mechanical stress during pump operation. Should the working diaphragm be damaged, no gas can escape from the pump.

The closed innerspace (5) between the two diaphragms can be monitored for pressure change with the help of the hole(s) (6) provided for this purpose. Damage to the working diaphragm can thereby be detected immediately.



## 6 Transport

### General

---



Personal injury and/or property damage due to incorrect or improper transport of the pump

In the event of incorrect or improper transport, the pump can fall down, be damaged or injure persons.

- Use suitable auxiliary means if necessary (carrying strap, lifting gear, etc.).
  - Where appropriate, wear suitable personal protective equipment (e.g., safety shoes, safety gloves).
- 



Risk of injury from sharp edges on the packaging

There is a risk of injury from cutting on the sharp edges when grabbing corners or when opening the packaging.

- Where appropriate, wear suitable personal protective equipment (e.g., safety shoes, safety gloves).
- 

Only for two-headed pumps:

---



Personal injury and/or property damage due to incorrect or improper transport of the pump

If the pump is raised and/or carried on the connection during transport, leaks and/or damages to the pump may result.

- Do not carry the pump on the pneumatic connection.
- 

- Transport the pump in the original packaging to the installation location.
- Store the original packaging of the pump (e.g., for later storage).
- Inspect the pump for transport damage after receiving it.
- Document any transport damage in writing.
- Remove any transport safeguards on the pump prior to commissioning.

**Parameter**

Parameter	Value
Storage temperature [°C]	+ 5 to + 40
Transport temperature [°C]	- 10 to + 60
Permissible humidity (non-condensing) [%]	30 to 85

*Tab. 14 Transport parameters*

**i** Prior to commissioning, make sure that the pump has reached the ambient temperature (4 *Technical data*).

**Transport with carrying strap***Fig. 5 Position of carrying strap (example)*

1. Pull the carrying strap under the pump (see Fig. 5).



Fig. 6

2. Fasten the carrying strap between compressor housing and motor (Fig. 1, see Fig. 6).
3. Make certain that the lifting load cannot be transferred from the belt to the pump connection.
4. Lift the pump from the packaging with the help of lifting gear.
5. Lower the pump carefully at the installation location.

## 7 Installation and connection

The pumps are only to be installed in accordance with the operating parameters and conditions described in Chapter 4 *Technical data*.

→ Observe safety notices (see Chapter 3 *Safety*).

### 7.1 Installing the pump

→ Before installing, store the pump at the installation location to allow it to reach the ambient temperature.

Mounting dimensions → For mounting dimensions, see the following figures:

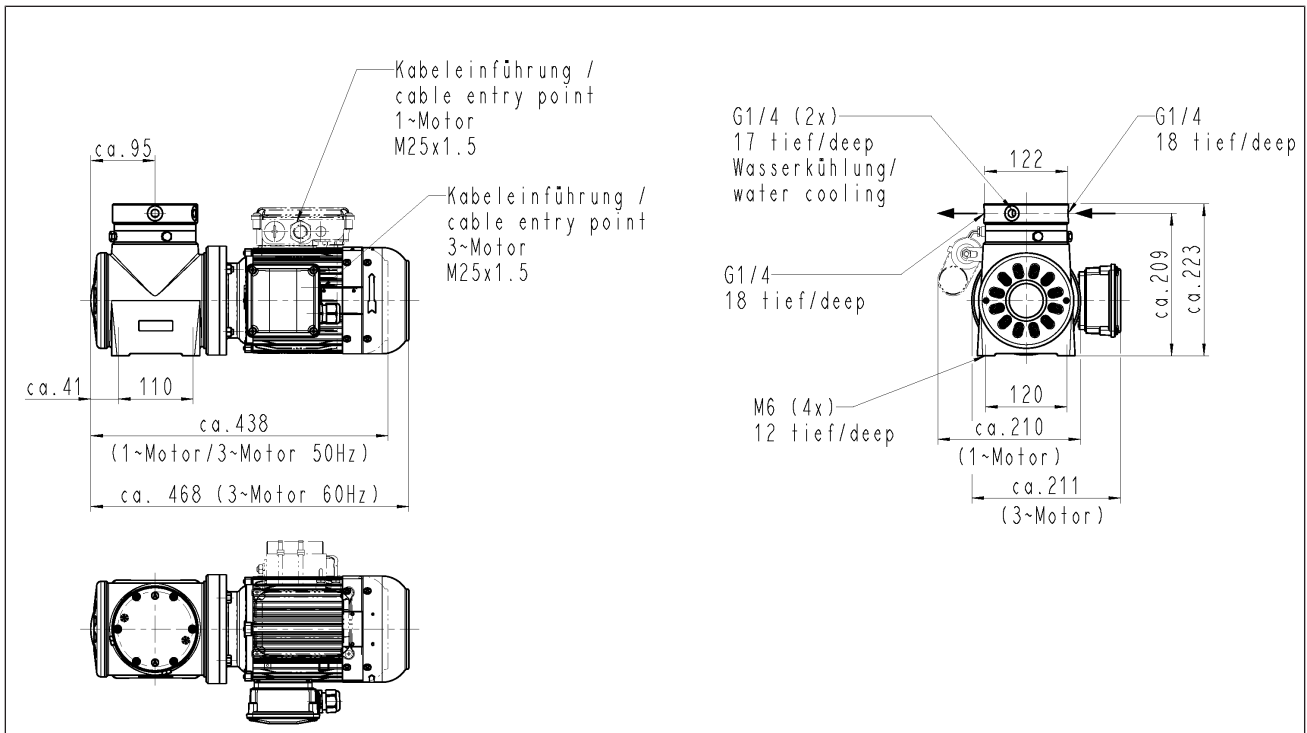


Fig. 7 Mounting dimensions pump series N143.12

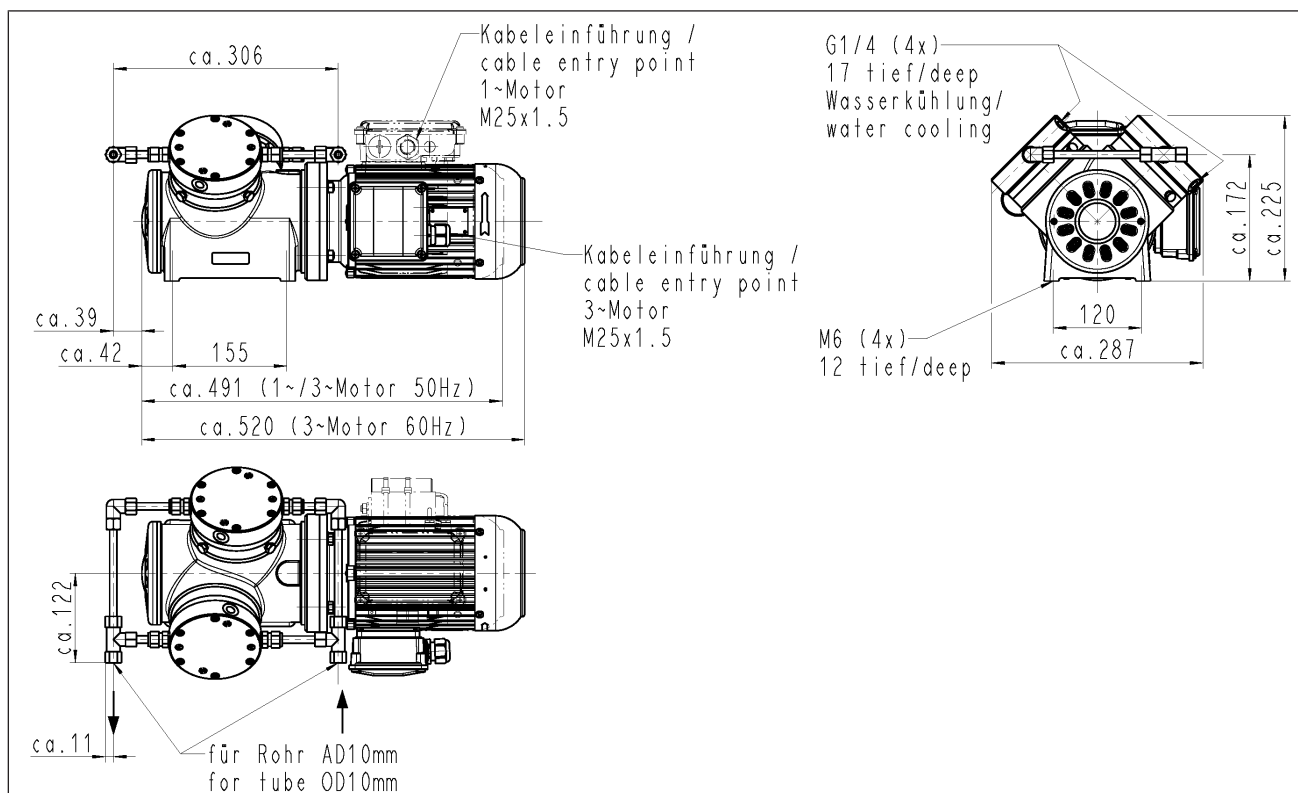


Fig. 8 Mounting dimensions pump series N186.1.2.12

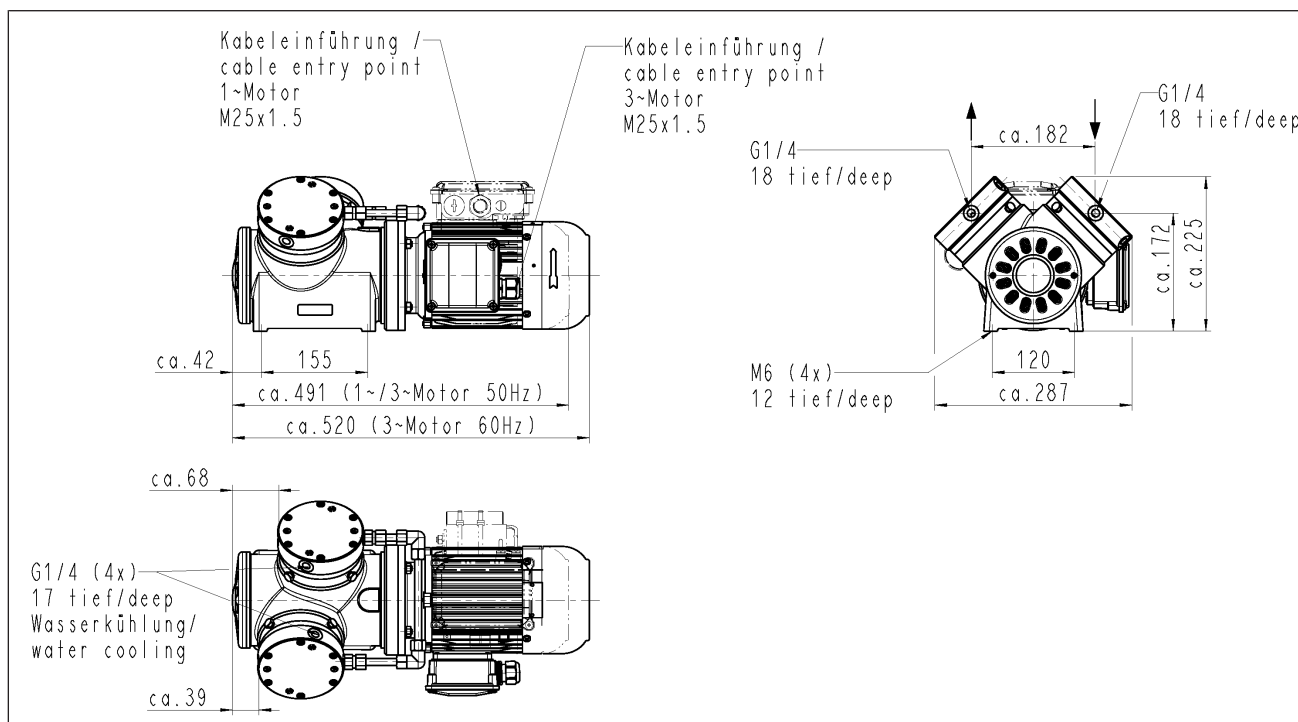




Fig. 9 Mounting dimensions pump series N186.3.12

Cooling air supply	 <b>WARNING</b>	<p>Danger of getting burned by hot surfaces Hot surfaces could occur if the pump overheats.</p> <p>→ When installing the pump, make sure that sufficient cooling air infeed and discharge is ensured.</p>
Immediate environment of the hot pump parts	<p>→ During installation, make sure that no combustible or thermally deformable objects are positioned in the immediate environment of the hot pump parts (head, motor).</p>	
Installation location	<p>→ Make sure that the installation location is dry and that the pump is protected against rain, splash, gushing and drip water as well as from other contaminants.</p> <p>→ Make sure that the installation location is accessible for maintenance and service.</p> <p>→ Make sure that the pump is securely attached to the intended fastening holes. If necessary, secure pump to base plate with rubber-bonded metal (see accessories, Chapter 11.2 <i>Accessories</i>; observe details on pump weight, Chapter 4 <i>Technical data</i>).</p> <p>→ Make sure that access to moving parts (such as via the pump housing from below) is avoided.</p> <p><b>i</b> The IP protection class of the pump motor is specified on the type plate.</p> <p>→ Mount the pump at the highest point in the system to prevent condensate from collecting in the pump head.</p> <p>→ Protect pump from dust.</p> <p>→ Protect pump from vibration and impact.</p>	
Installation position	<p>→ The pump can be mounted in any installation position. Use metal screws to fasten the pump at the indicated attachment points.</p>	
 <b>WARNING</b>		
<p>Personal injury and/or property damage from vibrations Pump vibrations, in combination with adjacent components, can result in crushing and/or damage to these components.</p> <p>→ Make sure that pump vibrations cannot lead to dangers in combination with adjacent components.</p>		
Protection against foreign objects	<p>→ Take protective measures against touching and foreign objects which could enter the pump.</p>	

## 7.2 Electrical connection



**DANGER**

Danger to life from electric shock

- Only have the pump connected by an authorized specialist.
- Only have the pump connected if the power supply is disconnected.

- When connecting to a power source, observe the applicable standards, directives, regulations and technical standards.
- When connecting to a power source, carefully read and observe the motor operating instructions (including the notice on insulation resistance measurement).
- Install a device for separating the pump motor from the electrical mains in the electrical installation (in accordance with EN 60335-1).
- Protect the pump motors in accordance with EN 60204-1 (overcurrent protection, overload protection).

**i** Refer to the pump type plate for the max. current consumption.

- It is recommended that an additional emergency-off system be installed.
- Mount the pumps in such a way that it is not possible to touch the electrically live parts (electrical connection).

Fastening the connection cables

- Fasten the connection cables so that
  - the cables do not come into contact with movable or hot parts.
  - the cables cannot be worn or damaged on sharp corners or edges
  - no tensile and pressure forces are exerted on the connection point of the cables (strain relief)

Thermal switch/PTC thermistor sensor

**i** The motors are equipped as standard with a thermal switch (capacitor motor) or with PTC thermistor sensor (three-phase motor) to monitor against overheating (see operating instructions for the motor).

**i** The three-phase motors are suitable for operation with frequency converters.

### Connecting the pump

1. Compare the data of the supply voltage with the details on the motor type plate. See the pump type plate for the maximum current consumption of the pump.

**i** For the permissible deviation of the supply voltage, see operating instructions for motor.

2. Open the terminal box cover.
3. Connect the earth wire to the pump motor.
4. Connect the cables for the electrical voltage according to the operating instructions for the motor.

**i** Set the direction of rotation according to the arrow on the fan hood (see 7.1 *Installing the pump* and operating instructions for the motor).

5. Close the terminal box cover again.

### 7.3 Pneumatic connection



Personal injury or property damage through ejected plugs

If not removed, the plugs on the pressure side of the pump can be ejected by the resulting operating pressure.

→ Remove plugs during installation.

- 
- |                        |  |
|------------------------|--|
| Connected components   | → Only connect components to the pump that are designed for the pneumatic data and thermal requirements of the pump. (see Chapter 4 <i>Technical data</i> ).   |
| Pressure relief device | → Protect compressors by means of a pressure relief device between the pressure-side connections of the compressor and the first shut-off valve.   |
| Pump discharge         | → If the pump is used as a vacuum pump, safely (with respect to medium and noise) drain the hot pump discharge that may, under certain circumstances, occur at the pneumatic outlet of the pump.                                   |
| Decoupling             | → KNF recommends mechanically decoupling the pump from the pipe system, e.g., through the use of flexible hoses or pipes. In this way it is possible to prevent the transfer of possible pump vibrations and noises to the system. |

#### Connecting the pump



A marking on the pump head indicates the flow direction.



Risk of injury from mixing up suction and pressure side

Mixing up the suction and pressure side can result in breakage of connected components on the suction and pressure side.

→ Observe the marking of inlet and outlet.

- 
1. Remove protective plugs from the hose connection threads.
  2. Connect suction and pressure line (for mounting dimensions, see Chapter 4 *Technical data*).



3. Lay the suction and pressure line at a downward angle to prevent condensate from running into the pump.

**i** Pneumatic noises can be reduced or dissipated by using a silencer (see Chapter 11.2 Accessories).

**i** Secure the pressure-side connections with a fastener (e.g., hose/pipe clamp) to prevent the hoses from slipping down from the connection.

### 7.4 Installing monitoring device and monitoring diaphragm innerspace

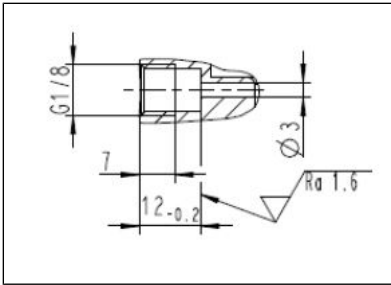


Fig. 10 Sectional drawing of hole for pressure monitoring



Risk of dangerous gas mixtures during pump operation if the working diaphragm breaks

Depending on the medium being transferred, breakage of the working diaphragm can result in a dangerous mixture if the medium mixes with the air in the innerspace between the working diaphragm and the safety diaphragm.

→ KNF recommends monitoring the innerspace between the working diaphragm and the safety diaphragm (see Fig. 4) through the hole(s) (see Fig. 10) in the intermediate ring for a change in pressure. If the pressure changes in the innerspace, the pump is to be stopped immediately.

→ After breakage of the working diaphragm, the pump must be stopped immediately. Replace the working diaphragm and safety diaphragm prior to further operation (see Chapter 9 Servicing).

### 7.5 Connecting water cooling (optional)

**i** Water cooling (see 11.2 Accessories) can increase the service life of the diaphragm, particularly with high pressures or high ambient temperature.

#### Recommended parameters

Parameter	Value
Water temperature [°C]	+ 5 to + 30
Water flow rate [l/min]	1.0

Tab. 15 Recommended parameters for connecting the water cooling

Mounting dimensions For mounting dimensions see Fig. 10, Fig. 11 and Fig. 12:

**i** The base plate is shown as an additional accessory on the following dimensional drawings.

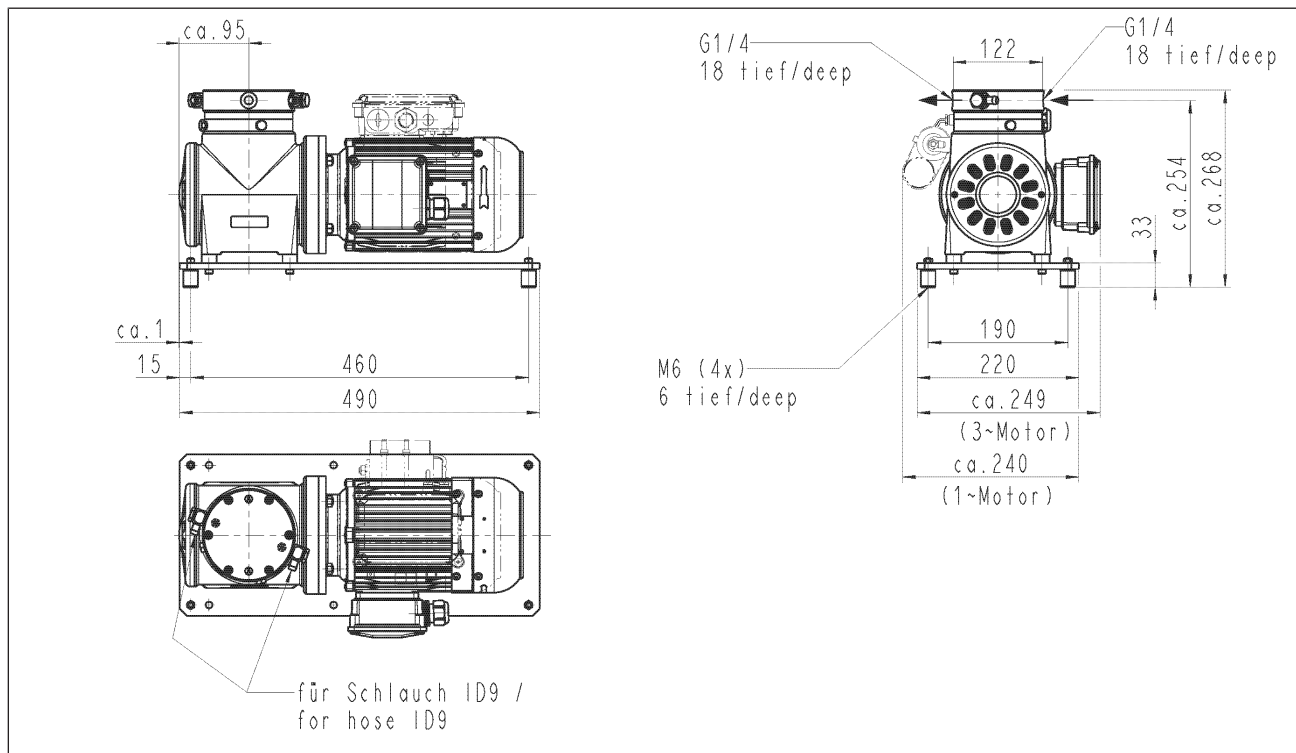


Fig. 11 Mounting dimensions pump series N143.12

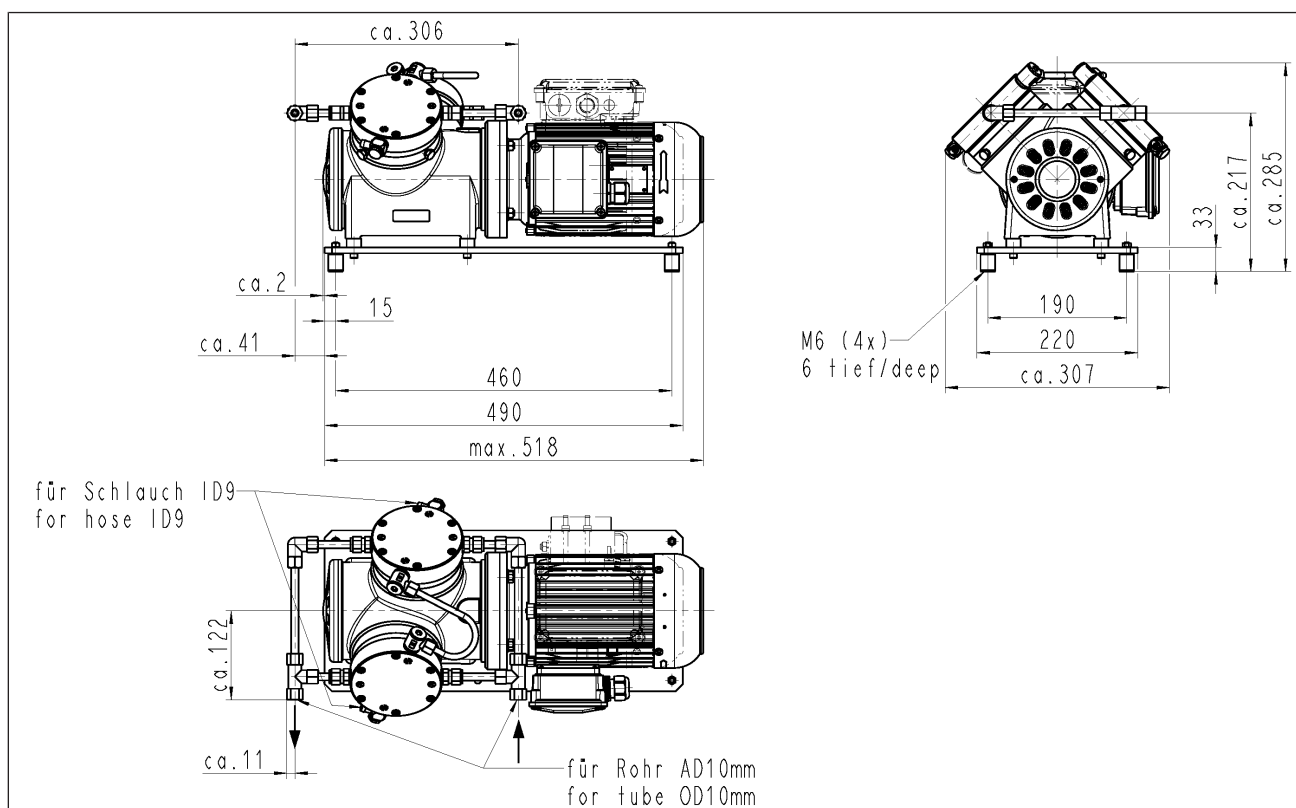


Fig. 12 Mounting dimensions pump series N186.1.2.12

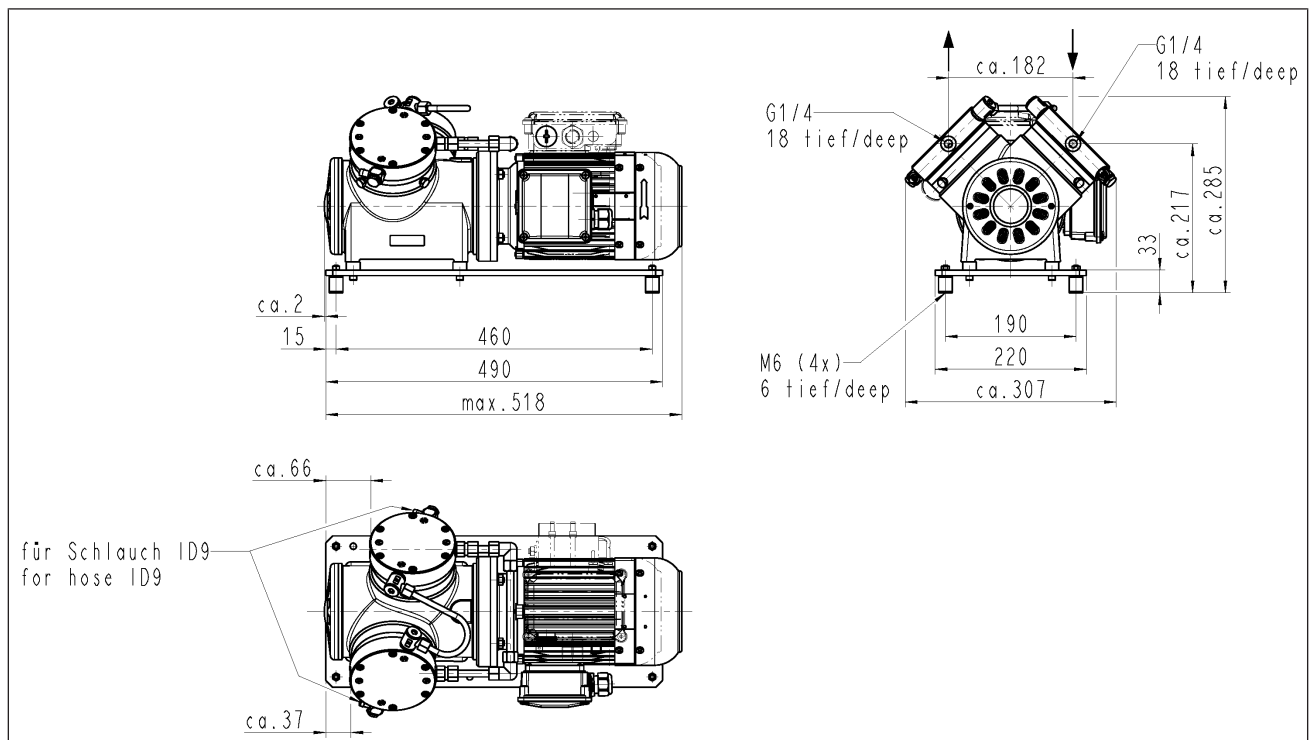


Fig. 13 Mounting dimensions pump series N186.3.12

→ Operate the water connection up to max. 1.0 bar gauge.

→ Safely drain water discharge.



Flow in both directions is permissible.

## 8 Operation

### 8.1 General

---



Risk of burns from hot pump parts and/or hot medium

Some pump parts may be hot during or after operation of the pump.

- Allow pump to cool after operation.
  - Take protective measures to protect against touching hot parts.
- 



Injury to eyes

Coming too close to the inlet/outlet of the pump may result in injury to the eyes due to the present vacuum/operating pressure.

- Do not look into the pump inlet/outlet during operation.
- 

- Only operate the pumps in accordance with the operating parameters and conditions described in Chapter 4 *Technical data*.
- Ensure the proper use of the pumps (See Chapter 2.1 *Proper use*).
- Eliminate the possibility of improper use of the pumps (see Chapter 2.2 *Improper use*).
- Observe safety notices (Chapter 3 *Safety*).
- The pumps are built-in devices. Before they are commissioned, it must be ensured that the machines or systems into which the pumps are installed comply with the relevant provisions.



Risk of bursting of pump head due to excessive pressure increase

- Do not exceed the maximum permissible operating pressure (see 4 *Technical data*).
- Monitor the pressure during operation.
- If the pressure exceeds the maximum permissible operating pressure of the pump: immediately switch off the pump and remedy the fault (see Chapter 10 *Troubleshooting*).
- Only throttle or regulate the air or gas quantity on the suction line to prevent the maximum permissible operating pressure from being exceeded.
- If the air or gas quantity on the pressure line is throttled or regulated, make sure that the maximum permissible operating pressure at the pump is not exceeded.
- Ensure that the pump outlet is not closed or restricted.

**i** Excessive pressure, with all of the associated hazards, can be prevented by means of a bypass line with a pressure relief valve between the pressure and suction sides of the pump. Further information is available from the KNF technical adviser (for contact data, see [www.knf.de](http://www.knf.de)).



Risk of dangerous gas mixtures during pump operation if the working diaphragm breaks

If the working diaphragm should break, the medium will mix with the air in the innerspace between working diaphragm and safety diaphragm.

- After breakage of the working diaphragm, the pump is to be stopped immediately. Breakage of the working diaphragm can be detected by monitoring the innerspace for a pressure change in the innerspace between working diaphragm and safety diaphragm. A change in the pressure or output of the pump without apparent reason may also indicate breakage of the working diaphragm.
- Working diaphragm and safety diaphragm must be changed prior to further operation (see Chapter 9 *Servicing*).



Personal injury and damage to the pump through automatic start

If pump operation is interrupted by the thermal switch or the triggering device for the PTC thermistor sensor due to overheating, the pumps resume operation automatically after they have cooled down.

→ Ensure that no dangerous situations can arise as a result.

**i** Operation with open suction-side gas connection can result in contaminants and objects being drawn in.

Pump standstill → When the pump is at a pump standstill, establish normal atmospheric pressure in the lines.

**i** The pump must not be started up against pressure or vacuum during switch-on. This also applies during operation after a brief power failure. If a pump starts up against pressure or vacuum, the pump may block, thereby activating the thermal switch or triggering device for the PTC thermistor sensors and switching off the pump.

→ Ensure that normal atmospheric pressure is present in the lines when switching on.

Vapors as medium The service life of the diaphragm can be extended by preventing the formation of condensate in the pump. Therefore:

→ Only perform work with saturated or nearly saturated vapors with a warm pump.

→ KNF recommends: When transferring aggressive media, flush the pump before switching off (see Chapter 9.2.1 *Flushing the pump*) to extend the service life of the diaphragm.

Switching off/decommissioning pump → Establish normal atmospheric pressure in the lines (relieve pump pneumatically).

Recommissioning → Before recommissioning, observe the applicable standards, guidelines, regulations and technical standards at the electrical connection.

Inspecting the pump → Inspect the pump periodically for external damage or leakage.

## 9 Servicing

### 9.1 Servicing schedule

Component	Servicing interval
Pump	<ul style="list-style-type: none"> <li>→ Periodic inspection for external damage or leakage.</li> <li>→ Periodic inspection for noticeable changes to noises and vibrations</li> </ul>
Hose connections	<ul style="list-style-type: none"> <li>→ Periodic inspection for external damage or leakage.</li> </ul>
Working diaphragm, safety diaphragm and reed valves	<ul style="list-style-type: none"> <li>→ Replace if the pressure in the (monitored) innerspace between working diaphragm and safety diaphragm changes (working diaphragm is broken).</li> <li>→ Replace if the pressure or flow rate of the pump changes without apparent reason.</li> <li>→ Replace no later than if there is a decrease in the pump flow rate.</li> </ul>

Tab. 16

## 9.2 Cleaning

### 9.2.1 Flushing the pump

When transferring dangerous and environmentally hazardous media, KNF recommends flushing the pump at atmospheric pressure for a few minutes prior to switch-off (if necessary for safety reasons: with an inert gas) to extend the service life of the diaphragm.

→ Discharge the media safely.

### 9.2.2 Cleaning the pump



#### CAUTION

Risk of burns from hot pump parts

The pump head or motor may still be hot after operation of the pump.

→ Allow pump to cool after operation.



#### WARNING

Health hazard due to dangerous substances in the pump

Depending on the medium being transferred, caustic burns or poisoning is possible.

→ Wear protective equipment if necessary, e.g., protective gloves, goggles.

→ Clean pump with suitable measures.

**i** During cleaning work, ensure that no fluids enter the interior of the housing.

→ Solvents should only be used during cleaning if head materials are not affected (ensure resistance of the material).

→ If compressed air is available, blow out parts.

### 9.3 Changing the working diaphragm, safety diaphragm and reed valves

- Requirements
- Disconnect the motor from mains and ensure that it is voltage-free.
  - Allow the pump and the motor to cool.
  - Clean the pump and free the pump of hazardous materials.
  - Remove the hoses/pipes from the pneumatic pump inlet and outlet.



## Information on the procedure



Risk of dangerous gas mixtures and leakage of the medium being transferred from the pump during pump operation if the safety diaphragm is not changed at the same time as the working diaphragm.

- If the working diaphragm is changed, always change the safety diaphragm at the same time.



Health hazard due to dangerous substances in the pump

Depending on the medium being transferred, caustic burns or poisoning is possible.

- Wear protective equipment if necessary, e.g., protective gloves, goggles.
- Clean pump with suitable measures.



Risk of burns from hot pump parts

The pump head or motor may still be hot after operation of the pump.

- Allow pump to cool after operation.



For two-headed pumps:

Servicing work should generally be performed on both heads at the same time.

- Always change the working diaphragm and safety diaphragm together so as to maintain the flow rate and safety of the pump.

With multi-headed pumps, parts may be interchanged between the individual pump heads.

- Change the parts of the individual pump heads that are to be exchanged one after the next.

## Spare parts

Spare part*	Position designation**	Quantity
Working diaphragm	(17)	1 (per pump head)
Safety diaphragm	(8)	1 (per pump head)
O-ring	(3)	2 (per pump head)
O-ring	(9)	1 (per pump head)
O-ring	(21)	2 (per pump head)
O-ring	(4) and (7)	2 (per pump head)
Reed valve	(24)	2 (per pump head)

Tab. 17 \* According to spare parts list, Chapter 11.1 Spare parts

\*\* According to Fig. 14

Tool and material

Quantity	Tool/material
1	Size 3 Allen key with torque indicator
1	Size 6 Allen key with torque indicator
1	Screwdriver blade width 5.5 mm
1	19 mm open-end wrench (only for two-headed pumps)
1	Adjustable face spanner wrench for nuts with two holes, pin diameter 4 mm, length approx. 160 mm (available as wrench for retainer plate as KNF accessory, see Chapter 11.2 Accessories).
1	Felt-tip pen
1	Hot-air blower
1	Adhesive (Delo ML5249) or comparable product

Tab. 18 \*According to accessory list, Chapter 11.2 Accessories

- 1 Head plate
- 2 Retainer plate
- 3 O-ring
- 4 O-ring
- 5 Hexagon socket head cap screws
- 6 Conrod plate, top
- 7 O-ring
- 8 Safety diaphragm
- 9 O-ring
- 10 Shim rings
- 11 Connecting rod
- 12 Shim rings
- 13 Conrod plate, bottom
- 14 Hexagon socket head cap screws
- 15 Housing
- 16 Intermediate ring
- 17 Working diaphragm
- 18 Intermediate plate
- 19 Pin
- 20 Hexagon socket head cap screws
- 21 O-ring
- 22 Screw plug
- 23 Slotted cheese head screw
- 24 Reed valve

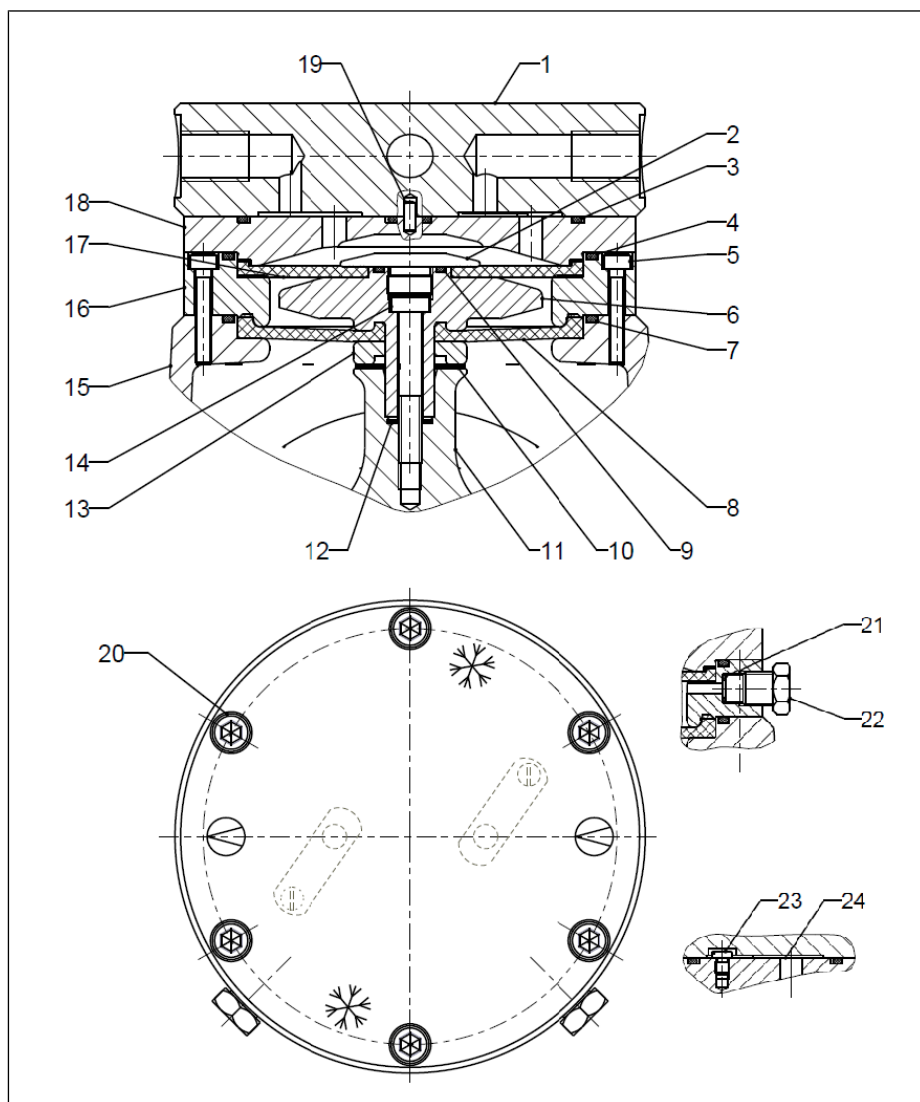


Fig. 14 Individual parts of the pump head

**i** The following item numbers refer to Fig. 14.

**Removing pump head**

1. Accessing the fan blades:  
Loosen fastening screws of the motor fan cover (see Fig. 1) and remove cover.

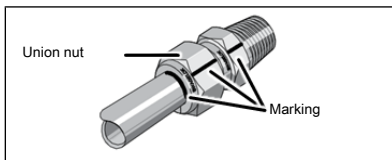


Fig. 15 Marking of the union nuts

2. Only for two-headed pumps:  
Remove the pneumatic connection between the pump heads; to do this, mark the union nuts (see Fig. 1) according to Fig. 15 and loosen.
3. Mark head plate (1), intermediate plate (18), intermediate ring (16) and housing (15) with a continuous line made with a felt-tip pen. This helps avoid incorrect assembly later.
4. Loosen the six hexagon socket head cap screws (20) using the Allen key by turning counterclockwise; remove head plate (1) and intermediate plate (18).
5. Remove O-ring (4).
6. For two-headed pumps:  
Perform steps 3 to 5 for second pump head.

#### Changing working diaphragm and safety diaphragm

1. Heat retainer plate (2) with a hot-air blower ( $T \approx 400^\circ\text{C}$ ) for approx. 5 minutes to approx.  $100^\circ\text{C}$ .



Risk of burns from hot parts

Burns may occur on skin contact with the hot retainer plate and countersunk screw or other heated pump parts.

- Wear protective gloves.
- Loosen retainer plate only with face spanner wrench.
- Only place retainer plate and countersunk screw on a heat-resistant surface.

2. Removing retainer plate:  
Loosen retainer plate (2) from the conrod plate (6) with the wrench for retainer plate by turning counterclockwise and remove.
3. Remove working diaphragm (17) and O-ring (9).
4. Heat hexagon socket head cap screws (14) with a hot-air blower ( $T \approx 400^\circ\text{C}$ ) for approx. 5 minutes to approx.  $100^\circ\text{C}$ .



Risk of burns from hot parts

Burns may occur on skin contact with the hot Allen screw or other heated pump parts.

- Wear protective gloves
- Loosen Allen screw with Allen key
- Only place Allen screw on a heat-resistant surface

5. Loosen hexagon socket head cap screws (14); remove conrod plate (6).
6. Loosen the three hexagon socket head cap screws (5); remove intermediate ring (16).
7. Remove the O-ring (7) from the housing (15).
8. Remove safety diaphragm (8).

9. Check all parts for soiling and clean if necessary.
  - i** There may be glue residue on the external thread of the retainer plate as well as on the internal thread of the conrod plate. Remove this.
  - i** There may be glue residue on the external thread of the hexagon socket head cap screws as well as on the internal thread of the connecting rod. Remove this.
10. Place safety diaphragm (8) together with conrod plate (6) on the lower conrod plate (13); make certain that the bulge on the inner diameter of the safety diaphragm lies in the groove of the lower conrod plate (13).
11. Mount the conrod plate (6).
12. Insert new O-ring (7) in housing (15).
13. Place the intermediate ring (16) on the housing (15) according to the felt-tip pen marking and tighten screws (5) crosswise (tightening torque: 3 Nm). Make certain that the bulge on the outer diameter of the safety diaphragm (8) lies in the groove of the housing.
14. Apply adhesive around the thread of the hexagon socket head cap screws (14) and in the threaded hole of the connecting rod (11) and screw the hexagon socket head cap screws into the connecting rod.
  - i** While screwing in, turn the screw back one turn to allow the adhesive to spread onto both thread flanks (screw and connecting rod).
  - i** Attention: Note the use-by-date for the adhesive.  
The adhesive may lose its effectiveness after the use-by-date has passed.
15. Then tighten hexagon socket head cap screws (14) (tightening torque: 9 Nm).
16. Insert new O-ring (9) in conrod plate (6).
17. Insert new O-ring (4) in intermediate ring (16).
18. Turn the fan blade to move the conrod plate (6) to the middle position.
19. Place new working diaphragm (17) on conrod plate (6) and intermediate ring (16);  
Make certain that the bulge around the inner circumference of the working diaphragm lies in the groove of the conrod plate.
20. Apply adhesive around the thread of the retainer plate (2) and in the threaded hole of the conrod plate (6) and screw the retainer plate into the conrod plate.
  - i** While screwing in, turn the retainer plate back one turn to allow the adhesive to spread onto both thread flanks (retainer plate and conrod plate).
  - i** Attention: Note the use-by-date for the adhesive.  
The adhesive may lose its effectiveness after the use-by-date has passed.
21. Then securely tighten retainer plate (19) with the wrench for retainer plate (tightening torque: 12 Nm).
  - i** Attention: Observe the hardening time for the adhesive when recommissioning the pump.  
The hardening time of the adhesive is approx. 24 hours.
22. For two-headed pumps:  
Perform steps 1 to 21 for second pump head.

**Changing reed valves**

1. Remove the two O-rings (3) from the intermediate plate (18).
2. Loosen the two screws (23) and remove the reed valves (24) from the intermediate plate (18) and the head plate (1).
3. Mount the new reed valves on the suction and pressure side.

**i** Make certain that the reed valves are placed symmetrically on the valve hole.

4. For two-headed pumps:  
Perform steps 1 to 3 for second pump head.

**Mounting pump head**

1. Place intermediate plate (18) on intermediate ring (16) according to the felt-tip pen marking (diaphragm should be held in middle position by holding the fan blade).
2. Insert the two new O-rings (3) into intermediate plate (18).
3. Place the head plate (1) on the intermediate plate (18) according to the felt-tip pen marking or the orientation indicated by the cylinder pin (19).
4. Turn in hexagon socket head cap screws (20) one to two threads.
5. Tighten the two hexagon socket head cap screws (20) crosswise (tightening torque: 11 Nm).
6. Check the pump for smooth running by turning the fan wheel.
7. For two-headed pumps:  
Perform steps 1 to 6 for second pump head.
8. Remount motor fan cover (see Fig. 1).
9. For two-headed pumps:  
Remount the pneumatic connection between the pump heads. In doing so, retighten the union nuts to the original position (as marked during disassembly, see Fig. 15).

**i** To ensure the required gas tightness of the pump following servicing, a leak test is to be performed.

10. Before recommissioning, observe the applicable standards, guidelines, regulations and technical standards at the electrical connection.

## 10 Troubleshooting



Danger to life from electric shock

- All work on the pump may only be performed by authorized specialists.
- Disconnect the pump power supply before working on the pump.
- Check and ensure that no voltage is present.

Check the pump (see following tables).

Pump does not transfer	
Cause	Fault remedy
Pump is not connected to the electrical mains.	→ Connect pump to the electrical mains.
No voltage in the electrical mains.	→ Check room fuse and switch on if necessary.
Connections or lines are blocked.	→ Check connections and lines. → Remove blockage.
External valve is closed or filter is clogged.	→ Check external valves and filters.
Condensate has collected in the pump head.	→ Separate the source of the condensate from the pump. → Flush the pump with air at atmospheric pressure for a few minutes (if necessary for safety reasons: with an inert gas).
Working diaphragm or reed valves are worn or defective.	→ Replace working diaphragm, safety diaphragm and reed valves (see Chapter 9.3 <i>Changing the working diaphragm, safety diaphragm and reed valves</i> ).
Thermal switch or triggering device for PTC thermistor sensor of the motor has tripped.	→ Disconnect pump from electrical mains. → Allow pump to cool. → Determine cause of the overheating and rectify.

Tab. 19

<b>Flow rate, pressure or vacuum too low</b>	
<b>The pump does not achieve the flow rate specified in the technical specifications or in the data sheet.</b>	
<b>Cause</b>	<b>Fault remedy</b>
Condensate has collected in the pump head.	<ul style="list-style-type: none"> <li>→ Separate the source of the condensate from the pump.</li> <li>→ Flush the pump with air at atmospheric pressure for a few minutes (if necessary for safety reasons: with an inert gas).</li> </ul>
There is overpressure on the pressure side and at the same time vacuum or pressure above atmospheric pressure on the suction side.	<ul style="list-style-type: none"> <li>→ Change the pneumatic conditions.</li> </ul>
Pneumatic lines or connection parts have insufficient cross section or are throttled.	<ul style="list-style-type: none"> <li>→ Disconnect pump from the system to determine the output values.</li> <li>→ Eliminate throttling (e.g., valve) if necessary.</li> <li>→ Use lines or connection parts with larger cross section if necessary.</li> </ul>
Leaks occur at connections, lines or pump head.	<ul style="list-style-type: none"> <li>→ Eliminate leaks.</li> </ul>
Connections or lines are completely or partially plugged.	<ul style="list-style-type: none"> <li>→ Check connections or lines.</li> <li>→ Remove the parts and particles that are causing the plugging.</li> </ul>
Head parts are soiled.	<ul style="list-style-type: none"> <li>→ Clean head components.</li> </ul>
Working diaphragm broken	<ul style="list-style-type: none"> <li>→ Stop pump immediately.</li> <li>→ Check whether the pressure has changed in the monitored innerspace between working diaphragm and safety diaphragm. Replace working diaphragm and safety diaphragm prior to further operation of the pump (see 9.3 <i>Changing the working diaphragm, safety diaphragm and reed valves</i>).</li> </ul>
Working diaphragm or reed valves are worn or defective.	<ul style="list-style-type: none"> <li>→ Replace working diaphragm, safety diaphragm and reed valves (see Chapter 9.3 <i>Changing the working diaphragm, safety diaphragm and reed valves</i>).</li> </ul>

Tab. 20

**Fault cannot be rectified**

If you are unable to identify any of the specified causes, send the pump to KNF Customer Service (contact data: see [www.knf.com](http://www.knf.com)).

1. Flush pump with air at atmospheric pressure for a few minutes (if necessary for safety reasons: with inert gas) to free the pump head of dangerous or aggressive gases (see Chapter 9.2.1 *Flushing the pump*).
2. Clean the pump (see Chapter 9.2.2 *Cleaning the pump*).
3. Send the pump together with completed Health and Safety Clearance and Decontamination Form to KNF, stating the nature of the transferred medium.

## 11 Spare parts and accessories

### 11.1 Spare parts

#### Spare part set

A spare part set consists of:

Parts	Item number*	Quantity N143.12	Quantity N186.1.2/.3.1 2
Working diaphragm	(17)	1	2
Safety diaphragm	(8)	1	2
Reed valves	(24)	2	4
O-ring (D5 x 1.5)	(21)	2	4
O-ring (D39.34 x 2.62)	(3)	2	4
O-ring (D14 x 2.0)	(9)	1	2
O-ring (D95 x 2.5)	(4) and (16)	2	4

Tab. 21 \*see Chapter 9.3 Changing the working diaphragm, safety diaphragm and reed valves

Spare part set	Order number
N143SP.12E	315457
N186.1.2SP.12E	315462
N186.3SP.12E	315462

Tab. 22

### 11.2 Accessories

Accessories	Order number
Wrench for retainer plate	018816
Water cooling connection:	
N143.12	310064
N186.1.2.12	303902
N186.3.12	303902
Suction filter G1/4	316661
Base plate with rubber-bonded metal:	310102
N143.12	
N186.1.2.12	
N186.3.12	
O-ring for screw plug ( Fig. 14/ 21)	026056

Tab. 23



## 12 Returns

Prerequisite for repairing a pump by KNF is a completed Decontamination Form.

This is made available on the KNF website as a download. To find the form, select your country on the overview page ([www.knf.com](http://www.knf.com)). You can find the Decontamination Form in the download area.

If you have questions, please contact your sales partner (contact data: see [www.knf.com](http://www.knf.com)).

## 13 Appendix

### See also

- Betriebsanleitung Drehstrommotor DE-EN.pdf
- CE-Erklärung Drehstrommotor DE-EN.pdf
- Betriebsanleitung Kondensatormotor DE-EN.pdf
- CE-Erklärung Kondensatormotor DE-EN.pdf

---

## **Betriebsanleitung für Drehstrommotoren (IE2 + IE3 nach IEC 60034-30)**

Operating Instructions for three-phase-motors  
(IE2 + IE3 according to IEC 60034-30)

**Baugröße / Frame size**            **HEF IE2 80 L/.. - HEF IE2 355 L/..**  
   **HEF IE3 80 L/.. - HEF IE3 355 L/..**

---

Ausgabe / Edition 07.15

Art.-Nr. / Art. No.: 187233

Ident.-Nr. / Ident No.: K.51.821.064

---



---

Alle Rechte vorbehalten! / All rights reserved.



## Achtung

Die in dieser Betriebsanleitung enthaltenen Sicherheitshinweise sind unbedingt zu beachten!

Sonderausführungen und Bauvarianten können in technischen Details von der Grundtype abweichen. Bei eventuell auftretenden Unklarheiten wird dringend empfohlen sich mit der EMOD Motoren GmbH in Verbindung zu setzen. Hierbei grundsätzlich Motortype und Motornummer angeben.

## 1 Allgemeine Hinweise

### 1.1 Anwendungsbereich

Die Motoren können entsprechend der auf dem Leistungsschild gestempelten Schutzart, der vom Hersteller vorgesehenen Bauform laut Katalog oder den Angaben des Kunden eingesetzt werden. Beim Einsatz von Sondermotoren gelten zusätzlich die Angaben in Angebot und Auftragsbestätigung.

### 1.2 Sicherheit



## Warnung

Die Aufstellung, Inbetriebnahme, Wartung und Reparatur darf nur von qualifiziertem, auf Grund seiner Ausbildung und Erfahrung geeignetem Personal durchgeführt werden.

Hierbei sind besonders zu beachten:

- die technischen Daten und Angaben über die zulässige Verwendung (Inbetriebnahme-, Umgebungs- und Betriebsbedingungen), die u.a. im Katalog, der Betriebsanleitung, den Schildangaben und der übrigen Produktdokumentation enthalten sind,
- die einschlägigen Errichtungs- und Unfallverhütungsvorschriften, -der fachgerechte Einsatz von Werkzeugen, Hebe- und Transporteinrichtungen,
- das Anbringen eines Berührungsschutzes im eingebauten Zustand, bei Gefährdung von Personen durch bewegliche Teile,
- die Benutzung persönlicher Schutzausrüstung.

## 2 Transport und Lagerung

### 2.1 Transport



## Warnung

Beim Transport der komplett montierten Antriebseinheit nur die dafür vorgesehenen Hebeösen benutzen. Komplette Antriebseinheiten nicht an den Motortransportösen anheben.

Die Motoren sind nach Eingang auf Transportschäden zu prüfen. Eventuell vorhandene Schäden grundsätzlich schriftlich aufnehmen.

Motoren mit Zylinderrollenlagern werden durch eine Transportsicherung gegen Lagerschäden geschützt. Vor dem Aufziehen der Übertragungselemente bzw. der Inbetriebnahme ist die Transportsicherung zu entfernen.

### 2.2 Lagerung

Der Lagerort sollte nach Möglichkeit trocken, sauber, temperaturkonstant und erschütterungsfrei sein.

Damit der Schmierfilm in der Motorlagerung und den Dichtungssystemen nicht abreißt, sollte bei längerer Einlagerungszeit die Motorwelle von Hand, z.B. in monatlichen Abständen, um einige Umdrehungen gedreht werden.

Die Wälzlager der Motoren sollten neu gefettet bzw. erneuert werden, wenn der Zeitraum zwischen Lieferung und Inbetriebnahme mehr als 4 Jahre beträgt. Bei ungünstigen Lagerungsbedingungen verringert sich dieser Zeitraum erheblich.

### 2.3 Überprüfung des Isolationswiderstandes



## Warnung

Bei der Messung des Isolationswiderstandes und unmittelbar danach haben die Klemmen teilweise gefährliche Spannungen und dürfen nicht berührt werden!

Vor Inbetriebnahme des Motors, nach längerer Lagerungsdauer oder Stillstandzeit (größer 6 Monate), muß der Isolationswiderstand der Wicklung ermittelt werden. Wicklung mittels Isolationswertmeßgerät (max. Gleichspannung 500 V) gegen Masse prüfen.

Ist der Mindest-Isolationswiderstand bei einer Wicklungstemperatur von 25 °C kleiner als 30 MΩ oder bei einer Wicklungstemperatur von 75 °C kleiner als 1 MΩ muß die Motorwicklung getrocknet werden bis der erforderliche Mindestisolationswiderstand erreicht ist.

Die Wicklungstemperatur darf hierbei 80 °C nicht überschreiten!

Damit bei geschlossenen Motoren ein Luftaustausch erfolgen kann Lagerschild lösen. Bei Trocknung der Wicklung durch Anschluß an Niederspannung sind Anweisungen des Lieferwerkes einzuholen.

Nach einem Austrocknen der Wicklung ist eine Wartung der Lager erforderlich (siehe entsprechendes Kapitel!).

## 3 Montage und Inbetriebnahme



## Warnung

Alle Arbeiten am Motor nur im elektrisch spannungslosen Zustand durchführen!

### 3.1 Aufstellung

#### 3.1.1 Standort

Die Motoren sollen leicht zugänglich, bei Umgebungs- bzw. Kühlmitteltemperaturen von max. -15 °C bis +60 °C aufgestellt bzw. angebaut werden. Aufstellhöhe max. 2000 m (ü.NN).

Die Kühlluft muß ungehindert zu- und abströmen können und darf nicht unmittelbar wieder angesaugt werden. Die Luftein- und Luftaustrittsöffnungen sowie die Kanäle zwischen den Kühlrippen sind von Verschmutzung freizuhalten.

Bei Aufstellung mit Wellenende nach oben und unten muß gewährleistet sein, daß in das obere Lager kein Wasser eindringen kann.

### 3.2 Befestigung von Motoren

Fußmotoren müssen auf ebener, erschütterungsfreier Auflagefläche aufgestellt und befestigt werden. Alle Befestigungsfüße müssen planflächig aufliegen; gegebenenfalls zum Ausgleich dünne Bleche unterlegen.

Bei Flanschmotoren ist auf Planlauf des Gegenflansches zu achten. Planlauffehler können zu Lagerschäden bzw. zum Ausfall von Dichtungssystemen führen.

### 3.3 Kondenswasser-Abflußlöcher

Es ist darauf zu achten, daß vorhandene Kondenswasser-Abflußlöcher nach der Montage an der tiefsten Stelle des Motors liegen und von Verunreinigungen freizuhalten sind.

Verschlossene Kondenswasser-Abflußlöcher sind von Zeit zu Zeit zu öffnen und danach wieder zu verschließen.

### 3.4 Auswuchtung



## Warnung

Wird ein Motor ohne Antriebsmoment in Betrieb genommen, so ist die Paßfeder gegen Herausschleudern zu sichern.

**Maßnahmen zum Berührungsschutz bei rotierenden Bauteilen beachten!**

Die Motorwellen sind am Wellenspiegel entsprechend DIN ISO 8821 mit der Auswuchtart gekennzeichnet:

Auswuchtung mit halber Passfeder „H“

Auswuchtung mit voller Passfeder „F“

Bei Montage des Abtriebsmomentes auf entsprechende Auswuchtart achten!

### 3.5 Elektrischer Anschluß

Der elektrische Anschluß darf nur durch einen Fachmann entsprechend den geltenden Sicherheitsvorschriften vorgenommen werden.

Netzspannung und -frequenz müssen mit den Daten auf dem Leistungsschild übereinstimmen.  $\pm 5\%$  Spannungs- und/oder  $\pm 2\%$  Frequenzabweichung sind zulässig.

Bei Betrieb des Motors an einem Frequenzumrichter ist ein EMV-gerechter Anschluß gemäß der Richtlinie 89/336 EWG vorzunehmen.

Ein Anschlußplan, Bild 3, befindet sich bei jedem Motor. Anschluß des Motors und der Steuerung, Überlastungsschutz und Erdung sind nach den VDE- und Installationsvorschriften, sowie den landesüblichen, nationalen und internationalen Bestimmungen der EVU's vorzunehmen.

Die Drehrichtung des abtriebseitigen Wellenendes ist vor der Inbetriebnahme zu überprüfen. Die Umkehr der Drehrichtung ist durch vertauschen von zwei beliebigen Netzzuleitungen möglich.

Die zur Zugentlastung oder als Verdrehenschutz für die Zuleitungen vorgesehenen Einführungsteile sind ordnungsgemäß anzuwenden. Nicht benötigte Einführungöffnungen verschließen.

Anziehdrehmomente für Schraubenverbindungen der Klemmbrettanschlüsse siehe Bild 2

### 3.6 Motorschutz

Eingebaute Kaltleiter entsprechend dem im Anschlußkastendeckel bzw. dem beim Motor befindlichen Anschlußplan mit dem Auslösegerät verbinden. Eventuell erforderliche Durchgangsprüfungen nur mit Meßbrücke (max. 2,5 V) durchführen.

Ist zum Motorschutz ein Temperaturwächter als Öffner vorgesehen, so ist dieser entsprechend dem Anschlußplan mit dem Hilfsstromkreis in Reihe zu schalten (min. 25 ..... max. 250 V 1,6 A).

Um einen selbstständigen Wiederanlauf des Motors nach dessen Abkühlung und der Rückschaltung der eingebauten Temperaturüberwachung zu verhindern, sind entsprechende schaltungstechnische Maßnahmen zu ergreifen.

### 3.7 Inbetriebnahme



#### Warnung

**Vorsicht Verbrennungsgefahr!**  
**An der Motoroberfläche können hohe Temperaturen von über 80 °C auftreten.**

**Bei Bedarf Berührungsschutz vorsehen!**

#### 3.7.1 Montage der Übertragungselemente

Zum Auf- und Abziehen der Übertragungselemente nur geeignete Werkzeuge und Vorrichtungen verwenden. Auf die Motorlagerung darf kein Druck oder Schlag übertragen werden.

#### 3.7.2 Ausrichten bei Kupplungsbetrieb

Bei Kupplungsbetrieb sind die Wellen axial und radial gegeneinander auszurichten. Das Einstellen der Luft zwischen den Kupplungshälften ist nach den Angaben der Kupplungshersteller vorzunehmen.

Nur Kupplungen verwenden, die mitterversatz-, winkel-, längs- und drehelastisch sind. Starre Kupplungen sind nicht zulässig und nur in Ausnahmefällen nach Absprache mit dem Hersteller einsetzbar.

#### 3.7.3 Vor Inbetriebnahme ist mindestens zu prüfen ob:

- der Läufer ohne anzustreifen gedreht werden kann,
- der Motor ordnungsgemäß ausgerichtet und montiert ist,
- die Abtriebs Elemente richtige Einstellbedingungen haben,
- alle elektrischen Anschlüsse, Verbindungselemente sowie Befestigungsschrauben ordnungsgemäß angezogen und ausgeführt sind,
- vorhandene Zusatzeinrichtungen funktionsfähig sind,
- die Kühlmittelzuführung nicht beeinträchtigt ist,
- Berührungsschutzmaßnahmen für bewegte und spannungsführende Teile getroffen sind.

## 4 Instandhaltung



#### Warnung

**Alle Arbeiten am Motor nur im abgeschalteten, gegen Wiedereinschalten gesicherten Zustand durchführen! Neben den Hauptstromkreisen auch auf eventuell vorhandene Zusatz- oder Hilfstromkreise, insbesondere Stillstandheizungen achten.**

### 4.1 Inspektion

Je nach Schmutzbefall sind die Motoren regelmäßig entlang der gesamten Oberfläche, z.B. mit trockener Druckluft, zu säubern.

Erste Inspektion im Normalfall nach ca. 500 Betriebsstunden, spätestens 1 Jahr durchführen. Weitere Folgeinspektionen sollten je nach Einsatzbedingungen in geeigneten Intervallen, wie z.B. Nachschmier- bzw. Fettwechselfristen, mindestens jedoch einmal im Jahr durchgeführt werden.

#### Bei Inspektionen ist zu prüfen, daß

- die technischen Daten laut Typenschild eingehalten werden,
- keine Leckagen (Öl, Fett, Wasser) vorhanden sind,
- sich die Laufgeräusche der Lager sowie die Laufruhe des Motors nicht verschlechtern haben,
- alle Befestigungsschrauben für elektrische und mechanische Verbindungen fest angezogen sind,
- bei Kupplungsbetrieb die Ausrichtung des Motors in den zulässigen Toleranzen liegt.

### 4.2 Lager

#### 4.2.1 Lager mit Dauerschmierung

Die Lager der Motoren mit Fettdauerschmierung sind unter normalen Betriebsbedingungen 10000 bis 20000 Betriebsstunden, längstens jedoch 3 Jahre wartungsfrei.

Bei Motoren mit zwei Deckscheiben als Lagerabdichtung (ZZ-Lager) und einer Drehzahl bis  $3600 \text{ min}^{-1}$  sollten die Lager nach 20000 Betriebsstunden, spätestens 3 Jahren erneuert werden.

Bei Motoren mit einer Deckscheibe (Z-Lager) oder einem Lagerabschlußdeckel als Lagerabdichtung sollte,

- bei Drehzahlen bis  $1800 \text{ min}^{-1}$  nach 20000 Betriebsstunden,
  - bei Drehzahlen bis  $3600 \text{ min}^{-1}$  nach 10000 Betriebsstunden,
- spätestens jedoch nach 3 Jahren das Fett und wenn erforderlich die Lagerung erneuert werden.

#### 4.2.2 Lager mit Nachschmierung

Bei Motoren mit Nachschmiereinrichtung sind Nachschmierfrist, Fettmenge und Fettqualität durch ein Zusatzschild am Motor angegeben. Falls die im Schmierschild genannten Betriebsstunden innerhalb von 3 Jahren nicht erreicht werden sollte vorzeitig nachgeschmiert werden. Nachschmieren nur bei drehendem Läufer, damit sich das neue Fett im Lager verteilt!

#### Schmierstoffe (siehe Bild 1)

Das Mischen verschiedener Fettsorten ist zu vermeiden!

**Achtung:** Beim Nachschmieren der Lager müssen unbedingt die Fettablaßschrauben am Lagerschild AS und BS geöffnet werden!

### 4.3 Instandsetzung

Ersatzteillisten und normale zeichnerische Darstellungen enthalten keine detaillierten Angaben über Art und Abmessungen der Bauteile. Deshalb beim Demontieren Zuordnung der jeweiligen Bauteile feststellen und diese für den Zusammenbau kennzeichnen.

#### 4.3.1 Lagerwechsel

Motor im erforderlichen Umfang demontieren. Wälzlager mit geeigneter Vorrichtung abziehen und Lagerstellen von Verunreinigungen säubern!

Neues Wälzlager gleichmäßig auf ca. 80 °C erwärmen und aufziehen.

Ca. 50% des freien Raumes im Lager sowie der Fetträume im Lager-schild bzw. Lagerdeckel mit Fett der zugelassenen Qualitäten füllen.

Dichtungselemente (z.B. Wellendichtringe) müssen vor dem Zusammenbau auf Funktion sowie Beschädigung überprüft und bei nicht mehr ausreichender Wirksamkeit erneuert werden.

#### 4.3.2 Fugenabdichtung

Bei Motoren der Schutzart IP56 oder höher (siehe Leistungsschild) müssen die Teilefugen zwischen dem Motorgehäuse und den Lager-schilden durch eine geeignete, nicht aushärtende Dichtungsmasse abgedichtet werden.

## 5 Ersatzteile

Bei Ersatzteilbestellungen bitte neben der genauen Teilebezeichnung unbedingt Motortype und Motornummer (Daten sind dem Leistungsschild zu entnehmen) angeben.

## 6 Endgültige Außerbetriebnahme (Demontage, Recycling, Entsorgung)

Motoren grundsätzlich so zerlegen das ein umweltgerechtes Recycling und Entsorgen der Motorkomponenten möglich ist.

Bei Recycling und Entsorgung der demontierten Motorkomponenten grundsätzlich die zum Zeitpunkt der endgültigen Außerbetriebnahme gültigen gesetzlichen Vorschriften und Bestimmungen beachten!

## English



### Important

The safety instructions in this operating manual are to be observed at all times.

Special versions and variants may differ from the basic model in terms of their technical details. In the event of any points being unclear, you are urgently recommended to contact EMOD Motoren GmbH, giving details of the motor type and motor serial number.

## 1. General information

### 1.1 Area of application

The motors may be used in accordance with the protection type specified on the rating plate, the model quoted by the manufacturer in the catalogue or the details given by the client. When using special motors the details in the quotation and confirmation of order also apply.

### 1.2 Safety



### Warning

The installation, commissioning, maintenance and repair of these motors may only be completed by qualified, suitable personnel who have been trained to do so and have experience of this type of work.

The following points must be given particular consideration:

- the technical data and details on permissible uses (commissioning, ambient and operating conditions) which are given in the catalogue, the operating manual, the plates and the other product documentation,
- the relevant installation and accident prevention regulations,
- the proper use of tools, lifting gear and transport equipment,
- the installation of a contact guard when the motor has been fitted, if there is any risk to persons from moving parts,
- the use of personal safety equipment.

## 2 Transport and storage

### 2.1 Transport



### Warning

When transporting the completely assembled drive unit only use the lifting eyes provided for this purpose.

Complete drive units must not be lifted by the motor transport-eyes.

The motors are to be checked on receipt for transport damage. Any damage must be reported immediately in writing.

Motors with cylindrical roller bearings are protected from bearing damage by a transport guard. Before connecting the transmission elements or commissioning the motor, the transport guard is to be removed.

### 2.2 Storage

The storage site should, if possible, be dry, clean, kept at a constant temperature and not subject to shocks.

To protect the bearings and the lubricating system, the motor shaft has to be turned around from some rotations from time to time.

The roller bearings in the motors should be greased or replaced if the period between placing the motors in storage and commissioning them exceeds four years. In poor storage conditions this period will be considerably reduced.

## 2.3 To check the insulation resistance



### Warning

**When measuring the insulation resistance and immediately afterwards the terminals may be carrying dangerous voltages and must not be touched.**

Before commissioning the motor, after it has been in storage or has not been used for a lengthy period of time (longer than six months) the insulation resistance of the coil must be measured. Check the coil using an insulation resistance measuring instrument (max. direct voltage 500 V) against the earth.

If the minimum insulation resistance at a coil temperature of 25 °C is less than 30 MΩ or less than 1 MΩ at a coil temperature of 75 °C, the motor coil must be dried until the required minimum insulation resistance has been achieved.

The coil temperature must not be allowed to exceed 80 °C. To ensure that air exchange takes place in enclosed motors, loosen the bearing plate. If you wish to dry the coil by connecting it to low voltage, seek assistance from the supplier.

After drying the coil the bearings must be serviced (see relevant section).

## 3 Installation and commissioning



### Warning

**Before completing any work on the motor the voltage supply must be disconnected.**

### 3.1 Installation

#### 3.1.1 Site

The motors should be installed where they allow easy access, at ambient and coolant temperatures of max. -15 °C to +40 °C (IEC 60034-30). Altitude of site max. 1000 m (above sea level).

The cooling air must be able to flow to and from the motor without hindrance and must not be drawn in again immediately after being fed out of the motor. The air intake and outfeed apertures and the ducts between the cooling ribs are to be kept free of dirt.

If the motor is installed with its shaft ends pointing upwards and downwards, it must be ensured that no water can ingress into the top bearing.

### 3.2 Securing the motors

Motors with feet must be installed and secured on a flat, shockfree surface. All the securing feet must lie flat on the surface; if necessary place thin sheets of metal beneath the feet to compensate for unevenness.

For flange motors attention must be given to ensuring that the counter flange runs evenly. Even running errors may cause bearing damage or the failure of sealing systems.

### 3.3 Condensation drain holes

It must be ensured that the existing condensation drain holes are at the lowest point of the motor when it has been installed and are kept free of dirt.

Sealed condensation drain holes are to be opened from time to time and then sealed again.

### 3.4 Balancing



### Warning

**If a motor is commissioned without a drive element, the fitted spring is to be secured to prevent it being thrown out.**

**Take the appropriate action to prevent contact with rotating parts.**

The motors are marked on the shaft end face with the kind of balance corresponding to DIN ISO 8821:  
Balancing with a half featherkey „H“  
Balancing with a full featherkey „F“

If the drive element is connected, consideration must be given to the relevant balancing type.

## 3.5 Electrical connection

The electrical connection may only be performed by a specialist in accordance with current safety regulations.

The mains voltage and frequency must comply with the data on the rating plate. Tolerances of ±5% for the voltage and/or ±2% for the frequency are permissible.

Operating the motor with a frequency inverter, an EMC-compliant connection in accordance with Directive 89/336 EEC is carried out.

A connection diagram, Figure 3, is supplied with every motor. The connection of the motor and the controller, overload guard and earth are to comply with the VDE and installation regulations as well the country-specific, national and international regulations of the electricity supply companies.

The direction of rotation from the shaft has to be checked before starting. The reversal of the direction of rotation is possible by swapping any two mains wires.

The infeed parts used as a pull-relief and torsion guard for the supply cables are to be used properly. Any infeed apertures which are not required are to be sealed.

The tightening torques for screw connections on the terminal board connectors are shown in Figure 2.

## 3.6 Motor protection

Connect the integral neutral conductors to the trip unit as shown on the connection diagram in the connection box cover or supplied with the motor. Any puncture tests which are necessary should only be completed using a measurement bridge (max. 2.5 V).

If a temperature monitor is fitted as an opener to protect the motor, it is to be connected in series as shown on the connection diagram to the auxiliary power circuit (min. 25 V ..... max. 250 V 1,6 A).

In order to prevent an independent restart of the motor after it has been cooled down and the downshift of the embedded sensors, appropriate actions are taken.

## 3.7 Commissioning



### Warning

**Caution - risk of burns. Temperatures of over 80 °C can be generated on the surface of the motor.**

**If necessary fit a contact guard.**

### 3.7.1 To install the transmission elements

Only use suitable tools and equipment to install and remove the transmission element. No pressure or blows must be exerted on the motor bearing.

### 3.7.2 Alignment for operation with a coupling

For operation with a coupling, the shafts are to be aligned axially and radially against each other. The gap between the coupling halves is to be adjusted as instructed by the coupling manufacturer.

Only use couplings which are elastic to central offset, angled, longitudinal and rotary motion. Rigid couplings are not allowed and may only be used in exceptional cases by agreement with the manufacturer.

### 3.7.3 Before commissioning at least the following checks are to be made:

- the rotor can be turned without catching,
- the motor has been aligned and installed properly,
- the output elements have correct settings,
- all the electrical connections, connection elements and securing bolts have been properly tightened and made,
- any additional equipment is fully functional,
- the coolant supply is not defective,
- contact guards have been fitted for moving parts and live parts.

## 4 Maintenance



### Warning

**Before completing any work on the motor, ensure that it has been switched off and secured to prevent its being switched on again. In addition to the main circuits, this also applies to any additional or auxiliary circuits, particularly standstill heating systems.**

### 4.1 Servicing

Depending on the amount of dirt they generate the motors are to be cleaned on a regular basis over their entire areas, for example using compressed air.

The first service is generally necessary after approx. 500 operating hours, but at the latest after one year. Subsequent servicing is to be carried out at suitable intervals, for example relubricating or grease replacement intervals, but at least once per year.

#### During services checks are to be made that

- the technical data on the rating plate are observed,
- there are no leaks (oil, grease or water),
- the noises generated by the bearings and the smoothness of the motor have not deteriorated,
- all the securing bolts for electrical and mechanical connections are tight,
- if operating with a coupling, the alignment of the motor is within the permissible tolerances.

### 4.2 Bearings

#### 4.2.1 Bearings with permanent lubrication

The bearings for motors with permanent lubrication generally require no maintenance in normal operating conditions for between 10000 and 20000 operating hours, but at most for three years.

On motors which have two cover plates acting as bearing seals (2Z bearings) and a speed of up to 3600 rpm, the bearings should be replaced at 20000 operating hours, but at the latest after three years.

On motors which have one cover plate (Z bearings) or a bearing cover seal acting as the bearing seal, the grease and, if necessary, the bearing should be replaced

- after 20000 operating hours if the motor is used at speeds of up to 1800 rpm,
  - after 10000 operating hours if the motor is used at speeds of up to 3600 rpm,
- but at the latest after three years.

#### 4.2.2 Bearings which require lubrication

On motors which have a lubrication device, the lubrication intervals, amount of grease and grease quality are specified on an additional plate on the motor. If the operating hours specified on this plate have not been completed within a period of three years, the lubrication work should be completed. Only lubricate the motor when the rotor is turning so that the new grease is spread in the bearings.

#### Lubricants (see Figure 1).

Do not mix different types of grease.

**Important:** The grease outlet plugs on drive-end and non-drive-end side are to be opened when regreasing.

### 4.3 Repair work

Spare parts lists and normal drawings do not contain any detailed information on the type and dimensions of the components. Therefore, when dismantling the motors, mark the components so that you know which part belongs where to facilitate re-assembly.

#### 4.3.1 To change the bearings

Dismantle the motor as necessary. Pull off the roller bearings using a suitable device and clean the bearing positions of any impurities. Heat the new roller bearings to a temperature of approx. 80 °C and pull them into position.

Fill approx. 50% of the free space in the bearing and the grease chambers in the bearing plate and bearing cover with grease of approved quality.

The sealing elements (eg. shaft sealing rings) must be examined for signs of damage and to ensure that they are fully functional before assembly and if they are no longer adequately effective they are to be replaced.

#### 4.3.2 Joint seal

On motors with a protection type of IP 56 or higher (see rating plate) the part joints between the motor casing and the bearing plates must be sealed with a suitable, non-hardening sealing compound.

## 5 Spare parts

When ordering spare parts please quote the motor type and motor serial number (this information is shown on the rating plate) in addition to a precise description of the part.

## 6 Final decommissioning (Dismantling, recycling, disposal)

Disassemble engines always be organized so that an environmentally friendly recycling and disposal of engine components is possible.

Note on recycling and disposal of the dismantled engine components generally at the time of final decommissioning applicable laws and regulations!



Anhang / Appendix

**Bild 1: Schmierstoffe**

Fig. 1: Lubricants

Betriebsbedingungen Operating conditions	Wärmeklasse Temperature class	Wälzlagerfett / Einsatzbereich Bearing grease / Application
Normal	F	Baugrößen 80 – 112: Lithiumseifenfett / -30 °C bis +140 °C Baugrößen 132 – 355: Barium-Komplex / -20 °C bis +140 °C
Normal		Frame sizes 80 – 112: lithium-based grease / -30 °C to +140 °C Frame sizes 132 – 355: barium complex / -20 °C to +140 °C
Hohe Temperaturen, extreme Betriebsbedingungen	H	Hochtemperatur- und Langzeitschmierstoff, vollsynthetisches Grundöl / -20 °C bis +180 °C
High temperatures, extreme operating conditions		High-temperature and long-term grease, fully synthetic base oil / -20 °C to +180 °C
Tiefe Temperaturen	F	Tiefemperaturschmierstoff, Barium-Komplex / -50 °C bis +150 °C
Low temperatures		Low-temperature grease, barium complex / -50 °C to +150 °C

**Bild 2: Anziehdrehmomente für Schraubenverbindungen der Klemmbrettanschlüsse**

Fig. 2: Tightening torques for the screws and bolts of electrical connections on terminal boards

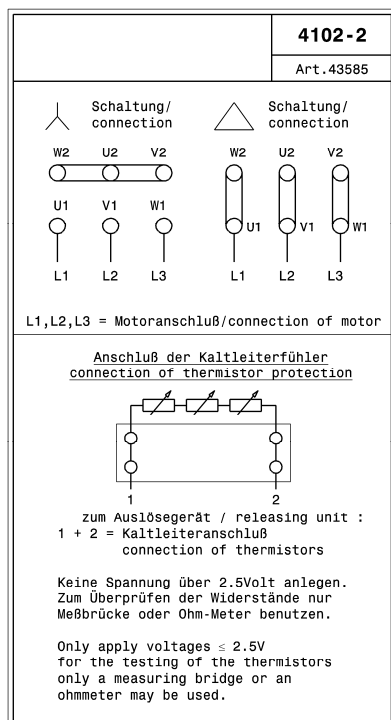
Gewinde-Ø / Thread-Ø		M4	M5	M6	M8	M10	M12	M16
Anziehdrehmoment / Tightening torque (Nm)	min.	0,8	1,8	2,7	5,5	9,0	14,0	27,0
	max.	1,2	2,5	4,0	8,0	13,0	20,0	40,0

Die Anziehdrehmomente gelten, soweit keine anderen Werte angegeben sind!

The tightening torques apply unless alternative values are specified.

**Bild 3: Anschlußschaltbild**

Fig. 3: Connection diagram



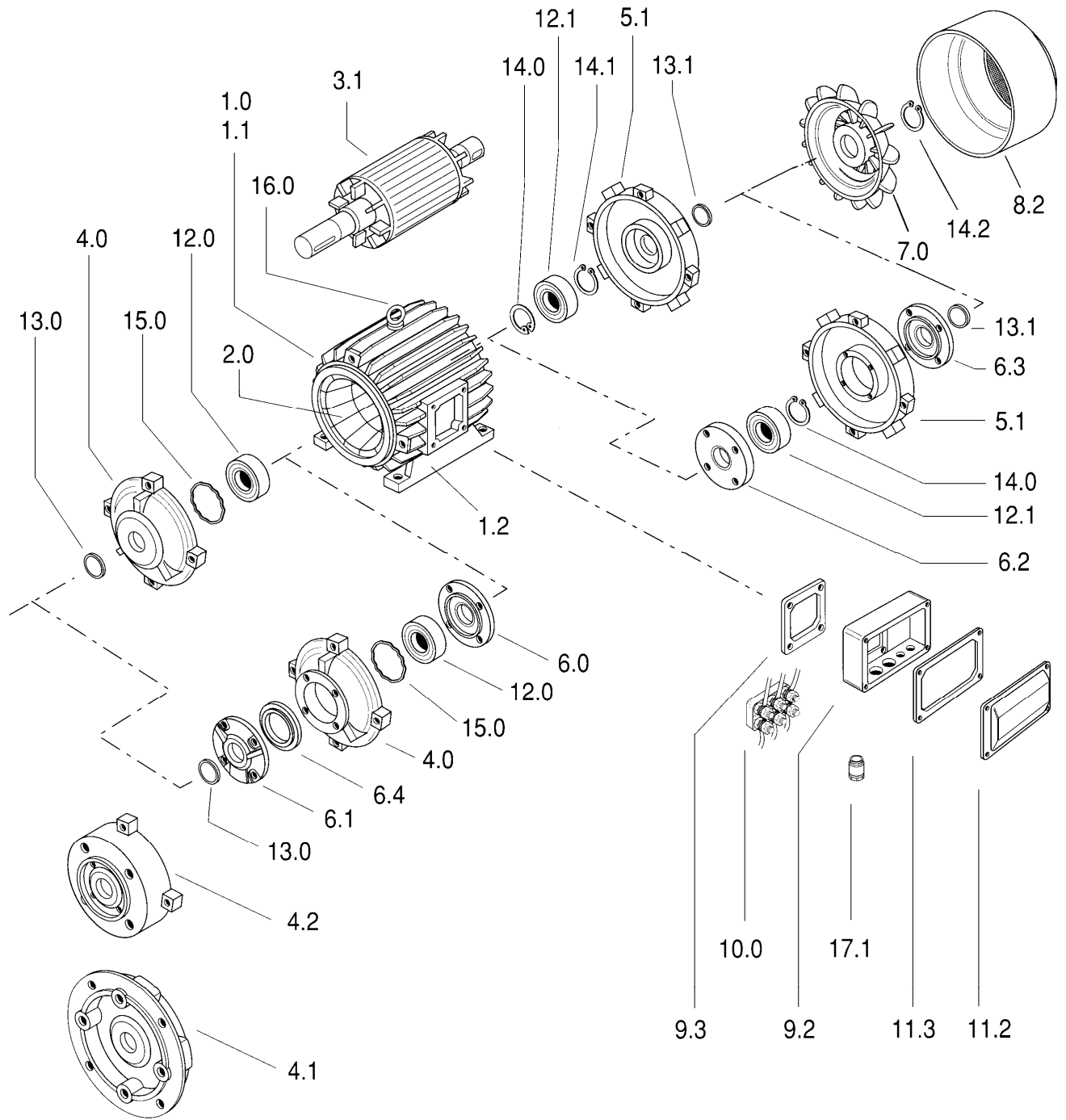
**Bild 4: Ersatzteile**

Fig. 4: Spare parts

Teile.-Nr. Part No.	Bezeichnung	Description
1.0	Gehäuse (IMB3)	Casing (IMB3)
1.1	Gehäuse ohne FüÙe (IMB5 / IMB14)	Casing without feet (IMB5/IMB14)
1.2	MotorfüÙe	Motor feet
2.0	Statorpaket mit Wicklung	Stator cove with winding
3.1	Rotor mit Welle	Rotor with shaft
4.0.	Lagerschild AS (IMB3)	Endshield drive end (IMB3)
4.1	Flanschlerschild (IMB5)	Flange endshield (IMB5)
4.2	Flanschlerschild (IMB14)	Flange endshield (IMB14)
5.1	Lagerschild BS	Endshield non drive end
6.0	Lagerdeckel ASi	Bearing cover drive end internal
6.1	Lagerdeckel ASa	Bearing cover drive end external
6.2	Lagerdeckel BSi	Bearing cover non drive end internal
6.3	Lagerdeckel BSa	Bearing cover non drive end external
6.4	Schleuderscheibe	Grease slinger drive end
7.0	Lüfter (Thermoplast)	Fan (plastic)
7.1	Lüfter (Aluminiumlegierung)	Fan (aluminium alloy)
8.2	Lüfterhaube	Fan cover
8.3	Schutzdach (IMV1)	Protective canopy (IMV1)
9.2	Klemmenkastenrahmen	Terminal box frame
9.3	Klemmenkastenrahmendichtung	Gasket of terminal panel box frame
10.0	Klemmbrett, komplett	Terminal, complete
11.2	Klemmenkastendeckel	Terminal box cover
11.3	Klemmenkastendeckeldichtung	Gasket of terminal panel box cover
12.0	Wälzlager AS	Roller bearings drive end
12.1	Wälzlager BS	Roller bearings non drive end
13.0	Wellendichtring	Shaft seal
13.1	Wellendichtring	Shaft seal
14.0	Sicherungsring (Wälzlager)	Securing ring (roller bearings)
14.1	Sicherungsring (Wälzlager)	Securing ring (roller bearings)
14.2	Sicherungsring (Lüfter)	Securing ring (fan)
15.0	Wellenbandfeder	Spring plate
16.0	Ringschraube	Eyebold
17.1	Kabel-Verschraubung	Motor connect plug

**Bestellbeispiel:** Baugröße : HEF IE2 80L  
 Motor.-Nr. : 6574507  
 Bauteil : 3.1 Rotor mit Welle

**Specimen order:** Frame size : HEF IE2 80L  
 Motor serial number: 6574507  
 Component : 3.1 Rotor with shaft



## EG-Konformitätserklärung EC declaration of conformity

**Dokument-Nr./Monat.Jahr** : 1.51.821.010/04.16  
*Document-No./Month.Year*

**Hersteller** : EMOD Motoren GmbH  
*Manufacturer*

**Anschrift** : Zur Kuppe 1  
*Address* D-36364 Bad Salzschlirf

**Produktbezeichnung** : Drehstrommotoren  
*Product designation* Three-phase motors

**Type (Baugröße)** : HEF IE2 80 L/.. – HEF IE2 355 L/..  
*Type (Frame size)* HEF IE3 80 L/.. – HEF IE3 355 L/..

**Drehstrommotoren entsprechend Richtlinie 2005/32/EG und Verordnung (EG) Nr. 640/2009**  
*Three-phase motors according to Directive 2005/32/EG and Regulation (EC) No. 640/2009*

**Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein:**  
*The named product is in conformity with the requirements of the following European Directive:*

### 2014/35/EU

**Richtlinie 2014/35/EU des Europäischen Parlaments und des Rates zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die Bereitstellung elektrischer Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen auf dem Markt (Neufassung)**

### 2014/35/EU

*Directive 2014/35/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits (recast)*

### 2014/30/EU

**Richtlinie 2014/30/EU des Europäischen Parlaments und des Rates zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit (Neufassung)**

### 2014/30/EU

*Directive 2014/30/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast)*

**Das bezeichnete Produkt ist entwickelt und gefertigt worden in Übereinstimmung mit folgenden Normen:**  
*The named product is developed and produced in conformity with the following standards:*

EN 60034-1: 2011	EN 60034-5: 2007	EN 60034-6: 1996	EN 60034-9: 2008
EN 61000-6-1: 2007	EN 61000-6-2: 2006	EN 61000-6-3: 2011	EN 61000-6-4: 2011
EN 60204-1: 2007	EN 60034-30-1: 2014		

**Erstmalige Anbringung der CE-Kennzeichnung: 2010**  
*CE symbol displayed*

**Aussteller** : EMOD Motoren GmbH  
*Issuer*

**Ort, Datum** : Bad Salzschlirf, 01.04.2016  
*Place, Date*

**Unternehmensleitung:** \_\_\_\_\_  
*Management* Roland Odenwald

**Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien und Normen, beinhaltet jedoch keine Zusicherung von Eigenschaften im Sinne der Produkthaftung.**

**Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.**

*This Declaration certifies the conformity with the named directives and standards, but does not contain the assurance of properties within the meaning of product liability.*

*The safety instructions provided in the product documentation must be observed.*

---

## **Betriebsanleitung für Einphasenmotoren**

Operating Instructions for single-phase motors

### **Baugrößen (Bg.) 56 ..... 112 EAZR**

Frame size

---

Ausgabe / Edition 07.15

Art.-Nr. / Art. No.: 187278

Ident.-Nr. / Ident No.: B.51.820.003

---

---

Alle Rechte vorbehalten! / All rights reserved.

EMOD Motoren GmbH • D-36364 Bad Salzschlirf • Zur Kuppe 1  
Fon 06648/51-0 • Fax 06648/51143 • [info@emod-motoren.de](mailto:info@emod-motoren.de) • [www.emod-motoren.de](http://www.emod-motoren.de)

**Achtung**

Die in dieser Betriebsanleitung enthaltenen Sicherheitshinweise sind unbedingt zu beachten!

Sonderausführungen und Bauvarianten können in technischen Details von der Grundtype abweichen. Bei eventuell auftretenden Unklarheiten wird dringend empfohlen sich mit der EMOD Motoren GmbH in Verbindung zu setzen. Hierbei grundsätzlich Motortype und Motornummer angeben.

## 1 Allgemeine Hinweise

### 1.1 Anwendungsbereich

Die Motoren können entsprechend der auf dem Leistungsschild gestempelten Schutzart, der vom Hersteller vorgesehenen Bauform laut Katalog oder den Angaben des Kunden eingesetzt werden. Beim Einsatz von Sondermotoren gelten zusätzlich die Angaben in Angebot und Auftragsbestätigung.

### 1.2 Sicherheit

**Warnung**

Die Aufstellung, Inbetriebnahme, Wartung und Reparatur darf nur von qualifiziertem, auf Grund seiner Ausbildung und Erfahrung geeignetem Personal durchgeführt werden.

Hierbei sind besonders zu beachten:

- die technischen Daten und Angaben über die zulässige Verwendung (Inbetriebnahme-, Umgebungs- und Betriebsbedingungen), die u.a. im Katalog, der Betriebsanleitung, den Schildangaben und der übrigen Produktdokumentation enthalten sind,
- die einschlägigen Errichtungs- und Unfallverhütungsvorschriften, -der fachgerechte Einsatz von Werkzeugen, Hebe- und Transporteinrichtungen,
- das Anbringen eines Berührungsschutzes im eingebauten Zustand, bei Gefährdung von Personen durch bewegliche Teile,
- die Benutzung persönlicher Schutzausrüstung.

### 1.3 Baureihen (Kurzbeschreibung)

**EHB**

Einphasenmotor mit Arbeits- und Hilfswicklung, mit Betriebskondensator.  
M<sub>A</sub>/M<sub>N</sub> ca. 0,4 - 0,6

**EAF**

Einphasenmotor mit Arbeits- und Hilfswicklung, mit Betriebs- und Anlaufkondensator.  
Der Anlaufkondensator wird nach erfolgtem Hochlauf durch den angebauten Fliehkraftschalter abgeschaltet.  
M<sub>A</sub>/M<sub>N</sub> ca. 1,5 - 2,0

**EAR**

Einphasenmotor mit Arbeits- und Hilfswicklung, mit Betriebs- und Anlaufkondensator.  
Der Anlaufkondensator wird nach erfolgtem Hochlauf durch ein stromabhängiges Relais abgeschaltet.  
M<sub>A</sub>/M<sub>N</sub> ca. 1,5 - 2,0

## 2 Transport und Lagerung

### 2.1 Transport

**Warnung**

Beim Transport der komplett montierten Antriebseinheit nur die dafür vorgesehenen Hebeösen benutzen. Komplette Antriebseinheiten nicht an den Motortransportösen anheben.

Die Motoren sind nach Eingang auf Transportschäden zu prüfen. Eventuell vorhandene Schäden grundsätzlich schriftlich aufnehmen.

### 2.2 Lagerung

Der Lagerort sollte nach Möglichkeit trocken, sauber, temperaturkonstant und erschütterungsfrei sein.

Damit der Schmierfilm in der Motorlagerung und den Dichtungssystemen nicht abreißt, sollte bei längerer Einlagerungszeit die Motorwelle von Hand, z.B. in monatlichen Abständen, um einige Umdrehungen gedreht werden.

Die Wälzlager der Motoren sollten neu gefettet bzw. erneuert werden, wenn der Zeitraum zwischen Lieferung und Inbetriebnahme mehr als 4 Jahre beträgt. Bei ungünstigen Lagerungsbedingungen verringert sich dieser Zeitraum erheblich.

### 2.3 Überprüfung des Isolationswiderstandes

**Warnung**

Bei der Messung des Isolationswiderstandes und unmittelbar danach haben die Klemmen teilweise gefährliche Spannungen und dürfen nicht berührt werden!

Vor Inbetriebnahme des Motors, nach längerer Lagerungsdauer oder Stillstandzeit (größer 6 Monate), muß der Isolationswiderstand der Wicklung ermittelt werden. Wicklung mittels Isolationswertmeßgerät (max. Gleichspannung 500 V) gegen Masse prüfen.

Ist der Mindest-Isolationswiderstand bei einer Wicklungstemperatur von 25 °C kleiner als 30 MΩ oder bei einer Wicklungstemperatur von 75 °C kleiner als 1 MΩ muß die Motorwicklung getrocknet werden bis der erforderliche Mindestisolationswiderstand erreicht ist.

Die Wicklungstemperatur darf hierbei 80 °C nicht überschreiten! Damit bei geschlossenen Motoren ein Luftaustausch erfolgen kann Lagerschild lösen. Bei Trocknung der Wicklung durch Anschluß an Niederspannung sind Anweisungen des Lieferwerkes einzuholen. Nach einem Austrocknen der Wicklung ist eine Wartung der Lager erforderlich (siehe entsprechendes Kapitel!).

## 3 Montage und Inbetriebnahme

**Warnung**

Alle Arbeiten am Motor nur im elektrisch spannungslosen Zustand durchführen!

### 3.1 Aufstellung

#### 3.1.1 Standort

Die Motoren sollen leicht zugänglich, bei Umgebungs- bzw. Kühlmitteltemperaturen von max. 50 °C aufgestellt bzw. angebaut werden. Höhere Kühlmittel- bzw. Umgebungstemperaturen bis max. 60 °C, bei entsprechender Leistungsreduzierung, sind nach Rücksprache mit dem Hersteller möglich.

Die Kühlluft muß ungehindert zu- und abströmen können und darf nicht unmittelbar wieder angesaugt werden. Die Lufterein- und Luftaustrittsöffnungen sowie die Kanäle zwischen den Kühlrippen sind von Verschmutzung freizuhalten.

Bei Aufstellung mit Wellenende nach oben und unten muß gewährleistet sein, daß in das obere Lager kein Wasser eindringen kann.

### 3.2 Befestigung von Motoren

Fußmotoren müssen auf ebener, erschütterungsfreier Auflagefläche aufgestellt und befestigt werden. Alle Befestigungsfüße müssen planflächig aufliegen; gegebenenfalls zum Ausgleich dünne Bleche unterlegen.

Bei Flanschmotoren ist auf Planlauf des Gegenflansches zu achten. Planlauffehler können zu Lagerschäden bzw. zum Ausfall von Dichtungssystemen führen.

### 3.3 Kondenswasser-Abflußlöcher

Es ist darauf zu achten, daß vorhandene Kondenswasser-Abflußlöcher nach der Montage an der tiefsten Stelle des Motors liegen und von Verunreinigungen freizuhalten sind.

Verschlossene Kondenswasser-Abflußlöcher sind von Zeit zu Zeit zu öffnen und danach wieder zu verschließen.

### 3.4 Auswuchtung



#### Warnung

**Wird ein Motor ohne Antriebselement in Betrieb genommen, so ist die Paßfeder gegen herausschleudern zu sichern.**

**Maßnahmen zum Berührungsschutz bei rotierenden Bauteilen beachten!**

Die Motorwellen sind am Wellenspiegel entsprechend DIN ISO 8821 mit der Auswuchtart gekennzeichnet:  
Auswuchtung mit halber Passfeder „H“  
Auswuchtung mit voller Passfeder „F“

Bei Montage des Antriebselementes auf entsprechende Auswuchtart achten!

### 3.5 Elektrischer Anschluß

Der elektrische Anschluß darf nur durch einen Fachmann entsprechend den geltenden Sicherheitsvorschriften vorgenommen werden.

Netzspannung und -frequenz müssen mit den Daten auf dem Leistungsschild übereinstimmen.  $\pm 5\%$  Spannungs- und/oder  $\pm 2\%$  Frequenzabweichung sind zulässig.

Die Abschaltung des Motors muss durch eine komplette Netztrennung aller Phasen erfolgen.

Ein Anschlußplan, Bild 4, befindet sich bei jedem Motor. Anschluß des Motors und der Steuerung, Überlastungsschutz und Erdung sind nach den DIN/EN-, IEC- und Installationsvorschriften, bzw. den landesüblichen, nationalen und internationalen Bestimmungen der elektrischen Versorgungsunternehmen vorzunehmen.

Die Drehrichtung des abtriebseitigen Wellenendes ist vor der Inbetriebnahme zu überprüfen. Die Umkehr der Drehrichtung ist entsprechend dem beigefügten Anschlußplan durchzuführen.

Die zur Zugentlastung oder als Verdrehenschutz für die Zuleitungen vorgesehenen Einführungsteile sind ordnungsgemäß anzuwenden. Nicht benötigte Einführungsöffnungen verschließen.

Anziedrehmomente für Schraubenverbindungen der Klemmbrettanschlüsse siehe Bild 3

### 3.6 Motorschutz

Eingebaute Kaltleiter entsprechend dem im Anschlußkastendeckel bzw. dem beim Motor befindlichen Anschlußplan mit dem Auslösegerät verbinden. Eventuell erforderliche Durchgangsprüfungen nur mit Meßbrücke (max. 2,5 V) durchführen.

Ist zum Motorschutz ein Temperaturwächter als Öffner vorgesehen, so ist dieser entsprechend dem Anschlußplan mit dem Hilfsstromkreis in Reihe zu schalten (min. 25 ..... max. 250 V 1,6 A).

Um einen selbstständigen Wiederanlauf des Motors nach dessen Abkühlung und der Rückschaltung der eingebauten Temperaturüberwachung zu verhindern, sind entsprechende schaltungstechnische Maßnahmen zu ergreifen.

### 3.7 Inbetriebnahme



#### Warnung

**Vorsicht Verbrennungsgefahr!  
An der Motoroberfläche können hohe Temperaturen von über 80 °C auftreten.**

**Bei Bedarf Berührungsschutz vorsehen!**

#### 3.7.1 Montage der Übertragungselemente

Zum Auf- und Abziehen der Übertragungselemente nur geeignete Werkzeuge und Vorrichtungen verwenden. Auf die Motorlagerung darf kein Druck oder Schlag übertragen werden.

#### 3.7.2 Ausrichten bei Kupplungsbetrieb

Bei Kupplungsbetrieb sind die Wellen axial und radial gegeneinander auszurichten. Das Einstellen der Luft zwischen den Kupplungshälften ist nach den Angaben der Kupplungshersteller vorzunehmen. Nur Kupplungen verwenden, die mitterversatz-, winkel-, längs- und drehelastisch sind. Starre Kupplungen sind nicht zulässig und nur in Ausnahmefällen nach Absprache mit dem Hersteller einsetzbar.

#### 3.7.3 Vor Inbetriebnahme ist mindestens zu prüfen ob:

- der Läufer ohne anzustreifen gedreht werden kann,
- der Motor ordnungsgemäß ausgerichtet und montiert ist,
- die Abtriebselemente richtige Einstellbedingungen haben,
- alle elektrischen Anschlüsse, Verbindungselemente sowie Befestigungsschrauben ordnungsgemäß angezogen und ausgeführt sind,
- vorhandene Zusatzeinrichtungen (z.B. Bremse) funktionsfähig sind,
- die Kühlmittelzuführung nicht beeinträchtigt ist,
- Berührungsschutzmaßnahmen für bewegte und spannungsführende Teile getroffen sind.

## 4 Instandhaltung



#### Warnung

**Alle Arbeiten am Motor nur im abgeschalteten, gegen Wiedereinschalten gesicherten Zustand durchführen!  
Neben den Hauptstromkreisen auch auf**

**eventuell vorhandene Zusatz- oder Hilfstromkreise, insbesondere Stillstandheizungen achten.**

**Kondensatoren grundsätzlich entladen, da diese auch nach dem Abschalten des Motors noch unter einer für den Menschen gefährlichen Restspannung stehen können!**

### 4.1 Inspektion

Je nach Schmutzbefall sind die Motoren regelmäßig entlang der gesamten Oberfläche, z.B. mit trockener Druckluft, zu säubern.

Erste Inspektion im Normalfall nach ca. 500 Betriebsstunden, spätestens 1 Jahr durchführen. Weitere Folgeinspektionen sollten je nach Einsatzbedingungen in geeigneten Intervallen, wie z.B. Nachschmier- bzw. Fettwechselfristen, mindestens jedoch einmal im Jahr durchgeführt werden.

#### Bei Inspektionen ist zu prüfen, daß

- die technischen Daten laut Typenschild eingehalten werden,
- keine Leckagen (Öl, Fett, Wasser) vorhanden sind,
- sich die Laufgeräusche der Lager sowie die Laufruhe des Motors nicht verschlechtern haben,
- alle Befestigungsschrauben für elektrische und mechanische Verbindungen fest angezogen sind,
- bei Kupplungsbetrieb die Ausrichtung des Motors in den zulässigen Toleranzen liegt.

### 4.2 Lager

#### 4.2.1 Lager mit Dauerschmierung

Die Lager der Motoren mit Fettdauerschmierung sind unter normalen Betriebsbedingungen 10000 bis 20000 Betriebsstunden, längstens jedoch 3 Jahre wartungsfrei.

Bei Motoren mit zwei Deckscheiben als Lagerabdichtung (2Z-Lager) und einer Drehzahl bis  $3600 \text{ min}^{-1}$  sollten die Lager nach 20000 Betriebsstunden, spätestens 3 Jahren erneuert werden.

Bei Motoren mit einer Deckscheibe (Z-Lager) oder einem Lagerabschlußdeckel als Lagerabdichtung sollte,

- bei Drehzahlen bis  $1800 \text{ min}^{-1}$  nach 20000 Betriebsstunden,
  - bei Drehzahlen bis  $3600 \text{ min}^{-1}$  nach 10000 Betriebsstunden,
- spätestens jedoch nach 3 Jahren das Fett und wenn erforderlich die Lagerung erneuert werden.

#### 4.2.2 Lager mit Nachschmierung

Bei Motoren mit Nachschmiereinrichtung sind Nachschmierfrist, Fettmenge und Fettqualität durch ein Zusatzschild am Motor angegeben. Falls die im Schmierschild genannten Betriebsstunden innerhalb von

3 Jahren nicht erreicht werden sollte vorzeitig nachgeschmiert werden. Nachschmieren nur bei drehendem Läufer, damit sich das neue Fett im Lager verteilt!

**Schmierstoffe** (siehe Bild 2)

Das Mischen verschiedener Fettsorten ist zu vermeiden!

### 4.3 Instandsetzung

Ersatzteillisten und normale zeichnerische Darstellungen enthalten keine detaillierten Angaben über Art und Abmessungen der Bauteile. Deshalb beim Demontieren Zuordnung der jeweiligen Bauteile feststellen und diese für den Zusammenbau kennzeichnen.

#### 4.3.1 Lagerwechsel

Motor im erforderlichen Umfang demontieren. Wälzlager mit geeigneter Vorrichtung abziehen und Lagerstellen von Verunreinigungen säubern!

Neues Wälzlager gleichmäßig auf ca. 80 °C erwärmen und aufziehen.

Ca. 50% des freien Raumes im Lager sowie der Fetträume im Lager-schild bzw. Lagerdeckel mit Fett der zugelassenen Qualitäten füllen.

Dichtungselemente (z.B. Wellendichtringe) müssen vor dem Zusammenbau auf Funktion sowie Beschädigung überprüft und bei nicht mehr ausreichender Wirksamkeit erneuert werden.

#### 4.3.2 Fugenabdichtung

Bei Motoren der Schutzart IP56 oder höher (siehe Leistungsschild) müssen die Teilefugen zwischen dem Motorgehäuse und den Lager-schilden durch eine geeignete, nicht aushärtende Dichtungsmasse abgedichtet werden.

## 5 Zusatzhinweise für Bremsmotoren



### Warnung

**Nach dem Anbau der Motoren ist die Bremse auf einwandfreie Funktion zu überprüfen!**

### 5.1 Allgemeines

Die angebaute Einscheiben-Federkraftbremse ist eine Sicherheitsbremse, die bei abgeschalteter Spannung durch Federkraft bremst. Gelüftet wird die Bremse über einen Elektromagneten.

### 5.2 Schaltung und Anschluß

Der Anschluß des Bremssystems erfolgt über einen im Klemmenkasten eingebauten Gleichrichter, entsprechend dem jeweils beige-fügten Schaltbild. Die anzulegende Anschlußspannung ist auf einem am Motor angebrachten Zusatzschild angegeben.

### 5.3 Wartung

Die angebauten Bremsen sind bis auf das nachstellen des Luftspaltes "X" (siehe Bild 1) wartungsfrei. Beim überschreiten des maximalen Luftspaltes " $X_{max}$ ", je nach Bremsengröße etwa 0,5 -1,3 mm, wächst die Ansprechzeit der Bremse stark an bzw. die Bremse lüftet bei ungünstigen Spannungsverhältnissen nicht mehr. Der erforderliche Luftspalt "X" kann bei gelösten Zylinderschrauben (18.11) durch Linksdrehen der Nachstellhülsen (18.12) wieder eingestellt werden.

### 5.4 Bremsmomenteinstellung

Die stufenlose Bremsmomenteinstellung erfolgt durch Verdrehen der Einstellmutter (18.6) mittels eines Hakenschlüssels. Durch Rechtsdrehung, in Richtung Antriebswelle gesehen, vergrößert sich das Bremsmoment. Durch Linksdrehung verringert sich das Bremsmoment.

## 6 Ersatzteile

Bei Ersatzteilbestellungen bitte neben der genauen Teilebezeichnung unbedingt Motortype und Motornummer (Daten sind dem Leistungsschild zu entnehmen) angeben.



## English



### Important

The safety instructions in this operating manual are to be observed at all times.

Special versions and variants may differ from the basic model in terms of their technical details. In the event of any points being unclear, you are urgently recommended to contact EMOD Motoren GmbH, giving details of the motor type and motor serial number.

## 1. General information

### 1.1 Area of application

The motors may be used in accordance with the protection type specified on the rating plate, the model quoted by the manufacturer in the catalogue or the details given by the client. When using special motors the details in the quotation and confirmation of order also apply.

### 1.2 Safety



#### Warning

The installation, commissioning, maintenance and repair of these motors may only be completed by qualified, suitable personnel who have been trained to do so and have experience of this type of work.

The following points must be given particular consideration:

- the technical data and details on permissible uses (commissioning, ambient and operating conditions) which are given in the catalogue, the operating manual, the plates and the other product documentation,
- the relevant installation and accident prevention regulations,
- the proper use of tools, lifting gear and transport equipment,
- the installation of a contact guard when the motor has been fitted, if there is any risk to persons from moving parts,
- the use of personal safety equipment.

### 1.3 Type series (Short description)

#### EHB

Single-phase motor with power winding and auxiliary winding, with running capacitor.

$M_A/M_N$  approx. 0,4 - 0,6

#### EAF

Single-phase motor with power winding and auxiliary winding, with running capacitor and starting capacitor.

Starting capacitor is cut off by a centrifugal switch.

$M_A/M_N$  approx. 1,5 - 2,0

#### EAR

Single-phase motor with power winding and auxiliary winding, with running capacitor and starting capacitor.

Starting capacitor is cut off by a current-dependent relay.

$M_A/M_N$  approx. 1,5 - 2,0

## 2 Transport and storage

### 2.1 Transport



#### Warning

When transporting the completely assembled drive unit only use the lifting eyes provided for this purpose. Complete drive units must not be lifted by the motor transport-eyes.

The motors are to be checked on receipt for transport damage. Any damage must be reported immediately in writing.

### 2.2 Storage

The storage site should, if possible, be dry, clean, kept at a constant temperature and not subject to shocks.

To protect the bearings and the lubricating system, the motor shaft has to be turned around from some rotations from time to time.

The roller bearings in the motors should be greased or replaced if the period between placing the motors in storage and commissioning them exceeds four years. In poor storage conditions this period will be considerably reduced.

### 2.3 To check the insulation resistance



#### Warning

When measuring the insulation resistance and immediately afterwards the terminals may be carrying dangerous voltages and must not be touched.

Before commissioning the motor, after it has been in storage or has not been used for a lengthy period of time (longer than six months) the insulation resistance of the coil must be measured. Check the coil using an insulation resistance measuring instrument (max. direct voltage 500 V) against the earth.

If the minimum insulation resistance at a coil temperature of 25 °C is less than 30 MΩ or less than 1 MΩ at a coil temperature of 75 °C, the motor coil must be dried until the required minimum insulation resistance has been achieved.

The coil temperature must not be allowed to exceed 80 °C. To ensure that air exchange takes place in enclosed motors, loosen the bearing plate. If you wish to dry the coil by connecting it to low voltage, seek assistance from the supplier.

After drying the coil the bearings must be serviced (see relevant section).

## 3 Installation and commissioning



#### Warning

Before completing any work on the motor the voltage supply must be disconnected.

### 3.1 Installation

#### 3.1.1 Site

The motors should be installed where they allow easy access, at ambient and coolant temperatures of max. 50 °C. Higher coolant or ambient temperatures up to max. 60 °C are possible, with an appropriate reduction in power, by agreement with the manufacturer.

The cooling air must be able to flow to and from the motor without hindrance and must not be drawn in again immediately after being fed out of the motor. The air intake and outfeed apertures and the ducts between the cooling ribs are to be kept free of dirt.

If the motor is installed with its shaft ends pointing upwards and downwards, it must be ensured that no water can ingress into the top bearing.

### 3.2 Securing the motors

Motors with feet must be installed and secured on a flat, shockfree surface. All the securing feet must lie flat on the surface; if necessary place thin sheets of metal beneath the feet to compensate for unevenness.

For flange motors attention must be given to ensuring that the counter flange runs evenly. Even running errors may cause bearing damage or the failure of sealing systems.

### 3.3 Condensation drain holes

It must be ensured that the existing condensation drain holes are at the lowest point of the motor when it has been installed and are kept free of dirt.

Sealed condensation drain holes are to be opened from time to time and then sealed again.

### 3.4 Balancing



#### Warning

If a motor is commissioned without a drive element, the fitted spring is to be secured to prevent it being thrown out.

Take the appropriate action to prevent contact with rotating parts.

The motors are marked on the shaft end face with the kind of balance corresponding to DIN ISO 8821:

Balancing with a half featherkey „H“

Balancing with a full featherkey „F“

If the drive element is connected, consideration must be given to the relevant balancing type.

### 3.5 Electrical connection

The electrical connection may only be performed by a specialist in accordance with current safety regulations.

The mains voltage and frequency must comply with the data on the rating plate. Tolerances of  $\pm 5\%$  for the voltage and/or  $\pm 2\%$  for the frequency are permissible.

The shutdown of the motor must result by a complete power separation of all phases .

A connection diagram, Figure 4, is supplied with every motor. The connection of the motor and the controller, overload guard and earth are to comply with the DIN/EN, IEC and installation regulations, respectively the country-specific, national and international regulations of the electricity supply companies.

The direction of rotation from the shaft has to be checked before starting. The reversal of the direction of rotation has to be taken analogous the enclosed connection diagram.

The infeed parts used as a pull-relief and torsion guard for the supply cables are to be used properly. Any infeed apertures which are not required are to be sealed.

The tightening torques for screw connections on the terminal board connectors are shown in Figure 3.

### 3.6 Motor protection

Connect the integral neutral conductors to the trip unit as shown on the connection diagram in the connection box cover or supplied with the motor. Any puncture tests which are necessary should only be completed using a measurement bridge (max. 2.5 V).

If a temperature monitor is fitted as an opener to protect the motor, it is to be connected in series as shown on the connection diagram to the auxiliary power circuit (min. 25 V ..... max. 250 V 1,6 A).

In order to prevent an independent restart of the motor after it has been cooled down and the downshift of the embedded sensors, appropriate actions are taken.

### 3.7 Commissioning



#### Warning

**Caution - risk of burns.**  
Temperatures of over 80 °C can be generated on the surface of the motor.

If necessary fit a contact guard.

#### 3.7.1 To install the transmission elements

Only use suitable tools and equipment to install and remove the transmission element. No pressure or blows must be exerted on the motor bearing.

#### 3.7.2 Alignment for operation with a coupling

For operation with a coupling, the shafts are to be aligned axially and radially against each other. The gap between the coupling halves is to be adjusted as instructed by the coupling manufacturer.

Only use couplings which are elastic to central offset, angled, longitudinal and rotary motion. Rigid couplings are not allowed and may only be used in exceptional cases by agreement with the manufacturer.

#### 3.7.3 Before commissioning at least the following checks are to be made:

- the rotor can be turned without catching,
- the motor has been aligned and installed properly,
- the output elements have correct settings,
- all the electrical connections, connection elements and securing bolts have been properly tightened and made,
- any additional equipment (eg. brake) is fully functional,
- the coolant supply is not defective,
- contact guards have been fitted for moving parts and live parts.

## 4 Maintenance



#### Warning

Before completing any work on the motor, ensure that it has been switched off and secured to prevent its being switched on again. In addition to the main circuits, this also applies to any additional or auxiliary circuits, particularly standstill heating systems.

The capacitors for single-phase motors can still carry for people dangerous voltage after the motor is switched off, so the capacitor is always to discharge!

### 4.1 Servicing

Depending on the amount of dirt they generate the motors are to be cleaned on a regular basis over their entire areas, for example using compressed air.

The first service is generally necessary after approx. 500 operating hours, but at the latest after one year. Subsequent servicing is to be carried out at suitable intervals, for example relubricating or grease replacement intervals, but at least once per year.

#### During services checks are to be made that

- the technical data on the rating plate are observed,
- there are no leaks (oil, grease or water),
- the noises generated by the bearings and the smoothness of the motor have not deteriorated,
- all the securing bolts for electrical and mechanical connections are tight,
- if operating with a coupling, the alignment of the motor is within the permissible tolerances.

### 4.2 Bearings

#### 4.2.1 Bearings with permanent lubrication

The bearings for motors with permanent lubrication generally require no maintenance in normal operating conditions for between 10000 and 20000 operating hours, but at most for three years.

On motors which have two cover plates acting as bearing seals (2Z bearings) and a speed of up to 3600 rpm, the bearings should be replaced at 20000 operating hours, but at the latest after three years.

On motors which have one cover plate (Z bearings) or a bearing cover seal acting as the bearing seal, the grease and, if necessary, the bearing should be replaced

- after 20000 operating hours if the motor is used at speeds of up to 1800 rpm,
  - after 10000 operating hours if the motor is used at speeds of up to 3600 rpm,
- but at the latest after three years.

#### 4.2.2 Bearings which require lubrication

On motors which have a lubrication device, the lubrication intervals, amount of grease and grease quality are specified on an additional plate on the motor. If the operating hours specified on this plate have not been completed within a period of three years, the lubrication work should be completed. Only lubricate the motor when the rotor is turning so that the new grease is spread in the bearings.

**Lubricants** (see Figure 2).  
Do not mix different types of grease.

### 4.3 Repair work

Spare parts lists and normal drawings do not contain any detailed information on the type and dimensions of the components. Therefore, when dismantling the motors, mark the components so that you know which part belongs where to facilitate re-assembly.

#### 4.3.1 To change the bearings

Dismantle the motor as necessary. Pull off the roller bearings using a suitable device and clean the bearing positions of any impurities. Heat the new roller bearings to a temperature of approx. 80 °C and pull them into position.

Fill approx. 50% of the free space in the bearing and the grease chambers in the bearing plate and bearing cover with grease of approved quality.

The sealing elements (eg. shaft sealing rings) must be examined for signs of damage and to ensure that they are fully functional before assembly and if they are no longer adequately effective they are to be replaced.

#### 4.3.2 Joint seal

On motors with a protection type of IP 56 or higher (see rating plate) the part joints between the motor casing and the bearing plates must be sealed with a suitable, non-hardening sealing compound.

## 5 Additional instructions for brake motors



### Warning

After installing the motors the brake is to be check to ensure that it functions properly.

### 5.1 General

The installed single-disc spring-loaded brake is a safety brake which is engaged by the force of the spring in the event of a voltage failure. The brake is ventilated by an electromagnet.

### 5.2 Circuit and connection

The brake system is to be connected using a rectifier fitted in the terminal box, as shown in the enclosed circuit diagram. The connection voltage is shown on an additional plate on the motor.

### 5.3 Maintenance

The installed brakes require no maintenance apart from the readjustment of the air gap "x" (see Figure 1). If the maximum air gap "x<sub>max.</sub>" (around 0,5 - 1,3 mm depending on the brake size) is exceeded, the tripping time of the brake will be increased drastically or the brake will not ventilate if the voltage conditions are not perfect. The necessary air gap "x" can be reset by undoing the cheese-head screws (18.11) and turning the resetting sleeves (18.12) anti-clockwise.

### 5.4 Braking torque adjustment

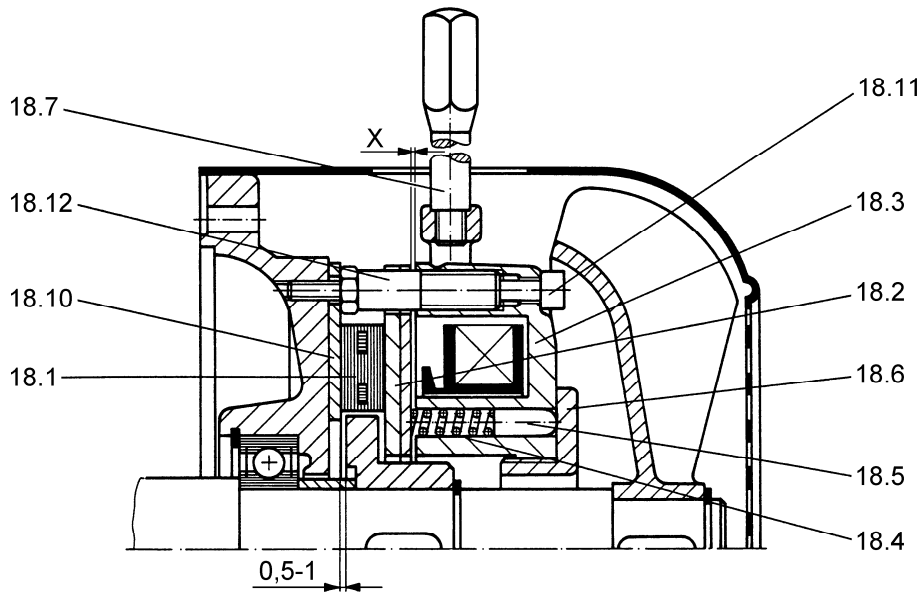
The infinite braking torque adjustment is made by turning the setting nut (18.6) using a hock wrench. By turning it clockwise, looking at it in the direction of the drive shaft, the braking torque will be increased. Turning it anti-clockwise will reduce the braking torque.

## 6 Spare parts

When ordering spare parts please quote the motor type and motor serial number (this information is shown on the rating plate) in addition to a precise description of the part.

**Bild 1: Einscheiben-Federkraftbremse**

Fig. 1: Single-disc springloaded brake



Bremsmoment / Braking torque (Nm)	2	4	8	16	32	60	80
Luftspalt X / Air gap X (mm)	0,2	0,2	0,2	0,2	0,3	0,3	0,3

**Bild 2: Schmierstoffe**

Fig. 2: Lubricants

Betriebsbedingungen Operating conditions	Wärmeklasse Temperature class	Wälzlagerfett / Einsatzbereich Bearing grease / Application
Normal	F	Baugrößen 56 – 112: Lithiumseifenfett / -30 °C bis +140 °C
Normal		Frame sizes 56 – 112: lithium-based grease / -30 °C to +140 °C
Hohe Temperaturen, extreme Betriebsbedingungen	H	Hochtemperatur- und Langzeitschmierstoff, vollsynthetisches Grundöl / -20 °C bis +180 °C
High temperatures, extreme operating conditions		High-temperature and long-term grease, fully synthetic base oil / -20 °C to +180 °C
Tiefe Temperaturen	F	Tieftemperaturschmierstoff, Barium-Komplex / -50 °C bis +150 °C
Low temperatures		Low-temperature grease, barium complex / -50 °C to +150 °C

**Bild 3: Anziehdrehmomente für Schraubenverbindungen der Klemmbrettanschlüsse**

Fig. 3: Tightening torques for the screws and bolts of electrical connections on terminal boards

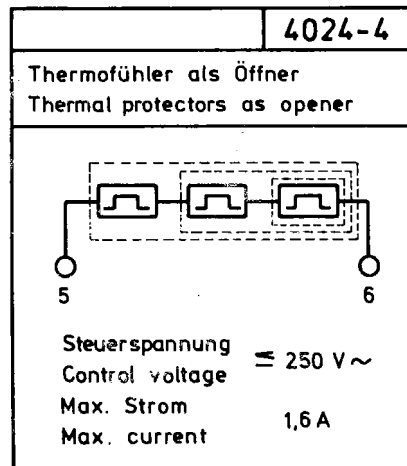
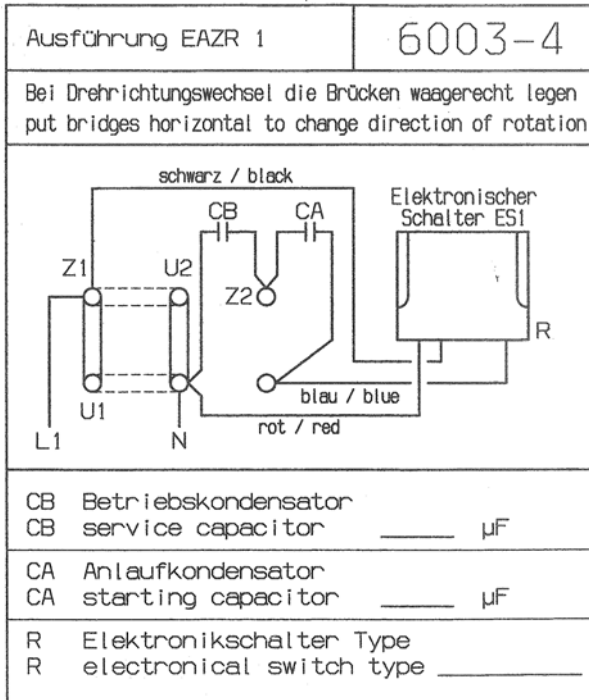
Gewinde-Ø / Thread-Ø		M4	M5	M6	M8	M10
Anziehdrehmoment / Tightening torque (Nm)	min.	0,8	1,8	2,7	5,5	9,0
	max.	1,2	2,5	4,0	8,0	13,0

Die Anziehdrehmomente gelten, soweit keine anderen Werte angegeben sind!

The tightening torques apply unless alternative values are specified.

**Bild 4: Anschlußschaltbild**

Fig. 2: Connection diagram



## EG-Konformitätserklärung EC declaration of conformity

**Dokument-Nr./Monat.Jahr** : 1.51.820.001/04.16  
*Document-No./Month. Year*

**Hersteller** : EMOD Motoren GmbH  
*Manufacturer*

**Anschrift** : Zur Kuppe 1  
*Address* D-36364 Bad Salzschlirf

**Produktbezeichnung** : **Einphasenmotoren**  
*Product designation* *Single phase motors*

**Type (Baugröße)** : **63 EHB .. – 112 EHB ..**  
*Type (Frame size)* **63 EAF .. – 112 EAF ..**  
**63 EAR .. – 112 EAR ..**

**Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein:**  
*The named product is in conformity with the requirements of the following European Directive:*

**2014/35/EU**

**Richtlinie 2014/35/EU des Europäischen Parlaments und des Rates zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die Bereitstellung elektrischer Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen auf dem Markt (Neufassung)**

**2014/35/EU**

*Directive 2014/35/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits (recast)*

**2014/30/EU**

**Richtlinie 2014/30/EU des Europäischen Parlaments und des Rates zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit (Neufassung)**

**2014/30/EU**

*Directive 2014/30/EU of the European Parliament and of the Council on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast)*

**Das bezeichnete Produkt ist entwickelt und gefertigt worden in Übereinstimmung mit folgenden Normen:**  
*The named product is developed and produced in conformity with the following standards:*

EN 60034-1: 2011	EN 60034-5: 2007	EN 60034-6: 1996	EN 60034-9: 2008
EN 61000-6-1: 2007	EN 61000-6-2: 2006	EN 61000-6-3: 2011	EN 61000-6-4: 2011
EN 60204-1: 2007			

**Erstmalige Anbringung der CE-Kennzeichnung: 1996**  
*CE symbol displayed*

**Aussteller** : EMOD Motoren GmbH  
*Issuer*

**Ort, Datum** : Bad Salzschlirf, 01.04.2016  
*Place, Date*

**Unternehmensleitung:**   
*Management* Roland Odenwald

**Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien und Normen, beinhaltet jedoch keine Zusicherung von Eigenschaften im Sinne der Produkthaftung.**

**Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.**

*This Declaration certifies the conformity with the named directives and standards, but does not contain the assurance of properties within the meaning of product liability.*

*The safety instructions provided in the product documentation must be observed.*



**KNF worldwide**

Find your local KNF partner on: [www.knf.com](http://www.knf.com)