

## Wilo NL-HE



**en** Installation and operating instructions



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## 1 General

### 1.1 About these instructions

These instructions are a part of the product. It is essential to follow the instructions for correct handling and use:

- Before all activities, read the instructions carefully.
- Always keep the instructions in an accessible place.
- Observe all product specifications.
- Observe the markings on the product.

The language of the original instructions is English. All other languages of these instructions are translations of the original instructions.

### 1.2 Copyright

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### 1.3 Subject to change

Wilo reserves the right to change the listed data without prior notice and is not liable for technical inaccuracies and/or omissions. The illustrations vary from the original and are intended as a sample representation of the product.

### 1.4 Exclusion from warranty and liability

Wilo assumes no warranty or liability in the following cases:

- Improper configuration due to insufficient or incorrect instructions by the operator or the customer
- Non-compliance with these instructions
- Improper use of the product
- Incorrect storage or transport
- Incorrect installation or dismantling
- Insufficient maintenance
- Unauthorised repairs
- Unsuitable installation location
- Chemical, electrical or electrochemical influences
- Wear of product components

## 2 Safety

This chapter contains basic information for the individual phases of the life cycle. Failure to observe this information carries the following risks:

- Injury to persons from electrical, mechanical and bacteriological factors as well as electromagnetic fields
- Environmental damage from discharge of hazardous substances
- Property damage
- Failure of important functions of the product

Failure to observe the information contained herein will result in the loss of claims for damages.

**The instructions and safety instructions in the other chapters must also be observed!**

### 2.1 Identification of safety instructions

These installation and operating instructions set out safety instructions for preventing personal injury and damage to property. These safety instructions are shown differently:

- Safety instructions relating to personal injury start with a signal word, are **preceded by a corresponding symbol** and are shaded in grey.

## DANGER



### Type and source of the danger!

Consequences of danger and instructions for avoidance.

- Safety instructions relating to property damage start with a signal word and are displayed **without** a symbol.

## CAUTION

### Type and source of the danger!

Consequences or information.

## Signal words

- **DANGER!**  
Failure to follow the instructions will result in serious injuries or death!
- **WARNING!**  
Failure to follow the instructions can lead to (serious) injury!
- **CAUTION!**  
Failure to follow the instructions can lead to potentially irreparable property damage.
- **NOTICE!**  
Useful information on handling the product

## Symbols

These instructions use the following symbols:



Danger – high voltage



General warning symbol



Warning – danger of crushing



Warning – risk of cutting injuries



Warning – hot surfaces



Warning – high pressure



Warning – suspended loads



Personal protective equipment: wear a safety helmet



Personal protective equipment: wear foot protection



Personal protective equipment: wear hand protection



Personal protective equipment: wear mouth protection



Personal protective equipment: wear safety goggles



Useful information

## 2.2 Personnel qualifications

Personnel must:

- Be instructed about locally applicable regulations governing accident prevention.
- Have read and understood the installation and operating instructions.

Personnel must have the following qualifications:

- Electrical work: A qualified electrician must carry out the electrical work.
- Installation/dismantling must be carried out by a qualified technician who is trained in the use of the necessary tools and fixation materials.

### Definition of “qualified electrician”

A qualified electrician is a person with appropriate technical education, knowledge and experience who can identify **and** prevent electrical hazards.

## 2.3 Electrical work

- Electrical work must be carried out by a qualified electrician.
- When connecting to the mains, comply with the locally applicable laws and regulations of the local energy supply company.
- Before commencing work, disconnect the device from the mains and secure it against being switched on again without authorization.
- Train personnel on how to make the electrical connection as well as on the methods for switching off the device.

- Observe the technical information in these installation and operating instructions as well as on the rating plate.
- Ground the device.
- Observe the manufacturer's specifications when connecting to electrical switching systems.
- Comply with the specifications on electro-magnetic compatibility when using electronic start-up controllers (e.g. soft starter or frequency converter). If required, take into account special measures (shielded cables, filters, etc.).
- Replace defective connection cables. Contact customer service.

## 2.4 Transport

- Wear protective equipment:
  - Safety gloves for protection against cuts
  - Safety shoes
  - Sealed safety goggles
  - Safety helmet (when using lifting equipment)
- Only use legally specified and approved lifting gear.
- Select lifting gear based on the available conditions (weather, attachment point, load, etc.).
- Always attach the lifting gear to the designated attachment points (lifting eyes).
- Position the lifting equipment in a way that ensures stability during use.
- When using lifting equipment, a second person must be present to coordinate the procedure if required (e.g. if the operator's field of vision is blocked).
- Persons must not stand underneath suspended loads. Do **not** move suspended loads over workplaces where people are present.

**Please note the following information during transport and prior to installation:**

- Do not reach into suction ports, discharge ports or other openings.
- Avoid the penetration of foreign objects. To this end, leave the protective covers or packaging on until they have to be removed for installation.
- Packaging and covers may be removed from suction or outlet openings for inspection purposes. They must be put back on afterwards to protect the pump and ensure safety.

## 2.5 Installing/dismantling

- Wear the following protective equipment:
  - Safety shoes
  - Safety gloves for protection against cuts

- Safety helmet (when using lifting equipment)
- Comply with laws and regulations on work safety and accident prevention in force at the site of installation.
- The procedure described in the installation and operating instructions for shutting down the product/unit must be strictly observed.
- Disconnect the device from the mains and secure it against being switched on again without authorization.
- All rotating parts must be at a standstill.
- Close the gate valve in the inlet and in the pressure pipe.
- Provide adequate aeration in enclosed spaces.
- Clean the device thoroughly. Disinfect devices that use fluids hazardous to health!
- Make sure that there is no risk of explosion when carrying out any type of welding work or work with electrical devices.

## 2.6 During operation

- Wear protective equipment:
  - Safety shoes
  - Safety helmet (when using lifting equipment)
- The work area in which the device is used is not a recreational area. No persons are allowed in the work area during operation.
- The operator must report any faults or irregularities to a line manager immediately.
- If hazardous defects occur, the operator must immediately deactivate the device. Hazardous defects include:
  - Malfunction of safety and monitoring devices
  - Damage to housing parts
  - Damage to electrical equipment
- Open all gate valves in the piping on both the suction and pressure sides.
- Collect any leakage of fluids and operating fluids immediately and dispose of it according to the locally applicable guidelines.
- Tools and other objects should only be kept in their designated places.

### Thermal hazards

Most drive surfaces can become hot during operation. The areas of the mechanical seal and bearing bracket on the pump can become hot in the event of a malfunction or incorrect setting.

The surfaces in question also remain hot after switching off the unit. These surfaces may only be touched with extreme caution. Wear protective gloves if it is essential to touch hot surfaces.



Make sure that the drained water is not too hot for more intensive contact with skin.

Introduce appropriate equipment to protect components that may become hot against accidental contact.

### **Hazard due to articles of clothing or other objects being caught**

To avoid the dangers presented by the rotating parts of the product:

- Do not wear loose or frayed clothing or jewellery.
- Do not dismantle devices for protecting against accidental contact with moving parts (e.g. coupling guard).
- Only put the device into operation once this protection is in place.
- The devices for protecting against accidental contact with moving parts may only be removed when the system is at a standstill.

### **Hazards due to noise**

Observe the sound pressure specifications on the motor rating plate. The sound pressure value of the pump is generally about the same value as that of the motor +2 dB(A).

Observe the applicable health and safety regulations. If the device is operated under normal operating conditions, the operator must measure the sound pressure.

Sound pressure levels of 80 dB(A) and above must be noted in the work regulations! The operator must also introduce the following preventative measures:

- Inform the operating personnel
- Provide hearing protection

For a sound pressure level of 85 dB(A) and above, the operator must:

- Make it a mandatory requirement to wear hearing protection
- Demarcate the noisy areas.
- Take measures to reduce noise (e.g. insulation, noise barriers)

### **Leakages**

Observe local standards and regulations. Avoid pump leakages to protect persons and the environment against hazardous (explosive, toxic or hot) substances.

Ensure that a dry run of the pump is not possible. A dry run can damage the shaft seal and thereby cause leakages.

## 2.7 Maintenance tasks

- Wear the following protective equipment:
  - Sealed safety glasses
  - Safety shoes
  - Safety gloves for protection against cuts
- Only carry out the maintenance tasks described in these installation and operating instructions.
- Only original parts from the manufacturer may be used for maintenance and repairs. Use of parts other than original parts releases the manufacturer from any liability.
- Collect any leakage of fluid and operating fluid immediately and dispose of it according to the locally applicable guidelines.
- Tools and other objects should only be kept in their designated places.
- After completing work, reattach all safety and monitoring devices and check that they function properly.

## 2.8 Drive: NEMA standard motor

The hydraulics have a standardized connection flange for installing a NEMA standard motor. See the technical data for the performance data (e.g. size, construction, hydraulic rated power, speed) needed to select a motor.

## 2.9 Operator responsibilities

The operator must:

- Provide the installation and operating instructions in a language which the personnel can understand.
- Make sure that personnel are suitably trained for the specified work.
- Ensure that safety and information signs mounted on the device are always legible.
- Train personnel with regard to the operating principles of the system.
- Eliminate any risk from electrical current.
- Equip hazardous components (extremely cold, extremely hot, rotating, etc.) with an on-site guard.
- Demarcate and cordon off the hazardous area.
- Define personnel responsibilities to ensure safe working practice.

Children and persons younger than 16 years or with reduced physical, sensory or mental capacities or limited experience are prohibited from handling the device! Persons under the age of 18 must be supervised by a technician.

### 3 Application/use

#### 3.1 Intended use

The glanded pumps in the Wilo NL-HE series are intended for use as circulators in building services.

The Wilo NL-HE pumps may only be used for:

- Hot-water heating systems
- Cooling and cold water circulation systems
- Drinking water systems (special version)
- Industrial circulation systems
- Heat carrier circuits
- Irrigation

The pumps are only approved for the fluids specified in the “Technical data” section.

#### 3.2 Improper use

**WARNING! Misuse of the pump can lead to dangerous situations and damage.**

- Never use with fluids that have not been approved by the manufacturer.
- Non-permitted substances in the fluid can destroy the pump. Abrasive solids (e.g. sand) increase pump wear.
- Highly flammable materials/fluids should always be kept at a safe distance from the device.
- Never allow unauthorized persons to carry out work.
- Never operate the pump beyond the specified limits of use.
- Never carry out unauthorized conversions.
- Use authorized accessories and genuine spare parts only.

Typical installation locations are technical rooms within the building with other domestic installations. No provision has been made for direct installation of the pump in rooms used for other purposes (residential and work rooms).

Outdoor installation requires a corresponding, special version (motor with anti-condensation heater).

Intended use also includes compliance with this manual. Any other use is regarded as non-compliant with the intended use.

### 4 Product description

#### 4.1 Design

The Wilo NL-HE pump is a single-stage back pull-out-centrifugal pump with spiral housing for horizontal installation. Motor dimensions in accordance with NEMA standards.

Suitable Wilo control devices (e.g. Wilo-EFC Variable Frequency Drive) can control the power of the pumps continuously. This allows optimization of the pump output for the demands of the installation and particularly economically efficient pump operation.

##### 4.1.1 Hydraulics

The pump consists of a radially divided spiral housing and cast-on pump support feet. The impeller is a closed radial impeller. The pump shaft is supported by grease-lubricated radial ball bearings.

##### 4.1.2 Motor

The system is driven by NEMA standard motors in a three-phase current version.

#### NOTICE



Use a heat-resistant mains connecting cable in systems where fluid temperatures exceed 194 °F!

##### 4.1.3 Seal

The fluid pump is sealed via a mechanical seal in accordance with EN 12756.

#### 4.2 Operation with frequency converter

Operation on the frequency converter is permitted. Refer to the documentation from the motor manufacturer for the relevant requirements and observe its contents.

### 4.3 Technical data

General	
Date of manufacture [MFY]	See rating plate
Mains connection [U/f]	See motor rating plate
Power consumption [P <sub>1</sub> ]	See motor rating plate
Rated power [P <sub>2</sub> ]	See motor rating plate
Rated speed [n]	See rating plate
Max. delivery head [H]	See rating plate
Max. volume flow [Q]	See rating plate
Permissible fluid temperature [t]	–4 °F to +284 °F
Permissible ambient temperature [t]	+104 °F
Permissible operating pressure [P <sub>max</sub> ]	232 psi
Flanges	Class 125# ANSI compatible drill pattern in accordance with ASME B16.1
Permissible fluids	– Heating water – Cooling/cold water – Water-glycol mixture up to 40 % vol.
Protection class	IP21, IP23, IP55
Insulation class [Cl.]	F
Motor protection	See manufacturer's documentation
Special version or with auxiliary equipment (at additional charge)	
Permissible fluids	– Heating water – Water-glycol mixture up to 40 % vol.
Special voltages/frequencies	Pumps with motors with different voltages or other frequencies are available on request
Additional information CH	
Approved fluids for heating pumps	– No oxygen binding agents, no chemical sealant. – Ensure enclosed system from corrosion perspective.

The date of manufacture is indicated in the format: MMDDYYYY

- MM = month
- DD = day
- YYYY = year

### 4.4 Type key

Example: NL-HE 2x1.25x5-5-182/4T-460-2-TEFC	
NL-HE	Product family
2	Nominal diameter of Suction Flange
1.25	Nominal diameter of Discharge Flange
5	Nominal diameter of the impeller in inches
5	Rated motor power in hp
182/4T	Motor Frame size
460	Motor rated voltage
2	Motor poles
TEFC	Motor Enclosure

#### 4.5 Scope of delivery

Complete unit

- NL-HE pump
- Baseplate
- Coupling and coupling guard
- With or without electric motor
- Installation and operating instructions

Pump by itself:

- NL-HE pump
- Bearing bracket without baseplate
- Installation and operating instructions

#### 4.6 Accessories

Accessories have to be ordered separately. For a detailed list, consult the catalogue and spare parts documentation.

#### 4.7 Anticipated noise levels

##### 4.7.1 Pump with three-phase motor, 60 Hz without speed control

Motor power $P_N$ [hp]	Measuring surface sound-pressure level $L_p$ , A [dB(A)] <sup>1)</sup>	
	2-Pole (3550 rpm)	4-Pole (1750 rpm)
0.75	–	52
1	68	52
1.5	68	52
2	68	52
3	66	56
5	66	56
7.5	68	59
10	68	59
15	72	64
20	72	64
25	72	64
30	73	64
40	76	66
50	76	66
60	79	69
75	84	69
100	84	69
125	84	73
150	84	78
200	85	78
250	85	78
300	85	75

<sup>1)</sup> Spatial mean value of sound-pressure levels within a cube-shaped measuring area at a distance of 1 m from the surface of the motor

Table 1: Anticipated noise levels for standard pump (60 Hz)

#### 4.8 Permissible forces and torques on the pump flanges

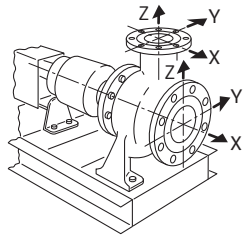


Fig. 1: Permissible forces and torques on the pump flanges – pump made of grey cast iron (see table “Permissible forces and torques on the pump flanges”)

ANSI	Forces F [lb]				Torques M [lb]			
	F <sub>x</sub>	F <sub>y</sub>	F <sub>z</sub>	Σ Forces F	M <sub>x</sub>	M <sub>y</sub>	M <sub>z</sub>	Σ Torques M

##### DISCHARGE

1.25"	71	67	83	130	3407	2328	2637	4956
1.5"	87	79	98	154	4027	2788	3257	5885
2"	118	106	130	205	4337	3098	3567	6354
2.5"	146	134	165	260	4646	3407	3717	6815
3"	177	161	197	311	4956	3567	4027	7284
4"	236	212	264	413	5425	3876	4496	8054
5"	279	252	311	488	6505	4646	5885	9452
6"	354	319	393	618	7744	5425	6354	11310

##### SUCTION

2"	130	118	106	205	4337	3098	3567	6354
2.5"	165	146	134	260	4646	3407	3717	6815
3"	197	177	161	311	4956	3567	4027	7284
4"	264	236	212	413	5425	3876	4496	8054
5"	311	279	252	477	6505	4646	5885	9452
6"	393	354	319	618	7744	5425	6354	11310
8"	527	472	425	822	10071	7124	823	14868

Values in acc. with ISO/DIN 5199 – class II (2002) – Appendix B, Family no. 1A

Table 2: Permissible forces and torques on the pump flanges

If not all working loads reach the maximum permitted values, one of these loads may exceed the normal limit value. This is under the condition that the following additional conditions are fulfilled:

- All force and torque components are limited to 1.4 times the maximum permitted value.
- The forces and torques acting on each flange meet the requirements of the compensation equation.

$$\left( \frac{\sum |F|_{\text{effective}}}{\sum |F|_{\text{max. permitted}}} \right)^2 + \left( \frac{\sum |M|_{\text{effective}}}{\sum |M|_{\text{max. permitted}}} \right)^2 \leq 2$$

Fig. 2: Compensation equation

Σ F<sub>effective</sub> and Σ M<sub>effective</sub> are the arithmetic sums of the effective values of both pump flanges (inlet and outlet). Σ F<sub>max. permitted</sub> and Σ M<sub>max. permitted</sub> are the arithmetic sums of the maximum permitted values of both pump flanges (inlet and outlet). The algebraic signs of Σ F and Σ M are not taken into consideration in the compensation equation.

## 5 Transportation and storage

### 5.1 Delivery

The pump is secured to a pallet ex works and is protected against dirt and moisture.

Check the shipment immediately on receipt for defects (damage, completeness). Defects must be noted on the freight documentation. Any defects must be notified to the transport company or the manufacturer immediately on the day of receipt of shipment. Subsequently notified defects can no longer be asserted.

### 5.2 Transport

#### DANGER



##### Risk of fatal injury due to suspended loads!

Never allow anyone to stand under suspended loads! Danger of (serious) injuries caused by falling parts. Loads may not be carried over work places where people are present!

The safety zone must be marked so that there is no danger when the load (or part of it) slips away or if the lifting device snaps or is ripped off. Loads must never be suspended for longer than necessary.

Accelerations and braking during the lifting operation must be performed in a way that rules out any danger to people.

#### WARNING



##### Hand and foot injuries due to lack of protective equipment!

Danger of (serious) injuries during work. Wear the following protective equipment:

- Safety shoes
- Safety gloves for protection against cuts
- Sealed safety goggles
- Safety helmet must be worn if lifting equipment is used!

#### NOTICE



##### Use only properly functioning lifting equipment!

Use only properly functioning lifting equipment to lift and lower the pump. Ensure that the pump does not become jammed during lifting and lowering. Do **not** exceed the maximum bearing capacity of the lifting equipment! Check that lifting equipment is functioning properly before use!

## CAUTION

Property damage due to incorrect transport

To ensure proper alignment, all equipment is pre-assembled. If dropped or if improperly handled, there is a risk of misalignment or deficient performance due to deformations. The pipes and valves will not withstand loads and should not be used to secure loads in transit.

- Only use permitted lifting gear for transport. Ensure the stability of the load since, with this particular pump design, the centre of gravity is shifted to the top (top-heavy).
- **Never** attach lifting gear to shafts in order to lift the unit.
- Do **not** use the transport lugs on the pump or motor to lift the entire unit. They are only meant for transporting the individual components during installation or dismantling.

Only remove the outer packaging at the place of utilization to ensure that the pump is not damaged during transport.

## CAUTION

### Risk of damage due to incorrect packaging.

If the pump is transported again at a later date, it must be packaged so that it cannot be damaged during transport. Use the original packaging for this, or choose equivalent packaging.

### 5.2.1 Proper lifting of the pump

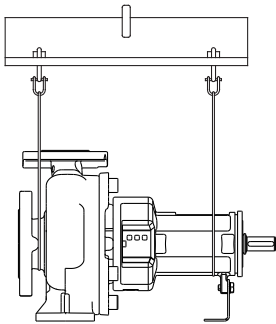


Fig. 3: Lifting of the pump

- Comply with applicable national safety regulations.
- Use legally specified and approved lifting gear.
- Select the lifting gear based on the prevailing conditions (weather, attachment point, load, etc.).
- Only attach the lifting gear to the attachment point. Fix in place with a shackle.
- Never feed the lifting gear over or through transport lugs without protection.
- Never feed the lifting gear over sharp edges without protection.
- Use lifting equipment with sufficient bearing capacity.
- The stability of the lifting equipment must be ensured during operation.
- When using lifting equipment, ensure a second person is present to coordinate the procedure if required (e.g. if the operator's field of vision is blocked).
- When lifting, make sure that the load limit of the lifting gear is reduced when pulling at an angle. The safety and efficiency of the lifting gear is best guaranteed when all load-bearing elements are loaded vertically. If necessary, use a lifting arm, to which the lifting gear can be vertically attached.
- **Ensure the load is lifted vertically!**
- **Prevent the suspended load from swinging!**

### 5.2.2 Proper lifting of the complete unit

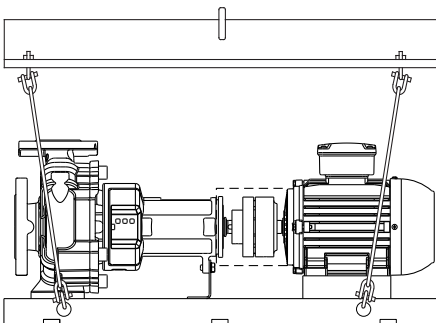


Fig. 4: Lifting the complete unit

- Comply with applicable national safety regulations.
- Use legally specified and approved lifting gear.
- Select the lifting gear based on the prevailing conditions (weather, attachment point, load, etc.).
- Only attach the lifting gear to the attachment point. Fix in place with a shackle.
- Never feed the lifting gear over or through transport lugs without protection.
- Never feed the lifting gear over sharp edges without protection.
- Use lifting equipment with sufficient bearing capacity.
- The stability of the lifting equipment must be ensured during operation.
- When using lifting equipment, ensure a second person is present to coordinate the procedure if required (e.g. if the operator's field of vision is blocked).
- When lifting, make sure that the load limit of the lifting gear is reduced when pulling at an angle. The safety and efficiency of the lifting gear is best guaranteed when all load-bearing elements are loaded vertically.



ing elements are loaded vertically. Make sure that the motor terminal box does not interfere with the lifting equipment. If necessary, use a lifting arm, to which the lifting gear can be vertically attached.

- **Ensure the load is lifted vertically!**
- **Prevent the suspended load from swinging!**

### 5.3 Storage

#### NOTICE



#### **Improper storage can lead to damage to the equipment.**

Damage caused by improper storage is not covered by the guarantee or warranty.

- Requirements at the storage location:
  - dry
  - clean
  - well-ventilated
  - free from vibrations
  - free from humidity
  - free from rapid or extreme changes in temperature
- Store the product somewhere safe against mechanical damage.
- Protect the bearings and couplings from sand, gravel and other foreign objects.
- Lubricate the unit to prevent rust and bearing seizing.
- Manually rotate the drive shaft several times once a week.

#### **Storage for more than three months**

Additional precautionary measures:

- All rotating parts must be coated with a suitable protective medium to protect them from rust.
- If the pump is to be stored for more than a year, consult the manufacturer.

## 6 Installation and electrical connection

### 6.1 Personnel qualifications

### 6.2 Operator responsibilities

- Electrical work: A qualified electrician must carry out the electrical work.
- Observe locally applicable accident prevention and safety regulations of professional and trade associations.
- Observe all regulations for working with heavy loads and under suspended loads.
- Provide protective equipment and ensure that the protective equipment is worn by personnel.
- Avoid pressure surges!  
Pressure surges can occur in long pressure pipes. These pressure surges can lead to the destruction of the pump!
- Structural components and foundations must be of sufficient stability in order to allow the device to be fixed in a secure and functional manner. The operator is responsible for the provision and suitability of the building/foundation!
- Check that the available consulting documents (installation plans, design of the operating space, inflow conditions) are complete and correct.

### 6.3 Preparing the installation

#### WARNING



#### Risk of personal injury and property damage due to improper handling!

- Never set up the pump unit on unfortified surfaces or surfaces that cannot bear loads.
- Flush the pipe system if required. Dirt can cause the pump to fail.
- Install only after completion of all welding and soldering work and after the pipe system has been flushed, if required.
- Observe the minimum axial distance between a wall and the fan cover of the motor: 8 inches + diameter of the fan cover

- The pumps (in the standard version) must be protected from the weather and installed in a frost/dust-free, well-ventilated environment that is not potentially explosive.
- Mount the pump in a readily accessible place. This makes it easier to complete inspections, maintenance (e.g. mechanical seal change) or replacement in the future.
- A travelling crane or a device for attaching hoisting gear should be installed above the set-up site of large pumps.

### 6.4 Setting up the pump by itself (variant B, Wilo variant key)

When installing a pump by itself, the required coupling guard and baseplate of the pump manufacturer should be used. In any case, all components must meet the local regulations. An OSHA compliant coupling guard should be used.

#### 6.4.1 Selecting the motor

Select a motor with sufficient power.

Shaft power	< 5 hp	5 hp < P <sub>2</sub> < 15 hp	15 hp < P <sub>2</sub> < 50 hp	50 hp < P <sub>2</sub>
Limit value P <sub>2</sub> for the motor	25 %	20 %	15 %	10 %

Table 3: Motor/shaft power

Example:

- Duty point water: Q = 440 gpm; 115 feet
- Efficiency: 78 %
- Hydraulic power: 16.75 hp

The required limit value for this duty point lies at 16.75 hp x 1.15 = 19.26 hp. A motor with a power of 20 hp would be the correct choice.

#### 6.4.2 Selecting the coupling

- To establish the connection between the pump with bearing bracket and motor, use a flexible coupling.
- Select the coupling size according to the recommendations of the coupling manufacturer.
- Follow the instructions of the coupling manufacturer.
- After installation on the base and connecting the pipes, check the coupling alignment and correct it if necessary. The procedure is described in the chapter "Coupling alignment".
- After reaching the operating temperature, the coupling alignment must be checked again.
- Avoid accidental contact during operation. The coupling should be protected with an OSHA compliant coupling guard.

## 6.5 Installing the pump unit on a base

### CAUTION

#### Danger of property and material damage!

A missing foundation or incorrect installation of the unit on the base can lead to a malfunction of the pump. Incorrect installation is not covered by the warranty.

- Only have the pump unit installed by qualified personnel.
- A professional from the concrete sector must be hired for all base work.

### 6.5.1 Base

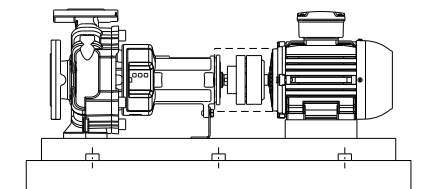


Fig. 5: Installing the unit on a base

The base must be able to support the unit installed on the baseplate indefinitely. The base must be level to ensure there is no tension on the baseplate or unit. Wilo recommends using premium, non-shrink concrete of an adequate thickness for manufacturing. This would prevent vibrations from being transmitted.

The base must be able to accommodate the forces, vibrations and impact that occur.

Guidance values for dimensioning the base:

- Approx. 1.5 to 2 x heavier than the unit.
- The width and length should each be about 8 inches greater than the baseplate.

The baseplate must not be strained or pulled down on the surface of the base. It must be supported so that the original alignment is not changed.

Prepare drilled holes for the anchor bolts. Position pipe sleeves vertically in the base at the corresponding points. Diameter of the pipe sleeves: Around  $2\frac{1}{2}$  x the diameter of the screws. This allows the screws to be moved in order to achieve their final positions.

Wilo recommends initially pouring the concrete base up to about 1 inch below the planned height. The surface of the concrete base must be well contoured before curing. Remove the pipe sleeves after the concrete cures.

When the concrete base is poured out, insert steel rods vertically into the base at regular intervals. The required number of steel rods is dependent on the size of the baseplate. The rods must project into the baseplate by up to  $\frac{2}{3}$ .

### 6.5.2 Preparing the baseplate for anchoring

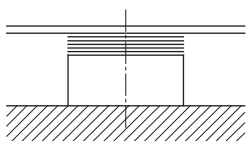


Fig. 6: Shims on the base surface

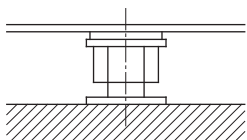


Fig. 7: Levelling screws on the base surface

- Thoroughly clean the base surface.
- Place shims (approx.  $\frac{7}{8}$  to 1 inch thick) on every screw hole on the base surface. Alternatively, levelling screws can also be used.
- For a length spacing of the fixation bores  $\geq 32$  inches, shims should be additionally placed in the middle of the baseplate. Shims should also be placed under **all** middle bracing C channels (see below in figure "Levelling and aligning the baseplate showing shim locations").
- Level in both directions with additional shims.
- Align the unit when installing on the base using a spirit level (at the shaft/pressure port). The baseplate must be horizontal; tolerance: 0.006 inches per foot
- Fit anchor bolts in the provided drilled holes.

### NOTICE



**The anchor bolts must fit in the fastening bores (6; 3 per side) of the baseplate.**

They must meet the relevant standards and be sufficiently long, so that a firm fit in the base is guaranteed.

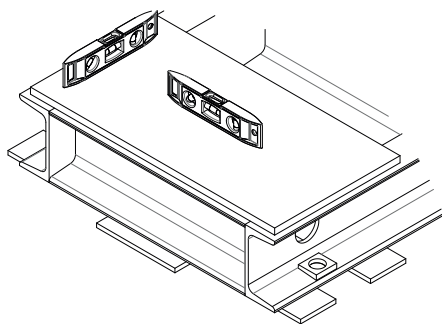


Fig. 8: Levelling and aligning the baseplate showing shim locations

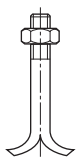


Fig. 9: Anchor bolt

### 6.5.3 Grouting the baseplate

The baseplate can be grouted after fixing. The process of grouting reduces vibrations to a minimum.

- Wet the base surface before grouting.
- Use a suitable, non-shrink grout.
- Pour the grout through the available openings in the baseplate. Be sure to avoid hollow spaces.
- Before pouring concrete or grout create an enclosed frame around the base.
- After curing, check the anchor bolts for a tight fit.
- Coat the unprotected surfaces of the base to protect from moisture.

### 6.6 Pipework

The pipe connections of the pump are fitted with dust caps so that no foreign objects can penetrate during transport and installation.

- These caps must be removed before connecting pipes.

## CAUTION

**Improper pipework/installation can lead to property damage! Welding beads, cinder and other contaminants can damage the pump!**

- The pipes must be sufficiently dimensioned, taking the pump inlet pressure into account.
- Connect the pump and pipes using suitable gaskets. Take the pressure, temperature and fluid into account. Check the gaskets for proper fitting.
- The pipes must not transfer any forces to the pump. Brace the pipes directly before the pump and connect them without tension.
- Observe the permissible forces and torques on the pump connecting pieces!
- The expansion of the pipes in the event of a temperature rise is to be compensated by suitable means.
- Avoid air pockets in piping by means of appropriate installations.

## NOTICE

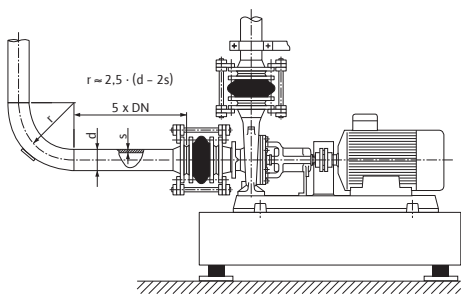


Fig. 10: Connecting the pump without tension, settling section upstream and downstream of the pump



### Simplify subsequent work on the unit!

- To ensure the entire unit does not have to be emptied, install a check valve and shut-off devices before and after the pump.

## NOTICE



### Avoid flow cavitation!

- A settling section must be provided upstream and downstream of the pump in the form of a straight pipe. The length of the settling section must be at least 5 times the nominal diameter of the pump flange.

- The pipes and pump must be free of mechanical stress when installed.
- The pipes must be fixed in such a way that the pump does not have to support the weight of the pipes.
- Clean, flush and purge the unit before connecting the pipes.
- Remove the covers from the suction and discharge ports.
- If required, install a dirt filter upstream of the pump in the pipe on the suction side.
- Then connect the pipes to the pump connecting pieces.

## 6.7 Aligning the unit

### CAUTION

#### Incorrect alignment can result in property damage!

The transport and installation of the pump can affect the alignment. The motor must be aligned to the pump (not vice versa).

- Check the alignment before the first start.

### CAUTION

#### Changes to the alignment during operation can result in property damage.

The pump and motor are usually aligned at ambient temperature. Thermal expansion at operating temperature can change the alignment, particularly in the case of very hot fluids.

Adjustment may be required if the pump is required to pump very hot fluids:

- Allow the pump to run at the actual operating temperature.
- Switch off the pump then immediately check the alignment.

Precondition for reliable, smooth and efficient operation of a pump unit is proper alignment of the pump and the drive shaft.

Misalignments can be the cause of:

- excessive noise development during pump operation
- vibrations
- premature wear
- excessive coupling wear

## 6.7.1 Coupling alignment

### EPDM Coupling Alignment

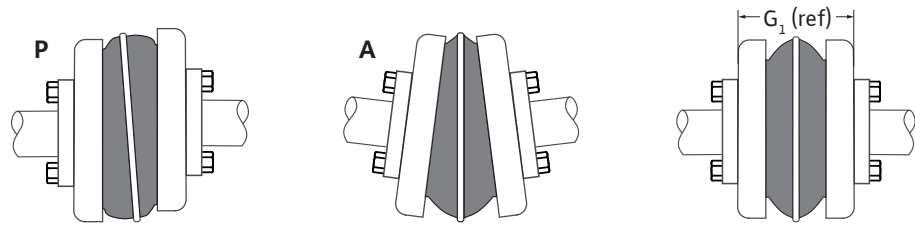


Fig. 11: EPDM Coupling Alignment

P Parallel Alignment				A Angular alignment			
Sleeve size	Max. RPM	G <sub>1</sub> (ref)		EPDM Allowable Misalignment			
		in	mm	Parallel		Angular	
				in	mm	in	mm
4	7600	1.5	38	0.01	0.25	0.043	1.09
5	7600	1.9	49	0.015	0.38	0.056	1.42
6	6000	2.4	60	0.015	0.38	0.07	1.78
7	5250	2.6	65	0.02	0.51	0.081	2.06
8	4500	2.9	75	0.02	0.51	0.094	2.39
9	3750	3.5	89	0.025	0.64	0.109	2.8
10	3600	4.1	103	0.025	0.64	0.128	3.21
11	3600	4.9	124	0.032	0.81	0.151	3.89

Table 4: Maximum RPM and Allowable Misalignment for EPDM couplings

### NOTICE



Hytrel sleeves should not be used as replacements for EPDM sleeves. When using a VFD with a centrifugal pump, reduce allowable parallel and angular alignment values by half.

### Alignment for flexible jaw couplings

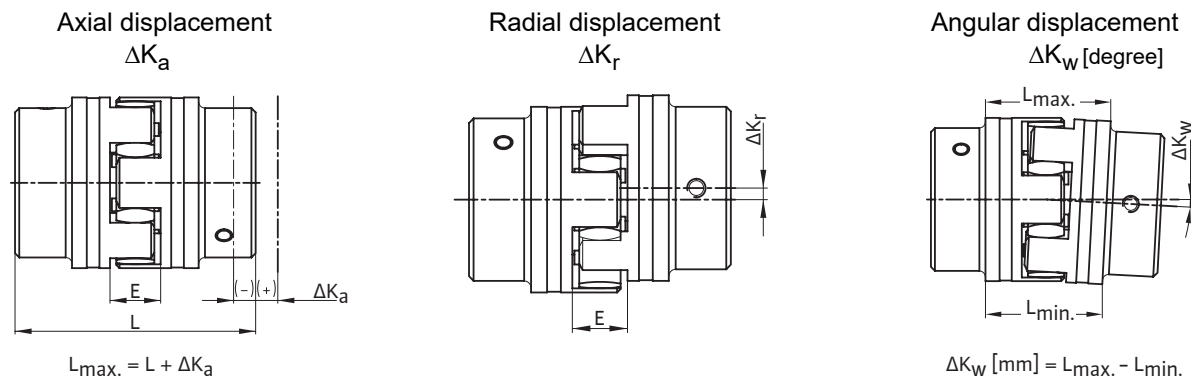


Fig. 12: Jaw coupling alignment

ROTEX® Size																
14	19	24	28	38	42	48	55	65	75	90	100	110	125	140	160	180
Max. axial misalignment $\Delta K_a$ [in]																
-0.2	-0.02	-0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.06	-0.06	-0.06	-0.06	-0.08	-0.08	-0.08	-0.10	0.12
+0.04	+0.05	+0.06	+0.07	+0.08	+0.08	+0.09	+0.10	+0.10	+0.12	+0.13	+0.15	+0.17	+0.18	+0.20	+0.22	+0.25

ROTEX® Size																
14	19	24	28	38	42	48	55	65	75	90	100	110	125	140	160	180
Max. parallel misalignment with $n = 1,800 \text{ rpm } \Delta K_p [\text{in}]$																
0.006	0.007	0.008	0.009	0.010	0.011	0.013	0.014	0.015	0.017	0.018	0.019	0.020	0.021	0.022	0.022	0.024
Max. angular misalignment with $n = 1,800 \text{ rpm } \Delta K_w [\text{degree}]$																
1.1	1.0	0.8	0.9	0.9	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Max. angular misalignment with $n = 1,800 \text{ rpm } \Delta K_w [\text{in}]$																
0.024	0.029	0.031	0.039	0.051	0.067	0.079	0.090	0.102	0.126	0.161	0.181	0.213	0.248	0.256	0.303	0.354

Table 5: Allowable Misalignment for flexible jaw couplings

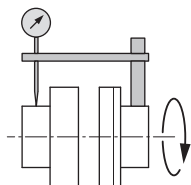


Fig. 13: Checking the radial alignment with a dial indicator

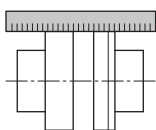


Fig. 14: Checking the radial alignment with a ruler

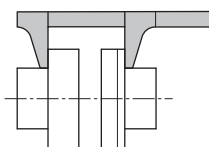


Fig. 15: Checking the axial alignment with a calliper gauge

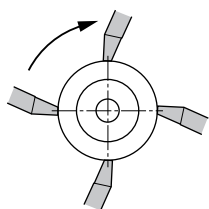


Fig. 16: Checking the axial alignment with a calliper gauge – circumferential check

#### Checking the radial alignment

- Firmly clamp a dial gauge to one of the couplings or to the shaft. The piston of the dial gauge must lie against the crown of the other half-coupling.
- Set the dial gauge to zero.
- Turn the coupling and write down the measuring result after every quarter turn.
- Alternatively, the radial coupling alignment can also be checked with a ruler.

#### NOTICE



The radial deviation of the two coupling halves must not exceed the maximum values found in tables “Maximum RPM and Allowable Misalignment for EPDM couplings” and “Allowable Misalignment for flexible jaw couplings”. This requirement applies to every operating status – including operating temperature and inlet pressure.

#### Checking the axial alignment

#### NOTICE



The axial deviation of the two coupling halves must not exceed the maximum values found in tables “Maximum RPM and Allowable Misalignment for EPDM couplings” and “Allowable Misalignment for flexible jaw couplings”. This requirement applies to every operating status – including operating temperature and inlet pressure.

Using a calliper gauge, circumferentially check the distance between the two coupling halves.

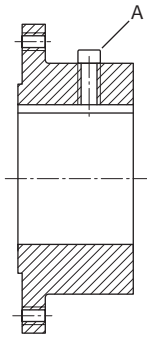


Fig. 17: Adjusting screw A for axial safeguard

- Connect the coupling halves once correctly aligned.  
The tightening torques for the coupling are listed in the tables below, according to the different possible coupling models.

Coupling Size	Type J Set Screws (A)		Type S Set Screws (A)	
	ft-lbs	Nm	ft-lbs	Nm
4	3	4	–	–
5	7	10	7	10
6	13	18	13	18
7	–	–	13	18
8	–	–	23	31
9	–	–	23	31
10	–	–	23	31
11	–	–	23	31

Table 6: Tightening torques for TB Woods EPDM coupling halves

Coupling Size	Type J Set Screws (A)		Type S Set Screws (A)	
	ft-lbs	Nm	ft-lbs	Nm
4	7	10	–	–
5	7	10	7	10

Table 7: Tightening torques for Lovejoy EPDM coupling halves

Coupling Size	Screw (A)	lb-in
38	M8	89
42	M8	89
48	M8	89
55	M10	150
65	M10	150
75	M10	150

Table 8: Tightening torques for Jaw type coupling halves

- Install the coupling guard.

### 6.7.2 Alignment of the pump unit

Any deviations in the measuring results indicate a misalignment. In this case, the unit must be realigned to the motor.

- Loosen the hexagon head screws and counter nuts on the motor.
- Place shims under the motor feet until the height difference is compensated.
- Pay attention to the axial alignment of the coupling.

## NOTICE



**Aluminum riser blocks under motor or pump feet are not enough to align the unit.**

Additional shims are needed.

- Finally, check the functioning of the coupling and shaft. The coupling and shaft must be easy to turn by hand.
- After correct alignment, mount the coupling guard.



For tightening torques for the pump and motor on the baseplate, see table "Tightening torques for baseplate bolts (Grade 5, Zinc plated, Hex bolts)".

Grade 5, Zinc plated, Hex bolt:	5/16"-18	3/8"-16	1/2"-13	5/8"-11	3/4"-10
Tightening torque [ft-lbs]	17.5	31	75	150	267

Table 9: Tightening torques for baseplate bolts (Grade 5, Zinc plated, Hex bolts)

## CAUTION

### **Risk of damage due to vibrations! Incorrect alignment can lead to vibrations.**

Vibrations can damage or destroy individual components.

- Carefully align the pump unit until all measurement results are within the permissible range.

### 6.7.3 Laser alignment of the pump unit

Proceed per manufacturer's recommendations for proper laser alignment instructions.

### 6.8 Electrical connection

## DANGER



### **Risk of fatal injury due to electrical current!**

Improper conduct when carrying out electrical work can lead to death due to electric shock!

- Only use an electrical installer approved by the local electricity supplier to make the connection.
- Observe the locally applicable regulations.
- Before beginning work on the product, make sure that the pump and drive are electrically isolated.
- Make sure that no one can turn on the power supply again before work is completed.
- Make sure that all energy sources can be isolated and locked. If the pump was switched off by a protective device, it must be secured against switching back on again until the error has been remedied.
- Electrical machines must always be grounded. Grounding must be appropriate for the motor and meet the relevant standards and regulations. Ground terminals and fixation elements must be dimensioned appropriately.
- Connection cables must **never** touch the piping, pump or motor housing.
- If it is possible for persons to come into contact with the pump or the pumped fluid, the grounded connection must also be fitted with a residual current circuit breaker.
- Observe the manufacturer's installation and operating instructions for the motor and accessories!
- During installation and connection work, observe the circuit diagram in the terminal box!

## CAUTION

### Risk of property damage caused by improper electrical connection!

An inadequate mains design can lead to system failures and cable fires due to mains overload! If the wrong voltage is applied, the pump can be damaged!

- Ensure that the current type and voltage of the mains connection correspond to the specifications on the motor rating plate.

## NOTICE



Three-phase motors are equipped with a thermistor depending on the manufacturer.

- Observe the wiring information in the terminal box.
- Observe the documentation from the manufacturer.

- Establish an electrical connection via a stationary mains connection cable.
- In order to ensure drip protection and strain relief on the cable connections, only cables with a suitable outer diameter may be used and the cable feedthroughs must be firmly screwed.  
Cables must be installed with a drip loop to avoid accumulation of water.
- Unused cable feedthroughs should be sealed with the sealing plates provided, and screwed tight.
- Reinstall any uninstalled safety devices, such as terminal box covers!
- **Check the direction of rotation of the motor while commissioning!**

### 6.8.1 Fuse on mains side

#### Circuit breaker

- Design the power and switching characteristics of the circuit breakers according to the rated current of the connected product.
- Observe local regulations.

#### Residual-current device (RCD)

- Install a residual-current device (RCD) in accordance with the regulations of the local energy supply company.
- If people can come into contact with the device and conductive fluids, install a residual-current device (RCD).

### 6.8.2 Protective devices

## WARNING



### Risk of burns from hot surfaces!

The spiral housing and the discharge cover assume the temperature of the fluid during operation. It may cause burns.

- Depending on the application, insulate the spiral housing.
- Provide corresponding guards.
- **Allow the pump to cool down at ambient temperature after switching it off!**
- Observe local regulations.

## CAUTION

### Risk of property damage due to incorrect insulation!

The discharge cover and the bearing bracket must not be insulated.

## 7 Commissioning

### WARNING



#### Risk of injury due to lack of protective equipment!

(Serious) injuries can occur due to lack of protective equipment.

- Do not remove the unit casings of moving parts (such as that of the coupling) during machine operation.
- Always wear protective clothing, protective gloves and protective goggles when working.
- Do not remove or disable the safety devices on the pump and motor.
- An authorized technician must check the functionality of the safety devices on the pump and motor prior to commissioning.

### CAUTION

#### Risk of material damage due to unsuitable operating mode!

Operating outside of the duty point impairs the pump efficiency and can damage the pump. Operating with the shut-off devices closed for more than 5 minutes is not recommended and generally dangerous in the case of hot fluids.

- The pump must not be operated outside of the specified operating range.
- Do not operate the pump with the shut-off devices closed.
- Make sure that the NPSHA value is always higher than the NPSHR value.

### CAUTION

#### Risk of material damage due to the formation of condensate!

When using the pump in air-conditioning or cooling applications, the formation of condensate can cause pump corrosion. WILO USA leaves insulation of the pump to the discretion of the installer.

### NOTICE



However, the plug on the discharge flange can be removed for venting purposes.

#### 7.1 Personnel qualifications

- Electrical work: A qualified electrician must carry out the electrical work.
- Operation/control: Operating personnel must be instructed in the functioning of the complete system.

#### 7.2 Filling and venting

### NOTICE



The standard version of the NL-HE pump has **no** air vent valve. The suction line and pump are vented via a suitable venting device on the pressure flange of the pump. An optional air vent valve is available.

## WARNING



### Risk of personal injury and property damage due to extremely hot or extremely cold pressurised fluid!

Depending on the temperature of the fluid, when the venting screw is opened completely, extremely hot or extremely cold fluid in liquid or vapour form may escape or shoot out at high pressure. Fluid may shoot out at high pressure depending on the system pressure.

- Make sure the venting screw is in a suitable, secure position.
- Always exercise caution when opening the venting screw.

### Procedure for venting systems where the fluid level lies above the suction port of the pump:

- Open the shut-off device on the pressure side of the pump.
- Slowly open the shut-off device on the suction side of the pump.
- To vent, open the venting screw on the pressure side of the pump or on the pump.
- Close the venting screw as soon as fluid escapes.

### Procedure for filling/venting systems with a non-return valve, where the fluid level lies below the suction port of the pump:

- Close the shut-off device on the pressure side of the pump.
- Open the shut-off device on the suction side of the pump.
- Fill fluid in via a funnel until the suction line and the pump are completely filled.

## 7.3 Checking the direction of rotation

## CAUTION

### Risk of property damage!

Danger of damage to the pump parts that rely on the fluid supply for lubrication.

- Before checking the direction of rotation and commissioning, the pump must be filled with fluid and vented.
- Do not operate the pump with the shut-off devices closed.

The correct direction of rotation is indicated by an arrow on the pump housing. As seen from the motor side, the pump rotates correctly in the clockwise direction.

- Remove coupling guard.
- To check the direction of rotation, disengage the pump from the coupling.
- Switch the motor on **briefly**. The direction of rotation of the motor must correspond to the direction of rotation arrow on the pump.
- If the direction of rotation is wrong, change the electrical connection of the motor.
- Connect the pump to the motor after ensuring the correct direction of rotation.
- Check the alignment of the coupling and realign it if required.
- Reinstall the coupling guard.

## 7.4 Switching on the pump

## CAUTION

### Risk of property damage!

- Do not operate the pump with the shut-off devices closed.
- Only operate the pump within the permissible operating range.

Once all preparatory work has been properly completed and all necessary precautionary measures have been taken, the pump is ready to start.

Before starting up the pump, check whether:

- Filling and ventilation lines are closed.
- The motor is turning in the right direction.

- The coupling guard is attached correctly and is screwed tightly.
- Pressure gauges with a suitable measurement range are installed on the suction and pressure side of the pump. Do not install the pressure gauges on the bends in the piping. The kinetic energy of the fluid can affect the measured values at these points.
- All blind flanges are removed.
- The shut-off device on the suction side of the pump is completely opened.
- The shut-off device in the pressure pipe of the pump is completely closed or only slightly opened.

### WARNING



#### Risk of injury due to high system pressure!

The power and status of the installed centrifugal pumps must be constantly monitored.

- Do **not** connect pressure gauges to a pressurised pump.
- Install pressure gauges on the suction and pressure side.

### NOTICE



It is recommended to attach a flow meter to determine the exact pump delivery rate.

### CAUTION

#### Risk of property damage due to motor overload!

- To start up the pump, use the soft start, star-delta connection or speed control.

- Switch on the pump.
- After reaching the speed, slowly open the shut-off device in the pressure pipe and regulate the pump to the duty point.
- While the pump is starting, vent completely via the venting screw.

### CAUTION

#### Risk of property damage!

If abnormal noises, vibrations, temperatures or leaks occur when starting up:

- Switch the pump off immediately and remedy the cause.

## 7.5 Switching frequency

### CAUTION

#### Risk of property damage!

The pump or motors may be damaged by incorrect switching.

- Only switch on the pump again when the motor is at a complete standstill.

A maximum of 6 connections per hour are permitted in accordance with IEC 60034-1. It is recommended that repeated activations occur at regular intervals.

## 8 Shutdown

### 8.1 Switching off the pump and temporary shutdown

#### CAUTION

##### Risk of property damage due to overheating!

Hot fluids can damage the pump seals when the pump is at a standstill. After deactivating the heat source:

- Allow the pump to run until the fluid temperature has dropped to an appropriate level.

#### CAUTION

##### Risk of property damage due to frost!

If there is a danger of frost:

- Drain the pump completely to avoid damage.

- **Close** the shut-off device in the pressure pipe. If a check valve is installed in the pressure pipe, and there is counter pressure, the shut-off device can remain open.
- Do **not** close the shut-off device in the suction line.
- Switch off the motor.
- If there is no danger of frost, make sure the fluid level is sufficient.
- Operate the pump every month for 5 minutes. Doing this prevents deposits from occurring in the pump compartment.

### 8.2 Shutdown and storage

#### WARNING



##### Risk of injury and damage to property!

- Dispose of the pump contents and rinsing fluid by taking the legal regulations into account.
- Always wear protective clothing, protective gloves and protective goggles when working.

- Clean the pump thoroughly prior to storage!
- Drain the pump completely and rinse thoroughly.
- The remaining fluid and rinsing fluid should be drained, collected and disposed of via the drain plug. Observe local regulations along with the notes under "Disposal"!
- Spray the interior of the pump with a preservative through the suction and discharge ports.
- Close the suction and discharge ports with caps.
- Grease or oil the blank components. For this, use silicone-free grease or oil. Observe the manufacturer's instructions for preservatives.

## 9 Maintenance/repair

It is recommended to have the pump serviced and checked by customer service.

Maintenance and repair work require the pump be partially or completely dismantled. The pump housing can be installed in the piping.

### DANGER



#### Risk of fatal injury due to electrical current!

Improper conduct when carrying out electrical work can lead to death due to electric shock!

- Any work on electrical devices may only be carried out by a qualified electrician.
- Before all work on the unit, deactivate the power supply and guard against accidental switch-on.
- Any damage to the pump connection cable should only ever be rectified by a qualified electrician.
- Observe the installation and operating instructions for the pump, motor and other accessories.
- Reinstall any uninstalled safety devices, such as terminal box covers, once the work is complete.

### WARNING



#### Risk of cutting injuries from sharp edges!

Sharp edges can form on the impeller. There is a risk of cuts and severed limbs!

- Wear cut-protection gloves.

#### 9.1 Personnel qualifications

- Electrical work: A qualified electrician must carry out the electrical work.
- Maintenance tasks: The technician must be familiar with the use of operating fluids and their disposal. In addition, the technician must have basic knowledge of mechanical engineering.

#### 9.2 Operation monitoring

### CAUTION

#### Risk of property damage!

Improper operation can damage the pump or motor. Operating with the shut-off device closed for more than 5 minutes is not recommended and generally dangerous in the case of hot fluids.

- Never allow the pump to run without fluid.
- Do not operate the pump with the shut-off device in the suction line closed.
- Do not operate the pump for a longer period of time with the shut-off device in the pressure pipe closed. This can cause the fluid to over-heat.

The pump must run quietly and vibration-free at all times.

The rolling bearings must run quietly and vibration-free at all times.

Increased current consumption with unchanged operating conditions is a sign of bearing damage. The bearing temperature may be up to 50°C above the ambient temperature, but never rise above 80°C.

- Check the static gaskets and the shaft seal regularly for leakages.
- For pumps with mechanical seals, there is little to no visible leakage during operation. If a gasket is leaking significantly, this is a sign that the gasket surfaces are worn. The gasket must be replaced. The service life of a mechanical seal greatly depends on the operating conditions (temperature, pressure, fluid properties).

- Wilo recommends checking the flexible coupling elements regularly and replacing them at the first sign of wear.
- Wilo recommends briefly putting the standby pumps into operation at least once a week to ensure they are always ready for operation.

### 9.3 Maintenance tasks

The bearing bracket of the pump is equipped with rolling bearings that have lifetime lubrication.

- The rolling bearings of the motors are to be maintained according to the installation and operating instructions of the motor manufacturer.

### 9.4 Draining and cleaning

#### WARNING



##### Risk of injury and damage to property!

- Dispose of the pump contents and rinsing fluid by taking the legal regulations into account.
- Always wear protective clothing, protective gloves and protective goggles when working.

### 9.5 Dismantling

#### DANGER



##### Risk of fatal injury due to electrical current!

Improper conduct when carrying out electrical work can lead to death due to electric shock!

- Any work on electrical devices may only be carried out by a qualified electrician.
- Before all work on the unit, deactivate the power supply and guard against accidental switch-on.
- Any damage to the pump connection cable should only ever be rectified by a qualified electrician.
- Observe the installation and operating instructions for the pump, motor and other accessories.
- Reinstall any uninstalled safety devices, such as terminal box covers, once the work is complete.

Maintenance and repair work require the pump be partially or completely dismantled. The pump housing can be installed in the piping.

- Switch off the energy supply to the pump and secure against switching on again.
- Close all valves in the suction line and pressure pipe.
- Drain the pump by opening the drainage screw and the venting screw.
- Remove coupling guard.
- If present: Remove the intermediate sleeve of the coupling.
- Remove the fastening screws of the motor from the baseplate.

#### NOTICE



Observe the section drawing in the chapter "Spare parts".



### 9.5.1 Dismantling the slide-in unit

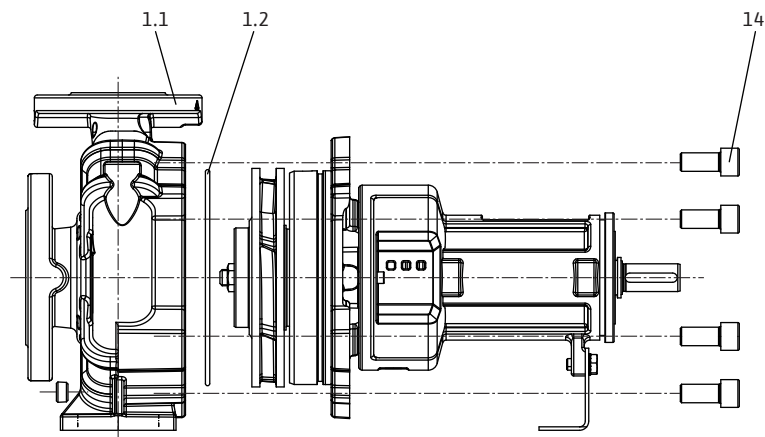


Fig. 18: Removing the slide-in unit

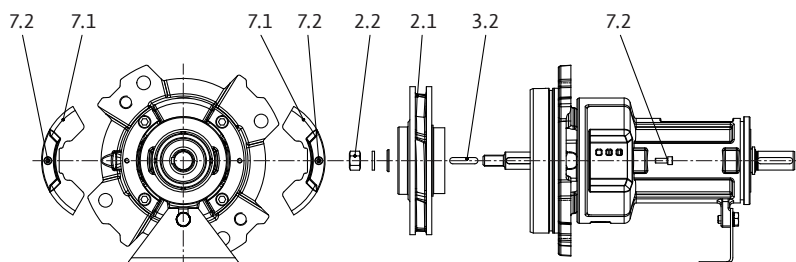


Fig. 19: Dismantling the slide-in unit

1. Mark positions of the parts that belong together with a coloured pen or scribe.
2. Remove the hexagon head screws (14).
3. Carefully pull the slide-in unit straight out of the spiral housing (1.1) to avoid damage to interior parts.
4. Put the slide-in unit down at a safe workplace. To continue dismantling the slide-in unit, fix it **vertically** in position with the drive shaft facing downward. The kit must be removed vertically to avoid damage to the impellers and other parts.
5. Remove the housing seal (1.2).
6. Remove the hexagon head screws (7.2) and remove the protective grid (7.1).
7. Loosen the impeller nut (2.2) and remove along with the lock washer and impeller disc.

#### Version with mechanical seal (optional: mechanical seal on the sleeve)

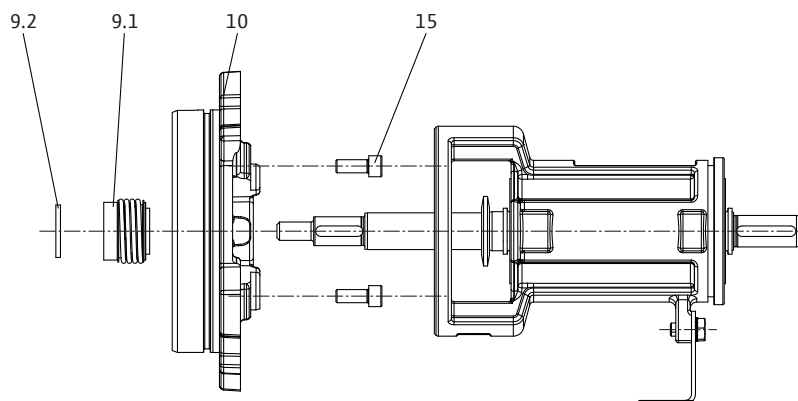


Fig. 20: Version with mechanical seal

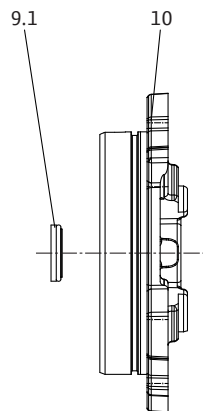


Fig. 21: Housing cover, mechanical seal

1. Remove the spacer (9.2).
2. Remove the rotating part of the mechanical seal (9.1).
3. Loosen the interior hexagonal head screws (15) and remove the housing cover (10).
4. Remove the stationary part of the mechanical seal (9.1).

### 9.5.2 Dismantling the bearing bracket

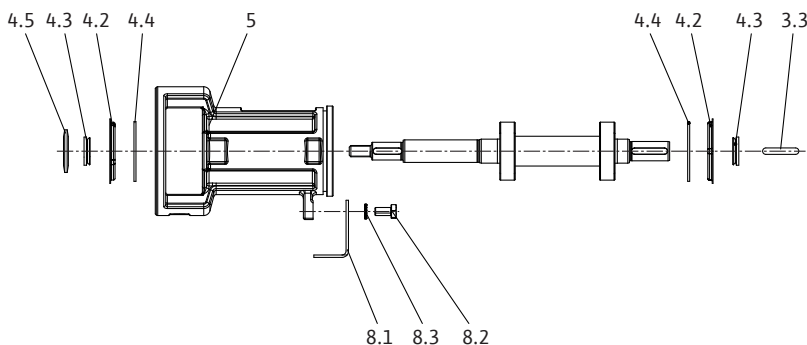


Fig. 22: Bearing bracket

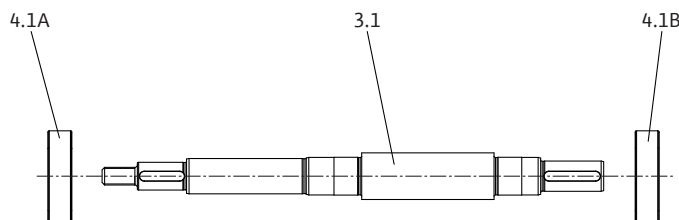


Fig. 23: Shaft

1. Remove the key (3.3).
2. Pull off the thrower (4.5) and V-gaskets (4.3).
3. Remove the bearing cover (4.2) and retaining ring (4.4).
4. Loosen the hexagon head screw (8.2), remove the lock washer (8.3) and remove the pump support foot (8.1).
5. Completely remove the shaft (3.1) from the bearing bracket (5).
6. Remove the ball bearings (4.1A and 4.1B) from the shaft (3.1).

## 9.6 Installation

Installation must be carried out according to the detailed drawings in the “Dismantling” chapter and the general drawings in the “Spare parts” chapter.

- Clean the single components and check them for wear before installing them. Damaged or worn parts must be replaced with original spare parts.
- Coat location points with graphite or similar materials before installation.
- Check the O-rings for damage and replace if necessary.
- Flat gaskets must be constantly replaced.

## DANGER



### Risk of fatal injury due to electrical current!

Proceeding incorrectly when carrying out electrical work can lead to death by electric shock!

- Any work on electrical devices may only be carried out by a qualified electrician.
- Before all work on the unit, deactivate the power supply and secure it against being accidentally switched on again.
- Any damage to the pump connection cable should only ever be repaired by a qualified electrician.
- Observe the installation and operating instructions for the pump, motor and other accessories!
- Reinstall any uninstalled safety devices, such as terminal box covers, once the work is complete!

## NOTICE



Take note of the drawings in the “Spare parts” chapter.

### 9.6.1 Installing the shaft/bearing bracket

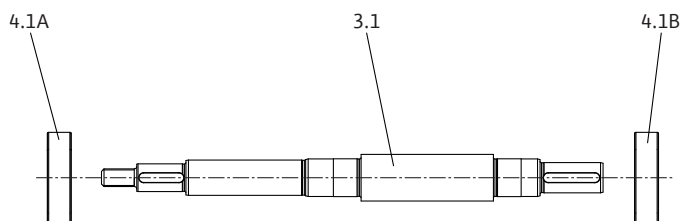


Fig. 24: Shaft

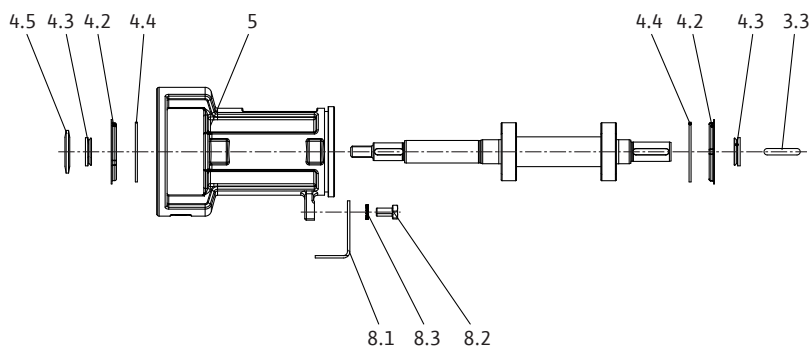


Fig. 25: Bearing bracket

1. Press the ball bearings (4.1A and 4.1B) onto the shaft (3.1).
2. Push the shaft (3.1) into the bearing bracket (5).
3. Insert the retaining rings (4.4) into the groove and the bearing cover (4.2) into the drilled hole of the bearing bracket (5).
4. Push the V-gaskets (4.3) and thrower (4.2) onto the shaft (3.1).
5. Insert the key (3.3) into the shaft nut.
6. Fasten the pump support foot (8.1) with the hexagon head screw (8.2) and lock washer (8.3).

## 9.6.2 Assembling the slide-in unit

### Version with mechanical seal (optional: mechanical seal on the sleeve)

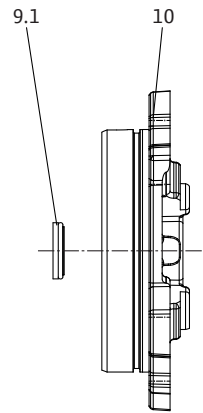


Fig. 26: Housing cover, mechanical seal

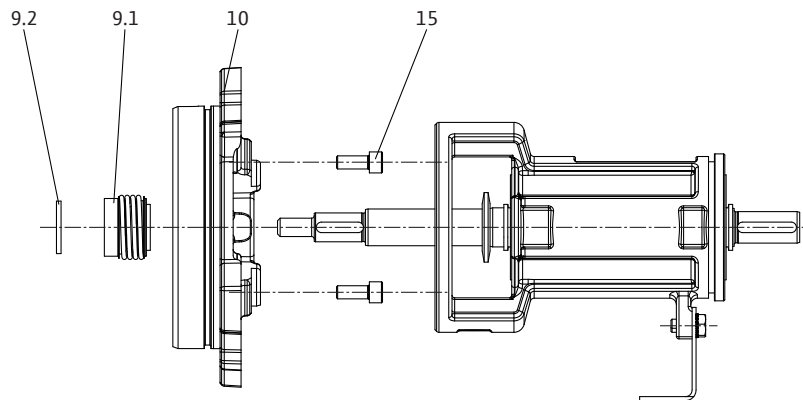


Fig. 27: Version with mechanical seal

1. Clean the stationary ring seat in the housing cover.
2. Insert the stationary part of the mechanical seal (9.1) carefully into the housing cover (10).
3. Optional: Push the sleeve onto the shaft.
4. Screw the housing cover (10) onto the bearing bracket with the interior hexagonal head screws (15).
5. Push the rotating part of the mechanical seal (9.1) onto the shaft (optional: sleeve).
6. Push the spacer (9.2) onto the shaft.

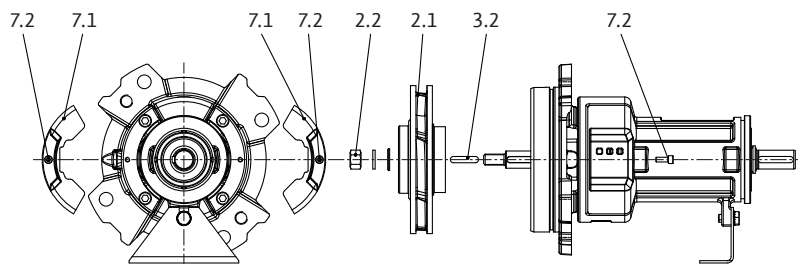


Fig. 28: Fitting the slide-in unit

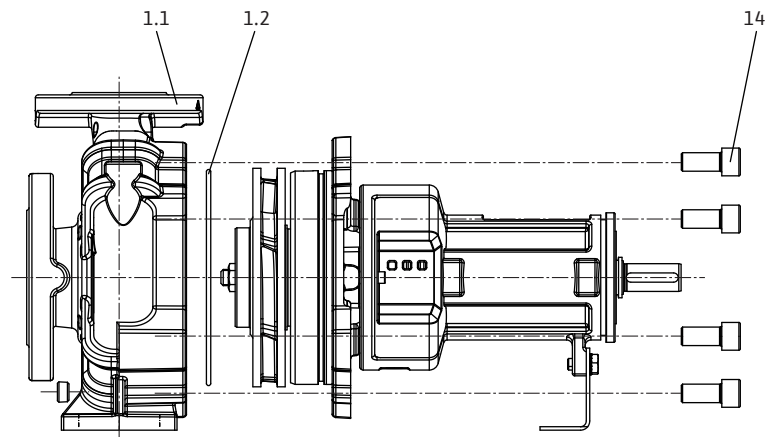


Fig. 29: Inserting the slide-in unit

1. Mark positions of the parts that belong together with a coloured pen or scribe.
2. Mount the impeller disc, impeller (2.1) and key(s) (3.2) on the shaft and tighten with the impeller nut (2.2).
3. Mount the protective grid (7.1) with interior hexagonal head screws (7.2).
4. Put the slide-in unit down at a safe workplace. To continue dismantling the slide-in unit, fix it **vertically** in position with the drive shaft facing downward. The kit must be removed vertically to avoid damage to the impellers and other parts.
5. Insert a new housing seal (1.2).
6. Carefully insert the slide-in unit into the spiral housing (1.1) and tighten with the hexagon head screws (14).

### 9.6.3 Screw tightening torques

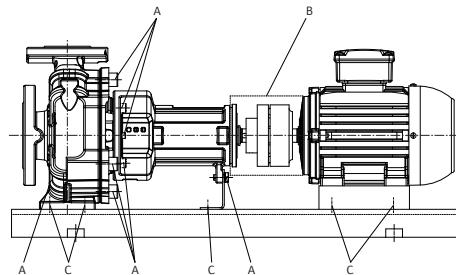


Fig. 30: Screw tightening torques

When tightening the screws, use the following tightening torques.

- A (pump)

Thread:	M8	M10	M12	M16	M20	M24
Tightening torque [Nm]	25	35	60	100	170	350

Table 10: Screw tightening torque A (pump)

- B (coupling): Refer to tables for manufacturer specific tightening torques for adjusting screws and coupling halves in chapter "Coupling alignment".
- C (baseplate): Refer to table "Tightening torques for baseplate bolts (Grade 5, Zinc Plated, Hex Bolts)" in chapter "Alignment of the pump unit".

## 10 Troubleshooting possible causes and remedies

### DANGER



#### **Danger of death due to electrical current!**

Improper conduct when carrying out electrical work can lead to death due to electric shock!

- Disconnect the external power supply before any work.
- Have electrical work carried out by a qualified electrician.
- Observe local regulations.

### WARNING



#### **Risk of injury from rotating components!**

No persons are allowed to be present in the working area of the pump. There is a risk of injury!

- Demarcate and cordon off the working area.
- If there are no persons in the working area, activate the pump.
- If persons enter the working area, switch off the pump immediately.

### WARNING



#### **Risk of cutting injuries from sharp edges!**

Sharp edges can form on the impeller. There is a risk of cuts and severed limbs!

- Wear cut-protection gloves.

#### **Further steps for troubleshooting**

If the points listed here do not rectify the fault, contact customer service. Customer service can assist in the following ways:

- Telephone or written support.
- On-site support.
- Inspection and repair at the factory.

Costs may be incurred if you request customer services! Please contact customer services for more information.

### 10.1 Troubleshooting

#### **Possible error types**

Error type	Description
1	Delivery rate too low
2	Motor overloaded
3	Pump end pressure too high
4	Bearing temperature too high
5	Pump housing leakage
6	Shaft seal leakage
7	Pump does not run smoothly or is loud
8	Pump temperature too high

Table 11: Error types

## 10.2 Causes and remedies

Error type:								Cause	Remedy
1	2	3	4	5	6	7	8		
X								Counter pressure too high	<ul style="list-style-type: none"> <li>– Check system for contaminants</li> <li>– Reset the duty point</li> </ul>
X						X	X	Pump and/or piping not completely filled	<ul style="list-style-type: none"> <li>– Vent pump and fill suction line</li> </ul>
X						X	X	Inlet pressure too low or negative suction head too high	<ul style="list-style-type: none"> <li>– Correct the fluid level</li> <li>– Minimise resistances in the suction line</li> <li>– Clean filter</li> <li>– Reduce negative suction head by installing the pump lower</li> </ul>
X								Incorrect direction of rotation	<ul style="list-style-type: none"> <li>– Change the motor connection phases</li> </ul>
X								Pump sucks air or the suction line is leaky	<ul style="list-style-type: none"> <li>– Replace gasket</li> <li>– Check suction line</li> </ul>
X								Supply line or impeller clogged	<ul style="list-style-type: none"> <li>– Remove clog</li> </ul>
X	X							Pump blocked by loose or jammed parts	<ul style="list-style-type: none"> <li>– Clean pump</li> </ul>
X								Air pockets in the piping	<ul style="list-style-type: none"> <li>– Change the pipe layout or install an air vent valve</li> </ul>
X								Speed too low <ul style="list-style-type: none"> <li>– with frequency converter operation</li> <li>– without frequency converter operation</li> </ul>	<ul style="list-style-type: none"> <li>– Increase frequency in the permissible range</li> <li>– Check voltage</li> </ul>
X	X							Motor running on 2 phases	<ul style="list-style-type: none"> <li>– Check phases and fuses</li> </ul>
	X					X		Counter pressure of the pump too low	<ul style="list-style-type: none"> <li>– Readjust the duty point or adjust the impeller</li> </ul>
	X							The viscosity or density of the fluid is higher than the design value	<ul style="list-style-type: none"> <li>– Check the pump dimensioning (consult with the manufacturer)</li> </ul>
	X		X		X	X	X	The pump is strained	<ul style="list-style-type: none"> <li>– Correct the pump installation</li> </ul>
	X	X						Speed too high	<ul style="list-style-type: none"> <li>– Lower speed</li> </ul>
			X		X	X		Pump unit poorly aligned	<ul style="list-style-type: none"> <li>– Correct alignment</li> </ul>
			X					Thrust too high	<ul style="list-style-type: none"> <li>– Clean the relief bores in the impeller</li> </ul>
			X					Bearing lubrication not sufficient	<ul style="list-style-type: none"> <li>– Check bearing, exchange bearing</li> </ul>
			X					Coupling distance not maintained	<ul style="list-style-type: none"> <li>– Correct the coupling distance</li> </ul>
			X			X	X	– Flow rate too low	<ul style="list-style-type: none"> <li>– Maintain recommended minimum flow rate</li> </ul>
				X				– Housing screws not correctly tightened or gasket defective	<ul style="list-style-type: none"> <li>– Check tightening torque</li> <li>– Replace gasket</li> </ul>

Error type:									Cause	Remedy
1	2	3	4	5	6	7	8			
					X				Leak in mechanical seal	– Replace the mechanical seal
					X				Shaft sleeve (if present) worn	– Replace the shaft sleeve
					X	X			Imbalance of the impeller	– Rebalance the impeller
						X			Bearing damage	– Exchange bearing
						X			Foreign object in the pump	– Clean pump
							X		Pump pumps against closed shut-off device	– Open the shut-off device in the pressure pipe

Table 12: Causes of error and remedies

11 Spare parts

Spare parts may be ordered via a local installer and/or Wilo customer service. List of original spare parts: Refer to the Wilo spare parts documentation and the following information in these installation and operating instructions.

CAUTION

Risk of material damage!

Trouble-free pump operation can only be guaranteed when original spare parts are used.  
Use only original Wilo spare parts!  
Information to be provided when ordering spare parts: Spare part numbers, spare part designations, all data from pump and drive rating plate.  
This helps prevent return queries and incorrect orders.



## 11.1 Spare parts list

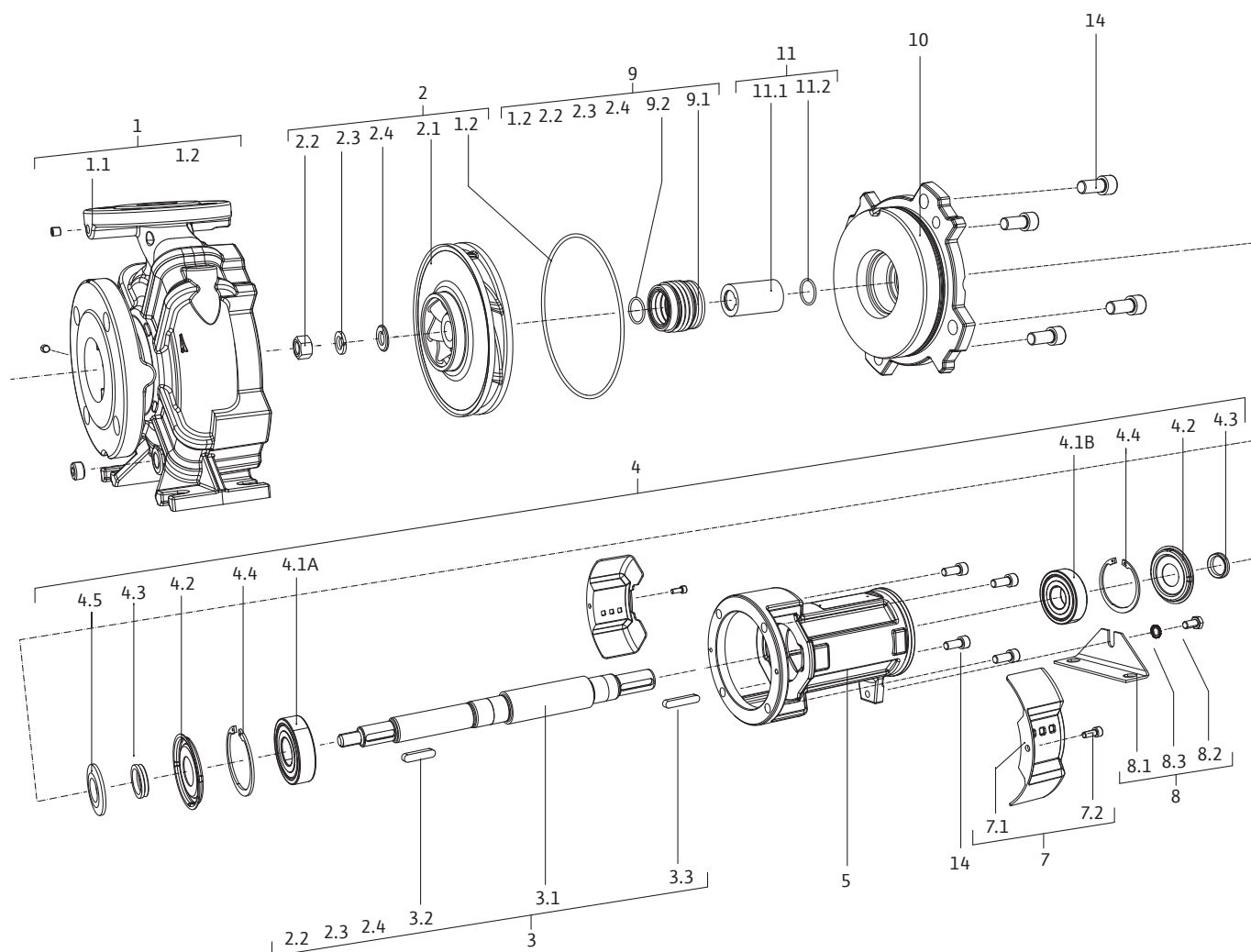


Fig. 31: Pump with mechanical seal

Item no.	Description	Number	Safety-relevant
1.1	Pump housing	1	
1.2	Flat gasket	1	X
2.1	Impeller	1	
2.2	Nut	1	
2.3	Disc	1	
2.4	Disc	1	
3.1	Shaft	1	
3.2	Key	1	
3.3	Key	1	
4.1A	Ball bearing	1	X
4.1B	Ball bearing	1	X
4.2	Cover	1	
4.3	V-gasket	1	
4.4	Retaining ring	1	
4.5	Thrower	1	

Item no.	Description	Number	Safety-relevant
5	Bearing bracket housing	1	
7.1	Shaft protection kit	2	
7.2	Screw	2	
8.1	Supporting foot	1	
8.2	Screw	1	
8.3	Disc	1	
9.1	Mechanical seal	1	X
9.2	Disc	1	
10	Discharge cover	1	
14	Screw	4	
15	Screw	4	

Table 13: Spare parts list, version with mechanical seal

12 Disposal

- 12.1

Oils and lubricants

Operating fluid must be collected in suitable tanks and disposed of in accordance with the locally applicable guidelines.
- 12.2

Water-glycol mixture

When disposing of this mixture, the locally applicable guidelines must be observed.
- 12.3


Protective clothing

Used protective clothing must be disposed of in accordance with the locally applicable guidelines.
- 12.4

Information on the collection of used electrical and electronic products

Proper disposal and appropriate recycling of this product prevents damage to the environment and danger to your personal health.

NOTICE



Disposal in domestic waste is prohibited!

In the European Union this symbol may be included on the product, the packaging or the accompanying documentation. It means that the electrical and electronic products in question must not be disposed of along with domestic waste.

Please note the following points to ensure proper handling, recycling and disposal of the used products in question:

- Hand over these products at designated, certified collection points only.
- Observe the locally applicable regulations!

Please consult your local municipality, the nearest waste disposal site, or the dealer who sold the product to you for information on proper disposal. See [www.wilo-recycling.com](http://www.wilo-recycling.com) for more information about recycling.

Subject to change without prior notice!





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