

Wilo Motor T 17.3, 20.2: EMU FA, Rexa SUPRA, Rexa SOLID



en Installation and operating instructions



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1 General information

1.1 About these instructions

These instructions form part of the product. Adherence to these instructions is a requirement for the intended use and correct operation of the product:

- Carefully read the instructions prior to any activities on and with the product.
- Keep the instructions in an accessible place at all times.
- Observe all product specifications and labels on the device.

The language of the original operating instructions is German. Versions of these instructions in any other language are translations of the original operating instructions.

1.2 Copyright

Copyright remains with Wilo. Do not:

- Reproduce any content.
- Distribute any content.
- Use any content for competition purposes without authorisation.

Wilo shall reserve the right to change the listed data without notice and shall not be liable for technical inaccuracies and/or omissions.

1.3 Subject to change

Wilo shall reserve the rights to make technical changes to the product and individual components. The illustrations used may differ from the original and are intended as a sample representation of the device.

1.4 Exclusion from warranty and liability

Wilo shall specifically not assume any warranty or liability in the following cases:

- Inadequate configuration due to inadequate or incorrect instructions by the operator or the client
- Non-compliance with these instructions
- Improper use
- Incorrect storage or transport
- Incorrect installation or dismantling
- Insufficient maintenance
- Unauthorised repairs
- Inadequate construction site
- Chemical, electrical or electrochemical influences
- Wear

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 the 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 observe the safety instructions will result in serious injuries or death!

→ WARNING!

Failure to follow the instructions can lead to (serious) injuries!

→ CAUTION!

Failure to follow the instructions can lead to property damage and a possible total loss.

→ NOTICE!

Useful information on handling the product

Markups

✓ Prerequisite

1. Work step/list

⇒ Notice/instructions

► Result

Symbols

These instructions use the following symbols:



Danger caused by electric voltage



Danger of bacterial infection



Danger caused by strong magnetic field



Danger of explosion



Danger caused by explosive atmosphere



General warning symbol



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 safety footwear



Personal protective equipment: wear protective gloves



Personal protective equipment: wear face mask



Personal protective equipment: wear safety goggles



Working alone is prohibited! A second person must be present.



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: The technician must be trained in the use of the necessary tools and fixation materials for the relevant construction site.
- 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.

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.
- Before commencing work, disconnect the product from the mains and safeguard it from being switched on again.
- Observe applicable local regulations when connecting to the mains power supply.
- Adhere to the requirements of the local energy supply company.
- Train personnel in connecting electrics.
- Instruct personnel in options for switching off the device.
- Comply with the technical specifications contained in these installation and operating instructions and on the rating plate.
- Earth the device.
- Observe regulations for connection to the electrical switching system.
- 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 (e.g. shielded cables, filters etc.).
- Replace defective connection cables. Contact customer service.

2.4 Monitoring devices

The following monitoring devices must be provided on-site:

Circuit breaker

The size and switching characteristics of the circuit breakers must conform to the rated current of the connected product. Observe local regulations.

Motor protection switch

Make provision for an on-site motor protection switch for devices without a plug! The minimum requirement is a thermal relay/motor protection switch with temperature compensation, differential triggering and anti-reactivation device in accordance with the local regulations. In case of sensitive mains, make provision for the installation on-

site of other protective equipment (e.g. overvoltage, undervoltage or phase failure relay, etc.).

Residual-current device (RCD)

Comply with the regulations of the local energy supply company! The use of a residual-current device is recommended.

If persons come into contact with the device and conductive fluids, secure the connection **with** a residual-current device (RCD).

2.5 Use in fluids hazardous to health

There is a danger of bacterial infection when using the device in fluids hazardous to health! Thoroughly clean and disinfect the device after dismantling and prior to further use. The operator must ensure the following:

- The following protective equipment is provided and worn when cleaning the device:
 - Closed safety goggles
 - Breathing mask
 - Protective gloves
- All persons are informed about the fluid, the associated danger and its correct handling!

2.6 Permanent magnet motor

Permanent magnet motors are driven by a permanently magnetised rotor. Please note the following when using permanent magnet motors:

→ Magnet and magnetic field

There is no risk from magnets and the magnetic field as long as the motor housing is closed. Persons with a pacemaker are also not at any particular risk. Screw plugs can be undone for maintenance purposes without hesitation. Do not open the motor housing! Only customer service staff are permitted to work on an open motor!

→ Generator operation

The motor generates an inductive voltage if the rotor is driven without electrical energy (e.g. when the fluid returns). In this case, the connection cable is live. Once the pump has been connected, energy is fed back into the connected frequency converter. Implement the following options to prevent destruction of the frequency converter and motor as a result of overvoltage:

- Feed back input energy into the supply network.
- Dissipate input energy using a brake resistor.

2.7 Transport

- Wear the following protective equipment:
 - Safety shoes
 - Safety helmet (when using lifting equipment)
- Always hold the handle to transport the device. Never pull the device by the connection cable!
- Only use legally specified and approved lifting gear.
- Select the lifting gear based on the prevailing conditions (weather, attachment point, load, etc.).
- Always attach the lifting gear to the attachment points (handle or lifting eye).
- 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).
- Persons must not stand underneath suspended loads. Do **not** move suspended loads over workplaces where people are present.

2.8 Installing/dismantling

- Wear the following protective equipment:
 - Safety shoes
 - Safety gloves for protection against cuts
 - Safety helmet (when using lifting equipment)
- Locally applicable laws and regulations for work safety and accident prevention must be complied with.
- Disconnect the device from the mains and secure it against being switched on again without authorisation.
- All rotating parts must be at a standstill.
- Provide adequate aeration in closed rooms.
- When working in chambers and closed spaces, a second person must be present for safety reasons.
- Take immediate countermeasures if there is a build-up of toxic or suffocating gases!
- Clean the device thoroughly. Disinfect devices that are used in fluids hazardous to health!

2.9 During operation

- Make sure that there is no risk of explosion when carrying out any type of welding work or work with electrical devices.
- Wear the following protective equipment:
 - Safety footwear
 - Hearing protection (in accordance with work regulations notice)
- The work area in which the device is used is not a recreational area. No persons are allowed in the work area during operation.
- Depending on the process, the product is switched on and off using separate controls. The product may automatically switch on following power cuts.
- Users must immediately notify the person in charge of every fault or irregularity.
- 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
- Do not reach into the suction port. The rotating parts can crush and sever limbs.
- If the motor emerges during operation, the motor housing can heat up to above 40 °C (104 °F).
- Open all gate valves in the piping on both the suction and pressure sides.
- Ensure minimum water submersion by using dry-running protection.
- Under normal operating conditions, the sound-pressure level of the product is below 85 dB(A). However, the actual sound-pressure level depends on several factors:
 - Installation depth
 - Installation
 - Fixation of accessories and piping
 - Duty point
 - Immersion depth
- If the device is operated under normal operating conditions, the operator must measure the sound pressure. From a sound-pressure level of 85 dB(A), wear hearing protection and mark out the working area!

2.10 Maintenance tasks

- Wear the following protective equipment:
 - Closed safety goggles
 - Safety shoes
 - Safety gloves for protection against cuts
- Always carry out maintenance tasks outside the operating space/installation site.
- Only carry out maintenance tasks mentioned in these installation and operating instructions.
- Only original parts from the manufacturer may be used for maintenance and repairs. Use of parts other than the 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.
- Store tools at the designated locations.
- After completing work, reattach all safety and monitoring devices and check that they function properly.

Changing operating fluid

In case of a defect, a pressure **of several bar can build up** in the motor! This pressure escapes when the screw plugs are **opened**. If screw plugs are opened without due caution, they can be ejected at high speed! To avoid injuries, observe the following instructions:

- Adhere to the prescribed sequence of work steps.
 - Unscrew the screw plugs slowly, but never unscrew them completely. As soon as the pressure escapes (audible whistling or hissing of air), stop turning the screw plug any further.
- WARNING! Hot operating fluids can also spray out when the pressure is escaping. This can result in scalding! To avoid injuries, allow the motor to cool down to the ambient temperature before carrying out any work!**
- When the pressure has completely dissipated, fully unscrew the screw plug.

2.11 Operating fluid

In the sealing chamber, the motor is filled with white oil. Operating fluid must be replaced during regular maintenance work and disposed off according to the local guidelines.

2.12 Operator responsibilities

- Installation and operating instructions must be in a language which the personnel can understand.
- Make sure that the personnel is relevantly trained for the specified work.
- Provide the necessary protective equipment and make sure that the personnel wears it.
- Safety and information signs mounted on the device must be always legible.
- Train the personnel pertaining to the functioning of the system.
- Eliminate risk from electrical current.
- Equip hazardous components inside the system with an on-site guard.
- Identify and cordon off the work area.
- To ensure safe working practice, define the responsibilities of the employees.

Children and persons younger than 16 years or with reduced physical, sensory or mental capacities or limited experience are prohibited from handling the product! A technician must supervise persons younger than 18 years!

3 Application/use

3.1 Intended use

Submersible pumps are suitable for pumping:

- Sewage containing faeces
- Wastewater (with small amounts of sand and gravel)
- Process sewage
- Fluids with dry matter up to max. 8 %

3.2 Improper use



DANGER

Explosion due to pumping of explosive fluids!

Pumping of highly flammable and explosive fluids (gasoline, kerosene, etc.) in pure form is strictly prohibited. There is a risk of fatal injury due to explosion! The pumps are not designed for these fluids.



DANGER

Danger due to fluids hazardous to health!

If the pump is used in fluids hazardous to health, decontaminate the pump after dismantling and before carrying out any other work! There is a risk of fatal injury! Observe the specifications in the work regulations! The operator must make sure that the personnel have received and read the work regulations!

The submersible pumps must **not be used** for pumping:

- Drinking water
- Fluids containing hard components (such as stones, wood, metal, etc.)
- Fluids containing large quantities of abrasive contents (e.g. sand, gravel)

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

Submersible sewage pump as submersible monobloc unit for wet well and dry well installation.

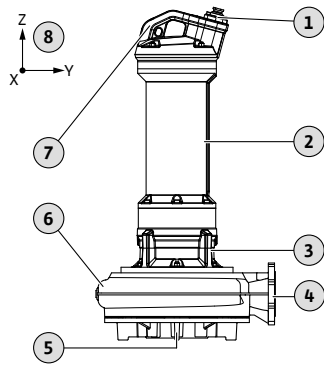


Fig. 1: Sample illustration

4.1.1 Hydraulics

Centrifugal hydraulics with different impeller shapes, horizontal flange connection on the pressure side, casing and impeller wear rings.

The hydraulics are **not** self-priming, in other words, the fluid must flow in either automatically or with supply pressure.

Impeller shapes

The individual impeller shapes depend on the size of the hydraulics and not every impeller shape is available for every hydraulic system. The following is an overview of the different impeller shapes:

- Vortex impeller
- Single-channel impeller
- Two-channel impeller
- Three-channel impeller
- Four-channel impeller
- SOLID impellers, closed or half open

Casing and impeller wear rings (depending on the hydraulics)

The suction port and impeller are subjected to the most stress when pumping. In the case of channel impellers, the gap between the impeller and the suction port is an important factor for constant efficiency. The larger the gap between the impeller and the suction port, the higher the losses in the delivery rate. The efficiency decreases and the danger of clogging increases. In order to ensure long and efficient operation of the hydraulics, an impeller wear ring and/or neck ring is installed depending on the impeller and the hydraulics.

→ Impeller wear ring

The impeller wear ring is attached to the channel impellers and protects the incoming flow edge of the impeller.

→ Neck ring

The neck ring is installed in the suction port of the hydraulics and protects the incoming flow edge in the centrifugal chamber.

If worn, customer service can simply replace both components.

4.1.2 Motor

Surface-cooling, asynchronous or permanent magnet motor as three-phase current version. The motor is cooled by the fluid around it. The waste heat is transferred directly to the fluid or the ambient air via the motor housing. The motor may emerge during operation, dry well installation is possible. **NOTICE! Output and activation times must be adapted to prevent the motor from overheating in dry well installation!** The connection cable has bare cable ends.

Motor fittings overview

	Asynchronous motor	Permanent magnet motor	
	T 20.2	T 17.3...-P	T 20.2...-P
Design type	Asynchronous	Synchronous	Synchronous
Max. efficiency category (based on IEC 60034)	IE3	IE5	IE5
Operation with frequency converter	o	! (Wilo-EFC)	! (Wilo-EFC)
Digital Data Interface	o	•	•
Immersed operating mode	S1	S1	S1

	Asynchronous motor	Permanent magnet motor	
	T 20.2	T 17.3...-P	T 20.2...-P
Non-immersed operating mode	S2*	S2*	S2*
Dry well installation operating mode	S2*	S2*	S2*
Upper rolling bearings: permanently lubricated, low-maintenance	•	•	•
Lower rolling bearings: permanently lubricated, low-maintenance	•	•	•
Connection cable sealed as longitudinally wa- tertight	•	•	•

! = Required/mandatory, • = Standard, o = Optional, – = Not available

* The operation duration in minutes depends on the motor power, see rating plate.

4.1.3 Seal

Different methods are used for the seal to the fluid and the motor compartment:

- Version "G": two separate mechanical seals
- Version "K": two mechanical seals in a block seal cartridge made of stainless steel

Leakage from the seal is caught in the sealing chamber or leakage chamber:

- The sealing chamber accommodates any possible leakage of the seal on the fluid side.
This sealing chamber is filled with medicinal white oil ex works.
- The leakage chamber accommodates any possible leakage of the seal on the motor side.
The leakage chamber is empty ex works.

CAUTION! In the case of motors without an additional leakage chamber, the leakage from the seal on the motor side is taken up in the motor!

Overview of gasket and leakage chamber

	Asynchronous motor	Permanent magnet motor	
	T 20.2	T 17.3...-P	T 20.2...-P
Sealing chamber	•	•	•
Leakage chamber	•	–	•

• = Standard, – = Not available

4.1.4 Material

The following materials are used in the standard version:

- Pump housing: grey cast iron
- Impeller: grey cast iron
- Motor housing: grey cast iron
- Seal on the motor side:
 - "G" = Carbon/ceramic or SiC/SiC
 - "K" = SiC/SiC
- Seal on the fluid side: SiC/SiC
- Static seal: FKM (ASTM D 1418) or NBR (nitrile)

The precise details of the materials used are shown in the respective configuration.

4.2 Digital Data Interface



NOTICE

Note the instructions for the Digital Data Interface!

Read the separate instructions for the Digital Data Interface and comply with them.

The Digital Data Interface is a communication module with integrated web server that has been integrated in the motor. It is accessed and controlled in an Internet browser using a graphical user interface. The user interface enables easy pump configuration, control and monitoring. Different sensors may have been installed in the pump for this purpose. External signal transmitters may also input additional system parameters in the control. The Digital Data Interface is capable of the following, depending on the system mode:

- Pump monitoring.

- Controlling the pump with a frequency converter.
- Controlling the complete system with up to four pumps.

4.3 Monitoring devices

Overview of monitoring devices

	Asynchronous motor		Permanent magnet motor	
	T 20.2	T 20.2	T 17.3...-P	T 20.2...-P
Internal monitoring devices				
Digital Data Interface	–	•	•	•
Motor winding: Bimetallic strip	•	–	–	–
Motor winding: PTC	o	• (+ 1...3x Pt100)	• (+ 1...3x Pt100)	• (+ 1...3x Pt100)
Motor bearings: Pt100	o	o	o	o
Sealing chamber: conductive sensor	–	–	–	–
Sealing chamber: capacitive sensor	–	•	•	•
Leakage chamber: Float switch	•	–	–	–
Leakage chamber: capacitive sensor	–	•	–	•
Vibration sensor	–	•	•	•
External monitoring devices				
Sealing chamber: conductive sensor	o	–	–	–

• = Standard, – = Not available, o = Optional

All the monitoring devices fitted must always be connected!

4.3.1 Motor without Digital Data Interface

Motor winding monitoring

Thermal motor monitoring protects the motor winding from overheating. A temperature limiter with a bimetallic strip is fitted as standard. Once the activation temperature has been reached, deactivation with reactivation lock must take place.

Optionally, the temperature can also be measured using a PTC sensor. Thermal motor monitoring can also be designed as temperature control. This allows two temperatures to be measured. Once the low activation temperature has been reached, an automatic reactivation can be initiated after the motor has cooled down. The unit is forced to deactivate with reactivation lock once the high activation temperature has been reached.

External monitoring of the sealing chamber

The sealing chamber can be equipped with an external pencil electrode. The electrode registers fluid ingress through the mechanical seal on the fluid side. An alarm or deactivation of the pump can therefore take place by pump control.

Leakage chamber monitoring

The leakage chamber is equipped with a float switch. The float switch registers fluid ingress through the mechanical seal on the motor side. An alarm or deactivation of the pump can therefore take place by pump control.

Monitoring of motor bearing

The thermal monitoring of the motor bearing protects the roller bearings against overheating. Pt100 sensors are used for temperature measurement.

4.3.2 Motor with Digital Data Interface



NOTICE

Note the instructions for the Digital Data Interface!

Read the separate instructions for the Digital Data Interface and comply with them.

The Digital Data Interface evaluates all available sensors. Use the graphical user interface of the Digital Data Interface to display current values and set the limit parameters. A warning message or alarm signal is output upon exceeding the limit parameters. The motor winding additionally features PTC sensors to enable secure pump deactivation.

4.4 Operating modes

Operating mode S1: Continuous duty

The pump can operate continuously at the rated load without exceeding the permissible temperature.

Operating mode: Non-immersed operation

The "non-immersed operation" operating mode describes the possibility of the motor emerging during the drainage pumping sequence. This allows a further lowering of the water level as far as the upper edge of the hydraulics.

Observe the following points during non-immersed operation:

- Operating mode "non-immersed" indicated
The motor emerging in "non-immersed" operating mode is permissible.
- Operating mode: "non-immersed" **not** indicated
If the motor is fitted with a temperature controller (2-circuit temperature monitoring), emergence of the motor is permitted. Automatic reactivation can be initiated after the motor has cooled down using the low temperature. The unit is forced to deactivate with reactivation lock once the high-temperature has been reached.
CAUTION! To protect the motor winding from overheating, the motor must be equipped with a temperature controller! If only one temperature limiter is installed, the motor must not emerge during operation.
- Motor with integrated Digital Data Interface
The motor can be run in emerged mode. The framework parameters are specified using the "Non-immersed operation" function on the user interface.
- Max. fluid and ambient temperature: The maximum ambient temperature corresponds to the maximum fluid temperature shown on the rating plate.

4.5 Operation with frequency converter

4.5.1 Asynchronous motor

It is possible to operate asynchronous motors at the frequency converter. The frequency converter must feature the following connections at a minimum:

- Bimetallic strip and PTC sensor
- Moisture probe
- Pt100 sensor (if motor bearing monitoring is available!)

Refer to section entitled "Frequency converter operation [► 52]" for additional requirements and comply with these!

If the motor features a Digital Data Interface, also guarantee the following prerequisites:

- Network: Ethernet 10BASE-T/100BASE-TX, IP-based
- Protocol support: Modbus TCI/IP

Refer to the separate instructions for the Digital Data Interface for detailed requirements!

4.5.2 Permanent magnet motor

Guarantee the following conditions when operating permanent magnet motors:

- Frequency converter with connection for PTC sensor
- Network: Ethernet 10BASE-T/100BASE-TX, IP-based
- Protocol support: Modbus TCI/IP

Refer to the separate instructions for the Digital Data Interface for detailed requirements!

Permanent magnet motors have been approved for operation with the following frequency converters:

- Wilo-EFC

Other frequency converters on request!

4.6 Operation in an explosive atmosphere

	Asynchronous motor	Permanent magnet motor	
	T 20.2	T 17.3...-P	T 20.2...-P
Approval according to IEC-Ex	o	o	o
ATEX approval	o	o	o

	Asynchronous motor	Permanent magnet motor	
	T 20.2	T 17.3...-P	T 20.2...-P
FM approval	o	o	o
CSA-Ex approval	–	–	–

Key

– = Not available/possible, o = Optional, • = Standard

For use in explosive atmospheres, the pump must be marked as follows on the rating plate:

→ “Ex” symbol of the corresponding approval

→ Ex classification

For the relevant requirements, refer to the explosion protection chapter in the appendix of these installation and operating instructions!

ATEX approval

The pumps are suitable for operation in potentially explosive atmospheres:

→ Device group: II

→ Category: 2, zone 1 and zone 2

These pumps must not be used in zone 0!

FM approval

The pumps are suitable for operation in potentially explosive atmospheres:

→ Protection class: Explosionproof

→ Category: Class I, Division 1

Notice: If the cabling is carried out according to Division 1, installation in Class I, Division 2 is also permitted.

4.7 Rating plate

The following section provides an overview of the abbreviations and associated data on the rating plate:

Rating plate designation	Value
P-Type	Pump type
M-Type	Motor type
S/N	Serial number
Art.-No.	Article number
MFY	Date of manufacture*
Q_N	Volume flow duty point
Q_{max}	Max. volume flow
H_N	Delivery head duty point
H_{max}	Max. delivery head
H_{min}	Min. delivery head
n	Speed
T	Max. fluid temperature
IP	Protection class
I	Rated current
I_{ST}	Starting current
I_{SF}	Rated current at service factor
P_1	Power consumption
P_2	Rated power
U	Rated voltage
U_{EMF}	Inductive voltage
f	Frequency
f_{op}	Max. operating frequency

Rating plate designation	Value
Cos φ	Motor efficiency
SF	Service factor
OT _s	Operating mode: immersed
OT _E	Operating mode: non-immersed
AT	Starting mode
IM _{org}	Impeller diameter: original
IM _{korr}	Impeller diameter: corrected

*The date of manufacture is stated in accordance with ISO 8601: JJJJWWww

→ JJJJ = year

→ W = abbreviation for week

→ ww = calendar week

4.8 Type key

Type keys vary between individual hydraulics. The following section lists individual type keys.

4.8.1 Hydraulics type key: EMU FA

Example: Wilo-EMU FA 15.52-245E	
FA	Sewage pump
15	x10 = Nominal diameter of pressure connection
52	Internal performance coefficient
245	Original impeller diameter (for standard variants only, omitted for configured pumps)
D	Impeller shape: W = Vortex impeller E = Single-channel impeller Z = Two-channel impeller D = Three-channel impeller V = Four-channel impeller T = Closed two-channel impeller G = Half-open single-channel impeller

4.8.2 Hydraulics type key: Rexa SUPRA

Example: Wilo-Rexa SUPRA-V10-736A	
SUPRA	Sewage pump
V	Impeller shape: V = Vortex impeller C = Single-channel impeller M = Multi-channel impeller
10	x10 = Nominal diameter of pressure connection
73	Internal performance coefficient
6	Characteristic curve number
A	Material version: A = Standard version B = Corrosion protection 1 D = Abrasion protection 1 X = Special configuration

4.8.3 Hydraulics type key: Rexa SOLID

Example: Wilo-Rexa SOLID-Q10-768A	
SOLID	Sewage pump with SOLID impeller
Q	Impeller shape: T = Closed two-channel impeller G = Half-open single-channel impeller Q = Half-open two-channel impeller
10	x10 = Nominal diameter of pressure connection
76	Internal performance coefficient

Example: Wilo-Rexa SOLID-Q10-768A

8	Characteristic curve number
A	Material version: A = Standard version B = Corrosion protection 1 D = Abrasion protection 1 X = Special configuration

4.8.4 Motor type key: T motor**Example: T 20.2M-4/32GX-P5**

T	Surface-cooled motor
20	Size
2	Configuration version
M	Shaft design
4	Number of poles
32	Package length in cm
G	Seal version
X	Ex-rated
P	Motor design: - None = Standard asynchronous motor - E = Highly efficient asynchronous motor - P = Permanent magnet motor
5	IE efficiency class (based on IEC 60034-30): None = IE0 to IE2 3 = IE3 4 = IE4 5 = IE5

4.9 Scope of delivery**Standard pump**

- Pump with bare cable end
- Installation and operating instructions

Configured pumps

- Pump with bare cable end
- Cable length as per customer request
- Mounted accessories, e.g. external pencil electrode, pump support foot, etc.
- Installation and operating instructions

4.10 Accessories

- Suspension unit
- Pump support foot
- Special versions with Ceram coatings or special materials
- External pencil electrode for sealing chamber control
- Level control devices
- Fixation accessories and chains
- Switchgear, relays and plugs

5 Transportation and storage**5.1 Delivery**

After receiving the shipment, this must be checked immediately for defects (damage, completeness). Defects must be noted on the freight documentation! Furthermore, 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



WARNING

Standing under 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!



WARNING

Head and foot injuries due to a lack of protective equipment!

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

- Safety shoes
- Safety helmet must be worn if lifting equipment are 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!

Only remove the outer packaging at the place of utilisation to ensure that the pump is not damaged during transport. Use tear-proof plastic sacks of sufficient size to package used pumps for transport in a leak-proof manner.

The following points must also be observed:

- Adhere to the applicable national safety regulations.
- Use legally specified and approved lifting gear.
- Select the lifting gear based on the existing conditions (weather, attachment point, load, etc.).
- Only attach the lifting gear to the attachment point. Fix with a shackle.
- Use lifting equipment with sufficient bearing capacity.
- The stability of the lifting equipment must be ensured during operation.
- 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).

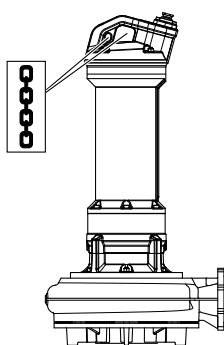


Fig. 2: Attachment point

5.3 Storage



DANGER

Danger due to fluids hazardous to health!

If the pump is used in fluids hazardous to health, decontaminate the pump after dismantling and before carrying out any other work! There is a risk of fatal injury! Observe the specifications in the work regulations! The operator must make sure that the personnel have received and read the work regulations!



WARNING

Sharp edges on the impeller and suction port!

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.

CAUTION**Permanent magnet motors: Connection wire may be live!**

Turning the rotor may mean a voltage applies at the connection wires. Insulate connection wires and do not short circuit!

CAUTION**Total damage due to moisture ingress**

The ingress of moisture into the connection cable damages the cable and the pump! Never immerse the ends of the connection cable in fluid. Seal them tightly during storage.

Newly delivered pumps can be stored for one year. Contact customer service before storing the device for more than one year.

When storing the pump, please note the following points:

- Place the pump upright (vertical) on a firm bearing surface. **Secure the pump against falling over and slipping!**
- The max. storage temperature is -15 °C to $+60\text{ °C}$ (5 °F to 140 °F). The max. relative humidity is 90 %, non-condensing. We recommend frost-proof storage. Ambient temperature: $5\text{ to }25\text{ °C}$ ($41\text{ to }77\text{ °F}$), relative humidity: 40 to 50 %.
- Do not store the pump in rooms in which welding work is carried out. The resulting gases or radiation can corrode the elastomer parts and coatings.
- Seal the suction and pressure connection tightly.
- Protect the connection cable against kinking and damage. Maintain a constant bend radius!
- Impellers must be turned by 180° at regular intervals (3 – 6 months). This prevents the bearings from jamming and renews the lubrication film on the mechanical seal.
- WARNING! There is a risk of injury due to sharp edges on the impeller and suction port!**
- Elastomer parts and the coating are subject to natural brittleness. Contact customer service if the mixer has to be stored for more than 6 months.

After storage, remove any dust and oil from the pump and check the coating for damage. Repair damaged coatings before further use.

6 Installation and electrical connection

6.1 Personnel qualifications

- Electrical work: A qualified electrician must carry out the electrical work.
- Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials for the relevant construction site.

6.2 Installation types

- Vertical stationary wet well installation
- Vertical portable wet well installation
- Vertical stationary dry well installation

The following installation types are **not** permitted:

- Horizontal installation

6.3 Operator responsibilities

- Observe locally applicable accident prevention and safety regulations of 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.
- Observe local sewage technology regulations for the operation of sewage systems.
- Avoid pressure surges!
Pressure surges can occur in long pressure pipes with steep terrain. These pressure surges can lead to the destruction of the pump!
- Ensure the cooling time of the motor depending on the operating conditions and the size of the pump chamber.
- Structural components and foundations must be of sufficient stability in order to allow the device to be fixed securely and functionally. The operator is responsible for the provision and suitability of the structural component/foundation!

- Check that the available consulting documents (installation plans, design of the operating space, inflow conditions) are complete and correct.

6.4 Installation



DANGER

Permanent magnet motors: Risk of fatal injury caused by inductive voltage!

The motor generates an inductive voltage if the rotor is driven without electrical energy (e.g. when the fluid returns). In this case, the connection cable is live. There is a risk of fatal injury caused by electric shock! Earth the connection cable prior to making the connection and dissipate inductive voltage!



DANGER

Risk of fatal injury due to dangerous lone working practices!

Work in chambers and narrow rooms as well as work involving risk of falling are dangerous work. Such work may not be carried out autonomously! A second person must be present for safety reasons.



WARNING

Hand and foot injuries due to lack of protective equipment!

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

- Safety gloves for protection against cuts
- Safety shoes
- Safety helmet must be worn if lifting equipment are 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!

- Prepare the operating space/installation location as follows:
- Clean, free of coarse solids
 - Dry
 - Frost-free
 - Decontaminated
- Take immediate countermeasures if there is a build-up of toxic or suffocating gases!
- Attach the lifting gear to the attachment point using a shackle. Only use lifting gear that has been technically approved.
- Use lifting gear for lifting, lowering and transporting the pump. Do not pull the pump by the connection cable!
- It must be possible to attach the lifting equipment safely. The storage location and the operating space/installation site must be accessible by the lifting equipment. The set-down location must have a firm surface.
- Routed connection cables must enable safe operation. Check whether the cable cross-section and the cable length are sufficient for the selected installation type.
- The corresponding IP class must be observed when using switchgears. Install the switchgear in an overflow-proof position and away from potentially explosive atmosphere areas!
- Avoid air intake into the fluid, use baffles or deflector plates for the inlet. Air that has entered the system can collect in the pipe system and lead to impermissible operating conditions. Air pockets must be removed using the ventilation systems!
- Do not allow the pump to dry run! Avoid air pockets in the hydraulics housing or in the pipe system. Ensure that the water never falls below the minimum level. The installation of dry-running protection is recommended!

6.4.1 Indications for double pump operation

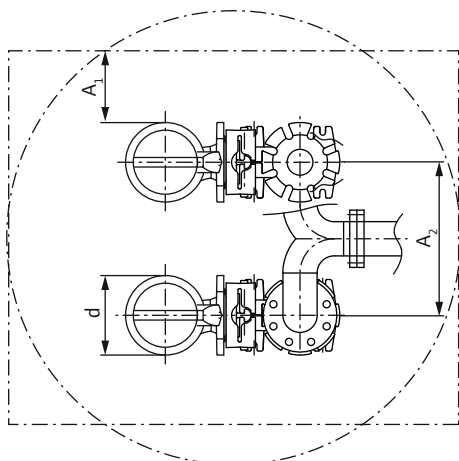


Fig. 3: Minimum distances

6.4.2 Maintenance tasks

6.4.2.1 Rotate impeller



WARNING

Sharp edges on the impeller and suction port!

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.

Small pumps (up to DN 100 pressure port)

- ✓ The pump is **not** connected to the mains!
- ✓ Use protective equipment!
- 1. Place the pump on a firm surface in a horizontal position. **WARNING! Risk of hands being crushed. Make sure that the pump cannot fall over or slip!**
- 2. Slowly and carefully reach into the hydraulics housing from below and rotate the impeller.

Large pumps (from DN 150 pressure port)

- ✓ The pump is **not** connected to the mains!
- ✓ Use protective equipment!
- 1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Make sure that the pump cannot fall over or slip!**
- 2. Carefully and slowly reach into the hydraulics housing through the pressure port and rotate the impeller.

6.4.2.2 Check oil in the sealing chamber



NOTICE

Slightly tilt the motor to fill the oil!

Slightly tilt the sealing chamber to completely fill it with oil. Secure the motor against falling over and slipping during the filling process!

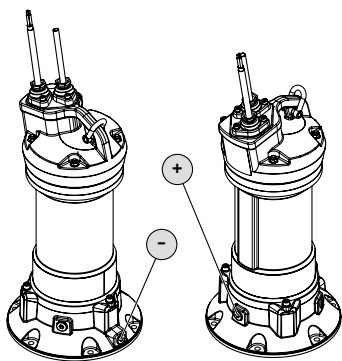


Fig. 4: Sealing chamber: Check the oil

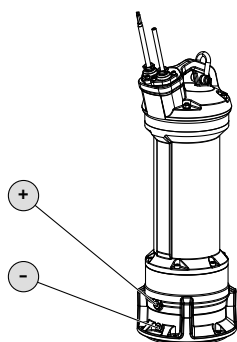


Fig. 5: Sealing chamber: Check the oil

Motor T 17.3...-P (permanent magnet motor)

+	Add the oil to the sealing chamber
-	Drain the oil from the sealing chamber

- ✓ Pump is **not** installed.
 - ✓ Pump is **not** connected to the mains.
 - ✓ Use protective equipment!
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Make sure that the pump can not fall over or slip!**
 2. Position a suitable reservoir to collect the operating fluid.
 3. Unscrew the screw plug (+).
 4. Unscrew the screw plug (-) and drain the operating fluid. Open the ball valve if a ball valve has been installed at the outlet opening.
NOTICE! Vacuum the oil or rinse the sealing chamber to fully drain the system.
 5. Check the operating fluid:
 - ⇒ If the operating fluid is clear, reuse the operating fluid.
 - ⇒ If the operating fluid is contaminated (black), fill with new operating fluid. Dispose of the operating fluid in accordance with local regulations!
 - ⇒ If there is water in the operating fluid, fill with new operating fluid. Dispose of the operating fluid in accordance with local regulations!
 - ⇒ Notify customer service if the operating fluid contains metal swarf!
 6. If a ball valve is installed on the outlet opening, close the ball valve.
 7. Clean the screw plug (-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**
 8. Pour new operating fluid in through the hole for the screw plug (+).
 - ⇒ Comply with the specifications for the operating fluid type and quantity! When recycling the operating fluid, check the quantity and adjust it, if required!
 9. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**

Motor T 20.2 (asynchronous and permanent magnet motor)

+	Add the oil to the sealing chamber
-	Drain the oil from the sealing chamber

- ✓ Pump is **not** installed.
 - ✓ Pump is **not** connected to the mains.
 - ✓ Use protective equipment!
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Make sure that the pump can not fall over or slip!**
 2. Position a suitable reservoir to collect the operating fluid.
 3. Unscrew the screw plug (+).
 4. Unscrew the screw plug (-) and drain the operating fluid. Open the ball valve if a ball valve has been installed at the outlet opening.
NOTICE! Vacuum the oil or rinse the sealing chamber to fully drain the system.
 5. Check the operating fluid:
 - ⇒ If the operating fluid is clear, reuse the operating fluid.
 - ⇒ If the operating fluid is contaminated (black), fill with new operating fluid. Dispose of the operating fluid in accordance with local regulations!
 - ⇒ If there is water in the operating fluid, fill with new operating fluid. Dispose of the operating fluid in accordance with local regulations!
 - ⇒ Notify customer service if the operating fluid contains metal swarf!
 6. If a ball valve is installed on the outlet opening, close the ball valve.

7. Clean the screw plug (–), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**
8. Pour new operating fluid in through the hole for the screw plug (+).
 - ⇒ Comply with the specifications for the operating fluid type and quantity!
 - When recycling the operating fluid, check the quantity and adjust it, if required!
9. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**

6.4.3 Stationary wet well installation



NOTICE

Pumping problems due to water level being too low

If the fluid is lowered too much, separation of the volume flow may occur. Furthermore, air cushions may form in the hydraulic system, resulting in undesirable behaviour during operation. The minimum permissible water level must reach the upper edge of the hydraulics housing!

The pump is installed in the fluid for the wet well installation. For this, a suspension unit must be installed in the chamber. On the pressure side, the on-site pipe system is connected to the suspension unit and on the suction side to the pump. The connected pipe system must be self-supporting. The suspension unit must **not** support the pipe system!

Work steps

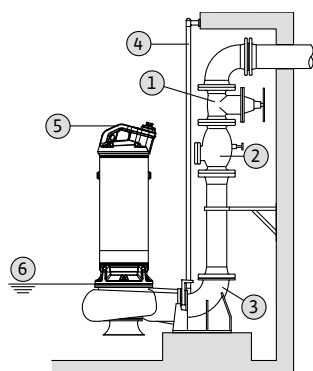


Fig. 6: Wet well installation, stationary

1	Gate valve
2	Non-return valve
3	Suspension unit
4	Guide pipes (provided by the customer)
5	Attachment point for lifting equipment
6	Minimum water level

- ✓ Operating space/installation location has been prepared for the installation.
 - ✓ Suspension unit and pipe system have been installed.
 - ✓ Pump is prepared for operation on the suspension unit.
1. Use a shackle to attach the lifting equipment to the attachment point on the pump.
 2. Lift the pump, swivel it above the chamber opening and slowly lower the guide claw onto the guide pipe.
 3. Lower the pump until it sets on the suspension unit and is connected automatically. **CAUTION! Hold the connection cable slightly taut when lowering the pump!**
 4. Loosen the lifting equipment from the lifting gear and secure it against falling at the chamber outlet.
 5. Have the connection cable routed into the chamber by a qualified electrician and properly route it outside from the chamber. **CAUTION! Do not damage the connection cable (no kinks, note the bend radius)!**
- The pump is installed, the qualified electrician can make the electrical connection.

6.4.4 Portable wet well installation



WARNING

Risk of burns from hot surfaces!

Motor housing can become hot during operation. It may cause burns. Allow the pump to cool down at ambient temperature after switching it off!

**WARNING****Separation of pressure hose!**

Separation or movement of the pressure hose can lead to (serious) injuries. Securely attach the pressure hose to the outlet! Prevent buckling of the pressure hose.

**NOTICE****Pumping problems due to water level being too low**

If the fluid is lowered too much, separation of the volume flow may occur. Furthermore, air cushions may form in the hydraulic system, resulting in undesirable behaviour during operation. The minimum permissible water level must reach the upper edge of the hydraulics housing!

For portable installation, the pump must be equipped with a pump support foot. The pump support foot ensures minimum ground clearance in the suction area and enables secure footing if placed on a solid bearing surface. In this installation type, the pump can be installed anywhere in the operating space/installation site. A hard base must be used at the installation location to prevent sinking in case of soft bearing surfaces. A pressure hose is connected on the pressure side. If operated for longer periods of time, fix the pump firmly to the floor. This prevents vibration and ensures quiet and low-wearing running.

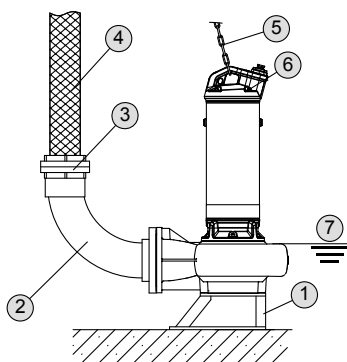


Fig. 7: Wet well installation, portable

Work steps

1	Pump support foot
2	Pipe elbow
3	Storz coupling
4	Pressure hose
5	Lifting equipment
6	Attachment point for lifting equipment
7	Minimum water level

- ✓ Pump support foot mounted.
- ✓ Pressure connection prepared: Pipe elbow with hose connection or pipe elbow with Storz coupling mounted.
 1. Use a shackle to attach the lifting equipment to the attachment point on the pump.
 2. Lift the pump and lower it to the intended location (chamber, pit).
 3. Place the pump on a solid load bearing surface. **CAUTION! Sinking must be prevented!**
 4. Route the pressure hose and fasten it to an appropriate point (e.g. the drain off). **DANGER! Separation or movement of the pressure hose can lead to (serious) injuries! Secure the pressure hose at the outlet.**
 5. Correctly route the connection cables. **CAUTION! Do not damage the connection cable (no kinks, note the bend radius)!**
- The pump is installed, the qualified electrician can make the electrical connection.

6.4.5 Stationary dry well installation

**NOTICE****Pumping problems due to water level being too low**

If the fluid is lowered too much, separation of the volume flow may occur. Furthermore, air cushions may form in the hydraulic system, resulting in undesirable behaviour during operation. The minimum permissible water level must reach the upper edge of the hydraulics housing!

In dry well installation, the operating space is divided into the collecting space and the machine room. In the collecting space, the fluid flows and is collected; the pump technology is installed in the machine room. The pump is installed in the machine room and

connected to the pipe system on the suction and pressure side. Observe the following points for installation:

- The suction- and pressure-side pipe system must be self-supporting. The pump must not support the pipe system.
- Connect the pump to the pipe system ensuring that it is free of stress and vibrations. The use of elastic connection pieces (compensators) is recommended.
- The pump is not self-priming, in other words, the fluid must flow in either automatically or with supply pressure. The minimum level in the collecting space must be at the same height as the upper edge of the hydraulics housing!
- Max. ambient temperature: 40 °C (104 °F)

Work steps

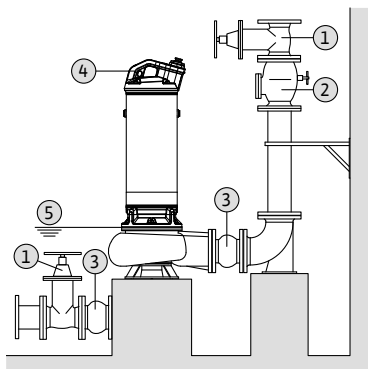


Fig. 8: Dry well installation

1	Gate valve
2	Non-return valve
3	Compensator
4	Attachment point for lifting equipment
5	Minimum water level in collecting space

- ✓ Machine room/installation location is prepared for the installation.
- ✓ Pipe system has been properly installed and is self-supporting.
- 1. Use a shackle to attach the lifting equipment to the attachment point on the pump.
- 2. Lift the pump and position it in the machine room. **CAUTION! Hold the connection cable slightly taut when positioning the pump!**
- 3. Secure pump to the foundation properly.
- 4. Connect pump to the pipe system. **NOTICE! Ensure the connection is free of stress and vibrations. If required, use plastic connection pieces (compensators).**
- 5. Loosen the lifting gear from the pump.
- 6. Have the connection cable installed in the machine room by a qualified electrician. **NOTICE! Do not damage the connection cable (no kinks, note the bend radius)!**
- The pump is installed, the qualified electrician can make the electrical connection.

6.4.6 Level control



DANGER

Risk of explosion due to incorrect installation!

If the level control is installed within a potentially explosive area, the signal transmitter must be connected via an Ex cut-off relay or a Zener barrier. There is a risk of explosion if connected incorrectly! Connection must be carried out by a qualified electrician.

With a level control device, the current fill levels are determined and the pump is switched on and off automatically depending on the fill levels. Fill levels are recorded by using different sensor types (float switches, pressure and ultrasound measurements or electrodes). The following must be observed when using a level control device:

- Float switches can move freely!
- The water level must **not fall below** the minimum permissible!
- The maximum switching frequency **must not be exceeded!**
- If the fill levels fluctuate strongly, a level control with two measuring points is recommended. This makes it possible to achieve larger differential gaps.

6.4.7 Dry-running protection

Dry-running protection must prevent the pump from operating without fluid and air from entering the hydraulics. The minimum permissible fill level must be determined with the help of a signal transmitter. Once the specified limit value is reached, the pump must be deactivated with an appropriate signal. Dry-running protection can expand the available level controls by an additional measuring point or function as an independent switch-off device. Depending on the system security, the pump can be restarted automatically or manually. Installation of dry-running protection is recommended for optimum operational reliability.

6.5 Electrical connection



DANGER

Risk of death due to electrocution!

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.



DANGER

Risk of explosion due to incorrect connection!

- Always connect the pump to an electrical outlet outside the explosive area. If the connection must be established within explosive atmospheres, the connection must be carried out in an Ex-rated housing (ignition protection class according to DIN EN 60079-0)! Non-compliance may lead to a risk of fatal injury from explosion!
- Connect the equipotential bonding conductor to the earth terminal indicated. The earth terminal is installed in the area near the connection cables. Use cable cross-sections as per locally applicable regulations for the equipotential bonding conductor.
- The connection must always be carried out by a qualified electrician.
- For the electrical connection, also note the additional information in the chapter on potentially explosive areas found in the appendix of these installation and operating instructions!

- The mains connection must match the specifications on the rating plate.
- Power supply on mains side for three-phase current motors with clockwise rotating field.
- Lay the connection cable in accordance with the locally applicable regulations and connect it according to the wire assignment.
- Connect the monitoring devices and check their function.
- Earth the device properly in accordance with applicable local regulations.

6.5.1 Fuse on mains side

Circuit breaker

The size and switching characteristics of the circuit breakers must conform to the rated current of the connected product. Observe local regulations.

Motor protection switch

Make provision for an on-site motor protection switch for devices without a plug! The minimum requirement is a thermal relay/motor protection switch with temperature compensation, differential triggering and anti-reactivation device in accordance with the local regulations. In case of sensitive mains, make provision for the installation on-site of other protective equipment (e.g. overvoltage, undervoltage or phase failure relay, etc.).

Residual-current device (RCD)

Comply with the regulations of the local energy supply company! The use of a residual-current device is recommended.

If persons come into contact with the device and conductive fluids, secure the connection **with** a residual-current device (RCD).

6.5.2 Maintenance tasks

Carry out the following maintenance tasks prior to installation:

- Check the insulation resistance of the motor winding.
- Test the resistance of the temperature sensor.

There are several reasons if the measured values differ from the specifications:

- Humidity in the motor.
- Humidity in the connection cable.
- Monitoring device faulty.

Contact customer service in the event of a fault.

6.5.2.1 Checking the insulation resistance of the motor winding

Use an insulation tester to measure the insulation resistance (measuring voltage = 1000 V). Observe the following values:

- At the time of initial commissioning: Insulation resistance may not be less than 20 MΩ.
- For further measurements: Value must be greater than 2 MΩ.

6.5.2.2 Test the resistor of the temperature sensor

Measure the resistor of the temperature sensors with an ohmmeter. The following measured values must be complied with:

- **Bimetallic strip**: Measured value = 0 ohms (continuity).
- **PTC sensor** (PTC thermistor): Measured value depends on the number of sensors installed. A PTC sensor has a cold resistance range of 20 to 100 ohms.
 - With **three** sensors in series, the measured value range is from 60 to 300 ohms.
 - With **four** sensors in series, the measured value range is from 80 to 400 ohms.
- **Pt100 sensor**: Pt100 sensors have a resistance value of 100 ohms at 0 °C (32 °F). Between 0 °C (32 °F) and 100 °C (212 °F), the resistance increases by 0.385 ohms per 1 °C (1.8 °F) increase. At an ambient temperature of 20 °C (68 °F), the resistance is 107.7 ohms.

6.5.3 Asynchronous motor power connection

The three-phase current version is supplied with bare cable ends. Connection to the mains is made by connecting the connection cables in the switchgear. Refer to the attached connection diagram for more precise details regarding the connection. **Electrical connection must always be carried out by a qualified electrician!**

NOTICE! The individual wires are designated according to the connection diagram. Do not cut the wires! There is no additional assignment between the wiring diagram and connection diagram.

Wiring diagram of the power connections for direct starting

U, V, W	Mains connection
PE (gn-ye)	Earth

Wiring diagram of the power connections for star-delta starting

U1, V1, W2	Mains connection (start of winding)
U2, V2, W2	Mains connection (end of winding)
PE (gn-ye)	Earth

6.5.4 Permanent magnet motor power connection

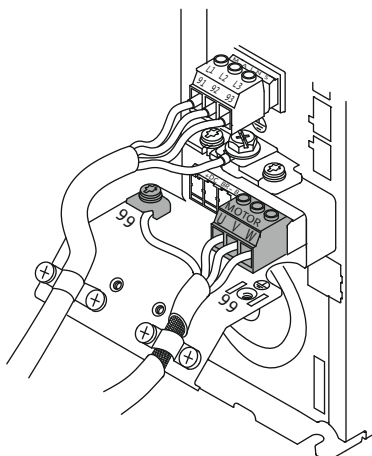


Fig. 9: Pump connection: Wilo-EFC

6.5.5 Digital Data Interface connection



NOTICE

Note the instructions for the Digital Data Interface!

Read the separate instructions for the Digital Data Interface and comply with them.

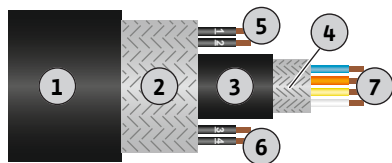


Fig. 10: Hybrid cable diagram

Description

A hybrid cable is used as the control cable. The hybrid cable merges two cables in one:

- Signal cable for control voltage and winding monitor
- Network cable

Pos.	Wire no/colour	Description
1		Outer cable sheath
2		Outer cable shielding
3		Inner cable sheath
4		Inner cable shielding
5	1 = +	Connection wires for Digital Data Interface power supply. Operating voltage: 24 VDC (12–30 V FELV, max. 4.5 W)
	2 = -	
6	3/4 = PTC	PTC sensor connection wires in the motor winding. Operating voltage: 2.5 to 7.5 VDC
7	White (wh) = RD+	Prepare the network cable and install the supplied RJ45 plug.
	Yellow (ye) = TD+	
	Orange (og) = TD-	
	Blue (bu) = RD-	

The connection of the Digital Data Interface depends on the selected system mode and other system components. Note installation suggestions and connection variants in the instructions for the Digital Data Interface.

NOTICE! Widely position cable shielding!

6.5.6 Monitoring equipment connection

Overview of monitoring devices

	Asynchronous motor		Permanent magnet motor	
	T 20.2	T 20.2	T 17.3...-P	T 20.2...-P
Internal monitoring devices				
Digital Data Interface	–	•	•	•
Motor winding: Bimetallic strip	•	–	–	–
Motor winding: PTC	o	• (+ 1...3x Pt100)	• (+ 1...3x Pt100)	• (+ 1...3x Pt100)
Motor bearings: Pt100	o	o	o	o
Sealing chamber: conductive sensor	–	–	–	–
Sealing chamber: capacitive sensor	–	•	•	•
Leakage chamber: Float switch	•	–	–	–
Leakage chamber: capacitive sensor	–	•	–	•
Vibration sensor	–	•	•	•
External monitoring devices				
Sealing chamber: conductive sensor	o	–	–	–

• = Standard, – = Not available, o = Optional

All the monitoring devices fitted must always be connected!

Motor with Digital Data Interface

**NOTICE****Note the instructions for the Digital Data Interface!**

Read the separate instructions for the Digital Data Interface and comply with them.

The Digital Data Interface evaluates all available sensors. Use the graphical user interface of the Digital Data Interface to display current values and set the limit parameters. A warning message or alarm signal is output upon exceeding the limit parameters. The motor winding additionally features PTC sensors to enable secure pump deactivation.

Motor without Digital Data Interface

Refer to the enclosed connection diagram for details regarding the connection and installation of the monitoring devices. **Electrical connection must always be carried out by a qualified electrician!**

NOTICE! The individual wires are designated according to the connection diagram. Do not cut the wires! There is no additional assignment between the wiring diagram and connection diagram.



DANGER

Risk of explosion due to incorrect connection!

If the monitoring devices are not connected correctly, there is a risk of fatal injury due to explosion in potentially explosive areas! Connection must always be carried out by a qualified electrician. If used in potentially explosive areas:

- Connect the thermal motor monitoring via an evaluation relay!
- Deactivation by the temperature limiter must be conducted with reactivation lock! It must only be possible to restart the unit when the unlock key has been actuated by hand!
- Connect the external electrode (e.g. sealing chamber control) via an evaluation relay with an intrinsically safe circuit!
- Note the additional information in the chapter on potentially explosive areas found in the appendix of these installation and operating instructions!

6.5.6.1 Monitoring of motor winding

With bimetallic strips

Connect the bimetallic strips directly to the switchgear or via an evaluation relay. Connection values: max. 250 V (AC), 2.5 A, $\cos \varphi = 1$

Wiring diagram for bimetallic strip

Temperature limiter

20, 21	Bimetallic strip connection
--------	-----------------------------

Temperature controller and limiter

21	High temperature connection
----	-----------------------------

20	Centre terminal
----	-----------------

22	Low temperature connection
----	----------------------------

With PTC sensor

Connect the PTC sensor via an evaluation relay. "CM-MSS" relay is recommended for this purpose.

PTC sensor wiring diagram

Temperature limiter

10, 11	PTC sensor connection
--------	-----------------------

Temperature controller and limiter

11	High temperature connection
----	-----------------------------

10	Centre terminal
----	-----------------

12	Low temperature connection
----	----------------------------

Trigger status for temperature controller and limiter

The installed sensor specifies the trigger temperature as part of thermal motor monitoring using bimetallic or PTC sensors. Depending on the thermal motor monitoring version, the following triggering status must occur when the trigger temperature is reached:

- Temperature limiter (1 temperature circuit):
The unit must be deactivated once the trigger temperature has been reached.
- Temperature controller and limiter (2 temperature circuits):

Once the trigger temperature for the low temperature is reached, the motor can deactivate with automatic reactivation. Upon reaching the trigger temperature for the high temperature limit, the motor must deactivate with manual reactivation.

Note the additional information in the section on potentially explosive areas described in the appendix!

6.5.6.2 Leakage chamber monitoring

The float switch is equipped with a potential-free normally closed contact. The switching capacity can be found in the supplied connection diagram.

Wiring diagram

K20, K21	Float switch connection
-------------	-------------------------

When the float switch is activated, a warning must be issued or deactivation must take place.

6.5.6.3 Monitoring of motor bearing

Connect the Pt100 sensor via an evaluation relay. Relay "DGW 2.01G" is recommended for this. The threshold is 100 °C (212 °F).

Wiring diagram

T1, T2	Pt100 sensor connection
--------	-------------------------

When the threshold is reached, deactivation must take place!

6.5.6.4 Sealing chamber monitoring (external electrode)

Connect the external electrode via an evaluation relay. Relay "NIV 101/A" is recommended for this. The threshold is 30 kOhm.

Once the threshold is reached, a warning must be output or the unit must be switched off.

CAUTION

Connection of the sealing chamber control

If on reaching the threshold, there is only a warning, the pump could be irreparably damaged by the water ingress. Deactivation of the pump is always recommended!

Note the additional information in the chapter on potentially explosive areas found in the appendix!

6.5.7 Motor protection adjustment

Motor protection must be set depending on the selected activation type.

6.5.7.1 Direct activation

At full load, set the motor protection switch to the rated current (see rating plate). At partial load, it is recommended to set the motor protection switch 5 % above the current measured at the duty point.

6.5.7.2 Star-delta activation

The motor protection setting depends on the installation:

- Motor protection installed in the motor line: Set the motor protection to 0.58 x the rated current.
- Motor protection installed in the mains supply cable: Set the motor protection to the rated current.

The maximum start-up time in star connection is 3 seconds.

6.5.7.3 Soft starter

At full load, set the motor protection switch to the rated current (see rating plate). At partial load, it is recommended to set the motor protection switch 5 % above the current measured at the duty point. The following points must also be observed:

- Power consumption must always be below the rated current.
- Complete starting and stopping within 30 s.
- To avoid power dissipation, bypass the electronic starter (soft start) once normal operation is reached.

6.5.8 Operation with frequency converter

6.5.8.1 Asynchronous motor

It is possible to operate asynchronous motors at the frequency converter. The frequency converter must feature the following connections at a minimum:

- Bimetallic strip and PTC sensor
- Moisture probe
- Pt100 sensor (if motor bearing monitoring is available!)

Refer to section entitled "Frequency converter operation [► 52]" for additional requirements and comply with these!

If the motor features a Digital Data Interface, also guarantee the following prerequisites:

- Network: Ethernet 10BASE-T/100BASE-TX, IP-based
- Protocol support: Modbus TCI/IP

Refer to the separate instructions for the Digital Data Interface for detailed requirements!

6.5.8.2 Permanent magnet motor

Guarantee the following conditions when operating permanent magnet motors:

- Frequency converter with connection for PTC sensor
- Network: Ethernet 10BASE-T/100BASE-TX, IP-based
- Protocol support: Modbus TCI/IP

Refer to the separate instructions for the Digital Data Interface for detailed requirements!

Permanent magnet motors have been approved for operation with the following frequency converters:

- Wilo-EFC

Other frequency converters on request!

7 Commissioning



WARNING

Foot injuries due to a lack of protective equipment!

Danger of (serious) injuries during work. Wear safety shoes!



NOTICE

Automatic activation after power cut

Depending on the process, the product is switched on and off using separate controls. The product may automatically switch on following power cuts.

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 Operator responsibilities

- Providing installation and operating instructions by the pump or at a place specially reserved for it.
- Making the installation and operating instructions available in the language of the personnel.
- Making sure that the installation and operating instructions are read and understood by all personnel.
- All safety devices and emergency cut-outs on the system-side must be active and checked to ensure that they work properly.
- The pump is suitable for use under the specified operating conditions.

7.3 Direction of rotation check (for three-phase current motors only)

The pump is factory-checked and adjusted to the correct direction of rotation for a clockwise rotating field. Connection is made in accordance with the specifications in chapter "Electrical connection".

Direction of rotation check

A qualified electrician checks the rotating field at the mains connection with a rotating field-test device. For the correct direction of rotation, a clockwise rotating field must be available at the mains connection. The pump is **not** approved for operation with a counter-clockwise rotating field! **CAUTION! If the direction of rotation is checked with a test run, comply with the ambient and operating conditions!**

Incorrect direction of rotation

If the direction of rotation is incorrect, change the connection as follows:

- Swap two phases for motors with direct starting.
- Swap the connections of two windings (e.g. U1/V1 and U2/V2) for star-delta activation motors.

7.4 Operation in an explosive atmosphere

**DANGER****Risk of explosion due to flying sparks in the hydraulics!**

During operation the hydraulics must be flooded (completely filled with the fluid). If the volume flow is interrupted or the hydraulics emerges, air cushions can form in the hydraulics. If this happens, there is a risk of explosion, e.g. flying sparks due to static charge! Dry-running protection must ensure that the pump is deactivated at the appropriate level.

	Asynchronous motor	Permanent magnet motor	
	T 20.2	T 17.3...-P	T 20.2...-P
Approval according to IEC-Ex	o	o	o
ATEX approval	o	o	o
FM approval	o	o	o
CSA-Ex approval	–	–	–

Key

– = Not available/possible, o = Optional, • = Standard

For use in explosive atmospheres, the pump must be marked as follows on the rating plate:

- “Ex” symbol of the corresponding approval
- Ex classification

For the relevant requirements, refer to the explosion protection chapter in the appendix of these installation and operating instructions!

ATEX approval

The pumps are suitable for operation in potentially explosive atmospheres:

- Device group: II
- Category: 2, zone 1 and zone 2

These pumps must not be used in zone 0!

FM approval

The pumps are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosionproof
- Category: Class I, Division 1

Notice: If the cabling is carried out according to Division 1, installation in Class I, Division 2 is also permitted.

7.5 Before switching on

Check the following prior to activation:

- Check whether the device has been installed properly and in accordance with the locally applicable regulations:
 - Has the pump been earthed?
 - Layout of power supply cable tested?
 - Electrical connection made properly?
 - Mechanical components attached correctly?
- Check level control:
 - Float switches can move freely?
 - Switching level tested (pump on, pump off, minimum water level)?
 - Additional dry-running protection installed?
- Test operating conditions:
 - Min./max. temperature of the fluid tested?
 - Max. immersion depth tested?

- Operating mode defined depending on the minimum water level?
 - Maximum switching frequency adhered to?
 - Check installation location/operating space:
 - Pipe system on the pressure side free of deposits?
 - Inlet or pump sump cleaned or free of deposits?
 - All gate valves open?
 - Minimum water level defined and monitored?
- The hydraulics housing must be filled completely with the fluid and there must be no air cushions in the hydraulics. **NOTICE! Provide suitable venting devices if there is a risk of air cushions being formed in the system!**

7.6 Switch on and off

During the start process, the rated current is temporarily exceeded. During operation, the rated current may no longer be exceeded. **CAUTION! If the pump does not start, switch off the pump immediately. Remove the fault before reactivating the pump!**

The pump is switched on and off using a separate operating point (on/off switch, switchgear) provided by the customer.

7.7 During operation



DANGER

Risk of explosion due to overpressure in the hydraulics!

If the gate valves on the suction and pressure sides are closed during operation, the fluid in the hydraulics housing is heated up by the pumping movement. This heating creates a pressure of several bars in the hydraulics. The pressure can result in the pump exploding! Make sure that all gate valves are open during operation. Open closed gate valves immediately!



WARNING

Amputation of limbs due to rotating components!

No persons must be present in the work area of the pump! There is risk of (serious) injuries due to rotating components! No persons must be present in the work area of the pump during start-up or operation.



WARNING

Risk of burns from hot surfaces!

Motor housing can become hot during operation. It may cause burns. Allow the pump to cool down at ambient temperature after switching it off!



NOTICE

Pumping problems due to water level being too low

If the fluid is lowered too much, separation of the volume flow may occur. Furthermore, air cushions may form in the hydraulic system, resulting in undesirable behaviour during operation. The minimum permissible water level must reach the upper edge of the hydraulics housing!

When operating the pump, observe the locally applicable regulations on the following topics:

- Work safety
- Accident prevention
- Handling electrical machines

Strictly adhere to the responsibilities of the personnel specified by the operator. All personnel are responsible for ensuring that the responsibilities of the personnel and the regulations are observed!

Due to their design, centrifugal pumps have rotating parts that are easily accessible. Depending on operating conditions, sharp edges can develop on these parts. **WARNING! This can lead to cuts and limbs may be severed!** Check the following at regular intervals:

- Operating voltage (+/- 5 % of the rated voltage)

- Frequency (+/- 2 % of the rated frequency)
- Current consumption between individual phases (max. 5 %)
- Voltage difference between the individual phases (max. 1 %)
- Max. switching frequency
- Minimum water submersion depending on the operating mode
- Inlet: no air intake.
- Level control device/dry-running protection: Switching points
- Quiet/low-vibration running
- All gate valves open

Operation in the limit range

The pump can briefly be operated in the limit range (max. 15 min/day). During operation in the limit range, expect relatively large deviations from the operating data. **NO-TICE! Continuous duty in the limit range is prohibited! The pump is exposed to high wear and there is a greater risk of failure!**

The following parameters apply during operation in the limit range:

- Operating voltage (+/- 10 % of the rated voltage)
- Frequency (+3/-5 % of the rated frequency)
- Power consumption between individual phases (max. 6 %)
- Voltage difference between the individual phases (max. 2 %)

8 Shut-down/dismantling

8.1 Personnel qualifications

- Operation/control: Operating personnel must be instructed in the functioning of the complete system.
- Electrical work: A qualified electrician must carry out the electrical work.
- Installation/dismantling: The technician must be trained in the use of the necessary tools and fixation materials for the relevant construction site.

8.2 Operator responsibilities

- Locally applicable accident prevention and safety regulations of trade associations.
- Observe regulations for working with heavy loads and under suspended loads.
- Provide the necessary protective equipment and make sure that the personnel wears it.
- Provide adequate aeration in closed rooms.
- Take immediate countermeasures if there is a build-up of toxic or suffocating gases!

8.3 Shut-down

The pump is deactivated during shutdown, but remains installed. This ensures that the pump is always ready for operation.

- ✓ Completely immerse the pump in the fluid to protect the pump from frost and ice.
- ✓ Minimum fluid temperature: +3 °C (+37 °F).

1. Switch off the pump at the operating point.

2. Secure the operating point against being switched on again by unauthorised persons (e.g. lock main switch).

► The pump has been shut down and can be dismantled.

If the pump remains installed after decommissioning, observe the following points:

- Ensure that the aforementioned requirements are maintained for the complete period of shutdown. Remove the pump if meeting these requirements cannot be guaranteed!
- For an extended period of shutdown, carry out a function test at regular intervals:
 - Period: monthly to quarterly
 - Running time: 5 minutes
 - Only run a function test in valid operating conditions! **CAUTION! Do not run when dry! Non-compliance may result in irreparable damage!**

8.4 Removal



DANGER

Danger due to fluids hazardous to health!

If the pump is used in fluids hazardous to health, decontaminate the pump after dismantling and before carrying out any other work! There is a risk of fatal injury! Observe the specifications in the work regulations! The operator must make sure that the personnel have received and read the work regulations!

**DANGER****Risk of death due to electrocution!**

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

**DANGER****Risk of fatal injury due to dangerous lone working practices!**

Work in chambers and narrow rooms as well as work involving risk of falling are dangerous work. Such work may not be carried out autonomously! A second person must be present for safety reasons.

**WARNING****Risk of burns from hot surfaces!**

Motor housing can become hot during operation. It may cause burns. Allow the pump to cool down at ambient temperature after switching it off!

**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!

8.4.1 Stationary wet well installation

- ✓ Pump is decommissioned.
- ✓ Gate valves on the inlet and pressure sides are closed.
 1. Disconnect the pump from the mains.
 2. Attach the lifting equipment to the attachment point. **CAUTION! Do not pull on the connection cables! This damages the connection cables!**
 3. Slowly raise the pump and lift it above the guide pipes from the operating space. **CAUTION! There is a risk of damaging the connection cable when lifting the pump! Hold the connection cable slightly taut when lifting!**
 4. Coil up the connection cable and attach to the motor. **CAUTION! Do not kink the connection cable and maintain the bend radius. Do not damage the connection cables during attachment! Check for crushing and wire breaks.**
 5. Thoroughly clean the pump (see section entitled "Cleaning and disinfecting"). **DANGER! Disinfect the pump if the pump has been used in fluids that are hazardous to health!**

8.4.2 Portable wet well installation

- ✓ Pump has been taken out of service.
 1. Disconnect the pump from the mains.
 2. Roll up the connection cable and lay it across the motor housing. **CAUTION! Do not kink the connection cable and maintain a constant bend radius. Never pull the device by the connection cable – doing so will damage the connection cable!**
 3. Loosen the pressure pipe from the pressure port.
 4. Attach the lifting equipment to the attachment point.
 5. Lift the pump out of the operating space. **CAUTION! There is a risk of squeezing and damaging the connection cable when setting the pump down! Pay attention to the connection cable when setting the pump down!**
 6. Clean the pump thoroughly (see "Cleaning and disinfecting"). **DANGER! If the pump has been used in fluids hazardous to health, disinfect the pump!**

8.4.3 Stationary dry well installation

- ✓ Pump has been decommissioned.

- ✓ Gate valves on the inlet and pressure sides are closed.
- 1. Disconnect the pump from the mains.
- 2. Coil up the connection cable and attach to the motor. **CAUTION! Do not kink the connection cable and maintain the bend radius. Do not damage the connection cables during attachment! Check for crushing and wire breaks.**
- 3. Undo the pipe system at the suction and discharge ports. **DANGER! Fluids are hazardous to health! Residue from the pumped fluid may still be present in the piping and hydraulics! Place collector tank, immediately wipe up drips and dispose of fluids properly.**
- 4. Attach the lifting equipment to the attachment point.
- 5. Undo the pump from the foundation.
- 6. Lift the pump slowly out of the pipework and place on a suitable set-down location. **CAUTION! There is a risk of crushing and damaging the connection cables when setting down the pump! Pay attention to the connection cable when setting down the pump!**
- 7. Thoroughly clean the pump (see section entitled "Cleaning and disinfecting"). **DANGER! Disinfect the pump if the pump has been used in fluids that are hazardous to health!**

8.4.4 Clean and disinfect



DANGER

Danger due to fluids hazardous to health!

Danger to life if the pump is used in fluids hazardous to health! Decontaminate the pump before carrying out any further work! Wear the following protective equipment while performing cleaning tasks:

- Closed safety goggles
- Breathing mask
- Protective gloves

⇒ The equipment listed here is the minimum requirement, observe the specifications of the work regulations! The operator must make sure that the personnel have received and read the work regulations!

- ✓ Pump has been removed.
- ✓ Contaminated cleaning water is disposed of in the sewer in accordance with local regulations.
- ✓ Disinfectants are provided for contaminated pumps.
- 1. Ensure that the plug or bare cable ends are packed and stored in a watertight manner!
- 2. Attach the lifting equipment to the attachment point on the pump.
- 3. Lift the pump approximately 30 cm (10 in) above the ground.
- 4. Spray the pump with clean water from top to bottom. **NOTICE! Use a suitable disinfectant on contaminated pumps! Strictly observe the manufacturer's specifications concerning use!**
- 5. Direct the water jet towards the inside via the pressure port to clean the impeller and the pump interior.
- 6. Flush any dirt residues on the floor into the drain.
- 7. Allow the pump to dry out.

9 Maintenance and repair



DANGER

Danger due to fluids hazardous to health!

If the pump is used in fluids hazardous to health, decontaminate the pump after dismantling and before carrying out any other work! There is a risk of fatal injury! Observe the specifications in the work regulations! The operator must make sure that the personnel have received and read the work regulations!



DANGER

Permanent magnet motors: Risk of fatal injury with an open motor housing caused by a strong magnetic field!

Opening the motor housing suddenly exposes a strong magnetic field! This magnetic field may lead to severe injuries. This magnetic field may cause death to persons with electronic implants (pacemakers, insulin pump, etc.). Do not open the motor housing! Only customer service staff are permitted to work on an open motor!



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!

- Always carry out maintenance tasks in a clean, well lit location. Securely position the pump and lock in place.
- Only carry out maintenance tasks described in these installation and operating instructions.
- Wear the following protective equipment while performing maintenance tasks:
 - Safety goggles
 - Safety footwear
 - Safety 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 Operator responsibilities

- Provide the necessary protective equipment and make sure that the personnel wears it.
- Collect operating fluids in suitable tanks and dispose of properly.
- Dispose of protective clothing used in accordance with regulations.
- Use only original parts of the manufacturer. Use of parts other than the 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.
- Provide the tools required.
- If flammable solvents and cleaning agents are used, open flames, naked lights and smoking are prohibited.

9.3 Operating fluid

9.3.1 Filling quantities

Motor type	Sealing chamber	
	White oil	
T 17.3 motor		
T 17.3M...G...	3.8 l	128.5 US.fl.oz.
T 17.3M...K...	2.9 l	98 US.fl.oz.
T 17.3L...G...	3.6 l	121.5 US.fl.oz.

Motor type	Sealing chamber	
	White oil	
T 17.3L...K...	2.9 l	98 US.fl.oz.
T 20.2 motor		
T 20.2M...G...	1.8 l	61 US.fl.oz.
T 20.2M...K...	1.1 l	37 US.fl.oz.

9.3.2 Oil types

- ExxonMobile: Marcol 52
- ExxonMobile: Marcol 82
- Total: Finavestan A 80 B (NSF-H1 certified)

9.3.3 Grease

- Esso: Unirex N3
- Tripol: Molub-Alloy-Food Proof 823 FM (USDA-H1 approved)

9.4 Maintenance intervals

To ensure reliable operation, maintenance tasks must be carried out regularly. Depending on the real ambient temperatures, maintenance intervals different from those mentioned in the contract can be defined! If strong vibrations occur during operation, the pump and the installation must be checked regardless of the defined maintenance intervals.

9.4.1 Maintenance intervals for normal conditions

8000 operating hours or after 2 years at the latest

	Visual inspection of the connection cables	Visual inspection of accessories	Visual inspection of the coating and the housing for wear	Function test of monitoring devices	Sealing chamber oil change*	Draining the leakage chamber*
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Asynchronous motors

T 20.2	•	•	•	•	•	•
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Permanent magnet motors

T 17.3...-P	•	•	•	•	o	–
T 20.2...-P	•	•	•	•	o	o

Key

- = Carry out maintenance measures, o = Carry out maintenance measure as instructed, – = Maintenance measure omitted
- * Note information in "Deviating maintenance intervals"!

15000 operating hours or after 10 years at the latest

- Complete overhaul

9.4.2 Deviating maintenance intervals

Motors without Digital Data Interface

It is possible to install external sealing chamber control (pencil electrode) in motors without Digital Data Interface. Change the oil as instructed if this monitoring type has been installed!

Motors with Digital Data Interface

In motors with Digital Data Interface the sealing and/or leakage chamber is monitored by capacitive sensors. The Digital Data Interface outputs a warning once the predefined threshold has been reached. Carry out the corresponding maintenance measure if this warning is displayed.

9.4.3 Maintenance intervals for harsh conditions

Under harsh operating conditions, specified maintenance intervals must be shortened if required. Harsh operating conditions include:

- Fluids with long-fibre components
- Turbulent inlet (e.g. due to air intake, cavitation)
- Strongly corroding or abrasive fluids
- Heavily gas generating fluids
- Operation at an unfavourable duty point

→ Pressure surges

When using pumps under hard conditions, it is recommended to sign a maintenance contract. Contact customer service.

9.5 Maintenance measures



WARNING

Sharp edges on the impeller and suction port!

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.



WARNING

Hand, foot or eye injuries due to the absence of protective equipment!

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

- Safety gloves for protection against cuts
- Safety shoes
- Closed safety goggles

The following pre-requisites must be fulfilled prior to starting maintenance measures:

- Pump cooled down to the ambient temperature.
- Pump cleaned thoroughly and disinfected (if required).

9.5.1 Recommended maintenance measures

Regular inspection of power consumption and the operating voltage in all three phases is recommended for smooth operation. In normal operation, these values remain constant. Slight fluctuations depend on the characteristics of the fluid. Power consumption can provide an early indication of damage or malfunctions in the impeller, bearings or motor, which can be rectified. Larger voltage fluctuations strain the motor winding and can cause the pump to break down. Regular inspections can therefore largely prevent major secondary damage and reduce the risk of total breakdown. In this regard, it is recommended to use remote monitoring for regular inspections.

9.5.2 Visual inspection of the connection cable

Check connection cable for:

- Bubbles
- Cracks
- Scratches
- Abrasion
- Pinch points

If damage is identified on the connection cable, decommission the pump immediately! Have the connection cable replaced by Wilo customer service. Only operate the pump up again once the damage has been properly remedied!

CAUTION! Water may penetrate into the pump due to the damaged connection cable! Water ingress leads to total failure of the pump.

9.5.3 Visual inspection of accessories

Accessories must be checked for:

- Correct fixation
- Smooth function
- Signs of wear, e.g. cracks caused by frequencies

Any defects detected must be repaired immediately or the accessories must be replaced.

9.5.4 Visual inspection of coatings and housing for wear

The coatings and housing parts must not show any signs of damage. If there are defects, the following must be observed:

- If the coating is damaged, it must be restored.
- Contact customer service if housing parts have worn out!

9.5.5 Function test of the monitoring device

To test resistances, the pump must be cooled down to the ambient temperature!

9.5.5.1 Test the resistor of the temperature sensor

Measure the resistor of the temperature sensors with an ohmmeter. The following measured values must be complied with:

- **Bimetallic strip:** Measured value = 0 ohms (continuity).
- **PTC sensor** (PTC thermistor): Measured value depends on the number of sensors installed. A PTC sensor has a cold resistance range of 20 to 100 ohms.
 - With **three** sensors in series, the measured value range is from 60 to 300 ohms.
 - With **four** sensors in series, the measured value range is from 80 to 400 ohms.
- **Pt100 sensor:** Pt100 sensors have a resistance value of 100 ohms at 0 °C (32 °F). Between 0 °C (32 °F) and 100 °C (212 °F), the resistance increases by 0.385 ohms per 1 °C (1.8 °F) increase.
At an ambient temperature of 20 °C (68 °F), the resistance is 107.7 ohms.

9.5.5.2 Testing the resistor of the external electrode for sealing chamber control

9.5.6 Oil change in sealing chamber



WARNING

Operating fluid under high pressure!

A pressure of **several bar can build up** in the motor! This pressure escapes when the screw plugs are **opened**. If screw plugs are opened without due caution, they can be ejected at high speed! To avoid injuries, observe the following instructions:

- Adhere to the prescribed sequence of work steps.
- Unscrew the screw plugs slowly, but never unscrew them completely. As soon as the pressure escapes (audible whistling or hissing of air), stop turning the screw plug any further!
- When the pressure has completely dissipated, fully unscrew the screw plugs.
- Wear closed safety goggles.



WARNING

Scalding from hot operating fluids!

Hot operating fluids can also spray out when pressure is released. This can result in scalding! To avoid injuries, the following instructions must be observed:

- Allow the motor to cool down to the ambient temperature before opening the screw plugs.
- Wear closed safety goggles or face protection and gloves.



NOTICE

Slightly tilt the motor to fill the oil!

Slightly tilt the sealing chamber to completely fill it with oil. Secure the motor against falling over and slipping during the filling process!

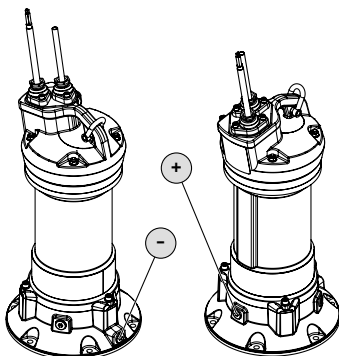


Fig. 11: Sealing chamber: Oil change

T 17.3 motors

+	Add the oil to the sealing chamber
-	Drain the oil from the sealing chamber

- ✓ Use protective equipment!
 - ✓ Pump has been dismantled and cleaned (decontaminated, if required).
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Make sure that the pump can not fall over or slip!**
 2. Position a suitable reservoir to collect the operating fluid.
 3. Unscrew the screw plug (+) slowly, but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if you can hear hissing or whistling! Wait until the pressure has completely dissipated.**
 4. Once the pressure has dissipated, fully unscrew the screw plug (+).

5. Unscrew the screw plug (–) and drain the operating fluid. Open the ball valve if a ball valve has been installed at the outlet opening.
NOTICE! Vacuum the oil or rinse the sealing chamber to fully drain the system.
6. Check the operating fluid:
 - ⇒ If there is a leakage in the mechanical seal, small amounts of water may enter the sealing chamber. This turns the oil milky/cloudy. If the ratio of oil to water is less than 2:1, the mechanical seal may be damaged. Change the oil and check again after 4 weeks. If water is again present in the oil during the second check, contact customer service!
 - ⇒ Notify customer service if the operating fluid contains metal swarf!
7. If a ball valve is installed on the outlet opening, close the ball valve.
8. Clean the screw plug (–), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**
9. Fill the new operating fluid through the opening for the screw plug (+).
 - ⇒ Comply with the specifications for the operating fluid type and quantity!
10. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**

T 20.2 motors

+	Add the oil to the sealing chamber
–	Drain the oil from the sealing chamber

- ✓ Use protective equipment!
 - ✓ Pump has been dismantled and cleaned (decontaminated, if required).
1. Place the pump upright on a firm surface. **WARNING! Risk of hands being crushed. Make sure that the pump can not fall over or slip!**
 2. Position a suitable reservoir to collect the operating fluid.
 3. Unscrew the screw plug (+) slowly, but do not unscrew it completely. **WARNING! Overpressure in the motor! Stop turning the screw plug further if you can hear hissing or whistling! Wait until the pressure has completely dissipated.**
 4. Once the pressure has dissipated, fully unscrew the screw plug (+).
 5. Unscrew the screw plug (–) and drain the operating fluid. Open the ball valve if a ball valve has been installed at the outlet opening.
NOTICE! Vacuum the oil or rinse the sealing chamber to fully drain the system.
 6. Check the operating fluid:
 - ⇒ If there is a leakage in the mechanical seal, small amounts of water may enter the sealing chamber. This turns the oil milky/cloudy. If the ratio of oil to water is less than 2:1, the mechanical seal may be damaged. Change the oil and check again after 4 weeks. If water is again present in the oil during the second check, contact customer service!
 - ⇒ Notify customer service if the operating fluid contains metal swarf!
 7. If a ball valve is installed on the outlet opening, close the ball valve.
 8. Clean the screw plug (–), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**
 9. Fill the new operating fluid through the opening for the screw plug (+).
 - ⇒ Comply with the specifications for the operating fluid type and quantity!
 10. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**

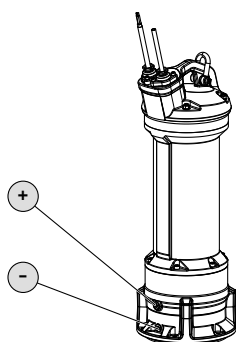


Fig. 12: Sealing chamber: Oil change

9.5.7 Drain the leakage chamber

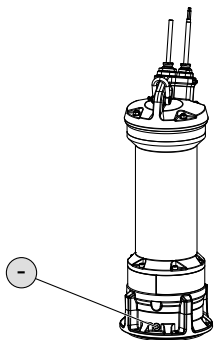


Fig. 13: Drain the leakage chamber

9.5.8 General overhaul

During the general overhaul, the motor bearings, shaft sealings, O-rings and connection cables are checked for wear and damage. Damaged components are replaced with original parts. This ensures correct operation.

The general overhaul is performed by the manufacturer or an authorised service centre.

9.6 Repairs



WARNING

Sharp edges on the impeller and suction port!

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.



WARNING

Hand, foot or eye injuries due to the absence of protective equipment!

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

- Safety gloves for protection against cuts
- Safety shoes
- Closed safety goggles

The following preconditions must be met prior to starting repair work:

- Pump cooled down to the ambient temperature.
- Pump is switched voltage-free and secured against being activated inadvertently.
- Pump cleaned thoroughly and disinfected (if required).

For repair work the following generally applies:

- Wipe up spillage quantities of fluid and operating fluid immediately!
- Always replace O-rings, gaskets and screw locking devices!
- Observe the tightening torques in the appendix!
- Never use force when carrying out this work!

9.6.1 Instructions on using screw locking devices

A screw locking device can be used on the screws. Screw locking is done at the factory using two different methods:

- Thread-locking fluid
- Mechanical screw locking device

Always re-apply the screw locking device!

Thread-locking fluid

Medium-strength thread-locking fluid (e.g. Loctite 243) is used for the liquid screw locking compound. This threadlocker can be loosened with increased force. If the thread-locking fluid cannot be loosened, then the compound must be heated to approx. 300 °C (572 °F). Clean the components thoroughly after dismantling.

Mechanical screw locking device

The mechanical screw locking device consists of two Nord-Lock wedge lock washers. The screw connection is secured by the clamping force. The Nord-Lock screw locking device must only be used on bolts with strength class 10.9 which have been coated with Geomet. **The use of stainless screws is prohibited!**

9.6.2 Which repair work may be carried out

- Changing the hydraulics housing.
- SOLID G- and Q impeller: Readjusting the suction port.

9.6.3 Changing the hydraulics housing



DANGER

Dismantling the impeller is prohibited!

Depending on the impeller diameter, the impeller must be removed for dismantling the hydraulics housing on some pumps. Before carrying out any work, check whether dismantling the impeller is necessary. If yes, notify customer service! The dismantling of the impeller must be carried out by customer service or an authorized specialist workshop.

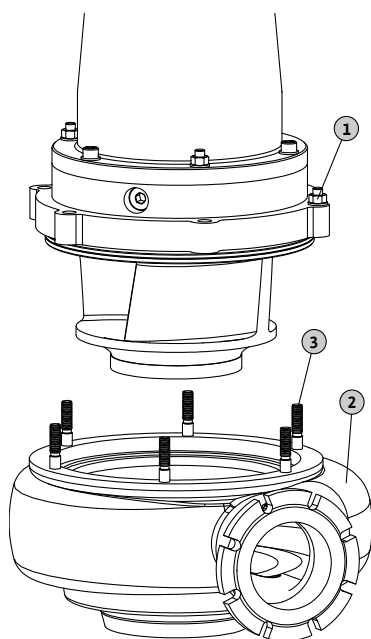


Fig. 14: Changing the hydraulics housing

1	Hexagon nuts for fixation of the motor/hydraulics
2	Hydraulics housing
3	Threaded bolt

✓ Lifting equipment with sufficient bearing capacity is available.

✓ Protective equipment is used.

✓ New hydraulics housing is ready.

✓ Impeller **must not** be dismantled!

1. Attach lifting equipment with suitable lifting gear to the attachment point of the pump.

2. Position the pump upright.

CAUTION! The hydraulics housing will be damaged if the pump is put down too quickly. Set the pump down slowly on the suction port!

NOTICE! If the pump cannot be placed level on the suction port, use appropriate adjustment plates. The pump must be positioned vertically to be able to lift the motor without issues.

3. Mark the motor/hydraulics position on the housing.

4. Undo and remove hexagon nuts at the motor flange.

5. Slowly lift the motor and pull it off the hydraulics housing.

CAUTION! Lift the motor vertically and do not tilt! Threaded bolts are damaged if the unit is tilted!

6. Insert a new seal ring at the motor flange.

7. Swivel the motor over the new hydraulics housing.

8. Slowly lower the motor. Make sure that the motor/hydraulic markings match and the threaded bolts screw exactly into the drilled holes.

9. Screw hexagon nuts and connect the motor to the hydraulics firmly. **NOTICE! Observe the tightening torques stated in the appendix!**

► Hydraulics housing changed. Pump can be reinstalled.

WARNING! If the pump is placed in temporary storage and the lifting equipment is dismantled, secure the pump against falling over and slipping!

9.6.4 SOLID G- and Q impeller: Readjusting the suction port

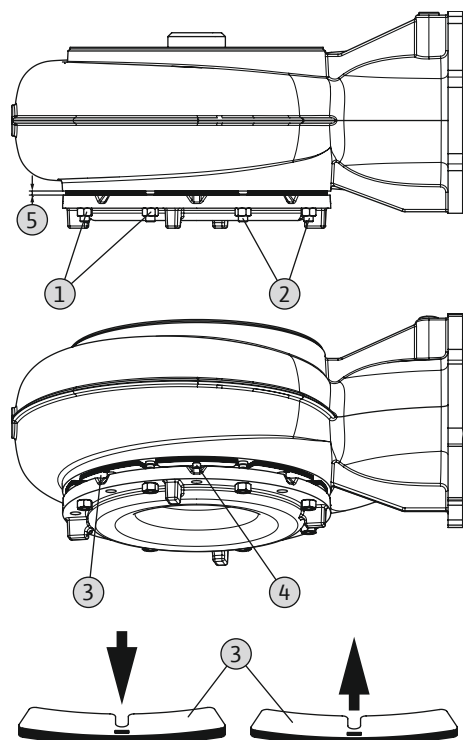


Fig. 15: SOLID G: Readjusting the gap

1	Hexagon nut for suction port attachment
2	Threaded bolt
3	Laminated core
4	Laminated core fastening screw
5	Gap between suction port and hydraulics housing

✓ Lifting equipment with sufficient bearing capacity is present.

✓ Protective equipment has been put on.

1. Attach lifting equipment with suitable lifting gear to the attachment point of the pump.
2. Lift the pump so that the pump is approx. 50 cm (20 in) above the ground.
3. Loosen the hexagon nuts for fixation of the suction port. Unscrew the hexagon nut until the hexagon nut is flush with the threaded bolt.

WARNING! Risk of crushing fingers! The suction port can stick on the hydraulics housing due to encrustations and slide down suddenly. Loosen the nuts only in a crosswise manner and grasp them from the bottom. Wear protective gloves!

4. Suction port is on the hexagon nuts. If the suction port sticks to the hydraulics housing, carefully loosen the suction port with a wedge!
 5. Clean the sliding surface and the screwed-on laminated cores and disinfect (if necessary).
 6. Loosen the screws from the laminated cores and remove the individual laminated cores.
 7. Slowly re-tighten the three hexagon nuts crosswise until the suction port is in contact with the impeller. **CAUTION! Only tighten the hexagon nuts by hand! If the hexagon nuts are excessively tightened, the impeller and the motor bearings may get damaged!**
 8. Measure the gap between the suction port and hydraulics housing.
 9. Adjust the laminated cores according to the measured dimensions and add another metal sheet.
 10. Unscrew the three hexagon nuts again until the hexagon nuts are flush with the threaded bolt.
 11. Reinsert the laminated cores and screw into place.
 12. Tighten the hexagon nuts crosswise until the suction port is flush with the laminated cores.
 13. Firmly tighten the hexagon nuts crosswise. **Observe the tightening torques in the appendix!**
 14. Reach into the suction port from below and turn the impeller. When the gap is correctly set, the impeller can be rotated. If the gap is too small, the impeller is difficult to rotate. Repeat setting. **WARNING! Danger of amputation of limbs! Sharp edges can form on the suction port and impeller. Wear safety gloves to protect against cuts!**
- Suction port correctly set. Pump can be reinstalled.

10 Faults, causes and remedies



DANGER

Danger due to fluids hazardous to health!

Danger of death in case of pumps with fluids hazardous to health! Wear the following protective equipment while performing the work:

- Closed safety goggles
- Breathing mask
- Protective gloves

⇒ The equipment listed here is the minimum requirement, observe the specifications of the work regulations! The operator must make sure that the personnel have received and read the work regulations!



DANGER

Risk of death due to electrocution!

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.



DANGER

Risk of fatal injury due to dangerous lone working practices!

Work in chambers and narrow rooms as well as work involving risk of falling are dangerous work. Such work may not be carried out autonomously! A second person must be present for safety reasons.



WARNING

No persons are allowed to be present inside the working area of the pump!

Persons may suffer (serious) injuries while the pump is in operation! No persons may therefore be present inside the working area. If persons must enter the working area of the pump, the pump must be decommissioned and secured against being switched on again without authorisation.



WARNING

Sharp edges on the impeller and suction port!

Sharp edges can form on the impeller and suction port. There is danger of limbs being severed! Protective gloves must be worn to protect from cuts.

Fault: Pump does not start

1. Electricity supply interrupted or short-circuit/earth fault in the cable or motor winding.
 - ⇒ Have the connection and motor checked by a qualified electrician and replace if necessary.
2. Tripping of fuses, of the motor protection switch or the monitoring device
 - ⇒ Have the connection and the monitoring device checked by a qualified electrician and change it if necessary.
 - ⇒ Have the motor protection switches and fuses installed and adjusted according to the technical specifications by a qualified electrician and reset monitoring device.
 - ⇒ Check the impeller to make sure that it runs smoothly, clean the hydraulics if necessary.
3. The sealing chamber control (optional) has interrupted the electric circuit (connection-related)

- ⇒ See “Fault: Mechanical seal leakage, sealing chamber control reports a fault and switches the pump off”.

Fault: Pump starts up, motor protection trips after short period

1. Motor protection switch set incorrectly.
 - ⇒ Have the adjustment of the trigger checked and corrected by a qualified electrician.
2. Increased power consumption due to major voltage drop.
 - ⇒ Have the voltage of individual phases checked by a qualified electrician. Contact the electricity distribution network.
3. There are only two phases at the connection.
 - ⇒ Have the connection checked and corrected by a qualified electrician.
4. Excessive differences in voltage between the phases.
 - ⇒ Have the voltage of individual phases checked by a qualified electrician. Contact the electricity distribution network.
5. Incorrect direction of rotation.
 - ⇒ Have the connection corrected by a qualified electrician.
6. Increased power consumption through jammed hydraulics.
 - ⇒ Clean the hydraulics and check the inlet.
7. The density of the fluid is too high.
 - ⇒ Contact customer service.

Fault: Pump runs, there is no volume flow

1. There is no fluid.
 - ⇒ Check the inlet, open all gate valves.
2. Inlet clogged.
 - ⇒ Check the inlet and remove clogging.
3. Hydraulics jammed.
 - ⇒ Clean the hydraulics.
4. Pipe system on the pressure side or pressure hose clogged.
 - ⇒ Remove clogging and replace the damaged components if necessary.
5. Intermittent operation.
 - ⇒ Check the switching system.

Fault: Pump starts, duty point is not reached

1. Inlet clogged.
 - ⇒ Check the inlet and remove clogging.
2. Slide valves on the pressure side closed.
 - ⇒ Completely open all gate valves.
3. Hydraulics jammed.
 - ⇒ Clean the hydraulics.
4. Incorrect direction of rotation.
 - ⇒ Have the connection corrected by a qualified electrician.
5. Air cushion in the pipe system.
 - ⇒ Vent the pipe system.
 - ⇒ If air cushions occur frequently: Locate and prevent the air intake, if required install ventilation systems at specified locations.
6. Pump pumping against excessive pressure.
 - ⇒ Open all gate valves on the pressure side completely.
7. Signs of wear on the hydraulics.
 - ⇒ Have the components (impeller, suction port, pump housing) checked and replaced by customer service.
8. Pipe system on the pressure side or pressure hose clogged.

⇒ Remove clogging and replace the damaged components if necessary.

9. Strongly gassing fluid.

⇒ Contact customer service.

10. The connection only has two phases.

⇒ Have the connection checked and corrected by a qualified electrician.

11. Excessive decrease in the fill level during operation.

⇒ Check supply/capacity of the system.

⇒ Have the switching points of the level control checked and adjusted if necessary.

Fault: The pump does not run smoothly and is noisy

1. Improper duty point.

⇒ Check the pump configuration and the duty point, contact customer service.

2. Hydraulics jammed.

⇒ Clean the hydraulics.

3. Strongly gassing fluid.

⇒ Contact customer service.

4. There are only two phases at the connection.

⇒ Have the connection checked and corrected by a qualified electrician.

5. Incorrect direction of rotation.

⇒ Have the connection corrected by a qualified electrician.

6. Signs of wear on the hydraulics.

⇒ Have the components (impeller, suction port, pump housing) checked and replaced by customer service.

7. Motor bearings have worn.

⇒ Inform customer service; send the pump back to the factory for overhauling.

8. Pump is installed under tension.

⇒ Check installation, install rubber compensators if necessary.

Fault: Sealing chamber control reports fault or switches the pump off

1. Condensation water build-up due to extended storage or high temperature fluctuations.

⇒ Operate the pump for a short period (max. 5 min.) without pencil electrode.

2. Increased leakage when running in new mechanical seals.

⇒ Change the oil.

3. Pencil electrode cable is defective.

⇒ Replace the pencil electrode.

4. Mechanical seal is defective.

⇒ Inform customer service.

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.

11 Spare parts

Spare parts are ordered via customer service. To avoid return queries and incorrect orders, the serial or article number must always be supplied. **Subject to change without prior notice!**

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. Wipe up drips immediately!

12.2 Protective clothing

Used protective clothing must be disposed off in accordance with the locally applicable guidelines.

12.3 Information on the collection of used electrical and electronic products

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



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 for more information about recycling.

Subject to change without prior notice!

13 Ex rating

This section contains further information on the operation of the pump in an explosive atmosphere. All personnel must read this section. **This section applies only to Ex-rated pumps!**

13.1 Identification of Ex-rated pumps

For use in explosive atmospheres, the pump must be marked as follows on the rating plate:

- "Ex" symbol of the corresponding approval
 - Ex classification
 - Certification number (depending on the approval)
- The certification number, if required by the approval, is printed on the rating plate.

13.2 Protection class

The motor's design version corresponds to the following protection classes:

- Flameproof enclosure (ATEX)
- Explosionproof (FM)

In order to limit the surface temperature, the motor must be equipped with at least one temperature limiter (1-circuit temperature monitoring). It may also be equipped with a temperature controller (2-circuit temperature monitoring).

13.3 Intended use



DANGER

Explosion due to pumping of explosive fluids!

Pumping of highly flammable and explosive fluids (gasoline, kerosene, etc.) in pure form is strictly prohibited. There is a risk of fatal injury due to explosion! The pumps are not designed for these fluids.

ATEX approval

The pumps are suitable for operation in potentially explosive atmospheres:

- Device group: II
- Category: 2, zone 1 and zone 2

These pumps must not be used in zone 0!

FM approval

The pumps are suitable for operation in potentially explosive atmospheres:

→ Protection class: Explosionproof

→ Category: Class I, Division 1

Notice: If the cabling is carried out according to Division 1, installation in Class I, Division 2 is also permitted.

13.4 Electrical connection**DANGER****Risk of death due to electrocution!**

Improper conduct when carrying out electrical work can lead to death due to electric shock! Electrical work must be carried out by a qualified electrician in accordance with the locally applicable regulations.

- Always connect the pump to an electrical outlet outside the explosive area. If the connection must be made within the explosive area, then the connection must be carried out in an Ex-rated housing (ignition protection class according to DIN EN 60079-0)! Non-observance may lead to fatal injury due to explosion! Connection must always be carried out by a qualified electrician.
- All monitoring devices outside the “spark-proof areas” must be connected via an intrinsically safe circuit (e.g. Ex-i relay XR-4...).
- The voltage tolerance may not be higher than max. $\pm 10\%$.

Overview of monitoring devices

	Asynchronous motor		Permanent magnet motor	
	T 20.2	T 20.2	T 17.3...-P	T 20.2...-P
Internal monitoring devices				
Digital Data Interface	–	•	•	•
Motor winding: Bimetallic strip	•	–	–	–
Motor winding: PTC	o	• (+ 1...3x Pt100)	• (+ 1...3x Pt100)	• (+ 1...3x Pt100)
Motor bearings: Pt100	o	o	o	o
Sealing chamber: conductive sensor	–	–	–	–
Sealing chamber: capacitive sensor	–	•	•	•
Leakage chamber: Float switch	•	–	–	–
Leakage chamber: capacitive sensor	–	•	–	•
Vibration sensor	–	•	•	•
External monitoring devices				
Sealing chamber: conductive sensor	o	–	–	–

• = Standard, – = Not available, o = Optional

All the monitoring devices fitted must always be connected!

13.4.1 Motor with Digital Data Interface**NOTICE****Note the instructions for the Digital Data Interface!**

Read the separate instructions for the Digital Data Interface and comply with them.

The Digital Data Interface evaluates all available sensors. Use the graphical user interface of the Digital Data Interface to display current values and set the limit parameters. A warning message or alarm signal is output upon exceeding the limit parameters. The motor winding additionally features PTC sensors to enable secure pump deactivation.

The connection of the Digital Data Interface depends on the selected system mode and other system components. Note installation suggestions and connection variants in the instructions for the Digital Data Interface.

13.4.2 Motor without Digital Data Interface

13.4.2.1 Monitoring of motor winding



DANGER

Risk of explosion due to overheating of the motor!

If the temperature limiter is connected incorrectly, there is a risk of explosion due to overheating of the motor! Always connect the temperature limiter to a manual re-activation lock. This means that a “release button” must be manually activated!

The motor is equipped with a temperature limit (1-circuit temperature monitoring). As an option, the motor can be fitted with a temperature control and limit function (2-circuit temperature monitoring).

The installed sensor specifies the trigger temperature as part of thermal motor monitoring. Depending on the thermal motor monitoring version, the following triggering status must occur when the trigger temperature is reached:

→ Temperature limiter (1 temperature circuit):

The unit must be deactivated **with anti-reactivation lock** once the trigger temperature has been reached!

→ Temperature controller and limiter (2 temperature circuits):

Once the trigger temperature for the low temperature is reached, the motor can deactivate with automatic reactivation. Upon reaching the trigger temperature for the high temperature limit, the motor must deactivate with manual **anti-reactivation lock!**

CAUTION! Motor damage due to overheating! In the event of automatic reactivation, comply with the specifications for the maximum switching frequency and switching break!

Connection of the thermal motor monitoring

→ Connect the bimetallic strip using an evaluation relay. “CM-MSS” relay is recommended for this purpose.

Connection values: max. 250 V(AC), 2.5 A, $\cos \varphi = 1$

→ Connect the PTC sensor via an evaluation relay. “CM-MSS” relay is recommended for this purpose.

→ If a frequency converter is used, connect the temperature sensor at the Safe Torque Off (STO). This guarantees that the hardware deactivates the pump.

13.4.2.2 Leakage chamber monitoring

Connect the float switch using an evaluation relay! “CM-MSS” relay is recommended for this purpose.

13.4.2.3 Monitoring of motor bearing

The connection is made as described in the “Electrical connection” section.

13.4.2.4 Sealing chamber monitoring (external electrode)

→ Connect the external pencil electrode via an Ex-rated evaluation relay! Relay “XR-4...” is recommended for this.

The threshold is 30 kOhm.

→ The connection must be made using an intrinsically safe circuit!

13.4.3 Frequency converter operation

→ Converter type: Pulse-width modulation

→ Min./max. frequency during continuous duty:

– Asynchronous motors: 30 Hz up to rated frequency (50 Hz or 60 Hz)

– Permanent magnet motors: 30 Hz up to the stated maximum frequency as per rating plate

NOTICE! The maximum frequency may be below 50 Hz!

– Comply with the minimum flow velocity!

→ Min. switching frequency: 4 kHz

→ Max. overvoltage at the terminal board: 1350 V

→ Output current at the frequency converter: max. 1.5 times rated current

→ Max. overload time: 60 s

→ Torque applications: quadratic pump curve or automatic energy optimisation procedure (e.g. VVC+)

Required speed/torque curves are available on request!

→ Observe additional measures with regard to EMC regulations (choice of frequency converter, filters, etc.).

- Do not exceed the rated current or rated speed of the motor.
- It must be possible to connect the motor's own temperature monitoring (bimetallic strip or PTC sensor).
- If the temperature class is marked as T4/T3, temperature class T3 applies.

13.5 Commissioning



DANGER

Risk of explosion when using non Ex-rated pumps!

Pumps without Ex rating may not be used in potentially explosive areas! There is a risk of fatal injury due to explosion! Only use pumps which have the appropriate Ex labelling on the rating plate within potentially explosive areas.



DANGER

Risk of explosion due to flying sparks in the hydraulics!

During operation the hydraulics must be flooded (completely filled with the fluid). If the volume flow is interrupted or the hydraulics emerges, air cushions can form in the hydraulics. If this happens, there is a risk of explosion, e.g. flying sparks due to static charge! Dry-running protection must ensure that the pump is deactivated at the appropriate level.



DANGER

There is a risk of explosion if dry-running protection is connected incorrectly!

If the pump is operated within an explosive atmosphere, the dry-running protection must have a separate signal transmitter (redundant protection of the level control). Pump deactivation must be performed with a manual reactivation lock!

- The operator is responsible for defining the potentially explosive area.
- Only pumps with corresponding Ex rating may be used within a potentially explosive area.
- Pumps with Ex rating must be labelled on the rating plate.
- Do not exceed the **maximum fluid temperature!**
- Dry running of the pump must be prevented! Ensure on-site (dry-running protection) that emerging of the hydraulics is prevented.
According to DIN EN 50495, a safety device with SIL level 1 and hardware fault tolerance 0 must be provided for category 2.

13.6 Maintenance and repair

- Carry out maintenance tasks according to the regulations.
- Only carry out maintenance tasks described in these installation and operating instructions.
- The spark-proof gaps must **only** be repaired according to the manufacturer's design specifications. Carrying out repairs according to the values in tables 1 and 2 of DIN EN 60079-1 is **not** permitted.
- Only use screws as stipulated by the manufacturer, which at a minimum correspond to a strength class of 600 N/mm² (38.85 long tons-force/inch²).

13.6.1 Repair of housing coating

The paint layer can become electrostatically charged in case of thicker coats. **DANGER! Risk of explosion! In explosive atmospheres, a discharge can cause an explosion!**

If the housing coating has to be repaired, the maximum coat thickness is 2 mm (0.08 in)!

13.6.2 Changing the mechanical seal

Changing the seal on the fluid and motor side is strictly prohibited!

13.6.3 Replacing the connection cable

Changing the connection cable is strictly prohibited!

14 Appendix

14.1 Tightening torques

Rust-free screws A2/A4			
Threaded	Tightening torque		
	Nm	kp m	ft·lb
M5	5.5	0.56	4
M6	7.5	0.76	5.5
M8	18.5	1.89	13.5
M10	37	3.77	27.5
M12	57	5.81	42
M16	135	13.77	100
M20	230	23.45	170
M24	285	29.06	210
M27	415	42.31	306
M30	565	57.61	417

Geomet-coated screws (strength 10.9) with Nord-Lock washer			
Threaded	Tightening torque		
	Nm	kp m	ft·lb
M5	9.2	0.94	6.8
M6	15	1.53	11
M8	36.8	3.75	27.1
M10	73.6	7.51	54.3
M12	126.5	12.90	93.3
M16	155	15.81	114.3
M20	265	27.02	195.5

14.2 Frequency converter operation

The motor in series design (confirming to IEC 60034-17) can be operated with a frequency converter. Contact customer service if the rated voltage is over 415 V/50 Hz or 480 V/60 Hz. As a result of the additional heating caused by harmonics, the rated power of the motor must be around 10 % more than the power requirement of the pump. For frequency converters with a low-harmonic output, it may be possible to reduce the 10 % power reserve. Harmonic waves are reduced by means of output filters. The frequency converter and filter must be compatible.

The configuration of the frequency converter depends on the rated motor current. Make sure that the pump operates without jerking or vibration, specifically in the lower speed range. Otherwise, the mechanical seals may leak or be damaged. The flow rate in the pipe must also be observed. A low flow rate increases the risk of solids depositing in the pump and piping. A minimum flow rate of 0.7 m/s (2.3 ft/s) with a pumping pressure of 0.4 bar (6 psi) is recommended.

It is important that the pump operates across the entire control range without vibrations, resonance, oscillation or excessive noise. Increased motor noise caused by the harmonics of the power supply is normal.

During parameter configuration of the frequency converter, observe the setting of the quadratic characteristic curve (U/f curve) for pumps and fans! The U/f characteristic curve ensures that the output voltage at frequencies below the rated frequency (50 Hz or 60 Hz) is adjusted to the power requirement of the pump. More recent frequency converters feature an automatic power optimisation function – this automation achieves the same effect. For the frequency converter setting, refer to its installation and operating instructions.

Motor monitoring faults may occur in motors operated with a frequency converter depending on the type used and the installation conditions. The following measures can help to reduce or avoid these faults:

- Keeping within the limit values stated in IEC 60034-25 for overvoltage and rise speed. Output filters may need to be installed.

- Vary the pulse frequency of the frequency converter.
- In the event of a fault in the internal sealing chamber control, use the external double-rod electrode.

The following construction measures can also help to reduce or prevent faults:

- Separate connection cables for the main and control cable (depending on the motor size).
- Keep an adequate distance between main and control cable during routing.
- Use shielded connection cables.

Summary

- Min./max. frequency during continuous duty:
 - Asynchronous motors: 30 Hz up to rated frequency (50 Hz or 60 Hz)
 - Permanent magnet motors: 30 Hz up to the stated maximum frequency as per rating plate
- NOTICE! The maximum frequency may be below 50 Hz!**
- Comply with the minimum flow velocity!
 - Observe additional measures with regard to EMC regulations (choice of frequency converter, using filters, etc.).
 - Do not exceed the rated current or rated speed of the motor.
 - It must be possible to connect the motor's own temperature monitoring (bimetallic strip or PTC sensor).



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