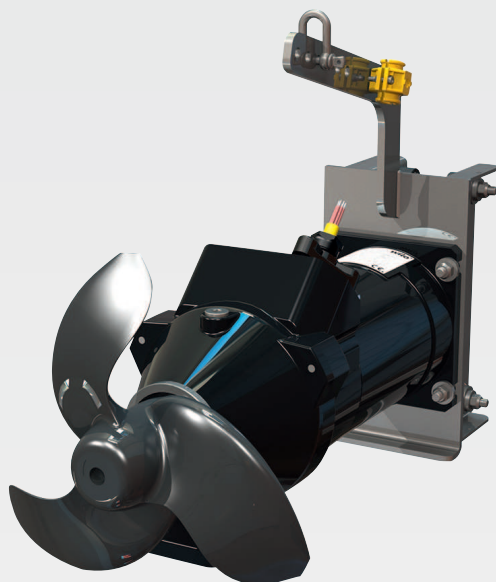


Wilo-EMU TR 14-40



en Installation and operating instructions



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1 General information

1.1 About these instructions

These installation and operating instructions are an integral part of the product. Read these instructions before commencing work and keep them in an accessible place at all times. Strict adherence to these instructions is a precondition for the intended use and correct operation of the product. All information and markings on the product must be observed.

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

1.2 Copyright

These installation and operating instructions have been copyrighted by the manufacturer. Contents of any kind may not be reproduced or distributed, or used for purposes of competition and shared with others.

1.3 Subject to change

The manufacturer reserves the right to make technical modifications to the device or individual components. The illustrations used may differ from the original and are intended as an example representation of the device.

1.4 Warranty

The specifications in the current "General Terms and Conditions" apply to the warranty and the warranty period. These can be found at www.wilo.com/legal

Any deviations must be contractually agreed and shall then be given priority.

Claim to warranty

If the following points are complied with, the manufacturer is obligated to rectify every qualitative or constructive flaw:

- The defects are reported in writing to the manufacturer within the warranty period.
- Application according to intended use.
- All monitoring devices are connected and tested before commissioning.

Exclusion from liability

Exclusion from liability excludes all liability for personal injury, material damage or financial losses. This exclusion ensues as soon as one of the following applies:

- Inadequate configuration due to inadequate or incorrect instructions by the operator or the client
- Non-compliance with installation and operating instructions
- Improper use
- Incorrect storage or transport
- Incorrect installation or dismantling
- Insufficient maintenance
- Unauthorised repairs
- Inadequate construction site
- Chemical, electrical or electro-chemical 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 of electric voltage



Danger of bacterial infection



Danger – explosive atmosphere



General warning symbol



Warning of cutting injuries



Warning of hot surfaces



Warning of high pressure



Warning of suspended loads



Personal protective equipment: wear a safety helmet



Personal protective equipment: wear foot protection



Personal protective equipment: wear hand protection



Personal protective equipment: wear safety harness



Personal protective equipment: wear mouth protection



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.
- Lifting work: A specialist suitably trained in the operation of lifting devices must carry out lifting work. Evidence must be presented in accordance with BGV D8 or applicable local regulations.
- 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 Transport

- Risk of injury from impact or crushing. Wear the following protective equipment:
 - Safety shoes
 - Safety helmet
- Locally applicable laws and regulations for work safety and accident prevention must be complied with.
- Demarcate the working area.
- Unauthorised persons must be kept away from the working area.
- Observe packaging regulations:
 - Impact-resistant
 - Ensure the product is properly fixed in place.
 - Protect it against dust, oil and moisture.
- Only use legally prescribed and approved lifting and hoisting gear.
- Select the lifting gear based on the prevailing conditions (weather, attachment point, load, etc.).
- Always attach the lifting gear to the attachment points and ensure they are securely attached.
- The stability of the hoisting gear must be ensured during operation.
- When using hoisting gear, a second person must be present to coordinate the procedure if required (e.g. if the operator's field of vision is blocked).
- Keep away from the hoisting gear's swivel range when hoisting the product.
- Persons are not permitted to stand beneath suspended loads. Do **not** carry suspended loads over workplaces where people are present.

2.7 Installing/dismantling

- Risk of injury from:
 - Slipping
 - Tripping
 - Impact
 - Crushing
 - Falling
- Wear the following protective equipment:
 - Safety shoes
 - Safety gloves for protection against cuts
 - Safety helmet
 - Safety harness
- Comply with laws and regulations on work safety and accident prevention in force at the site of installation.
- Demarcate the working area.
- Keep the working area free of ice.
- Keep the working area free of any objects lying around.
- If the weather conditions mean it is no longer possible to work safely, stop work.
- Keep unauthorised persons away from the working area.

- Work must always be carried out by two persons.
- When working at a height of more than 1 m (3 ft) above the ground, use scaffolding with a safety harness.
- Cordon off the working area around the scaffolding.
- Disconnect the device from the mains and secure it against being switched on again without authorisation.
- All rotating parts must be at a standstill.
- Make sure that there is no risk of explosion when carrying out any work with electrical devices.
- Only use properly functioning hoisting gear.
- Keep away from the hoisting gear's swivel range when hoisting the product.
- Toxic or asphyxiating gases may build up when working in closed rooms or buildings. Ensure there is sufficient ventilation and observe protective measures according to work regulations (examples):
 - Measure the gas concentration before entering.
 - Carry a gas detector with you.
 - etc.

2.8 During operation

- The work area in which the device is used is not a recreational area. No persons are allowed in the work area during operation.
- Wear protective equipment in accordance with the notice of the work regulations.
- The operator must immediately report any faults or irregularities to their line manager.
- If hazardous defects occur, the operator must immediately deactivate the device:
 - Malfunction of safety and monitoring devices
 - Damage to housing parts
 - Damage to electrical equipment
- The propeller must not bump into fixtures or walls in the operating space. Observe defined clearances to fixtures and basin walls in accordance with consulting documents.
- If the water level significantly fluctuates, ensure the required water immersion using level monitoring.
- Under normal operating conditions, the sound pressure level of the device is below 85 dB(A). However, the actual sound pressure level depends on several factors:
 - Installation depth
 - Installation type
 - Utilisation
 - Immersion depth

2.9 Maintenance tasks

- Risk of injury through crushing and hot operating fluid. Wear the following protective equipment:
 - Closed safety goggles
 - Protective gloves
 - Safety shoes
- Always carry out maintenance tasks outside the operating space.
- Only carry out maintenance tasks mentioned in these installation and operating instructions.
- Use only original parts from the manufacturer for maintenance and repairs. Use of parts other than the original parts releases the manufacturer from any liability.
- Collect any drips of fluid and operating fluid immediately and dispose of them according to locally applicable guidelines.

Changing operating fluid

In the event of a motor defect, pressure of **several bar can build up** in the sealing chamber! This pressure is released 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 pressure is released (audible whistling or hissing of air), stop turning the screw plug any further.

WARNING! Hot operating fluids can also spray out when pressure is released. 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 been completely released, fully unscrew the screw plug.

2.10 Operating fluid

The seal housing is filled with white oil. Replace the operating fluid during regular maintenance work and dispose of it according to the local guidelines.

2.11 Operator responsibilities

- Provide installation and operating instructions 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 personnel wear it.
- Safety and information signs mounted on the device must always be legible.
- Train the personnel on how the system operates.
- Eliminate risk from electrical current.
- Demarcate and cordon off the working area.
- To ensure safe working practice, define personnel responsibilities.
- Carry out sound pressure measurement when the product is in normal operation. If the measured sound pressure is more than 85 dB(A), wear hearing protection and include such instruction in the work regulations!

3 Application/use

3.1 Intended use

The mixers are suitable for both intermittent and continuous duty in drainage and sewage (with and without faeces) as well as in sludge:

- for flow generation
- for suspension of solid matter
- for homogenisation

Intended use also includes compliance with this manual. Any use other than the intended use is regarded as improper use.

3.2 Improper use

The mixers must not be used in:

- Drinking water
- Non-Newtonian fluids
- Severely contaminated fluids containing hard components such as stone, wood, metals, etc.
- Highly flammable and explosive fluids in pure form

4 Product description

4.1 Construction

The submersible mixer consists of the following main components:

1	Connection cable
2	Seal housing
3	Propeller
4	Pencil electrode (optional)
5	Motor
6	Frame for lowering device
7	Attachment point

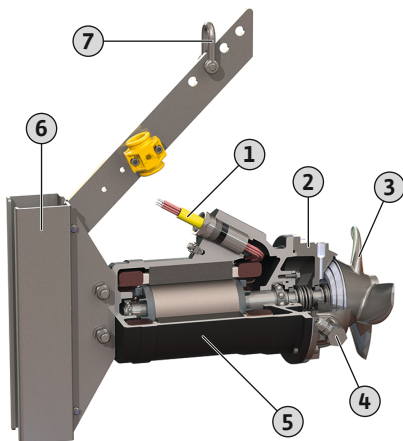


Fig. 1: Overview of the submersible mixer

4.1.1 Propeller

Propeller made of solid material with backward-curved incoming flow edge and patented helical hub. **NOTICE! The propeller must not emerge during operation. Observe specified minimum water immersion!**

	TR 14...	TR 16...	TR 21...	TR 22...	TR 28...	TRE 36...	TR 40...
Nominal diameter in mm (in)	140 (5.5)	160 (6)	210 (8)	220 (8.5)	280 (11)	360 (14)	400 (16)
Number of blades	2	2	2	3	2	3	3

Material version

PUR	•	•	•	–	•	•	•
EN-GJL-250 (ASTM A48 Class 35/40B)	–	–	–	o	–	–	–
1.4571 (AISI 316Ti)	–	–	o	–	–	o	o
1.4408 (ASTM A 351)	–	–	–	•	–	–	–

• = standard, – = not available, o = optional

* = high wear-resistant propeller made of composite PUR/GFK (PUR/GFRP) material featuring reinforced leading edge.

4.1.2 Motor

The system is driven by a surface-cooled motor in three-phase current version. The motor is fitted with maintenance-free, permanently lubricated and appropriately dimensioned roller bearings. The motor is cooled by the fluid around it. Waste heat is transferred directly to the fluid via the motor housing.

The connection cable is sealed water pressure-tight against the fluid and is sealed longitudinally watertight. The connection cable has bare cable ends and the standard length is 10 m (33 ft). Longer cables are available on request.

	TR...
Fluid temperature	3...40 °C (37...104 °F)
Protection class	IP68
Insulation class	H
Number of poles	4, 6, 8
Max. switching frequency	15/h
Max. immersion depth	20 m (66 ft)
Explosion protection	ATEX, FM, CSA
Operating mode, immersed	S1
Operating mode, non-immersed	–
Motor efficiency class	–
Housing material	EN-GJL-250 (ASTM A48 Class 35/40B)

4.1.3 Seal

Between the motor and propeller, there is the seal housing with the seal on the fluid and on the motor side.

The seal on the fluid side is provided by a mechanical seal. The mechanical seal is fitted with an additional packing sleeve. The packing sleeve ensures a durable and corrosion-resistant fit for the mechanical seal. The seal on the motor side involves either a rotary shaft seal or a mechanical seal.

The seal housing is filled with white oil and absorbs leakage from the seal on the fluid side.

	TR 14...	TR 16...	TR 21...	TR 22...	TR 28...	TR 36...	TR 40...

Seal

Fluid side: SiC/SiC	•	•	•	•	•	•	•
On the motor side: NBR (nitrile)	–	–	–	•	–	•	•
On the motor side: SiC/SiC	•	•	•	–	•	–	–

Housing material

EN-GJL-250 (ASTM A48 Class 35/40B)	•	•	•	•	•	•	•
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4.2 Monitoring devices

Overview of possible monitoring devices:

	TR 14...	TR 16...	TR 21...	TR 22...	TR 28...	TR 36...	TR 40...

Internal monitoring devices

Motor compartment	o	o	o	–	o	–	–
Motor compartment/sealing chamber*	–	–	–	o	–	o	o
Motor winding**	•	•	•	•	•	•	•

External monitoring devices

Sealing chamber	o	o	o	o	o	o	o
-----------------	---	---	---	---	---	---	---

Legend

– = not available/possible, o = optional, • = standard

* In the Ex version, this monitoring is omitted and not substituted!

** A temperature limiter is fitted as standard. The Ex version as per ATEX also features an installed temperature controller and limiter.

All the monitoring devices fitted must always be connected!**Monitoring of motor compartment**

The motor compartment monitoring protects the motor winding from short-circuits. The moisture is measured by an electrode.

Monitoring the motor compartment and sealing chamber

The motor compartment monitoring protects the motor winding from short-circuits. Sealing chamber control detects fluid ingress through the mechanical seal on the fluid side. In each case, the humidity is recorded by an electrode in the motor compartment and sealing chamber.

NOTICE! The Ex version does not feature this monitoring unit!**Monitoring of motor winding**

The thermal motor monitoring protects the motor winding from overheating. Temperature limiting with bimetallic strip is fitted as standard.

As an option, the temperature can also be measured with a PTC sensor. The thermal motor monitoring can also be designed as temperature control. This allows the measurement of two temperatures. When the low temperature is reached, an automatic re-activation can be initiated after cooling the motor. When the high temperature is reached, the unit must deactivate with reactivation lock.

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.

4.3 Operating modes

Operating mode S1: Continuous duty

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

4.4 Operation with frequency converter

Operation on the frequency converter is permitted. Refer to the appendix for the relevant requirements!

4.5 Operation in an explosive atmosphere

Approval according to	TR 14...	TR 16...	TR 21...	TR 22...	TR 28...	TR 36...	TR 40...
ATEX	o	o	o	o	o	o	o
FM	o	o	o	o	o	o	o
CSA-Ex	o	o	o	o	o	o	o

Legend

– = not available/possible, o = optional, • = standard

For use in explosive atmospheres, the mixer 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 mixers are suitable for operation in potentially explosive atmospheres:

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

Mixers must not be used in zone 0!

FM approval

The mixers 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.

CSA Ex rating

The mixers are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosion-proof
- Category: Class 1 Division 1

4.6 Rating plate

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

Rating plate designation	Value
P-Typ	Mixer type
M-Typ	Motor type
S/N	Serial number

Rating plate designation	Value
MFY	Date of manufacture*
n	Speed
T	Max. fluid temperature
IP	Protection class
I_N	Rated current
I_{ST}	Starting current
I_{SF}	Rated current at service factor
P_2	Rated power
U	Rated voltage
f	Frequency
$\cos \varphi$	Motor efficiency
SF	Service factor
OT _s	Operating mode: immersed
OT _e	Operating mode: non-immersed
AT	Starting mode
m	Weight

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

→ JJJJ = year

→ W = abbreviation for week

→ ww = calendar week

4.7 Type key

Example: Wilo-EMU TR 36.95-6/16REx S17	
TR	Submersible mixer, horizontal: TR = mixer with standard asynchronous motor TRE = mixer with asynchronous motors of motor efficiency class IE3/IE4
36	x10 = nominal propeller diameter in mm
95	Rated propeller speed in rpm
6	Number of poles
16	x10 = stator pack length in mm
R	Motor version: R = mixer version V = mixer version with reduced power
Ex	Ex-rated
S17	Propeller code for special propeller (omitted for standard propeller)

4.8 Scope of delivery

- Mixer with bare cable end
- Cable length as per customer request
- Mounted accessories, e.g. frame, pencil electrode, etc.
- Installation and operating instructions

4.9 Accessories

- Lowering device
- Auxiliary lifting device
- Mounting bracket for wall and floor fixation
- Cable bollard to secure the hoist cable
- Terminal stop
- Additional rope anchoring
- Fixation sets with anchor bolts

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 mixer. Ensure that the mixer 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!



NOTICE

Transporting mixers without attachment points

Mixers for ground and wall fixation have no in-built frame and therefore no attachment point. Transport the mixer on the pallet to the installation site. Have one or two persons position the mixer at the installation site. Bear in mind the weight of the mixer!

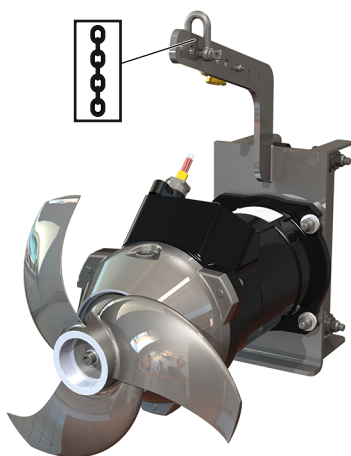


Fig. 2: Attachment point

- Only remove the outer packaging at the site of use to ensure that the mixer is not damaged during transport.
- Use tear-proof plastic sacks of sufficient size to package used mixers for transport in a leak-proof manner.
- Seal the open end of the connection cable against water ingress.
- 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).

5.3 Storage



DANGER

Danger from fluids hazardous to health!

Risk of fatal injury if the mixer is used in fluids hazardous to health.

- Decontaminate the mixer after dismantling and before carrying out any other work.
- Observe the specifications provided by work regulations. The operator must make sure that personnel have received and read work regulations.



WARNING

The propeller blade has sharp edges!

Sharp edges can form on the propeller blades. There is a risk of limbs being severed. Wear safety gloves to protect against cuts.

CAUTION

Total damage from to moisture ingress

Moisture ingress in the connection cable damages the connection cable and the mixer! Never immerse the end of the connection cable in a fluid and firmly seal it during storage.

Newly supplied mixers can be stored for one year. Contact customer service before storing the mixer for more than one year.

The following must be observed as regards storage:

- Place the mixer (horizontally) on a solid surface **and secure it against slipping and falling over!**
CAUTION! Do not set the mixer down on the propeller. Doing so will damage the propeller or the shaft! In the case of larger propeller diameters, ensure an appropriate platform is provided.
- The max. storage temperature is -15 °C to +60 °C (5 °F to 140 °F) at a max. relative humidity of 90 %, non-condensing. Frost-proof storage at a temperature of 5 °C to 25 °C (41 °F to 77 °F) with relative humidity of 40 % to 50 % is recommended.
- Do not store the mixer in rooms in which welding work is carried out. The resulting gases or radiation can corrode the elastomer parts and coatings.
- Protect the connection cable against kinking and damage.
- Protect the mixer from direct sunlight and heat. Extreme heat can cause damage to the propeller and the coating!
- Turn the propeller at regular intervals (twice a year). This prevents locking of the bearings and renews the lubrication film of the mechanical seal. **WARNING! There is a risk of injury from sharp edges on the propeller!**
- 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 mixer 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.
- Lifting work: A specialist suitably trained in the operation of lifting devices must carry out lifting work. Evidence must be presented in accordance with BGV D8 or applicable local regulations.

6.2 Operator responsibilities

- Observe the 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.
- Demarcate the working area and keep it free from any objects lying around.
- Unauthorised persons must be kept away from the working area.
- If the weather conditions (e.g. ice formation, strong wind) mean it is no longer possible to work safely, stop work.
- Structural components and foundations must be of sufficient stability in order to allow the device to be fixed in a secure and functional manner. The operator is responsible for the provision and suitability of the building/foundation!
- Check that the available consulting documents (installation plans, design of the operating space, inflow conditions) are complete and correct.

6.3 Installation types

- Stationary ground and wall fixation
- Flexible installation with lowering device

NOTICE! Vertical installation between -90° and $+90^\circ$ may be possible depending on the system. For such installations, contact customer service!

6.4 Installation



DANGER

Danger due to fluids hazardous to health during installation!

Ensure that the installation site is clean and disinfected during installation. If contact with fluids that are hazardous to health is possible, observe the following points:

- Wear protective equipment:
 - ⇒ Closed safety goggles
 - ⇒ Mouth protection
 - ⇒ Protective gloves
- Immediately wipe up drips.
- Observe the specifications provided by work regulations! The operator must make sure that personnel have received and read work 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

A lack of protective equipment may result in hand and foot injuries or the risk of falling!

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

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

CAUTION**Material damage due to incorrect fixation**

Defective fixation may limit the functionality of the mixer or damage it.

- If the mixer is fixed to a concrete structure, use anchor bolts for fixation. Follow the manufacturer's installation instructions! Temperature specifications and hardening periods must be strictly observed.
- If the mixer is fixed to a steel structure, ensure that the structure is sufficiently strong. Use fixation materials with sufficient strength!
Use suitable materials to avoid electrochemical corrosion!
- Tighten all screwed connections. Observe torque specifications.

**NOTICE****Use only properly functioning lifting equipment!**

Use only properly functioning lifting equipment to lift and lower the mixer. Ensure that the mixer 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 site:
 - Clean, free of coarse solids
 - Dry
 - Frost-free
 - Decontaminated
- Work must always be carried out by two persons.
- Avoid any painful or tiring body postures.
- When working at a height of more than 1 m (3 ft) above the ground, use scaffolding with a safety harness.
- Cordon off the working area around the scaffolding.
- Toxic or asphyxiating gases may build up when working in closed rooms. Ensure there is sufficient ventilation and observe protective measures according to work regulations (examples):
 - Measure the gas concentration before entering.
 - Carry a gas detector with you.
 - etc.
- Take immediate countermeasures if there is a build-up of toxic or asphyxiating gases.
- Use hoisting gear to lift, lower and transport the mixer.
- Attach the hoisting gear to the attachment point using a shackle. Only use lifting gear which has been technically approved.
- Keep away from the hoisting gear's swivel range when hoisting the product.
- Only use hoisting gear if it can be safely attached. The storage place and the installation site must be accessible with the hoisting gear. The set-down location must have a firm surface.
- Observe minimum clearances with respect to walls and any fixtures.
- The laid connection cable must allow safe operation. Check whether the cable cross-section and the cable length are sufficient for the selected installation type.

6.4.1 Maintenance tasks

After a storage period of more than 6 months, carry out the following maintenance tasks before installation:

- Rotate propeller.
- Seal housing oil change.

6.4.1.1 Rotating the propeller**WARNING****The propeller blade has sharp edges!**

Sharp edges can form on the propeller blades. There is a risk of limbs being severed. Wear safety gloves to protect against cuts.

- ✓ The mixer is **not** connected to the mains!

6.4.1.2 Oil change in seal housing (TR 14/16/21/28)

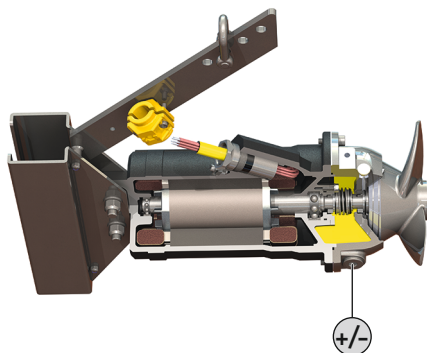


Fig. 3: Oil change

6.4.1.3 Oil change in seal housing (TR 22/36/40)

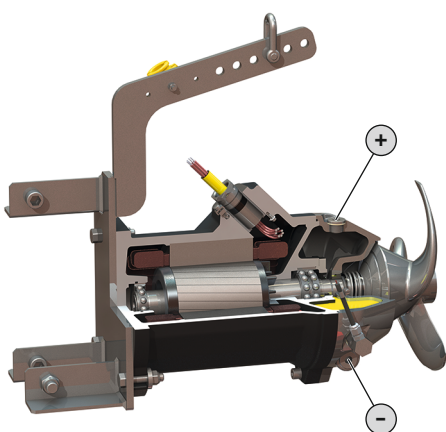


Fig. 4: Oil change

✓ Protective equipment must be put on!

1. Place the mixer horizontally on a firm surface.

WARNING! Risk of hands being crushed. Ensure that the mixer cannot fall over or slip away!

CAUTION! Do not set the mixer down on the propeller! Use an appropriate platform for the propeller diameter.

2. Grip the propeller slowly and carefully and rotate the propeller.

+/-	Drain/fill seal housing oil
-----	-----------------------------

✓ Mixer is **not** installed.

✓ Mixer is **not** connected to the mains.

✓ Protective equipment must be put on!

1. Place the mixer horizontally on a firm surface.

WARNING! Risk of hands being crushed. Ensure that the mixer cannot fall over or slip away!

CAUTION! Do not set the mixer down on the propeller! Use an appropriate platform for the propeller diameter.

2. Position a suitable tank to collect the operating fluid.

3. Unscrew the screw plug (+/-).

4. Tip the mixer and allow the operating fluid to drain out.

5. Check the operating fluid: Notify customer service if the operating fluid contains metal swarf!

6. Dispose of operating fluid in accordance with local regulations!

7. Return the mixer to a horizontal position so that the opening points upwards.

8. Pour the new operating fluid in through the hole for the screw plug (+/-).

⇒ Comply with the specifications for the operating fluid type and quantity!

9. Clean the screw plug (+/-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**

10. Restore corrosion protection: Seal screw plug, e.g. with Sikaflex.

+	Fill oil in the seal housing
-	Drain oil in the seal housing

✓ Mixer is **not** installed.

✓ Mixer is **not** connected to the mains.

✓ Protective equipment must be put on!

1. Place the mixer horizontally on a firm surface.

WARNING! Risk of hands being crushed. Ensure that the mixer cannot fall over or slip away!

CAUTION! Do not set the mixer down on the propeller! Use an appropriate platform for the propeller diameter.

2. Position a suitable tank to collect the operating fluid.

3. Unscrew the screw plug (+).

4. Unscrew screw plug (-) and drain the operating fluid.

5. Check the operating fluid: Notify customer service if the operating fluid contains metal swarf!

6. Dispose of operating fluid in accordance with local regulations!

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!

9. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft-lb)!**

10. Restore corrosion protection: Seal screw plug, e.g. with Sikaflex.

6.4.2 Wall fixation



Fig. 5: Wall fixation

In the case of wall fixation, the mixer is mounted directly on the basin wall. Lay the connection cable against the basin wall and lead it upwards.

- ✓ Operating space/installation location is prepared for the installation. Defined clearances to fixtures and basin walls are kept in accordance with the consulting documents.
 - ✓ Mixer is not connected to the mains.
 - ✓ For installation at heights over 1 m, use scaffolding with a safety harness.
1. Have 2 persons position the mixer against the basin wall and mark the fixation holes.
 2. Set the mixer down outside of the working area.
 3. Drill fixation holes and insert anchor bolts. **NOTICE! Follow the manufacturer's installation instructions!**
 4. Once the anchor bolts have hardened in place, have 2 persons place the mixer on the anchor bolts and fix in place with fixation material.
 5. Fix the mixer firmly against the basin wall. **NOTICE! Follow the manufacturer's installation instructions!**
 6. Lay the connection cable against the basin wall so that it is slightly taut. **CAUTION! If the connection cable leads over the edge of the basin, beware of potential abrasion. Sharp edges may damage the connection cable. Bevel the basin edge if necessary!**
 7. Apply corrosion protection (e.g. Sikaflex): Fill the slotted holes on the motor flange up to the washer.
- Mixer is installed. Make the electrical connection.

6.4.3 Ground installation

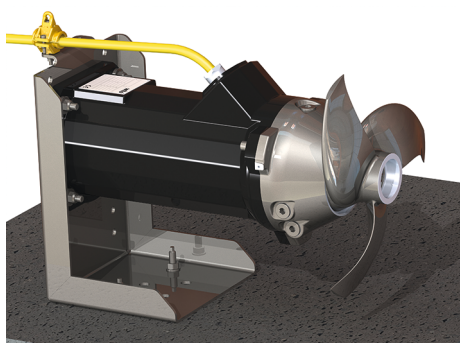


Fig. 6: Ground installation

In the case of ground installation, the mixer is fixed directly to the floor of the basin using a mounting bracket. **CAUTION! If the mixer is ordered for ground installation, the mounting bracket comes pre-assembled. If the mixer is delivered without a mounting bracket, order the appropriate mounting bracket from customer service!** Lay the connection cable along the basin floor and upwards up the basin wall.

- ✓ Operating space/installation location is prepared for the installation. Defined clearances to fixtures and basin walls are kept in accordance with the consulting documents.
 - ✓ Mixer is not connected to the mains.
 - ✓ Mounting bracket mounted on the mixer.
1. Have 2 persons position the mixer on the basin floor and mark 2 fixation holes.
 2. Set the mixer down outside of the working area.
 3. Drill fixation holes and insert anchor bolts. **NOTICE! Follow the manufacturer's installation instructions!**
 4. Once the anchor bolts have hardened in place, have 2 persons position the mixer on the anchor bolts and fix in place with fixation material.
 5. Mount the mixer firmly against the basin floor. **NOTICE! Follow the manufacturer's installation instructions!**
 6. Lay the connection cable against the basin floor and the basin wall so that it is slightly taut. **CAUTION! If the connection cable leads over the edge of the basin, beware of potential abrasion. Sharp edges may damage the connection cable. Bevel the basin edge if necessary!**
 7. Apply corrosion protection (e.g. Sikaflex):
 - Sealing joint between mounting bracket and structure.
 - Fill holes in the baseplate of the mounting bracket.
 - Fill scratches in the mounting bracket.

6.4.4 Installation with lowering device

► Mixer is installed. Make the electrical connection.

The mixer is lowered into the basin using a lowering device. The lowering device's guide pipe safely guides the mixer to the duty point. The resultant reaction forces are transferred directly into the foundation via the lowering device. The foundation **must** be designed to bear this load!

CAUTION! Material damage due to incorrect accessories! Due to the high reaction forces, the mixer may only be operated with the manufacturer's accessories (lowering device and frame). If the mixer is ordered together with a lowering device for installation, the frame comes pre-assembled. If the mixer is delivered without a frame, order the appropriate frame from customer service!

Preparatory works

1	Hoisting gear
2	Lifting equipment
3	Shackle for attachment
4	Support
5	Platform for secure set-down
6	Frame
7	Cable brackets for strain relief

- ✓ Mixer set down and horizontal.
- ✓ Frame mounted on the mixer.
- ✓ Lowering device mounted in basin.
- ✓ Hoisting gear with sufficient bearing capacity provided.

1. Attach lifting equipment to frame with a shackle.
2. Version with plastic rollers: Loosen linchpins and dismantle plastic rollers and quick-release axles.

NOTICE! Prepare components for further installation.

3. Lay all connection cables and mount cable brackets.
The cable brackets fix the connection cable to the lifting equipment and prevent uncontrolled floating of the connection cable in the basin.

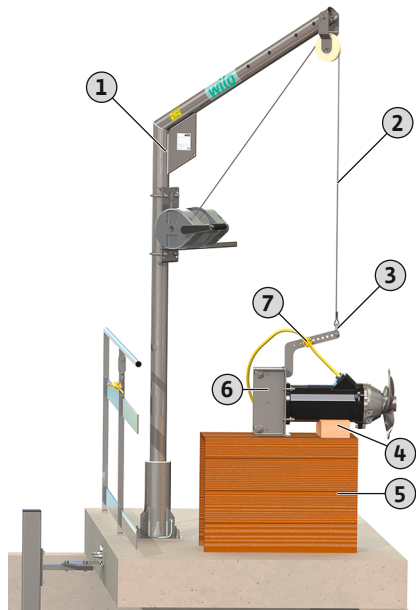


Fig. 7: Prepare the mixer

Mixer	Cable bracket clearance
TR 14	550 mm (20 in)
TR 16	550 mm (20 in)
TR 21	550 mm (20 in)
TR 22	750 mm (30 in)
TR 28	550 mm (20 in)
TR 36	750 mm (30 in)
TR 40	750 mm (30 in)

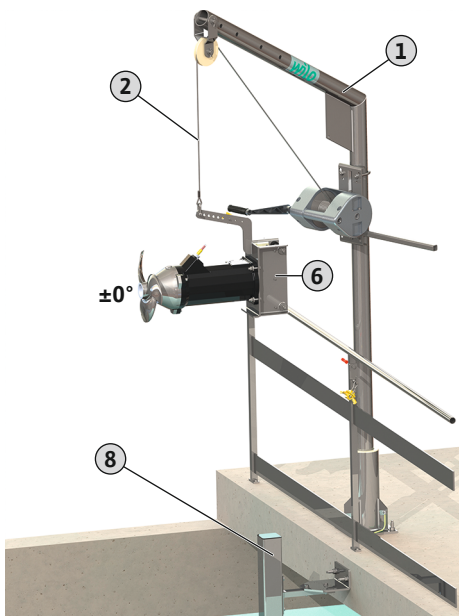


Fig. 8: Swivel the mixer over the basin

Lift the mixer and swivel it over the basin

1	Hoisting gear
2	Lifting equipment
6	Frame
8	Guide pipe for lowering device

✓ Preparatory tasks completed.

1. Lift mixer so that it can be swivelled safely over the railings.

NOTICE! The mixer must hang horizontal on the hoisting gear. If the mixer hangs at an angle to the hoisting gear, adjust the attachment point on the frame.

2. Swivel the mixer over the basin.

NOTICE! The frame must be perpendicular to the guide pipe. If the frame is not perpendicular to the guide pipe, adjust the reach of the hoisting gear.

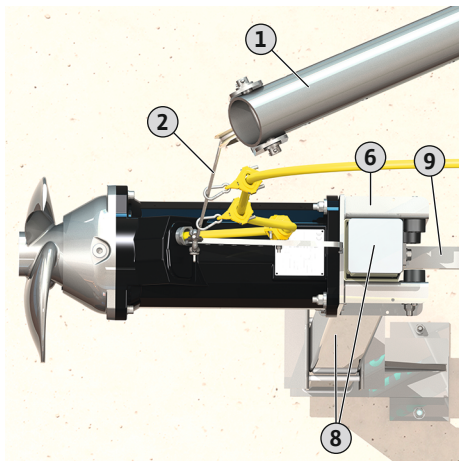


Fig. 9: Mixer on the lowering device

Mounting the mixer on the lowering device

1	Hoisting gear
2	Lifting equipment
6	Frame
8	Guide pipe for lowering device
9	Upper holder of the lowering device

✓ Mixer hangs horizontally.

✓ Frame perpendicular to the guide pipe.

✓ Cable bracket is installed.

1. Slowly lower the mixer.

2. Insert the guide pipe in the frame without tilting.

NOTICE! The guide rollers are in contact with the guide pipe.

3. Version with quick-release axles:

Lower the mixer until the frame is below the upper holder. Install the quick-release axles and plastic rollers and secure them with linchpins!

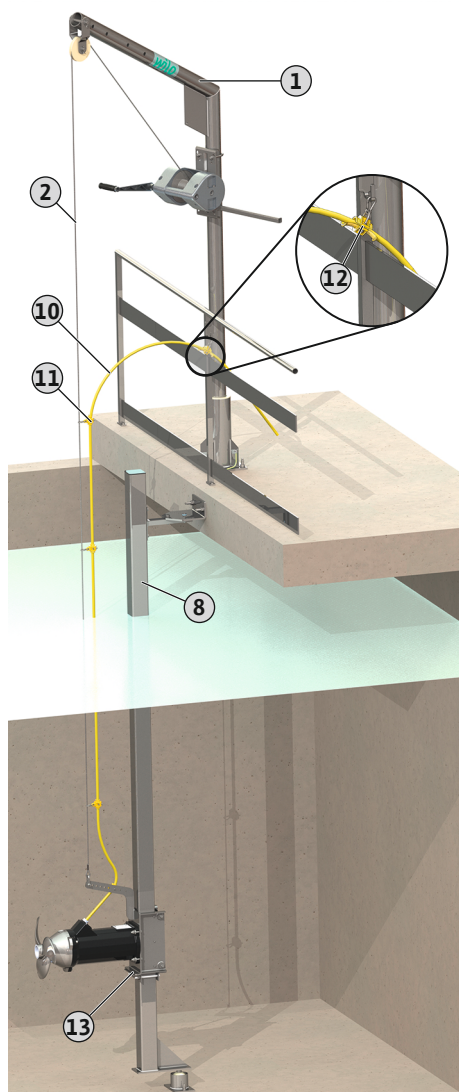


Fig. 10: Mixer set down on the fixed limit stop

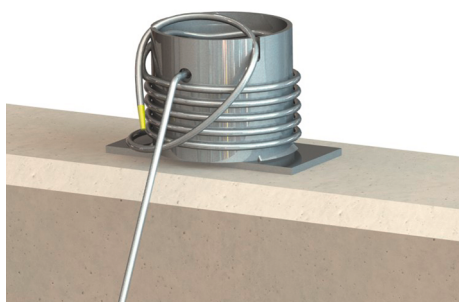


Fig. 11: Lifting equipment secured to a cable bollard

6.5 Electrical connection



Completing installation

1	Hoisting gear
2	Lifting equipment
8	Guide pipe for lowering device
10	Connection cable
11	Cable bracket with snap hook, cable routing via lifting equipment
12	Cable bracket with snap hook, safeguard against falling
13	Fixed limit stop

✓ Mixer mounted on the lowering device

1. Slowly lower the mixer.
 2. Hang the connection cable on the lifting equipment using the cable brackets. The connection cable is routed safely using the lifting equipment (e.g. wire rope). **CAUTION! If no cable brackets are used to route the connection cable, ensure that the connection cable is not pulled into the propeller!**
 3. Lower the mixer to the end of the guide pipe or until it reaches the fixed limit stop.
 4. Secure the connection cable to the railing or hoisting gear to prevent it from falling!
 5. Check the swivel range of the lowering device. Check the entire swivel range of the lowering device. The mixer must not bump into any structures (fixtures, basin wall). **CAUTION! If the full swivel range cannot be used, mechanically limit the swivel range!**
 6. Set the desired angle and install a screw to secure the lowering device against further adjustments.
- Installation is complete. Lay the connection cable and make the electrical connection.

Mobile hoisting gear: Installing a cable bollard

If a mobile hoisting gear is used, install a cable bollard at the edge of the basin:

- Remove lifting equipment (e.g. wire rope) from the hoisting gear and secure to the cable bollard.
- Secure the connection cable edge of the basin to prevent it from falling.

CAUTION! If the connection cable leads over the edge of the basin, beware of potential abrasion. Sharp edges may damage the connection cable. Bevel the basin edge if necessary!

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 mixer 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 DIN EN 60079-0)! Non-compliance will 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 of the connection cable. A cable cross-section in accordance with the locally applicable regulations must be used 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.
- Test the resistance of the pencil electrode (optionally available).

If the measured values differ from the specifications:

- Moisture may have penetrated into the motor or the connection cable.
- The monitoring device may be defective.

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 Ohm (passage).

- **PTC sensor** (PTC thermistor): Measured value depends on the number of sensors installed. At PTC sensor has a cold resistance of between 20 and 100 Ohm.
- With **three** sensors in series, the measured value is between 60 und 300 Ohm.
 - With **four** sensors in series, the measured value is between 80 und 400 Ohm.

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

Measure the resistor of the electrode with an ohmmeter. The measured value must approach "infinity". For values $\leq 30 \text{ kOhm}$, if there is water in the oil – change the oil!

6.5.3 Three-phase motor connection

The three-phase current version is supplied with bare cable ends. Connection to the mains is established by connecting the power supply 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 activation

U, V, W	Mains connection
PE (green-yellow)	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 (green-yellow)	Earth

6.5.4 Monitoring equipment connection

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!

Overview of possible monitoring devices:

	TR 14...	TR 16...	TR 21...	TR 22...	TR 28...	TR 36...	TR 40...
Internal monitoring devices							
Motor compartment	o	o	o	–	o	–	–

	TR 14...	TR 16...	TR 21...	TR 22...	TR 28...	TR 36...	TR 40...
Motor compartment/sealing chamber*	–	–	–	o	–	o	o
Motor winding**	•	•	•	•	•	•	•
External monitoring devices							
Sealing chamber	o	o	o	o	o	o	o

Legend

– = not available/possible, o = optional, • = standard

* In the Ex version, this monitoring is omitted and not substituted!

** A temperature limiter is fitted as standard. The Ex version as per ATEX also features an installed temperature controller and limiter.

6.5.4.1 Monitoring of motor compartment

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

Wiring diagram

DK	Electrode connection
----	----------------------

The system must be deactivated when the threshold is reached!

6.5.4.2 Motor compartment/sealing chamber monitoring

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

Wiring diagram

DK	Electrode connection
----	----------------------

The system must be deactivated when the threshold is reached!

6.5.4.3 Monitoring of motor winding

With bimetallic strips

Directly connect bimetallic strips 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. Relay "CM-MSS" is recommended for this. The threshold has been preset.

PTC sensor wiring diagram

Temperature limiter

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

Temperature controller and limiter

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

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

PTC sensor wiring diagram

12 Low temperature connection

Triggering status for temperature controller and limiter

Depending on the version of the thermal motor monitoring, the following triggering status must occur when the threshold value is reached:

- Temperature limiter (1 temperature circuit):
The system must be deactivated when the threshold is reached.
- Temperature controller and limiter (2 temperature circuits):
When the threshold for the low temperature is reached, the motor can deactivate with automatic reactivation. When the threshold for the high temperature limit is reached, the motor must deactivate with manual reactivation.

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

6.5.4.4 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.

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

CAUTION

Connection of the sealing chamber control

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

6.5.5 Motor protection adjustment

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

6.5.5.1 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.

6.5.5.2 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.

6.5.5.3 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.

6.5.6 Operation with frequency converter

Operation on the frequency converter is permitted. Refer to the appendix for the relevant requirements!

7 Commissioning



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!

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

- Provide installation and operating instructions by the mixer or at a place specially reserved for it.
- Make the installation and operating instructions available in a language the personnel can understand.
- Make 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 mixer is suitable for use under the specified operating conditions.

7.3 Direction of rotation monitoring

The mixer is checked at the factory and set 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

- ✓ Mains connection with clockwise rotating field present.
- ✓ Rotating field inspected by a qualified electrician.
- ✓ No persons are allowed in the working area of the mixer.
- ✓ Mixer securely installed.

WARNING! Do not touch mixer with hands! The high starting torque can lead to serious injuries!

- ✓ Propeller is visible.

1. Switch on the mixer. **Max. operation duration: 15 s!**

2. Direction of propeller rotation:

View from front: The propeller rotates anti-clockwise (to the left).

View from behind: The propeller rotates clockwise (to the right).

- Direction of rotation correct.

Incorrect direction of rotation

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

- Direct starting: swap two phases.
- Star-delta starting: swap connections of two windings (e.g. U1/V1 and U2/V2).

NOTICE! After changing this connection, check the direction of rotation again!

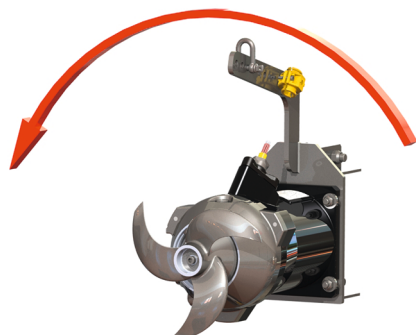


Fig. 12: Correct direction of rotation

7.4 Operation in an explosive atmosphere

Approval according to	TR 14...	TR 16...	TR 21...	TR 22...	TR 28...	TR 36...	TR 40...
ATEX	o	o	o	o	o	o	o
FM	o	o	o	o	o	o	o

Approval according to	TR 14...	TR 16...	TR 21...	TR 22...	TR 28...	TR 36...	TR 40...
CSA-Ex	o	o	o	o	o	o	o

Legend

– = not available/possible, o = optional, • = standard

For use in explosive atmospheres, the mixer 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 mixers are suitable for operation in potentially explosive atmospheres:

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

Mixers must not be used in zone 0!

FM approval

The mixers 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.

CSA Ex rating

The mixers are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosion-proof
- Category: Class I Division 1

7.5 Before switching on

Before activating the mixer, check the following points:

- Check whether the device has been installed properly and in accordance with the locally applicable regulations:
 - Has the mixer been earthed?
 - Has the connection cable route been checked?
 - Has electrical connection been made in accordance with regulations?
 - Are mechanical components attached correctly?
- Check the operating conditions:
 - Min./max. fluid temperature checked?
 - Max. immersion depth checked?
 - Intermittent operation: Max. switching frequency complied with?
- Check installation location/operating space:
 - Has the minimum water level above the propeller been defined and monitored?
 - Min. fluid temperature can drop below 3 °C: Monitoring device with automatic deactivation installed?
 - No installations within the direct rotary range of the propeller?

7.6 Switch on and off

The mixer must switch on and off using a separate operating point (on/off switch, switchgear) set by the customer.

During the start process, the rated current is exceeded for several seconds. Current consumption continues to be slightly above the rated current until the operating temperature of the motor is reached and the flow in the basin increases. During regular operation, the rated current should no longer be exceeded. **CAUTION! If the mixer does not start up, switch off immediately. Remove the fault before reactivating!**

7.7 During operation



WARNING

Risk of burns from hot surfaces!

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



WARNING

The propeller blade has sharp edges!

Sharp edges can form on the propeller blades. There is a risk of limbs being severed. Wear safety gloves to protect against cuts.

During operation, observe the locally applicable regulations on the following topics:

- Work safety
- Accident prevention
- Handling electrical machines

Personnel responsibilities specified by the operator must be strictly adhered to. All personnel are responsible for ensuring that responsibilities and regulations are adhered to!

- Operating voltage (+/-10 % 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 immersion of the propeller
- Quiet/low-vibration running

Increased current consumption

Depending on the fluid and the flow, the current consumption may vary slightly. If current consumption is elevated for a longer period, this indicates a change in configuration. The cause for a change in conditions could be:

- A change in the viscosity and density of the fluid, e.g. caused by modified addition of polymers or precipitating agents. **CAUTION! This modification may cause a severely increasing power consumption and even overload the system!**
- Insufficient mechanical pre-cleaning, e.g. fibrous and abrasive content.
- Non-homogeneous flow conditions due to fixtures or deflections in the operating space.
- Vibrations due to blockage of the basin inlet/outlet and draining, modified air intake (aeration) or the combined effect of several mixers.

Check system configuration and take counter-measures. **CAUTION! Permanently increased current consumption causes increased wear on the mixer!** Contact customer service for further assistance.

Monitoring fluid temperature

The fluid temperature must not drop below 3 °C. A fluid temperature below 3 °C results in thickening of the fluid, which can result in fractures in the propeller. If the fluid temperature may fall below 3 °C, install an automatic temperature measurement device with advance warning and deactivation functions.

Monitoring minimum immersion

The propeller must not emerge from the fluid during operation. Minimum immersion specifications must be observed! If fluid levels fluctuate significantly, install a level monitoring device. If the fluid level drops below the minimum immersion level, switch off the mixer.

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

- Lifting work: A specialist suitably trained in the operation of lifting devices must carry out lifting work. Evidence must be presented in accordance with BGV D8 or applicable local regulations.
- 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 mixer is deactivated during decommissioning, but remains installed. This ensures that the mixer is always ready for operation.

- ✓ To protect the mixer from frost and ice, always immerse the mixer completely in the fluid.
- ✓ The fluid temperature must always be above +3 °C (+37 °F).
 1. Switch off the mixer at the operating point.
 2. Secure the operating point against being switched on again by unauthorised persons (e.g. lock main switch).
- The mixer is decommissioned and can now be dismantled.

If the mixer remains installed after decommissioning, observe the following:

- Ensure that the aforementioned requirements are maintained for the complete period of decommissioning. If these requirements cannot be guaranteed, dismantle the mixer after decommissioning!
- For an extended period of decommissioning, carry out a 5-minute function test at regular intervals (monthly to quarterly). **CAUTION! A function test should only be carried out under the applicable operating conditions. Never run the machine dry! Non-compliance can lead to irreparable damage!**

8.4 Removal



DANGER

Danger due to fluids hazardous to health during removal!

During removal, contact with fluids that are hazardous to health may occur. Observe the following points:

- Wear protective equipment:
 - ⇒ Closed safety goggles
 - ⇒ Mouth protection
 - ⇒ Protective gloves
- Immediately wipe up drips.
- Observe the specifications in the work regulations! The operator must make sure that the personnel have received and read the work regulations!



DANGER

Danger from fluids hazardous to health!

Risk of fatal injury if the mixer is used in fluids hazardous to health.

- Decontaminate the mixer after dismantling and before carrying out any other work.
- Observe the specifications provided by work regulations. The operator must make sure that personnel have received and read 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****A lack of protective equipment may result in hand and foot injuries or the risk of falling!**

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

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

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

Motor housing can become hot during operation. It may cause burns. Allow the motor 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 mixer. Ensure that the mixer 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 Ground and wall fixation

- ✓ Mixer decommissioned.
- ✓ Operating space emptied, cleaned and, if required, disinfected.
- ✓ Mixer cleaned and, if required, disinfected.
- ✓ Ensure work is carried out by two persons.
 1. Disconnect mixer from the mains.
 2. Disconnect and wind up the connection cable.
 3. Enter the operating space. **DANGER! If the operating space cannot be cleaned and disinfected, wear protective equipment according to work regulations!**
 4. Uninstall mixer from the basin wall or the basin floor.
 5. Set the mixer down on a pallet, secure it against slipping and lift it out of the operating space.
- Removal is complete. Clean and disinfect the mixer thoroughly.

8.4.2 Using a lowering device

- ✓ Mixer decommissioned.
- ✓ Protective equipment put on according to work regulations.
 1. Disconnect mixer from the mains.
 2. Disconnect and wind up the connection cable.
 3. Insert lifting equipment in hoisting gear.
 4. Slowly lift mixer and remove it from the basin. During the lifting procedure, detach the connection cable from the lifting equipment and wind it up. **DANGER! Mixer and connection cable come directly out of the fluid. Wear protective equipment according to work regulations!**

5. Swivel mixer and set it down on a firm surface.

- Removal is complete. Clean mixer and set-down location thoroughly, disinfect if required and store away.

8.4.3 Clean and disinfect



DANGER

Danger from fluids hazardous to health!

Risk of fatal injury if the mixer was used in fluids hazardous to health! Decontaminate the mixer 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 work regulations! The operator must make sure that personnel have received and read work regulations!

- ✓ Mixer has been dismantled.
- ✓ Apply a watertight seal to the open end of the connection cable.
- ✓ Contaminated cleaning water is disposed of in the sewer in accordance with local regulations.
- ✓ A disinfectant is available for contaminated mixers.
 1. Attach the lifting equipment to the attachment point.
 2. Lift the mixer approximately 30 cm (10 in) above the ground.
 3. Spray the mixer with clear water from top to bottom. **NOTICE! Use an appropriate disinfectant for contaminated mixers! Follow the specifications of work regulations!**
 4. Spray the propeller from all sides.
 5. Flush dirt residues from the floor into the drain.
 6. Allow the mixer to dry.

9 Maintenance and repair



DANGER

Danger from fluids hazardous to health!

Risk of fatal injury if the mixer is used in fluids hazardous to health.

- Decontaminate the mixer after dismantling and before carrying out any other work.
- Observe the specifications provided by work regulations. The operator must make sure that personnel have received and read work regulations.



NOTICE

Use only properly functioning lifting equipment!

Use only properly functioning lifting equipment to lift and lower the mixer. Ensure that the mixer 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!

- Carry out maintenance tasks in a clean location with good lighting and ventilation. Set the mixer down horizontally on a firm surface and secure it against tipping over / slipping away. **NOTICE! Do not set the mixer down on the propeller!**
- Only carry out maintenance tasks mentioned in these installation and operating instructions.

- Wear the following protective equipment while performing maintenance tasks:
 - Safety goggles
 - Safety shoes
 - 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 Oil types

Medicinal white oil is filled into the sealing chamber ex-factory. The following oil types are recommended when changing the oil:

- Aral Autin PL*
- Shell ONDINA 919
- Esso MARCOL 52* or 82*
- BP WHITEMORE WOM 14*
- Texaco Pharmaceutical 30* or 40*

All oil types marked with “*” are approved for use with foods in accordance with “USDA-H1”.

9.3.2 Grease

Use the following greases:

- Esso Unirex N3
- Tripol Molub-Alloy-Food Proof 823 FM (with “USDA-H1” approval)

9.3.3 Filling quantities

- TR 14: 0.35 l (12 US.fl.oz.)
- TR 16: 0.35 l (12 US.fl.oz.)
- TR 21: 0.35 l (12 US.fl.oz.)
- TR 22: 1.30 l (44 US.fl.oz.)
- TR 28: 0.35 l (12 US.fl.oz.)
- TR 36: 1.10 l (37 US.fl.oz.)
- TR 40: 1.10 l (37 US.fl.oz.)

Stated filling quantities apply for described installation types. Refer to the enclosed data sheet for the filling quantities required for deviating installation types.

9.4 Maintenance intervals

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

9.4.1 Maintenance intervals for normal conditions

8000 operating hours or after 2 years at most

- Visual inspection of the connection cable
- Visual inspection of cable brackets and cable tensioning
- Visual inspection for wear of the mixer
- Function test of monitoring devices
- Visual inspection of accessories
- Oil change

15000 operating hours or after 10 years at the latest

- General overhaul

9.4.2 Maintenance intervals for harsh conditions

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

- Fluids with long-fibre components
- Strongly corrosive or abrasive fluids
- Highly gaseous fluids
- Operation at an unfavourable duty point
- Unfavourable flow conditions (e.g. due to fixtures or aeration)

When using the mixer under harsh conditions, it is recommended that a maintenance contract be entered into. Contact customer service.

9.5 Maintenance measures



WARNING

The propeller blade has sharp edges!

Sharp edges can form on the propeller blades. There is a risk of limbs being severed. Wear safety gloves to protect against 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 fulfilled prior to the start of maintenance measures:

- Motor must have cooled down to the ambient temperature.
- Mixer must be thoroughly cleaned and disinfected (if required).

9.5.1 Recommended maintenance measures

Regular inspection of current 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.

Current consumption can provide an early indication of damage to or malfunctions in the mixer, which can then be rectified. Larger voltage fluctuations strain the motor winding and can cause breakdown. 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
- Changes caused by chemical corrosion

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

CAUTION! Water can enter into the mixer if the connection cable is damaged! Water ingress leads to the mixer being written off.

9.5.3 Visual inspection of cable brackets and cable tensioning

Check cable brackets and anchoring of the connection cable (lifting equipment or separate nylon rope) for material fatigue or shrinkage. If there are signs of wear, replace the faulty components immediately.

9.5.4 Visual inspection for wear of the mixer

Inspect individual components (propeller, hub, etc.) for damage and wear. If there are defects, observe the following:

- If the coating is damaged, restore it.
- If components have worn, contact customer service and replace the components in question!

9.5.5 Function test of the monitoring device

The mixer must be cooled down to ambient temperature to test resistances!

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 Ohm (passage).
- **PTC sensor** (PTC thermistor): Measured value depends on the number of sensors installed. At PTC sensor has a cold resistance of between 20 and 100 Ohm.
 - With **three** sensors in series, the measured value is between 60 und 300 Ohm.
 - With **four** sensors in series, the measured value is between 80 und 400 Ohm.

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

Measure the resistor of the electrode with an ohmmeter. The measured value must approach "infinity". For values ≤ 30 kOhm, if there is water in the oil – change the oil!

9.5.6 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.

9.5.7 Oil change



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.

9.5.7.1 Oil change in seal housing (TR 14/16/21/28)

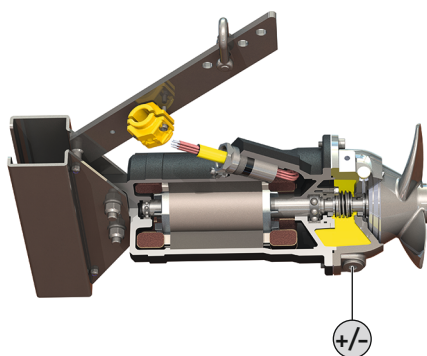


Fig. 13: Oil change

9.5.7.2 Oil change in seal housing (TR 22/36/40)

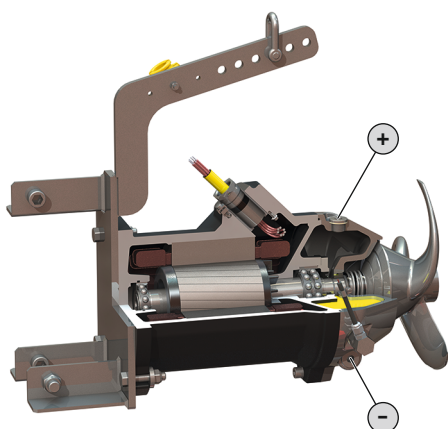


Fig. 14: Oil change

+/-	Drain/fill seal housing oil
-----	-----------------------------

- ✓ Mixer is **not** installed.
 - ✓ Mixer is **not** connected to the mains.
 - ✓ Protective equipment must be put on!
1. Place the mixer horizontally on a firm surface.
WARNING! Risk of hands being crushed. Ensure that the mixer cannot fall over or slip away!
CAUTION! Do not set the mixer down on the propeller! Use an appropriate platform for the propeller diameter.
 2. Position a suitable tank to collect the operating fluid.
 3. Unscrew the screw plug (+/-).
 4. Tip the mixer and allow the operating fluid to drain out.
 5. Check the operating fluid: Notify customer service if the operating fluid contains metal swarf!
 6. Dispose of operating fluid in accordance with local regulations!
 7. Return the mixer to a horizontal position so that the opening points upwards.
 8. Pour the new operating fluid in through the hole for the screw plug (+/-).
⇒ Comply with the specifications for the operating fluid type and quantity!
 9. Clean the screw plug (+/-), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**
 10. Restore corrosion protection: Seal screw plug, e.g. with Sikaflex.

+	Fill oil in the seal housing
-	Drain oil in the seal housing

- ✓ Mixer is **not** installed.
 - ✓ Mixer is **not** connected to the mains.
 - ✓ Protective equipment must be put on!
1. Place the mixer horizontally on a firm surface.
WARNING! Risk of hands being crushed. Ensure that the mixer cannot fall over or slip away!
CAUTION! Do not set the mixer down on the propeller! Use an appropriate platform for the propeller diameter.
 2. Position a suitable tank to collect the operating fluid.
 3. Unscrew the screw plug (+).
 4. Unscrew screw plug (-) and drain the operating fluid.
 5. Check the operating fluid: Notify customer service if the operating fluid contains metal swarf!
 6. Dispose of operating fluid in accordance with local regulations!
 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!
 9. Clean the screw plug (+), replace the seal ring and screw it back in. **Max. tightening torque: 8 Nm (5.9 ft·lb)!**
 10. Restore corrosion protection: Seal screw plug, e.g. with Sikaflex.

9.5.8 General overhaul

The following components are checked for wear and damage as part of general maintenance:

→ Motor bearings

- Gear bearing and planetary gear speed
- Propeller
- Shaft sealings
- O-rings
- Connection cable
- Fitted accessories

Damaged components are replaced with original parts. This will ensure correct operation. The general overhaul is performed by the manufacturer or an authorised service centre.

9.6 Repairs



WARNING

The propeller blade has sharp edges!

Sharp edges can form on the propeller blades. There is a risk of limbs being severed. Wear safety gloves to protect against 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:

- Mixer cooled to ambient temperature.
- Mixer is switched voltage-free and safeguarded against being inadvertently activated.
- Mixer must be thoroughly cleaned and disinfected (if required).

For repair work the following generally applies:

- Immediately collect dripping fluid and operating fluids!
- 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 a clamping force.

9.6.2 Which repair work may be carried out

- Propeller replacement
- Replacement of mechanical seal on the fluid side.
- Replacement of the frame.
- Replacement of the mounting bracket for ground installation.

9.6.3 Propeller replacement

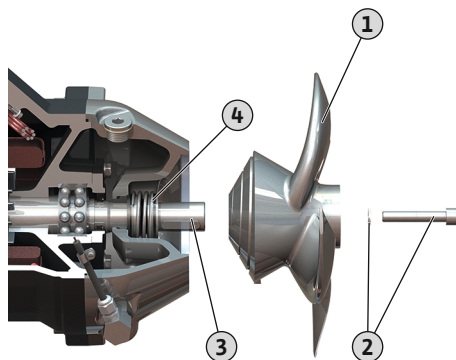


Fig. 15: Propeller replacement

1	Propeller
2	Propeller attachment: Interior hexagonal head screw and washer
3	Shaft
4	Mechanical seal

✓ Mixer set down on a firm surface and secured.

✓ Tools are ready for use.

1. Loosen and unscrew the propeller attachment. **NOTICE! Fix the propeller in place with suitable equipment.**
 2. Carefully remove the propeller from the shaft. **CAUTION! The mechanical seal is now no longer secured. Only operate the mixer with the propeller! If the mixer is operated without the propeller, the mechanical seal will be destroyed. If the mechanical seal is faulty, oil escapes from the sealing chamber.**
 3. Clean the shaft and apply new lubricating grease.
 4. Carefully slide the propeller back on as far as it will go.
 5. Coat the interior hexagonal head screw with the thread-locking fluid, insert the washer and screw it into the shaft.
 6. Tighten the propeller attachment. Max. tightening torque: see appendix.
 7. Turn the propeller by hand and check that it rotates easily.
- Propeller is changed. Check the oil in the seal housing and fill up if required.

9.6.4 Replacing the mechanical seal on the fluid side

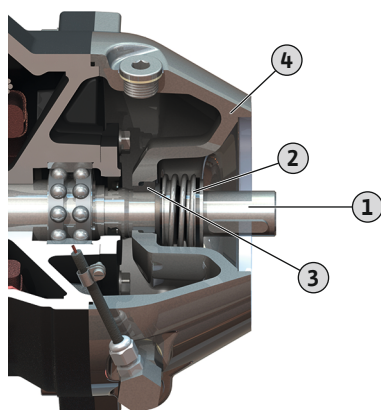


Fig. 16: Replacing mechanical seals

1	Shaft
2	Mechanical seal: Spring
3	Mechanical seal: Stationary ring
4	Seal housing

✓ Mixer set down on a firm surface and secured.

✓ Tools are ready for use.

✓ Oil drained from seal housing.

✓ Propeller removed.

1. Remove key from the shaft.
 2. Remove the spring of the mechanical seal with support washer from the shaft.
 3. Push the stationary ring of the mechanical seal out of its seating and remove from the shaft.
 4. Clean the shaft and check for wear and corrosion. **WARNING! Contact customer service if the shaft has been damaged!**
 5. Lubricate the shaft using wetted water or detergent. **CAUTION! Do not use oil or grease as lubricants!**
 6. Press in a new stationary ring for the mechanical seal into the housing using an assembly unit. **CAUTION! Do not tilt the stationary ring when pushing it in. If the stationary ring is tilted or installed at an angle when it is pushed in, the stationary ring will fracture. The mechanical seal can then no longer be used!**
 7. Insert new spring of the mechanical seal with support washer onto the shaft.
 8. Clean the key and lay it in the groove of the shaft.
 9. Mount the propeller.
- Mechanical seal is replaced. Fill oil in the seal housing.

9.6.5 Replacing the frame

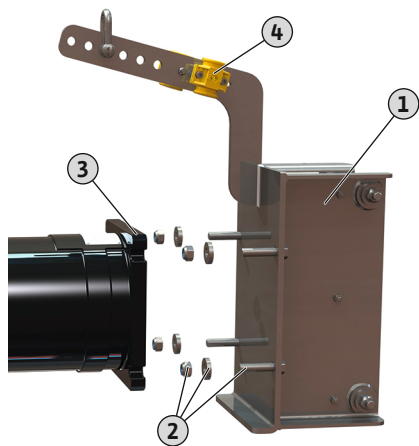


Fig. 17: Replacing the frame

1	Frame
2	4x fixation material: Hexagon head screw, washer, hexagon nut
3	Motor flange
4	Cable brackets for strain relief

- ✓ Mixer set down on a firm surface and secured.
 - ✓ Motor supported in such a way that the frame can easily be changed.
 - ✓ Tools are ready for use.
1. Open the cable brackets and take out the connection cable.
 2. Undo and remove hexagon nuts.
 3. Remove washers from the hexagon head screws.
 4. Remove the frame from the motor flange.
 5. Clean dirt from the motor flange, e.g. deposits, old sealing material.
 6. Remove hexagon head screws from the frame and insert them in the new frame.
 7. Coat the hexagon head screws with thread-locking fluid.
 8. Place the new frame on the motor flange.
 9. Place washers on the hexagon head screws.
 10. Attach and firmly tighten hexagon nuts. Max. tightening torque: see appendix.
 11. Lay connection cable in the cable bracket and close the cable bracket. **CAUTION! Do not tighten the cable bracket yet!**
 12. Align the connection cable: The connection cable should be slightly bent, it should not be taut.
 13. Close the cable brackets tightly.
 14. Apply corrosion protection (e.g. Sikaflex):
 - Sealing joint between motor flange and frame.
 - Fill slots on the motor flange up to the washer.
- Frame is changed.

9.6.6 Replacing the mounting bracket for ground installation

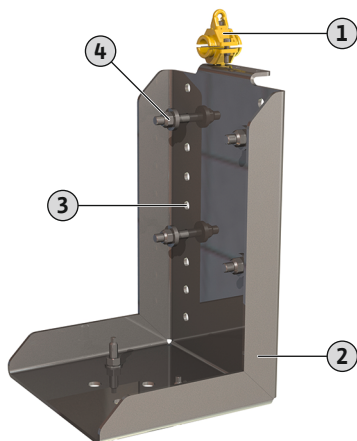


Fig. 18: Mounting bracket for ground installation

1	Cable brackets for strain relief
2	Mounting bracket
3	Height grid
4	4x fixation material: Hexagon head screw, washer, hexagon nut

- ✓ Mixer set down on a firm surface.
 - ✓ Have work carried out by two persons!
 - ✓ Tools are ready for use.
1. Open the cable brackets and take out the connection cable.
 2. Undo and remove hexagon nuts.
 3. Remove washers from the hexagon head screws.
 4. Second person: Remove mixer from the mounting bracket and hold the mixer.
 5. Remove hexagon head screws.
 6. Insert hexagon head screws in the new mounting bracket.

NOTICE! Observe the height grid! The propeller must not come into contact with the floor!
 7. Second person: Place the mixer on the hexagon head screws.
 8. Place washers on the hexagon head screws.
 9. Attach and firmly tighten hexagon nuts. Max. tightening torque: see appendix.
 10. Lay connection cable in the cable bracket and close the cable bracket. **CAUTION! Do not tighten the cable bracket yet!**

11. Align the connection cable: The connection cable should be slightly bent, it should not be taut.
12. Close the cable brackets tightly.
 - Mounting bracket is changed.

10 Faults, causes and remedies



DANGER

Danger from fluids hazardous to health!

Risk of fatal injury in the case of mixers working in 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 work regulations! The operator must make sure that personnel have received and read 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 may remain in the working area of the mixer!

Persons can suffer (serious) injury while the mixer is in operation! No persons may therefore be present inside the working area. If persons should enter the mixer's working area, deactivate the mixer and safeguard it against being switched on again by unauthorised persons!



WARNING

The propeller blade has sharp edges!

Sharp edges can form on the propeller blades. There is a risk of limbs being severed. Wear safety gloves to protect against cuts.

Fault: The mixer does not start up

1. Mains connection 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 technical specifications by a qualified electrician and reset the monitoring devices.
- ⇒ Check that the propeller rotates easily, and clean the propeller and mechanical seal if necessary.
- 3. The sealing chamber control (optional) has broken the electric circuit (connection-related).
 - ⇒ See “Fault: Mechanical seal leakage, pre-chamber/sealing chamber control reports a fault and switches the mixer off”

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

1. Motor protection switch set incorrectly.
 - ⇒ Have the setting of the trigger checked and corrected by a qualified electrician.
2. Increased current consumption due to major voltage drop.
 - ⇒ Have the voltage of individual phases checked by a qualified electrician. Contact the power grid operator.
3. The connection only has two phases.
 - ⇒ Have the connection checked and corrected by a qualified electrician.
4. Voltage differences between the phases are too great.
 - ⇒ Have the voltage of individual phases checked by a qualified electrician. Contact the power grid operator.
5. Incorrect direction of rotation.
 - ⇒ Have the connection corrected by a qualified electrician.
6. Increased current consumption due to clogging.
 - ⇒ Clean propeller and mechanical seal.
 - ⇒ Check the pre-treatment.
7. The density of the fluid is too high.
 - ⇒ Check unit design.
 - ⇒ Contact customer service.

Fault: Mixer runs, but system parameters are not reached

1. Propeller clogged.
 - ⇒ Clean propeller.
 - ⇒ Check the pre-treatment.
2. Incorrect direction of rotation.
 - ⇒ Have the connection corrected by a qualified electrician.
3. Signs of wear on propeller.
 - ⇒ Inspect propeller and replace if necessary.
4. The connection only has two phases.
 - ⇒ Have the connection checked and corrected by a qualified electrician.

Fault: Mixer does not run smoothly and is noisy

1. Improper duty point.
 - ⇒ Check fluid density and viscosity.
 - ⇒ Inspect system configuration, and contact customer service.
2. Propeller clogged.
 - ⇒ Clean propeller and mechanical seal.
 - ⇒ Check the pre-treatment.
3. The connection only has two phases.
 - ⇒ Have the connection checked and corrected by a qualified electrician.
4. Incorrect direction of rotation.
 - ⇒ Have the connection corrected by a qualified electrician.

5. Signs of wear on propeller.

⇒ Inspect propeller and replace if necessary.

6. Motor bearings have worn.

⇒ Inform customer service; send the mixer back to the factory for reconditioning.

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.

12.2 Protective clothing

Used protective clothing must be disposed of 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 danger to your personal health.



NOTICE

Disposal in domestic waste is forbidden!

In the European Union, this symbol can appear 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.

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

→ Only hand over these products at designated, certified collecting points.

→ 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. Further recycling information can be found at www.wilo-recycling.com.

13 Appendix

13.1 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

Rust-free screws A2/A4			
Threaded	Tightening torque		
	Nm	kp m	ft·lb
M20	230	23.45	170
M24	285	29.06	210
M27	415	42.31	306
M30	565	57.61	417

If a Nord-Lock screw locking device is used, increase the tightening torque by 10 %!

13.2 Operation with frequency converter

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. Because of the additional heating caused by harmonics, the rated power of the motor must be around 10 % more than the power requirement of the mixer. 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. Care must be taken to ensure that the mixer operates without jerking or vibrating, especially in the lower speed range. Otherwise, the mechanical seals can leak or be damaged. It is important that the mixer 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 parameterisation of the frequency converter, observe the setting of the quadratic curve (U/f curve) for submersible motor and fans! The U/f curve ensures that the output voltage at frequencies less than the rated frequency (50 Hz or 60 Hz) is adjusted to the power requirement of the mixer. Newer 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.

Faults with the motor monitoring may occur on 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 overvoltages and rise speed. Output filters may need to be installed.
- Vary the pulse frequency of the frequency converter.
- In the event of a fault on the internal sealing chamber control, use the external double-rod electrode.

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

- Separate power supply cables for the main and control cable (depending on the motor size).
- When laying, ensure there is adequate clearance between the main and control cable.
- Using shielded power supply cables.

Summary

- Continuous duty up to rated frequency (50 Hz or 60 Hz).
- Observe additional measures with regard to EMC regulations (choice of frequency converter, using filters, etc.).
- Never 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).

13.3 Ex rating

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

13.3.1 Identification of Ex-rated mixers

For use in explosive atmospheres, the mixer 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.

13.3.2 Protection class

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

- Flameproof enclosure (ATEX)
- Explosionproof (FM)
- Flameproof enclosures (CSA-EX)

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).

13.3.3 Intended use

ATEX approval

The mixers are suitable for operation in potentially explosive atmospheres:

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

Mixers must not be used in zone 0!

FM approval

The mixers 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.

CSA Ex rating

The mixers are suitable for operation in potentially explosive atmospheres:

- Protection class: Explosion-proof
- Category: Class 1 Division 1

13.3.4 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 mixer to an electrical outlet outside the explosive area. If the connection has to 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-compliance will lead to a risk of fatal injury from explosion! The 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 possible monitoring devices:

Type	TR 14	TR 16	TR 21	TR 22	TR 28	TR 36	TR 40
Motor compartment	o	o	o	–	o	–	–
Motor winding: Temperature limiter	•	•	•	o	•	o	o
Motor winding: Temperature controller and limiter	o	o	o	•	o	•	•
Sealing chamber (external pencil electrode)	o	o	o	o	o	o	o

Legend

– = not available/possible, o = optional, • = standard

13.3.4.1 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!

Depending on the version of the thermal motor monitoring, the following triggering status must occur when the threshold value is reached:

- Temperature limiter (1 temperature circuit):
When the threshold is reached, deactivation **with reactivation lock** must take place!
- Temperature controller and limiter (2 temperature circuits):
When the threshold for the low temperature is reached, the motor can deactivate with automatic reactivation. When the threshold for the high temperature is reached, the motor must deactivate **with 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 via an evaluation relay. Relay “CM-MSS” is recommended for this. The threshold is preset.
Connection values: max. 250 V(AC), 2.5 A, $\cos \varphi = 1$
- Connect the PTC sensor via an evaluation relay. Relay “CM-MSS” is recommended for this. The threshold is preset.

13.3.4.2 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!

13.3.4.3 Frequency converter operation

- Type of converter: Pulse-width modulation
- Continuous duty: 30 Hz up to rated frequency (50 Hz or 60 Hz).
- Min. switching frequency: 4 kHz
- Max. overvoltages on the terminal board: 1350 V
- Output current on the frequency converter: max. 1.5 times rated current
- Max. overload time: 60 s
- Torque applications: quadratic curve
Speed/torque curves required are available on request!
- Observe additional measures with regard to EMC regulations (choice of frequency converter, filters, etc.).
- Never 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.

13.3.5 Commissioning



DANGER

Risk of explosion when using non-Ex-rated mixers!

Risk of fatal injury due to explosion! Only use mixers which have Ex labelling on the rating plate within potentially explosive areas.

- The operator is responsible for defining the potentially explosive area.
- Only Ex-rated mixers may be used within potentially explosive areas.
- Mixers with an Ex rating must be labelled as such on the rating plate.
- Do not exceed the **max. fluid temperature!**
- According to DIN EN 50495, a safety device with SIL level 1 and hardware fault tolerance 0 must be provided for category 2.

13.3.6 Maintenance and repair

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

13.3.6.1 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)!

13.3.6.2 Replacing the connection cable

Changing the connection cable is strictly prohibited!

13.3.6.3 Changing the mechanical seal

Changing the seal on the motor side is strictly prohibited!







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