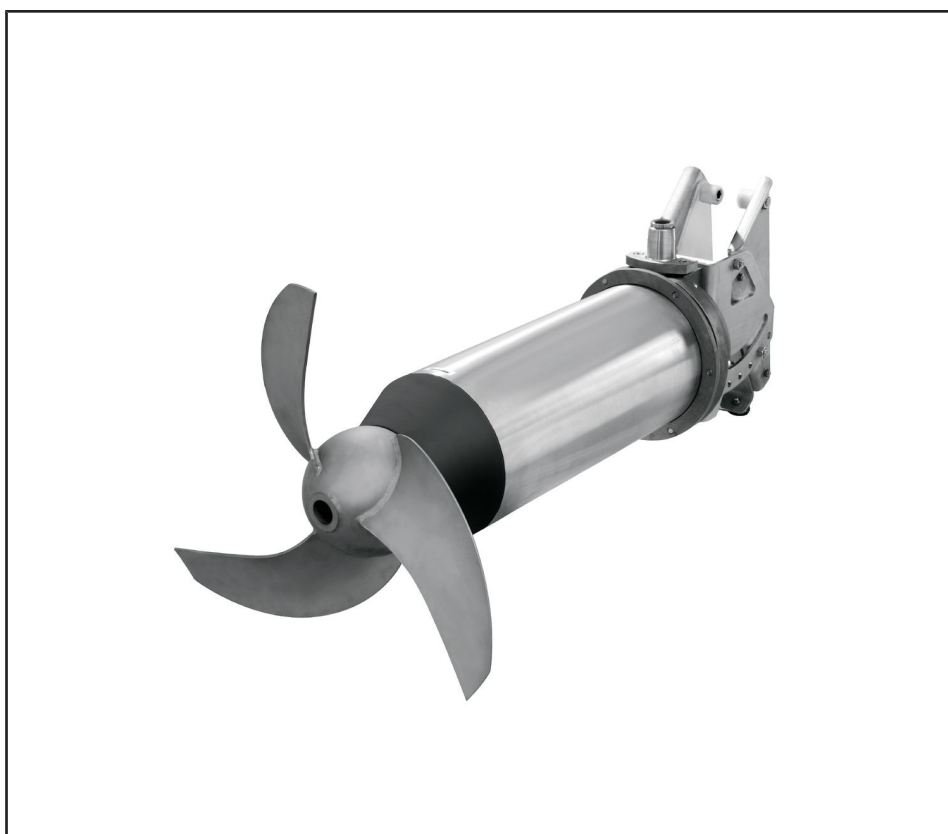


Submersible Mixer

Amamix

60 Hz

Installation/Operating Manual



Mat. No.:

Legal information/Copyright

Installation/Operating Manual Amamix

Original operating manual

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Glossary

Certificate of decontamination

If a product is to be returned to the manufacturer, the customer declares in a certificate of decontamination that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

Fluid

In accordance with the intended use of the submersible mixer, the term "fluid" (also referred to as the fluid handled) refers to the fluid the mixer is operated in, i.e. generally municipal or industrial waste water and sludges. The fluid is described in greater detail by means of the gas and solids content, the content and length of fibrous substances, its chemical composition and temperature.

Submersible mixer

Submersible mixers are mixing units with open axial propeller hydraulics and an air-filled submersible motor.

1 General

1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series and size, the main operating data, the order number and the order item number. The order number and order item number uniquely identify the submersible mixer and serve as identification for all further business processes.

In the event of damage, immediately contact your nearest KSB Service center to maintain the right to claim under warranty.

1.2 Installation of partly completed machinery

To install partly completed machinery supplied by KSB refer to the sub-sections under Servicing/Maintenance.

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel.


1.4 Other applicable documents

Table 1: Overview of other applicable documents

Document	Contents
Data sheet	Description of the technical data
General arrangement drawing/ outline drawing	Description of mating and installation dimensions
General assembly drawing ¹⁾	Sectional drawing
Sub-supplier product literature ¹⁾	Operating manuals and other product literature describing accessories and integrated machinery components
Spare parts lists ¹⁾	Description of spare parts
List of components ¹⁾	Description of components

1.5 Symbols

Table 2: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇒	Result of an action
⇔	Cross-references
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

1) If agreed to be included in the scope of supply









2 Safety

All the information contained in this section refers to hazardous situations.

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
 DANGER	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 WARNING	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2.2 General

This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.

The safety information in all sections of this manual must be complied with.

The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.

The contents of this operating manual must be available to the specialist personnel at the site at all times.

Information attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:

- Arrow indicating the direction of rotation
- Markings for connections
- Name plate

The operator is responsible for ensuring compliance with all local regulations which are not taken into account.

2.3 Intended use

- The submersible mixer must only be operated within the operating limits described in the other applicable documents.
- Only operate submersible mixers which are in perfect technical condition.
- Do not operate partially assembled submersible mixers.
- Only use the submersible mixer in the fluids described in the data sheet or product literature.

- Never operate the submersible mixer without fluid.
- Observe the minimum fluid levels indicated in the data sheet or product literature (to prevent overheating, bearing damage, cavitation damage, etc.).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.

2.3.1 Prevention of foreseeable misuse

- Never exceed the permissible operating limits and use limits specified in the data sheet or product literature regarding temperature etc.
- Observe all safety information and instructions in this manual.

2.4 Personnel qualification and personnel training

All personnel involved must be fully qualified to install, operate, maintain and inspect the machinery this manual refers to.

The responsibilities, competence and supervision of all personnel involved in installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by sufficiently trained specialist personnel training and instructing the personnel who will carry out the respective tasks. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the submersible mixer must always be supervised by technical specialist personnel.

2.5 Consequences and risks caused by non-compliance with these operating instructions

- Non-compliance with these operating instructions will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.6 Safety awareness

In addition to the safety information contained in this manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health regulations and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.7 Safety information for the operator/user

- Provide the personnel with protective equipment and make sure it is used.
- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- Take suitable precautions to prevent persons from coming near the propeller when the submersible mixer is running.
- It is strictly prohibited for any person to enter the tank while the submersible mixer is running.

2.8 Safety information for maintenance, inspection and installation

- Modifications or alterations of the submersible mixer are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorized by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation is performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.
- Carry out work on the submersible mixer during standstill only.
- The submersible mixer must have cooled down to ambient temperature.
- When taking the mixer out of service always adhere to the procedure described in the manual.
- Decontaminate submersible mixers used in fluids posing a health hazard.
- As soon as the work has been completed, re-install and/or re-activate any safety-relevant and protective devices. Before returning the product to service, observe all instructions on commissioning.

2.9 Unauthorized modes of operation

Never operate the submersible mixer outside the limits stated in the data sheet and in this manual.

The warranty relating to the operating reliability and safety of the submersible mixer supplied is only valid if the mixer is used in accordance with its intended use.

2.10 Explosion protection

Special conditions apply to the operation of explosion-proof submersible mixers.

- The explosion-proof status of the product is only assured if the product is used in accordance with its intended use.
- The limits stated in the data sheet and on the name plate must not be exceeded under any circumstances.
- Correct monitoring of the motor temperature is imperative to ensure explosion protection.
- Observe the wiring diagrams.
- Never operate an explosion-proof submersible mixer without temperature monitoring equipment!
- Modifications or alterations of the submersible mixer can affect explosion protection and are only permitted after consultation with the manufacturer.
- Only original spare parts and accessories authorized by the manufacturer must be used for explosion-proof submersible mixers.

3 Transport/Temporary Storage/Disposal


3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the distributor and the insurance company about the damage in writing immediately.

3.2 Lifting rope

For lifting/lowering with lifting equipment, the lifting rope can also be attached directly at the attachment point. It can remain attached during operation.

3.3 Lifting hook

	<p>NOTE</p> <p>Lifting hooks can only be used in low-viscosity substrates.</p>
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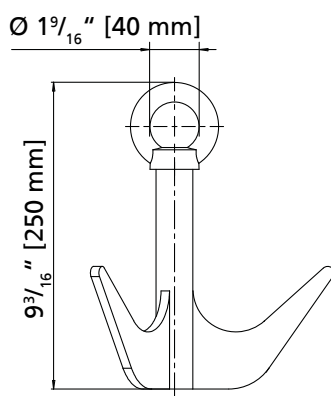





Fig. 1: Lifting hook

The lifting hook has a maximum load-carrying capacity of 1100 lbs [500 kg].

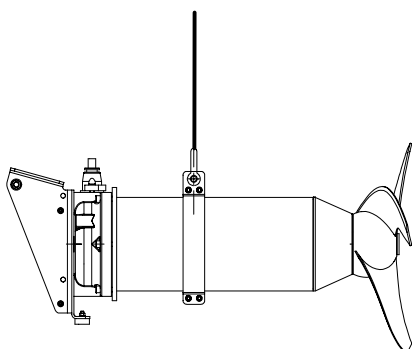
For lifting/lowering with a lifting hook, the lifting hook is attached to the lifting rope of the lifting equipment (crane) with a shackle.

3.4 Transport

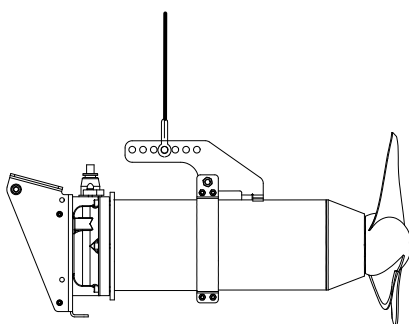
	<p>⚠ DANGER</p> <p>Improper transport</p> <p>Danger to life from falling parts! Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▷ Use the attachment point provided (lifting lug or bail) for attaching lifting accessories. ▷ Never suspend the submersible mixer by its power cable. ▷ Never use the lifting ropes included in KSB's scope of supply for lifting loads other than the KSB product supplied. ▷ Safely attach lifting ropes to the submersible mixer and crane. ▷ Protect the power cable against damage. ▷ Maintain adequate safety distance during lifting operations.
---	--

	<p>! WARNING</p> <p>Submersible mixer tipping over or rolling off Risk of personal injury!</p> <ul style="list-style-type: none"> ▸ Secure the submersible mixer against tipping over or rolling off.
	<p>! WARNING</p> <p>Temporary storage on unsecured and uneven surfaces Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Place the submersible mixer on level firm ground only. ▸ Refer to the weights given in the data sheet/on the name plate.

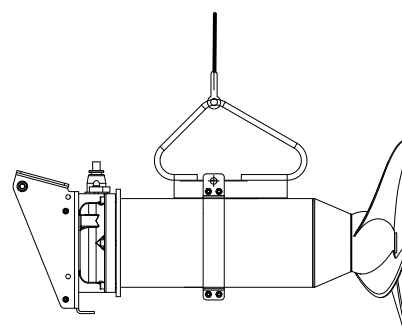
Transport the submersible mixer as shown.



Transport with supporting clamp





Transport with supporting strap



Transport with lifting bail

3.5 Storage/Preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for storage:

	<p>CAUTION</p> <p>Improper storage Damage to the power cables!</p> <ul style="list-style-type: none"> ▸ Support the power cables at the cable entry to prevent permanent deformation. ▸ Only remove the protective caps from the power cables at the time of installation.
	<p>CAUTION</p> <p>Damage during storage by humidity, dirt or vermin Corrosion/contamination of the submersible mixer!</p> <ul style="list-style-type: none"> ▸ For outdoor storage cover the (packed or unpacked) submersible mixer and accessories with waterproof material.

- Store the submersible mixer under dry and vibration-free conditions, if possible in its original packaging.

Table 4: Ambient conditions for storage


Ambient conditions	Value
Relative humidity	5 % to 85 % (non-condensing)
Ambient temperature	- 4 °F [- 20 °C] to 158 °F [+ 70 °C]

3.6 Return to supplier

1. Always flush and clean the submersible mixer, particularly if it has been used in noxious, explosive, hot or other hazardous fluids.
2. If the submersible mixer has been used in fluids leaving residues which might lead to corrosion when coming into contact with atmospheric humidity, or which might ignite when coming into contact with oxygen, the submersible mixer must also be neutralized and treated with anhydrous inert gas for drying purposes.
3. Always complete and enclose a certificate of decontamination when returning the submersible mixer stand.
Always indicate any safety and decontamination measures taken.

	<p>NOTE</p> <p>If required, a blank certificate of decontamination can be downloaded from the KSB web site at: www.ksb.com/certificate_of_decontamination</p>
---	--

3.7 Disposal

	<p>! WARNING</p> <p>Fluids posing a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Submersible mixers used in fluids posing a health hazard must be decontaminated. ▷ Collect and properly dispose of flushing liquid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of substances posing a health hazard.
--	--

1. Dismantle the submersible mixer.
Collect greases and other lubricants during dismantling.
2. Separate and sort the materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

4 Description

4.1 General description

- Submersible mixer

Submersible mixer with self-cleaning propeller for handling municipal or industrial waste water and sludges, as well as for use in biogas applications.

4.2 Designation

Example: Amamix C 57 3 5 R / 10 12 YD G

Table 5: Key to the designation

Code	Description
Amamix	Type series
C	Propeller material
C	Stainless steel
G	Gray cast iron
57	Nominal propeller diameter, e.g. 570 mm
3	Number of blades
2, 3	
5	Code for incidence angle of propeller
1, 5, 6, 8	
R	²⁾ Version without jet ring
R	Version with jet ring
10	Motor size
0, 2, 3, 4, 6, 8, 10	
12	Number of motor poles
4, 6, 8, 12	
YD	Motor version
UD/UM	Standard design
YD/YM	Explosion protection to ATEX
C	Casing material
C	Stainless steel
G	Gray cast iron

4.3 Name plate

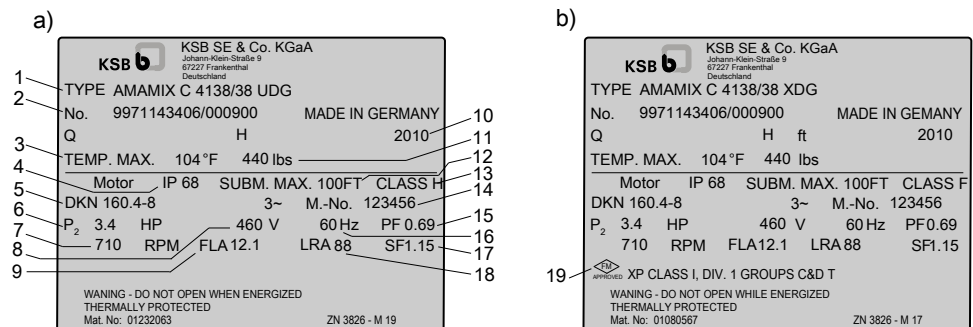


Fig. 2: Name plate (example) a) for standard submersible mixer b) for explosion-proof submersible mixer

1	Designation	2	KSB order number
3	Maximum fluid and ambient temperature	4	Enclosure

2) Blank

5	Motor type	6	Rated power
7	Nominal propeller speed	8	Rated voltage
9	Rated current	10	Year of construction
11	Total weight	12	Maximum submergence
13	Thermal class of winding insulation	14	Motor number
15	Power factor at design point	16	Rated frequency
17	Service factor	18	Starting current
19	Marking for explosion-proof submersible mixers		

4.4 Design details

Design

- Fully floodable submersible mixer
- Horizontal installation (with adjustable pitch)

Propeller

- Self-cleaning (ECB) propeller

Shaft seal

- Two bi-directional mechanical seals in tandem arrangement, with liquid reservoir

Bearings

- Grease-packed rolling element bearings sealed for life

Drive

- Three-phase asynchronous squirrel-cage motor
- Version with explosion protection to NEC 500: Explosion-proof for Class I, Division 1, Groups C and D, T3, hazardous (classified) locations.

4.5 Configuration and function

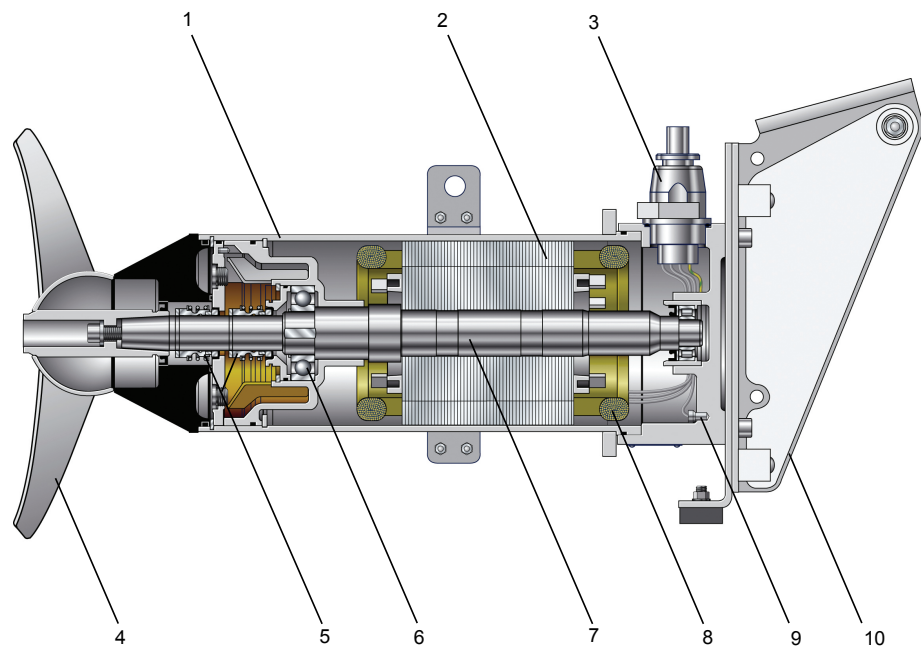


Fig. 3: Sectional drawing

1	Housing	2	Stator
3	Cable gland	4	Propeller
5	Mechanical seals	6	Rolling element bearing
7	Shaft	8	Temperature sensor
9	Leakage sensor	10	Guide bracket (accessory)

Design Submersible mixer with self-cleaning propeller (4) for mixing and keeping in suspension municipal or industrial waste water and sludges.

Function Driven by the motor, the propeller (4) generates thrust for mixing the fluid handled.

The motor is monitored by means of temperature sensors (8) and leakage sensors (9).

Sealing The submersible mixer shaft (7) is equipped with two bi-rotational mechanical seals (5) in tandem arrangement. A lubricant reservoir between the mechanical seals ensures cooling and lubrication.
The cable gland (3) is totally watertight.

4.6 Scope of supply

Depending on the model, the following items are included in the scope of supply:

- Submersible mixer with supporting clamp
- Cable support for properly routing the power cable
- Two shackles (for lifting tackle and cable support)
- Separate name plate

**NOTE**

A separate name plate is included in KSB's scope of supply. Attach this name plate in a clearly visible location outside the place of installation, e.g. in the control cabinet or on the mounting bracket.

Accessories







- Submersible mixer stand
- Jet ring for Amamix 300, 400, 600
- Pitch adapter
- Bail
- Hook
- Lifting rope
- Cable support for properly routing the power cables
- Forcing screw
- Other accessories on request

4.7 Dimensions and weights

For dimensions and weights please refer to the general arrangement drawing/outline drawing and data sheet of the submersible mixer.

5 Installation at Site

5.1 Safety regulations



	<div data-bbox="507 315 683 358"> DANGER</div> <p>Improper installation in potentially explosive atmospheres Explosion hazard! Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▸ Comply with the applicable local explosion protection regulations. ▸ Observe the information given in the data sheet and on the name plate.
	<div data-bbox="507 593 683 636"> DANGER</div> <p>Persons entering the tank Electric shock!</p> <ul style="list-style-type: none"> ▸ Never start up the submersible mixer when there are persons inside the tank. ▸ Disconnect or electrically disable the submersible mixer before entering the tank.
	<div data-bbox="507 869 703 911"> WARNING</div> <p>Hands, other body parts, or foreign objects in the propeller or propeller intake area Risk of personal injury! Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▸ Never place your hands, other body parts or foreign objects into the propeller or propeller intake area.

5.2 Checks to be carried out prior to installation

5.2.1 Checking the operating data

Before setting up the submersible mixer, verify that the name plate data matches the data given in the purchase order and the system data.

5.2.2 Preparing the place of installation

	<div data-bbox="507 1431 703 1473"> WARNING</div> <p>Installation on foundations which are unsecured and cannot support the load Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Make sure the foundation concrete is of sufficient strength (min. 3000 psi [class C25/30 to DIN 1045]). ▸ Only place the submersible mixer stand on a foundation whose concrete has set firmly. ▸ Refer to the weights given in the data sheet/on the name plate.
---	---

1. Check the structural requirements.
All structural work required must have been prepared in accordance with the dimensions stated in the outline drawing/general arrangement drawing.
2. Clean the concrete surface; if required, clean with a broom to remove any loose particles.

5.2.3 Checking the lubricant level

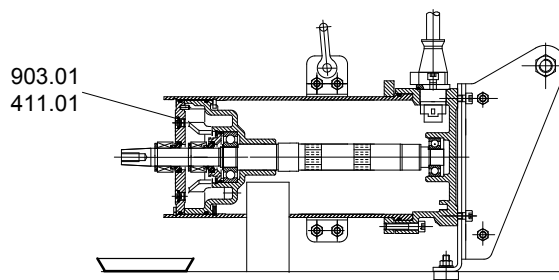



Fig. 4: Checking the lubricant

The lubricant chambers have been filled with an environmentally-friendly, non-toxic lubricant at the factory.

✓ The propeller has been removed. (⇒ Section 7.4.2, Page 38)

1. Position the submersible mixer as shown.
2. Unscrew screw plug 903.01 with joint ring 411.01.
⇒ The lubricant level must reach the filler opening.
3. If the lubricant level is lower, top up lubricant through the filler opening until the lubricant reservoir overflows.
4. Fit screw plug 903.01 and joint ring 411.01 again.
5. Fit the propeller. (⇒ Section 7.5.5, Page 42)

5.3 Setting up the submersible mixer

	<p>CAUTION</p> <p>Incorrect installation position of submersible mixer Damage by excessive stresses or strains!</p> <ul style="list-style-type: none"> ▷ Observe the information given in the general arrangement drawing. ▷ Installation in other positions is only permitted after prior consultation with and approval by KSB.
---	---


Mount the submersible mixer on the applicable submersible mixer stand as described in the separate "Submersible mixer stand" installation instructions.

5.4 Electrical system

5.4.1 Information for planning the control system

For the electrical connection of the submersible mixer observe the wiring diagrams. (⇒ Section 9.3, Page 50)

The submersible mixer is supplied with a power cable and is wired for DOL starting. Star-delta starting is possible with 8-pole and 12-pole motors.



	<p>NOTE</p> <p>When laying a cable between the control system and the submersible mixer's connection point, make sure to have a sufficient number of cores for the sensors. A minimum cross-section of 1.5 mm² (AWG 15) is required.</p>
---	--

The motors can be connected to electrical low-voltage grids with rated voltages and voltage tolerances to IEC 60038. The permissible tolerances must be observed.

5.4.1.1 Overload protection

1. Protect the submersible mixer against overloading by a thermal time-lag overload protection device in accordance with IEC 947 and local regulations.
2. Set the overload protection device to the rated current specified on the name plate.



5.4.1.2 Level switch

	<p>! DANGER</p> <p>Dry-running of submersible mixer Explosion hazard!</p> <p>▷ Never allow an explosion-proof submersible mixer to run dry.</p>
	<p>CAUTION</p> <p>Propeller not fully submerged Damage to the submersible mixer!</p> <p>▷ Never allow the liquid level to drop below the submersible mixer during mixer operation (not even for short periods).</p>

Automatic mixer operation in a tank requires the use of level control equipment. Observe the specified minimum fluid level.

5.4.1.3 Frequency inverter operation

The submersible mixer is suitable for frequency inverter operation as per IEC 60034-17.

	<p>! DANGER</p> <p>Operation outside the permitted frequency range Explosion hazard!</p> <p>▷ Never operate an explosion-proof submersible mixer outside the specified range.</p>
	<p>! DANGER</p> <p>Incorrect selection and setting of the frequency inverter Explosion hazard!</p> <p>▷ Observe the following information on selecting and setting a frequency inverter.</p>

Selection When selecting a frequency inverter, check the following details:

- Data provided by the manufacturer
- Electrical data of the submersible mixer, particularly the rated current
- Only voltage intermediate-circuit inverters (VSI) with pulse width modulation (PWM) and carrier frequencies between 1 and 16 kHz are suitable.

Setting Observe the following instructions for setting a frequency inverter:

- Set the current limit to max. 1.2 times the rated current. The rated current is indicated on the name plate.

Operation Observe the following limits when operating the pump set on a frequency inverter:

- Only utilize up to 95 % of the motor rating P_2 indicated on the name plate.
- Frequency range 30 to 60 Hz

Electromagnetic compatibility

Frequency inverter operation produces RFI emissions of various extents, depending on the inverter used (type, interference suppression, make). To prevent the drive system, consisting of a submersible motor and a frequency inverter, from exceeding any given limits always observe the EMC information provided by the inverter manufacturer. If the inverter manufacturer recommends a shielded power cable, make sure to use a submersible mixer with shielded power cables.


Interference immunity

The submersible mixer generally meets interference immunity requirements. For monitoring the sensors installed the operator must ensure sufficient interference immunity by appropriately selecting and laying the power cables in the plant. No modifications are required on the power/control cable of the submersible mixer. Suitable analyzing devices must be selected. To monitor the leakage sensor inside the motor, it is recommended to use a special relay available from KSB.

5.4.1.4 Sensors

	<div style="background-color: #e67e22; color: white; padding: 5px;">! DANGER</div> <p>Operating an incompletely connected submersible mixer Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Never start up a submersible mixer with incompletely connected power cables or non-operational monitoring devices.
---	--

The submersible mixer features sensors that avoid hazards and damage to the submersible mixer.


	<div style="background-color: #2980b9; color: white; padding: 5px;">NOTE</div> <p>Reliable and safe operation of the submersible mixer within the scope of our warranty is only possible if the sensor signals are properly analyzed as stipulated in this operating manual.</p>
--	---


All sensors are located inside the submersible mixer and are connected to the power cable.

For information on wiring and core identification please refer to the wiring diagrams. (⇒ Section 9.3, Page 50)

The individual sensors and the limit values to be set are described in the following sections.



5.4.1.4.1 Motor temperature

	<div style="background-color: #e67e22; color: white; padding: 5px;">! DANGER</div> <p>Insufficient cooling Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Never operate an explosion-proof submersible mixer without operational temperature monitoring equipment. ▷ For explosion-proof submersible mixers use a thermistor tripping unit with manual reset.
---	---

	<div style="background-color: #f1c40f; color: black; padding: 5px;">CAUTION</div> <p>Insufficient cooling Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▷ Never operate a submersible mixer without operational temperature monitoring equipment.
---	--

The motor is monitored by three series-connected PTC thermistors with terminals 10 and 11. Tripping must result in the submersible mixer cutting out. Automatic re-start is not permitted.

5.4.1.4.2 Leakage inside the motor

	 DANGER
	<p>Incorrect monitoring of leakage electrode</p> <p>Explosion hazard!</p> <p>Danger of death from electric shock!</p> <p>▸ Voltages must be < 30 V AC and tripping currents < 0.5 mA.</p>

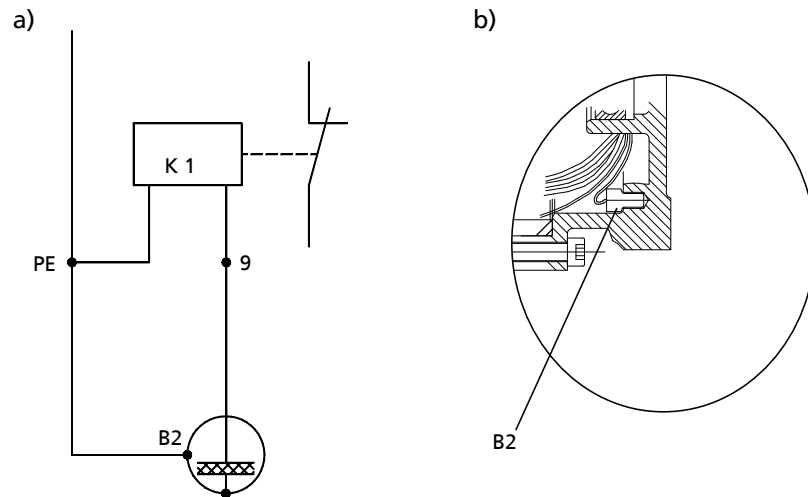


Fig. 5: a) Wiring of the electrode relay and b) Position of the electrode in the motor housing

An electrode (B2) fitted inside the motor monitors the winding and connection space for leakage. This electrode must be connected to an electrode relay (core marked 9). Tripping of the electrode relay must result in the submersible mixer cutting out.

The electrode relay (K1) must meet the following requirements:

- Sensor circuit 10 to 30 V AC
- Tripping current ≤ 0.5 mA

5.4.1.4.3 Leakage at the mechanical seal (optional)

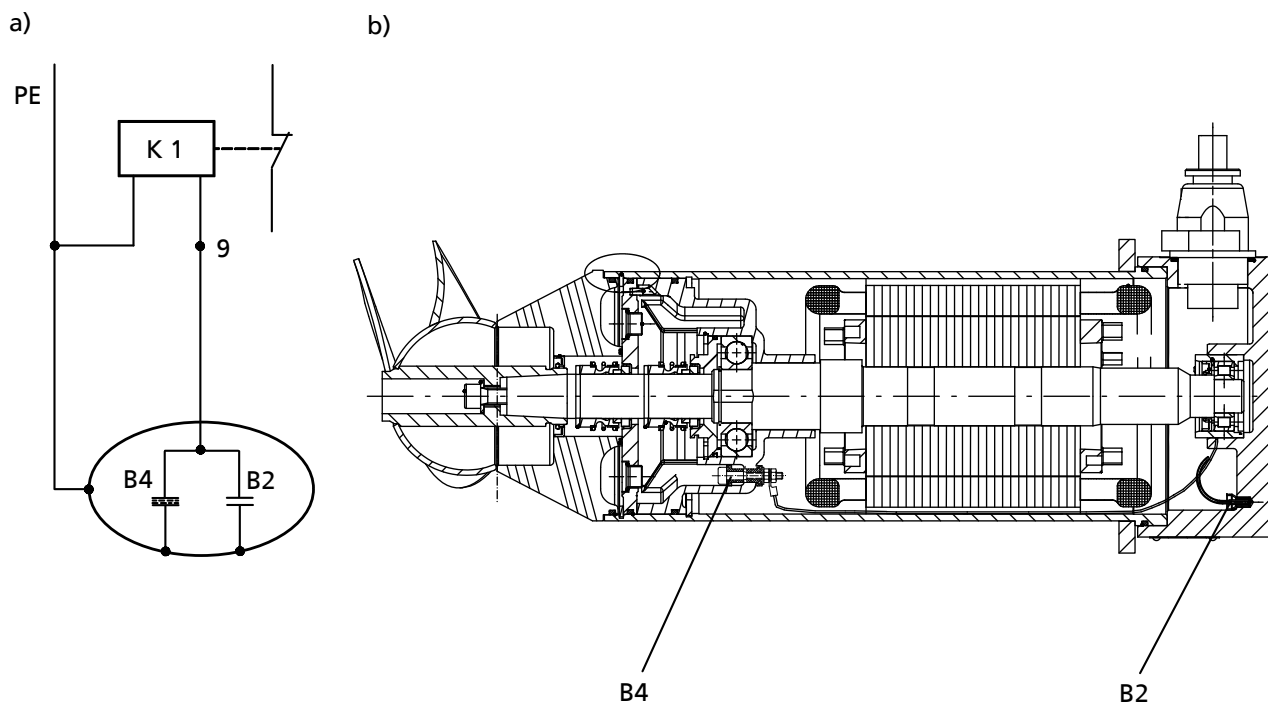





Fig. 6: a) Wiring of the electrode relay and b) Position of the leakage sensor


Versions with (optional) monitoring of mechanical seal leakage are fitted with an electrode in the oil chamber (B4) in addition to the electrode (B2) monitoring the winding space inside the motor for leakage. Both electrodes are connected in parallel and must be monitored by a single electrode relay.

The electrode relay (K1) must meet the following requirements:

- Sensor circuit 10 to 30 V AC
- Tripping current 0.5 to 3 mA
(equivalent to a tripping resistance of 3 to 60 kΩ)

5.4.2 Electrical connection


	<div style="background-color: #f4a460; padding: 5px;">⚠ DANGER</div> <p>Electrical connection work by unqualified personnel Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▷ Always have the electrical connections installed by a trained electrician. ▷ Observe IEC 60364 regulations as well as any locally applicable regulations.
	<div style="background-color: #f4a460; padding: 5px;">⚠ WARNING</div> <p>Incorrect connection to the mains Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▷ Observe the technical specifications of the local energy supply companies.
	<div style="background-color: #f4d03f; padding: 5px;">CAUTION</div> <p>Improper routing of power cable Damage to the power cables!</p> <ul style="list-style-type: none"> ▷ Never move the power cables at temperatures below -13 °F [-25 °C]. ▷ Never kink or crush the power cables. ▷ Never lift the submersible mixer by its power cable.


	<p>CAUTION</p> <p>Motor overload Damage to the motor!</p> <ul style="list-style-type: none"> ▷ Protect the motor by a thermal time-lag overload protection device in accordance with IEC 60947 and local regulations.
---	--


For electrical connection observe the wiring diagrams and the information on planning the control system. (⇒ Section 9.3, Page 50) (⇒ Section 5.4.1, Page 18)

The submersible mixer is supplied with a power cable. Always connect all marked cores.

	<p>! DANGER</p> <p>Operating an incompletely connected submersible mixer Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Never start up a submersible mixer with incompletely connected power cables or non-operational monitoring devices.
---	---


	<p>! DANGER</p> <p>Incorrect connection Explosion hazard!</p> <ul style="list-style-type: none"> ▷ The connection point of the cable ends must be located outside hazardous areas or in an area approved for electrical equipment.
---	---


	<p>CAUTION</p> <p>Flow-induced motion Damage to the power cable!</p> <ul style="list-style-type: none"> ▷ Run the power cable upwards without slack.
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	<p>NOTE</p> <p>We recommend to use cable supports available as accessories for properly fastening the power cable at the tank edge.</p>
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1. Run the power cable directly upwards without slack, and fasten it.
2. Remove the protective caps from the power cable immediately before connection.
3. If necessary, adjust the length of the power cable to the site requirements.
4. After shortening the cable, correctly re-affix the markings on the individual cores at the cable end.


Potential equalization The submersible mixer does not have an external PE connection (risk of corrosion).


	<p>! DANGER</p> <p>Incorrect wiring Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Explosion-proof submersible mixers installed in a tank must never be retrofitted with an external potential equalization connection!
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	⚠ DANGER
	Touching the submersible mixer during operation Electric shock! ▷ Make sure that the submersible mixer cannot be touched during operation.

5.5 Checking the direction of rotation

	⚠ WARNING
	Hands, other body parts, or foreign objects in the propeller or propeller intake area Risk of personal injury! Damage to the submersible mixer! ▷ Never place your hands, other body parts or foreign objects into the propeller or propeller intake area.

	CAUTION
	Wrong direction of rotation Damage to the submersible mixer and the submersible mixer stand! ▷ Check the direction of rotation. ▷ Observe the arrow indicating the direction of rotation. ▷ Run the submersible mixer for a short period of time only (max. 1 minute) when checking the direction of rotation.

	CAUTION
	Propeller not fully submerged Damage to the submersible mixer! ▷ Never lower the submersible mixer into the fluid while checking the direction of rotation.

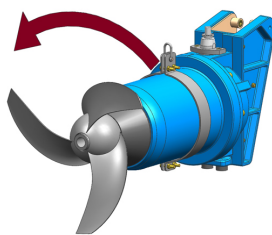


Fig. 7: Checking the direction of rotation

- ✓ The submersible mixer is mounted on the submersible mixer stand and located completely outside the fluid handled.
 If tank is filled: Mixer mounted on the guide rail and suspended from lifting gear.
 If tank is empty: Mixer mounted on the guide rail and in operating position.
- ✓ The submersible mixer is connected to the power supply.
 1. Start the submersible mixer and stop it again immediately to determine the direction of rotation.
 2. Check the direction of rotation.
 - ⇒ Propeller rotation must be anti-clockwise (looking at the propeller hub). (See rotation arrow on the housing)
 3. If the impeller is running in the wrong direction of rotation, check the electrical connection of the submersible mixer and the control system, if applicable.
 4. Lower the submersible mixer into its operating position.

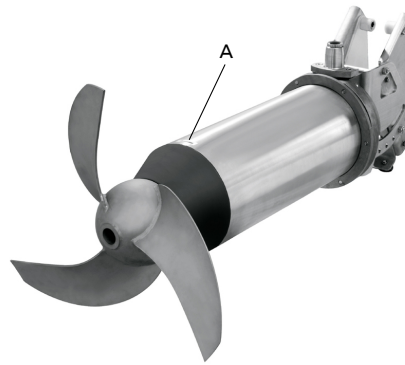


Fig. 8: Arrow indicating the direction of rotation

A	Arrow indicating the direction of rotation
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6 Commissioning/Start-up/Shutdown




6.1 Commissioning/start-up

6.1.1 Prerequisites for commissioning/start-up

Before commissioning/start-up make sure that the following requirements are met:


- The submersible mixer has been correctly mounted on the submersible mixer stand.
- The submersible mixer has been properly connected to the power supply and is equipped with all protection devices.
- The operating data, the lubricant level and the direction of rotation have been checked.

6.1.2 Start-up


	<div style="background-color: #f4a460; padding: 5px;">! DANGER</div> <p>Excessive temperatures due to dry running or excessive fluid temperature Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Never operate the submersible mixer outside the fluid. ▷ Observe the minimum level of the fluid handled. ▷ Never operate an explosion-proof submersible mixer at ambient and fluid temperatures exceeding those specified in the data sheet or on the name plate. ▷ Always operate the submersible mixer within the permissible operating range.
	<div style="background-color: #ffcc00; padding: 5px;">CAUTION</div> <p>Excessive temperatures due to dry running or excessive fluid temperature Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▷ Never operate the submersible mixer outside the fluid. ▷ Observe the minimum level of the fluid handled. ▷ Always operate the submersible mixer within the permissible operating range.
	<div style="background-color: #ffcc00; padding: 5px;">CAUTION</div> <p>Re-starting while motor is still running down Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▷ Do not re-start the submersible mixer before it has come to a standstill. ▷ Never start up a submersible mixer running in reverse rotation.

1. Start up the submersible mixer.

6.2 Operating limits


	<div style="background-color: #f4a460; padding: 5px;">! DANGER</div> <p>Non-compliance with operating limits Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▷ Comply with the operating data indicated in the data sheet. ▷ Never operate an explosion-proof submersible mixer at ambient and fluid temperatures exceeding those specified in the data sheet or on the name plate.
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6.2.1 Frequency of starts

	CAUTION
	<p>Re-starting while motor is still running down Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▷ Do not re-start the submersible mixer before it has come to a standstill. ▷ Never start up a submersible mixer running in reverse rotation.


To prevent high temperature increases in the motor and excessive loads on the motor, seal elements and bearings, the maximum number of start-ups shall not exceed 10 per hour and 5000 per year. These values apply to mains start-up (DOL or with star-delta contactor, autotransformer, soft starter). These limits do not apply to frequency inverter operation.

6.2.2 Supply voltage

	! DANGER
	<p>Non-compliance with permissible supply voltage tolerances Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Never operate an explosion-proof submersible mixer outside the specified range.

The maximum permissible deviation in supply voltage is $\pm 10\%$ of the rated voltage. The voltage difference between the individual phases must not exceed 1 %.



6.2.3 Frequency inverter operation

	! DANGER
	<p>Operation outside the permitted frequency range Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Never operate an explosion-proof submersible mixer outside the specified range.

Frequency inverter operation of the submersible mixer is permitted in the frequency range from 25 to 60 Hz.

6.2.4 Fluid properties

6.2.4.1 Minimum level of fluid handled

	! DANGER
	<p>Excessive temperatures due to dry-running Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Always operate the submersible mixer in fully submerged condition only (incl. propeller). ▷ Observe the minimum level of the fluid handled.
	<p style="background-color: #FFD700;">CAUTION</p> <p>Propeller not fully submerged Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▷ Never allow the liquid level to drop below the submersible mixer during mixer operation (not even for short periods).

The submersible mixer is operational when the fluid level is not lower than dimension W_T . This minimum level of the fluid handled must also be ensured during automatic operation.

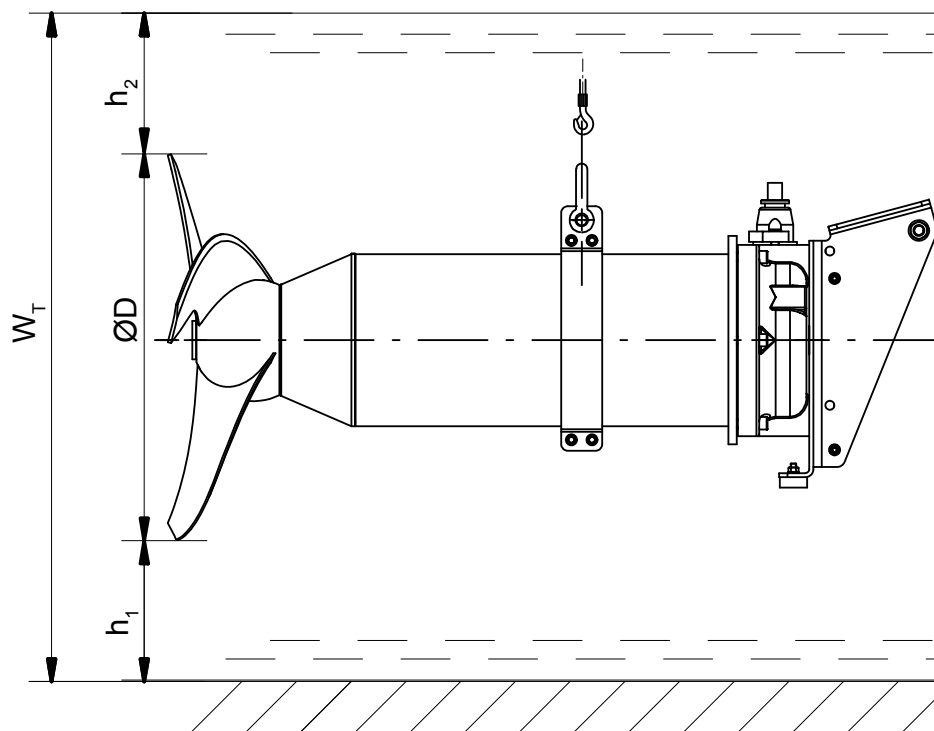


Fig. 9: Minimum level of fluid handled

Table 6: Minimum level of fluid handled

$\varnothing D$		$h_{1 \min}$		$h_{2 \min}$		$W_{T \min}$	
["]	[mm]	["]	[m]	["]	[m]	["]	[m]
8	200	4	0.11	20	0.50	32	0.82
12	300	6	0.15	31	0.80	49	1.25
20	400	8	0.20	33	0.85	57	1.45
24	600	12	0.30	39	1.00	75	1.90

A minimum distance h_1 should also be kept from any vertical walls. If more than one submersible mixer is installed, the mixers should be spaced at a distance $\varnothing D$. Reflections of the water jet and flow turbulence must be taken into account.


With accessories set 6 for shallow tanks and racetracks, the floor clearance h_1 can be reduced to 2" [approx. 50 mm]. Condition: solid floor (concrete/steel/plastics)

6.2.4.2 Fluid temperature

	<p>⚠ DANGER</p> <p>Fluid temperature Explosion hazard!</p> <p>► Never operate the submersible mixer at fluid temperatures exceeding those specified in the data sheet or on the name plate.</p>
	<p>⚠ DANGER</p> <p>Fluid temperature Danger of frost/freezing!</p> <p>► The submersible mixer is designed for operation in liquids. The submersible mixer is not operational, and therefore must not be operated, under freezing conditions.</p>

6.2.4.3 Density of fluid handled

The power input of the submersible mixer increases in proportion to the density of the fluid handled.


	CAUTION
	<p>Impermissibly high density of the fluid handled Motor overload!</p> <ul style="list-style-type: none"> ▸ Observe the information on fluid density in the data sheet. ▸ Make sure the motor has sufficient power reserves.


6.2.4.4 Abrasive fluids

Do not exceed the maximum permissible solids content specified in the data sheet. When the mixer is operated in fluids containing abrasive substances, increased wear of the propeller and the shaft seal are to be expected. In this case, halve the intervals commonly recommended for servicing and maintenance.


6.3 Shutdown/storage/preservation


6.3.1 Measures to be taken for shutdown

	! WARNING
	<p>Fluids, consumables and supplies posing a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▸ Submersible mixers used in fluids posing a health hazard must be decontaminated. ▸ Wear safety clothing and a protective mask, if required. ▸ Observe all legal regulations on the disposal of fluids posing a health hazard.

	! WARNING
	<p>Submersible mixer started up unintentionally Risk of injury by moving parts!</p> <ul style="list-style-type: none"> ▸ Always make sure the electrical connections are disconnected before carrying out work on the submersible mixer. ▸ Make sure that the submersible mixer cannot be started up unintentionally.

The submersible mixer remains installed

	! DANGER
	<p>Persons entering the tank Electric shock!</p> <ul style="list-style-type: none"> ▸ Never start up the submersible mixer when there are persons inside the tank. ▸ Disconnect or electrically disable the submersible mixer before entering the tank.

	! WARNING
	<p>Hands, other body parts, or foreign objects in the propeller or propeller intake area</p> <p>Risk of personal injury! Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▸ Never place your hands, other body parts or foreign objects into the propeller or propeller intake area.

- Start up the submersible mixer regularly once a month or once every three months for approximately one minute during prolonged shutdown periods. This will prevent the formation of deposits on the surface of the submersible mixer.


The submersible mixer is removed from the tank and stored

- ✓ All safety regulations are observed.
 1. Clean the submersible mixer.
 2. Carry out maintenance work.
Follow the maintenance instructions.

6.4 Returning to service

For returning the submersible mixer to service adhere to the sections on commissioning/start-up and the operating limits.










For returning the mixer to service after storage also follow the instructions for maintenance/inspection. (⇒ Section 7.2, Page 32)



	NOTE
	<p>On submersible mixers older than 5 years we recommend replacing all elastomer seals.</p>

7 Servicing/Maintenance

7.1 Safety regulations

The operator ensures that all maintenance, all inspections and all installation work is performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.

	<div data-bbox="507 414 683 459"> DANGER</div> <div data-bbox="496 477 995 510">Sparks produced during maintenance work</div> <div data-bbox="496 512 699 542">Explosion hazard!</div> <div data-bbox="517 553 1382 611"> <ul style="list-style-type: none"> ▷ Always perform maintenance work on explosion-proof submersible mixers outside potentially explosive atmospheres only. </div>
	<div data-bbox="507 640 683 685"> DANGER</div> <div data-bbox="496 703 718 736">Improper transport</div> <div data-bbox="496 739 868 772">Danger to life from falling parts!</div> <div data-bbox="496 775 887 808">Damage to the submersible mixer!</div> <div data-bbox="517 819 1401 1111"> <ul style="list-style-type: none"> ▷ Use the attachment point provided (lifting lug or bail) for attaching lifting accessories. ▷ Never suspend the submersible mixer by its power cable. ▷ Never use the lifting ropes included in KSB's scope of supply for lifting loads other than the KSB product supplied. ▷ Safely attach lifting ropes to the submersible mixer and crane. ▷ Protect the power cable against damage. ▷ Maintain adequate safety distance during lifting operations. </div>
	<div data-bbox="507 1140 702 1184"> WARNING</div> <div data-bbox="496 1202 1016 1236">Submersible mixer started up unintentionally</div> <div data-bbox="496 1238 841 1272">Risk of injury by moving parts!</div> <div data-bbox="517 1283 1415 1386"> <ul style="list-style-type: none"> ▷ Always make sure the electrical connections are disconnected before carrying out work on the submersible mixer. ▷ Make sure that the submersible mixer cannot be started up unintentionally. </div>
	<div data-bbox="507 1415 702 1460"> WARNING</div> <div data-bbox="496 1478 1386 1538">Fluids handled and supplies posing a health hazard or hot fluids handled and supplies</div> <div data-bbox="496 1541 654 1574">Risk of injury!</div> <div data-bbox="517 1585 1366 1688"> <ul style="list-style-type: none"> ▷ Observe all relevant laws. ▷ Take appropriate measures to protect persons and the environment. ▷ Decontaminate submersible mixers used in fluids posing a health hazard. </div>
	<div data-bbox="507 1729 587 1774">NOTE</div> <div data-bbox="496 1792 1445 1883"> <p>Special regulations apply to repair work on explosion-proof submersible mixers. Modification or alteration of the submersible mixers can affect explosion protection and is only permitted after consulting the manufacturer.</p> </div>

	<p>NOTE</p> <p>A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation with a minimum of maintenance expenditure and work.</p>
	<p>NOTE</p> <p>All maintenance work, service work and installation work can be carried out by KSB Service or authorized workshops. Find your contact in the attached "Addresses" booklet or on the Internet at "www.ksb.com/contact".</p>

Never use force when dismantling and reassembling the submersible mixer.

7.2 Servicing/inspection

KSB recommends the following regular maintenance schedule:


Table 7: Overview of maintenance work

Maintenance interval	Maintenance work
Every 8,000 operating hours ³⁾	Measure the insulation resistance (⇒ Section 7.2.1.1, Page 32)
	Check the power cables (⇒ Section 7.2.1.2, Page 33)
	Visually inspect the shackle/lifting rope (Amaprop V) (⇒ Section 7.2.1.3, Page 33)
Every 16000 operating hours ⁴⁾	Visually inspect the shackle/lifting rope (Amaprop J, K) (⇒ Section 7.2.1.3, Page 33)
	Check the sensors (⇒ Section 7.2.1.4, Page 33)
	Change the lubricant (⇒ Section 7.2.1.5, Page 34)
Every five years	Perform a general overhaul.

7.2.1 Inspection work

7.2.1.1 Measuring the insulation resistance

- ✓ The submersible mixer has been disconnected in the control cabinet.
- ✓ Use an insulation resistance measuring device.
- ✓ The maximum measuring voltage is 1000 V.
 1. Measure winding against ground.
To do so, connect all winding ends together.
 2. Measure winding temperature sensor against ground.
To do so, connect all core ends of the winding temperature sensors together and connect all winding ends to ground.
- ⇒ The insulation resistance of the core ends against ground must not be lower than 1 MΩ.
If the resistance measured is lower, cable and motor resistance must be measured separately. Disconnect the power cable from the motor for this purpose.

	<p>NOTE</p> <p>If the insulation resistance of the power cable is lower than 1 MΩ, the power cable is defective and must be replaced.</p>
---	--

3) At least once a year
4) At least every three years



NOTE

If the motor insulation resistance measured is too low, the winding is defective. The submersible mixer must not be returned to service in this case.

7.2.1.2 Checking the power cables

Visual inspection

1. Inspect the power cable for visual damage.
2. Replace any damaged components by original spare parts.

Checking the ground conductor

1. Measure the resistance between ground conductor and ground.
The resistance must be lower than 1 Ω .
2. Replace any damaged components by original spare parts.



DANGER

Defective ground conductor

Electric shock!

- ▷ Never switch on a submersible mixer with a defective ground conductor.

7.2.1.3 Checking the shackle/lifting rope

Visual inspection

- ✓ The submersible mixer has been lifted out of the fluid handled and cleaned.
1. Inspect the shackle/lifting rope and all fixing elements for visual damage.
 2. Replace damaged components by original spare parts.

7.2.1.4 Checking the sensors



CAUTION

Excessive test voltage

Damage to the sensors!

- ▷ Use a commercially available ohmmeter to measure the resistance.

The tests described below measure the resistance at the core ends of the power cable. The actual function of the sensors is not tested.

Temperature sensors in the motor winding

Table 8: Resistance measurement of the temperature sensors in the motor winding

Measurement between terminals ...	Resistance
	[Ω]
10 and 11	100 to 1000

If the tolerances indicated are exceeded, disconnect the power cable at the submersible mixer and repeat the check inside the motor.

If tolerances are exceeded here, too, the winding will have to be replaced.

Leakage sensor in the motor (also mechanical seal leakage)

Table 9: Resistance measurement of the leakage sensors

Measurement between terminals ...	Resistance
9 and ground conductor (PE)	> 60 k Ω

Lower resistance values suggest water ingress into the motor. In this case the motor must be opened and overhauled.

If mechanical seal leakage is monitored, completely drain the oil chamber first, then repeat the measuring procedure with the motor in horizontal position. If the measured value is okay now, the motor is dry inside but the outboard mechanical seal is defective.

7.2.1.5 Lubrication and lubricant change

7.2.1.5.1 Lubricant quality


The lubricant reservoir is filled at the factory with environmentally friendly, non-toxic lubricant of medicinal quality (unless otherwise specified by the customer). The following lubricants can be used to lubricate the mechanical seals:


Table 10: Oil quality

Description	Properties	
Paraffin oil or white oil Alternative: motor oils of grades SAE 10W to SAE 20W	Kinematic viscosity at 40 °C	< 20 mm²/s
	Flash point (to Cleveland)	+160 °C
	Solidification point (pour point)	-15 °C

Recommended oil quality:

- Merkur WOP 40 PB, made by SASOL
- Merkur white oil Pharma 40, made by DEA
- Thin-bodied paraffin oil No. 7174, made by Merck
- Equivalent brands of medical quality, non-toxic
- Water-glycol mixture



 **WARNING**

Contamination of fluid handled by lubricant
Hazard to persons and the environment!


- ▷ Using machine oil is only permitted if the oil can be disposed of properly.


7.2.1.5.2 Lubricant quantity

Table 11: Lubricant quantity depending on the size

Size	Lubricant quantity	
	[oz]	[l]
200 G	10	0.3
200 C	13.5	0.4
300	13.5	0.4
400	27	0.8
600 C	47	1.4
600 G	81	2.4


7.2.1.5.3 Draining the lubricant



 **WARNING**

Lubricants posing a health hazard and/or hot lubricants
Hazard to persons and the environment!

- ▷ When draining the lubricant take appropriate measures to protect persons and the environment.
- ▷ Wear safety clothing and a protective mask if required.
- ▷ Collect and dispose of any lubricants.
- ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

	<p>! WARNING</p> <p>Excess pressure in the lubricant chamber Liquid spurting out when the lubricant chamber is opened at operating temperature!</p> <p>▷ Open the screw plug of the lubricant chamber very carefully.</p>
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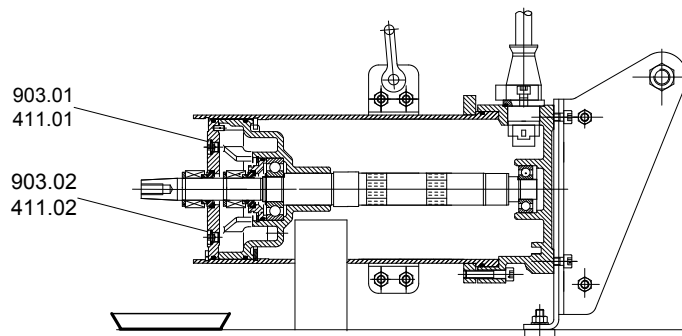




Fig. 10: Draining the lubricant

1. Position the submersible mixer as shown.
2. Place a suitable container under the screw plug.
3. Remove screw plugs 903.01 and 903.02 with joint rings 411.01 and 411.02, and drain off the lubricant.
4. Close screw plug 903.02 again, fitting a new joint ring 411.02.

7.2.1.5.4 Refilling the lubricant

	<p>! WARNING</p> <p>Lubricants posing a health hazard Hazard to persons and the environment!</p> <p>▷ When refilling the lubricant take appropriate measures to protect persons and the environment.</p>
	<p>CAUTION</p> <p>Lubricant level too high Mechanical seal operation is impaired!</p> <p>▷ Always place the submersible mixer in horizontal position (as shown) for refilling the lubricant.</p>

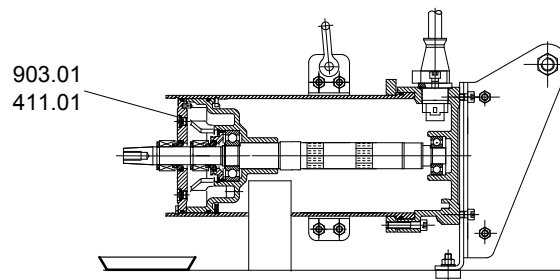




Fig. 11: Refilling the lubricant

- ✓ The submersible mixer has been positioned as shown.
 - ✓ The screw plug 903.01 and joint ring 411.01 have been removed.
1. Fill the lubricant through the lubricant filler opening until the lubricant reservoir overflows.
 2. Close screw plug 903.01 again, fitting a new joint ring 411.01.





7.3 Drainage/disposal










	 WARNING
	<p>Fluids posing a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Submersible mixers used in fluids posing a health hazard must be decontaminated. ▷ Collect and properly dispose of flushing liquid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of substances posing a health hazard.

1. Always flush the submersible mixer if it has been used for handling noxious, explosive, hot or other hazardous fluids.
2. Always flush and clean the submersible mixer before sending it to the workshop.
Make sure to add a certificate of decontamination.

7.4 Dismantling the submersible mixer

7.4.1 General information/Safety regulations

	 WARNING
	<p>Work on the submersible mixer by unqualified personnel Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Always have repair and maintenance work performed by specially trained, qualified personnel.
	 WARNING
	<p>Submersible mixer started up unintentionally Risk of injury by moving parts!</p> <ul style="list-style-type: none"> ▷ Always make sure the electrical connections are disconnected before carrying out work on the submersible mixer. ▷ Make sure that the submersible mixer cannot be started up unintentionally.

	<div data-bbox="507 188 703 232"> WARNING</div> <div data-bbox="496 253 1307 358"> <p>Hot surface Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Allow the submersible mixer to cool down to ambient temperature. </div>
	<div data-bbox="507 387 703 432"> WARNING</div> <div data-bbox="496 452 1388 593"> <p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components. </div>
	<div data-bbox="507 622 703 667"> WARNING</div> <div data-bbox="496 687 1414 909"> <p>Fluids, consumables and supplies posing a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Submersible mixers used in fluids posing a health hazard must be decontaminated. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard. </div>
	<div data-bbox="507 936 703 981"> WARNING</div> <div data-bbox="496 1001 1334 1158"> <p>Components with sharp edges Risk of cutting or shearing injuries!</p> <ul style="list-style-type: none"> ▷ Always use appropriate caution for installation and dismantling work. ▷ Wear work gloves. </div>
<p>For dismantling and reassembly observe the general assembly drawing. (⇒ Section 9.1, Page 45)</p>	
	<div data-bbox="507 1261 587 1305">NOTE</div> <div data-bbox="496 1326 1441 1415"> <p>All maintenance work, service work and installation work can be carried out by KSB Service or authorized workshops. Find your contact in the attached "Addresses" booklet or on the Internet at "www.ksb.com/contact".</p> </div>

7.4.2 Dismantling the propeller

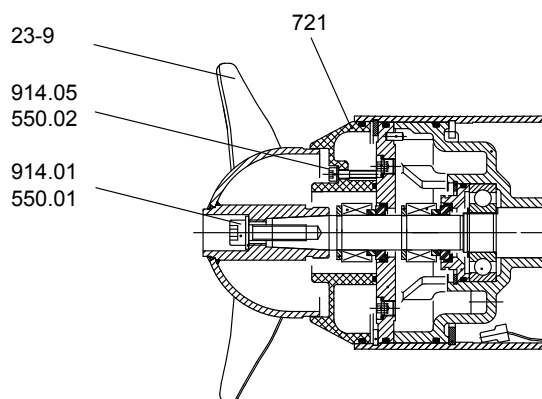


Fig. 12: Dismantling the propeller

- ✓ The submersible mixer has been lifted out of the tank, cleaned and placed outside the tank as per operating instructions.
- 1. Unscrew propeller screw 914.01 and disc 550.01.
- 2. Screw a forcing screw into propeller 23-9 and pull off the propeller. (N.B.: tight conical fit)
- 3. Unscrew socket head cap screws 914.05 and disc 550.02.
- 4. Remove taper piece 721.



NOTE

For Amamix 200G, only carry out steps 1 and 2 to remove the propeller.

7.4.3 Removing the mechanical seals



CAUTION

Improper removal of mechanical seal

Damage to the shaft!

- ▷ Carefully remove and dismantle the mechanical seal.

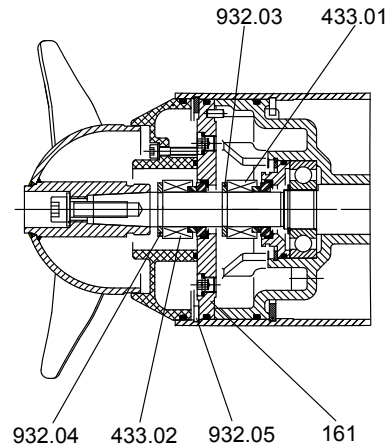




Fig. 13: Removing the mechanical seal

- ✓ The propeller has been removed.
- 1. Undo circlip 932.04.
- 2. Take out mechanical seal 433.02.
- 3. Undo circlip 932.05.
- 4. Take out casing cover 161.
- 5. Take out mechanical seal 433.01.


7.4.4 Dismantling the motor section



	<p>NOTE</p> <p>Special regulations apply to repair work on explosion-proof submersible mixers. Modification or alteration of the submersible mixers can affect explosion protection and is only permitted after consulting the manufacturer.</p>
	<p>NOTE</p> <p>The motors of explosion-proof submersible mixers are supplied in "flameproof enclosure" type of protection. Any work on the motor section which could affect explosion protection, such as re-winding and machining repairs, must be inspected and approved by an approved expert or performed by the motor manufacturers. No modifications may be made to the internal configuration of the motor. Repair work at the joints relevant for explosion protection must only be performed in accordance with the manufacturer's instructions.</p>

When dismantling the motor section and the connection cable make sure that the cores/terminals are clearly marked for future reassembly.

7.5 Reassembling the submersible mixer

7.5.1 General information/Safety regulations

	<p>⚠ WARNING</p> <p>Improper lifting/moving of heavy assemblies or components</p> <p>Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
---	---




	<p>CAUTION</p> <p>Improper reassembly Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▷ Reassemble the submersible mixer in accordance with the general rules of sound engineering practice. ▷ Use original spare parts only.
	<p>NOTE</p> <p>Before reassembling the motor section, check that all joints relevant to explosion protection (flamepaths) are undamaged. Any components with damaged flamepaths must be replaced. Refer to the flamepath positions specified in the Annex.</p>

Sequence Always reassemble the submersible mixer in accordance with the corresponding general assembly drawing.

- Sealing elements**
- O-rings
 - Check O-rings for any damage and replace by new O-rings if required.
 - Never use O-rings that have been glued together from material sold by the yard.
 - Assembly adhesives
 - Avoid the use of assembly adhesives if possible.

Tightening torques For reassembly, tighten all screws and bolts as indicated. In addition, secure all screwed connections closing off the flameproof enclosure with a thread-locking agent (Loctite type 243).

7.5.2 Reassembling the motor section

	<p> DANGER</p> <p>Wrong screws/bolts Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Only use original screws/bolts on explosion-proof submersible mixers.
	<p>NOTE</p> <p>Before reassembling the motor section, check that all joints relevant to explosion protection (flamepaths) are undamaged. Components with damaged flamepaths must be replaced. Only use original spare parts made by KSB for explosion-proof submersible mixers. The flamepaths are shown in the relevant drawings. All screwed connections closing off the flameproof enclosure must be secured with a thread-locking agent (Loctite Type 243).</p>

7.5.3 Installing the mechanical seal

The following rules must be observed when installing the mechanical seal:

- Work cleanly and accurately.
- Only remove the protective wrapping of the contact faces immediately before installation takes place.
- Prevent any damage to the sealing surfaces or O-rings.

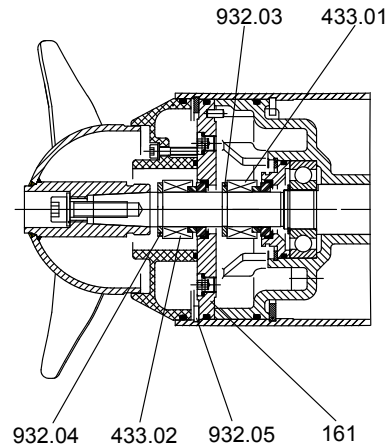


Fig. 14: Installing the mechanical seal

- ✓ The individual parts are kept in a clean and level assembly area.
 - ✓ All disassembled parts have been cleaned and checked for wear.
 - ✓ Damaged or worn parts have been replaced by original spare parts.
 - ✓ The sealing surfaces have been cleaned.
1. Clean the shaft, and touch up any score marks or scratches with a polishing cloth, if necessary. If score marks or scratches are still visible, replace shaft 210.
 2. Fit mechanical seal 433.01.
 3. Fit circlip 932.03.
 4. Fit casing cover 161.
 5. Fit circlip 932.05.
 6. Fit mechanical seal 433.02.
 7. Fit circlip 932.04.

7.5.4 Leak testing

After reassembly, the mechanical seal area/lubricant reservoir must be tested for leakage. The lubricant filler opening is used for leak testing.

Observe the following values for leak testing:

- **Test medium:** compressed air
- **Test pressure:** 11.6 psi [0.8 bar] max.
- **Test period:** 2 minutes

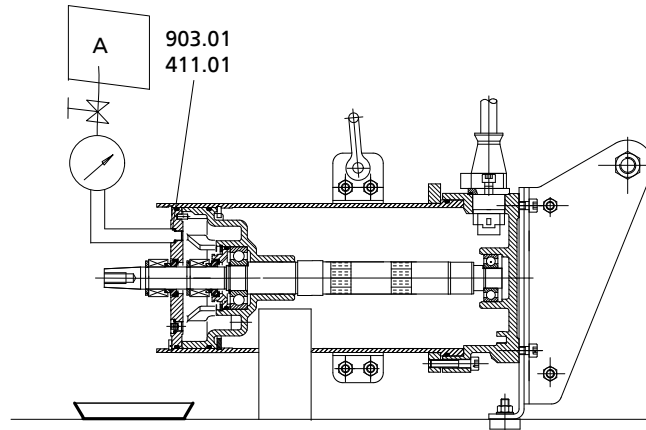


Fig. 15: Leak test

1. Undo and remove screw plug 903.01 with joint ring 411.01.
2. Screw the testing device tightly into the lubricant filler opening.
3. Carry out the leak test with the values specified above.



NOTE

The pressure must not drop during the test period.

4. Unscrew and remove the testing device.
5. Fit screw plug 903.01 and joint ring 411.01 again.



NOTE

The pressure must not drop during the test period.

7.5.5 Fitting the propeller

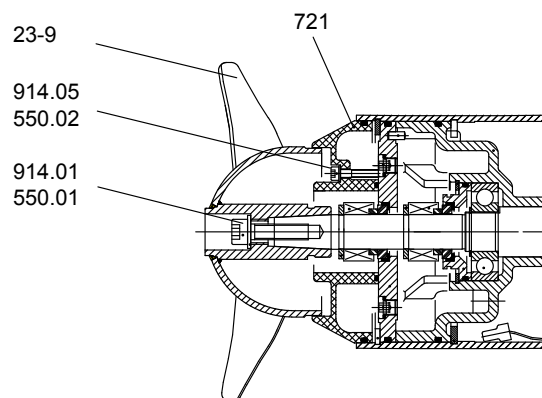


Fig. 16: Fitting the propeller

1. Fit taper piece 721.
2. Screw in socket head cap screw 914.05 and disc 550.02.
3. Fit propeller 23-9.
4. Fit screw 914.01 and disc 550.01.



NOTE

For Amamix 200G only carry out steps 3 - 4.

7.6 Tightening torques

Table 12: Tightening torques

Thread	[ft lbs]	[Nm]
0.18 [M5]	4	4
0.24 [M6]	5	7
0.31 [M8]	12	17
0.39 [M10]	25	35
0.47 [M12]	45	60
0.63 [M16]	112	150

7.7 Spare parts stock

7.7.1 Ordering spare parts

Always quote the following data when ordering replacement parts or spare parts:

- Order number
- Order item number
- Type series
- Size
- Motor number

Refer to the name plate for all data.

Also supply the following data:

- Part No. and description (⇒ Section 9.1, Page 45)
- Quantity of spare parts
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)



7.7.2 Recommended spare parts stock for 2 years' operation to DIN 24296

Table 13: Quantity of spare parts for recommended spare parts stock

Part No.	Description	Number (including stand-by mixers)							Type ⁵⁾
		2	3	4	5	6	8	10 and more	
80-1	Motor unit	-	-	-	1	1	2	3	E
834	Cable gland	1	1	2	2	2	3	40%	R
818	Rotor	-	-	-	1	1	2	3	E
23-9	Propeller	1	1	1	2	2	3	30%	E
433.01	Mechanical seal, motor end	2	3	4	5	6	7	90%	V
433.02	Mechanical seal, propeller end	2	3	4	5	6	7	90%	V
321.01	Rolling element bearing, propeller end	1	1	2	2	3	4	50%	R
321.02	Rolling element bearing, motor end	1	1	2	2	3	4	50%	R
	Set of sealing elements	4	6	8	8	9	10	100%	V

5) E = spare part, R = replacement part, V = wear part; it is recommended to keep a stock of wear and replacement parts

8 Trouble-shooting

	<div style="background-color: #f4a460; padding: 5px; border: 1px solid black; margin-bottom: 5px;">  WARNING </div> <p>Improper remedial work Risk of personal injury!</p> <p>▷ For any work performed in order to remedy faults observe the relevant information given in this operating manual and/or the product literature provided by the accessories manufacturers.</p>
---	--

If problems occur that are not described in the following table, consultation with KSB's customer service is required.

- A** Submersible mixer does not generate flow
- B** Insufficient flow
- C** Excessive current/power input
- D** Vibrations and noise during mixer operation

Table 14: Trouble-shooting

A	B	C	D	Possible cause	Remedy ⁶⁾
-	X	-	-	Wrong direction of rotation	Check electrical connection.
-	X	-	-	Unfavorable installation of submersible mixer	Check installation. Remove any obstacles from the flow passage.
-	-	X	X	Propeller covered in solids; density of fluid handled is too high	Clean the propeller. Check power data.
-	X	-	X	Propeller damaged	Replace the propeller.
-	X	X	X	Wear of internal parts	Replace worn parts by new ones.
-	X	X	X	Wrong direction of rotation	If the mixer is running in the wrong direction of rotation, check the electrical connection of the mixer and the control system, if necessary.
-	-	X	-	Operating voltage is too low.	Check mains voltage. Check electrical cable connections.
X	-	-	-	Motor is not running because of lack of voltage	Check electrical installation, inform electric utility company.
X	X	-	-	Motor is running on two phases only.	Replace the defective fuse. Check the electrical cable connections.
X	-	-	-	Motor winding or electric cable are defective.	Replace with original KSB parts or contact KSB.
-	-	X	X	Defective radial bearing in the motor	Contact KSB.
-	X	X	-	In case of star-delta configuration: motor running in star configuration only	Check star-delta contactor.
-	X	-	X	Water level dropping excessively during operation	Check supply and capacity of system, check level control equipment.
X	-	-	-	The temperature control device monitoring the winding has tripped due to excessive winding temperatures.	Overhaul the submersible mixer.
X	-	-	-	Leakage relay has tripped Moisture in the motor	Overhaul the submersible mixer.

6) Disconnect the submersible mixer from the power supply

9 Related Documents

9.1 General assembly drawing with list of components

9.1.1 Amamix 200 - motor housing material stainless steel

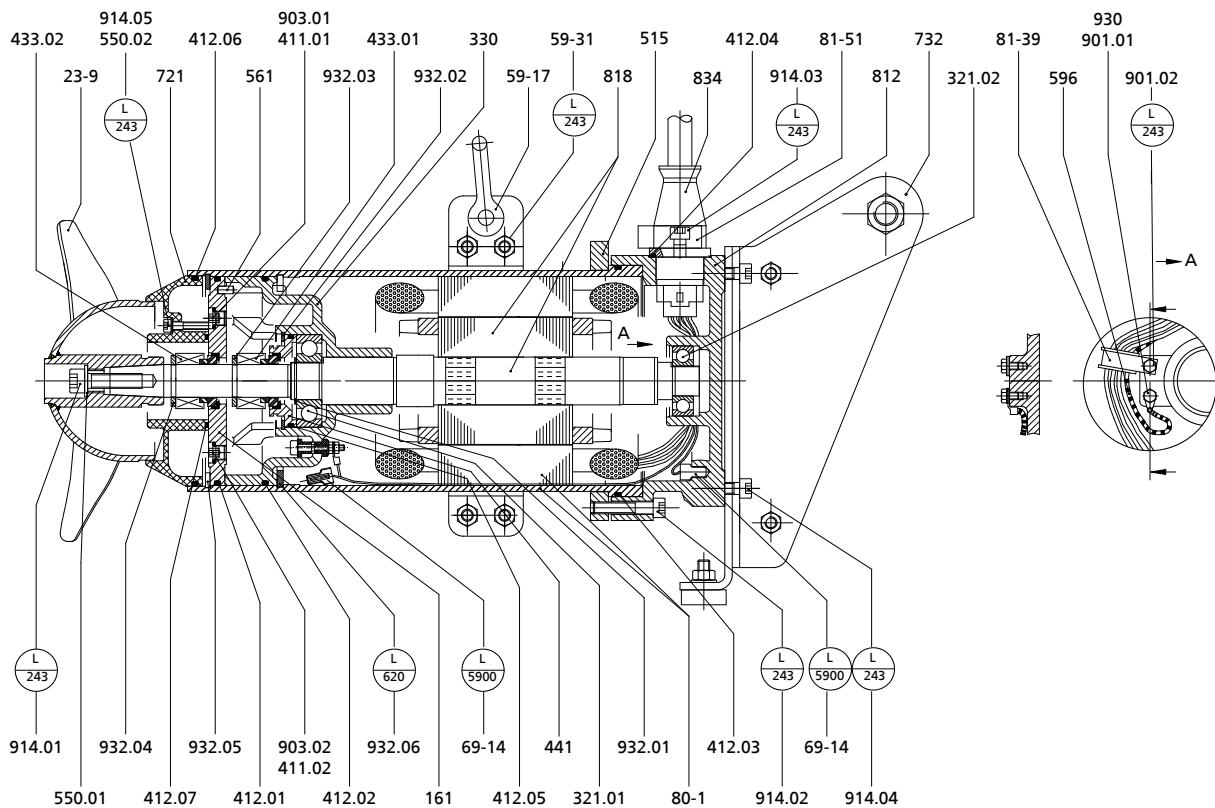


Fig. 17: General assembly drawing Amamix 200, motor housing material stainless steel

Table 15: List of components Amamix 200, motor housing material stainless steel

Part No.	Description	Part No.	Description
161	Casing cover	69-14	Leakage monitor
23-9	Axial propeller	721	Adapter
321	Radial ball bearing	732	Guide bracket (accessory)
330	Bearing bracket	80-1	Motor unit
411	Joint ring	81-39	Clamp
412	O-ring	81-51	Clamping sleeve
433	Mechanical seal	812	Motor housing cover
441	Shaft seal housing	818	Rotor
515	Locking ring	834	Cable gland
550	Disc	901	Hexagon head bolt
561	Grooved pin	903	Screw plug
59-17	Shackle	914	Hexagon socket head cap screw
59-31	Supporting clamp	930	Safety device
596	Wire	932	Circlip

9.1.2 Amamix 200 - motor housing material gray cast iron

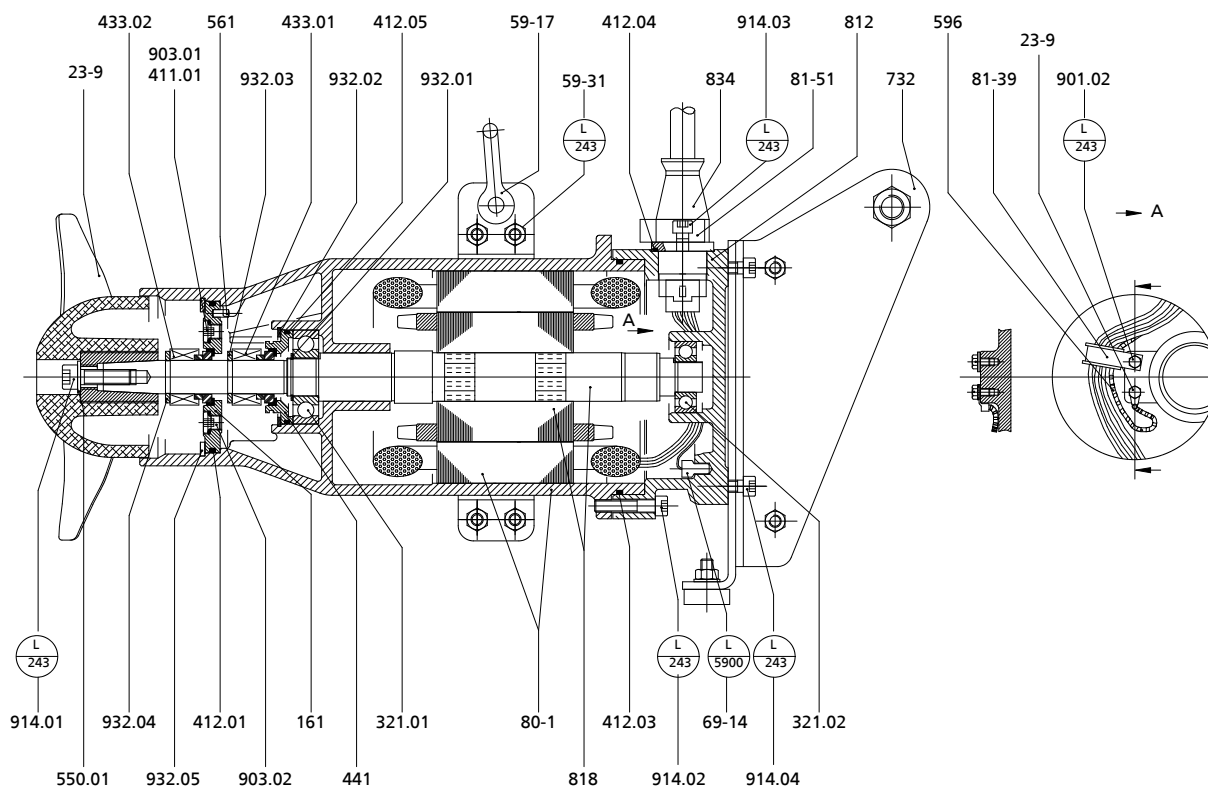


Fig. 18: General assembly drawing Amamix 200, motor housing material gray cast iron

Table 16: List of components Amamix 200, motor housing material gray cast iron

Part No.	Description	Part No.	Description
161	Casing cover	732	Guide bracket (accessory)
23-9	Axial propeller	80-1	Motor unit
321	Radial ball bearing	81-39	Clamp
411	Joint ring	81-51	Clamping sleeve
412	O-ring	812	Motor housing cover
433	Mechanical seal	818	Rotor
441	Shaft seal housing	834	Cable gland
550	Disc	901	Hexagon head bolt
561	Grooved pin	903	Screw plug
59-17	Shackle	914	Hexagon socket head cap screw
59-31	Supporting clamp	930	Safety device
596	Wire (ground connection)	932	Circlip
69-14	Leakage monitor		

9.1.3 Amamix 300/400/600 - motor housing material stainless steel

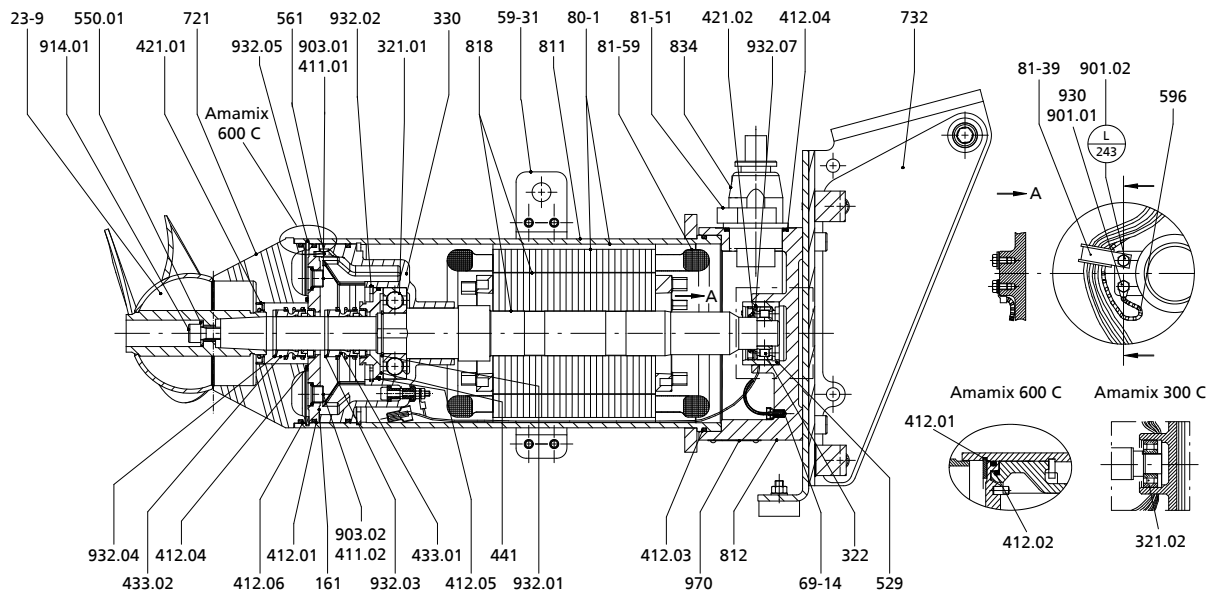


Fig. 19: General assembly drawing Amamix 300/400/600, motor housing material stainless steel

Table 17: List of components Amamix 300/400/600, motor housing material stainless steel

Part No.	Description	Part No.	Description
161	Casing cover	721	Adapter
23-9	Axial propeller	732	Guide bracket (accessory)
321	Radial ball bearing	80-1	Motor unit
322	Radial roller bearing	81-39	Clamp
330	Bearing bracket	81-51	Clamping sleeve
411	Joint ring	81-59	Stator
412	O-ring	811	Motor housing
421	Lip seal	812	Motor housing cover
433	Mechanical seal	818	Rotor
441	Shaft seal housing	834	Cable gland
529	Bearing sleeve	901	Hexagon head bolt
550	Disc	903	Screw plug
561	Grooved pin	914	Hexagon socket head cap screw
59-31	Supporting clamp	930	Safety device
596	Wire (ground connection)	932	Circlip
69-14	Leakage monitor	970	Label/plate

9.1.4 Amamix 300/400/600 - motor housing material gray cast iron

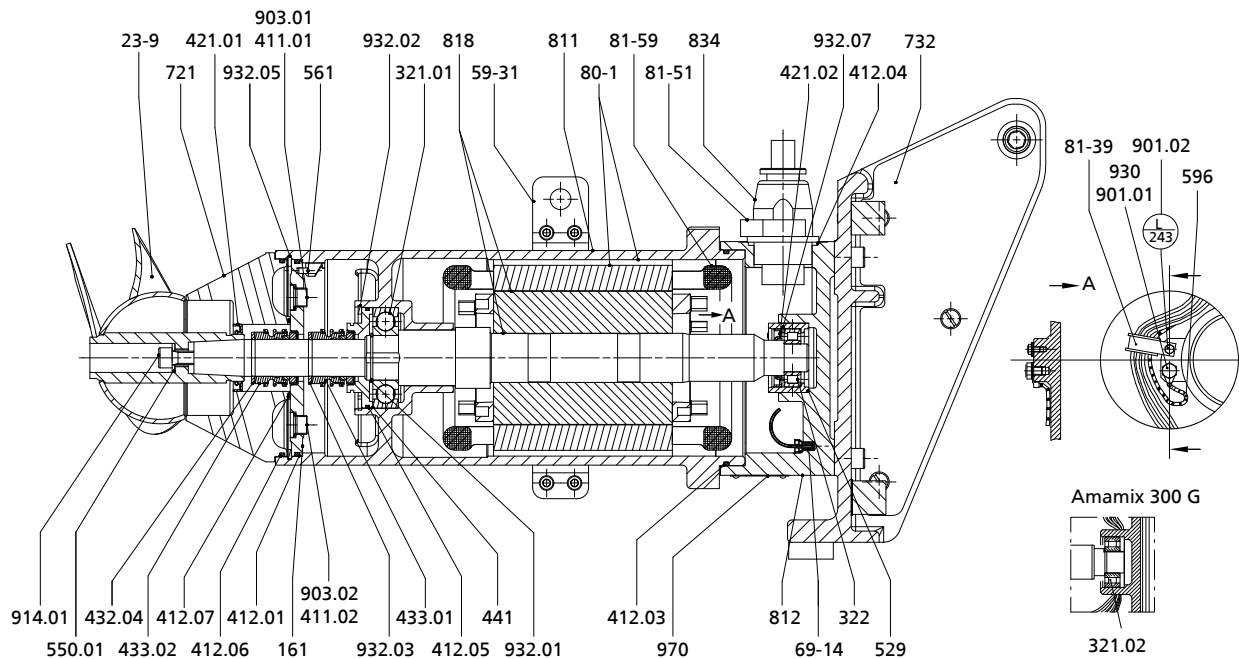


Fig. 20: General assembly drawing Amamix 300/400/600, motor housing material gray cast iron

Table 18: List of components Amamix 300/400/600, motor housing material gray cast iron

Part No.	Description	Part No.	Description
161	Casing cover	721	Adapter
23-9	Axial propeller	732	Guide bracket (accessory)
321	Radial ball bearing	80-1	Motor unit
322	Radial roller bearing	81-51	Clamping sleeve
411	Joint ring	81-59	Stator
412	O-ring	811	Motor housing
421	Lip seal	812	Motor housing cover
433	Mechanical seal	818	Rotor
441	Shaft seal housing	834	Cable gland
529	Bearing sleeve	901	Hexagon head bolt
550	Disc	903	Screw plug
561	Grooved pin	914	Hexagon socket head cap screw
59-31	Supporting clamp	930	Safety device
596	Wire (ground connection)	932	Circlip
69-14	Leakage monitor	970	Label/plate

9.2 Flamepaths on explosion-proof motors

9.2.1 Flamepaths on explosion-proof motors - Variant C

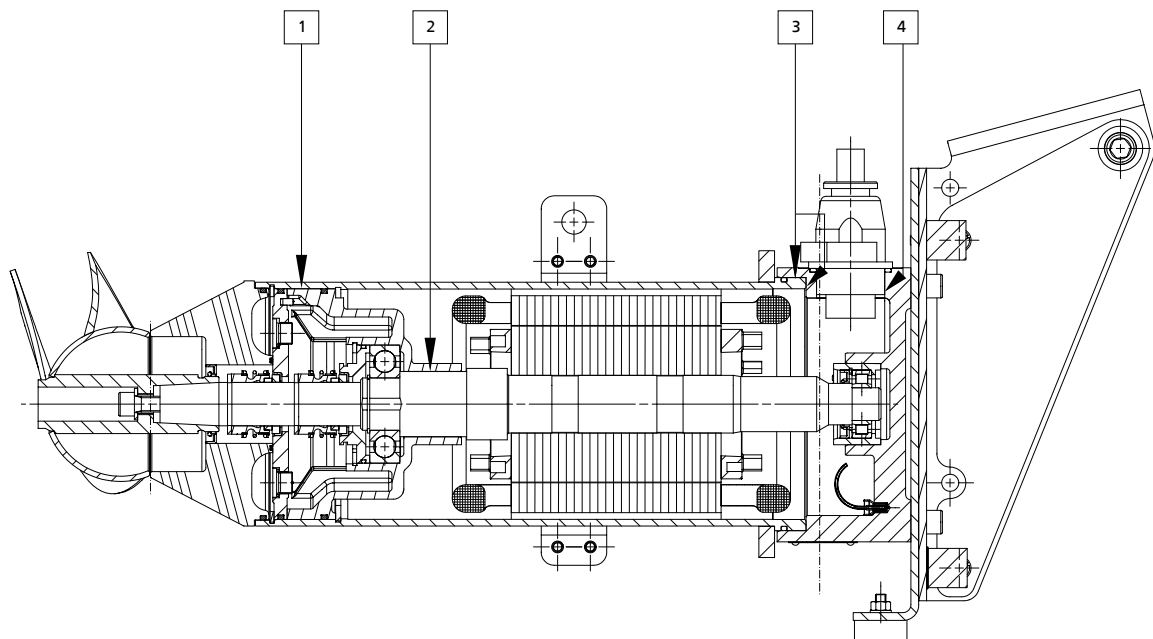


Fig. 21: Flamepaths on explosion-proof motors - Variant C

9.2.2 Flamepaths on explosion-proof motors - Variant G

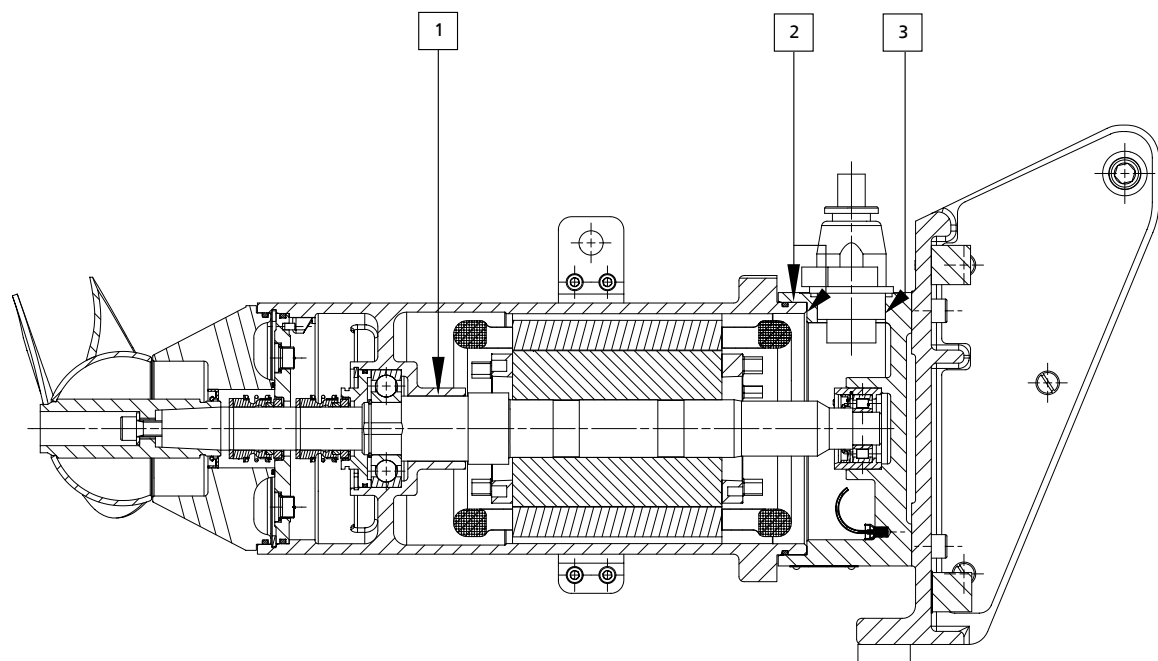


Fig. 22: Flamepaths on explosion-proof motors - Variant G

9.3 Wiring diagrams

9.3.1 Motors: 1 4, 2 4, 0 6, 2 6

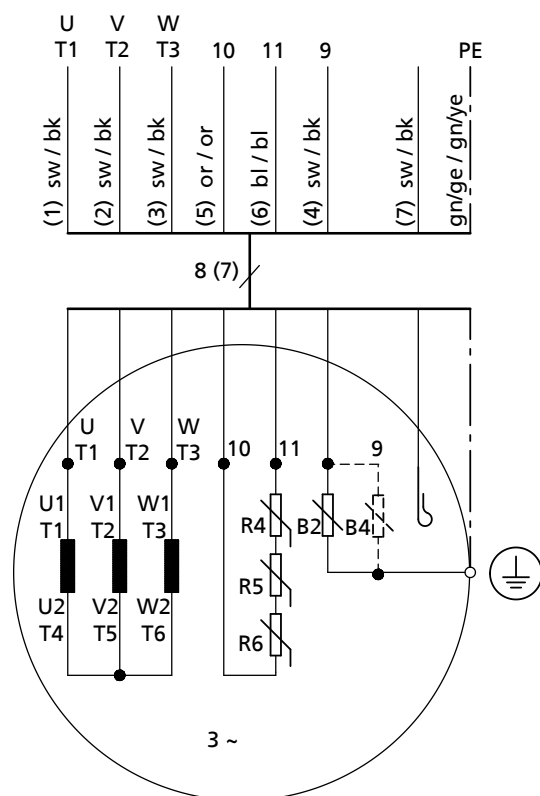


Fig. 23: Wiring diagram

9.3.2 Motors: 3 8, 4 8, 4 12, 6 12, 8 12, 10 12

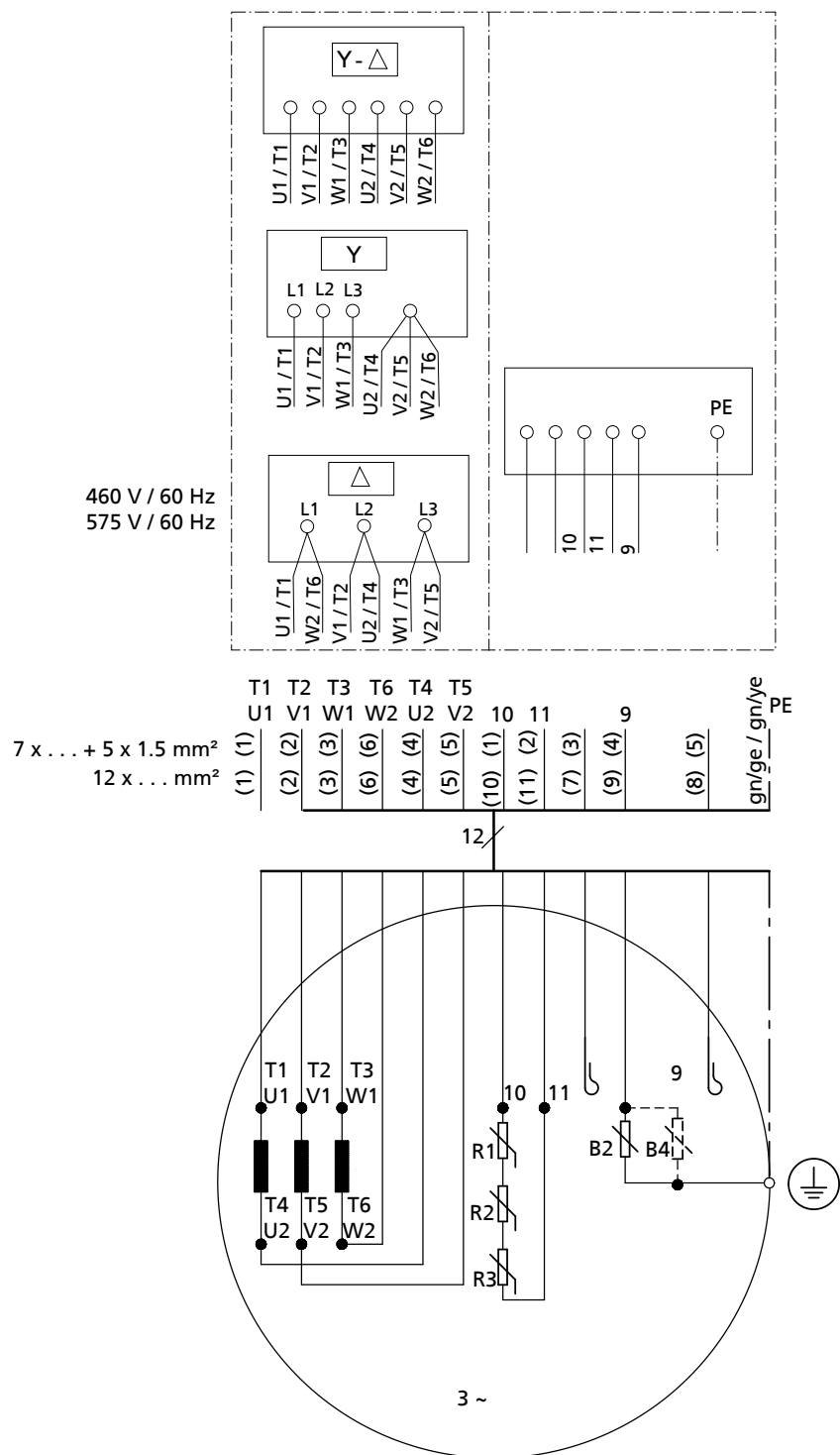
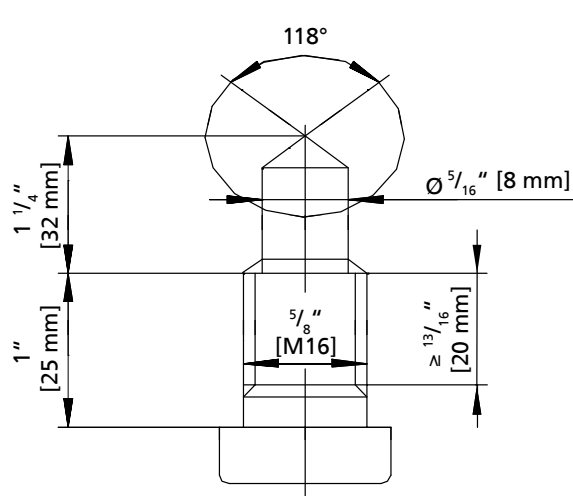
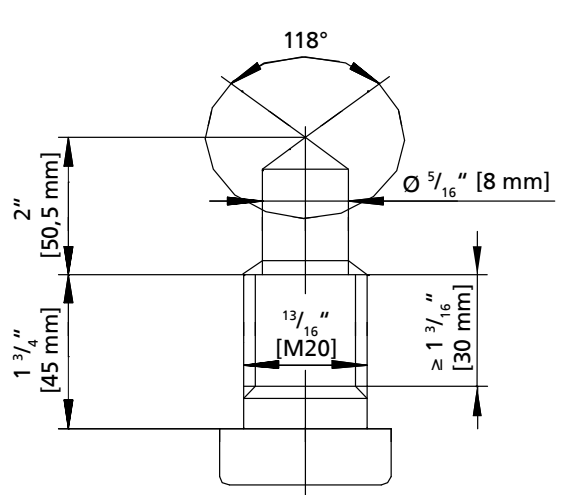


Fig. 24: Wiring diagram

9.4 Forcing screws

Table 19: Forcing screws

Size	Forcing screw	
8" [200] 12" [300] 20" [400]	$\frac{5}{8} \times 2\frac{3}{8}$ " M16 x 60	
24" [600]	$\frac{13}{16} \times 3\frac{3}{4}$ " M20 x 95	

10 Certificate of Decontamination

Type:
 Order number/
 order item number⁷⁾:
 Delivery date:
 Field of application:
 Fluid handled⁷⁾:

Please check where applicable⁷⁾:


☐

Radioactive


☐

Explosive


☐

Corrosive


☐

Toxic


☐

Harmful


☐

Bio-hazardous


☐

Highly flammable


☐

Safe

Reason for return⁷⁾:
 Comments:

The product/accessories have been carefully drained, cleaned and decontaminated inside and outside prior to dispatch/
 placing at your disposal.

We herewith declare that this product is free from any hazardous chemicals as well as from biological and radioactive
 substances.

For mag-drive pumps, the inner rotor unit (impeller, casing cover, bearing ring carrier, plain bearing, inner rotor) has been
 removed from the pump and cleaned. In cases of containment shroud leakage, the outer rotor, bearing bracket lantern,
 leakage barrier and bearing bracket or intermediate piece have also been cleaned.

For canned motor pumps, the rotor and plain bearing have been removed from the pump for cleaning. In cases of leakage at
 the stator can, the stator space has been examined for fluid leakage; if fluid handled has penetrated the stator space, it has
 been removed.

- ☐ No special safety precautions are required for further handling.
☐ The following safety precautions are required for flushing fluids, fluid residues and disposal:

.....

We confirm that the above data and information are correct and complete and that dispatch is effected in accordance with the
 relevant legal provisions.

.....
 Place, date and signature

.....
 Address

.....
 Company stamp

7) Required fields

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