

## Wilo-EMU TR326... + T17...

Installation and operating instructions

Order no.:

template

serial no.

TMPTR2X3X

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# 1 Introduction

Dear Customer,

Thank you for choosing one of our company's products. You have purchased a product which has been manufactured to the latest technical standards. Read this operating and maintenance manual carefully before you first use it. This is the only way to ensure that the product is safely and economically used.

The documentation contains all the necessary specifications for the product, allowing you to use it properly. In addition, you will also find information on how to recognize potential dangers, reduce repair costs and downtime, and increase the reliability and working life of the product.

All safety requirements and specific manufacturer's requirements must be fulfilled before the product is put into operation. This operating and maintenance manual supplements any existing national regulations on industrial safety and accident prevention. This manual must also be accessible to personnel at all times and also be made available where the product is used.

The manual is divided into several chapters. Each chapter has a clear heading which tells you what it describes.

The numbered chapters correspond to the standard chapters for a product. They contain all the detailed information on your product.

Chapters numbered alphabetically are added for specific customers. They contain information including the selected accessories, special coatings, connection diagrams and the declaration of conformity.

The table of contents also acts as a brief reference, because all the important sections are given headers. The header of each section is in the outside column, so that you can find everything, even when skimming through the manual.

All important operating and safety instructions are highlighted. You can find detailed information on the structure of these texts in chapter 2, "Safety".

All personnel who work on or with the product must be qualified for such work; electrical work, for example may only be carried out by a qualified electrician. The entire personnel must be of age.

Operating and maintenance staff must also work according to local accident prevention regulations.

It must be ensured that personnel have read and understood the instructions in this operating and maintenance handbook; if necessary this manual must be ordered from the manufacturer in the required language.

The illustrations used are of dummies and original drawings of the products. This is the only realistic solution for our wide range of products and the differing sizes enabled by the modular system. More exact drawings and specifications can be found on the dimension sheet, the planning information and/or the installation plan.

This operation and maintenance manual has been copyrighted by the manufacturer. The operation and maintenance handbook is intended for the use by assembly, operating and maintenance personnel. It contains technical specifications and diagrams which may not be reproduced or distributed, either completely or in part, or used for any other purpose without the expressed consent of the manufacturer.

Various abbreviations and technical terms are used in this operating and maintenance manual. Table 1 contains all the abbreviations, and Table 2 all the technical terms.

*Preface*

*Structure of the manual*

*Personnel qualification*

*Illustrations*

*Copyright*

*Abbreviations and technical terms*

Abbreviations	Explanation
<b>p.t.o.</b>	please turn over
<b>re.</b>	regarding
<b>approx.</b>	approximately
<b>i.e.</b>	that means
<b>pos.</b>	possible
<b>if nec.</b>	if necessary
<b>incl.</b>	including
<b>min.</b>	minimum
<b>max.</b>	maximum
<b>etc.</b>	and so on
<b>s.a.</b>	see also
<b>e.g.</b>	for example

**Table 1-1: Abbreviations**

Technical term	Explanation
<b>Dry run</b>	The product is running at full speed, however, there is no liquid to be pumped. A dry run is to be strictly avoided. If necessary, a safety device must be installed.
<b>“wet” installation type</b>	This installation type requires the product to be immersed in the pumped fluid. It is completely surrounded by the pumped fluid. Please observe the values for the maximum submersion depth and the minimum water coverage.
<b>“dry” installation type</b>	In this installation type, the product is installed dry, i.e. the pumped fluid is delivered to and discharged via a pipeline system. The product is not immersed in the pumped fluid. Please note that the surfaces of the product become very hot!
<b>“transportable” installation type</b>	With this installation type the product is equipped with a pedestal. It can be installed and operated at any location. Please observe the values for the maximum submersion depth and the minimum water coverage, and remember that the surfaces of the product become very hot.
<b>“S1” operating mode (continuous operation)</b>	At the rated load, a constant temperature is reached that does not increase even in prolonged operation. The operating equipment can operate uninterruptedly at the rated load without exceeding the maximum permissible temperature.

**Table 1-2: Terms**



Technical term	Explanation
<b>“S2” operating mode (short-term operation)</b>	The period of service at the rated load is short in comparison to the subsequent pause. The maximum operating period is indicated in minutes, for example, S2-15. The operating equipment can operate during this time uninterruptedly at the rated load without exceeding the maximum permissible temperature. The pauses must continue until the machine temperature no longer exceeds that of the coolant by more than 2 K.
<b>“Siphoning operation”</b>	Siphoning operation is similar to dry running. The product operates at full speed, but only small amounts of liquid are pumped. <b>Siphoning operation is only possible with certain types; see the “Product description” chapter.</b>
<b>Dry-run protection</b>	The dry-run protection is designed to automatically shut down the product if the water level falls below the minimum water coverage value of the product. This is made possible by installing a float switch.
<b>Level control</b>	The level control is designed to switch the product on or off depending on the filling level. This is made possible by installing a float switch.

Table 1-2: Terms

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*Manufacturer's address*

The manufacturer reserves the right to make technical alterations to systems or components. This operating and maintenance manual refers to the product indicated on the title page.

*Rights of alteration*



## 2 Safety

This chapter lists all the generally applicable safety instructions and technical information. Furthermore, every other chapter contains specific safety instructions and technical information. All instructions and information must be observed and followed during the various phases of the product's lifecycle (installation, operation, maintenance, transport etc.). The operator is responsible for ensuring that personnel follow these instructions and guidelines.

This manual uses instructions and safety information for preventing injury and damage to property. To make this clear for the personnel, the instructions and safety information are distinguished as follows:

*Instructions and safety information*

Instructions are indented by 10 mm and printed in 10pt bold script. Instructions contain text referring to previous text or particular sections of chapters, or highlight brief instructions. Example:

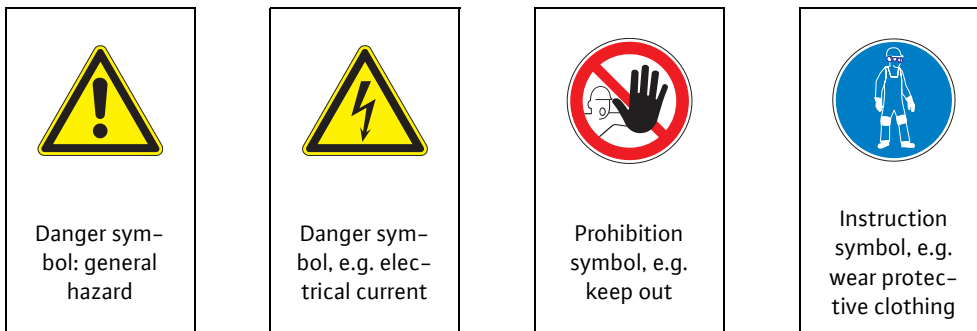
*Instructions*

**For machines approved for work in explosion zones, please refer to the “Explosion protection in accordance with the .... regulation” chapter.**

Safety information is indented by 5 mm and printed in 12pt bold script. Information only referring to damage to property is printed in gray.

*Safety information*

Information referring to personal injury is printed in black and always accompanied by a danger symbol. Danger, prohibition or instruction symbols are used as safety symbols. Example:



The safety symbols conform to the generally valid guidelines and regulations, for example DIN and ANSI.

Each safety instruction begins with one of the following signal words:

Signal word	Meaning
<b>Danger</b>	Serious or fatal injuries can occur.
<b>Warning</b>	Serious injuries can occur.
<b>Caution</b>	Injuries can occur.
<b>Caution (Instruction without symbol)</b>	Serious damage to property can occur, including irreparable damage.

Table 2-1: Signal words and what they mean

Safety instructions begin with a signal word and description of the hazard, followed by the hazard source and potential consequences, and end with information on preventing it.

Example:

**Beware of rotating parts!**  
**The moving rotor can crush and sever limbs. Switch off the machine and let the rotor come to a rest.**

## *Guidelines used and CE certification*

Our products are subject to

- various EC directives
- various harmonized standards
- various national standards.

Please consult the EU Declaration of Conformity for the precise information and the guidelines and norms in effect. The EU Declaration of Conformity is issued in accordance with EU Directive 98/37/EC, Appendix II A.

Also, various national standards are also used as a basis for using, assembling and dismantling the product. These include the German accident prevention regulations, VDE regulations, German Equipment Safety Law etc.

The CE symbol is found either on the type plate or next to the type plate. The type plate is attached to the motor casing or to the frame.

## *General safety*

- Never work alone when installing or removing the product.
- The machine must always be switched off before any work is performed on it (assembly, dismantling, maintenance, installation). The product must be disconnected from the electrical system and secured against being switched on again. All rotating parts must be at a standstill.
- The operator should inform his/her superior immediately should any defects or irregularities occur.
- It is of vital importance that the system is shut down immediately by the operator if any problems arise which may endanger safety of personnel. Problems of this kind include:
  - Failure of the safety and/or control devices
  - Damage to critical parts
  - Damage to electric installations, cables and insulation
- Tools and other objects should be kept in a place reserved for them so that they can be found quickly.
- Sufficient ventilation must be provided in enclosed rooms.
- When welding or working with electronic devices, ensure that there is no danger of explosion.
- Only use fastening devices which are legally defined as such and officially approved.
- The fastening devices should be suitable for the conditions of use (weather, hooking system, load, etc). If these are separated from the machine after use, they should be expressly marked as fastening devices. Otherwise they should be carefully stored.
- Mobile working apparatus for lifting loads should be used in a manner that ensures the stability of the working apparatus during operation.
- When using mobile working apparatus for lifting non-guided loads, measures should be taken to avoid tipping and sliding etc.
- Measures should be taken that no person is ever directly beneath a suspended load. Furthermore, it is also prohibited to move suspended loads over workplaces where people are present.
- If mobile working equipment is used for lifting loads, a second person should be present to coordinate the procedure if needed (for example if the operator's field of vision is blocked).
- The load to be lifted must be transported in such a manner that nobody can be injured in the case of a power cut. Additionally, when working outdoors, such procedures must be interrupted immediately if weather conditions worsen.

**These instructions must be strictly observed. Non-observance can result in injury or serious damage to property.**

## *Electrical work*

Our electrical products are operated with alternating or industrial high-voltage current. The local regulations (e.g. VDE 0100) must be adhered to. The "Electrical connection" data sheet must be observed when connecting the product. The technical specifications must be strictly adhered to.

**If the machine has been switched off by a protective device, it must not be switched on again until the error has been corrected.**

**Beware of electrical current**

**Incorrectly performed electrical work can result in fatal injury!  
This work may only be carried out by a qualified electrician.**

**Beware of damp**

**Moisture penetrating cables can damage them and render them useless. Never immerse cable ends in the pumped fluid or other liquids. Any unused wires must be disconnected.**

The operator is required to know where the machine is supplied with current and how to cut off the supply.

When the machine is connected to the electrical control panel, especially when electronic devices such as soft startup control or frequency drives are used, the relay manufacturer's specifications must be followed in order to conform to EMC. Special separate shielding measures e.g. special cables may be necessary for the power supply and control cables.

**The connections may only be made if the relays meet the harmonized EU standards. Mobile radio equipment may cause malfunctions.**

*Electrical connection*

**Beware of electromagnetic radiation**

**Electromagnetic radiation can pose a fatal risk for people with pacemakers. Put up appropriate signs and make sure anyone affected is aware of the danger.**



Our products (machine including protective devices and operating position, auxiliary hoisting gear) must always be grounded. If there is a possibility that people can come into contact with the machine and the pumped liquid (e.g. at construction sites), the grounded connection must be additionally equipped with a fault current protection device.

**The electrical products conform to motor protection class IP 68 in accordance with the valid norms.**

*Ground connection*

When operating the product, always follow the locally applicable laws and regulations for work safety, accident prevention and handling electrical machinery. To help to ensure safe working practice, the responsibilities of employees should be clearly set out by the owner. All personnel are responsible for ensuring that regulations are observed.

Certain parts such as the rotor and propeller rotate during operation in order to pump the fluid. Certain materials can cause very sharp edges on these parts.

**Beware of rotating parts**

**The moving parts can crush and sever limbs. Never reach into the pump unit or the moving parts during operation. Switch off the machine and let the moving parts come to a rest before maintenance or repair work.**



*Operating procedure*

Our products are equipped with various safety and control devices. These include, for example suction strainers, thermo sensors, sealed room monitor etc. These devices must never be dismantled or disabled.

Equipment such as thermo sensors, float switches, etc. must be checked by an electrician for proper functioning before start-up (see the "Electrical Connection" data sheet). Please remember

*Safety and control devices*

that certain equipment requires a relay to function properly, e.g. posistor and PT100 sensor. This relay can be obtained from the manufacturer or a specialist electronics dealer.

**Staff must be informed of the installations used and how they work.**

### Caution

**Never operate the machine if the safety and monitoring devices have been removed or damaged, or if they do not work.**

### Operation in an explosive atmosphere

Products marked as explosion-proof are suitable for operation in an explosive atmosphere. The products must meet certain guidelines for this type of use. Certain rules of conduct and guidelines must be adhered to by the operator as well.

**Products that have been approved for operation in an explosive atmosphere are labeled as explosion-protected “Ex” (e.g. T...Ex...). In addition, an “Ex” symbol must be included on the type plate! When used in an explosive atmosphere, the chapter entitled “Explosion protection according to the ...standard” must be observed!**

### Sound pressure

Depending on the size and capacity (kW), the products produce a sound pressure of approximately 70 dB (A) and 110 dB (A).

The actual sound pressure, however, depends on several factors. These include, for example, the installation type (wet, dry, transportable), fastening of accessories (e.g. suspension unit) and pipeline, operating site, immersion depth, etc.

Once the product has been installed, we recommend that the operator make additional measurements under all operating conditions.



### Caution: Wear ear protectors

**In accordance with the laws in effect, guidelines, standards and regulations, ear protection must be worn if the sound pressure is greater than 85 dB (A)! The operator is responsible for ensuring that this is observed!**

### Pumped fluids

Each pumped fluid differs in regard to composition, corrosiveness, abrasiveness, TS content and many other aspects. Generally, our products can be used for many applications. For more precise details, see chapter 3, the machine data sheet and the order confirmation. It should be remembered that if the density, viscosity or the general composition change, this can also alter many parameters of the product.

Different materials and impeller shapes are required for different pumped fluids. The more exact your specifications on your order, the more exactly we can modify our product to meet your requirements. If the area of application and/or the pumped fluid change, please inform us of this so that we can adapt the product to the new circumstances.

When switching the product into another pumped fluid, observe the following points:

- Products which have been operated in sewage or waste water must be thoroughly cleaned with pure water or drinking water before use.
- Products which have pumped fluids which are hazardous to health must always be decontaminated before changing to a new fluid. Also clarify whether the product may be used in a different pumped fluid.
- With products which have been operated with a lubricant or cooling fluid (such as oil), this can escape into the pumped fluid if the mechanical shaft seal is defective.



### Danger – explosive fluids

**It is absolutely prohibited to pump explosive liquids (e.g. gasoline, kerosene, etc.). The products are not designed for these liquids!**

This chapter contains the general information on the warranty. Contractual agreements have the highest priority and are not superseded by the information in this chapter! *Warranty*

The manufacturer is obliged to correct any defects found in the products it sells, provided that the following requirements have been fulfilled:

- The defects are caused by the materials used or the way the product was manufactured or designed. *General information*
- The defects were reported in writing to the manufacturer within the agreed warranty period.
- The product was used only as prescribed.
- All safety and control devices were connected and inspected by authorized personnel.

If no other provisions have been made, the warranty period applies to the first 12 months after initial start-up or to a max. of 18 months after the delivery date. Other agreements must be made in writing in the order confirmation. They will remain valid at least until the agreed warranty period of the product has expired. *Warranty period*

Only original spare parts as supplied by the manufacturer may be used for repairs, replacements, add-ons and conversions. Only these parts guarantee a long working life and the highest level of safety. These parts have been specially designed for our products. Self-made add-ons and conversions or the use of non-original spare parts can seriously damage the product and/or injure personnel. *Spare parts, add-ons and conversions*

The prescribed maintenance and inspection work should be carried out regularly. This work may only be carried out by qualified, trained and authorized personnel. **The maintenance and inspection log supplied must be properly updated.** This enables you to monitor the status of inspections and maintenance work. Quick repairs not listed in this operation and maintenance manual and all types of repair work may only be performed by the manufacturer and its authorized service centers. *Maintenance*

The machine operator list **must** be filled out completely. By signing this list, all persons working on or with the product confirms that they have received, read and understood this operating and maintenance manual. *List of machine operators*

Damage as well as malfunctions that endanger safety must be eliminated immediately by authorized personnel. The product should only be operated if it is in proper working order. During the agreed warranty period, the product may only be repaired by the manufacturer or an authorized service workshop! The manufacturer reserves the right to recall the damaged product to the factory for inspection! *Damage to the product*

No liability will be assumed for product damage if one or more of the following points applies: *Exclusion from liability*

- Incorrect design on our part due to faulty and/or incorrect information provided by the operator or customer
- Non-compliance with the safety instructions, the regulations and the requirements set forth by German law and this operating and maintenance manual
- Incorrect storage and transport
- Improper assembly/dismantling
- Improper maintenance
- Unqualified repairs
- Faulty construction site and/or construction work
- Chemical, electrochemical and electrical influences
- Wear

This means the manufacturer's liability excludes all liability for personal, material or financial injury.





### 3 Product description

The machine is manufactured with great care and is subject to constant quality controls. Trouble-free operation is guaranteed if it is installed and maintained correctly.

Submersible mixers are generally used in sewage treatment plants. They prevent solid matter from settling and floating layers of sludge from forming. They are also used for flow generation to ensure that the active sludge flakes are distributed evenly. For other areas of application, please consult the manufacturer.

*Proper use and fields of application*

The machine is used for flow generation, suspension of solid matter and for homogenization. In the standard version, the stirred liquid has a permitted maximum density of  $1050\text{kg/m}^3$  and a maximum viscosity of  $1\text{mPa}\cdot\text{s}$ . The exact details about your machine version can be found in the technical data.

*Conditions of use*

Additionally, special models are also available for use with abrasive and corrosive liquids. For information on these models, please consult the manufacturer.

The machine is operated from the operating position intended for this purpose.

**The machine may only be operated while it is submerged. Please ensure that you have the necessary minimum level of submergence. Dry running is inadmissible. Nonobservance can lead to serious damage to the machine.**

The unit consists of a T series motor, a sealing system and a propeller.

*Construction*

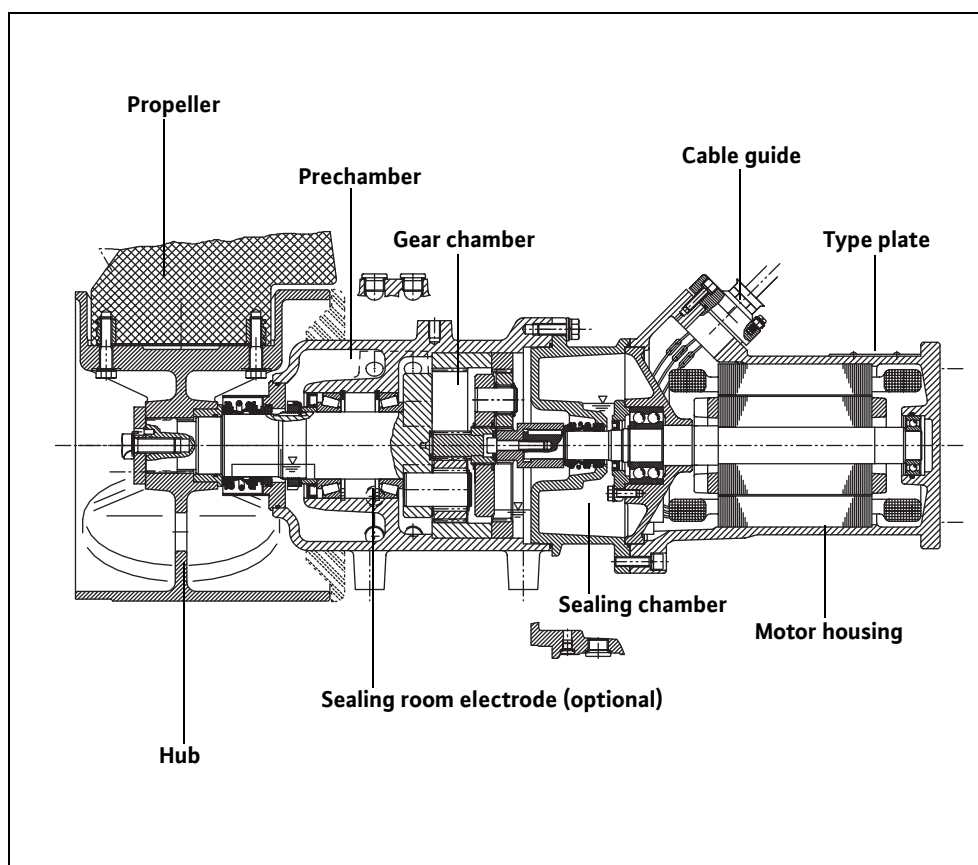


Fig. 3-1: Submersible mixer

## Product description

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**Motor** The shaft and screw connections are made of stainless steel. The three-phase asynchronous motor consists of a stator in the “F” or “H” insulation class as well as the motor shaft with rotor package. The power supply cable is designed for the maximum mechanical load and is sealed against water pressure from the pumped liquid. The motor cable lead connections are sealed from the pumped liquid as well. The bearings used are permanently lubricated maintenance-free antifriction bearings.

**Sealing system** The submersible mixer is equipped with a multi-chamber system. The pre-chamber, gear chamber and sealing chamber are between the propeller and the motor. The pre-chamber is filled with gear oil and is designed to absorb leakages from the sealing on the liquid side. The sealing chamber is filled with white oil, which ensures a long-lasting lubrication of the sealing.

The sealing on the liquid and motor side consists of two mechanical shaft seals. The sliding surfaces of the mechanical shaft seals used are made from silicon carbide.

**Gears** The gear chamber is also filled with gear oil, this means optimal lubrication of the planetary gear is guaranteed. The planetary gear is comprised of two planetary levels.

The second planetary level can be swapped and ensures that the machine can be adapted to various capacities and propellers. The transmissions can be obtained from the manufacturer. The bearings used are permanently lubricated maintenance-free antifriction bearings.

As a very large thrust is generated by these machines, the manufacturer must be consulted before any modifications are made.

**Component parts and/or transmissions which are not approved by the manufacturer may not be used.**

**Propeller** Just as different requirements exist for pumped liquids and circulation capacity, there are many different propellers. These are not only differentiated from one another in size, but in shape and slant as well. A sandwich design consisting of a fiberglass plastic shell with a PUR foam filling is the material used. The blade's connecting flange is made of stainless steel.

**Safety and monitoring devices** The motor is equipped with temperature sensors; these must be connected effectively to protect the motor from overheating. In addition, the machine can be equipped with a sealed chamber electrode. Depending on the connection, a warning signal can be displayed and/or the motor switched off if water enters the sealing chamber.

**The exact specifications for the safety and control devices used and the connection of these can be found in the “Electrical connection plan” data sheet.**

## Type designation

The type code provides information about the design of the machine.

Example pump: TR 221.46-4/8	
TR	Submersible mixer
2	Number of propeller blades
21	Propeller diameter in 100 (mm)
46	Propeller speed (1/min)
4	Number of poles
8	Package length in cm

**Table 3-1: Type designation**

## Cooling

Submersible mixers work with T motors. This motor type is a dry motor. This means that the motor chamber is filled with ambient air. The motor is cooled through its surface. The heat created is transferred to the pumped fluid.

*Name plate*

Symbol	Name	Symbol	Name
P-Type	Pump type	MFY	Year of manufacture
M-Type	Motor type	P	Rated power
S/N	Machine number	F	Frequency
Q	Pump flow	U	Rated voltage
H	Pump head	I	Rated current
N	Speed	I <sub>ST</sub>	Starting current
TPF	Temperature of pumped fluid	SF	Service factor
IP	Protection class	I <sub>SF</sub>	Current at service factor
OT	Operating mode (s = wet / e = dry)	MC	Motor wiring
Cos φ	Cosine phi	∇	Max. submersion
IMφ / S	Impeller diameter/number of levels		

**Table 3-2: Name plate key**

*Technical data*

*Unit*

Year of manufacture:	2008
Order no.:	template
Machine number:	TMPTR2X3X
Product description:	Wilo-EMU
Agitator type:	TR326...
Version:	A
Model:	0
Motor type:	T17...
Version:	A
Model:	0

**Table 3-3:**

*Operating point\**

Circulation capacity:	-
Propeller speed:	-
Transmission ratio:	1.0000
Speed:	-

**Table 3-4:**

## Product description

---

Voltage:	-
Frequency:	50 Hz

**Table 3-4:**

### *Motor data\**

Starting current:	-
Rated current:	-
Rated power:	-
Activation type:	direct
Cos phi:	-
Max. starts per hour:	15 /h
Min. switching break:	3 min
Service factor:	1.00
Operating mode:	
Wet installation:	S1
Dry installation:	---
Explosion coding:	-
Explosion number:	-

**Table 3-5:**

### *Filling quantity/lubricant*

Prechamber:	-	BP Energol GR-XP 220 (Gear oil)
Gear chamber:	-	BP Energol GR-XP 220 (Gear oil)
Sealing chamber:	-	Esso Marcol 82 (White oil)

**Table 3-6:**

### *Coatings*

Mixer:	-
Propeller:	-

**Tabelle 3-7:**

### *Power supply connection*

Power cable length:	10.00 m
Power cable 1	

**Table 3-8:**

Number:	1
Type:	-
Size:	-
Trip line	
Number:	0
Type:	-
Size:	-
Sealing chamber monitor	
Number:	0
Type:	-
Size:	-

**Table 3-8:**

*General information*

Type of erection:	wet
Installation type:	vertical
Max. submersion:	12.5 m
Min. water coverage:	0.10 m
Max. pump fluid temperature:	40 °C
Dimensions:	see dimension sheet/catalogue
Weight:	see dimension sheet/catalogue
Sound pressure:	system-dependent

**Table 3-9:**

\*Valid for standard conditions (pumped fluid: pure water, density: 1 kg/dm<sup>3</sup>. Dyn. viscosity: 1mPa\*s, temperature: 20°C, pressure: 1.013 bar)



## 4 Transport and storage

On arrival, the delivered items must be inspected for damage and a check made that all parts are present. If any parts are damaged or missing, the transport company or the manufacturer must be informed on the day of delivery. Any claim made at a later date will be deemed invalid. Damage to parts must be noted on the delivery or freight documentation.

### *Delivery*

Only the appropriate and approved fastening devices, transportation means and lifting equipment may be used. These must have sufficient load bearing capacity to ensure that the product can be transported safely. If chains are used they must be secured against slipping.

### *Transport*

The staff must be qualified for the tasks and must follow all applicable national safety regulations during the work.

The product is delivered by the manufacturer/shipping agency in suitable packaging. This normally precludes the possibility of damage occurring during transport and storage. The packaging should be stored in a safe place if the location used is changed frequently.

### **Beware of frost**

**If drinking water is used as a coolant/lubricant, the product must be protected against frost during transport. If this is not possible, the product must be drained and dried out.**

Newly supplied products are prepared that they can be stored for at least 1 year. The product should be cleaned thoroughly before interim storage.

### *Storage*

The following should be taken into consideration for storage:

- Place the product on a firm surface and secure it against falling over. Submersible mixers, auxiliary lifting devices and pressure shroud pumps should be stored horizontally and waste water and sewage pumps, submersible sewage pumps and submersible motor pumps should be stored vertically. Submersible motor pumps can also be stored horizontally. It should be ensured that they cannot bend if stored horizontally. Otherwise excessive bending tension may arise.

### **Danger from falling over**

**Never put down the product unsecured. If the product falls over, injury can occur.**



- Our products can be stored at temperatures down to -15 °C. The store room must be dry. We recommend a frost-protected room with a temperature of between 5 °C and 25 °C for storage.

**Products that are filled with drinking water can only be stored in frost-free rooms for up to 4 weeks. If longer storage is intended they should be emptied and dried out beforehand.**

- The product may not be stored in rooms where welding work is conducted as the resulting gases and radiation can damage the elastomer parts and coatings.
- Any suction or pressure connections on products should be closed tightly before storage to prevent impurities.

- The power supply cables should be protected against kinking, damage and moisture.



### **Beware of electrical current**

**Damaged power supply cables can cause fatal injury! Defective cables must be replaced by a qualified electrician immediately.**

### **Beware of damp**

**Moisture penetrating cables can damage them and render them useless. Therefore, never immerse cable ends in the pumped fluid or other liquids.**

- The machine must be protected from direct sunlight, heat, dust, and frost. Heat and frost can cause considerable damage to propellers, rotors and coatings.
- The rotors or propellers must be turned at regular intervals. This prevents the bearing from locking and the film of lubricant on the mechanical shaft seal is renewed. This also prevents the gear pinions (if present on the product) from becoming fixed as they turn and also renews the lubricating film on the gear pinions (preventing rust film deposits).



### **Beware of sharp edges**

**Sharp edges can form on rotors and propellers. There is a risk of injuries. Wear protective gloves.**

- If the product has been stored for a long period of time it should be cleaned of impurities such as dust and oil deposits before start-up. Rotors and propellers should be checked for smooth running, housing coating and damage.

**Before start-up, the filling levels (oil, motor filling etc.) of the individual products should be checked and topped up if required. Products filled with drinking water should be completely filled before start-up. Please refer to the machine data sheet for specifications on filling.**

**Damaged coatings should be repaired immediately. Only a coating that is completely intact fulfills the criteria for intended usage.**

If these rules are observed, your product can be stored for a longer period. Please remember that elastomer parts and coatings become brittle naturally. If the product is to be stored for longer than 6 months, we recommend checking these parts and replacing them as necessary. Please consult the manufacturer.

### *Returning to the supplier*

Products which are delivered to the plant must be clean and correctly packaged. In this context, clean means that impurities have been removed and decontaminated if it has been used with materials which are hazardous to health. The packaging must protect the product against damage. If you should have any questions please contact the manufacturer.



## 5 Installation

In order to prevent damage to the machine or serious injury during installation the following points must be observed:

- Installation work – assembly and installation of the machine – may only be carried out by qualified persons. The safety instructions must be followed at all times.
- The machine must be inspected for transport damage before any installation work is carried out.

Possible types of installation for the machine:

- Permanently mounted on suitable platforms
- Flexible installation using a lowering device

**The machine is installed and operated horizontally. If it is to be used vertically or in an inclined position please consult the manufacturer and observe the machine's data sheet.**

*Installation types*

Proper machine positioning and design for the operating room plays a decisive role in the length of service life. Low-speed mixers are extremely sensitive to the flow guidance. Strong vibrations and/or turbulence will occur if placement is less than ideal and/or the capacity feed is too high. This will cause the noise level to increase and the machine to run unevenly. The result will be strong fluctuations and/or twisting of the guide pipe, fluctuations in consumption and increased eddy formation. Such negative influences will significantly reduce the machine's service life. Note the following information:

- The machine must not be placed directly behind channel deflections, ventilation fields, and basin installations (inlet pipes, downflow baffles, deflecting flow vanes, etc.).
- Do not install the machine in corners and/or near basin walls.
- Make certain that the incoming and outgoing flow on the propeller can form without any hindrance.
- Place the machine in such a way that there is through-flow throughout the entire basin cross-section.
- The distance between the machine and the deflection must be at least 5 times the propeller diameter.
- The distance from ventilation areas (pressure and suction sides) must be at least 3 to 4 times the propeller diameter. Air bubbles must not be permitted to be drawn through the propeller.
- The distance from the tip of the propeller to the floor of the basin must be at least 200mm, and the distance to the wall of the basin must be at least 300mm.
- The minimum submersion (measured from the tip of the propeller) is 800mm.
- The distance from the mixer to the rear of the basin wall must be from 1.5 to 3 times the propeller diameter.
- If several machines are to be installed next to one another, there must be a distance of at least 1x propeller diameter between one propeller tip to the next. If the distance falls below the minimum, a partition must be installed.
- It must be ensured that hoisting gear can be easily mounted, as all work on the EMU machine must be carried out outside the basin. It must be possible to safely reach the machine where it is located using the hoisting gear and with the degree of stability required.
- Electric power cables must be laid out in such a way that safe operation and non-problematic assembly/dismantling are possible at all times.
- If different filling levels are used, a level control unit must be installed as the EMU machine may only be operated while it is submerged.

**A reactive force of up to 5000 N may occur. For this reason, the machine must be properly assembled in either the basin or on the lowering**

*The operating room (basin) and the system when low-speed mixers are used*

**device. In addition, there must not be any solid particles in the pumped liquid. Such particles could cause severe damage to the machine.**

**These are the minimum requirements. Working life and operating safety depend upon placement and design. The manufacturer will prepare a design with positioning for each operating area. This is to be strictly observed.**

## *Assembly accessories*

### *Swiveling hoisting gear*

The maximum bearing capacity of the hoisting equipment must be greater than the weight of the machine, add-on units and cable. It is essential that the machine can be lifted and lowered without hindrance or endangering personnel. There should be no objects or obstacles in the swiveling range of the hoisting gear. Take note of the corresponding planning guides.

### *Cable guides*

The electric power cables are fastened in accordance with local regulations with cable guides. This should prevent loose hanging and damage to the electric power cables.

**Fasten all power supply lines using the cable guides. If this is not done, damage to the machine may result.**

- Electric cable guide on cable – see planning guide PLH045
- Electric cable guide on edge of basin – see planning guide PLH047
- Electric cable guide on cable bracing – see planning guide PLH128
- Fixed cable laying in cable ducts

### *Fixing materials and tools*

Make sure you have the required tools (such as wrenches) and other material (such as plugs and anchor bolts). The fastening materials should be sufficiently stable to ensure safe assembly.

### *Lowering device (dependent on type of assembly)*

The machine is secured to the lowering device and lowered to the operating point. If a mobile auxiliary hoisting gear is used, a cable lifting post or catch hook/catch device will be needed as well. If a permanently installed auxiliary hoisting gear is used, the cable lifting post/catch hook/catch device is not necessary as the traction cable is secured on the winch.

### *Cable lifting post (dependent on type of assembly)*

This is necessary if you use a mobile auxiliary hoisting gear without catch device. The traction cable, which is needed to raise and lower the machine, is secured to the cable lifting post (see planning guide PLH046).

### *Catch hook/catch device (dependent on type of assembly)*

This is necessary if you use a mobile auxiliary hoisting gear. The spacers can be used to set the required spacing for the various submersible mixers. This enables the mixer to be raised and lowered, even when the basin is full (see planning guide PLH127).

## *Installation*

The following information should be taken into consideration when installing the machine:

- This work may only be carried out by qualified personnel. Electrical work may only be carried out by qualified electricians.
- Lift the machine by the handle or lifting eyelets, never by the the power supply cable. When assembling with chains, they must be connected with a shackle to the lifting eyelets or the carrying handle. Fastening devices must have official approval.
- Please observe all guidelines, rules and legal requirements for working with and underneath heavy suspended loads.
- Wear the appropriate protective clothing/equipment.
- If there is danger that poisonous or asphyxiating gases may collect, then the necessary counter-measures should be taken.

- Please also observe all accident prevention guidelines, trade association safety guidelines and the advice contained in this operating and maintenance manual.
- The reactive forces of the submersible mixer and the auxiliary hoisting gear are conducted into appropriate connected components (basin floor and walls and operating areas and platforms). Pay attention to the correct dimensions of the connected components. The reactive forces and torques in question can be queried from the manufacturer.
- The coating of the machine is to be examined before installation. If defects are found, these must be eliminated.

**An intact coating is necessary for the best possible protection from corrosion.**

### **Danger of falling!**

**Installation work for the machine and its accessories is performed directly on the edge of the basin. Carelessness or wearing inappropriate clothing could result in a fall. There is a risk of fatal injury! Take all necessary safety precautions to prevent this.**



# Installation

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## *Permanently mounted on suitable platforms*

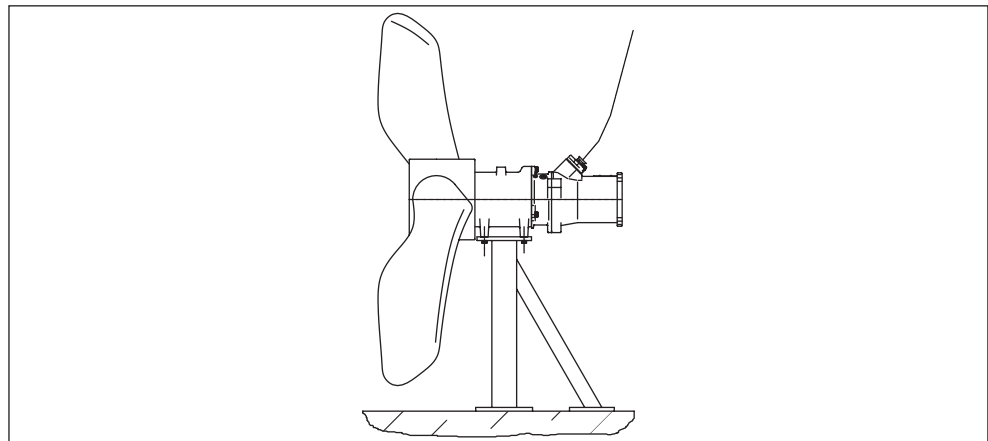
For this type of installation, there must be either a panel or platform in the work area. The machine is fixed directly to one of these using bolts which fulfill the requirements for construction. Assembly, service, and repairs as well as disassembly can only be carried out when the basin is empty. The panels must be present at the site and be checked to ensure that they are sufficiently stable.

- Drill fastening holes on the floor or wall of your operating area at the point where the machine will be used. You will find specifications for the anchor bolts, distances between holes and their sizes in the assembly data sheets and the accompanying planning guide.
- Use appropriate fastening material secure the bracket on the floor or wall of the basin.
- Using appropriate hoisting gear, bring the machine into the proper position and affix it with the required fastening material to the bracket.

**Make certain that the screws and plugs are sufficiently stable.**

- Lay the cables in such a manner that no-one (maintenance personnel etc.) will be endangered by them at any time (operation, quick repairs). The cable must not enter the propeller.

**The electrical connection must be carried out by an authorized technician in accordance with the “Electrical connection plan” data sheet. The propeller’s direction of rotation must then be checked.**



**Fig. 5-1: Permanent assembly**

## *Flexible installation using a lowering device ... and a mobile hoisting gear*

If the machine is assembled using a lowering device, the machine can be lifted out of the tank at any time. This has the advantage that all work may be carried out with a full tank, and the machine may be moved to another location at any time.

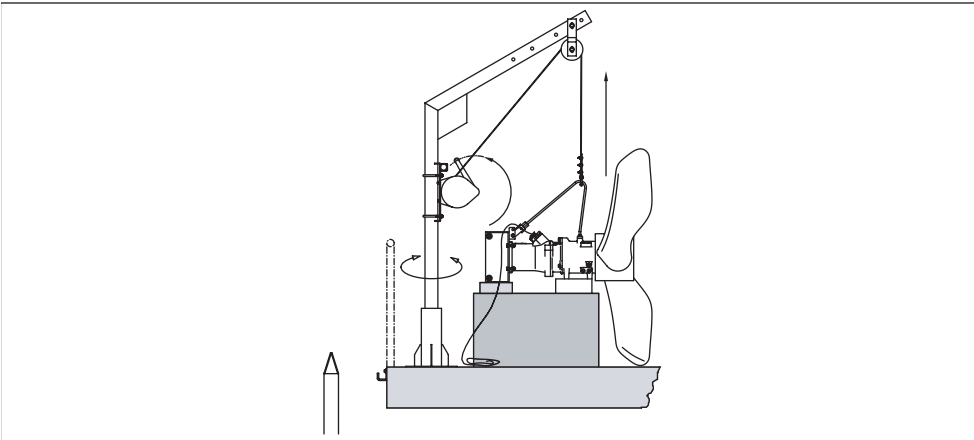
**As these machines develop very high thrusts, lowering devices are used with fixed tripods (AVM). The machines have a fixed operating point and cannot be operated in different positions.**

**When this type of assembly is used, remember that the foundations must be able to support this load.**

Assemble the lowering device and the auxiliary hoisting gear on either the basin wall or basin edge. The specifications required can be found in the assembly data sheets or the operating and maintenance manual.

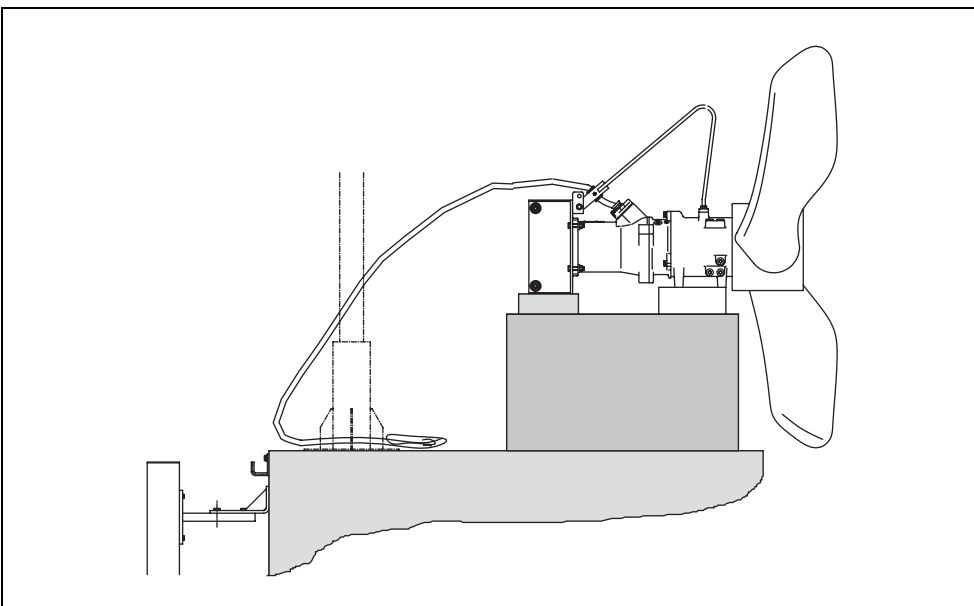
- Step 1: If they have not already been fitted at the factory, lay out all electrical supply cables and guide the cables through the cable holders on the retaining strap. The cable must

be secured in such a way that a short bend is created on the machine. All electric supply cables must be guided through the cable holder.



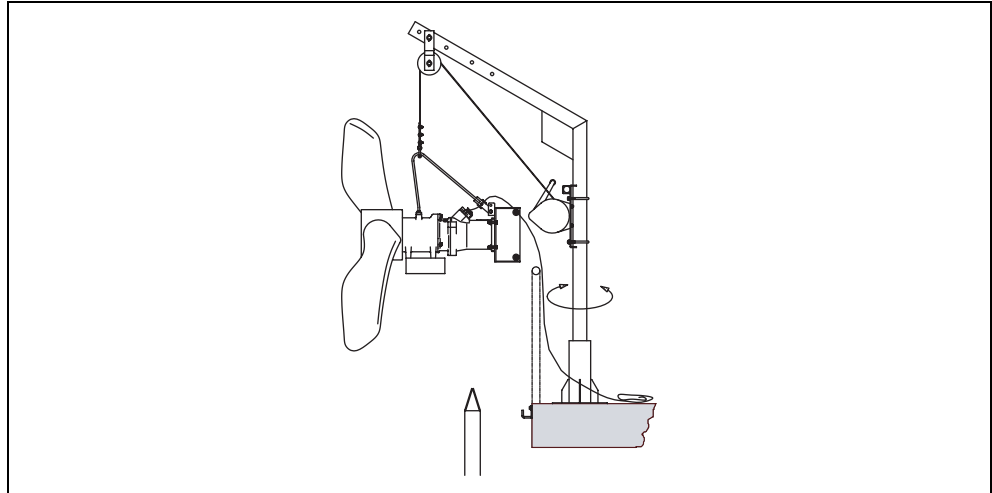
**Fig. 5-2: Fixing the cable holders**

Step 2: Carefully lift the machine until it can be turned without causing danger to personnel.



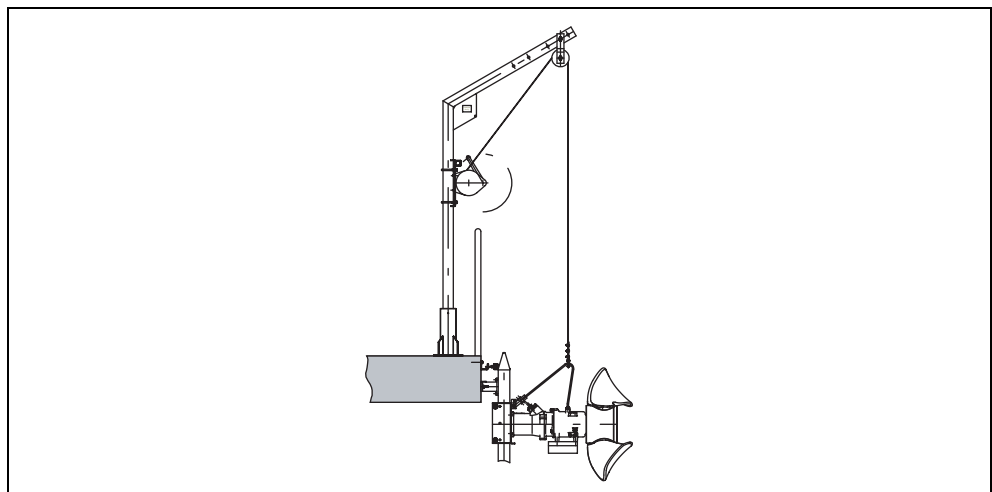
**Fig. 5-3: Lifting the machine**

- Step 3: Swing the raised machine with the hoisting gear over the basin. Pay attention to the position of the guide pipe to the sliding carriage (sliding carriage must stand parallel to the guide pipe).



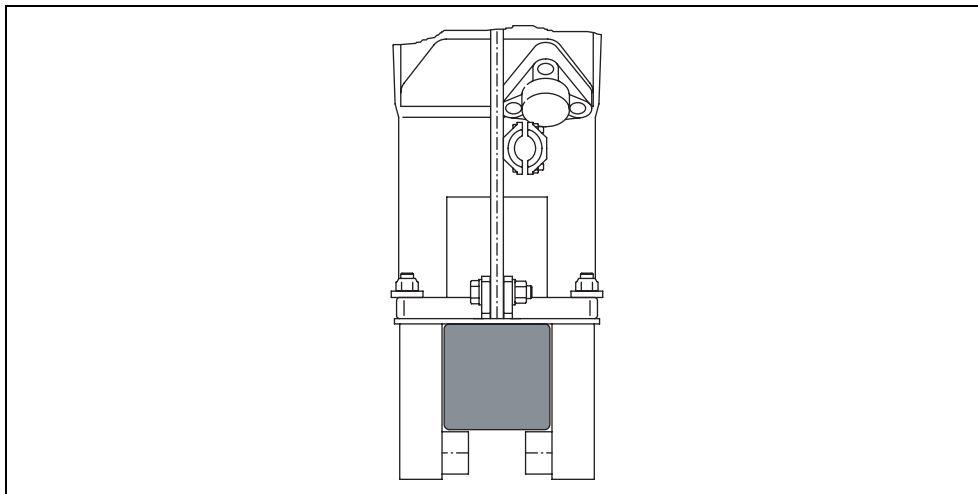
**Fig. 5-4: Swinging the machine over the end of the guide pipe**

- Step 4: Carefully lower the machine down to the guide pipe. Align the sliding carriage to the guide pipe using a suitable device. If necessary, adjust the roller on the boom in another take-up opening.



**Fig. 5-5: Aligning the machine**

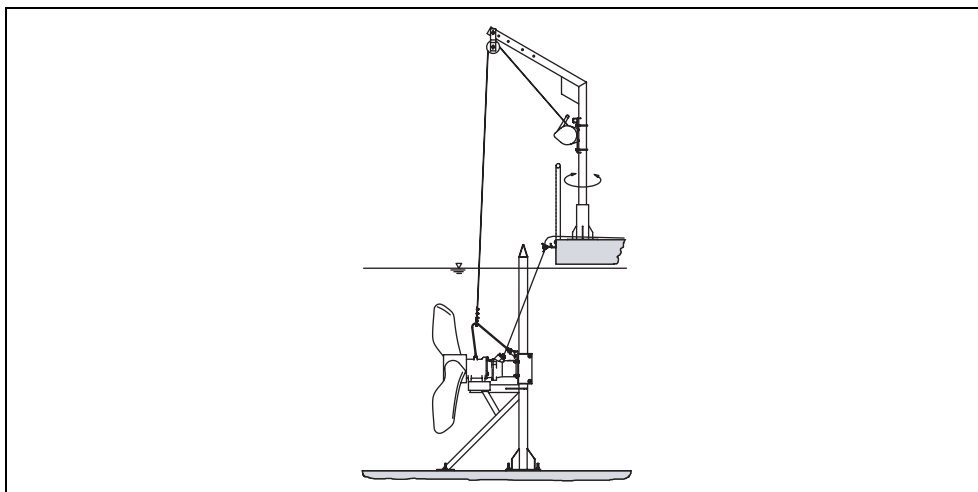
- Step 5: In the case of tripod lowering devices without an upper support bracket, the submersible mixer can be placed directly on the regularly-shaped free end of the guide pipe. This applies to both short rollers (open sliding carriage) and to the full floating axle system (closed sliding carriage). In the case of tripod lowering devices with an upper support bracket, the submersible mixer can be placed directly on the end of the guide pipe when the open sliding carriage is used. With the closed sliding carriage, the full floating axles and plastic rollers can only be assembled and secured when they are underneath the guide pipe holder.



**Fig. 5-6: Lowering the machine to the guide tube**

- Step 6: Slowly lower the machine until it is completely resting with the rubber buffer on the tripod's support pipe.

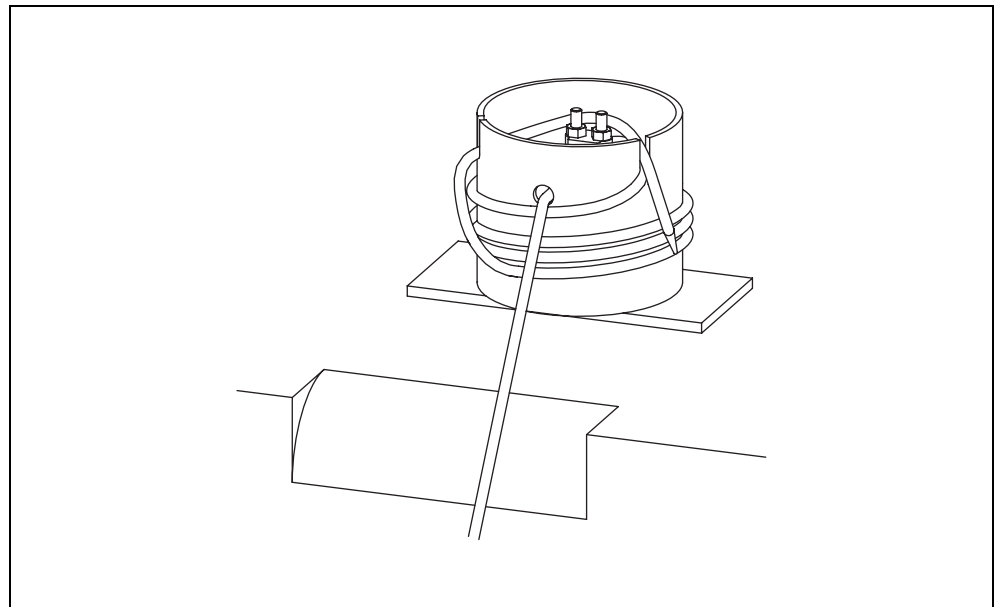
**When lowering, make certain that the cable guide does not become knotted up in the propeller and/or the machine.**



**Fig. 5-7: Lowering the machine slowly**

Step 7: Remove the traction cable from the hoisting gear, secure it to the cable lifting post (observe “Special fastening parts” assembly data sheet) and secure it with a wire grip.

**The traction cable must not be overloaded. The cable lifting post is used only to secure the traction cable. The entire machine must be lying on the lowering device.**



**Fig. 5-8: Fastening and securing traction cable**

Step 8: All cables are guided into a cable holder and secured at the edge of the basin with a wall holder to prevent falling down, becoming loose and slipping out. Make certain that none of the cables can become entangled in the propeller and/or the machine.

**The traction cable and power supply cable must be laid out or secured in such a manner that no bend and chafe marks can form. These are to be strictly avoided, as non-observance may lead to major damage to the machine and/or physical injury.**

Due to the current present in the basin, the lifting cable with fastening devices (shackles) is subjected to constant wear. For that reason, we recommend that you use catch hooks or catch systems (see planning guide PLH127).



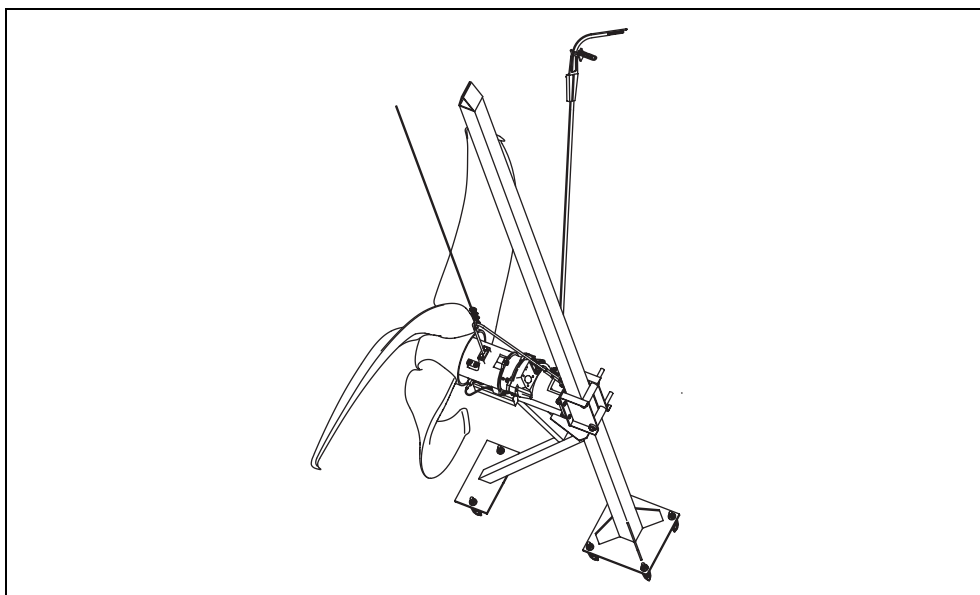


Fig. 5-9: Bundling and securing cables

**With flexible assembly using the lowering device AVM... and a fixed hoisting gear, the traction cable remains in the hoisting gear and is secured to the winch. "Step 7" is omitted.**

When the machine is assembled at great depths, an additional cable bracing will be required. Further information can be found in the "Additional cable bracing" assembly sheet.

*Cable assembly at great depths and/or powerful flow load*

Before assembly, the steel construction parts must be checked for sufficient stability. The operating company is responsible for carrying out any static calculations that may be necessary.

*Assembling the machine and its accessories on steel structural components*

**It is essential to keep in mind the weight of the machine (up to 220 kg) as well as the resulting reactive forces from the hoisting gear. Also bear in mind that there is a thrust of up to 5000N acting on the lowering device.**

No other parts of the equipment (such as scrapers and scraper bridges) must be impaired by assembly. Suitable materials should be chosen to avoid electrochemical corrosion. The fastening materials should be sufficiently stable; consult the manufacturer if necessary. The screw connections must be secured with a strong bonding locking glue (for example Loctite 2701).

When removing the machine, make certain that it is first disconnected from the power supply by an authorized electrician and secured against inadvertent switching on. The basin must be emptied for a permanent installation. You may then remove the entire installation. To dismantle the machine, you must use lifting equipment to secure or lift out the machine. If you have a lowering device, you can use the hoisting gear to lift out the machine even if the basin has been filled. If you have secured the traction cable on the cable lifting post, this must first be reinserted into the winch. Make sure the power supply cable does not become damaged.

*Removal*

**Beware of poisonous substances!**

**Machines which pump fluids hazardous to health present a fatal risk. This machine must be decontaminated before any other work is carried out. Wear the necessary protective clothing/equipment when doing so.**





## 6 Startup

The "Startup" chapter contains all the important instructions for the operating personnel for starting up and operating the machine safely.

The following specifications must be adhered to and checked:

- Type of installation
- Operating mode
- Minimum water coverage / max. submersion

**If the machine has not been operated for some time, check these specifications again and rectify any faults you find.**

**The operation and maintenance handbook must always be kept either by the machine or in a place specially reserved for it where it is accessible for operating personnel at all times.**

In order to prevent damage or serious injury during startup of the machine, the following points must be observed:

**The machine may only be started up by qualified personnel. The safety advice must be followed at all times.**

- Every person working on the machine must have received, read and understood this operating and maintenance manual. This must also be confirmed with a signature in the machine operator list.
- Activate all safety devices and emergency stop elements before startup.
- Electrical and mechanical settings may only be made by specialists.
- This machine may only be used under the working conditions specified in this handbook.

The machine has been designed and constructed using the very latest technology. Under normal working conditions it will operate reliably and for long periods. The one condition for this is that all instructions and advice are observed. Minor oil leakage in the mechanical shaft seal on delivery is no cause for concern. However, it must be removed prior to submersion in the pumped liquid.

### *Preparatory measures*

Please check the following:

- Cable guidance – no loops, slightly taut
- Check the temperature of the pumped liquid and the submersion depth – see machine data sheet
- The machine is securely fixed on the support provided – vibration-free operation must be assured
- The accessories – lowering device, cable lifting post, hoisting device. – are securely fixed
- Have the planning guide and assembly specifications been observed during installation? There should be no interaction between machines, placement should be correct, and there should be good flow ratios in both directions
- It must be possible to turn the propeller by hand

**An insulation test and oil level check must be carried out prior to start-up. For details on this, see the "Maintenance" chapter.**

Observe the relevant local and national regulations when laying out and selecting the electric lines as well as when connecting the motor. The motor must be protected by a motor protection switch. Have the motor connected in accordance with the "Electrical connection" data sheet. Pay attention to the direction of rotation. If the direction of rotation is incorrect, the machine will not perform as specified, and under certain circumstances, can become damaged. In accordance with the machine data sheet, check the operating voltage and make certain that the current consumption remains uniform during all phases.

### *Electrical system*

Make sure that all temperature sensors and monitoring devices, such as the sealing chamber monitor, are connected and that their function is tested. For details on this, see the "Electrical connection plan" data sheet.



### **Beware of electrical current!**

**Electrical current can cause fatal injuries if not handled correctly!  
All machines with free cable ends (i.e. without plugs) must be connected by a qualified electrician.**

**If intermittent operation is planned, the machine must be operated with a switching system that makes this type of operation possible.**

### *Direction of rotation*

The machine must be connected in accordance with the data sheet "Electrical connection plan". Rotation direction is controlled by a rotating field tester. This tester is switched on when the pump is connected and displays the rotation direction of the rotating field. There must be a clockwise rotating field for the machine to run correctly.

If a counter-clockwise rotating field is displayed, two phases must be swapped.

**The pump and performance data specified can only be achieved when there is a clockwise rotating field. The machine is not designed for operation with a counter-clockwise rotating field.**

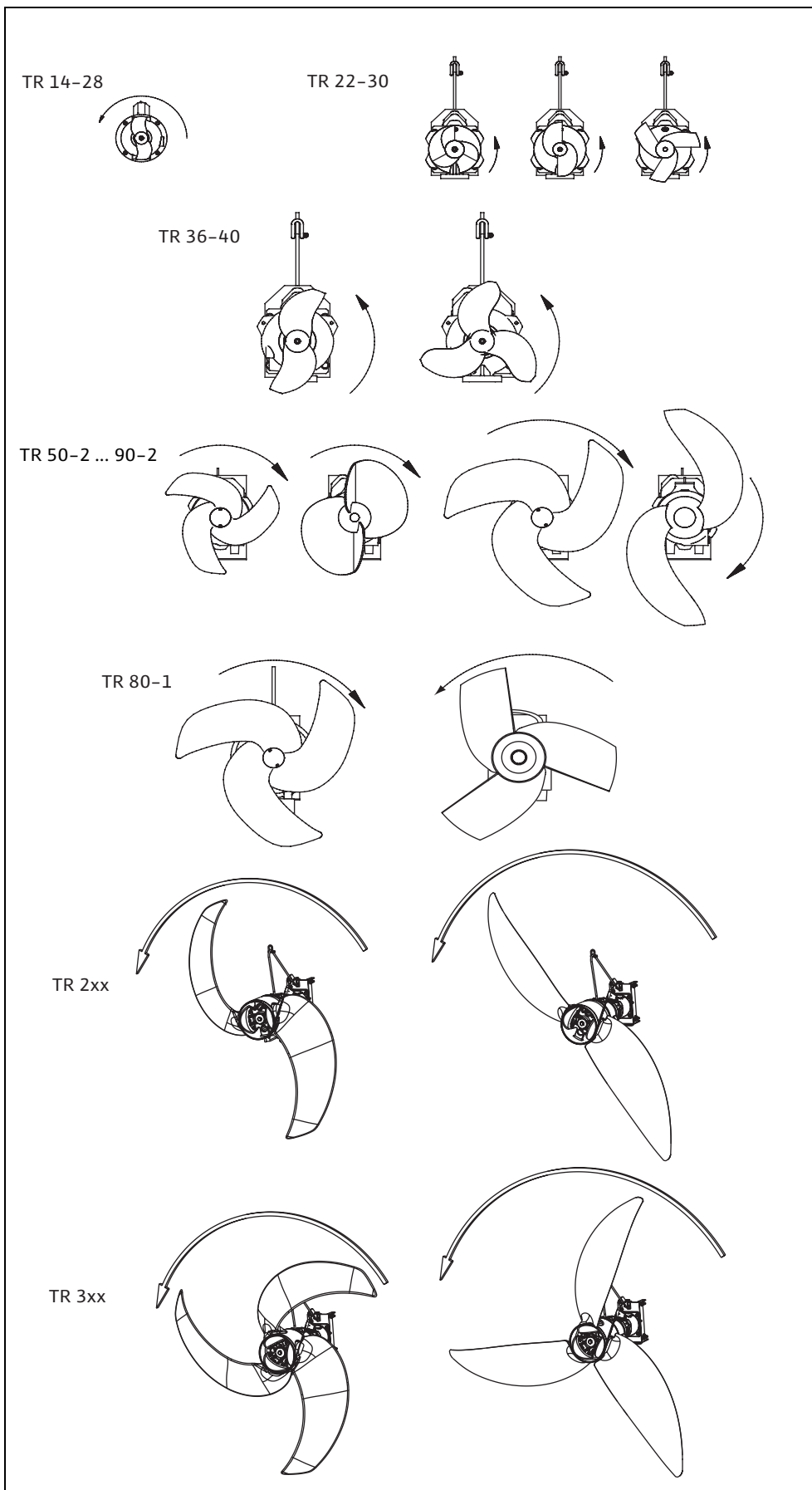


Fig. 6-1: Direction of rotation

## *Motor protection and activation types*

### *Motor protection*

The minimum requirement is a thermal relay / motor protection switch with temperature compensation, differential triggering and an anti-reactivation device in accordance with VDE 0660 or the appropriate national regulations. If the machines are connected to electrical systems in which faults frequently occur, we recommend installing additional protective devices (overvoltage, undervoltage or phase failure relays, lightning protection). Local and national regulations must be adhered to when connecting the machine.

### *Activation types for cables with free ends (without plugs)*

#### **Direct activation**

Motor protection should be set to the rated current when fully loaded. At partial load, we recommend that motor protection is set 5% above the measured current at the operating point.

#### **Star-delta activation**

If the motor protection is installed in the line:

Set the motor protection to 0.58 x the rated current. The maximum start-up time in star-delta mode is 3 seconds.

If the motor protection is not installed in the line:

Set the motor protection to the rated current when fully loaded.

#### **Starting transformer/soft start**

Motor protection should be set to the rated current when fully loaded. At partial load, we recommend that motor protection is set 5% above the measured current at the operating point. The maximum start-up time at reduced voltage (approx. 70%) is 3 seconds.

#### **Operation with frequency transformers**

The machine can be operated on frequency transformers.

**Observe the data sheet in the appendix of this manual.**

## *After starting*

The rated current is briefly exceeded during the start-up procedure. Once this process has ended, the operating current should no longer exceed the rated current.

If the motor does not start immediately after the machine is switched on, it must be switched off immediately. The start pauses specified in the technical data must be adhered to before starting up again. If the fault recurs, the machine must be switched off again immediately. The machine may only be started again once the fault has been rectified.

The following items should be monitored:

- Operating voltage (permissible deviation +/- 5% of the rated voltage)
- Frequency (permissible deviation +/-2% of the rated frequency)
- Current consumption (permissible deviation between phases is a maximum of 5%)
- Voltage difference between the individual phases (max. 1%)
- Starts and stops per hour (see technical data)
- Air intake by propeller – observe minimum water coverage!
- Smooth flow
- Check for leaks, if need be, follow the necessary steps as set out in "Maintenance"

**As mechanical shaft seals have a certain running-in phase, it is possible that minor leaks may occur. This running-in phase lasts approx. 1 - 3 months. Change the oil several times during this phase. Please consult the manufacturer if leakage continues after this running-in phase has ended.**

#### *Operation in the limit range*

The maximum limit range deviation for operational data is +/- 10% of the rated voltage and +3% to -5% of the rated frequency. Significant deviation from the operational data is to be expected

(also see DIN VDE 0530, Section 1). The permissible voltage difference between the individual phases is a maximum of 1%. Continuous operation in the limit range is not recommended.

The machine can only be repositioned using the "AVU..." lowering device. Machines with the "AVR..." and "AVM..." lowering devices are rigid installations.

### *Repositioning*

The machine must be switched off and secured against being switched on again if it is to be swiveled, lowered and/or raised. Wait until the propeller is in the starting position. Observe the chapter "Installation" when changing the position. Startup is performed after the position change has been completed in accordance with "Startup".

#### **Beware of damage to cables!**

**Even if the machine has been switched off, the propeller can still be driven by the flowing liquid. The cable must never become caught up in the propeller. If this occurs the cable will be damaged and must be immediately replaced.**





## 7 Maintenance

The machine and the entire system must be inspected and maintained at regular intervals. The time limit for maintenance is set by the manufacturer and applies to the general conditions of use. The manufacturer should be consulted if the system is to be used with corrosive and/or abrasive pumped liquids, as the time limit between inspections may need to be reduced.

Note the following information:

- The operating and maintenance manual must be available to the maintenance personnel and its instructions followed. Only the repair and maintenance measures listed here may be performed.
- All maintenance, inspection and cleaning work on the machine and the system may only be carried out by trained specialists exercising extreme care in a safe workplace. Proper protective clothing is to be worn. The machine must be disconnected from the electricity supply before any work is carried out. There must be no way that it can be inadvertently switched on. Additionally, the appropriate protective measures as defined by the BGV/GNV should be enforced when working in basins and/or containers.
- Above a weight of 50kg, only hoisting gear which has been officially approved and which is in a technically perfect condition should be used for lowering and raising the machine.

**Make sure that all fastening devices, ropes and safety devices of the hand winch are in a technically perfect condition. Work may only commence if the auxiliary hoisting gear has been checked and found to be in perfect working order. If it is not inspected, danger to personnel may result.**

- Electrical work on the machine and system must be carried out by an electrician. For machines approved for work in areas subject to explosion danger, please refer to the "Explosion protection in accordance with the .... regulation" chapter. Defective fuses must be replaced. Under no circumstances are they to be repaired. Only fuses at the specified current and of the prescribed type may be used.
- When working with inflammable solvents and cleaning agents, fires, unshielded lighting and smoking are prohibited.
- Machines which circulate fluids hazardous to health, or which come into contact with them, must be decontaminated. It must be ensured that no dangerous gases can form or are present.

**If injuries involving hazardous pumping liquids or gases occur, first-aid measures must be performed in accordance with the notices in the workplace and a doctor should be called immediately.**

- Ensure that all necessary tools and materials are available. Tidiness and cleanliness guarantee safe and problem-free operation of the machine. After working on the machine all cleaning materials and tools should be removed from it. All materials and tools should be stored in an appropriate place.
- Operating supplies such as oil and lubricants must be collected in appropriate vessels and properly disposed of (in accordance with the 75/439/EEC directive and with §§5a, 5b AbfG). Appropriate protective clothing is to be worn for cleaning and maintenance jobs. This is to be disposed of in accordance with waste code TA 524 02 and EC Directive 91/689/EEC. Only lubricants expressly recommended by the manufacturer may be used. Oils and lubricants should not be mixed. Only use genuine parts made by the manufacturer.

**A trial run or functional test of the machine must be performed as instructed in the general operating conditions.**

**The machine may be operated for a maximum of 10 seconds in a dry run in order to check the direction of rotation. A trial run or functional test of the machine must be performed as instructed in the general operating conditions.**

## Lubricants

You will find an overview of the lubricants used below:

Manufacturer	Gear oil (DIN 51 519 / ISO VG 220 Type CLP)	Transformer oil (DIN 57370 / VDE 0370)	White oil
Aral	Degol BG 220	Isolan T	Autin PL*
Shell	Omala 220	Diala D	ONDINA G13*, 15*, G17*
Esso	Spartan EP 220	UNIVOLT 56	MARCOL 52*, 82*
BP	Energol GR-XP 220	Energol JS-R	Energol WM2*
DEA	Falcon CLP 220	Eltec GK 2	
Texaco	Meropa 220	KG 2	Pharmaceutical 30*, 40*
ELF mineral oil		TRANSFO 50	ALFBELF C15
Tripol	Food Proof 1810/220*		

**Table 7-1: Lubricant overview**

The following can be used as grease in accordance with DIN 51818/NLGI class 3:

- Esso Unirex N3
- Tripol Molub-Alloy-Food Proof 823 FM\*

When using white oil, note the following:

- The machine lubricants may only be topped up or replaced with lubricants from the same manufacturer.
- Machines which have previously been operated using other lubricants must first be thoroughly cleaned before they can be operated using white oil.

**Lubricants which are approved for use with foodstuffs in accordance with USDA-H1 are marked with an asterisk.**

The specified lubricants are used in the pre-, gear and sealing chamber.

## Maintenance intervals

Overview of the maintenance intervals needed:

### Before initial start-up or after a longer period of storage

- Checking the insulation resistance
- Fill level check in sealing room/pre-chamber – lubricant must reach up to the lower edge of the filling opening. Check only possible with a measuring cup (for the correct quantity, see the machine data sheet)

### Monthly

- Monitoring the current consumption and voltage
- Checking the used relays for pistors, sealing room monitor, etc.

### Every six months

- Checking the insulation resistance
- Visual inspection of the power supply cable
- Visual inspection of the cable holder and the cable bracing
- Visual inspection of accessories, e.g. lowering device, hoisting gears, etc.

### Yearly

- Changing the lubricant in the pre-, gear and (if present) sealing chamber
- Functional inspection of all safety and control devices

- Coating check and touch-up as required

Overview of the individual maintenance intervals:

The current consumption and voltage is to be monitored periodically during all 3 phases. This remains constant during normal operation. Slight fluctuations are a result of the composition of the pumped fluid. The current consumption can assist in early detection and correction of damage and/or faulty operation in the impeller/propeller, bearings and/or the motor. More extensive resulting damage can thus be largely prevented and the risk of a total failure can be reduced.

Check the relays used are functioning fault-free. Defective devices must be immediately replaced, because these cannot ensure safe operation of the machine. The test procedure details should be followed closely (in the operating instructions for each relay).

To check the insulation resistance, the power supply cable must be disconnected. The resistance can then be measured with an insulation tester (measuring voltage = 1000V DC). The following values may not be exceeded:

The insulation resistance may not be below 20mega-ohms during initial operation. For all further measurements the value must be greater than 2mega-ohms.

Insulation resistance too low: Moisture may have penetrated the cable and/or the motor.

**Do not connect the machine, consult manufacturer.**

The power supply line must be examined for bubbles, cracks, scratches, chafed areas and/or crushed sections. If damage is found, the power cable must be exchanged immediately.

**The cables may only be changed by the manufacturer or an authorized/certified service workshop. The machine may not be used again until the damage has been adequately rectified.**

When the machine is used in activating basins, the lifting cables/cable holders (carabiners) and the cable bracing are subject to constant wear. Regular inspections are necessary in order to prevent the lifting cables/cable holders (carabiners) and/or cable bracing from wearing out and to prevent the electricity cable from being damaged.

**The lifting cables/cable holders (carabiners) and the cable bracing are to be immediately replaced if any signs of wear appear.**

Inspect accessories such as suspension units and hoisting gear to check whether they are secured in a stable manner. Loose and/or defective accessories should be repaired immediately or replaced.

Monitoring devices are temperature sensors in the motor, sealing room monitors, motor protection relays, overvoltage relays, etc.

Motor protection and overvoltage relays and other trip elements can generally be triggered manually for test purposes.

To inspect the sealing room monitor or the temperature sensor, the machine must be cooled to ambient temperature and the electrical supply cable of the monitoring device in the switch cabinet must be disconnected. The monitoring device is then tested with an ohmmeter. The following values should be measured:

Bi-metal sensor: Value = "0" – throughput

PTC sensor: A PTC sensor has a cold resistance of between 20 and 100ohms. For 3 sensors in series this would result in a value of between 60 and 300ohms.

PT 100 sensor: PT 100 sensors have a value of 100ohms at 0°C. Between 0°C and 100°C this value increases by 0.385ohms per 1°C. PT 20 sensors have a value of 107.7 ohms at 20°C.

## Maintenance tasks

*Monitoring the current consumption and voltage*

*Checking the used relays for posistors, sealing room monitor, etc.*

*Checking the insulation resistance*

*Visual inspection of the power supply cable*

*Visual examination of the cable holders (carabiners) and the cable bracing*

*Visual inspection of accessories*

*Functional inspection of safety and control devices*

Moisture sensor: This value must approach infinity. If there is a low value, there may be water in the oil. Also observe the instructions of the optionally available evaluation relay.

**In the case of larger deviations, please consult the manufacturer.**

Please consult the appropriate operating manual for details on inspecting the safety and monitoring devices on the auxiliary lifting gear.

## Changing the lubricant

- The filling and drain plugs are protected by plastic caps where certain casing coatings are used (e.g. Ceram C0). These must be removed and do not need to be replaced.
- Slowly and carefully remove the filling and drain plugs from all chambers.

**Oil in the chambers may be under pressure, even after cooling down.**

- Drain the oil through the drain plug opening and collect it in a suitable reservoir. Clean the filling and drain plugs and fit them with a new sealing ring. Screw in the drainage plugs again.
- Check the oil. Replace the oil if it is contaminated and/or contains water. Replace the mechanical shaft seal if there are large quantities of water (> 0.4l) in the oil. The oil from the gear chamber may have a jet-black cast; that from the prechamber may be brownish.
- Fill new oil by means of the opening in the filling plugs. Please observe the prescribed lubricants (see also "List of lubricants") and oil quantities (see machine data sheet).
- Screw the filling plugs back in place. Once work has been completed, the filling and drain plugs must be lined with an acid-resistant sealant (such as SIKAFLEX 11FC).

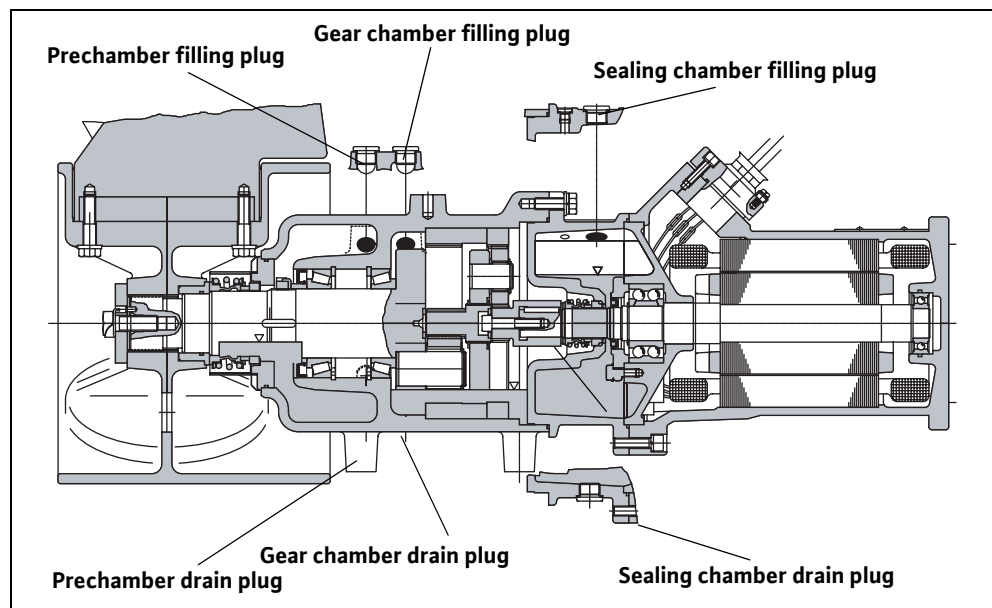


Fig. 7-1: Filling and drain plugs

*Repairs*

Assembly of the individual blades and the hub is described in the “Propeller Assembly” chapter. Dismantling is carried out in the reverse order.

*Propeller change***Beware of injury**

**Sharp edges can form on the propeller blades during operation. The repair work must be carried out with the utmost caution. Wear the necessary protective clothing/equipment.**



**The machine may not be run without a propeller, as the propeller fixes the position of the mechanical shaft seal.**

- The mechanical shaft consists of two parts – a fixed part and a rotating part.
- The fixed part consists of the counter-ring (1) with an angle sleeve and/or O-ring. This part is fixed in the housing.
- The rotating part consists of the sliding ring (2) – rubber bellows with spring system. This is pushed along the shaft and rotates with it.

*Structure of the mechanical shaft seal (5)*

**Make sure the sliding surfaces are not dirty or damaged. Do not use faulty parts.**

**Due to their function, mechanical shaft seals are never completely watertight. Leaked fluid is collected in the pre- and/or sealing chamber and disposed of at the regular maintenance intervals. Since there are no bearings and gears in the pre- or sealing chamber, this does not adversely affect the service life of the machine.**

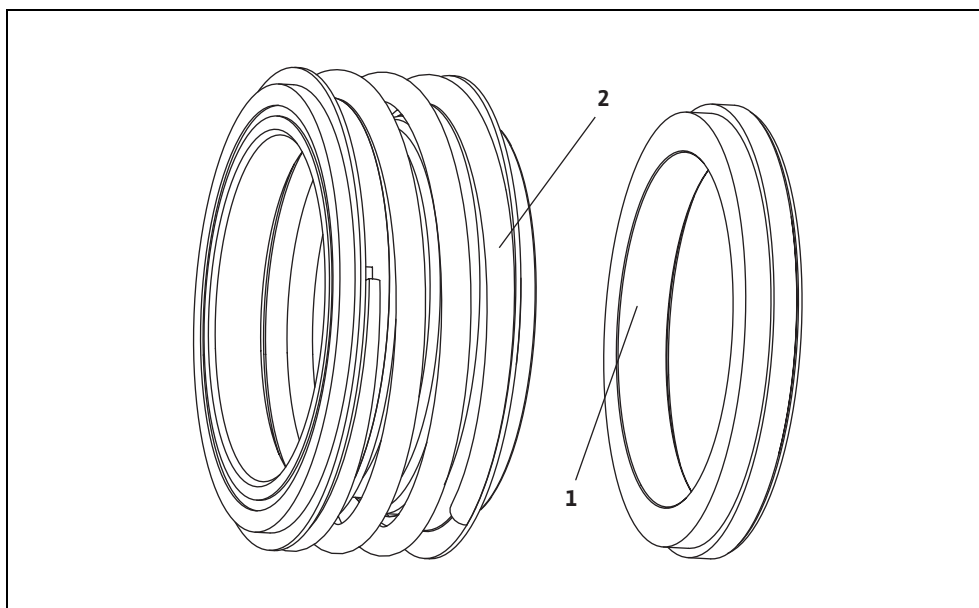


Fig. 7-2: Mechanical shaft seal

# Maintenance

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## **Removing the propeller unit**

- Lift the machine from the basin and place it in a vertical position on a fixed support (with the shaft facing upward). Secure the machine against falling. Loosen the VA hexagon bolt, remove the disk with outer tappet and the pressure disk and using appropriate hoisting gear, lift the propeller unit off the shaft. Put the propeller unit down on a suitable platform.

## **Removing the mechanical shaft seal**

- Pull the sliding ring (2) (rubber bellows with spring system) carefully and slowly out of the protective ring (1). Avoid touching the sides!
- Loosen the protective ring (1) from the housing by tapping it with a rubber mallet and remove it.
- Carefully remove the counter-ring (3) (counter-ring with angle sleeve).

## **Inserting the mechanical shaft seal**

- Clean the shaft thoroughly and check for wear and tear or corrosion. If in doubt, consult the manufacturer!
- Thoroughly clean the bearing surfaces on the housing for the mechanical shaft seal and the protective ring.
- Unpack the mechanical shaft seal and check it for damage. Do not install faulty parts.
- To minimize friction during installation, use water with added detergent or pure detergent. Never use oil or grease.
- Push the counter-ring with angle sleeve (3) into the housing with an even distribution of pressure. Caution: do not damage the sliding surface.
- Lightly coat the contact surface of the protective ring (1) with Loctite 2701 and carefully push the protective ring (1) onto the housing using a rubber mallet.
- With a slight clockwise turn, push the sliding ring (2) on to the shaft until it touches the counter-ring (3). Avoid touching the sides! Wet a few times on long distances.

### **Apply force only via the rear winding of the spring!**

- Check that the mechanical shaft seal is correctly seated. It must protrude approximately 1mm out of the protective ring. The correct pressing force is only attained when the propeller is mounted.
- Lubricate the shaft with ESSO Unirex N3.

## **Assembling the propeller unit**

See "Propeller Assembly".

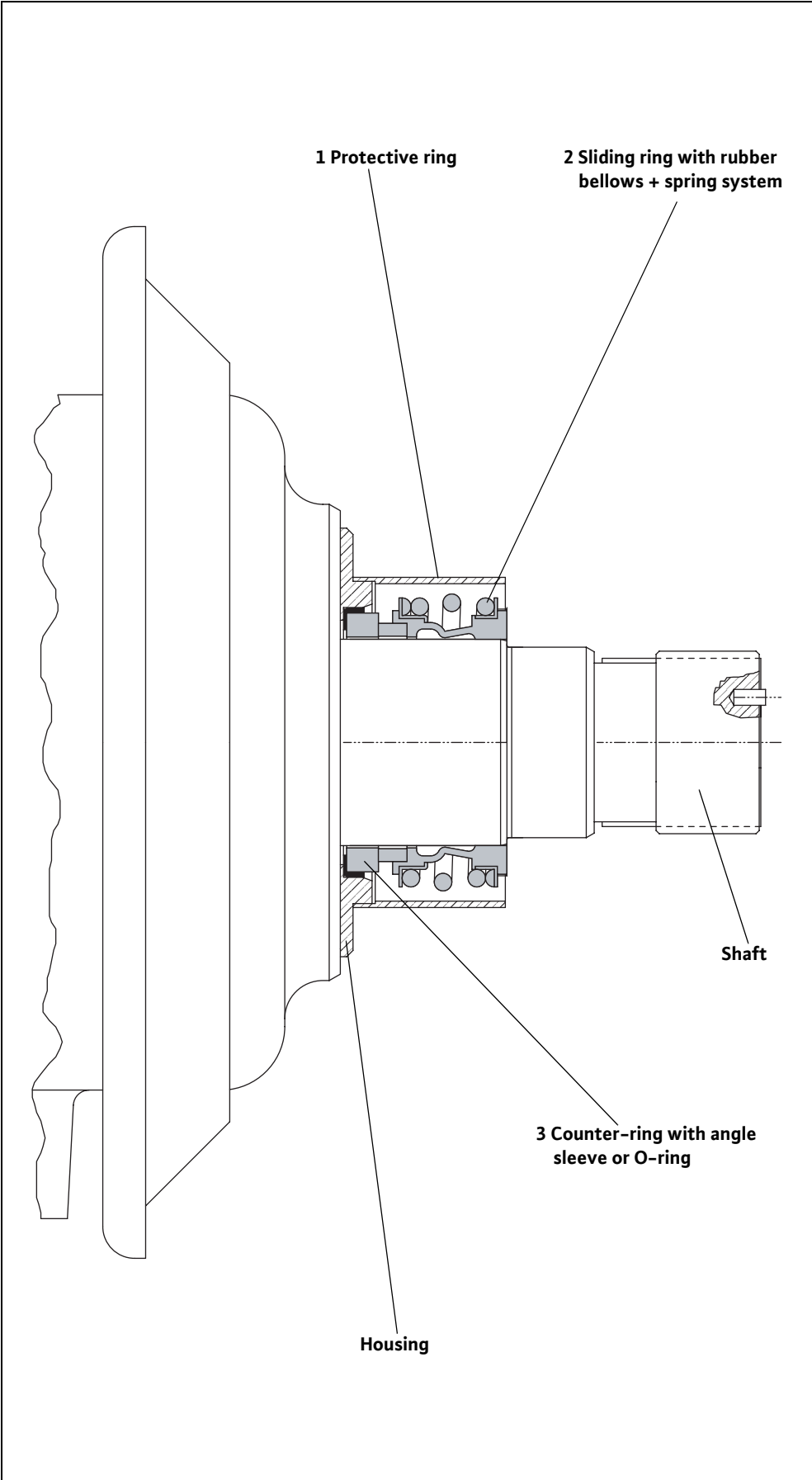


Fig. 7-3: Changing the propeller and mechanical shaft seal

## Torque values

Overview of the correct torques for dacromet-coated screws with Nord-Lock screw fixing

Thread	Tensile strength 10.9	
	Nm	kp m
M5	9.2	0.94
M6	15.0	1.53
M8	36.8	3.75
M10	73.6	7.50
M12	126.5	12.90
M16	316.3	32.24
M20	621.0	63.30
M24	1069.5	109.02
M27	1610.0	164.12
M30	2127.5	216.87

**Table 7-2: Dacromet-coated screws with Nord-Lock screw fixing**

Overview of the correct torques for rustproof screws without screw fixing:

Thread	Nm	kp m	Thread	Nm	kp m
M5	5.5	0.56	M16	135.0	13.76
M6	7.5	0.76	M20	230.0	23.45
M8	18.5	1.89	M24	285.0	29.05
M10	37.0	3.77	M27	415.0	42.30
M12	57.0	5.81	M30	565.0	57.59

**Table 7-3: Rustproof screws without Nord-Lock screw fixing**



## 8 Shutdown

This chapter provides an overview of the various ways to shut down the machine.

For this type of shutdown, the machine remains installed and is not cut off from the electricity supply. For temporary shutdown, the machine must remain completely submerged so that it is protected from frost and ice. Make sure the operating room and the pumped fluid cannot be covered by ice.

### *Temporary shutdown*

This ensures that the machine is always ready for operation. During longer shutdown periods, carry out a regular (monthly to quarterly) function run for a period of 5 minutes.

#### **Caution**

**Only carry out a function run under the proper conditions of operation and use (see “Product Description”). Never run the machine dry. This can result in irreparable damage!**

Switch off the system, disconnect the machine from the electricity supply and dismantle and store it. Note the following information concerning storage:

### *Final shutdown / storage*

#### **Beware of hot parts!**

**When removing the machine, be careful of the temperature of the housing components. These can heat up to well above 40°C. Let the machine cool down to ambient temperature before you touch it.**



#### **Caution**

**For machines filled with drinking water, drain out the water and let the machine dry out if it is not operated for more than 4 weeks, or if there is a risk of freezing.**

- Clean the machine.
- Store it in a clean, dry place, protect the machine against frost.
- Place it down vertically onto a firm foundation and secure it against falling.
- Seal the intake and discharge ports of pumps with suitable material (such as foil).
- Support the electric connecting lead on the cable lead-in to help avoid a permanent deformation.
- Protect the ends of the electric power cable from moisture.
- Protect the machine from direct sunshine as a preventive measure against brittleness in elastomer parts and the propeller and casing coating.
- When storing the machine in a garage please remember: Radiation and gases which occur during electric welding destroy the elastomers of the seals.
- During lengthy periods of storage, regularly (for example every six months) turn the impeller or propeller by hand. This prevents indentations in the bearings and stops the rotor from rusting up.
- See also “Transport and Storage”.

Before restarting the machine, clean it of dust and oil deposits. Then carry out the necessary maintenance actions (see “Maintenance”). Check that the mechanical shaft seal is in good order and working properly.

### *Restarting after an extended period of storage*

## Shutdown

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Once this work has been completed, the machine can be installed (see “Installation”) and connected to the electricity supply by a specialist. See “Startup” a for instructions on restarting.

**Only restart the machine if it is in perfect condition and ready for operation.**

## 9 Troubleshooting

In order to prevent damage or serious injury while rectifying machine faults, the following points must be observed:

- Only attempt to rectify a fault if you have qualified staff. This means each job must be carried out by trained specialist staff, for example electrical work must be performed by a trained electrician.
- Always secure the machine against an accidental restart by disconnecting it from the electric system. Take appropriate safety precautions.
- Always have a second person make sure the machine is switched off in an emergency.
- Secure moving parts to prevent injury.
- Independent work on the machine is at one's own risk and releases the manufacturer from any warranty obligation.

*Fault: The machine will not start*

Cause	Remedy
Electricity supply interrupted – short circuit or earth connection in the cable or motor windings	Have the motor and wires checked by a specialist and replaced if necessary
Fuses, the motor protection switch and/or monitoring devices are triggered	<p>Have a specialist inspect the connection and correct them as necessary</p> <p>Have the motor protection switch adjusted according to the technical specifications, and reset monitoring equipment</p> <p>Check that the impeller/propeller runs smoothly. Clean it or free it as necessary</p>
The moisture sensors (option) has interrupted the power circuit (operator-related)	See fault: Mechanical shaft seal leaks, sealing chamber monitor reports fault and switches the machine off

**Table 9-1: The machine will not start**

*Fault: The motor starts, but the motor protection switch triggers shortly after start-up*

Cause	Remedy
The thermal trigger on the motor protection switch is incorrectly set	Have a specialist compare the setting of the trigger with the technical specifications and adjust it if necessary
Increased power consumption due to major voltage drop	Have an electrician check the voltage on each phase and rewire if necessary
Two-phase operation	Have a specialist inspect the connection and correct it as necessary
Excessive voltage differences on the three phases	Have a specialist inspect the connection and the switching system and correct it as necessary
Incorrect direction of rotation	Swap the 2 phases from the mains supply

**Table 9-2: The motor starts, but the motor protection switch triggers shortly after start-up**

Cause	Remedy
Impeller/propeller impeded by adhesive material, blockages and/or solid matter, increased current consumption	Switch off the machine, secure it against being switched on again and free the impeller/propeller or clean the suction port
The pumped fluid is too dense	Contact the manufacturer

**Table 9-2: The motor starts, but the motor protection switch triggers shortly after start-up**

*Fault: Machine runs but does not pump*

Cause	Remedy
No pumped fluid	Open the container intake or sliders
Intake blocked	Clean the intake, slider, suction port or intake strainer
Impeller/propeller blocked or obstructed	Switch off the machine, secure it against being switched on again and free the impeller/propeller
Defective hose or piping	Replace defective parts
Intermittent operation	Check the control panel

**Table 9-3: Machine runs but does not pump**

*Fault: The machine runs, but not at the stated operating levels*

Cause	Remedy
Intake blocked	Clean the intake, slider, suction port or intake strainer
Slide in the discharge line closed	Fully open the slide
Impeller/propeller blocked or obstructed	Switch off the machine, secure it against being switched on again and free the impeller/propeller
Incorrect direction of rotation	Replace 2 phases on the mains supply
Air in the system	Check the pipes, pressure shroud and/or pump unit, and bleed if necessary
Machine pumping against excessive pressure	Check the slide in the discharge line, if necessary open it completely, use a different impeller or contact the factory
Signs of wear	Replace worn parts
Defective hose or piping	Replace defective parts
Inadmissible levels of gas in the pumped liquid	Contact the factory
Two-phase operation	Have a specialist inspect the connection and correct it as necessary

**Table 9-4: The machine runs, but not at the stated operating levels**

Cause	Remedy
Excessive decrease in the water table during operation	Check the supply and capacity of the system, and inspect the level control settings and function

**Table 9-4: The machine runs, but not at the stated operating levels**

*Fault: The machine does not run smoothly and is noisy*

Cause	Remedy
Machine is running in an impermissible operation range	Check the operational data of the machine and correct if necessary and/or adjust the operating conditions
The suction port, strainer and/or impeller/propeller is blocked	Clean the suction port, strainer and/or impeller/propeller
The impeller is impeded	Switch off the machine, secure it against being switched on again and free the impeller
Inadmissible levels of gas in the pumped liquid	Contact the factory
Two-phase operation	Have a specialist inspect the connection and correct it as necessary
Incorrect direction of rotation	Replace 2 phases on the mains supply
Signs of wear	Replace worn parts
Defective motor bearing	Contact the factory
The machine is installed with mechanical strain	Check the installation, use rubber spacers if necessary

**Table 9-5: The machine does not run smoothly and is noisy**

(Sealing chamber monitoring is optional, and is not available for all types. For details on this, see the order confirmation or the electrical terminal connection plan.)

*Fault: Mechanical shaft seal leaks, sealing chamber monitor reports fault and switches the machine off*

Cause	Remedy
Condensation build-up due to lengthy storage and/or temperature fluctuation	Operate the machine briefly (max. 5 min.) without sealing chamber monitoring
Expansion tank (optional for polder pumps) is too high	Install the expansion tank no more than 10m above the top edge of the suction port
Increased leakage when running in new mechanical shaft seals	Change the oil
Defective sealing chamber cables	Replace the moisture sensors
Mechanical shaft seal is defective	Replace the mechanical shaft seal after contacting the factory

**Table 9-6: Mechanical shaft seal leaks, sealing chamber monitor reports fault and switches the machine off**

*Further steps for trouble-shooting*

If the items listed here do not help you rectify the fault, contact our customer service. They can help you as follows:

- Telephone or written help from customer service
- On-site support from customer service
- Checking and repairing the machine at the factory

Note that you may be charged for some services provided by our customer support. Customer service will provide you with details on this.







## B Assembly Sheet For the Anchor Bolts

Anchor bolts consist of a metal anchor rod, a grout cartridge (a glass tube or plastic bag containing adhesive cement), a washer and a hexagonal nut. They create a firm connection in concrete foundations, thus enabling heavy loads to be supported. Once fitted, the anchor cannot be removed!

*General product information*

The anchor bolts supplied by WILO EMU GmbH may only be used for WILO auxiliary hoisting gear and accessories.

*Scope of proper use*

These anchor bolts may only be used in normal reinforced or non-reinforced concrete in a strength class of min. C20/25 and max. C50/60 (according to EN 206:2000-12). The foundation for the anchors should be dry. The anchor bolt is only suitable for non-cracked concrete. Anchor bolts are also available for cracked concrete.

Before using the anchor bolts, make sure the background structure is strong enough to withstand the reactive forces generated by the auxiliary hoisting gears and their accessories.

The anchor bolts are designed to fasten auxiliary hoisting gears and their accessories to the basis edge and/or basin floor.

Take care not to damage the grout cartridge during transport, as otherwise the adhesive cement will harden. Do not use faulty grout cartridges. Do not use grout cartridges after the expiration date printed on them.

*Transport and storage*

The cartridges must be transported only at temperatures between -5°C and 30°C and stored at temperatures between 5°C to 25°C. The mortar cartridge must be kept in a cool, dry, dark place.

**Beware of irritant substances!**

**The grout cartridges contain dibenzoyl peroxide. This substance is caustic. Note the following information:**

**R36/38 Irritates eyes and skin**

**R43 Skin may react to contact**

**S37/39 Wear suitable protective clothing during work**

**S26 If it comes into contact with the eyes, wash them out with water and call a doctor**

**S28 If it comes into contact with the skin, wash thoroughly with water and plenty of soap**



*Setting the anchor bolts*

Name	Rod length	Drill hole depth	Drill hole diameter	Min. distance from edge a <sub>r</sub>
HAS-R M8x80/14	110mm	80mm	10mm	100mm
HAS-R M12x110/28	160mm	110mm	14mm	135mm
HAS-R M16x125/38	190mm	125mm	18mm	155mm
HAS-R M16x125/108	260mm	125mm	18mm	155mm
HAS-E-R M20x170/48	240mm	170mm	24mm	210mm
HAS-E-R M24x210/54	290mm	210mm	28mm	260mm

**Table B-1: Dimensions and tightening torque values**

# Assembly Sheet For the Anchor Bolts

Name	Rod length	Drill hole depth	Drill hole diameter	Min. distance from edge $a_r$
HIS-RN M16x170	170mm	170mm	28mm	210mm

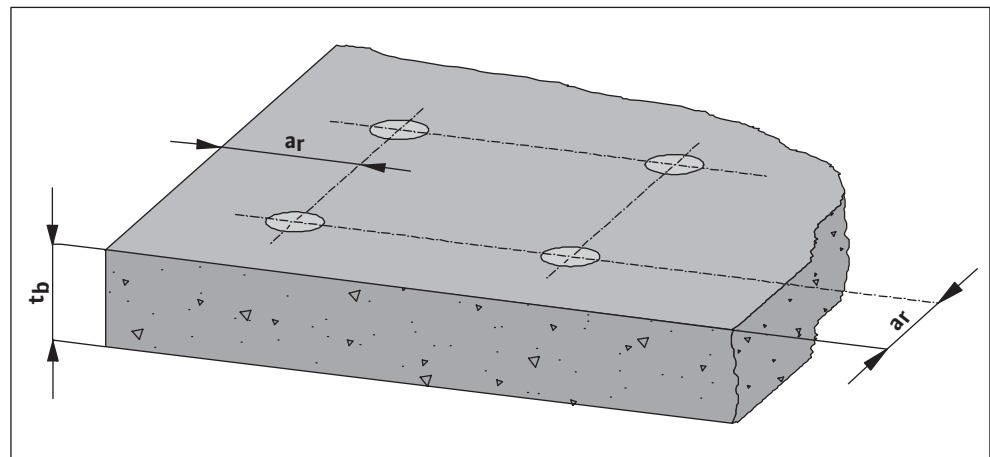
**Table B-1: Dimensions and tightening torque values**

Name	Minimum thickness $t_b$	Torque $T_{inst}$	Max. thickness of the part to be fastened
HAS-R M8x80/14	130mm	10Nm	14mm
HAS-R M12x110/28	160mm	40Nm	28mm
HAS-R M16x125/38	175mm	80Nm	38mm
HAS-R M16x125/108	175mm	80Nm	108mm
HAS-E-R M20x170/48	220mm	150Nm	48mm (without hexagon head)
HAS-E-R M24x210/54	260mm	200Nm	54mm (without hexagon head)
HIS-RN M16x170	220mm	80Nm	(internal thread M16)

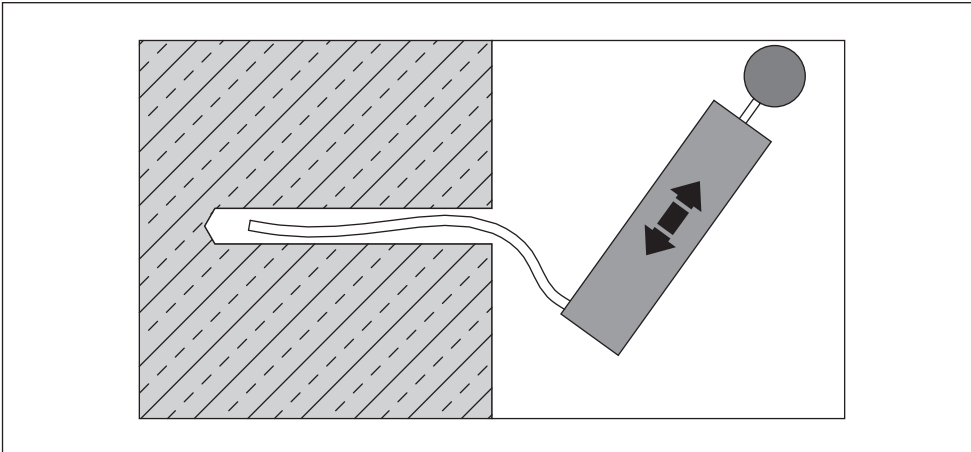
**Table B-2: Dimensions and tightening torque values**

- 1 Drill the holes as shown in table 1 and the following drawing.

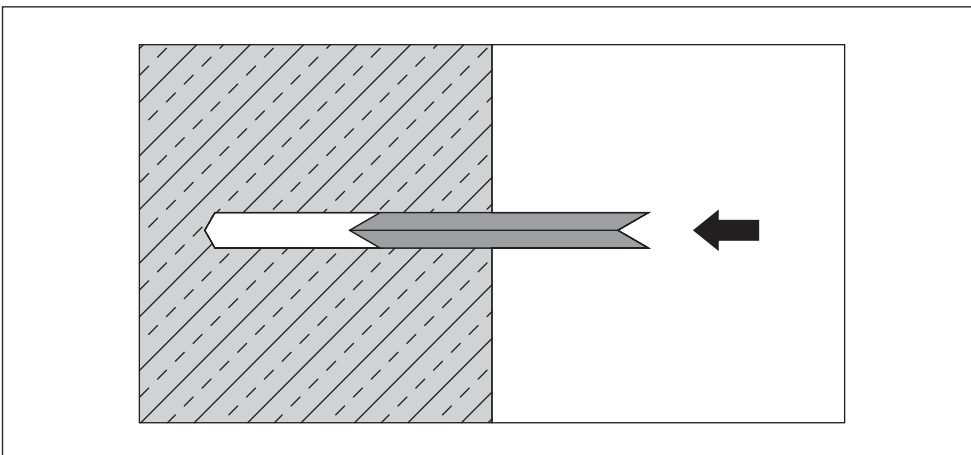
**Note: The quality of the fastening depends on how well the anchor bolts are correctly seated!**



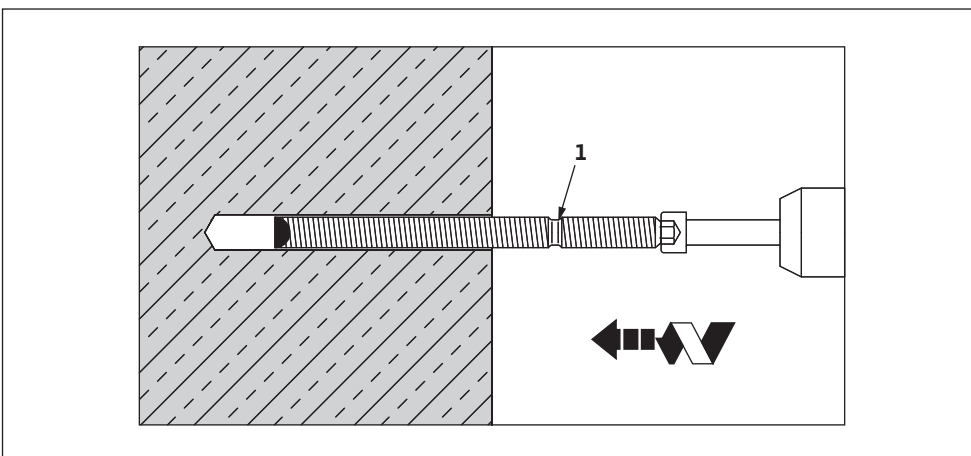
- 2 Carefully and thoroughly clean the holes using a brush and bellows.



- 3 Insert the grout cartridge carefully into the hole. Any air bubbles must face outwards. If the drilled hole is too deep or broken at the edges, you may need to use more than one grout cartridge.

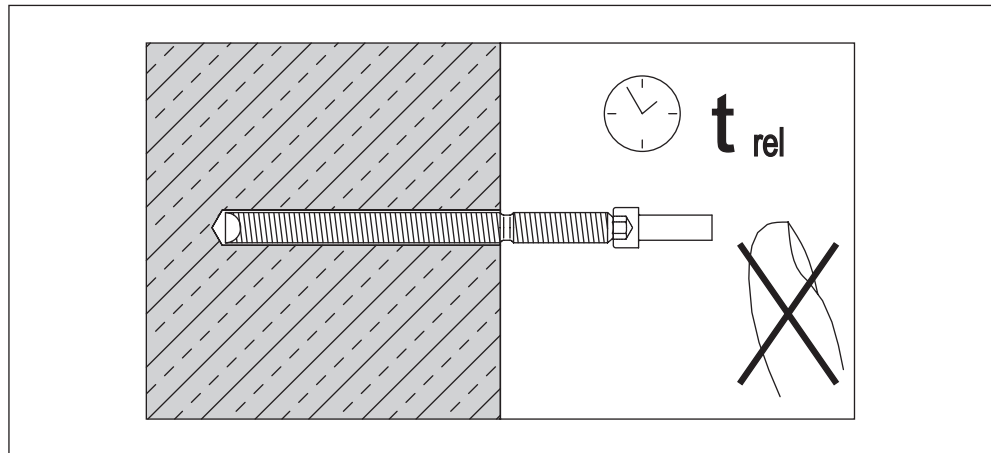


- 4 Using a suitable insertion tool, turn and knock the anchor bolt into the mortar cartridge until it reaches the insertion depth marking (1). The gap between the anchor bolt and the background structure must be completely filled with grout.



# Assembly Sheet For the Anchor Bolts

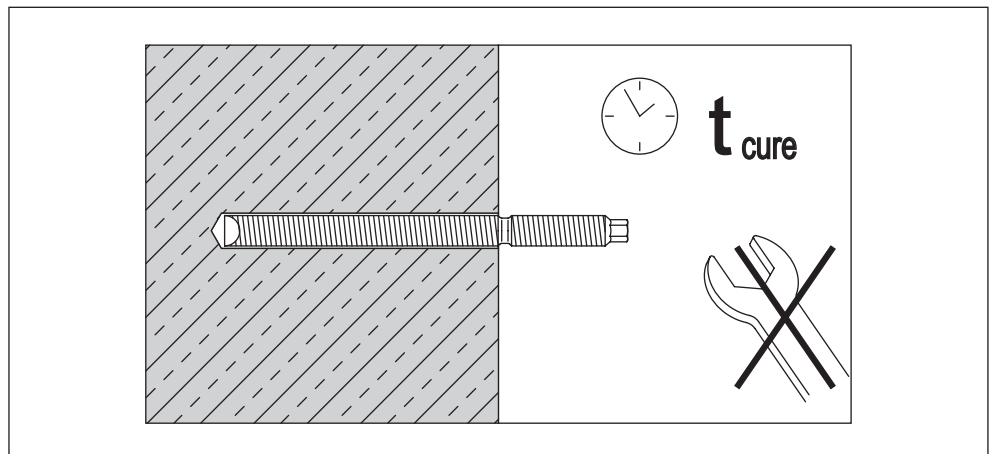
- 5 Carefully remove the insertion tool, do not remove a jammed insertion tool until  $t_{rel}$  has elapsed – see Table 2.



Temp. in the drill hole	>+ 20 °C	>+ 10 °C	> 0 °C	>- 5 °C
Waiting time $t_{rel}$	8 min	20 min	30 min	1 hr
Waiting time $t_{cure}$	20 min	30 min	1 hr	5 hr
<b>If the background structure is damp, the waiting time must be doubled!</b>				

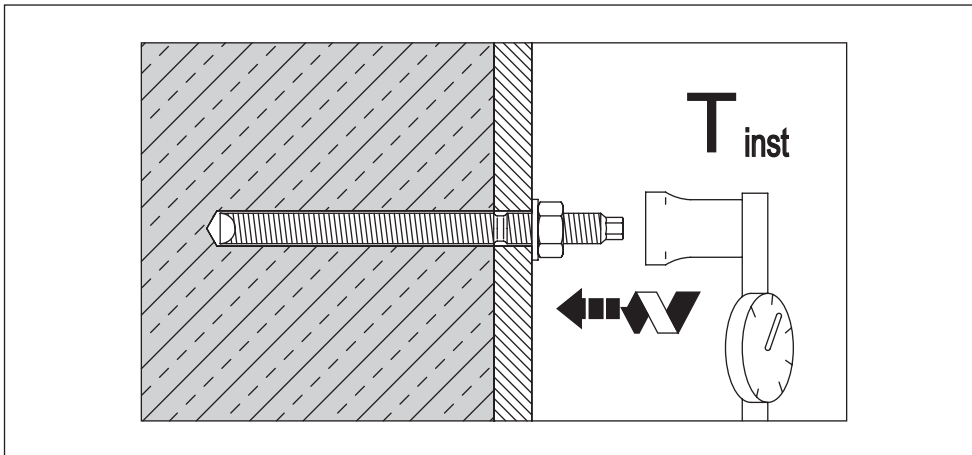
**Table B-3: Hardening time**

- 6 Let the anchor bolts harden – see  $t_{cure}$  in Table 2. While curing, do not move or place any load on the anchor bolt.



- 7 When the anchor bolts has hardened, clean the bearing surface of any impurities such as dirt, adhesive resin or drilling dust. The part to be attached must be firmly fitted to the base and may not be in any way loose. Then bolt the part to the base and tighten it to the specified torque (see Table 1). To secure the nut, coat it with Loctite 2701 locking glue and re-tighten

it to the specified torque at least three times in order to compensate for any movement due to setting.





## C Operation with a static frequency converter

WILO products can be operated with standard frequency converters. These are normally pulse-width-modulated converters. However, the following points must be observed when operating the converter:

Any standard WILO motor can be used. **If the rated voltage is above 415 V, you must consult the manufacturer.** Because of the additional heating caused by harmonics, the rated power of the motor should be around 10% more than the power requirement of the pump. For converters with a **low-harmonic output**, it may be possible to reduce the 10% power reserve. This is normally done by using output filters. Ask the converter manufacturer.

*Selecting the motor and converter*

The size of the converter depends on the rated motor current. Selecting the motor power in kW can cause problems, since submersible motors have **different specifications** to standard motors. **Waste water motors are marked with the appropriate rated power** (type sheet power in catalog).

Submersible pumps have water-lubricated bearings. A minimum speed is required in order for a lubricating film to form.

*Minimum speed for submersible pumps (well pumps)*

**Continuous operation at frequencies below 25 Hz (30 Hz 4-pole) must be avoided**, since the lack of lubrication and possible occurrence of mechanical vibrations may cause damage to the bearings.

**The lowest speed range (up to 12.5 Hz) should be passed through within 2 seconds.**

In practice, the speed should only be lowered to the extent that a pump flow of at least 10% of the maximum flow remains. The precise value depends on the type – ask the manufacturer for details.

There is no prescribed minimum speed for waste water and sewage pumps.

*Minimum speed for waste water and sewage pumps*

However, make sure that the motor operates without jerking or vibrating, especially in the lower speed range. Otherwise, the mechanical shaft seals could be damaged and start leaking.

It is important that the pump motor operates across the entire control range without vibrations, resonance, oscillation or excessive noise (ask the manufacturer if necessary).

*Operation*

Increased motor noise caused by the harmonics of the power supply is normal.

When configuring the converter, always make sure the quadratic curve (U/F characteristic) for pumps and fans is correctly set. This ensures that the output voltage at < 50 Hz frequencies is adjusted to the power requirement of the pump. Newer converters feature an automatic power optimization function which achieves the same effect. See the converter operating manual for this setting and other parameters.

Submersible motors with water-cooled windings are more susceptible to voltage peaks than dry motors.

*Max. voltage peaks and rise speed*

**The following thresholds may not be exceeded:**

**Max. voltage rise speed: 500 V/μs**

**Max. voltage peak to earth: 1250 V**

These values apply for well pumps < 1 kV and can usually be attained by replacing a sinusoidal filter or dV/dt filter. For motors > 1 kV, the permissible values can be obtained from the plant. It remains the case that the lowest possible pulse frequency should be set.

## Operation with a static frequency converter

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### EMC

In order to comply with EMC (electromagnetic compatibility) regulations, it may be necessary to use shielded wires, lay cables in metal tubes and install filters. The exact actions required to comply with the EMC directives depend on the converter type, converter manufacturer, length of cable laid and other factors. In individual cases it is therefore necessary to look up the actions to be taken in the converter operating manual or contact the manufacturer directly.

### Motor protection

As well as the built-in electrical current monitor system in the converter, or the thermal relay in the switching system, we recommend installing temperature sensors in the motor. Cold conductor temperature sensors (PTC) and resistor temperature sensors (PT 100) are both suitable.

**Explosion-proof motors (whose type code has the addition “Ex”) must always be fitted with cold-type thermistors in frequency conversion mode. Also, an approved motor protection relay for cold-type thermistors (such as MSS) must be used.**

### Operation up to 60 Hz

A WILO submersible motor can be adjusted up to 60 Hz provided the motor has been rated for the pump’s higher power requirement. However, the rated power should be taken from the 50 Hz data sheets.

### Efficiency

As well as the efficiency of the motor and the pump, the efficiency of the converter (approx. 95 %) must also be taken into account. The efficiency of all components is lower when the speed is reduced.

Formulas

Pump flow	Pump head	Power
$Q_2 = Q_1 * \left( \frac{n_2}{n_1} \right)$	$H_2 = H_1 * \left( \frac{n_2}{n_1} \right)^2$	$P_2 = P_1 * \left( \frac{n_2}{n_1} \right)^3$

Table C-1: Formulas

### Summary

As long as all these points are taken into account and the instructions for the converter are followed, speed-regulated operation with WILO products is possible without any problems.



## D Ceram C0 data sheet

WILO products are used for many different pumped liquids and installation sites. We want our coatings to offer an even higher degree of protection against wear and corrosion. For this purpose, we mainly use our Ceram coatings. However, only an intact coating provides the best possible protection.

### General information

Therefore check the coating after all installation and maintenance work, and repair any minor damage immediately. In the event of major damage, please consult the manufacturer.

Ceram C0 is a sprayable, solvent-free, two-component aluminum-oxide-based coating material which protects our products from corrosion under particularly harsh mechanical conditions.

### Description

Solvent-free epoxy polymer with solvent-free polyamine hardener and various extenders.

### Composition

- A tough, hard and long-lasting coating with high mechanical and chemical resistance and excellent resistance to abrasion.
- Excellent wet adhesion and compatibility with corrosion protection as a single-layer coating on steel surfaces.
- Very good adhesion to steel surfaces.
- Replaces coatings containing tar.
- Cost-effective thanks to its durability, low maintenance and easiness to repair.
- Tested by the Federal Waterways Engineering and Research Institute (BAW).
- Solvent-free.
- High-gloss coating when hardened.

### Properties

### Technical data

Density (mixture)	ASTM D 792	1.4	g/cm <sup>3</sup>
Adhesion / steel	ISO 4624	15	N/mm <sup>2</sup>
Impact resistance / hardness	DIN EN ISO 6272	9	J
Temperature resistance: dry, long-term		60	°C
Temperature resistance: dry, short-term		120	°C
Temperature resistance: wet / fluid	Depends on pumped fluid	Information on request	°C
Solid content (mixture)	Volume	97	%
	Weight	98	%

**Table D-1: Technical data**

## Resistance

Pumped fluid	Temperature	Resistance rating
Waste water, alkaline (pH 11)	+20°C	1
Waste water, alkaline (pH 11)	+40°C	1
Waste water, slightly acidic (pH 6)	+20°C	1
Waste water, slightly acidic (pH 6)	+40°C	1
Waste water, very acidic (pH 1)	+20°C	2
Waste water, very acidic (pH 1)	+40°C	3
Ammonium hydroxide (5%)	+40°C	3
Decanol (fatty alcohol)	+20°C	1
Decanol (fatty alcohol)	+50°C	1
Ethanol (40%)	+20°C	1
Ethanol (96%)	+20°C	3
Ethylene glycol	+20°C	1
Heating oil / diesel	+20°C	1
Compressor oil	+20°C	1
Methyl ethyl ketone (MEK)	+20°C	3
Sodium hydroxide solution (5%)	+20°C	1
Sodium hydroxide solution (5%)	+50°C	2
Sodium chloride solution (10%)	+20°C	1
Hydrochloric acid (5%)	+20°C	2
Hydrochloric acid (10%)	+20°C	2
Hydrochloric acid (20%)	+20°C	3
Sulfuric acid (10%)	+20°C	2
Sulfuric acid (20%)	+20°C	3
Nitric acid (5%)	+20°C	3
Toluene	+20°C	2
Water (cooling/industrial water)	+50°C	1
Xylene	+20°C	1

**Table D-2: Resistance**

Total layer thickness: at least 400µm

Key: 1 = resistant; 2 = resistant for 40 days; 3 = resistant against overflow, immediate cleaning recommended

In order to achieve the best results with this product, proper preparation of the surface is of critical importance. The exact requirements change depending on the application, expected period of service and original surface condition.

*Surface preparation*

Make sure it is clean, dry and free of grease. The best results are attained by removing rust by blasting in accordance with DIN EN ISO 12944-4, standard cleanliness grade Sa 2.5 - 3. The roughness should be at least 50µm deep. A test certificate for the blasting equipment must be available.

*Steel*

**Please ask for our advice on preparing other surfaces.**

The material is supplied in the agreed mixing ratio. Mix all the hardener component into the basic component, preferably using a mechanical mixer, also mixing around the walls and bottom of the container. Only mix as much material as can be applied during the pot life.

*Material preparation*

The mixing ratio is 4:1 by weight.

*Application instructions*

The surface and air temperatures must be at least +10°C, and the relative air humidity at most 80%. The temperature of the surface to be coated must be at least 3°C above the dew point. Low temperatures slow down hardening and make application more difficult. For the coating to harden completely, the surface temperature must be above the minimum hardening temperature. High air humidity or temperatures below the dew point can cause condensation to form on the substrate or the coating surface. This can cause problems of adhesion to the surface and between layers. These object conditions must be maintained during the application and hardening period. If the temperature or humidity approach the threshold values, we recommend the use of heating or drying equipment. Ceram C0 can be applied on small surfaces by roller or brush.

*Object requirements*

Temperature	16°C	20°C	25°C	32°C
Pot life (minutes)	30	20	15	10

*Pot life*

**Table D-3: Pot life**

**This table shows the practical hardening time from the start of mixing.**

Ceram C0 is applied in layers of 400µm to around 1000µm, depending on the media and intended duration of protection.

*Coating layers and material requirements*

Theoretical yield: 1.8m<sup>2</sup>/kg at 400µm or 0.9m<sup>2</sup>/kg at 800µm.

Theoretical consumption: 0.60kg/m<sup>2</sup> at 400µm or 1.15kg/m<sup>2</sup> at 800µm.

In practice, consumption depends on the surface properties and the application method.

Use the following formula to determine how much is needed to cover a given surface:

$$\text{Density x area (m}^2\text{) x average thickness (mm) = consumption (kg)}$$

Another layer of Ceram C0 can be applied after around 16 hours up to 24 hours at +20°C. The surfaces must be clean, dry and free of oil or grease. If this interval is exceeded, the coating must be blasted. In hot sunshine, the repeat coating interval is much shorter. Take suitable measures to prevent this.

*Repeat coating intervals / subsequent coating*

Temperature	15°C	25°C	30°C
Hand dry	8 hours	4.5 hours	4 hours

*Hardening time*

**Table D-4: Hardening time**

# Ceram C0 data sheet

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Light load	1 day	13 hours	10 hours
Full load	6 days	3 days	2 days
Chemically resistant	10 days	6 days	4 days

**Table D-4: Hardening time**

## *Material needed*

- Cleaning agent for cleaning the surface
- Abrasive paper for roughening the surface (select the roughness according to the surface)
- Paintbrush for applying the coating (select the size according to the extent of the damage)
- 2 component coating (Ceram C0 + hardener)
- Vessel for mixing the two components

## *Working steps*

- 1 Lift the WILO machine from the basin, place it on a secure surface and clean it.
- 2 Thoroughly clean the damaged area with suitable cleaning agent.
- 3 Roughen the surface around the damaged area.
- 4 Mix the 2 component coating (Ceram C0 + hardener) in a 4 to 1 ratio in a suitable vessel.
- 5 Wait 10 to 15 minutes.
- 6 Apply the finished Ceram C0 coating to the damaged area with a suitable paintbrush. Make sure the coating is of at least the minimum thickness: 400µm

**If you are using a combination of different Ceram types (e.g. C2+C1), please consult the manufacturer.**

- 7 After repairing the damage, let the Ceram C0 completely dry. See "Hardening time".

## *Cleaning tools*

Use a commercial solvent (acetone, alcohol or methyl ethyl ketone) to clean your tools immediately after use. Once the material has dried, it can only be removed by abrasion.

## *Storage*

Store at temperatures between 10°C and 32°C, slight deviations during transport are acceptable. The containers can be stored unopened for 12 months.

## *Safety precautions*

Before using any products, read the material DIN safety data sheet (MSDS) or the safety regulations regarding them. Observe all applicable safety regulations when working in enclosed rooms.

## E Propeller assembly

- 1 Due to the great length of the propeller, this machine is supplied and transported without a mounted propeller. This must be mounted or dismantled on the machine at the site. Once propeller assembly or dismantling has been completed, the machine can be installed, stored or transported. The following is a parts list for the various impeller designs:

Type	Item	Part	Size / No.
2 propeller	1	Propeller hub	2 propeller
	12	Hexagon head screw	M12x55 - DIN 931
	12	Self-holding bolt lock	M12 V4A
	1	VA pressure disc	Type no. 512002
	1	Disk with outer tappet	17 - DIN 432
	1	VA hexagon head bolt	M16x45 - DIN 933
	1	Round sealing ring	60x3 - DIN 3770
	2	Propeller blade	Order-related
	1	Sikaflex 11FC	Cartridge
	1	Bolt lock	5g / Loctite 2701 or 262
	1	Protective ring for the mechanical shaft seal	Type no. 194260
3 propeller	1	Propeller hub	3 propeller
	18	Hexagon head screw	M12x55 - DIN 931
	18	Self-holding bolt lock	M12 V4A
	1	VA pressure disc	Type no. 512002
	1	Disk with outer tappet	17 - DIN 432
	1	VA hexagon head bolt	M16x45 - DIN 933
	1	Round sealing ring	60x3 - DIN 3770
	3	Propeller blade	Order-related
	1	Sikaflex 11FC	Cartridge
	1	Bolt lock	5g / Loctite 2701 or 262
	1	Protective ring for the mechanical shaft seal	Type no. 194260

Table E-1: Parts list for propeller assembly

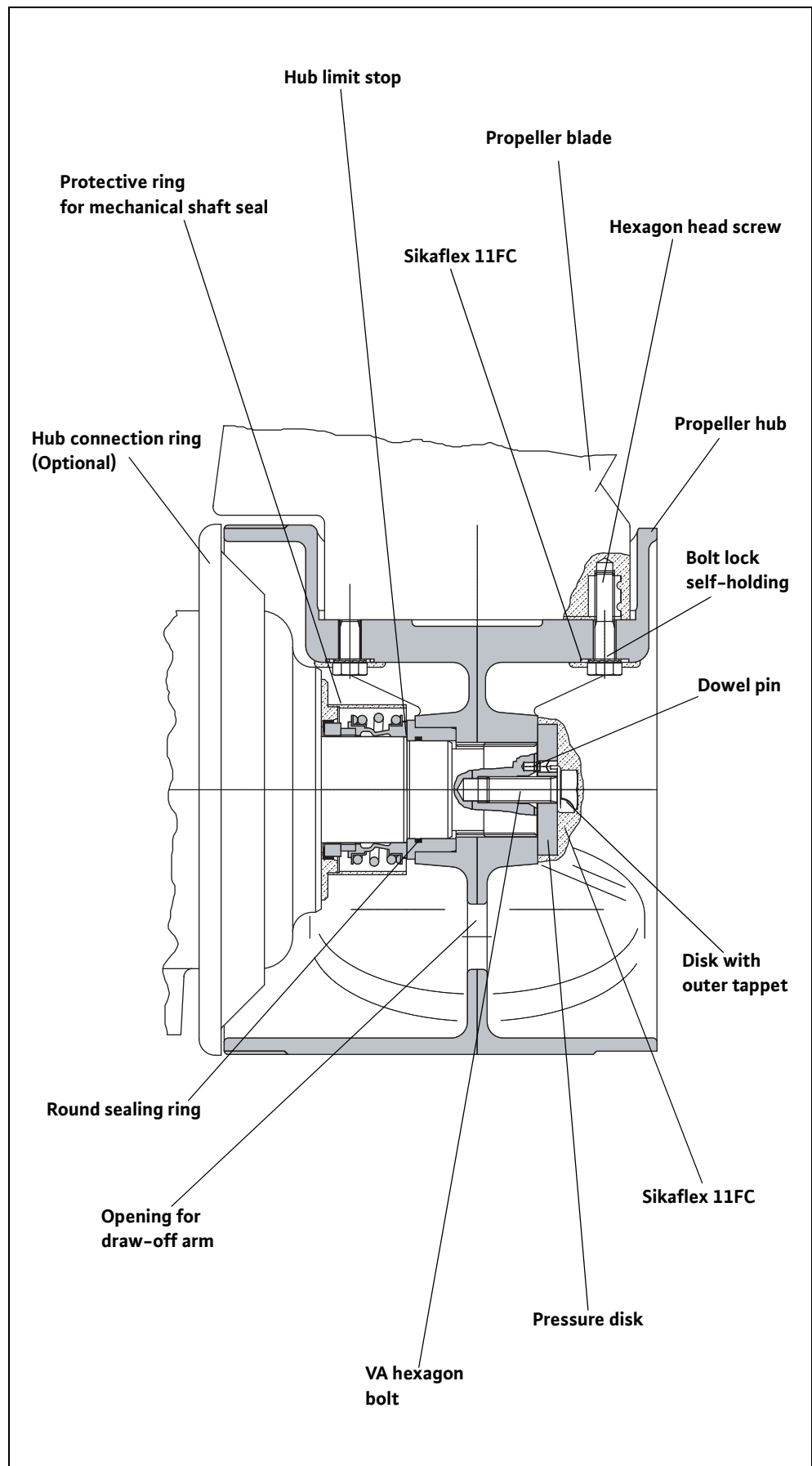


Fig. E-1: Cross-sectional drawing for hub and propeller assembly

- The hub (1) forms the connection between the mixer and the propeller blade. This has 2 or 3 connection flanges for the propeller blade depending on model. The front and back sides of the hub can be distinguished by the drill hole in the middle. The illustration shows the back with the pressed in steel bush bearing (3).

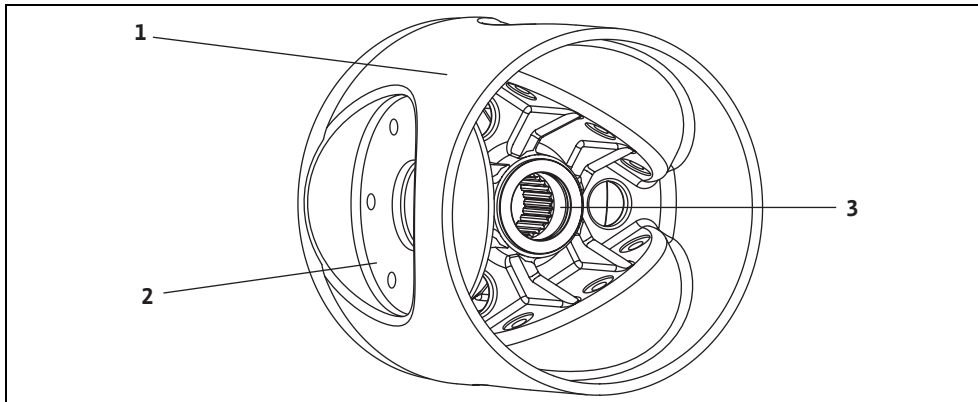


Fig. E-2: Description of the hub

- Place the hub (1) with the rear side facing up on a suitable platform. The platform should not be larger than the hub as it is otherwise difficult to mount the propeller blade.

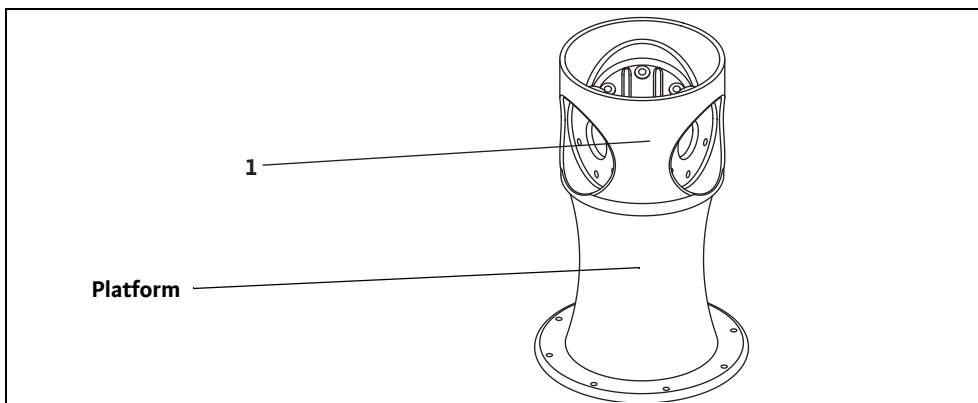


Fig. E-3: Preparing for installation

- Take the 12 or 18 M12 hexagon head bolts (4) and apply self-holding bolt lock (5).

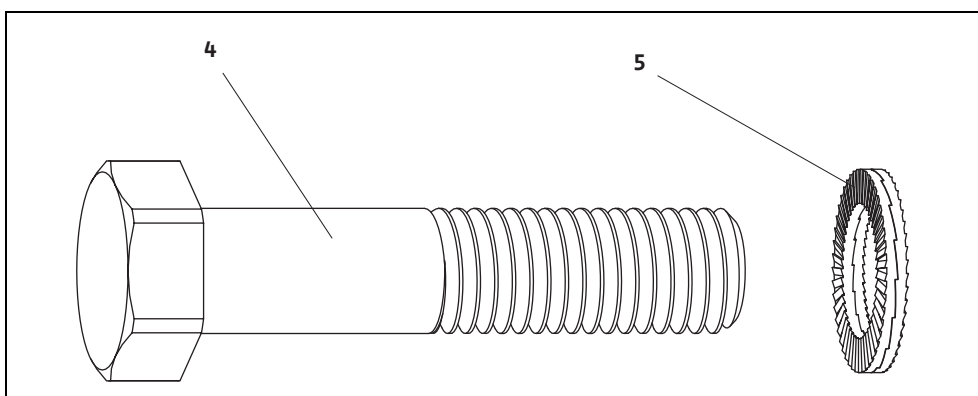


Fig. E-4: Hex bolts

- 2 or 3 propeller blades (6) are supplied depending on model. The leading and trailing edges must be taken into consideration when the propeller blades are mounted.

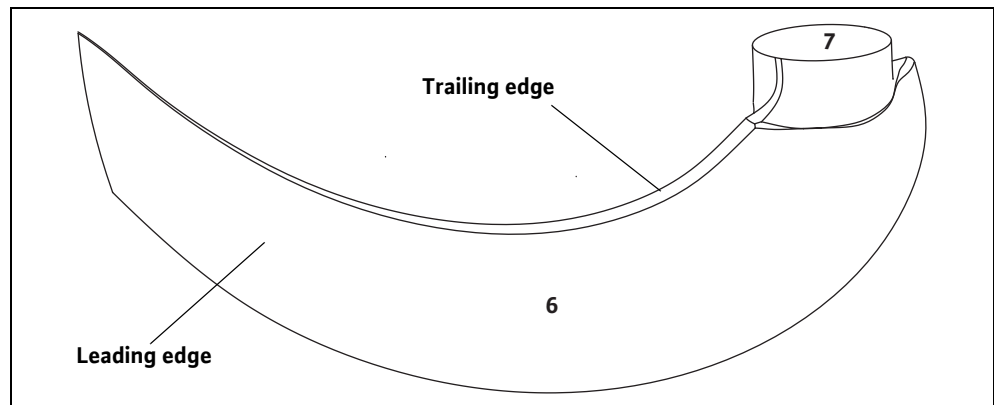


Fig. E-5: Propeller blade

- Press the propeller (6) onto the connecting flange (2) of the hub (1) and secure with 3 tipped hexagon head bolts (4). Remember that the propeller flange (7) must lie flat on the connecting flange (2) and the hexagon head bolts (4) must be tightened by hand (see "Cross-sectional drawing for hub and propeller assembly" on page E-2).

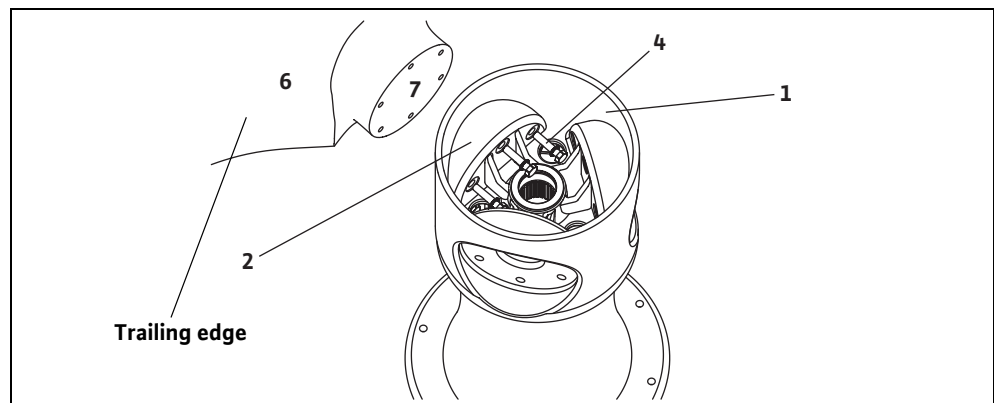


Fig. E-6: Installing the impeller blades

- Turn the hub (1) with the propeller blade (6) so that the front side faces down. Screw in another 3 tipped hexagon head bolts (4) and tighten by hand.

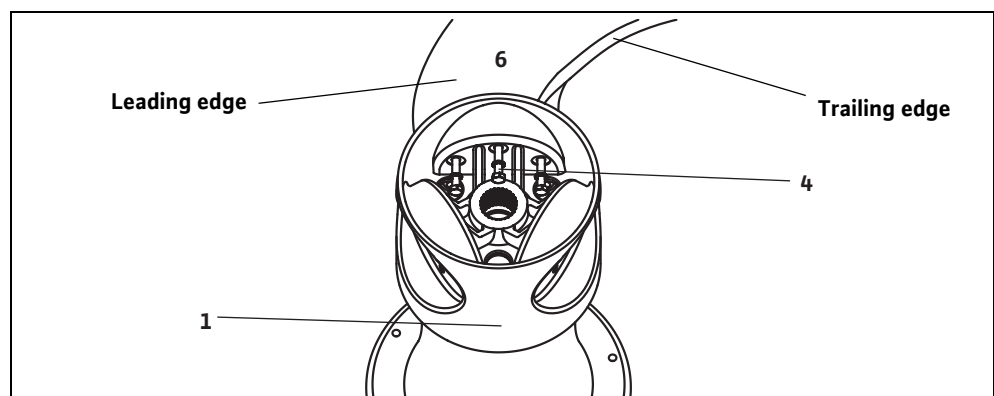
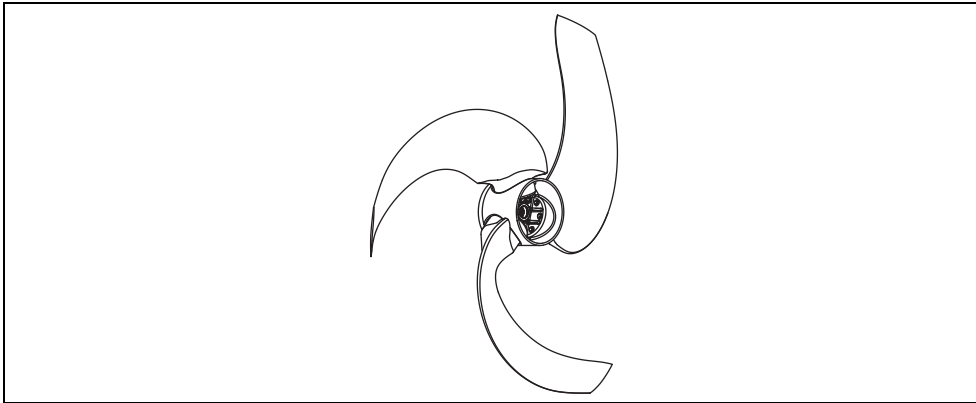


Fig. E-7: Installing the impeller blades



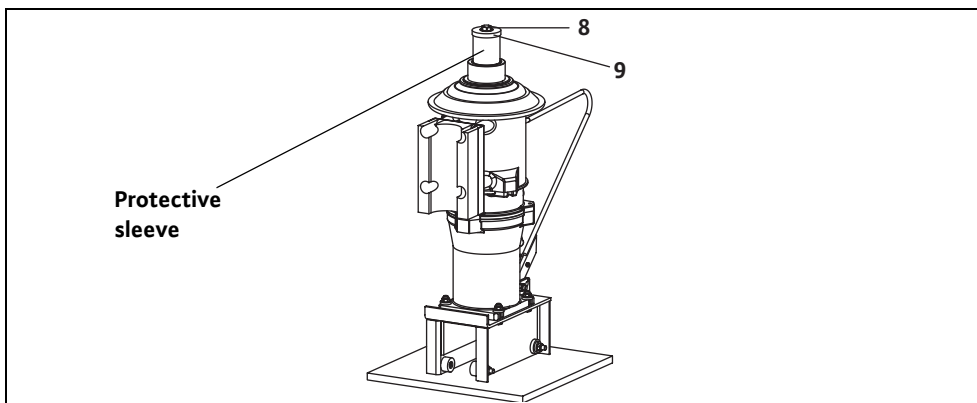
- 8 Repeat steps 5 and 6 until all propeller blades have been mounted.

**All hexagon head bolts (4) must then be tightened once with a force of 40Nm and twice with a force of 65Nm. After tightening, seal with Sikaflex 11FC.**



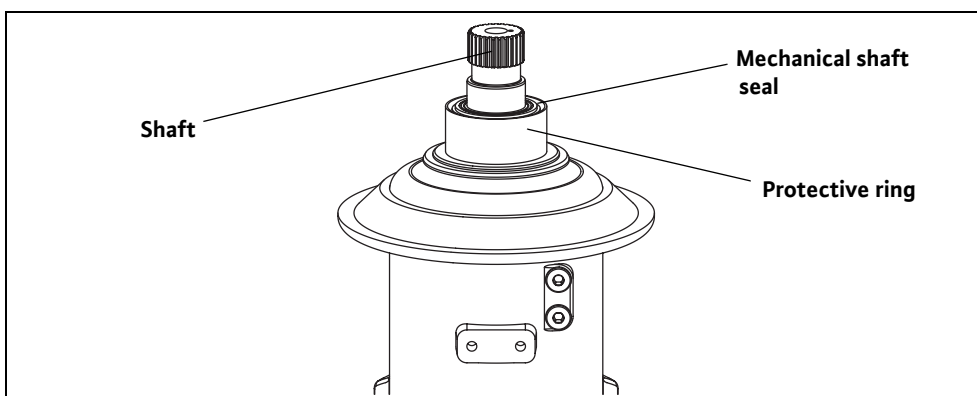
**Fig. E-8: Installing the remaining impeller blades**

- 9 Place the machine in a vertical position on a fixed support and secure it against falling. Remove the VA hexagon head bolt (8) and the pressure disc (9). Remove the protective sleeve.



**Fig. E-9: Removing the protective sleeve**

- 10 Push back the mechanical shaft seal so that it protrudes approximately 0.5mm out of the protective ring. Smear some grease (ESSO Unirex N3) on and distribute evenly (see “Cross-sectional drawing for hub and propeller assembly” on page E-2).



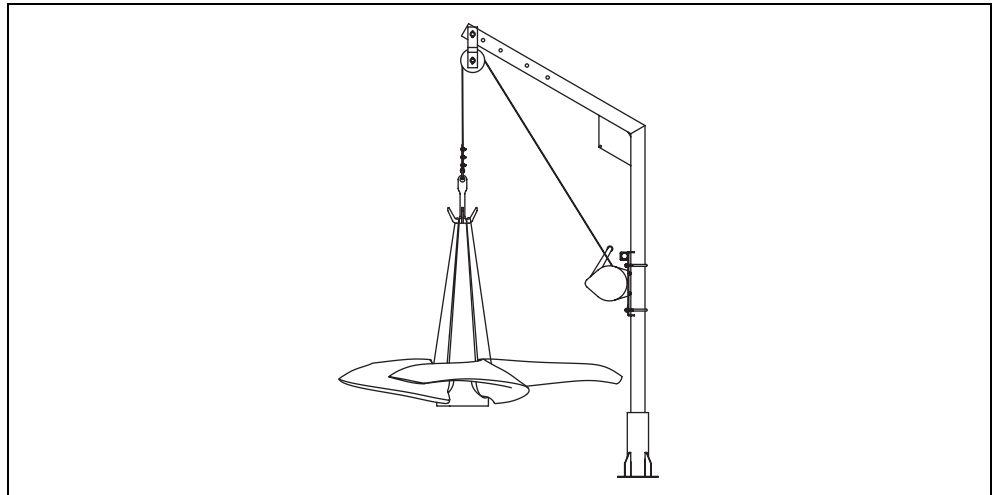
**Fig. E-10: Pushing back the sliding seal, greasing the shaft**

- 11 Lift up the complete propeller unit (hub with mounted propeller blades) with a suitable hoisting gear.

**Make sure that the back of the hub is facing down.**



**Beware of heavy and suspended loads.  
Please observe rules, guidelines, and legal requirements for working with and underneath heavy suspended loads.**

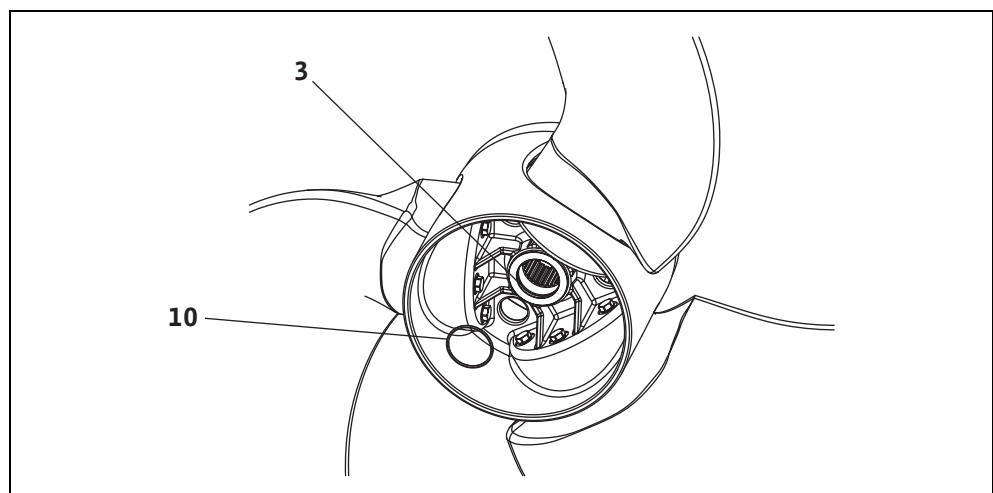


**Fig. E-11: Lifting the impeller unit**

- 12 Hub bottom view. Apply a little grease (ESSO Unirex N3) to the steel bush bearing (3) and place the round seal (10) in the groove.



**Beware of suspended loads.  
You a working with a suspended load. The load must be secured to prevent it from falling. It can cause serious injuries to personnel.**



**Fig. E-12: Hub bottom view**

- 13 Swing the entire propeller unit over the machine and lower it on to the shaft.

**Pay attention to the gearing of the shaft and the hub.**

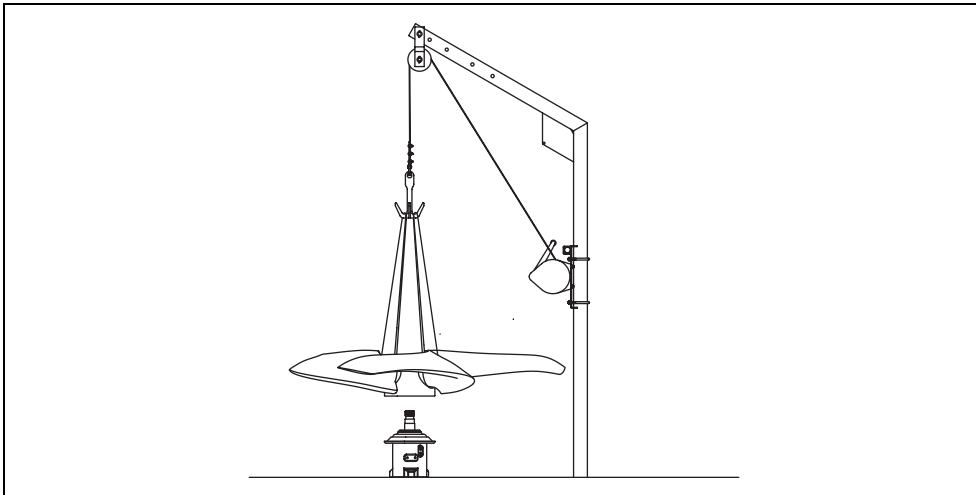


Fig. E-13: Lowering the shaft

- 14 Should a propeller not push onto the shaft on its own, then put the pressure disc in place and turn the VA hexagon head bolt (8) slowly. This pushes the hub completely onto the shaft.

**When placing the pressure disc (9) take the drill hole for the dowel pin into account.**

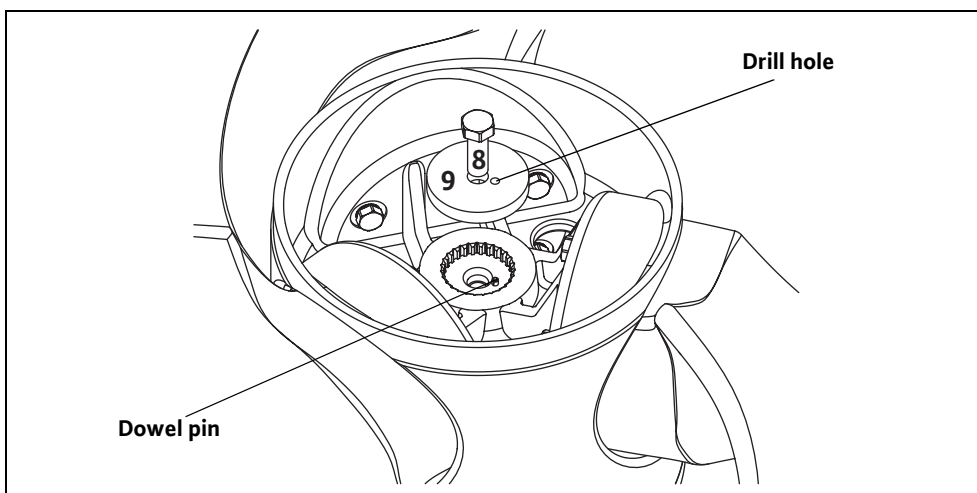


Fig. E-14: Screwing in the hex bolt

- 15 The hub and the shaft must be nearly completely flush with each other. Remove the VA hexagon head bolt (8) and the pressure disc (9). Clean the surface and the thread to remove grease residue and dirt.

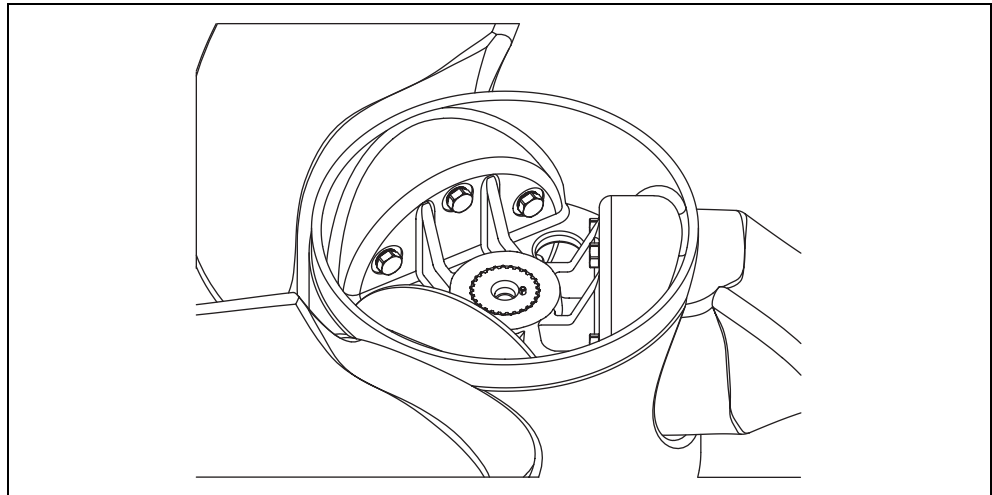


Fig. E-15: Cleaning the surface

- 16 Place the pressure disc (9) in position and remember the drill hole for the dowel pin. Place the disc with outer tappet (11) on the pressure disc (9), latch the outer tappet into the drill hole for the dowel pin. Coat the VA hexagon head bolt (8) with Loctite 2701 or 262, then screw it in and tighten with a force of 90Nm.

**To secure it, two sides of the disc (11) are bent over with a suitable tool.**

**Seal the entire assembly surface with Sikaflex 11FC.**

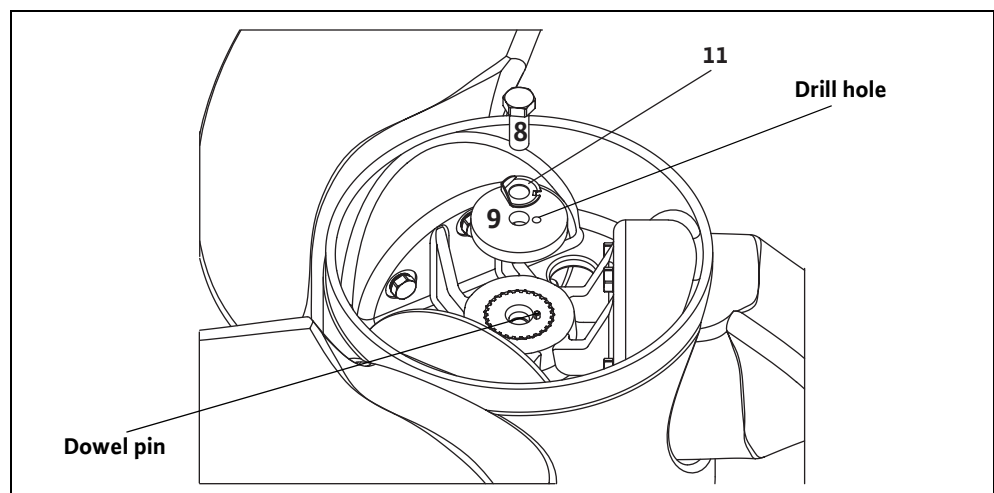


Fig. E-16: Sealing the installation face

## F AVM lowering devices...

The lowering devices consist of a guide pipe, base and wall holders, and several anchor bolts for fastening. They are made completely from stainless steel and designed for the respective machine. Fastening the devices with anchor bolts guarantees the greatest stability possible.

When assembling with a firmly installed auxiliary hoisting gear, the machine can be operated at various heights.

**All lowering devices of the type AVR... are firmly installed standing units.**

*Product description*

The lowering devices may be used for machines made by the manufacturer. Lowering devices are designed to guide the machine when it is lifted and lowered with an auxiliary hoisting gear.

**The AVU lowering device... may only be used for machines of the type TR2xx and TR3xx!**

*Proper use and fields of application*

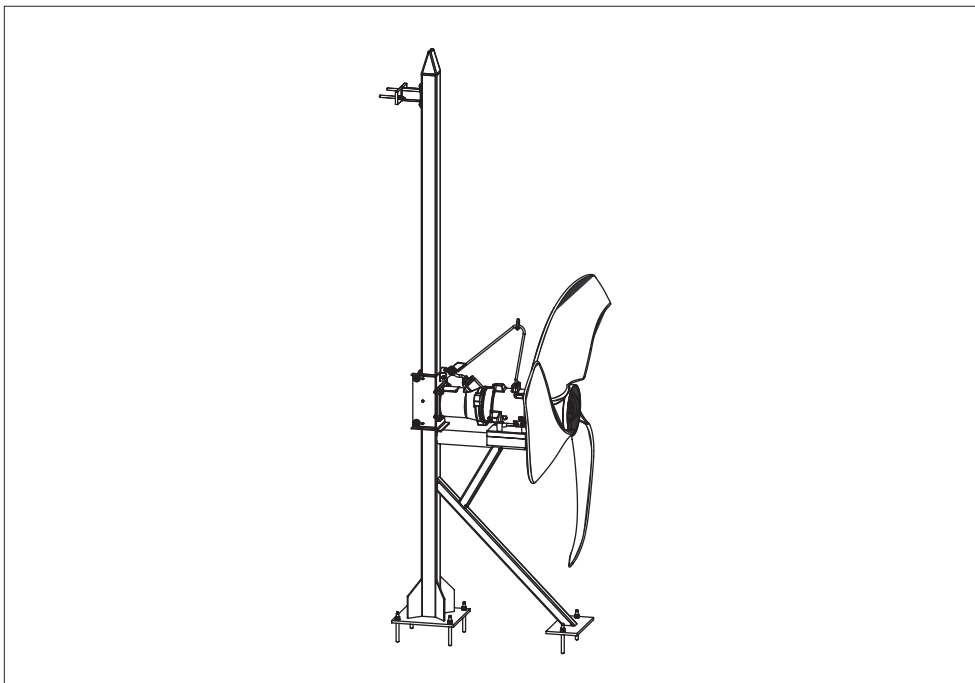


Fig. F-1: AVM lowering devices...

The individual parts of the lowering device must be checked for damage before the device is used.

**Only material in proper working order may be used.**

*Transport and storage*

The lowering device is assembled and positioned in accordance with the planning documentation, which must be present in its entirety at the installation site. The lowering devices must be positioned in such a way that the propeller cannot knock against the basin wall against components in the basin. In addition, it must be ensured that the wall holder and guide pipe are accessible when the basin is closed.

*Installation*

Make sure that the required tools are available at the assembly site. When setting the anchor bolts, also observe "Assembly Sheet For the Anchor Bolts". An anchor bolts consists of: anchor rod, hexagon nut with washer and spring washer and mortar cartridge.

**Assembly and disassembly of the lowering device may only be carried out by qualified specialists. All rules, regulations and laws intended to ensure safety are to be observed. Furthermore, all the necessary mea-**

**asures must be taken to ensure safe working practice. See also “General information”.**

### *Mounting the AVMS lowering device*

#### **Mounting the standing unit (1)**

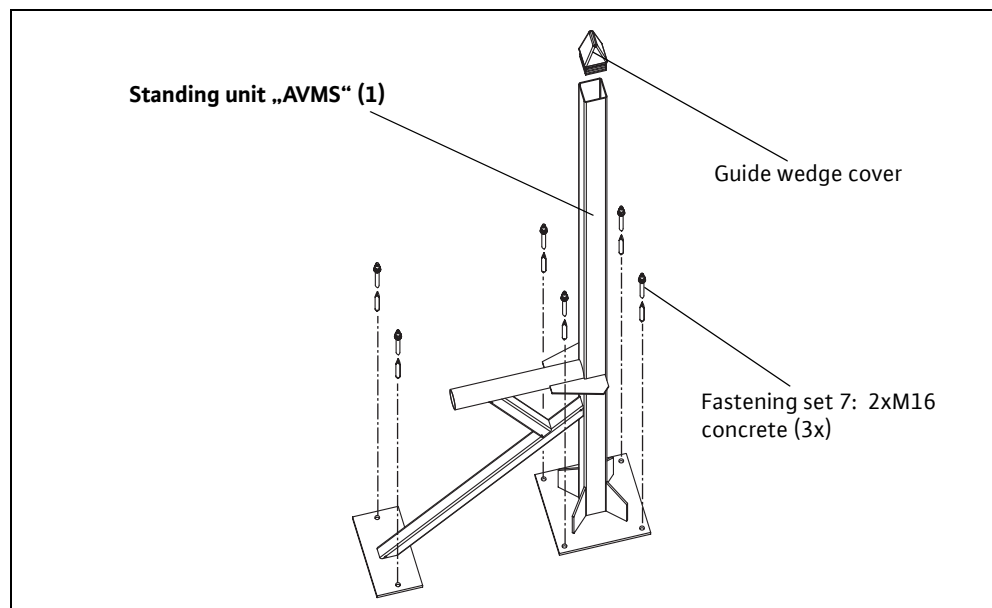
- 1 Lower the standing unit (1) with the help of a hoisting device to the bottom of the basin and then align it vertically at a suitable point in accordance with the planning guide. It may be necessary to level any uneven areas on the base.

**Loose supports are not permitted!**

- 2 Secure the standing unit (1) against falling down secure and insert the anchor bolt through the plate according to “Assembly Sheet For the Anchor Bolts”.

**When the anchor bolts have hardened, it may be necessary to remove dirt and/or resin residue.**

- 3 Fasten the standing unit (1) with the hexagon nuts, spring washers and washers. Secure the hexagon nuts with a strong bonding glue such as Loctite 2701.
- 4 For thread specifications, see table „AVMS, AVMH and AVMSH thread specifications“.



**Fig. F-2: Mounting the AVMS lowering device**

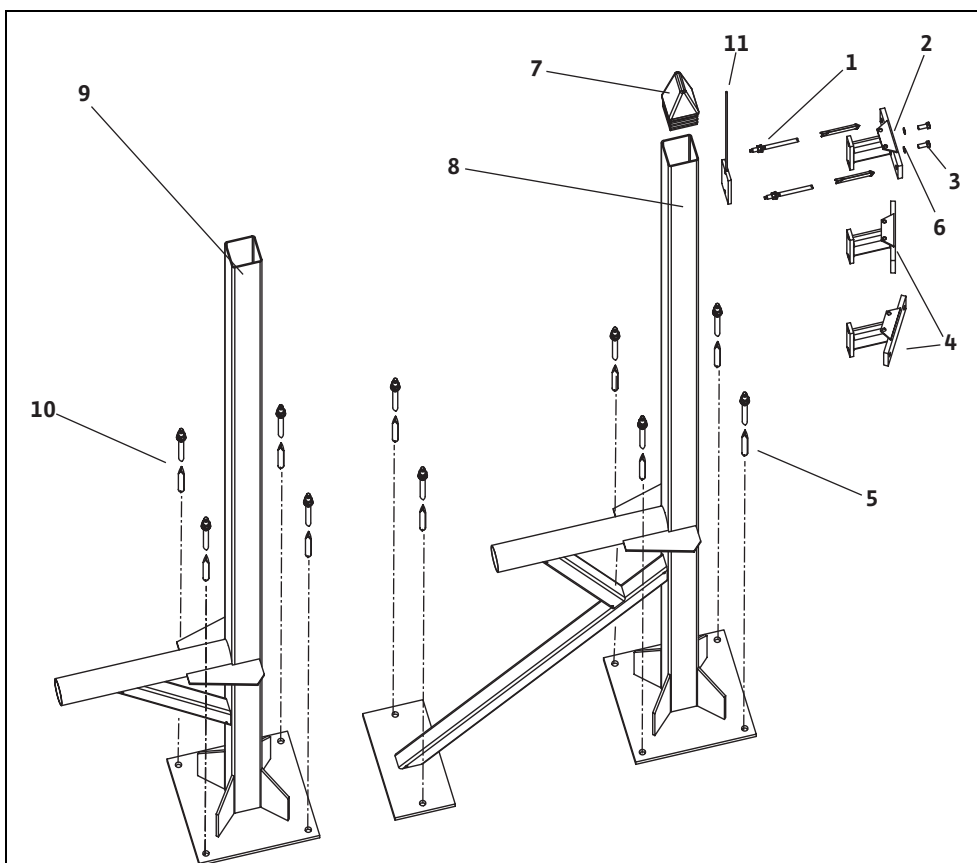
*Mounting the AVMH and AVMSH lowering devices*

AVM type	Anchor bolt (2)	Anchor bolt (3)	Hexagon bolt (6)	---
H, SH	M16	M12	M12 (with Nord Lock washer)	---
S	M16	---	---	---

**Table F-1: AVMS, AVMH and AVMSH thread specifications**

1	Fastening set 3: 2xM12 concrete or fastening set 8: 2xM12x70 steel	7	Guide wedge cover
2	<b>Wall holder „H“</b>	8	<b>Standing unit „AVMS“</b>
3	<b>Hexagonal bolt</b>	9	<b>Standing unit „AVM“</b>
4	Optional wall holder 15°, 30°, 45° inclination	10	Fastening set 1: 4xM16 concrete
5	Fastening set 7: 2xM16 concrete	11	<b>Terminal block</b>
6	Nordlock		

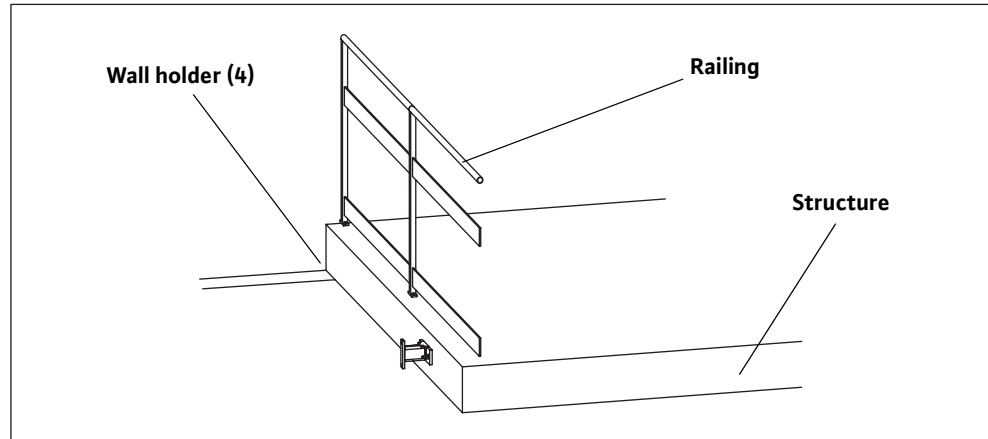
**Table F-2: Key**



**Fig. F-3: Mounting the AVMH and AVMSH lowering devices**

### **Assembling the wall holder**

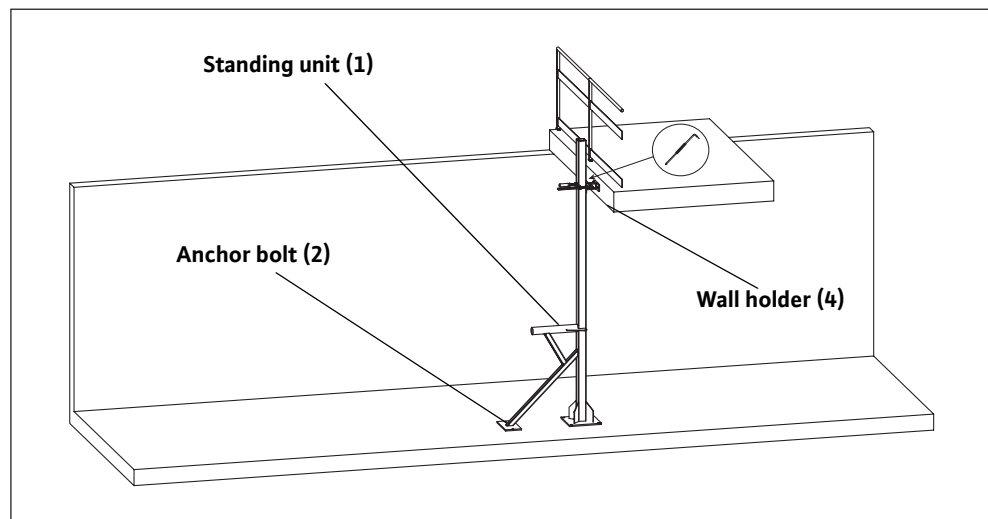
- 1 Align and mark the wall holder (4) with its rectangle flange on a suitable point on the bridge / platform. Ensure that the drill holes for the anchor bolt are correctly spaced!
- 2 Set the anchor bolts (3) according to the "Assembly Sheet For the Anchor Bolts" and allow them to harden.
- 3 Slide the wall holder (4) onto the anchor rod and fasten with washer, spring washer and nut. Tighten by hand only.



**Fig. F-4: Assembling the wall holder**

### **Adapting and cutting the guide pipe**

- 1 Lower the standing unit (1) to the bottom of the basin by means of a hoisting device and align it vertically at a proper point in accordance with the planning guide. As this is done, the standing unit (1) must lie centered against the wall holder (4).
- 2 Clamp the standing unit (1) to the wall holder (4) with suitable equipment so that the flange holes are visible.
- 3 Mark the through holes on the standing unit (1) and on the bottom of the basin.
- 4 Mark the standing unit's final length (1). We recommend a distance of 300 to 400 mm.
- 5 Detach the stand unit (1) from the wall holder and set it down horizontally. The markings will then point upward.
- 6 Detach the wall holder (4).
- 7 Set the anchor bolts (2) in the bottom of the basin and allow them to harden according to "Assembly Sheet For the Anchor Bolts".
- 8 Drill through-holes in the standing unit (1).



**Fig. F-5: Adapting and cutting the guide pipe**

- 9 Saw off the standing unit (1) at the marked point.



- 10 Reapply corrosion protection.
- 11 Saw enough off the terminal block so that the square plug can be pushed in completely. Keep a minimum distance of 20 mm to the thread!
- 12 Reapply corrosion protection.
- 13 Insert the terminal block into the standing unit (1) insert and fasten the wall holder (4) to it with the hexagonal bolts. Do not completely tighten.
- 14 Close the standing unit (1) with the square plug .

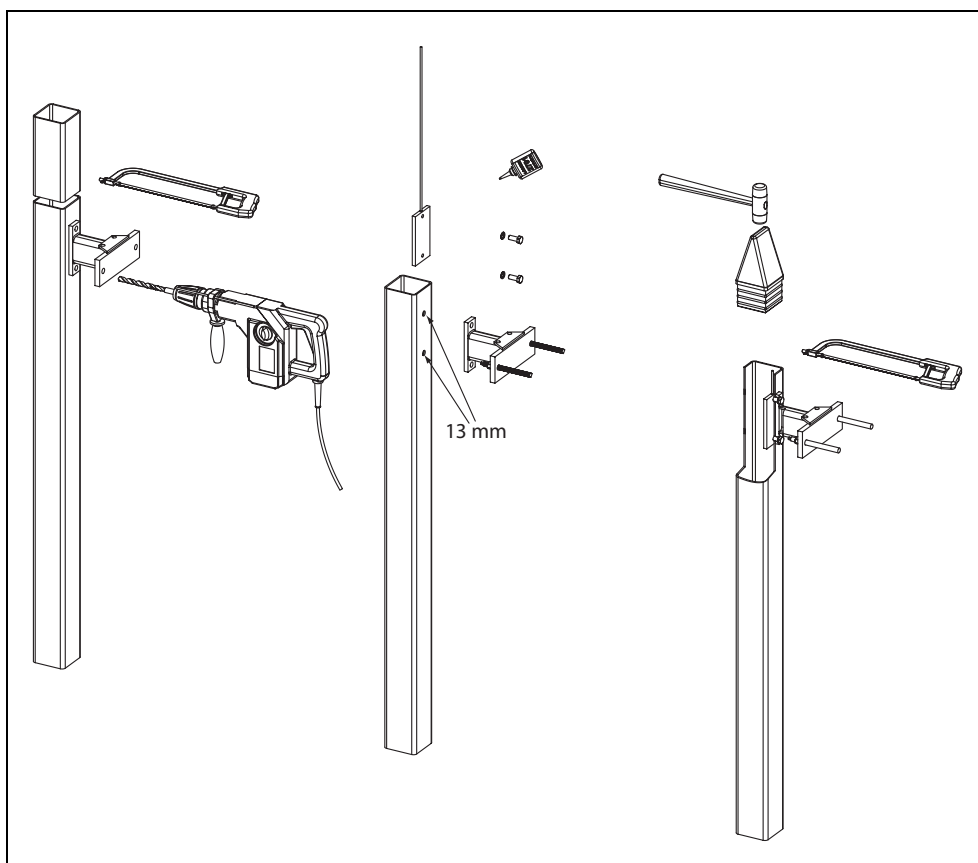
- 1 Fasten the standing unit to the auxiliary hoisting gear and lower it slowly into the basin.
- 2 Carefully attach the standing unit with wall holder onto the anchor rods in the basin bottom and in the platform / bridge. As you do this, hold the standing unit at a slight angle.
- 3 Completely attach the standing unit with the hexagon nuts, the washers and the spring washers to the bottom of the basin. Secure the hexagon nut with permanent locking glue (e.g. Loctite 2701).
- 4 Completely attach the wall holder with the hexagon nuts, the washers and the spring washers to the platform / to the bridge. Tighten the hexagon screw completely. Secure the hexagon nut with a strong bonding locking glue (e.g. Loctite 2701).

***Installing the complete lowering device***

Before assembly, check the steel structure parts for sufficient stability. The operating company is responsible for carrying out any static calculations that may be necessary.

Other parts of the equipment (such as scrapers and scraper bridges) must not be impaired by assembly. Suitable materials should be chosen to avoid electrochemical corrosion. The fixing materials should be sufficiently stable; consult the manufacturer if necessary. The screw connections must be secured with a strong bonding locking glue (for example Loctite 2701).

***Mounting the product on steel structure parts***



**Fig. F-6: Installing the complete lowering device**

## AVM lowering devices...

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### *Disassembling the lowering devices*

Disassembly is carried out in the reverse order of assembly. As you do this, remember that some of the connections have been secured with locking glue. To release these, you must heat the components (>300 °C).

### *Startup*

For the WILO machine assembly and startup, please observe the instructions in the appropriate chapters:

- Assembly: Chapter 5
- Startup: Chapter 6

### *Maintenance*

The lowering devices are to be inspected for signs of wear at periodic intervals or when the basin is empty. Furthermore, the stability of all bolted and glued connections are to be checked. Worn-out or damaged parts must be replaced immediately; loose connections must be retightened immediately.

**The lowering devices may only be mounted if they are in proper working order. Failure to observe these instructions will invalidate the manufacturer's warranty!**

## G Data Sheet – Electrical Connection

The motor must be connected only by an authorized electrician: The relevant local regulations must be observed when laying the cables and connecting the motor. The installation of motor protection equipment is mandatory. Refer to the Machine Data Sheet for the electrical values. The motor turns in the correct direction with a clockwise rotary field.

### Safety notes

The insulation resistance must not fall below 20 MOhm on commissioning. The insulation resistance must be  $\geq 2$  MOhm for further tests. The direct measuring voltage is 1000 V.

### Insulation resistance

### Monitoring equipment

Monitoring device	Wire identification	Recommended analyzing device	Threshold	Triggered condition
<b>Motor monitoring</b>				
Bimetal sensor (1st temperature circuit)	20/21	-	-	Switch off
Bimetal sensor (2nd temperature circuit)	20/21/22	-	-	Low temperature: early warning High temperature: switch off
PTC sensor (1st temperature circuit)	10/11	CM-MSS	Preset	Switch off
PTC sensor (2nd temperature circuit)	10/11/12	CM-MSS	Preset	Low temperature: early warning High temperature: switch off
PT-100 winding temperature sensor	1/2	DGW 2.01G	Depending on winding*	Switch off
PT-100 bearing temperature sensor	T1/T2	DGW 2.01G	100°C	Switch off
Pressure switch	D20/D21	-	-	Switch off
Thermo float switch	20/21	-	-	Switch off
<b>Leak monitoring</b>				
Seal chamber / motor chamber / terminal chamber monitoring	DK/DK	NIV 101	30 KOhm	Warning or switch off
Seal chamber monitoring for Ex	DK/DK	ER 143	30 KOhm	Switch off

Table G-1: \* Limit temperature: insulation class F = 140°, insulation class H = 160°, for oil motors = 110°, PVC wire = 80°, PE2 wire = 90°

## Data Sheet – Electrical Connection

Monitoring device	Wire identification	Recommended analyzing device	Threshold	Triggered condition
Leak chamber monitoring	K20/21	Coupling relay (CM-MSS or NIV 101)	-	Warning or switch off
<b>Protection device provided by customer</b>				
Bimetal relay / motor protection switch	-	-	Rated motor current	Switch off
Dry-run protection with float	-	-	-	Switch off
Dry-run protection with electrode	-	NIV 105	30 KOhm	Switch off

**Table G-1: \* Limit temperature: insulation class F = 140°, insulation class H = 160°, for oil motors = 110°, PVC wire = 80°, PE2 wire = 90°**

*When used in Ex-protected areas*

The temperature monitoring system should be connected in such a manner that if the early warning is triggered an automatic switch on can be performed. If a switch off is triggered then switching on again should only be possible if the release button has been manually activated!

*Wire designation of the connection lead*

- 1 designation
- 2 core
- 3 main cable
- 4 control cable
- 5 electrode cable
- 6 green-yellow
- 7 blue
- 8 black
- 9 brown
- 10 protective conductor
- 11 motor connection cable
- 12 motor connection cable beginning
- 13 motor connection cable end
- 14 motor connection cable low speed
- 15 motor connection cable high speed
- 16 cold type thermistor as per DIN 44081
- 17 cold type thermistor beginning
- 18 cold type thermistor high temperature per DIN 44081
- 19 cold type thermistor low temperature as per DIN 44081
- 20 bimetallic thermistor (break contact) 250V 2A cos j = 1
- 21 bimetallic thermistor beginning
- 22 bimetallic thermistor high temperature (break contact)
- 23 bimetallic thermistor low temperature (break contact)
- 24 temperature control Pt 100 beginning as per DIN 43760 B

- 25 temperature control Pt 100 end as per DIN 43760 B
- 26 leakage float (break contact) 250V 3A cos j = 1
- 27 motor overpressure switch (break contact) 250V 4A cos j = 1
- 28 thermal float (break contact) 250V 2A cos j = 1
- 29 sealing chamber control
- 30 bearing temperature control
- 31 bearing temperature control Pt 100 as per DIN 43760 B
- 32 motor – terminal and sealing chamber control
- 33 motor and terminal chamber control
- 34 thermal float and bimetallic thermistor (break contact) 250V 2A cos j = 1
- 35 Thermal float and cold type thermistors as per DIN 44081
- 36 Screening
- 37 Cold type thermistors end as per DIN 44081
- 38 Cold type thermistors tapping as per DIN 44081
- 39 white
- 40 Motor overpressure switch and cold type thermistors as per DIN 44081
- 41 Thermal float and motor over pressure switch (break contact) 250V 2A cos j = 1
- 42 Bi-metallic thermistors and motor overpressure switch (break contact) 250V 2A cos j = 1
- 43 red
- 44 motor chamber monitor
- 45 motor leak and sealing chamber monitor
- 46 motor and sealing chamber monitor
- 47 yellow
- 48 orange
- 49 green
- 50 white-black
- 51 Leak monitoring
- 52 Bimetal & Pt 100 temperature sensor start
- 53 Gray
- 54 Gray / (blue)
- 55 Cold conductor temperature sensor for winding/oil as DIN 44081

# DATENBLATT - ELEKTRISCHER ANSCHLUSS

## Sicherheitshinweise:

Der Anschluß des Motors darf nur von einer autorisierten Elektrofachkraft vorgenommen werden. Es sind bei der Leitungsverlegung und beim Anschließen des Motors die VDE- und die örtlichen Vorschriften zu beachten. Der Einbau eines Motorschutzes ist zwingend vorgeschrieben. Die elektrischen Werte sind aus dem Maschinendatenblatt zu entnehmen. Bei rechtsdrehendem Drehfeld hat der Motor die richtige Drehrichtung.

## Isolationswiderstand:

Bei Erstinbetriebnahme darf der Isolationswiderstand 20 MΩ nicht unterschreiten. Bei weiteren Prüfungen muß der Isolationswiderstand  $\geq 2$  MΩ sein. Die Meßgleichspannung ist 1000 V

## Aderbezeichnung der Anschlußleitung:

Bezeichnung <sup>1)</sup>	Ader <sup>2)</sup>	
<b>Hauptleitung <sup>3)</sup></b>		
<b>PE</b>	<b>grün-gelb <sup>6)</sup></b>	Schutzleiter <sup>10)</sup>
<b>U</b>	<b>3</b>	Motoranschlußleitung <sup>11)</sup>
<b>V</b>	<b>4</b>	
<b>W</b>	<b>5</b>	
<b>20</b>	<b>1</b>	Bi-Metalltemperaturfühler (Öffner) 250V 2A $\cos \varphi = 1$ <sup>20)</sup>
<b>21</b>	<b>2</b>	



## EC declaration of conformity

According to EC directive 98/37/EC

We hereby state that the product

Product designation: Wilo-EMU  
Type designation: TR326... + T17...  
Machine number: TMPTR2X3X

*Product definition*

fulfills the following relevant legal requirements:

EC - Machinery directive 98/37/EC  
EC - Electromagnetic compatibility directive 89/336/EEC  
EC - Low voltage directive 73/23/EEC

*EC directives*

Harmonized standards used, in particular:

DIN EN ISO 12100-1:2004  
DIN EN ISO 12100-2:2004  
DIN EN 809:1998  
DIN EN 60034-1:2005  
DIN EN 61000-6-2:2006  
DIN EN 61000-6-3:2005  
DIN EN 61000-3-2:2001  
DIN EN 61000-3-3:2006

*Harmonized standards*

Manufacturer: WILO EMU GmbH  
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Authorized representative: Volker Netsch  
Position: CE-Manager  
Date: 2008

*Manufacturer's information*

Signature:

i. V. Volker Netsch







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