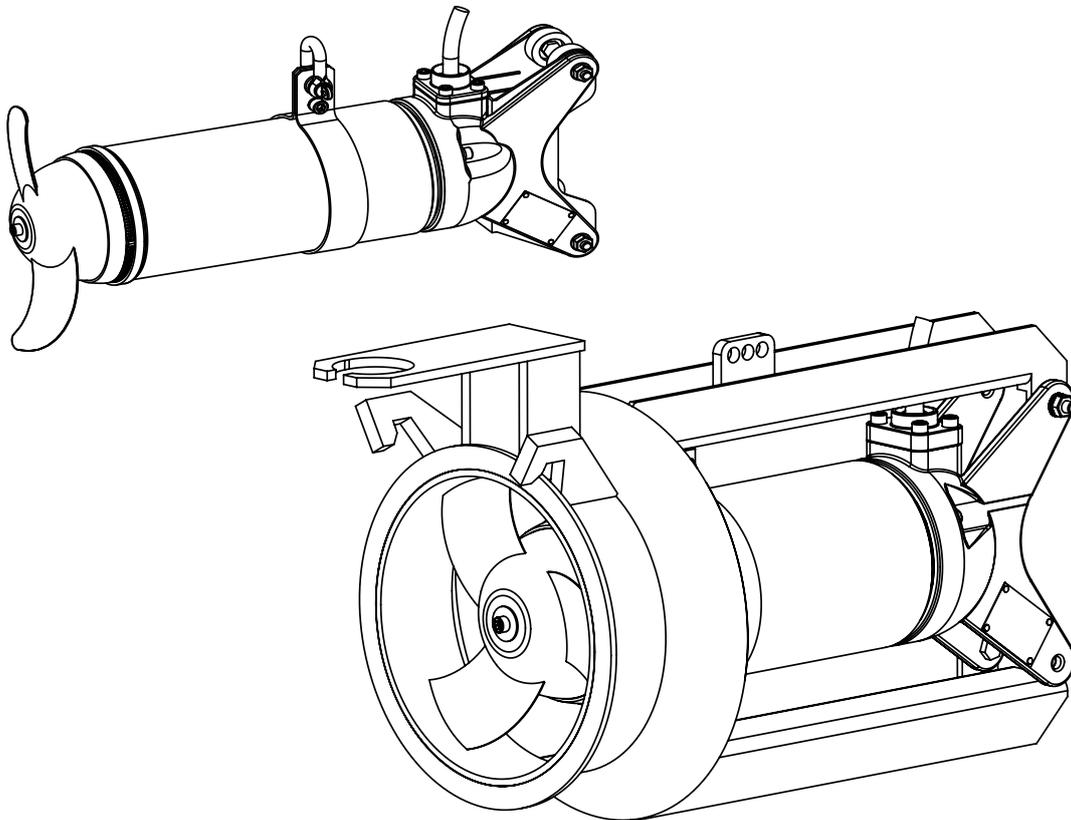


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## Submersible Mixer Type ABS RW 300 Submersible Recirculation Pump Type ABS RCP 250

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# Installation and Operating Instructions

## For Submersible Recirculation Pump RCP 250 and Submersible Mixer RW 300

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# 1 General

## 1.1 Introduction

These **Installation and Operating Instructions** and the separate booklet "**Safety Instructions for Sulzer Products Type ABS**" contain basic instructions and safety hints which must be observed during transport, installation and commissioning. For this reason it is essential that they are read by the installing technician as well as by relevant skilled operators or users. They should also be always available where the unit is installed.



Safety Instructions which might cause danger to life in case of non-observance have been specifically highlighted with the general danger symbol.



The presence of a dangerous voltage is identified with this safety symbol.



This symbol indicates the danger of an explosion occurring.

**ATTENTION** *Appears at safety hints, the non-observance of which could damage the unit or affect its functioning.*

**NOTE** *Used for important pieces of information.*

Illustrations code; e.g. (3/2). The first digit refers to the figure no. and the second digit to the position in that figure.

## 1.2 Correct usage of the products

The Sulzer products have been designed and built in accordance with the latest technology and taking into account the relevant safety regulations. However improper usage could cause a danger to life or limb of the user of a third party or cause damage or function impairment to the unit itself and other items of value.

The Sulzer units should only be used if they are in perfect technical condition taking into account all safety requirements and conscious of the need to avoid potentially dangers. The contents **of the installation and operating instructions and the safety hints** must be applied! Any other usage (abnormal usage) or usage beyond that specified will be considered as non-compliance.

The manufacturer/supplier will not accept any responsibility for damage due to this. The risk is borne by the user. In case of doubt the entire scope of the planned application must be approved by **Sulzer Pump Solutions (Kunshan) Co, Ltd.**

In the case of any faults arising, the Sulzer units should immediately be taken out of use and secured. The fault should be immediately rectified, or if necessary, contact your Sulzer Service Centre.

## 1.3 Application restrictions of RW / RCP

The RW 300 can be supplied both in standard and in explosion-proof versions (ATEX II 2G Ex h db IIB T4 Gb) for 50 Hz according to the standards EN ISO 12100:2010, EN 809:1998 + A1:2009 + AC:2010, EN 60079-0:2012 + A11:2018, EN 60079-1:2014, EN ISO 80079-36, EN ISO 80079-37.

**Limitations:** The ambient temperature range is 0 °C to + 40 °C (32 °F to 104 °F)  
Immersion depth maximum 20 m / ( 65 ft)

**ATTENTION** *In special cases an immersion depth greater than 20 m / 65 ft is possible. However, the maximum number of starts according to the motor datasheet may not be exceeded. In order to do this you need the written approval from the manufacturer Sulzer.*



**Pumping of flammable or explosive liquids with these pumps is not allowed!**



**Only explosion-proof executions may be used in hazardous areas!**

**ATTENTION** *Leakage of lubricants could result in pollution of the medium being pumped.*

## Operation of RW 300 Ex:

In hazardous areas care must be taken that during switching on and operation of the unit it is submerged or under water. Other types of operation e.g. snore operation or dry running are not allowed!

**ATTENTION** *RW 300 with Ex h d IIB T4 approval is not equipped with a DI in the oil chamber.!*

The temperature monitoring of the RW 300 Ex has to be carried out by bimetallic temperature limiters or thermistors according to DIN 44 081-150 connected to a suitable release device which is certified in accordance with EC directive 2014/34/EU.

### Operation of RW 300 Ex with frequency inverter:

Motors must have direct thermal protection devices fitted. These consist of temperature sensors (PTC DIN 44081-150) embedded in the windings. These must be connected to a suitable release device which is certified in accordance with EC directive 2014/34/EU.

Machines designated as Ex machines may never, without exception, be operated using a mains frequency that is greater than the maximum of 50 Hz or 60 Hz as indicated on the nameplate.

**ATTENTION** *Repair work on explosion-proof motors may only be carried out in authorized workshops by qualified personnel using original parts supplied by the manufacturer. Otherwise the Ex-approvals are no longer valid. All Ex-relevant components and dimensions can be found in the modular workshop manual and the spare parts list.*

**ATTENTION** *After repair work in unauthorized workshops by unqualified personnel the Ex approvals are no longer valid. After such repair the unit must not be operated in hazardous areas. The Ex nameplate has to be removed.*



## 1.4 Application areas

### 1.4.1 Application areas RW

The ABS submersible mixer RW 300, with a water pressure-tight encapsulated submersible motor, is a high class quality product with the following range of applications in municipal treatment plants, in industry and in agriculture:

- Mixing
- Stirring
- Agitation

### 1.4.2 Application areas RCP

The ABS submersible recirculation pump RCP 250 is fitted with a water pressure tight encapsulated motors and is a quality product suitable for use in the following areas:

- Pumping and recirculation of active sludge in treatment plants with nitrogen removal (nitrification/denitrification).
- Pumping of rain and surface water.

## 1.5 Nameplate

We recommend that you record the data from the original nameplate *Figure 1* so that you can refer to the data at any time.

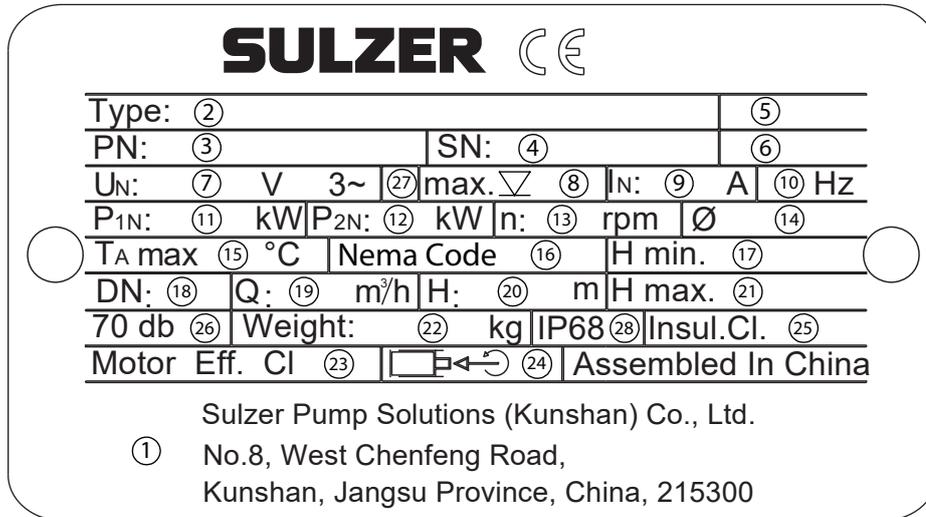


Figure 1: Nameplate

## Legend

- |                                    |   |
|------------------------------------|---|
| 1 Address                          | 15 Max. ambient temperature [flexible unit] |
| 2 Type designation                 | 16 Nema Code Letter (only at 60 Hz)         |
| 3 Art. no.                         | 17 Min. pumping height                      |
| 4 Serial number                    | 18 Nominal width                            |
| 5 Order number                     | 19 Pumping quantity                         |
| 6 Year of manufacture [month/year] | 20 Pumping height                           |
| 7 Nominal voltage                  | 21 Max. pumping height                      |
| 8 Max. immersion depth             | 22 Weight (without attached parts)          |
| 9 Nominal current                  | 23 Motor efficiency class                   |
| 10 Frequency                       | 24 Motor shaft direction of rotation        |
| 11 Power (consumption)             | 25 Insulation Class                         |
| 12 Power (output)                  | 26 Sound level                              |
| 13 Rotation speed                  | 27 Phase connection                         |
| 14 Propeller Ø                     | 28 Protection method                        |

**NOTE** In all communication please state type of the unit, item and serial number.

## 1.6 Tightening torque

Tightening torque for Sulzer stainless steel screws A4-70:							
Thread	M6	M8	M10	M12	M16	M20	M24
Tightening torque	6.9 Nm	17 Nm	33 Nm	56 Nm	136 Nm	267 Nm	460 Nm

### 1.6.1 Fitting position of the Nord-Lock® securing washers

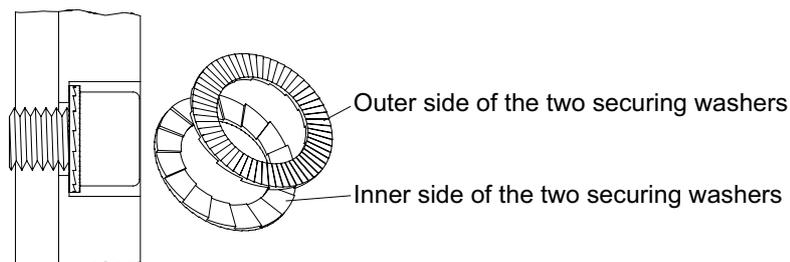


Figure 2: Correct fitting position of the Nord-Lock® securing washers

## 2.0 Technical data

The maximum noise level of the units of this series is  $\leq 70$  dB(A). In some types of installation it is possible that the noise level of 70 dB(A) or the measured noise level will be exceeded.

**ATTENTION** The maximum fluid temperature for continuous operation is 40 °C / 104 °F for a submerged unit.

### 2.1 Technical data RW 300

	Mixer type	Propeller			Motor type	Motor						Installation					
		Propeller diameter	Speed	Version with flow ring		Rated power input P <sub>1</sub>	Rated power output P <sub>2</sub>	Starting: Direct (D.O.L.)	Starting: Star/Delta	Rated current	Starting current	Temperature monitoring	Seal monitoring	Ex	Guide tube □ 60	Total weight (without flow ring)	Total weight (with flow ring)
		[mm]	[1/min]			[kW]	[kW]			[A]	[A]					[kg]	[kg]
50 Hz 400 V	RW 3021	300	904	○	A 15/6	2.21	1.5	●	-	4.6	16.8	●	●	○	●	47	53
	RW 3022	300	904	○	A 15/6	2.21	1.5	●	-	4.6	16.8	●	●	○	●	47	53
	RW 3031	300	904	○	A 15/6	2.21	1.5	●	-	4.6	16.8	●	●	○	●	47	53
	RW 3032	300	894	○	A 28/6	4.09	2.8	●	-	8.4	30.4	●	●	○	●	51	57
	RW 3033	300	894	○	A 28/6	4.09	2.8	●	-	8.4	30.4	●	●	○	●	51	57
	RW 3034	300	894	○	A 28/6	4.09	2.8	●	-	8.4	30.4	●	●	○	●	51	57
60 Hz 460 V	RW 3021	300	1111	○	A 17/6	2.36	1.7	●	-	4.3	15.5	●	●	-	●	47	53
	RW 3022	300	1111	○	A 17/6	2.36	1.7	●	-	4.3	15.5	●	●	-	●	47	53
	RW 3031	300	1097	○	A 32/6	4.4	3.2	●	-	8.8	24.8	●	●	-	●	51	57
	RW 3032	300	1097	○	A 32/6	4.4	3.2	●	-	8.8	24.8	●	●	-	●	51	57

P<sub>1</sub> = Power input. P<sub>2</sub> = Power output. ● = Standard. ○ = Option. Cable type: 1 x 7G 1.5. 10 m cable with free cable ends as standard.

### 2.2 Technical data RCP 250

	RCP hydraulics type	Propeller				Motor type	Motor						Total weight (Complete unit)	
		Propeller diameter	Propeller speed	H <sub>max</sub>	Q <sub>max</sub>		Rated input power P <sub>1</sub>	Rated motor power P <sub>2</sub>	Starting: Direct (D.O.L.)	Rated current	Starting current	Temperature monitoring		Seal monitoring
		[mm]	[1/min]	[m]	[l/s]		[kW]	[kW]		[A]	[A]			[kg]
50 Hz 400 V	RCP 2533	246	904	1,1	85	A 15/6	2,21	1,5	●	4,6	16,8	●	●	61
	RCP 2534	246	894	1,6	120	A 28/6	4,09	2,8	●	8,4	30,4	●	●	66
	RCP 2535	246	894	1,8	160	A 28/6	4,09	2,8	●	8,4	30,4	●	●	66
60 Hz 460 V	RCP 2533	246	1111	1,1	100	A 17/6	2,36	1,7	●	4,3	15,5	●	●	61
	RCP 2534	246	1097	1,6	145	A 32/6	4,39	3,2	●	8,8	24,8	●	●	66
	RCP 2535	246	1097	1,4	180	A 32/6	4,39	3,2	●	8,8	24,8	●	●	66

P<sub>1</sub> = Power input. P<sub>2</sub> = Power output. ● = Standard. ○ = Option. Cable type: 1 x 7G 1.5. 10 m cable with free cable ends as standard.

**NOTE** Data applies also for versions with flow ring. Other voltages available on request.

### 3.0 Dimensions (mm)

#### 3.1 Dimensions RW 300

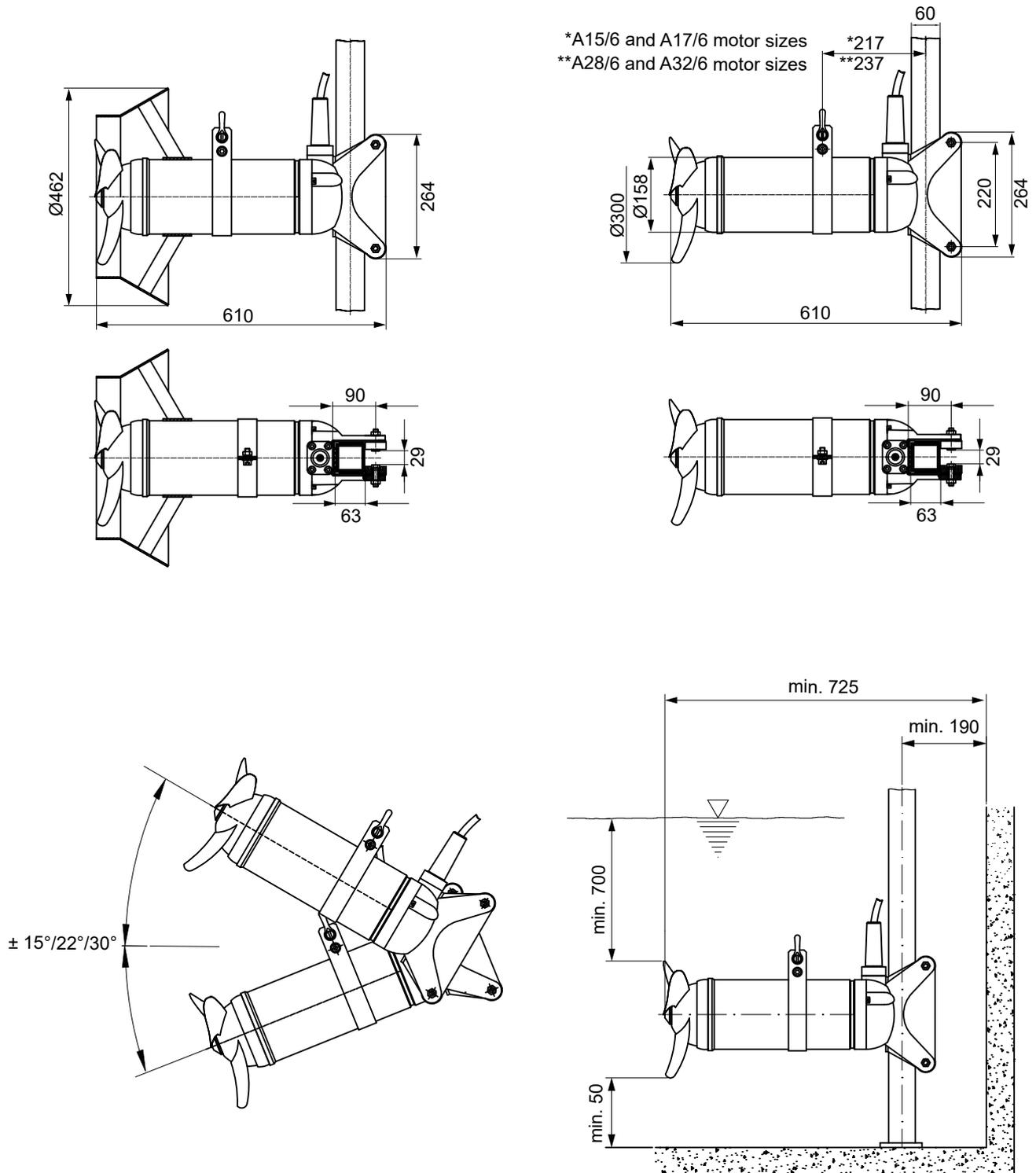


Figure 3: Dimensions RW 300

### 3.2 Dimension RCP 250

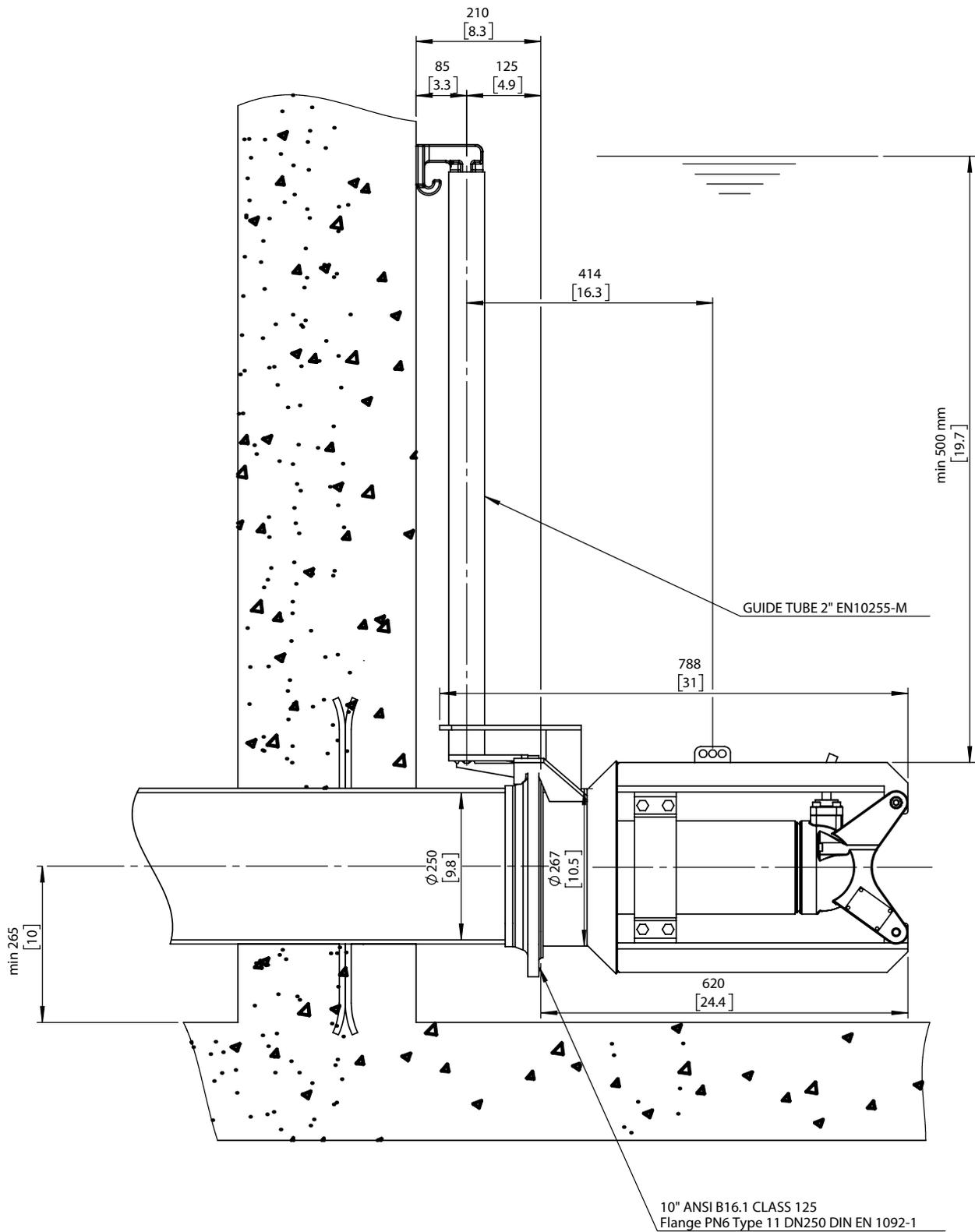


Figure 4: RCP 250

**NOTE**

The weights of the units can be obtained from the nameplate of the unit or from the tables in Section 2.0 Technical Data.

### 3.3 Flange dimension check RCP 250 (mm)

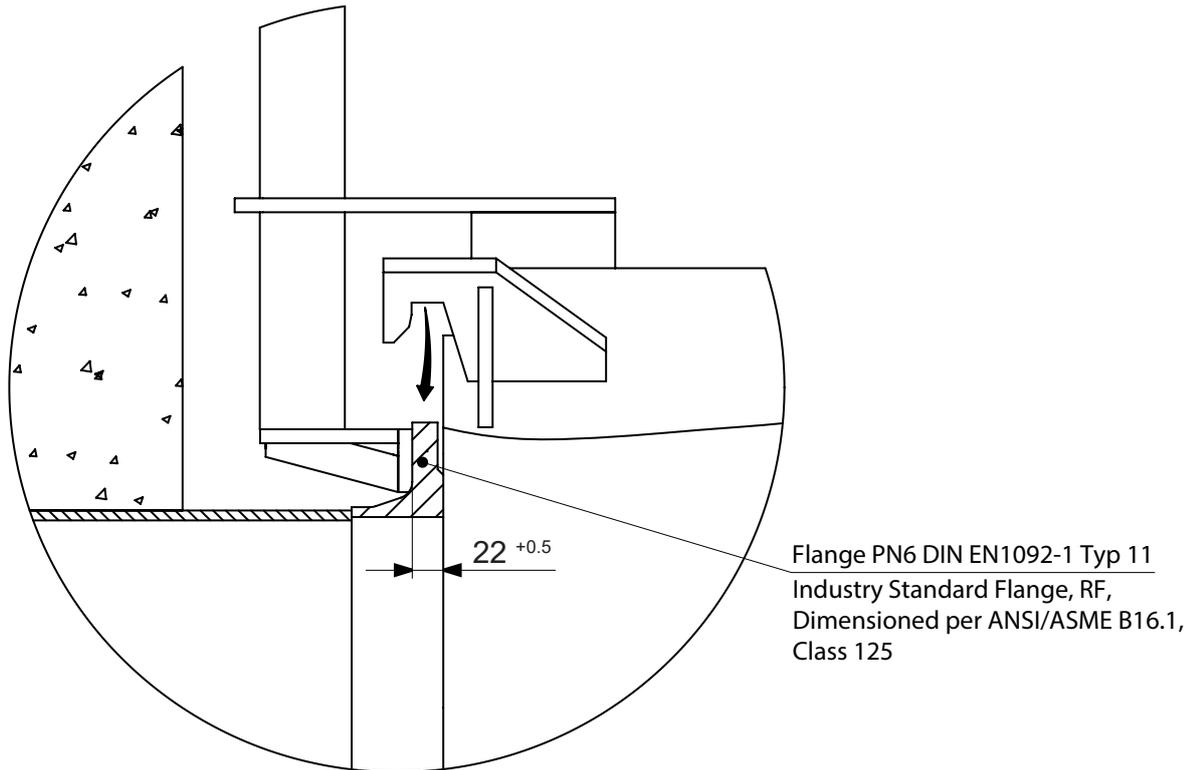


Figure 5: Flange dimensions

**ATTENTION** Before installing the recirculation pump, check the dimension of the flange. Make sure that the dimension specified in the drawing is adhered to, otherwise the flange will need to be reworked.

## 4 Safety

The general and specific health and safety hints are described in detail in the separate booklet **Safety Instructions for Sulzer Products Type ABS**. If anything is not clear or you have any questions as to safety make certain to contact the manufacturer Sulzer.

## 5 Lifting, transport and storage

### 5.1 Lifting

**ATTENTION!** *Observe the total weight of the Sulzer units and their attached components! (see nameplate for weight of base unit).*

The duplicate nameplate provided must always be located and visible close to where the pump is installed (e.g. at the terminal boxes / control panel where the pump cables are connected).

**NOTE!** *Lifting equipment must be used if the total unit weight and attached accessories exceeds local manual lifting safety regulations.*

The total weight of the unit and accessories must be observed when specifying the safe working load of any lifting equipment! The lifting equipment, e.g. crane and chains, must have adequate lifting capacity. The hoist must be adequately dimensioned for the total weight of the Sulzer units (including lifting chains or steel ropes, and all accessories which may be attached). The end user assumes sole responsibility that lifting equipment is certified, in good condition, and inspected regularly by a competent person at intervals in accordance with local regulations. Worn or damaged lifting equipment must not be used and must be properly disposed of. Lifting equipment must also comply with the local safety rules and regulations.

**NOTE!** *The guidelines for the safe use of chains, ropes and shackles supplied by Sulzer are outlined in the Lifting Equipment manual provided with the items and must be fully adhered to.*



The unit must never be raised by the power cable.

Depending on the version, the units are fitted with a lifting eyelet, to which a chain can be fastened by means of shackles for transportation, installation or removal.



Take note of the entire weight of the unit (see nameplate Figure 1). The hoist and chain must be adequately dimensioned for the weight of the unit and must comply with the current valid safety regulations as well as good technical practice must be observed.



The unit should be protected from rolling over!



The unit is prepared for transportation by placing it on an adequately strong, completely horizontal surface taking care that it cannot topple over.



Do not stay or work in the swivel area of a suspended load!

### 5.2 Transport securing devices

The motor connection cables are protected against the ingress of moisture along the cable by having the ends sealed at the works with protective covers.

**ATTENTION** *These protective covers should only be removed immediately prior to connecting the pumps electrically.*

Particular attention is necessary during storage or installation of units in locations, which could fill with water prior to laying and connection of the power cable of the motor. Please note that the cable ends, even where fitted with protective sleeves, cannot be immersed in water.

**ATTENTION** *These protective covers only provide protection against water spray or similar and are not a water tight seal. The ends of the cables should not be immersed in water, otherwise moisture could enter the connection chamber of the motor.*

**NOTE** *If there is a possibility of water ingress then the cables should be secured so that the ends are above the maximum possible flood level. Take care not to damage the cable or its insulation when doing this!*

### 5.3 Storage of the units

**ATTENTION** *The Sulzer products must be protected from weather influences such as UV from direct sunlight, high humidity, aggressive dust emissions, mechanical damage, frost etc. The Sulzer original packaging with the relevant transport securing devices (where used) ensures optimum protection of the unit. If the units are exposed to temperatures under 0 °C / 32 °F check that there is no water in the hydraulics, cooling system, or other spaces. In the case of heavy frosts, the units and cable should not be moved if possible. When storing under extreme conditions, e.g. in tropical or desert conditions suitable additional protective steps should be taken. We would be glad to advise you further.*

**NOTE** *Sulzer units do not generally require any particular maintenance during storage. After long storage periods (after approx. one year), the transportation locking device on the motor shaft (not with all versions) should be disassembled. By rotating the shaft several times by hand, new lubricating oil or, depending on the version, a small amount of coolant (which also serves to cool or lubricate the mechanical seals) is applied to the sealing surfaces, thus ensuring perfect operation of the mechanical seals. The bearings supporting the motor shaft are maintenance-free.*

## 6 Product description

### 6.1 General description

- Hydraulically optimized propeller with high wear resistance.
- The motor shaft is supported in lubricated-for-life maintenance-free ball bearings.
- The shaft is sealed on the medium side by means of a high quality mechanical seal, which is independent of direction of rotation.
- Oil chamber filled with lubricating oil (oil change not necessary).

#### Motor

- Three phase squirrel cage motor.
- Rated voltage: 400 V 3~ 50 Hz / 460 V 3~ 60 Hz.
- Other voltages available on request.
- Insulation class F = 155 °C / 311 °F. Protection type IP68.
- Medium temperature for continuous operation: + 40 °C / 104 °F.

#### Motor monitoring

- All motors are fitted with temperature monitors, which switch off the motor in the case of excessive temperatures. The sensors must be correctly wired into the control panel.

#### Seal monitoring

- The DI leakage sensor carries out the seal monitoring function and signals the ingress of moisture by means of a special electronic device (option).

#### Operation with frequency inverters

- When **suitably selected**, can be used with frequency inverters. **Observe the EMC-Directive and the installation and operating instructions of the inverter manufacturer!**

## 6.2 Structural design RCP 250

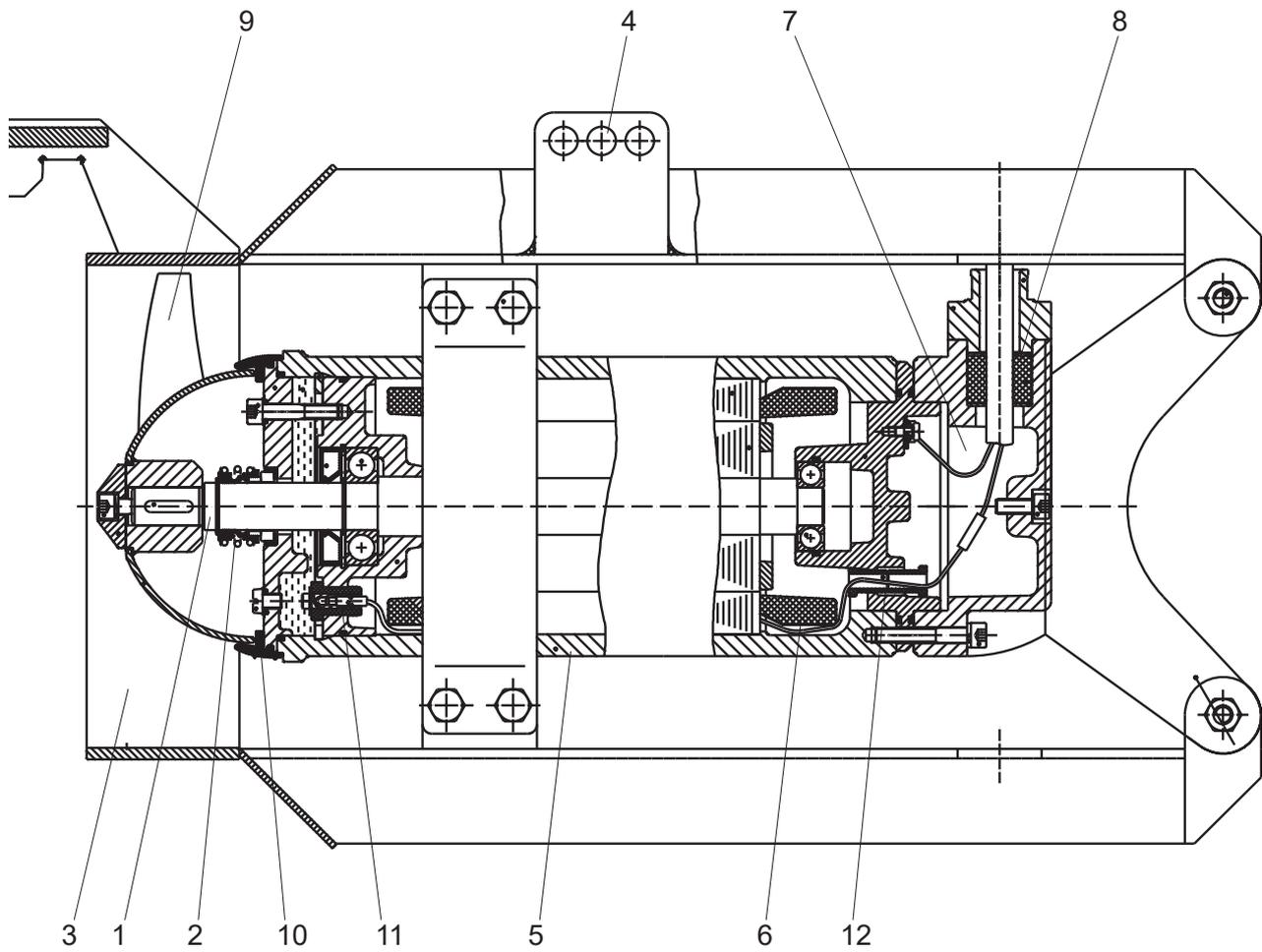


Figure 6: RCP 250

### Legend

1	Shaft unit with rotor and bearings	7	Connection chamber
2	Mechanical seal	8	Cable inlet
3	Inlet cone	9	Propeller
4	Lifting eyelet	10	SD - ring
5	Motorhousing	11	DI-electrode (seal monitor)
6	Stator	12	Sealing of motor chamber

### 6.3 Structural design RW 300

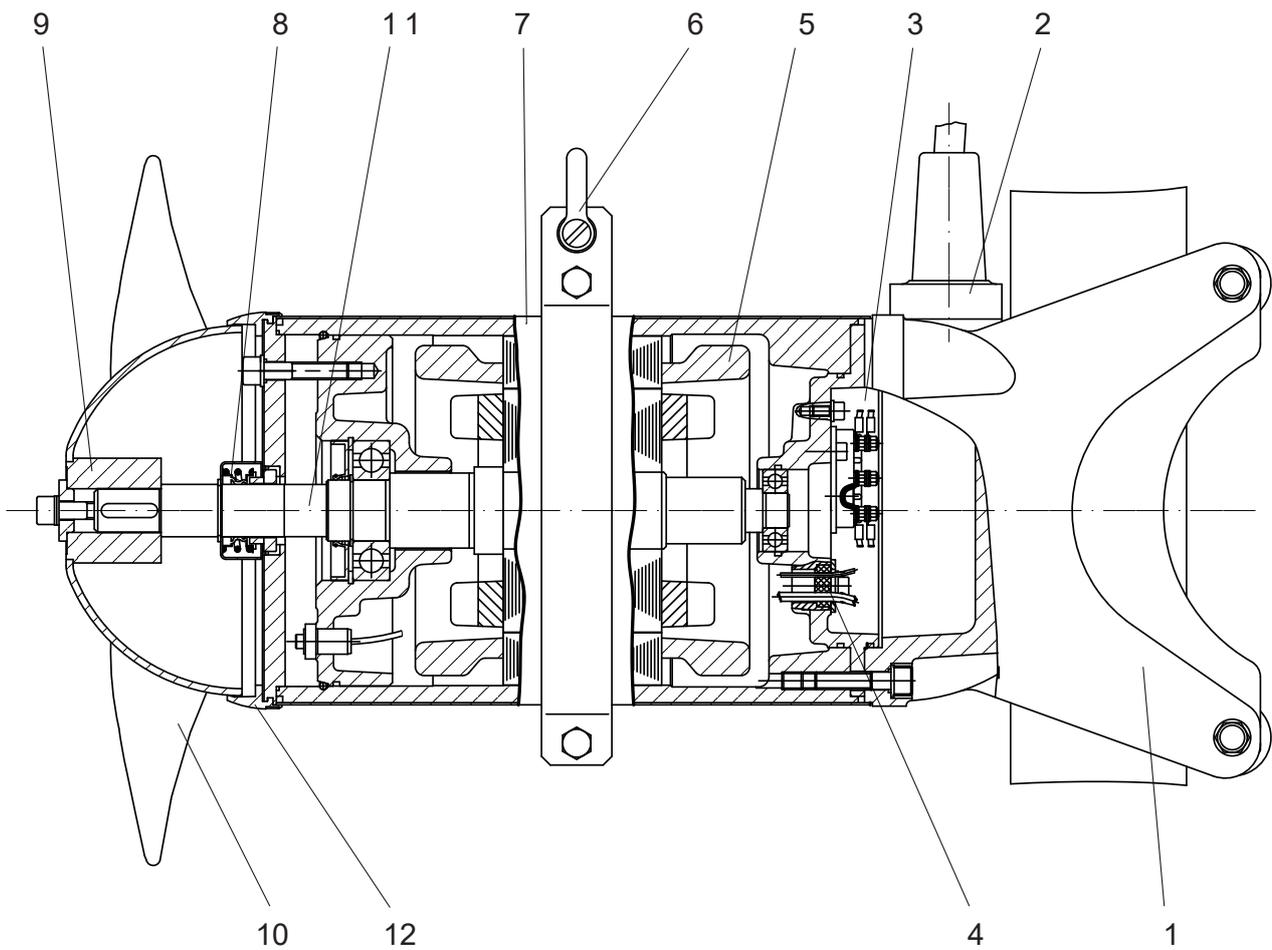


Figure 7: RW 300

#### Legend

- |   |                                   |    |                                    |
|---|-----------------------------------|----|------------------------------------|
| 1 | Bracket                           | 8  | Mechanical seal                    |
| 2 | Cable inlet                       | 9  | Propeller boss                     |
| 3 | Connection chamber                | 10 | Propeller                          |
| 4 | Sealing of the motor chamber      | 11 | Shaft unit with rotor and bearings |
| 5 | Stator                            | 12 | SD - ring                          |
| 6 | Lifting bracket with shackle      | 13 | Gear                               |
| 7 | Stainless steel covering (option) |    |                                    |

## 7 Installation



The safety hints in the previous sections must be observed!



Care must be taken that the connection cables are positioned that they cannot be caught up in the propeller blades and that they are not subjected to tension.



The electrical connection is carried out in accordance with Section 8 *Electrical connection*.

### NOTE

***We recommend that Sulzer installation accessories be used for the installation of the RCP recirculation pump and RW mixer.***



Particular attention must be paid to the safety regulations covering work in closed areas in sewage plants as well as good general technical practices.

### 7.1 Installation RCP 250

#### 7.1.1 Installation example with Sulzer lifting unit

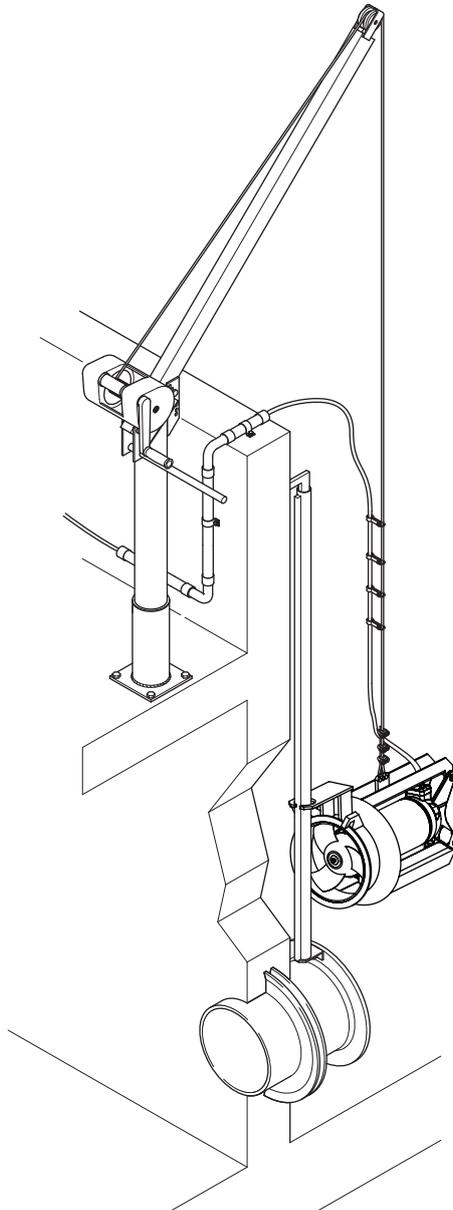


Figure 8: Installation example with Sulzer lifting unit 5 kN

### 7.1.2 Guide tube installation RCP



The safety hints in the previous sections must be observed!

#### ATTENTION

**The discharge line and the required flange DIN EN 1092-1 PN6 should be installed on site before starting the installation of the guide tube. The DIN-flange should be installed so that none of the holes in the flange are on the axis line but are symmetrically on either side of it. Ensure that the DIN flange is securely fixed in the concrete.**

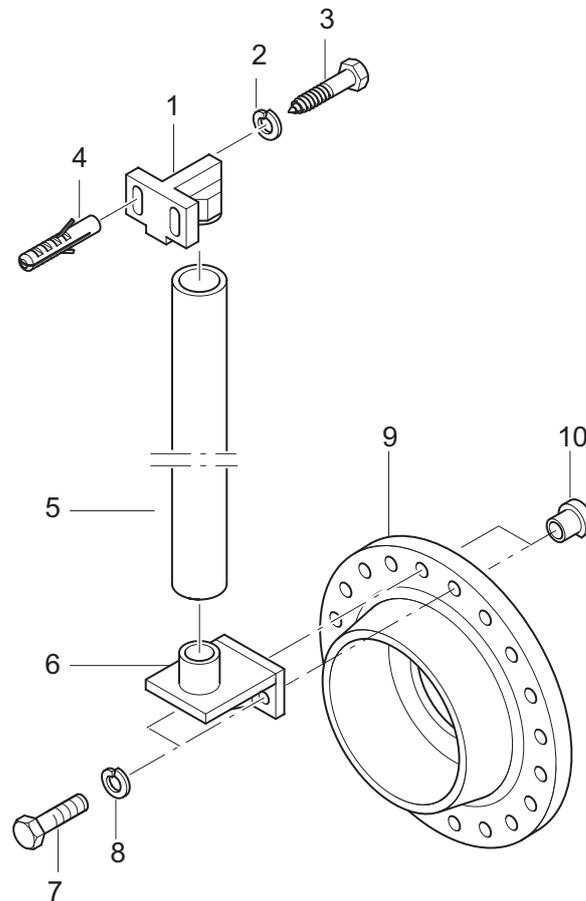


Figure 9: Guide tube installation

- Place bracket (9/6) on the DIN-flange (9/9) and fasten using hex nuts (9/7) together with spring washers (14/8) and the special nuts (9/10).

**ATTENTION**      **The flattened edge of the special nuts (9/10) must point towards the flange centre.**

- Position the tube retainer (9/1) vertically over the bracket (9/6). Mount with the aid of the wall plugs (9/4) but do not tighten yet!
- Place the guide tube (9/5) alongside the conical section of the bracket (9/6) and determine the required length. To do this measure the upper edge of the tube retainer (9/1).
- Cut the guide tube (9/5) to the required length and place it on the conical portion of the bracket (9/6).
- Press the tube retainer (9/1) into the guide tube (9/5), so that no vertical play remains. Now tighten the hex screws (9/3) using the spring washers.

### 7.1.3 Lowering of the RCP along the guide tube

To ensure the RCP will tilt enough to lower correctly on the guide tube, the angle of the pump created by the lifting hook when suspended by the hoist has to be checked prior to lowering. For this purpose, begin lifting the pump from a horizontal surface and check that the rear end of the fixing support rises 20- to 40- mm from the floor before the front end begins to lift clear (see drawing below).

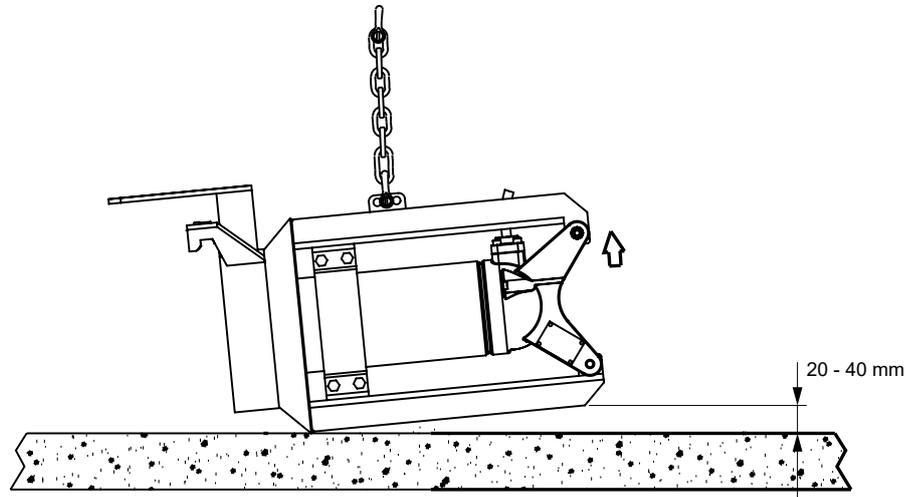


Figure 10: Checking installation angle of pump

The RCP together with the guide piece is connected into the guide tube and lowered along it until it automatically sits in its final position (see drawing below). When doing this carefully feed the power cable downwards at the same time.

**ATTENTION** *The power cable should be connected to the wire rope or chain in such a manner that it cannot become entangled in the propeller and that it is not subjected to any tension.*

After lowering of the RCP the tension of the wire rope or the chain should be released.

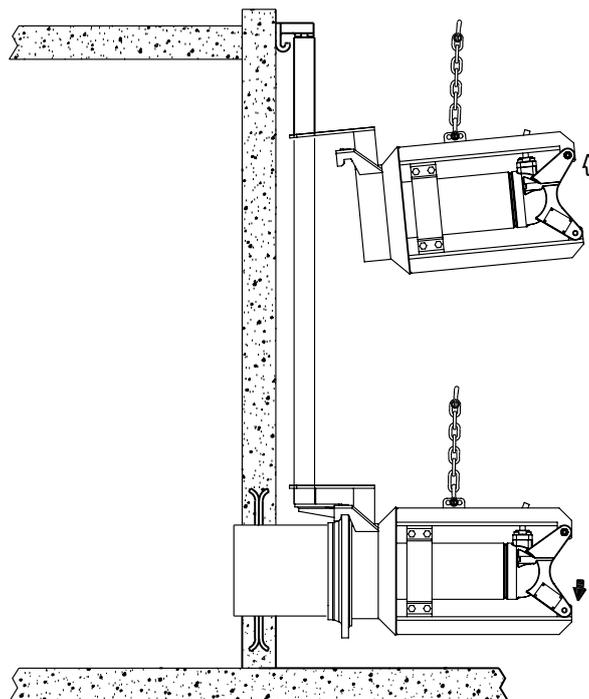


Figure 11: RCP lowering / RCP connected

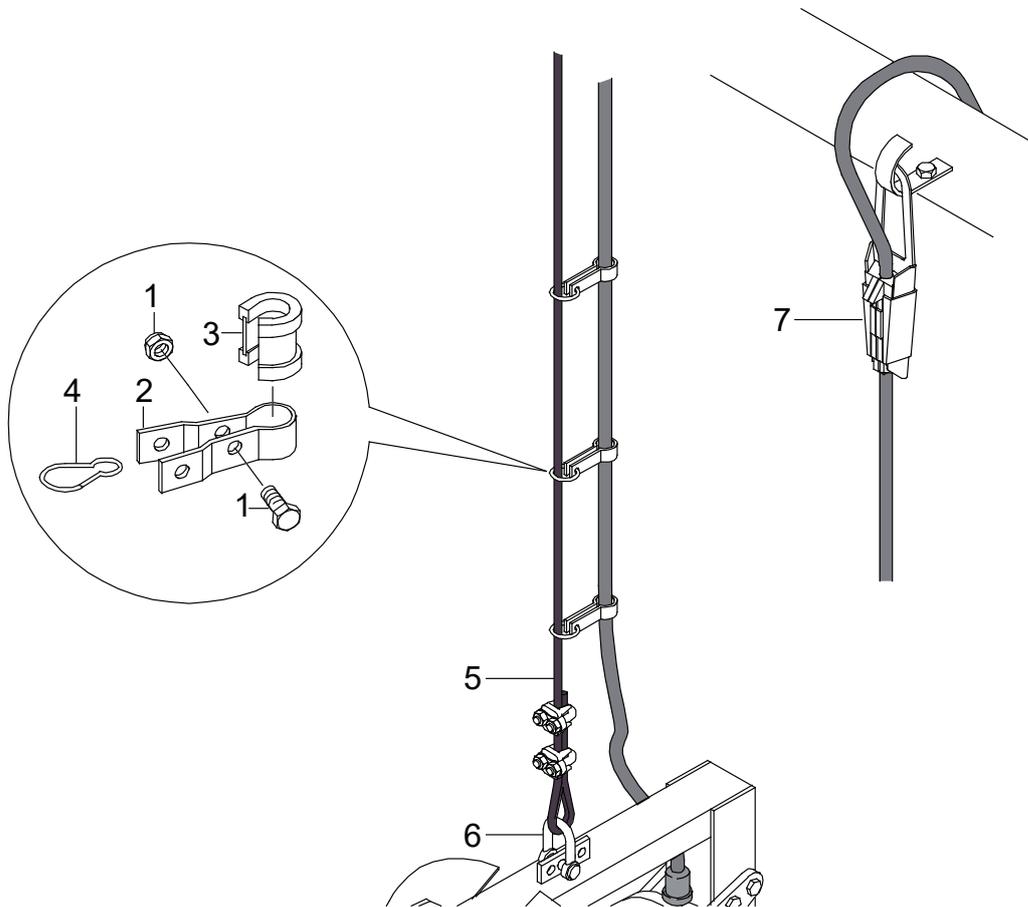
### 7.1.4 Securing and positioning of the motor connection cables of the RCP

The safety hints in the previous sections must be observed!



**NOTE**

***The cable holders described here are not supplied as part of the standard execution of the RCP.***



0551-0027

Figure 12: Securing and positioning of the motor connection cables of the RCP

- Place the cable holder (12/2) with rubber sleeve (12/3) on the connection cable close to the RCP itself and tighten using hex screw (12/1).
- Connect the snap hook (12/4) to the cable holder (12/2) and attach to the wire rope or chain.



Care must be taken that the connection cables are positioned that they cannot be caught up in the propeller blades and that they are not subjected to tension.

- Assemble all other cable holders in a similar manner. The spacing can be increased as the distance from the RCP increases.
- Hang the connection cable into the cable hook using the strain relief (12/7).



The electrical connection is carried out in accordance with Section 8 *Electrical connection*.

## 7.2 Installation RW 300

We recommend that the closed bracket be used for this type of installation (see Figure 14 closed bracket).

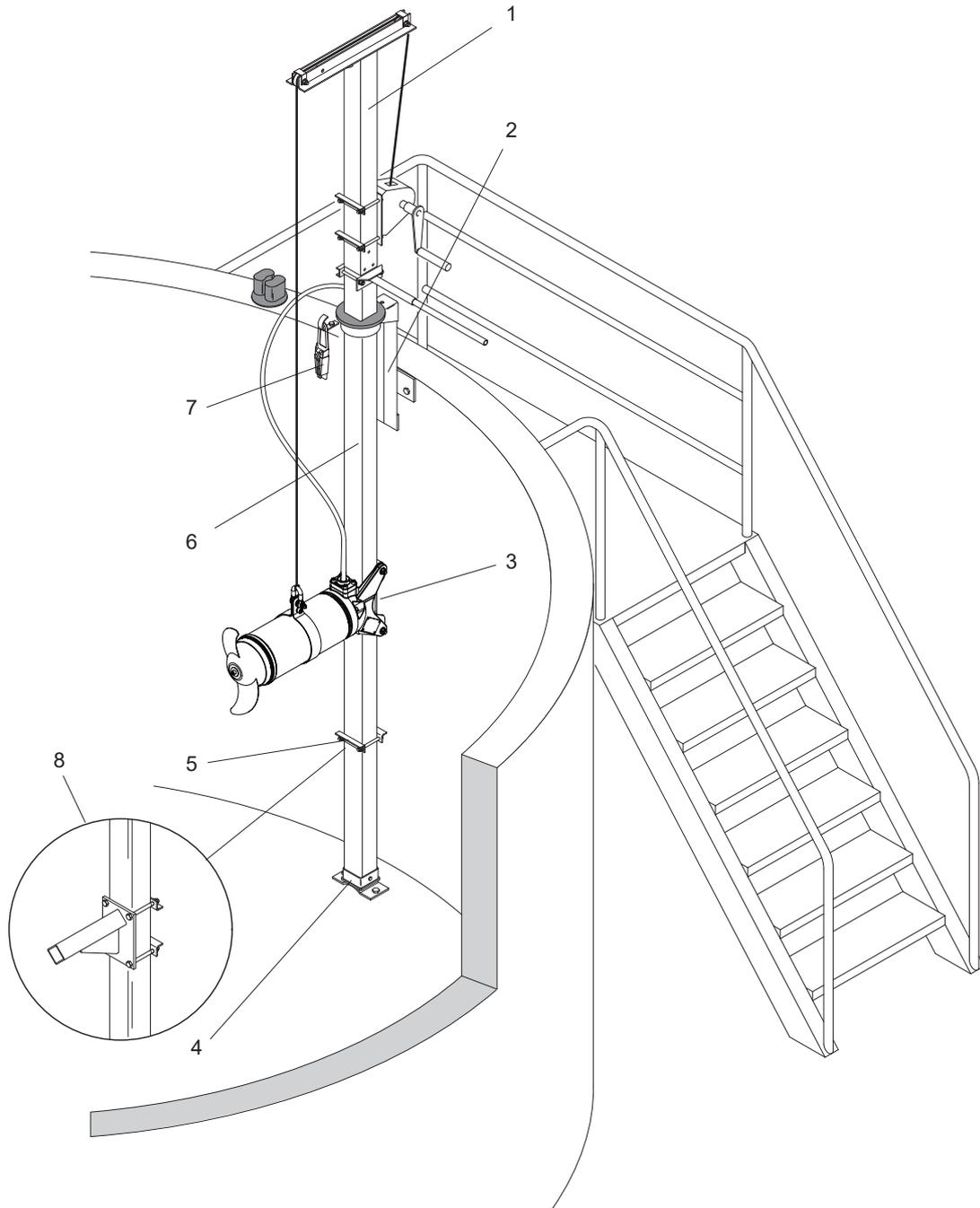


Figure 13: Installation example with existing accessories

### Legend

- |   |                                  |   |                                    |
|---|----------------------------------|---|------------------------------------|
| 1 | Hoist with winch and rope        | 5 | Safety stop clamp                  |
| 2 | Upper bracket with locking plate | 6 | Swivelling square guide tube       |
| 3 | Closed bracket                   | 7 | Cable clamp with cable hook        |
| 4 | Bottom plate                     | 8 | Stop for vibration damper (option) |

**ATTENTION** The maximum length of the guide tube is 5 m. This is based on the maximum allowable bending ( $1/300\text{th}$ ) of the length of the guide tube. This value has been determined in clean water of density  $1000 \text{ kg/m}^3$  for the maximum thrust of the most powerful mixer of the series.

### 7.2.1 Brackets RW 300

Brackets which can be swivelled vertically (only optional) are available for both open and closed models of the brackets for all mixers of the series RW 300.



Figure 14: Open bracket/closed bracket

### 7.2.2 Fitting of the open bracket with vertical swivelling (option)

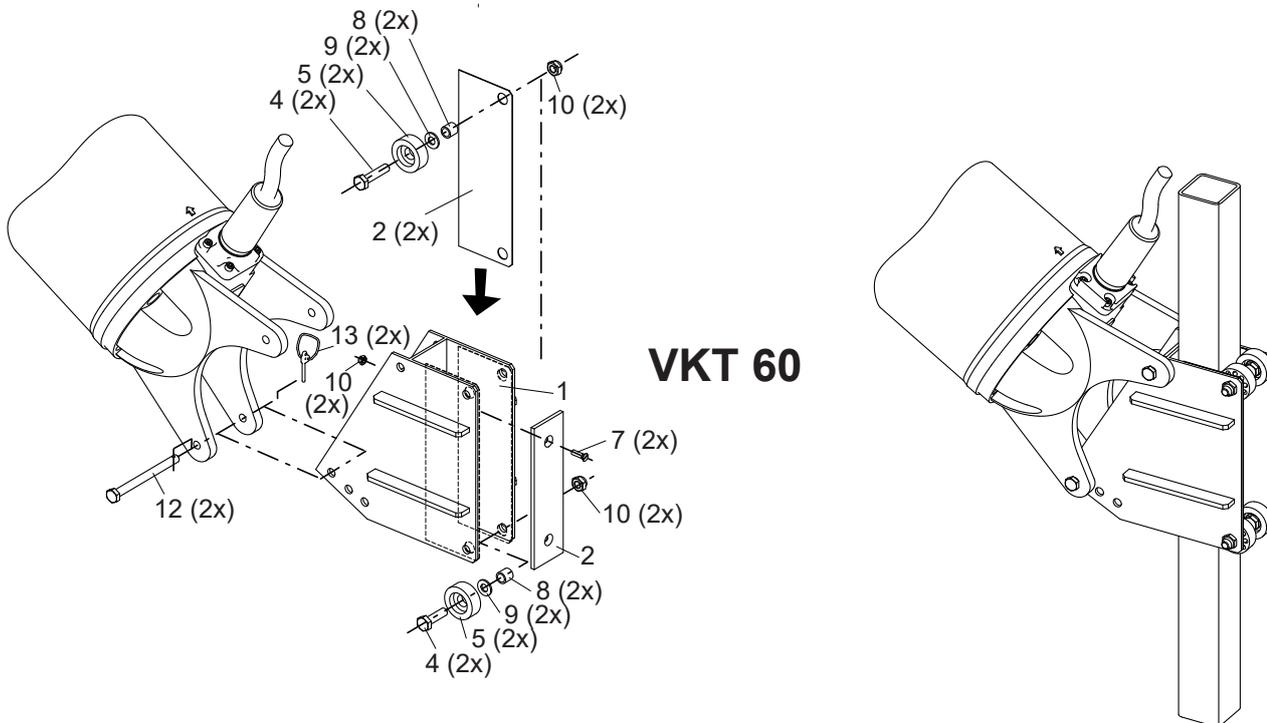


Figure 15: Open bracket with vertical swivelling

#### Legend

- |                    |                      |              |
|--------------------|----------------------|--------------|
| 1 Rail bracket     | 7 Flat head screw    | 13 Linch pin |
| 2 Cladding         | 8 Tube               |              |
| 3 Threaded inserts | 9 Washer             |              |
| 4 Hex bolts        | 10 Hex nut           |              |
| 5 Roller           | 11 Socket head screw |              |
| 6 Strap            | 12 Hinge bolt        |              |

### 7.2.3 Fitting of the closed bracket with vertical swivelling (option)

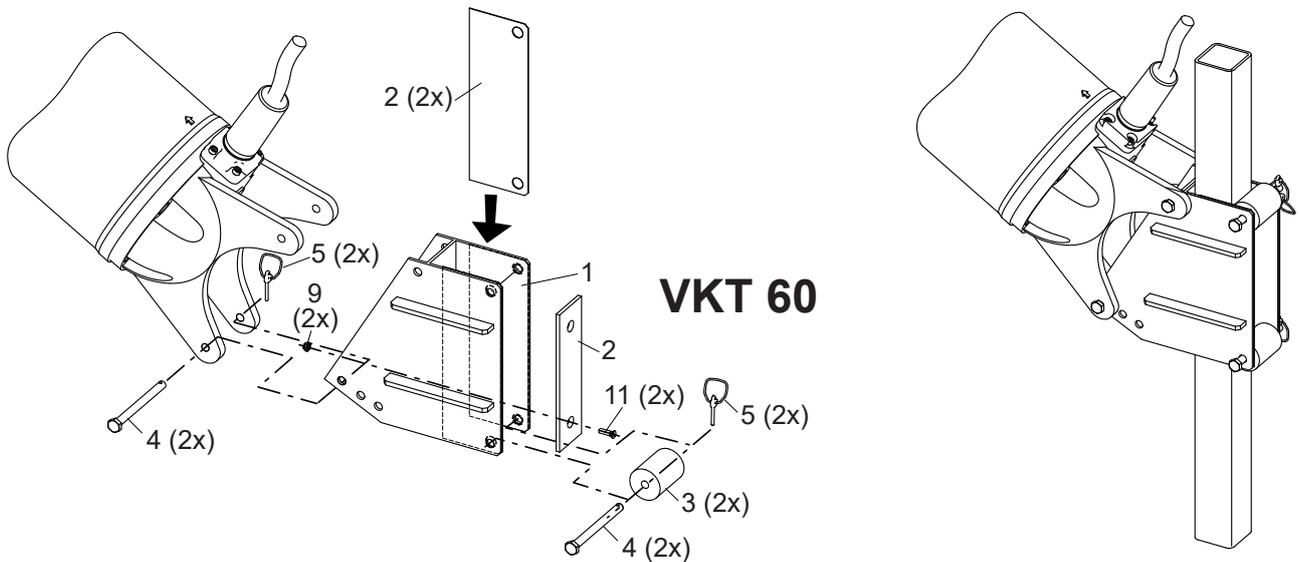


Figure 16: Closed bracket with vertical swivelling

#### Legend

- |                |                      |
|----------------|----------------------|
| 1 Rail bracket | 7 Bolt long          |
| 2 Cladding     | 8 Washer             |
| 3 Roller       | 9 Hex nut            |
| 4 Bolt short   | 10 Threaded insert   |
| 5 Linch pin    | 11 Socket head screw |
| 6 Strap        |                      |

### 7.2.4 Bracket alignment on guide rail

The mixer must be set up freely suspended with the rail bracket fully mounted. The position of the lifting bracket on the mixer should then be adjusted until the rail bracket points vertically towards the ground. This ensures that the mixer can slide up and down easily on the guide rail after it is fitted.

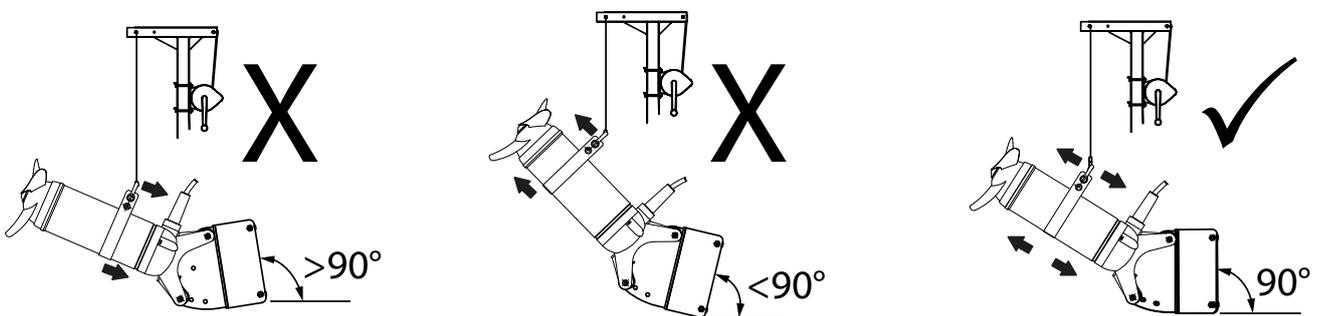


Figure 17: Setting up with fully mounted bracket

### 7.2.5 Vertical adjustment

The tilt bracket allows for installation of the mixer at various angles on the guide rail between  $\pm 30^\circ$ . This is depending on the installation/application and can be adjusted on site.

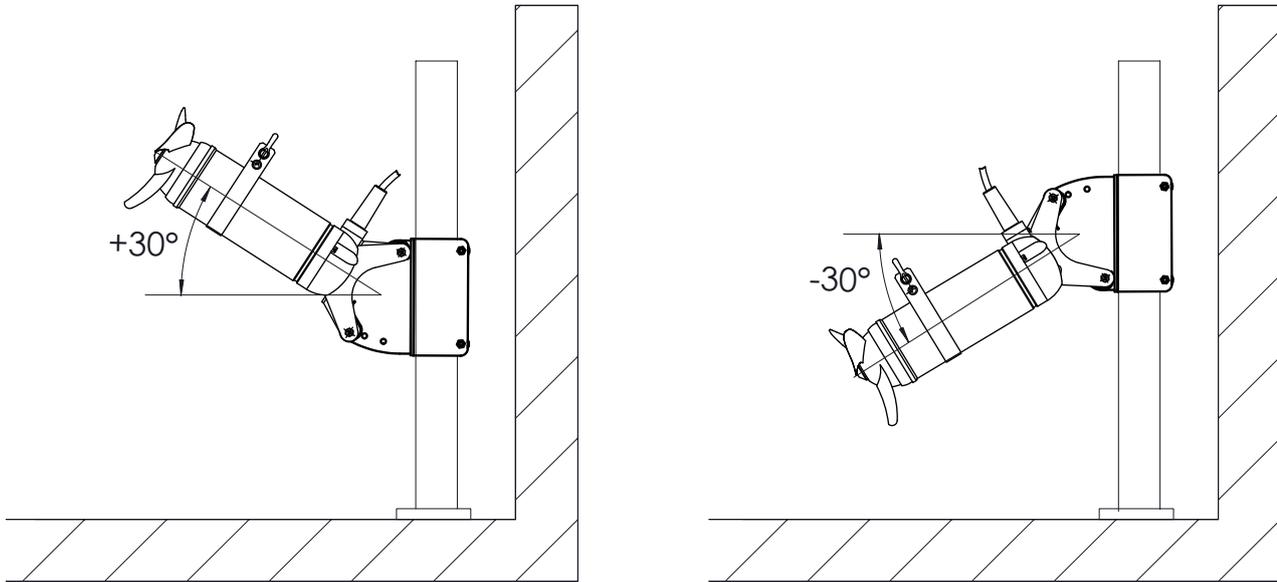


Figure 18: Vertical adjustment on the guide rail

## 8 Electrical connection



The safety hints in the previous sections must be observed!

Before commissioning an expert should check that one of the necessary electrical protective devices is available. Earthing, neutral, earth leakage circuit breakers, etc. must comply with the regulations of the local electricity supply authority and a qualified person should check that these are in perfect order.

**ATTENTION** *The power supply system on site must comply with local regulations with regard to cross-sectional area and maximum voltage drop. The voltage stated on the nameplate of the pump must correspond to that of the mains*



The incoming power supply as well as the connection of the unit itself to the terminals on the control panel must comply with the circuit diagram of the control panel as well as the motor connection diagrams and must be carried out by a qualified person.

The power supply cable must be protected by an adequately dimensioned slow-blow fuse corresponding to the rated power of the unit.

In pump stations/tanks, equipotential bonding must be carried out according to EN 60079-14:2014 [Ex] or IEC 60364-5-54 [non-Ex] (Regulations for the installation of pipelines, protective measures in high-voltage systems).

In the case of units supplied with a standard control panel this must be protected from dampness and installed above flood level by means of a correctly fitted CEE earthed socket.

**ATTENTION** *The only method of starting allowed is that specified in chapter 2.0 Technical data or on the nameplate. If you want to use other starting methods please consult the manufacturer.*

*In the case a control panel is not supplied as standard the following applies: The unit must only be operated with a motor protection switch with overload relay and thermal sensors connected.*

## 8.1 Standard connection diagram, mains voltage 380 - 420 V at 50 Hz / 460 V at 60 Hz

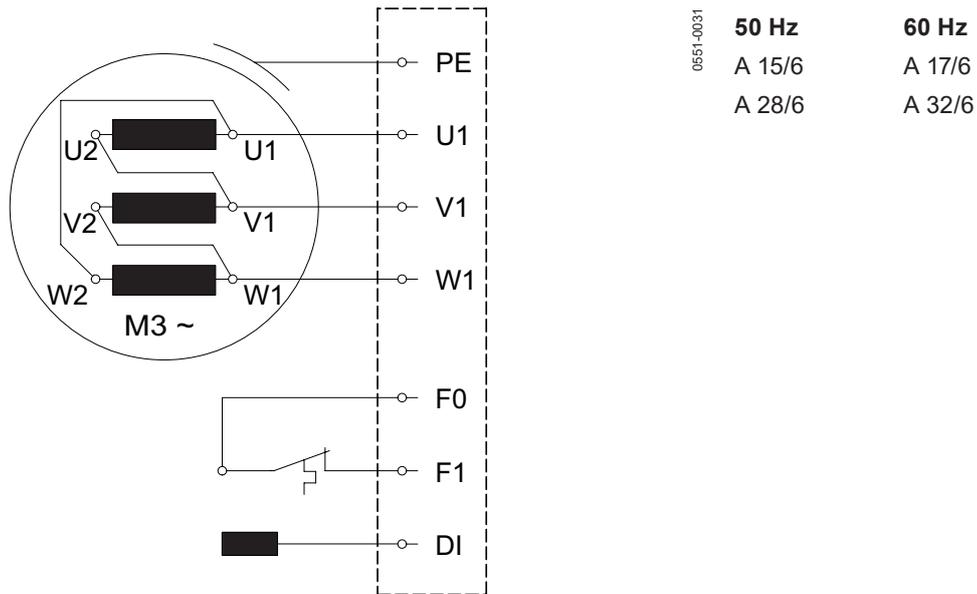


Figure 19: One power cable with integrated control leads (internal connection in the motor only for motor < 3 kW)

## 8.2 Lead designations

L1	L2	L3	Join	
U1	V1	W1	U2 & V2 & W2	
L1	L2	L3	-	
U1; W2	V1; U2	W1; V2	-	



The thermal monitoring circuit (F1) must be wired into the motor contactors in such a manner that a manual reset is required.

**ATTENTION** The temperature limiting switches may only be operated as specified by the manufacturer (see following table).

Operating voltage... <b>AC</b>	<b>100 V to 500 V ~</b>
Rated voltage <b>AC</b>	<b>250 V</b>
Rated current <b>AC cos φ = 1.0</b>	<b>2.5 A</b>
Rated current <b>AC cos φ = 0.6</b>	<b>1.6 A</b>
Max. switching current at $I_N$	<b>5.0 A</b>

### 8.3 Operation with frequency inverters

The stator design and the insulation grade of the motors from Sulzer means that they are suitable for usage with frequency inverters. It is however essential that the following conditions are met:

- The guidelines for EMC (electromagnetic compatibility) are complied with.
- Speed/torque curves for motors driven by frequency inverters can be found in our product selection range.
- Machines that are not designated as Ex machines may only be operated using the mains frequency indicated on the nameplate. Greater frequencies can be used but only after consulting with and receiving permission from the Sulzer manufacturing plant.
- The lowest frequency must be set so that it is not falling below 25 Hz.
- The maximum frequency must be set so the rated power of the motor is not exceeded.

Modern frequency inverters use higher wave frequencies and a steeper rise on the edge of the voltage wave. This means that motor losses and motor noise is reduced. Unfortunately these inverter output signals cause higher voltage spikes in the stator. Experience has shown that, depending on rated voltage and the length of the cable between the inverter and the motor, these voltage spikes can adversely affect the life of the motor. In order to avoid this, inverters of this type must be equipped with sinus filters when used in the critical zone (see Figure 20). The sinus filter chosen must be suitable for the inverter with regard to rated voltage, inverter wave frequency, rated current of the inverter and maximum inverter output frequency. Make sure that the rated voltage is supplied to the terminal board of the motor.

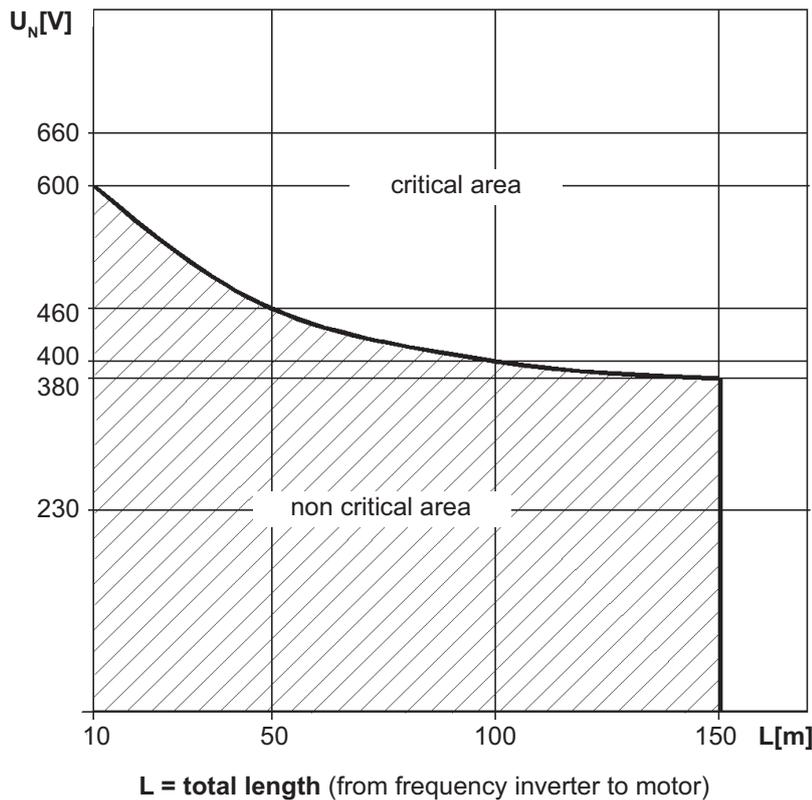


Figure 20: Critical/non critical area

## 8.4 Connection of the seal monitoring unit to the control panel

The standard versions of the units are fitted as standard with leakage sensors (DI) which monitor the state of the sealing. In order to integrate the seal monitoring function into the control panel it is necessary to fit a Sulzer leakage control module.

**ATTENTION** *If the leakage sensor is activated the unit must be immediately taken out of service. Please contact your Sulzer service centre.*

**NOTE** *Running the pump with the thermal and/or leakage sensors disconnected will invalidate related warranty claims.*

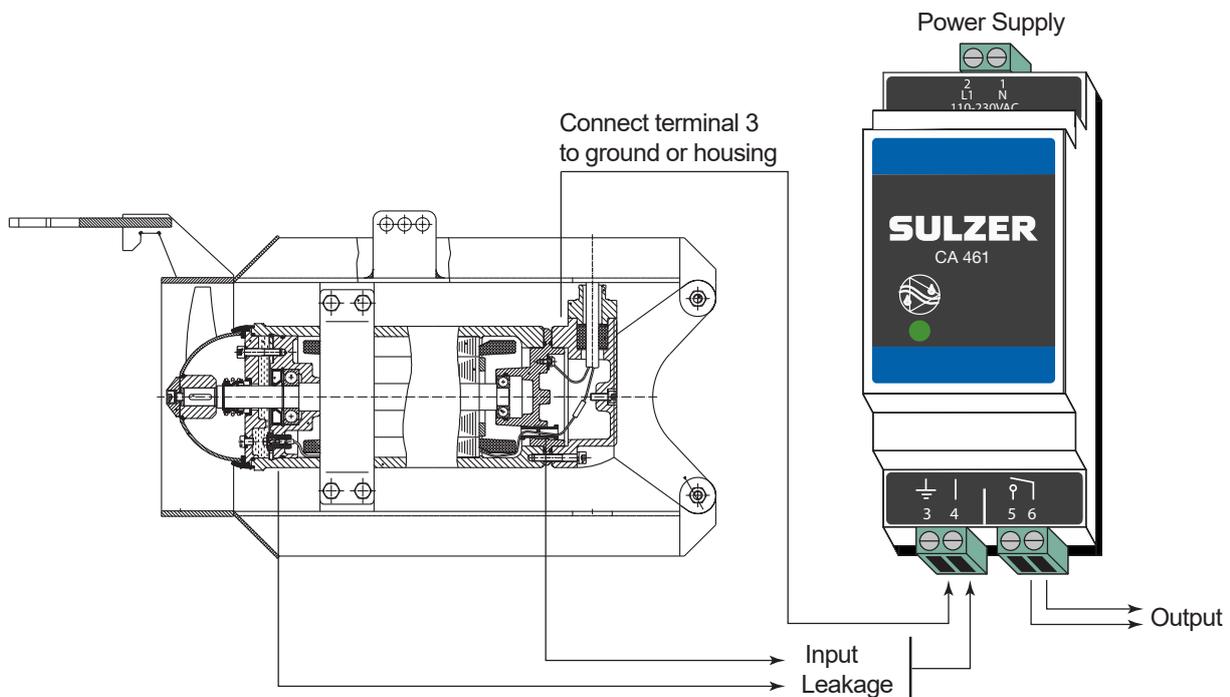


Figure 21: Sulzer leakage control type CA 461

**Electronic amplifier for 50/60 Hz**  
110 - 230 V AC. Part No.: 16907014.

**ATTENTION** *Maximum relay contact loading: 2 ampere*

**ATTENTION** *It is very important to note that with the connection example above it is not possible to identify which sensor/alarm is being activated. As an alternative Sulzer highly recommends to use a separate CA 461 module for each sensor/input, to allow not only identification but also to prompt to the appropriate response to the alarm category/severity.*

Multiple-input leakage control modules are also available. Please consult with your local Sulzer representative.

## 9 Commissioning

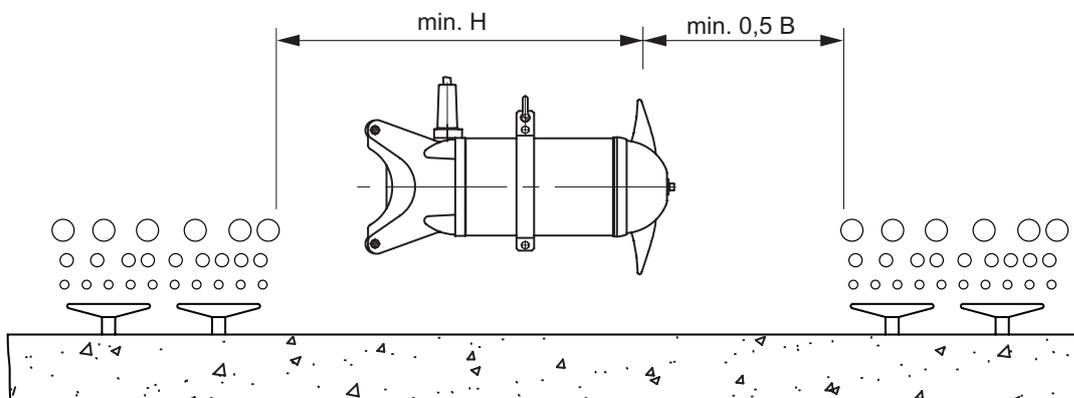


The safety hints in the previous sections must be observed!

Before commissioning, the unit should be checked and a functional test carried out. Particular attention should be paid to the following:

- Have the electrical connections been carried out in accordance with regulations?
- Have the thermal sensors/limiters been connected?
- Is the seal monitoring device correctly installed?
- Is the motor overload switch correctly set?
- Have the power and control circuit cables been correctly fitted?
- Has the motor connection cable been laid in such a manner that it cannot be caught up by the rotating body?
- Has the minimum submergence level been observed? (see Section 3.0).

### 9.1 Types of operation



B = Tank width; H = Water depth

Figure 22: Installation example with aeration

**ATTENTION** The illustration is only an example. For the correct installation please contact Sulzer.

**ATTENTION** Operation within the directly aerated area is not allowed!

**ATTENTION** The units must work fully submerged in the fluid. During operation no air should be drawn in by the propeller. Ensure that there is a smooth medium flow. The unit should not vibrate heavily when in operation.

**Uneven flow formation and vibrations can occur if:**

- Over active mixing in small tanks (only for RW).
- Prevention of free inflow or outflow in the area of the flow ring if fitted (only for RW). Changing the position or direction of the mixer may assist.
- Prevention of free inflow or outflow in the area of the guide cone (only for RCP).

## 9.2 Checking direction of rotation

When the units are being commissioned for the first time and also when used on a new site, the direction of rotation must be carefully checked by a qualified person.

The direction of rotation (propeller rotation) is correct if the propeller when viewed from the rear over the motor housing rotates in a clockwise manner (see arrow).

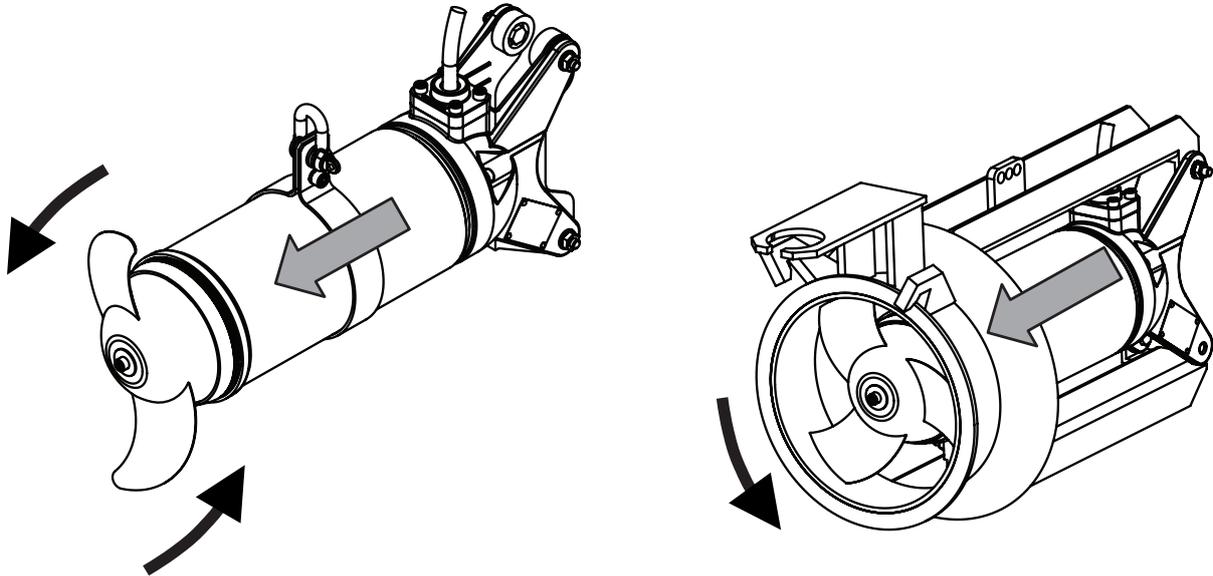


Figure 23: Checking direction of rotation



When checking the direction of rotation take care that no injury can be caused by the rotation of the propeller or the resulting airflow. Do not place a hand or other part of the body near the propeller or the hydraulics!



The direction of rotation should only be altered by a qualified person.



When carrying out the direction of rotation check as well as when starting the unit pay attention to the **START REACTION**. This can be very powerful.

### NOTE

***If a number of units are connected to a single control panel then each unit must be individually checked.***

### ATTENTION

***The mains supply in the control panel must have a clockwise sense of rotation. If the units are connected in accordance with the wiring diagram and the lead designations the direction of rotation will be correct.***

## 9.3 Changing direction of rotation



The safety hints in the previous sections must be observed!



Changing direction of rotation must only be carried out by a qualified person.

If the direction of rotation is incorrect then this is altered by changing over two phases of the power supply cable in the control panel. The direction of rotation should then be rechecked.

### NOTE

***The direction of rotation measuring device monitors the direction of rotation of the mains supply or that of an emergency generator.***

## 10 Maintenance



The safety hints in the previous sections must be observed!

In particular, the advice regarding maintenance in *paragraph 3.2* of the separate booklet “Safety Instructions for Sulzer Products Type ABS” are to be observed.

### 10.1 General maintenance hints



Before commencing any maintenance work the unit should be completely disconnected from the mains by a qualified person and care should be taken that it cannot be inadvertently switched back on.

**NOTE** *The maintenance hints given here are not designed for “do-it-yourself” repairs as special technical knowledge is required.*

Sulzer units are reliable quality products each being subjected to careful final inspection. Lubricated-for-life ball bearings together with monitoring devices ensure optimum pump reliability provided that the unit has been connected and operated in accordance with the operating instructions.

Should, nevertheless, a malfunction occur, do not improvise but ask your Sulzer customer service department for assistance.

This applies particularly if the unit is continually switched off by the current overload in the control panel, by the thermal sensors/limiters of the thermo-control system or by the seal monitoring system (DI).

The Sulzer service organisation would be pleased to advise you on any applications you may have and to assist you in solving your aerating problems.

**NOTE** *The Sulzer warranty conditions are only valid provided that any repair work has been carried out in Sulzer approved workshops and where original Sulzer spare parts have been used.*

**ATTENTION** *Regular checks are highly recommended and other checks are prescribed regulations after specific intervals. This ensures a long life time and trouble-free operation of the units (see section 10.3).*

**NOTE** *In the case of repair work, „Table 1“ from IEC60079-1 may not be applied. In this case please contact Sulzer after sales service!*

Inspections carried through at regular intervals and preventive maintenance guarantee trouble-free operation. For this reason the complete unit should be cleaned thoroughly on a regular basis, maintained and inspected. For this purpose special care must be taken that all parts of the unit are in good condition and that the operational security is guaranteed. The inspection period is determined by the type of usage of the units, but should however not exceed one year.

The maintenance and inspection work must be carried through corresponding to the subsequent inspection plan. The executed work must be documented in the attached inspection list. In case of non-observance the manufacturer’s warranty does not apply!

### 10.2 Faults

In addition to the maintenance and inspection tasks described in section *10.3 Inspection and maintenance intervals* an urgent check of the unit and installation should be carried out if heavy vibrations develop or uneven flow patterns occur.

#### Possible causes:

- Minimum liquid coverage of the propeller is not present.
- Aeration in the propeller area.
- Wrong direction of rotation of the propeller.
- Propeller is damaged.
- Restriction to the free inflow or outflow in the area of the RW flow ring.
- Restriction to the free inflow or outflow in the area of the RCP inflow cone.

- Parts of the Installation, such as bracket or coupling parts have become defective or become loose.

In these cases the unit should be immediately switched off and inspected. If no fault can be found or the fault remains after it has apparently been corrected the unit should be left switched off. The same applies also where the current overload in the control panel regularly trips, where the DI leakage sensor or the temperature sensors in the stator are activated. We recommend that in such cases you contact your local Sulzer Service Centre.

### 10.3 Inspection and maintenance intervals



The safety hints in the previous sections must be observed!

<b>PERIOD OF TIME:</b>	<b>Regulation: once a month</b>
<b>ACTIVITY:</b>	Cleaning and inspection of the power and control circuit cables.
<b>DESCRIPTION:</b>	Once a month (more frequently - for example - in difficult application cases where the medium is heavily polluted with fibrous matter) the power and control circuit cables should be cleaned. In particular fibrous materials must be removed. Part of the regular maintenance is also the inspection of the motor cables. These must be checked for scratches, fissures, bubbles or crushing.
<b>MEASURE:</b>	Damaged power and control circuit cables must be replaced in all cases. Please contact your local Sulzer Service Centre.

<b>PERIOD OF TIME:</b>	<b>Recommendation: once a month</b>
<b>ACTIVITY:</b>	Check the current consumption at the ampere meter.
<b>DESCRIPTION:</b>	With normal operation the current consumption is constant; occasional current fluctuations result from the constitution of the material being mixed.
<b>MEASURE:</b>	If the current consumption is too high for a longer period during normal operation please contact your local Sulzer Service Centre.

<b>PERIOD OF TIME:</b>	<b>Regulation: every 3 months</b>
<b>ACTIVITY:</b>	Inspection of the propeller and the SD ring (Solids-Deflection-Ring).
<b>DESCRIPTION:</b>	The propeller should be inspected carefully. The propeller might show spots of rupture and wear due to strongly abrasive or aggressive mixing material. In both cases the flow formation is reduced considerably and the propeller must be replaced. The solids-deflection-ring must also be checked. If wear or scoring is visible on the propeller boss these parts must be replaced as well.
<b>MEASURE:</b>	If you find out any cases of the damage described above please contact your local Sulzer Service Centre.

<b>PERIOD OF TIME:</b>	<b>Recommendation: every 6 months</b>
<b>ACTIVITY:</b>	Insulation resistance check.
<b>DESCRIPTION:</b>	Within the scope of the maintenance work the insulation resistance of the motor winding should be measured every 4,000 hours, and/or at least once a year. If the proper insulation resistance level is not reached, moisture might have got into the motor.
<b>MEASURE:</b>	The unit must be taken out of operation and may not be started again. Please contact your local Sulzer Service Centre.
<b>ACTIVITY:</b>	Functional testing of the monitoring devices.
<b>DESCRIPTION:</b>	In the scope of the maintenance measures functional testing of all monitoring devices must be carried through every 4,000 hours and/or at least once a year. For these functional tests the unit must have cooled down to the ambient temperature. The electrical connecting line of the monitoring device must be disconnected at the control box. These measurements must be carried through by means of an ohmmeter at the respective cable ends.
<b>MEASURE:</b>	In any case of any functional problems on the monitoring devices please contact your local Sulzer Service Centre.

<b>PERIOD OF TIME:</b>	<b>Recommendation: once a year</b>
ACTIVITY:	Checking of the tightening torques of the screws and nuts.
DESCRIPTION:	For safety reasons we recommend that all screws are checked for their perfect positioning once a year.
MEASURE:	Tighten screws with correct tightening torques ( <i>see Section 1.6</i> ).



