

Submersible Motor Pump

# Ama-Porter

S 545 \_E

## Installation/Operating Manual



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Installation/Operating Manual Ama-Porter

Original operating manual

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## Glossary

### **Certificate of decontamination**

A certificate of decontamination is enclosed by the customer when returning the product to the manufacturer to certify that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

### **Close-coupled design**

Motor directly fitted to the pump via a flange or a drive lantern

### **Hydraulic system**

The part of the pump in which the kinetic energy is converted into pressure energy

### **Pump set**

Complete pump set consisting of pump, drive, additional components and accessories

# 1 General

## 1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover (for details, refer to the table below)

**Table 1:** Variants covered by this manual

Sizes	Impeller type	Material variant
S545	S	G

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

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

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

## 1.2 Installation of partly completed machinery

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

## 1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.3, Page 8)

## 1.4 Other applicable documents

**Table 2:** Overview of other applicable documents

Document	Contents
Data sheet	Description of the technical data of the pump (set)
General arrangement drawing/ outline drawing	Description of mating and installation dimensions for the pump (set), weights
Hydraulic characteristic curve	Characteristic curves showing head, flow rate, efficiency and power input
General assembly drawing <sup>1)</sup>	Sectional drawing of the pump
Spare parts lists <sup>1)</sup>	Description of spare parts
Supplementary operating manuals <sup>1)</sup>	e.g. for installation parts for stationary wet installation


For accessories and/or integrated machinery components observe the relevant manufacturer's product literature.

## 1.5 Symbols

**Table 3:** Symbols used in this manual






Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
↪	Result of an action
⇔	Cross-references

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

Symbol	Description
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

### 1.6 Key to safety symbols/markings

Table 4: Definition of safety symbols/markings

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



## 2 Safety

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

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

### 2.1 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:
  - Arrow indicating the direction of rotation
  - Markings for connections
  - Name plate
- The operator is responsible for ensuring compliance with all local regulations not taken into account.

### 2.2 Intended use

- The pump (set) must only be operated in the fields of application and within the use limits specified in the other applicable documents.
- Only operate pump sets which are in perfect technical condition.
- Do not operate partially assembled pump sets.
- Observe the minimum flow rate and maximum flow rate indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage, etc.).
- Do not throttle the flow rate on the suction side of the pump (to prevent cavitation damage).
- Only use the pump to handle the fluids described in the data sheet or product literature of the pump model or variant.
- Never operate the pump without the fluid to be handled.
- Only operate pumps/pump sets which are in perfect technical condition.
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.
- Observe the limits for continuous duty specified in the data sheet or product literature ( $Q_{\min}$  and  $Q_{\max}$ ) (to prevent damage such as shaft fracture, bearing failure, mechanical seal damage, etc).
- When untreated waste water is handled, the duty points in continuous operation lie within  $0.7$  to  $1.2 \times Q_{\text{BEP}}$  to minimise the risk of clogging/hardening.
- Avoid duty points for continuous operation at very low speeds and small flow rates ( $< 0.7 \times Q_{\text{BEP}}$ ).
- The pump sets are not approved for use in countries stipulating explosion-proof units for handling waste water containing faeces.

### 2.3 Personnel qualification and training

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



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

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the pump (set) must always be supervised by technical specialist personnel.

#### **2.4 Consequences and risks caused by non-compliance with this manual**

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

#### **2.5 Safety awareness**

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

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

#### **2.6 Safety information for the user/operator**

- Provide the personnel with protective equipment and make sure it is used.
- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- If shutting down the pump does not increase potential risk, fit an emergency-stop control device in the immediate vicinity of the pump (set) during pump set installation.

#### **2.7 Safety information for maintenance, inspection and installation**

- Modifications or alterations of the pump (set) are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts/components authorised by the manufacturer. The use of other parts/components can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- Only perform work on the pump set when it has been disconnected from the power supply (de-energised).
- The pump (set) must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.

- When taking the pump set out of service always adhere to the procedure described in the manual. (⇒ Section 6.3, Page 31)
- Decontaminate pumps which handle fluids posing a health hazard.
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1, Page 29)

### **2.8 Unauthorised modes of operation**

Never operate the pump (set) outside the limits stated in the data sheet and in this manual.

The warranty relating to the operating reliability and safety of the supplied pump (set) is only valid if the equipment is used in accordance with its intended use.

### 3 Transport/Temporary Storage/Disposal

#### 3.1 Checking the condition upon delivery

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

#### 3.2 Transport

	<p><b>⚠ DANGER</b></p>
	<p><b>Improper transport</b>            Danger to life from falling parts!            Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Use the attachment point provided (pump handle) for attaching lifting accessories.</li> <li>▷ Never suspend the pump set by its power cable.</li> <li>▷ Use the lifting chain/rope included in the scope of supply exclusively for lowering/lifting the pump set into/out of the pump sump.</li> <li>▷ Securely attach the lifting chain/rope to the pump and crane.</li> <li>▷ Use tested, marked and approved lifting accessories only.</li> <li>▷ Observe the regional transport regulations.</li> <li>▷ Observe the product literature supplied by the lifting accessory manufacturer.</li> <li>▷ The load-carrying capacity of the lifting accessory must be higher than the weight indicated on the name plate of the pump set to be lifted. Take into account any additional system components to be lifted.</li> <li>▷ Always use the pump handle for transporting the pump (also for manual transport).</li> <li>▷ Always place the pump vertically on a solid surface with the motor on top.</li> </ul>

To transport the pump set suspend it from the lifting tackle as shown.

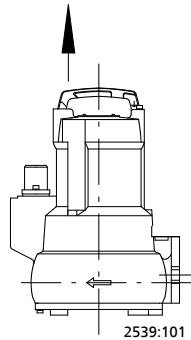



Fig. 1: Transporting the pump set


#### 3.3 Storage/preservation

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

	<p><b>CAUTION</b></p>
	<p><b>Improper storage</b>            Damage to the power cable!</p> <ul style="list-style-type: none"> <li>▷ Support the power cables at the cable entry to prevent permanent deformation.</li> </ul>

	<b>CAUTION</b>
	<p><b>Damage during storage due to humidity, dirt or vermin</b> Corrosion/contamination of the pump (set)!</p> <ul style="list-style-type: none"> <li>▷ For outdoor storage cover the pump (set) or the packaged pump (set) and accessories with waterproof material.</li> </ul>

- Store the pump set under dry and vibration-free conditions at a temperature above 0 °C, in a vertical position and in its original packaging.
1. Spray-coat the inside wall of the pump casing, and in particular the impeller clearance areas, with a preservative.
  2. Spray the preservative through the suction and discharge nozzles.  
It is advisable to then close the pump nozzles (e.g. with plastic caps or similar).
  3. Check the power cable for damage. Attach it to the pump handle to prevent it from trailing on the floor. Protect the cable end against moisture.



	<b>NOTE</b>
	<p>Observe the manufacturer's instructions for application/removal of the preservative.</p>

### 3.4 Return to supplier

1. Drain the pump as per operating instructions. (⇒ Section 7.3, Page 36)
2. Flush and clean the pump, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen also neutralise the pump and blow through with anhydrous inert gas to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the pump.  
Indicate any safety measures and decontamination measures taken.  
(⇒ Section 11, Page 47)

	<b>NOTE</b>
	<p>If required, a blank certificate of decontamination can be downloaded from the following web site: <a href="http://www.ksb.com/certificate_of_decontamination">www.ksb.com/certificate_of_decontamination</a></p>

### 3.5 Disposal

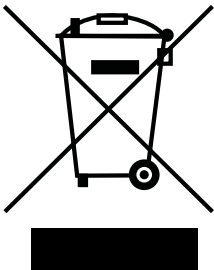
	 <b>WARNING</b>
	<p><b>Fluids, consumables and supplies posing a health hazard</b> Hazard to persons and the environment!</p> <ul style="list-style-type: none"> <li>▷ Collect and dispose of any preservatives, flushing liquids and fluid residues.</li> <li>▷ Wear safety clothing and a protective mask, if required.</li> <li>▷ Observe all legal regulations on the disposal of fluids posing a health hazard.</li> </ul>

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

Electrical or electronic equipment marked with the adjacent symbol must not be disposed of in household waste at the end of its service life.

Contact your local waste disposal partner for returns.

If the used electrical or electronic equipment contains personal data, the operator is responsible for deleting it before the equipment is returned.



## 4 Description of the Pump (Set)

### 4.1 General description

Handling waste water, especially waste water containing long fibres and solid substances, liquids containing gas/air, removing waste water from flooded rooms and surfaces.

### 4.2 Product information as per Regulation No. 1907/2006 (REACH)

For information as per chemicals Regulation (EC) No. 1907/2006 (REACH), see <http://www.ksb.com/reach>.

### 4.3 Designation

Example: Ama-Porter S B 5 45 SE

Table 5: Designation key

Code	Description
Ama-Porter	Type series
S	Impeller type, e.g. S = cutter
B	With control box
5	Pump series, e.g. 5 = DN50
45	Impeller size, e.g. 45 = impeller S
SE	Motor version, e.g. SE = single-phase with control system

### 4.4 Name plate

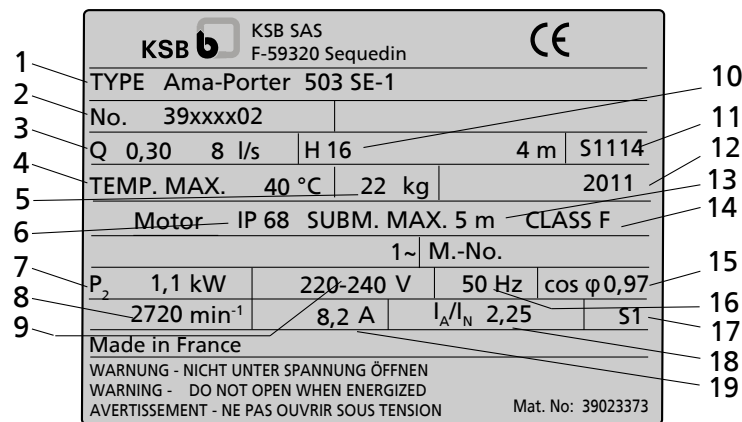


Fig. 2: Name plate (example)

1	Designation	2	KSB order number
3	Flow rate	4	Maximum fluid and ambient temperature
5	Total weight	6	Enclosure
7	Rated power	8	Rated speed
9	Rated voltage	10	Head
11	Series number	12	Year of construction
13	Maximum submergence	14	Thermal class of winding insulation
15	Power factor	16	Rated frequency
17	Mode of operation	18	Starting current ratio
19	Rated current		

## 4.5 Design details

### Design

- Fully floodable submersible motor pump
- Close-coupled design
- Vertical installation
- Single-stage

### Installation types

- Wet-installed stationary model
- Wet-installed transportable model

### Shaft seal

#### Drive end

- Shaft seal ring

#### Pump end

- 1 bi-directional mechanical seal with liquid reservoir

### Impeller type

- Application-oriented impeller type (⇒ Section 2.2, Page 8)

### Drive

- Single-phase AC motor
  - 50 Hz: 230 V (240 V maximum)
  - 60 Hz: 220 V (255 V maximum)
  - Integrated temperature switch
- Enclosure IP68 (permanently submerged) to EN 60529 / IEC 529

### Bearings

- Grease-packed bearings sealed for life

## 4.6 Types of installation

Two design variants are available, depending on the installation type:

- Stationary wet installation (installation type S)
- Transportable wet installation (installation type P)

The pump set is designed for continuously submerged operation. The motor is cooled by the fluid handled on the motor surface. Short-term operation with the motor outside the fluid handled is possible if the fluid level is above the level R specified by KSB (see outline drawings).

4.7 Configuration and function

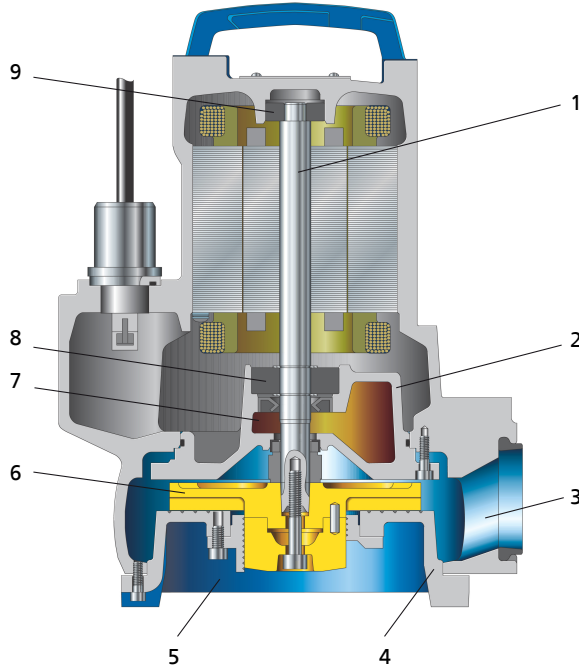


Fig. 3: Sectional drawing

1	Shaft	2	Bearing bracket
3	Discharge nozzle	4	Suction cover
5	Suction nozzle	6	Impeller
7	Shaft seal	8	Rolling element bearing, pump end
9	Rolling element bearing, motor end		

**Design** The pump is designed with an axial fluid inlet and a radial outlet. The hydraulic system sits on the extended motor shaft. The shaft runs in common bearings.

**Function** The fluid enters the pump axially via the suction nozzle (5) and is accelerated outward in a cylindrical flow by the rotating impeller (6). In the flow passage of the pump casing the kinetic energy of the fluid is converted into pressure energy. The fluid is pumped to the discharge nozzle (3), where it leaves the pump. At the rear side of the impeller, the shaft (1) enters the casing via the discharge cover. The shaft passage through the cover is sealed to (is sealed to atmosphere) atmosphere with a shaft seal (7). The shaft runs in rolling element bearings (8 and 9), which are supported by a bearing bracket (2) connected to the pump casing and/or discharge cover.

**Sealing** The pump-end shaft seal is a bi-rotational mechanical seal; the motor-end seal is a shaft seal ring. A lubricant reservoir between the shaft seal ring and the mechanical seal provides cooling and lubrication.

4.8 Scope of supply

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

Stationary wet-installed model (installation type S)

- Claw with sealing elements and fasteners
- Lifting rope / lifting chain<sup>2)</sup>
- Mounting bracket with fasteners
- Duckfoot bend with mounting elements
- Guiding equipment<sup>3)</sup>

2) Optional  
 3) The guide rails are not included in the scope of supply.



**Transportable wet-installed model (installation type P)**

- Pump set complete with power cables
- Installation parts for transportable models, comprising:
  - 3 feet
  - Connection elbow
  - Connection piece
  - And clamp
- Lifting rope / lifting chain<sup>4)</sup>

**NOTE**

A separate name plate is included in KSB's scope of supply.  
This name plate must be attached in a clearly visible position outside the place of installation, e.g. at the control panel, pipeline or mounting bracket.

**4.9 Dimensions and weights**

For dimensions and weights refer to the general arrangement drawing/outline drawing or data sheet of the pump set.



---

4) Optional

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## 5 Installation at Site


### 5.1 Safety regulations

	<p><b>⚠ DANGER</b></p> <p><b>Persons in the tank during pump operation</b>          Electric shock!          Risk of injury!          Danger of death from drowning!</p> <ul style="list-style-type: none"> <li>▷ Never start up the pump set when there are persons in the tank.</li> </ul>
	<p><b>⚠ WARNING</b></p> <p><b>Impermissible solid objects (tools, screws/bolts or similar) in the pump sump/inlet tank during pump start-up</b>          Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Check the pump sump/inlet tank for impermissible solid objects before flooding, and remove, if necessary.</li> </ul>

### 5.2 Checks to be carried out prior to installation

#### 5.2.1 Preparing the place of installation


##### Place of installation for stationary models

	<p><b>⚠ WARNING</b></p> <p><b>Installation on mounting surfaces which are unsecured and cannot support the load</b>          Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Ensure the concrete's compressive strength is sufficient (in accordance with C35/45 in exposure class XC1 to EN 206-1).</li> <li>▷ The mounting surface must have set and must be completely horizontal and even.</li> <li>▷ Observe the weights indicated.</li> </ul>
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**Resonances** Any resonances at the usual excitation frequencies (1 x and 2 x rotational frequency, blade passing frequency) must be prevented both in the foundation and in the connected piping, as such frequencies may cause extreme vibrations.

1. Check the structural requirements.  
 All structural work required must have been prepared in accordance with the dimensions stated in the outline drawing/general arrangement drawing.

##### Place of installation for transportable models

	<p><b>⚠ WARNING</b></p> <p><b>Incorrect positioning/placing down</b>          Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Position the pump set vertically with the motor on top.</li> <li>▷ Use appropriate means to secure the pump set against tilting and tipping over.</li> <li>▷ Refer to the weights given in the data sheet/on the name plate.</li> </ul>
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2539.812/05-EN

**Resonances** Any resonances at the usual excitation frequencies (1 x and 2 x rotational frequency, blade passing frequency) must be prevented both in the foundation and in the connected piping, as such frequencies may cause extreme vibrations.

1. Check the structural requirements.  
All structural work required must have been prepared in accordance with the dimensions stated in the outline drawing/general arrangement drawing.

**5.2.2 Checking the direction of rotation**

	<p><b>⚠ WARNING</b></p>
	<p><b>Hands or foreign objects in the pump casing</b> Risk of injuries, damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never insert your hands or any other objects into the pump.</li> <li>▷ Check that the inside of the pump is free from any foreign objects.</li> <li>▷ Take suitable precautions (e.g. wear safety goggles).</li> </ul>

- ✓ The pump set is connected to the power supply.
- ✓ Pump sets with three-phase motor: Check the direction of rotation via the reactive force generated by the motor torque.
  1. Hold the pump by the handle.
  2. Start up the pump for a short period (5 seconds max.).  
A reactive force in anti-clockwise direction must be felt.
  3. If the impeller is running in the wrong direction of rotation, check the electrical connection of the pump in the control system.
  4. Disconnect the pump set from the power supply again and make sure it cannot be switched on unintentionally.

**5.3 Installing the pump set**

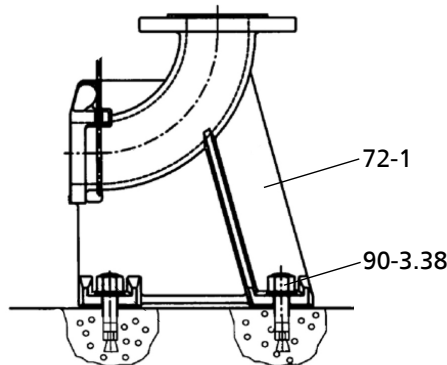
Always observe the general arrangement drawing/outline drawing when installing the pump set.

**5.3.1 Stationary wet installation**

**5.3.1.1 Fastening the duckfoot bend**

**Fastening the duckfoot bend with chemical anchors**

Depending on the pump size, the duckfoot bend is fastened with chemical anchors.



**Fig. 4:** Fastening the duckfoot bend

1. Position duckfoot bend 72-1 on the floor of the tank/sump.
2. Insert chemical anchors 90-3.38.
3. Bolt duckfoot bend 72-1 to the floor with chemical anchors 90-3.38.

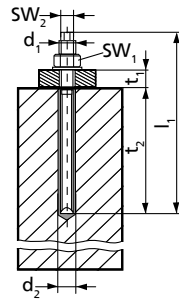


Fig. 5: Dimensions

Table 6: Chemical anchor dimensions

Size ( $d_1 \times l_1$ )	$d_2$ [mm]	$t_1$ [mm]	$t_2$ [mm]	$SW_1$ [mm]	$SW_2$ [mm]	$M_{d1}$ [Nm]
M10 x 130	12	20	90	17	7	20

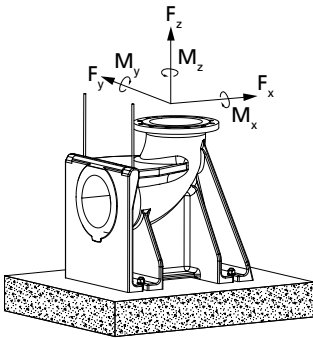
Table 7: Curing times of mortar cartridge

Floor temperature [°C]	Curing time [min]
-5 to 0	240
0 to +10	45
+10 to +20	20
> +20	10

5.3.1.2 Connecting the piping

	<p><b>⚠ DANGER</b></p> <p><b>Impermissible loads acting on the flange of the duckfoot bend</b>            Danger to life from escaping hot, toxic, corrosive or flammable fluids!</p> <ul style="list-style-type: none"> <li>▷ Do not use the pump as an anchorage point for the piping.</li> <li>▷ Anchor the pipes in close proximity to the pump and connect them without transmitting any stresses or strains.</li> <li>▷ Observe the permissible flange loads.</li> <li>▷ Take appropriate measures to compensate for thermal expansion of the piping.</li> </ul>
	<p><b>NOTE</b></p> <p>When the pump set is used for draining low-level building areas, install a swing check valve in the discharge line to avoid backflow from the sewer system.</p>
	<p><b>CAUTION</b></p> <p><b>Critical speed</b>            Increased vibrations!            Damage to mechanical seals and bearings!</p> <ul style="list-style-type: none"> <li>▷ Install a swing check valve in longer riser pipes to prevent the pump from excessive running in reverse.              When fitting a swing check valve, make sure that the unit can still be vented properly.</li> </ul>

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**Fig. 6:** Permissible flange loads

**Table 8:** Permissible flange loads

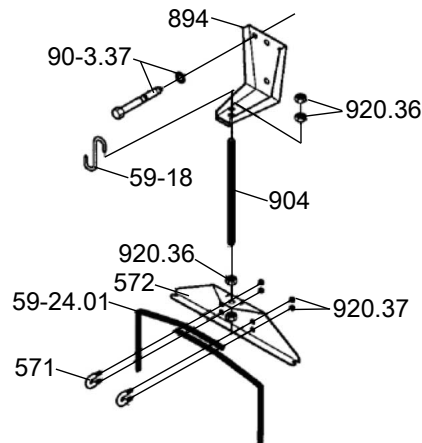
Nominal flange diameter	Forces [N]				Moments [Nm]			
	F <sub>y</sub>	F <sub>z</sub>	F <sub>x</sub>	ΣF	M <sub>y</sub>	M <sub>z</sub>	M <sub>x</sub>	ΣM
50	1350	1650	1500	2600	1000	1150	1400	2050

**5.3.1.3 Fitting the guide wire arrangement**

The pump set is guided into the sump or tank along two parallel, tightly stretched guide wires made of stainless steel. It attaches itself automatically to the duckfoot bend which has been fitted to the floor.

	<b>NOTE</b>
	Should site conditions/piping layout, etc. require the wire to run off the vertical, do not exceed a maximum angle of 5° to ensure reliable fitting and guiding of the pump set.

**Fitting the mounting bracket**



**Fig. 7:** Fitting the mounting bracket

1. Fasten mounting bracket 894 to the edge of the sump opening with anchor bolts 90-3.37 and tighten the anchor bolts to a tightening torque of 10 Nm.
2. Insert clamping pieces 571 through the holes of suspension bracket 572 and fasten with nuts 920.37.
3. Fasten fully threaded stud 904 with the pre-assembled clamping arrangement to the mounting bracket with nut 920.36. Tighten nut 920.36 allowing sufficient play for subsequently tensioning the guide wire.

Inserting the guide wire

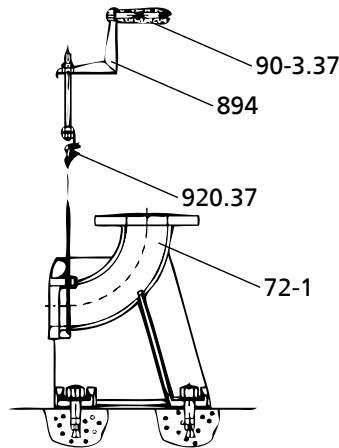


Fig. 8: Inserting the guide wire

1. Lift clamping piece 571 and insert one end of the guide wire.
2. Run wire 59-24.01 around duckfoot bend 72-1 and back again to suspension bracket 572 and insert it into clamping piece 571.
3. Manually tension wire 59-24.01 and secure it by means of hexagon nuts 920.37.
4. Pull the wire taut by tightening hexagon nut(s) 920.36 on the upper side of the mounting bracket.  
Refer to the "Guide wire tension" table.
5. Secure the nuts with a second hexagon nut.
6. The loose wire ends at guide wire suspension bracket 572 can either be twisted into a ring or the end can be cut off.  
After length adjustment, tape the ends to avoid fraying.
7. Attach hook 59-18 to mounting bracket 894 for attaching the lifting chain / lifting rope at a later stage.

Table 9: Guide wire tension

Pump size	Tightening torque $M_A$ [Nm]	Guide wire tension P [N]
DN 50	7	3000

5.3.1.4 Fitting the guide rail arrangement (1 or 2 guide rails)

The pump set is guided into the sump or tank along one or two vertical guide rails. It attaches itself automatically to the duckfoot bend which has been fitted to the floor.

	<b>NOTE</b>
	<p>The guide rails are not included in KSB's scope of supply. Select guide rail materials which are suitable for the fluid handled or as specified by the operator.</p>

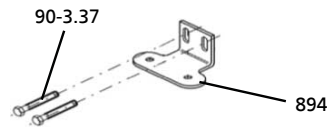
Observe the following dimensions for the guide rails:

Table 10: Guide rail dimensions

Pump size	Outside diameter [mm]	Wall thickness [mm] <sup>5)</sup>	
		Minimum	Maximum
DN 50	33,7	2	3,8

5) To DIN 2440/2442/2462 or equivalent standards

**Fitting the mounting bracket**

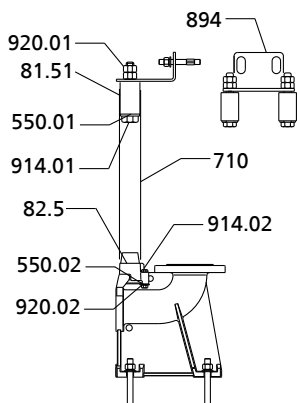


**Fig. 9:** Fitting the mounting bracket

1. Fasten mounting bracket 894 to the edge of the sump opening with steel anchor bolts 90-3.37 and tighten the anchor bolts to a tightening torque of 10 Nm.  
Observe the hole pattern for the anchor bolts. (See outline drawing.)

**Fitting the guide rails (twin guide rail arrangement)**

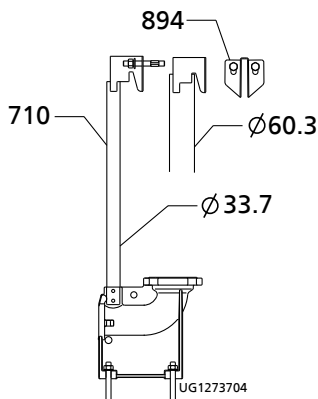
	<b>CAUTION</b>
	<p><b>Improper installation of the guide rails</b> Damage to the guide rail arrangement!</p> <p>▷ Always adjust the guide rails so that they are in a perfectly vertical position.</p>
	<b>NOTE</b>
	<p>For installation depths &gt; 6 m, the scope of supply may include brackets as a middle support for the guide rails. The mounting brackets also serve as spacers between the two guide rails.</p>



**Fig. 10:** Fitting 2 guide rails

1. Position adapter 82.5 on duckfoot bend 72.1 and fasten it with screws 914.2, discs 550.02 and nuts 920.02.
2. Place rails 710 onto the conical bosses of adapter 82.5 and position them vertically.
3. Mark the length of rails 710 (up to the lower edge of the mounting bracket), taking into account the adjusting range of the slotted holes in mounting bracket 894.
4. Shorten rails 710 with a 90° cut to the pipe axis. Debur the rails inside and outside.
5. Insert mounting bracket 894 with clamping sleeves 81.51 into guide rails 710 until the mounting bracket rests on the rail ends.
6. Tighten nuts 920.01.  
This expands the clamping sleeves so that they clamp the rails at the inside rail diameter.
7. Secure nut 920.01 with a second nut.

**Fitting the guide rails (single guide rail arrangement)**



**Fig. 11:** Fitting 1 guide rail

1. Position rail 710 in the recess of duckfoot bend 72.1. Place the rail in a vertical position.
2. Mark the length of rail 710 (up to the lower edge of the mounting bracket), taking into account the adjusting range of the slotted holes in mounting bracket 894.
3. Shorten rail 710 with a 90° cut to the pipe axis. Debur the rail inside and outside.
4. Insert mounting bracket 894 into guide rail 710 until the mounting bracket rests on the rail end.

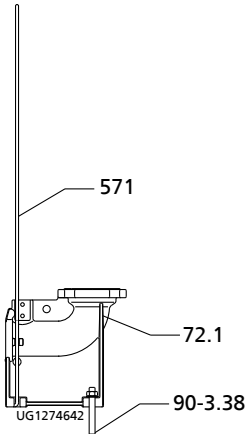
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### 5.3.1.5 Fitting the guide hoop arrangement

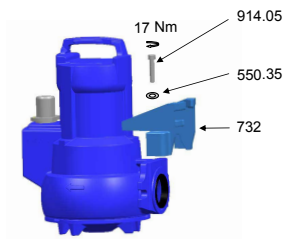
1. Insert the ends of guide hoop 571 into the grooves of duckfoot bend 72.1.
2. Fasten the duckfoot bend to the tank/sump floor with 2 anchor bolts 90-3.38.  
(⇒ Section 5.3.1.1, Page 19)

### 5.3.1.6 Preparing the pump set

#### Fastening the claw for guide wire, single guide rail and guide hoop arrangement



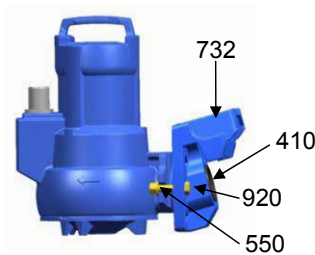
**Fig. 12:** Fitting the guide hoop arrangement



**Fig. 13:** Fastening the claw for guide wire, single guide rail and guide hoop arrangement

1. Fasten claw 723 with screw 914.05 and disc 550.35 to the discharge flange (see drawing). Tighten the screw to a torque of 17 Nm.

#### Fastening the claw for guide rail arrangements with 2 guide rails



**Fig. 14:** Fastening the claw for guide rail arrangements with 2 guide rails

1. Fasten claw 732 with screws 920 and discs 550 to the discharge flange (see illustration). Tighten the screws to a torque of 70 Nm.
2. Fit profile seal 410 in the groove of the claw.  
This will seal the duckfoot bend/pump connection.



**Attaching the lifting chain/rope**

**Stationary wet installation**

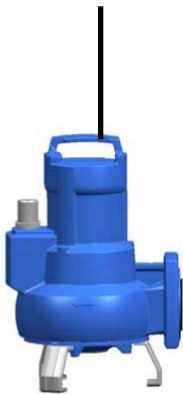
1. Attach the lifting chain or rope to the lug/eyebolt/bail at the pump set on the opposite side of the discharge nozzle.  
This attachment point achieves a forward inclination of the pump set towards the discharge nozzle, which allows the pump claw to hook onto the duckfoot bend.



Attaching the lifting chain/rope - stationary wet installation

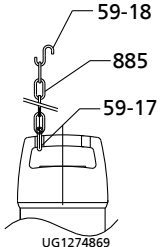
**Transportable wet installation**

1. Attach the lifting chain or rope to the lug/eyebolt/bail at the pump set on the side of the discharge nozzle.




Attaching the lifting chain/rope - transportable wet installation

**Table 11: Types of attachment**

Drawing	Type of attachment	
	<b>Shackle with chain at the pump casing</b>	
	59-17	Shackle
	59-18	Hook
	885	Chain

**5.3.1.7 Installing the pump set**

	<b>NOTE</b>
	<p>Make sure the pump set with the pre-assembled claw can easily be guided over the mounting bracket, threaded onto the guide rails and lowered down. If required, alter the position of the crane during installation.</p>

1. Guide the pump set over the suspension bracket/mounting bracket and slowly lower it down along the guide wire/guide rail(s).  
The pump set attaches itself to duckfoot bend 72-1.
2. Attach the lifting chain/rope to hook 59-18 at the mounting bracket.

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**5.3.2 Transportable wet installation**

Before installing the pump set, fit the 3 pump feet, the connection elbow and the connection piece from the installation kit for transportable models.

**Fitting the pump feet**

1. Undo screws 914.03.
2. Push pump feet 182 into the openings in the suction cover.
3. Tighten screws 914.03 again to the indicated tightening torque.

**Attaching the lifting chain/rope**

1. Attach the lifting chain or rope to the shackle on the discharge nozzle side of the pump set (see drawing and table "Types of attachment").

**Connecting the piping**

The DIN connection can be connected to rigid or flexible pipes.



Fig. 15: Attaching the lifting chain/rope

**5.4 Electrical system**

**5.4.1 Information for planning the control system**

For the electrical connection of the pump set observe the "Wiring diagrams" section. The pump set is supplied with power cables; it is wired for DOL starting.

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

**5.4.1.1 Setting the overload protection device**

1. Protect the pump set against overloading by a thermal time-lag overload protection device in accordance with IEC 60947 and local regulations.
2. Set the overload protection device to the rated current specified on the name plate.

**5.4.1.2 Level control**

	<b>CAUTION</b>
	<p><b>Fluid level below the specified minimum</b>                  Damage to the pump set by cavitation!</p> <ul style="list-style-type: none"> <li>▸ Never allow the fluid level to drop below the specified minimum.</li> </ul>

Automatic operation of the pump set in a tank requires the use of level control equipment. Observe the minimum level of fluid handled.

**5.4.1.3 Sensors**

	<b>! DANGER</b>
	<p><b>Operating a pump set that has not been fully connected</b>                  Explosion hazard!                  Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▸ Never start up a pump set with power cables that have not been fully connected or non-operational monitoring devices.</li> </ul>

On pump sets with with single-phase AC motors, a thermal motor protection device is integrated in the motor.

Pump sets with three-phase motors are not equipped with integrated thermal motor protection devices.

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For information on wiring and core identification please refer to the Annex "Wiring diagrams".

5.4.1.4 Motor temperature

	<b>CAUTION</b>
	<p><b>Insufficient cooling</b> Damage to the pump (set)!</p> <ul style="list-style-type: none"> <li>▷ Never operate a pump (set) without operational temperature monitoring.</li> </ul>

**Pump sets with single-phase AC motors** The thermal motor protection device stops the pump if the maximum permissible motor temperature is reached and re-starts it automatically after the motor has cooled down. The pump's power supply must be protected by a circuit breaker set to the rated motor current or a 10A fuse.

**Pump sets with three-phase motors** The motor is not equipped with an integrated thermal motor protection device. We recommend to use a control unit with an integrated circuit breaker set to the rated motor current +15 %.

5.4.2 Electrical connection

	<b>⚠ DANGER</b>
	<p><b>Electrical connection work by unqualified personnel</b> Risk of fatal injury due to electric shock!</p> <ul style="list-style-type: none"> <li>▷ Always have the electrical connections installed by a trained and qualified electrician.</li> <li>▷ Observe the IEC 60364 regulations as well as any regional regulations.</li> </ul>




	<b>⚠ WARNING</b>
	<p><b>Incorrect connection to the mains</b> Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> <li>▷ Observe the technical specifications of the local energy supply companies.</li> <li>▷ Inspect the power cable for visible damage.</li> <li>▷ Never connect damaged power cables.</li> </ul>

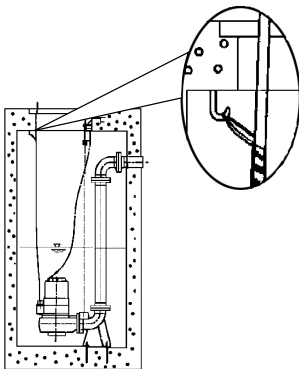
	<b>CAUTION</b>
	<p><b>Improper routing of power cable</b> Damage to the power cables!</p> <ul style="list-style-type: none"> <li>▷ Never move the power cables at temperatures below - 25 °C.</li> <li>▷ Never kink or crush the power cables.</li> <li>▷ Never lift the pump set by the power cables.</li> <li>▷ Adjust the length of the power cable to the site requirements.</li> </ul>

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

For electrical connection observe the wiring diagrams in the Annex and the information for planning the control system.


The pump set is supplied with a connection cable. Always connect all marked cores.

	<p><b>⚠ DANGER</b></p> <p><b>Operating a pump set that has not been fully connected</b> Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▸ Never start up a pump set with power cables that have not been fully connected or non-operational monitoring devices.</li> </ul>
	<p><b>⚠ DANGER</b></p> <p><b>Connection of damaged power cables</b> Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▸ Check the power cables for damage before connecting them.</li> <li>▸ Never connect damaged power cables.</li> <li>▸ Replace damaged power cables.</li> </ul>
	<p><b>CAUTION</b></p> <p><b>Flow-induced motion</b> Damage to the power cable!</p> <ul style="list-style-type: none"> <li>▸ Run the power cable upwards without slack.</li> </ul>



1. Run the power cables directly upwards without slack, and fasten.
2. If necessary, adjust the length of the power cables to the site requirements.
3. After shortening the cables, correctly re-affix the markings of the individual cores at the cable ends.




Fig. 16: Fastening the power cables

	<p><b>⚠ DANGER</b></p> <p><b>Touching the pump set during operation</b> Electric shock!</p> <ul style="list-style-type: none"> <li>▸ Make sure that the pump set cannot be touched during operation.</li> </ul>
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## 6 Commissioning/Start-up/Shutdown

### 6.1 Commissioning/Start-up




#### 6.1.1 Prerequisites for commissioning/start-up

	<p><b>CAUTION</b></p>
	<p><b>Fluid level too low</b> Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Always operate the pump set in such a way that air cannot ingress into the pump casing.</li> <li>▷ Never allow the fluid level to drop below the specified minimum (R3).</li> <li>▷ For continuous operation (S1) operate the pump set in fully submerged condition.</li> </ul>
	<p> <b>DANGER</b></p>
	<p><b>Persons in the tank during pump operation</b> Electric shock! Risk of injury! Danger of death from drowning!</p> <ul style="list-style-type: none"> <li>▷ Never start up the pump set when there are persons in the tank.</li> </ul>

Before commissioning/starting up the pump set, make sure that the following conditions are met:

- The pump set has been properly connected to the power supply and is equipped with all protection devices.
- The pump has been primed with the fluid to be pumped.
- The direction of rotation has been checked.
- After prolonged shutdown of the pump (set), the required activities have been carried out. (⇒ Section 6.4, Page 32)

#### 6.1.2 Start-up

	<p> <b>DANGER</b></p>
	<p><b>Persons in the tank during pump operation</b> Electric shock! Risk of injury! Danger of death from drowning!</p> <ul style="list-style-type: none"> <li>▷ Never start up the pump set when there are persons in the tank.</li> </ul>
	<p><b>CAUTION</b></p>
	<p><b>Re-starting while motor is still running down</b> Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Do not re-start the pump set before it has come to a standstill.</li> <li>▷ Never start up the pump set while the pump is running in reverse.</li> </ul>

- ✓ The fluid level is sufficiently high.

	<b>CAUTION</b>
	<p><b>Start-up against a closed shut-off element</b>                  Increased vibrations!                  Damage to mechanical seals and bearings!</p> <ul style="list-style-type: none"> <li>▷ Never operate the pump set against a closed shut-off element.</li> </ul>

1. Fully open the discharge line shut-off element, if any.
2. Start up the pump set.

**6.2 Operating limits**

	<b>! DANGER</b>
	<p><b>Non-compliance with operating limits</b>                  Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Comply with the operating data specified in the data sheet.</li> <li>▷ Never operate the pump set at ambient or fluid temperatures exceeding those specified in the data sheet or on the name plate.</li> <li>▷ Never operate the pump set outside the limits specified below.</li> </ul>

**6.2.1 Frequency of starts**

	<b>CAUTION</b>
	<p><b>Excessive frequency of starts</b>                  Risk of damage to the motor!</p> <ul style="list-style-type: none"> <li>▷ Never exceed the specified frequency of starts.</li> </ul>

To prevent high temperature increases in the motor and impermissible loads on the pump, coupling, motor, seals and bearings, the switching frequency shall not exceed 15 start-ups per hour (h).

These values apply to mains start-up.

**6.2.2 Operation on the power supply mains**

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

**6.2.3 Fluid handled**

**6.2.3.1 Fluid temperature**

The pump set is designed for transporting liquids. The pump set is not operational under freezing conditions.

	<b>CAUTION</b>
	<p><b>Danger of freezing!</b>                  Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Drain the pump set or protect it against freezing.</li> </ul>

Refer to the maximum permissible fluid temperature and ambient temperature indicated on the name plate and/or in the data sheet.

6.2.3.2 Minimum level of fluid handled

	<b>CAUTION</b>
	<p><b>Fluid level below the specified minimum</b>          Damage to the pump set by cavitation!</p> <ul style="list-style-type: none"> <li>▸ Never allow the fluid level to drop below the specified minimum.</li> </ul>

Before starting up the pump, make sure that the minimum fluid level is always higher than dimension R (see outline drawing). For continuous operation (S1) the pump must be fully submerged.

6.3 Shutdown/storage/preservation

6.3.1 Measures to be taken for shutdown

	<b>⚠ DANGER</b>
	<p><b>Electrical connection work by unqualified personnel</b>          Risk of fatal injury due to electric shock!</p> <ul style="list-style-type: none"> <li>▸ Always have the electrical connections installed by a trained and qualified electrician.</li> <li>▸ Observe the IEC 60364 regulations as well as any regional regulations.</li> </ul>

	<b>⚠ WARNING</b>
	<p><b>Unintentional starting of the pump set</b>          Risk of injury by moving components and shock currents!</p> <ul style="list-style-type: none"> <li>▸ Ensure that the pump set cannot be started unintentionally.</li> <li>▸ Always make sure the electrical connections are disconnected before carrying out work on the pump set.</li> </ul>

	<b>⚠ WARNING</b>
	<p><b>Fluids handled, consumables and supplies which are hot and/or pose a health hazard</b>          Risk of injury!</p> <ul style="list-style-type: none"> <li>▸ Observe all relevant laws.</li> <li>▸ When draining the fluid take appropriate measures to protect persons and the environment.</li> <li>▸ Decontaminate pumps which handle fluids posing a health hazard.</li> </ul>

	<b>CAUTION</b>
	<p><b>Danger of frost/freezing</b>          Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▸ If there is any danger of frost/freezing, remove the pump set from the fluid handled and clean, preserve and store it.</li> </ul>

**The pump set remains installed**

- ✓ Make sure sufficient fluid is available for the operation check run of the pump set.
- 1. For prolonged shutdown periods, start up the pump set regularly between once a month and once every three months for approximately one minute. This will prevent the formation of deposits within the pump and the pump intake area.

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**The pump (set) is removed from the pipe and stored**

✓ All safety regulations are observed. (⇒ Section 7.1, Page 33)



1. Clean the pump set.
2. Preserve the pump set.
3. Observe the instructions given in (⇒ Section 3.3, Page 11) .

**6.4 Returning to service**

For returning the pump set to service, observe the items on commissioning/start-up. (⇒ Section 6.1, Page 29)

Refer to and comply with the operating limits. (⇒ Section 6.2, Page 30)

For returning the pump set to service after storage also follow the instructions for maintenance/inspection.






	<p style="background-color: #f4a460; padding: 2px;"><b>⚠ WARNING</b></p> <p><b>Failure to re-install or re-activate protective devices</b>          Risk of injury from moving parts or escaping fluid!</p> <ul style="list-style-type: none"> <li>▸ As soon as the work is completed, properly re-install and re-activate any safety-relevant devices and protective devices.</li> </ul>
	<p style="background-color: #0070c0; color: white; padding: 2px;"><b>NOTE</b></p> <p>On pumps/pump sets older than 5 years we recommend replacing all elastomer seals.</p>




## 7 Servicing/Inspection

### 7.1 Safety regulations

The operator ensures that maintenance, inspection and installation are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

	<p><b>⚠ WARNING</b></p> <p><b>Unintentional starting of the pump set</b> Risk of injury by moving components and shock currents!</p> <ul style="list-style-type: none"> <li>▷ Ensure that the pump set cannot be started unintentionally.</li> <li>▷ Always make sure the electrical connections are disconnected before carrying out work on the pump set.</li> </ul>
	<p><b>⚠ WARNING</b></p> <p><b>Fluids handled, consumables and supplies which are hot and/or pose a health hazard</b> Risk of injury!</p> <ul style="list-style-type: none"> <li>▷ Observe all relevant laws.</li> <li>▷ When draining the fluid take appropriate measures to protect persons and the environment.</li> <li>▷ Decontaminate pumps which handle fluids posing a health hazard.</li> </ul>
	<p><b>⚠ WARNING</b></p> <p><b>Hot surface</b> Risk of injury!</p> <ul style="list-style-type: none"> <li>▷ Allow the pump set to cool down to ambient temperature.</li> </ul>
	<p><b>⚠ WARNING</b></p> <p><b>Improper lifting/moving</b> Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Always use the pump handle when moving the pump.</li> </ul>
	<p><b>⚠ WARNING</b></p> <p><b>Insufficient stability</b> Risk of crushing hands and feet!</p> <ul style="list-style-type: none"> <li>▷ During assembly/dismantling, secure the pump (set)/pump parts to prevent tilting or tipping over.</li> </ul>

A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the pump, pump set and pump parts with a minimum of servicing/maintenance expenditure and work.

	<p><b>NOTE</b></p> <p>All maintenance work, service work and installation work can be carried out by KSB Service or authorised workshops. For contact details please refer to the enclosed "Addresses" booklet or visit "<a href="http://www.ksb.com/contact">www.ksb.com/contact</a>" on the Internet.</p>
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Never use force when dismantling and reassembling the pump set.

## 7.2 Servicing/inspection

KSB recommends the following regular servicing schedule:

**Table 12:** Overview of maintenance work

Maintenance interval	Maintenance work	For details see ...
Every 4,000 operating hours <sup>6)</sup>	Measure the insulation resistance.	(⇒ Section 7.2.1.3, Page 34)
	Check the power cable and float switch cable.	(⇒ Section 7.2.1.2, Page 34)
	Visually inspect the lifting chain/rope.	(⇒ Section 7.2.1.1, Page 34)
	Change the lubricant.	
	Inspect the bearings.	
Every five years	General overhaul	

### 7.2.1 Inspection work

#### 7.2.1.1 Checking the lifting chain/rope

- ✓ The pump set has been lifted out of the pump sump and cleaned. (Applies to installation type K only.)
  1. Inspect the lifting chain/rope as well as their fasteners for any visible damage.
  2. Replace any damaged components by original spare parts.

#### 7.2.1.2 Checking the power cables

**Visual inspection**

- ✓ The pump set has been lifted out of the pump sump and cleaned.
  1. Inspect the power cables for visible damage.
  2. Replace any damaged components by original spare parts.

**Checking the earth conductor**

- ✓ The pump set has been lifted out of the pump sump and cleaned.
  1. Measure the resistance between the earth conductor and chassis ground. The electrical resistance must be lower than 1 Ω.
  2. Replace any damaged components by original spare parts.

	<b>⚠ DANGER</b>
	<p><b>Defective earth conductor</b> Electric shock!</p> <ul style="list-style-type: none"> <li>▷ Never switch on a pump set with a defective earth conductor.</li> </ul>

#### 7.2.1.3 Measuring the insulation resistance

Measure the insulation resistance of the motor winding during annual maintenance work.

- ✓ The pump set has been disconnected in the control cabinet.
- ✓ Use an insulation resistance measuring device.
- ✓ The recommended measuring voltage is 500 V (maximum permissible voltage: 1000 V).
  1. Measure the winding to chassis ground. To do so, connect all winding ends together.
- ⇒ The insulation resistance of the core ends to chassis ground must not be lower than 1 MΩ.  
If the resistance measured is lower, power cable and motor resistance must be measured separately. Disconnect the power cable from the motor for this purpose.

<sup>6)</sup> At least once a year

	<b>NOTE</b>
	If the insulation resistance of the power cable is lower than 1 MΩ, the power cable is defective and must be replaced.
	<b>NOTE</b>
	If the insulation resistances measured on the motor are too low, the winding insulation is defective. The pump set must not be returned to service in this case.

**7.2.2 Lubrication and lubricant change**

**7.2.2.1 Lubricating the mechanical seal**

The mechanical seal is supplied with lubricating liquid from the lubricant reservoir.

**7.2.2.2 Lubricating the rolling element bearings**

The rolling element bearings of the pump sets are grease-packed and maintenance-free.

**7.2.2.2.1 Intervals**

Change the lubricant every 4000 operating hours but at least once a year.

**7.2.2.2.2 Lubricant quality**

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

**Table 13: Oil quality**

Description	Properties	
Paraffin oil or white oil Alternative: motor oil grades SAE 10W to SAE 20W	Kinematic viscosity at 40 °C	<20 mm <sup>2</sup> /s
	Flash point (to Cleveland)	+160 °C
	Solidification point (pour point)	-15 °C

**Recommended oil quality:**

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

	<b>⚠ WARNING</b>
	<p><b>Lubricant contaminating fluid handled</b> Hazard to persons and the environment!</p> <p>▷ Using machine oil is only permitted if the oil is disposed of properly.</p>

7.2.2.2.3 Lubricant quantity

Table 14: Lubricant quantity [l] depending on the impeller type

Impeller type	Lubricant quantity
	[l]
S	0,13

7.2.2.2.4 Changing the lubricant

	<p><b>⚠ WARNING</b></p>
	<p><b>Lubricants posing a health hazard and/or hot lubricants</b> Hazard to persons and the environment!</p> <ul style="list-style-type: none"> <li>▷ When draining the lubricant take appropriate measures to protect persons and the environment.</li> <li>▷ Wear safety clothing and a protective mask if required.</li> <li>▷ Collect and dispose of any lubricants.</li> <li>▷ Observe all legal regulations on the disposal of fluids posing a health hazard.</li> </ul>
	<p><b>⚠ WARNING</b></p>
	<p><b>Excess pressure in the lubricant reservoir</b> Liquid spurting out when the lubricant reservoir is opened at operating temperature!</p> <ul style="list-style-type: none"> <li>▷ Allow the pump set to cool down to ambient temperature.</li> <li>▷ Carefully pull off the mechanical seal.</li> </ul>
	<p><b>NOTE</b></p>
	<p>Paraffin oil is bright and transparent in appearance. A slight discolouration, caused by the running-in process of new mechanical seals or small amounts of leakage from the fluid handled, has no detrimental effect. However, if the coolant is severely contaminated by the fluid handled, this suggests a defect at the mechanical seals.</p>

**Draining the lubricant**

- ✓ The suction cover and the impeller have been removed.
- 1. Place a suitable container under the pump set.
- 2. Slide mechanical seal 433.02 along the shaft.
- 3. Drain the oil.

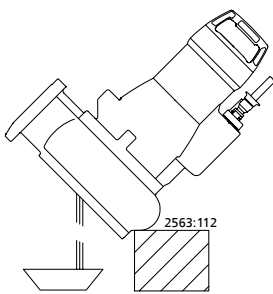


Fig. 17: Draining the lubricant

**Filling in the lubricant**

1. For impeller type S fill 0.13 litres of oil through the opening between the stationary assembly of mechanical seal 433.02 and rotor 818.
2. Thoroughly clean rotor 818 and the contact face of the stationary assembly of mechanical seal 433.02. Remove any oil residues.
3. Fit the rotating assembly of mechanical seal 433.02.
4. Fit impeller 230 and suction cover 162. Observe the tightening torques.

7.3 Drainage/cleaning

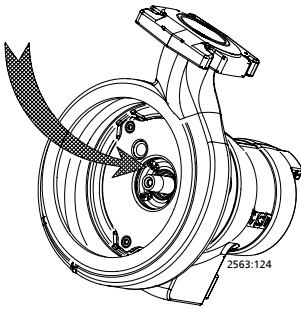


Fig. 18: Filling in the lubricant

	<p><b>⚠ WARNING</b></p>
	<p><b>Fluids handled, consumables and supplies which are hot and/or pose a health hazard</b>  Hazard to persons and the environment!</p> <ul style="list-style-type: none"> <li>▷ Collect and properly dispose of flushing fluid and any fluid residues.</li> <li>▷ Wear safety clothing and a protective mask if required.</li> <li>▷ Observe all legal regulations on the disposal of fluids posing a health hazard.</li> </ul>

1. Always flush the pump if it has been used for handling noxious, explosive, hot or other hazardous fluids.
2. Always flush and clean the pump before transporting it to the workshop. Provide a certificate of decontamination for the pump set. (⇒ Section 11, Page 47)

### 7.4 Dismantling the pump set

#### 7.4.1 General information/Safety regulations

	<p><b>⚠ WARNING</b></p>
	<p><b>Unqualified personnel performing work on the pump (set)</b>  Risk of injury!</p> <ul style="list-style-type: none"> <li>▷ Always have repair work and maintenance work performed by specially trained, qualified personnel.</li> </ul>
	<p><b>⚠ WARNING</b></p>
	<p><b>Hot surface</b>  Risk of injury!</p> <ul style="list-style-type: none"> <li>▷ Allow the pump set to cool down to ambient temperature.</li> </ul>
	<p><b>⚠ WARNING</b></p>
	<p><b>Improper lifting/moving of heavy assemblies or components</b>  Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.</li> </ul>

Observe the safety instructions and information.  
For dismantling and reassembly observe the general assembly drawing.  
In the event of damage you can always contact KSB Service.

	<p><b>⚠ DANGER</b></p>
	<p><b>Insufficient preparation of work on the pump (set)</b>  Risk of injury!</p> <ul style="list-style-type: none"> <li>▷ Properly shut down the pump set.</li> <li>▷ Close the shut-off elements in the suction line and discharge line.</li> <li>▷ Drain the pump and release the pump pressure.</li> <li>▷ Shut off any auxiliary feed lines.</li> <li>▷ Allow the pump set to cool down to ambient temperature.</li> </ul>
	<p><b>⚠ WARNING</b></p>
	<p><b>Components with sharp edges</b>  Risk of cutting or shearing injuries!</p> <ul style="list-style-type: none"> <li>▷ Always use appropriate caution for installation and dismantling work.</li> <li>▷ Wear work gloves.</li> </ul>

**7.4.2 Preparing the pump set**

- ✓ The notes and steps stated in (⇒ Section 7.4.1, Page 37) have been observed/ carried out.
- 1. De-energise the pump set and secure it against unintentional start-up.
- 2. Drain the lubricant.
- 3. Drain the leakage chamber and leave it open for the duration of the disassembly.

**7.4.3 Dismantling the pump section**

Dismantle the pump section in accordance with the relevant general assembly drawing.

**Pump sets with impeller type S**

1. Remove suction cover 162 and ring 500.
2. Take off impeller screw 914.04 and impeller body 23-7.
3. Use the M10 forcing thread provided in the centre of impeller type S to loosen and remove the impeller.  
Screw in the jack as shown in the drawing below and remove the impeller.

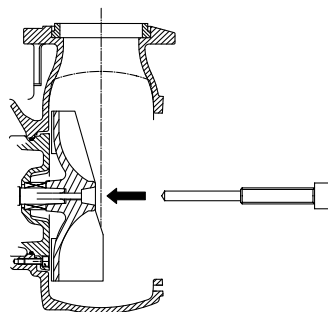


Fig. 19: Forcing screw

	<p><b>NOTE</b></p>
	<p>The forcing screw is not included in the scope of supply. It can be ordered separately from KSB.</p>

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### 7.4.4 Removing the mechanical seal and the motor section

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

- ✓ The oil has been drained.
  1. Undo and remove screws 914.02 at bearing bracket 330.
  2. Remove rotor unit 818 from bearing bracket 330.
  3. Push mating ring 433.02 out of bearing bracket 330.
  4. Remove circlip 932 (pump sets with impeller type S: remove both circlips 932).
  5. Pull off rolling element bearing 321.02.
  6. Pull off rolling element bearing 321.01.
  7. Take shaft seal ring 421 out of bearing bracket 330.

### 7.5 Reassembling the pump set

#### 7.5.1 General information/Safety regulations

	<p><b>⚠ WARNING</b></p>
	<p><b>Improper lifting/moving of heavy assemblies or components</b>          Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▸ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.</li> </ul>
	<p><b>CAUTION</b></p>
	<p><b>Improper reassembly</b>          Damage to the pump!</p> <ul style="list-style-type: none"> <li>▸ Reassemble the pump (set) in accordance with the general rules of sound engineering practice.</li> <li>▸ Use original spare parts only.</li> </ul>

**Sequence** Always reassemble the pump set in accordance with the corresponding general assembly drawing.

- Sealing elements**
- O-rings
    - Check O-rings for any damage and replace by new O-rings, if required.
  - Assembly adhesives
    - Avoid the use of assembly adhesives, if possible.

**Tightening torques** For reassembly, tighten all screws and bolts as specified in this manual.

### 7.5.2 Reassembling the pump section

#### 7.5.2.1 Fitting the mechanical seal

Observe the following points to ensure trouble-free operation of the mechanical seal:


- The shaft surface must be absolutely clean and undamaged.
  - Immediately before installing the mechanical seal, wet the contact faces with a drop of oil.
  - For easier installation of bellows-type mechanical seals, wet the inside diameter of the bellows with soapy water (not oil).
  - ✓ Shaft 210, shaft seal ring 420 and rolling element bearings 321.01/02 and baffle 17-5 have been properly fitted in bearing bracket 330.
1. Fit the stationary part of mechanical seal 433.02 correctly in bearing bracket 330.
  2. Push the primary ring carefully along the shaft until it rests against the mating ring, using assembly tool 969 (spare parts set).
  3. Press O-ring 412.03 into bearing bracket 330.
  4. Fill in oil.
  5. Slide the rotating part of mechanical seal 433.02 onto shaft 210.

#### 7.5.2.2 Fitting the impeller

##### 7.5.2.2.1 Fitting impeller type S and cutter

	<p><b>NOTE</b></p>
<p>For bearing brackets with tapered fit make sure that the tapered fit of impeller and shaft is undamaged and installed free from grease.</p>	

1. Slide impeller 230 onto the shaft end.
2. Insert grooved pin 561 into impeller 230.
3. Place impeller body 23-7 on the centring hub.
4. Insert impeller screw 914.04 and tighten it to a torque of 30 Nm.
5. Fasten ring 500 in the suction cover with screws 914.06.

	<p><b>CAUTION</b></p>
<p><b>Incorrect assembly</b> Inaccurate clearance gap!</p> <ul style="list-style-type: none"> <li>▶ Pull the rotor assembly right up to the suction cover until it will not go any further. Maintain this position until dimensions x and y have been measured.</li> </ul>	

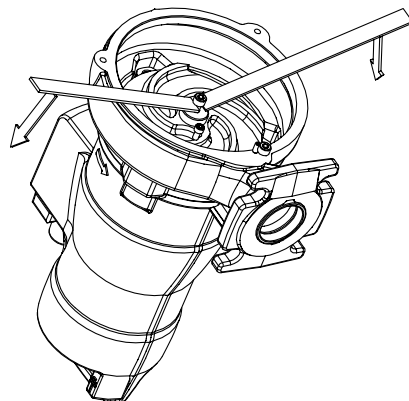


Fig. 20: Pulling the rotor assembly right up to the suction cover



- Pull the rotor assembly right up to the suction cover until it will not go any further.

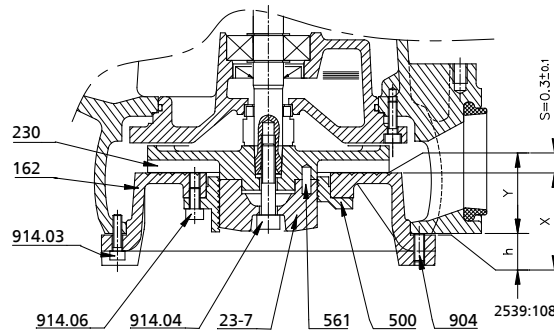


Fig. 21: Adjusting impeller type S

h	Distance between suction cover and pump casing
s	Clearance gap between suction cover and impeller vanes
x	Distance between the upper side of the suction cover and the mounting holes of the suction cover
y	Distance between the bottom of the pump casing and the impeller vanes

- Measure dimension x on the suction cover  
Dimension x is the distance between the upper side of the suction cover and the mounting holes of the suction cover.
- Measure dimension y between the pump casing and the impeller vanes.  
Dimension y is the distance between the bottom of the pump casing and the impeller vanes.
- Use screws 904 to set dimension h ( $h = x + s - y$ ), where s ( $0.3 + -0.1$ ) is the clearance between the suction cover and the impeller vanes.
- Tighten the suction cover with screws 914.03.
- Rotate the impeller body to check that the impeller turns smoothly.  
Make sure that the suction cover and impeller do not touch each other.

#### 7.5.2.2.2 Fitting impeller type F

Apply Loctite 243 (or similar) to the shaft stub thread and to the bore of impeller type F 230 and screw the impeller onto the shaft with a tightening torque of 2.5 Nm.

	<b>CAUTION</b>
	<p><b>Incorrect assembly</b> Damage to the shaft!</p> <p>▷ Wait at least 2 hours before starting the pump again.</p>

#### 7.5.3 Checking the connection of motor/power supply

Check the power cables after reassembly. (⇒ Section 7.2.1, Page 34)

#### 7.6 Tightening torques

Table 15: Tightening torques

Thread	Thread	[Nm]
M5		2,5
M6		7
M8		30

### 7.7 Spare parts stock

#### 7.7.1 Ordering spare parts

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

- Order number
- Order item number
- Type series
- Size
- Year of construction
- Motor number

Refer to the name plate for all data.

Also specify the following data:

- Part number and description
- Quantity of spare parts
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)

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

**Table 16:** Quantity of spare parts for recommended spare parts stock<sup>7)</sup>

Part No.	Description	Number of pumps (including stand-by pumps)						
		2	3	4	5	6 and 7	8 and 9	10 and more
230	Impeller	1	1	2	2	3	4	50 %
321.01	Rolling element bearing, motor end	1	1	2	2	3	4	50 %
321.02	Rolling element bearing, pump end	1	1	2	2	3	4	50 %
420	Shaft seal ring, motor end	2	3	4	5	6	7	90 %
433.02	Mechanical seal, pump end	2	3	4	5	6	7	90 %
99-9	Set of sealing elements	4	6	8	8	9	10	100 %



#### 7.7.3 Sets of spare parts

**Table 17:** Overview of spare parts sets

Description	Part No.
Rolling element bearing, motor end	321.01
Rolling element bearing, pump end	321.02
Shaft seal ring, motor end	420
Mechanical seal, pump end	433.02
Set of sealing elements	99-9
1 set of circlips	-

7) For two years of continuous operation or 4000 operating hours

## 8 Trouble-shooting

	 <b>WARNING</b>
	<p><b>Improper work to remedy faults</b> Risk of injury!</p> <p>▷ For any work performed to remedy faults, observe the relevant information given in this instruction manual and/or in the product literature provided by the accessories manufacturer.</p>

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

- A Pump is running, but does not deliver
- B Pump delivers insufficient flow rate
- C Excessive current/power input
- D Insufficient discharge head
- E Vibrations and noise during pump operation

Table 18: Trouble-shooting

A	B	C	D	E	Possible cause	Remedy
-	X	-	-	-	Pump delivers against an excessively high pressure.	Re-adjust to duty point.
-	X	-	-	-	Gate valve in the discharge line is not fully open.	Fully open the gate valve.
-	-	X	-	X	Pump is running in the off-design range (part load/overload).	Check the pump's operating data.
X	-	-	-	-	Pump or piping are not completely vented.	Vent by lifting the pump off the duckfoot bend and lowering it again.
X	-	-	-	-	Pump intake clogged by deposits	Clean the intake, pump components and lift check valve.
-	X	-	X	X	Supply line or impeller clogged	Remove deposits in the pump and/or piping.
-	-	X	-	X	Dirt/fibres in the clearance between the casing wall and impeller Sluggish rotor.	Check whether the impeller can be easily rotated. Clean the impeller if required.
-	X	X	X	X	Wear of internal components	Replace worn components by new ones.
X	X	-	X	-	Defective riser (pipe and sealing element)	Replace defective riser pipes, replace sealing elements.
-	X	-	X	X	Impermissible air or gas content in the fluid handled	Contact the manufacturer.
-	-	-	-	X	System-induced vibrations	Contact the manufacturer.
-	X	X	X	X	Wrong direction of rotation	Check the electrical connection of the motor and the control system if any.
-	-	X	-	-	Wrong supply voltage	Check the mains power supply. Check the cable connections.
X	-	-	-	-	Motor is not running because of lack of voltage.	Check the electrical installation. Contact the energy supplier.
X	-	X	-	-	Motor winding or connection cable are defective.	Replace by new original KSB parts or contact the manufacturer.
-	-	-	-	X	Defective rolling element bearing	Contact the manufacturer.
-	X	-	-	-	Water level lowered too much during operation	Check level control equipment.
X	-	-	-	-	Temperature control device monitoring the winding has tripped the pump as a result of excessive winding temperatures.	The motor will restart automatically once it has cooled down.

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## 9 Related Documents

### 9.1 Wiring diagram

#### Pump sets with single-phase AC motors

Version with float switch (SE)

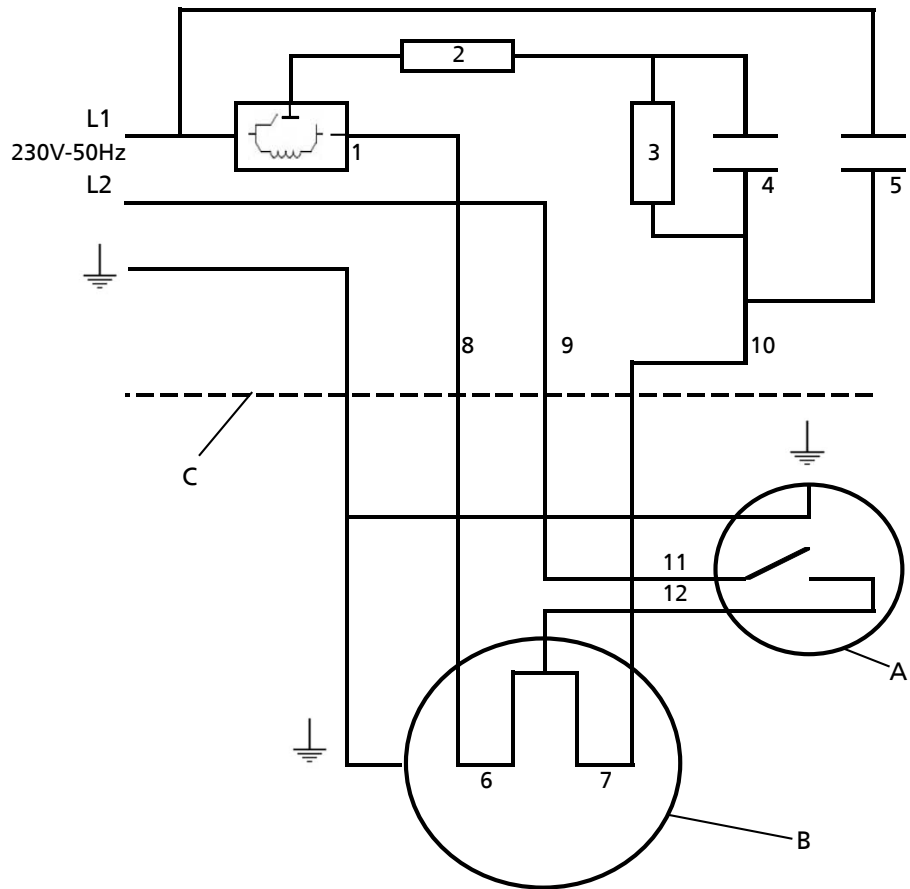


Fig. 22: Single-phase AC units with float switch (SE)

1	Relay 2CR3 200 or similar	2	Resistor 3.3 $\Omega$ , 25 W
3	Resistor 56 k $\Omega$ , 3 W	4	Start capacitor 60 $\mu$ F
5	Run capacitor 25 $\mu$ F	6	Main winding
7	Auxiliary winding	8	Conductor colour: black
9	Conductor colour: grey or blue	10	Conductor colour: brown
11	Conductor colour: blue	12	Conductor colour: brown
A	Float switch	B	Motor
C	KSB scope of supply		

Version without float switch (NE)

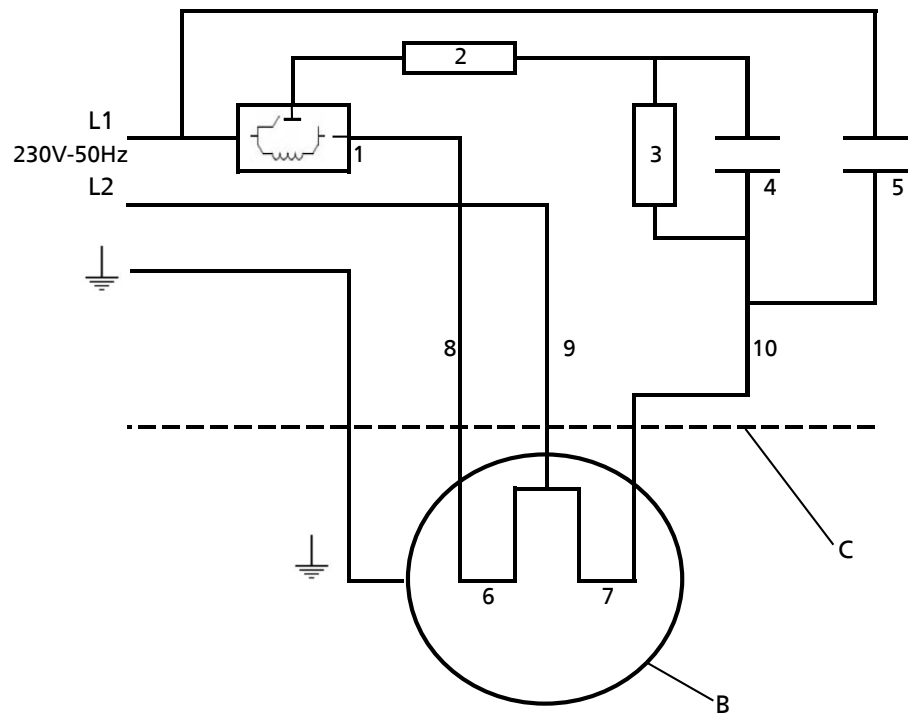


Fig. 23: Single-phase AC units without float switch (NE)

1	Relay 2CR3 200 or similar	2	Resistor 3,3 $\Omega$ , 25 W
3	Resistor 56 k $\Omega$ , 3 W	4	Start capacitor 60 $\mu$ F
5	Run capacitor 25 $\mu$ F	6	Main winding
7	Auxiliary winding	8	Conductor colour: black
9	Conductor colour: grey or blue	10	Conductor colour: brown
B	Motor	C	KSB scope of supply

## 10 EU Declaration of Conformity

Manufacturer: **KSB S.A.S.**  
**128, rue Carnot,**  
**59320 Sequedin (France)**

This EU Declaration of Conformity is issued under the sole responsibility of the manufacturer.

The manufacturer herewith declares that **the product:**

### **Ama-Porter S 545**

**Serial number range: S2001-S2452**

- is in conformity with the provisions of the following Directives as amended from time to time:
  - Pump (set): 2006/42/EC Machinery Directive
  - Electrical components<sup>8)</sup>: 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

The manufacturer also declares that

- the following harmonised international standards have been applied:
  - ISO 12100
  - EN 809
  - EN 60034-1, EN 60034-5/A1

Person authorised to compile the technical file:

Hugues Roland  
Head of Design/Engineering  
KSB S.A.S.  
128, rue Carnot,  
59320 Sequedin (France)

The EU Declaration of Conformity was issued in/on:

Frankenthal, 1 January 2020



Thomas Heng  
Head of Product Development Series Pumps  
KSB SE & Co. KGaA  
Johann-Klein-Straße 9  
67227 Frankenthal

---

8) Where applicable

### 11 Certificate of Decontamination

Type: .....

Order number/ .....

Order item number<sup>9)</sup>: .....

Delivery date: .....

Applications: .....

Fluid handled<sup>9)</sup>: .....

Please tick where applicable<sup>9)</sup>:



Corrosive



Oxidising



Flammable



Explosive



Hazardous to health



Seriously hazardous to health



Toxic



Radioactive



Bio-hazardous



Safe

Reason for return<sup>9)</sup>: .....

Comments: .....

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

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

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

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

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

.....  
.....

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

.....  
Place, date and signature

.....  
Address

.....  
Company stamp

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9) Required fields

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