

Submersible Motor Pump

Ama-Porter

F
India (IN)

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 operating manual

Sizes	Impeller type	Material variant G
5__	F	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 10)

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 ¹⁾	Sectional drawing of the pump
Spare parts lists ¹⁾	Description of spare parts

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



2 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.
- 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.
- 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).
- 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 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 $1.2 \times Q_{BEF}$ to minimise the risk of clogging/hardening.

- Avoid duty points for continuous operation at very low speeds and small flow rates ($< 0.7 \times Q_{BEP}$).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.
- 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 26)
- 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 24)

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/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

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

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

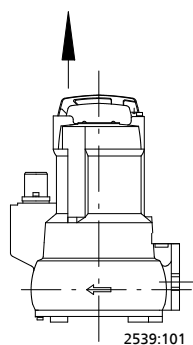





Fig. 1: Transporting the pump set

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>CAUTION</p> <p>Improper storage Damage to the power cable!</p> <ul style="list-style-type: none"> ▸ Support the power cables at the cable entry to prevent permanent deformation.
	<p>CAUTION</p> <p>Damage during storage due to humidity, dirt or vermin Corrosion/contamination of the pump (set)!</p> <ul style="list-style-type: none"> ▸ For outdoor storage cover the pump (set) or the packaged pump (set) and accessories with waterproof material.
	<ul style="list-style-type: none"> ▪ 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.
	<p>NOTE</p> <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 31)
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 10, Page 42)

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

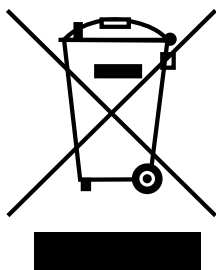
	<div style="background-color: #f4a460; padding: 5px;"> WARNING</div> <p>Fluids, consumables and supplies posing a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and dispose of any preservatives, flushing liquids and fluid residues. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.
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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>.

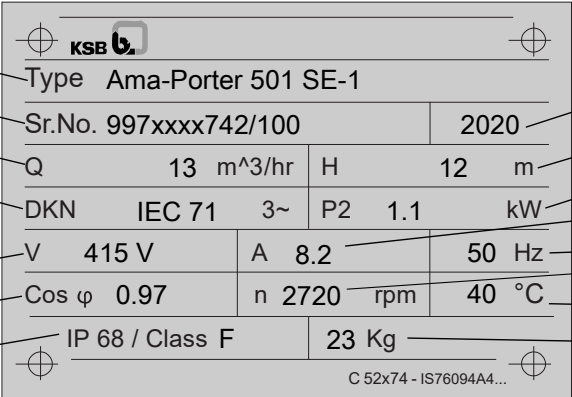
4.3 Designation

Example: Ama-Porter F 501 SE

Table 5: Designation key

Code	Description
Ama-Porter	Type series
F	Impeller type
	F Free-flow impeller
5	Size
	5.. DN 50
01	Impeller size
SE	Motor version
	SE Single-phase AC motor with float switch
	NE Single-phase AC motor without float switch
	ND Three-phase asynchronous motor without float switch

4.4 Name plate



1	Type	Ama-Porter 501 SE-1	8	
2	Sr.No.	997xxxx742/100	2020	9
3	Q	13 m ³ /hr	H	12 m
4	DKN	IEC 71 3~	P2	1.1 kW
5	V	415 V	A	8.2
6	Cos φ	0.97	n	2720 rpm
7	IP 68 / Class F			40 °C
			23 Kg	15

C 52x74 - IS76094A4...

Fig. 2: Name plate (example)

1	Designation	2	KSB order number and KSB order item number
3	Flow rate	4	Motor type / motor size
5	Rated voltage	6	Power factor at rated operating point
7	Enclosure	8	Year of construction
9	Head	10	Rated power
11	Rated current	12	Frequency
13	Rated speed	14	Maximum fluid temperature
15	Weight		

4.5 Design details

Design

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

Installation

- Vertical installation
- Wet-installed transportable model

Drive

- Single-phase AC motor, 50 Hz, 230 V, with integrated temperature switch
- Three-phase asynchronous motor, 50 Hz (+/-3 %), 415 V (+10 %/-15 %), DOL starting
- Enclosure IP68 (permanently submerged) to EN 60529 / IEC 529
- Thermal class F

Shaft seal

Drive end:

- Shaft seal ring

Pump-end:

- 1 bi-directional mechanical seal with liquid reservoir

Impeller type

- Free-flow impeller

Bearings

- Grease-packed bearings sealed for life

4.6 Installation types

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

- 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

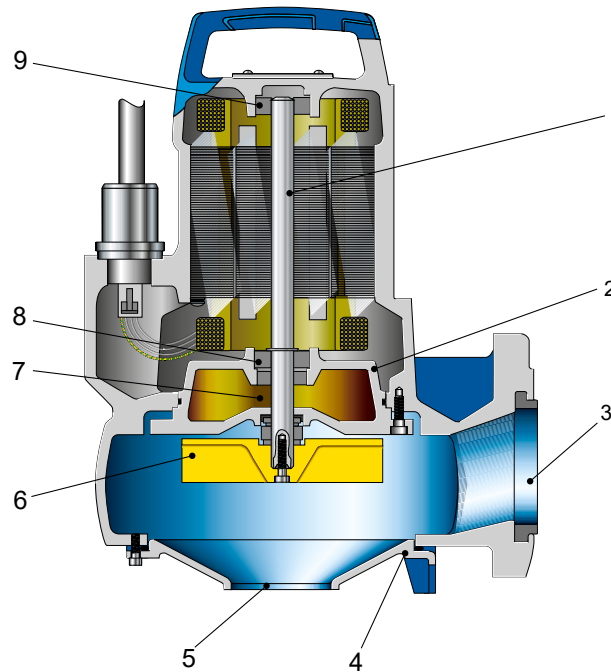


Fig. 3: Sectional drawing

1	Shaft	2	Bearing bracket
3	Casing (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 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 inboard shaft seal is a bi-rotational mechanical seal; the outboard shaft 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

Transportable wet-installed model (installation type P)



- Pump set complete with power cables
- Installation parts for transportable models:
 - 3 support feet
 - Discharge elbow
 - Support foot plate
- Lifting chain with shackle

4.9 Dimensions and weights

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

5 Installation at Site


5.1 Safety regulations

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

5.2 Checks to be carried out prior to installation

5.2.1 Preparing the place of installation

Place of installation for transportable models


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

5.2.2 Checking the direction of rotation

	<div style="background-color: #f4a460; padding: 5px;">⚠ WARNING</div> <p>Hands or foreign objects in the pump casing Risk of injuries, damage to the pump!</p> <ul style="list-style-type: none"> ▷ Never insert your hands or any other objects into the pump. ▷ Check that the inside of the pump is free from any foreign objects. ▷ Take suitable precautions (e.g. wear safety goggles).
---	--

- ✓ 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 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.

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.
(⇒ Section 6.2.2, Page 25)




Fig. 4: Attaching the lifting chain/rope

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

	CAUTION
	Fluid level below the specified minimum Damage to the pump set by cavitation! ▷ Never allow the fluid level to drop below the specified minimum.

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


	⚠ DANGER
	Operating a pump set that has not been fully connected Explosion hazard! Damage to the pump set! ▷ Never start up a pump set with power cables that have not been fully connected or non-operational monitoring devices.

On pump sets 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.

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

5.4.1.4 Motor temperature

	CAUTION
	Insufficient cooling Damage to the pump (set)! ▷ Never operate a pump (set) without operational temperature monitoring.







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

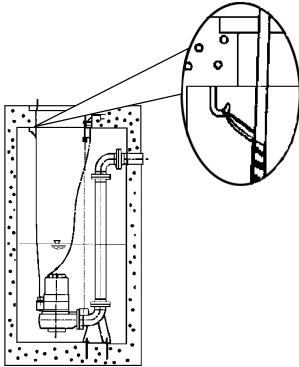
	<div data-bbox="507 232 683 277"> DANGER</div> <p>Electrical connection work by unqualified personnel Risk of fatal injury due to electric shock!</p> <ul style="list-style-type: none"> ▷ Always have the electrical connections installed by a trained and qualified electrician. ▷ Observe the IEC 60364 regulations as well as any regional regulations.
	<div data-bbox="507 508 703 553"> WARNING</div> <p>Incorrect connection to the mains Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▷ Observe the technical specifications of the local energy supply companies. ▷ Inspect the power cable for visible damage. ▷ Never connect damaged power cables.
	<div data-bbox="507 795 639 840">CAUTION</div> <p>Improper routing of power cable Damage to the power cables!</p> <ul style="list-style-type: none"> ▷ Never move the power cables at temperatures below - 25 °C. ▷ Never kink or crush the power cables. ▷ Never lift the pump set by the power cables. ▷ Adjust the length of the power cable to the site requirements.
	<div data-bbox="507 1124 639 1169">CAUTION</div> <p>Motor overload Damage to the motor!</p> <ul style="list-style-type: none"> ▷ Protect the motor by a thermal time-lag overload protection device in accordance with IEC 60947 and local regulations.

For electrical connection observe the wiring diagrams 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.


	<div data-bbox="507 1473 683 1518"> DANGER</div> <p>Operating a pump set that has not been fully connected Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Never start up a pump set with power cables that have not been fully connected or non-operational monitoring devices.
	<div data-bbox="507 1747 683 1792"> DANGER</div> <p>Connection of damaged power cables Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▷ Check the power cables for damage before connecting them. ▷ Never connect damaged power cables. ▷ Replace damaged power cables.

	<div style="background-color: #FFD700; padding: 5px;">CAUTION</div> <p>Flow-induced motion Damage to the power cable!</p> <p>▷ Run the power cable upwards without slack.</p>
---	---



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. 5: Fastening the power cables

	<div style="background-color: #FF4500; padding: 5px;">DANGER</div> <p>Touching the pump set during operation Electric shock!</p> <p>▷ Make sure that the pump set cannot be touched during operation.</p>
---	---

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/Start-up




6.1.1 Prerequisites for commissioning/start-up

	<div style="background-color: #FFD700; padding: 5px;">CAUTION</div> <p>Fluid level too low Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Always operate the pump set in such a way that air cannot ingress into the pump casing. ▷ Never allow the fluid level to drop below the specified minimum (R3). ▷ For continuous operation (S1) operate the pump set in fully submerged condition.
	<div style="background-color: #FF4500; padding: 5px;"> DANGER</div> <p>Persons in the tank during pump operation Electric shock! Risk of injury! Danger of death from drowning!</p> <ul style="list-style-type: none"> ▷ Never start up the pump set when there are persons in the tank.


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 27)

6.1.2 Start-up



	<div style="background-color: #FF4500; padding: 5px;"> DANGER</div> <p>Persons in the tank during pump operation Electric shock! Risk of injury! Danger of death from drowning!</p> <ul style="list-style-type: none"> ▷ Never start up the pump set when there are persons in the tank.
	<div style="background-color: #FFD700; padding: 5px;">CAUTION</div> <p>Re-starting while motor is still running down Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Do not re-start the pump set before it has come to a standstill. ▷ Never start up the pump set while the pump is running in reverse.

- ✓ The fluid level is sufficiently high.


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

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

6.2 Operating limits

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

6.2.1 Frequency of starts

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

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

These values apply to mains start-up.


6.2.2 Operation on the power supply network

The maximum permissible supply voltage deviation is +10 %/-15 % 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.

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

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

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

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

	<p>⚠ DANGER</p> <p>Electrical connection work by unqualified personnel Risk of fatal injury due to electric shock!</p> <ul style="list-style-type: none"> ▸ Always have the electrical connections installed by a trained and qualified electrician. ▸ Observe the IEC 60364 regulations as well as any regional regulations.
	<p>⚠ WARNING</p> <p>Unintentional starting of the pump set Risk of injury by moving components and shock currents!</p> <ul style="list-style-type: none"> ▸ Ensure that the pump set cannot be started unintentionally. ▸ Always make sure the electrical connections are disconnected before carrying out work on the pump set.
	<p>⚠ WARNING</p> <p>Fluids handled, consumables and supplies which are hot and/or pose a health hazard Risk of injury!</p> <ul style="list-style-type: none"> ▸ Observe all relevant laws. ▸ When draining the fluid take appropriate measures to protect persons and the environment. ▸ Decontaminate pumps which handle fluids posing a health hazard.
	<p>CAUTION</p> <p>Danger of frost/freezing Damage to the pump set!</p> <ul style="list-style-type: none"> ▸ If there is any danger of frost/freezing, remove the pump set from the fluid handled and clean, preserve and store it.

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.

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




- ✓ All safety regulations are observed.
- 1. Clean the pump set.
- 2. Preserve the pump set.
- 3. Observe the instructions given in (⇒ Section 3.3, Page 13) .

6.4 Returning to service

For returning the pump set to service, observe the items on commissioning/start-up.
(⇒ Section 6.1, Page 24)

Refer to and comply with the operating limits. (⇒ Section 6.2, Page 25)






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

	<div data-bbox="507 647 703 694"> WARNING</div> <div data-bbox="507 712 1450 846"> <p>Failure to re-install or re-activate protective devices Risk of injury from moving parts or escaping fluid!</p> <ul style="list-style-type: none"> ▸ As soon as the work is completed, properly re-install and re-activate any safety-relevant devices and protective devices. </div>
	<div data-bbox="507 889 587 920">NOTE</div> <div data-bbox="507 947 1388 1003"> <p>On pumps/pump sets older than 5 years we recommend replacing all elastomer seals.</p> </div>


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

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>NOTE</p> <p>All maintenance work, service work and installation work can be carried out by KSB Service or authorised workshops.</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 6: Overview of maintenance work

Maintenance interval	Maintenance work	For details see ...
Every 4,000 operating hours ²⁾	Measure the insulation resistance.	(⇒ Section 7.2.1.3, Page 29)
	Check the power cable and float switch cable.	(⇒ Section 7.2.1.2, Page 29)
	Visually inspect the lifting chain/rope.	(⇒ Section 7.2.1.1, Page 29)
	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.)
 - Inspect the lifting chain/rope as well as their fasteners for any visible damage.
 - 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.
 - Inspect the power cables for visible damage.
 - 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.
 - Measure the resistance between the earth conductor and chassis ground. The electrical resistance must be lower than 1 Ω.
 - Replace any damaged components by original spare parts.



	 DANGER
	Defective earth conductor Electric shock! ▶ Never switch on a pump set with a defective earth conductor.

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).
 - 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.

²⁾ At least once a year

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

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 7: Oil quality

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



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

Table 8: Lubricant quantity [l] depending on the impeller type

Impeller type	Lubricant quantity
	[l]
F	0,10

7.2.2.2.4 Changing the lubricant

	WARNING Lubricants posing a health hazard and/or hot lubricants Hazard to persons and the environment! <ul style="list-style-type: none"> ▷ When draining the lubricant take appropriate measures to protect persons and the environment. ▷ Wear safety clothing and a protective mask if required. ▷ Collect and dispose of any lubricants. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.
	WARNING Excess pressure in the lubricant reservoir Liquid spurting out when the lubricant reservoir is opened at operating temperature! <ul style="list-style-type: none"> ▷ Allow the pump set to cool down to ambient temperature. ▷ Carefully pull off the mechanical seal.
	NOTE 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.

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.

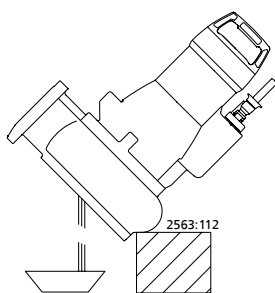


Fig. 6: Draining the lubricant

Filling in the lubricant

1. Fill 0.10 litres of oil (for impeller type F) 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

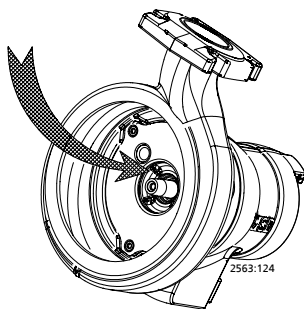






Fig. 7: Filling in the lubricant

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

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 10, Page 42)

7.4 Dismantling the pump set





7.4.1 General information/Safety regulations

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

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.

	<div data-bbox="507 190 683 235">  DANGER </div> <p>Insufficient preparation of work on the pump (set) Risk of injury!</p> <ul style="list-style-type: none"> ▷ Properly shut down the pump set. ▷ Close the shut-off elements in the suction line and discharge line. ▷ Drain the pump and release the pump pressure. ▷ Shut off any auxiliary feed lines. ▷ Allow the pump set to cool down to ambient temperature.
	<div data-bbox="507 560 702 604">  WARNING </div> <p>Components with sharp edges Risk of cutting or shearing injuries!</p> <ul style="list-style-type: none"> ▷ Always use appropriate caution for installation and dismantling work. ▷ Wear work gloves.

7.4.2 Preparing the pump set

- ✓ The notes and steps stated in (⇒ Section 7.4.1, Page 32) 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 F

1. Remove suction cover 162.
2. Unscrew impeller 230.



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

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

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 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.

	<div style="background-color: #FFD700; padding: 5px;">CAUTION</div> <p>Incorrect assembly Damage to the shaft!</p> <p>▷ Wait at least 2 hours before starting the pump again.</p>
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7.5.3 Checking the connection of motor/power supply

Check the power cables after reassembly. (⇒ Section 7.2.1, Page 29)

7.6 Tightening torques

Table 9: Tightening torques

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 10: Quantity of spare parts for recommended spare parts stock³⁾

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 %



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

7.7.3 Sets of spare parts

Table 11: 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	-

8 Trouble-shooting

	 WARNING
	Improper work to remedy faults Risk of injury! <p>► For any work performed to remedy faults, observe the relevant information given in this operating 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 12: 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.

9 Related Documents

9.1 General assembly drawings with list of components

Ama-Porter F

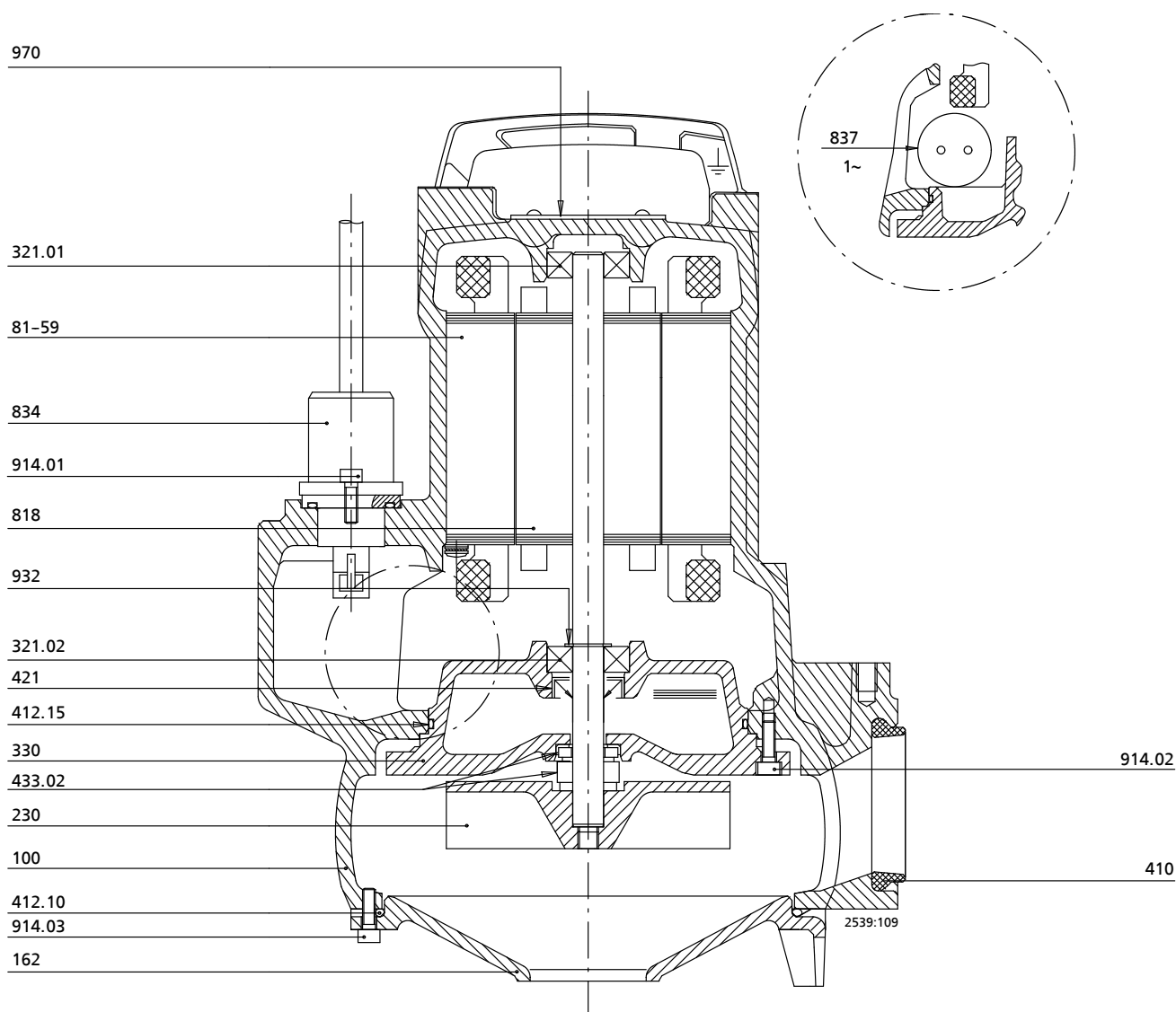


Fig. 8: General assembly drawing Ama-Porter F

Table 13: List of components

Part No.	Description	Part No.	Description
100	Casing	500	Ring
162	Suction cover	561	(Half round head) Grooved pin
23-7	Impeller body	81-59	Stator
230	Impeller	818	Rotor
321.01/.02	Radial ball bearing	834	Cable gland
330	Bearing bracket	837	Capacitor
410	Profile seal	904	Grub screw
412.15	O-ring	914.01/.02/.03/.04/.07	Hexagon socket head cap screw
421	Lip seal	932	Circlip
433.02	Mechanical seal	970	Label/plate

[illegible]

Fig. 9: Exploded view of Ama-Porter F

9.3 Wiring diagram

Pump sets with single-phase AC motors

Version with float switch
(SE)

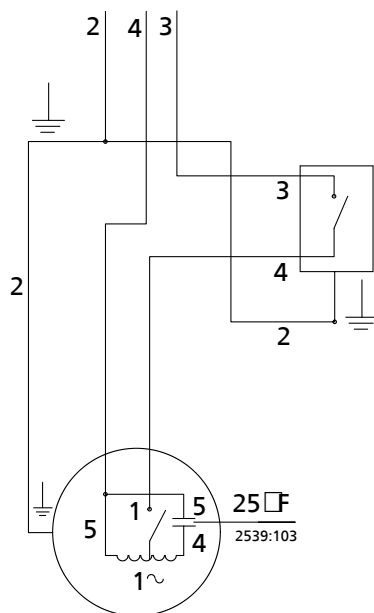
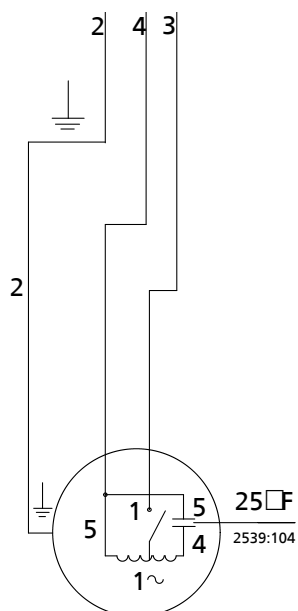


Fig. 10: Single-phase AC version with float switch (SE)

Core colours:			
1	White	2	Yellow/green
3	Blue	4	Brown
5	Black		

Version without float switch
(NE)



Motor

U = 220/240 V

Fig. 11: Single-phase AC version without float switch (NE)

Core colours:			
1	White	2	Yellow/green
3	Blue	4	Brown
5	Black		

2539.8115/01-EN

Pump sets with three-phase motors

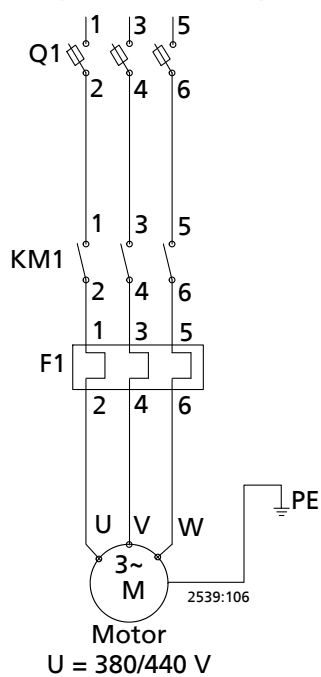


Fig. 12: Three-phase motor

Core colours:			
U (phase)	Black	V (phase)	Brown
W (phase)	Grey or blue	PE (earth conductor)	Green/yellow
Q1	Master switch	KM1	Contactator
F1	Protective switch		

10 Certificate of Decontamination

Type:
Order number/
Order item number⁴⁾:
Delivery date:
Applications:
Fluid handled⁴⁾:

Please tick where applicable⁴⁾:



Corrosive



Oxidising



Flammable



Explosive



Hazardous to health



Seriously hazardous to health



Toxic



Radioactive



Bio-hazardous



Safe

Reason for return⁴⁾:
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

4) Required fields

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