Submersible Motor Pump

AmaPorter

DN 50 to DN 80
Single-phase AC motor or three-phase asynchronous motor
50Hz - 60Hz

Installation/Operating Manual

CE

KSB

Legal information/Copyright

Installation/Operating Manual AmaPorter

Original operating manual

Subject to technical modification without prior notice.

Contents

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

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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
S545	S	G
5__	F	G
6__	F	G
8__	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 9)

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 dimensions 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
Supplementary operating manual[1)]	Installation/operating manual Installation Parts for Stationary Wet Installation

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

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1 If included in agreed scope of supply

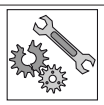
1.5 Symbols

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. 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

DANGER

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).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.
- When untreated waste water is handled, the duty points in continuous operation lie within 0.7 to 1.2 × Q_{BEP} to minimise the risk of clogging/hardening.
- Avoid duty points for continuous operation at very low speeds and small flow rates (< 0.7 × Q_{BEP}).
- The pump sets are not approved for use in countries stipulating explosion-proof units for handling waste water containing faeces.

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	Vortex impeller (impeller type F)	**Suitable for the following fluids:** fluids containing solids and stringy material as well as fluids with entrapped air or entrapped gas
	Impeller with cutter (impeller type S)	**Suitable for the following fluids:** faeces, domestic sewage and waste water containing long fibres

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 stopping 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.

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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 33)
- 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 31)

2.8 Unauthorised modes of operation

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

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

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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

Improper transport

Danger to life from falling parts!

Damage to the pump set!

- 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 documentation of 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.
(⇨ Section 5.3.1.6, Page 26)

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3.3 Storage/preservation

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

CAUTION

Improper storage

Damage to the power cable!

- ▷ Support the power cables at the cable entry to prevent permanent deformation.

CAUTION

Damage during storage due to humidity, dirt or vermin

Corrosion/contamination of pump (set)!

- ▷ For outdoor storage cover the pump (set) and accessories with waterproof material and protect against condensation.

CAUTION

Wet, contaminated or damaged openings and connections

Leakage or damage to the pump!

- ▷ Clean and cover pump openings and connections as required prior to putting the pump into storage.

Table 5: Ambient conditions for storage

Ambient condition	Value
Relative humidity	5 % to 85 % (non-condensing)
Ambient temperature	0 °C to 70 °C

- 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.

NOTE

Observe the manufacturer's instructions for application/removal of the preservative.

3.4 Return to supplier

1. Drain the pump properly. (⇨ Section 7.3, Page 41)
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, the pump must also be neutralised, and anhydrous inert gas must be blown through the pump 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 13, Page 59)

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NOTE

If required, a blank certificate of decontamination can be downloaded from the following web site: www.ksb.com/certificate_of_decontamination

3.5 Disposal

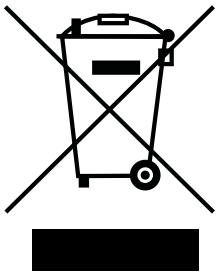
⚠ WARNING

Fluids, consumables and supplies posing a health hazard

Hazard to persons and the environment!

- ▷ 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.

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

Vertical single-stage submersible motor pump (grey cast iron) for waste water in close-coupled design for wet installation, stationary or transportable version. For handling untreated waste water with low levels of solids concentration and rainwater in intermittent operation and for sump drainage

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

For information as per European chemicals regulation (EC) No. 1907/2006 (REACH) see https://www.ksb.com/en-global/company/corporate-responsibility/reach.

4.3 Designation

Example: AmaPorter SB 545 SE

Table 6: Designation key

Code	Description	
AmaPorter	Type series	
S	Impeller type	
	F	Vortex impeller
	S	Impeller with cutter
B	Start capacitor	
		Without start capacitor
	B	With start capacitor
5	Size	
	5..	DN 50
	6..	DN 65
	8..	DN 80
45	Code nominal impeller diameter [mm]	
	45	145 mm
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

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4.4 Name plate

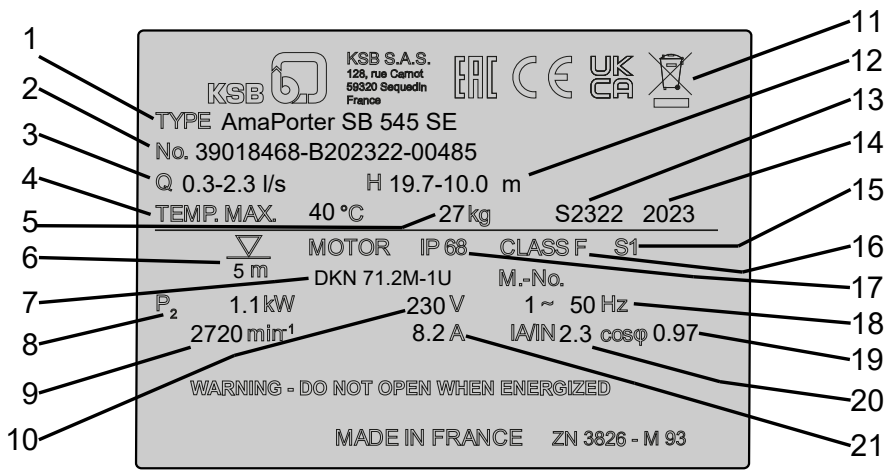

Fig. 1: Name plate (example)

1	Designation	2	KSB order number
3	Flow rate ($Q_{min.}$ / $Q_{max.}$)	4	Maximum fluid temperature and ambient temperature
5	Total weight	6	Maximum submergence
7	Motor data (type, number of phases, stator No.)	8	Rated power
9	Rated speed	10	Rated voltage
11	Symbol to WEEE Directive	12	Head ($H_{min.}$ / $H_{max.}$
13	Serial number	14	Year of construction
15	Mode of operation	16	Thermal class of winding insulation
17	Enclosure	18	Rated frequency
19	Power factor	20	Starting current ratio
21	Rated current		

4.5 Design details

Design

- Fully floodable submersible motor pump
- Close-coupled design
- Not self-priming
- Single-stage
- Vertical installation

Installation

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

Drive

- Single-phase or three-phase AC asynchronous motor, direct starting, with integrated thermal circuit breaker (depending on pump type)
- Enclosure IP68 (permanently submerged) to EN 60529/ IEC 529
- Thermal class F

Shaft seal

Drive end:

- Shaft seal ring

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Pump-end:

- One bi-directional mechanical seal with lip seal or two bi-directional mechanical seals in tandem arrangement (depending on the pump designation), with liquid reservoir

Impeller type

- Various application-oriented impeller types

Bearings

- Maintenance-free, grease-packed bearings sealed for life

4.6 Installation types

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

- Wet-installed stationary model (installation type S)
- Wet-installed transportable model (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 in type series booklet).

4.7 Configuration and function

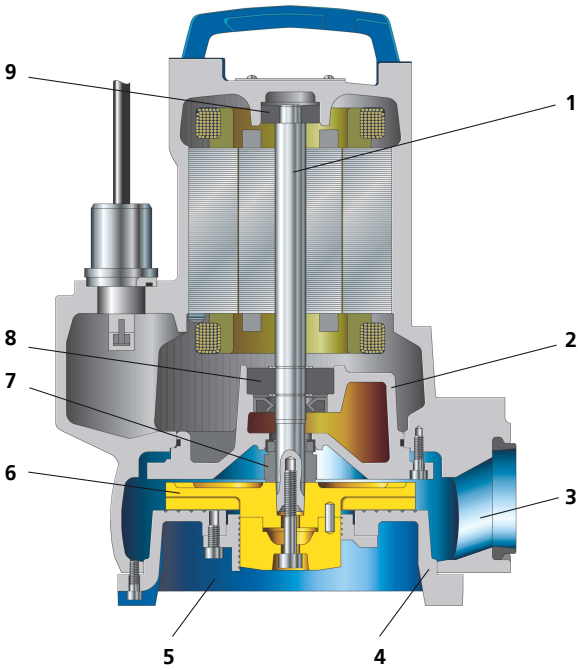

Fig. 2: Sectional drawing (example: AmaPorter S 545 ND)

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 bearing bracket (2). The shaft passage through the bearing bracket is sealed to atmosphere with a shaft seal

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(7). The shaft runs in rolling element bearings (8 and 9), which are supported by a bearing bracket (2). The bearing bracket is linked with the pump casing and/or casing cover on the drive end.

Sealing

Sealing the pump:

- 1 bi-directional mechanical seal (pump end) in combination with 1 shaft seal ring (drive end) or
- 2 bi-directional mechanical seals in tandem arrangement

A lubricant reservoir between the mechanical seals ensures 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)

- Pump set complete with power cables
- Claw with sealing elements and fasteners
- Lifting rope / lifting chain
- Mounting bracket with fasteners
- Duckfoot bend with mounting elements
- Guiding equipment[2)]

Transportable wet-installed model (installation type P)

- Pump set complete with power cables
- 3 feet
- Connection elbow incl. fasteners
- Connection piece
- Clamp
- Foot plate incl. fasteners
- Lifting rope / lifting chain

4.9 Dimensions and weights

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

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

5 Installation at Site

5.1 Safety regulations

DANGER

Persons in the tank during pump operation

Electric shock!

Risk of injury!

Danger of death from drowning!

- ▷ Never start up the pump set when there are persons in the tank.

DANGER

Risk of falling when working at a great height

Danger to life by falling from a great height!

- ▷ Do not step onto the pump (set) during installation work or dismantling work.
- ▷ Pay attention to safety equipment, such as railings, covers, barriers, etc.
- ▷ Observe the applicable local health and occupational safety regulations and accident prevention regulations.

WARNING

Impermissible solid objects (tools, screws/bolts or similar) in the pump sump/inlet tank during pump start-up

Personal injury and damage to property!

- ▷ Check the pump sump/inlet tank for impermissible solid objects before flooding, and remove, if necessary.

WARNING

Hands, other body parts or foreign objects in the impeller or intake area

Risk of injury! Damage to the submersible motor pump!

- ▷ Never insert your hands, other body parts or foreign objects into the impeller or impeller intake area.
- ▷ Always make sure the electrical connections are disconnected before checking whether the impeller rotates freely.

5.2 Checks to be carried out prior to installation

5.2.1 Preparing the place of installation

Place of installation for stationary models

WARNING

Installation on a mounting surface which is unsecured and cannot support the load

Personal injury and damage to property!

- ▷ Use a concrete of compressive strength class C25/30 which meets the requirements of exposure class XC4 to EN 206 .
- ▷ The mounting surface must be set, even, and level.
- ▷ Observe the weights indicated.

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Resonances Any resonances at the usual excitation frequencies (1 x and 2 x rotational frequency, vane 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

⚠ WARNING

Incorrect positioning / incorrect placing down

Personal injury and damage to property!

- ▷ 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.
- ▷ Adjust the handle position.

Resonances Any resonances at the usual excitation frequencies (1 x and 2 x rotational frequency, vane 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

⚠ WARNING

Hands and/or foreign objects in the pump casing

Risk of injuries, damage to the pump!

- ▷ Never insert your hands or any other objects into the running pump.
- ▷ Make sure that there is no foreign matter inside the pump.
- ▷ Do not hold the pump while checking the direction of rotation.
- ▷ Take suitable precautions (e.g. wear safety goggles).

CAUTION

Pump set running dry

Increased vibrations!

Damage to mechanical seals and bearings!

- ▷ Never operate the pump set for more than 60 seconds without the fluid handled.

✓ The pump set is connected to the power supply.

✓ Check the direction of rotation via the reactive force generated by the motor torque.

1. Position the pump as shown (a or b). Connect the power supply.

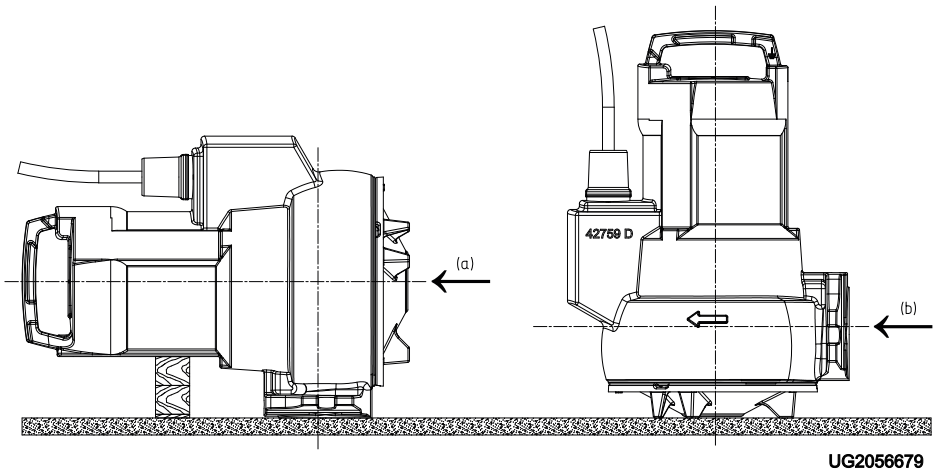

Fig. 3: Checking the direction of rotation

2. Start up the pump for a short period (5 seconds max.).
3. Check the direction of rotation. The direction of rotation is marked by an arrow on the pump casing. Anti-clockwise direction of rotation of the impeller can be determined via the suction-side pump opening (a) or the discharge side pump opening (b).
4. If the impeller is running in the wrong direction of rotation, check the electrical connection of the pump and the control system if necessary.
5. Disconnect the pump from the power supply. Ensure that the system 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 flanged bend

Fastening the flanged bend with chemical anchors

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

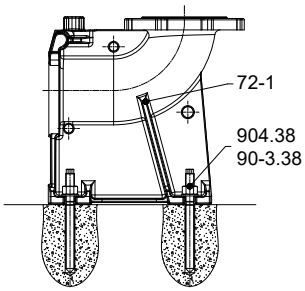

Fig. 4: Fastening the flanged bend

1. Position flanged bend 72-1 on the floor of the tank/sump.
2. Insert chemical anchors with resin capsules 90-3.38.
3. Bolt flanged bend 72-1 to the floor with chemical anchors 90-3.38 and grub screws 904.38.

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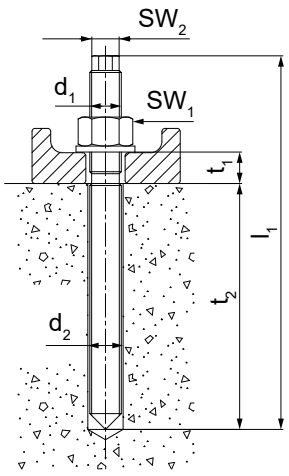

Fig. 5: Dimensions

Table 7: Chemical anchor dimensions

Size ($d_1 \times l_1$)	d_2 [mm]	t_1 [mm]	t_2 [mm]	WAF_1 [mm]	SW_2 [3] [mm]	M_{d1} [Nm]
M10 × 130	12	22	90	17	6	20
M16 × 190	18	35	125	24	12	80

Table 8: Curing times of resin capsule

Floor temperature	Minimum curing time	
	Dry concrete	Wet concrete
[°C]	[min]	
≥ +35	10	20
≥ +30	10	20
≥ +20	20	40
≥ +10	60	120
≥ +5	60	120
≥ 0	300	600
≥ -5	300	600

5.3.1.2 Connecting the piping

DANGER

Impermissible loads acting on the flange of the duckfoot bend

Danger to life from escaping hot, toxic, corrosive or flammable fluids!

- Do not use the pump as an anchorage point for the piping.
- Anchor the pipes in close proximity to the pump and connect them without transmitting any stresses or strains.
- Observe the permissible flange loads.
- Take appropriate measures to compensate for thermal expansion of the piping.

NOTE

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.

[3] SW = Width across flats

CAUTION

Critical speed of reverse rotation

Increased vibrations!

Damage to mechanical seals and bearings!

- If long risers are used, fit a swing check valve to prevent excessive rotational speed of the pump running in reverse after it has been stopped.
  Watch the venting function when arranging the swing check valve.
- Observe the maximum permissible speed (depending on the mechanical seal and bearings) in the event of reverse rotation.

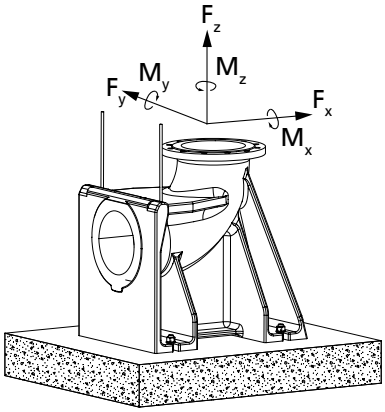

Fig. 6: Permissible flange loads

Table 9: Permissible flange loads

Nominal flange diameter	Forces [N]				Moments [Nm]			
	F_y	F_z	F_x	$\sum F$	M_y	M_z	M_x	$\sum M$
50	1350	1650	1500	2600	1000	1150	1400	2050
65	1700	2100	1850	3300	1100	1200	1500	2200
80	2050	2500	2250	3950	1150	1300	1600	2350

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 flanged bend which has been fitted to the floor.

NOTE

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.

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Fitting the mounting bracket

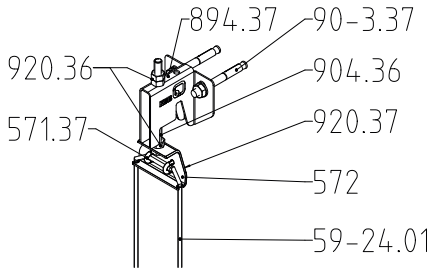


Fig. 7: Fitting the mounting bracket

1. Fasten mounting bracket 894.37 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 571.37 through the holes of suspension bracket 572 and fasten with nuts 920.37.
3. Fasten fully threaded stud 904.36 with the pre-assembled clamping arrangement to the mounting bracket with nut 920.36.
   Tighten nut 920.36 slightly, allowing sufficient play for subsequently tensioning the guide cable.

Inserting the guide wire

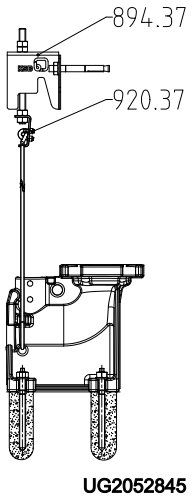


Fig. 8: Inserting the guide wire

1. Lift clamping piece 571.37 and insert one end of the guide wire.
2. Run wire 59-24.01 around flanged bend 72-1 and back again to suspension bracket 572 and insert it into clamping piece 571.37.
3. Manually tension cable 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.
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 59-18.01 to mounting bracket 894 for attaching the lifting chain / lifting rope at a later stage.

Table 10: Guide wire tension

Pump size	Tightening torque M_A [Nm]	Guide wire tension P [N]
DN 50	9	6000
DN 65	9	6000
DN 80	14	6000

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 flanged bend which has been fitted to the floor.

NOTE

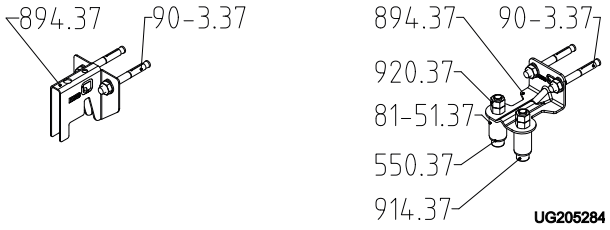
The guide rails are not included in the scope of supply.
Select guide rail materials which are suitable for the fluid handled or as specified by the operator.

Observe the following dimensions for the guide rails:

Table 11: Guide rail dimensions

Pump size	Outside diameter [mm]	Wall thickness [mm][4)]	
		Minimum	Maximum
DN 50	33,7	2	5
DN 65	33,7	2	5
DN 80	60,3	2	5

Fitting the mounting bracket



Single guide rail arrangement Twin guide rail arrang

Fig. 9: Fitting the mounting bracket

1. Fasten mounting bracket 894.37 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).
2. **Twin guide rail arrangement:** Fit clamping elements 81-51.37 with screws 914.37, discs 550.37 and nuts 920.37 to bracket 894.37.

Fitting the guide rails (twin guide rail arrangement)

CAUTION

Improper installation of the guide rails
Damage to the guide rail arrangement!

- ▷ Always adjust the guide rails so that they are in a perfectly vertical position.

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4 To DIN 2440/2442/2462 or equivalent standards

NOTE

For installation depths > 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.

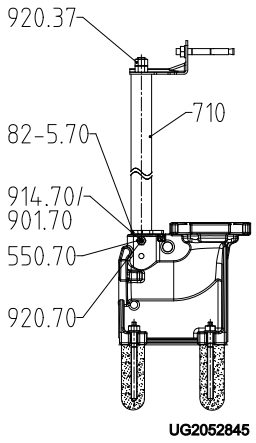


Fig. 10: Fitting two guide rails

1. Position adapter 82-5.70 on flanged bend 72-1 and fasten it with screws 914.70 (DN 50/65)/901.70 (DN 80), discs 550.70 (DN 80) and nuts 920.70.
2. Place rails 710 onto the conical bosses of adapter 82-5.70 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 894.37.
4. Shorten rails 710 with a 90° cut to the pipe axis. Debur the rails inside and outside.
5. Insert mounting bracket 894.37 with clamping elements 81-51.37 into guide rails 710 until the mounting bracket rests on the rail ends.
6. Tighten nuts 920.37.
   This expands the clamping elements so that they clamp the rails at the inside rail diameter.
7. Secure nut 920.37 with a second nut.

Fitting the guide rail (arrangement with 1 guide rail)

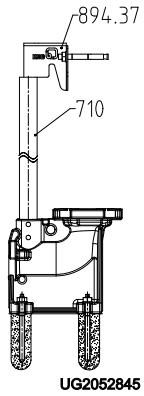


Fig. 11: Fitting one guide rail

1. Position rail 710 (for DN 50 - DN 65) into the recess of flanged bend 72-1 or (for DN 80) on the conical boss. 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 894.37.
3. Shorten rail 710 with a 90° cut to the pipe axis. Debur the rail inside and outside.
4. Insert bracket 894.37 into guide rail 710 until the bracket rests on the rail end.

5.3.1.5 Fitting the guide hoop arrangement (for DN 50 and DN 65 only)

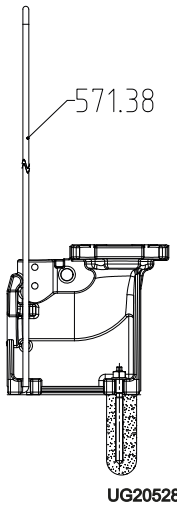


Fig. 12: Fitting the guide hoop arrangement

1. Insert the ends of guide hoop 571.38 into the grooves of flanged bend 72-1.
2. Fasten the flanged bend to the tank/sump floor with 2 anchor bolts 90-3.38 and grub screw 904.38. (⇨ Section 5.3.1.1, Page 20)

5.3.1.6 Preparing the pump set

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

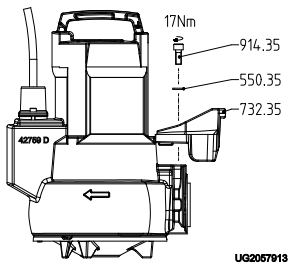


Fig. 13: Fastening the claw for guide wire, single guide rail and guide hoop arrangement

1. Fasten claw 732.35 with screw 914.35 and disc 550.35 to the discharge flange (see illustration opposite). Tighten the screw to a torque of 17 Nm.

Fastening the claw for twin guide rail arrangement

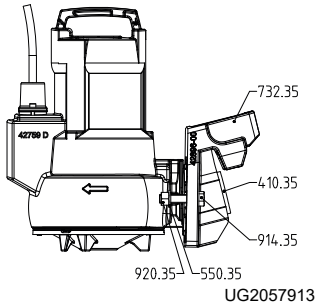
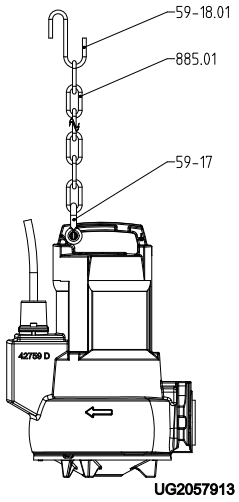


Fig. 14: Fastening the claw for twin guide rail arrangement

1. Fasten claw 732.35 with screws 914.35, nuts 920.35 and discs 550.35 to the discharge flange (see drawing). Tighten the screws to a torque of 70 Nm.
2. Insert profile seal 410.35 into the groove of the claw.
   This will seal the base elbow/pump connection.

Attaching the lifting chain / lifting rope



Attaching the lifting chain / lifting rope with

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 flanged bend.

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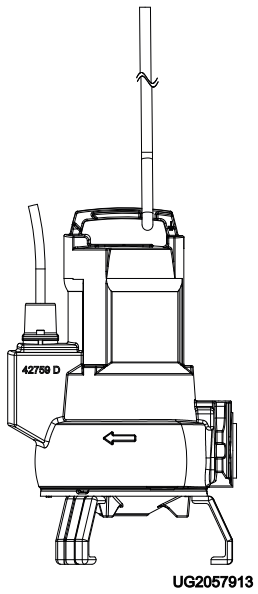
shackle 59-17 and hook 59-18.01 – stationary wet installation

Transportable wet-installed model

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-installed model

5.3.1.7 Installing the pump set

NOTE

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.

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 flanged bend 72-1.
2. Attach the lifting chain/rope to hook 59-18.01 at the mounting bracket.

5.3.2 Transportable wet-installed model

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 914.16.
2. Push pump feet 182 into the openings in the suction cover.
3. Tighten screws 914.16 again to the indicated tightening torque.

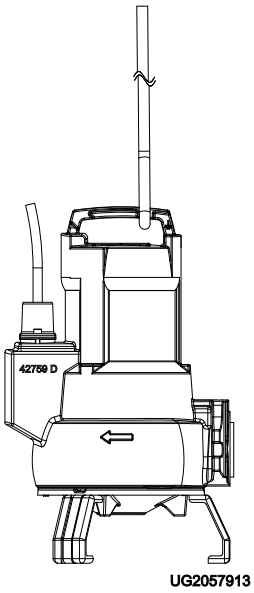


Fig. 15: Attaching the lifting chain / lifting rope

Attaching the lifting chain / lifting 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. (⇨ Section 9.2, Page 52)
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

	**⚠ DANGER** **Pump set running dry** Explosion hazard! ▹ Never allow a pump set to run dry.
	**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 sump / tank requires the use of level control equipment.
Observe the minimum fluid level indicated.

5.4.1.3 Motor temperature sensors

	**⚠ DANGER** **Operating an incompletely or incorrectly connected pump set** Damage to the pump set and the sensors! Electric shock! ▹ Never start up a pump set with incompletely connected power cables or any unused supply cables not secured.
	**CAUTION** **Insufficient cooling** Damage to the pump (set)! ▹ Never operate a pump (set) without operational temperature monitoring.

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All sensors are located inside the pump set and are connected to the power cable. The sensors are designed to prevent hazards and damage to the pump set.

Measuring transducers are required for analysing the sensor signals supplied. Suitable devices for 230 V AC can be supplied by KSB.

NOTE

Reliable and safe operation of the pump within the scope of our warranty is only possible if the sensor signals are properly analysed as stipulated in this manual.

Pump sets with single-phase AC motor

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 10 A fuse.

Pump sets with three-phase motor

AmaPorter F 51_/52_/61_/62_/82_:

The pump set features double monitoring of the winding temperature. Two bimetal switches (terminals 20 and 21, max. 250 V~/2 A) serve as temperature control devices which open when the winding temperature is too high.
Tripping must result in the pump set cutting out. Automatic re-starting is permitted.

Conductor 22 has no function. It may be live and must, therefore, be insulated or connected to a dummy terminal.

AmaPorter F 50_/ F 60_/S 545:

The motor is not fitted with thermal motor protection. We recommend to use a control unit with an integrated circuit breaker set to the rated motor current +15 %.

For information on wiring and core identification please refer to the "Wiring diagrams" section. (⇨ Section 9.2, Page 52)

5.4.2 Electrical connection

⚠ DANGER

Electrical connection work by unqualified personnel

Danger of death from electric shock!

- ▷ Always have the electrical connections installed by a trained and qualified electrician.
- ▷ Observe the EN 61557 regulations as well as any regional regulations.

⚠ WARNING

Incorrect connection to the mains

Damage to the mains network, short circuit!

- ▷ Observe the technical specifications of the local energy supply companies.
- ▷ Inspect the power cable for visible damage.
- ▷ Never connect damaged power cables.

CAUTION

Improper routing of power cable

Damage to the power cables!

- ▷ 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.

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 power cable. Always connect all marked cores.

DANGER

Operating an incompletely connected pump set

Damage to the pump set!

- Never start up a pump set with incompletely connected cables or non-operational monitoring devices.

DANGER

Connection of damaged electric cables

Danger of death from electric shock!

- Check the electric cables for any damage before connecting them.
- Never connect damaged electric cables.
- Replace damaged electric cables.

CAUTION

Flow-induced motion

Damage to the power cable!

- Run the power cable upwards without slack.

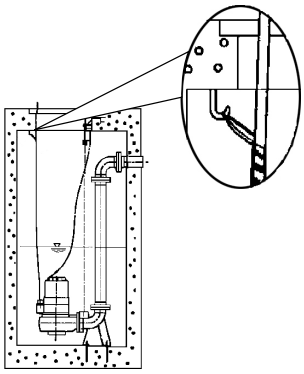

Fig. 16: Fastening the power cables

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.

DANGER

Touching the pump set during operation

Electric shock!

- Make sure that the pump set cannot be touched during operation.

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6 Commissioning/Start-up/Shutdown

6.1 Commissioning/Start-up

6.1.1 Prerequisites for commissioning/start-up

CAUTION

Fluid level too low

Damage to the pump set!

- ▷ 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 duty (S1) operate the pump set in fully submerged condition.

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 filled with the fluid to be handled. The pump has been vented.
- The direction of rotation has been checked.
- After prolonged shutdown of the pump (set), the activities required for returning the equipment to service have been carried out. (⇨ Section 6.4, Page 34)

6.1.2 Start-up

DANGER

Persons in the tank during pump operation

Electric shock!

Risk of injury!

Danger of death from drowning!

- ▷ Never start up the pump set when there are persons in the tank.

CAUTION

Re-starting while motor is still running down

Damage to the pump set!

- ▷ 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

Start-up against a closed shut-off element

Increased vibrations!

Damage to mechanical seals and bearings!

- ▷ 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.

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6.2 Operating limits

DANGER

Non-compliance with operating limits

Damage to the pump set!

- 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

Excessive frequency of starts

Risk of damage to the motor!

- 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 mains voltage and mains frequency may fluctuate around the rated values as defined for zone B to IEC 60034-1. 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

Danger of freezing!

Damage to the pump set!

- 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

Fluid level below the specified minimum

Damage to the pump set by cavitation!

- Never allow the fluid level to drop below the specified minimum.

The pump sets are designed for continuously **submerged** operation. This condition has to be fulfilled for the motor to be cooled sufficiently.

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The pump set is ready for operation (S1) as soon as the motor is fully submerged and the minimum level of fluid handled is not lower than the specified minimum (R3 or R4). For exact dimensions see general arrangement drawing / outline drawing.

The pump can be operated at a lower fluid level for short periods.

Depending on the installation type, the minimum fluid levels R1 or R2 must always be observed. Note that frequent starting and stopping of the pump set must be avoided.

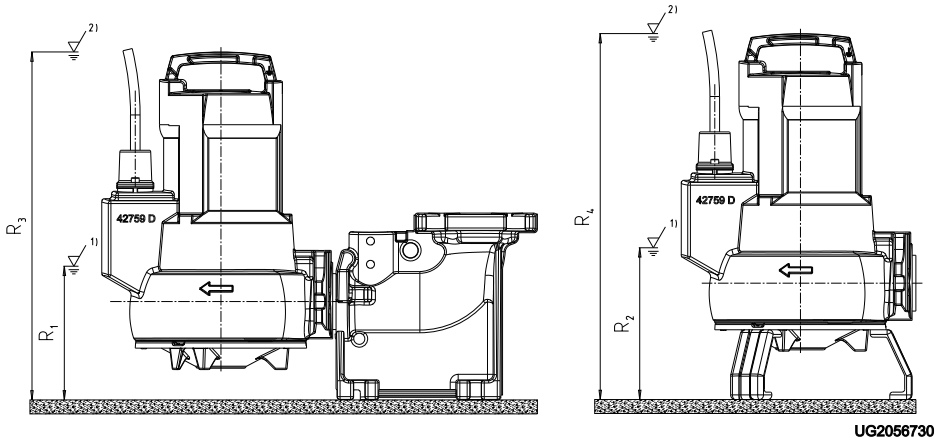

Fig. 17: Minimum levels for stationary (left) and transportable (right) models

For the exact R1, R2, R3 and R4 dimensions, see the general arrangement drawing / outline drawing.

6.2.3.3 Density of the fluid handled

The power input of the pump set will change in proportion to the density of the fluid handled.

	**CAUTION** **Impermissibly high density of the fluid handled** Motor overload! ▷ Observe the information about fluid density in the data sheet. ▷ Make sure the motor has sufficient power reserves.

6.3 Shutdown/storage/preservation

6.3.1 Measures to be taken for shutdown

	**DANGER** **Electrical connection work by unqualified personnel** Danger of death from electric shock! ▷ Always have the electrical connections installed by a trained and qualified electrician. ▷ Observe the EN 61557 regulations as well as any regional regulations.

⚠ WARNING

Unintentional starting of the pump set

Risk of injury by moving components and shock currents!

- ▷ 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.

⚠ WARNING

Fluids handled, consumables and supplies which are hot and/or pose a health hazard

Risk of injury!

- ▷ 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.

CAUTION

Danger of frost/freezing

Damage to the pump set!

- ▷ 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 12) .

6.4 Returning to service

For returning the pump set to service, observe the instructions on commissioning/start-up. (⇨ Section 6.1, Page 31)

Refer to and comply with the operating limits. (⇨ Section 6.2, Page 32)

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

⚠ WARNING

Failure to re-install or re-activate protective devices

Risk of injury from moving parts or escaping fluid!

- ▷ As soon as the work is completed, properly re-install and re-activate any safety-relevant devices and protective devices.

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NOTE

On pumps/pump sets older than 5 years we recommend replacing all elastomer seals.

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.

DANGER

Risk of falling when working at a great height

Danger to life by falling from a great height!

- Do not step onto the pump (set) during installation work or dismantling work.
- Pay attention to safety equipment, such as railings, covers, barriers, etc.
- Observe the applicable local health and occupational safety regulations and accident prevention regulations.

WARNING

Unintentional starting of the pump set

Risk of injury by moving components and shock currents!

- 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.

WARNING

Fluids handled, consumables and supplies which are hot and/or pose a health hazard

Hazard to persons and the environment!

- Observe all legal regulations on the disposal of fluids posing a health hazard.
- When draining the fluid take appropriate measures to protect persons and the environment.

WARNING

Hot surface

Risk of injury!

- Allow the pump set to cool down to ambient temperature.

WARNING

Improper lifting/moving of heavy assemblies or components

Personal injury and damage to property!

- Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.

WARNING

Insufficient stability

Risk of crushing hands and feet!

- During assembly/dismantling, secure the pump (set)/pump parts to prevent tilting or tipping over.

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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.

NOTE

All maintenance work, service work and installation work can be carried out by KSB Service or authorised workshops. Find your contact in the attached Addresses booklet or visit https://www.ksb.com/en-global/contact.

Never use force when dismantling and reassembling the pump set.

7.2 Servicing/inspection

KSB recommends the following regular maintenance schedule:

Table 12: Overview of maintenance work

Maintenance interval	Maintenance work	For details see ...
Every 4000 operating hours[5)]	Visual inspection of the lifting chain / lifting rope	(⇨ Section 7.2.1.1, Page 37)
	Check the power cable and float switch cable.	(⇨ Section 7.2.1.2, Page 37)
	Insulation resistance measurement	(⇨ Section 7.2.1.3, Page 38)
	Checking the sensors	(⇨ Section 7.2.1.4, Page 38)
	Changing the lubricant	(⇨ Section 7.2.2.1.3, Page 39)
	Checking the bearings	(⇨ Section 7.4.4, Page 42)
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.

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. If it comprises a float switch, check the corresponding cable.
2. Replace any damaged components by original spare parts.

Earth conductor test

✓ 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.

DANGER

Defective earth conductor

Electric shock!

▷ Never switch on a pump set with a defective earth conductor.

5 At least once a year

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 (e.g. 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.
2. For pumps with temperature sensors in the three-phase motor:
   Measure the winding temperature sensors to chassis ground. To do so, connect all core ends of the winding temperature sensors together and connect all winding ends to earth.

⇨ 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.

NOTE

If the insulation resistance of the power cable is lower than 1 MΩ, the power cable is defective and must be replaced.

NOTE

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.

7.2.1.4 Checking the sensors

CAUTION

Excessive test voltage

Damage to the sensors!

▹ Use a commercially available ohmmeter to measure the resistance.

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

The procedure may be applied to the following variants:

AmaPorter F 51_/52_ /61_ / 62_ /82_

Bimetal switch in the motor

Table 13: Resistance measurement of bimetal switch in the motor

Measurement between terminals ...	Resistance
	[Ω]
20 and 21	< 1

If the specified tolerances are exceeded, disconnect the power cable at the pump set and repeat the check inside the motor.
If the tolerances are exceeded here, too, the motor section has to be opened and overhauled. The temperature sensors are fitted in the stator winding and cannot be replaced.

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7.2.2 Lubrication and lubricant change

7.2.2.1 Lubricating the mechanical seal

DANGER

Excessive temperatures at the shaft seal

Explosion hazard!

Damage to the pump set!

▷ Regularly check the condition of the lubricant in the lubricant reservoir of the mechanical seal. Top it up if required.

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

7.2.2.1.1 Intervals

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

7.2.2.1.2 Lubricant quality

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

Table 14: 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^2/s
	Ignition temperature	>185 °C
	Flash point (to Cleveland)	+160 °C
	Solidification point (pour point)	-15 °C

Recommended oil types:

- 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

WARNING

Lubricant contaminating fluid handled

Hazard to persons and the environment!

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

7.2.2.1.3 Lubricant quantity

Table 15: Lubricant quantity depending on the size

Size	Lubricant quantity
	[l]
F 50_/ 60_	0,10
S_ 545	0,13
F 51_/ 52_/ 61_/ 62_/ 82_	0,25

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7.2.2.1.4 Changing the lubricant

⚠ WARNING

Lubricants posing a health hazard and/or hot lubricants

Hazard to persons and the environment!

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

⚠ WARNING

Excess pressure in the lubricant reservoir

Liquid spurting out when the lubricant reservoir is opened at operating temperature!

- ▷ 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 has been removed. The impeller has been removed from the shaft.

1. Place a suitable container under the shaft.
2. Push spring-loaded mechanical seal ring 433.02 along the shaft and remove.
3. Drain the oil.

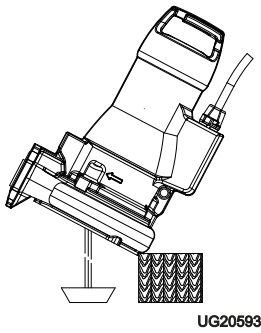

Fig. 18: Draining the lubricant (AmaPorter F 51_/52_/61_/62_/82_)

Filling in the lubricant

1. Fill high-grade oil (⇨ Section 7.2.2.1.4, Page 40) 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 (⇨ Section 7.5.2.2.2, Page 45) . Observe the tightening torques. (⇨ Section 7.6, Page 46)

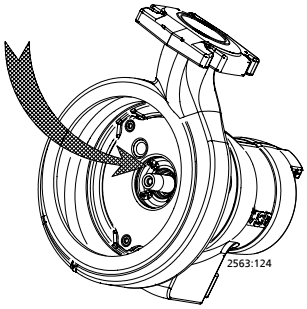

Fig. 19: Filling in the lubricant

7.2.2.2 Lubricating the rolling element bearings

The pump set is equipped with grease-lubricated, maintenance-free rolling element bearings.

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7.3 Drainage/cleaning

1. Always flush and clean the pump before transporting it to the workshop. Always flush the pump if it has been used for handling noxious, explosive, hot or other hazardous fluids.
2. Collect and properly dispose of flushing fluid and any fluid residues.
3. Provide a certificate of decontamination for the pump set. (⇨ Section 13, Page 59)

7.4 Dismantling the pump set

7.4.1 General information/Safety regulations

⚠ WARNING

Unqualified personnel performing work on the pump (set)

Risk of injury!

- ▹ Always have repair work and maintenance work performed by specially trained, qualified personnel.

Observe the safety instructions and information.

For dismantling and reassembly, observe the exploded view (⇨ Section 9.1, Page 49) .

In the event of damage, you can always contact the KSB Service.

⚠ DANGER

Insufficient preparation of work on the pump (set)

Risk of injury!

- ▹ 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.

⚠ WARNING

Components with sharp edges

Risk of cutting or shearing injuries!

- ▹ 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 41) have been observed / carried out.

1. De-energise the pump set and secure it against unintentional start-up.
2. Drain the lubricant.

7.4.3 Dismantling the pump section

Dismantle the pump section in accordance with the relevant exploded view.

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Pump with impeller F
AmaPorter F 50_/60_

1. Remove screws 914.16. Remove suction cover 162.
2. Remove the back pull-out unit from the pump.
3. Secure the shaft and remove impeller 230.

AmaPorter F 51_/52_/61_/62_/82_

1. Remove screws 914.16. Remove suction cover 162.
2. Undo and remove the fastening screw of impeller 914.10 (M8) and disc 550.23. The impeller has a tapered fit for fastening on the shaft.
3. Use the M10 forcing thread to undo and remove the impeller. Screw in the jack as shown in the drawing below. Remove impeller 230.

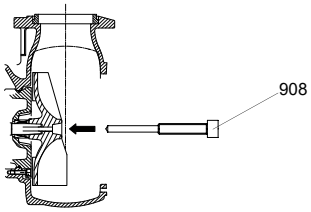

Fig. 20: Forcing screw

Pump with impeller S

1. Remove suction cover 162 with screws 914.16 as well as ring 500 with screws 914.07.
2. Take off impeller screw 914.10 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. Remove the impeller.

NOTE

The forcing screw is not included in the scope of supply. It can be ordered separately from KSB.

7.4.4 Removing the mechanical seal and motor section

Pumps with impeller F

AmaPorter F 50_/60_
Proceed as below to remove the rotor unit parts in the following sequence:

✓ The oil has been drained. (⇨ Section 7.2.2.1.4, Page 40)

1. Press mating ring 433.02 out of bearing bracket 330 and off shaft 210.
2. Remove circlip 932.04.
3. Take bearing bracket 330.
4. Pull off rolling element bearing 321.02.
5. Pull off rolling element bearing 321.01.
6. Pull off lip seal 421.

AmaPorter F 51_/52_/61_/62_/82_

✓ The oil has been drained. (⇨ Section 7.2.2.1.4, Page 40)

1. Undo and remove screws 914.74 at bearing bracket 330.
2. Remove rotor unit from pump casing 100 and dismantle in the following sequence:
3. Press mating ring 433.02 out of bearing bracket 330 and off shaft 210.
4. Remove circlip 932.04.
5. Take bearing bracket 330.
6. Remove circlip 932.03.
7. Slide the primary ring of mechanical seal 433.01 off shaft 210.
8. Pull off mating ring carrier 476 and mating ring of mechanical seal 433.01. Take mating ring 433.01 out of mating ring carrier 476.
9. Remove circlip 932.02.
10. Pull off rolling element bearing 321.02.
11. Pull off rolling element bearing 321.01.

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Pumps with impeller S AmaPorter S_ 545

✓ The oil has been drained. (⇨ Section 7.2.2.1.4, Page 40)

1. Undo and remove screws 914.74 at bearing bracket 330.
2. Remove rotor unit from pump casing 100.
3. Remove rotor unit from pump casing 100 and dismantle in the following sequence:
4. Press mating ring 433.02 out of bearing bracket 330 and off shaft 210.
5. Remove circlip 932.04.
6. Take bearing bracket 330.
7. Pull off rolling element bearing 321.02.
8. Pull off rolling element bearing 321.01.
9. Remove circlip 932.02.
10. Pull off lip seal 421.

7.5 Reassembling the pump set

7.5.1 General information/Safety regulations

CAUTION

Improper reassembly

Damage to the pump!

- ▷ Reassemble the pump (set) in accordance with the general rules of sound engineering practice.
- ▷ Use original spare parts only.

Assembly sequence Always reassemble the pump set in accordance with the corresponding exploded view.

Sealing elements O-rings

- Check O-rings for any damage and replace by new O-rings if required.

Assembly aids Avoid the use of assembly adhesives if possible.

Tightening torques For reassembly, tighten all screws and bolts as specified in this manual.
(⇨ Section 7.6, Page 46)

7.5.2 Reassembling the pump section

7.5.2.1 Installing the mechanical seal

Observe the following 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 seal faces with a drop of oil.
- For easier installation of the bellows-type mechanical seal, wet the inside diameter of the bellows with soapy water (not oil).
- To prevent any damage to the rubber bellows, place a thin foil (of approximately 0.1+/-0.3 mm thickness) around the free shaft stub.
  Slide the rotating assembly over the foil into its installation position. Then remove the foil.

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AmaPorter F 50_ /60_ / S_ 545

✓ Rolling element bearings 321.01/02 have been properly fitted on shaft 210 with circlip 932.02 if required.

1. Slide lip seal 421 onto shaft 210 up to rolling element bearing 321.02.
2. Press O-rings 412.15 into bearing bracket 330 and fit mating ring of mechanical seal 433.02 into bearing bracket 330. Slide this assembly onto rotor unit until it abuts.
3. Fill in oil.
4. Carefully slide primary ring of mechanical seal 433.02 onto shaft 210 until it abuts the counterpart of the mechanical seal.
5. Insert circlip 932.04 into bearing bracket 330 to secure rolling element bearing 321.02.

AmaPorter F 51_ /52_ /61_ /62_ /82_

✓ Rolling element bearings 321.01/02 have been properly fitted onto shaft 210 with circlip 932.02.

1. Place O-ring 412.63 on mating ring carrier 476. Slide mating ring carrier 476 onto shaft 210 until it abuts rolling element bearing 321.02.
2. Push mechanical seal 433.01 onto shaft 210 and secure it with circlip 932.03.
3. Press O-ring 412.15 into bearing bracket 330 and fit mating ring 433.02 into bearing bracket 330. Slide assembly 330 onto rotor unit until it abuts.
4. Fill in oil.
5. Carefully slide primary ring of mechanical seal 433.02 onto shaft 210 until it abuts the counterpart of the mechanical seal.
6. Insert circlip 932.04 into bearing bracket 330 to secure rolling element bearing 321.02.

7.5.2.2 Fitting the impeller

7.5.2.2.1 Fitting impeller type S and cutter

NOTE

For bearing brackets with tapered fit make sure that the tapered fit of impeller and shaft is undamaged and installed free from grease.

1. Slide impeller 230 onto the shaft end.
2. Insert grooved pin 561.03 into impeller 230.
3. Place impeller body 23-7 on the centring hub.
4. Insert impeller screw 914.10 and tighten it to a torque of 30 Nm.
5. Fasten suction cover 162 with screws 914.16 and fit ring 500.07 with screws 914.07 to suction cover.

CAUTION

Incorrect assembly

Clearance gap inaccurate!

▹ 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.

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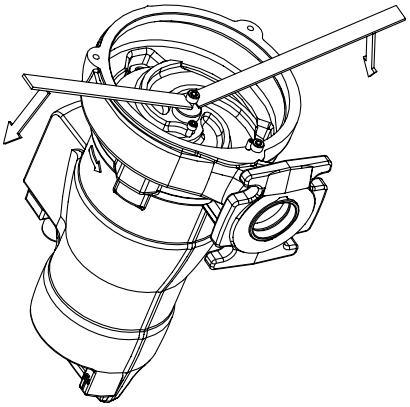

Fig. 21: Pulling the rotor assembly up to the suction cover

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

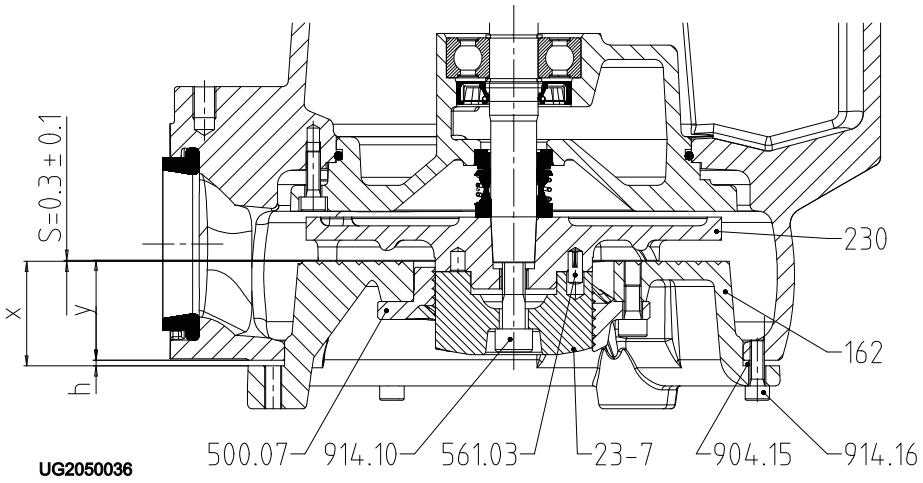

Fig. 22: Adjusting impeller type S

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

7. Measure dimension x on the suction cover
8. Measure dimension y between the pump casing and the impeller vanes.
9. Use screws 904.15 to set dimension h (h = x + s - y),
10. Tighten the suction cover with screws 914.16.
11. 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

AmaPorter F 50_ /60_

Apply Loctite 243 (or similar) to the shaft stub thread and to the bore of impeller 230. Screw the impeller onto shaft 210 with a tightening torque of 2.5 Nm.

CAUTION

Incorrect assembly

Damage to the shaft!

▷ Wait at least 2 hours before starting the pump again.

AmaPorter F 51_ /52_ /61_ /62_ /82_

Screw impeller 230 with screws 914.10 and discs 550.23 onto shaft 210.

7.5.3 Reassembling the motor section

CAUTION

Wrong screws/bolts

Damage to the pump set!

- ▷ Always use the original bolts/screws for assembling a pump set.
- ▷ Never use screws/bolts of different dimensions or of a lower property class.

7.5.4 Checking the connection of motor/power supply

Check the electric cables after reassembly. (⇨ Section 7.2.1, Page 37)

7.6 Tightening torques

Table 16: Tightening torques for AmaPorter F 50_ /60_ and S_ 545

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

Table 17: Tightening torques for AmaPorter F 51_ /52_ /61_ /62_ /82_

Thread	[Nm]
M8	17
Impeller screw M8	40

7.7 Spare parts stock

7.7.1 Ordering spare parts

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

- Series code
- Description
- Year of construction

Refer to the name plate for all data.

Also specify the following data:

- Part No. and description (⇨ Section 9.1, Page 49)
- Quantity of spare parts
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)

7.7.2 Recommended spare parts stock

Table 18: Quantity of spare parts for recommended spare parts stock for a minimum of two year's continuous operation or 4000 operating hours

Part No.	Description	Number of pumps (including stand-by pumps)							
		1	2	3	4	5	6 and 7	8 and 9	10 and more
99-19	Spare parts set	1	1	1	2	2	2	3	30 %

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Table 19: Quantity of spare parts for recommended spare parts stock for 5 years' continuous operation

Part No.	Description	Number of pumps (including stand-by pumps)							
		1	2	3	4	5	6 and 7	8 and 9	10 and more
99-19	Spare parts set	1	2	2	4	4	4	6	50 %
		and							
05-230	Impeller	1	1	1	2	2	2	3	30 %
05-834	Cable gland	1	1	1	2	2	2	3	30 %

7.7.3 Spare parts set

Table 20: Overview of spare parts set 99-19

Number of spare parts set	Description	Part No. in pump
99-19	Casing	321.01/.02
	O-ring	412.07/.15/.16/.63
	Mechanical seal	433.01/.02
	Disc	550.23
	Forcing screw	908
	Hexagon socket head cap screw	914.04/.10/.16/.74
	Circlip	932.02/.03/.04

8 Trouble-shooting

⚠ WARNING

Improper work to remedy faults

Risk of injury!

- ▷ 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.

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 21: Trouble-shooting

A	B	C	D	E	Possible cause	Remedy
-	✗	-	-	-	Pump delivers against an excessively high pressure.	Re-adjust to duty point.
-	✗	-	-	-	Gate valve in the discharge line is not fully open.	Fully open the gate valve.
-	-	✗	-	✗	Pump running in off-design conditions (part load / overload)	Check the pump's operating data.
✗	-	-	-	-	Pump or piping are not completely vented.	Vent by lifting the pump off the flanged bend and lowering it again.
✗	-	-	-	-	Pump intake clogged by deposits	Clean the intake, pump components and lift check valve.
-	✗	-	✗	✗	Supply line or impeller clogged	Remove deposits in the pump and/or piping.
-	-	✗	-	✗	Dirt/fibres in the clearance between the casing wall and impeller Sluggish rotor.	Check that the impeller can rotate freely. Clean the impeller if necessary.
-	✗	✗	✗	✗	Wear of internal components	Replace worn components by new ones.
✗	✗	-	✗	-	Defective riser (pipe and sealing elements)	Replace defective risers, replace sealing elements.
-	✗	-	✗	✗	Impermissible air or gas content in the fluid handled	Contact the manufacturer.
-	-	-	-	✗	System-induced vibrations	Contact the manufacturer.
-	✗	✗	✗	✗	Wrong direction of rotation	Check the electrical connection of the motor and the control system if any.
-	-	✗	-	-	Wrong supply voltage	Check the mains power supply. Check the cable connections.
✗	-	-	-	-	Motor is not running because of lack of voltage.	Check the electrical installation. Contact the energy supplier.
✗	-	✗	-	-	Motor winding or power cable defective	Replace by new original KSB parts or contact the manufacturer.
-	-	-	-	✗	Defective rolling element bearing	Contact the manufacturer.
-	✗	-	-	-	Water level lowered too much during operation	Check level control equipment.
✗	-	-	-	-	Temperature control device monitoring the winding[6)] has tripped the pump as a result of excessive winding temperatures.	The motor will restart automatically once it has cooled down.

6 Only available for some pumps

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9 Related Documents

9.1 Exploded views with lists of components

9.1.1 AmaPorter F

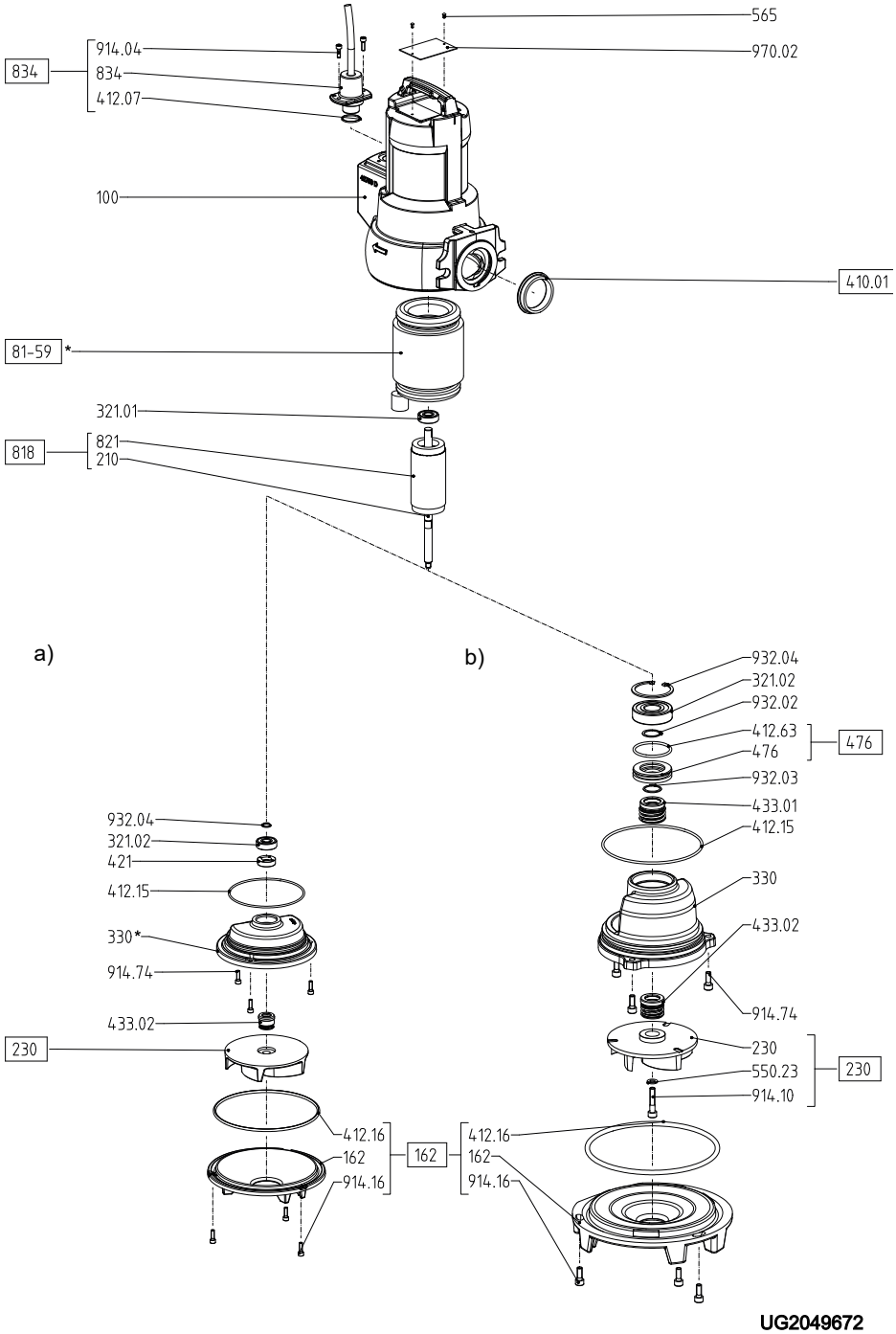

Fig. 23: Exploded view of AmaPorter F

a)	AmaPorter F 50_ /60_	b)	AmaPorter F 51_ /52_ /61_ /62_ /82_
*	For AmaPorter F 50_ /60_ with single-phase motor, the capacitor is connected to the stator and placed on the bearing bracket.		

Table 22: List of components

Part No.	Description	Part No.	Description
100	Casing	476	Mating ring carrier
162	Suction cover	550.23	Disc
230	Impeller	565	Rivet
321.01/.02	Radial ball bearing	81-59	Stator
330	Bearing bracket	818	Rotor
410.01	Profile seal	834	Cable gland
412.07/.15/.16/.63	O-ring	914.04/.10/.16/.74	Hexagon socket head cap screw
421	Lip seal	932.02/.03/.04	Circlip
433.01/.02	Mechanical seal	970.02	Label/plate

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9.1.2 AmaPorter S

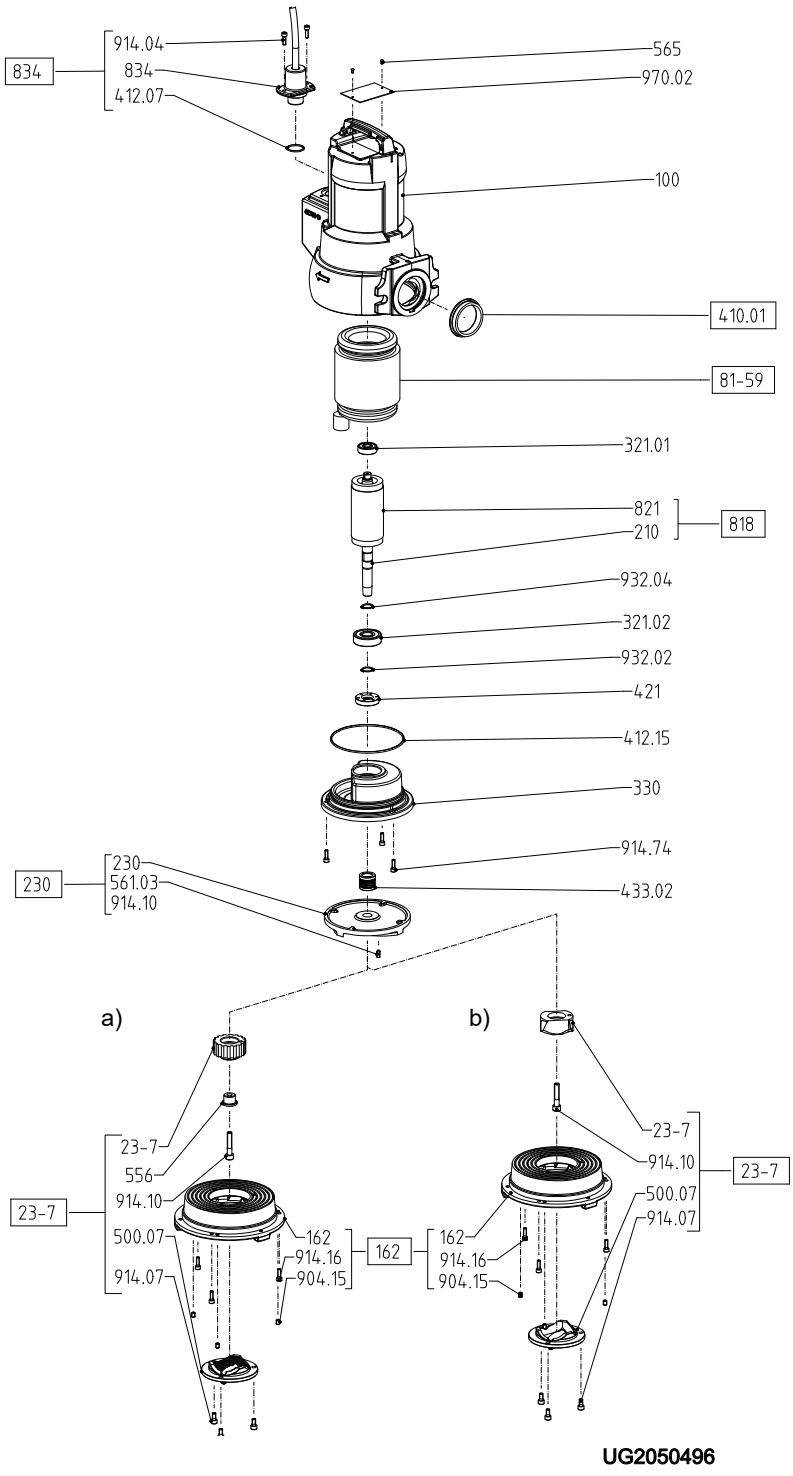

Fig. 24: Exploded view of AmaPorter S

a)	AmaPorter SB 545 SE/ NE	b)	AmaPorter SB 545 ND

For AmaPorter SB 545 SE/ NE:
Start capacitors are delivered with the pump and connected directly (via the cable gland). Use an installation casing which is connected to the mains.

Table 23: List of components

Part No.	Description	Part No.	Description
100	Casing	556	Fitting piece
162	Suction cover	561.03	Half round head / grooved pin
23-7	Impeller body	565	Rivet
230	Impeller	81-59	Stator
321.01/.02	Radial ball bearing	818	Rotor
330	Bearing bracket	834	Cable gland
410.01	Profile seal	837	Capacitor
412.07/.15	O-ring	904.15	Grub screw
421	Lip seal	914.04/.07/.10/.16/.74	Hexagon socket head cap screw
433.02	Mechanical seal	932.02/.04	Circlip
500.07	Ring	970.02	Label/plate

9.2 Wiring diagram

9.2.1 Pump sets with single-phase AC motors

9.2.1.1 Version with float switch (AmaPorter _____ SE)

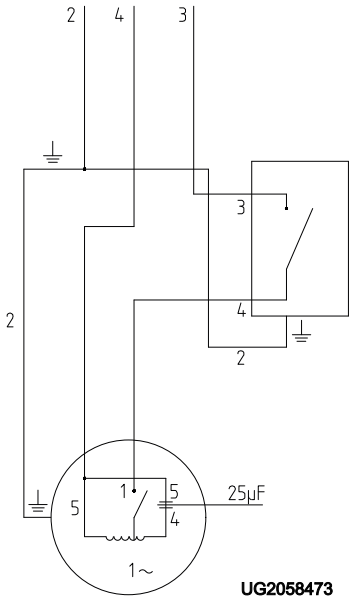

Fig. 25: Single-phase AC version with float switch

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

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9.2.1.2 Version without float switch (AmaPorter _____ NE)

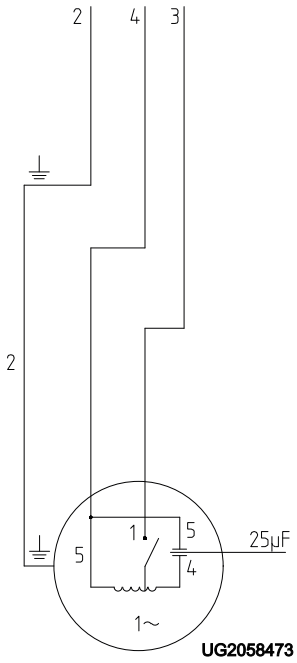

Fig. 26: Single-phase AC version without float switch

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

9.2.1.3 Version with capacitor (AmaPorter SB _____)

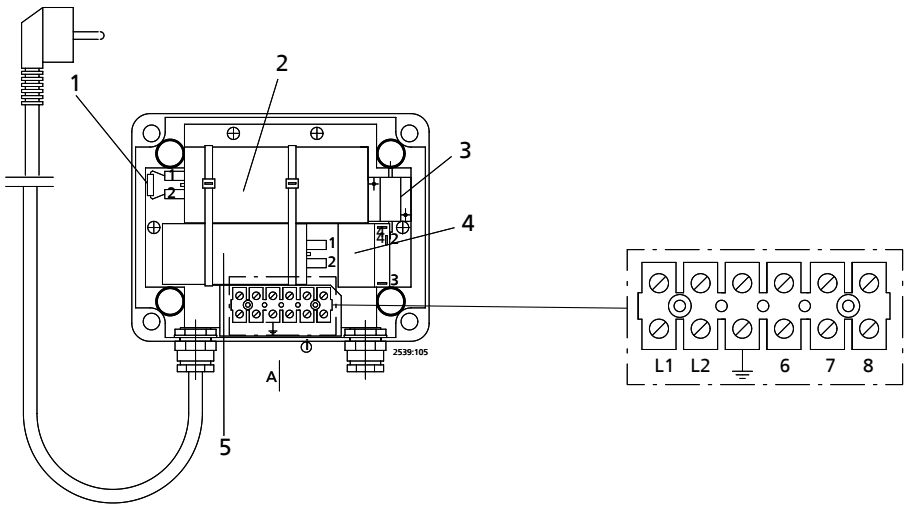

Fig. 27: Single-phase AC versions with start capacitor

1	Resistor 56 kΩ 3W	2	Start capacitor 60 µF HSFPU
3	Resistor 3.3 Ω - 25 W	4	Klixon relay 2CR3-300
5	Run capacitor 25 µF HPFNT		
Core colours:			
		6	Black
7	Brown	8	Grey or blue

9.2.2 Pumps with three-phase motors

9.2.2.1 Version without temperature sensors

AmaPorter F 50_ [7)8)] / 60_ [7) 8)] / S 545 [7)]

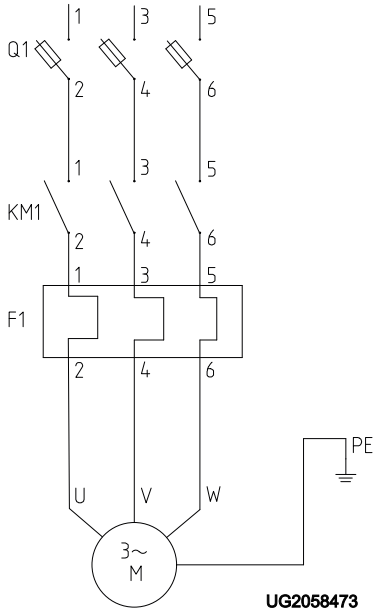

Fig. 28: Three-phase version without temperature sensors

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

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7 Available in 50 Hz, 380-415 V

8 Available in 60 Hz, 380-460 V

9.2.2.2 Version with temperature sensors

AmaPorter F 51_ /52_ /61_ /62_ /82_

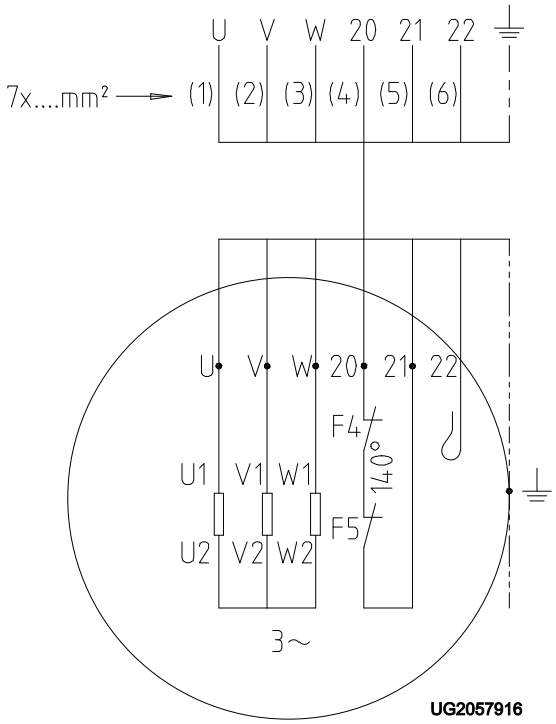

Fig. 29: Three-phase version with temperature sensors

U (phase)	V (phase)
W (phase)	
20	Bimetal switch
21	Bimetal switch

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**:

AmaPorter F 50_ _E, F 60_ _E, SB 545 _E

From serial number: xxxxxxxx-B202322-00001

- 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: 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
  - 2014/30/EU: Electromagnetic Compatibility (EMC)

The manufacturer also declares that

- the following harmonised international standards have been applied:
  - ISO 12100
  - EN 809
  - EN 60034-1, EN 60034-5/A1
  - EN 60335-1/A1, EN 60335-2-41

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 May 2023

Thomas Heng

Head of Product Development Series & Heavy Duty Pumps
KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

11 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**:

AmaPorter F 50_ ND, F 60_ ND, S 545_ ND

From serial number: xxxxxxxx-B202322-00001

- is in conformity with the provisions of the following directives / regulations as amended from time to time:
  - Pump set: 2006/42/EC Machinery Directive
  - Electrical components: 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
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Frankenthal, 1 May 2023

Thomas Heng

Head of Product Development Series & Heavy Duty Pumps

KSB SE & Co. KGaA
Johann-Klein-Straße 9

67227 Frankenthal (Germany)

12 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**:

AmaPorter F 51_ND, F 52_ND, F 61_ND, F 62_ND, F 82_ND

From serial number: xxxxxxxx-B202322-00001

- is in conformity with the provisions of the following directives / regulations as amended from time to time:
  - Pump set: 2006/42/EC Machinery Directive
  - Electrical components: 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
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128, rue Carnot,
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Johann-Klein-Straße 9

67227 Frankenthal (Germany)

13 Certificate of Decontamination

Type: .....

Order number /

Order item number[9]: .....

Delivery date: .....

Application: .....

Fluid handled[9]: .....

Please tick where applicable[9]:

☐ Corrosive

☐ Oxidising

☐ Flammable

☐ Explosive

☐ Hazardous to health

☐ Seriously hazardous to health

☐ Toxic

☐ Radioactive

☐ Bio-hazardous

☐ Safe

Reason for return:[9]: .....

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 and 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

2539.811/09-EN

9 Required field

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2539.811/09-EN (39023915)

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