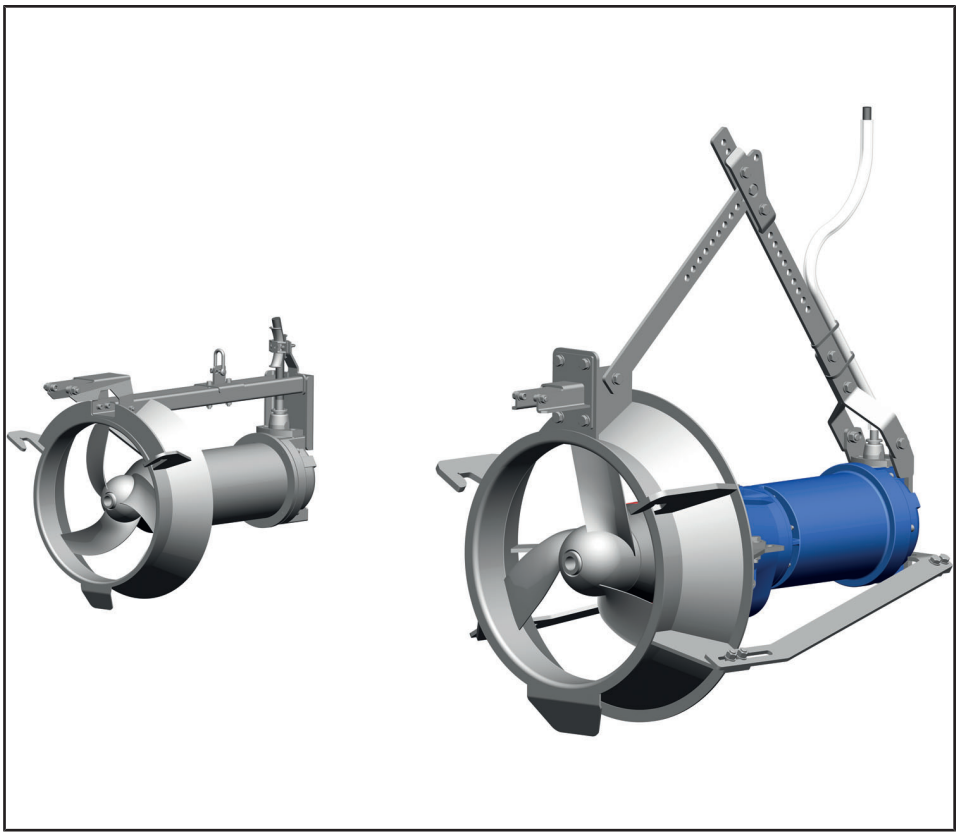
Submersible Motor Pump

Amaline

50 Hz

Installation/Operating Manual



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CE

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Legal information/Copyright

Installation/Operating Manual Amaline

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.

Pump

Machine without drive, additional components or accessories

Pump set

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

Submersible motor pump

Submersible motor pumps are floodable, close-coupled units which are not self-priming. Submersible motor pumps are operated completely submerged.

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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.

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 1: 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
Sub-supplier product literature[1)]	Operating manuals and other product literature describing accessories and integrated machinery components
Spare parts lists[1)]	Description of spare parts

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

1.5 Symbols

Table 2: 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

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1 If included in agreed 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 3: 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.
	**Explosion protection** This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EU Directive 2014/34/EU (ATEX).
	**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.

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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 pumps/pump sets which are in perfect technical condition.
- Do not operate the pump (set) in partially assembled condition.
- 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 minimum flow rates indicated in the data sheet or product literature (to prevent overheating, bearing 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.

Prevention of foreseeable misuse

- Observe all safety information and instructions in this manual.
- Never open the discharge-side shut-off elements further than permitted.
  - The maximum flow rates specified in the product literature or data sheet would be exceeded.
  - Risk of cavitation damage
- Never exceed the permissible application and operating limits specified in the data sheet or product literature regarding pressure, temperature, etc.

- Never use a non-explosion-proof pump in a potentially explosive atmosphere.
- Never use the pump as a turbine.
- Never use the lifting equipment supplied with the product as general lifting accessories.

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 operator/user

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. contact guards) during operation.
- 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.
- Always use appropriate caution for maintenance, inspection and installation work. Wear protective equipment as required.
- Only carry out work on the pump (set) during standstill of the pump.
- 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 42)
- 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 40)

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.

2.9 Explosion protection

DANGER

Always observe the information on explosion protection given in this section when operating an explosion-proof pump set.

Sections of the manual marked by the symbol opposite apply to explosion-proof pump sets also when temporarily operated outside potentially explosive atmospheres.
Pumps / pump sets must not be used in potentially explosive atmospheres unless marked as explosion-proof **and** identified as such in the data sheet.

Special conditions apply to the operation of explosion-proof pump sets in accordance with EU Directive *2014/34/EU (ATEX)*.

Especially adhere to the sections in this manual marked with the symbol opposite.
The explosion-proof status of the pump is only assured if the pump is used in accordance with its intended use.
Never operate the product outside the limits stated in the data sheet and on the name plate.
Prevent impermissible modes of operation.

2.9.1 Repair

Special regulations apply to repair work on explosion-proof pumps. Modifications or alterations of the pump set can affect explosion protection and are only permitted after consultation with the manufacturer.

Repair work at the flameproof joints must only be performed in accordance with the manufacturer's instructions. Repair to the values in tables 1 and 2 of EN 60079-1 is not permitted.

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 Fitting the bail or shackle

Amaline 200, 300, 400 As standard, shackle 59-17 is fitted to the pump set in the centre-of-gravity position. Bail 571 can be fitted instead, as an option.

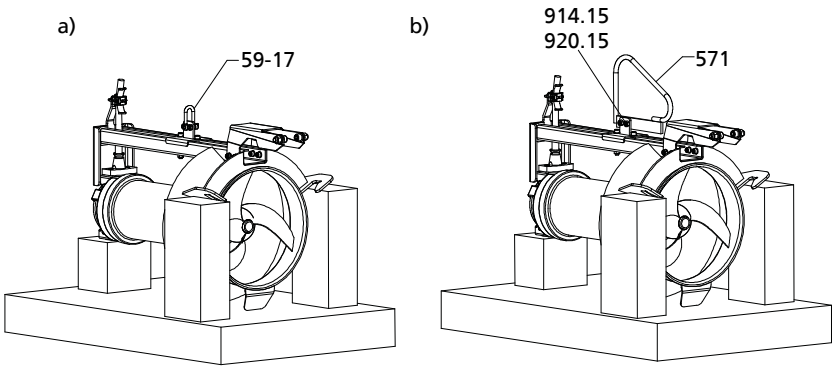

Fig. 1: Amaline with: a) shackle 59-17 b) bail 571

✓ The pump set has been positioned as illustrated.

1. Attach shackle 59-17 to the attachment lug at the pump casing, or fasten bail 571 to the attachment lug at the pump casing with screws 914.15 and nuts 920.15.

Amaline 500, 600, 800 As standard, bail 571 is fitted to the pump set in the centre-of-gravity position.

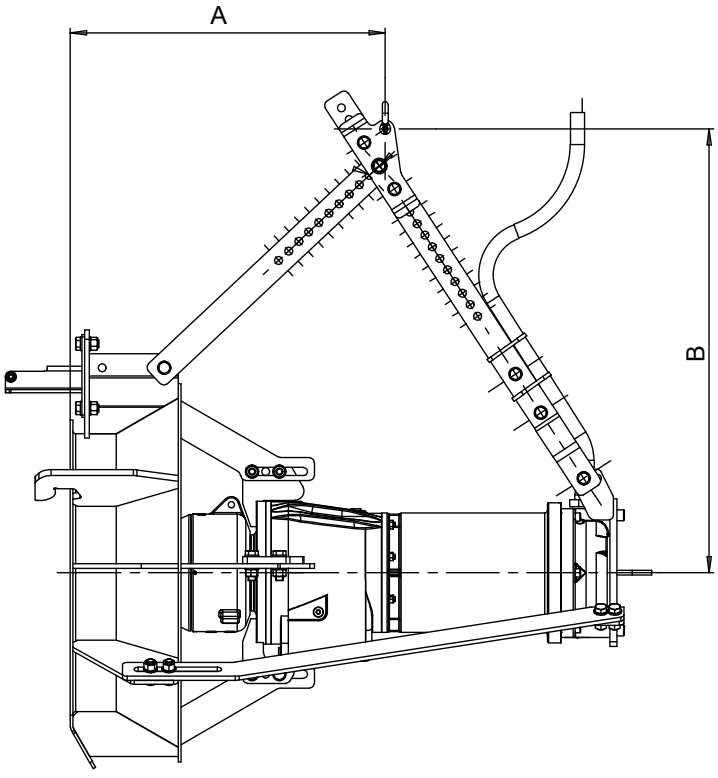

Fig. 2: Amaline with bail 571

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Table 4: Dimensions of bail 571

Size	Axial propeller	Gear unit	Motor	A	B
				[mm]	[mm]
500	5033	SP189	4 4	510	930
500	5033	SP189	6 4	550	900
500	5033	SP189	11 4	640	800
500	5035	SP189	4 4	510	910
500	5035	SP189	6 4	570	920
500	5035	SP189	11 4	580	920
500	5035	SP190	17 2	640	1000
600	6032 / 6033	SP189	4 4	460	650
600	6032 / 6033	SP189	6 4	610	820
600	6032 / 6033	SP189	11 4	720	1000
600	6035	SP190	16 4	560	780
600	6035	SP190	17 2	580	960
600	6035	SP190	25 2	610	1000
800	8032 / 8038	SP189	4 4	430	960
800	8032 / 8038	SP189	6 4	530	850
800	8032 / 8038	SP189	11 4	530	850
800	8032 / 8038	SP190	16 4	510	950
800	8032 / 8038	SP190	23 4	530	900
800	8032 / 8038	SP190	30 4	600	800

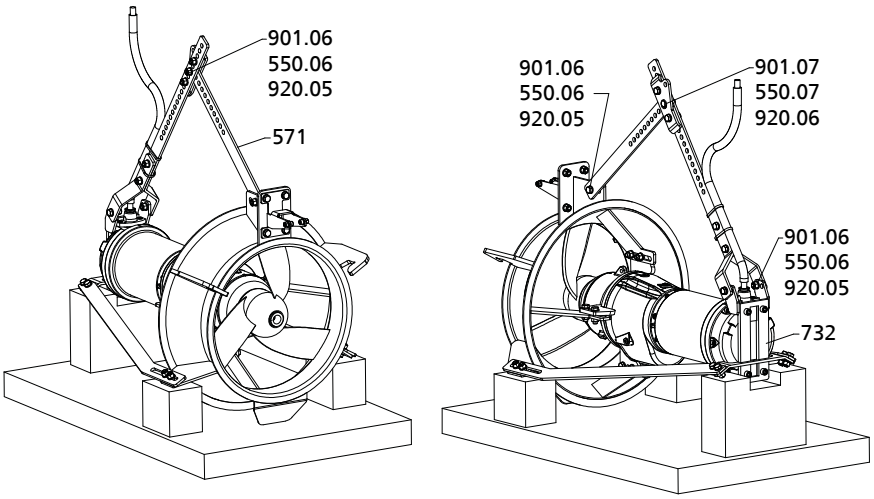

Fig. 3: Fitting bail 571

✓ The pump set has been positioned as illustrated.

1. Fasten the short leg of bail 571 to the pump casing with bolt 901.06, disc 550.06 and nut 920.05.
2. Fasten the long leg of bail 571 to bracket 732 with bolts 901.06, discs 550.06 and nuts 920.05.
3. Connect the two parts with bolt 901.06, disc 550.06 and nut 920.05.
4. Fit the reinforcement plate and fasten it with bolts 901.07, discs 550.07 and nuts 920.06.

3.3 Lifting rope

For lifting/lowering with lifting equipment, the lifting rope can also be attached directly at the attachment point. It can remain attached during operation.

3.4 Webbing sling

For lifting/lowering with lifting equipment, the webbing sling can also be attached directly at the attachment point.

3.5 Transport

DANGER

Improper transport

Danger to life from falling parts!

Damage to the pump set!

- Use tested, marked and approved lifting accessories only.
- The load-carrying capacity of the lifting accessory must be greater than the weight indicated on the name plate of the product to be lifted.
- Use the attachment point provided for attaching the lifting accessory.
- Never suspend the pump set by its power cable.
- Never enter the area underneath suspended load.
- Observe the regional transport regulations.

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

Temporary storage on unsecured and uneven surfaces

Personal injury and damage to property!

- Always place the pump (set) on a secured and level surface.
- Refer to the weights given in the data sheet/on the name plate.

WARNING

Pump set and transport holder tipping over or rolling off

Risk of injury!

- Secure the pump set and transport holder against tipping over or rolling off.

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

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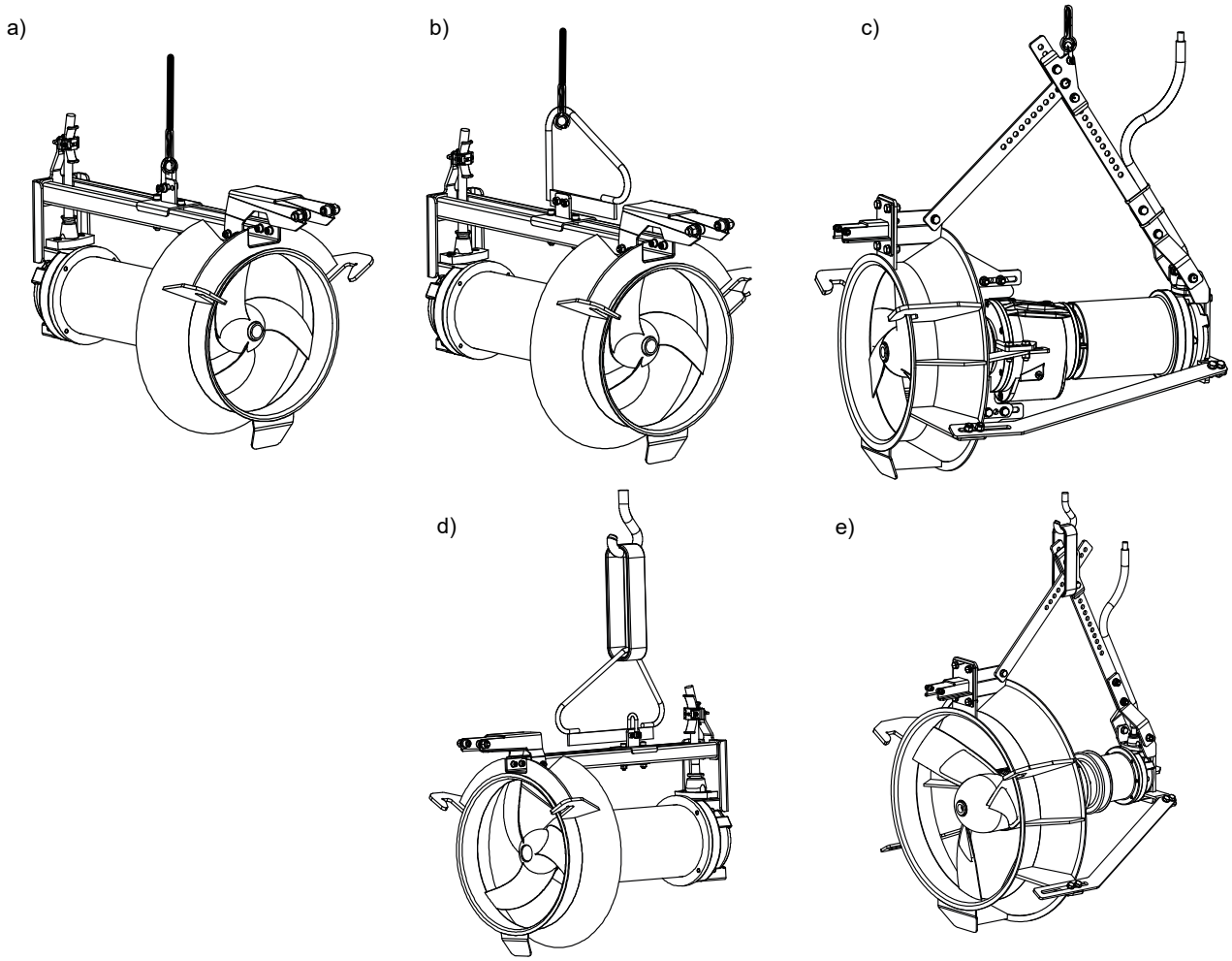


Fig. 4: Transporting the pump set a) Amaline 200, 300, 400 with lifting rope at shackle b) Amaline 200, 300, 400 with lifting rope at bail c) Amaline 500, 600, 800 with lifting rope at bail d) Amaline 200, 300, 400 with webbing sling at bail e) Amaline 500, 600, 800 with webbing sling at bail

3.6 Storage/preservation

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

	**CAUTION** **Improper storage** Damage to the power cable! ▷ Support the power cable at the cable entry to prevent permanent deformation. Observe the minimum bending radius[2)] of the power cable. ▷ Only remove the protective cap from the power cable at the time of installation.

	**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.

2 See cable manufacturer's documentation or DIN VDE 0298-3.

Table 5: Ambient conditions for storage

Ambient condition	Value
Relative humidity	5 % to 85 % (non-condensing)
Ambient temperature	-20 °C to +70 °C

- Store the pump set under dry and vibration-free conditions, if possible in its original packaging.

3.7 Return to supplier

1. Drain the pump as per operating instructions. (⇨ Section 7.3, Page 54)
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 11, Page 98)

NOTE

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

3.8 Disposal

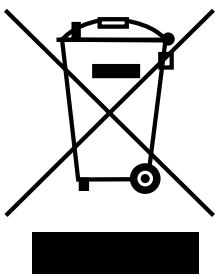
⚠ WARNING

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.

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4 Description

4.1 General description

- Submersible motor pump

Wet-installed horizontal propeller pump with submersible motor, equipped with direct drive or spur gear, ECB propeller with rigid, fibre-repellent blades, bolt-free connection to the discharge pipe. Explosion-proof version available.

4.2 Product information

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

For information as per chemicals Regulation (EC) No. 1907/2006 (REACH), see https://www.ksb.com/ksb-en/About-KSB/Corporate-responsibility/reach/ .

4.3 Designation

Example: Amaline C 2035 - 1450 / 24 UDG

Table 6: Designation key

Code	Description	
Amaline	Type series	
C	Pump casing material	
	C	Stainless steel
	S	Galvanised steel
20	Size, nominal diameter (DN)	
	20	200
	30	300
	40	400
	50	500
	60	600
	80	800
3	Number of blades	
	2, 3	
5	Code of blade incidence angle	
	1, 2, 3, 4, 5, 6, 8	
1450	Nominal speed of axial propeller [rpm]	
2	Motor size	
	0, 1, 2, 3, 4, 6, 8, 11, 16, 17, 23, 25, 30	
4	Number of motor poles	
	2, 4, 6, 8	
UD	Motor version	
	UD	Without gear unit, non-explosion-proof, for fluid temperatures of up to 40 °C
	YD	Without gear unit, explosion protection ⟨Ex⟩ II2G Ex db h IIB T4 Gb, for fluid temperatures of up to 40 °C
	UR	With gear unit, non-explosion-proof, for fluid temperatures of up to 40 °C
	YR	With gear unit, explosion protection ⟨Ex⟩ II2G Ex db h IIB T4 Gb, for fluid temperatures of up to 40 °C
G	Motor housing material	
	G	Grey cast iron

Code	Description	
G	C	Stainless steel

4.4 Name plate

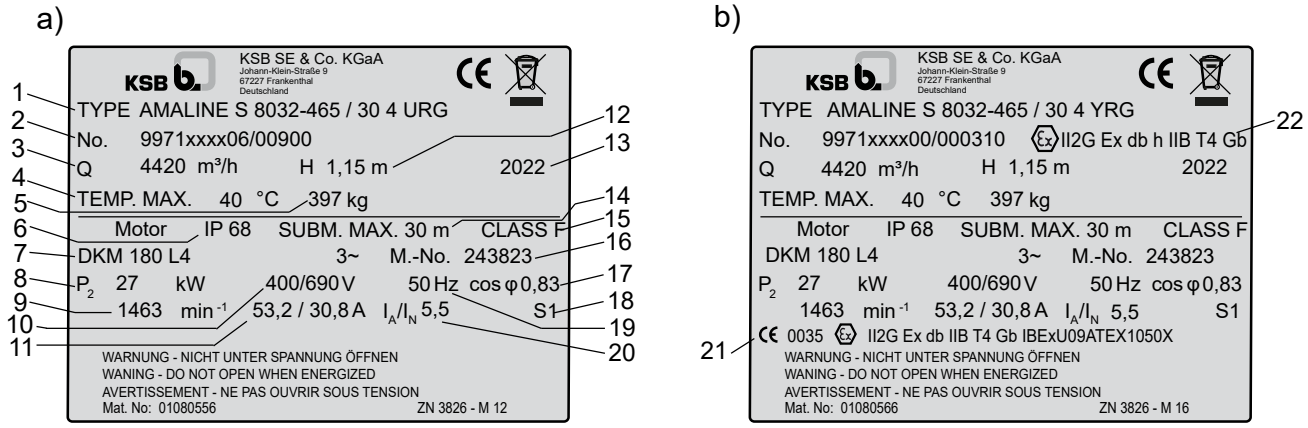

Fig. 5: Name plate (example) a) Standard pump set b) Explosion-proof pump set

1	Designation	2	KSB order number and order item number
3	Flow rate	4	Maximum fluid temperature and ambient temperature
5	Total weight	6	Enclosure
7	Motor type	8	Rated power
9	Rated speed	10	Rated voltage
11	Rated current	12	Head
13	Year of construction	14	Maximum immersion depth
15	Thermal class of winding insulation	16	Motor number
17	Power factor at rated operating point	18	Duty type
19	Rated frequency	20	Starting current ratio
21	ATEX marking for the submersible motor	22	ATEX marking for the pump set

4.5 Design details

Design

- Fully floodable submersible motor pump
- Horizontal installation
- Wet installation

Axial propeller

- Self-cleaning ECB propeller

Shaft seal

- Two bi-directional mechanical seals in tandem arrangement, with liquid reservoir

Amaline 500, 600, 800:

- Additional leakage chamber between the seat ring holder and the gear unit

Bearings

Amaline 200, 300, 400:

- Grease-packed rolling element bearings sealed for life

Amaline 500, 600, 800:

- Grease-packed rolling element bearings sealed for life in motor
- Oil-lubricated rolling element bearings in gear unit

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Drive

- Three-phase asynchronous squirrel-cage motor
- Type of protection Ex db IIB (applies to explosion-proof pump sets only)

Amaline 200, 300, 400:

- Direct drive

Amaline 500, 600, 800:

- Spur gear drive

4.6 Configuration and function

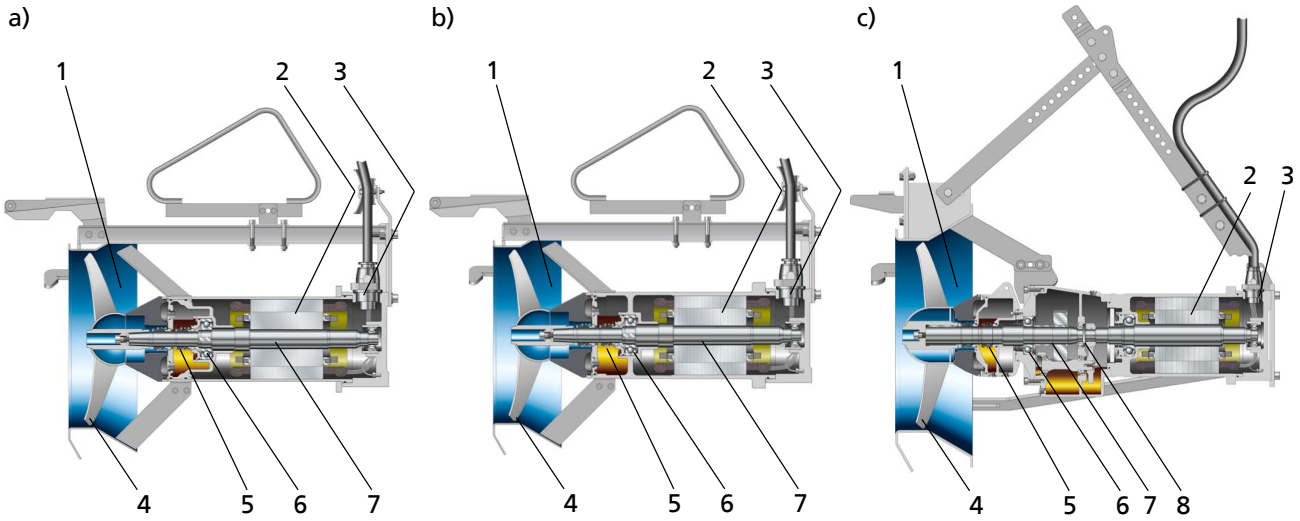

Fig. 6: Sectional drawings a) Amaline 400 (motor housing made of stainless steel) b) Amaline 400 (motor housing made of grey cast iron) c) Amaline 600 (motor housing made of grey cast iron)

1	Pump casing	2	Motor
3	Cable gland	4	Axial propeller
5	Mechanical seal	6	Rolling element bearing
7	Shaft	8	Gear unit

Design The self-cleaning propeller (4) is fitted in the pump casing (1). The pump set serves to recirculate activated sludge from the nitrification stage to the denitrification stage, for handling stormwater, river water, surface water and polder water at low heads, as well as for generating flow in water bodies.
The pump set is designed for continuously submerged operation. The motor (2) is cooled by the fluid handled on the motor surface.
The shaft (7) runs in rolling element bearings (6) located in the motor (2) or gear unit (8). (⇨ Section 2.2, Page 9)

Function The motor (2) converts electrical energy into mechanical energy, thus causing the shaft (7) connected to the motor to rotate. For Amaline 200, 300 and 400 the propeller (4) is directly connected to the shaft (7). For Amaline 500, 600 and 800 the propeller (4) is connected to the shaft (7) via a gear unit (8). The shaft drives the propeller (4), which generates thrust. This thrust induces the required flow.

Sealing The pump (set) shaft (7) is equipped with two bi-rotational mechanical seals (5) in tandem arrangement. A lubricant reservoir between the mechanical seals (5) ensures cooling and lubrication.
The cable gland (3) is absolutely watertight.

4.7 Scope of supply

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

- Pump set, complete with power cable
- Shackle
- Bail

Using a bail is recommended when the lifting rope of the crane will not remain attached to the attachment point of the pump set during operation; instead, the pump set will be pulled up or lowered by means of a hook.[3)]

NOTE

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

Accessories

- Depending on the model the installation parts consist of:
  - Guide rail
  - Mounting brackets
  - Middle support
- Connecting pipe
- Cable support for properly routing the power cable
- Other accessories on request

4.8 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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3 For Amaline 200, 300, 400 only

5 Installation at Site

5.1 Safety regulations

DANGER

Improper installation in potentially explosive atmospheres

Explosion hazard!

Damage to the pump set!

- Comply with the applicable local explosion protection regulations.
- Observe the information given in the data sheet and on the name plate of the pump set.

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.

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.

WARNING

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

Risk of injury! Damage to the submersible motor pump!

- Never insert your hands, other body parts or foreign objects into the axial propeller or intake area.
- Check that the axial propeller can rotate freely.

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.

5.2 Checks to be carried out prior to installation

5.2.1 Checking the operating data

Before installing the pump set, verify that the name plate data matches the data given in the purchase order and the site system data.

5.2.2 Preparing the place of installation

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.
   (⇨ Section 9.5, Page 90)
2. Check the lifting equipment.
   The lifting equipment must be of sufficient load-carrying capacity. The weight of the pump set is indicated on the name plate. (⇨ Section 4.4, Page 18)

5.2.3 Checking the lubricant level

The lubricant reservoirs have been filled with an environmentally-friendly, non-toxic lubricant at the factory.

Amaline 200, 300 with motor 0 6 or 2 6, 400

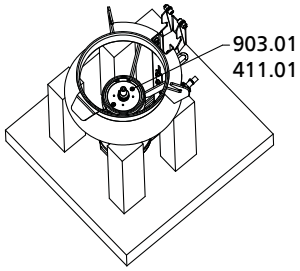

Fig. 7: Checking the lubricant level of an Amaline 200, 300 with motor 0 6 or 2 6, 400

✓ The pump set has been set down as illustrated.

✓ The axial propeller and adapter have been removed. (⇨ Section 7.4.3, Page 55)

1. Undo and remove screw plug 903.01 with joint ring 411.01.
2. Measure the lubricant level.
   ⇨ The lubricant level must not be any lower than 10 mm below the value "A" indicated in the following table.

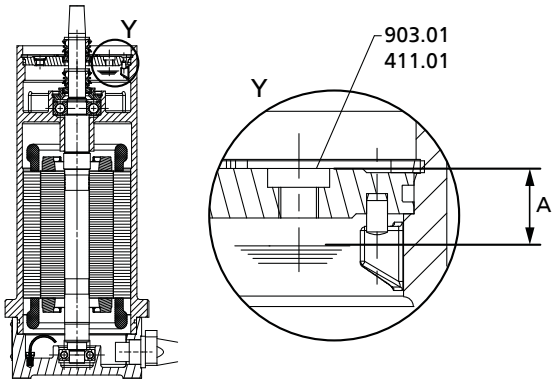

Fig. 8: Lubricant level Amaline 200, 300 with motor 0 6 or 2 6, 400

3. If the lubricant level is lower, top up the lubricant in the lubricant reservoir through the filler opening. (⇨ Section 7.2.1.5.4, Page 51)
4. Screw in screw plug 903.01 with joint ring 411.01.
5. Mount the adapter and axial propeller. (⇨ Section 7.5.5, Page 63)

Table 7: Distance "A" from the casing edge to the lubricant level

Size	A
	[mm]
200	25
300	38
400	35

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Amaline 300 with motor 8 6

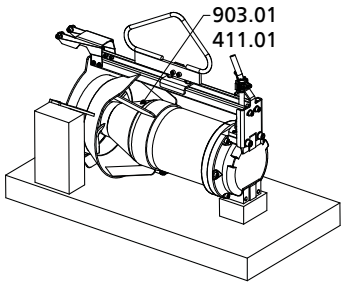

Fig. 9: Checking the lubricant level of an Amaline 300 with motor 8 6

✓ The pump set has been set down as illustrated.

1. Undo and remove screw plug 903.01 with joint ring 411.01.
   ⇨ The lubricant level must be approximately 50 mm below the filler opening.
2. If the lubricant level is lower, top up lubricant through the filler opening until the lubricant level is approximately 50 mm below the filler opening. (⇨ Section 7.2.1.5.1, Page 49)
3. Screw in screw plug 903.01 with joint ring 411.01.

Amaline 500, 600, 800

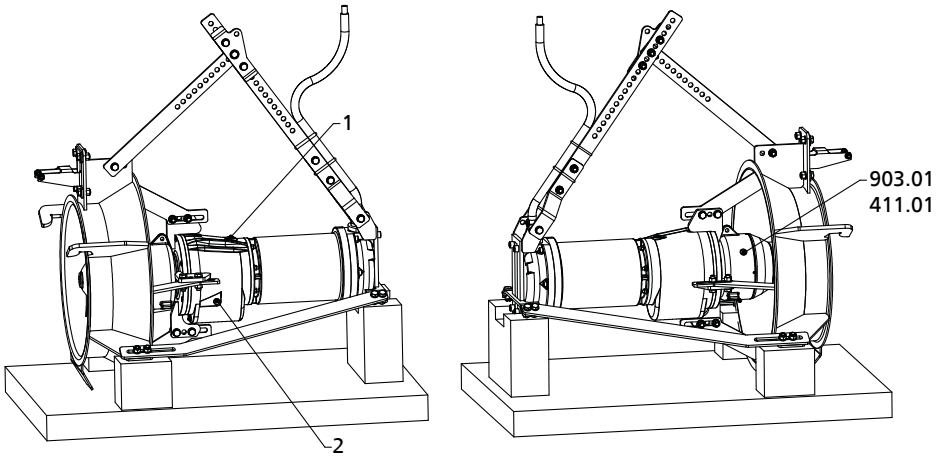

Fig. 10: Lubricant level of an Amaline 500, 600, 800

1	Lubricant filler plug of the gear unit
2	Lubricant check plug of the gear unit

Lubricant level for mechanical seal

✓ The pump set has been set down as illustrated.

1. Undo and remove screw plug 903.01 with joint ring 411.01.
   ⇨ The lubricant level must reach the lubricant check opening.
2. If the lubricant level is lower, top up lubricant through the filler opening until the lubricant reservoir overflows. (⇨ Section 7.2.1.5.1, Page 49)
3. Screw in screw plug 903.01 with joint ring 411.01.

Lubricant level of gear unit

1. Unscrew the lubricant check plug at the gear unit.
   ⇨ The lubricant level must reach the lubricant check opening.
2. If the lubricant level is lower, unscrew the lubricant filler plug on the gear unit and top up lubricant through the filler opening until the lubricant reservoir overflows at the lubricant check opening. (⇨ Section 7.2.1.5.1, Page 49)
3. Screw in the lubricant check plug of the gear unit and, if applicable, the lubricant filler plug.

5.3 Installing the pump set

Always refer to and comply with the general arrangement drawing/outline drawing when installing the pump set.

5.3.1 Fitting the protective cable sheath at the submersible motor pump

1. To protect the power cable, slip protective cable sheath 719 over the cable end, and slide it all the way up against the bushing.
2. Fasten the protective cable sheath to bail 571 with cable ties 81-7.

5.3.2 Fitting the installation parts

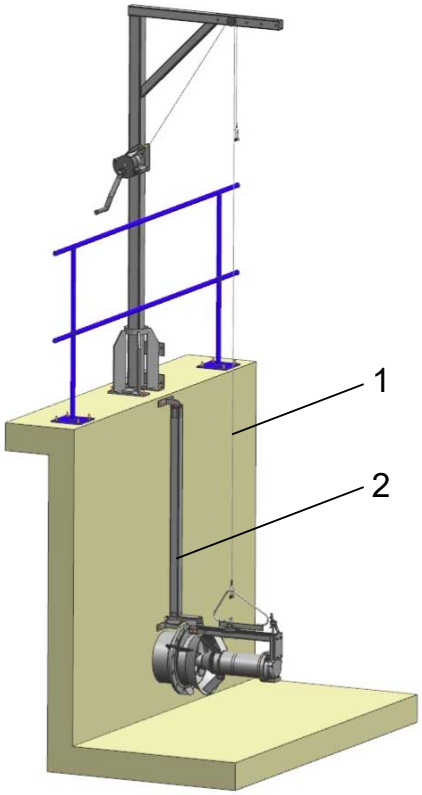

Fig. 11: Installation in the tank

1	Plumb-vertical	2	Vertical

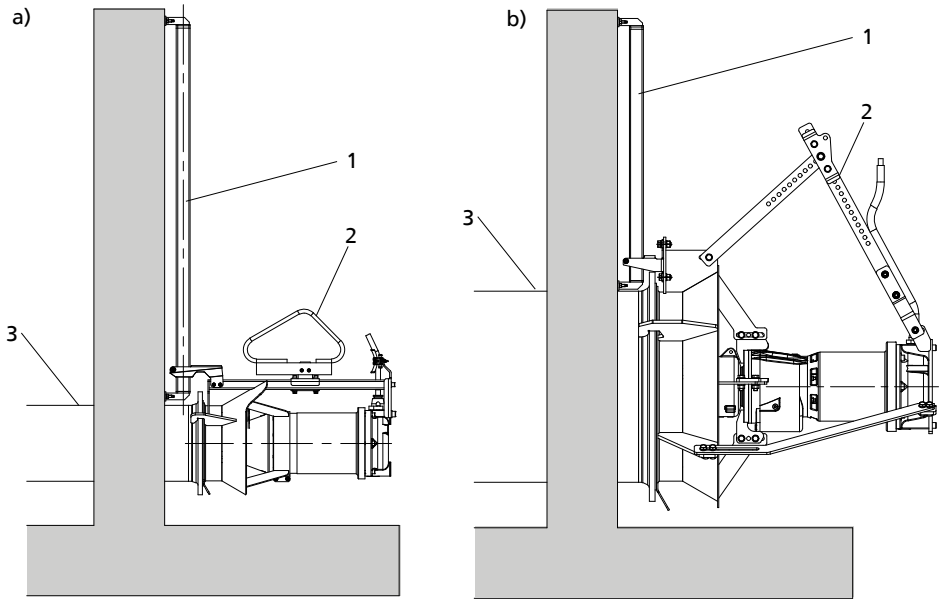

Fig. 12: Installation a) Amaline 200, 300, 400 b) Amaline 500, 600, 800

1	Guide rail	2	Bail
3	Connection pipe		

The connection pipe has been installed parallel to the floor and perpendicular to the wall.

The guide rail has been installed in a vertical position parallel to the wall.

Ensure that the guide rail is correctly positioned in compliance with the specified dimensions and tolerances and that it is fitted with chemical anchors.
(⇨ Section 9.5, Page 90)

5.3.3 Lifting hook

NOTE

Lifting hooks can only be used in low-viscosity substrates.

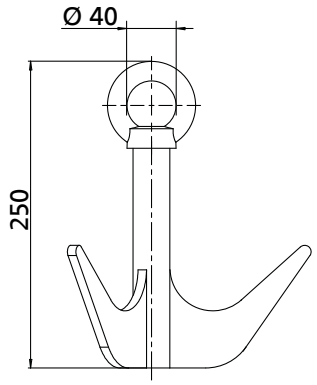

Fig. 13: Lifting hook

The lifting hook has a maximum load-carrying capacity of 500 kg.

For lifting/lowering with a lifting hook, the lifting hook is attached to the lifting rope of the lifting equipment (crane) with a shackle.

5.3.4 Checking and adjusting the attachment point

⚠ DANGER

Improper transport

Danger to life from falling parts!

Damage to the pump set!

- Use tested, marked and approved lifting accessories only.
- The load-carrying capacity of the lifting accessory must be greater than the weight indicated on the name plate of the product to be lifted.
- Use the attachment point provided for attaching the lifting accessory.
- Never suspend the pump set by its power cable.
- Never enter the area underneath suspended load.
- Observe the regional transport regulations.

⚠ 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.

To smoothly pull out / lower the pump set along the guide rail the pump set must be suspended from the attachment point in a perfectly horizontal position.

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Checking the attachment point

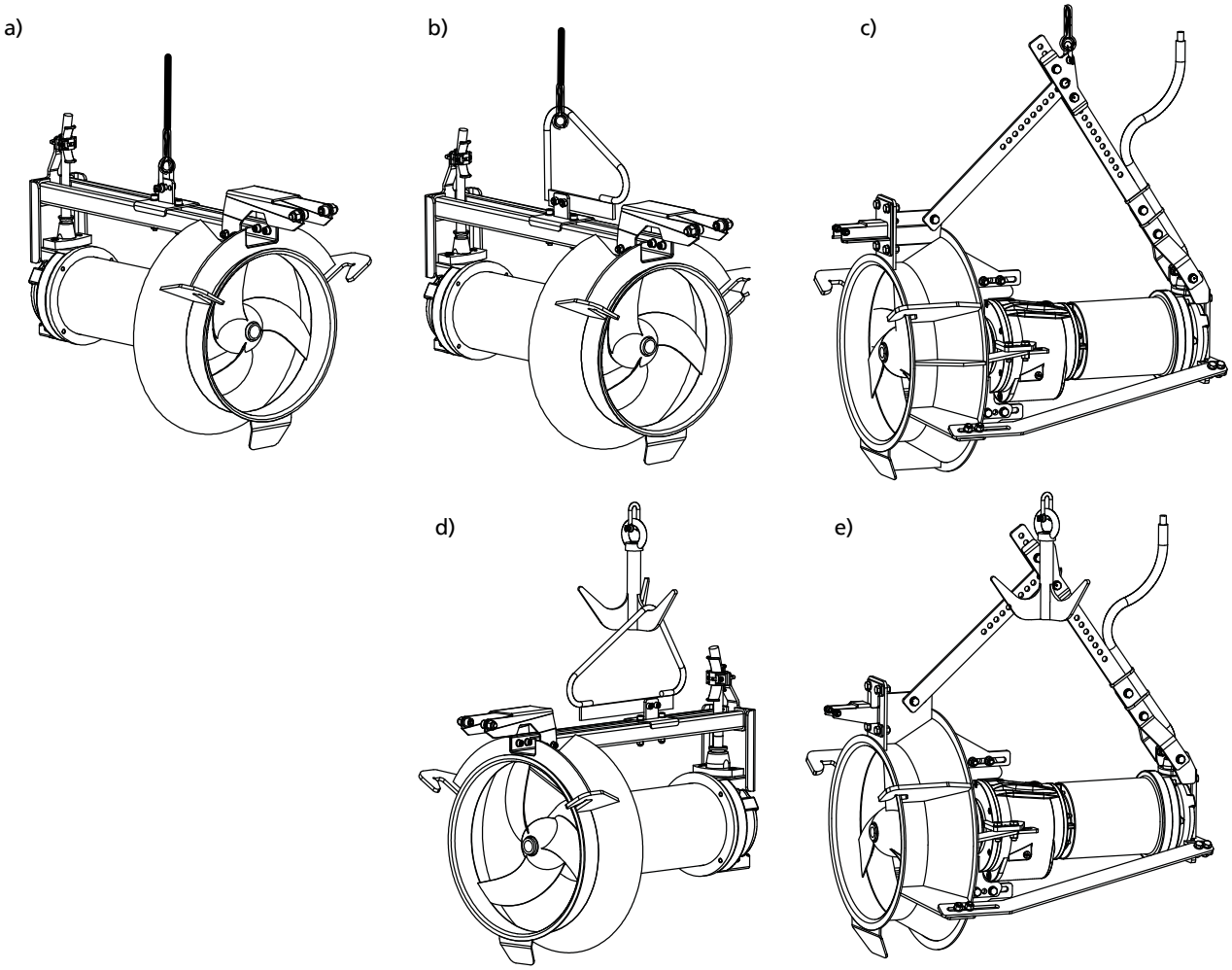

Fig. 14: Checking the attachment point a) Amaline 200, 300, 400 with lifting rope at shackle b) Amaline 200, 300, 400 with lifting rope at bail c) Amaline 500, 600, 800 with lifting rope at bail d) Amaline 200, 300, 400 with lifting hook at bail e) Amaline 500, 600, 800 with lifting hook at bail

1. Suspend the pump set as illustrated.
2. Lift the pump set.
3. Use a spirit level and measure the angular position.

⇨ The pump set is suspended in a perfectly horizontal position.

⇨ If the angle deviates from the requirements, the attachment point must be corrected.

Correcting the attachment point

⚠ WARNING

Temporary storage on unsecured and uneven surfaces

Personal injury and damage to property!

- ▹ Always place the pump (set) on a secured and level surface.
- ▹ Refer to the weights given in the data sheet/on the name plate.

⚠ WARNING

Pump set and transport holder tipping over or rolling off

Risk of injury!

▹ Secure the pump set and transport holder against tipping over or rolling off.

Amaline 200, 300, 400

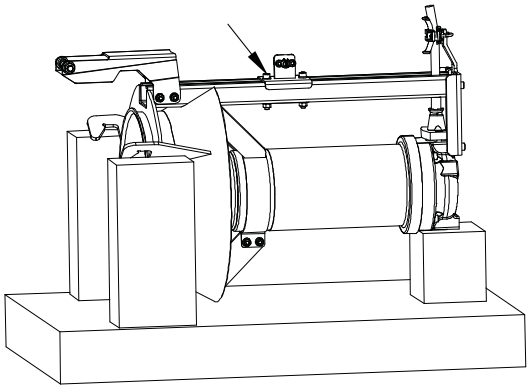

Fig. 15: Correcting the attachment point

✓ The angular position has been found to deviate from the requirements.

✓ The pump set has been placed down in a horizontal position as illustrated.

1. Undo the bolts, discs and nuts at the attachment lug as illustrated.
2. Shift the attachment lug along the guide structure.

CAUTION

Loose or insufficiently tightened screwed connections

Damage to the installation parts during operation

▹ Observe the tightening torques.

3. Re-tighten all bolts. (⇨ Section 7.6, Page 64)
4. Double-check the attachment point using a spirit level.

⇨ For the correct centre-of-gravity position the inclination angle must be close to 0°.

Amaline 500, 600, 800

Table 8: Attachment point, hole combination

Size	Axial propeller	Gear unit	Motor	Hole combination[4)]	
				Hole (long leg)	Hole (short leg)
500	5033	SP189	4 4	5	5
500	5033	SP189	6 4	5	1
500	5033	SP189	11 4	9	5
500	5035	SP189	4 4	5	5
500	5035	SP189	6 4	6	3
500	5035	SP189	11 4	7	4
500	5035	SP190	17 2	4	1
600	6032 / 6033	SP189	4 4	9	11
600	6032 / 6033	SP189	6 4	9	6
600	6032 / 6033	SP189	11 4	4	3
600	6035	SP190	16 4	10	8
600	6035	SP190	17 2	4	3
600	6035	SP190	25 2	4	2
800	8032 / 8038	SP189	4 4	5	11

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Size	Axial propeller	Gear unit	Motor	Hole combination[4)]	
				Hole (long leg)	Hole (short leg)
800	8032 / 8038	SP189	6 4	4	7
800	8032 / 8038	SP189	11 4	4	7
800	8032 / 8038	SP190	16 4	5	8
800	8032 / 8038	SP190	23 4	7	9
800	8032 / 8038	SP190	30 4	12	9

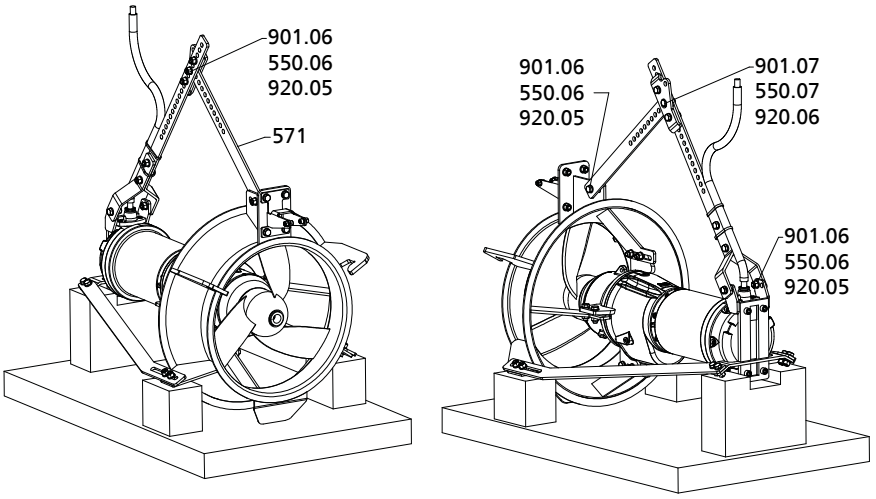

Fig. 16: Correcting the attachment point

✓ The angular position has been found to deviate from the requirements.

✓ The pump set has been placed down in a horizontal position as illustrated.

1. Remove the reinforcement plate with bolts 901.07, discs 550.07 and nuts 920.06.
2. Loosen bolts 901.06, discs 550.06 and nuts 920.05.
3. At the connection between the long leg and the short leg of bail 571 remove bolt 901.06 with disc 550.06 and nut 920.05.
4. Select the correct hole combination of bail 571.

CAUTION

Loose or insufficiently tightened screwed connections

Damage to the installation parts during operation

▹ Observe the tightening torques.

5. Re-tighten all bolts. (⇨ Section 7.6, Page 64)
6. Double-check the attachment point using a spirit level.

⇨ The pump set is suspended in a perfectly horizontal position to ensure smooth installation and removal.

5.3.5 Positioning of crane and crane hook

Choose the crane's height and position to ensure that the lifting rope between the crane and the pump set's attachment point is plumb-vertical.
(⇨ Section 9.5, Page 90)

4 The hole combination is composed of the hole used in the long leg and the hole used in the short leg (both of them counted starting from the top).

5.3.6 Checking attachment dimension

	**CAUTION** **Incorrect attachment dimension** Damage to the pump set when falling down or as a result of jamming! ▷ Observe attachment dimension (E). (⇨ Section 9.5, Page 90)

When mounting a new pump set to an existing guide rail and connection pipe, attachment dimension (E) at the claws (1) of the new pump set must match that of the previous pump set. Non-compliance could lead to the pump set becoming jammed at the connection pipe so that it can no longer be pulled out of the tank. For the pump set to be pulled out smoothly, the attachment dimension (E) must equal the flange thickness + 3 mm as a minimum.

When replacing an existing pump set, attachment dimension (E) at the claws of the new pump set must be reworked to match that of the previous pump set.

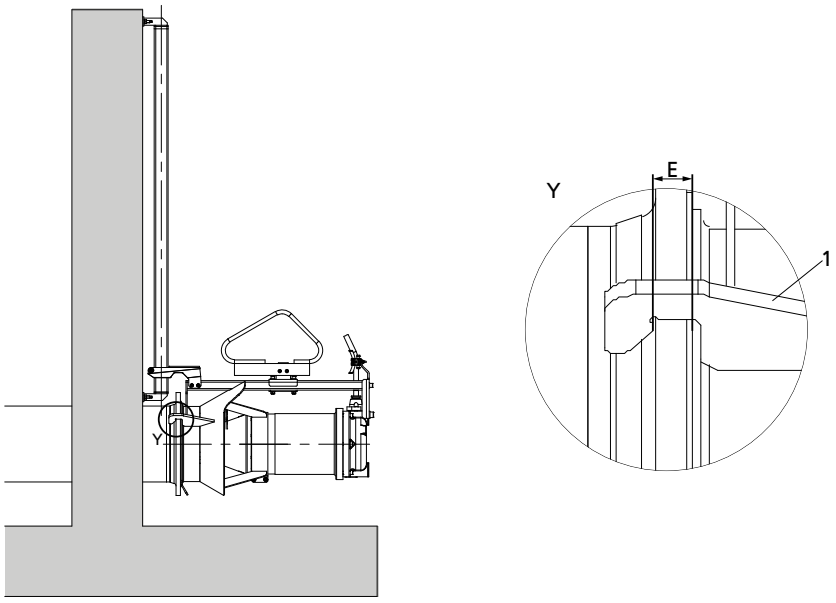

Fig. 17: Mounting a new pump set to an existing guide rail and connection pipe

1	Claws	E	Attachment dimension

5.3.7 Installing the pump set

- ✓ The bail or shackle has been fitted at the pump set. (⇨ Section 3.2, Page 12)
- ✓ The attachment point has been adjusted correctly. (⇨ Section 5.3.4, Page 26)
- ✓ The dimensions of guide piece 897 match the guide rail.
- ✓ The dimensions of the flange to be connected with claws have been verified. (⇨ Section 9.5.4, Page 95)
- ✓ If applicable, the access opening dimensions in the tank cover have been verified.
- ✓ The load-carrying capacity of the crane has been verified.

1. Suspend the pump set from the lifting gear and position it above the guide rail.
2. Lower the pump set onto the guide rail.
3. Lower the pump set down into the tank along the guide rail until it engages with the connection pipe. Avoid an inclined lifting rope angle.

   ⇨ The rope slackens.
4. Check rope tension and confirm that the pump set can be pulled out by tightening the rope using the original crane.

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NOTE

To facilitate finding this position of the pump (set) again, mark the rope accordingly.

5.3.8 Fastening and tensioning the power cable

DANGER

Power cable not properly routed

Risk of injury! Risk of falling!

- ▷ Route the power cable in such a way that it cannot pull down any persons if the pump set falls down or is lowered down.

CAUTION

Power cable routed with too much slack

Damage to power cable by axial propeller !

- ▷ Pull the power cable taut before fastening it at the tank edge.

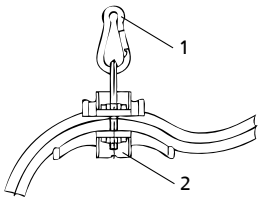

Fig. 18: Fastening and tensioning the power cable

1	Carabine hook	2	Cable support

If possible, the power cable should be fastened to the tank edge at a distance of approx. 0.8 m from the side of the guide rail, to prevent chafing on the guide rail, which would damage the power cable.

1. Fit the cable support to the power cable at the tank edge and use a carabine hook to attach it to an appropriate point (e.g. railing or eyebolt).
2. Pull the power cable taut up to the tank edge before tightening the cable support bolts.
   Prevent chafing of the power cable (use appropriate pads at the tank edge, if necessary).

5.3.9 Fastening the lifting rope

CAUTION

Loose or slack lifting rope

Damage to the lifting rope!

- ▷ With the system in its normal operating position, the lifting rope must be unstressed yet without excessive slack.
- ▷ Securely fasten the lifting rope. Use a rope winder/bollard or other rope fastening equipment if necessary.

To avoid damage to the lifting rope during operation, the lifting rope must always be lightly tensioned.

5.3.10 Fitting the rope winder/bollard

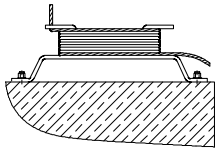

Fig. 19: Rope winder/bollard (RB)

When using transportable cranes, the lifting rope is removed from the winch of the lifting equipment after the submersible motor pump has been lowered into the tank. The lifting rope is then securely tied around the rope winder/bollard.

CAUTION

Loose or slack lifting rope

Damage to the lifting rope!

- With the system in its normal operating position, the lifting rope must be unstressed yet without excessive slack.
- Securely fasten the lifting rope. Use a rope winder/bollard or other rope fastening equipment if necessary.

1. Position the rope winder/bollard at the edge of the tank, e.g. beneath the railing, and fasten it with chemical anchors M10 x 130 or M10 bolts.
2. Run the end of the lifting rope through a stirrup bolt on the rope winder and pull it through completely.
3. Secure the lifting rope with the M5 stirrup bolt.
   Observe the tightening torques. (⇨ Section 7.6, Page 64)
4. Wind the rope around the two sheet metal brackets.
5. Secure the lifting rope against unintentional unwinding with the second M5 stirrup bolt.
   Observe the tightening torques. (⇨ Section 7.6, Page 64)

Alternatively, the rope winder/bollard can also be fastened to the railing.

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 9.3, Page 84)
The pump set is supplied with a power cable and is designed for DOL starting. Star-delta starting is an option for motor ratings exceeding 4 kW.

NOTE

When laying a cable between the control system and the pump set's connection point, verify that the number of cores is sufficient for the sensors. A minimum cross-section of 1.5 mm² is required.

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.

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5.4.1.1 Overload protection

1. Protect the pump set against overloading by a thermal time-lag overload protection device in accordance with IEC 947 and local regulations.
2. Set the overload protection device to the rated current specified on the name plate. (⇨ Section 4.4, Page 18)

5.4.1.2 Level control

DANGER

Pump set running dry

Explosion hazard!

▷ Never allow an explosion-proof 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 tank requires the use of level control equipment.
Observe the minimum level of fluid handled. (⇨ Section 6.2.4.1, Page 41)

5.4.1.3 Operation on a frequency inverter

The pump set is driven by an induction machine to IEC 60034-12 designed for fixed speed operation. In accordance with IEC 60034-25, section 18, the pump set is suitable for operation on a frequency inverter.

NOTE

For pump sets with rated voltages exceeding 500 V, a dv/dt filter should be fitted at the output of the frequency inverter to reduce the rate of voltage rise to the limits specified in IEC 60034-25, Section 18. Otherwise a considerably reduced service life of the insulation system has to be expected.

DANGER

Operation outside the permitted frequency range

Explosion hazard!

▷ Never operate an explosion-proof pump set outside the specified range.

DANGER

Incorrect selection and setting of the frequency inverter

Explosion hazard!

▷ Observe the following information on selecting and setting a frequency inverter.

Selection When selecting a frequency inverter, check the following details:

- Data provided by the manufacturer
- Electrical data of the pump set, particularly the rated current
- Only voltage source inverters (VSI) with pulse width modulation (PWM) and carrier frequencies between 1 and 16 kHz are suitable.

Setting Observe the following instructions for setting a frequency inverter:

- Set the current limit to max. 1.2 times the rated current. The rated current is indicated on the name plate. (⇨ Section 4.4, Page 18)

Start-up Observe the following instructions for starting the frequency inverter:

- Ensure short start ramps (maximum 5 seconds).
- Only start variable speed control after 2 minutes at the earliest.
  Pump start-up with long start ramps and low frequency may cause clogging.

Operation Observe the following limits during operation on a frequency inverter:

- Only utilise up to 95 % of the rated power P_2 indicated on the name plate. (⇨ Section 4.4, Page 18)
- Frequency range 25 to 50 Hz

Electromagnetic compatibility Operation on a frequency inverter produces interference emissions whose level varies depending on the inverter used (type, interference suppression, make). To prevent the drive system, consisting of a submersible motor and a frequency inverter, from exceeding any given limits always observe the EMC information provided by the inverter manufacturer. If the inverter manufacturer recommends a shielded power cable, make sure to use a submersible motor pump with shielded power cables.

Interference immunity The submersible motor pump generally meets interference immunity requirements. For monitoring the sensors installed the operator must ensure sufficient interference immunity by appropriately selecting and laying the power cables in the plant. No modifications are required on the power/control cable of the submersible motor pump. Suitable analysing devices must be selected. To monitor the leakage sensor inside the motor using a special relay available from KSB is recommended.

5.4.1.4 Sensors

CAUTION

Incorrect wiring

Damage to the sensors!

▷ Observe the limits stated in the following sections of this manual when connecting the sensors.

The pump set features sensors 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.

All sensors are located inside the pump set and are connected to the sensor cable.

For information on wiring and core marking see (⇨ Section 9.3, Page 84)

The individual sensors and the limit values to be set are described in the following sections.

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5.4.1.4.1 Motor temperature

DANGER

Insufficient cooling

Explosion hazard!

Winding damage!

- Never operate a pump set without operational temperature monitoring equipment.
- For explosion-proof pump sets use a thermistor motor protection relay with manual reset and ATEX certification for monitoring the temperature of explosion-proof motors in "flameproof enclosure" type of protection.

CAUTION

Insufficient cooling

Damage to the pump (set)!

- Never operate a pump (set) without operational temperature monitoring.

The motor is monitored by three series-connected PTC thermistors with terminals 10 and 11. They must be connected to a thermistor motor protection relay with manual reset. Tripping must result in the pump set cutting out.

For explosion-proof pump sets use a thermistor motor protection relay with ATEX certification for monitoring the temperature of explosion-proof motors in "flameproof enclosure" type of protection.

5.4.1.4.2 Leakage inside the motor

DANGER

Incorrect monitoring of leakage electrode

Explosion hazard!

Danger of death from electric shock!

- Voltages must be < 30 V AC and tripping currents < 0.5 mA.

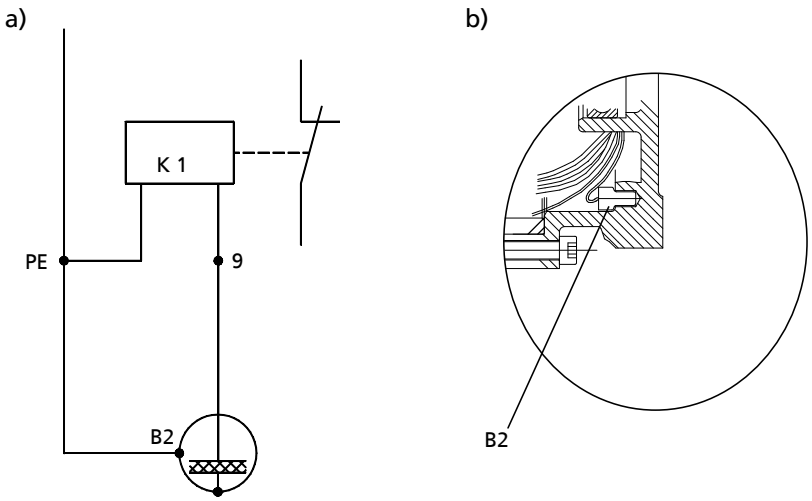

Fig. 20: a) Wiring of the electrode relay and b) Position of the electrode in the motor housing

An electrode fitted inside the motor monitors the winding space (B2) for leakage. The electrode is intended for connection to an electrode relay (core marking 9). Tripping of the electrode relay must result in the pump set cutting out.

The electrode relay (K1) must trip the motor at a tripping resistance between 3 and 60 kΩ.

5.4.1.4.3 Leakage at the mechanical seal (optional)

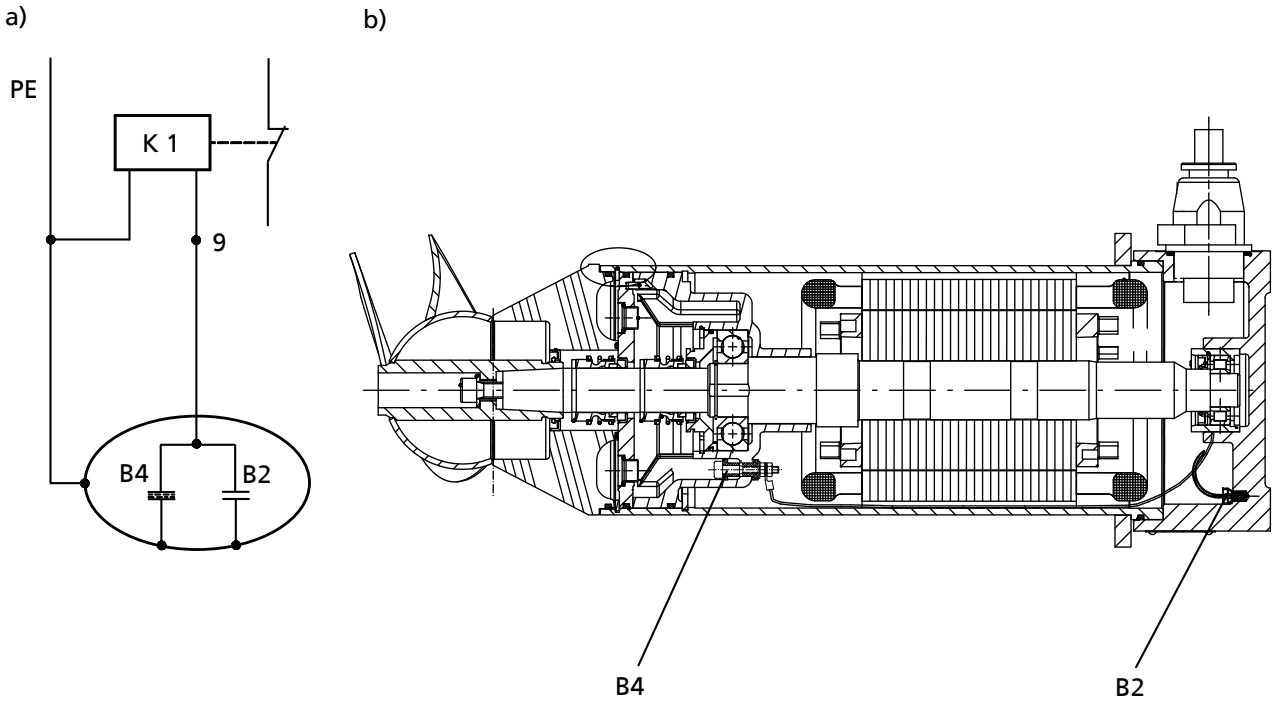

Fig. 21: a) Wiring of the electrode relay and b) Position of the leakage sensor

Versions with (optional) monitoring of mechanical seal leakage are fitted with an electrode in the oil reservoir (B4) in addition to the electrode (B2) monitoring the winding space inside the motor for leakage. Both electrodes are connected in parallel and must be monitored by a single electrode relay.

The electrode relay (K1) must fulfil the following requirements:

- Sensor circuit 10 to 30 V AC
- Tripping current 0.5 to 3 mA
  (equivalent to a tripping resistance of 3 to 60 kΩ)

5.4.2 Connection to power supply

	**DANGER** **Incorrect wiring** Explosion hazard! ▷ The connection point of the cable ends must be located outside of the potentially explosive atmosphere or inside electrical equipment approved to equipment category II2G.
	**DANGER** **Electrical connection work by unqualified personnel** Danger of death from electric shock! ▷ Always have the electrical connections installed by a trained electrician. ▷ Observe regulations IEC 60364 and, for explosion-proof versions, EN 60079 .

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.

WARNING

Faulty insulation

Danger of death from electric shock!

- ▷ Never connect to the power supply a pump set with faulty insulation.

WARNING

Incorrect connection to the mains

Damage to the power supply network, short circuit!

- ▷ Observe the technical specifications of the local energy supply companies.

CAUTION

Improper routing of power cables

Damage to the power cable!

- ▷ Never move the power cable at temperatures below -25 °C.
- ▷ Never kink or crush the power cable.

CAUTION

Flow-induced motion

Damage to the power cable!

- ▷ Run the power cable upwards without slack.

CAUTION

Motor overload

Damage to the motor!

- ▷ Protect the motor by a thermal time-lag overload protection device in accordance with IEC 60947 and local regulations.

NOTE

We recommend using cable supports available as accessories for properly fastening the power cable at the tank edge.

For electrical connection observe the wiring diagrams and the information for planning the control system. (⇨ Section 9.3, Page 84) (⇨ Section 5.4.1, Page 32)

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

1. Run the power cable upwards without slack and fasten it.
2. Remove the protective caps on the power cable immediately before connecting the cable.
3. If necessary, adjust the length of the power cable to the site requirements.
4. After shortening the cable, correctly re-affix the markings on the individual cores at the cable end.

Potential equalisation The pump set is not fitted with an external potential equalisation connection (risk of corrosion).

DANGER

Incorrect wiring

Explosion hazard!

- Explosion-proof pump sets installed in a tank must never be retrofitted with an external potential equalisation connection!

DANGER

Touching the pump set during operation

Electric shock!

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

5.5 Checking the direction of rotation

DANGER

Pump set running dry

Explosion hazard!

- Check the direction of rotation of explosion-proof pump sets outside potentially explosive atmospheres.

WARNING

Hands inside the pump casing

Risk of injuries, damage to the pump!

- Always disconnect the pump set from the power supply and secure it against unintentional start-up before inserting your hands or other objects into the pump.

CAUTION

Wrong direction of rotation

Damage to the pump!

- Follow the step-by-step instructions given for checking the direction of rotation.

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.

CAUTION

Axial propeller not fully submerged

Damage to the pump set!

- Never lower the pump set into the fluid while checking the direction of rotation.

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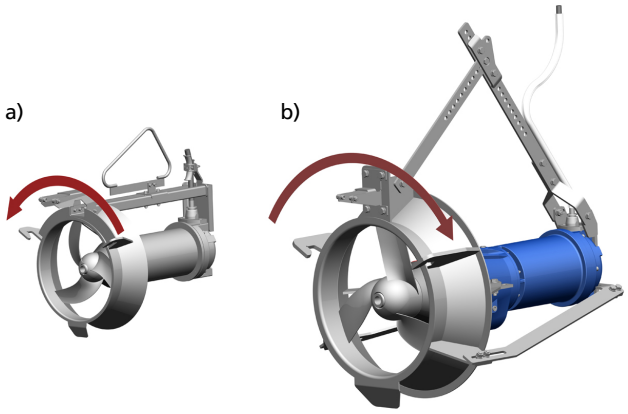

Fig. 22: Direction of rotation a) Amaline 200, 300, 400 b) Amaline 500, 600, 800

✓ The pump (set) is mounted on the guide rail and positioned entirely outside the fluid to be handled.
For filled tanks: mounted on the guide rail and suspended from the lifting equipment above the fluid handled, or placed down in a vertical position outside of the tank and protected against falling over or rolling off.
For empty tanks: mounted on the guide rail, attached to the connecting pipe, and in working position.

✓ The pump set is connected to the power supply.

1. Start the pump set and stop it again immediately to determine the axial propeller's direction of rotation.
2. Check the direction of rotation.
   Seen from the pump mouth, axial propeller rotation must match the arrow indicating the direction of rotation on the pump set.
3. If it is running in the wrong direction of rotation, check the electrical connection of the pump and the control system if necessary.

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/Start-up

6.1.1 Prerequisites for commissioning/start-up

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. (⇨ Section 5.4.2, Page 36)
- The direction of rotation has been checked. (⇨ Section 5.5, Page 38)
- The lubricant has been checked. (⇨ Section 5.2.3, Page 22)
- After prolonged shutdown of the pump (set), the activities required for returning the equipment to service have been carried out. (⇨ Section 6.4, Page 44)
- Safety-relevant protective equipment must be installed and fully functional.

6.1.2 Start-up

DANGER

Pump set running dry

Explosion hazard!

▷ Never allow an explosion-proof pump set to run dry!

DANGER

Operating an incompletely connected pump set

Explosion hazard!

Damage to the pump set!

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

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.

Start the pump (set).

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 an explosion-proof pump set at ambient temperatures or fluid temperatures exceeding those specified in the data sheet and/or on the name plate.

▷ Never operate the pump set outside the limits specified below.

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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 excessive loads on the motor, sealing elements and bearings, do not exceed the following number of starts per hour.

Table 9: Frequency of starts

Interval	Maximum frequency of starts
	Starts
Per hour	15

These values apply to mains start-up (DOL or with star-delta contactor, autotransformer, soft starter). This limitation does not apply to operation on a frequency inverter.

6.2.2 Operation on the power supply mains

DANGER

Permissible tolerances for operation on mains power exceeded

Explosion hazard!

- ▷ Never operate an explosion-proof pump (set) outside the specified range.

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

6.2.3 Operation on a frequency inverter

DANGER

Operation outside the permitted frequency range

Explosion hazard!

- ▷ Never operate an explosion-proof pump set outside the specified range.

Frequency inverter operation of the pump set is permitted in the frequency range from 25 to 50 Hz.

6.2.4 Fluid handled

6.2.4.1 Minimum level of fluid handled

DANGER

Pump set running dry

Explosion hazard!

- ▷ Never allow an explosion-proof pump set to run dry!

⚠ WARNING

Fluid spurting out

Health hazard by fluid spurting out!

- ▹ The fluid level must never drop below the minimum submergence $H_{Ümin}$ of the pump set. (⇨ Section 9.5, Page 90)

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 set is operational when the minimum fluid level is not lower than dimension W_T. (⇨ Section 9.5, Page 90) This minimum fluid level must also be ensured during automatic operation.

6.2.4.2 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. (⇨ Section 4.4, Page 18)

6.2.4.3 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.

6.2.4.4 Abrasive fluids

Do not exceed the maximum permissible solids content specified in the data sheet. When the pump handles fluids containing abrasive substances, increased wear of the hydraulic system and the shaft seal are to be expected. In this case, halve the intervals commonly recommended for servicing and maintenance.

6.3 Shutdown/storage/preservation

6.3.1 Shutdown

Switch off the pump (set).

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6.3.2 Measures to be taken for shutdown

⚠ 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.

The pump set remains installed

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.

✓ Sufficient fluid is available for the operation check run of the pump.

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 piping and stored

✓ All safety regulations are observed.

1. Clean the pump set.
2. Preserve the pump set.

6.4 Returning to service

For returning the pump set to service, observe the instructions on commissioning/ start-up. (⇨ Section 6.1, Page 40)

Refer to and comply with the operating limits. (⇨ Section 6.2, Page 40)

For returning the pump set to service after storage also follow the instructions for maintenance/inspection. (⇨ Section 7.2, Page 47)

⚠ 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.

NOTE

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

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7 Servicing/Maintenance

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

Sparks produced during servicing work

Explosion hazard!

- Observe the safety regulations in force at the place of installation!
- Never open an energised pump set.
- Always perform maintenance work on explosion-proof pump sets outside potentially explosive atmospheres only.

DANGER

Improperly serviced pump set

Explosion hazard!

Damage to the pump set!

- Service the pump set regularly.
- Prepare a maintenance schedule with special emphasis on lubricants, electric cables, bearing assembly and shaft seal.

DANGER

Electrical connection work by unqualified personnel

Danger of death from electric shock!

- Always have any work on the connection to the power supply performed by a trained electrician.
- Observe regulation EN 60079.

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

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

Risk of injury! Damage to the submersible motor pump!

- ▷ Never insert your hands, other body parts or foreign objects into the axial propeller or intake area.
- ▷ Check that the axial propeller can rotate freely.

⚠ 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.

⚠ 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.

NOTE

Special regulations apply to repair work on explosion-proof pump sets.
Modification or alteration of the pump set may affect explosion protection and are only permitted after consultation with the manufacturer.

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. For contact details refer to the enclosed "Addresses" booklet or visit "www.ksb.com/contact" on the Internet.

Never use force when dismantling and reassembling the pump set.

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7.2 Servicing/inspection

KSB recommends the following regular maintenance schedule:

Table 10: Overview of maintenance work

Maintenance interval	Maintenance work
Every 8000 operating hours[5)]	Insulation resistance measurement (⇨ Section 7.2.1.1, Page 47)
	Checking the power cable (⇨ Section 7.2.1.2, Page 48)
	Visual inspection of shackle/lifting rope (⇨ Section 7.2.1.3, Page 48)
Every 16,000 operating hours[6)]	Checking the sensors (⇨ Section 7.2.1.4, Page 48)
	Lubricant change (⇨ Section 7.2.1.5, Page 49)
	Bearing lubricant change (⇨ Section 7.2.1.5, Page 49)
Every five years	General overhaul

7.2.1 Inspection work

7.2.1.1 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 equals 500 V (maximum permissible 1000 V).

1. Measure the winding to chassis ground.
   To do so, connect all winding ends together.
2. 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 chassis ground.

⇨ 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.

5 At least once per year
6 At least every three years

7.2.1.2 Checking the power cable

Visual inspection

✓ The pump set has been cleaned.

1. Inspect the power cable for visible damage.
2. Replace any damaged components by original spare parts.

Earth conductor test

✓ The pump set has been cleaned.

1. Measure the resistance between earth conductor and earth.
   The resistance must be lower than 1 Ω.
2. Replace any damaged components by original spare parts.
   (⇨ Section 7.7.2, Page 65)

DANGER

Defective earth conductor

Electric shock!

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

7.2.1.3 Inspecting the lifting rope and shackle or bail

Visual inspection

✓ The pump set has been lifted out of the fluid handled and cleaned.

1. Inspect the lifting rope and shackle or bail and all fastening elements for visual damage.
2. Replace any damaged components by original spare parts.
   (⇨ Section 7.7.2, Page 65)

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.

Temperature sensors in the motor winding

Table 11: Resistance measurement

Measurement between terminals ...	Resistance
10 and 11	100 Ω - 1000 Ω

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.

Leakage sensor in the motor

Table 12: Resistance measurement of the leakage sensor in the motor

Measurement between terminals ...	Resistance
	[kΩ]
9 and earth conductor (PE)	> 60

Lower resistance values suggest water ingress into the motor. In this case the motor section must be opened and serviced.

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7.2.1.5 Lubrication and lubricant change

7.2.1.5.1 Lubricant quality

Recommended lubricant quality
- Environmentally friendly, non-toxic white oil, of medical quality

Alternative
- Thin-bodied paraffin oil, non-toxic
- Water/propylene glycol mixture with corrosion inhibitors for frost protection down to -20 °C

Recommended oil types for gear units:
- Lubricant to ISO VG 320 (viscosity 320)

⚠ WARNING

Lubricant contaminating fluid handled

Hazard to persons and the environment!

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

7.2.1.5.2 Lubricant quantity

Mechanical seal

Table 13: Quantity of mechanical seal lubricant

Size	Lubricant quantity
	[l]
200 (motor housing made of grey cast iron)	0,3
200 (motor housing made of stainless steel)	0,4
300 (motor 0 6, 2 6)	0,4
300 (motor 8 6)	1,4
400	0,8
500, 600, 800	1,9

Gear unit

Table 14: Quantity of gear unit lubricant

Motor	Gear unit model	Lubricant quantity
		[l]
4 4, 6 4, 11 4	SP 189	2,0
17 2, 25 2, 16 4, 23 4, 30 4	SP 190	2,6

7.2.1.5.3 Draining 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!

▷ Open the screw plug of the lubricant reservoir very carefully.

Amaline 200, 300 with motor 0 6 or 2 6, 400

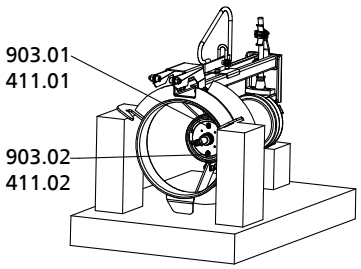

Fig. 23: Draining the lubricant of an Amaline 200, 300 with motor 0 6 or 2 6, 400

1. Position the pump set as shown.
2. Remove the axial propeller and adapter. (⇨ Section 7.4.3, Page 55)
3. Place a suitable container under the screw plugs.
4. Remove screw plugs 903.01 and 903.02 with joint rings 411.01 and 411.02. Drain off the lubricant.
5. Insert and tighten screw plugs 903.01 and 903.02 with new joint rings 411.01 and 411.02.
6. Mount the adapter and axial propeller. (⇨ Section 7.5.5, Page 63)

Amaline 300 with motor 8 6

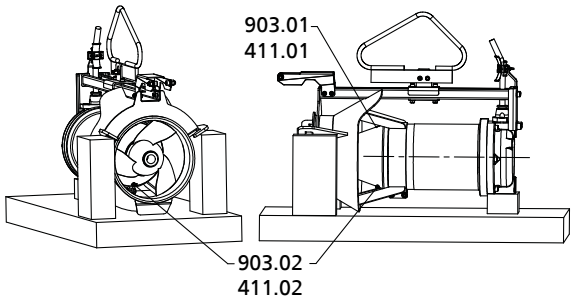

Fig. 24: Draining the lubricant of an Amaline 300 with motor 8 6

1. Position the pump set as shown.
2. Place a suitable container under the screw plugs.
3. Remove screw plugs 903.01 and 903.02 with joint rings 411.01 and 411.02. Drain off the lubricant.
4. Insert and tighten screw plugs 903.01 and 903.02 with new joint rings 411.01 and 411.02.

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Amaline 500, 600, 800

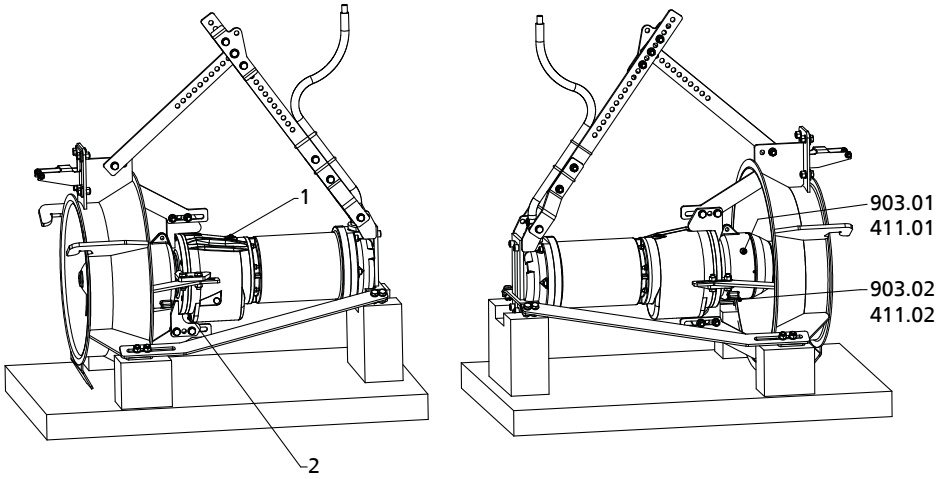

Fig. 25: Draining the lubricant of an Amaline 500, 600, 800

1	Lubricant filler plug of the gear unit
2	Lubricant drain plug of the gear unit

1. Position the pump set as shown.
2. Place a suitable container under the screw plugs.
3. Unscrew the lubricant filler plug of the gear unit and the lubricant drain plug of the gear unit. Drain off the lubricant.
4. Insert and tighten the lubricant filler plug of the gear unit and the lubricant drain plug of the gear unit.
5. Remove screw plugs 903.01 and 903.02 with joint rings 411.01 and 411.02. Drain off the lubricant.
6. Insert and tighten screw plugs 903.01 and 903.02 with new joint rings 411.01 and 411.02.

7.2.1.5.4 Filling in the lubricant

⚠ WARNING

Lubricants posing a health hazard

Hazard to persons and the environment!

- ▹ When filling in the lubricant take appropriate measures to protect persons and the environment.

CAUTION

Lubricant level too high

Mechanical seal operation is impaired!

- ▹ Always place the pump (set) in a horizontal position as shown for filling in the lubricant.

The lubricant reservoirs have been filled with an environmentally-friendly, non-toxic lubricant at the factory.

Amaline 200, 300 with motor 0 6 or 2 6, 400

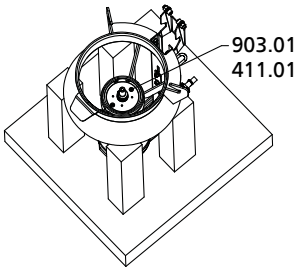

Fig. 26: Topping up the lubricant of an Amaline 200, 300 with motor 0 6 or 2 6, 400

✓ The pump set has been set down as illustrated.

✓ The axial propeller and adapter have been removed. (⇨ Section 7.4.3, Page 55)

1. Undo and remove screw plug 903.01 with joint ring 411.01.
2. Measure the lubricant level.
   ⇨ The lubricant level must not be any lower than 10 mm below the value "A" indicated in the following table.

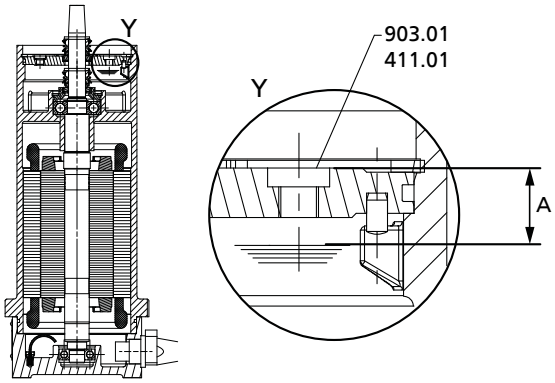

Fig. 27: Lubricant level Amaline 200, 300 with motor 0 6 or 2 6, 400

3. If the lubricant level is lower, top up the lubricant in the lubricant reservoir through the filler opening. (⇨ Section 7.2.1.5.1, Page 49)
4. Screw in screw plug 903.01 with joint ring 411.01.
5. Mount the adapter and axial propeller. (⇨ Section 7.5.5, Page 63)

Table 15: Distance "A" from the casing edge to the lubricant level

Size	A
	[mm]
200	25
300	38
400	35

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Amaline 300 with motor 8 6

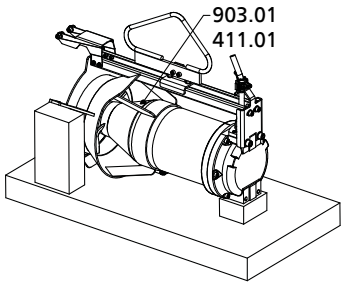

Fig. 28: Topping up the lubricant of an Amaline 300 with motor 8 6

1. Place the pump set down as illustrated.
2. Undo and remove screw plug 903.01 with joint ring 411.01.
   ⇨ The lubricant level must be approximately 50 mm below the filler opening.
3. If the lubricant level is lower, top up lubricant through the filler opening until the lubricant level is approximately 50 mm below the filler opening. (⇨ Section 7.2.1.5.1, Page 49)
4. Screw in screw plug 903.01 with joint ring 411.01.

Amaline 500, 600, 800

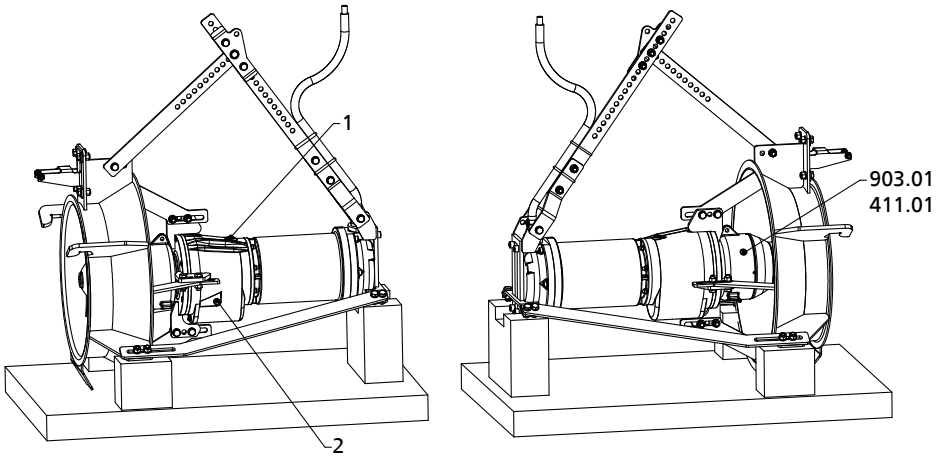

Fig. 29: Topping up the lubricant of an Amaline 500, 600, 800

1	Lubricant filler plug of the gear unit
2	Lubricant check plug of the gear unit

Lubricant level for mechanical seal

1. Place the pump set down as illustrated.
2. Unscrew screw plug 903.01 with joint ring 411.01.
   ⇨ The lubricant level must reach the lubricant check opening.
3. Fill the lubricant through the filler opening until the lubricant reservoir overflows. (⇨ Section 7.2.1.5.1, Page 49)
4. Screw in screw plug 903.01 with joint ring 411.01.

Lubricant level of gear unit

1. Unscrew the lubricant check plug at the gear unit.
   ⇨ The lubricant level must reach the lubricant check opening.
2. Unscrew the lubricant filler plug on the gear unit and top up lubricant through the filler opening until the lubricant reservoir overflows at the lubricant check opening. (⇨ Section 7.2.1.5.1, Page 49)
3. Screw in the lubricant check plug of the gear unit and the lubricant filler plug.

7.3 Drainage/cleaning

⚠ WARNING

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

Hazard to persons and the environment!

- ▹ 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 11, Page 98)

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.

⚠ 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.

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.

⚠ DANGER

Insufficient preparation of work on the pump (set)

Risk of injury!

- ▹ Properly shut down the pump set.
- ▹ Drain the pump. (⇨ Section 7.3, Page 54)
- ▹ Shut off any auxiliary connections.
- ▹ Allow the pump set to cool down to ambient temperature.

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⚠ 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

1. De-energise the pump set and secure it against unintentional start-up.
2. Drain the lubricant. (⇨ Section 7.2.1.5.3, Page 49)

7.4.3 Removing the axial propeller

Amaline 200, 300 with motor 0 6 or 2 6, 400

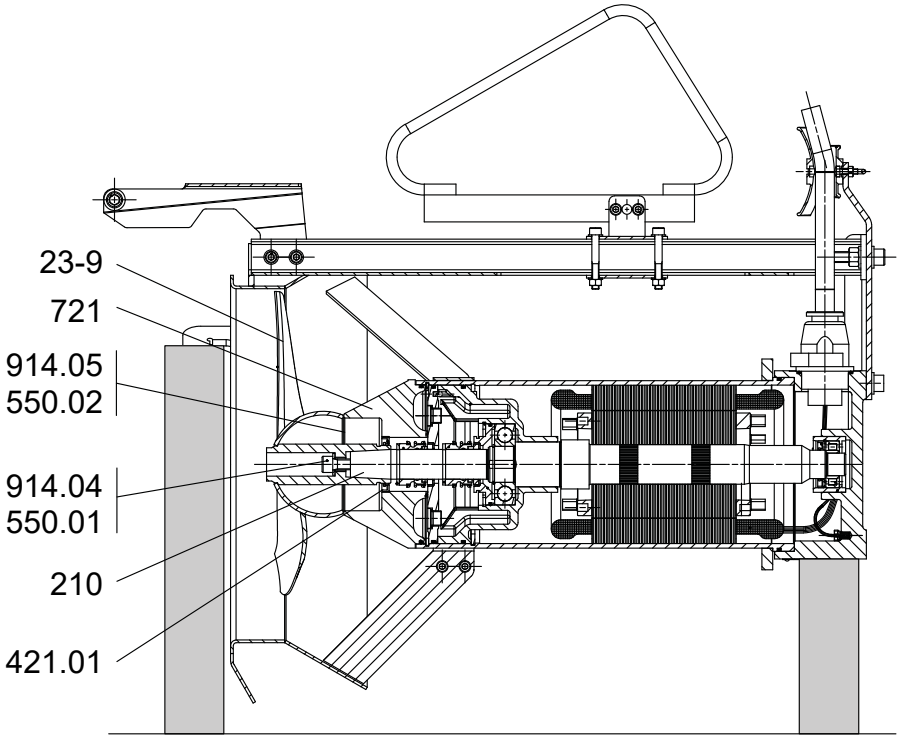

Fig. 30: Removing the axial propeller of an Amaline 200, 300 with motor 0 6 or 2 6, 400

✓ The pump set has been properly removed from the system, cleaned and placed down as illustrated.

1. Undo and remove hexagon socket head cap screw 914.04 with disc 550.01.
2. Screw a forcing screw into axial propeller 23-9 and pull the axial propeller off shaft 210. (⇨ Section 9.4, Page 89)
3. Undo and remove hexagon socket head cap screws 914.05 with discs 550.02.
4. Remove adapter 721.
5. Remove lip seal 421.01.

Amaline 300 with motor 8 6

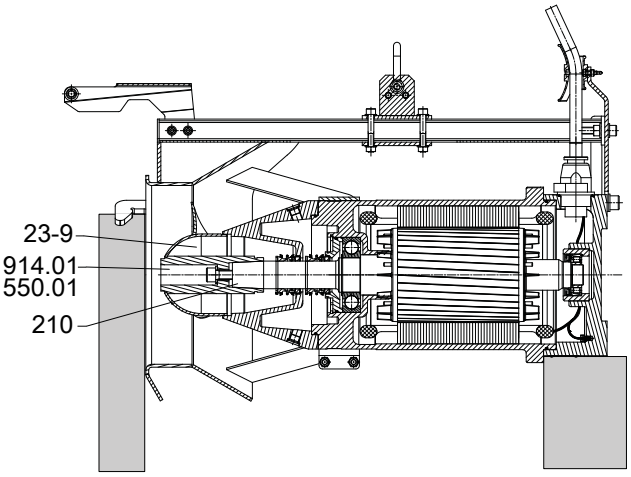

Fig. 31: Removing the axial propeller of an Amaline 300 with motor 8 6

✓ The pump set has been properly removed from the system, cleaned and placed down as illustrated.

1. Undo and remove hexagon socket head cap screw 914.01 with disc 550.01.
2. Screw a forcing screw into axial propeller 23-9 and pull the axial propeller off shaft 210. (⇨ Section 9.4, Page 89)

Amaline 500, 600

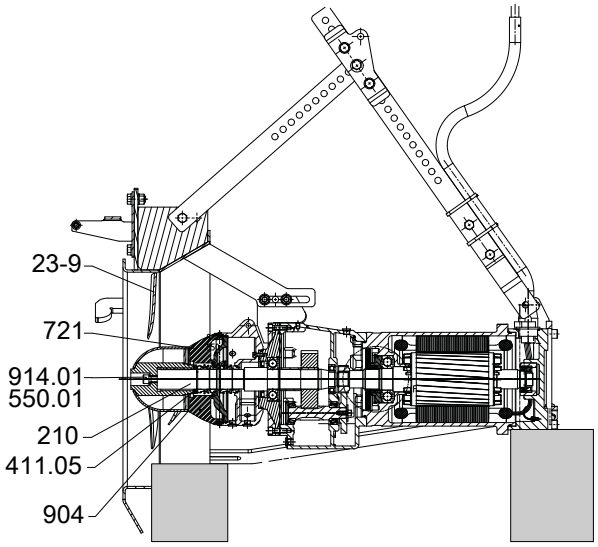

Fig. 32: Removing the axial propeller of an Amaline 500, 600

✓ The pump set has been properly removed from the system, cleaned and placed down as illustrated.

1. Undo and remove hexagon socket head cap screw 914.04 with disc 550.01.
2. Screw a forcing screw into axial propeller 23-9 and pull the axial propeller off shaft 210. (⇨ Section 9.4, Page 89)
3. Remove joint ring 411.05.
4. Undo and remove grub screws 904.
5. Remove adapter 721.

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Amaline 800

✓ The pump set has been properly removed from the system, cleaned and placed down.

1. Undo and remove hexagon socket head cap screw 914.01 with disc 550.01.
2. Screw a forcing screw into axial propeller 23-9 and pull the axial propeller off shaft 210. (⇨ Section 9.4, Page 89)

7.4.4 Removing the mechanical seals

CAUTION

Improper removal of mechanical seal

Damage to the shaft!

▹ Care must be taken when loosening and removing the mechanical seal.

Amaline 200, 300 with motor 0 6 or 2 6, 400

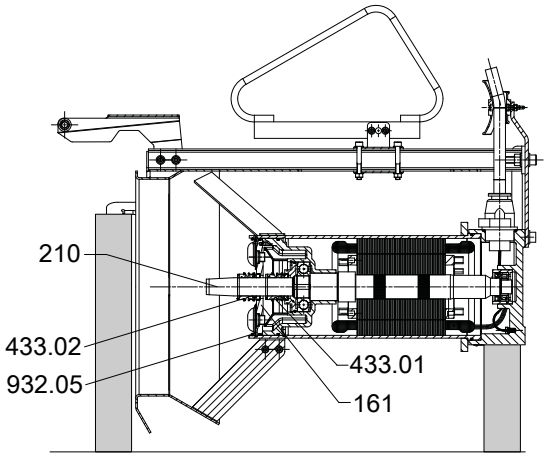

Fig. 33: Removing the mechanical seal of an Amaline 200, 300 with motor 0 6 or 2 6, 400

✓ The axial propeller and adapter have been removed. (⇨ Section 7.4.3, Page 55)

1. Gently pull mechanical seal 433.02 off shaft 210.
2. Remove circlip 932.05.
3. Take off cover 161.
4. Gently pull mechanical seal 433.01 off shaft 210.

Amaline 300 with motor 8 6

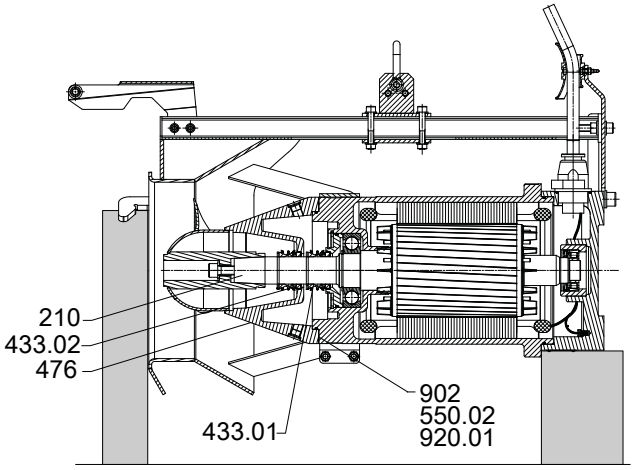

Fig. 34: Removing the mechanical seal of an Amaline 300 with motor 8 6

✓ The axial propeller has been removed. (⇨ Section 7.4.3, Page 55)

1. Gently pull mechanical seal 433.02 off shaft 210.
2. Undo and remove nuts 920.01 with discs 550.02 from studs 902.01.
3. Remove mating ring carrier 476.
4. Gently pull mechanical seal 433.01 off shaft 210.

Amaline 500, 600

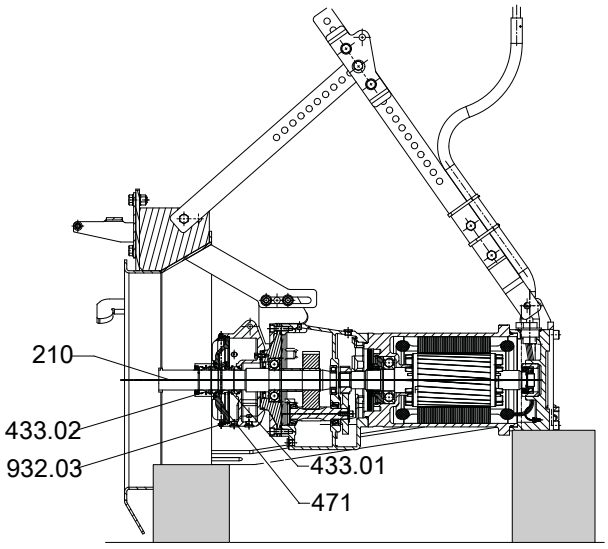

Fig. 35: Removing the mechanical seal of an Amaline 500, 600

✓ The axial propeller and adapter have been removed. (⇨ Section 7.4.3, Page 55)

1. Gently pull mechanical seal 433.02 off shaft 210.
2. Remove circlip 932.02.
3. Remove seal cover 471.
4. Gently pull mechanical seal 433.01 off shaft 210.

Amaline 800

✓ The axial propeller has been removed. (⇨ Section 7.4.3, Page 55)

1. Gently pull mechanical seal 433.02 off shaft 210.
2. Remove circlip 932.02.
3. Remove seal cover 471.
4. Gently pull mechanical seal 433.01 off shaft 210.

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7.4.5 Dismantling the motor section

NOTE

Special regulations apply to repair work on explosion-proof pump sets.
Modifications or alteration of the pump set may affect explosion protection and are only permitted after consultation with the manufacturer.

NOTE

The motors of explosion-proof pump sets are supplied in "flameproof enclosure" type of protection. Any work on the motor section which could affect explosion protection, such as re-winding and repair work involving machining, must be inspected and approved by an approved expert or performed by the motor manufacturer. No modifications must be made to the internal configuration of the motor space. Repair work at the flameproof joints must only be performed in accordance with the manufacturer's instructions. Repairs in accordance with the values specified in EN 60079-1, tables 1 and 2, are not permitted.

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

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!

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

⚠ WARNING

Components with sharp edges

Risk of cutting or shearing injuries!

- ▷ Always use appropriate caution for installation and dismantling work.
- ▷ Wear work gloves.

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.

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.
  - Never use O-rings that have been made by cutting an O-ring cord to size and gluing the ends together.
- Assembly adhesives
  - 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 64)

7.5.2 Reassambling the motor section

NOTE

Before reassembling the motor section, check that all joints relevant to explosion protection (flamepaths) are undamaged. Any components with damaged flamepaths must be replaced. Only use original spare parts made by KSB for explosion-proof pumps. Observe the flamepath positions specified in the Annex (Flamepaths on explosion-proof motors). (⇨ Section 9.2, Page 81) Secure all screwed/bolted connections closing off the flameproof enclosure with a thread-locking agent (Loctite Type 243).

⚠ DANGER

Wrong screws/bolts

Explosion hazard!

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

7.5.3 Installing the mechanical seals

The following rules must be observed when installing the mechanical seal:

- Work cleanly and accurately.
- Only remove the protective wrapping of the contact faces immediately before installation takes place.
- Prevent any damage to the sealing surfaces or O-rings.

Amaline 200, 300 with motor 0 6 or 2 6, 400

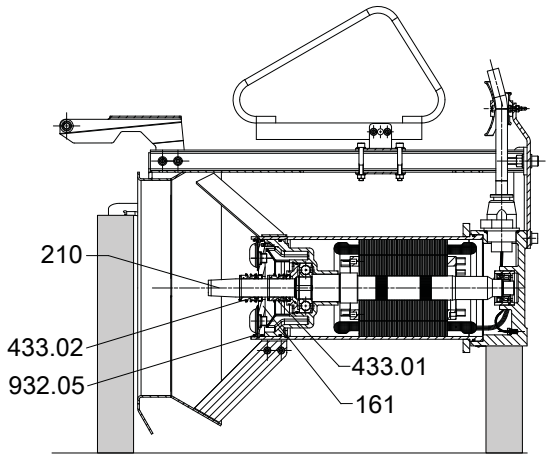

Fig. 36: Installing the mechanical seal of an Amaline 200, 300 with motor 0 6 or 2 6, 400

1. Gently slide mechanical seal 433.01 onto shaft 210.
2. Fit cover 161.
3. Insert circlip 932.05.
4. Gently slide mechanical seal 433.02 onto shaft 210.

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Amaline 300 with motor 8 6

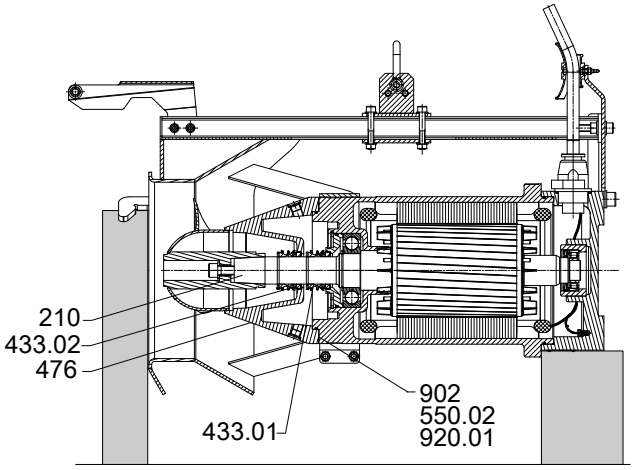

Fig. 37: Installing the mechanical seal of an Amaline 300 with motor 8 6

1. Gently slide mechanical seal 433.01 onto shaft 210.
2. Fit mating ring carrier 476.
3. Fasten nuts 920.01 with discs 550.02 on studs 902.01.
4. Gently slide mechanical seal 433.02 onto shaft 210.

Amaline 500, 600

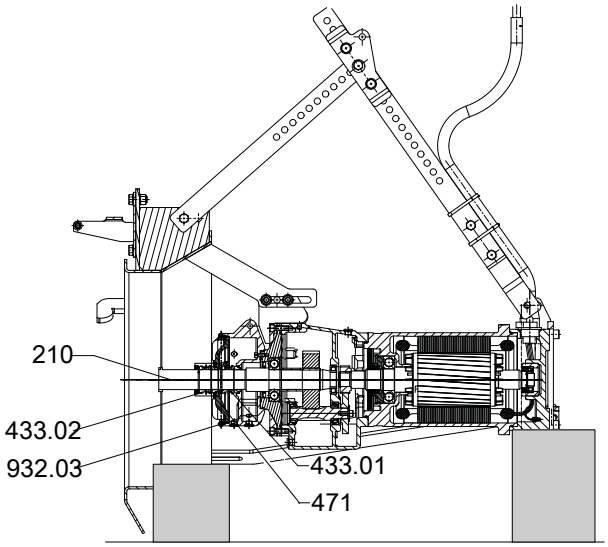

Fig. 38: Installing the mechanical seal of an Amaline 500, 600

1. Gently slide mechanical seal 433.01 onto shaft 210.
2. Fit seal cover 471.
3. Insert circlip 932.02.
4. Gently slide mechanical seal 433.02 onto shaft 210.

Amaline 800

1. Gently slide mechanical seal 433.01 onto shaft 210.
2. Fit seal cover 471.
3. Insert circlip 932.02.
4. Gently slide mechanical seal 433.02 onto shaft 210.

7.5.4 Leak testing

After reassembly, the mechanical seal area/lubricant reservoir must be checked for leakage. The leak test is performed at the lubricant filler opening.

Observe the following values for leak testing:

Table 16: Leak test values

Size	Test medium	Test pressure [bar]	Test duration [min]
200, 300, 400	Compressed air	0,8	2
500, 600, 800	Compressed air	0,5	2

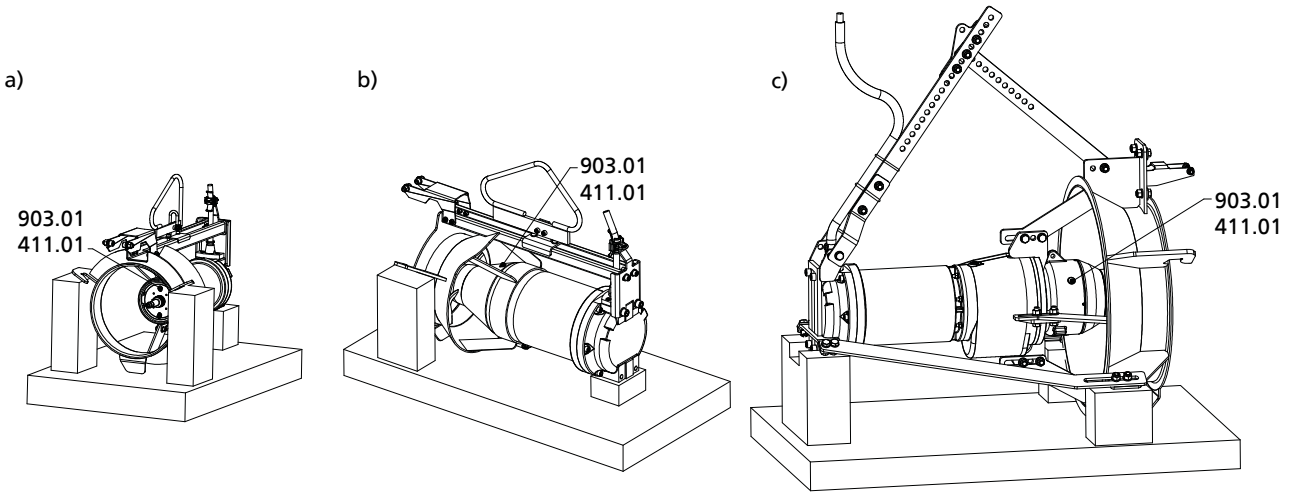

Fig. 39: Leak test a) Amaline 200, 300 with motor 0 6 or 2 6, 400 b) Amaline 300 with motor 8 6 c) Amaline 500, 600, 800

1. Undo and remove screw plug 903.01 with joint ring 411.01.
2. Screw the testing device tightly into the lubricant filler opening.
3. Carry out the leak test with the values specified above.

NOTE

The pressure must not drop during the test period.

4. Unscrew and remove the testing device.
5. Screw in screw plug 903.01 with joint ring 411.01.

7.5.5 Mounting the axial propeller

Amaline 200, 300 with motor 0 6 or 2 6, 400

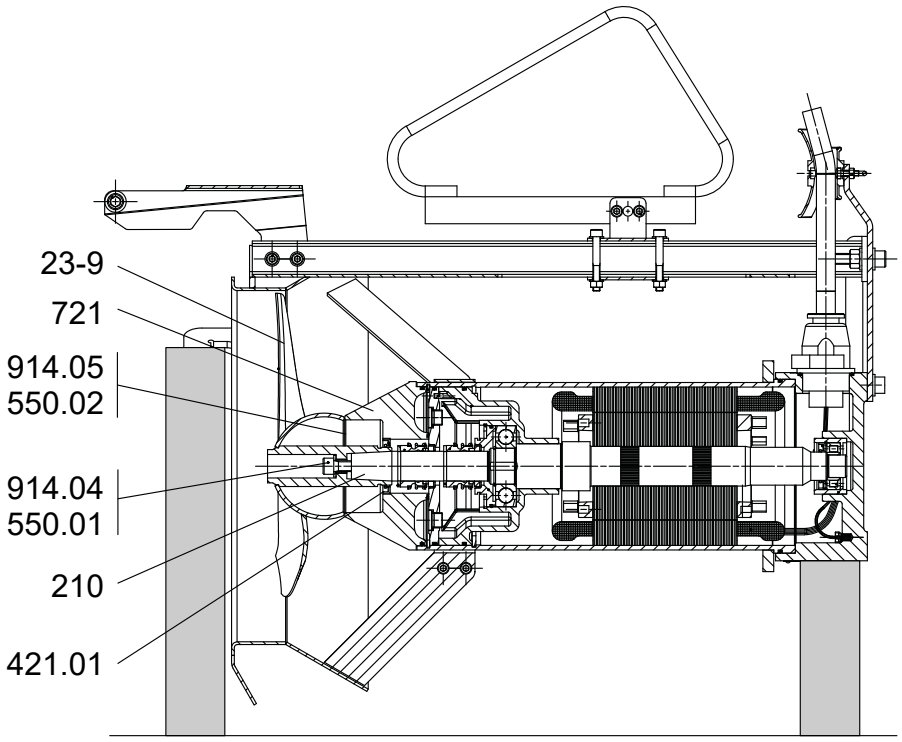

Fig. 40: Mounting the axial propeller of an Amaline 200, 300 with motor 0 6 or 2 6, 400

1. Fit lip seal 421.01.
2. Fit adapter 721.
3. Insert and tighten hexagon socket head cap screws 914.05 with discs 550.02.
4. Place axial propeller 23-9 onto shaft 210.
5. Insert and tighten hexagon socket head cap screw 914.04 with disc 550.01.

Amaline 300 with motor 8 6

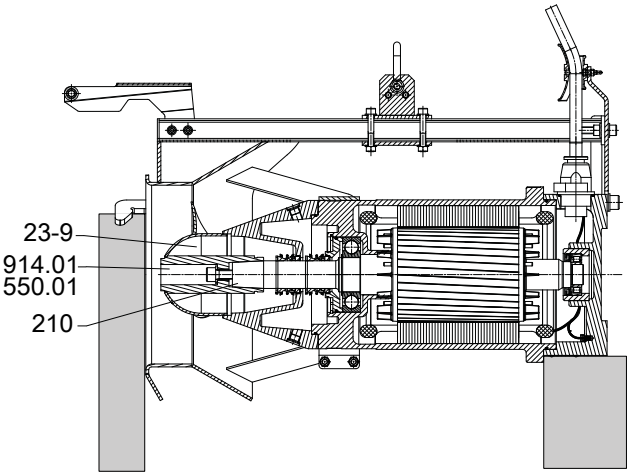

Fig. 41: Mounting the axial propeller of an Amaline 300 with motor 8 6

1. Place axial propeller 23-9 onto shaft 210.
2. Insert and tighten hexagon socket head cap screw 914.01 with disc 550.01.

Amaline 500, 600

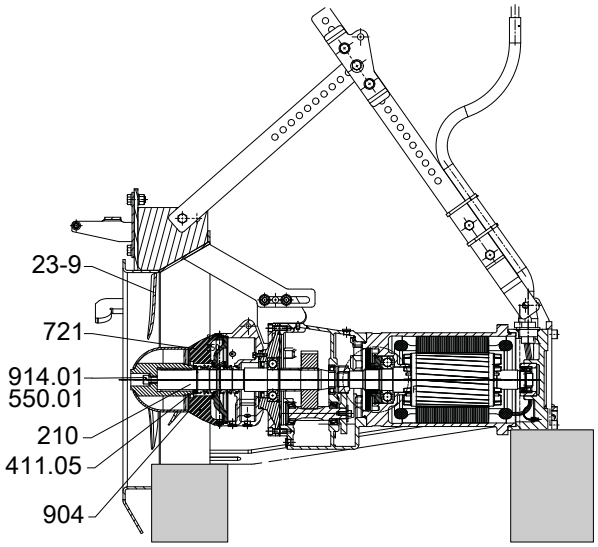

Fig. 42: Mounting the axial propeller of an Amaline 500, 600

1. Fit adapter 721.
2. Insert and tighten grub screws 904.
3. Fit joint ring 411.05.
4. Place axial propeller 23-9 onto shaft 210.
5. Insert and tighten hexagon socket head cap screw 914.04 with disc 550.01.

Amaline 800

1. Place axial propeller 23-9 onto shaft 210.
2. Insert and tighten hexagon socket head cap screw 914.01 with disc 550.01.

7.6 Tightening torques

Table 17: Tightening torques [Nm]
depending on thread, material and property class

Thread	Material				
	A4-50	A4-70		1.4462	8.8
	Property class Rp 0.2 $^{N}/_{mm^2}$				
	210	250	450	450	640
M5	-	-	4	4	6
M6	-	-	7	7	10
M8	-	-	17	17	25
M10	-	-	35	35	50
M12	-	-	60	60	85
M16	-	-	150	150	210

7.7 Spare parts stock

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

Table 18: Quantity of spare parts for recommended spare parts stock

Part No.	Description	Number of pump sets (including stand-by pumps)						
		2	3	4	5	6	8	10 and more
23-9	Axial propeller	1	1	1	2	2	3	30%
321.01	Rolling element bearing, propeller side	1	1	2	2	3	4	50%

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Part No.	Description	Number of pump sets (including stand-by pumps)						
		2	3	4	5	6	8	10 and more
321.02 / 322	Rolling element bearing, drive end	1	1	2	2	3	4	50%
433.01	Mechanical seal, drive end	2	3	4	5	6	7	90%
433.02	Mechanical seal, propeller side	2	3	4	5	6	7	90%
818	Rotor	-	-	-	1	1	2	3
834	Cable gland	1	1	2	2	2	3	40%
	Set of sealing elements	4	6	8	8	9	10	100%

7.7.2 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. (⇨ Section 4.4, Page 18)

Also specify the following data:

- Part number and description (⇨ Section 9.1, Page 67)
- Quantity of spare parts
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)

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 Vibrations and noise during pump operation

Table 19: Trouble-shooting

A	B	C	D	Possible cause	Remedy[7)]
-	✗	-	-	Unfavourable installation of pump	Check installation and, if necessary, remove obstacles from flow area.
-	-	✗	✗	Axial propeller covered in solids; density of fluid handled too high	Clean the axial propeller, check power data.
-	✗	-	✗	Axial propeller damaged	Replace the axial propeller.
-	✗	✗	✗	Wear of internal components	Replace worn components by new ones.
-	✗	✗	✗	Wrong direction of rotation	If the direction of rotation is incorrect, check the electrical connection of the pump set and the control system if necessary.
-	-	✗	-	Wrong supply voltage	Check mains voltage; check electrical cable connections
✗	-	-	-	No voltage	Check electrical installation. Contact energy supplier.
✗	-	-	-	Stator winding or power cable are defective.	Replace by new original KSB parts or contact KSB.
-		✗	✗	Defective rolling element bearing	Contact the manufacturer.
-	✗	✗		For star-delta starting: motor runs in star configuration only	Check star-delta contactor.
-	✗	-	-	Water level lowered too much during operation	Check level control equipment.
✗	-	-	-	Temperature control device monitoring the winding has tripped the pump as a result of excessive winding temperatures.	Have cause determined and eliminated by qualified and trained personnel.
✗	-	-	-	Thermistor motor protection relay with manual reset for temperature limiter (explosion protection) has tripped the pump as a result of the permissible winding temperature being exceeded.	Have cause determined and eliminated by qualified and trained personnel.
✗	-	-	-	Motor has been tripped by leakage monitor.	Have cause determined and eliminated by qualified and trained personnel.
✗	-	-	-	Mechanical seal monitor has tripped.	Have cause determined and eliminated by qualified and trained personnel.
✗	-	-	-	Bearing temperature monitor has tripped.	Have cause determined and eliminated by qualified and trained personnel.

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7 Disconnect the pump (set) from the power supply

9 Related Documents

9.1 General arrangement drawings with list of components

9.1.1 Amaline 200 (motors: 1 4, 2 4; motor housing made of grey cast iron)

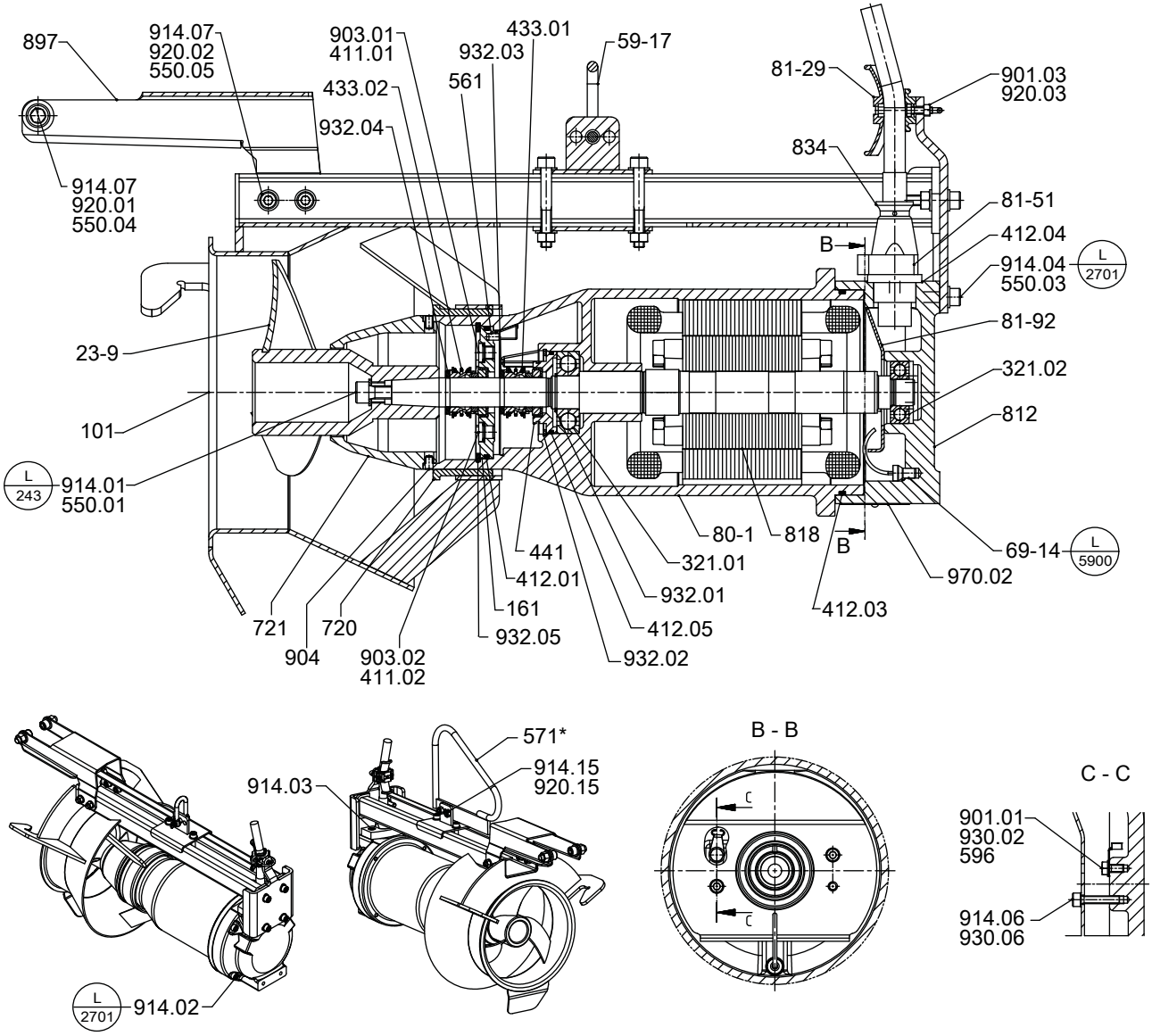

Fig. 43: General assembly drawing

*: On specific designs only

Table 20: Symbols key

Symbol	Description
L 243	Always secure screwed connections marked with this symbol with **Loctite 243** .
L 2701	Always secure screwed connections marked with this symbol with **Loctite 2701** .
L 5900	Always secure screwed connections marked with this symbol with **Loctite 5900** .

Table 21: List of components

Part No.	Description	Part No.	Description
23-9	Axial propeller	571	Bail (optional)
59-17	Shackle	596	Wire
69-14	Leakage sensor	720	Spacer
80-1	Motor unit	721	Adapter
81-29	Terminal	812	Motor housing cover
81-51	Clamping element	818	Rotor
81-92	Cover plate	834	Cable gland
101	Pump casing	897	Guide piece
161	Casing cover	901.01/.03	Hexagon head bolt
321.01/.02	Radial ball bearing	903.01/.02	Screw plug
411.01/.02	Joint ring	904	Grub screw
412.01/.03/.04/.05	O-ring	914.01/.02/.03/.04/.06/ .07/.15	Hexagon socket head cap screw
433.01/.02	Mechanical seal	920.01/.02/.03/.15	Nut
441	Shaft seal housing	930.02/.06	Safety device
550.01/.03/.04/.05	Disc	932.01/.02/.03/.04/.05	Circlip
561	Grooved pin	970.02	Label/plate

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9.1.2 Amaline 200 (motors: 1 4, 2 4; motor housing made of stainless steel)

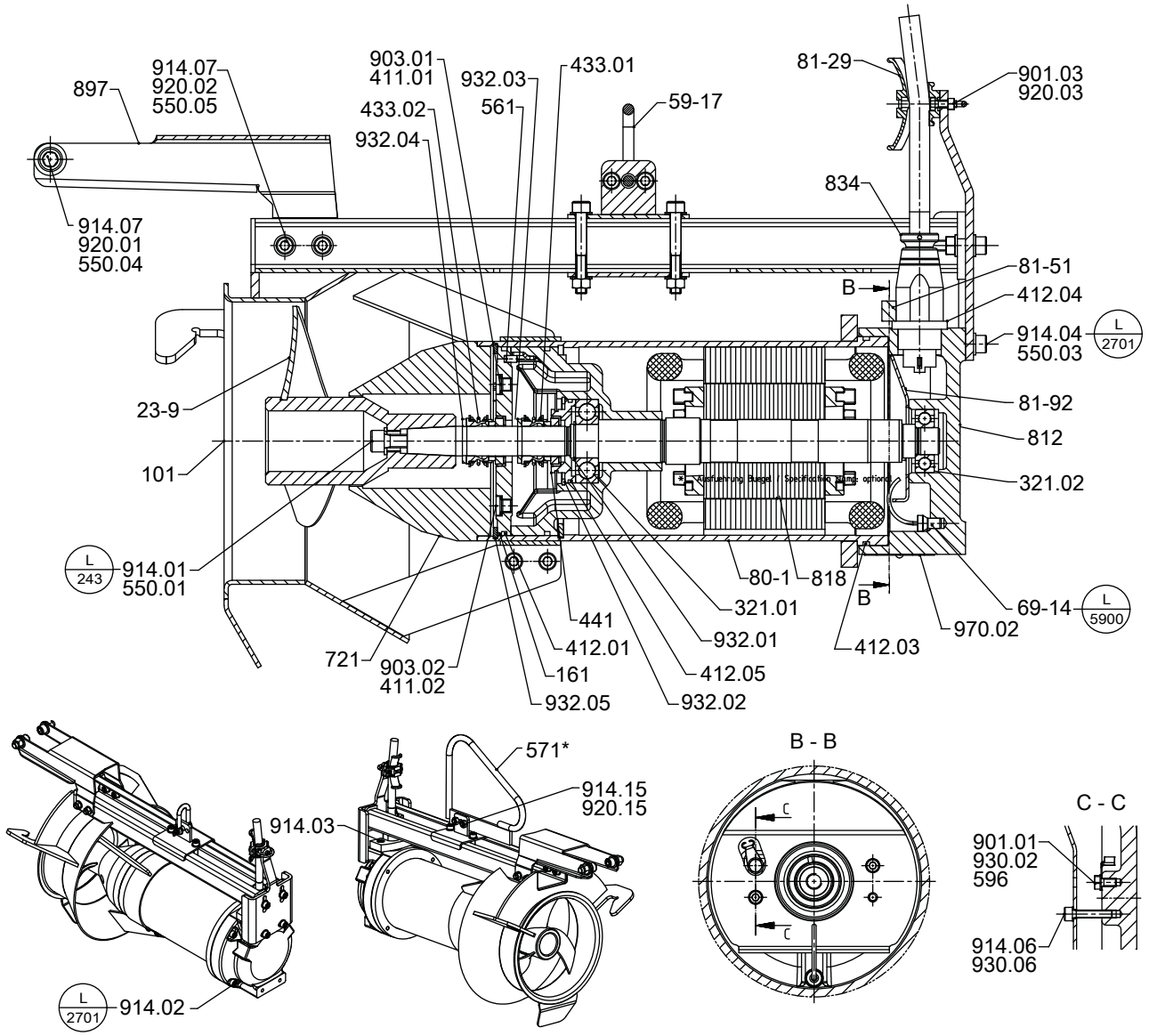

Fig. 44: General assembly drawing

*: On specific designs only

Table 22: Symbols key

Symbol	Description
L 243	Always secure screwed connections marked with this symbol with **Loctite 243** .
L 2701	Always secure screwed connections marked with this symbol with **Loctite 2701** .
L 5900	Always secure screwed connections marked with this symbol with **Loctite 5900** .

Table 23: List of components

Part No.	Description	Part No.	Description
23-9	Axial propeller	561	Grooved pin
59-17	Shackle	571	Bail (optional)
69-14	Leakage sensor	596	Wire
80-1	Motor unit	721	Adapter
81-29	Terminal	812	Motor housing cover

Part No.	Description	Part No.	Description
81-51	Clamping element	818	Rotor
81-92	Cover plate	834	Cable gland
101	Pump casing	897	Guide piece
161	Casing cover	901.01/.03	Hexagon head bolt
321.01/.02	Radial ball bearing	903.01/.02	Screw plug
411.01/.02	Joint ring	914.01/.02/.03/.04/.05/ .06/.07/.15	Hexagon socket head cap screw
412.01/.02/.03/.04/.05	Shaft seal ring	920.01/.02/.03/.15	Nut
433.01/.02	Mechanical seal	930.02/.06	Safety device
441	Shaft seal housing	932.01/.02/.03/.04/.05	Circlip
550.01/.03/.04/.05	Disc	970.02	Label/plate

9.1.3 Amaline 300 (motors: 0 6, 2 6; motor housing made of grey cast iron)

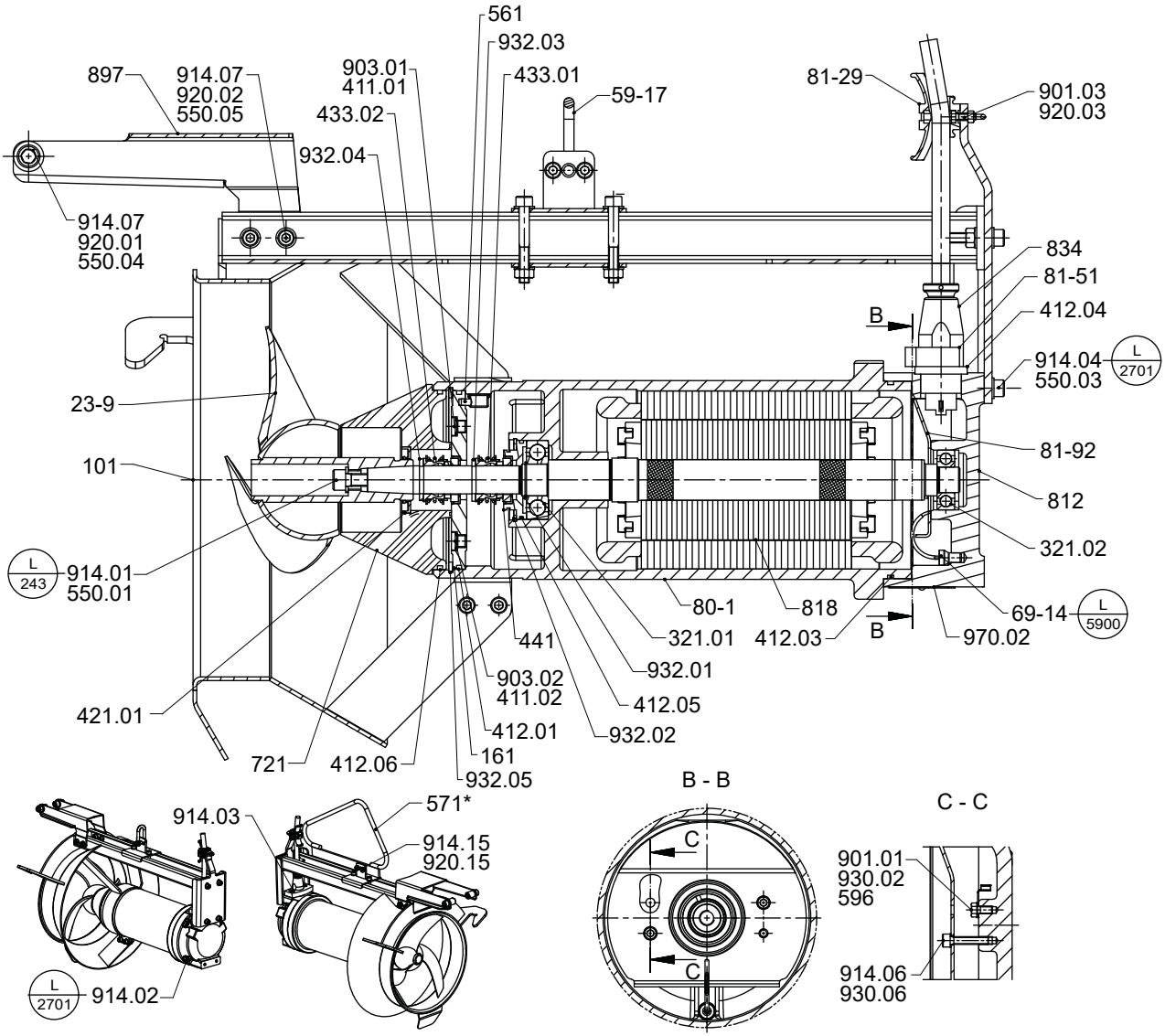

Fig. 45: General assembly drawing: a) with shackle b) with bail (optional)

*: On specific designs only

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Table 24: Symbols key

Symbol	Description
L 243	Always secure screwed connections marked with this symbol with **Loctite 243** .
L 2701	Always secure screwed connections marked with this symbol with **Loctite 2701** .
L 5900	Always secure screwed connections marked with this symbol with **Loctite 5900** .

Table 25: List of components

Part No.	Description	Part No.	Description
23-9	Axial propeller	561	Grooved pin
59-17	Shackle	571	Bail (optional)
69-14	Leakage sensor	596	Wire
80-1	Motor unit	721	Adapter
81-29	Terminal	812	Motor housing cover
81-51	Clamping element	818	Rotor
81-92	Cover plate	834	Cable gland
101	Pump casing	897	Guide piece
161	Casing cover	901.01/.03	Hexagon head bolt
321.01/.02	Radial ball bearing	903.02	Screw plug
411.01/.02	Joint ring	914.01/.02/.03/.04/.05/ .06/.07/.15	Hexagon socket head cap screw
412.01/.03/.04/.05/.06/.07	O-ring	920.01/.02/.03/.15	Nut
421.01	Lip seal	930.02/.06	Safety device
433.01/.02	Mechanical seal	932.01/.02/.03/.04/.05	Circlip
441	Shaft seal housing	970.02	Label/plate
550.01/.03/.04/.05	Disc		

9.1.4 Amaline 300 (motors: 0 6, 2 6; motor housing made of stainless steel)

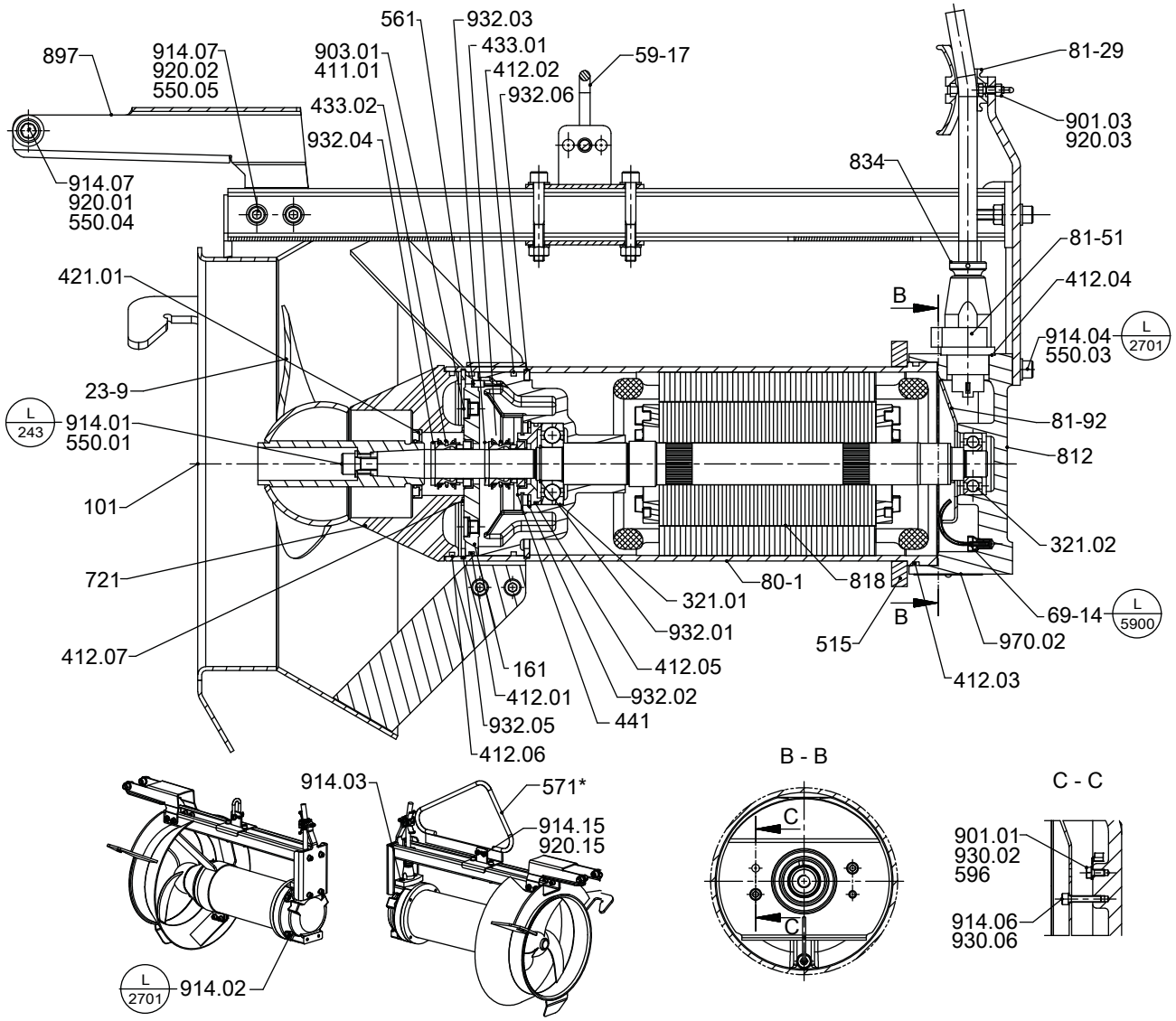

Fig. 46: General assembly drawing: a) with shackle b) with bail (optional)

*: On specific designs only

Table 26: Symbols key

Symbol	Description
L 243	Always secure screwed connections marked with this symbol with **Loctite 243** .
L 2701	Always secure screwed connections marked with this symbol with **Loctite 2701** .
L 5900	Always secure screwed connections marked with this symbol with **Loctite 5900** .

Table 27: List of components

Part No.	Description	Part No.	Description
23-9	Axial propeller	550.01/.03/.04/.05	Disc
59-17	Shackle	561	Grooved pin
69-14	Leakage sensor	571	Bail (optional)
80-1	Motor unit	596	Wire
81-29	Terminal	721	Adapter
81-51	Stator	812	Motor housing cover

Part No.	Description	Part No.	Description
81-92	Cover plate	818	Rotor
101	Pump casing	834	Cable gland
161	Casing cover	897	Guide piece
321.01/.02	Radial ball bearing	901.01/.03	Hexagon head bolt
411.01	Joint ring	903.01	Screw plug
412.01/.02/.03/.04/.05/.06 /.07	O-ring	914.01/.02/.03/.04/ .06/.07/.15	Hexagon socket head cap screw
421.01	Lip seal	920.01/.02/.03/.15	Nut
433.01/.02	Mechanical seal	930.02/.06	Safety device
441	Shaft seal housing	932.01/.02/.03/.04/.05/.06	Circlip
515	Locking ring	970.02	Label/plate

9.1.5 Amaline 300 (motors: 8 6; motor housing made of grey cast iron)

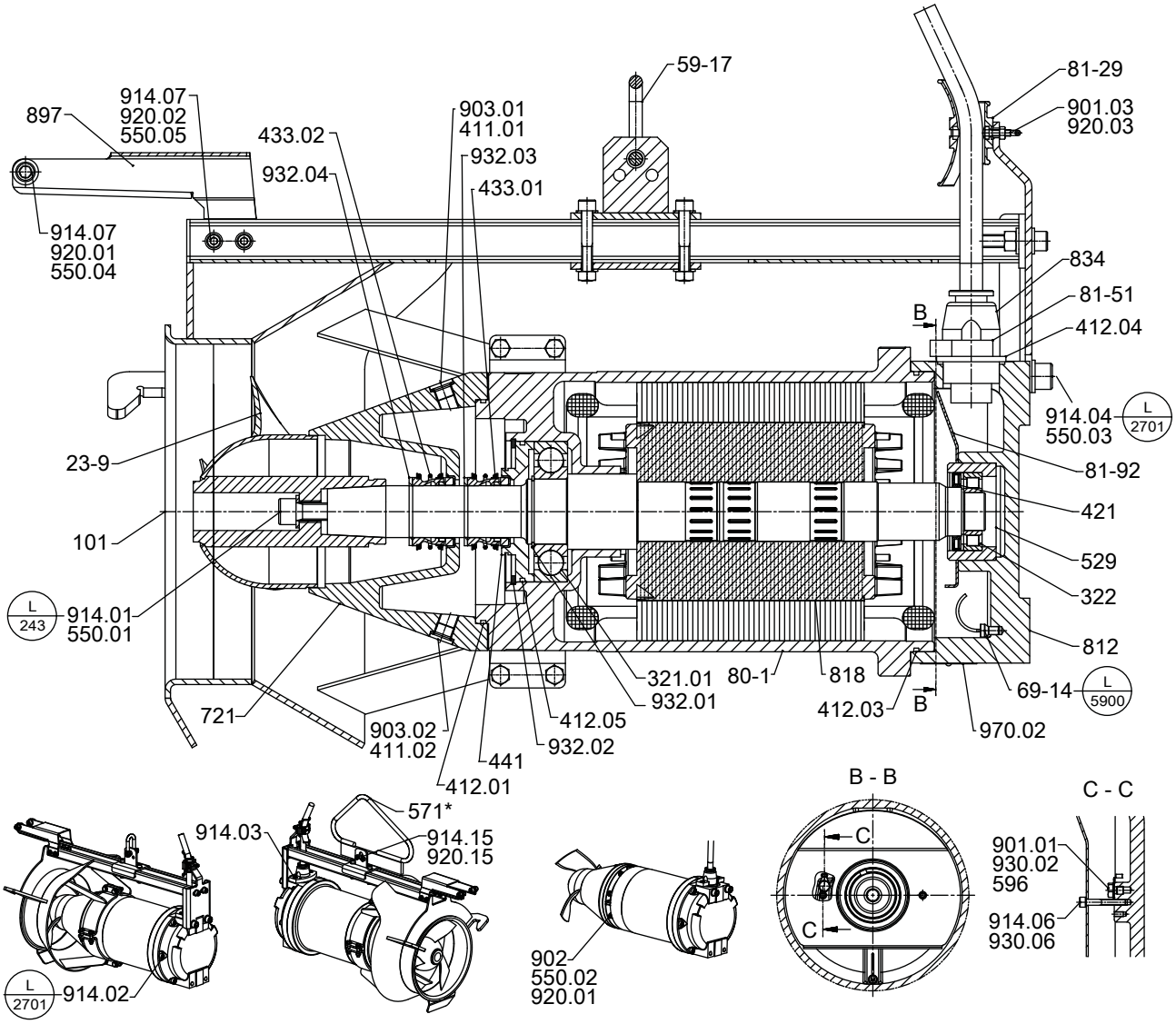

Fig. 47: General assembly drawing: a) with shackle b) with bail (optional)

*: On specific designs only

Table 28: Symbols key

Symbol	Description
L 243	Always secure screwed connections marked with this symbol with **Loctite 243** .
L 2701	Always secure screwed connections marked with this symbol with **Loctite 2701** .
L 5900	Always secure screwed connections marked with this symbol with **Loctite 5900** .

Table 29: List of components

Part No.	Description	Part No.	Description
23-9	Axial propeller	550.01/.02/.03/.04/.05	Disc
59-17	Shackle	571	Bail (optional)
69-14	Leakage sensor	596	Wire
80-1	Motor unit	721	Adapter
81-29	Terminal	812	Motor housing cover
81-51	Clamping element	818	Rotor
81-92	Cover plate	834	Cable gland
101	Pump casing	897	Guide piece
321.01	Radial ball bearing	901.01/.03	Hexagon head bolt
322	Radial roller bearing	902	Stud
411.01/.02	Joint ring	903.01/.02	Screw plug
412.01/.03/.04/.05	O-ring	914.01/.02/.03/.04/.06/ .07/.15	Hexagon socket head cap screw
421	Lip seal	920.01/.02/.03/.15	Nut
433.01/.02	Mechanical seal	930.02/.06	Safety device
441	Shaft seal housing	932.01/.02/.03/.04	Circlip
529	Bearing sleeve	970.02	Label/plate

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9.1.6 Amaline 400 (motors: 3 8, 4 8; motor housing made of grey cast iron)

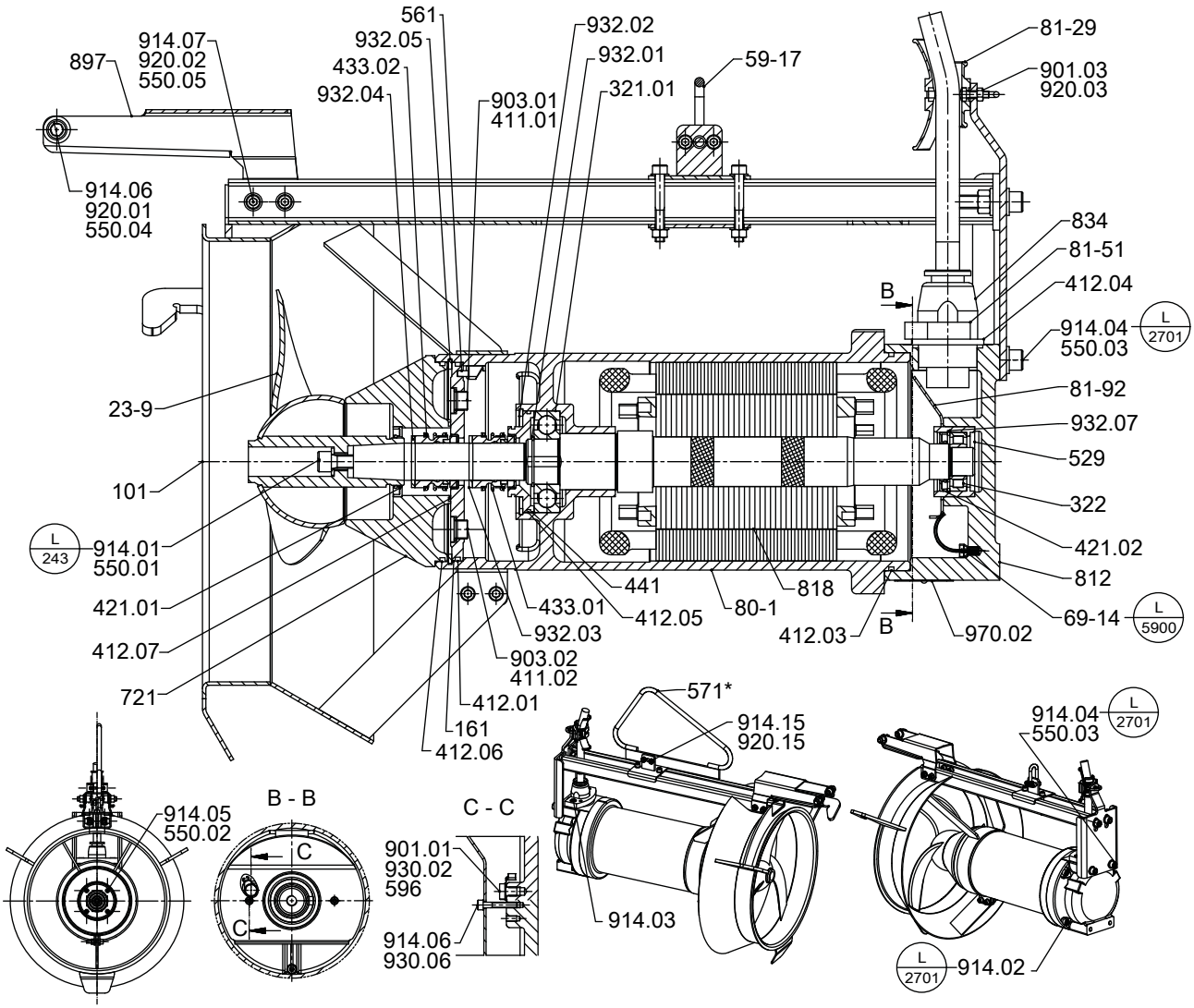

Fig. 48: General assembly drawing: a) with shackle b) with bail (optional)

*: On specific designs only

Table 30: Symbols key

Symbol	Description
L 243	Always secure screwed connections marked with this symbol with **Loctite 243** .
L 2701	Always secure screwed connections marked with this symbol with **Loctite 2701** .
L 5900	Always secure screwed connections marked with this symbol with **Loctite 5900** .

Table 31: List of components

Part No.	Description	Part No.	Description
23-9	Axial propeller	550.01/.02/.03/.04/.05	Disc
59-17	Shackle	561	Grooved pin
69-14	Leakage sensor	571	Bail (optional)
80-1	Motor unit	596	Wire
81-29	Terminal	721	Adapter
81-51	Clamping element	812	Motor housing cover

Part No.	Description	Part No.	Description
81-92	Cover plate	818	Rotor
101	Pump casing	834	Cable gland
161	Casing cover	897	Guide piece
321.01	Radial ball bearing	901.01/.03	Hexagon head bolt
322	Radial roller bearing	903.01/.02	Screw plug
411.01	Joint ring	914.01/.02/.03/.04/.05/ .06/.07/.15	Hexagon socket head cap screw
412.01/.03/.04/.05/.06/.07	O-ring	920.01/.02/.03/.15	Nut
421.01/.02	Lip seal	930.02/.06	Safety device
433.01/.02	Mechanical seal	932.01/.02/.03/.04/.05/.07	Circlip
441	Shaft seal housing	970.02	Label/plate
529	Bearing sleeve		

9.1.7 Amaline 400 (motors: 3 8, 4 8; motor housing made of stainless steel)

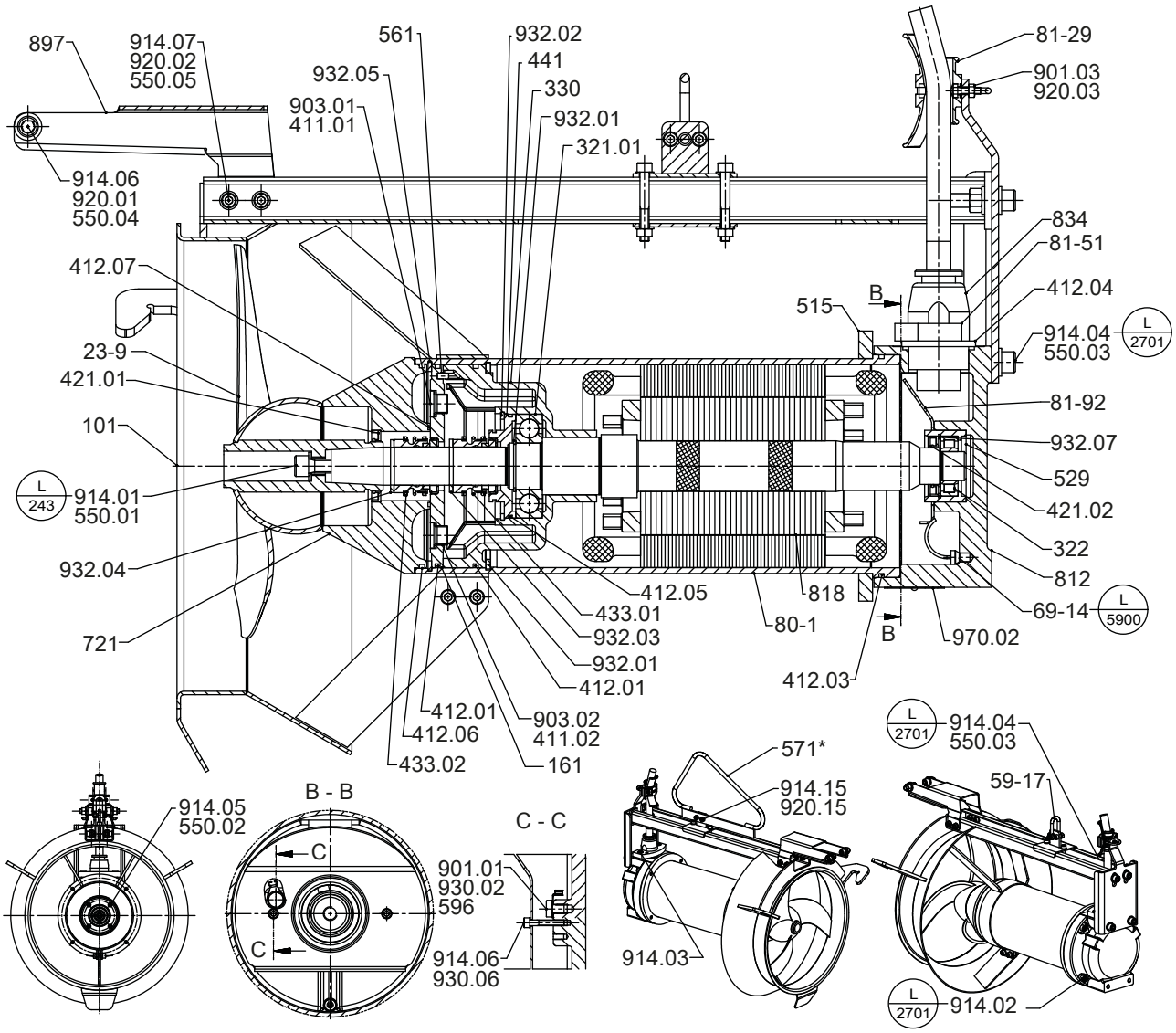

Fig. 49: General assembly drawing: a) with shackle b) with bail (optional)

*: On specific designs only

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Table 32: Symbols key

Symbol	Description
	Always secure screwed connections marked with this symbol with **Loctite 243** .
	Always secure screwed connections marked with this symbol with **Loctite 2701** .
	Always secure screwed connections marked with this symbol with **Loctite 5900** .

Table 33: List of components

Part No.	Description	Part No.	Description
23-9	Axial propeller	529	Bearing sleeve
59-17	Shackle	550.01/.02/.03/.04/.05	Disc
69-14	Leakage sensor	561	Grooved pin
80-1	Motor unit	571	Bail (optional)
81-29	Terminal	596	Wire
81-51	Clamping element	721	Adapter
81-92	Cover plate	812	Motor housing cover
101	Pump casing	818	Rotor
161	Casing cover	834	Cable gland
321.01	Radial ball bearing	897	Guide piece
322	Radial roller bearing	901.01/.03	Hexagon head bolt
330	Bearing bracket	903.01	Screw plug
411.01/.02	Joint ring	914.01/.02/.03/.04/.05/ .06/.07/.15	Hexagon socket head cap screw
412.01/.03/.04/.05/.06/.07	O-ring	920.01/.02/.03/.15	Nut
421.01/.02	Lip seal	930.02	Safety device
433.01/.02	Mechanical seal	932.01/.02/.03/.04/.05/.06/.07	Circlip
441	Shaft seal housing	970.02	Label/plate
515	Locking ring		

9.1.8 Amaline 500/600/800 (motors: 17 2, 25 2, 4 4, 6 4, 11 4, 16 4, 23 4, 30 4; motor housing made of grey cast iron)

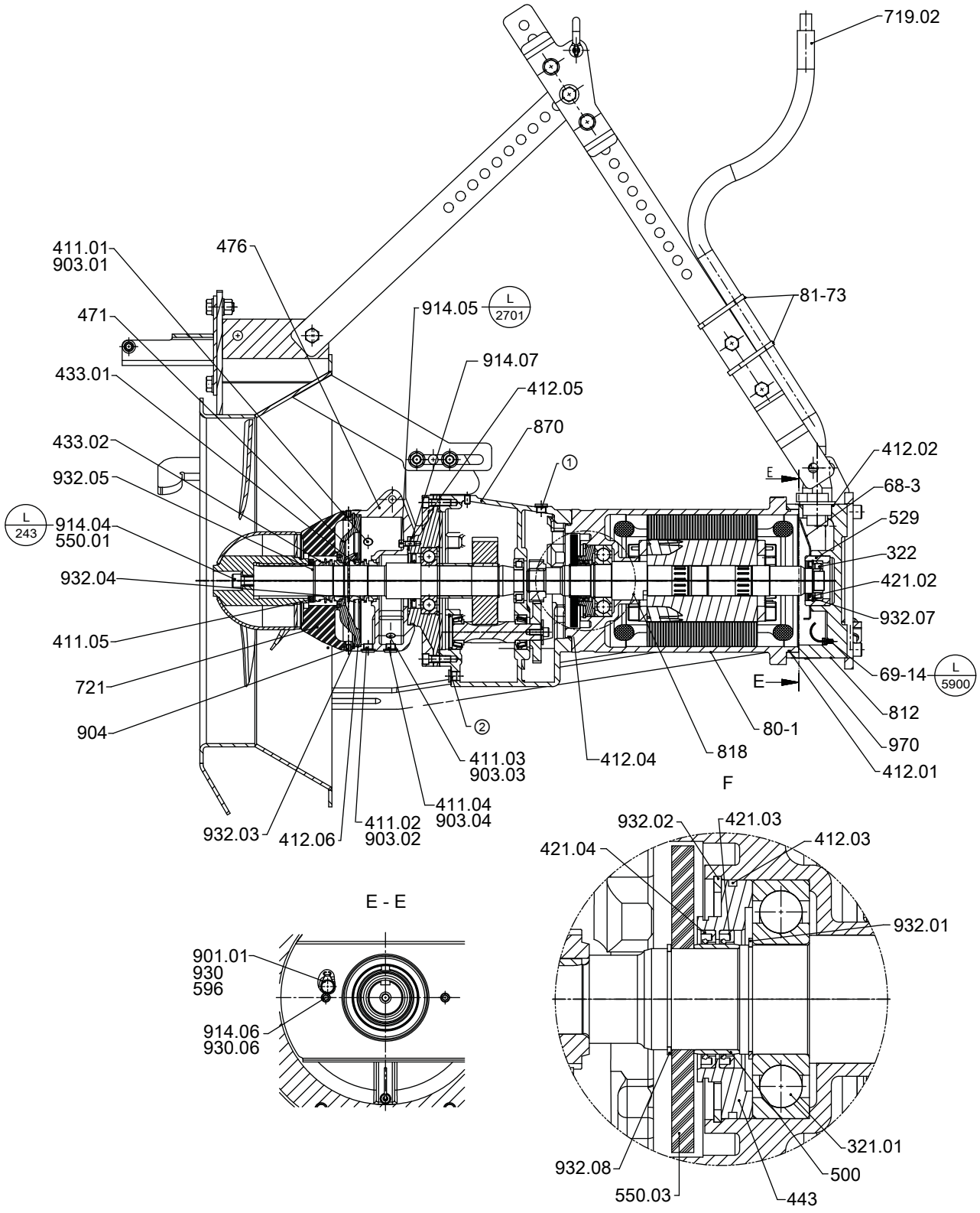

Fig. 50: General assembly drawing

①	Oil filler plug
②	Oil drain plug

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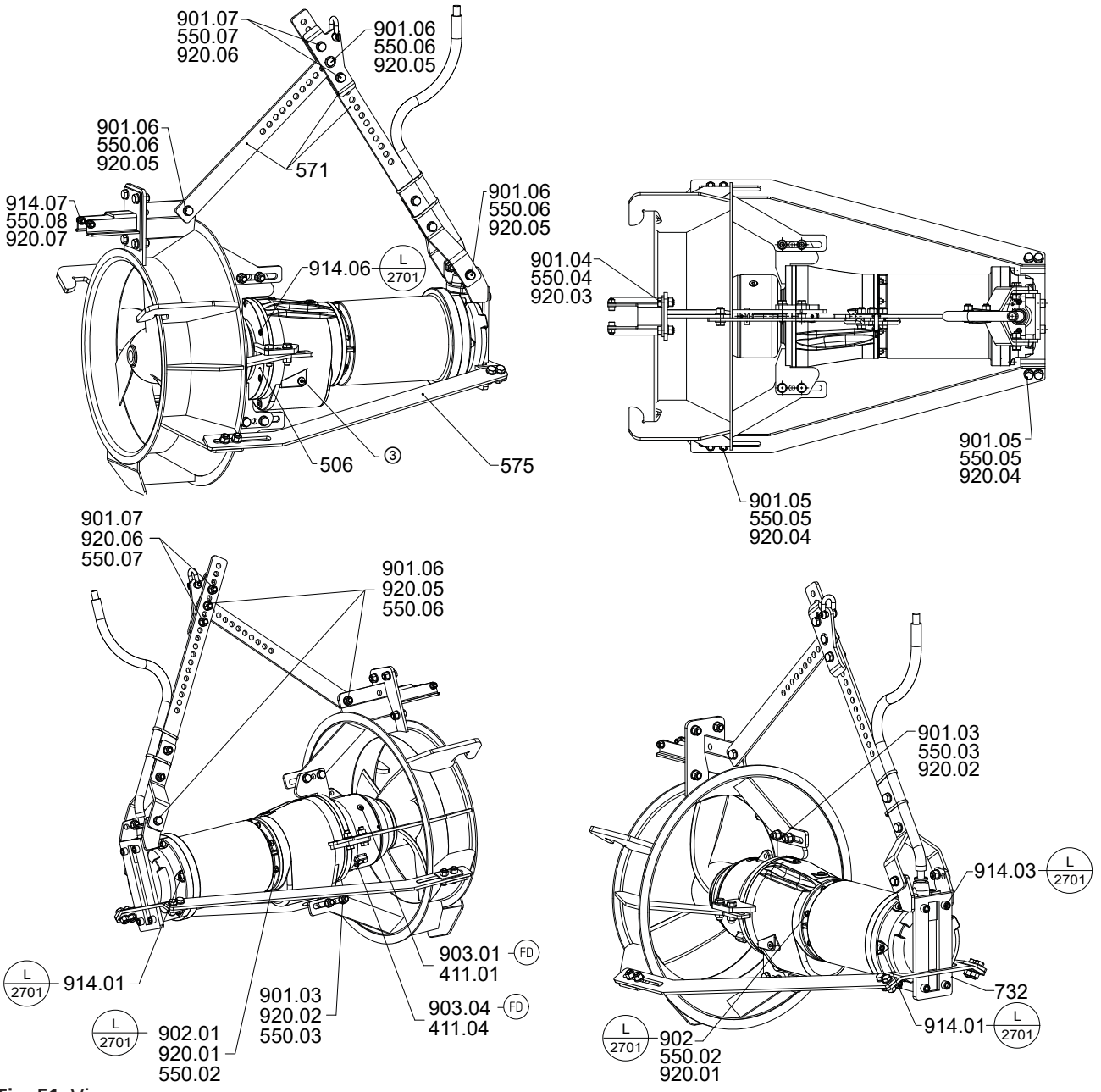

Fig. 51: Views

③	Oil check plug

Table 34: Symbols key

Symbol	Description
FD	Always apply a **liquid sealant** (e.g. Hylomar SQ32M) to sealing surfaces marked with this symbol.
L 243	Always secure screwed connections marked with this symbol with **Loctite 243** .
L 2701	Always secure screwed connections marked with this symbol with **Loctite 2701** .
L 5900	Always secure screwed connections marked with this symbol with **Loctite 5900** .

Table 35: List of components

Part No.	Description	Part No.	Description
23-9	Axial propeller	571	Bail
59-17	Shackle	575	Strip
68-3	Cover plate	596	Wire
69-14	Leakage sensor	719.02	Flexible tube
80-1	Motor unit	721 [8)]	Adapter
81-51	Clamping element	732	Holder
81-73	Cable support	812	Motor housing cover
101	Pump casing	818	Rotor
321.01	Radial ball bearing	834	Cable gland
322	Radial roller bearing	870	Gear unit
411.01/.02/.03/.04/.05	Joint ring	897	Guide piece
412.01/.02/.03/.04/.05/.06	O-ring	901.01/.03/.04/.05/.06/.07	Hexagon head bolt
421.02/.03/.04	Lip seal	902	Stud
433.01/.02	Mechanical seal	903.01/.02/.03/.04	Screw plug
443	Seal insert	904	Grub screw
471	Seal cover	914.01/.02/.03/.04/.05/.06/.07	Hexagon socket head cap screw
476	Mating ring carrier	920.01/.02/.03/.04/.05/.06/.07	Nut
500	Ring	930/.06	Safety device
506	Retaining ring	932.01/.02/.03/.04/.05/.07/.08	Circlip
529	Bearing sleeve	970/970.02	Label/plate
550.01/.02/.03/.04/.05/.06/.07/.08	Disc		

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8 For Amaline 500/600 only

9.2 Flamepaths on explosion-proof motors

9.2.1 Amaline 200, 300, 400 (motor housing made of stainless steel)

Motors: 1 4, 2 4, 0 6, 2 6, 3 8, 4 8

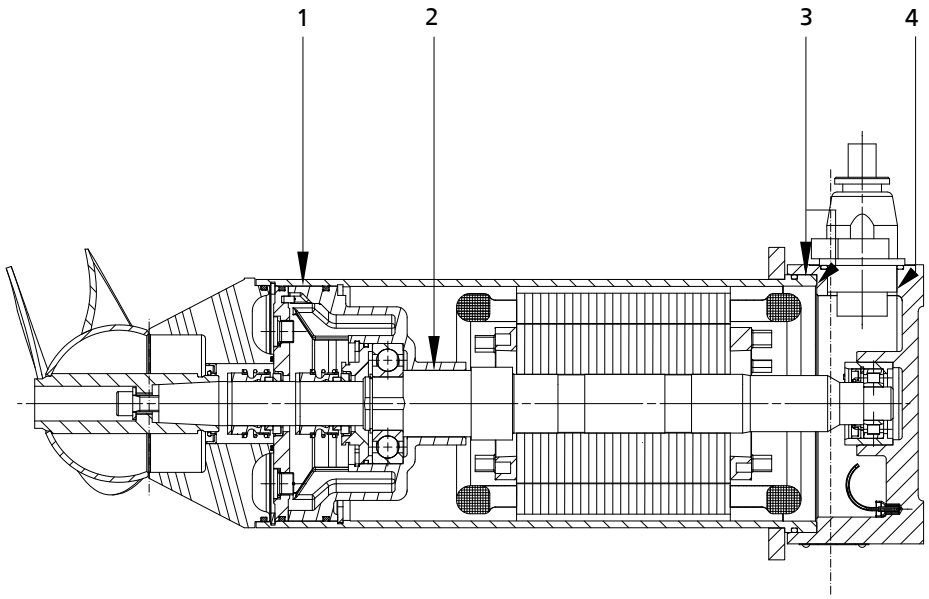

Fig. 52: Flamepaths

9.2.2 Amaline 200, 300, 400 (motor housing made of grey cast iron)

Motors: 1 4, 2 4, 0 6, 2 6, 3 8, 4 8

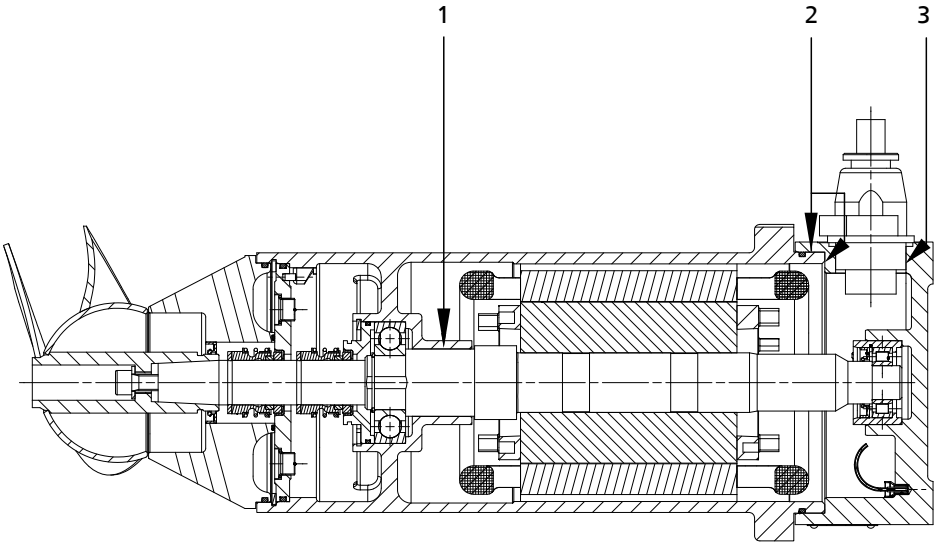

Fig. 53: Flamepaths

9.2.3 Amaline 300 with motor 8 6 (motor housing made of grey cast iron)

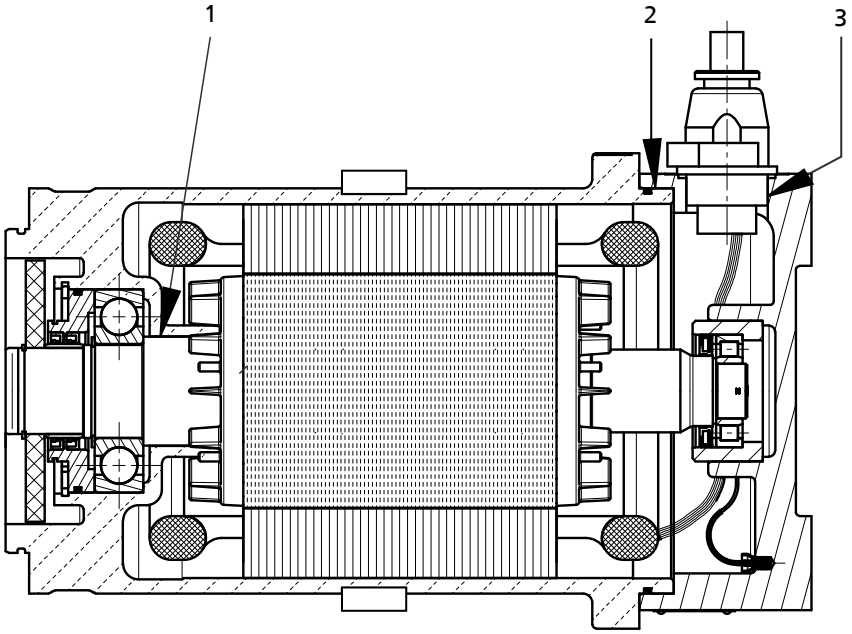

Fig. 54: Flamepaths

9.2.4 Amaline 500, 600, 800 (motor housing made of grey cast iron)

Motors: 17 2, 25 2, 6 4, 11 4, 16 4, 23 4, 30 4

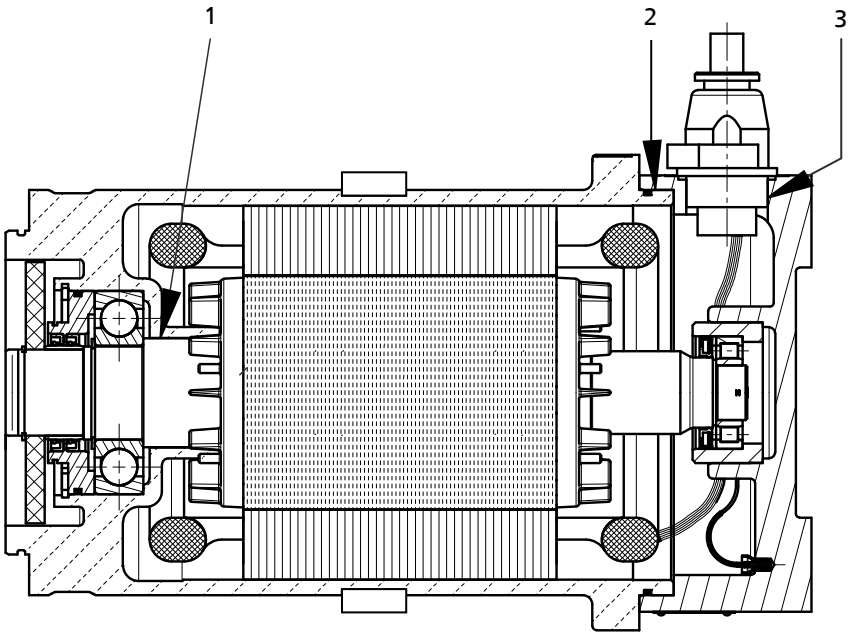

Fig. 55: Flamepaths

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9.2.5 Amaline 500, 600, 800 (motor housing made of grey cast iron)

Motor: 4 4

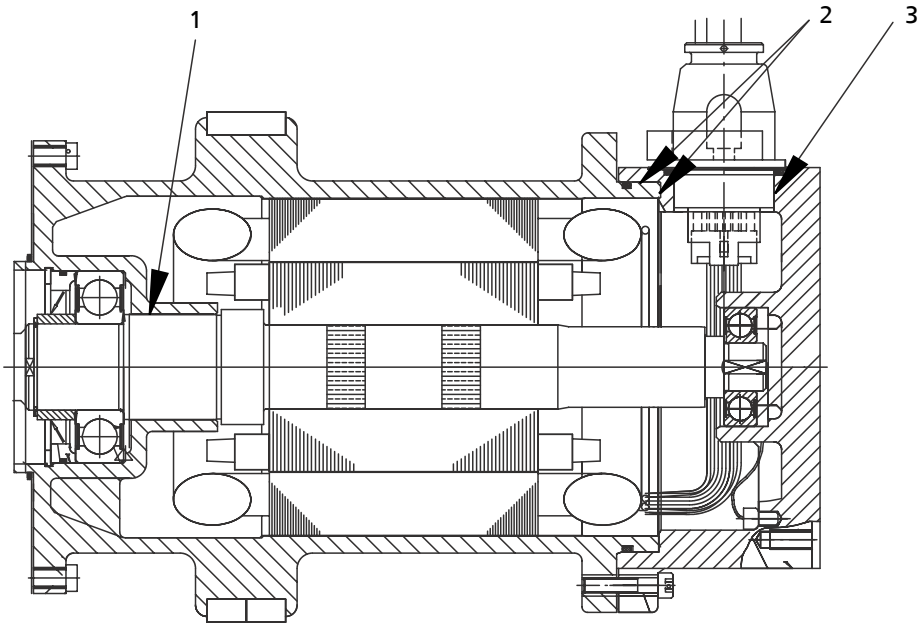

Fig. 56: Flamepaths

9.3 Wiring diagrams

9.3.1 Amaline 200, Amaline 300 with motor 0 6 or 2 6

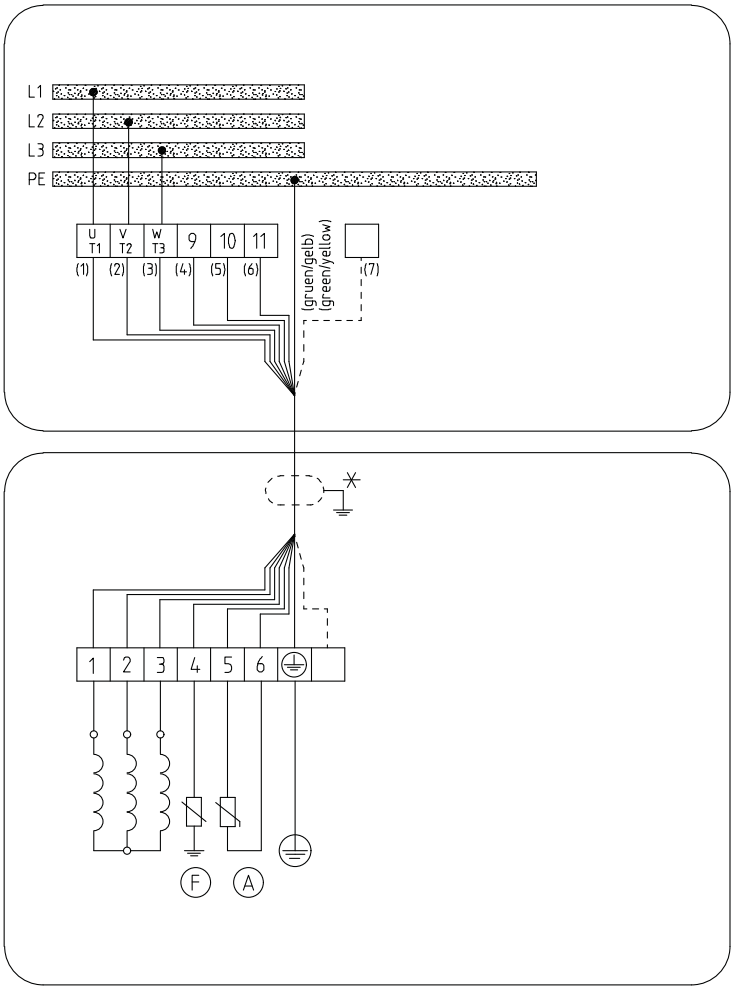

Fig. 57: Wiring diagram for Amaline 200, Amaline 300 with motor 0 6 or 2 6

*	Shielded cable optional
Ⓐ	Motor temperature (PTC)
Ⓕ	Leakage inside the motor

9.3.2 Amaline 300 with motor 8 6, Amaline 400

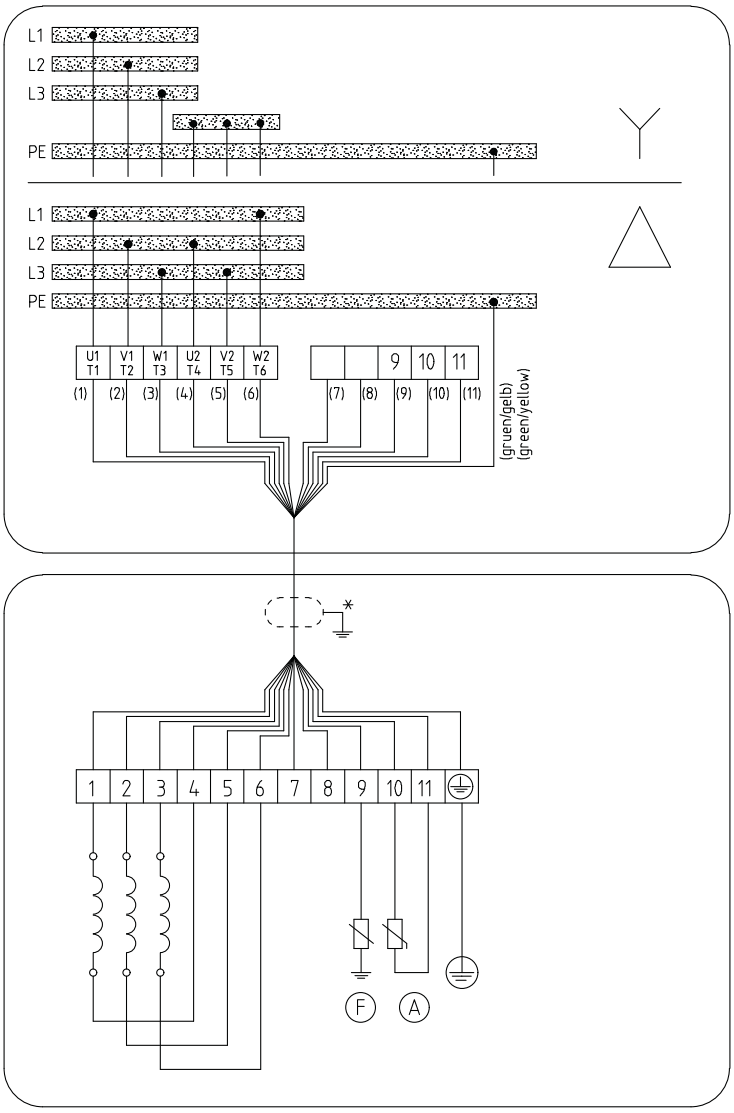

Fig. 58: Wiring diagram for power cables 12G 1.5 and 12G 2.5

*	Shielded cable optional
Ⓐ	Motor temperature (PTC)
Ⓕ	Leakage inside the motor

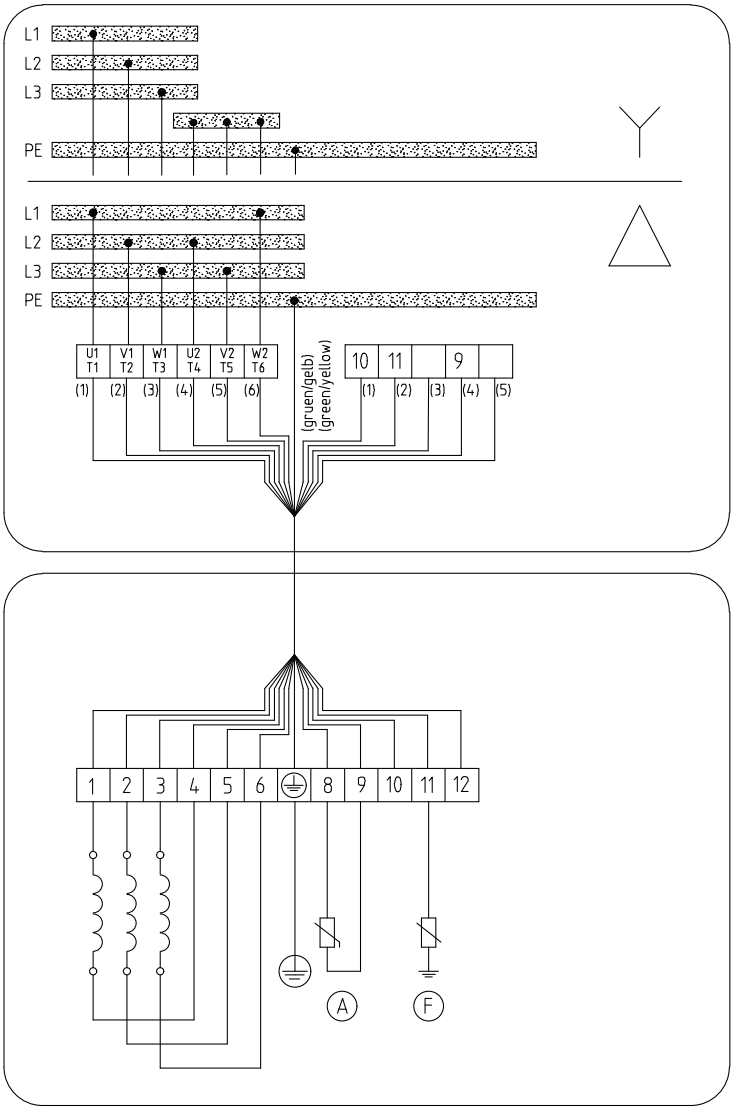

Fig. 59: Wiring diagram for power cables 7G4 + 5×1.5, 7G6 5 × 1.5 and 7G10 5 × 1.5

Ⓐ	Motor temperature (PTC)
Ⓕ	Leakage inside the motor

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9.3.3 Amaline 500, 600, 800

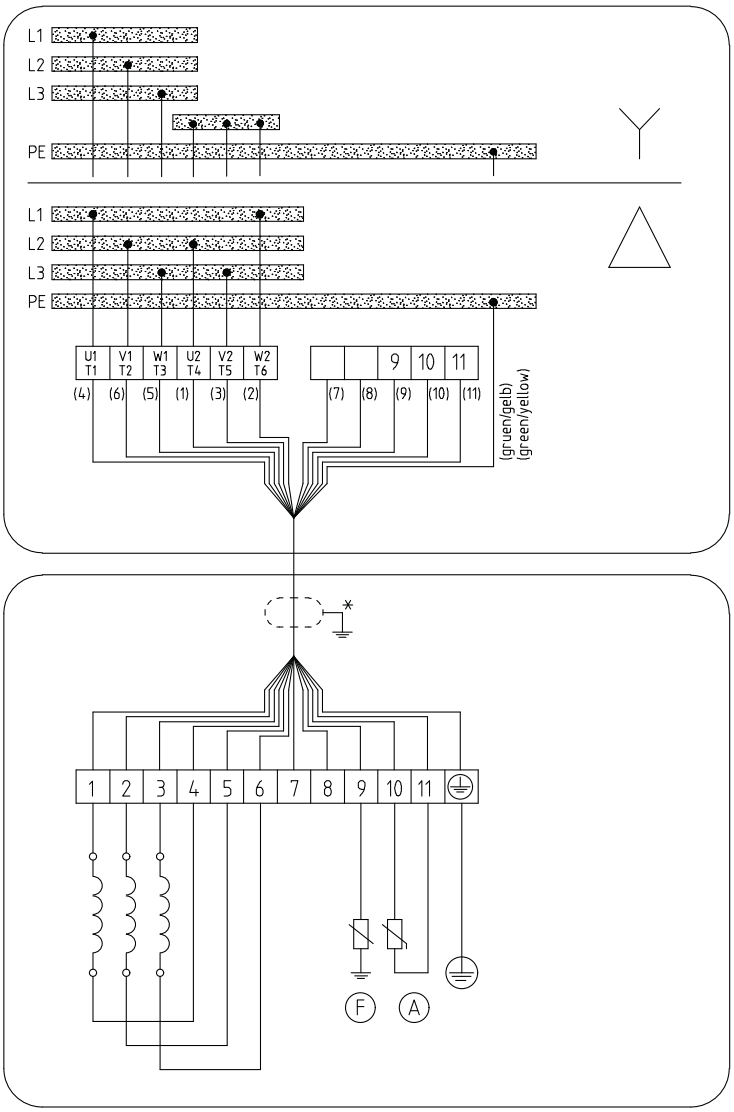

Fig. 60: Wiring diagram for Amaline 500, 600, 800 with power cables 12G 1.5 and 12G 2.5

*	* Shielded cable optional
Ⓐ	Motor temperature (PTC)
Ⓕ	Leakage inside the motor

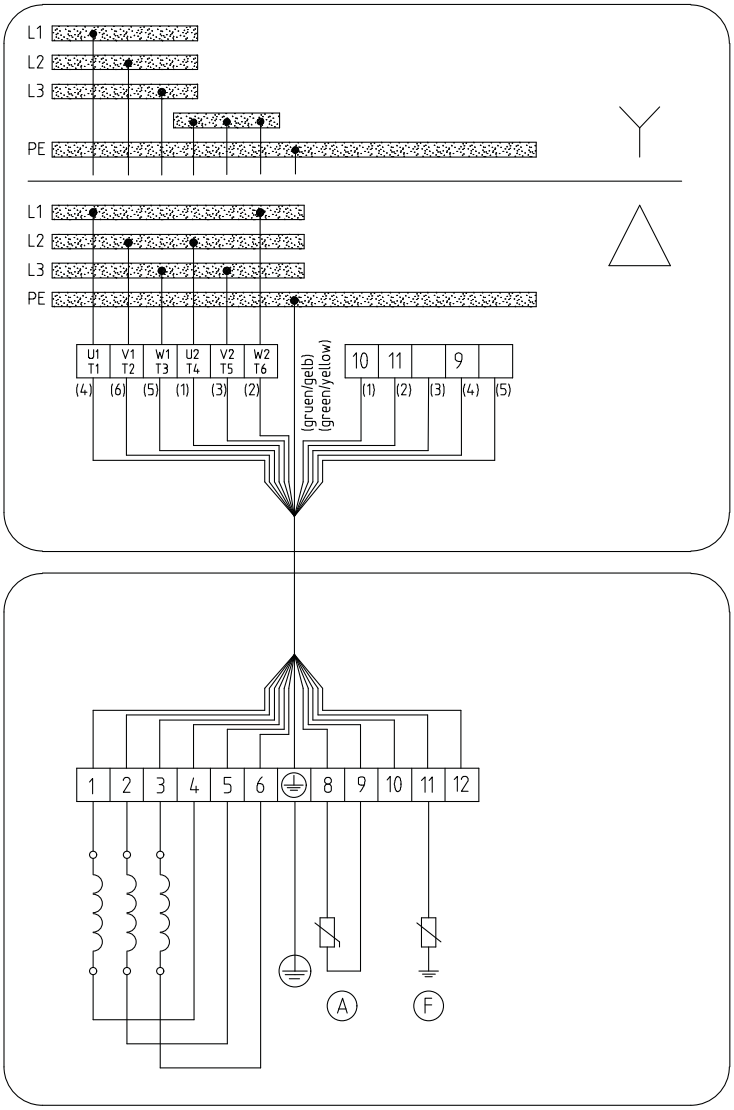

Fig. 61: Wiring diagram for Amaline 500, 600, 800 with power cables 7G4 + 5×1.5, 7G6 5×1.5 and 7G10 5×1.5

Ⓐ	Motor temperature (PTC)
Ⓕ	Leakage inside the motor

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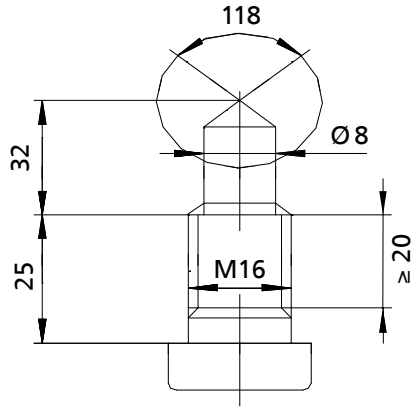
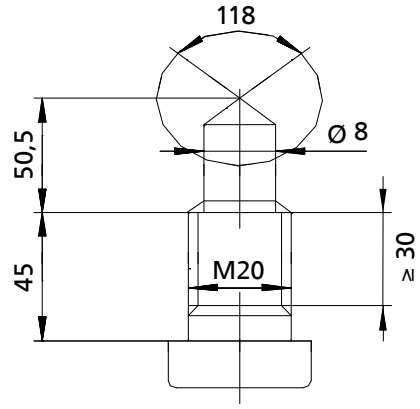
9.4 Forcing screws

Table 36: Forcing screws

Amaline	Forcing screw	
200 300, motors: 0 6, 2 6 400	M16 x 60	
300, motors: 8 6 600 800	M20 x 95	

9.5 Dimensions

9.5.1 Amaline 200, 300, 400; motor housing made of grey cast iron

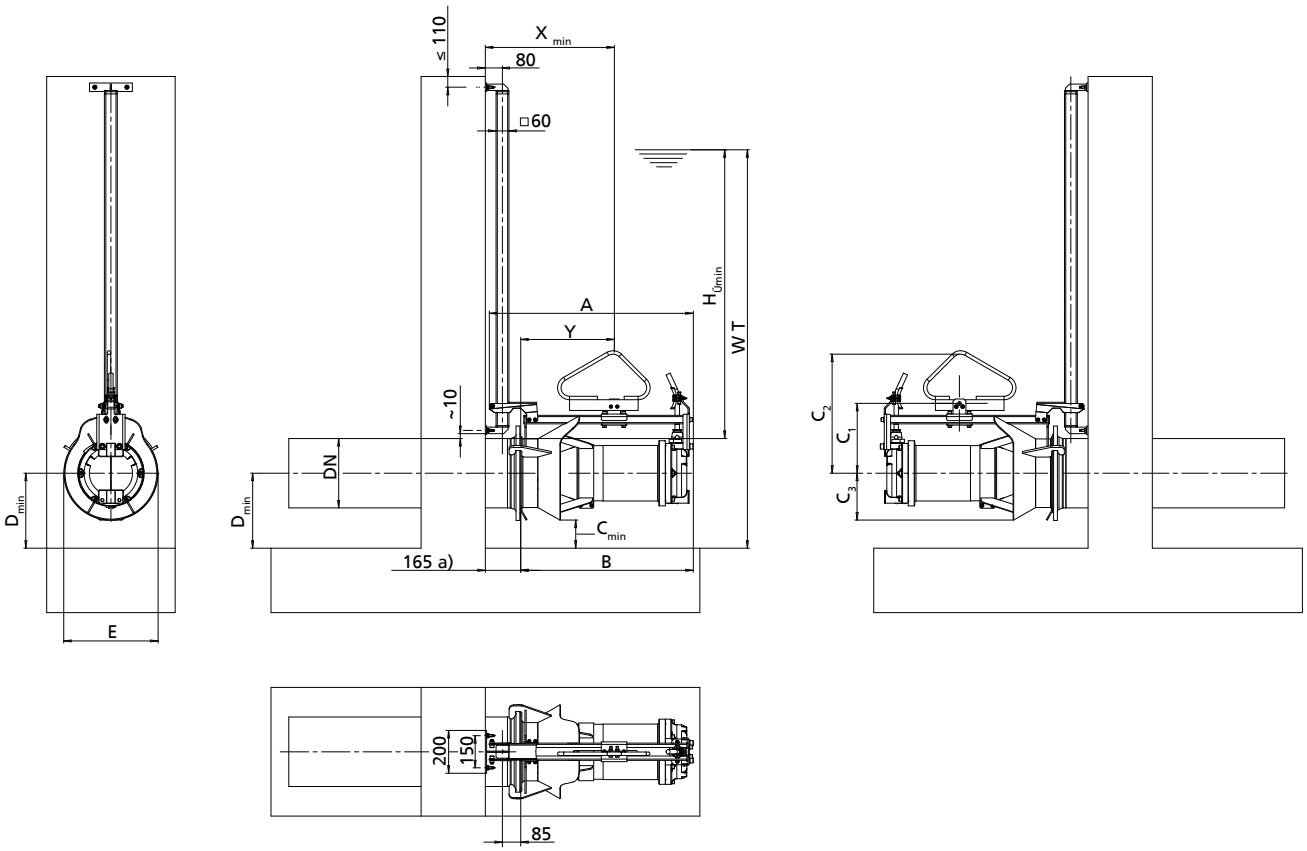


Fig. 62: Dimensions of an Amaline 200, 300, 400; motor housing made of grey cast iron

a)	Minimum

The tolerances of the connection pipe (flange diameter and flange thickness) must be observed to ensure smooth functioning. If required, the flanges must be reworked prior to installation. (⇨ Section 9.5.4, Page 95)

Table 37: Dimensions [mm]

Size	A	B	C_{min}	C_1	C_2	C_3	D_{min}	E	$Hü_{min}$	W_T	X_{min}	Y	[kg]
Amaline 200													
2021-1450/14	709	568	112	193	363	168	280	331	400	780	465	300	45,4
2022-1450/14	721	580	112	193	363	168	280	331	400	780	465	300	45,4
2022-1450/24	721	580	112	193	363	168	280	331	400	780	470	300	47
2034-1450/24	709	568	112	193	363	168	280	331	400	780	470	300	47
2035-1450/24	721	580	112	193	363	168	280	331	400	780	470	300	47
Amaline 300													
3021-960/06	778	637	130	243	458	220	350	436	500	1000	545	380	58,5
3022-960/06	784	643	130	243	458	220	350	436	500	1000	545	380	58,5
3022-960/26	784	643	130	243	458	220	350	436	500	1000	545	380	58,5
3031-960/06	778	637	130	243	458	220	350	436	500	1000	545	380	58,5
3031-960/26	778	637	130	243	458	220	350	436	500	1000	545	380	58,5
3032-960/06	784	643	130	243	458	220	350	436	500	1000	545	380	58,5
3032-960/26	784	643	130	243	458	220	350	436	500	1000	545	380	58,5
3033-960/06	796	655	130	243	458	220	350	436	500	1000	545	380	58,5
3033-960/26	796	655	130	243	458	220	350	436	500	1000	545	380	58,5
3034-960/86	957	820	131	326	556	219	350	438	500	1000	555	390	169,5

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Size	A	B	C_{min}	C_1	C_2	C_3	D_{min}	E	$Hü_{min}$	W_T	X_{min}	Y	[kg]
3035-960/86	963	826	131	326	556	219	350	438	500	1000	555	390	169,5
3036-960/86	969	832	131	326	556	219	350	438	500	1000	555	390	169,5
Amaline 400													
4021-725/38	867	726	135	283	498	265	400	524	600	1200	605	440	92,5
4022-725/38	873	732	135	283	498	265	400	524	600	1200	605	440	92,5
4022-725/48	873	732	135	283	498	265	400	524	600	1200	605	440	92,5
4031-725/38	867	726	135	283	498	265	400	524	600	1200	605	440	92,5
4031-725/48	867	726	135	283	498	265	400	524	600	1200	605	440	92,5
4032-725/38	873	732	135	283	498	265	400	524	600	1200	605	440	92,5
4032-725/48	873	732	135	283	498	265	400	524	600	1200	605	440	92,5
4033-725/38	885	744	135	283	498	265	400	524	600	1200	605	440	92,5
4033-725/48	885	744	135	283	498	265	400	524	600	1200	605	440	92,5

9.5.2 Amaline 200, 300, 400; motor housing made of stainless steel

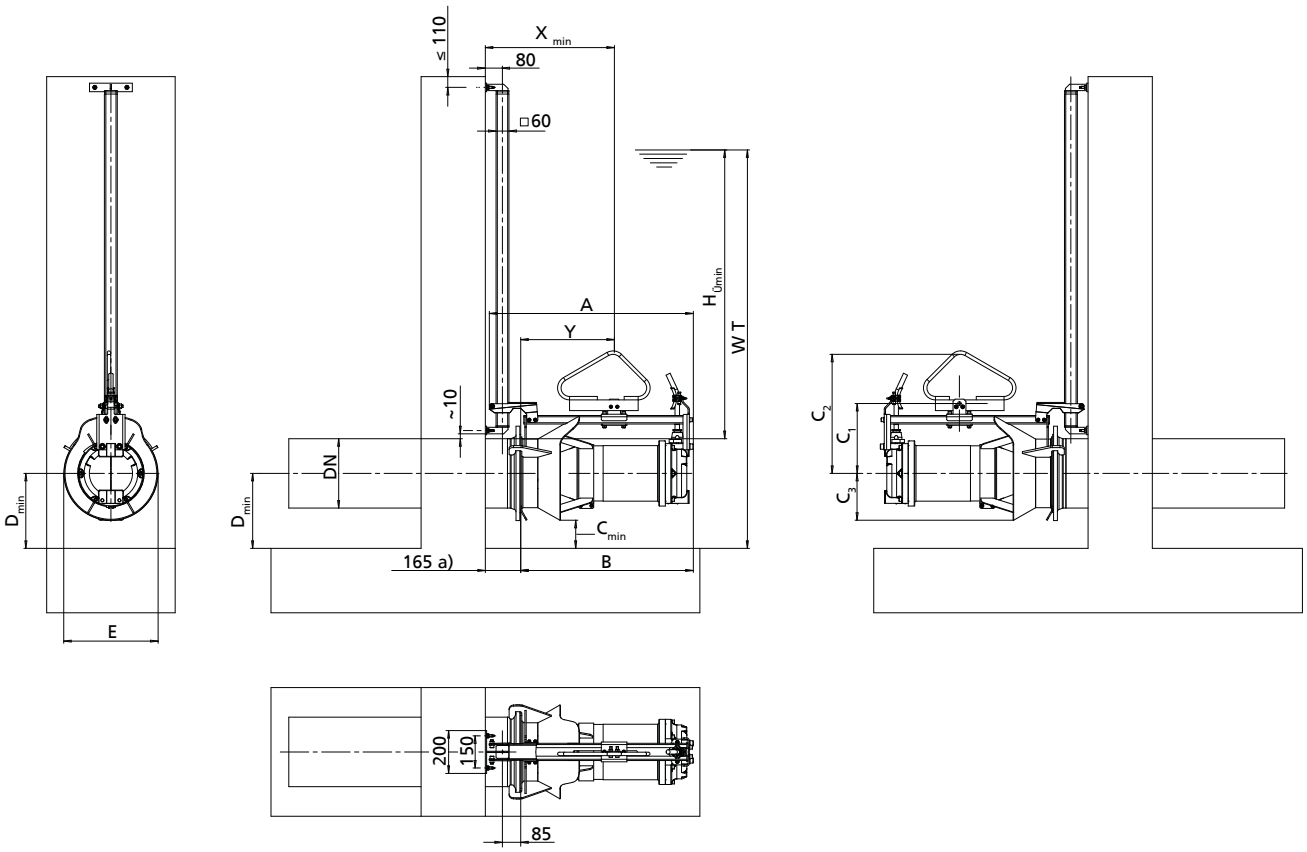

Fig. 63: Dimensions of an Amaline 200, 300, 400; motor housing made of stainless steel

a)	Minimum

The tolerances of the connection pipe (flange diameter and flange thickness) must be observed to ensure smooth functioning. If required, the flanges must be reworked prior to installation. (⇨ Section 9.5.4, Page 95)

Table 38: Dimensions [mm]

Size	A	B	C_{min}	C_1	C_2	C_3	D_{min}	E	$Hü_{min}$	W_T	X_{min}	Y	[kg]
Amaline 200													
2021-1450/14	707	566	112	193	363	168	280	332	400	780	465	300	45,2
2022-1450/14	719	578	112	193	363	168	280	332	400	780	465	300	45,2
2022-1450/24	719	578	112	193	363	168	280	332	400	780	470	300	47,6
2034-1450/24	707	566	112	193	363	168	280	332	400	780	470	300	47,6

Size	A	B	C_{min}	C_1	C_2	C_3	D_{min}	E	$Hü_{min}$	W_T	X_{min}	Y	[kg]
2035-1450/24	719	578	112	193	363	168	280	332	400	780	470	300	47,6
Amaline 300													
3021-960/06	778	637	130	243	458	220	350	436	500	1000	545	380	57,7
3022-960/06	784	643	130	243	458	220	350	436	500	1000	545	380	57,7
3022-960/26	784	643	130	243	458	220	350	436	500	1000	545	380	57,7
3031-960/06	778	637	130	243	458	220	350	436	500	1000	545	380	57,7
3031-960/26	778	637	130	243	458	220	350	436	500	1000	545	380	57,7
3032-960/06	784	643	130	243	458	220	350	436	500	1000	545	380	57,7
3032-960/26	784	643	130	243	458	220	350	436	500	1000	545	380	57,7
3033-960/06	796	655	130	243	458	220	350	436	500	1000	545	380	57,7
3033-960/26	796	655	130	243	458	220	350	436	500	1000	545	380	57,7
Amaline 400													
4021-725/38	867	726	135	283	498	265	400	524	600	1200	605	440	90,6
4022-725/38	873	732	135	283	498	265	400	524	600	1200	605	440	90,6
4022-725/48	873	732	135	283	498	265	400	524	600	1200	605	440	90,6
4031-725/38	867	726	135	283	498	265	400	524	600	1200	605	440	90,6
4031-725/48	867	726	135	283	498	265	400	524	600	1200	605	440	90,6
4032-725/38	873	732	135	283	498	265	400	524	600	1200	605	440	90,6
4032-725/48	873	732	135	283	498	265	400	524	600	1200	605	440	90,6
4033-725/38	885	744	135	283	498	265	400	524	600	1200	605	440	90,6
4033-725/48	885	744	135	283	498	265	400	524	600	1200	605	440	90,6

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9.5.3 Amaline 500, 600, 800; motor housing made of grey cast iron

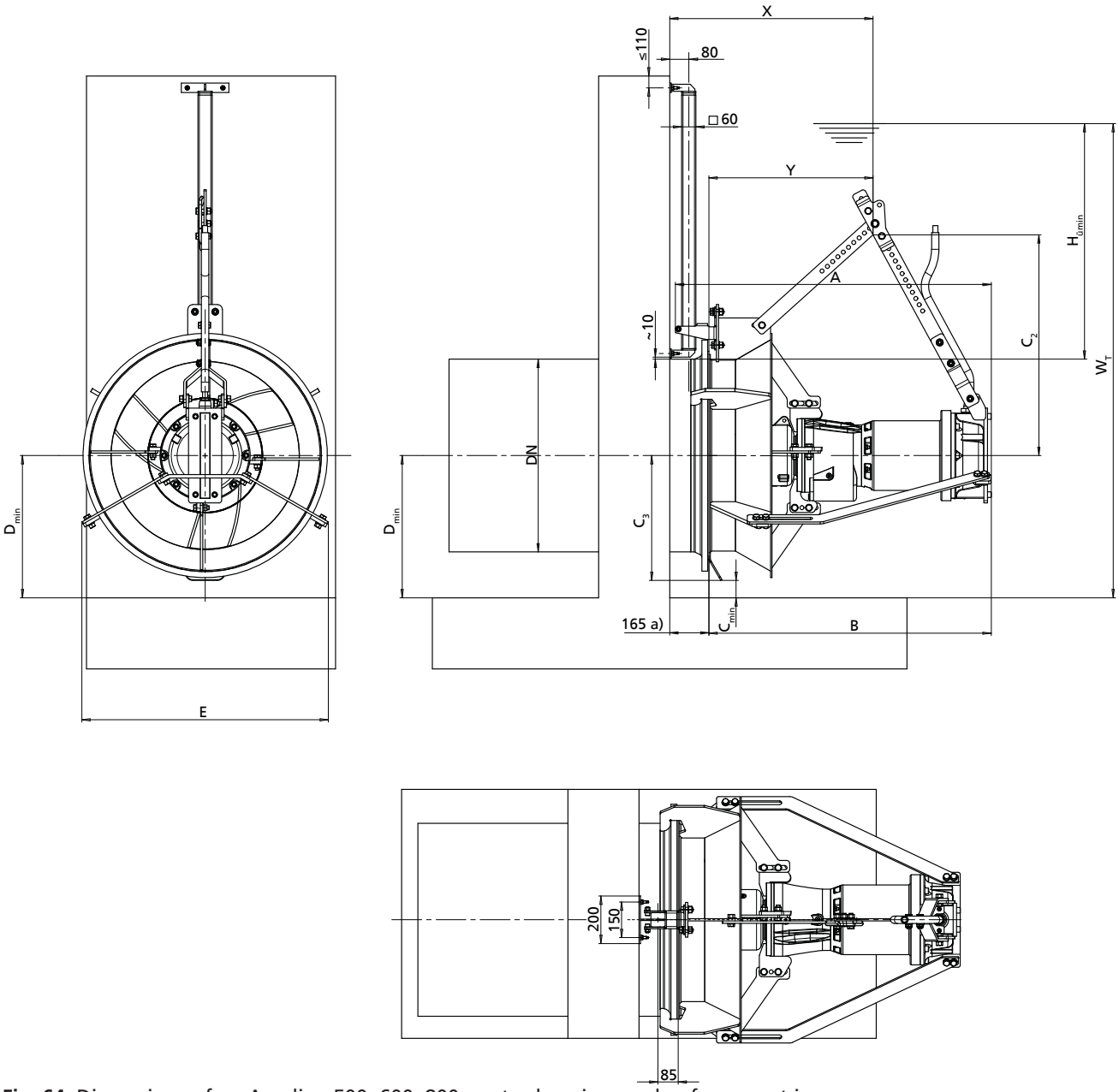

Fig. 64: Dimensions of an Amaline 500, 600, 800; motor housing made of grey cast iron

a)	Minimum

The tolerances of the connection pipe (flange diameter and flange thickness) must be observed to ensure smooth functioning. If required, the flanges must be reworked prior to installation. (⇨ Section 9.5.4, Page 95)

Table 39: Dimensions [mm]

Size	A	B	C_{min}	C_2	C_3	D_{min}	E	$Hü_{min}$	W_T	X_{min}	Y	[kg]
Amaline 500												
5033-... / 4 4...	1286	1145	70	945	380	450	768	700	1400	815	650	240,5
5033-... / 6 4…	1376	1235	70	910	380	450	768	700	1400	855	690	276
5033-... / 11 4…	1376	1235	70	910	380	450	768	700	1400	855	690	276
5035-... / 4 4…	1254	1113	70	945	380	450	768	700	1400	825	660	239
5035-... / 6 4...	1344	1203	70	905	380	450	768	700	1400	865	700	274,5
5033-... / 17 2...	1344	1203	70	905	380	450	768	700	1400	865	700	306,5
Amaline 600												
6032-... / 4 4...	1286	1145	75	980	425	500	838	900	1700	835	670	248,5
6032-... / 6 4...	1376	1235	75	950	425	500	838	900	1700	860	695	284
6032-... / 11 4...	1376	1235	75	950	425	500	838	900	1700	860	695	284
6033-... / 4 4...	1286	1145	75	980	425	500	838	900	1700	835	670	248,5
6033-... / 6 4...	1376	1235	75	950	425	500	838	900	1700	860	695	284
6033-... / 11 4...	1376	1235	75	950	425	500	838	900	1700	860	695	284
6035-... / 11 4...	1308	1168	75	980	425	500	838	900	1700	825	660	284
6035-... / 16 4...	1340	1199	75	945	425	500	838	900	1700	815	650	315,6
6035-... / 17 2...	1340	1199	75	945	425	500	838	900	1700	815	650	315
6035-... / 25 2...	1340	1199	75	945	425	500	838	900	1700	815	650	332
Amaline 800												
8032-... / 4 4...	1179	1038	73	1000	527	600	1037	1100	2100	795	630	270
8032-... / 6 4...	1271	1130	73	1000	527	600	1037	1100	2100	935	770	305,5
8032-... / 11 4...	1271	1130	73	1000	527	600	1037	1100	2100	935	770	305,5
8032-... / 16 4...	1309	1168	73	990	527	600	1037	1100	2100	945	780	337,5
8032-... / 23 4...	1309	1168	73	990	527	600	1037	1100	2100	945	780	349,5
8032-... / 30 4...	1331	1190	73	1060	527	600	1037	1100	2100	885	720	397
8038-... / 4 4...	1179	1038	73	1000	527	600	1037	1100	2100	795	630	270
8038-... / 6 4...	1271	1130	73	1000	527	600	1037	1100	2100	935	770	305,5
8038-... / 11 4...	1271	1130	73	1000	527	600	1037	1100	2100	935	770	305,5
8038-... / 16 4...	1309	1168	73	990	527	600	1037	1100	2100	945	780	337,5
8038-... / 23 4...	1309	1168	73	990	527	600	1037	1100	2100	945	780	349,5
8038-... / 30 4...	1331	1190	73	1060	527	600	1037	1100	2100	885	720	397

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9.5.4 Connecting pipe

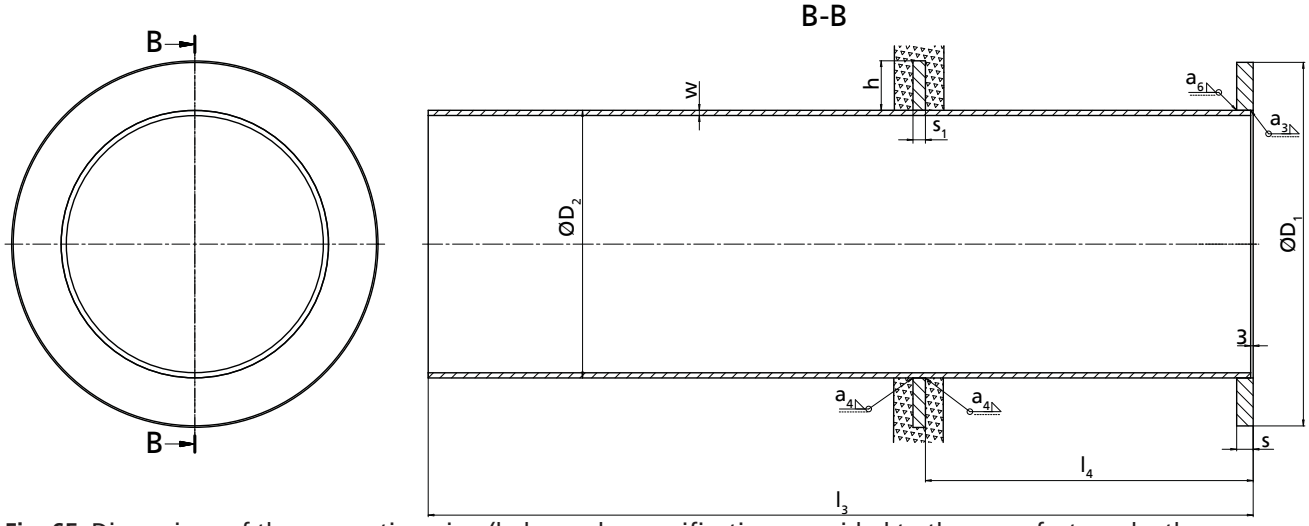


Fig. 65: Dimensions of the connection pipe (l_3, l_4 = order specifications provided to the manufacturer by the customer)

Prior to installation all dimensions including the indicated tolerances (especially the flange diameter and thickness) must be verified and, if required, adjusted by reworking.

Table 40: Dimensions of the connection pipe [mm]

DN	Ø D_1	Ø D_2	$s_{-0.5}$	w^{+1}	s_1	h
200	320	219	20	6	10	50
300	440	324	22	6	15	60
400	540	406	22	6	15	65
500	645	508	24	6	15	70
600	755	610	30	6	15	75
800	975	813	30	6	15	80

Table 41: Material variants of the connection pipe

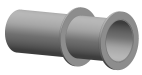
	Designation	DN	Material	[kg]
	Connection pipe with flange to DIN EN 1092-1 /PN 6, length l_3 = 1 m	200	Galvanised steel	45,5
		200	1.4571	45,5
		300	Galvanised steel	75,5
		300	1.4571	75,5
		400	Galvanised steel	95,5
		400	1.4571	95,5
		500	Galvanised steel	122,5
		500	1.4571	122,5
		600	Galvanised steel	155
		600	1.4571	155
		800	Galvanised steel	217,5
		800	1.4571	217,5

Table 42: Connection pipe extension per metre

DN	Material variant		[kg]
	Galvanised steel	1.4571	
200	✗	✗	33,8
300	✗	✗	50,8
400	✗	✗	64,5
500	✗	✗	78,5

DN	Material variant		[kg]
	Galvanised steel	1.4571	
600	✗	✗	94,5
800	✗	✗	129

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10 EU Declaration of Conformity

Manufacturer: **KSB SE & Co. KGaA**
Johann-Klein-Straße 9
67227 Frankenthal (Germany)

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

Amaline

KSB order number: .....

- is in conformity with the provisions of the following directives / regulations as amended from time to time:
  - Pump set: 2006/42/EC Machinery Directive

The manufacturer also declares that

- the following harmonised international standards[9)] have been applied:
  - ISO 12100
  - EN 809
  - EN 60034-1, EN 60034-5/A1

Person authorised to compile the technical file:

Name
Function
Address (company)
Address (street, No.)
Address (post or ZIP code, city) (country)

The EU Declaration of Conformity was issued in/on:

Place, date

.....[10)].....

Name

Function

Company
Address

9 Apart from the standards listed here referring to the Machinery Directive, further standards are observed for explosion-proof versions (ATEX Directive) as applicable and are listed in the legally binding EU Declaration of Conformity.

10 A signed, legally binding EU Declaration of Conformity is supplied with the product.

11 Certificate of Decontamination

Type: .....

Order number /

Order item number[11)]: .....

Delivery date: .....

Application: .....

Fluid handled[11)]: .....

Please tick where applicable[11)]:

☐ Corrosive

☐ Oxidising

☐ Flammable

☐ Explosive

☐ Hazardous to health

☐ Seriously hazardous to health

☐ Toxic

☐ Radioactive

☐ Bio-hazardous

☐ Safe

Reason for return:[11)]: .....

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

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11 Required field

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