

Submersible Pump in Discharge Tube

Amacan K

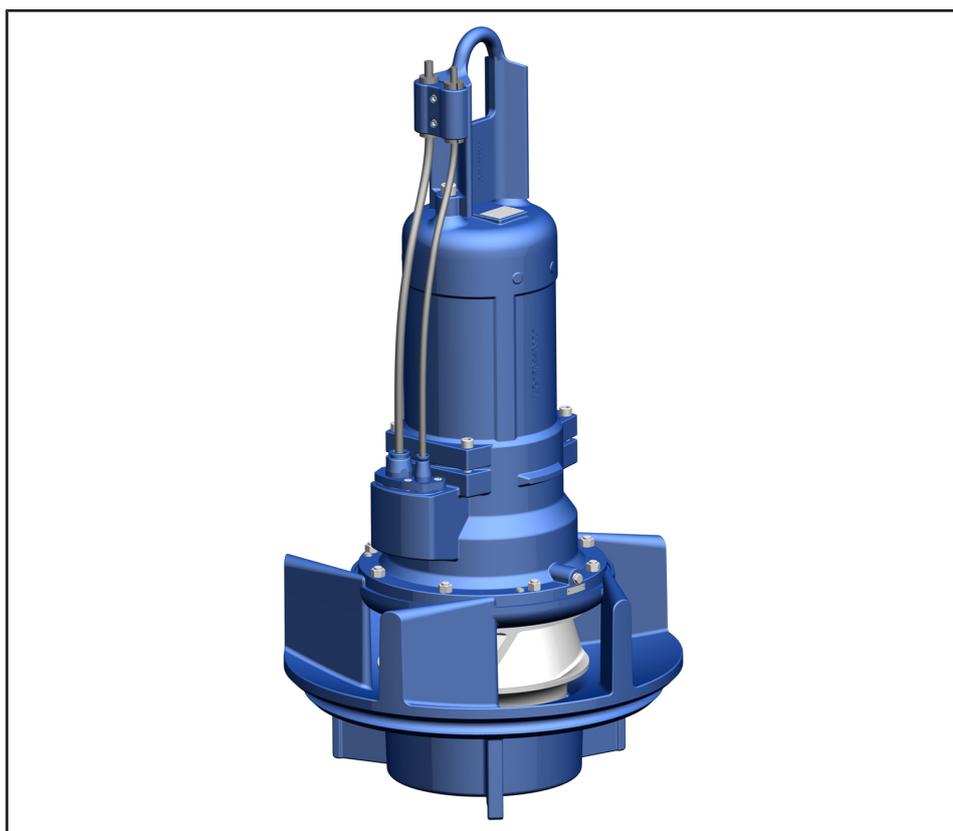
60 Hz

Sizes: 700-324 to 800-401

6 Poles: 22 6.E to 55 6.E

8 Poles: 11 8.E to 45 8.E

Installation/Operating Manual



Mat. No.:

Legal information/Copyright

Installation/Operating Manual Amacan K

Original operating manual

All rights reserved. The contents provided herein must neither be distributed, copied, reproduced, edited or processed for any other purpose, nor otherwise transmitted, published or made available to a third party without the manufacturer's express written consent.

Subject to technical modification without prior notice.

© KSB SE & Co. KGaA, Frankenthal 6/15/2018

Contents

Glossary	6
1 General	7
1.1 Principles	7
1.2 Installation of partly completed machinery.....	7
1.3 Target group.....	7
1.4 Other applicable documents.....	7
1.5 Symbols	7
1.6 Key to safety symbols/markings.....	8
2 Safety	9
2.1 General.....	9
2.2 Intended use	9
2.2.1 Prevention of foreseeable misuse.....	9
2.3 Personnel qualification and personnel training.....	9
2.4 Consequences and risks caused by non-compliance with these operating instructions.....	10
2.5 Safety awareness.....	10
2.6 Safety information for the operator/user.....	10
2.7 Safety information for maintenance, inspection and installation.....	10
2.8 Unauthorized modes of operation.....	11
2.9 Explosion protection	11
3 Transport/Temporary Storage/Disposal	12
3.1 Checking the condition upon delivery.....	12
3.2 Transport.....	12
3.2.1 Transporting the delivered pump set to the place of installation.....	12
3.2.2 Placing the pump set in a vertical or horizontal position	12
3.2.3 Transporting the pump set.....	14
3.3 Storage/preservation.....	15
3.4 Return to supplier.....	16
3.5 Disposal	16
4 Description of the Pump (Set)	17
4.1 General description	17
4.2 Designation.....	17
4.3 Name plate.....	17
4.4 Design details.....	18
4.5 Installation types	19
4.6 Configuration and function.....	19
4.7 Scope of supply.....	20
4.8 Dimensions and weights	20
5 Installation at Site	21
5.1 Safety regulations.....	21
5.2 Checks to be carried out prior to installation.....	21
5.2.1 Checking the structural requirements	21
5.2.2 Checking the operating data	21
5.2.3 Checking the lubricant of the mechanical seal	21
5.2.4 Checking the direction of rotation	23
5.3 Lowering the pump set into the discharge tube.....	24
5.3.1 Installing the pump set without support rope.....	25
5.3.2 Installing the pump set with a support rope	26
5.3.3 Installing the pump set with a support rope and support	29
5.4 Electrical system.....	34
5.4.1 Information for planning the control system	34
5.4.2 Connection to power supply	38

6	Commissioning/Start-up/Shutdown	41
6.1	Commissioning/start-up	41
6.1.1	Prerequisites for commissioning/start-up	41
6.1.2	Start-up	42
6.2	Operating limits	42
6.2.1	Operation on the power supply mains	42
6.2.2	Frequency of starts	43
6.2.3	Operation on a frequency inverter	43
6.2.4	Fluid handled	43
6.3	Shutdown/storage/preservation	45
6.3.1	Shutdown	45
6.3.2	Measures to be taken for shutdown	45
6.4	Returning to service	46
7	Servicing/Maintenance	47
7.1	Safety regulations	47
7.2	Maintenance/inspection	49
7.2.1	Inspection work	49
7.3	Removing the pump set	50
7.3.1	Removing the pump set	50
7.3.2	Drainage/cleaning	52
7.3.3	Checking the cable bundle	52
7.3.4	Checking the ground conductor	52
7.4	Lubrication and lubricant change	53
7.4.1	Lubricating the mechanical seal	53
7.4.2	Lubricating the rolling element bearings	56
7.5	Dismantling the pump set	56
7.5.1	General information/Safety regulations	56
7.5.2	Preparing the pump set	57
7.5.3	Removing the back pull-out unit	58
7.5.4	Removing the impeller	58
7.5.5	Removing the mechanical seal	59
7.5.6	Dismantling the motor section	60
7.5.7	Removing the cable gland with connection cable	61
7.6	Reassembling the pump set	62
7.6.1	General information/Safety regulations	62
7.6.2	Fitting the replacement cable gland	63
7.6.3	Reassembling the motor section	64
7.6.4	Installing the mechanical seals	65
7.6.5	Fitting the impeller	66
7.6.6	Installing the back pull-out unit	67
7.6.7	Leak testing	67
7.7	Checking the connection of motor/power supply	68
7.8	Tightening torques	68
7.9	Spare parts stock	69
7.9.1	Ordering spare parts	69
7.9.2	Recommended spare parts stock for 2 years' operation to DIN 24296	70
8	Trouble-shooting	71
9	Related Documents	73
9.1	General assembly drawing with list of components	73
9.1.1	Motor versions UE, XE	73
9.2	Detailed views	74
9.2.1	Cable gland	74
9.2.2	Bearing temperature sensor and leakage monitoring	75
9.3	Cable bundle	76
9.4	Wiring diagrams	78
9.4.1	Wiring diagram for one power cable 12G1.5 or 12G2.5	78
9.4.2	Wiring diagram for one power cable 7G4 + 5×1.5, 7G6 + 5×1.5 or 7G10 + 5×1.5	79

9.4.3	Wiring diagram for two power cables 7G6 and 8G1.5 (shielded version)	80
9.4.4	Wiring diagram for two power cables 4G16 and 8G1.5.....	81
9.4.5	Wiring diagram for three power cables 2×4GXX and 8G1.5 for pumps with optional bearing temperature monitoring	82
9.5	Flamepaths on explosion-proof motors.....	83
9.5.1	Motor version XE	83
9.6	Sectional drawings of the mechanical seal	84
9.6.1	Bellows-type mechanical seal.....	84
9.6.2	Mechanical seal with covered springs (HJ)	84
9.7	Dimensions.....	85
9.7.1	Motor version UE, XE [inch]	85
9.7.2	Motor version UE, XE [mm]	89
9.8	General arrangement drawings	93
9.8.1	Installation type BU, motor version UE, XE	93
9.8.2	Installation type BU, motor version UE, XE	95
9.8.3	Installation type CU, motor version UE, XE	97
9.8.4	Installation type CU, motor version UE, XE	100
9.8.5	Installation type DU, motor version UE, XE.....	103
9.8.6	Installation type DU, motor version UE, XE.....	106
10	Certificate of Decontamination.....	109
	Index	110

Glossary

Back pull-out unit

Pump without pump casing; partly completed machinery

Certificate of decontamination

If a product is to be returned to the manufacturer, the customer declares in a certificate of decontamination that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

Close-coupled design

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

Submersible pump in discharge tube

A submersible motor pump which is completely submerged and suspended in a discharge tube

1 General

1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The 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 center to maintain the right to claim under warranty.

1.2 Installation of partly completed machinery

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

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.3, Page 9)

1.4 Other applicable documents

Table 1: Overview of other applicable documents

Document	Contents
Data sheet	Description of the technical data of the pump (set)
Hydraulic characteristic curve	Characteristic curves showing head, NPSH required, efficiency and power input
General assembly drawing ¹⁾	Sectional drawing of the pump set
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
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

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

1.6 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

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



2 Safety

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

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

2.1 General

This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.

The safety information in all sections of this manual must be complied with.

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 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 which are 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 which are described 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 limits for continuous duty specified in the data sheet or product literature (Q_{\min} and Q_{\max}) (to prevent damage such as shaft fracture, bearing failure, mechanical seal damage, etc).
- Observe the minimum flow rates and maximum flow rates indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage, etc).
- Always operate the pump (set) in the direction of rotation it is intended for.

2.2.1 Prevention of foreseeable misuse

- Observe the minimum flow velocities required to fully open the swing check valves to prevent the reduction of pressure and risk of clogging. (Contact the manufacturer for the required minimum flow velocities/loss coefficients.)
- Never exceed the permissible operating limits and use limits specified in the data sheet or product literature regarding pressure, temperature, etc.
- Observe all safety information and instructions in this manual.

2.3 Personnel qualification and personnel 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 sufficiently trained specialist personnel training and instructing the personnel who will carry out the respective tasks. 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 these operating instructions

- 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 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 shutting down the pump does not increase potential risk, fit an emergency stop control device in the immediate vicinity of the pump (set) during pump set installation.

2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the pump (set) are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts/components authorized 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 is performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- Only perform work on the pump set when it has been disconnected from the power supply (de-energized).

- 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 45)
- 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 41)

2.8 Unauthorized modes of operation

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

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

2.9 Explosion protection

Special conditions apply to the operation of explosion-proof pumps.

- The explosion-proof status of the pump set is only assured if the pump set is used in accordance with its intended use.
- The limits stated in the data sheet and on the name plate must not be exceeded under any circumstances.
- Correct monitoring of the motor temperature is imperative to ensure explosion protection.
- Observe the wiring diagrams.
- Never operate an explosion-proof pump set without temperature monitoring.
- Modifications or alteration of the pump set could affect explosion protection and are only permitted after consultation with the manufacturer.
- Only original spare parts and accessories authorized by the manufacturer must be used for explosion-proof pumps.

3 Transport/Temporary Storage/Disposal

3.1 Checking the condition upon delivery

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

3.2 Transport

	DANGER
	<p>Improper transport Danger to life from falling parts! Damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Use the attachment point provided for attaching the lifting accessory. ▸ Never suspend the pump set by its power cable. ▸ Use the lifting chain/rope included in the scope of supply exclusively for lowering or lifting the pump set into/out of the pump sump. ▸ Securely attach the lifting chain/rope to the pump and crane. ▸ Use tested, marked and approved lifting accessories only. ▸ Observe the regional transport regulations. ▸ Observe the documentation of the lifting accessory manufacturer. ▸ The load-carrying capacity of the lifting accessories must exceed the weight indicated on the name plate of the pump set to be lifted. Take into account any additional system components to be lifted.

3.2.1 Transporting the delivered pump set to the place of installation

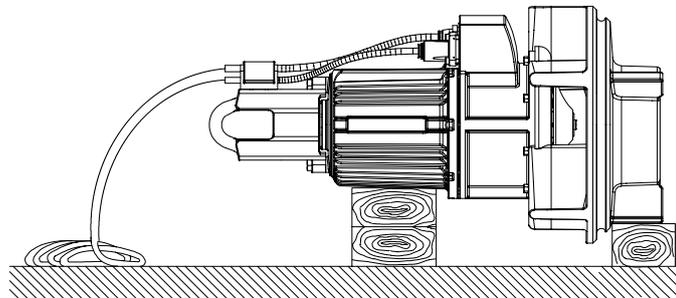


Fig. 1: Transporting the pump set in its original packaging

- The pump set is supplied in a horizontal position on a suitable transport support.
- Use suitable lifting equipment to transport the pump set in its original packaging to its place of installation.
 Observe the marked centers of gravity and/or attachment points on the transport boxes.
 For the weight refer to the name plate or data sheet.

3.2.2 Placing the pump set in a vertical or horizontal position

	WARNING
	<p>Pump set tilting Risk of squashing hands and feet!</p> <ul style="list-style-type: none"> ▸ Suspend or support the pump set.

	<p style="background-color: #f4a460; padding: 5px;">⚠ WARNING</p> <p>Placing down the pump set on unsecured and uneven surfaces Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Always place the pump set on a solid and level surface with the pump set in a vertical position and the motor on top. ▸ Only place the pump set on a surface of sufficient load-carrying capacity. ▸ Use appropriate means to secure the pump set against tilting or tipping over. ▸ Refer to the weights given in the data sheet / on the name plate.
	<p style="background-color: #f4a460; padding: 5px;">⚠ WARNING</p> <p>Incorrect handling of the power cable Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Secure power cables against falling down. ▸ Avoid power cables being laid on surfaces without fastening. ▸ When moving the pump set keep at a safe distance to the power cables.
	<p style="background-color: #f4a460; padding: 5px;">⚠ WARNING</p> <p>Improper handling when placing the pump set in a vertical/horizontal position Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Select suitable lifting equipment for the size of the pump. ▸ Use appropriate means to secure the pump set against tilting, tipping over or rolling off. ▸ Maintain a safe distance during lifting operations (load may swing when being lifted). ▸ Use additional supports for the transport holder to secure it against tilting.
	<p style="background-color: #f4a460; padding: 5px;">⚠ WARNING</p> <p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
	<p style="background-color: #f4d03f; padding: 5px;">CAUTION</p> <p>Improper storage Damage to the power cables!</p> <ul style="list-style-type: none"> ▸ Support the power cables at the cable entry to prevent permanent deformation. ▸ Only remove the protective caps from the power cables at the time of installation.

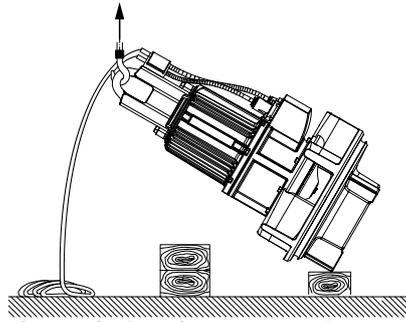


Fig. 2: Placing the pump set in an upright position

- ✓ Suitable lifting equipment has been selected.
 1. Attach the crane hook of the crane to the bail of the pump set.
 2. Lift the pump set with the lifting equipment (e.g. crane).
 - ⇒ Guiding the pump set over the edge of the pump casing inlet is only permissible on a wooden base!
 - ⇒ Protect the connection cable against kinking!
 3. Place the pump set on a level, clean surface and protect it against tilting or tipping over.

3.2.3 Transporting the pump set

	<p>⚠ WARNING</p>
	<p>Incorrect positioning/placing down Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Position the pump set vertically with the motor on top. ▷ Use appropriate means to secure the pump set against tilting and tipping over. ▷ Refer to the weights given in the data sheet/on the name plate.
	<p>⚠ WARNING</p>
	<p>Improper handling of the power cable when placing the pump set in a vertical position or transporting it Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Secure power cables against falling down.
	<p>⚠ WARNING</p>
	<p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
	<p>⚠ WARNING</p>
	<p>Improper handling when placing the pump set in a vertical/horizontal position Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Select suitable lifting equipment for the size of the pump. ▷ Use appropriate means to secure the pump set against tilting, tipping over or rolling off. ▷ Maintain a safe distance during lifting operations (load may swing when being lifted). ▷ Use additional supports for the transport holder to secure it against tilting.

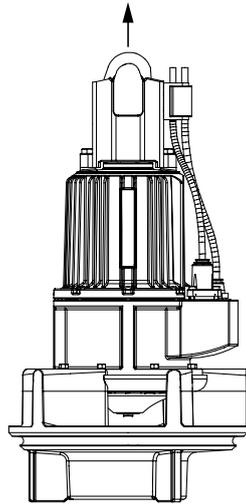


Fig. 3: Transporting the pump set in a vertical position

Use suitable lifting equipment to transport the pump set in the illustrated position.

3.3 Storage/preservation

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

Store the pump set as follows:

- In its original packaging: in a horizontal position
- Without packaging: in a vertical position with the motor on top

	<p>⚠ WARNING</p> <p>Pump set tilting Risk of squashing hands and feet!</p> <ul style="list-style-type: none"> ▷ Suspend or support the pump set.
	<p>CAUTION</p> <p>Improper storage Damage to the power cables!</p> <ul style="list-style-type: none"> ▷ Support the power cables at the cable entry to prevent permanent deformation. ▷ Only remove the protective caps from the power cables at the time of installation.
	<p>CAUTION</p> <p>Damage during storage due to humidity, dirt or vermin Corrosion/contamination of the pump (set)!</p> <ul style="list-style-type: none"> ▷ For outdoor storage cover the pump (set) or the packaged pump (set) and accessories with waterproof material.
	<p>CAUTION</p> <p>Wet, contaminated or damaged openings and connections Leakage or damage to the pump!</p> <ul style="list-style-type: none"> ▷ Clean and cover pump openings and connections as required prior to putting the pump into storage.

Table 4: Ambient conditions for storage

Ambient condition	Value
Relative humidity	5 % to 85 % (non-condensing)
Ambient temperature	-4 °F to 158 °F [-20 °C to +70 °C]

- Store the pump set under dry and vibration-free conditions, if possible in its original packaging.
- 1. Rotate the impeller by hand once every three months.
- 2. Spray-coat the inside wall of the pump casing, and in particular the impeller clearance areas, with a preservative.

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

3.4 Return to supplier

1. Drain the pump as per operating instructions. (⇒ Section 7.3.2, Page 52)
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 neutralized, 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.
Always indicate any safety measures and decontamination measures taken.
(⇒ Section 10, Page 109)

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

3.5 Disposal

	⚠ WARNING
	<p>Fluids handled, consumables and operating supplies which are hot or pose a health hazard</p> <p>Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled. ▷ 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 pump (set).
Collect greases and other lubricants during dismantling.
2. Separate and sort the pump 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.

4 Description of the Pump (Set)

4.1 General description

- Submersible pump in discharge tube

Pump set for handling river water and stormwater, pre-screened domestic and industrial waste water as well as activated sludge

4.2 Designation

Example: Amacan K 800-400 / 22 6 UE G - IE3

Table 5: Designation key

Code	Description	
Amacan	Type series	
K	Impeller type	
	K	Channel impeller
800	Nominal diameter of the discharge tube [mm]	
400	Nominal impeller diameter [mm]	
22	Motor size	
6	Number of motor poles	
UE	Motor version	
	UE	Without explosion protection
	XE	Explosion protection to NEC 500
G	Material variant	
	G	Impeller made of gray cast iron, standard variant
	G1	Like G, with impeller made of duplex stainless steel
IE3	Motor efficiency classification ²⁾	
	_3)	No efficiency classification
	IE2	High Efficiency
	IE3	Premium Efficiency

4.3 Name plate

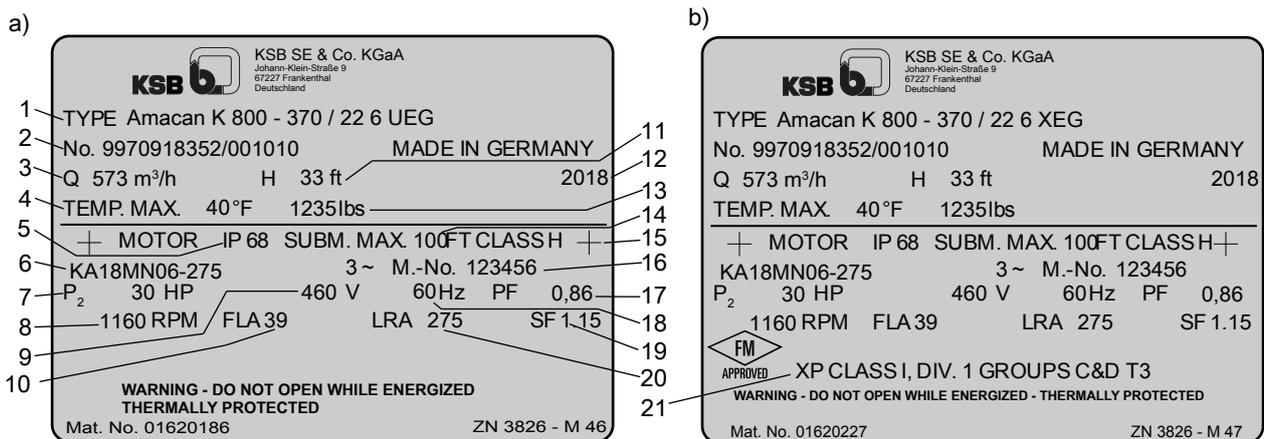


Fig. 4: Name plate (example) a) Standard pump set b) Explosion-proof pump set

- IEC 60034-30 standard not binding for submersible motor pumps. Efficiencies calculated/determined according to the measurement method specified in IEC 60034-2. The marking is used for submersible motors that achieve efficiency levels similar to those of standardized motors acc. to the IEC 60034-30 standard.
- Blank

1	Designation	2	KSB order number
3	Flow rate	4	Maximum fluid temperature and ambient temperature
5	Enclosure	6	Motor type
7	Rated power	8	Rated speed
9	Rated voltage	10	Rated current
11	Head	12	Year of construction
13	Total weight	14	Maximum submergence
15	Thermal class of winding insulation	16	Motor number
17	Power factor at rated operating point	18	Rated frequency
19	Service factor	20	Starting current
21	Explosion protection marking		

4.4 Design details

Design

- Fully floodable submersible pump in discharge tube (submersible motor pump)
- Not self-priming
- Close-coupled design
- Single-stage
- Vertical installation

Installation types

- Application-oriented installation types (⇒ Section 4.5, Page 19)

Drive

- Three-phase asynchronous squirrel-cage motor
- Motors integrated in explosion-proof pump sets are supplied in Explosionproof Class I Division 1, Groups C&D, T3.

Shaft seal

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

Impeller type

- Application-oriented impeller type

Bearings

Drive end:

- Grease-packed bearings sealed for life
- Maintenance-free

Pump end:

- Grease-packed bearings sealed for life
- Maintenance-free

4.5 Installation types

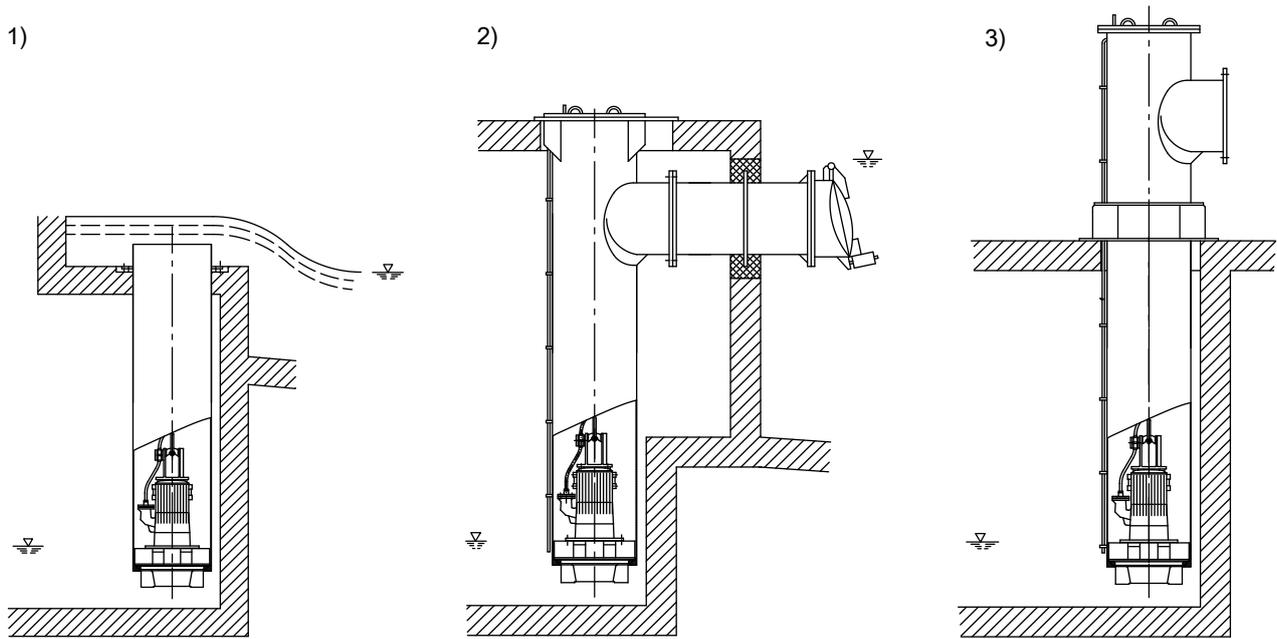


Fig. 5: Overview of installation types

1)	Installation type BU (overflow design)
2)	Installation type CU (underfloor discharge)
3)	Installation type DU (above-floor discharge nozzle)

4.6 Configuration and function

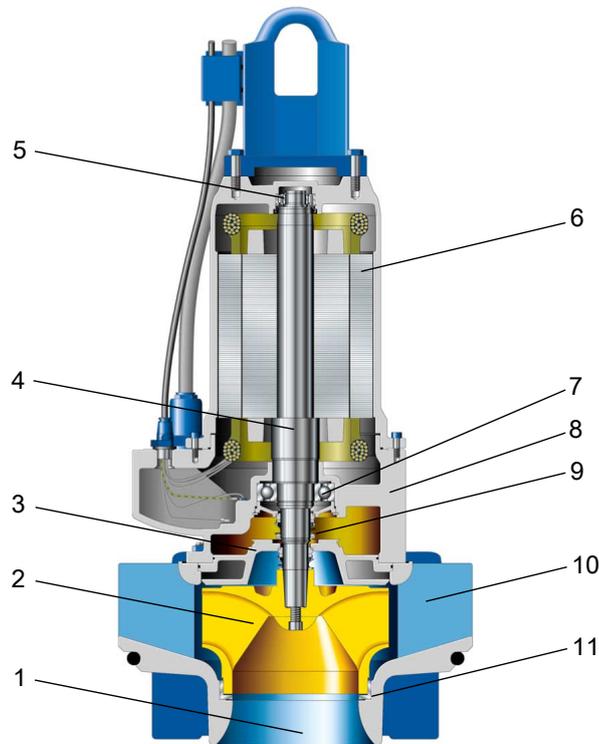


Fig. 6: Sectional drawing of an Amacan K

1	Inlet of the pump casing	7	Bearing, impeller end
2	Impeller	8	Bearing housing

3	Discharge cover	9	Shaft seal
4	Shaft	10	Pump casing
5	Bearing, drive end	11	Casing wear ring
6	Electric motor		

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

Function The fluid enters the pump axially via the inlet of the pump casing (1) and is accelerated outward in a radial flow by the rotating impeller (2). The required energy is transmitted from the electric motor (6) to the impeller (2) via the shaft (4). In the pump casing (10) the kinetic energy of the fluid is converted into pressure energy. The rotational movement diverts the fluid flow in axial direction. The casing wear ring (11) prevents any fluid from flowing back from the casing into the inlet of the pump casing. At the rear side of the impeller, the shaft enters the hydraulic system via the discharge cover (3). The shaft passage through the discharge cover is sealed to the fluid handled with a shaft seal (9). The shaft runs in rolling element bearings (5, 7), which are supported by a bearing housing (8) and motor housing.

Sealing The pump is sealed by two bi-directional mechanical seals in tandem arrangement. A lubricant chamber in-between the seals ensures cooling and lubrication of the mechanical seals.

Monitoring equipment The pump sets are equipped with various sensors.

Standard

- Temperature monitoring of the motor
- Leakage sensors in the motor

Option

- Temperature monitoring at the lower bearing

4.7 Scope of supply

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

- Pump set complete with power cables
- O-ring
- Back-up name plate

Optional accessories:

- Support rope
- Accessories for installing the cable guide:
 - Spacer
 - Turnbuckle
 - Support
 - Shackle
 - Cable clamps
- Cable support sleeves
- Discharge tube

4.8 Dimensions and weights

For dimensions and weights please refer to the name plate or data sheet of the pump set.

5 Installation at Site

5.1 Safety regulations

	<div style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</div> <p>Improper installation in potentially explosive atmospheres Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Comply with the applicable local explosion protection regulations. ▷ Observe the information given in the data sheet and on the pump/motor name plates.
	<div style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</div> <p>Persons in the intake chamber during pump set operation Electric shock! Risk of injury!</p> <ul style="list-style-type: none"> ▷ Never start up the pump set when there are persons in the intake chamber.
	<div style="background-color: #f1c40f; color: white; padding: 5px;">⚠ WARNING</div> <p>Impermissible solid objects (tools, screws/bolts or similar) in the pump sump/inlet tank during pump start-up Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Check the pump sump/inlet tank for impermissible solid objects before flooding, and remove, if necessary.

5.2 Checks to be carried out prior to installation

5.2.1 Checking the structural requirements

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

5.2.2 Checking the operating data

Before inserting the pump set into the discharge tube, verify the data on the name plate against the data given in the purchase order and the system data.

Back-up name plate

KSB's scope of supply includes a separate name plate attached to the end of the pump cable which indicates the pump and motor data.

1. Attach this name plate in a clearly visible position outside the discharge tube, e.g. at the control cabinet, pipeline or mounting bracket.

5.2.3 Checking the lubricant of the mechanical seal

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

The pump set is supplied in a horizontal position on a suitable transport support.

Visual inspection for signs of oil leakage

1. If no oil leakage is visible in the area of the pump casing, impeller and transport holder, the lubricant chamber is filled properly.
2. If oil leakage is visible in the area of the pump casing, impeller and transport holder, top up the lubricant chamber.

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

- ✓ Signs of oil leakage have been detected.
 1. Place the pump set in a vertical position. (⇒ Section 3.2.2, Page 12)
 2. Secure the pump set against tipping over.
 3. Unscrew and remove screw plug 903.03 with joint ring 411.03.
 4. Check the lubricant level.
 - ⇒ If the lubricant level reaches the opening, fit and tighten screw plug 903.03 with joint ring 411.03 again.
 - ⇒ If the lubricant level is below the opening, top up the lubricant. (⇒ Section 7.4.1.4.2, Page 55)
 5. Fit and tighten screw plug 903.03 with a new joint ring 411.03.

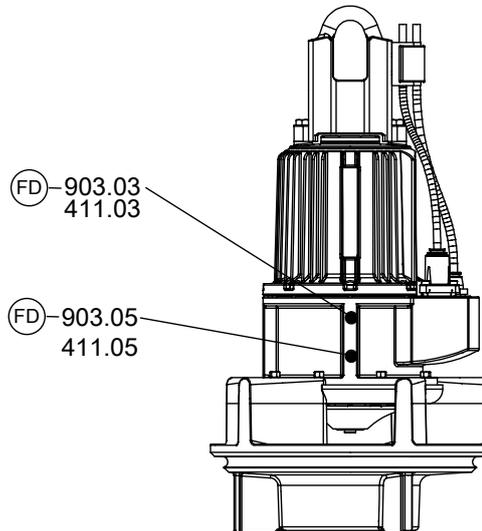


Fig. 7: Checking the lubricant level

903.03 411.03	Lubricant filler opening	903.05 411.05	Lubricant drain
------------------	--------------------------	------------------	-----------------

Table 6: Key to the symbols and codes

Symbol	Description
(FD)	Always apply a liquid sealing agent (e.g. Hylomar SQ32M) to sealing surfaces marked with this symbol.

	<p>NOTE</p>
	<p>If more than 1.5 liters of lubricant are required for topping up, this suggests a defect of the mechanical seals.</p>

5.2.4 Checking the direction of rotation

	<p>⚠ DANGER</p> <p>Pump set running dry Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Check the direction or rotation of explosion-proof pump sets outside potentially explosive atmospheres.
	<p>⚠ WARNING</p> <p>Improper handling when placing the pump set in a vertical/horizontal position Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Select suitable lifting equipment for the size of the pump. ▷ Use appropriate means to secure the pump set against tilting, tipping over or rolling off. ▷ Maintain a safe distance during lifting operations (load may swing when being lifted). ▷ Use additional supports for the transport holder to secure it against tilting.
	<p>⚠ WARNING</p> <p>Improper positioning of pump set when checking the direction of rotation Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use appropriate means to secure the pump set against tilting or tipping over.
	<p>⚠ WARNING</p> <p>Hands and/or foreign objects in the pump casing Risk of injuries, damage to the pump!</p> <ul style="list-style-type: none"> ▷ Never insert your hands or any other objects into the pump. ▷ Check that the inside of the pump is free from any foreign objects. ▷ Take suitable precautions (e.g. wear safety goggles).
	<p>CAUTION</p> <p>Pump set running dry Increased vibrations! Damage to mechanical seals and bearings!</p> <ul style="list-style-type: none"> ▷ Never operate the pump set for more than 60 seconds outside the fluid to be handled.

Check the direction of rotation before installing the pump set, i.e. in dry condition.

1. Place the pump set in a vertical position on a level surface and secure it sufficiently against tipping over.
2. Connect the pump set to the power supply and start it up.
3. Use one of the following options to check the direction of rotation:
 - ⇒ 1. When looking at the pump casing from the side, the impeller must turn in clockwise direction.
 - ⇒ 2. Verify the direction of rotation of the impeller against the arrow indicating the direction of rotation on the bearing bracket/bearing housing.
4. If the impeller rotates in the wrong direction of rotation, check and correct the electrical connection and the control system if applicable. Then check the direction of rotation again.

5. If the direction of rotation is correct, mark which core ends match which of the terminals in the control cabinet.
6. Disconnect the pump set from the power supply and secure it against unintentional start-up.

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

5.3 Lowering the pump set into the discharge tube

	<p>⚠ DANGER</p>
	<p>Improper transport Danger to life from falling parts! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Use the attachment point provided for attaching the lifting accessory. ▷ Never suspend the pump set by its power cable. ▷ Use the lifting chain/rope included in the scope of supply exclusively for lowering or lifting the pump set into/out of the pump sump. ▷ Securely attach the lifting chain/rope to the pump and crane. ▷ Use tested, marked and approved lifting accessories only. ▷ Observe the regional transport regulations. ▷ Observe the documentation of the lifting accessory manufacturer. ▷ The load-carrying capacity of the lifting accessories must exceed the weight indicated on the name plate of the pump set to be lifted. Take into account any additional system components to be lifted.

	<p>⚠ DANGER</p>
	<p>Improper installation in potentially explosive atmospheres Explosion hazard! Damage to the submersible mixer!</p> <ul style="list-style-type: none"> ▷ Comply with the applicable local explosion protection regulations. ▷ Observe the information given in the data sheet and on the name plate.

	<p>⚠ WARNING</p>
	<p>Incorrect handling of the power cable Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Secure power cables against falling down. ▷ Avoid power cables being laid on surfaces without fastening. ▷ When moving the pump set keep at a safe distance to the power cables.

	<p>⚠ WARNING</p>
	<p>People falling into the unsecured discharge tube Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Take suitable precautions during the entire installation/dismantling process to protect people from falling into the open discharge tube. ▷ Fence off the work area appropriately.

5.3.1 Installing the pump set without support rope

	<p>CAUTION</p>
	<p>Incorrect installation Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Verify that the pump set sits correctly on the bottom of the discharge tube.

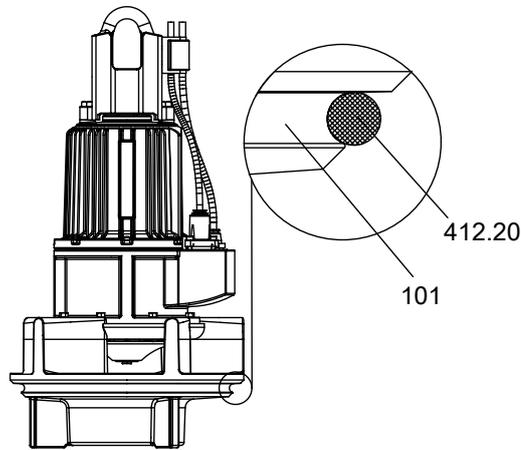


Fig. 8: Inserting the O-ring

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

1. If O-ring 412.20 is supplied but not fitted, insert it into pump casing 101.
2. Attach the crane hook to the bail of the pump set.
3. Center the pump set above the discharge tube. Slowly lower the pump set into the discharge tube until it is seated in the recommended position.
4. Pull the electric cables up by hand. Fasten them to the sump construction with a cable support sleeve if required. Do not lift the pump set out of its seat.

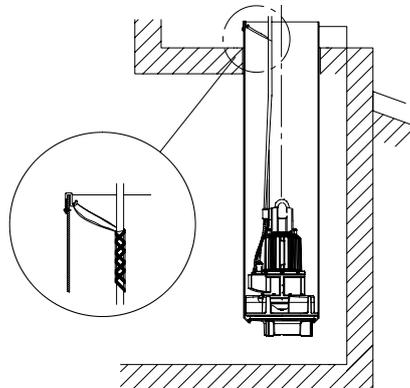


Fig. 9: Fastening the cable support sleeve

5.3.2 Installing the pump set with a support rope

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

Prior to installing the pump set, visually inspect the support rope. Do not exceed the permissible load-carrying capacity.

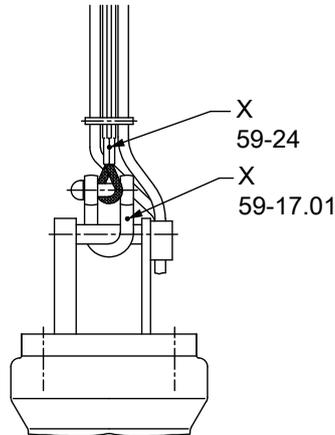
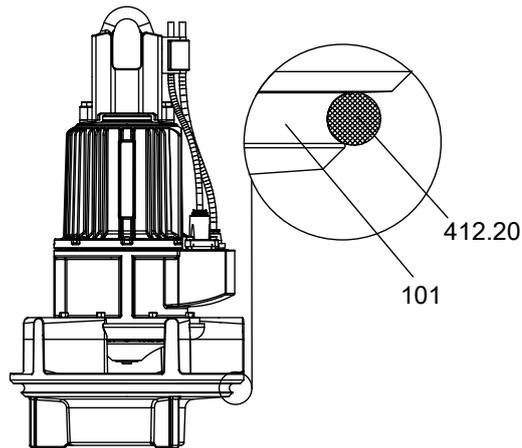


Fig. 10: X = indication of load-carrying capacity

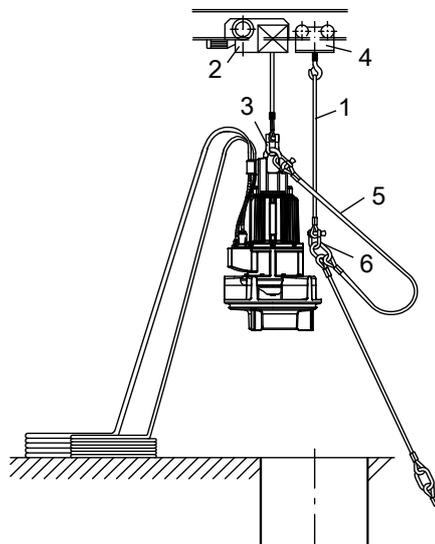
59-24	Support rope
59-17.01	Shackle

	<p>CAUTION</p>
	<p>Incorrect installation Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Verify that the pump set sits correctly on the bottom of the discharge tube.
	<p>WARNING</p>
	<p>Pump set drops during the installation or removal process Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Never use the turnbuckle, shackle or discharge tube cover to lift the pump set. ▷ Always use lifting lug 59-47.
	<p>NOTE</p>
	<p>Prior to fitting the turnbuckle, check that the corresponding split pin has not been cracked and/or chipped. If damaged, always use a new split pin.</p>

- ✓ Suitably sized lifting equipment is available.
- ✓ The support rope has been visually inspected.
- ✓ The split pin of the turnbuckle has been checked for any damage.


Fig. 11: Inserting the O-ring

1. If O-ring 412.20 is supplied but not fitted, insert it into pump casing 101.


Fig. 12: Lifting and positioning the pump set

2. Secure the lifting chain or lifting rope (1) to the trolley (4) of the lifting equipment (2).
3. Attach the support rope (5) to the bail by its shackle.
For a galvanized shackle, secure the pin at the shackle with Loctite 243.
For a stainless steel shackle, undo and tighten the pin twice and secure it with Loctite 243.
4. Check that the support rope is arranged correctly.
⇒ The free lifting lug (6) has to point away from the pump set
5. Partially unwind the support rope and cables.
6. Lower the pump set into the discharge tube until the bail is in an accessible position, protruding from the discharge tube.
7. Securely cover the discharge tube except for a gap which allows work to continue.
8. Attach the first lifting lug of the support rope (5) to the lifting rope (1) to securely position the pump set above the discharge tube.
9. Unclip the hook of the lifting equipment from the lifting lug of the support rope and run the lifting equipment to a higher level.

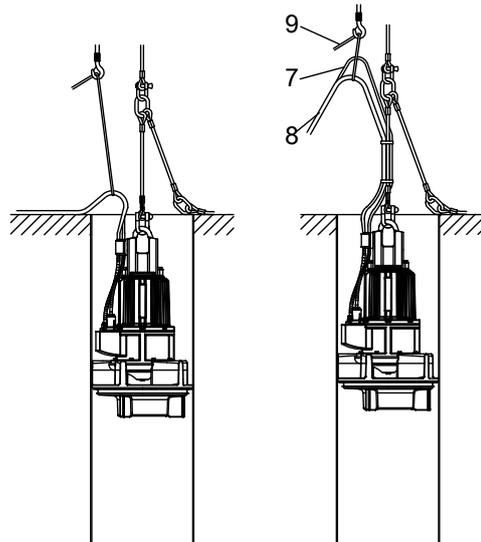


Fig. 13: Securing the control cable and power cables

10. Secure the control cable (7) and power cables (8) to the crane hook (3) of the lifting equipment with a manila rope (9).
11. Trim spacer (a) to fit between the two ferrules.

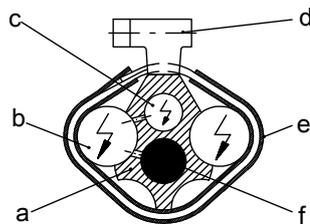


Fig. 14: Cross-section of the cable guide

12. Insert the support rope (f) and the control cable (c) into the spacer (a) and make sure that they are in their respective ducts.
13. Tighten the electric cables with the manila rope running over the crane hook.
14. Insert the power cables (b) into the hollows of the spacer (a).
15. Starting from the bottom, firmly clamp the power cables with cable clamps (d) covered by a plastic sheath (e).
16. In the area of the lifting lug between the rope sections, lay all electric cables in loops and fasten them to the rope section above.
17. Progressively lower the pump set into the discharge tube while securing the cable bundle with evenly spaced sheathed cable clamps.
18. Fit a heat shrink tube on any protruding sharp-edged rope ends (e.g. at the ferrule) to prevent any damage to the power cables and control cable.

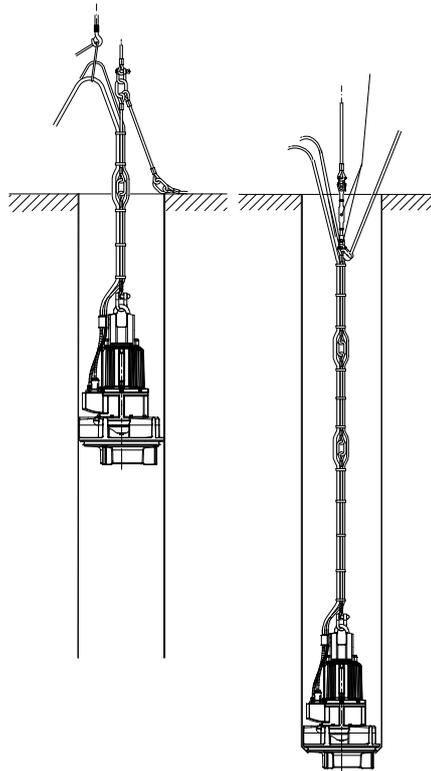


Fig. 15: Lowering the pump set

19. Finally, attach the support rope with shackle and turnbuckle to a suspension loop (provided in the discharge tube or structure). Secure the turnbuckle with a split pin. After inserting the split pin, bend over its two legs.
20. Tighten the turnbuckle until the cables are tight but do not lift the pump off its seat.
21. Unclip the hook of the lifting equipment from the lifting lug, free the electric cables from the manila rope and route them to the control cabinet.
22. Attach the top loose lifting lug to the cable bundle to prevent noise and wear caused by chafing.
23. Remove the safety cover from the discharge tube and mount the discharge tube cover.
24. Seal the cable entries if any.

5.3.3 Installing the pump set with a support rope and support

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

Prior to installing the pump set, visually inspect the support rope. Do not exceed the permissible load-carrying capacity.

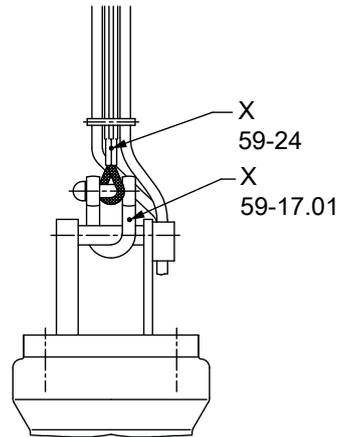


Fig. 16: X = indication of load-carrying capacity

59-24	Support rope
59-17.01	Shackle

	<p>CAUTION</p>
	<p>Incorrect installation Damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Verify that the pump set sits correctly on the bottom of the discharge tube.
	<p>WARNING</p>
	<p>Pump set drops during the installation or removal process Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Never use the turnbuckle, shackle or discharge tube cover to lift the pump set. ▸ Always use lifting lug 59-47.
	<p>NOTE</p>
	<p>Prior to fitting the turnbuckle, check that the corresponding split pin has not been cracked and/or chipped. If damaged, always use a new split pin.</p>

- ✓ Suitably sized lifting equipment is available.
- ✓ The support has been supplied pre-assembled and is available for use.
- ✓ The support rope has been visually inspected.
- ✓ The split pin of the turnbuckle has been checked for any damage.

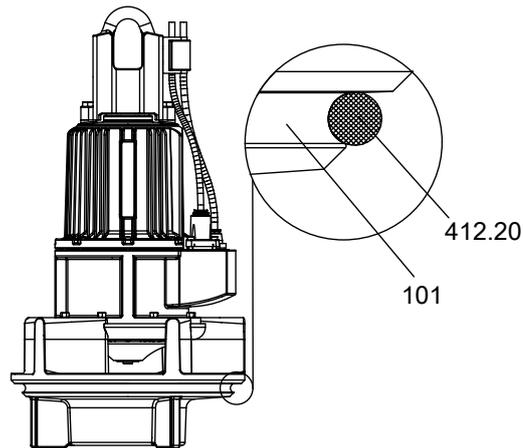


Fig. 17: Inserting the O-ring

1. If O-ring 412.20 is supplied but not fitted, insert it into pump casing 101.

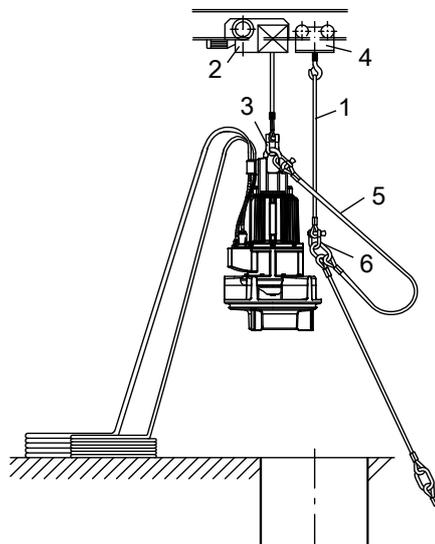


Fig. 18: Lifting and positioning the pump set

2. Secure the lifting chain or lifting rope (1) to the trolley (4) of the lifting equipment (2).
3. Attach the support rope (5) to the bail by its shackle.
4. Check that the support rope is arranged correctly.
 - ⇒ The free lifting lug (6) has to point away from the pump set
5. Partially unwind the support rope and electric cables.
6. Lower the pump set into the discharge tube until the bail is in an accessible position, protruding from the discharge tube.
7. Securely cover the discharge tube except for a gap which allows work to continue.
8. Attach the first lifting lug of the support rope (5) to the lifting rope (1) to securely position the pump set above the discharge tube.
9. Unclip the hook of the lifting equipment from the lifting lug of the support rope and run the lifting equipment to a higher level.

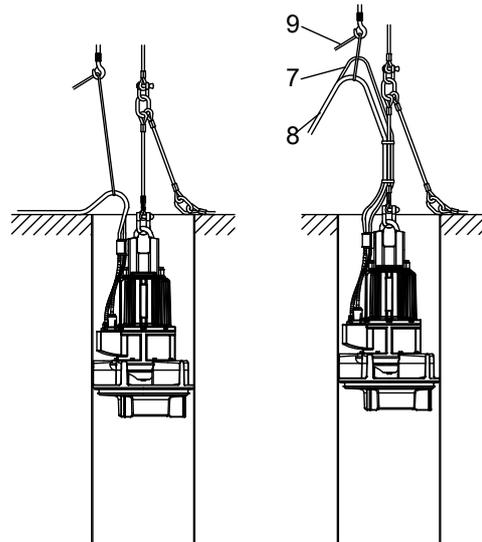


Fig. 19: Securing the control cable and power cables

10. Secure the control cable (7) and power cables (8) to the crane hook (3) of the lifting equipment with a manila rope (9).
11. Trim spacer (a) to fit between the two ferrules.

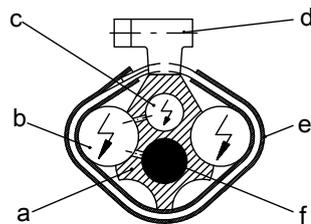


Fig. 20: Cross-section of the cable guide

12. Insert the support rope (f) and the control cable (c) into the spacer (a) and make sure that they are in their respective ducts.
13. Tighten the electric cables with the manila rope running over the crane hook.
14. Insert the power cables (b) into the hollows of the spacer (a).
15. Starting from the bottom, firmly clamp the power cables with cable clamps (d) covered by a plastic sheath (e).
16. Progressively lower the pump set into the discharge tube while securing the cable bundle with evenly spaced sheathed cable clamps.
17. In the area of the lifting lug between the rope sections, lay all electric cables in loops and fasten them to the rope section above.
18. Fit a heat shrink tube on any protruding sharp-edged rope ends (e.g. at the ferrule) to prevent any damage to the power cables and control cable.
19. Trim the spacer (a) to suit the position of support 59-7 at the support rope (f) and the type of installation. Insert the support rope and control cable (c).
20. Insert the power cables (b) into the hollows of the spacer (a) and firmly clamp the power cables with cable clamps (d).

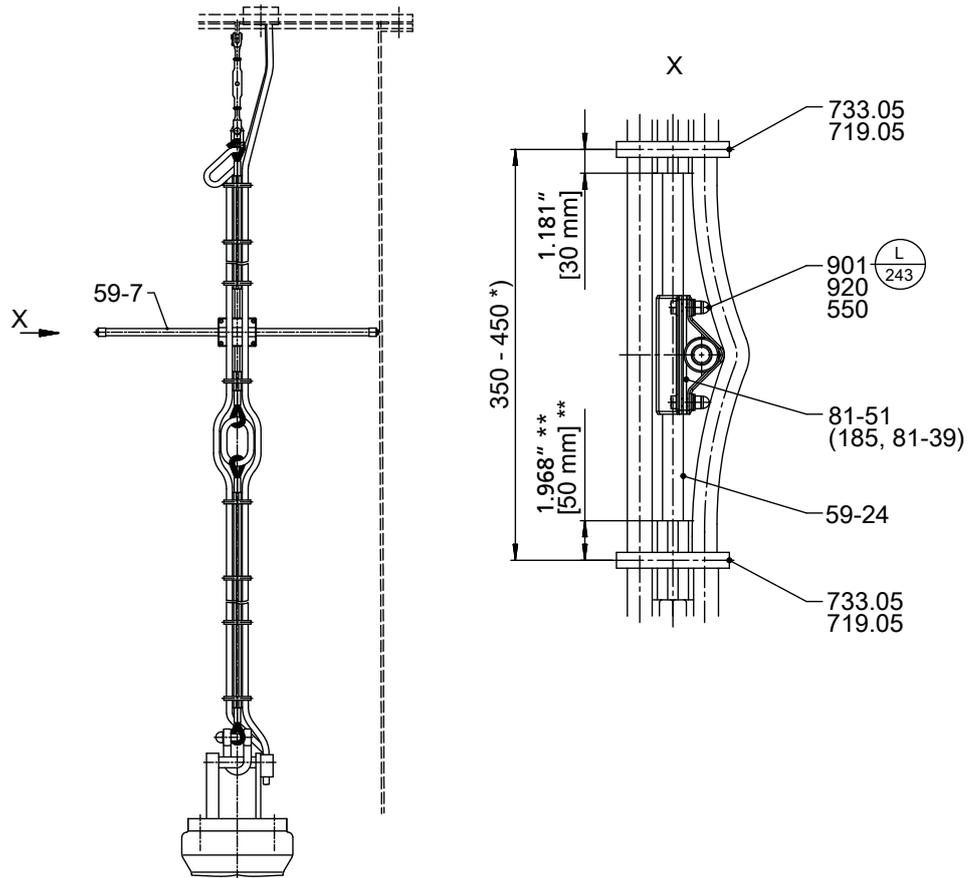


Fig. 21: Support rope with support, dimensions in [mm]

*) Depending on the cable cross-section,

***) For 1 rope or 3 ropes = 1.181 inch [30 mm]

Table 7: Key to the symbols and codes

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

21. Clamp support 59-7 with clamping element 81-51 to the support rope (f).
22. Undo the screwed connection at clamping element 81-51.
23. Place clamp 81-39 of the clamping element around the support rope.
24. Fasten plate 185 and clamp 81-39 of the GFRP rod to rope clamp 81-39 with hexagon head bolts 901, discs 550 and cap nuts 920. Tighten the connection and secure it with Loctite 243.

	NOTE
	The support must be firmly clamped to the support rope, and the GFRP rod must be firmly clamped to the support. If necessary, pad out clamps 81-39.

25. Trim the spacer to fit between the two ferrules and accommodate the support.
26. Guide the power cables and control cable along the support to the next cable clamp. Pull them taut and secure them with the clamp.

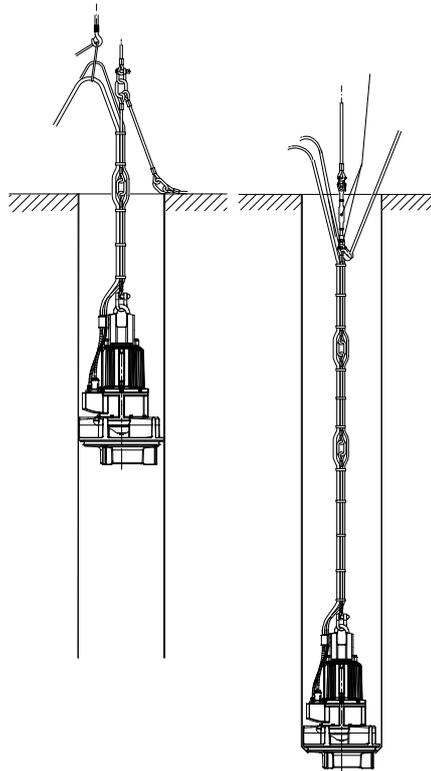


Fig. 22: Lowering the pump set

27. Progressively lower the pump set into the discharge tube. Secure the cable bundle with cable clamps.
28. Finally, attach the support rope with shackle and turnbuckle to a suspension loop (provided in the discharge tube or structure). Secure the turnbuckle with a split pin. After inserting the split pin, bend over its two legs.
29. Tighten the turnbuckle until the cable bundle is tight but does not lift the pump off its seat.
30. Unclip the hook of the lifting equipment from the lifting lug, free the electric cables from the manila rope and route them to the control cabinet.
31. Attach the top loose lifting lug to the cable bundle to prevent noise and wear caused by chafing.
32. Remove the safety cover from the discharge tube and mount the discharge tube cover.
33. Seal the cable entries if any.

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 9.4, Page 78)



NOTE

When laying a cable between the control system and the pump set's connection point, make sure the number of cores for the sensors is sufficient. A minimum cross-section of AWG 15 [1.5 mm²] is required.

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

5.4.1.1 Starting method

The pump set is wired for DOL starting. Star-delta starting is technically possible. This excludes:

- Pump sets with two power cables 4G16 and 8G1.5 (⇒ Section 9.4.4, Page 81)

For reducing the starting current autotransformers or soft starters can be used. For selecting suitable devices observe the rated current of the motor.

At least three times the rated current is required for reliable start-up. The run-up time must not exceed 4 seconds.

After start-up of the pump, a soft starter must always be bypassed.

5.4.1.2 Overload protection

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

5.4.1.3 Level control

	⚠ DANGER
	<p>Pump set running dry Explosion hazard!</p> <ul style="list-style-type: none"> ▸ Never allow an explosion-proof pump set to run dry.
	CAUTION
	<p>Fluid level below the specified minimum Damage to the pump set by cavitation!</p> <ul style="list-style-type: none"> ▸ Never allow the fluid level to drop below the specified minimum.

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

5.4.1.4 Operation on a frequency inverter

The pump set is suitable for operation on a frequency inverter as per IEC 60034-17.

	⚠ DANGER
	<p>Operation outside the permitted frequency range Explosion hazard!</p> <ul style="list-style-type: none"> ▸ Never operate an explosion-proof pump set outside the specified range.
	⚠ DANGER
	<p>Incorrect selection and setting of the frequency inverter Explosion hazard!</p> <ul style="list-style-type: none"> ▸ 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 nominal current
- Only voltage intermediate-circuit 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.
- Start-up** Observe the following instructions for starting up a frequency inverter:
 - Ensure short start ramps (maximum 5 seconds).
 - Only start speed-controlled operation after 2 minutes at the earliest. Pump start-up with long start ramps and low frequency may cause clogging.
- Operation** Observe the following limits when operating the pump set on a frequency inverter:
 - Only utilize up to 95 % of the motor rating P_2 indicated on the name plate.
 - Frequency range 30 to 60 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 analyzing devices must be selected. This applies in particular to the leakage sensor inside the motor.

5.4.1.5 Sensors

	<p>⚠ DANGER</p>
	<p>Operating an incompletely connected pump set Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Never start up a pump set with incompletely connected power cables or non-operational monitoring devices.
	<p>CAUTION</p>
	<p>Incorrect connection Damage to the sensors!</p> <ul style="list-style-type: none"> ▸ Observe the limits stated in the following sections of this manual when connecting the sensors.

The pump set features sensors that avoid hazards and damage to the pump set. Measuring transducers are required for analyzing the sensor signals supplied. Suitable devices for 230 V AC can be supplied by KSB.

	<p>NOTE</p>
	<p>Reliable and safe operation of the pump within the scope of our warranty is only possible if the sensor signals are properly analyzed as stipulated in this manual.</p>

All sensors are located inside the pump set and are connected to the power cable. For information on wiring and core identification please refer to the wiring diagrams. The individual sensors and the limit values to be set are described in the following sections.

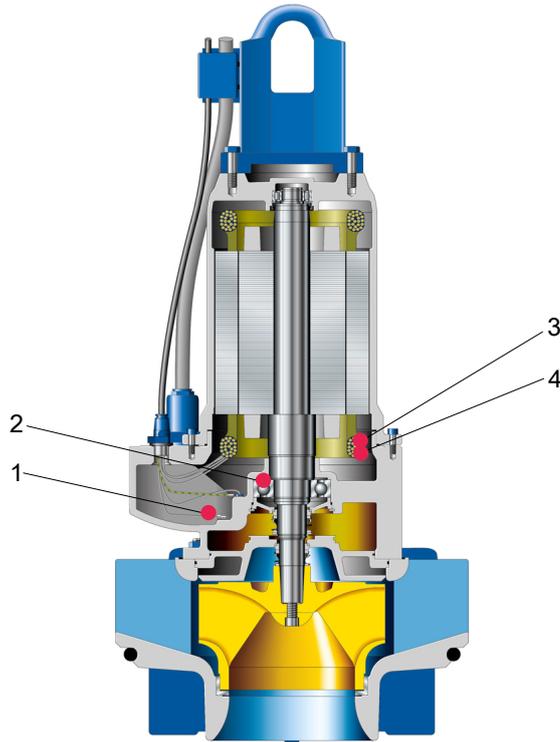


Fig. 23: Sensor positions

Position	Sensor	Standard	Optional
		Motor versions UE, XE	
1	Leakage inside the motor (connection and winding space)	X	-
2	Bearing temperature (lower bearing assembly)	-	X
3	Motor temperature (bimetal)	X	-
4	Motor temperature (PTC)	X	-

5.4.1.5.1 Motor temperature

	 DANGER
	<p>Insufficient cooling Explosion hazard! Winding damage!</p> <ul style="list-style-type: none"> ▷ Never operate a pump set without operational temperature monitoring. ▷ For explosion-proof pump sets use a thermistor tripping unit with manual reset.

The pump set features double monitoring of the winding temperature. Two bimetal switches (terminals 21 and 22, max. 250 V AC/2 A) serve as temperature control devices which open when the winding temperature is too high. Opening of the contacts must result in the pump set cutting out. Automatic re-starting is permissible.

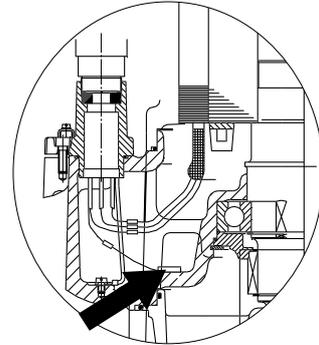
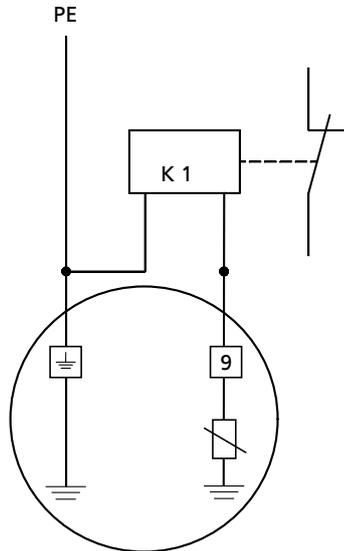
For explosion-proof pump sets, the three additional, series-connected (PTC) thermistors with terminals 10 and 11 must be used. They must be combined with a thermistor tripping unit with manual reset.

Resistance thermometer (Pt100)

As an option, in addition to the above, the motor can be fitted with resistance thermometers (Pt100) in the winding. These can be used for reading the motor temperature (sensor circuit maximum 6 V/2 mA).

5.4.1.5.2 Leakage inside the motor

	<p>⚠ DANGER</p>
	<p>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.</p>



Wiring of the electrode relay (standard) Position of the electrodes in the motor housing

An electrode fitted inside the motor monitors the winding space (B2) for leakage. This electrode must be connected to an electrode relay (core marked 9). Tripping of the electrode relay must result in the pump set cutting out.

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

- Sensor circuit 10 to 30 V AC
- Tripping current ≤ 0.5 mA

5.4.1.5.3 Bearing temperature

As an option, the pump set can be supplied with temperature monitoring in the area of the lower bearing assembly. Check in the data sheet whether the pump set is equipped with bearing temperature monitoring.

The bearing temperature sensor is a Pt100 resistance thermometer. It has to be connected to a temperature control device with a Pt100 input and 2 separate outputs for two different switching points (sensor circuit maximum 6 V/2 mA).

Set the following limits:

- Alert at 230 °F [110 °C]
- Cut-out of the pump set at 266 °F [130 °C]

5.4.2 Connection to power supply

	<p>⚠ DANGER</p>
	<p>Electrical connection work by unqualified personnel Danger of death from electric shock! ▷ Always have the electrical connections installed by a trained electrician. ▷ Observe IEC 60364 regulations as well as any locally applicable regulations.</p>

	<p>⚠ WARNING</p> <p>Incorrect connection to the mains Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▷ Observe the technical specifications of the local energy supply companies.
	<p>CAUTION</p> <p>Improper routing of power cables Damage to the power cables!</p> <ul style="list-style-type: none"> ▷ Never move the power cables at temperatures below -13 °F [-25 °C]. ▷ Never kink or crush the power cables. ▷ Never lift the pump set by the power cables. ▷ Adjust the length of the power cables to the site requirements.
	<p>CAUTION</p> <p>Motor overload Damage to the motor!</p> <ul style="list-style-type: none"> ▷ Protect the motor by a thermal time-lag overload protection device in accordance with IEC 60947 and local regulations.
<p>For the electrical connection of the pump set observe the wiring diagrams (⇒ Section 9.4, Page 78) in the Annex and the information for planning the control system .</p> <p>The pump set is supplied complete with connection cables. Always use all cables provided and connect all marked cores of the control cable.</p>	
	<p>⚠ DANGER</p> <p>Incorrect connection Explosion hazard!</p> <ul style="list-style-type: none"> ▷ The connection point of the cable ends must be located outside hazardous areas or in an area approved for electrical equipment.
	<p>⚠ DANGER</p> <p>Operating an incompletely connected pump set Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Never start up a pump set with an incompletely connected power cable or non-operational monitoring devices.
	<p>⚠ DANGER</p> <p>Using damaged power cables Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▷ Never connect damaged power cables. ▷ Visually inspect the power cable before connecting it. ▷ Replace the power cable, if it is damaged.

	CAUTION
	<p>Flow-induced motion Damage to the power cable!</p> <p>▷ Run the power cable upwards without slack.</p>

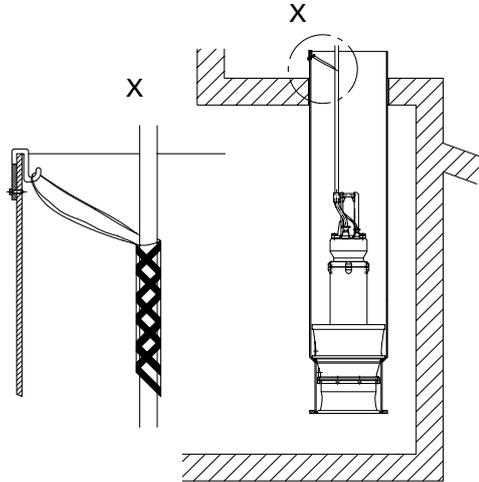


Fig. 24: Fastening the power cable

1. Run the power cables directly upwards without slack, and fasten.
2. Only remove the protective caps from the power cables immediately before connecting the cables.
3. If necessary, adjust the length of the power cables to the site requirements.
4. After shortening the cables, correctly re-affix the markings of the individual cores at the cable ends.

Potential equalization The pump set does not have an external PE connection (risk of corrosion).

	 DANGER
	<p>Incorrect connection Explosion hazard!</p> <p>▷ Explosion-proof pump sets installed in a tank must never be retrofitted with an external potential equalization connection!</p>

	 DANGER
	<p>Touching the pump set during operation Electric shock!</p> <p>▷ Make sure that the pump set cannot be touched during operation.</p>

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/start-up

6.1.1 Prerequisites for commissioning/start-up

	<p style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</p> <p>Persons in the tank during pump operation Electric shock! Risk of personal injury! Danger of death from drowning!</p> <ul style="list-style-type: none"> ▷ Never start up the pump set without special protective equipment when there are persons in the tank. ▷ If persons come into contact with the fluid handled during pump operation (e.g. in sports facilities and leisure parks), the plant designer/operator must comply with the legal requirements. ▷ Provide special electrical and mechanical protective devices in compliance with legal provisions and regulations.
	<p style="background-color: #f1c40f; color: white; padding: 5px;">⚠ WARNING</p> <p>People falling into the unsecured discharge tube Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Take suitable precautions during the entire installation/dismantling process to protect people from falling into the open discharge tube. ▷ Fence off the work area appropriately.

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

- The lubricant has been checked.
- The direction of rotation has been checked.
- The pump set has been properly connected to the electric power supply and is equipped with all protection devices.
- The pump set has been installed in the discharge tube as described in this manual.
- The minimum fluid level has been reached.
- After prolonged shutdown of the pump (set), the activities required for returning the pump (set) to service have been carried out. (⇒ Section 6.4, Page 46)
- Safety-relevant protective equipment must be installed and fully functional.

6.1.2 Start-up

	 DANGER
	<p>Persons in the tank during pump operation Electric shock! Risk of personal injury! Danger of death from drowning!</p> <ul style="list-style-type: none"> ▷ Never start up the pump set without special protective equipment when there are persons in the tank. ▷ If persons come into contact with the fluid handled during pump operation (e.g. in sports facilities and leisure parks), the plant designer/operator must comply with the legal requirements. ▷ Provide special electrical and mechanical protective devices in compliance with legal provisions and regulations.

	CAUTION
	<p>Re-starting while motor is still running down Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Do not re-start the pump set before it has come to a standstill. ▷ Never start the pump set while the pump is running in reverse.

✓ The fluid level is sufficiently high.

	CAUTION
	<p>Start-up against a closed shut-off element Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Never start up the pump set against a closed shut-off element.

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

6.2 Operating limits

	 DANGER
	<p>Non-compliance with operating limits Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Comply with the operating data indicated in the data sheet. ▷ Avoid operation below Q_{min}. ▷ 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.

6.2.1 Operation on the power supply mains

	 DANGER
	<p>Non-compliance with permissible supply voltage tolerances Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Never operate an explosion-proof pump (set) outside the specified range.

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

6.2.2 Frequency of starts

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

To prevent high temperature increases in the motor and excessive loads on the motor, sealing elements and bearings, the frequency of starts shall not exceed 6 starts per hour.

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

	CAUTION
	<p>Re-starting while motor is still running down Damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Do not re-start the pump set before it has come to a standstill. ▸ Never start the pump set while the pump is running in reverse.

6.2.3 Operation on a frequency inverter

	⚠ DANGER
	<p>Operation outside the permitted frequency range Explosion hazard!</p> <ul style="list-style-type: none"> ▸ 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 30 to 60 Hz.

6.2.4 Fluid handled

6.2.4.1 Temperature of the fluid handled

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

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

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

6.2.4.2 Density of the fluid handled

The power input of the pump changes in proportion to the density of the fluid handled.

	CAUTION
	<p>Impermissibly high density of fluid handled Motor overload!</p> <ul style="list-style-type: none"> ▷ Observe the information on fluid density in the data sheet. ▷ Make sure the motor has sufficient power reserves.

6.2.4.3 Minimum level of fluid handled

	! DANGER
	<p>Pump set running dry Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Never allow an explosion-proof pump set to run dry.

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

The pump set is ready for operation when the fluid level has reached dimension "t₁" as a minimum.

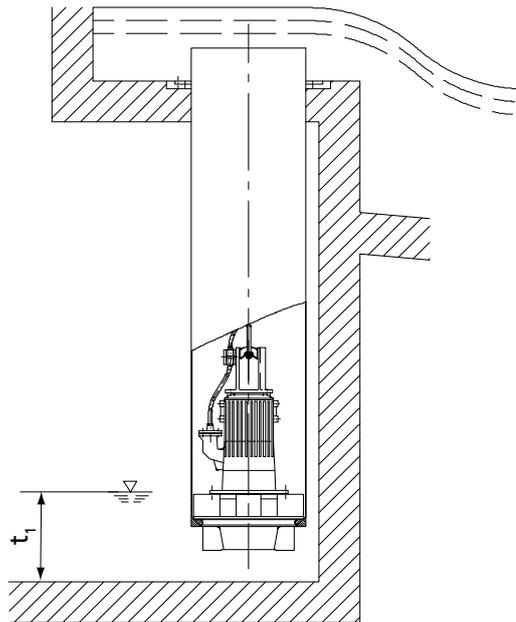


Fig. 25: Minimum level of fluid handled

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 shaft seal is to be expected. In this case, reduce the commonly recommended inspection intervals.

6.3 Shutdown/storage/preservation

6.3.1 Shutdown

	CAUTION
	<p>Uncontrolled backflow of the fluid from the riser Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Prevent any uncontrolled backflow of the fluid handled with suitable means. ▷ Control the fluid backflow, e.g. by throttling the gate valve in the discharge line.

6.3.2 Measures to be taken for shutdown

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

The pump set remains installed

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

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

- ✓ All safety regulations are observed.
 1. Clean the pump set.
 2. Spray-coat the inside wall of the pump casing and, in particular, the impeller clearance areas with a preservative.

6.4 Returning to service

For returning the pump set to service, observe the items on commissioning/start-up. (⇒ Section 6.1, Page 41)

Refer to and comply with the operating limits.

For returning the pump set to service after storage also follow the instructions for maintenance/inspection. (⇒ Section 7.2, Page 49)

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

7 Servicing/Maintenance

7.1 Safety regulations

The operator ensures that all maintenance, all inspections and all installation work is performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.

	<p>⚠ DANGER</p> <p>Sparks produced during maintenance work Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Observe the safety regulations in force at the place of installation. ▷ Never open a pump set that is connected to the power supply. ▷ Always perform maintenance work on pump sets outside potentially explosive atmospheres.
	<p>⚠ DANGER</p> <p>Improperly serviced pump set Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Service the pump set regularly. ▷ Prepare a maintenance schedule with special emphasis on lubricants, shaft seal and coupling.
	<p>⚠ DANGER</p> <p>Electrical connection work by unqualified personnel Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▷ Always have electrical connection work carried out by a trained electrician. ▷ Observe the provisions of the EN 60079 standard.
	<p>⚠ DANGER</p> <p>Risk of falling when working at great heights Danger to life by falling from great heights!</p> <ul style="list-style-type: none"> ▷ 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 occupational safety regulations and accident prevention regulations.
	<p>⚠ WARNING</p> <p>Unintentional starting of pump set Risk of injury by moving components and shock currents!</p> <ul style="list-style-type: none"> ▷ Make sure that the pump set cannot be started up unintentionally. ▷ Always make sure the electrical connections are disconnected before carrying out work on the pump set.

	<p>⚠ WARNING</p> <p>Hands, other body parts or foreign objects in the impeller or intake area Risk of personal injury! Damage to the submersible motor pump!</p> <ul style="list-style-type: none"> ▷ Never insert your hands, other body parts or foreign objects into the impeller and/or impeller intake area. ▷ Check that the impeller can rotate freely.
	<p>⚠ WARNING</p> <p>Fluids handled, consumables and operating supplies which are hot or pose a health hazard Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Observe all relevant laws. ▷ When draining the fluid take appropriate measures to protect persons and the environment. ▷ Decontaminate pumps which handle fluids posing a health hazard.
	<p>⚠ WARNING</p> <p>Hot surface Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Allow the pump set to cool down to ambient temperature.
	<p>⚠ WARNING</p> <p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
	<p>⚠ WARNING</p> <p>Insufficient stability Risk of crushing hands and feet!</p> <ul style="list-style-type: none"> ▷ During assembly/dismantling, secure the pump (set)/pump parts against tilting or tipping over.
	<p>NOTE</p> <p>Special regulations apply to repair work on explosion-proof pump sets. Modifications or alteration of the pump sets can affect explosion protection and are only permitted after consultation with the manufacturer.</p>

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

	<p>NOTE</p> <p>All maintenance work, service work and installation work can be carried out by KSB Service or authorized workshops. Find your contact in the attached "Addresses" booklet or on the Internet at "www.ksb.com/contact".</p>
---	---

Never use force when dismantling and reassembling the pump set.

7.2 Maintenance/inspection

KSB recommends the following regular maintenance schedule:

Table 8: Overview of maintenance work

Maintenance interval	Maintenance work	For details see ...
Every 4000 hours, at least once a year	Measuring the insulation resistance	(⇒ Section 7.2.1.1, Page 49)
Every 10,000 hours at least every 3 years	Checking the cables	(⇒ Section 7.3.3, Page 52)
	Checking the ground conductor	(⇒ Section 7.3.4, Page 52)
	Checking the sensors	(⇒ Section 7.2.1.2, Page 49)
	Changing the lubricant	(⇒ Section 7.4, Page 53)
Every 5 years	General overhaul	

On pump sets with sacrificial anodes, the sacrificial anodes must initially be checked after 6 months. If necessary, the sacrificial anodes must be replaced. If the sacrificial anodes show little wear, the maintenance interval can be extended to 12 months.

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 maximum measuring voltage is 500 V (maximum permissible voltage 1000 V).
 1. Measure the winding to chassis ground.
To do so, connect all winding ends together.
 2. Measure the winding temperature sensor 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.

7.2.1.2 Checking the sensors

	CAUTION
	<p>Excessive test voltage Damage to the sensors!</p> <ul style="list-style-type: none"> ▷ Use a commercially available ohmmeter to measure the resistance.

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

The sensors supplied with the pump set may not include the maximum scope of supply described in this section.

Temperature sensors in the motor winding

Table 9: Resistance measurement

Measurement between terminals ...	Resistance
	[Ω]
21 and 22	< 1
10 and 11	200 to 750

If the specified tolerances are exceeded, disconnect the connection cable at the pump set and repeat the check inside the motor.

If the tolerances are exceeded here, too, the motor part must be opened and overhauled. The temperature sensors are fitted in the stator winding and cannot be replaced.

Leakage sensor in the motor

Table 10: Resistance measurement of the leakage sensor in the motor

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

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

Bearing temperature sensor (optional)

Table 11: Resistance measurement of the bearing temperature sensor

Measurement between terminals ...	Resistance
	[Ω]
15 and 16	100 to 120

7.3 Removing the pump set

7.3.1 Removing the pump set

	<p>⚠ DANGER</p>
	<p>Insufficient preparation of work on the pump (set) Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Properly shut down the pump set. ▷ Close the shut-off elements in the suction line and discharge line. ▷ Drain the pump and release the pump pressure. ▷ Shut off any auxiliary feed lines. ▷ Allow the pump set to cool down to ambient temperature.
	<p>⚠ WARNING</p>
	<p>Incorrect handling of the power cable Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Secure power cables against falling down. ▷ Avoid power cables being laid on surfaces without fastening. ▷ When moving the pump set keep at a safe distance to the power cables.

	<p>⚠ WARNING</p>
	<p>People falling into the unsecured discharge tube Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Take suitable precautions during the entire installation/dismantling process to protect people from falling into the open discharge tube. ▷ Fence off the work area appropriately.

	<p>⚠ WARNING</p>
	<p>Turnbuckle and shackle are not suitable for lifting the pump set. Risk of personal injury! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Always use the eyebolts of the support rope to lift the pump set.

- ✓ The power cables have been disconnected and secured against accidental start-up.
- ✓ The discharge tube is open; its opening is securely covered except for a gap allowing work to continue.
- ✓ Suitable lifting equipment is available.
 1. Attach the lifting chain or lifting rope to the trolley.
 2. Free the uppermost lifting lug from the cable bundle, attach it to the crane hook and run the lifting equipment to a higher level.
 3. Open and disconnect the turnbuckle.

	<p>NOTE</p>
	<p>Loose parts must not fall into the pump sump!</p>

4. Pull the pump set up until it reaches the second lifting lug of the cable bundle.
5. Attach the lifting chain or lifting rope with the shackle to the first lifting lug (together with the crane hook).
6. Unclip the crane hook and attach it to the second lifting lug.
7. Pull the pump set up until it reaches the third lifting lug. Free the lifting chain or lifting rope from the first lifting lug and attach it to the third lifting lug.
8. Pull the pump set up until it reaches the fourth lifting lug. Unclip the crane hook and attach it to the fourth lifting lug.
9. Repeat this procedure until the pump bail is located above the discharge tube, then attach it to the crane hook.
10. Remove the safety cover from the discharge tube.
11. Extract the pump set from the discharge tube, move it sideways and place it down.

	<p>⚠ WARNING</p>
	<p>Pump set tilting Risk of squashing hands and feet!</p> <ul style="list-style-type: none"> ▷ Suspend or support the pump set.

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

12. Do not disconnect the pump set from the hook of the lifting equipment to prevent the pump set from tipping over.
13. Clean the pump set (e.g. with water).
14. Collect and properly dispose of any cleaning liquid.

7.3.2 Drainage/cleaning

	! WARNING
	<p>Fluids handled, consumables and operating supplies which are hot or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled. ▷ 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. Always complete and enclose a certificate of decontamination when returning the pump set. (⇒ Section 10, Page 109)

7.3.3 Checking the cable bundle

When removing the pump set from the discharge tube, check the lifting rope and electric cables for any damage. Replace any damaged components by original spare parts.

Longer cable bundles must be dismantled:

1. Free the cable clamps.
2. Remove the spacer.
3. Roll up the electric cables and place them next to the pump set.
4. Undo the shackle to separate the support rope from the pump set.

7.3.4 Checking the ground conductor

1. Measure the resistance between ground conductor and chassis ground. The resistance must be lower than 1 Ω.
2. Replace any damaged components by original spare parts.

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

7.4 Lubrication and lubricant change

7.4.1 Lubricating the mechanical seal

 	 DANGER
	<p>Excessive temperatures at the shaft seal Explosion hazard! Damage to the pump set!</p> <p>▸ Regularly check the condition of the lubricant in the lubricant chamber of the mechanical seal. Top it up if required.</p>

The mechanical seal is supplied with lubricant from the lubricant chamber.

7.4.1.1 Intervals

Replace the lubricant every 10,000 operating hours but at least every 3 years.
 (⇒ Section 7.2, Page 49)

7.4.1.2 Lubricant quality

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

Table 12: Lubricant quality

Description	Properties	
Paraffin oil or white oil. Alternative: motor oil grades SAE 10W to SAE 20W	Kinematic viscosity at 104 °F [40 °C]	< 0.065 ft/s ² [< 20 mm/s ²]
	Flash point (to Cleveland)	> 320 °F [> 160 °C]
	Solidification point (pour point)	< -5 °F [< -15 °C]

Recommended lubricants:

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

	 WARNING
	<p>Contamination of fluid handled by lubricant Hazard to persons and the environment!</p> <p>▸ Using machine oil is only permitted if the oil is disposed of properly.</p>

7.4.1.3 Lubricant quantity

Table 13: Lubricant quantity [l] depending on the motor

Size	Lubricant quantity depending on the motor			
	30 4.E 37 4.E 22 6.E 30 6.E 11 8.E 15 8.E 18 8.E 22 8.E		45 4.E 55 4.E 65 4.E 75 4.E 31 6.E 37 6.E 45 6.E 55 6.E 30 8.E 37 8.E 45 8.E	
	[quart]	[l]	[quart]	[l]
700-324	6,9	6,5	-	-
700-330	6,9	6,5	-	-
700-371	6,9	6,5	-	-
800-324	-	-	7,0	6,6
800-330	-	-	7,0	6,6
800-370	6,9	6,5	7,0	6,6
800-371	-	-	7,0	6,6
800-400	6,9	6,5	7,0	6,6
800-401	6,9	6,5	7,0	6,6

7.4.1.4 Changing the lubricant

	<p>⚠ WARNING</p> <p>Lubricants posing a health hazard and/or hot lubricants Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ When draining the lubricant take appropriate measures to protect persons and the environment. ▷ Wear safety clothing and a protective mask if required. ▷ Collect and dispose of any lubricants. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.
	<p>⚠ WARNING</p> <p>Excess pressure inside the pump set Risk of personal injury when opening the pump set!</p> <ul style="list-style-type: none"> ▷ Be careful when opening the inner chambers. Balance the pressure.
	<p>⚠ WARNING</p> <p>Improper handling when placing the pump set in a vertical/horizontal position Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Select suitable lifting equipment for the size of the pump. ▷ Use appropriate means to secure the pump set against tilting, tipping over or rolling off. ▷ Maintain a safe distance during lifting operations (load may swing when being lifted). ▷ Use additional supports for the transport holder to secure it against tilting.

7.4.1.4.1 Draining the lubricant

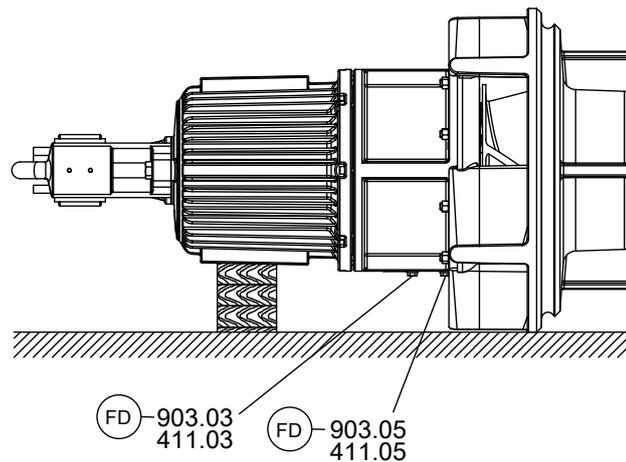


Fig. 26: Draining the lubricant

903.03 411.03	Lubricant filler opening	903.05 411.05	Lubricant drain
------------------	--------------------------	------------------	-----------------

Table 14: Key to the symbols and codes

Symbol	Description
(FD)	Always apply a liquid sealing agent (e.g. Hylomar SQ32M) to sealing surfaces marked with this symbol.

- ✓ The pump set is positioned horizontally on a clean and level surface and is protected against rolling off.
- ✓ A suitable container for collecting the lubricant is on hand.
 1. Place a suitable container under screw plug 903.05.
 2. Unscrew and remove screw plug 903.03 with joint ring 411.03. Observe the plate "Oil filler plug".
 3. Unscrew and remove screw plug 903.05 with joint ring 411.05. Observe the plate "Oil drain".
 4. Drain the lubricant and dispose of it properly.
 5. Apply a liquid sealant to screw plug 903.05. Screw it back in together with new joint ring 411.05.

7.4.1.4.2 Filling in the lubricant

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

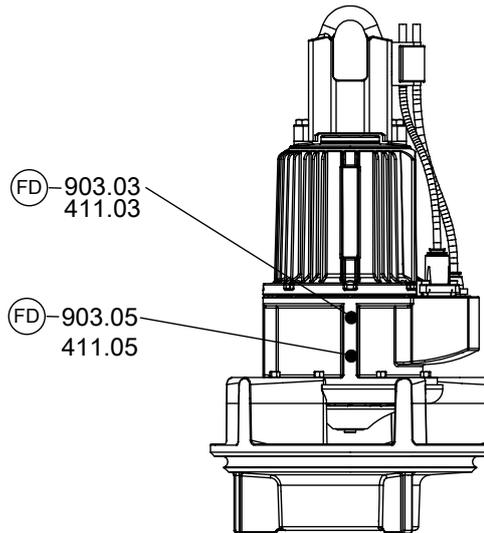


Fig. 27: Filling in the lubricant

903.03 411.03	Lubricant filler opening	903.05 411.05	Lubricant drain
------------------	--------------------------	------------------	-----------------

Table 15: Key to the symbols and codes

Symbol	Description
	Always apply a liquid sealing agent (e.g. Hylomar SQ32M) to sealing surfaces marked with this symbol.

- ✓ The pump set has been placed in a vertical position on a clean and level surface and protected against tipping over.
- 1. Fill the lubricant through the lubricant filler opening until the lubricant chamber overflows.
- 2. Apply a liquid sealant to screw plug 903.03. Screw it back in together with new joint ring 411.03.

7.4.2 Lubricating the rolling element bearings

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

7.5 Dismantling the pump set

7.5.1 General information/Safety regulations

	 DANGER
	<p>Improper transport Danger to life from falling parts! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Use the attachment point provided (eyebolt, lifting lug or bail) for attaching lifting accessories. ▷ Never suspend the pump set by its power cable. ▷ Never use the lifting ropes included in KSB's scope of supply for lifting loads other than the KSB product supplied. ▷ Securely attach the lifting ropes to the pump and crane.

	<p>⚠ WARNING</p> <p>Unqualified personnel performing work on the pump (set) Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Always have repair work and maintenance work performed by specially trained, qualified personnel.
	<p>⚠ WARNING</p> <p>Hot surface Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Allow the pump set to cool down to ambient temperature.
	<p>⚠ WARNING</p> <p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
	<p>⚠ WARNING</p> <p>Excess pressure inside the pump set Risk of personal injury when opening the pump set!</p> <ul style="list-style-type: none"> ▷ Be careful when opening the inner chambers. Balance the pressure.
	<p>⚠ WARNING</p> <p>Components with sharp edges Risk of cutting or shearing injuries!</p> <ul style="list-style-type: none"> ▷ Always use appropriate caution for installation and dismantling work. ▷ Wear work gloves.
	<p>⚠ WARNING</p> <p>Pump set tilting or rolling off Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Make sure the pump set is secured against tilting during the entire dismantling process. ▷ For dismantling the pump set in a horizontal position, secure it against rolling off.

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

7.5.2 Preparing the pump set

1. De-energize the pump set and secure it against unintentional start-up.
2. The pump set has been removed from the discharge tube.
 (⇒ Section 7.3.1, Page 50)
3. The pump set has been cleaned. (⇒ Section 7.3.2, Page 52)
4. The lubricant has been drained.

7.5.3 Removing the back pull-out unit

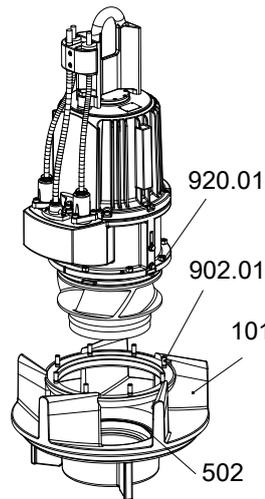


Fig. 28: Removing the back pull-out unit

- ✓ Suitable lifting equipment is available.
- 1. Attach the crane hook to bail 571 to secure the back pull-out unit.
- 2. Undo screwed connection 902.01 and 920.01. Pull the complete back pull-out unit out of pump casing 101 with the crane at bail 571.
- 3. Place the back pull-out unit in a safe and dry assembly area and secure it against tipping over or rolling off.

7.5.4 Removing the impeller

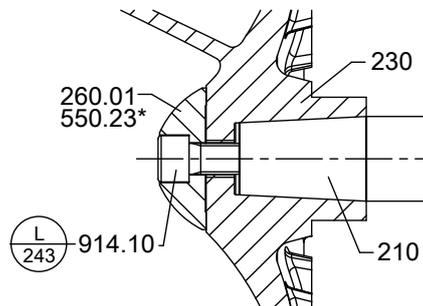


Fig. 29: Removing the impeller

*: On specific designs only

- ✓ The back pull-out unit has been placed in a horizontal position on wooden supports and secured against rolling off.
- ✓ The lubricant and any leakage have been drained.
- 1. Undo and remove hexagon socket head cap screw 914.10.
 - ⇒ The impeller/shaft connection is a tapered fit.
- 2. Remove impeller hub cap 260.01 or disc 550.23.
 - ⇒ For dismantling of the impeller, a jacking thread is provided at the impeller hub.
- 3. Screw in the forcing screw and remove impeller 230.



NOTE

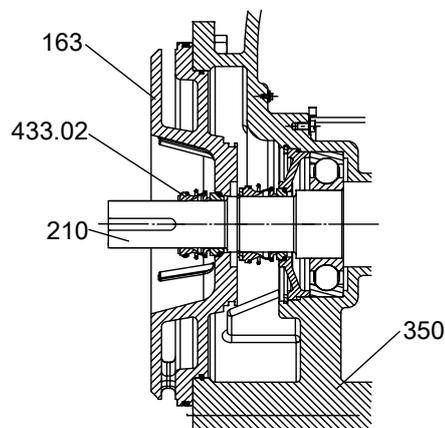
The forcing screw is not included in the scope of supply. It can be ordered separately from KSB.

Table 16: Forcing screws

Size	Forcing screw	
	Thread	Code
700-324	M24	ADS 9
700-330	M24	ADS 9
700-371	M24	ADS 9
800-324	M24	ADS 9
800-330	M24	ADS 9
800-370	M24	ADS 9
800-371	M24	ADS 9
800-400	M24	ADS 9
800-401	M24	ADS 9

7.5.5 Removing the mechanical seal

7.5.5.1 Removing the impeller-end mechanical seal


Fig. 30: Removing the mechanical seal

- ✓ The back pull-out unit has been securely placed in a horizontal position on wooden supports.
1. Pull the rotating assembly of mechanical seal 433.02 off shaft 210.
 2. Remove discharge cover 163 from bearing housing 350.
 3. Press the stationary seat of mechanical seal 433.02 out of discharge cover 163.

7.5.5.2 Removing the drive-end mechanical seal

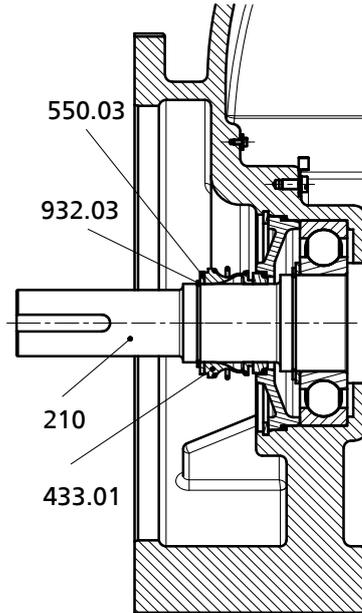


Fig. 31: Removing the mechanical seal

- ✓ The impeller and the impeller-end mechanical seal have been removed.
- 1. Remove circlip 932.03 and disc 550.03.
- 2. Carefully pull mechanical seal 433.01 and its mating ring off shaft 210.

	NOTE
	To protect the mechanical seal against damage when pulling it off the shaft placing a foil (no thicker than 0.3 mm) around the free shaft stub is recommended.

7.5.6 Dismantling the motor section

	NOTE
	Special regulations apply to repair work on explosion-proof pump sets. Modifications or alteration of the pump sets can 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 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.

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

7.5.7 Removing the cable gland with connection cable

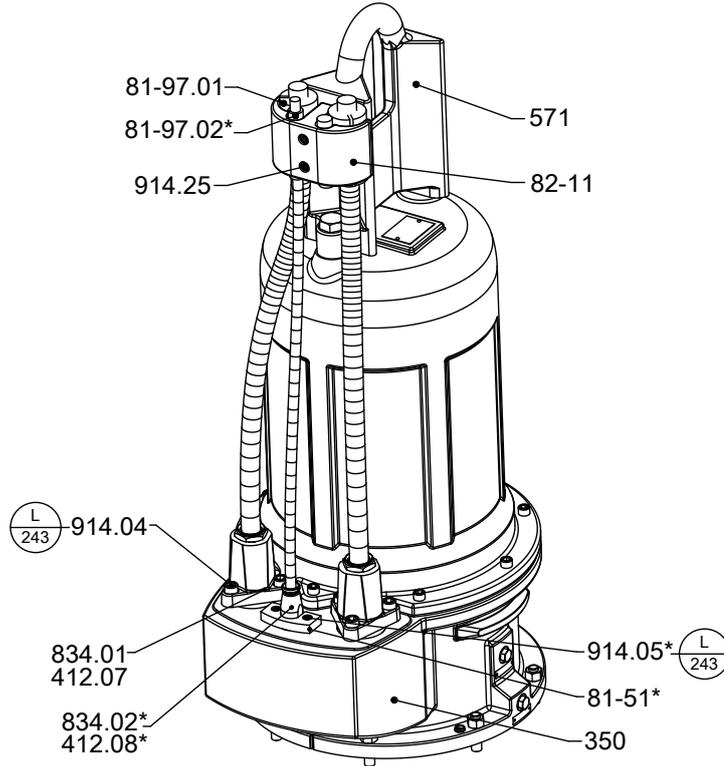


Fig. 32: Removing the connection cable and cable gland

*: On specific designs only

Table 17: Key to the symbols and codes

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

1. Undo hexagon socket head cap screws 914.25. Remove cover plate 82-11 from bail 571.
2. Take out the cable gland needing to be replaced.
3. Undo screwed connection 914.04 and/or 914.05 of cable gland 834.01/02.
4. Pull cable gland 834.01/02 out of the centering seat in bearing housing 350.
5. Separate cable gland 834.01 of the power cable by cutting it off at the connector or by pulling the plug.
6. Separate cable gland 834.02* of the control cable from the pump set by pulling the plug.

	NOTE
	Noting down the marking and length of the cable cores to facilitate fitting the replacement cable gland is recommended.

7.6 Reassembling the pump set

7.6.1 General information/Safety regulations

	<p>⚠ DANGER</p> <p>Wrong screws/bolts Explosion hazard!</p> <ul style="list-style-type: none"> ▷ 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.
	<p>⚠ WARNING</p> <p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
	<p>⚠ WARNING</p> <p>Components with sharp edges Risk of cutting or shearing injuries!</p> <ul style="list-style-type: none"> ▷ Always use appropriate caution for installation and dismantling work. ▷ Wear work gloves.
	<p>⚠ WARNING</p> <p>Insufficient stability Risk of crushing hands and feet!</p> <ul style="list-style-type: none"> ▷ During assembly/dismantling, secure the pump (set)/pump parts against tilting or tipping over.
	<p>CAUTION</p> <p>Improper reassembly Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Reassemble the pump (set) in accordance with the general rules of sound engineering practice. ▷ Use original spare parts only.
	<p>NOTE</p> <p>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. Secure all screwed connections closing off the flameproof enclosure with a thread-locking agent (Loctite type 243).</p>
	<p>NOTE</p> <p>Apply liquid sealant to all screw plugs. Apply liquid sealant to all wetted clearances (e.g. Hylomar SQ 32M).</p>

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 When reassembling the pump set, tighten all screws/bolts as indicated. In addition, secure all screwed connections closing off the flameproof enclosure with a thread-locking agent (Loctite Type 243).

7.6.2 Fitting the replacement cable gland

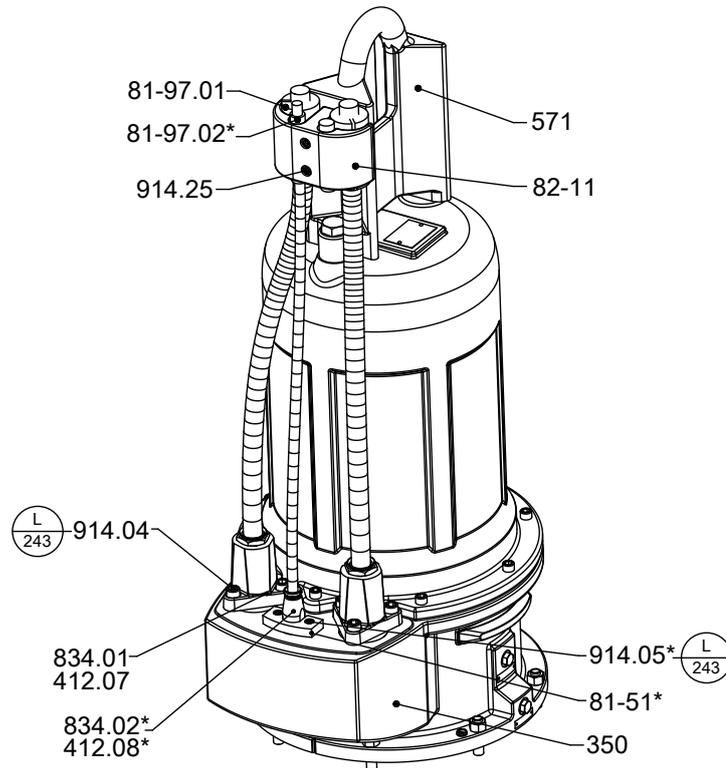


Fig. 33: Installing the power cable and cable gland

*: On specific designs only

Table 18: Key to the symbols and codes

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

Installing the power cable, version without plug

1. Adjust the lengths of the cable cores to the original cable gland.
2. Attach core identifications matching the original cable gland.
3. Slide O-ring 412.07 onto the core ends of the power cable and into the groove of the centering seat.
4. Use a connector to connect the strands of motor and cable gland.
5. Pull a heat shrink tube over the connection point.

- | | |
|--|---|
| Installing the power cable, version with plug | <ol style="list-style-type: none"> 6. Insert cable gland 834.01 with the power cable and O-ring 412.07 into the opening provided. 7. Fasten cable gland 834.01 of the power cable with hexagon socket head cap screws 914.04. Secure the screwed connection with Loctite 243. |
| Installing the control cable | <ol style="list-style-type: none"> 1. Slide O-ring 412.07 onto the core ends of the power cable until the O-ring reaches the centering seat. 2. Connect the plug of the power cable with the plug of the pump set. 3. Insert cable gland 834.01 with the power cable and O-ring 412.07 into the opening provided. 4. Fasten cable gland 834.01 with clamping element 81-51 and hexagon socket head cap screws 914.04. Secure the screwed connection with Loctite 243. |
| Fastening the cover plate to the bail | <ol style="list-style-type: none"> 1. Slide O-ring 412.08 onto the core ends of the control cable until the O-ring reaches the centering seat. 2. Connect the plug of the control cable with the plug of the pump set. 3. Insert cable gland 834.02 with the control cable and O-ring 412.08 into the opening provided. 4. Fasten cable gland 834.02 with clamping element 81-51 and hexagon socket head cap screws 914.05. Secure the screwed connection with Loctite 243. |
| Fastening the cover plate to the bail | <ol style="list-style-type: none"> 1. Insert the power cable and control cable with cable protectors 81-97.01/02 into cover plate 82-11. 2. Screw the cover plate to bail 571 with hexagon socket head cap screws 914.25. 3. The electric cables must be taut when fitted. |

7.6.3 Reassembling the motor section

	NOTE
	<p>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. Secure all screwed connections closing off the flameproof enclosure with a thread-locking agent (Loctite type 243).</p>
	! DANGER
	<p>Wrong screws/bolts Explosion hazard!</p> <ul style="list-style-type: none"> ▷ 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.

7.6.4 Installing the mechanical seals

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

- Only remove the protective wrapping of the contact faces immediately before assembly takes place.
- Make sure the surface of the shaft is absolutely clean and undamaged.
- Immediately before installing the mechanical seal, wet the contact faces with a drop of oil.
- For easier installation of bellows-type mechanical seals, wet the inside diameter of the bellows with soapy water (not oil).
- To prevent any damage to the rubber bellows, place a thin foil (of approximately 0.0039 to 0.0118 inch [0.1 to 0.3 mm] thickness) around the free shaft stub. Slip the rotating assembly over the foil into its installation position. Then remove the foil.
- Cover any grooves in the shaft into which the O-rings could slide with suitable means and/or assembly aids.

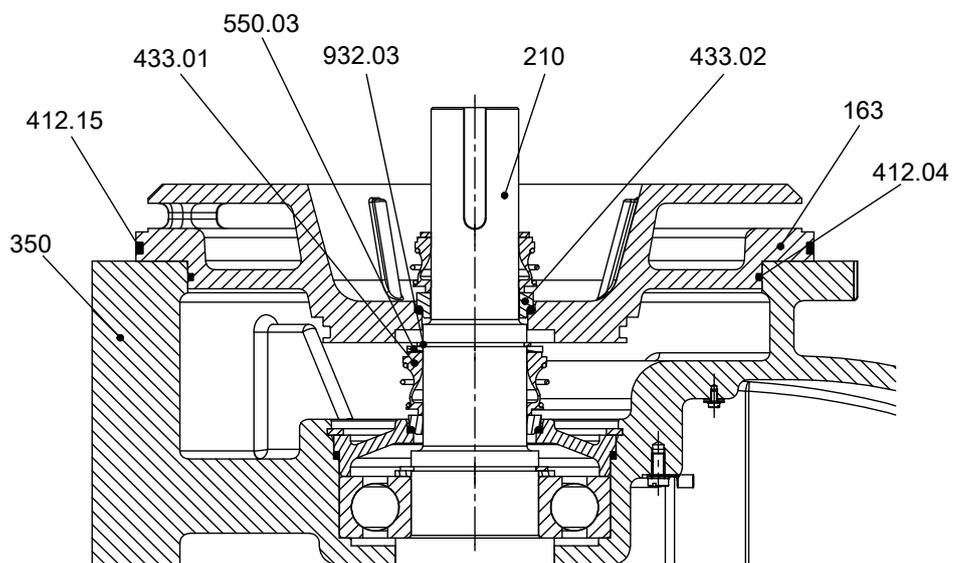


Fig. 34: Installing the mechanical seals

- ✓ The shaft and rolling element bearings have been properly fitted in the motor.
1. Guide drive-end mechanical seal 433.01 with disc 550.03 on shaft 210 and secure it with circlip 932.03.
 2. Insert O-rings 412.04 and 412.15 into discharge cover 163, and press them into bearing housing 350 as far as they will go.
 3. Guide the pump-end mechanical seal 433.02 onto shaft 210.

For special mechanical seals with covered spring, tighten the grub screw at the rotating assembly and secure it with Loctite before fitting the impeller.
 (⇒ Section 9.6.2, Page 84) Observe installation dimension "A".

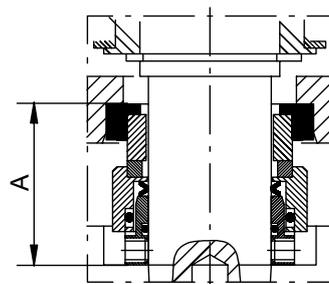


Fig. 35: Installation dimension "A"

Table 19: Installation dimension "A"

Size	Installation dimension "A"	
	[inch]	[mm]
700-324	1 ²²⁹ / ₂₅₄	48,3
700-330	1 ²²⁹ / ₂₅₄	48,3
700-371	1 ²²⁹ / ₂₅₄	48,3
800-324	1 ²²⁹ / ₂₅₄	48,3
800-330	1 ²²⁹ / ₂₅₄	48,3
800-370	1 ²²⁹ / ₂₅₄	48,3
800-371	1 ²²⁹ / ₂₅₄	48,3
800-400	1 ²²⁹ / ₂₅₄	48,3
800-401	1 ²²⁹ / ₂₅₄	48,3

7.6.5 Fitting the impeller

	CAUTION
	<p>Use of grease or other permanent lubricants Torque transmission impeded / overheating of and damage to the pump!</p> <ul style="list-style-type: none"> ▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal. ▷ Use soft soap to reduce any friction caused during assembly. ▷ Never coat the mechanical seal faces with grease or oil.

The impeller is reassembled with an impeller fitting tool

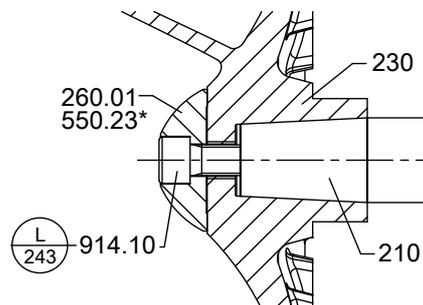


Fig. 36: Fitting the impeller

*: On specific designs only

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

- ✓ The shaft and rolling element bearings have been properly installed.
 - ✓ The mechanical seals have been properly installed.
1. Slide impeller 230 onto the shaft end.
 2. Apply Loctite 243 as thread-locking agent to the thread of the impeller screw.
 3. Screw in impeller screw 914.10 and disc 550.23, if any. Tighten with a torque wrench. Observe the tightening torques.

Table 20: Tightening torques for impeller screws

Size	Thread	Tightening torque	
		[lbf ft]	[Nm]
700-324	M20	213,89	290
700-330	M20	213,89	290

Size	Thread	Tightening torque	
		[lbf ft]	[Nm]
700-371	M20	213,89	290
800-324	M20	213,89	290
800-330	M20	213,89	290
800-370	M20	213,89	290
800-371	M20	213,89	290
800-400	M20	213,89	290
800-401	M20	213,89	290

7.6.6 Installing the back pull-out unit

	NOTE
	<p>After casing wear rings with a radial clearance have been fitted in pump casing 101, they have the required inside diameter and do not need to be readjusted.</p>

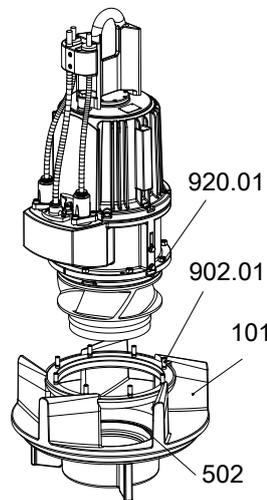


Fig. 37: Installing the back pull-out unit

1. Use a rubber mallet to insert casing wear ring 502 into pump casing 101 as far as it will go.
2. Insert the complete back pull-out unit into pump casing 101.
3. Evenly tighten screwed connection 920.01 between the pump casing and the bearing housing.

7.6.7 Leak testing

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

Observe the following values for leak testing:

- **Test medium:** compressed air
- **Test pressure:** 11.6 psi [0.8 bar] maximum
- **Test duration:** 2 minutes

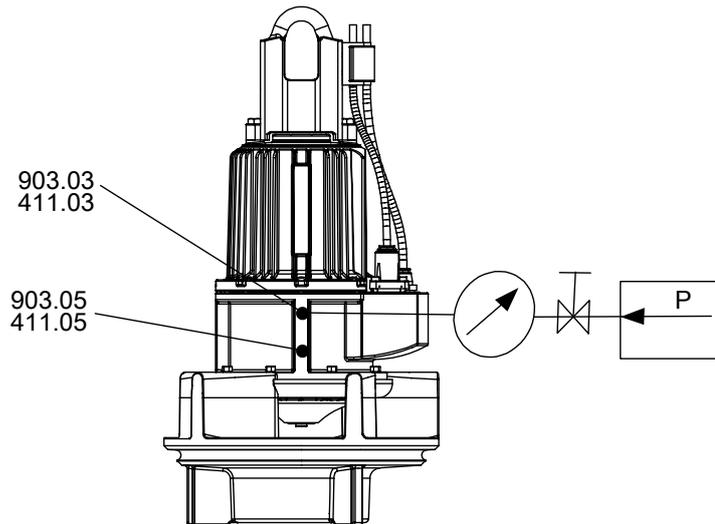


Fig. 38: Screwing in the testing device

1. Remove screw plug 903.03 and joint ring 411.03 from the lubricant chamber.
2. Screw the testing device tightly into the lubricant filler opening.
3. Carry out the leak test with the values specified above.
The pressure must not drop during the test period.
If the pressure does drop, check the seals and screwed connections.
Repeat the leak test.
4. If the leak test has been successful, fill in the lubricant.
5. Fit and tighten screw plug 903.03 and joint ring 411.03 of the lubricant chamber.

7.7 Checking the connection of motor/power supply

Check the power cables after reassembly. (⇒ Section 7.2.1, Page 49)

7.8 Tightening torques

Table 21: Tightening torques [lbf ft] depending on thread, steel grade and property class

Steel grade	-		A2, A4		A2, A4		1.4410		1.4462	
Property class	8.8		-50		-70		R _{p0,2} ≥ 530 N/mm ²		R _{p0,2} ≥ 450 N/mm ²	
Thread	Minimum	Rated value	Minimum	Rated value	Minimum	Rated value	Minimum	Rated value	Minimum	Rated value
M4	2,2	2,5	0,7	0,8	1,5	1,7	1,8	2,1	1,5	1,7
M5	4,5	5,0	1,5	1,6	3,2	3,5	3,7	4,1	3,2	3,5
M6	7,6	8,4	2,5	2,7	5,3	5,9	6,3	7,0	5,3	5,9
M8	18	21	6	7	13	14	15	17	13	14
M10	36	41	12	13	26	28	30	33	26	28
M12	62	69	21	23	43	49	52	52	43	49
M14	99	110	32	36	69	77	82	91	69	77
M16	154	171	51	56	108	120	128	142	108	120
M20	301	334	99	110	212	235	249	277	212	235
M24	519	577	170	190	365	406	430	478	365	406
M27	756	840	248	276	532	591	626	696	532	591
M30	1035	1150	339	377	727	808	857	952	727	808
M33	1393	1547	457	507	977	1088	1153	1281	977	1088
M36	1803	2004	592	657	1268	1409	1494	1660	1268	1409
M42	2879	3200	945	1050	2025	2250	2385	2649	2025	2250
M48	4337	4819	1423	1581	3050	3388	3592	3991	3050	3388

Table 22: Tightening torques [Nm] depending on thread, steel grade and property class

Steel grade			A2, A4		A2, A4		1.4410		1.4462	
Property class	8.8		-50		-70		R _{p0,2} ≥ 530 N/mm ²		R _{p0,2} ≥ 450 N/mm ²	
Thread	Minimum	Rated value	Minimum	Rated value	Minimum	Rated value	Minimum	Rated value	Minimum	Rated value
M4	3,0	3,4	1,0	1,1	2,1	2,4	2,5	2,8	2,1	2,4
M5	6,1	6,8	2,0	2,2	4,3	4,8	5,0	5,6	4,3	4,8
M6	10,3	11	3,4	3,7	7,2	8,0	8,5	9,5	7,2	8,0
M8	25	28	8,2	9,1	18	19	21	23	18	19
M10	49	55	16	18	35	38	41	45	35	38
M12	85	94	28	31	59	66	70	78	59	66
M14	134	149	44	49	94	105	111	124	94	105
M16	209	232	69	76	147	163	173	192	147	163
M20	408	453	134	149	287	319	338	375	287	319
M24	704	782	231	257	495	550	583	648	495	550
M27	1025	1139	36	374	721	801	849	944	721	801
M30	1403	1559	460	511	986	1096	1162	1291	986	1096
M33	1888	2098	619	688	1327	1475	1563	1737	1327	1475
M36	2445	2717	802	891	1719	1910	2025	2250	1719	1910
M42	3904	4338	1281	1423	2745	3050	3233	3592	2745	3050
M48	5880	6534	1929	2144	4135	4594	4870	5411	4135	4594


NOTE

When using adjustable torque wrenches or drivers, select a value in the indicated range between the minimum and the rated value.

7.9 Spare parts stock

7.9.1 Ordering spare parts

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

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

Refer to the name plate for all data.

Also supply the following data:

- Part No. and description (⇒ Section 9.1, Page 73)
- Quantity of spare parts
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)

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

Table 23: Quantity of spare parts for recommended spare parts stock⁴⁾

Part No.	Description	Number of pump sets (including stand-by pump sets)						
		2	3	4	5	6 and 7	8 and 9	10 and more
80-1	Motor unit	-	-	-	1	1	2	30 %
834	Cable gland	1	1	2	2	2	3	40 %
818	Rotor	-	-	-	1	1	2	30 %
230	Impeller	1	1	1	2	2	3	30 %
502	Casing wear ring	2	2	2	3	3	4	50 %
433.01	Mechanical seal, motor end	2	3	4	5	6	7	90 %
433.02	Mechanical seal, pump end	2	3	4	5	6	7	90 %
322	Rolling element bearing, motor end	1	1	2	2	3	4	50 %
321.02	Rolling element bearing, pump end	1	1	2	2	3	4	50 %
99-9	Set of sealing elements for the motor	4	6	8	8	9	10	100 %
99-9	Set of sealing elements for the hydraulic system	4	6	8	8	9	10	100 %
412.20	O-ring for sealing the discharge tube	2	3	4	5	6	8	100 %

4) For two years of continuous operation or 17,800 operating hours

8 Trouble-shooting

	 WARNING
	<p>Improper remedial work Risk of personal injury!</p> <p>▷ For any work performed in order to remedy faults observe the relevant information given in this operating manual and/or the product literature provided by the accessories manufacturers.</p>

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

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

Table 24: Trouble-shooting

A	B	C	D	E	Possible cause	Remedy ⁵⁾
-	X	-	-	X	Water level dropping excessively during operation	Check supply and capacity of system (sump floor area). Check level control equipment.
X	X	-	-	X	Total pressure corresponding to $NPSH_{pump}$ too high Total pressure corresponding to $NPSH_{system}$ too low	Increase fluid level on the suction side. Clean screening equipment, if required.
X	X	X	-	X	Penetration of air into the pump due to formation of an air pocket - Suction-side water level too low	Increase the suction-side water level. If this is not possible or unsuccessful, please contact KSB.
X	X	X	-	X	Unfavorable flow to the pump inlet	Improve the flow to the intake chamber (contact KSB).
-	X	X	-	X	Pump running in off-design conditions - part load/overload	Check the pump's operating data.
X	X	-	X	X	Pump clogged by deposits	Clean intake and pump components.
-	X	X	X	X	Wear	Replace worn parts by new ones.
-	X	-	X	X	Impermissible air or gas content in the fluid handled	Contact KSB.
-	-	-	-	X	System-induced vibrations	Contact KSB.
-	-	X	-	X	Wrong direction of rotation	Check the connection of the motor and control system, if any.
X	-	-	-	-	No voltage	Check the electrical installation. Contact the energy supplier.
X	-	-	-	-	Motor winding or electric cable defective	Replace with original KSB cable, or contact KSB.
-	-	X	-	X	Worn or defective rolling element bearings	Contact KSB.
X	-	-	-	-	The thermistor tripping unit with manual reset for temperature limiter has tripped the pump as a result of the permissible winding temperature being exceeded.	Have cause determined and eliminated by qualified and trained personnel.
X	-	-	-	-	Motor has been tripped by leakage monitor.	Have cause determined and eliminated by qualified and trained personnel.
X	-	-	-	-	Mechanical seal monitor has tripped.	Have cause determined and eliminated by qualified and trained personnel.

5) The pump pressure must be released before attempting to remedy faults on parts which are subjected to pressure. Disconnect the pump set from the power supply!

A	B	C	D	E	Possible cause	Remedy ⁵⁾
X	-	-	-	-	Bearing temperature monitor has tripped.	Have cause determined and eliminated by qualified and trained personnel.
-	X	-	X	-	In case of star-delta configuration: motor running in star configuration only	Check star-delta contactor.

9 Related Documents

9.1 General assembly drawing with list of components

9.1.1 Motor versions UE, XE

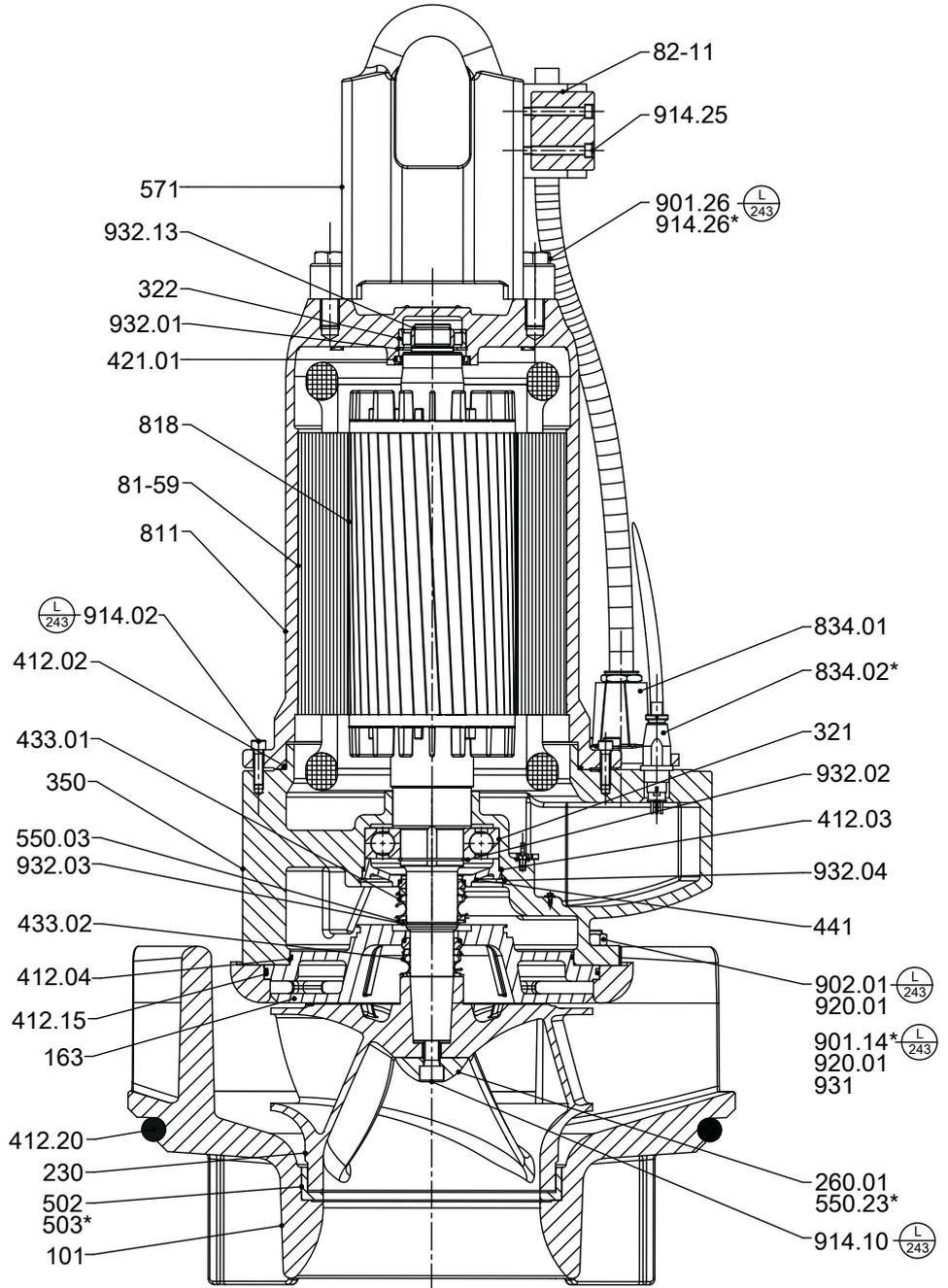


Fig. 39: General assembly drawing, motor versions UE, XE

*: On specific designs only

Table 25: Key to the symbols and codes

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

Table 26: List of components

Part No.	Description	Part No.	Description
101	Pump casing	550.03/.23	Disc
163	Discharge cover	571	Bail
230	Impeller	81-59	Stator
260.01	Impeller hub cap	811	Motor housing
321	Radial ball bearing	818	Rotor
322	Radial roller bearing	82-11	Strain relief device
350	Bearing housing	834.01/.02	Cable gland
412.02/.03/.04/.15/.20	O-ring	901.14/.20/.26	Hexagon head bolt
421.01	Lip seal	902.01	Stud
433.01/.02	Mechanical seal	914.02/.10/.25/.26	Hexagon socket head cap screw
441	Shaft seal housing	920.01	Nut
502	Casing wear ring	931	Lock washer
503	Impeller wear ring	932.01/.02/.03/.04/.13	Circlip

9.2 Detailed views

9.2.1 Cable gland

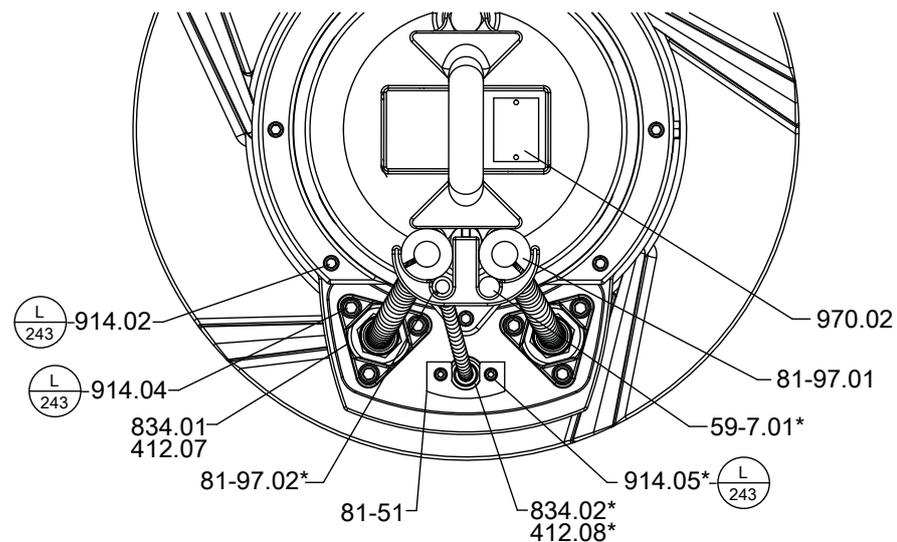


Fig. 40: Cable gland

*: On specific designs only

Table 27: Key to the symbols and codes

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

Table 28: List of components

Part No.	Description	Part No.	Description
412.07/.08	O-ring	834.01/.02	Cable gland
59-7.01	Support	914.02/.04/.05	Hexagon head bolt
81-51	Clamping element	970.02	Label/plate
81-97.01/.02	Cable protector		

9.2.2 Bearing temperature sensor and leakage monitoring

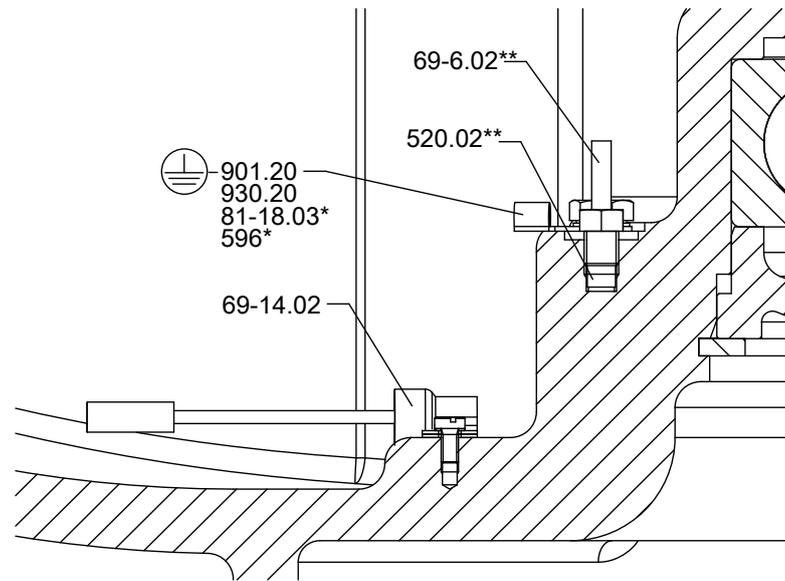


Fig. 41: Bearing temperature sensor and leakage monitoring

*: On specific designs only

** : Optional

Table 29: List of components

Part No.	Description	Part No.	Description
520.02	Sleeve	81-18.03	Cable terminal
596	Wire	901.20	Hexagon head bolt
69-6.02	Temperature sensor	930.20	Safety device
69-14.02	Leakage monitor		

9.3 Cable bundle

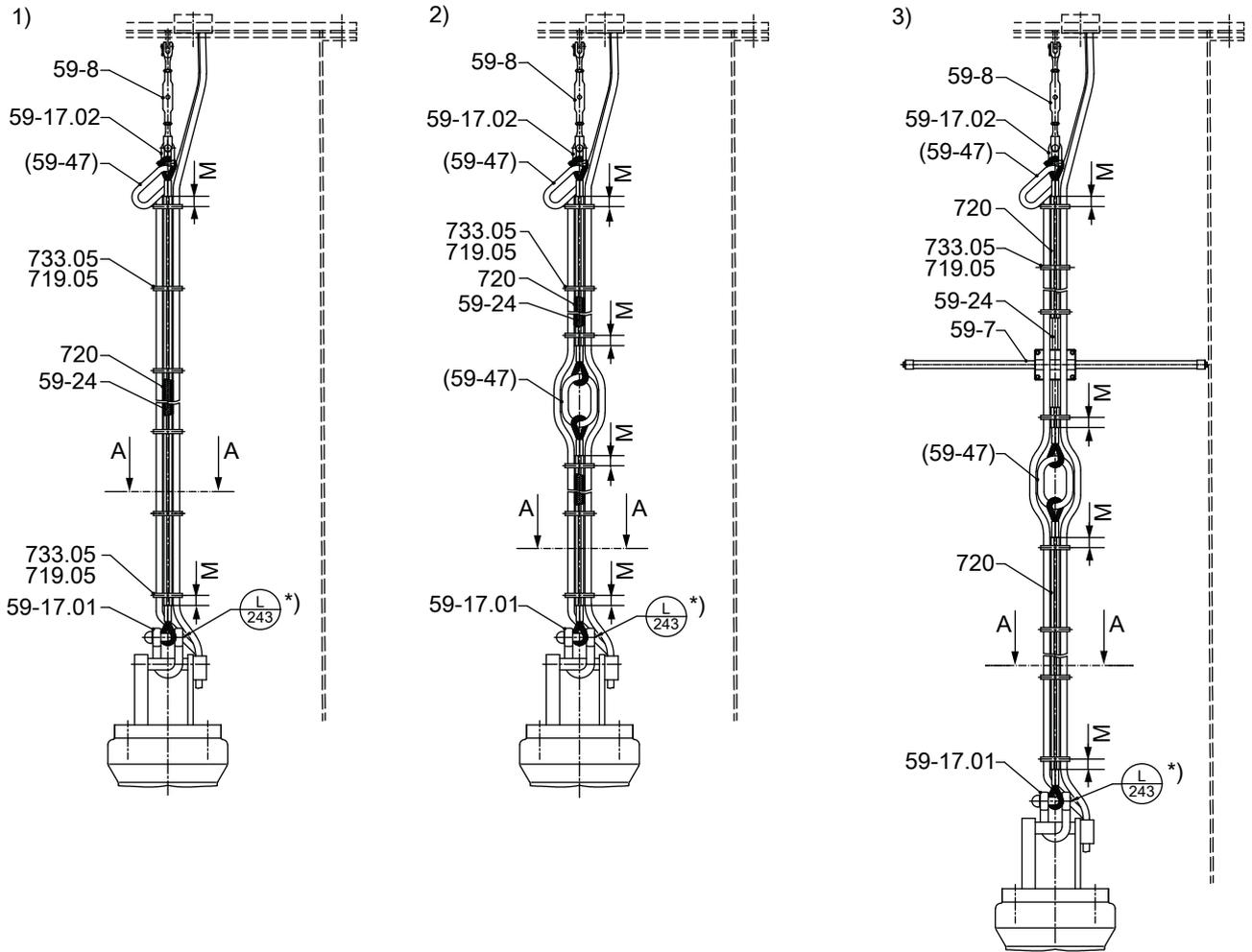


Fig. 42: Cable bundle

1)	Basic design
2)	Design with lifting lug
3)	Design with support

*) : Only required for galvanized version

	NOTE
	Dimension M = 2 inches [50 mm]

Table 30: Key to the symbols and codes

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

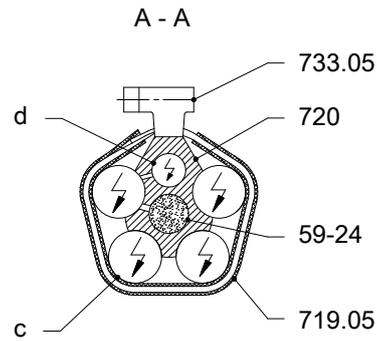


Fig. 43: Cross-section A - A, position of power cable, control cable and rope

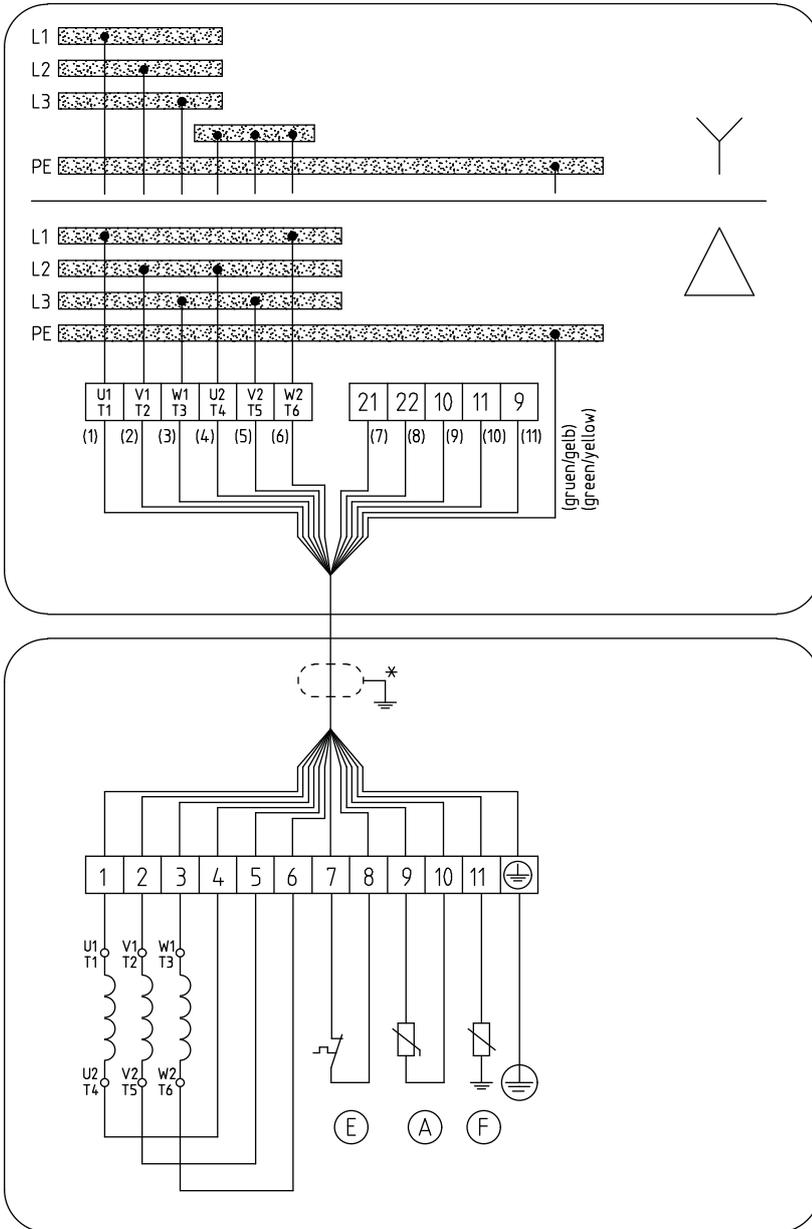
c	Power cable	d	Control cable
---	-------------	---	---------------

Table 31: List of components of the cable bundle

Part number	Description	Part number	Description
59-7	Support	59-47	Lifting lug
59-8	Turnbuckle	719.05	Sheath
59-17.01/.02	Shackle	720	Spacer
59-24	Rope / support rope	733.05	Cable clamp

9.4 Wiring diagrams

9.4.1 Wiring diagram for one power cable 12G1.5 or 12G2.5

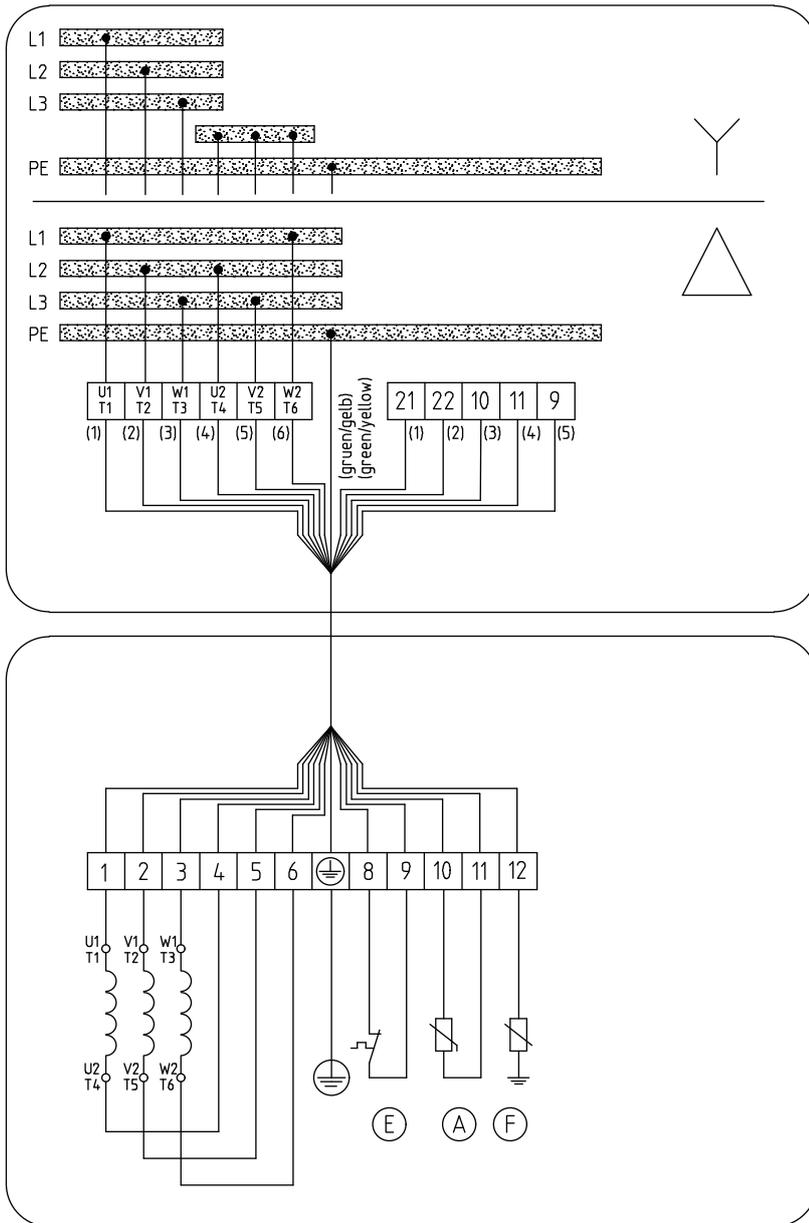


UG1377002

Fig. 44: Wiring diagram for pump sets with one power cable 12G1.5 or 12G2.5

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

9.4.2 Wiring diagram for one power cable 7G4 + 5x1.5, 7G6 + 5x1.5 or 7G10 + 5x1.5

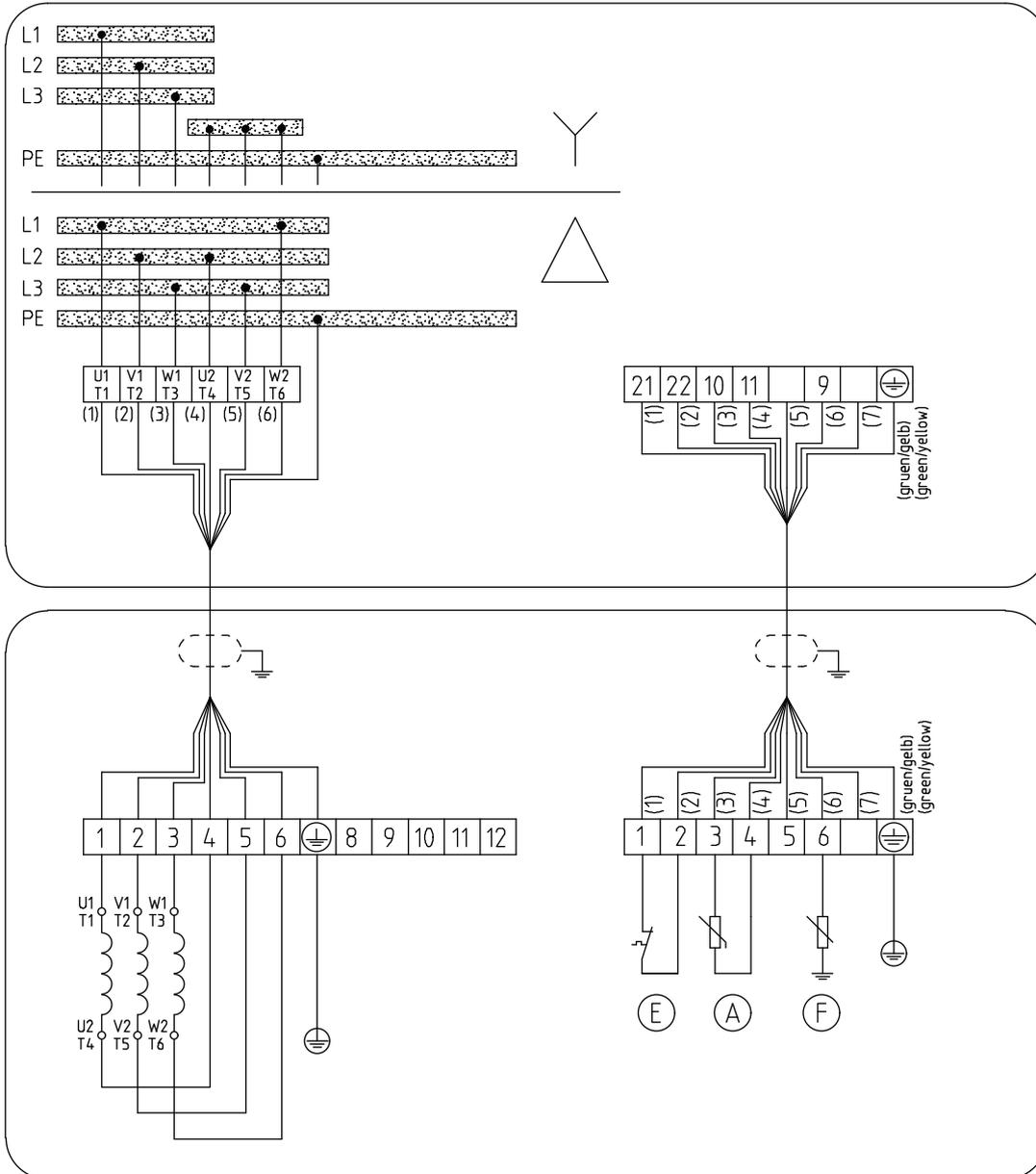


UG1377002

Fig. 45: Wiring diagram for pump sets with one power cable 7G4 + 5x1.5, 7G6 + 5x1.5 or 7G10 + 5x1.5

(A)	Motor temperature (PTC thermistor)
(E)	Motor temperature
(F)	Leakage inside the motor

9.4.3 Wiring diagram for two power cables 7G6 and 8G1.5 (shielded version)

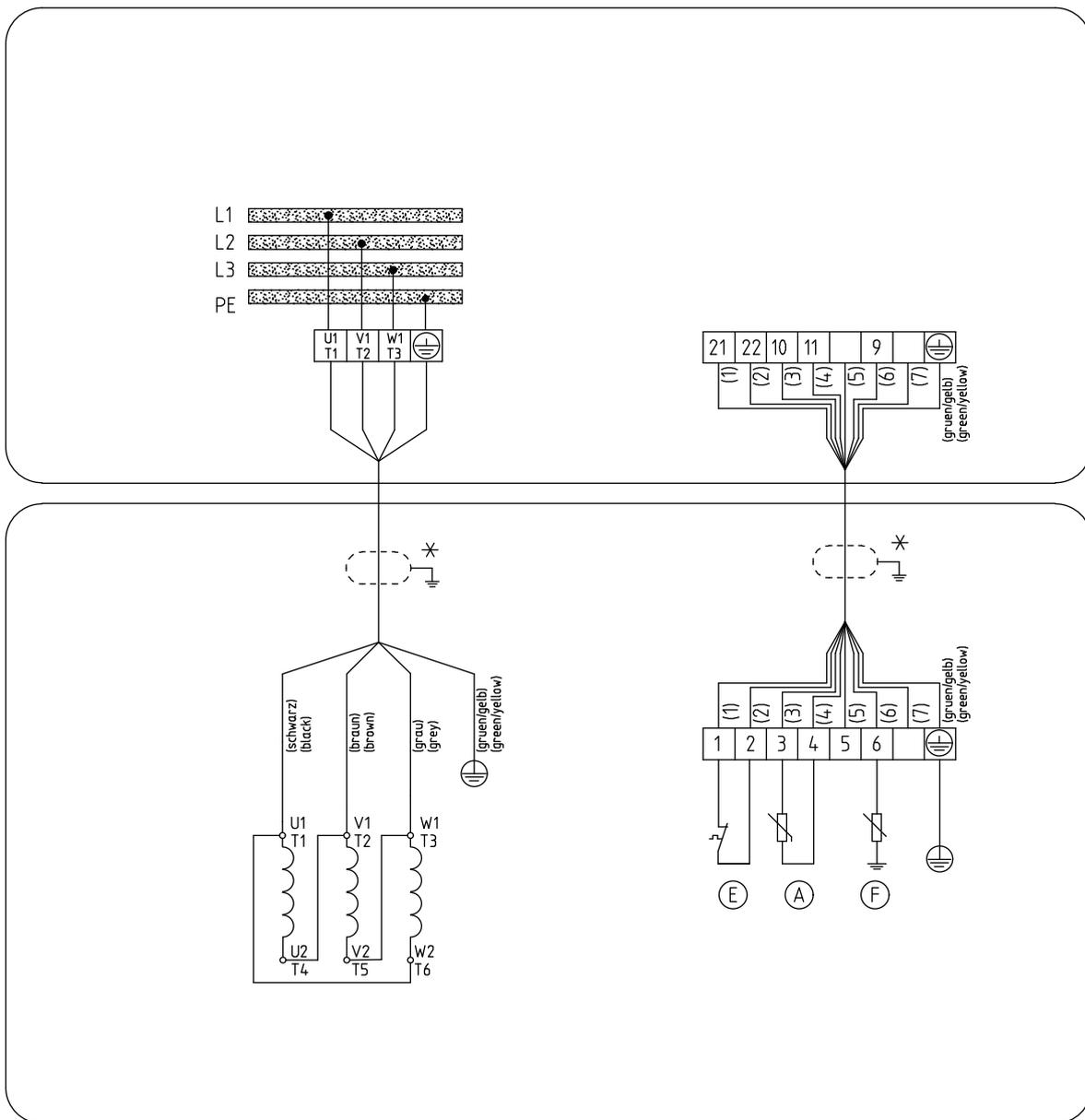


UG1572553

Fig. 46: Wiring diagram for pump sets with two power cables 7G6 and 8G1.5

Ⓐ	Motor temperature (PTC thermistor)
Ⓔ	Motor temperature
Ⓕ	Leakage inside the motor

9.4.4 Wiring diagram for two power cables 4G16 and 8G1.5

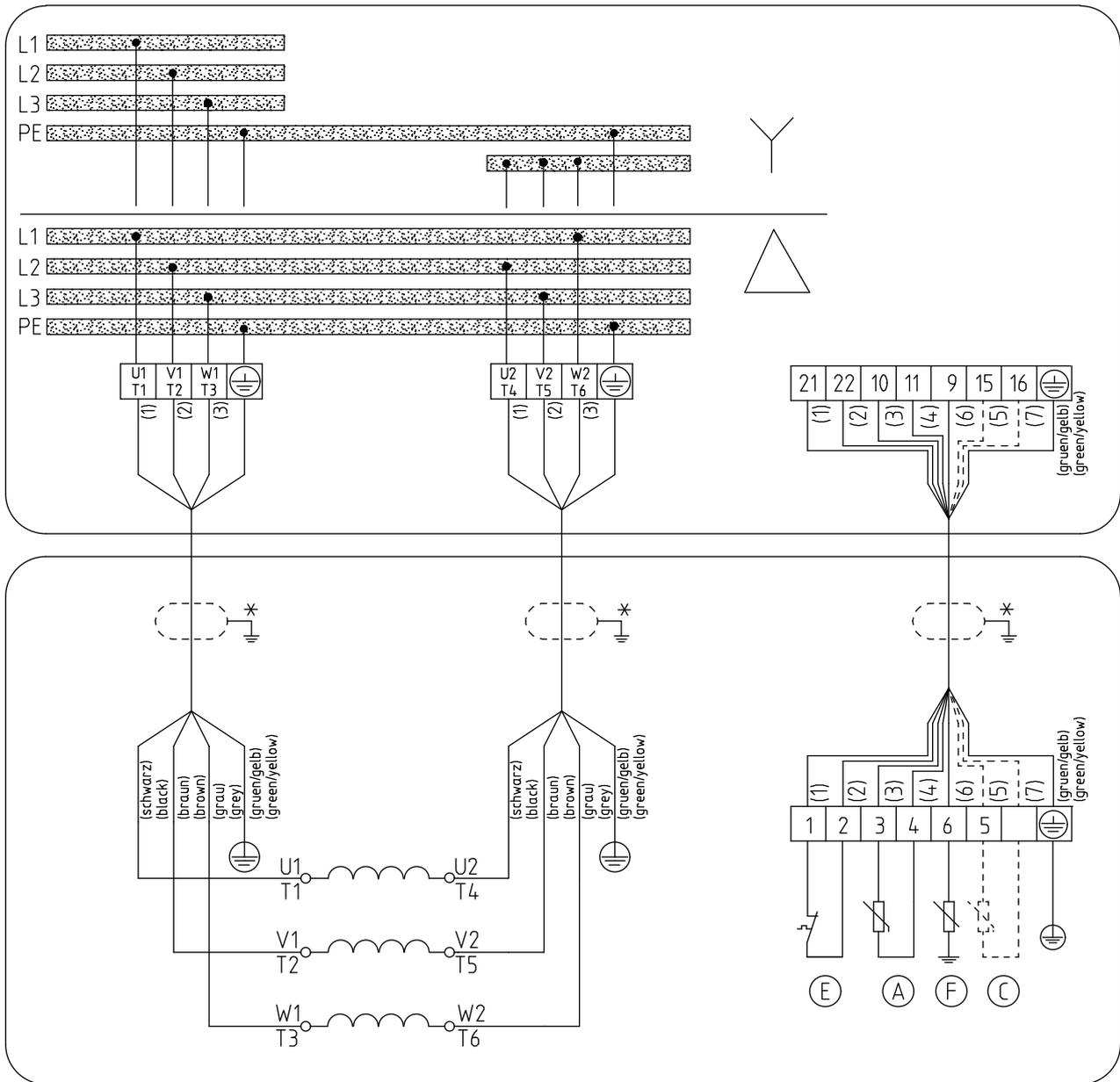


UG1572545

Fig. 47: Wiring diagram for pump sets with two power cables 4G16 and 8G1.5

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

9.4.5 Wiring diagram for three power cables 2x4GXX and 8G1.5 for pumps with optional bearing temperature monitoring



UG1580139

Fig. 48: Wiring diagram for three power cables 2x4GXX and 8G1.5 for pumps with optional bearing temperature monitoring

Ⓐ	Motor temperature (PTC thermistor)
Ⓒ	Bearing temperature (lower bearing assembly, optional)
Ⓔ	Motor temperature
Ⓕ	Leakage inside the motor
*	Shielded cable optional

9.5 Flamepaths on explosion-proof motors

9.5.1 Motor version XE

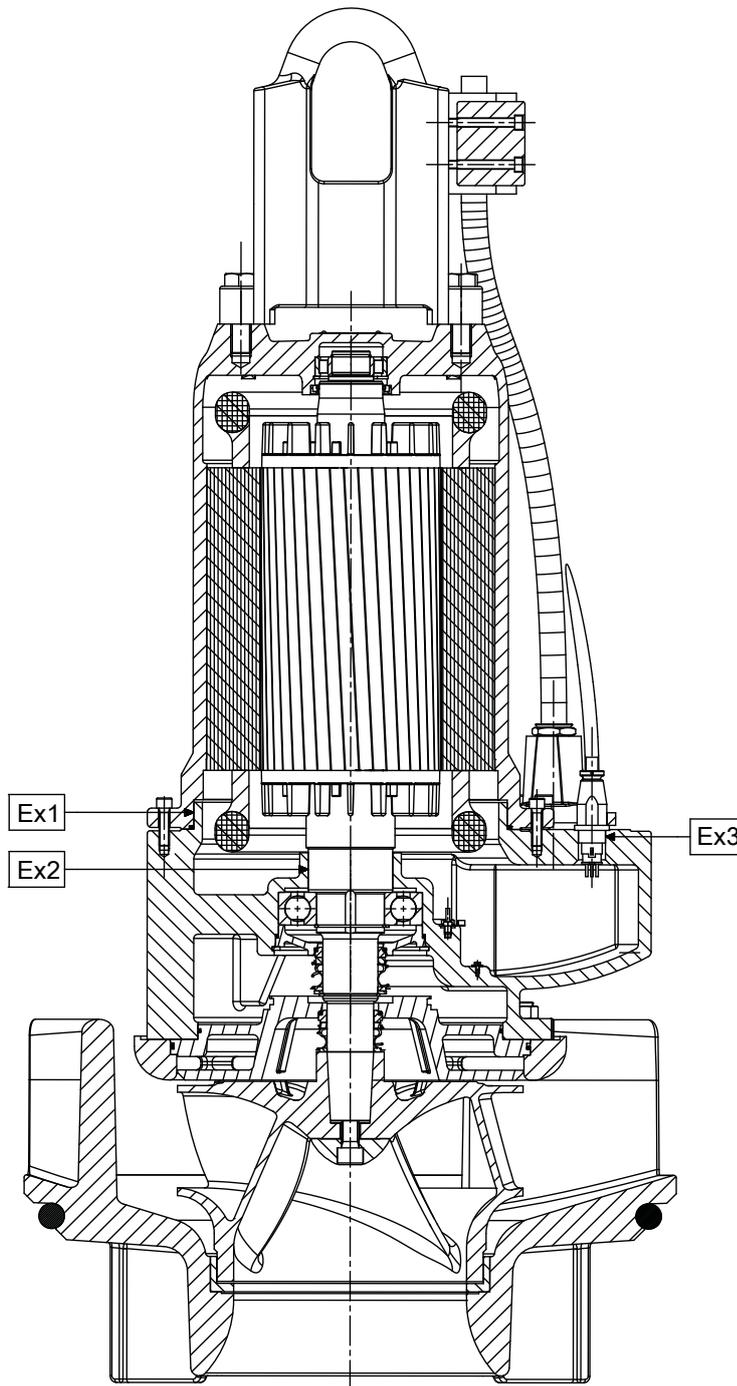


Fig. 49: Motor version XE

9.6 Sectional drawings of the mechanical seal

9.6.1 Bellows-type mechanical seal

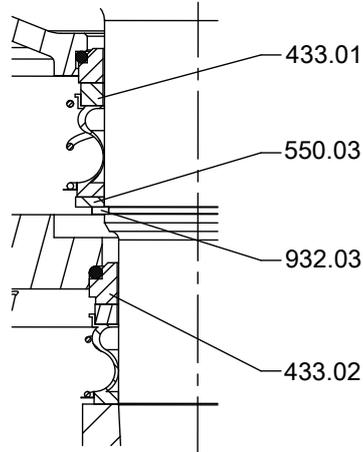


Fig. 50: Sectional drawing of bellows-type mechanical seal

Table 32: Bellows-type mechanical seal

Part No.	Description	Part No.	Description
433.01/02	Mechanical seal	932.03	Circlip
550.03	Disc		

9.6.2 Mechanical seal with covered springs (HJ)

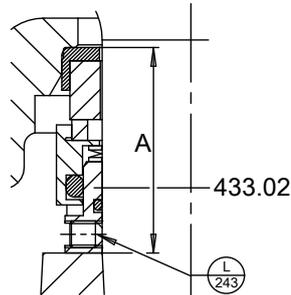


Fig. 51: Sectional drawing of mechanical seal with covered springs (HJ)

A: installation dimension

Table 33: Key to the symbols and codes

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

Table 34: Mechanical seal with covered springs (HJ)

Part No.	Description	Part No.	Description
433.02	Mechanical seal		

9.7 Dimensions

9.7.1 Motor version UE, XE [inch]

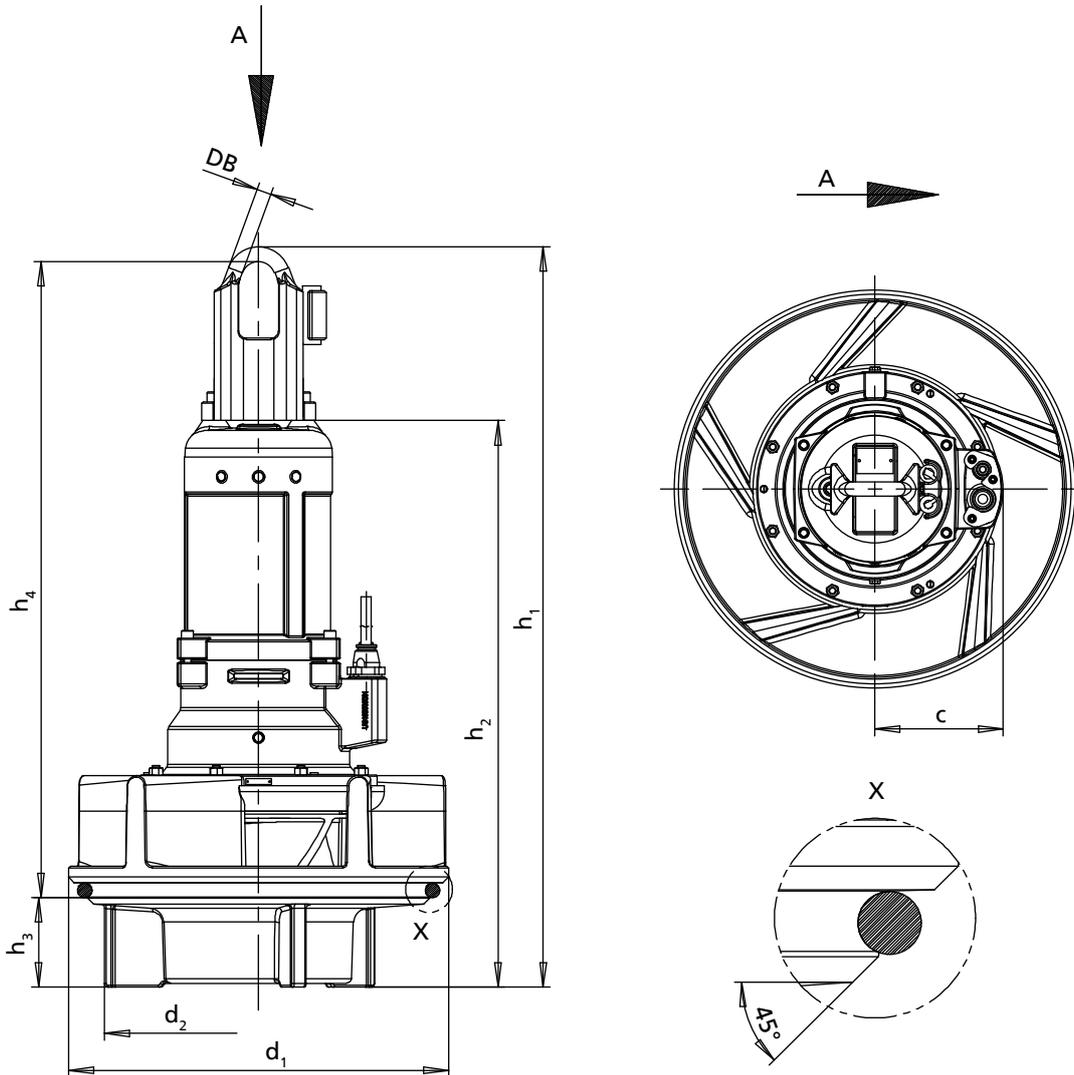


Fig. 52: Pump set dimensions

Table 35: Pump set dimensions [inch]

Size	Motor	c	d ₁	d ₂	DB	h ₁	h ₂	h ₃	h ₄	[lbs] ⁶⁾
700-324	11 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1058
700-324	15 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1058
700-324	18 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1102
700-324	22 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1168
700-330	22 6.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1080
700-330	30 6.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1168
700-330	11 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1036
700-330	15 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1036
700-330	18 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1102
700-330	22 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1168
700-371	22 6.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1146

6) Pump set with 10 m power cable (460 V)

Size	Motor	c	d ₁	d ₂	DB	h ₁	h ₂	h ₃	h ₄	[lbs] ⁵⁾
700-371	30 6.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1213
700-371	11 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1080
700-371	15 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1080
700-371	18 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1146
700-371	22 8.E	10 ¹ / ₄	26 ³ / ₈	21 ⁷ / ₈	1 ³ / ₁₆	57 ¹ / ₂	43 ¹ / ₂	5 ¹⁵ / ₁₆	50 ³ / ₈	1213
800-324	30 8.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	56 ¹ / ₂	41 ³ / ₄	5 ¹⁵ / ₁₆	49	1433
800-330	31 6.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	56 ¹ / ₂	41 ³ / ₄	5 ¹⁵ / ₁₆	49	1433
800-330	37 6.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	56 ¹ / ₂	41 ³ / ₄	5 ¹⁵ / ₁₆	49	1433
800-330	45 6.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	62 ³ / ₁₆	47 ⁷ / ₁₆	5 ¹⁵ / ₁₆	54 ³ / ₄	1455
800-330	55 6.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	62 ³ / ₁₆	47 ⁷ / ₁₆	5 ¹⁵ / ₁₆	54 ³ / ₄	1587
800-370	22 6.E	10 ¹ / ₄	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	55 ¹ / ₂	41 ⁹ / ₁₆	5 ¹³ / ₁₆	48 ⁷ / ₁₆	1235
800-370	30 6.E	10 ¹ / ₄	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	55 ¹ / ₂	41 ⁹ / ₁₆	5 ¹³ / ₁₆	48 ⁷ / ₁₆	1301
800-370	37 6.E	14	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	54 ¹ / ₂	39 ³ / ₄	5 ¹³ / ₁₆	47 ¹ / ₄	1565
800-370	45 6.E	14	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	60 ¹ / ₄	45 ¹ / ₂	5 ¹³ / ₁₆	52 ¹⁵ / ₁₆	1587
800-370	55 6.E	14	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	60 ¹ / ₄	45 ¹ / ₂	5 ¹³ / ₁₆	52 ¹⁵ / ₁₆	1720
800-370	11 8.E	10 ¹ / ₄	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	55 ¹ / ₂	41 ⁹ / ₁₆	5 ¹³ / ₁₆	48 ⁷ / ₁₆	1168
800-370	15 8.E	10 ¹ / ₄	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	55 ¹ / ₂	41 ⁹ / ₁₆	5 ¹³ / ₁₆	48 ⁷ / ₁₆	1168
800-370	18 8.E	10 ¹ / ₄	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	55 ¹ / ₂	41 ⁹ / ₁₆	5 ¹³ / ₁₆	48 ⁷ / ₁₆	1235
800-370	22 8.E	10 ¹ / ₄	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	55 ¹ / ₂	41 ⁹ / ₁₆	5 ¹³ / ₁₆	48 ⁷ / ₁₆	1301
800-370	30 8.E	14	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	54 ¹ / ₂	39 ³ / ₄	5 ¹³ / ₁₆	47 ¹ / ₄	1565
800-370	37 8.E	14	29 ¹⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	60 ¹ / ₄	45 ¹ / ₂	5 ¹³ / ₁₆	52 ¹⁵ / ₁₆	1587
800-371	31 6.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	56 ¹ / ₂	41 ³ / ₄	5 ¹⁵ / ₁₆	49	1477
800-371	37 6.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	56 ¹ / ₂	41 ³ / ₄	5 ¹⁵ / ₁₆	49	1477
800-371	45 6.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	62 ³ / ₁₆	47 ⁷ / ₁₆	5 ¹⁵ / ₁₆	54 ³ / ₄	1521
800-371	55 6.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	62 ³ / ₁₆	47 ⁷ / ₁₆	5 ¹⁵ / ₁₆	54 ³ / ₄	1631
800-371	30 8.E	14	26 ³ / ₈	21 ⁷ / ₈	1 ⁹ / ₁₆	56 ¹ / ₂	41 ³ / ₄	5 ¹⁵ / ₁₆	49	1477
800-400	18 8.E	10 ¹ / ₄	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	59 ⁵ / ₈	45 ¹ / ₁₆	7 ³ / ₁₆	51 ³ / ₁₆	1367
800-400	22 8.E	10 ¹ / ₄	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	59 ⁵ / ₈	45 ¹¹ / ₁₆	7 ³ / ₁₆	51 ³ / ₁₆	1433
800-400	30 8.E	14	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	58 ¹¹ / ₁₆	43 ⁷ / ₈	7 ³ / ₁₆	50	1698
800-400	37 8.E	14	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	64 ³ / ₈	49 ⁵ / ₈	7 ³ / ₁₆	55 ¹¹ / ₁₆	1742
800-400	45 8.E	14	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	64 ³ / ₈	49 ⁵ / ₈	7 ³ / ₁₆	55 ¹¹ / ₁₆	1874
800-401	37 6.E	14	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	58 ¹¹ / ₁₆	43 ⁷ / ₈	7 ³ / ₁₆	50	1720
800-401	45 6.E	14	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	64 ³ / ₈	49 ⁵ / ₈	7 ³ / ₁₆	55 ¹¹ / ₁₆	1764
800-401	55 6.E	14	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	64 ³ / ₈	49 ⁵ / ₈	7 ³ / ₁₆	55 ¹¹ / ₁₆	1874
800-401	15 8.E	10 ¹ / ₄	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	59 ⁵ / ₈	45 ¹¹ / ₁₆	7 ³ / ₁₆	51 ³ / ₁₆	1345
800-401	18 8.E	10 ¹ / ₄	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	59 ⁵ / ₈	45 ¹¹ / ₁₆	7 ³ / ₁₆	51 ³ / ₁₆	1389
800-401	22 8.E	10 ¹ / ₄	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ³ / ₁₆	59 ⁵ / ₈	45 ¹¹ / ₁₆	7 ³ / ₁₆	51 ³ / ₁₆	1455
800-401	30 8.E	14	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	58 ¹¹ / ₁₆	43 ⁷ / ₈	7 ³ / ₁₆	50	1720
800-401	37 8.E	14	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	64	49 ³ / ₁₆	7 ³ / ₁₆	55 ⁵ / ₁₆	1764
800-401	45 8.E	14	30 ⁵ / ₁₆	25 ³ / ₁₆	1 ⁹ / ₁₆	64 ³ / ₈	49 ⁵ / ₈	7 ³ / ₁₆	55 ¹¹ / ₁₆	1896

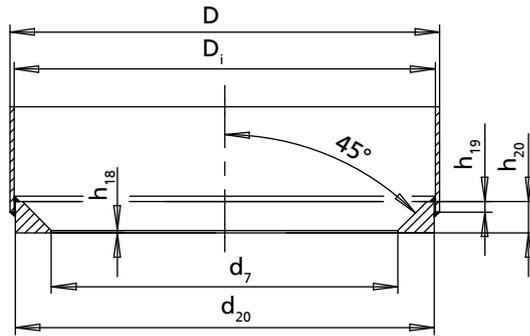


Fig. 53: Seating ring dimensions

Table 36: Seating ring dimensions [inch]

Size	Motor	D ⁷⁾	D _i	d ₇	d ₂₀	h ₁₈	h ₁₉	h ₂₀
700-324	11 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-324	15 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-324	18 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-324	22 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-330	22 6.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-330	30 6.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-330	11 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-330	15 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-330	18 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-330	22 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-371	22 6.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-371	30 6.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-371	11 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-371	15 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-371	18 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
700-371	22 8.E	28	27 ³ / ₈	22 ⁷ / ₁₆	27 ³ / ₁₆	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-324	30 8.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-330	31 6.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-330	37 6.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-330	45 6.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-330	55 6.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	22 6.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	30 6.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	37 6.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	45 6.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	55 6.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	11 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	15 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	18 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	22 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	30 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-370	37 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-371	31 6.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-371	37 6.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈

7) D for recommended wall thickness of the discharge tube (see dimension s1 in the general arrangement drawings or in General Arrangement Drawings booklet 1579.396)

Size	Motor	D ⁷⁾	D _i	d ₇	d ₂₀	h ₁₈	h ₁₉	h ₂₀
800-371	45 6.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-371	55 6.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-371	30 8.E	32	31 ³ / ₈	22 ⁷ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-400	18 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-400	22 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-400	30 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-400	37 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-400	45 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-401	37 6.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-401	45 6.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-401	55 6.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-401	15 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-401	18 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-401	22 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-401	30 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-401	37 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈
800-401	45 8.E	32	31 ³ / ₈	25 ¹³ / ₁₆	31 ¹ / ₄	³ / ₁₆	¹³ / ₁₆	2 ³ / ₈

9.7.2 Motor version UE, XE [mm]

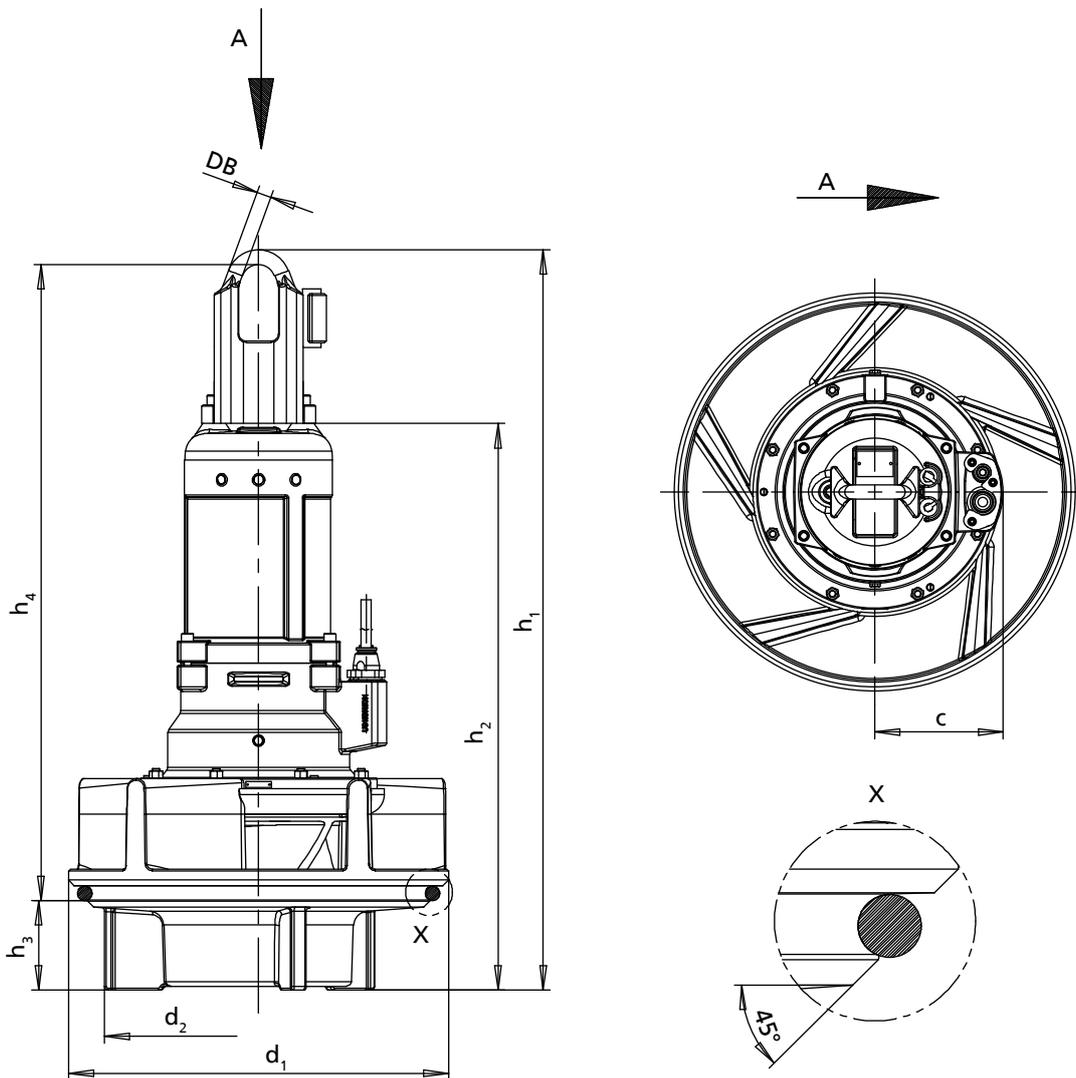


Fig. 54: Pump set dimensions

Table 37: Pump set dimensions [mm]

Size	Motor	c	d ₁	d ₂	DB	h ₁	h ₂	h ₃	h ₄	[kg] ⁸⁾
700-324	11 8.E	260	670	556	30	1460	1105	151	1280	480
700-324	15 8.E	260	670	556	30	1460	1105	151	1280	480
700-324	18 8.E	260	670	556	30	1460	1105	151	1280	500
700-324	22 8.E	260	670	556	30	1460	1105	151	1280	530
700-330	22 6.E	260	670	556	30	1460	1105	151	1280	490
700-330	30 6.E	260	670	556	30	1460	1105	151	1280	530
700-330	11 8.E	260	670	556	30	1460	1105	151	1280	470
700-330	15 8.E	260	670	556	30	1460	1105	151	1280	470
700-330	18 8.E	260	670	556	30	1460	1105	151	1280	500
700-330	22 8.E	260	670	556	30	1460	1105	151	1280	530
700-371	22 6.E	260	670	556	30	1460	1105	151	1280	520
700-371	30 6.E	260	670	556	30	1460	1105	151	1280	550
700-371	11 8.E	260	670	556	30	1460	1105	151	1280	490
700-371	15 8.E	260	670	556	30	1460	1105	151	1280	490

8) Pump set with 10 m power cable (460 V)

Size	Motor	c	d ₁	d ₂	DB	h ₁	h ₂	h ₃	h ₄	[kg] ⁸⁾
700-371	18 8.E	260	670	556	30	1460	1105	151	1280	520
700-371	22 8.E	260	670	556	30	1460	1105	151	1280	550
800-324	30 8.E	355	670	556	40	1435	1060	151	1245	650
800-330	31 6.E	355	670	556	40	1435	1060	151	1245	650
800-330	37 6.E	355	670	556	40	1435	1060	151	1245	650
800-330	45 6.E	355	670	556	40	1580	1205	151	1390	660
800-330	55 6.E	355	670	556	40	1580	1205	151	1390	720
800-370	22 6.E	260	760	640	30	1410	1055	148	1230	560
800-370	30 6.E	260	760	640	30	1410	1055	148	1230	590
800-370	37 6.E	355	760	640	40	1385	1010	148	1200	710
800-370	45 6.E	355	760	640	40	1530	1155	148	1345	720
800-370	55 6.E	355	760	640	40	1530	1155	148	1345	780
800-370	11 8.E	260	760	640	30	1410	1055	148	1230	530
800-370	15 8.E	260	760	640	30	1410	1055	148	1230	530
800-370	18 8.E	260	760	640	30	1410	1055	148	1230	560
800-370	22 8.E	260	760	640	30	1410	1055	148	1230	590
800-370	30 8.E	355	760	640	40	1385	1010	148	1200	710
800-370	37 8.E	355	760	640	40	1530	1155	148	1345	720
800-371	31 6.E	355	670	556	40	1435	1060	151	1245	670
800-371	37 6.E	355	670	556	40	1435	1060	151	1245	670
800-371	45 6.E	355	670	556	40	1580	1205	151	1390	690
800-371	55 6.E	355	670	556	40	1580	1205	151	1390	740
800-371	30 8.E	355	670	556	40	1435	1060	151	1245	670
800-400	18 8.E	260	770	640	30	1515	1160	183	1300	620
800-400	22 8.E	260	770	640	30	1515	1160	183	1300	650
800-400	30 8.E	355	770	640	40	1490	1115	183	1270	770
800-400	37 8.E	355	770	640	40	1635	1260	183	1415	790
800-400	45 8.E	355	770	640	40	1635	1260	183	1415	850
800-401	37 6.E	355	770	640	40	1490	1115	183	1270	780
800-401	45 6.E	355	770	640	40	1635	1260	183	1415	800
800-401	55 6.E	355	770	640	40	1635	1260	183	1415	850
800-401	15 8.E	260	770	640	30	1515	1160	183	1300	610
800-401	18 8.E	260	770	640	30	1515	1160	183	1300	630
800-401	22 8.E	260	770	640	30	1515	1160	183	1300	660
800-401	30 8.E	355	770	640	40	1490	1115	183	1270	780
800-401	37 8.E	355	770	640	40	1625	1250	183	1405	800
800-401	45 8.E	355	770	640	40	1635	1260	183	1415	860

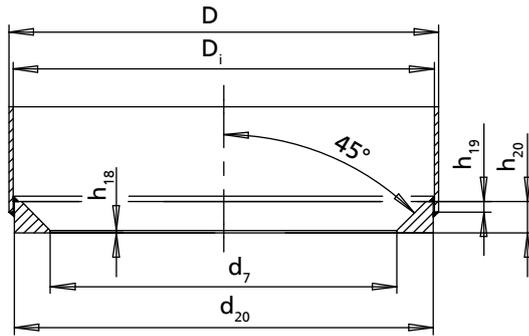


Fig. 55: Seating ring dimensions

Table 38: Seating ring dimensions [mm]

Size	Motor	D ⁹⁾	D _i	d ₇	d ₂₀	h ₁₈	h ₁₉	h ₂₀
700-324	11 8.E	711	695	570	691	5	20	60
700-324	15 8.E	711	695	570	691	5	20	60
700-324	18 8.E	711	695	570	691	5	20	60
700-324	22 8.E	711	695	570	691	5	20	60
700-330	22 6.E	711	695	570	691	5	20	60
700-330	30 6.E	711	695	570	691	5	20	60
700-330	11 8.E	711	695	570	691	5	20	60
700-330	15 8.E	711	695	570	691	5	20	60
700-330	18 8.E	711	695	570	691	5	20	60
700-330	22 8.E	711	695	570	691	5	20	60
700-371	22 6.E	711	695	570	691	5	20	60
700-371	30 6.E	711	695	570	691	5	20	60
700-371	11 8.E	711	695	570	691	5	20	60
700-371	15 8.E	711	695	570	691	5	20	60
700-371	18 8.E	711	695	570	691	5	20	60
700-371	22 8.E	711	695	570	691	5	20	60
800-324	30 8.E	813	797	570	793	5	20	60
800-330	31 6.E	813	797	570	793	5	20	60
800-330	37 6.E	813	797	570	793	5	20	60
800-330	45 6.E	813	797	570	793	5	20	60
800-330	55 6.E	813	797	570	793	5	20	60
800-370	22 6.E	813	797	656	793	5	20	60
800-370	30 6.E	813	797	656	793	5	20	60
800-370	37 6.E	813	797	656	793	5	20	60
800-370	45 6.E	813	797	656	793	5	20	60
800-370	55 6.E	813	797	656	793	5	20	60
800-370	11 8.E	813	797	656	793	5	20	60
800-370	15 8.E	813	797	656	793	5	20	60
800-370	18 8.E	813	797	656	793	5	20	60
800-370	22 8.E	813	797	656	793	5	20	60
800-370	30 8.E	813	797	656	793	5	20	60
800-370	37 8.E	813	797	656	793	5	20	60
800-371	31 6.E	813	797	570	793	5	20	60
800-371	37 6.E	813	797	570	793	5	20	60

9) D for recommended wall thickness of the discharge tube (see dimension s1 in the general arrangement drawings or in General Arrangement Drawings booklet 1579.396)

Size	Motor	D ⁹⁾	D _i	d ₇	d ₂₀	h ₁₈	h ₁₉	h ₂₀
800-371	45 6.E	813	797	570	793	5	20	60
800-371	55 6.E	813	797	570	793	5	20	60
800-371	30 8.E	813	797	570	793	5	20	60
800-400	18 8.E	813	797	656	793	5	20	60
800-400	22 8.E	813	797	656	793	5	20	60
800-400	30 8.E	813	797	656	793	5	20	60
800-400	37 8.E	813	797	656	793	5	20	60
800-400	45 8.E	813	797	656	793	5	20	60
800-401	37 6.E	813	797	656	793	5	20	60
800-401	45 6.E	813	797	656	793	5	20	60
800-401	55 6.E	813	797	656	793	5	20	60
800-401	15 8.E	813	797	656	793	5	20	60
800-401	18 8.E	813	797	656	793	5	20	60
800-401	22 8.E	813	797	656	793	5	20	60
800-401	30 8.E	813	797	656	793	5	20	60
800-401	37 8.E	813	797	656	793	5	20	60
800-401	45 8.E	813	797	656	793	5	20	60

9.8 General arrangement drawings

9.8.1 Installation type BU, motor version UE, XE

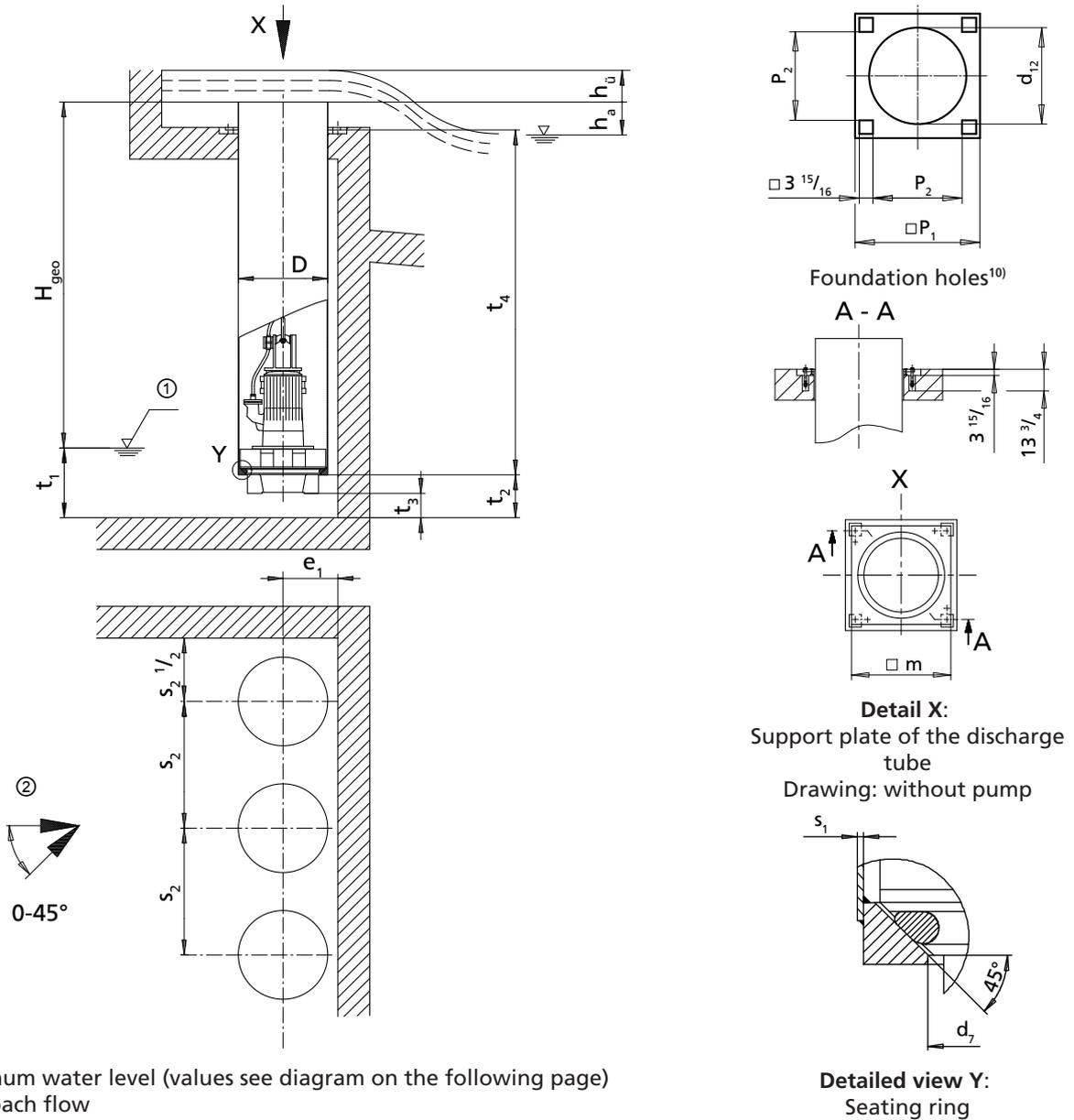


Table 39: Dimensions [inch]

Size	D	d ₇	d ₁₂	e ₁ ¹¹⁾	h _a	m	p ₁	p ₂	s _{1 min.}	s _{2 min.}	t ₂ ¹¹⁾	t ₃	t _{4 min.} ¹²⁾
700-324	28	22 ⁷ / ₁₆	29 ¹ / ₂	16 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	31 ¹ / ₂	35 ⁷ / ₁₆	25 ³ / ₁₆	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	59 ¹ / ₁₆
700-330	28	22 ⁷ / ₁₆	29 ¹ / ₂	16 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	31 ¹ / ₂	35 ⁷ / ₁₆	25 ³ / ₁₆	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	59 ¹ / ₁₆
700-371	28	22 ⁷ / ₁₆	29 ¹ / ₂	16 ¹⁵ / ₁₆	3 ¹⁵ / ₁₆	31 ¹ / ₂	35 ⁷ / ₁₆	25 ³ / ₁₆	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	59 ¹ / ₁₆
800-324	32	22 ⁷ / ₁₆	33 ⁷ / ₁₆	18 ⁷ / ₈	3 ¹⁵ / ₁₆	35 ¹³ / ₁₆	39 ³ / ₈	29 ¹ / ₈	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	59 ¹ / ₁₆
800-330	32	22 ⁷ / ₁₆	33 ⁷ / ₁₆	18 ⁷ / ₈	3 ¹⁵ / ₁₆	35 ¹³ / ₁₆	39 ³ / ₈	29 ¹ / ₈	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	64 ¹⁵ / ₁₆
800-370	32	25 ¹³ / ₁₆	33 ⁷ / ₁₆	18 ⁷ / ₈	3 ¹⁵ / ₁₆	35 ¹³ / ₁₆	39 ³ / ₈	29 ¹ / ₈	5 ⁵ / ₁₆	47 ¹ / ₄	13	7 ⁷ / ₈	61
800-371	32	22 ⁷ / ₁₆	33 ⁷ / ₁₆	18 ⁷ / ₈	3 ¹⁵ / ₁₆	35 ¹³ / ₁₆	39 ³ / ₈	29 ¹ / ₈	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	64 ¹⁵ / ₁₆
800-400	32	25 ¹³ / ₁₆	33 ⁷ / ₁₆	18 ⁷ / ₈	3 ¹⁵ / ₁₆	35 ¹³ / ₁₆	39 ³ / ₈	29 ¹ / ₈	5 ⁵ / ₁₆	55 ¹ / ₈	16 ¹ / ₈	9 ¹³ / ₁₆	66 ¹⁵ / ₁₆
800-401	32	25 ¹³ / ₁₆	33 ⁷ / ₁₆	18 ⁷ / ₈	3 ¹⁵ / ₁₆	35 ¹³ / ₁₆	39 ³ / ₈	29 ¹ / ₈	5 ⁵ / ₁₆	55 ¹ / ₈	16 ¹ / ₈	9 ¹³ / ₁₆	66 ¹⁵ / ₁₆

10) All dimensions for foundation holes apply to discharge tube design without intermediate flange.
 11) Observe this dimension.
 12) Value for maximum motor length

Permissible deviations:

- Tolerances in building construction to DIN 18202, Part 4, Group B
- Welded design: B/F to DIN EN ISO 13920
- Tolerances for conical seat (detailed view Y): ISO 2768-mH

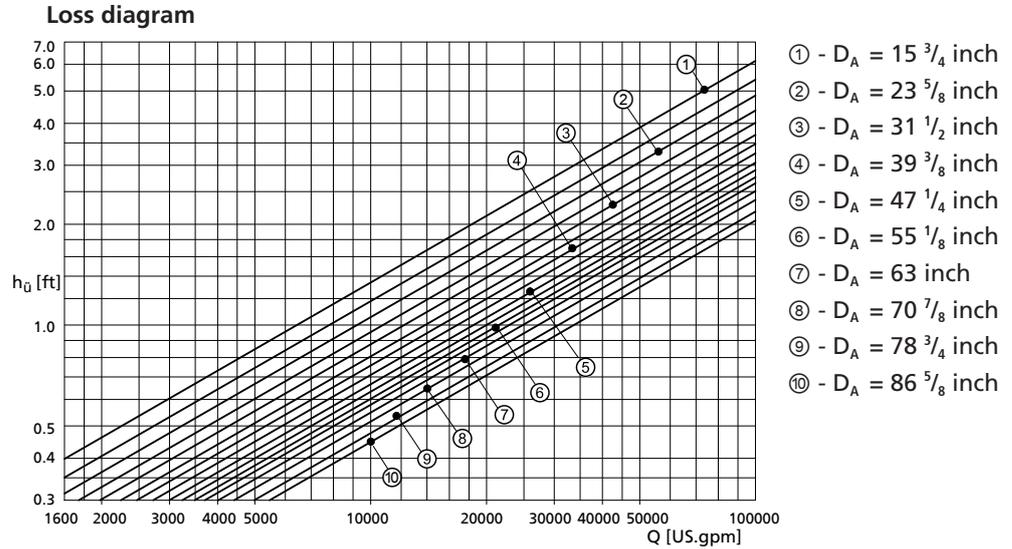
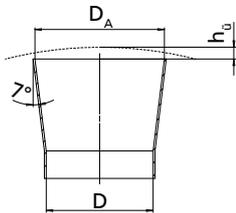


Illustration of the overflow head h_{oi}

Loss diagram

Calculation formulas:

$$H = H_{geo} + \Delta H_v$$

- ΔH_v
- Overflow head h_{oi} (see diagram)
 - Loss in the riser (pipe friction)
 - Outlet loss $v^2 / 2g$ (v refers to D_A)

Overflow head h_{oi} depends on Q and the discharge design $\varnothing D_A$. The characteristic curve values only apply to unimpeded outlet in all directions; otherwise they are approximate values only.

Minimum water level diagram

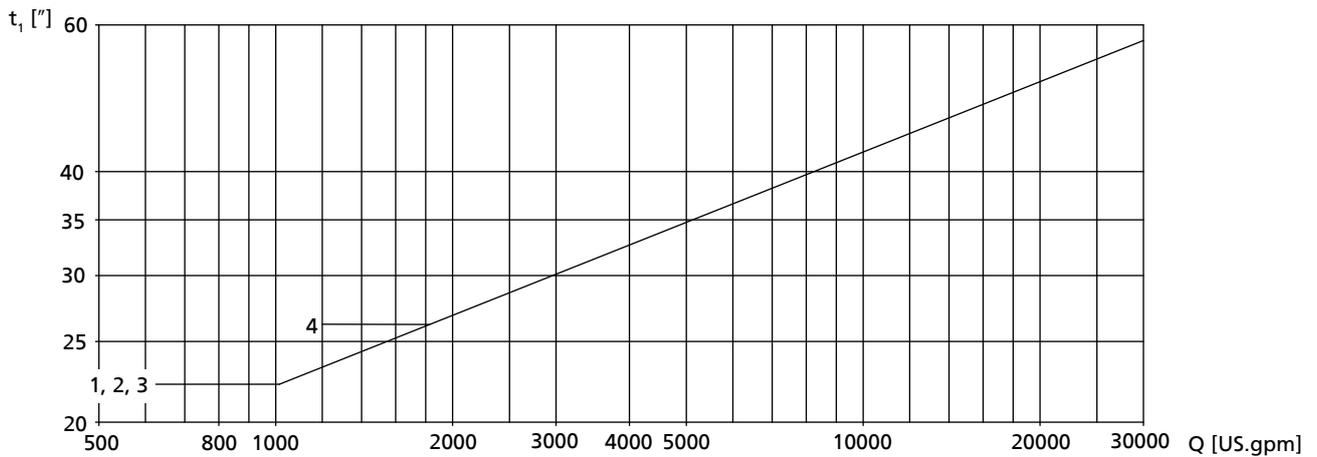
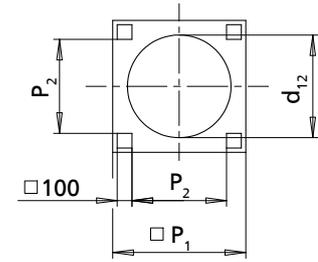
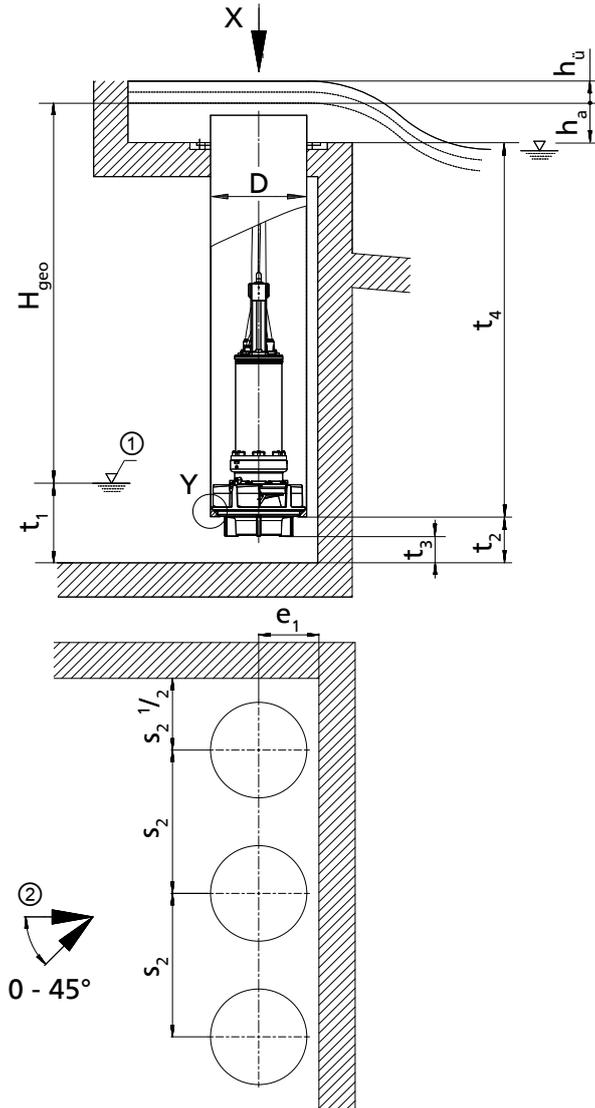


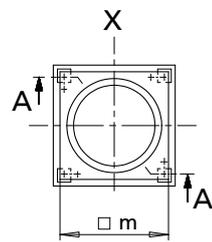
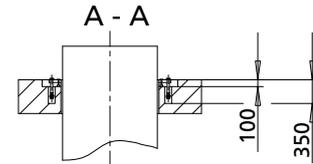
Fig. 56: Minimum water level diagram, motor version UE, XE

1	Amacan K 700-330, 800-330
2	Amacan K 700-324, 700-371, 800-324, 800-371
3	Amacan K 800-370
4	Amacan K 800-400, 800-401

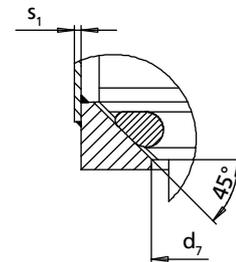
9.8.2 Installation type BU, motor version UE, XE



Foundation holes¹³⁾



Detail X:
Support plate of the discharge tube
Drawing: without pump



Detail Y:
seating ring

- ①: Minimum water level (values see diagram on the following page)
- ②: Approach flow

Table 40: Dimensions [mm]

Size	D	d ₇	d ₁₂	e ₁ ¹⁴⁾	h _a	m	p ₁	p ₂	s _{1 min.}	s _{2 min.}	t ₂ ¹⁴⁾	t ₃	t _{4 min.} ¹⁵⁾
700-324	711	570	750	430	100	800	900	640	8	1150	330	200	1500
700-330	711	570	750	430	100	800	900	640	8	1150	330	200	1500
700-371	711	570	750	430	100	800	900	640	8	1150	330	200	1500
800-324	813	570	850	480	100	910	1000	740	8	1150	330	200	1500
800-330	813	570	850	480	100	910	1000	740	8	1150	330	200	1650
800-370	813	656	850	480	100	910	1000	740	8	1150	330	200	1550
800-371	813	570	850	480	100	910	1000	740	8	1150	330	200	1650
800-400	813	656	850	480	100	910	1000	740	8	1400	410	250	1500
800-401	813	656	850	480	100	910	1000	740	8	1400	410	250	1500

13) All dimensions for foundation holes apply to discharge tube design without intermediate flange.
 14) Observe this dimension.
 15) Value for maximum motor length

Permissible deviations:

- Tolerances in building construction to DIN 18202, Part 4, Group B
- Welded design: B/F to DIN EN ISO 13920
- Tolerances for conical seat (detailed view Y): ISO 2768-mH

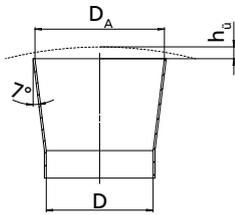
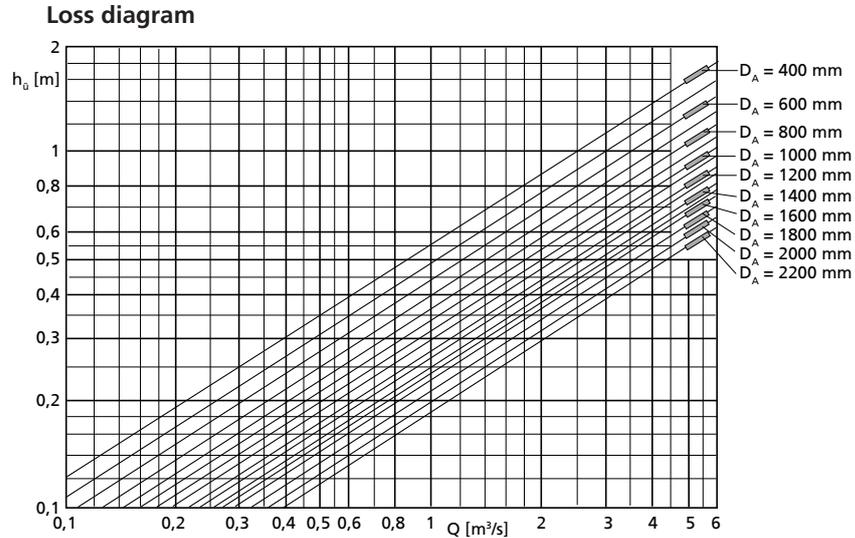


Illustration of the overflow head $h_{\bar{u}}$



Loss diagram

Calculation formulas:

$$H = H_{\text{geo}} + \Delta H_v$$

- ΔH_v
- Overflow head $h_{\bar{u}}$ (see diagram)
 - Loss in the riser (pipe friction)
 - Outlet loss $v^2 / 2g$ (v refers to D_A)

Overflow head $h_{\bar{u}}$ depends on Q and the discharge design $\varnothing D_A$. The characteristic curve values only apply to unimpeded outlet in all directions; otherwise they are approximate values only.

Minimum water level diagram

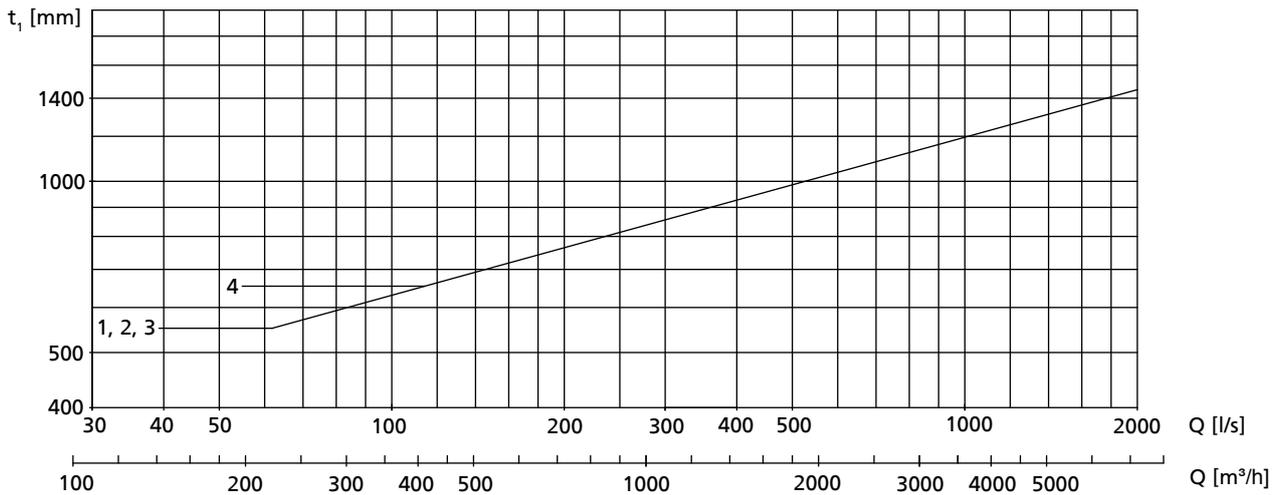
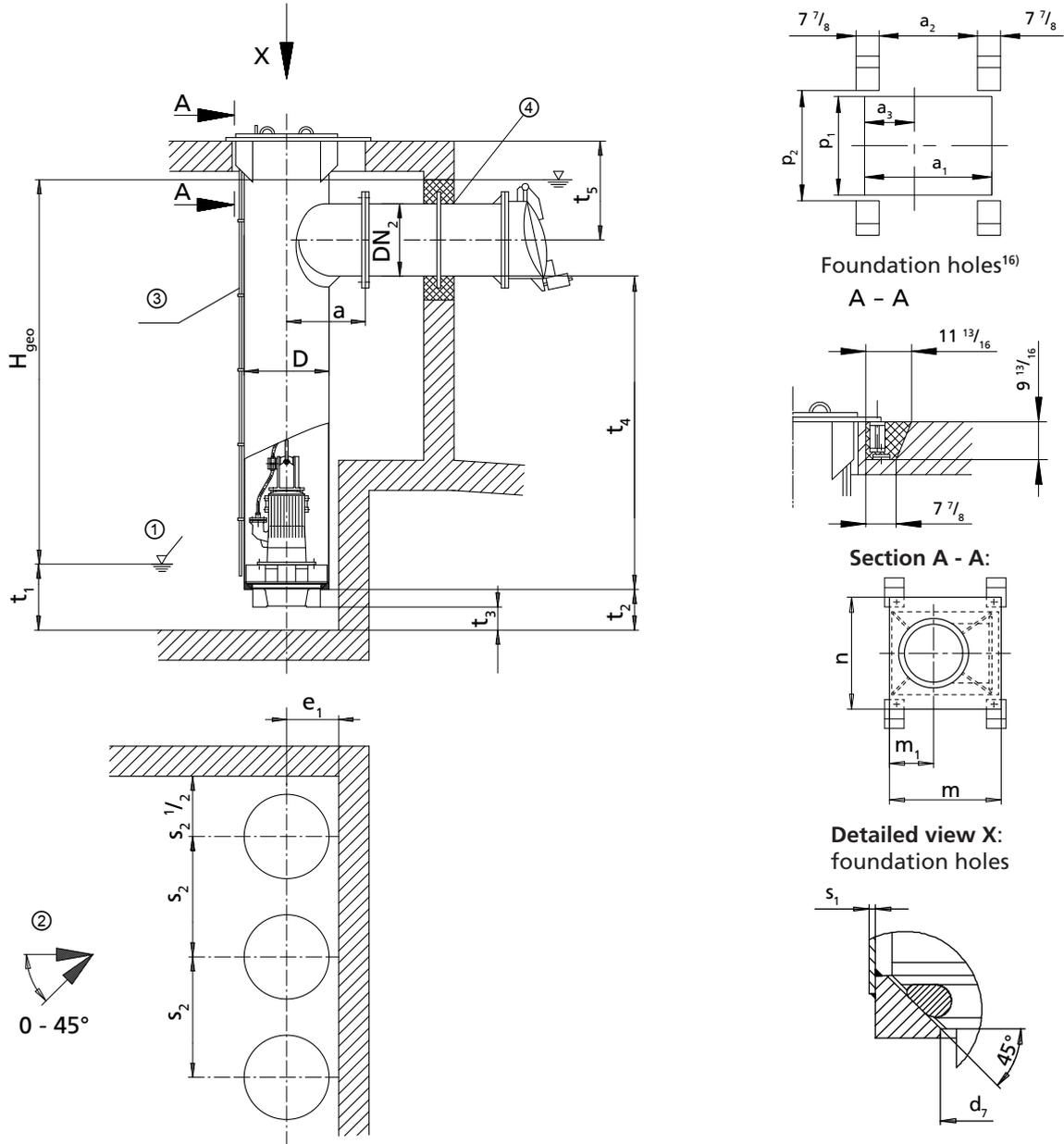


Fig. 57: Minimum water level diagram, motor version UE, XE

1	Amacan K 700-330, 800-330
2	Amacan K 700-324, 700-371, 800-324, 800-371
3	Amacan K 800-370
4	Amacan K 800-400, 800-401

9.8.3 Installation type CU, motor version UE, XE



- ①: Minimum water level (values see diagram on the following page)
- ②: Approach flow
- ③: Vent line
- ④: Connect the discharge pipe to the discharge tube without transmitting any stresses or strains.

Table 41: Dimensions [inch]

Size	D	DN _{2 min.}	DN _{2 max.}	a	a ₁ ¹⁷⁾	a ₂ ¹⁷⁾	a ₃ ¹⁷⁾	d ₇	e ₁ ¹⁸⁾	m ¹⁷⁾	m ₁ ¹⁷⁾	n ¹⁷⁾
700-324	28	11 ¹³ / ₁₆	23 ⁵ / ₈	25 ⁹ / ₁₆	44 ¹ / ₈	34 ¹ / ₄	16 ¹⁵ / ₁₆	22 ⁷ / ₁₆	16 ¹⁵ / ₁₆	46 ¹ / ₁₆	17 ¹⁵ / ₁₆	45 ¹¹ / ₁₆
700-330	28	11 ¹³ / ₁₆	23 ⁵ / ₈	25 ⁹ / ₁₆	44 ¹ / ₈	34 ¹ / ₄	16 ¹⁵ / ₁₆	22 ⁷ / ₁₆	16 ¹⁵ / ₁₆	46 ¹ / ₁₆	17 ¹⁵ / ₁₆	45 ¹¹ / ₁₆
700-371	28	11 ¹³ / ₁₆	23 ⁵ / ₈	25 ⁹ / ₁₆	44 ¹ / ₈	34 ¹ / ₄	16 ¹⁵ / ₁₆	22 ⁷ / ₁₆	16 ¹⁵ / ₁₆	46 ¹ / ₁₆	17 ¹⁵ / ₁₆	45 ¹¹ / ₁₆
800-324	32	15 ³ / ₄	27 ⁹ / ₁₆	48 ¹ / ₁₆	48 ¹ / ₁₆	38 ³ / ₁₆	18 ⁷ / ₈	22 ⁷ / ₁₆	18 ⁷ / ₈	50	19 ⁷ / ₈	49 ⁵ / ₈
800-330	32	15 ³ / ₄	27 ⁹ / ₁₆	48 ¹ / ₁₆	48 ¹ / ₁₆	38 ³ / ₁₆	18 ⁷ / ₈	22 ⁷ / ₁₆	18 ⁷ / ₈	50	19 ⁷ / ₈	49 ⁵ / ₈
800-370	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	48 ¹ / ₁₆	38 ³ / ₁₆	18 ⁷ / ₈	25 ¹³ / ₁₆	18 ⁷ / ₈	50	19 ⁷ / ₈	49 ⁵ / ₈

16) All dimensions for foundation holes apply to discharge tube design without intermediate flange.
 17) Selected for DN_{2max}
 18) Observe this dimension.

Size	D	DN _{2 min.}	DN _{2 max.}	a	a ₁ ¹⁷⁾	a ₂ ¹⁷⁾	a ₃ ¹⁷⁾	d ₇	e ₁ ¹⁸⁾	m ¹⁷⁾	m ₁ ¹⁷⁾	n ¹⁷⁾
800-371	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	48 ¹ / ₁₆	38 ³ / ₁₆	18 ⁷ / ₈	22 ⁷ / ₁₆	18 ⁷ / ₈	50	19 ⁷ / ₈	49 ⁵ / ₈
800-400	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	48 ¹ / ₁₆	38 ³ / ₁₆	18 ⁷ / ₈	25 ¹³ / ₁₆	18 ⁷ / ₈	50	19 ⁷ / ₈	49 ⁵ / ₈
800-401	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	48 ¹ / ₁₆	38 ³ / ₁₆	18 ⁷ / ₈	25 ¹³ / ₁₆	18 ⁷ / ₈	50	19 ⁷ / ₈	49 ⁵ / ₈

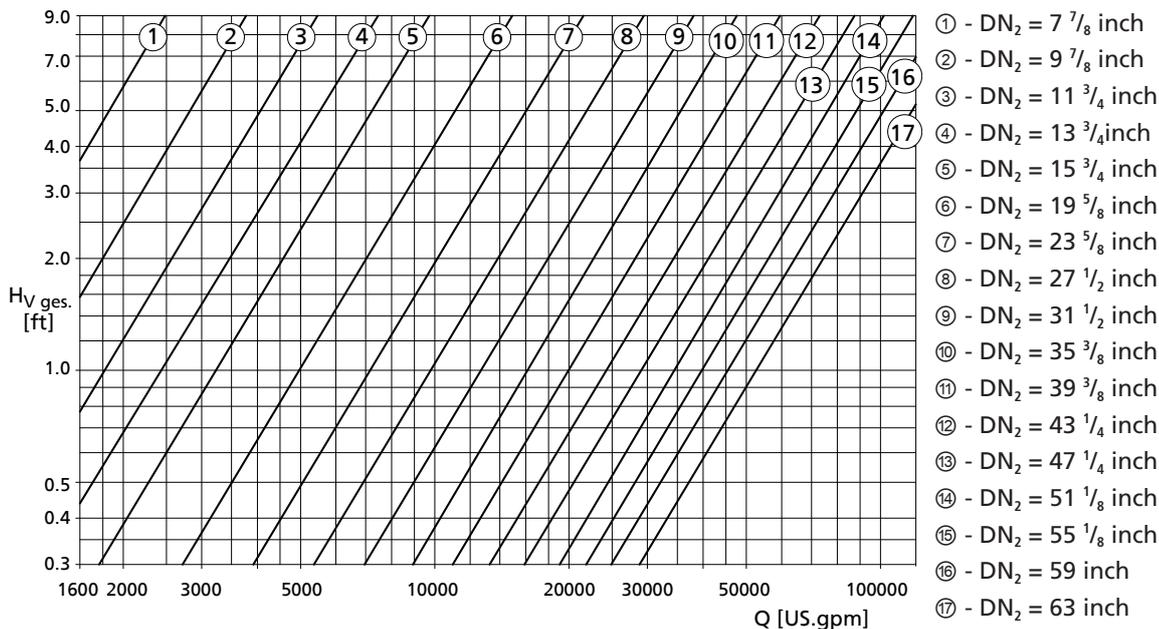
Table 42: Dimensions [inch]

Size	p ₁ ¹⁷⁾	p ₂ ¹⁷⁾	s _{1 min.}	s _{2 min.}	t ₂ ¹⁸⁾	t ₃	t _{4 min.} ¹⁹⁾	t _{5 min.} ¹⁷⁾
700-324	33 ⁷ / ₈	37 ¹³ / ₁₆	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	61	28 ³ / ₈
700-330	33 ⁷ / ₈	37 ¹³ / ₁₆	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	61	28 ³ / ₈
700-371	33 ⁷ / ₈	37 ¹³ / ₁₆	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	61	28 ³ / ₈
800-324	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	61	30 ⁵ / ₁₆
800-330	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	66 ¹⁵ / ₁₆	30 ⁵ / ₁₆
800-370	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	47 ¹ / ₄	13	7 ⁷ / ₈	63	30 ⁵ / ₁₆
800-371	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	66 ¹⁵ / ₁₆	30 ⁵ / ₁₆
800-400	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	55 ¹ / ₈	16 ¹ / ₈	9 ¹³ / ₁₆	68 ⁷ / ₈	30 ⁵ / ₁₆
800-401	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	55 ¹ / ₈	16 ¹ / ₈	9 ¹³ / ₁₆	68 ⁷ / ₈	30 ⁵ / ₁₆

Permissible deviations:

- Tolerances in building construction to DIN 18202, Part 4, Group B
- Welded design: B/F to DIN EN ISO 13920
- Tolerances for conical seat (detailed view Y): ISO 2768-mH
- Discharge flanges to DIN EN 1092-1 PN6 / DIN EN 1092-2 PN6

Loss diagram



Calculation formulas:

$$H = H_{geo} + \Delta H_v$$

ΔH_v

- Loss in the riser (pipe friction)
- $H_{v,ges.}$ (see diagram)

$H_{v,ges.}$ comprises:

- Elbow
- Discharge pipe length = 5 x DN₂
- Swing check valve
- Outlet losses $v^2/2g$

19) Value for maximum motor length

Minimum water level diagram

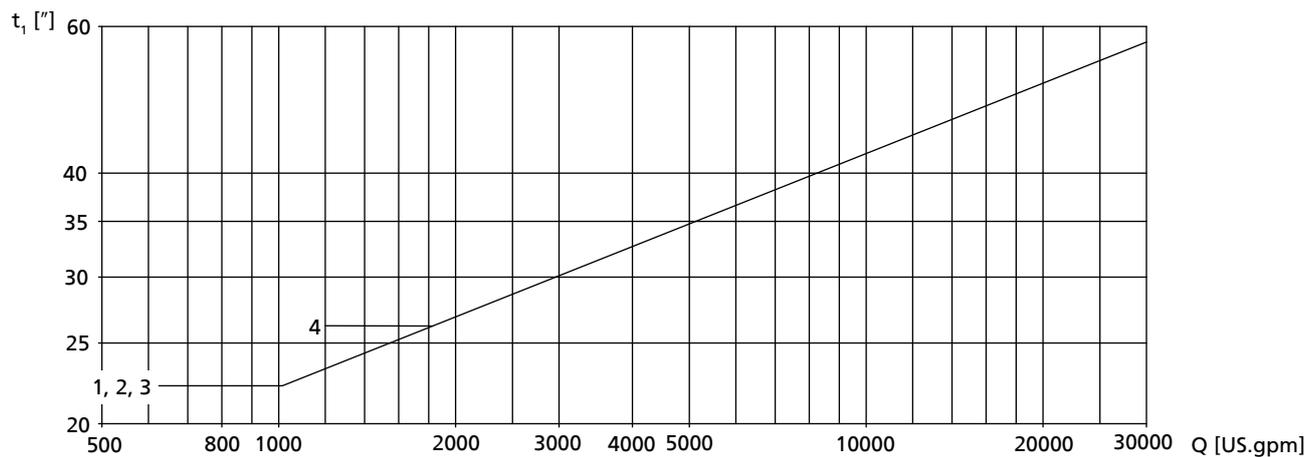
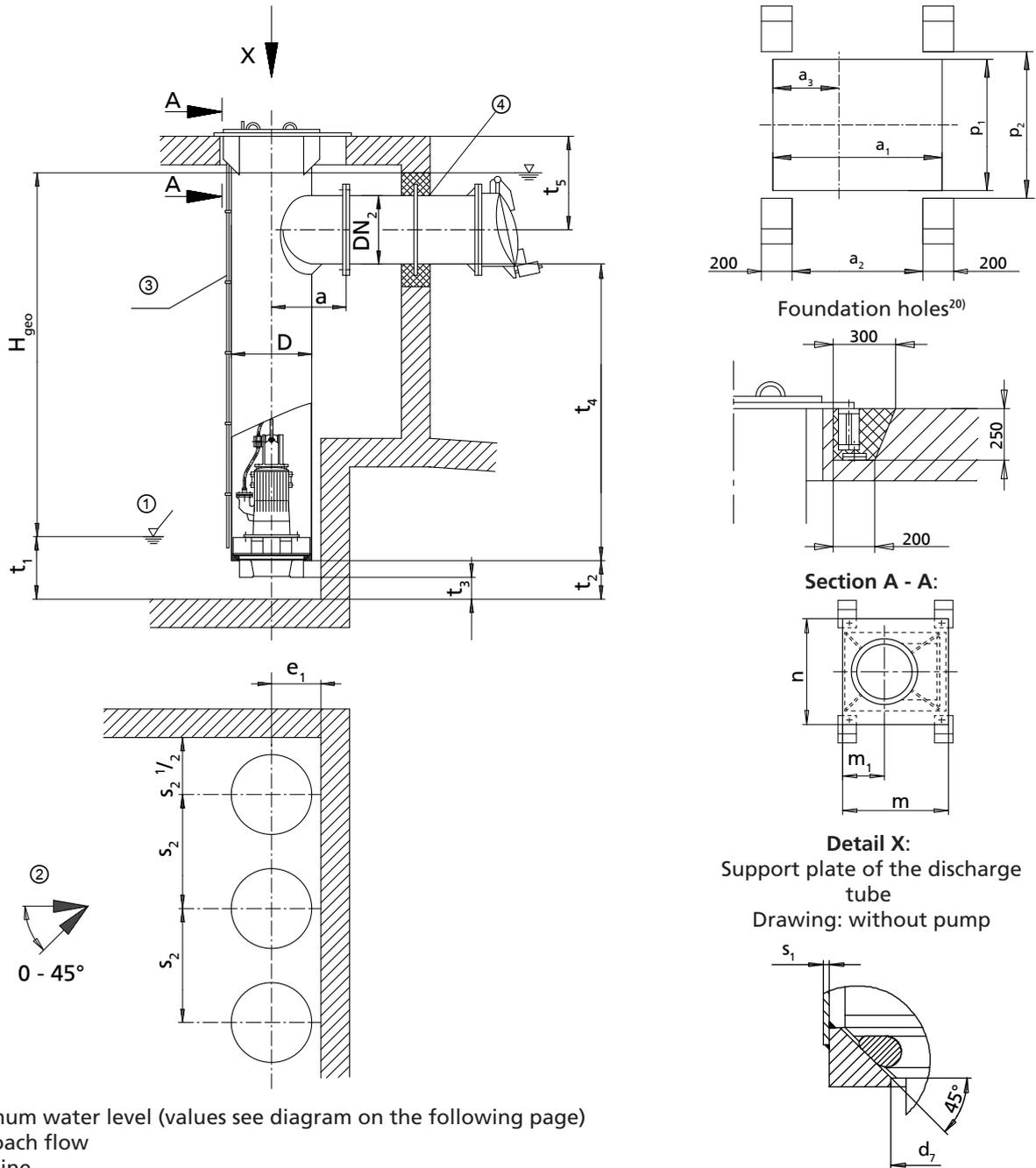


Fig. 58: Minimum water level diagram, motor version UE, XE

1	Amacan K 700-330, 800-330
2	Amacan K 700-324, 700-371, 800-324, 800-371
3	Amacan K 800-370
4	Amacan K 800-400, 800-401

9.8.4 Installation type CU, motor version UE, XE



- ①: Minimum water level (values see diagram on the following page)
- ②: Approach flow
- ③: Vent line
- ④: Connect the discharge pipe to the discharge tube without transmitting any stresses or strains.

Table 43: Dimensions [mm]

Size	D	DN _{2 min.}	DN _{2 max.}	a	a ₁ ²¹⁾	a ₂ ²¹⁾	a ₃ ²¹⁾	d ₇	e ₁ ²²⁾	m ²¹⁾	m ₁ ²¹⁾	n ²¹⁾
700-324	711	300	600	650	1120	870	430	570	430	1170	455	1160
700-330	711	300	600	650	1120	870	430	570	430	1170	455	1160
700-371	711	300	600	650	1120	870	430	570	430	1170	455	1160
800-324	813	400	700	700	1220	970	480	570	480	1270	505	1260
800-330	813	400	700	700	1220	970	480	570	480	1270	505	1260
800-370	813	400	700	700	1220	970	480	656	480	1270	505	1260

20) All dimensions for foundation holes apply to discharge tube design without intermediate flange.
 21) Selected for DN_{2max}
 22) Observe this dimension.

Size	D	DN _{2 min.}	DN _{2 max.}	a	a ₁ ²¹⁾	a ₂ ²¹⁾	a ₃ ²¹⁾	d ₇	e ₁ ²²⁾	m ²¹⁾	m ₁ ²¹⁾	n ²¹⁾
800-371	813	400	700	700	1220	970	480	570	480	1270	505	1260
800-400	813	400	700	700	1220	970	480	656	480	1270	505	1260
800-401	813	400	700	700	1220	970	480	656	480	1270	505	1260

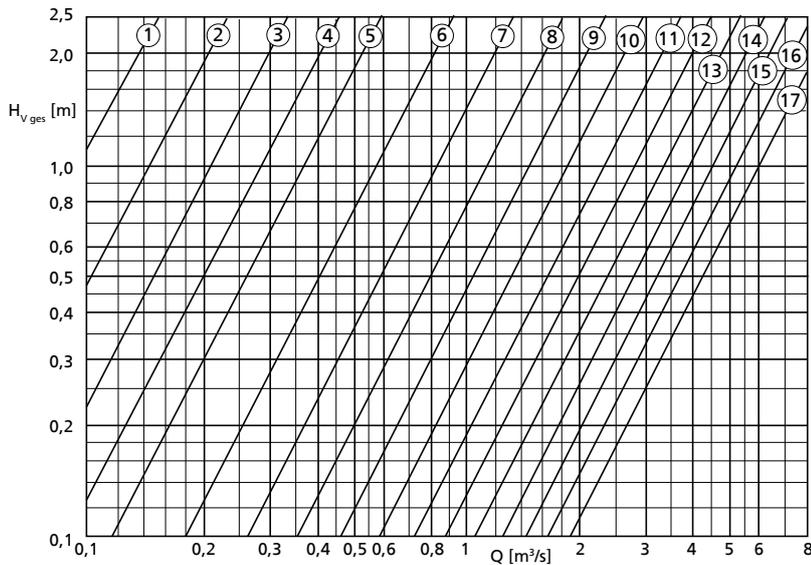
Table 44: Dimensions [mm]

Size	p ₁ ²¹⁾	p ₂ ²¹⁾	s _{1 min.}	s _{2 min.}	t ₂ ²²⁾	t ₃	t _{4 min.} ²³⁾	t _{5 min.} ²¹⁾
700-324	860	960	8	1150	330	200	1550	720
700-330	860	960	8	1150	330	200	1550	720
700-371	860	960	8	1150	330	200	1550	720
800-324	960	1060	8	1150	330	200	1550	770
800-330	960	1060	8	1150	330	200	1700	770
800-370	960	1060	8	1150	330	200	1600	770
800-371	960	1060	8	1150	330	200	1700	770
800-400	960	1060	8	1400	410	250	1750	770
800-401	960	1060	8	1400	410	250	1750	770

Permissible deviations:

- Tolerances in building construction to DIN 18202, Part 4, Group B
- Welded design: B/F to DIN EN ISO 13920
- Tolerances for conical seat (detailed view Y): ISO 2768-mH
- Discharge flanges to DIN EN 1092-1 PN6 / DIN EN 1092-2 PN6

Loss diagram



- ① - DN₂ = 200 mm
- ② - DN₂ = 250 mm
- ③ - DN₂ = 300 mm
- ④ - DN₂ = 350 mm
- ⑤ - DN₂ = 400 mm
- ⑥ - DN₂ = 500 mm
- ⑦ - DN₂ = 600 mm
- ⑧ - DN₂ = 700 mm
- ⑨ - DN₂ = 800 mm
- ⑩ - DN₂ = 900 mm
- ⑪ - DN₂ = 1000 mm
- ⑫ - DN₂ = 1100 mm
- ⑬ - DN₂ = 1200 mm
- ⑭ - DN₂ = 1300 mm
- ⑮ - DN₂ = 1400 mm
- ⑯ - DN₂ = 1500 mm
- ⑰ - DN₂ = 1600 mm

Calculation formulas:

$$H = H_{geo} + \Delta H_v$$

ΔH_v

- Loss in the riser (pipe friction)
- $H_{v ges.}$ (see diagram)

$H_{v ges.}$ comprises:

- Elbow
- Discharge pipe length = 5 x DN₂
- Swing check valve
- Outlet losses $v^2/2g$

23) Value for maximum motor length

Minimum water level diagram

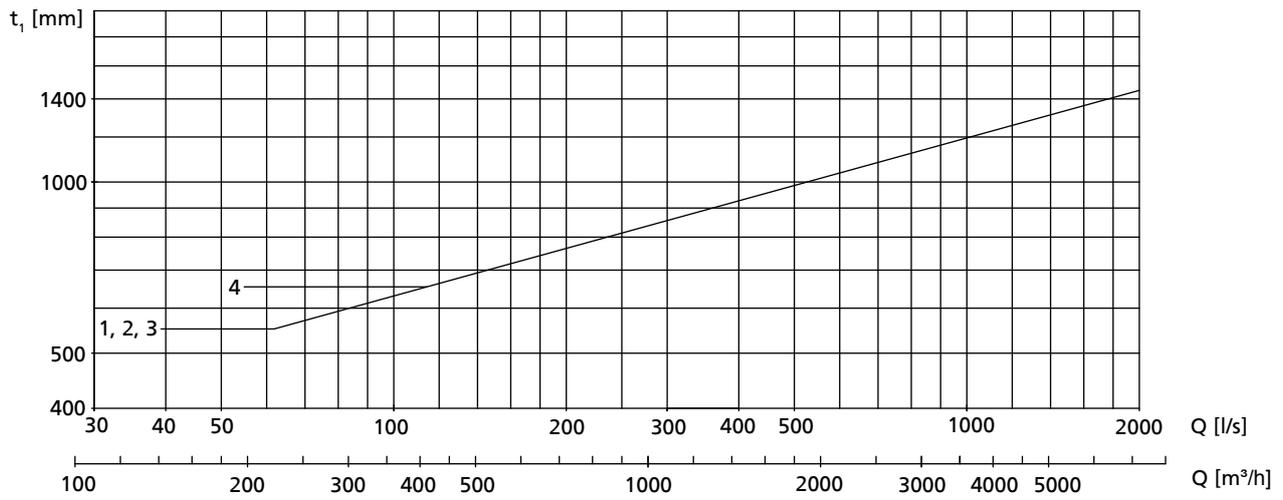
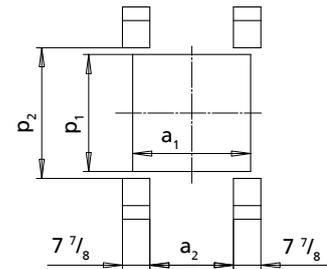
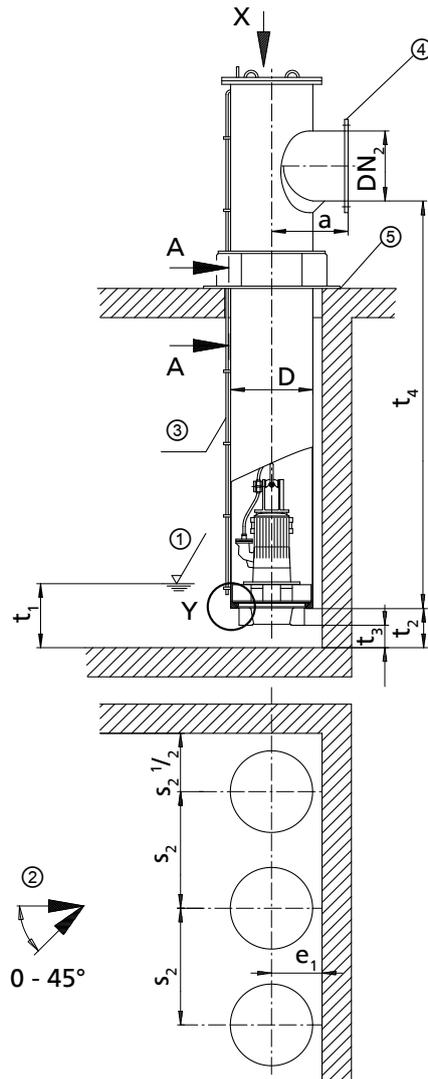


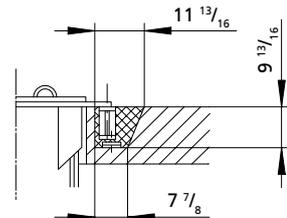
Fig. 59: Minimum water level diagram, motor version UE, XE

1	Amacan K 700-330, 800-330
2	Amacan K 700-324, 700-371, 800-324, 800-371
3	Amacan K 800-370
4	Amacan K 800-400, 800-401

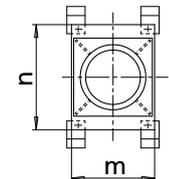
9.8.5 Installation type DU, motor version UE, XE



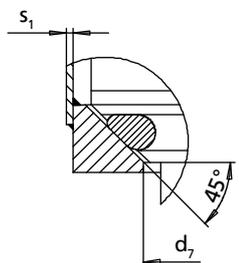
Foundation holes²⁴⁾
A - A



Section A - A:



Detail X:
Support plate of the discharge tube
Drawing: without pump



Detail Y:
Seating ring



- ①: Minimum water level (values see diagram on the following page)
- ②: Approach flow
- ③: Vent line
- ④: Connect the discharge pipe to the discharge tube without transmitting any stresses or strains.
- ⑤: Not pressure-proof

Table 45: Dimensions [inch]

Size	D	DN _{2 min.}	DN _{2 max.}	a	a ₁	a ₂	d ₇	e ₁ ²⁵⁾	m	n
700-324	28	11 ¹³ / ₁₆	23 ⁵ / ₈	25 ⁹ / ₁₆	33 ⁷ / ₈	24	22 ⁷ / ₁₆	16 ¹⁵ / ₁₆	36 ⁵ / ₈	45 ¹¹ / ₁₆
700-330	28	11 ¹³ / ₁₆	23 ⁵ / ₈	25 ⁹ / ₁₆	33 ⁷ / ₈	24	22 ⁷ / ₁₆	16 ¹⁵ / ₁₆	36 ⁵ / ₈	45 ¹¹ / ₁₆
700-371	28	11 ¹³ / ₁₆	23 ⁵ / ₈	25 ⁹ / ₁₆	33 ⁷ / ₈	24	22 ⁷ / ₁₆	16 ¹⁵ / ₁₆	36 ⁵ / ₈	45 ¹¹ / ₁₆
800-324	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	37 ¹³ / ₁₆	27 ¹⁵ / ₁₆	22 ⁷ / ₁₆	18 ⁷ / ₈	40 ⁹ / ₁₆	49 ⁵ / ₈
800-330	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	37 ¹³ / ₁₆	27 ¹⁵ / ₁₆	22 ⁷ / ₁₆	18 ⁷ / ₈	40 ⁹ / ₁₆	49 ⁵ / ₈
800-370	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	37 ¹³ / ₁₆	27 ¹⁵ / ₁₆	25 ¹³ / ₁₆	18 ⁷ / ₈	40 ⁹ / ₁₆	49 ⁵ / ₈
800-371	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	37 ¹³ / ₁₆	27 ¹⁵ / ₁₆	22 ⁷ / ₁₆	18 ⁷ / ₈	40 ⁹ / ₁₆	49 ⁵ / ₈
800-400	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	37 ¹³ / ₁₆	27 ¹⁵ / ₁₆	25 ¹³ / ₁₆	18 ⁷ / ₈	40 ⁹ / ₁₆	49 ⁵ / ₈
800-401	32	15 ³ / ₄	27 ⁹ / ₁₆	27 ⁹ / ₁₆	37 ¹³ / ₁₆	27 ¹⁵ / ₁₆	25 ¹³ / ₁₆	18 ⁷ / ₈	40 ⁹ / ₁₆	49 ⁵ / ₈

24) All dimensions for foundation holes apply to discharge tube design without intermediate flange.
 25) Observe this dimension.
 26) Value for maximum motor length

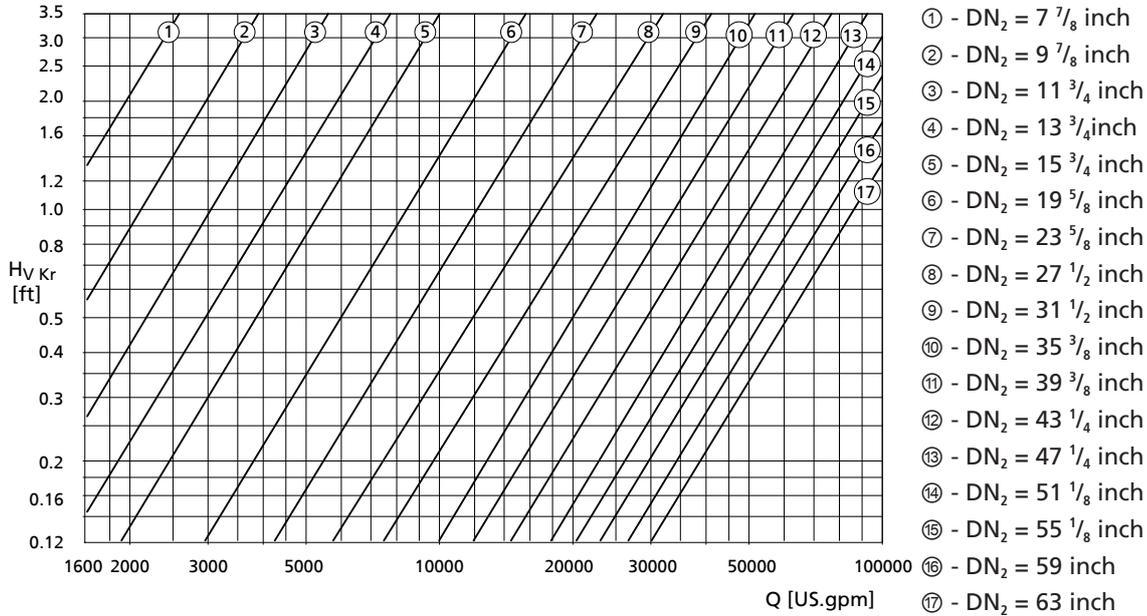
Table 46: Dimensions [inch]

Size	p ₁	p ₂	s _{1 min.}	s _{2 min.}	t ₂ ²⁵⁾	t ₃	t _{4 min.} ²⁶⁾
700-324	33 ⁷ / ₈	37 ¹³ / ₁₆	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	61
700-330	33 ⁷ / ₈	37 ¹³ / ₁₆	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	61
700-371	33 ⁷ / ₈	37 ¹³ / ₁₆	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	61
800-324	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	61
800-330	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	66 ¹⁵ / ₁₆
800-370	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	47 ¹ / ₄	13	7 ⁷ / ₈	63
800-371	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	45 ¹ / ₄	13	7 ⁷ / ₈	66 ¹⁵ / ₁₆
800-400	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	55 ¹ / ₈	16 ¹ / ₈	9 ¹³ / ₁₆	68 ⁷ / ₈
800-401	37 ¹³ / ₁₆	41 ³ / ₄	5 ⁵ / ₁₆	55 ¹ / ₈	16 ¹ / ₈	9 ¹³ / ₁₆	68 ⁷ / ₈

Permissible deviations:

- Tolerances in building construction to DIN 18202, Part 4, Group B
- Welded design: B/F to DIN EN ISO 13920
- Tolerances for conical seat (detailed view Y): ISO 2768-mH
- Discharge flanges to DIN EN 1092-1 PN6 / DIN EN 1092-2 PN6

Loss diagram



Calculation formulas:

$H = H_{geo} + \Delta H_v$

ΔH_v

- Loss in the elbow $h_{v,kr}$ (see diagram)
- Loss in the riser (pipe friction)
- $H_{v,system}$ (valves, etc.)

$H_{v,system}$ must be determined for the specific system.

Minimum water level diagram

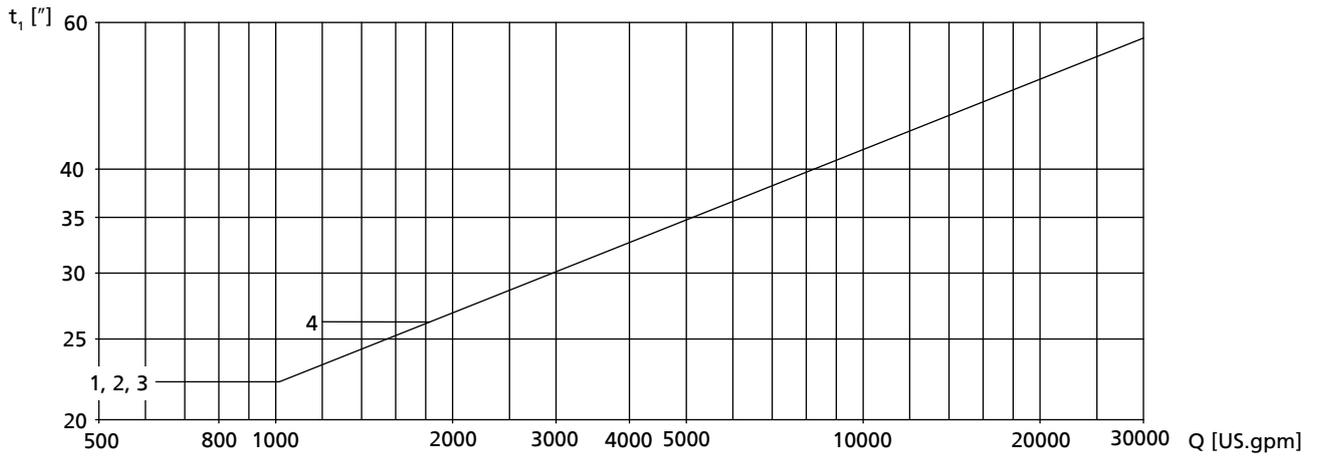
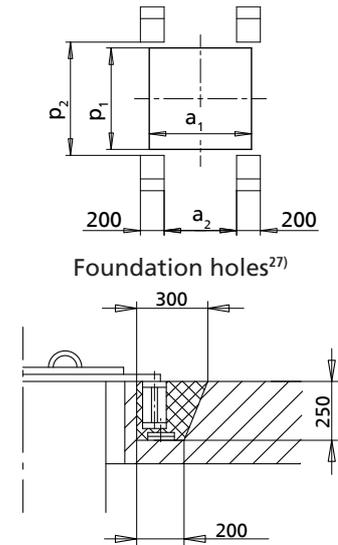
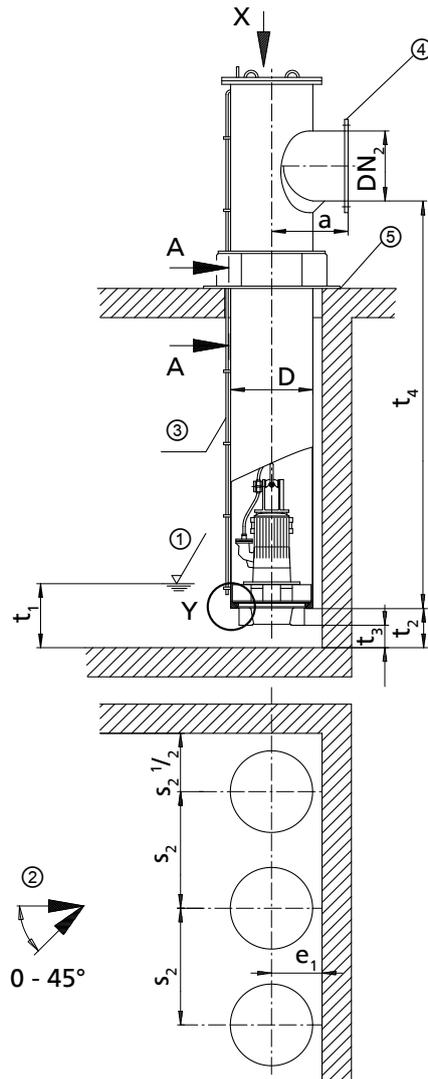


Fig. 60: Minimum water level diagram, motor version UE, XE

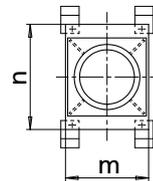
1	Amacan K 700-330, 800-330
2	Amacan K 700-324, 700-371, 800-324, 800-371
3	Amacan K 800-370
4	Amacan K 800-400, 800-401

9.8.6 Installation type DU, motor version UE, XE



Foundation holes²⁷⁾

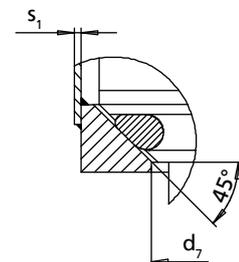
Section A - A:



Detail X:

Support plate of the discharge tube

Drawing: without pump



Detail Y:
Seating ring

- ①: Minimum water level (values see diagram on the following page)
- ②: Approach flow
- ③: Vent line
- ④: Connect the discharge pipe to the discharge tube without transmitting any stresses or strains.
- ⑤: Not pressure-proof

Table 47: Dimensions [mm]

Size	D	DN _{2 min.}	DN _{2 max.}	a	a ₁	a ₂	d ₇	e ₁ ²⁸⁾	m	n
700-324	711	300	600	650	860	610	570	430	930	1160
700-330	711	300	600	650	860	610	570	430	930	1160
700-371	711	300	600	650	860	610	570	430	930	1160
800-324	813	400	700	700	960	710	570	480	1030	1260
800-330	813	400	700	700	960	710	570	480	1030	1260
800-370	813	400	700	700	960	710	656	480	1030	1260
800-371	813	400	700	700	960	710	570	480	1030	1260
800-400	813	400	700	700	960	710	656	480	1030	1260
800-401	813	400	700	700	960	710	656	480	1030	1260

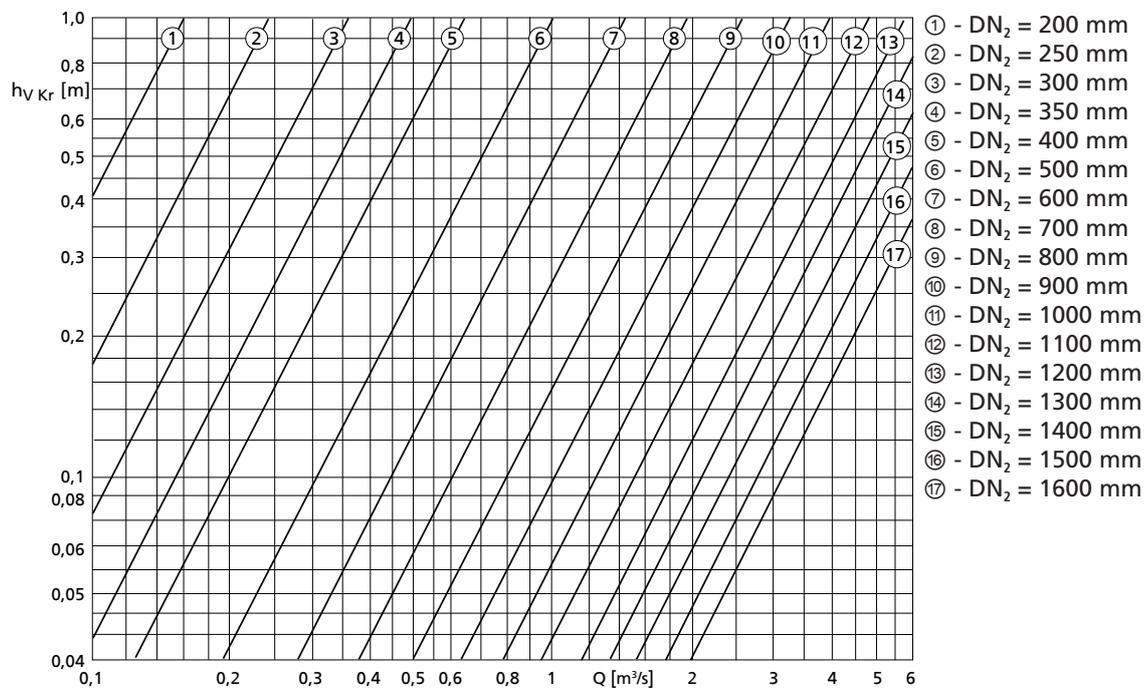
27) All dimensions for foundation holes apply to discharge tube design without intermediate flange.
 28) Observe this dimension.
 29) Value for maximum motor length

Table 48: Dimensions [mm]

Size	p ₁	p ₂	s _{1 min.}	s _{2 min.}	t ₂ ²⁸⁾	t ₃	t _{4 min.} ²⁹⁾
700-324	860	960	8	1150	330	200	1550
700-330	860	960	8	1150	330	200	1550
700-371	860	960	8	1150	330	200	1550
800-324	960	1060	8	1150	330	200	1550
800-330	960	1060	8	1150	330	200	1700
800-370	960	1060	8	1150	330	200	1600
800-371	960	1060	8	1150	330	200	1700
800-400	960	1060	8	1400	410	250	1750
800-401	960	1060	8	1400	410	250	1750

Permissible deviations:

- Tolerances in building construction to DIN 18202, Part 4, Group B
- Welded design: B/F to DIN EN ISO 13920
- Tolerances for conical seat (detailed view Y): ISO 2768-mH
- Discharge flanges to DIN EN 1092-1 PN6 / DIN EN 1092-2 PN6

Loss diagram

Calculation formulas:

$$H = H_{\text{geo}} + \Delta H_v$$

$$\Delta H_v$$

- Loss in the elbow $h_{v \text{ Kr}}$ (see diagram)
- Loss in the riser (pipe friction)
- $H_{v \text{ System}}$ (valves, etc.)

 $H_{v \text{ System}}$ must be determined for the specific system.

Minimum water level diagram

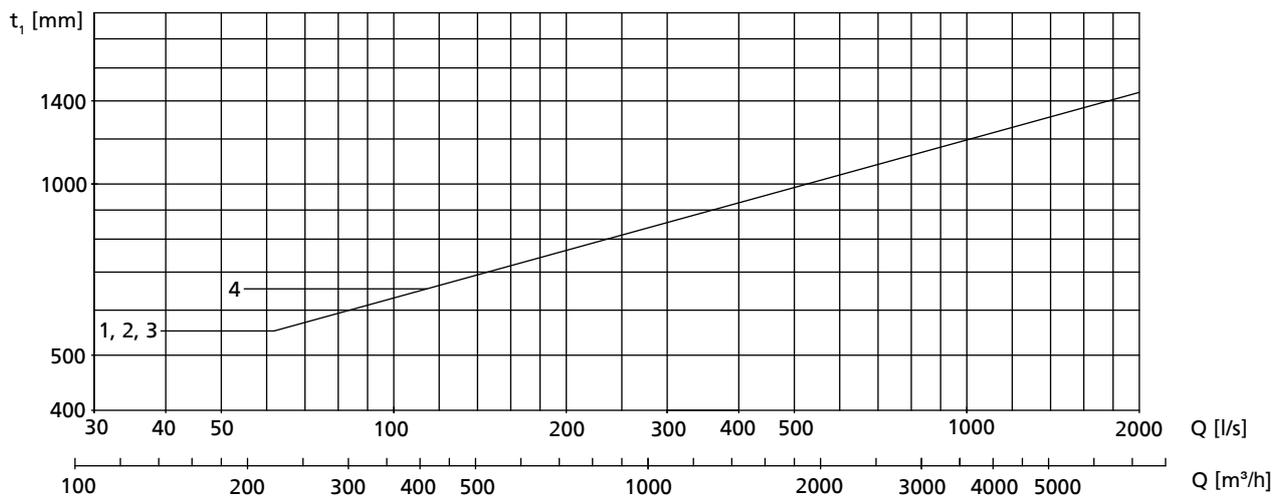


Fig. 61: Minimum water level diagram, motor version UE, XE

1	Amacan K 700-330, 800-330
2	Amacan K 700-324, 700-371, 800-324, 800-371
3	Amacan K 800-370
4	Amacan K 800-400, 800-401

Index

A

Abrasive fluids 44

B

Bearing temperature monitoring 38

Bearings 18

C

Certificate of decontamination 109

Commissioning/start-up 41

D

Design 18

Designation 17

Dismantling 57

Disposal 16

Drive 18

E

Electrical connection 39

Electromagnetic compatibility 36

Event of damage

Ordering spare parts 69

Explosion protection 23, 24, 35, 36, 37, 39, 40, 42, 43, 44, 47, 48, 53, 60, 62, 64

F

Faults

Causes and remedies 71

Fluid handled

Density 43

I

Impeller type 18

Installation 21

Installation at site 21

Installation types 18

Intended use 9

Interference immunity 36

K

Key to safety symbols/markings 8

L

Leakage monitoring 38

Level control 35

Lubricant 53

Quantity 54

O

Operating limits 9

Operation on a frequency inverter 36, 43

Order number 7

Other applicable documents 7

Overload protection 35

P

Partly completed machinery 7

Preservation 15

Product description 17

R

Reassembly 57

Return to supplier 16

Returning to service 46

S

Safety 9

Safety awareness 10

Scope of supply 20

Sensors 36

Shaft seal 18

Shutdown 45

Spare part

Ordering spare parts 69

Spare parts stock 70

Start-up 42

Storage 15, 46

Supply voltage 43

T

Tightening torque 68

Tightening torques 69

Tightening torques for impeller screws 66

W

Warnings 8



KSB SE & Co. KGaA

Johann-Klein-Straße 9 • 67227 Frankenthal (Germany)

Tel. +49 6233 86-0

www.ksb.com