

# Submersible Pump in Discharge Tube

## Amacan P

60 Hz

Amacan P 700 - 470

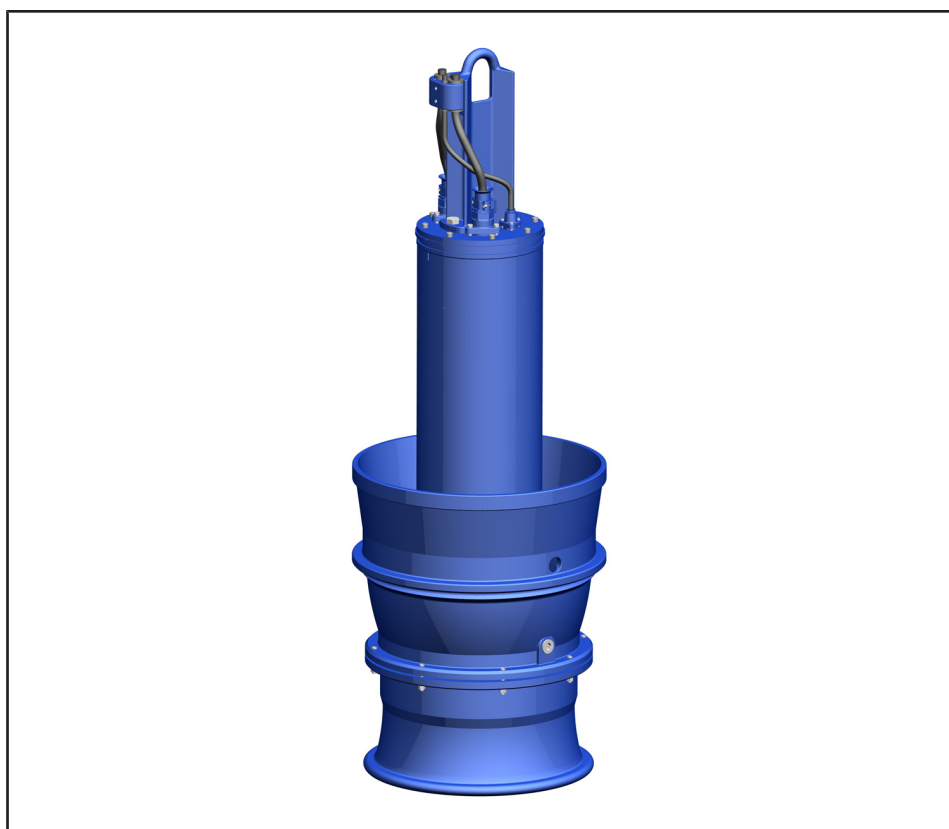
Amacan P 800/900 - 540

Amacan P 1000 - 700

Amacan P 1200 - 870

Amacan P 1500/1600 - 1060

## Installation/Operating Manual



Mat. No.: 01755511

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Installation/Operating Manual Amacan P

Original operating manual

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## Glossary

### **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

### **ECB (ever clean blade) design**

Self-cleaning vane profile

### **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 facility to maintain the right to claim under warranty.

### 1.2 Installation of partly completed machinery

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

### 1.3 Target group

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

### 1.4 Other applicable documents

**Table 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 <sup>1)</sup>        | Sectional drawing of the pump set                                                                         |
| Sub-supplier product literature <sup>1)</sup> | Operating manuals and other product literature describing accessories and integrated machinery components |
| Spare parts lists <sup>1)</sup>               | Description of spare parts                                                                                |

For accessories and/or integrated machinery components observe the product literature of the corresponding manufacturer.

### 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.<br>2.                                                                            | Step-by-step instructions                                                                  |
|  | Note<br>Recommendations and important information on how to handle the product             |

<sup>1</sup> If included in agreed scope of supply

## 1.6 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

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



## 2 Safety

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

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

### 2.1 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:
  - Arrow indicating the direction of rotation
  - Markings for connections
  - Name plate
- The operator is responsible for ensuring compliance with all local regulations 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 rate and maximum flow rate indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage).
- Always operate the pump (set) in the direction of rotation it is intended for.

### 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 operating manual and the intended use, the following safety regulations shall be complied with:

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

## 2.6 Safety information for the operator/user

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

## 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 50)
- 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 46)

## 2.8 Unauthorized modes of operation

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

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

## 2.9 Explosion protection

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/Storage/Disposal

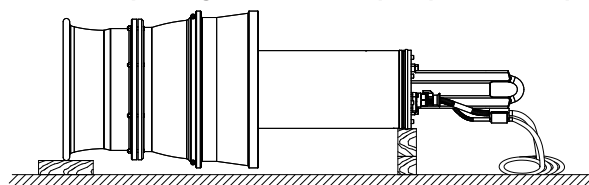
### 3.1 Checking the condition upon delivery

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

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #e67e22; color: white; padding: 5px;"><b>⚠ DANGER</b></div> <p><b>Improper transport</b><br/>           Danger to life from falling parts!<br/>           Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Use the attachment point provided for attaching the lifting accessory.</li> <li>▷ Never lift the pump set by the electric cables.</li> <li>▷ 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.</li> <li>▷ Securely attach the lifting chain/rope to the pump and crane.</li> <li>▷ Use tested, marked and approved lifting accessories only.</li> <li>▷ Observe the regional transport regulations.</li> <li>▷ Observe the documentation of the lifting accessory manufacturer.</li> <li>▷ The load-carrying capacity of the lifting accessory must be higher than the weight indicated on the name plate of the pump set to be lifted. Take into account any additional system components to be lifted.</li> <li>▷ Maintain a safe distance during lifting operations (load may swing when being lifted).</li> </ul> |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### 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. (⇒ Section 4.4, Page 18)

#### 3.2.2 Placing the pump set in a vertical or horizontal position

|                                                                                     |                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #f1c40f; color: white; padding: 5px;"><b>⚠ WARNING</b></div> <p><b>Pump set tilting</b><br/>           Risk of squashing hands and feet!</p> <ul style="list-style-type: none"> <li>▷ Suspend or support the pump set.</li> </ul> |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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

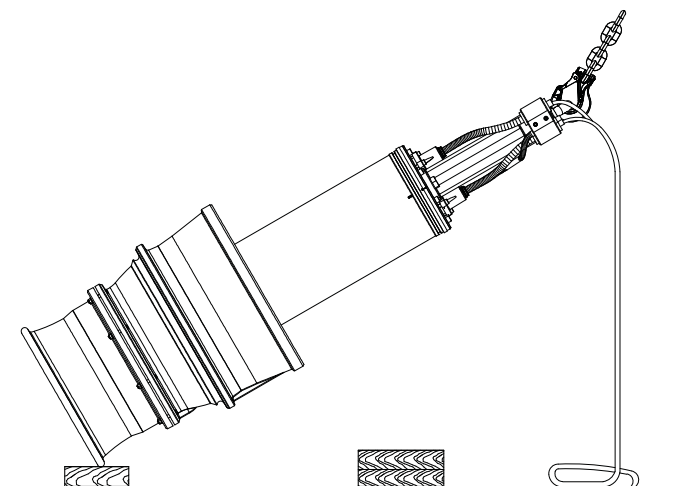


Fig. 2: Pulling the pump set upright with one crane

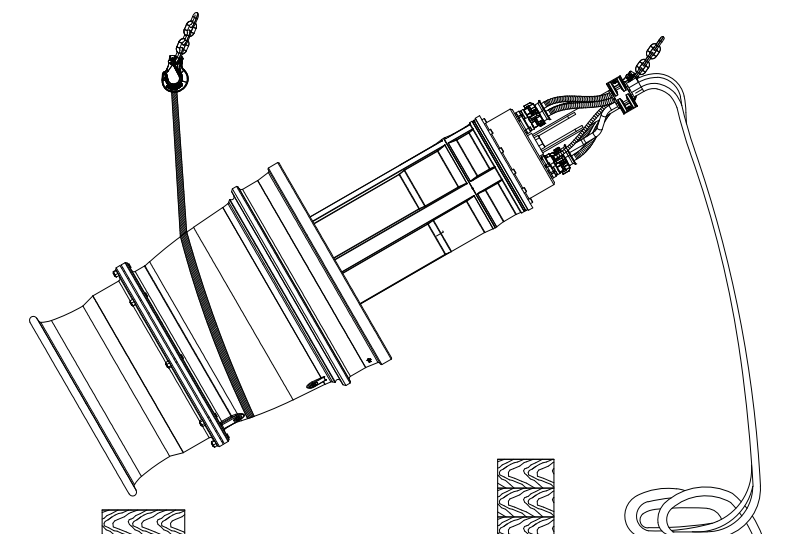


Fig. 3: Pulling the pump set upright with two cranes

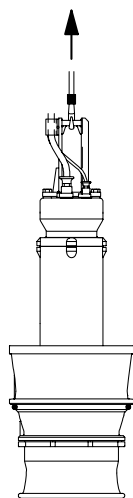
✓ Suitable lifting equipment (e.g. crane) has been selected.

1. a) If using one piece of lifting equipment: Attach the crane hook to the bail of the pump set.  
b) If using two pieces of lifting equipment: Attach the crane hook of one crane to the bail of the pump set **and** loop a rope around the pump set and attach it to the crane hook of the second crane.
2. Lift the pump set with the lifting equipment.
  - ⇒ Guiding the pump set over the edge of the bellmouth or pump casing is only permissible on a wooden base!
  - ⇒ Protect the power cable against kinking!
3. Place the pump set on a level, clean surface and protect it against tilting, tipping over or rolling off.

### 3.2.3 Transporting the pump set

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #f4a460; padding: 5px; border: 1px solid black;"> <p><b>! WARNING</b></p> </div> <p><b>Incorrect positioning/placing down</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Position the pump set vertically with the motor on top.</li> <li>▷ Use appropriate means to secure the pump set against tilting and tipping over.</li> <li>▷ Refer to the weights given in the data sheet/on the name plate.</li> </ul> |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>⚠ WARNING</b></p> <p><b>Incorrect handling of the electric cable</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▸ Secure electric cables against falling down.</li> <li>▸ Avoid electric cables being laid on surfaces without fastening.</li> <li>▸ When moving the pump set keep at a safe distance to the electric cables.</li> </ul>                                                                                                                                                                                                          |
|  | <p><b>⚠ WARNING</b></p> <p><b>Improper lifting/moving of heavy assemblies or components</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▸ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.</li> </ul>                                                                                                                                                                                                                                                                                        |
|  | <p><b>⚠ WARNING</b></p> <p><b>Improper handling when placing the pump set in a vertical/horizontal position</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▸ Use one or two pieces of lifting equipment, depending on the pump (set) size.</li> <li>▸ Use appropriate means to secure the pump set against tilting, tipping over or rolling off.</li> <li>▸ Maintain a safe distance during lifting operations (load may swing when being lifted).</li> <li>▸ Use additional supports for the transport holder to secure it against tilting.</li> </ul> |



**Fig. 4:** Transporting the pump set in a vertical position

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

#### 3.2.4 Transport lock

Pump sets from size Amacan P 1000 - 700 are supplied with a transport lock. Prior to checking the direction of rotation, lowering the pump into the discharge tube and commissioning, remove the transport lock, which is a metal plate between impeller and bellmouth.

#### 3.3 Storage/preservation

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

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

|                                                                                     |                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <div style="background-color: #f4a460; padding: 5px;"><b>⚠ WARNING</b></div> <p><b>Pump set tilting</b><br/>Risk of squashing hands and feet!</p> <p>▷ Suspend or support the pump set.</p>                                                                                                                                           |
|    | <div style="background-color: #f4c400; padding: 5px;"><b>CAUTION</b></div> <p><b>Improper storage</b><br/>Damage to the electric cables!</p> <p>▷ Support the electric cables at the cable entry to prevent permanent deformation.</p> <p>▷ Only remove the protective caps from the electric cables at the time of installation.</p> |
|    | <div style="background-color: #f4c400; padding: 5px;"><b>CAUTION</b></div> <p><b>Damage during storage due to humidity, dirt or vermin</b><br/>Corrosion/contamination of pump (set)!</p> <p>▷ For outdoor storage cover the pump (set) and accessories with waterproof material and protect against condensation.</p>                |
|  | <div style="background-color: #f4c400; padding: 5px;"><b>CAUTION</b></div> <p><b>Wet, contaminated or damaged openings and connections</b><br/>Leakage or damage to the pump!</p> <p>▷ Clean and cover pump openings and connections as required prior to putting the pump into storage.</p>                                          |

**Table 4:** Ambient conditions for storage

| Ambient condition   | Value                              |
|---------------------|------------------------------------|
| Relative humidity   | 5 % to 85 %<br>(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.

### 3.4 Return to supplier

1. Drain the pump as per operating instructions. (⇒ Section 7.3.2, Page 58)
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.  
Indicate any safety measures and decontamination measures taken.  
(⇒ Section 10, Page 151)

**NOTE**

If required, a blank certificate of decontamination can be downloaded from the KSB web site at: [www.ksb.com/certificate\\_of\\_decontamination](http://www.ksb.com/certificate_of_decontamination)

**3.5 Disposal****WARNING**

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

Hazard to persons and the environment!

- ▷ 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 Product information as per Regulation No 1907/2006 (REACH)

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

### 4.3 Designation

Example: Amacan PA4 800-540 / 100 8UTG1

Table 5: Designation key

| Code   | Description                                                                 |
|--------|-----------------------------------------------------------------------------|
| Amacan | Type series                                                                 |
| P      | Impeller type                                                               |
| P      | Propeller                                                                   |
| A      | Pressure class                                                              |
| A      |                                                                             |
| B      |                                                                             |
| 4      | Number of vanes                                                             |
| 800    | Nominal diameter of the discharge tube [mm]                                 |
| 540    | Nominal impeller diameter [mm]                                              |
| 100    | Motor size                                                                  |
| 8      | Number of motor poles                                                       |
| UT     | Motor version                                                               |
| UT     | Without explosion protection                                                |
| XT     | Explosion protection to NEC 500                                             |
| G1     | Material variant                                                            |
| G1     | Gray cast iron, standard material variant                                   |
| G3     | Gray cast iron with Zn anodes, shaft made of A 276 type 431 stainless steel |

### 4.4 Name plate

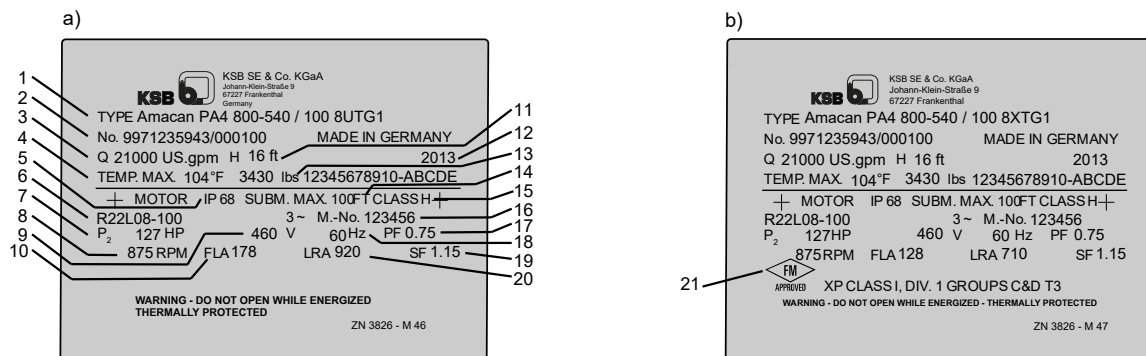


Fig. 5: Name plate (example) a) Standard pump set b) Explosion-proof pump set

|   |               |    |                                       |
|---|---------------|----|---------------------------------------|
| 1 | Designation   | 2  | KSB order number                      |
| 3 | Flow rate     | 4  | Maximum fluid 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 $\nabla$ |
| 15 | Thermal class of winding insulation   | 16 | Motor number                 |
| 17 | Power factor at rated operating point | 18 | Rated frequency              |
| 19 | Duty type                             | 20 | Starting current             |
| 21 | Explosion protection marking          |    |                              |

#### 4.5 Design details

##### Design

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

##### 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
- Leakage chamber

##### Impeller type

- Axial propeller in ECB design

##### Bearings

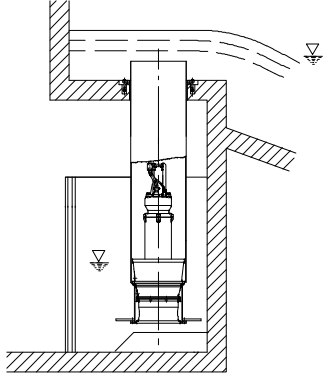
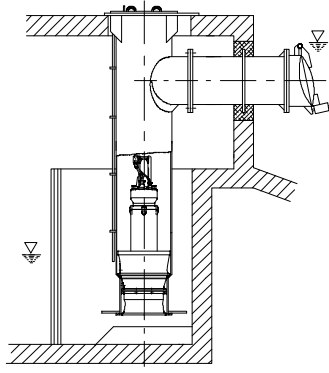
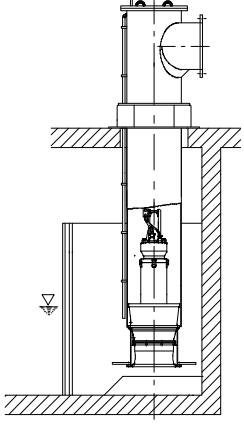
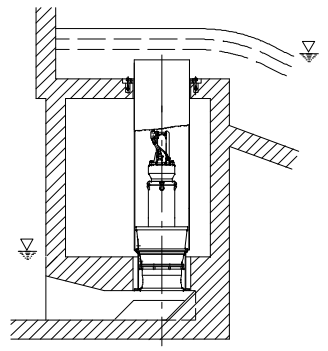
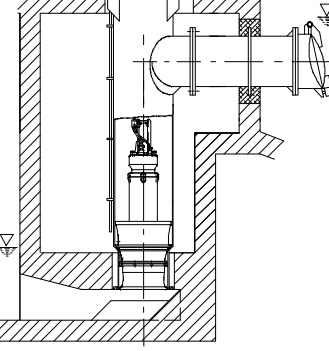
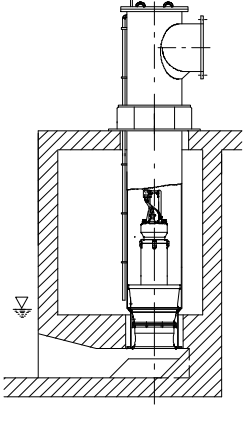
- Grease-packed rolling element bearings

#### 4.6 Types of installation

Six design variants are available<sup>2)</sup>:

<sup>2</sup> For information on the various designs (foundation measurements, intake chamber, etc.) refer to the general arrangement drawings.

Table 6: Overview of installation types

|                                                                                                                                   |                                                                                                                                                    |                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                  |                                                                   |                                                                         |
| <p><b>BU discharge tube</b><br/>Overflow design for installation in open intake chamber</p>                                       | <p><b>CU discharge tube</b><br/>Design with underfloor discharge for installation in open intake chamber</p>                                       | <p><b>DU discharge tube</b><br/>Design with above floor discharge nozzle for installation in open intake chamber</p>                                       |
|                                                 |                                                                  |                                                                        |
| <p><b>BG discharge tube</b><br/>Overflow design for installation in covered intake chamber with low suction-side water levels</p> | <p><b>CG discharge tube</b><br/>Design with underfloor discharge for installation in covered intake chamber with low suction-side water levels</p> | <p><b>DG discharge tube</b><br/>Design with above floor discharge nozzle for installation in covered intake chamber with low suction-side water levels</p> |

#### 4.7 Configuration and function

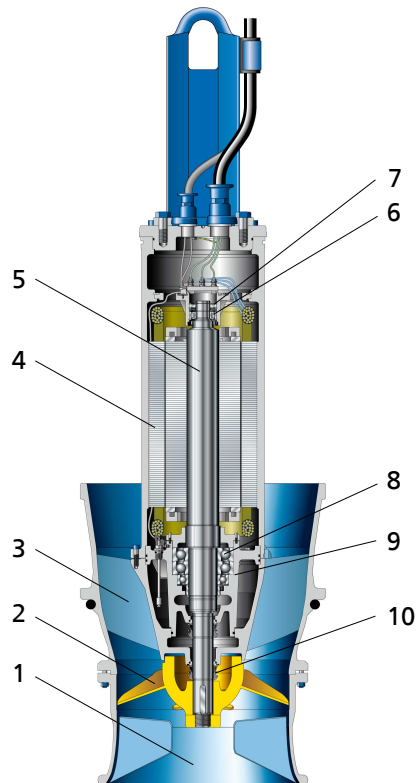


Fig. 6: Amacan with axial propeller

|   |                            |    |                    |
|---|----------------------------|----|--------------------|
| 1 | Suction nozzle (bellmouth) | 2  | Impeller           |
| 3 | Pump bowl                  | 4  | Electric motor     |
| 5 | Shaft                      | 6  | Bearing, motor end |
| 7 | Bearing bracket            | 8  | Bearing, pump end  |
| 9 | Bearing housing, pump end  | 10 | Shaft seal         |

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

**Function** The fluid enters the pump axially via a suction nozzle (bellmouth) (1) and is accelerated in a rotating flow by the rotating impeller (2). The required energy is transmitted from the electric motor (4) to the impeller (2) via the shaft (5). In the pump bowl (3) the kinetic energy of the fluid is converted into pressure energy. The rotational movement diverts the fluid flow into an axial flow. The shaft passage through the casing is sealed towards the fluid with a shaft seal (10). The shaft (5) runs in two rolling element bearings (6 and 8), which are supported by the bearing housing (9) and the bearing bracket (7).

**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
- Temperature monitoring at the lower bearing
- Leakage monitoring of the mechanical seals
- Leakage sensors in the motor space and connection space

### Option

- Temperature monitoring at the upper bearing<sup>3)</sup>
- Vibration sensor
- Additional winding temperature monitoring with Pt100 resistance thermometer

### 4.8 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
- Flow-straightening vane to prevent floor vortices



#### NOTE

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

### 4.9 Dimensions and weights

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

<sup>3</sup> Included in the standard design for size 1600-1060

## 5 Installation at Site

### 5.1 Safety regulations

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

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

#### 5.2.1 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 bowl, impeller and transport support, the lubricant chamber is filled properly.
2. If oil leakage is visible in the area of the pump bowl, impeller and transport support, top up the lubricant chamber.

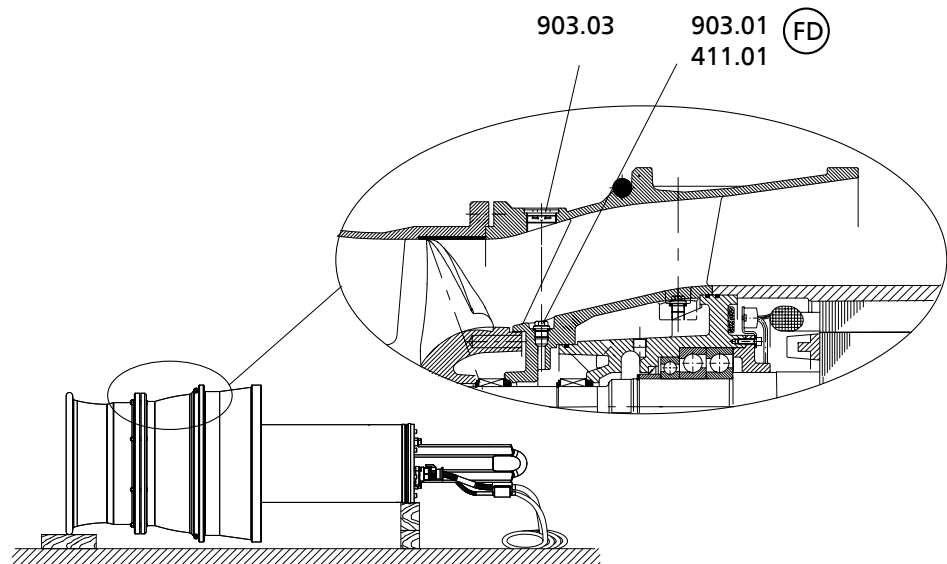


Fig. 7: Checking the lubricant level

Table 7: Key to the symbols

| Symbol                                                                            | Key                                                                                                    |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|  | Always apply a <b>liquid sealant</b> (e.g. Hylomar SQ32M) to sealing surfaces marked with this symbol. |

1. Place the pump set down in a horizontal position and make sure it cannot roll away. (⇒ Section 3.2.2, Page 12)
2. When placing it down, make sure that screw plug 903.03 is on top.
3. Remove screw plug 903.03.
4. Remove screw plug 903.01 and joint ring 411.01.
5. Shine a torch through the hole in the pump bowl to inspect the opening of the lubricant chamber.
  - ⇒ If the lubricant level reaches the opening, fit screw plug 903.01 together with a new joint ring 411.01 as well as screw plug 903.03.
  - ⇒ If the lubricant level is below the opening, top up the lubricant. (⇒ Section 7.4.1.4.2, Page 62)
6. Re-insert and tighten screw plug 903.01 with new joint ring 411.01.
7. Re-insert and tighten screw plug 903.03.



#### NOTE

If more than 1.59 quart [1.5 l] of lubricant are required for topping up, this suggests a defect of the mechanical seals.

#### 5.2.4 Checking the direction of rotation



#### DANGER

**Pump set running dry**  
Explosion hazard!

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

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p><b>! WARNING</b></p> <p><b>Improper handling when placing the pump set in a vertical/horizontal position</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Use one or two pieces of lifting equipment, depending on the pump (set) size.</li> <li>▷ Use appropriate means to secure the pump set against tilting, tipping over or rolling off.</li> <li>▷ Maintain a safe distance during lifting operations (load may swing when being lifted).</li> <li>▷ Use additional supports for the transport holder to secure it against tilting.</li> </ul> |
|    | <p><b>! WARNING</b></p> <p><b>Improper positioning of pump set when checking the direction of rotation</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Use appropriate means to secure the pump set against tilting or tipping over.</li> </ul>                                                                                                                                                                                                                                                                                                        |
|    | <p><b>! WARNING</b></p> <p><b>Hands and/or foreign objects in the pump casing</b><br/>Risk of injuries, damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never insert your hands or any other objects into the pump.</li> <li>▷ Check that the inside of the pump is free from any foreign objects.</li> <li>▷ Verify that the transport lock has been removed.</li> <li>▷ Take suitable precautions (e.g. wear safety goggles).</li> </ul>                                                                                                                                         |
|  | <p><b>CAUTION</b></p> <p><b>Pump set running dry</b><br/>Increased vibrations!<br/>Damage to mechanical seals and bearings!</p> <ul style="list-style-type: none"> <li>▷ Never operate the pump set without the fluid to be handled for more than 60 seconds.</li> </ul>                                                                                                                                                                                                                                                                                                                            |

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. (⇒ Section 3.2.2, Page 12)
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. Look down into the pump bowl and check that the impeller rotates clockwise.
  - ⇒ 2. Verify the direction of rotation of the impeller. The direction of rotation of the impeller must match the arrow indicating the direction of rotation on the pump bowl.
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.

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

### 5.3 Lowering the pump set into the discharge tube

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>⚠ DANGER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                   | <b>Improper transport</b><br>Danger to life from falling parts!<br>Damage to the pump set!<br><ul style="list-style-type: none"> <li>▷ Use the attachment point provided for attaching the lifting accessory.</li> <li>▷ Never lift the pump set by the electric cables.</li> <li>▷ 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.</li> <li>▷ Securely attach the lifting chain/rope to the pump and crane.</li> <li>▷ Use tested, marked and approved lifting accessories only.</li> <li>▷ Observe the regional transport regulations.</li> <li>▷ Observe the documentation of the lifting accessory manufacturer.</li> <li>▷ The load-carrying capacity of the lifting accessory must be higher than the weight indicated on the name plate of the pump set to be lifted. Take into account any additional system components to be lifted.</li> <li>▷ Maintain a safe distance during lifting operations (load may swing when being lifted).</li> </ul> |

|                                                                                     |                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>⚠ DANGER</b>                                                                                                                                                                                                                                                                                                      |
|                                                                                     | <b>Improper installation in potentially explosive atmospheres</b><br>Damage to the pump set!<br><ul style="list-style-type: none"> <li>▷ Comply with the applicable local explosion protection regulations.</li> <li>▷ Observe the information given in the data sheet and on the pump/motor name plates.</li> </ul> |

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

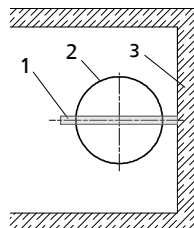
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|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------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

### 5.3.1 Information for correct installation

The **flow-straightening vane** is **indispensable** for the inlet conditions of the pump set. It prevents the development of a submerged vortex (floor vortex) which could cause a drop in performance, for example. For optimum inlet conditions observe the following information:

**1. Observe the structural requirements!**

Install the flow-straightening vane concentrically below the discharge tube, see general arrangement drawing.



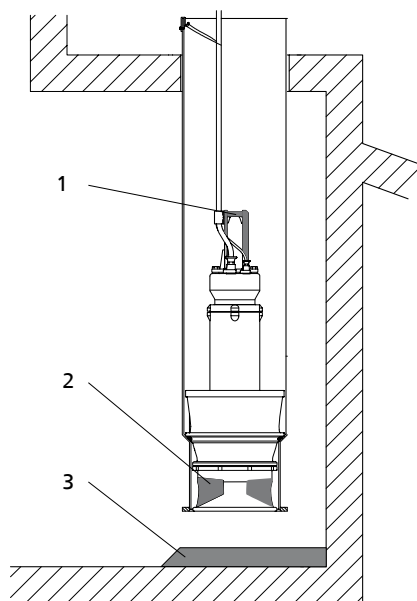
**Fig. 8:** Installation position of the flow-straightening vane

|   |                         |   |                |
|---|-------------------------|---|----------------|
| 1 | Flow-straightening vane | 2 | Discharge tube |
| 3 | Intake chamber          |   |                |

**2. Observe the installation position of the pump set!**

Lower the pump set into the discharge tube with the anti-swirl baffles (2) in the bellmouth aligned with the flow-straightening vane (3).

Use the bail alignment of the pump set for orientation. The bail (1) is aligned with the anti-swirl baffles (2).



**Fig. 9:** Installation position of the pump set

|   |                         |   |                   |
|---|-------------------------|---|-------------------|
| 1 | Bail                    | 2 | Anti-vortex vanes |
| 3 | Flow-straightening vane |   |                   |

### 5.3.2 Installing the pump set without support rope



#### CAUTION

##### Incorrect installation

Damage to the pump set!

- ▷ Verify that the pump set sits correctly on the bottom of the discharge tube.

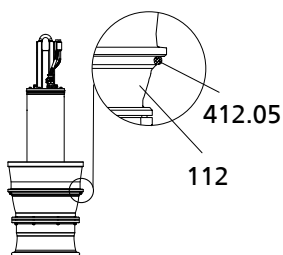


Fig. 10: Inserting the O-ring

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

1. If not already fitted, insert the supplied O-ring 412.05 into pump bowl 112.
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.  
(⇒ Section 5.3.1, Page 27)
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.

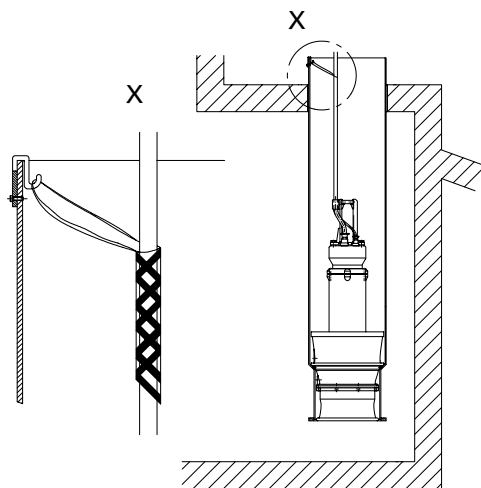


Fig. 11: Fastening the cable support sleeve

### 5.3.3 Installing the pump set with a support rope

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

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

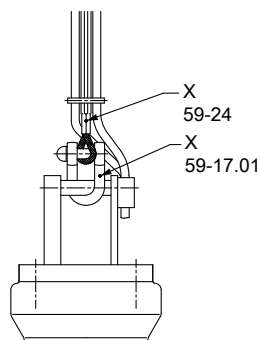


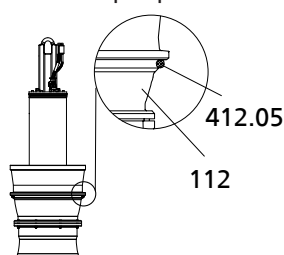
Fig. 12: X = indication of load-carrying capacity

|          |              |
|----------|--------------|
| 59-24    | Support rope |
| 59-17.01 | Shackle      |

|  |                                                                                                                                            |
|--|--------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>CAUTION</b>                                                                                                                             |
|  | <b>Incorrect installation</b><br>Damage to the pump set!<br>▷ Verify that the pump set sits correctly on the bottom of the discharge tube. |

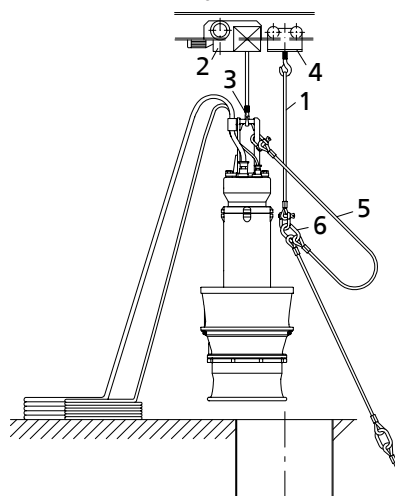
|                                                                                   |                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>! WARNING</b></p> <p><b>Pump set drops during the installation or removal process</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Never use the turnbuckle, shackle or discharge tube cover to lift the pump set.</li> <li>▷ Always use lifting lug 59-47.</li> </ul> |
|  | <p><b>NOTE</b></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. 13: Inserting the O-ring**

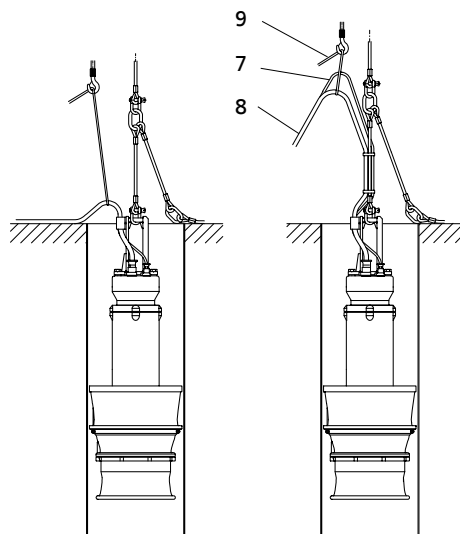
1. If not already fitted, insert the supplied O-ring 412.05 into pump bowl 112.



**Fig. 14: Lifting and positioning the pump set**

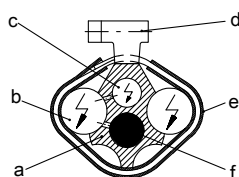
2. Secure the lifting chain or lifting rope (1) to the trolley (4) of the lifting equipment (2).
3. Attach the support rope (5) to the bail (3) by its shackle. (⇒ Section 9.2, Page 98)  
For a galvanized shackle, secure the pin at the shackle with Loctite 243.  
For a stainless steel shackle, undo and 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 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.



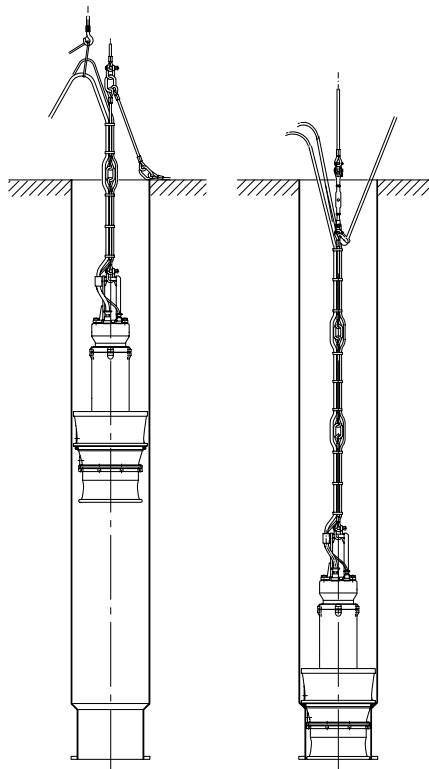
**Fig. 15:** Securing the control cable and power cable

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. 16:** 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) and, starting from the bottom, firmly clamp the power cables with cable clamps (d) covered by a plastic sheath (e).
15. 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.
16. Progressively lower the pump set into the discharge tube while securing the cable bundle with evenly spaced sheathed cable clamps.
17. Fit a heat shrink tube on any protruding sharp-edged rope ends (e.g. at the ferrule) to prevent any damage to the power cable and the control cable.



**Fig. 17:** Lowering the pump set

18. 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.
19. Tighten the turnbuckle until the cable bundle is tight but does not lift the pump off its seat.
20. Unclick 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.
21. Make sure that the top loose lifting lug is attached to the cable bundle to prevent noise and wear caused by chafing.
22. Remove the safety cover from the discharge tube and mount the discharge tube cover. Seal the cable entries if any!

#### 5.3.4 Installing the pump set with a support rope and support spacer

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

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

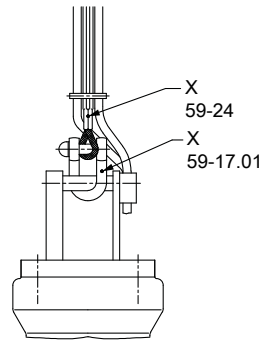


Fig. 18: X = indication of load-carrying capacity

|          |              |
|----------|--------------|
| 59-24    | Support rope |
| 59-17.01 | Shackle      |

|                                                                                     |                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p><b>CAUTION</b></p> <p><b>Incorrect installation</b><br/>Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▸ Verify that the pump set sits correctly on the bottom of the discharge tube.</li> </ul>                                                                                                |
|   | <p><b>WARNING</b></p> <p><b>Pump set drops during the installation or removal process</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▸ Never use the turnbuckle, shackle or discharge tube cover to lift the pump set.</li> <li>▸ Always use lifting lug 59-47.</li> </ul> |
|  | <p><b>NOTE</b></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.

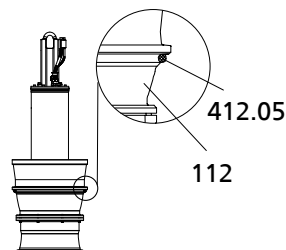
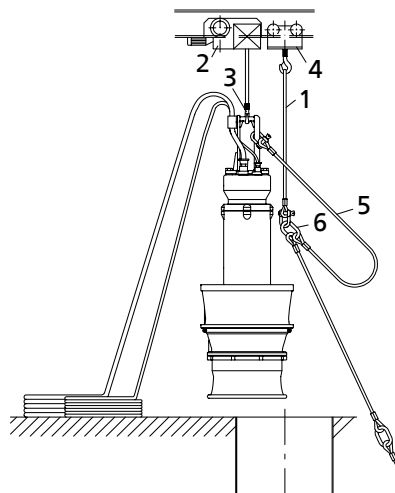


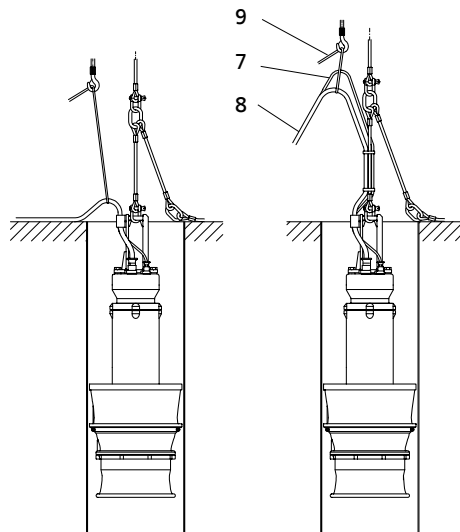
Fig. 19: Inserting the O-ring

1. If not already fitted, insert the supplied O-ring 412.05 into pump bowl 112.



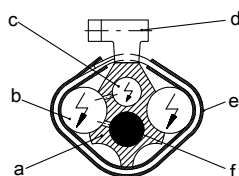
**Fig. 20:** Lifting and positioning the pump set

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. Check that the support rope is arranged with the free lifting lug (6) pointing away from the pump set.
4. Partially unwind the support rope and electric cables.
5. Lower the pump set into the discharge tube until the bail is in an accessible position, protruding from the discharge tube.
6. Securely cover the discharge tube except for a gap which allows work to continue.
7. 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.
8. Unhook the lifting equipment from the lifting lug of the support rope. Move the lifting equipment up higher.



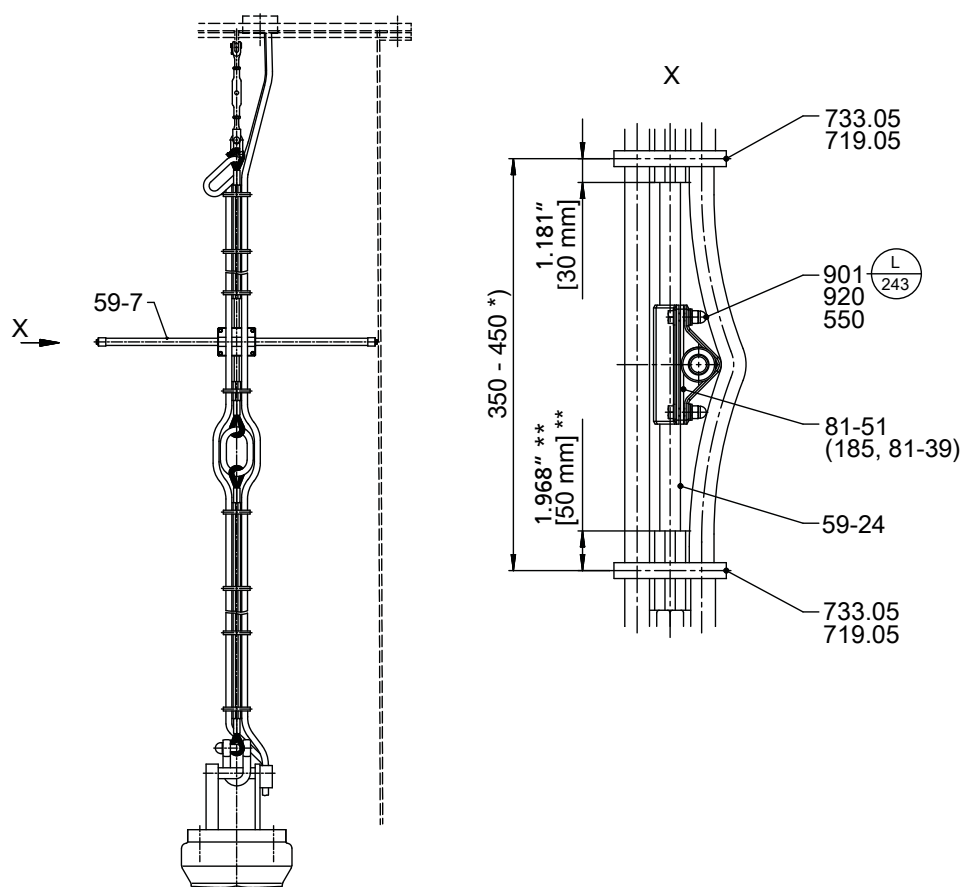
**Fig. 21:** Securing the power cable and sensor cable

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



**Fig. 22:** Cross-section of the cable guide

11. Insert the support rope (f) and the control cable (c) into the spacer (a).  
⇒ Make sure that they are in their respective ducts.
12. Tighten the electric cables with the manila rope running over the crane hook.
13. Insert the power cables (b) into the hollows of the spacer (a) and, starting from the bottom, firmly clamp the power cables with cable clamps (d) covered by a plastic sheath (e).
14. Progressively lower the pump set into the discharge tube while securing the cable bundle with evenly spaced sheathed cable clamps.
15. 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.
16. Fit a heat shrink tube on any protruding sharp-edged rope ends (e.g. at the ferrule).
17. 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 sensor cable (c).
18. Insert the power cables (b) into the hollows of the spacer (a) and firmly clamp the power cables with cable clamps (d).



**Fig. 23:** Support rope with support  
\*) depending on the cable cross-section,  
\*\*) for one rope or three ropes = 1.181 in. [30 mm]

**Table 8:** Key to the symbols

| Symbol | Key                                                                                 |
|--------|-------------------------------------------------------------------------------------|
|        | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> . |

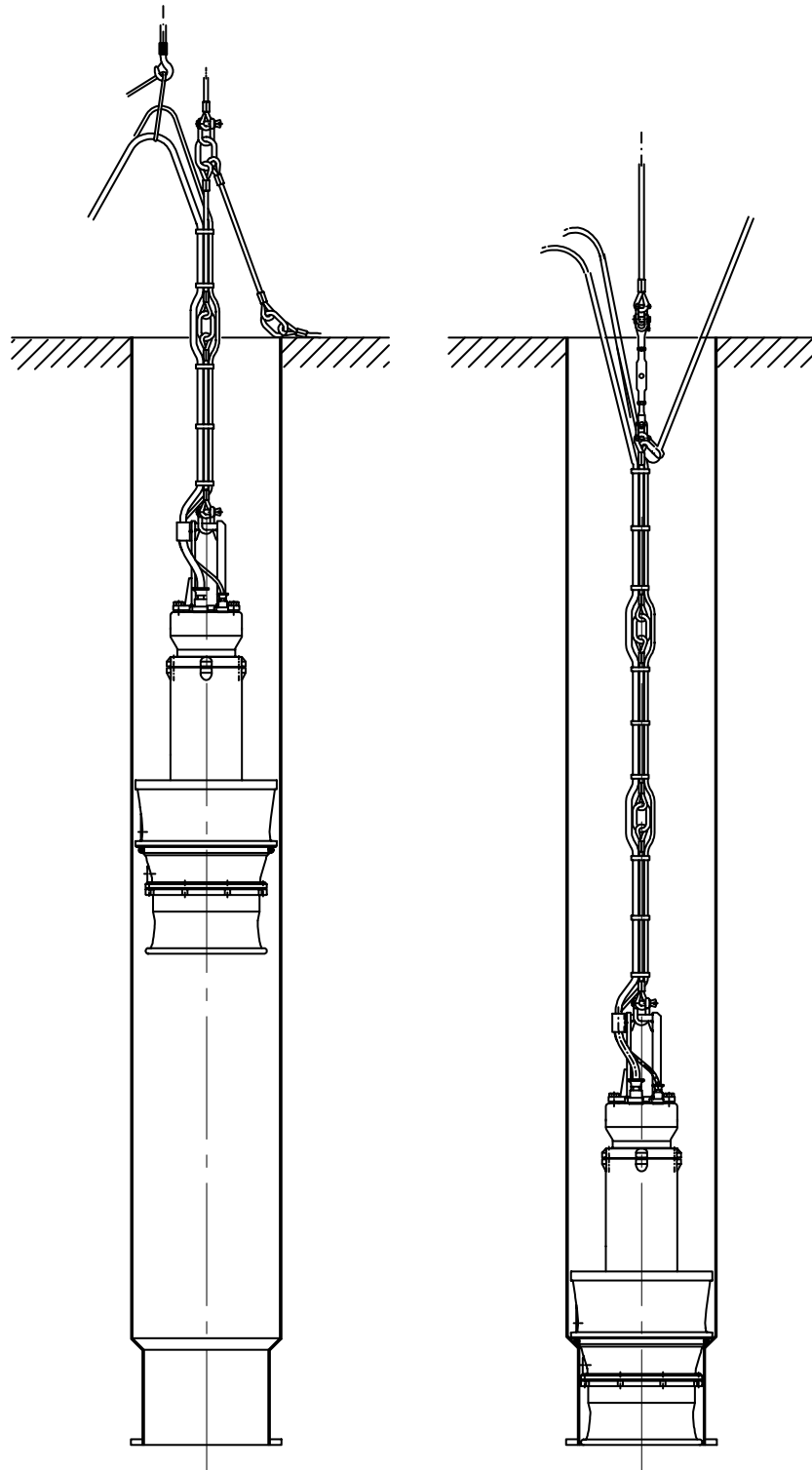
19. Clamp support 59-7 with clamping element 81-51 to the support rope (f).
20. Undo the screwed connection at clamping element 81-51.
21. Place clamp 81-39 of the clamping element around the support rope.

22. 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.

23. Trim the spacer to fill the space between the two ferrules and accommodate the support.
24. Guide the power cables and sensor cable along the support to the next cable clamp. Pull them taut and secure them with the clamp.
25. If more than one support is fitted, repeat steps 19 to 24 for the other supports.
- ⇒ Make sure that the supports are offset by 90° to each other.



**Fig. 24:** Lowering the pump set

26. Progressively lower the pump set into the discharge tube. Secure the cable bundle with cable clamps.
27. Finally, attach the support rope with shackle and turnbuckle to a suspension loop (provided in the discharge tube or structure).
28. Secure the turnbuckle with a split pin. After inserting the split pin, bend back its two legs.
29. Tighten the turnbuckle until the cable bundle is tight but does not lift the pump set 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. Fit the 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 contained in the Annex. (⇒ Section 9.3, Page 100)

The pump set is supplied with power cables; it is wired for DOL starting. Star-delta starting is possible, except for size Amacan P 1600 - 1060.

|                                                                                   |                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>NOTE</b></p> <p>When laying a cable between the control system and the pump set's connection point, make sure to have a sufficient number of cores for the sensors. A minimum cross-section of AWG 15 [1.5 mm<sup>2</sup>] is required.</p> |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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.

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 Setting the overload protection device

1. Protect the pump set against overloading by a thermal time-lag overload protection device in accordance with IEC 60947 and local regulations.
2. Set the overload protection device to the rated current specified on the name plate. (⇒ Section 4.4, Page 18)

#### 5.4.1.3 Level control

|                                                                                     |                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>DANGER</b></p> <p><b>Pump set running dry</b><br/>Explosion hazard!</p> <p>▷ Never allow an explosion-proof pump set to run dry.</p>                                                      |
|  | <p><b>CAUTION</b></p> <p><b>Fluid level below the specified minimum</b><br/>Damage to the pump set by cavitation!</p> <p>▷ Never allow the fluid level to drop below the specified minimum.</p> |

Automatic operation of the pump set in a sump / tank requires the use of level control equipment.

Observe the minimum fluid level indicated. (⇒ Section 6.2.4.3, Page 49)

#### 5.4.1.4 Operation on a frequency inverter

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

|                                                                                   |                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>NOTE</b></p> <p>For pump sets with rated voltages exceeding 500 V, a dv/dt filter should be fitted at the output of the frequency inverter to reduce the rate of voltage rise to the limits specified in IEC 60034-25, Section 18. Otherwise a considerably reduced service life of the insulation system has to be expected.</p> |
|  | <p><b>⚠ DANGER</b></p> <p><b>Operation outside the permitted frequency range</b><br/>Explosion hazard!</p> <p>▸ Never operate an explosion-proof pump set outside the specified range.</p>                                                                                                                                              |
|  | <p><b>⚠ DANGER</b></p> <p><b>Incorrect selection and setting of the frequency inverter</b><br/>Explosion hazard!</p> <p>▸ Observe the following information on selecting and setting a frequency inverter.</p>                                                                                                                          |

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

- Data provided by the manufacturer
- Electrical data of the pump set, particularly the rated current
- Only voltage 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 rated power  $P_2$  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><b>! DANGER</b></p> <p><b>Operating an incompletely connected pump set</b><br/>Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Never start up a pump set with incompletely connected power cables or non-operational monitoring devices.</li> </ul> |
|  | <p><b>CAUTION</b></p> <p><b>Incorrect connection</b><br/>Damage to the sensors!</p> <ul style="list-style-type: none"> <li>▷ Observe the limits stated in the following sections of this manual when connecting the sensors.</li> </ul>                                     |

The pump set features sensors that avoid hazards and damage to the pump set.

|                                                                                   |                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>NOTE</b></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 sensor cable.

For information on wiring and core marking see (⇒ Section 9.3, Page 100)

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

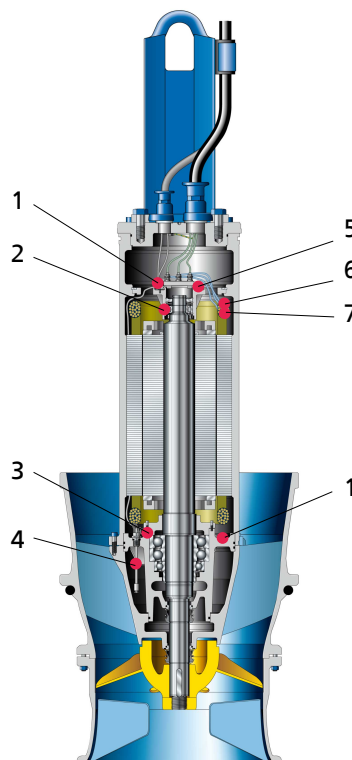


Fig. 25: Sensor positions

| Position | Sensor                                                  | Standard | Optional |
|----------|---------------------------------------------------------|----------|----------|
| 1        | Leakage inside the motor (connection and winding space) | X        | -        |
| 2        | Bearing temperature (upper bearing assembly)            | -        | X        |
| 3        | Bearing temperature (lower bearing assembly)            | X        | -        |

| Position | Sensor                    | Standard | Optional |
|----------|---------------------------|----------|----------|
| 4        | Mechanical seal leakage   | X        | -        |
| 5        | Vibration sensor          | -        | X        |
| 6        | Motor temperature (PTC)   | X        | -        |
| 7        | Motor temperature (Pt100) | -        | X        |

#### 5.4.1.5.1 Motor temperature

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

Three series-connected thermistors (PTC) at terminals 10 and 11 monitor the winding temperature. They must be combined with a thermistor tripping unit with manual reset.

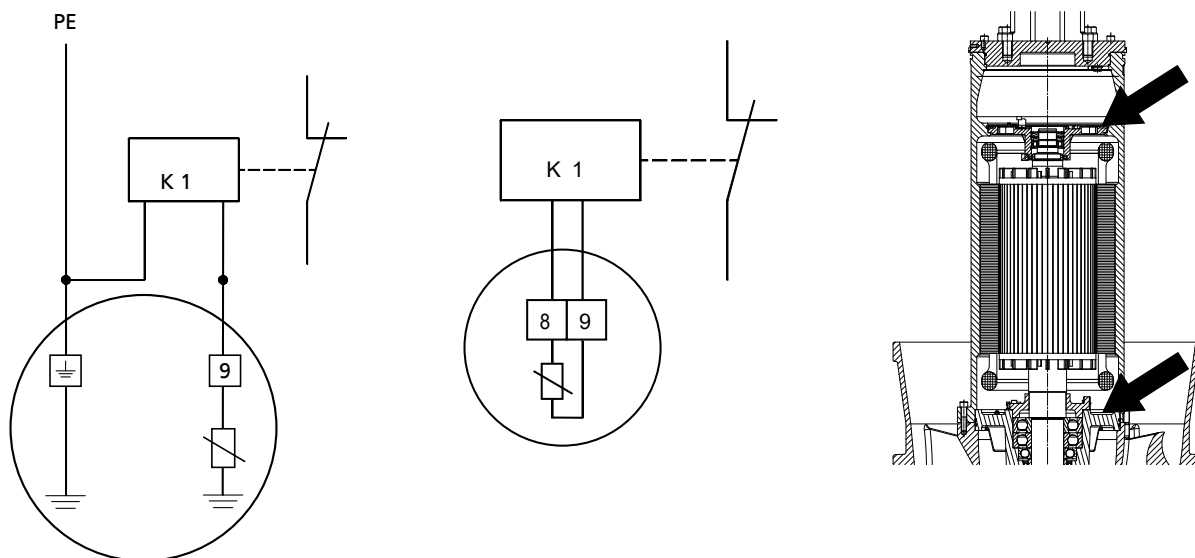
#### Pt100 resistance thermometer

As an option, in addition to the above, the motor can be fitted with Pt100 resistance thermometers in the winding. These can be used for reading the motor temperature (sensor circuit maximum 300 mV / 3 mA).

|                                                                                     |                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>CAUTION</b>                                                                                                                                                                                                                                 |
|                                                                                     | <p><b>Temperature monitoring equipment not properly connected</b><br/>Winding damage!</p> <ul style="list-style-type: none"> <li>▷ Never use the Pt100 resistance thermometers as a sole means of monitoring the motor temperature.</li> </ul> |

#### 5.4.1.5.2 Leakage inside the motor

|                                                                                     |                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  <b>DANGER</b>                                                                                                                                           |
|                                                                                     | <p><b>Incorrect monitoring of leakage electrode</b><br/>Explosion hazard!<br/>Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Voltages must be &lt; 30 V AC and tripping currents &lt; 0.5 mA.</li> </ul> |



Wiring of the electrode relay (standard)

Wiring of the electrode relay (pump sets with vibration sensor only)

Position of the electrodes in the motor housing

Electrodes fitted inside the motor monitor the winding and connection space for leakage. Both electrodes are connected in parallel (core identification 9). They must be connected to an electrode relay. Tripping of the electrode relay must result in the pump set cutting out.

The electrode relay (K1) must trip at a resistance between 3 and 60 k $\Omega$ .

#### Pump sets with vibration sensors

A different wiring system is used for the electrodes of pump sets with vibration sensors.

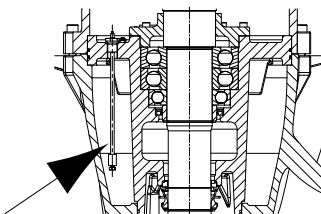


Fig. 26: Float switch

#### 5.4.1.5.3 Mechanical seal leakage

The chamber for mechanical seal leakage is equipped with a float switch (core identification 3 and 4). The contact (maximum 250 V~/2 A) opens when leakage is detected in the leakage chamber. Opening of the contact shall trigger an alarm signal.

#### 5.4.1.5.4 Bearing temperature

The lower bearing of the pump set is equipped with a bearing temperature sensor. This sensor is a Pt100 resistance thermometer (core marking 15 and 16). It must be connected to a temperature control device with a Pt100 input and two separate outputs for two different switching points (sensor circuit maximum 6 V/2 mA).

Set the following limits:

- Alert at 266 °F (130 °C)
- Cut-out of the pump set at 302 °F (150 °C)

As an option, the upper (drive-end) bearing can also be equipped with a temperature sensor (core marking 16 and 17). Its connection and settings are identical with the above. Check in the data sheet whether the pump set features temperature monitoring of the upper (drive-end) bearing.

#### 5.4.1.5.5 Vibration sensor

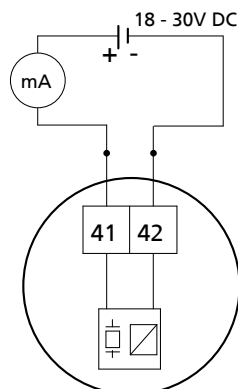
As an option, the pump set can be supplied with a vibration sensor in the area of the upper (drive-end) bearing.

The vibration sensor measures the root-mean-square value of the radial vibration velocity at the upper bearing. The sensor has an integrated signal converter with a standardized output (4 to 20 mA). This allows simple integration into existing PLC systems or process control systems.

**Table 9:** Technical data of the sensor

| Characteristic                    | Value                                        |
|-----------------------------------|----------------------------------------------|
| Measuring range                   | 4 - 20 mA at 0 - 0.79 in/s RMS [0 - 20 mm/s] |
| Measuring error                   | < 5 %                                        |
| Long-term stability               | +/- 1 % in 10 years                          |
| Maximum shock load                | 1.1 lb [500 g]                               |
| Frequency range                   | 2 Hz - 1000 Hz                               |
| Resonant frequency                | > 18 kHz                                     |
| Output impedance                  | 200 $\Omega$ max.                            |
| Voltage supply                    | 18 - 30 V (smoothed)                         |
| Load (maximum working resistance) | 50 - 100 $\Omega$                            |

**Connecting the vibration sensor**



**Fig. 27:** Connecting the vibration sensor

We recommend the following settings for vibration monitoring with the (optional) vibration sensor fitted at the factory:

- Alarm to be triggered at  $v_{\text{eff}} = 0.43$  in/s [11 mm/s]
  - This vibration limit requires remedial action.
  - In general, pump operation may continue until the causes of the change in vibration level have been detected and remedies have been determined.
- Cut-out at  $v_{\text{eff}} = 0.55$  in/s [14 mm/s]
  - If this vibration velocity is exceeded, continued pump set operation may result in damage.
  - Immediately take suitable measures to reduce vibrations or switch off the pump set.

#### 5.4.2 Connection to power supply

|  |                                                                                                                                                                                                                                                                                                                                                                                  |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>⚠ DANGER</b></p> <p><b>Electrical connection work by unqualified personnel</b><br/>                     Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▸ Always have the electrical connections installed by a trained electrician.</li> <li>▸ Observe the EN 61557 regulations as well as any locally applicable regulations.</li> </ul> |
|  | <p><b>⚠ WARNING</b></p> <p><b>Incorrect connection to the mains</b><br/>                     Damage to the power supply network, short circuit!</p> <ul style="list-style-type: none"> <li>▸ Observe the technical specifications of the local energy supply companies.</li> </ul>                                                                                               |

|                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                 | <div><b>CAUTION</b></div> <div><b>Improper routing of power cables</b></div> <div>Damage to the power cables!</div> <ul style="list-style-type: none"> <li>▶ Never move the power cables at temperatures below -13 °F [-25 °C].</li> <li>▶ Never kink or crush the power cables.</li> <li>▶ Never lift the pump set by the power cables.</li> <li>▶ Adjust the length of the power cables to the site requirements.</li> </ul> |
|                                                                                                                                                                                                                                                 | <div><b>CAUTION</b></div> <div><b>Motor overload</b></div> <div>Damage to the motor!</div> <ul style="list-style-type: none"> <li>▶ Protect the motor by a thermal time-lag overload protection device in accordance with IEC 60947 and local regulations.</li> </ul>                                                                                                                                                          |
| <p>For the electrical connection of the pump set observe the wiring diagrams (⇒ Section 9.3, Page 100) 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> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                | <div><b>⚠ DANGER</b></div> <div><b>Incorrect connection</b></div> <div>Explosion hazard!</div> <ul style="list-style-type: none"> <li>▶ The connection point of the cable ends must be located outside hazardous areas or in an area approved for electrical equipment.</li> </ul>                                                                                                                                          |
|                                                                                                                                                                                                                                               | <div><b>⚠ DANGER</b></div> <div><b>Operating an incompletely connected pump set</b></div> <div>Damage to the pump set!</div> <ul style="list-style-type: none"> <li>▶ Never start up a pump set with incompletely connected power cables or non-operational monitoring devices.</li> </ul>                                                                                                                              |
|                                                                                                                                                                                                                                               | <div><b>⚠ DANGER</b></div> <div><b>Using damaged power cables</b></div> <div>Danger of death from electric shock!</div> <ul style="list-style-type: none"> <li>▶ Never connect damaged power cables.</li> <li>▶ Visually inspect the power cable before connecting it.</li> <li>▶ Replace the power cable, if it is damaged.</li> </ul>                                                                                  |
|                                                                                                                                                                                                                                               | <div><b>CAUTION</b></div> <div><b>Flow-induced motion</b></div> <div>Damage to the power cable!</div> <ul style="list-style-type: none"> <li>▶ Run the power cable upwards without slack.</li> </ul>                                                                                                                                                                                                                     |

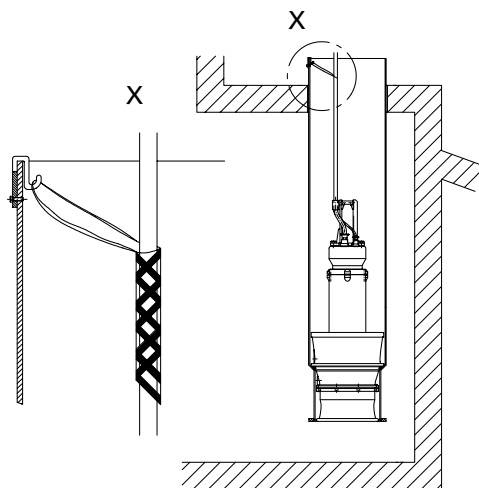


Fig. 28: Fastening the power cable

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).

|  |                                                                                                                                                                                                                      |
|--|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>! DANGER</b></p> <p><b>Incorrect connection</b><br/>Explosion hazard!</p> <p>▸ Explosion-proof pump sets installed in a tank must never be retrofitted with an external potential equalization connection!</p> |
|  | <p><b>! DANGER</b></p> <p><b>Touching the pump set during operation</b><br/>Electric shock!</p> <p>▸ Make sure that the pump set cannot be touched during operation.</p>                                             |

## 6 Commissioning/Start-up/Shutdown

### 6.1 Commissioning/start-up

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

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <div> <b>DANGER</b></div> <p><b>Operating the pump set without protective equipment</b></p> <p>Electric shock!<br/>Risk of injury!<br/>Danger of death from drowning!</p> <ul style="list-style-type: none"> <li>▷ Never start up the pump set without special protective equipment when there are persons in the tank.</li> <li>▷ 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.</li> <li>▷ Provide special electrical and mechanical protective equipment compliant with the legal regulations.</li> </ul> |
|   | <div> <b>WARNING</b></div> <p><b>Operating the pump set without mechanical protective equipment</b></p> <p>Risk of injury from solid matter in the fluid handled!</p> <ul style="list-style-type: none"> <li>▷ If persons come into contact with the fluid handled during pump operation (e.g. in sports facilities and leisure parks), install mechanical protective equipment (e.g. a screen) on the discharge side of the pump set.</li> </ul>                                                                                                                                                                                                           |
|  | <div> <b>WARNING</b></div> <p><b>People falling into the unsecured discharge tube</b></p> <p>Risk of personal injury!</p> <ul style="list-style-type: none"> <li>▷ Take suitable precautions during the entire installation/dismantling process to protect people from falling into the open discharge tube.</li> <li>▷ Fence off the work area appropriately.</li> </ul>                                                                                                                                                                                                                                                                               |

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 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 equipment to service have been carried out. (⇒ Section 6.4, Page 51)
- Safety-relevant protective equipment must be installed and fully functional.

### 6.1.2 Start-up

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>⚠ DANGER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                   | <p><b>Operating the pump set without protective equipment</b><br/>           Electric shock!<br/>           Risk of injury!<br/>           Danger of death from drowning!</p> <ul style="list-style-type: none"> <li>▷ Never start up the pump set without special protective equipment when there are persons in the tank.</li> <li>▷ 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.</li> <li>▷ Provide special electrical and mechanical protective equipment compliant with the legal regulations.</li> </ul> |

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

✓ The fluid level is sufficiently high.

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

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

### 6.2 Operating limits

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>⚠ DANGER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                     | <p><b>Non-compliance with operating limits</b><br/>           Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Comply with the operating data indicated in the data sheet.</li> <li>▷ Avoid operation below <math>Q_{min}</math>.</li> <li>▷ 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.</li> <li>▷ Never operate the pump set outside the limits specified below.</li> </ul> |

#### 6.2.1 Operation on the power supply mains

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

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

|                                                                                   |                                                                                                                   |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
|  | <b>CAUTION</b>                                                                                                    |
|                                                                                   | <b>Excessive frequency of starts</b><br>Damage to the motor!<br>▷ 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 10 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.

|                                                                                   |                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>CAUTION</b>                                                                                                                                                                                                            |
|                                                                                   | <b>Re-starting while motor is still running down</b><br>Damage to the pump set!<br>▷ Do not re-start the pump set before it has come to a standstill.<br>▷ Never start the pump set while the pump is running in reverse. |

### 6.2.3 Operation on a frequency inverter

|                                                                                     |                                                                                                                                                         |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>⚠ DANGER</b>                                                                                                                                         |
|                                                                                     | <b>Operation outside the permitted frequency range</b><br>Explosion hazard!<br>▷ 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 Fluid temperature

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

|                                                                                     |                                                                                                               |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
|  | <b>CAUTION</b>                                                                                                |
|                                                                                     | <b>Danger of freezing!</b><br>Damage to the pump set!<br>▷ 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 set changes in proportion to the density of the fluid handled.

|                                                                                   |                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #FFD700; padding: 5px;"><b>CAUTION</b></div> <p><b>Impermissibly high density of fluid handled</b><br/>Motor overload!</p> <ul style="list-style-type: none"> <li>▷ Observe the information on fluid density in the data sheet.</li> <li>▷ Make sure the motor has sufficient power reserves.</li> </ul> |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### 6.2.4.3 Minimum level of fluid handled

|                                                                                   |                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #FF4500; padding: 5px;"><b>! DANGER</b></div> <p><b>Pump set running dry</b><br/>Explosion hazard!</p> <ul style="list-style-type: none"> <li>▷ Never allow an explosion-proof pump set to run dry.</li> </ul> |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                   |                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #FFD700; padding: 5px;"><b>CAUTION</b></div> <p><b>Fluid level below the specified minimum</b><br/>Damage to the pump set by cavitation and air-entraining vortices!</p> <ul style="list-style-type: none"> <li>▷ Never allow the fluid level to drop below the specified minimum.</li> </ul> |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

The pump set is ready for operation when the fluid level has reached dimension "t<sub>1</sub>" as a minimum (see general arrangement drawing/outline drawing).

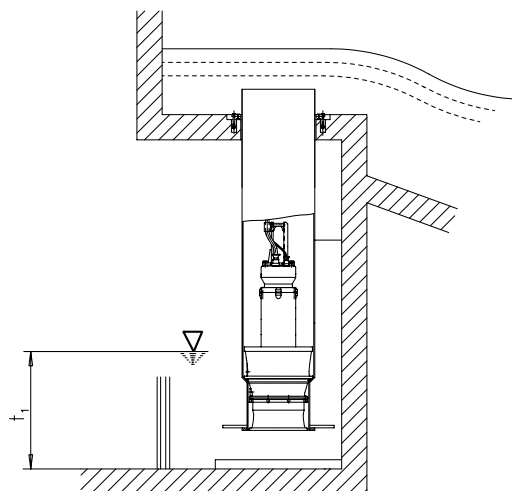


Fig. 29: Example: minimum level of fluid handled

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

#### 6.3.2 Measures to be taken for shutdown

|    | ⚠ DANGER                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                     | <p><b>Electrical connection work by unqualified personnel</b><br/>Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Always have the electrical connections installed by a trained electrician.</li> <li>▷ Observe the EN 61557 regulations as well as any locally applicable regulations.</li> </ul>                                                               |
|   | ⚠ WARNING                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                     | <p><b>Unintentional starting of pump set</b><br/>Risk of injury by moving components and shock currents!</p> <ul style="list-style-type: none"> <li>▷ Make sure that the pump set cannot be started up unintentionally.</li> <li>▷ Always make sure the electrical connections are disconnected before carrying out work on the pump set.</li> </ul>                                               |
|  | ⚠ WARNING                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                     | <p><b>Fluids handled, consumables and operating supplies which are hot or pose a health hazard</b><br/>Risk of personal injury!</p> <ul style="list-style-type: none"> <li>▷ Observe all relevant laws.</li> <li>▷ When draining the fluid take appropriate measures to protect persons and the environment.</li> <li>▷ Decontaminate pumps which handle fluids posing a health hazard.</li> </ul> |
|  | CAUTION                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                     | <p><b>Danger of frost/freezing</b><br/>Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ If there is any danger of frost/freezing, remove the pump set from the fluid handled and clean, preserve and store it.</li> </ul>                                                                                                                                                      |

#### The pump set remains installed

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

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

- ✓ All safety regulations are observed.
- 1. Clean the pump set.
- 2. Preserve the pump set.

#### 6.4 Returning to service

For returning the pump set to service, observe the items on commissioning/start-up.  
(⇒ Section 6.1, Page 46)

Refer to and comply with the operating limits.

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

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div> <b>WARNING</b></div> <div><b>Failure to re-install or re-activate protective equipment/devices</b></div> <div>Risk of personal injury from moving parts or escaping fluid!</div> <div>▷ As soon as the work is completed, re-install and/or re-activate any safety-relevant devices and protective devices.</div> |
|  | <div><b>NOTE</b></div> <div>On pumps/pump sets older than 5 years we recommend replacing all elastomer seals.</div>                                                                                                                                                                                                                                                                                                                                                |

## 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.

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <div>  <b>DANGER</b> </div> <p><b>Sparks produced during maintenance work</b><br/>Explosion hazard!</p> <ul style="list-style-type: none"> <li>▷ Observe the safety regulations in force at the place of installation.</li> <li>▷ Never open a pump set that is connected to the power supply.</li> <li>▷ Always perform maintenance work on pump sets outside potentially explosive atmospheres.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|    | <div>  <b>DANGER</b> </div> <p><b>Improperly serviced pump set</b><br/>Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Service the pump set regularly.</li> <li>▷ Prepare a maintenance schedule with special emphasis on lubricants, power cable, bearing assembly and shaft seal.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|  | <div>  <b>DANGER</b> </div> <p><b>Improper lifting/moving of heavy assemblies or components</b><br/>Danger to life from falling parts!<br/>Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.</li> <li>▷ Use the attachment point provided for attaching the lifting accessory.</li> <li>▷ Never lift the pump set by the electric cables.</li> <li>▷ 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.</li> <li>▷ Securely attach the lifting chain/rope to the pump and crane.</li> <li>▷ Use tested, marked and approved lifting accessories only.</li> <li>▷ Observe the regional transport regulations.</li> <li>▷ Observe the documentation of the lifting accessory manufacturer.</li> <li>▷ The load-carrying capacity of the lifting accessory must be higher than the weight indicated on the name plate of the pump set to be lifted. Take into account any additional system components to be lifted.</li> <li>▷ Maintain a safe distance during lifting operations (load may swing when being lifted).</li> </ul> |
|  | <div>  <b>DANGER</b> </div> <p><b>Electrical connection work by unqualified personnel</b><br/>Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Always have the electrical connections installed by a trained electrician.</li> <li>▷ Observe the EN 61557 regulations as well as any locally applicable regulations.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <div>  <b>DANGER</b> </div> <p><b>Risk of falling when working at great heights</b><br/>           Danger to life by falling from great heights!</p> <ul style="list-style-type: none"> <li>▷ Do not step onto the pump (set) during installation work or dismantling work.</li> <li>▷ Pay attention to safety equipment, such as railings, covers, barriers, etc.</li> <li>▷ Observe the applicable local occupational safety regulations and accident prevention regulations.</li> </ul>  |
|    | <div>  <b>WARNING</b> </div> <p><b>Unintentional starting of pump set</b><br/>           Risk of injury by moving components and shock currents!</p> <ul style="list-style-type: none"> <li>▷ Make sure that the pump set cannot be started up unintentionally.</li> <li>▷ Always make sure the electrical connections are disconnected before carrying out work on the pump set.</li> </ul>                                                                                                |
|    | <div>  <b>WARNING</b> </div> <p><b>Hands, other body parts or foreign objects in the impeller or intake area</b><br/>           Risk of injury! Damage to the submersible motor pump!</p> <ul style="list-style-type: none"> <li>▷ Never insert your hands, other body parts or foreign objects into the impeller and/or impeller intake area.</li> <li>▷ Always make sure that the electrical connections are disconnected before checking that the impeller can rotate freely.</li> </ul> |
|  | <div>  <b>WARNING</b> </div> <p><b>Fluids handled, consumables and operating supplies which are hot or pose a health hazard</b><br/>           Risk of personal injury!</p> <ul style="list-style-type: none"> <li>▷ Observe all relevant laws.</li> <li>▷ When draining the fluid take appropriate measures to protect persons and the environment.</li> <li>▷ Decontaminate pumps which handle fluids posing a health hazard.</li> </ul>                                              |
|  | <div>  <b>WARNING</b> </div> <p><b>Hot surface</b><br/>           Risk of personal injury!</p> <ul style="list-style-type: none"> <li>▷ Allow the pump set to cool down to ambient temperature.</li> </ul>                                                                                                                                                                                                                                                                              |
|  | <div>  <b>WARNING</b> </div> <p><b>Improper lifting/moving of heavy assemblies or components</b><br/>           Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.</li> </ul>                                                                                                                                                            |

|                                                                                    |                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | <p><b>! WARNING</b></p> <p><b>Insufficient stability</b><br/>Risk of crushing hands and feet!</p> <p>▷ During assembly/dismantling, secure the pump (set)/pump parts against tilting or tipping over.</p>                                                                                                                                                 |
|   | <p><b>! WARNING</b></p> <p><b>Corrosion on the pump set</b><br/>Risk of injury from solid matter in the fluid handled!</p> <p>▷ If persons come into contact with the fluid handled during pump operation (e.g. in sports facilities and leisure parks), check the pump set for corrosion regularly and adhere to the maintenance interval specified.</p> |
|   | <p><b>NOTE</b></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>                                                                                                            |
|  | <p><b>NOTE</b></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 visit <a href="https://www.ksb.com/en-global/contact">https://www.ksb.com/en-global/contact</a>.</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.

Never use force when dismantling and reassembling the pump set.

## 7.2 Servicing/inspection

KSB recommends the following regular maintenance schedule:

**Table 10:** Overview of maintenance work

| Maintenance interval                                                                                                | Maintenance work                        | For details see ...          |
|---------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------------------------------|
| First check after at least 6 months; interval can be extended to 12 months (in sports facilities and leisure parks) | Visually inspect for corrosion.         | (⇒ Section 7.3.6, Page 60)   |
| Every 4000 hours, at least once a year                                                                              | Measure the insulation resistance.      | (⇒ Section 7.2.1.1, Page 55) |
| Every 8000 hours, at least every 3 years                                                                            | Check the cable bundle.                 | (⇒ Section 7.3.3, Page 58)   |
|                                                                                                                     | Check the ground conductor.             | (⇒ Section 7.3.4, Page 58)   |
|                                                                                                                     | Check the sensors.                      | (⇒ Section 7.2.1.2, Page 55) |
|                                                                                                                     | Check the mechanical seal leakage.      | (⇒ Section 7.3.5, Page 59)   |
|                                                                                                                     | Change the lubricant.                   |                              |
| Every 16,000 hours, at least every 5 years                                                                          | Lubricate the rolling element bearings. | (⇒ Section 7.4.2, Page 62)   |
|                                                                                                                     | 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.

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

|  |                                                                                                                                                                  |
|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>NOTE</b>                                                                                                                                                      |
|  | If the insulation resistances measured on the motor are too low, the winding insulation is defective. The pump set must not be returned to service in this case. |

#### 7.2.1.2 Checking the sensors

|  |                                                                                                                               |
|--|-------------------------------------------------------------------------------------------------------------------------------|
|  | <b>CAUTION</b>                                                                                                                |
|  | <b>Excessive test voltage</b><br>Damage to the sensors!<br>▷ Use a commercially available ohmmeter to measure the resistance. |

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

#### Temperature sensors in the motor winding

Table 11: Resistance measurement

| Measurement between terminals ... | Resistance |
|-----------------------------------|------------|
|                                   | [Ω]        |
| 10 and 11                         | 200 - 1000 |
| 31 and 32 <sup>4)</sup>           | 100 - 120  |
| 33 and 34 <sup>4)</sup>           | 100 - 120  |
| 35 and 36 <sup>4)</sup>           | 100 - 120  |

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.

If the sensors are defective, use the back-up sensors provided at the same place in the stator winding.

<sup>4</sup> Optional

### Leakage sensors in the motor

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

| Measurement between terminals ... | Resistance<br>[kΩ] |
|-----------------------------------|--------------------|
| 9 and ground conductor (PE)       | > 60               |
| 8 and 9 <sup>5)</sup>             | > 60               |

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

### Float switch (mechanical seal leakage)

**Table 13:** Resistance measurement of the float switch

| Measurement between terminals ... | Resistance<br>[Ω] |
|-----------------------------------|-------------------|
| 3 and 4                           | < 1               |

If the readings suggest an open switch, check for mechanical seal leakage.

### Bearing temperature sensor

**Table 14:** Resistance measurement of the bearing temperature sensors

| Measurement between terminals ... | Resistance<br>[Ω] |
|-----------------------------------|-------------------|
| 15 and 16                         | 100 to 120        |
| 16 and 17 <sup>6)</sup>           | 100 to 120        |

### Vibration sensor

**Table 15:** Current measurement at the vibration sensor

| Measurement between terminals ... | Current value                   |
|-----------------------------------|---------------------------------|
| 41 and 42 <sup>7)</sup>           | Constant 4 mA during standstill |

#### Functional test

Connect the vibration sensor. Measure the current in the measuring circuit with a suitable ammeter. (⇒ Section 5.4.1.5.5, Page 42)

## 7.3 Removing the pump set

### 7.3.1 Removing the pump set

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #f4a460; padding: 5px;"><b>⚠ DANGER</b></div> <p><b>Insufficient preparation of work on the pump (set)</b><br/>Risk of injury!</p> <ul style="list-style-type: none"> <li>▷ Properly shut down the pump set.</li> <li>▷ Close the shut-off elements in the suction line and discharge line.</li> <li>▷ Drain the pump and release the pump pressure.</li> <li>▷ Shut off any auxiliary feed lines.</li> <li>▷ Allow the pump set to cool down to ambient temperature.</li> </ul> |
|  | <div style="background-color: #f4a460; padding: 5px;"><b>⚠ WARNING</b></div> <p><b>Incorrect handling of the electric cable</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Secure electric cables against falling down.</li> <li>▷ Avoid electric cables being laid on surfaces without fastening.</li> <li>▷ When moving the pump set keep at a safe distance to the electric cables.</li> </ul>                                                                |

<sup>5</sup> Only for pump sets with vibration sensor

<sup>6</sup> Included in the standard design for size 1600-1060; for other sizes optional

<sup>7</sup> Optional

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <div> <b>WARNING</b></div> <p><b>People falling into the unsecured discharge tube</b><br/>Risk of personal injury!</p> <ul style="list-style-type: none"> <li>▷ Take suitable precautions during the entire installation/dismantling process to protect people from falling into the open discharge tube.</li> <li>▷ Fence off the work area appropriately.</li> </ul> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <div> <b>WARNING</b></div> <p><b>Turnbuckle and shackle are not suitable for lifting the pump set.</b><br/>Risk of personal injury!<br/>Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Always use the eyebolts of the support rope to lift the pump set.</li> </ul>                                                                              |
| <ul style="list-style-type: none"> <li>✓ The power cables have been disconnected and secured against accidental start-up.</li> <li>✓ The discharge tube is open; its opening is securely covered except for a gap allowing work to continue.</li> <li>✓ Suitable lifting equipment is available. <ul style="list-style-type: none"> <li>1. Attach the lifting chain or lifting rope to the trolley.</li> <li>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.</li> <li>3. Open and disconnect the turnbuckle.</li> </ul> </li> </ul>                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <div><b>NOTE</b></div> <p>Loose parts must not fall into the pump sump!</p>                                                                                                                                                                                                                                                                                                                                                                           |
| <ul style="list-style-type: none"> <li>4. Pull the pump set up until it reaches the second lifting lug of the cable bundle.</li> <li>5. Attach the lifting chain or lifting rope with the shackle to the first lifting lug (together with the crane hook).</li> <li>6. Unclip the crane hook and attach it to the second lifting lug.</li> <li>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.</li> <li>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.</li> <li>9. Repeat this procedure until the pump bail is located above the discharge tube, then attach it to the crane hook.</li> <li>10. Remove the safety cover from the discharge tube.</li> <li>11. Extract the pump set from the discharge tube, move it sideways and place it down.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <div> <b>WARNING</b></div> <p><b>Pump set tilting</b><br/>Risk of squashing hands and feet!</p> <ul style="list-style-type: none"> <li>▷ Suspend or support the pump set.</li> </ul>                                                                                                                                                                               |

|                                                                                   |                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #FFD700; padding: 5px;"><b>CAUTION</b></div> <p><b>Improper storage</b><br/>Damage to the power cables!</p> <ul style="list-style-type: none"> <li>▷ Support the power cables at the cable entry to prevent permanent deformation.</li> <li>▷ Protect the core ends against humidity.</li> </ul> |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #FFA500; padding: 5px;"><b>! WARNING</b></div> <p><b>Fluids handled, consumables and operating supplies which are hot or pose a health hazard</b><br/>Hazard to persons and the environment!</p> <ul style="list-style-type: none"> <li>▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled.</li> <li>▷ Wear safety clothing and a protective mask if required.</li> <li>▷ Observe all legal regulations on the disposal of fluids posing a health hazard.</li> </ul> |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

1. Always flush the pump if it has been used for handling noxious, explosive, hot or other hazardous fluids.
2. Always flush and clean the pump before transporting it to the workshop.  
Always complete and enclose a certificate of decontamination when returning the pump set. (⇒ Section 10, Page 151)

### 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.

|                                                                                     |                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #FF4500; padding: 5px;"><b>! DANGER</b></div> <p><b>Defective ground conductor</b><br/>Electric shock!</p> <ul style="list-style-type: none"> <li>▷ Never switch on a pump set with a defective ground conductor.</li> </ul> |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 7.3.5 Checking the mechanical seal leakage

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>! WARNING</b></p> <p><b>Fluids handled, consumables and operating supplies which are hot or pose a health hazard</b></p> <p>Hazard to persons and the environment!</p> <ul style="list-style-type: none"> <li>▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled.</li> <li>▷ Wear safety clothing and a protective mask if required.</li> <li>▷ Observe all legal regulations on the disposal of fluids posing a health hazard.</li> </ul> |
|  | <p><b>! WARNING</b></p> <p><b>Excess pressure inside the pump set</b></p> <p>Risk of personal injury when opening the pump set!</p> <ul style="list-style-type: none"> <li>▷ Be careful when opening the inner chambers. Balance the pressure.</li> </ul>                                                                                                                                                                                                                                   |
|  | <p><b>NOTE</b></p> <p>Slight wear of the mechanical seal is unavoidable. This will be aggravated by abrasive substances contained in the fluid handled.</p>                                                                                                                                                                                                                                                                                                                                 |

Checking the leakage chamber serves to assess the function of the drive-end mechanical seal.

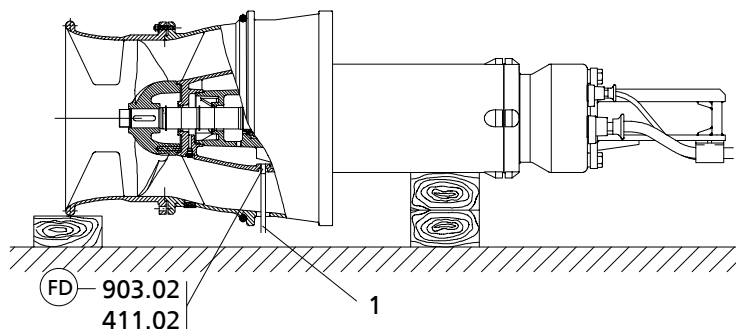


Fig. 30: Checking the leakage chamber

Table 16: Key to the symbols

| Symbol                                                                              | Key                                                                                                    |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|  | Always apply a <b>liquid sealant</b> (e.g. Hylomar SQ32M) to sealing surfaces marked with this symbol. |

- ✓ A suitable container for the leakage is on hand.
  - ✓ The pump is positioned horizontally on a level surface and is protected against rolling off.
- Place the container underneath screw plug 903.02.
  - Remove screw plug 903.02 with joint ring 411.02.
  - Screw in a sufficiently long tube (1) with G 1/2 thread.
  - Carefully rotate the pump set until the opening of the leakage chamber points downwards.
    - ⇒ If there is no leakage or, after several years of operation, only a small amount, the mechanical seals are working properly. If the leakage exceeds 1.59 quart [1.5 liters], the mechanical seals are defective and must be replaced.
  - Unscrew and remove the tube (1).
  - Re-insert and tighten screw plug 903.02 with new joint ring 411.02.

### 7.3.6 Visually inspecting for corrosion

- ✓ The pump set has been removed from the system.
- 1. Conduct a visual inspection of the pump set.
  - ⇒ Clearly visible corrosion: Replace defective components and check corrosion protection.
  - ⇒ No visible corrosion: Extend visual inspection interval to 12 months.

## 7.4 Lubrication and lubricant change

### 7.4.1 Lubricating the mechanical seal

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #f4a460; padding: 5px;"><b>⚠ DANGER</b></div> <p><b>Excessive temperatures at the shaft seal</b><br/>Explosion hazard!<br/>Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Regularly check the condition of the lubricant in the lubricant chamber of the mechanical seal. Top it up if required.</li> </ul> |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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

#### 7.4.1.1 Intervals

Replace the lubricant every 8000 operating hours but at least every 3 years.

#### 7.4.1.2 Lubricant quality

The lubricant chamber is filled at the factory with environmentally friendly, non-toxic lubricant (unless otherwise specified by the customer).

The following lubricants can be used to lubricate the mechanical seals:

#### Recommended lubricant quality

##### Alternative

- Environmentally friendly, non-toxic white oil of medical quality
- Thin-bodied paraffin oil, non-toxic
- Water / propylene glycol mixture with corrosion inhibitors for frost protection down to -4 °F [-20 °C].

**Table 17:** Lubricant quality

| Description                     | Properties                               |                                                     |
|---------------------------------|------------------------------------------|-----------------------------------------------------|
| Paraffin oil<br>or<br>white oil | Kinematic viscosity<br>at 104 °F [40 °C] | < 0.065 ft/s <sup>2</sup> [< 20 mm/s <sup>2</sup> ] |
|                                 | Flash point (to Cleveland)               | > 320 °F [> 160 °C]                                 |
|                                 | Solidification point (pour point)        | < 5 °F [< -15 °C]                                   |

|                                                                                     |                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #f4a460; padding: 5px;"><b>⚠ WARNING</b></div> <p><b>Contamination of fluid handled by lubricant</b><br/>Hazard to persons and the environment!</p> <ul style="list-style-type: none"> <li>▷ Using machine oil is only permitted if the oil is disposed of properly.</li> </ul> |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### 7.4.1.3 Lubricant quantity

**Table 18:** Lubricant quantity

| Size      | Lubricant quantity |     |
|-----------|--------------------|-----|
|           | [quart]            | [l] |
| 700 - 470 | 1,90               | 1,8 |
| 800 - 540 | 2,32               | 2,2 |

| Size        | Lubricant quantity |     |
|-------------|--------------------|-----|
|             | [quart]            | [l] |
| 900 - 540   | 2,32               | 2,2 |
| 1000 - 700  | 2,64               | 2,5 |
| 1200 - 870  | 4,02               | 3,8 |
| 1500 - 1060 | 7,40               | 7,0 |
| 1600 - 1060 | 5,28               | 5,0 |

#### 7.4.1.4 Changing the lubricant

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

#### 7.4.1.4.1 Draining the lubricant

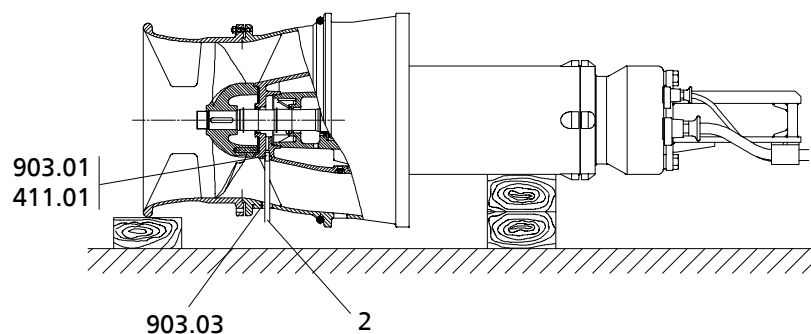


Fig. 31: Draining the lubricant

1. Place the pump set in a horizontal position and make sure it cannot roll off.
2. Remove screw plug 903.03.
3. Remove screw plug 903.01 and joint ring 411.01.

4. Screw in a sufficiently long tube (2) with G 1/2 thread.
5. Carefully rotate the pump set until the tube points downwards.
6. Collect the lubricant in a suitable container and dispose of it.
7. Remove the tube. Re-insert and tighten screw plug 903.01 with joint ring 411.01.
8. Re-insert and tighten screw plug 903.03.

#### 7.4.1.4.2 Filling in the lubricant

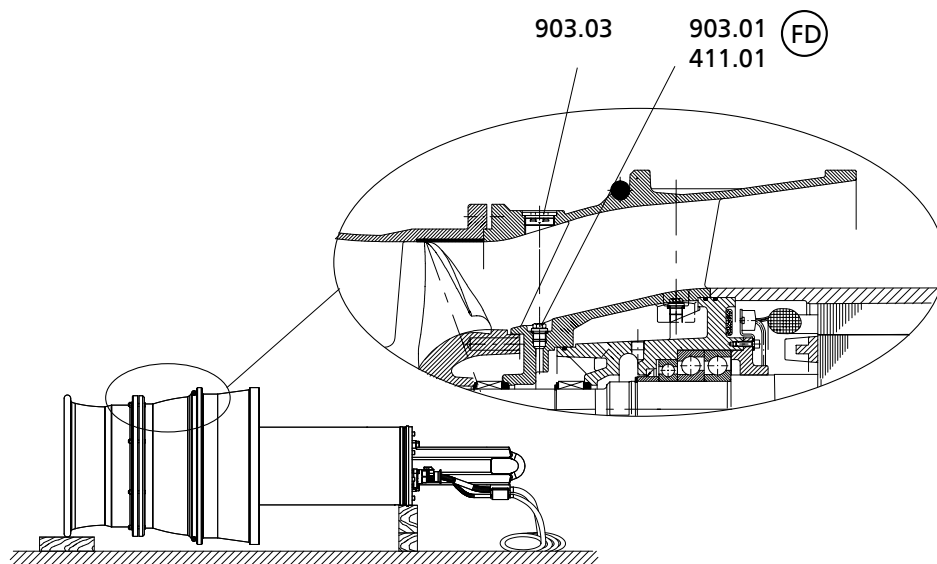


Fig. 32: Filling in the lubricant

Table 19: Key to the symbols

| Symbol | Key                                                                                                    |
|--------|--------------------------------------------------------------------------------------------------------|
| (FD)   | Always apply a <b>liquid sealant</b> (e.g. Hylomar SQ32M) to sealing surfaces marked with this symbol. |

1. Place the pump set down in a horizontal position. Secure it against rolling off.
2. Remove screw plug 903.03.
3. Remove screw plug 903.01 and joint ring 411.01.
4. Screw in a sufficiently long tube with G 1/2 thread.
5. Fill the lubricant in through the tube.
6. Remove the tube. Fit screw plug 903.01 and new joint ring 411.01 with liquid sealant.
7. Insert and tighten screw plug 903.03.

#### 7.4.2 Lubricating the rolling element bearings

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

##### 7.4.2.1 Intervals

Change the grease when carrying out a general overhaul but at least every 5 years.

### 7.4.2.2 Grease quality

|  | CAUTION                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   | <p><b>Mix of different grease types</b></p> <p>Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Make sure to use the right type of grease.</li> <li>▷ Never mix different types of grease.</li> </ul> |

The following greases can be used to lubricate the rolling element bearings:

**Table 20:** Lubricant characteristics

| Base oil                                   | Type | Thickener | NLGI grade (ISO 2137) | Worked penetration at 77 °F [25 °C], 0.1 mm (DIN 51818) | Drop point (ISO 2176)  | Application temperature range            | Viscosity (DIN 51562) [mm²/s] |           |
|--------------------------------------------|------|-----------|-----------------------|---------------------------------------------------------|------------------------|------------------------------------------|-------------------------------|-----------|
|                                            |      |           |                       |                                                         |                        |                                          | at 40 °C                      | at 100 °C |
| Ester oil                                  | A    | Polyurea  | 2                     | 265 to 295                                              | > 482 °F<br>[> 250 °C] | -40 °F to +356 °F<br>[-40 °C to +180 °C] | 100                           | 11        |
| Ester oil and perfluorinated polyether oil | B    | Polyurea  | 2                     | 240 to 270                                              | > 482 °F<br>[> 250 °C] | -40 °F to +392 °F<br>[-40 °C to +200 °C] | 160                           | 27        |

The re-lubrication and maintenance intervals apply to the grease type originally used by the manufacturer:

- Type A: Klüberquiet BQH 72-102, made by Klüber Lubrication München KG  
(⇒ Section 7.4.2.1, Page 62)
- Type B: Klübersynth BMQ 72-162, made by Klüber Lubrication München KG  
(⇒ Section 7.4.2.1, Page 62)

### 7.4.2.3 Grease quantity

**Table 21:** Grease quantity

| Pump size   | Grease type | Grease quantity |           |           |          |
|-------------|-------------|-----------------|-----------|-----------|----------|
|             |             | Drive end       |           | Pump end  |          |
| 700 - 470   | Type A      | 1.0 ounces      | 30 cm³    | 20 ounces | 600 cm³  |
| 800 - 540   | Type A      | 1.0 ounces      | 30 cm³    | 20 ounces | 600 cm³  |
| 900 - 540   | Type A      | 1.0 ounces      | 30 cm³    | 20 ounces | 600 cm³  |
| 1000 - 700  | Type A      | 1.0 ounces      | 30 cm³    | 27 ounces | 800 cm³  |
| 1200 - 870  | Type A      | 1.0/1.7 ounces  | 30/50 cm³ | 27 ounces | 800 cm³  |
| 1500 - 1060 | Type A      | 1.7 ounces      | 50 cm³    | 51 ounces | 1500 cm³ |
| 1600 - 1060 | Type B      | 1.7 ounces      | 50cm³     | 98 ounces | 2900 cm³ |

## 7.5 Dismantling the pump set

### 7.5.1 General information/Safety regulations

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <div> <b>DANGER</b></div> <p><b>Improper transport</b><br/>           Danger to life from falling parts!<br/>           Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Use the attachment point provided (eyebolt, lifting lug or bail) for attaching lifting accessories.</li> <li>▷ Never suspend the pump set by its power cable.</li> <li>▷ Never use the lifting ropes included in KSB's scope of supply for lifting loads other than the KSB product supplied.</li> <li>▷ Securely attach the lifting ropes to the pump and crane.</li> </ul> |
|    | <div> <b>DANGER</b></div> <p><b>Hazardous voltage</b><br/>           Danger to life from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Observe the safety rules for electrical work.</li> <li>▷ Disconnect the equipment from the power supply.</li> <li>▷ Secure the equipment against unintentional start-up.</li> <li>▷ Verify that the equipment is de-energized.</li> <li>▷ Ground and short-circuit the medium-voltage components.</li> <li>▷ Cover any adjacent components that are connected to the power supply.</li> </ul>                       |
|  | <div> <b>WARNING</b></div> <p><b>Unqualified personnel performing work on the pump (set)</b><br/>           Risk of personal injury!</p> <ul style="list-style-type: none"> <li>▷ Always have repair work and maintenance work performed by specially trained, qualified personnel.</li> </ul>                                                                                                                                                                                                                                                                        |
|  | <div> <b>WARNING</b></div> <p><b>Hot surface</b><br/>           Risk of personal injury!</p> <ul style="list-style-type: none"> <li>▷ Allow the pump set to cool down to ambient temperature.</li> </ul>                                                                                                                                                                                                                                                                                                                                                              |
|  | <div> <b>WARNING</b></div> <p><b>Improper lifting/moving of heavy assemblies or components</b><br/>           Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.</li> </ul>                                                                                                                                                                                                                                            |
|  | <div> <b>WARNING</b></div> <p><b>Excess pressure inside the pump set</b><br/>           Risk of personal injury when opening the pump set!</p> <ul style="list-style-type: none"> <li>▷ Be careful when opening the inner chambers. Balance the pressure.</li> </ul>                                                                                                                                                                                                                                                                                                  |

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>⚠ WARNING</b></p> <p><b>Components with sharp edges</b><br/>Risk of cutting or shearing injuries!</p> <ul style="list-style-type: none"> <li>▷ Always use appropriate caution for installation and dismantling work.</li> <li>▷ Wear work gloves.</li> </ul>                                                                               |
|  | <p><b>⚠ WARNING</b></p> <p><b>Pump set tilting or rolling off</b><br/>Risk of personal injury!</p> <ul style="list-style-type: none"> <li>▷ Make sure the pump set is secured against tilting during the entire dismantling process.</li> <li>▷ For dismantling the pump set in a horizontal position, secure it against rolling off.</li> </ul> |

Observe the general safety instructions and information.

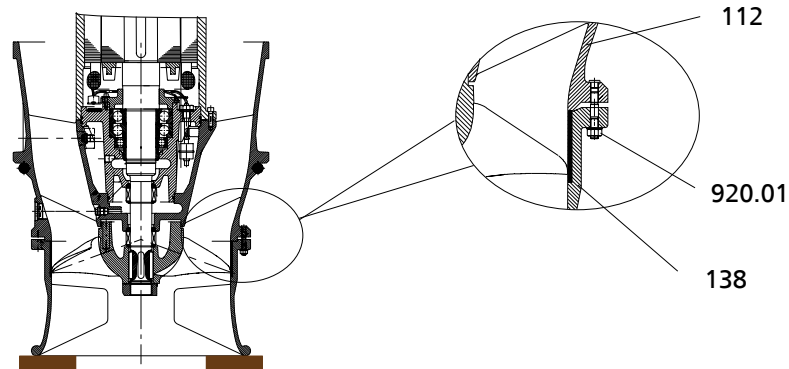
For dismantling and reassembly observe the general assembly drawing.

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. Remove the pump set from the discharge tube. (⇒ Section 7.3.1, Page 56)
3. Clean the pump set. (⇒ Section 7.3.2, Page 58)
4. Drain the lubricant. (⇒ Section 7.4.1.4, Page 61) (⇒ Section 7.4.1.4.1, Page 61)
5. Drain the leakage chamber and leave it open for the duration of the disassembly.

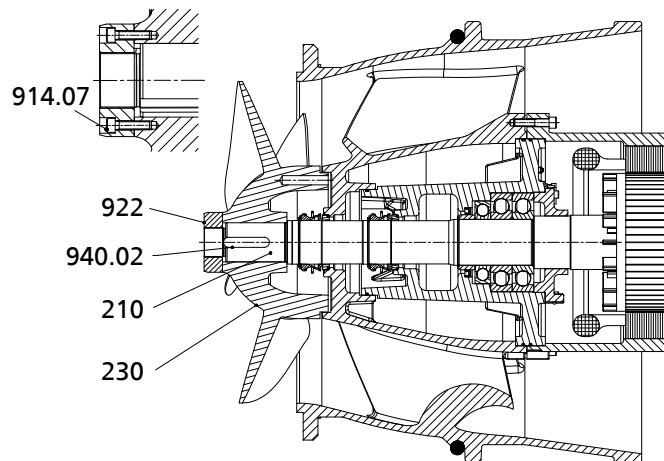
### 7.5.3 Removing the bellmouth



**Fig. 33: Removing the bellmouth**

- ✓ The pump set has been disconnected from the power supply and secured against unintentional start-up.
  - ✓ The pump set has been placed in a vertical position with the bellmouth on wooden supports. It has been secured against tipping over.
1. Undo nuts 920.01.
  2. Attach the crane hook to the bail and lift the pump set off bellmouth 138.
  3. Place the pump set down in a horizontal position on wooden supports. Secure it against rolling away.

### 7.5.4 Removing the impeller

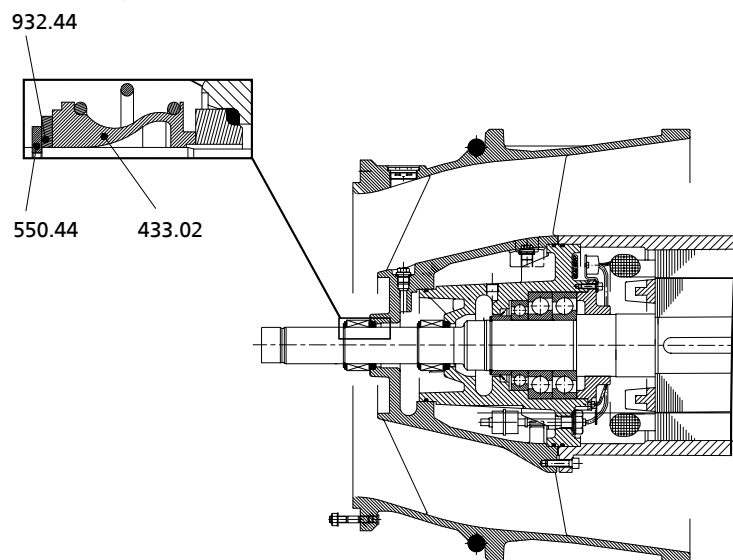


**Fig. 34: Removing the impeller**

- ✓ The pump set has been placed in a horizontal position on wooden supports. It has been secured against rolling off.
- ✓ The lubricant and any leakage have been drained.
- 1. Undo hexagon socket head cap screw 914.07 and impeller nut 922.
- 2. Pull impeller 230 off shaft 210.
- 3. Remove keys 940.02 from shaft 210.
- 4. Protect the shaft thread against damage.

### 7.5.5 Removing the mechanical seal

#### 7.5.5.1 Impeller-end mechanical seal - sizes 700-... to 1200-...



**Fig. 35: Removing the impeller-end mechanical seal**

- ✓ The pump set has been positioned horizontally on wooden supports. It has been secured in this position.
- ✓ The impeller has been removed.
- 1. Remove circlip 932.44 and disc 550.44.
- 2. Pull mechanical seal 433.02 off the shaft.



#### NOTE

To protect the mechanical seal against damage when pulling it off the shaft, placing a foil (no thicker than max. 0.01 inch [0.3 mm]) around the free shaft end is recommended.

#### 7.5.5.2 Impeller-end mechanical seal - sizes 1500-... to 1600-...

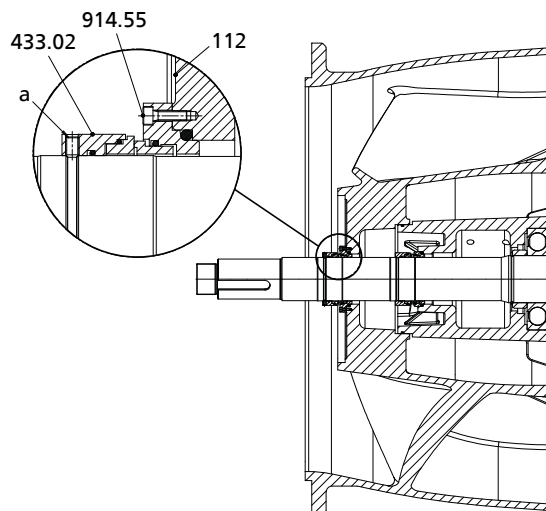


Fig. 36: Impeller-end mechanical seal

- ✓ The pump set has been placed in a horizontal position on wooden supports. It has been secured against rolling off.
  - ✓ The impeller has been removed.
1. Undo the grub screws (a) of mechanical seal 433.02. Pull the rotating assembly off the shaft.
  2. Undo hexagon socket head cap screw 914.55.
  3. Press the stationary seat of mechanical seal 433.02 out of pump bowl 112. Use the jacking threads in the stationary seat, which are either M6 or M8, depending on the size of mechanical seal.



#### NOTE

To protect the mechanical seal against damage when pulling it off the shaft, placing a foil (no thicker than max. 0.01 inch [0.3 mm]) around the free shaft end is recommended.

#### 7.5.5.3 Drive-end mechanical seal - sizes 700-... to 1200-...



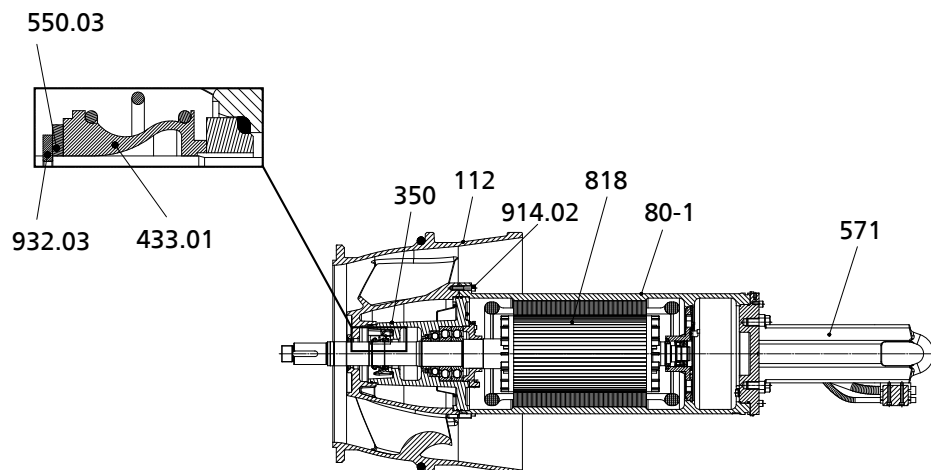
#### DANGER

**Improper lifting/moving/transporting of heavy assemblies or components**

Danger to life from falling parts!

Damage to the pump set!

- ▷ Never rotate the rotor in the motor housing during dismantling/reassembly.
- ▷ Place the motor (unit) including rotor and bearing housing on a wooden support and protect it against rolling off.

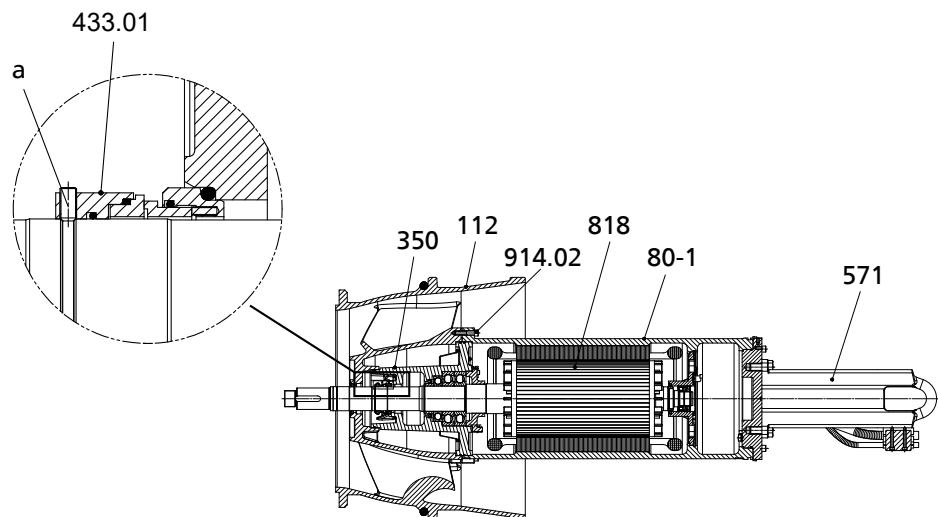


**Fig. 37: Removing the drive-end mechanical seal**

- ✓ The impeller-end mechanical seal has been removed.
  - ✓ The pump set has been placed in a horizontal position on wooden supports. It has been secured against rolling off.
1. Attach the pump set to the lifting equipment and pull it upright. Place the pump set, with pump bowl 112 down, on the bellmouth again.  
(⇒ Section 3.2.2, Page 12)
  2. Undo hexagon socket head cap screws 914.02.
  3. Attach the lifting tackle to bail 571 and lift the pump set out of pump bowl 112.
  4. Place motor unit 80-1 including rotor 818 with the bearing assembly and bearing housing 350 on a wooden support and protect it against rolling off.  
(⇒ Section 3.2.2, Page 12)
  5. Remove circlip 932.03 and disc 550.03.
  6. Carefully pull mechanical seal 433.01 and its mating ring off the shaft.

#### 7.5.5.4 Drive-end mechanical seal - sizes 1500-... to 1600-...

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <div style="background-color: #e67e22; color: white; padding: 5px; border: 1px solid black;">  <b>DANGER</b> </div> <p><b>Improper lifting/moving/transporting of heavy assemblies or components</b><br/>           Danger to life from falling parts!<br/>           Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Never rotate the rotor in the motor housing during dismantling/reassembly.</li> <li>▷ Place the motor (unit) including rotor and bearing housing on a wooden support and protect it against rolling off.</li> </ul> |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



**Fig. 38:** Drive-end mechanical seal

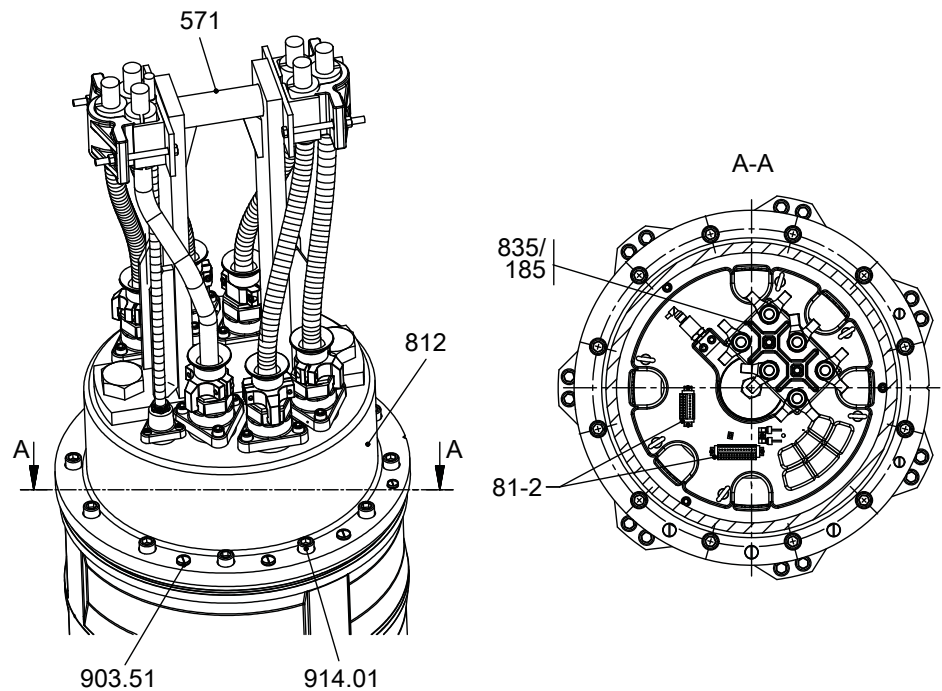
- ✓ The impeller-end mechanical seal has been removed.
  - ✓ The pump set has been placed in a horizontal position on wooden supports. It has been secured against rolling off.
1. Attach the pump set to the lifting equipment and pull it upright. Place the pump set, with pump bowl 112 down, on the bellmouth again.  
(⇒ Section 3.2.2, Page 12)
  2. Undo hexagon socket head cap screws 914.02.
  3. Attach the lifting tackle to bail 571 and lift the pump set out of pump bowl 112.
  4. Place motor unit 80-1 including rotor 818 with bearing and bearing housing 350 on a wooden support and protect it against rolling away.  
(⇒ Section 3.2.2, Page 12)
  5. Undo the grub screws (a).
  6. Carefully pull mechanical seal 433.01 and its mating ring off the shaft.
  7. If mechanical seal 433.01 has an integral seat lock, dismantle it as described.

#### 7.5.6 Dismantling the motor section

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <p><b>NOTE</b></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>                                                                                                                                                                                                                                                                                              |
|  | <p><b>NOTE</b></p> <p>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.</p> |

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

### 7.5.6.1 Removing the motor housing cover



**Fig. 39:** Removing the motor housing cover

- ✓ Suitable lifting equipment is on hand.
  - ✓ The pump set has been disconnected from the power supply. It has been securely placed on a level surface in a vertical position.
1. Attach lifting equipment to eyebolt 900.04 or bail 571.
  2. Undo hexagon socket head cap screws 914.01.
  3. Carefully lift off motor housing cover 812. If the motor housing cover cannot be lifted off, use the jacking threads located underneath caps 903.51.
  4. Remove the cable ties.
  5. Lift motor housing cover 812 up further until the power cables and control cable can be disconnected.
  6. Disconnect plug 81-2 of the control cable from the corresponding connector.
  7. Disconnect the power cable cores from terminal board 835 and terminal 185.
  8. Place motor housing cover 812 down and secure it against rolling off.

### 7.5.6.2 Dismantling the cable gland with connection cable

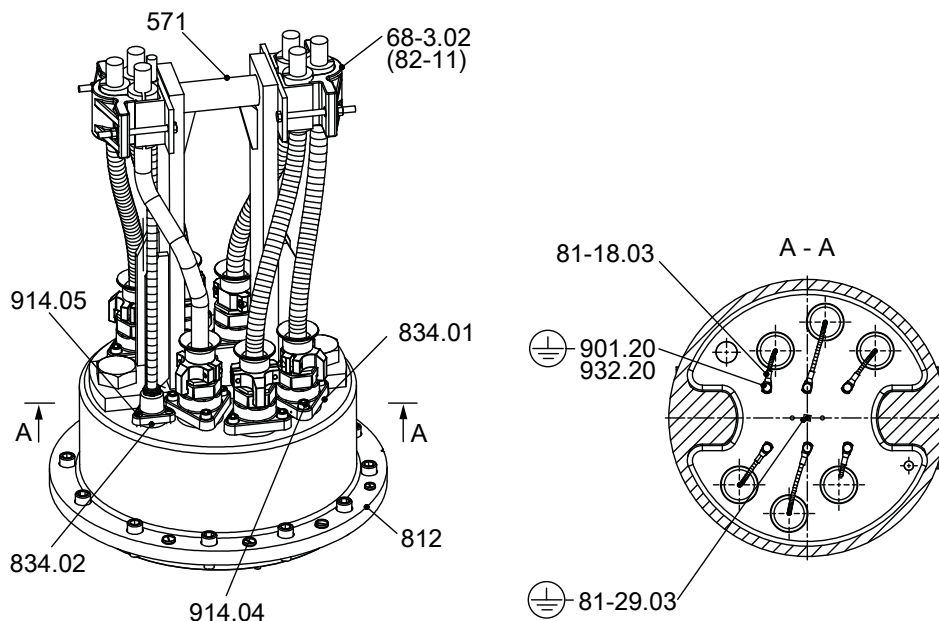


Fig. 40: Removing the cables and cable gland

#### Removing the power cable

✓ The motor housing cover has been removed, placed down and secured against rolling away.

1. Remove cover plate 82-11 or 68-3.02 from bail 571. Take out the cable gland 834.01/02 needing to be replaced.
2. Disconnect the ground conductor on the inside of motor housing cover 812. If a shielded cable is used, disconnect the shield as well.
3. Undo screws 914.04 of cable gland 834.01.
4. Pull cable gland 834.01 out of the centering seat in motor housing cover 812.

#### Removing the sensor cable

✓ The motor housing cover has been removed, placed down and secured against rolling away.

1. Disconnect the cores of the sensor cable from plug 81-2.
2. Undo screw 914.05 of cable gland 834.02.
3. Pull cable gland 834.02 out of the centering seat in motor housing cover 812.



#### 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



#### ⚠ DANGER

##### Wrong screws/bolts

Explosion hazard!

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

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p><b>! WARNING</b></p> <p><b>Improper lifting/moving of heavy assemblies or components</b><br/>Personal injury and damage to property!</p> <ul style="list-style-type: none"> <li>▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.</li> </ul>                                                                                                                                                                                                    |
|    | <p><b>! WARNING</b></p> <p><b>Components with sharp edges</b><br/>Risk of cutting or shearing injuries!</p> <ul style="list-style-type: none"> <li>▷ Always use appropriate caution for installation and dismantling work.</li> <li>▷ Wear work gloves.</li> </ul>                                                                                                                                                                                                                                              |
|    | <p><b>! WARNING</b></p> <p><b>Insufficient stability</b><br/>Risk of crushing hands and feet!</p> <ul style="list-style-type: none"> <li>▷ During assembly/dismantling, secure the pump (set)/pump parts against tilting or tipping over.</li> </ul>                                                                                                                                                                                                                                                            |
|   | <p><b>! WARNING</b></p> <p><b>Screwed/bolted connections working loose</b><br/>Risk of injury!</p> <ul style="list-style-type: none"> <li>▷ If persons come into contact with the fluid handled during pump operation (e.g. in sports facilities and leisure parks), apply a thread-locking agent (Loctite, type 243) to all screwed/bolted connections that are in contact with the fluid handled. Do not apply the thread-locking agent (Loctite, type 243) to the screw plugs.</li> </ul>                    |
|  | <p><b>CAUTION</b></p> <p><b>Improper reassembly</b><br/>Damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Reassemble the pump (set) in accordance with the general rules of sound engineering practice.</li> <li>▷ Use original spare parts only.</li> </ul>                                                                                                                                                                                                                                     |
|  | <p><b>NOTE</b></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 pump sets. Observe the flamepath positions specified in the Annex (Flamepaths on explosion-proof motors). Secure all screwed/bolted connections closing off the flameproof enclosure with a thread-locking agent (Loctite Type 243).</p> |
|  | <p><b>NOTE</b></p> <p>Apply liquid sealant to all screw plugs.<br/>Apply liquid sealant to all wetted clearances (e.g. Hylomar SQ 32M).</p>                                                                                                                                                                                                                                                                                                                                                                     |

**Sequence** Always re-assemble the pump (set) in accordance with the corresponding general assembly drawing and/or exploded view.

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

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

**Assembly adhesives** Avoid the use of assembly adhesives if possible.

**Tightening torques** For reassembly, tighten all screws and bolts as 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

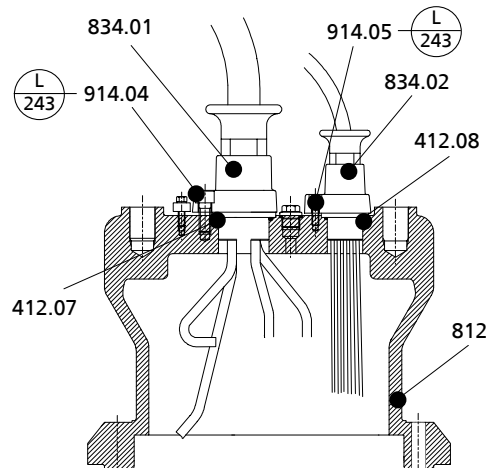


Fig. 41: Fitting the cable gland

Table 22: Key to the symbols

| Symbol | Key                                                                                 |
|--------|-------------------------------------------------------------------------------------|
|        | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> . |

#### Installing the power cable

- ✓ The motor housing cover has been removed, placed down and secured against rolling away.
- 1. Adjust the lengths of the cable cores to those of 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. Insert cable gland 834.01 with the power cable and O-ring 412.07 into the opening provided.
- 5. Fasten cable gland 834.01 with hexagon socket head cap screws 914.04. Secure the screwed connection with Loctite 243.
- 6. Fit cable terminals to the core ends of the power cable.

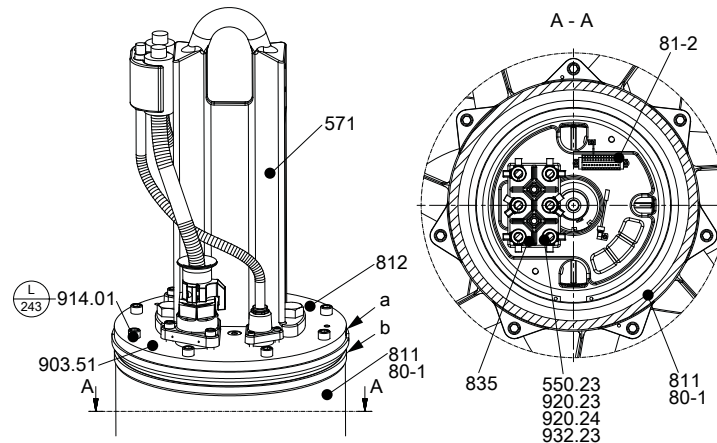
#### Installing the sensor cable

- ✓ The motor housing cover has been removed, placed down and secured against rolling away.
- 1. Adjust the lengths of the cable cores to those of the original cable gland.
- 2. Attach core identifications matching the original cable gland.
- 3. Slide O-ring 412.08 over the short core ends of the sensor cable and into the groove of the centering seat.
- 4. Insert cable gland 834.02 with the sensor cable and O-ring 412.08 into the opening provided.
- 5. Fasten cable gland 834.02 with hexagon socket head cap screws 914.05 and secure the screwed connection with Loctite 243.

### 7.6.3 Fitting the motor housing cover

#### 7.6.3.1 Fitting the motor housing cover - sizes 700 to 1500

|                                                                                   |                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  <b>DANGER</b>                                                                                                                                                                                                                                         |
|                                                                                   | <p><b>Electrical connection work by unqualified personnel</b></p> <p>Danger of death from electric shock!</p> <ul style="list-style-type: none"> <li>▷ Always have the electrical connections installed by a trained electrician.</li> <li>▷ Observe the EN 61557 regulations as well as any locally applicable regulations.</li> </ul> |



**Fig. 42:** Fitting the motor housing cover

|   |                                              |
|---|----------------------------------------------|
| a | Alignment grooves of motor housing cover 812 |
| b | Alignment groove of motor housing 811        |

**Table 23:** Key to the symbols

| Symbol                                                                              | Key                                                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> . |

- ✓ A new O-ring has been inserted into the groove of motor housing cover 812.
- 1. Attach lifting equipment to eyebolt 900.04 or bail 571 of motor housing cover 812. Lift up the motor housing cover and lower it down onto motor housing 811 or motor unit 80-1 until only a gap remains which allows work to continue. Align the alignment grooves in motor housing cover 812 and motor housing 811. The alignment grooves must be properly aligned.
- 2. Connect plug 81-2 of the control cable to the corresponding connector.
- 3. Connect the power cable cores to terminal board 835 with disc 550.23, circlip 932.23 and nuts 920.23/920.24 in accordance with the wiring diagram.
- 4. Tie the cores of the control cable and power cable together with cable ties.
- 5. Slowly lower motor housing cover 812 down onto motor housing 811. Align the alignment grooves in motor housing cover 812 and motor housing 811. The alignment grooves must be properly aligned.
- 6. Fasten motor housing cover 812 to motor housing 811 or motor unit 80-1 with socket head cap screws 914.01. Secure with Loctite 243. Observe the tightening torque!
- 7. Cover the jacking threads with caps 903.51.
- 8. Perform a leak test on the motor.

### 7.6.3.2 Fitting the motor housing cover - size 1600-...



**⚠ DANGER**

**Electrical connection work by unqualified personnel**

Danger of death from electric shock!

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

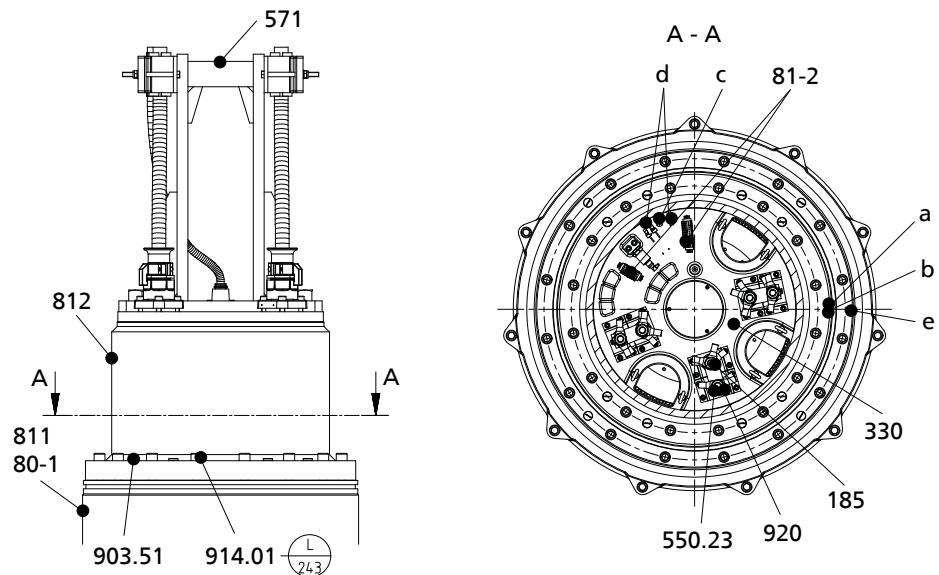


Fig. 43: Fitting the motor housing cover

|   |                                                            |
|---|------------------------------------------------------------|
| a | Alignment groove of motor housing cover 812                |
| b | Alignment groove of bearing bracket 330                    |
| c | Anti-rotation device of bearing bracket 330                |
| d | Recess for anti-rotation device in motor housing cover 812 |
| e | Alignment groove of motor housing 811, 80-1                |

Table 24: Key to the symbols

| Symbol                                                                              | Key                                                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> . |

✓ A new O-ring has been inserted into the groove of bearing bracket 330.

1. Attach lifting tackle to bail 571, lift up motor housing cover 812 and lower it down onto motor housing 811 or motor unit 80-1 until only a gap remains which allows work to continue. Make sure that the alignment grooves of motor housing 811 and bearing bracket 330 are correctly aligned. Only in this position will the anti-rotation device (c) of bearing bracket 330 engage in the corresponding recess (d) in motor housing cover 812.
2. Connect plug 81-2 of the control cable to the corresponding connector.
3. Connect the power cable cores to terminal 185 with disc 550.23 and nuts 920 in accordance with the wiring diagram.
4. Tie the cores of the control cable and power cable together with cable ties.
5. Slowly lower motor housing cover 812 down onto motor housing 811. Watch the alignment grooves in motor housing cover 812 and motor housing 811. The alignment grooves must be in alignment.

6. Fasten motor housing cover 812 to motor housing 811 / motor unit 80-1 with hexagon socket head cap screws 914.01 and secure the connection with Loctite 243. Observe the tightening torques.
7. Cover the jacking threads with caps 903.51.
8. Perform a leak test on the motor.

#### 7.6.4 Installing the mechanical seal

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

- Only remove the protective wrapping of the seal 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 seal faces with a drop of oil.
- For easier installation of a bellows-type mechanical seal, wet the inner bellows diameter and/or the O-rings with soapy water (not oil).
- Cover any grooves in the shaft into which the O-rings could slide with suitable means or tools.
- 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] around the free shaft stub. Slide the rotating assembly over the foil into its installation position. Then remove the foil.

##### 7.6.4.1 Drive-end mechanical seal - sizes 700-... to 1200-...

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>⚠ DANGER</b>                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                     | <p><b>Improper lifting/moving/transporting of heavy assemblies or components</b><br/>         Danger to life from falling parts!<br/>         Damage to the pump set!</p> <ul style="list-style-type: none"> <li>▷ Never rotate the rotor in the motor housing during dismantling/reassembly.</li> <li>▷ Place the motor (unit) including rotor and bearing housing on a wooden support and protect it against rolling off.</li> </ul> |

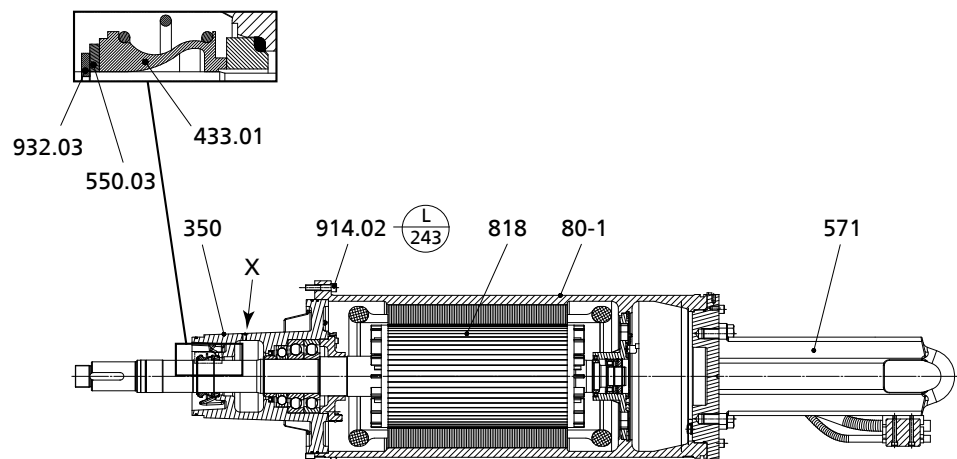


Fig. 44: Installing the drive-end mechanical seal

|   |                                 |
|---|---------------------------------|
| X | Drilled hole for testing device |
|---|---------------------------------|

**Table 25:** Key to the symbols

| Symbol                                                                            | Key                                                                                 |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> . |

- ✓ The pump set has been positioned horizontally on suitable wooden supports and is secured against rolling off.
- 1. Use an assembling sleeve of a suitable diameter to insert the mating ring of mechanical seal 433.01 together with the O-ring into the drilled seat of bearing housing 350.
- 2. Carefully guide on the bellows part of mechanical seal 433.01 until it rests against the mating ring.
- 3. Slide disc 550.03 and circlip 932.03 onto the shaft. Press the circlip in with an assembling sleeve until it is axially fastened in the shaft groove.
- 4. Screw the testing device into the leakage drain hole (X) of bearing housing 350 and perform a leak test.
- 5. Attach the eye hook to the bail and pull upright motor unit 80-1 including rotor 818 with bearing and bearing housing 350. (⇒ Section 3.2.2, Page 12)
- 6. Place the pump set on the pump bowl and bellmouth. Fasten it with hexagon socket head cap screws 914.02. Secure the screwed connection with a thread-locking agent (Loctite 243).

#### 7.6.4.1.1 Leak test during installation of the mechanical seal

Observe the following values for leak testing:

- **Test medium:** compressed air
- **Test pressure:** maximum 14.5 psi [1 bar]
- **Test period:** 5 minutes
- 1. The pressure must not drop during the test period.  
If the pressure does drop, check the seals and screwed connections.  
Then perform another leak test.
- 2. If the test has been successful, remove the testing device. Do not close the leakage drain hole as this will allow drainage of any water ingress.

#### 7.6.4.2 Drive-end mechanical seal - sizes 1500-... to 1600-...

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  <b>DANGER</b>                                                                                                                                                                                                                                                                                                           |
|                                                                                     | <b>Improper lifting/moving/transporting of heavy assemblies or components</b><br>Danger to life from falling parts!<br>Damage to the pump set! <ul style="list-style-type: none"> <li>▷ Never rotate the rotor in the motor housing during dismantling/reassembly.</li> <li>▷ Place the motor (unit) including rotor and bearing housing on a wooden support and protect it against rolling off.</li> </ul> |

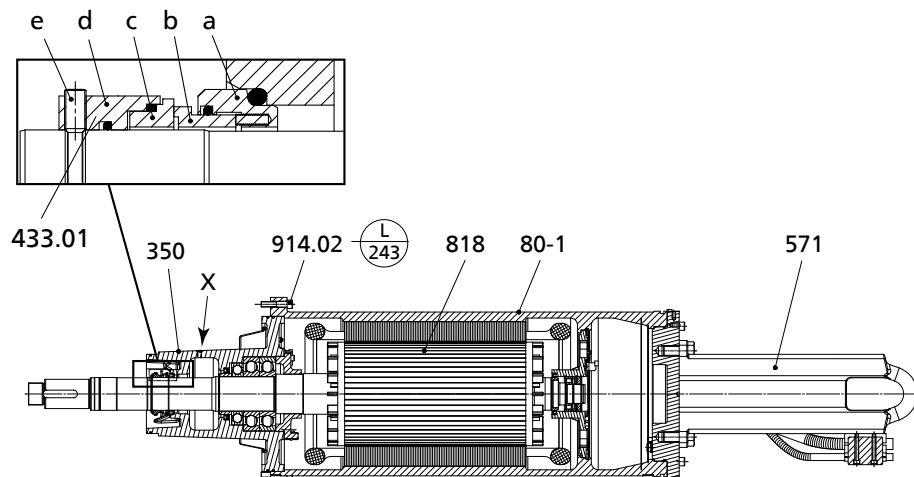


Fig. 45: Installing the drive-end mechanical seal

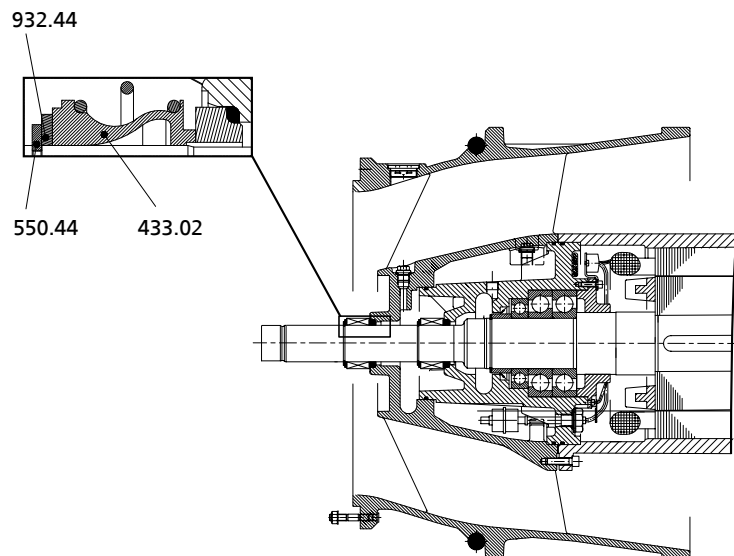
|   |                                 |
|---|---------------------------------|
| X | Drilled hole for testing device |
|---|---------------------------------|

Table 26: Key to the symbols

| Symbol | Key                                                                                 |
|--------|-------------------------------------------------------------------------------------|
|        | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> . |

- ✓ The pump set has been positioned horizontally on suitable wooden supports and is secured against rolling away.
- 1. Press the supporting ring (a) and primary ring (b) of mechanical seal 433.01 together with an O-ring into the drilled seat of bearing housing 350.
- 2. Carefully slide on mating ring (c) and torque-transmitting element (d) until they abut primary ring (b).
- 3. Press the mechanical seal in with an assembling sleeve until the grub screws (e) can be tightened in the undercut of the shaft. Apply a thread-locking agent (Loctite 243) to the grub screws (e).
- 4. For mechanical seals with a stationary seat lock, bolt the stationary assembly (supporting ring (a) and primary ring (b)) to bearing housing 350. Secure the screwed connection with a thread-locking agent (Loctite 243).
- 5. Screw the testing device into the leakage drain hole (X) of bearing housing 350 and perform a leak test.
- 6. Attach lifting equipment to bail 571 and pull upright motor unit 80-1 including rotor 818 with bearing and bearing housing 350. (⇒ Section 3.2.2, Page 12)
- 7. Place the pump set down on the pump bowl and bellmouth. Fasten it with hexagon socket head cap screws 914.02 and secure the screwed connection with a thread-locking agent (Loctite 243).

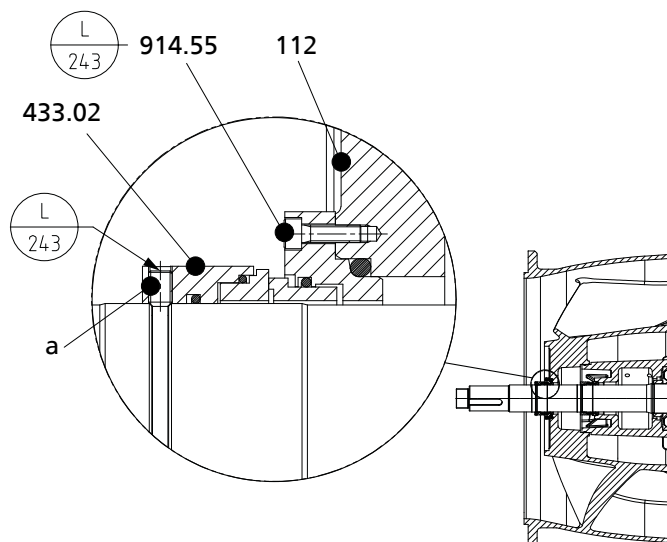
### 7.6.4.3 Impeller-end mechanical seal - sizes 700-... to 1200-...



**Fig. 46:** Installing the impeller-end mechanical seal

- ✓ The pump bowl has been fastened to the motor.
  - ✓ The pump set has been positioned horizontally on a wooden support. It has been secured against rolling off.
1. Use an assembly sleeve of a suitable diameter to press the mating ring of mechanical seal 433.02 together with the O-ring into the drilled recess in the pump bowl.
  2. Carefully guide on the bellows part of the mechanical seal until it rests against the mating ring.
  3. Slide disc 550.44 and circlip 932.44 onto the shaft. Press the circlip in with an assembly sleeve until the circlip is axially fastened in the shaft groove.
  4. Check the lubricant chamber for leakage. (⇒ Section 7.6.7.1, Page 83)
  5. Fill the lubricant chamber with lubricant. Then close the lubricant chamber.

### 7.6.4.4 Impeller-end mechanical seal - sizes 1500-... to 1600-...



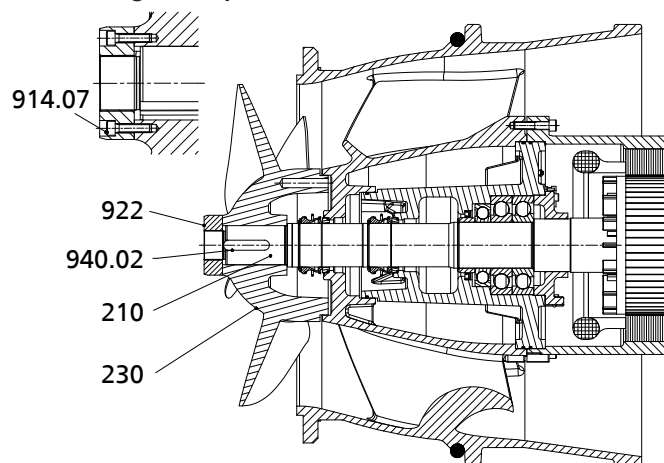
**Fig. 47:** Impeller-end mechanical seal

**Table 27:** Key to the symbols

| Symbol                                                                            | Key                                                                                 |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> . |

- ✓ The pump bowl has been fastened to the motor.
- ✓ The pump set has been positioned horizontally on a wooden support. It has been secured against rolling away.
- 1. Screw the stationary assembly of mechanical seal 433.02 to pump bowl 112 with hexagon socket head cap screw 914.55. Secure hexagon socket head cap screw 914.55 with a thread-locking agent (Loctite 243).
- 2. Slide the rotating assembly of mechanical seal 433.02 onto the shaft.
- 3. Press the mechanical seal in with an assembling sleeve until the grub screws (a) can be tightened in the undercut of the shaft. Apply a thread-locking agent (Loctite 243) to the grub screws (a).
- 4. Check the lubricant chamber for leakage. (⇒ Section 7.6.7.1, Page 83)
- 5. Fill the lubricant chamber with lubricant. Then close the lubricant chamber.

### 7.6.5 Fitting the impeller

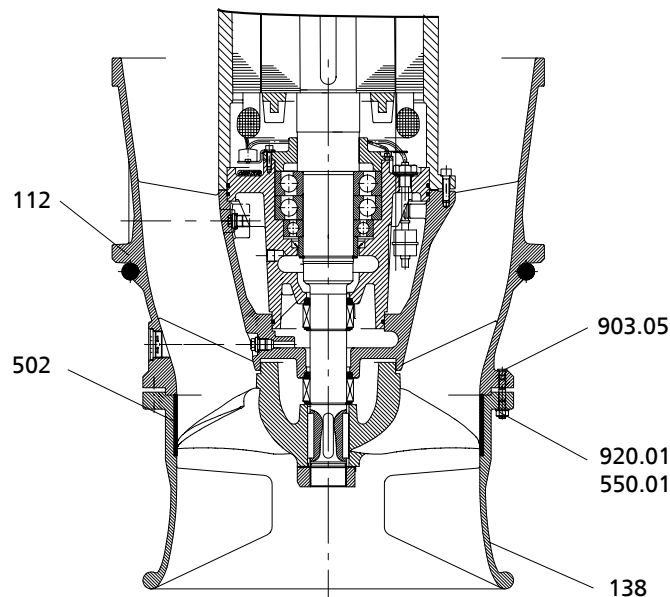


**Fig. 48:** Fitting the impeller

- ✓ The pump set has been positioned horizontally on a wooden support. It has been secured against rolling off.
- ✓ The impeller-end mechanical seal 433.02 has been installed.
- 1. Insert/fit two keys 940.02 into the keyway.
- 2. Coat all sides of the shaft seat and shaft thread with an assembly paste which prevents seizure of the chrome steel parts.
- 3. Guide impeller 230 onto shaft 210 until it abuts against the shaft collar.
- 4. Screw impeller nut 922 onto the shaft thread until impeller nut 922 and shaft 210 are flush.
- 5. Align the holes of impeller 230 and impeller nut 922. Insert and tighten hexagon socket head cap screw 914.07.

## 7.6.6 Fitting the bellmouth

### 7.6.6.1 Fitting the bellmouth for pressure class A



**Fig. 49:** Impeller of pressure class A

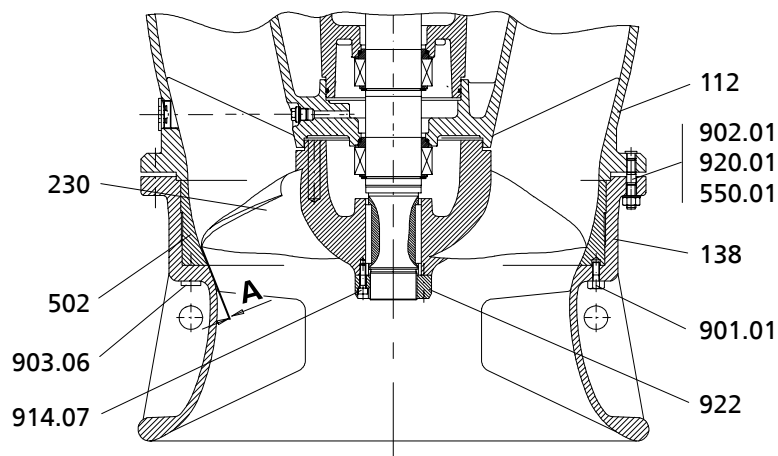
- ✓ Bellmouth 138 has been positioned on wooden supports on a level and solid surface.
  - ✓ Suitable lifting equipment is available.
  - ✓ The pump set has been completely pre-assembled.
  - ✓ A new casing wear ring 502 has been fitted in bellmouth 138.
1. Attach the lifting tackle to bail 571 and carefully pull the pump set upright.
  2. Center the pump set above bellmouth 138.  
**Note:** Make sure that the pin of bail 571 for attaching the lifting tackle and the baffles in bellmouth 138 are aligned in the same direction.
  3. Slowly lower the pump set. While lowering the pump set, make sure that studs 902.01 are aligned with the drilled holes.
  4. Then lower the pump set until it sits on bellmouth 138.
  5. Fasten all studs 902.01 with corresponding nuts 920.01 and discs 550.01. Observe the tightening torques. (⇒ Section 7.8, Page 85)
  6. Close the threaded holes with screw plugs 903.05.

**Table 28:** Diameter of the casing wear ring

| Size        | Nominal diameter |            |
|-------------|------------------|------------|
|             | [inch]           | [mm]       |
| 700 - 470   | 18,504 + 0,004   | 470 + 0,1  |
| 800 - 540   | 21,256 + 0,008   | 540 + 0,2  |
| 900 - 540   | 21,256 + 0,008   | 540 + 0,2  |
| 1000 - 700  | 27,559 + 0,012   | 700 + 0,3  |
| 1200 - 870  | 34,252 + 0,012   | 870 + 0,3  |
| 1500 - 1060 | 41,732 + 0,012   | 1060 + 0,3 |
| 1600 - 1060 | 41,732 + 0,012   | 1060 + 0,3 |

### 7.6.6.2 Fitting the bellmouth for pressure class B

On impellers of pressure class B, the outer contour of the vanes and the inner contour of the casing wear ring are spherical. For this pressure class the clearance is axially adjusted with the impeller nut.



**Fig. 50:** Impeller of pressure class B

- ✓ Bellmouth 138 has been positioned on wooden supports on a level and solid surface.
  - ✓ Suitable lifting equipment is provided.
  - ✓ The pump set has been completely pre-assembled.
  - ✓ A new casing wear ring 502 has been fitted in bellmouth 138.
1. Attach the lifting tackle to bail 571 and carefully pull the pump set upright.
  2. Center the pump set above bellmouth 138.  
Make sure that the pin of bail 571 for attaching the lifting tackle and the baffles in bellmouth 138 are aligned in the same direction.
  3. Slowly lower the pump set. While lowering the pump set, make sure that studs 920.01 are aligned with the drilled holes.
  4. Then lower the pump set until it sits on bellmouth 138.
  5. Fasten all studs 902.01 with corresponding nuts 920.01 and discs 550.01.  
Observe the tightening torque!
  6. Close the threaded holes with screw plugs 903.05.
  7. Loosen the impeller nut to adjust clearance "A" between impeller 230 and casing wear ring 502.
  8. Use a sensor to check that the required clearance "A" is met, see the following table.
  9. Align the holes of impeller 230 and impeller nut 922 and fasten them with hexagon socket head cap screw 914.07.

**Table 29:** Clearance "A"

| Pump size   | Standard dimension A |      | Increased clearance A <sup>8)</sup> |      |
|-------------|----------------------|------|-------------------------------------|------|
|             | [inch]               | [mm] | [inch]                              | [mm] |
| 700 - 470   | 0.0157               | 0,4  | 0.0472                              | 1,2  |
| 800 - 540   | 0.0197               | 0,5  | 0.0512                              | 1,3  |
| 900 - 540   | 0.0197               | 0,5  | 0.0512                              | 1,3  |
| 1000 - 700  | 0.0276               | 0,7  | 0.0669                              | 1,7  |
| 1200 - 870  | 0.0354               | 0,9  | 0.0787                              | 2,0  |
| 1500 - 1060 | 0.0433               | 1,1  | 0.0787                              | 2,0  |
| 1600 - 1060 | 0.0433               | 1,1  | 0.0787                              | 2,0  |

<sup>8</sup> For activated sludge or fluids containing long fibers

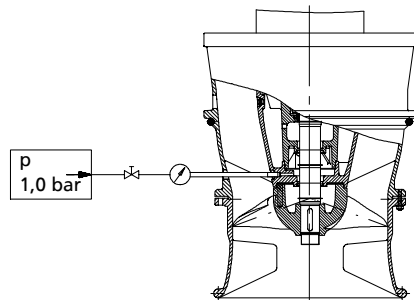
### 7.6.7 Leak testing

#### 7.6.7.1 Checking the lubricant chamber for leakage

After reassembly the mechanical seal area/lubricant chamber must be tested for leakage. The lubricant filler opening is used for leak testing.

Observe the following values for leak testing:

- **Test medium:** compressed air
- **Test pressure:** maximum 14.5 psi [1 bar]
- **Test period:** 5 minutes



**Fig. 51:** Screwing in the testing device

1. Remove screw plug 903.04 and joint ring 411.04 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 sealing elements and screwed connections.  
Repeat the leak test.
4. If the leak test has been successful, fill in the lubricant.  
(⇒ Section 7.4.1.4.2, Page 62)

#### 7.6.7.2 Checking the motor for leakage

Observe the following values for leak testing:

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

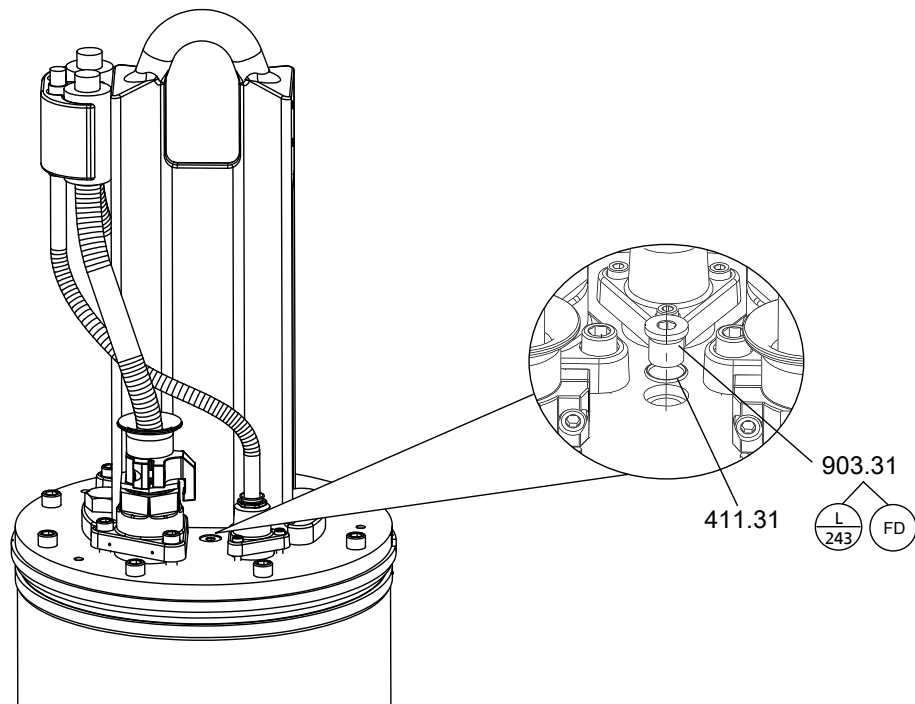


Fig. 52: Leak testing the motor

Table 30: Key to the symbols

| Symbol | Key                                                                                                    |
|--------|--------------------------------------------------------------------------------------------------------|
|        | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> .                    |
|        | Always apply a <b>liquid sealant</b> (e.g. Hylomar SQ32M) to sealing surfaces marked with this symbol. |

1. Undo and remove screw plug 903.31 and joint ring 411.31.
2. Screw the testing device tightly into the G 1/2 plug thread.
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 sealing elements and screwed connections.
4. Repeat the leak test if required.
5. Remove the testing device.

|  |  |                                                                                                                                                                                                                                                                        |
|--|--|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | <b>DANGER</b>                                                                                                                                                                                                                                                          |
|  |  | <b>Screw plug leaking or missing</b><br>Explosion hazard!<br>Damage to the motor! <ul style="list-style-type: none"> <li>▸ Never start up a pump set without screw plug 903.31.</li> <li>▸ Apply a thread-locking agent (Loctite 243) to screw plug 903.31.</li> </ul> |

6. Apply a thread-locking agent (Loctite 243) to screw plug 903.31.
7. Re-insert and tighten screw plug 903.31 with new joint ring 411.31.

### 7.7 Checking the connection of power supply and motor

Once reassembly has been completed, carry out the steps described in (⇒ Section 7.2.1, Page 55) and (⇒ Section 7.3.4, Page 58) .

## 7.8 Tightening torques

**Table 31:** 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     |             | $R_{p0,2} \geq 530 \text{ N/mm}^2$ |             | $R_{p0,2} \geq 450 \text{ N/mm}^2$ |             |
| 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 32:** 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     |             | $R_{p0,2} \geq 530 \text{ N/mm}^2$ |             | $R_{p0,2} \geq 450 \text{ N/mm}^2$ |             |
| 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
- 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 33:** Quantity of spare parts for recommended spare parts stock

| Part No.        | Description                               | Number of pumps (including stand-by pumps) |   |   |   |   |    |             |
|-----------------|-------------------------------------------|--------------------------------------------|---|---|---|---|----|-------------|
|                 |                                           | 2                                          | 3 | 4 | 5 | 6 | 8  | 10 and more |
| 230             | Impeller                                  | 1                                          | 1 | 1 | 2 | 2 | 3  | 30 %        |
| 320 / 321       | Rolling element bearing, pump end         | 1                                          | 1 | 2 | 2 | 3 | 4  | 50 %        |
| 322             | Rolling element bearing, drive end        | 1                                          | 1 | 2 | 2 | 3 | 4  | 50 %        |
| 412.05 / 412.60 | O-ring, for discharge tube cover          | 2                                          | 3 | 4 | 5 | 6 | 8  | 100 %       |
| 433.01          | Mechanical seal, drive end                | 2                                          | 3 | 4 | 5 | 6 | 7  | 90 %        |
| 433.02          | Mechanical seal, pump end                 | 2                                          | 3 | 4 | 5 | 6 | 7  | 90 %        |
| 502             | Casing wear ring                          | 2                                          | 2 | 2 | 3 | 3 | 4  | 50 %        |
| 80-1            | Motor unit                                | -                                          | - | - | - | 1 | 2  | 30 %        |
| 818             | Rotor                                     | -                                          | - | - | - | 1 | 2  | 30 %        |
| 834             | Cable gland                               | 1                                          | 1 | 2 | 2 | 2 | 3  | 40 %        |
| 99-9            | Set of sealing elements, motor            | 4                                          | 6 | 8 | 8 | 9 | 10 | 100 %       |
| 99-9            | Set of sealing elements, hydraulic system | 4                                          | 6 | 8 | 8 | 9 | 10 | 100 %       |

## 8 Trouble-shooting

|                                                                                   |                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  <b>WARNING</b>                                                                                                                                                                |
|                                                                                   | <b>Improper remedial work</b><br>Risk of personal injury!<br><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 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 34:** Trouble-shooting

| A | B | C | D | E | Possible cause                                                                                                                                                 | Remedy <sup>9)</sup>                                                                                |
|---|---|---|---|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| - | X | - | - | X | Water level dropping excessively during operation                                                                                                              | Check supply and capacity of system (sump floor area).<br>Check level control equipment.            |
| X | X | - | - | X | Total pressure corresponding to $NPSH_{\text{Pump}}$ too high<br>Total pressure corresponding to $NPSH_{\text{System}}$ too low                                | Increase fluid level on the suction side.<br>Clean screening equipment, if required.                |
| X | X | X | - | X | Penetration of air into the pump due to formation of an air pocket<br>- 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<br>- 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.<br>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.                            |

<sup>9)</sup> 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 <sup>9)</sup>                                                     |
|---|---|---|---|---|------------------------------------------|--------------------------------------------------------------------------|
| X | - | - | - | - | Mechanical seal monitor has tripped.     | Have cause determined and eliminated by qualified and trained personnel. |
| X | - | - | - | - | Bearing temperature monitor has tripped. | Have cause determined and eliminated by qualified and trained personnel. |

## 9 Related Documents

### 9.1 General assembly drawing

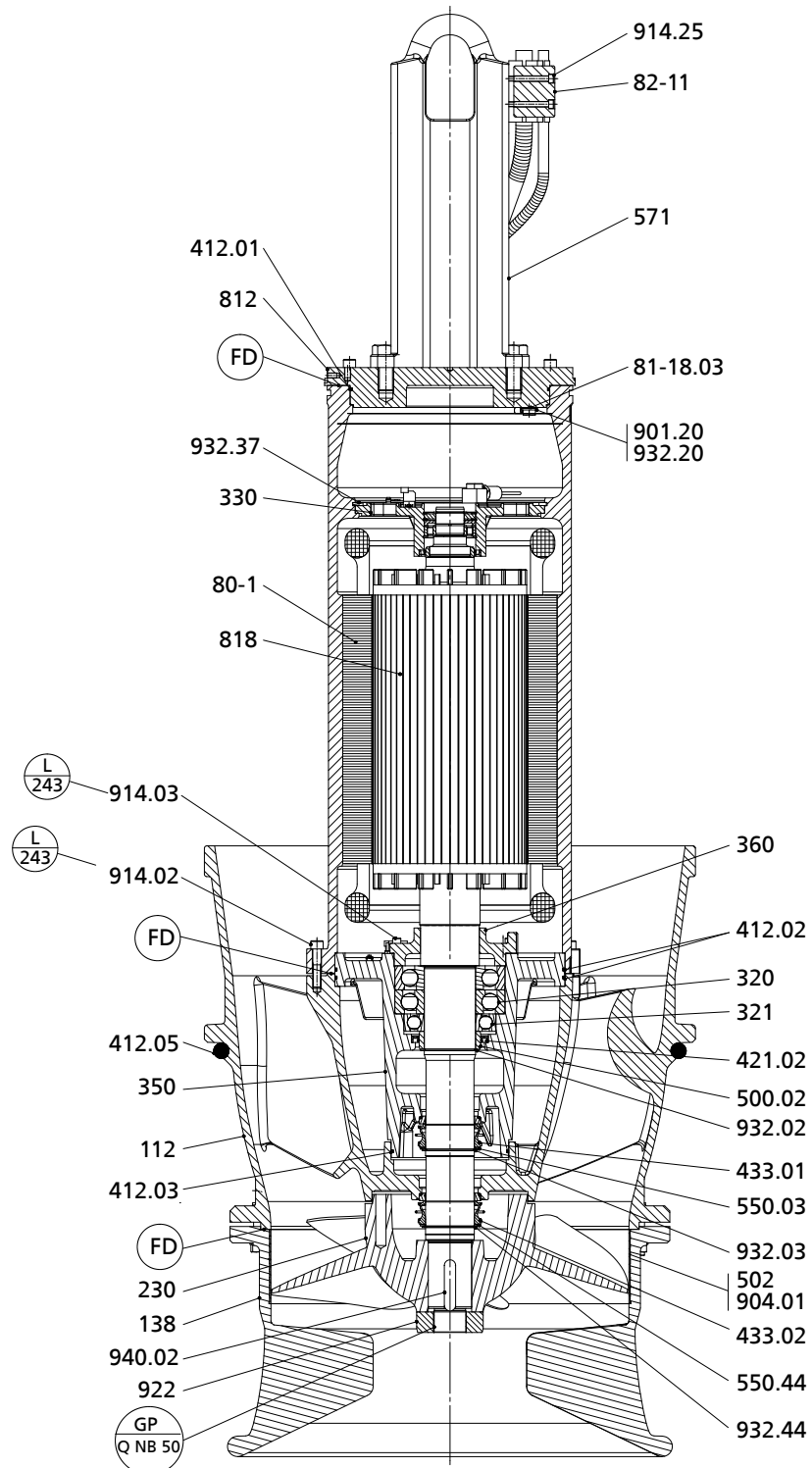
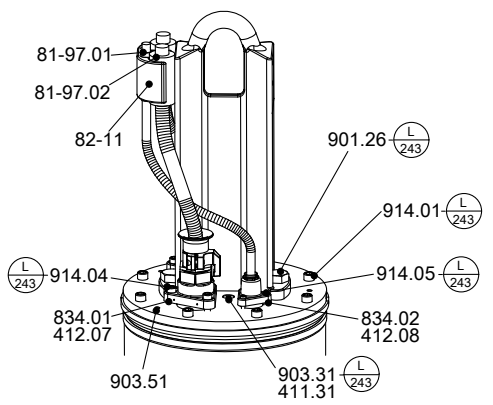
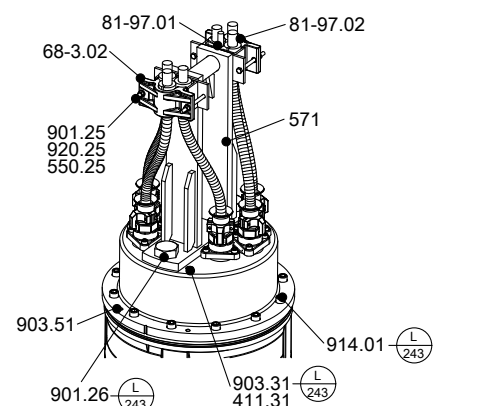
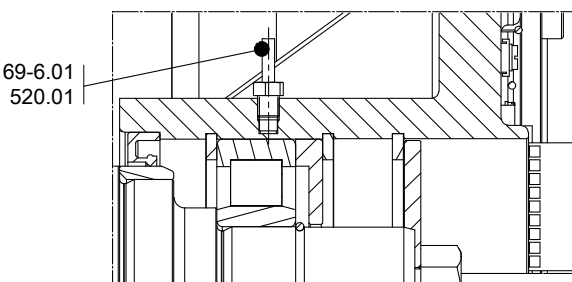
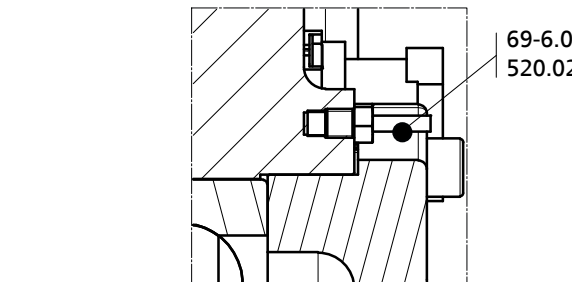


Fig. 53: General assembly drawing

**Table 35:** Detailed views of the general assembly drawing

|                                             |                                                                                    |                                                                                      |
|---------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Connection of cable gland and holder</b> | <b>Motor sizes:</b><br>80 6 ... 120 6<br>30 8 ... 160 8<br>40 10 ... 120 10        |    |
|                                             | <b>Motor sizes:</b><br>155 10 ... 250 10<br>130 12 ... 410 12<br>340 14 ... 550 14 |   |
| <b>Bearing temperature sensor</b>           | <b>Drive end</b>                                                                   |  |
|                                             | <b>Pump end</b>                                                                    |  |

**Table 36:** Detailed views of the general assembly drawing

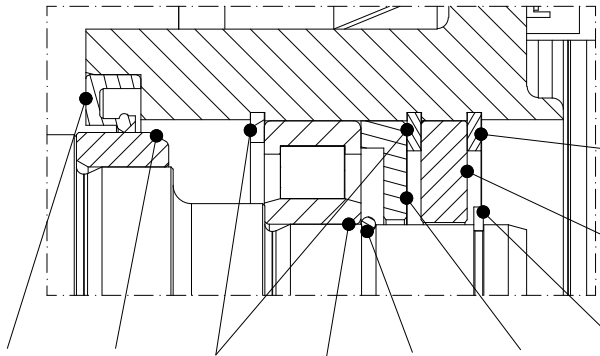
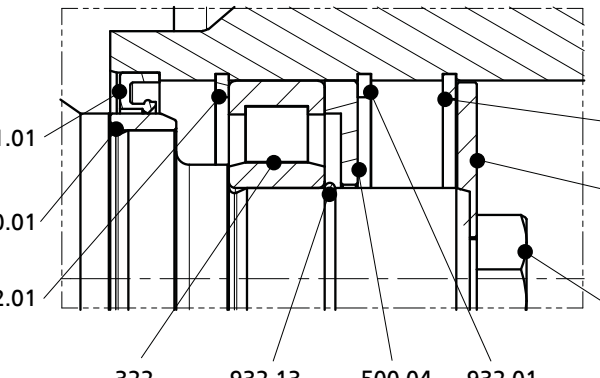
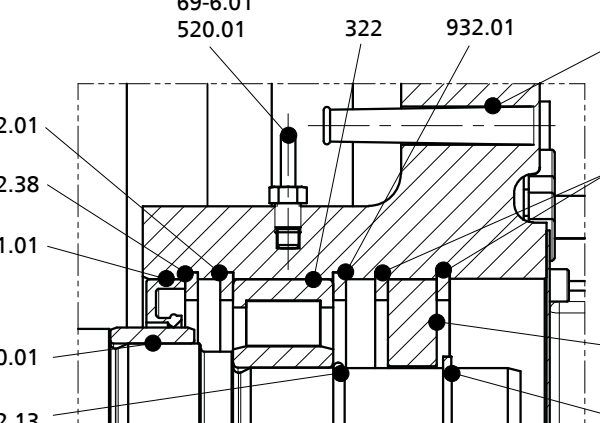
|                                   |                                                                                                  |                                                                                      |
|-----------------------------------|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>Drive-end bearing assembly</b> | <b>Motor sizes:</b><br>80 6 ... 120 6<br>30 8 ... 160 8<br>40 10 ... 250 10<br>130 12 ... 190 12 |    |
|                                   | <b>Motor sizes:</b><br>251 12 ... 410 12<br>340 14                                               |   |
|                                   | <b>Motor sizes:</b><br>370 14 ... 550 14                                                         |  |

Table 37: Detailed views of the general assembly drawing

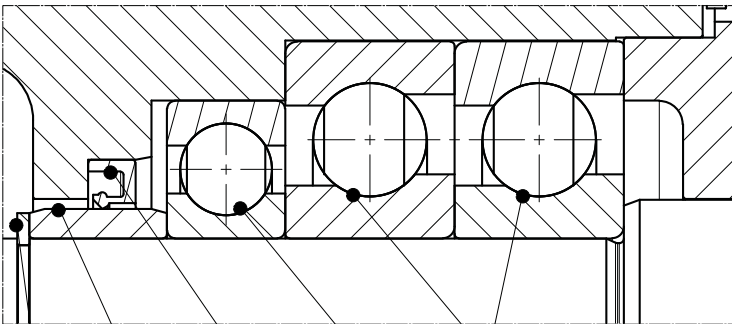
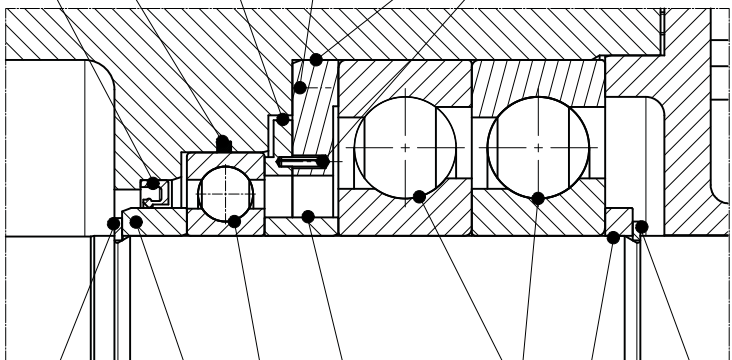
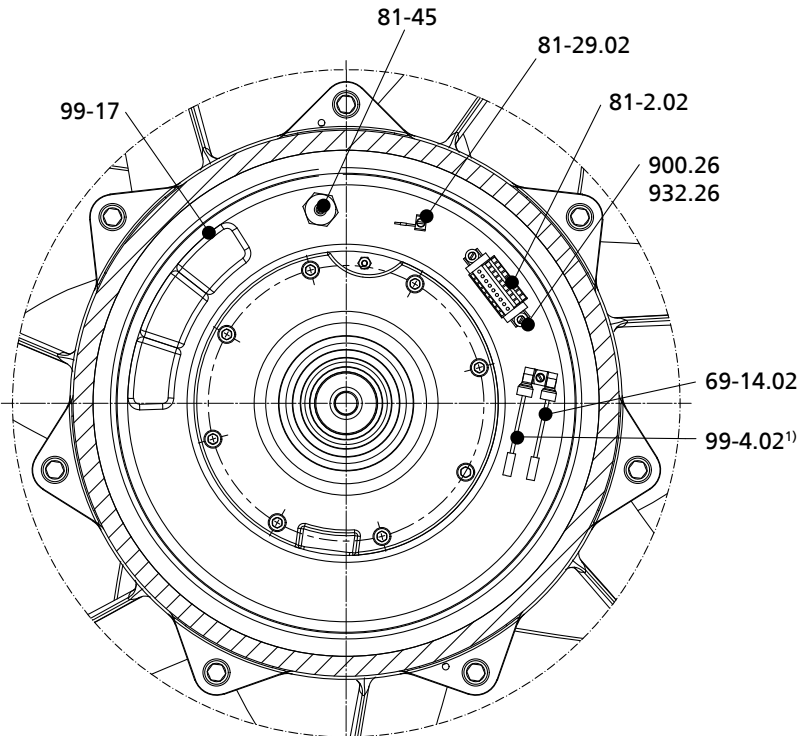
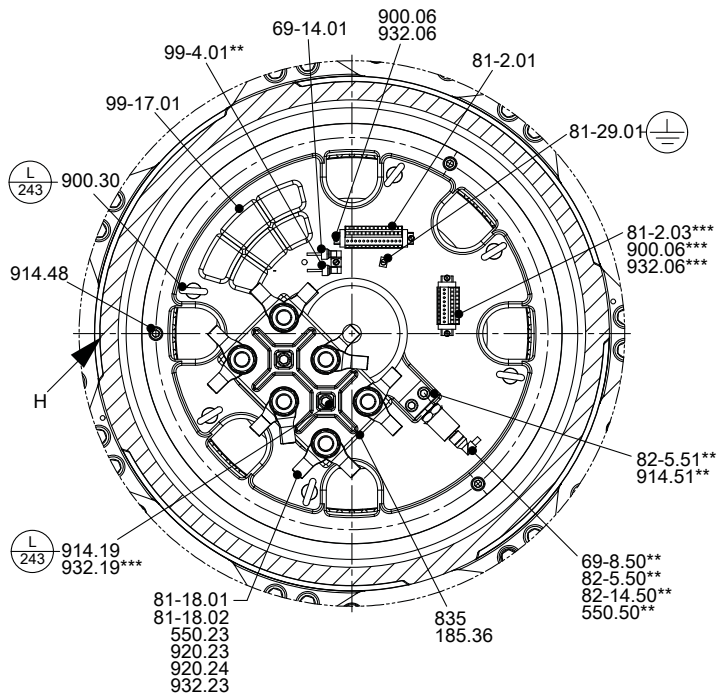
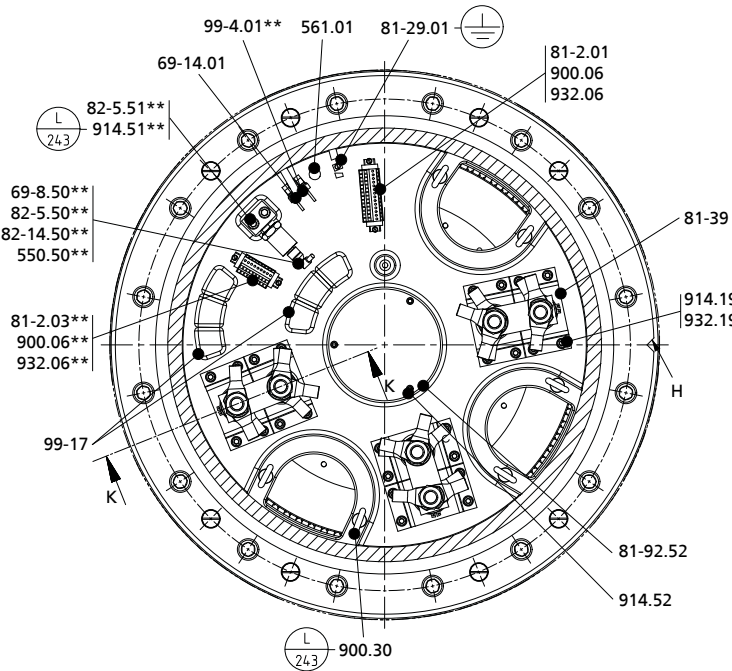
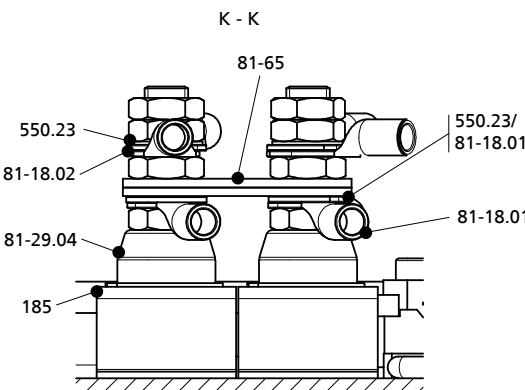
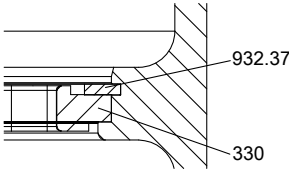
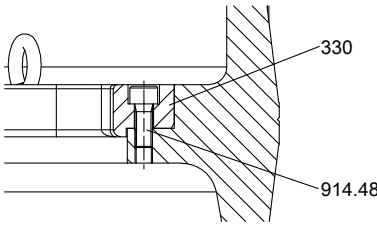
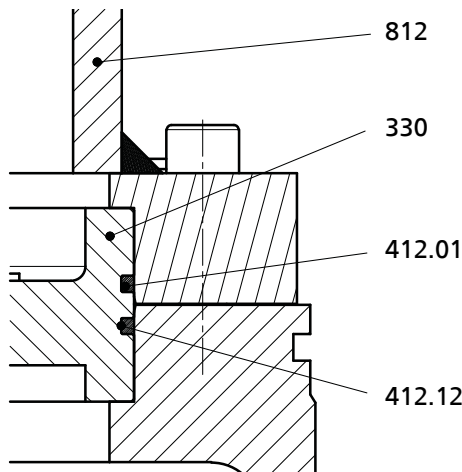
|                                  |                                                                                                                                                                                                                                          |                                                                                                                                                                                      |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Pump-end bearing assembly</b> | <b>Motor sizes:</b><br>80 6 ... 120 6<br>30 8 ... 160 8<br>40 10 ... 250 10<br>130 12 ... 410 12<br>340 14                                                                                                                               |  <p>932.02 500.02 421.02 321 320</p>                                                               |
|                                  | <b>Motor sizes:</b><br>370 14 ... 550 14                                                                                                                                                                                                 |  <p>421.02 412.57 484.02 950.02 483.02 561.02<br/>932.02 512.02 321 504.02 320 50-3.12 932.12</p> |
| <b>Sensors, bearing housing</b>  |  <p>81-45 81-29.02 81-2.02 99-17 900.26 932.26 69-14.02 99-4.02<sup>1)</sup></p> <p><sup>1)</sup> Only for version with vibration sensor 69-8.50</p> |                                                                                                                                                                                      |

Table 38: Detailed views of the general assembly drawing

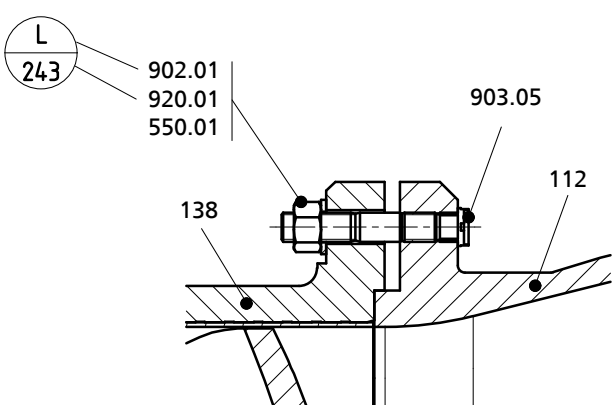
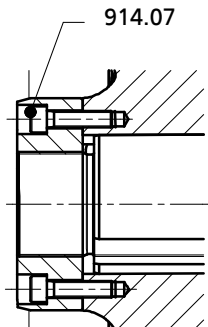
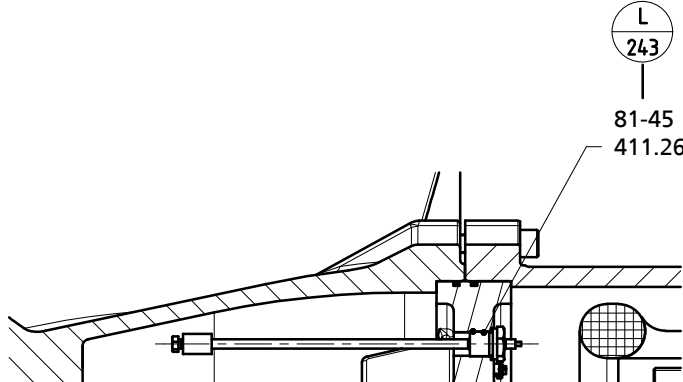
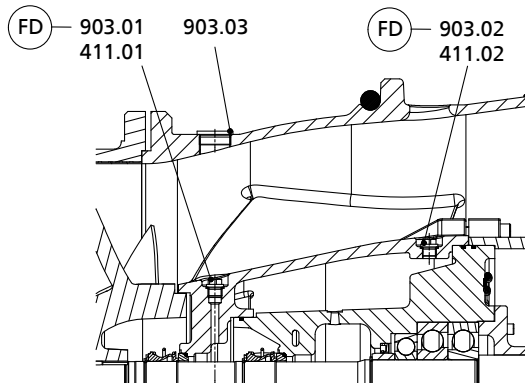
|                                               |                                                                                                            |                                                                                                                                                                                                                          |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sensors/terminals,<br/>bearing bracket</b> | <b>Motor sizes:</b><br>80 6 ... 120 6<br>30 8 ... 160 8<br>40 10 ... 250 10<br>130 12 ... 410 12<br>340 14 |  <p><b>** Only for version with vibration sensor 69-8.50</b><br/><b>*** On specific sizes only</b><br/><b>H = alignment groove</b></p> |
|                                               | <b>Motor sizes:</b><br>370 14 ... 550 14                                                                   |  <p><b>** Only for version with vibration sensor 69-8.50</b><br/><b>H = alignment groove</b></p>                                     |

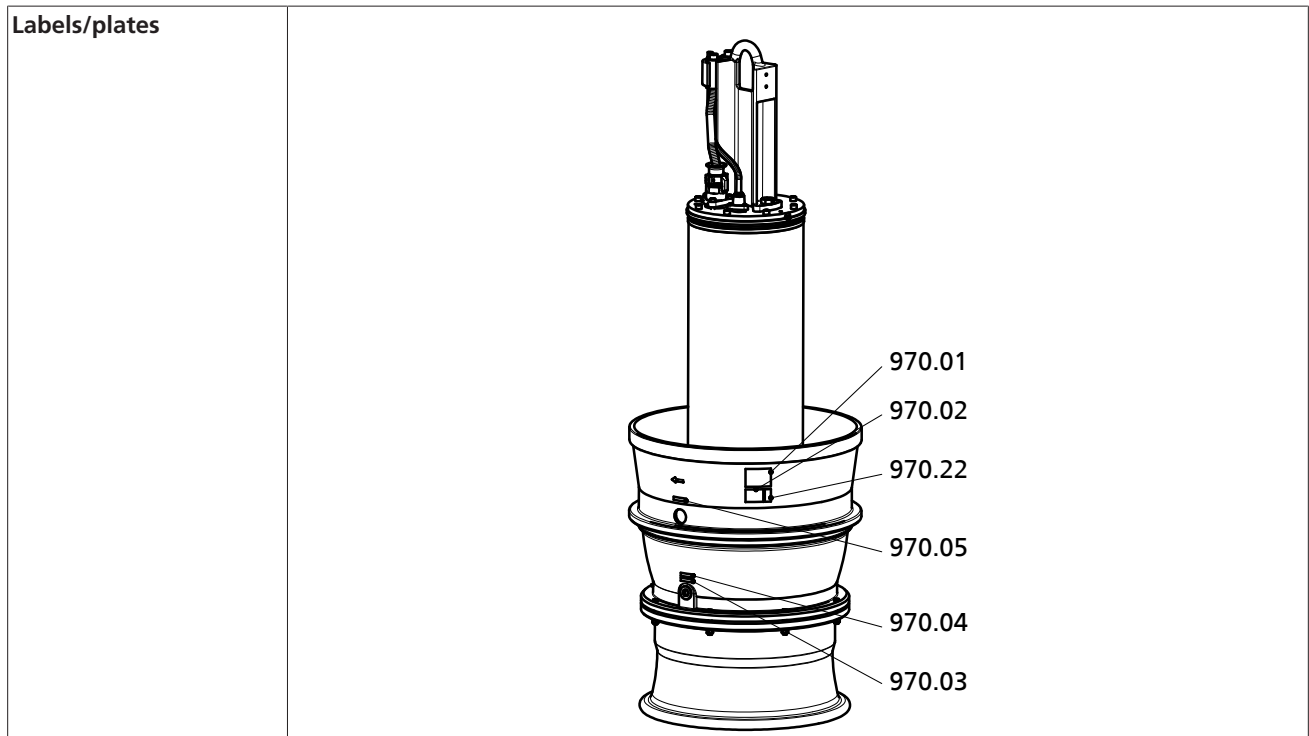
|                                                                                                         |
|---------------------------------------------------------------------------------------------------------|
|  <p><b>K - K</b></p> |
|---------------------------------------------------------------------------------------------------------|

**Table 39:** Detailed views of the general assembly drawing

|                                  |                                                                             |                                                                                     |
|----------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Bearing bracket fastening</b> | <b>Motor sizes:</b><br>80 6 ... 120 6<br>30 8 ... 160 8<br>40 10 ... 120 10 |   |
|                                  | <b>Motor sizes:</b><br>155 10 ... 250 10<br>130 12 ... 410 12<br>340 14     |   |
|                                  | <b>Motor sizes:</b><br>370 14 ... 550 14                                    |  |

**Table 40:** Detailed views of the general assembly drawing

|                                                            |                                                                                      |
|------------------------------------------------------------|--------------------------------------------------------------------------------------|
| <p><b>Screwed connection<br/>bellmouth / pump bowl</b></p> |    |
| <p><b>Impeller fastening<br/>elements</b></p>              |   |
| <p><b>Float switch</b></p>                                 |  |
| <p><b>Lubricant reservoir and<br/>leakage chamber</b></p>  |  |

**Table 41:** Detailed views of the general assembly drawing

**Table 42:** Key to the symbols

| Symbol                                                                              | Key                                                                                                    |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
|  | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> .                    |
|  | Always apply a <b>liquid sealant</b> (e.g. Hylomar SQ32M) to sealing surfaces marked with this symbol. |
|  | Use a <b>lubricant paste</b> (e.g. Altemp Q NB 50).                                                    |

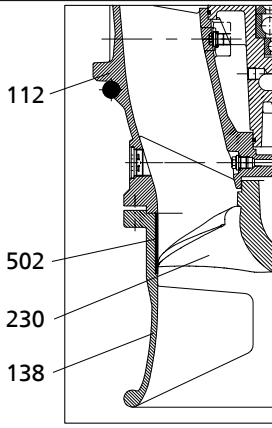
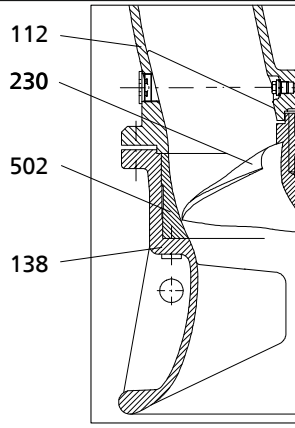
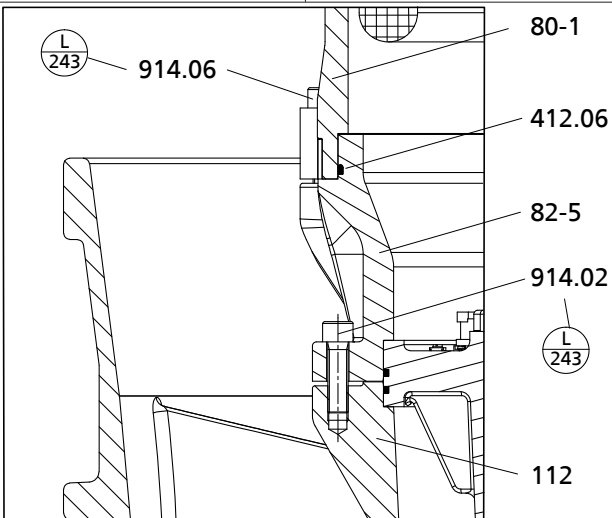
**Table 43:** List of components

| Part No.                   | Description                  | Part No.         | Description          |
|----------------------------|------------------------------|------------------|----------------------|
| 112                        | Pump bowl                    | 81-18.01/.02     | Cable terminal       |
| 138                        | Bellmouth                    | 81-2.01/.02/.03  | Plug                 |
| 185.36                     | Plate                        | 81-29.01/.02/.04 | Terminal             |
| 230                        | Impeller                     | 81-39            | Clamp                |
| 320                        | Angular contact ball bearing | 81-45            | Float switch         |
| 321                        | Deep groove ball bearing     | 81-65            | Star connector       |
| 322                        | Radial roller bearing        | 81-92            | Cover plate          |
| 330                        | Bearing bracket              | 81-97.01/.02/.11 | Cable protector      |
| 350                        | Bearing housing              | 82-5.50/.51      | Adapter              |
| 360                        | Bearing cover                | 82-11            | Strain relief device |
| 411.01/.02/.26/.31         | Joint ring                   | 82-14.50         | Cable with plug      |
| 412.01/.02/.03/.05/.07/.08 | O-ring                       | 812              | Motor housing cover  |
| 421.01/.02                 | Lip seal                     | 818              | Rotor                |
| 433.01/.02                 | Mechanical seal              | 834.01/.02       | Cable gland          |
| 50-3.12                    | Backing ring                 | 835              | Terminal board       |
| 500.01/.02/.04/.29         | Ring                         | 99-4.01/02       | Conversion kit       |
| 502                        | Casing wear ring             | 99-17            | Desiccant            |

| Part No.                       | Description        | Part No.                                                           | Description                   |
|--------------------------------|--------------------|--------------------------------------------------------------------|-------------------------------|
| 504.02                         | Spacer ring        | 900.06/.26/.30                                                     | Bolt/screw                    |
| 512.02                         | Wear ring          | 901/.05/.20/.25/.26                                                | Hexagon head bolt             |
| 520.01/.02                     | Sleeve             | 902.01                                                             | Stud                          |
| 550.01/.03/.05/.23/.25/.44/.50 | Disc               | 903.01/.02/.03/.05/.31/.51                                         | Screw plug                    |
| 561.01                         | Grooved pin        | 904.01                                                             | Grub screw                    |
| 571                            | Bail               | 914.01/.02/.03/.04/.05/.07/.19/.25/.48/.51/.52                     | Hexagon socket head cap screw |
| 68-3                           | Cover plate        | 920.01/.23/.24/.25                                                 | Nut                           |
| 69-6                           | Temperature sensor | 922                                                                | Impeller nut                  |
| 69-8                           | Sensor             | 932.01/.02/.03/.05/.06/.12/.13/.19/.20/.23/.25/.26/.29/.37/.38/.44 | Circlip                       |
| 69-14                          | Leakage sensor     | 940.02                                                             | Key                           |
| 80-1                           | Motor unit         | 970.01/.02/.03/.04/.05/.22                                         | Label/plate                   |

### 9.1.1 Special features

**Table 44:** Special features

| Description        | Detailed view                                                                                                                                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hydraulic system   |  <p>Hydraulic system A</p>  <p>Hydraulic system B</p> |
| Model with adapter |                                                                                                                                         |

**Table 45:** Key to the symbols

| Symbol                                                                              | Key                                                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  | Always secure screwed connections marked with this symbol with <b>Loctite 243</b> . |

| Part No. | Description | Part No.   | Description                   |
|----------|-------------|------------|-------------------------------|
| 112      | Pump bowl   | 502        | Casing wear ring              |
| 138      | Bellmouth   | 80-1       | Motor unit                    |
| 230      | Impeller    | 82-5       | Adapter                       |
| 412.06   | O-ring      | 914.02/.06 | Hexagon socket head cap screw |

### 9.2 Cable bundle

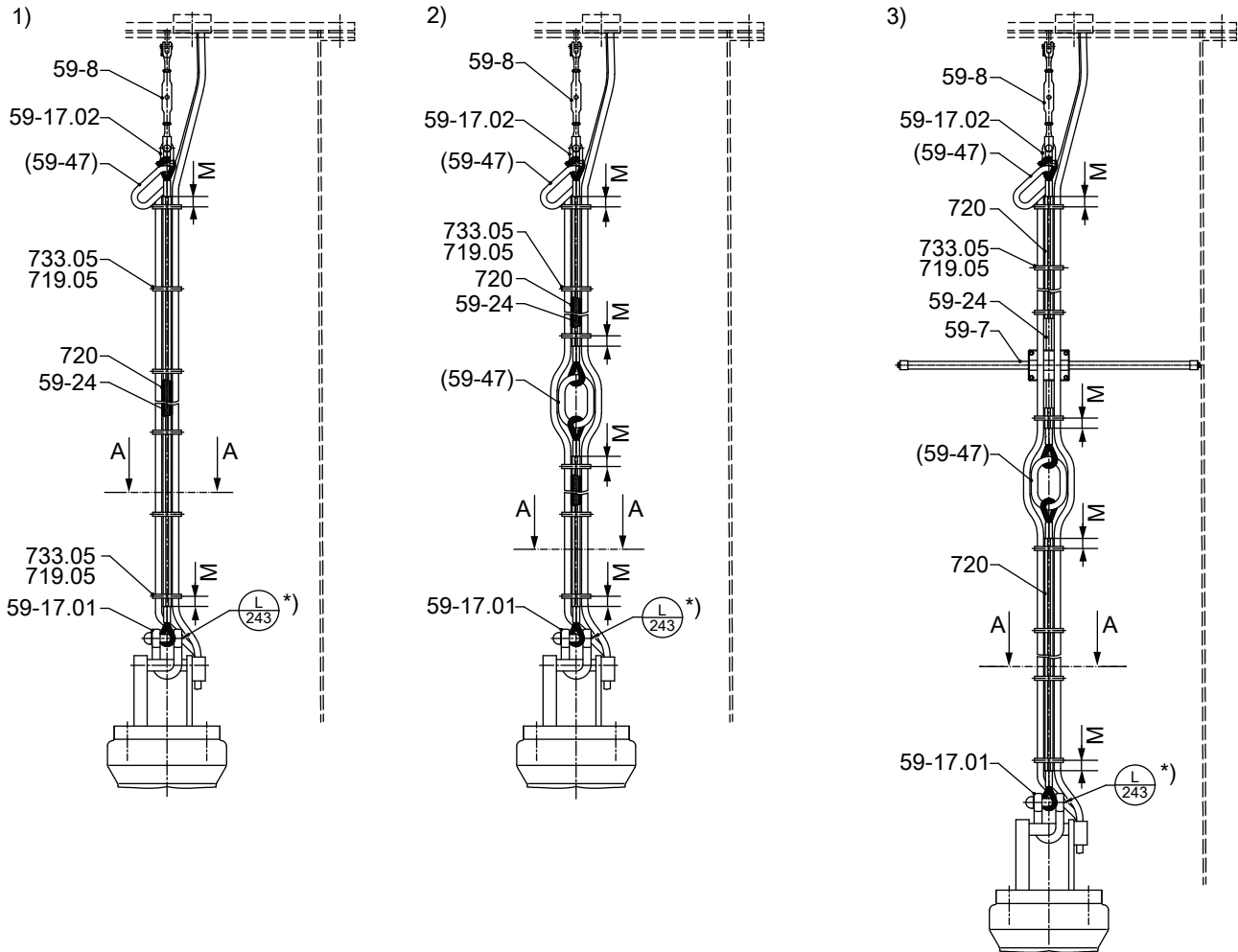


Fig. 54: Cable bundle

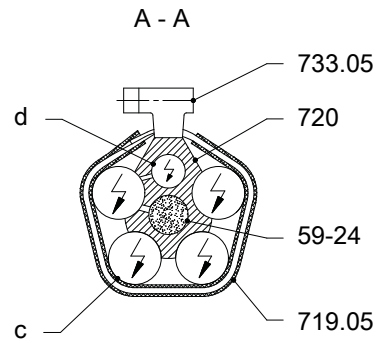
|    |                         |
|----|-------------------------|
| 1) | Basic design            |
| 2) | Design with lifting lug |
| 3) | Design with support     |

\*) : Only required for galvanized version (⇒ Section 5.3.3, Page 28)

|  |                                |
|--|--------------------------------|
|  | <b>NOTE</b>                    |
|  | Dimension M = 2 inches [50 mm] |

Table 46: Key to the symbols

| Symbol | Key                                                                          |
|--------|------------------------------------------------------------------------------|
|        | Always secure screwed connections marked with this symbol with Loctite 243 . |



**Fig. 55:** Section A - A, position of power cable, control cable and rope

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

**Table 47:** 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      | Flexible tube |
| 59-17.01/.02 | Shackle             | 720         | Spacer        |
| 59-24        | Rope / support rope | 733.05      | Cable clamp   |

### 9.3 Wiring diagrams

#### 9.3.1 Wiring diagram for the power cable 700-470...1500-1060

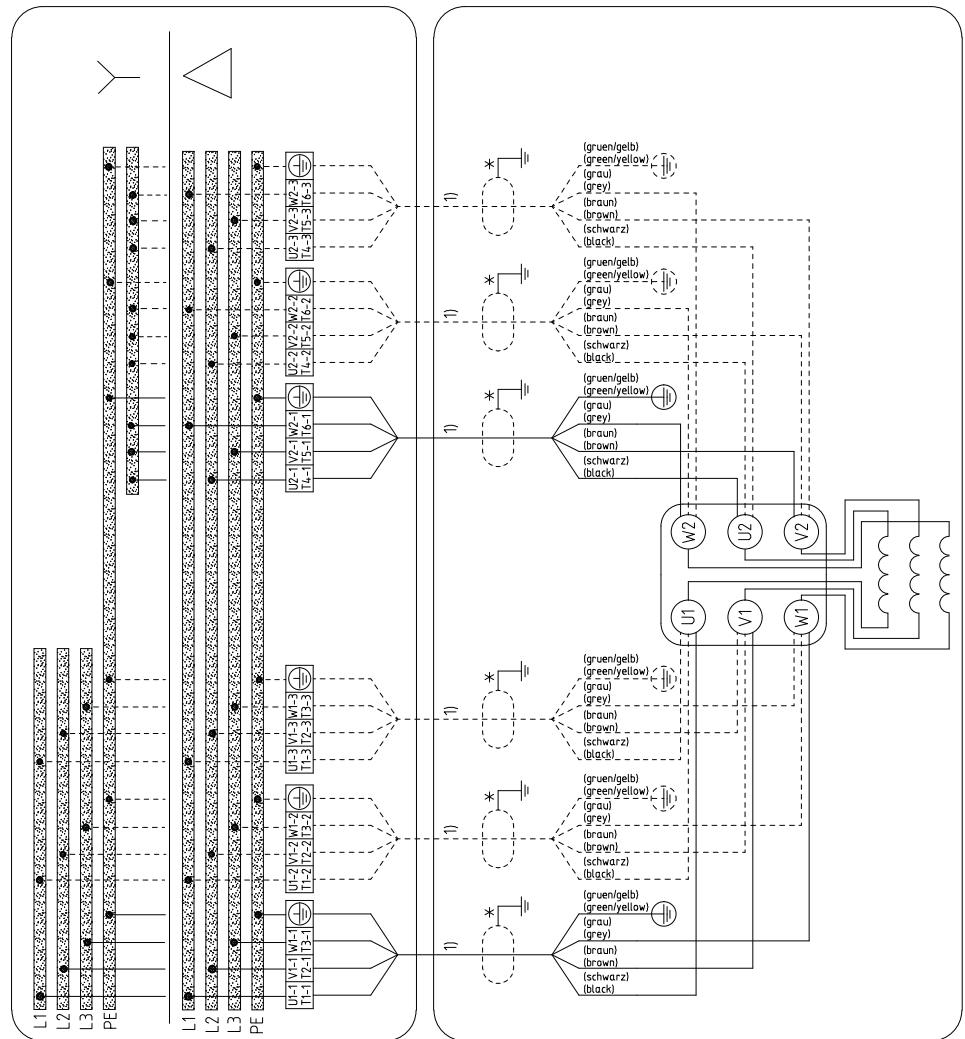
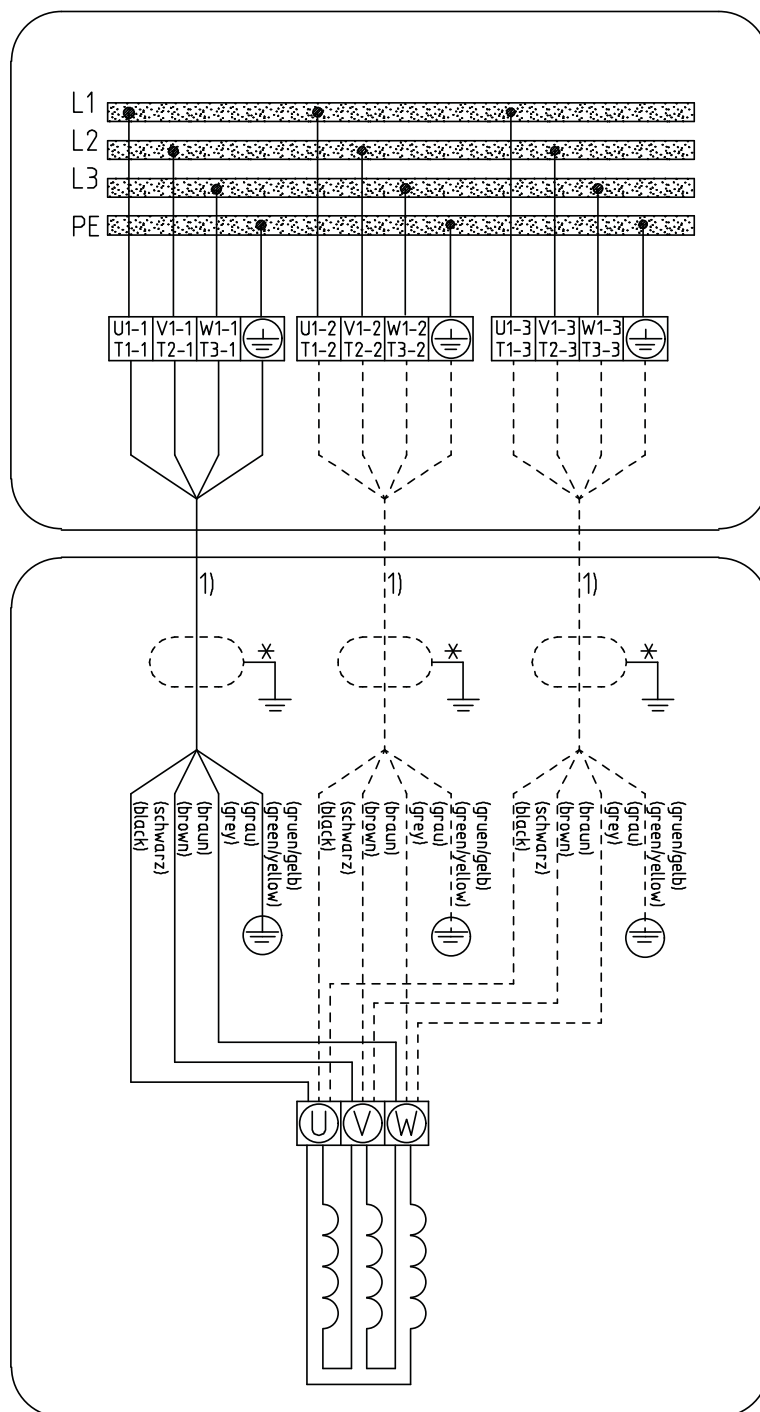


Fig. 56: Wiring diagram for the power cable 700-470...1500-1060

\* Shielded cable optional

<sup>1)</sup> Up to 3 parallel cable pairs possible

### 9.3.2 Wiring diagram for the power cable 1600-1060



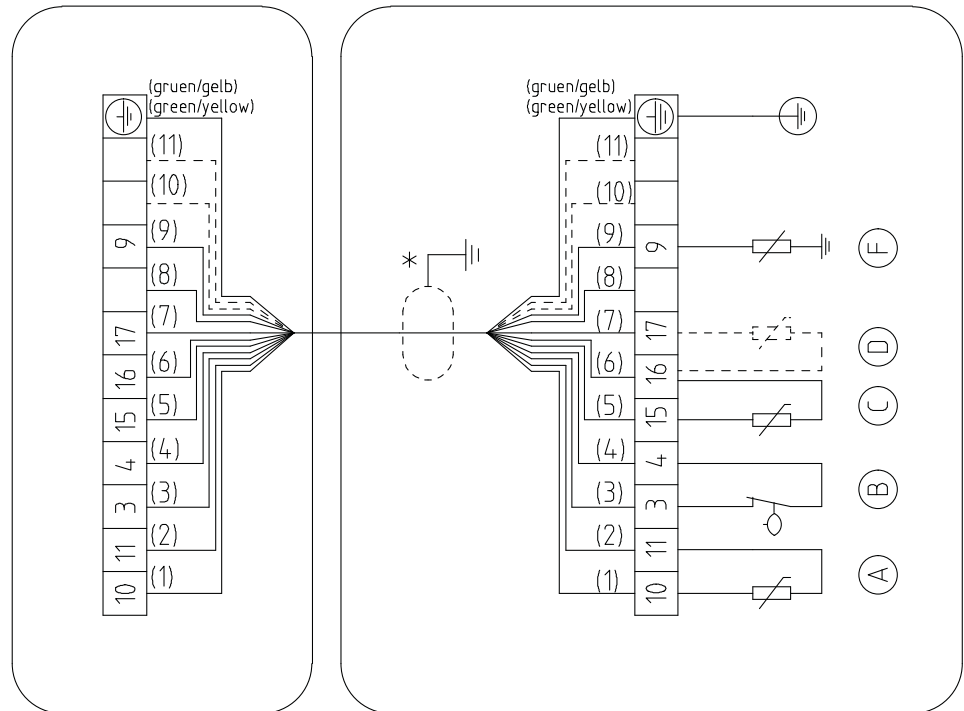
**Fig. 57:** Wiring diagram for the power cable 1600-1060

\* Shielded cable optional

<sup>1)</sup> Up to 8 parallel cables possible

### 9.3.3 Wiring diagrams for the sensors

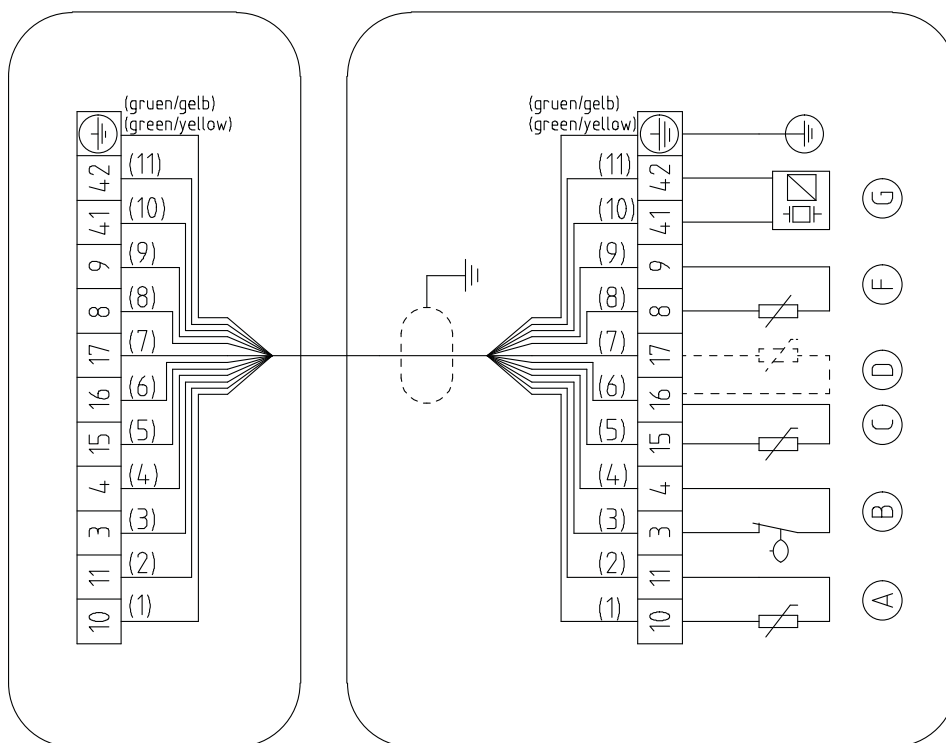
### Standard pump sets



**Fig. 58:** Wiring diagram for sensors of standard pump sets

|   |                                               |
|---|-----------------------------------------------|
| * | Shielded cables optional                      |
| Ⓐ | Motor temperature (PTC)                       |
| Ⓑ | Mechanical seal leakage                       |
| Ⓒ | Bearing temperature (lower bearings)          |
| Ⓓ | Bearing temperature (upper bearing, optional) |
| Ⓔ | Leakage inside the motor                      |

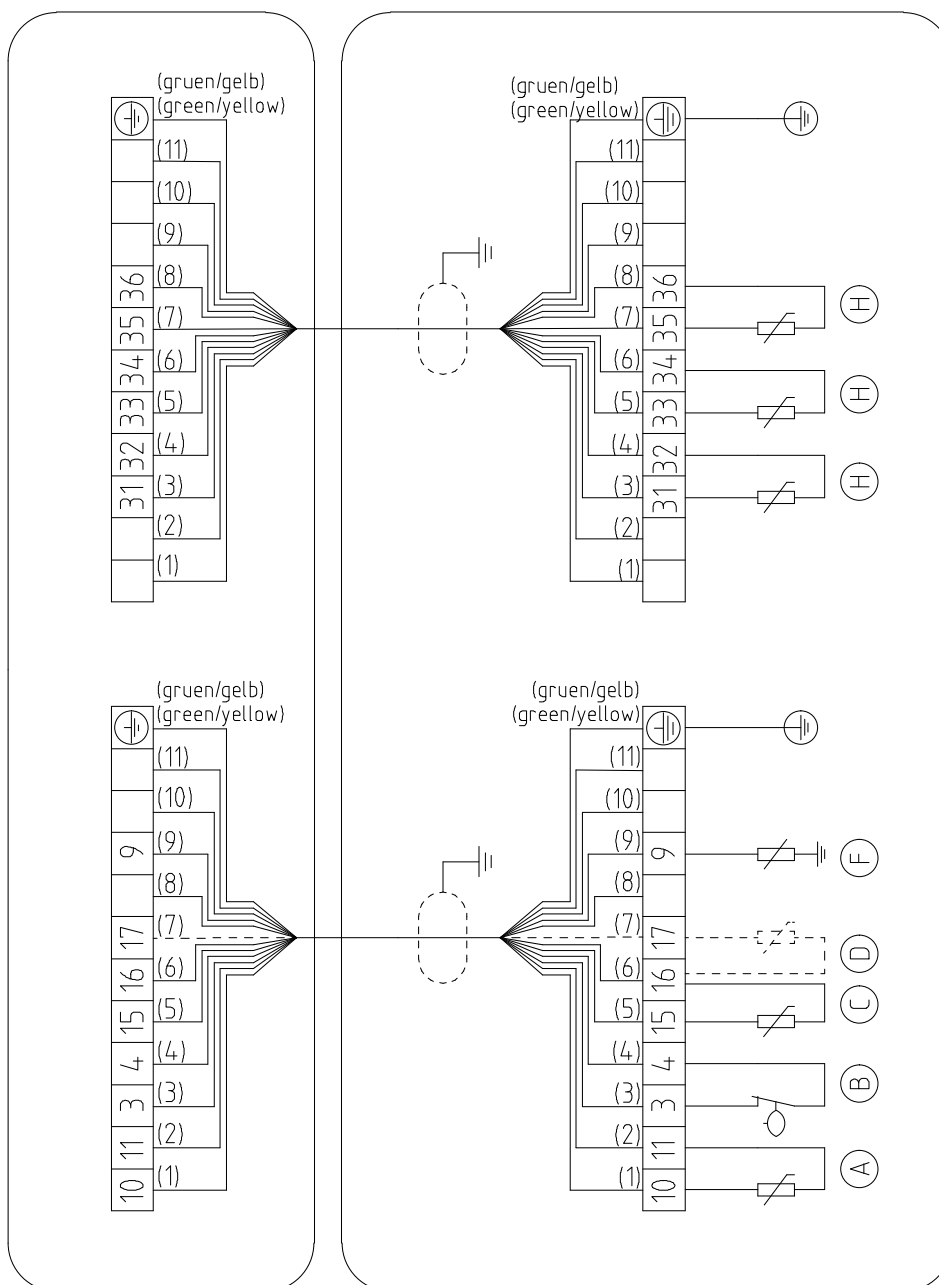
Pump sets with additional monitoring by vibration sensor



**Fig. 59:** Sensor wiring diagram for pump sets with additional monitoring by vibration sensor

|   |                                               |
|---|-----------------------------------------------|
| Ⓐ | Motor temperature (PTC)                       |
| Ⓑ | Mechanical seal leakage                       |
| Ⓒ | Bearing temperature (lower bearings)          |
| Ⓓ | Bearing temperature (upper bearing, optional) |
| Ⓔ | Leakage inside the motor                      |
| Ⓖ | Vibration sensor                              |

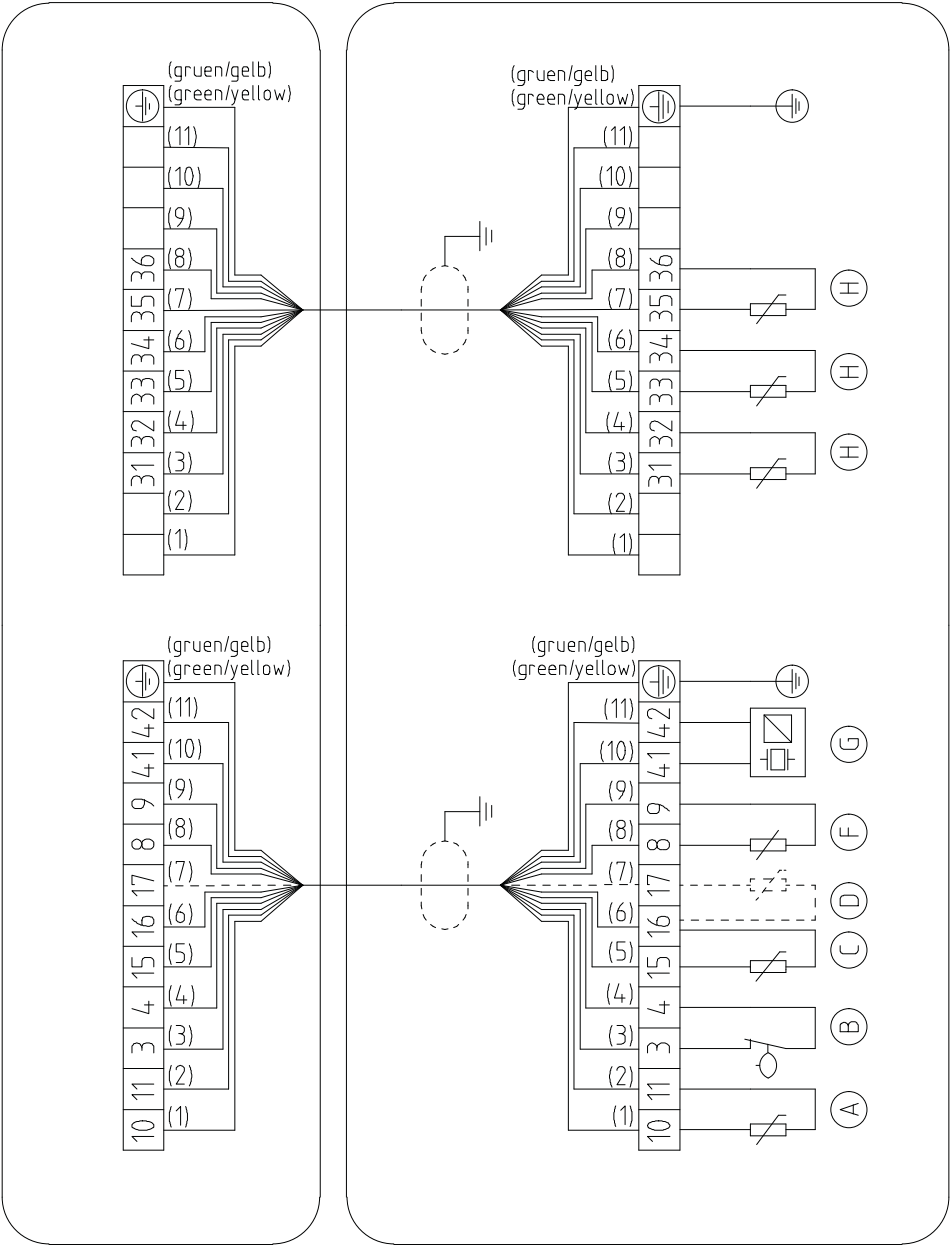
Pump sets with additional  
Pt100 motor temperature  
monitoring



**Fig. 60:** Sensor wiring diagram for pump sets with additional Pt100 motor temperature monitoring

|     |                                               |
|-----|-----------------------------------------------|
| (A) | Motor temperature (PTC)                       |
| (B) | Mechanical seal leakage                       |
| (C) | Bearing temperature (lower bearings)          |
| (D) | Bearing temperature (upper bearing, optional) |
| (E) | Leakage inside the motor                      |
| (H) | Motor temperature (Pt100)                     |

Pump sets with additional  
Pt100 motor temperature  
monitoring and vibration  
sensor



**Fig. 61:** Sensor wiring diagram for pump sets with additional Pt100 motor temperature monitoring and vibration sensor

|     |                                               |
|-----|-----------------------------------------------|
| (A) | Motor temperature (PTC)                       |
| (B) | Mechanical seal leakage                       |
| (C) | Bearing temperature (lower bearings)          |
| (D) | Bearing temperature (upper bearing, optional) |
| (E) | Leakage inside the motor                      |
| (F) | Vibration sensor                              |
| (H) | Motor temperature (Pt100)                     |

## 9.4 Flamepaths on explosion-proof motors

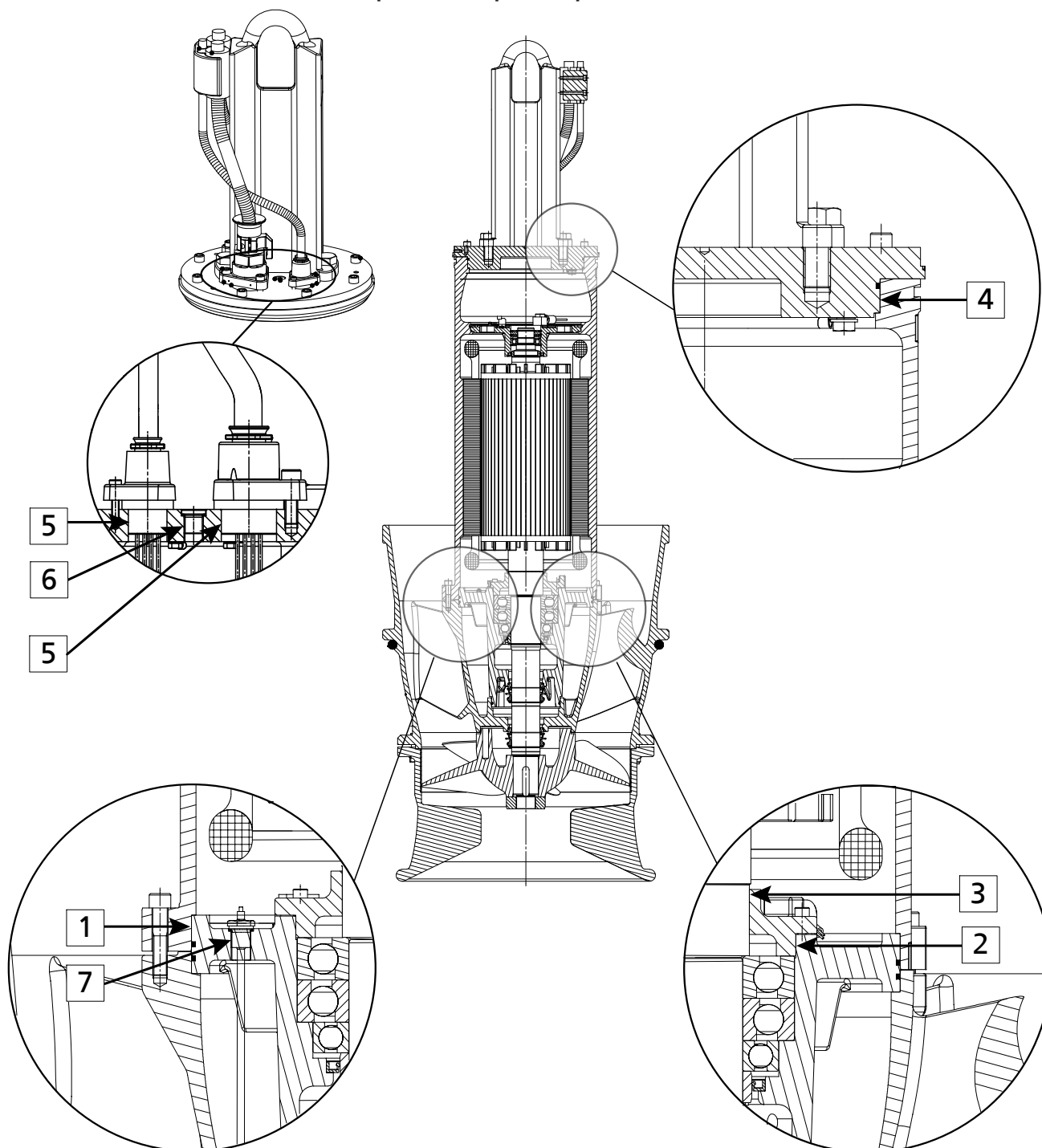


Fig. 62: Flamepaths for explosion-proof motors

## 9.5 Dimensions

## 9.5.1 Dimensions [inch]

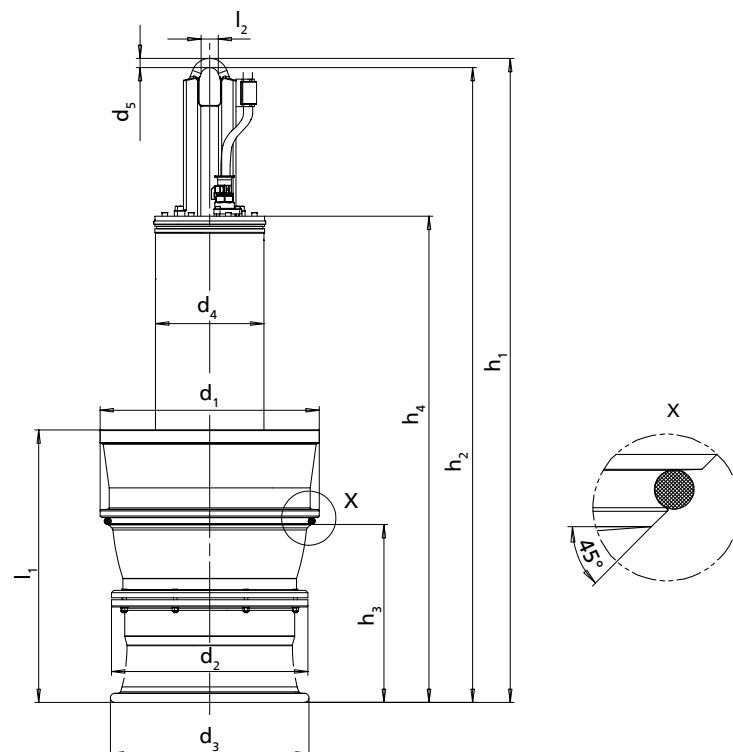


Fig. 63: Pump set dimensions

Table 48: Pump set dimensions [inch]

| Size      | Motor size | Number of poles | $d_1$                           | $d_2$                           | $d_3$                           | $d_4$                            | $d_5$                          | $h_1$                             | $h_2$                            | $h_3$                            | $h_4$                            | $l_1$                            | $l_2$                         | [lbs] <sup>10)</sup> |
|-----------|------------|-----------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|--------------------------------|-----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|-------------------------------|----------------------|
| A 700-470 | 80         | 6               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2240                 |
| A 700-470 | 100        | 6               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2360                 |
| A 700-470 | 120        | 6               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2515                 |
| A 700-470 | 30         | 8               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 86 <sup>1</sup> / <sub>4</sub>    | 84 <sup>5</sup> / <sub>8</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 59 <sup>1</sup> / <sub>16</sub>  | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 1995                 |
| A 700-470 | 40         | 8               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 86 <sup>1</sup> / <sub>4</sub>    | 84 <sup>5</sup> / <sub>8</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 59 <sup>1</sup> / <sub>16</sub>  | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2010                 |
| A 700-470 | 55         | 8               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2250                 |
| A 700-470 | 70         | 8               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2275                 |
| B 700-470 | 100        | 6               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2425                 |
| B 700-470 | 120        | 6               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2580                 |
| B 700-470 | 40         | 8               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 86 <sup>1</sup> / <sub>4</sub>    | 84 <sup>5</sup> / <sub>8</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 59 <sup>1</sup> / <sub>16</sub>  | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2075                 |
| B 700-470 | 55         | 8               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2305                 |
| B 700-470 | 70         | 8               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2340                 |
| B 700-470 | 100        | 8               | 26 <sup>9</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 23 <sup>1</sup> / <sub>16</sub> | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>8</sub>    | 92 <sup>1</sup> / <sub>2</sub>   | 16 <sup>15</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 28 <sup>15</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub> | 2580                 |
| A 800-540 | 55         | 8               | 30 <sup>5</sup> / <sub>16</sub> | 26                              | 26                              | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 96 <sup>1</sup> / <sub>4</sub>    | 94 <sup>11</sup> / <sub>16</sub> | 21 <sup>5</sup> / <sub>8</sub>   | 69 <sup>1</sup> / <sub>8</sub>   | 37 <sup>3</sup> / <sub>16</sub>  | 3 <sup>1</sup> / <sub>8</sub> | 2570                 |
| A 800-540 | 70         | 8               | 30 <sup>5</sup> / <sub>16</sub> | 26                              | 26                              | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 96 <sup>1</sup> / <sub>4</sub>    | 94 <sup>11</sup> / <sub>16</sub> | 21 <sup>5</sup> / <sub>8</sub>   | 69 <sup>1</sup> / <sub>8</sub>   | 37 <sup>3</sup> / <sub>16</sub>  | 3 <sup>1</sup> / <sub>8</sub> | 2590                 |
| A 800-540 | 100        | 8               | 30 <sup>5</sup> / <sub>16</sub> | 26                              | 26                              | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 96 <sup>1</sup> / <sub>4</sub>    | 94 <sup>11</sup> / <sub>16</sub> | 21 <sup>5</sup> / <sub>8</sub>   | 69 <sup>1</sup> / <sub>8</sub>   | 37 <sup>3</sup> / <sub>16</sub>  | 3 <sup>1</sup> / <sub>8</sub> | 2845                 |
| B 800-540 | 70         | 8               | 30 <sup>5</sup> / <sub>16</sub> | 26                              | 26                              | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 96 <sup>1</sup> / <sub>4</sub>    | 94 <sup>11</sup> / <sub>16</sub> | 21 <sup>5</sup> / <sub>8</sub>   | 69 <sup>1</sup> / <sub>8</sub>   | 37 <sup>3</sup> / <sub>16</sub>  | 3 <sup>1</sup> / <sub>8</sub> | 2660                 |
| B 800-540 | 100        | 8               | 30 <sup>5</sup> / <sub>16</sub> | 26                              | 26                              | 15 <sup>3</sup> / <sub>16</sub>  | 1 <sup>9</sup> / <sub>16</sub> | 96 <sup>1</sup> / <sub>4</sub>    | 94 <sup>11</sup> / <sub>16</sub> | 21 <sup>5</sup> / <sub>8</sub>   | 69 <sup>1</sup> / <sub>8</sub>   | 37 <sup>3</sup> / <sub>16</sub>  | 3 <sup>1</sup> / <sub>8</sub> | 2900                 |
| A 900-540 | 120        | 8               | 33 <sup>7</sup> / <sub>8</sub>  | 26                              | 26                              | 18 <sup>11</sup> / <sub>16</sub> | 1 <sup>9</sup> / <sub>16</sub> | 102 <sup>15</sup> / <sub>16</sub> | 101 <sup>3</sup> / <sub>8</sub>  | 22 <sup>7</sup> / <sub>16</sub>  | 75 <sup>13</sup> / <sub>16</sub> | 41 <sup>1</sup> / <sub>8</sub>   | 3 <sup>1</sup> / <sub>8</sub> | 3430                 |
| A 900-540 | 40         | 10              | 33 <sup>7</sup> / <sub>8</sub>  | 26                              | 26                              | 18 <sup>11</sup> / <sub>16</sub> | 1 <sup>9</sup> / <sub>16</sub> | 102 <sup>15</sup> / <sub>16</sub> | 101 <sup>3</sup> / <sub>8</sub>  | 22 <sup>7</sup> / <sub>16</sub>  | 75 <sup>13</sup> / <sub>16</sub> | 41 <sup>1</sup> / <sub>8</sub>   | 3 <sup>1</sup> / <sub>8</sub> | 3255                 |
| A 900-540 | 60         | 10              | 33 <sup>7</sup> / <sub>8</sub>  | 26                              | 26                              | 18 <sup>11</sup> / <sub>16</sub> | 1 <sup>9</sup> / <sub>16</sub> | 102 <sup>15</sup> / <sub>16</sub> | 101 <sup>3</sup> / <sub>8</sub>  | 22 <sup>7</sup> / <sub>16</sub>  | 75 <sup>13</sup> / <sub>16</sub> | 41 <sup>1</sup> / <sub>8</sub>   | 3 <sup>1</sup> / <sub>8</sub> | 3265                 |
| A 900-540 | 90         | 10              | 33 <sup>7</sup> / <sub>8</sub>  | 26                              | 26                              | 18 <sup>11</sup> / <sub>16</sub> | 1 <sup>9</sup> / <sub>16</sub> | 102 <sup>15</sup> / <sub>16</sub> | 101 <sup>3</sup> / <sub>8</sub>  | 22 <sup>7</sup> / <sub>16</sub>  | 75 <sup>13</sup> / <sub>16</sub> | 41 <sup>1</sup> / <sub>8</sub>   | 3 <sup>1</sup> / <sub>8</sub> | 3275                 |

<sup>10)</sup> Pump set with 33 ft [10 m] power cable (460 V) and 16.4 ft [5 m] support rope

| Size        | Motor size | Number of poles | d <sub>1</sub>                   | d <sub>2</sub>                  | d <sub>3</sub>                  | d <sub>4</sub>                   | d <sub>5</sub>                  | h <sub>1</sub>                    | h <sub>2</sub>                    | h <sub>3</sub>                   | h <sub>4</sub>                    | l <sub>1</sub>                  | l <sub>2</sub>                  | [lbs] <sup>(10)</sup> |
|-------------|------------|-----------------|----------------------------------|---------------------------------|---------------------------------|----------------------------------|---------------------------------|-----------------------------------|-----------------------------------|----------------------------------|-----------------------------------|---------------------------------|---------------------------------|-----------------------|
| B 900-540   | 120        | 8               | 33 <sup>7</sup> / <sub>8</sub>   | 26                              | 26                              | 18 <sup>11</sup> / <sub>16</sub> | 1 <sup>9</sup> / <sub>16</sub>  | 102 <sup>15</sup> / <sub>16</sub> | 101 <sup>3</sup> / <sub>8</sub>   | 22 <sup>7</sup> / <sub>16</sub>  | 75 <sup>13</sup> / <sub>16</sub>  | 41 <sup>1</sup> / <sub>8</sub>  | 3 <sup>1</sup> / <sub>8</sub>   | 3485                  |
| B 900-540   | 160        | 8               | 33 <sup>7</sup> / <sub>8</sub>   | 26                              | 26                              | 18 <sup>11</sup> / <sub>16</sub> | 1 <sup>9</sup> / <sub>16</sub>  | 102 <sup>15</sup> / <sub>16</sub> | 101 <sup>3</sup> / <sub>8</sub>   | 22 <sup>7</sup> / <sub>16</sub>  | 75 <sup>13</sup> / <sub>16</sub>  | 41 <sup>1</sup> / <sub>8</sub>  | 3 <sup>1</sup> / <sub>8</sub>   | 3825                  |
| A 1000-700  | 120        | 10              | 37 <sup>13</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>  | 34 <sup>1</sup> / <sub>4</sub>  | 18 <sup>11</sup> / <sub>16</sub> | 1 <sup>9</sup> / <sub>16</sub>  | 111                               | 109 <sup>7</sup> / <sub>16</sub>  | 30 <sup>11</sup> / <sub>16</sub> | 83 <sup>7</sup> / <sub>8</sub>    | 47 <sup>1</sup> / <sub>16</sub> | 3 <sup>1</sup> / <sub>8</sub>   | 4620                  |
| A 1000-700  | 155        | 10              | 37 <sup>13</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>  | 34 <sup>1</sup> / <sub>4</sub>  | 21 <sup>7</sup> / <sub>8</sub>   | 1 <sup>15</sup> / <sub>16</sub> | 127 <sup>3</sup> / <sub>16</sub>  | 124 <sup>13</sup> / <sub>16</sub> | 30 <sup>11</sup> / <sub>16</sub> | 103 <sup>9</sup> / <sub>16</sub>  | 47 <sup>1</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 6075                  |
| A 1000-700  | 200        | 10              | 37 <sup>13</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>  | 34 <sup>1</sup> / <sub>4</sub>  | 21 <sup>7</sup> / <sub>8</sub>   | 1 <sup>15</sup> / <sub>16</sub> | 127 <sup>3</sup> / <sub>16</sub>  | 124 <sup>13</sup> / <sub>16</sub> | 30 <sup>11</sup> / <sub>16</sub> | 103 <sup>9</sup> / <sub>16</sub>  | 47 <sup>1</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 6360                  |
| A 1000-700  | 250        | 10              | 37 <sup>13</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>  | 34 <sup>1</sup> / <sub>4</sub>  | 21 <sup>7</sup> / <sub>8</sub>   | 1 <sup>15</sup> / <sub>16</sub> | 127 <sup>3</sup> / <sub>16</sub>  | 124 <sup>13</sup> / <sub>16</sub> | 30 <sup>11</sup> / <sub>16</sub> | 103 <sup>9</sup> / <sub>16</sub>  | 47 <sup>1</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 6880                  |
| B 1000-700  | 155        | 10              | 37 <sup>13</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>  | 34 <sup>1</sup> / <sub>4</sub>  | 21 <sup>7</sup> / <sub>8</sub>   | 1 <sup>15</sup> / <sub>16</sub> | 127 <sup>3</sup> / <sub>16</sub>  | 124 <sup>13</sup> / <sub>16</sub> | 30 <sup>11</sup> / <sub>16</sub> | 103 <sup>9</sup> / <sub>16</sub>  | 47 <sup>1</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 6165                  |
| B 1000-700  | 200        | 10              | 37 <sup>13</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>  | 34 <sup>1</sup> / <sub>4</sub>  | 21 <sup>7</sup> / <sub>8</sub>   | 1 <sup>15</sup> / <sub>16</sub> | 127 <sup>3</sup> / <sub>16</sub>  | 124 <sup>13</sup> / <sub>16</sub> | 30 <sup>11</sup> / <sub>16</sub> | 103 <sup>9</sup> / <sub>16</sub>  | 47 <sup>1</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 6450                  |
| B 1000-700  | 250        | 10              | 37 <sup>13</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>  | 34 <sup>1</sup> / <sub>4</sub>  | 21 <sup>7</sup> / <sub>8</sub>   | 1 <sup>15</sup> / <sub>16</sub> | 127 <sup>3</sup> / <sub>16</sub>  | 124 <sup>13</sup> / <sub>16</sub> | 30 <sup>11</sup> / <sub>16</sub> | 103 <sup>9</sup> / <sub>16</sub>  | 47 <sup>1</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 6980                  |
| A 1200-870  | 190        | 12              | 45 <sup>1</sup> / <sub>4</sub>   | 41 <sup>5</sup> / <sub>16</sub> | 41 <sup>5</sup> / <sub>16</sub> | 21 <sup>7</sup> / <sub>8</sub>   | 1 <sup>15</sup> / <sub>16</sub> | 129 <sup>1</sup> / <sub>2</sub>   | 127 <sup>3</sup> / <sub>16</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 105 <sup>7</sup> / <sub>8</sub>   | 55 <sup>5</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 7830                  |
| A 1200-870  | 251        | 12              | 45 <sup>1</sup> / <sub>4</sub>   | 41 <sup>5</sup> / <sub>16</sub> | 41 <sup>5</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub>  | 2 <sup>3</sup> / <sub>8</sub>   | 147 <sup>1</sup> / <sub>4</sub>   | 144 <sup>5</sup> / <sub>16</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 119 <sup>11</sup> / <sub>16</sub> | 55 <sup>5</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 9605                  |
| A 1200-870  | 320        | 12              | 45 <sup>1</sup> / <sub>4</sub>   | 41 <sup>5</sup> / <sub>16</sub> | 41 <sup>5</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub>  | 2 <sup>3</sup> / <sub>8</sub>   | 156 <sup>1</sup> / <sub>8</sub>   | 153 <sup>1</sup> / <sub>8</sub>   | 39 <sup>15</sup> / <sub>16</sub> | 128 <sup>9</sup> / <sub>16</sub>  | 55 <sup>5</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 10630                 |
| A 1200-870  | 370        | 12              | 45 <sup>1</sup> / <sub>4</sub>   | 41 <sup>5</sup> / <sub>16</sub> | 41 <sup>5</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub>  | 2 <sup>3</sup> / <sub>8</sub>   | 156 <sup>1</sup> / <sub>8</sub>   | 153 <sup>1</sup> / <sub>8</sub>   | 39 <sup>15</sup> / <sub>16</sub> | 128 <sup>9</sup> / <sub>16</sub>  | 55 <sup>5</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 10980                 |
| A 1200-870  | 410        | 12              | 45 <sup>1</sup> / <sub>4</sub>   | 41 <sup>5</sup> / <sub>16</sub> | 41 <sup>5</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub>  | 2 <sup>3</sup> / <sub>8</sub>   | 156 <sup>1</sup> / <sub>8</sub>   | 153 <sup>1</sup> / <sub>8</sub>   | 39 <sup>15</sup> / <sub>16</sub> | 128 <sup>9</sup> / <sub>16</sub>  | 55 <sup>5</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 11365                 |
| B 1200-870  | 251        | 12              | 45 <sup>1</sup> / <sub>4</sub>   | 41 <sup>5</sup> / <sub>16</sub> | 41 <sup>5</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub>  | 2 <sup>3</sup> / <sub>8</sub>   | 147 <sup>1</sup> / <sub>4</sub>   | 144 <sup>5</sup> / <sub>16</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 119 <sup>11</sup> / <sub>16</sub> | 55 <sup>5</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 9880                  |
| B 1200-870  | 320        | 12              | 45 <sup>1</sup> / <sub>4</sub>   | 41 <sup>5</sup> / <sub>16</sub> | 41 <sup>5</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub>  | 2 <sup>3</sup> / <sub>8</sub>   | 156 <sup>1</sup> / <sub>8</sub>   | 153 <sup>1</sup> / <sub>8</sub>   | 39 <sup>15</sup> / <sub>16</sub> | 128 <sup>9</sup> / <sub>16</sub>  | 55 <sup>5</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 10695                 |
| B 1200-870  | 370        | 12              | 45 <sup>1</sup> / <sub>4</sub>   | 41 <sup>5</sup> / <sub>16</sub> | 41 <sup>5</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub>  | 2 <sup>3</sup> / <sub>8</sub>   | 156 <sup>1</sup> / <sub>8</sub>   | 153 <sup>1</sup> / <sub>8</sub>   | 39 <sup>15</sup> / <sub>16</sub> | 128 <sup>9</sup> / <sub>16</sub>  | 55 <sup>5</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 11265                 |
| B 1200-870  | 410        | 12              | 45 <sup>1</sup> / <sub>4</sub>   | 41 <sup>5</sup> / <sub>16</sub> | 41 <sup>5</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub>  | 2 <sup>3</sup> / <sub>8</sub>   | 156 <sup>1</sup> / <sub>8</sub>   | 153 <sup>1</sup> / <sub>8</sub>   | 39 <sup>15</sup> / <sub>16</sub> | 128 <sup>9</sup> / <sub>16</sub>  | 55 <sup>5</sup> / <sub>16</sub> | 3 <sup>9</sup> / <sub>16</sub>  | 11665                 |
| A 1500-1060 | 340        | 14              | 56 <sup>5</sup> / <sub>16</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 51 <sup>3</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub>  | 2 <sup>3</sup> / <sub>8</sub>   | 157 <sup>1</sup> / <sub>2</sub>   | 154 <sup>1</sup> / <sub>2</sub>   | 58 <sup>1</sup> / <sub>16</sub>  | 131 <sup>1</sup> / <sub>8</sub>   | 73 <sup>1</sup> / <sub>4</sub>  | 3 <sup>9</sup> / <sub>16</sub>  | 13160                 |
| A 1600-1060 | 370        | 14              | 60 <sup>5</sup> / <sub>8</sub>   | 53 <sup>1</sup> / <sub>8</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 29 <sup>15</sup> / <sub>16</sub> | 2 <sup>3</sup> / <sub>4</sub>   | 160 <sup>13</sup> / <sub>16</sub> | 157 <sup>5</sup> / <sub>16</sub>  | 49 <sup>5</sup> / <sub>8</sub>   | 132 <sup>7</sup> / <sub>8</sub>   | 70 <sup>7</sup> / <sub>8</sub>  | 3 <sup>15</sup> / <sub>16</sub> | 15540                 |
| A 1600-1060 | 410        | 14              | 60 <sup>5</sup> / <sub>8</sub>   | 53 <sup>1</sup> / <sub>8</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 29 <sup>15</sup> / <sub>16</sub> | 2 <sup>3</sup> / <sub>4</sub>   | 160 <sup>13</sup> / <sub>16</sub> | 157 <sup>5</sup> / <sub>16</sub>  | 49 <sup>5</sup> / <sub>8</sub>   | 132 <sup>7</sup> / <sub>8</sub>   | 70 <sup>7</sup> / <sub>8</sub>  | 3 <sup>15</sup> / <sub>16</sub> | 16250                 |
| A 1600-1060 | 450        | 14              | 60 <sup>5</sup> / <sub>8</sub>   | 53 <sup>1</sup> / <sub>8</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 30 <sup>1</sup> / <sub>2</sub>   | 2 <sup>3</sup> / <sub>4</sub>   | 172 <sup>5</sup> / <sub>8</sub>   | 168 <sup>11</sup> / <sub>16</sub> | 49 <sup>5</sup> / <sub>8</sub>   | 144 <sup>11</sup> / <sub>16</sub> | 70 <sup>7</sup> / <sub>8</sub>  | 3 <sup>15</sup> / <sub>16</sub> | 17615                 |
| A 1600-1060 | 500        | 14              | 60 <sup>5</sup> / <sub>8</sub>   | 53 <sup>1</sup> / <sub>8</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 30 <sup>1</sup> / <sub>2</sub>   | 2 <sup>3</sup> / <sub>4</sub>   | 172 <sup>5</sup> / <sub>8</sub>   | 168 <sup>11</sup> / <sub>16</sub> | 49 <sup>5</sup> / <sub>8</sub>   | 144 <sup>11</sup> / <sub>16</sub> | 70 <sup>7</sup> / <sub>8</sub>  | 3 <sup>15</sup> / <sub>16</sub> | 18210                 |
| A 1600-1060 | 550        | 14              | 60 <sup>5</sup> / <sub>8</sub>   | 53 <sup>1</sup> / <sub>8</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 30 <sup>1</sup> / <sub>2</sub>   | 2 <sup>3</sup> / <sub>4</sub>   | 172 <sup>5</sup> / <sub>8</sub>   | 168 <sup>11</sup> / <sub>16</sub> | 49 <sup>5</sup> / <sub>8</sub>   | 144 <sup>11</sup> / <sub>16</sub> | 70 <sup>7</sup> / <sub>8</sub>  | 3 <sup>15</sup> / <sub>16</sub> | 18695                 |
| B 1600-1060 | 410        | 14              | 60 <sup>5</sup> / <sub>8</sub>   | 53 <sup>1</sup> / <sub>8</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 29 <sup>15</sup> / <sub>16</sub> | 2 <sup>3</sup> / <sub>4</sub>   | 160 <sup>13</sup> / <sub>16</sub> | 157 <sup>5</sup> / <sub>16</sub>  | 49 <sup>5</sup> / <sub>8</sub>   | 132 <sup>7</sup> / <sub>8</sub>   | 70 <sup>7</sup> / <sub>8</sub>  | 3 <sup>15</sup> / <sub>16</sub> | 16645                 |
| B 1600-1060 | 450        | 14              | 60 <sup>5</sup> / <sub>8</sub>   | 53 <sup>1</sup> / <sub>8</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 30 <sup>1</sup> / <sub>2</sub>   | 2 <sup>3</sup> / <sub>4</sub>   | 172 <sup>5</sup> / <sub>8</sub>   | 168 <sup>11</sup> / <sub>16</sub> | 49 <sup>5</sup> / <sub>8</sub>   | 144 <sup>11</sup> / <sub>16</sub> | 70 <sup>7</sup> / <sub>8</sub>  | 3 <sup>15</sup> / <sub>16</sub> | 18010                 |
| B 1600-1060 | 500        | 14              | 60 <sup>5</sup> / <sub>8</sub>   | 53 <sup>1</sup> / <sub>8</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 30 <sup>1</sup> / <sub>2</sub>   | 2 <sup>3</sup> / <sub>4</sub>   | 172 <sup>5</sup> / <sub>8</sub>   | 168 <sup>11</sup> / <sub>16</sub> | 49 <sup>5</sup> / <sub>8</sub>   | 144 <sup>11</sup> / <sub>16</sub> | 70 <sup>7</sup> / <sub>8</sub>  | 3 <sup>15</sup> / <sub>16</sub> | 18605                 |
| B 1600-1060 | 550        | 14              | 60 <sup>5</sup> / <sub>8</sub>   | 53 <sup>1</sup> / <sub>8</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 30 <sup>1</sup> / <sub>2</sub>   | 2 <sup>3</sup> / <sub>4</sub>   | 172 <sup>5</sup> / <sub>8</sub>   | 168 <sup>11</sup> / <sub>16</sub> | 49 <sup>5</sup> / <sub>8</sub>   | 144 <sup>11</sup> / <sub>16</sub> | 70 <sup>7</sup> / <sub>8</sub>  | 3 <sup>15</sup> / <sub>16</sub> | 19090                 |

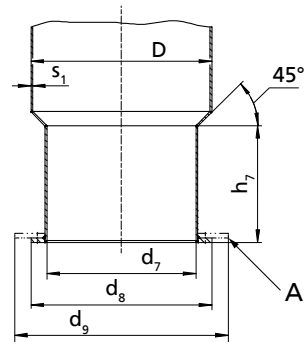


Fig. 64: Dimensions of the discharge tube

A Suction umbrella; option for reducing the minimum water level

Table 49: Pump set dimensions [inch]

| Size      | Motor size | Number of poles | D  | d <sub>7</sub>                 | d <sub>8</sub>                   | d <sub>9</sub>                  | h <sub>7</sub>                  | s <sub>1</sub>                 |
|-----------|------------|-----------------|----|--------------------------------|----------------------------------|---------------------------------|---------------------------------|--------------------------------|
| A 700-470 | 80         | 6               | 28 | 23 <sup>5</sup> / <sub>8</sub> | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| A 700-470 | 100        | 6               | 28 | 23 <sup>5</sup> / <sub>8</sub> | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| A 700-470 | 120        | 6               | 28 | 23 <sup>5</sup> / <sub>8</sub> | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| A 700-470 | 30         | 8               | 28 | 23 <sup>5</sup> / <sub>8</sub> | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| A 700-470 | 40         | 8               | 28 | 23 <sup>5</sup> / <sub>8</sub> | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| A 700-470 | 55         | 8               | 28 | 23 <sup>5</sup> / <sub>8</sub> | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| A 700-470 | 70         | 8               | 28 | 23 <sup>5</sup> / <sub>8</sub> | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| B 700-470 | 100        | 6               | 28 | 23 <sup>5</sup> / <sub>8</sub> | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |

| Size        | Motor size | Number of poles | D                               | d <sub>7</sub>                  | d <sub>8</sub>                   | d <sub>9</sub>                  | h <sub>7</sub>                   | s <sub>1</sub>                 |
|-------------|------------|-----------------|---------------------------------|---------------------------------|----------------------------------|---------------------------------|----------------------------------|--------------------------------|
| B 700-470   | 120        | 6               | 28                              | 23 <sup>5</sup> / <sub>8</sub>  | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub>  | 5 <sup>5</sup> / <sub>16</sub> |
| B 700-470   | 40         | 8               | 28                              | 23 <sup>5</sup> / <sub>8</sub>  | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub>  | 5 <sup>5</sup> / <sub>16</sub> |
| B 700-470   | 55         | 8               | 28                              | 23 <sup>5</sup> / <sub>8</sub>  | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub>  | 5 <sup>5</sup> / <sub>16</sub> |
| B 700-470   | 70         | 8               | 28                              | 23 <sup>5</sup> / <sub>8</sub>  | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub>  | 5 <sup>5</sup> / <sub>16</sub> |
| B 700-470   | 100        | 8               | 28                              | 23 <sup>5</sup> / <sub>8</sub>  | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub>  | 5 <sup>5</sup> / <sub>16</sub> |
| A 800-540   | 55         | 8               | 32                              | 26 <sup>3</sup> / <sub>4</sub>  | 31 <sup>7</sup> / <sub>8</sub>   | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>11</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| A 800-540   | 70         | 8               | 32                              | 26 <sup>3</sup> / <sub>4</sub>  | 31 <sup>7</sup> / <sub>8</sub>   | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>11</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| B 800-540   | 100        | 8               | 32                              | 26 <sup>3</sup> / <sub>4</sub>  | 31 <sup>7</sup> / <sub>8</sub>   | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>11</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| B 800-540   | 70         | 8               | 32                              | 26 <sup>3</sup> / <sub>4</sub>  | 31 <sup>7</sup> / <sub>8</sub>   | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>11</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| B 800-540   | 100        | 8               | 32                              | 26 <sup>3</sup> / <sub>4</sub>  | 31 <sup>7</sup> / <sub>8</sub>   | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>11</sup> / <sub>16</sub> | 5 <sup>5</sup> / <sub>16</sub> |
| A 900-540   | 120        | 8               | 36                              | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>1</sup> / <sub>4</sub>   | 5 <sup>5</sup> / <sub>16</sub> |
| A 900-540   | 40         | 10              | 36                              | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>1</sup> / <sub>4</sub>   | 5 <sup>5</sup> / <sub>16</sub> |
| A 900-540   | 60         | 10              | 36                              | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>1</sup> / <sub>4</sub>   | 5 <sup>5</sup> / <sub>16</sub> |
| A 900-540   | 90         | 10              | 36                              | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>1</sup> / <sub>4</sub>   | 5 <sup>5</sup> / <sub>16</sub> |
| B 900-540   | 120        | 8               | 36                              | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>1</sup> / <sub>4</sub>   | 5 <sup>5</sup> / <sub>16</sub> |
| B 900-540   | 160        | 8               | 36                              | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 49 <sup>3</sup> / <sub>16</sub> | 20 <sup>1</sup> / <sub>4</sub>   | 5 <sup>5</sup> / <sub>16</sub> |
| A 1000-700  | 120        | 10              | 40                              | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              | 30 <sup>1</sup> / <sub>8</sub>   | 3 <sup>3</sup> / <sub>8</sub>  |
| A 1000-700  | 155        | 10              | 40                              | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              | 30 <sup>1</sup> / <sub>8</sub>   | 3 <sup>3</sup> / <sub>8</sub>  |
| A 1000-700  | 200        | 10              | 40                              | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              | 30 <sup>1</sup> / <sub>8</sub>   | 3 <sup>3</sup> / <sub>8</sub>  |
| A 1000-700  | 250        | 10              | 40                              | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              | 30 <sup>1</sup> / <sub>8</sub>   | 3 <sup>3</sup> / <sub>8</sub>  |
| B 1000-700  | 155        | 10              | 40                              | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              | 30 <sup>1</sup> / <sub>8</sub>   | 3 <sup>3</sup> / <sub>8</sub>  |
| B 1000-700  | 200        | 10              | 40                              | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              | 30 <sup>1</sup> / <sub>8</sub>   | 3 <sup>3</sup> / <sub>8</sub>  |
| B 1000-700  | 250        | 10              | 40                              | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              | 30 <sup>1</sup> / <sub>8</sub>   | 3 <sup>3</sup> / <sub>8</sub>  |
| A 1200-870  | 190        | 12              | 48 <sup>1</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 39 <sup>3</sup> / <sub>8</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1200-870  | 251        | 12              | 48 <sup>1</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 39 <sup>3</sup> / <sub>8</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1200-870  | 320        | 12              | 48 <sup>1</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 39 <sup>3</sup> / <sub>8</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1200-870  | 370        | 12              | 48 <sup>1</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 39 <sup>3</sup> / <sub>8</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1200-870  | 410        | 12              | 48 <sup>1</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 39 <sup>3</sup> / <sub>8</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| B 1200-870  | 251        | 12              | 48 <sup>1</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 39 <sup>3</sup> / <sub>8</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| B 1200-870  | 320        | 12              | 48 <sup>1</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 39 <sup>3</sup> / <sub>8</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| B 1200-870  | 370        | 12              | 48 <sup>1</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 39 <sup>3</sup> / <sub>8</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| B 1200-870  | 410        | 12              | 48 <sup>1</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 39 <sup>3</sup> / <sub>8</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1500-1060 | 340        | 14              | 60 <sup>1</sup> / <sub>16</sub> | 52 <sup>3</sup> / <sub>8</sub>  | 59 <sup>13</sup> / <sub>16</sub> | 96 <sup>7</sup> / <sub>16</sub> | 57 <sup>1</sup> / <sub>2</sub>   | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1600-1060 | 370        | 14              | 64                              | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1600-1060 | 410        | 14              | 64                              | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1600-1060 | 450        | 14              | 64                              | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1600-1060 | 500        | 14              | 64                              | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 1 <sup>1</sup> / <sub>2</sub>  |
| A 1600-1060 | 550        | 14              | 64                              | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 1 <sup>1</sup> / <sub>2</sub>  |
| B 1600-1060 | 410        | 14              | 64                              | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 1 <sup>1</sup> / <sub>2</sub>  |
| B 1600-1060 | 450        | 14              | 64                              | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 1 <sup>1</sup> / <sub>2</sub>  |
| B 1600-1060 | 500        | 14              | 64                              | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 1 <sup>1</sup> / <sub>2</sub>  |
| B 1600-1060 | 550        | 14              | 64                              | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 1 <sup>1</sup> / <sub>2</sub>  |

### 9.5.2 Dimensions [mm]

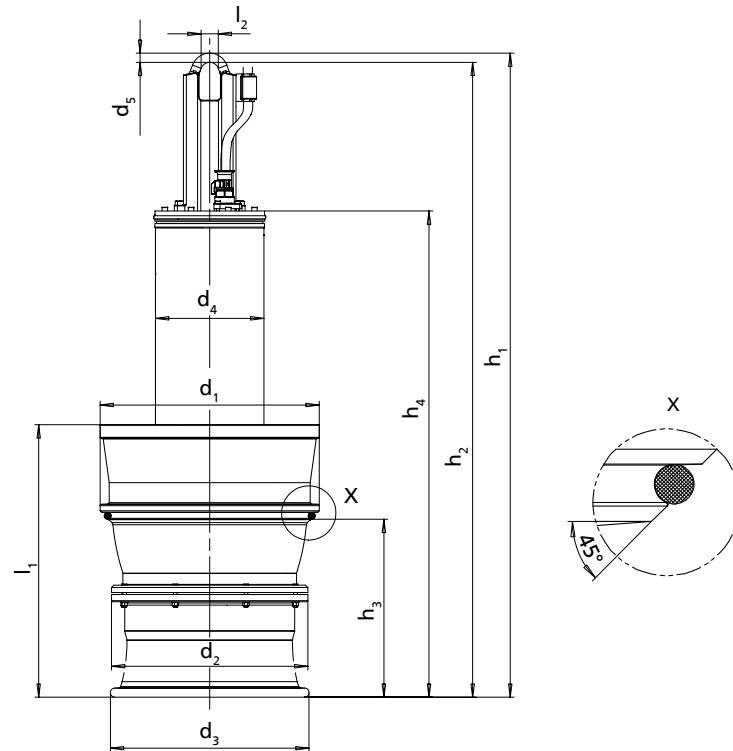


Fig. 65: Pump set dimensions

Table 50: Pump set dimensions

| Size       | Motor size | Number of poles | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | d <sub>5</sub> | h <sub>1</sub> | h <sub>2</sub> | h <sub>3</sub> | h <sub>4</sub> | l <sub>1</sub> | l <sub>2</sub> | [kg] <sup>11)</sup> |
|------------|------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|---------------------|
| A 700-470  | 80         | 6               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1015                |
| A 700-470  | 100        | 6               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1070                |
| A 700-470  | 120        | 6               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1140                |
| A 700-470  | 30         | 8               | 675            | 585            | 585            | 385            | 40             | 2190           | 2150           | 430            | 1500           | 735            | 80             | 905                 |
| A 700-470  | 40         | 8               | 675            | 585            | 585            | 385            | 40             | 2190           | 2150           | 430            | 1500           | 735            | 80             | 910                 |
| A 700-470  | 55         | 8               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1020                |
| A 700-470  | 70         | 8               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1030                |
| B 700-470  | 100        | 6               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1100                |
| B 700-470  | 120        | 6               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1170                |
| B 700-470  | 40         | 8               | 675            | 585            | 585            | 385            | 40             | 2190           | 2150           | 430            | 1500           | 735            | 80             | 940                 |
| B 700-470  | 55         | 8               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1045                |
| B 700-470  | 70         | 8               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1060                |
| B 700-470  | 100        | 8               | 675            | 585            | 585            | 385            | 40             | 2390           | 2350           | 430            | 1700           | 735            | 80             | 1170                |
| A 800-540  | 55         | 8               | 770            | 660            | 660            | 385            | 40             | 2445           | 2405           | 550            | 1755           | 945            | 80             | 1165                |
| A 800-540  | 70         | 8               | 770            | 660            | 660            | 385            | 40             | 2445           | 2405           | 550            | 1755           | 945            | 80             | 1175                |
| A 800-540  | 100        | 8               | 770            | 660            | 660            | 385            | 40             | 2445           | 2405           | 550            | 1755           | 945            | 80             | 1290                |
| B 800-540  | 70         | 8               | 770            | 660            | 660            | 385            | 40             | 2445           | 2405           | 550            | 1755           | 945            | 80             | 1205                |
| B 800-540  | 100        | 8               | 770            | 660            | 660            | 385            | 40             | 2445           | 2405           | 550            | 1755           | 945            | 80             | 1315                |
| A 900-540  | 120        | 8               | 860            | 660            | 660            | 475            | 40             | 2615           | 2575           | 570            | 1925           | 1045           | 80             | 1555                |
| A 900-540  | 40         | 10              | 860            | 660            | 660            | 475            | 40             | 2615           | 2575           | 570            | 1925           | 1045           | 80             | 1475                |
| A 900-540  | 60         | 10              | 860            | 660            | 660            | 475            | 40             | 2615           | 2575           | 570            | 1925           | 1045           | 80             | 1480                |
| A 900-540  | 90         | 10              | 860            | 660            | 660            | 475            | 40             | 2615           | 2575           | 570            | 1925           | 1045           | 80             | 1485                |
| B 900-540  | 120        | 8               | 860            | 660            | 660            | 475            | 40             | 2615           | 2575           | 570            | 1925           | 1045           | 80             | 1580                |
| B 900-540  | 160        | 8               | 860            | 660            | 660            | 475            | 40             | 2615           | 2575           | 570            | 1925           | 1045           | 80             | 1735                |
| A 1000-700 | 120        | 10              | 960            | 860            | 870            | 475            | 40             | 2820           | 2780           | 780            | 2130           | 1195           | 80             | 2095                |

<sup>11</sup> Pump set with 10-meter power cable (400 V) and 5-meter support rope

| Size        | Motor size | Number of poles | d <sub>1</sub> | d <sub>2</sub> | d <sub>3</sub> | d <sub>4</sub> | d <sub>5</sub> | h <sub>1</sub> | h <sub>2</sub> | h <sub>3</sub> | h <sub>4</sub> | l <sub>1</sub> | l <sub>2</sub> | [kg] <sup>1)</sup> |
|-------------|------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------|
| A 1000-700  | 155        | 10              | 960            | 860            | 870            | 555            | 50             | 3230           | 3170           | 780            | 2630           | 1195           | 90             | 2755               |
| A 1000-700  | 200        | 10              | 960            | 860            | 870            | 555            | 50             | 3230           | 3170           | 780            | 2630           | 1195           | 90             | 2885               |
| A 1000-700  | 250        | 10              | 960            | 860            | 870            | 555            | 50             | 3230           | 3170           | 780            | 2630           | 1195           | 90             | 3120               |
| B 1000-700  | 155        | 10              | 960            | 860            | 870            | 555            | 50             | 3230           | 3170           | 780            | 2630           | 1195           | 90             | 2795               |
| B 1000-700  | 200        | 10              | 960            | 860            | 870            | 555            | 50             | 3230           | 3170           | 780            | 2630           | 1195           | 90             | 2925               |
| B 1000-700  | 250        | 10              | 960            | 860            | 870            | 555            | 50             | 3230           | 3170           | 780            | 2630           | 1195           | 90             | 3165               |
| A 1200-870  | 190        | 12              | 1150           | 1050           | 1050           | 650            | 60             | 3740           | 3665           | 1015           | 3040           | 1405           | 90             | 4355               |
| A 1200-870  | 251        | 12              | 1150           | 1050           | 1050           | 650            | 60             | 3740           | 3665           | 1015           | 3040           | 1405           | 90             | 4480               |
| A 1200-870  | 320        | 12              | 1150           | 1050           | 1050           | 650            | 60             | 3965           | 3890           | 1015           | 3265           | 1405           | 90             | 4820               |
| A 1200-870  | 370        | 12              | 1150           | 1050           | 1050           | 650            | 60             | 3965           | 3890           | 1015           | 3265           | 1405           | 90             | 4980               |
| A 1200-870  | 410        | 12              | 1150           | 1050           | 1050           | 650            | 60             | 3965           | 3890           | 1015           | 3265           | 1405           | 90             | 5155               |
| B 1200-870  | 251        | 12              | 1150           | 1050           | 1050           | 650            | 60             | 3740           | 3665           | 1015           | 3040           | 1405           | 90             | 4480               |
| B 1200-870  | 320        | 12              | 1150           | 1050           | 1050           | 650            | 60             | 3965           | 3890           | 1015           | 3265           | 1405           | 90             | 4850               |
| B 1200-870  | 370        | 12              | 1150           | 1050           | 1050           | 650            | 60             | 3965           | 3890           | 1015           | 3265           | 1405           | 90             | 5110               |
| B 1200-870  | 410        | 12              | 1150           | 1050           | 1050           | 650            | 60             | 3965           | 3890           | 1015           | 3265           | 1405           | 90             | 5290               |
| A 1500-1060 | 340        | 14              | 1430           | 1300           | 1300           | 760            | 70             | 4085           | 3995           | 1260           | 3375           | 1800           | 100            | 7050               |
| A 1600-1060 | 370        | 14              | 1540           | 1350           | 1300           | 760            | 70             | 4085           | 3995           | 1260           | 3375           | 1800           | 100            | 7370               |
| A 1600-1060 | 410        | 14              | 1540           | 1350           | 1300           | 760            | 70             | 4085           | 3995           | 1260           | 3375           | 1800           | 100            | 7790               |
| A 1600-1060 | 450        | 14              | 1540           | 1350           | 1300           | 775            | 70             | 4385           | 4295           | 1260           | 3675           | 1800           | 100            | 8260               |
| A 1600-1060 | 500        | 14              | 1540           | 1350           | 1300           | 775            | 70             | 4385           | 4295           | 1260           | 3675           | 1800           | 100            | 8480               |
| A 1600-1060 | 550        | 14              | 1540           | 1350           | 1300           | 775            | 70             | 4385           | 4295           | 1260           | 3675           | 1800           | 100            | 8660               |
| B 1600-1060 | 410        | 14              | 1540           | 1350           | 1300           | 760            | 70             | 4085           | 3995           | 1260           | 3375           | 1800           | 100            | 7550               |
| B 1600-1060 | 450        | 14              | 1540           | 1350           | 1300           | 775            | 70             | 4385           | 4295           | 1260           | 3675           | 1800           | 100            | 8170               |
| B 1600-1060 | 500        | 14              | 1540           | 1350           | 1300           | 775            | 70             | 4385           | 4295           | 1260           | 3675           | 1800           | 100            | 8440               |
| B 1600-1060 | 550        | 14              | 1540           | 1350           | 1300           | 775            | 70             | 4385           | 4295           | 1260           | 3675           | 1800           | 100            | 8660               |

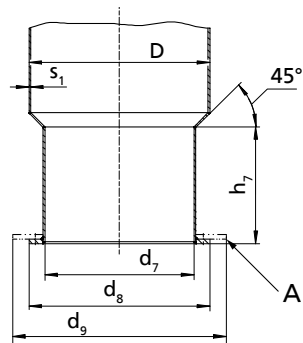


Fig. 66: Discharge tube dimensions

A Suction umbrella; option for reducing the minimum water level

Table 51: Discharge tube dimensions [mm]

| Size      | Motor size | Number of poles | D   | d <sub>7</sub> | d <sub>8</sub> | d <sub>9</sub> | h <sub>7</sub> | s <sub>1</sub> |
|-----------|------------|-----------------|-----|----------------|----------------|----------------|----------------|----------------|
| A 700-470 | 80         | 6               | 711 | 600            | 710            | 1100           | 420            | 8              |
| A 700-470 | 100        | 6               | 711 | 600            | 710            | 1100           | 420            | 8              |
| A 700-470 | 120        | 6               | 711 | 600            | 710            | 1100           | 420            | 8              |
| A 700-470 | 30         | 8               | 711 | 600            | 710            | 1100           | 420            | 8              |
| A 700-470 | 40         | 8               | 711 | 600            | 710            | 1100           | 420            | 8              |
| A 700-470 | 55         | 8               | 711 | 600            | 710            | 1100           | 420            | 8              |
| A 700-470 | 70         | 8               | 711 | 600            | 710            | 1100           | 420            | 8              |
| B 700-470 | 100        | 6               | 711 | 600            | 710            | 1100           | 420            | 8              |
| B 700-470 | 120        | 6               | 711 | 600            | 710            | 1100           | 420            | 8              |
| B 700-470 | 40         | 8               | 711 | 600            | 710            | 1100           | 420            | 8              |
| B 700-470 | 55         | 8               | 711 | 600            | 710            | 1100           | 420            | 8              |

| Size        | Motor size | Number of poles | D    | d <sub>7</sub> | d <sub>8</sub> | d <sub>9</sub> | h <sub>7</sub> | s <sub>1</sub> |
|-------------|------------|-----------------|------|----------------|----------------|----------------|----------------|----------------|
| B 700-470   | 70         | 8               | 711  | 600            | 710            | 1100           | 420            | 8              |
| B 700-470   | 100        | 8               | 711  | 600            | 710            | 1100           | 420            | 8              |
| A 800-540   | 55         | 8               | 813  | 680            | 810            | 1250           | 525            | 8              |
| A 800-540   | 70         | 8               | 813  | 680            | 810            | 1250           | 525            | 8              |
| A 800-540   | 100        | 8               | 813  | 680            | 810            | 1250           | 525            | 8              |
| B 800-540   | 70         | 8               | 813  | 680            | 810            | 1250           | 525            | 8              |
| B 800-540   | 100        | 8               | 813  | 680            | 810            | 1250           | 525            | 8              |
| A 900-540   | 120        | 8               | 914  | 700            | 910            | 1250           | 515            | 8              |
| A 900-540   | 40         | 10              | 914  | 700            | 910            | 1250           | 515            | 8              |
| A 900-540   | 60         | 10              | 914  | 700            | 910            | 1250           | 515            | 8              |
| A 900-540   | 90         | 10              | 914  | 700            | 910            | 1250           | 515            | 8              |
| B 900-540   | 120        | 8               | 914  | 700            | 910            | 1250           | 515            | 8              |
| B 900-540   | 160        | 8               | 914  | 700            | 910            | 1250           | 515            | 8              |
| A 1000-700  | 120        | 10              | 1016 | 880            | 1015           | 1600           | 765            | 10             |
| A 1000-700  | 155        | 10              | 1016 | 880            | 1015           | 1600           | 765            | 10             |
| A 1000-700  | 200        | 10              | 1016 | 880            | 1015           | 1600           | 765            | 10             |
| A 1000-700  | 250        | 10              | 1016 | 880            | 1015           | 1600           | 765            | 10             |
| B 1000-700  | 155        | 10              | 1016 | 880            | 1015           | 1600           | 765            | 10             |
| B 1000-700  | 200        | 10              | 1016 | 880            | 1015           | 1600           | 765            | 10             |
| B 1000-700  | 250        | 10              | 1016 | 880            | 1015           | 1600           | 765            | 10             |
| A 1200-870  | 190        | 12              | 1220 | 1070           | 1220           | 2000           | 1000           | 12             |
| A 1200-870  | 251        | 12              | 1220 | 1070           | 1220           | 2000           | 1000           | 12             |
| A 1200-870  | 320        | 12              | 1220 | 1070           | 1220           | 2000           | 1000           | 12             |
| A 1200-870  | 370        | 12              | 1220 | 1070           | 1220           | 2000           | 1000           | 12             |
| A 1200-870  | 410        | 12              | 1220 | 1070           | 1220           | 2000           | 1000           | 12             |
| B 1200-870  | 251        | 12              | 1220 | 1070           | 1220           | 2000           | 1000           | 12             |
| B 1200-870  | 320        | 12              | 1220 | 1070           | 1220           | 2000           | 1000           | 12             |
| B 1200-870  | 370        | 12              | 1220 | 1070           | 1220           | 2000           | 1000           | 12             |
| B 1200-870  | 410        | 12              | 1220 | 1070           | 1220           | 2000           | 1000           | 12             |
| A 1500-1060 | 340        | 14              | 1525 | 1330           | 1520           | 2450           | 1460           | 12             |
| A 1600-1060 | 370        | 14              | 1625 | 1420           | 1620           | 2450           | 1230           | 12             |
| A 1600-1060 | 410        | 14              | 1625 | 1420           | 1620           | 2450           | 1230           | 12             |
| A 1600-1060 | 450        | 14              | 1625 | 1420           | 1620           | 2450           | 1230           | 12             |
| A 1600-1060 | 500        | 14              | 1625 | 1420           | 1620           | 2450           | 1230           | 12             |
| A 1600-1060 | 550        | 14              | 1625 | 1420           | 1620           | 2450           | 1230           | 12             |
| B 1600-1060 | 410        | 14              | 1625 | 1420           | 1620           | 2450           | 1230           | 12             |
| B 1600-1060 | 450        | 14              | 1625 | 1420           | 1620           | 2450           | 1230           | 12             |
| B 1600-1060 | 500        | 14              | 1625 | 1420           | 1620           | 2450           | 1230           | 12             |
| B 1600-1060 | 550        | 14              | 1625 | 1420           | 1620           | 2450           | 1230           | 12             |

## 9.6 General arrangement drawings

### 9.6.1 General arrangement drawings [inch]

#### 9.6.1.1 Installation type BU

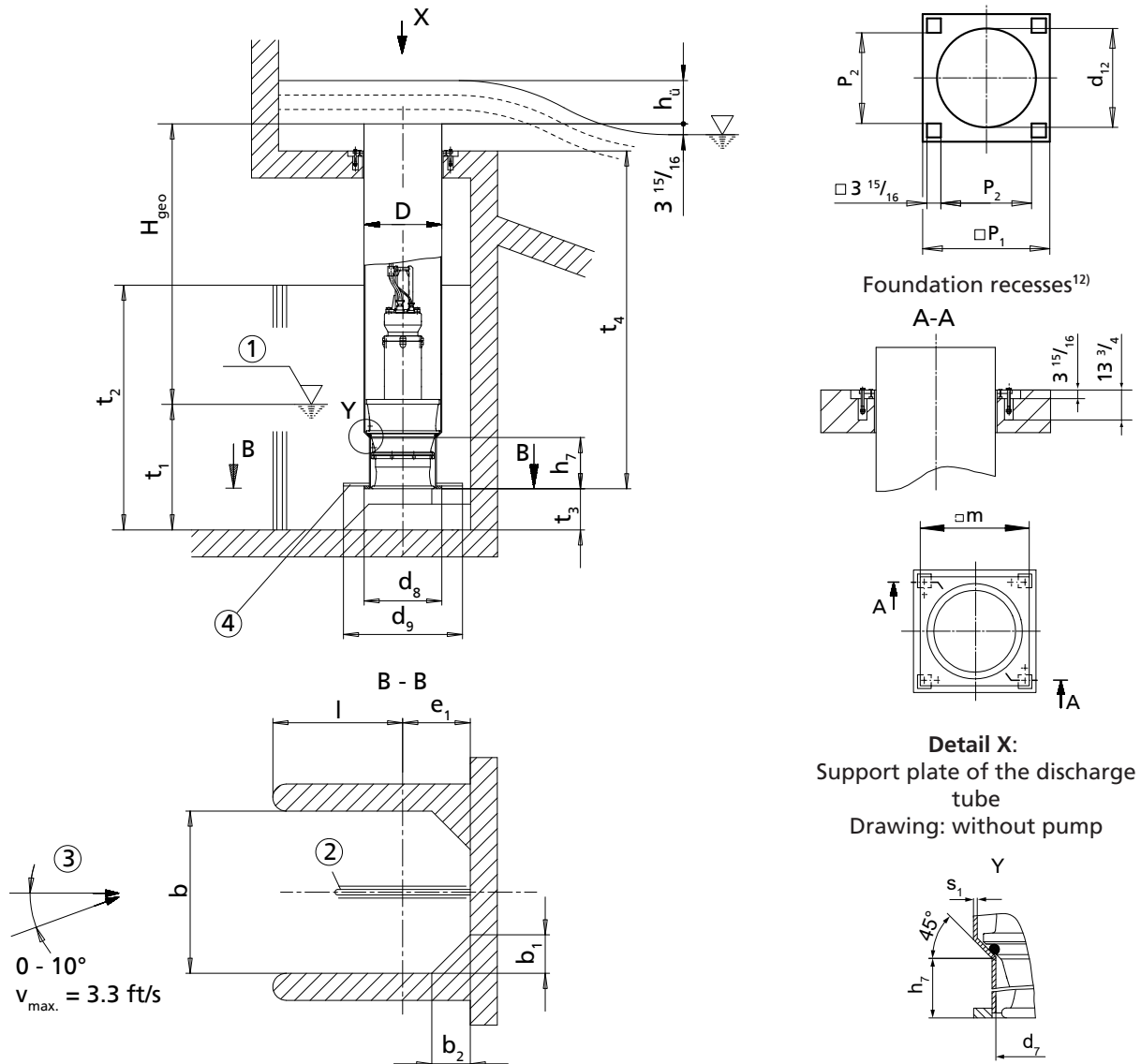


Table 52: Dimensions [inch]

| Size     | D  | b                               | b <sub>1</sub>                   |                | b <sub>2</sub>                   |                | d <sub>7</sub>                  | d <sub>8</sub>                   | d <sub>9</sub>                  |
|----------|----|---------------------------------|----------------------------------|----------------|----------------------------------|----------------|---------------------------------|----------------------------------|---------------------------------|
|          |    |                                 | Suction umbrella                 |                | Suction umbrella                 |                |                                 |                                  |                                 |
|          |    |                                 | ✗                                | ✓              | ✗                                | ✓              |                                 |                                  |                                 |
|          |    |                                 | d <sub>8</sub>                   | d <sub>9</sub> | d <sub>8</sub>                   | d <sub>9</sub> |                                 |                                  |                                 |
| 700-470  | 28 | 59 <sup>1</sup> / <sub>16</sub> | 11 <sup>13</sup> / <sub>16</sub> | —              | 11 <sup>13</sup> / <sub>16</sub> | —              | 23 <sup>5</sup> / <sub>8</sub>  | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> |
| 800-540  | 32 | 70 <sup>7</sup> / <sub>8</sub>  | 14 <sup>3</sup> / <sub>16</sub>  | —              | 14 <sup>3</sup> / <sub>16</sub>  | —              | 26 <sup>3</sup> / <sub>4</sub>  | 31 <sup>7</sup> / <sub>8</sub>   | 49 <sup>3</sup> / <sub>16</sub> |
| 900-540  | 36 | 70 <sup>7</sup> / <sub>8</sub>  | 14 <sup>3</sup> / <sub>16</sub>  | —              | 14 <sup>3</sup> / <sub>16</sub>  | —              | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 49 <sup>3</sup> / <sub>16</sub> |
| 1000-700 | 40 | 90 <sup>9</sup> / <sub>16</sub> | 18 <sup>1</sup> / <sub>8</sub>   | —              | 18 <sup>1</sup> / <sub>8</sub>   | —              | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              |

<sup>12</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

| Size      | D                               | b                                 | b <sub>1</sub>                  |                | b <sub>2</sub>                  |                | d <sub>7</sub>                 | d <sub>8</sub>                   | d <sub>9</sub>                  |
|-----------|---------------------------------|-----------------------------------|---------------------------------|----------------|---------------------------------|----------------|--------------------------------|----------------------------------|---------------------------------|
|           |                                 |                                   | Suction umbrella                |                | Suction umbrella                |                |                                |                                  |                                 |
|           |                                 |                                   | ✗                               | ✓              | ✗                               | ✓              |                                |                                  |                                 |
|           |                                 |                                   | d <sub>8</sub>                  | d <sub>9</sub> | d <sub>8</sub>                  | d <sub>9</sub> |                                |                                  |                                 |
| 1200-870  | 48 <sup>1</sup> / <sub>16</sub> | 110 <sup>1</sup> / <sub>4</sub>   | 22 <sup>1</sup> / <sub>16</sub> | —              | 22 <sup>1</sup> / <sub>16</sub> | —              | 42 <sup>1</sup> / <sub>8</sub> | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  |
| 1500-1060 | 60                              | 137 <sup>13</sup> / <sub>16</sub> | 52 <sup>3</sup> / <sub>8</sub>  | —              | 53 <sup>3</sup> / <sub>8</sub>  | —              | 52 <sup>3</sup> / <sub>8</sub> | 59 <sup>13</sup> / <sub>16</sub> | 96 <sup>7</sup> / <sub>16</sub> |
| 1600-1060 | 64                              | 137 <sup>13</sup> / <sub>16</sub> | 52 <sup>3</sup> / <sub>8</sub>  | —              | 53 <sup>3</sup> / <sub>8</sub>  | —              | 55 <sup>7</sup> / <sub>8</sub> | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> |

Table 53: Dimensions [inch]

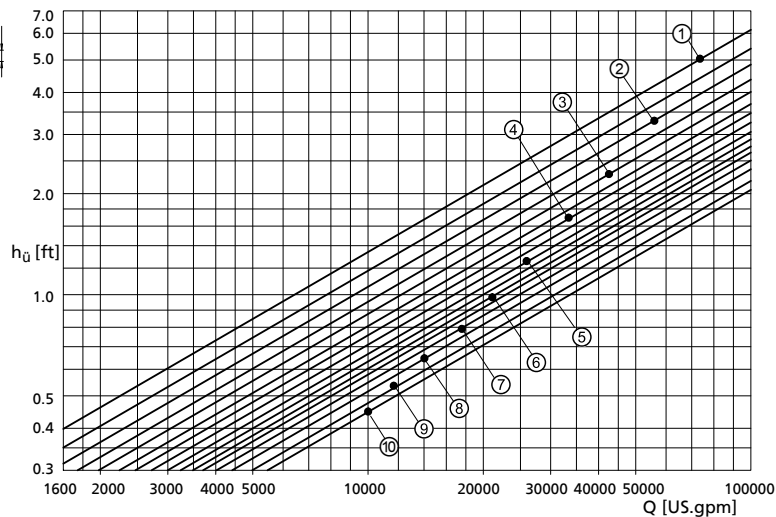
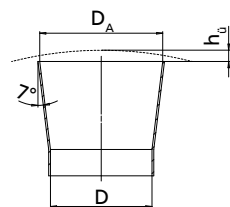
| Size      | d <sub>12</sub> | e <sub>1</sub> <sup>(13)</sup> |                | h <sub>7</sub> | l <sub>min.</sub> | m        | p <sub>1</sub> | p <sub>2</sub> | t <sub>3</sub> <sup>(13)</sup> | t <sub>4 min.</sub> <sup>(14)</sup> |
|-----------|-----------------|--------------------------------|----------------|----------------|-------------------|----------|----------------|----------------|--------------------------------|-------------------------------------|
|           |                 | Suction umbrella               |                |                |                   |          |                |                |                                |                                     |
|           |                 | ✗                              | ✓              |                |                   |          |                |                |                                |                                     |
|           |                 | d <sub>8</sub>                 | d <sub>9</sub> |                |                   |          |                |                |                                |                                     |
| 700-470   | 29 1/2          | 17 11/16                       | 25 9/16        | 16 9/16        | 41 5/16           | 31 1/2   | 35 7/16        | 25 3/16        | 14 15/16                       | 90 9/16                             |
| 800-540   | 33 7/16         | 19 11/16                       | 27 9/16        | 20 11/16       | 51 3/16           | 35 13/16 | 39 3/8         | 29 1/8         | 17 5/16                        | 92 1/2                              |
| 900-540   | 38 3/16         | 21 5/8                         | 27 9/16        | 20 1/4         | 51 3/16           | 41 5/16  | 44 1/8         | 33 7/8         | 17 5/16                        | 98 7/16                             |
| 1000-700  | 42 1/8          | 23 5/8                         | 35 7/16        | 30 1/8         | 66 15/16          | 45 1/4   | 48 1/16        | 37 13/16       | 22 1/16                        | 120 1/16                            |
| 1200-870  | 50 3/8          | 27 9/16                        | 43 5/16        | 39 3/8         | 82 11/16          | 53 9/16  | 55 7/8         | 45 11/16       | 26 3/4                         | 147 5/8                             |
| 1500-1060 | 62 5/8          | 33 7/16                        | 51 3/16        | 57 1/2         | 104 5/16          | 66 1/8   | 68 7/8         | 58 1/4         | 33 7/8                         | 153 9/16                            |
| 1600-1060 | 66 9/16         | 35 7/16                        | 51 3/16        | 48 7/16        | 102 3/8           | 70 1/16  | 72 13/16       | 62 3/16        | 33 7/8                         | 171 1/4                             |

t<sub>2</sub> = 1.1 × water level, maximum 2 × t<sub>1</sub>  
Height of corner lining (b<sub>1</sub> and b<sub>2</sub>) like t<sub>2</sub>

Permissible dimensional tolerances:

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

Loss diagram



- ① - D<sub>A</sub> = 15 <sup>3</sup>/<sub>4</sub> inches
- ② - D<sub>A</sub> = 23 <sup>5</sup>/<sub>8</sub> inches
- ③ - D<sub>A</sub> = 31 <sup>1</sup>/<sub>2</sub> inches
- ④ - D<sub>A</sub> = 39 <sup>3</sup>/<sub>8</sub> inches
- ⑤ - D<sub>A</sub> = 47 <sup>1</sup>/<sub>4</sub> inches
- ⑥ - D<sub>A</sub> = 55 <sup>1</sup>/<sub>8</sub> inches
- ⑦ - D<sub>A</sub> = 63 inches
- ⑧ - D<sub>A</sub> = 70 <sup>7</sup>/<sub>8</sub> inches
- ⑨ - D<sub>A</sub> = 78 <sup>3</sup>/<sub>4</sub> inches
- ⑩ - D<sub>A</sub> = 86 <sup>5</sup>/<sub>8</sub> inches

Illustration of the overflow head h<sub>u</sub>

Loss diagram

Calculation formulas:

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

<sup>13</sup> Observe this dimension.

<sup>14</sup> Value for maximum motor length

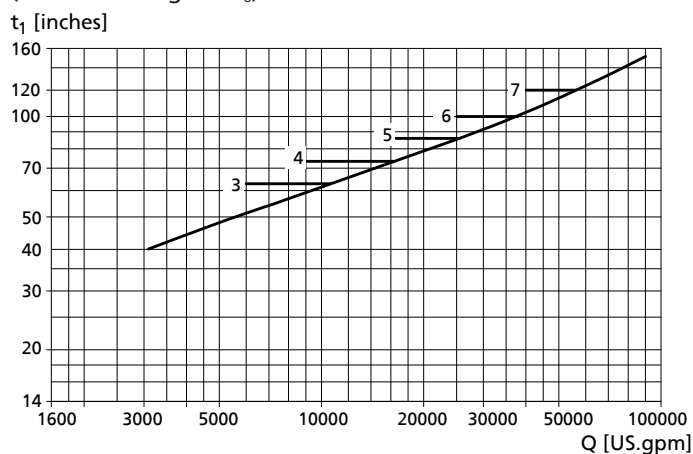
$\Delta H_v$

- Overflow head  $h_0$  (see diagram)
- Loss in the riser (pipe friction)
- Outlet loss  $v^2 / 2g$  (v refers to  $D_A$ )

Overflow head  $h_0$  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 diagrams

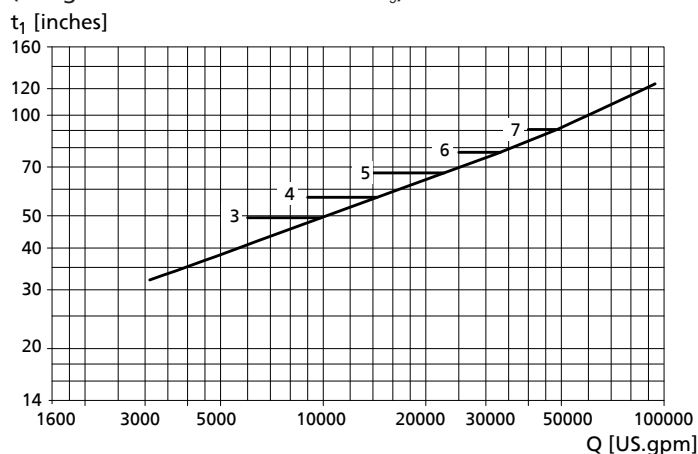
Open intake chamber  
(standard design  $\varnothing d_8$ )



Key

- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600 - 1060

Open intake chamber  
(design with suction umbrella  $\varnothing d_9$ )



### 9.6.1.2 Installation type BG

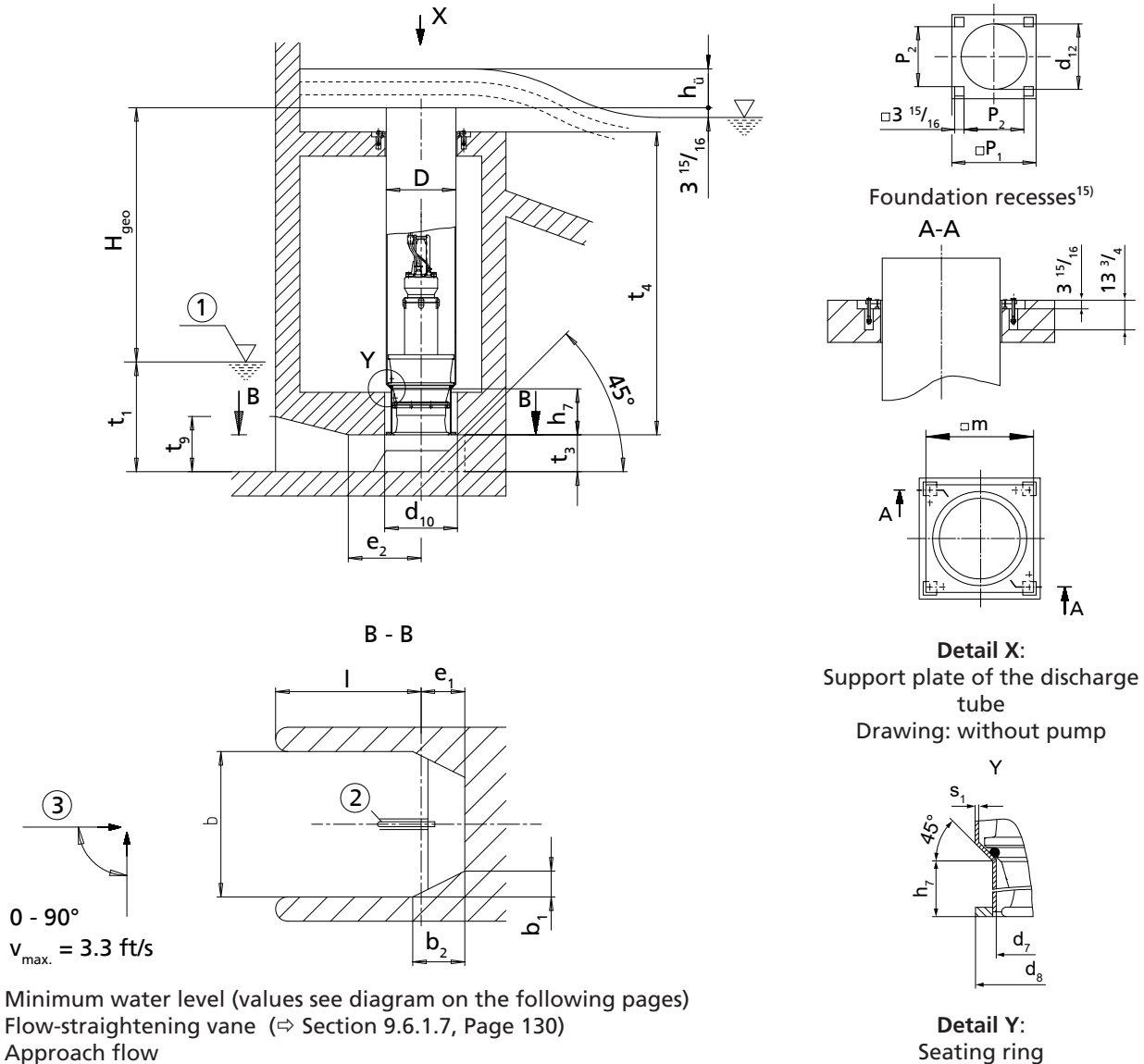


Table 54: Dimensions [inch]

| Size      | D                               | b                                 | b <sub>1</sub>                   | b <sub>2</sub>                 | d <sub>7</sub>                  | d <sub>8</sub>                   | d <sub>10</sub>                  | d <sub>12</sub>                 | e <sub>1</sub> <sup>15)</sup>    | e <sub>2</sub>                  |
|-----------|---------------------------------|-----------------------------------|----------------------------------|--------------------------------|---------------------------------|----------------------------------|----------------------------------|---------------------------------|----------------------------------|---------------------------------|
| 700-470   | 28                              | 59 <sup>1</sup> / <sub>16</sub>   | 11 <sup>13</sup> / <sub>16</sub> | 23 <sup>5</sup> / <sub>8</sub> | 23 <sup>5</sup> / <sub>8</sub>  | 27 <sup>15</sup> / <sub>16</sub> | 29 <sup>1</sup> / <sub>8</sub>   | 29 <sup>1</sup> / <sub>2</sub>  | 17 <sup>11</sup> / <sub>16</sub> | 29 <sup>1</sup> / <sub>2</sub>  |
| 800-540   | 32                              | 70 <sup>7</sup> / <sub>8</sub>    | 14 <sup>3</sup> / <sub>16</sub>  | 28 <sup>3</sup> / <sub>8</sub> | 26 <sup>3</sup> / <sub>4</sub>  | 31 <sup>7</sup> / <sub>8</sub>   | 33 <sup>7</sup> / <sub>8</sub>   | 33 <sup>7</sup> / <sub>16</sub> | 20 <sup>7</sup> / <sub>16</sub>  | 35 <sup>7</sup> / <sub>16</sub> |
| 900-540   | 36                              | 70 <sup>7</sup> / <sub>8</sub>    | 14 <sup>3</sup> / <sub>16</sub>  | 28 <sup>3</sup> / <sub>8</sub> | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 37 <sup>13</sup> / <sub>16</sub> | 38 <sup>3</sup> / <sub>16</sub> | 20 <sup>7</sup> / <sub>16</sub>  | 35 <sup>7</sup> / <sub>16</sub> |
| 1000-700  | 40                              | 90 <sup>9</sup> / <sub>16</sub>   | 18 <sup>1</sup> / <sub>8</sub>   | 36 <sup>1</sup> / <sub>4</sub> | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 42 <sup>1</sup> / <sub>2</sub>   | 42 <sup>1</sup> / <sub>8</sub>  | 26 <sup>1</sup> / <sub>2</sub>   | 45 <sup>1</sup> / <sub>4</sub>  |
| 1200-870  | 48 <sup>1</sup> / <sub>16</sub> | 110 <sup>1</sup> / <sub>4</sub>   | 22 <sup>1</sup> / <sub>16</sub>  | 44 <sup>1</sup> / <sub>8</sub> | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 50 <sup>13</sup> / <sub>16</sub> | 50 <sup>3</sup> / <sub>8</sub>  | 32 <sup>13</sup> / <sub>16</sub> | 55 <sup>1</sup> / <sub>8</sub>  |
| 1500-1060 | 60                              | 137 <sup>13</sup> / <sub>16</sub> | 27 <sup>9</sup> / <sub>16</sub>  | 55 <sup>1</sup> / <sub>8</sub> | 52 <sup>3</sup> / <sub>8</sub>  | 59 <sup>13</sup> / <sub>16</sub> | 63                               | 62 <sup>5</sup> / <sub>8</sub>  | 41 <sup>1</sup> / <sub>4</sub>   | 68 <sup>7</sup> / <sub>8</sub>  |
| 1600-1060 | 64                              | 137 <sup>13</sup> / <sub>16</sub> | 27 <sup>9</sup> / <sub>16</sub>  | 55 <sup>1</sup> / <sub>8</sub> | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 66 <sup>15</sup> / <sub>16</sub> | 66 <sup>9</sup> / <sub>16</sub> | 41 <sup>1</sup> / <sub>4</sub>   | 68 <sup>7</sup> / <sub>8</sub>  |

Table 55: Dimensions [inch]

| Size    | h <sub>7</sub>                   | l <sub>min.</sub>               | m                                | p <sub>1</sub>                  | p <sub>2</sub>                  | t <sub>3</sub> <sup>17)</sup>    | t <sub>4 min.</sub> <sup>18)</sup> | t <sub>9</sub>                  |
|---------|----------------------------------|---------------------------------|----------------------------------|---------------------------------|---------------------------------|----------------------------------|------------------------------------|---------------------------------|
| 700-470 | 16 <sup>9</sup> / <sub>16</sub>  | 59 <sup>1</sup> / <sub>16</sub> | 31 <sup>1</sup> / <sub>2</sub>   | 35 <sup>7</sup> / <sub>16</sub> | 25 <sup>3</sup> / <sub>16</sub> | 14 <sup>15</sup> / <sub>16</sub> | 90 <sup>9</sup> / <sub>16</sub>    | 22 <sup>7</sup> / <sub>16</sub> |
| 800-540 | 20 <sup>11</sup> / <sub>16</sub> | 70 <sup>7</sup> / <sub>8</sub>  | 35 <sup>13</sup> / <sub>16</sub> | 39 <sup>3</sup> / <sub>8</sub>  | 29 <sup>1</sup> / <sub>8</sub>  | 17 <sup>5</sup> / <sub>16</sub>  | 92 <sup>1</sup> / <sub>2</sub>     | 26                              |
| 900-540 | 20 <sup>1</sup> / <sub>4</sub>   | 70 <sup>7</sup> / <sub>8</sub>  | 41 <sup>5</sup> / <sub>16</sub>  | 44 <sup>1</sup> / <sub>8</sub>  | 33 <sup>7</sup> / <sub>8</sub>  | 17 <sup>5</sup> / <sub>16</sub>  | 98 <sup>7</sup> / <sub>16</sub>    | 26                              |

<sup>15</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

<sup>16</sup> Observe this dimension.

<sup>17</sup> Observe this dimension.

<sup>18</sup> Value for maximum motor length

| Size      | $h_7$             | $l_{min.}$          | $m$               | $p_1$              | $p_2$              | $t_3^{17)}$       | $t_{4 min.}^{18)}$ | $t_9$              |
|-----------|-------------------|---------------------|-------------------|--------------------|--------------------|-------------------|--------------------|--------------------|
| 1000-700  | $30 \frac{1}{8}$  | $90 \frac{9}{16}$   | $45 \frac{1}{4}$  | $48 \frac{1}{16}$  | $37 \frac{13}{16}$ | $22 \frac{1}{16}$ | $120 \frac{1}{16}$ | $33 \frac{7}{16}$  |
| 1200-870  | $39 \frac{3}{8}$  | $110 \frac{1}{4}$   | $53 \frac{9}{16}$ | $55 \frac{7}{8}$   | $45 \frac{11}{16}$ | $26 \frac{3}{4}$  | $147 \frac{5}{8}$  | $41 \frac{5}{16}$  |
| 1500-1060 | $57 \frac{1}{2}$  | $137 \frac{13}{16}$ | $66 \frac{1}{8}$  | $68 \frac{7}{8}$   | $58 \frac{1}{4}$   | $33 \frac{7}{8}$  | $153 \frac{9}{16}$ | $51 \frac{15}{16}$ |
| 1600-1060 | $48 \frac{7}{16}$ | $137 \frac{13}{16}$ | $70 \frac{1}{16}$ | $72 \frac{13}{16}$ | $62 \frac{3}{16}$  | $33 \frac{7}{8}$  | $171 \frac{1}{4}$  | $51 \frac{15}{16}$ |

Permissible dimensional tolerances:

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

### Loss diagram

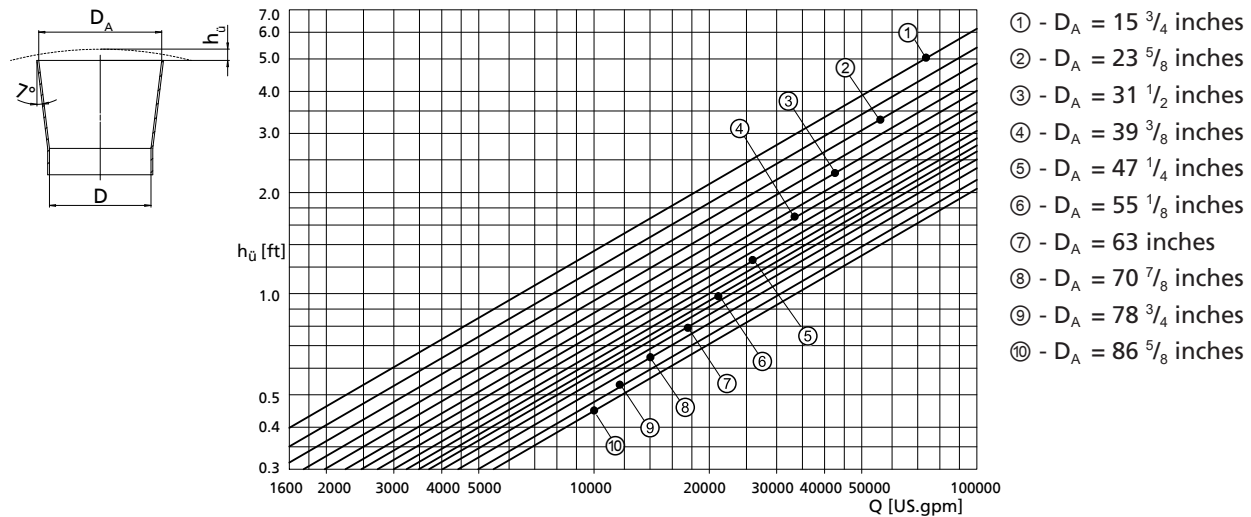


Illustration of the overflow head  $h_u$

Loss diagram

### Calculation formulas:

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

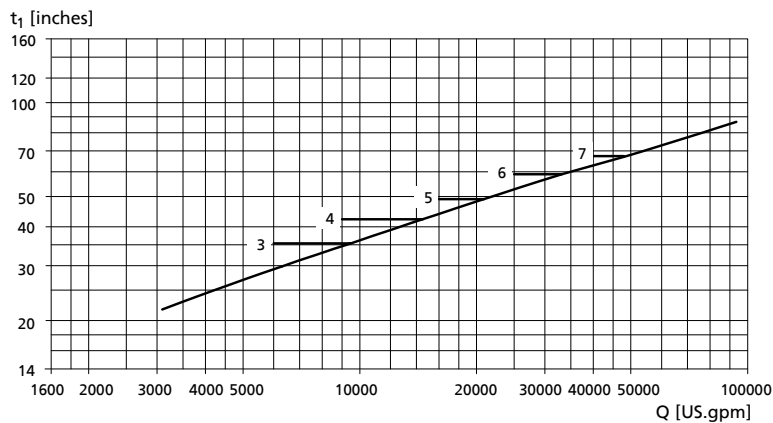
$$\Delta H_v$$

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

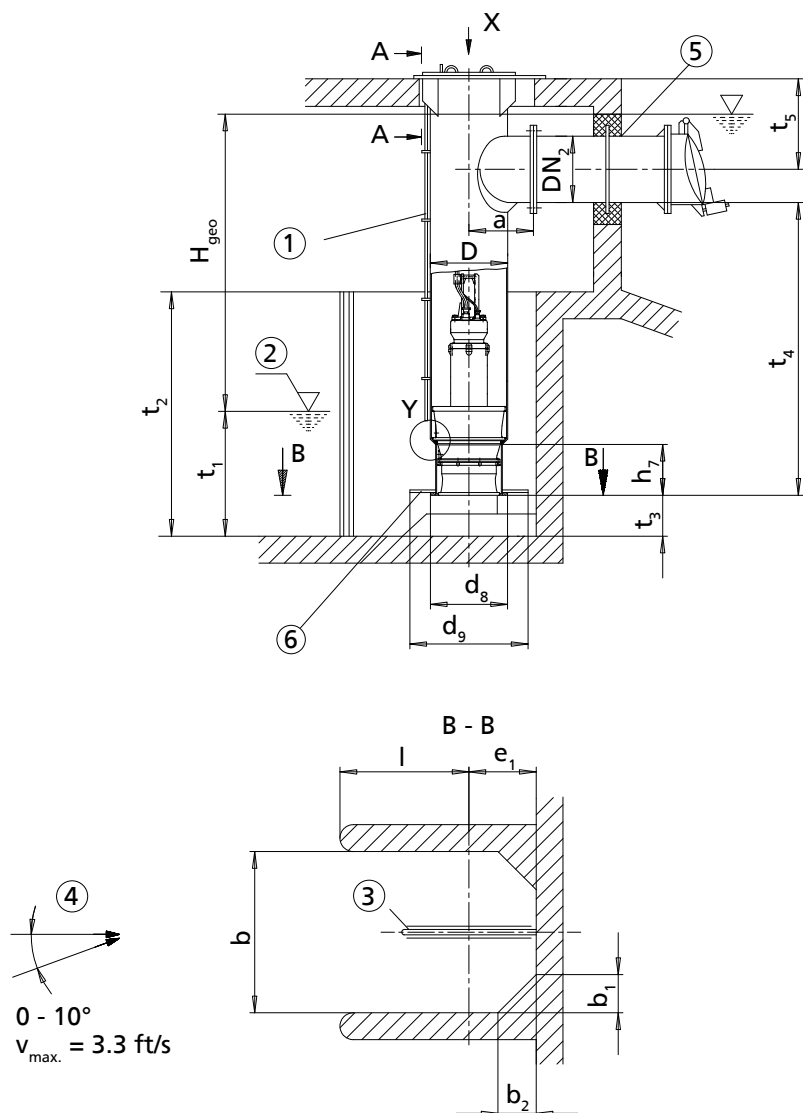
Overflow head  $h_u$  depends on  $Q$  and the discharge design  $\varnothing D_A$ . The characteristic curve values only apply to unimpeded outlet in all directions; otherwise they are approximate values only.

### Minimum water level diagrams

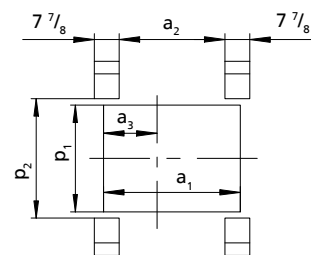
Covered intake chamber



### 9.6.1.3 Installation type CU

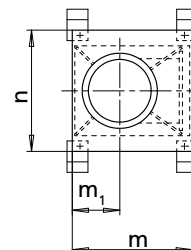
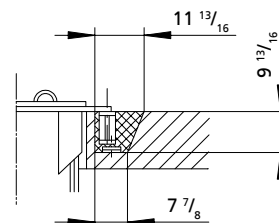


- ①: Vent line
- ②: Minimum water level (values see diagram on the next pages)
- ③: Flow-straightening vane (⇒ Section 9.6.1.7, Page 130)
- ④: Approach flow
- ⑤: Connect the discharge pipe to the discharge tube without transmitting any stresses or strains.
- ⑥: Suction umbrella - Option for reducing the minimum water level t<sub>1</sub>

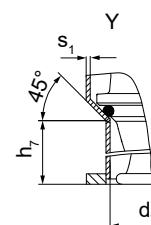


Foundation recesses<sup>19)</sup>

A - A



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



**Detail Y:**  
Seating ring

Table 56: Dimensions [inch]

| Size      | DN <sub>2 min.</sub> | DN <sub>2 max.</sub> | D       | a        | a <sub>1</sub> | a <sub>2</sub> | a <sub>3</sub> | b         | b <sub>1</sub>   |                | b <sub>2</sub>   |                |
|-----------|----------------------|----------------------|---------|----------|----------------|----------------|----------------|-----------|------------------|----------------|------------------|----------------|
|           |                      |                      |         |          |                |                |                |           | Suction umbrella |                | Suction umbrella |                |
|           |                      |                      |         |          |                |                |                |           | ✗                | ✓              | ✗                | ✓              |
|           |                      |                      |         |          |                |                |                |           | d <sub>8</sub>   | d <sub>9</sub> | d <sub>8</sub>   | d <sub>9</sub> |
| 700-470   | 15 3/4               | 27 9/16              | 28      | 25 9/16  | 44 1/8         | 34 1/4         | 16 15/16       | 59 1/16   | 11 13/16         | —              | 11 13/16         | —              |
| 800-540   | 19 11/16             | 31 1/2               | 32      | 27 9/16  | 48 1/16        | 38 3/16        | 18 7/8         | 70 7/8    | 14 3/16          | —              | 14 3/16          | —              |
| 900-540   | 23 5/8               | 35 7/16              | 36      | 29 15/16 | 51 15/16       | 42 1/8         | 20 7/8         | 70 7/8    | 14 3/16          | —              | 14 3/16          | —              |
| 1000-700  | 27 9/16              | 39 3/8               | 40      | 31 7/8   | 56 5/16        | 45 11/16       | 22 13/16       | 90 9/16   | 18 1/8           | —              | 18 1/8           | —              |
| 1200-870  | 35 7/16              | 47 1/4               | 48 1/16 | 35 13/16 | 64 3/16        | 53 9/16        | 26 3/4         | 110 1/4   | 22 1/16          | —              | 22 1/16          | —              |
| 1500-1060 | 47 1/4               | 59 1/16              | 60      | 41 3/4   | 77 3/16        | 66 9/16        | 33 7/16        | 137 13/16 | 27 9/16          | —              | 27 9/16          | —              |
| 1600-1060 | 51 3/16              | 63                   | 64      | 43 11/16 | 81 7/8         | 71 1/4         | 36 1/4         | 137 13/16 | 27 9/16          | —              | 27 9/16          | —              |

<sup>19)</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

Table 57: Dimensions [inch]

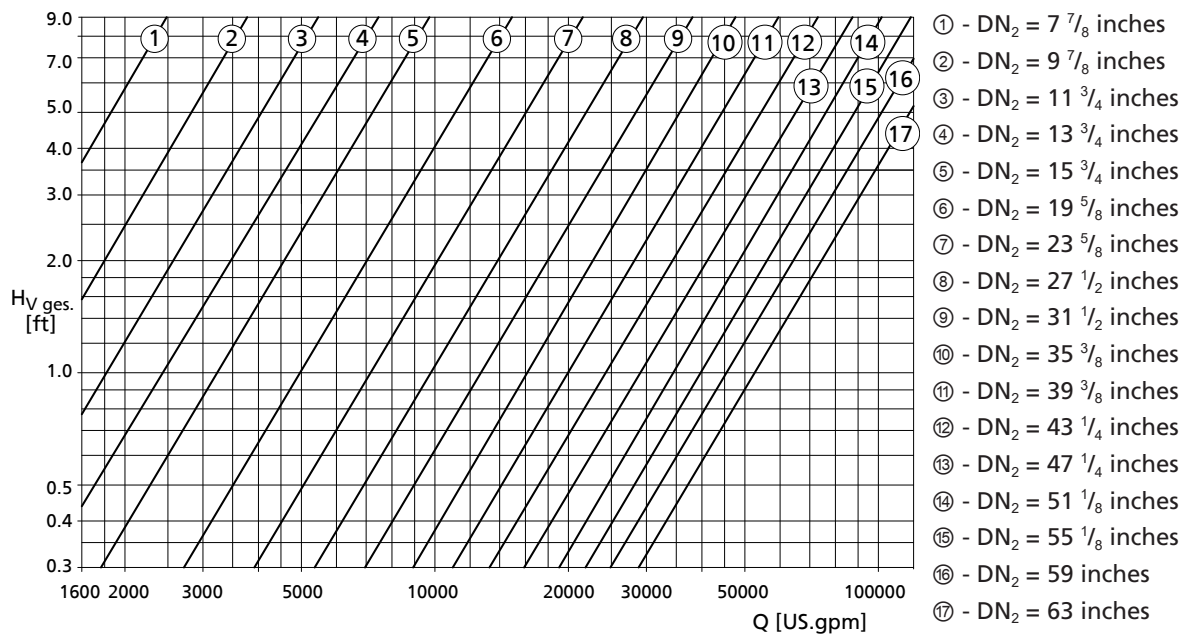
| Size      | d <sub>7</sub>                  | d <sub>8</sub>                   | d <sub>9</sub>                  | e <sub>1</sub> <sup>20)</sup>    |                                 | h <sub>7</sub>                   | l <sub>min.</sub>                | m                                | m <sub>1</sub>                   | n                                | p <sub>1</sub>                   | p <sub>2</sub>                  | t <sub>3</sub> <sup>20)</sup>    | t <sub>4 min.</sub> <sup>21)</sup> | t <sub>5 min.</sub> <sup>22)</sup> |
|-----------|---------------------------------|----------------------------------|---------------------------------|----------------------------------|---------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|---------------------------------|----------------------------------|------------------------------------|------------------------------------|
|           |                                 |                                  |                                 | Suction umbrella                 |                                 |                                  |                                  |                                  |                                  |                                  |                                  |                                 |                                  |                                    |                                    |
|           |                                 |                                  |                                 | ✗                                | ✓                               |                                  |                                  |                                  |                                  |                                  |                                  |                                 |                                  |                                    |                                    |
|           |                                 |                                  |                                 | d <sub>8</sub>                   | d <sub>9</sub>                  |                                  |                                  |                                  |                                  |                                  |                                  |                                 |                                  |                                    |                                    |
| 700-470   | 23 <sup>5</sup> / <sub>8</sub>  | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 17 <sup>11</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub>  | 41 <sup>5</sup> / <sub>16</sub>  | 46 <sup>1</sup> / <sub>16</sub>  | 17 <sup>15</sup> / <sub>16</sub> | 49 <sup>5</sup> / <sub>8</sub>   | 37 <sup>13</sup> / <sub>16</sub> | 41 <sup>3</sup> / <sub>4</sub>  | 14 <sup>15</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>2</sub>     | 30 <sup>5</sup> / <sub>16</sub>    |
| 800-540   | 26 <sup>3</sup> / <sub>4</sub>  | 31 <sup>7</sup> / <sub>8</sub>   | 49 <sup>3</sup> / <sub>16</sub> | 19 <sup>11</sup> / <sub>16</sub> | 27 <sup>9</sup> / <sub>16</sub> | 20 <sup>11</sup> / <sub>16</sub> | 51 <sup>3</sup> / <sub>16</sub>  | 50                               | 19 <sup>7</sup> / <sub>8</sub>   | 54 <sup>1</sup> / <sub>8</sub>   | 42 <sup>5</sup> / <sub>16</sub>  | 46 <sup>1</sup> / <sub>4</sub>  | 17 <sup>5</sup> / <sub>16</sub>  | 96 <sup>7</sup> / <sub>16</sub>    | 32 <sup>7</sup> / <sub>8</sub>     |
| 900-540   | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 49 <sup>3</sup> / <sub>16</sub> | 21 <sup>5</sup> / <sub>8</sub>   | 27 <sup>9</sup> / <sub>16</sub> | 20 <sup>1</sup> / <sub>4</sub>   | 51 <sup>3</sup> / <sub>16</sub>  | 54 <sup>5</sup> / <sub>16</sub>  | 22 <sup>1</sup> / <sub>16</sub>  | 58 <sup>1</sup> / <sub>4</sub>   | 46 <sup>7</sup> / <sub>16</sub>  | 50 <sup>3</sup> / <sub>8</sub>  | 17 <sup>5</sup> / <sub>16</sub>  | 104 <sup>5</sup> / <sub>16</sub>   | 36 <sup>7</sup> / <sub>16</sub>    |
| 1000-700  | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              | 23 <sup>5</sup> / <sub>8</sub>   | 35 <sup>7</sup> / <sub>16</sub> | 30 <sup>1</sup> / <sub>8</sub>   | 66 <sup>15</sup> / <sub>16</sub> | 59 <sup>13</sup> / <sub>16</sub> | 24 <sup>5</sup> / <sub>8</sub>   | 63 <sup>3</sup> / <sub>4</sub>   | 50 <sup>3</sup> / <sub>8</sub>   | 54 <sup>5</sup> / <sub>16</sub> | 22 <sup>1</sup> / <sub>16</sub>  | 127 <sup>15</sup> / <sub>16</sub>  | 36 <sup>9</sup> / <sub>16</sub>    |
| 1200-870  | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 27 <sup>9</sup> / <sub>16</sub>  | 43 <sup>5</sup> / <sub>16</sub> | 39 <sup>3</sup> / <sub>8</sub>   | 82 <sup>11</sup> / <sub>16</sub> | 67 <sup>11</sup> / <sub>16</sub> | 28 <sup>9</sup> / <sub>16</sub>  | 72 <sup>13</sup> / <sub>16</sub> | 59 <sup>7</sup> / <sub>16</sub>  | 63 <sup>3</sup> / <sub>8</sub>  | 26 <sup>3</sup> / <sub>4</sub>   | 157 <sup>1</sup> / <sub>2</sub>    | 43 <sup>5</sup> / <sub>16</sub>    |
| 1500-1060 | 52 <sup>3</sup> / <sub>8</sub>  | 59 <sup>13</sup> / <sub>16</sub> | 96 <sup>7</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>16</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 57 <sup>1</sup> / <sub>2</sub>   | 104 <sup>5</sup> / <sub>16</sub> | 80 <sup>11</sup> / <sub>16</sub> | 35 <sup>1</sup> / <sub>4</sub>   | 85 <sup>13</sup> / <sub>16</sub> | 72 <sup>7</sup> / <sub>16</sub>  | 76 <sup>3</sup> / <sub>8</sub>  | 33 <sup>7</sup> / <sub>8</sub>   | 159 <sup>7</sup> / <sub>16</sub>   | 51 <sup>3</sup> / <sub>16</sub>    |
| 1600-1060 | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 35 <sup>7</sup> / <sub>16</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 102 <sup>3</sup> / <sub>8</sub>  | 85 <sup>7</sup> / <sub>16</sub>  | 38                               | 89 <sup>3</sup> / <sub>4</sub>   | 76 <sup>3</sup> / <sub>8</sub>   | 80 <sup>5</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>   | 175 <sup>3</sup> / <sub>16</sub>   | 54 <sup>5</sup> / <sub>16</sub>    |

t<sub>2</sub> = 1.1 × water level, maximum 2 × t<sub>1</sub>  
 Height of corner lining (b<sub>1</sub> and b<sub>2</sub>) like t<sub>2</sub>

Permissible dimensional tolerances:

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

Loss diagram



#### Calculation formulas:

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

$\Delta H_v$

$H_{v \text{ ges.}}$  comprises:

- Loss in the riser (pipe friction)
- $H_{v \text{ ges.}}$  (see diagram)
- Elbow
- Discharge pipe length = 5 × DN<sub>2</sub>
- Swing check valve
- Outlet losses  $v^2/2g$

<sup>20</sup> Observe this dimension.

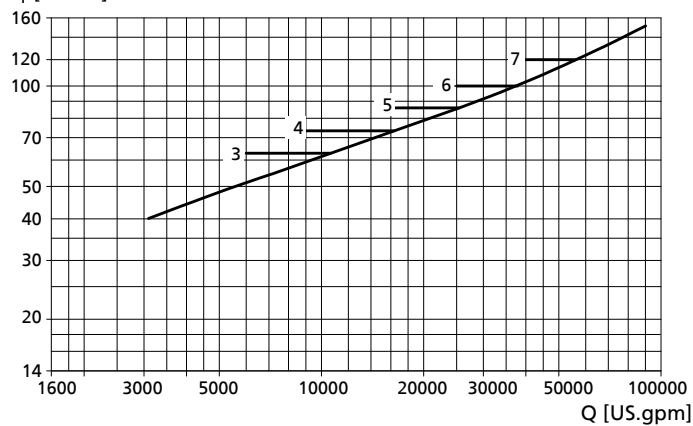
<sup>21</sup> Value for maximum motor length

<sup>22</sup> Designed for DN<sub>2</sub> max.

### Minimum water level diagrams

Open intake chamber  
(standard design  $\varnothing d_8$ )

$t_1$  [inches]



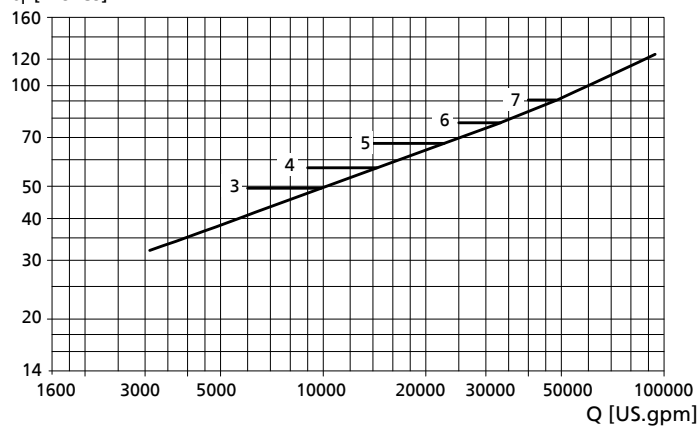
Key

- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600 - 1060

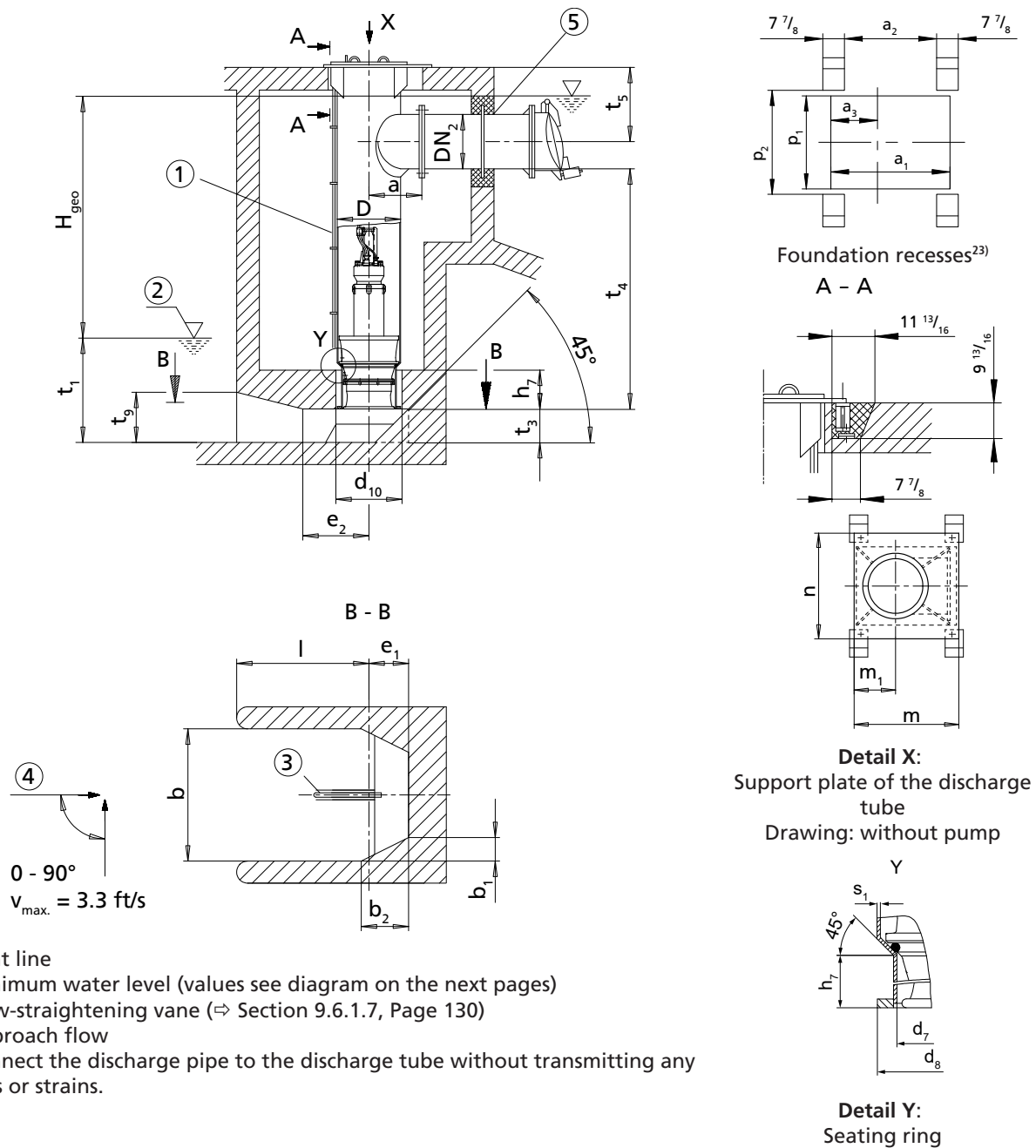
Open intake chamber

(design with suction umbrella  $\varnothing d_9$ )

$t_1$  [inches]



### 9.6.1.4 Installation type CG



<sup>23</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

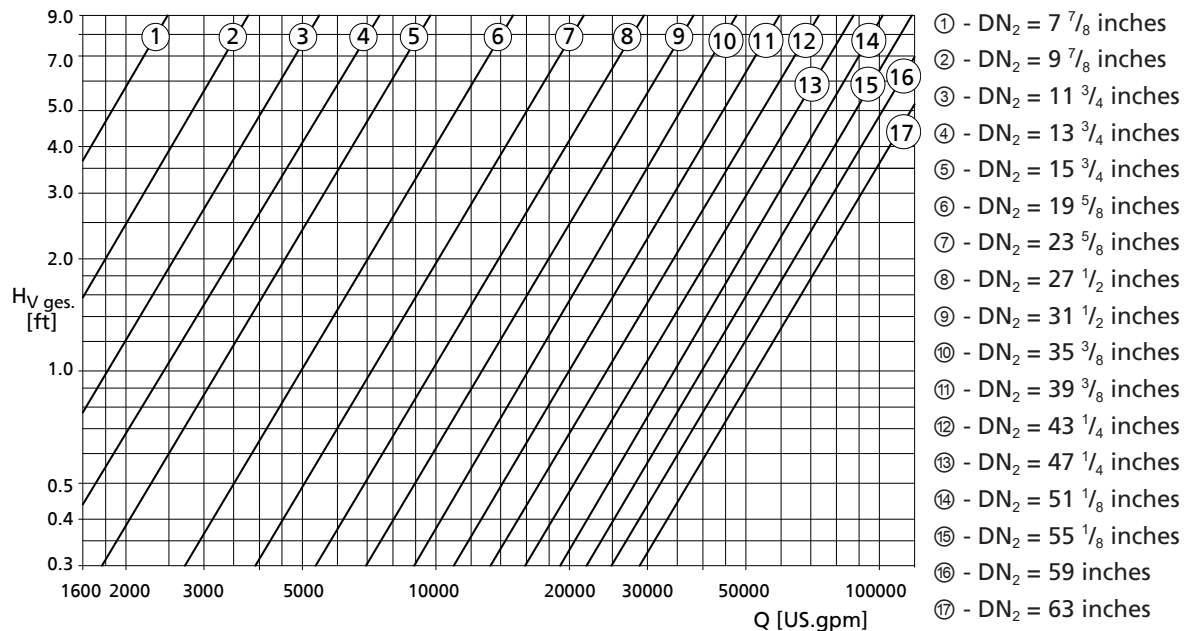
Table 59: Dimensions [inch]

| Size      | $e_1^{24)}$        | $e_2$             | $h_7$              | $l_{min.}$          | $m$                | $m_1$              | $n$                | $p_1$              | $p_2$             | $t_3^{24)}$        | $t_{4 min.}^{25)}$  | $t_{5 min.}^{26)}$ | $t_9$              |
|-----------|--------------------|-------------------|--------------------|---------------------|--------------------|--------------------|--------------------|--------------------|-------------------|--------------------|---------------------|--------------------|--------------------|
| 700-470   | 17 $\frac{11}{16}$ | 29 $\frac{1}{2}$  | 16 $\frac{9}{16}$  | 59 $\frac{1}{16}$   | 46 $\frac{1}{16}$  | 17 $\frac{15}{16}$ | 49 $\frac{5}{8}$   | 37 $\frac{13}{16}$ | 41 $\frac{3}{4}$  | 14 $\frac{15}{16}$ | 94 $\frac{1}{2}$    | 30 $\frac{5}{16}$  | 22 $\frac{7}{16}$  |
| 800-540   | 20 $\frac{7}{16}$  | 35 $\frac{7}{16}$ | 20 $\frac{11}{16}$ | 70 $\frac{7}{8}$    | 50                 | 19 $\frac{7}{8}$   | 54 $\frac{1}{8}$   | 42 $\frac{5}{16}$  | 46 $\frac{1}{4}$  | 17 $\frac{5}{16}$  | 96 $\frac{7}{16}$   | 32 $\frac{7}{8}$   | 26                 |
| 900-540   | 20 $\frac{7}{16}$  | 35 $\frac{7}{16}$ | 20 $\frac{1}{4}$   | 70 $\frac{7}{8}$    | 54 $\frac{5}{16}$  | 22 $\frac{1}{16}$  | 58 $\frac{1}{4}$   | 46 $\frac{7}{16}$  | 50 $\frac{3}{8}$  | 17 $\frac{5}{16}$  | 104 $\frac{5}{16}$  | 36 $\frac{7}{16}$  | 26                 |
| 1000-700  | 26 $\frac{1}{2}$   | 45 $\frac{1}{4}$  | 30 $\frac{1}{8}$   | 90 $\frac{9}{16}$   | 59 $\frac{13}{16}$ | 24 $\frac{5}{8}$   | 63 $\frac{3}{4}$   | 50 $\frac{3}{8}$   | 54 $\frac{5}{16}$ | 22 $\frac{1}{16}$  | 127 $\frac{15}{16}$ | 38 $\frac{9}{16}$  | 33 $\frac{7}{16}$  |
| 1200-870  | 32 $\frac{13}{16}$ | 55 $\frac{1}{8}$  | 39 $\frac{3}{8}$   | 110 $\frac{1}{4}$   | 67 $\frac{11}{16}$ | 28 $\frac{9}{16}$  | 72 $\frac{13}{16}$ | 59 $\frac{7}{16}$  | 63 $\frac{3}{8}$  | 26 $\frac{3}{4}$   | 157 $\frac{1}{2}$   | 43 $\frac{5}{16}$  | 41 $\frac{5}{16}$  |
| 1500-1060 | 41 $\frac{1}{4}$   | 68 $\frac{7}{8}$  | 57 $\frac{1}{2}$   | 137 $\frac{13}{16}$ | 80 $\frac{11}{16}$ | 35 $\frac{1}{4}$   | 85 $\frac{13}{16}$ | 72 $\frac{7}{16}$  | 76 $\frac{3}{8}$  | 33 $\frac{7}{8}$   | 159 $\frac{7}{16}$  | 51 $\frac{3}{16}$  | 51 $\frac{15}{16}$ |
| 1600-1060 | 41 $\frac{1}{4}$   | 68 $\frac{7}{8}$  | 48 $\frac{7}{16}$  | 137 $\frac{13}{16}$ | 85 $\frac{7}{16}$  | 38                 | 89 $\frac{3}{4}$   | 76 $\frac{3}{8}$   | 80 $\frac{5}{16}$ | 33 $\frac{7}{8}$   | 175 $\frac{3}{16}$  | 54 $\frac{5}{16}$  | 51 $\frac{15}{16}$ |

Permissible dimensional tolerances:

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

Loss diagram



Calculation formulas:

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

 $\Delta H_v$ 

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

 $H_{v ges.}$  comprises:

- Elbow
- Discharge pipe length = 5 x DN<sub>2</sub>
- Swing check valve
- Outlet losses  $v^2/2g$

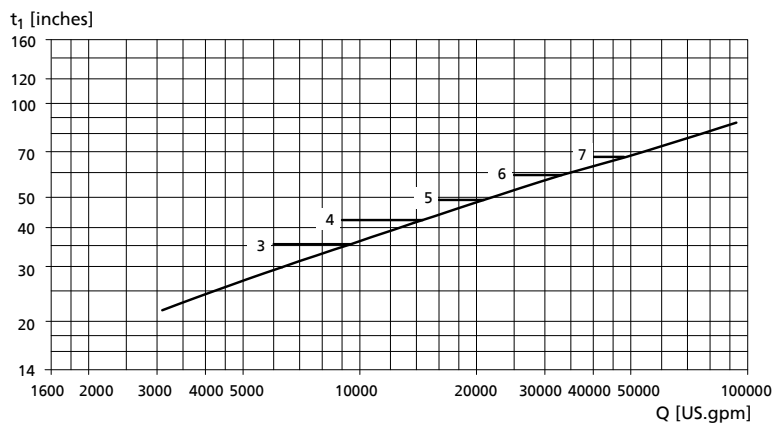
<sup>24</sup> Observe this dimension.

<sup>25</sup> Value for maximum motor length

<sup>26</sup> Designed for DN<sub>2</sub> max.

### Minimum water level diagrams

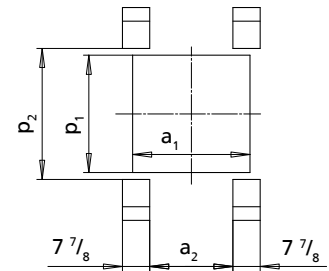
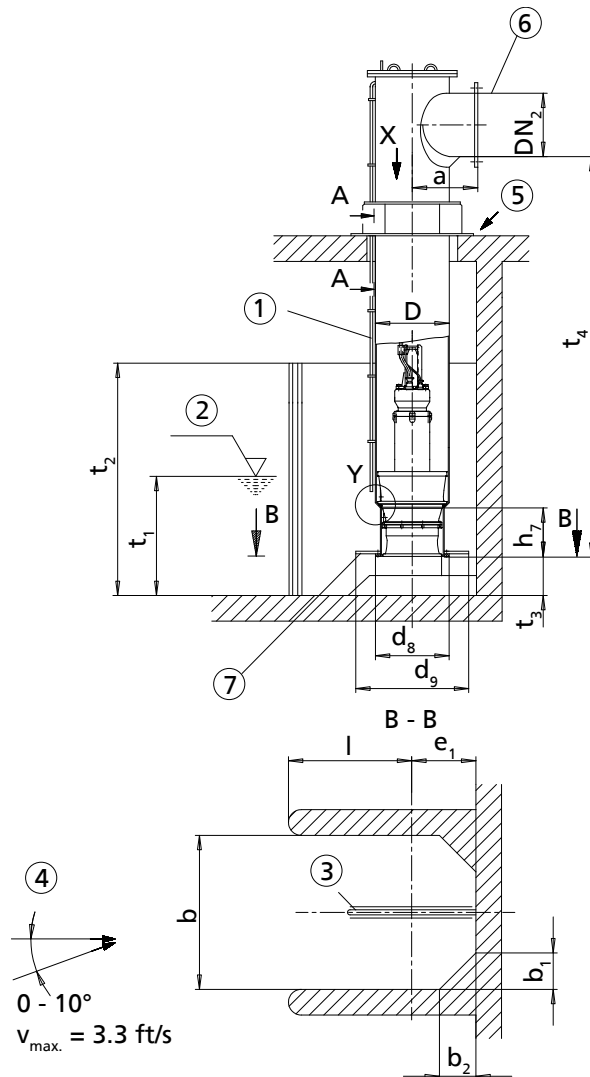
Covered intake chamber



Key

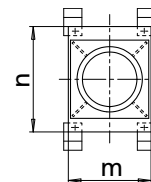
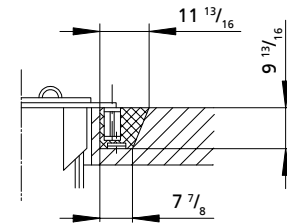
- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600 - 1060

### 9.6.1.5 Installation type DU



Foundation recesses<sup>27)</sup>

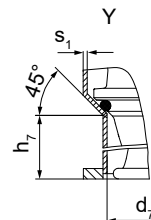
A - A



Detail X:

Support plate of the discharge tube

Drawing: without pump



Detail Y:

Seating ring

- ①: Vent line
- ②: Minimum water level (values see diagram on the next pages)
- ③: Flow-straightening vane (⇒ Section 9.6.1.7, Page 130)
- ④: Approach flow
- ⑤: Not pressure-proof
- ⑥: Connect the discharge pipe to the discharge tube without transmitting any stresses or strains.
- ⑦: Suction umbrellae; option for reducing the minimum water level  $t_1$

Table 60: Dimensions [inch]

| Size      | DN <sub>2 min.</sub> | DN <sub>2 max.</sub> | D       | a        | a <sub>1</sub> | a <sub>2</sub> | b         | b <sub>1</sub>   |                | b <sub>2</sub>   |                |
|-----------|----------------------|----------------------|---------|----------|----------------|----------------|-----------|------------------|----------------|------------------|----------------|
|           |                      |                      |         |          |                |                |           | Suction umbrella |                | Suction umbrella |                |
|           |                      |                      |         |          |                |                |           | X                | ✓              | X                | ✓              |
|           |                      |                      |         |          |                |                |           | d <sub>8</sub>   | d <sub>9</sub> | d <sub>8</sub>   | d <sub>9</sub> |
| 700-470   | 15 3/4               | 27 9/16              | 28      | 25 9/16  | 33 7/8         | 24             | 59 1/16   | 11 13/16         | —              | 11 13/16         | —              |
| 800-540   | 19 11/16             | 31 1/2               | 32      | 27 9/16  | 37 13/16       | 27 15/16       | 70 7/8    | 14 3/16          | —              | 14 3/16          | —              |
| 900-540   | 23 5/8               | 35 7/16              | 36      | 29 15/16 | 41 3/4         | 31 7/8         | 70 7/8    | 14 3/16          | —              | 14 3/16          | —              |
| 1000-700  | 27 9/16              | 39 3/8               | 40      | 31 7/8   | 45 11/16       | 35 13/16       | 90 9/16   | 18 1/8           | —              | 18 1/8           | —              |
| 1200-870  | 35 7/16              | 47 1/4               | 48 1/16 | 35 13/16 | 53 9/16        | 43 11/16       | 110 1/4   | 22 1/16          | —              | 22 1/16          | —              |
| 1500-1060 | 47 1/4               | 59 1/16              | 60      | 41 3/4   | 65 3/4         | 55 7/8         | 137 13/16 | 27 9/16          | —              | 27 9/16          | —              |
| 1600-1060 | 51 3/16              | 63                   | 64      | 43 11/16 | 69 11/16       | 59 13/16       | 137 13/16 | 27 9/16          | —              | 27 9/16          | —              |

<sup>27)</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

Table 61: Dimensions [inch]

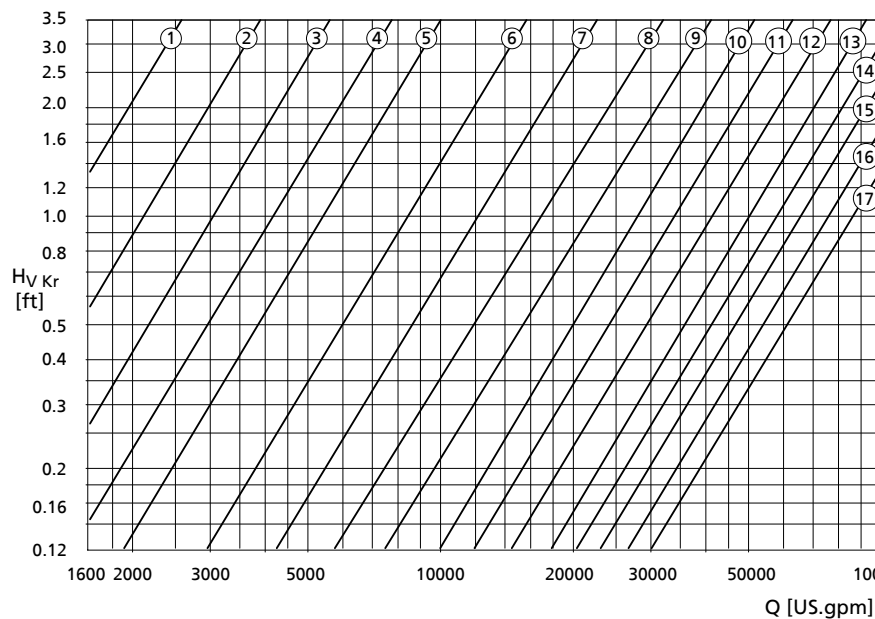
| Size      | d <sub>7</sub>                  | d <sub>8</sub>                   | d <sub>9</sub>                  | e <sub>1</sub> <sup>28)</sup>    |                                 | h <sub>7</sub>                   | l <sub>min.</sub>                | m                                | n                                | p <sub>1</sub>                   | p <sub>2</sub>                   | t <sub>3</sub> <sup>28)</sup>    | t <sub>4 min.</sub> <sup>29)</sup> |
|-----------|---------------------------------|----------------------------------|---------------------------------|----------------------------------|---------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|------------------------------------|
|           |                                 |                                  |                                 | Suction umbrella                 |                                 |                                  |                                  |                                  |                                  |                                  |                                  |                                  |                                    |
|           |                                 |                                  |                                 | ✗                                | ✓                               |                                  |                                  |                                  |                                  |                                  |                                  |                                  |                                    |
|           |                                 |                                  |                                 | d <sub>8</sub>                   | d <sub>9</sub>                  |                                  |                                  |                                  |                                  |                                  |                                  |                                  |                                    |
| 700-470   | 23 <sup>5</sup> / <sub>8</sub>  | 27 <sup>15</sup> / <sub>16</sub> | 43 <sup>5</sup> / <sub>16</sub> | 17 <sup>11</sup> / <sub>16</sub> | 25 <sup>9</sup> / <sub>16</sub> | 16 <sup>9</sup> / <sub>16</sub>  | 41 <sup>5</sup> / <sub>16</sub>  | 36 <sup>5</sup> / <sub>8</sub>   | 45 <sup>11</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>   | 37 <sup>13</sup> / <sub>16</sub> | 14 <sup>15</sup> / <sub>16</sub> | 94 <sup>1</sup> / <sub>2</sub>     |
| 800-540   | 26 <sup>3</sup> / <sub>4</sub>  | 31 <sup>7</sup> / <sub>8</sub>   | 49 <sup>3</sup> / <sub>16</sub> | 19 <sup>11</sup> / <sub>16</sub> | 27 <sup>9</sup> / <sub>16</sub> | 20 <sup>11</sup> / <sub>16</sub> | 51 <sup>3</sup> / <sub>16</sub>  | 40 <sup>9</sup> / <sub>16</sub>  | 49 <sup>5</sup> / <sub>8</sub>   | 37 <sup>13</sup> / <sub>16</sub> | 41 <sup>3</sup> / <sub>4</sub>   | 17 <sup>5</sup> / <sub>16</sub>  | 96 <sup>7</sup> / <sub>16</sub>    |
| 900-540   | 27 <sup>9</sup> / <sub>16</sub> | 35 <sup>13</sup> / <sub>16</sub> | 49 <sup>3</sup> / <sub>16</sub> | 21 <sup>5</sup> / <sub>8</sub>   | 27 <sup>9</sup> / <sub>16</sub> | 20 <sup>1</sup> / <sub>4</sub>   | 51 <sup>3</sup> / <sub>16</sub>  | 44 <sup>1</sup> / <sub>2</sub>   | 53 <sup>9</sup> / <sub>16</sub>  | 41 <sup>3</sup> / <sub>4</sub>   | 45 <sup>11</sup> / <sub>16</sub> | 17 <sup>5</sup> / <sub>16</sub>  | 104 <sup>5</sup> / <sub>16</sub>   |
| 1000-700  | 34 <sup>5</sup> / <sub>8</sub>  | 39 <sup>15</sup> / <sub>16</sub> | 63                              | 23 <sup>5</sup> / <sub>8</sub>   | 35 <sup>7</sup> / <sub>16</sub> | 30 <sup>1</sup> / <sub>8</sub>   | 66 <sup>15</sup> / <sub>16</sub> | 48 <sup>13</sup> / <sub>16</sub> | 59 <sup>1</sup> / <sub>16</sub>  | 45 <sup>11</sup> / <sub>16</sub> | 49 <sup>5</sup> / <sub>8</sub>   | 22 <sup>1</sup> / <sub>16</sub>  | 127 <sup>15</sup> / <sub>16</sub>  |
| 1200-870  | 42 <sup>1</sup> / <sub>8</sub>  | 48 <sup>1</sup> / <sub>16</sub>  | 78 <sup>3</sup> / <sub>4</sub>  | 27 <sup>9</sup> / <sub>16</sub>  | 43 <sup>5</sup> / <sub>16</sub> | 39 <sup>3</sup> / <sub>8</sub>   | 82 <sup>11</sup> / <sub>16</sub> | 56 <sup>11</sup> / <sub>16</sub> | 66 <sup>15</sup> / <sub>16</sub> | 53 <sup>9</sup> / <sub>16</sub>  | 57 <sup>1</sup> / <sub>2</sub>   | 26 <sup>3</sup> / <sub>4</sub>   | 157 <sup>1</sup> / <sub>2</sub>    |
| 1500-1060 | 52 <sup>3</sup> / <sub>8</sub>  | 59 <sup>13</sup> / <sub>16</sub> | 96 <sup>7</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>16</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 57 <sup>1</sup> / <sub>2</sub>   | 104 <sup>5</sup> / <sub>16</sub> | 69 <sup>5</sup> / <sub>16</sub>  | 79 <sup>1</sup> / <sub>8</sub>   | 65 <sup>3</sup> / <sub>4</sub>   | 69 <sup>11</sup> / <sub>16</sub> | 33 <sup>7</sup> / <sub>8</sub>   | 159 <sup>7</sup> / <sub>16</sub>   |
| 1600-1060 | 55 <sup>7</sup> / <sub>8</sub>  | 63 <sup>3</sup> / <sub>4</sub>   | 96 <sup>7</sup> / <sub>16</sub> | 35 <sup>7</sup> / <sub>16</sub>  | 51 <sup>3</sup> / <sub>16</sub> | 48 <sup>7</sup> / <sub>16</sub>  | 102 <sup>3</sup> / <sub>8</sub>  | 73 <sup>5</sup> / <sub>8</sub>   | 83 <sup>7</sup> / <sub>8</sub>   | 69 <sup>11</sup> / <sub>16</sub> | 73 <sup>5</sup> / <sub>8</sub>   | 33 <sup>7</sup> / <sub>8</sub>   | 175 <sup>3</sup> / <sub>16</sub>   |

t<sub>2</sub> = 1.1 × water level, maximum 2 × t<sub>1</sub>  
Height of corner lining (b<sub>1</sub> and b<sub>2</sub>) like t<sub>2</sub>

Permissible dimensional tolerances:

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

Loss diagram



- ① - DN<sub>2</sub> = 7 7/8 inches
- ② - DN<sub>2</sub> = 9 7/8 inches
- ③ - DN<sub>2</sub> = 11 3/4 inches
- ④ - DN<sub>2</sub> = 13 3/4 inches
- ⑤ - DN<sub>2</sub> = 15 3/4 inches
- ⑥ - DN<sub>2</sub> = 19 5/8 inches
- ⑦ - DN<sub>2</sub> = 23 5/8 inches
- ⑧ - DN<sub>2</sub> = 27 1/2 inches
- ⑨ - DN<sub>2</sub> = 31 1/2 inches
- ⑩ - DN<sub>2</sub> = 35 3/8 inches
- ⑪ - DN<sub>2</sub> = 39 3/8 inches
- ⑫ - DN<sub>2</sub> = 43 1/4 inches
- ⑬ - DN<sub>2</sub> = 47 1/4 inches
- ⑭ - DN<sub>2</sub> = 51 1/8 inches
- ⑮ - DN<sub>2</sub> = 55 1/8 inches
- ⑯ - DN<sub>2</sub> = 59 inches
- ⑰ - DN<sub>2</sub> = 63 inches

#### Calculation formulas:

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

$\Delta H_v$

- Loss in the elbow h<sub>V Kr</sub> (see diagram)
- Loss in the riser (pipe friction)
- H<sub>V System</sub> (valves, etc.)

H<sub>V System</sub> must be determined for the specific system.

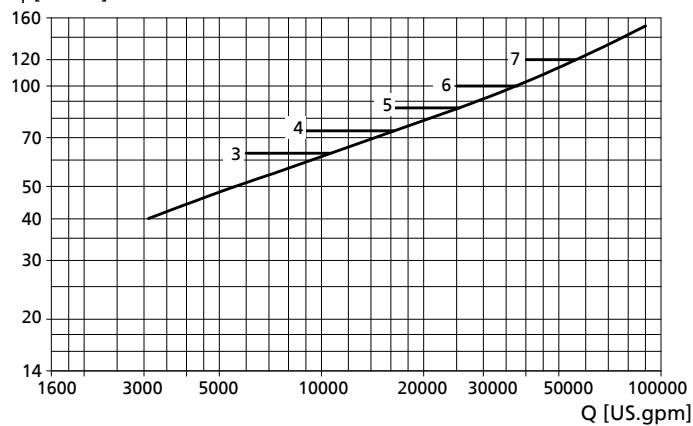
<sup>28</sup> Observe this dimension.

<sup>29</sup> Value for maximum motor length

# Minimum water level diagrams

Open intake chamber  
(standard design Ø d<sub>8</sub>)

t<sub>1</sub> [inches]

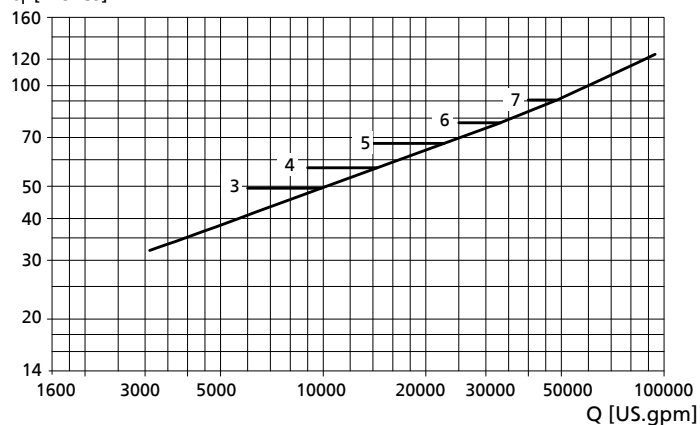


Key

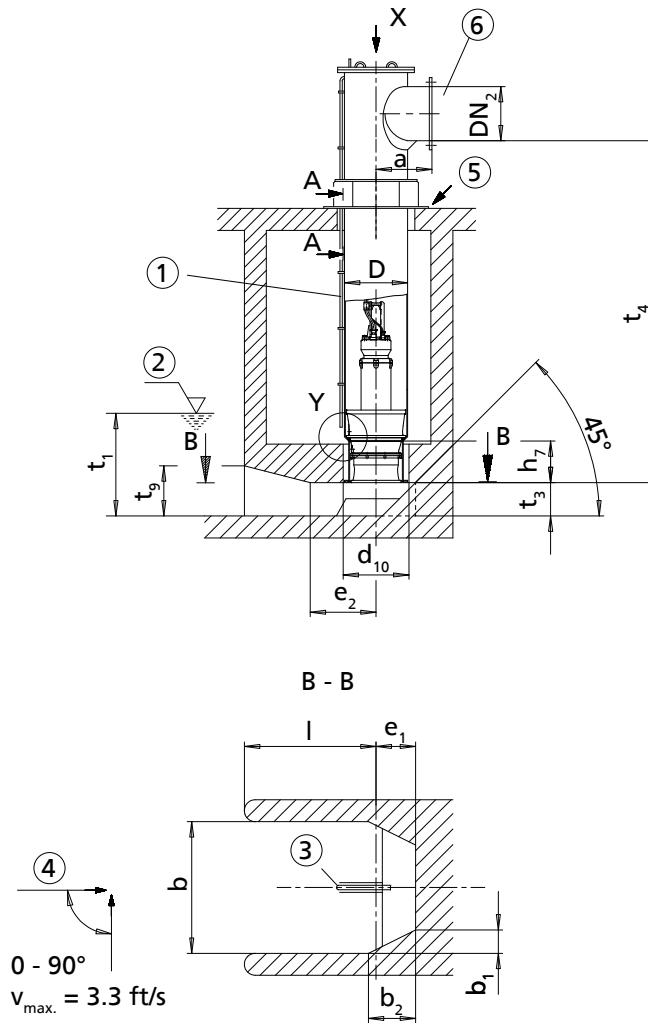
- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600 - 1060

Open intake chamber  
(design with suction umbrella Ø d<sub>9</sub>)

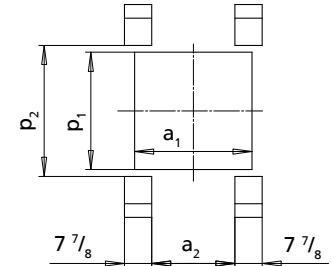
t<sub>1</sub> [inches]



### 9.6.1.6 Installation type DG

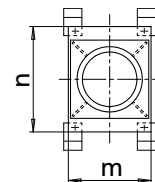
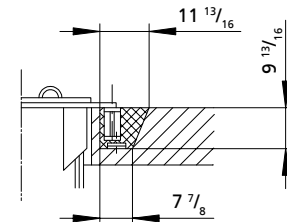


- ①: Vent line
- ②: Minimum water level (values see diagram on the next pages)
- ③: Flow-straightening vane (⇒ Section 9.6.1.7, Page 130)
- ④: Approach flow
- ⑤: Not pressure-proof
- ⑥: Connect the discharge pipe to the discharge tube without transmitting any stresses or strains.



Foundation recesses<sup>30)</sup>

A - A

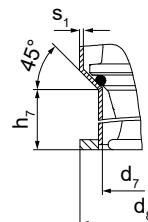


Detail X:

Support plate of the discharge tube

Drawing: without pump

Y



Detail Y:

Seating ring

Table 62: Dimensions [inch]

| Size      | DN <sub>2 min.</sub> | DN <sub>2 max.</sub> | D       | a        | a <sub>1</sub> | a <sub>2</sub> | b         | b <sub>1</sub> | b <sub>2</sub> | d <sub>7</sub> | d <sub>8</sub> | d <sub>10</sub> |
|-----------|----------------------|----------------------|---------|----------|----------------|----------------|-----------|----------------|----------------|----------------|----------------|-----------------|
| 700-470   | 15 3/4               | 27 9/16              | 28      | 25 9/16  | 33 7/8         | 24             | 59 1/16   | 11 13/16       | 23 5/8         | 23 5/8         | 27 15/16       | 29 1/8          |
| 800-540   | 19 11/16             | 31 1/2               | 32      | 27 9/16  | 37 13/16       | 27 15/16       | 70 7/8    | 14 3/16        | 28 3/8         | 26 3/4         | 31 7/8         | 33 7/8          |
| 900-540   | 23 5/8               | 35 7/16              | 36      | 29 15/16 | 41 3/4         | 31 7/8         | 70 7/8    | 14 3/16        | 28 3/8         | 27 9/16        | 35 13/16       | 37 13/16        |
| 1000-700  | 27 9/16              | 39 3/8               | 40      | 31 7/8   | 45 11/16       | 35 13/16       | 90 9/16   | 18 1/8         | 36 1/4         | 34 5/8         | 39 15/16       | 42 1/2          |
| 1200-870  | 35 7/16              | 47 1/4               | 48 1/16 | 35 13/16 | 53 9/16        | 43 11/16       | 110 1/4   | 22 1/16        | 44 1/8         | 42 1/8         | 48 1/16        | 50 13/16        |
| 1500-1060 | 47 1/4               | 59 1/16              | 60      | 41 3/4   | 65 3/4         | 55 7/8         | 137 13/16 | 27 9/16        | 55 1/8         | 52 3/8         | 59 13/16       | 63              |
| 1600-1060 | 51 3/16              | 63                   | 64      | 43 11/16 | 69 11/16       | 59 13/16       | 137 13/16 | 27 9/16        | 55 1/8         | 55 7/8         | 63 3/4         | 66 15/16        |

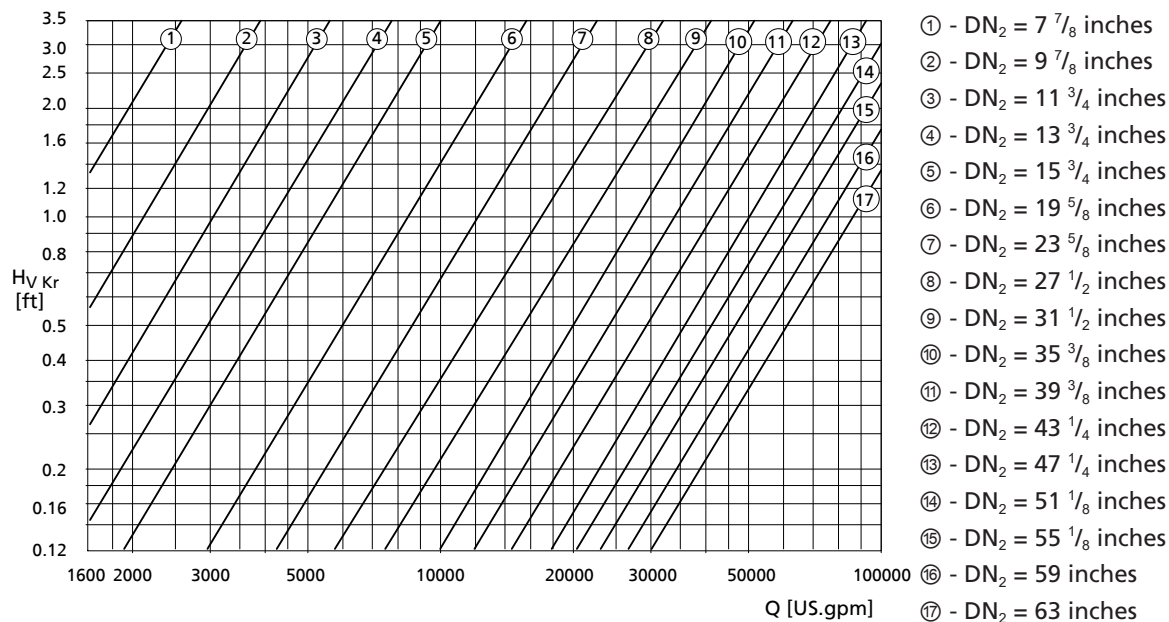
<sup>30)</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

**Table 63: Dimensions [inch]**

| Size      | $e_1^{31)}$        | $e_2$             | $h_7$              | $l_{min.}$          | $m$                | $n$                | $p_1$              | $p_2$              | $t_3^{31)}$        | $t_4 min.^{32)}$    | $t_9$              |
|-----------|--------------------|-------------------|--------------------|---------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------------|--------------------|
| 700-470   | $17 \frac{11}{16}$ | $29 \frac{1}{2}$  | $16 \frac{9}{16}$  | $59 \frac{1}{16}$   | $36 \frac{5}{8}$   | $45 \frac{11}{16}$ | $33 \frac{7}{8}$   | $37 \frac{13}{16}$ | $14 \frac{15}{16}$ | $94 \frac{1}{2}$    | $22 \frac{7}{16}$  |
| 800-540   | $20 \frac{7}{16}$  | $35 \frac{7}{16}$ | $20 \frac{11}{16}$ | $70 \frac{7}{8}$    | $40 \frac{9}{16}$  | $49 \frac{5}{8}$   | $37 \frac{13}{16}$ | $41 \frac{3}{4}$   | $17 \frac{5}{16}$  | $96 \frac{7}{16}$   | 26                 |
| 900-540   | $20 \frac{7}{16}$  | $35 \frac{7}{16}$ | $20 \frac{1}{4}$   | $70 \frac{7}{8}$    | $44 \frac{1}{2}$   | $53 \frac{9}{16}$  | $41 \frac{3}{4}$   | $45 \frac{11}{16}$ | $17 \frac{5}{16}$  | $104 \frac{5}{16}$  | 26                 |
| 1000-700  | $26 \frac{1}{2}$   | $45 \frac{1}{4}$  | $30 \frac{1}{8}$   | $90 \frac{9}{16}$   | $48 \frac{13}{16}$ | $59 \frac{1}{16}$  | $45 \frac{11}{16}$ | $49 \frac{5}{8}$   | $22 \frac{1}{16}$  | $127 \frac{15}{16}$ | $33 \frac{7}{16}$  |
| 1200-870  | $32 \frac{13}{16}$ | $55 \frac{1}{8}$  | $39 \frac{3}{8}$   | $110 \frac{1}{4}$   | $56 \frac{11}{16}$ | $66 \frac{15}{16}$ | $53 \frac{9}{16}$  | $57 \frac{1}{2}$   | $26 \frac{3}{4}$   | $157 \frac{1}{2}$   | $41 \frac{5}{16}$  |
| 1500-1060 | $41 \frac{1}{4}$   | $68 \frac{7}{8}$  | $57 \frac{1}{2}$   | $137 \frac{13}{16}$ | $69 \frac{5}{16}$  | $79 \frac{1}{8}$   | $65 \frac{3}{4}$   | $69 \frac{11}{16}$ | $33 \frac{7}{8}$   | $159 \frac{7}{16}$  | $51 \frac{15}{16}$ |
| 1600-1060 | $41 \frac{1}{4}$   | $68 \frac{7}{8}$  | $48 \frac{7}{16}$  | $137 \frac{13}{16}$ | $73 \frac{5}{8}$   | $83 \frac{7}{8}$   | $69 \frac{11}{16}$ | $73 \frac{5}{8}$   | $33 \frac{7}{8}$   | $175 \frac{3}{16}$  | $51 \frac{15}{16}$ |

Permissible dimensional tolerances:

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

**Loss diagram**


**Calculation formulas:**

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

$\Delta H_v$

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

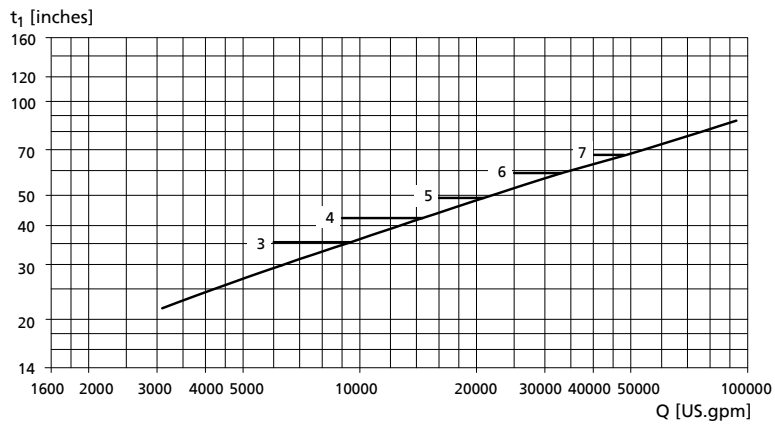
$H_{V System}$  must be determined for the specific system.

<sup>31</sup> Observe this dimension.

<sup>32</sup> Value for maximum motor length

### Minimum water level diagrams

Covered intake chamber



Key

- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600 - 1060

### 9.6.1.7 Dimensions of the flow-straightening vane

#### Design of the intake chamber wall surfaces (to prevent vortex formation)

The flow-straightening vane is indispensable for the inlet conditions of the pump set. It prevents the development of a submerged vortex (floor vortex) which could cause a drop in performance, for example. In addition, the floor and wall surfaces of the intake chamber should be designed as a rough concrete surface. Rough surfaces minimize the separation of boundary layers that may cause wall and floor vortices.

#### Flow-straightening vane and intake chamber

- The anti-vortex vanes in the bellmouth must be aligned with the flow-straightening vane.
- The bail of the pump is oriented in the same direction as the anti-vortex vanes in the bellmouth.

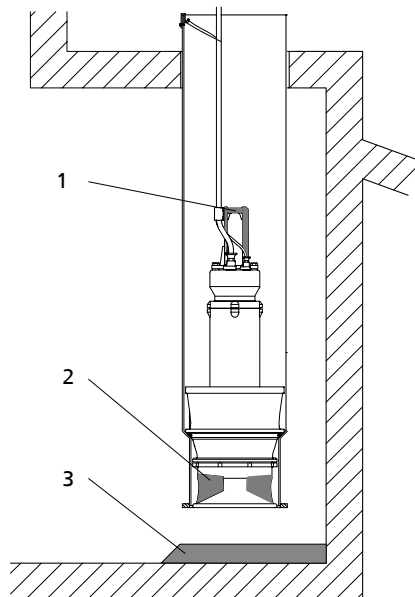
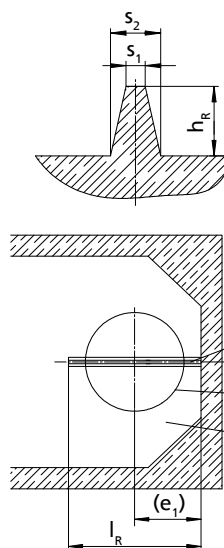


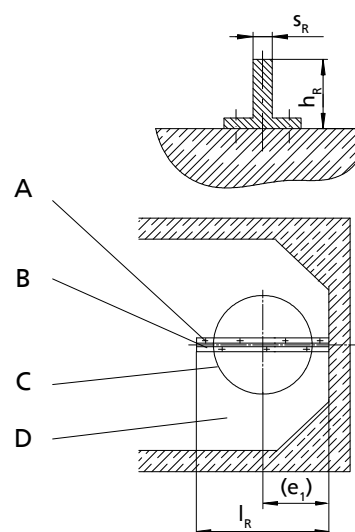
Fig. 67: Installation position of the pump set

|   |                         |
|---|-------------------------|
| 1 | Bail                    |
| 2 | Anti-vortex vanes       |
| 3 | Flow-straightening vane |

Variant 1  
Flow-straightening vane cast from concrete



Variant 2  
Steel section



|   |                                                             |
|---|-------------------------------------------------------------|
| A | Bolted to the floor of the intake chamber                   |
| B | Flow-straightening vane centered beneath the discharge tube |
| C | Discharge tube                                              |
| D | Intake chamber                                              |

#### Installation types BU, CU, DU

Table 64: Dimensions [inch]

| Size      | $h_R$             | $s_1$            | $s_2$             | $s_R$         | $(e_1)$            |                    | $I_R^{33)}$        |                    |
|-----------|-------------------|------------------|-------------------|---------------|--------------------|--------------------|--------------------|--------------------|
|           |                   |                  |                   |               | Suction umbrella   |                    | Suction umbrella   |                    |
|           |                   |                  |                   |               | $\times$           | $\checkmark$       | $\times$           | $\checkmark$       |
|           |                   |                  |                   |               | $d_8$              | $d_9$              | $d_8$              | $d_9$              |
| 500-270   | $4 \frac{3}{4}$   | $\frac{9}{16}$   | $2 \frac{3}{8}$   | $\frac{3}{8}$ | $13 \frac{3}{4}$   | $15 \frac{3}{4}$   | $26 \frac{3}{8}$   | $28 \frac{3}{8}$   |
| 600-350   | $7 \frac{1}{2}$   | $\frac{13}{16}$  | $2 \frac{3}{4}$   | $\frac{3}{8}$ | $15 \frac{3}{4}$   | $19 \frac{11}{16}$ | $34 \frac{7}{16}$  | 37                 |
| 700-470   | $9 \frac{1}{16}$  | 1                | $3 \frac{9}{16}$  | $\frac{3}{8}$ | $17 \frac{11}{16}$ | $25 \frac{9}{16}$  | $39 \frac{3}{8}$   | $47 \frac{1}{4}$   |
| 800-540   | $10 \frac{7}{16}$ | 1                | $3 \frac{15}{16}$ | $\frac{1}{2}$ | $19 \frac{11}{16}$ | $27 \frac{9}{16}$  | $45 \frac{7}{8}$   | $51 \frac{3}{16}$  |
| 900-540   | $10 \frac{7}{16}$ | 1                | $3 \frac{15}{16}$ | $\frac{1}{2}$ | $21 \frac{5}{8}$   | $27 \frac{9}{16}$  | $45 \frac{7}{8}$   | $51 \frac{3}{16}$  |
| 1000-700  | $13 \frac{3}{16}$ | $1 \frac{3}{16}$ | $4 \frac{3}{4}$   | $\frac{1}{2}$ | $23 \frac{5}{8}$   | $35 \frac{7}{16}$  | $54 \frac{1}{8}$   | $65 \frac{15}{16}$ |
| 1200-870  | $16 \frac{1}{8}$  | $1 \frac{3}{16}$ | $4 \frac{3}{4}$   | $\frac{1}{2}$ | $27 \frac{9}{16}$  | $43 \frac{5}{16}$  | $64 \frac{15}{16}$ | $80 \frac{11}{16}$ |
| 1500-1060 | $20 \frac{1}{4}$  | $1 \frac{9}{16}$ | $5 \frac{1}{2}$   | $\frac{1}{2}$ | $33 \frac{7}{16}$  | $51 \frac{3}{16}$  | $80 \frac{11}{16}$ | $98 \frac{7}{16}$  |
| 1600-1060 | $20 \frac{1}{4}$  | $1 \frac{9}{16}$ | $5 \frac{1}{2}$   | $\frac{1}{2}$ | $35 \frac{7}{16}$  | $51 \frac{3}{16}$  | $80 \frac{11}{16}$ | $98 \frac{7}{16}$  |

#### Installation types BG, CG, DG

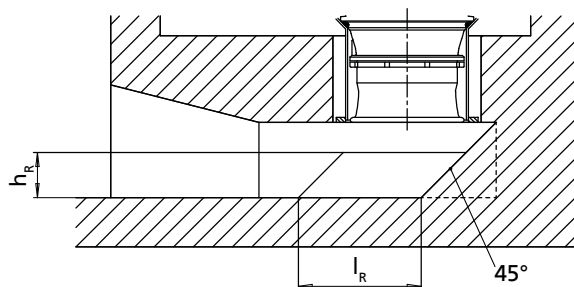


Fig. 68: Flow-straightening vane for covered intake chamber

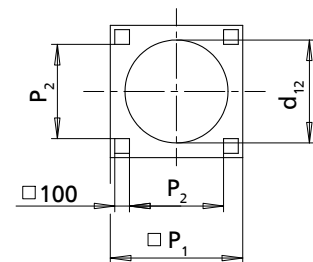
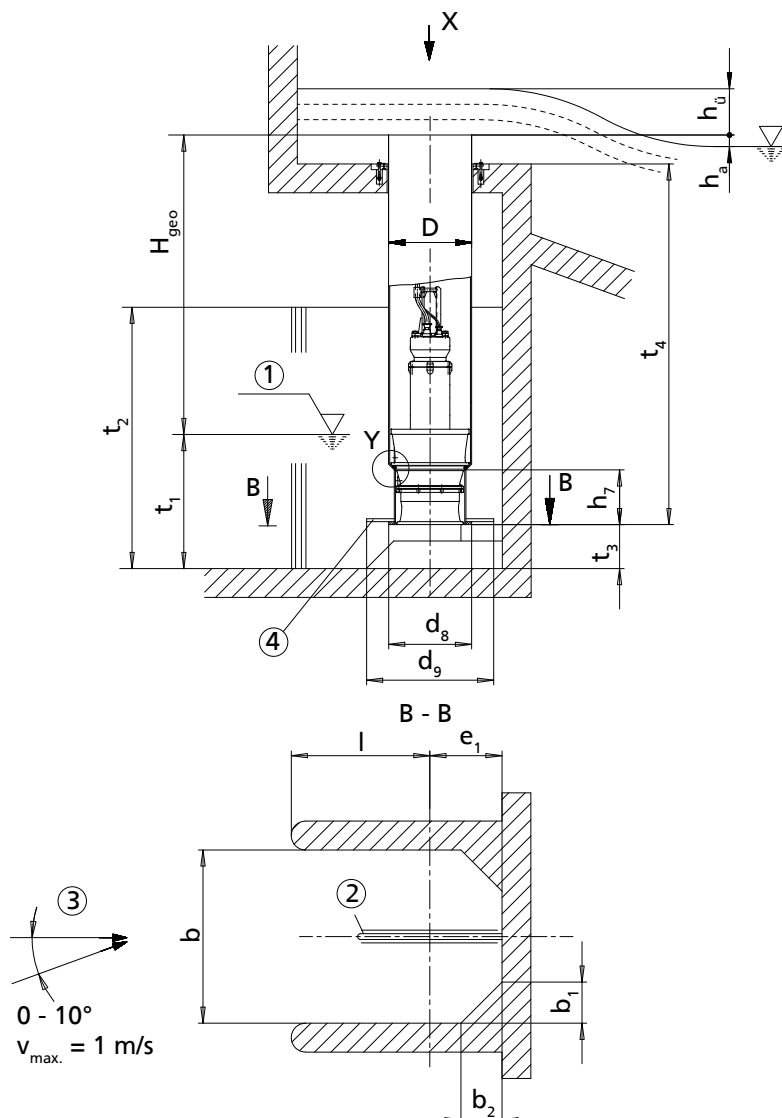
Table 65: Dimensions [inch]

| Size      | $h_R$             | $s_1$            | $s_2$             | $s_R$         | $I_R$              |
|-----------|-------------------|------------------|-------------------|---------------|--------------------|
| 500-270   | $4 \frac{3}{4}$   | $\frac{9}{16}$   | $2 \frac{3}{8}$   | $\frac{3}{8}$ | $16 \frac{15}{16}$ |
| 600-350   | $7 \frac{1}{2}$   | $\frac{13}{16}$  | $2 \frac{3}{4}$   | $\frac{3}{8}$ | $21 \frac{7}{16}$  |
| 700-470   | $9 \frac{1}{16}$  | 1                | $3 \frac{9}{16}$  | $\frac{3}{8}$ | $25 \frac{9}{16}$  |
| 800-540   | $10 \frac{7}{16}$ | 1                | $3 \frac{15}{16}$ | $\frac{1}{2}$ | $29 \frac{1}{8}$   |
| 900-540   | $10 \frac{7}{16}$ | 1                | $3 \frac{15}{16}$ | $\frac{1}{2}$ | $31 \frac{1}{8}$   |
| 1000-700  | $13 \frac{3}{16}$ | $1 \frac{3}{16}$ | $4 \frac{3}{4}$   | $\frac{1}{2}$ | 37                 |
| 1200-870  | $16 \frac{1}{8}$  | $1 \frac{3}{16}$ | $4 \frac{3}{4}$   | $\frac{1}{2}$ | $45 \frac{1}{4}$   |
| 1500-1060 | $20 \frac{1}{4}$  | $1 \frac{9}{16}$ | $5 \frac{1}{2}$   | $\frac{1}{2}$ | $57 \frac{1}{16}$  |
| 1600-1060 | $20 \frac{1}{4}$  | $1 \frac{9}{16}$ | $5 \frac{1}{2}$   | $\frac{1}{2}$ | $59 \frac{1}{16}$  |

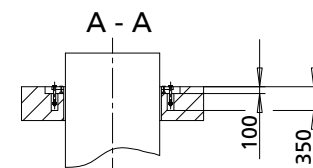
<sup>33</sup> Adjust length  $I_R$  of the flow-straightening vane to the 45° angle of the intake chamber.

## 9.6.2 General arrangement drawings [mm]

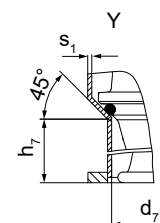
### 9.6.2.1 Installation type BU



Foundation recesses<sup>34)</sup>



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



**Detail Y:**  
Seating ring

- ①: Minimum water level (values see diagram on the next pages)  
②: Flow-straightening vane (⇒ Section 9.6.2.7, Page 149)  
③: Approach flow  
④: Suction umbrella; option for reducing the minimum water level  $t_1$

**Table 66:** Dimensions [mm]

| Size      | D    | b    | b <sub>1</sub>   |                | b <sub>2</sub>   |                | d <sub>7</sub> | d <sub>8</sub> | d <sub>9</sub> | d <sub>12</sub> |
|-----------|------|------|------------------|----------------|------------------|----------------|----------------|----------------|----------------|-----------------|
|           |      |      | Suction umbrella |                | Suction umbrella |                |                |                |                |                 |
|           |      |      | X                | ✓              | X                | ✓              |                |                |                |                 |
|           |      |      | d <sub>8</sub>   | d <sub>9</sub> | d <sub>8</sub>   | d <sub>9</sub> |                |                |                |                 |
| 700-470   | 711  | 1500 | 300              | —              | 300              | —              | 600            | 710            | 1100           | 750             |
| 800-540   | 813  | 1800 | 360              | —              | 360              | —              | 680            | 810            | 1250           | 850             |
| 900-540   | 914  | 1800 | 360              | —              | 360              | —              | 700            | 910            | 1250           | 970             |
| 1000-700  | 1016 | 2300 | 460              | —              | 460              | —              | 880            | 1015           | 1600           | 1070            |
| 1200-870  | 1220 | 2800 | 560              | —              | 560              | —              | 1070           | 1220           | 2000           | 1280            |
| 1500-1060 | 1524 | 3500 | 700              | —              | 700              | —              | 1330           | 1520           | 2450           | 1590            |
| 1600-1060 | 1625 | 3500 | 700              | —              | 700              | —              | 1420           | 1620           | 2450           | 1690            |

<sup>34</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

**Table 67:** Dimensions [mm]

| Size      | e <sub>1</sub> <sup>35)</sup> |                | h <sub>7</sub> | h <sub>a</sub> | l <sub>min.</sub> | m    | p <sub>1</sub> | p <sub>2</sub> | t <sub>3</sub> <sup>35)</sup> | t <sub>4 min.</sub> <sup>36)</sup> |
|-----------|-------------------------------|----------------|----------------|----------------|-------------------|------|----------------|----------------|-------------------------------|------------------------------------|
|           | Suction umbrella              |                |                |                |                   |      |                |                |                               |                                    |
|           | ✗                             | ✓              |                |                |                   |      |                |                |                               |                                    |
|           | d <sub>8</sub>                | d <sub>9</sub> |                |                |                   |      |                |                |                               |                                    |
| 700-470   | 450                           | 650            | 420            | 100            | 1050              | 800  | 900            | 640            | 380                           | 2300                               |
| 800-540   | 500                           | 700            | 525            | 100            | 1300              | 910  | 1000           | 740            | 440                           | 2350                               |
| 900-540   | 550                           | 700            | 515            | 100            | 1300              | 1050 | 1120           | 860            | 440                           | 2500                               |
| 1000-700  | 600                           | 900            | 765            | 100            | 1700              | 1150 | 1220           | 960            | 560                           | 3050                               |
| 1200-870  | 700                           | 1100           | 1000           | 100            | 2100              | 1360 | 1420           | 1160           | 680                           | 3750                               |
| 1500-1060 | 850                           | 1300           | 1460           | 100            | 2650              | 1680 | 1750           | 1480           | 860                           | 3900                               |
| 1600-1060 | 900                           | 1300           | 1230           | 100            | 2600              | 1780 | 1850           | 1580           | 860                           | 4350                               |

$t_2 = 1.1 \times \text{water level, maximum } 2 \times t_1$   
Height of corner lining ( $b_1$  and  $b_2$ ) like  $t_2$

Permissible dimensional tolerances:

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

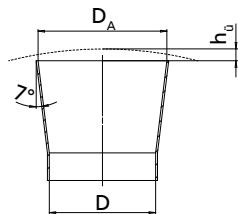
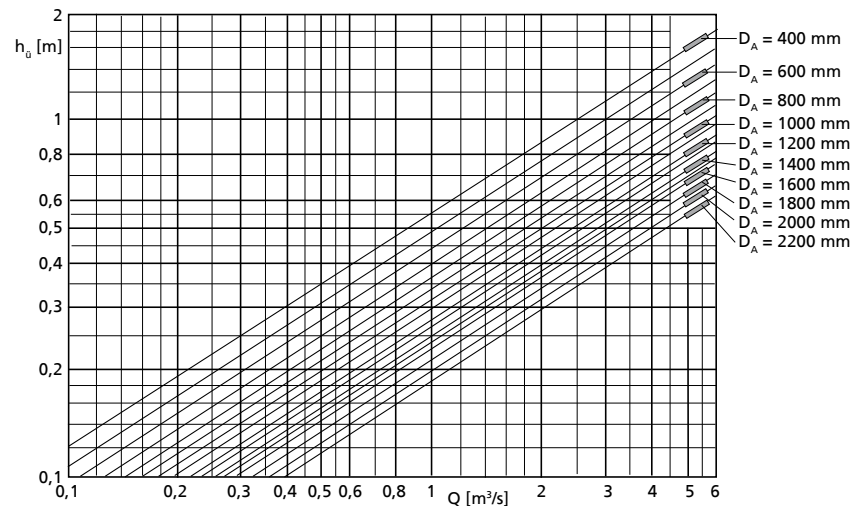


Illustration of the  
overflow head  
 $h_u$

**Loss diagram**

**Loss diagram**
**Calculation formulas:**

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

$$\Delta H_v$$

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

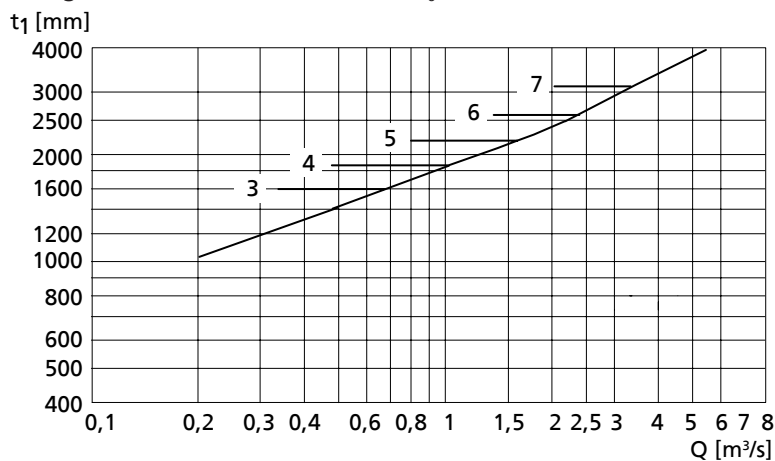
Overflow head  $h_u$  depends on  $Q$  and the discharge design  $\varnothing D_A$ . The characteristic curve values only apply to unimpeded outlet in all directions; otherwise they are approximate values only.

<sup>35</sup> Observe this dimension.

<sup>36</sup> Value for maximum motor length

### Minimum water level diagrams

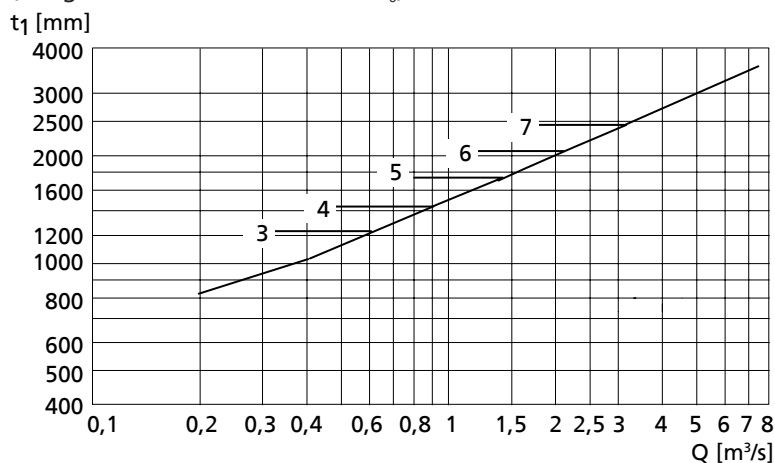
Open intake chamber  
(design without suction umbrella  $\varnothing d_8$ )



Key

- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600-1060

Open intake chamber  
(design with suction umbrella  $\varnothing d_9$ )



### 9.6.2.2 Installation type BG

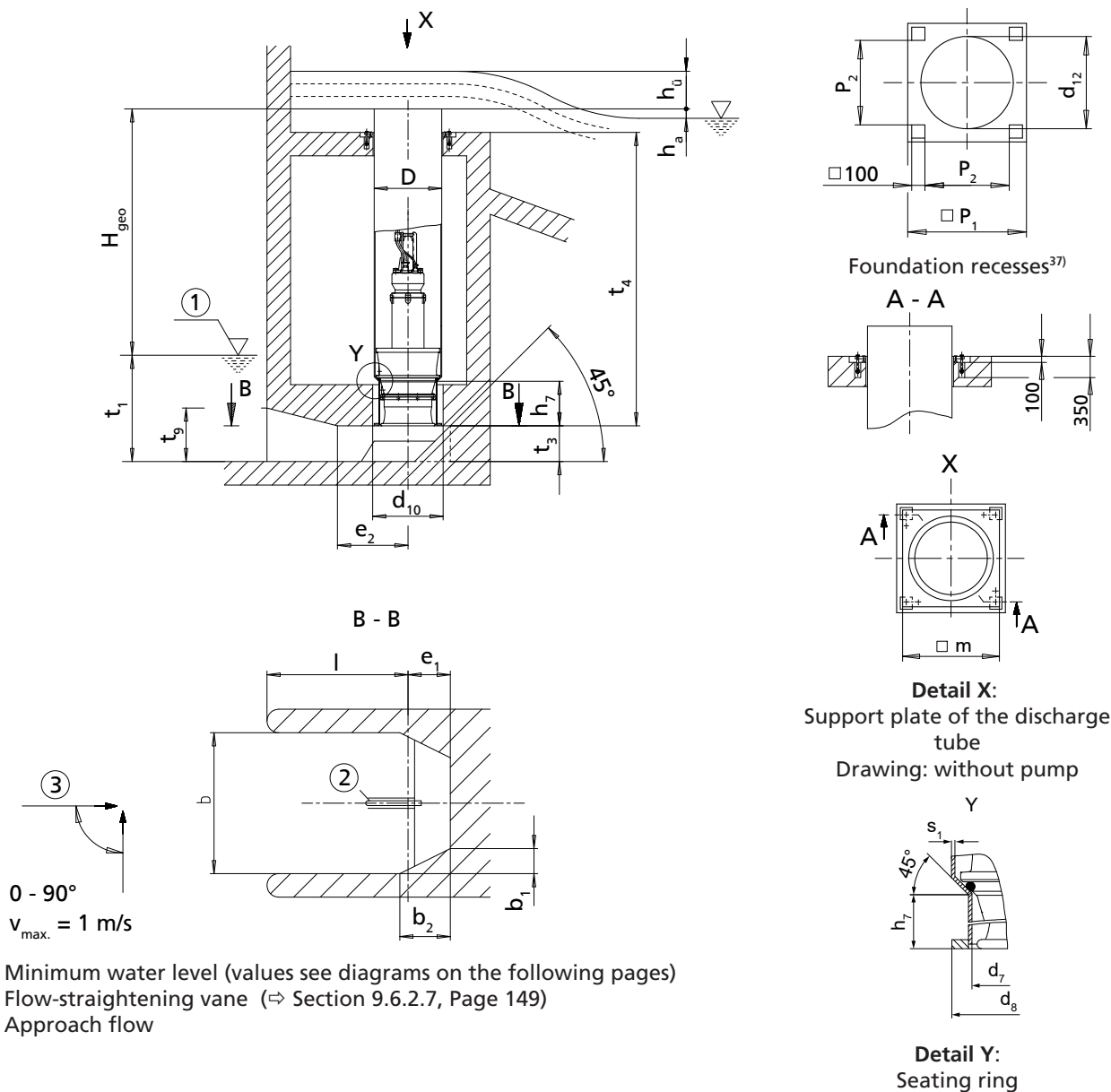


Table 68: Dimensions [mm]

| Size      | D    | b    | b <sub>1</sub> | b <sub>2</sub> | d <sub>7</sub> | d <sub>8</sub> | d <sub>10</sub> | d <sub>12</sub> | e <sub>1</sub> <sup>38)</sup> | e <sub>2</sub> |
|-----------|------|------|----------------|----------------|----------------|----------------|-----------------|-----------------|-------------------------------|----------------|
| 700-470   | 711  | 1500 | 300            | 600            | 600            | 710            | 740             | 750             | 450                           | 750            |
| 800-540   | 813  | 1800 | 360            | 720            | 680            | 810            | 860             | 850             | 519                           | 900            |
| 900-540   | 914  | 1800 | 360            | 720            | 700            | 910            | 960             | 970             | 519                           | 900            |
| 1000-700  | 1016 | 2300 | 460            | 920            | 880            | 1015           | 1080            | 1070            | 673                           | 1150           |
| 1200-870  | 1220 | 2800 | 560            | 1120           | 1070           | 1220           | 1290            | 1280            | 833                           | 1400           |
| 1500-1060 | 1524 | 3500 | 700            | 1400           | 1330           | 1520           | 1600            | 1590            | 1048                          | 1750           |
| 1600-1060 | 1625 | 3500 | 700            | 1400           | 1420           | 1620           | 1700            | 1690            | 1048                          | 1750           |

Table 69: Dimensions [mm]

| Size    | h <sub>a</sub> | h <sub>7</sub> | l <sub>min.</sub> | m   | p <sub>1</sub> | p <sub>2</sub> | t <sub>3</sub> <sup>38)</sup> | t <sub>4 min.</sub> <sup>39)</sup> | t <sub>9</sub> |
|---------|----------------|----------------|-------------------|-----|----------------|----------------|-------------------------------|------------------------------------|----------------|
| 700-470 | 100            | 420            | 1500              | 800 | 910            | 640            | 380                           | 2300                               | 570            |
| 800-540 | 100            | 525            | 1800              | 910 | 1000           | 740            | 440                           | 2350                               | 660            |

<sup>37</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

<sup>38</sup> Observe this dimension.

<sup>39</sup> Value for maximum motor length

| Size      | $h_a$ | $h_7$ | $l_{min.}$ | $m$  | $p_1$ | $p_2$ | $t_3^{38)}$ | $t_{4 min.}^{39)}$ | $t_9$ |
|-----------|-------|-------|------------|------|-------|-------|-------------|--------------------|-------|
| 900-540   | 100   | 515   | 1800       | 1050 | 1120  | 860   | 440         | 2500               | 660   |
| 1000-700  | 100   | 765   | 2300       | 1150 | 1220  | 960   | 560         | 3050               | 850   |
| 1200-870  | 100   | 1000  | 2800       | 1360 | 1420  | 1160  | 680         | 3750               | 1050  |
| 1500-1060 | 100   | 1460  | 3500       | 1680 | 1750  | 1480  | 860         | 3900               | 1320  |
| 1600-1060 | 100   | 1230  | 3500       | 1780 | 1850  | 1580  | 860         | 4350               | 1320  |

Permissible dimensional tolerances:

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

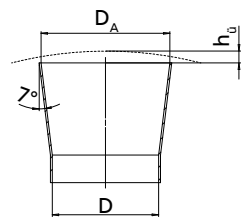
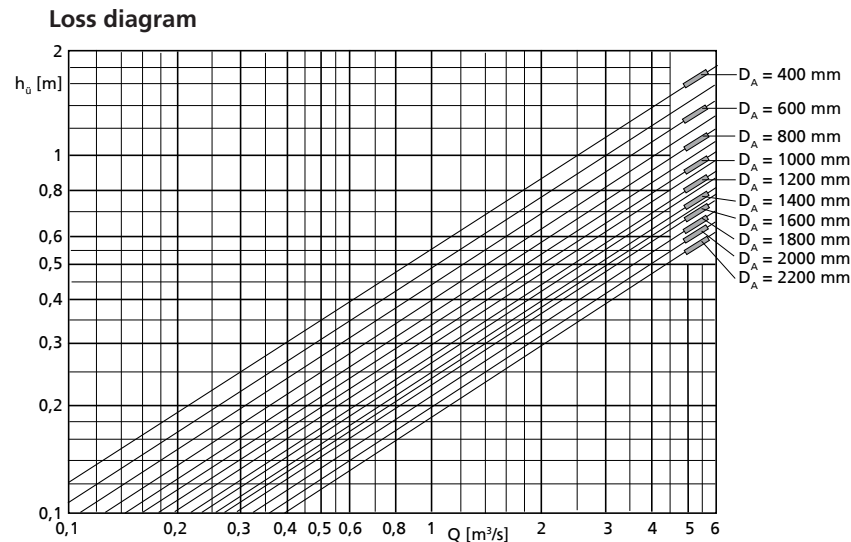


Illustration of the overflow head  $h_u$



Loss diagram

**Calculation formulas:**

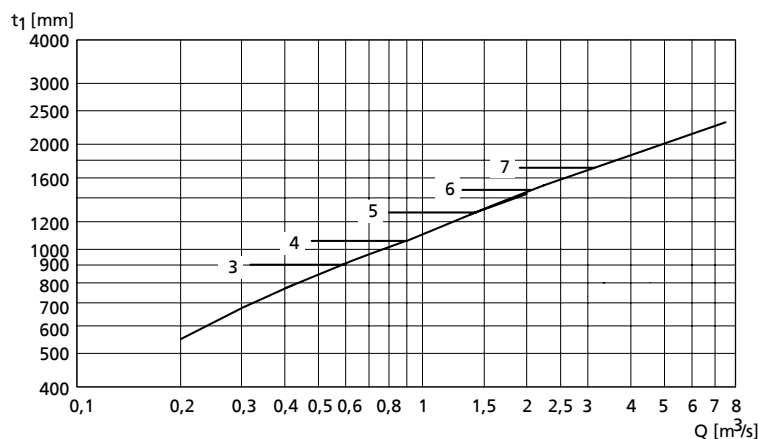
$$H = H_{geo} + \Delta H_v$$

- $\Delta H_v$
- Overflow head  $h_u$  (see diagram)
  - Loss in the riser (pipe friction)
  - Outlet loss  $v^2 / 2g$  ( $v$  refers to  $D_A$ )

Overflow head  $h_u$  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**

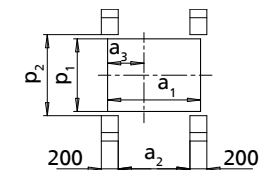
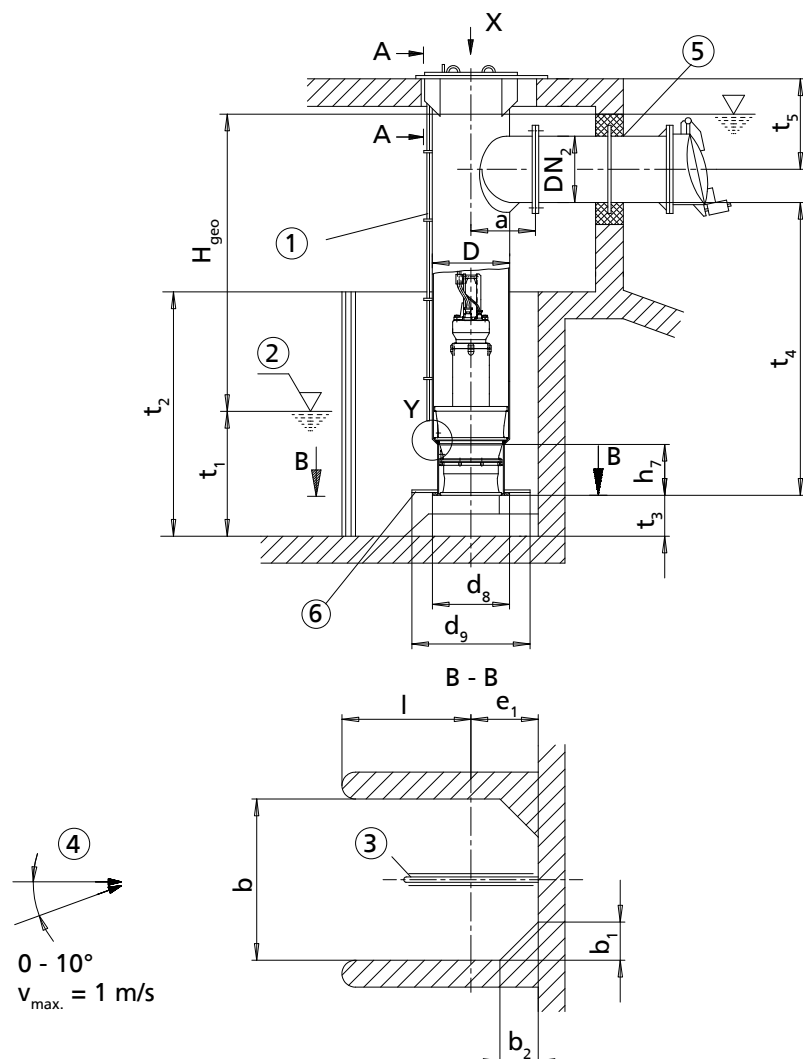
Covered intake chamber



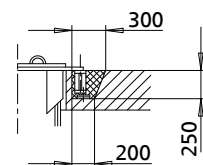
**Key**

- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600 - 1060

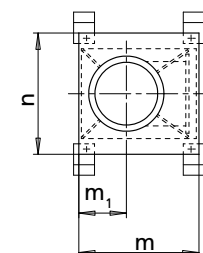
### 9.6.2.3 Installation type CU



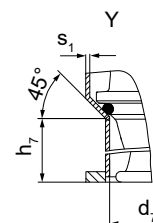
Foundation recesses<sup>40)</sup>



Section A - A



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



**Detail Y:**  
Seating ring

- ①: Vent line
- ②: Minimum water level (values see diagram on the next pages)
- ③: Flow-straightening vane (⇒ Section 9.6.2.7, Page 149)
- ④: Approach flow
- ⑤: Connect the discharge pipe to the discharge pipe without transmitting any stresses or strains.
- ⑥: Suction umbrella - Option for reducing the minimum water level  $t_1$

**Table 70:** Dimensions [mm]

| Size      | DN <sub>2</sub><br>min. | DN <sub>2</sub><br>max. | D    | a    | a <sub>1</sub> <sup>41)</sup> | a <sub>2</sub> <sup>41)</sup> | a <sub>3</sub> <sup>41)</sup> | b    | b <sub>1</sub>   |                | b <sub>2</sub>   |                |
|-----------|-------------------------|-------------------------|------|------|-------------------------------|-------------------------------|-------------------------------|------|------------------|----------------|------------------|----------------|
|           |                         |                         |      |      |                               |                               |                               |      | Suction umbrella |                | Suction umbrella |                |
|           |                         |                         |      |      |                               |                               |                               |      | ✗                | ✓              | ✗                | ✓              |
|           |                         |                         |      |      |                               |                               |                               |      | d <sub>8</sub>   | d <sub>9</sub> | d <sub>8</sub>   | d <sub>9</sub> |
| 700-470   | 400                     | 700                     | 711  | 650  | 1120                          | 870                           | 430                           | 1500 | 300              | —              | 300              | —              |
| 800-540   | 500                     | 800                     | 813  | 700  | 1220                          | 970                           | 480                           | 1800 | 360              | —              | 360              | —              |
| 900-540   | 600                     | 900                     | 914  | 760  | 1320                          | 1070                          | 530                           | 1800 | 360              | —              | 360              | —              |
| 1000-700  | 700                     | 1000                    | 1016 | 810  | 1430                          | 1160                          | 580                           | 2300 | 460              | —              | 460              | —              |
| 1200-870  | 900                     | 1200                    | 1220 | 910  | 1630                          | 1360                          | 680                           | 2800 | 560              | —              | 560              | —              |
| 1500-1060 | 1200                    | 1500                    | 1524 | 1060 | 1960                          | 1690                          | 850                           | 3500 | 700              | —              | 700              | —              |
| 1600-1060 | 1300                    | 1600                    | 1625 | 1110 | 2080                          | 1810                          | 920                           | 3500 | 700              | —              | 700              | —              |

<sup>40)</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

<sup>41)</sup> Designed for DN<sub>2</sub> max.

Table 71: Dimensions [mm]

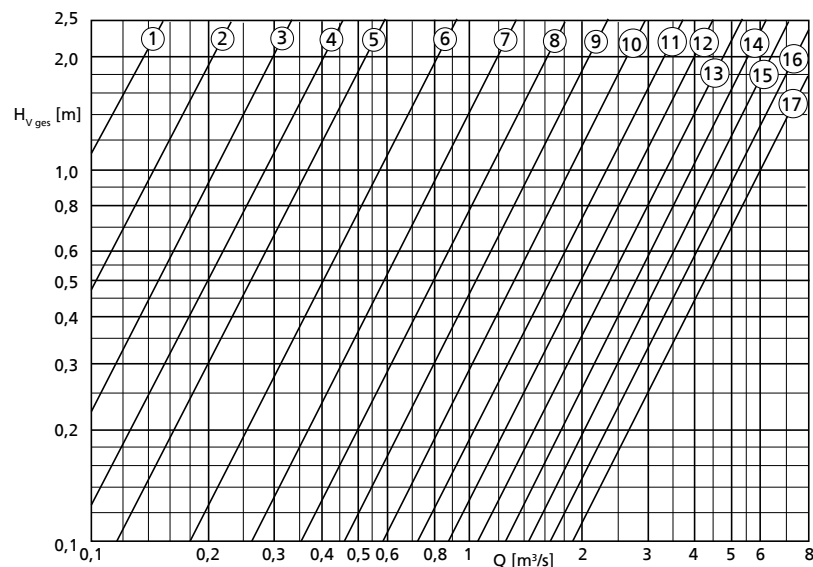
| Size      | d <sub>7</sub> | d <sub>8</sub> | d <sub>9</sub> | e <sub>1</sub> <sup>(42)</sup> |                | h <sub>7</sub> | l <sub>min.</sub> | m <sup>(41)</sup> | m <sub>1</sub> <sup>(41)</sup> | n <sup>(41)</sup> | p <sub>1</sub> <sup>(41)</sup> | p <sub>2</sub> <sup>(41)</sup> | t <sub>3</sub> <sup>(42)</sup> | t <sub>4 min.</sub> <sup>(43)</sup> | t <sub>5 min.</sub> <sup>(41)</sup> |
|-----------|----------------|----------------|----------------|--------------------------------|----------------|----------------|-------------------|-------------------|--------------------------------|-------------------|--------------------------------|--------------------------------|--------------------------------|-------------------------------------|-------------------------------------|
|           |                |                |                | Suction umbrella               |                |                |                   |                   |                                |                   |                                |                                |                                |                                     |                                     |
|           |                |                |                | X                              | ✓              |                |                   |                   |                                |                   |                                |                                |                                |                                     |                                     |
|           |                |                |                | d <sub>8</sub>                 | d <sub>9</sub> |                |                   |                   |                                |                   |                                |                                |                                |                                     |                                     |
| 700-470   | 600            | 710            | 1100           | 450                            | 650            | 420            | 1050              | 1170              | 455                            | 1260              | 960                            | 1060                           | 380                            | 2400                                | 770                                 |
| 800-540   | 680            | 810            | 1250           | 500                            | 700            | 525            | 1300              | 1270              | 505                            | 1375              | 1075                           | 1175                           | 440                            | 2450                                | 835                                 |
| 900-540   | 700            | 910            | 1250           | 550                            | 700            | 515            | 1300              | 1380              | 560                            | 1480              | 1180                           | 1280                           | 440                            | 2650                                | 925                                 |
| 1000-700  | 880            | 1015           | 1600           | 600                            | 900            | 765            | 1700              | 1520              | 625                            | 1620              | 1280                           | 1380                           | 560                            | 3250                                | 980                                 |
| 1200-870  | 1070           | 1220           | 2000           | 700                            | 1100           | 1000           | 2100              | 1720              | 725                            | 1850              | 1510                           | 1610                           | 680                            | 4000                                | 1100                                |
| 1500-1060 | 1330           | 1520           | 2450           | 850                            | 1300           | 1460           | 2650              | 2050              | 895                            | 2180              | 1840                           | 1940                           | 860                            | 4050                                | 1300                                |
| 1600-1060 | 1420           | 1620           | 2450           | 900                            | 1300           | 1230           | 2600              | 2170              | 965                            | 2280              | 1940                           | 2040                           | 860                            | 4450                                | 1380                                |

t<sub>2</sub> = 1.1 × water level, maximum 2 × t<sub>1</sub>  
Height of corner lining (b<sub>1</sub> and b<sub>2</sub>) like t<sub>2</sub>

Permissible dimensional tolerances:

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

Loss diagram



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

#### Calculation formulas:

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

$$\Delta H_v$$

- Loss in the riser (pipe friction)
- H<sub>v ges.</sub> (see diagram)

H<sub>v ges.</sub> comprises:

- Elbow
- Discharge pipe length = 5 × DN<sub>2</sub>
- Swing check valve
- Outlet losses v<sup>2</sup>/2g

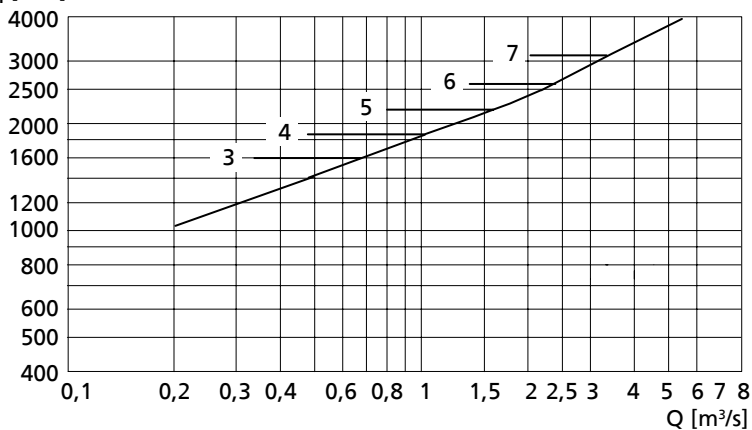
<sup>42</sup> Observe this dimension.

<sup>43</sup> Value for maximum motor length

# Minimum water level diagrams

Open intake chamber  
(design without suction umbrella Ø d<sub>8</sub>)

t<sub>1</sub> [mm]

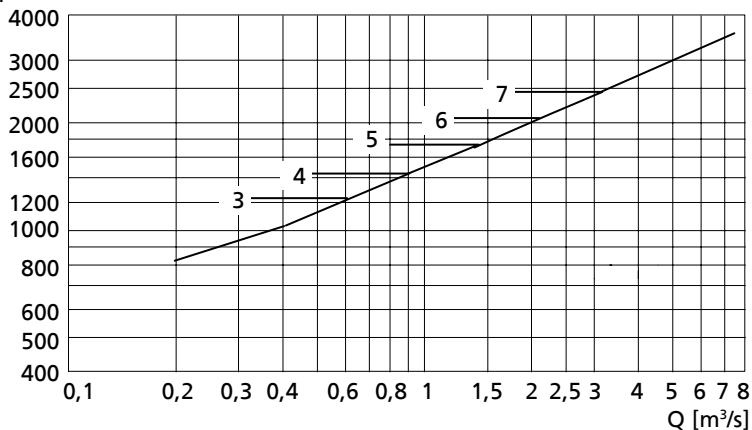


Key

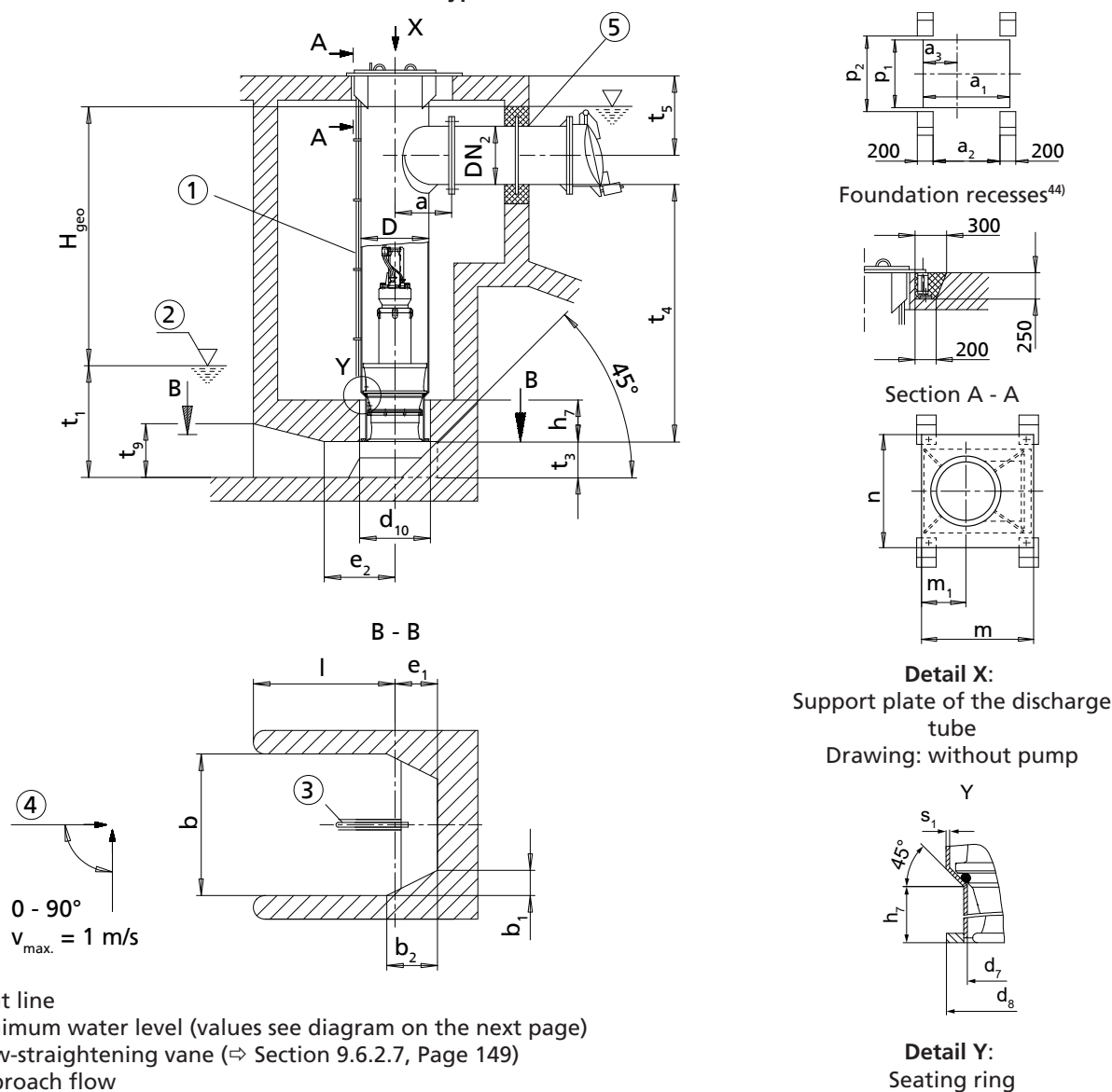
- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600-1060

Open intake chamber  
(design with suction umbrella Ø d<sub>9</sub>)

t<sub>1</sub> [mm]



### 9.6.2.4 Installation type CG



<sup>44</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

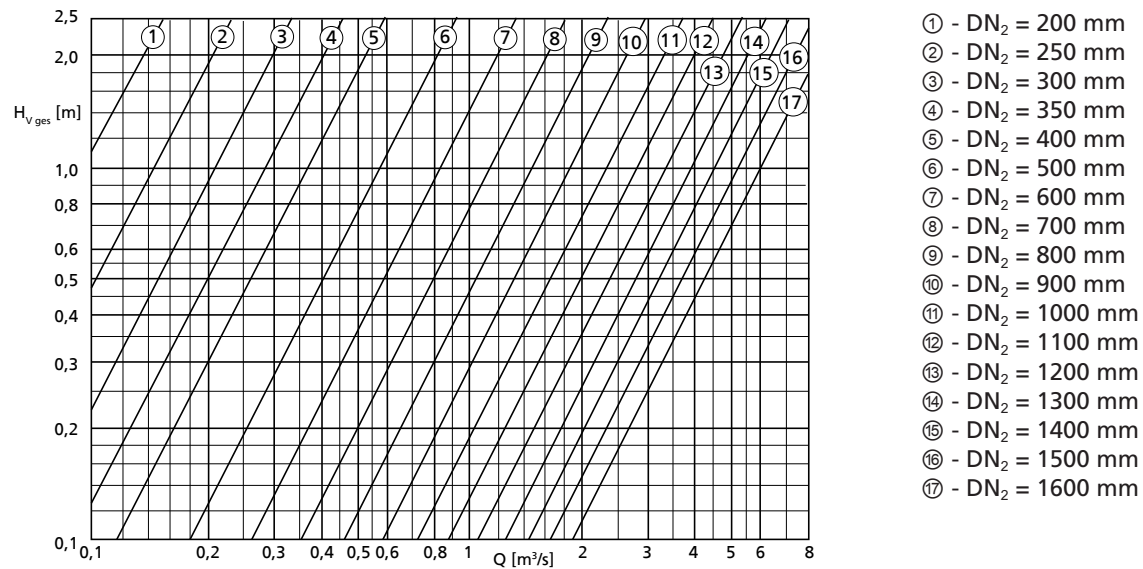
<sup>45</sup> Designed for DN2 max.

**Table 73:** Dimensions [mm]

| Size      | $e_1^{46)}$ | $e_2$ | $h_7$ | $l_{min.}$ | $m^{45)}$ | $m_1^{45)}$ | $n^{45)}$ | $p_1^{45)}$ | $p_2^{45)}$ | $t_3^{46)}$ | $t_{4 min.}^{47)}$ | $t_{5 min.}^{45)}$ | $t_9$ |
|-----------|-------------|-------|-------|------------|-----------|-------------|-----------|-------------|-------------|-------------|--------------------|--------------------|-------|
| 700-470   | 450         | 750   | 420   | 1500       | 1170      | 455         | 1260      | 960         | 1060        | 380         | 2400               | 770                | 570   |
| 800-540   | 519         | 900   | 525   | 1800       | 1270      | 505         | 1375      | 1075        | 1175        | 440         | 2450               | 835                | 660   |
| 900-540   | 519         | 900   | 515   | 1800       | 1380      | 560         | 1480      | 1180        | 1280        | 440         | 2650               | 925                | 660   |
| 1000-700  | 673         | 1150  | 765   | 2300       | 1520      | 625         | 1620      | 1280        | 1380        | 560         | 3250               | 980                | 850   |
| 1200-870  | 833         | 1400  | 1000  | 2800       | 1720      | 725         | 1850      | 1510        | 1610        | 680         | 4000               | 1100               | 1050  |
| 1500-1060 | 1048        | 1750  | 1460  | 3500       | 2050      | 895         | 2180      | 1840        | 1940        | 860         | 4050               | 1300               | 1320  |
| 1600-1060 | 1048        | 1750  | 1230  | 3500       | 2170      | 965         | 2280      | 1940        | 2040        | 860         | 4450               | 1380               | 1320  |

Permissible dimensional tolerances:

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

**Loss diagram**

**Calculation formulas:**

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

$\Delta H_v$

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

$H_{v ges.}$  comprises:

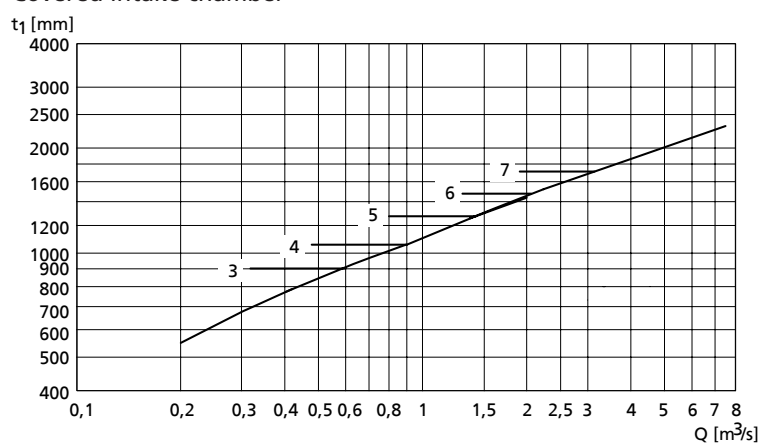
- Elbow
- Discharge pipe length = 5 x DN<sub>2</sub>
- Swing check valve
- Outlet losses  $v^2/2g$

<sup>46</sup> Observe this dimension.

<sup>47</sup> Value for maximum motor length

# Minimum water level diagram

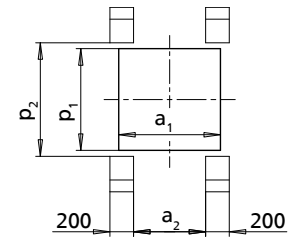
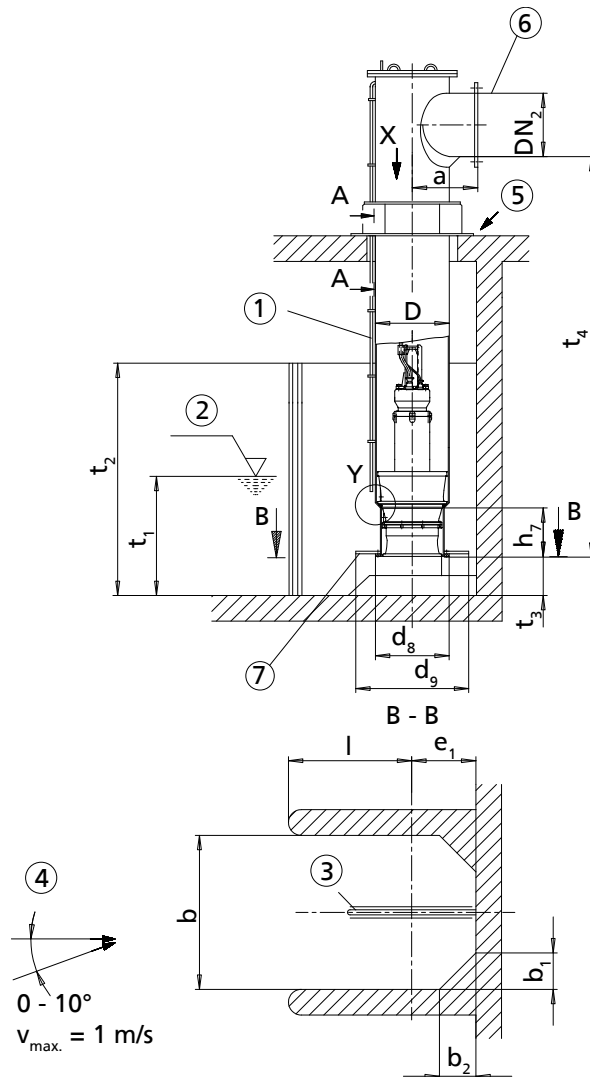
Covered intake chamber



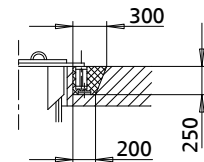
Key

- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600 - 1060

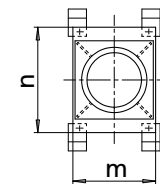
### 9.6.2.5 Installation type DU



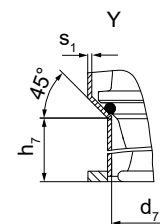
Foundation recesses<sup>48)</sup>



Section A - A



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



**Detail Y:**  
Seating ring

- ①: Vent line
- ②: Minimum water level (values see diagram on the next pages)
- ③: Flow-straightening vane (⇒ Section 9.6.2.7, Page 149)
- ④: Approach flow
- ⑤: Not pressure-proof
- ⑥: Connect the discharge pipe to the discharge tube without transmitting any stresses or strains.
- ⑦: Suction umbrella; option for reducing the minimum water level  $t_1$

**Table 74:** Dimensions [mm]

| Size      | DN <sub>2</sub> min. | DN <sub>2</sub> max. | D    | a    | a <sub>1</sub> | a <sub>2</sub> | b    | b <sub>1</sub>   |                | b <sub>2</sub>   |                |
|-----------|----------------------|----------------------|------|------|----------------|----------------|------|------------------|----------------|------------------|----------------|
|           |                      |                      |      |      |                |                |      | Suction umbrella |                | Suction umbrella |                |
|           |                      |                      |      |      |                |                |      | X                | ✓              | X                | ✓              |
|           |                      |                      |      |      |                |                |      | d <sub>8</sub>   | d <sub>9</sub> | d <sub>8</sub>   | d <sub>9</sub> |
| 700-470   | 400                  | 700                  | 711  | 650  | 860            | 610            | 1500 | 300              | —              | 300              | —              |
| 800-540   | 500                  | 800                  | 813  | 700  | 960            | 710            | 1800 | 360              | —              | 360              | —              |
| 900-540   | 600                  | 900                  | 914  | 760  | 1060           | 810            | 1800 | 360              | —              | 360              | —              |
| 1000-700  | 700                  | 1000                 | 1016 | 810  | 1160           | 910            | 2300 | 460              | —              | 460              | —              |
| 1200-870  | 900                  | 1200                 | 1220 | 910  | 1360           | 1110           | 2800 | 560              | —              | 560              | —              |
| 1500-1060 | 1200                 | 1500                 | 1524 | 1060 | 1670           | 1420           | 3500 | 700              | —              | 700              | —              |
| 1600-1060 | 1300                 | 1600                 | 1625 | 1110 | 1770           | 1520           | 3500 | 700              | —              | 700              | —              |

<sup>48)</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

Table 75: Dimensions [mm]

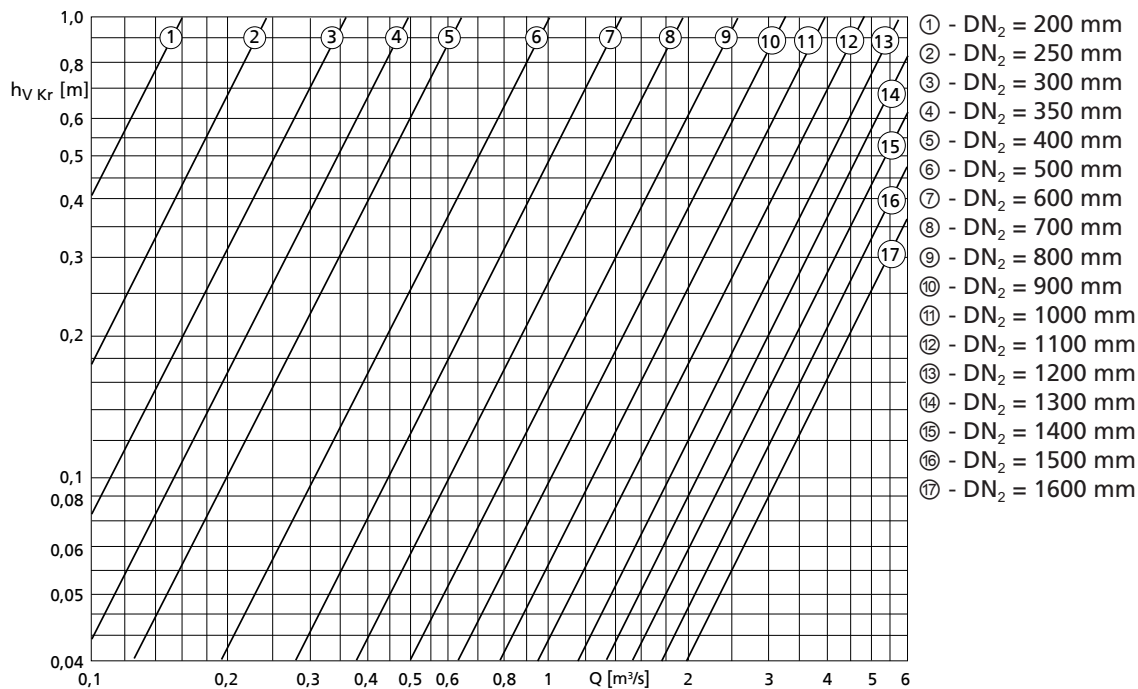
| Size      | d <sub>7</sub> | d <sub>8</sub> | d <sub>9</sub> | e <sub>1</sub> <sup>(49)</sup> |                | h <sub>7</sub> | l <sub>min.</sub> | m    | n    | p <sub>1</sub> | p <sub>2</sub> | t <sub>3</sub> <sup>(49)</sup> | t <sub>4 min.</sub> <sup>(50)</sup> |
|-----------|----------------|----------------|----------------|--------------------------------|----------------|----------------|-------------------|------|------|----------------|----------------|--------------------------------|-------------------------------------|
|           |                |                |                | Suction umbrella               |                |                |                   |      |      |                |                |                                |                                     |
|           |                |                |                | ✗                              | ✓              |                |                   |      |      |                |                |                                |                                     |
|           |                |                |                | d <sub>8</sub>                 | d <sub>9</sub> |                |                   |      |      |                |                |                                |                                     |
| 700-470   | 600            | 710            | 1100           | 450                            | 650            | 420            | 1050              | 930  | 1160 | 860            | 960            | 380                            | 2400                                |
| 800-540   | 680            | 810            | 1250           | 500                            | 700            | 525            | 1300              | 1030 | 1260 | 960            | 1060           | 440                            | 2450                                |
| 900-540   | 700            | 910            | 1250           | 550                            | 700            | 515            | 1300              | 1130 | 1360 | 1060           | 1160           | 440                            | 2650                                |
| 1000-700  | 880            | 1015           | 1600           | 600                            | 900            | 765            | 1700              | 1240 | 1500 | 1160           | 1260           | 560                            | 3250                                |
| 1200-870  | 1070           | 1220           | 2000           | 700                            | 1100           | 1000           | 2100              | 1440 | 1700 | 1360           | 1460           | 680                            | 4000                                |
| 1500-1060 | 1330           | 1520           | 2450           | 850                            | 1300           | 1460           | 2650              | 1760 | 2010 | 1670           | 1770           | 860                            | 4050                                |
| 1600-1060 | 1420           | 1620           | 2450           | 900                            | 1300           | 1230           | 2600              | 1870 | 2130 | 1770           | 1870           | 860                            | 4450                                |

t<sub>2</sub> = 1.1 × water level, maximum 2 × t<sub>1</sub>  
Height of corner lining (b<sub>1</sub> and b<sub>2</sub>) like t<sub>2</sub>

Permissible dimensional tolerances:

- Tolerances in building construction to DIN 18202, Part 4, Group B
- Welded design: B/F to DIN EN ISO 13920
- Tolerances for conical seat (detail 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.

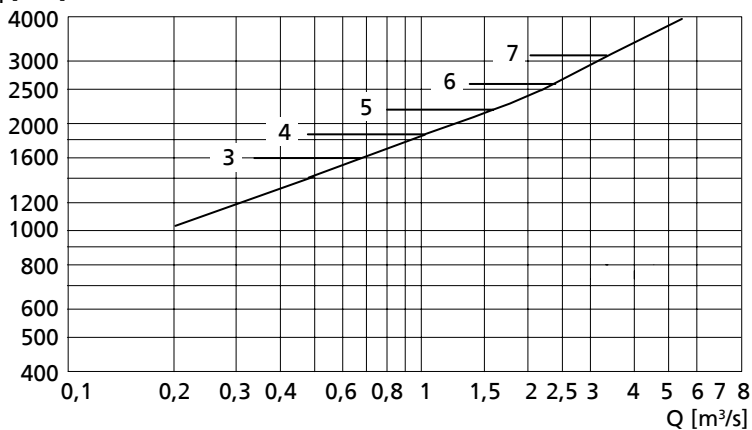
<sup>49</sup> Observe this dimension.

<sup>50</sup> Value for maximum motor length

# Minimum water level diagrams

Open intake chamber  
(design without suction umbrella Ø d<sub>8</sub>)

t<sub>1</sub> [mm]

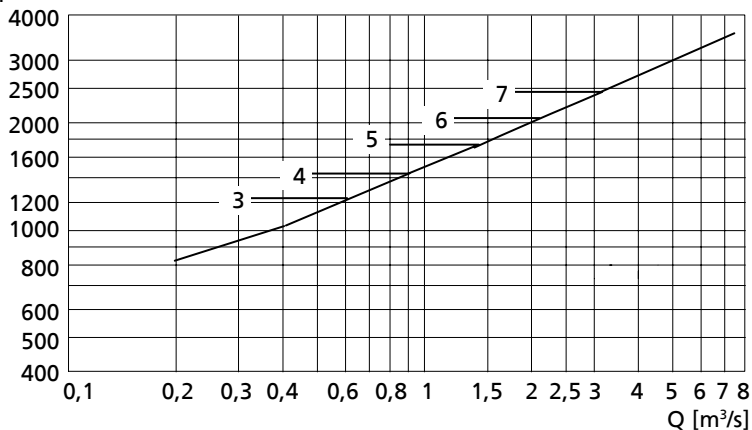


Key

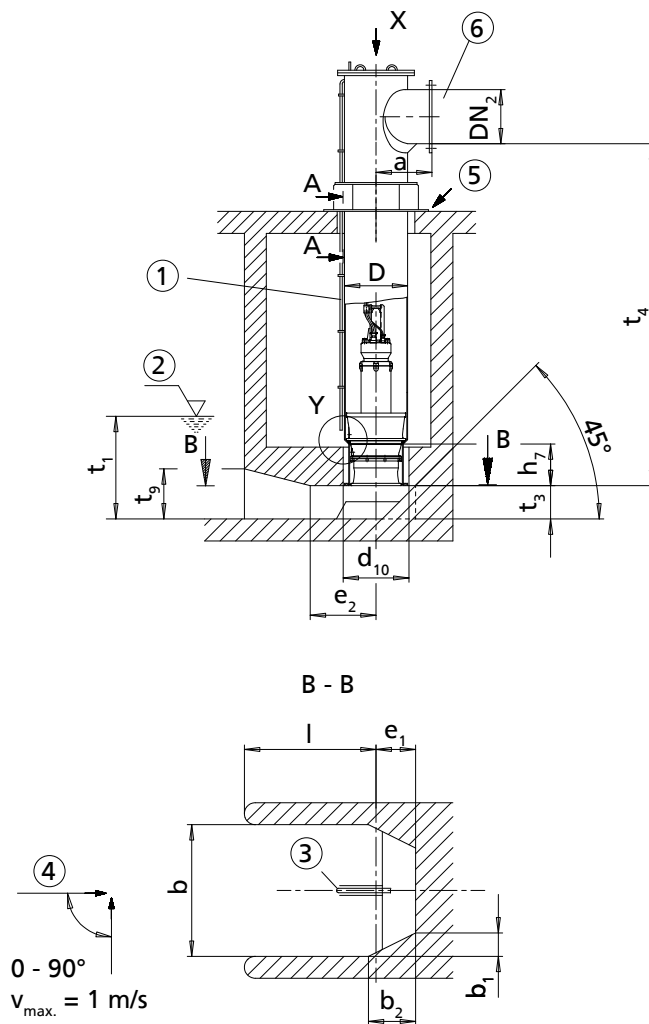
- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600-1060

Open intake chamber  
(design with suction umbrella Ø d<sub>9</sub>)

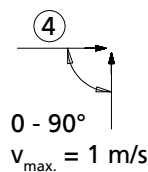
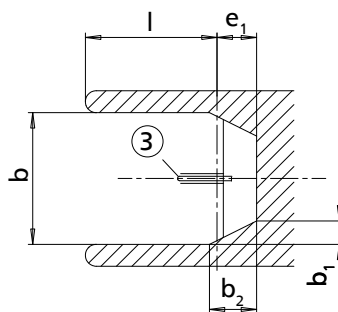
t<sub>1</sub> [mm]



### 9.6.2.6 Installation type DG



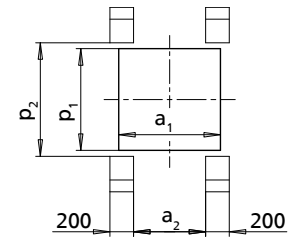
B - B



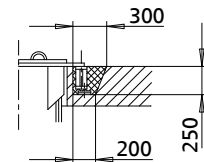
- ①: Vent line
- ②: Minimum water level (values see diagram on the next pages)
- ③: Flow-straightening vane (⇒ Section 9.6.2.7, Page 149)
- ④: Approach flow
- ⑤: Not pressure-proof
- ⑥: Connect the discharge pipe to the discharge tube without transmitting any stresses or strains.

Table 76: Dimensions [mm]

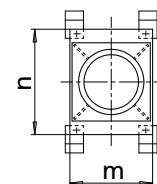
| Size      | DN <sub>2 min.</sub> | DN <sub>2 max.</sub> | D    | a    | a <sub>1</sub> | a <sub>2</sub> | b    | b <sub>1</sub> | b <sub>2</sub> | d <sub>7</sub> | d <sub>8</sub> | d <sub>10</sub> |
|-----------|----------------------|----------------------|------|------|----------------|----------------|------|----------------|----------------|----------------|----------------|-----------------|
| 700-470   | 400                  | 700                  | 711  | 650  | 860            | 610            | 1500 | 300            | 600            | 600            | 710            | 740             |
| 800-540   | 500                  | 800                  | 813  | 700  | 960            | 710            | 1800 | 360            | 720            | 680            | 810            | 860             |
| 900-540   | 600                  | 900                  | 914  | 760  | 1060           | 810            | 1800 | 360            | 720            | 700            | 910            | 960             |
| 1000-700  | 700                  | 1000                 | 1016 | 810  | 1160           | 910            | 2300 | 460            | 920            | 880            | 1015           | 1080            |
| 1200-870  | 900                  | 1200                 | 1220 | 910  | 1360           | 1110           | 2800 | 560            | 1120           | 1070           | 1220           | 1290            |
| 1500-1060 | 1200                 | 1500                 | 1524 | 1060 | 1670           | 1420           | 3500 | 700            | 1400           | 1330           | 1520           | 1600            |
| 1600-1060 | 1300                 | 1600                 | 1625 | 1110 | 1770           | 1520           | 3500 | 700            | 1400           | 1420           | 1620           | 1700            |



Foundation recesses<sup>51)</sup>



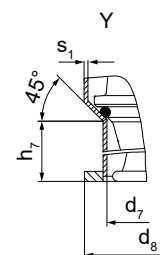
Section A - A



Detail X:

Support plate of the discharge tube

Drawing: without pump



Detail Y:

Seating ring

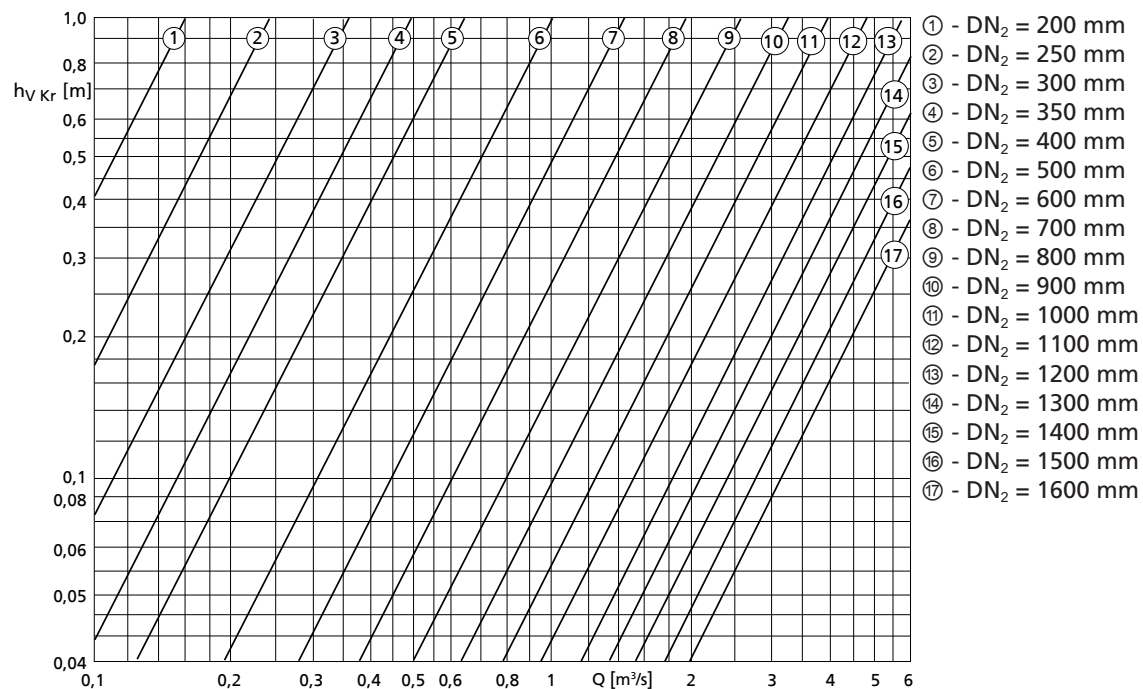
<sup>51)</sup> All dimensions for foundation recesses apply to discharge tube design without intermediate flange.

**Table 77: Dimensions [mm]**

| Size      | e <sub>1</sub> <sup>52)</sup> | e <sub>2</sub> | h <sub>7</sub> | l <sub>min.</sub> | m    | n    | p <sub>1</sub> | p <sub>2</sub> | t <sub>3</sub> <sup>52)</sup> | t <sub>4 min.</sub> <sup>53)</sup> | t <sub>9</sub> |
|-----------|-------------------------------|----------------|----------------|-------------------|------|------|----------------|----------------|-------------------------------|------------------------------------|----------------|
| 700-470   | 450                           | 750            | 420            | 1500              | 930  | 1160 | 860            | 960            | 380                           | 2400                               | 570            |
| 800-540   | 519                           | 900            | 525            | 1800              | 1030 | 1260 | 960            | 1060           | 440                           | 2450                               | 660            |
| 900-540   | 519                           | 900            | 515            | 1800              | 1130 | 1360 | 1060           | 1160           | 440                           | 2650                               | 660            |
| 1000-700  | 673                           | 1150           | 765            | 2300              | 1240 | 1500 | 1160           | 1260           | 560                           | 3250                               | 850            |
| 1200-870  | 833                           | 1400           | 1000           | 2800              | 1440 | 1700 | 1360           | 1460           | 680                           | 4000                               | 1050           |
| 1500-1060 | 1048                          | 1750           | 1460           | 3500              | 1760 | 2010 | 1670           | 1770           | 860                           | 4050                               | 1320           |
| 1600-1060 | 1048                          | 1750           | 1230           | 3500              | 1870 | 2130 | 1770           | 1870           | 860                           | 4450                               | 1320           |

Permissible dimensional tolerances:

- Tolerances in building construction to DIN 18202, Part 4, Group B
- Welded design: B/F to DIN EN ISO 13920
- Tolerances for conical seat (detail Y): ISO 2768-mH
- Discharge flanges to ISO 7005/2, DIN 2501 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.)

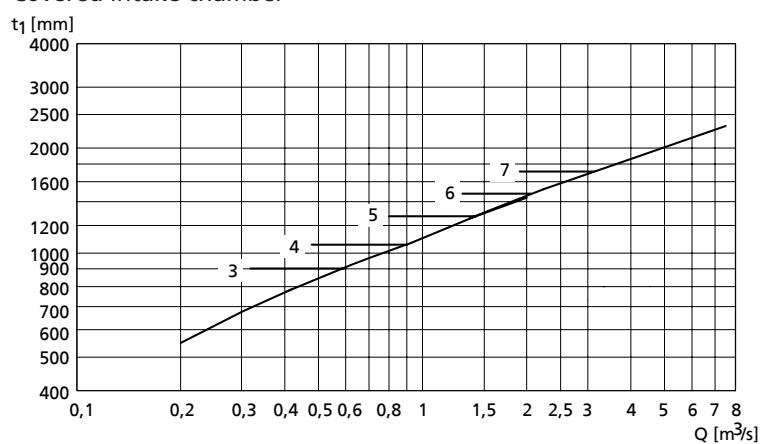
$H_{v \text{ System}}$  must be determined for the specific system.

<sup>52</sup> Observe this dimension.

<sup>53</sup> Value for maximum motor length

# Minimum water level diagram

Covered intake chamber



Key

- 3 - Amacan P 700 - 470
- 4 - Amacan P 800/900 - 540
- 5 - Amacan P 1000 - 700
- 6 - Amacan P 1200 - 870
- 7 - Amacan P 1500/1600 - 1060

### 9.6.2.7 Dimensions of the flow-straightening vane

#### Design of the intake chamber wall surfaces (to prevent vortex formation)

The flow-straightening vane is indispensable for the inlet conditions of the pump set. It prevents the development of a submerged vortex (floor vortex) which could cause a drop in performance, for example. In addition, the floor and wall surfaces of the intake chamber should be designed as a rough concrete surface. Rough surfaces minimize the separation of boundary layers that may cause wall and floor vortices.

#### Flow-straightening vane and intake chamber

- The anti-vortex vanes in the bellmouth must be aligned with the flow-straightening vane.
- The bail of the pump is oriented in the same direction as the anti-vortex vanes in the bellmouth.

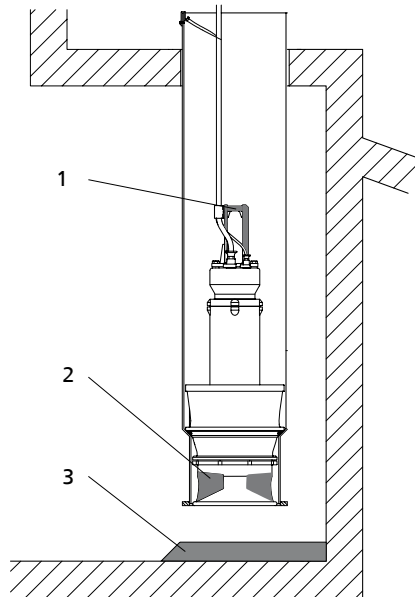
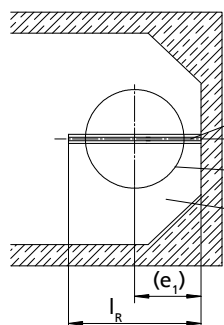
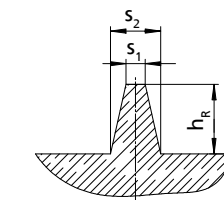


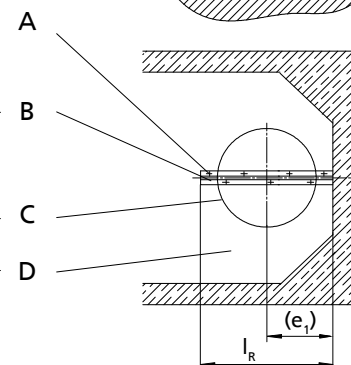
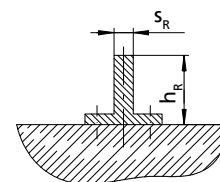
Fig. 69: Installation position of the pump set

|   |                         |
|---|-------------------------|
| 1 | Bail                    |
| 2 | Anti-vortex vanes       |
| 3 | Flow-straightening vane |

Variant 1  
Flow-straightening vane cast from concrete



Variant 2  
Steel section



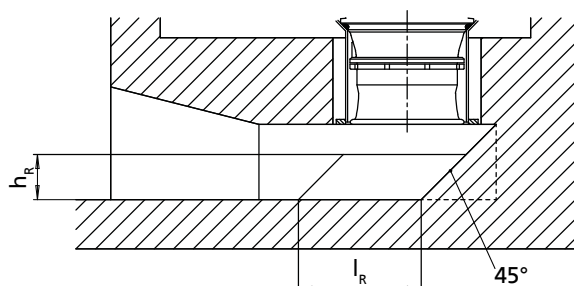
|   |                                                             |
|---|-------------------------------------------------------------|
| A | Bolted to the floor of the intake chamber                   |
| B | Flow-straightening vane centered beneath the discharge tube |
| C | Discharge tube                                              |
| D | Intake chamber                                              |

#### Installation types BU, CU, DU

**Table 78:** Dimensions [mm]

| Size      | $h_R$ | $s_1$ | $s_2$ | $s_R$ | $(e_1)$          |              | $l_R^{54)}$      |              |
|-----------|-------|-------|-------|-------|------------------|--------------|------------------|--------------|
|           |       |       |       |       | Suction umbrella |              | Suction umbrella |              |
|           |       |       |       |       | $\times$         | $\checkmark$ | $\times$         | $\checkmark$ |
|           |       |       |       |       | $d_8$            | $d_9$        | $d_8$            | $d_9$        |
| 500-270   | 120   | 15    | 60    | 10    | 350              | 400          | 670              | 720          |
| 600-350   | 190   | 20    | 70    | 10    | 400              | 500          | 875              | 940          |
| 700-470   | 230   | 25    | 90    | 10    | 450              | 650          | 1000             | 1200         |
| 800-540   | 265   | 25    | 100   | 12    | 500              | 700          | 1165             | 1300         |
| 900-540   | 265   | 25    | 100   | 12    | 550              | 700          | 1165             | 1300         |
| 1000-700  | 335   | 30    | 120   | 12    | 600              | 900          | 1375             | 1675         |
| 1200-870  | 410   | 30    | 120   | 12    | 700              | 1100         | 1650             | 2050         |
| 1500-1060 | 515   | 40    | 140   | 12    | 850              | 1300         | 2050             | 2500         |
| 1600-1060 | 515   | 40    | 140   | 12    | 900              | 1300         | 2050             | 2500         |

#### Installation types BG, CG, DG



**Fig. 70:** Flow-straightening vane for covered intake chamber

**Table 79:** Dimensions [mm]

| Size      | $h_R$ | $s_1$ | $s_2$ | $s_R$ | $l_R$ |
|-----------|-------|-------|-------|-------|-------|
| 500-270   | 120   | 15    | 60    | 10    | 430   |
| 600-350   | 190   | 20    | 70    | 10    | 545   |
| 700-470   | 230   | 25    | 90    | 10    | 650   |
| 800-540   | 265   | 25    | 100   | 12    | 740   |
| 900-540   | 265   | 25    | 100   | 12    | 790   |
| 1000-700  | 335   | 30    | 120   | 12    | 940   |
| 1200-870  | 410   | 30    | 120   | 12    | 1150  |
| 1500-1060 | 515   | 40    | 140   | 12    | 1450  |
| 1600-1060 | 515   | 40    | 140   | 12    | 1500  |

<sup>54</sup> Adjust length  $l_R$  of the flow-straightening vane to the 45° angle of the intake chamber.

## 10 Certificate of Decontamination

Type: .....  
Order number/ .....  
Order item number<sup>55)</sup>: .....  
Delivery date: .....  
Field of application: .....  
Fluid handled<sup>55)</sup>: .....

Please check where applicable<sup>55)</sup>:



Corrosive



Oxidizing



Flammable



Explosive



Hazardous to health



Seriously hazardous to health



Toxic



Radioactive



Hazardous to the environment



Safe

Reason for return<sup>55)</sup>: .....  
Comments: .....  
.....

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

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

For mag-drive pumps, the inner rotor unit (impeller, casing cover, bearing ring carrier, plain bearing, inner rotor) has been removed from the pump and cleaned. In cases of leakage at the stator can, the stator space has been examined for fluid leakage; if fluid handled has penetrated the stator space, it has been removed.

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

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

.....  
.....

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

.....  
Place, date and signature

.....  
Address

.....  
Company stamp

<sup>55)</sup> Required field

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**KSB SE & Co. KGaA**

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

Tel. +49 6233 86-0

[www.ksb.com](http://www.ksb.com)

(01755511)

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