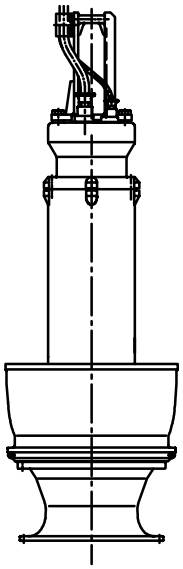
Amacan S



Submersible motor pump

50 Hz

Order No.:

. . . . . .

Works No.:

. . . . . .

Pump size:

. . . . . .

These operating instructions contain important notes and warnings. Please make quite sure that you have read them before installation, before making any electrical connections and before first commissioning. Additional operating instructions covering sections which form part of this unit must also be observed.

Basically, work at the unit must only be carried out with the electrical connections disconnected (including control cable).
The pump must be protected from inadvertent switching on.

Ident-No.: 01 077 013

KSB

Table of Contents

1 General Information

This KSB pump has been designed to the latest technical standards, has been manufactured with great care and is subject to continuous quality checks.

These operating instructions are meant to help you in getting to know the pump and to benefit from its intended applications.

The instructions contain important notes to operate the pump safely, correctly and economically. It is important that all these are observed to ensure the reliability and service life of the pump and to avoid elements of danger.

These operating instructions make no allowance for local requirements. It is the duty of the operator to ensure that these are all met by himself and by any staff that may have been recruited for local assembly work.

This unit must not be operated outside the parameters shown in its technical specifications. In particular, attention must be paid to the kind of pumped medium, flow rate, rotational speed, density, pressure, temperature and motor capacity and any other condition contained in the order documentation.

The factory identification plate quotes model number and size, the more important operating data and the manufacturers/ serial number. This must always be quoted when making enquiries or ordering spare parts.
If other information or help is required or in the case of malfunctions, please contact the nearest KSB-Customer Service Station.

2 Safety

These operating instructions contain fundamental notes, which must be observed when installing, operating and servicing the equipment. Therefore, they must be read prior to assembly and use by the installer, the responsible technician and operator. These instructions must at all times be available at the point of operation of the machine or plant.

Not only the general safety precautions listed under this heading must be observed, but also all precautions listed under all other headings.

2.1 Identification of Safety Instructions

Safety notes in these instructions, which could cause danger to life when not observed, are highlighted by the general danger symbol

Safety Identification as per DIN 4844-W 9

A warning against electrical voltage is indicated by

Safety Identification as per DIN 4844-W 8

Safety warnings, which could spell danger for the machine or its functions, are identified by

the word **Attention**

References affixed to the machine e.g.:

- an arrow for the direction of rotation
- identification of connections for fluids

must be noted and kept in readable condition.

2.2 Personnel Qualifications and Training

Personnel responsible for operation, maintenance, inspection and assembly must possess the appropriate qualifications. Levels of responsibility, competence and staff supervision must be clearly identified. If staff lack the required knowledge, training must be provided. If necessary, this can be given by the manufacturers / suppliers on request by the operator.

2.3 Implications when Safety Warnings are disregarded

Disregarding safety warnings may result in danger to life, the environment or the machine and will invalidate any claims for compensation.

Non-observance can, for example, lead to the following:

- failure of important machine or system functions.
- lack of effectiveness of service and maintenance.
- danger to persons by electrical, mechanical or chemical effects.
- endangering the environment by leakage of dangerous substances.

2.4 Awareness to Safety at Work

Safety instructions contained in this publication, all existing national requirements for accident prevention as well as any internal company or works requirements issued by the operator must be observed.

2.5 Safety Instructions for the Operator/User

- If hot or cold machine parts could pose a hazard, then these must be protected at site against contact.
- Such safety guards for moving machine parts (e.g. couplings) must not be removed when the machine is in operation.
- Leakage (e.g. at the shaft seal) of dangerous media (e.g. explosive, poisonous, hot) must be discharged in such a manner that there is no danger to life or the environment. Local laws must be observed.
- Danger from electric shock must be prevented. (Details should be obtained from country specific rules and/or the energy supply company).

2.6 Safety Instructions for Maintenance, Inspection and Installation work

The operator must ensure that all maintenance, inspection and installation work is only provided by authorised and qualified specialists who have studied the operating instructions and are therefore fully conversant with all procedures.

Basically, work must only be carried out when the machine is standing still. The method of bringing this to a standstill is shown in these operating instructions and must always be followed.

Pumps or systems which are operating with hazardous media, must be emptied and cleaned prior to any work to be performed.

Immediately after completion of the work, all guards and safety systems must be restored or re-activated.

Prior to re-commissioning all instructions given in the **paragraph outlining initial commissioning** must be observed.

2.7 Unauthorised Modifications and the Manufacture of Spare Parts

Modifications of the machine are only permitted after consulting the manufacturers. Original spare parts and accessories authorised by the manufacturers ensure safety. The use of other parts may invalidate any warranty claims.

2.8 Inadmissible Methods of Operation

The operational reliability of the pump supplied is only ensured if it is used in accordance with the data provided in **Section 1**. Under no circumstances must limit values given in the specification be exceeded.

3 Transport, Interim Storage

The lifting ropes supplied must only be used to lift the corresponding pump unit. General use for other types of lifting work is not permissible.

Do not support the pump by its motor cables!

The pump must be transported in a competent manner. Lifting ropes must be securely attached to crane and pump.
Should the pump be allowed to slip out of its suspension arrangement, then damage to persons or property may result.

3.1 Transport

The pump is prepared for the attachment of a lifting device. For vertical transport, attach on pin of clamp. For horizontal transport, attach pump analogous to **Appendix "General Pump Diagram"** Fig. 1a. Fastening the lifting device to other points can lead to damage of the unit.

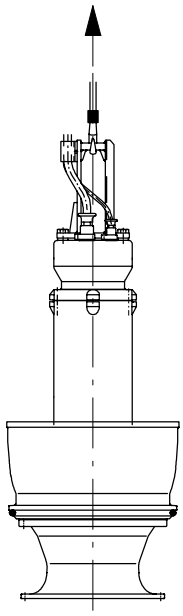


Fig. 1 Vertical transport of unit

The pump is raised as shown in **the Appendix "General Pump Diagram" Fig. 1a with 2 cranes.**

Only in exceptional cases or if no second crane is available, the pump can be raised with one crane according to Fig. 1b. As there is the risk of a sudden uncontrolled movement of the pump into vertical position, this must be avoided by holding the pump at a slight angle against the tipping direction.

The stability of a pump unit set down vertically on the bellmouth of the pump casing is inadequate. Consequently, prevent the pump unit from falling over by using clamp part No. 571 and a crane or by other means of attachment.

3.2 Interim Storage/Preservation

The procedure is described in **Section 6.3 "Shutdown/ Storage/Preservation"**.

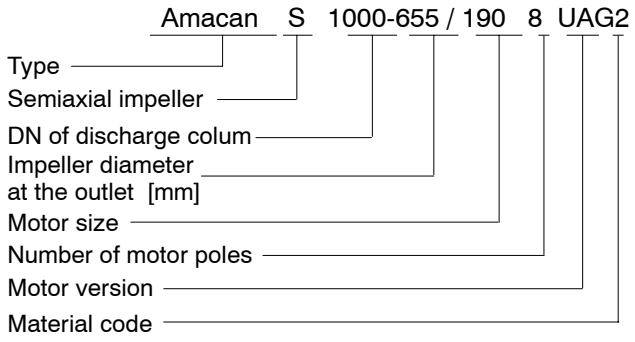
4 Product Description and Accessories

4.1 General Description

KSB submersible Amacan S pumps are identified by a semiaxial impeller with connected pump casing and electric motor.

4.2 Designation

The product identification is contained on the motor-mounted nameplate.



4.3 Design

4.3.1 Drive

KSB submersible pumps are supplied as three-phase A. C. version, complete with connection cable.
Electrical data according to information on the nameplate.
Starting mode: direct (*standard*).
The motors are generally suited for frequency inverters (FC).

4.3.2 Shaft Seal

Mechanical seals are fitted at the pump and motor ends of the shaft. Their action is independent of the direction of rotation. A liquid-containing chamber between the seals provides cooling and lubrication.

4.3.3 Bearings

All pump sizes are fitted with grease-lubricated, maintenance-free anti-friction bearings.

4.3.4 Impeller

- Semiaxial impeller, open
- Semiaxial impeller, closed

4.3.5 Method of Installation

The pump unit is installed vertically in a discharge column with a conical mating surface.

4.3.6 Dimensions and Weights

Information concerning general dimensions, dimensions for making connections and unit weights are contained in the **Appendix under "Dimension Table".**

4.4 Accessories

To ensure correct operation of the monitoring circuits, KSB can supply suitable switching units. Recommended units are described in the **Appendix under "Electrical Connection Diagram".**

Enquiries for additional accessories can be made through one of the KSB sales offices.

5 Assembly/Installation

5.1 Safety Regulations

When a submersible pump unit is in use or operational, the presence of persons within the inlet chamber or the discharge column and in the discharge channel is not permitted.

5.2 Inspection prior to Installation

All building work must have been carried out in conformity with the dimensions shown in the Dimension Table.

5.3 Installing the Pump/Unit

Attention

Before installing the pump, its operating data, Section 5.3.1, the oil level, Section 5.3.2 and the direction of rotation, Section 5.5.6 must all be checked.

An additional nameplate is supplied affixed to the end of the connecting cable, and containing data on pump and motor. This plate should be mounted in a clearly visible location outside the pump sump (e. g. control cabinet, pipe, bracket).

5.3.1 Checking the Operating Data

Prior to installation, or before commissioning, the information contained on the nameplate, the data contained in the order and the system data must be compared to ensure they all agree. This includes operating voltage, frequency, pumped medium temperature etc.

5.3.2 Checking the Oil Level

The oil vessels of KSB submersible pumps are filled at the factory with environmentally friendly, non-toxic paraffin oil, of medical quality.

The oil level must be checked before commissioning.

Procedure:
First of all, visually inspect the pump for oil leakage between impeller and pump casing while the pump is in horizontal position. If no traces of oil can be recognized, the oil chamber is appropriately filled and no further measures are required.

Should traces of oil leaks be found, proceed as follows:

- Set down pump as shown in **Appendix** "**General Pump Diagram"** Fig. 2.
- Remove bellmouth and impeller.
- At front end of the pump casing there are 1 or 2 screwed plugs depending on the pump size. If there are 2 screwed plugs, the plug which is nearest the shaft must be brought to upper position, then unscrewed and the oil level controlled. The minimum oil level may not drop below dimension **"M"**. If the oil level is lower, the oil chamber must be filled until oil flows out at the filler. Oil quality and quantity see Section 7.2.5.

5.3.3 Intake Chambers

Dimensions and shape of KSB intake chambers are based on 4 important criteria:

- The provision of a constant velocity profile in front of the impeller.
- When installing the pump in the discharge column, make sure that both flow straightening vanes in the bellmouth are located longitudinally to the flow direction.
- Air vortex-free flow of the pumped medium from intake chamber.
- The prevention of floor- or wall vortices.
  In order to prevent harmful turbulence, which results in the entrainment of air in the medium, it is important to ensure that for the maximum flow rate of the pump the water level will not fall below the required minimum. The minimum water level t_1 is given in the **Appendix under "Installation Lay-out".**

  Size and shape of intake chambers must conform to the drawings contained in the Installation Lay-out. Otherwise, harmful vortices may form at the chamber floor or walls.

5.4 Making the Pipe Connections

Piping expansions caused by the temperature have to be compensated by appropriate means to keep the discharge column stress-free.

5.5 Electrical Connections

5.5.1 General Information

Electrical connections may only be made by a qualified electrical engineer. The local mains supply must comply with the details given on the motor rating plate and the appropriate circuit should be selected.

The local mains voltage must comply with the information given on the nameplate.

With respect to the electrical connection of the motor, the **"Electrical connection diagram"** and the **"Functional Plan"** in the Attachment are applicable.

Attention **Remove the protective cover at the end of the cable just prior to making the electrical connection.**

The individual cable cores are marked by identification tapes (e.g. U (T1), V (T2), W (T3), 10, 11, ...). Should it become necessary to shorten the cables, then the core identification codes, respectively the colour of the conductors must be noted. In such an event, the identification tapes should be removed and should be re-affixed in the correct position after the shortening operation.

Attention To avoid contacts between electric cables placed outside the discharge column, make sure that the distance between them is not less than the cable diameter.

Attention When providing an earthing link between pumping station and electrical switchboard, then an additional multi-core control cable (1.5 mm^2 min.) must also be provided to support the motor monitoring circuits and level control equipment.The required number of conductors depends on individual applications.

5.5.2 Electrical Connection of Unit

5.5.2.1 Monitoring Equipment

The pump unit is fitted with monitoring equipment to prevent damage. Details on connection, description and functions of such equipment are contained in the **Appendix under "Electrical Connection Diagram"** and **"Circuit Diagram"**.

5.5.2.2 Potential Equalisation

Potential equalisation shall be subject to the regulations acc. to EN 600204-3-1.

5.5.2.3 Frequency Inverter Operation

- Low voltage motors are appropriate for frequency inverter operation according to standard IEC 60034-17.
- Frequency inverters not allowed with high voltage motors.
- The given motor rating P2 may only be used up to 95 %.
- When selecting the proper frequency inverter take into account the manufacturer's data as well as the electrical motor data (in particular rated motor current).
- As far as electromagnetic compatibility is concerned, take EN 61000-3 /IEC 61000-3 into consideration.

5.5.2.4 Soft Starter/Starting Transformer

- We recommend the use of soft-starting devices that switch off via a by-pass after the run-up.
- As far as electromagnetic compatibility is concerned, take the EN 61000-3 / IEC 61000-3 into consideration.

5.5.3 Fastening of Electrical Cables

Attention The electrical cables (power and control cable) must be led to the top, stretched out and connected to form a rigid cable assembly after the installation of the unit in the discharge column.

For proper installation of the electric cables in the discharge column (cable length below 3.5 m) we recommend **the use of cable socks, available as accessories (See Appendix 1 "General Pump Diagram" Fig. 3).**

If the cables are led too loosely, they will rub against other cables, on walls and especially on sharp edges and corners during pump operation, leading to damage on the electrical connecting cables.

Cables having a length of more than 3.5 m must be attached to the support cable using spacers and cleats and taken to a point just below the column cover.

All electric cables together with the support cable are tightened manually and fastened using a tie bar. Under no circumstances must the pump unit be lifted off its conical seat when tightening the tie bar.

5.5.4 Overload Protection

The motor has to be protected from overloading by means of an overcurrent relay with thermal delay complying with VDE 0660/IEC 947 and local regulations.
It has to be adjusted to the rated motor current, which is indicated on the nameplate of the motor.

5.5.5 Level Switch

Installations for automatic pump operation require the fitting of a level cut-off switch to prevent dry running of the pump. The switch-off point should be set to dimension **"t_1"** as shown in the **Appendix under "Installation Plans".**

This prevents flow interruption leading to dry running.

5.5.6 Checking the Direction of Rotation

The direction of rotation is checked before finally installing the pump, i.e. in its dry condition.
The arrow indicating the direction of rotation can be seen at the pump casing.

After making the electrical connections (Section 5.5), the following must be observed:

Attention An incorrect direction of rotation of the impeller in the pumped medium may damage the whole unit.

Absolutely no foreign matters may be in the pump.
Do not reach into the pump.

Typical checks for the direction of rotation:

Do not switch on and run the pump for more than 3 minutes. Pay attention that pumps mounted in vertical position are standing on an even level and are sufficiently secured against falling over.
Observe the direction of rotation of the impeller. This has to correspond to the arrow indicating the correct direction of rotation.
An incorrect direction of rotation requires the reversal of 2 of the 3 phases inside the control cabinet.
After checking the direction of rotation, the cable terminals are marked in the terminal box and are then again disconnected. It must also be ensured, that until final commissioning takes place, no modifications are made which might reverse the direction of rotation.

5.6 Installation

5.6.1 Installing the Submersible Pump into the Discharge Column

Attention Before lowering the pump into the discharge column, the O-ring (412.05) supplied has to be inserted into the pump casing (101) (Appendix, "General drawing of pump with parts list").

5.6.1.1 General Information

Amacan S pumps may be fitted into the discharge column in different ways. These are shown as types A, B, C, and D.
A support cable is used when the cable length in the discharge column is 3.5 m or more.
In cases where the length of cable within the discharge column is less than 3.5 m, the support cable is omitted. For shallow installations, the hoop may be used to lift the assembly out of the flooded column, using a crane shackle.

All work on or around the pump requires that the column is sufficiently covered.

Basically, work at the unit must only be carried out with the electrical connections disconnected (including control cable).
The pump must be protected from inadvertent switching on!
High voltage motors (> 1 kV) have to be grounded and short circuited.

Do not work below a suspended pump!

5.6.2. Lowering the Submersible Pump into the Discharge column, using the Support Cable.

Assembly is assisted by the drawings contained in the **Appendix "Assembly drawing - cable guidance"**

1. Secure hoist chain or rope (1) to trolley (4) of the lifting gear (2). **See Appendix "General Pump Diagram", Fig. 4a.**
2. Secure support cable (5) by its shackle to the hoop. Ensure that the support cable faces in the right direction (free cable-eye (6) must be placed away from pump) as shown in **Appendix "General Pump Diagram", Fig. 4a.**
3. Partially unwind support **cable** and power supply cables.
4. Lower pump into the discharge column until the hoop is accessible.
5. Securely cover the discharge column, except for a gap to allow work to continue. **See Appendix "General Pump Diagram", Fig. 4c.**
6. Secure the first cable-eye of support cable to hoist cable to bring the pump to a position above the discharge column for assembly work to continue. **(See Appendix "General Pump Diagram", Fig. 4c).** Unclip hook of hoist from the cable-eye of the support cable **(See Appendix "General Pump Outline", Fig. 4b.)** and run lifting gear to a higher level.
7. Secure control cable and power supply cables by a hemp rope to the crane hook of the hoist. **See Appendix " Pump Diagram", Fig. 4c.**
8. Trim profiled spacer (720) to reach from one cable thimble to the next.
9. Insert support cable (5) and the control cable into the spacer, making sure that both are placed into their correct channels.
10. Stretch the power supply cables using the hemp rope, place over the crane hook.
11. Position the power supply cables in the hollows of the spacer and, starting from below, firmly clamp the power supply cables, using cable clamps (covered by a plastic sleeve). **See Appendix "General Pump Diagram", Fig. 4d.**
12. The power supply cables are laid close to the cable-eyes, between individual sections of support cable. They are again secured to the next higher section of the support cable, using cable cleats covered by plastic sleeve.
13. The pump is slowly lowered into the discharge column whilst the cables are anchored with equal spacing. **See Appendix "General Pump Diagram", Fig. 4d.**
14. Finally, the support cable is secured by its shackle and tie bar to a support eye (provided in discharge column or shaft construction). **See Appendix "Cable Assembly".**
15. The tie bar is tightened sufficiently to stretch the **cables**, **without** lifting the pump from its seating.
    If the cables in the flow area are too slack, there may be excessive movement during pump operation which may damage cables.
16. Unclip crane hook from cable eye. Free cables from rope and route the cables to the control cabinet!
17. The uppermost, loose hanging **cable** eye must be secured to the cable form to avoid noise and wear through scraping. **See Appendix "General Pump Diagram", Fig. 4e.**
18. Remove safety cover from discharge column and for installation type C and D assemble lid. If provided, seal **cable** duct openings.
19. Tidy up discharge column area.
20. Connect terminals of control and power supply cables in control cabinet and commission pump (see Section 5.5).

5.6.3 Lifting the Submersible Pump from the Discharge Column using the Support Cable

1. Disconnect electric terminals.
2. Open discharge column and cover up opening, except for a slot to allow working access.
3. Secure chain or rope to hoist. Run lifting gear to a higher level.
4. Loosen the uppermost cable eye from the cable form and secure to crane hook.
5. Disconnect tensioning buckle and unclip.
   Loose parts must not fall into the pump sump!
6. Lift pump to reach the second cable eye in the support cable.
7. Secure hoist chain or rope by a shackle to the uppermost cable eye (together with the crane hook).
8. Unclip crane hook and secure this to the second cable eye.
9. Lift pump to reach its third cable eye.
10. Unclip hoist chain or rope from the uppermost cable eye and secure to the third cable eye.
11. Lift pump to reach the fourth cable eye.
12. Unclip crane hook and secure this to the fourth cable eye.
13. Repeat steps 8 to 12 until the pump support bracket is just outside the discharge column. Next secure the crane hook to it.
14. Remove safety cover from discharge column.
15. Lift pump from discharge column and move sideways.
16. The pump is now available for visual inspection or maintenance. For security, the pump must not be disengaged from the crane hook.
17. If the pump must be transported for inspection or maintenance, then the final cable eye must be removed from the hoist chain or rope. In case of lesser installation depths, the complete cable length is placed parallel to the pump on its transport support!
18. Longer cables must be dismantled:
    - Loosen cable cleats, remove profiled spacer, coil up power supply cables and place alongside the pump.
    - Remove support cable shackle from pump.
19. If required, the support cable and profiled spacer can be used to assemble a replacement pump.

5.6.4 Pump Assembly without Cable Guide

1. Secure crane hook to hoop and slowly lower into the discharge column.
2. Pull up power and control cable bundled hand-tight to a cable rope, if necessary, fasten by means of a cable harness at the pump tank.
   (Attachment **"General pump diagram", Fig. 3)**.
   Do not pull pump off its seat!

Next proceed as described in Section 5.6.1.

6 Start-up/Shutdown

Attention Observance of the instructions outlined below is most important. Damage which may otherwise result could invalidate any warranty claims.

Attention Do not use the pump for the pumping of media which are outside those confirmed in the technical documentation and for which the structural materials of the pump are unsuitable.

6.1 Commissioning

Before switching on the pump make sure that the following points have been checked.

- Operating data to Section 5.3.1, the oil level to Section 6.1.1 and the direction of rotation to Section 5.5.6.
- Electrical connections conforming to specification and **Appendix "Electrical connection plan/circuit plans"**.
- Pump must have been installed acc. to Section 5.6 to function properly.
- If the pump has been out of service for a longer time, the steps included in Section 6.4 must be carried out.

Attention Reliable operation can only be guaranteed if the monitoring equipment is functioning. **"Electrial Wiring Diagram/Functional Plans"** and **point 7.2.3**.

6.1.1 Checking the Oil Level

Refer to Section 5.3.2.

6.2 Operating Limits

6.2.1 Minimum Fluid Level

The pump is ready for operation when the fluid level has reached level **"t_1".**
The minimum fluid level must also be maintained in case of automatic pumping stations.
(See Appendix "Installation Plans").

t_1 = lowest switch-off level for automatic operation

In terms of control, a dry-run protection must be guaranteed by means of an automatic stop of the pump (disconnecting contact). (Section 5.5.5).

Attention **Dry running causes excessive wear and must be avoided!**

6.2.2 Media and Ambient Temperature

- Amacan S....
  Version **U** 30 °C
- or in conformity with data on the nameplate.

Attention Do not operate the pump at temperatures exceeding the above limits.
Damages due to non-observance of this warning will not be covered by warranty.

6.2.3 Switching Frequency

To avoid an excessive rise of the temperature in the motor as well as overloads of motor, seals and bearings, the number of switching operations must not exceed 10 per hour, for high voltage motors maximum 5 per hour.
Beyond this, we recommend to limit the maximum number of switching operations to 5,000 per year.

Attention Do not connect to pump in reverse motion!

6.2.4 Operating Voltage and Frequency

Compared to the rated values, the supply voltage may differ by up to ± 5 % and the supply frequency by up to ± 2 %, in conformity with range A to DIN EN 60034-1.

6.2.5 Density of Pumped Medium

The power consumption of the pump rises proportionally to the density of the pumped medium. Therefore, the medium density must comply with the details given on the order specification.

6.2.6 Abrasive Media

When pumping media containing abrasive constituents, then a higher rate of wear on hydraulic components and mechanical seals must be expected. In such a case periods between service should be halved against those shown in Section 7.

6.3 Shutdown/Storage/Preservation

Each pump leaves the factory fully assembled. If commissioning is likely to take place a considerable time after delivery, then the following measures for pump storage are recommended:

6.3.1 Storage of New Pumps

A pump unit standing vertically will not have adequate positional stability. Consequently, the pump unit should be secured using either the lifting ring or other means of protecting it from falling over during its storage period.

- Store pump in supplied condition (transport support structure) at a dry frost-free location and protected from the sun.
- If the pump is stored in vertical position, the electric connecting cables must be supported in order to avoid sharp bending of the cables.
- If the pump is stored for longer periods, the impeller must be turned by hand every quarter of a year.
- After turning the impeller, the plates must be inserted between impeller and bellmouth in order to avoid a deflection of the shaft.
- The electrical cables are tightly closed with protective caps in supplied condition. These may not be removed.

6.3.2 Measures to be taken in case of prolonged inoperation

1. **Pump remains installed with operational checks:**
To ensure continued operational readiness during prolonged periods of idleness and to prevent the formation of deposits within the pump and in its close proximity, the unit should be subjected to a brief duty cycle of about 5 minutes every quarter of a year. It is a prerequisite that sufficient liquid is available for the pump to handle.

2. **Pump is dismantled and stored:**
Before storing the pump, inspection and maintenance measures have to be carried out acc. to Section 7.1 and 7.2. Store pump at a dry, frost-free location, protected from the sun.

If the pump unit is to be stored horizontally, put it in horizontal position by proceeding in reverse order to the procedure described for putting the pump unit upright: see section **3.1 "Transport"**. Avoid hard impacts when setting it down. Then place the pump unit horizontally into an appropriate cradle.

Arrange the cables without any kinks. Place protective caps on the cable ends.

In order to avoid a deflection of the shaft, plates (intermediate piece) must be placed between impeller and bellmouth.
The coating must be checked. If there are defects, they must be touched up.

6.4 Re-commissioning after Storage

Prior to re-commissioning the pump, checks and **maintenance measures as outlined in Section 7.1 and 7.2** must be carried out.

In addition, the free movement of the impeller must be checked. **For this purpose reach into the bellmouth and move the impeller by hand (without the pump being electrically connected).** The mains cable terminals must be fully disconnected when this test is carried out.

Any new commissioning also requires that the actions for first commissioning, covered in Section 6.1, and the Operating Range, explained in Section 6.2, are carried out.

Immediately after completion of the work, all safety and protection equipment must be installed in a professional manner and operated.

7 Service/Maintenance

7.1 General Instructions

The operator must ensure that all maintenance- inspection and assembly work is carried out by authorised, technically qualified staff, who have studied the operating instructions and are fully conversant with procedures.

Provision of a service and maintenance plan helps to prevent expensive repairs and ensures reliable, trouble-free operation of the pump with a minimum of effort.

Basically, work on the unit must only be carried out with the electrical connections disconnected (including control cable).
The pump must be protected from inadvertent switching on!
High voltage motors (> 1 kV) have to be grounded and short circuited!

To carry out service work, the pump must be lifted from its chamber, placed on a level, solid surface and it must be prevented from toppling over.

Pumps which handle media which constitute a health hazard must be decontaminated. The pumped medium or oil filling must be drained in such a manner that danger to persons or the environment is prevented. All legal requirements must be complied with.

7.2 Maintenance/Inspection

The items listed in the table below form part of routine pump maintenance: It may only be carried out by skilled technical staff.

Table: Operation monitoring

Item	Maintenance	Frequency
7.2.1	Measurement of Insulation Resistance	After 4,000 hrs, but at least once a year
7.2.2	Checks on electrical terminals	
7.2.3	Checks on Monitoring Sections Visual checks of rope	
7.2.4	Check on Leakage Chamber	After 16,000 hrs, but at least once every 3 years
7.2.5	Oil Change	
7.2.6	Bearings and Lubrication	
	General Overhaul	After 24,000 hrs, but at least once every 5 years

7.2.1 Measurement of Insulation Resistance

To comply with the routine maintenance plan, the insulation resistance of the motor windings should be measured every 4,000 hours, but at least once a year.

Measurements are taken at the cable terminals (disconnected from to the control panel). A resistance meter should be used.

- **Test voltage:** Low voltage motors 500 V (max. 1000 V) (direct current voltage)
  high voltage motors at least 1000 V.

The insulation resistance of the conductors to earth must not fall below 5 MΩ. The insulation resistance of high voltage motors has to be higher than 400 MΩ/kV (measuring at 20 °C/68 °F temperature).
Should the reading be less than this figure, then separate measurements for cable and motor windings must be made. For this measurement the cable at the terminal box must first be disconnected and then, if necessary, the cable from the motor.

These measurements must be taken:

a) Windings to earth
   - All winding terminals are joined

b) Temperature sensors in windings to earth
   - All sensor terminals are joined and all motor windings are earthed.

Bearing temperature sensors must not be subjected to this test.

If the insulation resistance of the power supply cables reads less than 5 MΩ, then the cables are defective and must be replaced.

If the insulation resistance of the motor windings is less than required, then the motor windings are defective. In such an event the motor manufacturers or the KSB Pump Associates or Service Station should be contacted for further instructions.

7.2.2 Checking the Electrical Connecting Cables

- **Visual Inspection:**
  Whenever the pump is serviced, the electrical connecting cables must also be checked for damage, such as scratches or blisters, caused by mechanical or chemical action. If damage of this type is observed, all electrical connecting cables must be replaced.
- **Checking the Earth Cable:**
  Resistance measurements between the earth cable and pump casing must give a reading of less than 1 Ω.

7.2.3 Checking the Monitoring Equipment

These tests form part of preventive maintenance and must be conducted once every 4,000 hours of use, or at least once per year.

As for versions with ISM (integrated sensor module), the monitoring equipment is checked via control panel (see supplementary operating instructions) as well.

a) **Winding temperature of the motor**
   Sensor: PTC thermistor
   - resistance between core ends 10 and 11:
     100 Ω < R < 750 Ω

b) **Bearing temperature**
   Sensor: PT 100 (resistance thermometer)
   - resistance between core ends 15 and 16,
     resistance between core ends 16 and 17:
     100 Ω < R < 120 Ω

c) **Mechanical seal**
   Sensor: Float switch (Reed contact)
   - continuity check
   - resistance between core ends 3 and 4: R < 1 Ω

d) **Humidity protection**
   Sensor: Electrode
   - resistance between core ends 9 and earth: R> 5 MΩ.

If the tolerances specified are exceeded, then the power supply and control cables must be disconnected from the unit and a fresh check must be carried out at the pump terminals. If tolerances are again exceeded, proceed as follows:

- Thermistor Sensor

The motor windings are provided with a spare monitoring circuit. Its terminals are found in the motor chamber and must be used in place of the defective circuit.

- Bearing Temperature Sensor

If the readings obtained are correct but the protection circuit still activates, then the anti-friction bearing must be inspected and, if required, replaced.

- Float Switch

Check the leakage chamber as shown in Section 7.2.4. If this is found to be empty but the resistance measures > 1 Ohm, then it is recommended that the manufacturers, or the KSB Associates or Service Department are consulted.

- Moisture Protection Electrode

The motor chamber is monitored by a moisture protection electrode, Part No. 81-56.
For details of its operation and specification refer to the **Section of "Moisture Monitoring" in the Appendix.**

The moisture sensor will be okay if the insulation resistance measured at the electrode is > 5 MΩ. Inferior values indicate moisture or ingress of water in the motor. In this case, the motor has to be overhauled.

WE RECOMMEND THE FITTING OF A NEW MOISTURE SENSOR AFTER SUCH AN EVENT.

7.2.4 Checking the Leakage Chamber

The leakage chamber must be checked as part of every regular maintenance.
The purpose of such checks is to determine the condition of the mechanical seals.

Attention **If the pump has been used to pump media that may constitute a health hazard, then care must be taken when draining the leakage fluid to prevent danger to persons or the environment. All legal requirements must be observed.**

Method:
(See Appendix "General Pump Outline", Fig. 5)
Position the pump horizontally. Remove screwed plug 903.01 and gasket 411.01. Observe Note: **"Leakage Drain"** adjacent to drain plug. Rotate pump for drainage opening to face downwards. If no liquid or only a small amount drains out (less than 1l), then the mechanical seals are intact. A leakage quantity of more than 1l would indicate defective mechanical seals which must then be replaced.

7.2.5 Oil Change

After every 16,000 hours of operation or at least every 3 years the oil must be changed.

When warm, or if pumped medium has leaked into the oil chamber, then pressure may build up and care must be taken when removing the screwed plug 903.02.

Method:
(See Appendix "General Pump Diagram").
Position pump as depicted in **Fig. 6 (without bellmouth and impeller)**. Place a suitable vessel below the threaded plug. Remove plug 903.02 and gasket 411.02 and allow oil to drain, by lifting the pump a little bit.

7.2.5.1 Oil and Grease Quantity
Table "Lubrication Plan"

Pump sizes	Oil capacity [l]	Grease Refill Quantity (for general maintenance) [cm^3]	
		motor side	pump side
650- 364/365	1,6	200	600
650- 404/405	1,6	200	600
800- 505	1,8	200	600
850- 535	2,8	200	800
850- 550	2,8	200	800
900 /1000 - 600	3,1	200 / 230	800 / 1500
900 /1000 - 615	3,1	200 / 230	800 / 1500
900 / 1000- 620	3,1	200 / 230	800 / 1500
1000- 655	3,1	200	800 / 1500
1100- 720	4,6	230	1500
1300- 820	3,1	230	800

Paraffin oil is of bright, transparent appearance. Small discolorations, caused by the wearing-in of new mechanical seals or through a small amount of leakage, are of no significance. However, severe oil contamination by the pumped medium is a sign of defective mechanical seals and these must then be replaced.

Topping-up:
Place the pump as shown in **Fig. 2** and top-up the oil chamber until this overflows (also refer to Section 6.1.1). Fit screwed plug 903.02 and gasket seal 411.02.

Oil Quantity:
Details are contained in the **table of Section 7.2.5.1 "Lubrication Plan".**

Recommended Oil Quality:

Trade name:
Merkur Weissoil Pharma 40 Messrs. DEA,
Paraffin oil, thin bodied, Messrs. Merck, No. 7174 or equivalent non-toxic oil in medicinal quality.
It is safe and complies with the Food and Drinks Regulations.

Alternative:
All blended and non-blended motor oils, types SAE 10W to SAE 20W, may be used to lubricate mechanical seals. Local requirements must be observed with regard to the disposal of waste.

Attention Regional laws must be followed to the extent that the filling of oil must not contaminate the pumped medium (e.g. drinking water). Otherwise the use of machine oil is not permissible and only paraffin oil may be used.

7.2.6 Bearing Lubrication

The pump motor shaft is fitted with grease lubricated anti-friction bearings.

Re-packing these bearings is recommended after continuous operation of 16,000 hrs., respectively after 3 years as part of the routine maintenance cycle.

Grease Quality: Diester Oil, Polycarbamide

Recommended Brands:
Klueberquiet BQH 72-102, Messrs Klueber Lubrication, KG Munich

Grease Quantity:
Details are contained in the table of Section 7.2.5.1 "Lubrication Plan".

7.3 Dismantling

7.3.1 Basic Requirements and Notes

Pump repairs and maintenance work must only be carried out by fully trained staff, using **original spare parts.**

The safety requirements listed in Section 7.1 must be observed.

Dismantling and re-assembly may only take place by using the relevant general drawing. Sectional drawing and other documents are to be taken from the appendix. The sequence of dismantling has to be derived from the sectional drawing.

The KSB Service Department is available to deal with defects.

Basically, work on the unit must only be carried out with the electrical connections (including control cable). The pump must be protected from inadvertent switching.

7.3.2 Preparation for Dismantling

Prior to dismantling, the oil chamber must be drained as described in Section 7.2.5.

Furthermore, the leakage chamber has to be checked for leakage and must be emptied in case of necessity (see Section 7.2.4).
To empty the leakage chamber, first open the screwed plug 903.02 (see **Appendix "General Drawing of Pump and Parts List" as well as "General Pump Diagram", Fig. 5**) before putting the pump into a horizontal position. Pay attention to the sign **"Leakage drain"** beside the screwed plug. After that, lay the pump down with the leakage drain towards the bottom so that any liquid may leak out.

7.3.3 Dismantling the Pump Section

The pump section can be dismantled by following the details of the **General Drawing of Pump with its Parts List contained in the Appendix**. No special tools are required.

7.3.3.1 Removing the Impeller

The connection between shaft and impeller is made by means of a cylindrical slide/interference fit with key. The impeller has threaded holes on the front which can be used to remove it.

7.3.3.2 Dismantling the Mechanical Seal

The correct location of the **mechanical seals facing pump and motor are shown in the Appendix under "General Drawing of Pump and Parts List".**

Attention Make sure the mechanical seal will not be damaged when loosening or tightening the mechanical seal.

7.3.4 Dismantling the Motor Section

When dismantling the motor section and the electrical connecting cables, ensure that cables and motor terminals are clearly marked to assist in re-assembling the unit.
If windings are faulty, it is recommended to replace motor section 80-1 since the stator is assembled into the motor housing by a press fit.

7.4 Reassambly

7.4.1 General Notes

Assembly must take place in accordance with the accepted practices of mechanical engineering.
All parts removed must be cleaned and inspected for wear. Damaged or worn-out parts must be replaced by **original spare parts**. Attention must be paid to clean gasket surfaces and the proper seating of O-rings. It is advisable always to fit new O-rings / gaskets. **O-rings manufactured from lengths of material and stuck together must never be used.** A liquid sealing agent (e. g. Hylomar SQ 32 M) shall be applied to the sealing surfaces of O-rings.
Assembly of the pump takes place in reverse order to dismantling. The General Drawing of Pump, together with its Parts List, will help in establishing the location of components.
All screwed connections must be correctly tightened during assembly. General information is contained in the following **table "Bolt tightening torques".**

The screwed connections marked with

L / 243 in the **Appendix "General Drawing of Pump and Parts List"** have to be protected from loosening by applying **L**octite **243**.

The sealing faces marked with FD must be provided with a liquid sealing agent (e. g. Hylomar SQ 32 M)

GP / Q NB 50 = lubricant Altemp Q NB 50

FK / KB = contact adhesive Technikoll 8050

FK / Metalix S = 2-part polyester resin filler

Table: Bolt tightening torques

Thread Size	Torque [Nm]	
	A4-70	1.4462
M 6	4	7
M 8	10	18
M 10	20	35
M 12	34	60
M 16	84	150
M 20	164	296
M 24	283	510
M 27	409	736
M 30	566	1018
M 33	770	1390
M 36	985	1775
M 42	1590	2865

7.4.2 Special Component Features when re-assembling

7.4.2.1 Mechanical Seal

It is recommended that as a matter of course new original mechanical seals are fitted during re-assembly.
The following must be noted:
Extreme cleanliness and great care are imperative to ensure correct operation of the mechanical seal.
The protective film on the seal surfaces must only be removed just prior to assembly.

The shaft surface must be perfectly clean and undamaged.
Just before final assembly of the mechanical seals, a drop of oil should be put on their faces.
To ensure an easier sliding fit and to avoid damage, the mechanical seal bellow should have its inner diameter wetted with soapy water (not oil).

Attention

Fitting the Bellows Seal at the Motor Side:
To prevent damage to the rubber bellows by the keyway or shaft recess, place a thin foil (0.1 ...0.3 mm) around the free end of the shaft. Slide the rotating element over the shaft and locate in its final position. Afterwards, remove the foil.

7.4.2.2 Tightness Test

After assembly of the pump, the effectiveness of the sealing between mechanical seal and oil chamber as well as of the motor interior must be checked.

Method:
(See Appendix "General Pump Diagram", Fig. 7).

Use the bores represented to test the pressure retention.
The testing apparatus has to be firmly screwed into the bore.

Test medium: nitrogen
Test Pressure: 1 bar
Test Duration: 5 min.

Over the duration of the test, the pressure may fall by a maximum of 0.2 bar.

If the joints seal tight and if the test pressure of 0.2 bar has not dropped, the connections for the nitrogen supply are removed. Carefully re-insert the screwed plug with the joint ring, appropriately sealed.

Oil filling:
For method refer to Section 7.2.5 **"Oil Change"**

7.4.2.3 Impeller without cover (open)

Assembly work at the impeller

- Slide the impeller, part No. 233, over the shaft (before doing so, insert key, part No. 940.02).
- Screw the impeller nut, part No. 922, onto the threaded stem of the pump shaft until it abuts against the keys or shaft collar.
  Thus the impeller is in the farthest insertion position it can have. This position yields the maximum gap between the bellmouth with casing wear ring and the impeller vanes (see figure 2).

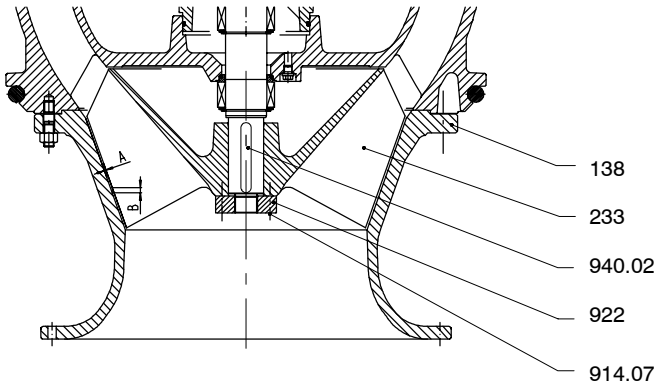


Fig. 2 Clearance "A" and "B"

- The bellmouth, part No. 138, with casing wear ring is to be fastened to the pump casing with screws. Remove the impeller nut.
- Screw appropriate screws and/or threaded rods into the front face tapped bores of the impeller hub and use them to draw the impeller towards the front until the impeller vanes touch the bellmouth.
- Adjustment of impeller clearance:

By drawing the impeller forward this way, it will be brought in the utmost frontal position possible (clearance = 0).
Next tighten the impeller nut until contact with the front face of the impeller hub is obtained. Continue to move the impeller upwards along the shaft by tightening the impeller nut (by dimension "B") until the specified clearance "A" has been obtained (see table).

The gap adjusted between the impeller vanes and the bellmouth can be measured and checked using a feeler gauge.
Check and verify the gap dimension at several points distributed along the circumference.

Two tapped holes in the impeller hub and two holes in the impeller nut must be brought into alignment. It is recommended to loosen the impeller nut somewhat until the holes are situated above each other. However, it should not be loosened to such a point that the holes are covered.

As the last thing, protect the socket head cap screw 914.07 with

FK
Metalix S

against erosion.

Table: Clearance dimensions "A" and "B".

Size	Clearance dimension A [mm]	Clearance dimension B [mm]
650- 364	0,45 $^{+0,2}_{-0,1}$	1,5 $^{+0,6}_{-0,3}$
650- 365	0,45 $^{+0,2}_{-0,1}$	1,5 $^{+0,6}_{-0,3}$
650- 404	0,55 $^{+0,2}_{-0,1}$	--
650- 405	0,55 $^{+0,2}_{-0,1}$	1,7 $^{+0,6}_{-0,3}$
800- 505	0,55 $^{+0,2}_{-0,1}$	1,6 $^{+0,6}_{-0,3}$
800 / **850- 535**	0,6 $^{+0,2}_{-0,1}$	1,9 $^{+0,6}_{-0,3}$
850 / **550**	0,6 $^{+0,2}_{-0,1}$	1,8 $^{+0,6}_{-0,3}$
900 / **1000- 600**	$^{+0,2}$	1,8 $^{+0,6}_{-0,3}$
900 / **1000- 615**	0,6 $^{+0,2}_{-0,1}$	1,8 $^{+0,6}_{-0,3}$
1000- 655	0,75 $^{+0,2}_{-0,1}$	2,7 $^{+0,6}_{-0,3}$
1300- 820	0,75 $^{+0,2}_{-0,1}$	2,4 $^{+0,6}_{-0,3}$

7.4.2.4 Motor/Electrical Connection

All motors must be subjected to an electrical test as outlined in Sections 7.2.1, 7.2.2 and 7.2.3.

Before re-commissioning, notes contained in **Section 6.1 "First Commissioning"** and in **Section 6.2 "Operating Limits"** must be observed.

7.5 Spare Parts

When ordering spare parts, please always quote the following details:

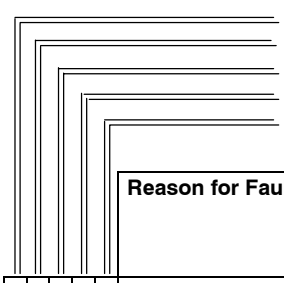
Type of pump: e.g. **Amacan S 1000- 655/ 190 8 UAG**2
Works no.:
Motor no.:
Year of production:

The information is contained on the nameplate.

7.5.1 Recommended Stock of Spare Parts for Two Years' operation (Applies to Continuous Operation)

Part No.	Description	Number of pumps (including reserves)						
		2	3	4	5	6	8	10 and more
233	Impeller	1	1	1	2	2	3	30 %
322	Anti-Friction Bearing motor side	1	1	2	2	3	4	50 %
320/321	Anti-Friction Bearing pump side	1	1	2	2	3	4	50 %
	Set of O-rings motor / pump	4	6	8	8	9	10	100 %
	Set of O-rings Cable duct	4	6	8	8	9	10	100 %
	Other seals	4	6	8	8	9	10	100 %
412.05	O-Ring to seal discharge column	2	3	4	5	6	8	100 %
433.01 433.02	Mechanical Seal	2	3	4	5	6	7	90 %
502	Casing wear ring	2	2	2	3	3	4	50 %
834	Cable gland	1	1	2	2	2	3	40 %

8 Faults/Reasons/Corrections



Reason for Fault	Correction Pressures must be relieved if any system section is pressurised! Disconnect pump from power supply.
Net positive suction head $NPSH_{pump}$ too great Net positive suction head $NPSH_{available}$ too small	Increase suction-side liquid level Clean grating
Pump operates against excessive pressure System head greater than rated head, resulting in inadequate pump power output through inadmissible parallel operation or excessive system losses	Open valve further until duty point is set. Reduce load on swing check valve, to reduce system losses. Reduce suction static head, e. g. by increasing the suction-side liquid level.
System head smaller than rated pump head, respectively flow rate is greater than rated. (System losses less than planned or inadmissible single-pump operation).	Throttle valve or increase system losses on the pressure side.
Air sucked into pump by formation of vortices. Inlet water level too low	Raise inlet water level. If impossible or ineffective, refer to suppliers.
Insufficient flow of medium to pump inlet nozzle	Improve flow in pump chamber [1]
Motor speed too low	Mains frequency does not correspond with motor selection or voltage too low
Motor speed too high	Mains frequency does not correspond with motor selection or voltage too high
Pump operates outside its operational limits (partial load, excessive load)	Check pump operating data
Pump intake blocked by foreign matter	Clean intake and pump sections
Inlet pipe or impeller blocked	Remove sediments in pump and/or pipes.
Dirt / fibres in impeller case, stiff bearings	Check free rotation of impeller, if need be, clean hydraulic components.
Worn pump parts	Replace worn parts
Inadmissible inclusion of air or gas in the pumped medium.	Refer to suppliers
Oscillations due to system configuration.	Refer to suppliers
Incorrect direction of rotation.	Reverse 2 phases in power supply.
Motor not running - no supply voltage	Check electrical installation Inform Power Supply Company.
Motor runs on 2 phases only.	Replace defective fuse Check supply terminals.
Motor winding or supply cables defective	Replace by original KSB cables or refer to suppliers.
Radial motor bearing defective	Refer to suppliers
Excessive lowering of water table when in use	Check fluid supply and capacity of system (shaft floor area)/ check level monitoring.
Motor protection switch has responded because of excessive winding temperature.	Carry out general pump overhaul (Contact manufacturer)
Thermistor trip with manual reset for the temperature limiter has responded because the permissible winding temperature has been exceeded.	Carry out general pump overhaul (Contact manufacturer)
Trip to respond to the temperature limit of motor bearings has disconnected motor, since permissible bearing temperature has been exceeded.	Check operation of excess temperature sensor of pump-side ball bearing as shown in Section 7.2.3
Moisture sensor has responded. Moisture in motor.	Carry-out general pump overhaul
Sensor circuit for leakage chamber has responded.	Check float switch as per Section 7.2.3 and check leakage vessel as per Section 7.2.4.

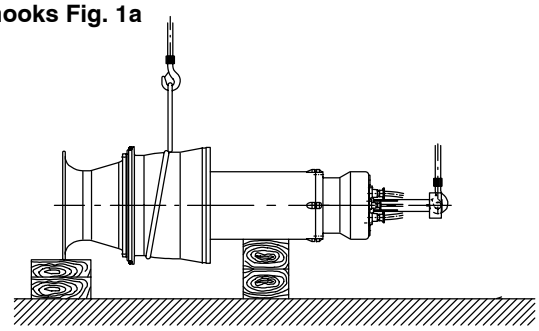
[1] Refer to suppliers

Attention: Work inside the pump during the warranty period requires prior contact with the manufacturers!

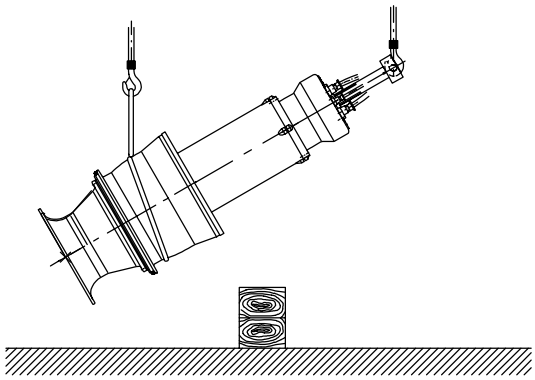
9 Appendix

General Pump Diagram

Uprighting pump unit using 2 crane hooks Fig. 1a

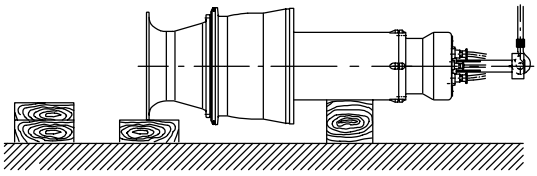


Set down unit horizontally on wooden supports and attach to two (2) crane hooks

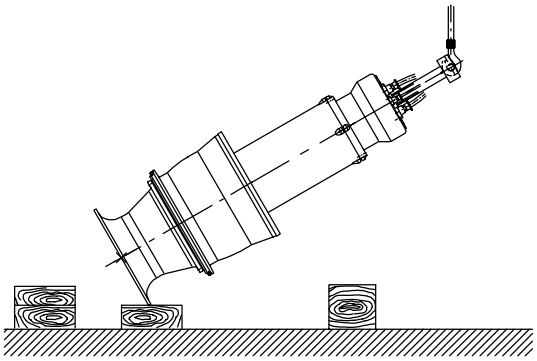


Pull unit upright using 2 cranes

Uprighting the pump unit using 1 crane hook Fig. 1b

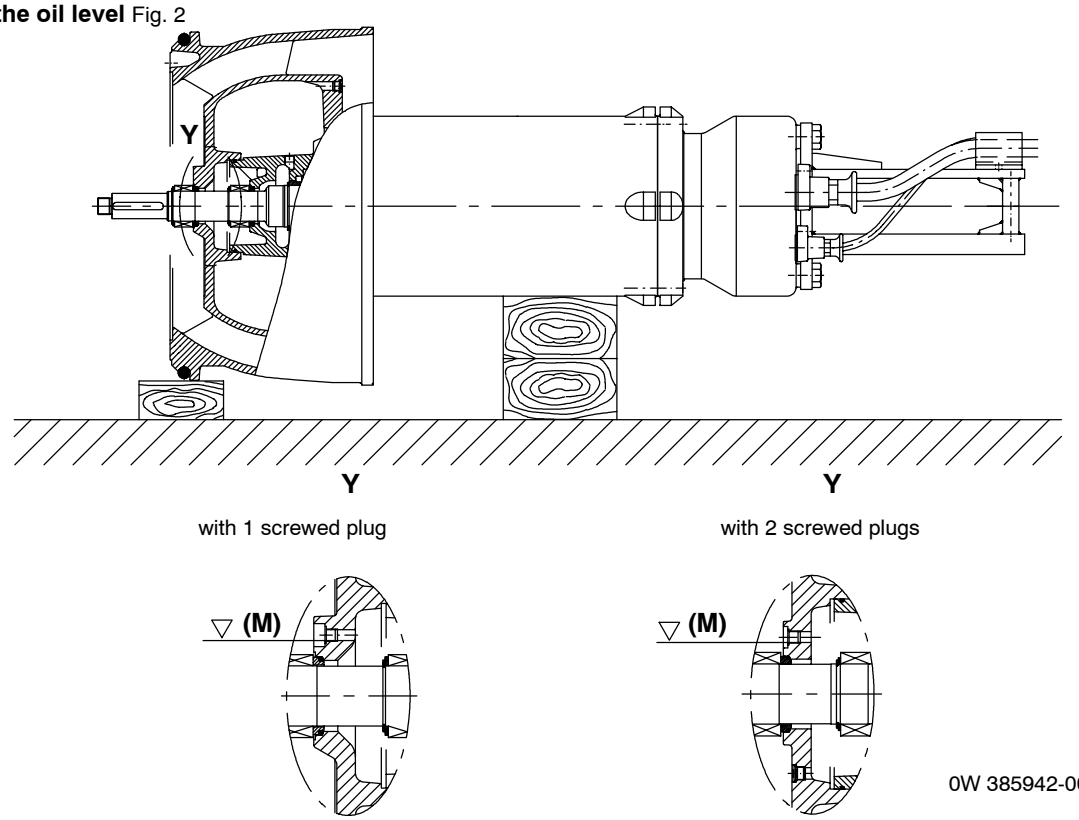


Set down unit horizontally on wooden supports and attach lifting hook to clamp



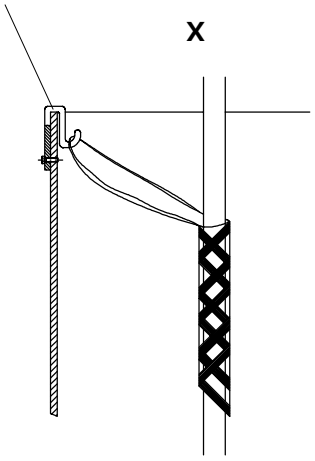
Rolling the unit on its bell mouth edge permissible only on a wooden support

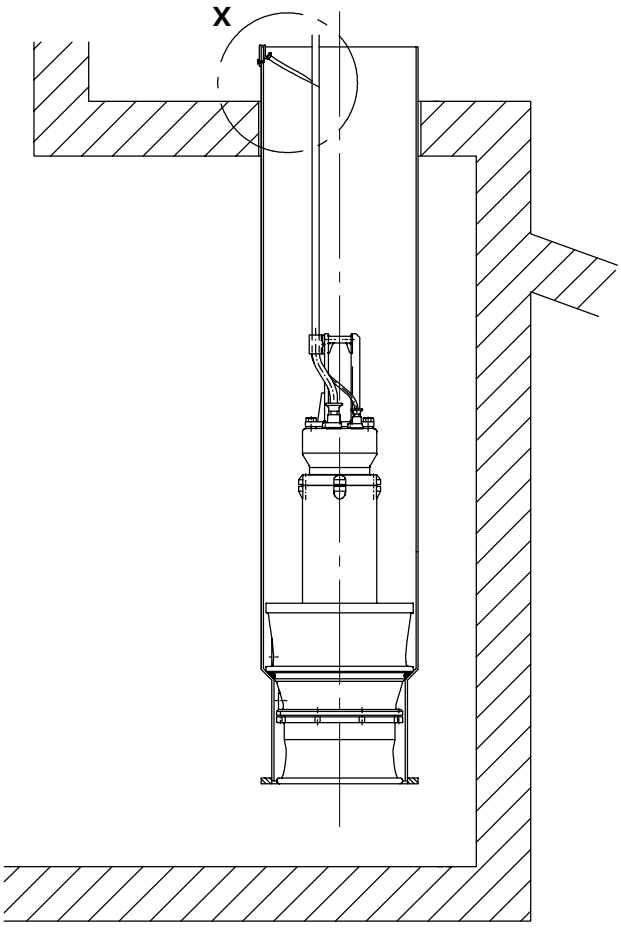
Checking the oil level Fig. 2



Cable sock Fig. 3

Remove fixing for pump installation and removal





Lowering the pump into the discharge column Fig. 4

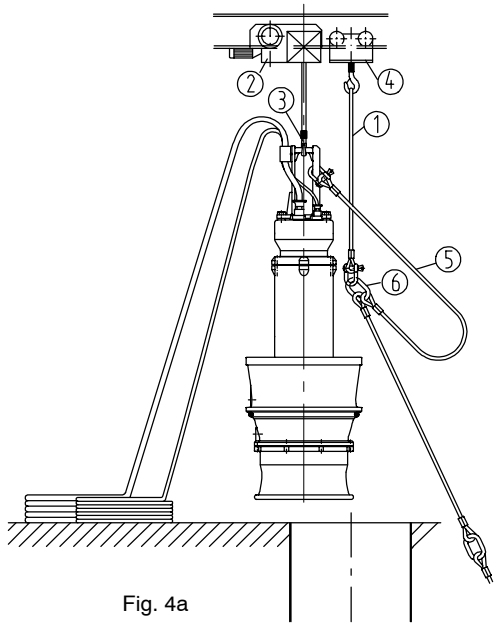


Fig. 4a

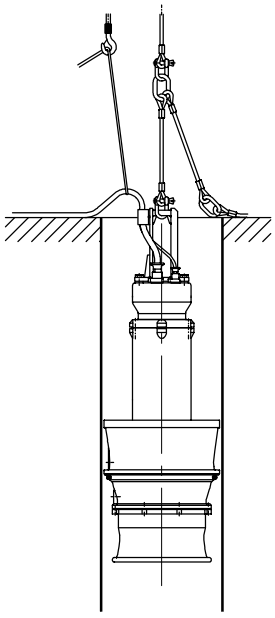


Fig. 4b

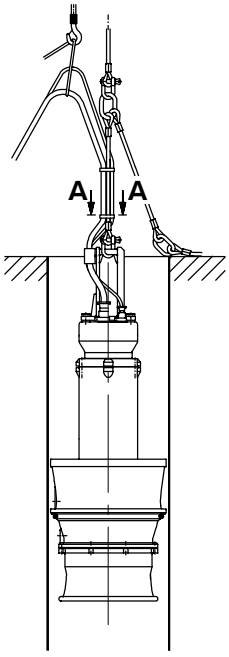


Fig. 4c

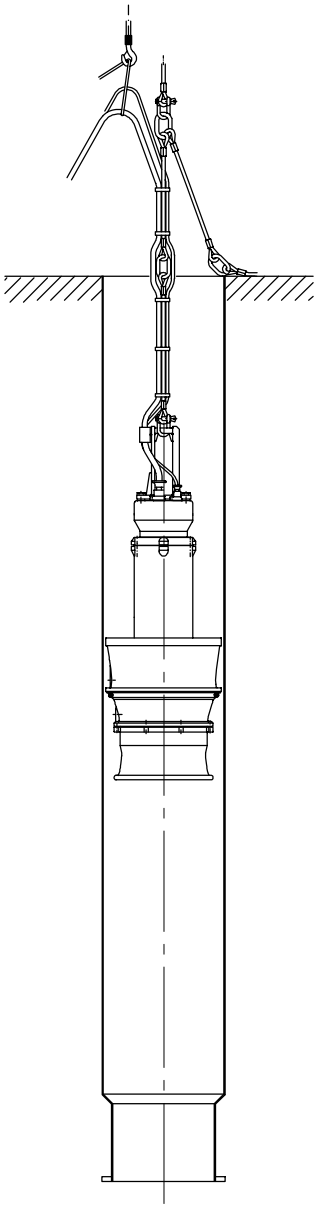


Fig. 4d

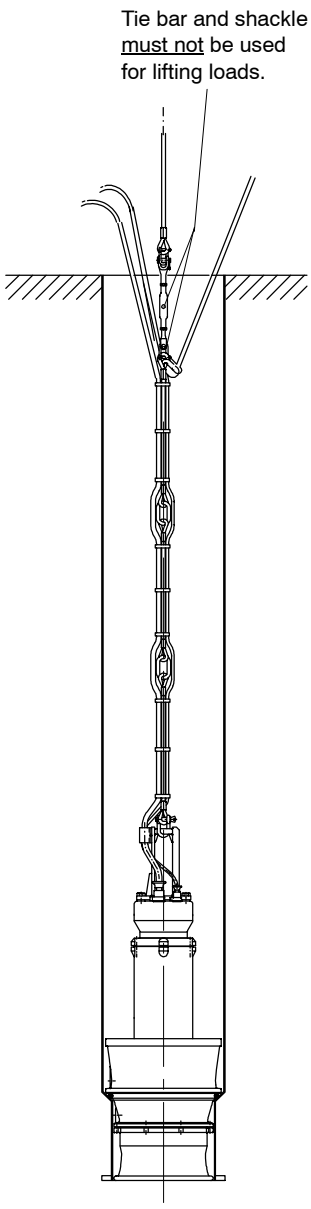
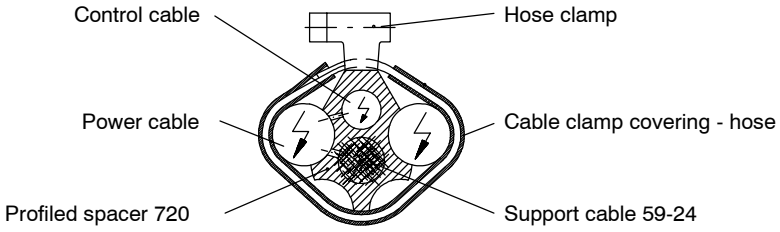
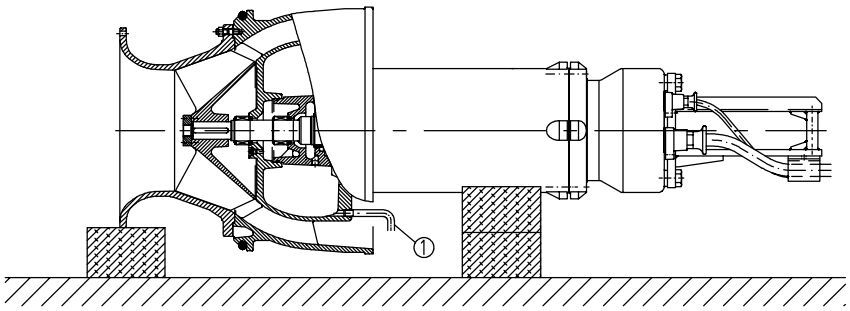


Fig. 4e

Section **A - A**



Checking the leakage chamber Fig. 5



① Drain pipe with G 1/2" thread

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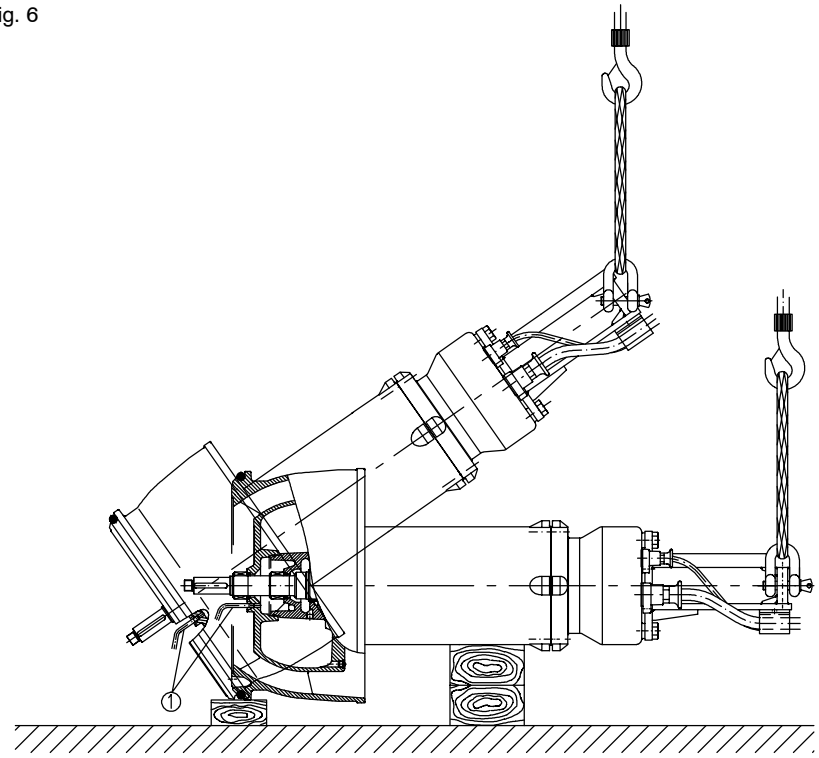
Draining the oil Fig. 6



① Pipe for Florence flask with thread G 1/2" or G 1/4".
Lift the pump a little bit to drain the oil.

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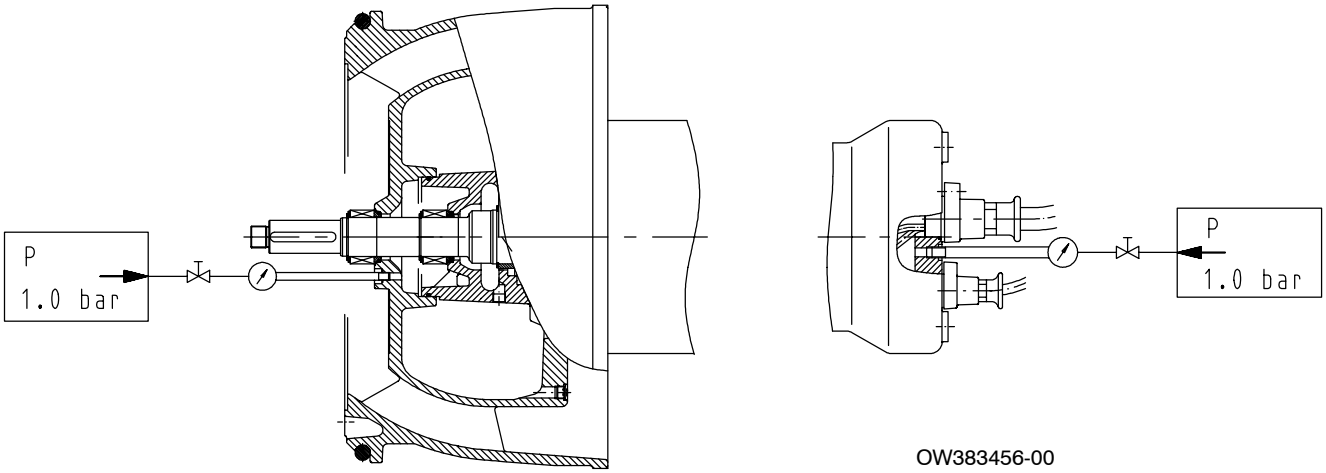
Leak test Fig. 7



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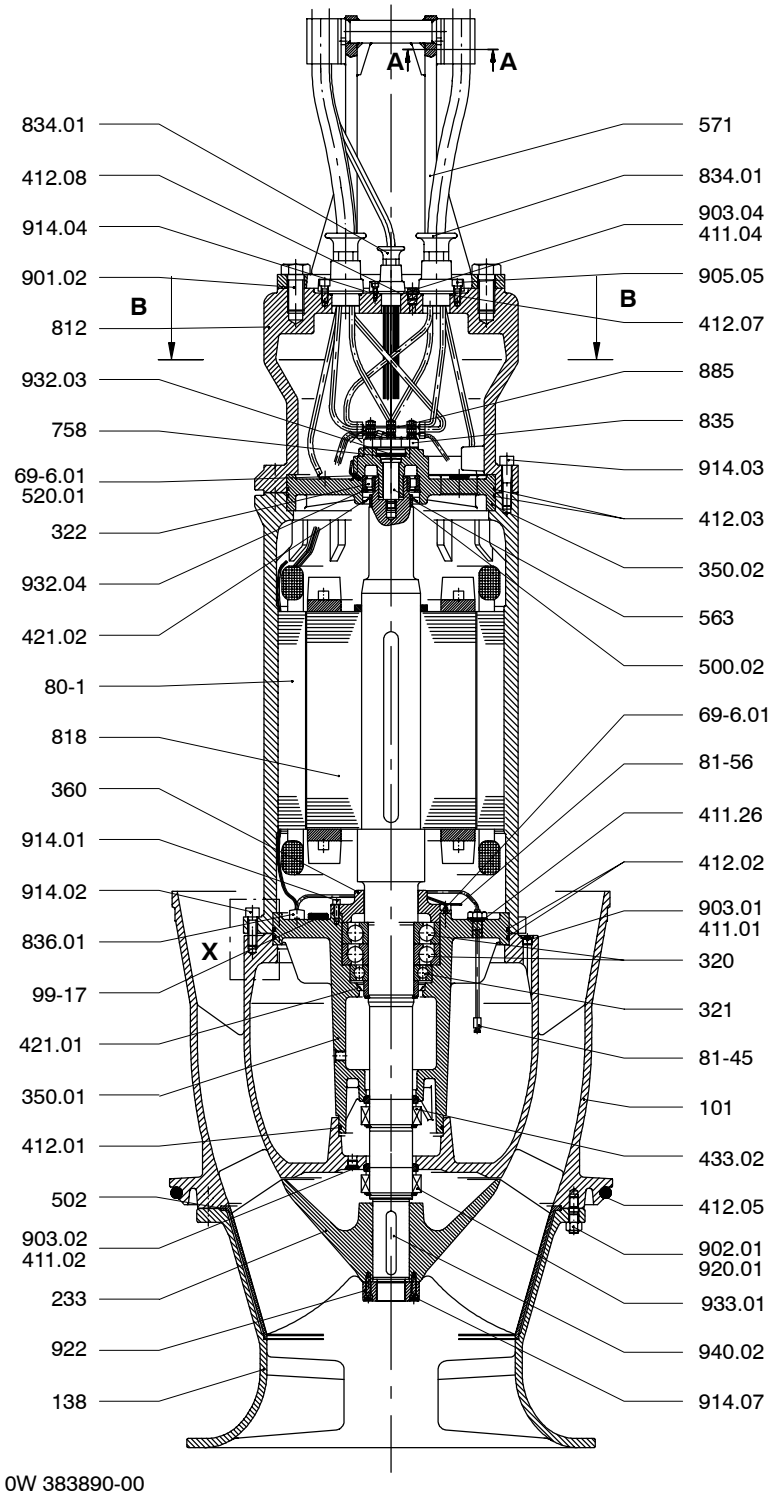
General drawing of pump with parts list – Standard



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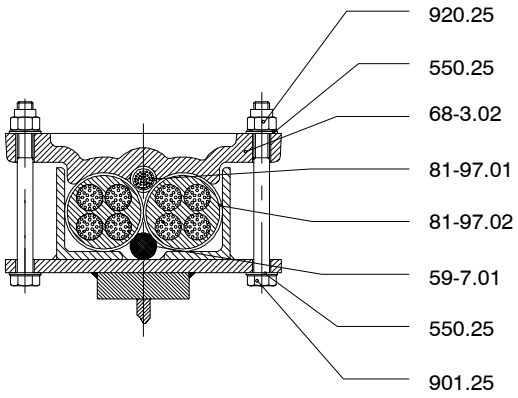
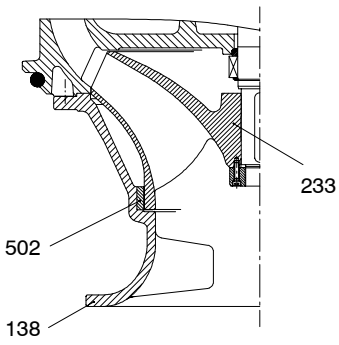
Part no.	Description
59-7	Support
68-3	Cover plate
69-6	Temperature sensor
80-1	Motor unit
81-29	Terminal
81-45	Float Switch
81-56	Moisture protection of motor
81-97	Cable protector
82-5	Adapter
99-17	Dessicant
101	Pump casing
138	Bellmouth
233	Impeller
320	Angular contact ball bearing
321	Deep grove ball bearing
322	Cylindrical roller bearing
350	Bearing housing
360	Bearing cover
411	Joint ring
412	O-Ring
421	Lip seal
433	Mechanical seal
500	Ring
502	Casing wear ring
520	Sleeve
550	Disc
563	Pin
571	Bracket
758	Strainer insert
812	Motor housing cover
818	Rotor
834	Cable gland
835	Terminal board
836	Terminal strip
894	Bracket
901	Hexagon head bolt
902	Stud
903	Screwed plug
914	Socket head cap
920	Nut
922	Impeller nut
932	Circlip
940	Key

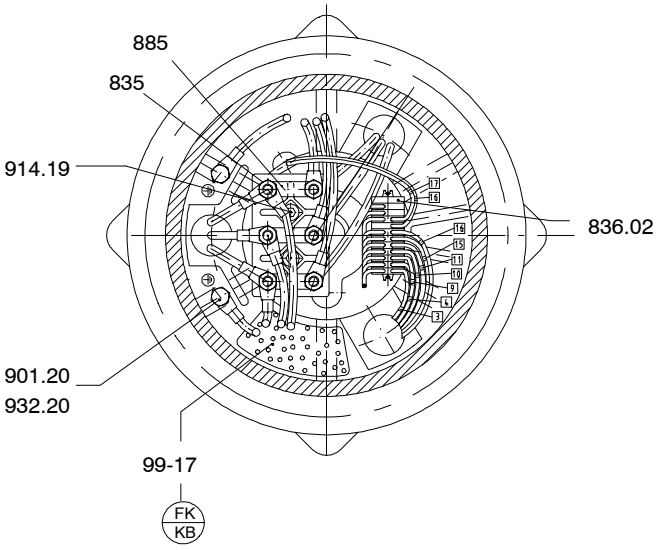
Section A - A



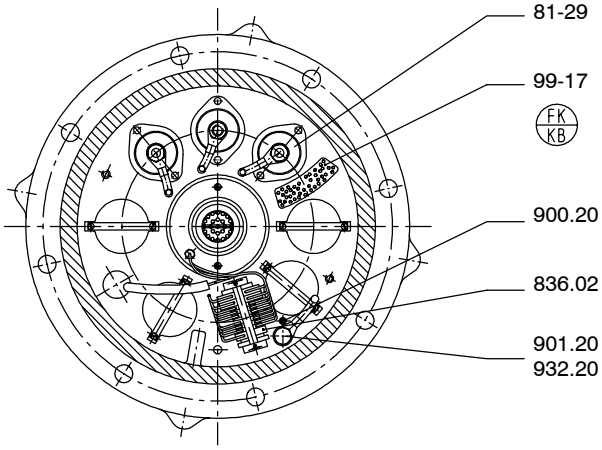
Version with closed impeller



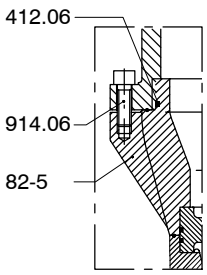
Section B - B
Version Standard – low voltage



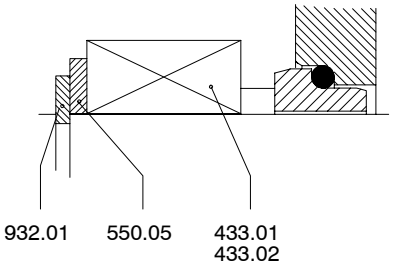
Section B - B
Version with high voltage



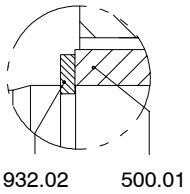
X

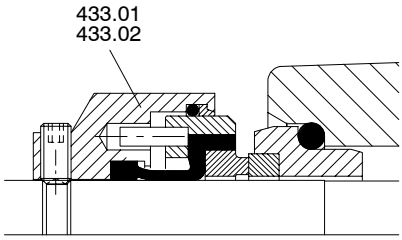


Y
Mechanical seal diagram



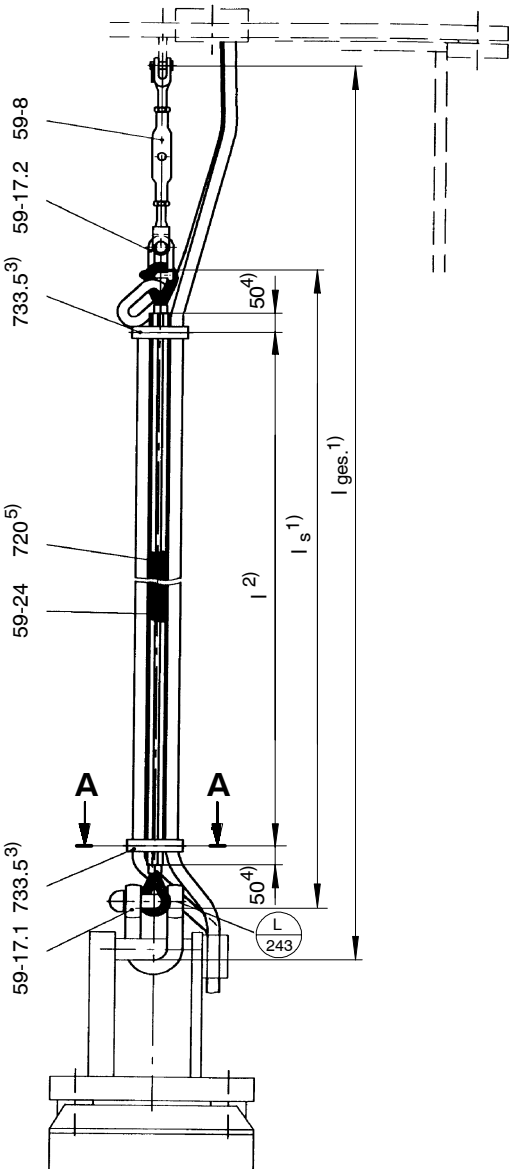
Z



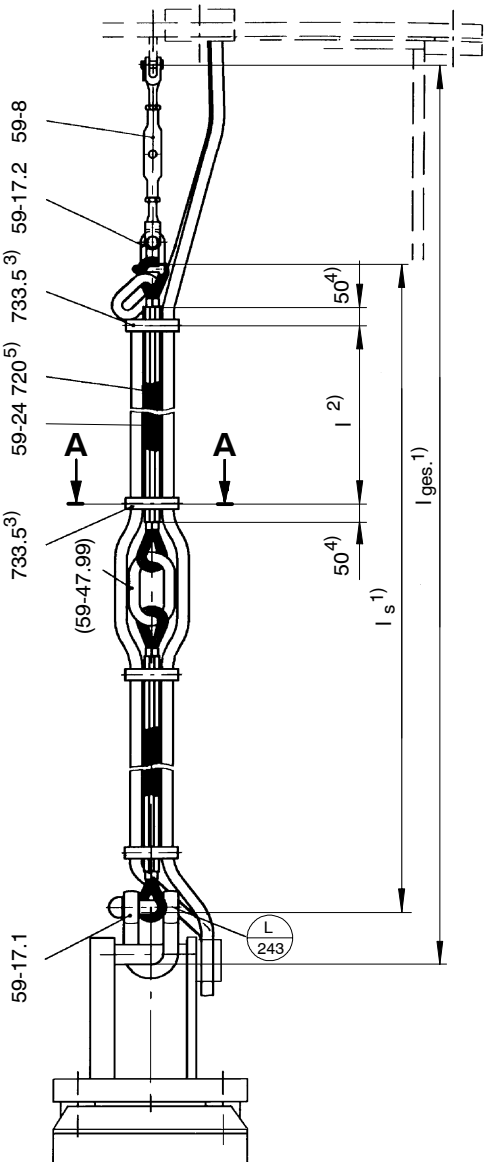


Assembly Drawing – Cable Assembly

- Basic version



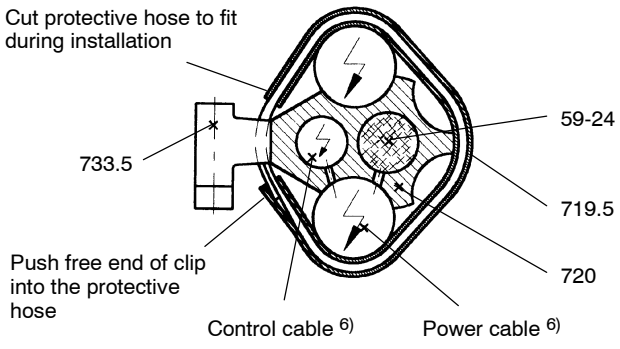
- including cable eye (59-47.99)
for transfer during assembly



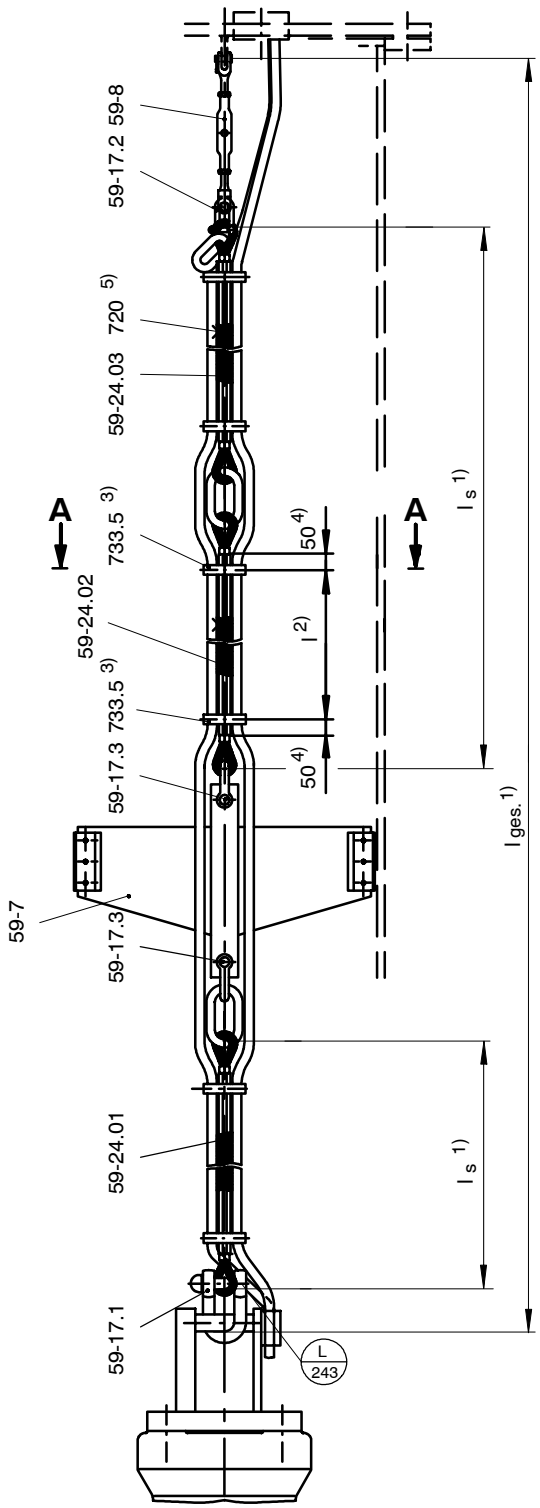
Part no.	Description
59-7	Support
59-8	Tie bar
59-17	Shackle
59-24	Carrier cable
59-47	Carrier cable eye
719	Flexible tube
720	Spacer
733	Clamp

When lifting the pump set, part nos. 59-8 and 59-17.2 must not be subjected to a load

Section **A – A**



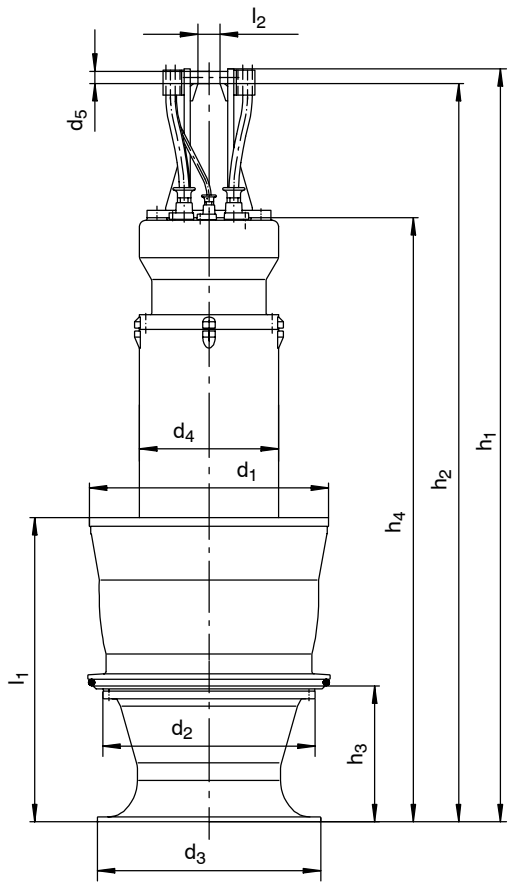
- with support (for long support cable lengths)



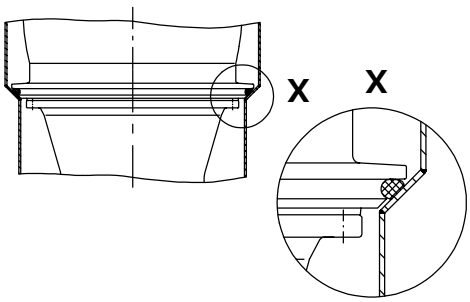
1) determine l_{ges} and l_s according to parts list
2) divide l in intervals of the same length of 300 to 400 mm
3) Number of clamps = number of distances + 1
4) distance dimension 50 to 100 mm
5) Length = l + (2 x 50 mm)
6) Number depends on size of motor

Dimension table - pump/discharge column

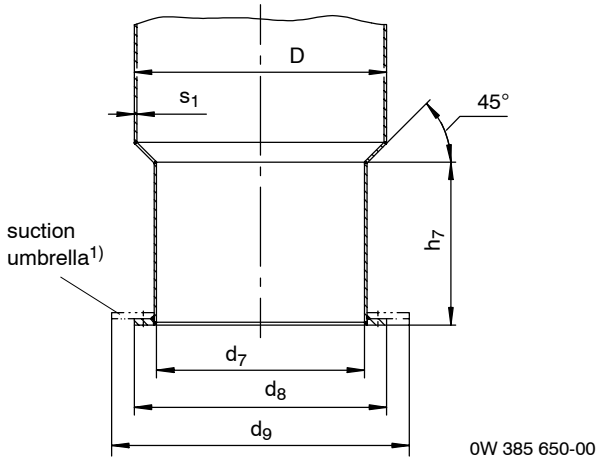
Dimensions in mm



Installation



Steel discharge column



1) Option for decreasing min. water level t_1

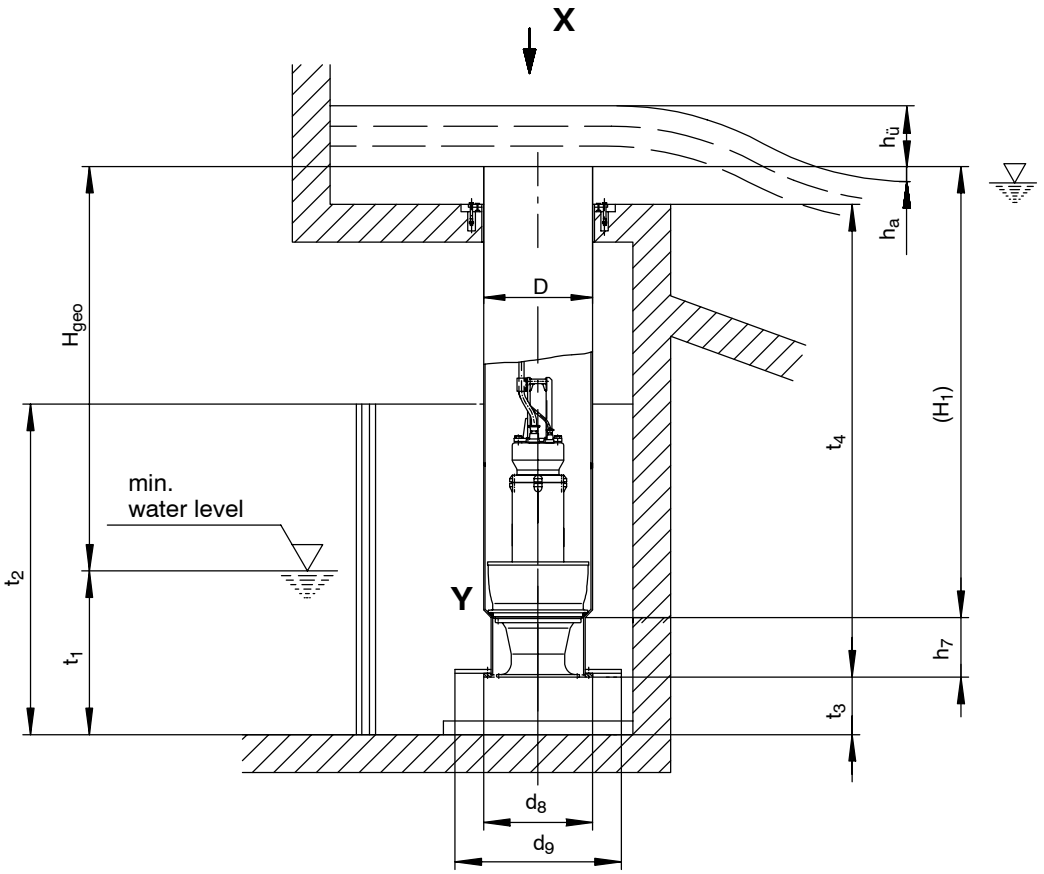
Amacan S . . . - . . . / . . .	D	d_7	h_7	d_8	d_9	s_1
650- 364 / 45 4 / 65 4 / 80 4	660	530	235	660	900	7.1
650- 365 / 65 4 / 80 4 / 100 4 / 120 4	660	530	235	660	900	7.1
650- 404 / 80 4 / 100 4 / 120 4 / 140 4	660	530	275	660	900	7.1
650- 405 / 120 4 / 140 4 / 160 4 / 180 4 / 200 4 / 220 4	660	530	275	660	900	7.1
800- 505 / 100 6 / 120 6 / 140 6 / 150 6 / 175 6	813	680	345	810	1050	8
800- 535 / 100 6 / 120 6 / 140 6 / 150 6 / 175 6	813	720	335	810	1300	8
850- 535 / 230 6	868	720	335	865	1300	8
850- 550 / 150 6 / 175 6 / 230 6 / 290 6	868	740	385	865	1300	8
850- 550 / 75 8 / 100 8 / 120 8	868	740	385	865	1300	8
900- 600 / 230 6 / 290 6	914	800	425	910	1300	10
1000- 600 / 360 6 / 420 6	1016	800	425	1015	1300	10
900- 615 / 230 6 / 290 6	914	780	430	910	1300	10
1000- 615 / 360 6 / 420 6	1016	780	430	1015	1300	10
900- 620 / 230 6 / 290 6	914	770	375	910	1300	10
1000- 620 / 360 6	1016	770	375	1015	1300	10
1000- 655 / 190 8 / 220 8 / 250 8 / 280 8 / 320 8 / 360 8	1016	920	525	1020	1500	10
1300- 820 / 220 10 / 250 10 / 310 10 / 380 10 / 450 10	1320	1080	555	1320	1800	12

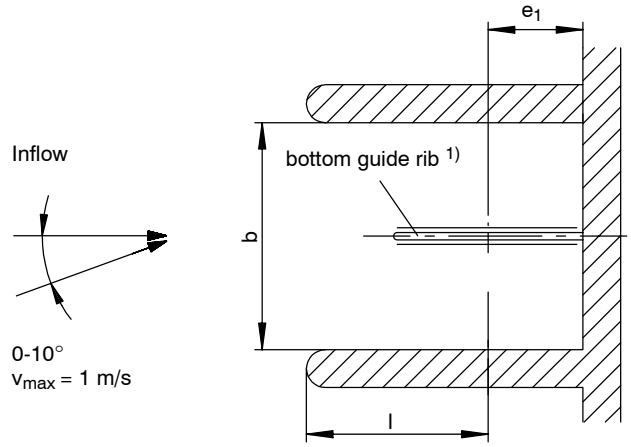
Dimensions in mm

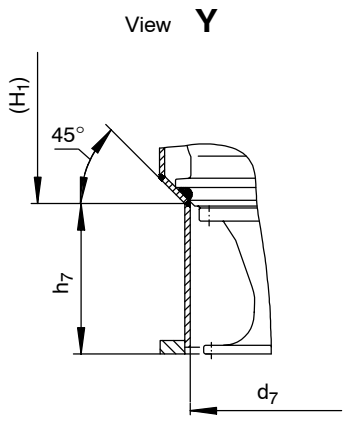
Amacan S . . . - . . . /	h_1	h_2	h_3	h_4	l_1	l_2	d_1	d_2	d_3	d_4	d_5	Weight *) kg
650- 364 / 45 4	2090	2042		1605								970
/ 65 4	2090	2042	260	1605	645	70	625	500	510	390	35	970
/ 80 4	2290	2242		1805								1080
650- 365 / 65 4	2090	2042		1605								960
/ 80 4	2290	2242	260	1805	645	70	625	500	510	390	35	1070
/ 100 4	2290	2242		1805								1100
/ 120 4	2290	2242		1805								1150
650- 404 / 80 4	2305	2258		1820								1080
/ 100 4	2305	2258	290	1820	665	70	620	(540)	500	390	35	1120
/ 120 4	2305	2258		1820								1170
/ 140 4	2505	2458		2020								1300
650- 405 / 120 4	2305	2258		1820						390	35	1160
/ 140 4	2505	2458		2020								1290
/ 160 4	2585	2528	290	2100	665	70	620	(540)	500	480	45	1550
/ 180 4	2585	2528		2100								1610
/ 200 4	2665	2608		2180								1690
/ 220 4	2665	2608		2180								1730
800- 505 / 100 6	2375	2328		1890								1340
/ 120 6	2375	2328		1890		70				390	35	1380
/ 140 6	2575	2528	370	2090	795		775	665	645			1480
/ 150 6	2520	2463		2035		90				480	45	1790
/ 175 6	2600	2543		2115								1890
800- 535 / 100 6	2630	2583		2145								1540
/ 120 6	2630	2583		2145		70				390	35	1580
/ 140 6	2830	2783	350	2345	855		775	670	700			1680
/ 150 6	2620	2563		2135		90				480	45	1850
/ 175 6	2700	2643		2215								1950
850- 535 / 230 6	3065	3005	350	2465	855	90	775	670	700	560	50	2510
850- 550 / 150 6	2660	2603		2175						480	45	1890
/ 175 6	2740	2683	415	2255	865	90	826	720	700			1990
/ 230 6	3105	3045		2505						560	50	2610
/ 290 6	3335	3275		2735								2950
850- 550 / 75 8	2540	2483		2055								1660
/ 100 8	2660	2603	415	2175	865	90	826	720	700	480	45	1770
/ 120 8	2660	2603		2175								1820
900- 600 / 230 6	3060	3000	450	2460	895	90	875	780	750	560	50	2540
/ 290 6	3290	3230		2690								2870
1000- 600 / 360 6	3540	3465	450	2840	895	100	875	780	750	650	60	3750
/ 420 6	3890	3815		3190								4140
900- 615 / 230 6	3035	2975	450	2435	815	90	870	760	730	560	50	2760
/ 290 6	3265	3205		2665								3090
1000- 615 / 360 6	3515	3440	450	2815	1190	100	960	760	730	650	60	4110
/ 420 6	3865	3790		3165								4500
900- 620 / 230 6	3020	2960	405	2420	970	90	875	755	645	560	50	2640
/ 290 6	3250	3190		2650								3000
1000- 620 / 360 6	3500	3425	405	2800	970	100	875	755	645	650	60	3820
1000- 655 / 190 8	3030	2970		2430								2530
/ 220 8	3150	3090		2550		90				560	50	2740
/ 250 8	3380	3320		2780								2910
/ 280 8	3380	3320	550	2780	1220		975	855	900			3020
/ 320 8	3630	3555		2930		100				650	60	3970
/ 360 8	3980	3905		3280								4370
1300- 820 / 220 10	3430	3370		2830		90				560	50	3880
/ 250 10	3430	3370		2830								4010
/ 310 10	3525	3450	600	2825	1195		1200	970	1050			4660
/ 380 10	3875	3800		3175		100				650	60	5220
/ 450 10	3875	3800		3175								5390

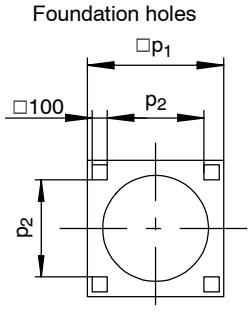
*) complete unit, with 10-metre cable (400 V) and 5-metre wire

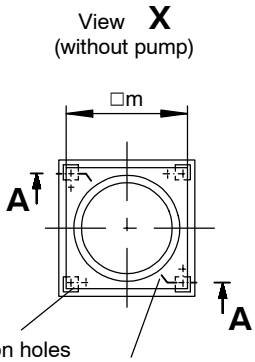
Installation Plan – Type of installation BU

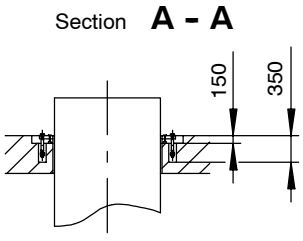












Support plate – discharge column

1) Dimensions of bottom guide rib – see type series booklet
Subject to technical modifications

0W 383955-00

Main dimensions discharge column and installation structure BU

Dimensions in mm

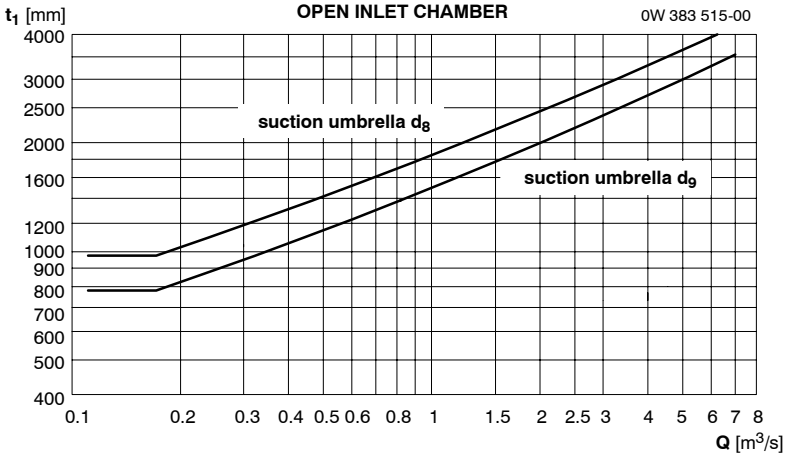
Pump size	D	d_7	h_7	$t_{4\ min}$	t_3	d_8	d_9	h_a	b	l_{min}
650- 364	660	530	235	2600	260	660	900	100	1000	570
650- 365	660	530	235	2600	260	660	900		1000	570
650- 404	660	530	275	2850	260	660	900		1000	570
650- 405	660	530	275	3000	320	660	900		1250	820
800- 505	813	680	345	3000	320	810	1050		1250	750
800- 535	813	720	335	3250	380	810	1300		1500	970
850- 535	868	720	335	3500	380	865	1300		1500	970
850- 550	868	740	385	3750	380	865	1300		1500	970
900- 600	914	800	425	3750	380	910	1300		1500	900
1000- 600	1016	800	425	4400	380	1015	1300		1500	900
900- 615	914	780	430	3700	440	910	1300		1800	1200
1000- 615	1016	780	430	4350	440	1015	1300		1800	1200
900- 620	914	770	375	3700	320	910	1300		1250	650
1000- 620	1016	770	375	4000	320	1015	1300		1250	650
1000- 655	1016	920	525	4500	440	1020	1500		1800	1200
1300- 820	1320	1080	555	4550	560	1320	1800		2300	1550

Pump size	e_1		p_1	p_2	m
	without suction umbrella	with suction umbrella			
650- 364	430	550	850	590	750
650- 365	430	550	850	590	750
650- 404	430	550	850	590	750
650- 405	430	550	850	590	750
800- 505	500	600	1000	740	900
800- 535	500	750	1000	740	900
850- 535	530	750	1050	790	950
850- 550	530	750	1050	790	950
900- 600	550	750	1100	840	1000
1000- 600	600	750	1220	960	1150
900- 615	550	750	1100	840	1000
1000- 615	600	750	1220	960	1150
900- 620	550	750	1100	840	1000
1000- 620	600	750	1220	960	1150
1000- 655	600	850	1220	960	1150
1300- 820	750	1000	1520	1260	1450

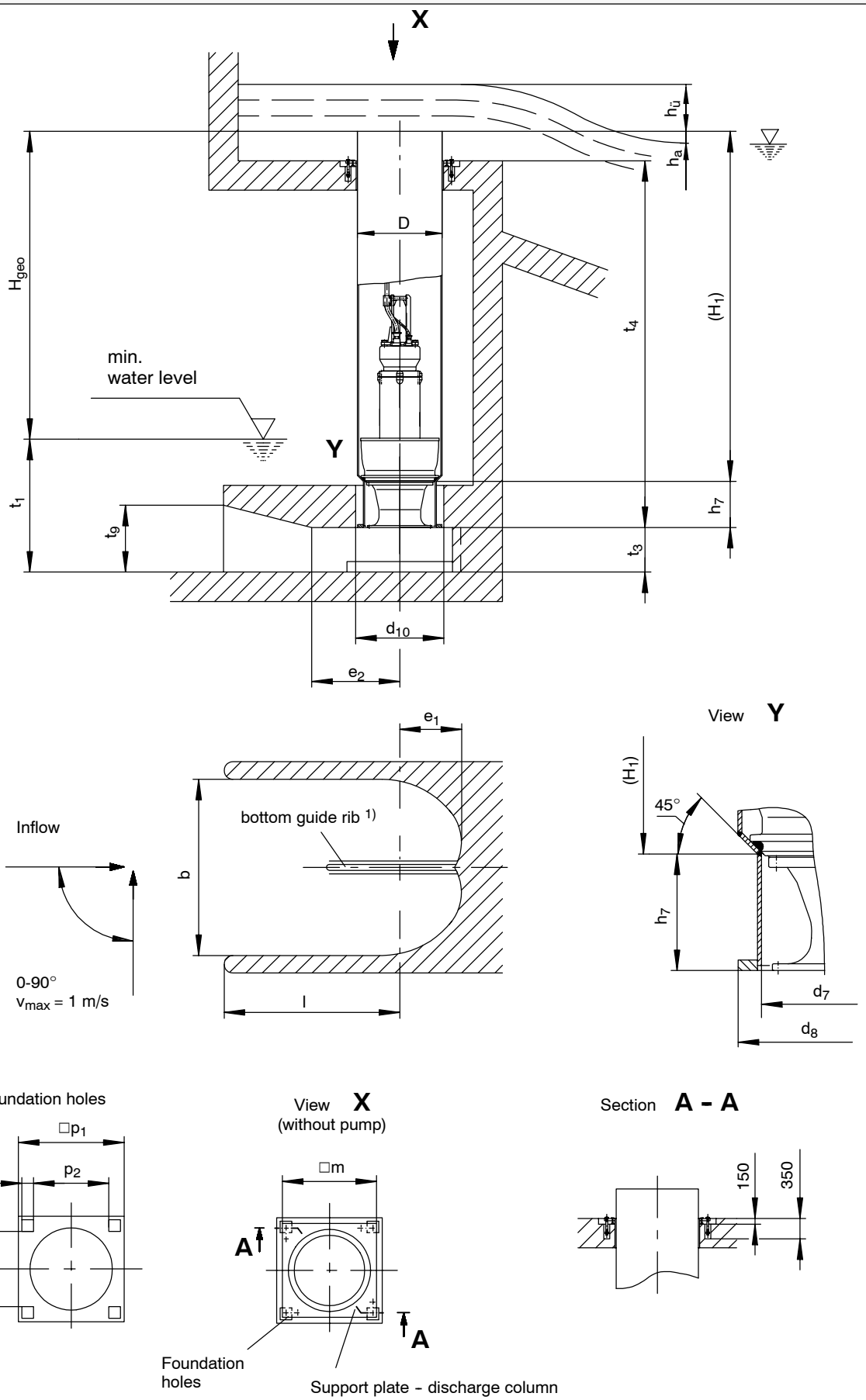
t_2 = 1.1 x water level; max. 2 x t_1 $t_{4\ max}$ = depends on discharge head H and installation structure

Dimensions for installation structure are according to DIN 18 202, part 4, group B

Diagram for minimum water level t_1



Installation Plan – Type of installation BG



1) Dimensions of bottom guide rib - see type series booklet

Main dimensions discharge column and installation structure BG

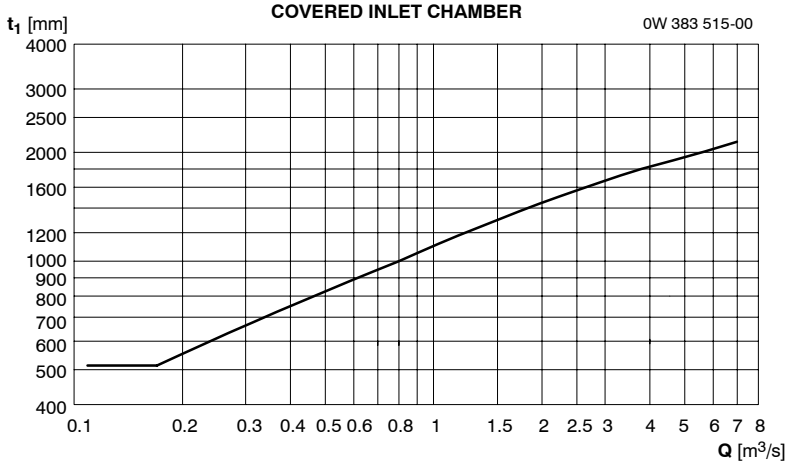
Dimensions in mm

Pump size	D	d_7	h_7	$t_{4\ min}$	t_3	d_8	d_{10}	t_9	b	l_{min}
650- 364	660	530	235	2600	260	660	690	375	1000	1000
650- 365	660	530	235	2600	260	660	690	375	1000	1000
650- 404	660	530	275	2850	260	660	690	375	1000	1000
650- 405	660	530	275	3000	320	660	690	470	1250	1250
800- 505	813	680	345	3000	320	810	850	470	1250	1250
800- 535	813	720	335	3250	380	810	850	570	1500	1500
850- 535	868	720	335	3500	380	865	910	570	1500	1500
850- 550	868	740	385	3750	380	865	910	570	1500	1500
900- 600	914	800	425	3750	380	910	955	570	1500	1500
1000- 600	1016	800	425	4400	380	1015	1065	570	1500	1500
900- 615	914	780	430	3700	440	910	955	660	1800	1800
1000- 615	1016	780	430	4350	440	1015	1065	660	1800	1800
900- 620	914	770	375	3700	320	910	955	470	1250	1250
1000- 620	1016	770	375	4000	320	1015	1065	470	1250	1250
1000- 655	1016	920	525	4500	440	1020	1070	660	1800	1800
1300- 820	1320	1080	555	4550	560	1320	1380	850	2300	2300

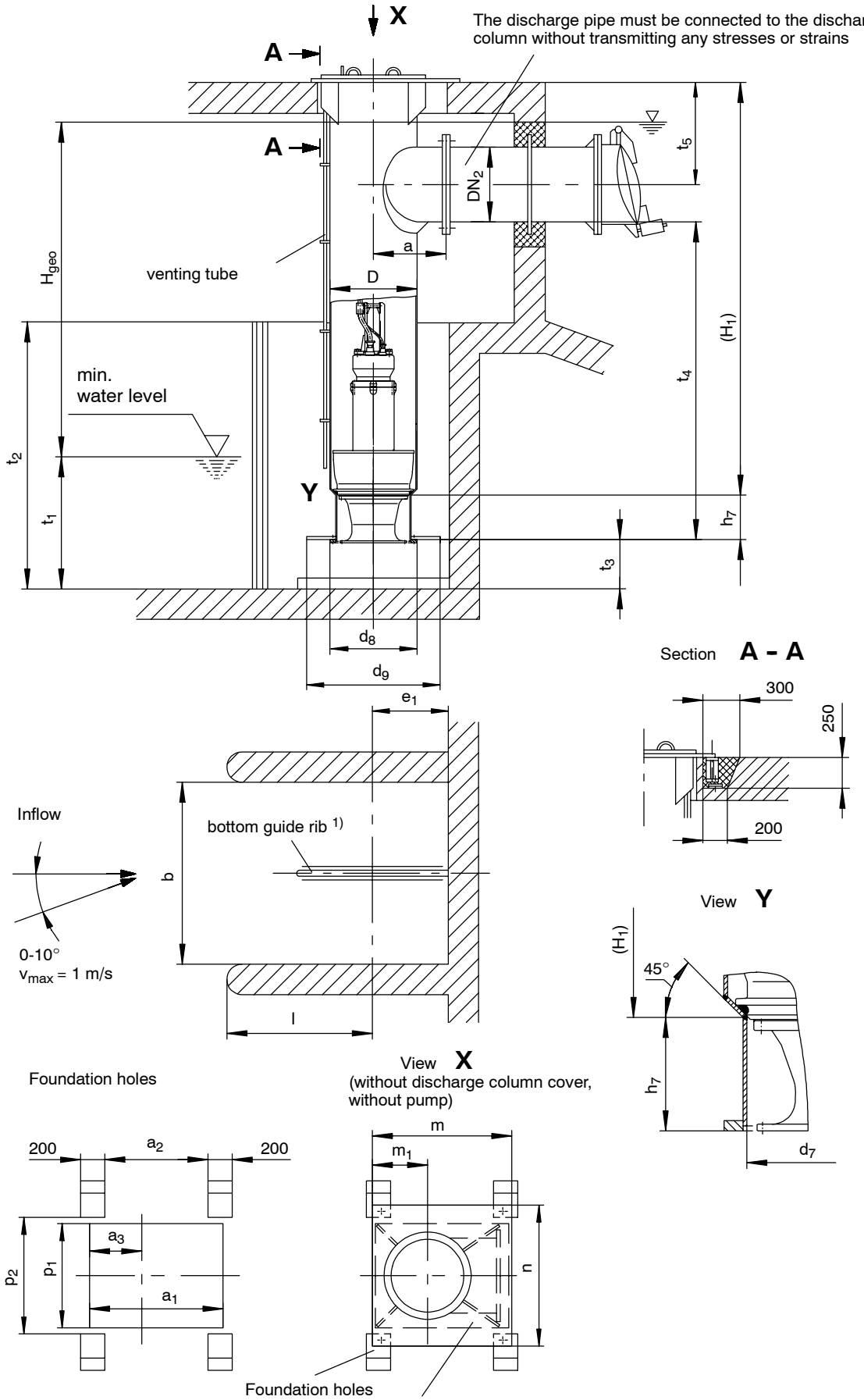
Pump size	e_1	e_2	p_1	p_2	m	h_a
650- 364	345	500	850	590	750	100
650- 365	345	500	850	590	750	
650- 404	345	500	850	590	750	
650- 405	432	625	850	590	750	
800- 505	432	625	1000	740	900	
800- 535	518	750	1000	740	900	
850- 535	518	750	1050	790	950	
850- 550	518	750	1050	790	950	
900- 600	518	750	1100	840	1000	
1000- 600	518	750	1220	960	1150	
900- 615	604	900	1100	840	1000	
1000- 615	604	900	1220	960	1150	
900- 620	432	625	1100	840	1000	
1000- 620	432	625	1220	960	1150	
1000- 655	604	900	1220	960	1150	
1300- 820	777	1150	1520	1260	1450	

$t_{4\ max}$ = depends on discharge head H and installation structure
Dimensions for installation structure are according to DIN 18 202, part 4, group B

Diagram for minimum water level t_1



Installation Plan – Type of installation CU



1) Dimensions of bottom guide rib – see type series booklet
Subject to technical modifications

0W 383458-00

Main dimensions discharge column and installation structure CU

Dimensions in mm

Pump size	D	d_7	h_7	$t_{4\ min}$	t_5 *)	a	$DN_{2\ min}$	$DN_{2\ max}$	t_3	d_8	d_9	b
650- 364	660	530	235	2600	720	600	400	600	260	660	900	1000
650- 365	660	530	235	2600	720	600	400	600	260	660	900	1000
650- 404	660	530	275	2850	720	600	400	600	260	660	900	1000
650- 405	660	530	275	3000	720	600	400	600	320	660	900	1250
800- 505	813	680	345	3000	820	700	500	800	320	810	1050	1250
800- 535	813	720	335	3250	820	700	500	800	380	810	1300	1500
850- 535	868	720	335	3500	820	700	500	800	380	865	1300	1500
850- 550	868	740	385	3750	820	700	500	800	380	865	1300	1500
900- 600	914	800	425	3750	870	750	600	900	380	910	1300	1500
1000- 600	1016	800	425	4400	980	800	700	1000	380	1015	1300	1500
900- 615	914	780	430	3700	870	750	600	900	440	910	1300	1800
1000- 615	1016	780	430	4350	980	800	700	1000	440	1015	1300	1800
900- 620	914	770	375	3700	870	750	600	900	320	910	1300	1250
1000- 620	1016	770	375	4000	980	800	700	1000	320	1015	1300	1250
1000- 655	1016	920	525	4500	980	800	700	1000	440	1020	1500	1800
1300- 820	1320	1080	555	4550	1130	960	1000	1300	560	1320	1800	2300

Pump size	l_{min}	e_1		a_1	a_2	a_3	p_1	p_2	m	m_1	n
		without suction umbrella	with suction umbrella								
650- 364	570	430	550	1050	800	405	810	910	1100	430	1110
650- 365	570	430	550	1050	800	405	810	910	1100	430	1110
650- 404	570	430	550	1050	800	405	810	910	1100	430	1110
650- 405	820	430	550	1050	800	405	810	910	1100	430	1110
800- 505	750	500	600	1200	950	480	1060	1160	1250	505	1360
800- 535	970	500	750	1200	950	480	1060	1160	1250	505	1360
850- 535	970	530	750	1250	1000	505	1060	1160	1300	530	1360
850- 550	970	530	750	1250	1000	505	1060	1160	1300	530	1360
900- 600	900	550	750	1300	1050	520	1160	1260	1350	545	1460
1000- 600	900	600	750	1410	1160	580	1280	1380	1460	605	1580
900- 615	1200	550	750	1300	1050	520	1160	1260	1350	545	1460
1000- 615	1200	600	750	1410	1160	580	1280	1380	1460	605	1580
900- 620	650	550	750	1300	1050	520	1160	1260	1350	545	1460
1000- 620	650	600	750	1410	1160	580	1280	1380	1460	605	1580
1000- 655	1200	600	850	1410	1160	580	1280	1380	1460	605	1580
1300- 820	1550	750	1000	1720	1470	720	1620	1720	1780	750	1960

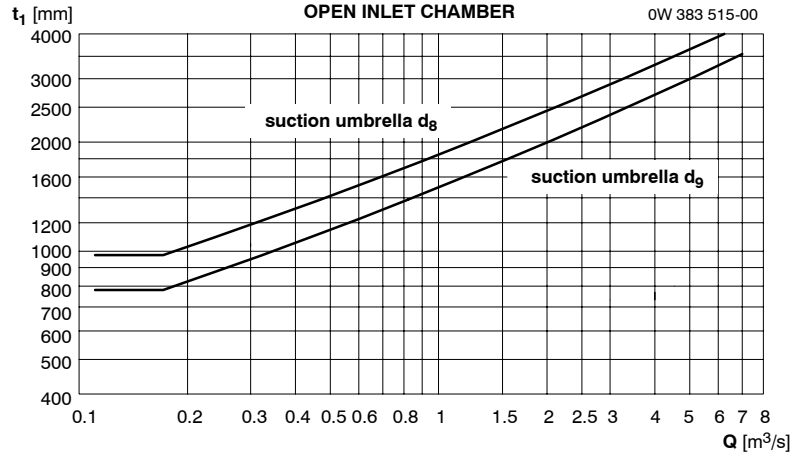
t_2 = 1.1 x water level; max. 2 x t_1

*) designed for $DN_{2\ min}$

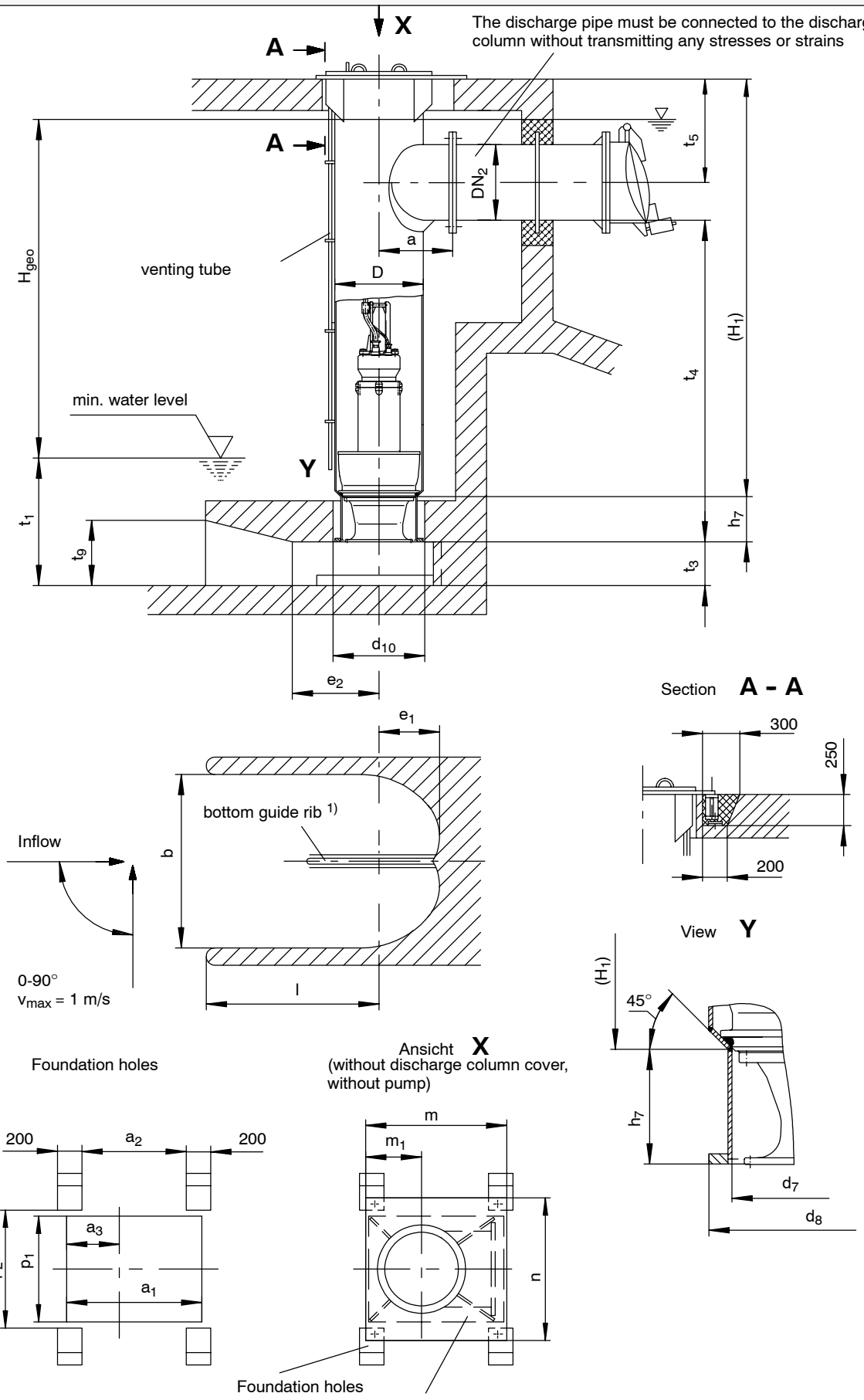
In case of falling short of $t_{4\ min}$, consultation is required.

Dimensions for installation structure are according to DIN 18 202, part 4, group B

Diagram for minimum water level t_1



Installation Plan – Type of installation CG



1) Dimensions of bottom guide rib - see type series booklet
Subject to technical modifications

0W 383957-00

Main dimensions discharge column and installation structure CG

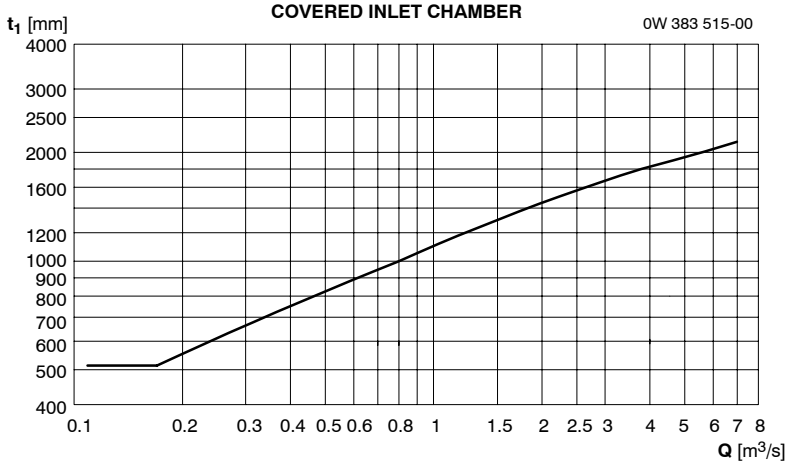
Dimensions in mm

Pump size	D	d_7	h_7	$t_{4\ min}$	t_5 *)	a	$DN_{2\ min}$	$DN_{2\ max}$	d_8	d_{10}	t_3	t_9
650- 364	660	530	235	2600	720	600	400	600	660	690	260	375
650- 365	660	530	235	2600	720	600	400	600	660	690	260	375
650- 404	660	530	275	2850	720	600	400	600	660	690	260	375
650- 405	660	530	275	3000	720	600	400	600	660	690	320	470
800- 505	813	680	345	3000	820	700	500	800	810	850	320	470
800- 535	813	720	335	3250	820	700	500	800	810	850	380	570
850- 535	868	720	335	3500	820	700	500	800	865	910	380	570
850- 550	868	740	385	3750	820	700	500	800	865	910	380	570
900- 600	914	800	425	3750	870	750	600	900	910	955	380	570
1000- 600	1016	800	425	4400	980	800	700	1000	1015	1065	380	570
900- 615	914	780	430	3700	870	750	600	900	910	955	440	660
1000- 615	1016	780	430	4350	980	800	700	1000	1015	1065	440	660
900- 620	914	770	375	3700	870	750	600	900	910	955	320	470
1000- 620	1016	770	375	4000	980	800	700	1000	1015	1065	320	470
1000- 655	1016	920	525	4500	980	800	700	1000	1020	1070	440	660
1300- 820	1320	1080	555	4550	1130	960	1000	1300	1320	1380	560	850

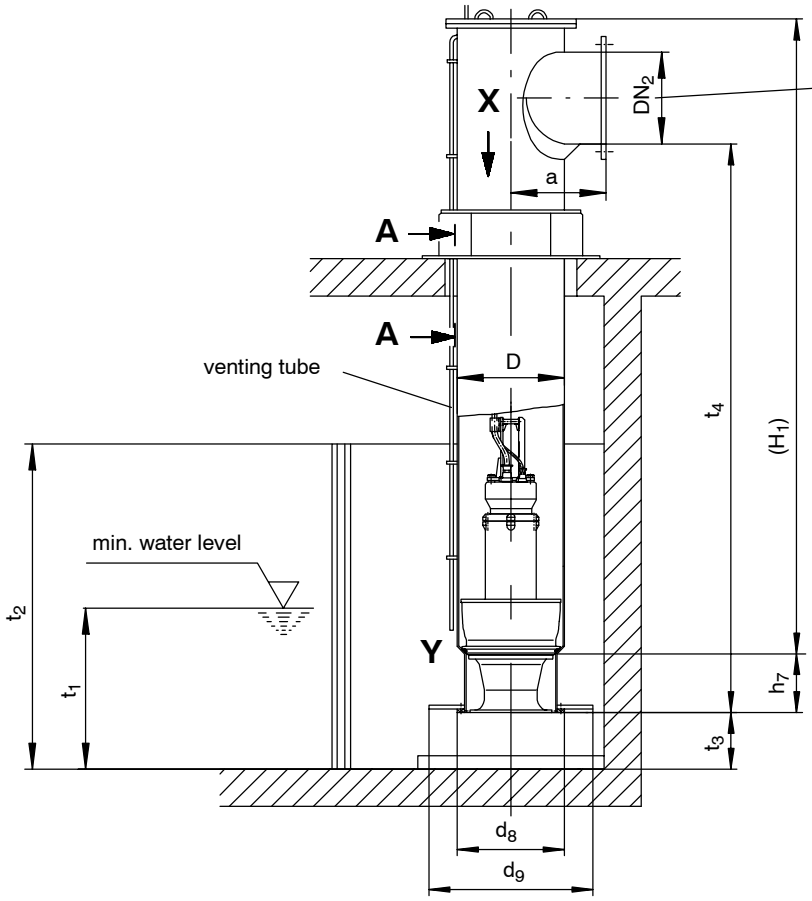
Pump size	b	l_{min}	e_1	e_2	a_1	a_2	a_3	p_1	p_2	m	m_1	n
650- 364	1000	1000	345	500	1050	800	405	810	910	1100	430	1110
650- 365	1000	1000	345	500	1050	800	405	810	910	1100	430	1110
650- 404	1000	1000	345	500	1050	800	405	810	910	1100	430	1110
650- 405	1250	1250	432	625	1050	800	405	810	910	1100	430	1110
800- 505	1250	1250	432	625	1200	950	480	1060	1160	1250	505	1360
800- 535	1500	1500	518	750	1200	950	480	1060	1160	1250	505	1360
850- 535	1500	1500	518	750	1250	1000	505	1060	1160	1300	530	1360
850- 550	1500	1500	518	750	1250	1000	505	1060	1160	1300	530	1360
900- 600	1500	1500	518	750	1300	1050	520	1160	1260	1350	545	1460
1000- 600	1500	1500	518	750	1410	1160	580	1280	1380	1460	605	1580
900- 615	1800	1800	604	900	1300	1050	520	1160	1260	1350	545	1460
1000- 615	1800	1800	604	900	1410	1160	580	1280	1380	1460	605	1580
900- 620	1250	1250	432	625	1300	1050	520	1160	1260	1350	545	1460
1000- 620	1250	1250	432	625	1410	1160	580	1280	1380	1460	605	1580
1000- 655	1800	1800	604	900	1410	1160	580	1280	1380	1460	605	1580
1300- 820	2300	2300	777	1150	1720	1470	720	1620	1720	1780	750	1960

In case of falling short of $t_{4\ min}$, consultation is required.
*) designed for $DN_{2\ min}$
Dimensions for installation structure are according to DIN 18 202, part 4, group B

Diagram for minimum water level t_1

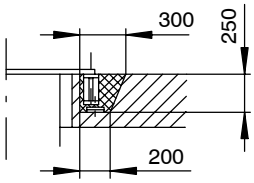


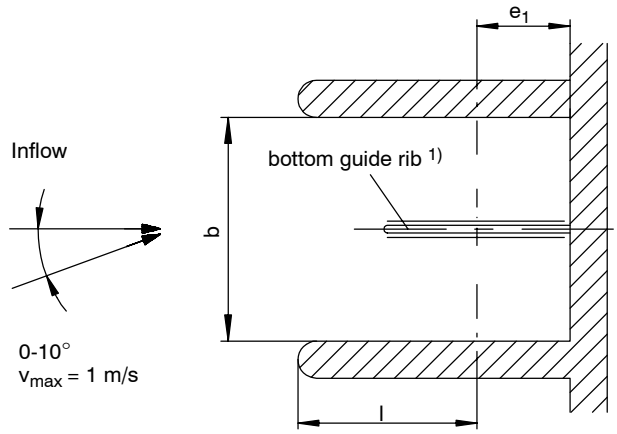
Installation Plan – Type of installation DU



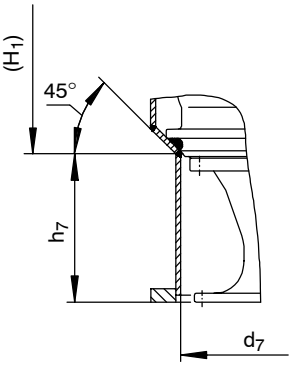
The discharge pipe must be connected to the discharge column without transmitting any stresses or strains

Section **A – A**

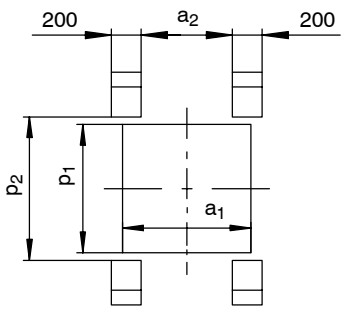




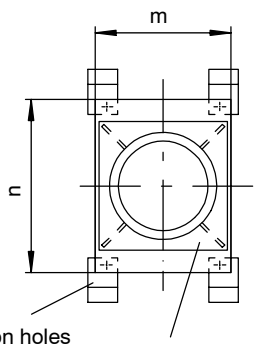
View **Y**



Foundation holes



View **X** (without pump)



Foundation holes

Support plate – discharge column

1) Dimensions of bottom guide rib – see type series booklet
Subject to technical modifications

0W 383 958-00

Main dimensions discharge column and installation structure DU

Dimensions in mm

Pump size	D	d_7	h_7	$t_{4\ min}$	a	$DN_{2\ min}$	$DN_{2\ max}$	t_3	d_8	d_9
650- 364	660	530	235	2600	600	400	600	260	660	900
650- 365	660	530	235	2600	600	400	600	260	660	900
650- 404	660	530	275	2850	600	400	600	260	660	900
650- 405	660	530	275	3000	600	400	600	320	660	900
800- 505	813	680	345	3000	700	500	800	320	810	1050
800- 535	813	720	335	3250	700	500	800	380	810	1300
850- 535	868	720	335	3500	700	500	800	380	865	1300
850- 550	868	740	385	3750	700	500	800	380	865	1300
900- 600	914	800	425	3750	750	600	900	380	910	1300
1000- 600	1016	800	425	4400	800	700	1000	380	1015	1300
900- 615	914	780	430	3700	750	600	900	440	910	1300
1000- 615	1016	780	430	4350	800	700	1000	440	1015	1300
900- 620	914	770	375	3700	750	600	900	320	910	1300
1000- 620	1016	770	375	4000	800	700	1000	320	1015	1300
1000- 655	1016	920	525	4500	800	700	1000	440	1020	1500
1300- 820	1320	1080	555	4550	960	1000	1300	560	1320	1800

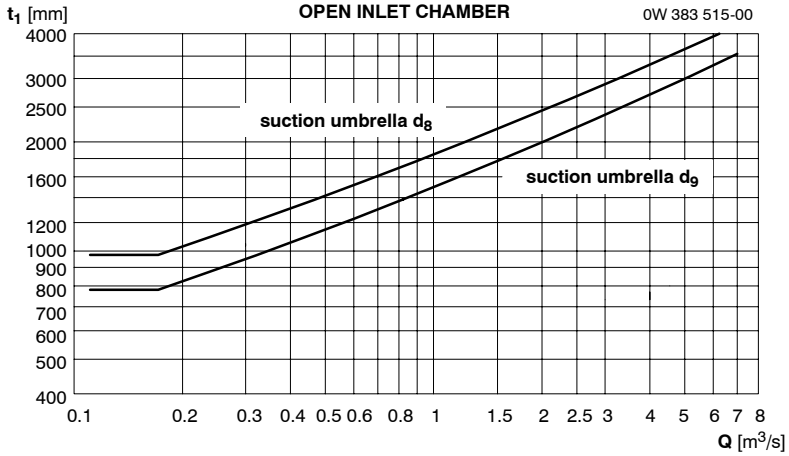
Pump size	b	l_{min}	e_1		a_1	a_2	p_1	p_2	m	n
			without suction umbrella	with suction umbrella						
650- 364	1000	570	430	550	810	560	810	910	860	1110
650- 365	1000	570	430	550	810	560	810	910	860	1110
650- 404	1000	570	430	550	810	560	810	910	860	1110
650- 405	1250	820	430	550	810	560	810	910	860	1110
800- 505	1250	750	500	600	960	710	960	1060	1010	1260
800- 535	1500	970	500	750	960	710	960	1060	1010	1260
850- 535	1500	970	530	750	1010	760	1010	1110	1060	1310
850- 550	1500	970	530	750	1010	760	1010	1110	1060	1310
900- 600	1500	900	550	750	1060	810	1060	1160	1110	1360
1000- 600	1500	900	600	750	1160	910	1160	1260	1210	1460
900- 615	1800	1200	550	750	1060	810	1060	1160	1110	1360
1000- 615	1800	1200	600	750	1160	910	1160	1260	1210	1460
900- 620	1250	650	550	750	1060	810	1060	1160	1110	1360
1000- 620	1250	650	600	750	1160	910	1160	1260	1210	1460
1000- 655	1800	1200	600	850	1160	910	1160	1260	1210	1460
1300- 820	2300	1550	750	1000	1460	1210	1460	1560	1520	1800

t_2 = 1.1 x water level; max. 2 x t_1

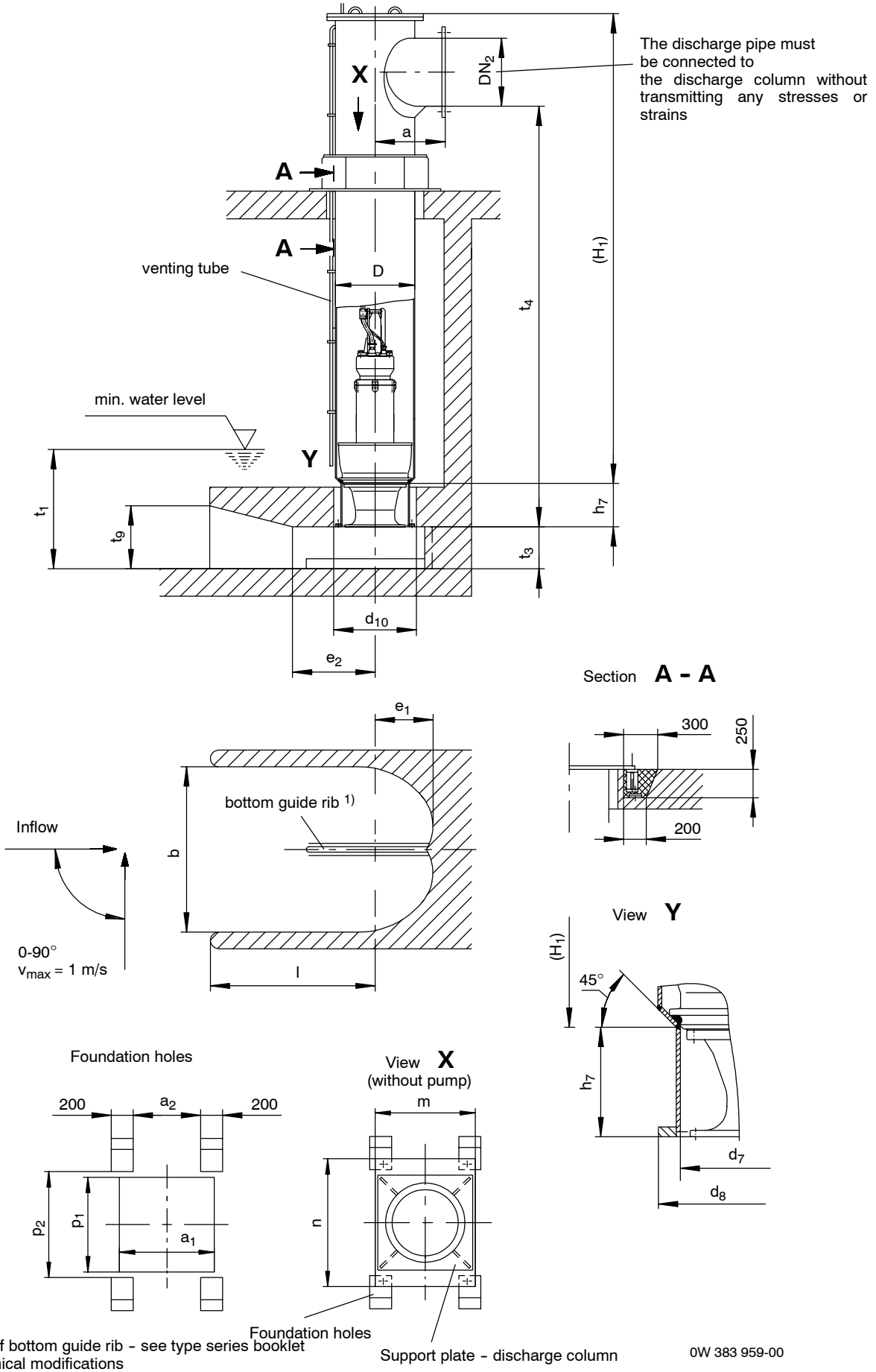
In case of falling short of $t_{4\ min}$, consultation is required.

Dimensions for installation structure are according to DIN 18 202, part 4, group B

Diagram for minimum water level t_1



Installation Plan – Type of installation DG



1) Dimensions of bottom guide rib - see type series booklet

Subject to technical modifications

0W 383 959-00

Main dimensions discharge column and installation structure DG

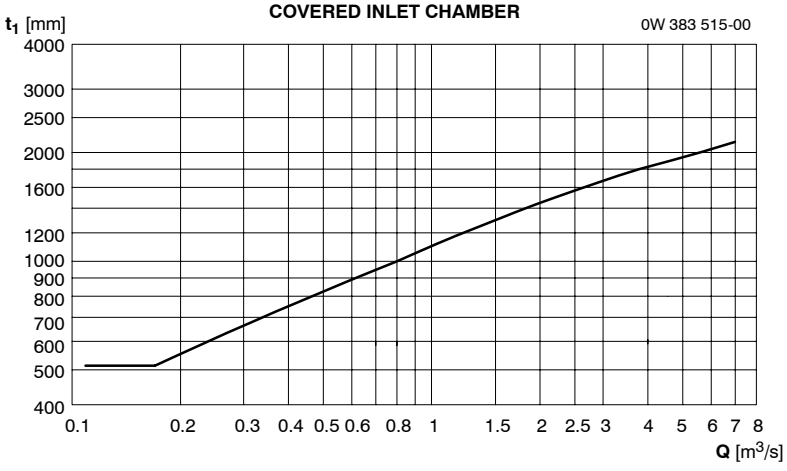
Dimensions in mm

Pump size	D	d_7	h_7	$t_{4\ min}$	a	$DN_{2\ min}$	$DN_{2\ max}$	d_8	d_{10}	t_3
650- 364	660	530	235	2600	600	400	600	660	690	260
650- 365	660	530	235	2600	600	400	600	660	690	260
650- 404	660	530	275	2850	600	400	600	660	690	260
650- 405	660	530	275	3000	600	400	600	660	690	320
800- 505	813	680	345	3000	700	500	800	810	850	320
800- 535	813	720	335	3250	700	500	800	810	850	380
850- 535	868	720	335	3500	700	500	800	865	910	380
850- 550	868	740	385	3750	700	500	800	865	910	380
900- 600	914	800	425	3750	750	600	900	910	955	380
1000- 600	1016	800	425	4400	800	700	1000	1015	1065	380
900- 615	914	780	430	3700	750	600	900	910	955	440
1000- 615	1016	780	430	4350	800	700	1000	1015	1065	440
900- 620	914	770	375	3700	750	600	900	910	955	320
1000- 620	1016	770	375	4000	800	700	1000	1015	1065	320
1000- 655	1016	920	525	4500	800	700	1000	1020	1070	440
1300- 820	1320	1080	555	4550	960	1000	1300	1320	1380	560

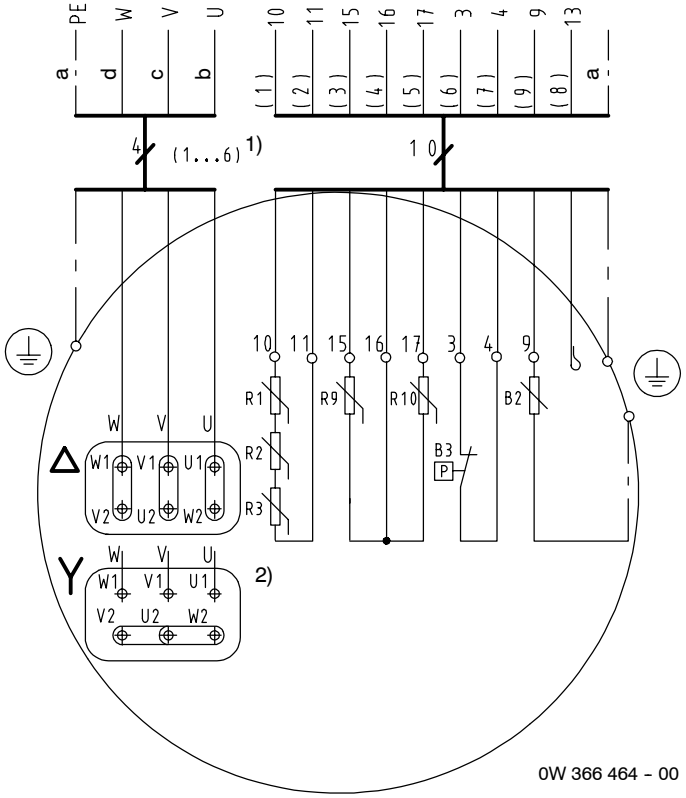
Pump size	t_9	b	l_{min}	e_1	e_2	a_1	a_2	p_1	p_2	m	n
650- 364	375	1000	1000	345	500	810	560	810	910	860	1110
650- 365	375	1000	1000	345	500	810	560	810	910	860	1110
650- 404	375	1000	1000	345	500	810	560	810	910	860	1110
650- 405	470	1250	1250	432	625	810	560	810	910	860	1110
800- 505	470	1250	1250	432	625	960	710	960	1060	1010	1260
800- 535	570	1500	1500	518	750	960	710	960	1060	1010	1260
850- 535	570	1500	1500	518	750	1010	760	1010	1110	1060	1310
850- 550	570	1500	1500	518	750	1010	760	1010	1110	1060	1310
900- 600	570	1500	1500	518	750	1060	810	1060	1160	1110	1360
1000- 600	570	1500	1500	518	750	1160	910	1160	1260	1210	1460
900- 615	660	1800	1800	604	900	1060	810	1060	1160	1110	1360
1000- 615	660	1800	1800	604	900	1160	910	1160	1260	1210	1460
900- 620	470	1250	1250	432	625	1060	810	1060	1160	1110	1360
1000- 620	470	1250	1250	432	625	1160	910	1160	1260	1210	1460
1000- 655	660	1800	1800	604	900	1160	910	1160	1260	1210	1460
1300- 820	850	2300	2300	777	1150	1460	1210	1460	1560	1520	1800

In case of falling short of $t_{4\ min}$, consultation is required.
Dimensions for installation structure are according to DIN 18 202, part 4, group B

Diagram for minimum water level t_1



Electrical Connection Plan – Standard / low voltage



a = green/yellow
b = black
c = brown
d = blue

1) Motor disposes of 1 to 6 parallel connection leads (see order confirmation) depending on the motor type.
2) Motor with star or delta mode (see nameplate)

The wiring diagram for high voltage is enclosed with the supplementary documentation.

– Cable identification

	Identification tape	Cable core identification numbers or colours
Power cable		
	U	black
	V	brown
	W	blue
	PE	green/yellow
Control cable		
	10	(1)
	11	(2)
	15	(3)
	16	(4)
	17	(5)
	3	(6)
	4	(7)
	13	(8)
	9	(9)
	green/yellow	

– Monitoring devices

Thermal cutout:

R1, R2, R3: PTC-Thermistors
Identification tapes: 10 11

Motor moisture cutout:

B2: Moisture sensor (electrode) in the motor chamber
Identification tape: 9

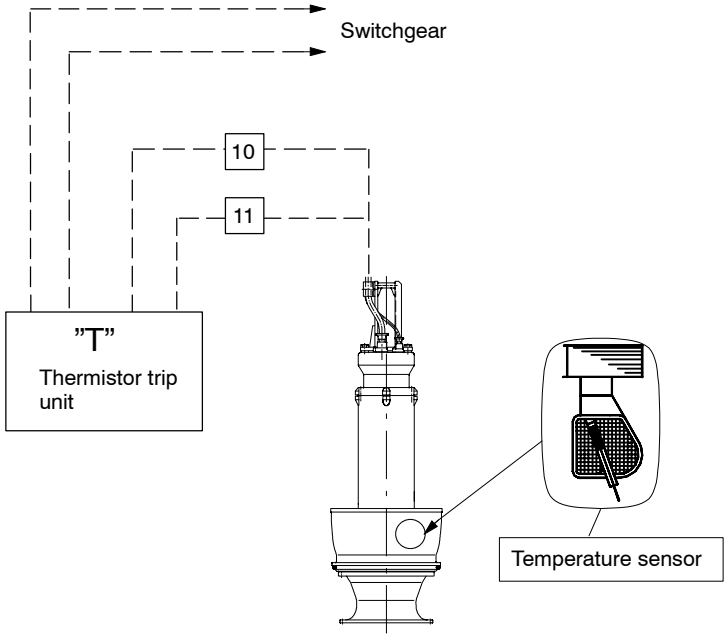
Monitoring of mechanical seal:

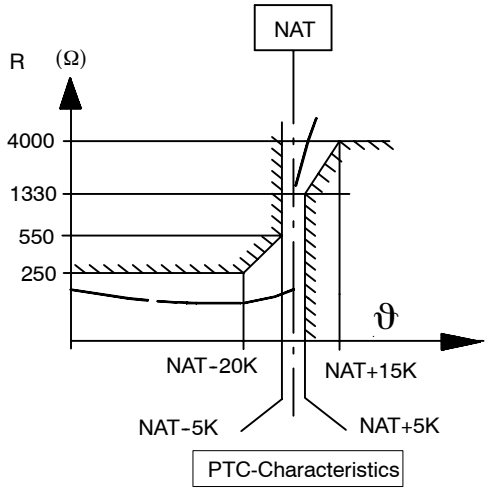
B3: Float switch (break contact) in the leakage chamber
Identification tapes: 3 4

Monitoring of bearing temperature:

R9, R10: PT 100 at the bearings
Identification tapes:
Locating bearing (bottom) 15 16
Floating bearing (top) 16 17

Circuit plan - Monitoring of motor temperature





Description - winding temperature monitoring
(see also "Electrical Connection Plan")

The winding is protected against overheating by a temperature control circuit.

3 thermistors R1, R2, R3 (core identification tape 10, 11) serve as temperature limiters. They have to be connected to a thermistor tripping device with manual reset.
Tripping caused by the temperature monitoring device must lead to the shut-down of the pump.

After tripping of the winding temperature monitoring, revision of the pump will be required. In urgent cases (after cooling down of the machine), the pump may be reset by hand until inspection takes place. However, you have to go on monitoring the winding temperature. Automatic reset must be prevented.

Generally, temperature sensors are insulated for the entire rated voltage. As additional protection against overvoltage, gas-tube surge arresters are installed in the terminal box of the high voltage motors.

rated voltage U_{BN}:	24 V AV
max. operating voltage $U_{B::}$	70 V AC
rated discharge surge current I_{SN}:	5 kA

R1, R2, R3
Monitoring circuit

= 3 PTC thermistors in the motor winding

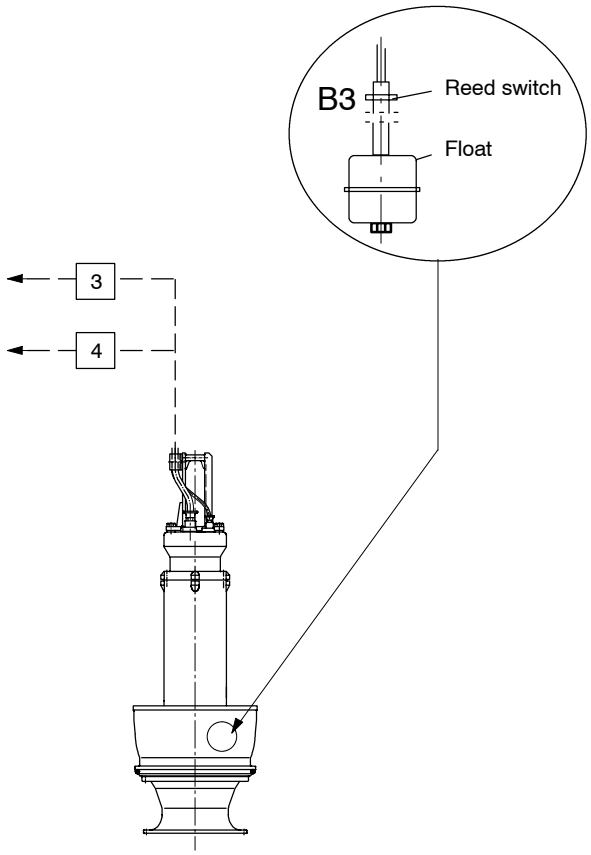
Identification tapes: 10 11

Max. operating voltage on terminals:
$U_{max.}$ = 30 V d. c.

Resistance between terminals 10/11:
- at ambient temperature 100 Ω < R < 750 Ω
- at shutdown temperature R ≥ 4000 Ω

Attention **Do not test monitoring circuits by means of a hand generator. Use an ohmmeter.**

Circuit plan - Monitoring of Mechanical Seal



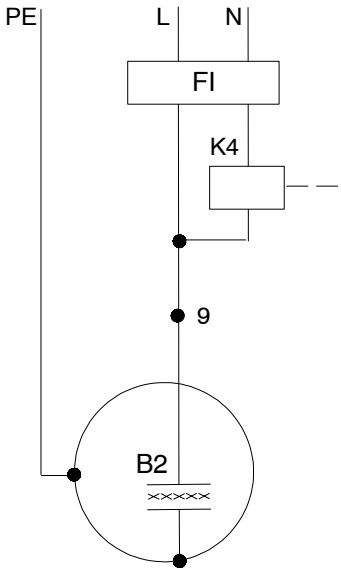
Monitoring of mechanical seal by means of a float switch
(see also "Electrical connection plan")

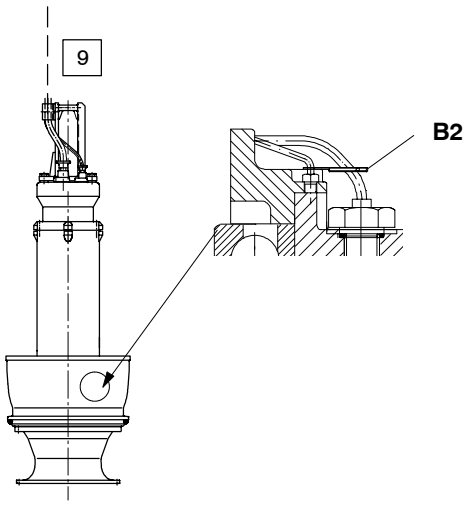
The contact of the installed float switch B3 (NC) opens if water penetrates into the leakage chamber due to defective mechanical seals.
The contact may thereby switch on an alarm signal or shut down the motor.

B3 = Float switch (NC) in the leakage chamber
Identification tapes: 3 4

max. 250 V ~/1.5 A
Switching capacity max. 60 VA

Circuit plan - Moisture monitoring





Motor chamber/moisture detection
(see also "Electrical Connection plan")

If moisture penetrates into the motor chamber, first of all, a current will be flowing from terminal 9 to the earth via the built-in moisture electrode. This leads to the triggering of the earth leakage circuit breaker fitted for monitoring the moisture electrode. The K4 auxiliary relay will drop and switch off the motor contactor. This switching does, however, not represent a fault current monitoring according to VDE 0100/ IEC 364. After moisture sensor has cut out the pump the pump will have to be overhauled.

Check of the moisture electrode

An **insulation resistance test** acc. to 7.2.1 has to be carried out.
If the insulation resistance is < 5 MΩ, for high voltage motor <10 MΩ, the motor has to be opened, inspected and overhauled.
After dismantling the pump restore or replace the moisture sensor. To restore the sensor dry it in an oven for about 1 hour at 120 °C. Thereafter, soak it in transformer oil.

WE RECOMMEND FITTING A NEW MOISTURE SENSOR IN THE EVENT OF DAMAGE.

B2 = Moisture transmitter (electrode) inside the motor space
Identification tapes: 9

Operating voltage 110 ... 250 V a. c.
Nominal fault current 30–50 mA

FI = earth leakage circuit breaker

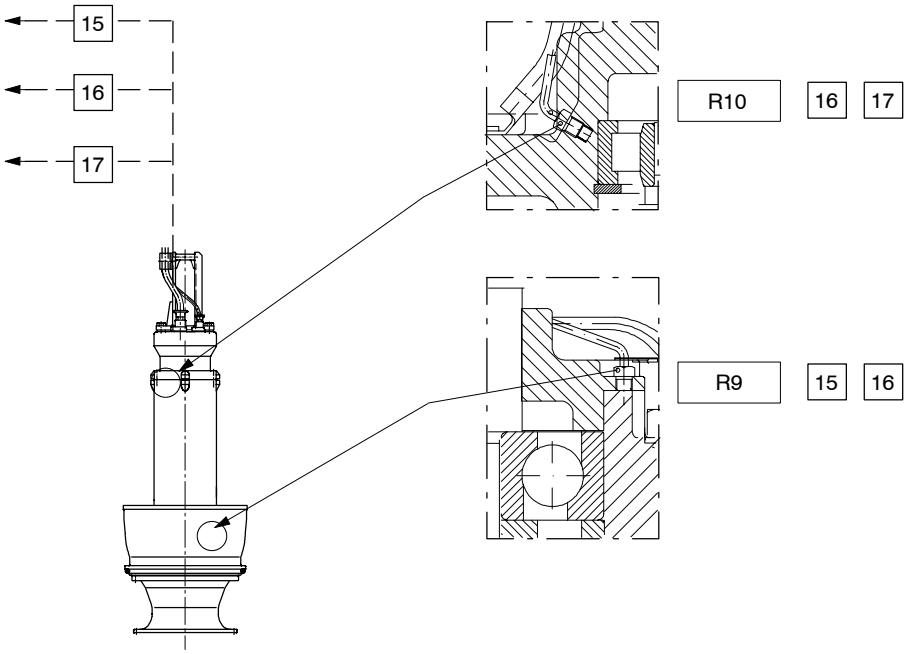
K4 = Auxiliary relay

Auslösekennlinie

Isolationswiderstände

>200 MΩ	fabrikneuer Zustand
>5 MΩ	in Betrieb befindlicher Motor ist hinsichtlich Feuchte in Ordnung
7,7 kΩ<R<5 MΩ	Motor muß bei der nächsten Revision geöffnet und geprüft werden
<7,7 kΩ	kritischer Zustand – Alarm

Circuit Plan – Bearing monitoring



Description – thermal monitoring of bearing
(see also "Electrical Connection plan")

Bearings on the pump and motor side will be protected by means of temperature monitoring. The temperature probes (PT 100) inserted in the bearing housing change their resistance proportionally to the temperature.

These resistance modifications can be analysed by means of a conventional measuring transducer for PT 100 precision resistors.

We recommend the following values for warning and switch-off temperatures:

Warning temperature: 110 °C
Switch-off temperature: 130 °C

After the bearing temperature monitoring has switched off the pump, it must undergo a revision.

Temperature sensor

R9: PT 100-sensor in the pump-side bearing housing
Identification tapes: 15 16

R10: PT 100-sensor in the motor-side roller bearing housing
Identification tapes: 16 17

max. sensor voltage 6 V,
max. sensor current 2 mA

Attention **Do not test monitoring circuits by means of a hand generator. Use an ohmmeter.**

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KKSB Aktiengesellschaft
P. O. 200743 · 06008 Halle (Saale) · Turmstraße 92 · 06110 Halle (Germany)
Tel. +49 (345) 48260 · Fax +49 (345) 48264699 · www.ksb-industry.com