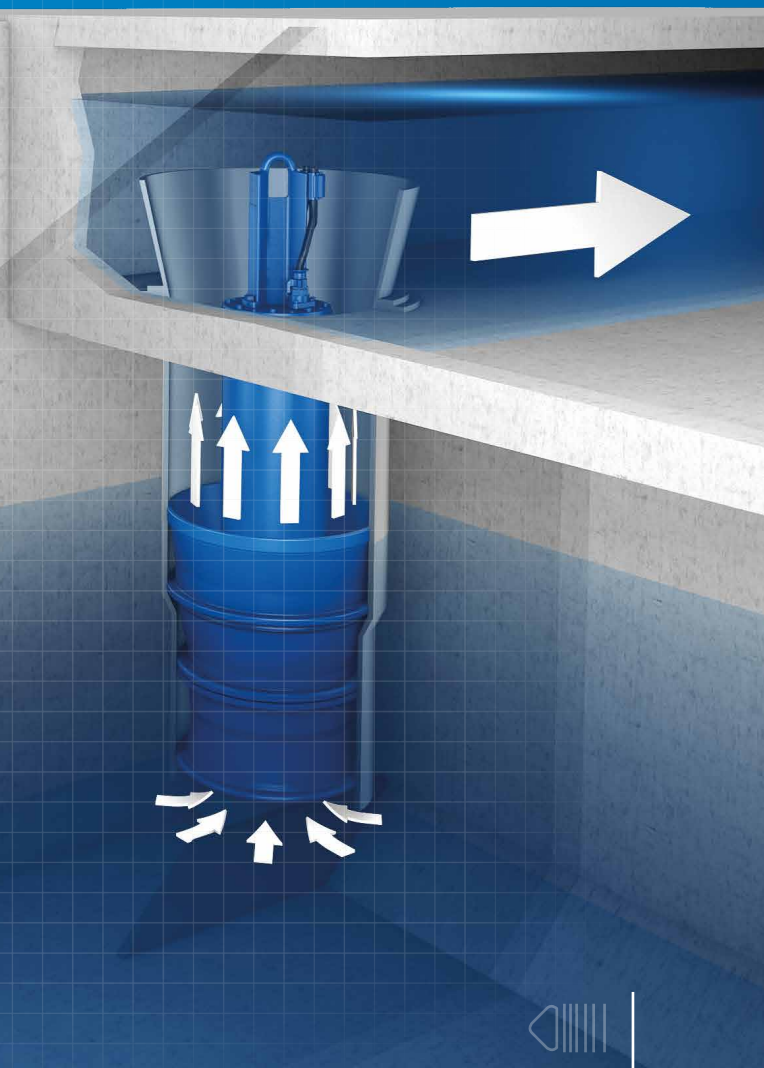
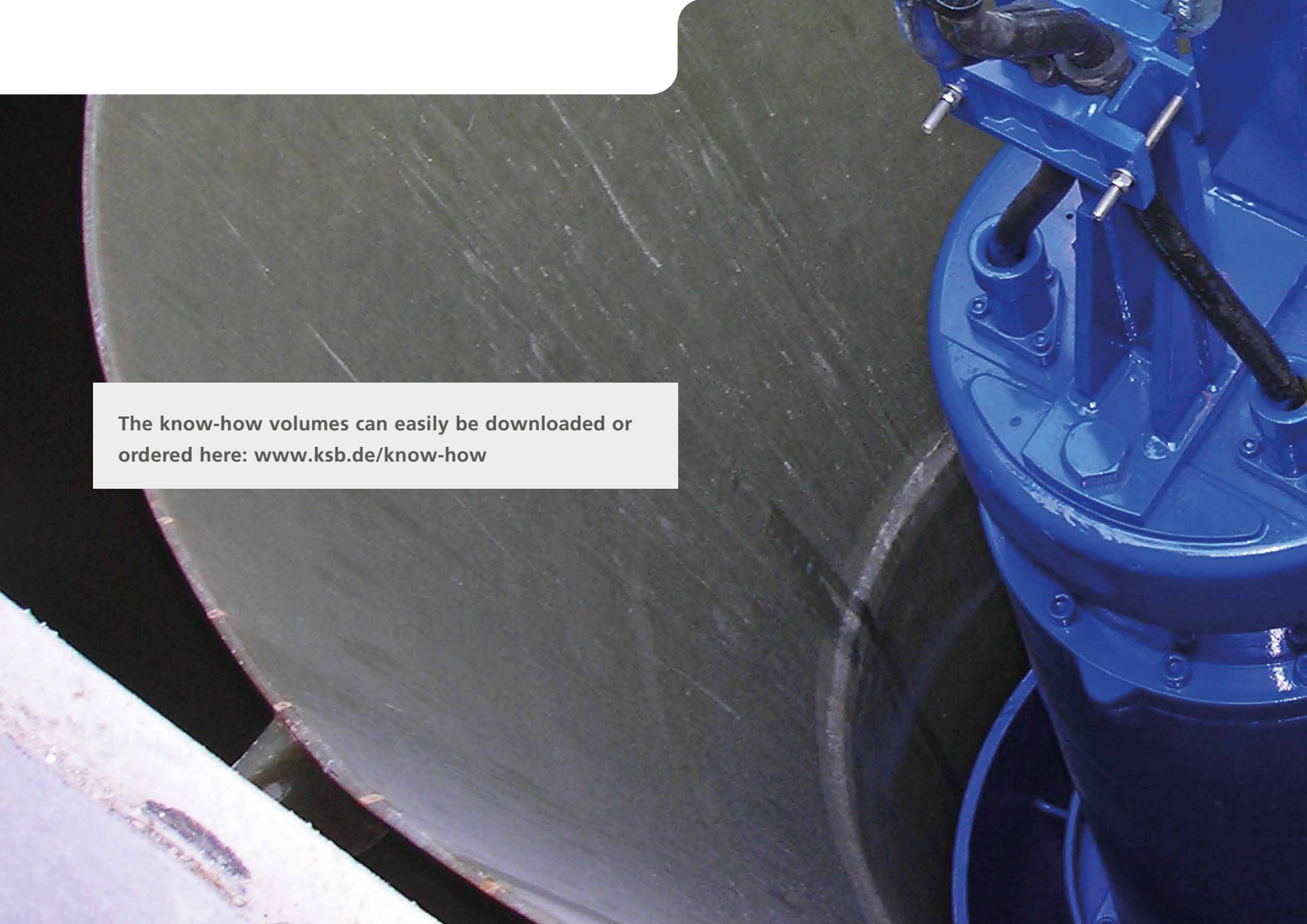


KSB Know-how: Supplementary Planning Information for Amacan Pumps





The know-how volumes can easily be downloaded or ordered here: www.ksb.de/know-how

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Supplementary Planning Information for Amacan Pumps

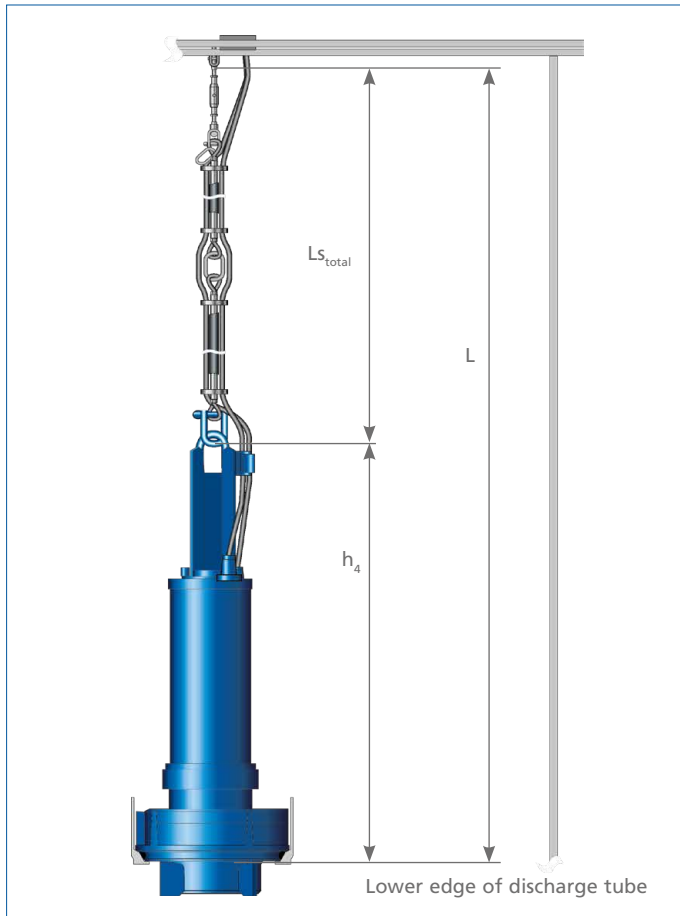


Fig. 1: Amacan K

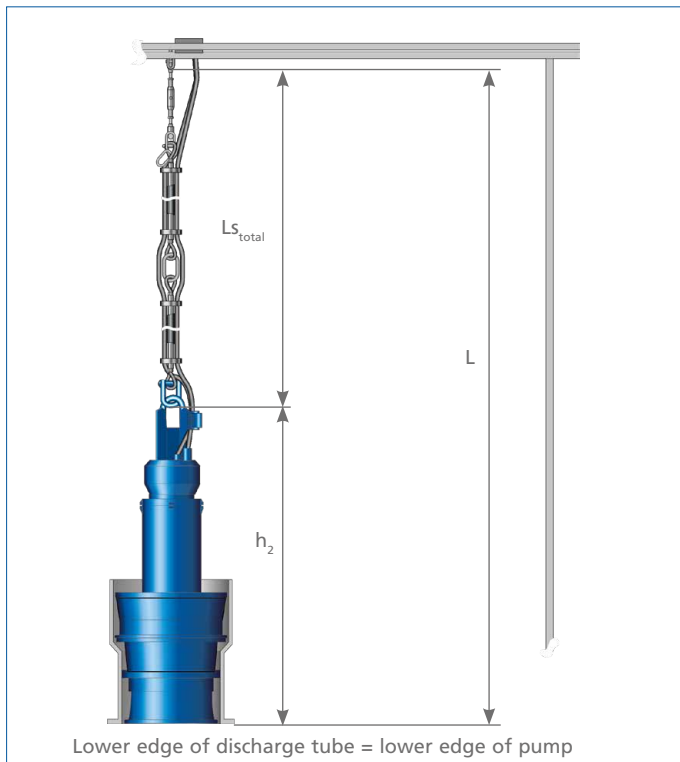


Fig. 2: Amacan P / S

Calculation of support rope length

The support rope length is determined by the installation conditions and the size of the Amacan pump.

Dimension “L” is always required to determine the correct length of the support rope.

“L” is the dimension from the lower edge of the discharge tube to the attachment point on the discharge tube cover, discharge tube wall or cross bar in the case of an open discharge tube.

Dimension h_2 or h_4 is determined by the pump size.

The total cable length L_{s_total} results from the difference between dimension “L” and h_2 or h_4 respectively.

The on-site lifting height of the lifting equipment or hoist must be taken into account when designing the cable assembly.

NOTE:

The lifting height of the hoist must be higher than the total pump height. If the lifting height is restricted by the building or the lifting height of the hoist, additional lifting lugs can be integrated in the support rope to allow the pump to be attached to a second hoist.

If additional lifting lugs are fitted, two hoists are required.

Additional lifting lugs allow the support rope including cables and pump to be attached to a second hoist after the pump has been partially lifted by the first hoist.

The hoist can continue lifting until the next maximum lifting height is reached.

This process is repeated until the lifting or installation procedure is completed.

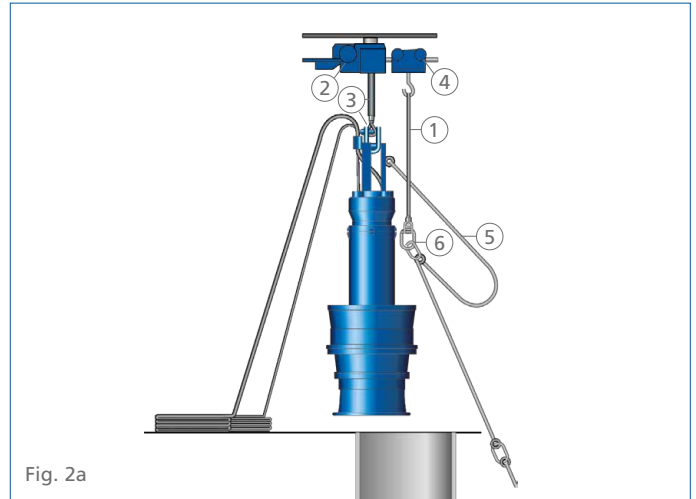


Fig. 2a

Fig. 2a = Lifting and positioning the pump set

- 1 = Lifting rope
- 2 = Hoist (1)
- 3 = Lifting accessories (crane hook)
- 4 = Lifting equipment trolley or hoist 2
- 5 = Support rope
- 6 = Free lifting lug

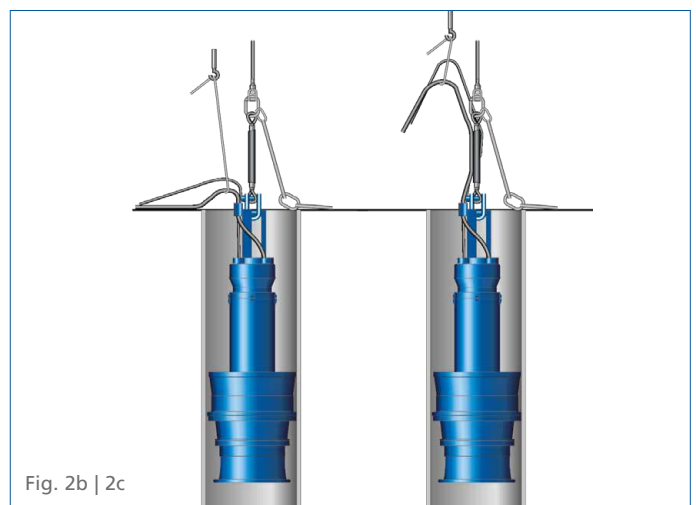


Fig. 2b | 2c

Fig. 2b / 2c = Securing control and power cables

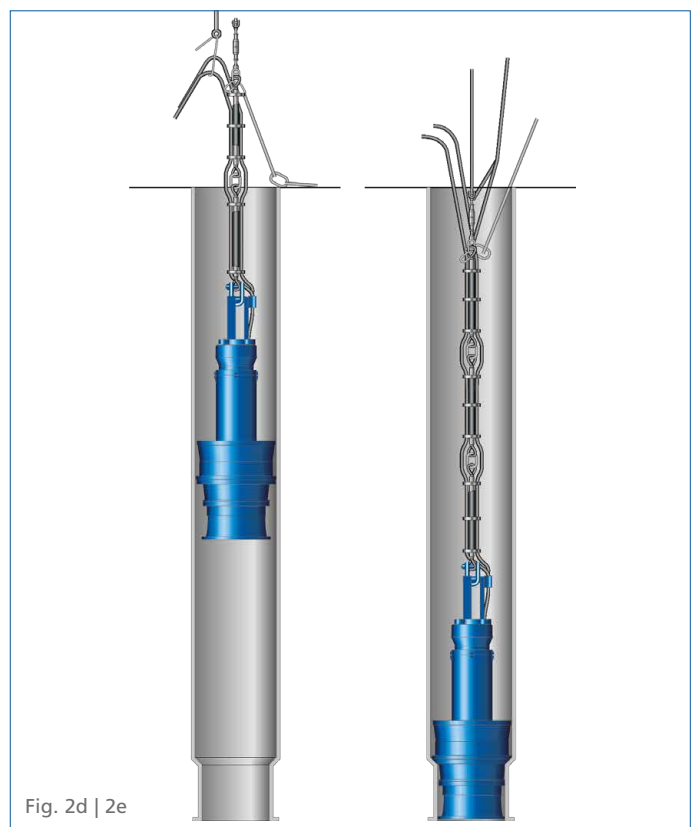
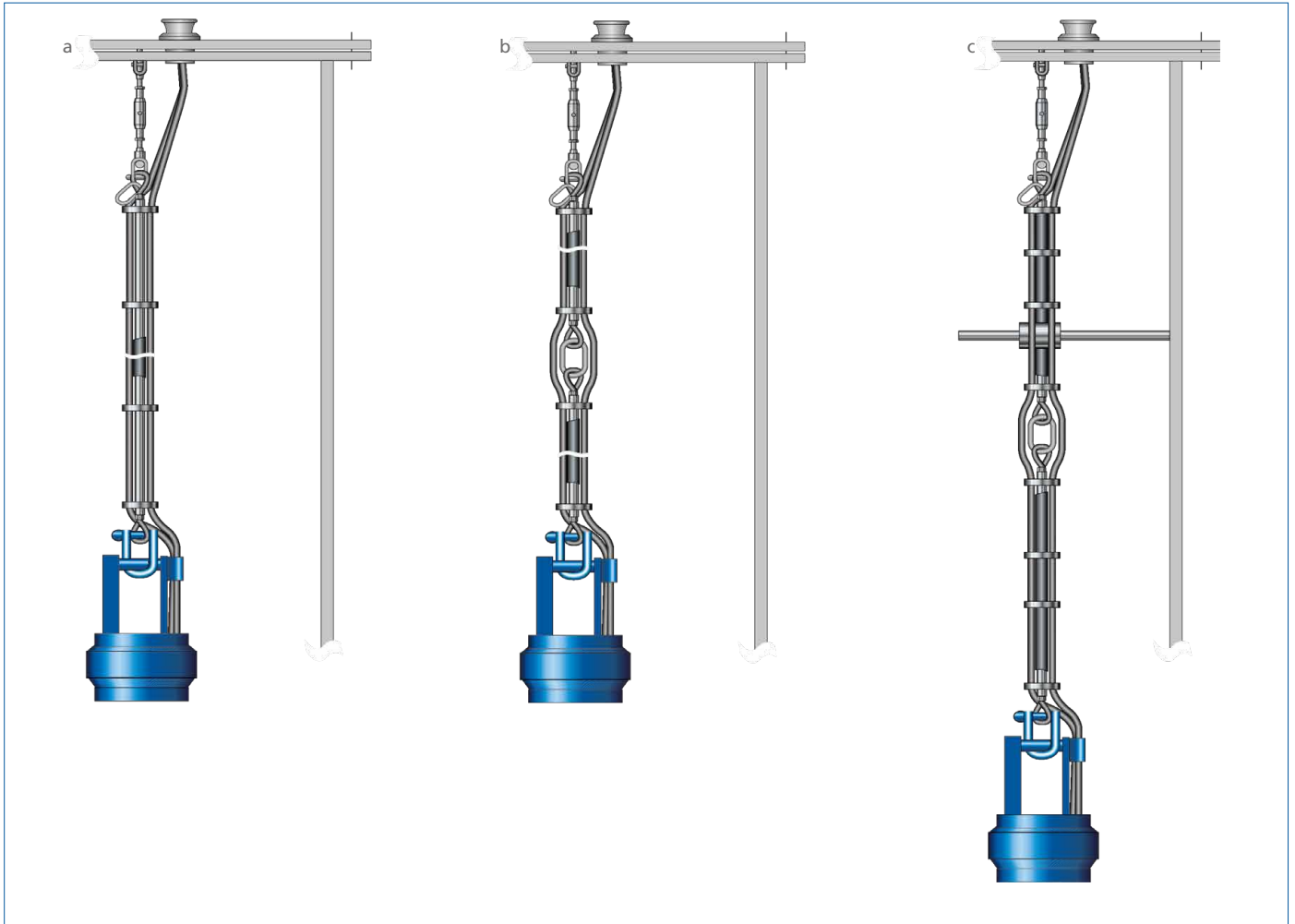


Fig. 2d | 2e

Fig. 2d / 2e = Lowering the pump set



Cable assembly variants

a = Basic design

b = Design with lifting lug (59-47)

c = Design with lifting lug and support (59-47 and 59-7)

Minimum lengths must be observed for individual rope sections. Specifications regarding rope lengths and technical feasibility depending on rope diameter are made by the rope manufacturer.

The rope diameter is determined by the weight of the pump set.

The optimum number of lifting lugs should be selected based on technical considerations. As the lifting height of the lifting equipment must be at least as high as pump length h_1 , individual rope sections only need to be this length.

Each additional lifting lug requires additional work and time for installation on site.

If dimension $L_{s_{total}}$ is > 5 m, we recommend using rope spacers (supports). This is necessary to rule out any possibility of the support rope incl. cables hitting the discharge tube, and causing damage.

Fitting the cable assembly

When fitting the cable assembly (support rope and control/power cables), always start at the pump and continue in the direction of the upper end of the discharge tube. Ensure that the cables are fitted with a sufficient degree of flexibility to prevent damage to the cable entries during inspections or repairs.

The installation steps must be carried out carefully (see operating manual) and only using original KSB parts, otherwise there is a risk of cable damage.

During this work it is also important to observe the permissible bending radii in relation to the respective cable diameter.

Bending radii for free movement:

Up to a cable diameter of 12 mm: 4 times the outside cable diameter

For cable diameters larger than 12 mm: 5 times the outside cable diameter

Components that come into mechanical contact with the cables or cable insulation must be checked for sharp corners and edges and, if necessary, deburred or reworked (filing or grinding).

Venting of discharge tube

Venting the discharge tube is vital for various hydraulic reasons. It is possible to calculate the size of the air volume and then determine the size of the cross-sections for the required venting devices.

The above depends on the discharge tube's geometry and the pipe connected to the discharge tube. The system is completely filled with air to begin with. When the pump starts pumping, the discharge tube and the connected pipe fill with water. Depending on the flow velocity in the individual system sections, the air is entrained or trapped in certain areas and compressed. The compressed air volume (air cushion) leads to transient or unsteady pump operating behaviour and influences the H/Q characteristic curve. As a result, the pump does not operate at the calculated design point under steady-state operating conditions. This operating behaviour also places additional loads on mechanical components and shaft seals.

If air cushions form, i.e. air is trapped, and block e.g. flow cross-sections, this will also change the operating point. The friction losses in the piping will increase, causing the pump to be pushed towards the part load range.

This will significantly increase the input power required by the hydraulic system and might lead to motor overload. The further away the operating point from the best efficiency point, the more likely it is that mechanical vibrations and hydraulic fluctuations will occur. Noise emissions and recirculation can occur on the left-hand side of the smallest permissible continuous operating range.

Vent line	Pump size		
	Amacan P	Amacan K	Amacan S
G 1/2	500		
G 1/2	600		
G 1/2			650
G 3/4	700	700	
G 1	800	800	800
G 1			850
G 1	900		900
G 1 1/4	1000	1000	1000
G 1 1/2	1200	1200	
G 1 1/2			1300
G 2	1500		
G 2	1600		

Table 1: Recommended cross-sections for vent lines

Discharge tubes and the connected piping should therefore be assessed with regard to potential air cushions and fitted with appropriate venting devices.

The uncompressed air volume can be roughly determined based on the following information: the pump size and thus the discharge tube diameter, the overall discharge tube length and the position of the discharge nozzle branching off into the horizontal pipe. Two options are available for venting: either a continuous process using a vent pipe/vent hose or a temporary process using an air valve. If a vent pipe/vent hose is used, it should end above the max. water level in the pump sump. The venting devices (vent pipe/vent hose and air valve) must be attached in the pump sump in such a way that they can also serve to remove fluid from both the pump and the piping after pump start-up (fluid via the pipes, a water/air mixture or spray via the air valve). Contamination is thus avoided, ensuring compliance with occupational health and safety regulations.

If the installation depth of the discharge tube is more than 10 m, the conditions in the system should be examined. This is done using modelling, i.e. a process for analysing transient conditions (also applied for pressure surge calculation). On the basis of this analysis, it is possible to determine the starting and stopping behaviour including the resultant conditions in the system and, if necessary, the behaviour of the check valve in order to avoid extreme valve closures.

In addition to this information, backflow into the pump sump can also be assessed.

In particular, pumps with high specific speeds ($n_s > 120$ rpm) tend to exceed the speed in reverse operation (turbine mode).

This reverse operating mode can lead to mechanical damage to the impeller and also to the bearings. A further aspect to be considered is pump re-start. In the worst case scenario, the pump and motor would still be rotating in turbine mode while the machine receives the signal to re-start the pump.

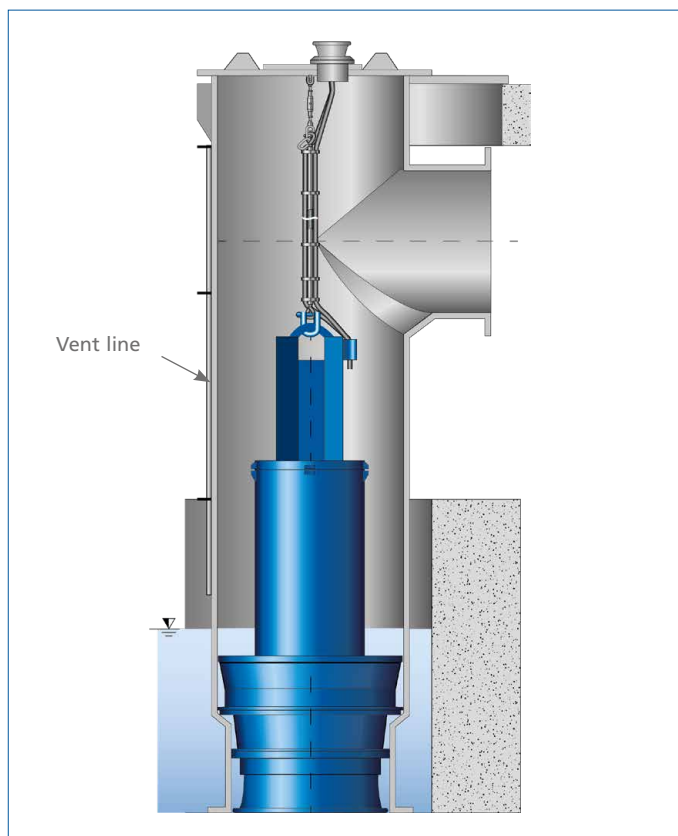


Fig. 3: Discharge tube with vent line

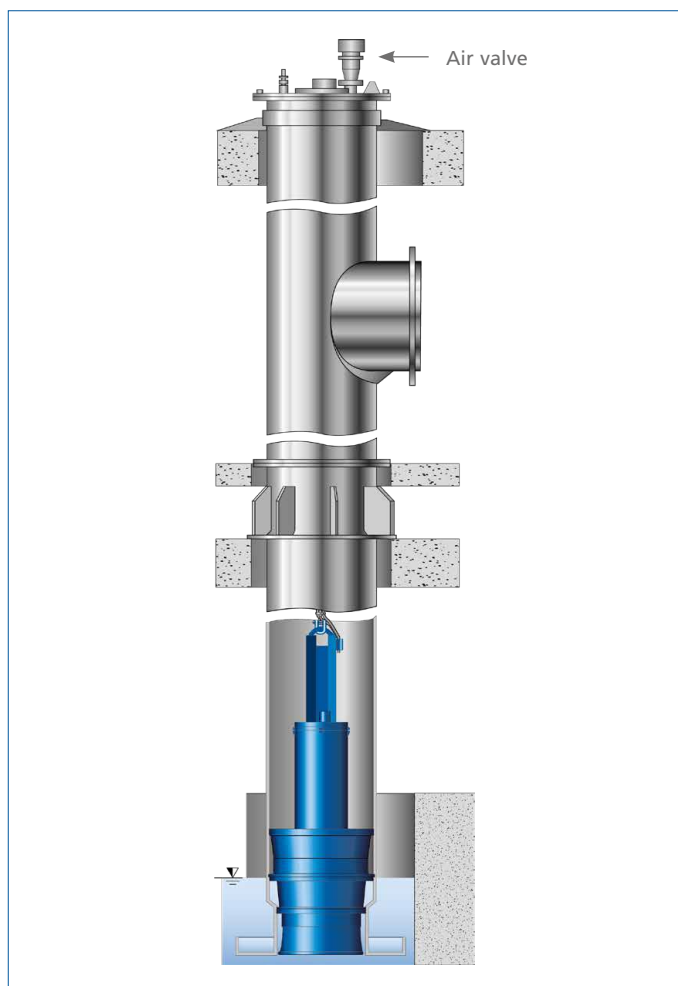


Fig. 4: Discharge tube with air valve

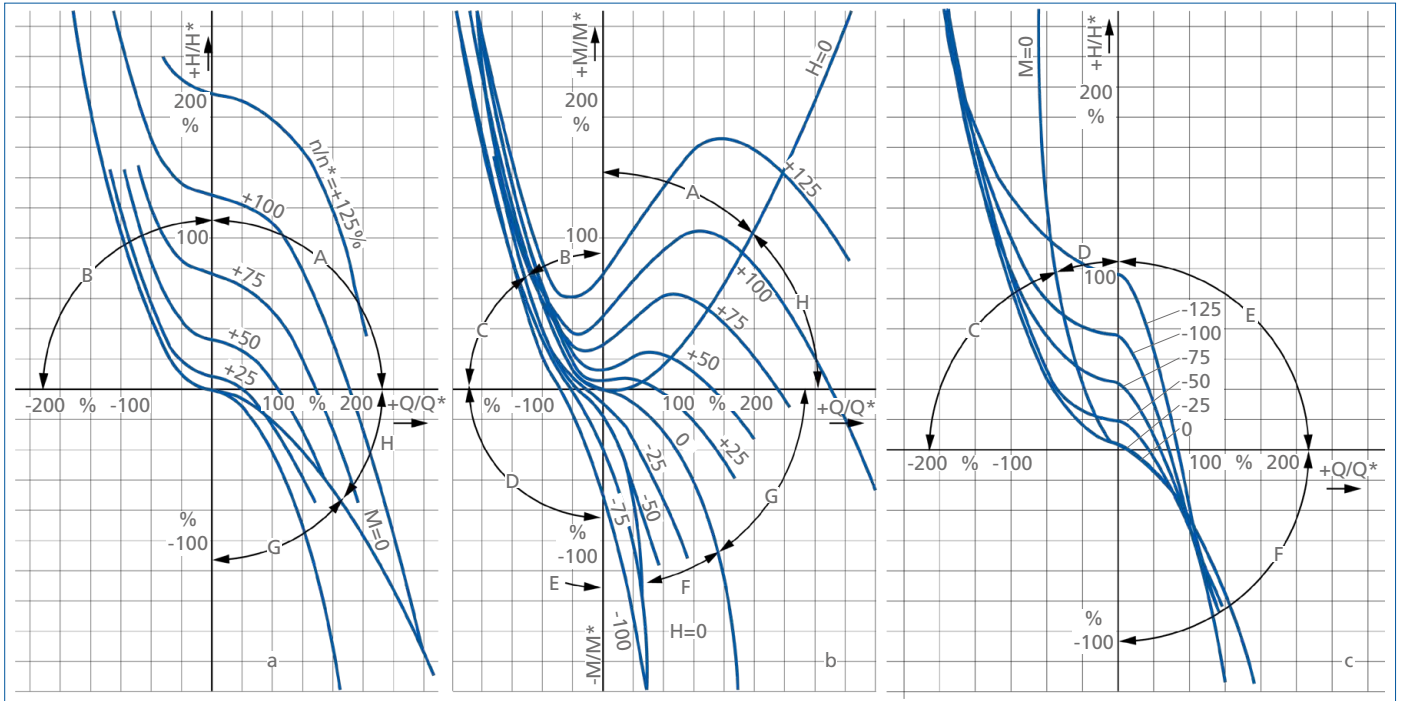


Fig. 5: Throttled-operation curve (pump characteristic curve) with positive speeds | Torque with positive speeds | Throttled-operation curve (turbine characteristic curve) with negative speeds

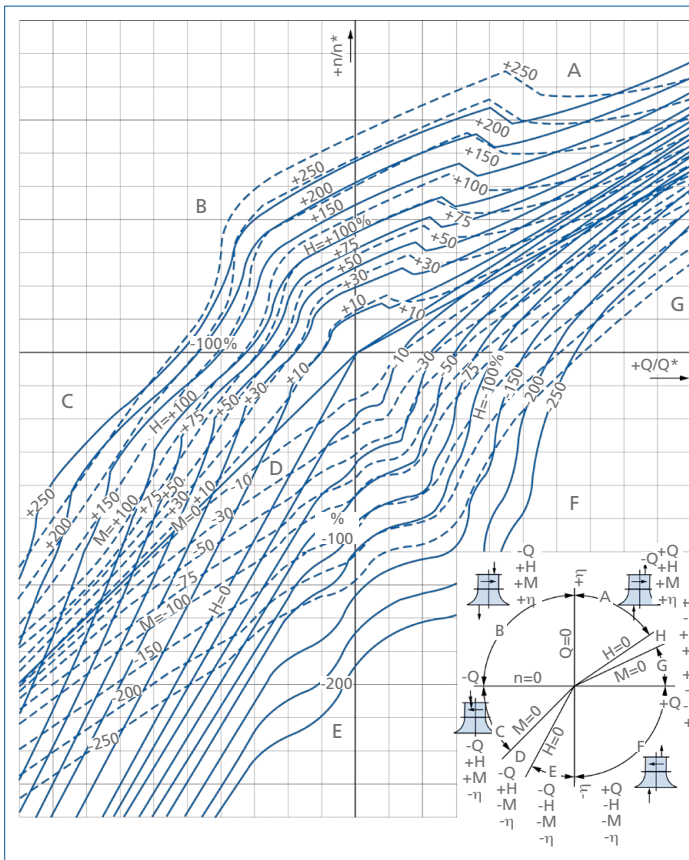


Fig. 6: Complete characteristic curve of a pump with mixed flow impeller; $\eta_c = 145$

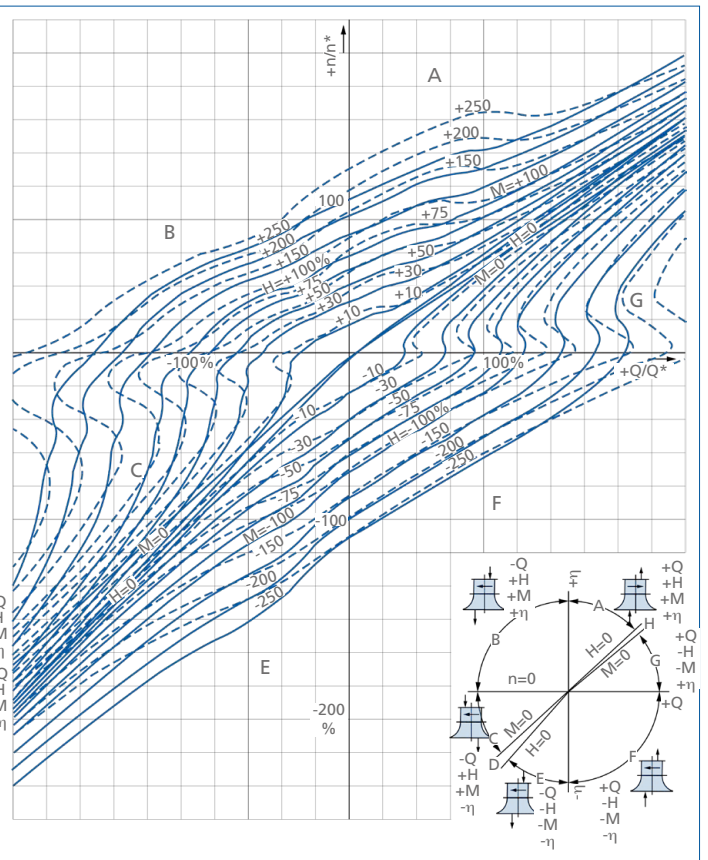


Fig. 7: Complete characteristic curve of an axial flow pump; $\eta_c = 260$

Cable entry into discharge tube

Split cover variants are only recommended to a limited extent as leakages can occur at the joint between the two cover parts.

Variants using gland packings as sealing elements make installation more complicated. If gland packings are used, they should preferably be installed in a horizontal position as recommended by the gland packing manufacturer.

Key:

- 1 = Discharge tube cover
- 2 = Manhole cover
- 3 = Welding sleeve
- 4 = Threaded bush with cable entry to DIN 22419
- 5 = Eye plate for fastening the cable support (support rope)
- 6 = Gasket

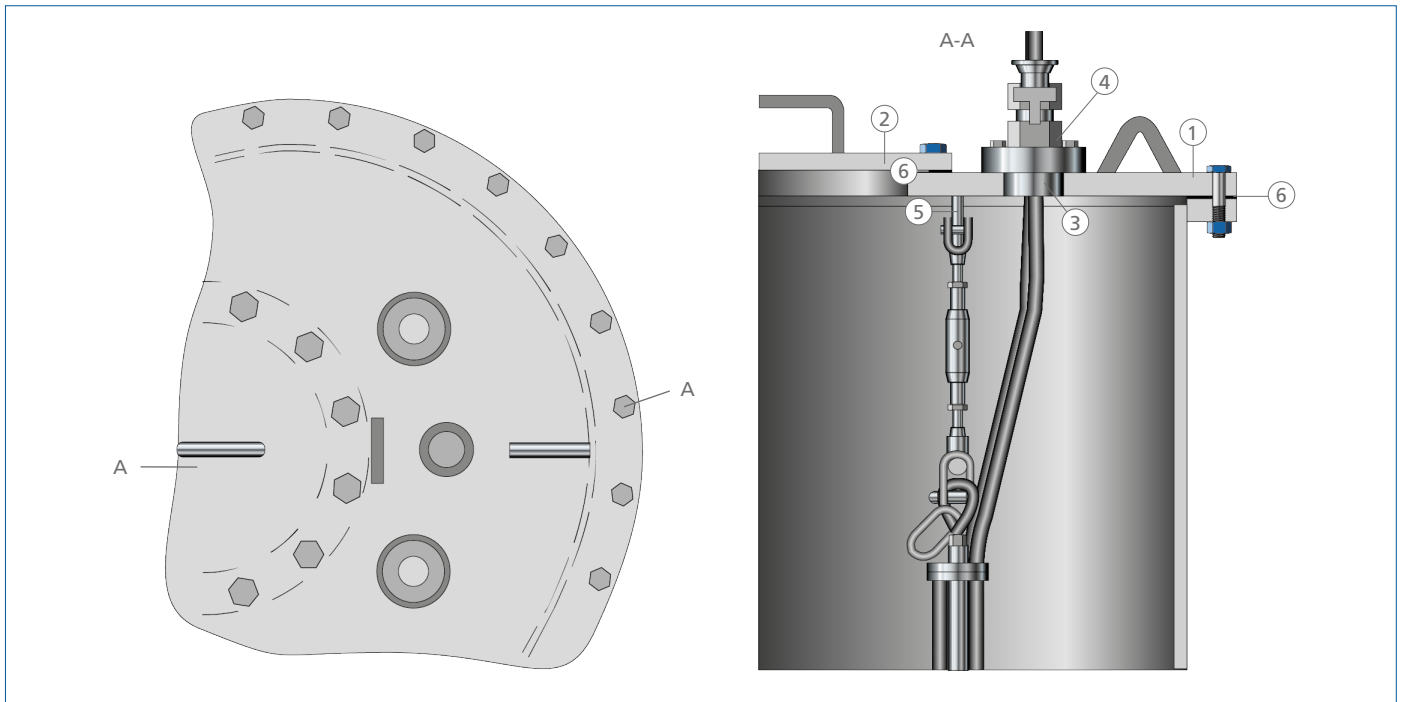


Fig. 8: The design with welding sleeves is the variant recommended by KSB.

Key:

- 1 = Discharge tube cover
- 2 = Transit frame
- 3 = Packing and insert blocks
- 4 = Cover segment with cable gland
- 5 = Closed-cell profile seal in groove between the two cover parts
- 6 = Sealing arrangement of groove between the two cover parts
- 7 = Support brackets for cover segment with cable glands
- 8 = Gasket (e.g. rubber with fabric reinforcement)

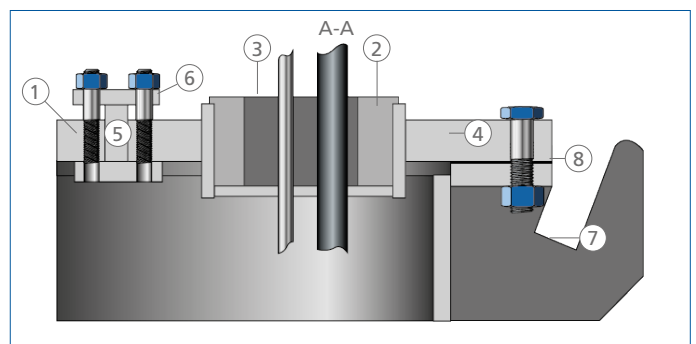


Fig. 9: Design variant with transit frame (up to 1 bar) (split cover)

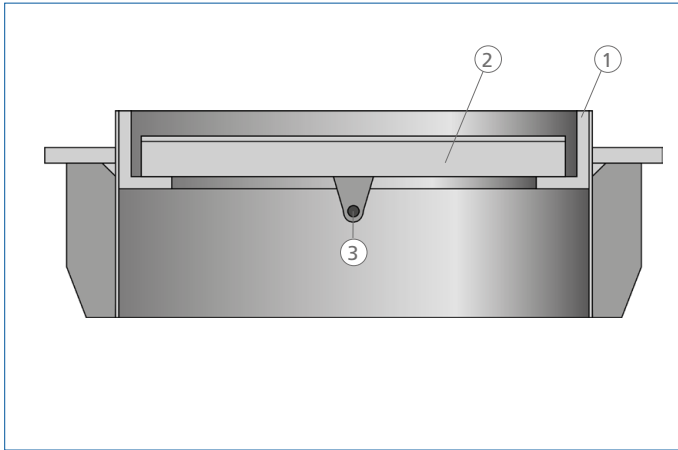


Fig. 10: Cross bar on the open discharge tube or in the building

Key:

- 1 = Holder
- 2 = Rail / support
- 3 = Lifting lug for holder (rope)

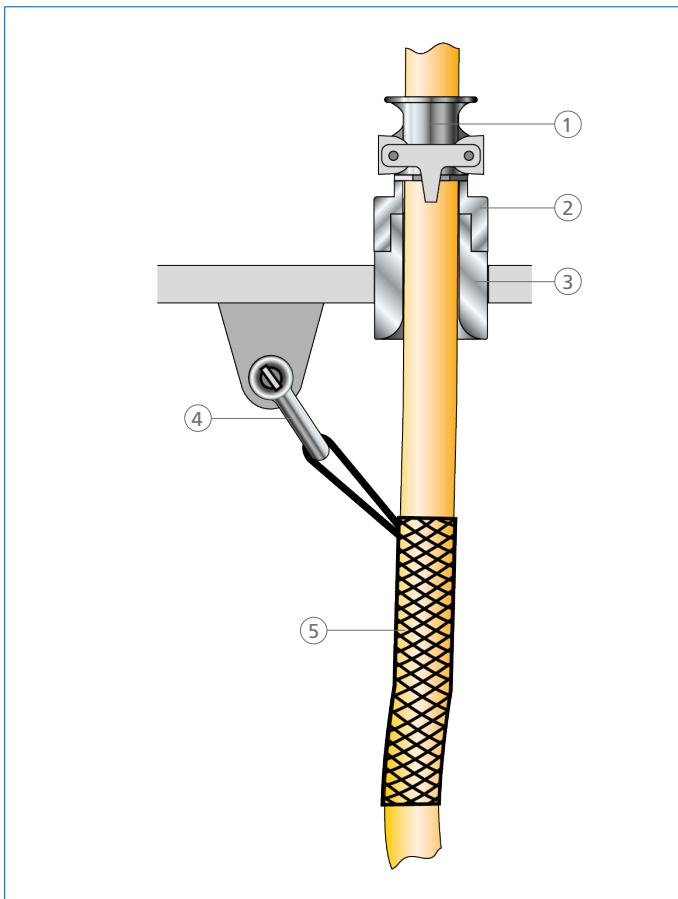


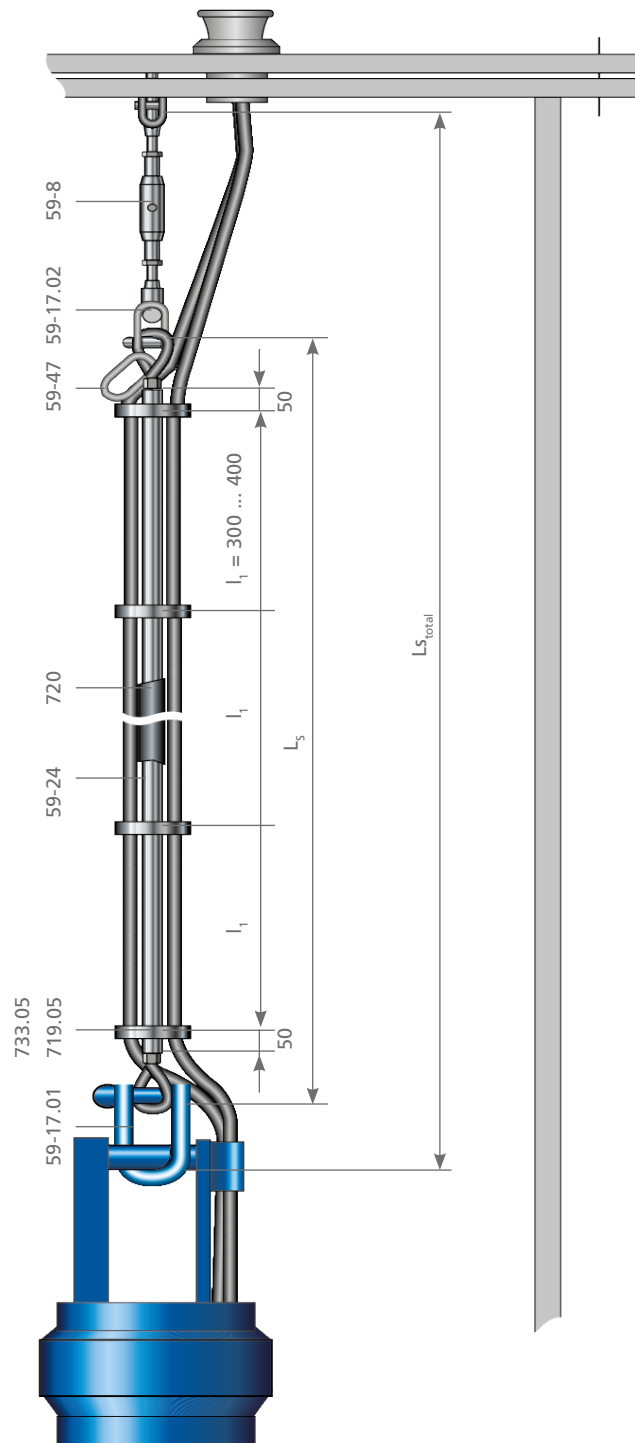
Fig. 11: Cable support sleeve for additional strain relief

Cable holder in discharge tube

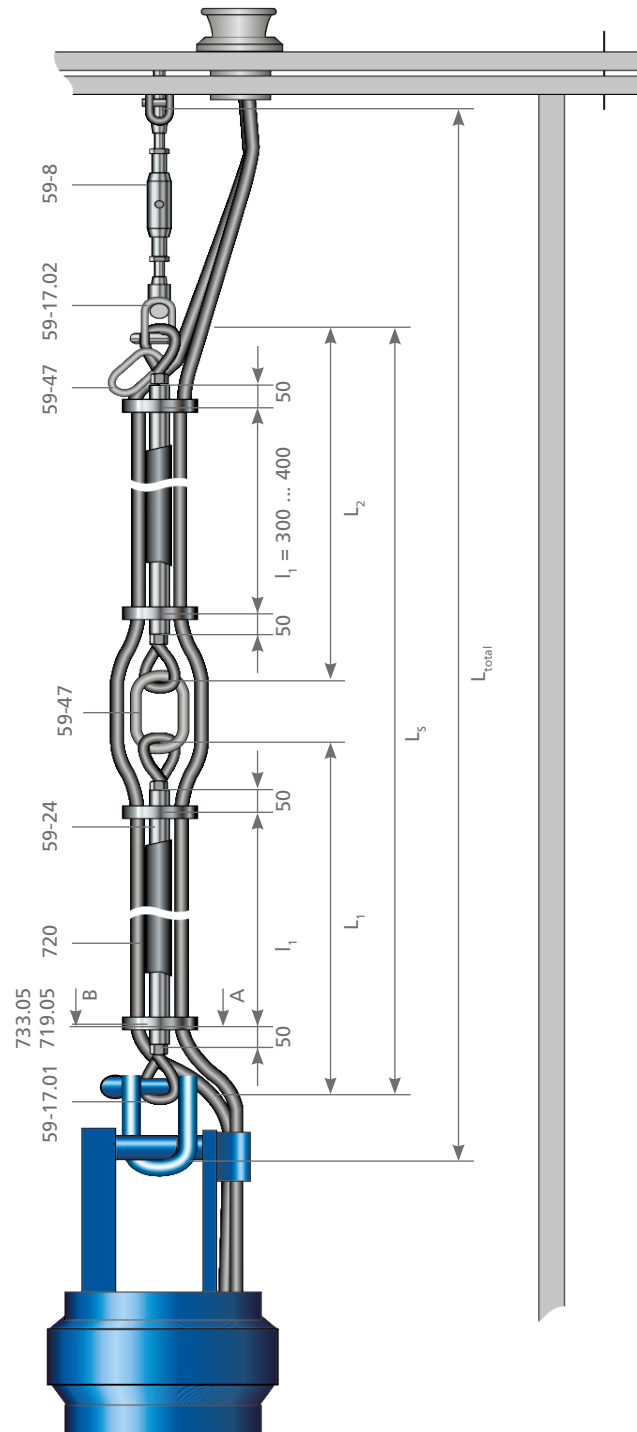
Cable support sleeve for additional strain relief if long cable sections with large cable cross-sections are used or if dimension $L_{s_{total}}$ is very small and an appropriate rope cannot be manufactured for technical reasons.

Key:

- 1 = Cable entry to DIN 22419
- 2 = Threaded bush
- 3 = Welding sleeve
- 4 = Shackle
- 5 = Cable support sleeve

**Legende:**

- A = Basic design
- 59-8 = Turnbuckle
- 59-17 = Shackle
- 59-24 = Rope
- 720 = Fitting
- 733.05 = Hose clip
- 719.05 = Hose

**Key:**

B = Design with lifting lug (59-47)

59-8 = Turnbuckle

59-17 = Shackle

59-24 = Rope

720 = Fitting

733.05 = Hose clip

719.05 = Hose

On ropes with additional lifting lugs, the individual ropes ($L_1=L_2$) are always the same length



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