

Pump Station

AmaDS³

Solids Separation System

Installation/Operating Manual



Mat. No.: 01368655

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Installation/Operating Manual AmaDS³

Original operating manual

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Glossary

Backflow

Waste water flowing back from the sewer into the connected drainage piping

Backflow loop

The section of the discharge pipe of a waste water lifting unit that is located above the flood level

Certificate of decontamination

A certificate of decontamination is enclosed by the customer when returning the product to the manufacturer to certify that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

Collecting tank

Unpressurised component of a sewage lifting unit in which the incoming waste water is stored prior to automatic lifting

DIN 1986-3 and -30

German standard which stipulates technical rules for the operation, maintenance and servicing of drainage systems in buildings and on premises

Domestic waste water

Faeces-free waste water from washbasins, showers, washing machines, etc.

Duty type S1

Pump set in continuous operation

Duty type S3 50% - 10 minutes

Pump set in intermittent periodic operation with a cyclic duration factor expressed in % relative to the duty cycle duration of 10 minutes.

Flood level

Maximum backflow level of waste water in a drainage system

Separator

Device which uses gravity to prevent any ingress of harmful substances into the drainage system by separating these substances from the waste water, e.g. grease separator

Stormwater

Water from natural precipitation which has not been contaminated by any form of use

Waste water

Water which has been changed by some type of use, e.g. domestic waste water

1 General

1.1 Principles

This manual is supplied as an integral part of the type series and variants indicated on the front cover (for details, refer to the table below).

Table 1: Variants covered by this manual

System sizes
AmaDS ³ 02.10 / 2 / 01.10
AmaDS ³ 02.10 / 2 / 01.11
AmaDS ³ 03.10 / 2 / 02.10
AmaDS ³ 03 / 2 / 03
AmaDS ³ 04.0 / 2 / 04.1
AmaDS ³ 03.10 / 2 / 03.05
AmaDS ³ 03.10 / 2 / 03.10
AmaDS ³ 03.10 / 2 / 04.10
AmaDS ³ 04.10 / 2 / 04.11
AmaDS ³ 04.11 / 2 / 05.10

The manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series and size, the main operating data, the order number and the order item number. The order number and order item number clearly identify the pump set and serve as identification for all further business processes.

In the event of damage, immediately contact your nearest KSB service centre to maintain the right to claim under warranty.

Noise characteristics see (⇒ Section 4.6, Page 18)

1.2 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.4, Page 9)

1.3 Other applicable documents

Table 2: Overview of other applicable documents

Document	Contents
Data sheet	Description of the technical data of the system
General arrangement drawing/ outline drawing	Description of mating and installation dimensions for the system, weights
Pump operating manual	Proper and safe use of the pump in all phases of operation
Motor operating manual	Proper and safe use of the motor in all phases of operation
Operating manual of the control cabinet incl. control system	Proper and safe use of the control system in all phases of operation
Operating manuals of the individual valves	Proper and safe use of the valves in all phases of operation
Technical literature on various accessories	Proper and safe use of the accessories in all phases of operation

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

1.4 Symbols

Table 3: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇔	Result of an action
⇔	Cross-references
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product



2 Safety

All the information contained in this section refers to hazardous situations. In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 Key to safety symbols/markings

Table 4: Definition of safety symbols/markings

Symbol	Description
 DANGER	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 WARNING	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	Explosion protection This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with Directive 2014/34/EU (ATEX).
	General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2.2 General

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

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

This manual must be read and completely understood by the specialist personnel/operators responsible prior to installation and commissioning.

The contents of this manual must be available to the specialist personnel at the site at all times.

Information attached directly to the pump must always be complied with and be kept in a perfectly legible condition at all times. This applies to, for example:

- Arrow indicating the direction of rotation
- Markings for connections
- Name plate

The operator is responsible for ensuring compliance with all local regulations not taken into account in this manual.

2.3 Intended use

- The system must only be operated within the operating limits described in the other applicable documents.
- Only operate systems which are in perfect technical condition.
- Do not operate partially assembled systems.
- The system may only handle the fluids described in the product literature of the relevant design variant.
- Never operate the system without the fluid to be handled.
- Observe the information on minimum flow rates specified in the product literature (to prevent overheating, bearing damage, etc).
- Do not throttle the flow rate on the suction side of the system. (Prevention of cavitation damage)
- The system must not be used in potentially explosive atmospheres.
- Consult the manufacturer about any other modes of operation not described in the product literature.

Prevention of foreseeable misuse

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

2.4 Personnel qualification and training

All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the machinery this manual refers to.

The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the pump (set) must always be supervised by technical specialist personnel.

2.5 Consequences and risks caused by non-compliance with this manual

- Non-compliance with this operating manual will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.6 Safety awareness

In addition to the safety information contained in this manual and the intended use, the following safety regulations shall be complied with:

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

2.7 Safety information for the operator/user

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

2.8 Safety information for maintenance, inspection and installation

- Modifications or alterations of the system require the manufacturer's prior consent.
- Use only original spare parts or parts authorised by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Carry out work on the system during standstill only.
- The pump casing must have cooled down to ambient temperature.
- The system (collecting tank, discharge line, solids separators, pump casings) must have been drained and depressurised.
- When taking the system out of service always adhere to the procedure described in the manual.
- Decontaminate systems which handle fluids posing a health hazard.
- As soon as the work has been completed, re-install and/or re-activate any safety-relevant and protective devices. Before returning the product to service, observe all instructions on commissioning.
- Make sure the system cannot be accessed by unauthorised persons (e.g. children).

2.9 Unauthorised modes of operation

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

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

The permissible operating pressure in the collecting tank must not exceed the following values:

Table 5: Maximum operating pressure in the collecting tank

Size	Maximum operating pressure in the collecting tank ¹⁾
	[bar]
AmaDS ³ 02.10/2/01.10	0,5
AmaDS ³ 02.10/2/01.11	0,5
AmaDS ³ 03.10/2/02.10	0,5
AmaDS ³ 03/2/03	0,5
AmaDS ³ 04.0/2/04.1	0,5
AmaDS ³ 03.10/2/03.05	2)
AmaDS ³ 03.10/2/03.10	2)
AmaDS ³ 03.10/2/04.10	2)
AmaDS ³ 04.10/2/04.11	2)
AmaDS ³ 04.11/2/05.10	2)

Take suitable constructional or technical measures to prevent the maximum operating pressure from being exceeded. Provide appropriate safety devices.

Compliance with the maximum operating pressure is also required in the event of a power failure. The safety devices must continue to work in such an event.

1) The pressure data refers to the pressure at the floor of the collecting tank.
 2) On request

3 Transport/Temporary Storage/Disposal

3.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the supplying dealer (as applicable) and the insurer about the damage in writing immediately.

3.2 Transport

	 DANGER
	<p>System falling off the pallet Risk of injury from falling system!</p> <ul style="list-style-type: none"> ▷ Always transport the system in horizontal position. ▷ Observe the weight and centre of gravity limits specified. ▷ Never suspend the pump by its power cable. ▷ Prevent the system from being knocked or dropped.
	 WARNING
	<p>Improper transport Risk of injury from falling system! The load could slip!</p> <ul style="list-style-type: none"> ▷ Select lifting accessories which are suitable for the system weight. ▷ Attach lifting accessories only to the transport lugs provided. ▷ Secure the load appropriately. ▷ Comply with the applicable health and safety regulations.
	 WARNING
	<p>Installation on mounting surface which is unsecured and cannot support the load Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class XC1 to EN 206-1. ▷ The mounting surface must have set and must be completely horizontal and even. ▷ Observe the weights indicated.

- ✓ Suitable lifting equipment and lifting accessories for the total weight of the system³⁾ are available.
- ✓ The system's transport lugs show no signs of damage.
 1. Attach the lifting accessories to the transport lugs provided.
 2. Lift the system and transport it. Maintain a safe distance during lifting operations (load may swing when being lifted).

3) See name plate of the system.

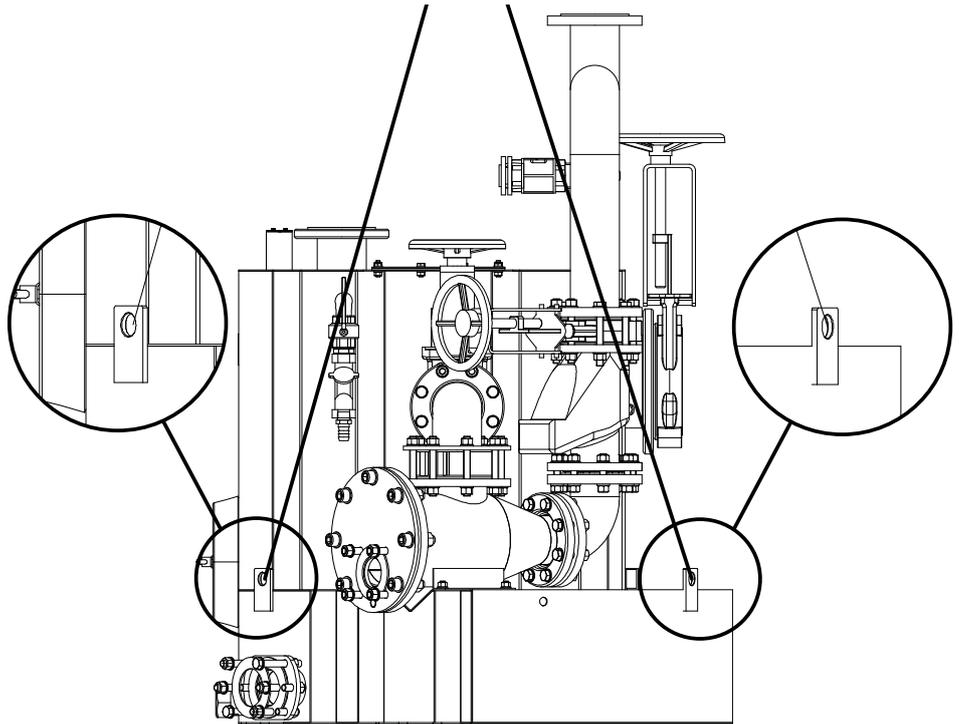


Fig. 1: Transport example for AmaDS³ 02.10/2/01.11

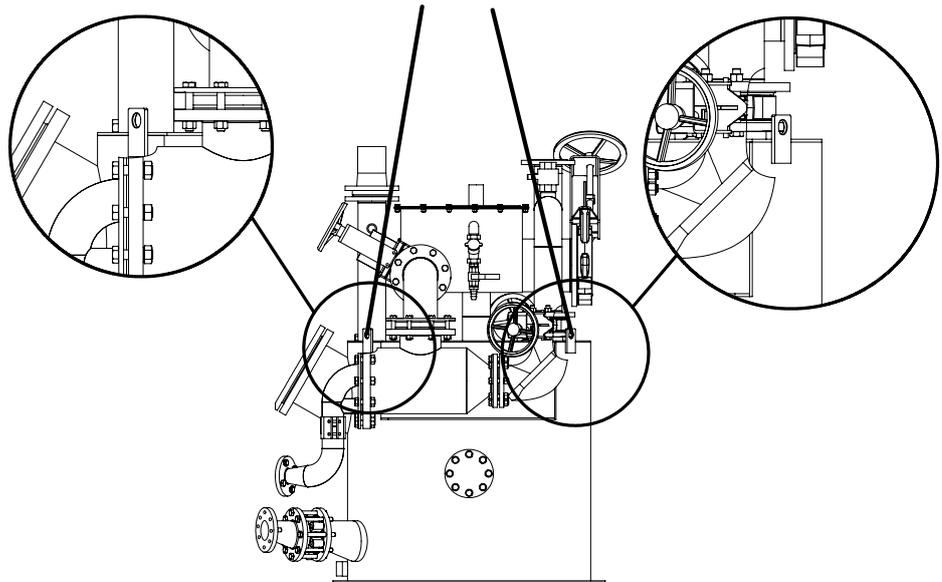


Fig. 2: Transport example for AmaDS³ 03 and all larger models

3.3 Storage/preservation

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

	CAUTION
	<p>Wet, contaminated or damaged openings and connections Leakage or damage to the system!</p> <p>▷ Only open the openings of the system at the time of installation.</p>

	CAUTION
	<p>Improper storage Damage to the power cables!</p> <ul style="list-style-type: none"> ▷ Support the power cables at the cable entry to prevent permanent deformation. ▷ Only remove the protective caps from the power cables at the time of installation.

Store the system in a dry, protected room where the atmospheric humidity is as constant as possible.

Table 6: Ambient conditions for storage

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

3.4 Return to supplier

1. Drain the solids separation system as described in the manual.
2. Always flush and clean the solids separation system, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the solids separation system has handled fluids whose residues could lead to corrosion in the presence of atmospheric humidity or could ignite upon contact with oxygen, the solids separation system must also be neutralised and treated with anhydrous inert gas to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the solids separation system. (⇒ Section 11, Page 78)
Always indicate any safety and decontamination measures taken.

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

3.5 Disposal

	⚠ WARNING
	<p>Fluids, consumables and supplies which are hot and/or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of flushing fluid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

1. Dismantle the solids separation system.
Collect greases and other lubricants during dismantling.
2. Separate and sort the pump materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

4 Description

4.1 General description

Waste water pump station for the collection and automatic lifting of unpressurised waste water with or without faeces to a level above the flood level.

The system consists of one gas- and watertight stainless steel tank (collecting tank), two solids separators, two pump sets and the control system.

4.2 Designation

Example:
AmaDS³ 03 / 2 / 03

Table 7: Designation key

Code	Description	
AmaDS ³	Type series	
03	Size of solids separator	
	02.10, 03, 04.0, 03.10, 04.10, 04.11	
2	Number of pump sets	
03	Size and type of collecting tank, see Combinations table (⇒ Section 5.3, Page 20)	
	01.10	Compact collecting tank
	01.11	
	02.10	
	03	Circular collecting tank
	04.1	
	03.05	Semi-circular collecting tank
	03.10	
	04.10	
	04.11	
	05.10	

4.3 Name plate



Fig. 3: Example: name plate of an AmaDS³

1	System size	2	Type of system
3	Order number and order item number	4	Maximum inflow rate
5	Collecting tank volume	6	Total system weight
7	Year of construction		

4.4 Design details

- Ready-to-connect system
- One gas- and water-tight stainless steel tank (collecting tank)
- Two solids separators
- Two pump sets

4.5 Configuration and function

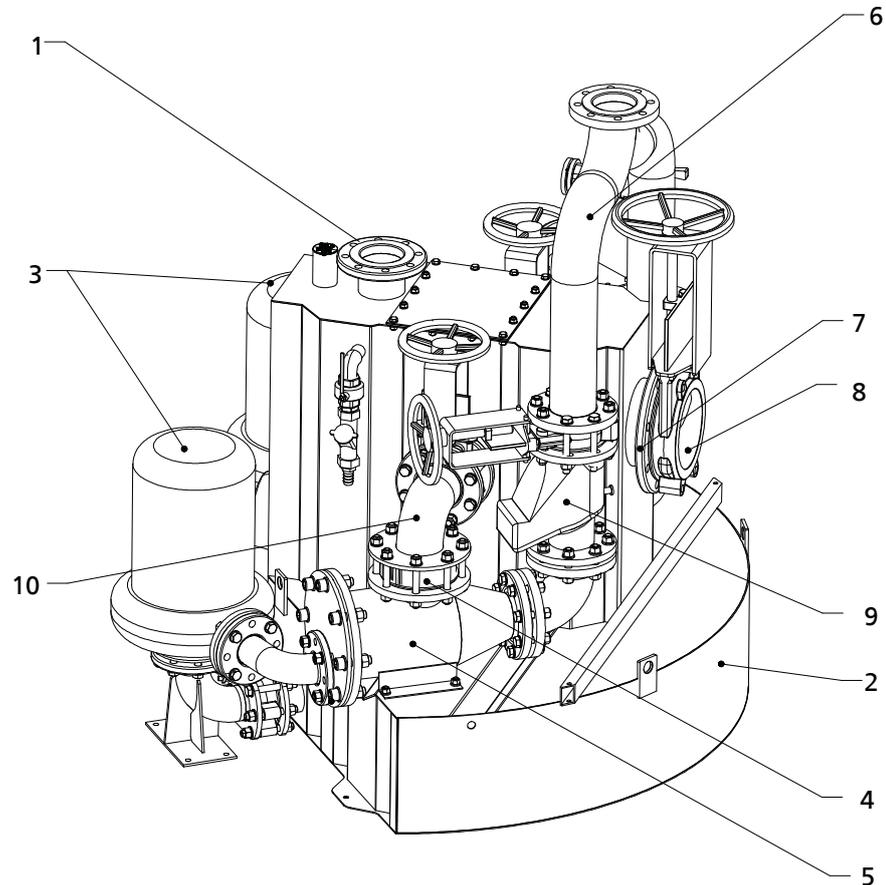
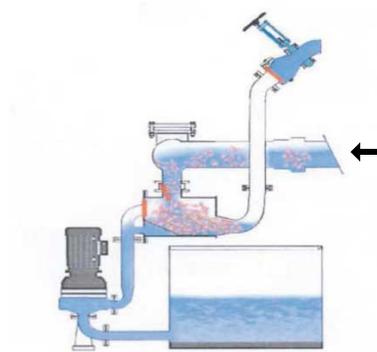


Fig. 4: Configuration of the solids separation system

1	Flange for venting
2	Collecting tank
3	Pump set
4	Swing check valve for inflow at the solids separator
5	Solids separator
6	Y-pipe leading to discharge line
7	Flange for inflow
8	Gate valve for inflow (optional)
9	Swing check valve for discharge line
10	Suction elbow for solids separator

Function The raw waste water flows through the (optional) gate valve for inflow (8) and the flange for inflow (7) into the solids separator (5), where the solids are separated from the liquid. The solids-free waste water flows through the pump set (3) into the collecting tank (2) where it is collected until a pre-set level is reached. The pump set (3) is started up via a control system. The pump set (3) transports the solids-free waste water from the collecting tank (2) to the discharge line (6). The pressure increase in the solids separator (5) causes the swing check valve (4) to close. By pumping the waste water through the solids separator (5) the solids are carried away with the waste water and pumped into the discharge line (6) while the solids separator (5) is flushed. As soon as a minimum level is reached in the collecting tank (2), the pump

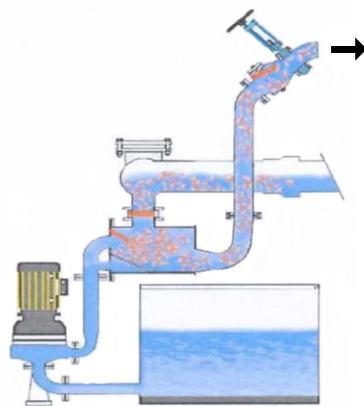
set (3) is stopped. The swing check valve (4) opens automatically and the inflow phase starts again. To prevent the raw waste water in the discharge line from flowing back the swing check valve (9) closes after every pumping process.



Inflow phase

Upstream of the pumps, the solids are separated from the inflowing waste water and temporarily stored in the solids separators. Only pre-treated waste water flows through the pumps.

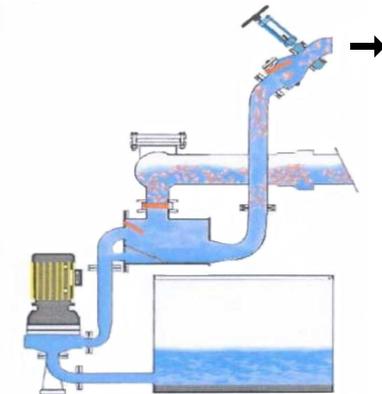
Inflow of fluid handled



Pumping process

In this phase the pre-treated waste water is pumped through the solids separators in the opposite direction and carries the solids out of the separators and into the discharge line. The swing check valves (4) in the separator inflow are closed during this process. Through this process the solids separators and pumps are cleaned and ready for the next inflow phase.

Start of pumping process



End of pumping process

4.6 Noise characteristics

Table 8: Surface sound pressure level L_{pA} ⁴⁾

Rated power input P_N	Pump set		
	2900 / 3500 rpm	1450 / 1750 rpm	960 / 1160 rpm 760 / 875 rpm
[kW]	[dB]	[dB]	[dB]
1,5	62,5	56,5	55,0
2,2	65,0	58,5	57,5
3,0	67,0	60,5	59,0
4,0	68,5	62,0	60,5
5,5	70,0	63,5	63,0
7,5	71,0	65,0	63,5
11,0	72,5	67,0	65,5
15,0	73,5	68,0	66,5
18,5	74,0	68,5	67,5
22,0	74,5	69,0	68,0
30,0	75,0	70,5	69,0
37,0	76,0	71,0	69,5

4.7 Collecting tank

The collecting tank is designed for unpressurised operation. The pre-treated waste water is stored in the tank in unpressurised condition and is then pumped into the discharge line leading to the sewer.

The permissible operating pressure in the collecting tank must not exceed the following values (⇒ Section 2.9, Page 11) : see "Maximum permissible operating pressure in the collecting tank" table.

4.8 Special aspects of duty types with Amarex KRT

Duty type All AmaDS³ systems are equipped with 2 pump sets, only one of which is in operation at any given time. The pump sets are changed over after each work cycle or following maximum runtime. The system's design thus results in periods of operation and rest periods. Pump sets for duty type S3 50% - 10 minutes have been specially matched to this application.



NOTE

Duty type S3 50% - 10 minutes in accordance with IEC (EN 60034-1) is a sequence of identical duty cycles, each including a time of operation at constant load and a time at rest. The starting current does not significantly affect the temperature rise.

In addition to the standard variant, Amarex KRT for duty type "S1", AmaDS³ systems are also available with Amarex KRT for duty type "S3, 50% - 10 minutes".

Note: Amarex KRT pumps for duty type S3 are only available in combination with the AmaDS³ systems.

This applies to the following motor sizes:

- 2-pole motors
 - KA 09
 - KA 11
 - KA 13
 - KA 16

⁴⁾ Measured at a distance of 1 m from the pump outline (as per DIN 45635 Part 1 and 24)

- KA 22
- 4-pole motors
 - KA 09
 - KA 11
 - KA 13
 - KA 16
 - KA 18
 - KA 22
- 6-pole motors
 - KA 13
 - KA 16
 - KA 18
 - KA 22

Example The dry-installed Amarex KRT pump set can be operated for 5 minutes at 4/4 load and must then stop for 5 minutes to cool down. During this period the pump set will reach its base temperature again. The duty cycle time of 10 minutes can also be divided into several cycles, e.g. 2 minutes' runtime at 4/4 load, 2 minutes' time at rest. In normal operation with 2 pump sets, this is ensured by pump changeover either depending on the liquid level or the maximum runtime. When stopping a pump set, ensure that the periods at rest are absolutely observed.

Information on name plate The duty type is indicated on the pump sets' name plates.



Fig. 5: Duty type S3 on name plate (example)

5 Installation at Site

5.1 Safety regulations

 	 DANGER
	<p>Improper installation in potentially explosive atmospheres Explosion hazard! Damage to the system!</p> <ul style="list-style-type: none"> ▷ Do not use the system in potentially explosive atmospheres where compliance with EC Directive 94/9/EC/ATEX is required.

5.2 Checks to be carried out prior to installation

Place of installation

	 DANGER
	<p>The system is incorrectly mounted on the foundation or the foundation is inadequate. Tipping over of system and/or system components! Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Make sure the foundation concrete is of sufficient strength (to EN 206-1).

	 WARNING
	<p>Installation on mounting surfaces which are unsecured and cannot support the load Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class X0 to EN 206-1. ▷ The mounting surface must have set and must be completely horizontal and even. ▷ Observe the weights indicated.

Check structural requirements.

All structural features such as the sump size and the positioning of the inflow and discharge piping must have been prepared in accordance with the dimensions specified at the planning stage.

	NOTE
	<p>When installing the system in its assembled state, it is necessary to remove the sump cover. Provide a sufficient amount of space.</p>

5.3 Installing the system

	 DANGER
	<p>Persons in the pump sump during operation/touching live components Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▷ Never turn on the electric power supply when there are persons in the pump sump.

	CAUTION
	<p>Insufficient ventilation Damage to the electric control unit!</p> <ul style="list-style-type: none"> ▷ Provide proper aeration and ventilation. ▷ For room drainage, a pump sump must be provided at the site of installation.

Table 9: Combinations

Size	System type
AmaDS ³ 02.10/2/01.10 AmaDS ³ 02.10/2/01.11 AmaDS ³ 03.10/2/02.10	 <p>Compact collecting tank</p>
AmaDS ³ 03/2/03 AmaDS ³ 04.0/2/04.1	 <p>Circular collecting tank</p>

Size	System type
AmaDS ³ 03.10/2/03.05	
AmaDS ³ 03.10/2/03.10	
AmaDS ³ 03.10/2/04.10	
AmaDS ³ 04.10/2/04.11	
AmaDS ³ 04.11/2/05.10	

Semi-circular collecting tank

AmaDS³ systems are supplied fully assembled. Models 04.11/2/05.10 and larger are supplied partially assembled, depending on the size of the pumps. The pump sets are supplied as separate units. The system is fully assembled during installation at the site.

	<p>⚠ WARNING</p>
	<p>Improper transport Risk of injury from falling system! The load could slip!</p> <ul style="list-style-type: none"> ▷ Select lifting accessories which are suitable for the system weight. ▷ Attach lifting accessories only to the transport lugs provided. ▷ Secure the load appropriately. ▷ Comply with the applicable health and safety regulations.

- ✓ The name plate data has been compared against the purchase order and the site data (e.g. supply voltage, frequency, pump operating data, etc.).
- ✓ The fluid to be handled is an approved fluid.
- ✓ The installation room is frost-proof.
- ✓ All structural work required has been prepared in accordance with the dimensions stated in the connection example and in EN 12056.
- ✓ The installation room is adequately ventilated.
- ✓ Suitably dimensioned lifting equipment incl. lifting tackle is available.
- ✓ The foundation has the required strength and characteristics.
- ✓ The pump sets have been removed prior to installation in the system.
NOTE! Prevent impermissible flange loads when lifting up the pump sets. See the "Permissible forces and moments at the pump nozzles" section in the operating manual of the pump (set).
- ✓ Prior to commissioning, the system has been checked for any leakage.
- ✓ The operating manual of the pump sets is available.
 1. Attach the system to the transport lugs provided and lift it up.
 2. Lower the system into the prepared sump and place it down.

	<p>NOTE</p>
	<p>Moving the module as far as possible towards the sump wall or inflow pipe is recommended.</p>

3. Place the system on a level floor. Use a spirit level to level the system.

	NOTE
	Use the prepared inflow (pipe) as a reference point for the alignment.

4. Completely install the system with the pipe unions only lightly tightened.
5. Align the system. Correct any displacements caused during the installation process.
NOTE! If the construction conditions at the site require the system to be dismantled and reassembled, observe the constructional tolerances of pipelines, flanges, pipe unions and couplings.
6. Properly tighten the flange connections and pipe unions. Observe the tightening torques (⇒ Section 7.2.3, Page 49) .
7. Once the system is positioned in its correct place of installation, the pump sets are installed, aligned and connected to the appropriate flanges in accordance with the manufacturer's operating manual. Observe the permissible flange loads and bolt tightening torques (refer to the operating manual of the pump set).
8. The system is mounted on the foundation using the lugs welded to the tank and the fasteners which are supplied along with the system. Further information for AmaDS³ 02.10/2/01.10, 02.10/2/01.11, 03.10/2/02.10: (⇒ Section 5.3.1, Page 25) , AmaDS³ 03.10/2/03.05, 03.10/2/03.10, 03.10/2/04.10, 04.10/2/04.11, 04.11/2/05.10: (⇒ Section 5.3.2, Page 27) .
9. Drill the holes as specified in the "Chemical anchor dimensions" table. Then clean the holes.

	⚠ WARNING
	Improper handling of mortar cartridges Skin sensitisation or irritation! ▷ Wear suitable protective clothing.

10. Insert the mortar cartridges into the drilled holes.
Observe the curing times of the mortar cartridges.
11. Insert threaded rods into the corresponding drilled holes with an electric tool (e.g. impact drill, hammer drill).
12. The number of chemical anchors supplied depends on the type of system.
Observe the curing times (see the following table). Then tighten the chemical anchors.
13. Check the pipe unions and couplings of the system. Adjust them, if necessary.
14. Check all bolted/screwed connections of the system.
(⇒ Section 7.2.3, Page 49) .

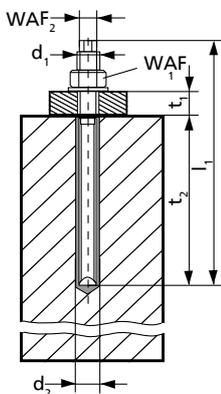


Fig. 6: Dimensions

Table 10: Chemical anchor dimensions

Size ($d_1 \times l_1$)	d_2	t_1	t_2	WAF_1	WAF_2	M_{d1}
	[mm]	[mm]	[mm]	[mm]	[mm]	[Nm]
M10 × 130	12	22	90	17	6	20
M12 × 160	14	25	110	19	8	40
M16 × 190	18	35	125	24	12	60
M20 × 260	25	65	170	30	14	120
M24 × 300 ⁵⁾	28	65	210	36	17	180
M30 × 380 ⁵⁾	35	65	280	46	-	400

5) Mounting accessories of the respective manufacturer are required.

Table 11: Curing times of mortar cartridge

Floor temperature [°C]	Curing time [min]
-5 to 0	240
0 to +10	45
+10 to +20	20
> +20	10

5.3.1 AmaDS³ 02.10/2/01.10, 02.10/2/01.11, 03.10/2/02.10

For the collecting tank to be resistant to pressure, the supplied fastening elements (set of mounting elements 99-23, heavy-duty anchor bolts 90-3) must be fitted for AmaDS³ 02.10/2/01.10, 02.10/2/01.11, 03.10/2/02.10.

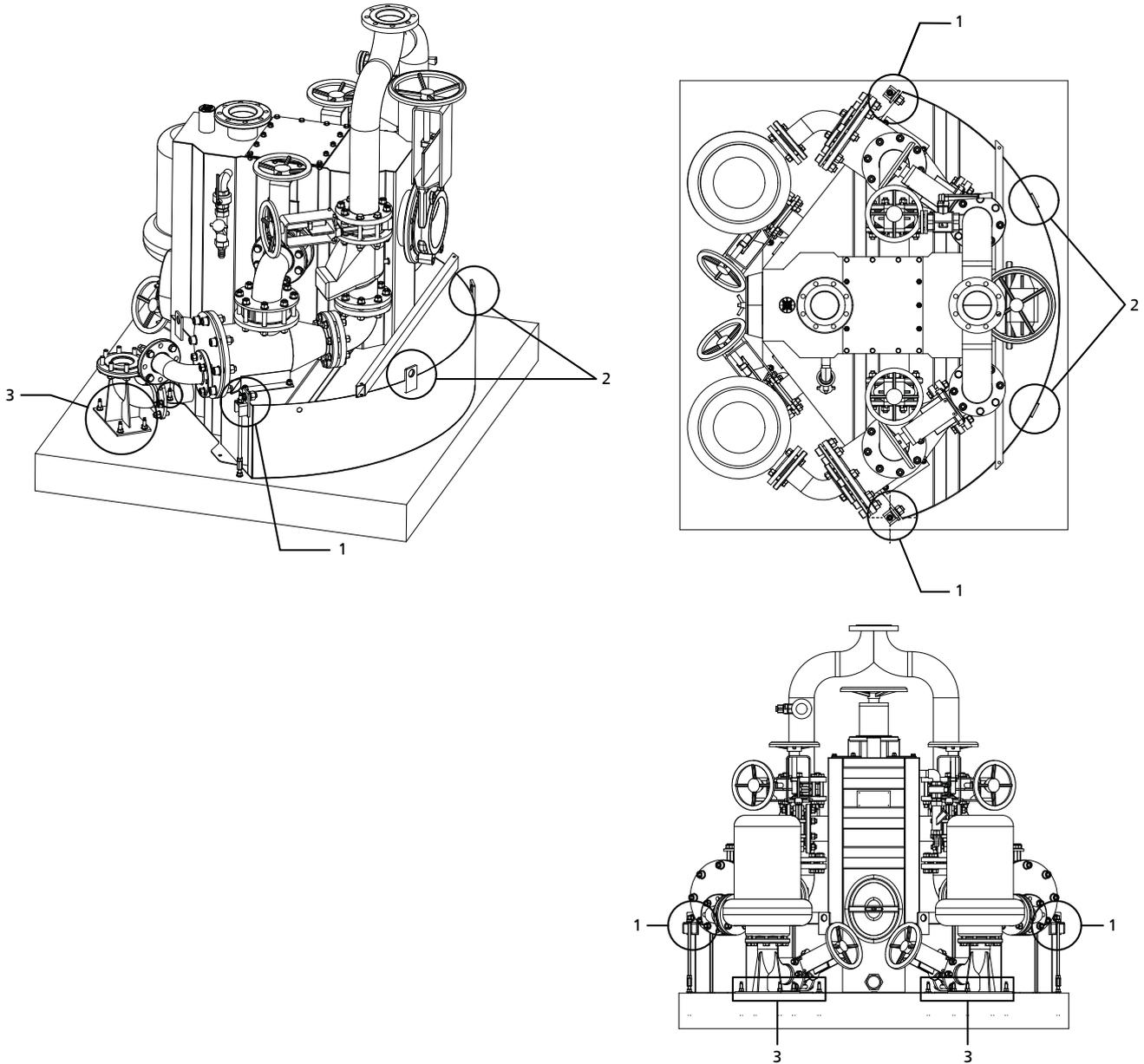
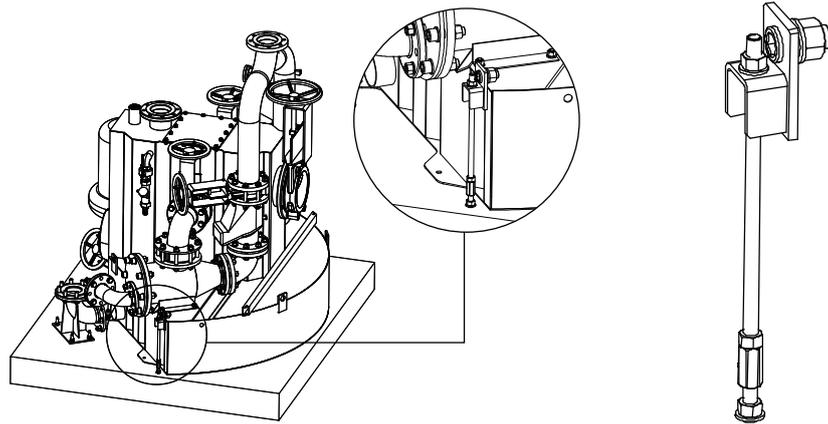


Fig. 7: Position of fasteners

1	Fasteners front, external: set of mounting elements 99-23
2	Fasteners rear, external: set of mounting elements 99-23
3	Fasteners front, centre: heavy-duty anchor bolts 90-3

Fasteners front, external: set of mounting elements 99-23

The set of mounting elements 99-23 comprises a clamping element (threaded rods made of stainless steel), a coupling element (internally threaded double-sided socket) and a mounting adapter.



Set of mounting elements 99-23, position: front, external Set of mounting elements 99-23 external

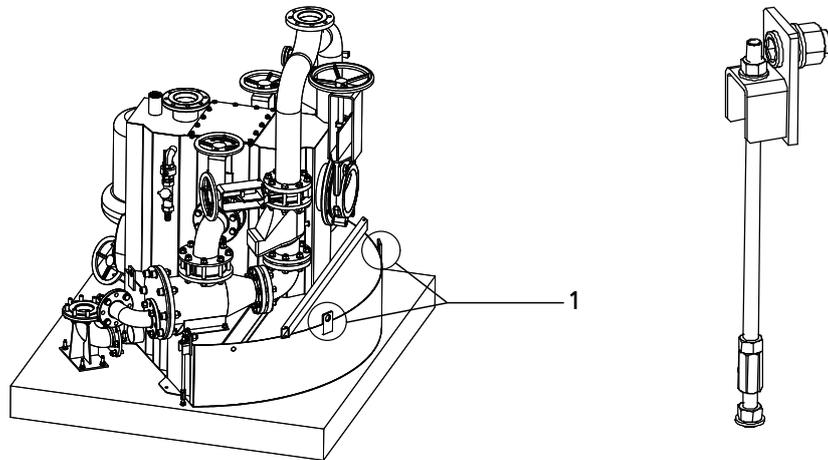
1. Insert the mounting adapters into the attachment lug of the collecting tank. Fasten it with the screwed connection.
2. Use the coupling elements to position the threaded rods on the threaded connections of heavy-duty anchor bolts 90-3. Tighten the screwed connections.
3. Observe the tightening torques (⇒ Section 7.2.3, Page 49) .
4. Cut off the excess length of the clamping elements.

Fasteners rear, external: set of mounting elements 99-23

The set of mounting elements 99-23 comprises a clamping element (threaded rods made of stainless steel), a coupling element (internally threaded double-sided socket) and a mounting adapter.

The collecting tank is not fitted with fixing plates at the rear (bottom of the floor).

If sufficient space is available (e.g. in concrete sumps):



Set of mounting elements 99-23, position: rear, external Set of mounting elements 99-23 external



1	Attachment lug
2	Threaded rod
3	Mounting adapter

1. Insert the mounting adapters into the attachment lug of the collecting tank. Fasten it with the screwed connection.
2. Use the the coupling elements to position the threaded rods on the threaded connections of heavy-duty anchor bolts 90-3. Establish a screwed connection.
3. Observe the tightening torques (⇒ Section 7.2.3, Page 49) .
4. Cut off the excess length of the clamping elements.

In confined spaces (e.g. narrow sumps):

If the collecting tank is to be installed in a narrow sump in which fastening at the bottom rear is not permissible, holders must be fitted between the sump wall and the upper part of the tank, especially at the rear traverse.

Fasteners front, centre: heavy-duty anchor bolts 90-3

The collecting tank is provided with fixing plates at the front centre.

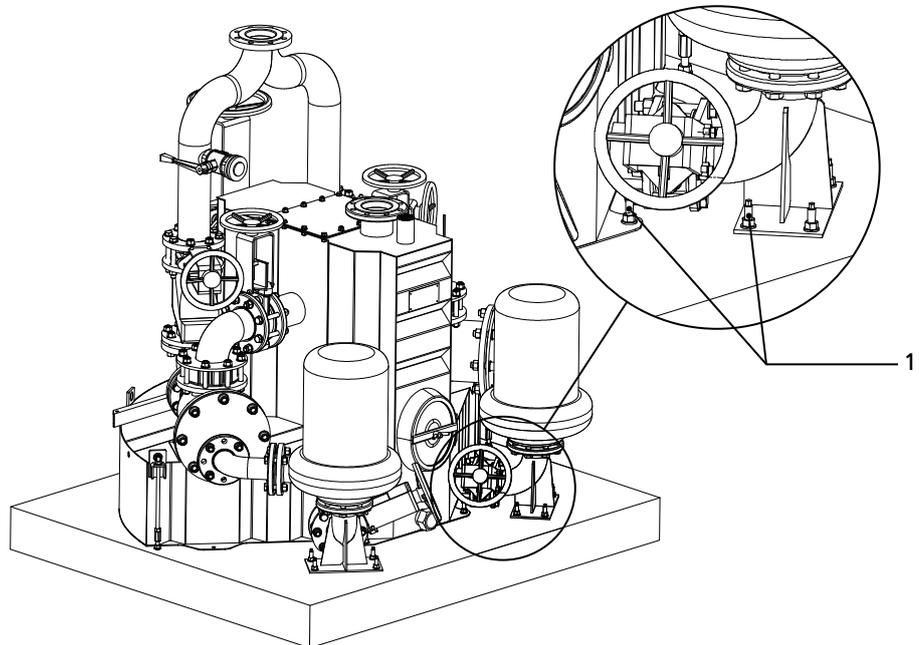


Fig. 8: Fasteners front, centre: heavy-duty anchor bolts 90-3

1	Heavy-duty anchor bolts 90-3
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1. Fasten the fixing plates at the collecting tank and the pump feet to the floor with heavy-duty anchor bolts 90-3.

5.3.2 AmaDS³ 03.10/2/03.05, 03.10/2/03.10, 03.10/2/04.10, 04.10/2/04.11, 04.11/2/05.10

The pump sets are arranged with the integrally cast pump feet at the pump casings in face-to-face arrangement (depending on the type series) with a clearance between the pump sets.

If the construction conditions at the site require the AmaDS³ solids separation system to be dismantled and reassembled, do not screw the pumps to each other at the pump feet.

5.4 Connecting the piping

	<div style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</div> <p>Impermissible loads acting on the system nozzles Danger to life from leakage of hot, toxic, corrosive or flammable fluids!</p> <ul style="list-style-type: none"> ▷ Do not use the system as an anchorage point for the piping. ▷ Anchor the pipes immediately up- and downstream of the system and connect them without transmitting any stresses or strains. ▷ Observe the permissible forces and moments in the system. ▷ Take appropriate measures to compensate thermal expansion of the piping.
	<div style="background-color: #2980b9; color: white; padding: 5px;">NOTE</div> <p>Moving the system as far as possible towards the sump wall or inflow pipe is recommended.</p>
	<div style="background-color: #2980b9; color: white; padding: 5px;">NOTE</div> <p>Observe DIN EN 13480 when laying the piping.</p>

- ✓ All bolted connections, couplings and pipe connections have been checked and tightened where required.
- ✓ The inflow and discharge piping is located at the heights specified at the planning stage.
- ✓ Make sure the inflow pipe is laid straight, without invert level offsets.
- ✓ The system is in the prepared place of installation.
 1. Connect the system to the customer-provided inflow pipe using appropriate means.
 2. Check the connection for leakage.
 3. Align the collecting tank using a spirit level.
 4. Fasten the system to the concrete floor using the lugs of the collecting tank.
 5. Check the specified piping heights.
 6. Connect the discharge line. Ensure that the discharge line's weight is supported and appropriate anchorage points are provided. (Precautionary measures against surge pressures)

Connecting the collecting tank venting equipment

- ✓ The system has been properly installed.
- ✓ The piping has been connected.
 1. Remove the blind flange (if any).
 2. Route the vent line to the outside (outside of the building structure), e.g. using a PE-HD discharge line with arc-welded socket weld ends. The routed line must be pressure- and water-tight.
 -  Observe the flood level of the system.
An extension pipe is not included in the scope of supply.
 3. Fit a protective cover on the end of the vent line outside of the building structure.

	<div style="background-color: #2980b9; color: white; padding: 5px;">NOTE</div> <p>The protective cover prevents foreign particles from entering the collecting tank.</p>
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5.5 Electrical connection

	<p>⚠ DANGER</p> <p>Electrical connection work by unqualified personnel Risk of fatal injury due to electric shock!</p> <ul style="list-style-type: none"> ▷ Always have the electrical connections installed by a trained and qualified electrician. ▷ Observe regulations IEC 60364 and, for explosion-proof models, EN 60079.
	<p>⚠ DANGER</p> <p>Operating a pump set that has not been fully connected Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Never start up a pump set with incompletely connected power cable or non-operational monitoring devices.
	<p>⚠ DANGER</p> <p>Live parts due to a damaged power supply cable Danger of death from electric shock! Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▷ Check the power cables for damage before connecting them to the power supply. ▷ Never connect a damaged power cable. ▷ Always have the electrical connections installed by a trained and qualified electrician.
	<p>⚠ WARNING</p> <p>Incorrect connection to the mains Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▷ Observe the technical specifications of the local energy supply companies.

Connection to power supply must be effected in accordance with the operating manual supplied and the wiring diagrams of the pump set.

When connecting and commissioning the pump sets, observe the information on the name plate regarding duty types S1 or S3. (⇒ Section 4.8, Page 18)

5.6 Fitting the level sensor

The level sensor must be fitted 50 mm above the floor of the collecting tank. The protective cover must be removed prior to installing the level sensor.

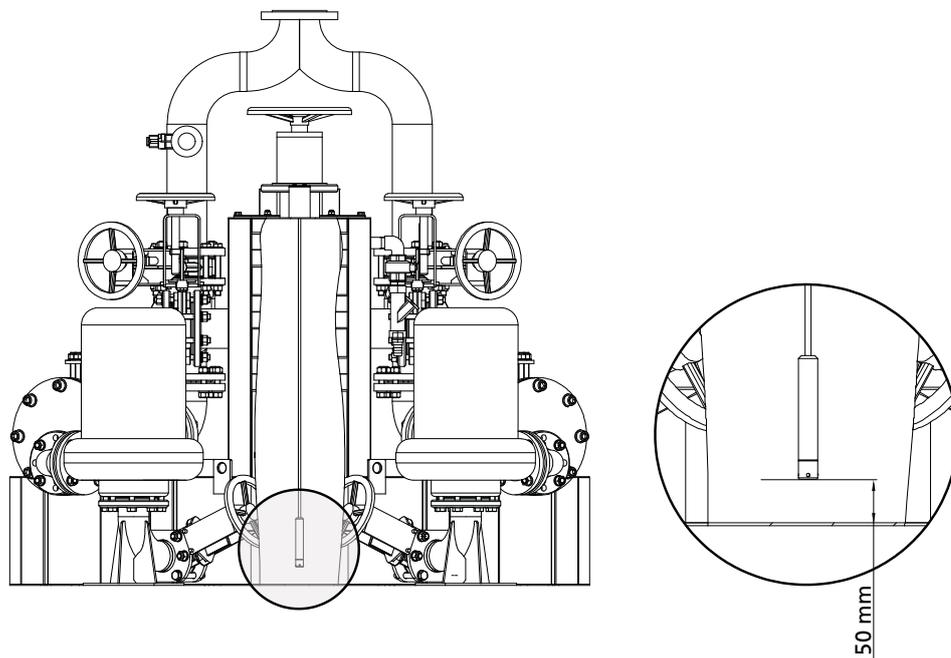


Fig. 9: Installing the level sensor (example: AmaDS³ 02.10/2/01.11)

6 Commissioning/Start-up/Shutdown

6.1 Prerequisites for commissioning/start-up

6.1.1 Priming and venting the system

- ✓ All inflow and discharge lines have been properly connected.
- ✓ All pipe unions and coupling connections have been checked for leakage.
- ✓ All screwed connections have been tightened to the maximum tightening torques (⇒ Section 7.2.3, Page 49) .
- ✓ All valves of the system (except for the inflow gate valve) are open.
 1. Open the inflow gate valve (if any).
 2. The system starts to be primed with the fluid to be handled.
 3. During the priming process check all parts and connections for leakage.
 - ⇒ If necessary, stop the priming process and eliminate leakage. Then prime and vent the system again.

6.1.2 Checklist for action to be taken

Table 12: Checklist for commissioning/inspection and maintenance

Action ⁶⁾	Further information	Required during		
		Commissioning/ start-up	Inspection	Servicing/ maintenance
Advise and/or train operating staff.		✓	✓	✓
Read the operating manuals and keep them in an appropriate place.		✓	✓	✓
Check power supply.	Check against the data on the motor name plate.	✓	✓	✓
Check the switching mechanism.		✓	✓	✓
Check that the pneumatic gate valve of the bypass system functions properly.		✓	✓	✓
Check automatic switching functionality: Manual-0-automatic selector switch Pump changeover after each start/stop cycle Check pump changeover after max. runtime Start-up of idle pump should duty pump fail Set selector switch back to automatic mode		✓	✓	✓
Check switchover time from star to delta.	Required: 3 seconds	✓	✓	✓
Check fuses.	Size, characteristics, three poles, mechanical interlocking device	✓	✓	✓
Check the alarm equipment to ensure that it functions properly.		✓	✓	✓
Check the collecting tank. Clean the collecting tank from deposits, if any. In case of major grease deposits in the tank as a result of greasy waste water from industrial businesses, inform the customer that according to DIN 1986-100 a grease separator must be installed (upstream of the system).		✓	✓	✓
Fit level sensor; check settings.	(⇒ Section 5.6, Page 30)	✓		

6) Actions to be taken may vary depending on the control system used.

Action ⁶⁾	Further information	Required during		
		Commissioning/ start-up	Inspection	Servicing/ maintenance
Remove the level sensor; check for jamming/ incrustations; clean, if necessary.			✓	✓
Check inspection hole covers on solids separator and collecting tank for leakage.		✓	✓	✓
Check winding resistances.	As described in the motor operating manual. Check the current limits set on the motor protection switches. Refer to the motor rating plate for the motor current.	✓	✓	✓
Re-tighten the terminals (motor, control system, level transmitter).		✓	✓	✓
Check motor power consumption.	Check data displayed at the control system against the data on the motor rating plate.	✓	✓	✓
Test-run for several start/stop cycles.		✓	✓	✓
Check the pump set for smooth running.		✓	✓	✓
Check bearings and replace, if required.	As described in the pump operating manual.		✓	✓
Check shaft seal and replace, if required.	As described in the pump operating manual.		✓	✓
Check lubricant and replace, if required.	As described in the pump operating manual.	✓	✓	✓
Check the shut-off, drain/vent and check valves for proper functioning and tightness.		✓	✓	✓

6.2 Commissioning/start-up

	CAUTION
	<p>Incorrect commissioning/start-up Damage to property!</p> <ul style="list-style-type: none"> ▷ Ensure that all local applicable regulations and directives – particularly the machinery and low-voltage directives – are fulfilled. ▷ Install a line protection device in the supply cable. For the line protection required please refer to the attached logic diagram. ▷ Before commissioning, check all connected cables against the wiring diagram.

	<p>⚠ DANGER</p> <p>Gauge pressure in the collecting tank caused by a failure of the pneumatic gate valve in the bypass system</p> <p>Pressure overload and bursting of the collecting tank Pressurised fluid handled escaping and parts flying off! Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Comply with the operating mode indicated in the technical product literature. ▷ Ensure that the pneumatic gate valve of the bypass system is closed while the corresponding pump is running. ▷ Regularly check that the pneumatic gate valve of the bypass system functions properly.
	<p>NOTE</p> <p>Commissioning should be performed by a KSB service centre.</p>
	<p>NOTE</p> <p>Commission/start up the pump sets in compliance with the accompanying pump operating manual. Observe all safety information in this operating manual. Carry out all steps required for the commissioning/start-up of the pump sets.</p>

- ✓ The system has been properly connected to the electric power supply and is equipped with all protection devices.
- ✓ All relevant VDE standards and/or regulations applicable in the country of use are complied with.
- ✓ The control system used is in compliance with KSB's specifications.
(⇒ Section 9.2, Page 56)
- ✓ The control system used has been properly connected and is ready for operation.
- ✓ The system is supplied with closed emergency overflow plates. If required due to increased inflow volumes, the "open" emergency overflow plates which are supplied but not fitted can be used. These plates enable a pre-filtered inflow to the collecting tank if the level in the system is too high. They have to be cleaned manually as required. Automatic back-washing will not take place. For any queries, please contact KSB Service.

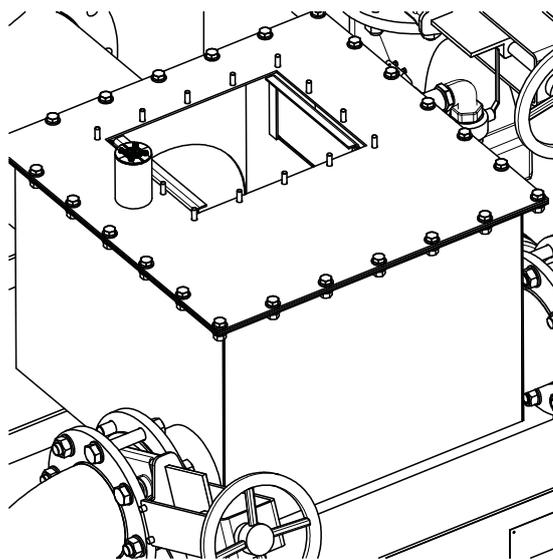


Fig. 10: Inflow splitter with closed emergency overflow plates

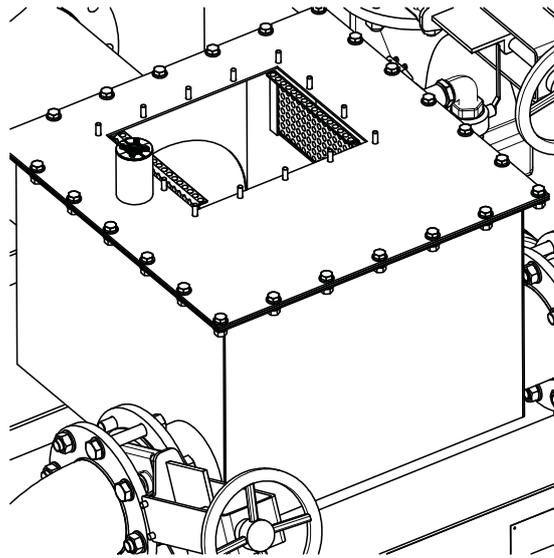


Fig. 11: Inflow splitter with open emergency overflow plates

1. Set the manual-0-automatic selector switches for both pumps to "0".
 2. Switch on the power supply.
 3. Check the parameters to ensure they are compatible with the required application and functionality. Adjust if necessary.
 4. For large systems: Check that the pneumatic gate valve of the bypass system and its control system function properly. Refer to the operating manual of the control system.
 5. Set the manual-0-automatic selector switches for both pumps to "Automatic".
- ⇒ Both pumps are now started/stopped by the control unit in line with demand.



NOTE

We recommend filling in the data sheets in the annex and the checklist for commissioning. This will help with the processing of any warranty cases.

6.3 Operating limits



DANGER

Non-compliance with operating limits for pressure and temperature

Leakage of hot or toxic fluid handled!

Explosion hazard!

- ▷ Comply with the operating data indicated in the technical product literature.
- ▷ Avoid prolonged operation against a closed shut-off element.
- ▷ Never operate the solids separation system at temperatures exceeding those specified in the technical product literature or on the name plate.
- ▷ Dry running must be prevented by all means.

Observe the following parameters and values during operation:

Parameter	Value
Maximum permissible fluid temperature	40 °C Up to 65 °C for max. 5 minutes
Max. ambient temperature (air)	40 °C

6.3.1 Fluids handled

	 WARNING
	<p>Pumping of impermissible fluids Hazardous to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Only discharge permissible fluids into the public sewer system. ▷ Check the suitability of pump/system materials.

Permissible fluids According to DIN 1986-3 the following fluids can be discharged into sewer systems: Water contaminated by domestic use, human and - as far as required and permitted - animal faeces together with the necessary flushing water as well as stormwater in case no other way of disposal is possible. ⁷⁾

Impermissible fluids Substances / water which must **not** be discharged into the sewer system are, amongst others:

Solid matter, fibres, tar, sand, cement, ash, coarse paper, paper towels, cardboard, debris, garbage, offal, grease, oil.

Waste water from installations situated above the flood level (EN 12 056-1).

Waste water containing hazardous substances (DIN 1986-100), e.g. greasy waste water from large-scale catering kitchens.

For drainage of greasy water a grease separator to DIN 4040-1 must be fitted.

6.3.2 Frequency of starts

To prevent high temperature increases in the motor and excessive loads on the pump, motor, seals and bearings, the frequency of starts shall not exceed the following number of start-ups per hour.

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

Sewatec/Sewabloc **Table 13:** Frequency of starts, pump: Sewatec / Sewabloc with standardised IEC frame motor

Motor rating [kW]	Maximum number of starts [Starts/hour]
≤ 11	25
≤ 37	20

Amarex KRT, duty type S1, dry installation **Table 14:** Frequency of starts, pump: Amarex KRT, duty type S1

Motor rating [kW]	Maximum number of starts [Starts/hour]
≤ 7,5	30

Amarex KRT, duty type S3, dry installation **Table 15:** Frequency of starts, pump: Amarex KRT, duty type S3 50 % - 10 minutes

Motor rating [kW]	Maximum number of starts [Starts/hour]
≤ 7,5	30
≥ 7,5	20

Always observe the ratio of the periods of operation and periods at rest.

 Observe the information on the name plate for S3 (intermittent periodic duty). This is a special variant of the Amarex KRT pump for duty type S3 50 % 5 - 10 minutes approved for use in the AmaDS³ solids separation system.

7) Other types of waste water, e.g. industrial waste water, must not be discharged into the local sewer system without prior treatment.

6.3.3 Start and stop points

Liquid levels must not exceed or fall below the following start and stop levels:

Table 16: Start and stop levels

Size	Start level	Stop level
	[mm]	[mm]
AmaDS ³ 02.10 / 2 / 01.10	500	200
AmaDS ³ 02.10 / 2 / 01.11	650	250
AmaDS ³ 03.10 / 2 / 02.10	950	250
AmaDS ³ 03 / 2 / 03	950	300
AmaDS ³ 3.10 / 2 / 03.05	950	300
AmaDS ³ 3.10 / 2 / 03.10	950	300
AmaDS ³ 3.10 / 2 / 04.10	1100	350
AmaDS ³ 04.0 / 2 / 04.1	1300	350
AmaDS ³ 4.10 / 2 / 04.11	1300	350
AmaDS ³ 4.11 / 2 / 05.10	1600	350

6.3.4 Supply voltage

	CAUTION
	<p>Wrong supply voltage Damage to the system!</p> <ul style="list-style-type: none"> ▷ The maximum permissible deviation in supply voltage is 10 % of the rated voltage indicated on the name plate.

6.4 Shutdown

	! DANGER
	<p>An incorrect sequence of the steps to be taken and malfunctioning of non-return valves may lead to overpressure in the collecting tank. Bursting of the collecting tank! Uncontrolled fluid leakage from the vent lines!</p> <ul style="list-style-type: none"> ▷ Step 1: Always close the discharge line first to prevent unchecked fluid backflow. ▷ Step 2: Then close the inflow line.

	! DANGER
	<p>Power supply not disconnected Danger to life!</p> <ul style="list-style-type: none"> ▷ Disconnect all electrical connections from the power supply and secure against unintentional start-up.

Short-term shutdown

1. Set the manual-0-automatic switches for both pumps to "0".
 - ⇒ Both pumps are switched off.
 - ⇒ The control unit remains operational.
2. **Check that the non-return valve functions properly.**

	NOTE
	<p>The non-return valve's function can be checked as follows:</p> <ol style="list-style-type: none"> 1) Listen for whether fluid is flowing! 2) Check the liquid level indication at the control system!

3. Shut off the discharge line using the appropriate valves.
4. Shut off the inflow line using the appropriate valve.

Short-term shutdown for work on one pump/solids separator

1. Set the manual-0-automatic switch of the pump on which work is to be done to "0".
 - ⇒ One pump is switched off.
 - ⇒ The control unit remains operational.
2. **Check that the non-return valve functions properly.**

	NOTE
	<p>The non-return valve's function can be checked as follows:</p> <ol style="list-style-type: none"> 1) Listen for whether fluid is flowing! 2) Check the liquid level indication at the control system!

3. Open the control unit.
4. For 400 V variants:
Deactivate the motor protection switch on the pump on which work is to be done and secure against unintentional activation.
5. Close the control unit again.
6. Close the shut-off valves provided in the discharge and suction line and the solids separator of the relevant pump.
7. The system's main inflow line remains open as the other pump is operating.

Long-term shutdown

1. Set the manual-0-automatic switches for both pumps to "0".
2. Switch off the power supply.
 - ⇒ This disables all control and signalling functions.
3. **Check that the non-return valve functions properly.**

	NOTE
	<p>The non-return valve's function can be checked as follows:</p> <ol style="list-style-type: none"> 1) Listen for whether fluid is flowing! 2) Check the liquid level indication at the control system!

4. Shut off the discharge line using the appropriate valves.
5. Shut off the inflow line using the appropriate valve.
6. Drain the collecting tank (e.g. using a hand diaphragm pump).
7. After prolonged standstill:
Clean the tank and the solids separator.
Clean and preserve the pump sets (refer to the operating manual of the pump sets).
Clean and preserve the valves (refer to the operating manuals of the valves).

6.5 Returning to service

	<p style="background-color: #f4a460; padding: 2px;">⚠ WARNING</p> <p>Failure to re-install or re-activate protective devices Risk of personal injury from moving parts or escaping fluid!</p> <ul style="list-style-type: none"> ▷ As soon as the work is complete, re-install and/or re-activate any safety-relevant and protective devices.
	<p style="background-color: #0070c0; color: white; padding: 2px;">NOTE</p> <p>If the pump has been out of service for more than one year, replace all elastomer seals.</p>

Before returning the system to service:

1. Check all screwed/bolted connections of the system. (⇒ Section 7.2.3, Page 49)
2. Check all sealing elements. If the system has been out of service for more than one year, replace all elastomer seals.
3. Check all piping connections. (⇒ Section 5.4, Page 28)
4. Observe and take all measures required to return the pump sets to service (refer to the operating manual of the pump set).
5. Observe and take all measures required to return the control system to service (refer to the operating manual of the control system).
6. For returning the pump set to service observe the sections on commissioning/start-up (⇒ Section 6.1, Page 31) , (⇒ Section 6.2, Page 32) and the operating limits (⇒ Section 6.3, Page 34) .

7 Servicing/Maintenance

7.1 Safety regulations

The operator ensures that maintenance, inspection and installation is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

	<div style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</div> <p>Insufficient preparation of work on the solids separation system Risk of injury!</p> <ul style="list-style-type: none"> ▷ Properly shut down the solids separation system and secure against unintentional start-up. ▷ Close the shut-off elements in the suction and discharge line. ▷ Drain the solids separation system. ▷ Shut off any auxiliary feed lines. ▷ Let the solids separation system cool down to ambient temperature.
	<div style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</div> <p>Insufficient preparation of work at the lifting unit Risk of personal injury!</p> <ul style="list-style-type: none"> ▷ Properly shut down the lifting unit and secure it against unintentional start-up. ▷ Close the shut-off elements in the suction and discharge line. ▷ Drain the lifting unit. ▷ Close any auxiliary connections. ▷ Allow the lifting unit to cool down to ambient temperature.
	<div style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</div> <p>Work on the system by unqualified personnel Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▷ Have system components modified and dismantled by authorised personnel only.
	<div style="background-color: #f1c40f; color: white; padding: 5px;">⚠ WARNING</div> <p>Fluids handled, consumables and supplies posing a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Solids separation systems handling fluids posing health hazards must be decontaminated. Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.
	<div style="background-color: #f1c40f; color: white; padding: 5px;">⚠ WARNING</div> <p>Unintentional starting of the pump set Risk of injury by moving components and shock currents!</p> <ul style="list-style-type: none"> ▷ Ensure that the pump set cannot be started unintentionally. ▷ Always make sure the electrical connections are disconnected before carrying out work on the pump set.

	⚠ WARNING
	Hot surface Risk of injury! ▷ Allow the pump set to cool down to ambient temperature.
	⚠ WARNING
	Pump sets with high noise levels Damage to hearing! ▷ Persons must only enter the vicinity of the running pump set if they are wearing protective clothing/ear protection. ▷ See noise characteristics. (⇒ Section 4.6, Page 18)
	⚠ WARNING
	Insufficient stability Risk of crushing hands and feet! ▷ During assembly/dismantling, secure the pump (set)/pump parts to prevent tilting or tipping over.

A regular servicing/maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the system with a minimum of maintenance expenditure and work.

	NOTE
	All maintenance, service and installation work can be carried out by KSB Service or authorised workshops. For contact details please refer to the enclosed "Addresses" booklet or visit " www.ksb.com/contact " on the Internet.

Never use force when dismantling and reassembling the pump set.

7.2 Servicing/inspection

7.2.1 Supervision of operation

	⚠ DANGER
	Risk of potentially explosive atmosphere inside the pump Explosion hazard! ▷ The pump internals in contact with the fluid to be handled, including the seal chamber and auxiliary systems must be filled with the fluid to be handled at all times. ▷ Provide sufficient inlet pressure. ▷ Provide an appropriate monitoring system.
	CAUTION
	Increased wear due to dry running Damage to the pump set! ▷ Never operate the pump set without liquid fill. ▷ Never close the shut-off element in the suction line and/or supply line during pump operation.

	CAUTION
	<p>Impermissibly high temperature of fluid handled Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Prolonged operation against a closed shut-off element is not permitted (heating of the fluid). ▷ Observe the temperature limits in the data sheet and in the section on operating limits (refer to the operating manual of the pump set).

While the pump is in operation, observe and check the following:

- The pump must run quietly and free from vibrations at all times.
- Monitor the correct functioning of any auxiliary connections.

7.2.2 Servicing/maintenance/inspection

This supervision plan contains the minimum scope of work recommended by KSB. Do not exceed the time intervals indicated; shorter intervals serve to improve the operating reliability.

Table 17: Servicing/maintenance intervals

Subassembly	Interval	Action
Pump set	Refer to the operating manual of the pump set.	
Collecting tank	Annually	<ul style="list-style-type: none"> ▪ Check for solids. ▪ Clean as required.
Solids separator	Annually	<ul style="list-style-type: none"> ▪ Check for solids. ▪ Clean as required.
Inflow splitter	Every 6 months	<ul style="list-style-type: none"> ▪ Check for solids. ▪ Clean as required.
Gate valve	Monthly	<ul style="list-style-type: none"> ▪ Functional test ▪ Lubrication
Lift check valve	Monthly	<ul style="list-style-type: none"> ▪ Functional test
	Every 6 months	<ul style="list-style-type: none"> ▪ Clean as required.

Check and service all components of the pump set as described in the corresponding operating manuals provided by the manufacturers. The manufacturer's product literature is filed with the order documents included with the delivery.

7.2.2.1 Cleaning the solids separator

7.2.2.1.1 AmaDS³ 02.10/2/01.10

	! DANGER
	<p>An incorrect sequence of the steps to be taken and malfunctioning of non-return valves may lead to overpressure in the collecting tank. Bursting of the collecting tank! Uncontrolled fluid leakage from the vent lines!</p> <ul style="list-style-type: none"> ▷ Step 1: Always close the discharge line first to prevent unchecked fluid backflow. ▷ Step 2: Then close the inflow line.

	<p>! WARNING</p>
	<p>Fluids posing a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of flushing liquid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of substances posing a health hazard.

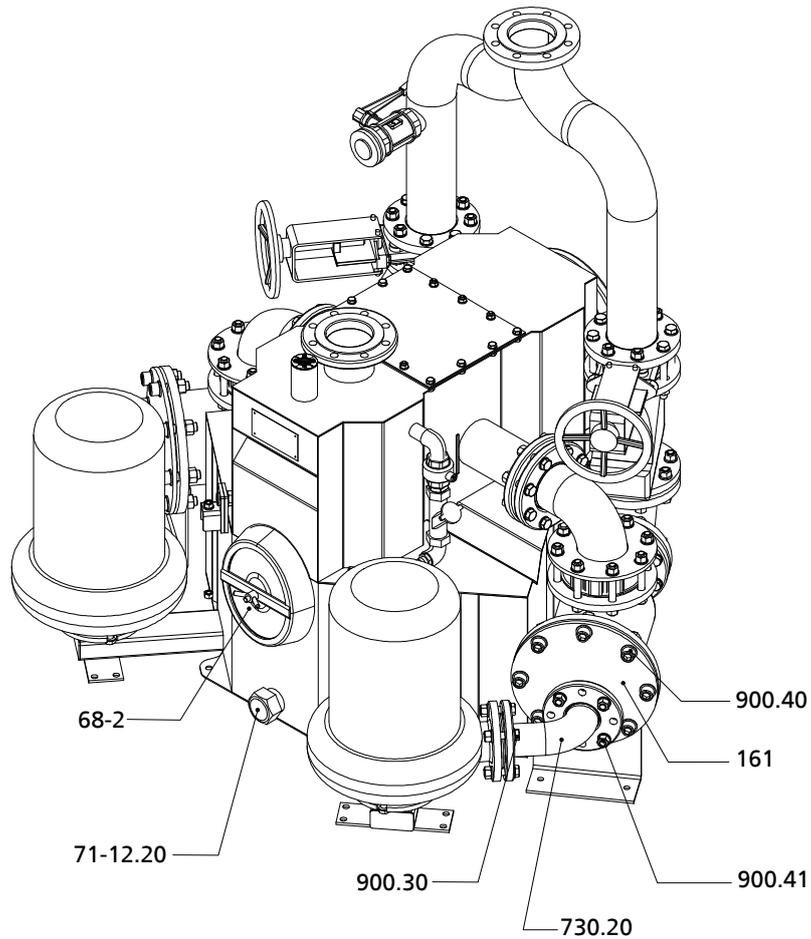


Fig. 12: Cleaning the solids separator: AmaDS³ 02.10/2/01.10

68-2	Cover plate for the inspection hole
71-12.20	Connection nozzle for residual drainage pump for draining the tank
161	Casing cover / separator flange plate
730.20	Pipe adapter

- ✓ The equipment has been properly shut down. (⇒ Section 6.4, Page 36)
 - ✓ The discharge line is closed with a gate valve.
 - ✓ The inflow gate valve⁸⁾ is closed. If no inflow gate valve is fitted, waste water inflow has been prevented by other appropriate measures.
 - ✓ An appropriate container for solids to be disposed of is available.
1. Water level below the inspection hole: Open the inspection hole cover plate 68-2. Insert a suitable submersible motor pump with hose system. (Alternatively, the contents of the collecting tank can be extracted or drained via the connection nozzle 71-12.20 for the residual drainage pump.)

8) Optional

- ⇒ The system and collecting tank have been drained.
- 2. Remove all screwed connections 900.30, 900.41 at pipe adapter 730.20. Remove pipe adapter 730.20 and store it in a safe place.
- 3. Remove all screwed connections 900.40 at the casing cover / separator flange plate 161.
- 4. Remove the casing cover / separator flange plate 161 and store it in a safe place.
- 5. Remove the sealing elements.
- 6. Carry out a visual inspection of the inflow non-return valve while the solids separator 74-5 is open.
- 7. Check and clean solids separator 74-5 and casing cover / separator flange plate 161. Remove any solids.
- 8. Check and clean the suction lines.
- 9. Fit casing cover / separator flange plate 161 with screwed connection 900.40.
- 10. Close the inspection hole with cover plate 68-2.
- 11. Fit pipe adapter 730.20 again. Replace the sealing elements and fasten it with screwed connections 900.30, 900.41.
- 12. Tighten all screwed connections at pipe adapter 730.20 and at the casing cover / separator flange plate 161 to the indicated tightening torque.
(⇒ Section 7.2.3, Page 49)
- 13. Commission the system including the pump sets.

7.2.2.1.2 AmaDS³ 02.10/2/01.11, 03.10/2/02.10, 03/2/.03, 04.0/2/04.1, 03.10/2/03.05, 03.10/2/03.10, 03.10/2/04.10, 04.10/2/04.11, 04.11/2/05.10

	<p style="background-color: #e67e22; color: white; padding: 5px;">⚠ DANGER</p> <p>An incorrect sequence of the steps to be taken and malfunctioning of non-return valves may lead to overpressure in the collecting tank.</p> <p>Bursting of the collecting tank! Uncontrolled fluid leakage from the vent lines!</p> <ul style="list-style-type: none"> ▷ Step 1: Always close the discharge line first to prevent unchecked fluid backflow. ▷ Step 2: Then close the inflow line.
	<p style="background-color: #f1c40f; color: white; padding: 5px;">⚠ WARNING</p> <p>Fluids posing a health hazard</p> <p>Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of flushing liquid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of substances posing a health hazard.

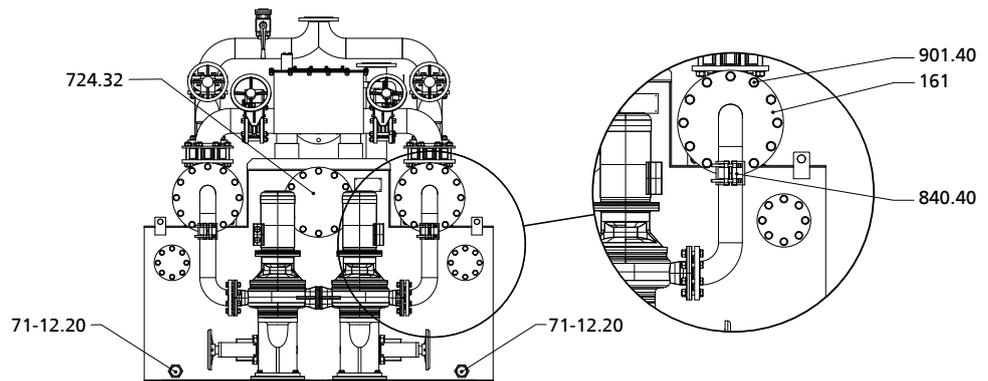


Fig. 13: Cleaning solids separator 74-5

71-12.20	Connection nozzle for residual drainage pump for draining the tank
161	Casing cover / separator flange plate for the solids separator
724.32	Blind flange for the inspection hole
840.40	Coupling
901.40	Hexagon head bolt M20 x 70

Cleaning during system standstill

- ✓ The equipment has been properly shut down. (⇒ Section 6.4, Page 36)
 - ✓ The non-return valve is closed and has been checked for proper functioning. (⇒ Section 6.4, Page 36)
 - ✓ The discharge line is closed with a shut-off valve.
 - ✓ The inflow gate valve⁹⁾ is closed. If no inflow gate valve is fitted, waste water inflow has been prevented by other appropriate measures.
 - ✓ An appropriate container for solids to be disposed of is available.
1. Water level below the inspection hole: Open the inspection hole blind flange 724.32. Insert a suitable submersible motor pump with hose system. (Alternatively, the contents of the collecting tank can be extracted or drained via connection nozzles 71-12.20 for the residual drainage pump.)
 - ⇒ The system and collecting tank have been drained.
 2. Undo the screwed connection of coupling 840.40.
 3. Undo screwed connection 901.40 of the casing cover / separator flange plate 161. Remove casing cover / separator flange plate 161 and keep it in a safe place.
 4. Remove the sealing elements.
 5. Carry out a visual inspection of the inflow non-return valve while the solids separator 74-5 is open.
 6. Check and clean solids separator 74-5. Remove any solids.
 7. Check and clean the suction lines.
 8. Fit casing cover / separator flange plate 161 again. Replace the sealing elements and fasten it with screwed connections 901.40.
 9. Fasten coupling 840.40 with screwed connections.
 10. Close the inspection hole with blind flange 724.32.
 11. Tighten all bolted connections applying the specified tightening torques. (⇒ Section 7.2.3, Page 49)

9) Optional

Cleaning while the parallel pump is operating

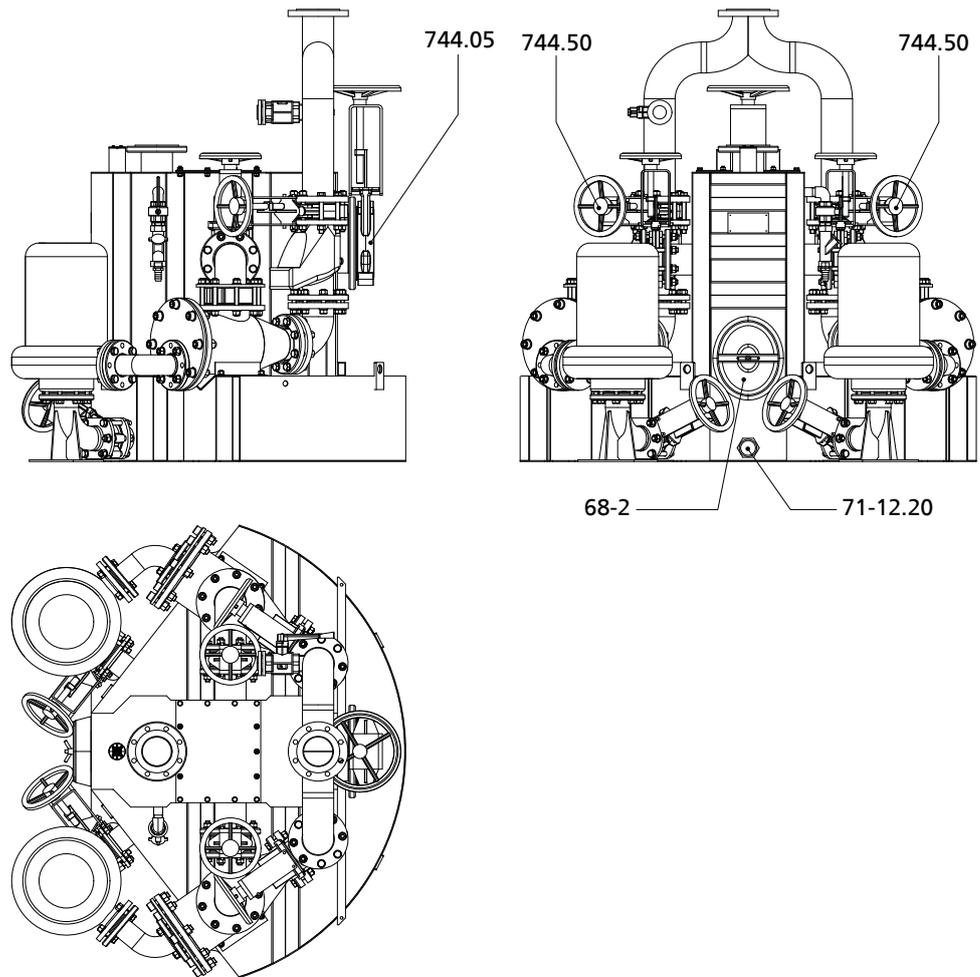
- ✓ The equipment has been properly shut down. (⇒ Section 6.4, Page 36)
- ✓ The non-return valve is closed and has been checked for proper functioning. (⇒ Section 6.4, Page 36)
- ✓ The corresponding shut-off element in the discharge line has been closed.
- ✓ An appropriate container for solids to be disposed of is available.

 1. Close the shut-off valves provided in the discharge and suction line and upstream of the solids separator of the relevant pump.
 2. Undo the screwed connection of coupling 840.40.
 3. Undo screwed connection 901.40 of the casing cover / separator flange plate 161. Remove casing cover / separator flange plate 161 and keep it in a safe place.
 4. Carry out a visual inspection of the inflow non-return valve while the solids separator 74-5 is open.
 5. Check and clean solids separator 74-5. Remove any solids.
 6. Fit casing cover / separator flange plate 161 again. Replace the sealing elements and fasten it with screwed connections 901.40.
 7. Fasten coupling 840.40 with screwed connections.
 8. Tighten all bolted connections applying the specified tightening torques. (⇒ Section 7.2.3, Page 49)
 9. Re-open the appropriate valves (gate valves).
 10. Return the pump which has been shut down to service.

7.2.2.2 Cleaning the collecting tank

7.2.2.2.1 AmaDS³ 02.10/2/01.10, AmaDS³ 02.10/2/01.11, AmaDS³ 03.10/2/02.10

	<p>⚠ DANGER</p>
	<p>An incorrect sequence of the steps to be taken and malfunctioning of non-return valves may lead to overpressure in the collecting tank.</p> <p>Bursting of the collecting tank! Uncontrolled fluid leakage from the vent lines!</p> <ul style="list-style-type: none"> ▷ Step 1: Always close the discharge line first to prevent unchecked fluid backflow. ▷ Step 2: Then close the inflow line.
	<p>⚠ WARNING</p>
	<p>Fluids posing a health hazard</p> <p>Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of flushing liquid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of substances posing a health hazard.


Fig. 14: Opening the collecting tank

68-2	Cover plate for the inspection hole
71-12.20	Connection nozzle for residual drainage pump for draining the tank
744.05	Inflow (optionally with inflow gate valve)
744.50	Gate valve in the discharge line

- ✓ The equipment has been properly shut down. (⇒ Section 6.4, Page 36)
 - ✓ The non-return valve is closed and has been checked for proper functioning. (⇒ Section 6.4, Page 36)
 - ✓ The discharge line is closed with a gate valve.
 - ✓ The inflow gate valve¹⁰⁾ is closed. If no inflow gate valve is fitted, waste water inflow has been prevented by other appropriate measures.
 - ✓ An appropriate container for solids to be disposed of is available.
1. Water level below the inspection hole: Unscrew the fastening elements for cover plate 68-2. Remove cover plate 68-2 and keep it in a safe place. Insert a suitable submersible motor pump with hose system. (Alternatively, the contents of the collecting tank can be extracted or drained via the connection nozzle 71-12.20 for the residual drainage pump.)
 - ⇒ The system and collecting tank have been drained.
 2. Clean the collecting tank.
 3. Fit cover plate 68-2. Replace the sealing elements, if necessary. Tighten the fastening elements.

10) Optional

4. Tighten all bolted connections applying the specified tightening torques.
(⇒ Section 7.2.3, Page 49)
5. Return the system to service. (⇒ Section 6.5, Page 38)

7.2.2.2.2 AmaDS³ 03/2/03, 04.0/2/04.1, 03.10/2/03.05, 03.10/2/03.10, 03.10/2/04.10, 04.10/2/04.11, 04.11/2/05.10

	<p>⚠ DANGER</p>
	<p>An incorrect sequence of the steps to be taken and malfunctioning of non-return valves may lead to overpressure in the collecting tank.</p> <p>Bursting of the collecting tank! Uncontrolled fluid leakage from the vent lines!</p> <ul style="list-style-type: none"> ▷ Step 1: Always close the discharge line first to prevent unchecked fluid backflow. ▷ Step 2: Then close the inflow line.
	<p>⚠ WARNING</p>
	<p>Fluids posing a health hazard</p> <p>Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of flushing liquid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of substances posing a health hazard.

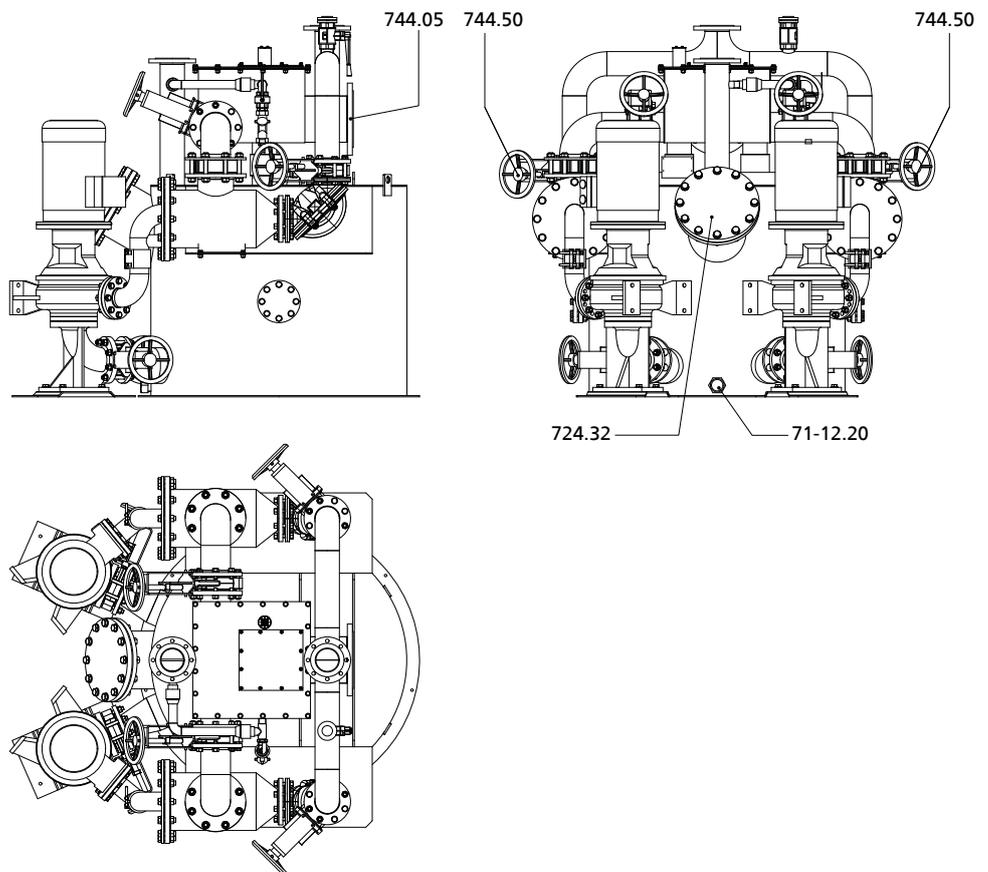


Fig. 15: Cleaning the collecting tank

71-12.20	Connection nozzle for residual drainage pump for draining the tank
724.32	Blind flange for the inspection hole

744.05	Inflow (optionally with inflow gate valve)
744.50	Gate valve in the discharge line

- ✓ The equipment has been properly shut down. (⇒ Section 6.4, Page 36)
- ✓ The non-return valve is closed and has been checked for proper functioning. (⇒ Section 6.4, Page 36)
- ✓ The discharge line is closed with a gate valve.
- ✓ Inflow gate valve 744.05¹¹⁾ is closed. If no inflow gate valve 744.05 is fitted, waste water inflow has been prevented by other appropriate measures.
- ✓ An appropriate container for solids to be disposed of is available.
 1. Water level below the inspection hole: Open the inspection hole blind flange 724.32. Insert a suitable submersible motor pump with hose system. (Alternatively, the contents of the collecting tank can be extracted or drained via the connection nozzle 71-12.20 for the residual drainage pump.)
 - ⇒ The system and collecting tank have been drained.
 2. Clean the collecting tank.
 3. Mount the blind flange 724.32 for the inspection hole. Replace the sealing element, if necessary, and fasten the screwed connections.
 4. Tighten all bolted connections applying the specified tightening torques. (⇒ Section 7.2.3, Page 49)
 5. Return the system to service. (⇒ Section 6.5, Page 38)

7.2.2.3 Cleaning the non-return valve

	 DANGER
	<p>An incorrect sequence of the steps to be taken and malfunctioning of non-return valves may lead to overpressure in the collecting tank.</p> <p>Bursting of the collecting tank! Uncontrolled fluid leakage from the vent lines!</p> <ul style="list-style-type: none"> ▷ Step 1: Always close the discharge line first to prevent unchecked fluid backflow. ▷ Step 2: Then close the inflow line.
	 WARNING
	<p>Fluids posing a health hazard</p> <p>Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of flushing liquid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of substances posing a health hazard.

11) Optional



Fig. 16: Opening the ball non-return valve / swing check valve

- ✓ The equipment has been properly shut down. (⇒ Section 6.4, Page 36)
- ✓ The non-return valve is closed and has been checked for proper functioning. (⇒ Section 6.4, Page 36)
- ✓ The discharge line is closed with a gate valve.
- ✓ The inflow gate valve¹²⁾ is closed. If no inflow gate valve is fitted, waste water inflow has been prevented by other appropriate measures.
- ✓ An appropriate container for solids to be disposed of is available.
 1. Undo the cover bolts.
 2. Remove the cover and the non-return element.
 3. Check the non-return element for wear and clean the inside of the valve.
 4. Fit the cover. Fasten it with the bolts after the sealing elements have been replaced.
 5. Tighten all bolted connections applying the specified tightening torques. (⇒ Section 7.2.3, Page 49)
 6. Re-open the appropriate valves (gate valves).
 7. Return the pump which has been shut down to service.

	NOTE
Depending on the system type, the non-return valve can be cleaned with the parallel pump in operation. Not an option for: AmaDS ³ 02.10/2/01.10 Option for: AmaDS ³ 02.10/2/01.11 and all larger models	

7.2.3 Tightening torques

Observe the tightening torques for the screwed / bolted connections based on the bolt size and bolt material.

Table 18: Tightening torques

Thread	Torque
	[Nm]
	A4-70 / 1.4462
M4	2
M5	4
M 6	7
M 8	17
M 10	35
M 12	60
M 16	150

12) Optional

Thread	Torque
	[Nm]
	A4-70 / 1.4462
M 20	290
M 24	278 / 500
M 27	409 / 736
M 30	554 / 1000

8 Trouble-shooting

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

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

Table 19: Trouble-shooting

Faults	Possible cause	Remedy
The fluid level in the collecting tank cannot be lowered.	System clogged	<ul style="list-style-type: none"> ✓ The operating manual of the pump set is on hand. ✓ The operating manual of the control system is on hand. 1. Shut down the pump set in compliance with the operating manual and secure it against unintentional start-up. 2. Close the gate valve in the discharge line first. Then close the gate valve in the inflow line. 3. Check and, if necessary, clean the respective non-return valves. 4. Check and, if necessary, clean the respective solids separator. 5. Check and, if necessary, clean the collecting tank including sensor zones. 6. Check and, if necessary, clean the respective suction line. 7. Check and, if necessary, clean the respective pump in compliance with the operating manual of the pump set. 8. Check the inflow and inflow splitter system.
	Defective pump set	<ul style="list-style-type: none"> ✓ The operating manual of the pump set is on hand. ✓ The operating manual of the control system is on hand. 1. Shut down the system. 2. Service the pump set in compliance with the operating manual of the pump set.
	Control system displays error message.	<ul style="list-style-type: none"> ✓ The operating manual of the control system is on hand. 1. Deal with the error messages in compliance with the operating manual of the control system.
	Discharge line clogged	<ul style="list-style-type: none"> 1. Request sewer cleaning vehicle. 2. Close the gate valve in the discharge line. 3. Flush the discharge line. Caution: Do not exceed the discharge line's maximum pressure class. Observe sewer cleaning company's specifications.
	Inflow rate too high	<ul style="list-style-type: none"> 1. Find the cause of the additional inflow of water and take remedial action.
	The collecting tank's venting equipment does not function properly.	<ul style="list-style-type: none"> 1. Find the cause and take remedial action; check for proper functioning.

9 Related Documents

9.1 Configuration of the solids separation system

9.1.1 AmaDS³ 02.10/2/01.10, 02.10/2/01.11, 03.10/2/02.10, compact collecting tank

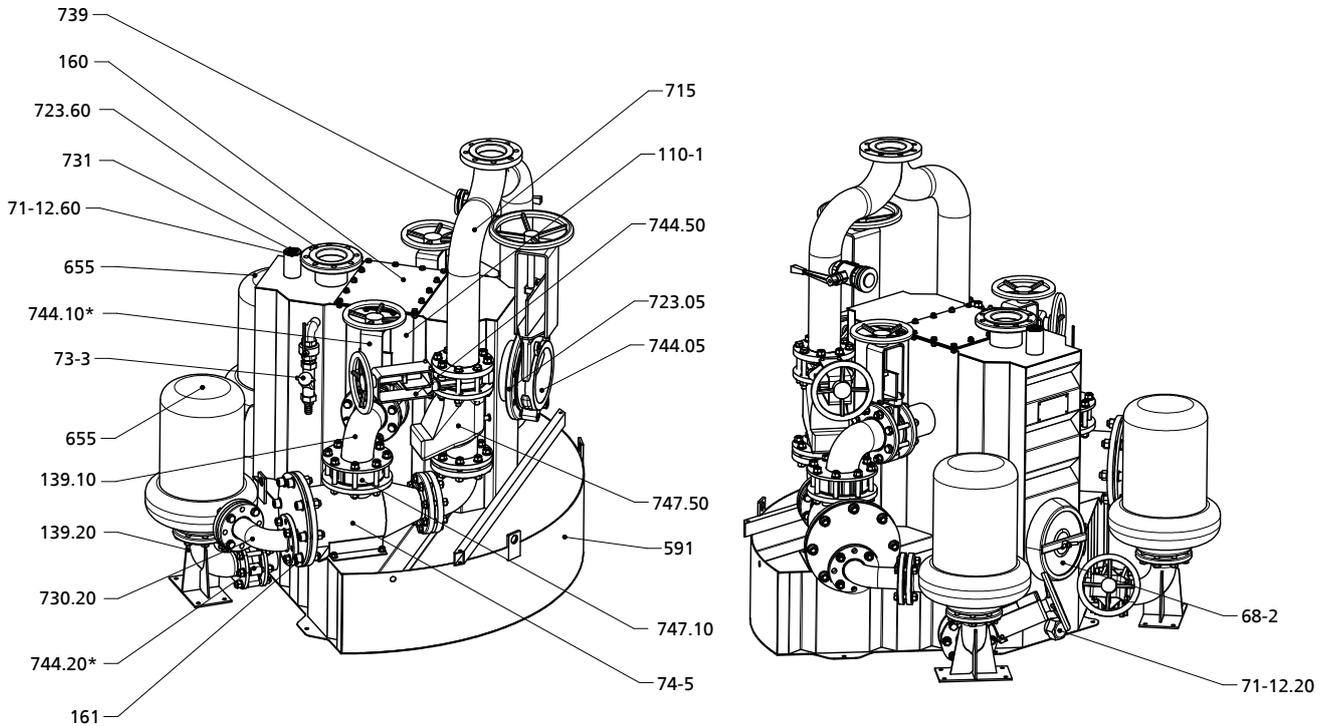


Fig. 17: Example: AmaDS³ 02.10/2/01.10, 02.10/2/01.11, 03.10/2/02.10, compact collecting tank

* AmaDS³ 02.10/2/01.10 systems are not fitted with gate valves 744.10 and 744.20.

Table 20: List of components

Part No.	Description	Quantity
110-1	Distributor casing (integrated)	1
139.10	Suction elbow for solids separator	2
139.20	Suction elbow for pump	2
160	Cover for distributor casing (inspection hole)	1
161	Casing cover for solids separator (separator flange plate)	2
591	Tank	1
68-2	Cover plate for the inspection hole	1
655	Pump	2
71-12.20	Connection nozzle for residual drainage pump	1
71-12.60	Connection nozzle for level sensor	1
715	Y-pipe leading to discharge line	1
723.05	Flange for inflow	1
723.60	Flange for venting	1
73-3	Hose connection for draining the installation room	1
730.20	Pipe adapter at discharge flange of the pump	2
731	Pipe union for measurement device (sealing element)	1
739	Hose coupling for flushing and cleaning	1
74-5	Solids separator	2
744.05	Gate valve for inflow (optional)	1

Part No.	Description	Quantity
744.10 ¹³⁾	Gate valve for solids separator	2
744.20 ¹³⁾	Gate valve for tank	2
744.50	Gate valve for discharge line	2
747.10	Swing check valve for inflow at the solids separator	2
747.50	Swing check valve for discharge line	2

9.1.2 AmaDS³ 03/2/03, 04.0/2/04.1, circular collecting tank

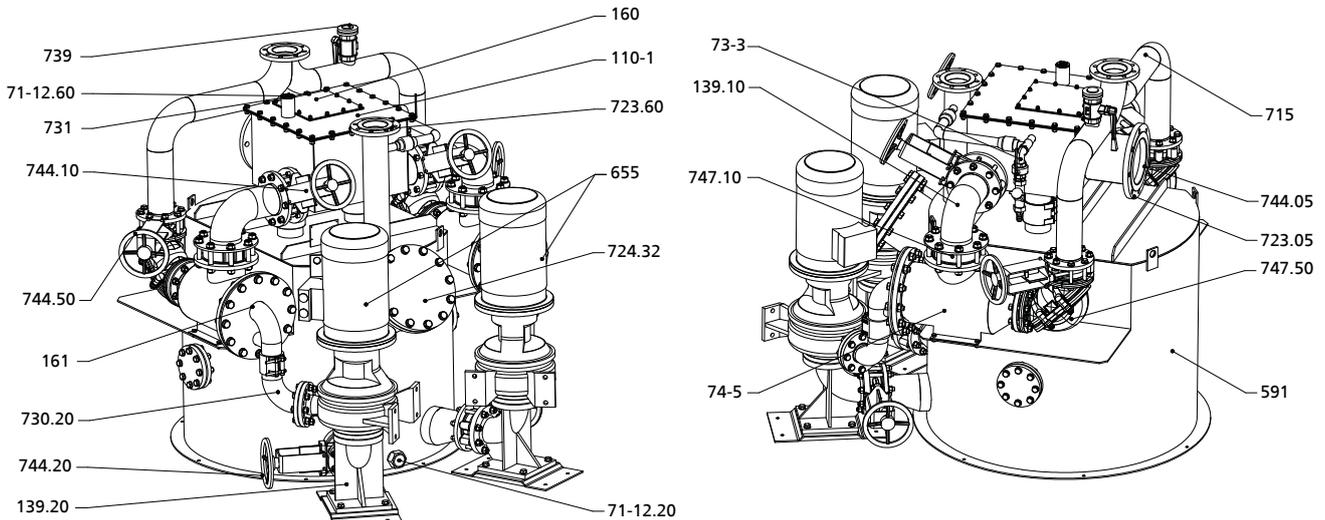


Fig. 18: Example: AmaDS³ 03/2/03, 04.0/2/04.1, circular collecting tank

Table 21: List of components

Part No.	Description	Quantity
110-1	Distributor casing	1
139.10	Suction elbow for solids separator	2
139.20	Suction elbow for pump	2
160	Cover for distributor casing (inspection hole)	1
161	Casing cover for solids separator (separator flange plate)	2
591	Tank	1
655	Pump	2
71-12.20	Connection nozzle for residual drainage pump	1
71-12.60	Connection nozzle for level sensor	1
715	Y-pipe leading to discharge line	1
723.05	Flange for inflow	1
723.60	Flange for venting	1
724.32	Blind flange for the inspection hole	1
73-3	Hose connection for draining the installation room	1
730.20	Pipe adapter at discharge flange of the pump	2
731	Pipe union for measurement device (sealing element)	1
739	Hose coupling for flushing and cleaning	1
74-5	Solids separator	2
744.05	Gate valve for inflow (optional, not shown)	1
744.10	Gate valve for solids separator	2
744.20	Gate valve for tank	2
744.50	Gate valve for discharge line	2

13) AmaDS³ 02.10/2/01.10 systems are not fitted with gate valves 744.10 and 744.20.

Part No.	Description	Quantity
747.10	Swing check valve for inflow at the solids separator	2
747.50	Swing check valve for discharge line	2

9.1.3 AmaDS³ 03.10/2/03.05, 03.10/2/03.10, 03.10/2/04.10, 04.10/2/04.11, 04.11/2/05.10, semi-circular collecting tank

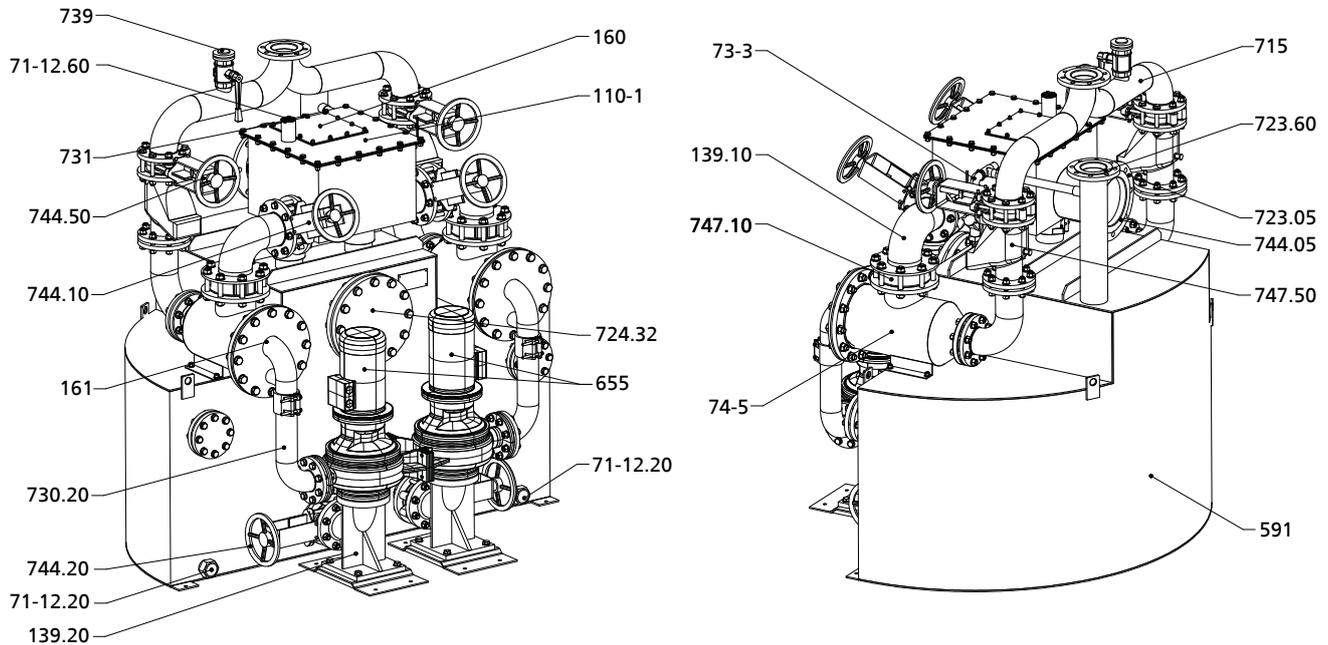


Fig. 19: Example: AmaDS³ 03.10/2/03.05, 03.10/2/03.10, 03.10/2/04.10, 04.10/2/04.11, 04.11/2/05.10, semi-circular collecting tank

Table 22: List of components

Part No.	Description	Quantity
110-1	Distributor casing	1
139.10	Suction elbow for solids separator	2
139.20	Suction elbow for pump	2
160	Cover for distributor casing (inspection hole)	1
161	Casing cover for solids separator (separator flange plate)	2
591	Tank	1
655	Pump	2
71-12.20	Connection nozzle for residual drainage pump	2
71-12.60	Connection nozzle for level sensor	1
715	Y-pipe leading to discharge line	1
723.05	Flange for inflow	1
723.60	Flange for venting	1
724.32	Blind flange for the inspection hole	1
73-3	Hose connection for draining the installation room	1
730.20	Pipe adapter at discharge flange of the pump	2
731	Pipe union for measurement device (sealing element)	1
739	Hose coupling for flushing and cleaning	1
74-5	Solids separator	2
744.05	Gate valve for inflow (optional, not shown)	1
744.10	Gate valve for solids separator	2
744.20	Gate valve for tank	2
744.50	Gate valve for discharge line	2

Part No.	Description	Quantity
747.10	Swing check valve for inflow at the solids separator	2
747.50	Swing check valve for discharge line	2

9.2 Requirements to be met by other manufacturers' control systems

Requirements to be met by other manufacturers' control systems suitable for use with the AmaDS³ solids separation system:

- Functions:**
 - Tank drainage
 - Automatic pump changeover at every start and in the case of a pump fault
 - ATEX mode (with integrated dry running protection)
 - Inflow-dependent starting
 - Runtime limitation with forced changeover, 0 - 600 seconds
 - Adjustable cut-in delay period, 0 - 300 seconds
 - Adjustable after-run time, 0 - 300 seconds
 - Liquid level-dependent stopping
 - Connection for optional redundant emergency level control system
 - Flushing cycle (functional check)
 - Remote acknowledgement, external faults
- Monitoring:**
 - Integrated alarm buzzer, 85 dB(A)
 - Mains-independent rechargeable battery with charging unit for powering the electronics and the level control system (optional)
 - High water alert with adjustable delay period, 0 - 600 seconds
 - Motor protection: overcurrent and short-circuit protection
 - General fault message (volt-free changeover contact)
 - Phase failure monitoring
 - Monitoring of rotary field (power supply)
 - Voltage monitoring
 - Sensor fault / broken wire detection
 - External alarm input
 - Service interval monitoring (optional)
- Information displayed:**
 - Tank water level indication
 - Traffic light LEDs signalling: operational availability, warning and alert (green/yellow/red)
 - Process symbol with LEDs for pump operation/fault and high water
 - Operation and status information per pump
 - Operating hours per pump
 - Mains voltage
 - Rotary field recognition of mains power supply
 - Pump starts per pump, manual-0-automatic switch per pump
 - Operating panel
 - Service interface: mini-USB (RS 232)
- Variant:**
 - Control of two pumps
 - Signalling module for transmitting alerts (optional)
 - Signalling module for transmitting the fill level (analog) 4 - 20 mA (optional)
 - Connection for level sensor 4 - 20 mA, analog
 - Connection/supply to level sensor in potentially explosive atmospheres via intrinsic safety barrier (optional)
 - Connection for redundant digital emergency level control system (optional)
 - Motor protection via bimetal switch (1 x)/PTC relay (1 x)
 - Master switch
 - Sheet steel housing

i Due to the system's design, parallel operation of 2 pumps is not advisable and provisions must be made to avoid it in automatic mode.

Inputs and outputs: Digital inputs:

- 12...25.2 V DC or 230 V AC
- Motor protection via bimetal switch, 24 V DC
- Motor protection via PTC relay
- 1 x external alarm input, 24 V DC
- 1 x remote acknowledgement, 24 V DC

Digital outputs:

- 1 x volt-free signalling output, changeover contact, max. 230 V DC / 1 A
- 1 x signalling output, 12 V DC, max. 200 mA

Analog inputs:

- 4 - 20 mA (two-wire and three-wire) input resistor ≤ 300 Ohm

Operating data: Table 23: Operating data

	Values to be observed:
Nominal operating voltage:	3 x 400 V (L1-L2-L3-N-PE)
Mains frequency:	50 / 60 Hz
Nominal insulation voltage:	500 V AC
Starting method:	DOL/star-delta
Transmitter supply:	24 V +/- 10 %, max. impedance 200 mA DC
Temperature range:	
▪ Operation	-10 to +50 °C
▪ Storage	0 to 70 °C
Enclosure	IP 54

Electronic planning

- Detailed information for the use of a PLC-based electronic control system – if the customer does not use KSB's control system – will be submitted on request.
- Detailed information for the use of the AmaDS³ solids separation system with a pneumatically operated, bypass line installed gate valve as special accessory will be submitted on request.
- Detailed information for the use of the AmaDS³ solids separation system as a controlled-discharge pump station will be submitted on request.

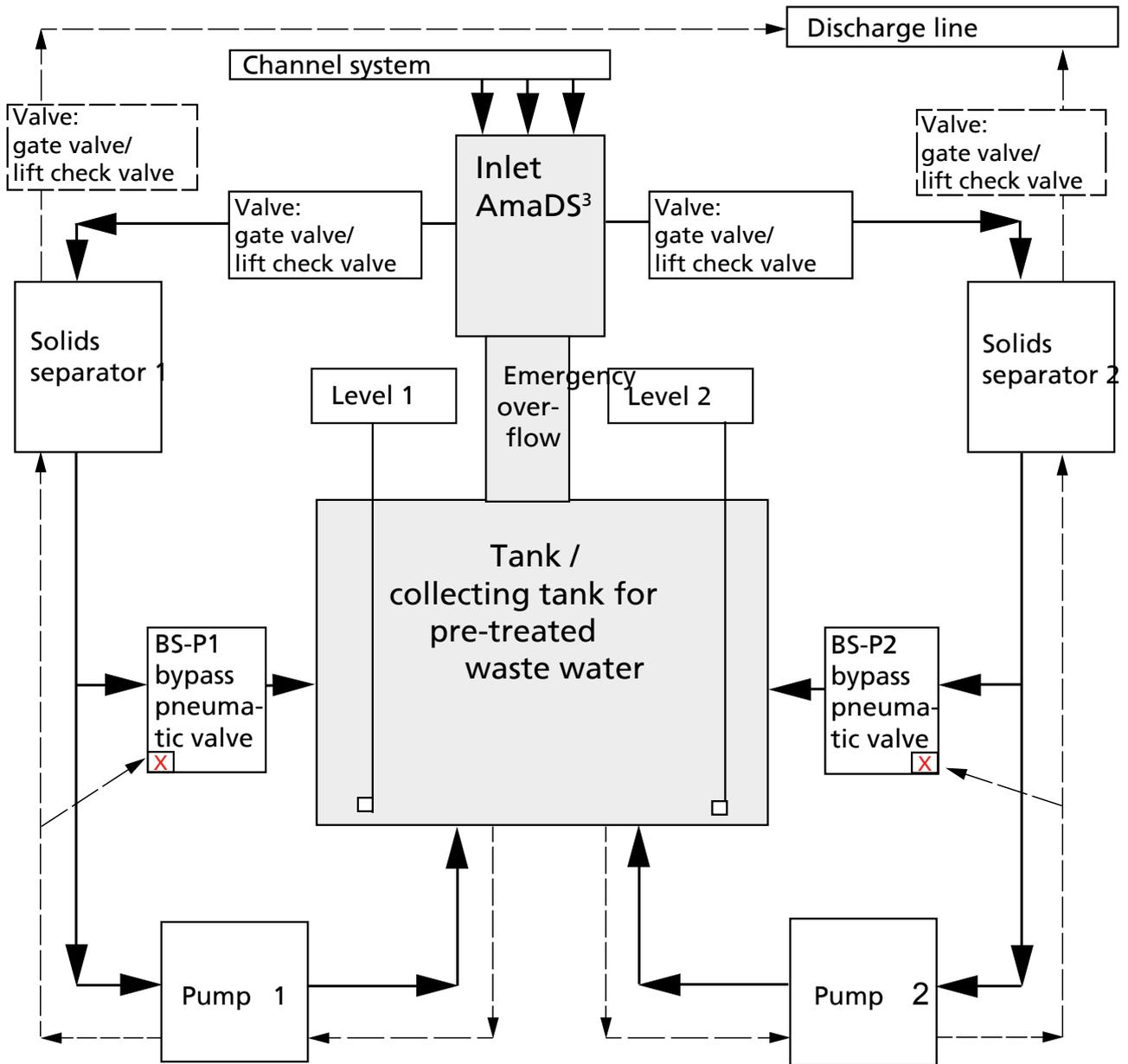


Fig. 20: Function chart

Arrows with uninterrupted line:	Inflow phase, pump is not running
Arrows with dashed line:	Operating phase, pump is running

Control functions:

- P1/P2 ON and OFF
- BS-P1 / BS-P2 ("X") CLOSED in operating phase and OPEN in inflow phase

9.3 Spare Parts

9.3.1 List of spare parts, AmaDS³ 02.10/2/01.10, 02.10/2/01.11, 03.10/2/02.10, compact collecting tank

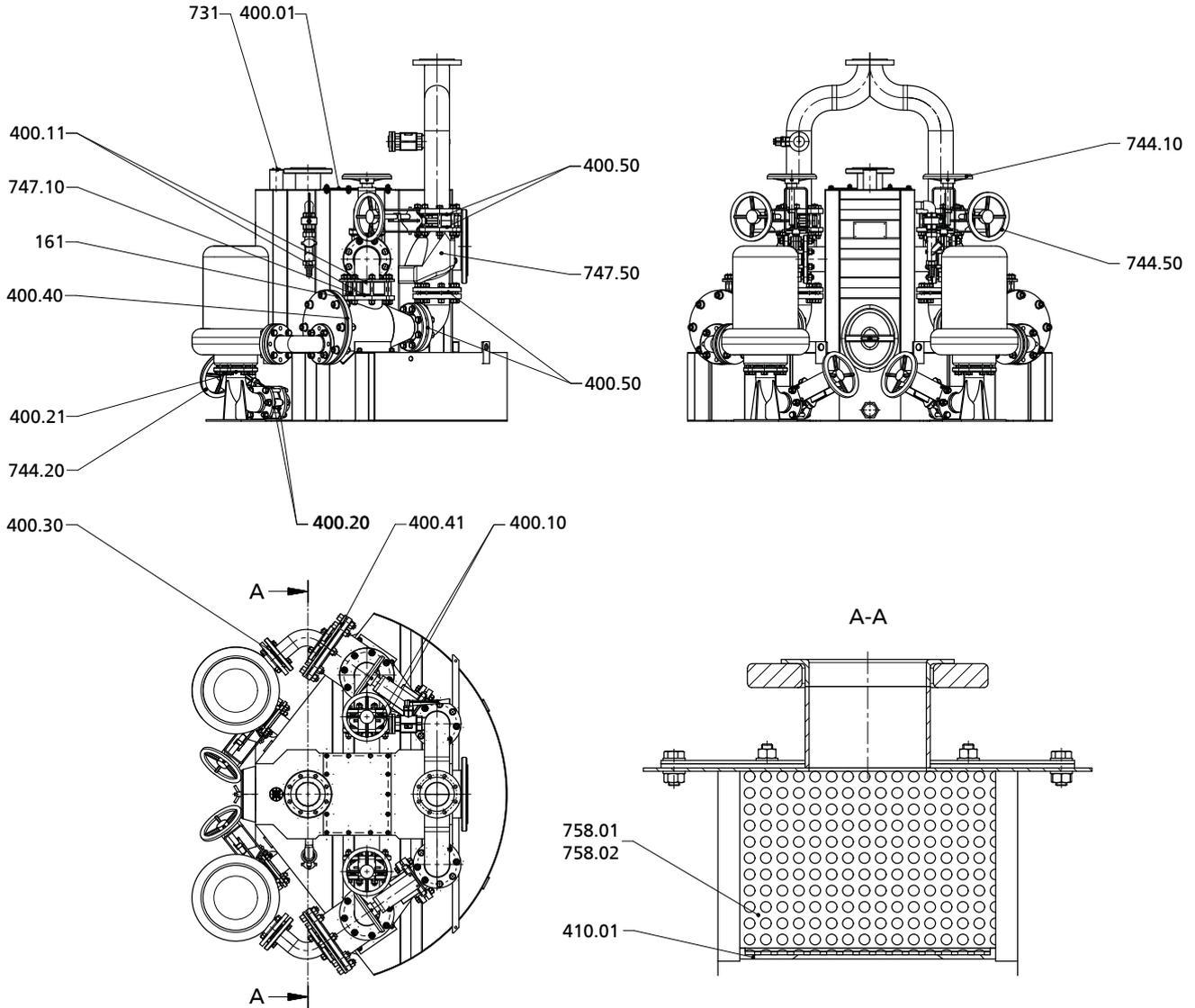


Fig. 21: AmaDS³ 02.10/2/01.10, 02.10/2/01.11, 03.10/2/02.10, compact collecting tank

Table 24: List of components

Part No.	Description
161	Casing cover for solids separator (separator flange plate)
400.01/.10/.11/.20/.21/.30/.40/.41/.50	Gasket
410.01	Profile seal
731	Pipe union for measurement device (sealing element)
744.10/.20/.50	Gate valve
747.10/.50	Swing check valve
758.01/02	Strainer insert (closed or perforated)

9.3.2 List of spare parts, AmaDS³ 03/2/03, 04.0/2/04.1, circular collecting tank

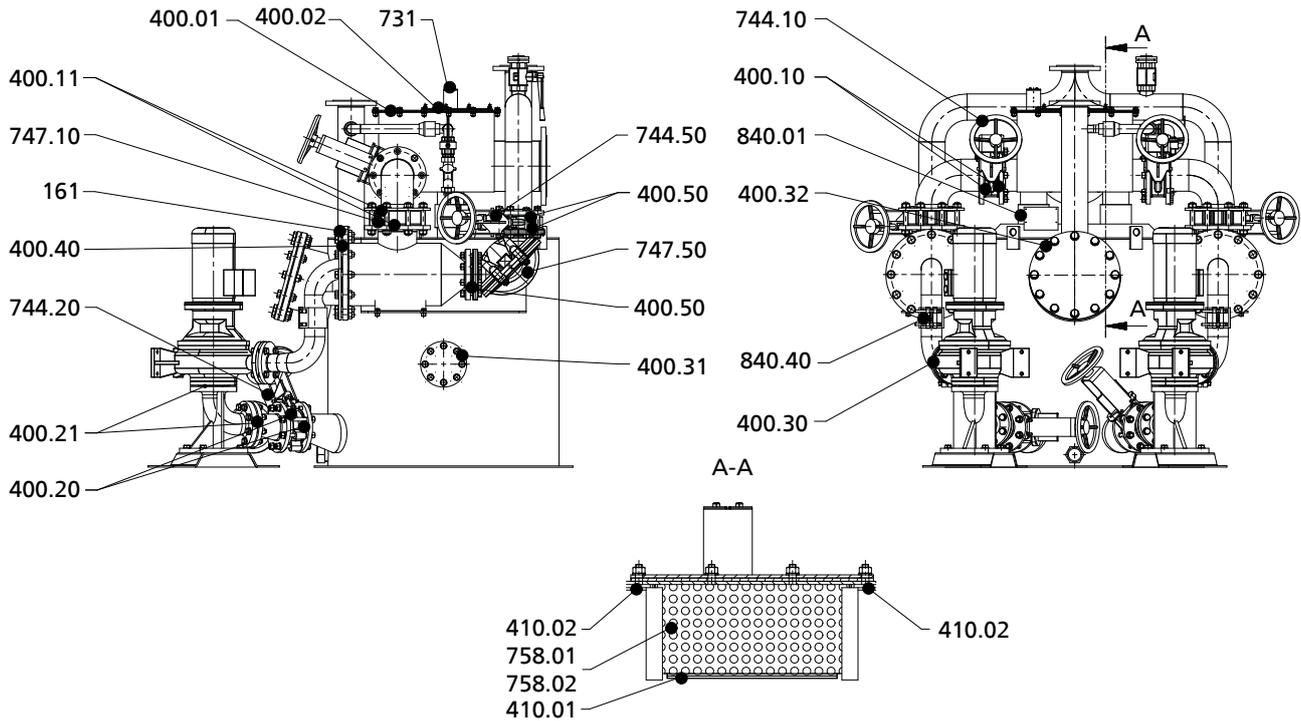


Fig. 22: AmaDS³ 03/2/03, 04.0/2/04.1, circular collecting tank

Table 25: List of components

Part No.	Description
161	Casing cover for solids separator (separator flange plate)
400.01/02/10/11/20/21/30/31/32/40/50	Gasket
410.01/02	Profile seal
731	Pipe union for measurement device (sealing element)
744.10/20/50	Gate valve
747.10/50	Swing check valve
758.01/02	Strainer insert (closed or perforated)
840.01/40	Coupling

9.3.3 List of spare parts, AmaDS³ 03.10/2/03.05, 03.10/2/03.10, 03.10/2/04.10, 04.10/2/04.11, semi-circular tank

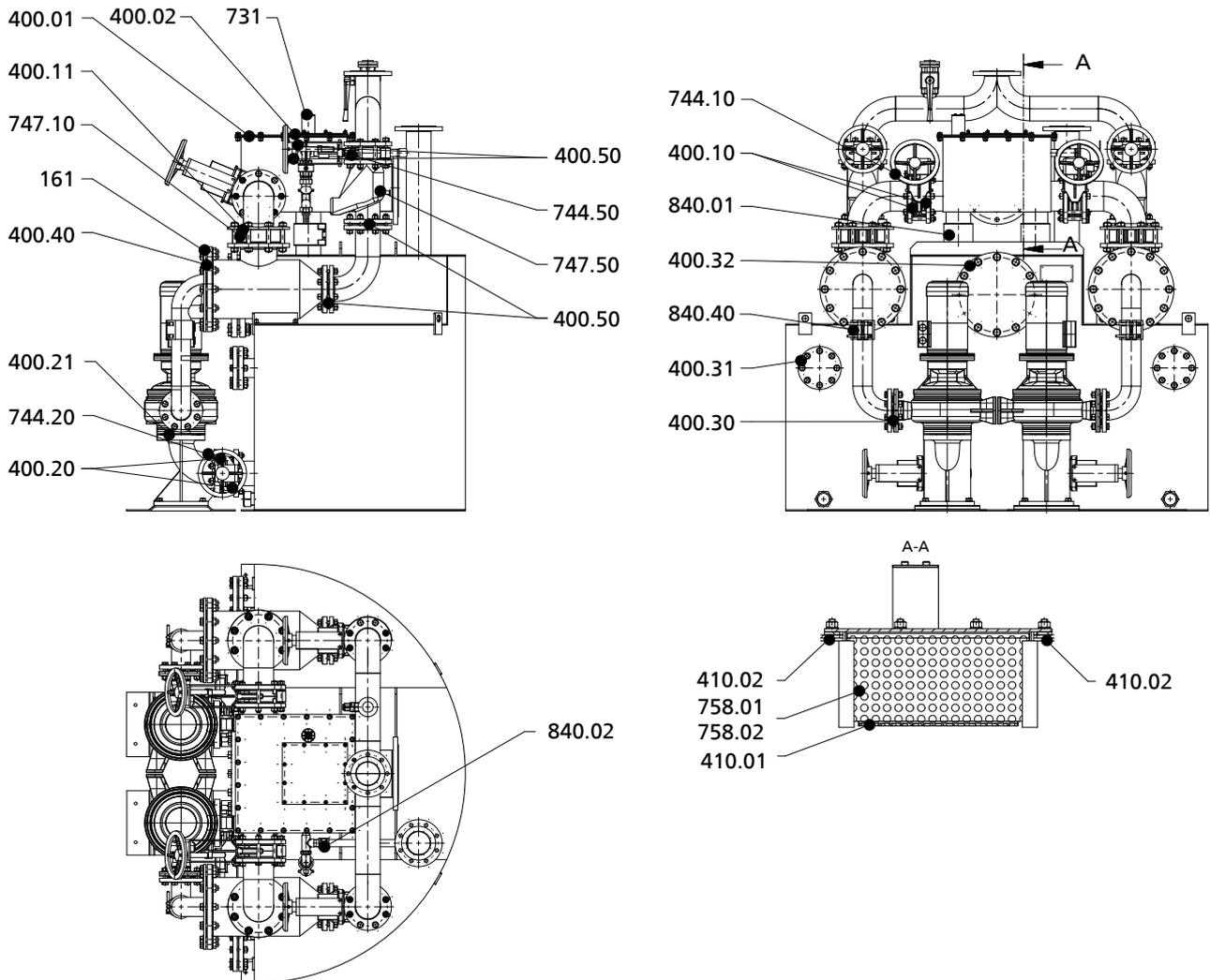


Fig. 23: AmaDS³ 03.10/2/03.05, 03.10/2/03.10, 03.10/2/04.10, 04.10/2/04.11, semi-circular tank

Table 26: List of components

Part No.	Description
161	Casing cover for solids separator (separator flange plate)
400.01/02/10/11/20/21/30/31/32/40/50	Gasket
410.01/02	Profile seal
731	Pipe union for measurement device (sealing element)
744.10/20/50	Gate valve
747.10/50	Swing check valve
758.01/02	Strainer insert (closed or perforated)
840.01/02/40	Coupling

9.3.4 List of spare parts, AmaDS³ 04.11/2.05.10, semi-circular tank

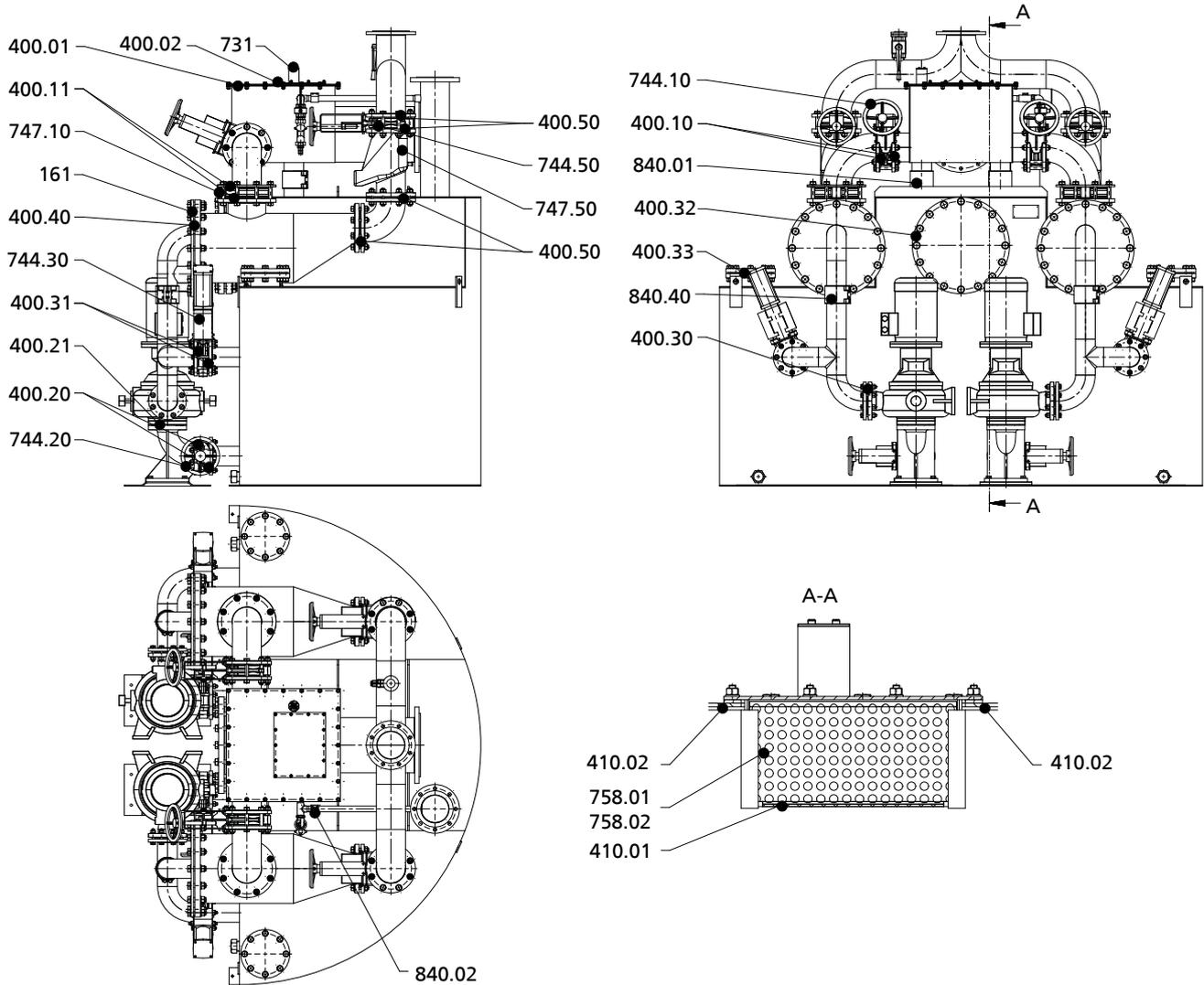


Fig. 24: AmaDS³ 04.11/2.05.10, semi-circular tank

Table 27: List of components

Part No.	Description
161	Casing cover for solids separator (separator flange plate)
400.01/.02/.10/.11/.20/.21/.30/.31/.32/.33/.40/.50	Gasket
410.01/.02	Profile seal
731	Pipe union for measurement device (sealing element)
744.10/.20/.30/.50	Gate valve
747.10/.50	Swing check valve
758.01/.02	Strainer insert (closed or perforated)
840.01/.02/.40	Coupling

9.4 Further information

9.4.1 LevelControl settings for AmaDS³ 02.10/2/01.10

Order: _____

Project: _____

Date: _____

AmaDS³ 02.10/2/01.10

Table 28: Enter settings here!

Mode	Name	Factory setting	Personal setting	Description/details
		Parameter	Parameter	
3-3-2	1 stand-by pump, 1 Pp HW	1 stand-by pump, 1 Pp HW		Always only 1 pump in operation
3-3-6	ATEX Mode	1		Yes
3-3-4-1	Level Pumps OFF	200 mm		
3-3-4-2	Level Base Load ON	500 mm		
3-3-4-3	Level Peak Load ON	650 mm		
3-3-4-4	Level High Water	650 mm		
3-3-5-1	Start Delay	0 s		Only after a power failure
3-3-5-3	Stop Delay	0 s		
3-3-5-4	Max. Pump Run Time	120 s		Runtime forced changeover
3-3-5-5	Minimum Standstill Period	100 s		
3-3-5-6	Baseload Delay	10 s		Start delay
3-3-7-1	Pump Changeover Mode	0		Pump changeover after each start
3-4-2	Measurement Method	2		4 - 20 mA sensor
3-4-3-1	Level at 4 mA	50		Sensor 5 cm above the tank floor
3-4-3-2	Level at 20 mA	6000		Measuring range of the sensor
3-6-5-1	4 - 20 mA Output Selection	Level (analog)		Analog level output
3-7-1	Check Run ON/OFF	1		
3-7-2	Function Run Time	10 s		
3-7-3	Standstill Period	2 h		
3-9-3	Delay High Water	180 s		Delay of external alarm
4-1-3	Product Key			
4-2-1	Pump Type	AmaDS ³ 01.10		AmaDS ³ module type

9.4.2 LevelControl settings for AmaDS³ 02.10/2/01.11

Order: _____

Project: _____

Date: _____

AmaDS³ 02.10/2/01.11
Table 29: Enter settings here!

Mode	Name	Factory settings	Personal setting	Description/details
		Parameter	Parameter	
3-3-2	1 stand-by pump, 1 Pp HW	1 stand-by pump, 1 Pp HW		Always only 1 pump in operation
3-3-6	ATEX Mode	1		Yes
3-3-4-1	Level Pumps OFF	250 mm		
3-3-4-2	Level Base Load ON	650 mm		
3-3-4-3	Level Peak Load ON	800 mm		
3-3-4-4	Level High Water	800 mm		
3-3-5-1	Start Delay	0 s		Only after a power failure
3-3-5-3	Stop Delay	0 s		
3-3-5-4	Max. Pump Run Time	120 s		Runtime forced changeover
3-3-5-5	Minimum Standstill Period	100 s		
3-3-5-6	Baseload Delay	10 s		Start delay
3-3-7-1	Pump Changeover Mode	0		Pump changeover at every start
3-4-2	Measurement Method	2		4 - 20 mA sensor
3-4-3-1	Level at 4 mA	50		Sensor 5 cm above the tank floor
3-4-3-2	Level at 20 mA	6000		Measuring range of the sensor
3-6-5-1	4 - 20 mA Output Selection	Level (analog)		Analog level output
3-7-1	Check Run ON/OFF	1		
3-7-2	Function Run Time	10 s		
3-7-3	Standstill Period	2 h		
3-9-3	Delay High Water	180 s		Delay of external alarm
4-1-3	Product Key			
4-2-1	Pump Type	AmaDS ³ 01.11		AmaDS ³ module type

9.4.3 LevelControl settings for AmaDS³ 03.10/2/02.10

Order: _____

Project: _____

Date: _____

AmaDS³ 03.10/2/02.10
Table 30: Enter settings here!

Mode	Name	Factory settings	Personal setting	Description/details
		Parameter	Parameter	
3-3-2	1 stand-by pump, 1 Pp HW	1 stand-by pump, 1 Pp HW		Always only 1 pump in operation
3-3-6	ATEX Mode	1		Yes
3-3-4-1	Level Pumps OFF	250 mm		
3-3-4-2	Level Base Load ON	950 mm		
3-3-4-3	Level Peak Load ON	1100 mm		
3-3-4-4	Level High Water	1100 mm		
3-3-5-1	Start Delay	0 s		Only after a power failure
3-3-5-3	Stop Delay	0 s		
3-3-5-4	Max. Pump Run Time	120 s		Runtime forced changeover
3-3-5-5	Minimum Standstill Period	100 s		
3-3-5-6	Baseload Delay	10 s		Start delay
3-3-7-1	Pump Changeover Mode	0		Pump changeover at every start
3-4-2	Measurement Method	2		4 - 20 mA sensor
3-4-3-1	Level at 4 mA	50		Sensor 5 cm above the tank floor
3-4-3-2	Level at 20 mA	6000		Measuring range of the sensor
3-6-5-1	4 - 20 mA Output Selection	Level (analog)		Analog level output
3-7-1	Check Run ON/OFF	1		Interval
3-7-2	Function Run Time	10 s		
3-7-3	Standstill Period	2 h		
3-9-3	Delay High Water	180 s		Delay of external alarm
4-1-3	Product Key			
4-2-1	Pump Type	AmaDS ³ 02.10		AmaDS ³ module type

9.4.4 LevelControl settings for AmaDS³ 03/2/03, 03.10/2/03.10, 03.10/2/03.05

Order: _____

Project: _____

Date: _____

**AmaDS³ 03/2/03
 AmaDS³ 03.10/2/03.10
 AmaDS³ 03.10/2/03.05**
Table 31: Enter settings here!

Mode	Name	Factory settings	Personal setting	Description/details
		Parameter	Parameter	
3-3-2	1 Stand-by pump, 1 Pp HW	1 Stand-by pump, 1 Pp HW		Always only 1 pump in operation
3-3-6	ATEX Mode	1		Yes
3-3-4-1	Level Pumps OFF	300 mm		
3-3-4-2	Level Base Load ON	950 mm		
3-3-4-3	Level Peak Load ON	1300 mm		
3-3-4-4	Level High Water	1300 mm		
3-3-5-1	Start Delay	0 s		Only after a power failure
3-3-5-3	Stop Delay	0 s		
3-3-5-4	Max. Pump Run Time	120 s		Runtime forced changeover
3-3-5-5	Minimum Standstill Period	100 s		
3-3-5-6	Baseload Delay	20 s		Start delay
3-3-7-1	Pump Changeover Mode	0		Pump changeover at every start
3-4-2	Measurement Method	2		4 - 20 mA sensor
3-4-3-1	Level at 4 mA	50		Sensor 5 cm above the tank floor
3-4-3-2	Level at 20 mA	6000		Measuring range of the sensor
3-6-5-1	4 - 20 mA Output Selection	Level (analog)		Analog level output
3-7-1	Check Run ON/OFF	1		Interval
3-7-2	Function Run Time	10 s		
3-7-3	Standstill Period	6 h		
3-9-3	Delay High Water	180 s		Delay of external alarm
4-1-3	Product Key			
4-2-1	Pump Type	AmaDS ³ 03		AmaDS ³ module type

9.4.5 LevelControl settings for AmaDS³ 04.0/2/04.1

Order: _____

Project: _____

Date: _____

AmaDS³ 04.0/2/04.1

Table 32: Enter settings here!

Mode	Name	Factory settings	Personal setting	Description/details
		Parameter	Parameter	
3-3-2	1 Stand-by pump, 1 Pp HW	1 Stand-by pump, 1 Pp HW		Always only 1 pump in operation
3-3-6	ATEX Mode	1		Yes
3-3-4-1	Level Pumps OFF	350 mm		
3-3-4-2	Level Base Load ON	1300 mm		
3-3-4-3	Level Peak Load ON	1700 mm		
3-3-4-4	Level High Water	1700 mm		
3-3-5-1	Start Delay	0 s		Only after a power failure
3-3-5-3	Stop Delay	0 s		
3-3-5-4	Max. Pump Run Time	120 s		Runtime forced changeover
3-3-5-5	Minimum Standstill Period	100 s		
3-3-5-6	Baseload Delay	20 s		Start delay
3-3-7-1	Pump Changeover Mode	0		Pump changeover at every start
3-4-2	Measurement Method	2		4 - 20 mA sensor
3-4-3-1	Level at 4 mA	50		Sensor 5 cm above the tank floor
3-4-3-2	Level at 20 mA	6000		Measuring range of the sensor
3-6-5-1	4 - 20 mA Output Selection	Level (analog)		Analog level output
3-7-1	Check Run ON/OFF	1		Interval
3-7-2	Function Run Time	10 s		
3-7-3	Standstill Period	6 h		
3-9-3	Delay High Water	180 s		Delay of external alarm
4-1-3	Product Key			
4-2-1	Pump Type	AmaDS ³ 04.1		AmaDS ³ module type

9.4.6 LevelControl settings for AmaDS³ 03.10/2/04.10

Order: _____

Project: _____

Date: _____

AmaDS³ 03.10/2/04.10
Table 33: Enter settings here!

Mode	Name	Factory settings	Personal setting	Description/details
		Parameter	Parameter	
3-3-2	1 Stand-by pump, 1 Pp HW	1 Stand-by pump, 1 Pp HW		Always only 1 pump in operation
3-3-6	ATEX Mode	1		Yes
3-3-4-1	Level Pumps OFF	350 mm		
3-3-4-2	Level Base Load ON	1100 mm		
3-3-4-3	Level Peak Load ON	1500 mm		
3-3-4-4	Level High Water	1500 mm		
3-3-5-1	Start Delay	0 s		Only after a power failure
3-3-5-3	Stop Delay	0 s		
3-3-5-4	Max. Pump Run Time	120 s		Runtime forced changeover
3-3-5-5	Minimum Standstill Period	100 s		
3-3-5-6	Baseload Delay	20 s		Start delay
3-3-7-1	Pump Changeover Mode	0		Pump changeover at every start
3-4-2	Measurement Method	2		4 - 20 mA sensor
3-4-3-1	Level at 4 mA	50		Sensor 5 cm above the tank floor
3-4-3-2	Level at 20 mA	6000		Measuring range of the sensor
3-6-5-1	4 - 20 mA Output Selection	Level (analog)		Analog level output
3-7-1	Check Run ON/OFF	1		Interval
3-7-2	Function Run Time	10 s		
3-7-3	Standstill Period	6 h		
3-9-3	Delay High Water	180 s		Delay of external alarm
4-1-3	Product Key			
4-2-1	Pump Type	AmaDS ³ 04.10		AmaDS ³ module type

9.4.7 LevelControl settings for AmaDS³ 04.10/2/04.11

Order: _____

Project: _____

Date: _____

AmaDS³ 04.10/2/04.11
Table 34: Enter settings here!

Mode	Name	Factory settings	Personal setting	Description/details
		Parameter	Parameter	
3-3-2	1 Stand-by pump, 1 Pp HW	1 Stand-by pump, 1 Pp HW		Always only 1 pump in operation
3-3-6	ATEX Mode	1		Yes
3-3-4-1	Level Pumps OFF	350 mm		
3-3-4-2	Level Base Load ON	1300 mm		
3-3-4-3	Level Peak Load ON	1700 mm		
3-3-4-4	Level High Water	1700 mm		
3-3-5-1	Start Delay	0 s		Only after a power failure
3-3-5-3	Stop Delay	0 s		
3-3-5-4	Max. Pump Run Time	120 s		Runtime forced changeover
3-3-5-5	Minimum Standstill Period	100 s		
3-3-5-6	Baseload Delay	20 s		Start delay
3-3-7-1	Pump Changeover Mode	0		Pump changeover at every start
3-4-2	Measurement Method	2		4 - 20 mA sensor
3-4-3-1	Level at 4 mA	50		Sensor 5 cm above the tank floor
3-4-3-2	Level at 20 mA	6000		Measuring range of the sensor
3-6-5-1	4 - 20 mA Output Selection	Level (analog)		Analog level output
3-7-1	Check Run ON/OFF	1		Interval
3-7-2	Function Run Time	10 s		
3-7-3	Standstill Period	6 h		
3-9-3	Delay High Water	180 s		Delay of external alarm
4-1-3	Product Key			
4-2-1	Pump Type	AmaDS ³ 04.11		AmaDS ³ module type

9.4.8 LevelControl settings for AmaDS³ 04.11/2/05.10

Order: _____

Project: _____

Date: _____

AmaDS³ 04.11/2/05.10
Table 35: Enter settings here!

Mode	Name	Factory settings	Personal setting	Description/details
		Parameter	Parameter	
3-3-2	1 Stand-by pump, 1 Pp HW	1 Stand-by pump, 1 Pp HW		Always only 1 pump in operation
3-3-6	ATEX Mode	1		Yes
3-3-4-1	Level Pumps OFF	350 mm		
3-3-4-2	Level Base Load ON	1600 mm		
3-3-4-3	Level Peak Load ON	1800 mm		
3-3-4-4	Level High Water	1800 mm		
3-3-5-1	Start Delay	0 s		Only after a power failure
3-3-5-3	Stop Delay	0 s		
3-3-5-4	Max. Pump Run Time	120 s		Runtime forced changeover
3-3-5-5	Minimum Standstill Period	100 s		
3-3-5-6	Baseload Delay	20 s		Start Delay
3-3-7-1	Pump Changeover Mode	0		Pump changeover at every start
3-4-2	Measurement Method	2		4 - 20 mA sensor
3-4-3-1	Level at 4 mA	50		Sensor 5 cm above the tank floor
3-4-3-2	Level at 20 mA	6000		Measuring range of the sensor
3-6-5-1	4 - 20 mA Output Selection	Level (analog)		Analog level output
3-7-1	Check Run ON/OFF	1		Interval
3-7-2	Function Run Time	10 s		
3-7-3	Standstill Period	6 h		
3-9-3	Delay High Water	180 s		Delay of external alarm
4-1-3	Product Key			
4-2-1	Pump Type	AmaDS ³ 05.10		AmaDS ³ module type

9.4.9 Data recorded during commissioning / diagnosis / servicing

Table 36: Data recorded

	Recorded values	Explanations	Details
General			
Date:			
Order number:			
Order description:			
Date of commissioning:			
Installation drawing:	.	Basis: system schematic	
	.		
	.	Values entered manually	
	.		
Special aspects of the order¹⁴⁾			
Additional pumps			
Control system responses/ blockages			
Controlled-discharge pump station			
Storage sewer			
Stormwater overflow tanks			
Inlet			
Inflow rate:		Calculated based on tank volume and time	Tool: stop watch
Inflow:			
Fluctuating			
Continuous			
Overflow of the inlet tank:			
Emergency overflow open:			
Emergency overflow closed:			
Condition of the emergency overflow:			
Operation			
Level ON:		Checking the set values	1. Level sensor signal This signal is interrupted for a configurable period of time after which the pump will start up.
Stabilisation time:		Checking the set values	Purpose: Limiting the number of pump starts, changing the start-up point depending on the inflow rate.
Level OFF:		Checking the set values	2. Level sensor signal This signal is extended for a configurable period of time after which the pump will stop.
Stop delay:		Checking the set values	Purpose: Safe stopping when the pump no longer transports any fluid and the level during operation does not fall any further.
Pump runtime:		The time the pump has been running in seconds.	
Inflow period:		The duration of the inflow phase with the pump not running in seconds.	

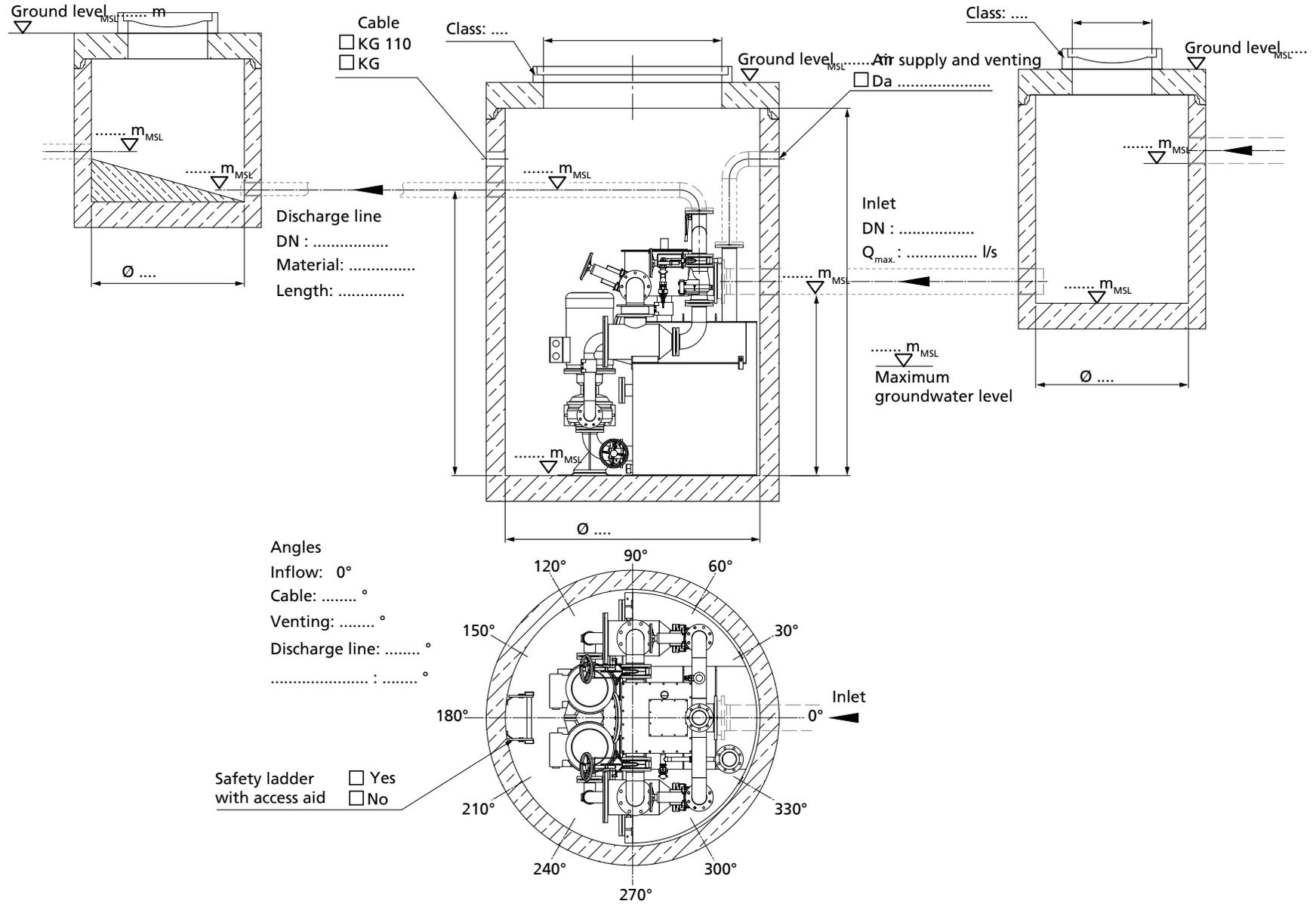
14) If a defined minimum flow rate (hourly average) must be reached for solids separation systems, please specify this average flow rate per hour.

	Recorded values	Explanations	Details
Cycle time (total):		Sum of inflow period and pump runtime	
High water / overflow:		Checking the set values	
Delay period HW:		Checking the set values	3. Level sensor signal This signal is interrupted for a configurable period of time after which the "HW" signal will be released. Purpose: Unwanted fault messages caused by waves, surges or excessive inflow are prevented as the conditions calm down within a certain period of time.
Pumps			
Direction of rotation:			
	Pump 1		
	Pump 2		
Noise:			
	Pump 1		
	Pump 2		
Current values:			
	Pump 1		
	Pump 2		
General condition:			
	Pump 1		
	Pump 2		
Leak tightness:			
	Pump 1		
	Pump 2		
Fastening:			
	Pump 1		Re-tightening of all bolted/ screwed connections.
	Pump 2		Re-tightening of all bolted/ screwed connections.
Settings			
Maximum runtime:		Checking the set values	4. Signal from the control unit. During continuous operation of one pump, a forced changeover to the stand-by separator/ pump combination will be effected after a configurable period of time has lapsed. The set maximum runtime must match the pump sets' periods of operation and periods at rest. Purpose: Inflow is directed to the separator/ pump combination which is on stand-by. If a level signal is continuously present, the same pump will be running all the time. To prevent clogging as a result of continuous operation a forced changeover to the stand-by combination is essential. The separator which was in the inflow phase will now be flushed in the pumping phase. The changeover is effected as a function of time.
Pump changeover:		Adjustments if required	
Run-up time			
	Soft start / star-delta:		Adjustments if required
	Frequency inverter:		Adjustments if required

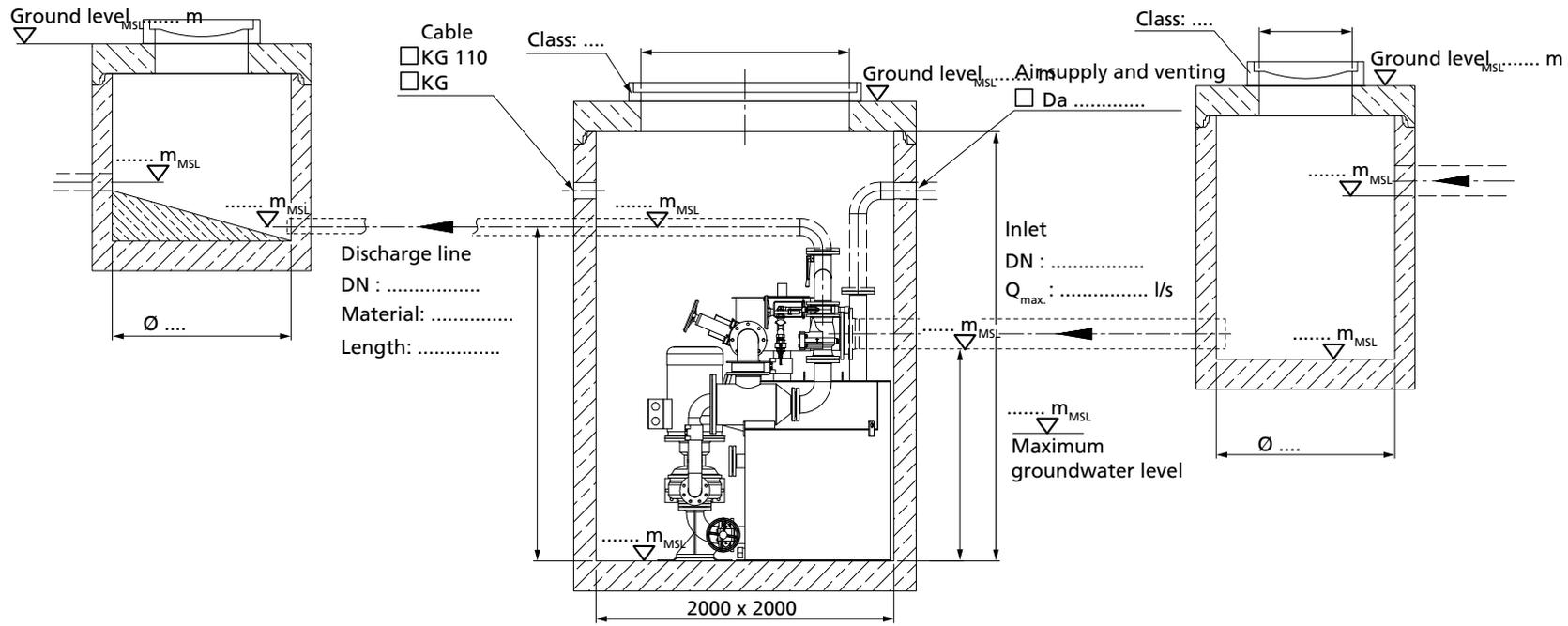
		Recorded values	Explanations	Details
	Ramp:			
	Starting frequency:			
	Brake time:		Monitoring and adjustments (if required) in case of pressure surges	
System				
	General condition:		Report / photo	
	Access opening:		Size / clearance	
	Ventilation:		Photos, design	
	Solids separators:		Report / photo	
	Check valve		Report / photo	
	Separator strainers / separator plates		Report / photo	
	Inflow check valve		Report / photo	
	Pressure measurement:		Data ¹⁵⁾	If the required equipment is available, the operating point of the system can be determined under actual operating conditions.
	Pressure at rest:		Data ¹⁵⁾	
	Operating pressure:		Data ¹⁵⁾	
	Measurement point / height:		Data ¹⁵⁾	This refers to the height difference between the measurement point and the sump floor.
Discharge line				
	Valves:			
	Height of the vertical riser (up to the point where the pipes reach the same horizontal level):			
	Pressure surges:			
Miscellaneous / difficulties				
	<ul style="list-style-type: none"> · · · · 			

15) If possible

9.5 Quotation example

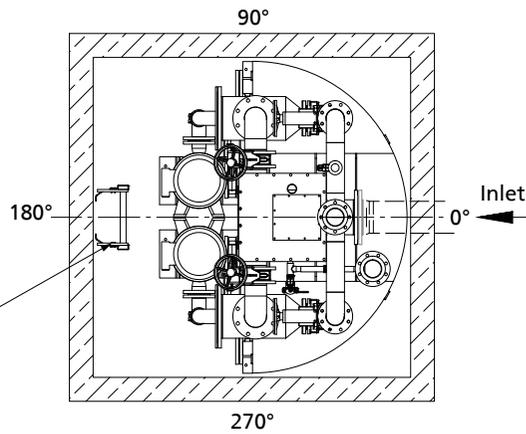


Please fill in and attach to inquiry!



- Angles
- Inflow: 0°
 - Cable:°
 - Venting:°
 - Discharge line:°
 - :°

- Safety ladder with access aid
 Yes
 No



Please fill in and attach to inquiry!

10 EU Declaration of Conformity

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

The manufacturer herewith declares that the product:

AmaDS³

KSB order number:

- is in conformity with the provisions of the following Directives as amended from time to time:
 - System: EC Machinery Directive 2006/42/EC
- Applied harmonised standards
 - ISO 12100

Person authorised to compile the technical file:

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

The EU Declaration of Conformity was issued in/on:

Place, date

.....¹⁶⁾.....

Name
Function
Company
Address

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

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