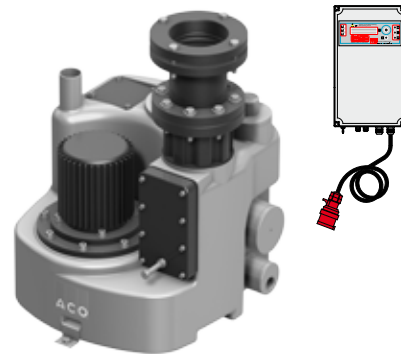


Muli-Star

Waste water lifting plant for water with faecal matter. Free-standing installation and above-floor installation in frostproof premises.

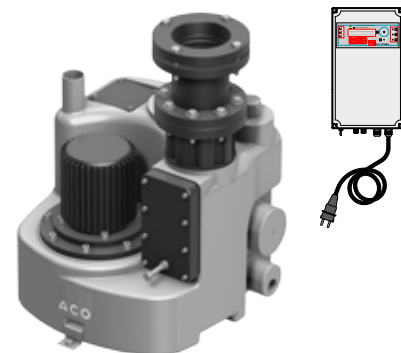
Type MDP1

Single_3-phase_pneumatic_
1 smallest container size



Type MWP1

Single_AC_pneumatic_
1 smallest container size



Please read this documentation and other product-related literature carefully to ensure safe and correct use.
Give to end users and keep it safely until the product is disposed of.

Welcome

ACO Passavant GmbH (hereafter referred to as ACO) would like to thank you for placing your confidence in us, and we have supplied you with a waste water lifting plant (hereafter referred to as the plant), which is state of the art and whose proper condition has been checked prior to delivery as part of a quality control process.



Images in these operating instructions are intended to help with basic understanding and details may vary slightly from the components supplied.

The following hints will help you to work with these operating instructions.

- A list of tables and illustrations can be found as an appendix.
- The following specific abbreviations are used in this manual:
 - Illus. = Illustration
 - Chap. = Chapter
 - max. = Maximum
 - min. = Minimum
 - mins = Minutes
 - secs = Seconds
 - hrs = Hours
 - Tab. = Table
 - e.g. = for example
- The following specific abbreviations are used in this manual:
 - ART OFF = After-running period OFF/switch-off point for the centrifugal pump
 - OFF = Base load OFF/after-running period of the centrifugal pump starts
 - ON = Base load ON/switch-on point of the centrifugal pump
 - AL = Overflow alarm

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Table of Contents

1	Introduction	6
1.1	ACO Service	6
1.2	Warranty	6
1.3	Declaration of Performance.....	6
1.4	Owners, users	6
1.5	Product Identification.....	7
1.6	Symbols used in the operating instructions	7
2	For your Safety	8
2.1	Appropriate Usage	8
2.1.1	Field of Application.....	8
2.1.2	Improper Applications.....	8
2.2	Qualification of Personnel	9
2.3	Personal Protective Equipment	10
2.4	Presentation of Warnings	11
2.5	Non-approved Parts.....	11
2.6	Basic Potential Risks	12
2.6.1	Thermal Risks.....	12
2.6.2	Risks Relating to Materials/Substances	12
2.7	Owner's Responsibility.....	12
3	Transport and Storage.....	13
3.1	Safety during Transport and Storage.....	13
3.2	Transport.....	14
3.3	Storage	15
4	Product Description.....	16
4.1	Scope of supply.....	16
4.2	Product Features	17
4.2.1	Technical Terms Used.....	17
4.2.2	Short Description of the Plant	18
4.2.3	Features of the Plant Parts.....	19
4.3	Components.....	22
4.4	Functional Principle	23
4.5	Type Plate.....	25
4.6	Accessories	25
4.7	Recommendations for Installation	26

4.8	Mono Pump Controls	27
4.8.1	Overview of Operating and Display Elements	27
4.8.2	Operating Elements.....	28
4.8.3	Display Elements	28
4.8.4	Messages in the Display Field.....	29
4.8.5	Settings.....	30
4.8.6	Setting values	30
4.8.7	Setting Options.....	31
5	Technical Data.....	33
5.1	Technical Data for Plant	33
5.2	Performance Data of the Centrifugal Pump	34
5.3	Technical Data for the Pump Controls.....	36
6	Installation.....	38
6.1	Safety during Installation.....	38
6.2	Sanitary Installation	39
6.2.1	Assembling the Tank	40
6.2.2	General Requirements for Pipework Systems	40
6.2.3	Installing the Stop Valve and Special Mounting Adapter	41
6.2.4	Connecting the Inlet Line	42
6.2.5	Installing the Stop Valve in the Inlet Line (Optional).....	43
6.2.6	Connecting Vent Stack	44
6.2.7	Installing and Connecting the Discharge Pressure Line	45
6.2.8	Connecting the Drain Line (Optional).....	47
6.2.9	Securing the Tank	48
6.3	Tightness Test.....	49
6.4	Electrical Installation	50
6.4.1	Mounting the Pump Control	51
6.4.2	Connecting the Connecting Cable for the Mini Compressor	51
6.4.3	Attaching the Mains Socket.....	52
6.4.4	Installing Cable for Transmitting the Group Alarm	52
6.4.5	Installing the Connecting Cable of the Centrifugal Pump	53
6.4.6	Install the Control Line and Connect to the Pump Controls	53
6.4.7	Attaching Mini Compressor (Optional).....	54
6.4.8	Connecting the Air Bubble Injection Line (Optional)	55
7	Commissioning and Operation.....	57
7.1	Safety during Commissioning and Operation	57
7.2	Commissioning	57
7.3	Adjusting the Ventilation Screw	58
7.4	Inserting Battery in Pump Controls	58
7.5	Adjusting the Pump Controls	59

7.6	Test Run	60
7.6.1	Specifications.....	60
7.6.2	Carry out Test Run	60
7.7	Control Checks	63
7.8	Setting Automatic Operation.....	63
7.9	Handing over Plant to User.....	63
7.10	ACO Maintenance Contract.....	63
7.11	Operation.....	64
8	Servicing	65
8.1	Safety during Installation.....	65
8.2	Plant Handbook	66
8.3	Servicing Tasks for Users	67
8.3.1	Daily Checks	67
8.3.2	Servicing Tasks as Needed	67
8.3.3	Annual Servicing Work	67
8.4	Servicing Tasks for Skilled Professionals	68
9	Correcting Faults and Repairs	69
9.1	Safety during Repairs and Fault Correction	69
9.2	Error Analysis	70
9.3	Repairs and Spares	71
10	Decommissioning and Disposal	72
10.1	Safety during Decommissioning and Disposal.....	72
10.2	Decommissioning.....	73
10.3	Stopping.....	73
10.4	Disposal	73
Appendix	74
	Index of Tables and Illustrations	74
Notes	75

1 Introduction

The greatest care has been taken when preparing these operating instructions for the Multi-Star MDP1 and MWP1, and they contain information which ensures its safe operation over a long working life.

If errors have nevertheless occurred, or if information has been omitted, please do let us know.

1.1 ACO Service

If you have any questions about the plant and the operating instructions, our ACO Service team will be happy to help.

ACO Service

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1.2 Warranty

For information on warranties see our "General Terms and Conditions", at  <http://www.aco-haustechnik.de/agb>

1.3 Declaration of Performance

The Declaration of Performance for the plant can be downloaded from the following Internet address by entering the "DoP number",  Chap. 4.5 "Type plate":
<http://www.aco-haustechnik.de/DoP>


1.4 Owners, users

The owner is responsible for the layout (planning and dimensions) of the plant. If the plant is not operated by the owner, the following points must be agreed with the user:

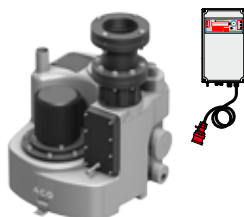
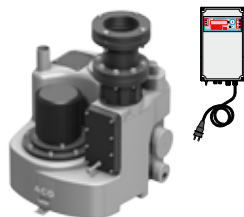
- Who is responsible for day-to-day operations?
- Who is responsible for initiating servicing or repairs for the plant?

- Who will react when there is a malfunction, for example?
- ...

1.5 Product Identification

Identify the supplied plant using the characteristic data from the type plate,  Chap. 4.5 "Type plate" and mark these on the following table.

Tab. 1: Characteristic data for product identification

	Item number	Type	Illus.	Year of construction	Serial No.
○	1200.50.00	MDP1		_____	_____
○	1200.50.01	MWP1		_____	_____

1.6 Symbols used in the operating instructions

To aid understanding, information in this operating instruction has been marked with the following symbols:




Useful tips and other information to make working with it easier

Steps to be carried out in the prescribed sequence



References to additional information in these operating instructions or in other documents



Presentation of warnings,  Chap. 2.4 "Presentation of Warnings"

2 For your Safety



In order to avoid injury to people or damage to property, read the safety instructions before installing or using the plant.

2.1 Appropriate Usage

2.1.1 Field of Application

This plant is used to collect and automatically raise waste water which contains faeces or is free of faeces above the backflow level. The waste water is fed into the waste water drain without any risk to humans or any threat to structures.


Areas of application:

- Private residential buildings
- Single residential units
- Basement flats

Other possible uses and applications, and modifications are not permitted.

2.1.2 Improper Applications

Some examples of incorrect applications are e.g.:

- Using the plant outside the scope of its application,  Chap. 5 "Technical Data".
- Letting the plant or the centrifugal pump pumps run dry.
- Using worn components (neglecting servicing).
- Ignoring these operating instructions and other documentation supplied with the product.
- Use in potentially explosive atmospheres.

Never put dangerous substances into the plant which could injure people, pollute the water or affect the proper functioning of the plant.

This includes in particular:

- Waste water containing mineral oils and fats
- Waste water containing organic oils and fats
- Heavy metals, e.g. zinc, lead, cadmium, nickel, chrome
- Corrosive substances, e.g. acids (pipe cleaning agents with a pH-value below 4), alkalines, lyes, and condensates
- Cleaning and disinfecting, rinsing and washing agents in large quantities or any which generate excessive quantities of foam.
- Inflammable or explosive substances e.g. petrol, benzene, oil, phenols, solvent-based paints, white spirit
- Solids, e.g. kitchen scraps, glass, sand, ashes, fibres, synthetic resins, tar, cardboard, textiles, fats (oils), paint
- Fluids which can set into solids, e.g. plaster of Paris, cement, lime
- Biocides, e.g. plant protection products and pest control products
- Waste water from manure pits and animal husbandry, e.g. swill, slurry, manure

2.2 Qualification of Personnel

Any activities which affect the plant must be carried out by qualified personnel, unless they are explicitly designated as suitable for other people (owners, users).

The immediate supplier of the plant is responsible for making these people available.

Qualified personnel must be able to provide proof of several years of professional experience and specific knowledge of the following:

Tab. 2: Qualification of Personnel






Tasks	Person	Knowledge
Design Functional changes New type of use	Planner	<ul style="list-style-type: none"> ■ Knowledge of sanitary engineering ■ Assessment of applications for waste water technology and correct planning of waste water lifting plants
Transport/storage	Dispatchers, dealers	<ul style="list-style-type: none"> ■ Proof of training in loading safely ■ Safe handling of lifting and fixing accessories
Installation of sanitary goods/electrical Commissioning, Servicing, Repair, Decommissioning, Dismantling, Checking	Qualified personnel	<ul style="list-style-type: none"> ■ Working safely with tools ■ Laying and connecting pipes and connectors ■ Laying electrical wiring ■ Fitting distributors, earth circuit breakers, other circuit breakers, electrical machinery, switches, buttons, mains sockets, etc. ■ Measuring effectiveness of electrical protective measures ■ Product-specific knowledge

Use, operation Monitoring operations, Simple servicing and fault correction	Owners, users	<ul style="list-style-type: none"> ■ No specific requirements
Disposal	Qualified personnel	<ul style="list-style-type: none"> ■ Correct and environmentally-friendly disposal of materials and substances ■ Decontamination of dangerous substances ■ Knowledge of recycling

2.3 Personal Protective Equipment

Personal protective equipment is required for various activities relating to the plant. Personal protective equipment must be provided to staff and its use must be enforced by supervisory staff.




Tab. 3: Personal Protective Equipment

Mandatory signs	Meaning	Explanation
	Wear safety shoes	Safety shoes offer good non-slip protection, especially in wet areas, and resistance to piercing, e.g. by nails, and also protect the feet from falling objects, e.g. when moving items.
	Wear a safety helmet	Safety helmets protect you from head injuries e.g. from falling objects or blows.
	Wear protective gloves	Protective gloves protect the hands from minor bruises, cuts, infections and hot surfaces, particularly during transport, commissioning, servicing, repairs and dismantling.
	Wear protective clothing	Protective clothing protects the skin from minor mechanical effects and from infections due to exposure to waste water.
	Wear protective goggles or glasses	Protective eye-gear will protect the eyes against exposure to waste water, especially during commissioning, servicing, repairs and decommissioning

2.4 Presentation of Warnings

To make them stand out, risks and dangers are indicated using the following warning symbols and words in these operating instructions:

Tab. 4: Levels of Risks

Warning symbols and words		Meaning	
	DANGER	Injuries	Indicates a dangerous situation which, if not prevented, will lead to death or serious injuries.
	WARNING		Indicates a dangerous situation which, if not prevented, can sometimes lead to death or serious injuries.
	BEWARE		Indicates a dangerous situation which, if not prevented, may lead to minor or moderate injuries.
	CAUTION	Damage to property	Indicates a situation which, if not prevented, may damage components, the plant and/or its functioning, or an item close by.

Examples of warning messages:



KEY WORD

Cause of risk

Impact of risk

Description/list of protective measure(s)

2.5 Non-approved Parts

The plant has completed a large number of quality control steps before it was launched, and all components were tested at maximum load.

Installing unapproved parts can compromise safety and it voids any warranty from ACO.

Only original parts from ACO, or ACO approved spares, may be used when replacing components.

2.6 Basic Potential Risks

This Chapter lists the basic risks relating to the plant.

2.6.1 Thermal Risks

The centrifugal pump works intermittently. Thermal risks do not exist in relation to the electric motor of the centrifugal pump when it is operating normally. In the event of a fault, the motor can heat up to a maximum of 110°C and cause burns, so protective equipment should be worn, see 📖 Chap. 2.3. "Personal Protective Equipment".

2.6.2 Risks Relating to Materials/Substances

On contact with waste water or contaminated pump parts, e.g. when removing obstructions, there is a risk of infection, protective equipment should be worn, 📖 Chap 2.3. "Personal Protective Equipment".

2.7 Owner's Responsibility



It is the responsibility of the owner to ensure the following points are respected:

- The plant must only be used as intended and in good operating condition, 📖Chap. 2.1 "Appropriate Usage".
- Nothing must prevent the safety devices functioning properly.
- Maintenance timetables must be respected and faults dealt with swiftly. The owner should only tackle malfunctions themselves when these measures are described in this operating instruction. ACO Service is responsible for all other tasks.
- Check the type plates on the plant for completeness and legibility, 📖 Chap. 4.5. "Type Plate".
- A sufficient quantity of personal protective equipment must be provided and must also be worn, 📖 Chap. 2.3. "Personal Protective Equipment".
- Make the operating instructions available in a legible and complete version at the place of use and train people in its contents.
- Only use qualified and authorised staff, 📖 Chap. 2.2 "Personnel Qualifications".

3 Transport and Storage

This Chapter provides information on the correct way to transport and store the plant.



The plant (weights  Chap. 5 "Technical Data") and the loose parts (packed in a box) are secured on a pallet for delivery and protected by foil. List,  Chap. 4.1. "Scope of Supply".


3.1 Safety during Transport and Storage

The following risks can arise during transport and storage:



WARNING

Read the following safety instructions carefully before transport or storage. If carried out incorrectly severe injuries may occur.

Ensure the staff carrying out the transport and storage have the necessary qualifications,  Chap. 2.2 "Qualification of Personnel".


Transporting the plant by persons

Physical injury may result from a single person trying to move too heavy a weight

- Two persons are required,  Chap 3.2 "Transport".


Transport using a forklift truck or lorry

Severe bruising, blows and serious accidents if transported incorrectly

- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".
- Move the plant while in its delivery packaging (fixed to a pallet).
- Fasten the load securely.
- Check the fastening materials for suitability and freedom from damage

Transport by crane

Severe bruising and blows from falling heavy items

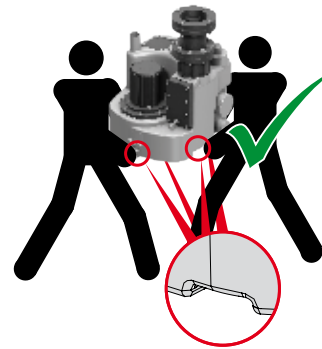
- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".
- Check the max. permitted load for the crane and the fastenings
- Never stand below a hoisted heavy item
- Make sure that no other people can access any of the danger area
- Avoid swinging movements while moving

3.2 Transport

The correct transport of the plant with 2 persons/the transport of parts using a crane is described below.

By 2 people:

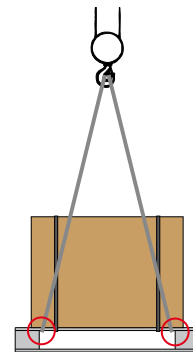
The container must be lifted by 2 persons using the carrying handles○.



By crane:

CAUTION Only transport using the crane in its delivery packaging.

The hoisting slings or ropes must be attached to the pallet○.



3.3 Storage

CAUTION Incorrect storage or storage conditions can cause damage to the plant. The following steps must be taken:

For short-term storage (less than 3 months)

- Store the plant in an enclosed, dry, dust-free and frost-free space.
- Avoid temperatures outside the range -20°C to $+60^{\circ}\text{C}$.

For long-term storage (more than 3 months)

- Store the plant in an enclosed, dry, dust-free and frost-free space.
- Avoid temperatures outside the range -20°C to $+60^{\circ}\text{C}$.
- For materials which are subject to corrosion: Apply a coating of preservative to all internal and external bare metallic parts.
- Check preservative after 6 months and repeat if necessary.

4 Product Description

This Chapter provides you with information about the scope of supply, features, components and functions.

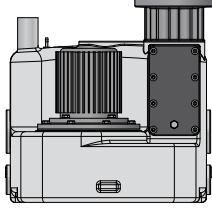
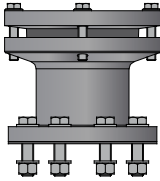

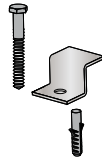
4.1 Scope of supply

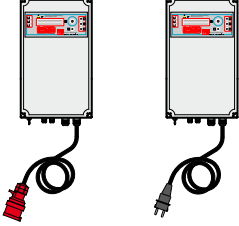
Check that the product is supplied undamaged and complete, using the following table.

CAUTION Never install a damaged plant.

Report any damage to the plant to the supplier, so that claims can be processed rapidly.

Tab. 5: Items delivered with the plant

Unit	Component	Illus.	Packaging
Tank, complete	<ul style="list-style-type: none"> ■ 1 x tank ■ 1 x control line, length 5 m ■ 1 x connecting cable 5 m long (attached to terminal boxes in the motor of the centrifugal pump and in the pump controls) 		Box
Special mounting adapter	<ul style="list-style-type: none"> ■ 1 x special mounting adapter ■ 1 x sealing ring ■ 1 x sealing ■ 1 x fixing kit (screws and washers) ■ 1 x fixing kit (screws, washers, and nuts) 		
Fitting accessories	<ul style="list-style-type: none"> ■ 2 x DN 50 pipe connectors (NBR hose with 2 clamps) ■ 1 x DN 100 pipe connector (NBR hose with 2 clamps) 		
	<ul style="list-style-type: none"> ■ 2 x brackets ■ 2 x wood screws ■ 2 x rawlplugs 		

Pump controls	<ul style="list-style-type: none"> ■ 1x ACO mono pump control (three-phase current type or alternating current type) 		Box
Documentation	<ul style="list-style-type: none"> ■ Operating instructions ■ Delivery documents 	-	Plastic bags

4.2 Product Features

This Chapter describes the main characteristics of the plant.

4.2.1 Technical Terms Used

- Backflow level:
The highest point in an installation which the polluted water can reach. The backflow level is found in the area with the greatest diameter and should be installed such that the water runs back into the sewage system and not into the lifting plant.

- Centrifugal pump with free flow impeller:
Flow machine; centrifugal force is used via a rotating impeller to keep the liquids moving. A large margin of free space in the volute (free ball passage, granulation 55 mm) allows the liquid to flow easily via the suction port into the pump chamber and allows solids and long-fibred thick matter, such as long bandages and textiles, to pass through without a problem without obstructing the volute.
A further advantage: as there is no throttle gap between the impeller and the volute, this construction offers a high level of operational safety in applications where there are long standstill periods. This prevents the impeller from seizing up and thereby obstructing the centrifugal pump.

4.2.2 Short Description of the Plant

A tank made of polyethylene collects the waste water without pressure. The tank is anchored in a buoyancy-proof manner by 2 fixing brackets.

The tank contains the hydraulic parts (volute and free flow impeller) of the centrifugal pump, the pilot tube of the level switching, and the ball retaining valve. The 5 m long control line is secured to a hose nozzle on the connecting flange of the pilot tube and thereby connects the pilot tube with the pressure switch in the pump controls.

The 3-phase or A.C. motor of the centrifugal pump is located outside the tank. The 5 m long connecting cable is attached in the pump controls.

On the pressure side of the centrifugal pump, a ball retaining valve with a venting device which can be operated from the outside is integrated in the container. An DN 80 adapter serves as external transition. A special mounting adapter is mounted on the adapter. The discharge pressure line DN 100 spigot can be inserted on-site in the special mounting adapter and flexibly connected with the supplied fixing material. A DN 80 stop valve must be fitted on-site between the adapter and the special mounting adapter.

Sockets (DN 50 and DN 100) are provided on the tank for the connection of the inlet line(s) and the ventilation line. All sockets for the inlet line are closed and must be opened before the pipeline is connected by sawing off the end piece.

A DN 50 socket and 2 R 1 ½" coupling sockets (all closed) are available at low points in the tank and enable a drain line to be connected (optional).


An inspection cover enables the internal parts and/or tank to be serviced, inspected, and cleaned.

4.2.3 Features of the Plant Parts


Tab. 6: Features of the Plant Parts

General
<ul style="list-style-type: none"> ■ Polyethylene tank ■ Revision opening (1x Ø133 mm) for easy servicing ■ Fixing kit for buoyancy-proof anchorage ■ DN 100 (3x horizontal, 1x vertical) and DN 50 (1x vertical) inlet connection ■ DN 50 ventilation connection (1x vertical) ■ Drain plug connection (1x DN 50 horizontal and 2x Rp 1" horizontal) ■ DN 70 connection (3x horizontal), only for parallel erection of the plant as connecting pipe ■ Ball retaining valve with integrated ventilation screw ■ DN 100 special mounting adapter for elastic connection of discharge pressure line ■ Connecting flange for stop valve DN 80/PN 10 ■ Centrifugal pump with free flow impeller and 3-phase-motor 400 V/50 Hz/IP 68 (type MDP1) with 5 m connecting cable ■ Centrifugal pump with free flow impeller and A.C. motor 230 V/50 Hz/IP 68 (type MWP1) with 5 m connecting cable ■ Pneumatic level switching with 5 m control line ■ Mono pump controls 400 V/50 Hz/IP 54 (type MDP1) with 1.5 m connecting cable and EEC plug ■ Mono pump controls 230 V/50 Hz/IP 54 (type MWP1) with 1.5 m connecting cable and safety plug ■ Mains-free group fault and operation signal ■ Low weight (approx. 31 kg) ■ Ready for connection, rapid to install ■ Low cost of maintenance ■ All components have high chemical stability ■ Usable volume (up to 30 l) adjustable by varying the inlet heights ■ Flood-proof as per IP 68: Flooding height (from base support surface) max. 2 m. Flood period max. 7 days
Dimensions and Connections
<ul style="list-style-type: none"> ■ Maximum dimensions: 520 x 575 x 700 mm (W x L x H) ■ 2x DN 100 horizontal sockets with pipe external diameter 110 mm for inlet line connection, distance from lower edge of tank to middle of pipe socket 180 mm, lateral layout ■ 1x DN 100 horizontal socket with pipe external diameter 110 mm for inlet line connection, distance from lower edge of tank to middle of pipe socket 250 mm, front-side layout ■ 1x DN 100 vertical socket with pipe external diameter 110 mm for inlet line connection ■ 1x DN 50 vertical socket with pipe external diameter 50 mm for inlet line connection ■ 1x DN 50 horizontal socket with pipe external diameter 50 mm for drain line connection ■ 2x Rp 1" horizontal connections for drain line connection ■ 1x DN 50 vertical socket with pipe external diameter 52 mm for vent stack connection

Centrifugal pump (type MDP1)

- Centrifugal pump with free flow impeller for 55 mm granulation
- S3 intermittent duty
- Permitted conveyance media temperature up to 40°C (temporarily 60°C)
- $H_{Max.} = 8.0$ m, $Q_{Max.} = 12.6$ m³/h (performance data,  Chap. 5 "Technical Data")
- Three-phase motor 400 V/50 Hz with 5 m connecting cable, protection type IP 68
- Shaft seal: Simmerring on the motor side, carbon graphite/ceramic circular rotating mechanical seal on the medium side

Centrifugal pump (type MWP1)

- Centrifugal pump with free flow impeller for 55 mm granulation
- S3 intermittent duty
- Permitted conveyance media temperature up to 40°C (temporarily 60°C)
- $H_{Max.} = 8.0$ m, $Q_{Max.} = 12.6$ m³/h (performance data,  Chap. 5 "Technical Data").
- Three-phase motor 230 V/50 Hz with 5 m connecting cable, protection type IP 68
- Shaft seal: Simmerring on the motor side, carbon graphite/ceramic circular rotating mechanical seal on the medium side

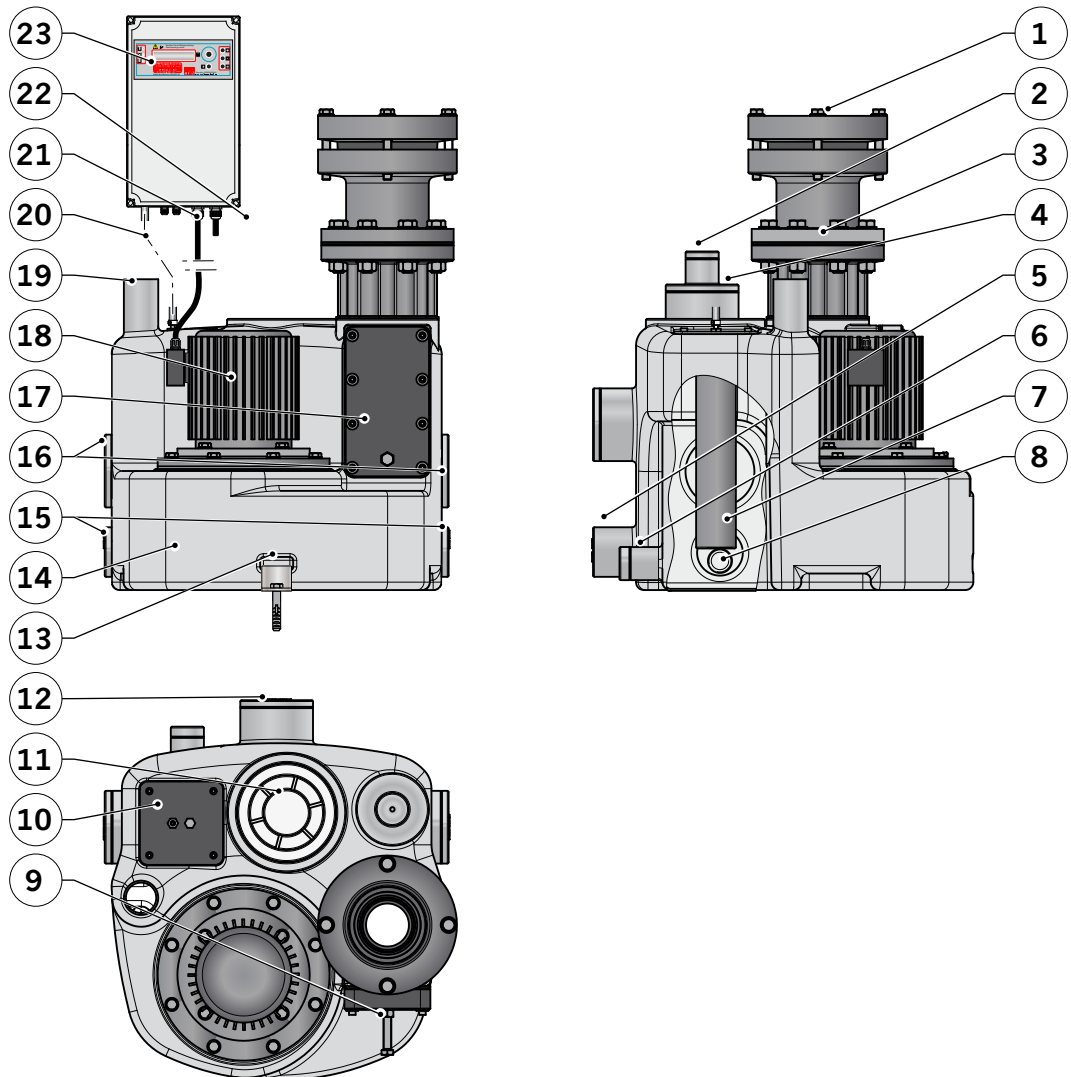
Mono pump controls

- Plastic housing for wall mounting
- Dimensions with cable connections: 190 x 320 x 110 mm (W x H x D)
- IP 54 protection type
- Ready to plug in:
 - 1.5 m connecting cable and EEC plug 16 A with phase inverter (three-phase current type)
 - 1.5 m connecting cable and safety plug (AC type)
- For level switching liquid levels via back pressure
- Control of the centrifugal pump via motor contactor
- 3 relay contacts for the output of fault signals
- Simple to use
- LCD text display
- Manual – 0 – Auto functions
- Acknowledge button
- Compulsory switching on of centrifugal pumps (24 hrs)
- Internal audible alarm
- Mains-free overflow alarm
- Operating hours counting device
- High level of resistance to faults
- Level reading using internal pressure transducers
- Storage of the last 3 error messages

- All settings and fault signals are preserved in event of a mains failure
- Rotating field check (type MDP1)
- When operating manually, the centrifugal pump automatically switches off after running for 2 minutes
- Pump is switched off via switch-off point and after-running period
- Electronic monitoring of power to motor
- Group alarm works with or without mains power
- Memory "Number of times pump started"
- Ammeter
- Service mode
- Battery backup, mains-independent alarm (approx. 5 - 6 hours) using built-in 9 V battery, horn sound level max. approx. 85 dB

4.3 Components

The following diagram shows the structure or position of the individual plant components and is used for unambiguous reference in the following chapters.

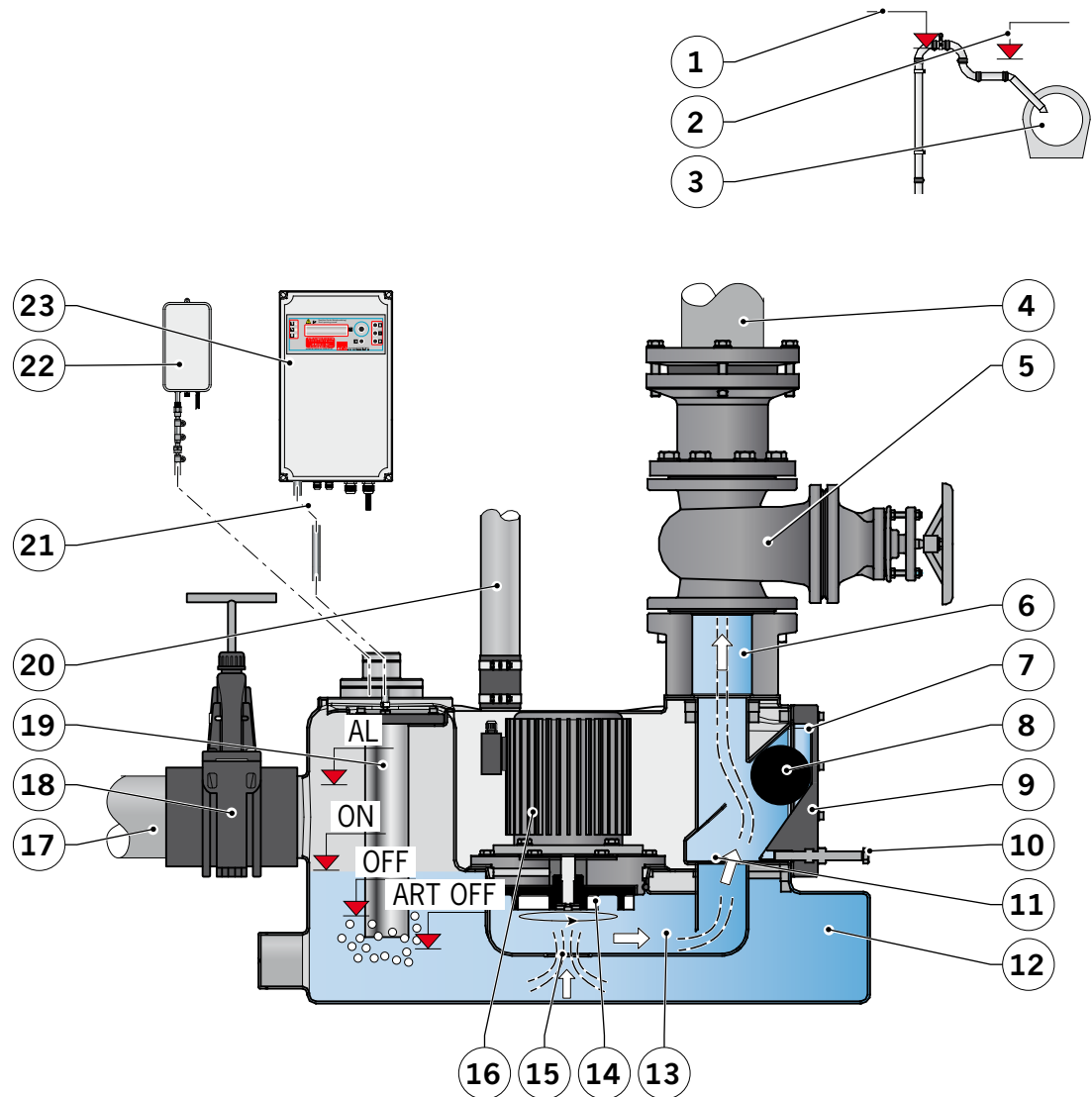


- | | | |
|---|--|---|
| 1 = Special mounting adapter | 10 = Connecting flange level switching | 17 = Cover with internal ball retaining valve |
| 2 = DN 50 inlet socket | 11 = Inspection cover | 18 = Centrifugal pump |
| 3 = DN 80 connecting flange | 12 = DN 100 inlet socket | 19 = DN 70 ventilation sockets |
| 4 = DN 100 inlet socket | 13 = Fixing kit | 20 = Control line |
| 5 = DN 70 connection port
(can only be used for parallel construction) | 14 = Tank | 21 = Centrifugal pump connecting cable |
| 6 = DN 50 connection port | 15 = DN 70 connection port
(can only be used for parallel construction) | 22 = Pump controls connecting cable |
| 7 = Pilot tube | 16 = DN 100 inlet socket | 23 = Pump controls |
| 8 = Rp 1 connection socket | | |
| 9 = Ventilation screw | | |

Illus. 1: Diagram of Components

4.4 Functional Principle

This Chapter describes the functions of the plant.



- | | | |
|--|--------------------------|---------------------------------|
| 1 = Backflow loop bottom of pipe | 7 = Pocket | 16 = Centrifugal pump |
| 2 = Backflow level | 8 = Backflow ball | 17 = In-situ inlet line |
| 3 = Drain | 9 = Ball retaining valve | 18 = Stop valve (optional) |
| 4 = In-situ discharge pressure line | 10 = Ventilation screw | 19 = Pilot tube |
| 5 = Stop valve | 11 = Valve seat | 20 = In-situ vent stack |
| 6 = Discharge pressure line transition | 12 = Tank | 21 = Control line |
| | 13 = Volute | 22 = Mini-compressor (optional) |
| | 14 = Free flow impeller | 23 = Pump controls |
| | 15 = Suction opening | |

Illus. 2: Schematic Representation of Functional Principle

The plant is a waste water lifting plant and is used to protect against backflow. All sanitary drainage objects below the backflow level (2) are at risk of backflow. Waste water (free of faeces or containing faeces) from these sanitary drainage objects flows through the inlet line (17) into the tank (12).

The water level in the tank (12) is displayed in the display field of the pump controls (23). If the waste water reaches a defined level, the centrifugal pump (16) switches on automatically. The free flow impeller (14) rotates, delivers the waste water to the volute (13) via the suction opening (15) and pushes it further through the valve seat (11) and the ball retaining valve (9). The backflow ball (8) is transported from the valve seat (11) in the laterally arranged pocket (7) of the ball retaining valve (9). The waste water is raised through the open stop valve (5, optional) and the discharge pressure line (4) over the "bottom of pipe backflow loop" (1) level and then flows to the waste water drain under gravity (3).

Should a waste water build-up occur up to the "AL" level, due to a centrifugal pump malfunction (16), for example, then the "overflow alarm" is triggered.

The level switching works as follows:


A pilot tube (19) mounted in the tank (12) is connected via a control line (21) to a diaphragm pressure switch in the pump controls (23). If the waste water level rises, then the air in the pilot tube (19) is compressed. At a defined pressure, the centrifugal pump (16) is switched on and off and/or the overflow alarm is triggered.


In order for the automatic level switching to work correctly, the tank ventilation (20) and the steady incline of the control line (21) are critical.

If the waste water reaches the "ON" level, then the centrifugal pump (16) will switch on and the waste water is pumped through the discharge pressure line (4) and the bottom of pipe of the backflow loop (1). If the centrifugal pump (16) is not in operation, the backflow ball (8) sits in the valve seat (11) of the ball retaining valve (9). This means that the contents of the discharge pressure line (6) cannot flow backwards and cannot empty into the tank (12). To empty the discharge pressure line in the event of a malfunction, the backflow ball (8) can be raised by turning the ventilation screw (10).

If the waste water level falls to the "OFF" level, then the predefined after-running period for the centrifugal pump (16) is activated and the centrifugal pump (16) is switched off at "ART OFF" once the after-running period elapses.

If the waste water reaches the "AL" level, the "overflow alarm" is triggered.

The volume between the two levels or switching points "ART OFF" and "ON" represents the usable volume of the plant. The automatic level switching is to be set to the relevant switching points by the plant user and/or adjusted to suit the individual operating conditions,  Chap. 7.6 "Setting the Pump Controls".

Prior to operating the plant, the plant must be filled with water via the inlet line and the level switching must be tested,  Chap. 7.7 "Test Run".

Operation with a mini-compressor (optional):

A mini-compressor (23) generates continuous compressed air and passes this through the control line (22) into the pilot tube (20). The compressed air (17) leaves the pilot tube (20) and mixes freely in the waste water in the tank (12). This helps to prevent any blockages and makes the level switching more reliable. Thanks to this procedure, fluctuations in readings can be kept to a minimum.

4.5 Type Plate

A type plate is attached to the tank. The following data needs to be copied from there and kept easily available for information and queries of all types.

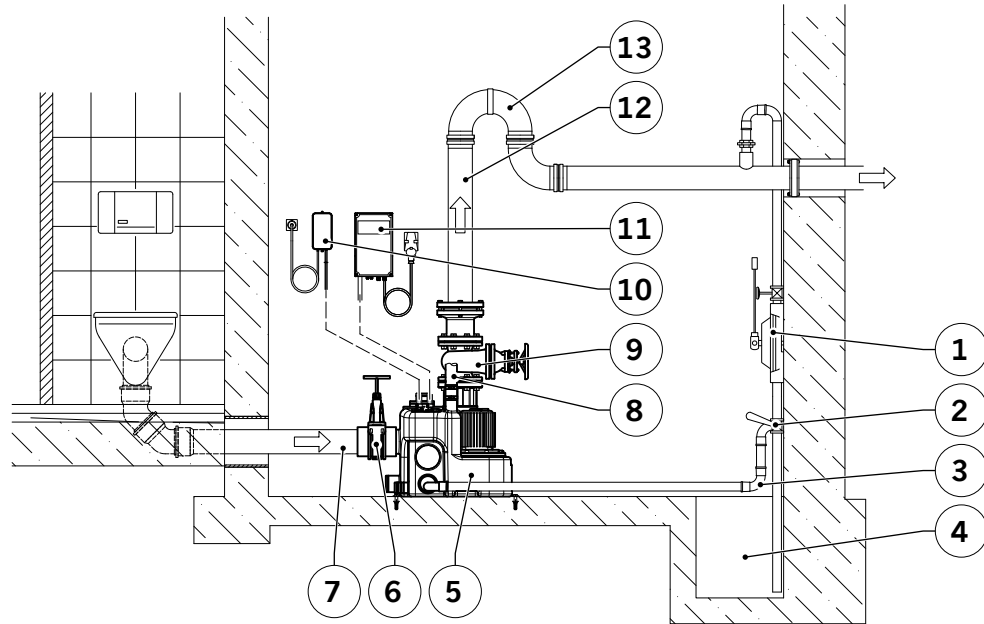
- Type
- DoP code
- Year of construction
- Item number
- Serial No.

4.6 Accessories

Information on suitable accessories,  Chap. 1.1 "ACO Service".

4.7 Recommendations for Installation

The following illustration shows a possible way of installing the plant.



- | | | |
|-------------------------------------|---------------------------------|---------------------------------|
| 1 = Manual membrane pump (optional) | 6 = Stop valve (optional) | 11 = Pump controls |
| 2 = Three-way valve (optional) | 7 = Inlet line* | 12 = Discharge pressure line* |
| 3 = Drain line* | 8 = Vent stack* | 13 = Backflow loop* |
| 4 = Pump sump* | 9 = Stop valve (optional) | *Need to be carried out on site |
| 5 = Plant | 10 = Mini-compressor (optional) | |

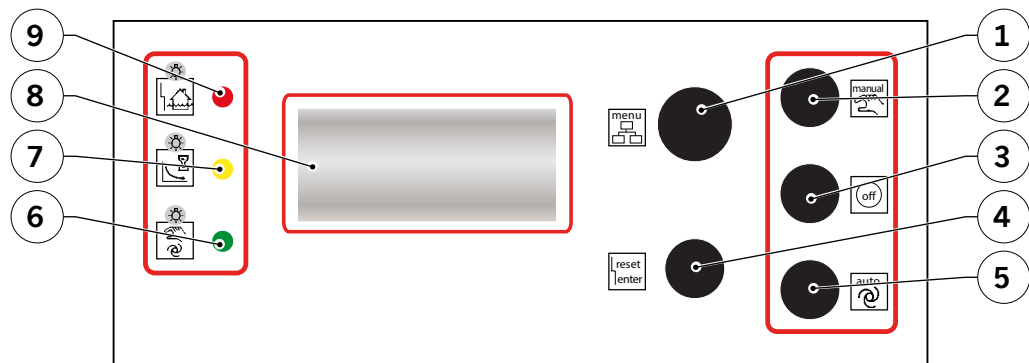
Illus. 3: Installation situation

4.8 Mono Pump Controls

This Chapter explains the pump controls.

4.8.1 Overview of Operating and Display Elements

The following diagram shows the pump controls or position of the individual operating and display elements and is used for unambiguous reference in the following chapters.







- | | | |
|---|--|--|
| 1 = Knob control: display/
menu selection | 4 = Switch: clearing malfunc-
tions and accepting
settings | 7 = LED: centrifugal pump
operation |
| 2 = Switch: manual operation
of centrifugal pump | 5 = Switch: switch on
automatic operation | 8 = Display area |
| 3 = Switch: switch off
automatic operation | 6 = LED: centrifugal pump
operating mode | 9 = LED: group alarm |



Illus. 4: Operation of Pump Controls



4.8.2 Operating Elements



Operating elements and what they mean:

- Query menu settings
Using the control knob, all information can be queried, (error messages, operating hours, number of pump starts and motor power), and all settings adjusted. After 20 secs, the display automatically reverts to the default setting.
 

- Clear malfunctions (confirming and resetting fault warnings) and adjusting settings
This button is used to clear all malfunctions and change all settings once the cause has been remedied. If a fault persists, then the group fault message relay and the alarm signal are switched off. This also applies to the "overflow alarm".
 

- Switch on manual operation
This button switches the centrifugal pump to manual operation. They then switch off automatically after 2 mins.
 

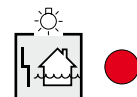
- Switch off automatic operation
This button switches off the automatic level switching.
 

- Switch on automatic operation
This button is used to automatically switch the centrifugal pump via the "level switching".
 

4.8.3 Display Elements

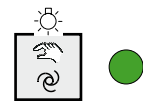
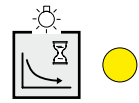
Display elements and what they mean:

- Group fault
 - If the tank is full = "overflow alarm": LED lights up.
 - If there is a group alarm (e.g. incorrect rotating field): LED lights up.



- Operational readiness
 - If the centrifugal pump is running: LED lights up and stays lit.
 - If the centrifugal pump is in operation in after-running mode: LED flashes.

- Centrifugal pump operation mode
 - If the centrifugal pump is switched automatically via the "level switching": LED lights up and stays lit.
 - If the centrifugal pump is operated manually: LED flashes regularly.
 - If the centrifugal pump switches off automatically after 2 minutes during manual operation: LED flashes irregularly.

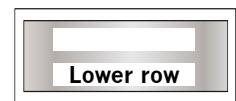
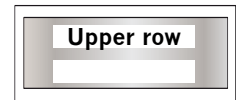


4.8.4 Messages in the Display Field

Meaning of messages in display field:

- Messages in top row
 - Water level in tank (when the centrifugal pump is not running)
 - Motor power (when the centrifugal pump is running)
 - Setting option (in adjustment mode)

- Messages in lower row
 - Operating hours of the centrifugal pump (if the centrifugal pump is not running)
 - Current malfunctions (alternating)
 - Adjustable values (in adjustment mode)



4.8.5 Settings

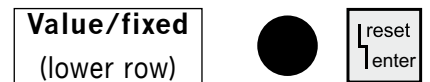
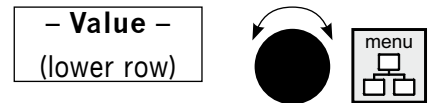
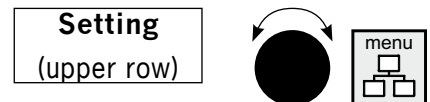
The settings in the display field can only be changed in service mode. If service mode has not been activated, then the settings are displayed but not stored.



- After 20 secs, the display automatically reverts to the default setting.
- Operating hours and number of pump starts can be queried, but not adjusted.

Changes to settings:

- Turn the "menu selection" control knob (to right or left), until the value of the setting you are looking for appears, Chap. 4.8.7 "Setting Options".
- Press the "value setting" button (the last value stored starts to flash).
- Turn the "menu selection" button until the value you want is reached (turning quickly will step changes more quickly, turn it slowly to fine tune).
- Press the "value setting" button (value stops flashing and is saved).



4.8.6 Setting values

CAUTION The setting values must be made according to the selected inlet connection, Chap. 7.6 "Setting the Pump Controls".

4.8.7 Setting Options

The table below contains an overview of the different setting options in the setting menus.

Tab. 7: Setting Menus

Upper row	Lower row	Explanation
Settings menu	Setting	Upper and lower row
Last malfunction	Delete value	The last 3 errors are stored in non-volatile memory and can be deleted using the acknowledgement button.
Next servicing	<ul style="list-style-type: none"> ■ 90 days ■ 180 days ■ 360 days 	Servicing/inspection is due.
Level ON	0 – 100 cm	Centrifugal pump switch-on point.
Level OFF	0 – 100 cm	Centrifugal pump switch-off point.
High water level	Ignore	Overflow alarm is switched off.
	0 – 100 cm	If the preset value is exceeded then the "group alarm" relay and the "overflow alarm" relay are activated .
Maximum running period	0 – 60 mins	Setting the value to zero de-activates this function. If a value between 1 – 60 mins is set, then the centrifugal pump is switched off if it runs uninterrupted for longer than the value which has been set. The centrifugal pump only works again after the error is cleared.
Delay	0 – 180 secs	Following a mains failure, the centrifugal pump only starts after the set time. The remaining time is shown on the display.
After-run	0 – 180 secs	The centrifugal pump continues to run after the switch-off point is reached until the time set here expires.
Current limiter	0.3 – 16.0 A	If the centrifugal pump exceeds the set current consumption for a given length of time, it is switched off. The message "excess current" appears. The centrifugal pump is only activated after the error has been cleared.
24 hr operation	Is switched off	-
	Is activated	If the centrifugal pump is not started for a period of 24 hours, it is automatically run for a period of 5 secs.
Audible signal	Is switched off	-
	Is activated	A warning horn is sounded if there is a malfunction.
Intermittent alarm	Is switched off	-
	Is activated	The group alarm relay switches on.
Rotating field fault (Type MDP1)	Is switched off	-
	Is activated	If the phase sequence is incorrect or if L2 or L3 is missing, then the "overflow alarm" is activated and the centrifugal pump cannot be operated.

Service mode	Is switched off	Settings are displayed but cannot be changed.
	Is activated	All settings can be changed.
Level control	Internal converter	Level – recorded via back pressure or air bubble injection
	Float switch	Level – recorded via float switch
	4 – 20 mA interface	Level – recorded via an external sensor (4 – 20 mA)
20 mA => level	0 – 1250 cm	Measuring range of the external level sensor
Language	German – English – French – ...	The local language can be selected for the display fields.

The following overview explains various settings in the setting menus:

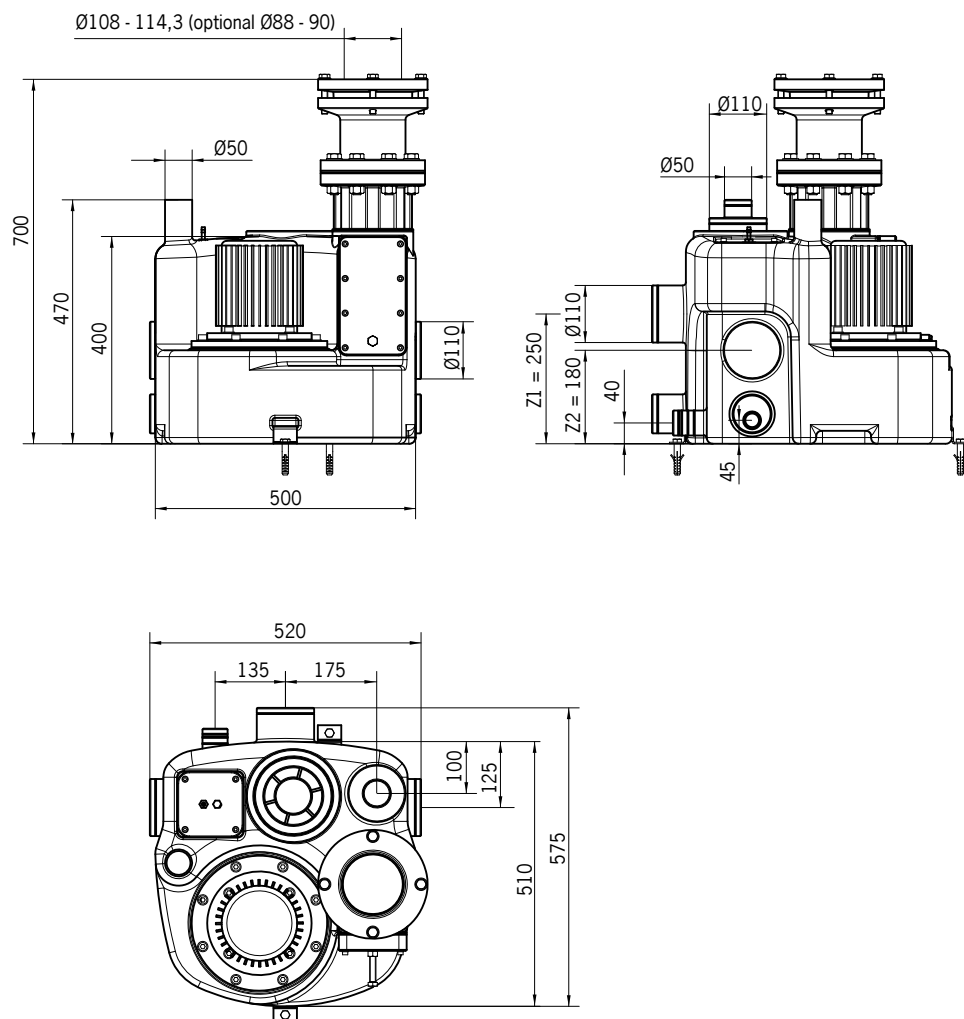
- Setting the minimum level settings
 - If value lower than 5 cm is selected for the switch-on point, then 5 cm is automatically stored.
 - If a value lower than 3 cm is selected for the switch-off point, then 3 cm is automatically stored.
- Setting the max. running period
The maximum running period for the centrifugal pump can be set.
- Setting the watchdog timing
Watchdog timing applies to both automatic and manual operation. In the menu, bring up the item Maximum Running Period. The factory setting for this value is set to zero, i.e. this function is switched off. If you set a value between 1 and 60 mins, then the centrifugal pump is switched off if it runs uninterrupted for longer than the value which has been set. In addition a warning signal sounds and a fault message is displayed in the display field. The centrifugal pump only works again after the error is cleared.
- Setting the after-running period
Enables the switch-off point to be adjusted.
- Clear the error memory
The last 3 errors are stored, even if there is a power failure and are shown in the menu under the item "Last Fault". The error messages can be deleted from the error memory using the "reset/enter" key.

5 Technical Data

This Chapter provides information about the technical data and dimensions of the plant.

5.1 Technical Data for Plant

The following diagrams show the dimensions and connection dimensions for the plant.



Illus. 5: Plant Dimensions

The following table shows the technical data for the plant.

Tab. 8: Technical Data for Plant

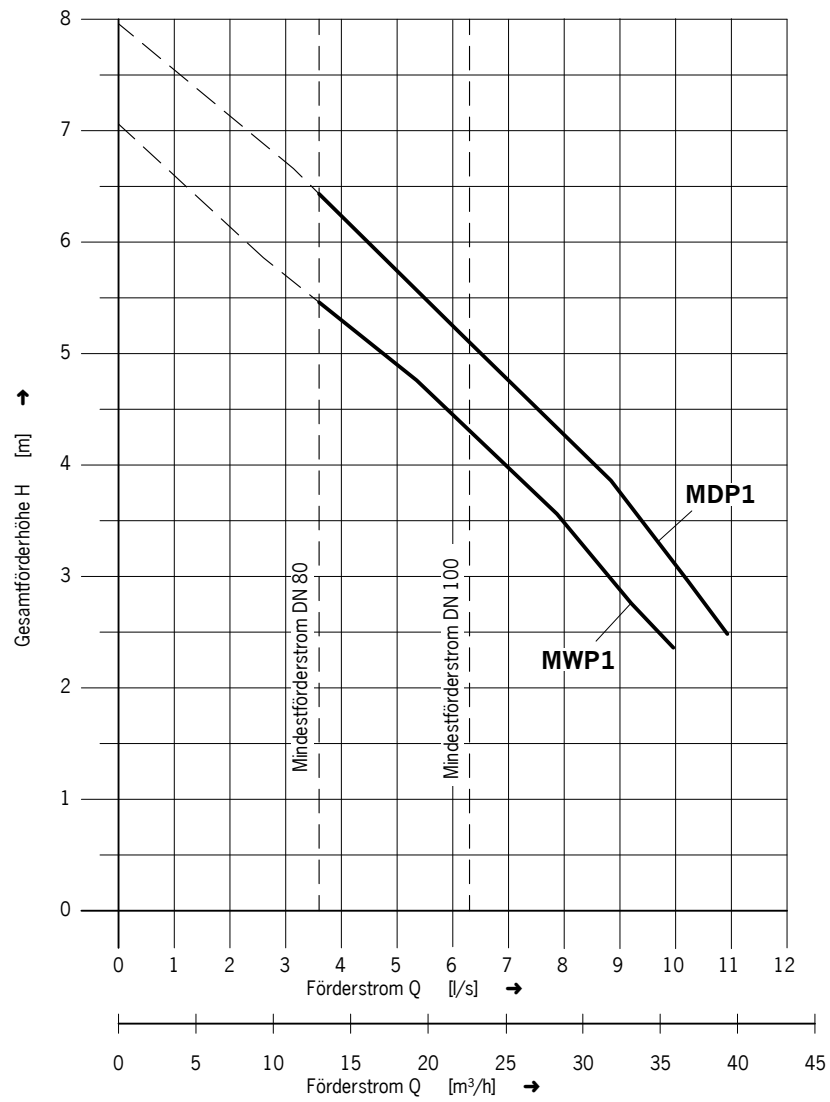
Type	Data										
	Operating voltage	Frequency	Rev count	Temperature of medium to be pumped	Temporary max. temperature	Max. granulation	Usable volume			Total volume	Max. weight
	[V]	[Hz]	[rpm]	[°C]	[°C/min.]	[mm]	180 mm	Inlet (at/-) 250 mm	from above	[l]	[kg]
MDP1	400	50	1400	40	60/ 3	55	20	25	30	60	31
MWP1	230	50	1400	40	60/ 3	55	20	25	30	60	31

5.2 Performance Data of the Centrifugal Pump

The following illustrations and tables show the performance data.

Tab. 9: Performance Data of the Centrifugal Pump

Type	Motor performance		Nominal current	Delivery flow									
	P1	P2		Q [m³/h and/or l/s]									
	[kW]	[kW]	[A]	for total delivery head [m]									
				2.5	3	3.5	4	4.5	5	5.5	6	6.5	
MDP1	1.00	0.75	4	[m³/h]	39.2	36.7	33.8	31.0	27.0	23.4	19.8	16.2	12.6
				[l/s]	10.9	10.2	9.4	8.6	7.5	6.5	5.5	4.5	3.5
MWP1	1.10	0.75	8	m³/h	34.9	31.7	28.8	25.2	21.2	17.3	12.6	-	-
				l/s	9.7	8.8	8.0	7.0	5.9	4.8	3.5	-	-



Illus. 6: Characteristic Curves of the Centrifugal Pump

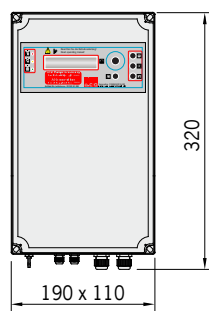
5.3 Technical Data for the Pump Controls

The following table shows the technical data for the pump controls.


Tab. 10: Technical Data for the Pump Controls

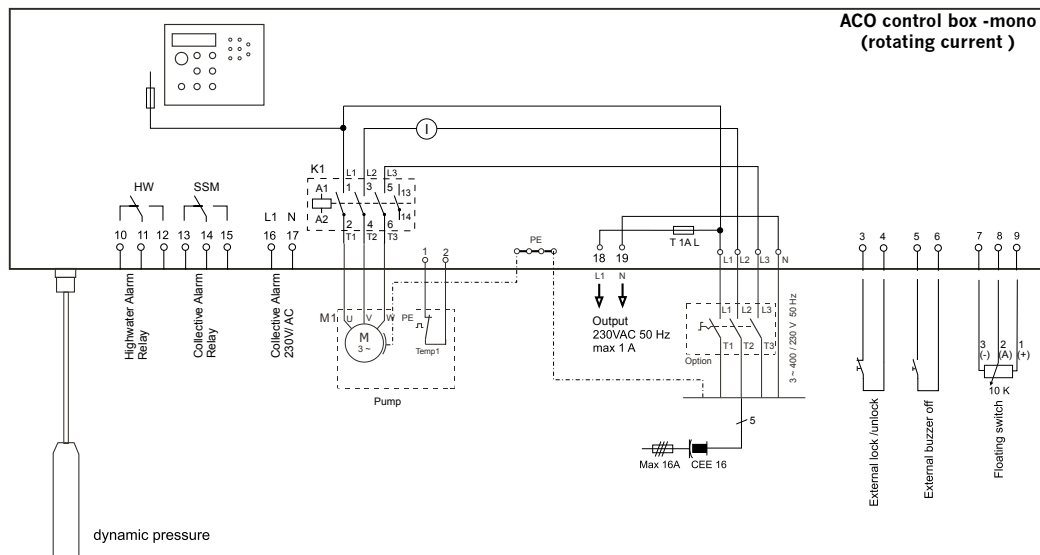
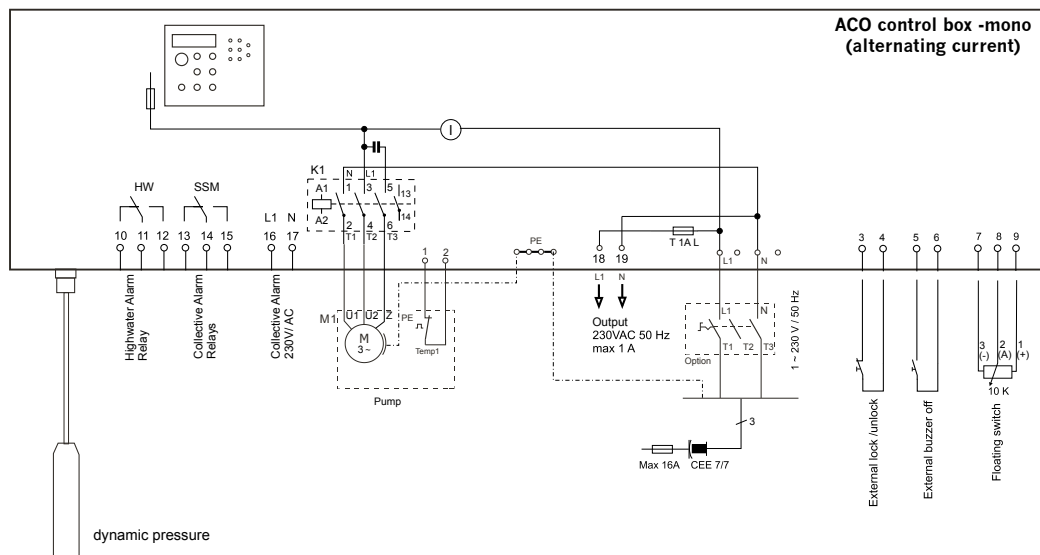
Characteristic data	Values
Operating voltage	Three-phase current: 3 ~ 400 V (L1, L2, L3, N, PE) Alternating current: 230 V
Frequency	50/60 Hz
Control voltage	230 V/AC/50 Hz
Current consumption (contactor activated)	< 20 VA
Connected load, max.	P2 < 5.5 kW
Range of electrical motor current limiter	0.3 to 12 A
Isolated alarm contact	3 A
Housing	Polycarbonate
Protection level	IP 54
Temperature range	-20°C to +60°C
Fuse	5 x 20 1AT (alarm output)
Mains-independent alarm	9 V/200 mAh battery, approx. 7 hrs, volume 85 dB

The dimensions of the pump controls can be seen from the following illustrations.



Illus. 7: Dimensions of the Pump Controls

The following illustration shows a reduced scale circuit diagram for the pump controls (alternating current or three-phase current). The original scale circuit diagram is provided with the pump controls and copies can be obtained if required,  Chap. 1.1. "ACO Service".



Illus. 8: Alternating current and three-phase current circuit diagram

6 Installation

This Chapter basically provides information on how to install the plant.

Tab. 11: Prerequisites for Installation

Tools, parts, installation materials		
<ul style="list-style-type: none"> ■ 16 A EEC mains socket ■ Stanley knife ■ Pressure pipe ■ Torque wrench WAF 17, 19, 24 ■ File ■ Hammer ■ Cable cutter ■ Cable: 2-core/0.75 mm² ■ Marker 	<ul style="list-style-type: none"> ■ Measuring tape ■ Open-ended spanner WAF 13, 19, 17, 24 ■ Spirit level ■ Pipeline DN 50, 100, 150 ■ Pipe clamps ■ Saw ■ Socket with earth contact 	<ul style="list-style-type: none"> ■ Hammer drill with <ul style="list-style-type: none"> □ masonry bit Ø8, 10 mm □ keyhole saw Ø29 mm ■ Screws and rawlplugs ■ Screwdrivers (straight and Phillips) ■ Acid-free grease ■ Side-cutter ■ Vacuum cleaner ■ Slow-blow fuses 16 A

The layout of the pipework system is the responsibility of the planner.


6.1 Safety during Installation

During installation work the following risks must be assumed:



WARNING

The following safety instructions must be read carefully before starting installation. If ignored severe injuries may occur.

Ensure the staff have the necessary qualifications,  Chap. 2.2 "Qualification of Personnel".

Mechanical hazards

Severe bruising from falling components (e.g. pipe sections)

- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".

Electrical hazards

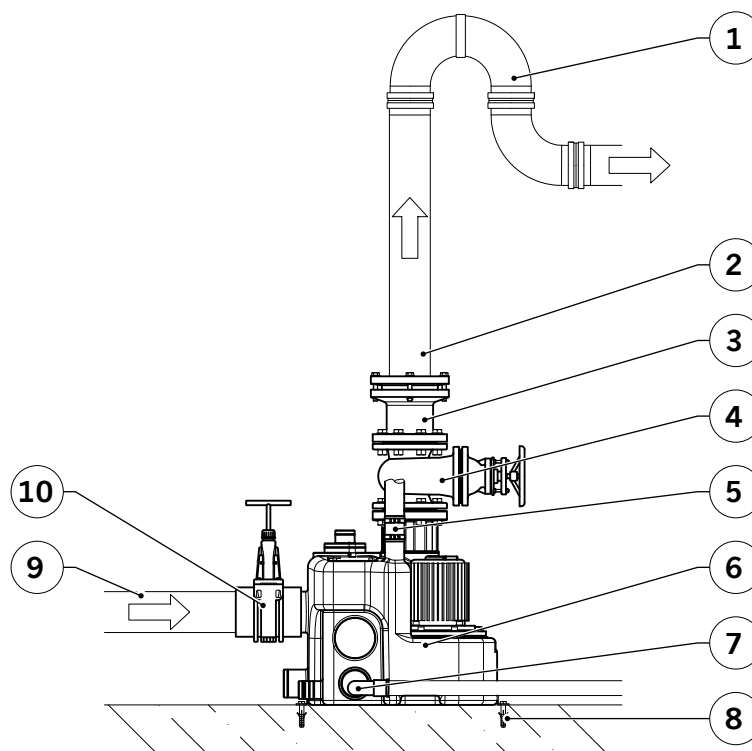
Severe injuries or death are possible from contact with parts which are connected to mains











- Centrifugal pumps, level switching, and pump controls must be connected by qualified electricians.
- Never carry out modifications.

6.2 Sanitary Installation

The following illustration provides an overview of the installation tasks and the pre-requisites for the on-site installation, and the following chapters describe these in more detail.

Observe the general requirements for pipework systems,  Chap 6.2.2.



- | | | |
|---|--|---|
| 1 = Connect backflow loop*,
 Chap. 6.2.7 | 5 = Connect the vent stack,
 Chap. 6.2.6 | 10 = Install the stop valve in the inlet line (optional)*,
 Chap. 6.2.5 |
| 2 = Connecting discharge pressure line*,
 Chap. 6.2.7 | 6 = Set up the tank,
 Chap. 6.2.1 | *Need to be carried out on site |
| 3 = Fit the special mounting adapter*,
 Chap. 6.2.3 | 7 = Connect the drain line,
 Chap. 6.2.8 | |
| 4 = Install the stop valve in the discharge pressure line (optional)*,
 Chap. 6.2.3 | 8 = Attach the tank*,
 Chap. 6.2.9 | |
| | 9 = Connect inlet pipe,*
 Chap. 6.2.4 | |

Illus. 9: Installation Work

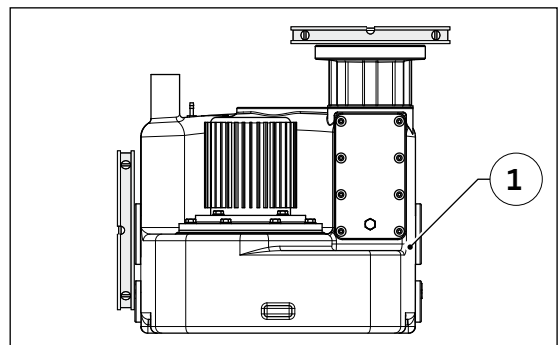
6.2.1 Assembling the Tank

CAUTION

- The installation base for the plant must be strong enough to bear the load and must be level.
- The space where the plant is to operate must be large enough to allow a free working space of at least 600 mm beside and above all parts which require access during operation or service.
- The erection space must be adequately lit and well ventilated.
- A pump sump must be arranged for drainage of the space for lifting plants containing faecal matter.

Required:

- Spirit level
 - Measuring tape
- Set up the tank (1) in the correct position.



6.2.2 General Requirements for Pipework Systems

This Chapter includes recommendations for professional pipe laying.

CAUTION To avoid damage to property and interruptions to operations the following requirements must be met:

- Pipelines must be installed in such a way that they can empty themselves.
- Pipelines must be connected to the plant free from tension. No pipe forces or torque must be transferred to the plant. Stretching of pipelines due to temperature must be compensated for.
- Support the weight of the pipes (e.g. using pipe mountings).
- For elastic connections which are not fixed longitudinally, secure the pipes against separation (e.g. pipe mountings).
- Ensure all connections to the plant are soundproof and flexible.
- Install pipelines in a frost-resistant manner.

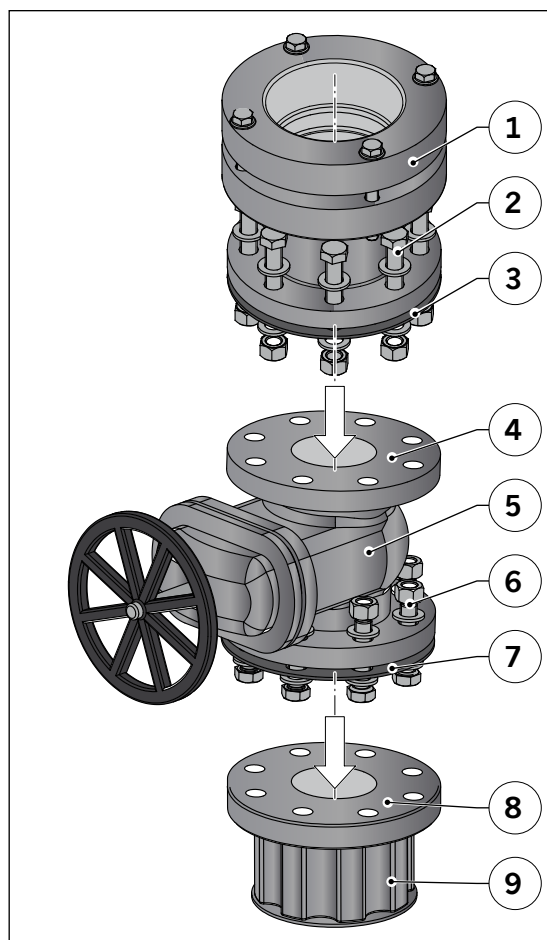
6.2.3 Installing the Stop Valve and Special Mounting Adapter

The "special mounting adapter" (1 - 3) building unit is supplied loose in the delivery.

CAUTION A DN 80 stop valve must be installed in the discharge pressure line behind the ball retaining valve (📖 Chap. 4.6 "Accessories").

Required:

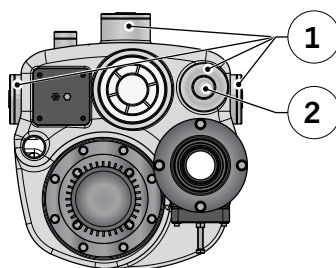
- Stop valve DN 80
 - Open-ended spanner WAF 19 and 24
 - Torque wrench SW 19 and 24
- Place the seal (7) on the connecting flange (8) of the adapter (9) and precisely align the holes/bore holes.
- Place the stop valve (5) over the connecting flange (8) and precisely align the bore holes.
- Create and tighten (max. 12 N·m) the screw connections crosswise and evenly using the fixing kit (6), consisting of screws, washers, and nuts.
- Place seal (3) on the connecting flange (4) of the stop valve (5) and precisely align holes/bore holes.
- Place special mounting adapter (1) on the connecting flange (4) and precisely align bore holes.
- Create and tighten (max. 12 N·m) the screw connections crosswise and evenly using the fixing kit (2), consisting of screws, washers, and nuts.



6.2.4 Connecting the Inlet Line


Four DN 100 sockets (1) with external Ø110 mm and 1 DN 50 socket (2) with external Ø52 mm are available on the tank for the connection of the inlet line(s).

A DN 50 and DN 100 pipe connector for flexible connection of the inlet line are supplied as loose parts in the delivery.



Illus. 10: "Inlet Sockets" Position

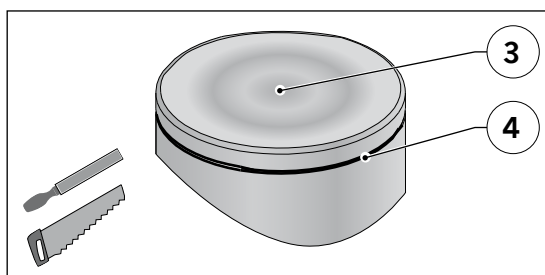
CAUTION

- All sockets are closed. The socket must be opened according to the required inlet line(s).
- The nominal width of the inlet line must not be reduced in the flow direction.
- Install the inlet line at a gradient to the plant.
- A stop valve for shutting-off the inlet must be fitted in the inlet line,  Chap 6.2.5. "Fitting a Stop Valve in the Inlet Line".
- Both pipe ends (7 + 9) must have at least 10 mm inserted into the pipe connector (8).

Required:

- Saw
- File
- Pipe sections DN 50
- Pipe sections DN 100
- Open-ended spanner WAF 13

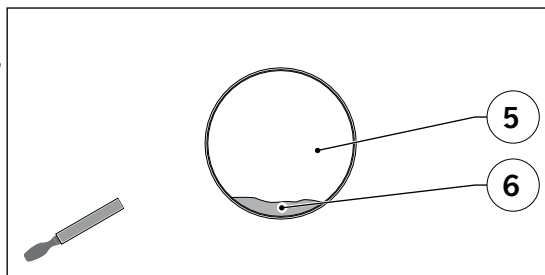
→ Cut open closed sockets (3) along the groove (4) and deburr the cut edge.





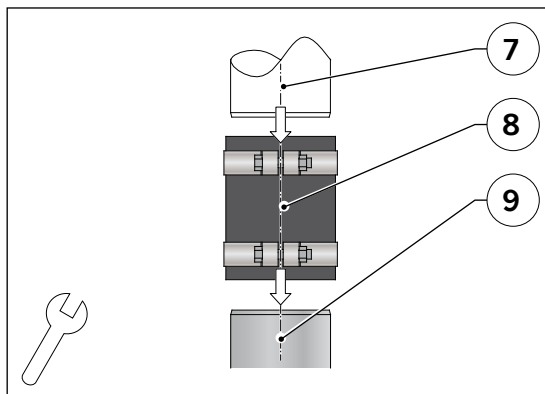
As a result of the manufacturing process there may be uneven wall thickness (lumps of material).

→ Any lumps of material (6) in the area of the bottom of the socket (5) should be removed.



→ Connect the inlet line (7) using the pipe connector (8) to the socket (9) of the tank.

→ Tighten the screw connection of the pipe connector (8) by hand.



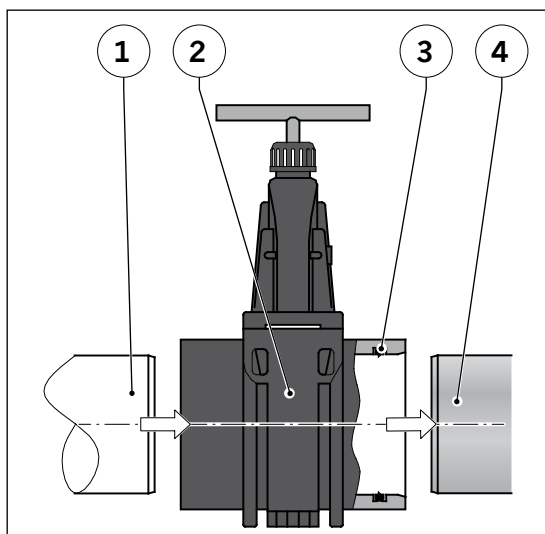
6.2.5 Installing the Stop Valve in the Inlet Line (Optional)

CAUTION A DN 100 stop valve must be installed in the inlet line (📖 Chap. 4.6 "Accessories") to shut-off the inlet.

Required:

- Stop valve (optional)
- Acid-free grease

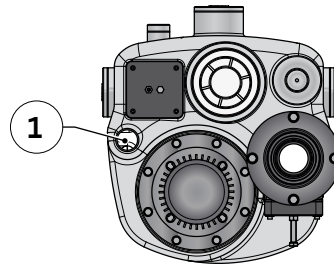
- Grease the end of the spigot (4) from the inlet socket of the tank.
- Grease the lip seals (3) of the stop valve (2).
- Grease the end of the spigot (1) of the inlet pipe.
- Push the stop valve (2) on the inlet socket (4) of the tank.
- Push the inlet line (1) into the stop valve (2).



6.2.6 Connecting Vent Stack

A DN 50 vertical socket (1) with external Ø52 mm is available on the tank for the connection of the vent stack.

A DN 50 pipe connector is supplied loose with the delivery for flexible connection of the vent stack.



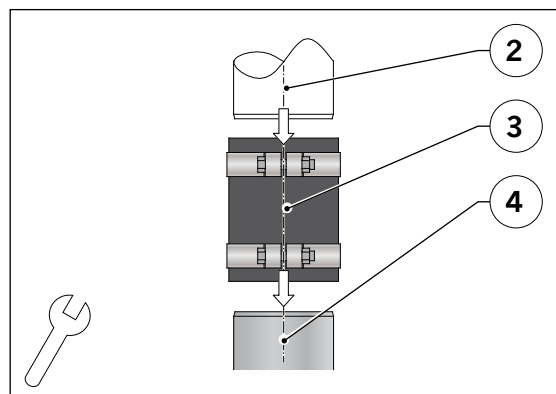
Illus. 11: "Ventilation Sockets" Position

CAUTION

- Vent stacks must have a constant diameter and must be laid continuously rising up to the roof of the building. The piping can be inserted into the main or the secondary ventilation.
- To avoid odours, the vent stack must never be connected to the input side vent stack of a grease separator.
- Both pipe ends (2 + 4) must have at least 10 mm inserted into the pipe connector (3).

Required:

- Pipe sections DN 50
 - Open-ended spanner WAF 13
- Connect the vent stack (2) using the pipe connector (3) to the socket (4) of the tank.
- Tighten the screw connection of the pipe connector (3) by hand.



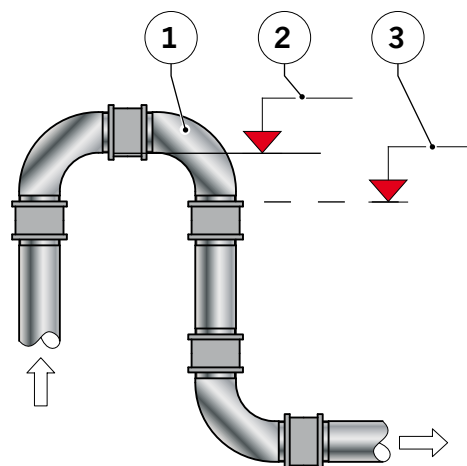
6.2.7 Installing and Connecting the Discharge Pressure Line

The special mounting adapter enables flexible connection of the in-situ DN 100 discharge pressure line (spigot $\text{\O}108 - 114 \text{ mm}$).

On delivery, the sealing ring (7) and the flange ring (6) is placed on the special mounting adapter (9) and the screws (1) are screwed one turn in the threaded hole of the flange (8).

CAUTION To ensure the plant functions correctly, the backflow loop (1) must have the lowest point of its pipe (2) above the height of the "backflow level" (3). The backflow level is normally the pavement height.

The following diagram is a schematic representation of a backflow loop (1). The list which follows instructs you on how to install it correctly.



Illus. 12: Backflow loop



- **Pump delivery quantity [l/s]**

The volume of the flow which the centrifugal pump pumps over the total delivery head at the operational site.

- **Delivery head in [m]**

Head of pressure which the centrifugal pump reaches at the operating level. This overcomes the static height difference plus the total head loss in the discharge pressure line.

- **Total delivery head in [m]**

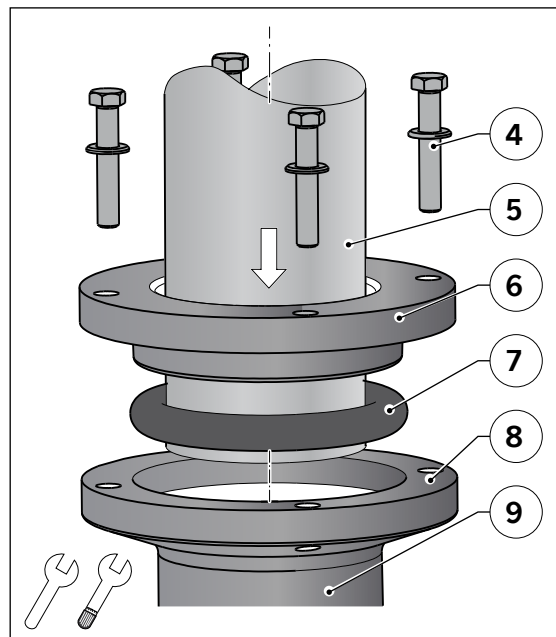
The total delivery head is the total of all static delivery heads and the pressure head losses in valves and fittings and pipe friction losses.

CAUTION To avoid damage to property and interruptions to operations the following requirements must be met:


- Discharge pressure lines must be frost-resistant.
- Discharge pressure lines must always be connected to either ventilated pipe systems or collecting lines. The connections must be installed in the same way as for non-pressurised lines.
- The discharge pressure line must resist at least 1.5 times the max. pump pressure.
- The discharge pressure line must be installed continuously rising.
- The flow speed in the discharge pressure line must not be less than 0.7 m/s or more than 2.3 m/s.
- Never connect other pipes to the discharge pressure line.
- Never connect discharge pressure lines for a lifting plant to waste water downpipes.
- Never connect ventilation valves to the discharge pressure line.

Required:

- Open-ended spanner WAF 19
 - Torque wrench WAF 19
- Push the pipe (5) through the flange ring (6) and the sealing ring (7) and push it approx. 50 mm into the special mounting adapter (9).
- Tighten M12 screws (4) evenly in a crosswise manner (max. 15 N·m).



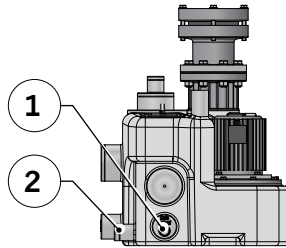
The use of another sealing ring (7) enables a DN 80 discharge pressure line to be connected (spigot Ø88 – 90 mm).

Sealing ring can be optionally purchased from ACO,  Chap. 4.6 "Accessories".

6.2.8 Connecting the Drain Line (Optional)

A horizontal DN 50 socket (2) is provided on the tank with external $\text{\O}50$ mm and 2 R 1" threaded sockets (1, both sides).

The sockets and threaded sockets are closed and must be opened prior to the connection of a drain line.



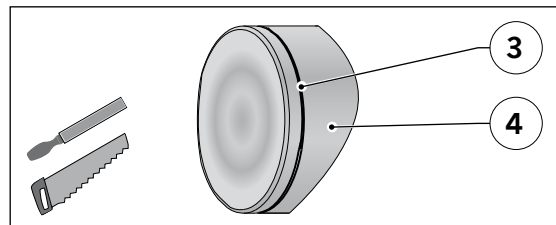
Illus. 13: "Draining Connections" Position

Option 1:

Required:

- Saw
- File

- Cut open closed sockets (4) along the groove (3) and deburr the cut edge.
- Connect the drain line (e.g. hose, hose clamps).

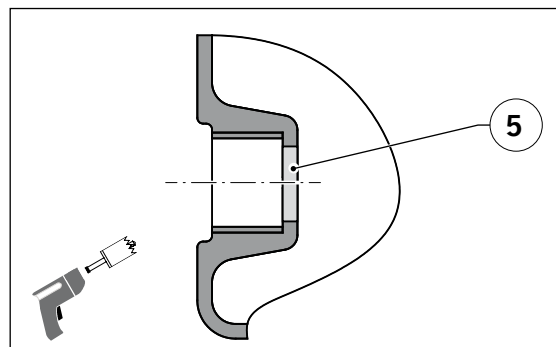


Option 2:

Required:

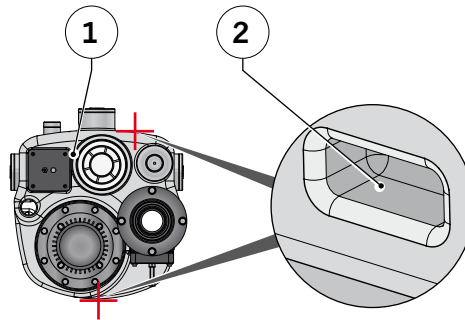
- Drill
- 29 mm diameter key-hole saw attachment

- Drill out closed socket base (5) with keyhole saw (max. $\text{\O}29$ mm).
- Connect the drain line (e.g. hose nozzle, hose, hose clamps).



6.2.9 Securing the Tank

A fixing kit is included loose with the delivery. Fix the set-up tank (1) to the ground with 2 shaped pockets (2) using the fixing kit.



Illus. 14: "Fixing pockets" Position

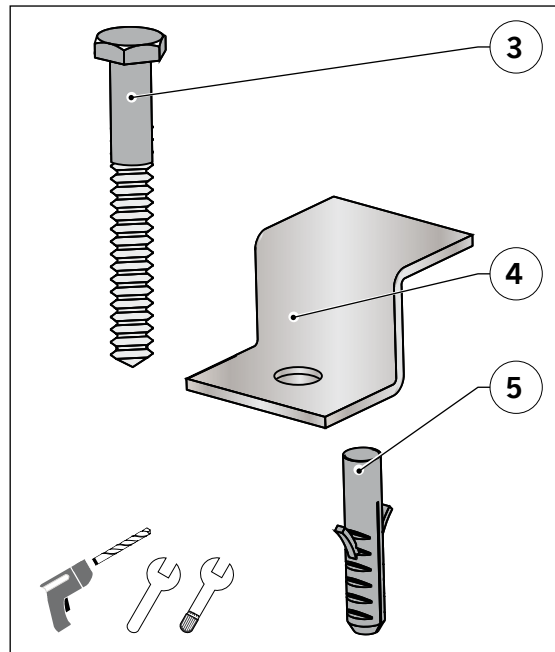
CAUTION

- Plants must be installed and fixed so they cannot swivel.
- Plants at risk of floating must be fixed securely so they cannot float.

Required:

- Marker (e.g. pencil)
- Drill with a 12 mm diameter masonry bit
- Hammer, vacuum cleaner
- Open-ended spanner WAF 17
- Torque wrench SW 17

- Place the brackets (4) in the moulded trough (2) on the tank and mark floor for drilling.
- Remove bracket (4) from trough (2).
- Drill 12 mm diameter hole 60 mm deep.
- Vacuum drilled hole clean.
- Insert a 12 W rawplug (5) into the drilled hole.
- For noise insulation insert rubber supports between the brackets (4) and the base.
- Place bracket (4) in the trough (2).
- Push 10 x 60 wood-screws (3) through the hole in the bracket and screw into the rawplugs (6).
- Tighten 10 x 60 screws (3)
(10 N·m).



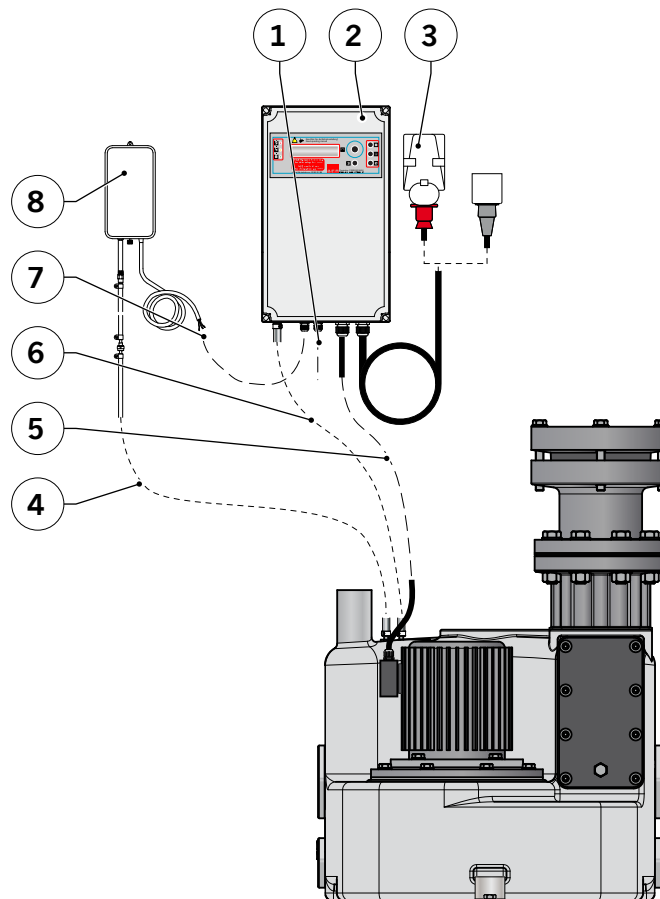
6.3 Tightness Test

The following basically applies: All drainage objects for buildings and land must be sealed (only applies for Germany. Requirements in other countries may vary).

The specifications and requirements for the tightness test procedure must be checked based on the country in question.

6.4 Electrical Installation

The following illustration provides an overview of the electrical work and the pre-requisites for the on-site installation, and the following chapters describe these in more detail.



- 1 = Install and connecting cable for transmitting the group alarm (optional)*, Chap. 6.4.4
- 2 = Mount the pump controls*, Chap. 6.4.1
- 3 = Attach EEC socket or socket with earth contact*, Chap. 6.4.3

- 4 = Connect the air bubble injection line (optional), Chap. 6.4.8
- 5 = Install and connect the connecting cable for the centrifugal pump*, Chap. 6.4.5
- 6 = Install the control line and connect to the pump controls, Chap. 6.4.6

- 7 = Install and attach the connecting cable of the mini compressor (optional)*, Chap. 6.4.2
- 8 = Attach the mini-compressor (optional)*, Chap. 6.4.7

*Installation site requirements

Illus. 15: Electrical Work

6.4.1 Mounting the Pump Control

A free wall surface which is flood-proof measuring approx. W x H = 300 x 500 mm is required to install the pump controls.

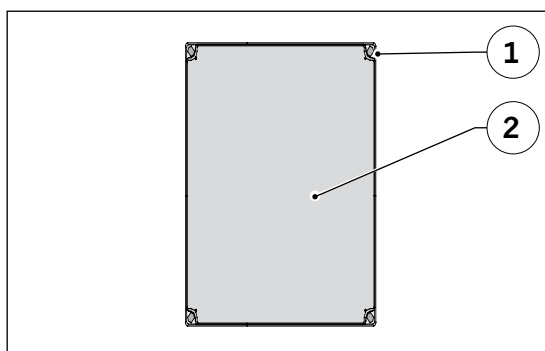


Connecting cable of the centrifugal pump is 5 m long. Select the mounting location accordingly.

Required:

- Marker
- Hammer drill with a masonry bit
- Hammer
- Vacuum cleaner
- Screwdrivers (straight and Phillips)
- Screws and rawlplugs

- Place the hole pattern (1) for all corners in the back panel of the original pump controls (2) against the wall and mark them.
- Drill the holes.
- Vacuum drilled holes clean.
- Knock in rawlplugs.
- Hold pump controls (2) against the wall and fix with the screws.




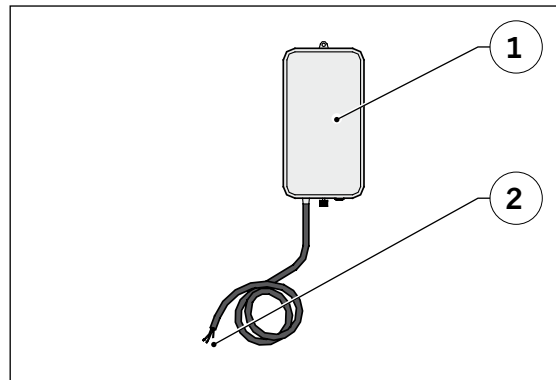
6.4.2 Connecting the Connecting Cable for the Mini Compressor (Optional)

The mini compressor (1) has a 1.5 m long connecting cable with safety plug. The plug must be cut off and the connecting cable must be connected to the pump control.



An on-site socket with earth contact can also supply power to the mini compressor. Connecting value 230 V/50 Hz with mains-side fuse max. 16 A delayed action.

- Strip insulation from cable ends (2) and attach cable end ferrules.
- Connect the control according to the circuit diagram in the connection box,  Chap. 5.3 "Circuit Diagram".



6.4.3 Attaching the Mains Socket

The pump controls have a 1.5 m long connecting cable with an EEC plug or safety plug.

CAUTION There will be functional problems if an unsuitable socket is used.

Install a mains socket on-site with the following specification:

EEC mains socket for "three-phase current" type Socket with earth contact for "alternating current" type


- 400 V/50 Hz connection
- Right-hand rotating field
- Mains fuse max. 3 x 16 A delayed action
- 230 V/50 Hz connection
- Mains fuse max. 16 A delayed action

- Install a socket (1) on the wall in accordance with the manufacturer's instructions.

6.4.4 Installing and Connecting Cable for Transmitting the Group Alarm (Optional)

In order to forward the isolated contact as a group alarm, a cable needs to be laid.

Required:

- 2-core/0.75 mm² cable
 - Screwdrivers (straight or Phillips)
 - Stanley knife, side cutter
 - Pipe clamps
- Introduce the cable through the cable fittings into the pump controls and connect according to the circuit diagram,  Chap. 5.3 "Circuit diagram".

6.4.5 Installing and Connecting the Connecting Cable of the Centrifugal Pump


The connecting cable for the centrifugal pump is 5 m long and is delivered already attached to the connection terminals in the connection space for the centrifugal pump. The connecting cable is coiled on the plant and is secured with cable ties.

CAUTION

- The ends of the individual wires are marked. If wires are connected incorrectly there is a risk of a short-circuit.
- If the connecting cables are shortened, transfer the markings on each wire.

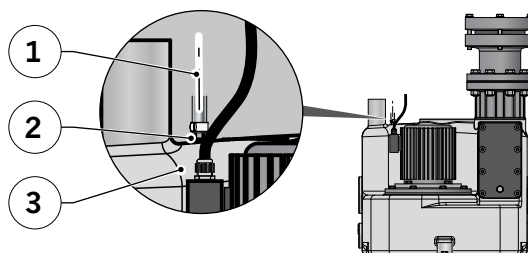
Required:

- Screwdrivers (straight or Phillips)
- Pipe clamps
- Side cutter, Stanley knife

→ Introduce the connecting cable through the cable fittings into the connection box of the pump controls and connect according to the circuit diagram,  Chap. 5.3 "Circuit diagram".

6.4.6 Install the Control Line and Connect to the Pump Controls

The 5 m long control line (1) is attached to the hose nozzle (2) on the tank (3) prior to delivery, lies coiled on the tank and is attached by cable ties.



Illus. 16: "Control Line Connection" Position

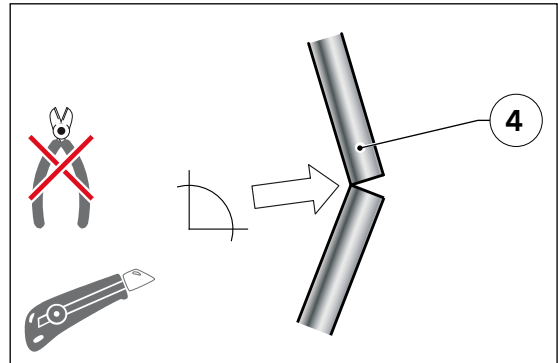
CAUTION

- The control line must not be bent or crushed.
- The control line must be installed continuously rising and protected from frost.
- Functional faults are possible if the length of the control line is not adjusted correctly.

Required:

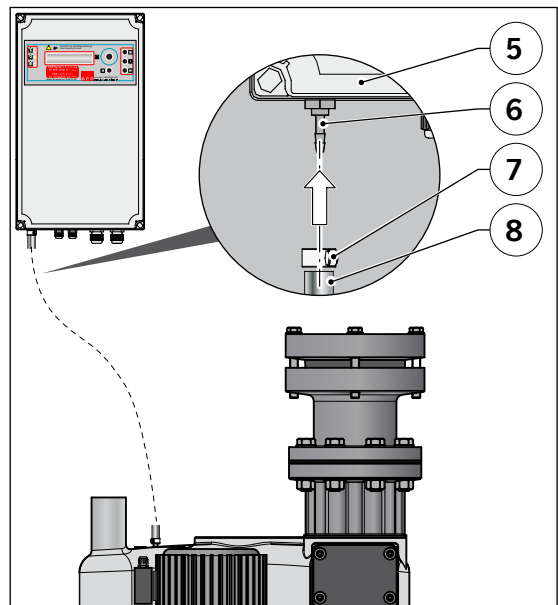
- Screwdrivers (straight or Phillips)
- Pipe clamps
- Stanley knife

→ Cut the control line (4) at right angles with a Stanley knife.



→ Push a hose clamp (7) over one end (8) of the 5 m long control line.

→ Push the hose end (8) onto the hose nozzle (6) of the control (5) and fix with the hose clamp (7).



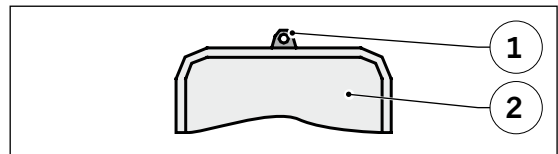
6.4.7 Attaching Mini Compressor (Optional)

A free wall surface which is flood-proof measuring approx. $W \times H = 100 \times 200$ mm is required to install the mini compressor.

Required:

- Marker
- Hammer drill with a masonry bit
- Hammer
- Vacuum cleaner
- Screwdrivers (straight and Phillips)
- Screw and rawlplug

- Drill hole for tag (1) at the requisite place.
- Vacuum drilled hole clean.
- Insert rawlplug.
- Hold mini-compressor (2) against the wall and fix with the screw.



6.4.8 Connecting the Air Bubble Injection Line (Optional)

The cables (hoses) and connectors are included with the mini-compressor.

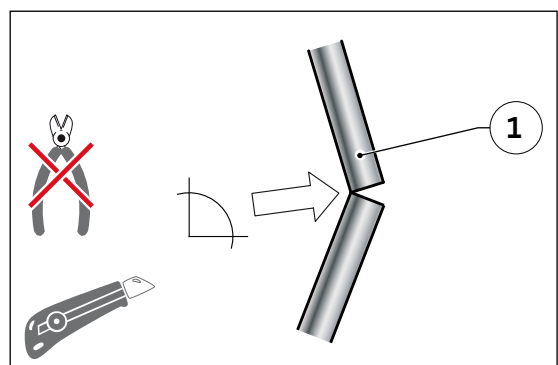
CAUTION

- The hoses must not be bent or crushed.
- Hoses must be installed continuously rising and protected from frost.
- Functional faults are possible if the length of the hose is not adjusted correctly.

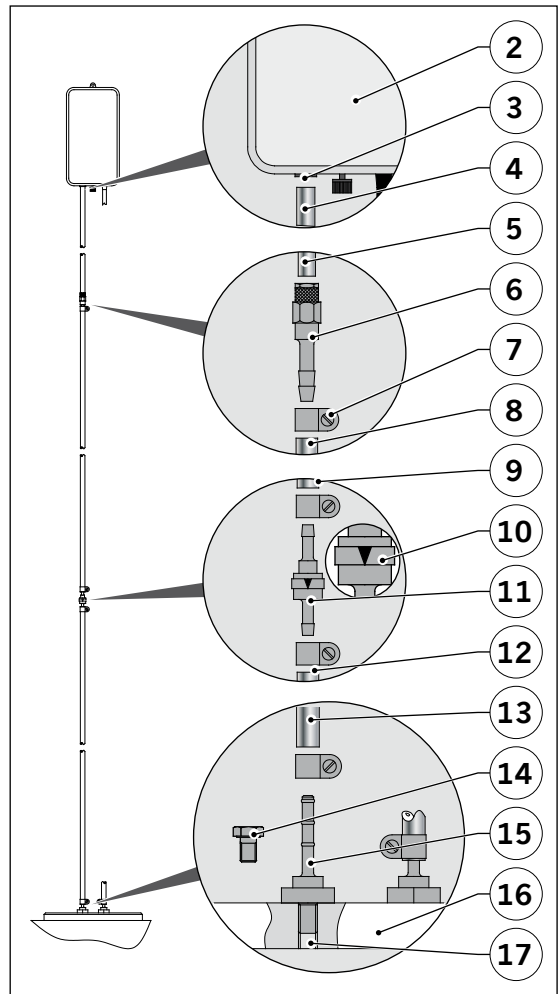
Required:

- Open-ended spanner WAF 13, 14
- Screwdrivers (straight or Phillips)
- Pipe clamps
- Stanley knife

- Cut the control line (1) at right angles with a Stanley knife.



- Remove and dispose of the M8 screw (14) with a USIT ring from the threaded hole (17) of the cover (16) on the tank.
- Screw the hose nozzle (15) with a USIT ring into the threaded hole (17).
- Push a hose clamp (7) over one end (13) of the 9.5 m long hose.
- Push the hose end (13) onto the hose nozzle (15) and fix with the hose clamp (7).
- Push a hose clamp (7) over the other end (12) of the hose.
- Push the hose end (12) onto the hose nozzle of the sprung retaining valve (11) and fix with the hose clamp (7). Note the direction of installation (10).
- Push a hose clamp (7) over one end (9) of the 500 mm long hose.
- Push the hose end (9) onto the hose nozzle of the sprung retaining valve (11) and fix with the hose clamp (7).
- Push a hose clamp (7) over the other end (8) of the hose.
- Push the hose end (8) onto the hose nozzle of the screw-on connector (6) and fix with the hose clamp (7).
- Insert the end of the 100 mm long hose (5) into the screw-on connector (6) and clamp.
- Insert the other end of the 100 mm long hose (4) into the intake (3) of the mini-compressor (2).



7 Commissioning and Operation

This Chapter provides you with information about the correct way to commission and operate the plant.


7.1 Safety during Commissioning and Operation

During commissioning work and operation the following risks must be assumed:




BEWARE

The following safety instructions must be read carefully before starting commissioning and operation. If ignored, injuries may occur.

Ensure staff have the necessary qualifications,  Chap. 2.2. "Qualification of Personnel".

Contact with waste water


Skin and eye injuries, risk of infection

- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".
- On contact with skin: relevant skin areas must be washed thoroughly with soap and disinfected.
- If in contact with eyes: Rinse eyes. If eyes continue to water, consult a doctor.

7.2 Commissioning

This Chapter describes the requirements for commissioning, the process of commissioning the plant and handover to the user.








Prerequisites for commissioning:

- All installation work has been completed,  Chap. 6 "Installation".
- Tank is empty.
- No waste water is yet being fed into the plant.

People required for commissioning:

- Installer
- Professional electrician
- Owner or users

CAUTION To ensure safe operation of the plant, the following sequence must be followed for commissioning:

1. Adjust ventilation screw,  Chap. 7.4.
2. Insert the battery in pump controls,  Chap. 7.5.
3. Adjust pump controls,  Chap. 7.6.
4. Carry out a test run,  Chap 7.7.
5. Carry out checks,  Chap. 7.8.
6. Switch on automatic operation,  Chap. 7.9.
7. Hand over plant to owner or user,  Chap. 7.10.

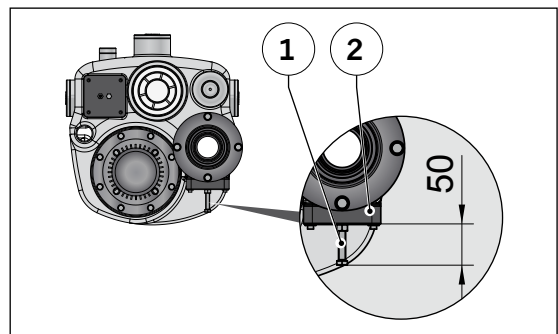
7.3 Adjusting the Ventilation Screw

The setting of the lifting screws must be checked before commissioning.

Required:

- Open-ended spanner SW 16
- Measuring tape

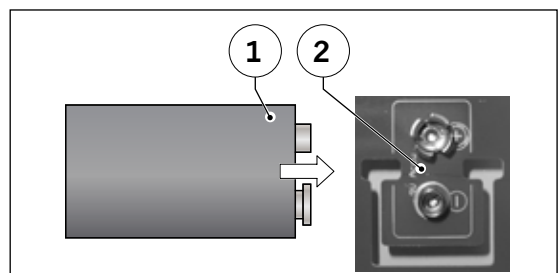
→ Adjust ventilation screw (1) on cover (2) with inside ball retaining valve to 50 mm.




7.4 Inserting Battery in Pump Controls

The battery guarantees the mains-independent alarm will function if the power is interrupted. Once the battery is inserted in the pump controls the alarm is automatically activated.

→ The battery (1) should be inserted in its position (2) on the circuit board by a professional electrician.




7.5 Adjusting the Pump Controls

Settings must be made in the settings menu of the pump controls prior to commissioning. Settings should be made according to the description in  Chap 4.8.5 "Control Settings".

The following table shows the data and values for the menu settings.

Tab. 13: Menu Data

Settings menu	Type	Values			Unit	Explanation
		Inlet ...				
		Z1	Z2	from above	[...]	 Chap.
Next servicing	MDP + MWP	...			Days	8.4
Level ON	MDP + MWP	8	12	20	cm	4.4
Level OFF	MDP + MWP	3	3	3	cm	4.4
High water level	MDP + MWP	12	16	24	cm	4.4
Maximum running period	MDP + MWP	4			Min.	4.8.7
Delay	MDP + MWP	0			secs	4.8.7
After-run	MDP + MWP	4			secs	4.8.7
Current limiter	MDP	4			A	5.2
	MWP	8			A	5.2
24 hr operation	MDP + MWP	Is switched off			-	4.8.7
Audible signal	MDP + MWP	Is activated			-	4.8.7
Intermittent alarm	MDP + MWP	Is switched off			-	4.8.7
Rotating field fault	MDP	Is activated				4.8.7
	MWP	Is switched off			-	4.8.7
Service mode	MDP + MWP	Is switched off			-	4.8.7
Level control	MDP + MWP	Internal converter			-	4.8.7
20 mA => level	MDP + MWP	0			cm	4.8.7
Language	MDP + MWP	German			-	4.8.7

7.6 Test Run

This Chapter describes the test run.

7.6.1 Specifications

CAUTION

To avoid damage to property and operational failures, the water level must be observed for the switching point "OFF". The values can be found in the following table and must be checked during the test run via the open inspection cover.

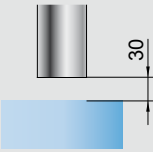
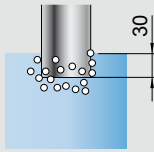
Version without Air Bubble Injection (Standard)

If the water level in the tank is higher, the centrifugal pump must be switched on manually and stopped when the water level specified in the table is reached (pilot tube approx. 30 mm free). Add the determined time in the pump controls to the pre-set after-running period.

Version with Air Bubble Injection (Optional)

Set the after-running period on the control to "0". If the water level in the tank is higher, the centrifugal pump must be switched on manually and stopped when the water level specified in the table is reached (pilot tube approx. 30 mm covered). The determined time must be set in the pump control as the after-running period.

Tab. 14: Water Level for Switching Point "OFF"

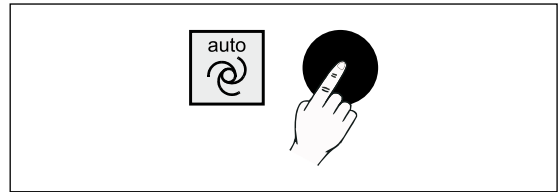
Distance from water line to lower edge of pilot tube	
Without air bubble injection	With air bubble injection (optional)
	

7.6.2 Carry out Test Run

The work and processes on and in the plant are described below. The illustrations are schematic.

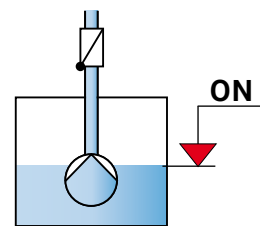
- Open stop valve in the inlet line (if present) and the discharge pressure line.
- Establish the pump control power supply.

- Check operational messages being received by pump controls.
- Press the "auto" button for automatic operation.



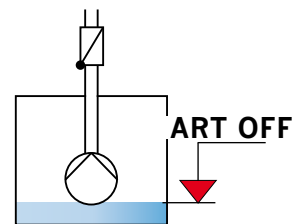
- Allow water to flow into the tank via the inlet line or the revision opening.

- Water level reaches "ON".
- Centrifugal pump switches on and pumps the waste water from the tank above the backflow level.



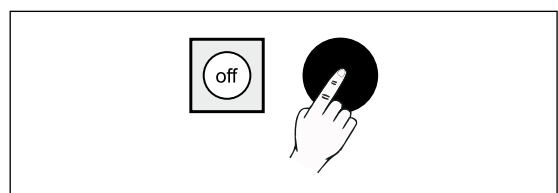
- Interrupt inflow of water.

- The water level reaches "OFF".
- The after-running period elapses.
- The centrifugal pump switches off.

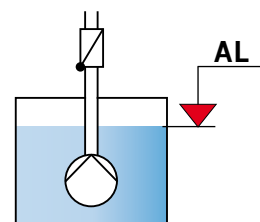


- Switch the inlet water on again.

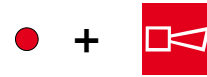
- Press the "off" button.
- The centrifugal pump switches off.



Water level reaches "AL" = overflow alarm.

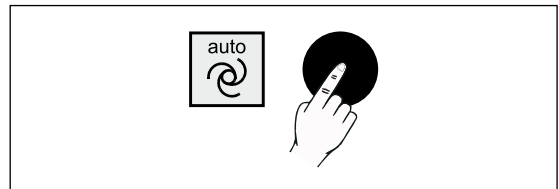


- Red LED lights up.
- Audible alarm sounds.

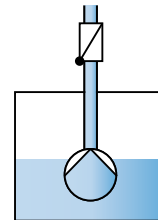


→ Interrupt inflow of water.

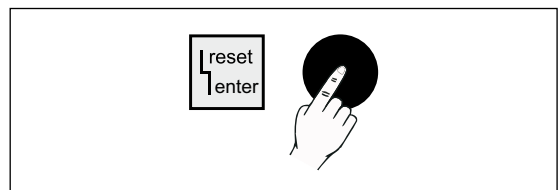
→ Press the "auto" button for automatic operation.



- Centrifugal pump switches on and pumps the waste water from the tank above the backflow level.
- The water level is below "AL".



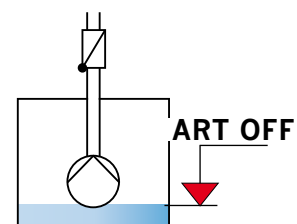
→ Press the "Clear selection" button.



- Red LED goes out.
- The audible alarm switches off.



- The water level reaches "OFF".
- The after-running period elapses.
- The centrifugal pump switches off.



CAUTION

If thumping noises/vibrations occur in the discharge pressure line when the centrifugal pump is switched off:

→ Increase after-running period.

The test run is complete.

→ Repeat the test run for a second time.

7.7 Control Checks

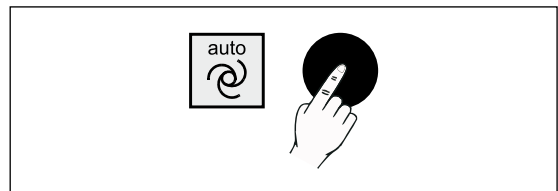
The following checks must be carried out:

- The shut-off devices work correctly
- The centrifugal pump works correctly
- The pump controls work correctly
- The accessories work correctly

7.8 Setting Automatic Operation

Set the following in the pump controls:

- Press the "auto" button for automatic operation of the centrifugal pump.



Plant is ready for operation.

7.9 Handing over Plant to User

On handover to the user:

1. Explain how the plant works.
2. Hand over the plant in good working order.
3. Provide a handover protocol with all significant data from commissioning (e.g. additions or changes to the ex-factory settings).
4. Hand over the operating instructions.

7.10 ACO Maintenance Contract

To safeguard the value and ensure that proper operation of the plant is maintained, and also as a condition of the manufacturer's guarantee, we recommend that work should be carried out directly by the manufacturer, ACO.

This ensures long-term operational safety, and you will also benefit from adjustments and updates which result from our ongoing product development programme.

To request a quotation for a **maintenance contract** please photocopy the next section, complete all details, and fax it to:

Fax + 49 (0) 3 69 65 / 81 9 -3 67.

Request: **Quotation for a maintenance contract for the plant**

Please send me a quotation for regular maintenance. I am aware this is not binding.

Sender

Type:

Installed on:

Usage:


Postcode

Town/city

...



...

7.11 Operation

CAUTION The plant may only be used for the purpose for which it is designed,  Chap. 2.1.



The plant runs automatically. The only necessary work or inspections during operations are:

- Monthly performance of at least 2 test runs,  Chap. 7.7 "Test Run".
- Other inspections of the plant relate only to servicing work,  Chap. 8.3 + 8.4.

8 Servicing

Regular servicing is necessary in order to ensure long-term, safe and interruption-free operation.

The necessary servicing activities are described in this chapter.


8.1 Safety during Installation


During servicing work on the plant, the following risks must be assumed:



WARNING

The following safety instructions must be read carefully before starting servicing work. If carried out incorrectly severe injuries may occur.

Ensure that maintenance personnel have the necessary qualifications,  Chap. 2.2 "Qualification of Personnel".

The user should only carry out tasks which are described in this operating instruction. All other work requires adequate professional training and sufficient experience in dealing with waste water lifting plants. Responsibility,  Chap. 1.1 "ACO Service".

Electrical hazards

Severe injuries or death are possible from contact with parts which are connected to mains


- All work on the electrical equipment in the plant must be carried out by a qualified electrician.



BEWARE


Contact with waste water

Skin and eye injuries, risk of infection

- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".
- On contact with skin: relevant skin areas must be washed thoroughly with soap and disinfected.
- If in contact with eyes: Rinse eyes. If eyes continue to water, consult a doctor.

Sharp edges due to damaged materials

Cuts from worn parts

- Be especially careful and vigilant.
- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".

8.2 Plant Handbook

CAUTION A plant handbook must be kept.

Keeping a plant handbook has many benefits, e.g. traceability of measures and targeted error analysis.

Entries in plant handbook:

- Dates of regular inspection and service work
- Problems, causes of problems, steps taken
- Dates of repair work carried out
- Dates of tests

8.3 Servicing Tasks for Users

This Chapter describes the work which can be carried out by a user.

8.3.1 Daily Checks

The following checks need to be carried out every 1 – 2 days:

- Check that the plant is operational by checking the pump controls.
- Take notice of anything unusual (e.g. different noises when the centrifugal pump is running), react and take the necessary measures.

8.3.2 Servicing Tasks as Needed

The following work can be carried out by the user if necessary:

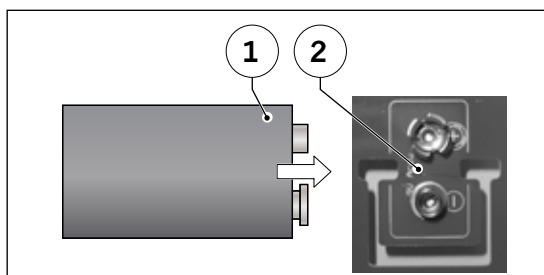
CAUTION To avoid damage to property only normal commercial, non-corrosive cleaning agents should be used.

- Cleaning work on plant parts
- Cleaning work on pump controls


8.3.3 Annual Servicing Work


An electrician must change the pump control battery every year.

- The battery (1) should be inserted in its position (2) on the circuit board by a professional electrician.



8.4 Servicing Tasks for Skilled Professionals

The following table provides an overview of the servicing work which needs to be carried out by a skilled professional,  Chap. 2.2. "Qualification of Personnel".

CAUTION Servicing work,  in Tab. 15, must be carried out at the following intervals:

- Plants operating in **commercial premises** = every 3* months
- Plants operating in **multi-occupancy domestic premises** = every 6* months
- Plants operating in **single occupancy domestic premises** = every 12* months

* Only applies in Germany. Requirements in other countries may vary.

Tab. 15: Servicing Plan for Qualified Personnel

Plant	Activity	Settings
Component	Description	to be done/completed
Pump controls	Check condition/functioning of signal lights	
	Check condition/functioning of controls	
	Check condition/functioning of display fields	
	Check functions and menu settings	
	Carry out test run	
	Check functioning of remote warnings	
	Check fuses are in place	
	Tighten up clamp connections	
Level switching	Check functions	
	Clean the pilot tube	
	Check the control line	
	Check the control line connection	
Tank	Check condition	
	Clean tank	
Centrifugal pump	Check condition/functioning of the motor	
	Check noise when running	
	Check condition of impeller and clean	
	Check condition of volute and clean	
	Clean outside of motor	
Ball retaining valve	Check condition and functioning	
	Check condition of balls	
Inlet valve	Check condition and functioning	
	Lubricate adjustment spindle	
Discharge pressure line stop valve	Check condition and functioning	
	Lubricate adjustment spindle	
Accessories	Check condition	
	Check functions	
	Clean externally	
Total plant	Carry out test run	

= Can use to check off completed tasks

9 Correcting Faults and Repairs

This Chapter basically provides information on how to troubleshoot and repair the plant.


9.1 Safety during Repairs and Fault Correction


During troubleshooting and repair work on the plant, the following risks must be assumed:



WARNING

The following safety instructions must be read carefully before starting troubleshooting and repair. If carried out incorrectly severe injuries may occur.

Ensure that staff have the necessary qualifications,  Chap. 2.2 "Qualification of Personnel".

The user should only carry out tasks which are described in this operating instruction. All other work requires adequate professional training and sufficient experience in dealing with waste water lifting plants. Responsibility,  Chap. 1.1 "ACO Service".

Electrical hazards

Severe injuries or death are possible from contact with parts which are connected to mains


- All work on the electrical equipment in the plant must be carried out by a qualified electrician.



BEWARE

Contact with waste water

Skin and eye injuries, risk of infection

- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".
- On contact with skin: relevant skin areas must be washed thoroughly with soap and disinfected.
- If in contact with eyes: Rinse eyes. If eyes continue to water, consult a doctor.


Sharp edges due to damaged materials

Cuts from worn parts

- Be especially careful and vigilant.
- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".

In the event of a fault, the motor of the centrifugal pump can heat up to a maximum of 110°C


Burn injuries




- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".
- Let the motor cool for at least 30 mins.
- Be especially careful and vigilant.

9.2 Error Analysis


The following table can be used to help identify the cause of problems and take the necessary measures.

Tab. 16: Error Analysis

Fault	Cause(s)	Remedy/ies	Expert required	
Centrifugal pump transports nothing or too little	Shut-off valve (stop valve) in discharge pressure line is neither open nor shut completely	Fully open shut-off valve (stop valve)		7.7
	Discharge pressure line obstructed	Clean discharge pressure line	x	9.3
or Container full	Impeller obstructed	Dismantle centrifugal pump and clean impeller	x	9.3
	Air in centrifugal pump	Vent centrifugal pump	x	9.3
	Worn pump parts	Replace worn pump parts	x	9.3
Centrifugal pump not running	Defective motor	Replace motor	x	9.3
	Centrifugal pump blocked by foreign body	Dismantle centrifugal pump and clean impeller and volute	x	9.3
	Connection to power supply broken	Check connection and repair as needed	x	6.4.3
	Automatic operation switched off	Switch on automatic operation		7.9
	Centrifugal pump overload protection has been triggered and cannot be cleared	Dismantle centrifugal pump and clean impeller and volute	x	9.3

Centrifugal pump only runs in manual mode	Control line for level switching is leaking, laid wrongly, kinked or obstructed	Check control line and correct problem		6.4.6
	Pilot tube blocked	Clean the pilot tube		8.3
	Pressure switch in pump controls not working	Replace pump controls	x	9.3
Centrifugal pump is running noisily and for too long or does not switch off	Discharge pressure line or vent stack is obstructed	Clean line	x	9.3
	Vent stack is not laid at all or incorrectly	Lay vent stack properly	x	6.2.6
	Discharge pressure line wrong size, losses too great	Reduce losses by selecting a larger nominal diameter	x	6.2.7
	Defective ball retaining valve	Open ball retaining valve; clean chamber, ball seat and ball and replace if necessary	x	9.3
Thumping noises/vibrations in the discharge pressure line when the centrifugal pump is switched off	Pressure or water hammer in the discharge pressure line	Increase the after-running period of the centrifugal pump		7.7.1
Display area: max. current Display element: 	Centrifugal pump is blocked by foreign body and current limiter has generated a malfunction	Dismantle centrifugal pump and clean impeller and volute	x	9.3
	Centrifugal pump overload protection has been triggered and cannot be cleared	Dismantle centrifugal pump and clean impeller and volute	x	9.3
Display area: Overflow alarm Display element:  + 	Shut-off valve in discharge pressure line is neither open nor shut completely	Fully open shut-off valve		7.7.2
	Automatic operation not switched on	Switch on automatic operation		7.9
	Defective pump motor	Check manual operation, if necessary replace motor	x	9.3
	Impeller obstructed	Dismantle centrifugal pump and clean impeller	x	9.3
	Venting of volute obstructed	Dismantle centrifugal pump and clean ventilation holes in the volute	x	9.3
	Discharge pressure line obstructed	Clean discharge pressure line	x	9.3
	Worn pump parts	Replace worn pump parts	x	9.3

9.3 Repairs and Spares

For repair work and ordering spares please contact ACO Service, quoting the details shown on the type plate,  Chap. 1.1 "ACO Service".

10 Decommissioning and Disposal

This Chapter provides you with information about the correct way to decommission and dispose of the plant.


10.1 Safety during Decommissioning and Disposal


During decommissioning and disposal work on the plant, the following risks must be assumed:



WARNING

The following safety instructions must be read carefully before starting decommissioning and disposal. If ignored severe injuries may occur.

Ensure that staff have the necessary qualifications,  Chap. 2.2 "Qualification of Personnel".

Follow additional safety instructions for "Transport and Storage",  Chap. 3.1 "Safety during Transport and Storage".

Electrical hazards

Severe injuries or death are possible from contact with parts which are connected to mains


- All work on the electrical equipment in the plant must be carried out by a qualified electrician.
- All work on decommissioning the electrical equipment in the lifting plant must be carried out by a qualified electrician.



BEWARE

Contact with waste water

Skin and eye infections

- Wear personal protective equipment,  Chap 2.3 "Personal Protective Equipment".
- On contact with skin: relevant skin areas must be washed thoroughly with soap and disinfected.
- If in contact with eyes: Rinse eyes. If eyes continue to water, consult a doctor.


Sharp edges due to damaged materials

Cuts from worn parts

- Be especially careful and vigilant.

10.2 Decommissioning

Sequence for decommissioning:

1. Disconnect the pump control from the power supply.
2. Rinse out connecting cables.
3. Empty and clean the tank and dispose of waste water.
4. Cover tank.
5. Cover pump controls and accessories and protect from damp.
6. If not in use for more than one month lubricate the plant,
 Chap. 3.3 "Storage".

10.3 Stopping

Sequence for stopping:

1. Disconnect the pump control from the power supply.
2. Disconnect the cable in the connection box from the pump control.
3. Disconnect the control line and remove.
4. Rinse out connecting cables.
5. Empty and clean the tank and dispose of waste water.
6. Dismantle connecting cables.
7. Dismantle plant elements.

10.4 Disposal

The plant is made from materials which can be recycled.

CAUTION Incorrect recycling damages the environment unnecessarily. Local disposal regulations must be respected.

- All steel or cast iron components should be separated out and taken for recycling.
- All rubber (NBR) components should be separated out and taken for recycling.
- All plastic (PE-HD or PUR) components should be separated out and taken for recycling.
- Separate out the pump controls and electrical components and recycle as electrical waste.

Appendix

Index of Tables and Illustrations

List of Tables

Tab. 1:	Characteristic data for product identification	7
Tab. 2:	Qualification of Personnel.....	9
Tab. 3:	Personal Protective Equipment	10
Tab. 4:	Levels of Risks	11
Tab. 5:	Items delivered with the plant	16
Tab. 6:	Features of the Plant Parts.....	19
Tab. 7:	Setting Menus.....	31
Tab. 8:	Technical Data for Plant	34
Tab. 9:	Performance Data of the Centrifugal Pump.....	34
Tab. 10:	Technical Data for the Pump Controls	36
Tab. 11:	Prerequisites for Installation	38
Tab. 13:	Menu Data	59
Tab. 14:	Water Level for Switching Point "OFF"	60
Tab. 15:	Servicing Plan for Qualified Personnel	68
Tab. 16:	Error Analysis	70

List of Illustrations

Illus. 1:	Diagram of Components	22
Illus. 2:	Schematic Representation of Functional Principle.....	23
Illus. 3:	Installation situation.....	26
Illus. 4:	Operation of Pump Controls	27
Illus. 5:	Plant Dimensions	33
Illus. 6:	Characteristic Curves of the Centrifugal Pump.....	35
Illus. 9:	Installation Work	39
Illus. 10:	"Inlet Sockets" Position	42
Illus. 11:	"Ventilation Sockets" Position.....	44
Illus. 12:	Backflow loop.....	45
Illus. 13:	"Draining Connections" Position.....	47
Illus. 14:	"Fixing pockets" Position	48
Illus. 15:	Electrical Work	50
Illus. 16:	"Control Line Connection" Position.....	53

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