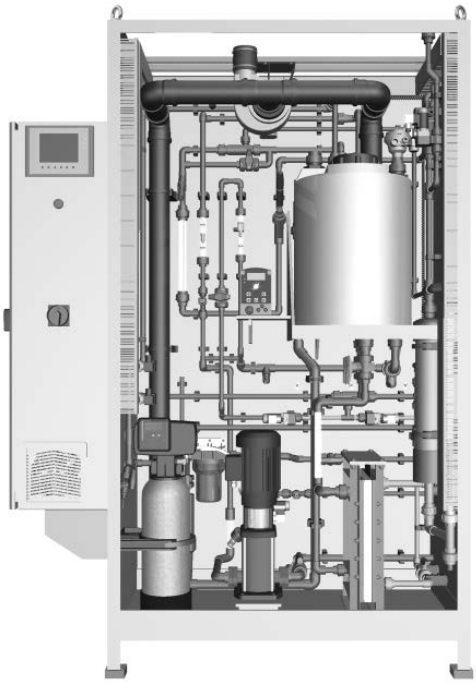
Operating instructions

Chlorine Electrolysis System

CHLORINSITU®-V FBA

EN



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Please carefully read these operating instructions before use. · Do not discard.
The operator shall be liable for any damage caused by installation or operating errors.
The latest version of the operating instructions are available on our homepage.

General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.

Supplementary information

Please read the supplementary information in its entirety.

Information

This provides important information relating to the correct operation of the unit or is intended to make your work easier.

Safety Information

The safety information includes detailed descriptions of the hazardous situation, see *Chapter 1.2 'Explanation of the safety information' on page 7*

The following symbols are used to highlight instructions, links, lists, results and other elements in this document:

More symbols

Symbol	Description
1.	Action, step by step
⇨	Outcome of an action
	Links to elements or sections of these instructions or other applicable documents
■	List without set order
[Button]	Display element (e.g. indicators) Operating element (e.g. button, switch)
'Display /GUI'	Screen elements (e.g. buttons, assignment of function keys)
CODE	Presentation of software elements and/or texts

Table of contents

1 Description of the System

The system is used for water disinfection in:

- F&B
- Brewery industry
- etc.

The system is used to produce a chlorine-based disinfectant.

The system is used to electrochemically produce *'free chlorine'* from substances naturally present in water.

The quantity of *'free chlorine'* is determined, among other things, by the concentration of the chloride ions, but also by the current strength.

The system has the following features:

- The product is generated in-situ where it is needed
- Concentrated chemicals do not need to be transported

1.1 Description and Operation

Water softener

Install a softener upstream of the system, which, among other things, will prevent pH-based deposits of calcium and the temperature rising. Calcium and magnesium cause serious deposits on the diaphragm cell.

The system produces free chlorine from a salt solution, as per the diagram below. The system produces chlorine by means of an electrochemical process in a diaphragm cell.

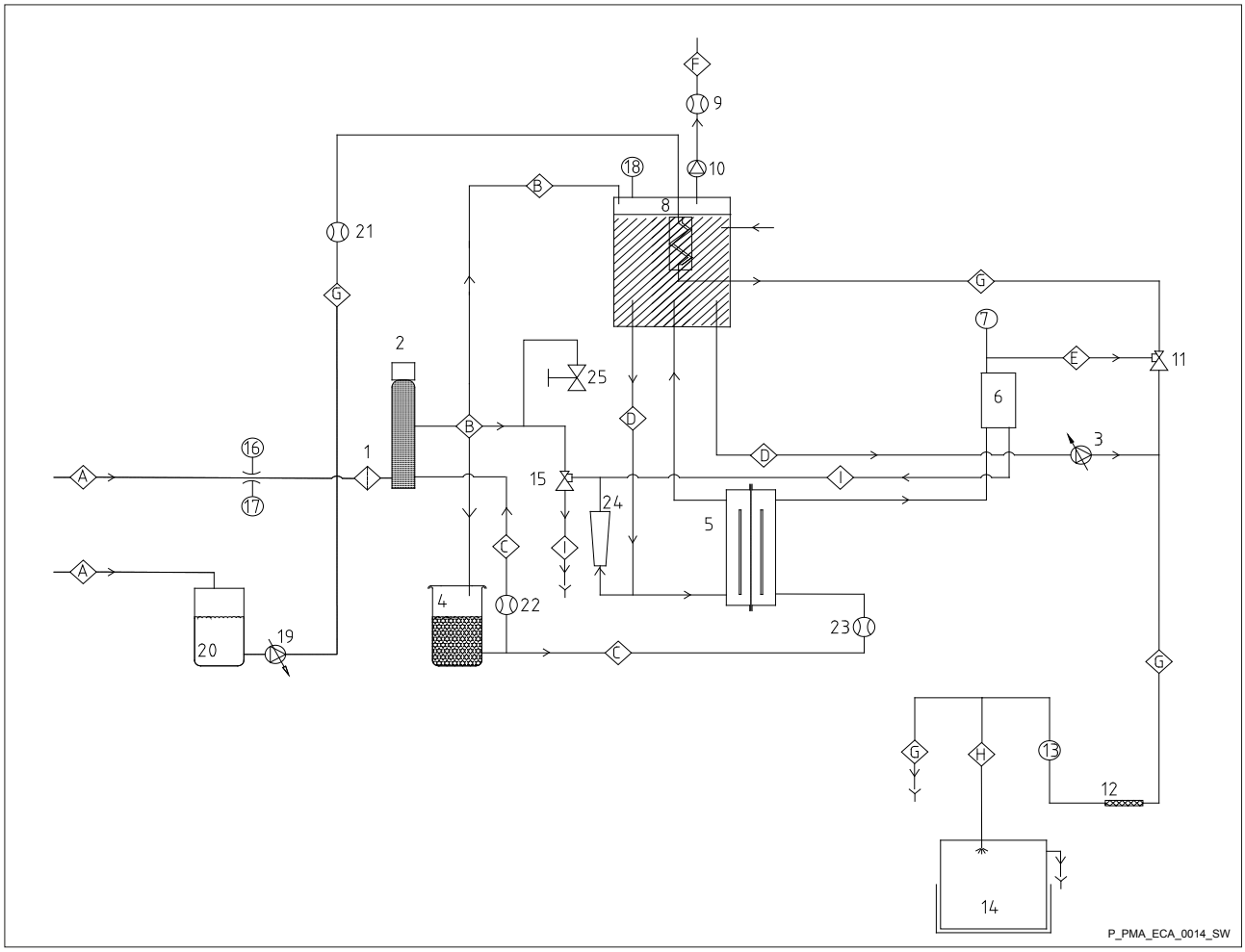


Fig. 1: Diagram CHLORINSITU® V FBA

No.	Part	Function
1	Water filter	to combat impurities > 500 µm
2	Water softener	softens the supply water
3	Lye metering pump	Pump to correct the pH value
4	Brine storage tank	prepares and stores brine
5	Diaphragm cell	to produce chlorine and NaOH
6	Refresh pipe	helps to regenerate the anode
7	Vacuum sensor	measures the negative pressure
8	Lye storage tank	stores the lye
9	Sensor air flow	continuously monitors the hydrogen gas/air mixture
10	Fan	mixes hydrogen gas with air until the mixture is no longer explosive
11	Chlorine gas water jet pump	dissolves the chlorine gas from the refresh pipe in the process water
12	Static mixer	mixes the lye with the process water
13	pH sensor	measures the pH value of the pH-neutralised process water
14	Product storage tank (accessory)	stores the Product

No.	Part	Function
15	Anode regeneration water jet pump	draws up brine and anode residue by suction
16	Manometer	measures the pressure in the supply water
17	Pressure reducer	used to adjust the pressure in the supply water
18	Conductivity sensor	used to keep the lye concentration constant in the lye storage tank
19	Booster pump	keeps the flow of process water through the electrolysis system stable
20	Separation storage tank	stores the potable water for the booster pump
21	Process water flow meter	measures the process water flow, kept constant by the booster pump
22	Brine flow meter for softener	measures the volume of brine for regeneration of the softener
23	Brine flow meter for diaphragm cell	measures the volume of brine for the diaphragm cell
24	Lye metering flow meter	measures the flow of lye, by means of which the process water can be adjusted to be pH-neutral via the metering tap
25	Sampling tap	it can be used to take a sample of process water

Basic substances required

If calcium and/or magnesium are present in the brine, then these elements precipitate as lime on the negative probe (cathode) and the diaphragm in the diaphragm cell will be irreparably damaged. Therefore install a softener upstream of the system. Use salt with as low a calcium and magnesium content as possible in this softener. We recommend using Marina® or Broxo-6-15® salt, which is specifically supplied for water softeners.

Ensure that the salt also meets the chemical specification below:

- Insoluble substances < 100 ppm
- Calcium (Ca^+) < 70 ppm
- Magnesium (Mg^+) < 70 ppm

Water quality: The system is suitable for connecting to the potable water network. The water should be of potable water quality or comparable.

Sound pressure level

The sound pressure level is < 70 dB (A) at maximum speed, at maximum back pressure, using water as the medium.

Protection against contact and humidity (IP)

Degree of protection for the system: IP 55.

1.2 Explanation of the safety information

Introduction

These operating instructions provide information on the technical data and functions of the product. These operating instructions provide detailed safety information and are provided as clear step-by-step instructions.

The safety information and notes are categorised according to the following scheme. A number of different symbols are used to denote different situations. The symbols shown here serve only as examples.

DANGER!

Nature and source of the danger

Consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger

Danger!

– Denotes an immediate threatening danger. If this is disregarded, it will result in fatal or very serious injuries.

WARNING!

Nature and source of the danger

Possible consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger

Warning!

– Denotes a possibly hazardous situation. If this is disregarded, it could result in fatal or very serious injuries.

CAUTION!

Nature and source of the danger

Possible consequence: Slight or minor injuries, material damage.

Measure to be taken to avoid this danger

Caution!

– Denotes a possibly hazardous situation. If this is disregarded, it could result in slight or minor injuries. May also be used as a warning about material damage.

NOTICE!

Nature and source of the danger

Damage to the product or its surroundings

Measure to be taken to avoid this danger

Note!

– Denotes a possibly damaging situation. If this is disregarded, the product or an object in its vicinity could be damaged.

Type of information

Hints on use and additional information

Source of the information, additional measures

Information!

– *Denotes hints on use and other useful information. It does not indicate a hazardous or damaging situation.*

1.3 Users' qualifications

WARNING!

Danger of injury with inadequately qualified personnel!

The operator of the plant / device is responsible for ensuring that the qualifications are fulfilled.

If inadequately qualified personnel work on the unit or loiter in the hazard zone of the unit, this could result in dangers that could cause serious injuries and material damage.

- All work on the unit should therefore only be conducted by qualified personnel.
- Unqualified personnel should be kept away from the hazard zone

Training	Definition
Instructed personnel	An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him/her and possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.
Trained user	A trained user is a person who fulfils the requirements made of an instructed person and who has also received additional training specific to the system from ProMinent or another authorised distribution partner.
Trained qualified personnel	A qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognize possible hazards based on his/her training, knowledge and experience, as well as knowledge of pertinent regulations. The assessment of a person's technical training can also be based on several years of work in the relevant field.
Electrician	Electricians are deemed to be people, who are able to complete work on electrical systems and recognize and avoid possible hazards independently based on his/her technical training and experience, as well as knowledge of pertinent standards and regulations. Electricians should be specifically trained for the working environment in which the are employed and know the relevant standards and regulations. Electricians must comply with the provisions of the applicable statutory directives on accident prevention.
Customer Service department	Customer Service department refers to service technicians, who have received proven training and have been authorised by ProMinent to work on the system.

Note for the system operator

The pertinent accident prevention regulations, as well as all other generally acknowledged safety regulations, must be adhered to!

2 Safety and Responsibility

2.1 General Safety Information

WARNING!

Danger due to hazardous substances

By operating this system the operator generates hazardous substances.

The operator is responsible for adapting the operating instructions to their system in the event that more recent knowledge about the dangers associated with a hazardous substance and its avoidance become available or national regulations prescribe something else to that stated in the supplied operating instructions.

WARNING!

Safely discharge any waste hydrogen produced

Always discharge any hydrogen produced during the electrolysis process outside into the atmosphere via a closed, continuously rising pipework system.

Check the continuity of the hydrogen discharge line annually.

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

The system operator is responsible for ensuring that the safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

Sound pressure level

The sound pressure level is < 70 dB (A) at maximum power (without the booster pump)

Explosion safety

The system generates a small volume of hydrogen-air mixture. It is essential that this hydrogen-air mixture is safely discharged into the surrounding air outdoors. Check during installation that no air is drawn in close to the outlet, for instance by an air conditioning system.

If hydrogen is released due to a damaged pipeline or due to another cause, it can form an explosive gas mixture (hydrogen-air mixture) with the ambient air. Ensure that the room has a minimum ventilation rate of 5 m^3/hour. Ensure that the ventilation system is operational when the system is running.

Open flame

No open flames are permitted when the system is in operation.

Industrial security concept for the entire system

For the safe operation of a system or machine, it is also necessary to take appropriate safety measures (e.g. cell protection concept) and to integrate the automation and drive components in an overall industrial safety scheme for the entire system or machine, which corresponds to the current state of the art. In doing so, take into account any other manufacturers' products used.

Organisational requirements:

- According to ATEX 137, it is the responsibility of the operator to draw up an explosion safety document.
- The operator should include the system in his Emergency Plan and state the outline safety plans.
- The Emergency Plan should not run any escape routes past the system.
- The operator should appoint a Safety Coordinator. This person is responsible for monitoring work that affects the system's explosion safety.

Personal protective equipment

The operator should provide personal protective equipment in line with the hazards and in compliance with national regulations.

Information in the event of an emergency

The operator should supplement the emergency information in line with the hazards and in compliance with national regulations.

- In the event of smelling chlorine gas:
  - immediately switch off the electrolysis system
  - or press an Emergency Stop switch
  - or disconnect the mains power supply
  - or trigger an external fuse
  - and inform Service.
- If an electrical emergency occurs, immediately disconnect the electrolysis system from the mains power supply and then inform Service.

2.2 Intended Use

- The system is only intended for the production and metering of a disinfection solution containing chlorine from sodium chloride. This disinfection solution is used to disinfect water.
- All other uses or modifications are prohibited.
- Do not operate the system in conditions other than those described in these operating instructions.
- Only allow qualified personnel to operate the system.
- Please observe the information in the operating instructions at every phase of the system's service life
- Please observe the relevant national regulations and guidelines at every phase of the system's service life

3 Components of the System

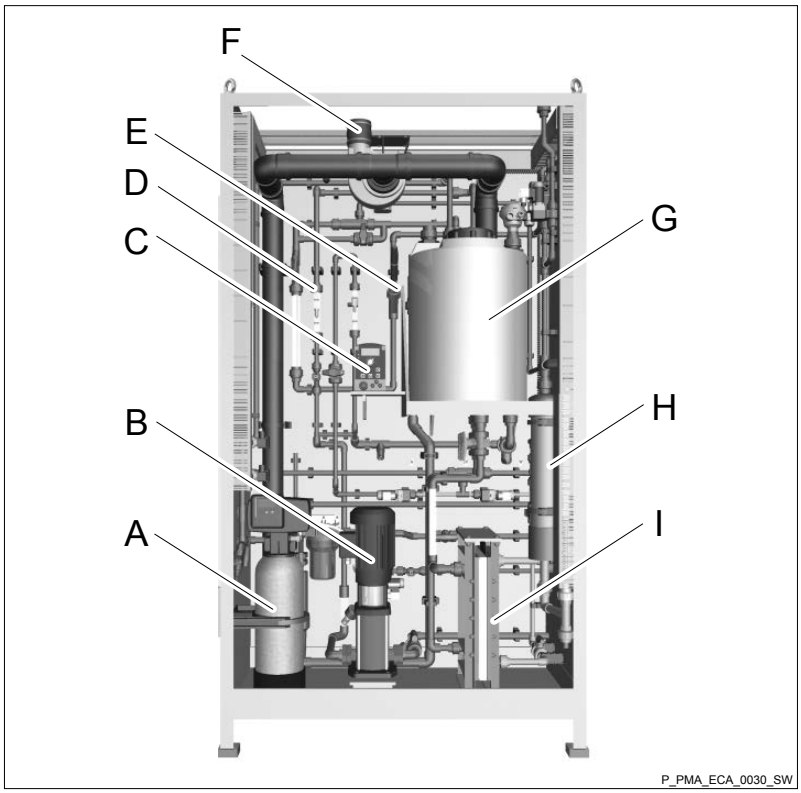


Fig. 2: Components of the System in the System Cabinet

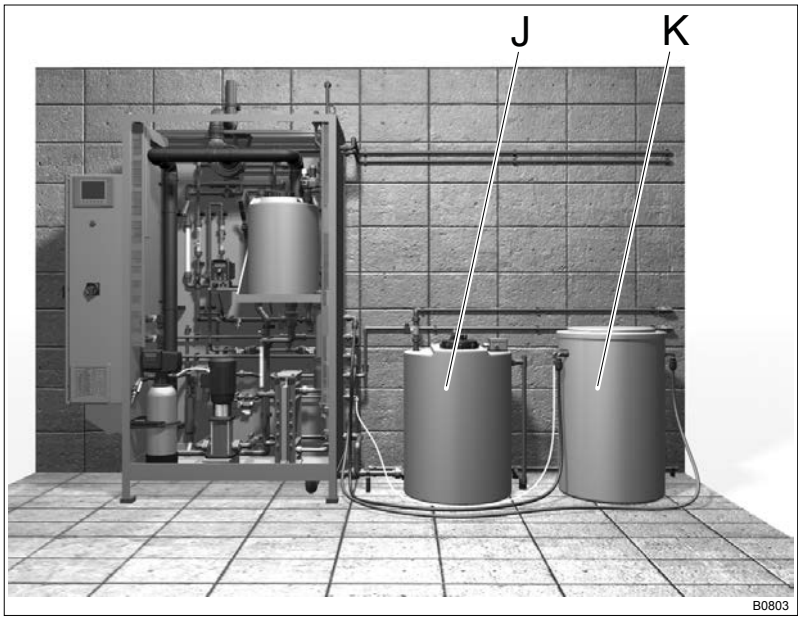


Fig. 3: Installation of the system

Number	Part	Function
A	Water softener	Softens the water. Removes calcium and magnesium.
B	Booster pump	Keeps the flow of process water through the electrolysis system stable
C	Lye metering pump	Increases the pH value of the product.
D	Flow meter	The process water to the lye storage tank is switched on and measured after measuring the flow volume.

Number	Part	Function
E	pH sensor	Measures the pH value of the product.
F	Fan	Dilution of the hydrogen gas up to 10% of the explosion limit.
E	Lye storage tank	Stores the sodium hydroxide solution produced.
H	Refresh pipe	Helps to regenerate the anode.
I	Diaphragm cell	Chlorine is produced from a salt solution in an electrochemical process in the diaphragm cell.
J	Separation storage tank	The booster pump storage tank helps the booster pump to keep the water pressure constant in the system, should the water pressure fall at the potable water connector.
K	Brine storage tank	Salt storage. It produces a saturated salt solution together with the softened water.
Above fig.	Product storage tank	The Product is stored in the product storage tank.

4 Storage and Transport

Storage

WARNING!

Storage of the system in unsuitable ambient conditions.

– It is mandatory that the following storage instructions are adhered to.

Unsuitable ambient conditions can lead to incorrect operation and malfunction of the system installed and, when the system is in operation, also lead to danger to personnel.

Store the system in its original transport packaging in a sealed room and also

- At a temperature of between 5 °C ... 50 °C
- At a relative air humidity of below 85 % without condensation
- In a non-aggressive environment (no harmful vapours, chemicals etc.),
- Protected from direct sunlight, rain and moisture
- Store the system upright.

Transport

WARNING!

Incorrect transport

Incorrect transport of the system by non-seaworthy packaging or horizontal packaging.

– It is mandatory that the following instructions are adhered to.

Incorrect transportation can result in damage to personnel and material damage.

- Only connect appropriate lifting equipment to the lifting eyes on the top of the system.
- Carefully transport the system vertically (see label on the transportation packaging).
- Avoid mechanical impacts
- Protect the system from direct sunlight, rain and moisture during transportation.

CAUTION!

Toppling of the system cabinet

– Once the system has been unpacked, secure the system with lashing straps to prevent it from toppling over.

If the system topples over it can cause injuries to personnel and material damage.

5 Preparation for Use

WARNING!

Danger from operation of the system in unsuitable locations.

– Adhere to all national and local regulations relating to the use of chlorine.
– The operator of the system is responsible for ensuring that the regulations are implemented.

Disregarding the safety requirements can lead to personal injuries or damage to property.

- Ensure that the floor of the room has sufficient load-bearing strength to carry the weight of the filled system.
- Ensure that the room has an adequately dimensioned floor drain to safely drain any escaping water in the event of a pipe leak.
- Do not locate permanent work places in rooms in which the system is situated.
- Ensure that the room is free of aggressive vapours and chemicals.
- Ensure that the room contains minimal dust.
- Ensure that the room temperature and air humidity do not exceed the permissible limits. Install an air conditioning system in the room if this cannot be guaranteed.
- Protect the system from direct sunlight.
- Ensure that there is adequate mechanical ventilation in the room to prevent harmful substances accumulating in the ambient air.
- Allow a minimum gap of ≥ 30 cm for the cooling fan and for maintenance to the left and right of the control cabinet.
- Ensure that the room has suitable and adequate mains voltage connections for operation of the relevant system.
- Ensure that the room has an adequate supply of cooling water, if cooling water is needed.
- Ensure that the floor is even and horizontal and has a solid base surface.
- Prevent the system from toppling over by, for example, fixing the control cabinet to the wall or floor. Secure it in another way should the latter not be possible.
- Check the requirements relating to accessories, operated together with the system in the same room, such as air separation systems. Refer to the literature for the accessories.
- Ensure that the rear wall of the system is at least ≥ 15 cm from the wall.

6 Installation and Assembly

6.1 Assembly Check-list

#	Assembly process	Tick
1	Check whether the installation location complies with the guidelines governing temperature, safety, space, humidity etc.	
2	Clear the space in which the system is to be installed.	
3	Remove the plastic wrapping from the system.	
4	Check whether the system has suffered damage during transport or displays other damage.	
5	Remove the securing material fixing the system to the pallet.	
6	Lift the system into its installation position.	
7	Check whether system is horizontal.	
8	Install the separation storage tank in its intended position.	
9	Position the brine storage tank in its intended position.	
10	Position the product storage tank in its intended position.	
11	Connect a pipe to the pipe supplied (Ø63 mm) and route the discharge pipe outside.	
12	Make sure that the discharge pipe (Ø63 mm) routed outside complies with ATEX regulations.	
13	Connect the Ø20 mm PVCU pipe to the ventilation line to the outside.	
14	Connect the Ø20 mm PVCU pipe to the bleed connector on the product storage tank to the outside.	
15	Connect tap water to the separation storage tank.	
16	Connect the overflow of the separation storage tank to the sewerage channel.	
17	Connect a Ø 32 mm PVCU line between the separation storage tank and the "Process water" connector on the system.	
18	Connect the Ø40 mm PVCU discharge pipe on the system to the sewerage channel.	
19	Connect a water line to the "Water feed" Ø 20 mm PVCU coupling on the system.	
20	Connect a PVCU line (Ø20 mm) between the "Product" connector on the system and the product storage tank.	
21	Connect a PVCU line (Ø20 mm) between the "Drainage pipe" connector on the system and the pipe to the waste water system.	
22	Connect the level switch on the product storage tank to the control cabinet.	
23	Fit the product storage tank level switch in the product storage tank.	
24	Electrically wire the level switch on the product storage tank.	
25	Connect the cable from the terminal box on the separation storage tank in the control cabinet.	
26	Use the Ø16 mm x 1.8 mm PE hose to join the "Fill brine storage tank" connector on the system to the Ø16 mm connector on the brine storage tank.	
27	Use the Ø16 mm x 1.8 mm PE hose to join the "Brine diaphragm cell" connector on the system to the Ø16 mm connector on the brine storage tank.	
28	Connect the transparent 8 mm nylon hose with ⌀ 10 mm between the "Brine softener" connector on the system and the ⌀10 mm connector on the brine storage tank.	
29	Connect a ⌀ 40 mm PVCU line to the brine storage tank and to the sewerage system. There should be salt in the brine storage tank once the PVCU lines have been connected.	
30	Connect the brine storage tank level switch.	

#	Assembly process	Tick
31	Fit the pH sensor into the line.	
32	Connect the power cable to the terminal strip in the control cabinet in accordance with the voltage and current specification.	

THIS PART WAS ACCEPTED BY:	NAME:	SIGNATURE:
Project number:		
System:		

6.2 Assembly and Installation of the System

- **User qualifications, mechanical/hydraulic installation:** trained skilled personnel, see *Chapter 1.3 'Users' qualifications' on page 9*
- **User qualification, electrical installation:** Electrical technician, see *Chapter 1.3 'Users' qualifications' on page 9*

1. Check whether the installation location complies with the guidelines governing temperature, safety, space, humidity etc.

Specification of the installation location

Ensure that the installation location ideally complies with the following conditions:

- *A dry area, which does not necessarily have to be a separate room.*
- *An area that can be locked/cordoned off so that only authorised personnel have access.*
- *An ambient temperature of 10 ... 35 °C, otherwise install an air conditioning system.*
- *It should be possible to fit a sewerage drain, a bleed valve and bleed openings.*

An installation drawing showing the correct dimensions can also be produced to ensure correct installation. The installation area and position are determined using the drawings provided.

CAUTION!

Contamination and impurities in the lines can subsequently seriously damage components in the system.

- Ensure that all lines are free from burrs, chips or other impurities before connecting them to the system.

CAUTION!

The level switches can subsequently fail.

- Make sure that no dirt remains in the storage tanks after installation.

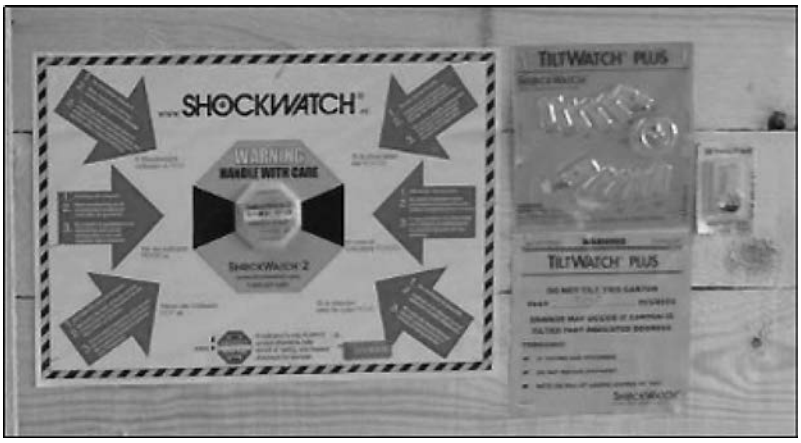
2. Clear the space in which the system is to be installed

Check that there are no obstacles around the system.

Provide a clearance of around 1 metre in front of and beside the system for maintenance purposes.

Always leave room for a waste water connection, discharge conduits and ventilation system. The waste water connection is located underneath the system.

3. Remove the plastic wrapping from the system.



4. Check whether the system has suffered damage during transport or displays other damage.

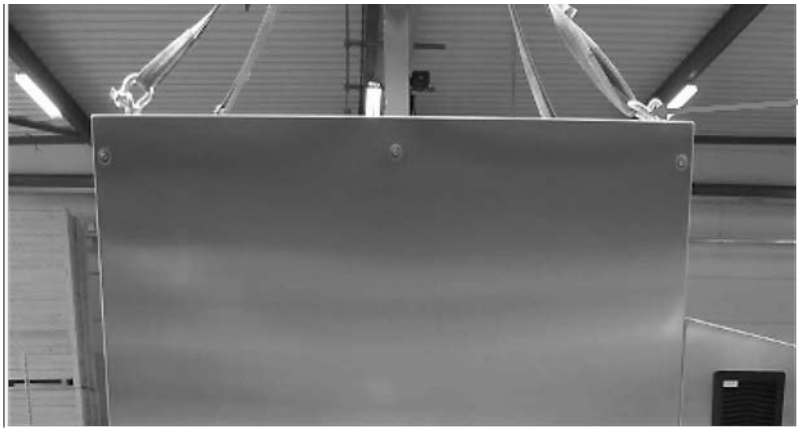
   Check that the scope of delivery is complete.

   Check the transport monitoring set on the transport crate.

5. Remove the securing material fixing the system to the pallet.

   In the system cabinet, remove:

   - securing material between the diaphragm cell and frame



6. Lift the system into its installation position.

The system has load hooks, by means of which the system can be lifted and moved to the correct position.

You can also use a fork-lift to position the system, taking into account the fact that there is a PVC connector on the underside of the system that can be damaged.

7. Check whether system is horizontal.

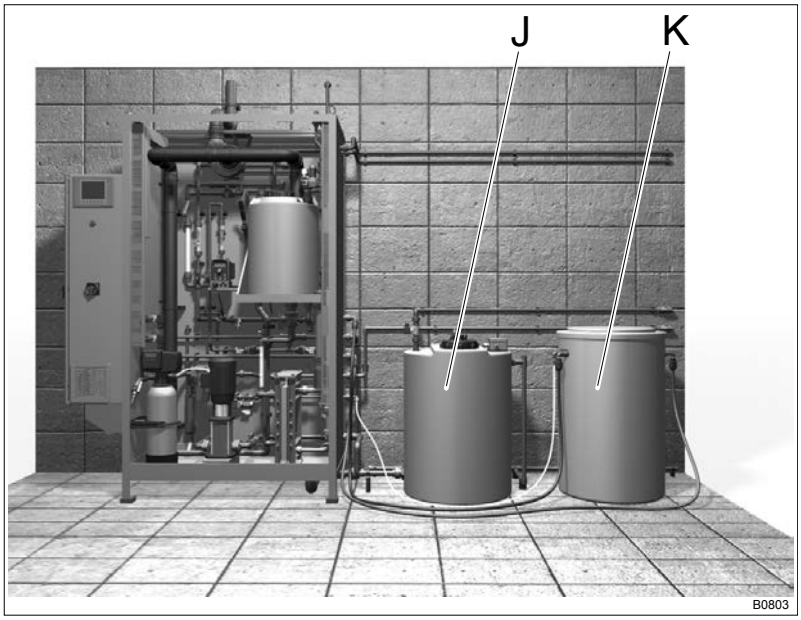


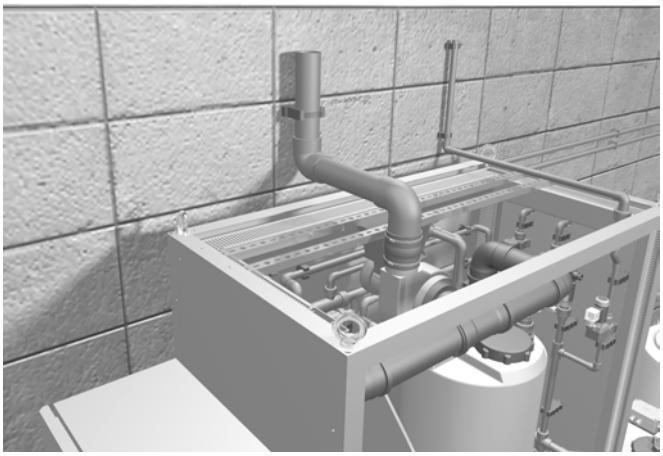
Fig. 4: CHLORINSITU® V FBA system

J Separation storage tank
K Brine storage tank

8. Position the separation storage tank (J) in its intended position. Preferably position the separation storage tank in the direct vicinity of the system. Remove all objects, even smaller foreign bodies, from the area under the separation storage tank. The storage tank can be damaged by these objects, owing to the heavy weight of the storage tank.

9. Position the brine storage tank (K) in its intended position. Preferably position the brine storage tank in the direct vicinity of the system. Remove all objects, even smaller foreign bodies, from the area under the brine storage tank. The storage tank can be damaged by these objects, owing to the heavy weight of the storage tank.

10. Position the product storage tank (accessories) to the right of the brine storage tank. Preferably position the product storage tank in the direct vicinity of the system. Remove all objects, even smaller foreign bodies, from the area under the product storage tank. The storage tank can be damaged by these objects, owing to the heavy weight of the storage tank.



11. Connect a pipe to the pipe supplied (Ø63 mm) and route the discharge pipe outside.

Route the line outside so that nothing can fall into it.

CAUTION!
Contamination and impurities in the lines can subsequently seriously damage components in the system.

– Ensure that all lines are free from burrs, chips or other impurities before connecting them to the system.

12. Make sure that the discharge pipe (Ø63 mm) routed outside complies with ATEX regulations.

Always route the PVCU discharge line upwards. Do not allow any part of the PVCU discharge line to point downwards.

Ensure that the PVCU discharge line does not have more than 3 bends.

The maximum permissible length of the PVCU discharge line is 10 metres.

Check that an ATEC 137-compliant safety plan has been produced.

CAUTION!
Contamination and impurities in the lines can subsequently seriously damage components in the system.

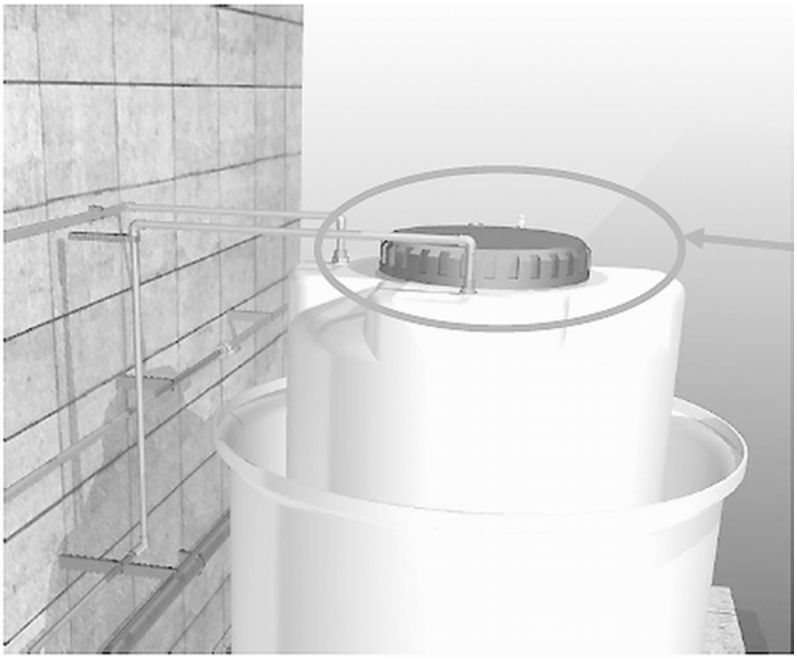
– Ensure that all lines are free from burrs, chips or other impurities before connecting them to the system.

13. Connect the Ø20 mm PVCU pipe to the ventilation line to the outside.

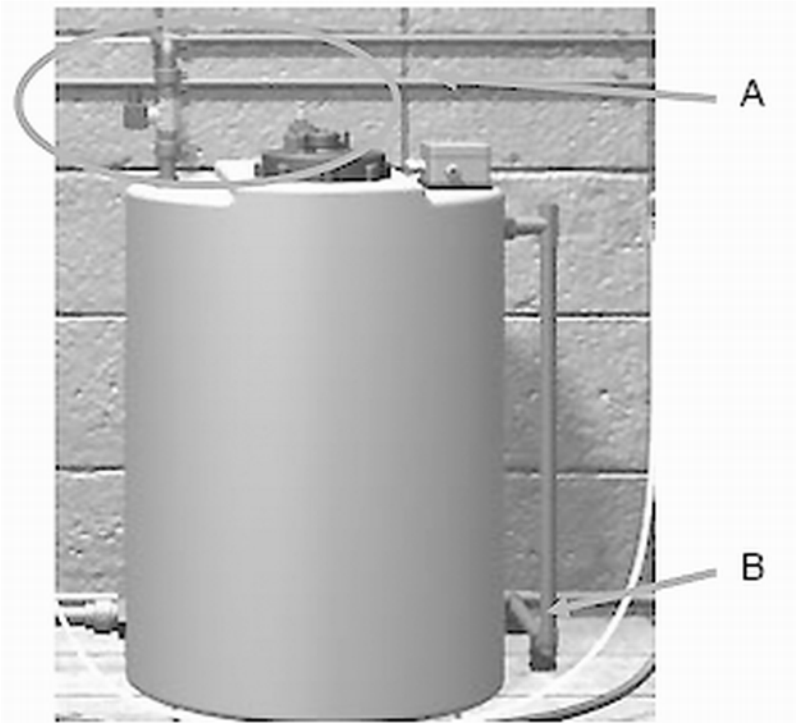
CAUTION!

Contamination and impurities in the lines can subsequently seriously damage components in the system.

– Ensure that all lines are free from burrs, chips or other impurities before connecting them to the system.



14. Connect a Ø20 mm PVCU pipe to the bleed connector on the product storage tank to the outside.



A PVCU connector (Ø20 mm) for tap water
B PVCU connector (Ø20 mm) for the overflow on the separation storage tank to the waste water system

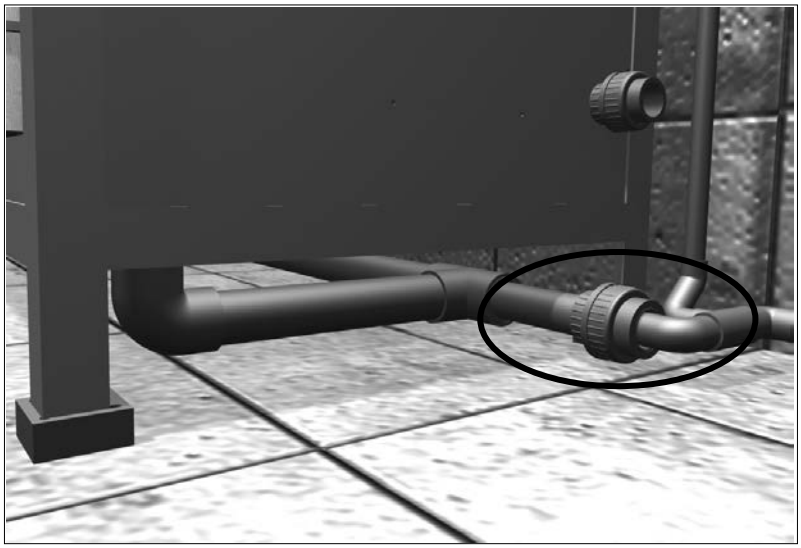
15. Connect tap water (A) to the separation storage tank.

16. Connect the overflow (B) of the separation storage tank to the sewerage channel.

Fig. 5: PVC-U line (Ø32 mm)

17. Connect a Ø 32 mm PVCU line between the separation storage tank and the "Process water" connector on the system.

    Make sure that the line does NOT fall so that the lower connector and the water jet pump are at least at the same height in the system.



18. Connect the Ø40 mm PVCU discharge pipe on the system to the sewerage channel.

Fig. 6: PVCU coupling Ø20 mm

19.

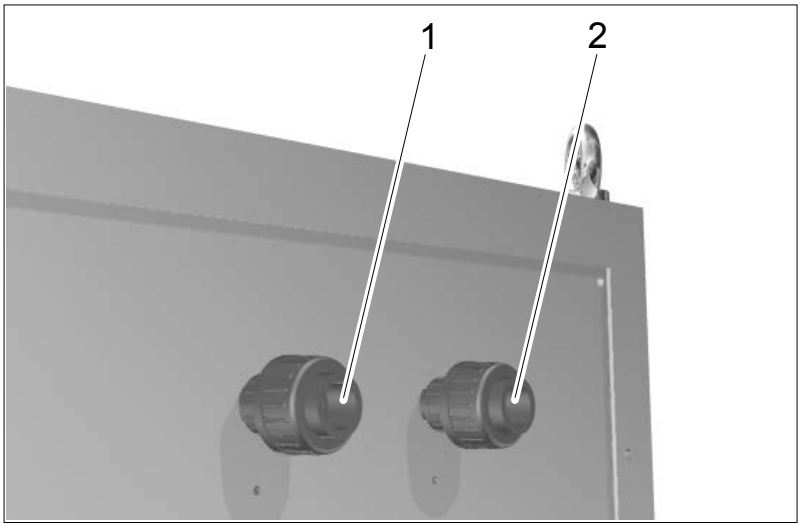
No.	Connector
1.	Brine for diaphragm cell
2.	Drainage line
3.	Brine storage tank filling line
4.	Water supply
5.	Brine for the softener
6.	Industrial process water

Connect a water line to the "Water feed" PVCU coupling (4) on the system

- Minimum pressure = 1.5 bar/overpressure
- Maximum pressure = 5 bar/overpressure
- Minimum flow = 10 l/min
- Quality = potable water

Non-return valve

Fit a non-return valve in the potable water supply line in compliance with national regulations.



1 Drainage line
2 Product

20. Connect a PVCU line (Ø20 mm) between the "Product" connector (2) on the system and the product storage tank.

21. Connect a PVCU line (Ø20 mm) between the "Drain pipe" connector (1) on the system and the pipe to the waste water system.

22. Fit the level switch for the product storage tank (included in the scope of delivery): remove the protective tube around the level switch. Fit the level switch into the prepared connector on the product storage tank.

    Connect the level switch cable to terminal X1 - 13 in the control cabinet.

23. Connect the collecting pan detector potential-free to terminal X1-18.

24. Fit the pressure sensor in the product storage tank.

    The system includes the following:

    - A threaded cable connector
    - A tank sleeve section Ø63 mm
    - PVCU pipe Ø20 mm with a pressure sensor

    Fit the Ø50 mm/Ø63 mm tank sleeve section into a Ø65 mm hole in the product storage tank.

    The pressure sensor comes complete with a Ø20 mm PVCU pipe. Shorten the ⌀20 mm PVCU pipe to the dimension between the base of the product storage tank and the opening of the Ø50 mm/Ø63 mm tank sleeve section.

    Insert the pressure sensor with the shortened Ø20 mm PVCU pipe through the opening of the Ø50 mm/Ø63 mm tank sleeve section as far as the base of the product storage tank.

    You can now insert the Ø63 mm coupling onto the upper end of the Ø20 mm PVCU pipe.

    Fit the threaded cable connector onto the Ø63 mm coupling.

25. Electrically connect the pressure sensor to the system's terminal box.

Cable	Terminal
Black	X3 - 65
White	X3 - 66
Shielding	Earth

If necessary, use the terminal box provided to extend the cables.

26. Connect the cable from the separation storage tank terminal box in the control cabinet.

Fig. 7: PE coupling connectors

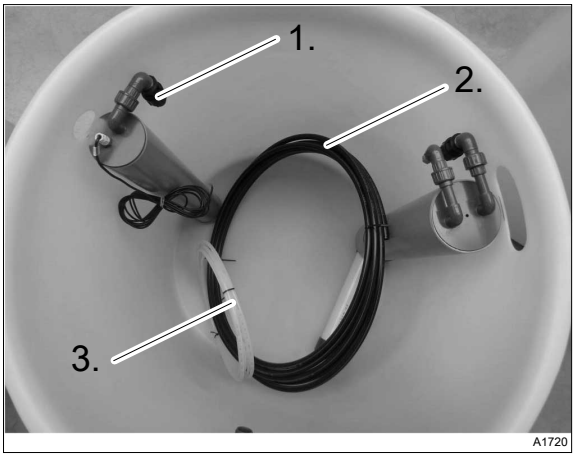


Fig. 8: Brine storage tank with hoses and coupling

1. Prepared PE coupling in the brine storage tank
2. Black 1.8-mm PE hose
3. White transparent 8-mm nylon hose

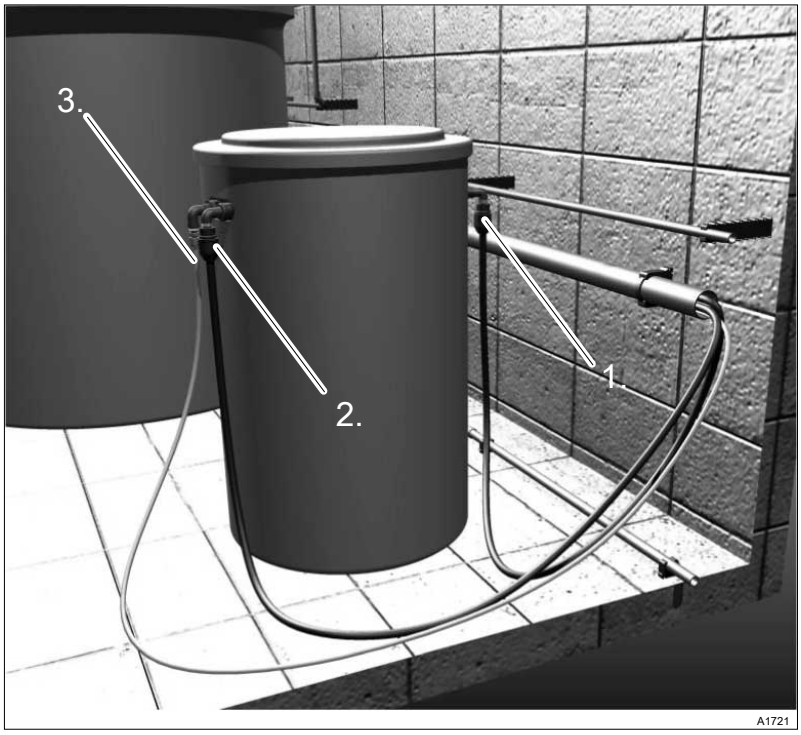


Fig. 9: Couplings

1. "Brine storage tank filling" PE coupling
2. "Brine diaphragm cell" PE coupling
3. Coupling for transparent "Brine softener" hose

27. Use the black PE hose (Ø16 mm x 1.8 mm) from the brine storage tank to join the "Fill brine storage tank" connector (3) on the system to the Ø16 mm connector on the brine storage tank.

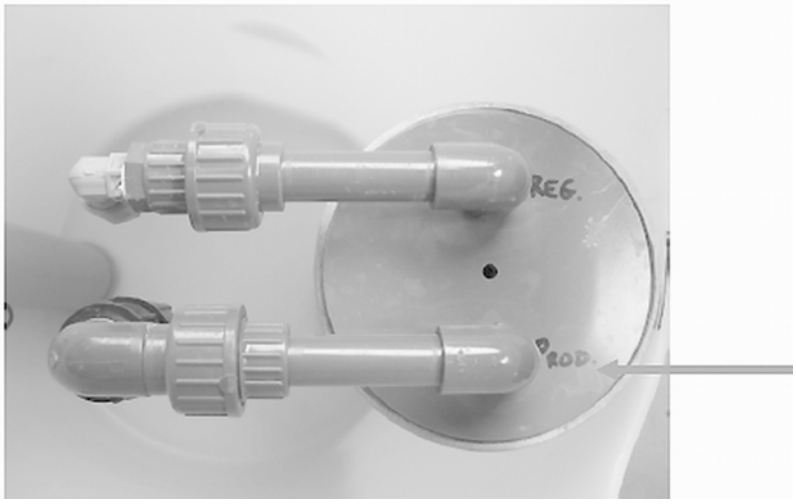


Fig. 10: "Brine diaphragm cell" connector

28. Use the Ø16 mm x 1.8 mm PE hose to join the "Brine diaphragm cell" connector on the system to the Ø16 mm connector on the brine storage tank.

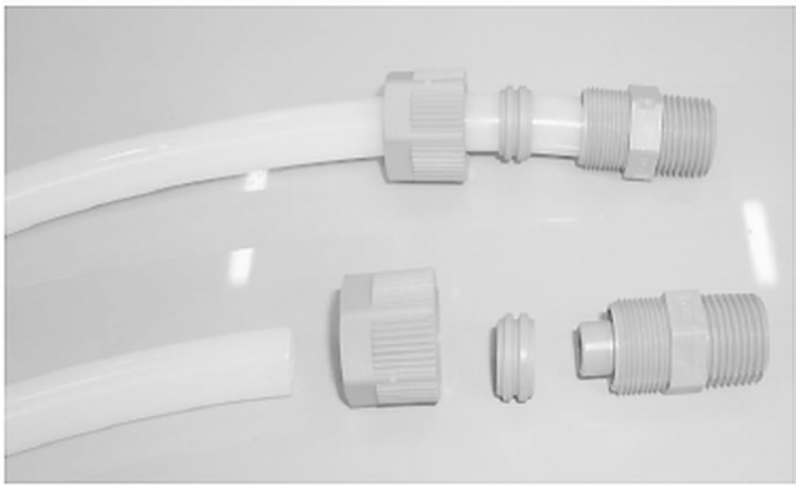
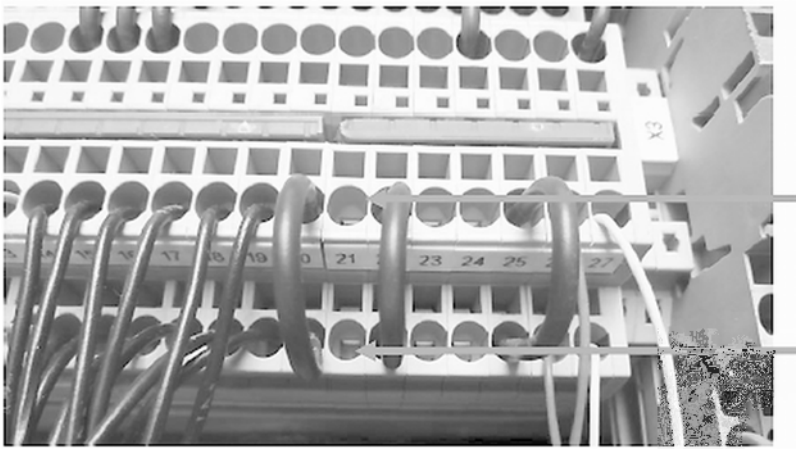


Fig. 11: Nylon coupling connectors

29. Connect the transparent 8 mm nylon hose (Ø 10 mm) between the "Brine softener" connector on the system and the Ø 10 mm connector on the brine storage tank.

30. Connect a Ø40 mm PVCU line to the brine storage tank and to the sewerage system as an overflow line. There should be salt in the brine storage tank once the PVCU lines have been connected.

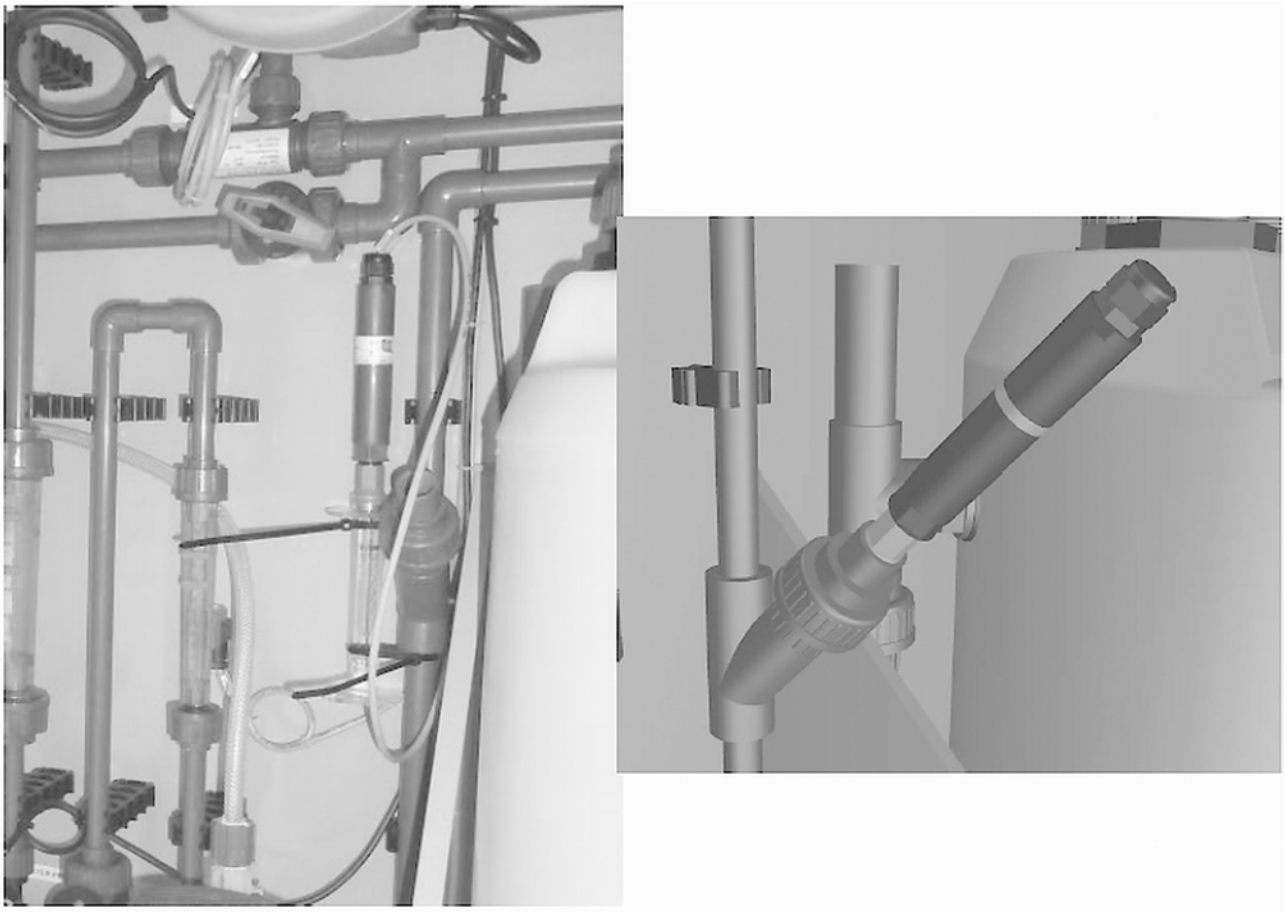


31. Connect the brine storage tank level switch:

Connect the cables to terminal strip X1-21:

- The brown cable in the top row of the terminal strip
- The blue cable in the bottom row of the terminal strip.

Do not remove the jumpers in the terminal strips!



32. Remove the pH sensor from its transparent tubular housing and fit into the sensor straight union on the system.

33. Electrically wire the system:

Connect the system's power cable as per the table below to the terminal strip in the control cabinet, taking into account the ratings.

Note the following when installing them:

- Make sure that the system is switched off when making or adjusting the electrical connections.
- Ensure that the electrical connections comply with the wiring diagram supplied.
- Cleanly connect up the system's cable conduits on completion of installation.
- The 1F, + N and + PE connectors are located in the bottom right of the control cabinet.

Capacity of the system	Internal fuse	Operating voltage	Capacity
100 (g/h)	16 A	230 VAC, N, PE	1.6 kW
200 (g/h)	16 A	230 VAC, N, PE	2.0 kW
300 (g/h)	16 A	230 VAC, N, PE	2.5 kW

7 Operation

- **User qualification, maintenance** instructed personnel, see *Chapter 1.3 'Users' qualifications' on page 9*

Switch the system on by turning the master switch to "1". The master switch is on the control cabinet.

7.1 Touch Screen

An overview of information and the control options available on the touch screen are shown below.

You can use the touch screen to:

- Start or stop the entire system
- Navigate from menu to menu.
- View the variables to be measured.
- Set different system parameters.
- Check the levels of the storage tanks.
- Acknowledge faults (*'Reset'*).
- View the alarms list and delete if necessary - refer to "Trouble-shooting" chapter.

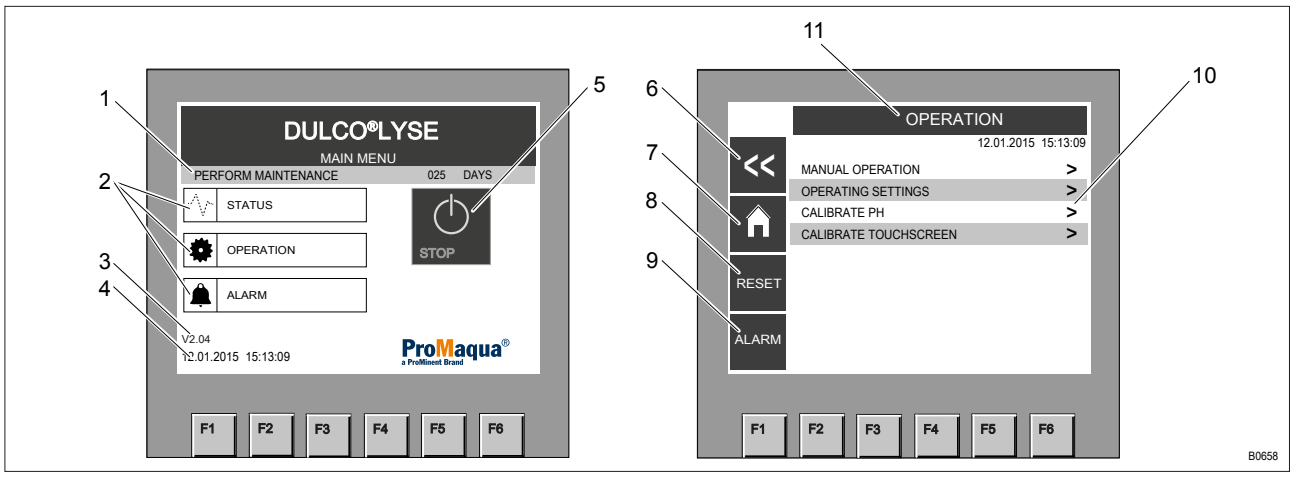


Fig. 12: Construction of the touch screen

1 System status bar, refer to "Troubleshooting" chapter
2 Buttons (lead to menus)
3 Software version
4 Date and time
5 *[STOP]* or *[START]* button (depending on the status of the system)
6 *[Back]* button (to previous display)
7 *[HOME]* button (to the main menu)
8 *[RESET]* button (for control)
9 *[ALARM]* button (to the "ALARM LIST")
10 Menu selection (leads to sub-menus)
11 Name of the display

The function keys F1 ... F6 have no function.

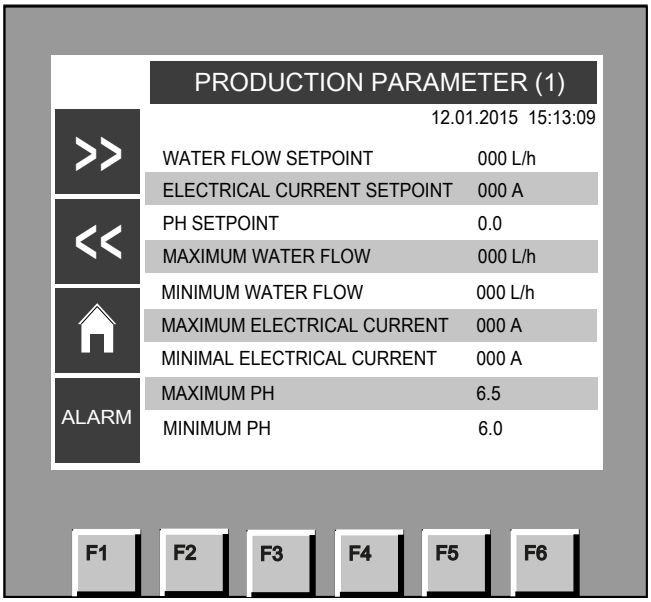


Fig. 13: Setting parameters

You can set production parameters or machine settings in a number of menus.

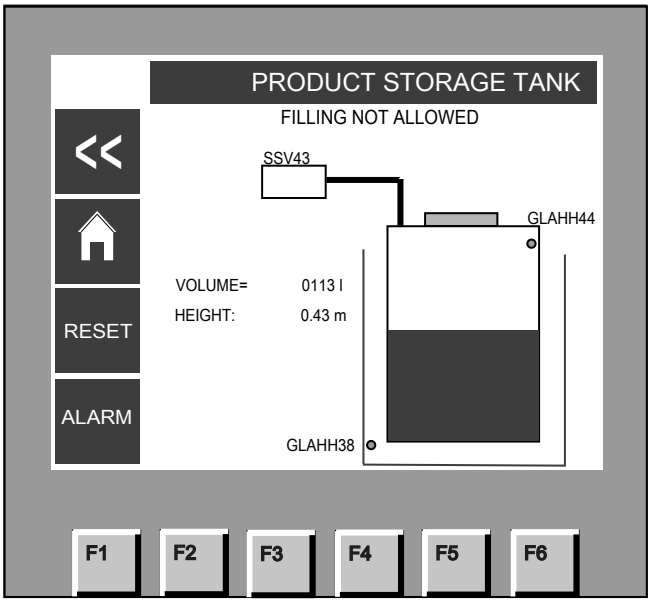


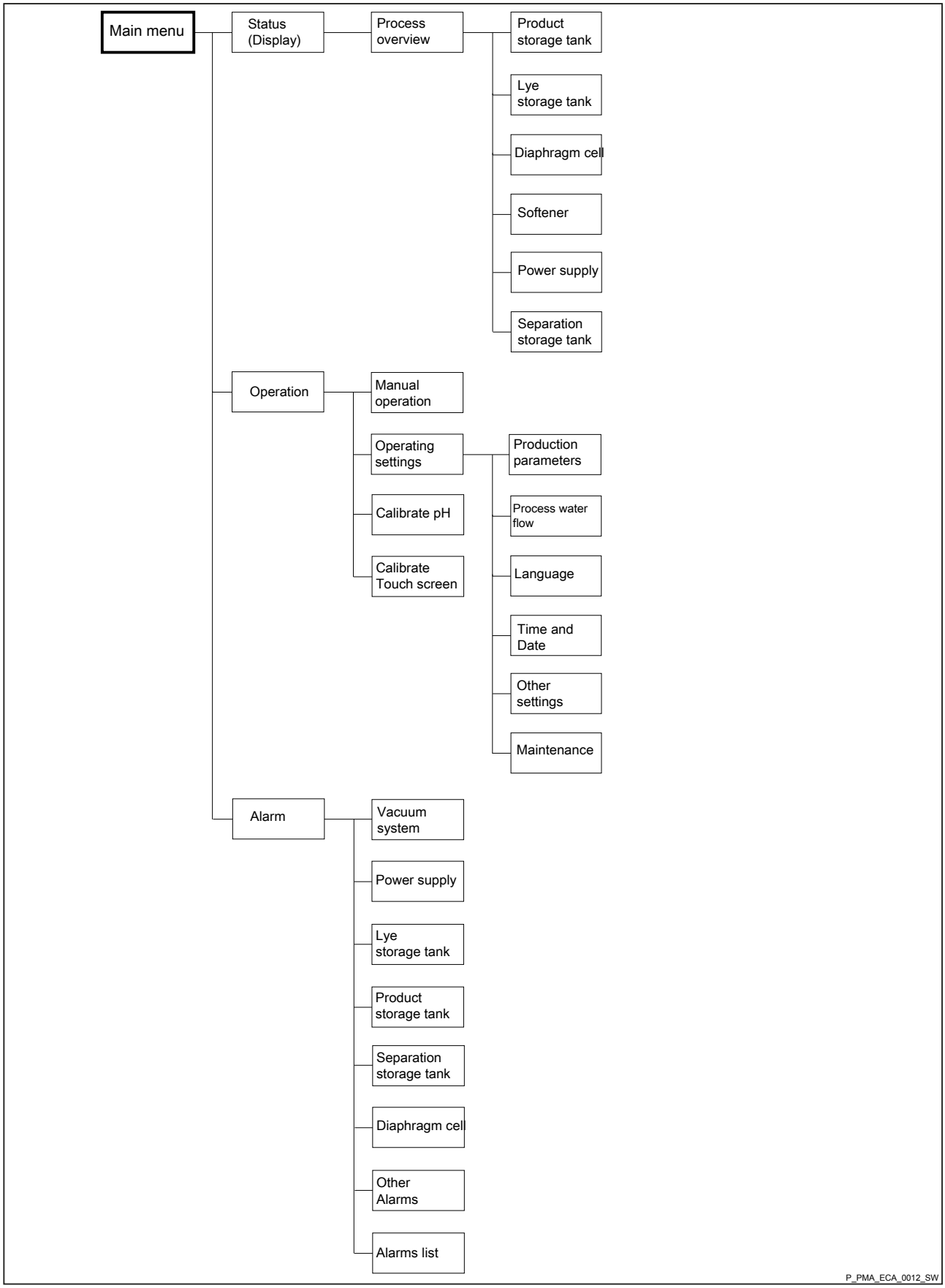
Fig. 14: Process flow chart (product storage tank unit is shown here)

The statuses of different units can be checked under *'Status ➔ Process overview'*.

On the level switches: "Green" = OK - "Red" = NOT OK.

- *Overview menu - see Appendix.*
- *Calibrating the pH sensor - refer to the "Calibrating the pH Measurement" chapter or instruction card.*

7.2 Menu overview



7.3 Operating Principles

You can adjust values on the touch screen regardless of the system status (*'Production Off'*, *'Production On'*).

The current display closes after 5 minutes (software V1.07 and later).

Password

You need the *'Operating personnel'* password to access the *'Operation'* menu.

You need the *'Service'* password to access the *'Process water flow'* and *'Language'* sub-menus.

All other protected menus can only be opened by van den Heuvel Water-technologie bv.

Name	Password
Operating personnel	2222
Service	4444

7.4 Other settings

As the *'Other settings'* menu could not be outlined in a self-explanatory manner at all relevant points, it is explained in more detail here:

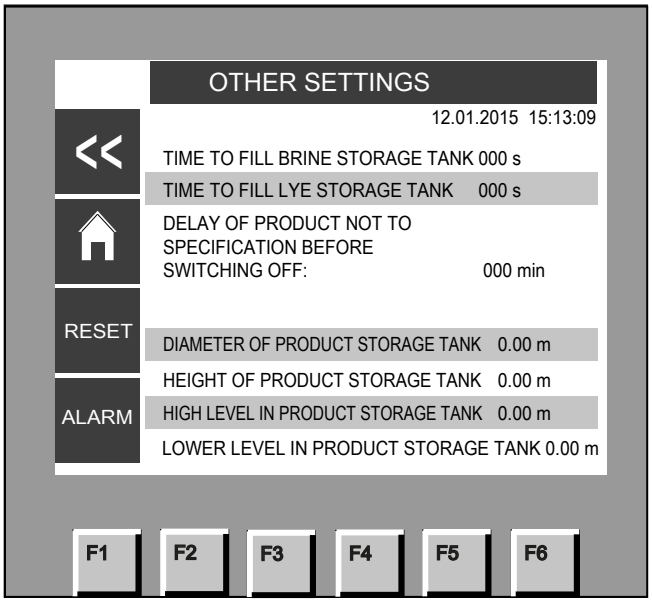


Fig. 15: "Other settings" menu

Display text	Explanation
'Time to fill brine storage tank'	Time needed to fill the brine storage tank as soon as the lower level switch is triggered
'Time to fill lye storage tank'	Time needed to dilute the lye
'Delay of product not to specification before switching off'	Time during which the system may produce "rejected product" before it switches off
'Diameter of product storage tank'	Diameter of product storage tank
' Height of product storage tank'	Height of product storage tank
'High level in product storage tank'	Height of upper level switch in the product storage tank
'Low level in product storage tank'	Height of lower level switch in the product storage tank

7.5 Manual operation

'Manual operation' menu item

As the *'Manual operation'* menu could not be outlined in a self-explanatory manner at all points, it is explained in more detail here:

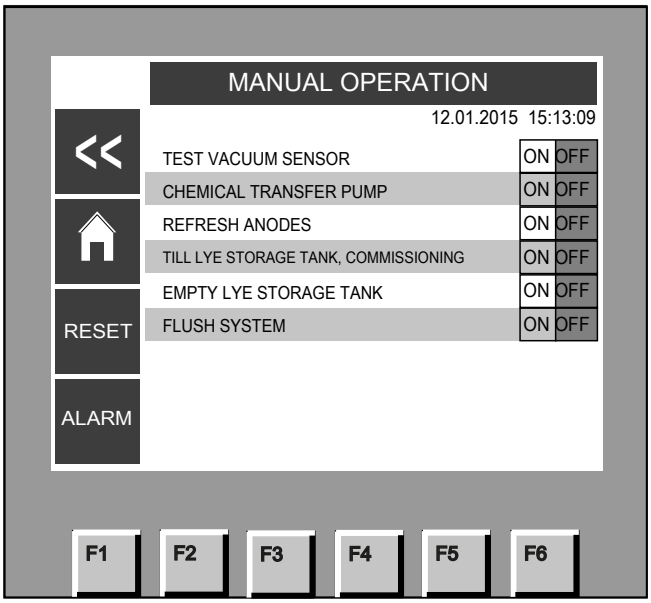


Fig. 16: "Manual operation" menu

Display text	Explanation
'Test vacuum sensor'	Test the vacuum sensor.
'Chemical transfer pump'	Only with the separation storage tank upstream of the product storage tank: a chemical transfer pump to pump from a separation storage tank into the product storage tank can be started and stopped.
'Fill lye storage tank, commissioning'	When commissioning: Fill the lye storage tank with water up to the lowest level
' Empty lye storage tank'	Press button once: The water jet pump starts draining the lye storage tank; Press the button again: The water jet pump stops.
'Flush system'	Only when *'Production off'*: Process water flows through the system for 10 minutes and through the "rejected product" connector.

8 Commissioning

The CHLORINSITU® V FBA systems have to be started up in the following order under the appropriate conditions. The system can only be safely started up, guarantee seamless operation and the warranty granted if this order is adhered to.

8.1 Check-list: Preparation for Commissioning

Commissioning process CHLORINSITU® V FBA

- **User qualification, preparation for commissioning:** trained qualified personnel, see *Chapter 1.3 'Users' qualifications' on page 9*

Customer			
Project number			
Capacity		g/h	

	Description
Customer-specific components	

	Tested by
Pre-commissioning	
Commissioning	

Basic production settings for testing and commissioning.

Capacity	Cell type	Current	Max. voltage	Brine volume Anode refresh	Lye 33%
(g/h)		(A)	(V)	ml *	(l)
100	HMC 10-1	100	6	300	3.5
200	HMC 10-2	100	12	400	3.5
300	HMC 10-3	100	18	500	3.5

*** The parameters are based on an ambient temperature of 20 °C and a brine concentration of 280 g/l. The refresh time is calculated by the PLC Programmable Logic Controller. It will affect the product concentration if these parameters change.**

	Preparation for Commissioning	Tick
1	Check whether the hydrogen discharge line is connected in compliance with ATEX.	
2	Check whether the vent lines for the product storage tank and refresh tube are connected.	
3	Check the drain connectors.	
4	Check the water supply.	
5	Check brine suction to the diaphragm cell.	
6	Check brine suction to the softener.	
7	Check whether the vent lines for the product storage tank and refresh tube are connected.	
8	Check all couplings, O-rings etc.	
9	Check filling line to the product storage tank.	
10	Check lines in general.	
11	Check the level switch in the product storage tank, lye storage tank and brine storage tank and product storage tank.	
12	Check the non-return valve in the diaphragm cell.	
13	Check all electrical connectors.	
14	Check that the system's main fuse (kW, I) corresponds to the specification in the list of basic settings.	
15	Check whether the operating voltage is 1x230 VAC, N, PE.	
16	Check electrical and hydraulic connectors on the diaphragm cell.	
17	Check whether all lines are connected in line with P&ID.	

	Preparation for Commissioning	
#	Remaining points	Remarks
Take into consideration the remarks on this page and take appropriate action before commencing commissioning.		

THIS PART WAS ACCEPTED BY:	NAME:	SIGNATURE:
Project number:		
System:		

8.2 Check-list: Commissioning

Commissioning process CHLORINSITU® V FBA

- **User qualification, commissioning:** Service, see *Chapter 1.3 'Users' qualifications' on page 9*

Check-list for commissioning

#	Step	OK
1	Before commencing commissioning, ensure that all preparations have been completed correctly.	
2	Switch on the master switch.	
3	Switch on master fuse in the control cabinet.	
4	Switch on 24 V AC/24 V DC control voltage and power supply for fuse.	
5	Switch on automatic cut-out on the frequency controller.	
6	Check whether the separation storage tank is filling.	
7	Check whether the filling of the separation storage tank stops at the corresponding float.	
8	Open the system's water valve.	
9	Check that the water supply has adequate pressure (> 2.5 bar < 5 bar) and adjust with the pressure regulating valve if necessary.	
10	Use a test kit to measure the hardness of the supply water.	
11	Check whether the brine storage tank is filling with softened water.	
12	Check whether the feed to the brine storage tank is stopped by the level switch.	
13	Set the softener regeneration time according to the hardness measured.	
14	Use a test kit to measure the hardness of the softened water.	
15	Remove the blanking plates on the vacuum sensor and diaphragm cell.	
16	Open all valves with the exception of the sampling valve.	
17	Enter the data for the product storage tank under "Other settings".	
18	Wear safety clothing. Open the lid of the lye storage tank and fill the storage tank with lye in accordance with the basic setting list for the quantity of lye.	
19	Replace the lid on the lye storage tank.	
20	Check the direction of rotation of the fan.	
21	Set the sensor air flow.	
22	Switch on "Start-up".	
23	Calibrate the pH sensor.	
24	Check on the display whether conductivity is being measured.	
25	MAKE SURE THAT THERE IS SUFFICIENT LYE IN THE LYE STORAGE TANK. NO LYE IN THE LYE STORAGE TANK CAN CAUSE SERIOUS HEALTH PROBLEMS AND ENVIRONMENTAL PROBLEMS. Before commencing production, make sure that lye is filling into the lye storage tank. Chlorine gas can be released if production is started without lye.	
	MAKE SURE THAT ALL BLANKING PLATES ON THE DIAPHRAGM CELL HAVE BEEN REMOVED. MAKE SURE THAT ALL BALL VALVES (EXCEPT FOR THE SAMPLING VALVE) HAVE BEEN OPENED. CHLORINE GAS CAN ESCAPE FROM THE DIAPHRAGM CELL AND CAUSE SERIOUS HEALTH PROBLEMS IF THE BLANKING PLATES ARE NOT REMOVED AND A BALL VALVE IS STILL CLOSED.	
26	Switch on production in the display.	

#	Step	OK
27	Check whether the booster pump has started.	
28	Check whether the water flow of softened water matches the value on the screen.	
29	Check that all parts fitted by the customer are working correctly.	
30	Check the cooling fans for the diaphragm cells and the control cabinet.	
31	Start anode refresh, measure brine suction and determine the offset of the flow meter for the diaphragm cell and softener brine suction.	
	After 2 hours of production:	
32	Measure the voltage at the diaphragm cell and check whether it corresponds to the specification in the basic settings list.	
33	Measure the mains current at full production.	
34	Check the modem or internet connection, if available.	
	After 6 hours of production:	
35	Take a product sample from the product storage tank.	
36	Measure the freely available chlorine and pH value of the sample from the product storage tank.	
37	Sign the handover report if freely available chlorine = 400 mg/l.	
38	Photograph the system.	

THIS PART WAS ACCEPTED BY:	NAME:	SIGNATURE:
Project number:		
System:		

8.3 Commissioning Work

- **User qualification, maintenance:** Service, see ↳ *Chapter 1.3 'Users' qualifications' on page 9*

Check before commencing commissioning that all preparations have been completed correctly. Commissioning is split into two phases. Commissioning preparation is used to monitor the installation phase and should be performed before commissioning.

Only allow trained service technicians to commission the system. Check that the system has been installed correctly and that work has been performed in line with the check-lists.

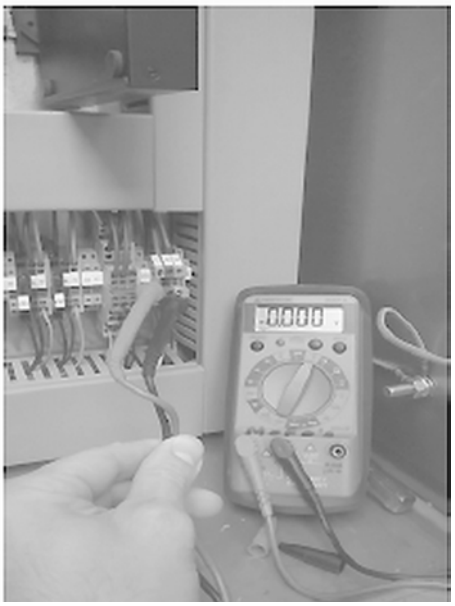
	Ventilate the room.
	Fire, naked flames and smoking are prohibited
	Wear safety glasses.
	Wear safety gloves.
	Caution high voltage.
	Danger due to corrosive dust.

The consequences of the non-use of protective equipment

The customer is responsible for the consequences of the non-use of protective equipment and the non-observation of the warnings in this document .

The use of personal protective equipment (PPE) is specified in the regulations applicable at the place of installation. The consequences of non-observation of these regulations are likewise explained in these local regulations.

1.
   - Check the system connectors, fuses and external connections on the product and brine storage tanks.
   - Check that the hydrogen discharge conduit complies with ATEX regulations and that the room is sufficiently ventilated.
   - Check that all lines comply with *'P&ID'*.



2. Switch on the master switch.

   Check that 1x230 VAC + N and PE are fitted. Measure 230 VAC between 1 phase and N and between a phase and PE.

3. Switch on the main automatic cut-out in the control cabinet.

4. Switch on the 24 V AC/24 V DC power supply.

   Measure whether there is 24 V AC at the 24 V AC terminal and 24 V DC at the 24 V DC terminal

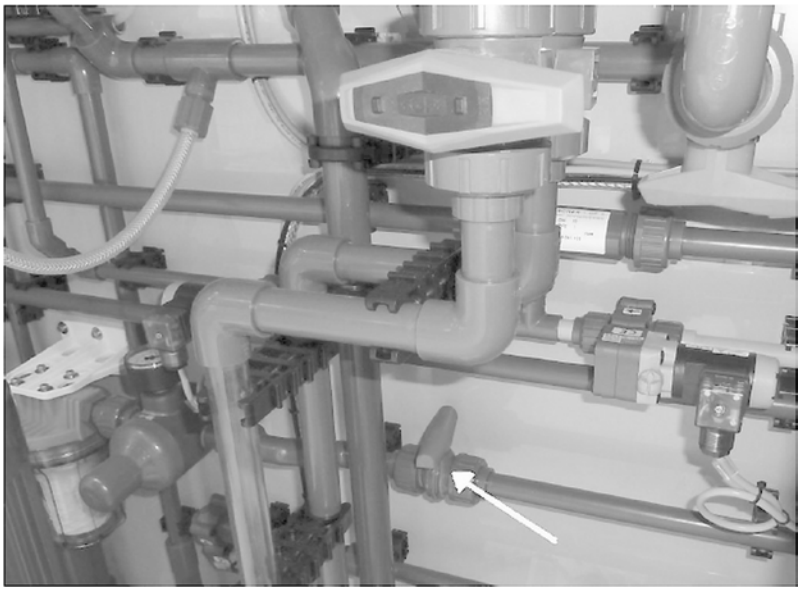
   Check whether the text on the control panel is set to the correct language.

5. Switch on the automatic cut-out on the frequency controller.

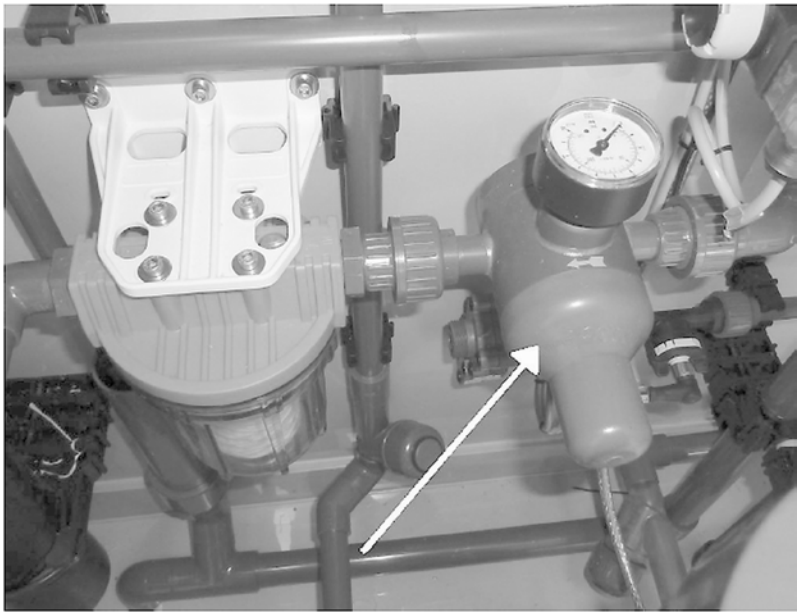
6. The separation storage tank with the solenoid valve on the top of the tank fills as soon as voltage is fed to the system.

   Check whether the feed water is connected and this tank is filling.

7. The separation storage tank has 4 levels: "too low" (alarm), "low (start filling), "high" (stop filling), "too high" (alarm). Check whether filling stops at "high".



8. Open the system's water inlet valve and check that the water lines are leak-tight.



9. Check the water feed for sufficient pressure (2.5 ... 5 bar) and use the pressure regulating valve to adjust the pressure if necessary.

10. Use the test kit to measure the hardness of the supply water.

    The scope of delivery of the system includes a test kit for measuring the water hardness. Measure the hardness of the supply water upstream of the softener. Follow the instructions for the water hardness test in the test kit manual.

    ⇨ Use the measured value to further configure the system.

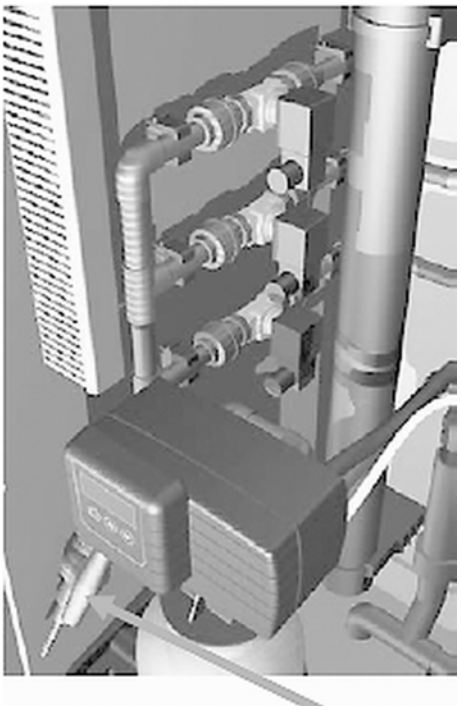
11. Check that the brine storage tank is filling with softened water. The brine storage tank should automatically fill with softened water once you have switched on the fuses.

12. Check that the feed to the brine storage tank is stopped by the level switch.

    Check that the brine storage tank is evenly filled with salt. Only use salt suitable for salt electrolysis!

13. Set the regeneration time of the water softener in line with the hardness of the supply water measured. Now set the regeneration time in accordance with the parameter list below.

	Programming the softener (Text only available in English)
1	Press *[∨]* and set the time to `12:01`.
2	Press *[Regeneration]* and then hold ⇑ and ⇓ for 5 seconds.
3	Press *[Regeneration]* to move to the *'Feed water hardness (H)'* parameter.
4	Press *[∧]* and *[∨]* to enter the correct water hardness.
5	If the hardness is higher than 15°dH, the Control Type (CT) should not show FD (*'delayed'*) but should be set to FI (*'intermediate'*).



14. Open the sampling tap for approx. 2 minutes and then take a sample.

    Use the test kit in "LOW RANGE" mode to measure the hardness of the softened water.

    Check whether the hardness of the softened water is 0°dH.

    Press *[Regeneration]*. The regeneration of the softener takes approx. 70 minutes.

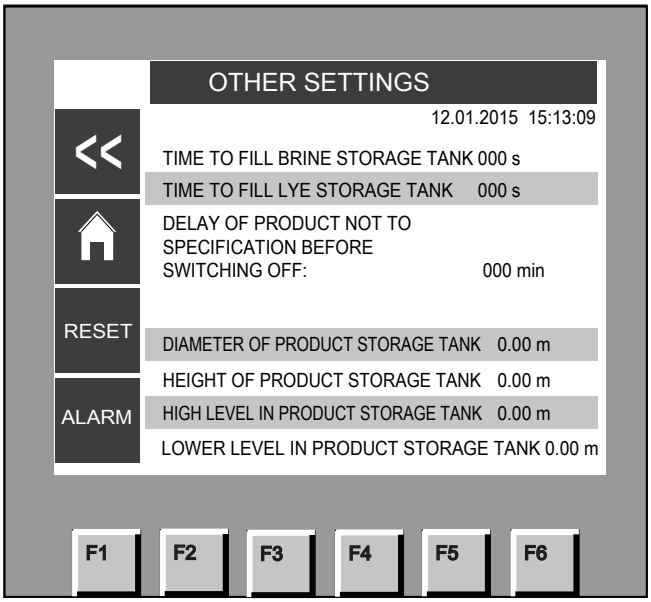
    Check whether the hardness of the softened water is now 0°dH.

Diaphragms drying out

The diaphragm cell is filled with brine. Do not allow the diaphragms to dry out. The diaphragms would be damaged by this with the result that the system would no longer work correctly. If commissioning is not completed, ensure that the diaphragm cell remains wet on both sides.

15. Remove all blanking plates on the vacuum sensor and the diaphragm cell.

16. Open all valves with the exception of the sampling tap and the control valve. Open the valves on the diaphragm cell, on the lye storage tank and to fill the product storage tank.



17. Go to *'Operating settings ➔ Other settings'*. Enter the diameter and height of the product storage tank. Determine the start and stop level and enter these figures for the high and low level of the product storage tank.

CAUTION!
Working with lyes
Before performing the next step: Wear protective clothing and note the dangers when working with lyes.

18.

	Fire, naked flames and smoking are prohibited.
	Danger due to corrosive dust.
	Wear safety glasses.
	Wear safety gloves.

Use the measuring cup and the funnel to fill the lye storage tank, remembering to wear gloves and safety glasses.

Open the lid (1) of the lye storage tank and pour lye into the storage tank. Fill the lye storage tank with 33% lye in line with the list of basic settings.

19. Use the lid to seal the lye storage tank.

20. Check the direction of rotation of the fan:

The correct direction of rotation of the fan is shown by the arrow on the fan motor.

Perform the following steps if the fan is rotating in the wrong direction:

- Use the main switch to switch off the system
- Swap phases 2 and 3 of the main power supply
- Use the master switch to switch on the system once you have swapped the phases.

21. Use the screwdriver supplied with the system's scope of delivery to turn the screw in the air flow sensor. With the fan running, turn the screw until the LED just turns green. The LED should turn red within 2 minutes when the fan is no longer running.

Filling the lye storage tank with the button on the PLC Programmable Logic Controller

22. On the display of the PLC Programmable Logic Controller press *[Start-up]* and check whether the lye storage tank is filling up with process water.

23. Calibrate the pH sensor. (Use the enclosed instruction card).

24. Check in the *'Status'* display whether the conductivity is approx. 180 mS.

25.

WARNING!
Chlorine gas
Possible consequence: Fatal or very serious injuries.

Before commencing production, make sure that lye is filling into the lye storage tank. Chlorine gas can be released if production is started without lye.

CAUTION!
Danger due to lye
Possible consequence: Danger to health from lye

Make sure that all blanking plates are removed on the diaphragm cell and vacuum transmitter, otherwise lye can escape and cause serious health problems.

Make sure that all ball valves, apart from the sampling tap, are open, otherwise lye could leak out and cause serious health problems.

Fill the lye storage tank with 33% sodium hydroxide solution in line with the basic settings list.

Switching on production in the display

26. Check that there is sufficient brine in the diaphragm cell.

Check that there is salt in the brine storage tank.

Use a manual refresh to check that brine is being pumped into the diaphragm cell.

Check whether the amperage setpoint is reached. If the amperage remains too low at the start, there is possibly too little lye or brine in the diaphragm cell.

Checking that the booster bump is starting up

27. The booster pump will start up at the start of production as soon as the liquid level in the separation storage tank has reached the right level.

28. Check whether the value of the water flow of the softened water at the flow meter matches the value on the screen.

Customer-specific components

29. Check that all customer-specific components are operating correctly. The customer-specific components in question are listed on page 1 of the test log.

30. Check that the fans for the control cabinet are working correctly.

    Make sure that the fans are rotating in the right direction. The fans on one side have to prime air into the control cabinet and the fans on the opposite side have to discharge air to the outside.

    Check that there is correct ventilation towards the power supply. If the power supply ventilation is correct, check whether the fans in the control cabinet are blowing in the right direction. The fans should be running in the same direction as the fans for the power supply.

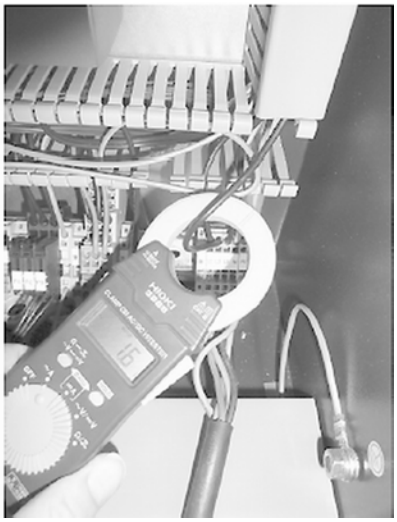
Starting anode refresh

31. Initial check:

    - Start manual refresh on the display of the PLC Programmable Logic Controller.
    - Check that there is a flow of lye during drainage.
    - Check that the refresh valve and the bleed valve are opened.
    - Check that the brine valve is opened.
    - Check that the brine flow corresponds to the setpoint.

    Allow the system to produce trouble-free for around 2 hours. Measure the voltage and the current at the diaphragm cell several times during this time; the voltage has to fall to between 5 ... 5.5 V DC per chamber. There should be a maximum of 6 VDC at one chamber.

After 2 hours of production



32. Measure the voltage at the diaphragm cell and check whether it corresponds to the basic settings list. If the power supply maintains the amperage setpoint at the diaphragm cells for a good 2 hours, note the voltage on page 13 of the test log. The voltage should be ±5 V DC per chamber after around 2 hours of production.

33. At full system load, measure the current at the power supply and enter the values in the test log. Compare the current measured with the values in the test log from the factory test phase.

34. Check the modem or internet connection, if available.

After 6 hours of production

35. *Wear protective clothing and note the dangers of working with lyes before continuing with the next step.*

	Fire, naked flames and smoking are prohibited.
	Danger due to corrosive dust.
	Wear safety glasses.
	Wear safety gloves.

Take a sample of product from the product storage tank

36. Measure the concentration of freely available chlorine and the pH value.

    The concentration of freely available chlorine should be 400 mg/l at pH = 6.5. Check all the functions tested in this commissioning chapter if the concentration is under 350 mg/l after 6 hours. Pay particular attention to the brine concentration and current if the concentration does not correspond to the specification. Check that the brine concentration in the brine storage tank is saturated.

    ⇨ Enter the values in the test log and compare the values with the values from the factory test phase.

37. Sign the handover report if the freely available chlorine is 400 mg/l. Commissioning of the system can be successfully ended once the specifications have been met.

    Train the end user's personnel in the operation of the system.

    Draw the end user's attention to the fact that the system has to be maintained annually. Standard packages of spare parts are available for annual maintenance.

38. Photograph the system and hand over the manual with the original test log to the customer. Send a copy of the test log and the photographs to the manufacturer of the system.

9 [ALARM] / Troubleshooting Menu

- **User qualification, maintenance:** Service, see *Chapter 1.3 'Users' qualifications' on page 9*

WARNING!
Only allow the work described to be performed by authorised personnel.

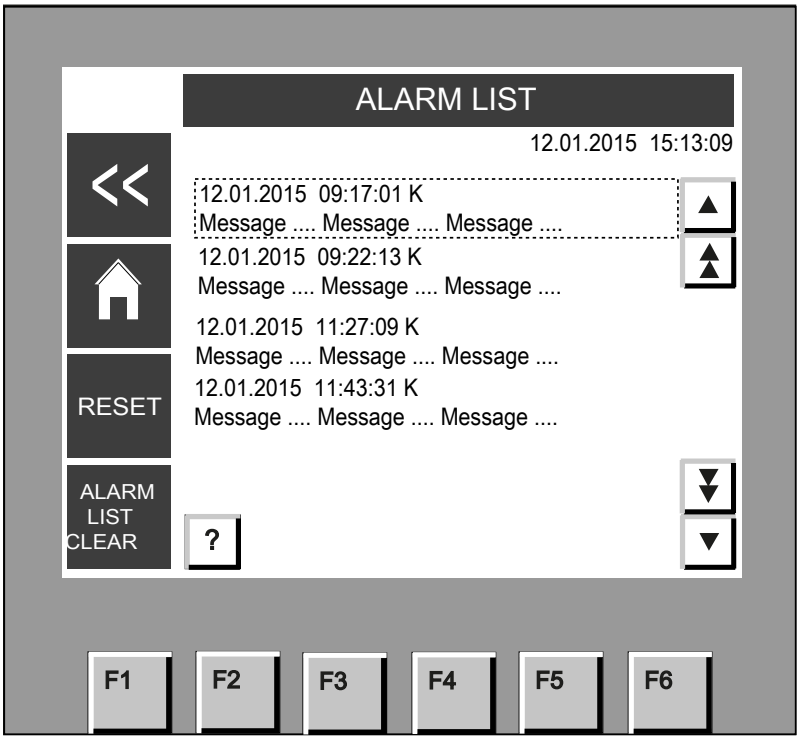
WARNING!
Hazardous chemicals can escape
Hydrogen, sodium hydroxide and chlorine remain in the CHLORINSITU® V FBA system even after operation.

– To flush the system, press *[On]* in the *'Operation ➔ Manual operation ➔ Flush system'* menu.
– Pump the contents of the lye storage tank into the drain using *'Operation ➔ Manual operation ➔ Empty storage tank'*, press *[On]* or process in accordance with a current material safety data sheet for "Sodium hydroxide solution".

WARNING!
Danger of electric shock
– Disconnect the system from the mains/power supply before working inside the cabinets.

This document will help fitters to eliminate any fault messages that appear on the touch screen of a CHLORINSITU® V FBA system (from software version V2.04 onwards).

Alarms List



Each error message appears twice in the alarms list:

as soon as the fault occurs, and as soon as it disappears again.

For initial orientation, press the error message and then "?" in the bottom left: A description and possible cause will appear. The texts below are more detailed.

You can delete the alarm list with *'Clear alarm list'*.

9.1 Overview of Status Messages

The error messages (red) appear as well as the warning messages (yellow) and the operating message (green) in the status bar of the touch screen.

Warning messages (yellow)

No.	Description	In the alarms list
1	Production off	-
2	Product storage tank is full	-
3	No external enable signal	X
4	Anode refresh	-
5	Emergency stop	-
6	Softener is regenerating	-

Error messages (red)*

No.	Description	In the alarms list
1	Vacuum system	
	Vacuum is too low	X
	Vacuum sensor faulty	X
2	Power supply	
	Electrical current too low	X
	Electrical current too high	X
3	Lye storage tank	
	Level in the lye storage tank too low	X
	Level in the lye storage tank remains high	X
	pH too low	X
	pH too high	X
	Air flow is too low	X
	Air flow sensor faulty	X
	Thermal overload relay for fan?	X
4	Product storage tank	
	Level in product storage tank too high	X
	Level in product storage tank too high	X
	Collecting pan leak detection	X
5	Separation storage tank	

No.	Description	In the alarms list
	Level in separation storage tank too high	X
	Level in the separation storage tank too low	X
	Thermal overload for booster pump	X
	Water flow too low	X
	Water flow rate too high	X
6	Diaphragm cell	
	Anode level too high	X
	Anode filling takes too long	X
	Anode drainage takes too long	X
	Brine valve faulty	X
	Brine flow meter cell faulty	X
	Temperature cathode too high	X
7	Other faults	
	Last regeneration too long ago	X
	Error at brine intake for softener	X

9.2 Status Messages

9.2.1 Warning messages

Production off

System response: Production is switched off.
Cause: *'Stop'* has been pressed.

Production on

System response: The system is working fault-free and producing.

Product storage tank is full

System response: Production is switched off.
Cause: The product storage tank is completely full with Product.

No external enable signal

System response: Production is switched off.
Cause: There is no external enable signal.

Anode refresh

The system refreshes the brine in the anode.
System response: Production is not switched off.

Emergency stop

The emergency stop switch was pressed.
System response: The Product system is completely switched off.

Softener is regenerating

The brine storage tank cannot be filled.

System response: Production is switched off.

Causes:

- The softener is regenerating.

9.2.2 Error messages

9.2.2.1 Vacuum system

Vacuum is too low

System response: If the vacuum is under 120 mbar for too long, the control will immediately switch off the power supply for the diaphragm cell.

This also switches off production. The Product flows as long as the delay period is showing (*'Operation ➔ Operating settings ➔ Other settings ➔ Product delay not to specification before switching off*). It flows as "rejected product" to the drain.

If the vacuum reaches the setpoint during the delay period, the system starts producing again and Product flows to the product storage tank.

If the vacuum does not reach the setpoint during the delay period, the system switches off completely. A reset is needed to restart.

Causes:

- There is a leak somewhere in the pipe (join insufficiently tight?)
- The vacuum sensor is faulty.

Vacuum sensor faulty

The control tests the vacuum sensor every 5 seconds. The bleed valve opens for 10 seconds to do so. During this time, the vacuum has to fall to below 48 mbar in 8 seconds. If this does not happen, the control emits this error message.

Causes:

- The vacuum sensor has a fault.
- The bleed valve does not open.

9.2.2.2 Power supply

Electrical current too low

The amperage measured during production is lower than the specified minimum amperage for the delay period.

System response: - see "A. System response at too low a value" at the end of the chapter.

Causes:

- Too little brine in the anode.
- The lye concentration is too low. Check the conductivity (mS).
- One of the power supplies is faulty.
- The analogue control of the power supply is not working properly.
- The analogue current valve fed back is incorrect.

Electrical current too high

The amperage measured during production is higher than the specified maximum amperage for the delay period.

System response: - see "B. System response at too high a value" at the end of the chapter.

Causes:

- The power supply is faulty.
- The analogue control of the power supply is not working properly.
- The analogue readout of the actual amperage is not working.

9.2.2.3 Lye storage tank

Level in the lye storage tank too low

The level in the lye storage tank has reached the lower float.

System response: Production is switched off.

Causes:

- The lye storage tank has a leak.
- Lines on the lye storage tank are not leak-tight.
- A diaphragm in the diaphragm cell has a leak.
- More lye is consumed than is produced; monitor the flow of lye during an anode refresh (injection valve).

Level in the lye storage tank remains high

If the level in the lye storage tank reaches the upper float, the system immediately starts to drain the lye storage tank. If the level is still at the top float after 2 minutes, an error message will appear and production will be switched off.

Causes:

- The lye drain valve is faulty.
- The water valve for the water jet pump is faulty.
- The injection valve is closed.
- Cooling water is entering the lye storage tank.

pH too low

The pH value measured during production is lower than the specified minimum pH value for the delay period.

System response: - see "A. System response at too low a value" at the end of the chapter.

Causes:

- The pH measurement is not correct. Recalibrate.
- The lye metering pump is not working - bleed the liquid end.
- The concentration of the lye is incorrect. Check the conductivity (mS).
- The injection valve is dirty or blocked.
- The pH of the supply water has changed.

pH too high

The pH value measured during production is higher than the specified maximum pH value for the delay period.

System response: - see "B. System response at too high a value" at the end of the chapter.

Causes:

- The pH measurement is incorrect. Recalibrate.
- The lye metering pump's analogue control is not working properly.
- The concentration of the lye is incorrect. Check the conductivity (mS).
- The pH of the supply water has changed.

Air flow is too low

The air flow in the exhaust air duct for the hydrogen is too low while the fan is running.

Causes:

- The exhaust air duct is blocked.
- The sensor air flow is incorrectly set.
- The fan is faulty.

Air flow sensor faulty

The sensor air flow does not switch off after the fan has been idle for 2 minutes.

Causes:

- The air flow sensor is faulty.
- The sensor air flow is incorrectly set.

Thermal overload relay for fan

A thermal fault has occurred on the fan.

Causes:

- The fan is operating under excessive load.
- One phase of the fan's power supply has failed.
- An electrical line to the fan is faulty.

9.2.2.4 Product storage tank

Level in product storage tank too high

The level in the product storage tank is higher than the level switch.

System response: The product storage tank is switched off.

Causes:

- The level switch in the product storage tank is faulty.
- An external cause results in liquid also entering the product storage tank.

Level in separation storage tank too high

The level in the separating storage tank is too high.

Causes:

- The pump for pumping on is faulty.
- The level switch in the separation storage tank is faulty.

Collecting pan leak detection

The sensor in the product storage tank collecting pan signals liquid present.

Causes:

- The product storage tank has a leak.
- The sensor is faulty.
- An external cause results in liquid also entering the product storage tank.

9.2.2.5 Separation storage tank

Level in separation storage tank too high

The level in the separating storage tank is too high.

Causes:

- The valve in the feed to the separation storage tank is faulty.
- The level switch is faulty.

Level in the separation storage tank too low

The level in the separating storage tank is too low.

Causes:

- The separating storage tank has a leak.
- A line on the separation storage tank is not leak-tight.
- No liquid reaches the separation storage tank.
- The level switch is faulty.

9.2.2.6 Booster pump

Thermal overload for booster pump

The thermal overload relay on the booster pump has triggered.

Causes:

- The booster pump is overloaded.
- One phase of the booster pump's power supply has failed.
- An electrical line to the booster pump is faulty.

Water flow too low

The water flow measured was lower than the specified minimum flow for the delay period.

System response: - see "A. System response at too low a value" at the end of the chapter.

Causes:

- The booster pump is faulty.
- The flow meter for the process water is faulty.
- The minimum flow is not correctly set.

Water flow rate too high

The water flow measured was higher than the specified maximum flow for the delay period.

System response: - see "B. System response at too high a value" at the end of the chapter.

Causes:

- The frequency converter is faulty.
- The flow meter for the process water is faulty.
- The maximum flow is not correctly set.

9.2.2.7 Diaphragm cell

Anode level too high

This error message appears if the level switch in the refresh pipe rises during production to the upper level "Anode level too high". The level switch is the uppermost of the 3 reed switches on the refresh pipe.

System response: Production is switched off.

Causes:

- The brine valve has an internal leak.
- Liquid leaks from a diaphragm in the diaphragm cell into the refresh pipe.
- The level switch is faulty.
- The refresh line is blocked.
- The measuring line is blocked.

Anode filling takes too long

Too little brine flows into the anode during a refresh.

Causes:

- Brine valve is faulty.
- Too little brine in the brine storage tank.
- Too little water in the brine storage tank.
- The refresh line is blocked.

Anode drainage takes too long

Lye does not leave the anode after a refresh.

Causes:

- The "Lye flow" metering tap is closed.
- The solenoid contact on the "Lye flow" flow meter is faulty.
- The refresh tap is closed.
- The refresh line is blocked

Brine valve faulty

Brine enters the refresh pipe because the brine valve is not activated.

Brine flow meter cell faulty

The central contact on the refresh pipe is reached during a refresh once the brine valve has been opened.

Temperature cathode too high

The temperature sensor on the cathode side of the diaphragm cell measures too high a temperature.

System response: The system switches off.

Causes:

- The cooling system is not working.
- Too little brine in the diaphragm cell.
- The current and voltage are too high.
- The temperature switch is faulty.
- The cell cables are not correctly tightened.

9.2.2.8 Other faults

Last regeneration too long ago

The "regeneration" contact was triggered the last time more than 7 days ago

Causes:

- The softener is faulty.
- One of the electrical connections is faulty.

Error at brine intake for softener

Too little brine was twice drawn in by suction during regeneration of the softener.

Causes:

- Insufficient brine in the brine storage tank.
- The brine line is blocked.
- The suction on the softener is not working very well.
- The brine valve is faulty.

9.2.2.9 Response of the system

A. System response at too low a value

This also switches off production. The Product flows as long as the delay period is showing (Menu *'Operation* ➔ *Operating settings* ➔ *Other settings* ➔ *Product delay not to specification before switching off*). It flows as "rejected product" to the drain.

If the value increases again during the delay period, the system starts producing again and Product flows to the separation storage tank.

If the value does not rise during the delay period, the system switches off completely. A reset is needed to restart.

A. System response at too high a value

This also switches off production. The Product flows as long as the delay period is showing (Menu *'Operation* ➔ *Operating settings* ➔ *Other settings* ➔ *Product delay not to specification before switching off*). It flows as "rejected product" to the drain.

If the value falls again during the delay period, the system starts producing again and Product flows to the separation storage tank.

The system switches off completely if the value does not fall during the delay period. A reset is needed to restart.

10 Maintenance Checks and Preparation for Maintenance

10.1 Care of the Operating Unit

- **User qualification, maintenance** instructed personnel, see *Chapter 1.3 'Users' qualifications' on page 9*

NOTICE!

Damage caused by prohibited cleaning equipment or agents

The operating unit can be damaged when cleaned using compressed air, steam cleaners, aggressive solvents or abrasive agents.

Triggering unintended actions

Tapping several operating objects simultaneously can trigger unintended actions.

Only ever touch one operating object on the screen.

Operating objects are touch-sensitive visuals on the touch screen of the operating unit.

Use a moist cleaning cloth with cleaning agent for cleaning. Only use washing-up liquid or foaming screen cleaning agent as a cleaning agent.

1. Switch off the operating unit.
2. Do not spray the operating unit directly.

   Spray cleaning agent onto the cleaning cloth.
3. Clean the operating unit.

   Wipe by cleaning the display from the screen edge inwards.

10.2 Maintenance

10.2.1 Introduction

- **User qualification, maintenance:** trained user, see *Chapter 1.3 'Users' qualifications' on page 9*

The system requires annual preventative maintenance. Perform extended preventive maintenance every three years. These instructions contain a detailed description of the maintenance work as per the maintenance plan. The manufacturer of the system has compiled standard maintenance packages for this purpose. Only qualified personnel are authorised to carry out maintenance work on the system. Always use protective equipment when performing maintenance work.

WARNING!

Danger from hazardous substances!

Possible consequence: Fatal or very serious injuries.

Please ensure when handling hazardous substances that you have read the latest safety data sheets provided by the manufacture of the hazardous substance. The actions required are described in the safety data sheet. Check the safety data sheet regularly and replace, if necessary, as the hazard potential of a substance can be re-evaluated at any time based on new findings.

The system operator is responsible for ensuring that these safety data sheets are available and that they are kept up to date, as well as for producing an associated hazard assessment for the workstations affected.

	Ventilate the room.
	Wear safety glasses.
	Wear safety gloves.
	Caution high voltage.
	Danger due to corrosive dust.

The consequences of the non-use of protective equipment

The customer is responsible for the consequences of the non-use of protective equipment and the non-observation of the warnings in this document .

The use of personal protective equipment (PPE) is specified in the regulations applicable at the place of installation. The consequences of non-observation of these regulations are likewise explained in these local regulations.

Prior to all checks on the system

Ensure that the system is producing before monitoring the check points. Ensure that the system is producing.

Prior to working on the system

Before working on the system, switch off the system in advance for a minimum of 15 minutes.

Fault list

Always check the fault list for recent faults. Faults that have occurred recently indicate where possible problems could lie.

Faults

Faults first have to be eliminated if the system is not producing due to faults or if the control points are not met. Refer to the "Troubleshooting" section for information on eliminating faults.

Maintenance begins with a series of check points to asses the correct operation of the system. The values recorded can be compared during subsequent maintenance work and provide an overview of the general state of the system. However, the system has to be producing to perform these check points. Chlorine demand can therefore be activated for this purpose. The level control on the buffer tank or the external contact may have to be activated for this purpose in certain circumstances.

Apart from normal tools, a number of special tools and equipment are needed to perform maintenance work:

- Multimeter
- DC current clamp
- Measuring cup, 1 litre

Following completion of maintenance, send a copy of the fully completed maintenance schedule with the serial number of the system to the manufacturer of the system.

10.2.2 Maintenance kits

Maintenance kits

The manufacturer of the system has a "1-year" maintenance kit and a "3-year" maintenance kit. Use the following order numbers to order these maintenance kits.

Maintenance kits

Maintenance kit	Order number
Maintenance kit 3 for CHLORINSITU® V FBA	80200010
Maintenance kit 1 for CHLORINSITU® V FBA	80200012
Spare parts kit for CHLORINSITU® V FBA	80200014

10.2.3 Note the production parameters

- Note the status of the system production hours counter (under *'Status'*). Calculate the difference to the status at the last maintenance.
- Note the frequency of the booster pump during production. (The frequency controller is located in the control cabinet).
- Note the amperage of the booster pump

10.2.4 Maintenance Schedule

Daily:

- Check whether there is sufficient salt in the brine storage tank.
  The brine storage tank should have a minimum of 70 cm of salt.
- Check that the vacuum system is operating correctly.
- Manually check the hardness of the softened water.
  Use the test kit provided.
- Check the system for leaks.

Once a week:

- Check that the water softener is operating correctly.

Water hardness testing process

Use the test kit to determine the hardness of the softened water. Proceed as follows:

Material:

- Volumetric flask with 100 ml markings
- Reagent 1, buffer solution, *[HARDNESS 1]*
- Reagent 2, indicator, *[HARDNESS 2]*
- Reagent 3, titration solution, *[HARDNESS 3]*

Procedure:

1. Fill the volumetric flask up to the 100 ml marking with the softened water sample
   ⇨ Take this water sample directly downstream of the water softener.
2. Add 2 full pipettes of *[HARDNESS 1]* to the water sample.
   ⇨ Shake the volumetric flask to mix the substances.
3. Add 4 drops of *[HARDNESS 2]* to the water sample.
   ⇨ Shake the volumetric flask to mix the substances.
4. Add one drop of *[HARDNESS 3]* to the water sample.
   ⇨ Shake the volumetric flask to mix the substances.

   The contents of the flask will turn blue if the hardness is correct and the water softener is suitable for further use.

   Should the substance turn red, go to step 5.
5. Regenerate the water softener. Repeat the water hardness test after waiting for an hour.

Every 6 months:

- Replace the water filter in the filter housing every six months or if the water filter is brown.
- Check the installed safety equipment, like drainage pipes and ventilation to the outside, as well as other protection equipment.

10.2.5 pH measurement of the Product

Measuring a fresh Product is crucial for a correct assessment. The pH determines the stability of the Product. A pH between 9 ... 12 produces a stable Product. A low pH can lead to a lower strength Product. The process water flow is measured. The system will issue an alarm and stop chlorine production if there is too great a deviation of the process water flow. Apart from the pH, temperature and light, among other things, can affect stability.

Take Product from the product storage tank. This sample can be used for the pH measurement.

If the system is producing at the start of maintenance, a good average value for the pH can be obtained by taking a sample from the product storage tank.

1. Take a sample of the Product from the chlorine storage tank and measure the pH of the product.
2. Note the pH of the Product on the maintenance schedule.

10.2.6 Checking the Brine Storage Tank

Check the brine storage tank before actually commencing maintenance.

1. Check the volume of salt in the brine storage tank.

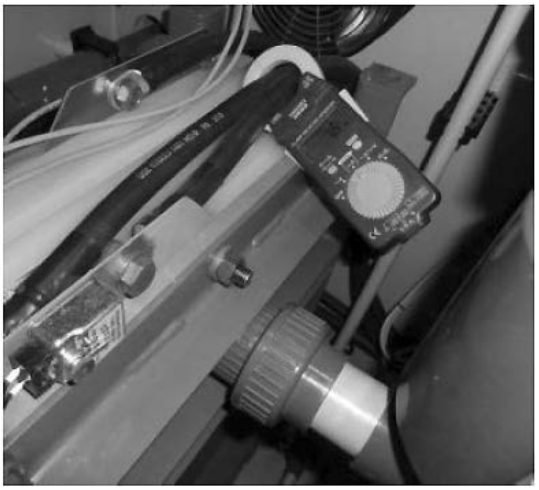
   The brine storage tank should always be 2/3 filled with salt.

   There should always be 1/3 water in the brine storage tank.
2. Check whether the quality of the salt complies as a minimum with Directive EN 973.
3. Check whether there are salt deposits on the base around the brine storage tank. This can mean that the brine storage tank has overflowed.

10.2.7 Cooling the Control Cabinet

Check whether all the fans are working correctly.

10.2.8 Check the amperage at the diaphragm cells



The amperage at the diaphragm cell has a direct relationship to chlorine production. In most cases, a deviation in the amperage measure leads to a poor output. The reason for this is that there is too little salt in the diaphragm cell or too much water in the lye storage tank. Generally, a lower amperage figure leads to lower chlorine production.

1. Measure the amperage figure during production with a current clamp on the diaphragm cell(s).
2. Compare the amperage measured with the amperage shown on the *[STATUS]* screen.
3. Note the value measured on the maintenance schedule.

10.2.9 Monitoring the Amperage at the Membrane Cells

The voltage at the membrane cell is the measurement of the power consumed. The voltage is composed of the sum of the voltage of the individual cell chambers. The voltage per membrane cell has to be between 3.5 ... 5.5 V DC during production. A strong deviation with one of the voltages can indicate a fault (short circuit) in one of the membrane cells. A constant high level of voltage in all membrane cells can indicate an output problem.

Fig. 17: In this example, the measurement is taken on cell chamber 3.

1. Cell chamber 1
2. Cell chamber 2
3. Cell chamber 3
4. Cell chamber 4
5. Measuring tip of the multimeter

→ Note the voltage measured on the maintenance schedule.

10.2.10 Regeneration of the Water Hardness Meter

1. → Replace the measuring cartridge with the reserve measuring cartridge.
2. → Regenerate/soften the measuring cartridge removed.

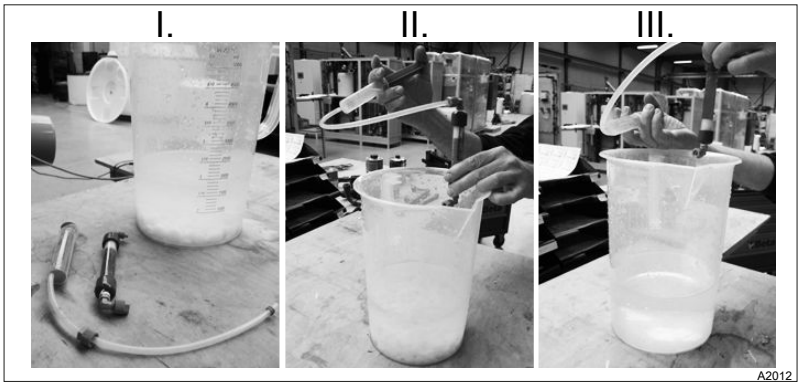


Fig. 18: Regenerating the measuring cartridge

1. → I: Use the regeneration kit provided. Use saturated brine for regeneration. For example use salt from the brine storage tank.
2. → II: Flush the measuring cartridge five times with brine. The white part of the cartridge should move right to the other side of the measuring cartridge.
3. → III. Flush the measuring cartridge five times with softened water. The measuring cartridge has been regenerated when the white part of the measuring cartridge has moved into its original position.

10.3 Maintenance on the Water Softener

- **User qualification, maintenance:** trained user, see *Chapter 1.3 'Users' qualifications' on page 9*

10.3.1 Maintenance on the Simplex Water Softener

10.3.1.1 Removing the Softener Head

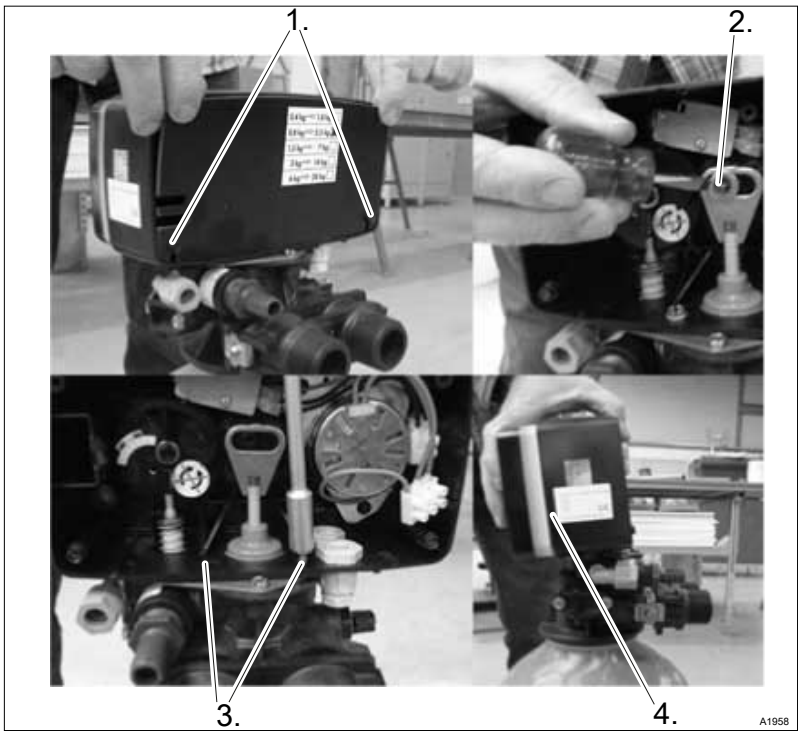


Fig. 19: Removing the softener head

1. Check the softener head (4) for leaks.
2. Unscrew the screws (1) on both sides and remove the cover.
3. Unscrew the screw (2).
4. Unscrew the screws (3) on both sides.
5. Incline the softener head backwards.

   Remove the softener head.

10.3.1.2 Replacing the Drainage Nozzle and Brine Valve O-ring.

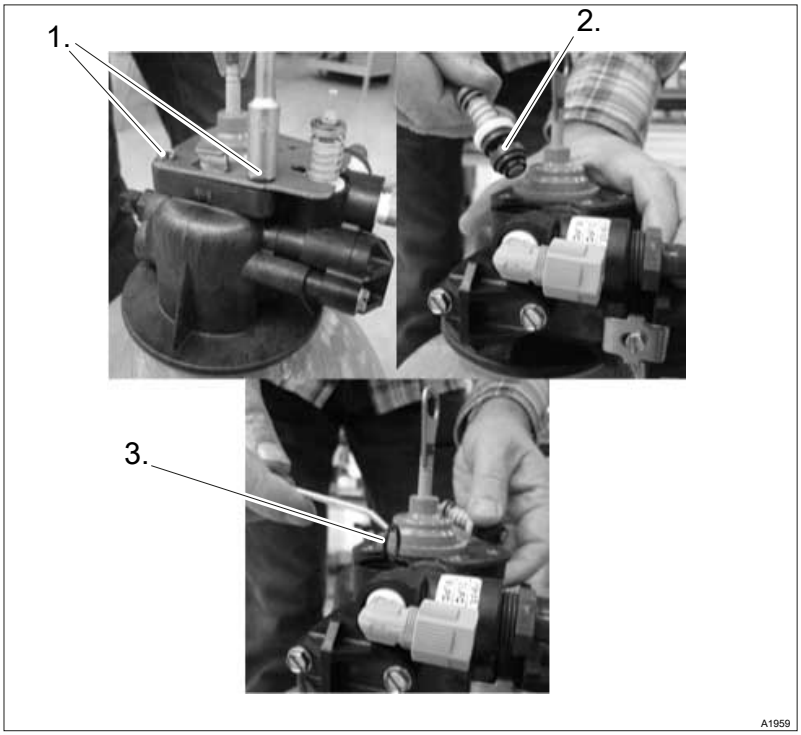


Fig. 20: Replacing the drainage nozzle and brine valve O-ring.

1. Unscrew the screws (1) and remove the protection plate.
2. Pull the brine valve (2) out of its seat.
3. Replace the drainage nozzle during annual maintenance.
4. Replace the brine valve O-ring (3).

10.3.1.3 Replacing the Rubber Washers

Fig. 21: Greasing and replacing the rubber washers

1. Remove the piston (1) out of its seat.

   The rubber washers and the spacers are arranged around the piston.

2. Replace the rubber washers.

   ⇨ Replace the rubber washers at the latest during three-yearly maintenance.

10.3.1.4 Cleaning the Filter Meshes on the Brine Side

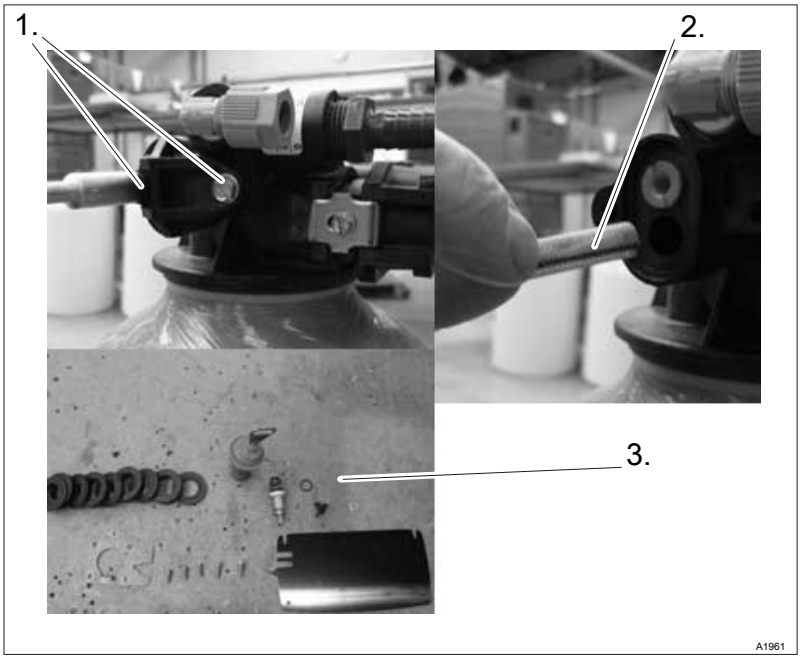


Fig. 22: Cleaning the filter meshes on the brine side

1. Unscrew the two screws (1).
2. Remove the filter meshes (2) out of their seat.
3. Clean the filter meshes.
4. Insert all parts (3) into the water softener head.

10.3.2 Maintenance on the Duplex Water Softener

10.3.2.1 Removing the softener head

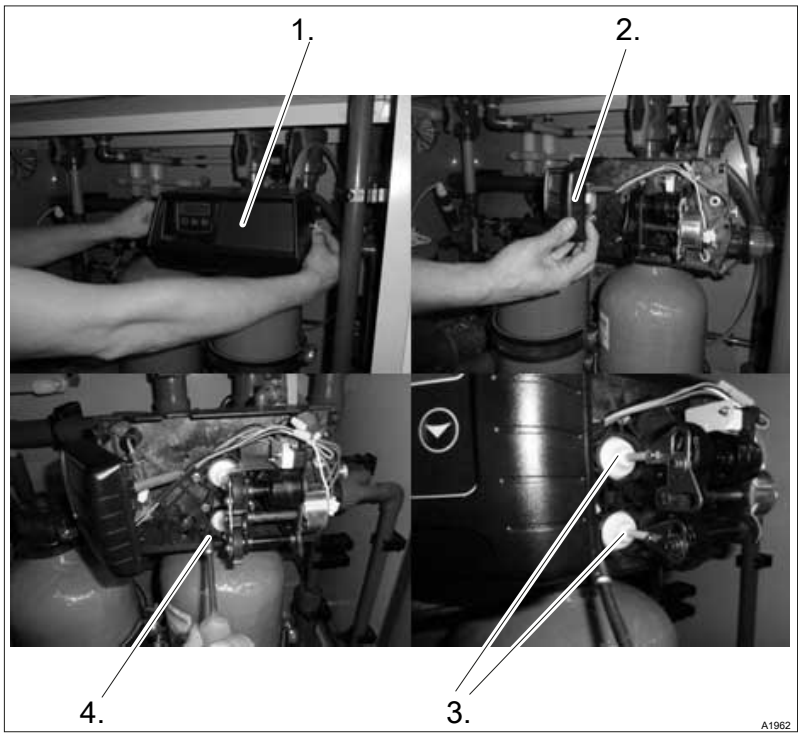


Fig. 23: Removing the softener head

1. Check the softener head for leaks.
2. Unscrew the screws on both sides and remove the cover (1).
3. Loosen the display (2) on the right side and pivot the display to the left.
4. Unscrew the nuts (3).
5. Unscrew the bolts (4) to release the front panel

10.3.2.2 Replacing the Drainage Nozzle and Brine Valve O-ring

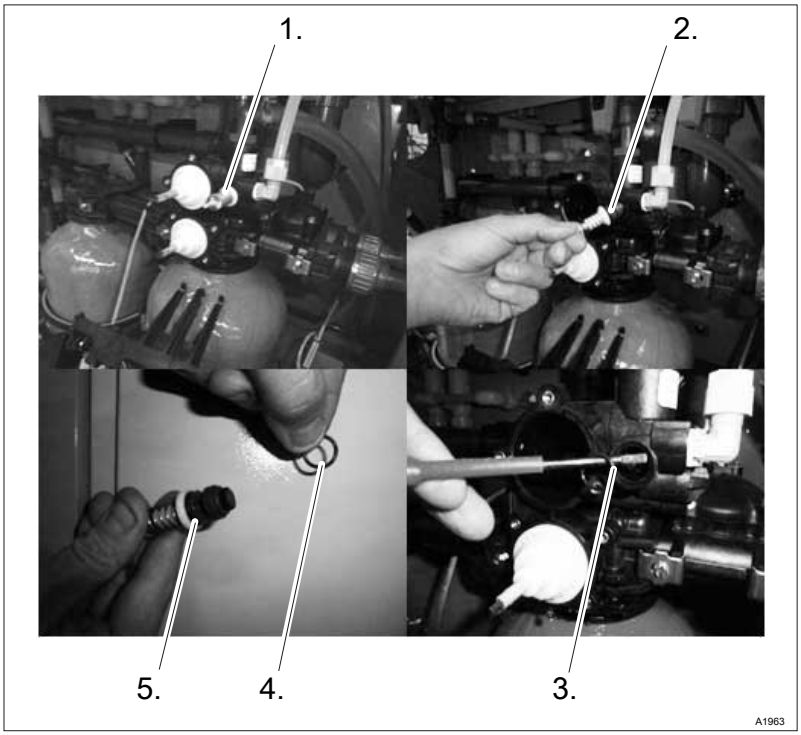


Fig. 24: Replacing the drainage nozzle (5) and brine valve O-ring (4)

1. Remove the front panel from the softener head.

   The drainage pin (1).

2. *The O-ring will also come loose when you remove the drainage nozzle. The O-ring belongs at the bottom in the drainage nozzle chamber.*

   Pull the drainage nozzle (2) out of its seat.

3. Replace the drainage nozzle during annual maintenance.
4. Replace the brine valve O-ring (3).

10.3.2.3 Replacing the Rubber Washers

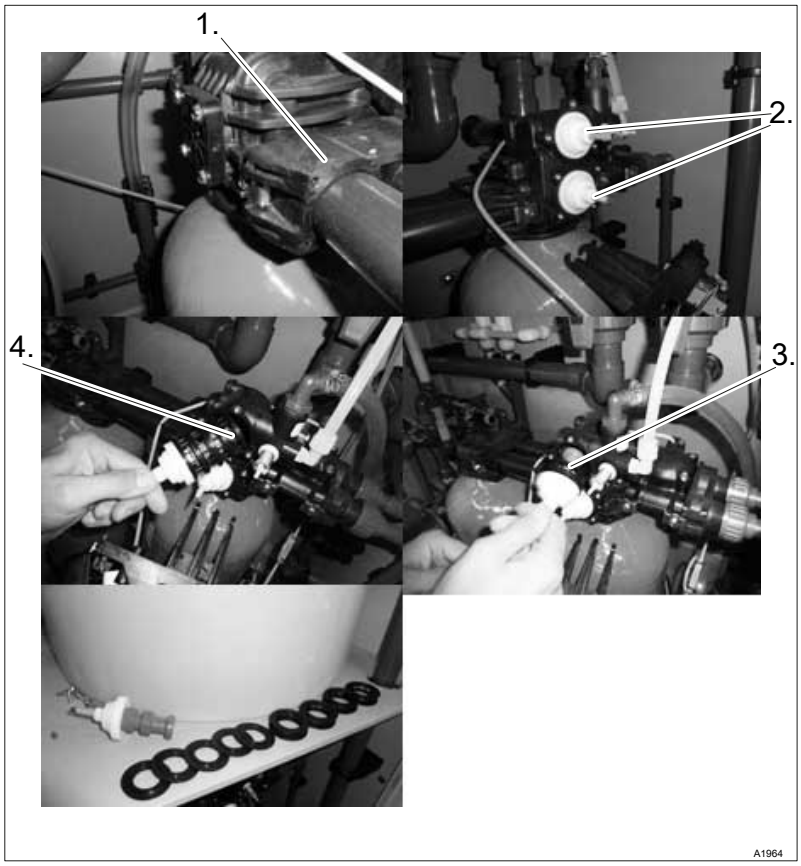


Fig. 25: Replacing the rubber washers

Correct order

Pay attention when dismantling the parts that you lay the parts in the correct order. This will ensure that you fit the rubber washers and spacers in the right order.

Ensure that the parts lie tightly against each other. Note the fact that the first seal can drop during installation.

1. Remove the cover (1)

   The rubber washers and the spacers are arranged around the piston.

2. There are two pistons (2); an upper piston and a lower piston.

3. Remove the upper piston (3) out of its seat.

4. *The lower piston is longer, with the result that is more difficult to remove the spacers and washers from the chamber.*

   Remove the lower piston (4) out of its seat.

5. Replace the rubber washers.

   ⇨ Replace the rubber washers at the latest during three-yearly maintenance.

6. Grease and fit the spacers during annual maintenance.

   Replace the spacers during three-yearly maintenance.

10.3.2.4 Cleaning the Filter Meshes on the Brine Side

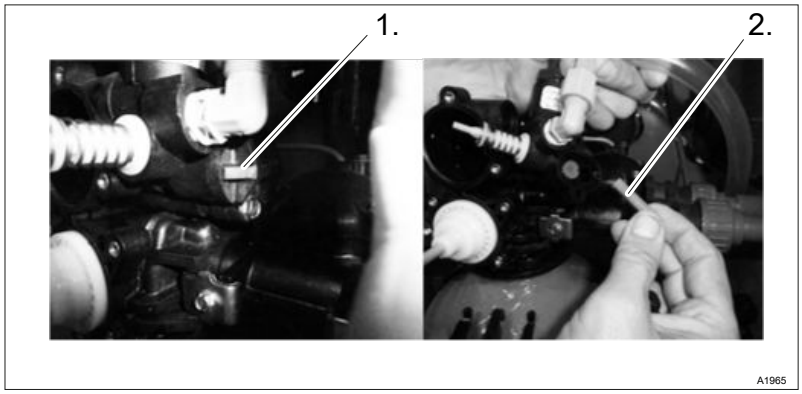


Fig. 26: Cleaning the filter meshes on the brine side

The filter meshes are located behind the cover (1).

1. Clean the filter meshes (2) for brine suction during annual maintenance.
2. Replace the filter meshes (2) during three-yearly maintenance.

10.3.3 Replacing the water filter

1. Screw the housing of the water filter in place.
2. Replace the water filter.
3. Screw the housing of the water filter in place.

10.4 Maintenance on the Brine Storage Tank

- **User qualification, maintenance:** trained user, see *Chapter 1.3 'Users' qualifications' on page 9*

10.4.1 Checking the Float on the Level Switch

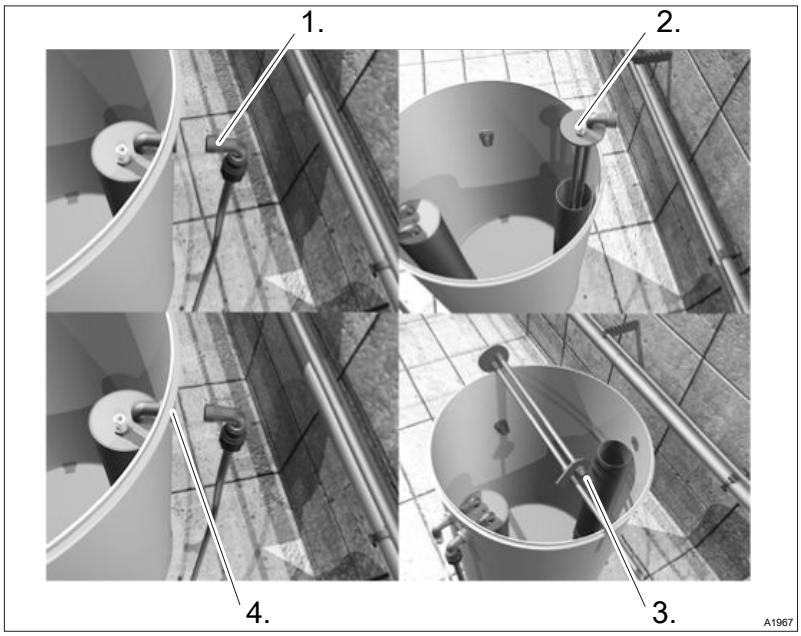


Fig. 27: Checking the float on the level switch

1. Unscrew the coupling on the charging hose (1).
2. Remove the liquid level switch (2) out of its housing.
3. Check the float (3) for dirt, damage and correct operation.
4. Insert the liquid level switch into the brine storage tank.
5.

> *Make sure that there are O-rings in the coupling and that they are undamaged.*

Connect the charging hose to the coupling (4).

10.4.2 Cleaning the Suction Unit in the Brine Storage Tank

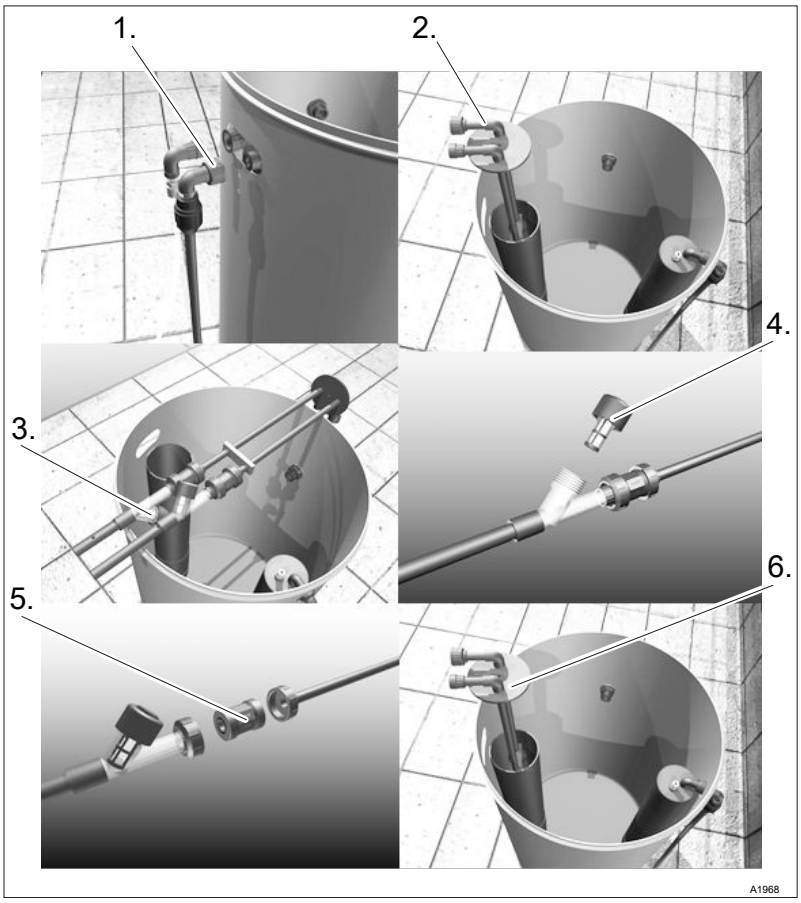


Fig. 28: Cleaning the suction unit in the brine storage tank

Performing maintenance on both suction lines:

1. Unscrew the coupling on both hoses (1) on the suction unit.
2. Remove the suction unit (2) out of its housing.
3. Unscrew the filter meshes (3) from the housing.
4. Flush the filter meshes (4) with softened water.

   Replace the filter meshes during three-yearly maintenance.
5. Screw the clean / new filter meshes into the housing.
6. Remove the non-return valve (5).
7. Flush the non-return valve (5) with softened water.
8. *Make sure that the arrow on the non-return valve points upwards.*

   Remove the non-return valve (5)
9. *Make sure that the arrow on the non-return valve points upwards.*

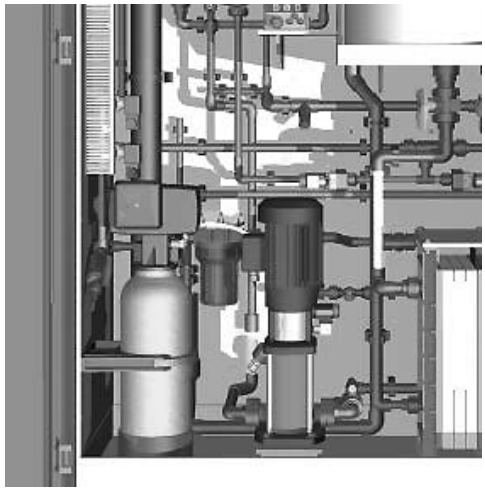
   Make sure that there are O-rings in the coupling and that they are undamaged.

   Insert the suction units into the housing.
10. Screw the coupling on both hoses onto the suction unit.

10.5 Maintenance on the Process Water System

Wear the goggles and gloves provided during maintenance on the process water system.

10.5.1 Cleaning the Booster Pump Filter Insert

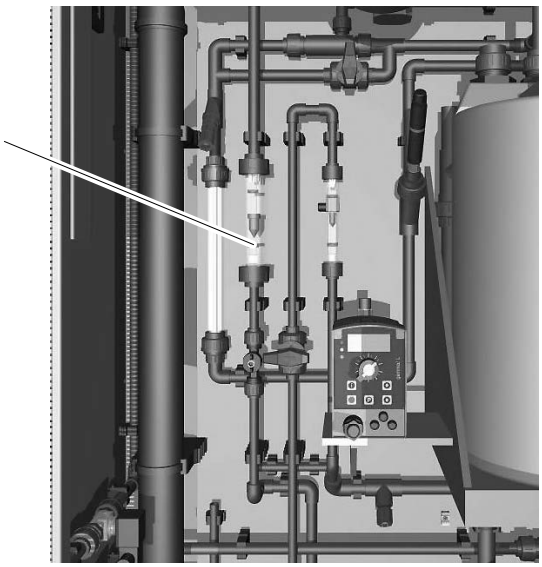


B0739

1. Close the shut-off valves for the booster pump.
2. Slowly open the filter insert coupling and allow the system to empty.
3. Annual maintenance: Clean the filter meshes in the filter insert.

   Three-yearly maintenance: Replace the filter meshes in the filter insert.

10.5.2 Cleaning the Process Water Flow Meter



B0740

1. Remove the process water flow meter from the line and clean it.

10.5.3 Replacing the Seals on the Water Jet Pump

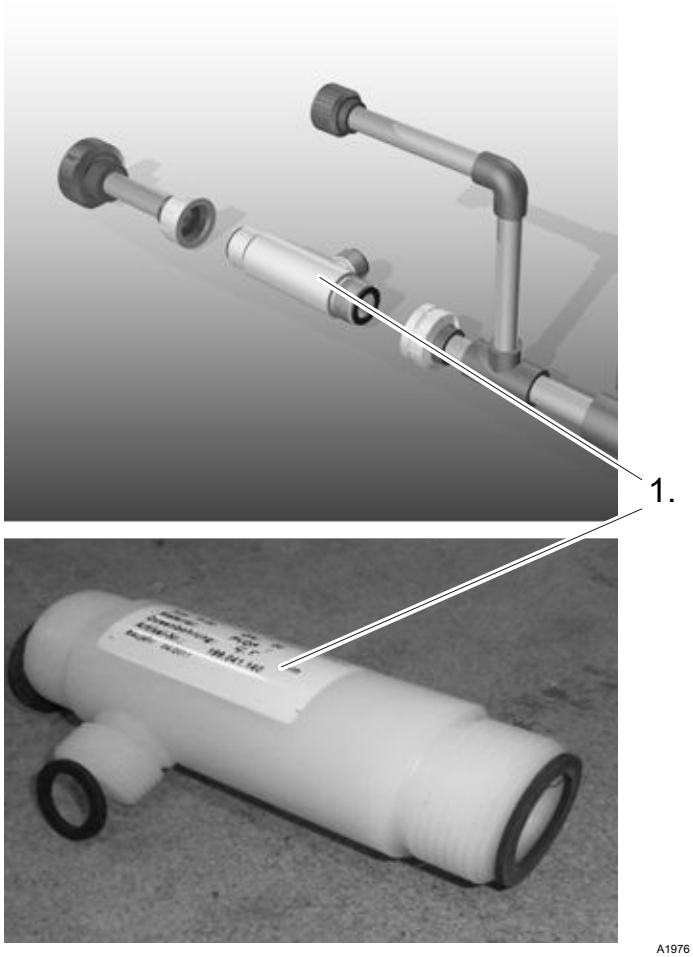


Fig. 29: Water jet pump seals

1. Loosen the threaded connectors on the water jet pump and remove the water jet pump.
2. Remove the old seals and insert new seals:
   - Seal on the venturi side
   - Seal on the inlet and outlet side

10.5.4 Cleaning the Water Jet Pump Nozzle

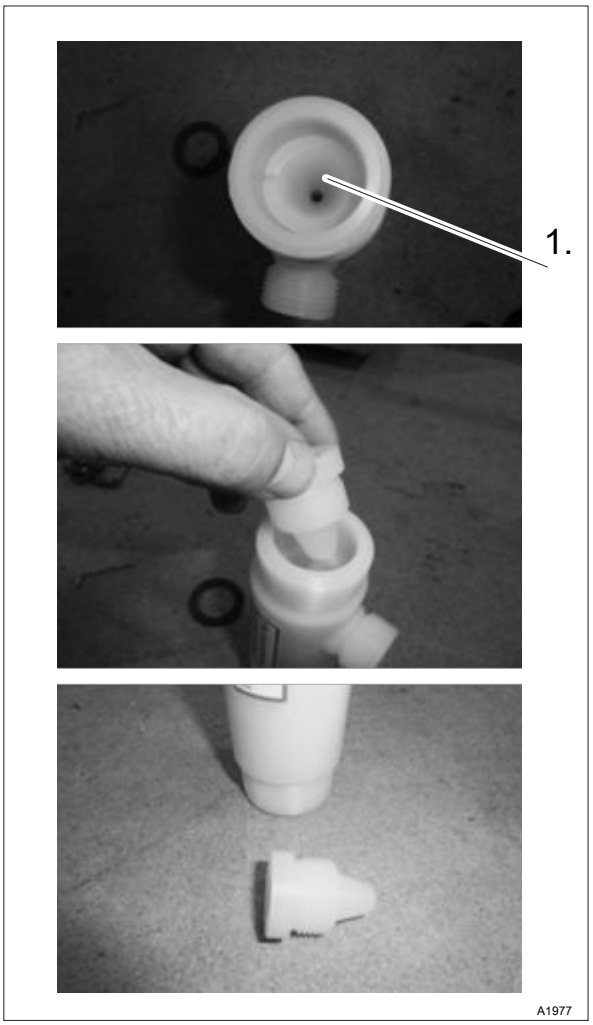


Fig. 30: Cleaning the water jet pump nozzle

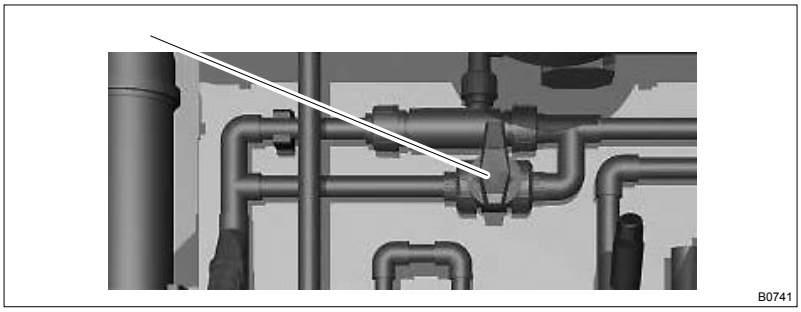
1. Turn the nozzle (1) in a counter-clockwise direction.
2. Remove the nozzle.
3. Check the nozzle for dirt and wear, cleaning or replacing the nozzle if necessary.

Make sure that the nozzle in the housing is fitted tightly.

A dirty or insufficiently tightened nozzle will result in too weak a vacuum.

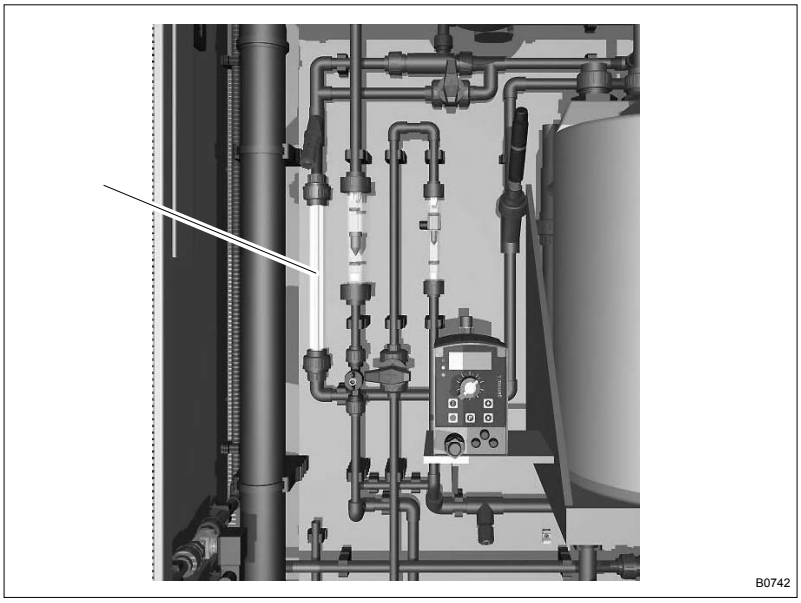
4. Insert the nozzle into the water jet pump.

10.5.5 Replacing the O-rings on the Vacuum Control Tap



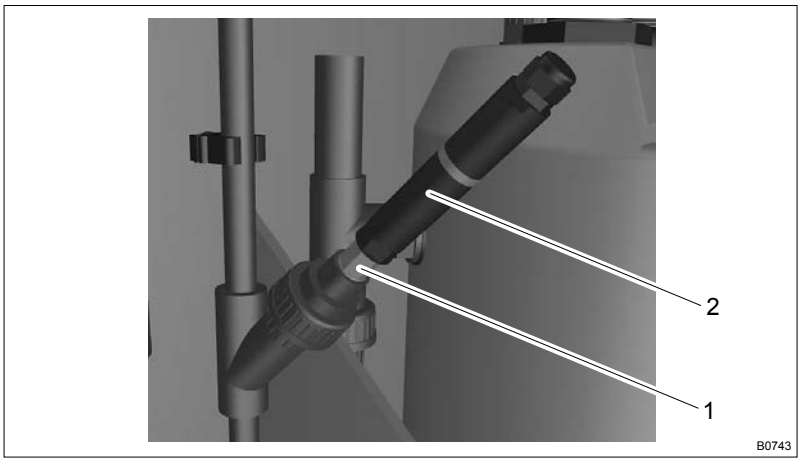
→ Remove the control tap from the line and replace the FPM O-rings on the vacuum control tap.

10.5.6 Replacing the O-rings on the Static Mixer



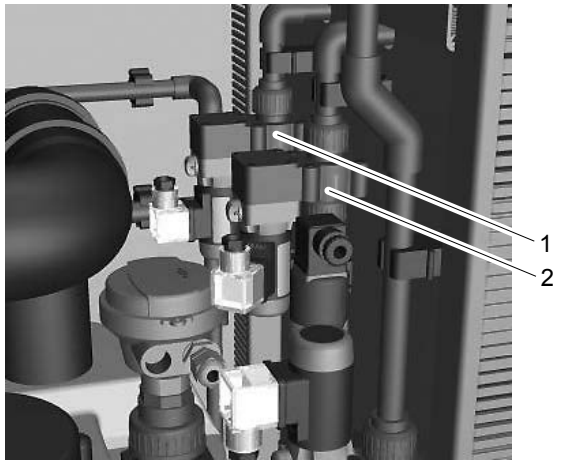
→ Remove the threaded connector on the static mixer and replace the FPM O-rings.

10.5.7 Replacing the pH Sensor



1. Open the threaded connector on the pH sensor and remove the pH sensor (1) from the system.
2. Unscrew the transmitter (2) from the pH sensor.
3. Replace the pH sensor.

10.5.8 Replacing the Product Valve



1 Product valve
2 Outlet valve

1. Loosen the threaded connectors on the product valve.
2. Remove the connector cap on the product valve.
3. Replace the product valve.
4. Attach the connector cap to the new product valve.

10.5.9 Replacing the Outlet Valve

1. Loosen the threaded connectors on the outlet valve.
2. Remove the connector cap for the outlet valve.
3. Replace the outlet valve.
4. Attach the connector cap to the new outlet valve.

10.6 Maintenance on the Lye Storage Tank

- **User qualification, maintenance:** trained user, see *Chapter 1.3 'Users' qualifications' on page 9*

WARNING!

Danger due to lye residue

Possible consequence: Fatal or very serious injuries from lye.

Measure: Wear the goggles and gloves provided during maintenance on the lye storage tank.

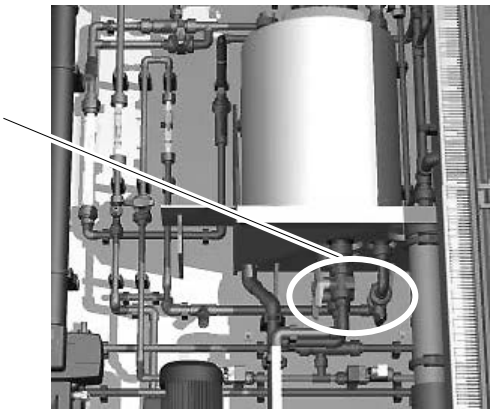
Ventilate the room during maintenance.

Only perform maintenance on the lye pump (end of chapter) and flow meter for lye suction annually.

The remaining points are only performed during three-yearly maintenance.

10.6.1 Emptying the lye storage tank

Use the hose supplied with coupling and a storage tank with a minimum capacity of 20 litres to drain the lye storage tank.



1. Close the taps under the lye storage tank.

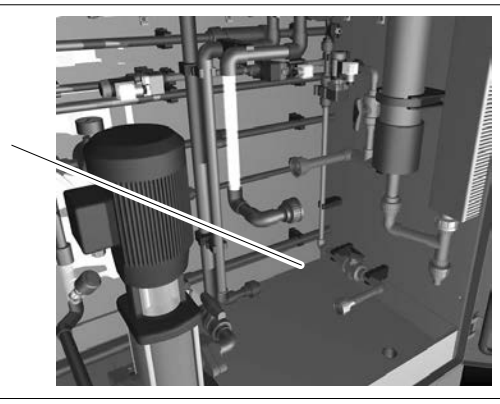
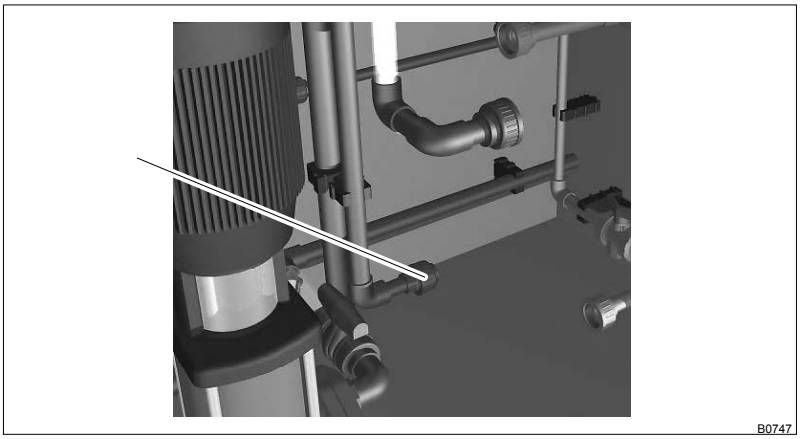
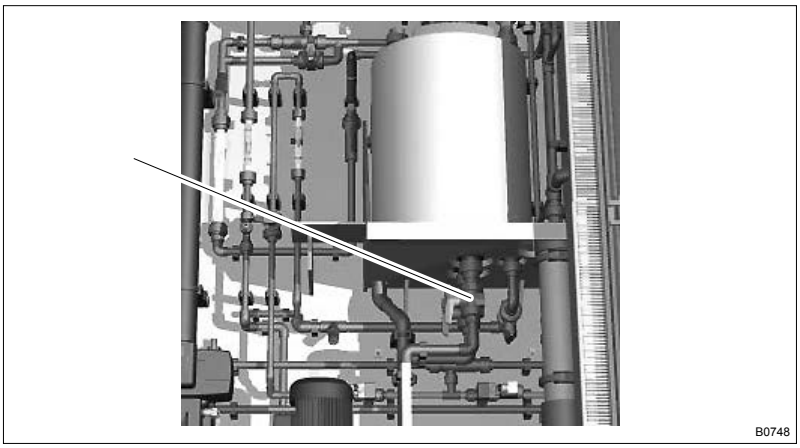


Fig. 31: Connections on the diaphragm cell when the diaphragm cell is dismantled. Indicator points to the empty position of the diaphragm cell

2. Slowly turn open the threaded connector on the supply line on the diaphragm cell and allow the cell to empty.

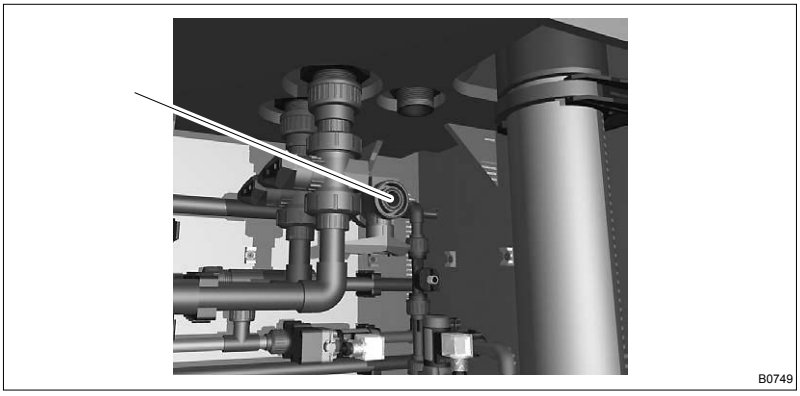


3. Open the coupling on the diaphragm cell and replace the O-ring.



4. Connect the hose supplied with the appropriate coupling to the feed tap at the bottom of the lye storage tank.

5. Open the feed tap at the bottom of the lye storage tank and drain the contents of the lye storage tank into a bucket.

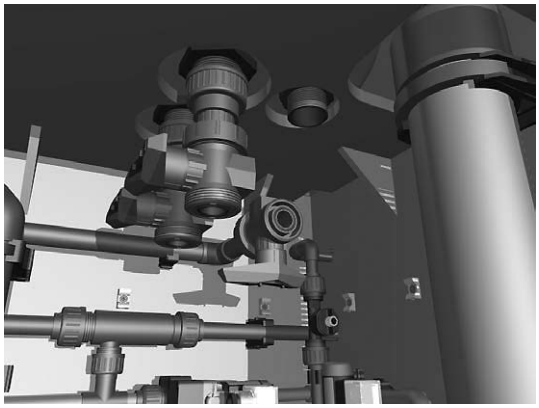


6. Open the coupling on the lye suction line at the bottom of the lye tank.

7. Open the threaded connector on the lye suction valve and close the hose supplied with the coupling.

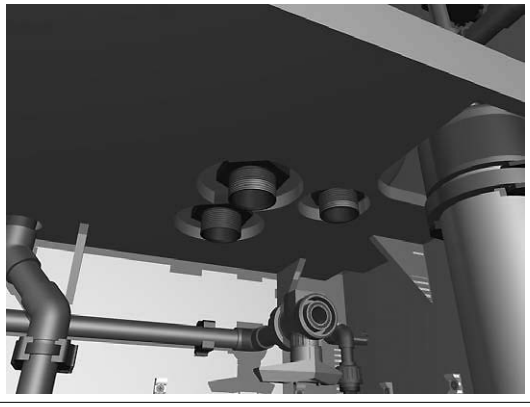
8. Open the shut-off valve and allow the lye suction line to drain empty.

10.6.2 Replacing the O-rings on the Taps on the Bottom of the Lye Storage Tank



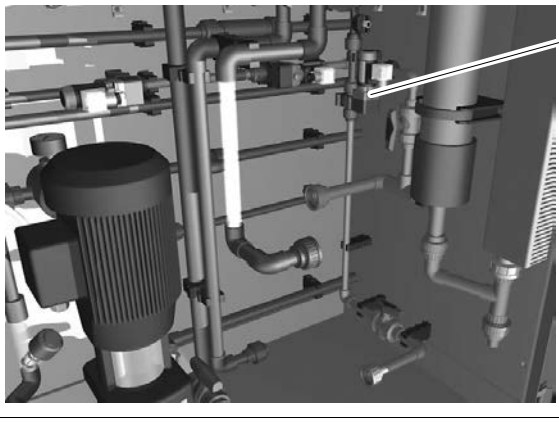
→ Replace the EPDM O-rings on the three taps on the bottom of the lye storage tank.

10.6.3 Replacing the O-rings on the Couplings on the Bottom of the Lye Storage Tank



→ Replace the O-rings on the couplings on the bottom of the lye storage tank.

10.6.4 Replacing the Level Switch in the Lye Storage Tank



→ Replace the level switch.

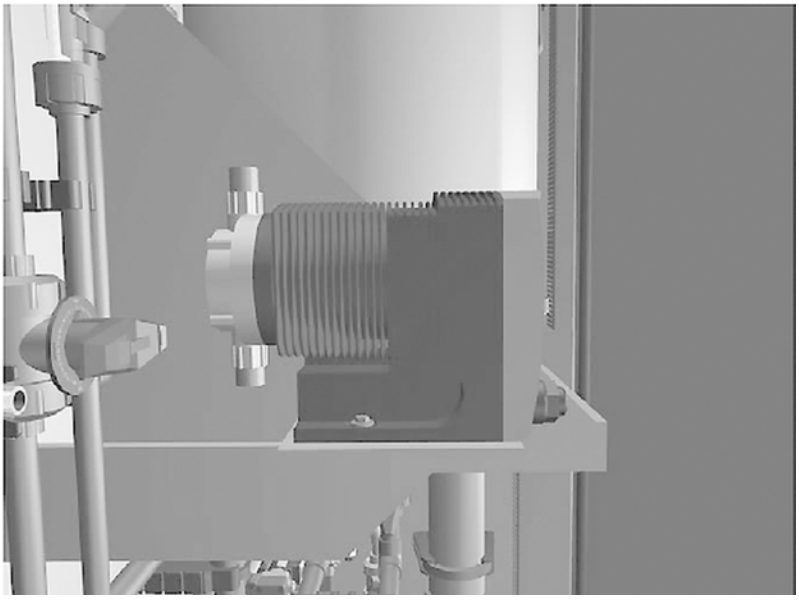
10.6.5 Replacing the O-rings on the Flow Meter for Lye Suction

1. Remove the flow meter from the line and clean the inside of the flow meter and the level switch.
2. During every maintenance: Replace the O-rings on the flow meter.

10.6.6 Replacing the O-rings on the Control Tap for Lye Suction

1. Replace the O-rings on the control tap for lye suction.
2. Replace all components in the lye storage tank.

10.6.7 Maintenance on the Lye Pump



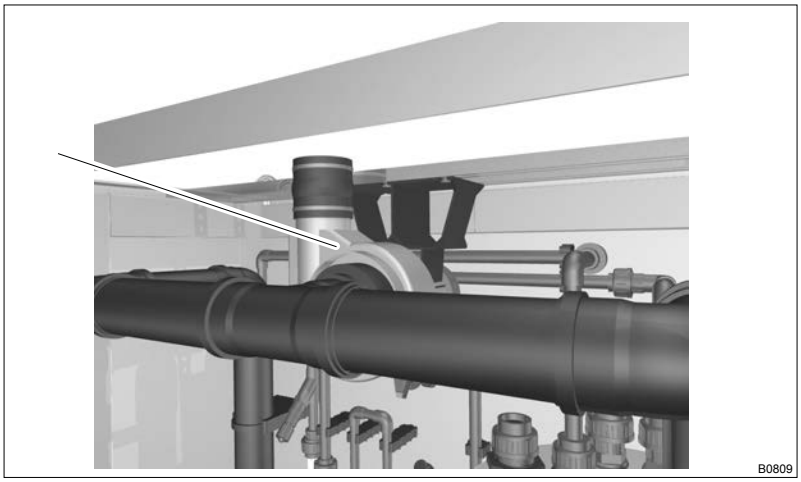
Renew the spare parts on the lye pump.

Spare parts on the lye pump:

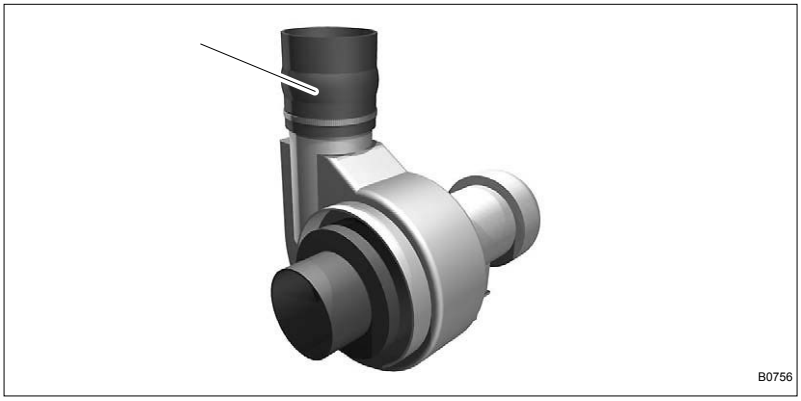
- Suction valve with connector kit
- Discharge valve with connector kit
- Diaphragm
- Sealing set

→ Use the four Allen screws to remove the liquid end. You can then replace all the spare parts.

10.6.8 Maintenance on the Fan

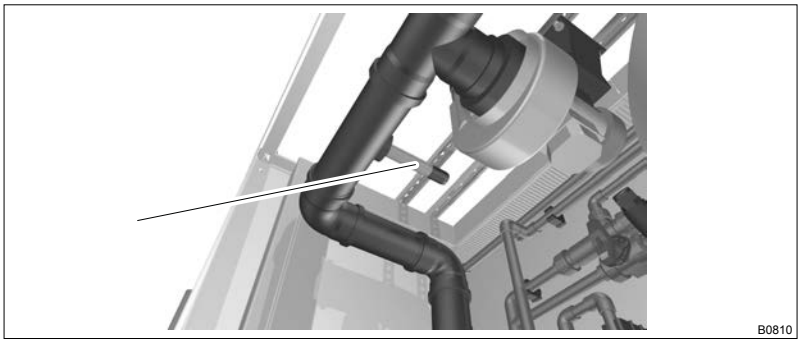


1. Loosen the connection from the fan to the pipe to the lye storage tank and the screw in the fan connector and remove the fan from the control cabinet.



2. Remove the connecting section from the fan.
3. Rinse the fan with water.
4. Fit the connecting piece on the fan and replace the fan in its position.

Maintenance on the Air Flow Sensor



5. Unscrew the adjustment screw and remove the air flow sensor from the supply pipe.
6. Clean the air flow sensor.
7. Fit the air flow sensor.

10.7 Maintenance on the Diaphragm Cell

- **User qualification, maintenance:** trained user, see *Chapter 1.3 'Users' qualifications' on page 9*

WARNING!

Danger from chemical residue

Possible consequence: Fatal or very serious injuries from chemical residue.

Measure: During maintenance wear the goggles and gloves provided.

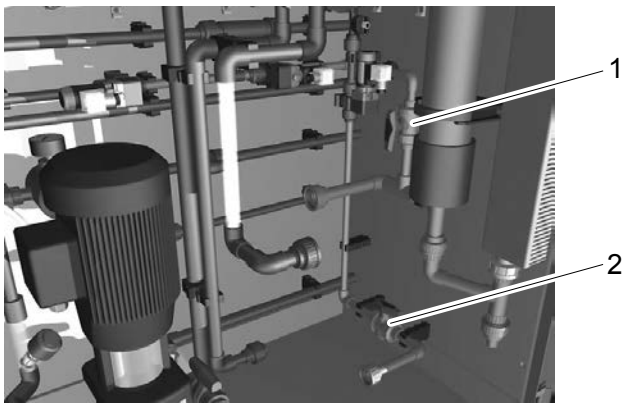
Ventilate the room during maintenance.

10.7.1 Replacing the O-rings on the Cathode Side of the Diaphragm Cell

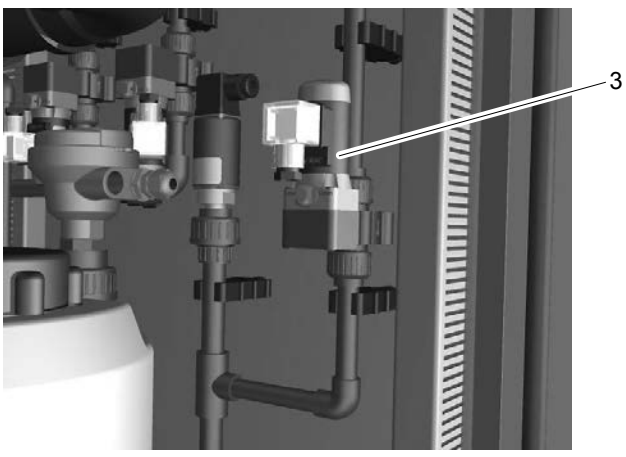
The couplings on the cathode side of the diaphragm cell are already loosened.

→ Three-yearly maintenance only: Replace the EPDM O-rings on the cathode side.

10.7.2 Replacing the O-rings on the Anode Side of the Diaphragm Cell

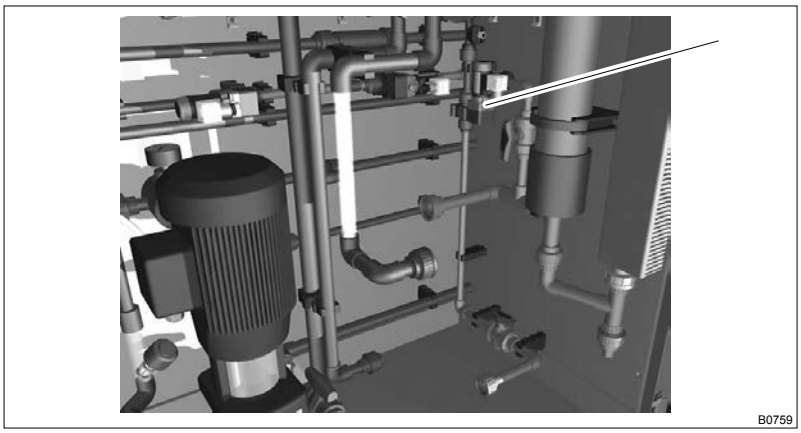


1. → Close the refresh tap (1).
2. → Close the brine tap (2)
3. → Tighten the threaded connector on the diaphragm cell.



4. → Manually open the bleed valve (3).
5. → Replace the O-rings on the anode side of the diaphragm cell.

10.7.3 Replacing the O-rings on the Brine Valve



1. Loosen the threaded connectors on the brine valve.
2. Remove the connector cap from the brine valve.

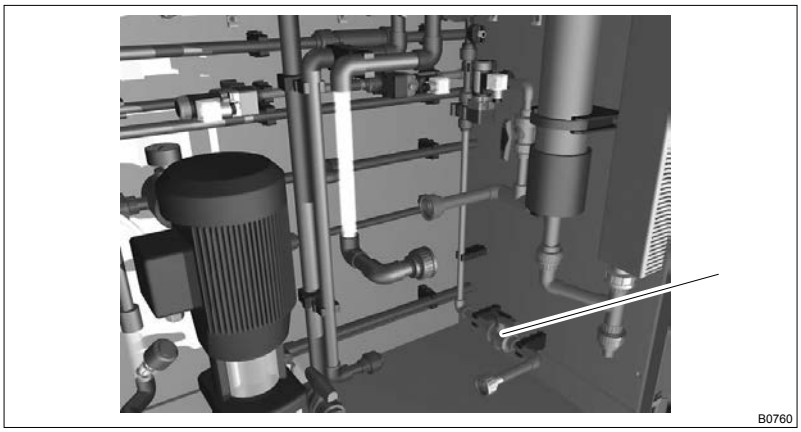
Annual maintenance:

3. Replace the O-rings.

Three-yearly maintenance:

4. Replace the brine valve and the O-rings.
5. Fit the connector cap on the brine valve.

10.7.4 Replace the O-rings on the brine valve



→ During every maintenance: Replace the FKM O-rings (DIN ISO 1629).

10.8 Maintenance on the Anode Pipe

- **User qualification, maintenance:** trained user, see *Chapter 1.3 'Users' qualifications' on page 9*

WARNING!
Danger from chemical residue
Possible consequence: Fatal or very serious injuries from chemical residue.

Measure: During maintenance wear the goggles and gloves provided.

Ventilate the room during maintenance.

10.8.1 The PVDF Float and Stop Pipe

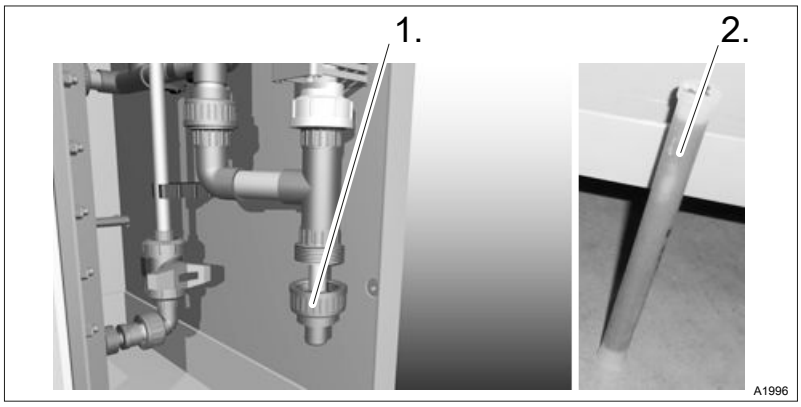


Fig. 32: The PVDF float

1. Tighten the coupling under the anode
2. Remove the PVDF float and the stop pipe from the anode pipe.

During annual maintenance:

3. Clean the PVDF float.
4. Check the PVDF float for leaks.
5. Clean the stop pipe.

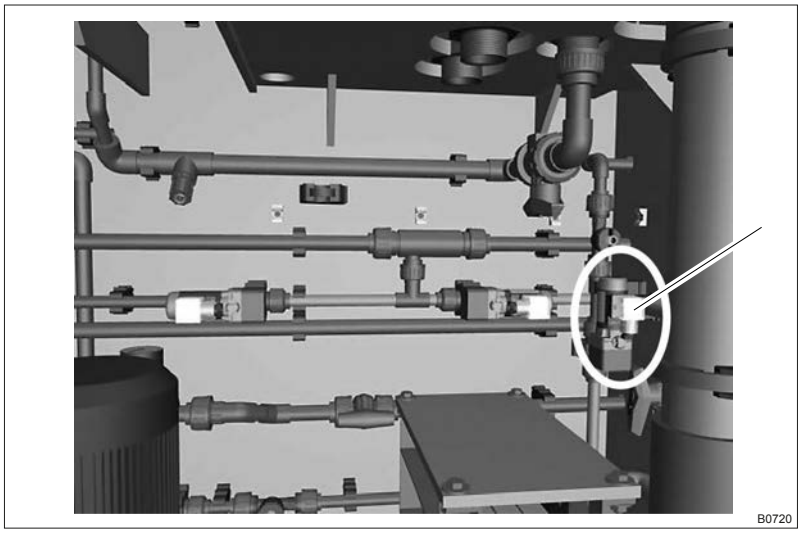
During three-yearly maintenance:

6. Replace the PVDF float.

Make sure that the reed switch for "low level" is correctly adjusted to the PVDF float pipe.

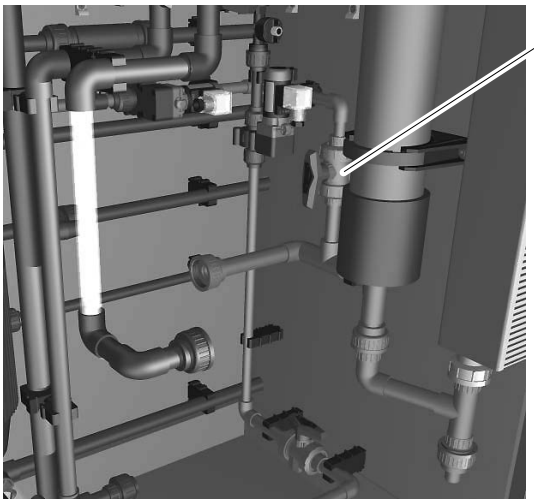
7. Replace the stop pipe.

10.8.2 Replacing the Refresh Valve



1. Loosen the threaded connectors on the refresh valve.
2. Remove the connector cap from the refresh valve.
3. Replace the refresh valve.
4. Fit the connector cap on the refresh valve.

10.8.3 Replace the O-rings on the Refresh Tap



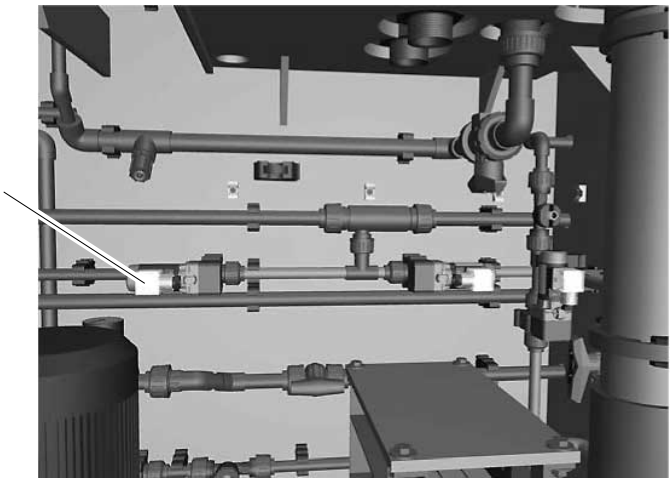
Annual maintenance:

1. Replace the FPM O-rings.

Three-yearly maintenance:

2. Replace the refresh tap and O-rings.

10.8.4 Replacing the O-rings on the Lye Valve



1. Loosen the threaded connectors on the lye valve.
2. Remove the connector cap from the lye valve.
3. Replace the lye valve.
4. Fit the connector cap on the lye valve.

10.8.5 Replacing the Seals on the Water Jet Pump

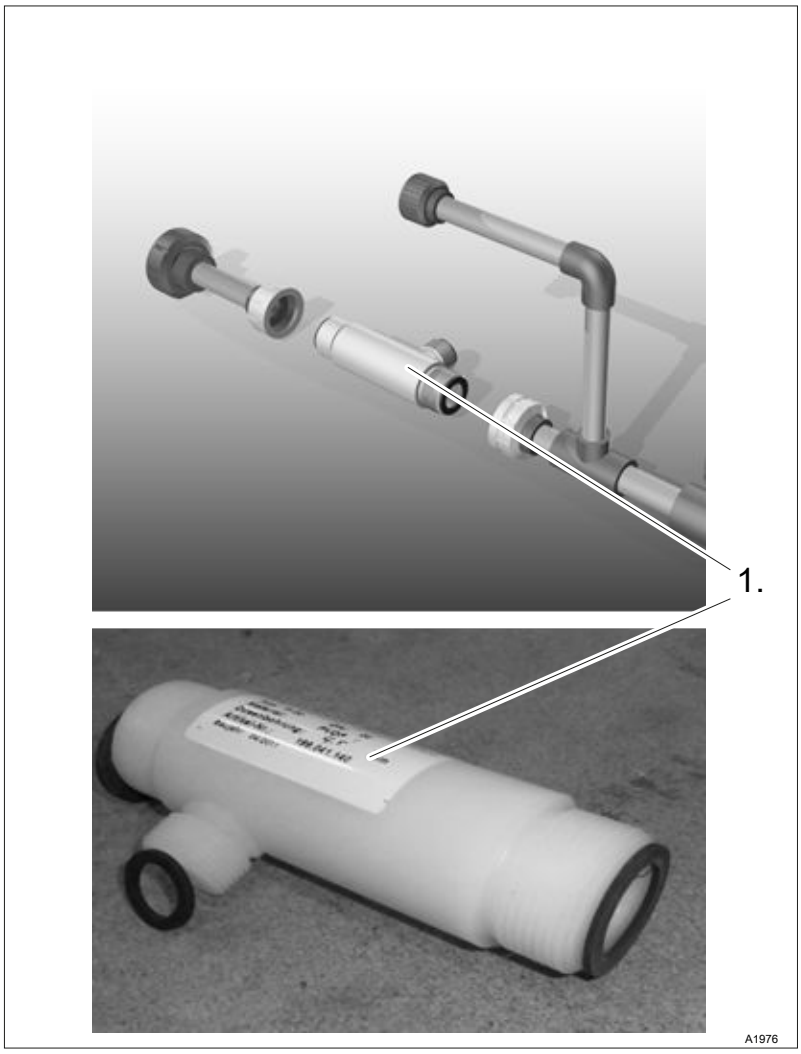


Fig. 33: Water jet pump seals

1. Loosen the threaded connectors on the water jet pump and remove the water jet pump.
2. Remove the old seals and insert new seals:
   - Seal on the venturi side
   - Seal on the inlet and outlet side

10.8.6 Cleaning the Water Jet Pump Nozzle

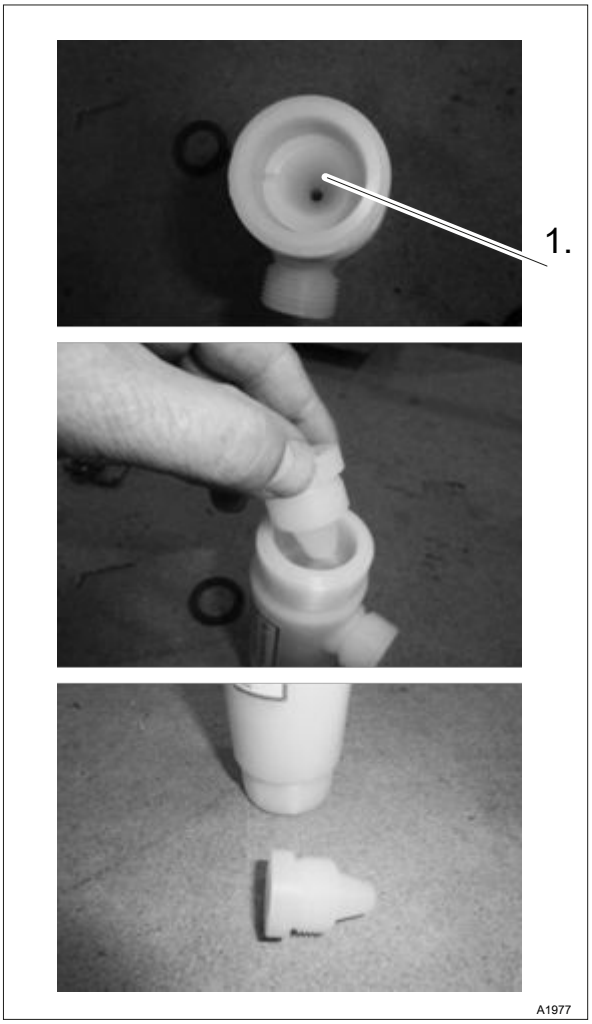


Fig. 34: Cleaning the water jet pump nozzle

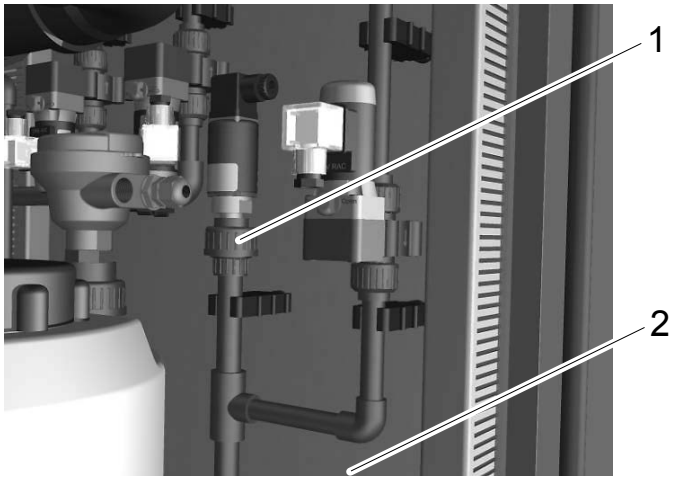
1. Turn the nozzle (1) in a counter-clockwise direction.
2. Remove the nozzle.
3. Check the nozzle for dirt and wear, cleaning or replacing the nozzle if necessary.

Make sure that the nozzle in the housing is fitted tightly.

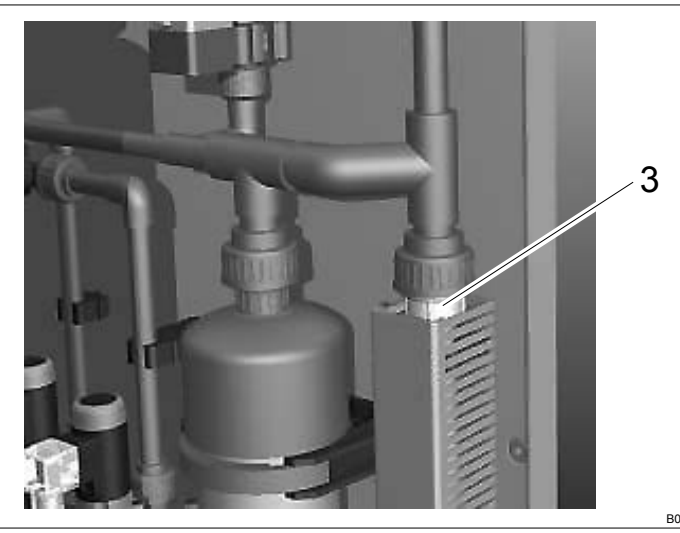
A dirty or insufficiently tightened nozzle will result in too weak a vacuum.

4. Insert the nozzle into the water jet pump.

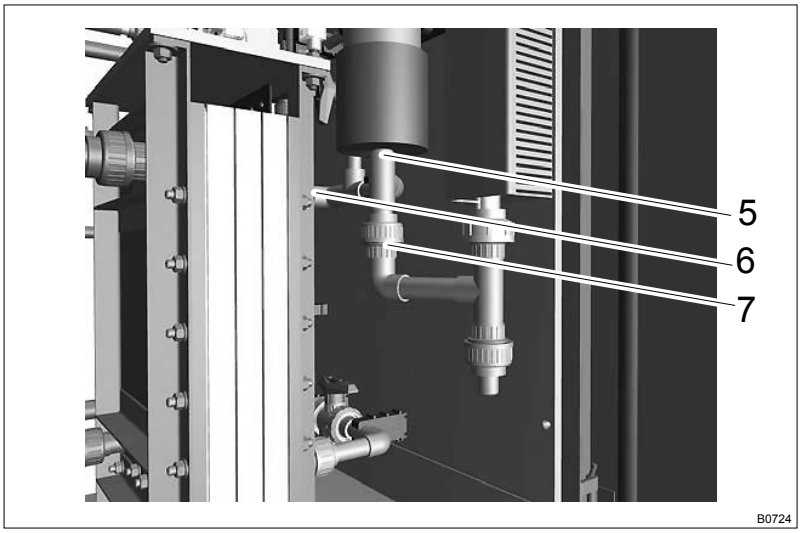
10.8.7 Replace the O-rings on the Anode Pipe



1. Loosen the threaded connectors on the vacuum generator.
   Replace the O-rings.
2. Loosen the threaded connectors on the top of the anode pipe.
   Replace the O-rings.

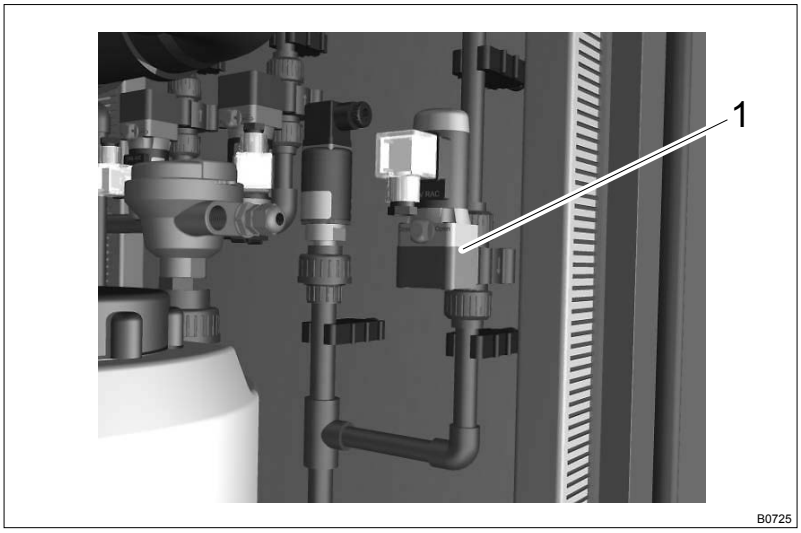


3. Loosen the threaded connectors on the top of the measuring pipe.
   Replace the O-rings.
4. Annual maintenance: Check the upper stop for oxidation.
   Three-yearly maintenance: Replace the upper stop.



5. Replace the O-ring on the lower measuring pipe connector.
6. Replace the O-ring on the lower anode pipe connector.
7. Replace the O-ring from the stop pipe.

10.8.8 Replacing the O-rings on the Bleed Valve



1. Loosen the threaded connectors on the vent valve.
2. Remove the connector cap from the vent valve.
3. Annual maintenance: Replace the O-rings on the ventilation valve.
   Three-yearly maintenance: Replace the bleed valve.
4. Fit the connector cap on the vent valve.

10.9 Maintenance on the Product Storage Tank (Accessory)

WARNING!

Danger due to chlorine residue

Possible consequence: Fatal or very serious injuries from chlorine residue.

Measure: Wear the goggles and gloves provided during maintenance on the product storage tank.

Ventilate the room during maintenance.

10.9.1 Checking for Leak-tightness

→ Check the product storage tank for leak-tightness.

10.9.2 Checking the Lid on the Product Storage Tank

→ Check whether the lid is properly closed and undamaged.

10.9.3 Checking the Level Switch

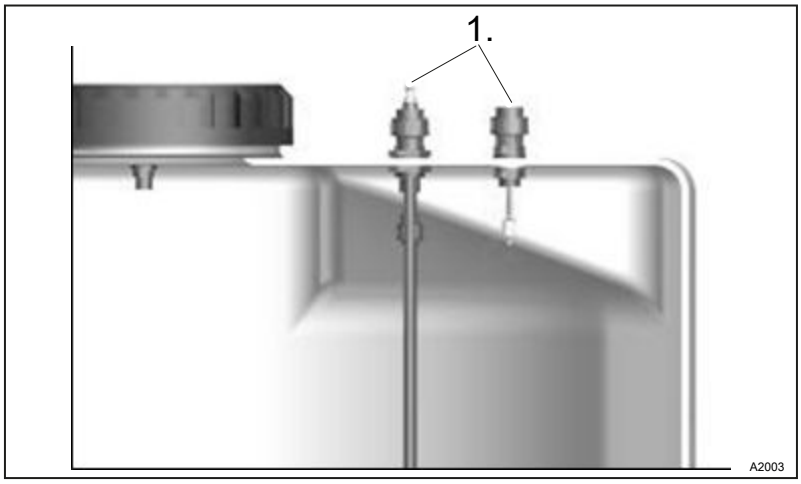


Fig. 35: Checking the level switch (1) (illustration)

Checking the Level Switch

1. → Open the level switch coupling.

During annual maintenance:

2. → Check the float for dirt and damage.

During three-yearly maintenance:

3. → Replace the level switch.

Checking the "Low flow" level switch

4. → Open the level switch coupling.

During annual maintenance:

5. → Check the float for dirt and damage.

During three-yearly maintenance:

6. → Replace the level switch.

10.9.4 Checking the Chlorine Suction Unit

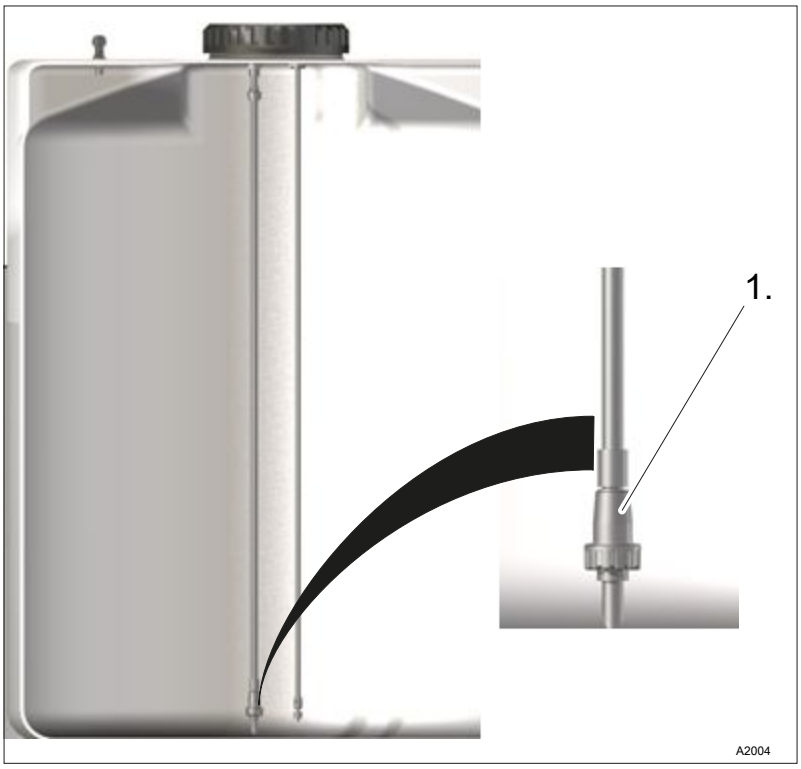


Fig. 36: Checking the chlorine suction unit

1. Remove the chlorine suction unit from the chlorine storage tank.
2. Check the chlorine suction unit for dirt and damage.
   ⇨ Clean or replace if necessary.

10.9.5 Replacing the Seals on the Chlorine Suction Unit

Maintenance package

The maintenance package includes two versions of seals for non-return valves, meaning that there is always a spare seal and O-ring.

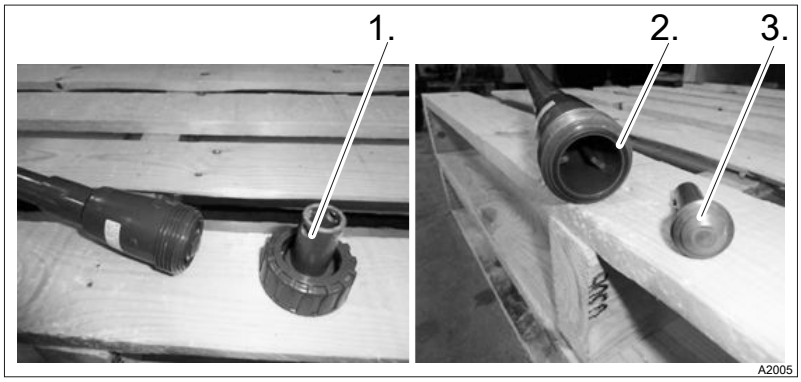


Fig. 37: Seals on the chlorine suction unit

1. Dismantle the threaded connector (1) on the non-return valve.
2. Replace the O-ring (2).
3. Dismantle the float (3) from the non-return valve
4. Replace the seal on the float.
5. Fit the threaded connector (1) into the non-return valve.

10.10 Maintenance on the Control Cabinet

10.10.1 Checking the Relay Contacts

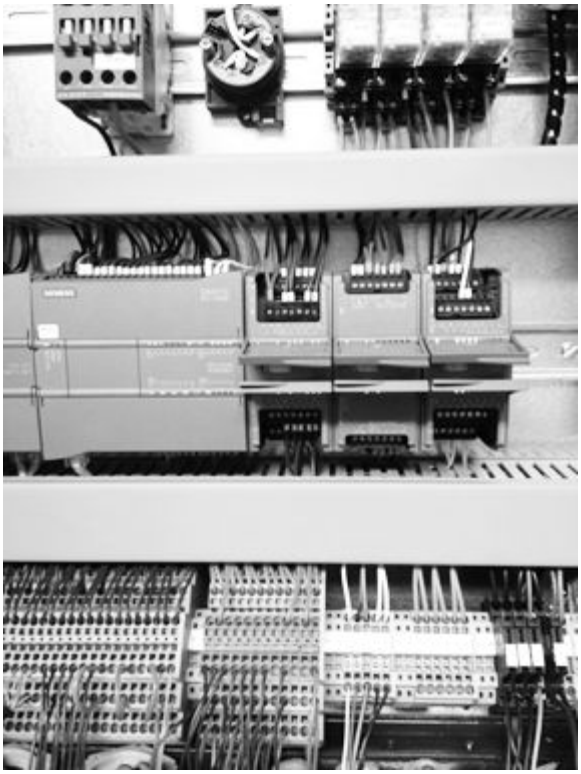


Fig. 38: Checking the relay contacts

1. Check all relay contacts for discolouration and oxidation and clean if necessary.
2. Check all connectors for discolouration and tighten, if necessary.
3. Check all components for discolouration and oxidation and clean if necessary.

10.10.2 Cleaning the Filters

Fig. 39: Cleaning the filters

> ***Frequency***
> *The frequency of cleaning depends on the contamination level of the filters and on the installation location.*

1. Clean the filter by tapping or blowing.

During three-yearly maintenance:

2. Replace the filter.

10.11 Commissioning the System after Maintenance

10.11.1 Commissioning Process

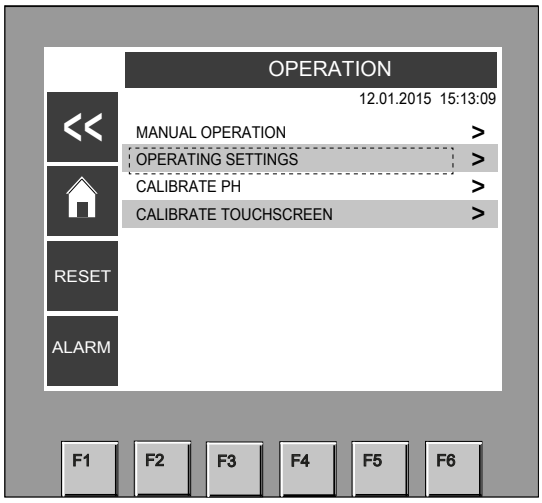
- **User qualification, maintenance** instructed personnel, see *Chapter 1.3 'Users' qualifications' on page 9*

Use the following abbreviated procedure for commissioning. Refer to the relevant chapter for a more detailed description of commissioning.

No.	Wear protective clothing when working with lye and chlorine product.	Check
1	Ensure before starting up the system that the system is clean and dry.	
2	Check whether all the couplings are tightened.	
3	Throw the master switch.	
4	Unscrew the water tap in the system.	
5	Use the test kit to measure the hardness of the water.	
6	Check whether the brine storage tank is filling with softened water.	
7	Check whether the brine storage tank stops filling up when the float is actuated.	
8	Open all shut-off valves with the exception of the sampling valve and the control valve for the cooling water.	
9	Open the cover of the lye storage tank and fill the lye storage tank with the volume of lye previously collected. Wear protective clothing when working with sodium hydroxide solution	
10	Replace the lid on the lye storage tank.	

11	MAKE SURE THAT THERE IS SUFFICIENT LYE IN THE LYE STORAGE TANK AND PRODUCTION TANK. PRODUCTION WILL NOT START IF THERE IS NO LYE IN THE LYE STORAGE TANK. THIS COULD RESULT IN SERIOUS PROBLEMS FOR THE ENVIRONMENT AND HEALTH. The lye storage tank has to be filled with lye before production is started. Chlorine gas can be released in the room if production is started without lye. MAKE SURE THAT ALL SHUT-OFF VALVES (WITH THE EXCEPTION OF THE SAMPLING TAP) ARE OPEN.	
12	Perform initial commissioning.	
13	Calibrate the pH sensor.	
14	Switch on production on the control panel and reset all faults	
15	Check whether there are leaks and whether a vacuum state has been achieved.	
16	Start an anode refresh.	
17	Measure the voltage on the diaphragm cell and monitor whether the voltage is not above 5 V DC per chamber.	
18	Measure and check during production that the amperage is identical to the current measured and shown on the control panel.	

10.11.2 Resetting the Maintenance Counter



1. Make sure that the CHLORINSITU® V FBA system is producing correctly and without malfunctioning again.
2. Select the *'Operating settings'* menu under *'Operation'*.
3. Request the *'Password'* for the *'Maintenance'* menu from Van den Heuvel Watertechnologie bv.
4. Select the *'Maintenance'* menu.

   Press *'Login'* and enter the *'Password'*.
5. Reset the *'Maintenance counter'*.

   Press and hold down *[Reset]* for a minimum of 3 seconds.

11 Repair

- **User qualification, repair:** Service, see *Chapter 1.3 'Users' qualifications' on page 9*

The system can only be repaired by the manufacturer or the authorised Service department. Please get in touch with your local Service contact.

12 Maintenance kits

Maintenance kits

The manufacturer of the system has a "1-year" maintenance kit and a "3-year" maintenance kit. Use the following order numbers to order these maintenance kits.

Maintenance kits

Maintenance kit	Order number
Maintenance kit 3 for CHLORINSITU® V FBA	80200010
Maintenance kit 1 for CHLORINSITU® V FBA	80200012
Spare parts kit for CHLORINSITU® V FBA	80200014

13 Disposal of Used Parts

- **User qualification:** instructed user, see *Chapter 1.3 'Users' qualifications' on page 9*

NOTICE!

Regulations governing the disposal of used parts

– Note the current national regulations and legal standards which apply in your country

The manufacturer will take back decontaminated used units providing they are covered by adequate postage.

Decontaminate the unit before returning it for repair. To do so, remove all traces of hazardous substances. Refer to the Material Safety Data Sheet for your feed chemical.

A current Declaration of Decontamination is available to download on the ProMinent website.

14 Electrical Data for the CHLORINSITU® V FBA

Capacity of the system	Internal fuse	Operating voltage	Capacity
100 (g/h)	16 A	230 VAC, N, PE	1.6 kW
200 (g/h)	16 A	230 VAC, N, PE	2.0 kW
300 (g/h)	16 A	230 VAC, N, PE	2.5 kW

15 Technical Data

Technical Data

Parameter	Unit	Types		
Capacity	g/h	100	200	300
	kg/d	2.2	4.4	6.6
Dimensions				
LxWxH of frame	mm	1250x610x2100	1250x610x2100	1250x610x2100
Space requirement	mm	1800x1500	1800x1500	1800x1500
Transport weight	kg	750	750	750
Transport box	mm	2815x1015x2340	2815x1015x2340	2815x1015x2340
Brine storage tank	l	130	130	200
Recommended product storage tank	l	200	300	400
Separation storage tank	l	200	200	200
Process data				
Number of cell chambers	Hours	1	2	3
Water needed*	l/h	50	50	50
Salt	kg/d	4.4	8.8	13.2
Fan bleed valve **	m³/h	8	16	24
Product concentration	mg/l	± 400	± 400	± 400
Maximum ambient temperature	°C	10 … 35	10 … 35	10 … 35
Maximum ambient humidity****	%	85	85	85
Electrical data				
Elec. voltage (50 Hz)		230 VAC/ 1P/N/PE	230 VAC/ 1P/N/PE	230 VAC/1P/ N/PE
Power consumption (net)	kVA	1.6	2.0	2.5
Fuse	A	C25A, 1P, N	C25A, 1P, N	C25A, 1P, N
Connectors				
Water supply	mm	20	20	20
Brine for diaphragm cell	mm	20	20	20
Brine storage tank filling level	mm	20	20	20
Ventilation line	mm	20	20	20
Brine for the softener	mm	20	20	20
Product	mm	20	20	20

Parameter	Unit	Types		
Fan bleed valve ***	mm	63	63	63
Industrial process water	mm	32	32	32
Drain	mm	40	40	40
Drain	mm	20	20	20
Remarks				
	*	Only water for regenerating softener: maximum hardness of water 15°dH		
	**	Provide a fan to ensure minimum dilution to 0.4% of the lower explosion limit		
	***	Ambient air in the installation space: non-condensing, non-corrosive and dust-free		
	****	Pipework: maximum 10 metres in length with a maximum of 3 bends		

Ambient conditions

Data	Value	Unit
Minimum ambient temperature	+10	°C
Maximum ambient temperature	+35	°C
Maximum air humidity *	85	% relative humidity

* non-condensing

Miscellaneous: Protect against sunlight

Sound pressure level

The sound pressure level is < 70 dB (A) at maximum power (without the booster pump)

16 EC Declaration of Conformity for Machinery

In accordance with DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, Appendix I, BASIC HEALTH AND SAFETY REQUIREMENTS, section 1.7.4.2. C.

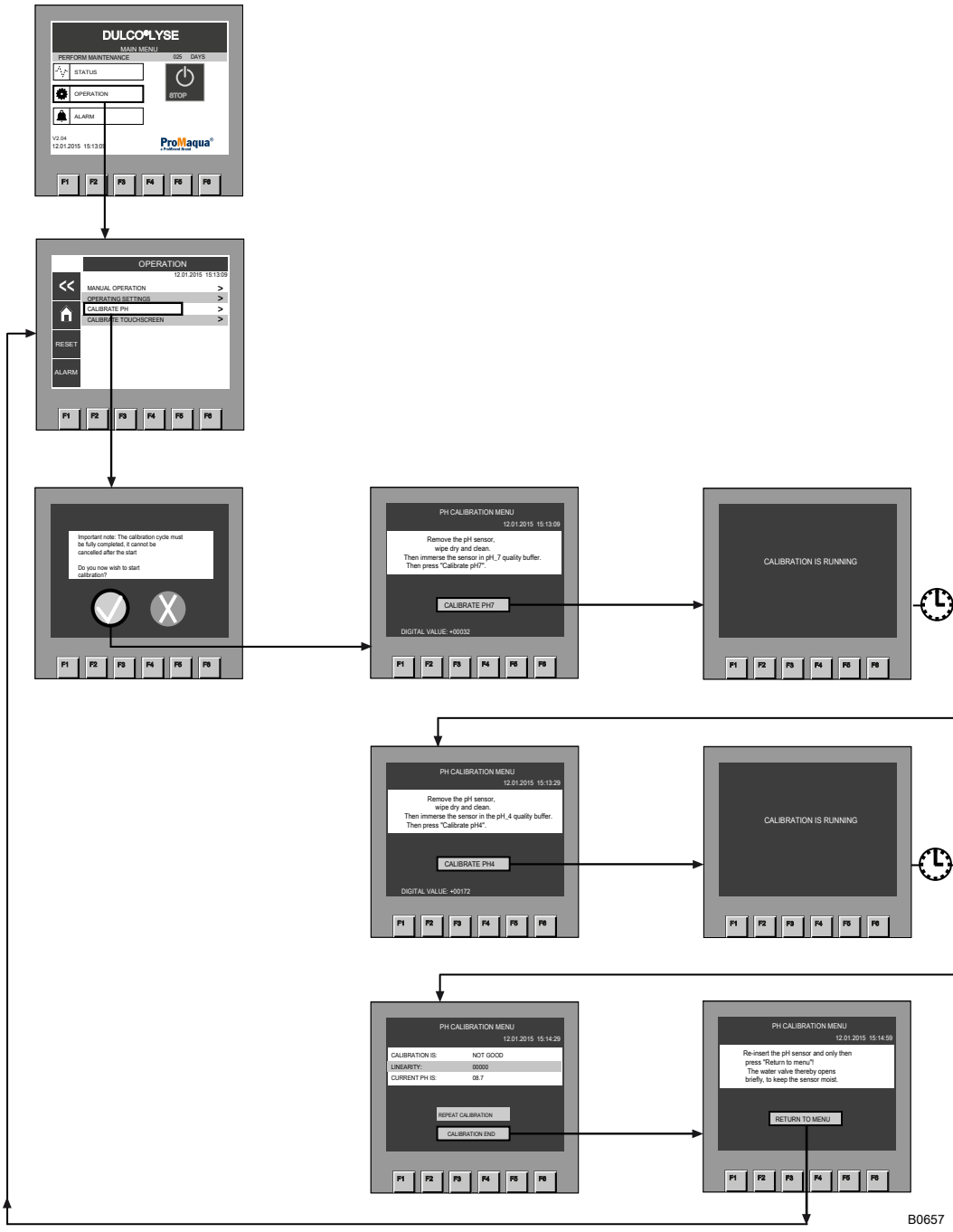
We,

- Van den Heuvel Watertechnologie bv
- Glashorst 114
- 3925 BV Scherpenzeel
- Netherlands,
- Tel.:+31 (0)33 2778600
- Fax:+31 (0)33 2778399
- URL: *www.vdhwater.nl*
- E-mail: *info@vdhwater.nl*

hereby declare under our own authority that the product to which this declaration relates conforms to the conditions of the following EC directives:

Designation of the product:	CHLORINSITU® V FBA
Serial number:	see nameplate on the unit
Relevant EC directives:	EC Machinery Directive (2006/42/EC) EC EMC Directive (2004/108/EC) Compliance with the protection targets of the Low Voltage Directive 2006/95/EC according to Appendix I, No. 1.5.1 of the Machinery Directive 2006/42/EC Explosion Safety Directive ATEX 95
The product also complies with the following international and national harmonised standards:	IEC/EN 60204-1 NEN ISO 14121-1: 2007 / EN ISO 13849 IEC/EN 61000-6.1- 6.2 NPR 7910-1
Place / Date:	Scherpenzeel, 21.11.2014

17 Calibrating the pH Measurement



1. Use the *[Stop]* button to switch off production of the CHLORINSITU® V FBA.
2. Select *'Calibrate pH'* in the *'Operation'* menu and in the message that appears press the green button with the tick.
   ⇨ A solenoid valve isolates the line with the pH-sensor from the power supply.
3. Unscrew the pH sensor and carefully dab it dry and clean.
4. Then immerse the sensor in the pH_7 quality buffer.
5. Then press *'CALIBRATE pH7'*.
   ⇨ *'CALIBRATION IN PROGRESS'* appears and, after a short time, the next menu item.
6. Remove the pH sensor from the quality buffer and carefully dab it dry and clean.
7. Then immerse the sensor in the pH_4 quality buffer.

8. Then press *'CALIBRATE pH4'*.

   ⇨ *'CALIBRATION IN PROGRESS'* appears and, after a short time, a window with the results.

9. If *'Calibration is: not good'* appears, press *'REPEAT CALIBRATION'*.

10. If *'Calibration is: Good'* appears, press *'END CALIBRATION'*.

11. Screw the pH sensor in again and only then press *'RETURN TO MENU'* - see above!

    ⇨ This opens the water valve briefly so that the sensor is kept moist.

18 Index

U

V

W

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