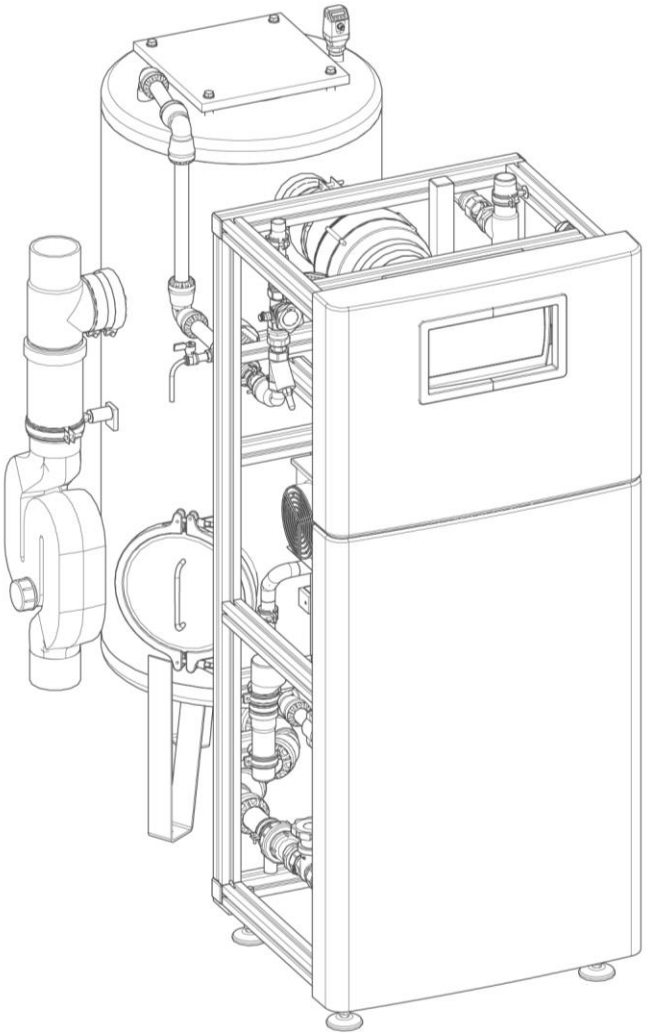
We understand water.



Oxidation filter system | fermaliQ:MB

Operation manual

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Monday to Thursday
7:00 am - 6:00 pm

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1 Introduction

This manual is intended for owners/operators/operating companies, users as well as qualified specialists and ensures the safe and efficient handling of the product. The manual is an integral part of the product.

- ► Carefully read this manual and the included manuals on the components before you operate your product.
- ► Obey all safety and handling instructions.
- ► Keep this manual and all other applicable documents, so that they are available when needed.

Illustrations in this manual are for basic understanding and can differ from the actual design.

1.1 Validity of the manual

This manual applies to the products below:

- fermaliQ:MB3000
- fermaliQ:MB5000
- fermaliQ:MB10000
- Special designs that essentially correspond to the standard products given above. For information on changes, please refer to the respective information sheet that is enclosed, if applicable.

1.2 Other applicable documents

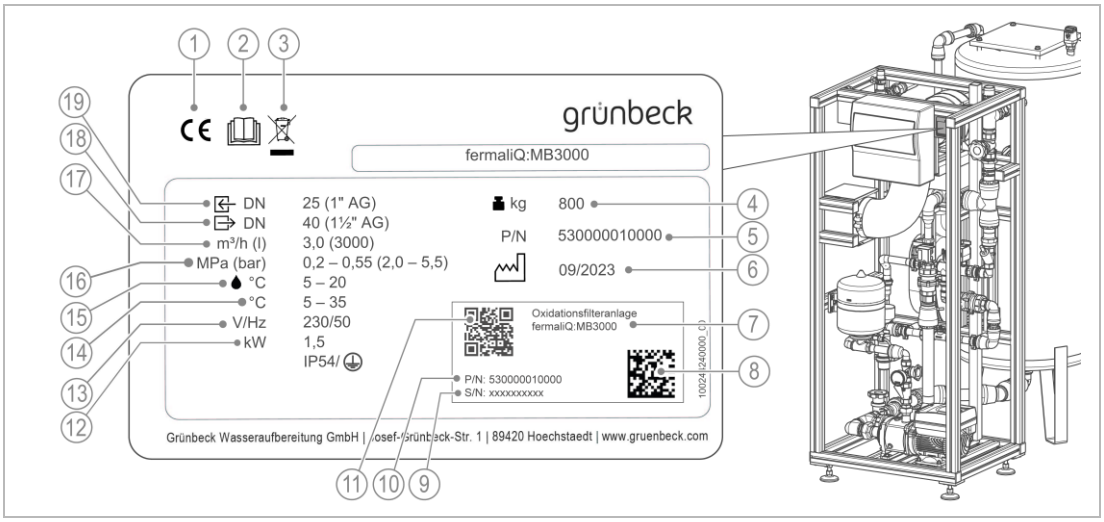
- Electrical circuit diagram, drawing no.: EPL_dn031341_1MSF1AE01
- The manuals of all accessories used.

1.3 Product identification

You can identify your product based on the product designation and the order no. indicated on the type plate.

► Check whether the products indicated in chapter 1.1 correspond to your product.

The type plate is located on the system rack.



	Designation
1	CE mark
2	Obey the operation manual
3	Disposal information
4	Empty weight (rack + filter tank)
5	Order no.
6	Date of manufacture
7	Product designation
8	Data matrix code
9	Serial no.
10	Order no.

	Designation
11	QR code
12	Connected load
13	Power supply
14	Ambient temperature
15	Water temperature
16	Operating pressure
17	Flow volume
18	Nominal connection diameter Filtrate outlet
19	Nominal connection diameter Raw water inlet

1.4 Symbols used

Symbol	Meaning
	Danger and risk
	Important information or requirement
	Useful information or tip
	Written documentation required
	Reference to further documents
	Work that must be carried out by qualified specialists only
	Work that must be carried out by qualified electricians only
	Work that must be carried out by technical service personnel only

1.5 Depiction of warnings

This manual contains information and instructions that you must obey for your personal safety. The information and instructions are highlighted by a warning symbol and are structured as shown below:

SIGNAL WORD Type and source of hazard

- Possible consequences

► Preventive measures

The signal words below are defined subject to the degree of danger and might be used in the present document:

Warning symbol and signal word		Consequences if the information/instructions are ignored	
	**DANGER**	Personal injury	Death or serious injuries
	**WARNING**		Possible death or serious injuries
	**CAUTION**		Possible moderate or minor injuries
	NOTE	Damage to property	Possible damage to components, the product and/or its functions, or an object in its vicinity

1.6 Demands on personnel

During the individual phases in the service life of the system, different persons carry out work on the system. This work requires different qualifications.

1.6.1 Qualification of personnel

Personnel	Requirements
Operator/user	• No special expertise required • Knowledge of the tasks assigned • Knowledge of possible dangers in case of incorrect behaviour • Knowledge of the required protective equipment and protective measures • Knowledge of residual risks
Owner/operator/ operating company	• Product-specific expertise • Statutory regulations on work safety and accident prevention
Qualified specialist • Electrical engineering • Sanitary engineering (HVAC and plumbing) • Transport	• Professional training • Knowledge of relevant standards and regulations • Knowledge of detection and prevention of potential hazards • Knowledge of statutory regulations on accident prevention
Technical service (Grünbeck's technical service/ authorised service company)	• Extended product-specific expertise • Trained by Grünbeck

1.6.2 Authorisations of personnel

The table below describes which tasks may be carried out by whom.

	User	Owner/ operator/ operating company	Qualified specialist	Technical service
Transport and storage			X	X
Installation and mounting			X	X
Start-up/commissioning			X	X
Operation and handling	X	X	X	X
Cleaning		X	X	X
Inspection	X	X	X	X
Maintenance annually				X
Troubleshooting		X	X	X
Repair			X	X
Decommissioning and restart/recommissioning				X
Dismantling and disposal			X	X

1.6.3 Personal protective equipment

► As an owner/operator/operating company, make sure that the required personal protective equipment is available.

The components below fall under the heading of personal protective equipment (PPE):

Protective gloves

Protective footwear

2 Safety

2.1 Safety measures

- Only operate your product if all components are installed properly.
- Obey the local regulations on drinking water protection, accident prevention and occupational safety.
- Do not make any changes, alterations, extensions or program changes on your product.
- Keep the premises locked against unauthorised access to protect imperilled or untrained groups of persons from residual risks.
- Lay pipes and cable trays away from traffic routes, escape/rescue routes and accesses to the system.
- Comply with the maintenance intervals (refer to chapter 8.2). Failure to comply can result in the microbiological contamination of your water system.

2.1.1 Mechanical hazards

- You must never remove, bridge, or otherwise tamper with safety equipment.
- For all work on the system that cannot be carried out from the ground, use stable, safe and self-standing access equipment.
- Make sure that the system is set up in a way that it cannot tip over and that the stability of the system is guaranteed at all times.

2.1.2 Pressure-related hazards

- Components can be under pressure. There is a risk of personal injury and damage to property due to escaping water and/or compressed air as well as unexpected movement of components. Check the system’s pressure lines at regular intervals.
- Before starting any repair and maintenance work, make sure that all affected components are depressurised.

2.1.3 Electrical hazards

In case of contact with live components, there is an immediate risk of death due to electric shock. Damage to the insulation or individual components can be lethal.

- Only have qualified electricians carry out electrical work on the system.
- If live components are damaged, immediately switch off the power supply. Arrange for repair.
- Switch off the voltage supply before working on electrical components.

- Make sure that the socket features a protective earth conductor (PE). Retrofit the socket with an adapter, if necessary.
- Never bridge electrical fuses. Do not disable fuses. Use the correct current ratings when replacing fuses.
- Keep moisture away from live parts. Moisture can cause short-circuits.

2.1.4 Danger due to chemicals

- Chemicals can be hazardous to health and environment.
  They can cause chemical skin and eye burns as well as irritation of the respiratory tract, or allergic reactions.
- Avoid any skin/eye contact with chemicals.
- Use personal protective equipment.
- Read the safety data sheet before handling chemicals. Always obey the instructions for different activities/situations.
- Current safety data sheets for chemicals are available for download at **www.gruenbeck.de/en/info-centre/safety-data-sheets**.
- Obey in-house instructions when handling chemicals. Make sure that protective and emergency equipment such as emergency showers and eye wash are available where required, and functional.

Mixing and residual amounts of chemicals

- Do not mix different chemicals. Unforeseeable chemical reactions posing a lethal risk can occur.
- Dispose of residual amounts of chemicals in accordance with local regulations and/or internal instructions.
- Residual amounts from used containers should not be transferred into containers with fresh chemicals in order not to impair the effectiveness of the chemicals.

Labelling/Minimum shelf life/Storage of chemicals

- Check the labelling of the chemicals – labels must not be removed or rendered illegible.
- Do not use any unknown chemicals (no labelling or labelling illegible).
- Obey the use-by date (minimum shelf life) stated on the label to ensure the functionality of the system and the quality of the treated water.
- If stored incorrectly, chemicals could change their state of matter, crystallise, outgas, or lose their effectiveness. Store and use the chemicals at the specified temperatures only.

Cleaning/Disposal

- Immediately absorb leaked chemicals with suitable binding agents.
- Collect and dispose of chemicals in such a way that they cannot pose a risk to people, animals, or the environment.

2.1.5 Persons in need of protection

- Children must not play with the product.
- This product is not designed to be used by persons (including children) with limited abilities, lack of experience or lack of knowledge. Unless they are supervised, have been instructed on the safe use of the product and understand the resulting hazards.
- This product must not be used by persons (including children) with limited abilities, lack of experience or knowledge.
- Cleaning and maintenance must not be carried out by children.

2.2 Product-specific safety instructions

Diaphragm expansion tanks operate with a nitrogen cushion and are subject to the Pressure Equipment Directive 97/23/EC.

- In the event of leaks, there is a risk of nitrogen escaping.

► Regularly check the diaphragm expansion tank for leaks (refer to chapter 8.4.2).

2.2.1 Signals and warning devices

Warnings/pictograms	
	Danger of electric shock (attached to the switch box) ► Disconnect the system from the power supply before working on electrical system parts.
	Warning label (attached to the tank) ► Keep the lid of the filter tank closed during operation.

The affixed information and pictograms must be clearly legible.
They must not be removed, soiled or painted over.

► Obey all warnings and safety instructions.

► Immediately replace illegible or damaged symbols and pictograms.

2.2.2 Availability of drinking water.

According to DIN 2001-1, the prerequisites below apply to the availability of drinking water:

- When supplied from small units, drinking water must be available at the withdrawal point at all times, in the required quality and sufficient quantity as well as with enough pressure.

- In the event the supply is interrupted, remedial action to eliminate the malfunction must be taken without delay.
- For small units that supply drinking water to third parties or that are used in the scope of commercial or public activities, the owner/operator/operating company must draw up an action plan in accordance with the German Drinking Water Ordinance.

► As the owner/operator/operating company, draw up an action plan in accordance with the German Drinking Water Ordinance which contains, for example, information on how to change to another supply in the event of an emergency or malfunction.

2.3 Conduct in emergencies

2.3.1 In the event of water leaks

1. De-energise the product. Unplug the power plug.
2. Locate the leak.
3. Eliminate the cause of the water leak.

2.3.2 System failure

Emergency bypass for emergency supply

- In case of a failure of the treatment system, raw water can be used for fire-fighting purposes and for flushing the toilets (refer to chapter 7.7).
- The emergency bypass must not be used for the supply of drinking water under any circumstances.

3 Product description

By a combination of raw water atomisation, aeration and multi-layer filtration, the substances below are reduced fully automatically in the oxidation filter system fermaliQ:MB:

- Iron
- Manganese
- Ammonium
- Solid particles
- Turbidities
- Unpleasant odours (e.g. hydrogen sulphide)

An additional effect of the treatment is a moderate deacidification of the raw water.

If the oxidation filter system fermaliQ:MB is used for drinking water treatment, the provisions of DIN 2001-1, DIN EN 1988 as well as DIN EN 1717 must be complied with.

Depending on the raw water quality, the fermaliQ:MB might require a run-in period of several weeks.

3.1 Intended use

The system is designed for the treatment of well and spring water.

The oxidation filter system fermaliQ:MB only is the first treatment step in the drinking water supply as per DIN 2001-1.

For complete and safe production of drinking water, the filtration stage must always be followed by a disinfection stage (e.g. UV disinfection).

3.1.1 Application limits

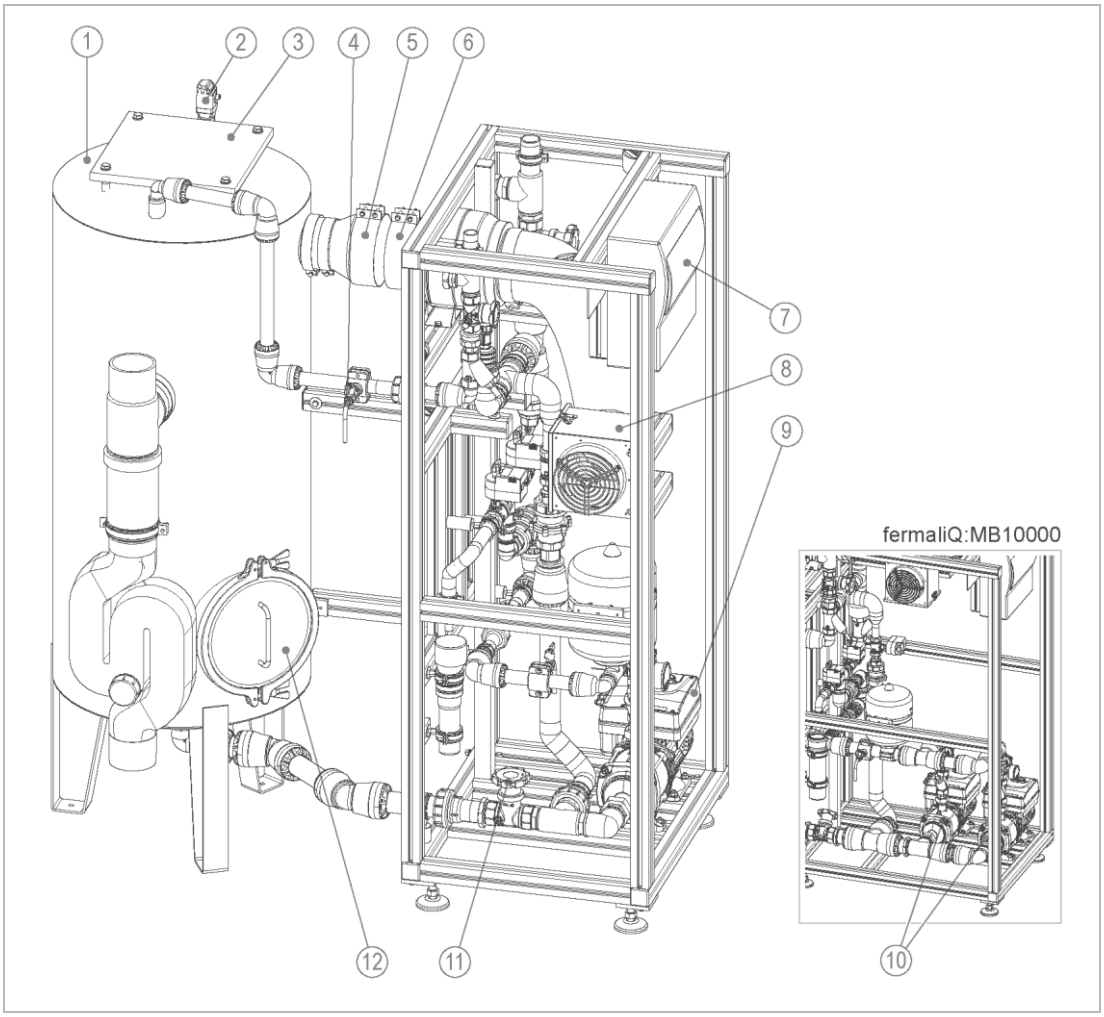
The application limits below must not be exceeded/undershot.

Application limits		
Manganese	mg/l	≤ 1.0
Iron	mg/l	≤ 15.0
pH range		6.5 – 8.5
Ammonium	mg/l	≤ 3.0

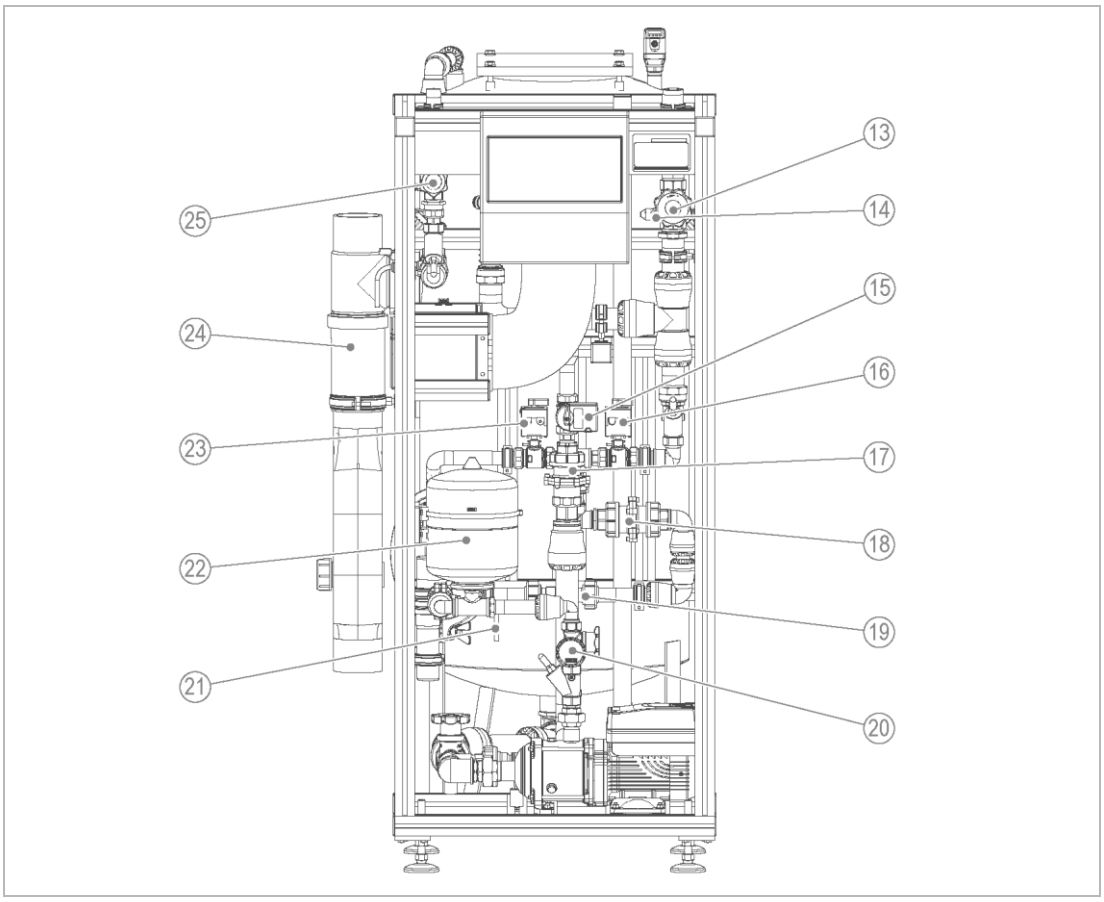
3.1.2 Foreseeable misuse

- Using the system for complete drinking water treatment.

3.2 Product components

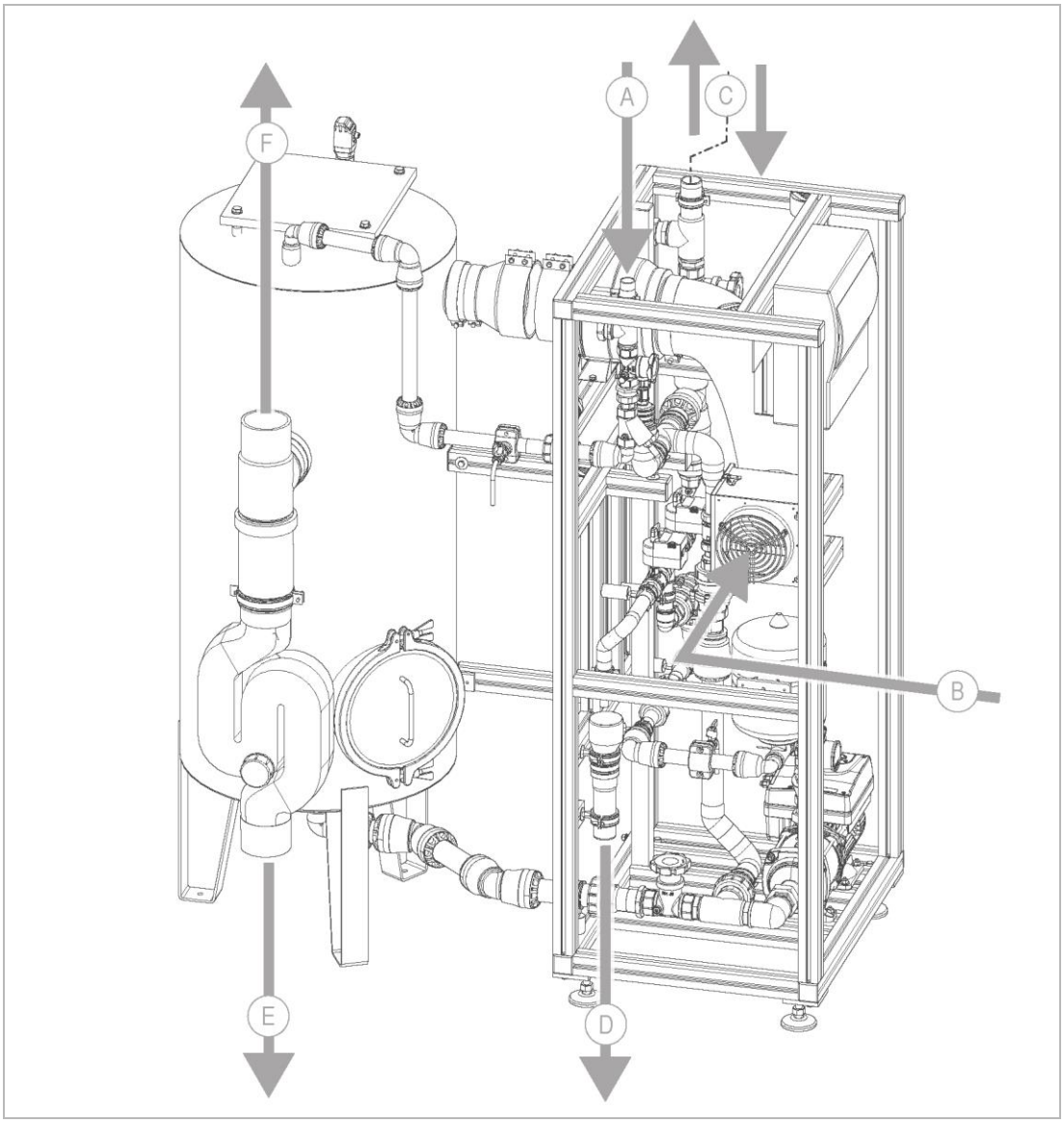


	Designation	Function	Coding
1	Filter tank	Tank including fixtures and filter materials	1MSF1AB01
2	Level probe	Level 1: Filling & aeration OFF (= Make-up feed Stop) Level 2: Filling & aeration ON (= Make-up feed & filtrate pump Start) Level 3: Dry-run protection of filtrate pump (= Filtrate pump Stop)	1MSF1ACL01
3	Lid	Closure of filter tank	–
4	Raw water sampling valve	Flame-sterilisable sampling valve to take water samples	1MSF1AH51
5	Pipe fan	Supply of atmospheric oxygen to oxidate iron and manganese Switch-off delay to outgas moist exhaust air	1MSF1AP03
6	Air backflow flap	Moist air in the filter tank is retained and does not penetrate back into the installation room	–
7	Switch box with operating unit	Control of the filter system	1MSF1AE01
8	Air filter box	Contains a particle filter to filter the intake air	1MSF1AF01
9	Filtrate pump	To perform the filtration and the discharge of first filtrate	1MSF1AP02
10	*For fermaliQ: MB10000:* 2 x Filtrate pump		1MSF1BP02
11	Tank shut-off valve	Piston valve to separate the filter tank from the rack with the technical equipment	1MSF1AH03
12	Handhole	Enables lateral access to the filter tank for maintenance work	–



	Designation	Function	Coding
13	Filtrate shut-off valve	Piston valve to separate the filtrate pipe from the interface provided by the client on site	1MSF1AH04
14	Pressure transducer	Converts pressure into an electrical output signal	1MSF1ACP03
15	Backwash shut-off valve	2-way ball valve for switching the backwash	1MSF1AV02
16	Filtrate shut-off valve	2-way ball valve for switching the filtrate	1MSF1AV01
17	Backwash flow stabiliser	Setting the backwash volume flow	1MSF1AS05
18	Filtration flow stabiliser	Setting of filtrate volume flow	1MSF1AS04
19	Flow sensor	Indication of actual flow rate in the display of the control unit and archiving of total flow	1MSF1ACF01
20	Filtrate pressure gauge	Indication of filtration pressure	1MSF1ACP02
21	Filtrate sampling valve	Flame-sterilisable sampling valve to take water samples	1MSF1AH52
22	Diaphragm expansion tank	To absorb water hammer Autonomous switch-off of filtrate pump (no interference from client on site) Protection of the filtrate pump against frequent switching changes	1MSF1AB02
23	Shut-off valve Discharge of first filtrate	2-way ball valve for switching the first filtrate	1MSF1AV03
24	Overflow loop	Discharge of flushing waste water to drain and upward discharge of exhaust air	–
25	Raw water shut-off valve	Piston valve to separate the raw water pipe from the interface provided by the client on site	1MSF1AH01

3.3 Connections



	Inlet
	Designation
A	Raw water inlet
B	Supply air
C	Backwash water inlet

	Outlet
	Designation
C	Filtrate outlet
D	Discharge of first filtrate to drain
E	Flushing waste water to drain
F	Exhaust air

3.4 Functional description

The filter system is operated in four steps:

- Filling, aeration and filtration
- Preparation
- Backwash
- Discharge of first filtrate

3.4.1 Filling, aeration and filtration

- The raw water pump provided by the client on site delivers the raw water to the filter tank.
- Afterwards the raw water is atomised (increase of the water's surface to optimise the oxidation process).
- At the same time, ambient air is introduced into the upper part of the tank by means of a pipe fan (increase of oxygen supply for improved oxidation of iron/ manganese and for outgassing odorous substances).
- The level control in the filter tank switches the raw water pump and the pipe fan on and off.
- The pipe fan switches off time-delayed to outgas the moist exhaust air generated by the atomisation process from the filter tank.

» The oxygenated raw water is located in the filter tank.

- A pressure booster system draws the raw water contained in the filter tank through the various filter layers and the star-shaped nozzle assembly.

» Filtrate is generated.

- A pressure booster system delivers the filtrate to a pressurised water tank provided by the client on site, or a diaphragm expansion tank provided by the client on site. This on-site tank on the one hand serves as buffer tank to meet short-term peak consumption and on the other hand, the filtrate volume stored in it is used to backwash the filter tank.
- Via a frequency converter, the filtrate pump is controlled to an adjustable constant pressure. When this pressure is reached permanently (e.g. when all withdrawal points of the consumer are closed), the pump is switched off.

» Filtrate is available.

3.4.2 Preparation

- If a backwash is released, the system initially switches to the step "Preparing".
- Four conditions are queried, which must be fulfilled before the system switches to the next step "Backwash".

  - Feedback “Preparing” by Enable input (NCC/NOC can be selected, e.g. feedback of the downstream valve)
  - The actual value of the flow rate is below the setpoint (factory setting: 200 l/h)
  - The actual value of the pressure is higher than the setpoint (factory setting: 2.0 bar)
  - Make-up water feed completed
- If all conditions are met, a backwash is started after the delay time has elapsed.

3.4.3 Backwash

- The energy stored in pressure cushion of the tank provided by the client on site is used to deliver the filtrate located there into the filter tank.
- The uniform distribution of the backwash water in the filter tank is ensured by the star-shaped nozzle assembly and by the support layer consisting of quartz gravel.
- During the backwash process, the filter material is loosened and the substances that have been deposited on the surface of the filter material during filtration are removed. Via the overflow funnel, the substances are then flushed to the drain.
- A backwash process is triggered when a certain fixed time (weekday and time) has been reached. The duration and time of the work step can be preset.
- For hygiene reasons, a backwash takes place at least once a day.
- An automatic backwash monitoring system with backwash counter checks whether the backwash has taken place. Backwash processes that have not been completed properly are detected by the control unit. When a preset counter value (e.g. 3) is reached, an error signal and a visual signal on the display of the control unit indicate an error.

» The filter tank was backwashed.

3.4.4 Discharge of first filtrate

- The first filtrate is always discharged fully automatically after a backwash process.
- The discharge of first filtrate corresponds to filtration into the waste water drain with a corresponding filtration volume flow.
- The duration of this work step can be preset.
- This process is designed to compress the filter material and to prevent particles/ turbidities from entering into the filtrate.

» Backwash and discharge of first filtrate were carried out.

» Filling & aeration as well as filtration are continued.

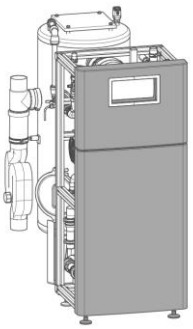
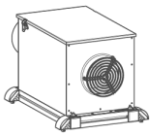
3.5 Accessories

You can retrofit your product with accessories. Please contact your local Grünbeck representative or Grünbeck's headquarters in Hoechstaedt/Germany for details.

Product			Order no.
	**Diaphragm expansion tank DD 33, G¾** To prevent water hammer in the inlet if a pressurised water tank provided by the client on site is used to store the filtrate.	33 l	**89060304**
	**Diaphragm expansion tank** As an addition to an existing diaphragm expansion tank – or for new installations – for water supply during the flushing process of the filter system	25 l	**535 105**
		60 l	**535 115**
		80 l	**535 125**
		100 l	**535 135**
		300 l	**535 155**
		500 l	**535 165**
	Valve for make-up feed control to fermaliQ:MB 3000/5000		**530000100000**
	Valve for make-up feed control to fermaliQ:MB 10000		**530000110000**
	**Pressurised water tank, 6 bar** As an addition to an existing pressurised water tank – or for new installations – for water supply during the flushing process of the filter system	300 l	**530 515**
		500 l	**530 525**
		750 l	**530 535**
		1000 l	**530 545**
Water test kit for iron Measuring range 0 – 0.8 mg/l and 1 – 10 mg/l (30 determinations)			**170 150**
Water test kit for manganese Measuring range 0.03 – 0.5 mg/l (100 determinations)			**170 097**
Refill pack of reagents for water test kit for manganese			**170 193**
Water test kit for pH value Measuring range 4.5 – 10 (100 test strips)			**170 148**

3.6 Optional accessories

Your product can be retrofitted with supplementary equipment. Please contact your local Grünbeck representative or Grünbeck's headquarters in Hoechstaedt/Germany for details.

Product		Order no.
	**Front cover for fermaliQ:MB**	**530 508**
	**Fine dust filtration for fermaliQ:MB**	**530800000000**

4 Transport, set-up and storage

4.1 Shipping/Delivery/Packaging

The system (system rack and filter tank) is fixed on a pallet each at the factory and secured against tipping.

- The system rack is transported standing up and has a low centre of gravity.
- The filter tank is transported in a horizontal position and has a low centre of gravity.

► Load and unload the system with a forklift or lift truck with suitable pallet forks. Mind the system's centre of gravity.

NOTE Damage to the system when lifted by crane and lifting strap

- The system does not feature any lifting points for lifting by a crane and lifting strap

► The system must not be loaded/unloaded by crane and lifting strap.

► Dispose of the packaging material in an environmentally sound and appropriate manner only after installation of the system.

4.2 Transport/Placing

WARNING Risk of tipping over in case of improper transport

- The system can tip and crush persons/limbs.

► Transport the system by means of a forklift or lift truck with appropriate forks only – obey the marked pick-up direction

► Do not transport the system over inclines or stairs.

Transporting the system rack

The system rack is fixed on a pallet at the factory and secured against tipping.

- The system rack is transported standing up.
- The system rack does not feature any lifting points for lifting with lifting gear. The system must not be loaded/unloaded by crane.

► Only transport the system rack to the installation site (longer distances) when secured on the pallet.

► Transport the unpacked system (without pallet) in close vicinity of the final installation site only – do not lift it at the system rack.

► Remove the transport lock, if present.

Transporting the filter tank

The filter tank is fixed on a pallet at the factory and secured against tipping/rolling off.

- The filter tank is transported in a horizontal position.

► Only transport the filter tank to the installation site (longer distances) when secured on the pallet.

► Install the level probe (refer to chapter 5.3).

► Erect the filter tank at the installation site using a suitable lifting device.

► Use the lugs on the filter tank to lift it.

4.3 Storage

► Protect the product from the impacts below when storing it:

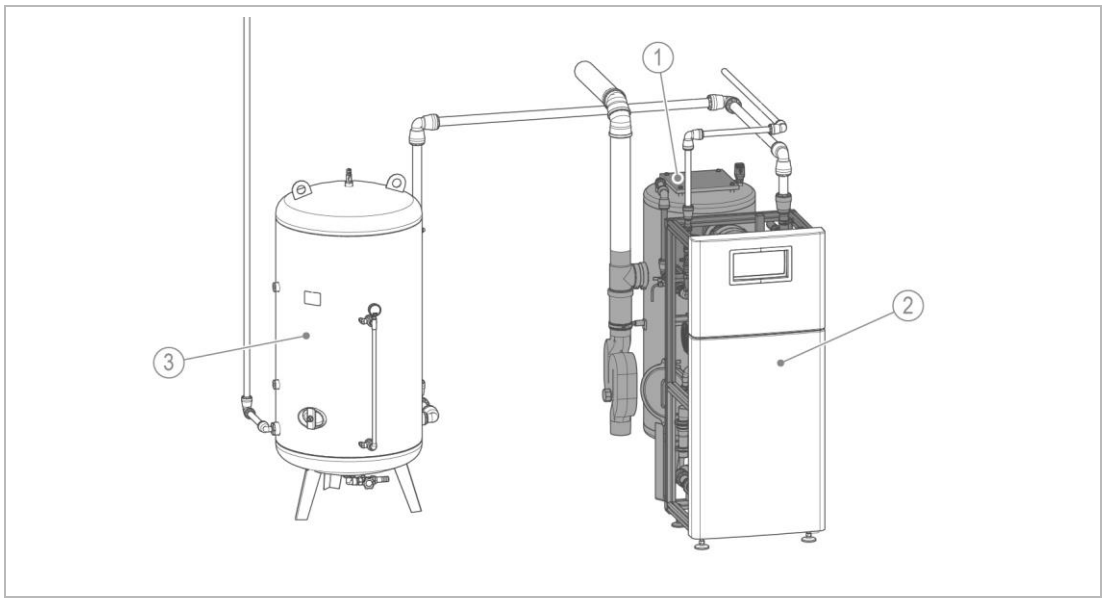
- Moisture, wetness
- Environmental impacts such as wind, rain, snow, etc.
- Frost, direct sunlight, severe heat exposure
- Chemicals, dyes, solvents and their vapours

► Do not stack the individual devices on top of each other and do not place any loads on the product packaging of the system.

5 Installation

The installation of the system represents a major intervention into the water system and must be carried out by a qualified specialist only.

Installation example



	Designation		Designation
1	Oxidation filter system fermaliQ:MB3000	3	Pressurised water tank (supply tank)
2	Front cover for fermaliQ:MB (option)		

CAUTION Laying cable trays/pipes on traffic routes.

- Persons can stumble/fall.
- ► Do not lay pipes and cable trays in traffic routes or accesses to the system components.
- ► Make sure that necessary traffic routes and escape routes are kept clear.

5.1 Requirements for the installation site

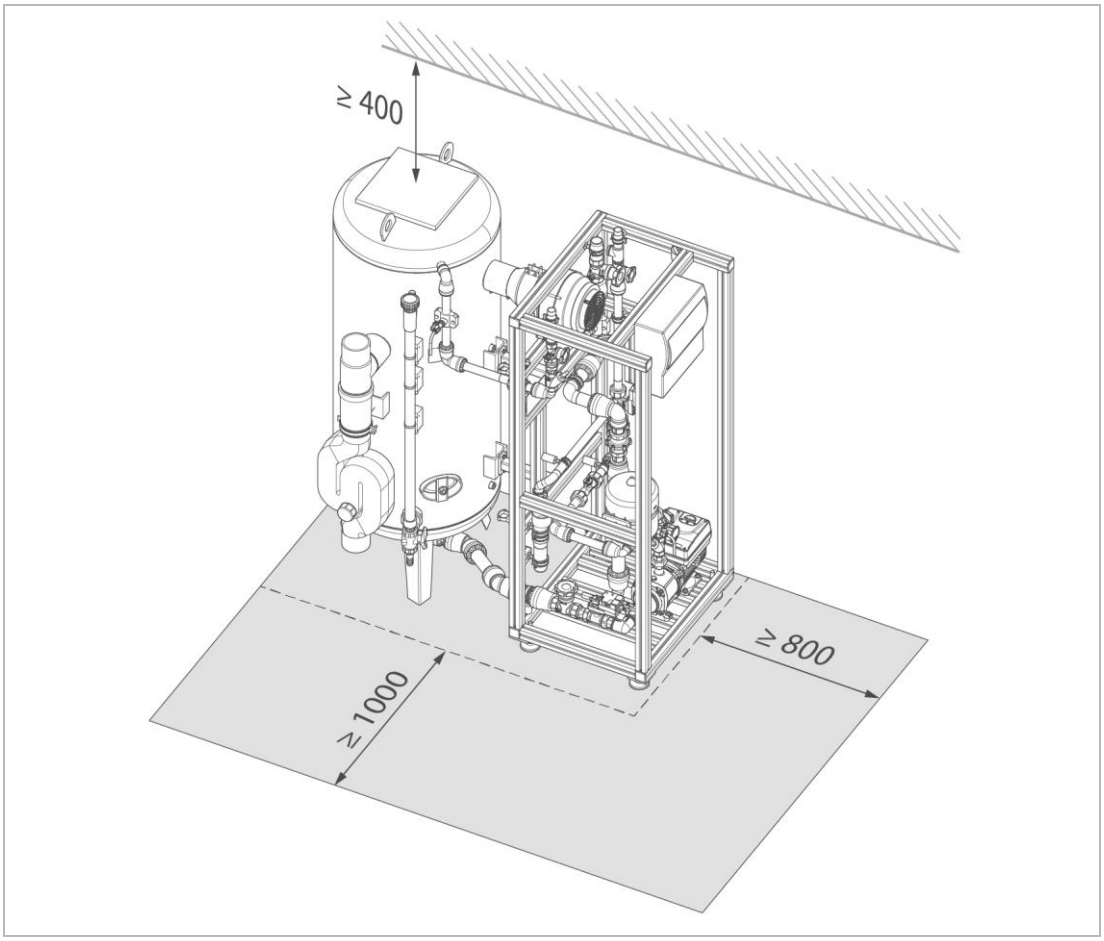
- ► Obey local installation directives, general guidelines and technical specifications.
- The installation site must be frost-proof and ensure the system's protection from chemicals, dyes, solvents and their vapours as well as from unauthorised access, etc.
- Avoid strong heat radiation and direct sunlight.
- For electrical connection, a Schuko socket is required within a distance of approx. 2 m. The socket outlet requires a permanent power supply and must not be coupled with light switches, emergency heating switches or the like.

- The installation site must be adequately illuminated and ventilated.
- Unimpeded and prompt placing of the system must be possible.
- Disturbing influences and restrictions on site must be indicated by the client in advance and taken into account in the design of the system.
- A drain connection of adequate dimensions (DN 100) must be present.
- A floor drain suitable for the respective system size must be available at the installation site. If no floor drain is available, the client must install a flushing waste water tank including waste water lifting system on site.
- Lifting systems must be secured against power failure.

5.1.1 Placing of the system/Required space

- The sufficiently dimensioned installation surface of the system (foundation) must be level and have sufficient strength and load-bearing capacity to support the operating weight of the system.
- The system must be accessible for maintenance and repair work.

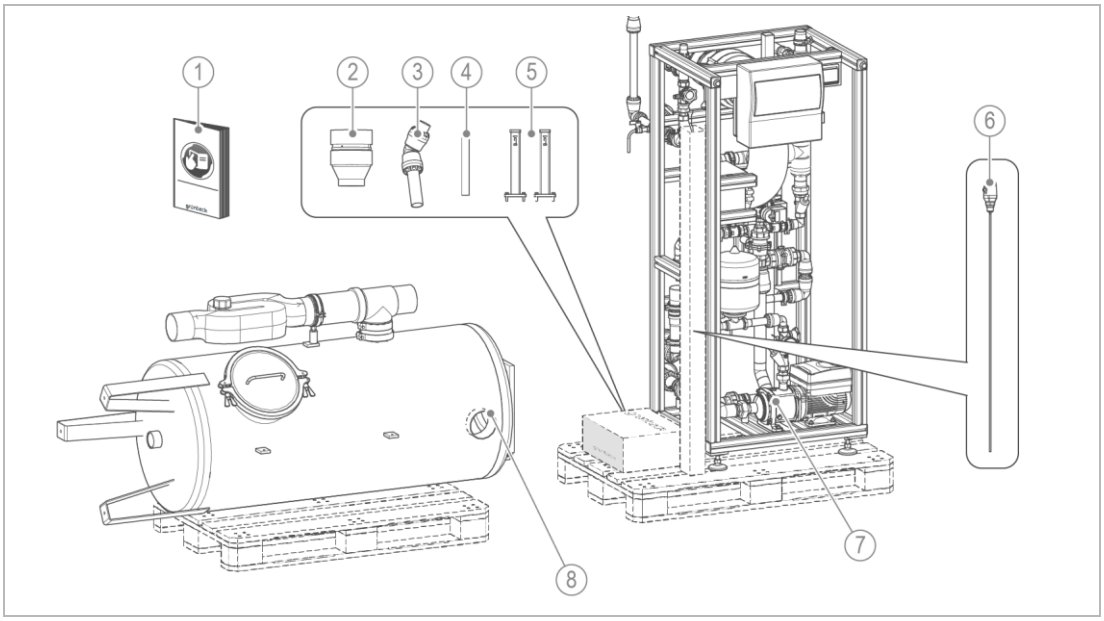
► Before setting up the individual systems, check that there is sufficient working space.



► Set up the system in a way that there is a working space of at least 800 mm on the front side (switch cabinet) and at least 1000 mm on the left side (to the left of the switch cabinet) of the system.

- In addition, a distance of at least 400 mm must be kept to the ceiling.

5.2 Checking the scope of supply



	Designation
1	Operation manual
2	Non-return valve Pipe fan
3	Outlet pipe Filtrate tank
4	Inlet pipe Filtrate tank

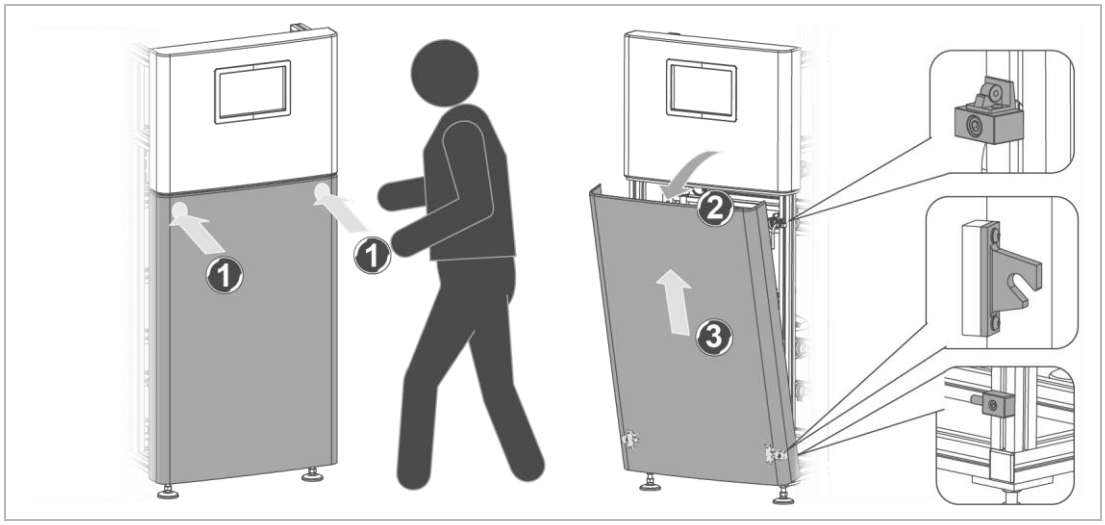
	Designation
5	Profile rails to connect the system rack and the filter tank (incl. screws)
6	Level probe
7	System rack fixed on a pallet
8	Filter tank fixed on a pallet

► Check the scope of supply for completeness and damage.

5.3 Removing the front cover (supplementary equipment)

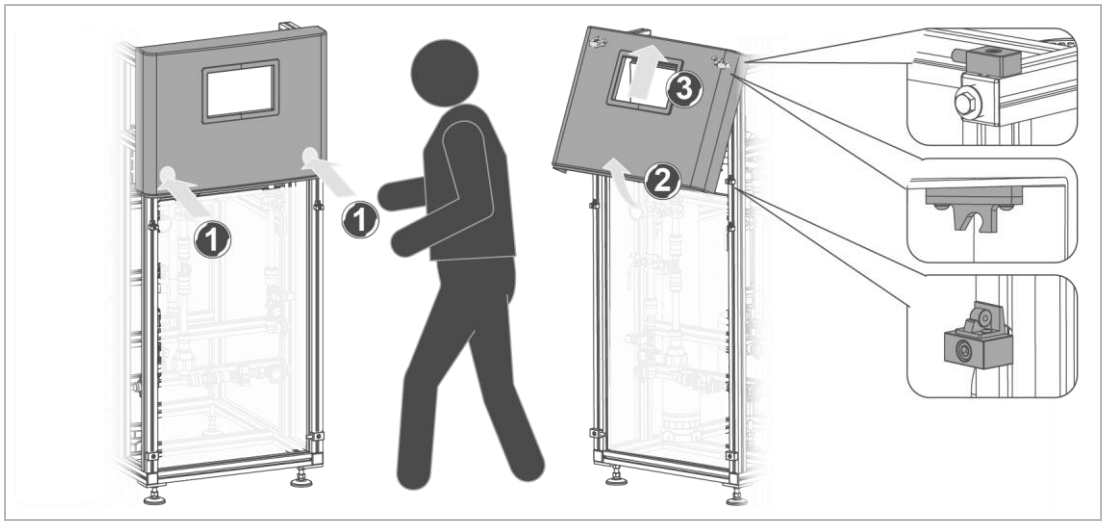
The optional front cover must be removed to be able to carry out preliminary work (installation, inspection and maintenance) on the technical equipment.

Removing the lower cover



1. Push the cover against the system rack at the upper corners.
» The snap-fit connections release the cover.
2. Tilt the upper part of the cover forwards.
3. Lift off the cover from the lower mounting bracket.
4. Put the cover down and secure it against toppling.

Removing the upper cover



5. Push the cover against the system rack at the bottom corners.
» The snap-fit connections release the cover.
6. Tilt the lower part of the cover forwards.

7. Lift off the cover from the upper mounting bracket Tilt the lower part of the cover forwards.
8. Put the cover down and secure it against toppling.

» The front cover is removed.

5.4 Installation

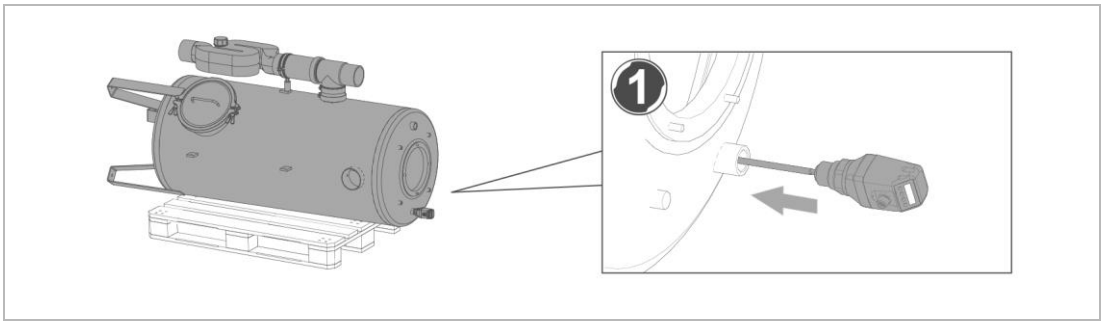
5.4.1 Preliminary work

1. Release the system rack from the transport lock.
2. Remove the pallet.
3. Securely place the system at the designated location – obey of the minimum space required.
4. Level out possible unevenness with the levelling feet.
5. Remove the protective caps from the connections.

5.4.2 Installing the level probe

To protect against damage, the level probe is dismantled for transport.

► Proceed as follows to install the level probe on the tank while the tank is still in horizontal position:

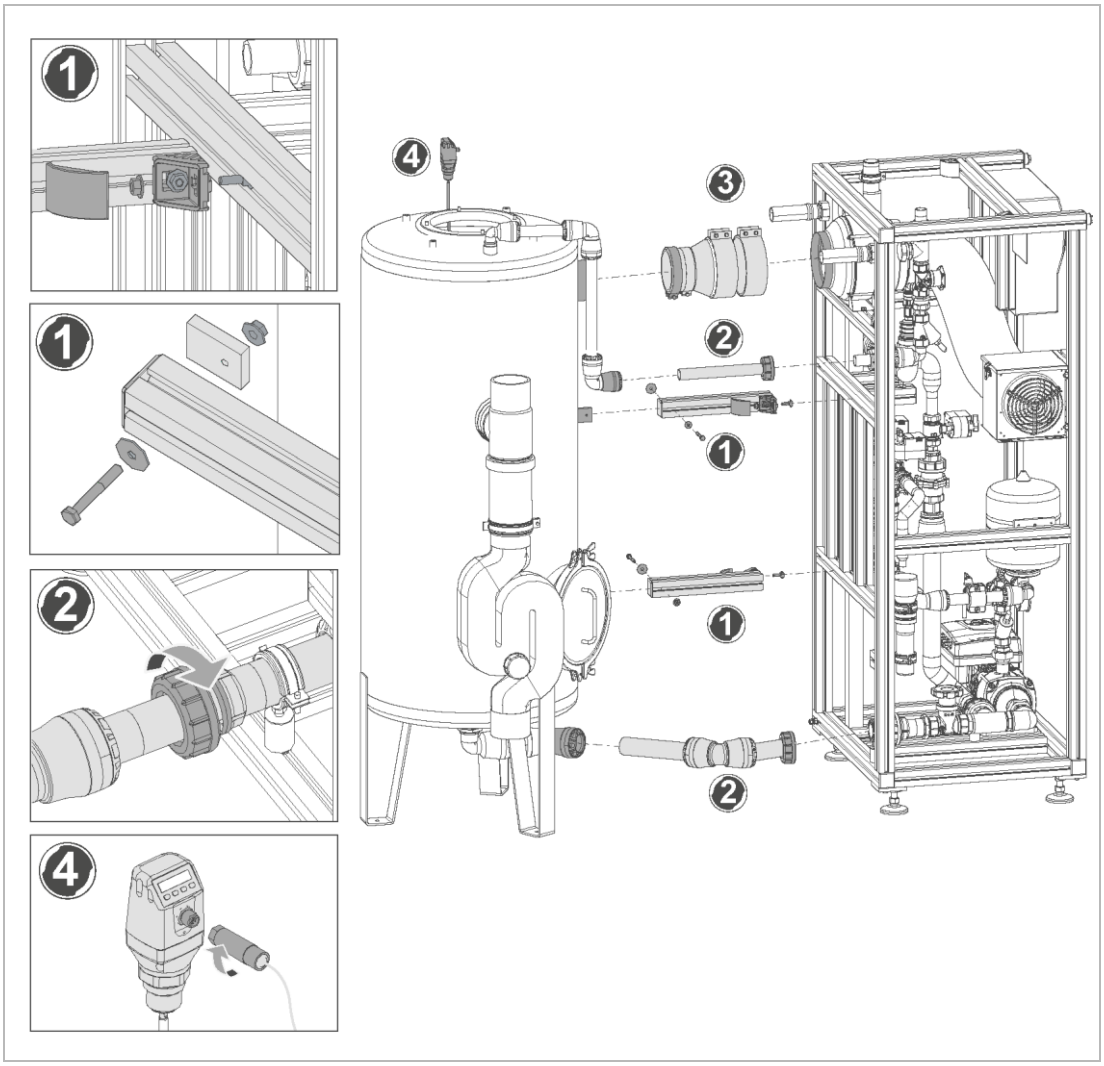


1. Insert the measuring rod of the level probe into the opening provided for this purpose.
2. Screw the level probe to the filter tank. Make sure that the sealing washer is located between the level probe and the filter tank. Tighten the level probe.

5.4.3 Connecting the system rack with the filter tank

CAUTION Working at heights (approx. 2 m) during installation

- Risk of injury when falling.
- ► Use stable access equipment.



1. Screw the system rack to the filter tank.
2. Connect the inlet and outlet pipes of the filter tank to the system rack.
3. Connect the pipe fan to the filter tank.

Make sure that the pipe fan points slightly downwards to the filter tank.

To do so, adjust levelling feet of the system rack accordingly.

The slight inclination makes sure that no water droplets get into the housing of the pipe fan (when atomising the raw water).

4. Plug in the level probe. The cable is prepared at the factory.

5. Fix the feet of the filter tank to the floor using suitable fastening materials (depending on the floor conditions).

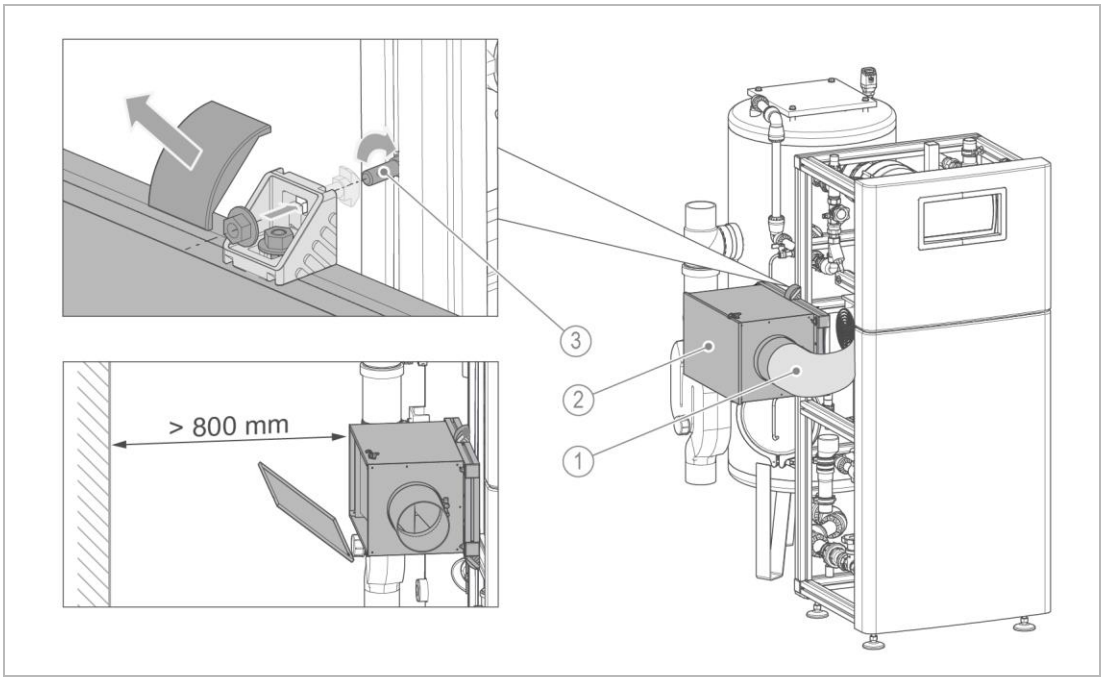
» The system rack and the filter tank are installed.

5.4.4 Installing the fine dust filtration (supplementary equipment)

You can install the fine dust filter directly on the system rack or on an even surface on site (e.g. on a wall) near the system. The supply air pipe is about 5 m in length.

► Choose the installation site of the filter box in such a way that it is easily accessible for replacing the filter.

Installation on the system rack



	Designation		Designation
1	Supply air pipe	3	Hammer head screw
2	Filter box		

1. Remove the covers on the angle brackets of the pre-assembled filter box.
2. Screw the filter box to the system rack using the angle brackets and a hammer screw.

» Connect the supply air pipe. Use a hose clamp to secure the pipe on the filter box.

5.5 Water installation

5.5.1 Connecting the system

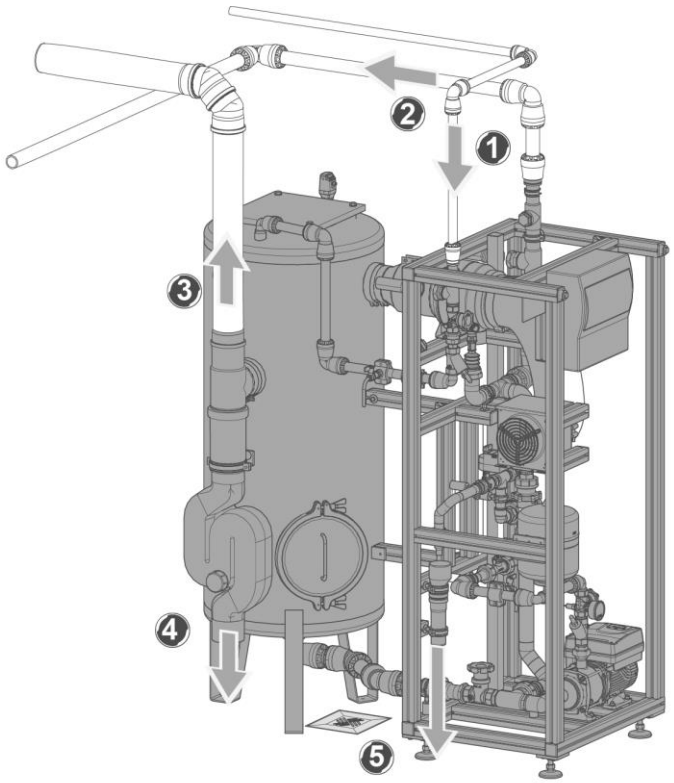
WARNING Incorrect routing of the exhaust air pipe

- Irritation/chemical burns of the respiratory tract due to harmful gases (H_2S, CH_4) escaping – only applicable if these gases are dissolved in the raw water.

► Check the supply and exhaust air piping provided by the client on site as well as the supply and exhaust air hoses for leaks at least once a week.

- Pipes for raw water, waste water and filtrate provided by the client on site must be separable, for instance, by a screw connection (shut-off valve).

► Only use corrosion-resistant materials for the piping of the system/system components.



1. Connect the inlet pipe to the “raw water inlet” connection.
2. Connect the outlet pipe “filtrate outlet” to the supply tank.
3. Connect the exhaust air piping to the upper part of the overflow loop. Route the pipe upwards and then along the ceiling. Make sure to use as few elbows as possible up to the interface to the outside in order to avoid unnecessarily slowing down the exhaust air volume flow.
4. Route the outlet “Flushing waste water to drain” to the drain.

5. Route the outlet “Discharge of first filtrate to drain” to the drain.

5.6 Electrical installation

DANGER Dangerous voltage of 230 V

- Risk of severe burns, cardiovascular failure, fatal electric shock
- ► The electrical installation must be carried out by a qualified electrician only.
- ► Check the system for proper condition before start-up/commissioning.
- ► Switch off the supply voltage before working on electrical system parts.
- ► Secure the system against restart.
- ► Discharge residual voltage.
- ► Only use suitable, undamaged tools.
- ► Use personal protective equipment – do not work with wet hands.

NOTE Malfunctions caused by the frequency converter

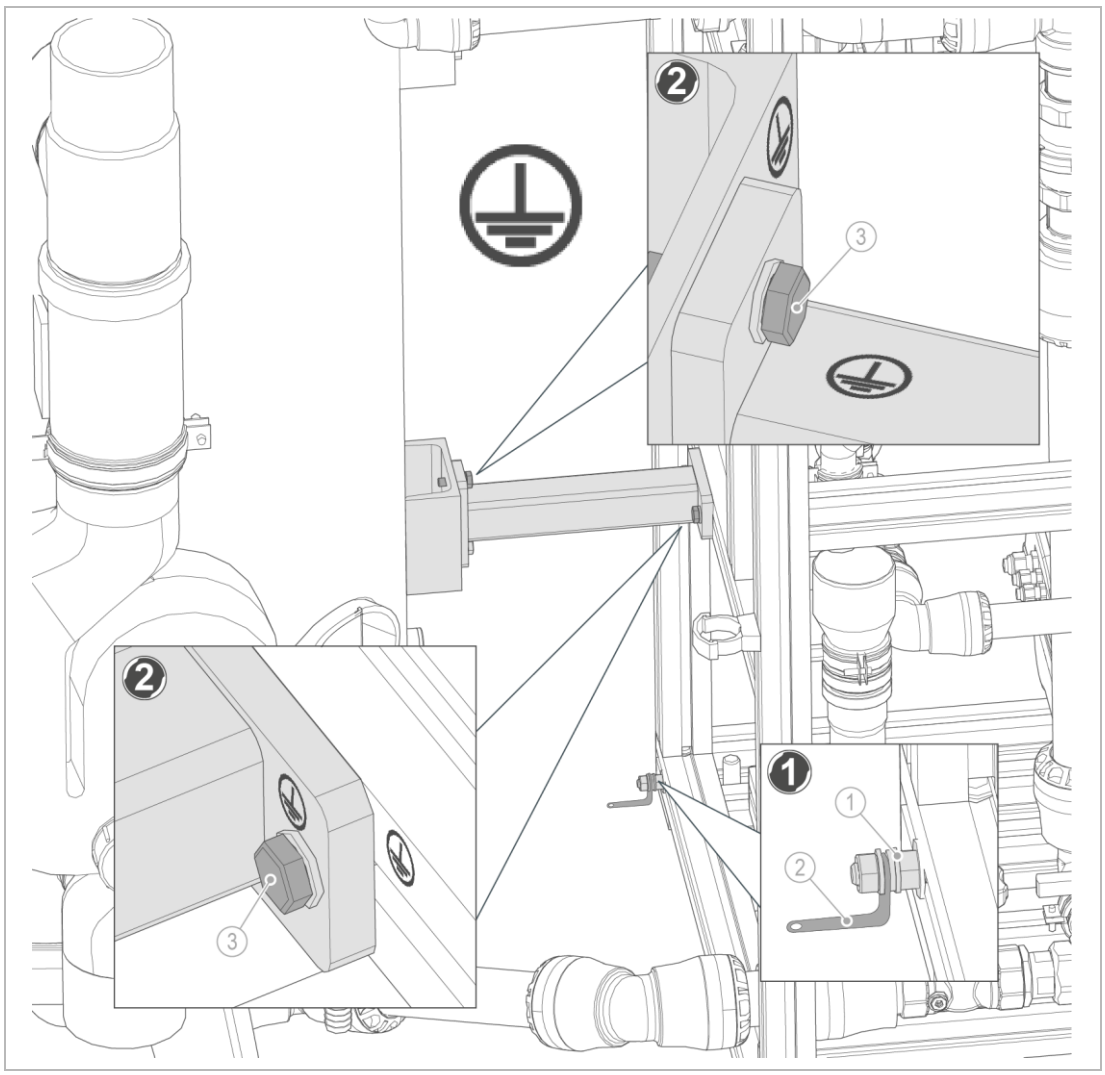
- The frequency converter of the centrifugal pump can cause malfunctions of the residual current circuit breaker installed in the mains supply line.
- ► Use an AC/DC sensitive RCCB with a response threshold of 30 mA.
- ► Use a of 230 V/50 Hz/L/N/PE power outlet with 16 A fuse protection for the on-site power supply of the system.
- ► Make sure that the protective conductor has at least a cross section of 10 mm² (Cu).

1. Carry out the electrical installation according to the electrical circuit diagram no. EPL_dn031341_1MSF1AE01.
2. Connect the raw water pump (refer to electrical circuit diagram no. EPL_dn031341_1MSF1AE01).

5.6.1 Establishing potential equalisation

In normal operation, the speed-controlled filtrate pump can have a ground leakage current > 10 mA.

► Proceed as follows to establish the connection to the potential equalisation:



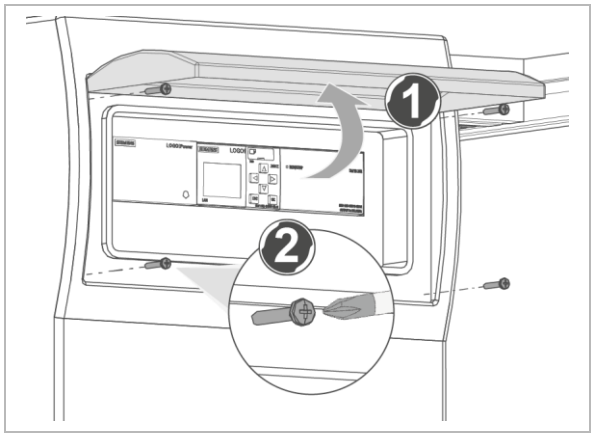
	Designation		Designation
1	Hammer head screw	3	Earth screw
2	Ribbon cable		

1. Connect the system rack to the potential equalisation provided by the client on site.
   a. Connect the ribbon cable to the hammer head screw.
   b. Connect the ribbon cable to the potential equalisation provided by the client on site.
2. Screw the system rack and the filter tank together on both sides with an earth screw each in accordance with the standard

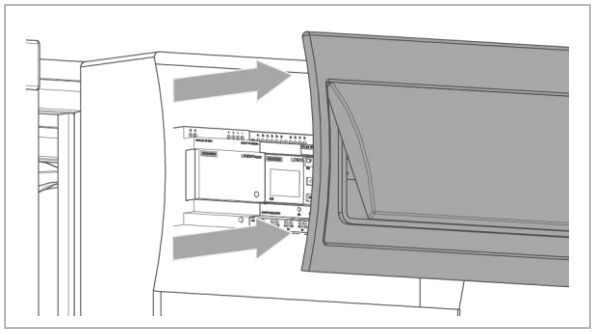
5.6.2 Connecting the raw water pump

The raw water pump provided by the client on site is enabled from switch cabinet 1MSF1AE01.

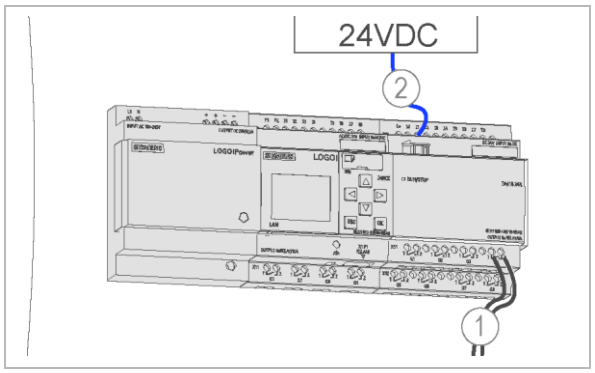
1. Open the cover of the control unit.
2. Using a cross-headed screwdriver, loosen the 4 screws at the corners under the cover.



3. Remove the cover.



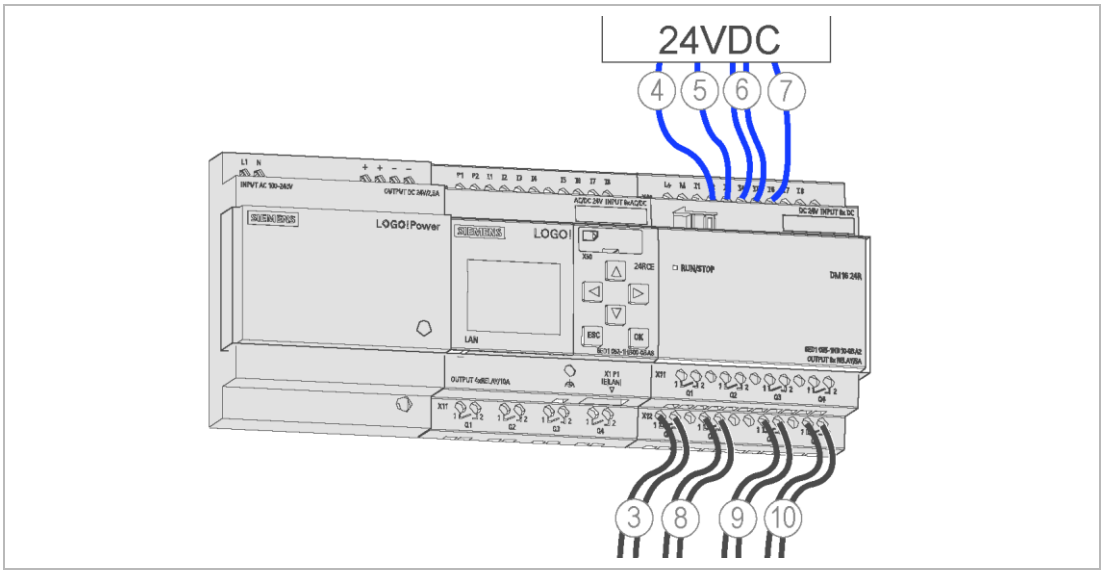
4. Connect the “Make-up feed control” (raw water pump, solenoid valve, actuator, etc.) to terminals “Q4” of the right-hand module CA-3K2.
5. Connect the “Feedback Make-up feed” (if available) to terminal “24VDC” and terminal "I1” of the right-hand module CA-3K2.



	Designation
1	Make-up feed control *voltage-free, max. 250 V, 2 A*
2	Feedback Make-up feed

5.6.3 Connecting the options

► Open the cover (refer to chapter 5.6.2, steps 1 – 3).



	Designation	Function
3	“Preparing Backwash” *voltage-free, max. 250 V, 2 A*	The output switches and stays in the switched state during steps Preparing, Backwash and First filtrate. (NCC/NOC can be selected in the technical service level) Functional example: Closing the solenoid valve on the outlet side
4	“Preparing Enable input"	Request for release/feedback for switching to the next step “Backwash”. (NCC/NOC can be selected in the technical service level) Functional example: Feedback of valve on the outlet side
5	“Releasing Backwash”	Option for triggering an additional backwash via an external release. If 24 VDC are applied to the input (signal change from 0 to 1), a backwash is triggered. To trigger again the input must be enabled again.
6	“Level Stop” and “Level Start”	To deliver filtrate to a tank provided by the client on site. When both levels are undershot, the filtrate pump delivers until both levels are exceeded. If only one contact is available, the inputs Stop and Start are activated at the same time.
7	“Locking entire system”	All system functions are locked.
8	“Backwash signal” *voltage-free, max. 250 V, 2 A*	Output switches during backwash (NCC/NOC can be selected in the technical service level)
9	"Enable Dosing inlet" *voltage-free, max. 250 V, 2 A*	Output switches during make-up feed into the filtrate tank. Output only switches if the feedback “Make-up feed” is present. (NCC/NOC can be selected in the technical service level)
10	“Collective fault signal” *voltage-free, max. 250 V, 2 A*	(NCC/NOC can be selected in the technical service level)

Connecting “Preparing Backwash”

► Connect “Preparing Backwash” to terminals “Q5” of the right-hand module CA-3K2.

Connecting "Preparing Enable input"

► Connect “Preparing Enable input” to terminals “I2” of the right-hand module CA-3K2.

Connecting “Releasing Backwash”

► Connect “Releasing Backwash” to terminals “I3” of the right-hand module CA-3K2.

Connecting “Level Stop” and “Level Start”

► Connect “Level Stop” and “Level Start” to terminals “I4” and “I5” of the right-hand module CA-3K2.

Connecting “Locking entire system” to “Preparing Enable input”

► Connect “Locking entire system” to terminals “I6” of the right-hand module CA-3K2.

Connecting “Backwash signal”

► Connect “Backwash” to terminals “Q6” of the right-hand module CA-3K2.

Connecting "Enable Dosing inlet”

► Connect “Enabling Dosing inlet” to terminals “Q7” of the right-hand module CA-3K2.

Connecting “Collective fault signal”

► Connect “Collective fault signal” to terminals “Q8” of the right-hand module CA-3K2.

5.6.4 Connection to the power supply

1. Install the cover and close the control unit.
2. Plug in the power plug.

6 Start-up/commissioning

The start-up/commissioning of the system must be carried out by a qualified specialist only.

6.1 Filling in filter material

CAUTION The containers/bags containing the filter material are heavy.

- Risk of injury when lifting heavy containers/bags
- When using lifting gear (e.g. cranes), there is risk caused by suspended loads

► Use a forklift, lifting cart or wheelbarrow to transport the filter material packed in bags.

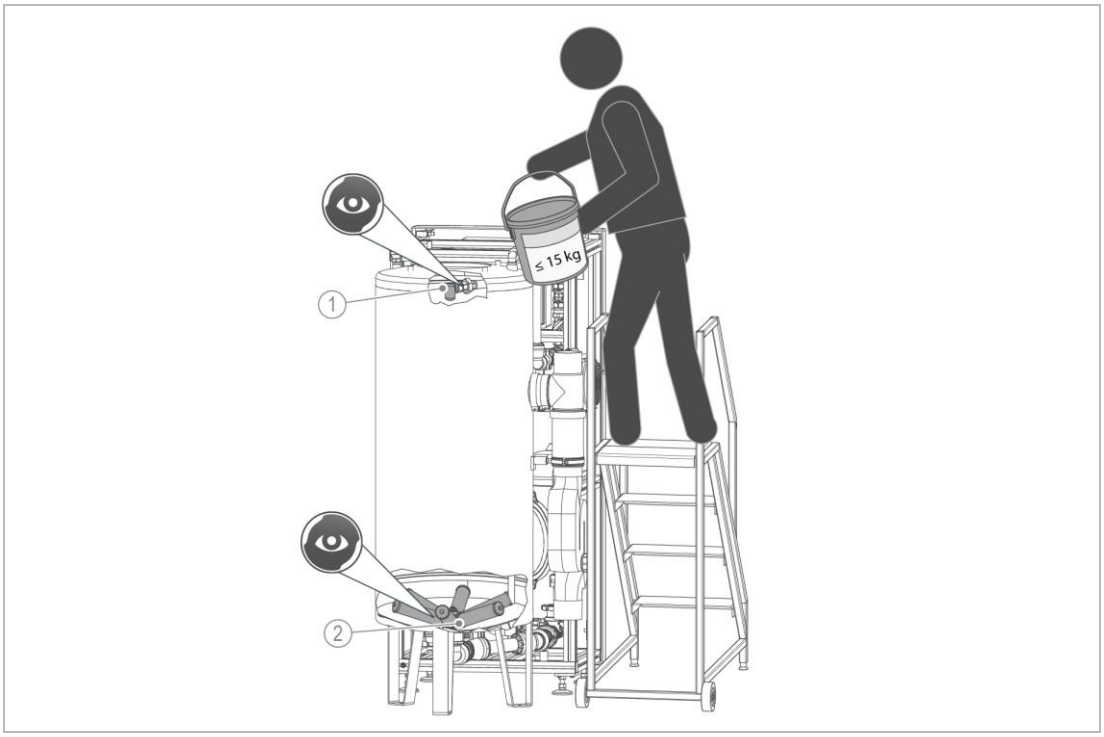
► For transport up or down stairs: Fill the filter material into containers, so that the weight to be transported does not exceed 25 kg.

► Use an auxiliary container, which does not exceed a weight of 15 kg when full, to fill the filter materials into the filter tank.

CAUTION Working at heights (approx. 2 m) during filling

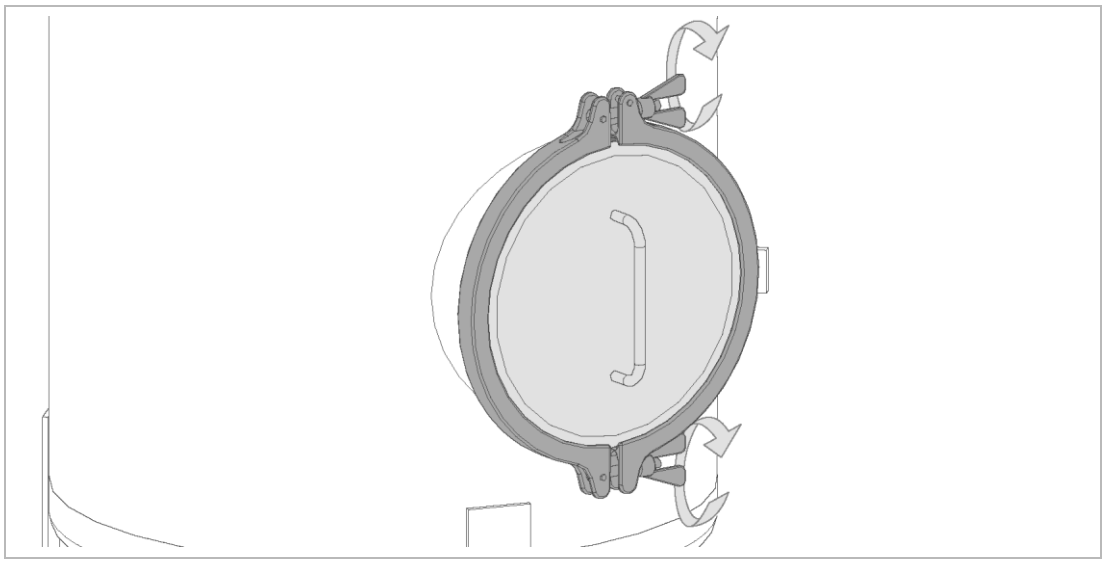
- Risk of falling

► Use stable access equipment with a platform for the filter material.



	Designation		Designation
1	Nozzle	2	Star-shaped nozzle assembly

1. Loosen the screw connections of the lid.
2. Remove the lid of the filter tank (weight approx. 5 kg) and place it next to the system.
3. Check the nozzle and the star-shaped nozzle assembly for completeness and integrity – use the handhole to check the star-shaped nozzle assembly.



   a. Open the handhole by loosening the wing nuts.
   b. Carry out a visual inspection.
   c. Close the handhole.
4. Fill the filter tank about halfway with water. This prevents dust when filling in the support and filter layers.

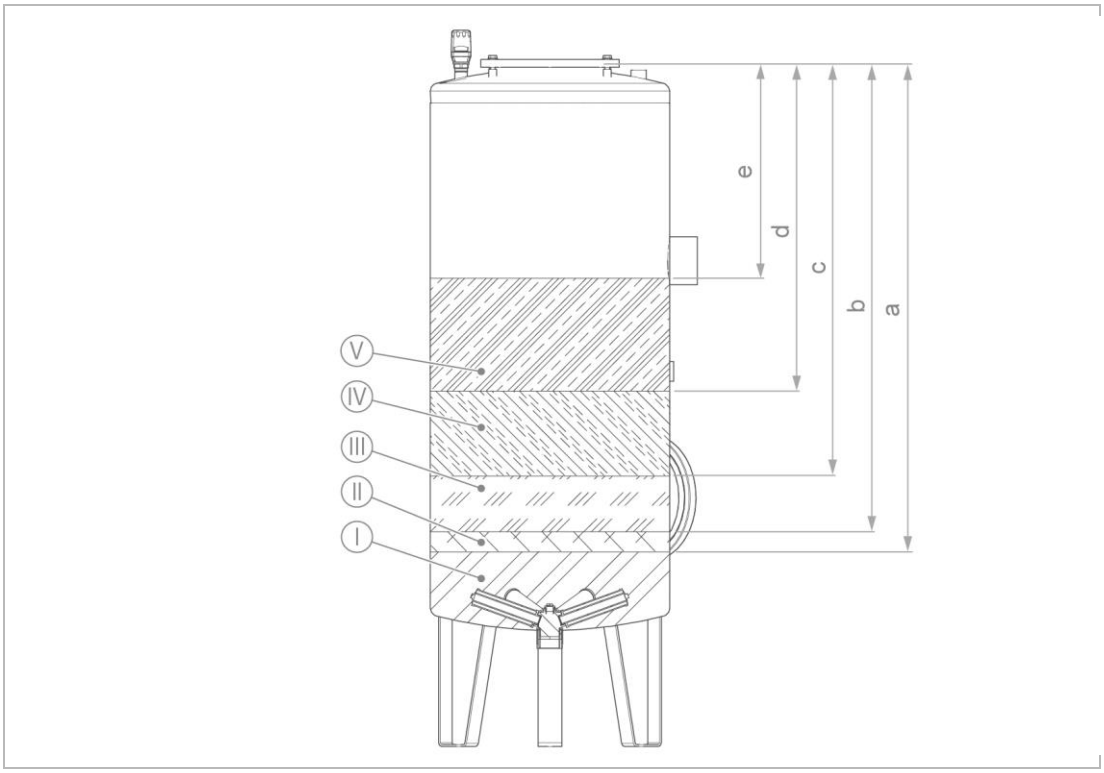
NOTE Damage to the star-shaped nozzle assembly during filling.

- ► Make sure that the filter tank is halfway full of water.
- ► Pour the filter material in slowly.
- ► Make sure that the support layers and filter layers are distributed uniformly.

5. Filling in the support layers:
   a. Fill in the support layers (I, II) in the specified order according to the filling diagram – refer to the chart and tables below.
6. Filling in the filter layers:
   a. Fill in the filter layers (III, IV, V) in the specified order according to the filling diagram – refer to the chart and tables below.
7. Fill the filter tank with water up to the overflow.
8. Leave the system in this state for 24 hours (soaking time).

» The filter material is wetted and partially soaks up the water.

» The resulting increase in weight prevents the filter material from being flushed out during future backwash processes.



6.1.2 Filter filling for deferrisation/demanganisation

	Filter material				3000	5000	10000
		a	**Free board**	mm	**1190**	**1215**	**1255**
I	Quartz gravel SB 3.15 – 5.6 T		Filling volume	kg	50	100	200
			Layer height	mm	135	150	155
		b	**Free board**	mm	**1055**	**1065**	**1100**
II	Quartz sand SB 1.0 – 2.0 T		Filling volume	kg	25	50	100
			Layer height	mm	60	70	70
		c	**Free board**	mm	**995**	**995**	**1030**
III	Filter sand SB 0.4 – 0.8 T		Filling volume	kg	25	50	100
			Layer height	mm	60	70	70
		d	**Free board**	mm	**935**	**925**	**960**
IV	GENO-Fermanit 0.5 – 1.0 mm		Filling volume	kg	125	225	425
			Layer height	mm	230	230	230
		e	**Free board**	mm	**705**	**695**	**730**
V	Hydro-anthracite “N” 0.6 – 1.6 mm		Filling volume	l	50	100	200
			Layer height	mm	185	205	215

6.1.3 Filter filling for solid particle filtration

	Filter material				3000	5000	10000
		a	**Free board**	mm	**1180**	**1210**	**1260**
I	Quartz gravel SB 3.15 – 5.6 T		Filling volume	kg	50	100	200
			Layer height	mm	135	150	155
		b	**Free board**	mm	**1045**	**1060**	**1105**
II	Quartz sand SB 1.0 – 2.0 T		Filling volume	kg	25	50	100
			Layer height	mm	50	70	70
		c	**Free board**	mm	**995**	**990**	**1035**
III	Filter sand SB 0.4 – 0.8 T		Filling volume	kg	125	225	425
			Layer height	mm	305	305	305
IV	–		**–**		**–**	**–**	**–**
		e	**Free board**	mm	**690**	**685**	**730**
V	Hydro-anthracite “N” 0.6 – 1.6 mm		Filling volume	l	50	100	200
			Layer height	mm	185	205	215

6.2 Diaphragm expansion tank: Setting the preload pressure

The filtrate pump of the oxidation filter system fermaliQ:MB is speed-controlled via a pressure sensor and keeps the set pressure constant. Smooth start-up and run-down of the centrifugal pump prevent water hammer. In addition, a diaphragm expansion tank operating with forced flow, absorbs pressure fluctuations in case of major changes in the flow rate and reduces the switching frequency in case only small amounts are withdrawn.

A change in the target pressure (operating pressure) requires an adjustment of the diaphragm expansion tank.

NOTE Incorrect setting of the preload pressure

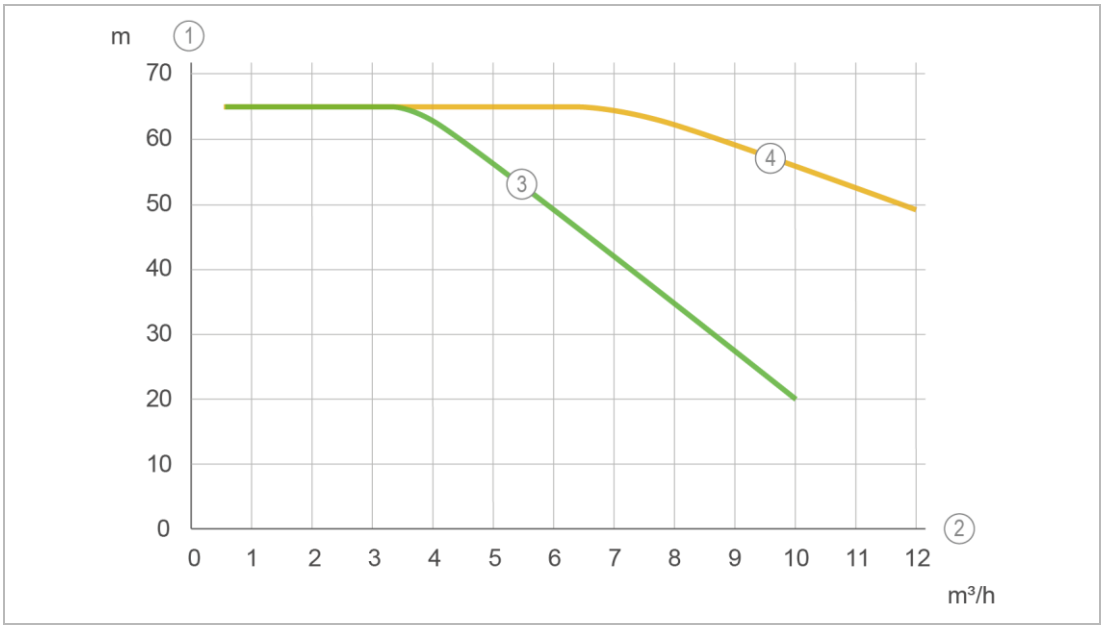
- Insufficient function of diaphragm expansion tank
- Increased wear and tear of the diaphragm

► Check the correct setting of the preload pressure.

- The diaphragm expansion tank is factory-set to a preload pressure of 4 bar.
- The preload pressure must be checked and adjusted with an empty diaphragm expansion tank without pressure on the water side.

► Set the preload pressure in a way that it corresponds to 90 % of the operating pressure. Proceed as follows to do so:

1. Determine your desired operating pressure which must correspond to the delivery characteristic range of the centrifugal pump.



	Designation
1	Delivery head in m
2	Delivery rate in m³/h

	Designation
3	Characteristic curve of fermaliQ:MB3000/ MB5000
4	Characteristic curve of fermaliQ:MB10000

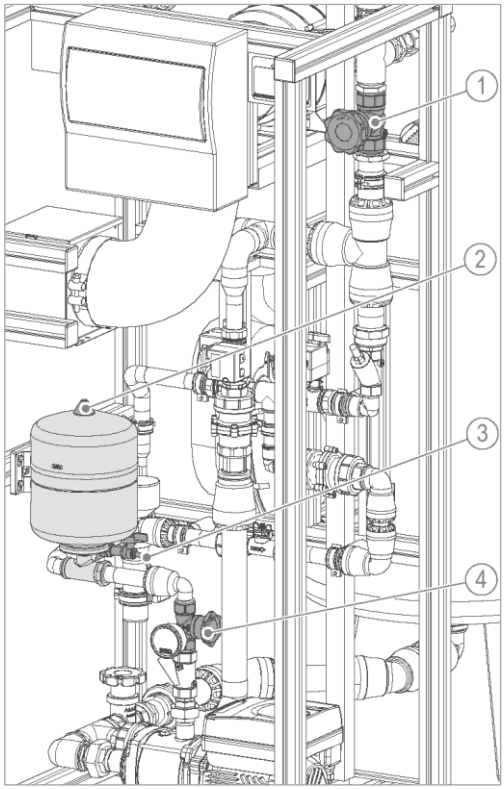
2. Set the operating pressure (target pressure) using ⊕ and ⊖ on the operating panel of the centrifugal pump.
3. Determine the required preload pressure.

Example: 5.0 bar × 90 % = 5.0 bar x 0.9 = 4.5 bar

↑ Operating pressure

↑ Preload pressure

4. Adjust the preload pressure of the diaphragm expansion tank.
   a Close shut-off valves **1** and **4.**
   b Drain the diaphragm expansion tank via sampling valve **3.**
   c Measure the set preload pressure on gas filling valve **2** with a hand-held pressure gauge.
5. Alternative 1: Preload pressure too high – release gas
   a Open gas filling valve **2** to release gas.
6. Alternative 2: Preload pressure too low – refill inert gas
   a Fill the diaphragm expansion tank with inert gas at the gas filling valve (e.g. by means of a nitrogen cylinder) until the desired preload pressure is reached.
   b Open shut-off valves **1** and **4.**



» The diaphragm expansion tank is ready for operation.

► Enter the newly set preload pressure on the type plate of the diaphragm expansion tank.

6.3 Checking the system

1. Check the screw connections on the pumps, valves, flange connections and pipes.
   a Check the screw connections for leaks and retighten them, if necessary.
2. Check the electrical installation:
   a Check the electrical connections.
   b Check the cable screw connections and retighten or reseal them, if necessary.
3. Vent the system.

6.4 Flushing the system

1. Completely open all valves except for the filtrate shut-off valve (1MSF1AH04).
2. Switch on the system (refer to chapter 7).
3. Initiate the discharge of the filtrate (refer to chapter 7.2). Repeat this process until clear water runs off.

» After the filtrate has been discharged, the system returns to normal operation. Completely open the filtrate shut-off valve(1MSF1AH04).

4. Initiate a backwash after an operating time of 30 minutes.

A backwash is required to flush out the fines from the uppermost filter layer and thus prevent them from entering the filtrate.

- ► Make sure that the soaking time (24 h) specified above was kept, so that the filter material has absorbed a sufficient amount of liquid.
- ► Make sure that the pressurised water tank provided by the client on site is functional when filled with filtrate for the first time, i.e. a pressure cushion must form in order to be able to carry out a proper backwash of the filter tank.

If fines of the filter material are still present in the filtrate after backwashing the filter system, supplementary flushing can be carried out if the raw water quality is suitable. To do so, contact technical service.

6.5 Handing over the product to the owner/operator/operating company

1. Explain to the owner/operator/operating company how the system works.
2. Use the manual to brief the owner/operator/operating company and answer any questions.
3. Inform the owner/operator/operating company about the need for inspections and maintenance.
4. Hand over all documents to the owner/operator/operating company for keeping.

Depending on the quality of the raw water, filter systems for the removal of iron, manganese and ammonium might require a run-in period of several weeks.

6.5.1 Disposal of packaging

► Dispose of the packaging material as soon as it is no longer needed.

NOTE Danger to the environment due to incorrect disposal

- Packaging materials are valuable raw materials that can be reused in many cases
- Incorrect disposal can cause hazards to the environment

► Dispose of packaging materials in an environmentally sound manner.

► Obey the local disposal regulations.

► If necessary, commission a specialist company with the disposal.

7 Operation/handling

Normally, no intervention by the owner/operating company/operator or the user is required during operation.

WARNING Leaking exhaust air pipe, failure of pipe fan

- Irritation/chemical burns of the respiratory tract and risk of asphyxiation due to harmful gases (e.g. hydrogen sulphide, methane) escaping – only applicable if these gases are dissolved in the raw water.

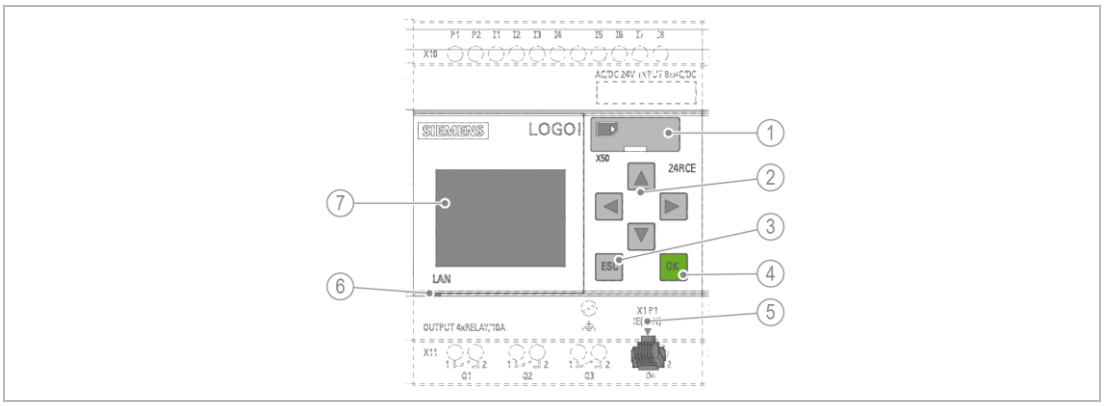
► Check the supply and exhaust air piping provided by the client on site as well as the supply and exhaust air hoses for leaks at least once a week.

► Watch out for the smell of hydrogen sulphide in the installation room and at the exhaust air pipe outside (foul odour) – contact the technical service if you suspect this.

► Make sure the installation site is sufficiently ventilated.

7.1 Operation of the control unit

The system is controlled by means of the PLC controller “Siemens Logo! 12/24RCE”. The operating unit is located at the front of the system rack.



	Designation		Designation
1	Slot for memory card (micro SD)	5	LAN connection
2	Navigation keys	6	LAN indicator lamp
3	ESC button	7	Display
4	OK button		

7.1.1 Operating concept

The menu consists of one level.

► Use ▼ and ▲ to change the displays.

Setting the values

1. Press and hold ESC for 3 seconds.

» The input field is highlighted in black.

2. Use ▼ and ▲ to switch between different input fields within a display
3. Press OK to change a value.

» The input field highlighted in black is flashing.

4. Change the setting value using ▼ and ▲ or trigger an action with OK.
5. Press ESC to quit the settings.

7.1.2 Menu structure (as of software V02)

In the different displays, there are purely informative elements (I) as well as elements where settings can be made (E) or actions can be triggered (A).

No.	Display	Explanation
1/17	fermaliQ-MB V01 System: OFF Backwash? OFF Start in 00:00 m	Displayed when the system is switched off • Information on the system and software version • Switching the system ON/OFF (action possible) • Performing a manual backwash (no action possible) • Delay time in minutes before a backwash is performed
2/17	fermaliQ-MB V01 System: ON Filtration Backwash? OFF Start in 00:00 m	Displayed when the system is switched on • Information on the system and software version • Switching the system ON/OFF (action possible) • Performing a manual backwash (action possible) • Delay time in minutes before a backwash is performed
3/17	Filtration 0 l/h 3.07 bar 291 mm Pump: OFF Make-up feed:OFF	Display in step “Filtration” • Current actual value of flow rate in l/h • Current actual value of pressure in bar • Current actual value of filling level on level sensor in mm • Filtrate pump ON/OFF • Raw water pump, solenoid valve, actuator ON/OFF

4/17	Feedback Make-up feed: 0 Fan: OFF Run-down:00:00m	Display in step “Filtration” • Information on whether 24 VDC have been applied to the input or not (1 or 0). • Switching state of fan: ON/OFF • Current run-down time of fan in minutes (run-down time only elapses when the valve no longer receives an enable signal)
5/17	Discharge of filtrate 00:00m/05:30m Start/Stop? OFF	Display in step “Filtration” • Actual/target time of discharge of filtrate • If the discharge of filtrate has been triggered, the actual time elapses. When the target time is reached, the discharge of filtrate is cancelled automatically.
6/17	Tank Level Stop: 0 Level Start: 0 Counter Filtrate: 0 m³ Backwashes: 0	Display in step “Filtration” • Information on whether 24 VDC have been applied to the input or not (1 or 0). • The levels are only required in case of delivery into an on-site tank. When delivered into a pressurised water tank or a diaphragm expansion tank, both levels are on 0 (standard). • Counter of filtrate volume in m³ and of successful backwash processes
7/17	fermaliQ-MB V01 System: ON Preparing Backwash? OFF Start in 00:13 m	Display in step “Preparing” • Information on the system and software version • Switching the system ON/OFF (action possible) • Performing a manual backwash (no action possible) • Delay time in minutes before a backwash is performed
8/17	Preparing Enable input: ---- Flow: OK Pressure: ---- Make-up feed: OK	Display in step “Preparing” • Conditions to be fulfilled to switch from step “Preparing” to step “Backwash” (all conditions must be fulfilled) • OK: Condition fulfilled • ---: Condition not fulfilled
9/17	Abort Preparing? OFF	Display in step “Preparing” • Manually abort step “Preparing” • Preparing the backwash is aborted and step “Filtration” is started.

10/17	fermaliQ-MB V01 System: ON RC Backwash Backwash? OFF Start in 00:00 m	Display in step “Backwash” • Information on the system and the software version • Switching the system ON/OFF (action possible) • Performing a manual backwash (no action possible) • Delay time in minutes before a backwash is peformed
11/17	Backwash Set time: 00:00m Flushing time: 00:00m Pressure under- shot? Yes	Display in step “Backwash” • Current actual value of valve set time in minutes • Current actual value of backwash time in minutes • Information on whether the setpoint of the presssure for the backwash process has been undershot
12/17	Pressure: 1.63bar Target: 1.90bar Aborting backwash in 00:00 m	Display in step “Backwash” • Current actual value of the pressure on the pressure sensor in bar • Setpoint of the pressure for backwash monitoring and aborting backwash in bar • Delay time in minutes until the backwash will be aborted (if the setpoint of the pressure was undershot)
13/17	fermaliQ-MB V01 System: ON First filtrate Backwash? OFF Start in 00:00 m	Display in step “First filtrate” • Information on the system and the software version • Switching the system ON/OFF (action possible) • Performing a manual backwash (no action possible) • Delay time in minutes before a backwash is performed
14/17	First filtrate Set time:00:00m Remaining time:00:00m	Display in step “First filtrate” • Current actual value of valve set time • Current actual value of first filtrate time

15/17	ATTENTION! Supplementary flushing with raw water active!	Displayed if supplementary flushing backwack with raw water was started via the technical service level
16/17	System locked externally:	Displayed if “Locking entire system” is activated
17/17	Fri. 09:28 2023-10-20	Display of time and date

7.2 Switching on the system

► Proceed as follows to switch on the system:

1. Navigate to view 1/17/.
2. Press and hold ESC for 3 seconds.
3. Use ▼ and ▲ to navigate to the SYSTEM: OFF field.
4. Press OK to change the value.
5. Use ▼ and ▲ to set the value to ON.
6. Press OK.
7. Press ESC to quit the settings.

» The system is switched on.

7.3 Initiating manual discharge of filtrate

During start-up/commissioning, it is necessary to thoroughly flush the filter material in the filter tank.

► Proceed as follows to initiate a manual discharge of filtrate:

1. Navigate to view 5/17.
2. Press and hold ESC for 3 seconds.
3. Use ▼ and ▲ to navigate to the XX:XXm field.
4. Press OK to change the value.
5. Use ▲ and ▼ to set the required value for the duration of the discharge of filtrate.
6. Confirm the value with OK.
7. Use ▼ and ▲ to navigate to the OFF field.
8. Press OK to change the value.
9. Use ▼ and ▲ to set the value to ON.
10. Press OK.
11. Press ESC to quit the settings.

» The discharge of filtrate starts.

You can abort the discharge of filtrate prematurely by using ▼ and ▲ to navigate to the OFF field and to set the value to ON. (After switching, the display returns to OFF again)

7.4 Initiating a manual backwash

Under certain circumstances, it might be necessary to initiate a backwash outside the planned intervals.

► Proceed as follows to initiate a manual backwash:

1. Navigate to view 2/17.
2. Press and hold ESC for 3 seconds.
3. Use ▼ and ▲ to navigate to the BACKWASH? OFF field.
4. Press OK to change the value.
5. Use ▼ and ▲ to set the value to ON.
6. Press OK.
7. Press ESC to quit the settings.

» The backwash starts.

7.5 Backwash monitoring

During the backwash, the pressure sensor on the outlet side monitors the pressure. If the pressure falls below the target pressure during the time the backwash takes place, the backwash will be aborted. Other possible reasons for an unsuccessful backwash are listed and explained in chapter 9.1, fault ER 2.

If a backwash process is not carried out or is not carried out completely, this is logged as a failed attempt.

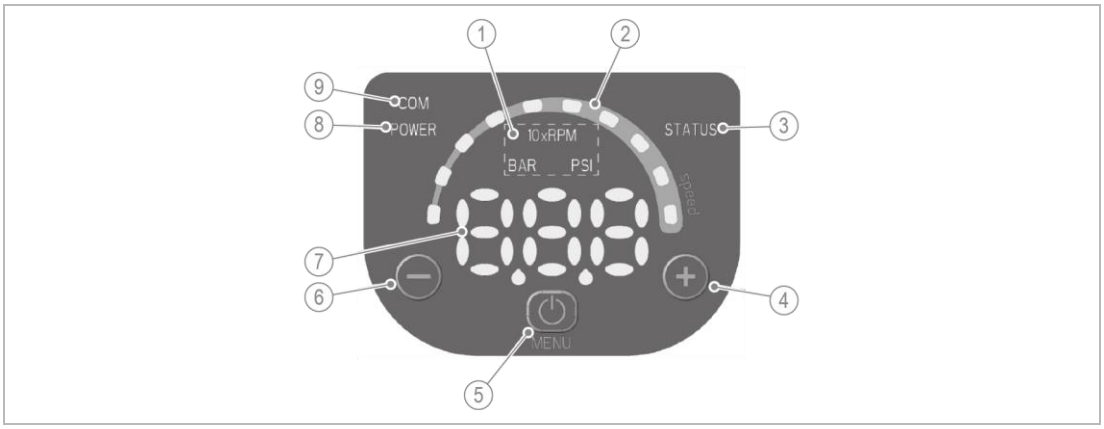
A backwash aborted for the first time does not trigger a fault message. A fault message is only triggered after another aborted backwash.

At the next successful backwash, the number of failed attempts is reset automatically.

7.6 Operation of filtrate pump

The following chapter provides information on the operating and display elements of the filtrate pump.

Only the technical service personnel must make settings on the filtrate pump.



	Designation	Function
1	Measuring unit LEDs	Information on the unit of the rotational speed LED strip and the display
2	Rotational speed LED strip	Display of the current rotational speed in steps of 10 % (subject to the set min./max. rotational speed)
3	Status LED	Indication of the operating state
4	Plus key	• To increase values • Navigation in the menu
5	START/STOP key	• To start/stop the pumps • Pressing and holding the key to call up the parameter menu • Confirmation of a selection in the parameter menu
6	Minus key	• To decrease values • Navigation in the menu
7	Display	Display of parameters/menu
8	POWER LED	Information on power supply
9	Communication LED	Information on communication

7.6.1 Status LED

The status LED indicates the operating state of the pump and signals any malfunctions.

LED	Description
○ OFF	Pump stopped
● Steady green light	Pump in operation
 Flashing green/orange light	Non-locking alarm during operation of the pump
● Steady orange light	Non-locking alarm when pump is stopped
● Steady red light	Locking error, the pump cannot be started

7.6.2 Rotational speed LED strip

The rotational speed LED strip consists of 10 LEDs.

Each LED represents the rotational speed range between parameter P27 (min. speed) and parameter P26 (max. speed) in stages between 10 and 100 %.

LED	Description
ON	Motor in operation – the speed corresponds to the percentage stages that are indicated by the switched-on LEDs on the strip (e.g.: 3 LEDs ON = rotational speed 30 %).
First LED flashes	Motor in operation – the speed is below the absolute minimum value (parameter P27)
OFF	Motor stopped

7.6.3 Display

The display indicates operating state, operating values, menu and error codes.

Display	Mode	Description
OFF	OFF	Pump off
StP	STOP	Pump stopped manually
ON	ON	Pump on; the motor starts depending on the selected control mode – appears for a few seconds, then the operating pressure is displayed

Alarm and error display

Indication (example)	Mode	Description
A01 → 3.56	Alarm	In the event of an alarm, the corresponding code is displayed alternately with the main display.
E15	Error	If an error occurs, the display shows the corresponding code number.

Alarm and error codes (refer to chapter 9.2).

7.7 Emergency bypass

All oxidation filter systems fermaliQ:MB feature an emergency bypass as standard which can optionally be connected. The system is bypassed by means of a drinking water hose.

Using raw water (non-drinking water quality) as emergency supply (“emergency bypass”) is admissible for the fields of application below:

- Fire-fighting purposes
- Toilet flushing

WARNING Risk of infection due to microbially contaminated water

- Infectious diseases

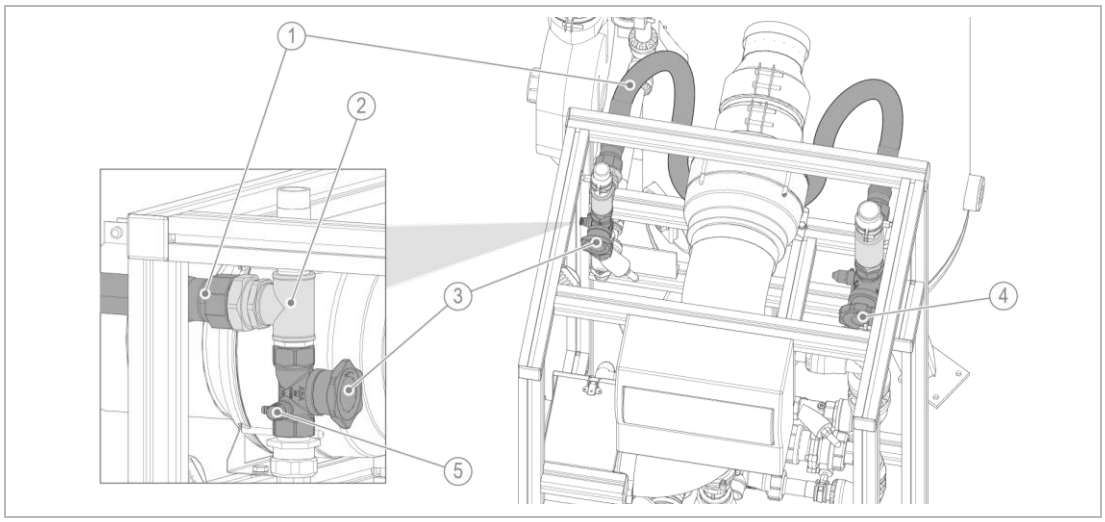
► Make sure that no microbially contaminated water gets into the drinking water supply when using the emergency bypass.

► If it is nevertheless necessary to use microbially contaminated raw water, route the water directly to the above-mentioned consumers, if possible, and do not connect the drinking water hose to the filtrate side.

► If the water must be routed via the filtrate side, all components coming into contact with the water must be chemically cleaned and disinfected after the emergency bypass has been used or after the emergency has been remedied.

Obey the installation requirements: It must be possible to switch the well water pump on and off by means of the pressure switch controller.

The steps below are required for using the emergency bypass:



	Designation		Designation
1	Drinking water hose	4	Filtrate shut-off valve
2	Hose connection	5	Draining at shut-off valve
3	Raw water shut-off valve		

1. Switch off the system (refer to chapter 7).
2. Close the fittings below:
   - Raw water shut-off valve (1MSF1AH01)
   - Filtrate shut-off valve (1MSF1AH04)
   - Shut-off valves on the raw water side provided by the client (downstream of diaphragm expansion tank provided by the client on site)
   - Shut-off valves on the filtrate side provided by the client (upstream of pressurised water tank/buffer tank provided by the client on site)
3. Drain the corresponding pipe section by means of the on-site valves or by slightly opening the blind plug of the piping for the emergency bypass.
4. Remove the blind plugs of the piping.
5. Tightly connect the drinking water hose using tools.
6. Open the shut-off valves on the raw water and filtrate side provided by the client.

» The emergency bypass can be operated with a pressure switch controlled well pump.

» The system stays out of operation

In case of longer periods of standstill (> 48 h) of the fermaliQ system, the piping and the filter tank must be drained completely via the corresponding discharge valves. The filter material contained in the filter tank should be filled up again with fresh raw water directly after the draining.

The drinking water hose can also be used to carry out supplementary flushing during start-up. To do so, contact technical service.

8 Maintenance and repair

Maintenance and repair includes cleaning, inspection and maintenance of the product.

The responsibility for inspection and maintenance is subject to local and national requirements. The owner/operator/operating company is responsible for compliance with the prescribed maintenance and repair work.

By concluding a maintenance contract, you make sure that all maintenance work will be carried out on time.

- ► Only use genuine spare and wearing parts from Grünbeck.

8.1 Cleaning

Have the cleaning work only carried out by persons who have been instructed on the risks and dangers that can arise from the system.

WARNING Damp cleaning of live components

- Risk of electric shock
- Sparking possible due to short circuit
- ► Switch off the voltage supply as well as any external voltage before starting the cleaning work.
- ► Wait for 15 minutes and make sure that the components do not carry any voltage.
- ► Do not open any switch cabinets.
- ► Do not use any high-pressure equipment for cleaning and do not blast electric/electronic devices with water.

CAUTION Climbing onto system components

- Risk of falling when climbing onto system components
- ► Do not climb onto system components such as pipes, racks, etc.
- ► Use stable, safe and self-standing access equipment such as stepladders, platforms, etc. when cleaning components that are located at high levels.

NOTE Do not clean the system with cleaning agents containing alcohol/solvents.

- These substances damage the plastic components
- ► Use a mild/pH-neutral soap solution.

- ► Use personal protective equipment.
- ► Only clean the outside of the system.
- ► Do not use any strong or abrasive cleaning agents.
- ► Wipe the surfaces with a damp cloth.
- ► Dry the surfaces with a cloth.

8.2 Intervals

By way of regular inspections and maintenance, malfunctions can be detected in time and system failures might be avoided.

► As owner/operator/operating company determine which components must be inspected and maintained at which intervals (load-dependent).

The interval table below shows the minimum intervals for the activities to be carried out.

Activity	Interval	Execution
Inspection	weekly	• Visual check for damage, leaks and tears • Odour test • Check the pipe fan for function • Check the air filter for impurities
Maintenance	annually	• Check the entire system for leaks • Check the pump for function • Check the rack • Remove the level probe and clean it • Check the connections • Check the diaphragm expansion tank • Check the control unit • Replace the air filter • Check and clean the pipe fan
	5 years	• Replace seals
	as required	• Replace the filter material

8.3 Inspection

Regular inspections increase the operational reliability of your product.

► Carry out an inspection at least once a week. To do so, proceed as follows:

1. Visually check for damage, leaks and tears.
2. Check the air filter of the pipe fan for impurities – replace the air filter, if necessary.
3. Check whether the fan and the ventilation slots of the pump are free of dust – clean the pump, if necessary.
4. Watch out for the smell of hydrogen sulphide in the installation room and at the exhaust air pipe outside (foul odour) – contact the technical service if you suspect this.

8.4 Maintenance

Carrying out annual maintenance work requires specialist knowledge. This kind of maintenance work must be carried out by technical service personnel only.

DANGER Life-threatening electrical voltage during interventions on the system

- Risk of severe burns, cardiovascular failure, fatal electric shock
- Short-circuits and voltage transfers are possible

► Only have qualified electricians carry out electrical work on the system.

► Before starting work on active system parts, make sure they are de-energised. Ensure their de-energised state for the duration of the work. Obey the five safety rules below while doing so:

a De-engerise

b Secure against restart

c Verify that no voltage is present

d Earth and short-circuit

e Cover or block off adjacent live parts

8.4.1 Removing (old) filter material

It might be necessary to change the filter material from time to time. This period of time can vary depending on the quality of the raw water.

CAUTION Working at heights (approx. 2 m) when removing the filter material

- Risk of falling by slipping or loosing balance

► Use stable access equipment.

1. Remove the lid of the filter tank (weight approx. 5 kg) and place it next to the system.
2. Extract the filter material through the tank opening.
   a Use a solid matter vacuum cleaner (the length of the suction hose must reach to the bottom of the tank).

8.4.2 Checking the diaphragm expansion tank

1. Check the diaphragm expansion tank for damage and corrosion. Replace the diaphragm expansion tank in case of damage.
2. Briefly operate the gas filling valve. Replace the diaphragm expansion tank if water escapes.
3. Check the setting pressure (preload pressure) of the diaphragm expansion tank. Correct it, if necessary.

► Use nitrogen for gas filling. The water side must be non-pressurised.

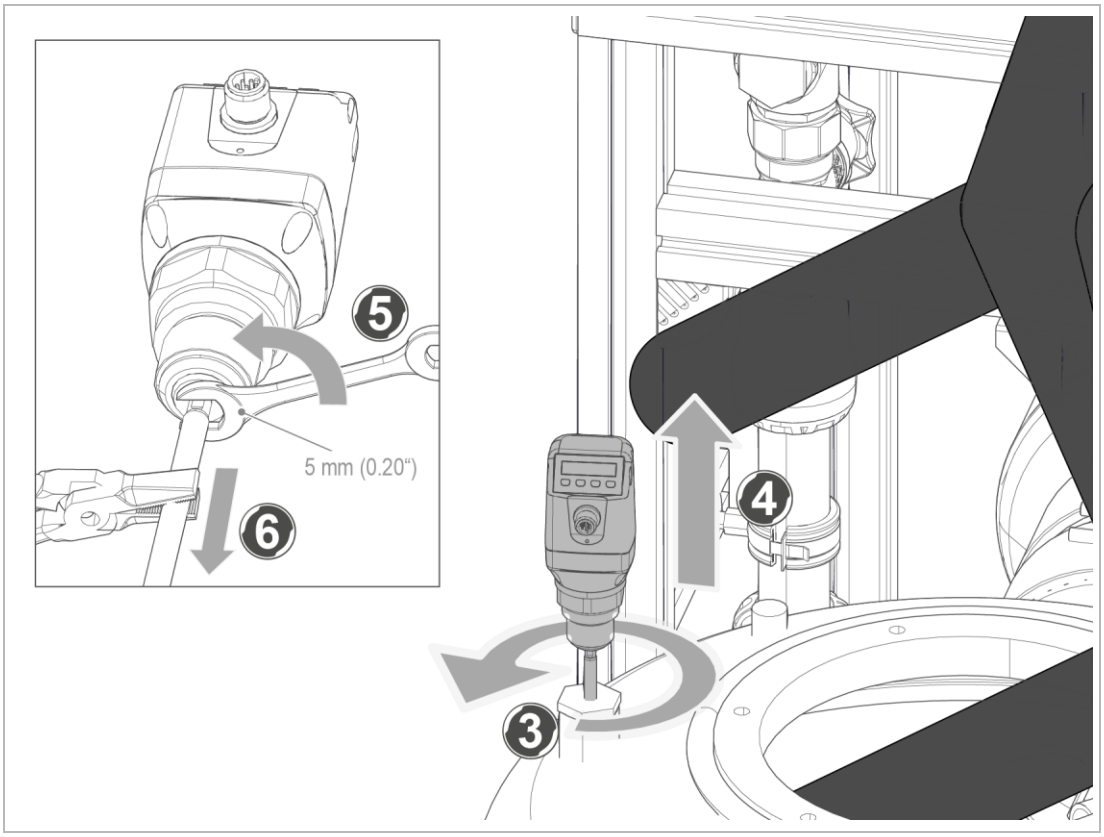
8.4.3 Removing and cleaning the level probe

CAUTION Working at heights (approx. 2 m) when removing the level probe

- Risk of falling

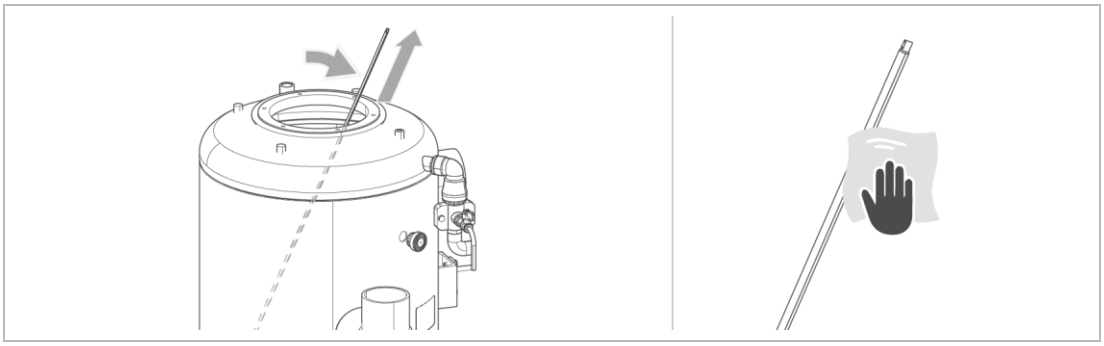
► Use stable access equipment

1. Loosen the screw connections of the lid.
2. Remove the lid of the filter tank (weight approx. 5 kg) and place it next to the system.



3. Unscrew the top part of the level probe from the tank.
4. Pull the rod sensor upwards until the entire top part is visible.

5. Unscrew the rod from the top part.



6. Grasp the rod through the opening of the tank and push it down until it can be pulled out of the tank opening by tilting it.
7. Clean the rod or replace the rod, if necessary.
   a Clean the rod with a cloth.
   b For heavy iron deposits, you can use acid solution.

► When installing the level probe, proceed in reverse order.

8.5 Consumables

Filter filling for deferrisation/demanganisation

Product	Order no.
Filter filling fermaliQ:MB3000, FE/MN	530000040000
Filter filling fermaliQ:MB5000, FE/MN	530000050000
Filter filling fermaliQ:MB10000, FE/MN	530000060000

Filter filling for solid particle filtration

Product	Order no.
Filter filling fermaliQ:MB3000, FIL	530000070000
Filter filling fermaliQ:MB5000, FIL	530000080000
Filter filling fermaliQ:MB10000, FIL	530000090000

Other consumables

Product	Order no.
Replacement air filter LFV	530529000001
Bag filter LFT for fine dust filtration	100009890001

8.6 Spare parts, wearing parts

For spare parts and wearing parts, please contact your local Grünbeck representative which you may find on the internet at www.gruenbeck.com.

9 Troubleshooting

WARNING Contaminated water due to stagnation

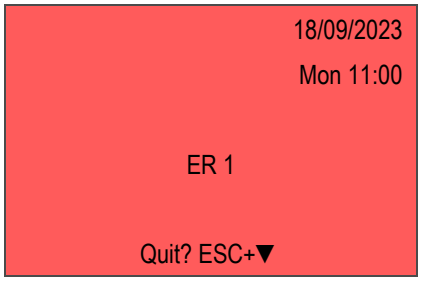
- Infectious diseases

► Have faults eliminated immediately.

9.1 Display messages

In case of a malfunction, the display of the control unit flashes in red.

The following appears on the display: Time when the fault occurred and error code of the fault.



To acknowledge the malfunctions:

► Press and hold ESC and simultaneously press ▼.

» The malfunction was acknowledged.

Code	Meaning	Causes	Remedy
ER 0	Make-up feed faulty	• The filling level (between level 3 and level 2) is not reached within a certain delay time. • There has been no feedback from the make-up feed.	► Check function, control signal and feedback of make-up feed
ER 1	Fault Filtrate pump	• The pump is in fault mode	► Check filtrate pump for function ► (For a description of the fault, refer to the fault code on the frequency converter and the operation manual of the filtrate pump)
		The fermaliQ:MB10000 features 2 pumps. If one of the pumps fails, a fault is output. However, the system can continue to operate at half power.	
ER 2	Backwash unsuccessful	• The required backwash volume was not reached.	► Check the compressed air cushion in the pressurised

			water tank and refill, if necessary.
		• The existing compressed air cushion was not sufficient for the backwash process (error only appears after repeated occurrence of the cause of the error).	► Check the pressure sensor for function.
ER 3	Requirements for backwash process not met	• No backwash process could be started because there was no enabling during Preparing the backwash, there was no pressure, water was continuously withdrawn, or the minimum filling level in the tank was not reached.	► Check the compressed air cushion in the pressurised water tank and refill, if necessary. ► Check the backwash times and adjust them, if necessary. ► Check make-up feed and control signal for function.

9.2 Pump displays

In the event of an alarm or error, the display of the pump indicates a code and the status LED lights up.

- Alarms and errors are saved with the date and time.
- Alarms and errors can be reset by switching the device off for at least one minute.

9.2.1 Alarm codes

Code	Meaning	Causes	Remedy
A03	Loss of performance	• Temperature too high	► Lower the room temperature ► Lower the water temperature ► Reduce the load
A05	Data memory alarm	• Data memory corrupted	► Forward fault message to technical service
A06	LOW alarm	• Lack of water detected	► Check water level in the tank
A15	EEPROM	• Data memory corrupted	► Stop the pump for 5 min and then restart it If the problem persists: ► Forward fault message to technical service
A20	Internal alarm		
A30	Multi-pump connection alarm	• Faulty multi-pump connection	► Check the condition of the connection cables

			► Check that there are no discrepancies in the addresses
A31	Loss of multi-pump connection	• Loss of multi-pump connection	► Check the condition of the connection cables

9.2.2 Error codes

Code	Meaning	Causes	Remedy
E01	Internal communication error	• Lack of internal communication	► Stop the pump for 5 min and then restart it If the problem persists: ► Forward fault message to technical service
E02	Motor overload error	• High motor voltage • Current consumption of motor too high	
E03	DC bus overvoltage error	• DC bus overvoltage • External causes condition pump operation via generator	► Check system configuration ► Check position and integrity of non-return valves
E04	Rotor blocked	• Motor stands still • No rotor synchrony or rotor is blocked by foreign matter	► Make sure that there is no foreign matter preventing the pump from rotating ► Stop pump for 5 min and then restart it If the problem persists: ► Forward fault message to technical service
E05	EEPROM data memory error	• EEPROM data memory corrupted	► Stop pump for 5 min and then restart it If the problem persists: ► Forward fault message to technical service
E06	Grid voltage error	• Voltage supply outside the operating range	► Check voltage ► Check electrical connection
E07	Motor winding temperature error	• Thermal contactor of motor tripped	► Check whether there are impurities near the impeller and the rotor – remove them, if necessary ► Check the condition of the installation as well the water and air temperature ► Wait until the motor has cooled down If the problem persists:

			► Stop pump for 5 min and then restart it If the problem persists: ► Contact technical service
E08	Power module temperature error	• Thermal contactor of frequency converter has tripped	► Check condition of installation and air temperature
E09	General hardware error	• Hardware error	► Stop pump for 5 min and then restart it If the problem persists: ► Contact technical service
E11	LOW error	• Detection of lack of water (if P48 = ERR)	► Check water level in tank
E12	Pressure sensor error	• Missing pressure sensor (not available in ACT mode)	► Check the condition of the sensor's connection cable
E14	Low-pressure error	• Pressure below minimum limit (not available in ACT mode)	► Check settings of parameters P45 and P46
E15	Loss of phase	• Loss of one of the 3 phases (only in case of three-phase version)	► Check the connection to mains
E30	Multi-pump protocol error	• Incompatible multi-pump protocol	► Update all devices to the same firmware version

9.3 Other observations

Observation	Meaning	Remedy
Pump does not start running	• Intervention of amperometric thermal protection	► Wait for reset after cooling ► Check voltage and integrity of the connection to mains
	• Main fuse or residual current circuit breaker has tripped; fuse has blown	► Reset fuse or replace blown fuses
Pump starts running, but after a short time the overload protection trips or the fuses blow	• Supply cable damaged, short-circuit of electric motor, overload protection or fuses are not suitable for the supply current of the motor	► Check components and replace, if necessary
	• Intervention of amperometric thermal protection or protection device because current consumption is too high	► Check motor
	• A power supply phase is missing	► Check supply

	• Foreign matter inside the pump blocks the impellers	► Clean pump
Pump starts running but does not deliver water	• Pump draws in air	► Check liquid level, seal of suction line and bottom valve
	• Pump is not filled correctly	► Repeat filling process
Pump does not deliver enough water		► Check the lines for bottlenecks and restrictions
	• Pump is not filled correctly	► Repeat filling process
	• Direction of rotation is not correct	► Check direction of rotation

10 Dismantling and disposal

10.1 Dismantling

Have this work carried out by qualified specialists only.

1. Flush the system with raw water.
2. Disconnect the system from mains – discharge residual voltage.
3. Close the shut-off valves provided by the client on the raw water and filtrate side (upstream and downstream of the system).
4. Vent and drain the system.
5. Drain the filter material.
6. Separate the system from the plumbing installation (raw water inlet, filtrate outlet, exhaust air, drain connections).
7. Disconnect the potential equalisation (grounding) provided by the client on site.
8. Remove individual components such as accessories, if necessary.
9. Transport the system secured on a pallet.

10.2 Disposal

► Obey the applicable national regulations.

Packaging

► Dispose of the packaging in an environmentally sound manner.

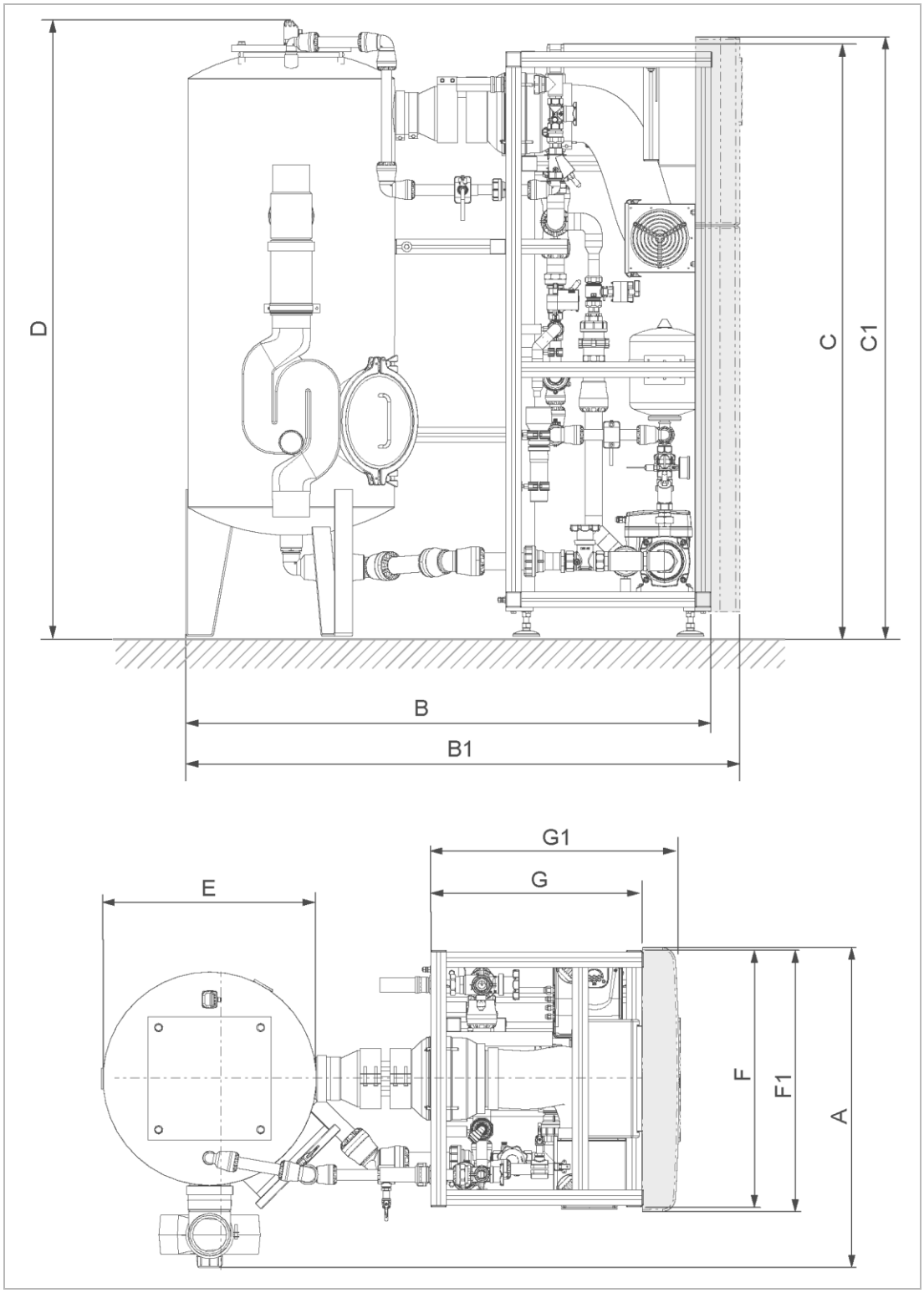
Product

If this symbol (crossed-out wheelie bin) is on the product, this product or its electrical and electronic components must not be disposed of as household waste.

► Dispose of electrical and electronic products or components in an environmentally sound manner.

For more information on take-back and disposal, go to www.gruenbeck.de.

11 Technical specifications



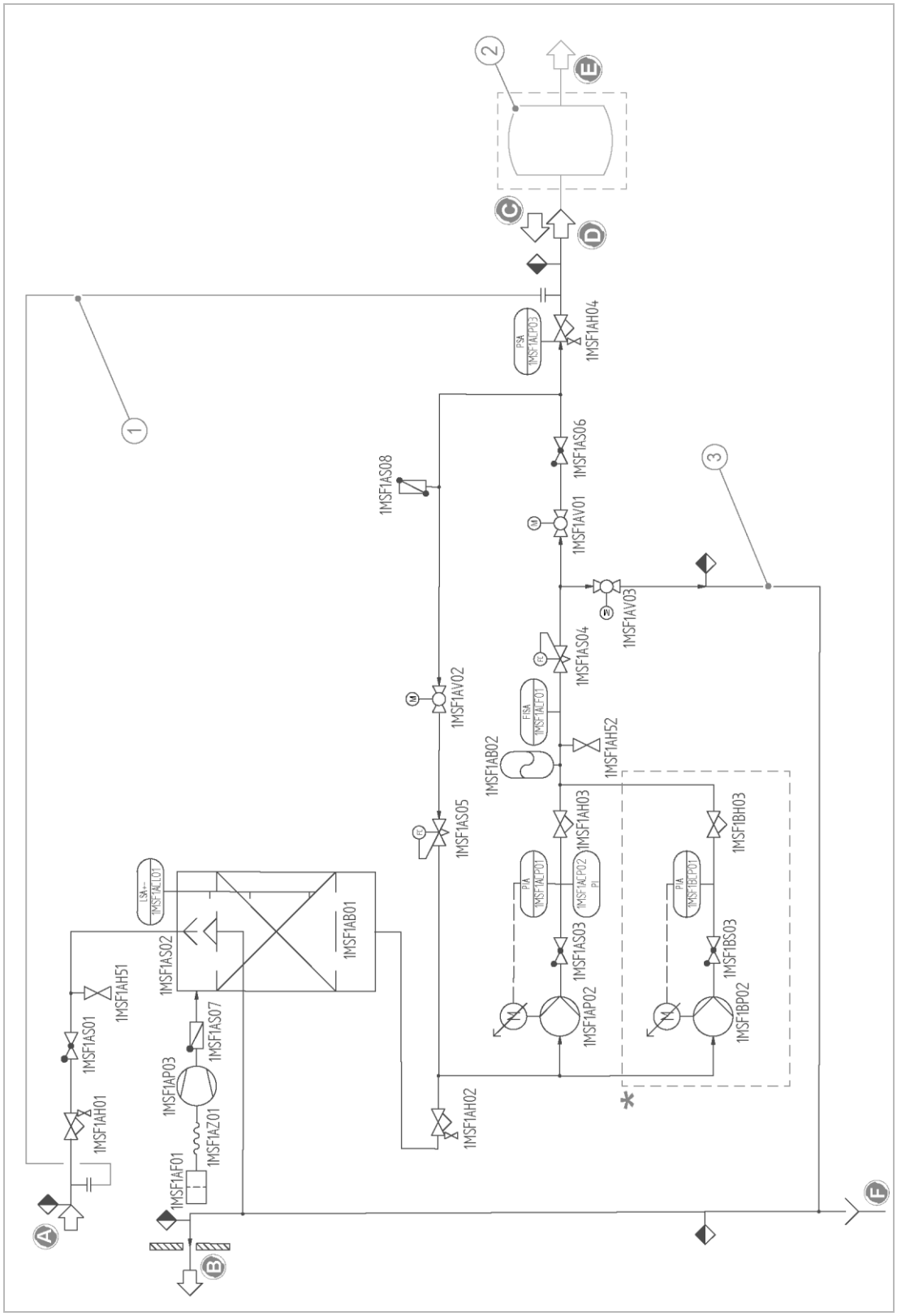
Dimensions and weights			MB3000	MB5000	MB10000
A	Width of entire system	mm	920	1060	1340
B	Depth of entire system	mm	1630	1800	2430
B1	Depth of entire system with front cover	mm	1690	1860	2490
C	Height of system rack	mm	1730		
C1	Height of system rack with front cover	mm	1750		
D	Height of filter tank	mm	1800	1830	1930
E	Outside diameter of filter tank	mm	600	800	1100
F	Width of system rack	mm	720		
F1	Width of system rack with front cover	mm	750		
G	Depth of system rack	mm	600	600	990
G1	Depth of system rack with front cover	mm	660	660	1050
Operating weight of filter tank, approx.		kg	800	1200	2300
Empty weight of filter tank, approx.		kg	110	130	330
Weight of system rack, approx.		kg	100	100	120

Connection data		MB3000	MB5000	MB10000
Raw water inlet	DN	25 (1" male thread)	32 (1¼" male thread)	40 (1½" male thread)
Filtrate outlet/backwash water inlet	DN	40 (1½" male thread)	50 (2" male thread)	65 (2½" male thread)
Flushing waste water to drain (HT pipe)	DN	100 (PE)		
Discharge of first filtrate to drain (HT pipe)	DN	50 (PP)	50 (PP)	100 (PP)
Supply air D_o	mm	160		
Exhaust air	DN	100 (PE)		
Connected load, approx.	kW	1.5	1.5	3.0
Power supply	V/Hz	230/50		
Protection/protection class		IP 54/ ⏚		

Performance data		MB3000	MB5000	MB10000
Nominal flow (subject to raw water quality)	m³/h	3.0	5.0	10.0
Backwash volume flow	m³/h	7.9	12.5	18.2
Well water volume flow	m³/h	4.5 – 6.0	7.5 – 10.0	15.0 – 20.0
Operating pressure Well water	bar	2.0 – 5.5		
Operating pressure Filtrate	bar	3.5 – 5.5		
Operating pressure Backwash	bar	3.5 – 5.5		
Required dimensioning of pressurised water tank (for backwash)	l	≥ 750	≥ 1000	≥ 2000 or 2 x 1000
Waste water volume Backwash/First filtrate	l	~ 200	~ 320	~ 520

General data		MB3000	MB5000	MB10000
Water temperature (drinking water)	°C	5 – 20		
Ambient temperature (drinking water)	°C	5 – 25		
Water temperature (technical applications)	°C	5 – 35		
Ambient temperature (technical applications)	°C	5 – 35		
pH value Raw water		6.5 – 8.5		
Humidity (non-condensing)	%	≥ 70		
Order no.		**530000010000**	**530000020000**	**530000030000**

11.1 PID flow diagram



** Only fermaliQ:MB10000, order no. 530000030000*

No./Coding	Designation
1	Emergency bypass
2	Pressurised water tank (accessories)
3	Discharge of first filtrate
1MSF1AB01	Filter tank
1MSF1AB02	Diaphragm expansion tank
1MSF1ACF01	Flow sensor
1MSF1ACL01	Level control
1MSF1ACP01	Filtrate pressure sensor
1MSF1ACP02	Filtrate pressure gauge
1MSF1ACP03	Pressure switch (backwash monitoring)
1MSF1AE01	Switch cabinet
1MSF1AF01	Air filter box
1MSF1AH01	Raw water shut-off valve
1MSF1AH02	Tank shut-off valve
1MSF1AH03	Filtrate pump shut-off valve
1MSF1AH04	Filtrate shut-off valve
1MSF1AH51	Raw water sampling valve

No./Coding	Designation
1MSF1AH52	Filtrate sampling valve
1MSF1AP02	Filtrate pump
1MSF1AP03	Pipe fan
1MSF1AS01	Non-return valve Raw water
1MSF1AS02	Hollow cone spray nozzle
1MSF1AS03	Non-return valve Filtrate
1MSF1AS04	Flow stabiliser Filtration
1MSF1AS05	Flow stabiliser Backwash
1MSF1AS06	Non-return valve Backwash
1MSF1AS07	Air backflow flap
1MSF1AV01	Shut-off valve Filtration
1MSF1AV02	Shut-off valve Backwash
1MSF1AV03	Shut-off valve Discharge of first filtrate
1MSF1BCP01	Filtrate pressure sensor
1MSF1BH03	Filtrate pump shut-off valve
1MSF1BP02	Filtrate pump
1MSF1BS03	Non-return valve Filtrate

Connections

	Designation
A	Raw water inlet
B	Exhaust air into the atmosphere
C	Backwash water inlet

	Designation
D	Filtrate outlet
E	To consumer
F	To drain

EU Declaration of Conformity

In accordance with the EC Machinery Directive 2006/42/EC

CE

This is to certify that the system designated below meets the safety and health protection requirements of the applicable EC/EU guidelines in terms of its design, construction and execution.

This certificate becomes void if the system is modified in any way not approved by us.

Oxidation filter system fermaliQ:MB

Serial no.: Refer to type plate

We further confirm compliance with the essential requirements of the EMC Directive 2014/30/EU.

The following harmonised standards have been applied:

- DIN EN ISO 12100:2011-03
- DIN EN 60204-1:2019-06

Responsible for documentation: Mirjam Müller

Manufacturer:

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Hoechstaedt, 18.10.2023

i. V.

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