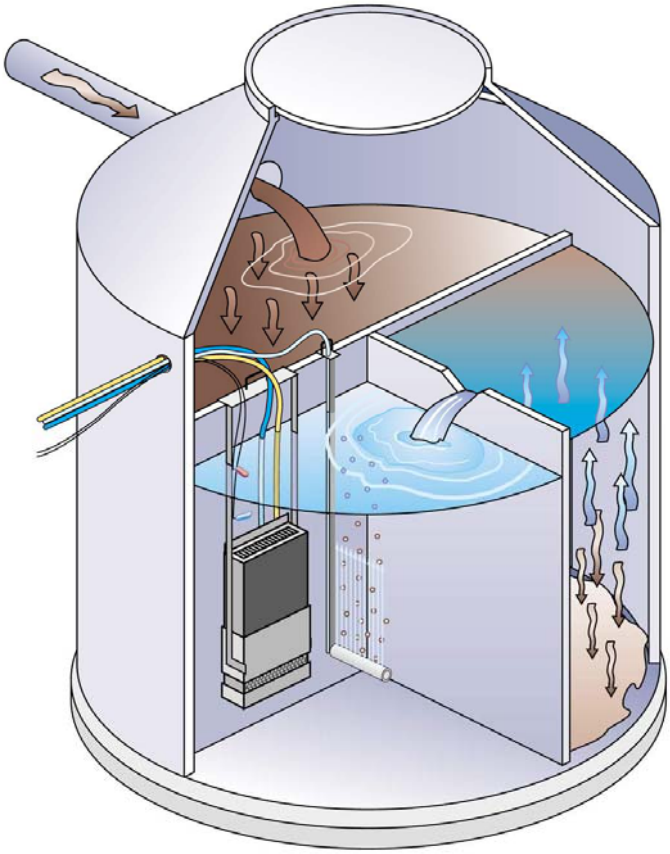
Operating Instructions

MembraneClearBox®
Biological sewage plant for 4-50 PE



Huber Technology

Hans Huber AG
Maschinen- und Anlagenbau
Industriepark Erasbach A1

92334 Berching

Original operating instructions
Version 10/05

Translation
Supplies to EEA countries require translation of the operating instructions into the language of the country of destination.
Should there emerge any inconsistencies in the translation, the original (German) operating instructions shall be used for clarification or the supplier consulted.

1 Product specification

1.1 General

The MembraneClearBox® is a small biological sewage plant for treatment of domestic wastewater according to the principle of a activated sludge plant with membrane filtration. Due to the special ultrafiltration membranes the plant meets the maximum performance requirements (class C, N, D, +H) of the new European standards DIN EN 12566-3.

The plant has the approval of DIBt (German institute for engineering) where it is licensed under number **Z-55.3-107.** The design approval comprises all standardised sizes of small sewage plants from 4 to 50 PE.

The long-term functionality of a small sewage plant and whether the respective permissible effluent standards are met depends in general on

- the technical/biological plant efficiency (as proven in a forty-week practical type testing by an independent institute)
- the specific site conditions (wastewater quality and volume, day hydrographs, etc.)

Read these operating instructions carefully and observe the manufacturer's specifications and instructions to ensure that the long-term efficiency of your Huber MembraneClearBox® is maintained and required effluent standards are reliably met.

1.2 Intended use

The MembraneClearBox® is designed and intended to be installed or retrofitted into multi-compartment septic tanks of appropriate size (in Germany according to DIN 4261, in other countries installation into technically suitably designed tanks.)

The Huber MembraneClearBox® is especially suited to be used for treatment of domestic wastewater up to 8 m³/d (which corresponds to 50 PE in Germany for example).

This PE definition does not apply to foreign countries as hydraulic conditions and loads in most cases do not correspond to German sizes (Q_d = 150 l/Ed, BOD_5 = 60 g/Ed), so that each project must be calculated and designed specifically and individually.

Only domestic wastewater is permitted to be fed into the plant. **It is not permitted to feed the plant with** • **industrial wastewater** • **outside water** • **cooling water** • **swimming pool runoff** • **precipitation water** as this will lead to plant overloading.	

The plant must be operated with municipal wastewater only. The feed must not contain any material that may be harmful for or even kill the microorganisms in the biological treatment stage. Do not feed the plant with disinfectants or similar substances. The following materials should not be thrown into sinks or toilets:

Solids or liquids not to be thrown into sinks or toilets	Negative effects	Proper disposal routes
Ash	No decomposition	Dustbin
Sanitary towels	Clogging of the WWTP	Dustbin
Chemicals	Wastewater contamination	Collection point
Disinfectants	Kill bacteria	Avoid their use! Collection point
Colours	Wastewater contamination	Collection point
Photo chemicals	Wastewater contamination	Collection point
Chip fat	Deposition in pipes leading to pluggage	Dustbin
Adhesive plaster	Clogging of pipes	Dustbin
Cat litter	Clogging of pipes	Dustbin
Crown corks	Deposition within the plant	Dustbin / collection point
Varnish	Wastewater contamination	Collection point
Medicine	Wastewater contamination	Collection point / pharmacy
Motor oil	Wastewater contamination	Collection point / petrol station
Oil containing waste	Wastewater contamination	Collection point
Bud sticks	Clogging of the WWTP	Dustbin
Pesticides	Wastewater contamination	Collection point
Brush cleanser	Wastewater contamination	Collection point
Cleaning agents	Wastewater contamination	Collection point
Razor blades	Clogging of the WWTP Risk of injury	Dustbin
Pipe cleaner	Wastewater contamination	Do not use!
Pesticides	Wastewater contamination	Collection point
Pant liners, tampons	Clogging of the WWTP	Dustbin
Edible oil	Clogging of the WWTP	Dustbin
Food leftover	Clogging of the WWTP	Dustbin
Wallpaper paste	Clogging of the WWTP	Collection point
Textiles (e.g. nylons, cleaning rags, handkerchieves)	Clogging of the WWTP	Old clothes collection / dustbin
Diluters	Wastewater contamination	Collection point
Birdseed	Clogging of the WWTP	Dustbin
WC stones	Wastewater contamination	Do not use!
Cigarette ends	Deposition within the plant	Dustbin

For fully biological wastewater treatment of municipal wastewater and filtration of activated sludge the plant is applied for

treatment of **industrial wastewater**, however only after prior testing and piloting	

The intended use also includes:

- Observance of the start-up, operation and maintenance conditions as set out in these operating instructions
- Taking foreseeable malpractice into account
- **Skilled workers** only (who are familiar with the correct procedures and know the dangers) are permitted to work on the plant.
- Conclusion of a maintenance contract with the supplier, equipment distributor or approved servicing company. Prior extensive instruction and written approval by the supplier is required if the customer wants to perform any maintenance and servicing on his own according to the manufacturer's instructions.

The equipment is intended exclusively for the above specified use. Any additional use or rebuilding of the equipment without prior written approval by the manufacturer does not comply with the intended use. The manufacturer will not assume liability for consequential damage to the plant or the environment. The operator alone will bear the risk. Do not start up the plant before there has been ensured that all safety devices are completely mounted and operable, and that the plant complies with the rules.	

1.3 General functional description

The MembraneClearBox® is a combination of the activated sludge process and separation of clarified water by means of submerged ultrafiltration membranes, comprising basically three process steps:

- Preliminary treatment
- Aeration
- Membrane filtration

In the **preliminary treatment** stage the majority of the solids are removed from the raw wastewater by sedimentation. The first (or the two first) chambers of a multi-compartment tank has (have) three functions:

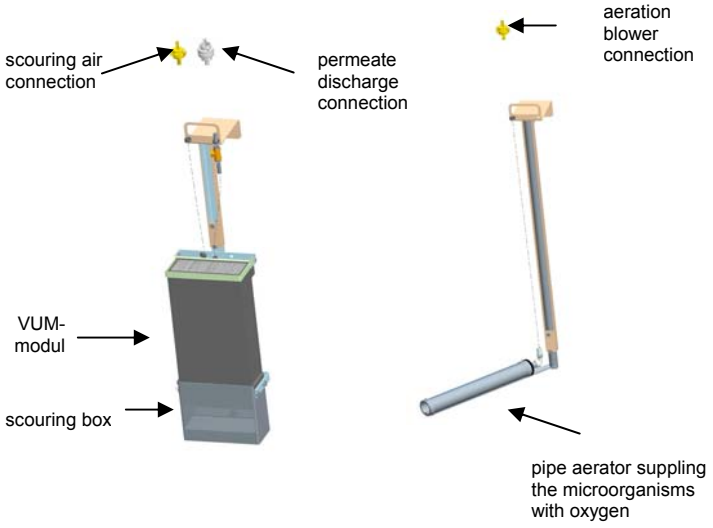
- Mechanical preliminary wastewater treatment through sedimentation (generation of primary sludge)
- Intermediate storage tank and buffer if an inlet pump is installed
- Storage of the sludge generated in the biological treatment process

After preliminary treatment the pre-treated wastewater flows by gravity into the last chamber of the multi-compartment tank, which is used as an aeration tank and houses the MembraneClearBox® installation kit and a blower for the oxygen supply. Actual clarification is accomplished by microorganisms which decompose the pollutants and nutrients contained within the wastewater and transformed into biomass.
Simultaneous **membrane filtration** is performed by the membrane module with a 38 nm separation size that ensures separation of the treated wastewater from the activated sludge. The membrane itself will reliably retain all solids and bacteria along with virtually all germs as the diameter of the membrane openings themselves is 1,500 times smaller than the diameter of a human hair, which again allows for the treated water to be reused. The filtrate even meets the EU standards for bathing water quality.
The associated equipment and electrical controls required can be installed either into the cellar of the house or into a heated adjacent control cabinet positioned adjacent to the septic tank.
The HUBER MembraneClearBox® can also as an optional extra be equipped with a patented remote control feature that reports any fault immediately by SMS. Due to the combination of on-site and remote control features the plant can be operated with the minimum operator attendance and maximum operating reliability.

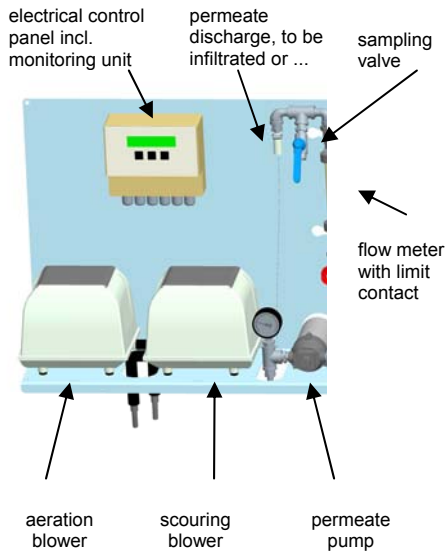
1.4 Definition and function of plant components:

Terms for equipment components according to the following drawing

Installation kit:



Associated equipment and control unit:



The part of the plant installed within the multi-compartment tank, **the MCB installation kit** (left figure), consists of:

- Frame for the MCB module unit, adjustable in height
- Ultrafiltration membrane module[s], with a 38 nm separation size
- Scouring box with scouring air connection for membrane surface cleaning
- Fine-bubble pipe membrane aerator mounted on an adjustable telescopic pipe
- Two float switches for level control (not shown)
- Connections for hose lines incl. couplings
- Airlift line to the excess sludge discharge (not shown)

The MCB module unit is installed directly into the last compartment of the septic tank. A customer-supplied item is the cable duct or connection to the external **associated equipment and control unit** (right figure), which consists of:

- Mounting plate for the associated equipment
- Electrical control unit for the MCB plant
- Aeration blower
- Scouring blower
- Permeate pump
- Flow meter with limit contact
- Sampling valve
- Module for remote control (optional, not shown)
- Airlift solenoid valve for excess sludge (optional, not shown)

These two units (installation kit + associated equipment and control unit), together with the connection hoses, form the MembraneClearBox® sewage treatment plant.

The maximum distance between the septic tank and installation place for the associated equipment and control unit is as a standard limited to **15 m**. Any other arrangements require prior consultation of and approval by the manufacturer.

1.4.1 Components of the installation kit and their functions:

1.4.1.1 Supporting frame for MCB module unit

The supporting frame carries the membrane module or aeration system. Depending on the plant size it is either simply hung onto the partition wall in the last chamber (MCB1, MCB2), or installed on the tank floor (if it s a bigger size plant).

- The suspension kit is adjustable in height and can also be adjusted to the individual wall thickness by means of wing bolts. This ensures the specific adaptability to any tank shape.
- The fixed support frame with guide rods allows for mounting and dismounting of the modules without the need to evacuate the biotank.

1.4.1.2 Ultrafiltration membrane module[s] (VUM module)

The membrane module separates the activated sludge and clear water. The membrane module[s] consist of individual membrane plates, which on both sides are covered with ultrafiltration membranes. Due to its separation size of approx. 38 nm, the membrane system is an ultrafiltration system. The small pore size retains not only solids but even all bacteria and virtually all viruses and germs.

• **An ultrafiltration membrane module must never run dry once it is wetted!** • Handle the module with care when and after dismounting the module, especially when dismounting the connection hoses as the connection pipe can easily break.	

1.4.1.3 Scouring box

The scouring box houses the membrane module and distributes the scouring air which removes the covering layers produced during the membrane filtration process and the sludge concentrated on the membrane surface. For this purpose a perforated distribution plate is fitted inside the scouring box below the membrane module. The perforated plate initiates an upflow of scouring air and the sludge/water mix within the membrane module. The scouring box also sucks in activated sludge. The scouring box is equipped with a perforated plate to prevent coarse material from passing into the membranes.

1.4.1.4 Fine-bubble pipe membrane aerator

Air is introduced into the activated sludge by the externally arranged aeration blower via the pipe membrane aerator to achieve the biological decomposition of the pollutants and nutrients contained in the wastewater (primarily COD and ammonium nitrogen). The aerator is mounted on a telescopic pipe, which is pivotable and adjustable in height to allow optimal positioning. This ensures the specific adaptability to any tank shape.

• Mind the marks on the pipe aerator. The blue line must normally point up. • Do not place the aerator onto pointed or edged objects when mounting/dismounting the plant!	

1.4.1.5 Float switch

The float switches control the complete plant and its different operating states. The operating states change automatically due to the level control by means of float switches. There is no need for operator interference.

- The float switch for nominal filtration is mounted to prevent dry running of the membrane module and stop filtration whenever the filling level reaches the upper edge of the module. **(Pay attention with initial installation).**
- The lower float switch responds when the inflow sets in and induces the plant to return to normal operation.

- A second float switch responds if the discharged volume is smaller than the inflow, i.e. the filling level exceeds a certain level. This float switch activates the second stage of the permeate pump and enables increased filtration. In this way the plant is able to handle varying inflows and flow peaks over the course of the day.

• Mount the **lower float switch** so that dry running of the membrane is eliminated (upper edge of membrane module). • Mount the **upper float switch** so that overflowing of the compartment is eliminated and high-load operation is reduced to a minimum (where possible, approx. 30 cm below the emergency overflow). • Make sure the float switches can operate unhindered and cannot get caught on built-in equipment! Consider this point when installing the plant!	

1.4.2 Components of the associated equipment and control unit and their functions:

1.4.2.1 Mounting plate for the associated equipment

The mounting plate is a chamfered stainless steel plate onto which the aeration blower, scouring blower, permeate pump, electrical control unit and pipework are mounted. The mounting plate can be arranged either in the cellar of the house or optionally in a control panel that is arranged adjacent to the septic tank and may optionally be heated. All electrical devices are pre-wired.
Attention: The associated equipment requires frost-proof installation!

1.4.2.2 Electrical control unit for the MCB plant

The electrical control unit serves for fully automatic operation of the MCB plant.
The program stored in the electrical control system ensures that the required effluent standards are met provided the parameters are correctly adjusted.
The detailed description is provided in the documentation for the electrical control system (6.5).

If it turns out that the plant is overloaded or underloaded and the aeration intervals for example must be optimised, the parameters may have to be adjusted (deviating from the standards) by professional experts to suit the actual conditions.

A 230 V alternating current connection with 16A fusing must be provided for supply of the plant.

1.4.2.3 Permeate pump

The permeate pump pumps the clear water through the ultrafiltration membranes out of the tank and delivers the discharged permeate (filtrate) to a discharge or reuse facility. A controlled float element flow meter is positioned on the pressure side of the permeate pump to provide for a possibility to adjust and control the flow rates of the different operating statuses.
The pump is operated in two stages to enable delivery of the filtrate volumes both in normal and high load mode. The pump receives the signal for the second stage from the second float switch.

1.4.2.4 Aeration blower

The aeration blower generates the oxygen required for the biological system. Through the pipeline system the blower introduces air into the pipe aerators which release the fine-bubble pores as a result of the overpressure, generate fine-bubble aeration and supply thus the oxygen for the micro organisms. The aeration system supplies not only the oxygen required but ensures continuous optimal mixing of the activated sludge in the last chamber.
The standard aeration blower settings are specified in table 1, page 12.

Maintenance required after 3 years: Replacement of the miniature compressor membrane and air filter. The optional maintenance contract offered by HUBER includes compressor replacement. Air filter cleaning is required once a year.	**NOTE!**

1.4.2.5 Scouring blower

The scouring blower generates the scouring air required for cleaning the membrane surfaces. The blower operates continuously during the filtration process but only sporadically in low-load mode to keep the membrane surfaces at any time free and ready to operate.
The standard scouring blower settings are specified in table 1, page 12.

Maintenance required after 3 years: Replacement of the miniature compressor membrane and air filter. The optional maintenance contract offered by HUBER includes compressor replacement. Air filter cleaning is required once a year.	**NOTE!**

1.4.2.6 Float element flow meter with limit contact

The two different flow rates of the two operating statuses (normal mode and high load mode) are set by means of the scale on the flow meter. As the float element is magnetic, the minimum flow is able to be controlled through the contact switch installed at the outside. If the flow falls below minimum flow, an extra scouring cycle will automatically be initiated. If the programmed washing program is not successful, then a fault report will be generated.

1.4.2.7 Airlift solenoid valve and airlift line

If a regular sludge disposal – for example within the scope of a maintenance contract – cannot be ensured, an airlift system is optionally available for regular excess sludge discharge.
By means of an air lift the excess sludge (secondary sludge) is returned into the sludge storage tank. For this purpose an additional outlet with solenoid valve is installed into the air line of the aeration blower. During an aeration phase the solenoid opens for a certain time and activates thus the air lift and pumps the excess sludge back into the sludge storage tan.

Attention: The excess sludge production can greatly vary in small sewage plants. A definite setting recommendation can therefore not be made. It is necessary to regularly re-determine the sludge concentrations and according discharge cycles.

1.4.3 Available additional equipment:

1.4.3.1 Casing (optional)

The MCB size 1, 2 and 4 can optionally be supplied with a casing.
There are two versions of casing available:

- Steel panel casing
  Control panel for wall mounting in compliance with UVV and VDE standards.
  Painted steel or powder-coated, colour: RAL 7032
  Control panel size H x W x D = 800 x 800 x 300 mm.
  Control panel (protection grade IP 54) or equal quality

- Stainless steel casing
  Corrosion-resistant control panel for outdoor installation

1.4.3.2 Frost-proof design (optional)

For sites where no frost-proof installation of the control panel or no frost-proof laying of hoses and cable can be provided.
Control panel, ditto, incl. trace heating of the permeate line up to 10 m length and tempering of the control panel by means of a thermostat, suitable for outdoor installation.
Geeignet für Freiluftaufstellung.

1.4.3.3 Telecontrol (optional):

The HUBER MembraneClearBox® can also as an optional extra be equipped with a remote control feature that reports any fault immediately by SMS. In the event of a plant fault the electrical control system itself will at first try to eliminate the fault with an extra scouring program. If this attempt is unsuccessful, then a fault will be indicated. Fault indications are sent via GSM modem to a connected maintenance service for example. The required mobile radio SIM card is to be provided by the customer.

1.5 Electrical control unit for the MCB plant

Die Steuerung dient zum vollautomatischen Betrieb der Kleinkläranlage.
The complete plant is controlled via two float switches that change between low-load mode and nominal filtration and between nominal filtration and high-load mode, depending on the flow rate. Characteristic running times for the aggregates are programmed for each of these operation modes to meet varying conditions in a small sewage plant.

- **Economy mode:**
  In times without inflow the control of the two blowers is activated only sporadically while the permeate pump remains out of operation. The operating phases of the blower are reduced to a level at which the oxygen supply for the microorganisms is limited to the basic supply.
- **Normal operation:**
  When the inflow starts again, the plant switches automatically into normal operation. In this operating status the plant runs under normal conditions with a moderate load.
- **High load mode:**
  The high load mode is activated when the inflow to the plant is temporarily higher than the plant is able to handle in normal mode. In high load mode the pump is able to temporarily filtrate a higher flow than the flow it is actually designed for.

The applicable operation times of the individual blowers are specified in table 1.
All associated equipment comes connected to the control unit so that extensive on-site wiring work is avoided and minimised in case parts need to be replaced.
An alternating current connection with 16A fusing is sufficient for supply of the complete plant. The electrical control system has an additional potential-free contact. In the event of any fault a signal can be forwarded to any local alarm unit or by means of an optional GSM modem to any connected maintenance service.
If a plant fault occurs, the electrical control tries at first to eliminate the fault itself. If this cannot be achieved, then a fault will be indicated.
Possible fault conditions are implausibility of the float switches (upper switch switched, lower switch not switched), or a lack of inflow although the permeate pump is in operation. Due to the characteristics of the membrane filtration process any plant fault will lead to a decrease in the permeate flow rate, which is registered and reported if required.

The following parameters are preset in the electrical control system. Never change them without prior written approval by the manufacturer. Any unauthorised change of parameters does not comply with the intended use and will invalidate any warranty and may additionally lead to an irreversible damage of the membrane module or deterioration of the effluent quality.

Table 1: Electrical control settings

In seconds	Low load mode		Normal operation		High load operation	
Operating status	ON	OFF	ON	OFF	ON	OFF
Permeate pump	aus		270	30	270	30
Scouring blower	60	3600	continuous		continuous	
Aeration blower	20	300	60	60	60	60
Airlift (optional)	to be adjusted to specific local conditions					
Switch-off when no flow	180					
Extra scouring time	300					
Fault report after too long high load	5 hours					

1.6 Special design version: containerised test plant

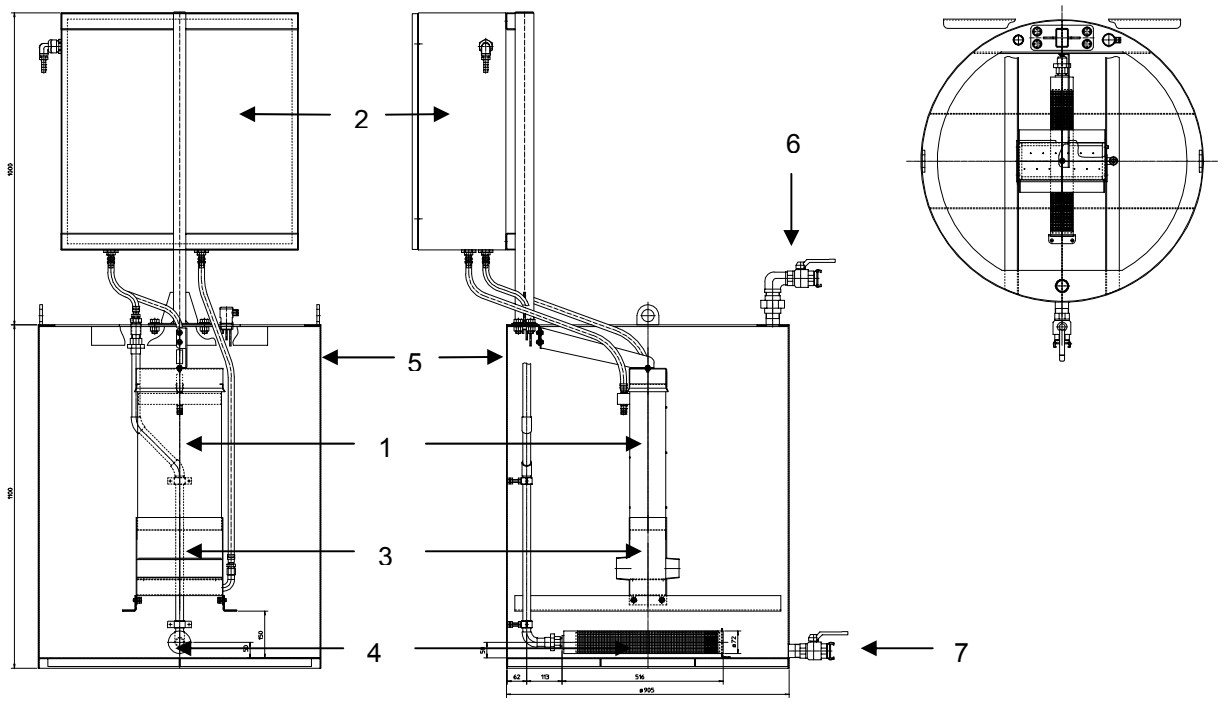
Instead of being installed in a septic tank a VUM membrane module may also be installed in to a container.
This type of containerised VUM plant is used as a test plant for examination of different parameters in wastewater treatment with membrane technology.

Plant feeding with wastewater to be performed as described under chapter 1.2.

Treatment of **industrial wastewater** only after prior testing and piloting.

The plant is designed for the **maximum flow of 1 m³/d**.

Terms for equipment components according to the following diagram:



The VUM test plant in a container (no photo/drawing shown) consists of:

- Ultrafiltration membrane modules, membrane material: polyether sulphone (PES), separation size: 38 nm (1)
- Control panel with all required associated equipment and controls (2)
- Scouring box with scouring air connection for membrane surface cleaning (3)
- Fine-bubble pipe membrane aerator (4)
- Container, material: stainless steel (V4A), volume: approx. 700 l (5)
- Connection for the customer's feed pump (6)
- Tank drain (7)

Level control is achieved with two rod probes, different from the system with float switches described above. The level control system with rod probes is provided for filling level independent permeate pump and thus filtration control, and for feed pump control. Plant feeding (via inlet pump or similar) with pre-treated wastewater to be ensured by the customer.

The associated equipment and electrical control functions are identical with the MembraneClearBox® plant described above.

2 EC Conformity Certificate, Certificate of Incorporation

The plant complies with the EC standards which prescribe the CE label. The EC Conformity Certificate confirms that the operable equipment fulfils all relevant safety and health requirements. The EC Conformity Certificate is attached to these operating instructions as a separate sheet only if the HUBER plant is supplied as a ready-to-operate unit complete with the electrical switchboard and control panel, and if plant installation and commissioning are performed by HUBER.

The Certificate of Incorporation is required if the supplied equipment is not operable independently, i.e. if the machine is to be incorporated in other machines for example to obtain an operable complete plant.

The EC Conformity Certificate / Certificate of Incorporation is attached in the appendix and is additionally included in the table of contents.

3 Safety

3.1 General safety instructions

These operating instructions have to remain attached to the plant. It must be made sure that the operating instructions are ready to hand any time for any person that has to perform work on the plant. In addition to these operating instructions, instructions in the sense of the labour protection law and ordinance regulating the use of tools have to be available.
As these operating instructions contain fundamental instructions to be observed when installing, operating and servicing the machine, the responsible staff must read the instructions prior to machine installation and start-up. The operating instructions must at any time be available ready to hand at the installation place of the machine/plant. Not only the general safety instructions contained in this chapter have to be observed but also the special safety instructions added under the main items.

3.1.1 Operator's duty of care

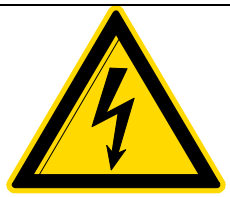
The plant has been constructed and manufactured taking into consideration a risk analysis and after careful selection of the applicable harmonized standards and other technical specifications. The machine complies with the state-of-the-art technology and offers a maximum amount of safety.

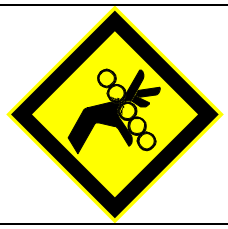
To achieve such safety in practical operation, it is however necessary to take any measures required therefore. It is the operator's duty of care to plan these measures and control their implementation.

The operator must especially ensure that

- The equipment is applied according to its intended use (see chapter *Product Specification*) ➔ Any use that is not in compliance with the plant's specified intended use will invalidate any warranty.
- yearly maintenance and the checkups according to chapter 8.1 are carried out ➔ The operator is responsible for the effluent equality.
- the machine is operated only in a perfect ready-to-operate condition.
- These operating instructions are permanently available on site complete and in a legible condition.
- Only sufficiently qualified and authorised personnel are in charge of machine operation, maintenance and repair.
- Any safety and warning symbols attached to the plant remain there in a legible condition.

3.1.2 Definition of safety symbols

Occupational safety symbol This symbol will accompany all safety instructions that are associated with risks to life and/or limb. Follow these instructions and proceed carefully! At the same time, follow all applicable laws, general safety and accident prevention regulations.	
Electric current warning This symbol warns of electric current. Prior to performing any work, switch off mains isolator and make sure that the system is off-circuit. At the same time, follow all applicable laws, general safety and accident prevention regulations.	

Be careful not to get caught when starting up, servicing or repairing the machine!	
Attention symbol This symbol is found where special attention is required to ensure compliance with instructions concerning correct operating sequences to prevent damage to the plant or its function.	**Attention!**

Instructions directly attached to the plant, e.g.
- Instructions and warning signs
- Labels for liquid connections
- Arrow showing the direction of rotation

must be strictly followed and kept in absolutely legible condition.
Signs or labels that have become illegible must be replaced immediately.

3.1.3 Demands on operating and maintenance staff

Only well-trained and briefed persons who know these operating instructions and act according to these instructions are authorized to operate the equipment. The individual areas of responsibility of operating staff must be defined clearly.

Personnel being trained must in the beginning work under the supervision of an experienced person. The completed successful training and briefing must be confirmed in writing.

Any electrical control devices must generally be operated by instructed and authorized persons only.

Only qualified personnel is authorised to modify the pre-programmed electrical control settings. Non-observance of this instruction will invalidate any warranty.	**Attention!**

Any person performing work on the plant must read these operating instructions and confirm by signature that the operating instructions have been understood.

Maintenance staff must be trained specifically for plant maintenance work, beyond the standard of knowledge operating staff have. Preferably, well trained expert staff (e.g. from a nearby wastewater treatment plant) should be consulted for maintenance work on the MCB module unit. They have professionally certified knowledge of safety and hygiene regulations for handling biological substances.

3.1.4 Safety instructions for maintenance, inspection, installation

Any maintenance work must be carried out by qualified staff only.
Any inspection and installation work must be carried out by authorized and qualified staff only.

Switch off all current carrying plant parts prior to entering the wastewater treatment plant.

Enclosed rooms of wastewater treatment plants that need to be entered for service and maintenance have to be aerated in a way that prevents a dangerous explosive atmosphere, lack of oxygen and presence of harmful concentrations of gas or vapour. The maintenance company or the manufacturer's personnel is therefore only permitted to enter the tank after

sufficient prior aeration and use of a gas warning device. In addition, appropriate measures must be taken to protect maintenance and start-up personnel against falling into the tank.

Attention: Dangerous gases in the tank Directly after opening the cover of full multi-compartment tanks the atmosphere is explosive (biogas) and oxygen deficiency. Only the maintenance company or the manufacturer's personnel is therefore permitted to enter the tank but only after sufficient prior aeration. Only the maintenance company or the manufacturer's personnel have the special equipment required. Operator control work (chapter 8.1) must be carried out outside the tank only.	
Attention: Danger of falling into the tank Only the maintenance or start-up personnel with appropriate protective equipment is permitted to enter the tank!	
Attention: How to behave in the event of an accident Whenever someone enters a septic tank, a second person must be there to secure him. Never follow unconscious persons into the tank. Immediately call for help instead.	

It is in your own interest to clean the plant prior to working on it to prevent the danger of infections.

Always protect yourself by means of waterproof protective gear, boots, gloves, and, if possible, also by face protection during cleaning of the plant to avoid being hit by waste water, organic material, etc. Do not use a high pressure cleaner but only a soft water jet.	

Before starting the machine again, check the items mentioned in chapter *Start-up*.
Re-attach all safety equipment, covers, grates completely to their original place and assure that they are properly and completely reattached.

3.1.5 Other dangers

Other dangers are potential, non-apparent dangers.

Despite all precautions taken, there are other dangers, such as:

- To slip on wet or dirty ground
- Malfunctioning or damaged electrical control
- Allergies and irritations caused by contact with waste water
- Infections caused by bacteria or pollution
- Explosions or fire caused by gas or fumes

3.1.6 Unauthorised rebuilding and production of spare parts

Alterations or changes to the plant:

For safety reasons, it is not permitted to make unauthorized alterations or changes to the plant. This applies also to welding work on bearing components.

Any intended modifications, alterations or changes require the prior written consent of Huber Technology.
Use only original spare parts, original wearing parts and original accessories as these are especially designed for the plant. Components purchased from other sources give no guarantee that they have been designed and manufactured to suit the specific operating and safety requirements.

Components purchased from other sources give no guarantee that they have been designed and manufactured to suit the specific operating and safety requirements.

3.2 Machine identification

Any specifications made in these operating instructions apply to only the type of plant that is named on the title page.
The identification plate is attached to the associated equipment unit and specifies the following.

- Name and address of supplier
- Serial name and type, optionally serial number
- Year of manufacture

Always forward the machine type, year of manufacture and order number when inquiring or ordering spare parts to ensure perfect and prompt processing of your queries and orders.

3.3 Incorporated safety systems

The incorporated safety systems are subject to regular checkups (**t** = daily, **w** = weekly, **m** = monthly, **j** = yearly). The following methods are applied:
S = sight inspection, **F** = functional test, **M** = measuring.

The electrical control is designed for connection to the customer's net isolator (switch, plug).

Check-up	
Interval	**Method**
j	**F**

These operating instructions are part of the plant and have to be available for the operating staff at any time. The safety instructions contained must be observed.	

It is strictly prohibited to override any safety instructions or change the mode of action of safety instructions. It is further strictly forbidden to change any instrument settings without prior approval.	

3.4 Safety measures

It is the operator's responsibility to instruct his operating and servicing staff concerning:

- Protective devices on the plant,
- Control of observance of safety measures.

This copy of operating instructions has to be stored to be at hand when needed in future. Observe the intervals for inspection and control measures! In these operating instructions, the work is described so that it can be understood by

- **an instructed person** (referring to chapter *Operation and operation modes*
- skilled staff (referring to chapters *Transport, Installation, Maintenance, Trouble Shooting and Repair*).

The chapters ***Transport, Installation, Maintenance, Trouble Shooting and Repair*** are intended **for skilled staff only**. Any work described under these chapters must be performed by skilled staff only.

Instructed person
An instructed person is a person that has been instructed by a skilled person, and trained if necessary, about the assigned jobs and possible risks arising from improper performance and informed about necessary protective devices and protective measures.

Skilled persons
Skilled persons are persons that are able to evaluate assigned jobs and recognize possible risks, due to their professional skills, expertise and experience and knowledge of corresponding standards.
This definition follows EN 60204-1.

4 Handling and transporting

Observe the following points to avoid damage to the equipment or persons when handling the equipment:

- Only qualified persons are permitted to perform transport work, observing the safety instructions.
- Lifting and righting the equipment should be done only by the lifting eyes provided.
- Use only the lifting devices specified hereunder to transport the equipment.
- Read also the chapter *General Safety Instructions*.

4.1 Dimensions and weight

The weight of the MembraneClearBox depends on the size of the plant.

The plant dimensions and weights are specified in general dimension sheet attached to these installation instructions. All weights (kg) apply to plants of which the associated equipment unit is installed in the cellar of the house (without control panel) and without additional equipment.

MCB size 1 and 2 is for transport packed in a folding box. Bigger plant sizes are shipped on a palette.

4.2 Permitted transport devices and auxiliaries

Have transport and unloading done by experienced experts only.	

Inspect all materials for damage before and during unloading. Any transport damage found should be noted on the bill of lading and the forwarder and manufacturer/supplier notified immediately.

Make sure the delivery is complete by carefully checking all received materials against the bill of delivery.	**Note!**

4.3 Storage

When selecting the storage place take care that the components cannot be damaged. Make sure the components cannot get dirty due to splashes of concrete or mortar and protect the equipment against spark fountains from angle grinders etc.
Cover the MCB module unit and associated equipment of machines stored outdoors and protect them against moisture or rain as the membrane module must never run dry once it is wet. Never expose the complete unit to frost.

Never expose the plant to frost, dust or rain!	**Note!**

4.4 Transport to the installation place

As the situation and possibilities are different on each individual site, we cannot provide exact installation instructions. This work must be carried out by qualified fitters.

Wear safety shoes with steel caps to prevent injuries. Always stand clear off a suspended load!	

Unpacking:
Do not loosen the clamping bands or steel ropes before the machine is right in its installation place.

5 Installation

Observe the following safety instructions when installing the equipment to avoid perilous injuries, damage to the equipment and other physical damage.

- Only qualified persons are permitted to perform installation work, observing the safety instructions.
- Check the machine for transport damage prior to starting with any installation work.
- Make sure that only authorized persons have access to the working area and that installation work does not endanger any other persons.
- All plant connections – cables, hoses, pipelines – must be laid frost-proof (80 cm minimum depth). If this cannot be achieved, an optional trace heating must be installed or an alternative and sufficient frost protection provided.
- Observe the prescribed bending radii when laying cables/hoses/pipelines.
- Read also the chapter *General Safety Instructions*.

5.1 Acceptable environmental conditions

The MembraneClearBox® module unit is installed directly into the last compartment of the septic tank. Depending on the plant size, the associated equipment and control unit are installed either in the cellar of the house or in a control panel mounted next to the septic tank, or sometimes even in a small building if it is a bigger plant.

Frost protection:
Plants without trace heating and insulation and/or casing must not be operated in winter due to the danger of freezing. Appropriate measures must be taken (e.g. installation of a trace heating, insulation of the associated equipment unit) to ensure that the plant cannot freeze. (See 1.4.3.2.)

Protection against dust and water:
As the atmosphere in the multi-compartment septic tank is permanently humid and the unit is operation-conditioned positioned in the activated sludge, the equipment is designed to resist these conditions. The associated equipment and control unit, however, must be protected against water.

5.2 Requirements on the tank and installation place of the associated equipment

For **plants in Germany** the septic tank must be dimensioned according to DIN 4261 and the construction must be intact. The required tank dimensions for different containers are provided in appendix 9 of the general design approval **Z-55.3-107**.

In other countries any technically suitable tank can be used for the treatment of municipal wastewater. Reference values for dimensioning of tanks are specified in the following table.

Table 2: Reference values for the design of the biological treatment unit and dimensioning of septic tanks.

				Inflow			Membrane filtration		Biological treatment			Pre-treatment
		Size		Q_d	Q_{10}	B_d	Permeate setting		MIN aeration tank volume			Capacity
		PE		[m³/d]	[l/h]	[kg/d]	nom [l/h]	max [l/h]	m³ DS **4**g/l	m³ DS **6**g/l	m³ DS **8**g/l	m³
Small biological sewage plants	MCB 1.4	1 -	4	0.60	60	0.20	48	96	0.92	0.61	0.46	3.0
	MCB 2.8	5 -	8	1.20	120	0.40	72	144	1.83	1.22	0.92	4.0
	MCB 4.12	9 -	12	1.80	180	0.60	144	288	2.75	1.83	1.37	6.0
	MCB 6.16	14 -	16	2.40	240	0.80	216	432	3.66	2.44	1.83	8.0
	MCB 6.20	17 -	20	3.00	300	1.00	216	432	4.58	3.05	2.29	10.0
	MCB 8.25	21 -	25	3.75	375	1.25	288	576	5.72	3.81	2.86	11.0
	MCB 8.30	26 -	30	4.50	450	1.50	288	576	6.87	4.58	3.44	12.0
	MCB 10.35	31-	35	5.25	525	1.75	360	720	8.01	5.34	4.01	14.0
	MCB 10.40	36 -	40	6.00	600	2.00	360	720	9.16	6.11	4.58	16.0
	MCB 12.45	41 -	45	6.75	675	2.25	432	864	10.30	6.87	5.15	18.0
	MCB 14.50	46 -	50	7.50	750	2.50	504	1008	11.45	7.63	5.73	20.0
Small ww treatment plants	MCB 16	51 -	58	8.70	-	2.90	480	960	13.28	8.85	8.90	*
	MCB 20	59 -	72	10.80	-	3.60	600	1200	16.48	10.99	10.79	*
	MCB 24	73 -	87	13.05	-	4.35	720	1440	19.92	13.28	13.49	*
	MCB 28	88 -	101	15.15	-	5.05	840	1680	23.12	15.41	15.52	*
	MCB 32	102 -	115	17.25	-	5.75	960	1920	26.33	17.55	17.54	*
	MCB 36	116 -	130	19.50	-	6.50	1080	2160	29.76	19.84	20.24	*
	MCB 40	131 -	144	21.60	-	7.20	1200	2400	32.96	21.97	20.24	*

* mechanical preliminary treatment or sedimentation tank

The values in the table are reference values only! This PE definition does not apply to foreign countries as hydraulic conditions and loads in most cases do not correspond to German sizes (150 l/Ed, BOD_5 = 60 g/Ed), so that each project must be designed specifically and individually for the specific type and amount of wastewater.

The minimum required water level in the aeration tank is 1.6 m.
A start DS of 3-4 g/l is required for initial start-up of the biological system.

Submerged pipes or a scumboard are required at the connecting points between the individual chambers to prevent settleable and floating sludge from passing into the aeration tank.

The associated equipment must be installed in a frost-proof and dry place. If this cannot be achieved, the associated equipment must be purchased and supplied with insulation and heated control panel and must be protected against direct sunlight and permanent temperatures > 35 °C.

A DN 100 cable duct without angles over 30° must be installed in a frost-proof depth between the multi-compartment septic tank and the installation place of the associated equipment, preferably in the cone of the tank respectively as high as possible above water level. The cable duct must be laid with a steady incline from the installation place of the associated equipment down to the tank. Avoid large angles of 45°/60°/90°. The cable duct is required for the hose lines and float switch cables.

The maximum distance between the septic tank and installation place for the associated equipment and control unit is as a standard limited to **15 m**. Any other arrangements require prior consultation of and approval by the manufacturer.

5.3 General instructions for installation

Installation must be carried out in accordance with these instructions if installation is not part of the supply contract with HUBER Technology, or an authorised trader or maintenance company. If installation is not performed by HUBER Technology, HUBER Technology cannot accept responsibility for incorrect offloading or installation.
Installation should preferably be performed by qualified and experienced personnel.

Prerequisites for plant installation:

- **Evacuate** the multi-compartment septic tank and clean it.
- **Aerate** the multi-compartment tank to allow all biogases to escape.
- Completely read these **operating instructions**. They contain important information how to prevent damage caused by lack of knowledge.
- Make sure the tank design is suitable and a **cable duct** (DN 100 minimum) is available that leads to the installation place of the associated equipment.
- **Electrical power** (230 V, 16 A) must be provided to be available at the time of installation where the associated equipment will be installed.
- Make sure a **telephone jack** is available if the plant is to be equipped with telecontrol
- Make sure the operator has arranged for sufficient **activated sludge** to be available on site for initial plant feeding.

Preparatory work:

- Measure the height of the partition wall in the tank (starting from the tank bottom).
- Adjust the height of the aerator installation kit so that the aerator is positioned close to the bottom and as central as possible in the last compartment.
- Adjust the height of the membrane module installation kit so that there remains as much as possible headroom above the membrane module (up to the emergency overflow).
- Select a suitable installation place for the associated equipment (maximum distance: 15 m). Make sure the lines can be laid with a continuous slope and that no water bags can form neither in the air nor in the permeate line.
- Check all assembly and fixing material making sure it is complete.
- Prepare the cable and hose lengths according to the locally required distances.

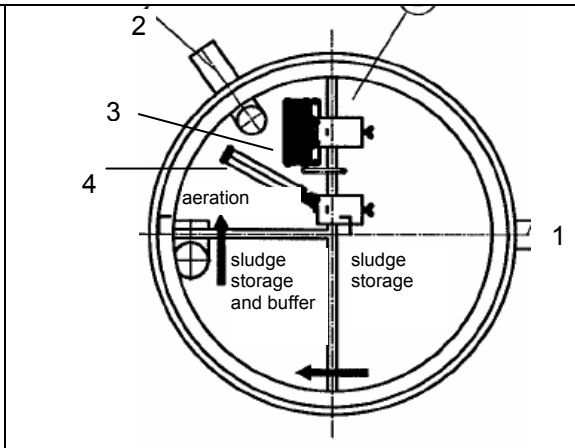
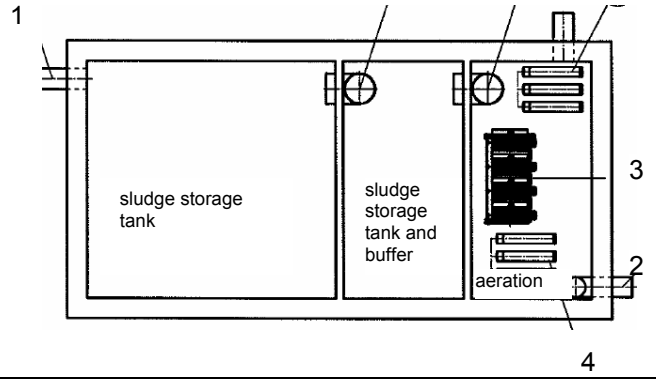
5.4 Assembly and installation

5.4.1 Mechanical installation

- Safeguard yourself outside the tank.

• Handle the MCB module unit with care. Do not bang the aerator or membrane module against any edge or point. • Wear a safety belt during the complete installation to avoid falling into the tank.	**Note !**

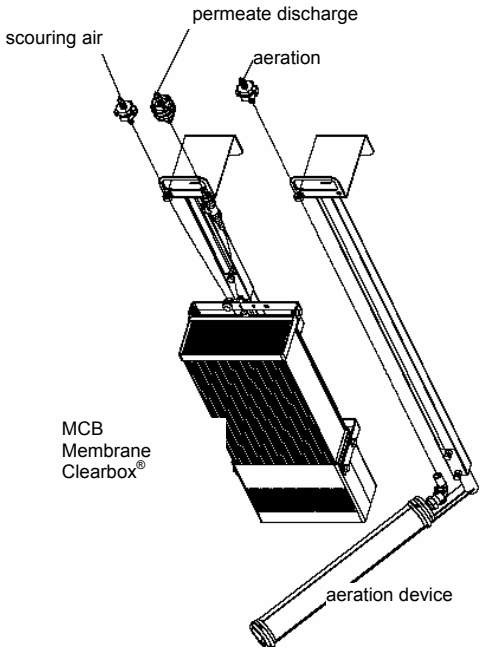
- Position and mount the aeration unit so that perfect intermixing within the tank is ensured. Position the aeration kit centrally and as close as possible to the floor. Pay attention that the aeration plugs are correctly installed. A blue line marks their correct position.
- If it is a MCB size 1 or 2, hang the MCB module unit carefully onto the partition wall in the last chamber, opposite to the feed entrance point, and fix it with wing bolts.
- If its is a MCB size 4 or bigger with an installation kit, screw the base plates with the guide rods individually onto the tank floor and slip the two-storey modules individually over the guide rods.
- The following installation examples are provided for support.

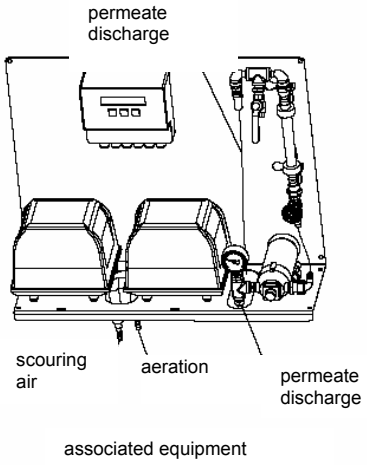
Round multi-compartment tank		1 inlet 2 outlet 3 membrane module(s) 4 aeration system
Angular multi-compartment tank		

- Check the vertical installation!
- Use a traction rope to lead the hoses and cables through the cable duct to the installation place of the associated equipment. Mark them, if required, (with adhesive type for example) to avoid interchanging.
- Connect the hose lines with the couplings. Connect the lines for the pipe aerator and scouring box with GEKA couplings. Connect the permeate line with the Storz coupling. The different couplings are shown in the following graphic.

Storz coupling GEKA coupling

The following graphics explains how to connect the lines.





Mount the rail for the float switches inside the third compartment so that the lower float switch switches off before the module runs dry and the upper float switch enables high-load operation before the tank overflows.

• Mount the **lower float switch** so that dry running of the membrane is eliminated (upper edge of membrane module). • Mount the **upper float switch** so that overflowing of the compartment is eliminated and high-load operation is reduced to a minimum (where possible, approx. 30 cm below the emergency overflow). • Make sure the float switches can operate unhindered and cannot get caught on built-in equipment! Consider this point when installing the plant!	

The float switches must never touch each other during operation, or touch any other object, to avoid malfunctions.	**Attention!**

Bore the holes carefully. Do not bore through the wall!	**Note !**

Installation of the associated equipment unit – How to proceed:

- Mount the associated equipment unit at the selected installation place. If the unit is to be wall mounted, bore holes at the four points provided and screw the unit to the wall.

The surrounding area must be frost-proof, or suitable measures taken to ensure frost protection.	**Attention!**

- Completely wire the plant. Connect the power supply to the control terminals.

Have electro-technical connection work performed by a specialist company as only they know how to work safe with voltage.	**Attention!**

- Connect the hose lines of the MCB module unit with the associated equipment unit but leave the permeate line on the suction side at first unconnected. The permeate line must be filled at the time of initial plant start-up.

Be careful not to interchange any lines as air in the permeate line would destroy the module.	**Attention!**

- Connect the outlet from the associated equipment unit (permeate pump pressure side) with the provided outlet for the permeate. (Where required, back into the tank through the natural plant outlet).

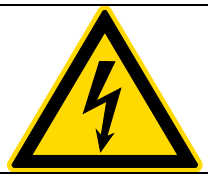
For safety: Never leave the open tank unattended. Close the tank if it is out of sight for a longer time.

5.4.2 Electrical installation

Electrical installation to be carried out by qualified electricians only.

General:
The following instructions are offered for guidance if installation is not part of HUBER supply. If installation is not included in the supply contract, HUBER Technology cannot accept responsibility for incorrect installation.

Wiring:

Make sure that power supply is disconnected! **Take appropriate measure to secure this status!**	

- If required, wire the control unit with the mains voltage via a suitable net isolator.
- If required, wire the associated equipment unit with the mains voltage via a connection box.
- Wire the float switch at the provided points on the electrical control system.
- Check that the limit switch of the flow meter is properly wired to the electrical control system.

Faulty wiring of the plant can damage the associated equipment and electrical control system.	**Note !**

6 Start-up

Observe the following instructions when performing plant start-up to avoid injuries or damage to the plant.

- Only qualified persons are permitted to perform start-up work, observing the safety instructions.
- Check before the first start-up that all tools and foreign objects have been removed.
- Check once again the correct connections between the MCB module unit and associated equipment unit (hoses and cables of the float switches).
- Check the correct position of the MCB module unit in the tank (see 5.4.1).
- Read also the chapter *General Safety Instructions*.

6.1 Customer-supplied connections

All customer-supplied connections must be installed on the marked positions, or at least as close as possible, according to the manufacturer's instructions respectively installation drawing. (See also under 5.1 and 5.3.)

Electrical connection
The electrical connections must be laid to the installation place of the associated equipment unit; supply of 1 x 230 V with 50 Hz PEN (16 A fusing)

6.2 Checks prior to initial start-up

Prior to initial start-up make yourself familiar with the

- operating and control elements
- plant equipment
- working principle
- immediate vicinity of the plant
- safety devices of the plant
- measures to be taken in case of emergency

Prior to every plant start, check the plant for visible damage and eliminate any damage found immediately or report them to the supervisory staff, as equipment operation is only permitted if in perfect condition.

6.3 Start-up procedure

Tank and module unit

Fill the preliminary treatment unit with wastewater/water.

Fill clear water into the last chamber, in which the filtration unit and aeration system is installed, up to approx 15 cm above the pipe aerator. Activate the aeration blower via the electrical control unit and control the uniformity of aeration inside the tank. (The rising fine air bubbles should be distributed uniformly.) The pipe connections must be leak-proof. There must not be any points where coarse bubbles exit from the aerator.

If big bubbles rise at some point, the aerator or hose connection is damaged. In this case it is necessary to interrupt plant start-up and, if required dismount the aeration system to re-check it.	**Note !**

Activated sludge that must be added to the feed for plant start-up. It is the customer's responsibility to ensure that activated sludge is available on site. Fill the tank (up to above the membrane module) with activated sludge from a municipal wastewater treatment plant or any other small biological sewage treatment plant. Should necessity require it, also pressed activated sludge pellets may be used for plant start-up. (Mix with tap water if no wastewater available.)

The biomass concentration of the activated sludge should be 3 – 4 g/l. This is usually the normal concentration in most biological sewage treatment plants. Should the concentration be higher, it can be diluted to 3-4 g/l.

The biomass concentration of the activated sludge should be 3 – 4 g/l, otherwise the performance of the biological system will be too low, which in turn leads to initially poorer effluent values and damage of the membrane module.	**Note !**

Check the switch points of the float switches already during the filling process. The lower float switch must witch off the plant before the module runs dry. The upper float switch must in time – before the tank overflows – enable the second filtration stage.

Associated equipment
When the tank is filled up to above the membrane module the permeate pipe system must be filled for initial plant start-up of the permeate pump. Use tap water for this purpose and fill it from the upper hose end on the associated equipment unit into the hose until the hose is completely filled. Connect then the end of the permeate hose with the associated equipment unit. Check once again if all hose and cable connections are correctly connected to the associated equipment unit.

Activate the aeration blower via the menu for manual plant operation (see under chapter *Control Philosophy*) menu and control the uniformity of aeration inside the tank. (The rising air bubbles should be distributed uniformly.)

Activate the scouring blower for a short time via the plant start-up menu. (See under chapter *Control Philosophy*.) Check if the air rises uniformly between the membrane plates. Non-uniform distribution of air is a sign for clogging in the scouring box. In this case the MCB module unit must be dismounted and checked.

Change over into AUTO mode. After a short delay the program will start with plant operation.

Adjust the flow-throughs for normal and high-load operation via the electrical control system. (See under chapter *Control Philosophy*.) Check on the display which operating status is prevailing. Check if the flow achieves the preset value again even after a filtration pause. If no, re-adjust the permeate pump via the electrical control system.

Some air may still be in the system in the beginning as not all air can be removed by filling the permeate system. If so, air bubbles can be seen in the flow meter. In this case, operate the plant for a short time in high load mode to suck the air off the system. Then the flow must immediately be reduced to the values specified in the table under 5.2.	**Note !**
Do not leave the plant unattended during this procedure as longer operation with an increased inflow could lead to damage of the ultrafiltration membrane.	**Attention!**

Read the flow measured by the flow meter and compare the flow with the specified values. Correct the set value if required.

Do not allow the values to exceed those specified in the above table as overload may result in a damage of the membrane. A permanently too low value can lead to tank overflow.	

6.4 Checking and setting electrical plant control

The plant control is fully programmed and starts automatically provided the start-up procedure as described under 6.3 is observed. Please check the parameters specified in the table in chapter 5.2, proceeding as described under 6.5.

6.5 Description and operation of the electrical control system

6.5.1 General description

The MCB control system serves for operation of two pumps/blowers via 230 V relay outputs and a PWM controlled direct current pump (PWM = pulse width modulation).
Up to three transmitters (e.g. float switch or flow switch) can additionally be connected.
Any faults that may occur will be indicated acoustically and by a LED on the front plate. As another option, fault indications may be collected via a 230 V connection or a potential-free contact.
The operator guidance is menu-driven with three keys on the front plate and a LCD display with 2 x 20 characters.

Supply:
- Device voltage: 230 V AC
- Fusing: inside the device 6 A

Inputs – outputs:
- 2 outputs 230 V: blower
- 1 output 230 V: fault report
- 1 potential-free closer: fault report
- 1 output 12 V: pump
- 3 inputs 12V : filling level and flow
- 1 battery plug for activation of the net-independent fault report

This chapter explains the operation of the electrical control system. There are two different operation levels: one for the user and one for the service expert. The menu navigation is the same for both. Parameters can be changed only on the service expert level by operating the "security level mode" key.

Only authorised service experts are permitted to change parameters. Improper parameter settings can damage the plant.

6.5.2 Safety instructions

This chapter refers to the electrical control system only and contains important instructions and warning notices. It is therefore essential prior to starting with installation and start-up that the service technician and responsible operator reads this document, which further must at any time be available ready to hand at the installation place of the plant.

This document does not cover all constructional details and options, neither all circumstances or events that may occur during plant installation, operation or maintenance.

Installation and handling of the electrical control system requires well-trained personnel (see EN 50 110-1).
Ask the manufacturer if there are any information or instructions you cannot find in this documentation. In case of non-observance the manufacturer will not take on any liability.

Prior to start-up and switching on the mains voltage make sure that
- the device does not show any visible damage.
- especially the mains connections and pumps a are properly connected.
- the protective cover is closed (protection against contact)
- the prescribed fusing value of the mains fuse is used.
- all connections have been established properly and professionally.

- all cables and lines have been laid and designed according to applicable standards and regulations
- the device is properly connected
- the plant is properly protected.

Observe the applicable standards (EN, VDE, …) and regulations of the local energy suppliers.

It is absolutely essential to switch off the voltage before opening the device. **Open only the bottom terminal box cover. Never open the top casing cover!**	

6.5.3 Control philosophy

MembraneClearBox® plants are equipped with the following control philosophy.

Electrical control includes a start delay; i.e. the respective associated equipment is enabled approx. 5 seconds after connection to the mains supply. Operating hours counters for the associated equipment are integrated in the electrical control system.

Permeate pump

The permeate pump is a two-stage operation pump.

The permeate pump operates in a clock cycle that can be programmed in a display. This is required to achieve during the rest periods of the permeate pump more intensive filter cleaning by means of scouring air.

A switch contact on the flow meter on the pressure side of the permeate pump is provided to control the programmed minimum delivery of the permeate pump. If the delivery falls below this minimum amount, the electrical control system will add an extra scouring pause, i.e. the permeate pump is switched off and the scouring blower remains in operation (see above.) The pause length is selectable via the display. Flow control is effective only during permeate pump operation.
As such delivery amount variations can operationally occur but are eliminated by adding an extra scouring pause (60 sec.). However, as counteraction is required if they occur frequently especially at the end of the nominal filter running time, the extra scouring pauses are counted. If more than five extra scouring cycles are counted within one hour, filtration is taken out of operation (fault: flow too low). If less than five extra scouring cycles are counted within one hour, the counter is reset. In this way it can be achieved that in temporary phases of increased covering layer formation on the filter (which may be caused by high-load operation) the plant is returned into normal operation by means of extra scouring pauses.
The operating hours of filtration are recorded in the system. When the filter is at the end of its nominal operating time, a signal is sent but the plant continuous to operate.
The plant is operated level-dependent. If the filling level is so low that continued filtration would lead to dry running of the membrane, filtration is switched off and the plant changes into low-load mode. This is also the switch mode for a longer absence or holiday to keep the biological system in a ready-to-operate status.
When wastewater flows again into the plant, the electrical control switches back into normal operation. If this step is insufficient for the prevailing inflow conditions, this will be registered by the second flow switch and high-load operation enabled.
After the increased inflow is worked off and the filling level low again, the plant returns to nominal filtration respectively later into low-load mode.

Scouring blower

The air that is permanently blown into the gaps between the vertically arranged plates of the filter module creates a flow that washes off the covering layer forming on the filter surfaces during filtration, respectively prevents formation of covering layers.

Depending on the filling level in the tank the scouring blower is operated in two different operation modes. While the plant is in filtration mode, i.e. at least the lower float is activated, the scouring blower operates continuously. If there is no inflow into the tank, the plant switches into low-load mode and the scouring blower switches into a low-load operation.

Aeration blower
The aeration blower supplies the biological system with the oxygen required and is also operated in two different operation modes. While there is inflow into the plant, the blower operates in a normal aeration cycle, otherwise in a low-load mode.

Airlift (optional):
If HUBER supply does not include a maintenance contract and regular excess sludge discharge is impossible, an optional airlift is available from HUBER. This airlift, however, must be adjusted to suit specific local conditions. Therefore, setting recommendations cannot be provided here.

6.5.4 Operation modes:

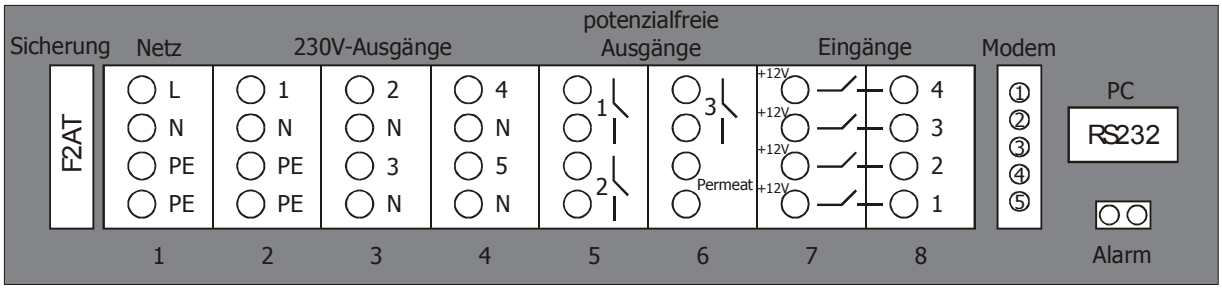
Low load mode
Both float switches have not responded and filtration is out of operation. In this operation mode both blowers go into operation only for a short time and are then switched off again. In addition, the permeate pump has a blocking protection integrated that puts this pump daily into operation for 5 seconds in case the operator is absent.

Normal operation
The lower float switch has responded, the upper float switch has not responded. The plant delivers the normal amount, the scouring blower operates continuously, the aeration blower operates in defined time cycles.

High load operation
The upper float switch has responded and activated the second stage (high load mode) of the permeate pump so that an increased amount is delivered and the plant is thus able to cope with increased inflows.

Check the preset parameters and notify the manufacturer if they deviate. Wrong parameter settings may lead to malfunction of the plant and do therefore not comply with the intended use of the plant.	

6.5.5 Terminal and connection diagram

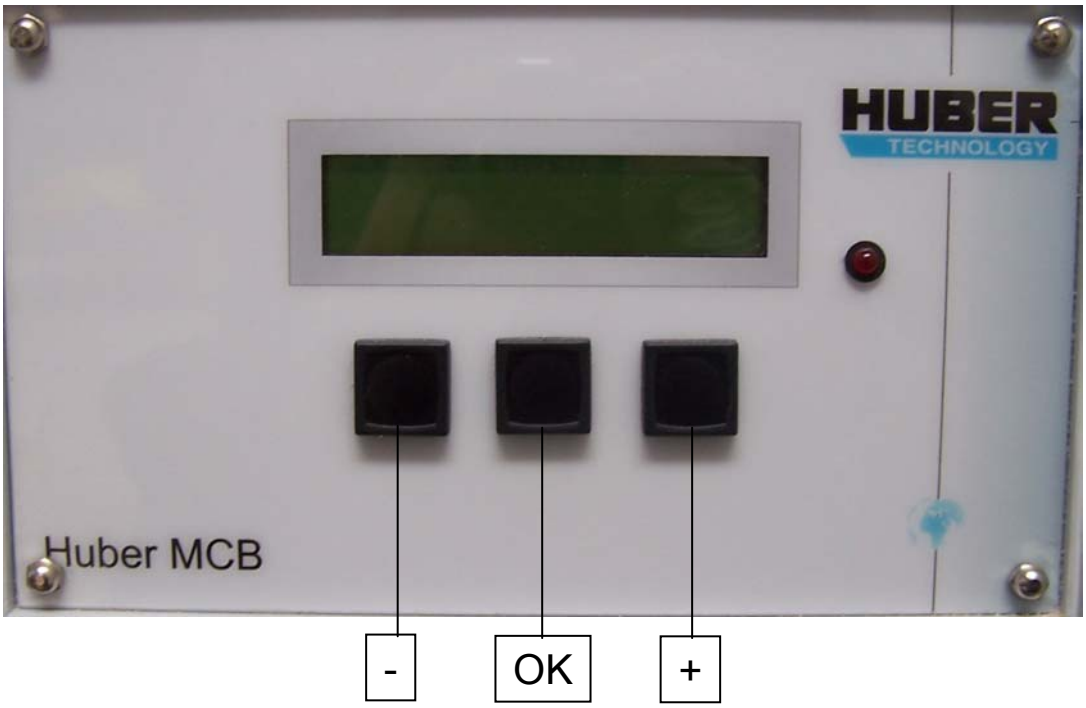


	Application	Connection	Terminals	Annotations
	Network connection 230V	Block 1	L N PE PE	
230 V outputs (2-4)				
	Scouring blower	Block 2	1 N PE	230 V switched
	Aeration blower	Block 3	2 N PE	230 V switched
	Alarm		3 N PE	No alarm -> continuously activated
	Airlift	Block 4	4 N PE	230 V switched
	-		5 N PE	*Blank*
Potential-free outputs				
	Alarm	Block 5	1	
	-		2	*Blank*
	-	Block 6	3	*Blank*
	Permeate pump		Permeate	PWM output 12V
Inputs				
	Flow switch	Block 7/8	1	
	Upper float switch		2	
	Lower float switch		3	
	-		4	*Blank*
Modem				
	Modem connection	Modem	1=orange 3=red 5=green	
PC				
	PC connection	RS232		

Alarm:
To be bridged at the time of plant start-up. (Power failure detection)

6.5.6 Operating display overview

Key pad mode:

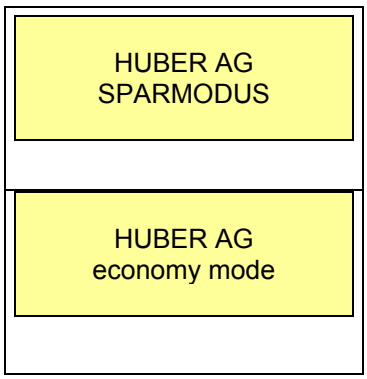


The electrical control unit has a double-line LCD for 20 digits each, which are displayed in clear text.

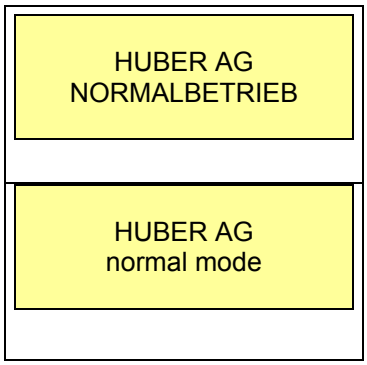
- : Select (up)
OK: Confirm
+ : Select (down)

6.5.7 Operation mode display

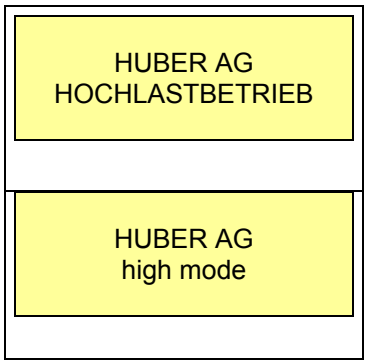
When the plant is operating without trouble, the following basic information will be displayed, depending on the present operation mode the plant.



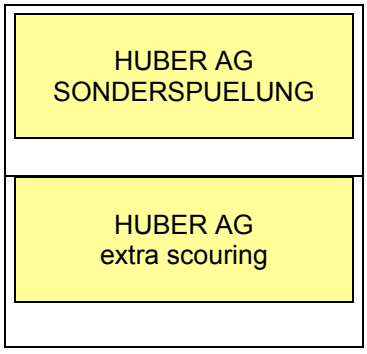
This is displayed when the plant is operating in economy mode.



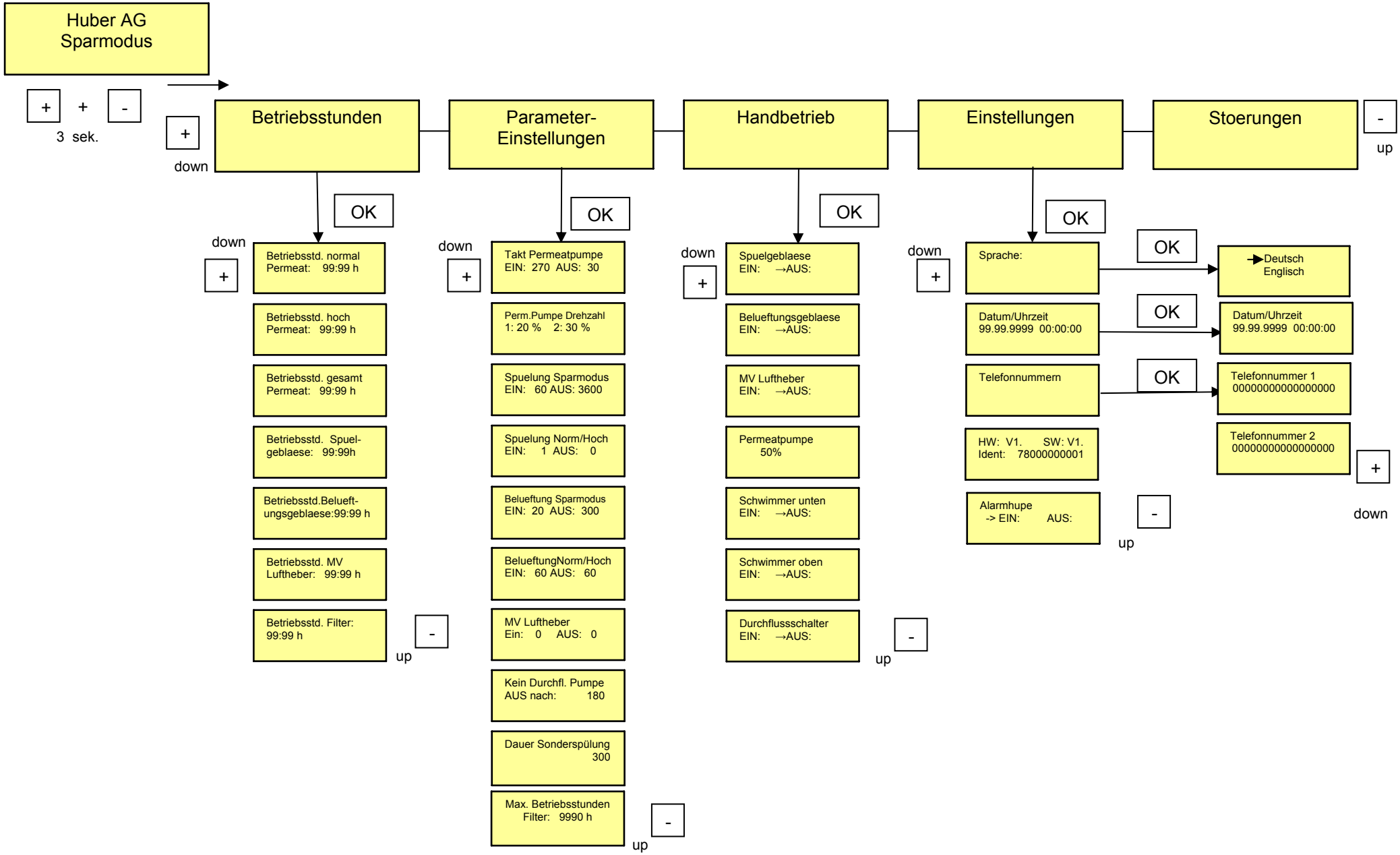
This is displayed when the plant is operating in normal mode.

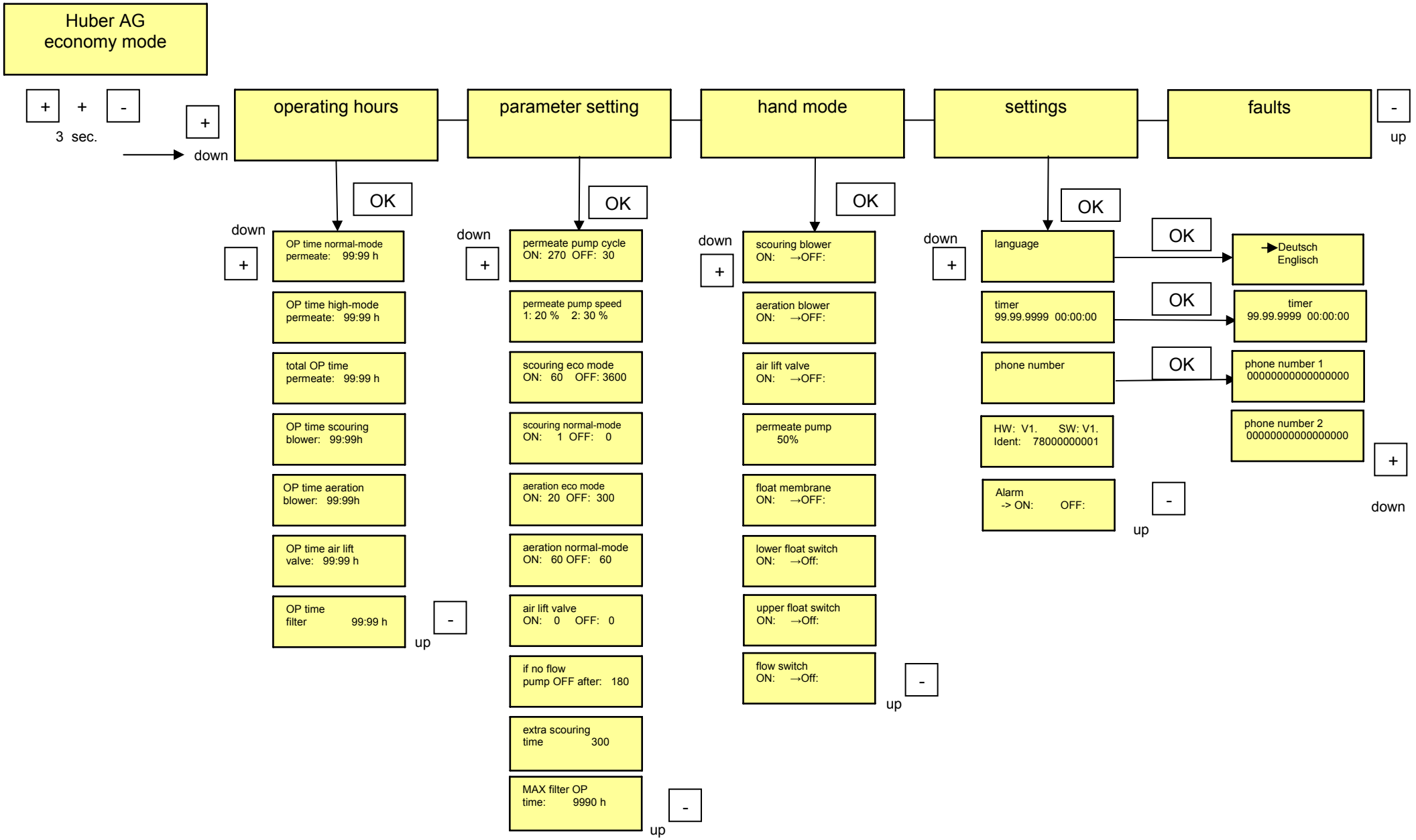


This is displayed when the plant is operating in high load mode.



This is displayed when the plant is performing an extra scouring cycle. Extra scouring is performed when the plant switches from high load mode into normal mode, or when the flow is too small.


Huber AG
Sparmodus
+ + -
3 sek.
+
down
Betriebsstunden
Parameter-
Einstellungen
Handbetrieb
Einstellungen
Stoerungen
-
up
OK
down
+
Betriebsstd. normal
Permeat: 99:99 h
Betriebsstd. hoch
Permeat: 99:99 h
Betriebsstd. gesamt
Permeat: 99:99 h
Betriebsstd. Spuel-
geblaese: 99:99h
Betriebsstd.Beluef-
tungsgeblaese:99:99 h
Betriebsstd. MV
Luftheber: 99:99 h
Betriebsstd. Filter:
99:99 h
up
-
Takt Permeatpumpe
EIN: 270 AUS: 30
Perm.Pumpe Drehzahl
1: 20 % 2: 30 %
Spuelung Sparmodus
EIN: 60 AUS: 3600
Spuelung Norm/Hoch
EIN: 1 AUS: 0
Belueftung Sparmodus
EIN: 20 AUS: 300
BelueftungNorm/Hoch
EIN: 60 AUS: 60
MV Luftheber
Ein: 0 AUS: 0
Kein Durchfl. Pumpe
AUS nach: 180
Dauer Sonderspülung
300
Max. Betriebsstunden
Filter: 9990 h
Spuelgeblaese
EIN: →AUS:
Belueftungsgeblaese
EIN: →AUS:
MV Luftheber
EIN: →AUS:
Permeatpumpe
50%
Schwimmer unten
EIN: →AUS:
Schwimmer oben
EIN: →AUS:
Durchflussschalter
EIN: →AUS:
Sprache:
Deutsch
Englisch
Datum/Uhrzeit
99.99.9999 00:00:00
Telefonnummern
Telefonnummer 1
00000000000000000
Telefonnummer 2
00000000000000000
HW: V1. SW: V1.
Ident: 78000000001
Alarmhupe
-> EIN: AUS:
down

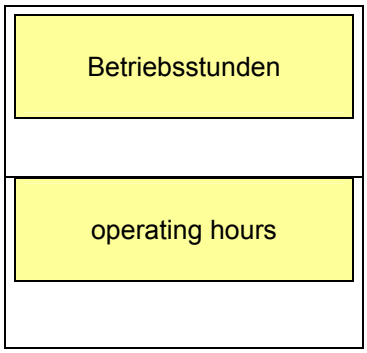

Huber AG
economy mode
+
+
-
3 sec.
+
down
operating hours
parameter setting
hand mode
settings
faults
-
up
OK
down
+
OP time normal-mode
permeate: 99:99 h
OP time high-mode
permeate: 99:99 h
total OP time
permeate: 99:99 h
OP time scouring
blower: 99:99h
OP time aeration
blower: 99:99h
OP time air lift
valve: 99:99 h
OP time
filter 99:99 h
-
up
permeate pump cycle
ON: 270 OFF: 30
permeate pump speed
1: 20 % 2: 30 %
scouring eco mode
ON: 60 OFF: 3600
scouring normal-mode
ON: 1 OFF: 0
aeration eco mode
ON: 20 OFF: 300
aeration normal-mode
ON: 60 OFF: 60
air lift valve
ON: 0 OFF: 0
if no flow
pump OFF after: 180
extra scouring
time 300
MAX filter OP
time: 9990 h
scouring blower
ON: →OFF:
aeration blower
ON: →OFF:
air lift valve
ON: →OFF:
permeate pump
50%
float membrane
ON: →OFF:
lower float switch
ON: →Off:
upper float switch
ON: →Off:
flow switch
ON: →Off:
language
timer
99.99.9999 00:00:00
phone number
HW: V1. SW: V1.
Ident: 78000000001
Alarm
-> ON: OFF:
Deutsch
Englisch
timer
99.99.9999 00:00:00
phone number 1
00000000000000000
phone number 2
00000000000000000

6.5.8 Operation

The electrical control system is operated by menu navigation. Operate the **left key (-)** and **right key (+)** for three seconds **both at the same time** to enter the MCB control menu. Use now the **right key (+)** and **left key (-)** to move between the five different menu items.
Operate the **middle key (OK)** for three seconds to exit and return to the operation mode display.
The following menu items are available.

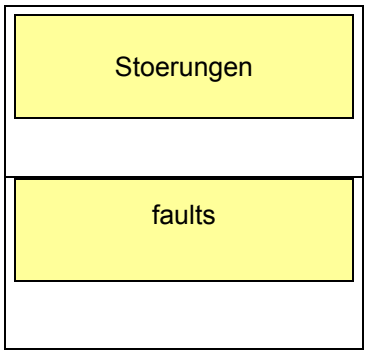
1. Menu items

a) Operating hours



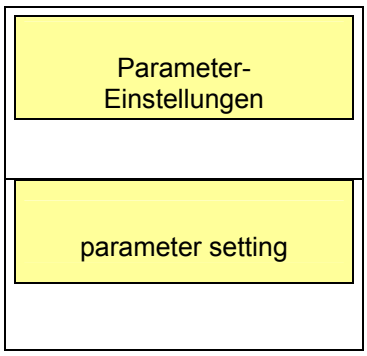
In this menu item the operation hours of the individual associated equipment can be read and reset to zero.

b) Faults



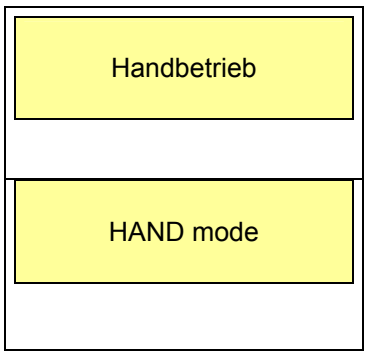
In this menu item the last ten fault reports can be looked up.

c) Parameter setting



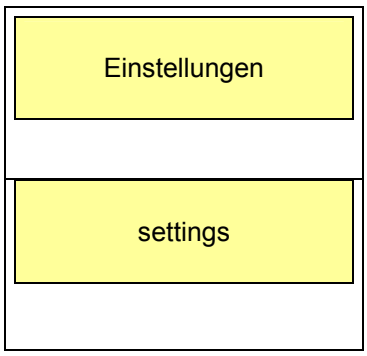
In this menu item the parameters for the individual associated equipment items can be set and read (but only possible in security level mode).

d) Start-up



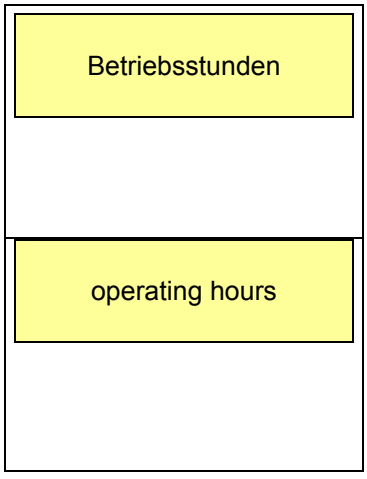
This menu item provides a possibility to operate all associated equipment items manually. In addition, the function of the float and flow switches can be checked here.

e) Settings



In this menu item the standard settings of the electrical control system can be programmed.

2. Operating hours



This menu item displays the operation hours of the individual associated equipment. Operate the **middle key (OK)** for a **short** moment if you want to read the operation hours of the individual associated equipment. You are now in the menu *operating hours.* Use now the **right key (+)** and **left key (-)** to move between the different operation hours indications. Use the **right key (+)** to move forwards and the **left key (-)** to move back. Use the **left key (-)** to exit and return to the overview menu. Operate the **middle key (OK)** for approx. three seconds to exit and return to the operation mode display.

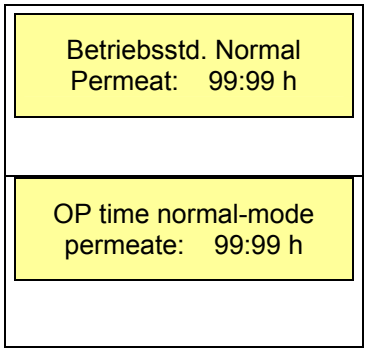
Only authorised service technicians are permitted to perform this work!!!

If you want to reset operating times to zero, select at first the individual operating time you want to reset to zero. Keep the **security level mode key (G)** pressed and operate the **middle key (OK)**.

Possible display options for operation time:

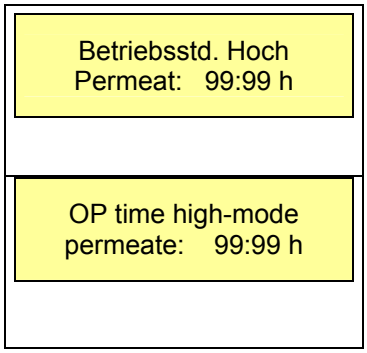
All values specified in hours.

a)



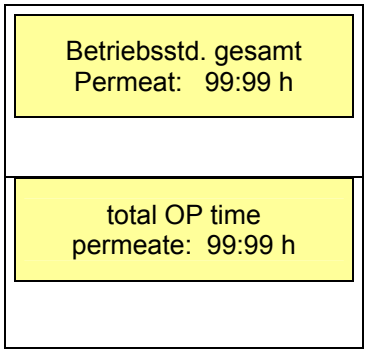
Displays the operation hours of the permeate pump in normal mode.

b)



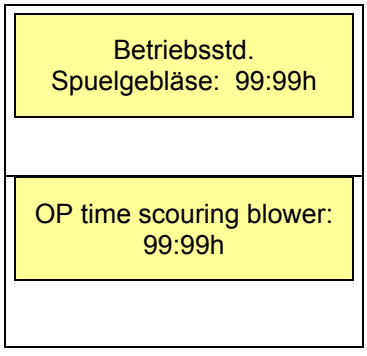
Displays the operation hours of the permeate pump in high load mode.

c)



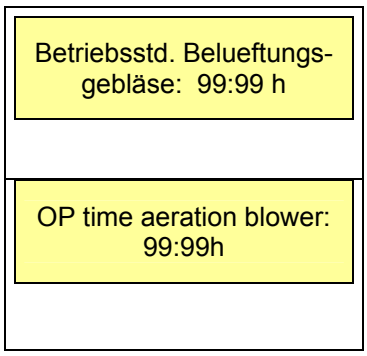
Displays the total operation hours of the permeate pump. (Operation hours in normal mode and high load mode summed up.)

d)



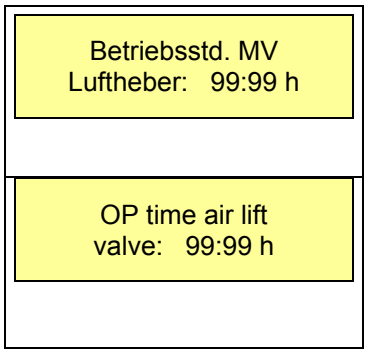
Displays the operation hours of the scouring blower.

e)



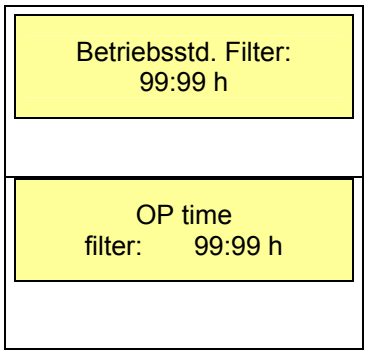
Displays the operation hours of the scouring blower.

f)



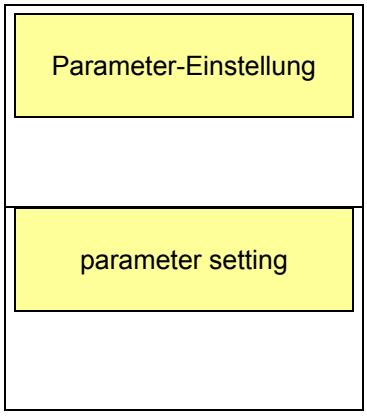
Displays the operation hours during which the airlift solenoid valve has been open.

g)



Displays the operation hours of the filter since its latest cleaning cycle. This operation hours display can only be reset to zero as described under 7 c) concerning the fault indication *filter operat. time end*.

3. Parameter setting



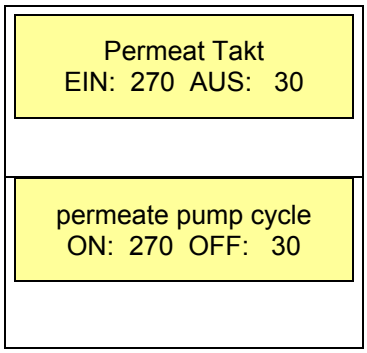
In this menu item all plant-specific parameters can be read, and changed in security level mode. Operate the **middle key (OK)** to move through the parameter setting menu.
Use the **right key (+)** and **left key (-)** to move between the different parameter settings. Use the **right key (+)** to move forwards and the **left key (-)** to move back. Use the **left key (-)** to return to the overview menu. Operate the **middle key (OK)** for approx. three seconds to exit and return to the operation mode display.

Only authorised service technicians are permitted to perform this work!!!

How to change parameters:
After selection of the requested parameter keep the **security level mode key (G)** pressed and operate the **middle key (OK)**.
An arrow will be appearing in front of the settable parameter. Operate the **middle key (OK)** to move between the different statuses (ON; OFF). Use the **right key (+)** and **left key (-)** to change the parameter. Use the **right key (+)** to increase the parameter. Use the **left key (-)** to reduce the parameter. Use the **middle key (OK)** to accept this parameter.

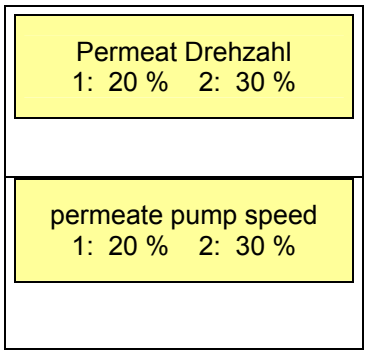
Possible parameter setting readouts

a)



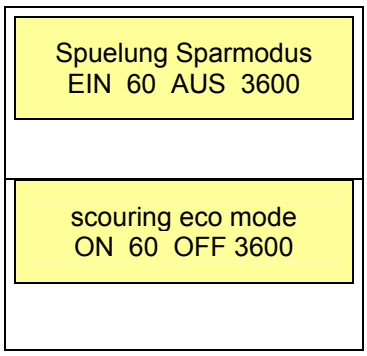
In this window the ON and OFF times of the permeate pump in normal / high load mode can be set.

b)



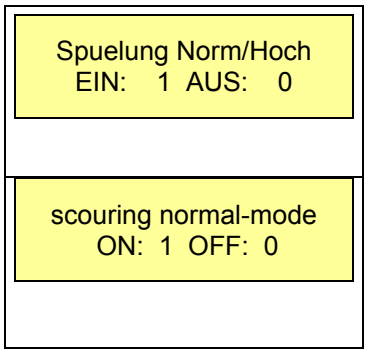
In this window the rotational speed of the permeate pump in normal mode (1) and high load mode (2) can be set. Setting of the speed according to the specified flow rates.

c)



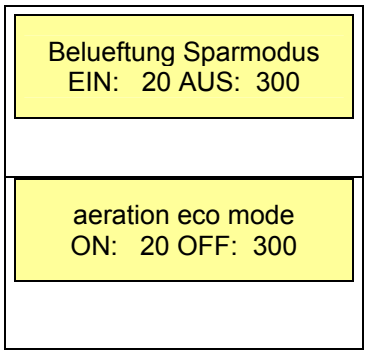
In this window the ON and OFF times of the scouring blower in eco mode can be set. (Idle operation means that the permeate pump is not in normal / high load mode.)

d)



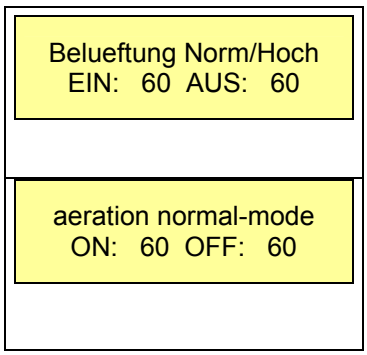
In this window the ON and OFF times of the scouring blower in normal / high load mode can be set. The OFF time is set to "0" because the scouring blower should operate continuously in normal / high load mode.

e)



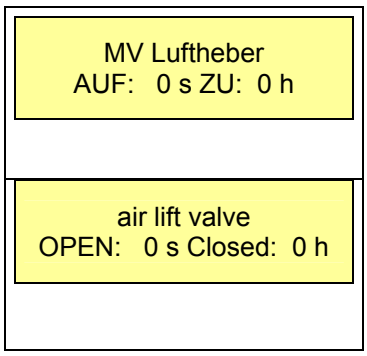
In this window the ON and OFF times of the aeration blower in eco mode can be set.

f)



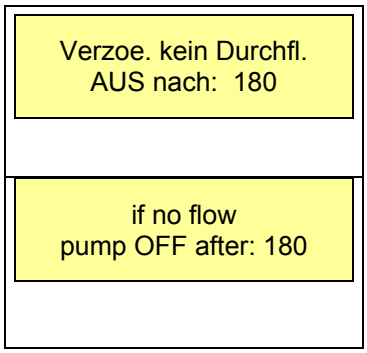
In this window the ON and OFF times of the aeration blower in normal / high load mode can be set.

g)



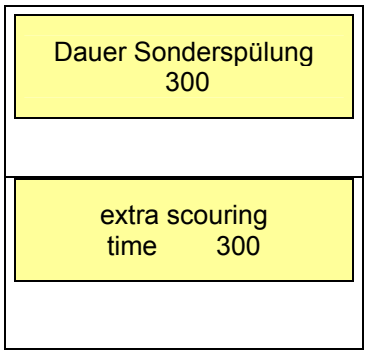
In this window the OPEN and CLOSED times of the airlift solenoid valve can be set.

h)



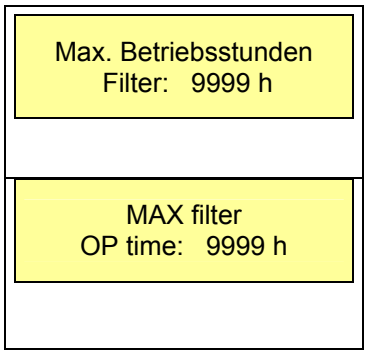
In this window the delay time can be set after which the flow switch control is active.

i)



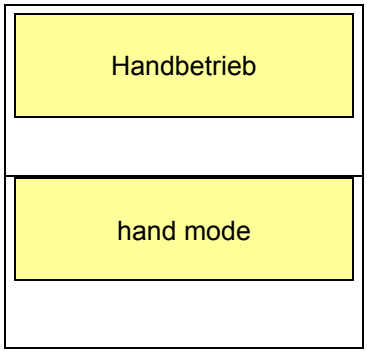
In this window the extra scouring time (in seconds) can be set. Extra scouring is performed when the plant switches from high load mode into normal mode, or when the fault *low flow* is indicated.

j)



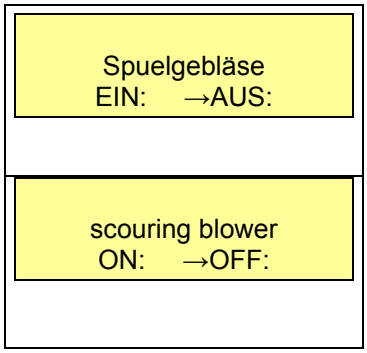
In this window the maximum permitted filter time can be set (filter age up until it must be cleaned).

4. Hand mode



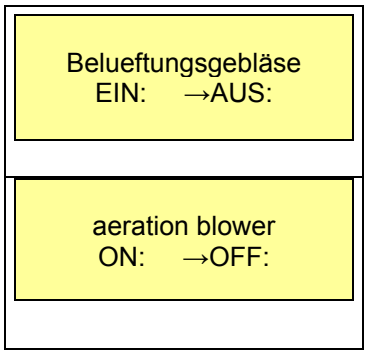
In this menu the individual associated equipment can be switched on manually independent of the filling level. Operate the **middle key (OK)** to move through the hand mode menu. Use now the right **key (+)** and **left key (-)** to move between the following associated equipment:
Operate the **middle key (OK)** for a longer moment to return to the operation mode display.

a)



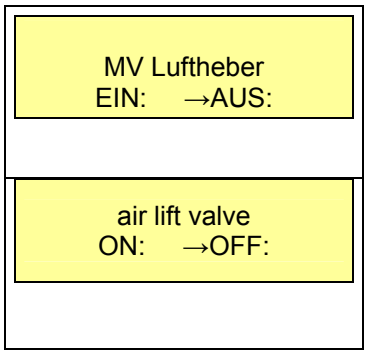
Operate the **middle key (OK)** to switch on the scouring blower. An arrow will appear in front of ON when the scouring blower is ON, or in front of OFF when the scouring blower is OFF.

b)



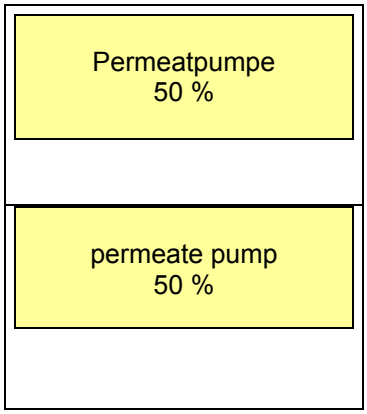
Operate the **middle key (OK)** to switch on/off the aeration blower. An arrow will appear in front of ON when the aeration blower is ON, or in front of OFF when the aeration blower is OFF.

c)



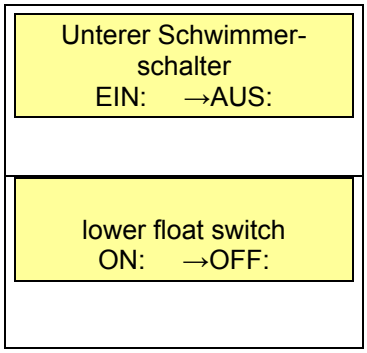
Operate the **middle key (OK)** to switch on/off the airlift solenoid valve. An arrow will appear in front of ON when the airlift is ON, or in front of OFF when the airlift is OFF.

d)



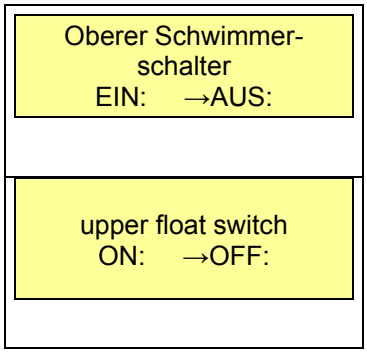
When operating the **middle key (OK)** an arrow will appear in front of the figure for the rotational speed. Use the **right key (+)** or **left key (-)** to change it. Operate the **right key (+)** to increase the parameter. Operate the **left key (-)** to reduce the parameter. By changing the rotational speed of the permeate pump the rotational speed for a defined flow rate (stage 1 and stage 2) can be identified. The speed identified for stage 1 and stage 2 can then be set in the parameter setting menu for the permeate pump. Operate the middle key for a short moment to again take over the old previously programmed value for the rotational speed.

e)



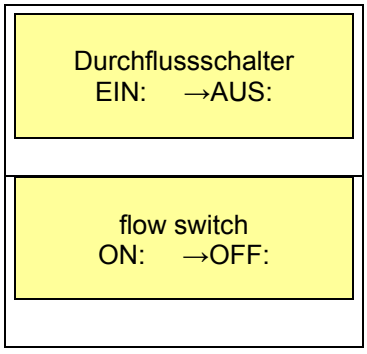
When switching the lower float switch an arrow will appear in front of ON. When switching the lower float switch off again, the arrow will appear in front of OFF.

f)



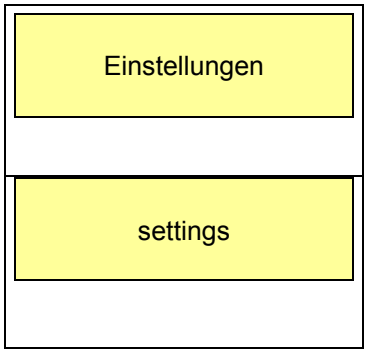
When switching the upper float switch an arrow will appear in front of ON. When switching the upper float switch off again, the arrow will appear in front of OFF.

g)



When switching the flow switch an arrow will appear in front of ON.

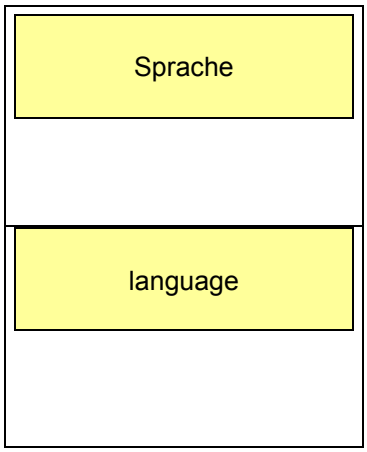
5. Settings



In this menu item the standard settings of the electrical control system can be programmed. Operate the **middle key (2)** to enter the setting menu. Use now the **right key (+)** and **left key (-)** to move between the following setting options:

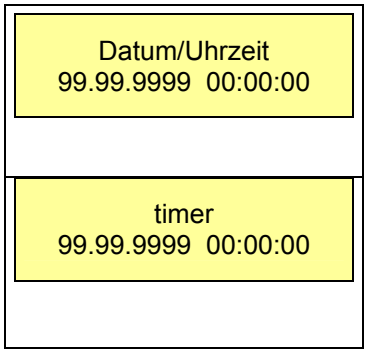
Operate the **middle key (OK)** for a longer moment to return to the operation mode display.

Language



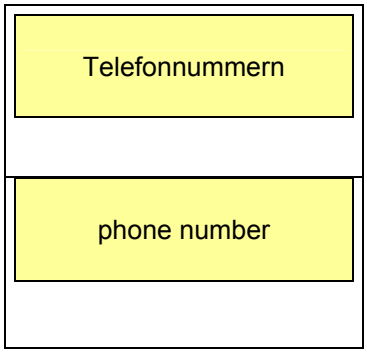
Operate the **middle key (OK)** for a short moment to select the language. You are now in the *language* menu. Use now the **right key (+)** and **left key (-)** to move between the two available languages German and English. Select the language now with the **left (-)** or **right key (+)**. An arrow will appear in front of each language. Operate the **middle key (OK)** for a longer moment to confirm the selected language.
Operate the **middle key (OK)** for a longer moment to return to the operation mode display.

Date/Time

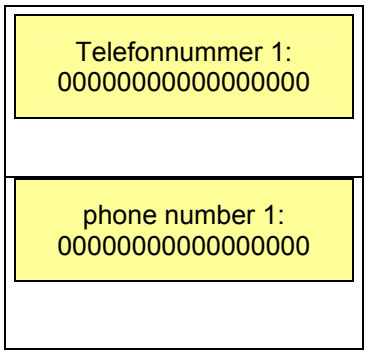


In this window the date and time can be set. Operate the **middle key (OK)** for a **short** moment to change the date or time. The figure to be changed is now blinking. Use the **right key (+)** or **left key (-)** to change it. Operate the **right key (+)** to increase the parameter. Operate the **left key (-)** to reduce the parameter. Operate the **middle key (OK)** for a **short** moment to move to the next digit. Operate the **middle key (OK)** for a **longer** moment to confirm the set date and time.

Phone number

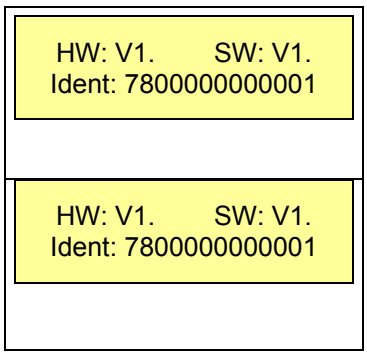


In this menu item the phone numbers of the failure reporting service can be programmed. Operate the **middle key (2)** to enter the phone number menu. Use now the right **key (+)** and **left key (-)** to move between the two possible phone numbers.
Operate the **middle key (OK)** for a longer moment to return to the operation mode display.



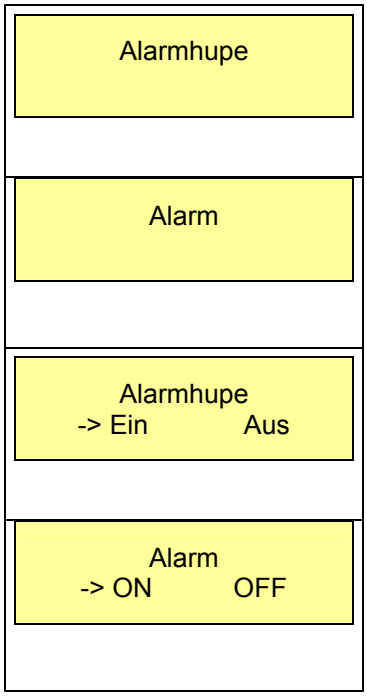
Operate the **middle key (OK)** for a short moment to change the phone numbers. The figure to be changed is now blinking. Use the **right key (+)** or **left key (-)** to change it. Operate the **right key (+)** to increase the parameter. Operate the **left key (-)** to reduce the parameter. Operate the **middle key (OK)** for a **short** moment to move to the next digit. Operate the **middle key (OK)** for a longer moment to confirm the phone number.

Identity check-up



Here you can check up the identity of the electrical control unit. *HW* stands for *hardware number*. *SW* stands for *software number*. *Ident* is the HUBER identity number.

Alarm signal



In this menu item the alarm can be switched ON/OFF.. Operate the **middle key (OK)** to enter the switch ON/OFF menu.

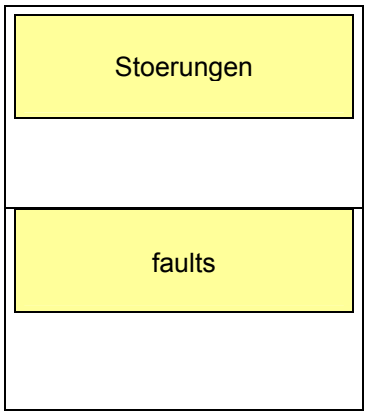
Use the **left key (-)** to switch on the alarm. Operate the **right key (+)** to switch off the alarm. Operate the **middle key (OK)** to accept this parameter.

Operate the **middle key (OK)** for a longer moment to return to the operation mode display.

6. Faults

The control unit is equipped with an optical and acoustic fault detection system. Whenever a fault is detected, the red diode will be lit and an alarm buzzer sound a continuous tone. After fault elimination and reset the diode will go out and the alarm buzzer fall silent. The acoustic alarm can generally be disabled. See under menu item a*larm*. When a fault has been detected, the acoustic alarm can be deactivated.
How to proceed:

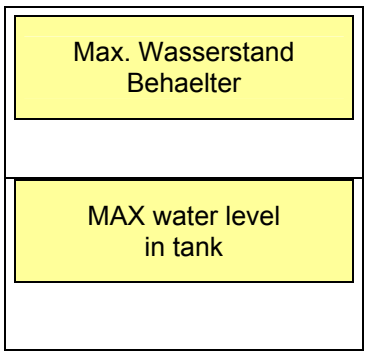
- A fault has been indicated.
- Operate the "+" and "-" keys at the same time.
- Deactivate the acoustic alarm by operating the OK key.



The menu item *faults* indicates the last 10 occured faults with date and time. Operate the **middle key (OK)** for a short moment to read the last 10 faults. Use now the **right key (+)** and **left key (-)** to move between the last 10 faults.
Use the **right key (+)** to move forwards and the **left key (-)** to move back. With the **left key (-)** it also possible to return to the menu overview. Operate the **middle key (OK)** for a longer moment to return to the operation mode display.

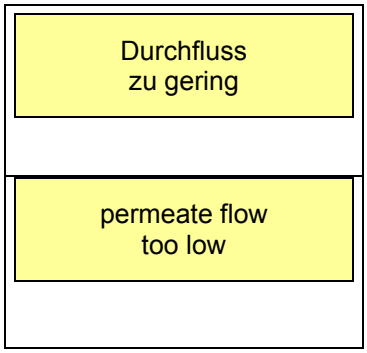
7. Fault reports and their meaning

a)



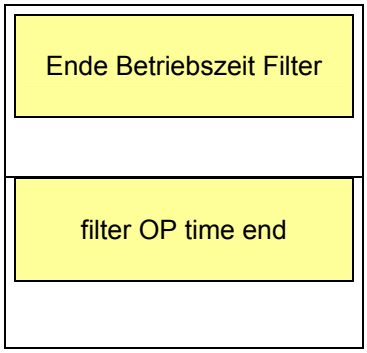
This fault report indicates that the upper filling level switch has been active for longer than three hours. The plant continues operating normally. The fault report will disappear automatically when the upper filling level switch is again deactivated, i.e. when the plant returns to normal operation mode.

b)

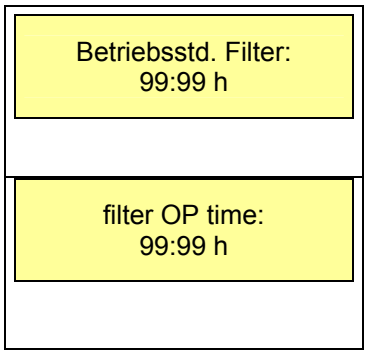


This fault report indicates that the flow switch has not responded within an hour after five pumping-off attempts. The plant can be restarted by switching the supply voltage **OFF** and **ON**.

c)

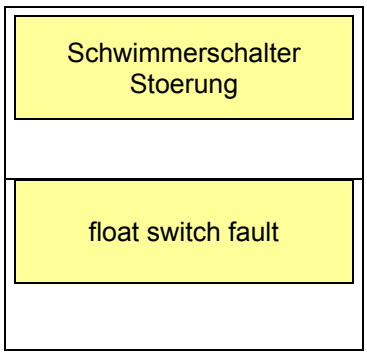


This report indicates that the permeate pump has run for the maximum permissible time since the latest filter cleaning cycle. It is necessary to again clean the filter. The fault report can be reset after completed filter cleaning. Operate the **security level mode key (G) and middle key (OK) both at the same time for a longer moment** to reset the fault report. The operating time will then be displayed.



Operate then the security level mode (G) key and the middle key (OK) at the same time both for a short moment to reset the operation hours to zero. Operate the **middle key (OK)** for a longer moment to return to the operation mode display.

d)



This fault report indicates that the upper filling level switch is active whilst the lower filling level is inactive. The reason for this may be that the lower filling level switch is stuck or has any other defect. The plant continues to operate. Check the lower filling level switch. Operate the **middle key (OK)** for a longer moment to reset the fault report.

8. Technical data

Temperature range (operation)	0 °C ... +40 °C
Temperature range (storage)	0 °C ... +70 °C
Air moisture (operation and storage)	0 ... 90 % RH non-condensating
Protection grade	IP42
Dimensions	215 x 185 x 80 mm
Casing material	light grey plastic
Net connections (L1, N, PE)	230V~ ±10%, 50–60Hz
Scouring blower / aeration blower Relay contact	max. 250V~ AC1: 2.500 VA AC15 (230 V AC) : 500VA 1-phase motor load, AC3 operation (230 V AC): 0.37kW
Fault signal 230V switched, potential-free contact	max. 250V~ AC1: 1.500 VA AC15(230 V AC) : 300VA 1-phase motor load, AC3 operation (230 V AC): 0.185kW
Required pre-fusing	**1 x 16A**
Connection	screw terminals

maximum cable cross sections	1.5mm² inflexible 1.0mm² flexible (with wire end sleeve)
Screw-type cable fittings	6 x M20x1,5
Inputs	12V= / 5mA
Displays	1 x LCD display 2 x 20 characters 1 x LED red (fault report)
Operation	3 keys

7 Trouble shooting and repair

Symptom	Possible cause	Repair
The plant does not run although the mains isolator is switched on (no report on the display).	Connection fault, wrong phasing	Check phasing by means of a phase tester and synchronise with the plant control.
	Connection fault	Check wiring.
	Electrical control is defective.	Measure the power before and after the mains isolator.
Text display "float switch fault"	Jammed float switches	Open the tank and check the float switch position. If required, rearrange the switch in a new position and/or clean it.
	Float switch is defective.	Use a continuity tester to check the float switch function.
Text display "MAX water level in tank"	The plant is longer than three hours in high-load mode ➔ Filtration stops.	Set the float switch position higher if required. Recheck plant dimensioning.
Text display "End of filter operation time"	Membrane module operation time > 3000h, filtration continues to operate.	Clean membrane module, check dimensioning of plant ➔ Clean the filter once a year.
Text display "Flow too low" **Attention: Filtration stopped, remedy this situation immediately!**	Filter blocking	Dismount the MCB module unit, take it out of the tank and check it. If required, purify the unit chemically or replace it. Then check all associated equipment for perfect function.
	Wrong limit contact setting	Check the limit contact on the flow meter ➔ It must lie approx. 30 l/h below nominal flow.
	Wrong flow rate setting	Check the flow rates if they comply with table 2.
	Due to a lack of scouring air the membranes are not cleaned.	Check the scouring air blower: Remove the connecting bow of the blower and check the blower for perfect operation.
		Check the scouring air distribution plate in the scouring box. If required, remove blockings.

8 Maintenance and repair

Enclosed rooms of wastewater treatment plants that need to be entered for service and maintenance have to be aerated in a way that prevents a dangerous explosive atmosphere, lack of oxygen and presence of harmful concentrations of gas or vapour. Only qualified technicians are permitted to enter the multi-compartment tank, but only after sufficient preceding tank aeration.	
The contents and structure of these maintenance instructions have been made up according to DIN 31 052.	
The chapter maintenance and repair is intended for skilled staff only, except for the passage referring to operator control work. Any maintenance or repair work must be performed by skilled staff only.	

Regular cleaning and plant maintenance is required to ensure trouble-free plant operation.

Always wear protective glasses and rubber gloves if harmful materials have been processed by the plant.		

Observe the following instructions when performing maintenance or repair work on the machine to avoid damage to the machine or injuries.

- Prior to performing any repair work, shut off a wide area around the machine.
- Never use any other than the specified operating media.
- Never use any other than the spare parts specified in the HUBER spare parts lists.
- Read also the chapter *General Safety Instructions*.

8.1 Operator control work

The plant must be operated by the owner or a person commissioned by the owner (operator).

The operator is responsible to carry out and document control work on his own responsibility. Any operating disorder must immediately be eliminated by the operator or a specialised company. Keep records an note down any operating disorders or failures that may occur. Keep records also of maintenance work, sludge removal, maintenance reports and other incidents.
The records must be submitted to the responsible authority when requested.

The operator of small sewage plants is bound to keep a log book. The manufacturer does not accept any liability for operational problems caused by improperly controlled plants.	**Note !**

The operator is bound to carry out the control work specified in the below table in the intervals specified and document the work by means of the form attached in the appendix.

Table: Operator control work for MembraneClearBox® small biological sewage plants

Activity	Interval	
	Daily	Monthly
1. Function control (plant in operation?)	x	
2. Reading and recording of operation hours.		x
3. Visual inspection of the outlet for sludge overflow		x
4. Visual inspection of inlets and outlets for blockage		x
5. Check the sedimentation tank and biotank for scum formation. If any, remove it.		x

1. Plant operation
The general plant function is controlled on the display of the control unit where the prevailing operating status must be shown (low-load, normal or high-load mode) according to the description in chapter 6.5.1.

2. Reading and documentation of operation hours.
Reading of the operation hours as described under chapter 6.5.8, documentation in the form attached in the appendix.

The differences from the weekly read operation hours approx. be equal for the individual associated equipment items. If the deviation is very high – despite otherwise unchanged habits – please contact your service company or the manufacturer.	**Note !**

3. Visual inspection of the outlet for sludge overflow
The permeate quality can be determined by means of the transparent float element flow meter on the associated equipment unit. As an alternative the effluent of the complete plant can be controlled.

If particles or suspended material are contained in the permeate, immediately contact the service company or manufacturer. Particles in the permeate are a sign for a damaged membrane or leaking pipeline.	**Note !**

4. Visual inspection of inlets and outlets for blockage
Visual inspection of inlets and outlets of the septic tank for blockages. The inlets and outlets must be free to eliminate backwater in the tank.
Arrange for any blockages to be removed by a specialised company.

5. Check the sedimentation tank and biotank for scum formation. If any, remove it.
Open the multi-compartment tank and observe the surfaces of all compartments. They should be free without any solid sludge layers.
If the sludge layers are very thick, have the settling tanks evacuated.

8.2 Maintenance

The operator receives the permission according to the water right provided he concludes a maintenance contract with the plant manufacturer or a specialised company.
Maintenance to be carried out by the plant manufacturer or a specialised company at least three times a year (approx. every four months).

Before entering aerate the tank for a while and check the atmosphere in the tank by means of a gas warning device. Only qualified personnel with appropriate protective equipment is permitted to enter the tank!	

The scope of maintenance comprises:

- Inspection of the record book and check for regular operation (target-performance comparison)
- Function control of operation-relevant mechanical, electro-technical and other plant parts, in particular the membrane, blowers, pumps and airlift. Maintenance of these plant parts according to the manufacurer's instructions
- Function control of the electrical control and alarm system
- Adjusting the optimal operation values, such as oxygen supply and sludge volume
- Checking the sludge level in the pre-treatment tank / sludge storage tank If required, the operator has to arrange for the sludge to be collected. Requirements-oriented sludge disposal is necessary for perfect plant operation. Sludge removal is required at the latest when the sludge storage tank is filled to 70%.
- Replacement of membranes once a year.
- General cleaning work, e.g removal of sediments.
- Checking the constructional state of the plant
- Check for sufficient aeration and ventilation
- Recording the maintenance work carried out in the record book.

Untersuchungen im Belebungsbecken:
- Oxygen concentration
- Sludge volume

Within the scope of maintenance take a random sample from the effluent and measure the following:
- Temperature
- pH
- Settleable solids
- COD
- NH_4-N
- N_{anorg}
- Turbidity at 520 nm. (This can be omitted if maintenance and membrane replacement are carried out at the same time.)

The maintenance report must be forwarded to the operator who must add the maintenance report to the operation manual, which he has to submit to the building supervisory authority if/when requested.

8.3 Supplementary recommendations for plant operation and efficiency

The following instructions are supplementary recommendations concerning maintenance as described in the DIBT approval.
Membrane plants require supervision by professional experts and may also require increased operator attendance especially in the run-in phase. In the course of the first year plant operation must continuously be optimised to meet the specific local conditions. Like with any other small biological sewage treatment plant, a stable adjustment of the biological system is the basic requirement for a perfect plant operation.
Extreme underloading of the biological system or temperatures < 12 °C may cause problems.
Membrane plants must be inoculated with activated sludge to ensure they achieve their maximum performance right from the beginning.

The following items are prerequisites for achieving the maximum plant efficiency:

- The introduced domestic wastewater must not contain any inadmissible material. (See 1.2.)
- The sludge flocks in the biotank must have a sufficient settleability (sludge index < 100 ml/g)
  Measures to be taken if the index is ≥ 100 ml/g:
  - Inoculation with activated sludge
  - No excess sludge removal
- Adjust the biological system to the real PE figures. (Avoid underloading.)
- Ensure that the biomass concentration in the aeration tank lies over 4 g DS/l (dry substance per litre).
  For the according measures to be taken, see above.
- Make sure the oxygen concentration in the aeration tank does not fall below 2 mg/l.
  Measures to be taken if the concentration falls below 2 mg/l:
  - Check the aeration system.
  - Change the aeration times. (Prolong them.)
- Make sure the pH in the inlet, sludge storage tank and aeration tank does not fall below a pH of 6.8.
  Measures to be taken if the PH falls below 6.8:
  - Check the pH in the inlet.
  - Check if any inadmissible material is introduced.
- Make sure the temperature in the aeration tank is constantly kept at > 12 °C.

8.4 Spare parts, components subject to wear

a) Components subject to wear

All wearing parts are included within the scope of a service contract. If HUBER supply does not include a service contract, the parts listed below are defined as wearing parts and therefore excluded from warranty. Wearing parts are defined as parts that show increased wear due to their function, the degree of wear depending on operational conditions, running hours and plant maintenance.

Main wearing parts of the plant:
- VUM membrane module
- Membrane of permeate pump
- Membranes of blowers
- Air filter of blowers
- Solenoid valves

b) Spare parts

For other spare parts such as permeate pump, blowers, solenoid valve, etc., see appendix.

Whenever you order spare parts please specify:
Size
Order number = machine number
Year of manufacture
Operational voltage of the corresponding electrical component
Order no. from the spare part list (appendix)
Required quantity
Delivery address

9 Shutdown

Observe the following safety instructions for equipment shutdowns to avoid damage to the equipment, injuries or environmental damage.

- Qualified staff only is authorized to carry out shutdowns.
- Contact the manufacturer for questions concerning disposal of the plant.
- Lifting and righting of the equipment must be done only by the lifting eye provided on the MCB module unit.
- This equipment should be moved only with lifting devices of sufficient capacity to handle the weight and size of the equipment as specified hereunder.
- Read also the chapter *Transport*.
- Read also the chapter *General Safety Instructions*.

9.1 Temporary shutdown

A temporary plant shutdown may be required if the operator is absent for longer than 2 months or if longer times without inflow become necessary.

Version a:
Select this version if you are unable to exclude any possibility of frost in the tank, associated equipment unit and pipeline system.

- Switch off the associated equipment unit.
- Dismount the complete MCB module unit and remove the membrane module.
  ➔ The membrane module must permanently be stored moist (best in a filled water bucket). Refer also to the chapter *General safety instructions* and *Assembly and installation*, chapter 5.4.
- Clean the membrane modules: Run a smooth water jet through the individual modules from top to bottom.
- The MCB module unit without membrane modules can either be inserted directly ino the tank or stored in any other place. If stored in any other place, the connections of the air lines on the module must be dismounted and the complete unit cleaned.
- Evacuate the permeate line system on the pressure and suction side and make sure also the pump is emptied. Open the back valve above installation kit and drain the permeate line. Dismount for this purpose the permeate line on the suction side of the permeate pump so that the line sucks in air.
- Close the tank and secure it against unauthorised access.

Version b:
Select this version if you can exclude frost and if the membrane module is always kept moist (which may be impossible due to high water evaporation).

- Switch the associated equipment unit off, respectively pull out the power plug.
- Fill the last compartment of the multi-compartment tank with tap water up to above the membrane module.
- Close the tank and secure it against unauthorised access.

9.2 Final shutdown / Disposal

Qualified staff only is authorized to perform electrical and mechanical shutdowns.
Prior to a final shutdown, follow the instructions for a temporary shutdown according to version A.

- Dismount the float switches and pull them together with the hoses through the cable duct to the associated equipment unit.
- Dismount the associated equipment unit.

10 Additional Information

If you require more information, please write or phone. We will do our best to support you.

Our headquarters:

Hans Huber AG
Maschinen- und Anlagenbau
Industriepark Erasbach A1
92334 Berching
Germany

Phone: +49-8462-201-0
Fax: +49-8462-201-810
E-mail info@huber.de

Our customer service:

Phone: +49-8462-201-455
Fax: +49-8462-201-459
E-mail service@huber.de

We will help you to quickly find the right specialist to answer your questions.

Or visit our website http://www.huber.de providing up-to-date information concerning our Business Unit Service.

Our service comprises **preventive maintenance, routine servicing, short-term repair**. Our service hotline is available **24 hours a day, 7 days a week.**

Our qualified team offers a customer-oriented and reliable service. This service includes:

- **Installation and start-up**
- **Expert support, information and briefing of operating staff**
- **Regular servicing**
- **Optimisation of plant operation**
- **Maintenance of machine performance**
- **Repair and standard spare parts within 48 hours**

These additional services guarantee reliable plant operation, which is an important aspect for both municipal and industrial applications, and will help you to meet the requirements within your area of responsibility.