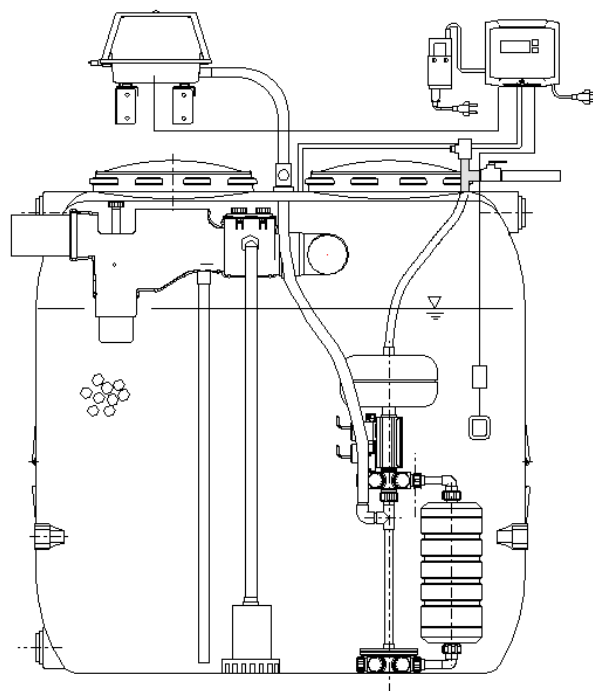


INTEΨA



AQUALOOP System GW greywater recycling

- AQUALOOP System GW 300 L**
- AQUALOOP System GW 600 L**
- AQUALOOP System GW 900 L**
- AQUALOOP System GW 1200 L**
- AQUALOOP System GW 1500 L**
- AQUALOOP System GW 1800 L**

Installation and operating instructions

WATER, WE'RE IN OUR ELEMENT

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1. Introduction

In grey water recycling the less contaminated water from shower, bath tub, hand basin and washing machine is collected and processed for reuse in toilet flushing, garden watering, washing machines and household cleaning purposes. The storage volume required for a grey water system is very small, as the water accumulates daily, therefore grey water systems require little space.

The major benefit of shower water recycling: In many countries, customers are levied twice for municipal water - once for the amount of mains water used and once for the amount sent down the waste pipe. By installing an AQUALOOP grey water system and re-using your water again around the home, you save twice as much on your municipal bills.

The AQUALOOP System is specially designed for grey water utilization in commercial applications. Depends on the mounted amount of membrane cartridges it can treat up to 1800 Liter of grey water per day.

All AQUALOOP components make up the system and are installed by the client in a tank.



Fig.: AQUALOOP System components

This manual describes the assembly, settings, start-up procedure and maintenance of the AQUALOOP System including a troubleshooting description.

2. Dimensioning and general description for the AQUALOOP GW series

The AQUALOOP membrane station can be equipped with 1 up to 6 membrane cartridges. In the standard grey water application 300 liter a day are filtered in maximum with one single membrane cartridge. One full equipped membrane station (6 membrane cartridges) generates a daily flow of 1800 liter.

The bioreactor size depends on the daily recycled quantity and the blower size depends on the amount of used membrane cartridges.

AQUALOOP System GW	0300 L	0600 L	0900 L	1200 L	1500 L	1800 L
Daily treatment quantity (L/day) *	300	600	900	1200	1500	1800
Bioreactor net volume $V_{BR,use}$ (L) **	100-300	200-600	300-900	400-1200	500-1500	600-1800
AL-MS: Membrane station (pcs.)	1	1	1	1	1	1
AL-MEM: Membrane cartridge (pcs.)	1	2	3	4	5	6
AL-F100: Preliminary filter (pcs.)	1	1	1	1	1	1
AL-FK: Support medium (L)	30	60	90	120	150	180
AL-BLxxx: Blower size	AL-BL100	AL-BL100	AL-BL120	AL-BL120	AL-BL200	AL-BL200
AL-VIP: sludge pump	AL VIP	AL VIP	AL VIP	AL VIP	AL VIP	AL VIP

* Typical average daily grey water yield and demand

** $V_{BR,use} = V_{BR,max} - V_{BR,min}$;

Tab.: System specifications for the various AQUALOOP System model sizes

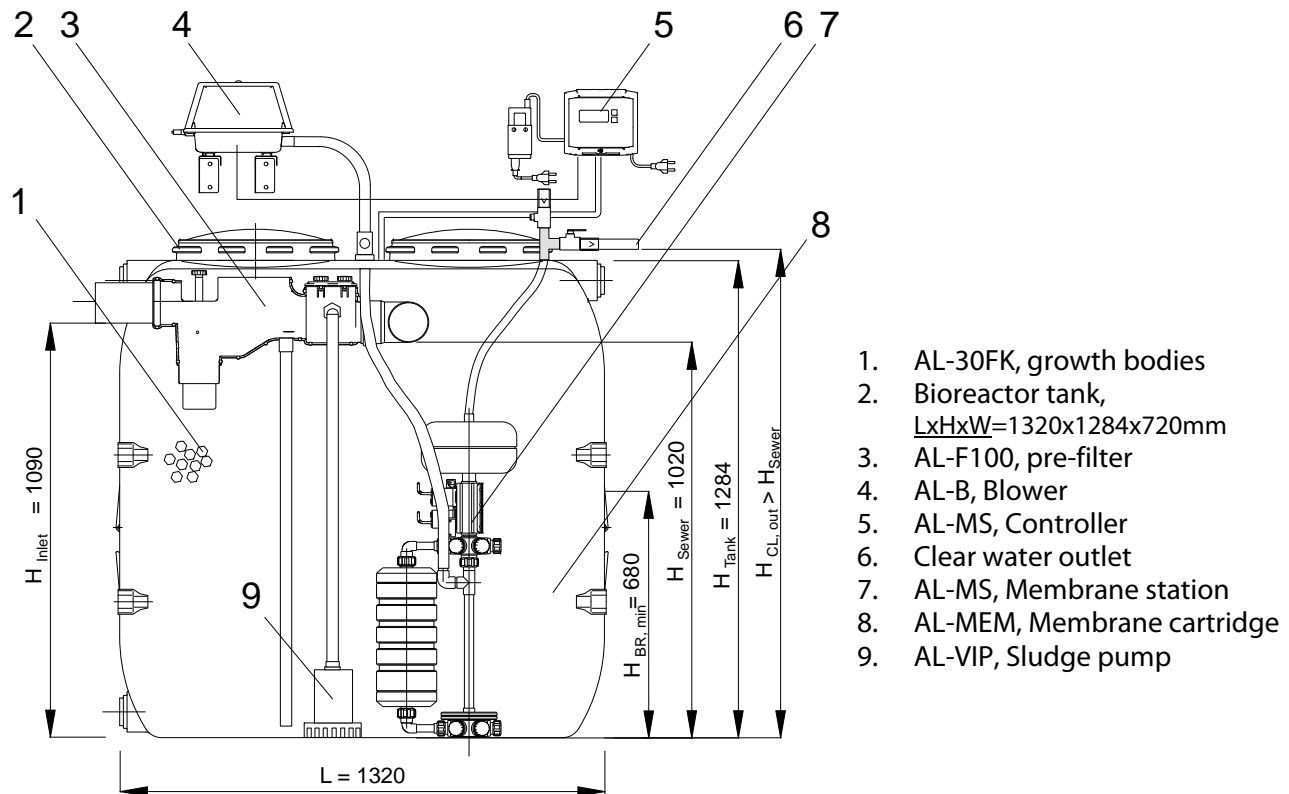


Fig.: Example of an AQUALOOP system 300L (with one equipped membrane cartridge)

2.1 Functional description

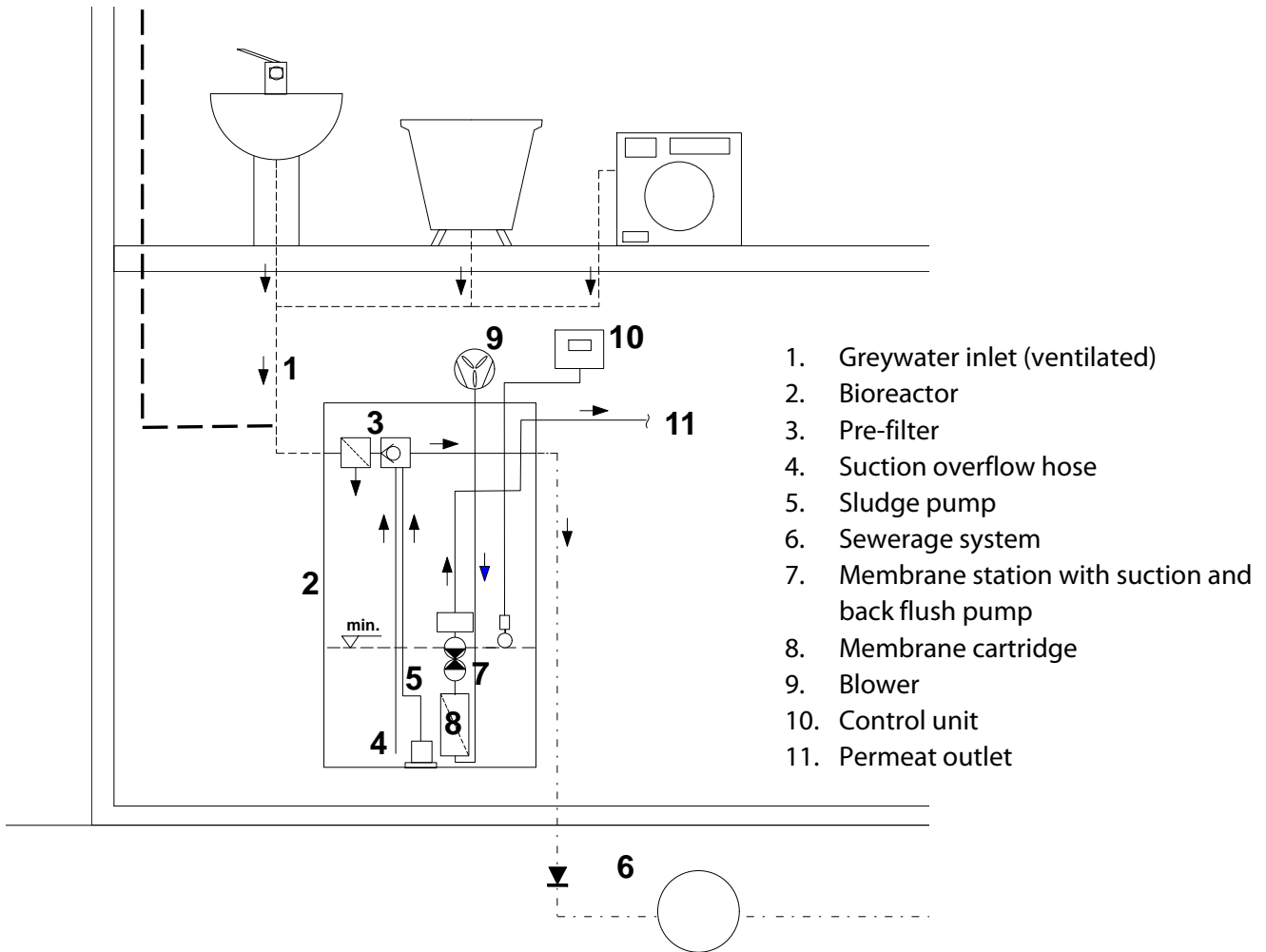


Fig.: Installation layout of AQUALOOP System GW

The grey water (1) from bathroom (bath tub, shower, sinks) and washing machine effluent is filtered by the pre-filter (3) and enters the bio reactor (2). In case the bio reactor is full of water, the grey water flows directly to the filter overflow outlet into the sewer (6). The built in non-return valve prevents the backflow of water, small animals and vermin from entering the tank. With each overflow of the bioreactor the ground sediments are automatically extracted through the suction overflow (4) in the AQUALOOP pre-filter. If the overflow has reached its maximum capacity, the water overflows through the integrated skimmer and thereby cleans the floating debris (foam, grease, oil) from the surface of the water. The sludge pump (5) is connected at a further pre-filter connection and is used for cleaning and maintenance of the system. The sludge pumped outlet is directly routed into the sewer.

In the bio reactor the grey water is treated in a biological way (aeration/growth bodies). The aeration (9) is regulated by the AQUALOOP control unit (10). The aeration pipe is connected on the bottom side with the membrane cartridge (8). The aeration has two functions: Aeration for the biological treatment and cleaning of the membrane fibre themselves.

After the biological treatment the suction pump of the membrane station starts the microfiltration process and the filtered, clear water is pumped to the clear water outlet. After each suction interval (15 min) the membrane is cleaned with a back flush sequence (15 sec).

The minimum level of the bio reactor is controlled by a floating level switch. The filtration process interrupts if the minimum is indicated. The bio reactor is ventilated via a ventilated grey water pipe or via a separate ventilation pipe.

2.2 Influent quality

The AQUALOOP System 300-1800L designed for greywater treatment. Greywater is only less contaminated water from shower, bath tub, hand basin and washing machine!

Permitted entry of the following detergents and cleaning products:

- All usual detergents and personal cleaning products (soap, shampoo, shaving cream, toothpaste etc.) may be used.
- All household cleaning agents are safe to use in accordance with the manufacturer directions for home use.



Attention:

Please attention to water inlet qualities and substances which are not allowed to enter the bioreactor because the membrane filter can be blocked or destroyed. Furthermore the outlet water quality could not guarantee for reuse in this cases!

Water inlet qualities and substances which are not allowed:

- Faeces and kitchen water, fats and chemicals (eg paints, thinners) must not be fed to the plant.
- Hair dyes can cause discoloration of the process water.

Note:

Influent greywater shall be not exceeded the challenge water from NSF/ANSI 350-2012. (Systems treating bathing and laundry source waters combined.)

The 30-d average concentration of the graywater delivered to the system shall be as follows:

Parameter	Range
CBOD (mg/L)	130 - 180
TSS (mg/L)	80 - 160
turbidity (NTU)	2
temperatur	25 – 35 °C
E. coli (cfu/100 mL)	102 – 103
pH (SU)	6.5 – 8.0
total phosphorous – P (mL)	1.0 – 3.0
total Kjeldahl nitrogen – N (mL)	3.0 – 5.0
COD (mg/L)	250 – 400
TOC (mg/L)	50 – 100
total coliforms (cfu/100 mL)	103 – 104

Tab.: Influent quality according to NSF/ANSI 350-2012

2.3 Effluent quality

Based on influent quality the averages treated effluent quality according to NSF/ANSI 350-2012 has to be as follows:

Measure	Class C requirement		Class C AQUALOOP Test result NSF certification	
	Test Average	Single Sample Maximum	Result Average	Single Sample Maximum
CBOD (mg/L)	10	25	10	25
TSS (mg/L)	10	30	10	30
turbidity (NTU)	2	5	2	5
E. coli 2 (MPN/100 mL)	2,2	200	2,0	20
pH (SU)	6.0 – 9.0	NA1	6.0 – 9.0	NA1
color	MR3	NA	MR3	NA
odor	Non offensive	NA	Non offensive	NA
oily film and foam	Non-detectable	Non-detectable	Non-detectable	Non-detectable

¹ NA: not applicable.

² Calculated as geometric mean.

³ MR: measured and reported only.

2.4 Certification NSF/ANSI 350 -2012

Name and address of manufacturer: INTEWA GmbH
 Jülicher Str. 336
 52070 Aachen,
 Germany

Model designations: **AQUALOOP System GW 0300 L**
AQUALOOP System GW 0600 L
AQUALOOP System GW 0900 L
AQUALOOP System GW 1200 L
AQUALOOP System GW 1500 L
AQUALOOP System GW 1800 L

The model designations are tested to meet the requirements in NSF/ANSI 350 corresponding to the designated classification:

Number and Date of NSF/ANSI Standard:	NSF/ANSI 350-2012 Onsite residential and commercial water reuse treatment Systems
Certification number:	
Class of grey water input:	Combined, bathing and laundry water effluent
Class of treated water output:	Class C, multi-family and commercial facilities
Performance classification, (nominal hydraulic daily flow)	AQUALOOP System GW 0300 L = 300 Liter / day AQUALOOP System GW 0600 L = 600 Liter / day AQUALOOP System GW 0900 L = 900 Liter / day AQUALOOP System GW 1200 L = 1200 Liter / day AQUALOOP System GW 1500 L = 1500 Liter / day AQUALOOP System GW 1800 L = 1800 Liter / day

Signed: _____

Fig.: NSF/ANSI350-2012, Certification for AQUALOOP System GW series

3. General safety instructions



The live components have to be installed only by a qualified electrician. In case of failure of the electronic device, the product has to be repaired by a qualified electrician before being operated again. There is a risk of electric shock!

The outlet circuit used for the device has to be secured through a circuit breaker protected (16 A in several countries). If unavailable, an FI switch with maximum operating current of 30 mA has to be connected.

When working inside of the tank or on electrical components unplug the power cord before.

National rules and electrical standards have to be considered!



These installation and operating guidelines have to be read carefully before installing the product. The instructions mentioned have to be followed strictly. Modifications to the product are not permitted, otherwise the warranty becomes void.

National rules and safety standards have to be considered!

The following points have to be strictly observed during the installation and operation:

- Check the product before installation for any visible defects. If defects are present, then the product must not be installed. A damaged product can be dangerous.
- A floor drain has to be provided near the installation site, which can collect inadvertent water discharge (such as with pump defect, pipe breakage etc.) and prevent water damage inside the building. The brickwork behind the water-carrying system must be protected from water (such as with water-resistant paint).
- Make sure that the existing emergency overflows are connected and adequately sized.
- All products must be regularly inspected to maintain proper condition. The minimum inspection interval is mentioned in the maintenance chapter.
- Electric devices may be hazardous for children. Therefore children always have to be kept away from the product. Do not let children play with the product.
- Do not install the water-carrying products in locations where the temperature may drop below 0 °C.
- Do not install any electric products in flood-prone areas.
- The operator is responsible for adherence of the safety and installation guidelines
- Access ports of the tank system shall be protected against unauthorized intrusions (e.g. lockable plant room, a padlock, locking the cover with specialized tools or cover with net weight > 30 kg).
- The national and local regulations with regards to the installation and operation of a grey water harvesting system must be complied by the installer as well as the operator.

4 Declaration of conformity , electrical standards, approvals

The electronical AQUALOOP equipment corresponds with the basic safety and health requirements of the EC directives for machines. Any modification of the equipment not coordinated by INTEWA will void the warranty.

INTEWA GMBH hereby declares that the electronical equipment of AQUALOOP fulfils the requirements of the following EU directives and conforms to the following safety standards for electrical appliances:



EC directives for machines (89/392/EWG) in accordance with 91/368/EWG
EC Low voltage directives (73/23/EWG)
EG Directives for electromagnetic compatibility (89/336/EWG) in accordance with 9

Applied harmonized EU standards:

EN 60335-1: 1194/A1/A11/A12/A13/A14, EN 60335-2-41: 1996

The conformity of the equipment with the above mentioned directives is confirmed by the CE symbol.

Approval:

Switchable power supply:
TÜV Rheinland, TÜV GS approved



5. Scope of delivery, Transporting, Storage

1. AQUALOOP-MS, membrane station with control unit, switching power supplier, floating switch (2pcs.)
2. AQUALOOP-MEM, membrane (numbers depending on necessary daily flow rate)
3. AQUALOOP-F100, pre-filter
4. AQUALOOP-xxL , blower (size depends on the numbers of cartridges)
5. AQUALOOP-FK30I, growth media material (depends on the daily flow rate)
6. Bioreactor tank (size depends on the daily treated water amount)
7. Installation material:
 - Connection pipe for prefilter Ø110mm
 - 3 pcs. cable ducts PG 11 with nut
 - ½" clear water hose
 - 1" aerator hose, inside and outside
 - Dataplate and service label (without picture)



Fig.: Scope of delivery and on site material

The AQUALOOP parts delivered in cartons or on pallet. All parts could unloaded manually (also the tanks).

All parts have to be stored dry and frostproof. The tank can be stored outside but have to be protected against direct sunlight and heat by using a bright, opaque covering.



Please attention.
The parts may be damaged due to inappropriate handling.
Parts not throw or drop.

6. Technical data and installation details

6.1 Membrane station control unit

Dimensions (H x W/(incl. AC switching power supply) x T):	201 x 198 (329) x 110 mm
Mains supply central controller (230V-IN):	110 - 230 V AC / 50-60 Hz
AC switching power supply input:	110 - 230 V AC / 50-60 Hz (24 V DC, 4.0 A)
AC switching power supply output:	24 V DC, 4.0 A
Cable length of mains supply:	3 x 1.0 mm ² x 1.5 m
Cable length of AC switching power supply:	3 x 0.75 mm ² x 2.0 m
Power outputs:	
- Blower (230V Air):	110 - 230 V AC / 50-60 Hz, max. 4 A
- Sludge pump (230V Sludge):	110 - 230 V AC / 50-60 Hz, max. 4 A
Low voltage outputs:	
- Suction pump:	24 V DC, max. 4 A
- Back flush pump:	24 V DC, max. 4 A
- Blower (Air):	24 V DC, max. 4 A (alternative)
Signal inputs:	
- Bioreactor MIN (BR min):	Floating switch, normally open contact
- Clear water tank MAX (CL max):	Floating switch, normally open contact
- Clear water tank MIN (CL min):	Pot, free contact (alternative)
Potential-free signal output:	
- Clear water tank MIN (CL min OUT):	Signal of CL max
Signal inputs:	
- Pressure sensor Membrane hub (ADr):	4 ... 20 mA
- Pressure sensor blower (ADg):	4 ... 20 mA
- Programmer connection:	6 pol., RM 2.53
Protection type:	IP54
Material unit case:	PS, PA
Float switch:	
Function:	Normally open contact (MIN = closed contact)
Cable length x Diameter, Material:	15 m x Ø8 mm, 2 x 0.75mm ² , H07 RN-F
Protection type:	IP68
Material:	PP

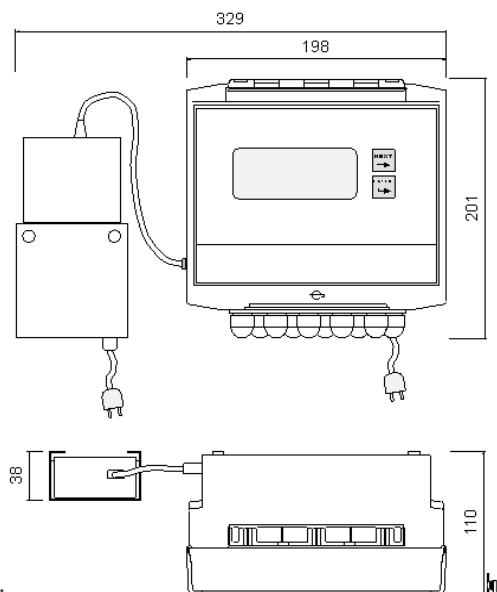


Fig.: Dimensions of controller with DC switching power supply (Front and top view)

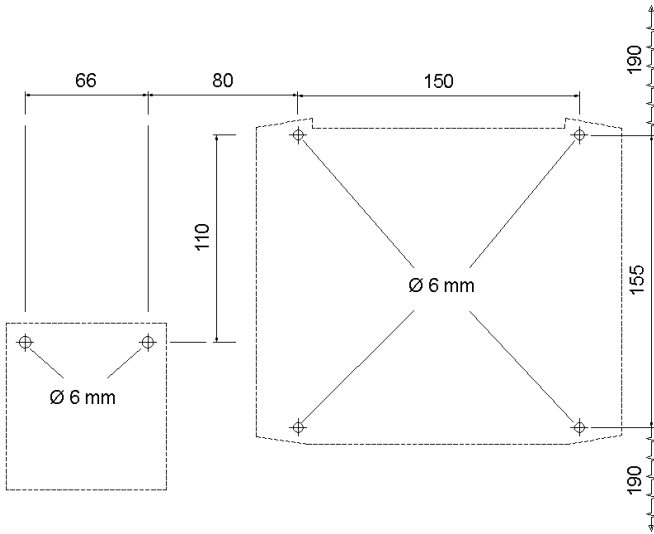


Fig.: Drilled hole distances of controller housing and DC switching power supply brackets

Note: Pay attention that there is space to open the housing lid above the housing and a place for cable routings below the housing installation space (each at least 190 mm).

Electric connections:

- All electric cables are now to be connected to the controller. The spring terminal is opened with the supplied screwdriver.
 - 1.) Insert slotted screwdriver in the top opening, then press from top (arrow direction) and hold.
 - 2.) Insert cable in the opening underneath. Then release the screwdriver (terminal closes) and remove.

Note:

- NOTE: It must be observed during connection of the electrical wiring that the bottom pump is the suction pump (clamp terminal: suction pump) and the top pump is the back flushing pump (clamp terminal: back flush pump).



Fig.: Operating mode spring terminal

Finally, insert the cable bridge plug and firmly press until it is fully inserted.



Fig.: cable bridge

6.2 Membrane station

Article:	AL-MS
Dimension (Ø x H):	max. Ø 504 x 833 mm (with max. mounting)
Weight without Membranes:	3,5 kg
Central blower connection:	Nozzle, Ø 25 mm
Clear water connection:	¾" AG
Power consumption suction- / back flush pump	30-60 W (depending on the membrane amount)
Max. length / height clear water pipe:	max. 10m / 2 m
Height of the clear water hose outlet	$H_{CL, outlet} > H_{sewer}$
Pump cable	2 x 0.75mm ² x Ø 6mm, 3 m
Protection type of pump:	IP68
Material:	PVC (Fittings), ABS (Pump-body), PE (Pump), ceramic (Pump axle) SS304 (back flush tank)
Total weight (total/gross):	11.0 kg / 12.5 kg

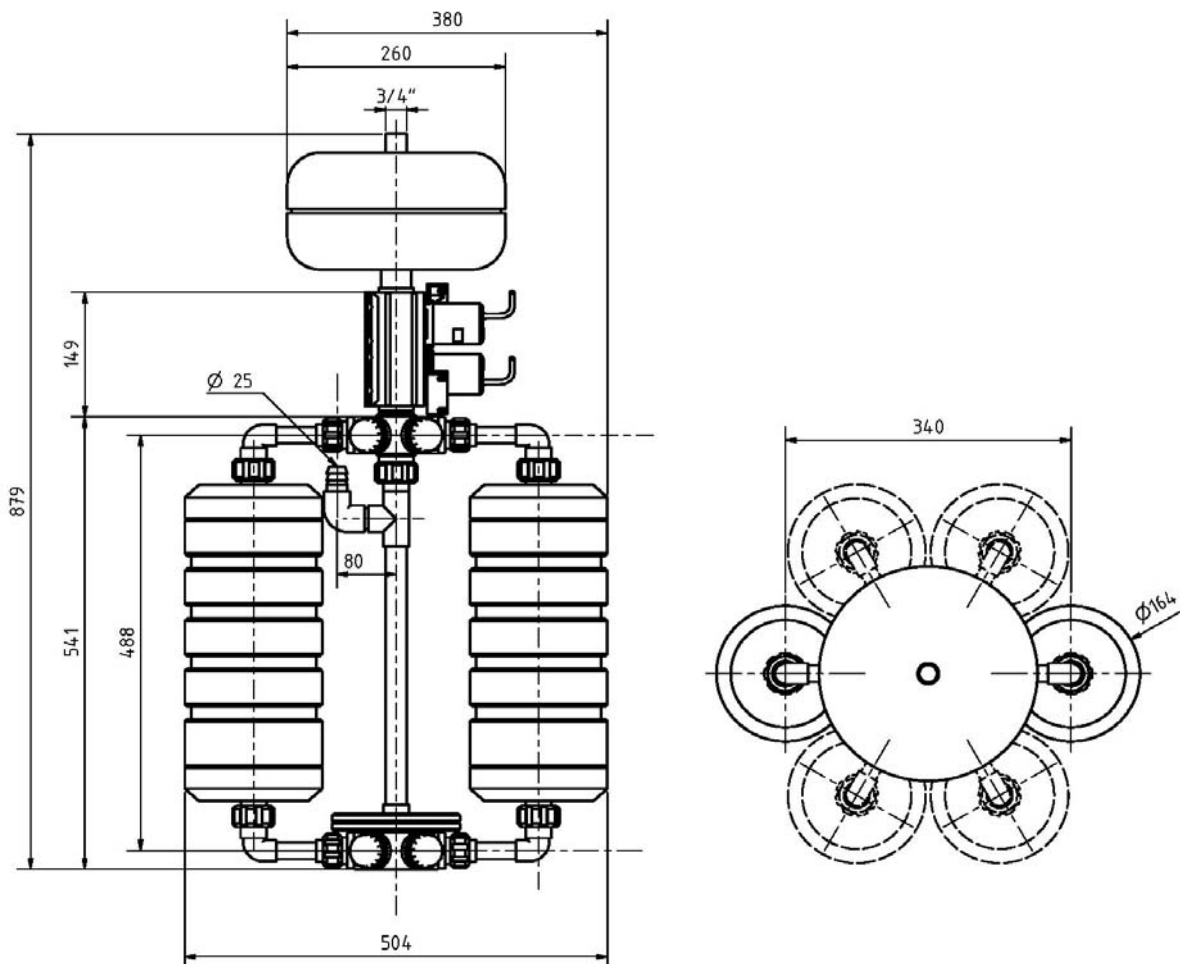


Fig. Dimensions of Membrane station

All connection points are sealed with O-rings or flat seals.

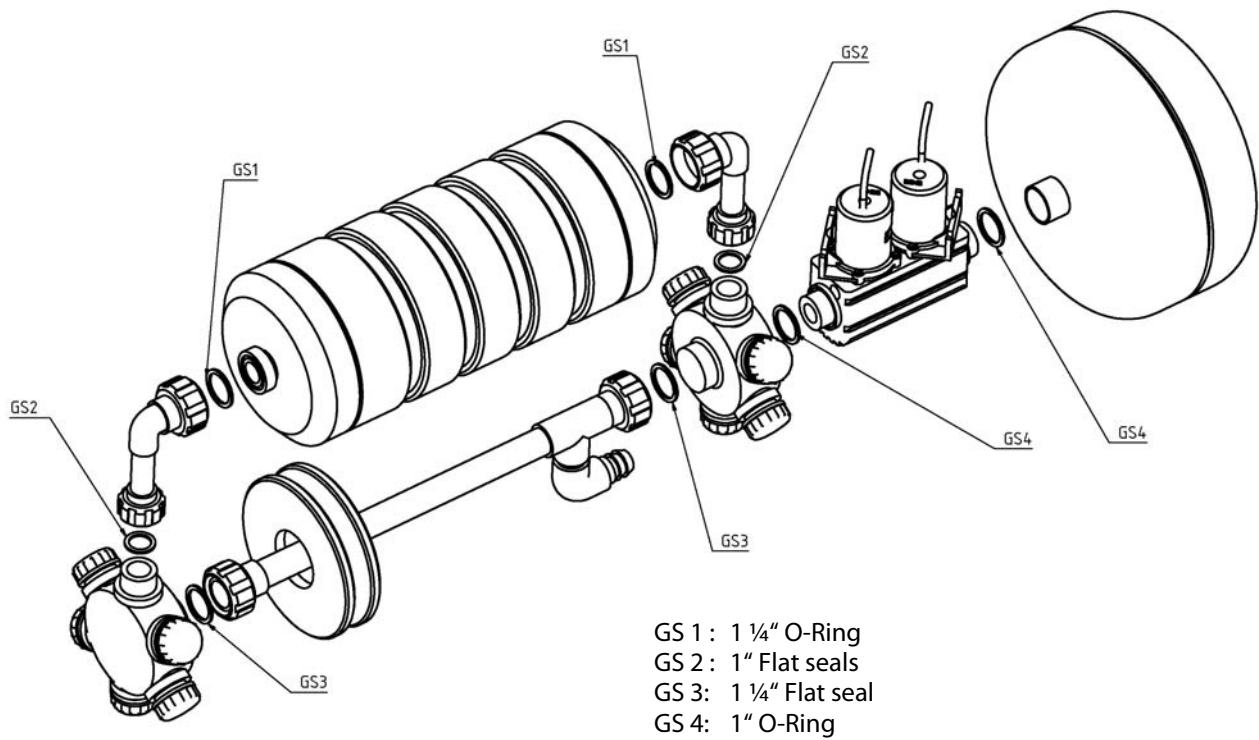


Fig.: Connectors of the membrane station

6.3 Membrane cartridge

Article:	AL-MEM
Measure cartridge (Ø x H):	Ø 164 mm x 410 mm
Connection size with ell-outlets:	Ø 164 mm x 486 mm
Weight:	1.6 kg
Membrane filter area:	6 m ²
Membrane fibre material / - type:	PE / hollow fibre membrane
Fibre diameter / -quantity / - length:	0.41 mm – 0.44 mm / 1600-2000 / 740 mm ± 15 mm
Pore size:	0,1 – 0,3 µm (0,2 µm nominal)
Anti-fouling:	yes
Pre-wetting:	yes
Flow range:	30 l - 600 l/h
Temperature range:	0 - 55 °C
Max. trans membrane pressure:	0,7 bar
Max. back-flush pressure:	2,5 bar
Max. free chlorine at 25°C or subordinate:	5000 ppm at 9.5 pH during chemical treatment
Max. treatment pollution (free chlorine):	1.0 Mio ppmh (hours accumulated)
Material protection cartridge and circuit points:	PP (central permeate pipe, housing, cap, bottom), U-PVC (nut), ABS (potting housing), NBR (O-ring), Polyol (potting resin)
Connection aeration / permeate branch:	1 ¼" AG / 1 ¼" AG
O-ring-seal:	Ø 26 mm x 3.5 mm, NBR
Patented:	yes
Economic life-time:	up to 10 years
Germ test certificate:	Accredited laboratory HUS Salzburg
Testing standard:	ÖNORM EN ISO 9308-1

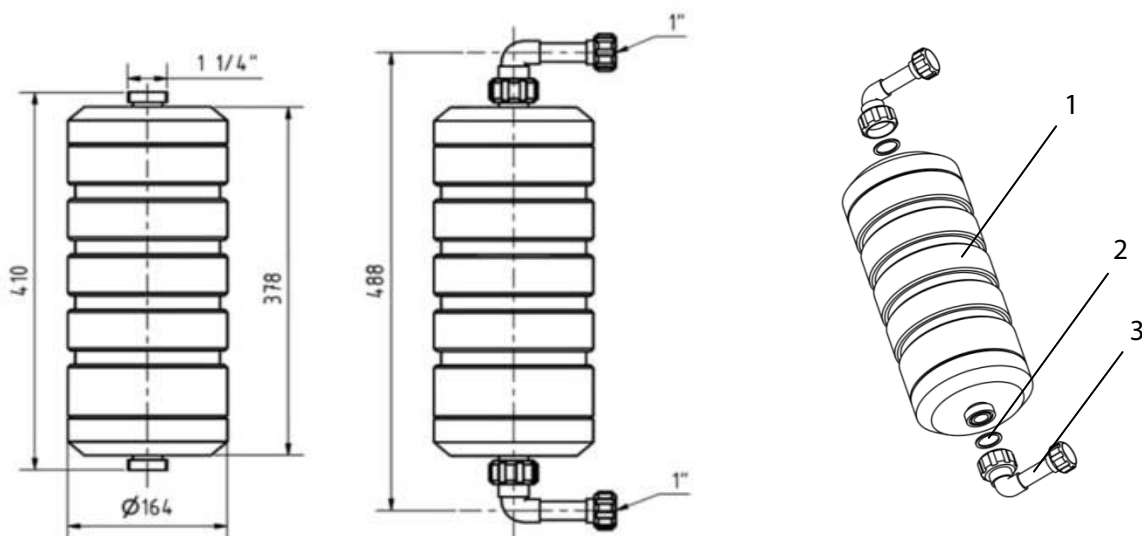


Fig.: Dimension membrane cartridge

Note:

The membrane cartridge has a blower connection and a permeate connection. The membrane cartridge is always operated in a vertical position, whereby the blower connection is situated at the bottom. (The air should rise upwards in the cartridge through the fibre bundles.)

The lower side of membrane used with the blower connection can be distinguished by the larger holes (s. Fig. 2).

The top side of membrane with the permeate connection is distinguished by 18 slotted slits and the external interlocking ring. The blue cover of the cartridge is fixed with this.

Attention: Please check, that the interlocking ring is in LOCK position when you mount the membrane in the bio reactor !

The membrane connection is equipped with an O-ring nut into which an O-ring is inserted.



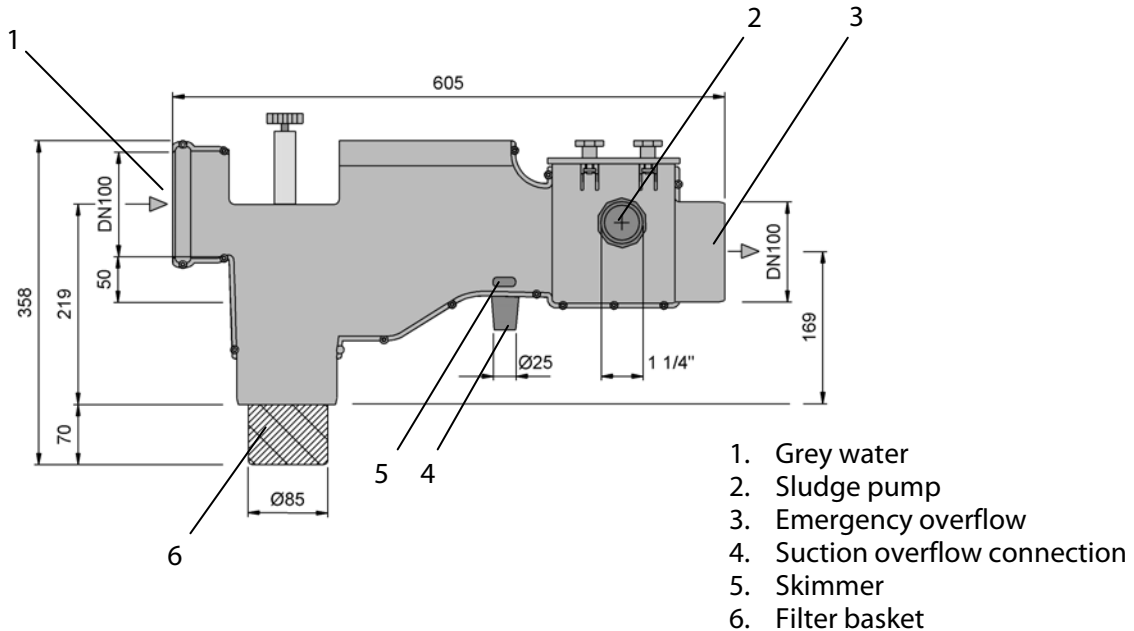
Fig.: Lower side of membrane



Fig.: Top side of membrane with sliding LOCK

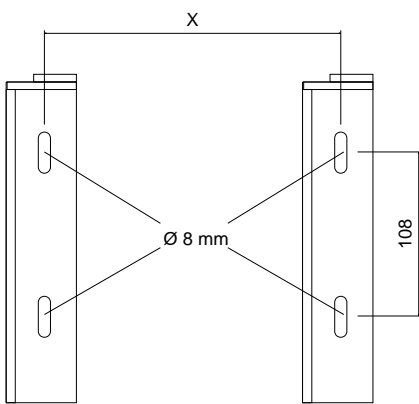
6.4 Pre-filter

Article:	AL-F100
Dimensions: (L x B x H):	605 mm x 180 mm x 358 mm
Weight:	3.5 kg
Branch:	DN100/ Ø 110 mm (bush)
Wastewater outlet:	DN100/ Ø 110 mm (spigot end)
Max. branch:	5 l/s
Rough filter cage (Ø x H):	Ø 95 mm x 120 mm
Mesh size scalping screen:	2 mm
Overflow siphon:	Ø 1" (25 mm)
Sludge pump connection:	1 1/4"
Skimmer:	integrated
Non-return valve:	DN100, integrated
Height difference Inlet-outlet	50 mm
Material box:	PP
Material filter mesh:	stainless steel
Material non-return valve:	stainless steel



6.5 Blower

Article:	AL-BL100L	AL-BL120L	AL-BL200L
Blower size:	100 L	120 L	200 L
Length:	408 mm	408 mm	418 mm
Width:	210 mm	210 mm	212 mm
Height:	232 mm	232 mm	268 mm
Power supply	230 V AC/50-60Hz		
Pressure range up to	0,18 bar	0,2 bar	0,3 bar
Aeration flow	50 – 128 l/min	75 – 145 l/min	110 – 280 l/min
Power consumption	100 W	130 W	215 W
Hose connection hose	Ø 26 mm	Ø 26 mm	Ø 26 mm
Protection class	IP54	IP54	IP54
Weight incl. wall braket	9,4 kg	9,4 kg	12,5 kg



Blower	Plug distance X
AL-BL 100	285 mm
AL-BL 120	285 mm
AL-BL 200	240 mm

Plug drilling Ø 8 mm



6.6 Growth bodies

Article:	AL-FK
Diameter:	36 mm
Height:	30 mm
Geometric surface:	320 m ² /1 m ³
Density range:	0.95 - 1.10 g/1 cm ³
Material:	HD-PE - Recyclat
Color:	black
Packaging unit:	30 l



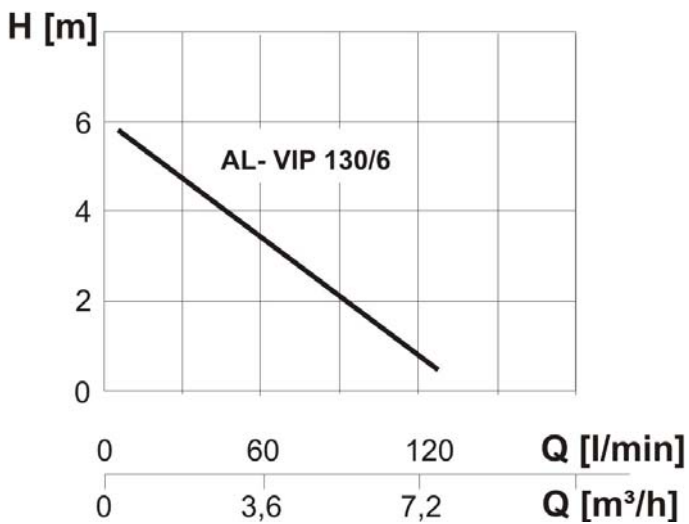
6.7 Pressure sensor aeration

Article:	AL-BPS
Measuring range:	0 to +0.6 bar
Connection:	4-20 mA,
Cable:	Ø5mm, 3 m length
Material:	stainless steel, PP, NBR, PVC



6.8 Sludge pump

Article:	AL-VIP130/6 AL-VIP130/6 B (on request)
Operating voltage:	AL-VIP130/6: 230 V AC/ 50 Hz, 4A AL-VIP130/6 B 230 V AC/ 60 Hz, 4A (on request)
Dimension:	Ø165 x 290 mm
Lifting height:	max. 6 m
Lifting volume:	max. 120 l/min
Pressure connection:	1 ¼ ", hose bush Ø 25mm
Cable length:	10 m
Weight:	4 kg



7. Electrical function and operation of the control unit

7.1 Electronic connections

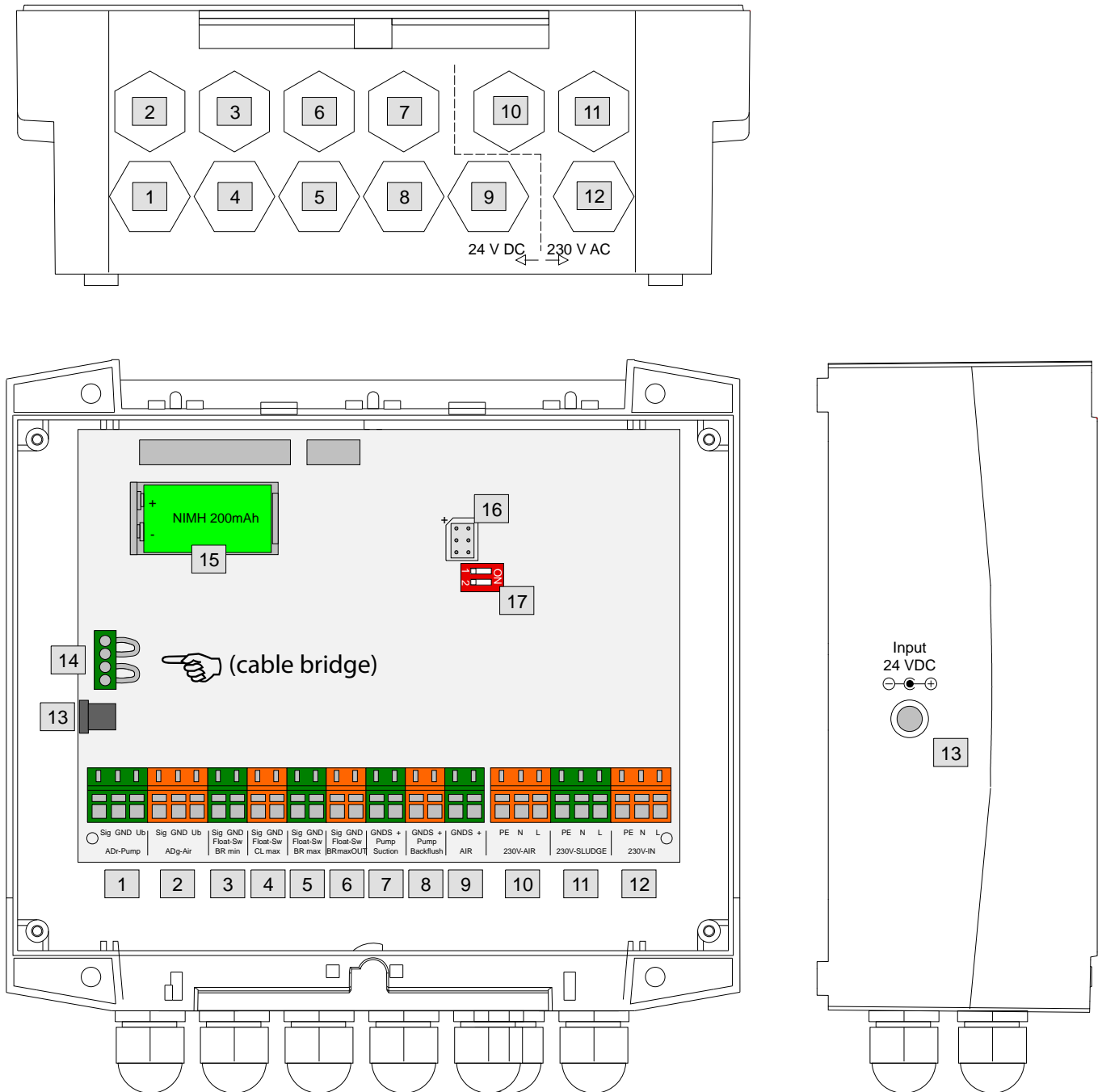



Fig.: Electrical connections of control board and assigning cable routings

Item	Connection	Description	Connecting contact/Function
1	ADr Pump	Analogue pressure sensor for suction and back flushing pump monitoring	Sig = green GND = gray Ub + = brown
2	ADg Air	Analogue pressure sensor, for monitoring blower	Sig = black GND = gray Ub + = brown
3	Float Sw BR min	Float switch in bioreactor for minimum water level	Pot. free contact, normally open contact, no polarity
4	Float Sw CL max	Float switch in clear water tank for maximum water level	Pot. free contact, normally open contact, no polarity
5	Float Sw BR_max	Float switch for max. level in the bio reactor	Pot. free contact, normally open contact, no polarity
6	Float Sw BR_max out	No function--	--
7	Pump Suction	24 V DC suction pump for filtration process (lower pump!)	GND = blue + = brown
8	Pump Backflush	24 V DC backflushing pump For cleaning process (upper pump!)	GND = blue + = brown
9	Air	Only for use with a 24 Volt DC blower (alternative to 230V blower)	GND = blue + = brown
10	230V- Air	Blower Max. switching voltage = 400V AC Rated voltage = 250 V AC Rated current = 12A	PE = Green/yellow N = blue L = brown
11	230V-Sludge	Sludge pump Max. switching voltage = 400V AC Rated voltage = 250 V AC Rated current = 12A	PE = Green/yellow N = blue L = brown
12	230V-IN	Mains for switching voltage 110- 230 V AC / 50-60 Hz	PE = Green/yellow N = blue L = brown
13	24 V DC	Switching power supply: IN: 110- 230 V AC / 50-60 Hz OUT: 24 V DC, 4A	Stereo jack Ø5.5mm, Centre positive 
14	Cable bridge	For activation of rechargeable battery and switching power supply (install cable bridge while start-up installation, s. page 9)	4-pin plug , reverse-polarity protected
15	9V rechargeable battery	9 V battery, 200 mA, NIMH Attention: <u>Only</u> a rechargeable battery must be used when changing the internal battery!	Pay attention to polarity while changing
16	6-pin	6-pin programmed connection (for update programming)	Pay attention to polarity
17	DIL	DIL switch Factory setting 1 = ON Factory setting 2 = OFFN	1=ON : Alarm* with battery operation ON 1=OFF : Alarm with battery operation OFF 2=ON /Off: without function <i>* A short beep sounds at an interval of 5 seconds indicating the battery alone is being used!!</i>

Tab.: Connection description of control board

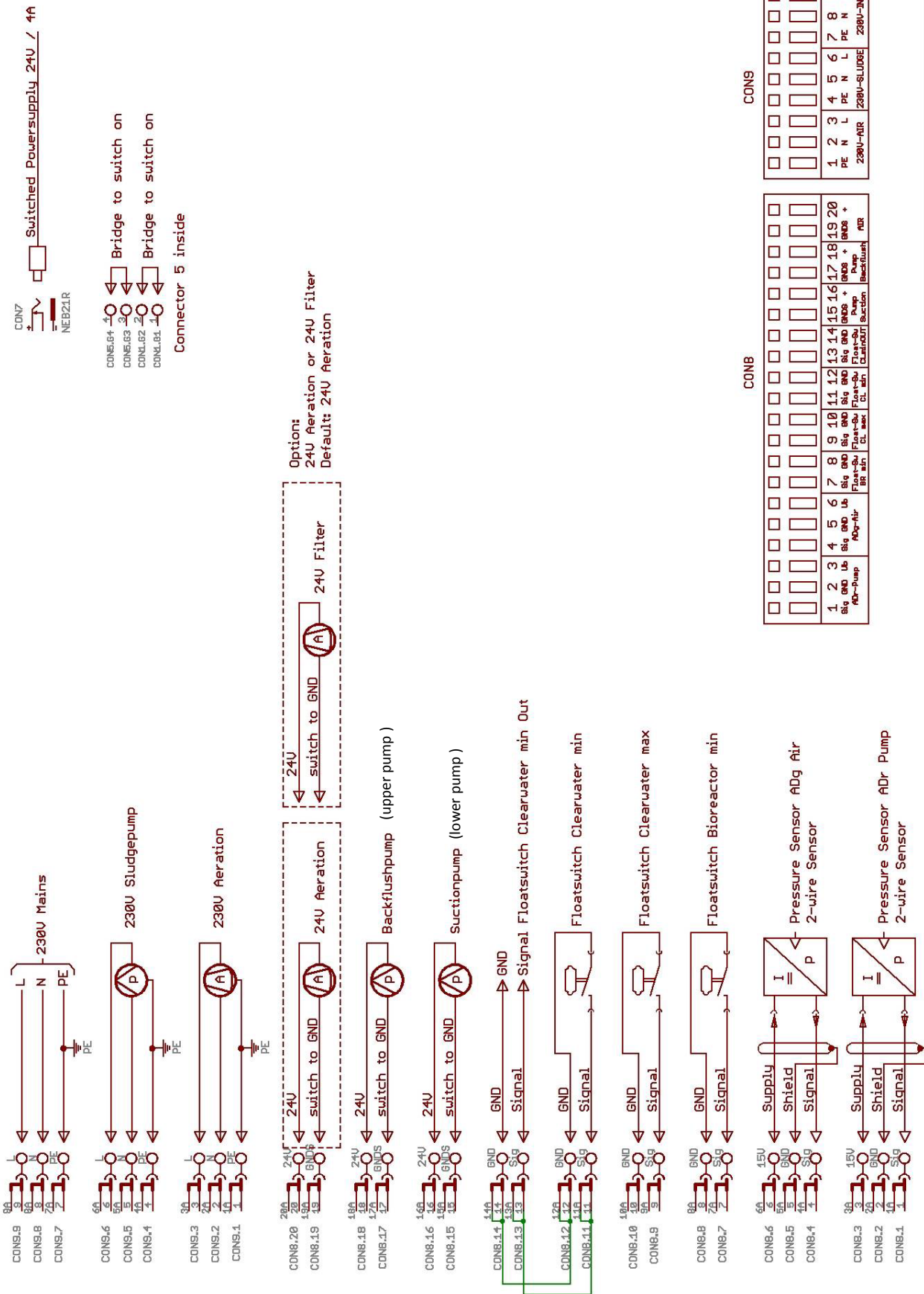
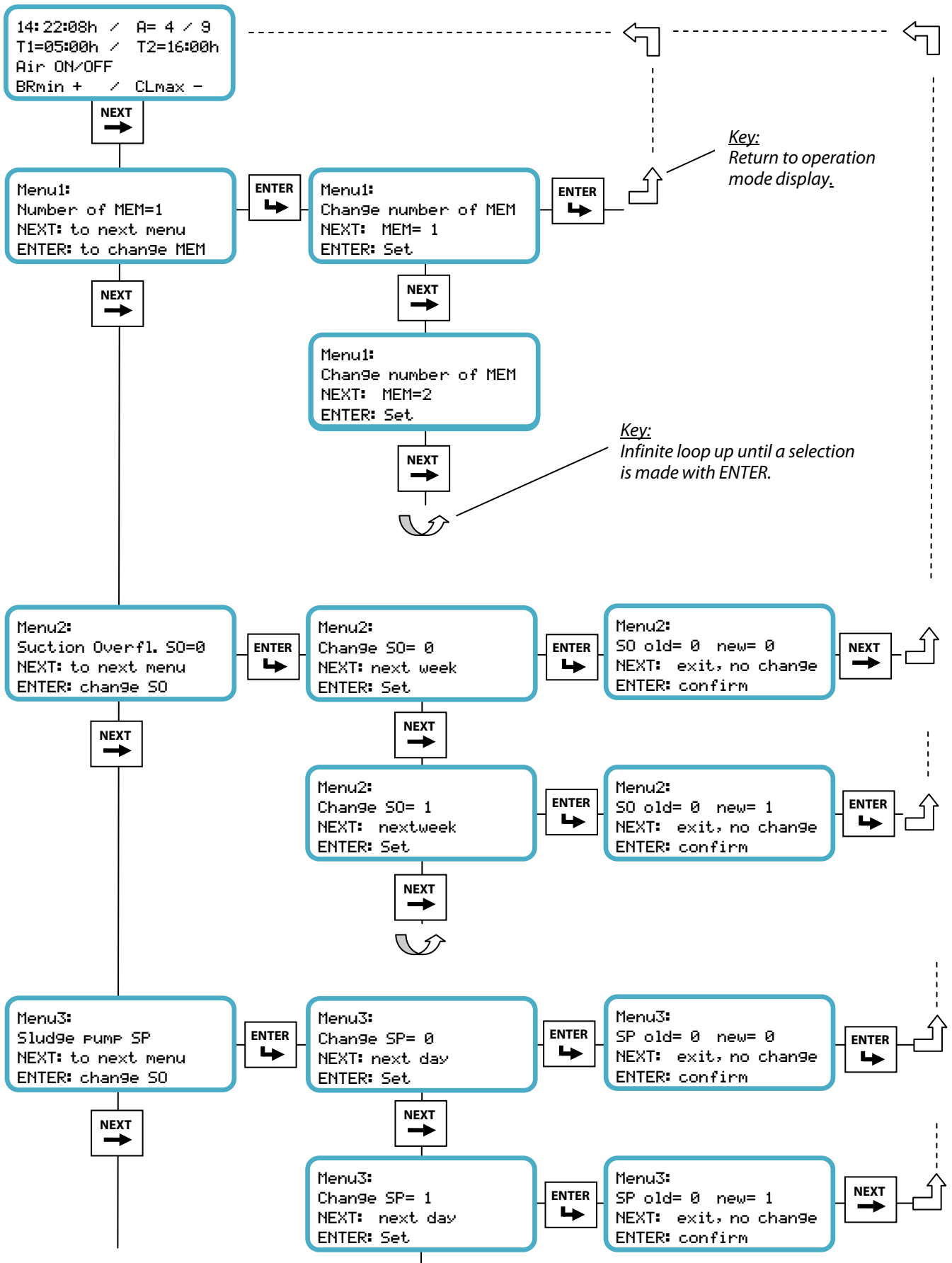
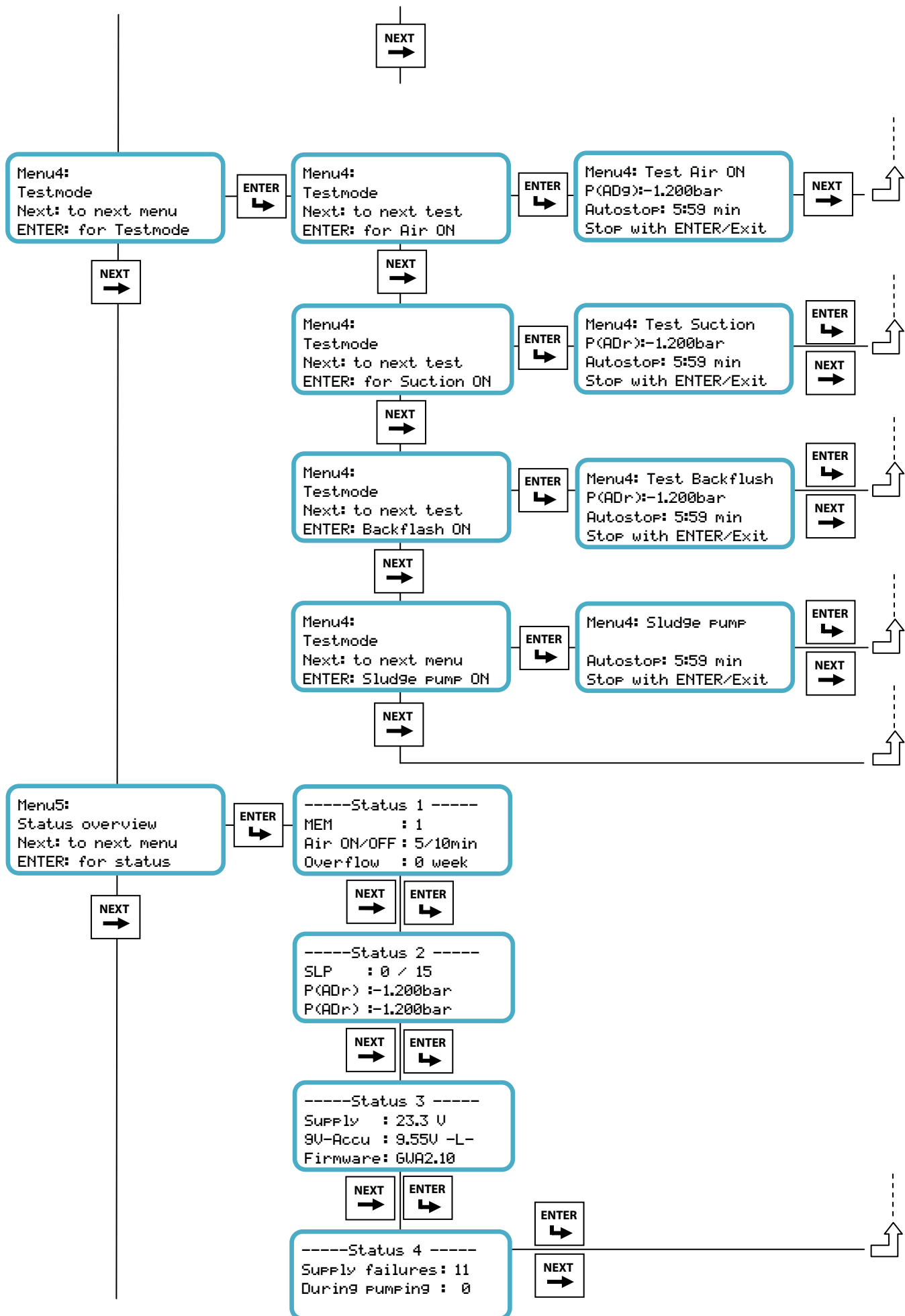
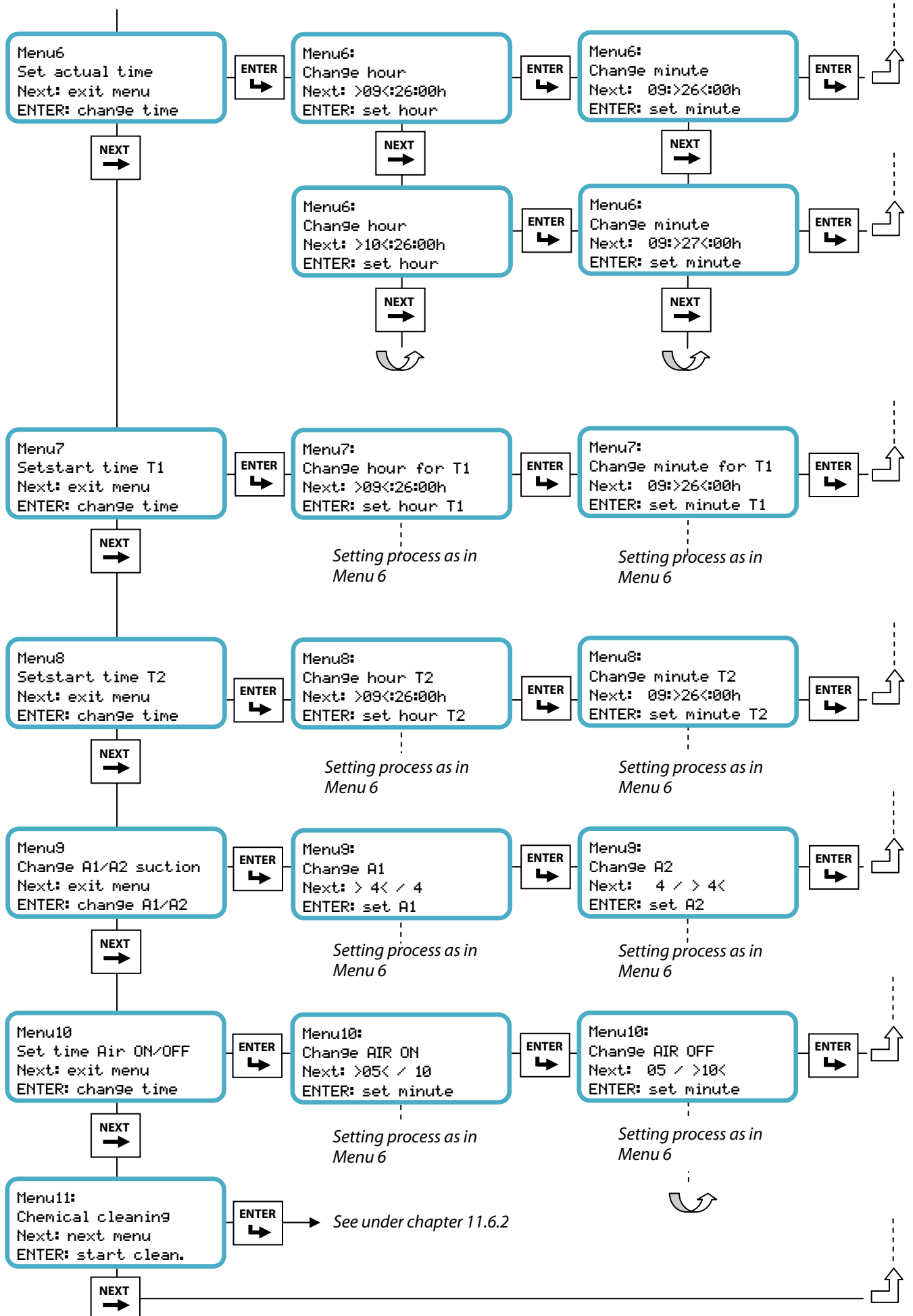


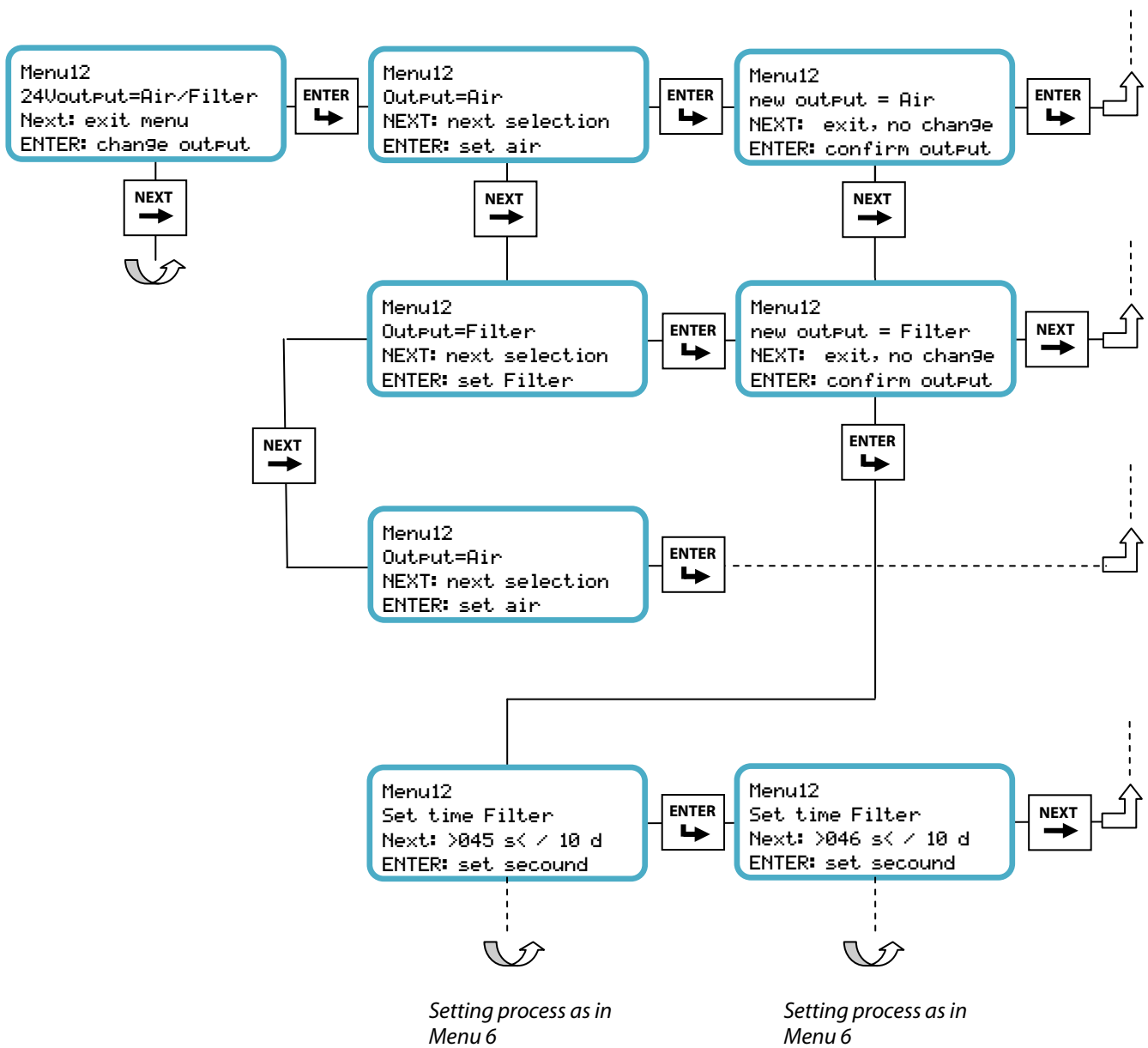
Fig.: Electrical connection plan

7.2 Menu overview



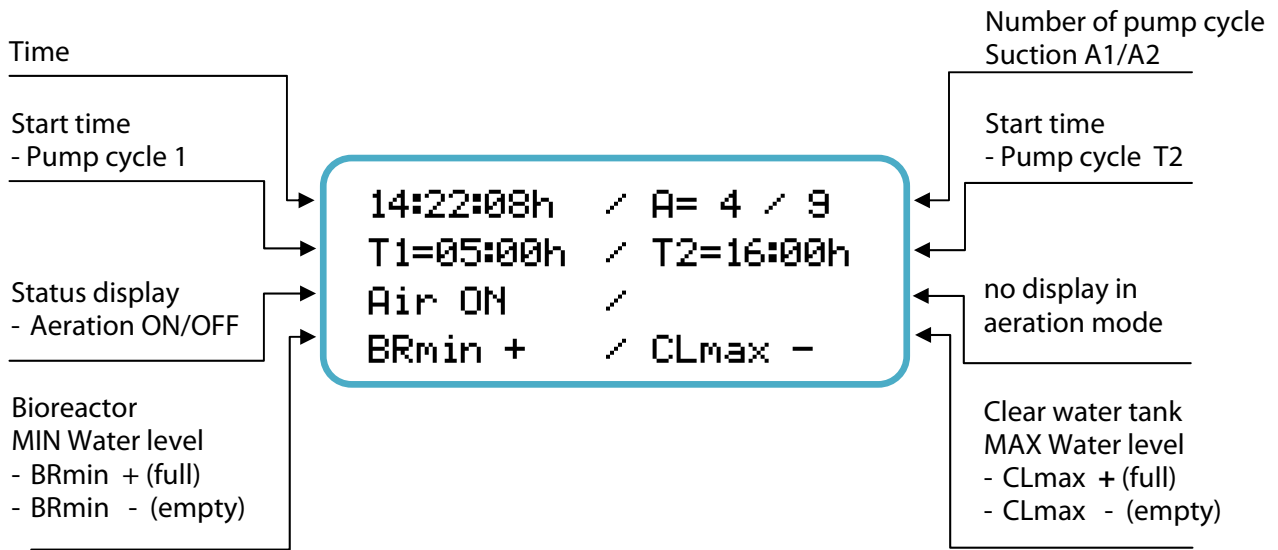




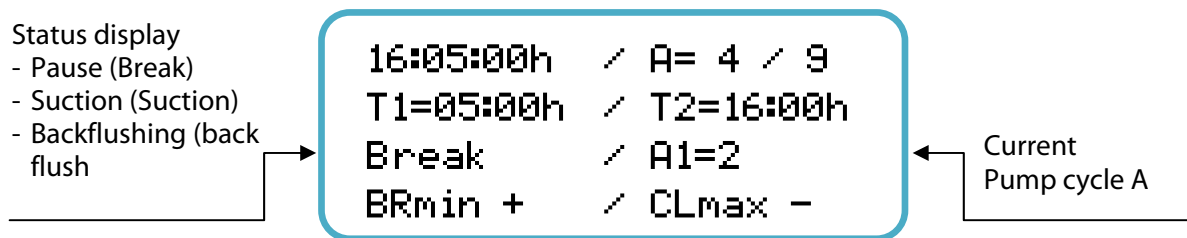


7.2.1 Operating mode display

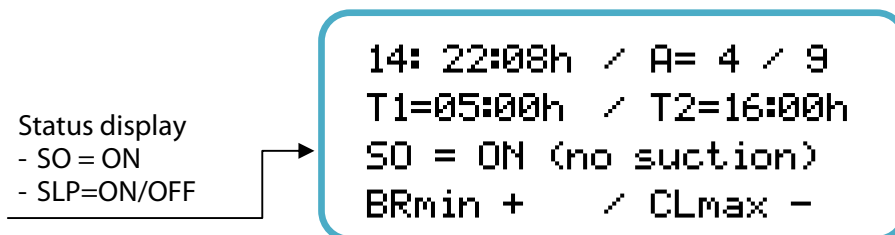
Operating mode display: Aeration cycle/Rest cycle



Operation display: Pump cycle T1 or T2 active



Operation display: Suction overflow or sludge pump mode



7.2.2 Menu settings and description

Any menu can be retrieved by selecting NEXT on the operation display. One is directed to respective menu settings by selecting ENTER. After leaving the menu setting, the display reverts back to the standard operation display screen.

Generally, inputs or settings are displayed in addition to NEXT and ENTER.

If there is no input within 6 minutes in a menu mode, then the display automatically switches back to the standard operation mode display.

Each menu setting must be set to the respective position the first time the controller is used. Any adjustments are permanently stored in the internal memory, and can be overwritten at any time.

RESET Function / Factory settings:

The device can be reset to factory settings by the simultaneous pressing of both the NEXT and ENTER buttons (for approx. 5 s)

1. Time: 12:00:00 hrs
2. Number of membranes: MEM = 1
3. Start time T1: T1 = 04:00 hrs
4. Start time T2: T2 = 16:00 hrs
5. Pump cycles: A1/A2 = 4 / 9
6. Blower time: Air ON / Air OFF = 5 / 10 (min/min)
7. Suction overflow: SO=0 week
8. Sludge pump: SLP/t=0 /0 (days/min)

Menu 1: Number of membranes

(MEM = 1 to 6)

With this setting, the number of installed membranes is confirmed. This has reference to the best setting for suction pump performance in the filtration process.

Note: MEM can always be modified even while flushing/backflushing is in progress.

Menu 2: Suction overflow

(Suction Overflow SO = 0 to 4)

This setting determines how many weeks shall pass before the pump will automatically enforce a controlled overflow of the bioreactor tank.

With this function, through the AQUALOOP pre-filter, the sediment/light weight sludge (*) at the bottom of the tank is siphoned out via the suction overflow. As the water level rises, the surface contaminants are sucked out through the overflow skimmers.

- SO week = 0: Not operating.
- SO week = 1 to 4: Suction overflow after first, second, third or every fourth week. (The aeration Air ON/OFF further runs in normal rhythm.)

* which drawn

Menu 3: Sludge pump

(Sludge pump SLP=0 to 60 days, t=0 to 60min)

This setting determines the weekly cycle of sludge pumping and the duration of the pumping.

Note: This function is crucial only for MBR applications where solid material content must be minimised in the Bioreactor. This function is not required for other applications. In these other cases the sludge pump feature is deactivated on the controller. (SLP=0, corresponds to factory settings)

- SLP = 0 (days)/ t=0 min The sludge pump is not activated with this setting
- SLP = 1 to 60 (days): The pump frequency is set from 1 to 60 days for 24h with this setting. Then the sludge pump starts at specified period t. Aeration runs at the same time. If the pump runtime is interpreted by "BR min - ", it restarts with "BR min + ". This mode is left if the sludge pump has worked for the entire running period t.

Recommendation: The running time t of the sludge pump should be selected in such a way so that the pump draw out once a week 25% of the net bioreactor volume ($V_{BR, use}$).

Example of dimensioning for a grey water unit 300L/day :

$$V_{sludge} = 0,25\% V_{br,use} = 25\% \times 300 \text{ L} = 75\text{Liter (each week)}$$

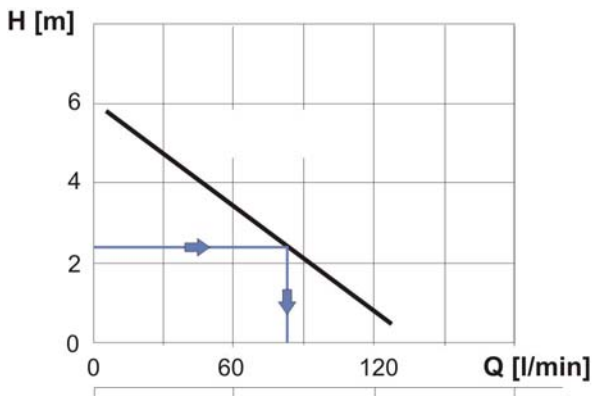


Fig: Curve of the sludge pump

Pressure lost because of pipe height and liquid resistance:

$$H_{lost} = 2,3\text{m} \rightarrow Q_{max} = 80\text{l/min}$$

➔ Running time of the sludge pump: $t_{sludge} = V_{sludge} / Q_{max} = 1 \text{ min (each week)}$

Menu 4: Test menu

(Test menu for blower, suction pump, back flushing pump and sludge pump)

The blower (air), suction pump (suction pump) back flushing pump (back flush pump) and sludge pump (sludge pump) can be separately controlled and tested via the test menu. The test mode can be terminated at any time with NEXT/ENTER. The time until automatic stop (max. 6 min) is shown on the display by a count-down stopwatch.

A test can be performed anytime, however there must be sufficient water for pump activation (BR min +). If the water level falls below minimum, (BR min -) then the display shows that a pump test is not possible.

Menu 5: Status overview

(Status Overview: Status 1 to 4)

The overview mode can be viewed at any time. All other activities, such as aeration mode and pump frequency, continue in the background. All current settings and operating status can be viewed in this mode.

Status 1:

Number of membranes: MEM : 1
Aeration settings (230 + 24V) AIR ON/OFF : 5 / 10 min
Suction overflow: Overflow : 1 week

Status 2:

Sludge pump (days/min): SLP : 5 / 20
Pressure sensor Pumps: P(ADr) : -0,23 bar
Pressure sensor blower: P(ADg) : -0,05 bar

Status 3:

Voltage power supply : Supply : 23,3 V
Battery voltage: 9V battery : 9,55 V -L-
Software version: Firmware : GWA2.21

Status 4:

Number of current interruptions in 24 V supply): Supply : 11
Number of current interruptions (24 V) with pump frequency: during pumping: 0
Aeration 24 V : 24V-OUTPUT: Air
or
filter back flush (24v) Filter: 60s/ 5d

Menu 6: Setting time

The set time is critical for pump start times T1 and T2. The clock will operate for approx. 3 hours on battery life in the event of a power failure. Thereafter, the capacity of battery is exhausted (Display switches off). When the external AC switching power supply comes on again after battery ran off, the clock must be re-set in order to correctly restart the cycle times T1 and T2 corresponding to real time.

Note: A started pumping cycle is terminated independent of the corrected time.

The time can be adjusted at any time.

Menu 7/8: Start time T1 and T2

(Starting time point T1 and T2 for pumping cycle)

Note for selection of start times:

The pump starting times are primarily set according to the times of incoming grey water being processed in the bioreactor with MBR Filtration. It is recommended to have three hours for biological treatment before starting with the filtration process.

Example: If the taking of showers is scheduled mostly in the morning between 7:00-8:00, then the pump cycle T1 is recommended to be finished before 7:00.

It is important that a pump cycle run time is not overlapped with next start time. If this is the case then the second timed start will not occur as required.

Menu 9: Number of pump intervals A1/A2

The numbers A1 and A2 determine how many pump intervals A (each with 15min run time/15s back flushing) must be passed in pump cycles T1 and T2.

The number of pump intervals is adjustable from A=0 to A= 55.

The pump cycle starts when the starting time point T1 or T2 is reached.

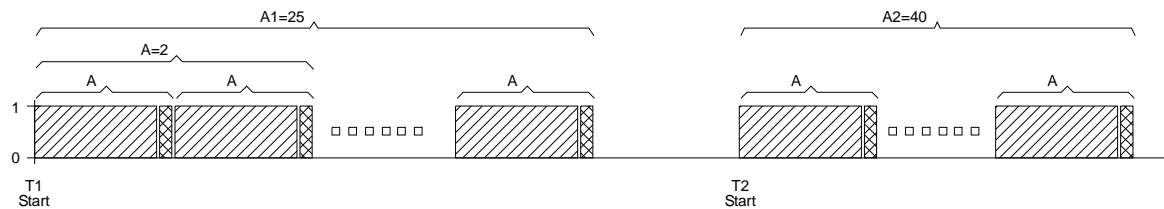


Fig.: Illustration of start times and pump cycles

The pump cycle can be interrupted by the float switch "BR min -" (when the water level for the membrane falls below the minimum allowed level) and "CL max +" (when the clear water tank is full).

Note: A = 0, no filtration cycle

Menu 10: Blower times and intervals

The blower run time (Air ON) and blower break time (Air OFF) can be set within the range of 1 to 15 min. The set blower operation is performed in total aeration mode and interrupted only by the pump cycle. The aeration always starts with "Air ON" after any adjustments to the time have been made.

Setting example for various aeration types:

Timed aeration: Air ON/Off = 5 / 10 (5 Minutes aeration, 10 Minutes Pause)

Continuous aeration: Air ON/OFF = 15 / 0

Deactivated aeration Air ON/OFF = 0 / 0

Grey water application: Air ON/OFF = 5 / 5

Note: The necessary aeration time depends on the needed oxygen content which depends on the present BOD. We recommend an oxygen content between 3-5mg/L. If the measured oxygen content is higher the aeration time can be reduced to reduce the power consumption.

Menu 11: Chemical cleaning

See under section "Maintenance and chemical cleaning"

Menu 12: Aeration 24V / Filter back flush 24 V

Two setting options for separate 24 V switching output "AIR" (Section 6.1, Tab, Pos.9)

24 OUTPUT = AIR:

The blower setting (blower runtime (Air ON) and blower pause (Air OFF)) is transferred from Menu10 when activated.

24 OUTPUT = Filter:

Setting the duration of filter back flushing (0-120 s) and interval of filter back flushing (0-30 days).

Factory setting: 60 s / 5 d (means: 60 seconds back flushing every 5 days)

8 Installation and connection

General requirements:

- dry, frostproof and ventilated room
- contact area of the tank have to be smooth and even
- distance between tank and ceiling minimum 0,9 m for maintenance purpose
- a floor drain has to be provided near the installation
- the electric pump cables should be measured to ensure that the entire membrane station can be extracted without first having to disconnect the wiring from the controller.
- The blower and clear water hose should be installed with quick detachable connections for simple removal of the membrane station

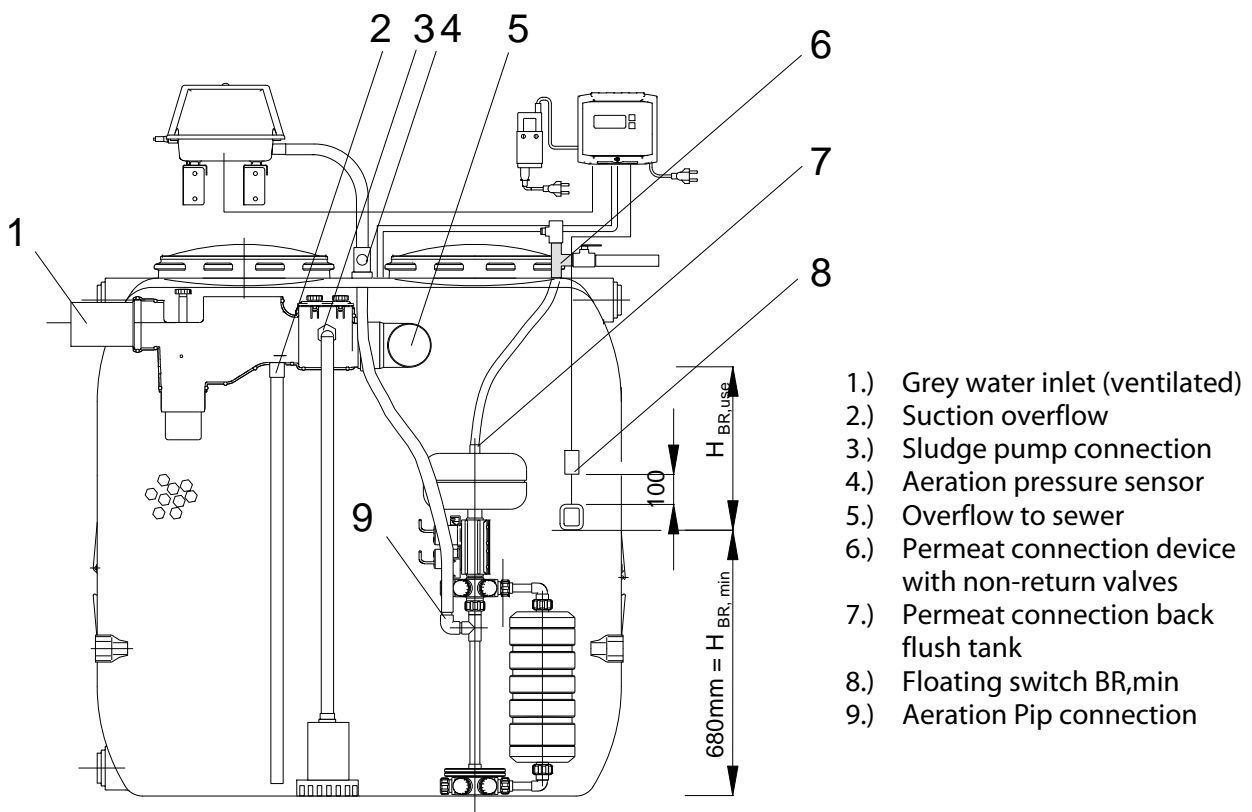


Fig.: Pipe connections and sensors

Connection of the pre-filter, sludge pump and suction overflow

The suction overflow hose is connected to the pipe socket (2) and secured with a hose clamp. The sludge pump pipe is connected with the sludge pump connector (3) of the pre-filter. The electrical cable from the sludge pump is connected to the control unit. The ventilated sewer pipes of the shower, bath water and hand basin must be connected to the inlet (1) of the pre-filter.

Note: The sewer pipes must have an air separator vent pipe in compliance with the DIN 1986-1!

To ensure smooth functioning of the overflow, connect the emergency overflow (5) with:

- The drainage or
- A pumping system, which will pump the sewerage into drainage

It is recommended to install a siphon to prevent unpleasant odors from the drainage.

If the system is installed below the backwater level*, then the overflow must be routed to a pumping station, so that the water above the backwater level can be routed to the drainage via a tube loop. Look for a pumping system with sufficiently large dimensions.

*Backwater level:

The level up to which an overloaded drainage network can be refilled. It usually corresponds to the respective street level. Check with your local building authorities.

Connection of the blower

The blower pipe is connected with the blower connection of the membrane station (9)

The electrical cable is connected with the control unit

The pressure sensor (4) is mounted in the blower pipe. The sensor cable is connected with the control unit.

Membrane station

The clear water hose is connected to the back flushing tank (7) and permeate connection device (6).

Note:

The systems designed for indoor restricted urban water use, such as toilet and urinal flushing and for outdoor irrigation use. Cross connections to the public water supply are strictly prohibited!

The electrical cable from suction and backflush pump are connected to the control unit (Chap. 6.1)

Floating switch

The floating switch (8) in the bioreactor indicates the minimum water level (700 mm).

Note: The distance between float switch and counterweight have to be 100 mm!

Permeate connection device

The connection device (6) is connected with the permeate hose from the back flush tank.

The pipe outlet is protected with a non-return valve.



- The permeate outlet pipe is protected against back flush and is marked with a non-potable sign.
- Cross connections to the public water supply are strictly prohibited

8.1 Data plate and labelling of the control unit

The data plate is mounted visible in front of the bio reactor!



Model type:	AQUALOOP GW300L
Serial No.:	AL-System-300L-1.1-0001
Daily treated capacity:	300 L /day
Inlet greywater:	combined (bathing and laundry water)
Certification:	according to NSF/ANSI 350-2012
Classification :	CLASS C, combined

Manufacturer: INTEWA GmbH, Jülicher Str. 336, 52070 Aachen, Germany
www.intewa.com, info@intewa.de,



Permitted water quality for grey water treatment:

- Water from shower, bath tub, hand basin and washing machine
- All usual detergents and personal cleaning products (soap, shampoo, shaving cream, toothpaste etc.) can be used.
- All household cleaning agents are safe to use in accordance with the manufacturers directions for home use.

Attention:

- **Faeces** and kitchen water, fats and chemicals may not be supplied to the plant.
- Hair dyes can cause discoloration of the permeate.
- Cross connections to the public water supply are strictly prohibited

Fig.: Data plate with general inlet water requirements

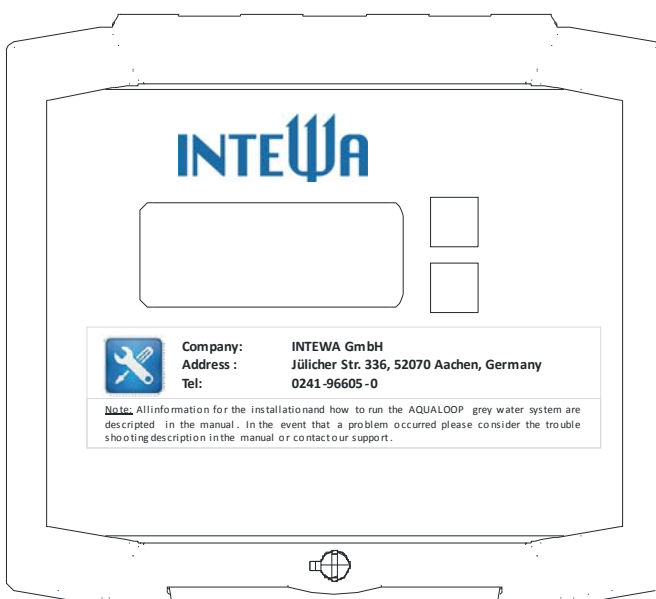


Fig: Example for labeling of the control unit with the local service company

9. System start-up

Open at least one of the shower, bathtub or hand wash basin connected to the system. Fill the bioreactor with potable water up to the level of 800mm.

9.1 Tightness test



Attention:

The water tightness of all screw fixings is particularly important so that none of the contaminated water contaminates the clear water. Furthermore, any wastewater which accidentally enters through poorly tightened screw fittings is sent to the membranes hollow fibres which may cause clogging of the fibres. Therefore, a water tightness test must be performed before the start-up process.

Suggestion: Before connecting the blower hose to the aeration pipe, it should be connected to the $\frac{3}{4}$ " connection on top of the back flushing tank in order to pressurize the membrane station with pressure (0.2bar). (The required adapter (3/4" IG x Ø25 sleeve) is included in scope of delivery.)

Then the blower is started in test mode. The membrane station is then immersed in tank water up to the mid line of the back flushing tank. If no bubbles can be seen in the water then all screw connections are water tight and the assembly can be finally installed.

! Note: run the test for 5 minutes!

9.2 Start-up phase of the bioreactor

The microbiology builds up in the grey water tank within few weeks as a result of continuous grey water supply. Until then, there may be variations in the biological cleaning.

The water must be injected with biology in order to guarantee a satisfactory biological treatment within 3 weeks. For this purpose, 25% of the support material used by the existing and previous greywater system must be fed to the bioreactor.

The setting are performed like the description in Chapter 9.3. As the start-up phase is started like the description in Chapter 9.3.

In the first 3 weeks the filtrated permeate should not use and drainage to the sewer. After 3 weeks the daily filtrated permeate can be used.

9.3 Starting the bio reactor

Following settings values are performed as follows for the filtration process (*Example of an AQUALOOP System 300L/day*):

- Menu 1: Number of membranes: MEM = 1
- Menu 2: Suction overflow: SO= 0 (weeks)
- Menu 3: Sludge pump: SLP/t= 7 / 1 (days/min)
- Menu 6: local Time: e.g. 14:16:00 hrs
- Menu 7: Start time T1: e.g. T1 = 15:00 hrs
- Menu 8: Start time T2: e.g. T2 = 10:00 hrs
- Menu 10: Pump cycles: e.g. A1/A2 = 55 / 0
- Menu 11: Blower time: Air ON / Air OFF: e.g. 5 / 5 (min/min)

Suction and back flush pump can be started and tested in the test mode. Please run the suction pump until the water flows from the clear water device.

Note: If the minimum water level is reached (Br_{min} -), the test of the pump is interrupted. The tank is filled up until the floating switch displays $Br_{min}+$.

The back flush pump can be monitored only indirectly in the system. For this purpose, it is activated in test mode for one minute. Thereafter revert back to suction pump. If the suction pump requires some time to refill the back flush tank then, before the permeate flows out of the clear water hose, it can be noted that the back flushing pump is working.

The system is ready to use after termination of test mode.

9.4 References: Bio reactor in process

The device will continue to work normally even during the holiday (stagnancy) period. This means that a separate holiday setting is not needed. If the bio reactor runs for a longer period without any incoming grey water then this may decrease the efficiency of biological treatment.

In case of a further expected incoming grey water, the start-up phase (wasted of the filtrated permeate) must be performed again (s. Chap. 9.2).

Note:


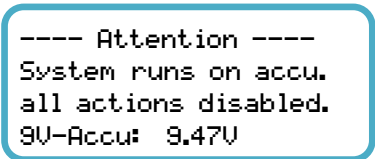
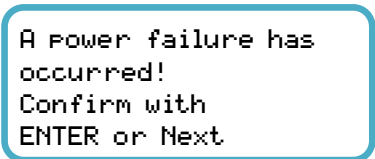
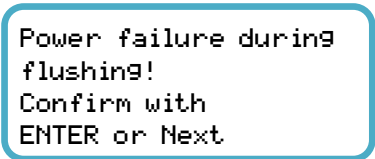
An error message will appear after 21 days of stagnancy of the bio reactor

The permeat flow reduces to a lower level during the life time.

In case the permeat flow drop down to a lower value the filtration cycle A1/A2 can be increased at all times.

Note: The filtrated permeate can be extracted for sampling via the connection device.

10. Trouble shooting

Symptom	Cause	Remedy
No display 	<ul style="list-style-type: none"> - Jumper (s. section 6.1) not inserted - No 24 V voltage supply and discharged battery - Display cable is loose or defective 	<ul style="list-style-type: none"> - Plug in jumper - Check AC switching power supply, recharge battery via internal charging switch. * - Check display cable or change display
Battery operating mode display  <p><i>Note: After estimate 2 hours the accu is empty LCD and audible signal ON/OFF (1 sec./ 1sec.)</i></p>	<ul style="list-style-type: none"> - Power failure - 24 V Switching power supply is not connected - 24 V Switching power supply is defective 	<ul style="list-style-type: none"> - Wait for power to come back on - Connect AC switching power supply - Change AC switching power supply
Display after power failure  <p><i>Note: Flashing LCD and audible signal ON/OFF (1 sec./ 1sec.)</i></p>	<ul style="list-style-type: none"> - Display (for 30 seconds) after power failure of 24 V voltage supply 	<ul style="list-style-type: none"> - Check the number of failures in status mode in a period of 24 h, for instance. If the number increases and the reason is not a general power failure, then the power supply is to be checked.
Display after power failure  <p><i>Note: Flashing LCD and audible signal ON/OFF (1 sec./ 1sec.)</i></p>	<ul style="list-style-type: none"> - Display with power failure during pump cycle 	<ul style="list-style-type: none"> - Check pumps via test menu. If there is a power failure even in test mode, then check for defect in respective pump or power supply.
No clear water generates in the filtration cycle	<ul style="list-style-type: none"> - Defective suction pump - Incorrectly installed float switch BR min or CI max or defective 	<ul style="list-style-type: none"> - Check suction pump in test mode and change if necessary - Check the position and function of float switch and change if necessary
Low operating life of Membrane(s)	<ul style="list-style-type: none"> - Backflushing pump does not flush the membrane regularly - Leakage clogs the membrane fibres 	<ul style="list-style-type: none"> - Check backflushing pump in test mode (see. start-up process) and change if necessary - Perform leakage test (see. section 8) and remove source of leak if necessary

* **Note:** If the battery voltage does not reach more than 8.5 Volt (see. Status display) after a charging period of approx. 14 h, then the battery needs to be replaced.

Symptom	Cause	Remedy
Display failure <pre>Ooo/+-/ooo//+/-ssdf o/+-/ooof//,+oo0//00</pre>	<ul style="list-style-type: none"> - Display crashed - for instance, by voltage surge in power supply (lightning) or electrostatic effect Note: The program runs normally in future.	<ul style="list-style-type: none"> - Restore the display function by RESET (adjusted parameters are lost) or disconnect the cable bridge (s. section 6.1) on control board.
Storage time exceeded <pre>Storage time exceeded Check bio reactor! Confirme with ENTER or NEXT</pre> <p><i>Note: Flashing LCD and audible signal ON/OFF (1 sec. / 1sec.)</i></p>	<ul style="list-style-type: none"> - The water in the bio reactor has not been changed since at least 21 days (no filtration process has been started within this time range) 	<ul style="list-style-type: none"> - Please check the water inlet flow - Please repeat the start –up phase of the bio reactor (Cap. 9.2)
Power failure <pre>Power failure > 21d? Check bio reactor! Confirm with ENTER or NEXT</pre> <p><i>Note: Flashing LCD and audible signal ON/OFF (1 sec. / 1sec.)</i></p>	<ul style="list-style-type: none"> - power failure for more than 2 hours (Biological treatment could be affected when the failure duration for more than 1 day!) 	<ul style="list-style-type: none"> - If power failure less than days please confirm with NEXT - If a power failure occurred for more than 1 days please repeat the start –up phase of the bio reactor (Cap. 9.2)
Aeration failure <pre>Failure aeration! Check air and confirm with ENTER or NEXT</pre> <p><i>Note: Flashing LCD and audible signal ON/OFF (1 sec. / 1sec.)</i></p>	<ul style="list-style-type: none"> - Working pressure of the blower to low (Biological treatment could be affected when the failure duration for more than 1 day!) - Water level in the bioreactor to low < 30cm 	<ul style="list-style-type: none"> - Please check the blower, replacement if necessary - If a power failure occurred for more than 1 days please repeat the start –up phase of the bio reactor (Cap. 9.2)
Optional if the pressure sensor mounted: Failure back flush pump <pre>Failure back flush Check and confirm confirm with ENTER or NEXT</pre> <p><i>Note: Flashing LCD and audible signal ON/OFF (1 sec. / 1sec.)</i></p>	<ul style="list-style-type: none"> - For 4 pump cycle the backflush pressure > 0.1 bar was detected. (normal 0,3-0,5 bar) 	<ul style="list-style-type: none"> - Please check the back flush pump via the test menu 4 - If a pump failure occurred please clean the pump in case there blocking) otherwise change the pump.
Informative: Maximum level of the bio reactor <pre>Maximum water level bio reactor exceeded Confirm with ENTER or NEXT</pre> <p><i>Note: Flashing LCD and audible signal ON/OFF (1 sec. / 1sec.)</i></p>	<ul style="list-style-type: none"> - Floating switch detected the maximum level of the bio reactor 	<ul style="list-style-type: none"> - Only informative, Alarm has to be confirmed manually

Note: All information for the installation and how to run the AQUALOOP grey water system are described in the manual.

In case of a failure please consider the trouble shooting description in the manual. If there are any questions or a support is necessary please contact the local service.

The local service address is stated on the control unit (see Chap. 8.1).

11. Maintenance and replacement instructions

The following maintenance schedule made be carried out by authorized service personnel or by the owner themselves.

The instructions mentioned must be followed strictly!



When working inside of the tank or on electrical equipment please unplug the power cord before.



Avoid direct skin contact with the grey water when cleaning the pre-filter and the membrane. Please use rubber gloves!

The following table represents an overview of regular maintenance and replacement intervals. Detailed descriptions are outlined in the corresponding chapters.

	<i>Maintenance and/or check interval</i>	<i>Replacement interval</i>
Pre-filter	Checked and cleaned every 2 months	--
Suction / back flush pump	Checked every 4 months	Replaced after 4 years (latest after 20.000 hrs.)
Floating switch	Checked every 4 months	--
Pressure sensor	Checked every 4 months	--
Blower	Filter element: Checked and cleaned every 3 months	Filter element: Replaced after 1 year Blower piston set assembly: Replaced after 4-6 year (latest after 20.000hrs.)
Membrane	Flow test: every 4 months Mechanical/chemical cleaning: every 6-12 months --depends on the average flow	Membrane replaced after 10 years
Bio reactor	Checked by sight and by smell every 4 months	---

11.1 Pre-filter

The filter basket should be checked every 2 months and cleaned (extract and rinsing with water), if necessary. The cleaning interval can then be extended depending on the build-up of contaminants. The integrated non return valve must be checked twice a year and cleaned of any dirt or deposits.

11.2 Suction and Back flush pump

It is recommended that a function test of the pumps is carried out every six months. Each pump is started in the test menu 4.

In the case where one pump should fail the complete twin pump unit has to be replaced.

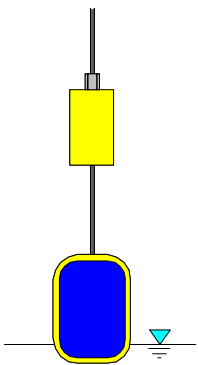
It is suggested that the suction and back flush pump be replaced every 48 months or after 20,000 h running time.



Please re-run the tightness test after the replacement of the twin pump unit (look chapter 9.1).

11.3 Floating switch

The float switch is tested by manually positioning it into the two switching positions (Empty=lower position /Full=upper position) while the display is checked.



```
Status2:  
SLP : 5 / 20  
P(ADr) : -0,23 bar  
P(ADg) : -0,05 bar
```

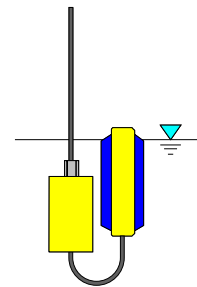


Fig.: lower position ->Display = $B_{r_{min}} -$

Fig.: upper position -> $B_{r_{min}} +$

11.4 Pressure sensor

If a pressure sensor is installed it can be tested in the menu overview (menu 5, Status 2)

Pressure sensor Pumps P(ADr):
Pressure sensor blower P(ADg):

When the pressure sensor is not connected the pressure displayed should be 1,200 bar.

11.5 Blower



AQUALOOP blowers are oil less. Never lubricate them.
All blowers have already been precisely adjusted. Never disassemble them.
(Do not try to loosen the hex. bolts on the endcap)

Time to replace the Filter Element

It is recommended that the Filter Element(s) is cleaned or replaced with new one(s) depending on the extent of its deterioration as determined by the atmospheric conditions particular to each installation. The filter element(s) should be checked every three months and should be replaced yearly. Detailed information can be found in the separate blower instruction manual (MEDO LA Blower).

Piston Set Assembly replacement period

It is suggested that the Piston Set Assembly is replaced every 24 months or after 20,000 h depending on the deterioration of the blower's pressure and airflow delivery. There is a groove on each Teflon Seal of the Piston indicating the degree of wear. If one or both grooves are worn away, replacement of the Piston Set Assembly is recommended. Detailed information can be found in the separate blower instruction manual (MEDO LA Blower).

11.6 Membrane

The membrane performance (flow) should be checked four times a year by measuring the permeate flow rate. Mechanical or chemical cleaning is recommended at a minimum flow rate:

$$Q_{\min} < 0.3 \text{ l/min (at } 15^{\circ}\text{C) per membrane}$$

(Kindly note, that the filtration performance is linearly dependant on the water temperature.)

11.6.1 Mechanical cleaning of the membrane

Sludge that has accumulated on the outside of the fibres (inside the cartridge) can be mechanically washed with a jet of water (see description below).

The outer ring is rotated from the LOCK position to the OPEN position (counter clockwise) to open the cartridge. The grey underside of the membrane must be held secure.

The outer ring can be removed in the OPEN position. Then the blue external cover is free to be removed from the top.

Attention:

a.) Do not loosen the counternuts located at the top to open the membrane as the assembling of the cartridge is very difficult without specialised tools.

b.) After cleaning please check that the external ring is in the Lock-Position!

The hollow fibres are now exposed and can be washed with a strong water jet.

Note:

Damaged or cracked fibers are simply knotted by the client to pass the leakage test of quality assurance. A tear in a fiber during use undergoes a kind of self-repair as the fibers becomes blocked and thus seals itself.



Fig. : external ring with arrow marking on OPEN position



Fig. : Opened membrane



Fig. : Washing the membrane

11.6.2 Chemical cleaning

Chemical cleaning dissolves biological clogging (fouling) and mineral deposits (such as lime) trapped inside of the hollow fibres. Chemical cleaning is done only if the flow is extremely reduced.

Intensive chemical cleaning of the membrane cartridge may be done in two ways:

- In-Situ, directly in the bio reactor
- External in a separate cleaning container

The main differences of the two cleaning possibilities are:

	In-Situ cleaning	External cleaning
Cleaning time	1 hrs	12 - 24 hrs.
Cleaning result (grey water application)	Depends on the state of the membrane up to 1.5 l/min	Independents of the state of the membrane up to 2.0 l/min
Required accessories	Bracket and connection hose	separate cleaning container, container size depends on the number of membranes on the Membrane Station

11.6.2.1 In-Situ cleaning in the bioreactor

Description:

The Membrane Station remains in the bio reactor. For each membrane 2 litres of cleaning fluid are poured into the back flush tank. With an automatic cleaning process controlled by the control unit the membranes are cleaned for one hour. After the flushing with clear water the cleaning process is finished.

Note:

Throughout the chemical cleaning cycle the growth bodies can remain in the tank, the amount of chlorine used does not affect the bacteria on the growth media, it removes only the biological accumulations in the membrane. However, it is important that the amount of chlorine used shall not be higher than directed.

Function of the connection device AL-CKIT for the In-Situ process:

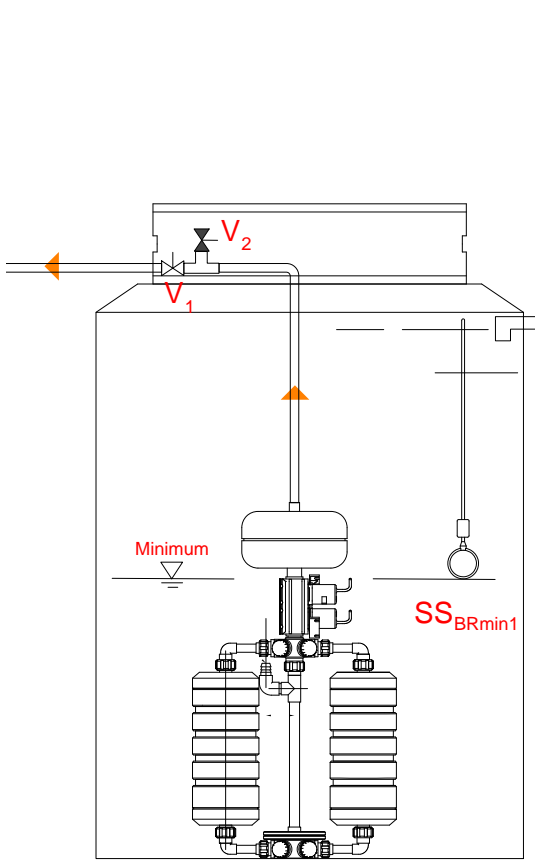


Fig.: Connection device normal filtration working
 Shut off valve V₁ open
 Shut off valve V₂ close

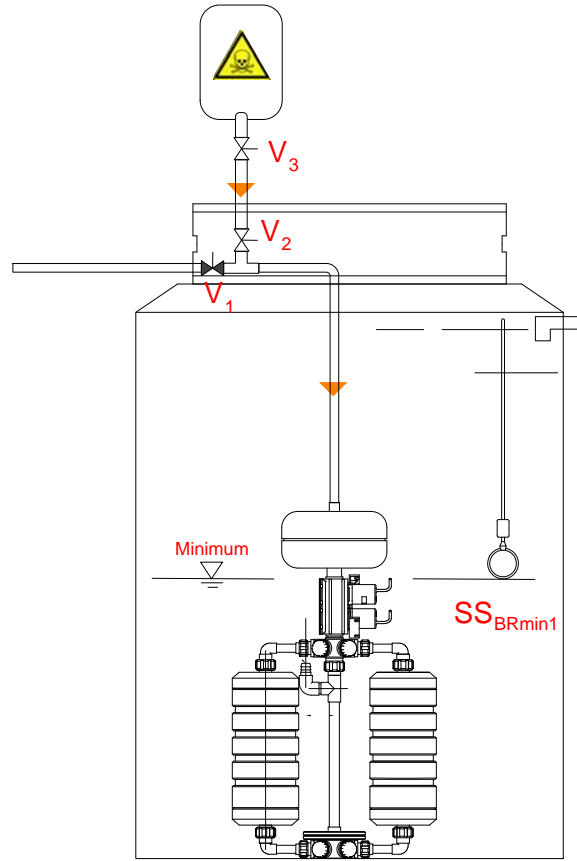


Fig.: Cleaning device with connected canister (chem. fluid)
 Shut off valve V₁ close
 Shut off valve V₂ open
 Shut off valve V₃ open

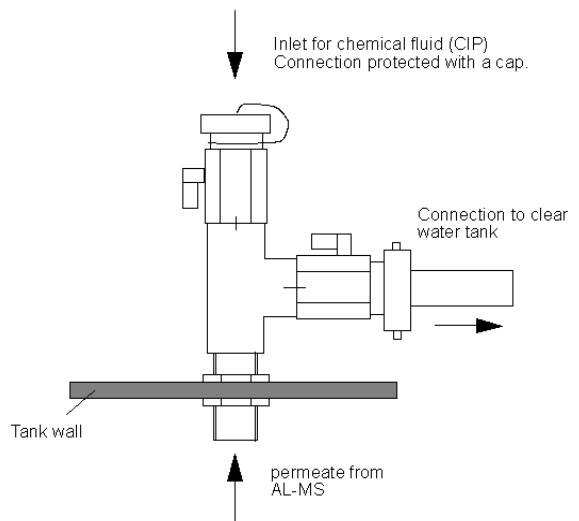
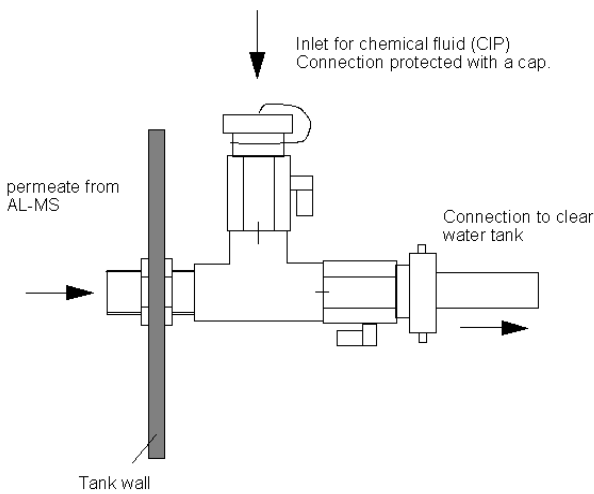


Fig.: Function of the connection device in either horizontal and vertical position

Chemical cleaning routine for the AQUALOOP System:

A cleaning option is available in the control menu of the AQUALOOP Membrane controller. A semi-automatic cleaning of membrane cartridges can be performed without the need to dismount the membranes.

Menu start of cleaning routine

Selection of menu 11

```
Menu11:  
Chemical cleaning  
Next: next menu  
ENTER: start clean
```

- 1.) Security questions for starting the cleaning routine

```
Menu11: Step 1  
Chem. cleaning start?  
NEXT: exit menu  
ENTER: confirm
```

- 2.) Controller automatically starts the sludge pump until the minimum level of water is reached in the bioreactor (BRmin).
Note: If no internal sludge pump is connected, then the bioreactor should be pumped out with an external pump until "BRmin -" appears in the display (with a simultaneous sound of 5 beep tones)
Attention: The suction pump must not be allowed to run dry!

```
Menu11: Step 2  
Sludgepump working  
Status: BRmin +  
ENTER: exit menu
```

- 3.) If the controller shows "BRmin -", then a back flush process is automatically performed to empty the backflush tank. This procedure ends automatically or can also be terminated manually.
- 4.) Now the cleaning solution (see. Chap. 11.6.3) can be added via the connection device. In small tank systems with good accessibility (for instance, AL-System 6) the cleaning liquid can be filled directly into the back flushing tank.

```
Menu11: Step 3  
Status: BRmin -  
Backflush pump  
NEXT: abort backflush
```

```
Menu11: Step 4  
Chem. liquid filled?  
NEXT: menu exit  
ENTER: Start cleaning
```

Note:

The cleaning solution must be refilled during the cleaning process in the case where more than three membranes are installed as the back flushing tank has only approx. 6 l holding capacity and each membrane requires 2l of cleaning solution.

- 5.) When the cleaning solution is filled, then the cleaning cycle starts with ENTER. A pre-set cleaning routine now runs. The routine takes about one hour.
- 6.) After the completion of the cleaning routine a clear water flush must be started. At least two litres of clear water must be filled into the back flushing tank for each membrane.
- 7.) With ENTER the clear water flushing is confirmed. The routine takes about max. 4 minutes. Water which comes out of the pipe must be sent to waste.

```
Menu11: Step 5  
Cleaning working  
Time: 60: 00min  
ENTER: exit cleaning
```

```
Menu11: Step 6  
Clearwater filled in?  
NEXT: exit flushing  
ENTER: start flushing
```

```
Menu11: Step 7  
Clearwater flushing  
Time: 04: 00min  
ENTER: exit flushing
```

After the completion of the clear water flushing, the operation mode appears in the display and the normal program continues to operate further, corresponding to the set parameters.

```
22:08h / A= 4 / 9  
T1=05:00h / T2=16:00h  
Air ON/OFF  
BRmin + / CLmax -
```

In case a chlorine cleaning routine will be started after the acid cleaning the cleaning menu must be started again.



ATTENTION!

If chlorine cleaning is performed after acid cleaning, then the pipes must be sufficiently rinsed (see description Step 6.)

11.6.2.2 Intensive cleaning in an external cleaning tank

Description:

The Membrane Station is taken out of the bio reactor and put in a cleaning container. (If the Membrane station is very dirty it has to be first sprayed down with a water hose.) The cleaning container is filled with the cleaning fluid up to the top of the pump unit (700mm). Please consider the target cleaning fluid concentration!

The pump unit is connected with the control unit in the standard manner. Target is to circulate the cleaning solution under normal pressure and flow rate for 24 hours. Therefore the start times T1 and T2 and filtration cycles have to be changed.

Example:

T1 = 18:00 (A1 = 45 = 11.5 hrs)

T2 = 06:00 (A2 = 45 = 11.5 hrs)

After the cleaning process the cleaning solution is wasted and clear water is filled into the cleaning container. After flushing with clear water for one hour the cleaning process is finished. The Membrane Station put back into the bio reactor.

11.6.3 Cleaning solution

We recommend the cleaning solution be made from regular domestic cleaning agents and should be mixed as follows:

- 1) Acid cleaning against deposits such as calcium carbonate
Citric acid (target cleaning solution 1% acid):
 - a.) Available in all drug stores as granulate packets
Dissolve 20 g per cartridge in 2 l warm, clean water (30°C).
 - b.) Available in all drug stores also as liquid concentrate (e.g. with 30% acid portion)
Dilute 0.5 l per cartridge in 2 l warm, clean water (30°C) to achieve a cleaning fluid concentration about 1%!

- 2) Alkali cleaning against excessive Biofouling
Chlorine (target cleaning solution 0.25% chlorine):
 - a.) Available in all drug stores as domestic cleaner with chlorine base (such as BREF-Henkel, DanKlorix) In normal with 5% chlorine portion.
Dilute 100 ml per cartridge in 2 l warm, clean water (30°C) to achieve a cleaning fluid concentration about 0.25%!
 - b.) Available in all stores which sell pool accessories concentrate (e.g. with 30% chlorine portion)
Dilute 17 ml per cartridge in 2 l warm, clean water (30°C) to achieve a cleaning fluid concentration about 0.25%!



ATTENTION!

Never mix acids and alkali!

All pipes and connections must be rinsed well with water after being cleaned with acid before cleaning with alkali and the other way around!

Follow the warning and safety instructions of the chemicals used!

Protective gloves and glasses are to be used during all cleaning operations!

Examples for different initial concentration:

Initial concentration solution Citric acid or Chlorine	Citric acid Target cleaning fluid concentration	Mixing ratio Water / Citric acid	Chlorine Target cleaning fluid concentration	Mixing ratio Water / Chlorine
5%	1%	2 Liter / 500 ml	0,25%	2 Liter / 105 ml
10%	1%	2 Liter / 222 ml	0,25%	2 Liter / 83 ml
15%	1%	2 Liter / 124 ml	0,25%	2 Liter / 69 ml
20%	1%	2 Liter / 105 ml	0,25%	2 Liter / 25 ml
25%	1%	2 Liter / 83ml	0,25%	2 Liter /20 ml
30%	1%	2 Liter / 69ml	0,25%	2 Liter / 17 ml

Note: The target cleaning fluid concentration is also required for the external cleaning

11.7 Bio reactor

The bio reactor itself needs no periodic cleaning. The removal of the sludge is done by the sludge pump (when installed) which is controlled by the AQUALOOP control unit.

However, the bio reactor can be checked by sight and by smell.

AQUALOOP works with an aerated moving bed principle. If a strong odor is noticed e.g. like sulfuric (rotten egg) the aeration process may not be operating correctly or the system may be overloaded and the biological treatment doesn't work in the correct manner. Check the aeration and perhaps increase the aeration setting. (The dissolved oxygen content shall be > 3 mg/liter with a range up to 6 mg/liter.)

The AQUALOOP system treated outflow should be clear like tap water. If the effluent is not clear please check the tightness of all membrane station connections (chap.9.1).

Should the bio reactor need cleaning the tank sludge will be discharged by the sludge pump – this process can start manually in the test mode (Chap. 7.2.2, Menu 4).

11.7.1 Collecting effluent samples

Effluent samples can be collected via the connection device.

Steps:

- disconnect the hose to the consumer
- decontaminate the outlet in case you want to measure micro biological parameters (e.g. by disinfection fluid or by heat)
- Start the filtration via the test menu "suction".

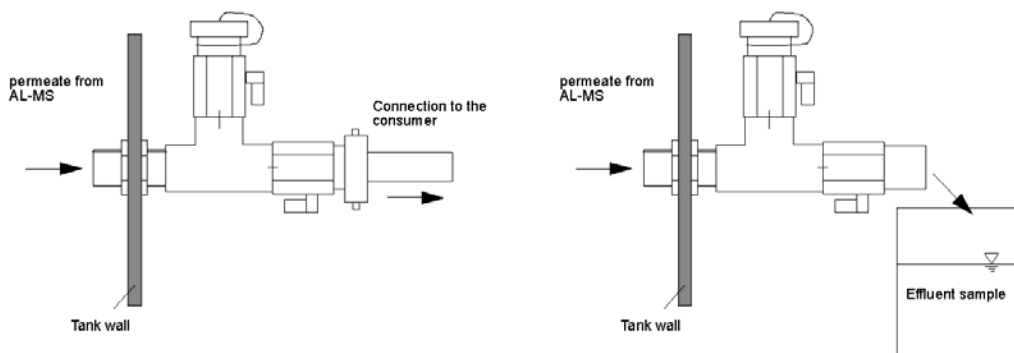


Fig.: Collection of an effluent sample via the connection device

12. Spare parts

Article description	Order description	Art.-no.
AQUALOOP control unit	ALMS-CU	600 700
AQUALOOP AC switching power supply 24 V DC, 4A	ALMS-PSS-4A	600 701
AQUALOOP float switch 3 m	ALMS-SCHW	600 702
AQUALOOP twin pump unit	ALMS-P	600 703
Membrane incl. PVC connection bends	AL-MEM	230 010
Seal set (2 pcs. O-ring, 2 pcs. flat seal)	ALMEM-SEAL	600 715
AQUALOOP Blower 30 L	AL-BL30L	230 035
AQUALOOP Blower 60 L	AL-BL30L	230 040
AQUALOOP Blower 100 L	AL-BL30L	230 045
AQUALOOP Blower 120 L	AL-BL30L	230 050
AQUALOOP Blower 200 L	AL-BL30L	230 055
Blower Filter Element for BL30, BL100, BL120 Note: BL100 and BL 120 needs two elements	ALBL-FILTER-A	600716
Blower Filter Element for BL60, BL200 Note: BL200 needs two elements	ALBL-FILTER-B	600717
Blower repair kit for BL30	ALBL-KIT030	600718
Blower repair kit for BL60	ALBL-KIT060	600719
Blower repair kit for BL100 and BL120	ALBL-KIT100-120	600720
Blower repair kit for BL200	ALBL-KIT200	600721

Spare parts can be ordered directly from INTEWA GmbH or please ask your local dealer.

13. Optional accessory

Order description: AL-PCS

AQUALOOP Pressure sensor for monitoring pump performance

Measuring range: -0.8 to +0.8 bar,

Connection: 4-20 mA, ventilated 3 line terminals

Cable: Ø6mm, 3 m length



Order description: AL-CLTANK 60L

AQUALOOP Cleaning tank 60 Liter

Suitable for external cleaning of one single membrane station

Tank volume: 60 Liter

Dimension: Ø 164 x 486 mm



Order description: AL-CLTANK 350L

AQUALOOP Cleaning tank 350 Liter

Suitable for external cleaning of one membrane station equipped with up to 6 membranes.

Tank volume: 350 Liter

Dimensions: Ø740 mm x 1250 mm



14. Limited Warranty / Service policy / Contact

LIMITED WARRANTY

INTEWA GmbH (hereinafter identified as manufacturer) warrants each AQUALOOP part to be free from defects in workmanship and materials for a period of two years from the date of purchase.

Some countries/states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply. Sole obligation under this warranty is as follows:

The manufacturer shall fulfill this warranty by repairing or exchanging any component part, F.O.B. factory, that in manufacturer's judgment shows evidence of defects, provided said component part has been paid for and is returned through an authorized dealer, transportation prepaid. The warranty must also specify the nature of the defect to the manufacturer.

The warranty does not cover treatment processes/systems that have been flooded, by external means, or that have been disassembled by unauthorized persons, improperly installed, subjected to external damage, or damage due to altered or improper wiring or failed overload protection.

This warranty applies only to the AQUALOOP components and does not include any of the locally installed wiring, plumbing, drainage, or disposal system. The manufacturer is not responsible for any delay or damages caused by defective components or materials, for loss incurred because of interruption of service, or for any other special or consequential damages or incidental expenses arising from the manufacture, sale, or use of this process/system.

The manufacturer reserves the right to revise, change, or modify the construction and design of the treatment process for grey water or any component part or parts thereof without incurring any obligation to make such changes for modifications in previously sold equipment. The manufacturer also reserves the right, in making replacements of component parts under this warranty, to furnish a component part which, in its judgment, is equivalent to the company part replaced.

Under no circumstances will the manufacturer be responsible to the warranty for any other direct or consequential damages, including but not limited to lost profits, lost income, labor charges, delays in production, and/or idle production, which result from defects in material and/or workmanship of the system. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty is expressly in lieu of any other expressed or implied warranty, excluding any warranty of merchantability or fitness, and of any other obligation on the part of the manufacturer.

Service policy

INTEWA's Requirements:

1. INTEWA has developed a general installation and operating manual for the AQUALOOP System GW series. Please refer to this manual for all questions regarding safe and reliable installation as well as troubleshooting.
2. INTEWA requires that local service providers are trained by INTEWA or by the local country distributors. The training covers the following aspects:
 - a. Local installation instructions with a hands on assembly requirement for certification.
 - b. A training which covers all aspects of installation and services.
 - c. INTEWA reviews and approves each training and certification plan from local distributors on an annual basis.
3. INTEWA requires that a spare parts inventory level appropriate to sales and installed base be kept locally in each service area. The spare parts are listed in chapter 12.

Service Provider Requirements and Qualifications – The service provider is typically a local dealer or distributor who buys equipment from the distributor for the purpose of local resale and installation:

1. The service provider will only allow factory certified and trained installation and service technicians to work on AQUALOOP equipment. The training must include demonstrating capability to perform minor repairs and conduct water quality testing.
2. The service provider should assure their technicians are properly vetted to local standards and perform a background check.
3. Service providers should provide insurance and financial bonding covering:
 - a. Financial liability for maintenance fees
 - b. Owners for failure of service provider to perform contract
 - c. Insurance for liability and acts of omission.
4. In providing a service contract to owners, that contract should include:
 - a. A fixed and stated fee for parts, labor, and materials required for ongoing operation except for consumable chemicals and electrical power
 - b. Service frequency should be on a quarterly basis with a planned CIP (Clean in place) scheduled annually or at some other pre-determined frequency or performance trigger (e.g. flow <0.3 lpm/membrane cartridge). Quarterly checks must include all recommended checks including bioreactor discharge to sewer, transfer pump flow, setting, and water quality. The checks must also adhere to any state and local regulations that apply.
 - c. Service response by service provider should be less than 24 hours from notification.

Owner Requirements:

1. AQUALOOP system owners must sign a service contract with a local dealer to conduct periodic checks and maintenance and comply with all requirements outlines in INTEWA's and the distributor's written materials for installation and service.
1. Owners should only purchase AQUALOOP systems from certified and trained service providers.
2. Owners should contact the local distributor or dealer with questions specific to their system.

CONTACT

For customers in Germany:

For any queries, ordering of spare parts, as well as in case of service, kindly contact INTEWA GmbH directly, quoting the model type, the serial-number and the purchase invoice details.

INTEWA GmbH
Jülicher Straße 336
52070 Aachen, Germany

Tel.: 0049-241-96605-0
Fax: 0049-241-96605-10
Email: info@intewa.de
Internet: www.intewa.de

In the event a service is required we will offer the estimate service costs in advance.

The warranty provisions are included in our sales conditions and can be viewed at:

<http://www.intewa.de/en/cs/contact/legal-conditions/terms-of-sale/>

For customers in other countries:

For any queries, orders for spare parts or service enquiries, please get in touch with your local dealer or visit the service domain at the INTEWA website of your country.

<http://www.intewa.de/en/company/partners/international-distributors/>

Always keep your purchase invoice, the model type and the serial-number of the control unit handy.
The local service address is also stated on the control unit (see Chap. 8.1)

