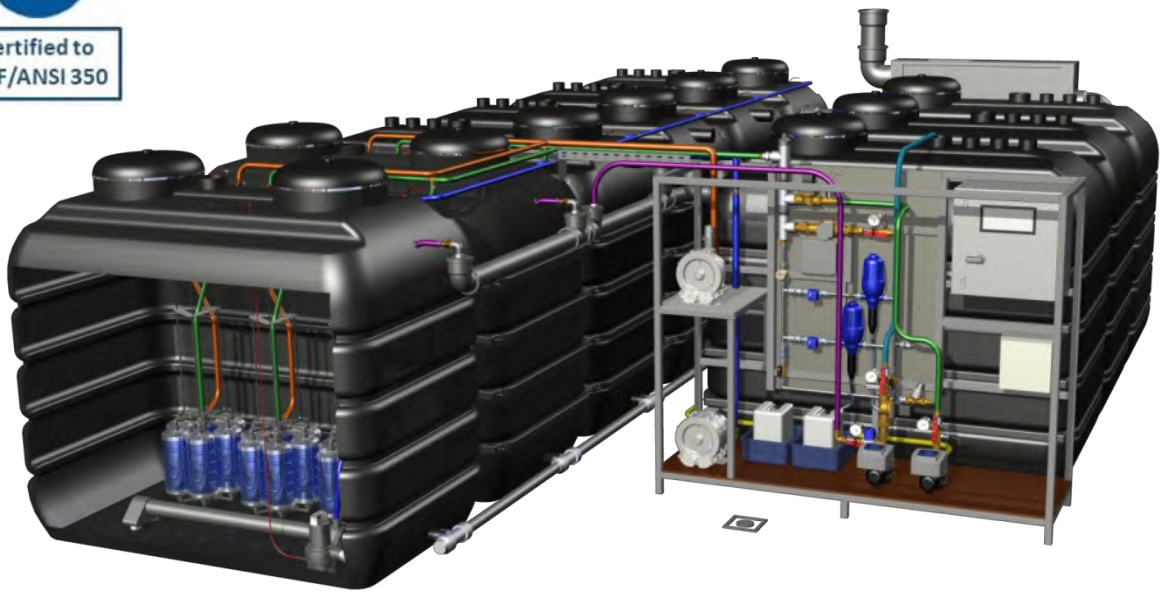
Certified to NSF/ANSI 350



Commercial Packaged Solution EU Version

AQUALOOP Greywater Recycling Systems

- **AL-GW 32400**
- **AL-GW 48600**

Installation and operating instructions

WATER, WE' RE IN OUR ELEMENT

I. Basic Information

1. Introduction

Up to 65% of the water demand of many buildings is used for showering, bathing, washing hands and for the washing machine. The resulting wastewater is the so-called greywater. With AQUALOOP technology, this water is treated in a membrane bioreactor and then stored in a clear water tank. The heat contained in the water can also be recycled via a heat exchanger using a heat pump. The treated water is of excellent quality and is reused for toilet flushing, irrigation and washing machine use by means of a pressure boosting system and further UV disinfection.

Especially for sports facilities, schools, hotels and apartment buildings with significant amounts of shower and bath water and a matching process water demand for toilet flushing, washing machines or irrigation are suitable for a greywater recycling plant. However, many office buildings can also use water from hand washing sinks. Unlike rainwater harvesting systems, greywater systems are independent of roof surfaces and precipitation conditions.

A particular advantage is also that the greywater yield and demand have a good degree of coverage in terms of time. During vacation periods, for example, when less water is needed, less water is produced. Only a correspondingly small amount of water is also treated.

Since a separate greywater and process water piping system is required for greywater recycling plants, new buildings or renovation projects are usually suitable. Here, the separate pipelines cause justifiable additional costs. To allow good accessibility and maintenance of the plant, the installation of the plant should be inside the building.

NSF Certification NSF350:
The NSF 350 (Class C) listing covers AQUALOOP models with capacities up to 5400 litres average daily flow. According to the official NSF listing, AQUALOOP for greater capacities can be designed for system sizes dimensioned and approved by INTEWA GmbH in accordance with the NSF certification.

BS- Certification BS 8525-2:
The INTEWA system is also certified to the British Standard for a spray irrigation system. The test carried out at the PIA Test Institute for Wastewater for the smallest and thus most difficult plant, the AQUALOOP plant 6 for the most critical application, the "spray application". BS-certified plants must also be equipped with a UV system. The certification can be applied to plants up to 5400 l/day. As the standard only covers plants up to 10 m³, larger plants can be declared as "following" BS 8525-2.

This manual describes the sizing, technical data, installation, settings, start-up procedure and maintenance of AQUALOOP greywater recycling including a troubleshooting guide.

This manual is strictly confidential and for internal use only. Do not pass it on, neither in digital nor in printed version.

2. General safety instructions

The electrical components must be installed only by a qualified electrician according to local regulations. In case of failure of an electronic component, the product must be repaired by a qualified electrician before being operated again. There is a risk of electric shock and fire!

The outlet circuit used for the device shall be secured and protected with a separate circuit breaker. If unavailable, a GFCI (Ground Fault Circuit Interrupter) with sensitivity of 30 mA shall be connected.

When working inside of the tank or on electrical components always switch the power off and disconnect the circuit breaker first.

Local rules and electrical standards must be considered!
These installation and operating guidelines must be read carefully before installing the product. The instructions mentioned must be followed strictly. Modifications to the product are not permitted, otherwise the warranty will be invalidated.

Local rules and safety standards must be considered!

The following points must 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 must 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 tank installation position should be protected from water (such as with water-resistant paint).
- Make sure that the existing emergency overflows are connected and the pipes adequately sized.
- All products must be regularly inspected to maintain proper condition. The minimum inspection interval is described in the maintenance chapter.
- Electrical devices may be hazardous for children. Do not let children near the product.
- Do not install the water-handling products in locations where the temperature may drop below 0°C.
- Do not install any electrical products in areas of high water risk.
- The operator is responsible for adherence of the safety and maintenance 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 weight > 30 kg).
- The national and local regulations with regards to the installation and operation of a greywater treatment system must be complied by the installer as well as the operator.
- The handling of substances for chemical cleaning must be carried out in compliance with the required safety standards (e.g. UK: refer to COSHH).
- When walking on storage tanks, the local safety regulations must be observed. Indoor storage tanks must not be walked on.

Note:
The system is designed for indoor restricted urban water use, to supply water for consumers such as toilet, urinal flushing, washing machine and for outdoor irrigation use. Cross connections to the city water supply are strictly prohibited!

- Cross connections to the public water supply are strictly prohibited.
- Always meet safety instructions of local chemicals provider (e.g. REACH, COSHH etc.)
- Please check the direction of rotation of the blowers after the electrical wiring and before connecting them to the pipe diffusers and the membrane stations. If the direction of rotation is incorrect, the blowers operate in vacuum mode and can suck in water. This will destroy the blowers.

- The clear water outlet connection (e.g. for irrigation) are marked with a non-potable sign.

2.1 Safety instructions for chemical cleaning

Storage and handling of citric acid and sodium hypochlorite may fall under national regulations.
Please check your **national guidelines** and act accordingly.

When there are no guidelines, these **minimum requirements** should be met:

- Always wear protective gear when handling chemicals: Gloves, protective glasses and clothing.
- Containers for chemical storage must be clearly labelled for the contents.
- Place a catch basin under your storage container so it might collect any spillage.
- Make sure that citric acid and sodium hypochlorite under no circumstances can be mixed. Mixing the chemicals will a result in an exothermic reaction which is extremely dangerous

Citric Acid:

 **Irritant** Eye Irritation 2	**Hazard statements:** Causes serious eye irritation. **Precautionary statements:** If medical advice is needed, have product container or label at hand. Keep out of reach for children. Read label before use. Wash thoroughly after handling. Wear protective gloves/protective clothing/ eye protection/face protection. Do not eat, drink or smoke when using this product. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing. If eye irritation persists seek medical advice/attention urgently.

Sodium Hypochlorite:

 **Corrosive** Corrosive to metals, cat 1 Serious eye damage, cat 1	**Hazard Statements:** May be corrosive to metals. Causes serious eye damage. Causes skin irritation. Toxic to aquatic life with long lasting effects. **Precautionary statements:** If medical advice is needed, have product container or label at hand. Keep out of reach for children. Read label before use. Wear protective gloves / protective clothing / eye protection / face protection. Wash skin thoroughly after handling. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. IF ON SKIN: Wash with soap and water. Specific treatment (See supplemental first aid instructions on this label). If skin irritation occurs: seek medical advice/attention urgently. Take off contaminated clothing and wash before reuse. Collect spillage. Absorb spillage to prevent material damage. Store locked up. Store in corrosive resistant stainless-steel container with resistant inner liner. Dispose of contents and container to an approved waste disposal plant. Report in case of accident occurred.
 **Irritant** Skin irritation, cat 2	

3. Scope of delivery, transportation, storage

AQUALOOP components are delivered on pallets or boxes. All components must be stored in a dry and frost-proof area.

Attention:
The components may be damaged by inappropriate or rough handling.
Do not throw or drop components.

Offloading instructions:

- Pallets can be unloaded with the forklift truck
- On site, the 260 kg tanks can be handled on a pallet or with a crane.

NOT included in the scope of delivery:

- chemical tanks, chemicals, drip pans

Optional accessories are:

- City water top up
- Booster pumps for process water
- UV unit

3.1 Scope of delivery AL-GW32400

1 pce. Bioreactor tank 5000 L (1) pre-installed with:

- 1 pce. tank opening with cap Ø600
- 1 pce. tank connection DN200 (Ø200 mm) (greywater inlet, from pre-filter)
- 1 pce. pipe diffusor AL-PD142
- 1 pce. tank coupling connection

3 pce. Bioreactor tank 5000 L (2, 3, 4) pre-installed with:

- 1 pce. tank opening with cap Ø600
- 1 pce. pipe diffusor AL-PD142
- 1 pce. tank coupling connection

1 pce. Bioreactor tank 5000 L (5) pre-installed with:

- 2 pcs. tank opening with cap Ø600
- 3 pcs. AQUALOOP membrane station with permeate and aeration connection
- 1 pce. pipe diffusor AL-PD142
- 1 pce. sludge pump VIP130/60
- 1 pce. tank coupling connection

1 pce. Bioreactor tank 5000 L (6) pre-installed with:

- 2 pcs. tank opening with cap Ø600
- 3 pcs. AQUALOOP membrane station with permeate and aeration connection
- 1 pce. pipe diffusor AL-PD142
- 1 pce. sludge pump VIP130/60
- 1 pce. level sensor
- 1 pce. tank coupling connection

2 pcs. Clear water tank 5000 Liter (1, 2) pre-installed with

- 1 pce. tank opening with cap Ø400
- 1 pce. tank coupling connection

1 pce. Clear water tank 5000 Litre (3) pre-installed with

- 1 pce. tank opening with cap Ø400
- 1 pce. level sensor
- 1 pce. emergency overflow connection DN100
- 1 pce. connection permeate inlet
- 1 pce. connection for city water top up
- 1 pce. tank coupling connection

1 pce. Technical Unit pre-installed with

- 1 pce. Dosing station (I-CON-ADS)
- 1 pce. Control Unit (I-CON-WT-CP) with central filtration and backwash pumps
- 1. pce Central filtration pump
- 1. pce Central backwash pump
- 1 pce. Blower (B1, Membrane cartridge aeration) AL-BLK05 with accessories:
  - 1 pce. pressure relief valve 2”
  - 1 pce. air filter 2”
  - 1 pce. blower control kit 2”, I-CON-BCS-KIT2 ”
  - 1 pce. aeration pressure sensors
- 1 pce. Blower (B2, Pipe diffusor) AL-BLR30, with accessories:
  - 1 pce. pressure relief valve 2”
  - 1 pce. air filter 1 ¼ ”
  - 1 pce. blower control kit 1 ¼ ”, I-CON-BCS-KIT1 ¼ ”
  - 1 pce. aeration pressure sensors

Separate single components:

- 1 pce. pre-filter PURAIN filter 200 with backwash nozzle
- 1 pce solenoid valve (V8) and flow meter (W5) for Pre-filter backwash
- 1 pce. permeate valve (V6), Sewer valve (V7) and Water meter (W1) at Technical Unit
- 6 pcs. growth bodies 540 L
- Optional City water top up (solenoid valve and flow meter).

3.2 Scope of delivery AL-GW48600

1 pce. Bioreactor tank 5000 L (1) pre-installed with:

- 1 pce. tank opening with cap Ø600
- 1 pce. tank connection DN300 (Ø300 mm) (greywater inlet, from pre-filter)
- 1 pce pipe diffusor AL-PD142
- 1 pce. tank coupling connection

5 pcs. Bioreactor tank 5000 L (2, 3, 4, 5, 6) pre-installed with:

- 1 pce. tank opening with cap Ø600
- 1 pce. pipe diffusor AL-PD142
- 1 pce. tank coupling connection

2 pcs. Bioreactor tank 5000 L (7, 8) pre-installed with:

- 2 pcs. tank opening with cap Ø600
- 3 pcs. AQUALOOP membrane station with permeate and aeration connection
- 1 pce. pipe diffusor AL-PD142
- 1 pce. sludge pump VIP130/60
- 1 pce. tank coupling connection

1 pce. Bioreactor tank 5000 L (9) pre-installed with:

- 2 pcs. tank opening with cap Ø600
- 3 pcs. AQUALOOP membrane station with permeate and aeration connection
- 1 pce. pipe diffusor AL-PD142
- 1 pce. sludge pump VIP130/60
- 1 pce. level sensor
- 1 pce. tank coupling connection

4 pcs. Clear water tank 5000 Litre (1, 2, 3, 4) pre-installed with

- 1 pce. tank opening with cap Ø400
- 1 pce. tank coupling connection

1 pce. Clear water tank 5000 Litre (5) pre-installed with

- 1 pce. tank opening with cap Ø400
- 1 pce. level sensor
- 1 pce. emergency overflow connection DN100
- 1 pce. connection permeate inlet
- 1 pce. connection for city water top up
- 1 pce. tank coupling connection

1 pce. Technical Unit pre-installed with

- 1 pce. Dosing station (I-CON-ADS)
- 1 pce. Control Unit (I-CON-WT-CP) with central filtration and backwash pumps
- 1. pce Central filtration pump
- 1. pce Central backwash pump
- 1 pce. Blower (B1, Membrane cartridge aeration) AL-BLK06, with accessories:
  - 1 pce. pressure relief valve 2”
  - 1 pce. air filter 2”
  - 1 pce. Blower control kit 2 ”, I-CON-BCS-KIT2 ”
  - 1 pce. aeration pressure sensors
- 1 pce. Blower (B2, Pipe diffusor) AL-BLR40 with accessories:
  - 1 pce. pressure relief valve 2”
  - 1 pce. air filter 1 ½”
  - 1 pce. Blower control kit 1 ½”, I-CON-BCS-KIT1 ½”
  - 1 pce. aeration pressure sensors

Separate single components:

- 1 pce. pre-filter PURAIN filter 300 with backwash nozzle
- 1 pce solenoid valve (V8) and flow meter (W5) for Pre-filter backwash
- 1 pce. permeate valve (V6), Sewer valve (V7) and Water meter (W1) at Technical Unit
- 9 pcs. growth bodies 540 L
- 1 pce. solenoid valve and flow meter, optional for city water top up
- optional City water top up (solenoid valve and flow meter).

4. Warranty and Contact

The warranty terms are included in the sales conditions from your local dealer.

CONTACT

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

INTEWA GmbH
Auf der Hüls 182
52068 Aachen, Germany

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

For customers in other countries:
For any queries, orders for spare parts or service requests please get in touch with your local dealer or visit the service domain on the INTEWA website according to your country.

https://www.intewa.com/en/company/international-partners/

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.

5. General Description and Dimensioning

5.1 Functional description

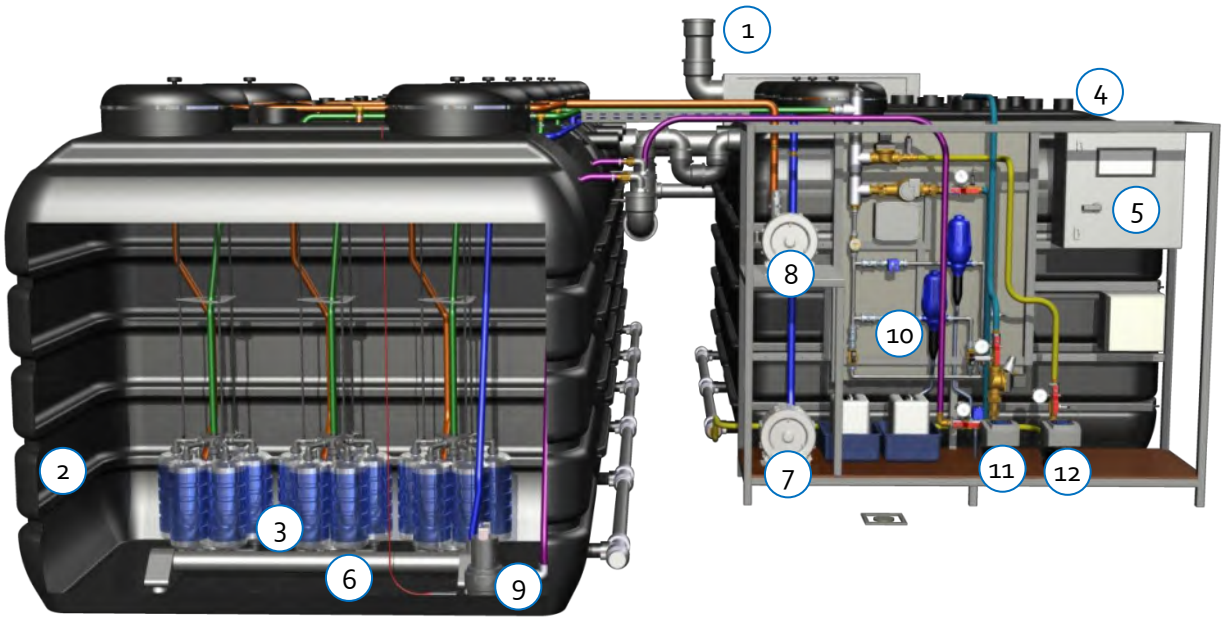


Figure 1: Packaged system AQUALOOP Greywater Recycling System 32400 l/day

1. PURAIN pre-filter
2. Bioreactor
3. AQUALOOP Membrane station
4. Clear water tank
5. I-CONNECT system control unit
6. Pipe diffuser
7. Blower for pipe diffuser
8. Blower for membrane station
9. Sludge pump
10. I-CON-ADS cleaning technology
11. Filtration pump
12. Backwash pump

Pre-filtration and bioreactor

In the AQUALOOP complete greywater systems we use prefabricated, stable, opaque and reinforced inner tanks.

The greywater from showers, bathtubs and hand wash basins is pre-filtered through a highly efficient PURAIN filter (1) before entering the bioreactor (2). The coarse dirt collected in the PURAIN filter is regularly flushed back into the sewer using a backwash nozzle.

Continuous biodegradation takes place in the heart of the system, the bioreactor. This is achieved by a pipe diffuser (6) located at the bottom of the system and growth bodies floating in the water. This fine-beaded diffuser, which disperses oxygen from a blower (7), creates an aerated fluidized bed, which is a prerequisite for the growth of bacteria within the greywater. Settlement of the bacteria required for biodegradation occurs here on the many hundreds of AQUALOOP growth bodies, which are special suspended bodies with a maximized surface area. A sludge pump (9), which is also located at the bottom, periodically removes sediment that is formed.

Membrane station and control

The bioreactor also contains the AQUALOOP membrane station (3), which filters the greywater into the clear water storage tank (4) via a central filtration pump (11). Due to the small membrane pore size of 0.02 µm, particles, bacteria and viruses are retained by ultrafiltration. The membrane station is pre-installed with a hose connection for installation of a blower (8). The pressurized air provided cleans the ultrafiltration membrane fibres and also delivers oxygen for biological treatment in the bioreactor.

The membranes are periodically cleaned by backwashing via the central backwash pump (12) and by coarse air bubbles. Systems are equipped with the I-CONNECT control system (5) and the automatic chemical cleaning technology I-CON-ADS (10). This enables an even more economical and low-maintenance operation.

Automatic chemical dosing system

The fully automatic cleaning station is controlled by the central control unit. The cleaning process can be timed regularly (e.g. every 14-28 days) or on demand.

The cleaning consists of two steps, first an acid cleaning through citric acid, for the removal of scaling components. The second step is an oxidative cleaning with chlorine to remove biofilm in the membrane's fibres. Both cleaning steps follow the same dosing routine.

Cleaning Routine:

1. The pipe will be fully filled with a cleaning solution. Afterwards a 10 min pause will occur so the chemicals can react with the components in the membrane fibres.
2. A small dosage will be injected into the system to exchange the volume of solution, in the membrane fibres. Another 10 min break will occur afterwards.
    - Step 2 will be performed 5 times.
3. As the pipe is still fully filled with the solution, the next injections into the system will be done with clear water. So, the amount of chemicals in the pipes will not be wasted. As in Step 2, the required amount of water will be injected into to system to exchange the volume of the membrane fibres. The 10 min break will occur again.
    - Step 3 will be performed 5 times.
4. To make sure no chemicals get mixed in the system, the dosing station and the pipe needs to be flushed. This flushing process also occurs at the end of the cleaning, so no chemicals will get into the clear water tank. To accomplish this, first the dosing station will be flushed with water. Then a break will occur for 10 mins. Afterwards an amount of water will be filtrated to the sewer to clean the permeate pipe.
    - The cleaning is finished.

Note: The duration of the whole cleaning process depends on the size of your system. After the chemical cleaning, the system will go back to its normal filtration routine.

Further process and components

The water from the clear water tank is pumped to the consumers by a pressure boosting system, such as the RAINMASTER systems, depending on the calculated and required flow rate and pressure. The process water can be used for consumers such as toilets, washing machines or irrigation. In order to achieve the greatest possible safety, the already ultra-filtrated process water passes through a UV treatment as the last stage. The dimensioning of the UV disinfection system is done according to the dimensioning of the pressure boosting system.

5.2 Overview table AQUALOOP systems

AQUALOOP models for commercial package solutions described in this manual are sized for daily flow capacities from 32400 litres per day (L/day) up to 48600 L/day.

The AQUALOOP membrane station can be equipped with up to 6 membrane cartridges. In the standard greywater application with automatic chemical cleaning, 900 L/day are filtered using a single membrane cartridge. One fully equipped membrane station (using 6 membrane cartridges) generates 5400 L/day cleaned water.
The number of membrane cartridges, bioreactor size, aeration volume supplied by the blower, pre-filter size, and amount of growth bodies, depends on the daily volume of greywater to be recycled. A minimum treatment rate table is provided below for the NSF 350 (C) listed model 5400 L/day.
For systems larger than 5400 L/day, NSF compliant complete systems have been developed with an NSF Declaration of Conformity (see chapter 3.5). An on-site test is not required.

All main components are individually matched to the system size.

Table 1: AQUALOOP greywater systems specifications overview

AQUALOOP System GW		32400	48600
Numbers of equivalent 5400 systems		6	9
Daily treatment quantity (L/day) *		32400	48600
Daily treatment quantity (US GPD) *		8568	12852
Bioreactor net volume $QV_{BR,use}$ (L) **		16200-32400	21600-48600
I-Connect-WT: Central control unit (pcs.)		1	1
AL-MS:	Membrane station (pcs.) ***	6	9
AL-MEM:	Membrane cartridge (pcs.)	36	54
PR-M:	Pre-filter (DN)	200	300
AL-FK540:	Growth bodies 540 L bag (pcs.)	6	9
AL-BLxx:	Blower (for membranes)	K05	K06
AL-BLxx:	Blower (for diffuser)	R30	R40
AL-PD142:	Pipe diffuser (pcs.)	6	9
VIP130-6:	Sludge pump (pcs.)	2	3

* *minimum average daily greywater yield and demand*
** *BR,use = VBR,max - VBR,min*
*** *Amount of Membrane Stations are dimensioned on daily flow of 900 L/day per membrane cartridge*

5.3 Hydraulic scheme

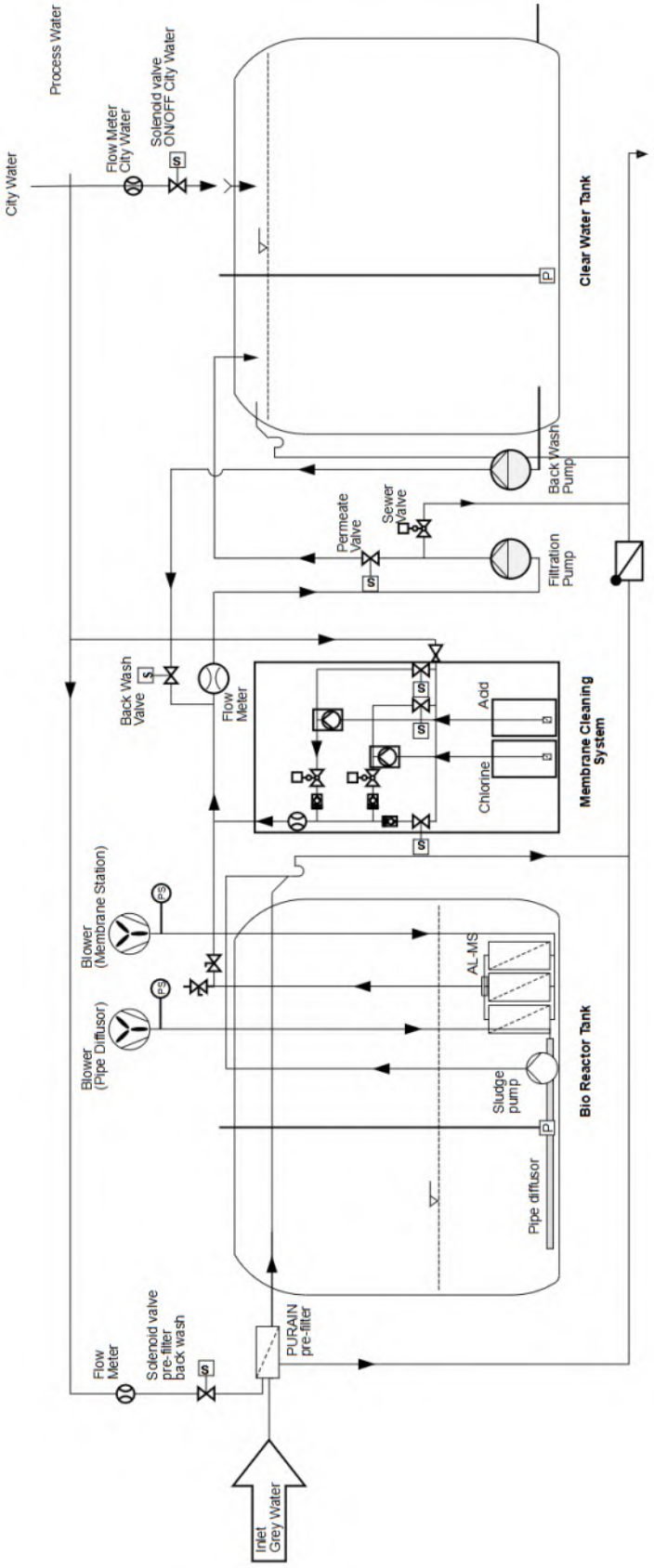


Figure 2: Hydraulic scheme

5.4 NSF/ANSI 350 influent quality requirement

The AQUALOOP Greywater Recycling System is designed for greywater treatment. Greywater as certified for this listing is combined shower, bath, bathroom sink water and effluent from washing machines. Toilet, dishwasher and kitchen wastewater are excluded from this listing due to high contaminant load or due to fat content.
The quality of the incoming greywater shall not exceed the NSF/ANSI 350 influent water quality requirements. The water parameters of the greywater delivered to the system must be as follows:

Table 2: Requirement of influent water quality

Parameter	Maximum Values / Ranges
COD (mg/L)	< 400
BOD5 (mg/L)	< 180
TSS (mg/L)	< 160
Turbidity (NTU)	< 100
Temperature	25 – 35 °C
E. coli (cfu/100 mL)	$< 10^3$
pH (SU)	6.5 – 8.0
total phosphorous – P (mL)	< 3.0
total Kjeldahl nitrogen – N (mL)	< 5.0
TOC (mg/L)	< 100
Total Coliforms (cfu/100 mL)	$< 10^4$
FOG (mg/L)	< 37
Water Hardness (°dH)	< 7.3

Permitted use of the following detergents and cleaning products:

- All usual personal cleaning products (soap, shampoo, shaving cream, toothpaste etc.) must be biodegradable.
- Detergents for washing machines should have low phosphate, low salts and be biodegradable. Refer to manufacturers for more information.

  Note: We do not recommend connecting the drain of the washing machine, as this shortens the maintenance intervals. The reason for this is that the biodegradability of washing machine detergents is usually poor or even partially non-degradable. If the washing machine drain is still to be used, the maximum inflow must be limited to 20% of the daily flow.
- All household cleaning agents should be used in accordance with the manufacturer's safe home used directions.

Attention:

The water quality should be monitored to ensure that no undesirable substances enter the system. The function of the membranes and the system in general can be impaired if excessive quantities enter the system and damage to the system can occur.

Water inlet qualities and substances which are not allowed:

- Water from toilet, kitchen
- Fats, oils, and greases
- Chemicals such as paints, thinners and cleaning chemicals
- Hair dyes (can cause discoloration of the filtered water)

5.5 NSF/ANSI 350 effluent water quality

During the certification process the INTEWA AQUALOOP Greywater Recycling System produces an effluent that successfully meets the performance requirements established by NSF/ANSI Standard 350 Class C for a multi-family or commercial location:

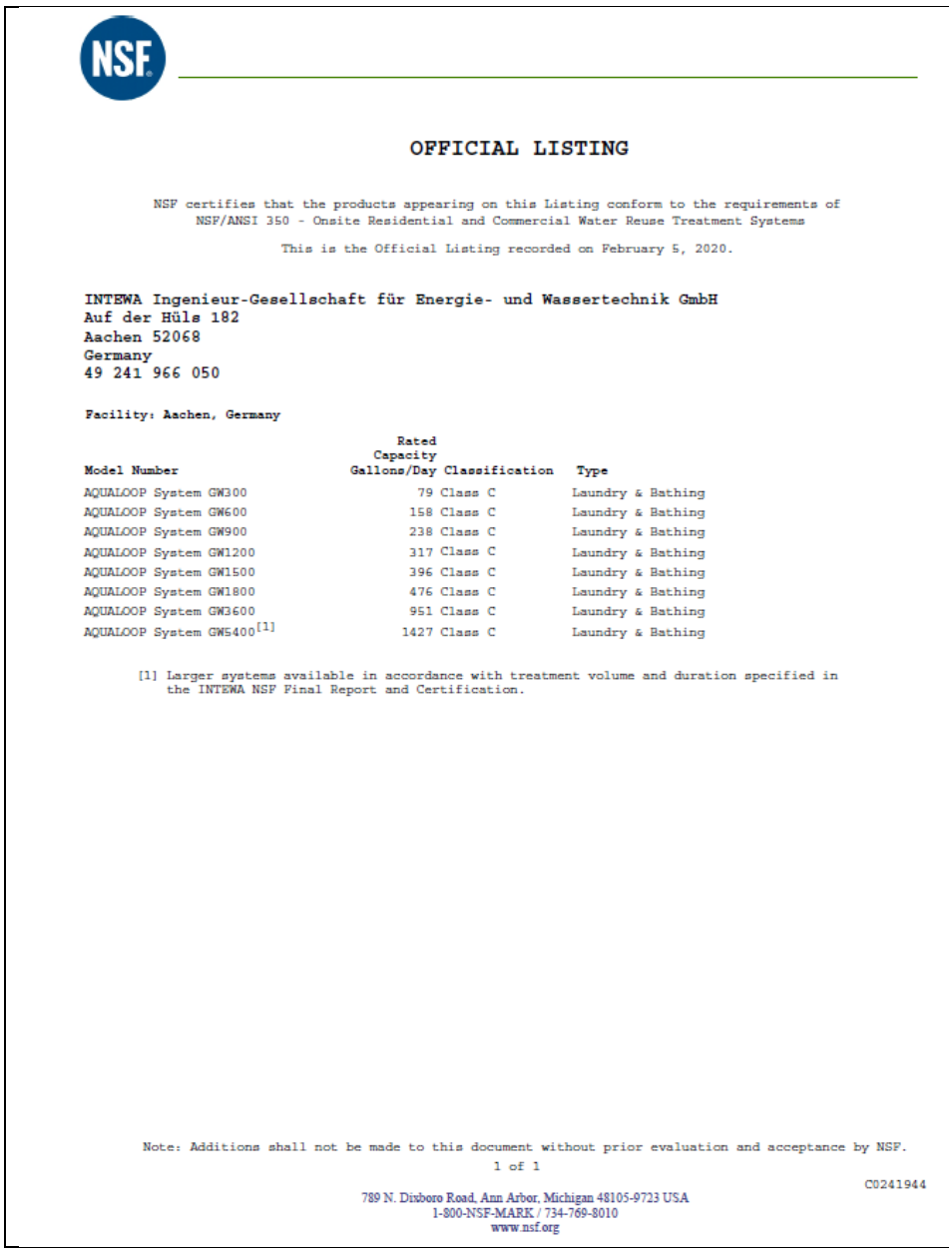
Table 3: NSF/ANSI 350 effluent requirements and certification test results for AQUALOOP

Measure	NSF/ANSI 350 Class C requirement		Class C AQUALOOP test result NSF approval Certificate No.: C0241944 - 01	
Measure	Test Average	Single Sample Maximum	Result Average	Single Sample Maximum
$CBOD_5$ (mg/L)	10	25	6	17
TSS (mg/L)	10	30	2	8
turbidity (NTU)	2	5	0.5[1]	4.0
E. coli [2] (MPN/100 mL)	2.2[2]	200	2.0[2]	13.0
pH (SU)	6.0 – 9.0	NA[3]	6.7 – 8.0	NA1
colour	MR[2]	NA[3]	MR[4]	NA1
door	Non offensive	NA[3]	Non offensive	NA1
oily film and foam	Non-detectable	Non-detectable	Non-detectable	Non-detectable

[1] median, [2] geometric mean, [3] NA: not applicable, [4] MR: measured and reported only

5.6 NSF/ANSI 350 certification

The systems AL-GW300 to AL-GW5400 (300 – 5400 L/d) are NSF certified according to NSF/ANSI 350-2014.
For systems larger than 5400 L/day INTEWA is authorized to issue an NSF declaration of conformity, which entitles the holder to carry the NSF certificate. An on-site test is not required.
For this purpose, INTEWA will perform a system-specific verification of compliance with the specifications of the INTEWA NSF report. See the confirmation of the official NSF listing above.



OFFICIAL LISTING

NSF certifies that the products appearing on this Listing conform to the requirements of NSF/ANSI 350 - Onsite Residential and Commercial Water Reuse Treatment Systems

This is the Official Listing recorded on February 5, 2020.

INTEWA Ingenieur-Gesellschaft für Energie- und Wassertechnik GmbH
Auf der Hüls 182
Aachen 52068
Germany
49 241 966 050

Facility: Aachen, Germany

Model Number	Rated Capacity Gallons/Day	Classification	Type
AQUALOOP System GW300	79	Class C	Laundry & Bathing
AQUALOOP System GW600	158	Class C	Laundry & Bathing
AQUALOOP System GW900	238	Class C	Laundry & Bathing
AQUALOOP System GW1200	317	Class C	Laundry & Bathing
AQUALOOP System GW1500	396	Class C	Laundry & Bathing
AQUALOOP System GW1800	476	Class C	Laundry & Bathing
AQUALOOP System GW3600	951	Class C	Laundry & Bathing
AQUALOOP System GW5400[1]	1427	Class C	Laundry & Bathing

[1] Larger systems available in accordance with treatment volume and duration specified in the INTEWA NSF Final Report and Certification.

Note: Additions shall not be made to this document without prior evaluation and acceptance by NSF.
1 of 1
C0241944
789 N. Dixboro Road, Ann Arbor, Michigan 48105-9723 USA
1-800-NSF-MARK / 734-769-8010
www.nsf.org

Figure 3: Official NSF listing (https://www.intewa.com/fileadmin/documents/Zertifikate/NSF_Certifikation_2019_02.pdf)

5.7 NSF/ANSI 350 data plate

The data plate is mounted visibly on the front of the bioreactor or in front of the I-Connect Control Unit.

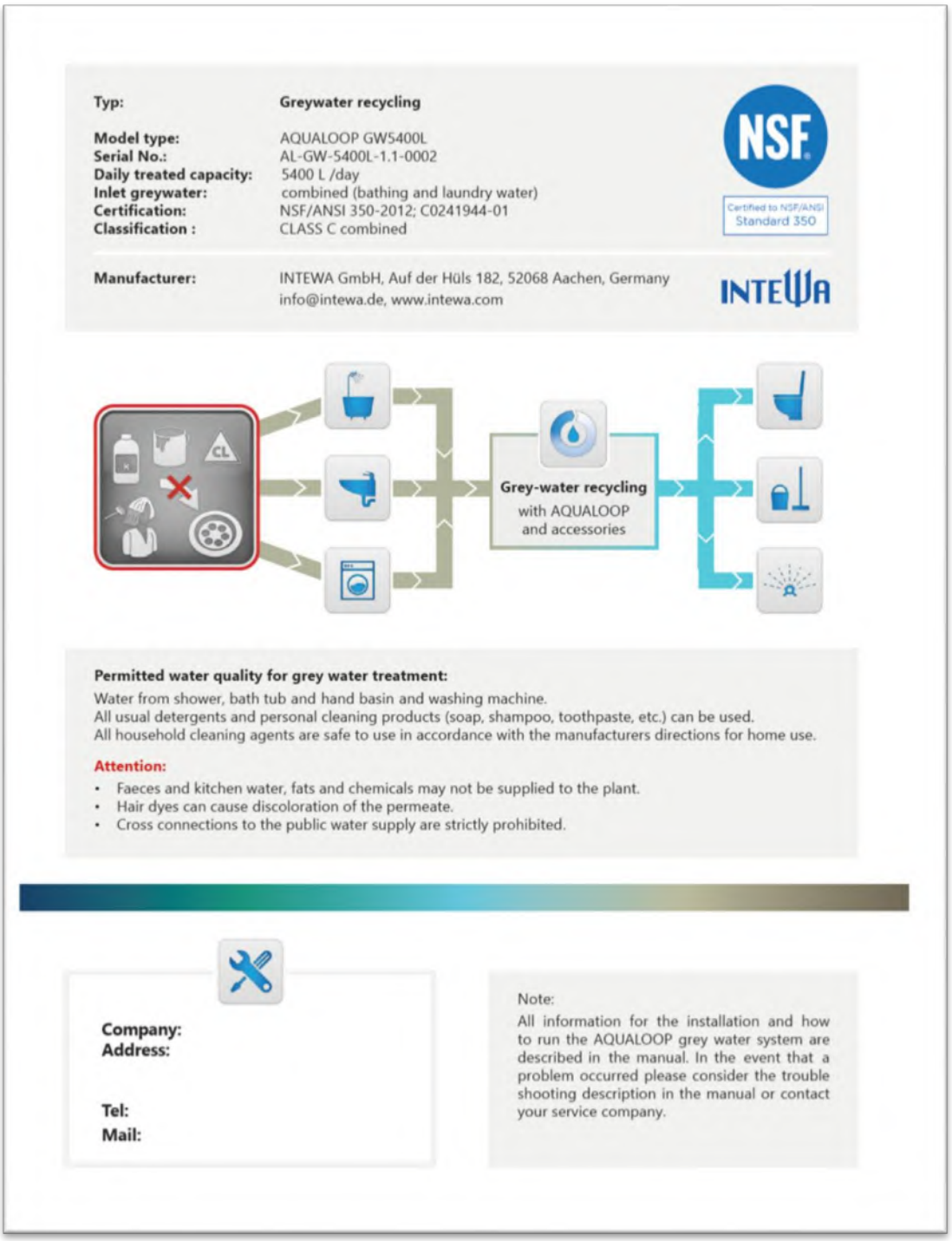


Figure 4: Exemplary picture of a data plate for a AL-GW5400 System

5.8 BS 8525-2 effluent water quality

During the certification process the INTEWA AQUALOOP Greywater Recycling System produces an effluent that successfully meets the performance requirements established by BS Standard BS8525-2:2011 for spray application:

Table 4: Microbiological quality of treated greywater for type tests

Parameter	Spray applications	Non-spray applications			Testing	
	Pressure washing, garden sprinkler use and car washing	WC flushing	Garden watering	Washing machine use	Spray applications	Non-spray applications
E. coli number/ 100 mL	Not detected	25	25	Not detected	BS EN ISO 9308-1	BS EN ISO 9308-3
Intestinal enterococci number/ 100 mL	Not detected	10	10	Not detected	BS EN ISO 7899-2 or BS EN ISO 7899-1	BS EN ISO 7899-1

Table 5: Chemical and physical quality of treated greywater for type tests

Parameter	Spray applications	Non-spray applications			Testing
	Pressure washing, garden sprinkler use and car washing	WC flushing	Garden watering	Washing machine use	
Turbidity NTU	<10	<10	N/A	<10	BS EN ISO 7027
pH	5–9.5	5–9.5	5–9.5	5–9.5	BS 1427
Residual chlorine [A)] mg/L	<2.0	<2.0	<0.5	<2.0	BS EN ISO 7393-2
Residual bromine [A)] mg/L	0.0	<5.0	0.0	<5.0	Blue Book 218, Method E10 [N1]

[A)] Where chlorine or bromine is used in the treatment process.

5.9 BS Standard 8525-2 performance results

BS- Certification BS 8525-2:

The INTEWA system is tested to the British Standard for a spray irrigation system. The test carried out at the PIA Test Institute for Wastewater for the smallest and thus most difficult plant, the AQUALOOP plant 6 for the most critical application, the "spray application". **BS-certified plants must also be equipped with a UV system.** The certification can be applied to plants up to 5400 l/day. As the standard only covers plants up to 10 m³, larger plants can be declared as "following" BS 8525-2.

PIA Testing Institute for Wastewater Technology

PERFORMANCE RESULTS

Test performed according to BS 8525-2:2011

Manufacturer
INTEWA GmbH, Jülicher Straße 336, 52070 Aachen/Germany

AQUALOOP-System 6
Membrane Bioreactor with UV Disinfection
for the Treatment of Greywater

Class of greywater input	Bathroom greywater including washing machine effluent
Class of treated water output	Spray application
Nominal hydraulic daily load	200 l/d
Acceptance flow rate	1l/sec
Acceptance volume	100 l
Maximum storage time	21 days
Details of desinfection process	UV desinfection after storage
Nominal occupancy	4 beds
Power supply requirements	230 volts, 1 amps, Single phase

Performance tested by:
PIA – Prüfinstitut für Abwassertechnik GmbH
(PIA GmbH)
Hergenrather Weg 30
52074 Aachen, Germany

Certified according to ISO 9001:2008
Notified Body No.: 1739

Prüfinstitut für Abwassertechnik GmbH
Dr. rer. nat. Martina Defrain April 2014
- tested - testé

Figure 5: Official test performance results according to BS 8525-2:2011

5.10 General drawing AQUALOOP GW Systems

Note: All units of measure are metric or Anglo-American units.

5.10.1 AL-GW System 32400

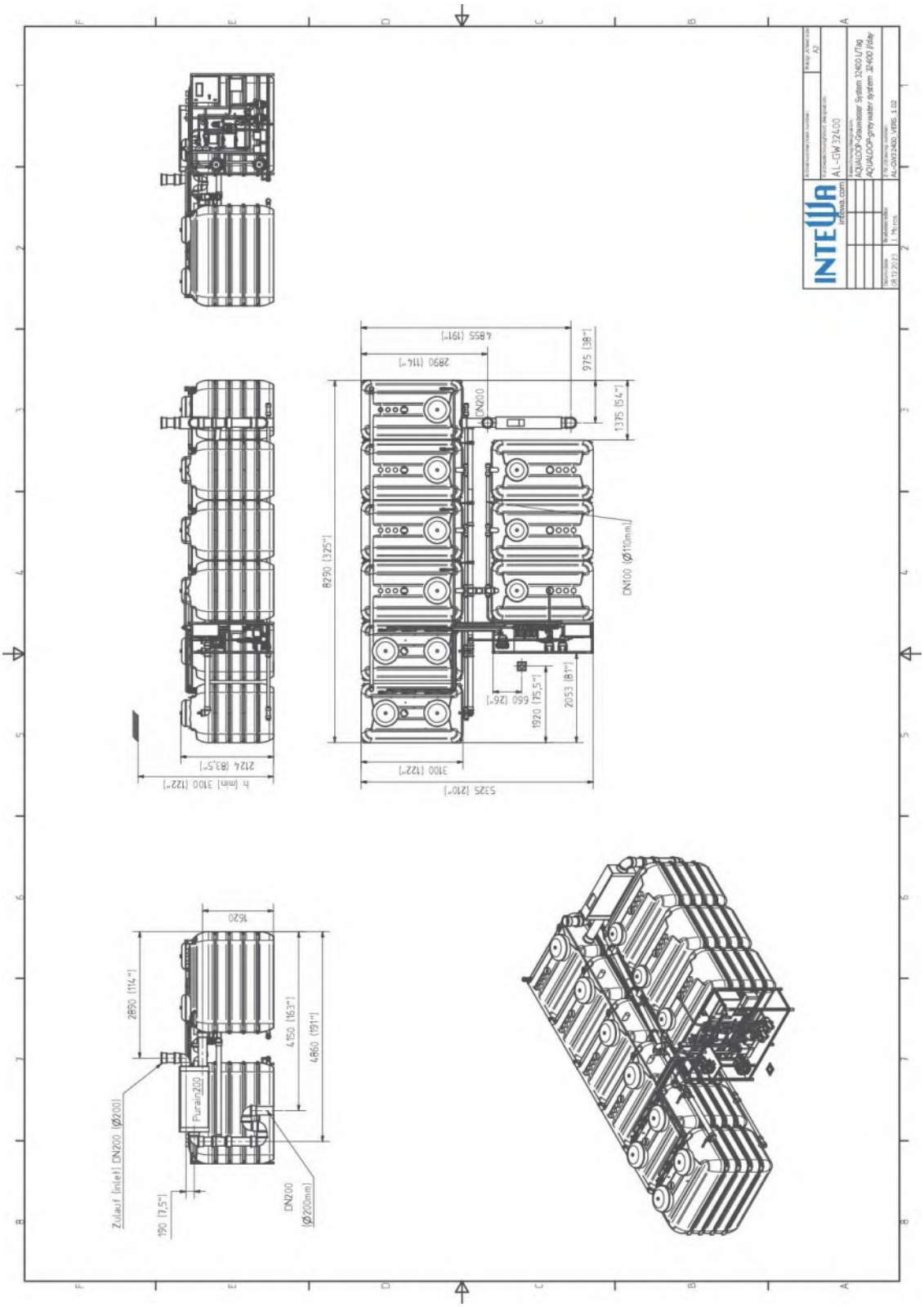


Figure 6: AQUALOOP System 32400 L/day

5.10.1.1 Required floor space AL-GW System 32400

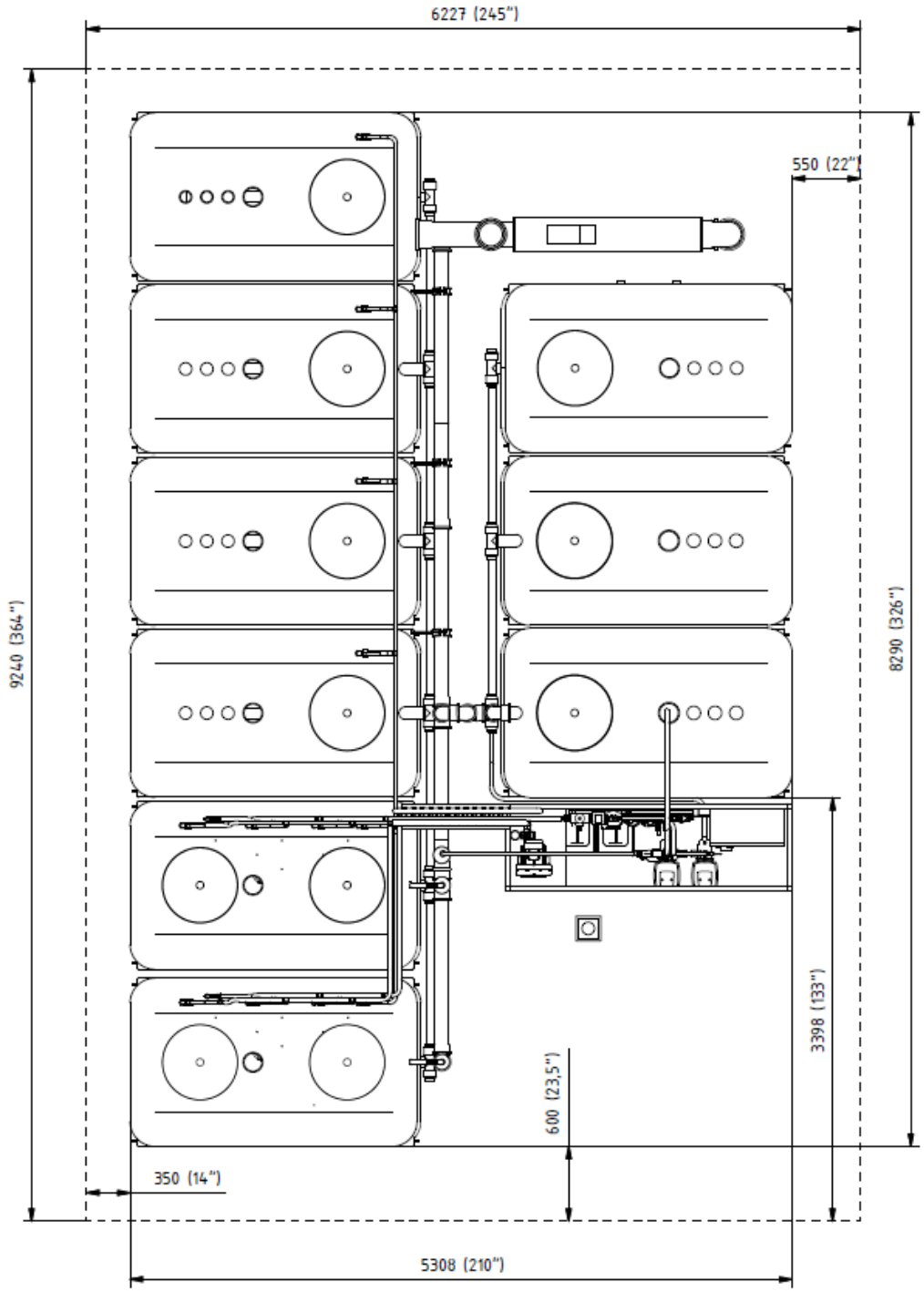


Figure 7: Minimum workspace required for AL-GW System 32400

5.10.1.2 Bioreactor AL-GW System 32400

Figure 8: Overview Bioreactor Tanks 1 to 6 for AL-GW 32400

Figure 9: Bioreactor Tank 1 for AL-GW 32400

Bioreactor Tank 1

1. Greywater inlet pipe DN200 from PURAIN PR200 with installed Grid filter Ø200
2. Access shaft Ø600 for tank maintenance
3. Coupling with grid filter DN70

Pipe diffusor (installed)

4. Pipe diffusor AL-PD142 with connected hose 1“, threat connection on tank top 1“ OT (connected to Blower B1 for pipe diffusor)

Figure 10: Bioreactor Tank 2/3/4 for AL-GW 32400

Bioreactor Tank 2/3/4

1. Coupling with Grid filter Ø70mm
2. Access shaft Ø600 for tank maintenance

Pipe diffusor (installed)

3. Pipe diffusor AL-PD142 with connected hose 1“, threat connection on tank top 1“ OT (connected to Blower B1 for pipe diffusor)

Figure 11: Bioreactor Tank 5/6 for AL-GW 32400

Bioreactor Tank 5/6

Tank connections:

1. Coupling with Grid filter DN70
2. Access shaft 2 x Ø600 for tank maintenance

Membrane station (installed)

3. 3 pcs. Membrane station (AL-MS) equipped with 6 membrane cartridge each, Permeate Pipe ½“, connection on top of the tank AL-CKIT ¾“, Aeration pipe 1“, connection on top of the tank 1“ OT
4. Fixing of the membrane station to prevent buoyancy

Pipe diffusor (installed)

5. Pipe diffusor AL-PD142 with connected hose 1“, threat connection on tank top 1“ OT (connected to Blower B1 for pipe diffusor)

Sludge pump (installed)

6. Sludge pump with 1“ hose, , connection on top of the tank 1“ OT

Level sensor (installed)

7. Level sensor, cable gland on top of the tank, Senor cable (exclusive to Tank 6)

5.10.1.3 Clear water tank AL-GW System 32400

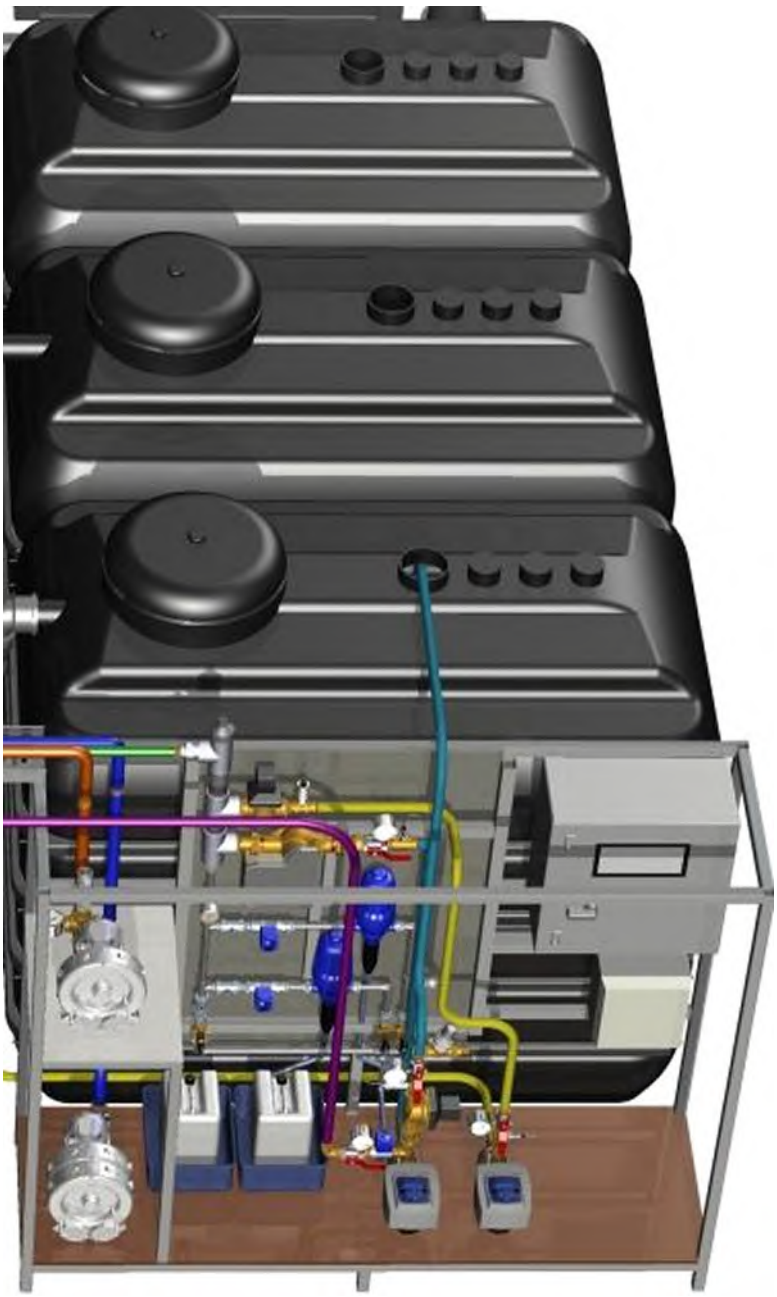


Figure 12: Overview Clear Water Tanks for AL-GW 32400 and technical unit

Figure 13: Clear Water Tank 1/2 for AL-GW 32400

Clear water tank 1/2

1. Tank coupling DN70
2. Access shaft Ø400 for tank maintenance

Figure 14: Clear Water Tank 3 for AL-GW 32400

Clear water tank 3

Level sensor (installed)

1. Level sensor, cable gland on top of the tank (must be connected to the control unit)

Tank connection

2. Emergency Overflow DN 100 (piping to sewer via a siphon to prevent door from sewer on side
3. Inlet permeate connection 1“, from filtration valve V6
4. Top connection for suction hose booster pump
5. Top connection city water top up (optional use)
6. Tank coupling DN70
7. Access shaft Ø400 for tank maintenance

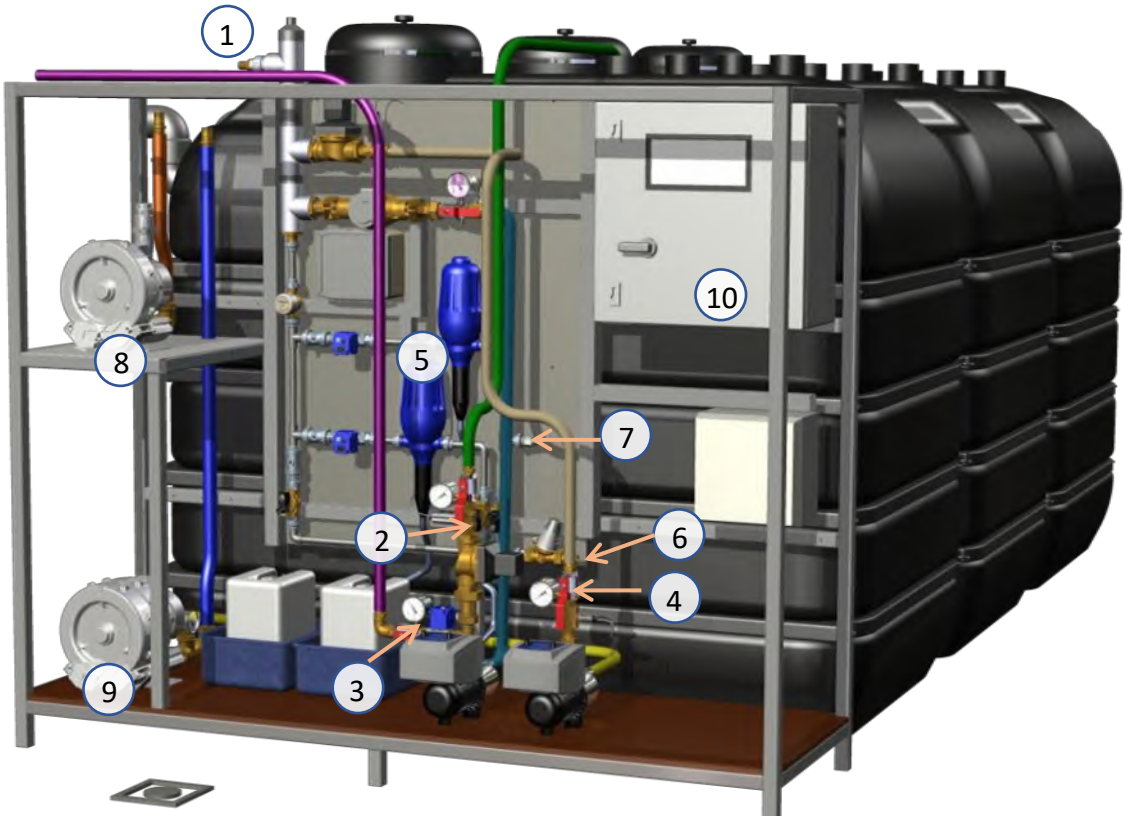


Figure 15: Technical Unit; Control unit, Dosing station, Filtration/backwash pumps and Blowers

Technical Unit

Dosing station

1. Permeate inlet from membrane station
2. Permeate outflow from filtration pump (valve V6) to clear water tank
3. Permeate outflow from filtration pump (valve V7) to sanitary sewer
4. Clear water inlet from Backwash pump (valve V10) to membrane station
5. Dosing pumps with suction hoses to chemical containers acid / chlorine
6. Process water inlet from booster pump
7. Over pressure valve, hose outlet to sewer

Blowers

8. Blower B1 for Membrane aeration
9. Blower B2 for pipe diffusor

Control unit

10. Control unit I-CON-WT with touch display

5.10.2 AL-GW System 48600

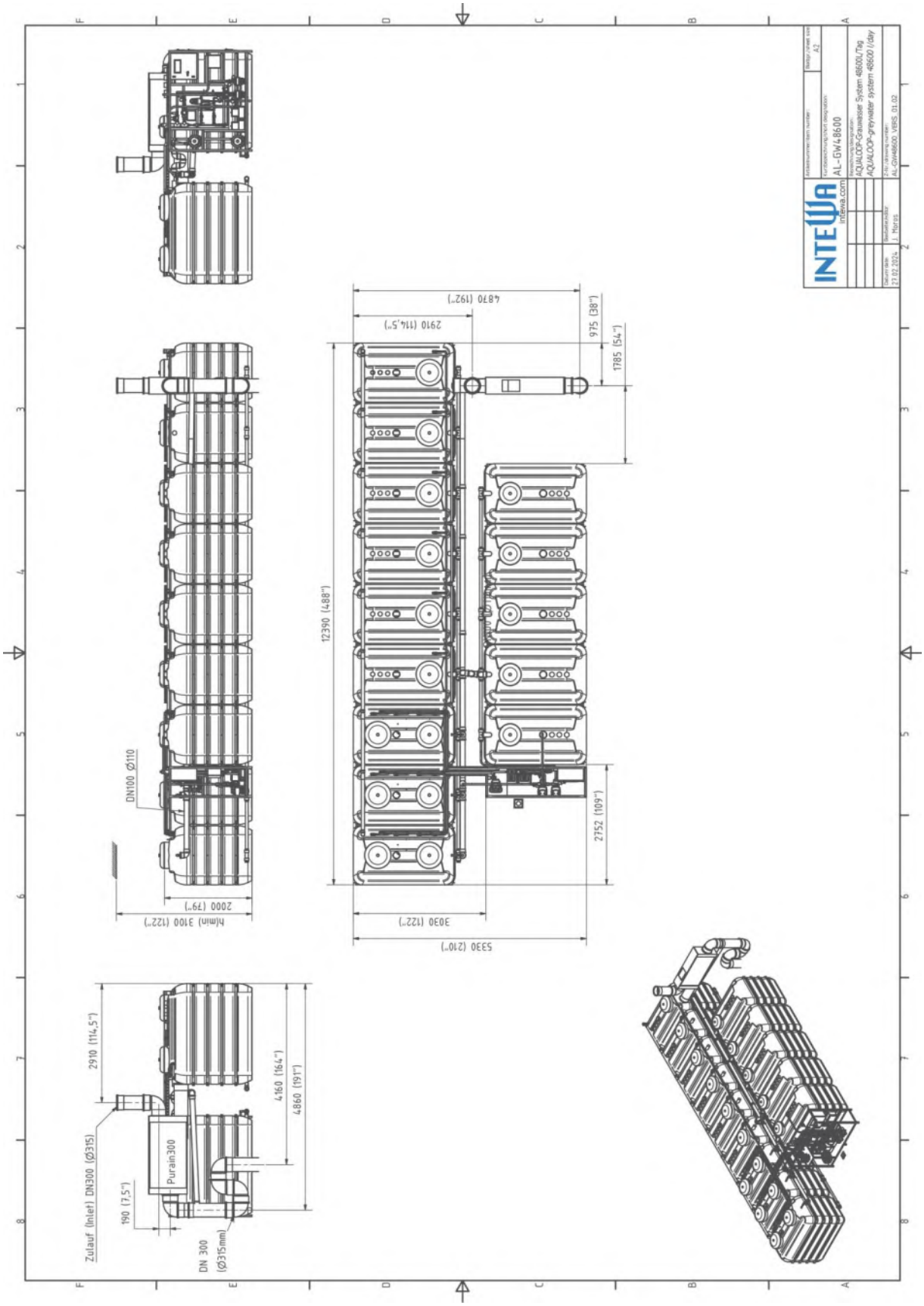


Figure 16: AQUALOOP System 48600 L/day

5.10.2.1 Required floor space AL-GW System 48600

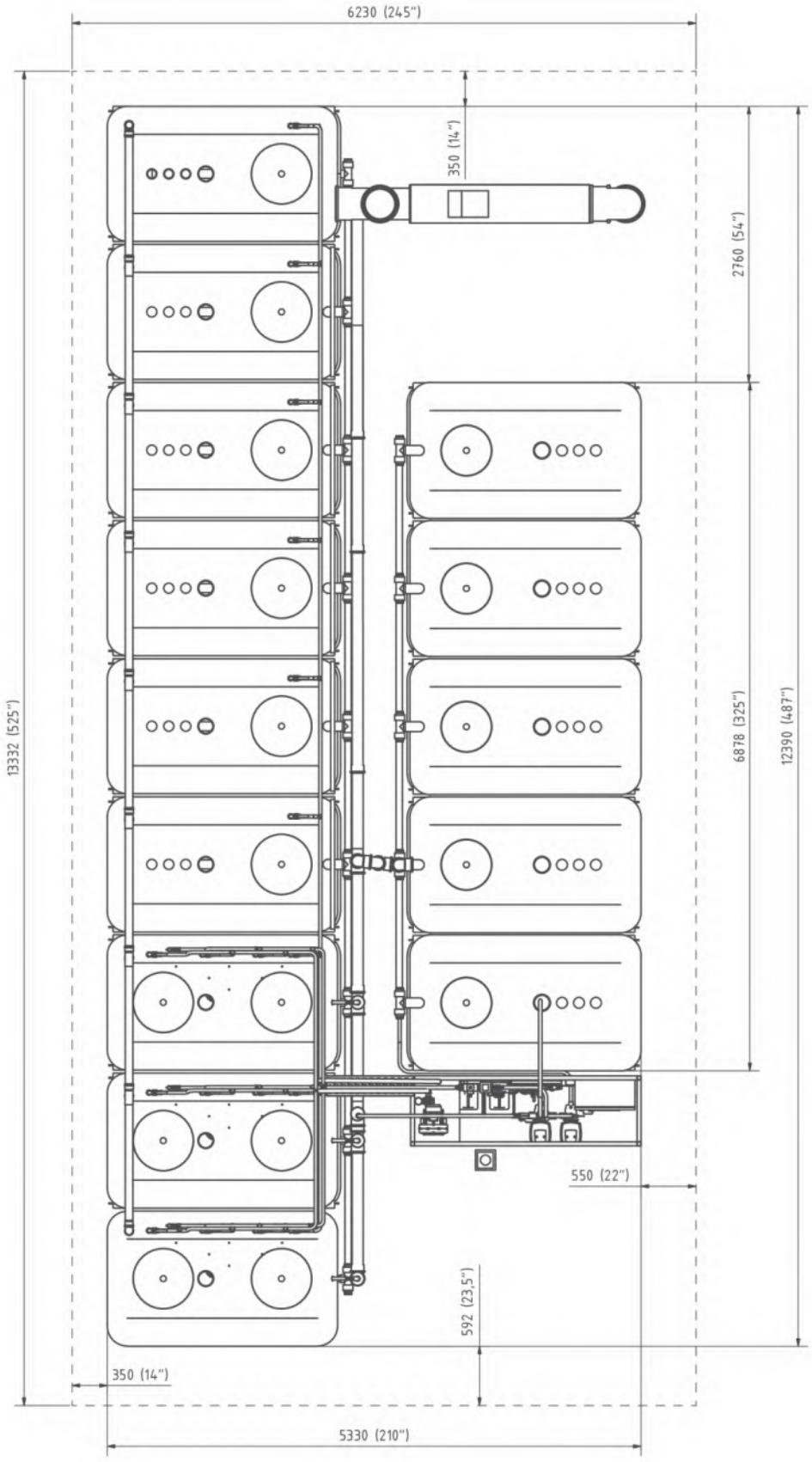


Figure 17: Minimum workspace required for AL-GW System 48600

5.10.2.2 Bioreactor AL-GW System 486000

Figure 18: Overview Bioreactor Tanks 1 to 9 for AL-GW 48600

Figure 19: Bioreactor Tank 1 for AL-GW 48600

Bioreactor Tank 1

1. Greywater inlet pipe DN200 from PURAIN PR300 with installed Grid filter Ø300
2. Access shaft 2 x Ø600
3. Coupling with Grid filter Ø70mm

Pipe diffusor (installed)

4. Pipe diffusor AL-PD142 with connected hose 1“, threat connection on tank top 1“ OT (connected to Blower B1 for pipe diffusor)

Figure 20: Bioreactor Tank 2/3/4/5/6 for AL-GW 48600

Bioreactor Tank 2/3/4/5/6

1. Coupling with Grid filter Ø70mm

Pipe diffusor (installed)

2. Pipe diffusor AL-PD142 with connected hose 1“, threat connection on tank top 1“ OT (connected to Blower B1 for pipe diffusor)

Figure 21: Bioreactor Tank 7/8/9 for AL-GW 48600

Bioreactor Tank 7/8/9

Tank connections:

1. Coupling with Grid filter DN70
2. Access shaft 2 x Ø600 for tank maintenance

Membrane station (installed)

3. 3 pcs. Membrane station (AL-MS) equipped with 6 membrane cartridge each, Permeate Pipe ½“, connection on top of the tank AL-CKIT ¾“, Aeration pipe 1“, connection on top of the tank 1“ OT
4. Fixing of the membrane station to prevent buoyancy

Pipe diffusor (installed)

5. Pipe diffusor AL-PD142 with connected hose 1“, threat connection on tank top 1“ OT (connected to Blower B1 for pipe diffusor)

Sludge pump (installed)

6. Sludge pump with 1“ hose, , connection on top of the tank 1“ OT

Level sensor (installed)

7. Level sensor, cable gland on top of the tank, Senor cable (exclusive to Tank 9)

5.10.2.3 Clear water tank AL-GW System 48600

Figure 22: Overview Clear Water Tanks for AL-GW 48600 an Technical unit

Figure 23: Clear Water Tank 1/2/3/4 for AL-GW 48600

Clear water tank 1/2/3/4

1. Tank coupling DN70
2. Access shaft Ø400 for tank maintenance

Figure 24: Clear Water Tank 5 for AL-GW 48600

Clear water tank 3

Level sensor (installed)

1. Level sensor, cable gland on top of the tank (must be connected to the control unit)

Tank connection

2. Emergency Overflow DN 100 (piping to sewer via a siphon to prevent door from sewer on side
3. Inlet permeate connection 1“, from filtration valve V6
4. Top connection for suction hose booster pump
5. Top connection city water top up (optional use)
6. Tank coupling DN70
7. Access shaft Ø400 for tank maintenance

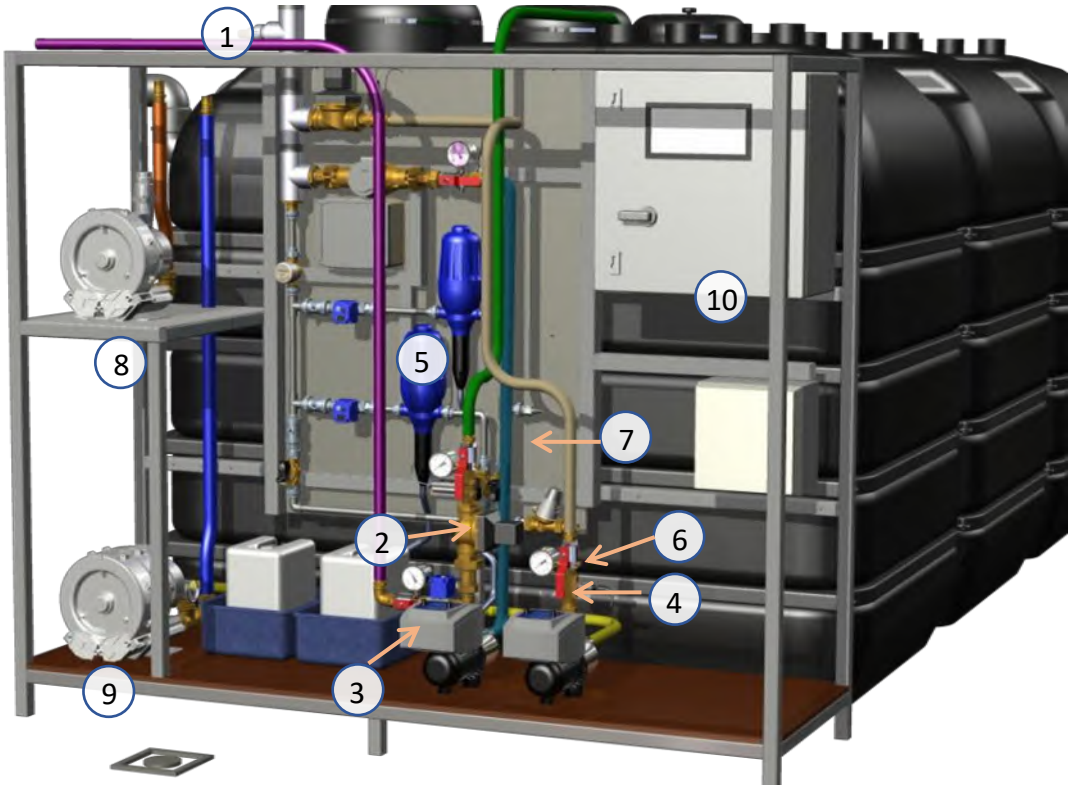


Figure 25: Technical unit; Control unit, Dosing station, Filtration/backwash pumps and Blowers

Technical Unit

Dosing station

1. Permeate inlet from membrane station
2. Permeate outflow from filtration pump (valve V6) to clear water tank
3. Permeate outflow from filtration pump (valve V7) to sanitary sewer
4. Clear water inlet from Backwash pump (valve V10) to membrane station
5. Dosing pumps with suction hoses to chemical containers acid / chlorine
6. Process water inlet from booster pump
7. Over pressure valve, hose outlet to sewer

Blowers

8. Blower B1 for Membrane aeration
9. Blower B2 for pipe diffusor

Control unit

10. Control unit I-CON-WT with touch display

6. Technical data

6.1 Control Unit I-Connect Water Treatment (I-CON-WT)

The control unit is designed for commercial scale applications with multiple AQUALOOP membrane stations (AL-MS).
The local interface is a touch screen. The controller can be connected to the building management system (BMS) via BACnet connectivity. Remote control, monitoring and data history are available via the Web-Portal (https://connect.intewa.com) depending on the chosen licence.

	I-CON-WT-EU
Dimensions (H x W x D):	600x600x210 mm
Mains supply central controller:	400 VAC / 50 Hz, 3ph
Total full load amperes:	AL-GW32400: 10,5 kW/ 13A AL-GW48600: 13,5kW/ 16,5A
Components power consumption:	
• Filtration pumps:	400 VAC/50Hz, 0,8 kW
• Backwash pumps:	400 VAC/50Hz, 1, 3kW
• Membrane station blowers:	AL-GW32400: 400 VAC/50Hz, 3,5kW AL-GW48600: 400 VAC/50 Hz 4,8 kW
• Pipe diffusor blowers	AL-GW32400: 400 VAC/50Hz,, 1,3kW AL-GW48600: 400 VAC/50Hz,, 1,3kW
• Sludge pumps (each):	230 VAC/50 Hz, 300W
• 2/2 Ball valves (V7):	230 VAC/50 Hz, 18 W
24V DC components:	
• 2/2 Ball valves (V3,V5):	24 VDC, 4 W
• 2/2 Solenoid valves (V6, V10):	24 VDC 28 W
• 2/2 Solenoid valves (V1, V2, V4, V8, V9):	24 VDC 9 W
• Alarm beeper:	24 V DC, 1 W
12V DC Components:	
• Controller/ Display:	12 V DC, 5 W
Signal inputs:	
• Level sensor, bioreactor:	4 … 20 mA, 1 W
• Level sensor, clear water tank:	4 … 20 mA, 1 W
• Water meter	0,25L/Impuls (pot. Free)
• Pressure transducer membrane blower	4 … 20 mA, 0,5 W
• Pressure transducer pipe diffusor blower	4 … 20 mA, 0,5 W
Signal Outputs:	
• Bus connection ti Inverts:	ModBus
• Internet Access:	LAN, RJ45
• Remote Monitoring and Control Protocol:	Encrypted HTTPS connection
• BMS networking protocol:	BacNet IP (Server),Vers.: 1.58, 2018
Protection class IEC 60 529 / NEMA	IP 66 / NEMA 4
Material unit case:	Coated steel
Display size:	10,1”, resistive
Remote Monitoring and Control Protocol:	Encrypted HTTPS connection / VPN
Certification:	CE
Weight:	60 kg

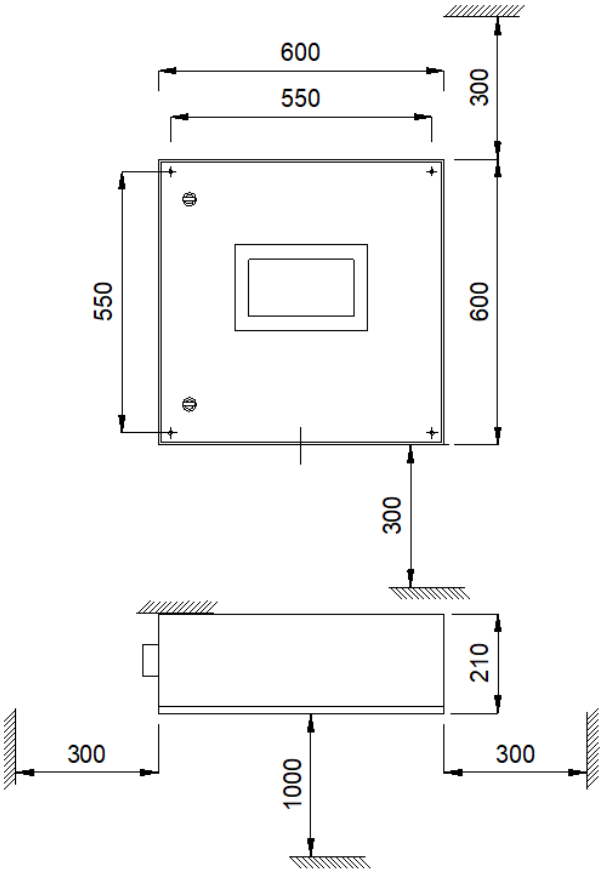


Figure 26: Dimensions of controller (Front and top view)

Note:

Attention must be given that an installation and maintenance space is needed (to open the housing lid and a place for cable routings) for at least 300 mm all around.

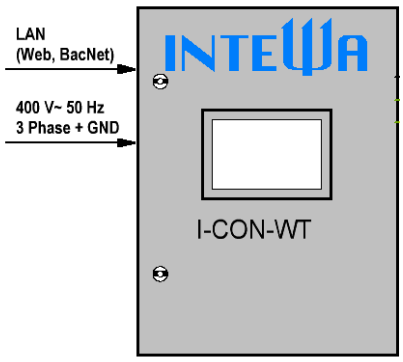


Figure 27: Overview of connections to Central Control Unit

6.2 Tanks for Bioreactor and clear water

	INT-5000-E
Dimensions:	2390 x 1350 x 1980 mm
Net capacity:	5000 L/day (1320 US gal/day)
Material:	HDPE plastic, steel
Weight:	240 kg (530 lbs.)

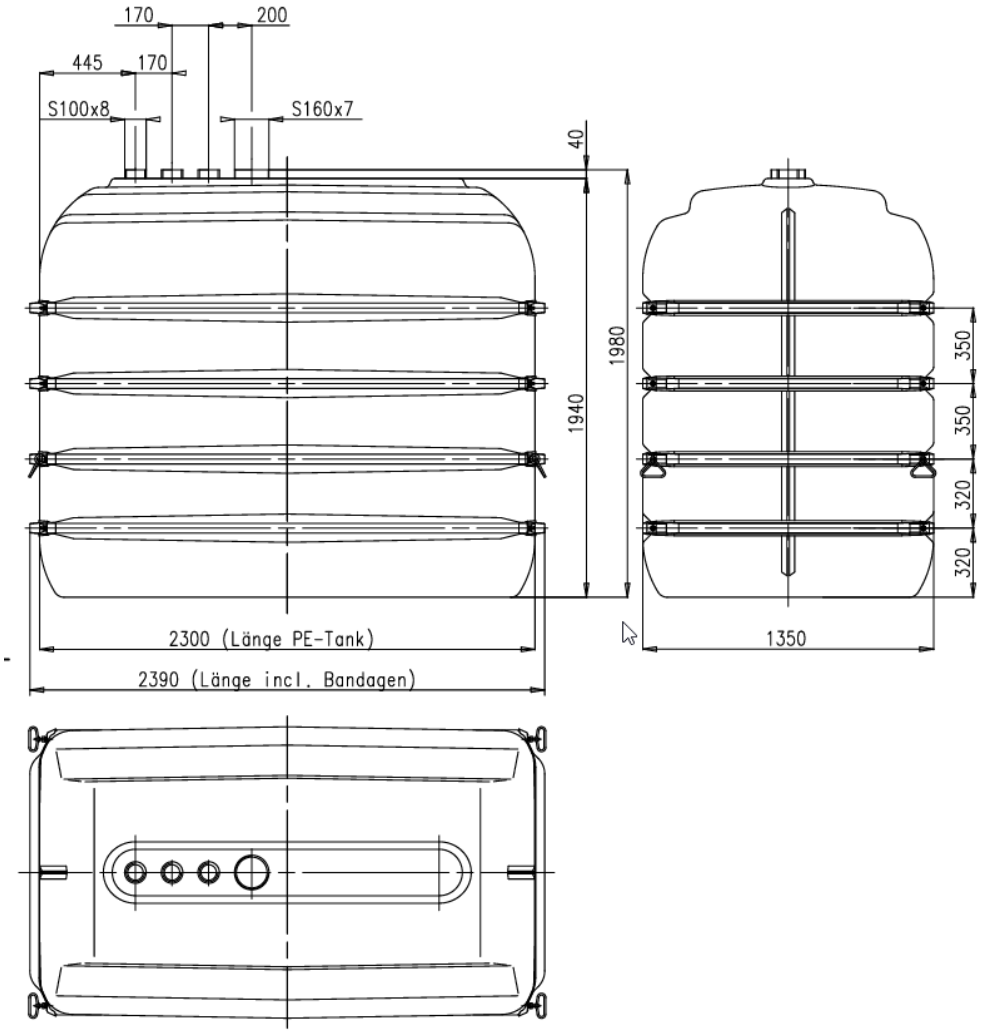


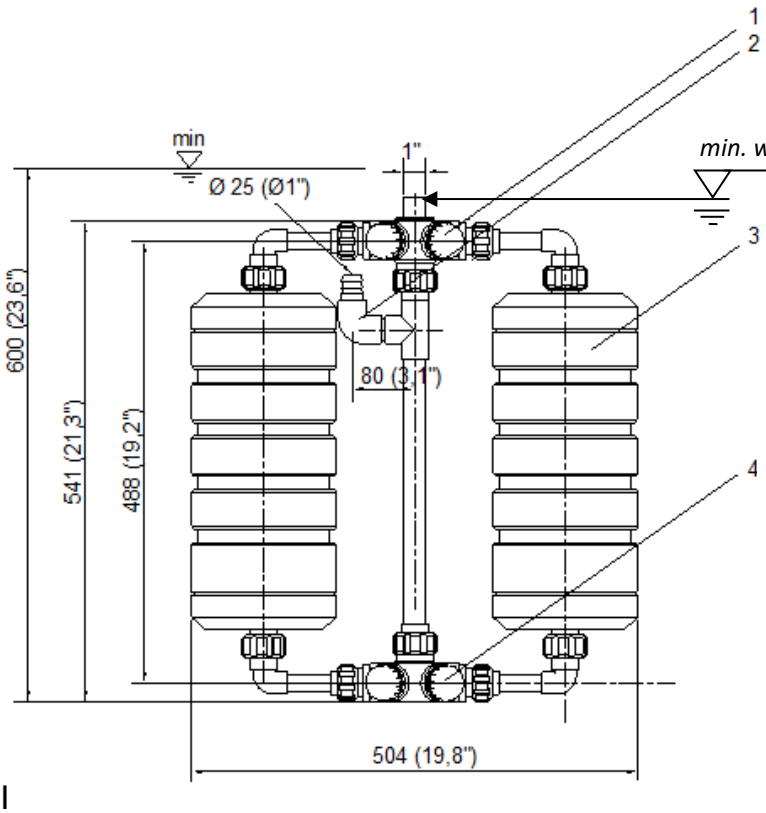
Figure 28: Dimensions of INT-5000-E tank

Table 6: Tanks involved in each standard systems

Standard systems		**Bioreactor tank**	**Clear water tank**
[m^3/day]	**[US gal/ day]**		
32400	8568	6 x INT-5000-E	3 x INT-5000-E
48600	12852	9 x INT-5000-E	5 x INT-5000-E

6.3 AQUALOOP Membrane Station (AL-MS-B)

	AL-MS-B
Dimension (Ø x H):	max. Ø 504 x 600 mm (20 x 23,6”) (with max. 6 membrane cartridges)
Central blower connection:	Barbed End, Ø 25 mm (1”)
Treated water connection:	1” External Thread
Max. water level, total:	2 m (6.6 ft.)
Max. length / height treated water pipe:	10m / 2 m (32 ft. / 6.6 ft.)
Height of the treated water outlet:	$H_{CL,\ outlet} > H_{Sewer}$
Pump cable each:	0.75mm² x Ø 6mm, 3 m (0.003 inch² x Ø 0.3” 9.8 ft.)
Pump protection type:	IP68
Material:	PVC (fittings), ABS (pump-body), PE (membranes), ceramic (pump axle)
Weight without membranes:	3.5 kg (7.8 lbs)
Total weight (6 membranes):	11.0 kg (27.6 lbs)



1. Membrane permeate connections on top distributor
2. Central pipe with blower connection
3. Membrane cartridges
4. Membrane aeration connections on bottom distributor

Figure 29: Dimensions of membrane station

Note: Please refer to the corresponding manual AL-MS for more information.
https://www.intewa.com/en/weiteres/downloads/downloads/instructions-and-data-sheets/

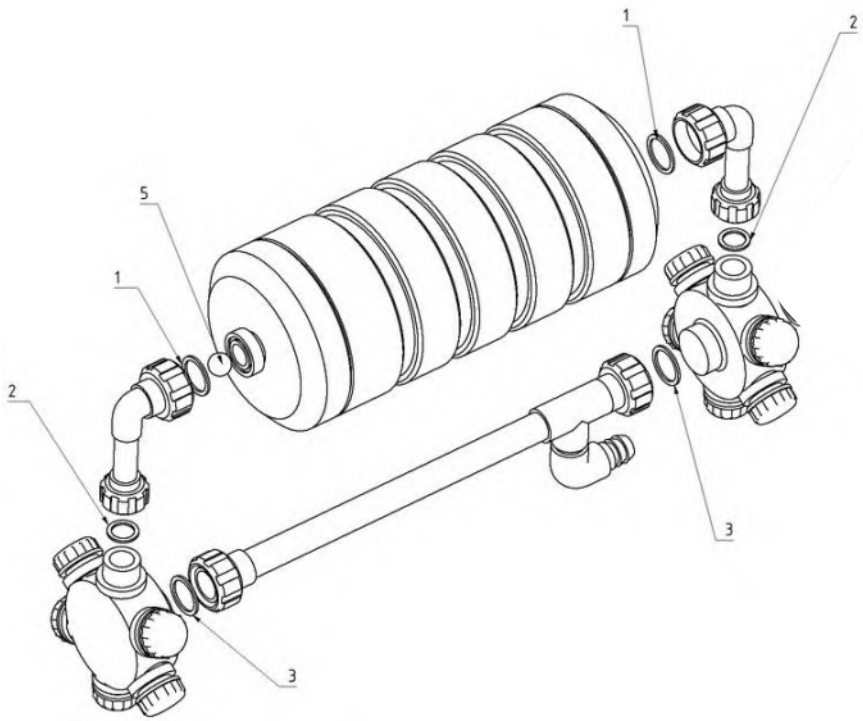
Installation sequence:

- The central pipe (2) is connected with top (1) and bottom (4) distributor.
- Assemble the membrane cartridge with supplied bends and screw them into the distributors.

  Note: Mount the membranes (3) on the right-way-up! See mounting instruction AQUALOOP Membrane! All screws must first be loosely attached to prevent jamming. Only when all membrane cartridges are positioned should all union nuts be tightened.

Assembly of the membrane station

The membrane station is delivered assembled. All connection points are sealed with O-rings or flat gaskets. Individual components can be easily replaced during maintenance or servicing.



1: 1 ¼“ O-ring
2: 1“ flat seal
3: 1 ¼“ flat seal
5: Ball

Figure 30: Assembling of the membrane station

6.4 AQUALOOP Membrane Cartridge (AL-MEM)

	AL-MEM
Cartridge dimensions (Ø x H):	Ø 164 x 410 mm
Dimension with elbow connector:	Ø 164 x 488 mm
Weight:	1.6 kg
Membrane filter area:	6 m²
Membrane fibre material / type:	PE / Hollow fibre
Fibre diameter / number / length:	0.41 – 0.44 mm / 1600-2000 / 740 mm ± 15 mm
Medium pore size:	0.02 µm
Anti-fouling:	yes
Pre-wetting:	yes
Flow range:	30 -600 l/h (depending on application and pressure range)
Temperature range:	0 - 40 °C
Max. Suction Transmembrane pressure:	0,7 bar
Max. Backflush pressure:	1 bar (max 30°C) / 0,5 bar (max 40 °C)
Max. Membrane aeration:	30- 100 l/min (with max. 8 - 3h Aeration duration/day)
Max. free chlorine at 25°C or lower:	5000 ppm 9.5 pH during chemical cleaning
Max. cleaning load (free chlorine):	1.0 Mio ppmh (Cumulative hours)
Cartridge protection material and connectors:	PE / PPH / U-PVC / ABS / Epoxy compound
Aeration / permeate connection:	1 ¼“ OT / 1 ¼“ OT
O-Ring seal:	Ø 26mm x 3,5 mm, NBR
Patented design:	yes
Lifetime:	Up to 10 years
Retention Bacteria:	Log6, SGS Institut, Report BS_20240129_RW_1
Retention Viruses:	Log5, SGS Institut, Report BS_20240318_RW_1

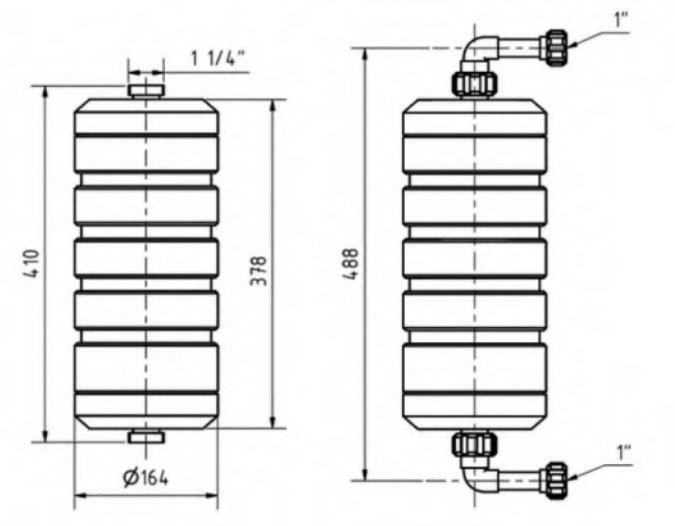


Figure 31: Connections of the membrane station

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 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 by this.

Figure 32: Top side of membrane cartridge with sliding LOCK (permeate connection)

The bottom of the membrane-cartridge used for the blower connection can be identified by the larger holes.

Figure 33: Lower side of membrane-cartridge (blower connection)

The ball inserted in the aeration connection ensures that the air is distributed evenly to the membranes when membranes are connected in parallel (such as in the membrane station with 6 membranes).

Note: If the ball is not used with a membrane-cartridge, this membrane is supplied with significantly more air. This can significantly shorten the service life of this membrane-cartridge due to the higher mechanical stress.

Figure 34: Insertion of ball for air distribution

Note: Please refer to the corresponding manual AL-MEM for more information.
https://www.intewa.com/en/weiteres/downloads/downloads/instructions-and-data-sheets/

6.5 Filtration Pump (AL-FPUMPxxx)

Aqualoop System:	**AL-GW32400** **AL-FPUMPMULTI-EVO3**	**AL-GW48600** **AL-FPUMPMULTI-EVO5**
Operating Voltage:	400-480V	400-480V
Max. Current:	1,55A	1,9A
Max. Power:	0,53kW (0,75HP)	1kW (1,34HP)
Dimension (HxWxL):	19x17,6x37cm (7,5x7x15 inch)	19x17,6x41,5cm (7,5x7x16,35inch)
Max. pressure:	45m (49,21yd)	55m (60,15yd)
Operating pressure:	-0,4bar (-5,8psi)	-0,4bar (-5,8psi)
Max. flow rate:	80 l/min (21 gpm)	110 l/min (29 gpm)
Inverter:	ITTI3.0M-Neo	ITTI3.0M-Neo
Pipe connection in/out:	1" / 1"	1" / 1"
Weight:	8,2kg (18.1lbs)	11,5 kg

Note: The filtration pump is pressure-controlled via a frequency converter and is always operated at the same pressure. This ensures that the nominal operating conditions of the membranes are maintained to maximize their service life. The flow rate of the entire system can vary due to the pressure loss through the diaphragms. The frequency inverter is delivered fully programmed. If the inverter needs to be reprogrammed, Table 6 below shows the settings for the various system sizes.

Table 7: Inverter settings for the filtration pumps

Menu	**Submenu 1**	**Submenu 2**	**Default Setting**	**AL-GW32400**	**AL-GW48600**
Language	IT/EN/DE/FR/ES		English	**English**	**English**
Communication	Auto tuning	Code Motor	1	**1**	**1**
		Radio MHz	870	**872**	**872**
	Manual tuning	Code Motor	1	**1**	**1**
		Radio MHz	870	**872**	**872**
Motor data	P nominal		3kW	**0,53kW**	**0,9kW**
	V nominal		400V	**400V**	**400V**
	I nominal		7A	**1,55A**	**2,1A**
	Nom. Freq.		50 Hz	**50 Hz**	**50Hz**
	Nom. RPM		2850	**2850**	**2850**
	Cos ϕ		0,8	**0,8**	**0,8**
	Rotation		1	**1**	**1**
Advanced Function (Password: 1)	Motor Limits	Max. Speed	100%	**100%**	**100%**
		Min. Speed	20%	**20%**	**20%**
		Acceleration	5s	**5s**	**5s**
		Deceleration	10s	**10s**	**10s**
		Maximum current	120%	**120%**	**120%**
		Magnetize	100%	**100%**	**100%**
		Joule Brake	300	**300**	**300**
	Control Type	Mode	H.P. Pump	-	-
			Air Compressor	-	-
			Centrifugal	**Centrifugal Fan**	**Centrifugal Fan**

			Fan		
			Speed + Encoder	-	-
			Open Loop Speed	-	-
		Enable Restart	Not enabled	**Not enabled**	**Not enabled**
		Dead Time after Alarm	10s	**10s**	**10s**
		Start/Stop Source	Keypad	**Keypad**	**Keypad**
		Input Signal	Internal	**internal**	**internal**
		RS485 Master Slave N.motor/Tot.	1/1	**1/1**	**1/1**
		T/R fault stop	Off	**off**	**off**
		Preheating Temp. In Stand-by	25°C	**25°C**	**25°C**
		Relay RL1 mode	FAN	**FAN**	**FAN**
		Fault Stop RS485	off	**off**	**off**
	Feedback	Pressure	**default**	**correct**	**correct**
		Unit (bar/psi)	Bar	**bar**	**bar**
		Min out P. (AN2)/(0-10mA)	4	**4**	**4**
		Max out P. (AN2)/(10-30mA)	20	**20**	**20**
		Sensor range (Fan)	16bar	**1bar**	**1bar**
		Pressure reference		**0,3bar**	**0,3bar**
		Pressure Hysteresis		**0,05bar**	**0,05bar**
		Maximum Pressure Fan		**0,5bar**	**0,5bar**
		Time stop at pressure reference (P min)	10s	**10s**	**10s**
		Stop Power without load	50%	**10%**	**10%**
	Electromagnetic brake	Enable brake	0	**0**	**0**
		Voltage V	104	**104**	**104**
	P.I.D. Factors	K Proport.	25	**10**	**10**
		K integr.	25	**100**	**100**
	ModBus	MB Comm.	Off	**On**	**On**
		Baud rate	4800	**4800**	**4800**
		ModBus code	1	**1**	**1**

6.6 Backwash Pump (AL-BPUMPxxx)

AQUALOOP System	**AL-GW32400** **AL-BPUMPMatrix10-2**	**AL-GW48600** **AL-BPUMPMatrix10-3**
Operating Voltage Inverter:	400-480V~/50-60Hz	400-480V~/50-60Hz
Operating Voltage Pump:	400V~/50Hz	400V~/50Hz
Max. Current:	1,7A	3,33 A
Max. Power:	0,75kW (1,0HP)	1,3kW (1,8HP)
Dimension (HxWxL):	19x17,6x41,5cm (7,5x7x16,35inch)	20,9x16,5x41,6cm (8,2x6,5x16,38inch)
Max. pressure:	55m	100m
Operating pressure:	1,5bar (21,8psi)	1,5bar (21,8psi)
Max. flow rate:	110 l/min	250 l/min
Inverter:	ITTI3.0M-Neo	ITTI3.0M-Neo
Pipe connection in/out:	1" / 1"	1" ½ / 1" ¼
Weight:	11,5 kg (25,35 lbs)	13,6 kg (29,98 lbs)

Note: The backwash pump is pressure controlled via a frequency converter and is always operated at the same pressure. This is to ensure, that the nominal operating conditions of the membranes will be met, for maximizing their lifetime. the Due to the change in pressure loss, through the membranes the flowrate of the overall system can vary. The frequency converter will be shipped fully programmed. In case the inverter needs to be reprogrammed, the following table 7 shows the settings for the different system sizes.

Table 8: Inverter settings for the backwash pumps

Menu	**Submenu 1**	**Submenu 2**	**Default Setting**	**AL-GW32400**	**AL-GW48600**
Language	IT/EN/DE/FR/ES		English	**English**	**English**
Communication	Auto tuning	Code Motor	1	**3**	**3**
		Radio MHz	870	**875**	**875**
	Manual tuning	Code Motor	1	**3**	**3**
		Radio MHz	870	**875**	**875**
Motor data	P nominal		3kW	**0,75kW**	**1,3kw**
	V nominal		400V	**400V**	**400V**
	I nominal		7A	**1,7A**	**3,3A**
	Nom. Freq.		50 Hz	**50 Hz**	**50 Hz**
	Nom. RPM		2850	**2850**	**2850**
	Cos ϕ		0,8	**0,8**	**0,8**
	Rotation		1	**1**	**1**
Advanced Function (Password: 1)	Motor Limits	Max. Speed	100%	**100%**	**100%**
		Min. Speed	20%	**20%**	**20%**
		Acceleration	5s	**5s**	**5s**
		Deceleration	10s	**10s**	**10s**
		Maximum current	120%	**120%**	**120%**
		Magnetize	100%	**100%**	**100%**
		Joule Brake	300	**300**	**300**
	Control Type	Mode	H.P. Pump	-	-
			Air Compressor	-	-

			Centrifugal Fan	**Centrifugal Fan**	**Centrifugal Fan**
			Speed + Encoder	-	-
			Open Loop Speed	-	-
		Enable Restart	Not enabled	**Not enabled**	**Not enabled**
		Dead Time after Alarm	10s	**10s**	**10s**
		Start/Stop Source	Keypad	**Keypad**	**Keypad**
		Input Signal	Internal	**Internal**	**Internal**
		RS485 Master Slave N.motor/Tot.	1/1	**1/1**	**1/1**
		T/R fault stop	Off	**off**	**off**
		Preheating Temp. In Stand-by	25°C	**25°C**	**25°C**
		Relay RL1 mode	FAN	**FAN**	**FAN**
		Fault Stop RS485	off	**off**	**off**
	Feedback	Pressure	--	--	--
		Unit (bar/psi)	bar	**bar**	**bar**
		Min out P. (AN2)/(0-10mA)	4	**4**	**4**
		Max out P. (AN2)/(10-30mA)	20	**20**	**20**
		Sensor range (Fan)	16bar	**16bar**	**16bar**
		Pressure reference		**1,0bar**	**1,0bar**
		Pressure Hysteresis		**0,1bar**	**0,1bar**
		Maximum Pressure Fan		**2bar**	**2bar**
		Time stop at pressure reference (P min)	10s	**10s**	**10s**
		Stop Power without load	50%	**10%**	**10%**
	Electromagnetic brake	Enable brake	0	**0**	**0**
		Voltage V	104	**104**	**104**
	P.I.D. Factors	K Proport.	25	**10**	**10**
		K integr.	25	**100**	**100**
	ModBus	MB Comm.	On	**On**	**On**
		Baud rate	4800	**4800**	**4800**
		ModBus code	1	**2**	**2**

6.7 Pipe diffusor (AL-PD142)

	AL-PD142
Air flow (Qvz,e)	3.0 – 20.0 m³/h
Recommended air flow per diffusor (Qvz,e)	7.0 – 13.0 m³/h
Loss of pressure depending on the air flow (Δp)	3 - 7 kPa
Maximal surface density of diffusor (Ds)	12 ks/m²
Oxygen use efficiency under standard conditions (Ea)	5 – 7 %/m
Standard oxygenation efficiency (E*)	6 - 10 kg O_2/kWh
Length	1420 mm
Width	140mm
Length air hose	3 m
Amount of aerator membrane	2
Connection	G 1”
Life time	6-10 years
Operating mode	permanent and intermittent
Weight	22 kg

Air supply:
If the air supply falls below the minimum limit, the diffusor should be switched off completely. The short-time overload limit should not be exceeded for more than 10 minutes (e.g. for cleaning purposes).

Table 9: Operation overview

Type	Operating conditions m^3/h	Underload limit m^3/h	Short-time overload limit m^3/h
AL-PD142	7.0 – 13.0	3.0	20.0

Please refer to the corresponding manual for more information.
https://www.intewa.com/en/weiteres/downloads/downloads/instructions-and-data-sheets/

6.8 Blower (AL-BLxxx)

The blower type depends on the size of the system. The manual of this device is contained in the scope of delivery. Please refer to the corresponding manuals for more information.

Article: AL-BLR20: -BLR40: https://oxydent.nl/uploads/r20-40-md-ie2.pdf
Article: AL-BLK05 : https://oxydent.nl/uploads/dsb-k-05-ms-mor-ie2-it-15-02.pdf
Article: AL-BLR06: https://oxydent.nl/uploads/dsb-k-06-ms-mor-ie2-it-15-02.pdf

6.9 Blower control kit (I-CON-BCS-Kit)

	I-CON-BCS-KIT1 1/4	I-CON-BCS-KIT1 1/2	I-CON-BCS-KIT2
Inlet connection	G1 ¼”	G1 ½ “	G2“
Outlet connection	G1 ¼”	G1 ½ “	G2“
connection Sensor I-CON-BCS	G ¼ “	G ¼ “	G ¼ “
Connection relief valve	G2”	G2”	G2”
Material:	stainless steel, Brass, Silicon, Viton	stainless steel, Brass, Silicon, Viton	stainless steel, Brass, Silicon, Viton
Weight	1,0 kg	1,2 kg	1,5 kg

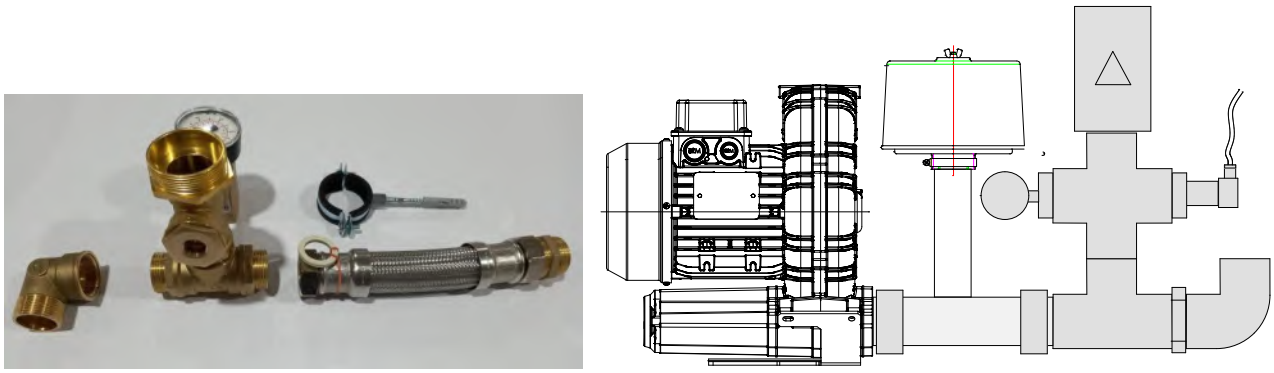


Figure 35: Assembly group I-CON-BCS-Kit 1 1/4 and 1 1/2

6.10 Blower Pressure Sensor (I-CON-BCS)

	I-CON-BCS
Dimensions	Ø28 x 75 mm
Connection:	¼" OT
Measurement range:	0 to +0.6 bar (0 to +8.7 psi)
Signal:	4 … 20 mA,
Connection:	2 wire
Cable:	Ø5 mm (0.2"), 3 m (9.8 ft.) length
Material:	stainless steel, PP, NBR, PVC

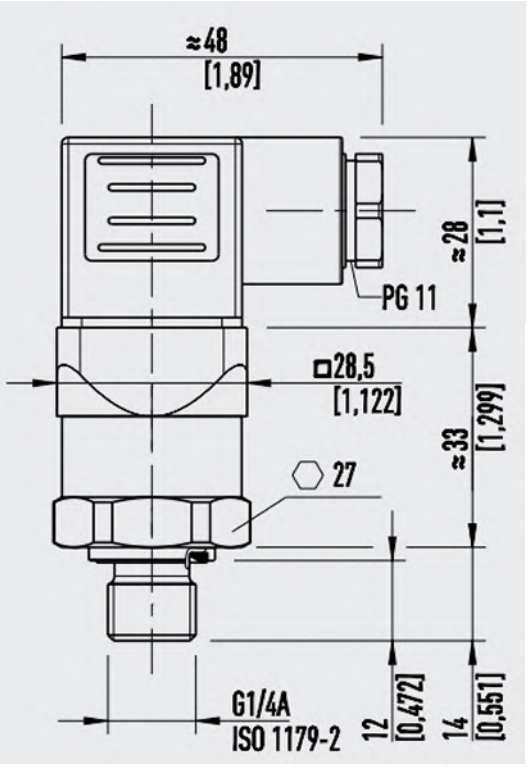


Figure 36: Dimensions of the pressure sensor [mm/inch]

6.11 Pre-Filter (PURAIN PR-150/200)

Size of the Pre-Filter is dependent on the size of the system.

Please refer to the corresponding manual PURAIN PR for more information.
https://www.intewa.com/en/weiteres/downloads/downloads/instructions-and-data-sheets/

6.12 Automatic dosing station (I-CON-ADS)

	I-CON-ADS
Dimension (L x W x H):	1370 x 975 x 200 mm
Inlet permeate:	1” female, union nut
Outlet permeate:	1” male
Outlet to sewer:	1” male
Outlet permeate:	1” female, union nut
Connection solenoid valve V1, V2, V4:	¾” female
Connection 2/2 ball valve V3, V5:	1” female
Power consumption solenoid valves V1, V2, V4:	24V DC, 5 W
Power consumption ball valve V3, V5:	24V DC, 15 W
Water meter WM2:	0,25 L/LMP
protection class:	IP41
Material:	PVC-U, PE, PS, brass, stainless steel
Total weight:	18.0 kg

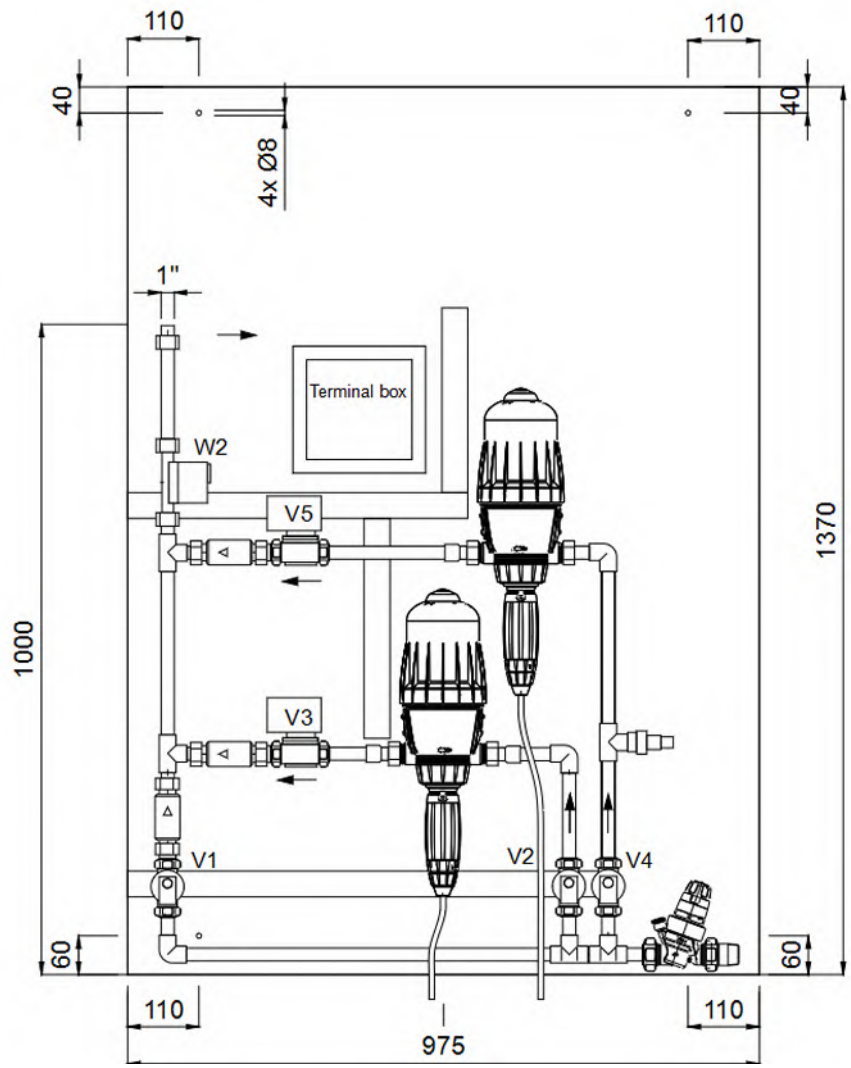


Figure 37: Dimension and connection of the Dosing Station

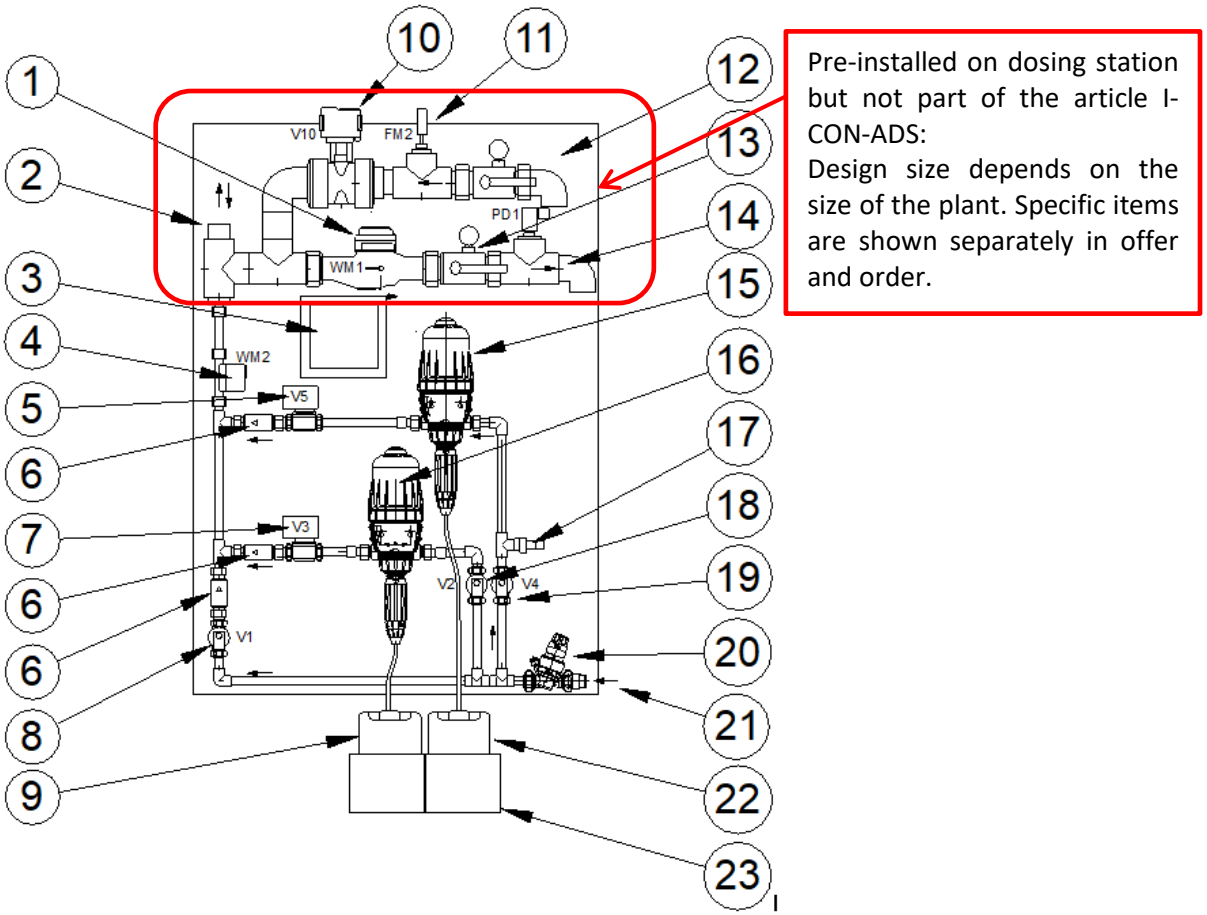


Figure 38: Dimension and connection of the Dosing Station with pre-installed water meter W1, permeate valve V6 and sewer valve V7 depends on system size)

1.: Water meter permeate (W1)
2.: Inlet permeate from the bioreactor
3.: terminal box for cable connections
4.: Water meter dosing station (W2)
5.: Ball valve chlorine outlet (V5)
6.: Non-return valves
7.: Ball valve Citric Acid outlet (V3)
8.: Solenoid valve process water dosing (V1)
9.: Citric Acid tank (not scope of delivery)
10.: Direct valve backwash (V10)
11.: Flow meter back wash
12.: Ball valve backwash
13.: Ball valve filtration
14.: Outlet to sewer, 1" – 1 ½" male thread
15.: Dosing pump Chlorine
16.: Dosing pump Citric Acid
17.: Chlorine pressure relief valve
18.: Solenoid valve Citric Acid inlet (V2)
19.: Solenoid valve Chlorine inlet (V4)
20.: Pressure Reducer (Set to 1,0bar)
21.: Inlet process Water; 1" external thread
22.: Chlorine Tank (not scope of delivery)
23.: 2 pcs. Drip pan (not scope of delivery)

Working principle

Valves V2 ⑦ and V3 ⑰ are responsible for the dosing of citric acid, valves V4 ⑤ And V5 ⑱ for dosing of chlorine. The chemicals will then be mixed in the dosing pumps ⑭/⑮ with water to achieve the required target concentration of the cleaning solution. The valve V1 ⑧, doses water into the system, this is part of the chemical cleaning routine. Three non-return valves ⑥, protect the dosing station against backflow in the event of a fault. Two water meters are installed on the dosing station: Water meter W1 ① measures the flow/volume of the filtrated permeate, this information can be checked via the control unit/web application. For dosing the correct amount of cleaning solution, the water meter W2 ④ is used.

Connections:
The inlet ② needs to be attached to the filtrate connection of the bioreactor. Outlet ⑪ needs to the connected to the inlet of clear water tank. The sewer outlet ⑬ needs to be linked to the sewer pipe. The sewer connection is important for the start-up phase (s. Chapter 8.2) and flushing the system after a chemical cleaning (s. Chapter 10.2.1). The process water inlet ⑳ needs a connection to the booster pump. This water will be used for the chemical dosing in the automatic cleaning process.

Pressure reducer
At the inlet of the dosing station, a pressure reducer ⑲ is installed to protect the dosing station. The reducer should be set to 1,5bar.

Pressure relief valve (16):
Chlorine will produce a small amount of vapour over time, to make sure no components get damaged through pressure build up in the system, a pressure relief valve is installed ⑯. There might be some condensation of chlorinated fluid, at the valve. Make sure that a hose leading to a container is connected at the valve. As the fluid may contain small amounts of chlorine the excess fluid must be discharged in compliance with your local regulation.

Wiring:
All valves and water meters of the dosing station are operated automatically by the Control Unit. Therefore, all cables of the dosing station must be connected to Control Unit. The cable connections of the components are collected at the terminal box and are then extended. The cables running out of box come marked, refer to Chapter 7.7.3 for the correct wiring. The terminal box comes fully wired on delivery. It only needs to be opened in case of a component replacement.

Table 10: Design size

Connection	Inlet connection ②	Water meter W 1 ①	permeate valve V6 ⑪	sewer valve V7 ⑬
AL-GW32400	1 ½ male	Q_N 16	1 ½	1 ¼"
AL-GW48600	2" male	Q_N 25	2"	1 ¼"

6.13 Level Sensor (I-CON-LS250)

	I-CON-LS250
Dimensions:	Ø27 x 100 mm
Measurement range:	0 to 0.25 bar (0 to +3.62 psi)
Signal:	4 - 20 mA,
Cable:	Ø 6mm (0.24 “), 3 m (9.8 ft.) length
Material:	stainless steel, PP, NBR
Max. extension:	60m, 0,75mm^2

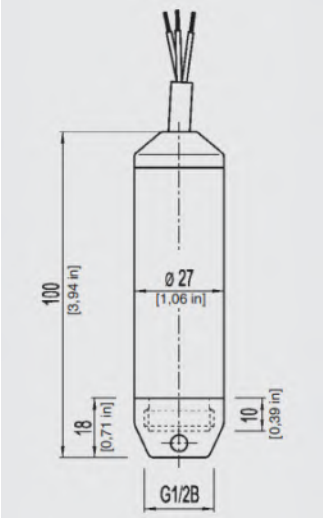


Figure 39: Dimensions of the level sensor [mm/inch]

The level sensor of the bioreactor and the clear water tank measures the water column above the sensor. Install the level sensor. For a correct display of the water level, make sure the sensor is located horizontally on the bottom of the bioreactor or clear water tank (see figure below).

Figure 40: Correct installation of the level sensor

6.14 Sludge Pump (VIP130-6)

	VIP130-6
Operating voltage:	230 V AC/ 50 Hz, 4A
Dimension:	Ø165 x 290 mm
Max. pressure:	6 m
Max. flow rate:	120 L/min
Pipe connection:	1 ¼ “, hose bush Ø 25mm
Cable length:	10 m
Weight:	4 kg

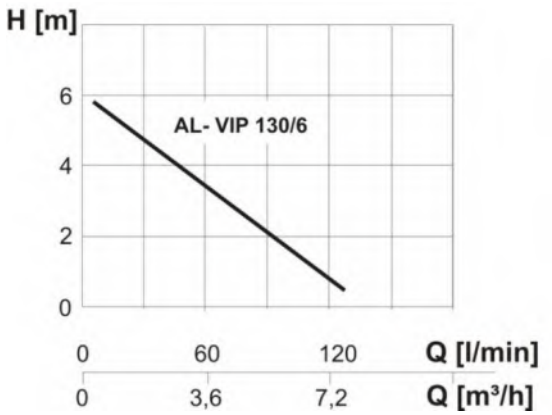


Figure 41: Pump curve diagram VIP130/6

6.15 Water meter (I-CON-WMXX)

Type and size of the water meters depend on the size of the system. Water meters are mandatory before backwash nozzle of pre-filter and before dosing station.

	I-CON-WM2.5	**I-CON-WM4**	**I-CON-WM10**
Volume flow Q_N:	2,5 m³/h	4 m³/h	10 m³/h
Nominal width:	15 mm / ½ “	20 mm / ¾ “	25 mm / 1 “
Housing length L2:	110 mm	190 mm	260 mm
Length with screw connection L1:	190 mm	286 mm	378 mm
Housing connection D2:	¾ “	1 “	1 ¼ “
Screw connection D1:	½ “	¾ “	1 “
Wide B:	66 mm	95 mm	95 mm
Height H1:	77 mm	120 mm	120 mm
Height H2:	--	25 mm	40 mm
Signal Output:	0,25 L/impulse	0,25 L/impulse	0,25 L/impulse
Cable length:	2 m	1,5 m	1,5 m
Type:	Single-Jet	Multi-Jet	Multi-Jet
Weight:	0,42	1,45 kg	2,2 kg

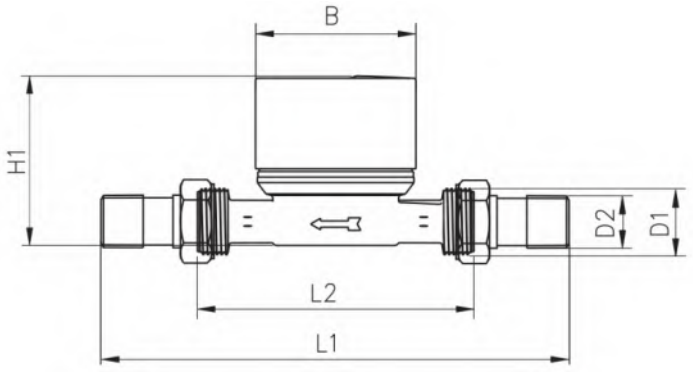


Figure 42: Dimensions of I-CON-WM2.5

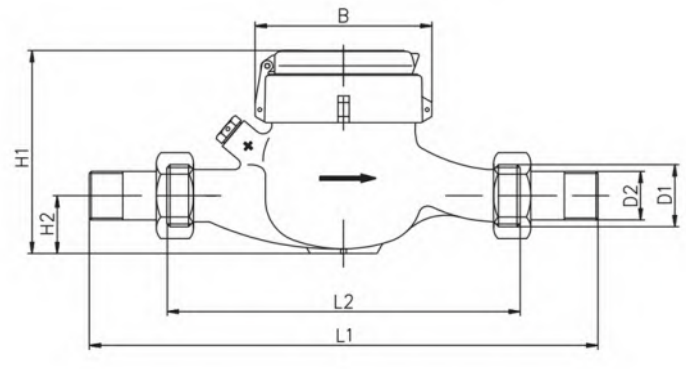


Figure 43: Dimensions of I-CON-WM4 / 10

Table 11: Used water meter sizes in the systems

System size	Permeate W1	Dosing station W2	City water top up W3*	Process water W4*	Pre-filter back wash W5
AL-GW32400	Q_N 16	Q_N 2,5	--	--	Q_N 2,5
AL-GW48600	Q_N 25	Q_N 2,5	--	--	Q_N 2,5

** The size must be calculated separately and depends on the size of the booster pump.*

6.16 Growth Bodies (AL-FK540)

	AL-FK540
Diameter:	36 mm (1.4 “)
Length:	30 mm (1.2 “)
Geometric surface:	320 m²/m³
Density range:	0.95 - 1.10 g/cm³
Material:	HD-PE, recycled
Colour:	black
Package volume:	540 L
Weight:	65 kg

Figure 44: Growth Bodies

II. Installation

7. Installation of system components and control unit

Before starting the installation, check the delivery bill for all parts required for the assembly of the bioreactor and the clear water tank.
Compare the parts supplied with those listed to ensure that all the required parts are present.

7.1 General requirements

In the following, an example of a 5400 L/day greywater recycling system is used to show how the assembly and piping is carried out.
In case the configuration of the system components differs from the standard, the routing, installation and pipe lengths must be adapted by the installer to the conditions.

General requirements:

- Dry, frost-proof and ventilated room (required air exchange see table below)

Table 12: required max. air exchange

AL-GW 32400	225 m³/h
AL-GW 48600	355 m³/h

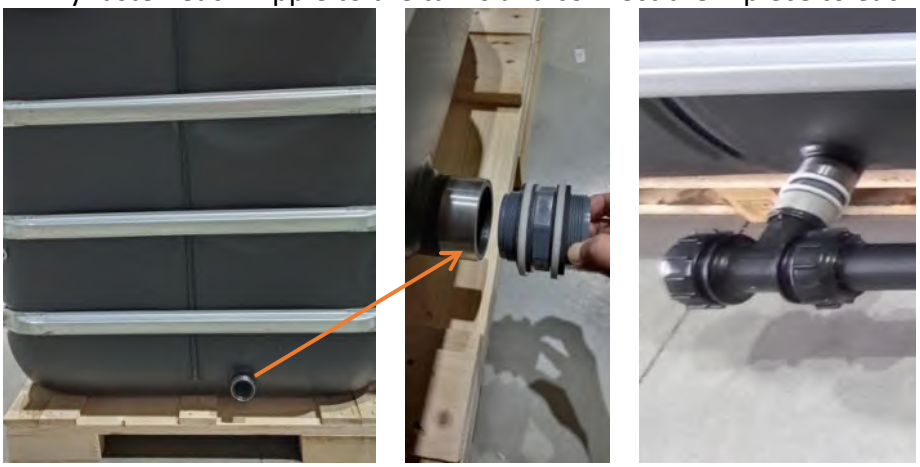
- ground area under the tanks must be smooth, even, solid and load bearing
- distance between tank and ceiling should be min. 900 mm for maintenance purposes
- the drainage system must be dimensioned in such a way that the maximum volume flow can be handled
- a floor drain must be provided near the installation, in case of emergency
- pipe connections should be made with quick disconnect connections for easy maintenance and service
- consider dependency of sewer position, grey water inlet, tanks sizes and position of floor drain when planning the layout (position of tanks) of the plant room

7.2 General description of tank couplings

Step 1: Tank connection and T-Fittings

- Connect the 2” PVC nipple with gasket and holding ring

- Firmly fasten each nipple to the tanks and connect the T-piece to each nipple



Step 2: Pipe coupling

- Apply grease to the exterior of the pipe and the interior of the T-piece. Connect the pipe to one of the tank T-piece and firmly fasten using the union nut.

Note: The retaining ring must be fitted close to the T-connection

- Gradually move the other tank close to correctly orient and securely fit it into the T-piece of the other tank and fasten the union nuts.

  Note: The tanks must be aligned in parallel to avoid stress in the Thread connections.

Step 3: End connections of the coupling

- Both end of the coupling has a sealing cap which is fixed by a union nut

- Optional a ball valve can be connected instead of a cap. Therefore an interconnection adapter is necessary

7.3 Description of the Installation

7.3.1 Installation of AL-GW 32400

Step 1: Set up of pre-filter, tanks and piping to the sewer

- Set up the bioreactors, clear water storage tanks, pre-filter and Technical unit considering the minimum distances to walls and fixtures.

  If the filter is positioned freely in the room, as shown in the figure below, the filters must be supported from below. However, the filter can also be mounted on a wall max 2 m far away from the inlet tank connection (example position of the filter see red marked).

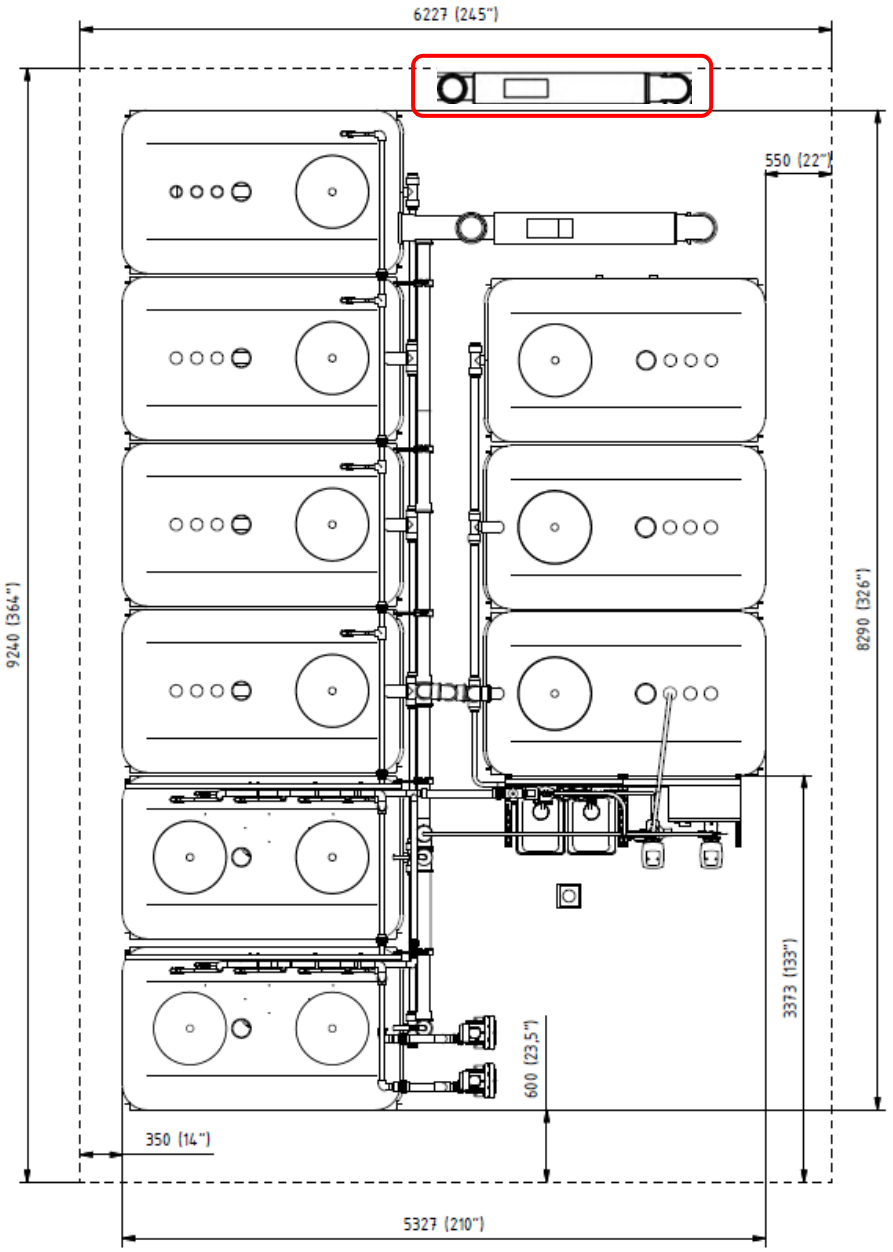


Figure 45: Minimum workspace required for AQUALOOP GW System 32400

- The six bioreactors and three clear water tanks are connected via coupling ports. (included in the scope of delivery) (s.Chapter. 7.2)

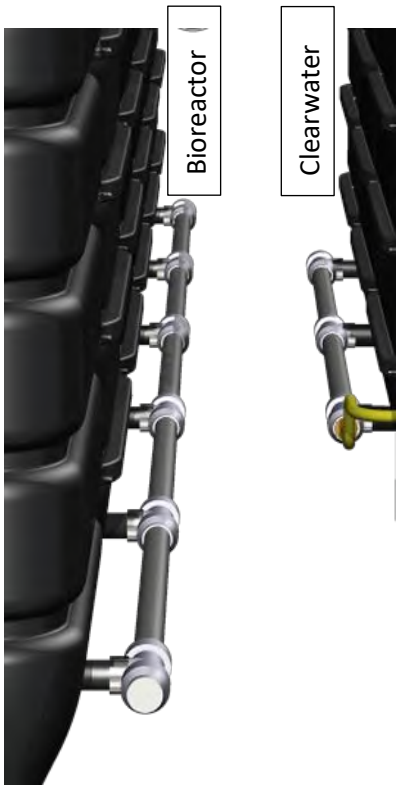


Figure 46: Coupling connections of the bio reactor tanks [for water distribution]

- The bio reactors are vented via a central line on the top of the tank. The air must be led **out of the room** via venting pipes.

Figure 47: Coupling connections of the bio reactor tanks [for air ventilation]

- Connect the pre-filter outlet to the inlet of the first bioreactor tank1①.
- Connect the greywater inlet (ventilated greywater pipes from shower, bath water and sinks) to the PR200 pre-filter inlet②.
- Connect the emergency overflow from the pre-filter sewer ③ to the sewer.

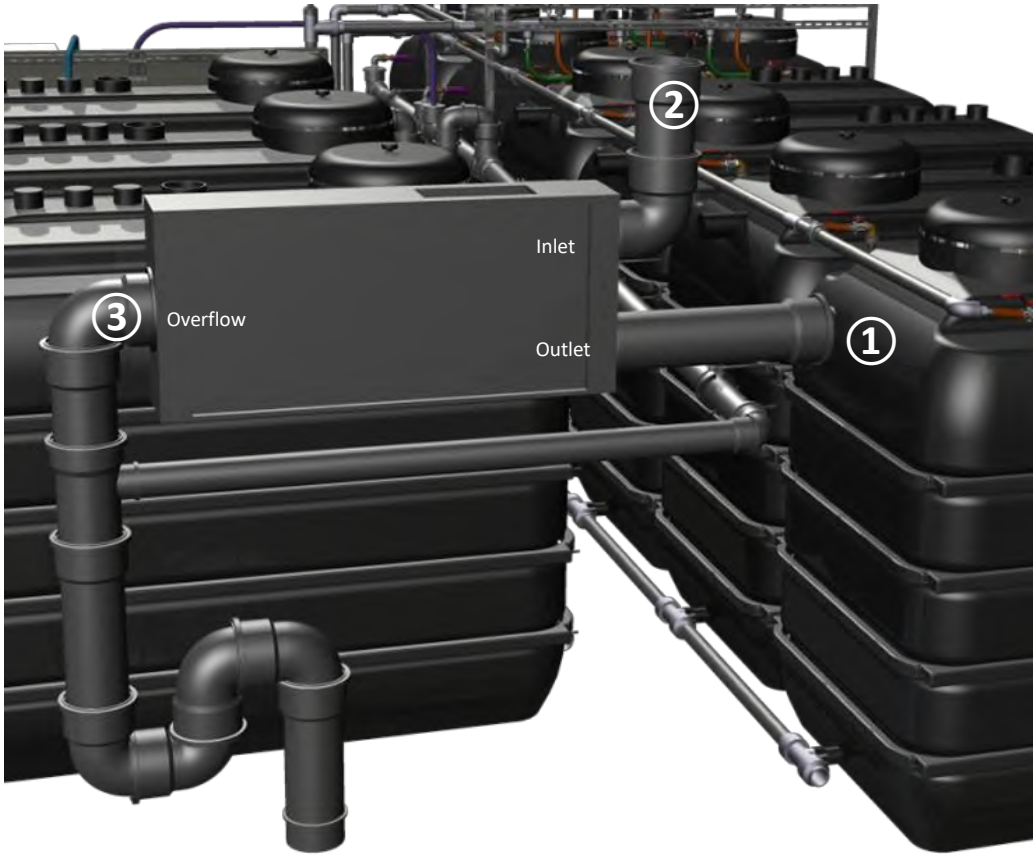


Figure 48: Positioning of the PR200 pre-filter

Note:
The incoming greywater pipe must have an air separator vent pipe in compliance with the DIN 1986-1 or local venting regulations!

To ensure smooth functioning of the overflow, connect the emergency overflow to the sewer or to a pumping system which will pump the overflow into the sewer drain. The overflow tube must be vented.

If the system is installed below the backwater level (check with your local building authorities), the overflow tube must be routed to a lifting pump station. The sewer pipe dimensioning shall be not smaller as described in the overview schematic.

- Connect the emergency overflow of the clear water tank④ as well as the sludge pump connections from two bio reactors [5 & 6) ⑤ ⑥and flushing line⑦ from the dosing station to the drainage system. Install siphon elements as door barrier according to figure below.

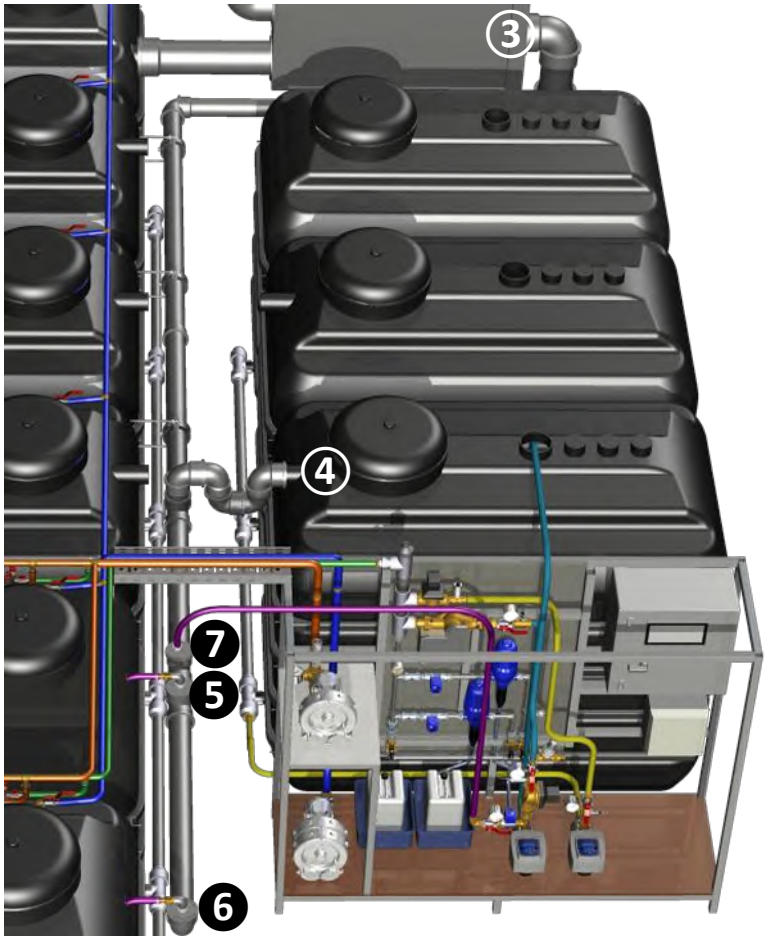


Figure 49: Piping of the overflow connections from bioreactor, Clearwater (grey) and sludge pump (purple)

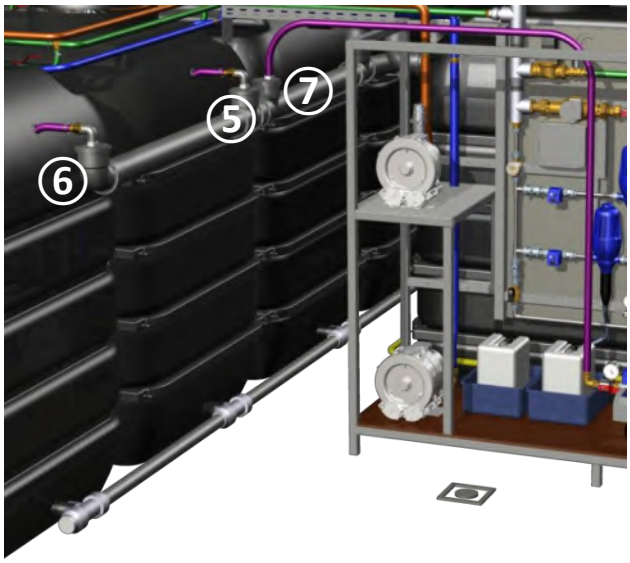


Figure 50: Installation of the sludge hose (5 & 6) and sewer hose (7) to overflow pipe DN100

Note:

The 1" hose connection from the sludge pump must be routed above the maximum water level of the bioreactor (1,6 m) into the extended sewer connection (gravity drain) to avoid a suction effect.

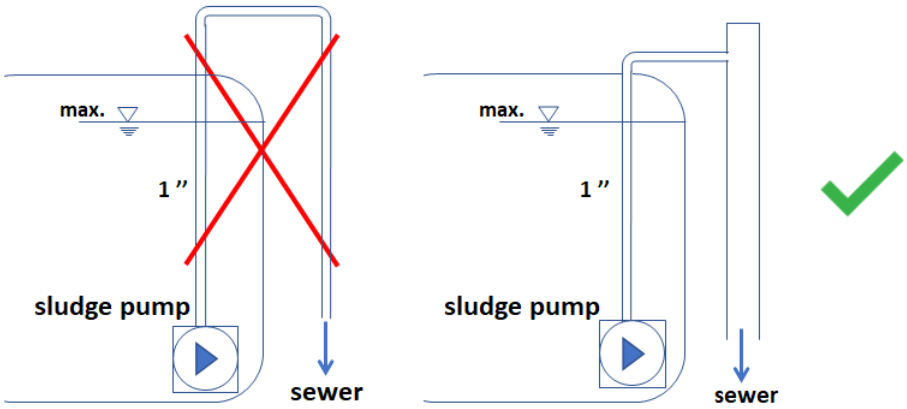


Figure 51: Correct installation of sludge hose to overflow

Step 2: Hose connections across Bio reactor tanks

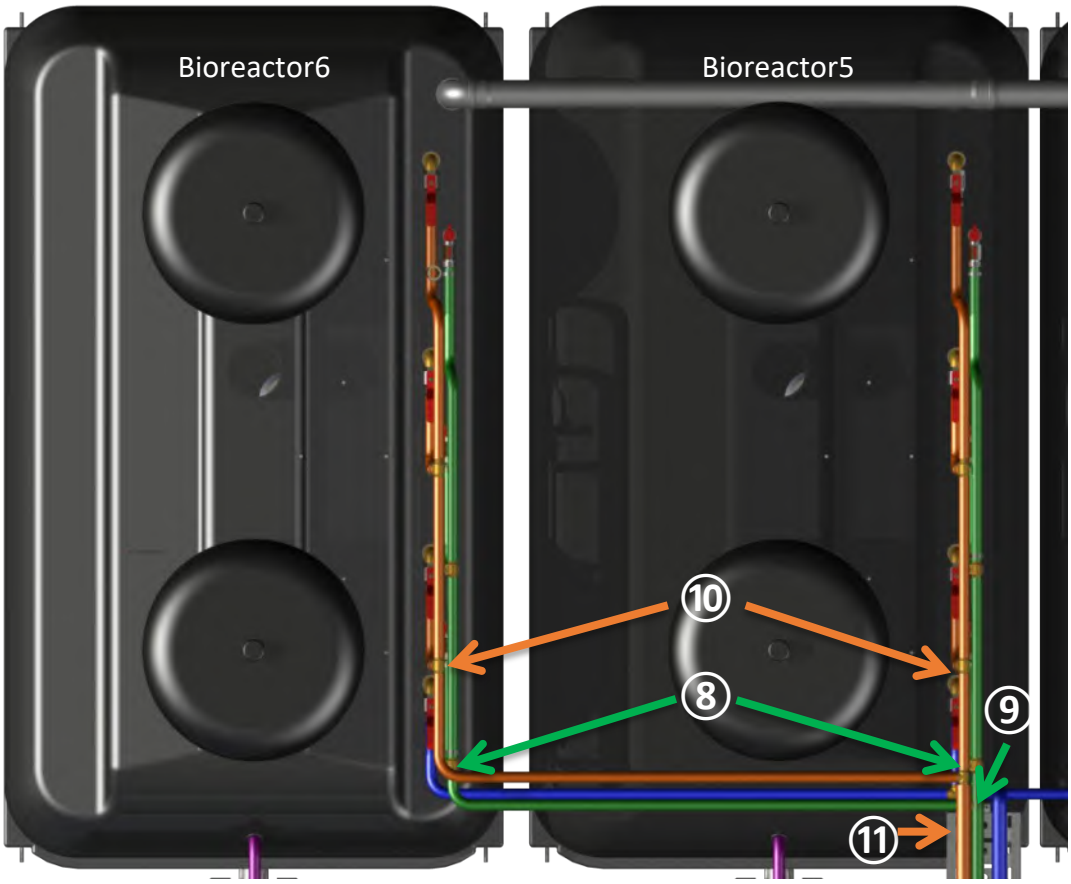


Figure 52: Hose connection across bioreactor tanks

- Establish a connection by using a permeate hose1" from the pre-mounted T-joint 1¼"⑧ on bioreactor 5 & 6 to form a new T-joint 1¼"⑨ (green hose).
- Establish a connection by using a membrane aeration hose 1¼" from the pre-mounted T-joint 1½"⑩on bioreactor 3 & 4 to form a new T-joint 1½"⑪ (orange hose).

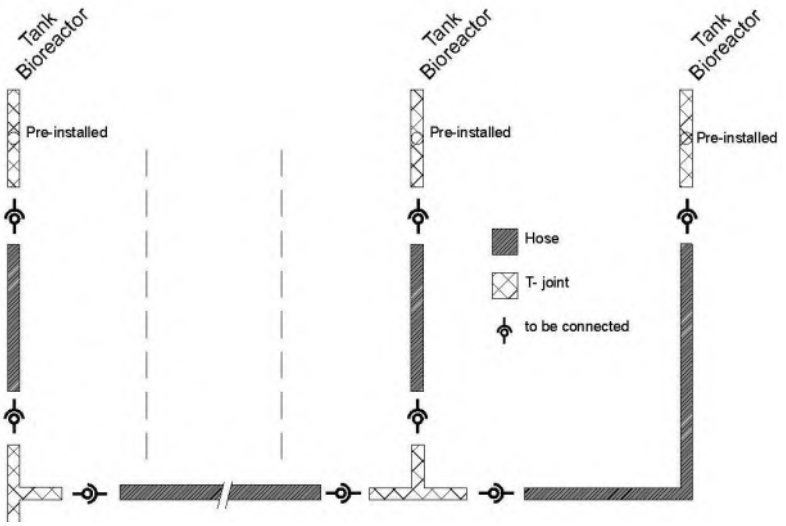


Figure 53: Schematic representation of connections across bioreactor tanks with hose and T-joints

- Establish a connection by using a diffusor aeration hose 1” from the pre-mounted T-Joint 1¼” ⑫ on each bioreactor to form a new T-joint 1¼” ⑬(blue hose).

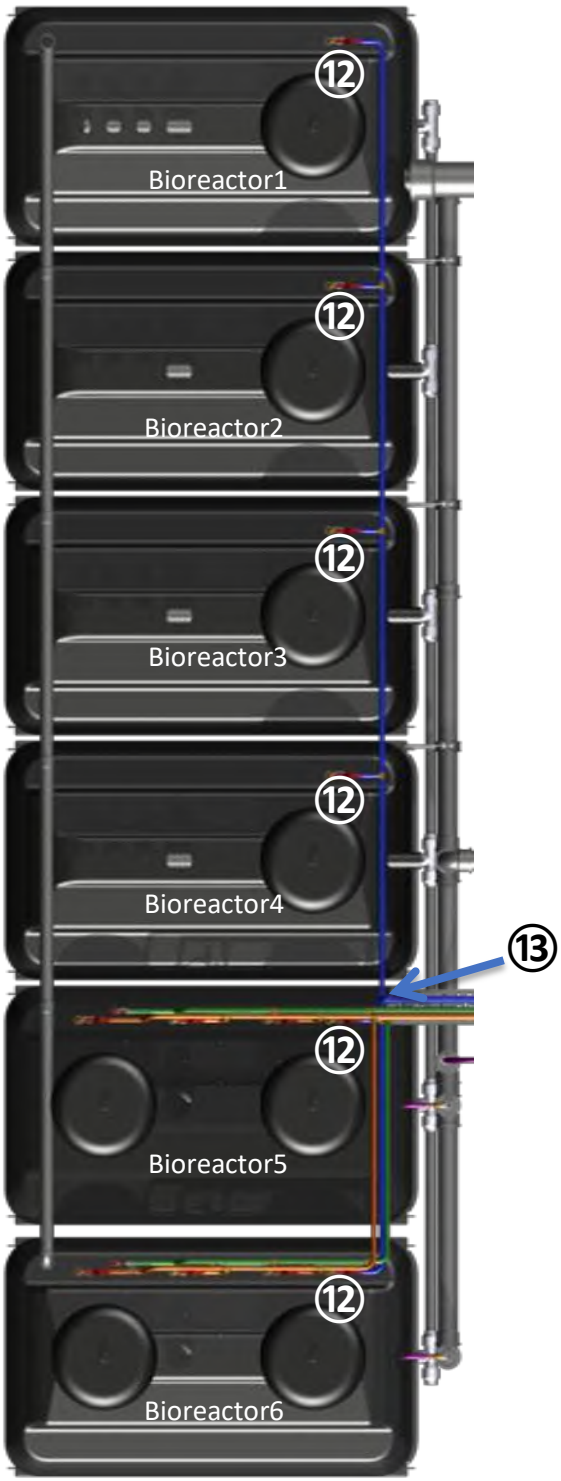


Figure 54: Hose connection across bioreactor tanks [Top view]

- Establish the intermediate diffusor connections across the bioreactor tanks by using a diffuser hose 1" and T-joint 1¼”.

Step 3: Setup of the Technical Unit and hose connections

- The Technical Unit (with dosing station, blowers and the control unit) has to be placed in front of the clear water tank.
- The sewer hose 1” connection from the sewer valve V7 1¼”⑭ routed to the emergency overflow pipe 1¼ ” ⑦ (purple hose).

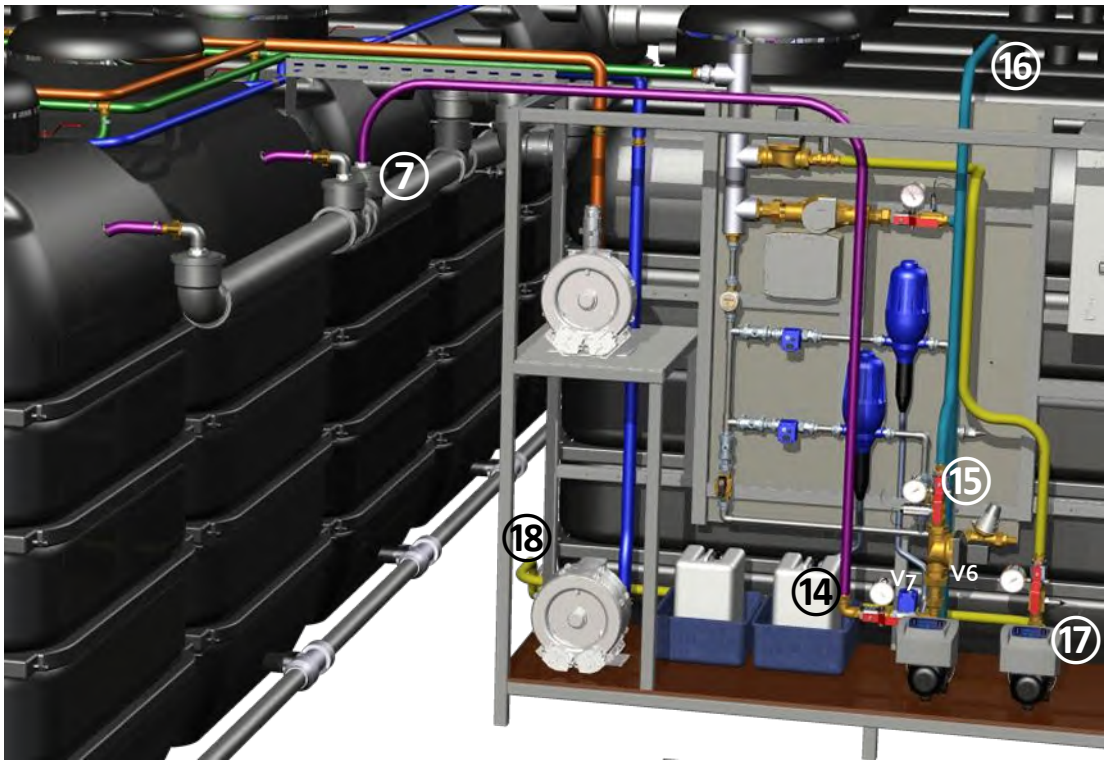


Figure 55: Hose connections at the Technical unit

- The permeate hose 1” connection from the filtration pump-permeate valve V6 1¼”⑮ to the connection on top of clear water tank3 1¼”⑯(cyan hose).
- The clearwater hose 1” connection from the backwash pump valve V10 1¼” ⑰to the connection ventil of clear water tank3 ventil 1¼” ⑱ (yellow hose).

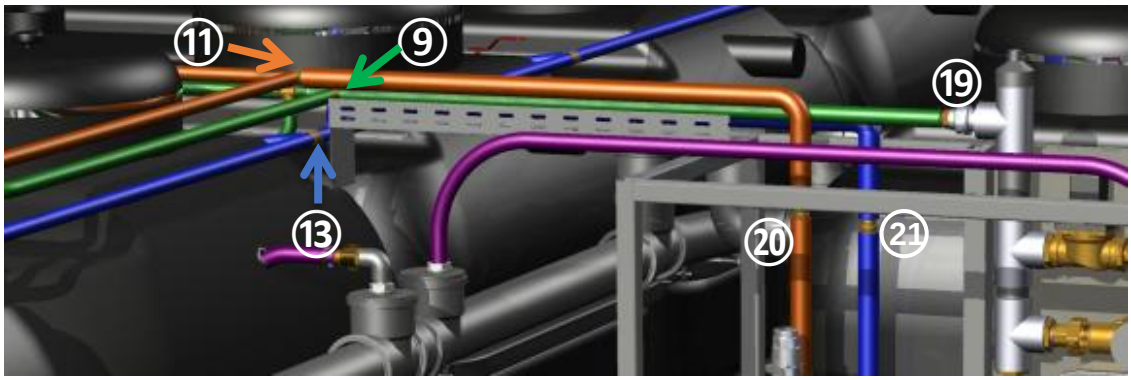


Figure 56: Hose connections between Bioreactor tanks and Technical unit

-

- The permeate hose 1¼” connection (a ‘T joint’ connecting two bioreactors) 1½”⑨is connected to the inlet on the Technical Unit 1½” ⑲ (green hose).
- Establish the membrane aeration hose 2” connection from the top the bioreactor 2½”(‘T joint’) ⑪ to Blower AL-BLK05 hose at the technical Unit 2½”⑳ (orange hose).
- Establish the diffusor aeration hose 1¼” connection from top of the bioreactor 1½”⑬ (a ‘T joint’) to the blower AL-BLR30 hose at the technical Unit 1½” 21 (blue hose).

Before the final pipe connection please proof the spin direction to prevent that the blower working in vacuum mode!

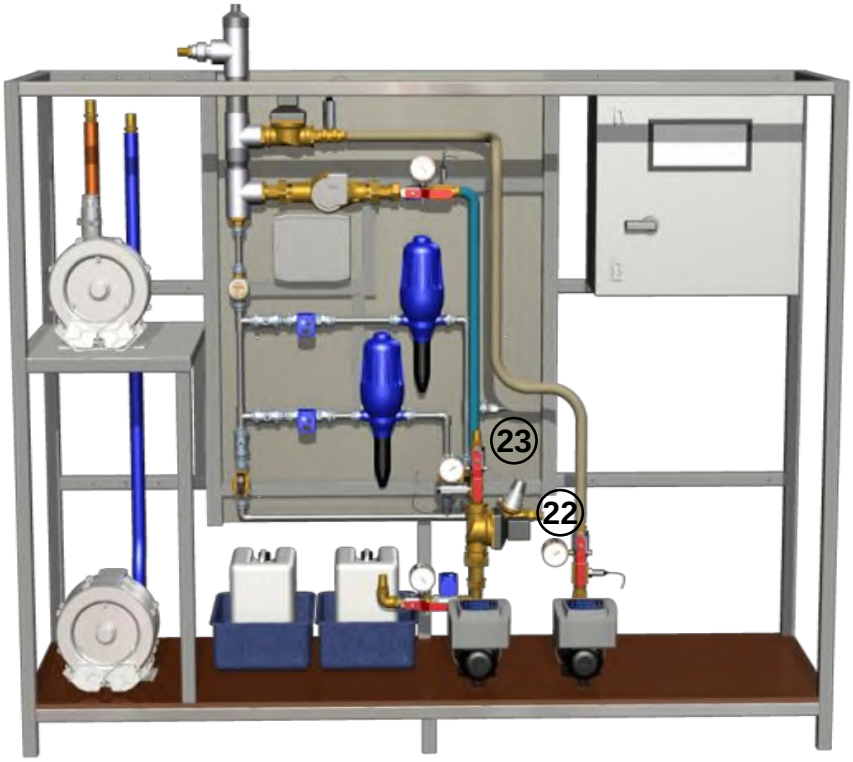


Figure 57: Technical Unit Overview

- The clear water inlet connection ¾“of the dosing station ㉒connected later with the process water pipe 1“ from the booster pump.
- The safety outlet connection ½“ ㉓(emergency overpressure) routed into the sewer or a small container.

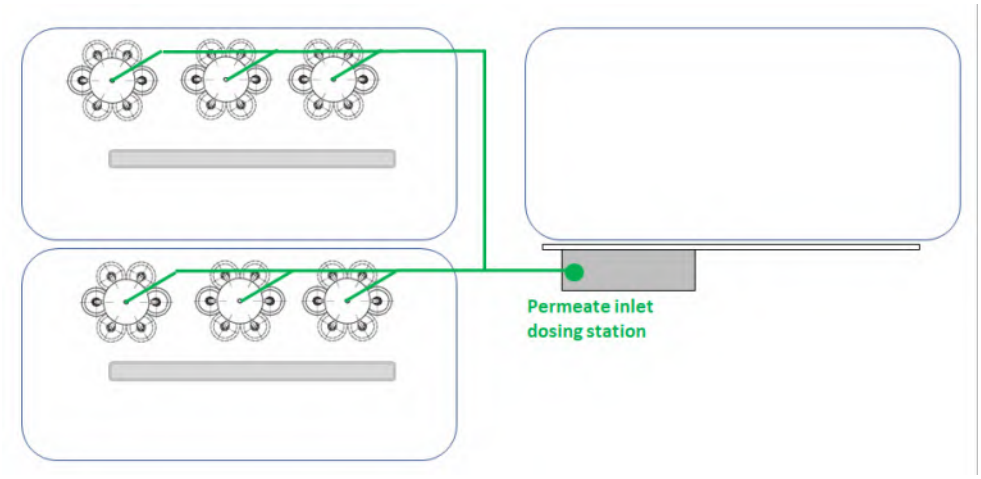


Figure 58: Overview pipe connection to the central pipe for permeate to the dosing station

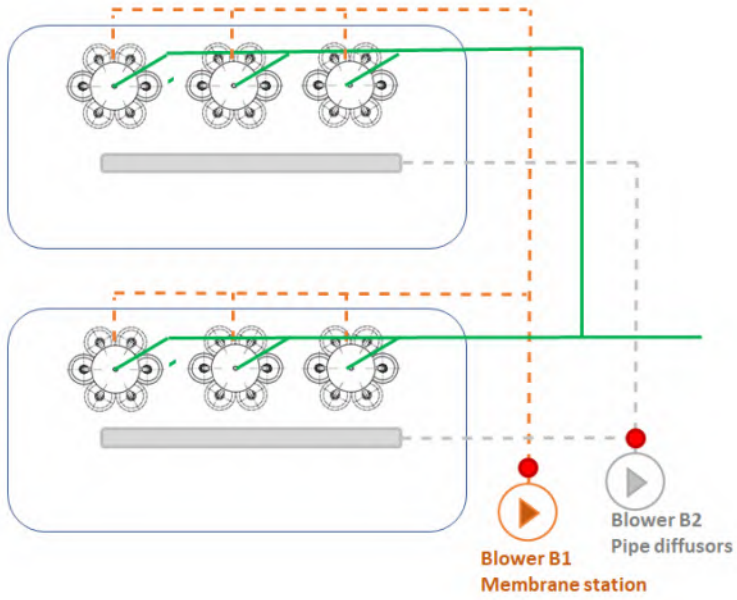


Figure 59: Overview pipe connection to the central pipe to blower B1 and B2

Step 4: Pipe connection process water

- Establish the process water connection via booster pump from the clear water tank to the consumer unit (s. Chapter 7.3.3)
- Thereafter, connect pressurized process water pipe to backwash connection of the pre-filter (via water meter W5 and solenoid valve V8), dosing station and consumer water supply.

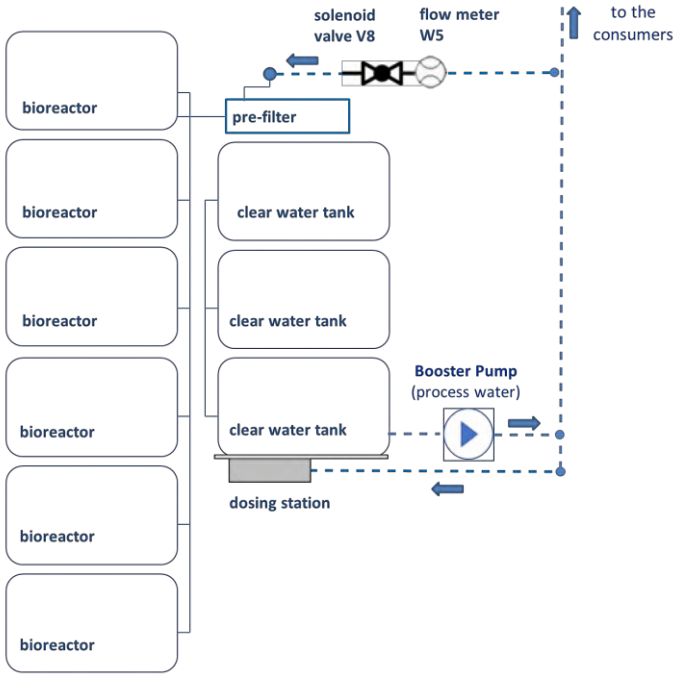


Figure 60: Scheme for process water to consumers and to pre-filter backwash and dosing station

Step 5: Cable connections from tanks to control unit

- All cable connections are labeled according to the terminal diagram in Chap. 7.4
- Connect the cables from the component to the corresponding cables from the control unit using quick cable connectors

Component	Label
○ Level sensor -BR	Ls - BR
○ Level sensor -CL	Ls - CL
○ Sludge pump – BR5	Sp –BR5
○ Sludge pump – BR6	Sp –BR6
○ Solenoid valve V8	Sv – V8
○ Water meter W5	Wm –W5

Note:

Ensure that the cable connections are safely connected and the hoses have been firmly fastened using hose clamps.

Before using chemicals, test the function of dosing station with water. After testing successfully, install chemical tanks and connect them to dosing stations.

7.3.2 Installation of AL-GW 48600

Step 1: Set up of pre-filter, tanks and piping to the sewer

- Set up the bioreactors, clear water storage tanks, pre-filter and Technical unit considering the minimum distances to walls and fixtures.

  If the filter is positioned freely in the room, as shown in the figure below, the filters must be supported from below. However, the filter can also be mounted on a wall (example position of the filter see red marked).

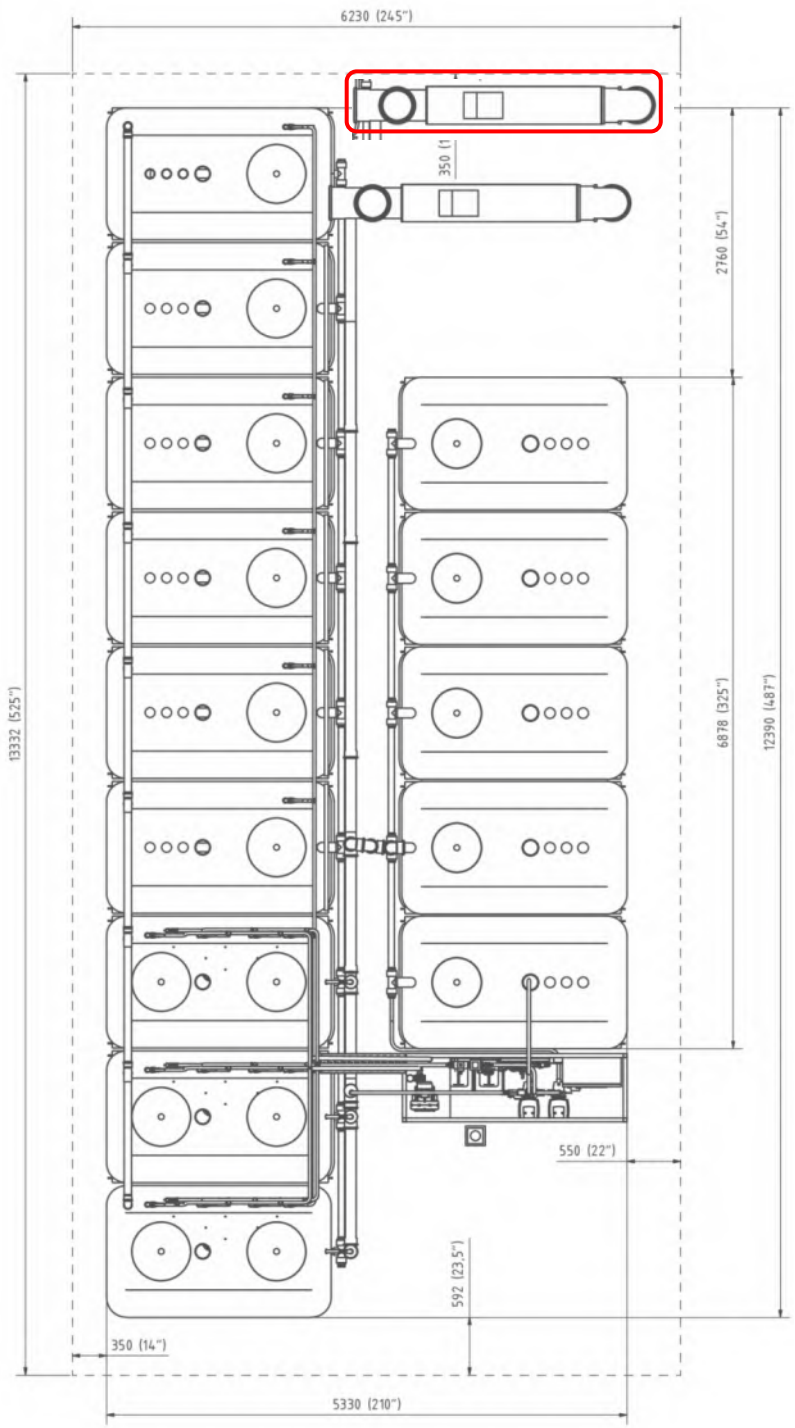


Figure 61: Minimum workspace required for AQUALOOP GW System 48600

- The nine bioreactors and five clear water tanks are connected via coupling ports. (included in the scope of delivery) (s.Chapter. 7.2)

Figure 62: Coupling connections of the bio reactor tanks [for water distribution]

- The bio reactors are vented via a central line on the top of the tank. The air must be led **out of the room** via venting pipes.

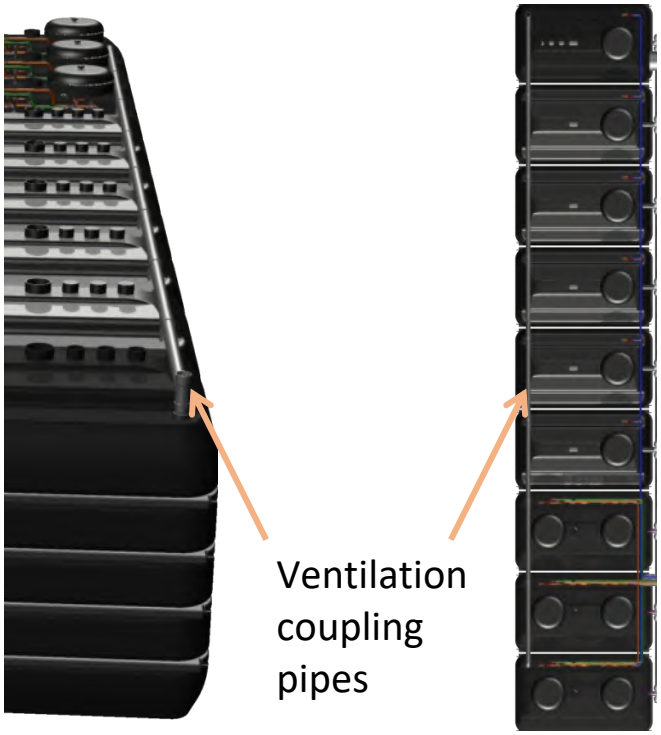


Figure 63: Coupling connections of the bio reactor tanks [for air ventilation]

- Connect the pre-filter outlet to the inlet of the first bioreactor tank1①.
- Connect the greywater inlet (ventilated greywater pipes from shower, bath water and sinks) to the PR200 pre-filter inlet②.
- Connect the emergency overflow from the pre-filter sewer ③ to the sewer.

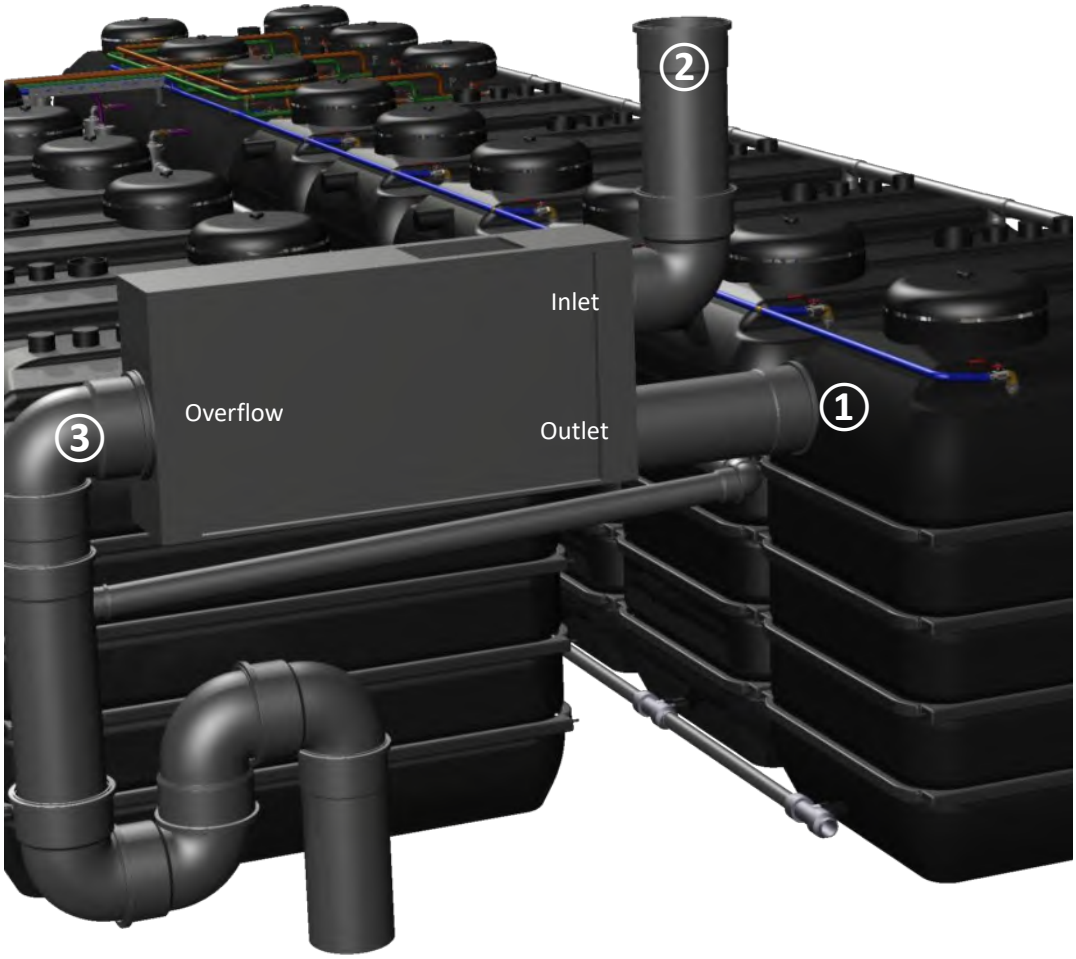


Figure 64: Positioning of the PR300 pre-filter

Note:
The incoming greywater pipe must have an air separator vent pipe in compliance with the DIN 1986-1 or local venting regulations!

To ensure smooth functioning of the overflow, connect the emergency overflow to the sewer or to a pumping system which will pump the overflow into the sewer drain. The overflow tube must be vented.

If the system is installed below the backwater level (check with your local building authorities), the overflow tube must be routed to a lifting pump station. The sewer pipe dimensioning shall be not smaller as described in the overview schematic.

- Connect the emergency overflow of the clear water tank④ as well as the sludge pump connections from three bio reactors [7, 8 and 9] ⑤and flushing line ⑥ from the dosing station to the drainage system. Install siphon elements as door barrier according to figure below.

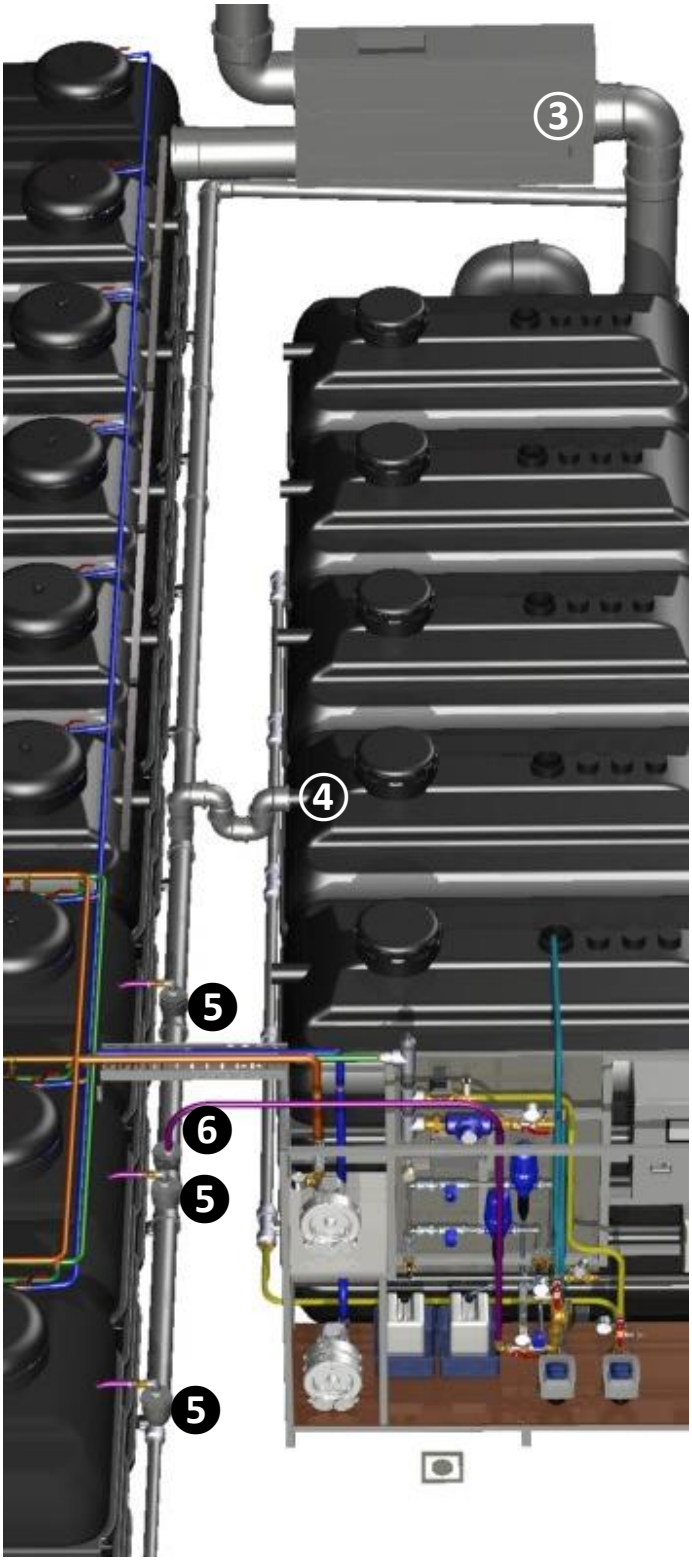


Figure 65: Piping of the overflow connections from bioreactor, Clearwater (grey) and sludge pump (purple)

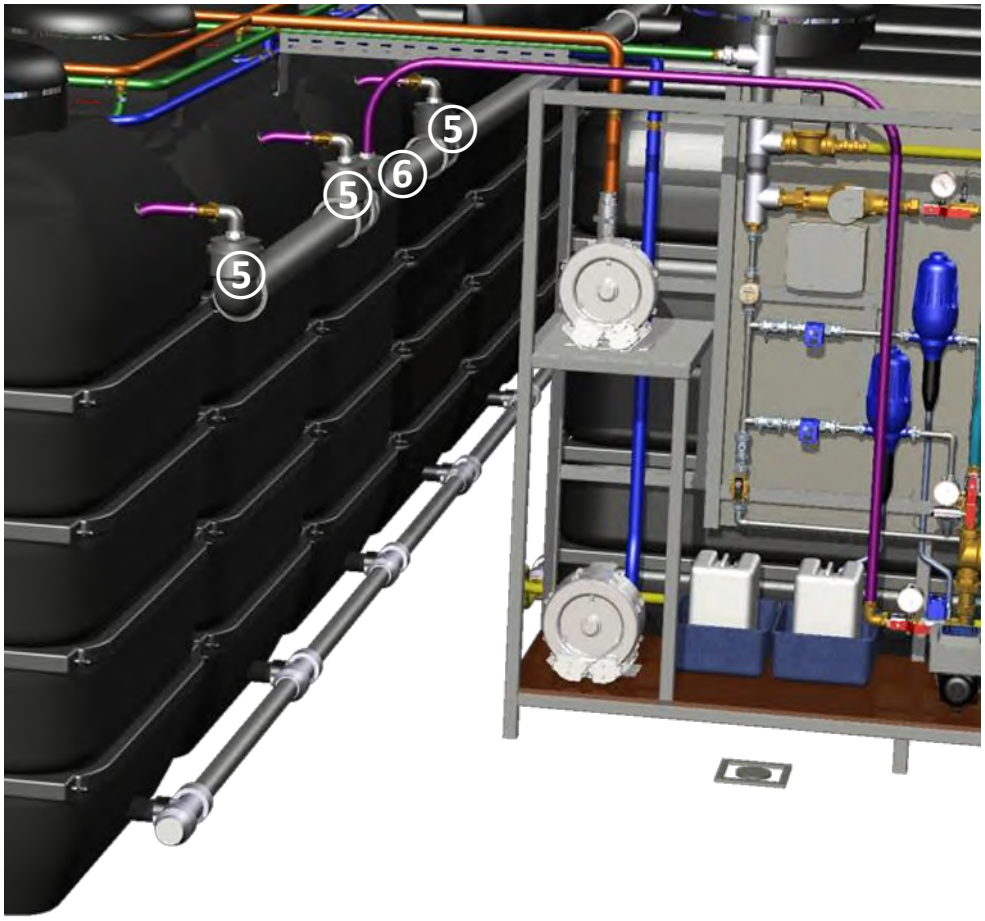


Figure 66: Installation of the sludge hose (5) and sewer hose (6) to overflow pipe DN100

Note:

The 1" hose connection from the sludge pump must be routed above the maximum water level of the bioreactor (1,6 m) into the extended sewer connection (gravity drain) to avoid a suction effect.

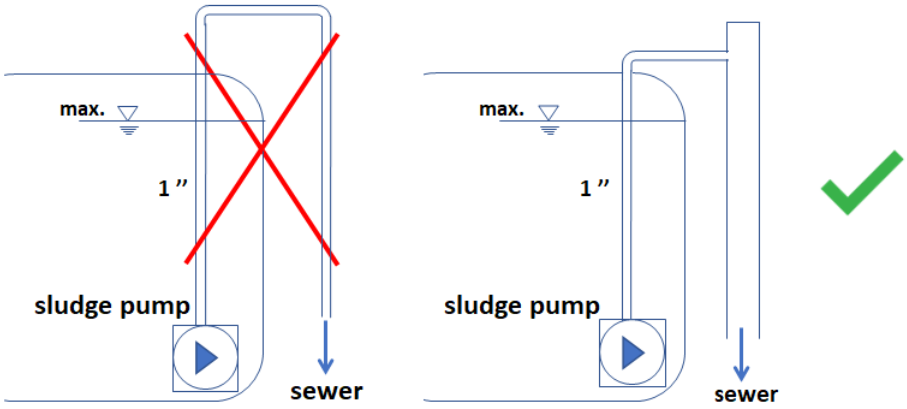


Figure 67: Correct installation of sludge hose to overflow

Step 1: Hose connections across Bio reactor tanks

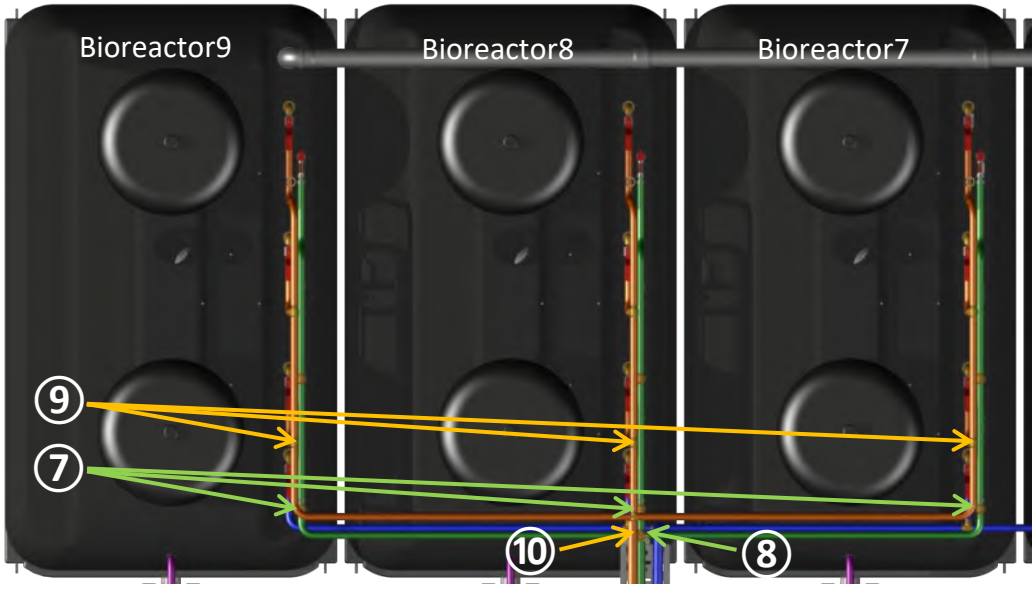


Figure 68: Hose connection across bioreactor tanks

- Establish a connection by using a permeate hose1" from the pre-mounted T-joint 1¼"⑦on bioreactors [7, 8 & 9] to form a new T-joint 1¼"⑧(green hose).
- Establish a connection by using a membrane aeration 1¼" from the pre-mounted T-joint 1½"⑨on bioreactors [7, 8 & 9] to form a new T-joint 1½"⑩ (orange hose).

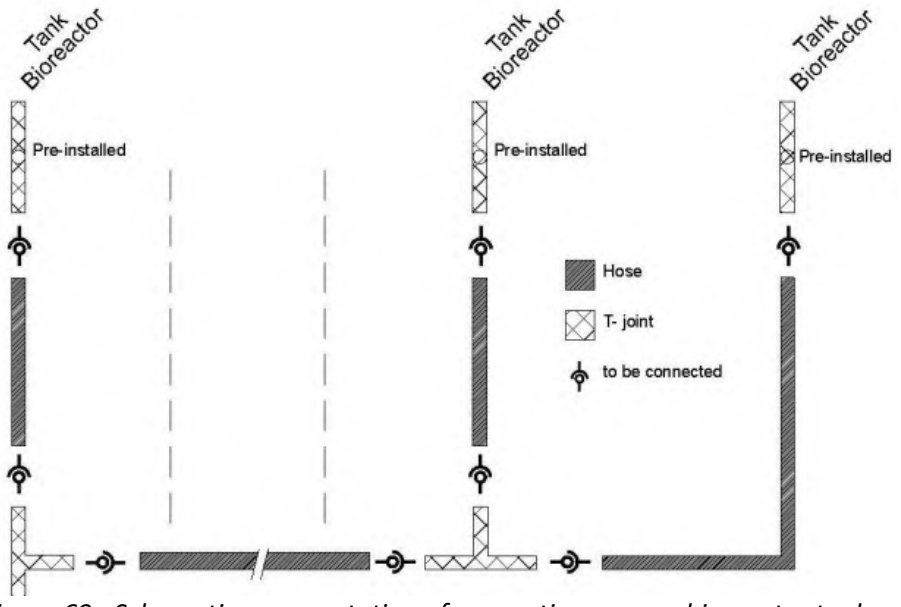


Figure 69: Schematic representation of connections across bioreactor tanks with hose and T-joints

- Establish a connection by using a diffusor aeration hose 1" from the pre-mounted T-Joint 1¼" ⑪ on each bioreactor to form a new T-joint 1¼" ⑫(blue hose).

Figure 70: Hose connection across bioreactor tanks [Top view]

- Establish the intermediate diffusor connections across the bioreactor tanks by using a diffuser hose 1" and T-joint 1¼”.

Step 2: Setup of the Technical Unit and hose connections

- The Technical Unit (with dosing station, blowers and the control unit) has to be placed in front of the clear water tank.
- The sewer hose 1” connection from the sewer valve V7 1¼”⑬ routed to the emergency overflow pipe 1¼ ” ⑦ (purple hose).

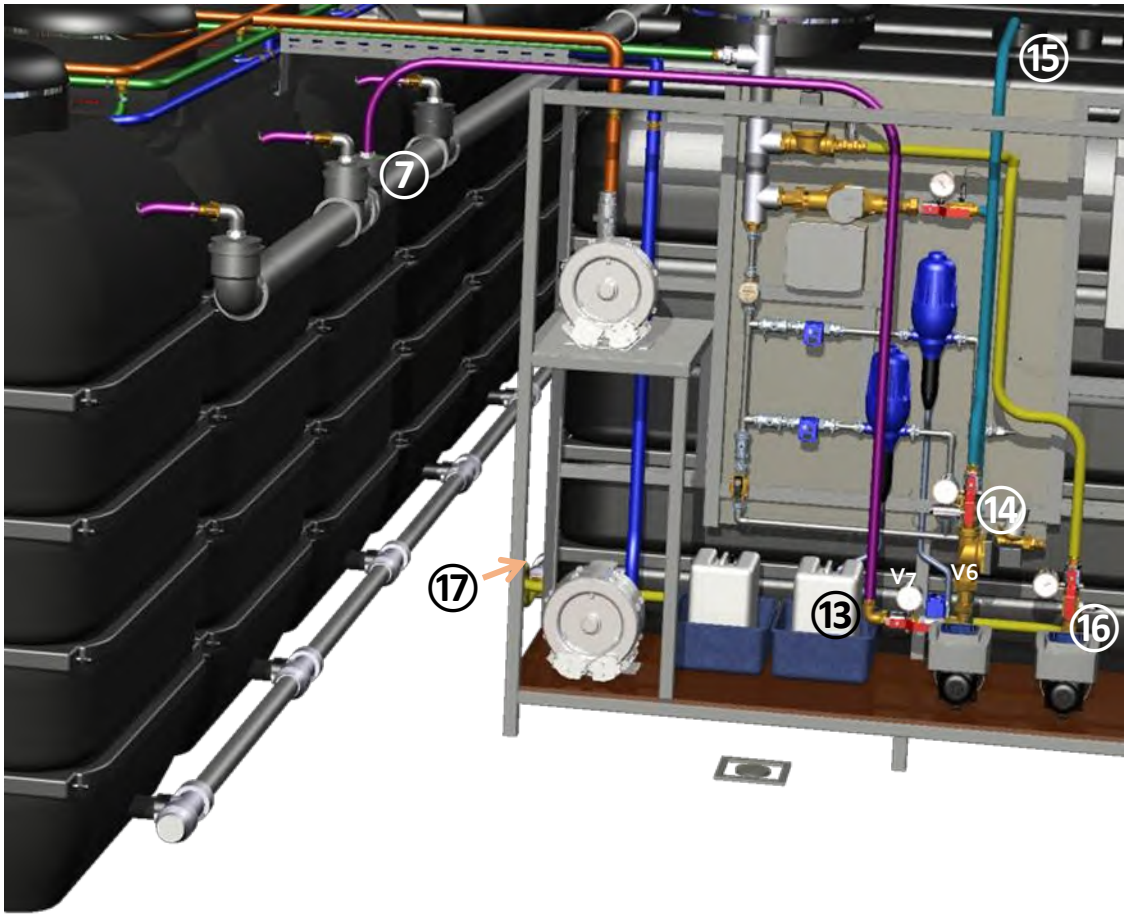


Figure 71: Hose connections at the Technical unit

- The permeate hose 1” connection from the filtration pump-permeate valve V6 1¼”⑭ to the connection on top of clear water tank 1¼” ⑮(cyan hose).
- The clearwater hose 1” connection from the backwash pump valve V10 1¼” ⑯to the connection ventil of clear water tank3 ventil 1¼” ⑰ (yellow hose).

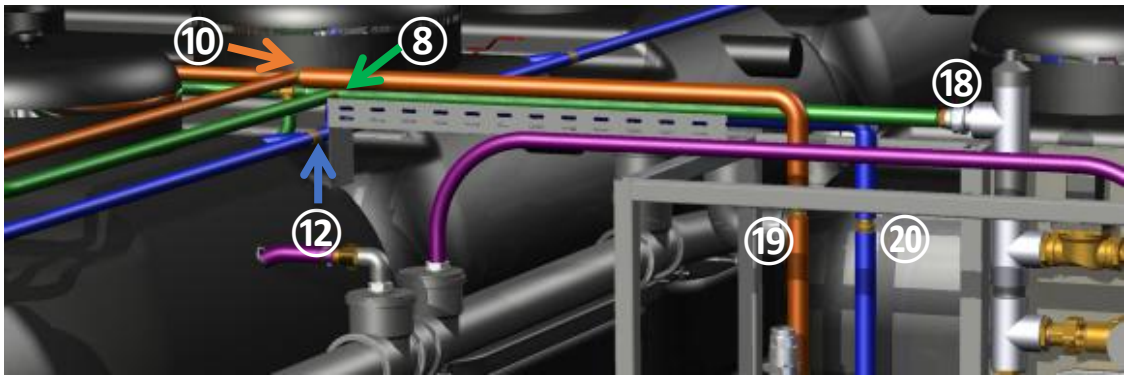


Figure 72: Hose connections between Bioreactor tanks and Technical unit

- Establish the permeate hose 2" connection (a 'T joint' connecting three bioreactors) 2½"⑧is connected to the inlet on the Technical Unit 2½" ⑱ (green hose).
- Establish the membrane aeration hose 3" connection from the top the bioreactor 1¼"('T joint') ⑩ to Blower AL-BLK05 hose at the technical Unit 1¼" ⑲ (orange hose).
- Establish the diffusor aeration hose 1¼ connection from top of the bioreactor 1½"⑫ (a 'T joint') to the blower AL-BLR30 hose at the technical Unit1½" ⑳(blue hose).

Before the final pipe connection please proof the spin direction to prevent that the blower working in vacuum mode!

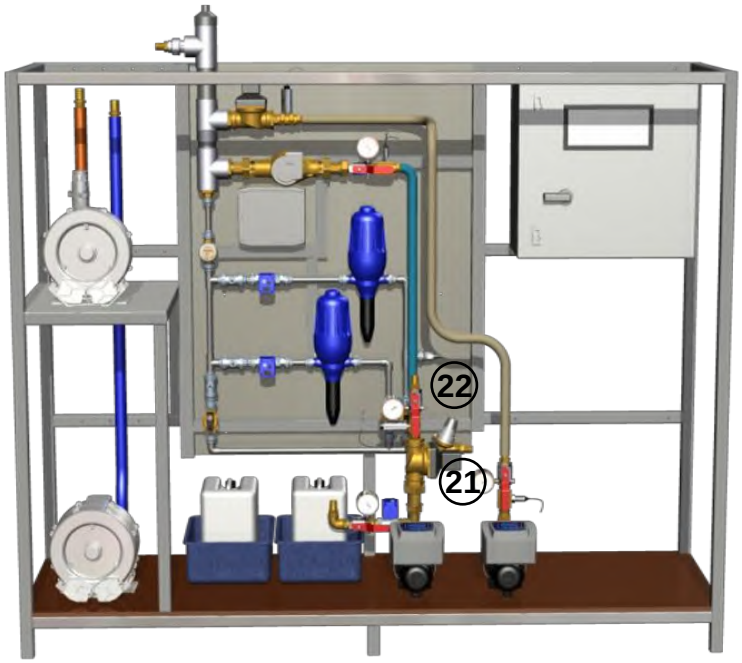


Figure 73: Technical Unit Overview

- The clear water inlet connection ¾"of the dosing station ㉑ connected later with the process water pipe 1" from the booster pump.
- The safety outlet connection ½" ㉒ (emergency overpressure) routed into the sewer or a small container.

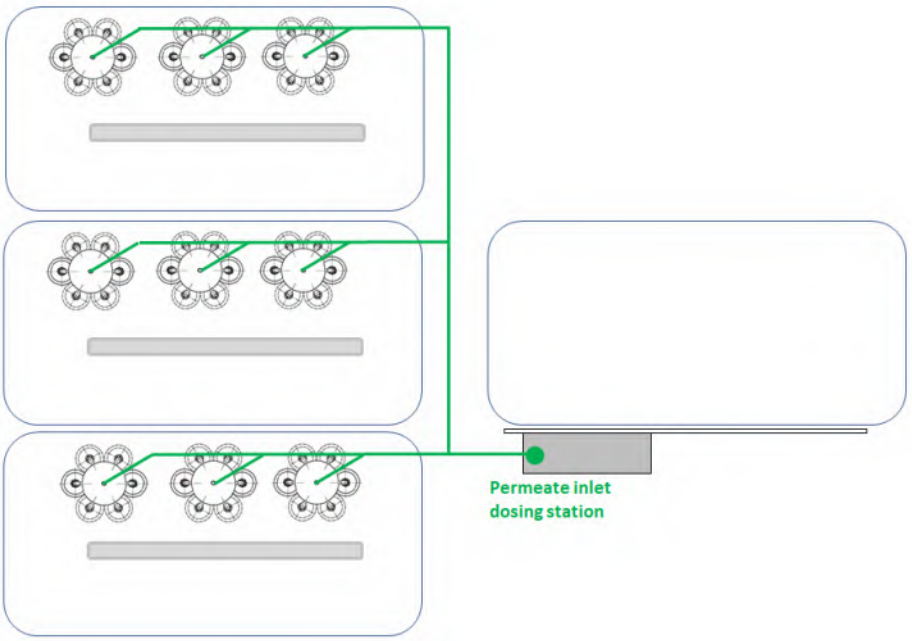


Figure 74: Overview pipe connection to the central pipe for permeate to the dosing station

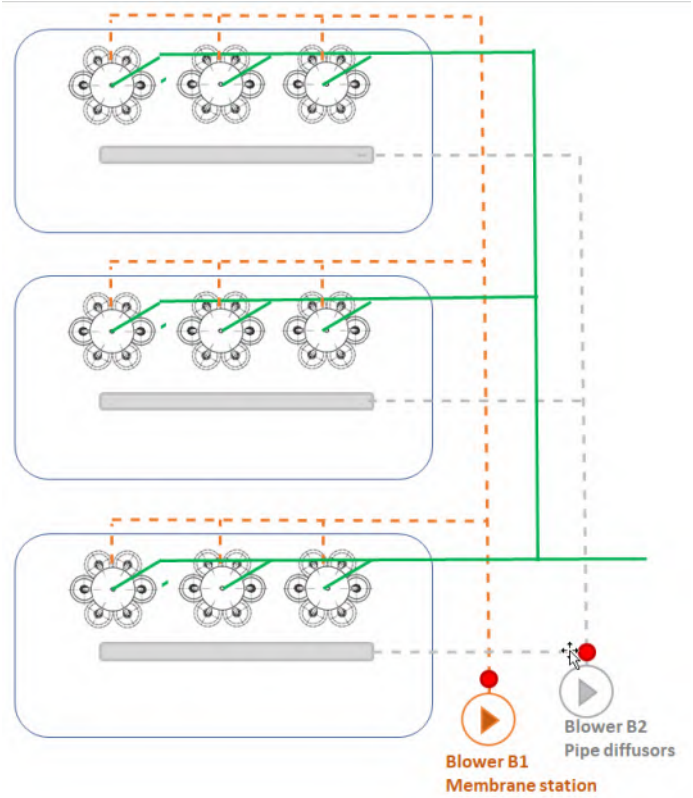


Figure 75: Overview pipe connection to the central pipe to blower B1 and B2

Step 3: Pipe connection process water

- Establish the process water connection via booster pump from the clear water tank to the consumer unit (s. Chapter 7.3.3)
- Thereafter, connect pressurized process water pipe to backwash connection of the pre-filter (via water meter W5 and solenoid valve V8), dosing station and consumer water supply.

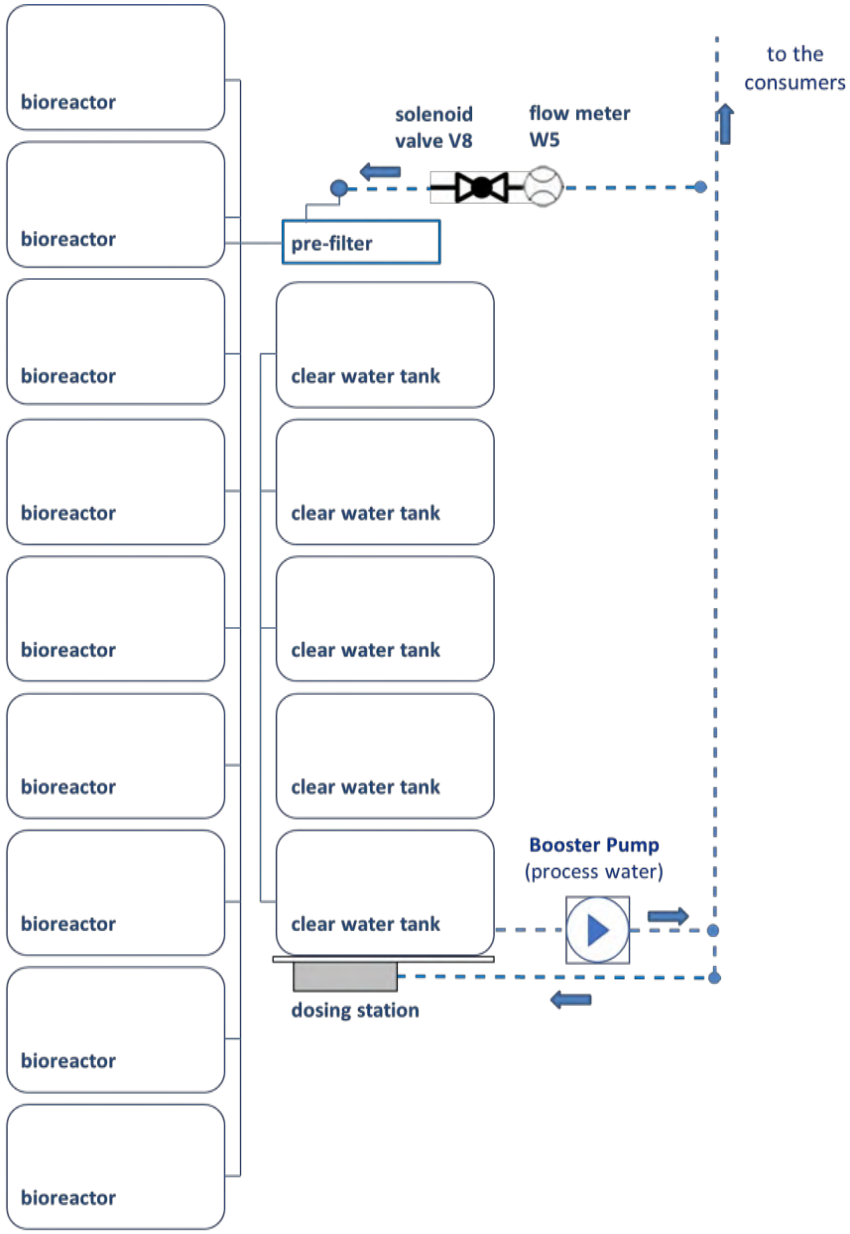


Figure 76: Scheme for process water to consumers and to pre-filter backwash and dosing station

Step 4: Cable connections from tanks to control unit

- All cable connections are labeled according to the terminal diagram in Chap. 7.4
- Connect the cables from the component to the corresponding cables from the control unit using quick cable connectors

Component	Label
○ Level sensor -BR	Ls - BR
○ Level sensor -CL	Ls - CL
○ Sludge pump – BR7	Sp –BR7
○ Sludge pump – BR8	Sp –BR8
○ Sludge pump – BR9	Sp –BR9
○ Solenoid valve V8	Sv – V8
○ Water meter W5	Wm –W5

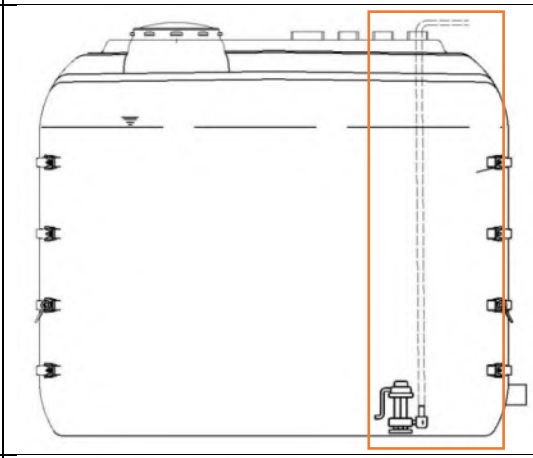
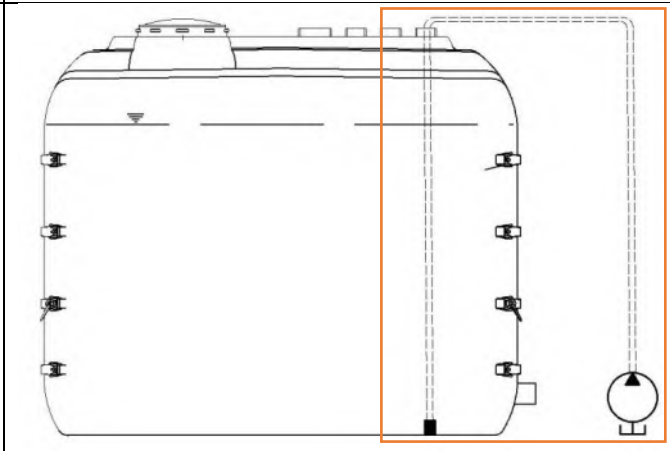
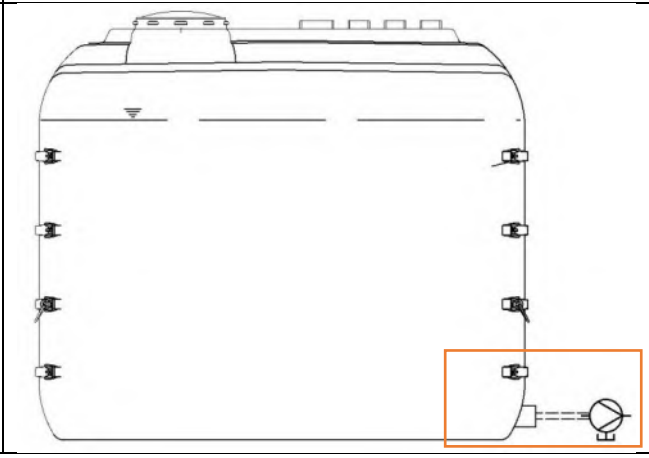
Note:

Ensure that the cable connections are safely connected and the hoses have been firmly fastened using hose clamps

Before using chemicals, test the function of dosing station with water. After testing successfully, install chemical tanks and connect them to dosing stations.

7.3.3 Connection of booster pump

The treated water from the clear water tank can be efficiently supplied for consumption using a booster pump. The pump could be employed by any of three distinct methods.

S. Nr	Pump variant	Illustration
1	**Submersible Pump:** This pump is positioned within the clear water tank and connects via any available provisions above the tank. It operates without the need for a primer, but maintenance could be challenging.	
2	**Priming Pump:** The pump, equipped with a primer, is situated outside the clear water tank and is connected to the tank through available provisions. It requires priming before operation and generally demands less maintenance.	
3	**Non-Priming Pump:** The pump, located outside the clear water tank, connects directly through an available provision at the bottom of the tank. Unlike priming pumps, it operates without the need for a primer, simplifying the initial setup, although regular maintenance would be demanding.	

Note: The technical specifications for the booster pump depend on factors unique to the consumer's building arrangement. Thus it not included in the scope of the system. However, booster pump could be suggested based on consumer requirements and need to be ordered separately.

7.4 Terminal Diagram

7.4.1 Terminal Diagram I-CON-WT-CP

The following table show all the terminal blocks, as well as cable connections for the equipment for the 3-phase systems. Connect all devices correspondingly. Following the terminal diagram of the central control unit can be seen.

Note: Only cable connections supplied by INTEWA are listed. No information is provided about the power supply as this is not included in the scope of delivery.

Table 13: Terminal Diagram Connections Central Control Unit

Terminal Diagram I-Connect Controller					
Terminal block	**Terminal No.**	**Connection**	**Description**	**Cable connection**	**Module**
X0	**1**	L1	Main supply, 400 VAC/50Hz		**--**
	2	L2			
	3	L3			
	4	N			
	PE	PE			
XD1	**1**	L1	Blower, Membrane Station 400 V AC	Black 1	**Relais Module 10**
	2	L2		Black 2	
	3	L3		Black 3	
	4	N		--	
	5	PE		Green/Yellow	
	6	L1	Blower Pipe Diffusor, 400 V AC	Black 1	
	7	L2		Black 2	
	8	L3		Black 3	
	9	N		--	
	10	PE		Green/Yellow	
	11	L1	Filtration-pump 400V AC	Black 1	
	12	L2		Black 2	
	13	L3		Black 3	
	14	N		--	
	15	PE		Green/Yellow	
	16	L1	Backwash-pump 400V AC	Black 1	
	17	L2		Black 2	
	18	L3		Black 3	
	19	N		--	
	20	PE		Green/Yellow	
XD2	**1**	L	Sludge pump 1 230 VAC	Brown	
	2	N		Blue	
	3	PE		Green/Yellow	
	4	L	Sludge pump 2 230 VAC	Brown	
	5	N		Blue	
	6	PE		Green/Yellow	

XD2	**7**	L	Sludge pump 3 230 VAC	Brown	**Relais Module 10**
	8	N		Blue	
	9	PE		Green/Yellow	
XD3	**1**	P_{open}	Sewer open/close Ball Valve V7, 230 V AC	Brown	
	2	P_{close}		Grey	
	3	GND		Black	
	4	PE		--	
	5	+24	Service water open Solenoid Valve V1, 24V DC	Brown	**Relais Module 11**
	6	GND		Blue	
	7	free		--	
	8	+24	Citric Acid Inlet open Solenoid Valve V2, 24V DC	Brown	
	9	GND		Blue	
	10	free		--	
	11	+24	Chlorine inlet open Solenoid Valve V4, 24V DC	Brown	
	12	GND		Blue	
	13	free		--	
	14	$+24_{open}$	Citric Acid drain Ball Valve V3, 24V DC	Brown	
	15	$+24_{close}$		Grey	
	16	GND		Black	
	17	$+24_{open}$	Chlorine drain Ball Valve V5, 24V DC	Brown	
	18	$+24_{close}$		Grey	
	19	GND		Black	
	20	+24	Alarm-Buzzer, 24V DC	Brown	
	21	GND		Blue	
	22	free		--	
	23	+24	Permeate open/close, Solenoid Valve V6 24 V DC	Brown	**Relais Module 12**
	24	GND		Blue	
	25	free		--	
	26	+24	Backwash open Solenoid Valve V10, 24V DC	Brown	
	27	GND		Blue	
	28	free		--	
	29	+24	Pre-Filter back wash open Solenoid Valve V8, 24V DC	Brown	
	30	GND		Blue	
	31	free		--	
	32	+24	Drink water Top-Up Solenoid Valve V9, 24V DC	Brown	
	33	GND		Blue	
	34	free		--	
XD4	**1**	S_{AUF}	Position open/closed Citric Acid Valve V3	Brown	**Analog Module 15**
	2	S_{ZU}		Grey	
	3	GND		Black	
	4	S_{AUF}	Position open/closed Chlorine Valve V5	Brown	
	5	S_{ZU}		Grey	
	6	GND		Black	
	7	S_{ZU}	Position closed Sewer Valve V7	Brown	
	8	free		--	
	9	GND		Blue	

XD4	**10**	IMP	Water Meter, pulse Chemical cleaning**	Brown	**Analog Module 15**
	11	free		--	
	12	GND		Blue	
	13	+24	Flowmeter Permeate 24VDC, 4-20mA	Brown	
	14	E4-20		White	
	15	GND		Blue	
	16	+24	Flowmeter Backwash 24VDC, 4-20mA	Brown	
	17	4-20mA		White	
	18	GND		Blue	
XD5	**1**	+24	Level Sensor Bio Reactor 24 VDC, 4-20mA**	Brown	**Analog Module 16**
	2	4-20mA		Green	
	3	GND		Grey	
	4	+24	Level Sensor Clear Water Tank 24VDC, 4-20mA**	Brown	
	5	4-20mA		Green	
	6	GND		Grey	
	7	+24	Pressure Sensor Blower Membrane Station 24VDC, 4-20mA *	Brown	
	8	E4-20		Blue	
	9	free		--	
	10	+24	Pressure Sensor Blower Pipe Diffusor 24VDC, 4-20mA *	Brown	
	11	E4-20		Blue	
	12	free		--	
	13	IMP	Water Meter, pulse Permeate**	Brown	
	14	GND		Blue	
	15	free		Green/Yellow Striped	
	16	IMP	Water Meter, pulse Service Water**	Blue	
	17	GND		Brown	
	18	free		--	
	19	IMP	Water Meter, pulse Drink Water Top-Up**	Blue	
	20	GND		Brown	
	21	free		--	
	22	IMP	Water meter, pulse Prefilter**	Blue	
	23	GND		Brown	
	24	free		--	
XG01	**1**	B	ModBus Filtration-Pump	Brown	**USB-Nano TF02**
	2	A		White	
	3	X		Shield	
	4	B	ModBus Backwash-Pump	Brown	
	5	A		White	
	6	X		Shield	

-- Free Terminal

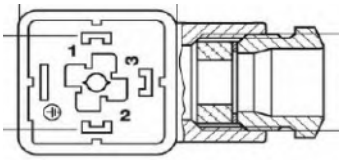
This indicates the terminals are free and no cables have connected

*** Pressure sensor:**

Connection of the cable to the pressure sensor in accordance with the cable diagram, requires the following cabling with the sensor plug:

Pin 1: Brown

Pin 2: Blue



**** Extended Cords:**

Some components are wired directly to the control unit; while other components require an extended cable to lengthen the component feed cable. Such components are listed in the table below with their respective cable colour codes that has to be connected to the control unit.

Table 14: Component corresponding extended colour codes

Component	Cable connection	Extension Cable
Sludge Pump	Black	Brown
	White	Grey
	Green	Black
Level Sensor	Brown	Brown
	Green	Grey
	Grey	Black
Water meter, pulse	White	Brown
	Brown	Blue

Additional demands:

This is to consider if any special requirements are integrated to the standard systems

- EQ Tanks: Blower and Sludge pump are additionally installed in the EQ tanks.

Table 15: The terminal diagram for the additional connections

Terminal block	Terminal No.	Connection	Description	Cable connection	Module
XD5	**21**	L1	Blower EQ tank 400 VAC /50Hz	Black 1	**Analog Module 16**
	22	L2		Black 2	
	23	L3		Black 3	
	24	N		--	
	25	PE		Green/Yellow	
XD2	**10**	L	Sludge pump EQ Tank 230 VAC /50Hz	Brown	
	11	N		Blue	
	12	PE		Green/Yellow	

7.4.2 Terminal diagram I-CON-ADS (distribution box)

The following table refers to the distribution box, attached to the dosing station. At delivery, the box is completely wired. This table is not relevant at start-up, only when a part of the dosing station has to be replaced.

Table 16: Terminal Diagram distribution box from I-CON ADS

Terminal Diagram I-Connect Dosing Station					
Terminal block	**No.**	**Connection**	**Description**	**Cable connection**	
				Terminal -IN	**Terminal -OUT**
XD3	**14**	+24	Citric Acid drain Ball Valve V3, 24 VDC	Red	Brown
	15	$+24_{open}$		Green	Grey
	16	GND		Black	Black
	17	+24	Chlorine drain Ball Valve V5, 24 VDC	Red	Brown
	18	$+24_{open}$		Green	Grey
	19	GND		Black	Black
XD4	**1**	S_{open}	Position open/closed Citric Acid Valve V3	Blue	Brown
	2	S_{closed}		Yellow	Grey
	3	GND		Brown	Black
	4	S_{open}	Position open/closed Chlorine Valve V5	Blue	Brown
	5	S_{closed}		Yellow	Grey
	6	GND		Brown	Black
	11	IMP	Water Meter, pulse Chemical cleaning	White	Brown
	12	GND		Brown	Blue
X5	**11**	IMP	Water Meter, pulse Permeate	Green	Brown
	12	GND		Grey	Blue

Note:

- Terminal -IN: The cables directed from the component to the distribution box
- Terminal -OUT: The cables directed to the Control Unit from the distribution box
- Trimming cables:
  - The white and blue colours cables on Ball valves V6 and V7 have to be trimmed
  - The white colour cable on Ball valves V3 and V5 have to be trimmed

III. Start-Up and Operation

8. AQUALOOP System Start-up

Fill the bioreactor with mains water, up to a level of one meter.

Note:

- When starting the controller, it can take up to 2 minutes for the screen to boot up.
- On delivery, all component settings (fan, pumps, etc.) are set to OFF to prevent uncontrolled start-up when the controller is switched on.
- Only switch on the blower for the pipe diffuser when the bioreactor is full, otherwise the membrane of the pipe diffuser will be damaged (as the maximum permissible volume flow will be exceeded without back pressure from the water level).

8.1 Water-tightness test membrane station

Attention:
The tightness of all screw connections on the membrane station is particularly important to prevent contaminated water from entering the treated water. In addition, raw water that accidentally penetrates through poorly sealed screw connections can lead to clogging of the fibres.
All membrane stations are assembled and tested for the packaged systems. Means the tightness is already tested when getting the packaged solution. Only in case of a maintenance (replacement of a membrane etc.) it could be necessary to test the tightness again.

Procedure:

The membrane station will be placed in a separate chamber (e.g. AL-T350) and will get pressurized with air with a separate small blower e.g. Blower AL-BL30.

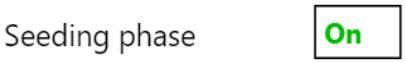
First connect the blower with the permeate connection of the membrane station. The membrane stations must be covered with water. To start the tightness test of the PVC parts, start the blower. If no bubbles can be seen on all permeate connections between the membrane and the backwash tank the station can be used.

Note: Run the test for minimum 5 minutes! Bubbles which came outside the membrane itself could be ignored.

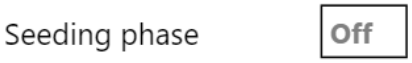
8.2 Start-up phase of the bioreactor

The microorganisms build up in the greywater tank within approx. 3 weeks as a result of continuous greywater supply. This time can vary, depending on the incoming greywater. Until that time, there may be variations in the biological cleaning performance.
In the first 3 weeks of system operation the treated water should not be used and should be sent to the sewer. After 3 weeks of biological activity the daily treated water can be normally safely used. (We recommend taking a sample of the water.)

Until the biological treatment in the bioreactor builds up, the seeding phase must be activated. During this time, the treated water is discharged into the sewer.



After 3 weeks, the seeding phase must be deactivated manually (switched to Off).



Note:
AQUALOOP GW Systems has been thoroughly tested and will continue to work normally even during a short holiday (vacation) period. This means that a separate holiday setting is not needed. If the bioreactor runs for a longer period of time (>21 days) without greywater supply, the efficiency of the biological treatment may decrease. In this case, the start-up phase (in which the clear water is fed into the sewage system for 3 weeks) may have to be carried out again (see section Start-up phase of the bioreactor).

8.3 Settings of the control unit

The following are the suggested start up settings that must be adjusted for individual system use (*Example of a 5400 L/day grey water application):*

Table 17: Minimum recommended settings

Overflow height	Bioreactor	1,6m/ 63 inch
	Clearwater Tank	1,80 m / 70 inch
All Pumps, blower and valves		Auto
Process Flow	Operating hours	0:00 – 24:00
Sludge Pump	Operating hours	09:00 – 18:00
	Runtime	AL_GW 32400: 330 s (2 pcs. Pump)
		AL_GW 48600: 220 s (3 pcs. Pump)
	Interval (days)	1

Pre-Filter valve (V8)	Operating hours	09:00 – 18:00	
	Runtime	180 s	
	Interval (days)	1	
Chemical cleaning (Timer)	Cleaning interval (days)	14	
	Operating hours	00:00 – 06:00	
Blower membrane (B1)	Operating hours	0:00 – 24:00	
	AL-GW 32400	Runtime	1 min
		Break time	7 min
	AL-GW 48600	Runtime	1 min
		Break time	7 min
Blower pipe diffusor (B2)	Operating hours	0:00 – 24:00	
	AL-GW 32400	Runtime	5 min
		Break time	5 min
	AL-GW 48600	Runtime	5 min
		Break time	5 min

Note:
If the minimum water level in bioreactor or maximum water level in clear water tank is indicated, the filtration and backflush pumps will be interrupted, although the process timers are continued. As the water level in the bioreactor rises/ water level in the clear water tank falls, the pumps are enabled again.

You can simulate the function by changing the overflow heights in the menu settings.
If the overflow heights are almost reached (95%), the pumps stop and will continue when the tank capacity reaches 90%. To check the operation of the filtration and backwash pumps the pump test can be performed.

8.4 Pre-setting of the dosing units

When commissioning the dosing station, both dosing units must be set to the respective target concentration. To set the concentration, the locking nut must be loosened and the setting nut turned to the desired position. Afterwards, the locking nut must be hand-tightened again(s. Figure 77). The target concentration is set manually at the two dosing units. This depends on the concentration of the initially supplied chemicals and the target concentration.

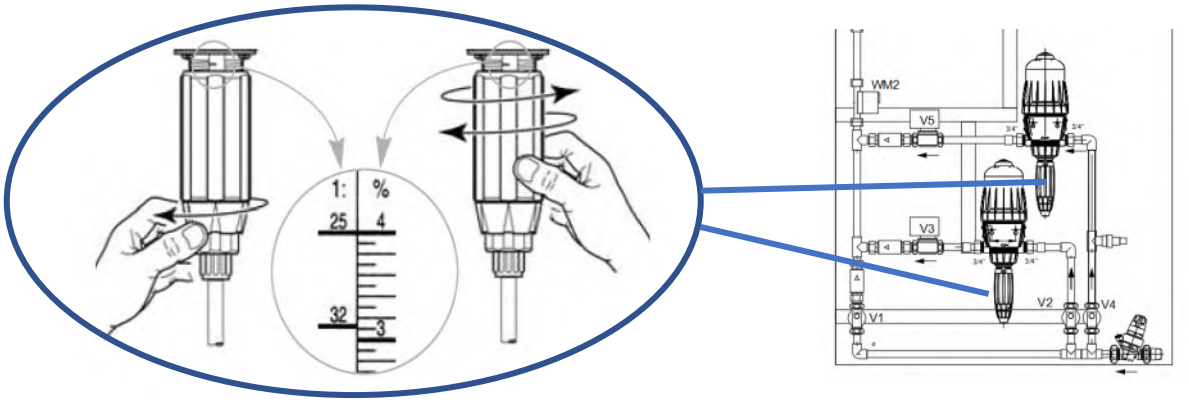


Figure 77: Manual pre-setting of the two dosing units

The required target concentrations for the Dosatron RE2 can be taken from table below.

Table 18: Dosatron RE2 pre-setting of the target concentration

Initial concentration solution	***citric acid***		**chlorine**	
	Pre-setting of the dosing unit for citric acid	*output target concentration for* citric acid	*Pre-setting of the* dosing unit for chlorine	*output target concentration for* chlorine
12,5 %	--	--	2 %*	0,25 %
20 %	--	--	1,25 %	0,25 %
30 %	-	--	0,8 %	0,25 %
50 %	2 % *	1%	—	—
70 %	1,4 %	1%	--	--
80 %	1,25 %	1%	--	--
90 %	1,1 %	1%	--	--
100 %	1 %	1%	--	--

Table 19: Example amount of cleaning solution per cleaning interval

Number of Membrane stations	**1**	**2**	**3**	**4**
Citric Acid, initial concentration 50%	0.35 L	0.70 L	1.05 L	1.46 L
Hypochlorite, initial concentration 12%	0.36 L	0.73 L	1.09 L	1.52 L
Mixed solution of a cleaning process (water and chemicals)	17.25 L	34.80 L	51.75 L	73.00 L

9. Operation of the system via I-CONNECT: operation mode display, menu settings and description

The access to the following menus can take place via the display of the control cabinet, by using a web browser or optionally by using the INTEWA Connect App.

Note: At delivery, all options and functions are set to off. Functions should only be activated after the installation and system start-up steps are completed.
Following figures are displayed in the U.S. unit system (Anglo American), the metric unit system is also available. It is possible to switch between the systems at any time.

9.1 Menu "Status“

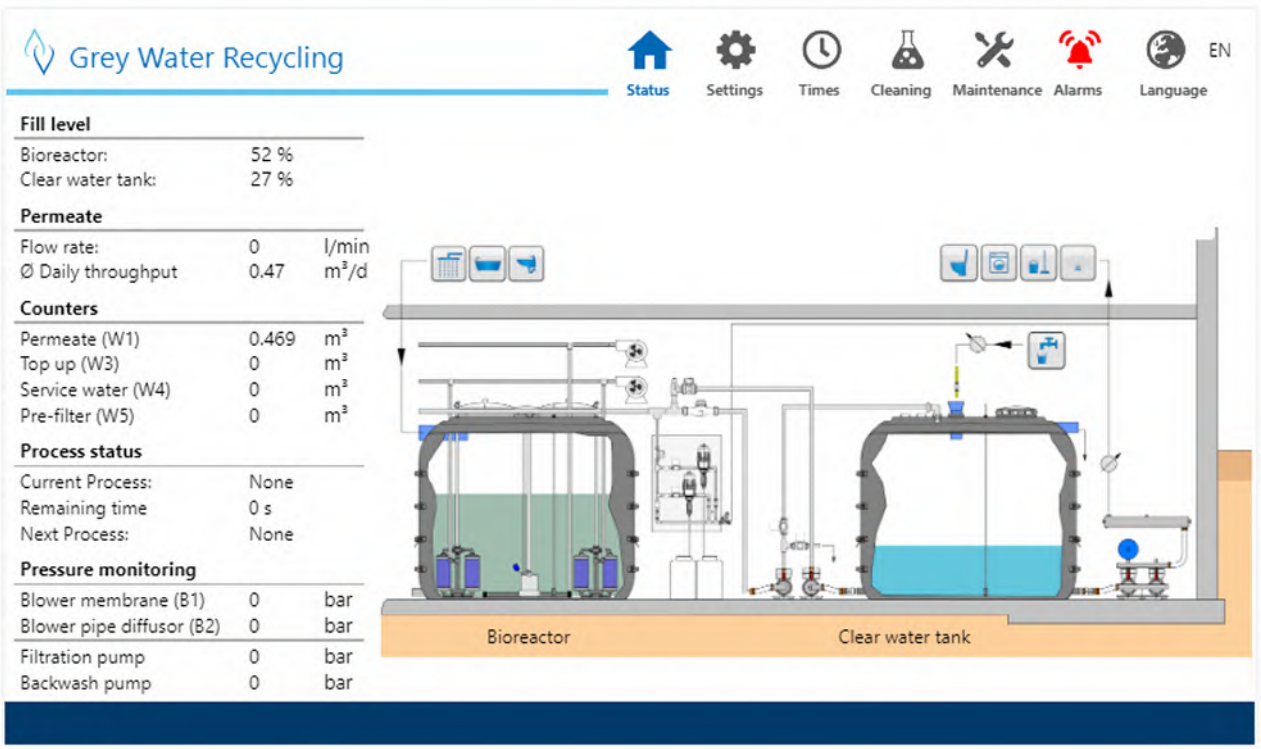


Figure 78: Menu Status

Fill level:

- Fill level of the bioreactor
- Fill level of the clear water tank

Note: The fill levels are calculated via the set overflow height (menu section 7.2) and output as a percentage.

Permeate:

- Flow rate
- Ø Daily throughput (24 h)

Counters:

- Permeate (W1)
- Top-up (W4) (optional flow meter for measuring the water replenishment amount)
- Process water (W3) (optional flow meter for measuring the pressurized water)

Process Status:

- Current process
- Remaining time
- Next process

Note: Following processes are displayed: Filtration, backwash, breaks, chemical cleaning, pump test. For chemical cleaning and pump test, no remaining time will be displayed.

Pressure monitoring:

- Blower Membrane (B1)
- Blower pipe diffusor (B2)
- Filtration pump
- Backwash pump

In case of an Info/Alarm message a red flashing screen will appear on the Status page.
For more information, see section Menu „Alarms“.

9.2 Menu „Settings“

System settings can be adjusted under the Settings menu item. These include the filtration/backwashing process, as well as pumps, blowers and valves. The following Table shows an in-depth explanation of the different options.

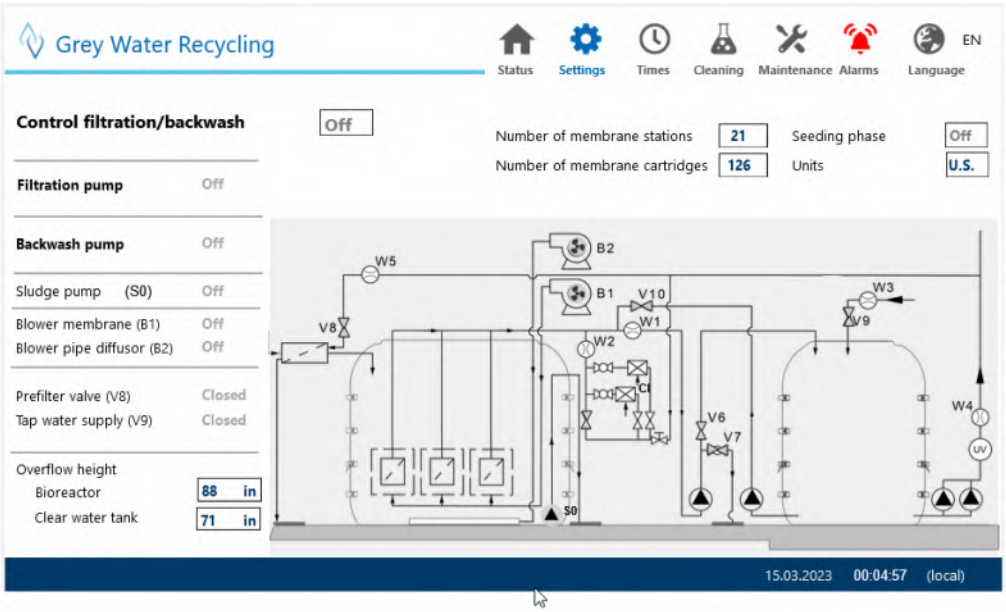
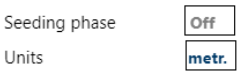


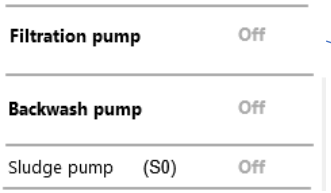
Figure 79: Menu Settings

Control filtration/backwash Off Off On Auto Off	“Process control of all membrane stations” turns on the process cycle of the plant. When set to ON, the plant will start the cycle endlessly. On AUTO the plant will only operate in a timed window, which can be set at the “Menu Times” (Chapter 8.3). When the drop down is set to off, the plant will finish its current running cycle and will stop afterwards. <u>The process cycle:</u> Start = 5sec. Filtration= 900sec Break 1 = 5sec. Backwash = 15sec. Break 2 = 5sec.
Number of membrane stations 9 Number of membrane cartridges 54	These two settings are important for the right calculation of the chemical dosing amount. Number of membrane stations / Numbers of membrane cartridge AL- GW 32400: 6 / 36 AL- GW 48600: 9 / 54



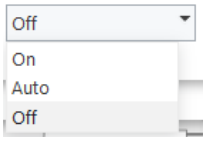
Seeding phase
The seeding phase is activated (On) when the system is started for the first time or during restart after longer downtime period. (s. Chapter 8.2)
After approx. 3 weeks, the seeding phase can be switched to Off.

Units
Units can be changed from U.S. (Anglo-American) to metric system.



Setting of Filtration pump and Backwash pump and sludge pump (S0) via a Drop-down menu.

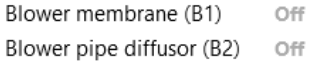
Drop-down menu:



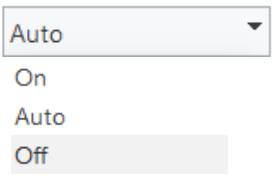
Auto
The auto setting is controlled by the operating times on the Timer menu.

On
For testing purposes.
Activation of the pump. Pump runs for maximum 5 minutes. If the time has elapsed, it is automatically reset to Auto.

Off
Stop function. Pump is permanently deactivated!



Drop-down menu:

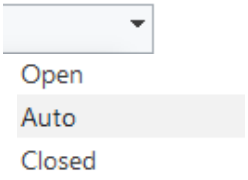


On
For testing purposes.
Activation of the blower for maximum 5 minutes. If the time has elapsed, it is automatically reset to Auto.

Auto
The auto setting is controlled by the operating times on the Timer menu.

Off
Stop function. Pump is permanently deactivated!

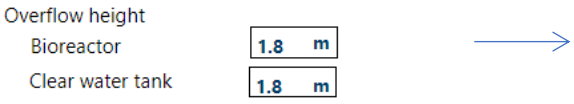
Drop-down menu:



Open
For testing purposes.
Activation of maximum 5 minutes. If the time has elapsed, it is automatically reset to Auto.

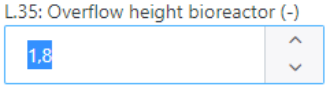
Auto
The auto setting is controlled by the operating times on the Timer menu.

Closed
Stop function. Valve is permanent closed!



By setting the overflow height, the level is calibrated to 100%.

Setting window:



9.3 Menu „Times“

This menu can be used to set operating times for e.g. the filtration/backwash process and the blowers. The interval for chemical cleaning can also be adjusted in this menu.

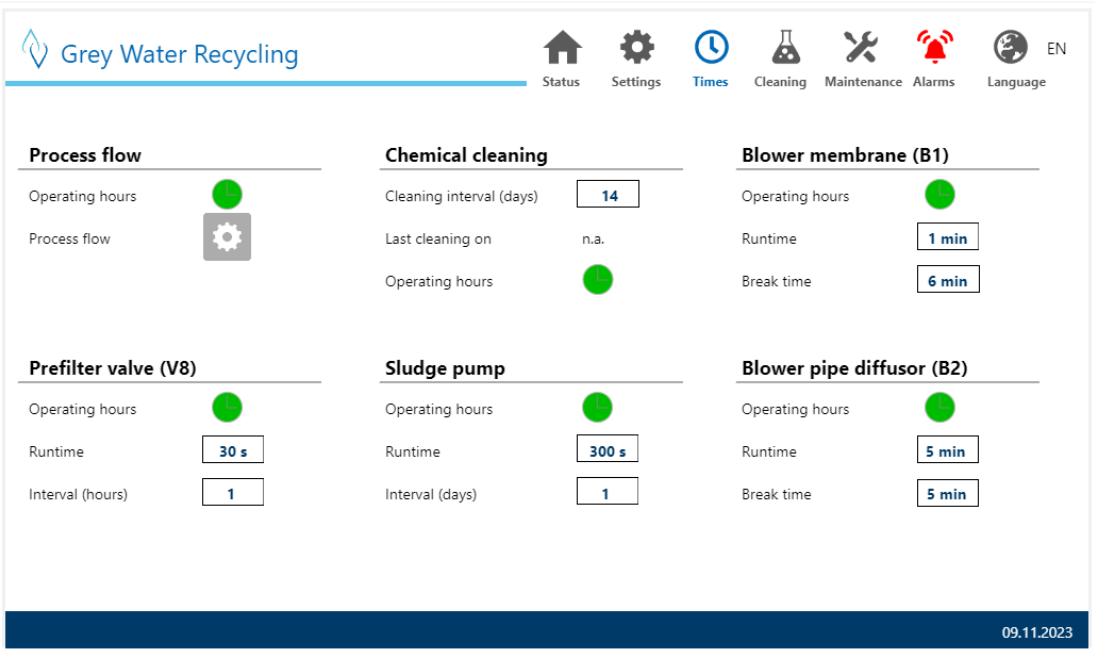
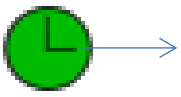
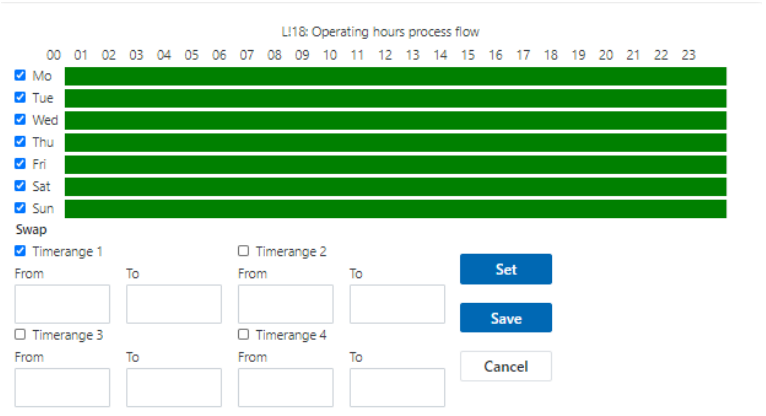


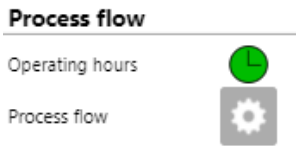
Figure 80: Menu Times



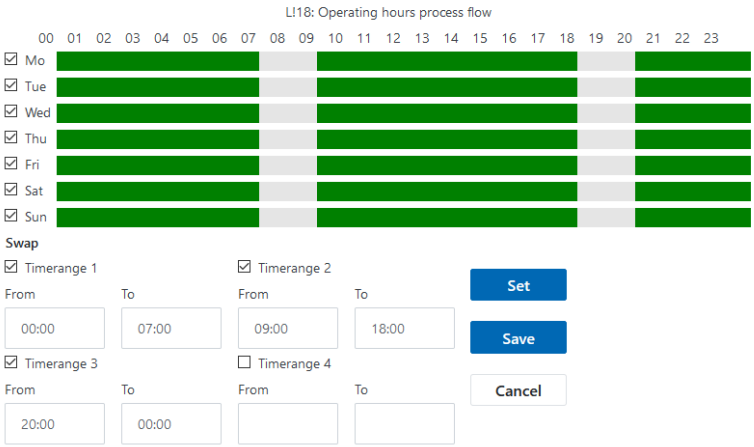


The operating times can be selected on a daily basis via a separate window. A total of four different time ranges can be set. Days can be selected and deselected. To save the changes, first press **Set** and afterwards **Save**.

Note:
For the consideration of the operating times, all relevant components must be set to **Auto**!



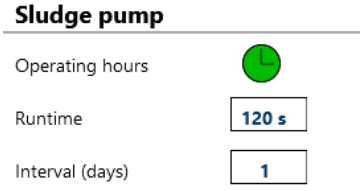
Operation hours
Time setting of the time range for the filtration/backwash process.
Example with break times:



Note:
The recommended time range is 24/7. Filtration/backwash process stops automatically if water level of the bioreactor is < 0.7 m (27,6 in) or the water level of the clear water tank is reached 95 % (safety distance to the emergency overflow).

Process flow
An internal process cycle for filtration and backwash pump is set:

5 sec.	Break
900 sec.	Filtration
5 sec.	Break
15 sec.	Backwash



Operation hours
Time range wherein the runtime starts.

Runtime
Total duration per startup

Interval (days)
In which interval the pump should start

Calculation of sludge pumps runtime and interval:

Recommendation: The runtime of the sludge pump should be selected that the pump extracts every day 3% of the daily inlet quantity.

Example of dimensioning for a greywater unit 5400 L/day (1190 GPD):

V_{sludge} = 3 % $V_{br,use}$ = 3 % x 5400 L = 162 Litres (every day)

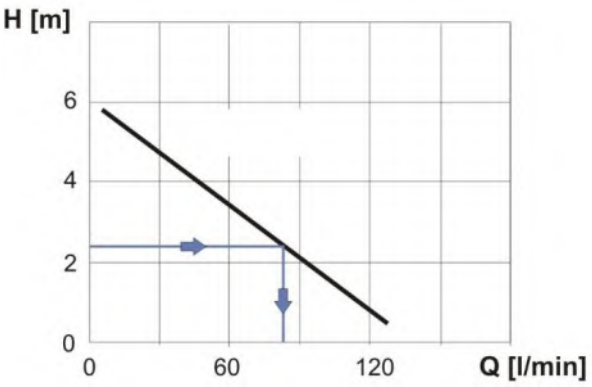


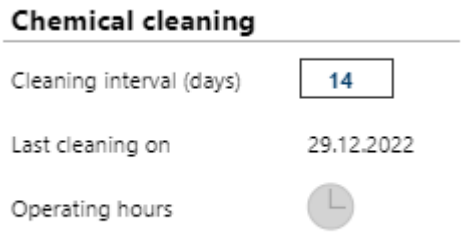
Figure 81: Curve of the sludge pump

Pressure loss due to height difference between pipe inlet and outlet and length:

H_{Lost} =2.3 m => Q_{max}=80 l/min

- Daily Runtime of the sludge pump: $t_{sludge} = V_{sludge}/Q_{max}$ = 2 min

Prefilter valve (V8) Operating hours Runtime 200 s Interval (days) 1	**Operation hours** Operating hours for the pre-filter valve V8 **Runtime** Total duration per startup **Interval (days)** In which interval the pre-filter cleaning should be performed **Note:** Pre-filter cleaning should be done every day for minimum 200 sec.

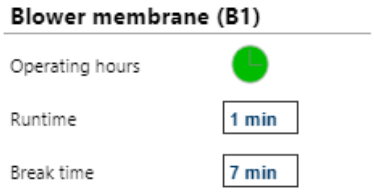


Interval (days)
Interval in which the cleaning should be performed.

Last cleaning on
Date on which the last successful cleaning was performed.

Operating hours
Operation hours where the chemical cleaning shall be started.

Note:
Chemical Cleaning should be performed every 2-3 weeks, depending on system performance. Total duration depends on system size and takes about 5 hours. During chemical cleaning, the filtration process is paused.

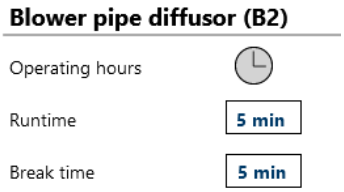


Operating hours
Operating hours for the blower routine.

Runtime
Total aeration time (interval).

Break time
Break time for aerations (interval).

Note:
Default setting of Blower B1 is 3h/day (runtime 1 min, break time 7 min). Membrane aeration > 3 h/day could reduce the lifetime of the membrane.



Setting s. above

Note:
Default setting of B2 is 12h/day (runtime 5 min, break time 5 min). If necessary, the time can be set to higher daily runtime.
Continuous aeration takes place when the break time is set to zero.

9.4 Menu „Cleaning“

On the "Cleaning" page, the automatic chemical cleaning can be activated/deactivated or started/cancelled manually. It is necessary to enter the concentrations and quantities of the supplied chemicals, as these are used to calculate and display the number of possible cleanings.

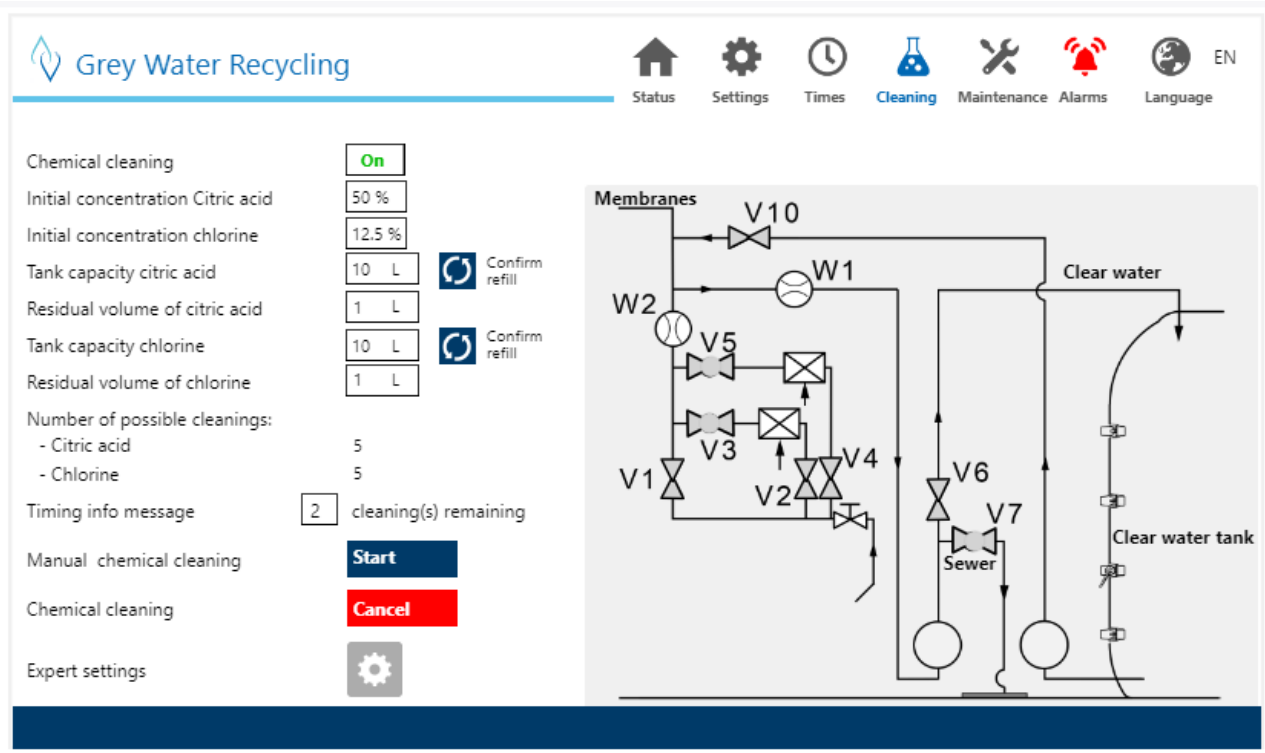
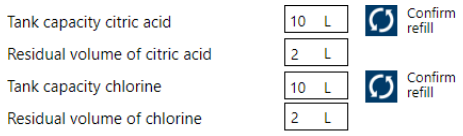


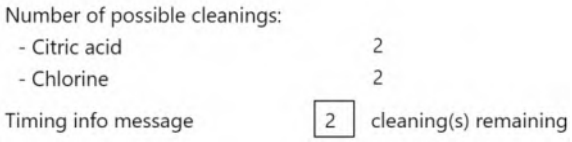
Figure 82: Menu cleaning

Chemical cleaning **On**	Automatic chemical cleaning can be activated or deactivated (On/Off). Previously set operating times and intervals are ignored in the deactivated state (Off).
Initial concentration Citric acid 50 % Initial concentration chlorine 12.5 %	Set the initial concentration of citric acid and chlorine to calculate the amount of possible cleanings **Note:** The Dosatron’s must be manually adjusted to the initial concentrations. See Chapter 10.2



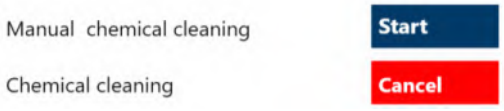
The tank volume of the chemicals must be entered. The residual volume, depending on the tank size needs to be set as well. Due to a suction filter of the dosing unit, not the entire tank size can be used.

Note: After refilling the tanks, the **Confirm refill** button must be pressed.

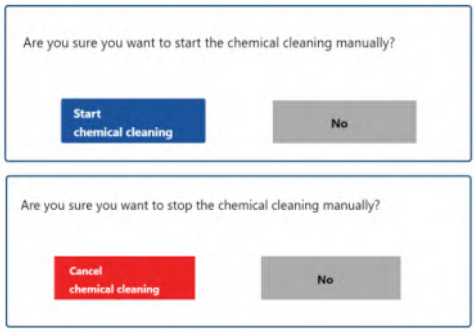


By entering the concentration and quantity of chemicals, the number of possible cleanings can be calculated. An info message is output when a certain number is reached. This can be customized.

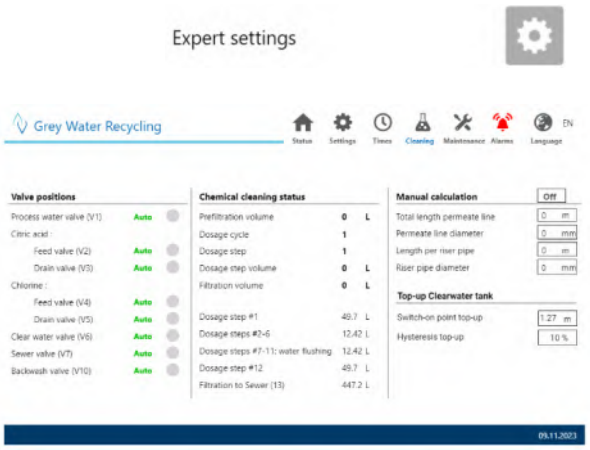
Note: The number of possible cleanings is a calculated value. Deviations from the calculation are possible.



To manually start the chemical cleaning, press the start button and confirm on the next page. To stop the cleaning manually, press the stop button and confirm again.

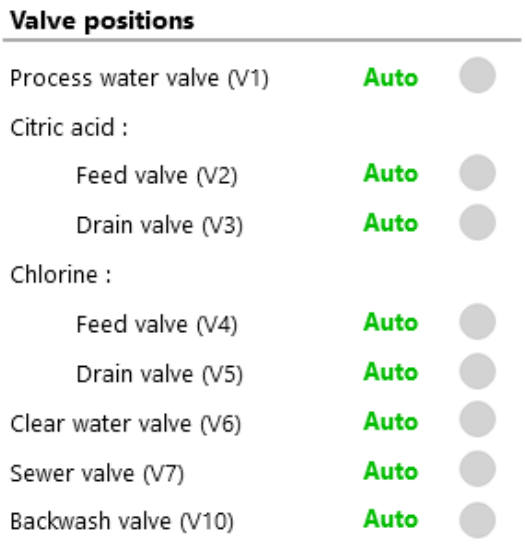


Note: When stopping the chemical cleaning, the emergency flushing of the system will start as a safety measure. This is to ensure that all of the chemicals are rinsed out of the system before resuming normal operation.



The Expert Settings button opens a password-protected page.

The Expert settings page allows changing the operating mode of the valves. Also, the setting of pipe length and diameter for individual systems (non-packaged solution).



The operating mode of the valves can be set via a pop-up menu. This can be accessed by pressing on the text (open/auto/closed). Manual valve settings are only allowed when commissioning with water.

Note:
The operating mode **Closed** deactivates the automatic operating mode.
The grey dot lights up green, when the valve is actuated.

Attention:
If the dosing station is filled with chemicals, the valves of the dosing must not be switched manually. The chemicals may mix! This will lead to an exothermic reaction and maybe the formation of harmful vapours.

Never open citric acid and chlorine valves at the same time! Otherwise, chemicals can mix!

Chemical cleaning status Prefiltration volume 0 L Dosage cycle 1 Dosage step 1 Dosage step volume 0 L Filtration volume 0 L	**Chemical cleaning solution** Displays the cleaning progress (cycle and steps) and shows the dosing volume during an active cleaning procedure.
Dosage step #1 34.67 L Dosage steps #2-6 12.42 L Dosage steps #7-11: water flushing 12.42 L Dosage step #12 34.67 L Filtration to Sewer (13) 387.08 L	Shows the automatically calculated dosing volume per cleaning step
Manual calculation Off Total length permeate line 0 in Permeate line diameter 0 in Length per riser pipe 0 in Riser pipe diameter 0 in	**Manual calculation** For non-packaged solutions, the manual calculation must be set to On. The pipe lengths and diameters must be entered. **Note:** Enter only one length of the riser pipe(hose from membrane station to the permeate line) – it is automatically multiplied

9.5 Menu „Maintenance”

The maintenance display shows the run time [h] of all Filtration and Backwash pump. Timers of the units can be reset, in case of replacement.

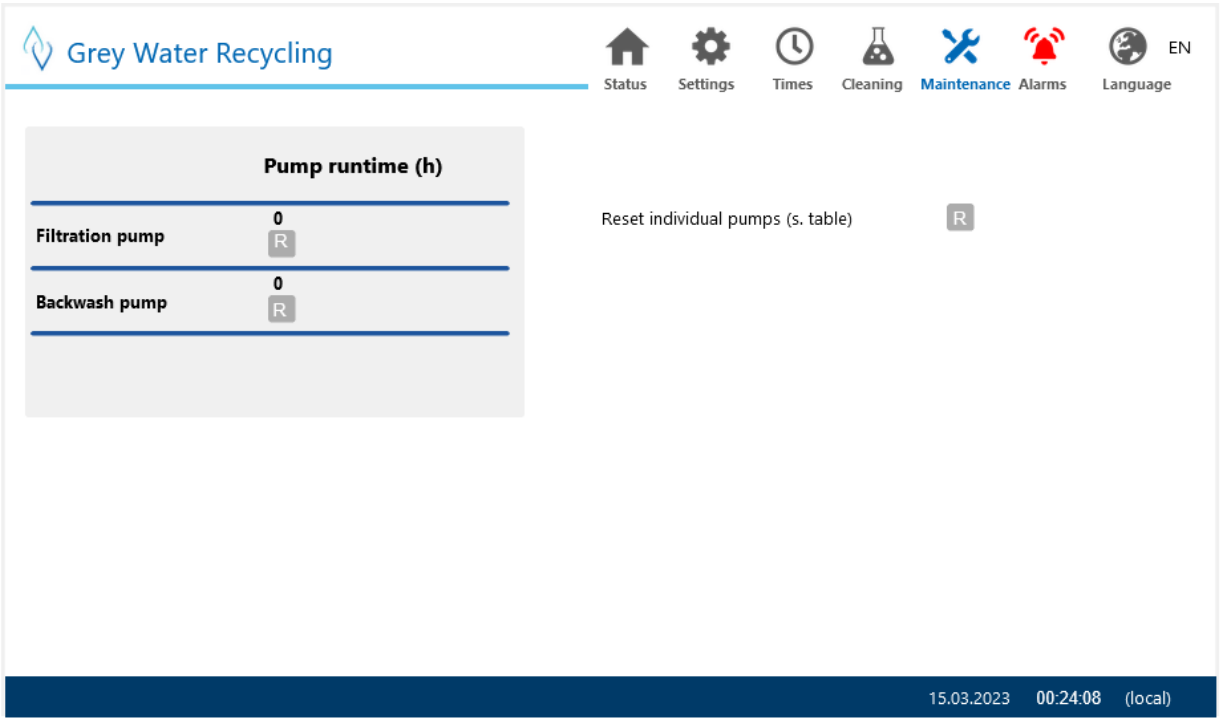


Figure 83: Maintenance Pump runtime

9.6 Menu „Alarms“

In this menu all current Alarms and Info’s are listed.

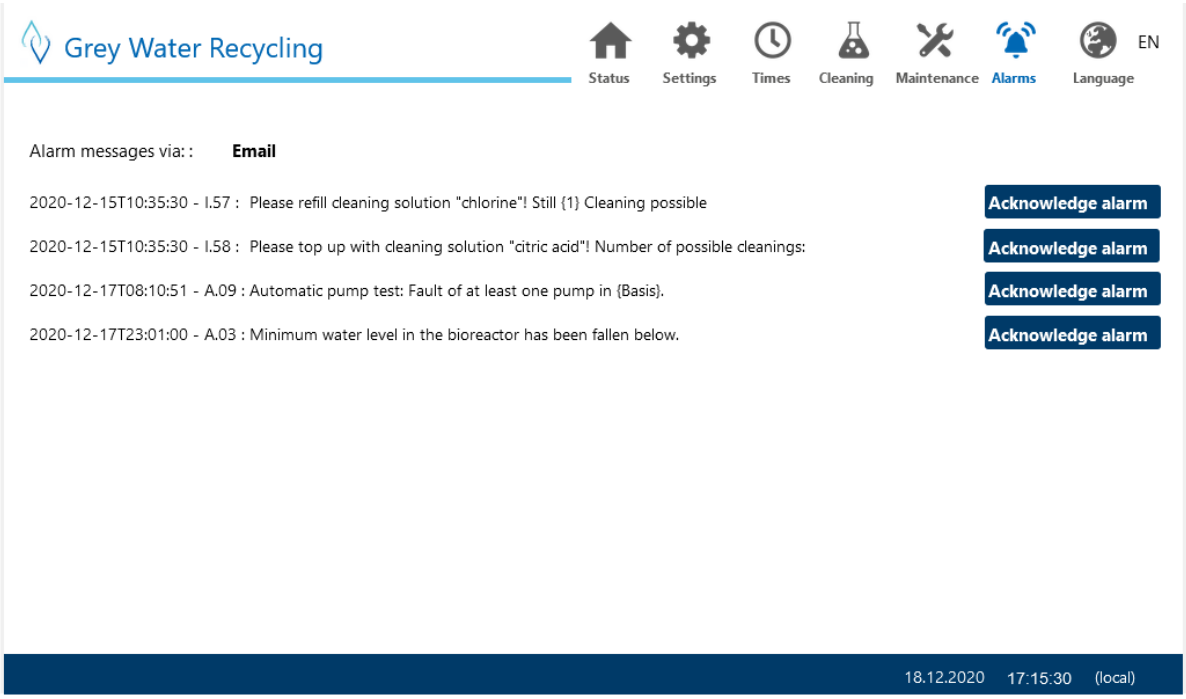
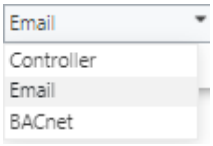


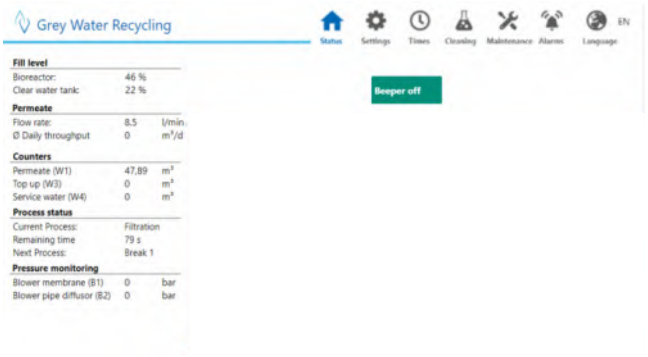
Figure 84: Alarms

Alarm messages via: : **Email**	There are 3 different options available for receiving the messages. Drop-Down-menu:  **E-mail:** Message will be received via the registered e-mail account. The alarm beeper and the flashing red screen on the Status page are disabled. **BACnet:** Messages will be received through the BACnet interface of the Building Management System. The beeper and the flashing red screen are also enabled.

Alarm messages via: : **Controller** Beeper : **Off**

Controller:
The messages will only be received through the controller (touch display).

There is an option available to activate or inactivate the internal beeper if a message is raised.



2020-12-15T10:35:30 - I.57 : Please refill clear

2020-12-17T08:10:51 - A.09 : Automatic pum

Generally, the raised messages are sorted in 2 categories.

Info Messages:

- These messages will inform you, that something is wrong, but the problem is not critical for the functionality of the whole treatment process.
- E.g.: Please refill cleaning solution “chlorine”! Greywater will still be treated as normal, but the chemical cleaning will not be performed until the solution is refilled.

Alarm Messages:

- These messages are of a more critical nature and should be dealt with as soon as possible.
- E.g.: Fault of at least one pump in Basis. One pump in the central control system is not working and no water is filtered through the regarding membrane station.

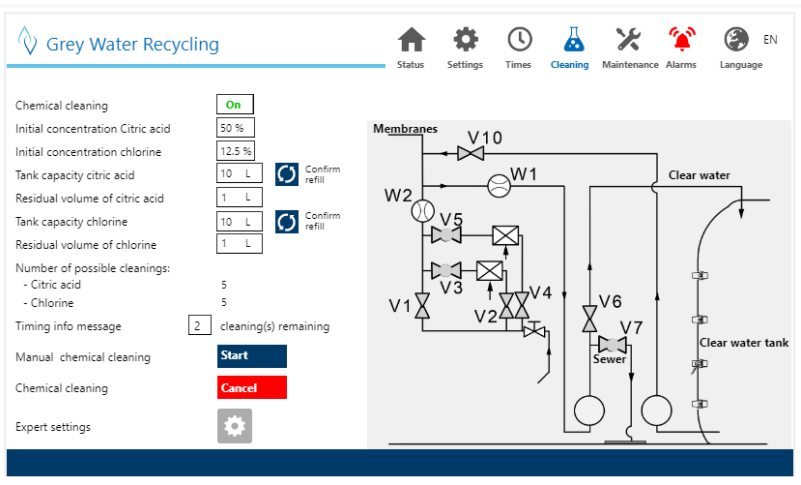
Note:
The nature of the message can be identified through the Capital Letter in front of the message text. The following number refers to an error code. For Troubleshooting the messages, please refer to Chapter 11 Troubleshooting.

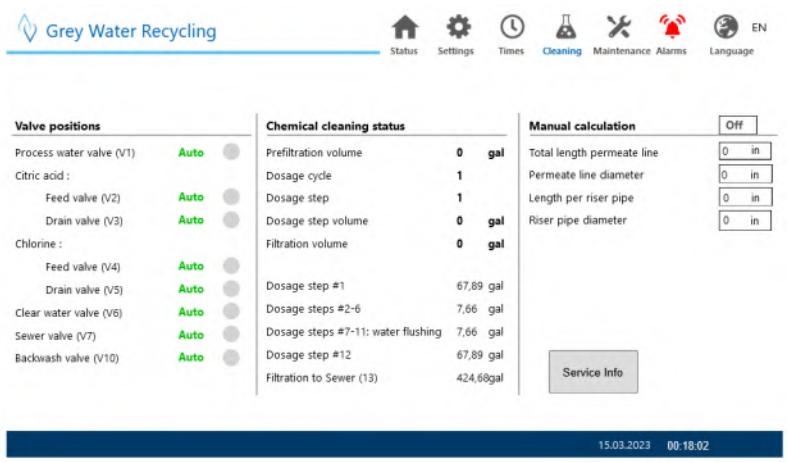
Acknowledge alarm	**Acknowledgement** If the cause for an alarm has not been solved the button will greyed out and can't be pushed. Only if the problem has been solved, the alarm can be acknowledged. Info messages can always be acknowledged, but if the cause hasn't been solved, the message will appear again.

9.7 Network setting /BACnet

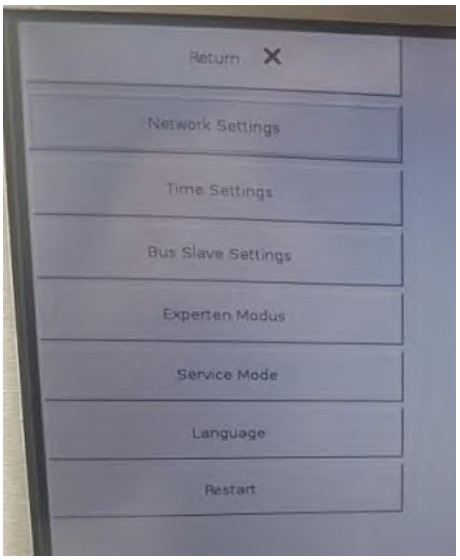
The network settings only can be done one the controller screen. As default setting the connection to the Web is automatically carried out via DHCP.
If a static IP Address must be used the setting can be change in the Expert settings /System setting.

Default settings for BacNet are:
Network No.: 14
Instance No.: 388988

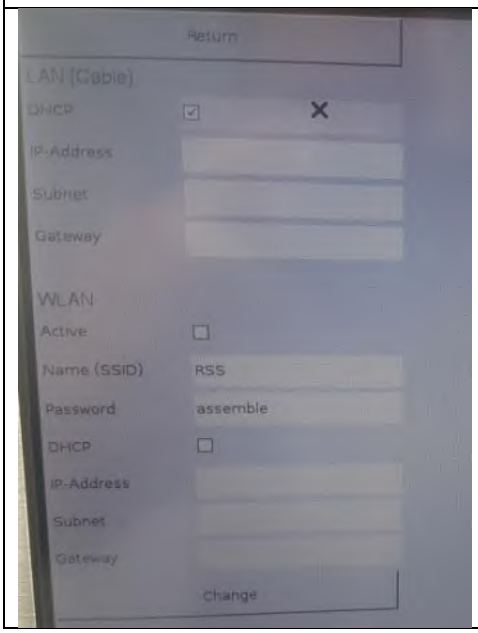
	Network settings: Step 1: - Open cleaning Menu cleaning - Button: Expert setting - Enter the password



Step 2:
- press the button:
  System Settings



Step 3:
- press the button:
  Network Settings



Step 4:
- unclick DHCP
- fill in under LAN (cable)
  IP-Address (static IP-Address)
  Subnet
  Gateway

10. Maintenance and cleaning

The following described maintenance schedule can be performed only by trained operator. The safety instructions below must be followed strictly!

Disconnect the power before working inside the tank or on electrical equipment.

Avoid direct skin contact with the greywater when cleaning the pre-filter and the membrane(s). Please use rubber gloves!

10.1 Maintenance and replacement intervals

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

Table 20: Overview of maintenance and replacement intervals

Component	**Recommendation Maintenance and/or check interval**	***Replacement interval***
Pre-filter	Check every 6 months. Manual Cleaning is necessary The automatic-cleaning interval can then be extended depending on the build-up of contaminants.	
Filtration / backwash pump	Check every 6 months	Replacement of the pump unit after 30,000 hrs. running time (approx. 4 years).
Level sensor	Check every 6 months (The sensor reading must be compared with the actual water level)	---
Blower Pressure sensor	Check every 6 months (The displayed pressure varies with the water level. Depending on the water level, the pressure should be between approx. 100 - 200 mbar for membrane aeration and between approx. 160 - 250 mbar for diffuser aeration.)	---

Component	Recommendation Maintenance and/or check interval	Replacement interval
Blower	Check every 6 months	Replacement of blower filter after 4 years Replacement of the bearings after 40,000 hrs. running time Detailed information can be found in the separate blower instruction manual, which is included with the blowers.
Pipe Diffusor	Cleaning interval every 36 months	Detailed information can be found in the manual AQUALOOP AL-PDxx
Membrane	Systems with automatic cleaning ensure a min. flow of 0.75 L/min, in order to achieve a throughput of 900 L/day/cartridge (238 GPD/cartridge) is achieved.	Replace after 10 years
Bioreactor	Clean every 36 months or as needed	Please refer to Chapter 10.2.2
Clearwater tank	Clean every 12 months or as needed	Please refer to Chapter 10.2.3
Water Meter	Each water meter must be checked every 12 months for correct flow	Please refer to the corresponding manual
Dosing station	Clean every 12 months or as needed, Replacement of the gaskets	Please refer to Chapter 10.2.4 and to the corresponding manual

**Components and replacement parts are listed on intewa.store.com/home.aspx*

10.2 Cleaning procedures

10.2.1 Cleaning of membranes

Due to the regular chemical in-situ cleaning, e.g. intensive cleaning is only necessary if the volume flow is strongly reduced.

Note:

Instructions for the mechanical cleaning of the membrane cartridge can be found in the manual AQUALOOP AL-Mem. The mechanism can only remove the sludge on the outside of the fibre, not the biofilm inside the fibre.

The intensive cleaning, in a separate cleaning container with AL-MS-Controller, descripted in the manual AQUALOOP AL-MS. The intensive cleaning will only be required, if there is a contamination of fats/oils or the in-situ cleaning does not show the desired effect. Low performance of the in-situ cleaning may happen after a couple of years, or the time period between cleaning cycles are too large (e.g. 2 weeks).

10.2.2 Cleaning of the bioreactor

Regular cleaning of the bioreactor is recommended every three years. Frequent removal of the sludge is done by the sludge pump, which is controlled to the *Central Control Unit or Expansion Control Units*. Nevertheless, there might be an excessive sludge formation, due to short sludge pump or aeration run times. This may lead to siltation of the growth bodies. Their ability to float gets inhibited and the effectiveness of the biological treatment is reduced. In this case careful cleaning of the growth bodies, with water jet pressure and without any cleaning agents is recommended since cleaning agents may destroy the biofilm.

Cleaning steps:

Step 1: Switch off the blower and filtration

Step 2: Remove sludge deposits in the tank with a separate submersible pump. To do this, run the pump slowly (to keep turbulence to a minimum) along the entire floor area. This results in door formation, as anaerobic sludge is stirred up.

Step 3: Remove sludge from walls and installations with a water hose. If the growth bodies are heavily sludged, rinse with water.

Step 4: Fill the tank halfway with water and repeat step 2. Finally, empty the tank completely.

Step 5: Fill the Bioreactor again with water up to the minimum water level of 700mm.

After this procedure, switch on the blower and filtration again.

10.2.3 Cleaning of the Clear water tank

Regular cleaning of the clear water tank is recommended once a year.

Depending on the age of the system and bioreactor effectiveness there might be a formation of biofilm on the clear water tank walls. To ensure a satisfactory water quality, the biofilm needs to be removed by water hose and cleaning solution.

Cleaning steps:

Step 1: Turn off filtration, city water top up, and booster pump system.

Step 2: Remove debris from walls and installations with a water hose.

Step 3: Remove sludge deposits from the floor tank using a separate submersible pump. To do this, run the pump slowly over the entire floor area. Empty the tank completely.

Step 4: If necessary, clean the tank mechanically with a cleaning solution (e.g. Danclorix) and a scrubbing brush. Rinse with water and empty the tank completely. Repeatedly fill the tank and aspirate at the same time until the water in the tank is clear and all detergent is removed.

Step 5: Turn on filtration, city water top up, and booster pump system.

10.2.4 Cleaning of the dosing station

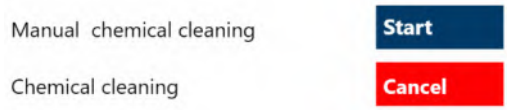
The mixing units Dosatron which are part of the dosing station should be cleaned once a year. In this surrounding the seals should be changed once a year.

Note: The following excerpts of the most parts are from the external Dosatron manual. This is a just for rough overview. Refer to the Dosatron manual for the complete information.

Changing seals in the injection assembly (with pressure off)

Use no tool or metallic tools
Before disassembling parts of the injection assembly, it is important to start up the Dosatron and inject clean water to flush the injection system. In this way, risks of contact with concentrated solutions in the injection assembly are minimized.

Note: This can be done through replacing the chemical tanks with water tanks. After that a chemical cleaning can be started manually, this will ensure the dosing station and the Dosatron are free of any chemicals.



Note: During any such intervention, wear protective eyewear and gloves!

Method of removing seal

(A): Between index finger and thumb, pinch the component and the seal; push towards one side to deform the seal.

(B): Increase the deformation to grip the part of the seal thus exposed and pull it out of its groove.

Clean the seal seating without any tools. Refitting is done by hand. It is very important that the seal is not twisted once in place as this would impair its efficiency.

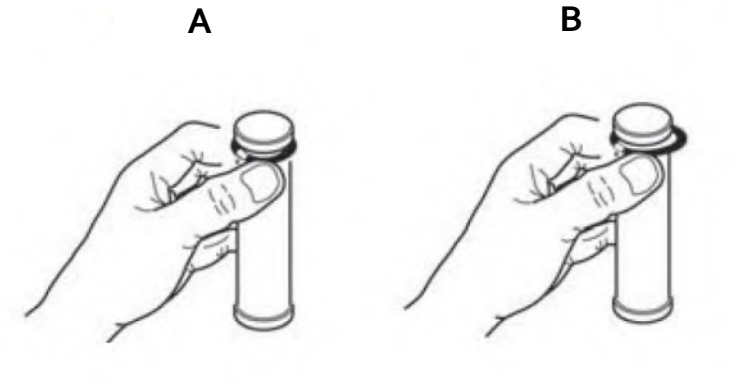


Figure 85: Removing of the seal

Changing the dosing seal

- Change the seals once a year.
- Turn off the water supply and allow the pressure to drop to zero.
- Take off the suction tube of product (C).
- Unscrew the retaining ring (D).
- Pull downwards to remove the injection assembly (E).
- Change the seals, the suction valve and the barbed fitting.
- Re-assemble in the reverse order to the above by hand.

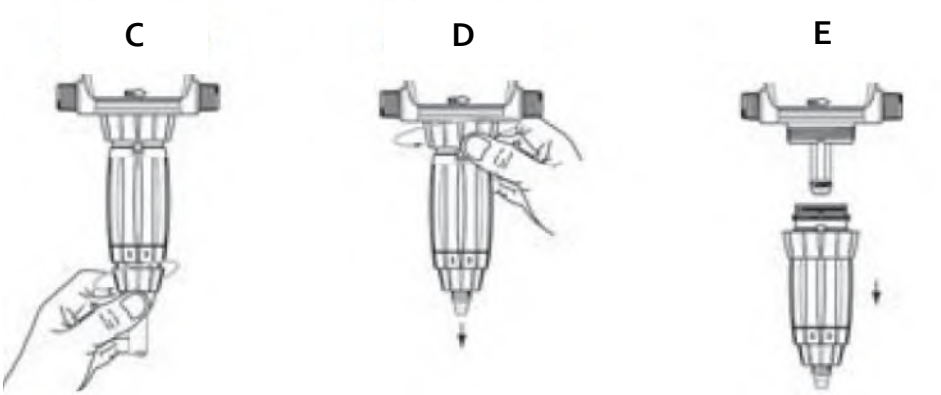


Figure 86: Changing of the dosing seal

Cleaning and re-assembling the suction valve seal:

- Turn off the water supply and allow the pressure to drop to zero.
- Unscrew the nut and pull downwards to remove the suction tube (F).
- Unscrew and take off the suction valve retaining nut (G), pull out the valve assembly, dismantle the valve and thoroughly rinse the separate components in clean water.
- Put the valve components in the order shown in the diagram (H).
- Re-assemble the components in the reverse order to the dismantling process.

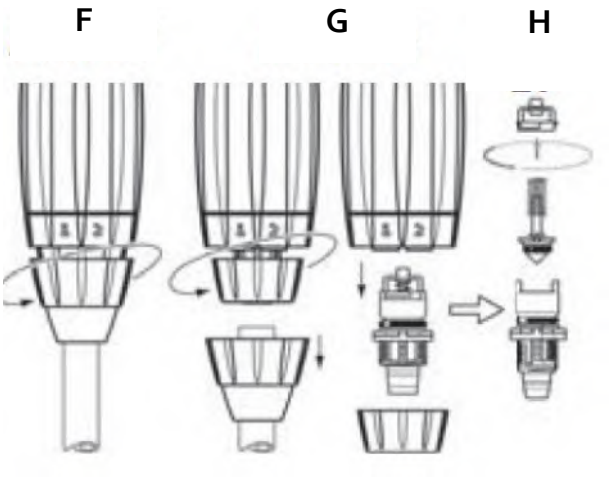


Figure 87: Demounting steps suction valve

11. Troubleshooting

The I-Connect monitoring system transmits the following message categories:

Info messages: will inform you that something is detected, but not critical for the functionality of the whole treatment process. E.g.: Please refill cleaning solution “chlorine”! Greywater will still be treated as normal, but the chemical cleaning will not be performed until the solution is refilled.

Alarm messages: are of a more critical nature and should be dealt with as soon as possible. E.g. Fault of at least one pump in Basis (Pumps which connect in control unit I-CON-WT). One pump in the central control system is not working and no water is filtrated through the concerning membrane station.

Some errors occur, however, without alarm messages and can be solved with the help of instructions in chapter 11.3, 11.4 and 11.5.

11.1 Alarm Messages

In this chapter all alarm numbers are displayed with the corresponding messages. For each alarm cause and remedy are mentioned.

Table 21: Alarm messages, causes and remedies

No.	Alarm Message	Cause	Remedy
A.01	Level sensor in clear water tank is defective or not connected.	• Level sensor defective (>> 100%) • Not connected (n.a. = not applicable)	• Change position of level sensor and check level indication. • Check connections and/or replace sensor if necessary
A.02	Maximum fill level in the bioreactor exceeded. Check level sensor.	See above (A.01)	See above (A.01)
A.03	Water level in the bioreactor has been fallen below the minimum.	• Leakage tank or coupling • Sludge pump sucks water (communicating tube) • Defect water level sensor	• Check operating times of the sludge pumps • Change position of level sensor and check level indicator. • Check connections and/or replace sensor if necessary

No.	Alarm Message	Cause	Remedy
A.04	Level sensor bioreactor defective or not connected.	• Sensor not connected correctly • Sensor defective • Cable defective	• Check connections and/or replace sensor if necessary
A.05	Minimum blower pressure (membrane station) not reached.	• Blower defective • Hose connections leaking • Sensor not connected • Sensor defective	• Check and/or replace pressure sensor • Check and seal hose connections (retighten hose clamps if necessary) • Replace blower
A.06	Maximum blower pressure (membrane station) exceeded.	• Pipe blocked • Sensor defective	• Unblock pipe again • In case of intentional shut-off, switch off blower in control unit
A.07	Minimum blower pressure (pipe diffusor) not reached.	See above (A.05)	See above (A.05)
A.08	Maximum blower pressure (pipe diffusor) exceeded.	See above (A.06)	See above (A.06)
A.16	Incorrect flow rate detected (W1). Testing of valves V6 and V7 necessary.	• Defect at V6 and/or V7 (end position control) • Defect at W1	• Replace defective valve • Replace defective water meter
A.17	No flow (W1) measurable during filtration.	• Defect at V6 and/or V7 (end position control) • Permeate line shut off • Pumps do not deliver water • Defect W1	• Check end position wiring • Check shut-off valves • Carry out pump test • Test permeate meter
A.18	End position not reached. Check valve V7.	• End position closed although process control active (or vice versa)	• Check end position wiring • Replace defective valve

No.	Alarm Message	Cause	Remedy
A.19	End position not reached. Check valve V6.	See above (A.18)	See above (A.18)
A.20	Chemical cleaning was cancelled. Check valve V5.	• End position error during chemical cleaning	• Check the wiring of the end position control. • Check the valve wiring (replace the valve if necessary)
A.21	Chemical cleaning was cancelled. Check valve V3.	See above (A.20)	See above (A.20)
A.22	No flow detected at tap water supply valve. Check valve V9.	• Defect at V9 • Defect at W3 • Tap water supply line shut off	• Replace defective valve • Replace defective water meter
A.23	Incorrect flow detected at tap water supply valve Check valve V9.	See above (A.23)	• Replace defective valve • Replace defective water meter
A.24	No flow detected at the pre-filter valve. Check valve V8.	• Defect at V8 • Defect at W5 • Pre-filter line shut off	• Replace defective valve • Replace defective water meter
A.25	Incorrect flow detected at pre-filter valve. Check V8.	• Defect at V8 • Defect at W5	• Replace defective valve • Replace defective water meter

11.2 Info Messages

Table 22: Info messages, causes and remedies

No.	Info Message	Cause	Remedy
I.51 – I.57	Maintenance on at least one pump in {name} is necessary!	• The maximum pump running time of 20000 h has been reached.	• Appropriate pumps should be checked.
I.58	Please refill cleaning solution "chlorine"! Number of possible cleanings: (x)	• With the contents of the chlorine tank, only (x) more cleanings can be performed.	• Fill up the chemical tank and press the "Confirm refill" button on the touch display (menu “cleaning”)
I.59	Please refill cleaning solution "citric acid"! Number of possible cleanings: (x)	See above (I.58)	See above (I.58)
I.60	Cleaning is no longer possible. Please refill cleaning solution "chlorine"!	• No further cleaning can be performed with the contents of the chlorine tank.	• Fill up the chlorine tank and press the "Confirm refill" button on the touch display
I.61	Cleaning is no longer possible. Please refill cleaning solution "citric acid"!	See above (I.60)	See above (I.60)
I.62	The chemical cleaning was started manually.	• Button "manual start" was pressed at the touch display	• Chemical cleaning was started.
I.63	The chemical cleaning was cancelled manually.	• Button "manual abort" was pressed at the touch display	• Chemical cleaning was cancelled
I.64	The chemical cleaning was stopped. No flow (W1) measurable during filtration.	• The permeate flow meter could not measure any flow.	• Checking of valves V1 to V5 necessary. • Check W1 or replace
I.65	Check dosing station. Flow rate (W2) detected, although dosing is not active.	• The flow meter in the dosing station has measured a flow, although the chemical cleaning is not active.	• Checking of valves V1 to V5 necessary.

11.3 Errors without Alarm Messages

Table 23: Errors without Alarm Messages

Error	Cause	Remedy
Touch display does not respond	• Central Controller / Touch display crashed	• Check if there is a power failure • Disconnect the unit from the mains and reconnect after 1 min.
Touch display is black	• Sleep mode	• Touch the Display
Filtration / backwash process doesn't work	• Internal fault • Operating times set incorrectly	• Operating hours • Set Settings "control filtration/ backwash of all modules" to "off" and back to "auto" • Restart of the Central Control Unit
Pre-filter blocked	• Too much fouling on the wedge wire sieve • Backwash valve V8 of the pre-filter is defect • Backwash nozzle is clogged	• Clean the sieve by hand and enlarge the cleaning runtime and amount • Replace pre-filter valve V8 • Demount and cleaning backwash nozzle
Filling level is detected incorrectly	• Wrong settings at height overflow Position of the level sensor incorrect	• Make sure you have entered the correct overflow heights • Change position of level sensor and check level indication.

11.4 Troubleshooting low water quality

Table 24: Troubleshooting for low water quality

Error	Cause	Remedy
Water in bioreactor smells sulphurous	Insufficient oxygen supply in the bioreactor (< 4 mg/l)	• Check if aeration pipe is blocked or leaking • Increase oxygen input by increasing the blower run time of the tube diffusers from: **10 On/10 OFF to 1O ON/5 OFF (or) up to (10 ON/0 OFF)** • If continuous operation is insufficient => per 300 l GW accumulation / day, increase 30 l aeration input by larger fan and additional diffuser(s) **Note: Increasing the membrane aeration of >8 h/day reduces the membranes lifetime**
	Insufficient sludge removal in the bioreactor	• Check time setting and calculation of the sludge pump(s) (see Chapter 7.3 Menu “Times”)
	Inlet BOD (dirt inlet) in the bioreactor > than 200 mg/L	• Minimize pollution load • Washing machine wastewater may be max. 20% of the daily greywater inflow, if washing machine water is not absolutely required, do not feed into the bioreactor **Note: Kitchen wastewater and black water must not be discharged into the bioreactor.**
Water in the clear water tank smells sulphurous	See above	See above
	Biological treatment insufficient in bioreactor (clear water quality BOD > 10 mg/L)	• If necessary, extend the run-in phase or restart the run-in phase after a long standstill (vacation period). • Guarantee temperature > 15°C in the bioreactor • Increase the amount of packing in the bioreactor from 1x AL-FK 30 per 300L grey water to 2x AL-FK30 per 300 L grey water. • If necessary, drain water and clean storage tank

Error	Cause	Remedy
Turbidity of the clear water	Treatment of the bioreactor is not sufficient. This can lead to the BOD in the clear water tank being > 10 mg/l (biological degradation processes can take place).	See above
	Membrane fibres damaged	• Check tightness (s. Chapter 8.2) • Repair membrane fibres or replace membrane cartridge
	Particles in permeate e.g. due to damaged membrane fibres or due to deposits in the permeate hose (e.g. detached components such as lime after chemical cleaning).	• See above (membrane fibres damaged) • Clean permeate hose
	Screw connections leaking (membrane pump backwash tank)	• Retighten screw connections or change seals
	Membrane cartridge connected the wrong way round	• Install membrane correctly • Filtration into the channel for 24h (Start-up phase) is recommended
Discoloration of the clear water	Treatment of the bioreactor not sufficient. Clear water tank BOD > 10 mg/l	See above
	Dissolved substances can’t be retained by the membrane Examples: • Hair dye • Urea (yellowish) • Humid substances (brownish)	• Check if toilets or kitchens are connected • Check if users urinate while showering • Adding an activated carbon filtration system • Insertion of an extended oxidation stage

11.5 Troubleshooting low Flow Rate

The flow rate of greywater-treatment systems relates strongly to the biological cleaning. The lower the BOD of the filtered water, the lower the so-called fouling of the membrane and the higher the volume flow. This has an influence on the possible daily flowrate as well as on the run time of the pumps, which have to be replaced after 30,000h.
Through the chemical cleaning intervals, the average flowrate can be increased.

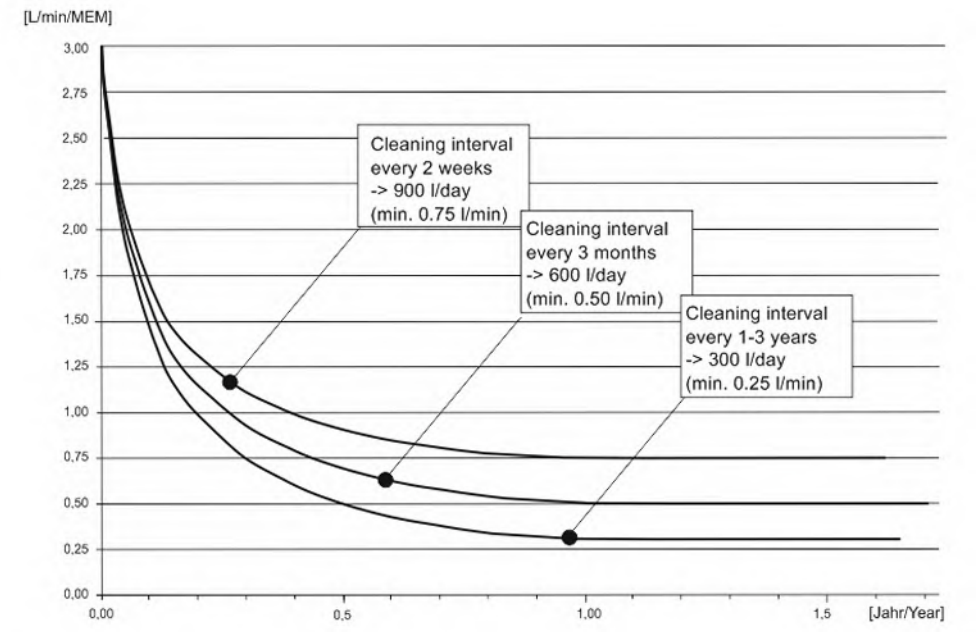


Figure 88: Membrane cartridge stabilization flow with proposed cleaning schedules

Table 25: Troubleshooting for low flow rate

Error	Cause	Remedy
Flow rate too low < 0,3l(0,08gal)/min/Membrane	Blocking of the membrane due to excessive sludge content in the water	• See above • Reduction of dirt input, if necessary do not connect washing machine • Carry out mechanical cleaning of the membrane (s. Manual AL-MEM)
	Blocking of the membrane due to fouling	• See above (low water quality) • Check inlet sources, disconnect washing machines if necessary.
	Only slight increase in volume flow after chemical in-situ cleaning (CIP)	• Perform CIP cleaning again • Chemicals overaged? • Perform mechanical cleaning followed by intensive cleaning (see section 10.2.1).
	Volume flow too low despite intensive cleaning	• Check if grease/fat/oil is blocking the membrane fibres • If that is the case: Perform ethanol cleaning

Annex: Maintenance list

Quarterly periodic maintenance checklist for every operating year

Operation start Date: __/__/____ Operating year: 20__ - 20__

Duration	Components	Acknowledgement	Observation /Date	Approved by
3 Months	Pre-filter PURAIN	Checked ☐ OK ☐ Not OK		
	Membranes*	Checked ☐ OK ☐ Not OK _____ l/min		
	AL-BLR20-R40 Blower	Checked ☐ OK ☐ Not OK		
	AL-BLK05-R4K06 Blower	Checked ☐ OK ☐ Not OK		
	Clear water tank	Checked ☐ OK ☐ Not OK		
6 Months	Pre-filter PURAIN	Cleaned ☐ Yes ☐ No		
	AL-Membranes*	Checked ☐ OK ☐ Not OK _____ l/min		
	AL-Filtration/ backwash pump	Checked ☐ OK ☐ Not OK		
	AL-BLR20-R40 Blower	Checked ☐ OK ☐ Not OK Air filter cleaned ☐ Yes ☐ No		
	AL-BLK05-R4K06 Blower	Checked ☐ OK ☐ Not OK Air filter cleaned ☐ Yes ☐ No		
	AL-PD142 Diffusor	Checked ☐ OK ☐ Not OK		
	Level sensor BR	Checked ☐ OK ☐ Not OK		
	Level sensor CL	Checked ☐ OK ☐ Not OK		
	Sludge pump	Checked ☐ OK ☐ Not OK		
	Pressure Mem-Aeration	Checked ☐ OK ☐ Not OK _____bar		
	Pressure Diffusor Aeration	Checked ☐ OK ☐ Not OK _____bar		
	Bio reactor	Checked ☐ OK ☐ Not OK		
	Clear water tank	Checked ☐ OK ☐ Not OK		
9 Months	Pre-filter PURAIN	Checked ☐ OK ☐ Not OK		
	AL-Membranes*	Checked ☐ OK ☐ Not OK _____ l/min		
	AL-BLR20-R40 Blower	Checked ☐ OK ☐ Not OK		
	AL-BLK05-R4K06 Blower	Checked ☐ OK ☐ Not OK		
	Clear water tank	Checked ☐ OK ☐ Not OK		
12 Months	Pre-filter PURAIN	Cleaned ☐ Yes ☐ No		
	AL-Membranes*	Checked ☐ OK ☐ Not OK _____ l/min		
	AL-Filtration/ backwash pump	Checked ☐ OK ☐ Not OK		
	AL-BLR20-R40 Blower	Checked ☐ OK ☐ Not OK Air filter cleaned ☐ Yes ☐ No		
	AL-BLK05-R4K06 Blower	Checked ☐ OK ☐ Not OK Air filter cleaned ☐ Yes ☐ No		
	AL-PD142 Diffusor	Checked ☐ OK ☐ Not OK		

	Level sensor BR	Checked ☐ OK ☐ Not OK		
	Level sensor CL	Checked ☐ OK ☐ Not OK		
	Sludge pump	Checked ☐ OK ☐ Not OK		
	Pressure Mem-Aeration	Checked ☐ OK ☐ Not OK _____bar		
	Pressure Diffusor Aeration	Checked ☐ OK ☐ Not OK _____bar		
	Bio reactor	Checked ☐ OK ☐ Not OK		
	Clear water tank	Checked ☐ OK ☐ Not OK		
	Water meter – Permeate (W1)	Checked ☐ OK ☐ Not OK		
	Water meter – Dosing station (W2)	Checked ☐ OK ☐ Not OK		
	Water meter – Pre-filter backwash(W5)	Checked ☐ OK ☐ Not OK		
	Dosatron	Dosatron cleaned ☐ Yes ☐ No		

** Automatic chemical cleaning interval could be adjusted in response to the decrease in volume flow.*

Note: A brief description outlining the checking procedure, refer to the *Table 20: Overview of maintenance and replacement intervals*, Chap.10.1.

Further information on maintenance can be found in the corresponding component manuals, which are labelled with 🕮. These can be found in the download page under (*https://www.intewa.com/en/weiteres/downloads/downloads/instructions-and-data-sheets/*)

Further periodic cleaning checklist

Operation start Date: __/__/____ Operating year: 20__ - 20__

Duration	Components	Acknowledgement	Observation /Date	Approved by
3 Year	Bio reactor	Clean Tank ☐ Yes ☐ No		
	AL-PD142 Diffusor	Clean Diffusor ☐ Yes ☐ No		

Periodic replacement/refill checklist

Operation start Date: __/__/____ Operating year: 20__ - 20__

Duration	Component/Part	Acknowledgement	Observation /Date	Approved by
3 month	Citric Acid	Refilled ☐ Yes ☐ No		
3 month	Chlorine	Refilled ☐ Yes ☐ No		
1 Year	Dosatron seal	Replaced ☐ Yes ☐ No		
20.000hrs. ~3 Years	AL-Filtration/ backwash pump	Replaced ☐ Yes ☐ No		
4 Years	Air filter - AL-BLR30-R40 Blower	Replaced ☐ Yes ☐ No		
4 Years	Air filter - AL-BLK05-K06 Blower	Replaced ☐ Yes ☐ No		
10 Years	AQUALOOP Membrane	Replaced ☐ Yes ☐ No		