ECA Generator

MI-F1-10
USER MANUAL

revision	date	description
2	●	Analog doosing system
2	●	Internet connection
01	17/07/2025	first release

Kirkmayer Industries OÜ - Kopli tn 72 Tallinn - 10412 Harju maakond - Estonia
T +372 5563 8827 | email: office@kirkmayer.com | www.kirkmayer.com

1 SUMMARY

2 SAFETY INFORMATIONS

Caution

The installation site must be under cover!
Ensure that the enclosure is not affected by the atmospheric conditions.
Unit with electronics are only suitable for indoor use! Do not install outdoors!

Qualification and training of personnel

The personnel responsible for the operation, maintenance, inspection and installation must be appropriately qualified for these tasks. Areas of responsibility, levels of authority and the supervision of the personnel must be precisely defined by the operator. If the personnel do not have the necessary knowledge, the necessary training and instruction must be given. If necessary, training can be performed by the manufacturer/supplier at the request of the operator of the unit. It is the responsibility of the operator to make sure that the contents of the unit's manual are understood by the personnel.

Safety-conscious working

The safety instructions in this manual, applicable national health and safety regulations and any operator internal working, operating and safety regulations must be observed. Safety instructions for the operator/user. Hazardous hot or cold parts of the unit must be protected to prevent accidental contact. Leakages of anolyte or catholyte must be disposed of in a way that is not harmful to the personnel or the environment. Legal regulations must be observed. Damage caused by electrical energy must be prevented (for more details, see for example the regulations of the VDE and the local electricity supply company).

Unauthorized modification and manufacture of spare parts

Modification or changes to the unit are only permitted following an agreement with the manufacturer. Original spare parts and accessories authorized by the manufacturer are safe to use. Using other parts can result in liability for any resulting consequences.

3 CONTACTS AND TECHNICAL SERVICES

- **email: production@kirkmayer.com**

4 SYSTEM DESCRIPTION

Thank you for purchasing Kirkmayer's generator. This unit is based on the ECA technology developed by Kirkmayer Industries Ltd., for on-site generation of 9 LPH Sicursan solution with 700 ppm FAC (Free available chlorine), out of NaCl brine, to be used for a maximum of 16 hours per day. Before using this unit, read carefully this user manual in order to obtain the best results and ensuring safety & health measures. Not following the prescriptions contained in this manual will be considered improper use.

General Description

The system produces a liquid disinfectant, non-toxic and degradable, capable of destroying bacteria, spores, viruses, molds, yeasts, fungi, biofilms (biological incrustations) on pipes and removing odours. Its operation requires only water, Sodium or Potassium Chloride (salt) and electricity.

Based on an electrolysis process, consisting in passing through a high purity saline solution with pre-defined and controlled amperage and voltage values, the system produces an aqueous solution that can be directly used as disinfectants in diluted form, injected into the liquid to be treated or nebulized with extreme adaptability to the different operating conditions and complete absence of toxicity for humans and the environment.

The main benefits include low costs, the versatility of use, easy to install (no need to modify any existing system), proven effectiveness and the absence of problems that we can find in the traditional treatments such as chlorination and UV radiation.

Our patented systems have been successfully applied for disinfection of sewage, industrial water (food industries), swimming pools, farms, agriculture and the removal of pollutants from industrial, urban wastewater and other numerous applications.

As presented in several scientific publications, multicellular organisms, including humans and hot blood mammals, to defend themselves against pathogens and foreign microorganisms are able to synthesize, through metabolism, complex mixtures of metastable oxidizing compounds.

These compounds possess a wide spectrum of action and are capable of damaging all major systemic groups of pathogenic microorganisms (bacteria, mycobacteria, viruses, moulds, spores, etc.) without damaging multicellular organisms and human tissues.

The oxidizing liquids and their chemical production mechanisms are similar to those generated in our ECA system and are precisely these common characteristics that gives to Sicursan a high biocompatibility with human tissues and multicellular organisms besides not being toxic to the environment.

4.1 General requirements

Power source

- Power supply for AC voltage
- Rated voltage range: 230 VAC / 3A.
- Deviation from the rated value: ± 10 %.
- Mains frequency: 50/60 Hz.
- Maximum input power: 150 W including all sensors;

Ambient and operating conditions

- Permissible ambient temperature: 0 °C to +50 °C.
- Permissible storage temperature: 0 °C to +50 °C.
- Permissible air humidity: max. relative humidity: 92 % (non-condensing).

Mains water basic characteristics

- preferably tap water;
- preferably soft or softened water;
- filtered water;
- Iron: max 0,2 mg/l
- Manganese: max 0,05 mg/l

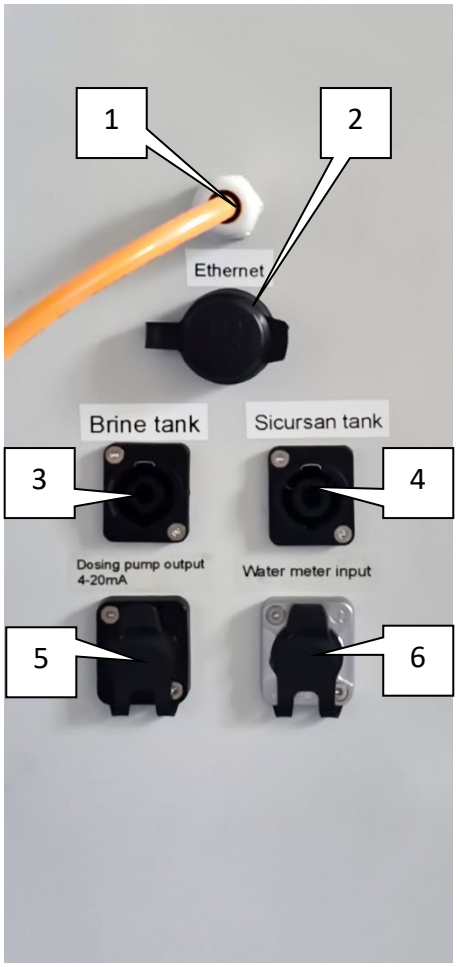
Operating condition

Input water: maximum system pressure is 1.6 - 2.0 bar.
The system water for unit needs to be filtered to ~50 microns prior to the input and pulses/water hammer effects should be minimized to prevent unit damage.
Optimal suction lift (start-up) for brine media is ~1.00 mt

4.2 Controls and connectors - electrical enclosure

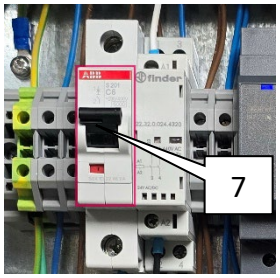
External panels

1. Mains power cord
2. Ethernet socket
3. Brine tank level switch
4. Sicursan tank level switch
5. Analog output 4-20mA for dosing pump
6. Water meter pulses input



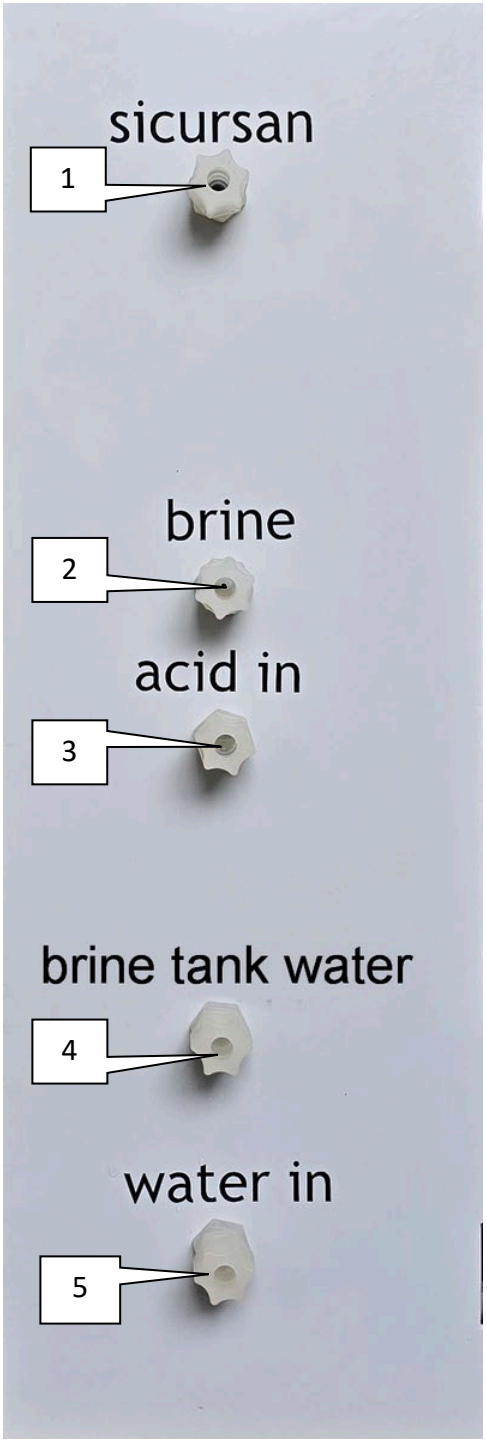
Electrical compartment front panel

1. PLC
2. Power switch
3. Main power LED
4. Alarm LED
5. Stand by LED
6. Generating LED
7. Circuit breaker inside electrical compartment



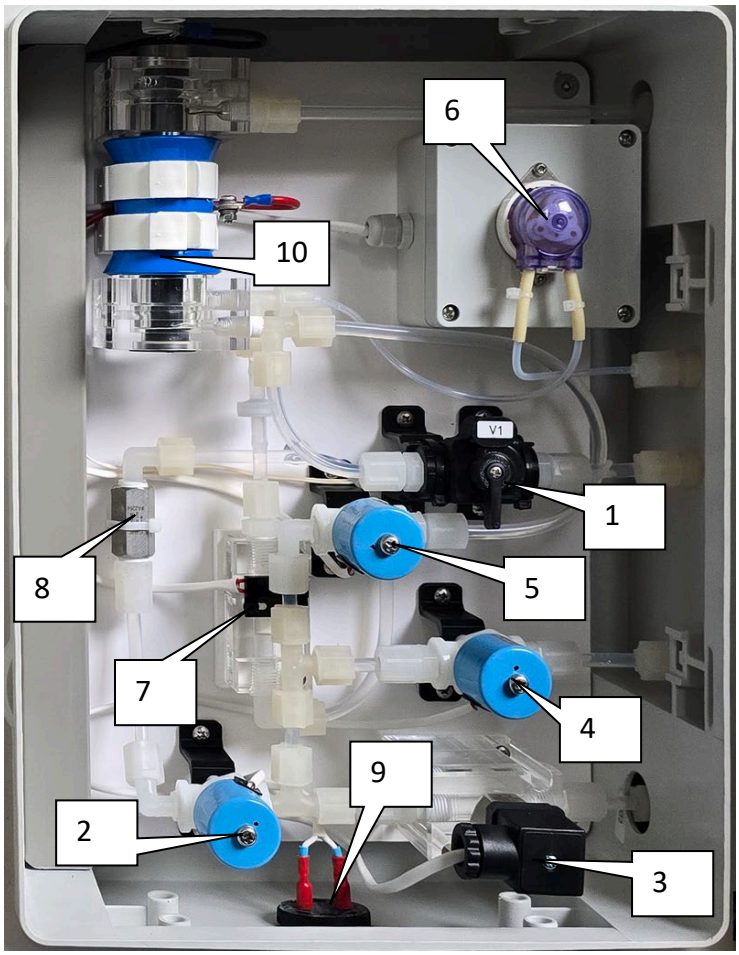
Controls and connectors - hydraulic enclosure

1. Sicursan output
2. Brine inlet
3. Acid in
4. Water output for brine tank
5. Water input



Hydraulic parts description

1. Manual Valve V1
2. Input water solenoid valve
3. Pressure sensor
4. Brine tank water solenoid valve
5. Cell flushing solenoid valve
6. Brine pump
7. Flow sensor
8. Flow restrict valve
9. Leakage sensor
10. Electrolysis cell



5 INSTALLATION

5.1 Installation location

- Space required for operation and maintenance;
- The control elements must be easily accessible during operation;
- Provide sufficient space for operation and maintenance;

5.2 Mounting surface

The unit must be mounted on a flat wall surface.

5.3 Preparation of saturated saline (NaCl) solution

Salt purity.

The electrolyzer uses aqueous solutions of NaCl to produce Sicursan. In order to prevent the cell from rapid plugging up, we advise to use NaCl with the highest purity. Using salts with a substantial amount of other cations (e.g. magnesium or calcium), that could be in the salt will result in extra cleansing of the cell elctrodes and will eventually result in a reduced lifetime.

The salt must be composed 99.8-99.9% of sodium chloride (NaCl) and cannot contain any additives such as iodine or anticaking agents. Using the wrong salt can cause damage to the electrolysis cells. Salt must conform to EN 973, grade A standard. In case salt not conform standard then brine must be prepared using Anolyte to oxidize side products in salt, this will avoid oxidation in electrolysis cell , set external sediment filter 20 micron before unit intake.

Preparation of saturated saline (NaCl) solution

The use of salt hopper is advise to prepared the brine. A salt hopper ensures that the saline solution is always of the same quality. The saline solution is always fully saturated and different dilutions of the saline solution are avoided. In a salt hopper the saline-solution for the unit is pumped from the bottom of the container, whereas a thick layer (>25cm) of NaCl is placed on a permeable mesh. This holds the salt above the bottom of the container, allows water to pass though the mesh. The water that passes the salt layer is fully saturated.

Depending on the capacity of the salt hopper, the operator only has periodically to fill the container with softened/filtered water and NaCl. Please ask your distributor for the drawing of one of the possible designs of the salt hopper.

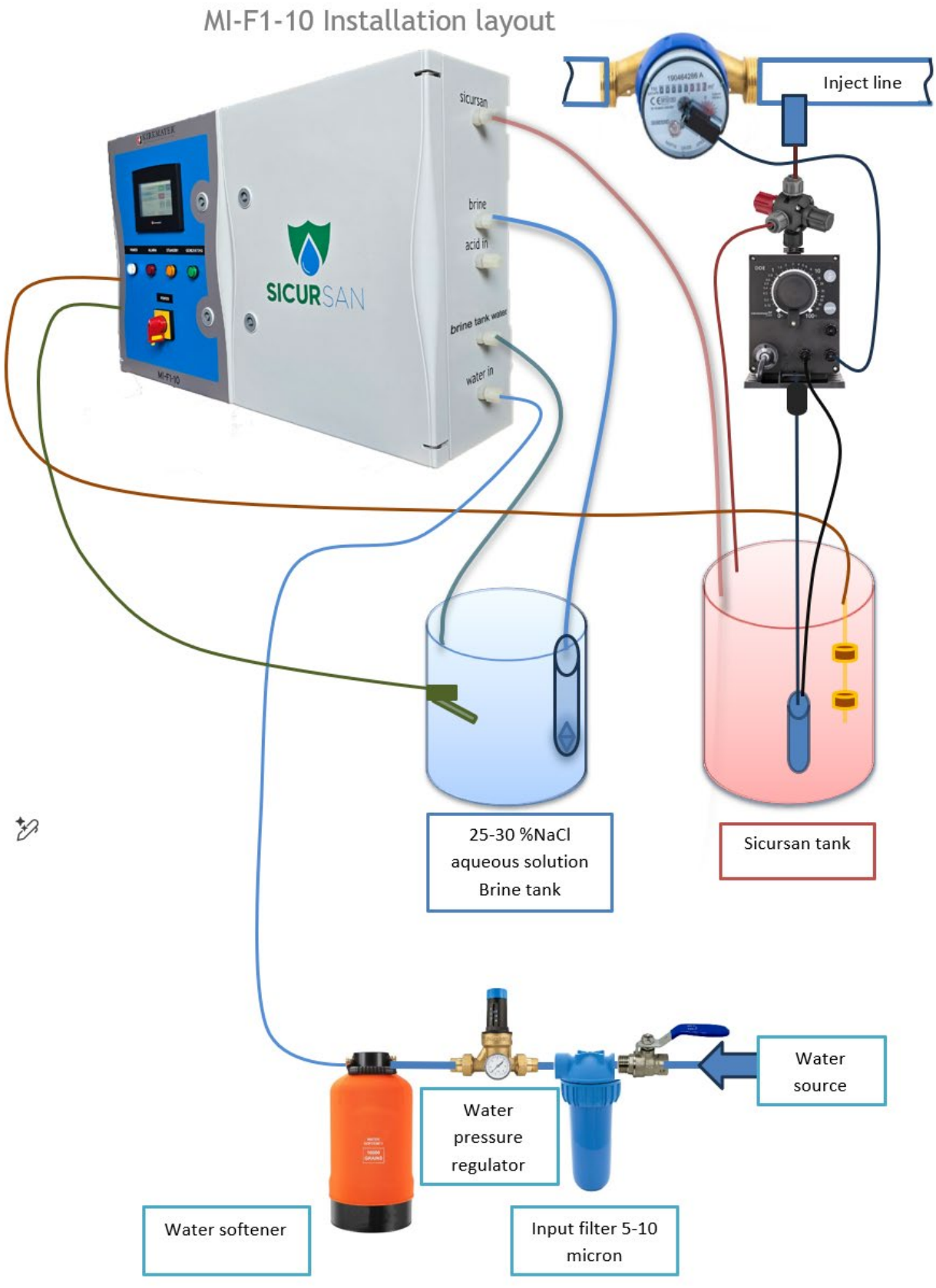
Manual preparation of 10 litres saline-solution.

- In case no salt hopper is available, the operator has to prepare and monitor the saline solution before and during the production of activated solutions;
- Using unsaturated saline solution can result in shutdowns of the unit;
- Fill up a container with 10 litre of softened/filtered water;
- Weigh 3-kg salt;
- Add the 3-kg salt to the 10-litre container;
- Mix the solution in the container until the salt is completely dissolved;

NOTE

Using pure salts, softened/filtered water and salt hopper guarantee best performances and maximum lifetime of the electrolyzer.

5.4 Typical installation layout



Advised installation requirements

- Install a manual valve prior to the unit in the mains water supply to close all water to the unit;
- Install a simple water filter to avoid deposits within the unit. (~10 Microns or so);
- Install a pressure controller to set the right mains water pressure ~1.5-2.0 bars;
- Use always a salt filter to prevent the NaCl-particles blocking the tubing inside the unit, supplied with the unit;
- Ensure that ventilation in room is sufficient;
- Make one person responsible for operating the unit or provide traceability of operators;
- Have at all-time safety & health instructions available for the operator;

5.5 Preliminary operations

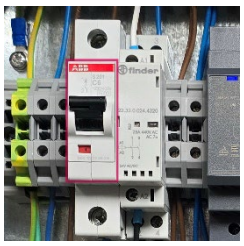
- Unpack the unit and ensure that all parts as per the packing list are present and undamaged;
- Locate the unit adjacent to a power and water supply in a safe and secure position, in a well-ventilated area;
- Check all valves inside the hydraulic cabinet and make sure they all in a position as indicated the table above or Operation mode;
- Check all power connections if they might have gone loose during transportation. Tighten them up;
- Ensure containers are available for holding the salt solution (salt hopper) and the Sicursan;
- These containers should ideally be sited next to the unit and made of industrial plastic;
- Ensure that pressure of the water supply is maximum ~1.5 - 2.0 bar and volume (LPH) is what needed for unit (9 LPH);
- Connect water-input tube to the marked input connector;
- Connect salt input tube to the input connector;
- Connect output tubes to the marked output connectors;
- Insert Sicursan output into the container.

- Check what all manual valve V1 are set in operating positions; See table and picture below:
- **NB! Wrong set of valves can provoke flooding .**

Valve	Position
V1	close

Prepare the salt solution which for standard applications should be a >25% NACL solution (see instructions above);

- Immerse the salt pickup (incl. salt filter) into bottom of the prepared brine solution tank;
- Ensure that ALL switches are switched off;
- Check once again if all plugs are connected to the right sockets;
- Check if tubes are properly fitted;
- Check Circuit breaker inside the electrical box in ON position. See the picture below:

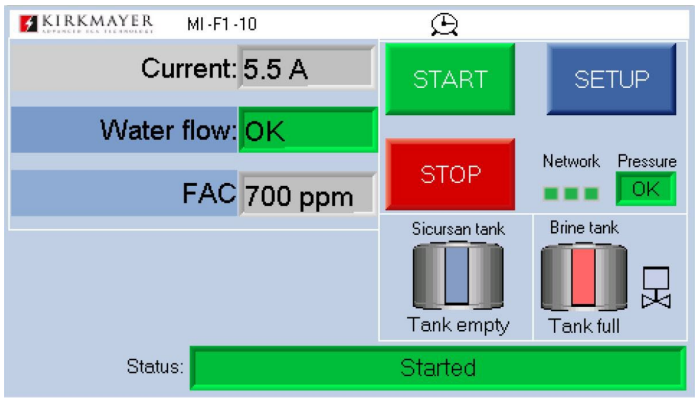


- Connect the power cable to a 230 volts AC/ 1 phase power socket;
- Switch on main power switch;
- With the power ON you will be power LED lights;
- Connct Level switch in Anolyte container
- NOTE. Sicursan output hose must be fixed at top of Anolyte collecting tank and not submersed, Sicursan will flow free falling, this prevent back pressure to unit cell, Sicursan tank must be below unit output level;
- **NB! Never install any valves on unit outputs hoses;**
- Maximum output hose length is 2.5 meter, avoid sharp angles;

6 OPERATION

6.1 PLC panel

PLC panel show work current during unit generating, tanks conditions, working mode.
From PLC panel operator can start or stop generation, go to setup, flushing section.



Diagnostics of the problems.

Unit have built in protection and diagnostic.

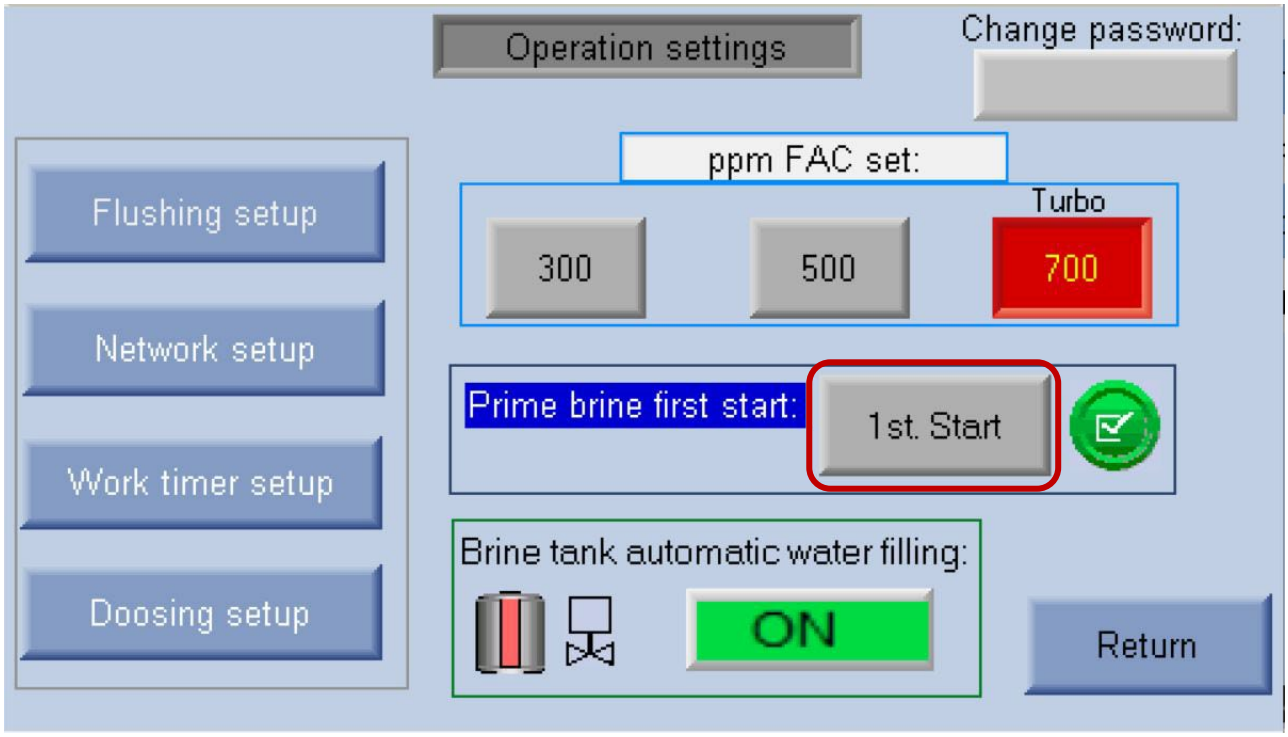
Possible alarm reasons:

- Inadequate main water flow and pressure: If water flow goes below minimum flow, unit will go in standby mode. If sicursan tank level reaches the high-level, the unit will go to standby mode and resume generation automatically, when the level reaches the minimum
- Brine pump problem: Brine quality/saturation, flushing Alarm lamp continue light, what mean cell need to be flushed or brine is weak or finished
- Cell power problem or electrical problem handled by mains circuit breaker: In case of mains circuit breaker tripped off, switch off power switch then switch on circuit breaker then switch on the power switch
- Leakage sensor detects leakage in hydraulic box cut water and alarm lamp light continuously. Find leakage reason and restore leaking connection, dry out leaking water and leaking sensor

6.2 First start of commissioning

For first start of commissioning unit.

1. Have input water connected to unit with pressure 1.5-2.0bar
2. Have brine input hose connected to unit and immersed to bottom of brine tank
3. Have Sicursan output connected and directed to storage tank
4. Have level switch plug connected to socket and fixed in Sicursan collecting tank
5. Check what the manual valve V1 is set in close position
7. Push on PLC screen "Setup" button, then push "Operation settings" button use default password [1]



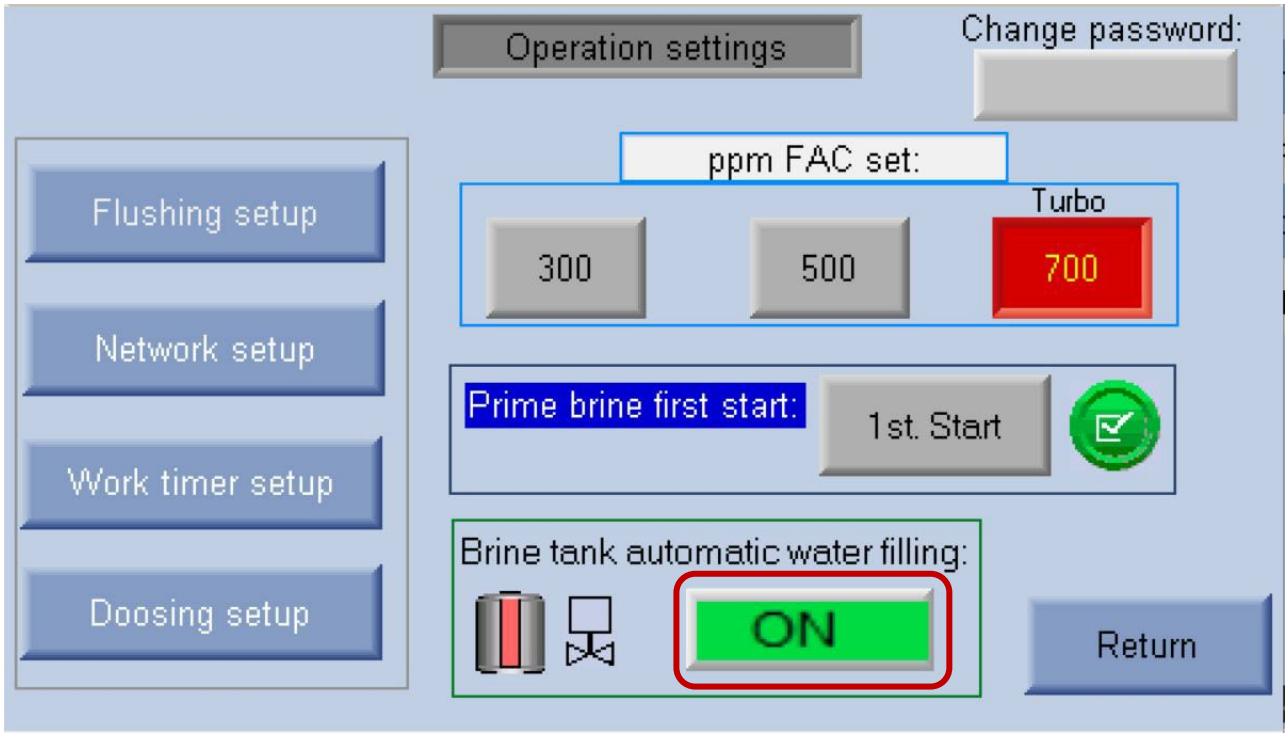
8. Check brine input hose fitting firmly tighten, push "1ST.Start" button and brine pump start priming brine, it stop automatically when brine reached cell (∇) green sign will appear. In case of brine is not sucked, check what brine input hose fitting firmly tighten. Consider also that at the first start brine contain air and take time to fill hose with brine. During the first start work current Amperage slowly increasing to reach it nominal around 5A, this procedure can take 3-5min.
In case need terminate brine priming push "1ST. Start" button.
9. Push "Return" button to return main screen on PLC, push "Start" button to start generation in automatic mode.

6.3 Brine tank automatic water filling

To use automatic brine tank filling with water push on PLC screen “Setup” button, then push “Operation settings” button use default password [1]

1. Check what Brine tank water hose connected to brine tank, check what input water pressure ~1.5 -2.0bar.
2. Connect brine tank level switch cable to unit.
3. Activate automatic brine tank filling by pushing button ON.
4. Water filling solenoid valve close automatically when PLC get signal from brine tank level switch.

NB! To prevent flooding water filling solenoid valve close after ~6min. if not get signal from brine tank level switch or in case level switch cable not connected.



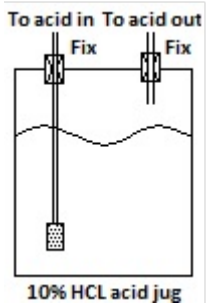
6.4 Cell flushing instructions

Assuming that you have installed a water softener, periodically the cell(s) in the unit needs to be flushed as the hardness of water will result in deposits on the electrodes. As the hardness of water varies all over the world, it is difficult to say how many times the unit should be flushed. Usually, if source water has 0° French degree of hardness flushing interval is once every 5 month. The necessity for flushing is controlled by PLC and will be indicated by alarm lamp when the necessity arises.

NOTE! Advised to make flush independent of PLC ones in 5 Month, to flush out deposit collected in the cell.

Chemicals / Materials/ Tools needed:

- Hydrochloric acid (~5-10%) in 2L canister or jug
- Mains water must be connected to unit
- In case you have 30% of HCl acid it must be diluted with water. To dilute 30% HCl acid, add 1L of 30% of HCl acid into 2L of water. **NB! In dilution process always add acid in water to prevent acid splash, use eyes protection glasses**
- **NOTE**. Acid input hose must be fixed in acid jug and submersed in acid, the terminal of the hose must be set in middle of tank's liquid height to avoid pickup deposit from bottom of jug and send to the acid pump.
- Acid out hose must be fixed in acid jug at top of jug.



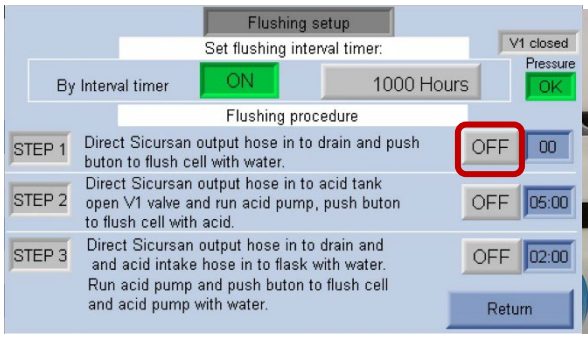
With 4-5L of 10% HCL acid can make 3 – 4 flush circles, then acid should be replaced

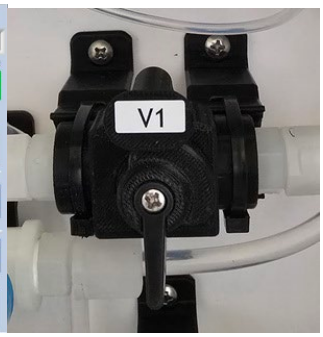
• To flush cell, use external acid pump with ¼' input/output hoses

6.4.1 Flushing cell with water Step 1

Step1 - pre-flush cell with water :

1. Stop unit
2. Direct Sicursan output hose to drain
3. push on PLC screen “Setup” button, then push “Operation settings” button use default password [1] , push “Flushing setup” button
4. Push Step1 ON button.
5. Water will flush cell chambers with water, remove Sicursan solution from the cell, this step will be done for 1-2 minutes until and stop automatically (∇) green sign will appear.

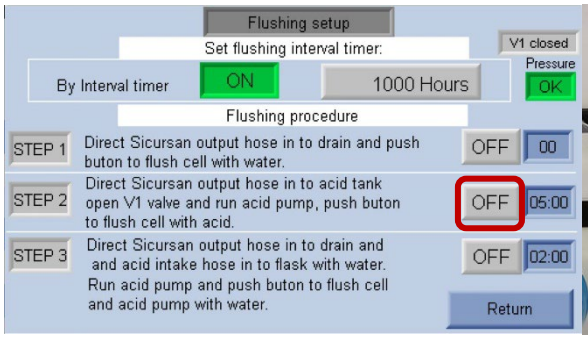


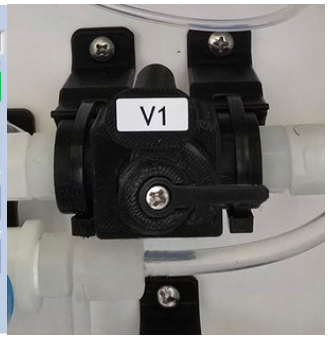


6.4.2 Flushing with 5-10% HCL acid Step 2

Step2 - flush cell with 5-10% HCL acid:

7. Connect **Acid in** hose to acid pump output and direct acid pump intake hose into container with 1-2L of 5-10% HCL acid
8. Connect Sicursan output hose and direct into same container with 1-2L of 5-10% HCL acid
9. Set valve V1 in open flush position .





10. Start acid pump, push Step2 ON button.
11. Check what acid is circulated, pumped in unit and coming back to acid tank
12. Flush cell chambers with acid, remove scale from cell electrodes and clean it, this step must be done for 5 minutes. In case need terminate flushing stop acid pump, push button to OFF.
13. This step will be done for 5 minutes until and after(∇) green sign will appear stop acid pump.

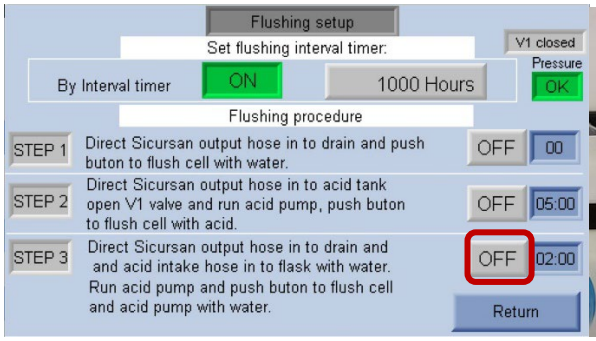
.

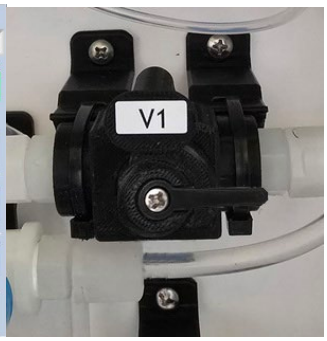
6.4.3 Flushing with water Step 3

Step3 - final flush cell and acid pump with water :

14. Direct Sicursan output hose to drain
15. Remove acid pump intake hose from the container with acid and direct into 3L jug with water
16. Set V1 valve open
17. Start acid pump
18. **Push Step3 ON button, water will flush cell chambers with water, remove acid from cell, this step must be for 2 -3 minutes until 5 L of water finish**

After 3L of water finish stop pump, close V1 valve





6.4.4 Restore valves operation position Step 4

Step4 - set valves back to operation position:

19. Close V1 valve according to picture below

20. Connect Sicursan hose and direct into Sicursan collecting tank
21. After valve V1 set in operation position start unit by set mode switch in to “Start” (1) position

Work current Amperes will slowly increase and reach its nominal value in 2 minutes

7 MAINTENANCE

7.1 Daily Maintenance

- Check if volume of NaCl in the brine container is adequate for the output required for that day;
- Check the generator to see if there are any obvious problems, i.e. leakages;
- Check the flow indicator for adequate flow through the generator;
- Check if the current meter indicates the working current according to the setting;

7.2 Weekly Maintenance

- Carry out daily maintenance schedule.
- Check Sicursan quality measuring , ORP and active chlorine of freshly generated Sicursan. Take sample from Sicursan container.

7.3 Monthly Maintenance (depending on hardness of the water)

- Carry out weekly maintenance.
- Carry out cell flushing procedures.
- Check all power connections if they might have gone loose. Tighten them up. Clean them from rust as well, if any.
- Check and clean input water filter

7.4 Maintenance on peristaltic pump

- Change hose every 1.000 hours
- Change head (hose included) every 2.000 hours

8 TROUBLESHOOTING

What may appear to be trouble is not always a real problem. Re-start the unit a couple of times. See if it helps. If not, you can read all the problems which might influence smooth performance of the unit such as low pressure/flow of the mains water, low quality of brine etc.

This appliance is manufactured to conform to the Low Voltage Electrical Equipment and Electrical Safety Regulations and is designed to comply with the requirements of the following EEC Directives:

- **European Machinery Directive (2006/42/EEC)**
- **E.M.C Emissions Testing (EN55022)**
- **E.M.C Generic Immunity Testing (EN 50082-1)**
- **CE Marking LVD Directive (2014/35/UE)**
- **Electro Magnetic Compatibility Directive (2014/30/UE)**

ECHA
EUROPEAN CHEMICALS AGENCY

- **ECHA (European Chemical Agency – the responsible authority for the BPR) INCLUDED KIRKMAYER INDUSTRIES OÜ, IN THE LIST OF ACTIVE SUBSTANCES AND SUPPLIERS (Article 95 list) UNDER ARTICLE 95(1) REGULATION (EU) No 528/2012.**
- **Decision number: ACC-D-1363343-55-00/F (PT 1, 2, 3, 4, 5)**
- **Decision number: ACC-D-1513330-61-00/F (PT 11)**

KIRKMAYER
ADVANCED ECA TECHNOLOGY

EC – DECLARATION OF CONFORMITY

We

Manufacture: Kirkmayer Industries OÜ

Address: Tööstuse tn 86, Tallinn - 10416 Harju maakond, Estonia

declare under sole responsibility for issuing this declaration of conformity in relation the following Product(s)

Type: ECA generator

Series: BMI – LAMI – AMI – MI-F1 – MI-F2 – MI-F3

For the above given Product(s) is hereby declared that it conforms to the essential requirements set out in community harmonization legislation mentioned below:

European Machinery Directive (2006/42/EEC)

E.M.C Emissions Testing (EN55022)

E.M.C Generic Immunity Testing (EN 50082-1)

CE Marking LVD Directive (2014/35/UE)

Electro Magnetic Compatibility Directive (2014/30/UE)

Signed for and on behalf of:

Name: Igor But

Position: Senior Project Engineer

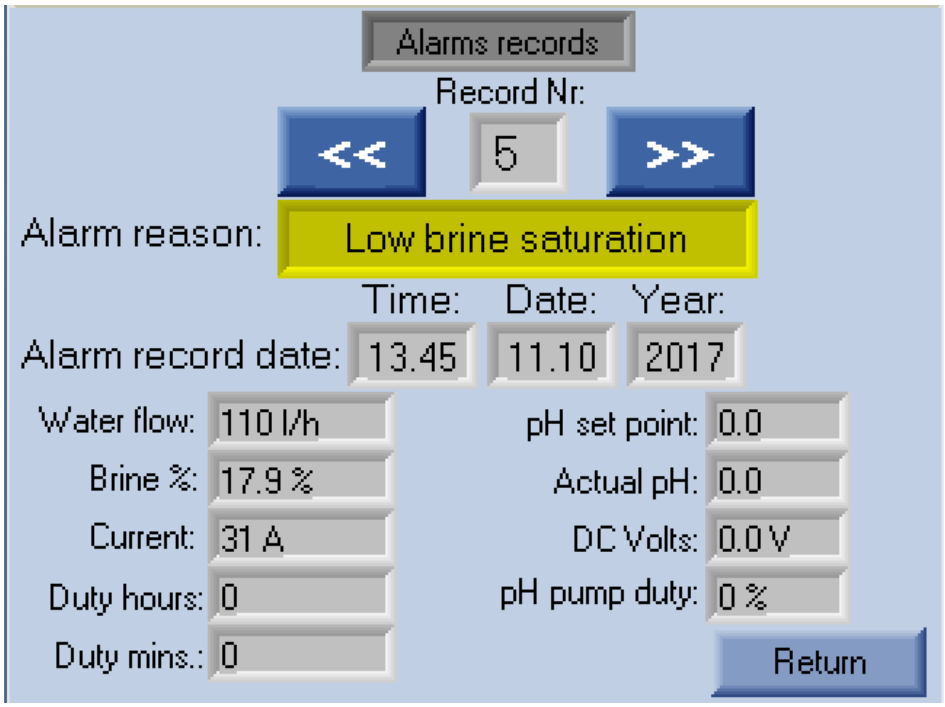
Kirkmayer Industries OÜ
Tööstuse tn. 86 Tallinn, Estonia
10416 Harju maakond
Reg.nr. 14130692
VAT nr: EE101917623

Tallinn, Estonia, 09/12/2024

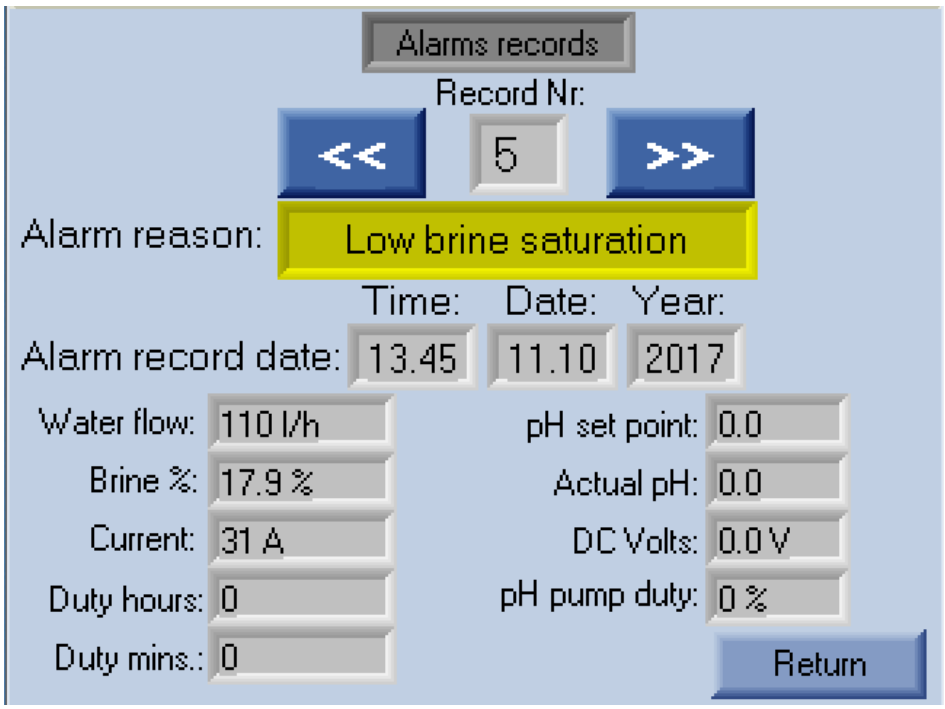
Tööstuse tn 86, Tallinn
10416 Harju maakond, Estonia
office@kirkmayer.com
www.kirkmayer.com
+372 5563 8827

9 OPTIONAL INFORMATIONS

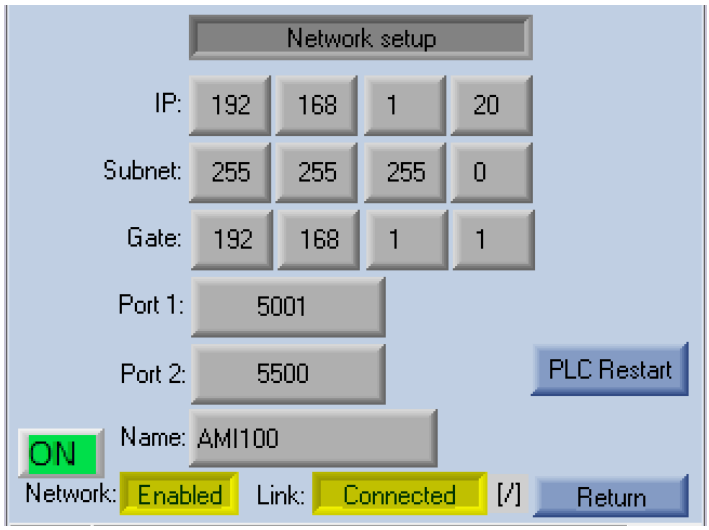
9.1 Statistics



9.2 Alarm records



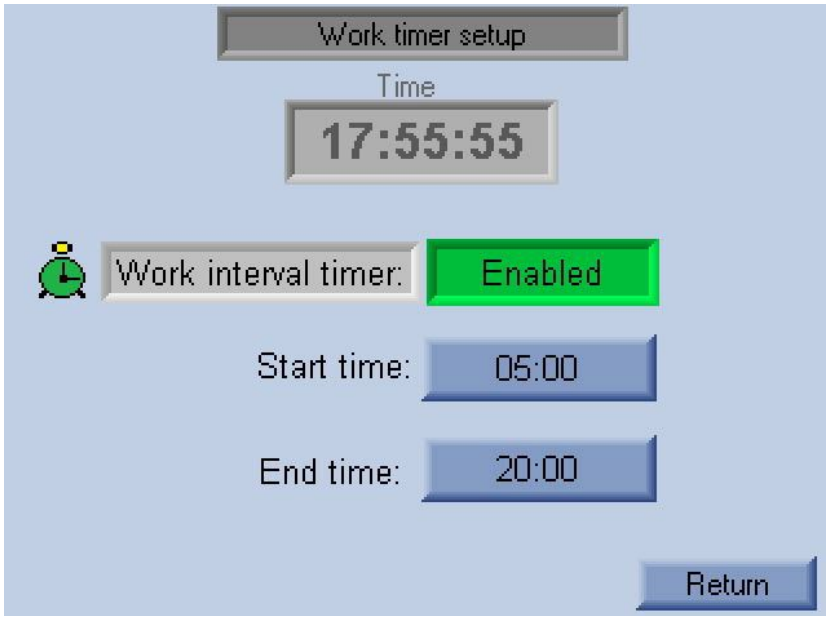
9.3 Network setup



To set up the network: Connect network cable into the network socket on the unit.
Ask a local network administrator or your Internet provider for the available IP address, subnet mask, default gateway, and available ports.
If the unit needs remote access outside of the local network, then the Internet router must set to port forwarding to the PLC IP address.
PLC support 2 ports it means what when 2 ports set then 2 PC or PC and smartphone can connect to PLC simultaneously.
If only one port is set, then only one PC or smartphone can connect to PLC at a time.
Press the name button and type desired PLC network name 8 characters max. PLC network name also means network PLC access password.
After setup, all network parameters press PLC re-start button to reload it with new settings.
To connect and remote the unit from the PC, two programs can be used.
1. Remote Access V9.8.10 View and control a PLC directly from PC, via local or remote connection: download link - https://unitronicsplc.com/Download/SoftwareUtilities/RemoteAccess_9_8_10.exe
2. Remote Operator V1.0.71 Simultaneously view and operate the HMI panels of multiple PLCs in multiple locations: download link - https://unitronicsplc.com/Download/SoftwareUtilities/Remote%20Operator%20Version%201.0.71.zip
3. For Android smartphone, look Unitronics' Remote Operator in Google play
Link - https://play.google.com/store/apps/details?id=com.unitronics.remoteoperator
For Apple IOS smartphone look app store Unitronics' Remote Operator
Link - https://itunes.apple.com/us/app/unitronics-remote-operator/id1063107386?mt=8

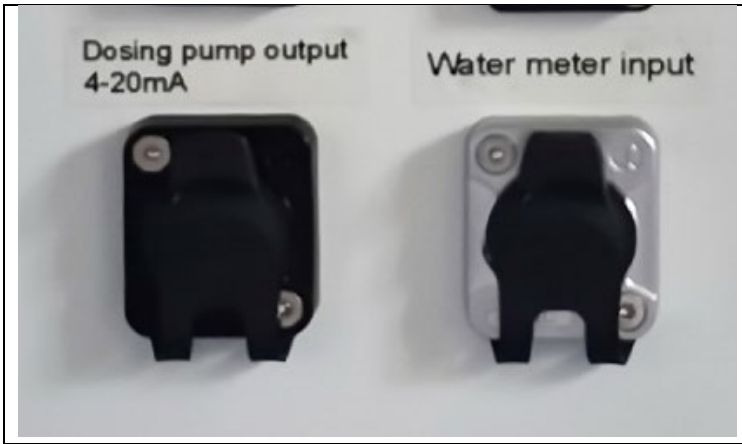
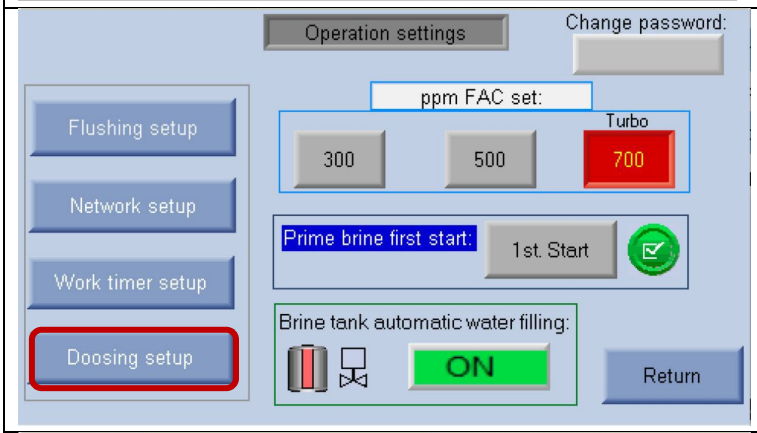
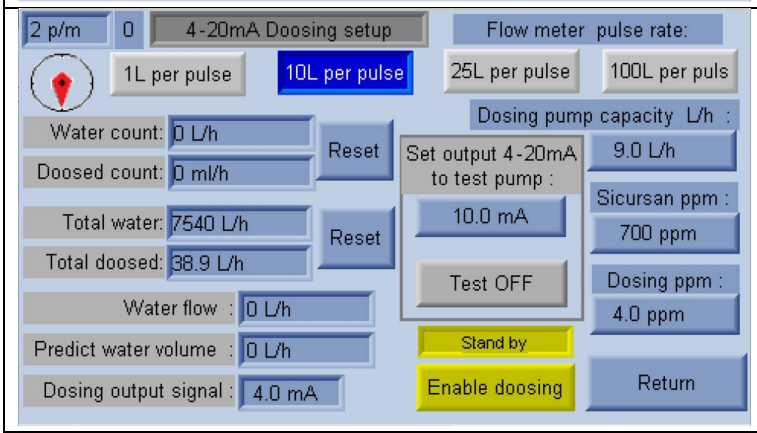
9.4 Work timer setup

The work timer allows setup time intervals during the day when unit can work.
In the picture below unit allow working from 5 AM till 8 PM. After 8 PM unit will go to stand by until the next day at 5 AM.



10 Dosing function

Dosing function designed to connect unit with doosing pump by 4-20mA signal. Also need connect water meter signal to unit.

	4-20mA dosing pump signal socket Water meter pulses signal socket
	To use PLC dosing function open operation section push dosing button.
	In dosing setup setup screen set Water meter liter per pulse rate Dosing pump capacity Sicursan ppm Desired dosing ppm Test 4-20mA connection with dosing pump, dosing can be enabled/disabled, check dosing rate and dosing status.