APRO 120 UN

INSTALLATION MANUAL

Emergency water purification

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Technical modification	Revision No 2

1. Description of APRO 120 UN

1.1. About the system

APRO 120 UN is a portable reverse osmosis station designed for emergency water purification in areas with limited water access and space, and electricity supply shortage.

The system purifies water from the following water sources:

- Fresh lakes
- Rivers
- Ponds
- Borehole water
- Well water
- Tap water (municipal water supply)

The system is not suitable for:

- Lakes with high salt content
- Seawater
- Freshwater with high oil content (contamination)

The suitable electricity sources:

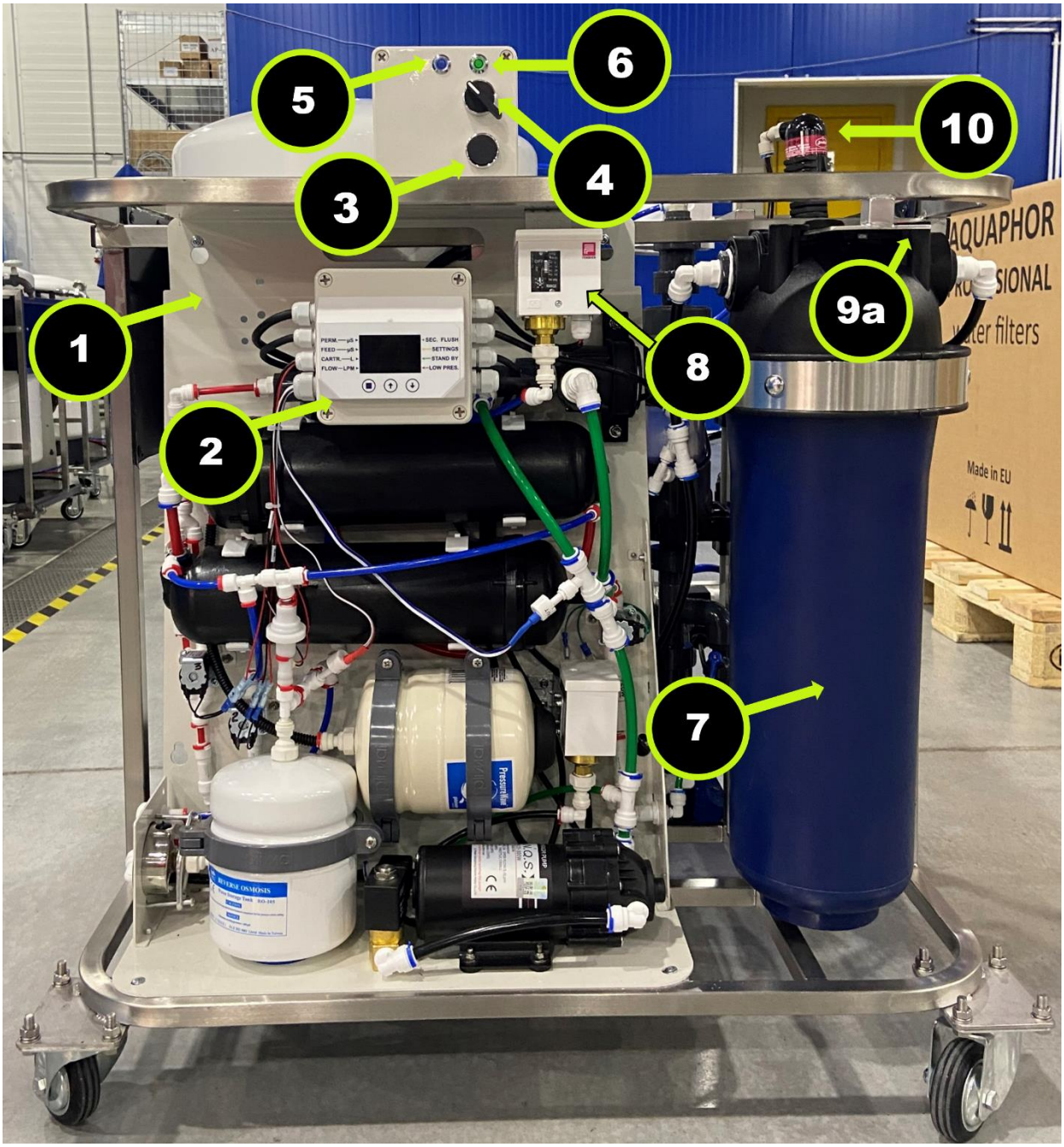
- Car battery (with an adapter)
- Small solar battery
- Electrical generator
- Electricity network

1.2. About the system

Inlet water (from the reservoir) is sucked by the pump through a strainer (Pic. 5)

a. Then, it is absorbed in the degassing and amortization tank with a chlorine solution (Pic.2-11).
b. It passes through the next mechanical filter (Pic.2-12), and then the feed water goes to the Viking prefiltration module (Pic. 1-7). Carbon cartridge absorbs chlorine and organic compounds from water.
c. Pre-filtered water goes into a reverse osmosis system for deep purification (Pic.1-1). Afterwards, the source water is divided into two streams, the product (pure water) and the concentrate (dirty water). The concentrate is discharged into the drain (Pic.3-16), the product is accumulated in the storage tank (Pic.3-21a).
d. Pure water proceeds with the stage of conditioning and mineralization by Aquaphor K7BM modules (Pic.3-19a).
e. Pure mineralized water is supplied through a tap (Pic.3-22).
f. When the pressure in the storage tank reaches the set value, the system enters standby mode. The pressure pump relay (Pic.1-8) will be switched off. At the same time, the valve for washing the coarse filter (Pic.3-25) will open for 12 seconds.

1.3. System's equipment

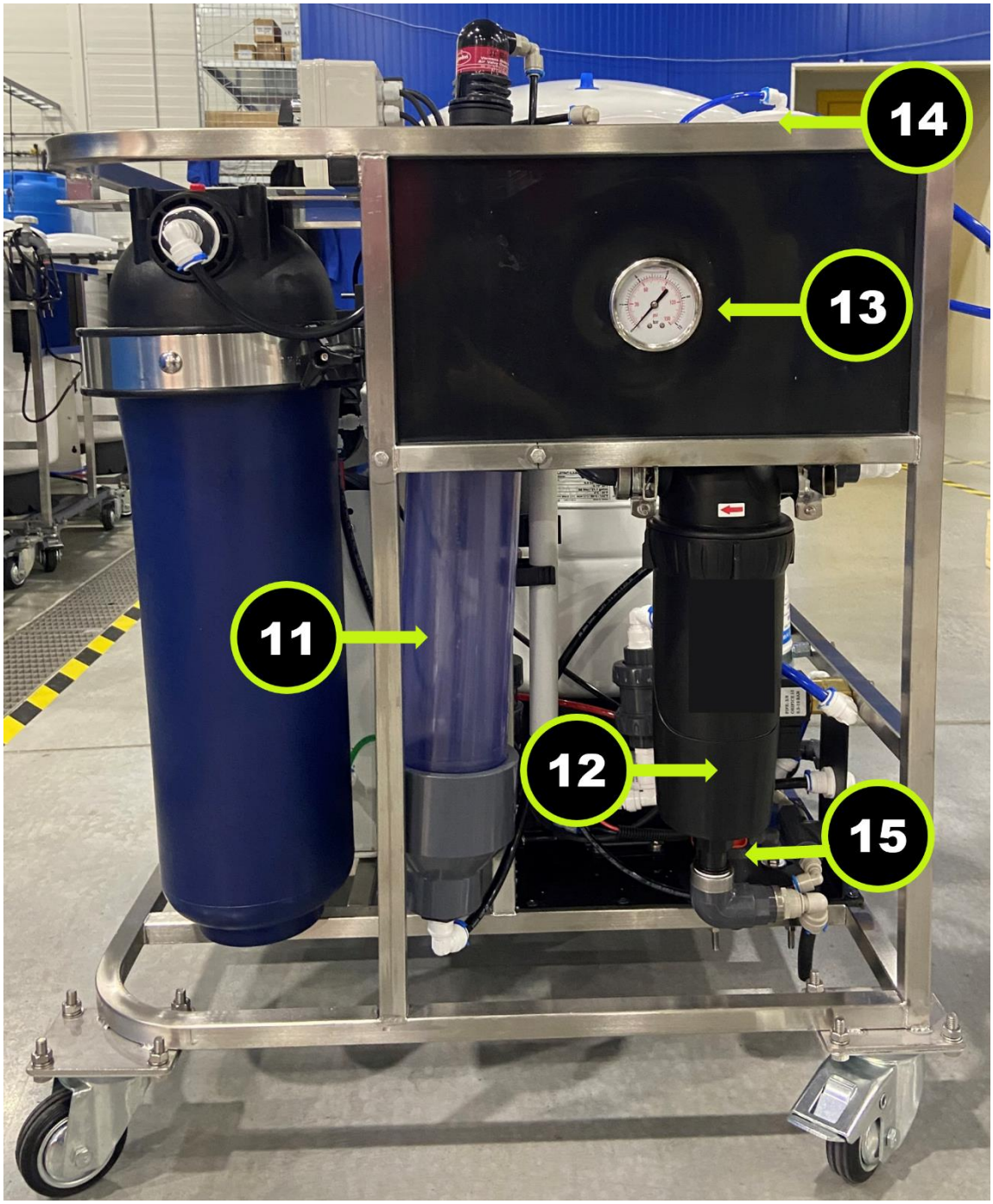


Picture 1

1. Reverse Osmosis system
2. Controller
3. Push button for chlorinator's air relief
4. ON/OFF switch
5. Run indicator
6. Power indicator
7. Prefiltration module "Viking" with carbon cartridge
8. Recirculation Pump High Pressure Switch

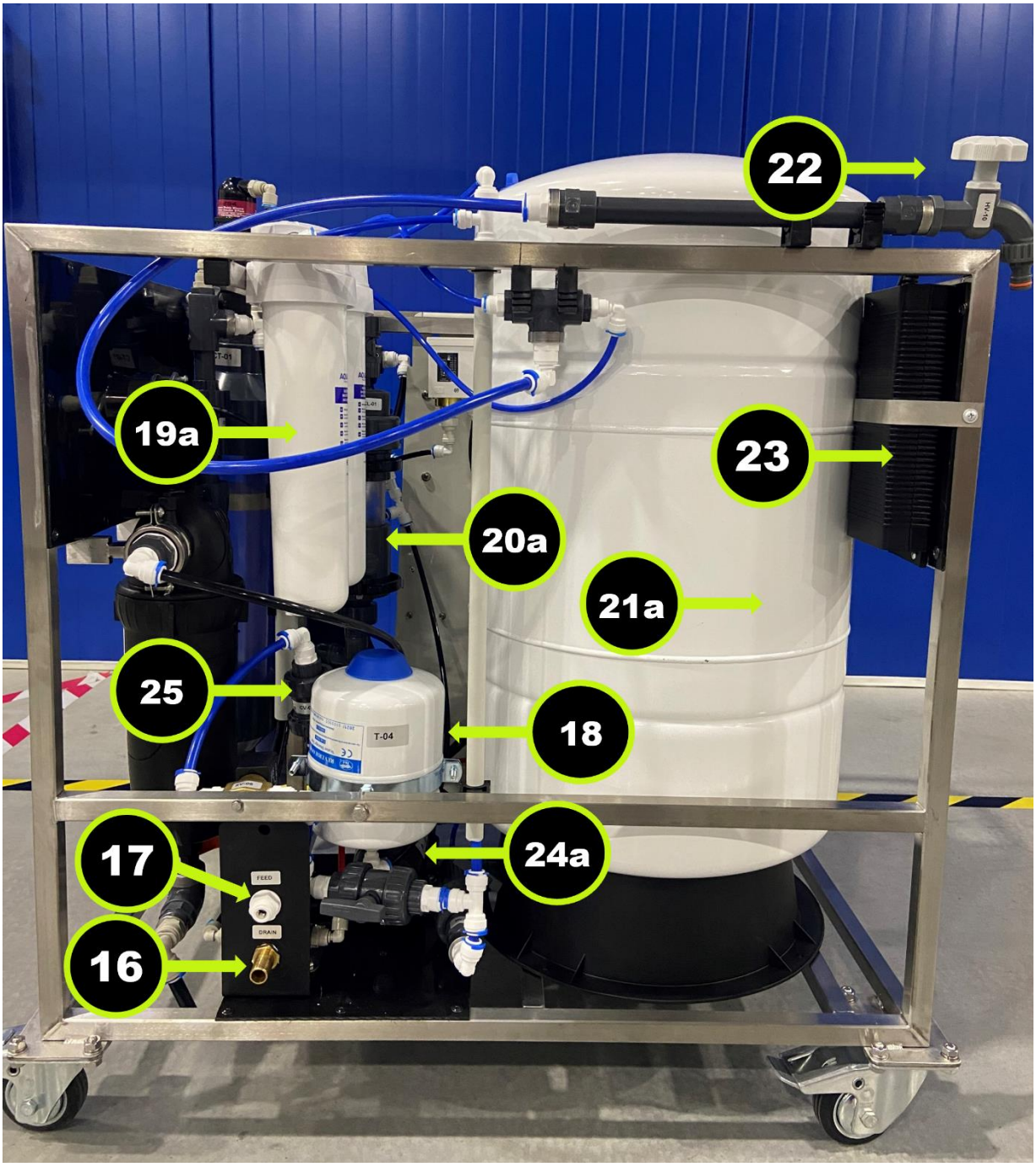
9a. Filter air exhaustion button

10. Air Relief Valve



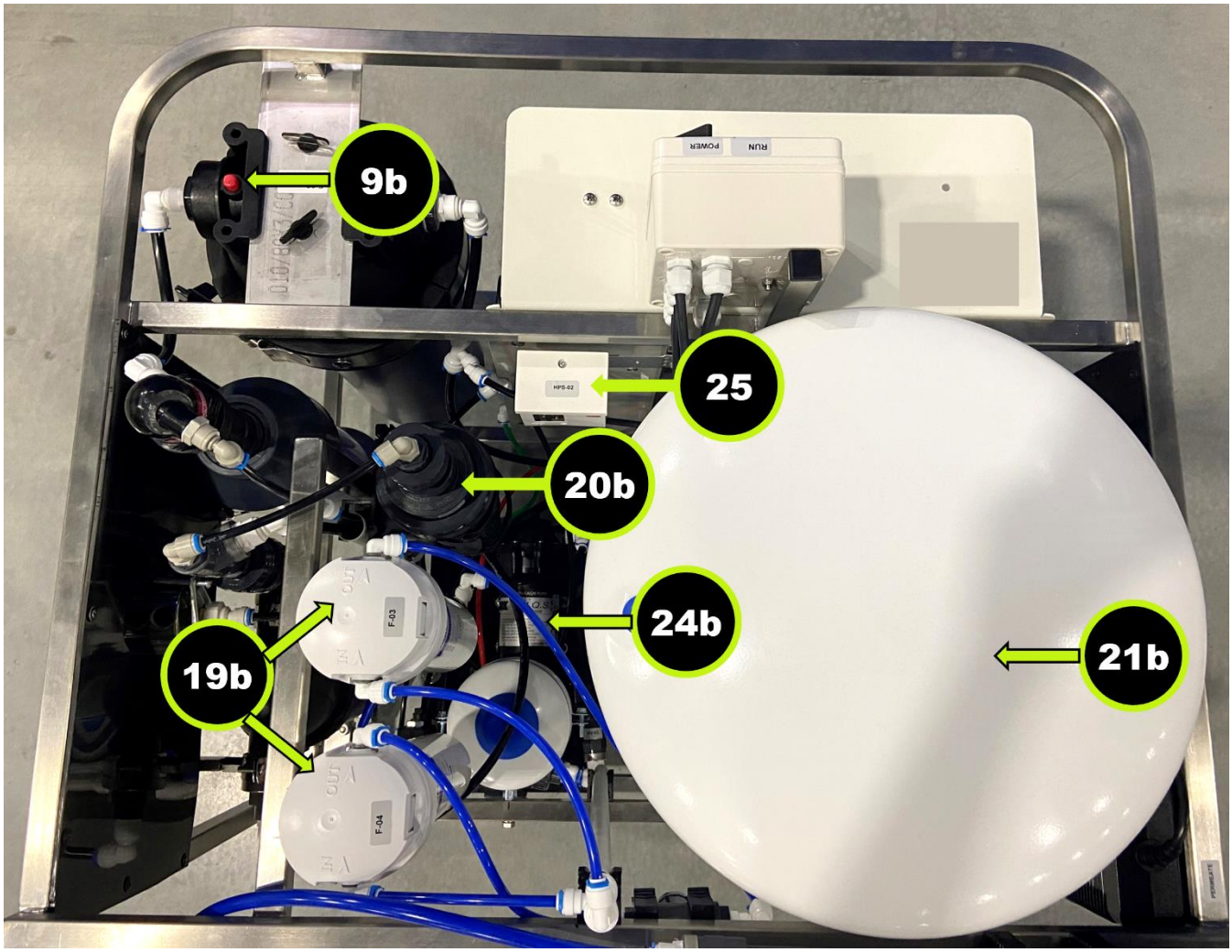
Picture 2

11. Tank for mixing inlet water with chlorine solution
12. Mechanical filter
13. Pump pressure indicator
14. Expansion tank
15. Mechanical filter cleaning tap (red, behind 12)



Picture 3

16. Drainage
17. Water inlet
18. Feed water tank
19a. Water mineralization and conditioning modules
20a. A container with a chlorine tablet for preparing a solution
21a. Storage tank
22. Clean water tap
23. Power supply
24a. Feed pump
25. Valve for washing the coarse filter



Picture 4

9b. Filter air exhaustion button

19b. Water mineralization and conditioning modules

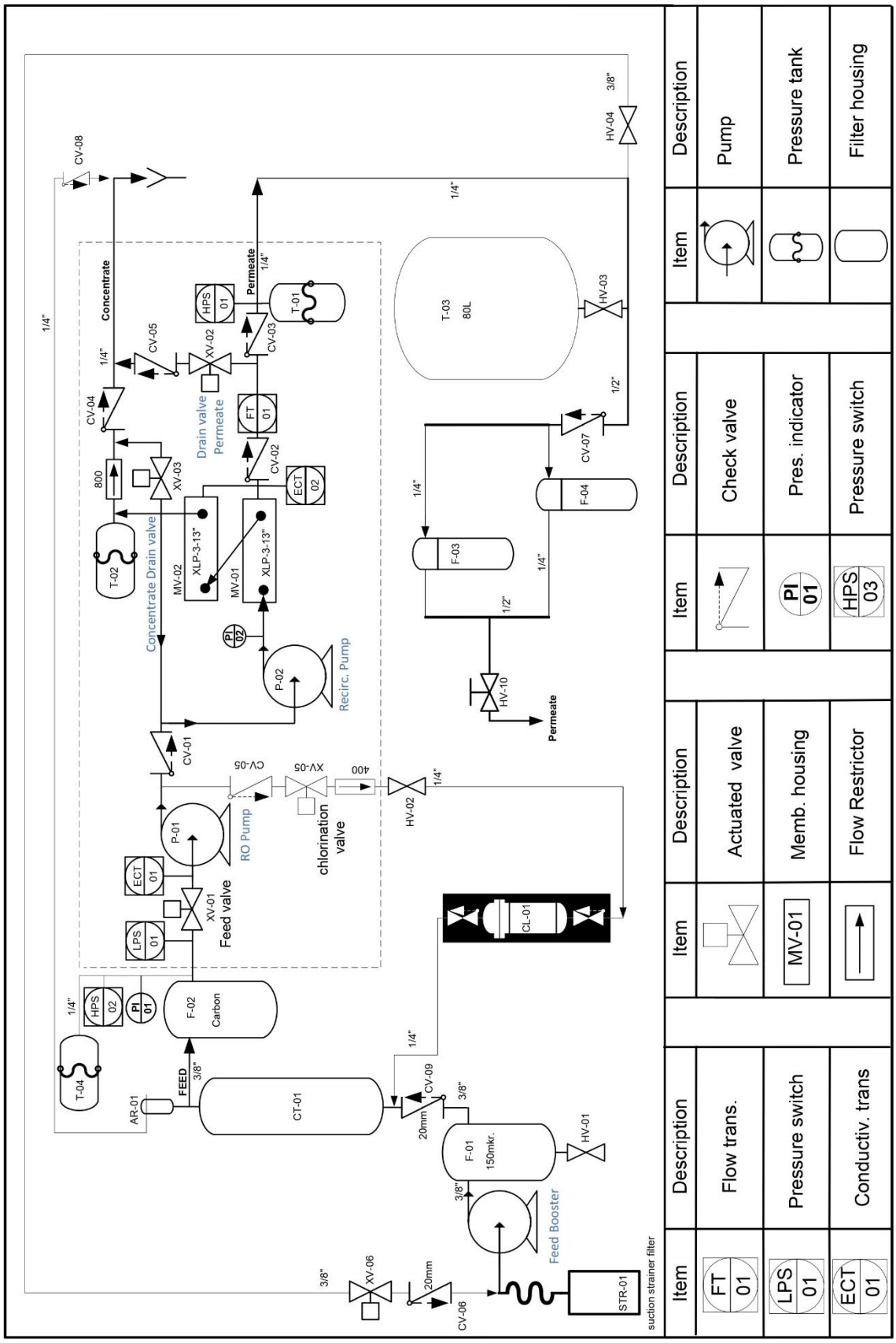
20b. A container with a chlorine tablet for preparing a solution

21b. Storage tank

24b. Feed pump

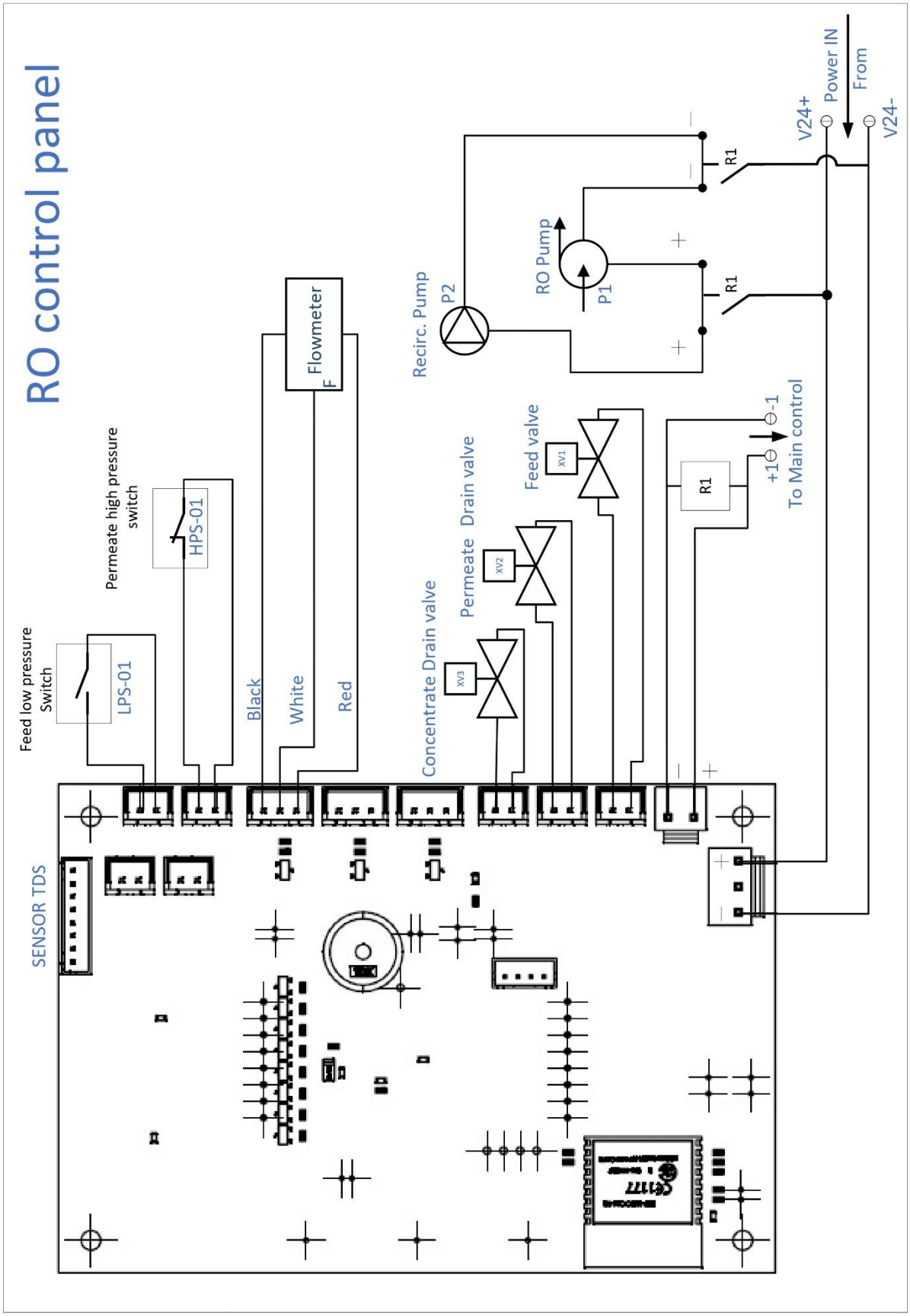
25. Supply Pump High Pressure Switch

2. Schemes

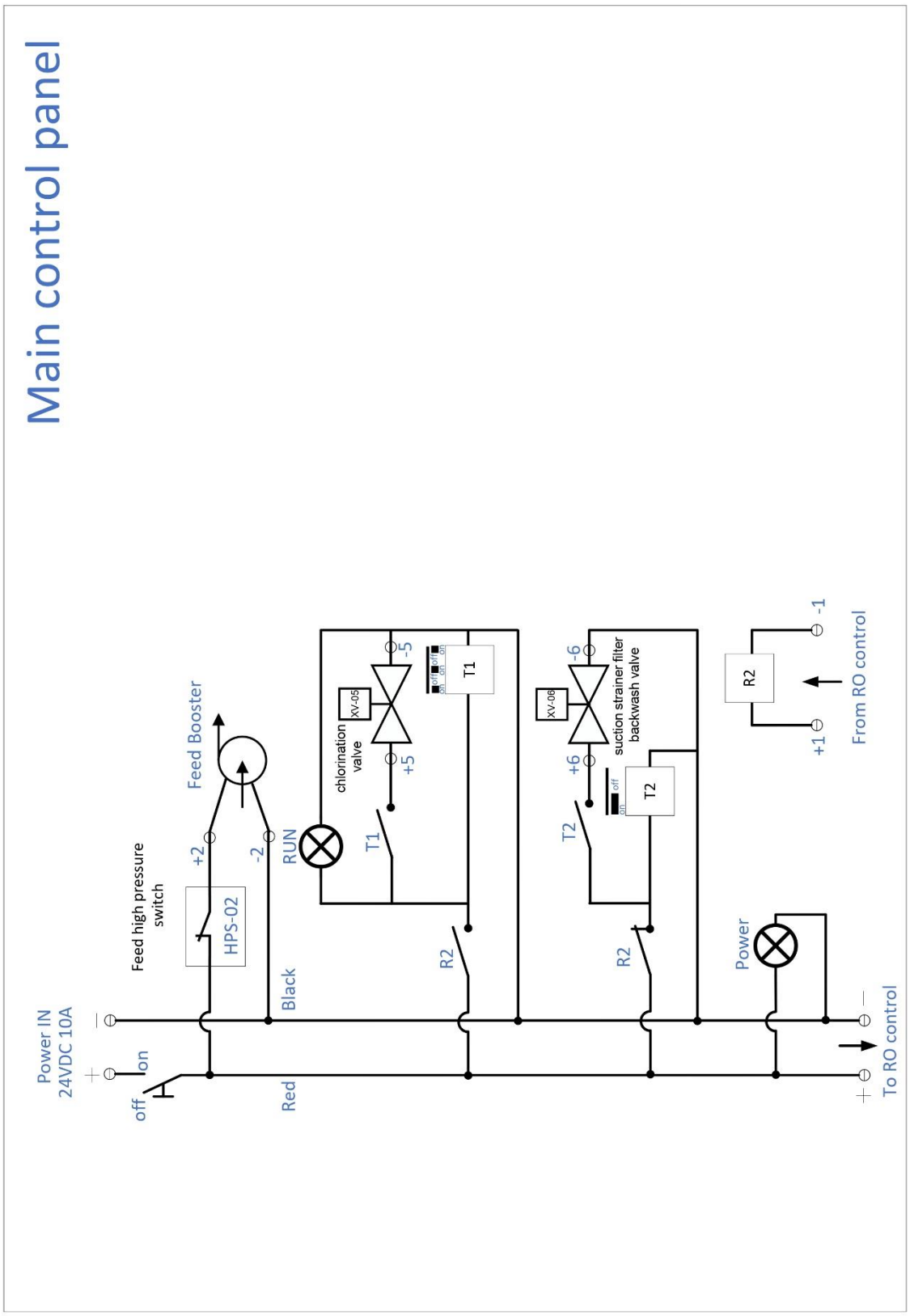

Item
Description
FT 01
Flow trans.
LPS 01
Pressure switch
ECT 01
Conductiv. trans
Item
Description
Actuated valve
MV-01
Memb. housing
Flow Restrictor
Item
Description
Check valve
PI 01
Pres. indicator
HPS 03
Pressure switch
Item
Description
Pump
Pressure tank
Filter housing
Concentrate
Permeate
Drain valve Permeate
Concentrate Drain valve
Recirc. Pump
RO Pump
chlorination valve
Feed valve
Feed Booster
Permeate
FEED
suction strainer filter
T-01
T-02
T-03 80L
T-04
F-01 150mkr.
F-02 Carbon
F-03
F-04
CT-01
CL-01
AR-01
P-01
P-02
XLP-3-13"
XLP-3-13"
MV-02
MV-01
XV-01
XV-02
XV-03
XV-05
XV-06
CV-01
CV-02
CV-03
CV-04
CV-05
CV-06
CV-07
CV-08
CV-09
HV-01
HV-02
HV-03
HV-04
HV-10
STR-01
HPS 01
HPS 02
LPS 01
ECT 01
ECT 02
PI 01
PI 02
FT 01
CV-05
XV-05
400
800
20mm
1/4"
3/8"
1/2"

Code	Name
STR-01	Suction strainer filter
F-01	150 micron filter housing
HV-01	Pressure Valve
CV-09	Check Valve
CT-01	Feed water tank
F-02	Carbon filter housing
T-04	Tank
HPS-02	High pressure switch
PI-01	Pressure indicator
LPS-01	Low pressure switch
XV-01	Feed valve
ECT-01	Feed water conductivity transmitter
P-01	RO pump
CV-05	Check valve
XV-05	Chlorination valve
HV-02	Pressure valve
CL-01	Chlorination module
CV-01	Check valve
XV-03	Concentrate drain valve
P-02	Restriction Pump
PI-02	Pressure indicator
MV-01/02	Membrane housing

Code	Name
T-02	Concentrate expansion tank
CV-04	Check Valve
CV-08	Check valve
AR-01	Air relief
ECT-02	Permeate conductivity transmitter
CV-02	Check valve
FT-01	Permeate flow transmitter
XV-02	Permeate drain valve
CV-05	Check valve
CV-03	Check valve
HPS-01	High pressure switch
T-01	Permeate expansion tank
HV-04	Pressure valve
XV-06	First permeate drainage valve
CV-06	Check valve
HV-03	Pressure valve
T-03	Permeate accumulation tank
CV-07	Check valve
F-04	Filter housing
F-03	Filter housing
HV-10	Pressure valve


RO control panel
Power IN
From
V24+
V24-
R1
RO Pump
P1
R1
Recirc. Pump
P2
Flowmeter
F
Feed valve
XV1
R1
-1
+1
To Main control
Permeate high pressure switch
HPS-01
Drain valve
Permeate
XV2
Concentrate Drain valve
XV3
Feed low pressure Switch
LPS-01
Black
White
Red
SENSOR TDS

Main control panel



3. System Installation

3.1. Connection

a. Connect the black tube to the system (Pic.3 - **17**). Immerse the other end of the tube (the one with the installed strainer) into a water reservoir
(Pic. 4).
b. Attention! It is not allowed to place the filter directly on the bottom of the reservoir. Avoid the silting and the sand particles infiltration into the system

Picture 5

3.2. Chlorine tablet

Picture 6

For a proper operation of system, it is necessary to use a chlorine tablet.

a. Make sure the system is OFF.
b. Open (drain) the faucet (Pic.6).
c. Remove the cup of chlorinator (**Pic. 3-20a, Pic.4 – 20b**). and place the tablet on the bottom of the container for preparing the solution.
d. Close the cup.
e. Close the faucet (Pic. 6).
f. When the system is ON, add water to the chlorine solution tank by holding chlorination button (Pic.1-3) for 30 second.

Repeat the process when changing the cartridge (when the cartridge source becomes 0).

Attention! It is necessary to use protective equipment, glasses, gloves.

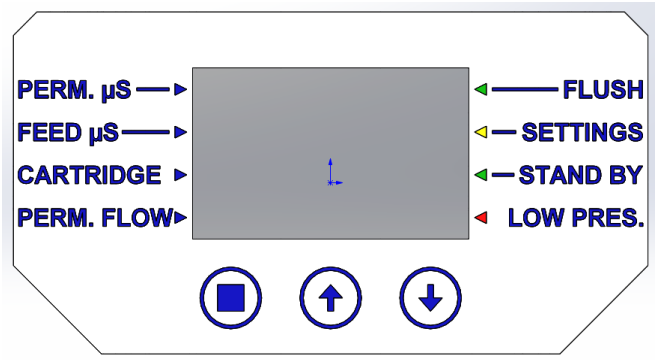
3.3. System's start

1. Make sure you set up the system based on instructions described in 3.1 and 3.2.
2. Connect the system to the electricity source. Turn the switch to the ON position (Pic.1-4). The feed pump will start to work (Pic.3-24).
3. The system is equipped with an air valve (Fig. 1-10) that bleeds air from the pipeline. Make sure it is not interrupted by other objects.
4. It is necessary to release air from the Viking prefiltration module (Pic.1-7). Press and hold the air bleed button (Fig. 1-9) until water starts to come out.
5. If the system is started for the first time, the container with the chlorine tablet needs to be topped up with water. Press and hold the force feed button (Figure 1-3). Make sure the container is completely filled with water.

Attention! The mechanical filter should be regularly rinsed: while the system is in filtration mode, open the drain valve for a short period of time (Pic.2-15)

4. Controller

4.1. Controller description



Picture 6

Controller board with LED display is designed to operate reverse osmosis systems and provides the following features:

1. Controlling the activation of the pump and the concentrate discharge solenoid valve
2. Control via touch buttons
3. Sensors data collection and processing
4. Filter resource indication
5. Setup of the main parameters of the system

Perm. µS	Permeate electrical conductivity, µS
FEED µS	Feed water electrical conductivity, µS
PERM.FLOW	Permeate flow, liters per minute
CARTRIDGE	Remaining capacity of the system's replaceable modules, liters
FLUSH	Flush time, seconds
SETTINGS	System settings menu
STAND BY	Standby mode
LOW PRES	Low inlet water pressure

4.2. Controller operation

a. When the system is turned on for the first time, the flush process begins. The right column displays the FLUSH menu item. At the end of flushing, the system goes into normal mode.

b. While the system is running, the following menu items are shown in turn on the display: **Perm. µS, FEED µS, CARTRIDGE, PERM.FLOW**.

c. The current menu item is highlighted by the cursor.

d. If the value of the electrical conductivity of the permeate is higher than the set parameter, then the numbers on the display will flicker.

e. The resource of cartridges is counted backward. When the cartridge resource equals 0 (zero), the lower operation indication bars will flicker. To reset the value, you need to simultaneously hold down the buttons for 6 seconds.

f. To start a forced system flush, use the arrows to select the FLUSH menu and press the select button ⏹. To exit flushing, press this button again.

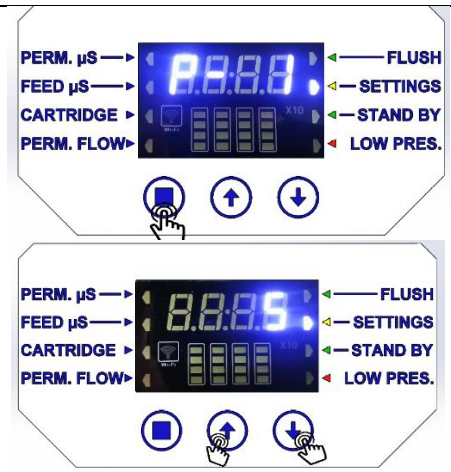
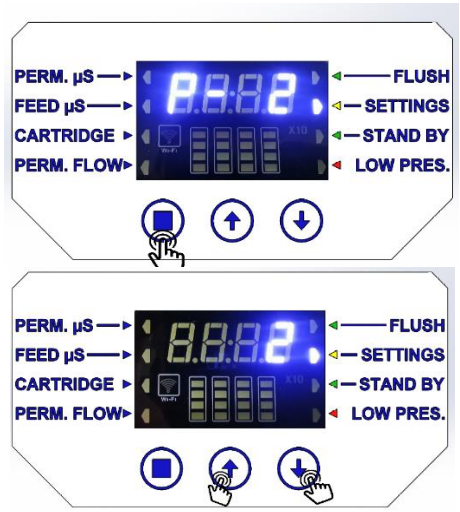
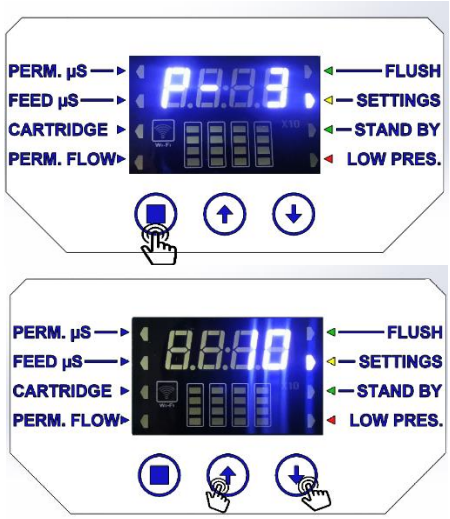
P-1	Stagnant water drainage start-up delay
P-2	Opening the drainage valve during system operation, number of pulses per minute
P-3	Impulse (P-2) duration
P-4	Number of permeate flowmeter pulses per liter ***(IT IS STRONGLY RECOMMENDED TO USE THE DEFAULT VALUE)***
P-5	Cartridge capacity, liters
P-6	Maximum permeate conductivity value
ESC.	Exit the menu

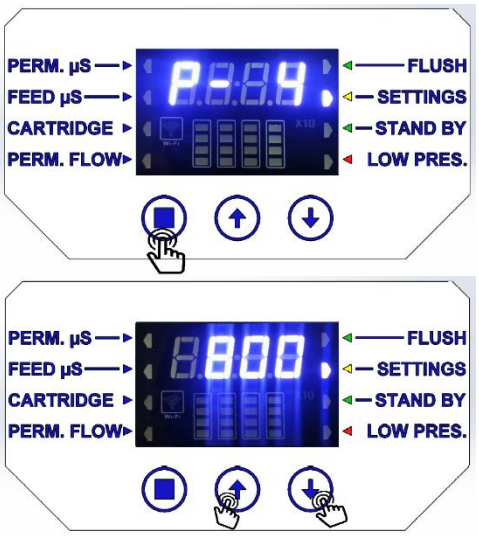
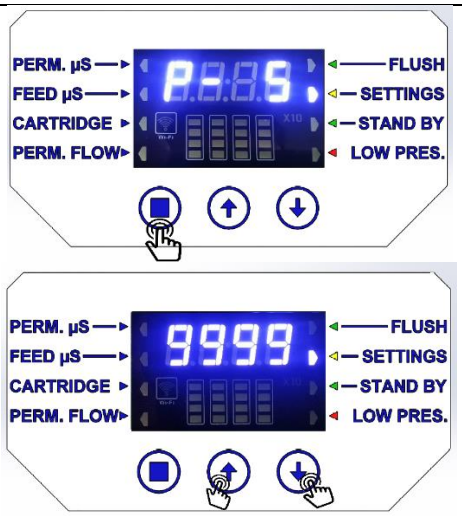
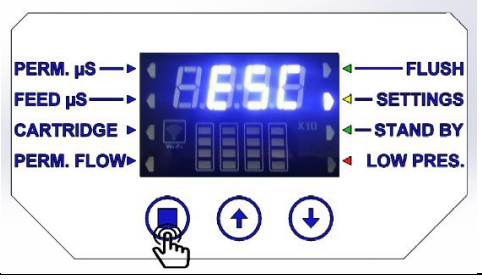
4.3. Modes

MODE	IMAGE	Description
FLUSH		This mode is on: ➢ At the first system's startup. ➢ When the permeate tank is filled, the flush mode is activated. After flushing, the system goes to STAND BY mode. ➢ Flush mode can be turn on manually while the system is operating. Using ⬆ ⬇ button, choose **FLUSH** and press ■. To turn off FLUSH mode, press ■ button again. **NOTE:** In FLUSH mode, the pump is ON.
STAND-BY		➢ The mode is on when the filtration process is done, the feed pump is off and the permeate tank is full. **NOTE:** While entering and leaving this mode, the **FLUSH** process is performed.
OPERAITION		When the system is operating, the controller displays the current parameters of permeate conductivity (µS), feed water conductivity (µS), cartridge resource (l), and permeate flow (l/min).
SETTINGS		SETTINGS mode allows to change the operation parameters. Enter SETTINGS menu using ⬆ ⬇ buttons to choose **SETTINGS** и and press ■ button.

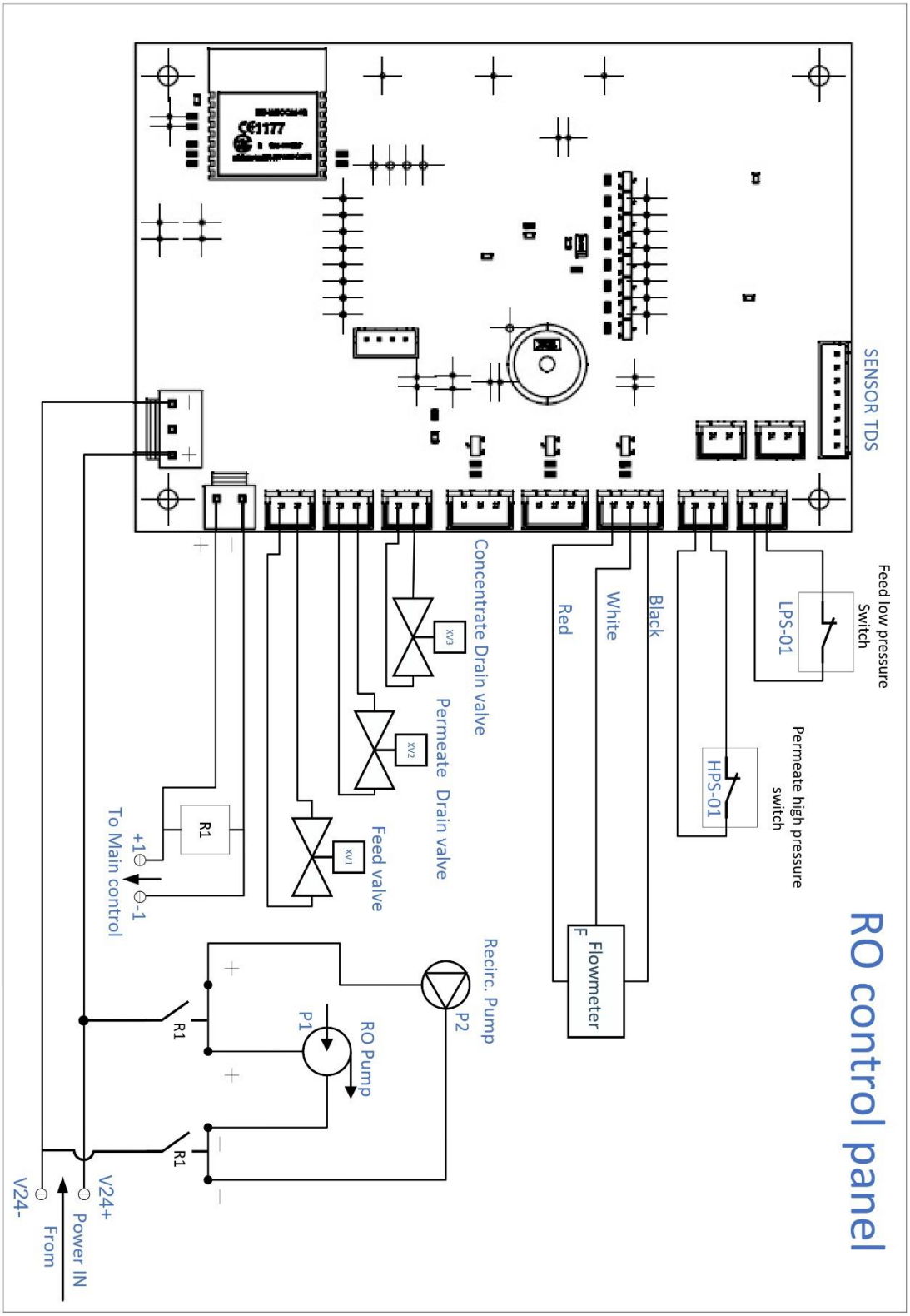
4.4. Settings

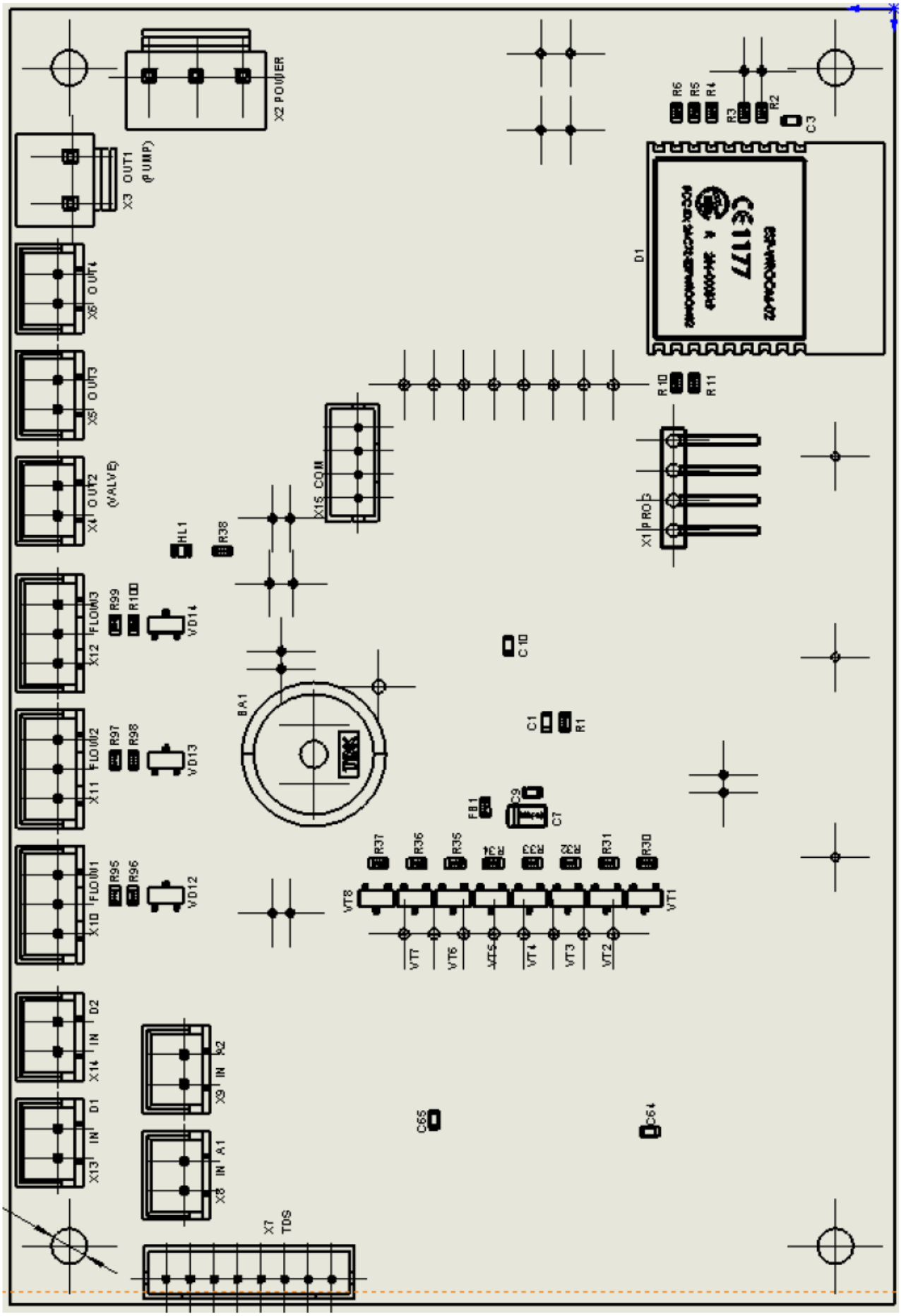
- To enter SETTINGS menu, use ⏫ ⏬ buttons to choose SETTINGS и and press ⏹ button.
- To navigate in menu, use ⏫ ⏬ buttons. Press ⏹ button to choose the parameter that you would like to change. To change the parameter, use ⏫ ⏬ buttons. Press ⏹ to save changes.

№	Name	Picture	Values	Unit
P-1	Flushing duration		1 - 60	Seconds
P-2	Number of drainage valve opening pulses per minute		1-5	pulse per minute
P-3	The duration of P-2 impulses		1 - 28	seconds

P-4	Flowmeter pulses per minute **Attention!** It is not recommended to change the default number installed at the factory.		1 – 1000	pulses per minute
P-5	Cartrdige module source		1 – 9999	L
P-6	Max. acceptable level of permeate TDS. If permeate TDS is higher than this value, the system will show an error.		1 - 2000	mkS
ESC	Escape (close the SETTINGS menu)			

4.5. Connection and controller board scheme




X2 POWER
X3 OUT1 (PUMP)
X6 OUT4
X5 OUT3
X4 OUT2 (VALVE)
X12 FLOW3
X11 FLOW2
X10 FLOW1
X14 IN D2
X13 IN D1
X9 IN A2
X8 IN A1
X7 TDS
X15 COM
X1 PROB
D1
HL1
R38
VD14
VD13
VD12
R99
R100
R97
R98
R95
R96
BA1
C10
C1
R1
C9
C7
FB1
R37
R36
R35
R31
R30
VT8
VT1
VT7
VT6
VT4
VT3
VT2
C65
C64
R6
R5
R4
R3
R2
C3
R10
R11

Contacts applications		
X2: Power connection		
Contact	Name	Application
1	+24V	Power 24V
2		Not used
3	GND	General
X3: Pump control connection		
Contact	Name	Application
1	X3	Pump operation
2	OUT1	Power 24V
X4, X5, X6: Valve control connection		
Contact	Name	Application
1	X4	Drainage valve control
2	OUT2	Power 24V
3	X5	Permeate drainage valve control
4	OUT3	Power 24V
5	X5	Inlet valve control
6	OUT4	Power 24V
X7: TDS transmitter control		
Contact	Name	Application
1	CNDA	General analog
2	Temp1_IN	Temperature sensor input, 1 channel
3	TDS1_0	TDS output, 1 channel
4	TDS1_I	TDS input, 1 channel
5	TDS2_I	TDS input, 1st channel
6	TDS2_O	TDS output, 2nd channel
7	TEMP2_IN	Temperature sensor input, 2nd channel
8	GNDA	General analogue
X8, X9: Auxiliary inputs		
Contact	Name	Application
1	X8 IN	Power 24V
2	X8 A1	Control of the conversion circuit of sensors with current output
3	X9 IN	Power 24V
4	X9 A2	Control of the conversion circuit of sensors with current output
X10 FLOW1, X11 FLOW2, X12 FLOW3: Auxiliary inputs		
Contact	Name	Application
1	Flow power	Flowmeter power
2	Flow1_H1	Flowmeter signal - 1
3	GND	General
4	Flow power	Flowmeter power
5	Flow2_H1	Flowmeter signal - 2
6	GND	General
7	Flow power	Flowmeter power
8	Flow3_H1	Flowmeter signal - 3
9	GND	General

X13, X14: Logic inputs connection		
Contact	Name	Application
1	X13 IN	Logic input circuit control
2	X13 D1	Power 24V
3	X14 IN	Logic input circuit control
4	X14 D2	Power 24V
X15 Com: Communication port		
Contact	Name	Application
1	IN10 (PC13, COM)	Logic input IN 10
2	UEART_EXT_RX(PA10:USART_RX)	UART - RX
3	UEART_EXT_RX(PA10:USART_TX)	UART - TX
4	GND	General

5. Troubleshooting

5.1. Low Inlet Pressure

Picture 7

If inlet pressure is low, the system will not start operation. The display will show sign LPS (pic.7).

Possible reason	Solution
Strainer (pic. 4) is not fully submerged under water	Make sure strainer is fully submerged
Strainer is clogged up	Clean the strainer
Mechanical filter is clogged up (Pic.2-12)	Turn off the system. Disconnect the system from electricity. Drain the water using mechanical filter drainage tap (Pic.2-15). Clean the filter with water/air stream.
Airlock in “Viking” module (Pic.1-7)	Bleed the air with filter air exhaustion button (Pic.1-9)
Carbon filter has to be replaced	Replace the carbon filter
Feed pump is broken	Change feed pump (contact us or your local service)

If you want to manually turn off LPS error, press select button ⏹.

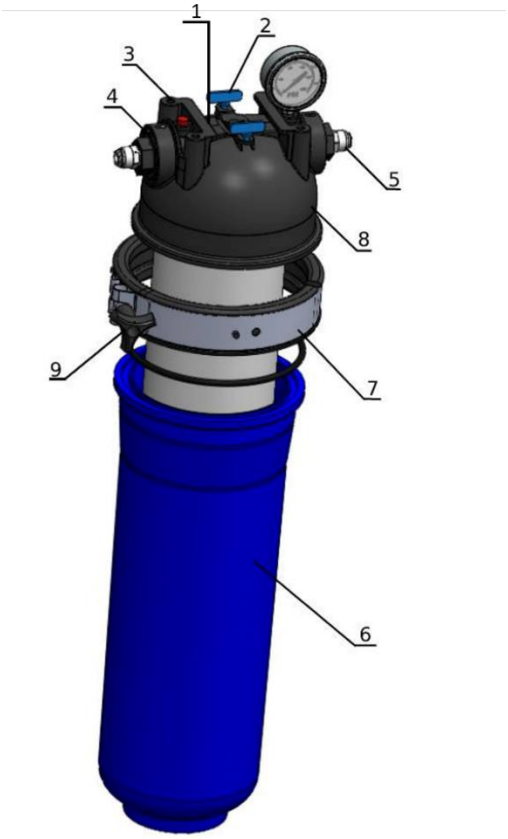
5.2. Cartridge source ran out

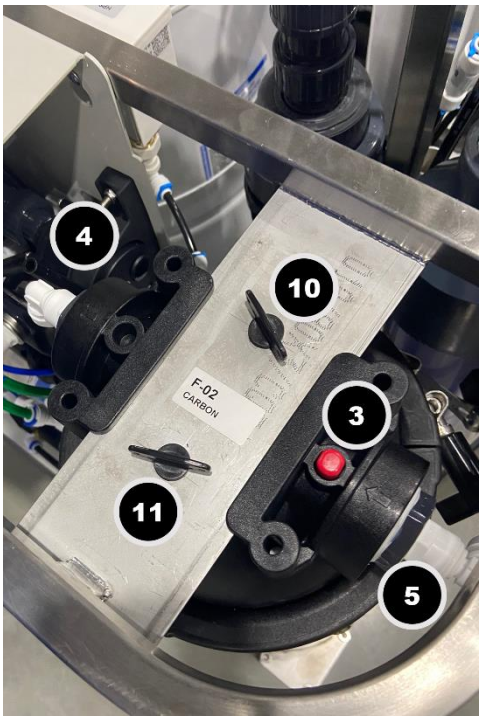
Picture 8

If cartridge source is equal to 0, lower indicators will start blinking (Pic.8). To reset cartridge source value, simultaneously hold ⬇ ⬆ buttons for 6 seconds.

6. Maintenance

6.1. Viking prefilter replacement



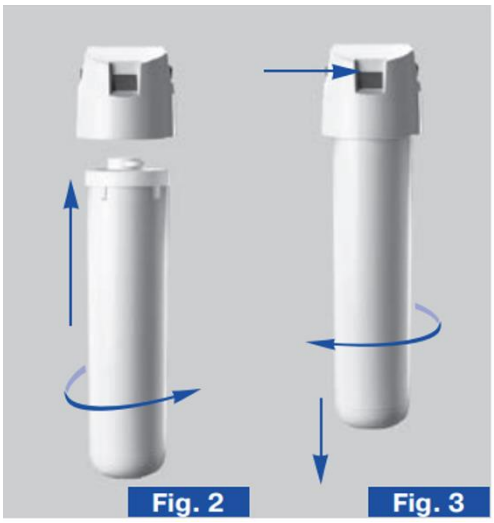


1. Shut off the water supply to the prefiltration unit.
2. Press button (3) for pressure relief. Hold the button until the air relief sound is gone.
3. Disconnect the quick-release couplings by unscrewing the union nuts (4,5).
4. Unscrew the filter housing from the metal holder (10, 11).
5. Remove the water purifier from the housing (1), drain any excess water from it; place the wing nut (9), and remove the fixing collar (7) from the housing.
6. Remove the manifold and disconnect the filter cartridge by pulling it off the central fitting.
7. When replacing the cartridge, wash the inner surfaces of the manifold, bowl, and rubber ring with water.
8. Install a new filter cartridge.
9. Assemble the water purifier, connect the manifold and the bowl with a clamp, and tighten the wing nut (9) until it stops.
10. Put the assembled water purifier into the housing (1). Make sure the water flow direction matches the direction of the arrow on the manifold.
11. After the filter cartridge is installed, turn on the water supply and make sure that the connections between the pipe and the prefiltration unit are tight.

Make sure there are no leaks.

The filter cartridge is successfully replaced.

6.2. K7BM mineralization module replacement



1. Shut off water supply and drain any excess water.
2. Close HV-03 valve.
3. Press and hold the locking button, turn the cartridge clockwise and then remove it (fig. 2).
4. Remove the shrink wrap from a new cartridge.
5. Insert a new cartridge into the manifold and turn the cartridge counter clockwise, until you hear the locking button 'click' (fig. 3).
6. Open HV-03 valve.

Replace the cartridges at least once in 6 months.

7. Service and Warranty

Aquaphor Water Filters products are backed by some of the most comprehensive warranties in the industry. Aquaphor warrants that the Aquaphor water filtration system shall be free from defects in material and workman ship under normal use and service.

The reverse osmosis system APRO 120 UN – Two Year Warranty from the date of purchase. This does not apply, however, to consumable filters.

EXCLUSIONS AND LIMITATIONS

1. Aquaphor warrants its products to be free from manufacturing defects under normal use and service. This warranty is extended only to the ORIGINAL PURCHASER.

2. Aquaphor obligations under this warranty are limited to repairs or replacement, at Aquaphor's option, of products or parts found to be defective, provided that such products were properly installed and used in accordance with instructions. Aquaphor reserves the right to make such inspections as may be necessary to determine the cause of the defect. Aquaphor will not charge for labor or parts in connection with warranty repairs for the first full year from date of purchase on all products except those that may be subject to commercial use limitations.

3. Aquaphor is not responsible for the cost of removal, return (shipping) and/or reinstallation of products. This warranty does NOT apply to:

- Damage or loss which occurs during shipment.
- Damage or loss sustained through any natural or man-made causes beyond the control of Aquaphor, including but not limited to fire, earthquake, floods, etc.
- Damage or loss resulting from sediments or foreign matter contained in a water system.
- Damage or loss resulting from negligent or improper installation including installation of a unit in a harsh or hazardous environment.
- Damage or loss resulting from removal, improper repair, modification of the product, or improper maintenance including damage caused by chlorine or chlorine related products.
- Damage or loss resulting from acts which are not the fault of Aquaphor or which the Product is not specified to tolerate.

4. This warranty gives you specific legal rights. You may have other rights which vary from state to state.

THIS WRITTEN WARRANTY IS THE ONLY WARRANTY MADE BY AQUAPHOR. REPAIR OR REPLACEMENT AS PROVIDED UNDER THIS WARRANTY SHALL BE THE EXCLUSIVE REMEDY AVAILABLE TO THE PURCHASER.

AQUAPHOR SHALL NOT BE RESPONSIBLE FOR LOSS OF USE OF THE PRODUCT OR FOR OTHER INCIDENTAL, SPECIAL, FOR CONSEQUENTIAL DAMAGES OR EXPENSES INCURRED BY THE PURCHASER OR FOR LABOR OR OTHER COSTS DUE TO INSTALLATION OR REMOVAL OR COSTS OF REPAIRS BY OTHERS, OR FOR ANY OTHER EXPENSE NOT SPECIFICALLY STATED ABOVE. EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, ANY IMPLIED WARRANTIES, INCLUDING THAT OF MERCHANTABILITY, ARE EXPRESSLY LIMITED TO THE DURATION OF THIS WARRANTY. SOME STATES DO NOT ALLOW LIMITATIONS, SO THE ABOVE LIMITATION AND EXCLUSION MAY NOT APPLY TO YOU

Tag	Name	Material	Connection size	Code
STR-01	Suction strainer filter	plastic	1-1/2”	521430
F-01	150 micron filter housing	plastic	1”	520220
HV-01	Pressure Valve			
CV-09	Check Valve	PVC	20 mm	217498
CT-01	Feed water tank	PVC	3/8”	
F-02	Carbon filter housing	plastic	1”	513990
T-04	Tank	SS	1/4"	211823
HPS-02	High pressure switch	Brass	1/4"	217996
PI-01	Pressure indicator	Brass	1/4"	217312
LPS-01	Low pressure switch	Brass	1/4"	218001
XV-01	Feed valve	Brass	3/8”	211201
ECT-01	Feed water conductivity transmitter	Plastic	1/4"	510537
P-01	RO pump		3/8”	208724
CV-05	Check valve		1/4"	201614
XV-05	Chlorination valve		1/4"	217923
HV-02	Pressure valve	Plastic	1/4"	217513
CL-01	Chlorination module			
CV-01	Check valve	PVC	20 mm	217497
XV-03	Concentrate drain valve		1/4"	217923
P-02	Recirculation Pump		1/2"	217261
PI-02	Pressure indicator	Brass	1/4"	217312
MV-01/02	Membrane housing		3/8”	514771
T-02	Concentrate expansion tank		1/4"	516248
CV-04	Check Valve		1/4"	201614
CV-08	Check valve		1/4"	201614
AR-01	Air relief	Plastic	3/4"	521553
ECT-02	Permeate conductivity transmitter	Plastic	1/4"	510537
CV-02	Check valve		1/4"	201614
FT-01	Permeate flow transmitter		1/4"	209925
XV-02	Permeate drain valve		1/4"	217923
CV-05	Check valve		1/4"	201614
CV-03	Check valve		1/4"	201614
HPS-01	High pressure switch	Brass	1/4"	217996
T-01	Permeate expansion tank		1/4"	211823
HV-04	Pressure valve	PVC	20 mm	217514
XV-06	First permeate drainage valve	Brass	3/8”	211201
CV-06	Check valve	PVC	20 mm	217498
HV-03	Pressure valve	PVC	20 mm	217514
T-03	Permeate accumulation tank		3/4"	515867
CV-07	Check valve		1/4"	201614
F-04	Filter housing		1/4"	201446
F-03	Filter housing		1/4"	201446
F-03	Filter housing			

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