AQUAPHOR
PROFESSIONAL

APRO-120

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Technical modification	Revision No 3

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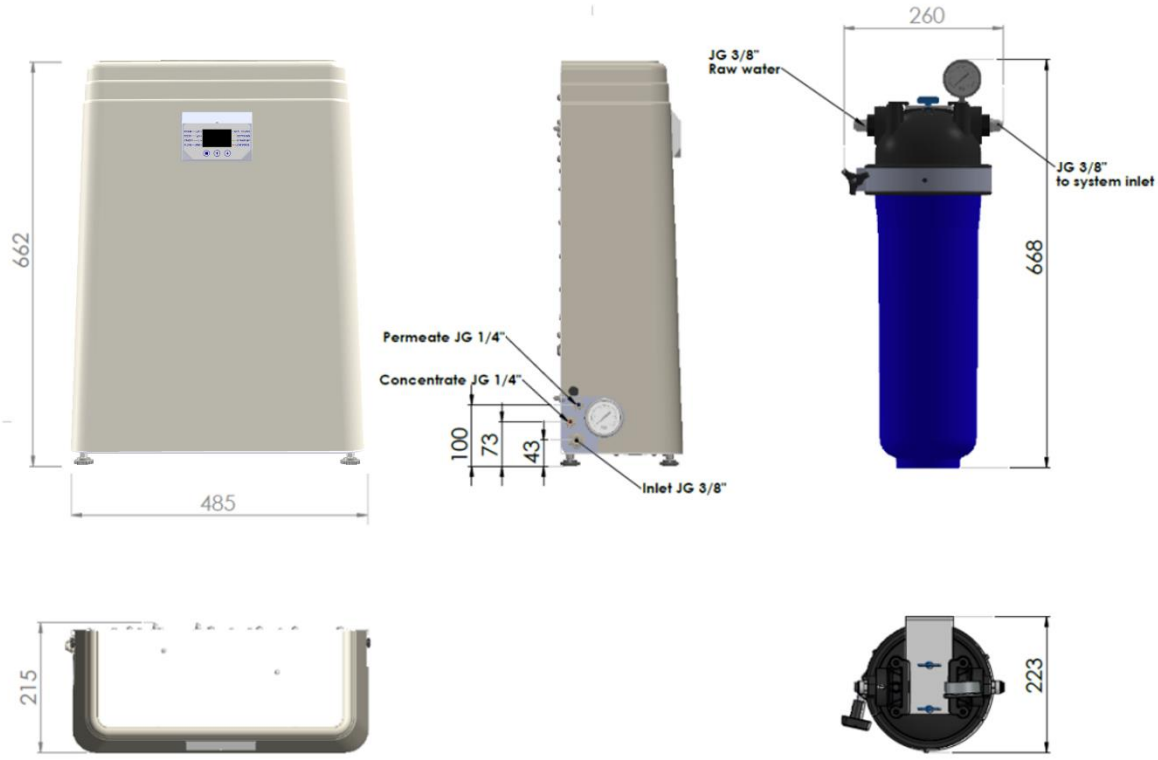
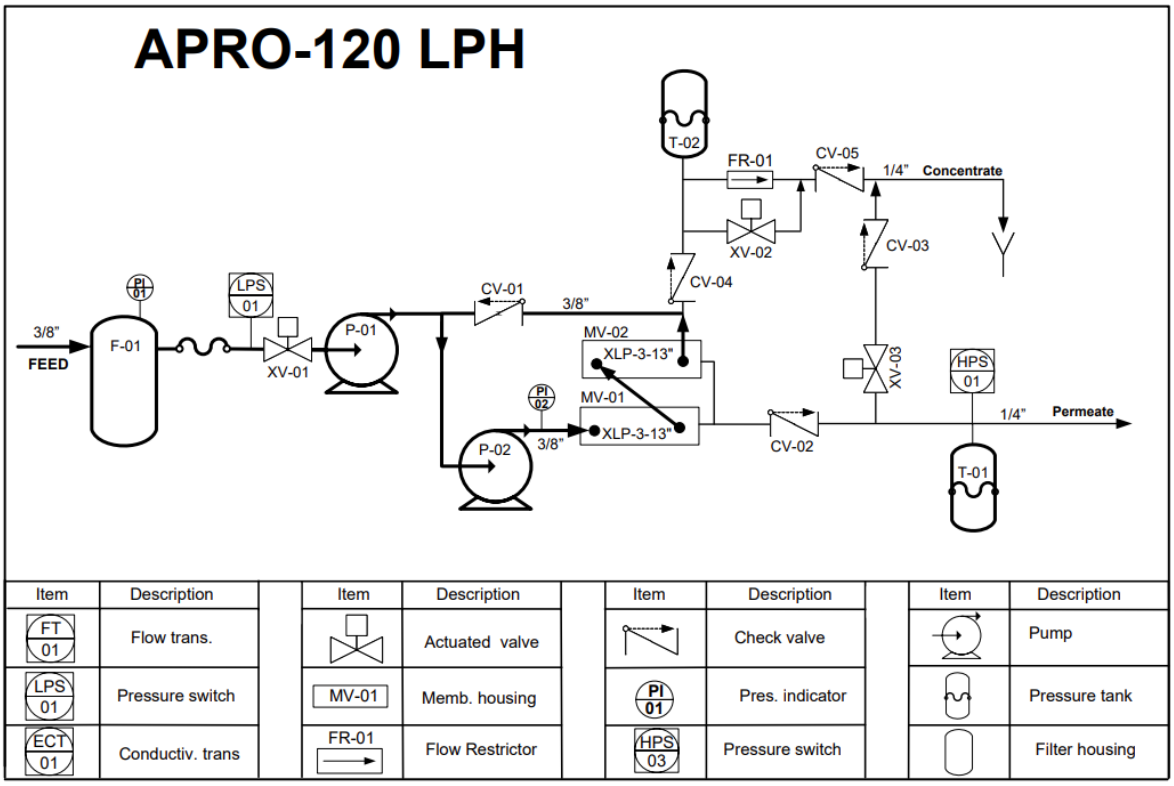
1. System Overview

1.1. System's dimensions

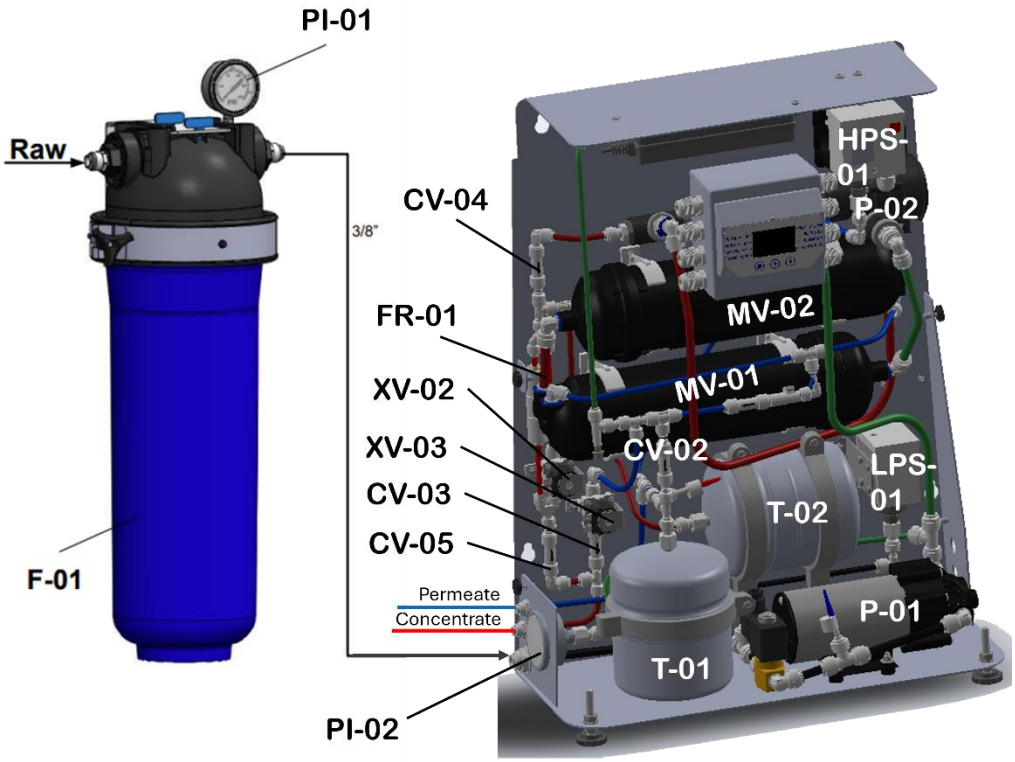
Net weight of the system: 27 kg.



1.2. APRO-120 system equipment

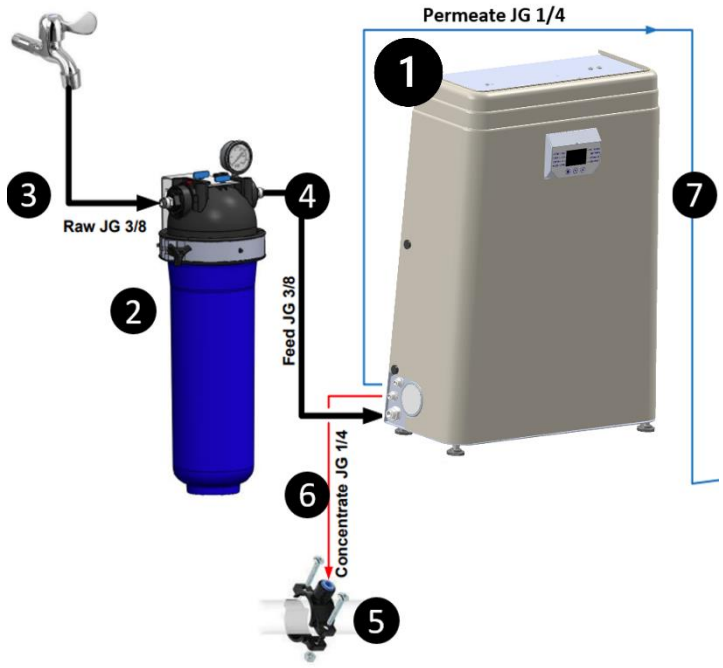


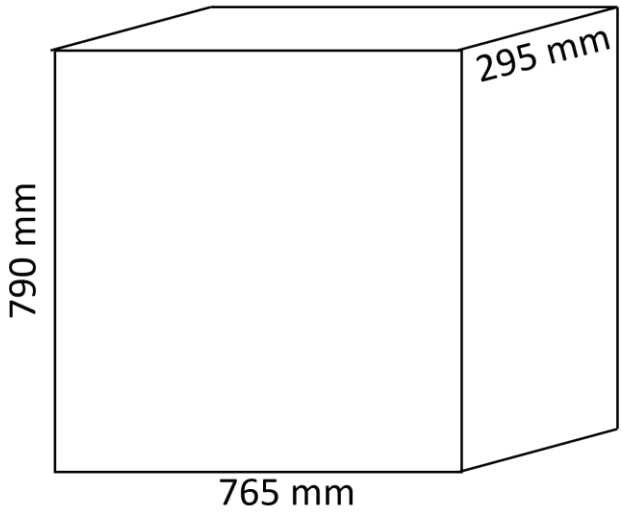
Item	Description	Item	Description	Item	Description	Item	Description
FT 01	Flow trans.		Actuated valve		Check valve		Pump
LPS 01	Pressure switch	MV-01	Memb. housing	PI 01	Pres. indicator		Pressure tank
ECT 01	Conductiv. trans	FR-01	Flow Restrictor	HPS 03	Pressure switch		Filter housing



Tag	Name	Function
F-01	Cartridge Filter Housing	Feed water filtration cartridge.
LPS-01	Low pressure switch	Low-pressure sensor in the supply line. Protects the system from dry running in case of interruption of the water supply.
XV-01	Feed valve	The valve for supplying feed water to the reverse osmosis system.
XV-02	Concentrate valve	Concentrate drainage valve.
XV-03	Drainage valve	First permeate drainage.
P-01	Pressure pump	Builds up pressure and supply water to reverse osmosis membranes.
P-02	Recirculation pump	Concentrate recirculation pump. Serves to recirculate concentrate through the osmotic membranes.
PI-01	Pressure Indicator	Feed water pressure.
PI-02	Pressure Indicator	Pump pressure.
MV-01/02	Membrane housing	
T-01	Permeate tank	Serves for the accumulation of permeate.
T-02	Concentrate tank	Serves for the accumulation of concentrate.
HPS-01	Permeate pressure switch	The pressure sensor stops the system when the T-01 tank is filled with permeate.
CV-01	Check valve	Concentrate recirculation check valve.
CV-02	Check valve	Permeate check valve.
CV-03	Check valve	Permeate drainage check valve.
CV-04	Check valve	Concentrate check valve.
CV-05	Check valve	Concentrate drainage check valve.
FR-01	Flow restrictor	

1.3. Standard package equipment





The net weight of the system is 27 kg.
The weight of the package is ~ 30 kg.

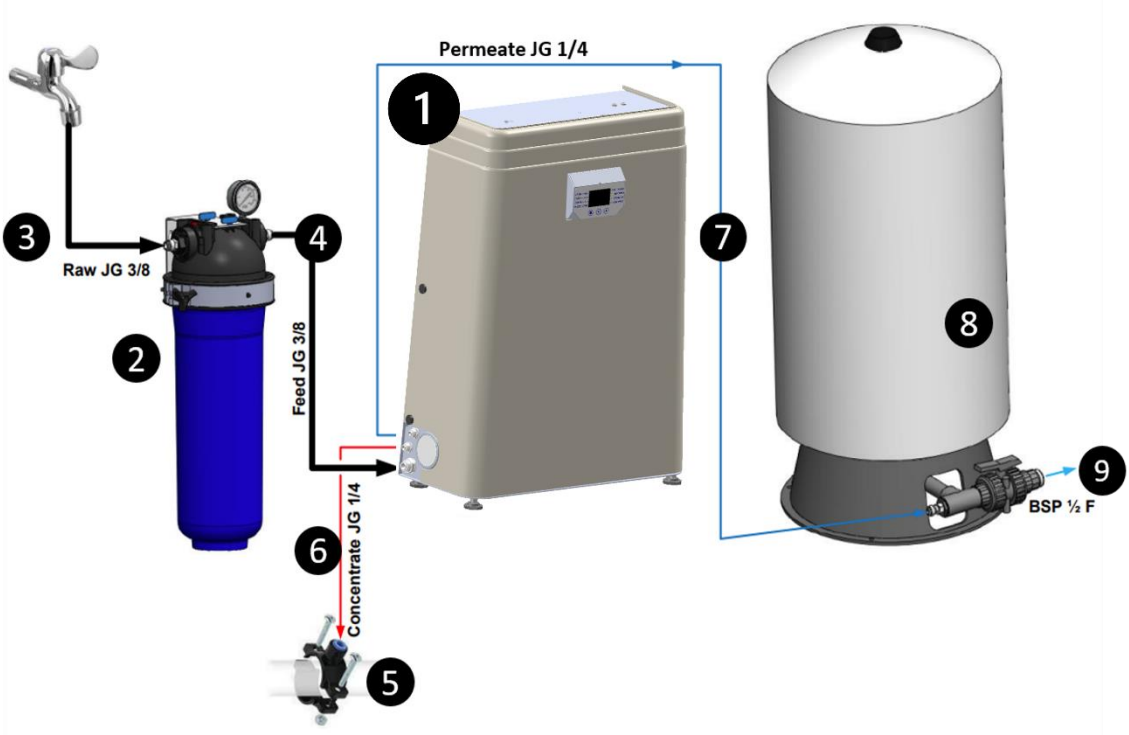
The standard equipment:

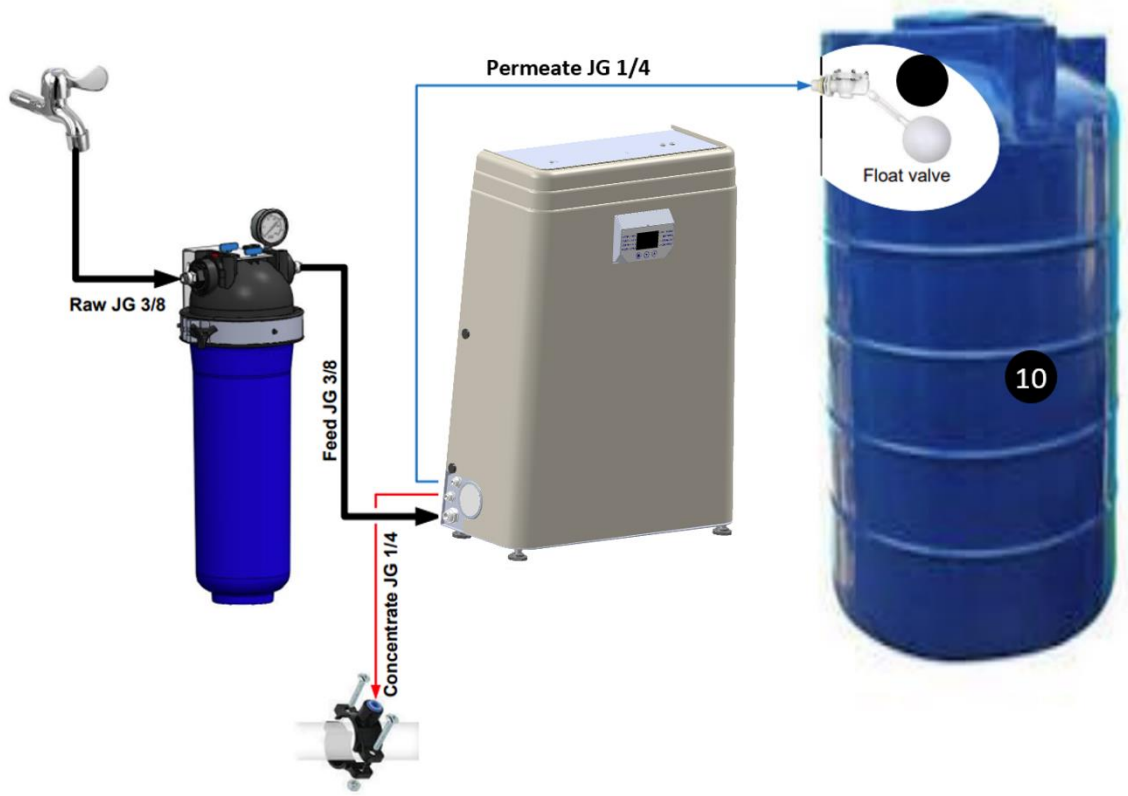
1. APRO 120 LPH system
2. Prefiltration unit (Viking)
3. Feed pipe
4. Supply pipe
5. Concentrate drainage clamp
6. Concentrate drainage pipe
7. Permeate supply pipe

1.4. Optional equipment connection

Optional equipment:

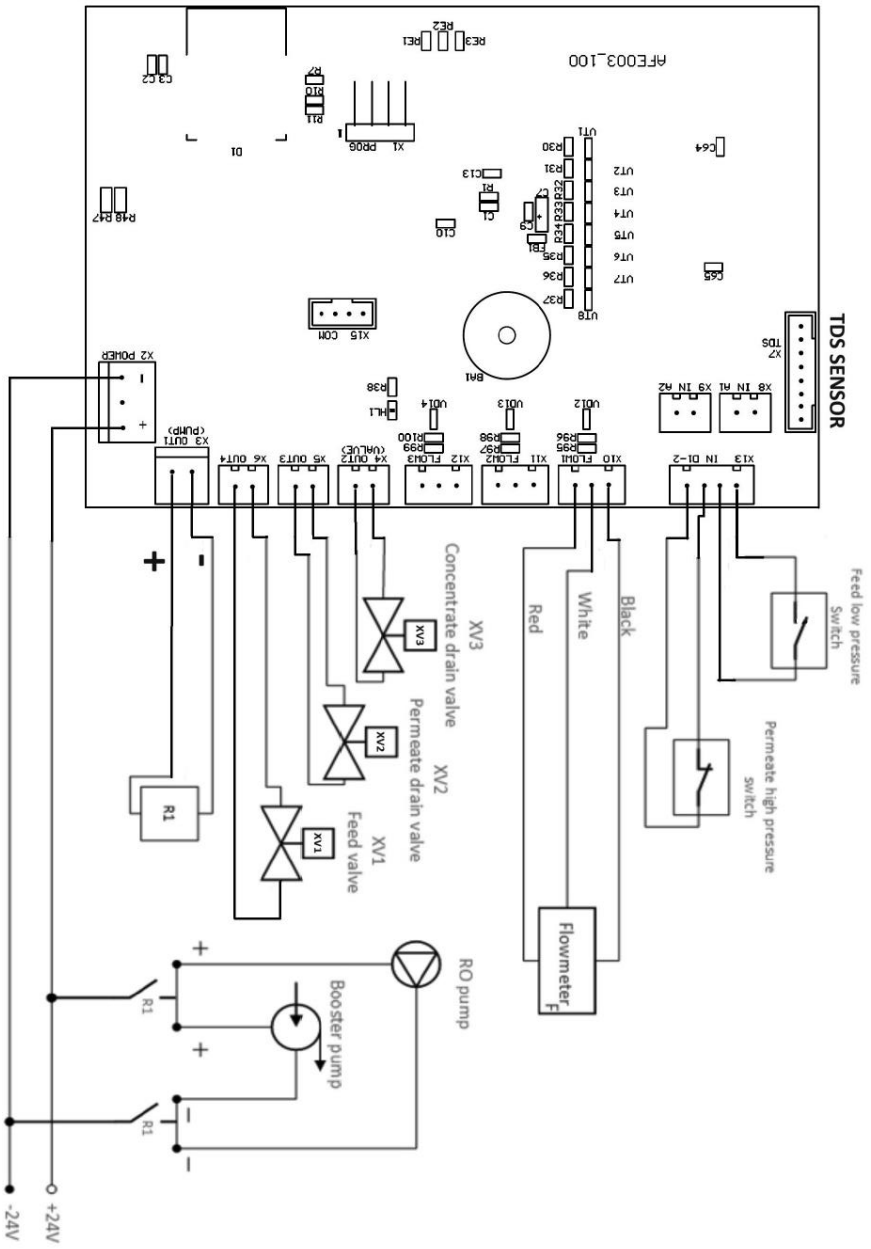
8. Pressure tank
9. Permeate water supply
10. Atmospheric accumulation tank

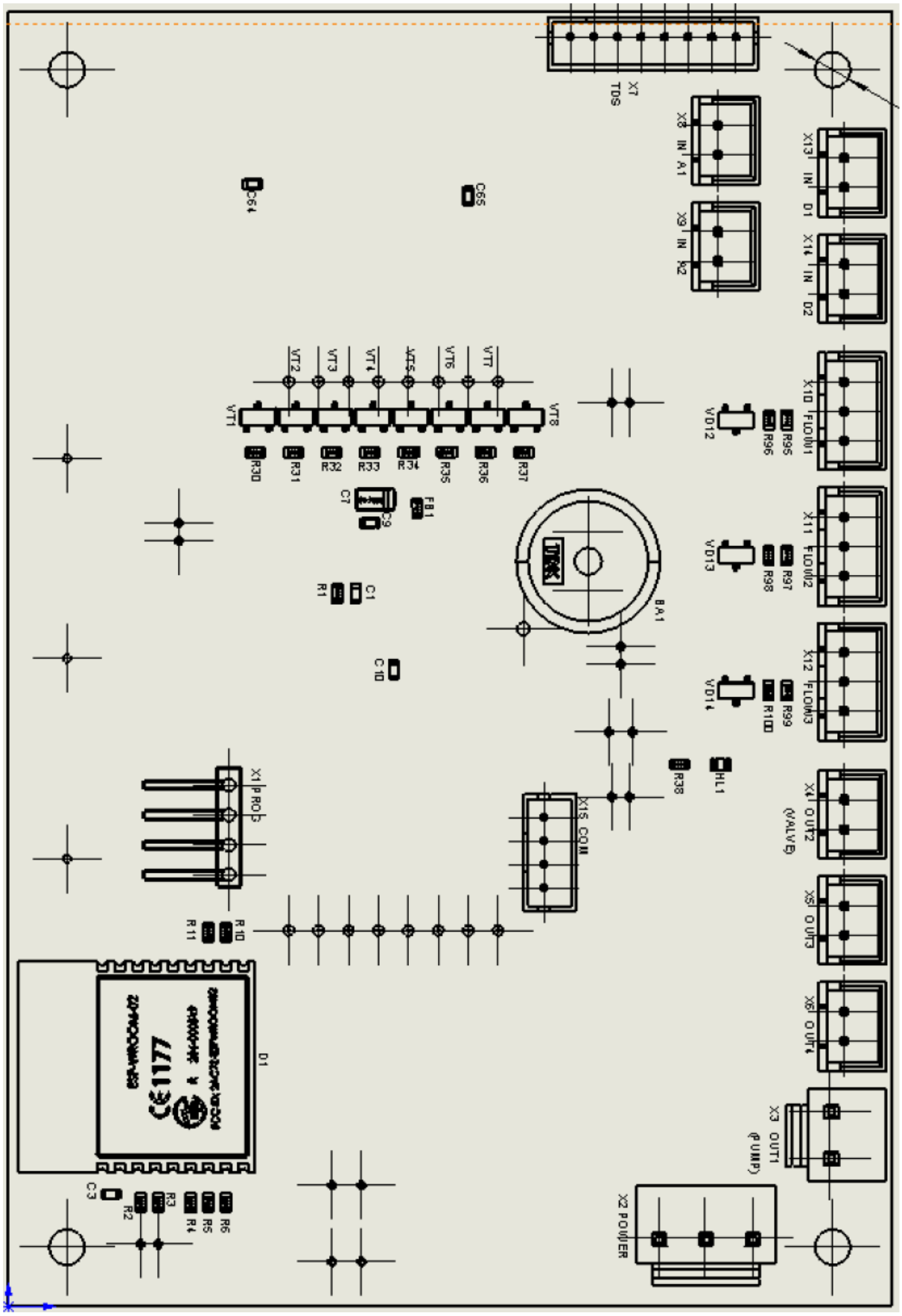




2. Electric circuit

2.1. Connection and controller board scheme




X7 TDS
X8 IN A1
X9 IN A2
X13 IN D1
X14 IN D2
X10 FLOW1
X11 FLOW2
X12 FLOW3
X4 OUT2 (VALVE)
X5 OUT3
X6 OUT4
X3 OUT1 (PUMP)
X2 POWER
X15 COM
X1 PROG
BA1
HL1
D1
C64
C65
C7
C9
FB1
C1
R1
C10
C3
R2
R3
R4
R5
R6
R10
R11
R30
R31
R32
R33
R34
R35
R36
R37
R38
R95
R96
R97
R98
R99
R100
VD12
VD13
VD14
VT1
VT2
VT3
VT4
VT5
VT6
VT7
VT8

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

2.2. Operation & Modes

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.

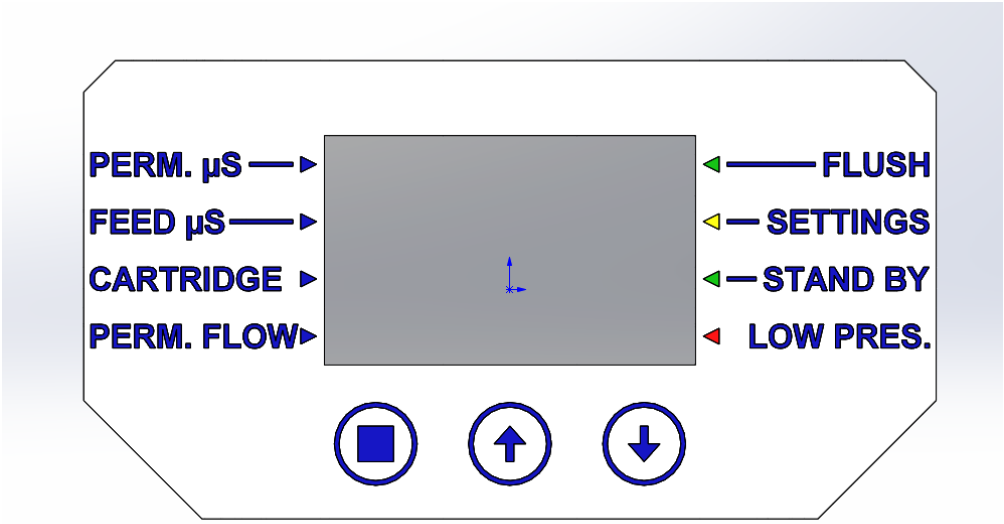
f. To start a forced system flush, use the arrows to select the FLUSH menu and press the select button  . To exit flushing, press this button again.

3. Controller

3.1. Description

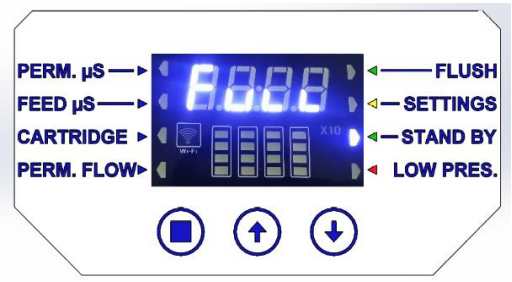
Controller board with LED display is designed to operate reverse osmosis systems and provides the following features:

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



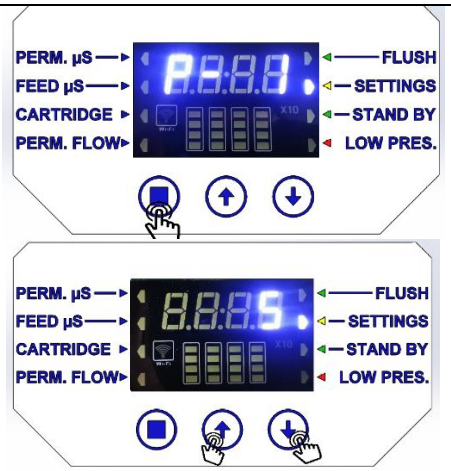
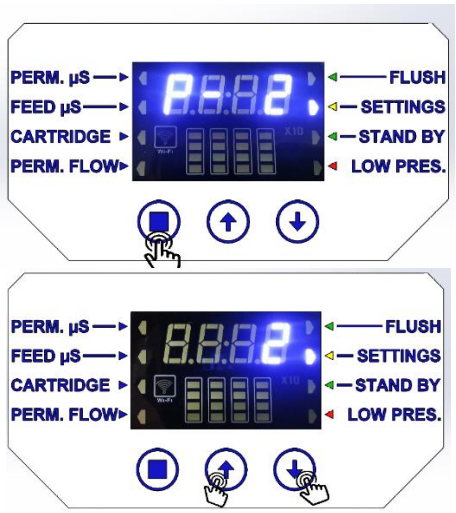
List of indicators

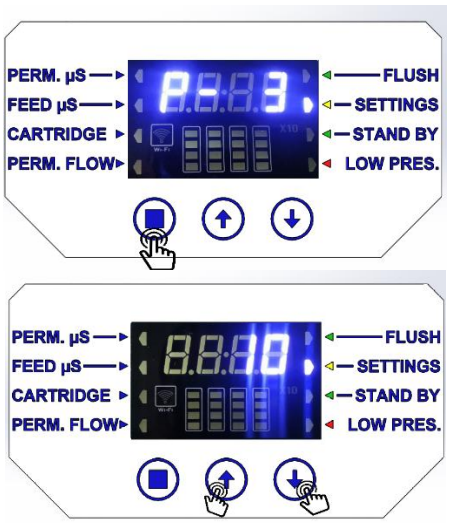
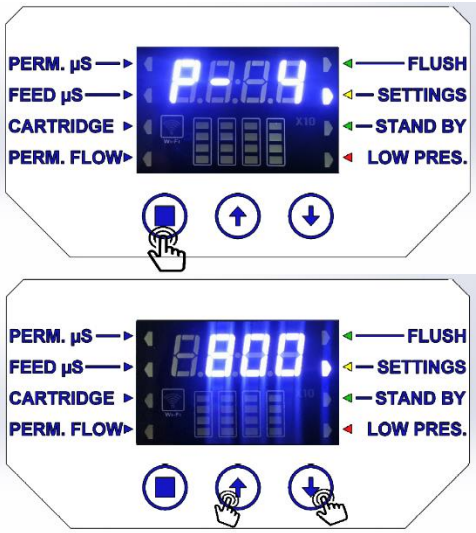
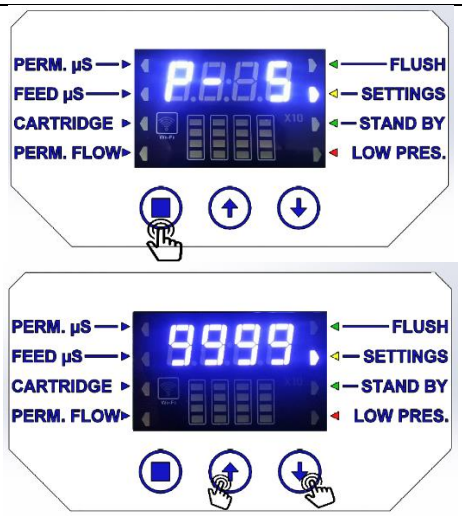
Perm. µS	Permeate electrical conductivity, µS
FEED µS	Feed water electrical conductivity, µS
PERM.FLOW	Permeate flow, liters per minute
CARTRIDGE	Remaining capacity of the system's replaceable modules, liters
FLUSH	Flush time, seconds
SETTINGS	System settings menu
STAND BY	Standby mode
LOW PRES	Low inlet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

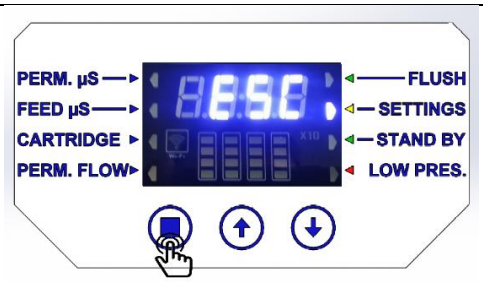
MODE	IMAGE	Description
FLUSH		This mode is on: ➢ At the first system's startup. ➢ When the permeate tank is filled, the flush mode is activated. After flushing, the system goes to STAND BY mode. ➢ Flush mode can be turn on manually while the system is operating. Using ⬆ ⬇ button, choose **FLUSH** and 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.

3.2. 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. Technical Data Description

4.1. Water Quality Requirements

Designation	Unit	Value
Water supply for the reverse osmosis system		
Temperature	°C	5 - 30
Turbidity factor	NTU	<1
Blocking factor (sludge / index of sedimentation density)	SDI	<3
Feed pressure	bar	2.5 - 6
Salinity	ppm	<1500
Total hardness	°dH	0 - 15
pH under constant operation	-	6.5 - 9
Short term for the rinse	-	1 - 12
Odour	-	odourless
Oil	mg/l	0
Free chlorine	mg/l	<0.2
Iron	mg/l	<0.1
Manganese	mg/l	<0.1
Sewage		according to local regulations

4.2. Installation Rooms Requirements

Designation	Unit	Value
Temperature	°C	5 to 40
Lighting	lx	at least 150
Source of fresh air	-	aerate and deaerate sufficiently

4.3. Reverse Osmosis Data

Designation	Unit	Value
Permeate		
With 20 °C	l/h	120
With 10 °C	l/h	84
Operating pressure max.	bar	6-9
Power		24WDC 5A
Control	W	1
Connections		
Raw water	NW	3/8''
Concentrate	NW	1/4''
Permeate	NW	1/4''
Pressure fluctuations max.	bar	± 1
RO salt retention rate max.	%	80 - 95
Operating temperature	°C	30 - 40
Surrounding temperature	°C	4 - 40
Electric connection		EU plug
Connection	-	1/N/PE
Voltage	V	230
Frequency	Hz	50

4.4. Viking Prefilter Data

Application	Cold water pretreatment	Drinking water purification	
Filtered contaminants	Mechanical impurities, colloidal iron, residual active chlorine, organic substances (phenol, benzene), heavy metal ions (lead, cadmium)	Mechanical impurities, µm	>1
		Colloidal iron, %	>80
		Residual active chlorine, %	>90
		Organic substances (phenol, benzene), %	>90
		Heavy metal ions (lead, cadmium), %	>90
Replacement Cartridge	B520 PRO, B520 PRO H		
Cartridge life*	150 000 L, but not more than 6 months		
Filtered particle size	5 µm or more		

5. Installation

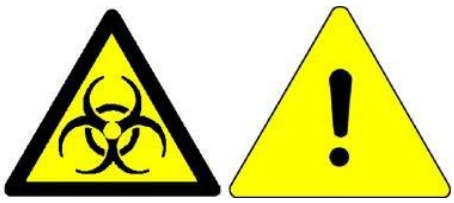
5.1. Safety Points

DANGER: Danger for life, Electric shock

- Turn OFF the main switch and avoid its reactivation.
- Let only the competent staff carry out the electric work.
- Ensure the absence of power before starting to work.
- Consider the national regulations, the safety ones, and if available, the factory prescriptions.

WARNING: Dangerous tasks

- Ensure that only specially trained personnel carries out the tasks.
- Ensure that the laws, regulations, and directives applicable to the site of use are fulfilled
- Before beginning the tasks, ensure that the air and water systems are pressureless.
- Ensure that the tasks are carried out with suitable tools only.
- Ensure the use of adequate climbing aids and protective measures before working at height to prevent a fall.
- Ensure that the safety data sheets of the auxiliary and operating materials used are fulfilled.
- Ensure the use of personal protective equipment (helmet, non-skid safety shoes, safety goggles, ear protectors, gloves, etc.)
- Consider stumbling and spraining areas.
- Avoid slip hazard.
- Provide sufficient lighting.
- Provide sufficient aeration.
- In case of danger, actuate the emergency-stop switching device.



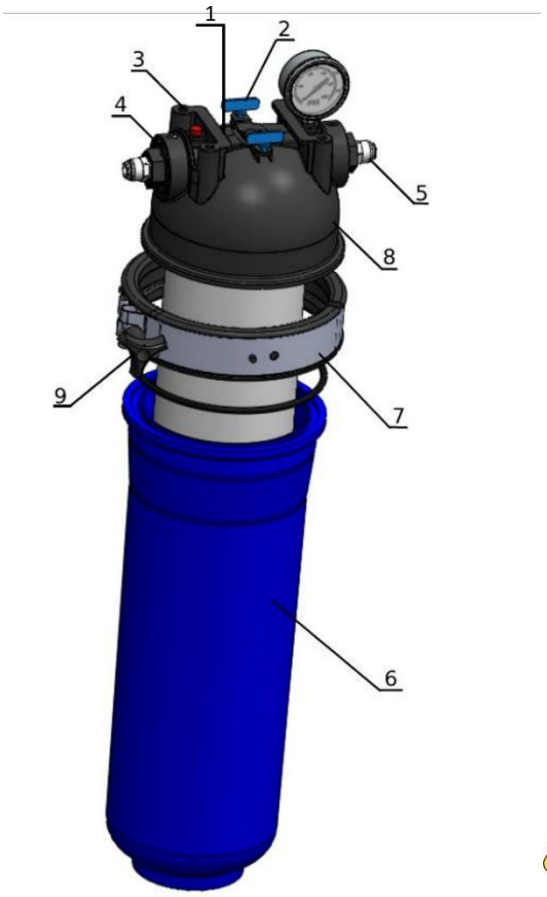
CAUTION : Possible contamination of the washing water / air; Infections and diarrhea

- Wear personal protective equipment (waterproof clothing, boots,

gloves and breathing protection (e.g. particle filtering half-mask).

- Avoid any contact with washing water and spray mist.
- Provide sufficient aeration.

5.2. Prefiltration module (Viking) installation



The pre-filter needs no specific servicing during its service life, except the timely replacement of the filtration module. It is recommended to change the filtration module once every 3 months (***Maintenance 7.3***).

1. Shut off the water supply and relieve excess pressure before starting installation.
2. Determine the location on the wall for the pre-filtration unit installation (1). Keep in mind to leave some space for the pre-filter's housing when replacing the filter cartridge. At least 40 mm of free space should be left under the water.
3. Drill holes in the wall so that they match the holes in the bracket (1).
4. Fasten the bracket to the wall using all the mounting holes with suitable fasteners (depending on the wall material).
5. Install the replacement filter cartridge into the water purifier housing, then assemble the water purifier (***Maintenance 7.3***).

CAUTION: It is important not to mix up the entry and exit holes of the water purifier. The arrows on the cover designate the direction of the water flow.

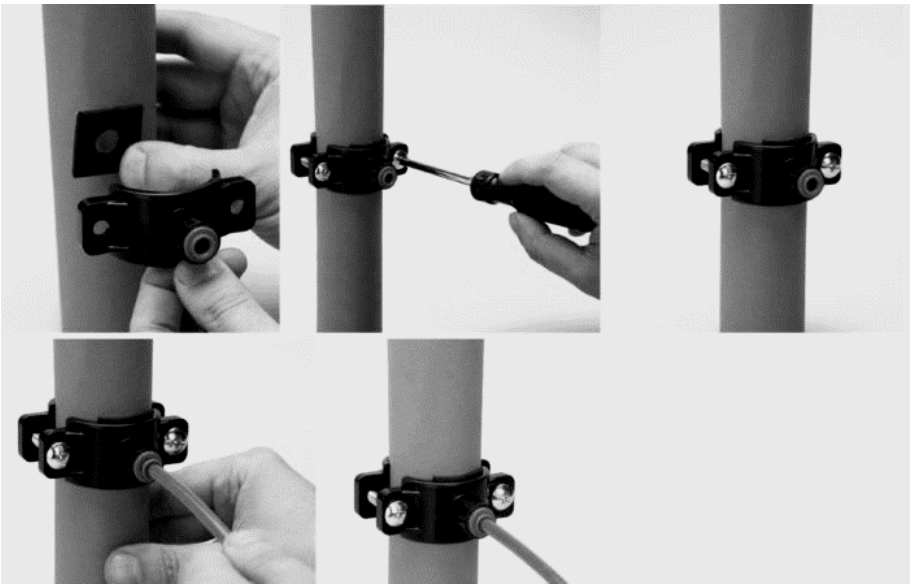
6. Insert the housing holder (1) into the L-shaped guide rails on the top cover (8) until the holes on top and on the bracket are aligned. Secure the structure with a retainer (2).
7. Connect the water purifier

Replace the filter cartridge in the proper time!

5.3. System Installation

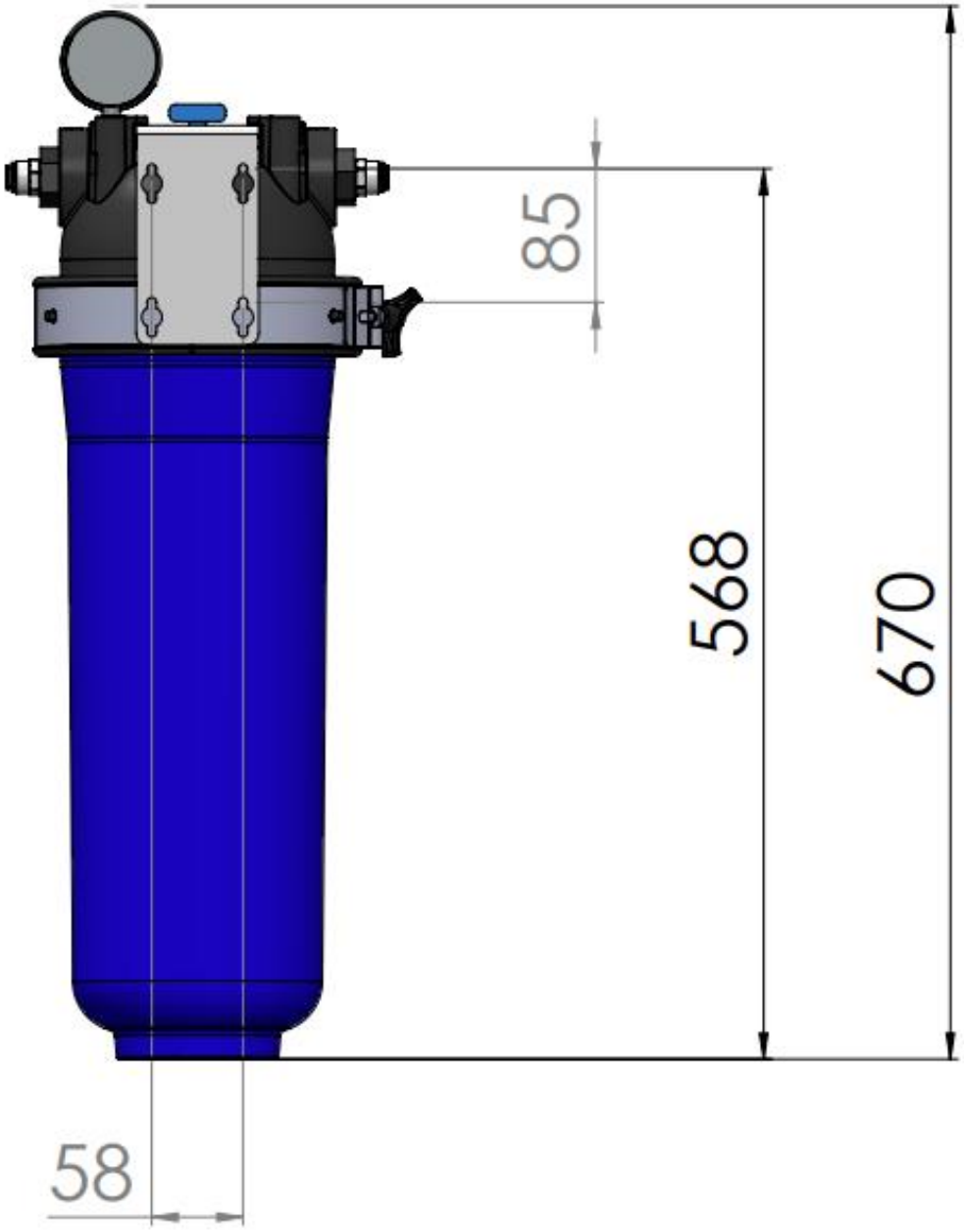
The system should be stored in a dry place at a temperature between +5 °C and +45 °C. It can be installed on the floor or hung on a wall (***Installation 5.4)***.

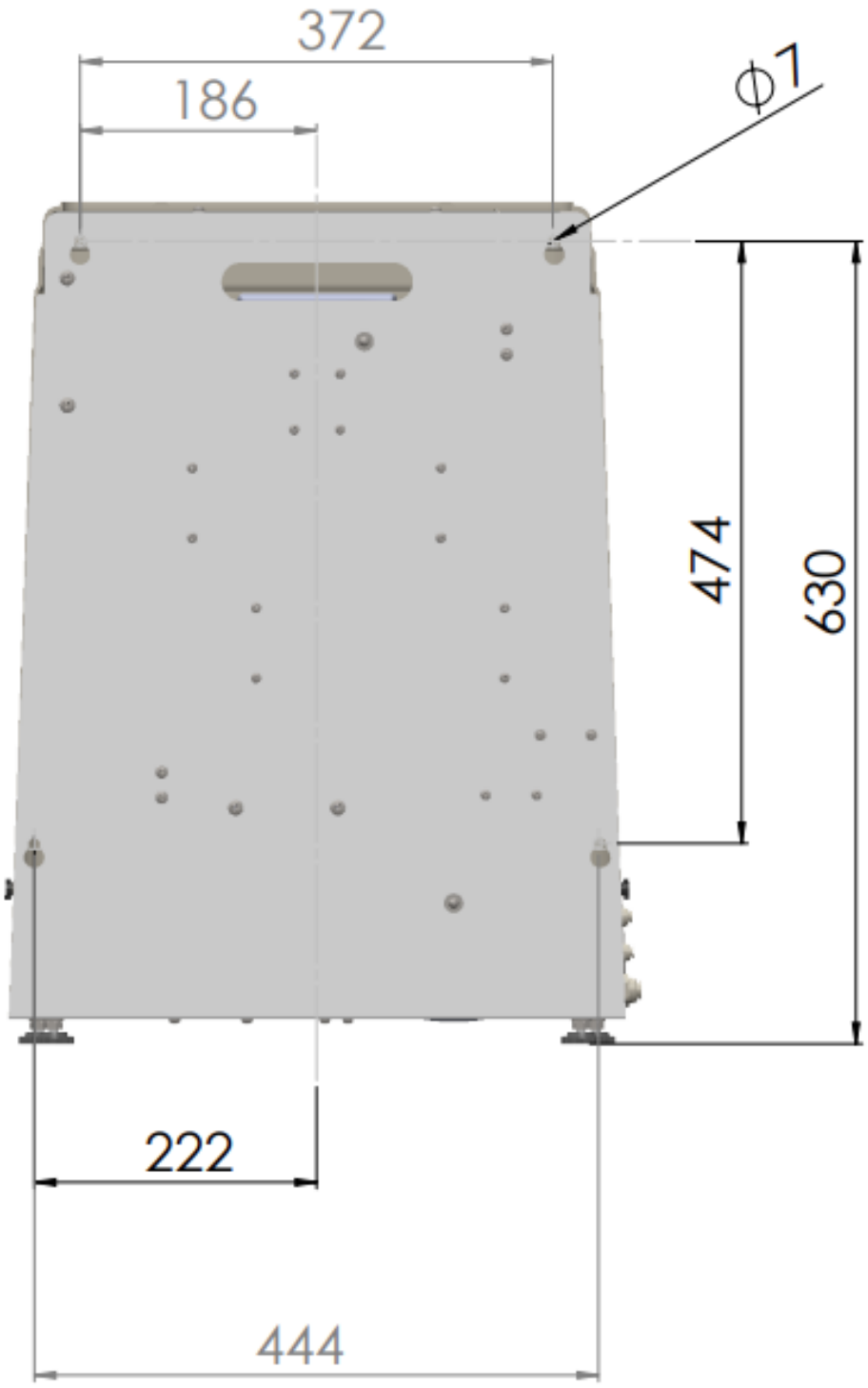
1. Unpack the system and place it to the permanent place of work.
2. A prefiltration unit should be installed on the floor with a stand fixed on a wall.
3. A prefiltration unit should be hung on a wall of the house (via a fixed stand). It is recommended that the unit is standing on the floor with a fixed stand to the wall (***Installation 5.2***).
4. Check if there is a cartridge inside the prefiltration unit. (***Installation 5.2, Maintenance 7.3***)
5. Pipe connection. Connect the water supply to the pre-filter inlet with a flexible pipe. From the pre-filter outlet, connect the pipe to the system's feed input. Concentrate pipe should be connected to drainage according to the picture below. Permeate pipe goes to water user with pressure tank or accumulation tank. Float valve the level of water in atmospheric accumulation tank.



6. Take off the cover of the system
7. and apply pressure to the pre-filter. Push the air release (red) button on top of the pre-filter to release the air. After the air is released, check the pressure indicator (PI-2), the pressure should be at least 2 bar but no greater than 6 bar.
8. Make sure there are no leaks. Connect the electricity plug to the power supply. The system should automatically start, a run indicator should turn ON.
9. Put the cover back on.
10. Squeeze the permeate supply tube for 5 minutes and make sure the system stops, a Stand-by indicator should turn ON. Release (unclench) the permeate tube and continually drain the 1st permeate for 20 minutes.
11. System is ready to use

5.4. Wall mounting and installation dimensions

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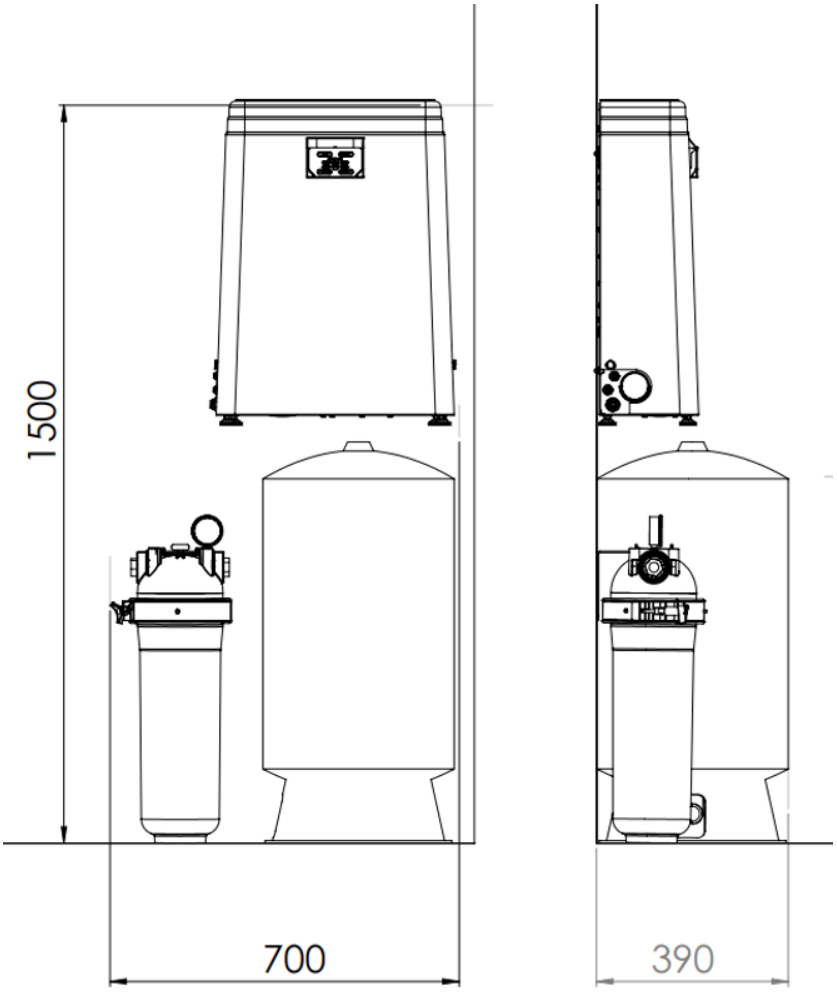
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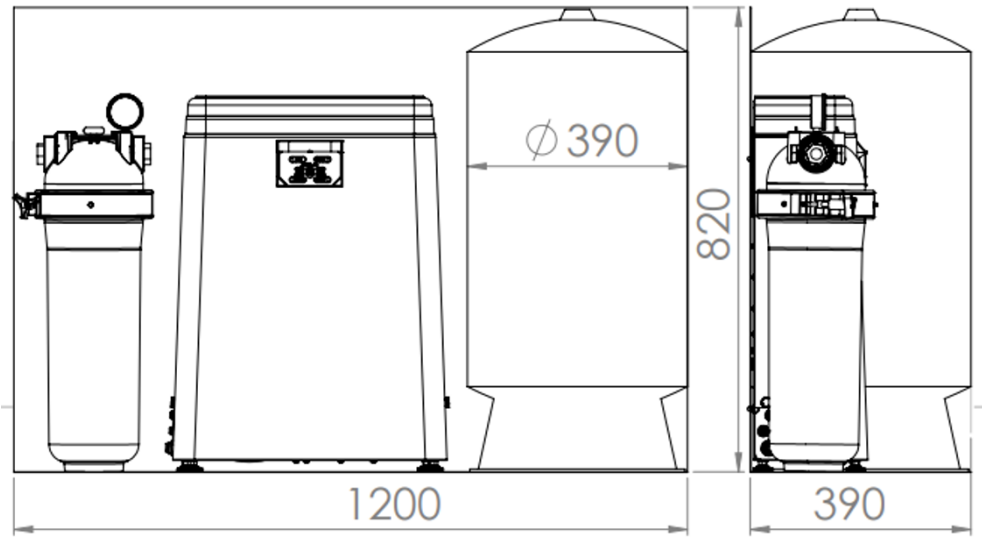
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1200
390

6. Troubleshooting

6.1. Low Feed Pressure

If **Low Press.** (Low Feed Pressure) indicator is ON:

a. Check on P-01 pressure. If the pressure is less than 2 bar, check feed water supply line.
b. If **Low Feed Pressure** indicator is ON after restarting the system, or the system turns ON and OFF repeatedly, check:
    - The pressure supply line
    - Cartridge condition
    - LPS-01 condition

6.2. STANBY indicator is ON while permeate tank is empty

STAND-BY indicator is ON, while permeate tank is empty:

- Check the permeate supply line
- Check HPS-01 condition

6.3. STANBY indicator is ON, system turns on and off repeatedly

STAND-BY indicator is ON, and the system turns on and off repeatedly.

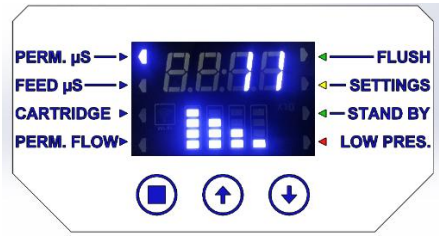
- Check the air pressure in T-01 (permeate tank). Make sure it is less than 0.8 bar.
- Check HPS-01 setup and condition

If the error remains, please, change T-01 and HPS-01.

6.4. RUN indicator is ON, no permeate produced

If RUN indicator is on, but the system do not produce permeate, check PI-02 pressure. It should be 5 to 10 bar.

- If PI-02 pressure is less or equals P-01 pressure, it means the pump P-01 has malfunction and it should be changed.
- If P-02 has no pressure at all, XV-01 (feed valve) has malfunction and it should be changed.

Alarm	Picture	Possible Reason/Solution
LOW PRES. Low pressure alarm **Attention!** The system will not operate before the problem is fixed.		➢ No pressure in the supply pipe **Solution:** Make sure the supply line has the required operational pressure (2 bar) ➢ The prefilter is clogged **Solution:** Perform a visual inspection of prefilter and replace it if necessary. ➢ Low pressure sensor (LPS) does not signal to open inlet valve XV-1 **Solution:** Conduct a visual inspection of the sensor, check whether the water inlet hole in the sensor is clogged.
CARTRIDGE The bottom indicators are blinking & the number on the screen is 0.		**Solution:** Replace filter modules. Reset the resource value to factory settings: simultaneously hold down the ⊕ ⊖ buttons for 6 seconds.
Perm. µS The current permeate conductivity is higher than the setup number. The numbers on the display are flickering.		➢ Membrane fouling **Solution:** Replace the membrane. ➢ Low pressure RO pump **Solution:** Make sure the pump is working. ➢ High inlet water TDS

7. Maintenance

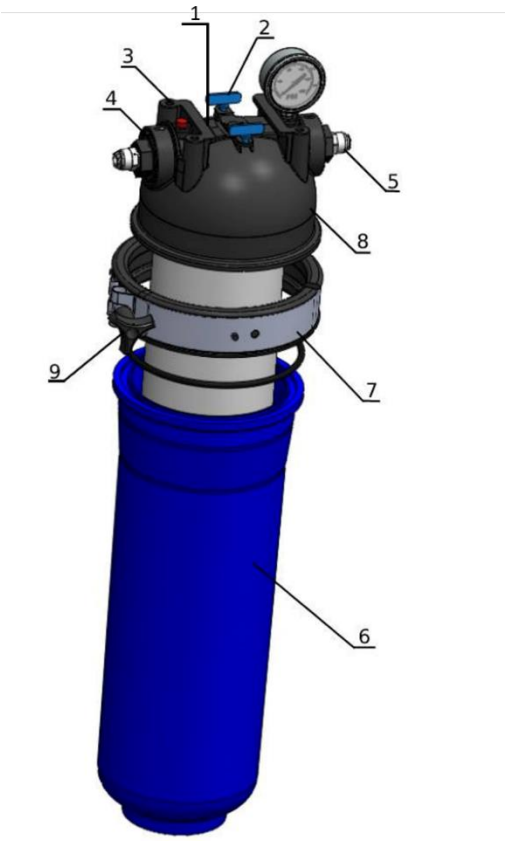
7.1. General Recommendations

1. It is recommended to replace the pre-filter cartridge (*Maintenance 7.3*) once every 3 months, or if the pressure is too low.
2. The RO membranes (MV-01/MV-02) and pressure pump (P-01) are recommended to be replaced once a year. Check the air pressure in both permeate and concentrate tanks (T-01/T-02). This pressure shall not be less than 1 bar and more than 1.2 bar*.
3. Permeate and concentrate tanks (T-01/T-02) are recommended to be replaced once every 3 years.

7.2. Tank Air Pressure Regulation

1. Empty the tank before pumping air to get an accurate pressure reading. To empty the tank, shut off the feed water to the system and turn on the outlet of the tank to drain water.
2. To check the tank's pressure, unscrew the air valve cover on the tank body. Use a low-pressure gauge to check the pressure reading. We recommend 1 - 1.2 bar for common use on our standard RO tanks.
3. If the pressure is below 1 bar, use a hand pump, electrical pump, or compressor to add air. Any remaining water will flow out from the outlet of the tank.
4. Once the recommended pressure is reached, reinstall the air valve cover, shut off the outlet of the tank, and turn on the feed water valve. The RO tank is successfully pressurized.

7.3. Prefiltration Cartridge Installation & Replacement



1. Shut off the water supply to the prefiltration unit.
2. Disconnect the quick-release couplings by unscrewing the union nuts.
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.
3. Remove the manifold and disconnect the filter cartridge by pulling it off the central fitting.
4. When replacing the cartridge, wash the inner surfaces of the manifold, bowl and rubber ring with water.
5. Install a new filter cartridge.
6. Assemble the water purifier, connect the manifold and the bowl with a clamp, and tighten the wing nut (9) until it stops.
7. Put the assembled water purifier into the housing (1). Make sure the water flow direction matches the direction of the arrow on the manifold.
8. 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.
9. Make sure there are no leaks.
10. The filter cartridge is successfully replaced.

8. 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 LPH – 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

System Equipment List

Tag	Name	Material	Connection size	Code
F-01	Cartridge Filter Housing	PP	1”	513990
LPS-01	Low pressure switch	Brass	1/4”	218001
XV-01	Feed valve	Brass	3/8”	217932
XV-02	Concentrate valve		1/4”	217923
XV-03	Drainage valve		1/4”	217923
P-01	Pressure pump		3/8”	208724
P-02	Recirculation pump		1/2”	217261
PI-01	Pressure Indicator		1/4"	217312
PI-02	Pressure Indicator		1/4"	217313
MV-01/02	Membrane housing	PP	3/8”	514771
T-01	Permeate tank	SS	1/4"	211823
T-02	Concentrate tank	SS	1/4"	211823
HPS-01	Permeate pressure switch	Brass	1/4"	217996
CV-01	Check valve	PVC	20 mm	217497
CV-02	Check valve		1/4"	212128
CV-03	Check valve		1/4"	201614
CV-04	Check valve		1/4"	201614
CV-05	Check valve		1/4"	201614
FR-01	Flow restrictor		1/4"	205069

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