



**AQUAPHOR**  
**PROFESSIONAL**  
WATER TREATMENT

## **REVERSE OSMOSIS SYSTEM**

### **APRO series**

## Installation and operation manual

Model: \_\_\_\_\_

Serial number: \_\_\_\_\_

Installation site: \_\_\_\_\_

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## 1. INTRODUCTION

The reverse osmosis system of Aquaphor (hereinafter RO system) manufactured by “Westaqua-Invest OÜ”(Estonia) on request “Aquaphor” (Russia, Saint-Petersburg). The RO system is designed to reduce the total salt content by reverse osmosis (desalination, demineralization, reduction of conductivity) water from municipal and local water supply systems (brackish water) under the correspondence of the requirements established by the demands.

The RO system is the most efficient and safe installation of desalination.

***Note: The RO system is not designed to solve all problems related to water treatment. For proper operation it requires pretreatment.***

Materials of RO systems are safety, non-toxic and do not release to the water any dangerous substances to health or the environment.

## 2. ASSIGNMENT

2.1 RO system is designed for the demineralization of water, i.e. removing dissolved salts, including hardness salts, heavy metals, Flouride, nitrate, ammonium, organic matter, bacteria, and viruses.

2.2 RO system version L is set to perform where electric power networks, water supply mains correspond to the present requirements.

2.3 The RO system is designed and manufactured to work in a continuous mode during the whole period of operation, provided that the requirements set out in this operating manual are continuous. Hold intervals are caused by routine maintenance, implementation of chemical washes, etc.

2.4 For optimized RO system selection and type of membranes the customer must provide a water sample for analysis.

### 3. DESIGNATION AND ARRANGED SETS

#### 3.1 Designation (formula) RO systems Aquaphor

#### Reverse osmosis system Aquaphor – model T-RO-X-Y-L-Z-Q-Q

Designation	Content designation	Transcript notation
T	Trade name (availability)	AP (Aquaphor Professional)
RO	Type of system	Reverse osmosis
X	Type of performance	S – small
		L – standard
		I – industrial
Y	Rated production system of clean water	From 125... up to 500000 L/h
Z	Pump(s) (availability)	C – Hydroo
		G – Grundfos
		W – Lowara
		T – Fluid-o-Tech
		P – Procon
		X – Pentax Pump
Q	Dosing pump (availability)	D
Q	Quantity of dosing pump	1-10

Example: **Reverse osmosis system Aquaphor model APRO L-1000-C**

Performance of the system – a big, nominal performance for clear water of 500 LPH, with a pump CNP, the basic version (pre-filter membrane, highly selective, the size of the membrane 4040, H – high-pressure).

### 3.2 Configuration of the system

№	ITEM	Type	Quantity of elements				
			APRO L-500	APRO L-750	APRO L-1000	APRO L-1500	APRO L-2000
F01-F02	Filter housing	“Gross20”	2	2	2	2	2
	Polypropylene	PP 20 mkm	1	1	1	1	1
	Carbon filter	BB carbon	1	1	1	1	1
LPS 01- LPS 02	Low pressure switch	P6E	2	2	2	2	2
HPS 01	High pressure switch	P30DE	1	1	1	1	1
XV-01	Inlet actuated valve	DN 20 220V DN 25 220V	1	1	1	1	1
XV-02	Flush valve	DN 16 220V DN 20 220V DN 25 220V	1	1	1	1	1
PI1- PI2	Pressure gauge	0-10 bar	2	2	2	2	2
V-01	CIP valve	3/4", 1”	1	1	1	1	1
P-01	High pressure pump	Hydroo, Grundfos	1	1	1	1	1
MV-XX	Membrane housing (XX – number housing)	4080 4040	2	3	4	6	8
RV01	Pump pressure regulation valve	1”	1	1	1	1	1

№	ITEM	Type	Quantity of elements				
			APRO L-500	APRO L-750	APRO L-1000	APRO L-1500	APRO L-2000
RV02-RV03	Regulative valve	½" ( ¾" / 1")	2	2	2	2	2
CV01-CV03	Reverse valve	½" ( ¾" / 1")	3	3	3	3	3
FL01-FL03	Flowmeter	½"( ¾" / 1")	3	3	3	3	3
ECT-20	Conductivity sensor	CON3134-14	1	1	1	1	1
	Controller	CCT-7320	1	1	1	1	1
	Control panel	220/380B	1	1	1	1	1
	Frame		1	1	1	1	1
	Passport		1	1	1	1	1
	Packing		1	1	1	1	1

#### 4. SPECIFICATION

MODEL	AP RO L-500	AP RO L-750	AP RO L-1000	AP RO L-1500	AP RO L-2000
Power supply	380B , 50Hz				
Reduction of salt content, %	до 99,7				
Membrane’s type	2 x 4040	3 x 4040	4 x 4040	6 x 4040	8 x 4040
Production of clean water LPH	500	750	1000	1500	2000
Input flow of water at a pressure of 3 bar	0,8—1,1	1,2—1,65	1,6—2,2	2,4—3,3	3,2—4,4
Systems recovery, %	45-85				
Mass (kg) + packing	210	215	220	225	240
Power consumption, Wt	1500	1500		3000	
Dimensions, mm	1775 / 1210 / 915			1200 / 860 / 1510	
Sizing ( inlet, outlet, concentrate)	1” / ¾” / ¾” NPT (PB)				

#### 5. REQUIREMENTS FOR THE QUALITY OF SOURCE WATER

5.1 Chlorine: If the water is chlorinated you need to install a carbon filter

5.2 Hardness: If water hardness exceeds 17 ppm, it is necessary to established water softener or antiscalant dosing system.

5.3 Fe: If the concentration of iron ions in the raw water is more than 0,1 mg/l, Iron removal system must be installed.

Membranes performance data refers to inlet temp of 25°C, it decreases with a reduction of the raw water temperature.

Example: Reduction temperature of raw water of 1°C can decrease production by 3%.

## The operating parameters of the raw water

PARAMETERS	VALUE
Temperature of raw water	+5...+35 °C
Minimum pressure of raw water	40 PSI (2,8 kg/cm <sup>2</sup> )
Minimum flow of raw water	2,0 m <sup>3</sup> /h
Maximum concentrate to flow	1,25 m <sup>3</sup> /h
Operating temperature range	4 – 45 °C
Allowed (optimum) PH range	3 - 10 (7 – 7,5)
Hardness	Not more 17 (ppm)
Turbidity	Not more 5 SDI
Mineral oil	-
Salinity (TDS)	5000 mg/l
Fe total	Not more than 0,1mg/l
Oxidizers (chlorine, ozone, KMnO <sub>4</sub> )	Not more than 0,1 mg/l
Manganese (Mn)	Not more than 0,05 mg/l
Organic impurities	Not more than 5 mgO <sub>2</sub> /l

**Note:** *In the case of non-compliance of your water requirements, Additional stages of treatment may be required we will recommend the most suitable system upon your water quality and requirements.*



## 6 EQUIPMENT AND PRINCIPLE OF WORK

### 6.1 Equipment



#### 6.1.1 Drawing of process

##### Protective filter:

The filter Gross 20 with a module B520-12 (CB) is installed at the entrance of the installation to protect the RO membrane from influence of active chlorine. It is made of sintered powdered activated carbon in a polymeric matrix (technology Carbon Block).

The filter gross 20 with module PP5 micron is installed after the CB filter to prevent particles larger than 5 microns to enter the RO system. Filter element is made of polypropylene. It is necessary to replace regularly the filter modules in order to keep the water feed rate, and also to avoid ingress of chlorine, solid particles in the membrane modules

Replacement instructions: Shut off the system from electricity, make sure there is no pressure (relief the pressure if needed), put a container under the system, with special key open the housing of Gross. Remove the old module, pour the water. If necessary, wipe the housing and the top cover. Install the new module. Set back the housing vertically, tighten the nut of the housing by hand and gently close it with a key.

After replacement , inspect the modules by opening slightly the CIP valve , switch on the system and close after a few seconds.

#### 6.1.2 High-pressure pump

RO system can be equipped with pumps of different manufacturers and brands.

##### 6.1.2.1 Instruction of operation

Install a pressure regulator to ensure the recommended pressure at the inlet of the RO system, switch the pump to automatic mode. Automatic operation of the pump is

provided by water level sensors in the water feed tank, clean water tank, and the input pressure switch.

6.1.2.2 Before starting the pump, unscrew the venting plug located on the top of the pump to release the air.

6.1.2.3 If the pump is used after a long period of shut down, firstly check the free rotation of the fan motor, to ensure it is not jammed due to corrosion.

### 6.1.3 Installation of reverse osmosis.

Before installing the membrane, the piping must be flushed to eliminate the dust formed during the installation, or other debris in the system with the high-pressure reverse osmosis pump. Warning: direction of fitting the membrane strictly defined and indicated by the arrows.

### 6.1.4 The principle of water purification reverse osmosis system.

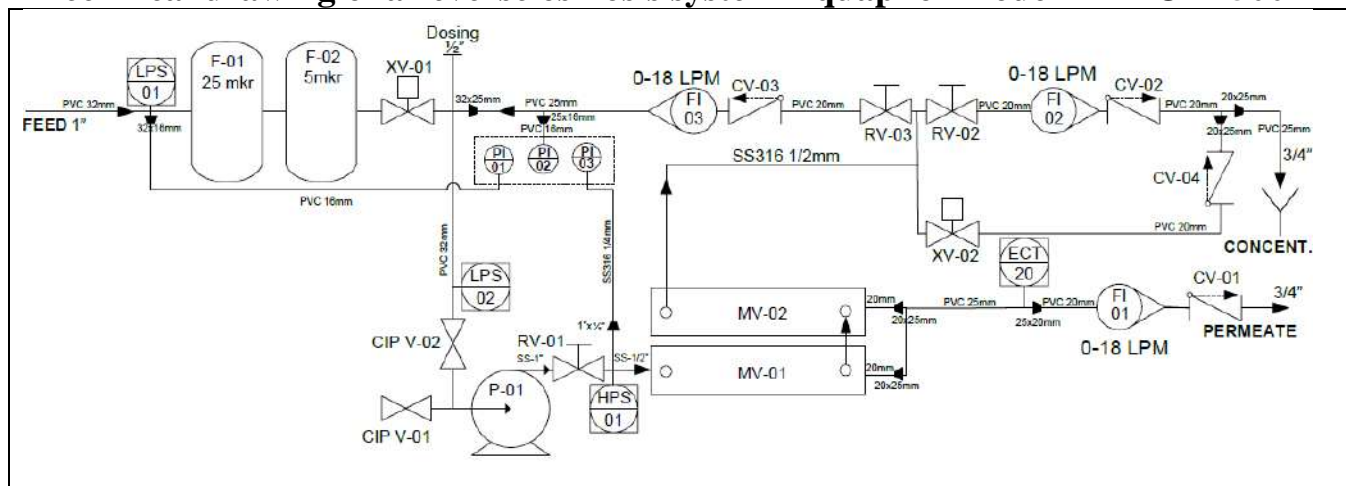
The system is set to use reverse osmosis membrane. With proper maintenance of the RO system, the lifetime of the membrane is 3-5 years and over. RO system is based on the method of membrane separation that allows to remove salt ions, organic compounds, bacteria and other impurities from the water with the aim of purification or desalting. It is based on the principle of separation of permeate (clean water) and concentrate (dirty water) through the membrane. Water tends to get to a solution – a process called osmosis. Between water and solution is the osmotic pressure. If the solution is provided with more pressure than the osmotic pressure then permeate (water) to be filtered through the membrane will not desalt the solution properly. Thus, it takes desalting by reverse osmosis. With sufficient pressure, the raw water passes through the RO membrane, and permeate as purified water. The concentration of solutes and suspended particulates gradually increases and discharge to the drain. This is the principle of operation of water purification by reverse osmosis system.

## 6.2 Technological drawing of the reverse osmosis system

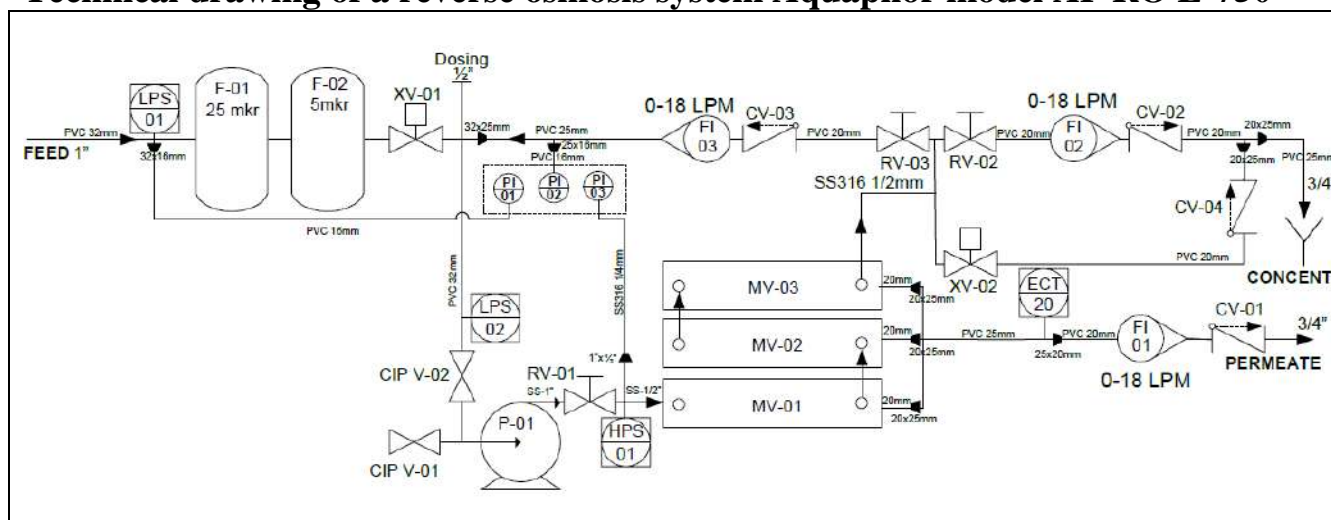
Raw water passes through the protective filters, which allow to remove chlorine and most of the suspended particles, and enters to the high-pressure pump, which builds pressure up to 100-250 PSI (pressure required depends of the type of membrane). Then, water is fed to the RO membranes under pressure. The RO membranes are installed in the housings and produce separating permeate (product, i.e. purified water) and concentrate (drainage).

№	Item	№	Item
F-01	Micronic filter	MV-XX	Housing of membrane (xx-the number of housing)
F-02	Micronic filter	RV-01	Pump pressure regulation valve
LPS01	Low pressure switch	RV-02	Concentrate flow regulation valve
LPS02	Low pressure after filtration	RV-03	Recirculation flow regulation valve
HPS02	High pressure switch	CV-01	Check valve permeate
XV-01	Solenoid inlet valve	CV-02	Check valve concentrate
XV-02	Servo valve	CV-03	Check valve recycle
PI1	Feed pressure gauge	CV-04	Check valve wash line
PI2	RO inlet pressure gauge	FL-01	Permeate flow indicator
PI3	RO pump pressure	FL-02	Concentrate flow indicator
V-01	CIP valve	FL-02	Recirculate flow indicator
P-01	RO pump	ECT-20	Conductivity sensor

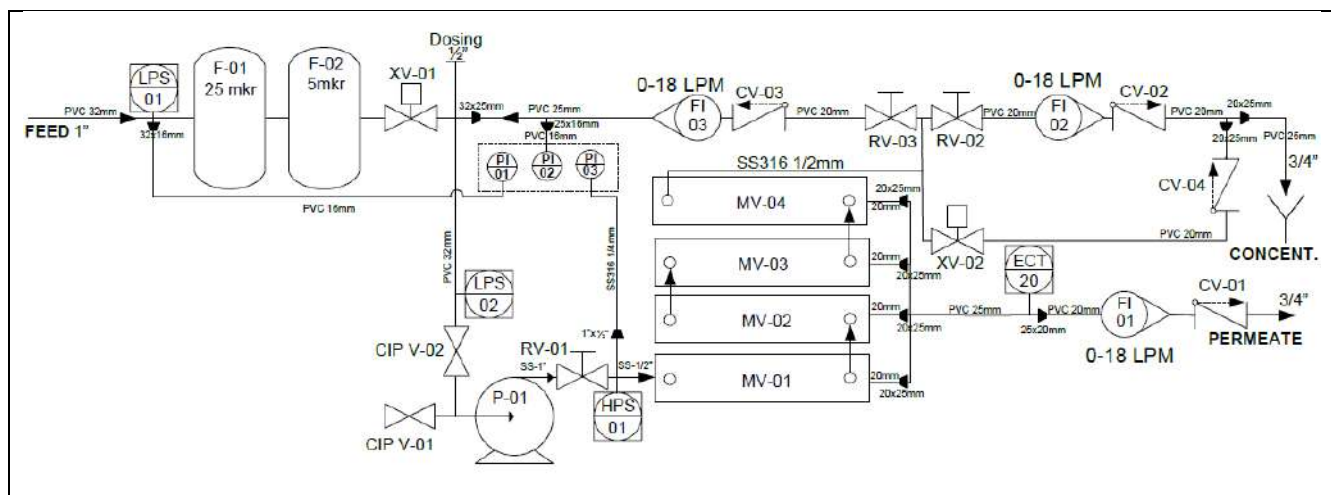
### Technical drawing of a reverse osmosis system Aquaphor model AP RO L-500



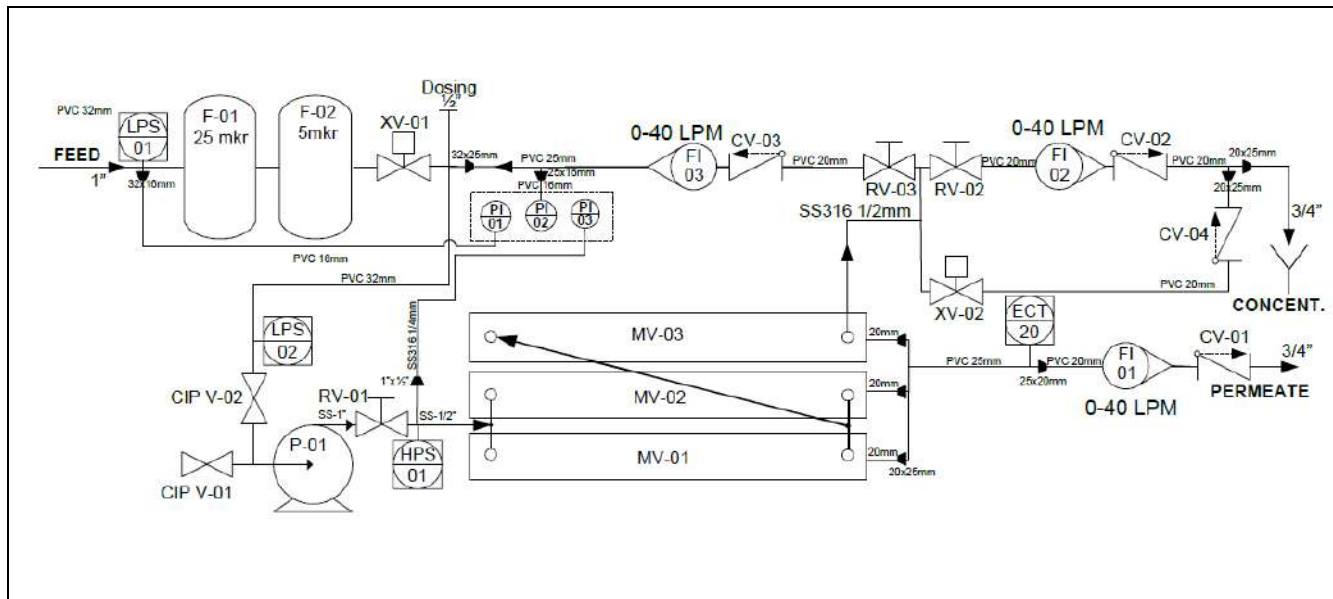
### Technical drawing of a reverse osmosis system Aquaphor model AP RO L-750



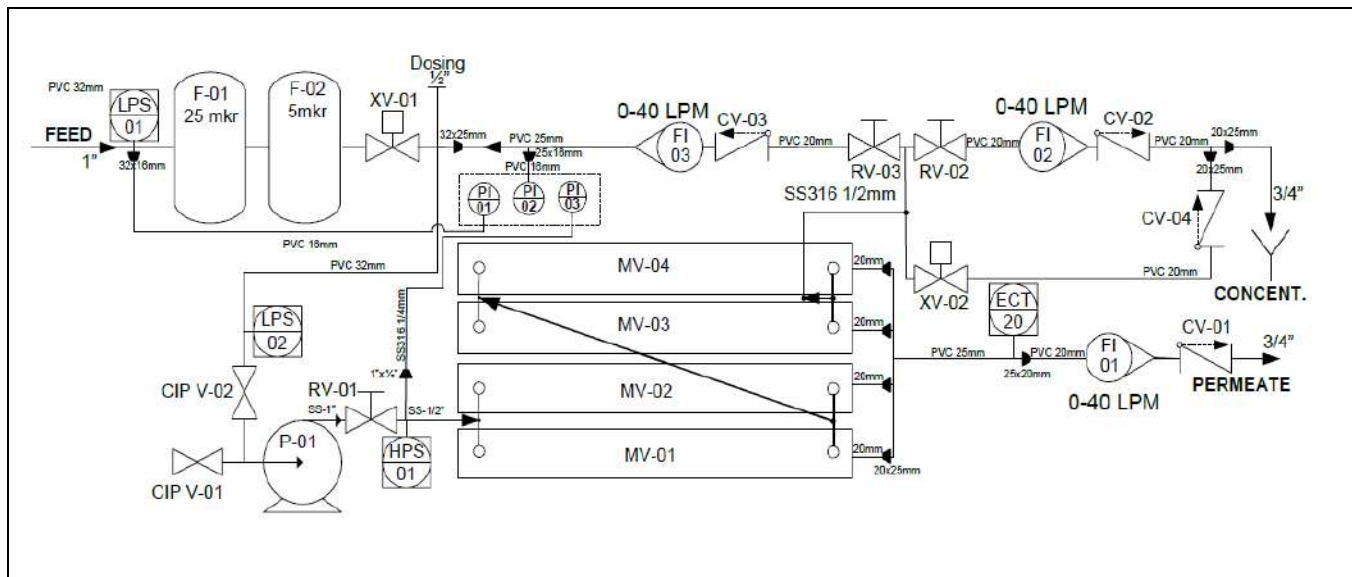
### Technical drawing of a reverse osmosis system Aquaphor model AP RO L-1000



## Technical drawing of a reverse osmosis system Aquaphor model AP RO L-1500



## Technical drawing of a reverse osmosis system Aquaphor model AP RO L-2000



## **7. INSTALLATION OF REVERSE OSMOSIS SYSTEMS**

### **7.1 Attention**

- The system must be installed in a dry place, out of direct sunlight. Excessive moisture can cause failure of electrical components.
- Make sure that the location of the installation is suitable and provide enough space for servicing.
- In case of mismatch of raw water requirements which are in a passport, install the necessary elements of water treatment recommended by your service representative or RO system supplier: multimedia filter, iron removal system, filter based on coal sorbents, softener, ultrafiltration system, etc.
- The frame of the RO system must be lined up and leveled.
- In order to prevent malfunction of the RO system, the temperature in the room where it is installed should be between 4 ÷ 45 ° C.
- The level in the tank with permeate must not be higher than 1,5m above the level of the permeate line (exit from the membrane), otherwise the system may malfunction (for version without check valve on permeate line).
- The diameter of the supply lines (permeate) must be less than the diameter of the connecting lines of the RO system.
- Please view carefully the drawing connections and check the characteristics of the electrical network.

### **7.2 Connection**

7.2.1 It is desirable to place the RO system close to the water supply and electricity grid.

7.2.2 Connect the RO system to the raw water supply, permeate line and the drain line respectively.

7.2.3 Connect the power, make sure that the frame of the RO system is grounded, turn on the power, the power LED should light up.

7.2.4 In case of 3- phase power supply, check the rotation direction of the motor for a few seconds.

7.2.5 Before supplying water to the RO system inlet, it is recommended to start-up and wash each stage of prefiltration, if it is installed.



### 7.3 Start-up

7.3.1 Start the pump of raw water and hold up a low pressure of at least 2 kg/ cm<sup>2</sup>. Turn the switch of the system to manual control (CIP). Open the valves V-01 and RV-01, but do not close completely valves RV-02 and RV-03

7.3.2 Pass water through the RO system for 10 ~ 15 minutes for removing air.

### 7.4 Security measures

7.4.1 In order to handle the RO system, you must be trained with the principle of operation, design and operating rules and safety guidelines.

7.4.2 The RO system is subject to all safety requirements of electrical equipment with voltage 220/380B 50 Hz.

7.4.3 The RO system should be connected to a grounded power source.

7.4.4 Do not open the electric control box or conduct manipulation with the electrical components of the RO system, while it is energized.

7.4.5 It is forbidden to make any installation and/or change of the system while it works.

### 7.5 Commissioning

7.5.1 Prepare to work (carry out in manual mode):

New RO membranes are soaked with conserving agent. before using them for the first time , it must be thoroughly rinsed. Fully open valves RV-01 and RV-02, close the valve RV-3. Start the raw water pump and high pressure pump. Achieve stable operation of the pump, covering the valve RV-01 (When the high pressure pump is working, **do not** close the valve RV-01 more than 2-3 times).

**WARNING:** Proper adjustment of the valve RV-01 is needed to eliminate the effect of cavitation. If you have no experience, do not attempt to configure the system, call for service. Improper adjustment can lead to pump failure.

Make the system work for 30 minutes, then adjust the valves RV-01, RV-02 to ensure proper operation and leave the system to work for 1 hour, while the permeate is derived to the drainage.

7.5.2 Run the RO system:

After washing the membranes, slowly adjust the valve of concentrate RV-02 and valve of recirculation flow RV-03, increasing the operating pressure up to 100-250 PSI (it depends of the type of membrane element).

Achieve the ratio of permeate and concentrate up to 70/30% (60/40, 80/20, etc. depends on salinity, requirements for the quality of purified water, and the type of the membrane element). The output capacity of the permeate should be ~ 500-2000 liters /h, and concentrate should be 150 to 600 l / h, depending on the model.

**Attention:** Depending on the raw water quality and the type of membrane elements, the ratio of concentrate and permeate can be changed. The optimum ratio of permeate and concentrate can be provided after a full water analysis in order to evaluate the quantity of cations and anions of the dissolved salts.

If the flow of concentrate or permeate is not correspond to the values, adjust the flows of valves RV-02 and RV-03. Changing the flows and/or increasing the permeate flow will result in scaling, which will reduce the interval between the cleaning treatment and reduce the life of the RO membranes.

7.5.3 Check the working pressure and compare it with the results of the first test and the technical characteristics.

7.5.4 Check the presence of water at the outlet.

7.5.5 Check the system for leaks, remove them if necessary. Before working de-energized the system, release the pressure.

7.5.6 Check the concentrate flow.

Note: After the start of operation, write the display values of the RO system, they can help to predict the regulation for system maintenance.

## 7.6 Operation

7.6.1 Pressure and the degree of regeneration.

The system works at a design pressure. The operator must adjust the release valve of the concentrate so that the operating pressure should be 100-250 PSI (depending on the type of membrane), a maximum of 250 PSI and flow permeate should be 50-90% of the feed water flow. Guided by the following principles:

7.6.1.1.1 Pressure in the system should not be more than maximum allowable.

7.6.1.1.2 The capacity of the concentrate will be in the operation range.

7.6.1.1.3 Productivity for purified water (permeate) is calculated according to temperature of raw water.

7.6.1.1.4 If the flow of permeate and total water consumption is reduced, system must be flushed.



#### 7.6.2 Replacement of membranes.

If the degree of demineralization is reduced after changing or servicing the reverse osmosis membranes, it is possible if the membranes are damaged or installed not correctly.

7.6.3 This RO system has the function of low pressure protection. If the pressure of the raw water or water after the pre-filtration is below the minimum operating pressure, the RO system will stop.

**7.6.4 Never close the regulator of concentrate and/or the pump valve completely. This will lead to a sudden increase of pressure and damage to the RO system. Also the system will be under high pressure, it is not safe for service staff.**

7.6.5 The conductivity meter installed on the purified water, allow you to see the effectiveness of the RO system.

7.6.6 At the first start-up it is necessary to drain purified water to flush the RO system.

### **7.7 Maintenance operations at shutdown**

#### 7.7.1 Short shutdown (1 ~ 3 days)

When the ambient temperature is 5 ~ 35 ° C, you can turn off the system as a normal shutdown. After turning the system on, the RO system should operate for at least 1 ~ 2 hours.

#### 7.7.2 Long shutdown period (more than one week) will require the following steps:

7.7.2.1 Soak the membranes in a 1% solution of sodium bisulfite.

7.7.2.2 Soak the membranes in 0.5% formaldehyde solution (it is not recommended to use this chemical for installations operating in the food and medical industries).

7.7.2.3 If the ambient temperature is below 0 ° C, it is necessary to add antifreeze.

Sodium bisulfate 2%

Propylene glycol 40%

Clean water 58%

This solution passes through the RO system. Drain the liquid chemical agents in conjunction with the flush water for 3 minutes. Stop the pump and close the RV-01, RV-02 and RV-03 valves. This solution must be replaced after 2 months maximum. If the shutdown period is more than 2 months, you must fill in a fresh solution.

## **7.8 Mode of operation**

The unit has two modes – automatic and manual (CIP). Fully automatic operation is operated by the RO controller, the water level sensor, the pressure sensor and the TDS meter. In most cases the system is able to provide a continuous supply of water automatically.

## **8. CONTROL SYSTEM**

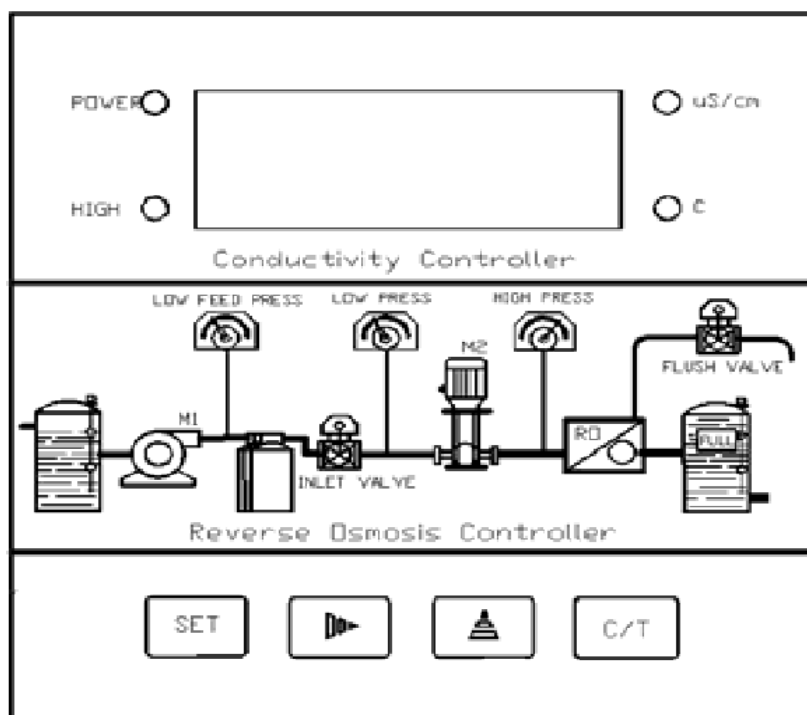
### **a. Control system and indication**

RO system equipped with a switch system operating modes “AUTO” – automatic mode, “OFF” – switch off and “CIP” – manual mode. Fully automatic operation is operated by the controller. In most cases the system is able to provide a continuous supply of water automatically. If necessary, it is possible to switch to manual mode, eg; for flushing the membrane. It is necessary to switch from “AUTO” to “MANUAL” or “CIP”. The switch “EMERGENCY STOP” de-energizes the entire electrical circuit and is activated by turning in the direction of the arrows which is drawn on it (typically clockwise). To re-power the RO system is necessary to press the switch “EMERGENCY STOP”. To reset the conductivity controller in the case of emergency stop, you need to press the "RESET" button.

### **b. Conductivity controller**

Your system is equipped with a conductivity controller with the function of TDS meter with temperature compensation mode, in the presence of the corresponding conductivity sensor, on the screen the controller will display the conductivity of the raw water in the “on-line”. The controller monitors the status of various sensors and controls the operation of the RO system, based on the adjusting algorithm, the standard for the majority of osmosis.

Visual screen display of the work process intuitively and immediately gives an idea of the condition and operation of various modules of the RO system.



### c. Technical parameters of the controller

Voltage	AC 220V $\pm$ 15% 50 Hz
Power consumption	$\leq$ 2 W
Operating temperature range	0-45°C
Interval operating humidity	$\leq$ 85%
The load capacity of the output contacts	5A / 250VAC (constant load)

### d. Indication of the controller

The drawing below shows the panel with the indicators responsible for following functions and parameters:

° C-temperature display, indicating that the displayed value is the current value of the fluid temperature.

µS / cm (mkSm / cm) - Indication of conductivity values, indicating that the displayed value is the value of the conductivity produced at the moment.

M1 (feed pump) - Indication of the feed pump displays as ON state.

INLET VALVE - Indication of the inlet solenoid valve, it displays as ON state.

M2 (high pressure pump) - Indication of the high pressure pump, displays as ON state.

FLUSH VALVE (flushing valve) - indication of the flush solenoid valve, displays as ON state.

FULL - indication of the filling process of the permeate tank, shows the upper limit level of permeate in the tank.

LOW FEED PRESS (LOW PRESSURE OF WATER SUPPLY) - The alarm indicator of low water level. The indicator lights in the absence or lack of water in the raw water tank.

LOW PRESS (low pressure) - Indication of the pressure sensor at the entrance to the high pressure pump. The indicator lights when the pressure of the water supply is too low on the entrance of the high pressure pump.

HIGH PRESS (high pressure) - Indication of abnormal high pressure at the pump outlet. The indicator lights when the pressure is too high at the outlet of the high pressure pump (for models with index "S" transducer are not included).

CD max (max. conductivity) - the alarm of exceeding the limit of conductivity.


SLP (sleep\waiting) - the system is in standby mode.


FULL (shown in the sign display) full tank of water, lit the lamp «FULL».

ALARM (error) (shown in the sign display) - the presence of the error lights the lamp "ALARM".

### Display panel controller

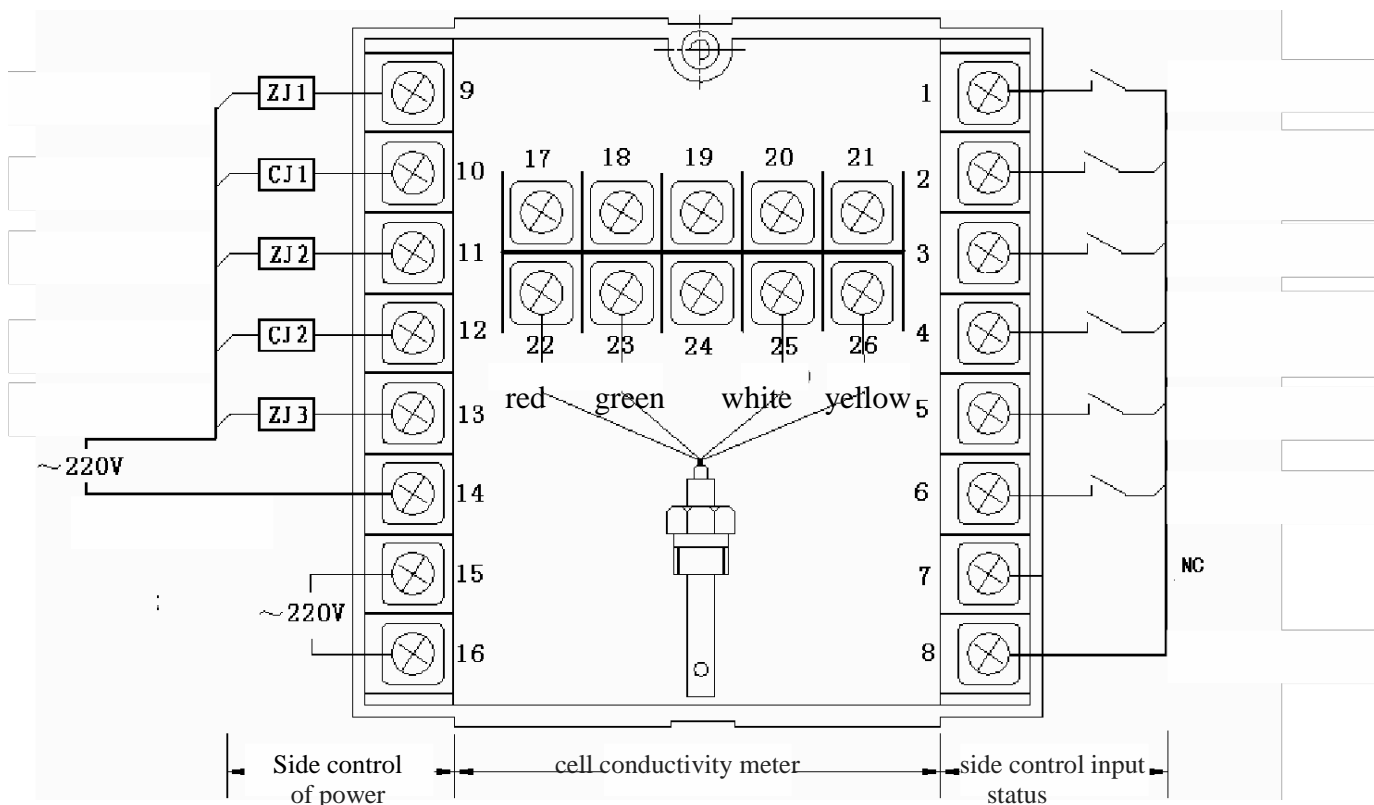
**SET** - button parameter setting, selection of the parameters to change the display

 - circular selection discharge – thousands, hundreds, tens and units, selected number is flashing

 - setting the value of the selected item (cyclically from 0 to 9)

**C/T** - button C/T, confirmation the saving of changed parameter or switching over between the value of the conductivity and temperature in measurement mode

## 8.5 Connecting and configuring the controller



Attention: The controller is working with low-power relays, using large inductive load must be applied with relays or contactors. Direct connection will damage the contact or shorten its life.

Designation:

ZJ - intermediate relay

CJ - magnetic contactor

The drawing shows the connectors which are located on the rear panel. The panel is equipped with the following connectors:

### Connectors from top to bottom on the left:

9 - exit control signal on / off high-pressure pump (normally open, passive)

10 - output control of the upper limit of the conductivity (normally open, passive)

11 - output control signal on / off the low-pressure pump (normally open, passive)

12 – output control signal on / off control input of the valve (normally open, passive)

- 13 - output control signal on / off solenoid valve flushing (normally open, passive)
- 14 - common connector (using together to control signal outputs 9, 10, 11, 12 and 13)
- 15, 16 – terminals of power supply in 220 V

**Connectors from top to bottom on the right:**

- 1 – input high water level sensor in the storage of permeate (normally open, closes in the case of low water level in the storage of permeate).
- 2 – relay input of over-pressure pump (normally closed, is opened in the case of excessive pressure).
- 3 - relay input of low pressure permeate (normally open, closes at a given pressure).
- 4 - sensor input of lack in feed water (normally open, closes at the presence of water).
- 5 - a contact of external switch, ECS (system works when the contact is closed). ECS may be controlled by push-button switch on the control panel, if the pushbutton is not used, lock out the contacts 5 and 8.
- 6- The reset signal can be connected to the reset button on the control panel which uses to unlock and reset the alarm in the event of high or low pressure.
- 8 - the general conclusion to be used for the sensor signal contacts 1,2,3,4,5 and 6.

**Connectors from left to right at the middle:**

- 22 - input wire of electrode conductivity measurement (green wire).
- 23 - input wire of electrode conductivity measurements (red wire).
- 25 - input wire of electrode conductivity measurement (white wire).
- 26 - input wire of electrode conductivity measurement (yellow wire).

Other connectors including contacts 7, 17, 18, 19, 20, 21, 24 have no internal connection.

**Mode of operations:**

When the controller is turned on, the lamp lights «POWER», and the display panel will show the conductivity value. Turn ECS (« CONTROL OF RO »to" AUTO "), the system will start to filter the water, if you turn off the ECS, the system will be in "hold" mode.

Press the "SET", the display panel will show "1000" (the constant of electrode). Press the button "SET" again, and the display will show the following menu items:



"1.000" constant of electrode. This value is suitable for most electrodes, other electrodes require to change the value in according with the manufacturer's recommendations. Default Value is "1.000".


"200.0" The limit for electrical conductivity of the electrode. The default value "100.0" The duration of flushing "A - 050" "005" is the default value in seconds, the range can be changed from 0 to 249 seconds. If fixed with "90", it will wash for 90 seconds every time the system starts.

The duration of the washing «B - 050" "005" is the default, the range is 0-249 seconds. If set to "90", the system will flush 90 seconds every time the system stops after filling the tank of permeate, or if the system is restarted in the case of a low water level in the storage source water.

The interval between washes "C - 99" "03" default value in hours, in the range of 0-99 hours. If set to "03", the system will flush the membrane every 3 hours of continuous operation or standby mode.

If you are not satisfied with the parameters, you can change them using the buttons



When changes are made, press the button  to save your changes and return to the control and measurement (if you don't press this button, after 3 minutes the system returns to the control and measurement automatically, but the changes will not be saved).

**If your system has the function of washing membranes (index F)**

**ATTENTION:** The system is equipped with SERVO VALVE for membranes washing. This valve is more reliable and is better suited for RO systems operating at high pressure (more than 1 mPa). Servo valve helps eliminate such factors as a breaking membrane of solenoid valve and clogging salts from drainage water, which leads to uncontrolled drain water.

The RO system must keep those parameters:

Flush time A- not less than 50 seconds

Flush time B - not less than 50 seconds

This time is necessary to fully close the servo valve (~ 45 seconds). In the switch position "RO CONTROL» «OFF» and «CIP» servo valve will be open, and it will be a red indicator. Additionally, the valve position can be determined by mechanical

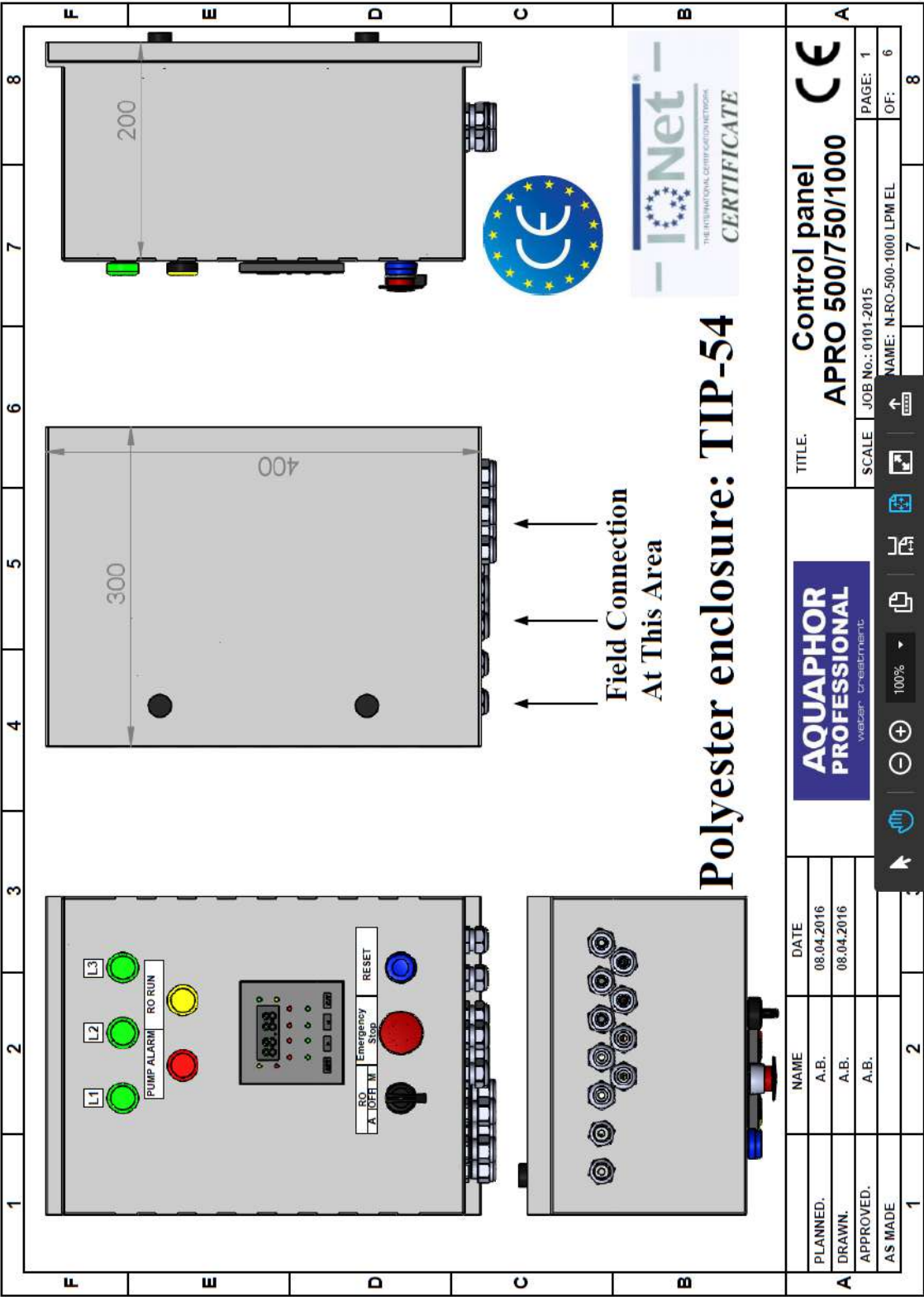
indicator - arrow, which is located on the cover of the drive. When you switch to the "AUTO" valve begins to close.

In this case high-pressure pump will also start with a pause which you choose, when the valve is fully closed. This is done with a purpose in order to prevent shutdown of the system by work out sensors feed water, and exhaustion (the formation of a vacuum) inlet line. If the input pressure and flow is enough the flushing time can be shortened with a purpose to extensively flushing the membranes.

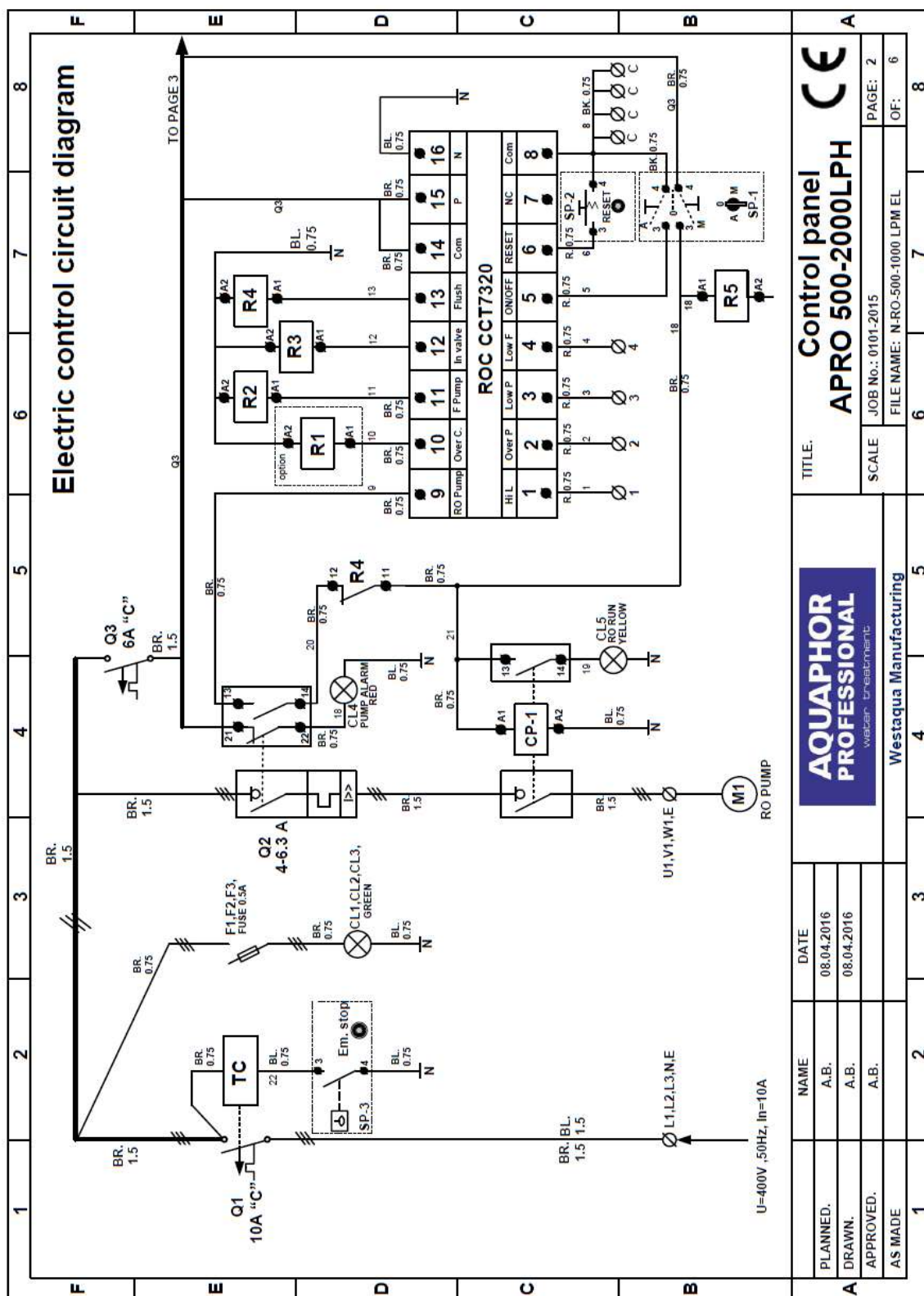
NOTE: Draining concentrate after filtration is carried out without the high pressure pump with a closed drain valve by the pressure of water supply and if the recycling drainage is missing.



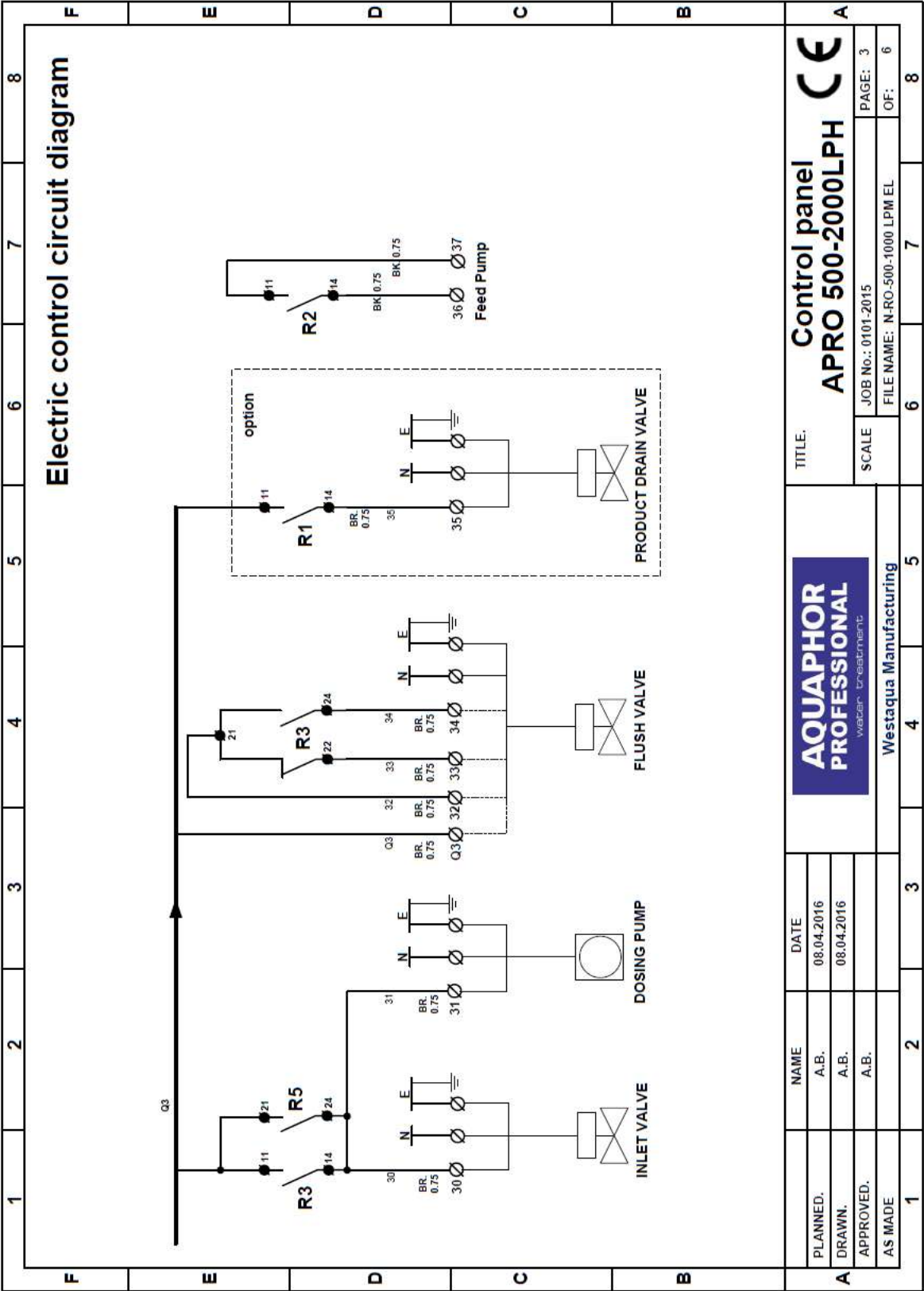
Electrical drawings



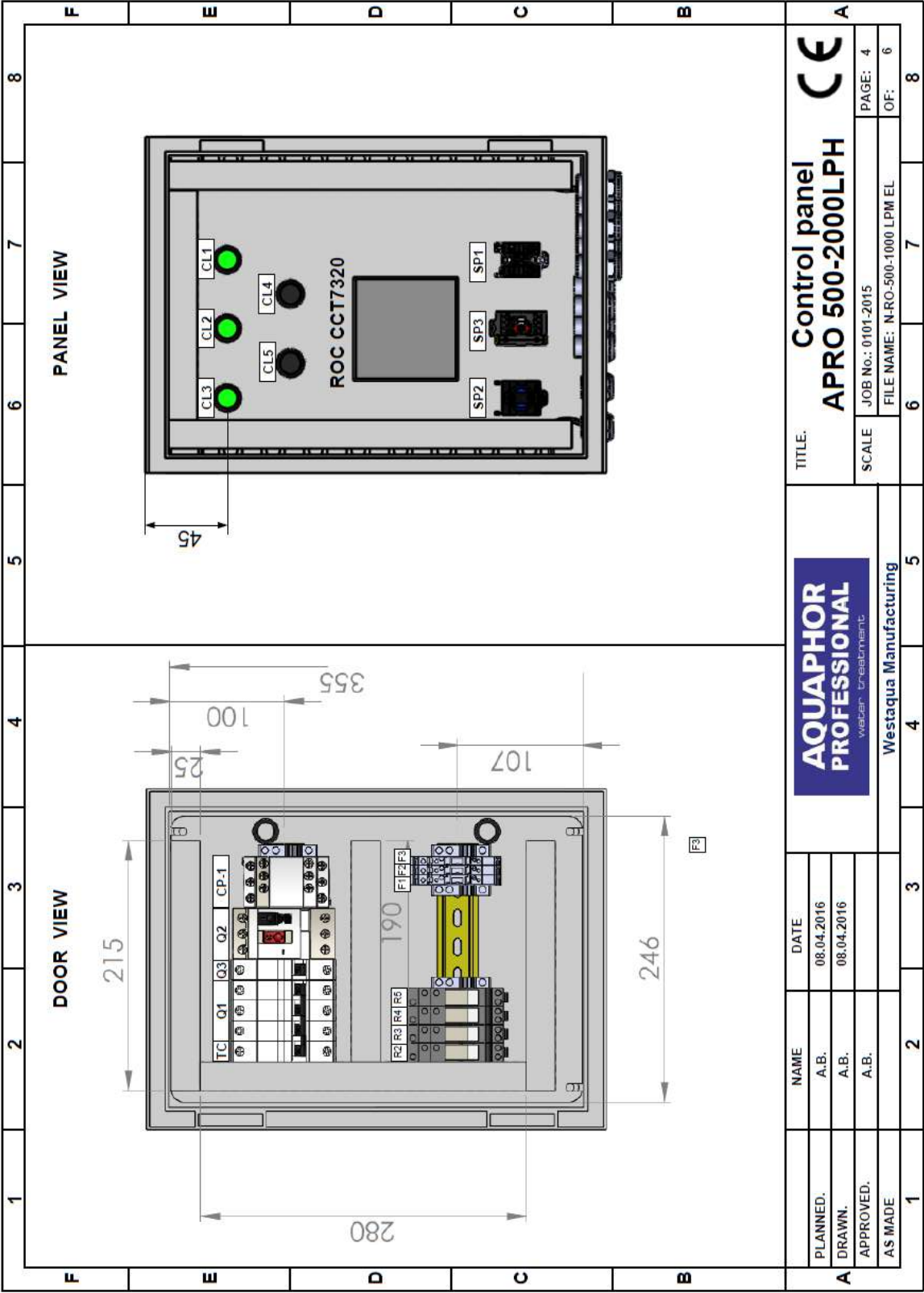
## Electrical drawings



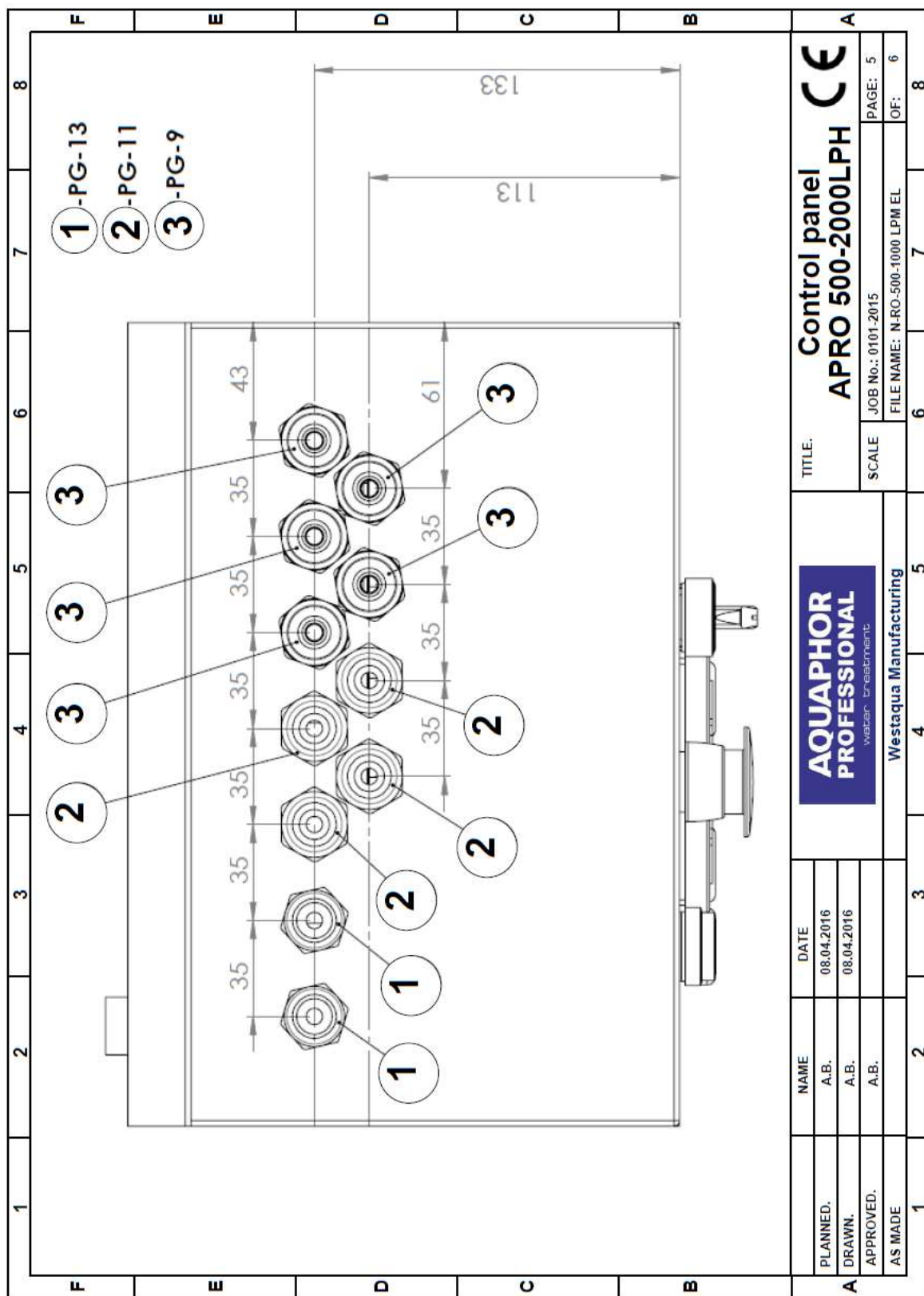
Electrical drawings



Electrical drawings

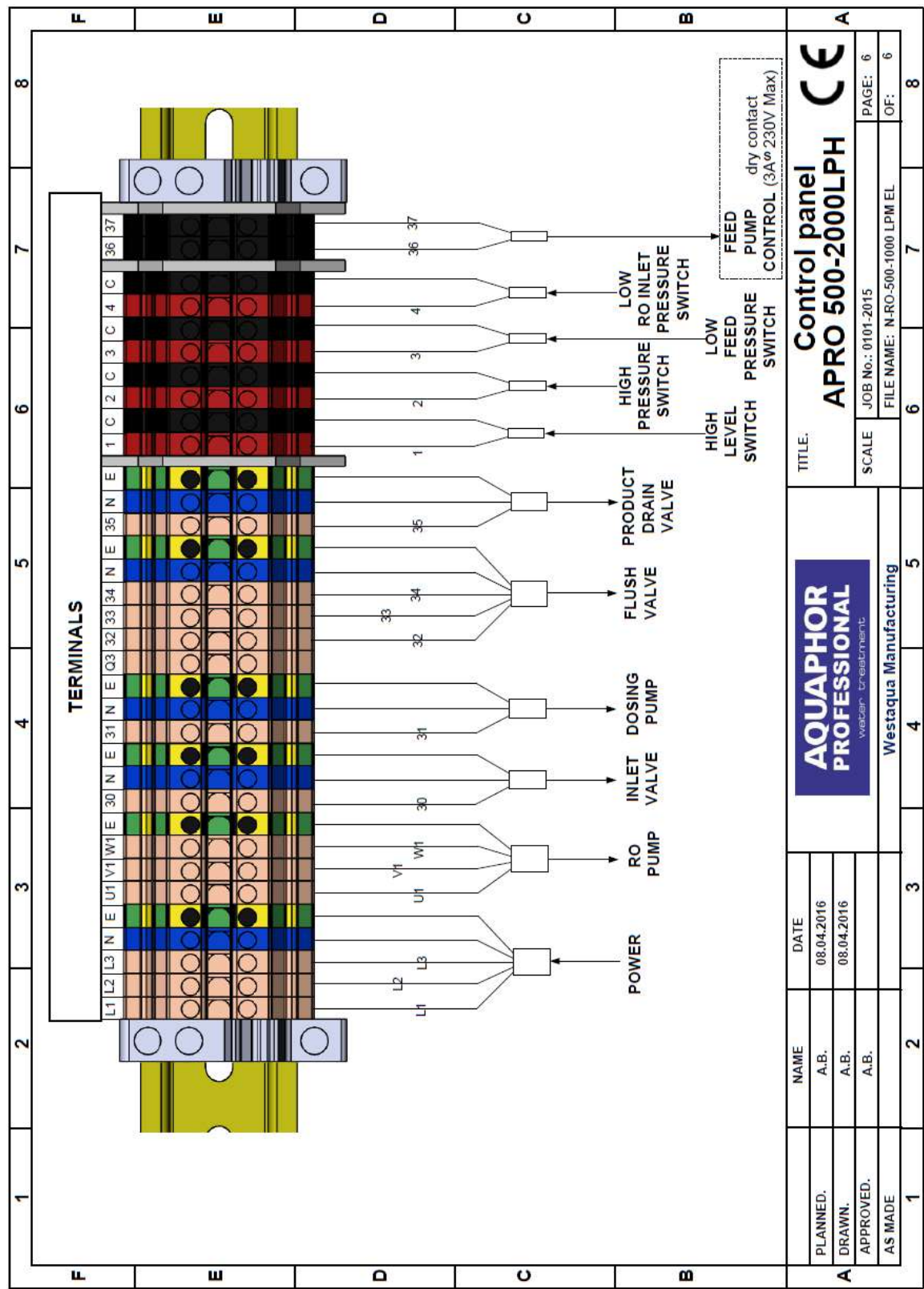


## Electrical drawings

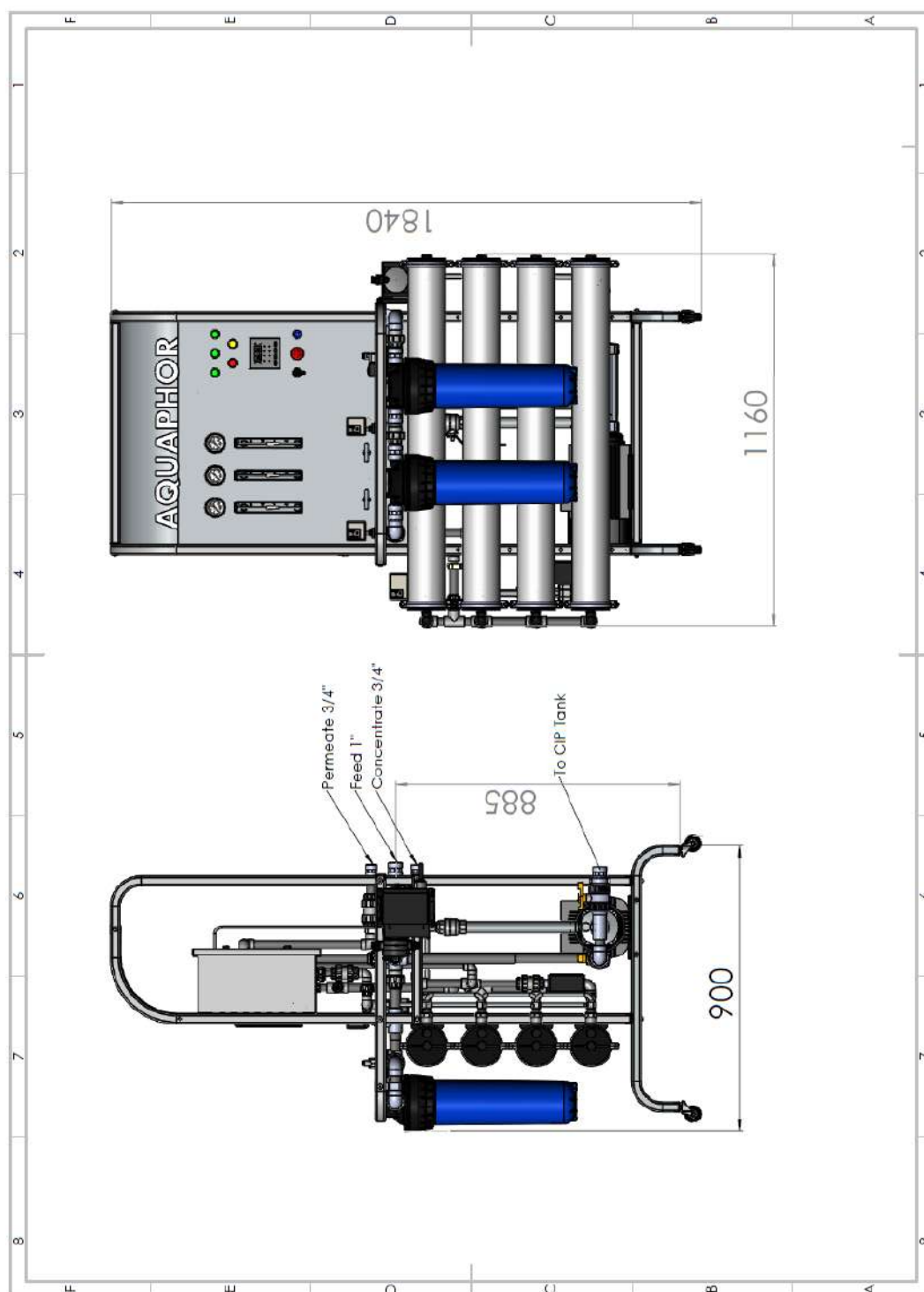




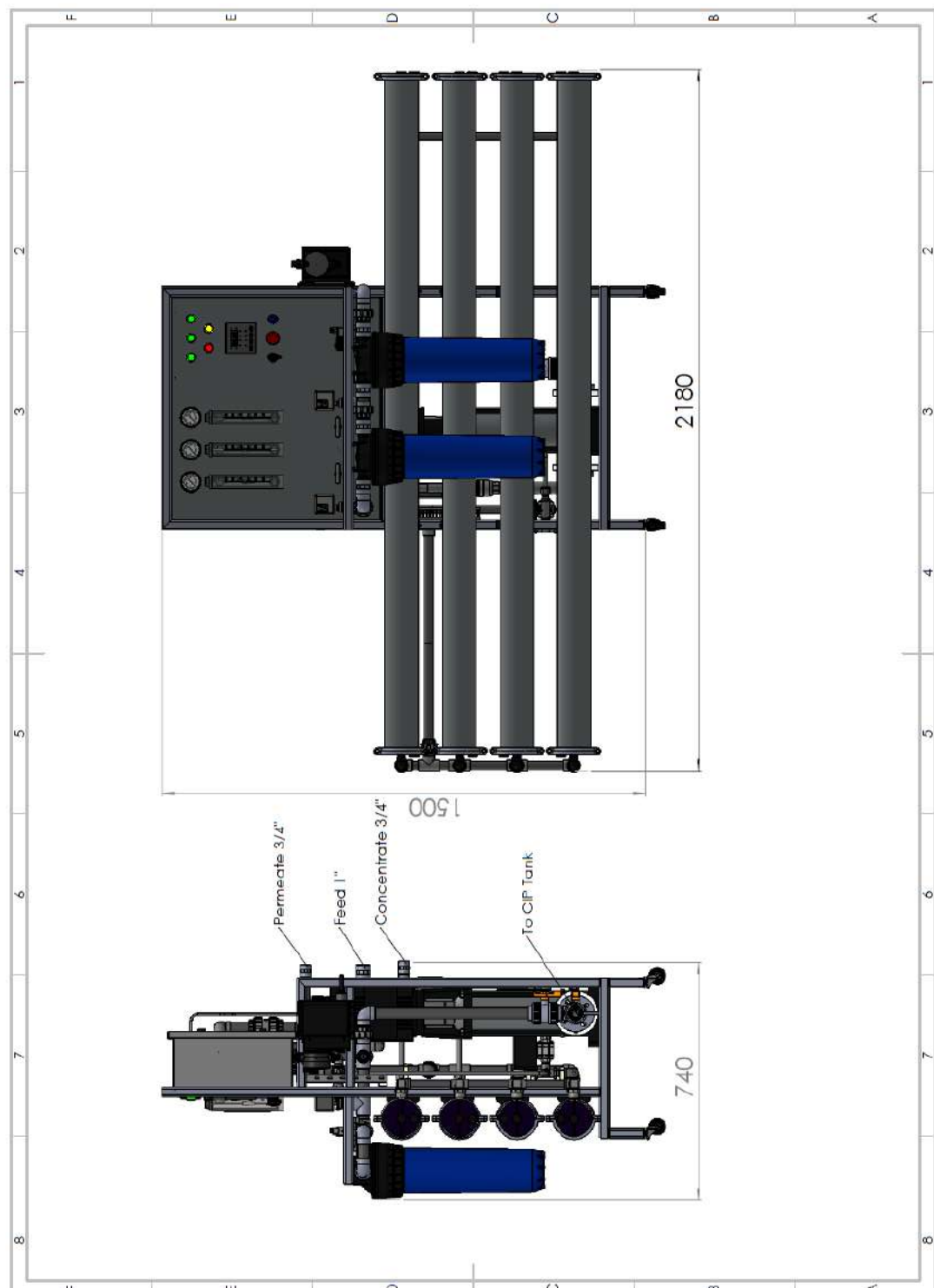
Electrical drawings



**Dimensional specifications of reverse osmosis system Aquaphor model  
 APRO L-500, L-750, L-1000**



**Dimensional specifications of reverse osmosis system Aquaphor model  
 APRO L-1500, L-2000**





## 8.6 Troubleshooting

Nº	Case	Cause	Solution
1.	Reverse osmosis system does not start after pressing the "Start"	a. Damage in wiring, fuse problem , do not connect the power supply wires	Check the voltage, connect the power supply and wiring
		b. Element overheating protection to "overheating"	Reinstall the element overheating protection
		c. No inlet pressure	Check the inlet water
2.	Inlet valve does not open	a. the power supply is not connected	Connect the power supply
		b. The valve is faulty	Replace solenoid
		c. Soil valve is broken	Replace the coil
3.	Pump starts, but does not reach rated power	a. wrong rotation	Check the electrical connection of the pump
		b. Clogged module of fine filtration	Clean or replace the module
		c. Air in the pump	Remove the air
		d. Flushing valve is switch on*	Check the operation of the pump after flushing
4.	Very loud pump operation sound when pressure grow up	a. Control block or element of posting valve	Check and replace the item of wiring, or the control block
		b. Mechanical failure of the solenoid	Replace or repair the solenoid
5.	Flushing valve does not switch off	a. Clogged or broken washing solenoid *	Replace or repair the solenoid
6.	System stops due to drops of pressure	a. Insufficient water inlet	Check the operation of the pump supplying raw water
		b. Clogged module fine filtration	Clean or replace the module
		c. Incorrectly adjusted drainage flow	Adjust the drainage flow, maintain the pressure differential of 20 psi (1,4 kg / cm <sup>2</sup> )
7.	The pressure at the drain line does not achieve a nominal	a. Leak flow in the pipeline	Check pipeline
		b. Not completely blocked drain solenoid *	Check and if necessary clean or replace the drain solenoid
8.	Not indicated pressure; meter readings do not	a. Clogged or broken tube manometer	Check the supply tube

	achieve the actual values	b. The air in the supply tube manometer	Remove air from the tube
		c. Manometer is damaged	Replace manometer
9.	Deterioration of permeate	Dirty or fouled RO membrane	Apply chemical cleaning of the membrane, if it is not helpful , replace the membrane
10	Decreased flow rate production of permeate	a. Clogged RO membrane	Apply chemical cleaning of the membrane, if it is not helpful , replace the membrane
		b. The temperature of the source water has changed downwards	Calculate the flow rate production in accordance with the real temperature

### **\*modification of the system with automatic flushing module**

#### **9. FLUSHING/CLEANING MODE IN PLACE (CIP)**

Flushing/cleaning mode in place (CIP)

Your system is equipped with an option and corresponding entry for the chemical flushing of the membranes. For flushing it is necessary to purchase a reagent container (not included) for a capacity of 50 - 100 liters , with a flexible reinforced piping , with a diameter larger than 1 ".the tank is filled by 1/2 - 2/3 of the flushing solution. Also, you must have T-branches and locking valves on the line of the permeate (product) and concentrate with outputs for flexible hoses (not included). Flushing will be regulated by the pump.

To flush:

- Turn the valves on the line of the permeate to supply water to the flexible hose. The hose should be lower in the reagent container.
- Fill the reagent container with osmosis water to the necessary capacity.
- Turn the "CONTROL RO» to "Off.".
- Switch valves of the line of the concentrate for feed on the flexible hose of concentrate. Hose should be lower in the reagent container.
- Close the valve V-01 and RV-01, fully open the RV-03.
- Fully open the RV-02 in the models with the lack of drainage tap flushing.
- Connect the reagent container to the input denoted as «CIP», unscrewing the blind (if it includes). Open the valve CIP (if it includes).
- Open the valve RV-01 by about 1/3.
- Turn the "CONTROL RO» to «CIP».

The pump will start to work and to intake the reagent from the tank. The reagent which has passed through the system will drain back into the container by the hoses. Continue the procedure for 3-5 minutes.

j. Add the concentrate of reagent for flushing in the proportions recommended by the manufacturer.

k. Continue the procedure as recommended by the supplier of the reagent (but not less than 30 minutes), control the indications of pressure gauges and consumption, adjust the valves RV-01, RV-02, if it is necessary.

**Note: The pressure at the inlet of the membrane should not exceed 2 - 2.5 bar.**

l. After flushing, put the switch "CONTROL RO» to "OFF."

m. Switch valves of the concentrate line to the working position, the hose of permeate will be derived to the drain. Turn the valve V-01 (crane is opened) and CIP (crane is closed or screw the blind) in the operating position.

n. Turn the "CONTROL RO» to position «CIP», if necessary, adjust the valve RV-01.

o. Continue treatment for about 15 minutes, than adjust the valves RV-01... RV-03 to the operation conditions. Control the pressure gauge during the adjustment.

p. Continue draining the permeate to the drain for at least 15 min, control the TDS parameter shown on the TDS meter.

q. If all indicators of devices are normal, switch the valves of permeate line into operation position.

**WARNING:** The system is flushed with chemicals. It is important to flush the RO membranes after the chemical flushing. Incorrect adjustment of valves RV-01 ... RV-03 may damage the membranes and high-pressure pump. The procedure should be performed by trained staff only. If you do not have the appropriate skills in this area, contact with your service.

## **10. RULES OF STORAGE AND TRANSPORTATION**

The RO system should be stored in a plastic packaging, in a closed carton, in closed spaces with natural ventilation, with a relative humidity no higher than 80%, at a temperature not lower than +3 °C and not higher than 50 °C.

Transportation and storage of the RO system are always in a vertical position. It is forbidden to turn over the system and other mechanical changes.

The RO system must be transported within temperature limits of +3 °C up to + 50 °C. Shelf life of the RO system before the beginning of usage is not more than 5 years from date of manufacture, if all storage conditions are kept.

## **11. WARRANTY**

### **Warranty of quality**

Aquaphor professional guarantees compliance of the reverse osmosis system.

Lifetime of the RO system is 10 years from the beginning of operation excluding RO membranes and pre-filtration module.

Lifetime of pre-filtration modules and polypropylene modules – not more than 3 months from the beginning of operation.

Lifetime of membrane is 1 year from the beginning of operation.

### **Warranty period**


The warranty period of the RO system is one year from the date of sale of the RO system. The warranty period of the components of the RO system is one year.

The warranty period for RO membranes is 3 month from the date of sale of the RO system and begins to run with the warranty period for the RO system.

The warranty period is extended for the period during which the RO system could not be used because of the deficiencies in it, provided the notice of "Aquaphor professional" about the defects during ten days period of finding out.



## 12. CE CERTIFICATE


 EU Notified Body No. 2549	International Center for Quality Certification - ICQC Ltd. 63-19, Skolas str., Jūrmala, LV-2016, Latvia Phone: +371 27168371 E-mail: office@icqc.lv www.icqc.lv SIA „International Center for Quality Certification - ICQC” Reģ. Nr. LV40103539825 Skolas iela 63-19, Jūrmala, LV-2016, Latvija
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### CERTIFICATE OF CONFORMITY

*ATBILSTĪBAS SERTIFIKĀTS*

No. 1-077-110/2016


<b>Product name, model / type:</b>	Reverse Osmosis Systems Series APRO Models: APRO-S-125, APRO-S-250, APRO-S-375, APRO-L-500, APRO-L-750, APRO-L-1000, APRO-L-1500, APRO-L-2000.
<b>Manufacturer, address:</b>	Westaqua-Invest OÜ L.Tolstoi 2A, 40231 Sillamäe, Estonia www.aquaphor.com Phone: +372 3924116, fax: +372 3926128, e-mail: sales@westaqua.eu
<b>Trademark:</b>	
<b>Quality system of manufacturer's:</b>	DIN EN ISO 9001:2008 Certificate Registration No. 44 100 066128-003 (TÜV NORD CERT GmbH)


**This certificate of conformity is based on an evaluation of sample of the above mentioned product. This is to certify that the tested sample is in conformity with requirements of following Directives:**


Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery	
Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 of electrical equipment designed for use within certain voltage limits	
Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC	
<b>Used standards:</b>	LVS EN ISO 12100:2011, LVS EN 60204-1:2006, LVS EN 61000-6-2:2005+AC:2006, LVS EN 61000-6-4:2007+A1:2011
<b>Test report references:</b>	No. 1311834506/45004/TR/16 dated March 04 2016, TÜV Nord Baltik Ltd. (Accredited Body No. LATAK-T-177) No. LEITC-TR-16-18 dated February 12 2016, Latvian Electronic Equipment Testing Center Ltd. (Accredited Body No. LATAK-T-397)
<b>Notes:</b> <ul style="list-style-type: none"> <li>Technical assessment is carried out for the machine, which is not included in Annex IV to the Directive 2006/42/EC on dangerous machinery; with this the continuous compliance of machine with the requirements of Directive is to be ensured by the manufacturer.</li> <li>This certificate is only valid for the equipment and configuration described and in conjunction with the test data detailed above.</li> <li>The certificate is valid only at presence of the declaration of conformity.</li> <li>The certificate is issued to a particular product with the provision that manufacturer will not make any changes in the product.</li> <li>The certificate holder is responsible for its correct use, maintenance and storage of technical documentation, as well as for the affixing of the CE marking.</li> </ul>	

Director of Certification:  
 Sertifikācijas direktors:




 Sergey Kovalev



Date of issue: March 07 2016  
 Certificate is valid until: March 07 2021

Certificate No. 1-077-110/2016

## 13. EC DECLARATION OF CONFORMITY

L.Tolstoi 2A, Sillamäe,  
 40231 Estonia  
 www.pro.aquaphor.com

International: +372 356 2204 21  
 Skype: aquaphor market.pro  
 e-mail: market.pro@aquaphor.com

## EC Declaration of conformity

**Manufacturer, address:** Westaqua-Invest OÜ  
L.Tolstoi 2A, 40231 Sillamäe, Estonia  
www.aquaphor.com  
Phone: +372 3924116, fax: +372 3926128, e-mail: sales@westaqua.eu

**Quality system of manufacturer's:** DIN EN ISO 9001:2008  
Certificate Registration No. 44 100 066128-003 (TUV NORD CERT GmbH)

**Product name, model:** Reverse Osmosis Systems Series APRO  
Models: APRO-S-125, APRO-S-250, APRO-S-375, APRO-L-500, APRO-L-750, APRO-L-1000,  
APRO-L-1500, APRO-L-2000.

**Directives:** Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery.  
  
Directive 2004/108/EC of the European Parliament and of the Council  
of 15 December 2004 on the approximation of the laws of the Member States relating to  
electromagnetic compatibility and repealing Directive 89/336/EEC.  
  
Directive 2006/95/EC of the European Parliament and of the Council  
of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical  
equipment designed for use within certain voltage limits.

**Used standards:** EN ISO 12100:2010, EN 60204-1:2006/A1:2009, EN 61000-6-2:2005/AC:2005,  
EN 61000-6-4:2007/A1:2011

**Verification of conformity:** EC Certificates of Conformity No. 1-077-110/2016 dated March 07 2016  
(ICQC Ltd., EU Notified Body No. 2549, Accredited body No. LATAK-S1-499)

**Test report references:** No. 1311834506/45004/TR/16 dated March 04 2016,  
TÜV Nord Baltik Ltd. (Accredited Body No. LATAK-T-177)  
No. LEITC-TR-16-18 dated February 12 2016, Latvian Electronic Equipment Testing Center Ltd.  
(Accredited Body No. LATAK-T-397)

I, the undersigned, representing the manufacturer's, declare in sole responsibility, that the product specified above, to which this declaration relates, conforms to the above mentioned Directives and Standards.



This product carries the CE Mark, which was first applied in 2016.

**Date and place of issue:** March 10 2016, Sillamäe, Estonia

Valery Lavrov, Management Board Member

