

# GreenLife



User manual for the Rain2Drink Osmose reverse osmosis system



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# User manual for ROS series reverse osmosis systems

## INTRODUCTION

Thank you for choosing a SMART Water Systems product. Our products undergo comprehensive testing and inspection throughout the manufacturing process. This brochure contains all the information you need to ensure the proper and trouble-free operation of your product. Please read the instructions carefully before you begin installing the unit.

## GENERAL INTRODUCTION

The reverse osmosis system works by purifying water using a cross-flow process, in which water is forced through semi-permeable membranes with pores measuring 5 Ångström. This system removes microorganisms, ions of all kinds and minerals from the water. The chemical purification efficiency of reverse osmosis membranes is 90–95%. Reverse osmosis systems are designed for continuous operation over 24 hours. To ensure high performance, regular operation without long interruptions is necessary. For optimal membrane operation, chemicals should be dosed at specified intervals and consumables should be replaced regularly. It is particularly recommended to operate reverse osmosis systems between two tanks. To ensure that the system is supplied with water at the desired flow rate and pressure, a raw water tank and a hydrophore are used to ensure the water supply to the system at the desired flow rate and the required pressure, while a product water tank and another hydrophore are used to pressurise the product water.

## WARNINGS AND PRECAUTIONS

- In order for reverse osmosis systems to work optimally and achieve the desired level of purification, the raw water must first undergo thorough pre-filtration.
- The sand or activated carbon filters upstream of the system must be checked daily to ensure that they are backwashed regularly. The reverse osmosis system should remain switched off until the backwash process is complete.
- The reverse osmosis system should be operated at a minimum inlet pressure of 2 bar and a maximum operating pressure of 16 bar. If these values are exceeded, the system must be and Smart Water Systems must be notified.
- The function and settings of the dosing pumps used in the system for chemical dosing should be checked regularly and the necessary chemical additives should be added.
- The cartridge filters in the pre-treatment line of the reverse osmosis unit must be checked and replaced regularly.
- The filter replacement interval can also be determined by the low pressure signal from the low pressure regulator. When the low pressure signal is received, the system activates a minimum pressure alarm and shuts down. The need for a filter replacement in the pre-treatment line can be determined by checking the pressure differences between the filter inlet and outlet on the pressure gauge located on or near the filter.
- During production, no valves or similar objects that impede the flow of water may be attached to the outlet line, as this could damage the pump and the membranes

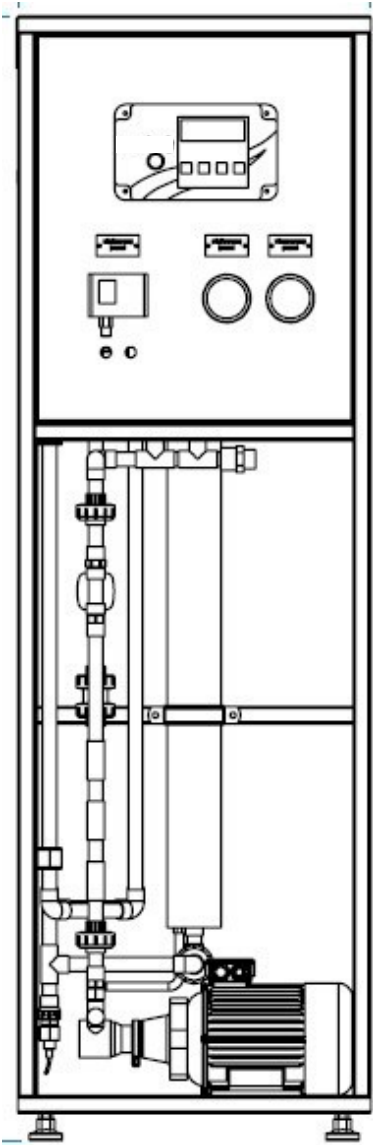
- Chlorine or other substances that can mix with the feed water, such as oil or grease, damage the membranes. Therefore, the supply line to the system must be free of chlorine, oil and grease.
- A decrease in the production flow rate of the reverse osmosis system indicates that chemical cleaning of the membranes is required. These membranes should be chemically cleaned regularly under the supervision of authorised service personnel, depending on the production capacity of the system and the quality of the source water.
- The positions of the valves in the system should be checked regularly in accordance with the processes performed by the reverse osmosis unit.
- The upper level signal of the float interrupts the production process and initiates the flushing process.
- In the event of a power failure, the system locks automatically and must be restarted by the operator.
- Microorganisms that must not be present in the raw water or that exceed the limit values impair the proper functioning of the system. In this case, additional measures are required in the system, in particular a check of the membranes. We accept no responsibility for this situation. If we are not informed and the necessary precautions are not taken, the warranty for the system will be void.
- As the system is designed for automatic operation, manual changes to the automation settings can affect the overall operation of the system. For this reason, manual intervention in the system is strictly prohibited.
- Reverse osmosis systems are designed for international well water temperatures and +20 °C. The system's production volume may vary by +/- 20% if water temperatures fluctuate significantly.

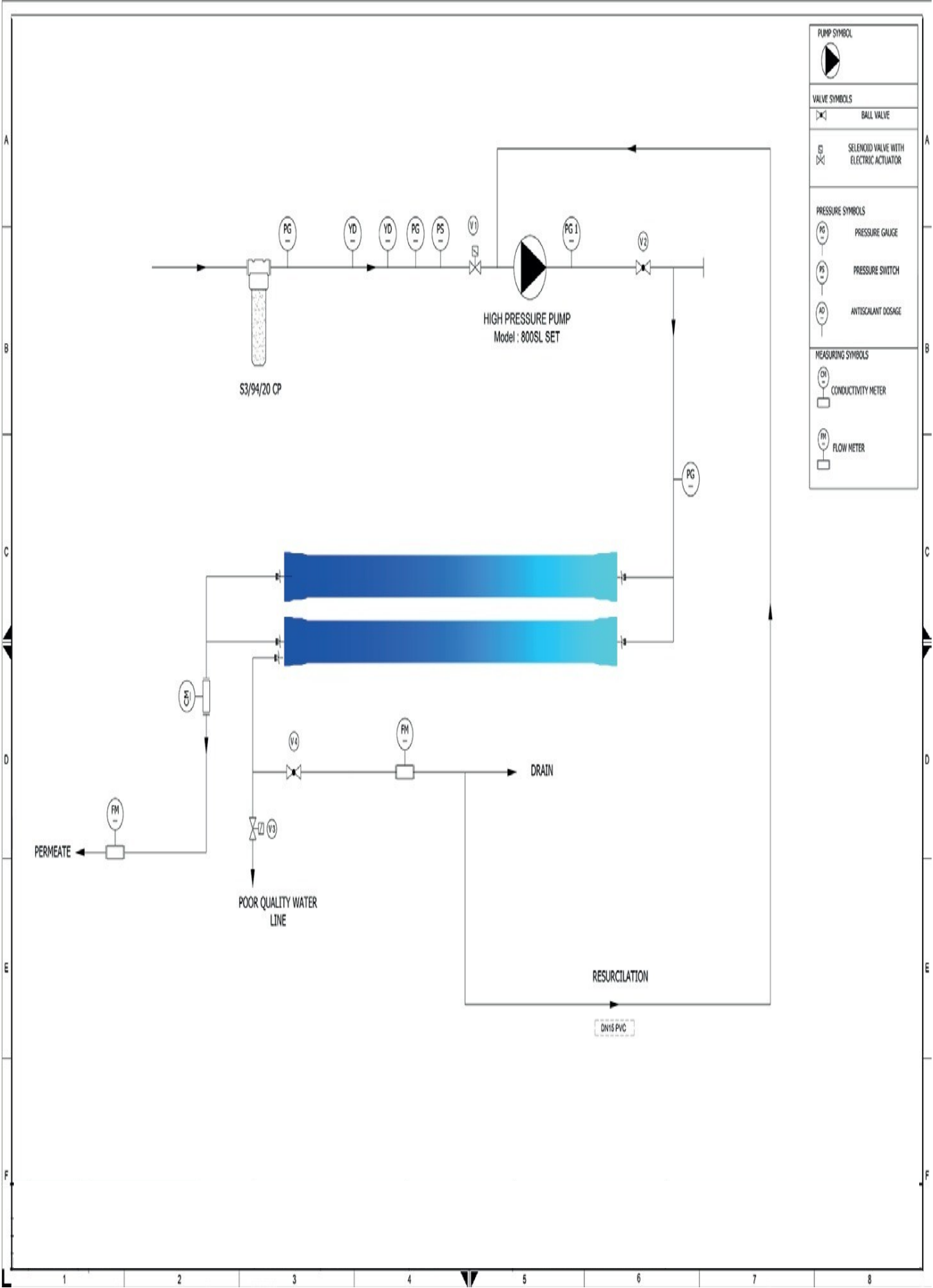
## **Installation instructions**

- The location of the reverse osmosis system must be level and stable. The ambient temperature at the location should not exceed 45 °C and the humidity should not exceed 50 %. If necessary, air conditioning should be installed to maintain these conditions. In addition, the environment must be protected from frost. Sufficient space and comfort must be ensured for maintenance work.
- The waste water pipe, production pipe and supply pipe must be prepared for connection to the device to be installed without impairing the water flow.
- There should be at least one metre of space on the right and left sides of the reverse osmosis device in the installation area to ensure easy membrane replacement.
- All electrically operated devices of the reverse osmosis system (such as pumps, valves, pressure switches, pressure gauges, etc.) must be kept away from any conditions in which they could come into contact with water.
- After the measuring devices for production and waste water flow on the device, the ends of the production and waste water pipes remain open. The production pipe is then connected to the production water storage tank or, if there is a balancing unit upstream of the tank, to this unit. The waste water pipe is connected to the nearest drain to continue the installation.

Technical data for ROS series reverse osmosis systems Technical overview

MODEL	FEED (l/h)	PERMEATE (l/h)	WASTEWATER (l/h)	PUMP (kW)	MEMBRANE (Type * Quantity)
ROS 75	150	75	75	0.55	2540 * 1
ROS 220	440	220	220	0.75	4040 * 1
ROS 440	880	440	440	0.75	4040 * 2





S3/94/20 CP

HIGH PRESSURE PUMP  
Model : 800SL SET

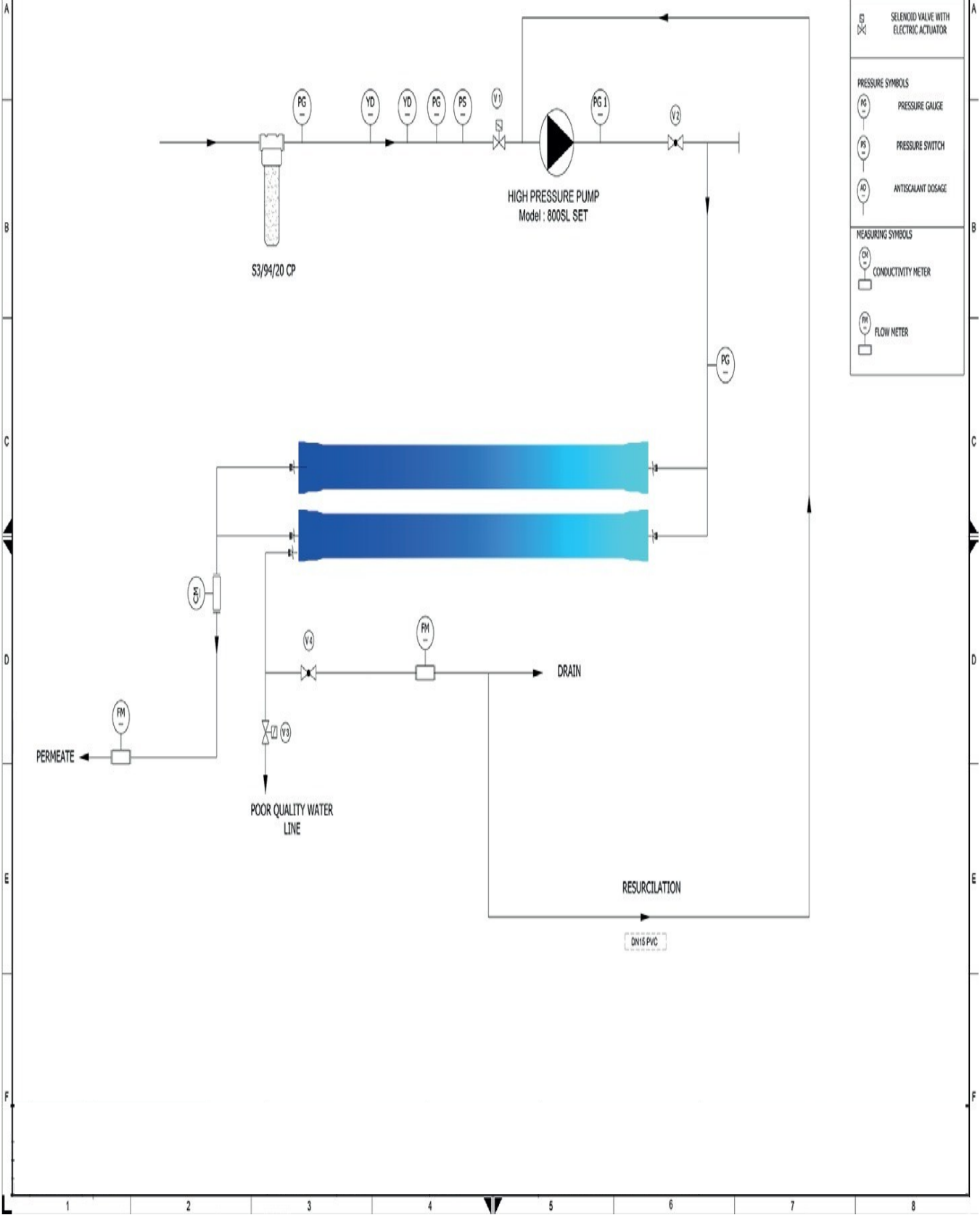
DRAIN

PERMEATE

POOR QUALITY WATER  
LINE

RESURCILATION

DN15 PVC



## **System components**

### **Cartridge filter**

The system includes a cartridge filter with a 5-micron cartridge that carefully filters the raw water before it reaches the reverse osmosis membranes.

If a low pressure signal is detected in the system, the filters should be checked and replaced if necessary, taking other factors into account.

When replacing the cartridge, you should first shut off the water supply by turning off the reverse osmosis system.

After stopping the system, open the cartridge housing with the housing key. Remove the cartridge from the housing and insert a new one. Tighten the housing with the key. After reconnecting the water supply to the system, release the air through the vent valve and ensure that there are no leaks.

The recommended interval for cartridge replacement is 6 to 8 weeks; however, depending on the quality of the raw water, earlier replacement may be necessary.

### **Antiscalant dosing pump**

The chemicals used in the reverse osmosis system are dosed into the system inlet via dosing pumps.

These dosing units are equipped with a dosing tank. Once the chemical in the dosing tank has been used up, a new solution must be prepared. After the solution in the dosing tank has been refreshed, the dosing pumps operate automatically as long as the reverse osmosis system is in operation. To minimise the risk of air in the dosing pump, the pump should be vented regularly via the vent valve.

### **Inlet solenoid and flush valve**

When the reverse osmosis system starts up, the solenoid valve opens and allows water to enter. The solenoid valve coil should be checked regularly. If the coil fails, no water will enter the system and a low pressure fault alarm will be triggered.

The flush valve in the waste water pipe opens when the reverse osmosis system is started and stopped. It directs ions that have accumulated or could accumulate on the membrane into the waste water circuit. The valve closes after the flushing phase is complete.

### **Low pressure switch**

The low pressure switch monitors the pressure of the incoming water. If the inlet pressure falls below the specified value, the system is deactivated. The switch offers two setting points. On the right-hand side is the designation SET, under which the pressure gauge displays the low pressure value, which is usually set to 2 bar. On the left-hand side is the designation DIFF, which indicates the difference to the set pressure, which is usually set to 0.2 bar.

### **High-pressure pump and high-pressure motor**

The principle of reverse osmosis is based on passing salt water through membranes under high pressure to remove ions. The high-pressure pump brings the raw water to a pressure of around 8–12 bar and thus supplies the membranes. A rotary pump with a motor is used for this purpose.

To optimise the efficiency of the pump, the bypass screw next to the pump can be readjusted if necessary.

### High-pressure switch

The high-pressure switch monitors the pressure at the membrane inlet. If the inlet pressure exceeds the specified value, the system is shut down. The switch has two setting points. On the right-hand side is the label SET, under which the pressure gauge displays the high pressure value, which is usually set to 14 bar. On the left-hand side is the label DIFF, which indicates the difference to the set pressure, which is usually set to 0.2 bar.

### Reverse osmosis membrane

Reverse osmosis membranes are filters that treat water under high pressure, directing concentrated ions into the drain and collecting purified water in storage tanks. They filter the incoming water so that 2–3% of the conductivity value remains. This is the central component of the reverse osmosis system. For proper functioning, the incoming water must not contain any of the following substances:

- Organic contaminants (removed by chlorination)
- Iron (removed by chlorination and sand filtration)
- Hardness (removed by a water softener)
- Chlorine (removed by activated carbon filtration)

Otherwise, the membranes may become clogged, resulting in reduced production flow, or cracked, which increases the conductivity of the production water.

### Installation of membranes

After installing the reverse osmosis system, remove the end cap of the membrane housing.

Insert the membranes into the housing in accordance with the direction of water flow and ensure that the membrane is fully seated in the housing.

- After positioning the membranes, fit the end cap seal around the cap.
- Place the sealed end cap on the housing.
- Ensure that the cap is fully and securely seated on the housing.
- Repeat the process for all housings and membranes.

### Production and waste flow meters

The unit's water production flow rate (litres per hour) is read on the production flow meter.

The measured value should be determined by the position of the red float on the measuring device.

Compare the value with the table.

The wastewater flow rate (litres/hour) of the system is read on the wastewater meter. The measured value should be determined based on the position of the red float on the meter. Compare the value with the table.

### Wastewater and recovery valve

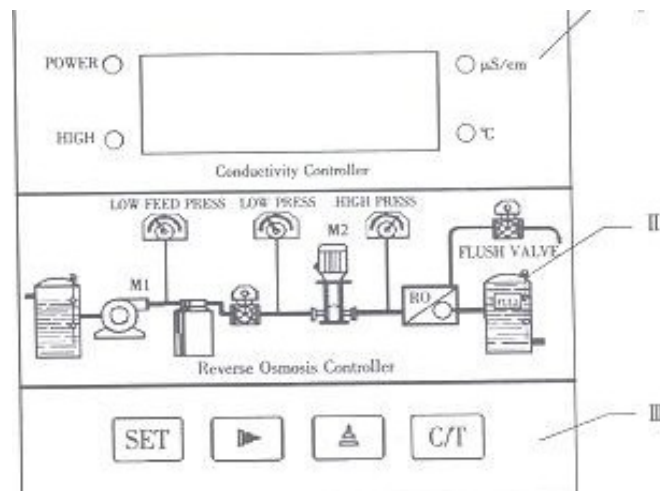
A waste water control valve is installed to regulate the waste water flow rate. The valve should be adjusted according to the table.

The recovery valve is installed in the pipe that directs part of the wastewater to the raw water pipe. Adjust the valve according to the recovery flow rate specified in the project. The wastewater control valve should never be completely closed.

### Pressure gauges

Pressure gauges are installed upstream and downstream of the high-pressure pump. These pressure gauges enable the operating pressure of the system to be monitored.

## Control panel



### Section 1:

- **Operating display:** Indicates the status of the power connection.
- **High conductivity** Indicates that the conductivity exceeds the limit value.
- **µS/cm:** Indicates the conductivity value of the water produced.
- **C:** Shows the temperature of the water.

### Section 2:

- **Low feed pressure:** Lights up when there is no feed water, indicating that the raw water tank is empty or insufficiently filled.
- **Low pressure:** Lights up when the inlet pressure to the high-pressure pump falls below the limit value.
- **High pressure:** Lights up when the pressure after the high-pressure pump exceeds the permissible limit.
- **Inlet valve:** Lights up when the inlet valve is activated.
- **M1:** Lights up when the system supply pump is in operation.
- **M2:** Lights up when the high pressure pump is in operation.
- **RO:** Lights up when the RO unit is producing water (in operation).
- **Flush valve:** Lights up when the flush valve is activated.
- **Full:** Lights up when the treated water tank is full.

### Section 3:

- **SET** Used to access the parameters to be changed.
- **:** Used to select the digit position of the parameter to be changed.
- **→:** Used to change the numerical value.
- **↑:**

- **C/T:** Used to save the entered value or to switch between the conductivity and temperature displays.
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### System operation

After installation and checks (inlet and outlet connections, electrical connections, filling the chemical tank, installing the membrane and cartridge, etc.), please follow these instructions to start the system:

**Power on:** Activate the power switch to supply power to the system. **Inlet solenoid valve:** Activate the inlet solenoid valve. After a certain amount of time, the high-pressure pump will start operating. Adjust the production and waste flow rates according to the waste control valve. Once the system starts production, the production flow meter will display the production rate, while the waste flow meter will display the waste rate.

**Chemical dosing:** Adjust the dosing rates of the chemicals.

**Flushing:** As soon as the upper float switch sends a signal (i.e., the tank is full), the flush solenoid valve opens and the flushing process takes approximately 30 seconds. **Standby:** After flushing, the system automatically switches to standby mode and "RO Standby" is displayed on the screen.

**Restart:** When the lower float switch in the tank sends a signal, the system restarts the process from step 2.

If the operating pressure is insufficient or a fault occurs during these phases, the device switches to standby mode.

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### Daily operating procedures

1. **Check valves:** Ensure that the inlet, production and waste valves are correctly positioned.
2. **Start the system:** Press the start/stop button on the control panel. The system opens the inlet valve and activates the high-pressure pump. If the inlet pressure is below the specified value, the system will sound an alarm and stop within 10 to 15 seconds.
3. **Documenting values:** Enter the daily values in the control table.

### Maintenance

The system requires simple maintenance, which includes recording the daily values and carrying out preventive maintenance measures. Compare the commissioning table with the daily value table to evaluate the system performance.

**Daily control tables:** Keep track of general operating conditions (pressure, flow rates, pH value, conductivity) as well as routine or special maintenance (cartridge replacement, chemical cleaning).

2. **Pressure readings:** Enter the pressures before and after the pump in the table.

## Weekly maintenance

In addition to daily maintenance:

**Cartridge replacement:** Microfiltration cartridges capture particles larger than 5 micrometres. If the pressure difference before and after microfiltration is 0.5 to 0.7 bar, the filter should be replaced. Replacement should take place at regular intervals.

**RO temperature recording:** Measure the feed water temperature of the RO unit and document it in the control table. The temperature can be monitored via the control system.

Monthly or quarterly maintenance In addition to

weekly maintenance:

**Checking operating information:** Check the operating information to determine whether additional maintenance or cleaning work is required. For example, a change in flow rate of 5% indicates that an inspection is necessary.

## Annual maintenance

In addition to monthly maintenance:

**Checking the instrument panel:** Check the instrument display panels. **Leak detection:** Check for leaks in hoses, pipes or fittings.

**Switches and lighting:** Ensure that switches and lighting are functioning properly.

**Pre-treatment devices:** Ensure that the pre-treatment devices are working properly.

**Membrane performance:** Check the performance of the membrane. The average service life of the membrane is 2–3 years.

## Troubleshooting guide

The troubleshooting guide provides information on how to resolve common operating problems. If you are unable to resolve the problem yourself, please contact technical support. The information that should be provided to technical support includes:

- Unit commissioning date
- Model of the unit,
- Serial number of the unit
- Daily monitoring forms
- Detailed information about the problem

This information helps the technical service to diagnose and resolve the problem efficiently.

PROBLEM	CAUSE	SOLUTION
Low feed pressure (alarm when pressure is reduced)	Insufficient feed water pressure	Increase delivery pressure, open delivery valve, check delivery pump and flow limiter
	Clogged pre-filter	Replace microfiltration cartridges
	Supply valve does not open	Check the check valve, both mechanically and electrically
Low operating pressure	High flow rate	Check the production and waste streams.
	Low pump pressure	Check the production and waste streams.
	Contaminated or blocked membranes (low drop pressure)	Check and clean Perform chemical cleaning of the membranes.
	Increase in feed water temperature	Check the water temperature
		correct phases
	Pump running in reverse direction	
High temperatures	Pump malfunction	Section "Checking for pump faults"
	Temperature too high.	Switch off the device and allow it to cool down. Lower feed water temperature.
	Incorrect switch configuration	Set switch to the correct value
High/low pH value of the feed water	Faulty temperature sensor	Check equipment in accordance with standards. Replace if necessary.
	pH value outside the permitted range	If the pH value is too low, check the acid dosing unit. Calibrate it. Calibrate the device. Replace if necessary.
	Defective pH probe	
Low production throughput rate	Low operating pressure	Check section with low operating pressure Perform chemical cleaning of the membranes.
	Contaminated or blocked membranes	
	Misaligned membranes or defective drain seals	Check the arrangement of the membranes. Perform chemical cleaning of the device. Clean and replace damaged seals as necessary.
		Check the calibration of the flow meter.

Flow meter is defective.

	valve position	Ensure that the flush and outlet valves are correctly positioned.
Low wastewater flow rate, normal or increased operating pressure	Clogged waste water outlet	Remove and clean the waste outlet.
	Waste water pipe blocked	Check the position of the valve on the waste pipe.
	Flow meter defective.	Check the calibration of the flow meter.
High operating pressure (alarm in case of increased production or High conductivity)	Wastewater pipe blocked	Check the opening of the waste water pipe.
	Incorrect switch configuration	Adjust the switch settings.
	Service valve is closed.	Open the valve.
	Closed or blocked production line	Check the section with low production flow rate.
High pressure drop (difference between the membrane supply pressure and the waste pressure)	Restricted flow after the pump.	Check the lines to the membranes. Check the pump outlet line.
	Defective transition connection between the	Ensure that the transition piece is positioned correctly.
	tap and the membrane.	Perform chemical cleaning of the membranes.
Water flow through the system even though it is not in the correct position. The device is deactivated.	Clogging or contamination of individual membranes. Inlet valve does not close or	Check the valve mechanically and electrically. Chemically clean the membranes. No water should flow through the system when the device is switched off. Replace defective parts in the inlet valve if necessary.
	Contaminated or blocked membranes	Perform chemical cleaning of the membranes. Replace O-rings.
Decrease in ion removal efficiency (high production conductivity)	Damaged sealing rings	Replace O-rings.
	Change in feed water quality	Flush the system by operating the waste valve. Check the pH value, iron content, conductivity and hardness of the inlet water.
	Faulty conductivity meter	Calibrate the conductivity meter. Check the connection between the probe and the monitor. Replace the probe if necessary.