



*OPAL NW SERIES
WATER TREATMENT SYSTEMS
USER MANUAL*



Innovation has a name.



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Dear customer,

Thank you for purchasing a “A. O. Smith” branded water purifier!

You are now the owner of water treatment equipment produced by the world’s leading manufacturer of water treatment systems. This equipment produces pure water that can be consumed directly, providing you with a cleaner and healthier source of drinking water.

Please read this user manual carefully before you install and operate your “A. O. Smith” branded water purifier. To achieve maximum efficiency this user manual provides detailed instructions regarding the installation of your water purifier as well as information related to the proper operation and maintenance of your water purifier.

The installation should only be handled by professionals authorized by A.O. Smith

Spare parts used for maintenance and replacement filter should be approved by A.O. Smith before they are installed.

Any degradation of performance caused by the use of spare parts or filters that have not been approved by A.O. Smith will not be covered by our warranty.

If you experience any difficulties during installation or operation, please contact your local distributor to have them carry out repairs or maintenance on your equipment.

GENERAL INFORMATION

What is REVERSE OSMOSIS?

Osmosis is a process in which water passes through a semi-permeable membrane from a less concentrated solution into a more concentrated one. In naturally occurring osmosis process, reverse osmosis is achieved by pressurizing to higher concentrated environment. If higher concentrated environment is pressurized, water passes through lower concentrated one. Semi-permeable membranes used in reverse osmosis systems are in pore diameter of 8-12 angstroms. Water molecules are smaller than 8-12 angstroms and have a neutral electric charge. For this reason, water molecules can easily pass through the membranes. However, positively and negatively charged ions and molecules in the water, bacteria and viruses cannot pass through the membranes because they are bigger than 12 angstroms and flow to the drainage.

As a summary, reverse osmosis is the most ideal water treatment method for ion removal by advanced filtration. Reverse osmosis method is one of the rapidly progressing technologies.

Design of the reverse osmosis system requires various technical knowledge and experience such as product water quality, raw water analysis, type of membrane etc.

Reverse osmosis practices

A. O. Smith water treatment device is designed to work with minimum water pressure. It does not require chemical use and produces quality water. It is manufactured as a compact device that can easily be installed anywhere thanks to minimum dimensions.

RO treatment device enhances taste and quality of your water. It decreases odor and sediment whilst minimizing chlorine up to 99%. Reverse osmosis device also decreases contaminants such as lead, copper, barium, chromium, mercury, sodium, cadmium, fluoride, nitrite, nitrate and selenium which may be present in water.

Water treatment devices will serve you for many years economically and efficiently as long as they are used according to the installation and assembly instructions and technical specifications described in this manual.

This device shall only be used in accordance with the design purpose and technical specifications described in brochure and the users manual. Maintenance and repair must be performed in accordance with the instructions in the users manual and original parts supplied by an authorized service must be used.

ION REMOVAL IN REVERSE OSMOSIS

ION AND ORG. PESTICIDE	REMOVAL (%)	ION AND ORG. PESTICIDE	REMOVAL (%)
Aluminum	97-98	Nickel	97-99
Ammonium	85-95	Nitrate	93-96
Arsenic	94-96	Phosphate	99+
Magnesium	96-98	Potassium	92
Bicarbonate	95-96	Radioactivity	95-98
Bromide	93-96	Radium	97
Cadmium	96-98	Selenium	97
Calcium	96-98	Silica	85-90
Chloride	94-95	Silver	95-97
Chromate	90-98	Sodium	92-98
Chromium	96-98	Sulfate	99+
Copper	97-99	Zinc	98-99
Cyanide	90-95	Boron	50-70
Fluoride	94-96	Borate	30-50
Iron	98-99	Mercury	96-98
Lead	96-98	Bacteria	99+
Mangan	96-98	Virus	99+

WORKING PRINCIPLE

STAGES OF CLEAN WATER PRODUCTION IN REVERSE OSMOSIS SYSTEM

Feed water pressure must be minimum 3 bar for reverse osmosis system to work. If the feed water pressure is not sufficient, the system can be reinforced with a pump. Feed water passes through the following filtrations respectively;

- 1st Stage: 5 micron pp sediment filter. The pre-sediment filter retains suspended materials and particles in the water and protects successive filtrations, especially the membrane filter. (1 mm=1000 micron).
- 2nd Stage: Activated carbon filter removes pollutants, which are harmful to human health and membrane filter, by retaining organic substances and high amounts of cancerogenic chlorine and chlorine compounds.
- 3rd stage: Block carbon filter is used for more sensitive particle filtration to retain the suspended materials in the water.
- 4th stage: Membrane filter. The semi-permeable membrane with 8-12 angstrom pores retains bacteria, viruses and heavy metals in the water at 95-98% and pollutant runs to the drainage through wastewater part of membrane.
- 5th stage: Last carbon filter (post carbon). Water runs through the carbon filter at the last stage to provide clean and extremely safe drinking water.

BEFORE INSTALLATION

A. O.Smith water treatment system's operating water temperature is between minimum 5°C (41°F) and maximum 40°C (104°F). It has risk of freezing to operate the device below 5°C as it carries risk of damage to filters when operated at above 40°C.

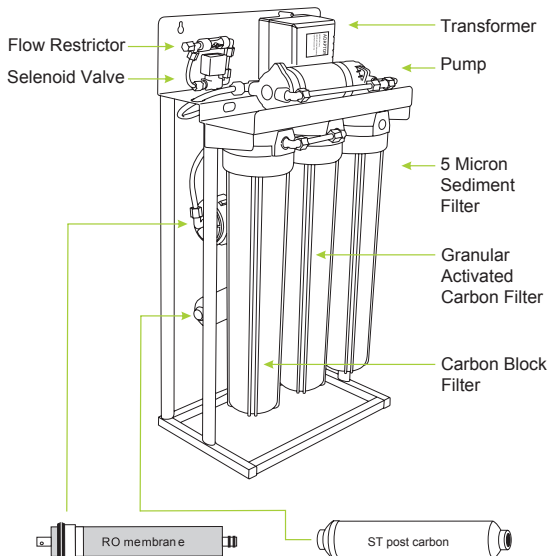
It is necessary to select a suitable location first for installation of A. O.Smith water treatment device. It must be considered during selection that installation place should be close to cold water line of the RO device and to the drainage and sufficient space should be left for working in case of malfunction and filter replacement.

Water treatment device is designed for water with specifications close to tap water, whose inlet conductivity is max. 600 ppm and the turbidity is max 3 NTU. If raw water source and specifications are unknown, the raw water should be sent for analysis before installation of the device in order to check the suitability.

"If the device is used beyond the limit values mentioned in technical specification part of the users' manual, the requested quality will not be achieved for product water. Usage of such feed water will cause variation in replacement periods of filters and membrane.

Inlet pressure is between 3 - 6 bar for water treatment devices without pump and between 1 - 6 bar for water treatment devices with pump. The optimum working pressure is 3 bar. In case the inlet pressure is above 4 bar, it is recommended to install a pressure reducer to prevent more wastewater discharge. Do not connect the device to power socket before it is installed. Our company will not be liable for any problems caused by nonobservance of the above warnings.

TREATMENT DEVICE FLOW SCHEME



BOX CONTENTS AND ASSEMBLY PARTS



- 1 Reverse Osmosis Device
- 2 Faucet
- 3 20" Transparent Housing
- 4 20" Black Mat Housing
- 5 20" Block Carbon Cartridge Filter (Udf)
- 6 20" Block Gac Carbon Cartridge Filter (Udf)
- 7 12" Coconut Post Carbon Filter
- 8 20" 5 Micron Spun Sediment Filter
- 9 Membrane
- 10 Metal Manometer
- 11 3 Way Inlet Valve
- 12 High Pressure Pump
- 13 36V Adapter
- 14 Tubing
- 15 Metal Ball Valve
- 16 36V Solenoid Valve
- 17 User's Manual & Warranty



HAND TOOLS REQUIRED FOR INSTALLATION

(They are not included in the box and should be provided.)


*A drill, a steel or diamond drilling set in 12 and 13 mm and half-round file. You need to use these according to the surface or place where you will install the device.

*Teflon Band

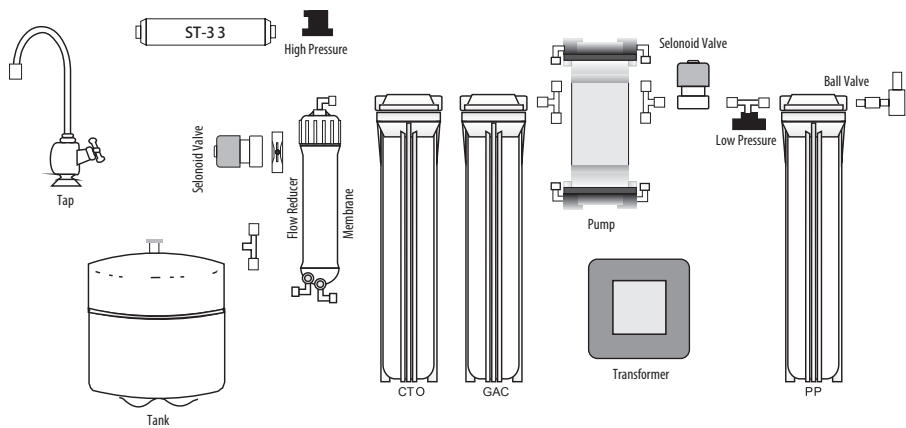
*Screw wrench (crescent wrench or open end wrench in required dimensions)

*A sharp knife or snap blade knife.

DEVICE PROPERTIES

Model	OPAL 603 NW	OPAL 402 NW	OPAL 303 NW	OPAL 202 NW
Max. Daily Water Production Capacity	600 GPD (1500 lt)	400 GPD (1000 lt)	300 GPD (750 lt)	200 GPD (500 lt)
Voltage / Current	36 V / 2.8 A			
Total Power	36 W			
Electric Shock Protection Type	Class II 			
Inlet Water Pressure	0.2-0.5 MPa (1-4 bars)			
Inlet Water Temperature	5~40 °C			
Max. Inlet Water TDS	<1000 ppm			
Max. Inlet Water SDI	3			
Dimensions	490 x 330 x 900 mm			
Weight	23 kg			

FLOW SCHEME



MANUAL INSTALLATION AND ASSEMBLY

INSTALLATION STEPS

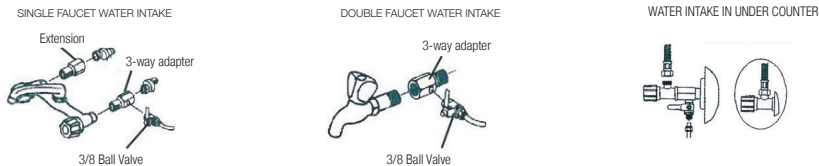


FIGURE A-2

1. Before the installation, turn off the valve of main feedwater line or the inlet valve.
2. After draining the remaining water in the pipes, install feedwater connection adapter (3-way adapter) by fastening with teflonband (Figure A- 2)
3. Install 3/8" metal ball valve on the feedwater connection adapter (3-way adapter) by means of teflon band so as to turn on/off easily (Figure A -3).
4. Install 8 mm water inlet tube to the 3/8 "metal ball valve. Note that the ball valve is closed.
5. Then, turn on the valve of main feedwater line or the inlet valve and check whether there is any leakage.

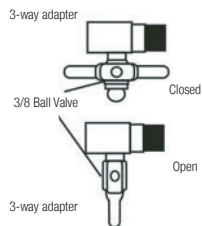


FIGURE A-3

RO FAUCET INSTALLATION

1. In case of drilling countertop or sink, faucet for clean water must be installed carefully in terms of usage and aesthetics. You can start to drill countertop or sink after leaving enough space for installation of seal, nut and union at the bottom of countertop or sink. Otherwise, you may drill the wrong place.
2. If you drill marble, granite ceramic, laminate or sheet metal sink, first you should use 5 mm drilling bit and then 12 mm drilling bit, respectively. The drill must be operated at low speed and without impact. If the counter is covered with tile-coated cast concrete, it must be drilled with a diamond bit. (Figure A- 4)
3. Outer length of the faucet is 7 cm. If the counter is thicker than 7 cm, you'll need to use fittings as many as required. Finally, place the faucet into the hole, adjust its joints and tighten the nuts.

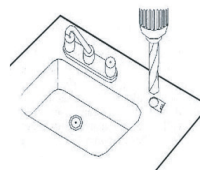


FIGURE A-4

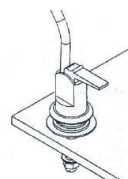


FIGURE A-5

i The images in the manual may not be identical to each other.

i **NOTE:** If you do not want to drill the undercounters sink and washbasin, you can also install it by using an angle faucet. Contact our authorized service for replacement of the faucet adapter, which you have used, with the three-way one through which hot, cold and purified water flow (Extra charge for the faucet).

MEMBRANE INSTALLATION

See: "Membrane Installation and Replacement" on page 12.

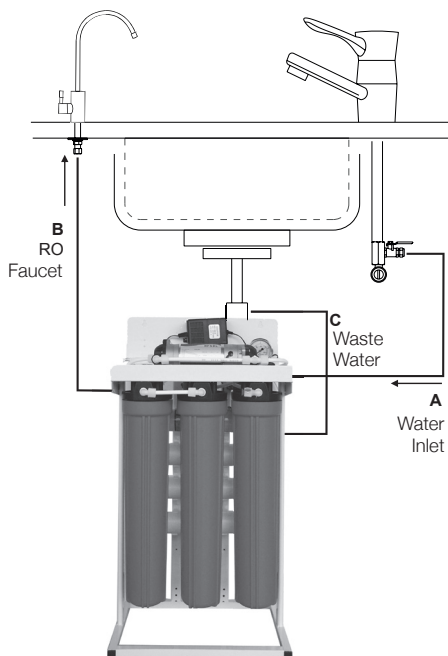
TUBE CONNECTION DIAGRAM

As shown in figure;

A: Connect feedwater to the water inlet of the device.

B: Post carbon outlet must be connected to RO faucet.

C: Wastewater tube must be connected to outflow tube.



DRAINAGE (WASTE) TUBE INSTALLATION



- Use 3/8" drainage tube.
- Stick the self-adhesive sponge seal in the wastewater clamp to the hole of the clamp.
- Drill a 6 mm hole on the outflow tube.
- Tighten the clamp (side with the seal) in correct relative position of the hole to prevent any possible water leakage. Make the seal connection on the outflow tube. Ensure that the tube connection will not loose.
- Drainage connection –It must be connected in such a way that the wastewater flows out without any flush or air swirl.
- Ensure that the wastewater tube is not connected to the dishwasher waste or garbage disposal outflow line because it can result in back-pressure and so, overflow.
- After these steps, RO unit is ready to be installed.

TANK VALVE INSTALLATION

- There is a pre-set amount of air in the water tank. Please do not touch the air valve.
- Tank tap can be connected easily with hand without using pliers. Please do not tighten much.

i Tank tap should be installed in models with tank.

START-UP AFTER INSTALLATION

Once you have assembled and installed all the components, turn on the water supply first to check for leaks.

Then, turn on the faucet slowly. At the first stage, water will run from the faucet slowly. Let it run in this way for 10 minutes. If the water starts to drip and do not reach normal flowrate, it probably means that the water pressure is so low that the device cannot perform with 100% efficiency. If you are experiencing such a problem, see Troubleshooting on page 17.

Now your device is ready for usage, you can enjoy quality water safely.

INSTALLING CARTRIDGES

If the cartridge filters have packages, remove them and insert in proper housings according to the order shown in the installation diagram. Screw bottoms of housings back onto caps securely, if necessary, use teflon or gasket to prevent possibility of any leakage.

Filters must be washed to sanitize dust and particles before they are used (check the washing procedures on page 12).

i !! IMPORTANT !!

"During the first few days after installation, air bubbles may be seen in the water."

"Water treatment device will work better and longer when it is used more often. For this reason, we recommend you use the purified water for cooking, preparing tea, coffee etc."

"In case of water leaks, broken filters etc., turn off the valve of water supply and correct the faults"

REPLACEMENT PERIODS OF CARTRIDGE FILTERS

FILTER REPLACEMENT INTERVALS

20" 5 Micron Spun (Sediment) Filter:

It should be replaced approximately every 6 months depending on the water contamination.

20" GAC Carbon Cartridge Filter (UDF):

If the water is clear and the total amount of chlorine is low, the cartridge life is 6 months on average.

20" Block Carbon Cartridge Filter (CTO):

The cartridge life is approximately 6 months depending on the amount of chlorine in the water and replacement periods of pre-filters.

Membrane Filter:

The membrane life is approximately 3 years depending on the regular maintenance.

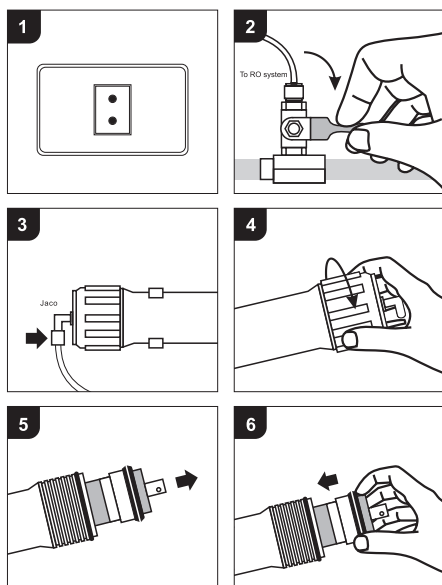
12" Inline Coconut Post Carbon Filter:

The cartridge life is approximately 12 months.

INSTALLATION AND REPLACEMENT OF MEMBRANE FLUSH PROCEDURES

1. Disconnect the plug from the socket.
2. Turn off the water supply valve.
3. Turn the Jaco fittings clockwise.
4. Unscrew membrane housing's cap by turning it clockwise.
5. Grasp the membrane with a clamp and pull out.
6. Push new membrane carefully into the housing until it stops.

After installing the membrane, screw the cap and reinsert the tube in the same way. Open RO tap to clean the newly installed membrane filter. Let the system run for 2 hours and the water run out. Then, you can drink the purified water.



i Do not forget to connect the power plug to the socket in models with pump.

1. Open the tube union of 3rd housing and discharge the water supplied to Sedimentfilter, Activated Carbon filter and BlockCarbon filter. Perform washing for 10 minutes.
2. First three filters are washed. If post-carbon and mains pressure are present, mineral filter is washed with the mains pressure for 10 minutes. Waste water is discharged from the faucet.
3. The membrane filter is pushed in the housing with the O-ring side first and the housing cap is screwed. Water is supplied to the membrane. The water first-supplied to the membrane should be flown out without reaching the tank and the post carbon. The water should be drained for 10 min.

Membrane replacement and housing sanitisation as seen in figures;

- Open drinking water faucet.
- Loose the union of the membrane housing on the water inlet side and disconnect tubing from the housing.
- Unscrew the membrane housing from the cap (with pliers) and displace the used membrane. -Clean the membrane housing with disinfectant (bleach solution) and rinse the housing. Wet or wipe the O-ring at the bottom of the new membrane element for being seated properly. Push the membrane into the housing with o-ring side first. Ensure the membrane fit into the housing properly.
- Screw the cap back onto the membrane housing and tighten with hand or the supplied wrench.
- Finally, place the union at the water inlet side of the membrane properly and tighten firmly.

i **!! ATTENTION !!**
The water first-supplied to the device should be discharged after passing through the filters. It should definitely not contact the tank and post carbon

i The treatment device must not be supplied with hot water. Otherwise, all filters will be damaged and the device will be out of warranty.

REPLACEMENT OF POST CARBON FILTER

- Turn off the water supply and open drinking water faucet.
- Loose tubing unions at inlet and outlet and discard the used post-carbon.
- Disconnect the union placed at the outlet of the filter. To prevent leaks, apply teflon tape to the T-connector on water supply and install the filter.
- Tighten the tube unions.

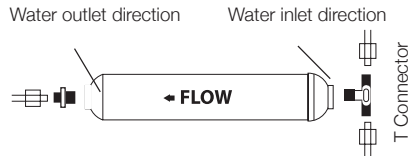
i **WARNING:** *FLOW marking on the filter shows the direction of the water outlet. Ensure not to insert it backwards and do not over-tighten T-connector and the union on the other side.*

A. O. Smith Water Treatment Device is designed for easy installation and maintenance. It is essential not to exceed the recommended replacement periods of cartridge filters and to use the device properly. When the required maintenance and repair is not provided, the life span of the device is shortened and the efficiency of the membranes is reduced. Such situations may cause certificate of warranty to be void.

DISINFECTION PROCEDURE

The water treatment device should be disinfected at least once a year as follows;

- Turn off the water supply.
- Drain all of the water from the tank by opening the faucet (for the models with tanks).
- Add a teaspoon of chlorine to the filter housing and screw back onto the cap.
- Turn on the water supply.
- Repeat this process for 2 times and replace all cartridge filters (for the models with tanks).



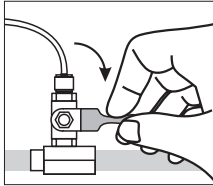
PRECAUTIONS TO USE YOUR DEVICE LONGER;

To ensure that your device functions properly and to prolong the life of the device, the following points must be taken into consideration. Otherwise, the warranty will be voided.

- Do not use with water that has temperature above 40 °C.
- Place or fix the device on a flat surface.
- Do not touch the valves on the device except when necessary.
- It is recommended to install pressure reducer on water inlet of RO device when installation pressure is high. Ensure that periodical maintenance is performed on time and by the authorized service.
- In case of long periods of non-use, turn off water supply. Follow start-up procedure when you want to re-operate.
- Keep your device clean by wiping with a wet cloth periodically and avoid using harsh and corrosive cleaners.

START-UP AFTER MAINTENANCE

"After turning on the valves, turn on the water supply. Open RO faucet and check the entire system for leaks. Now you can enjoy the quality water safely."



Turn on the mini valve of the water supply as shown in the figure.

TRANSPORTATION AND HANDLING

At first, follow the occupational safety rules.

- Drain the water in the tank before transportation and handling.
- Close the water supply of the tank and if the device model is with pump, disconnect the plug from the socket carefully.
- Demount the device carefully.
- Do not leave your device hanging from a higher place.
- Pay attention to keep the parts in the same place to avoid losing them.
- Keep the device in a dry and closed place.
- Pay attention not to drop, break, shake, crush the device during transportation and handling. Ensure that it does not get damaged due to heat, humidity or dust. Keep it out of sun exposure.
- You can get support from our authorized services to avoid unexpected damages during transported handling."

MAINTENANCE

Maintenance of your filters requires very little time or effort but it is essential. Regular maintenance will ensure many years of efficient and trouble free operation.

Standard Care

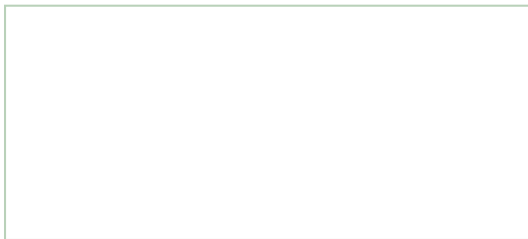
To retain the attractive appearance of your new water filter, clean occasionally with a mild soap solution. DO NOT use abrasive cleaners, ammonia or solvents. Never subject your filter to freezing. The filter media will only require replacement once it has reached the limits of its designated life. Refer to the product information of the particular filter media used.

WARNING:

Disconnect all electrical power prior to performing system maintenance.

Troubleshooting Guide

FAILURE EXPERIENCED	REASON	RESOLUTION METHOD
The machine will not start	<ul style="list-style-type: none"> The power source is not connected Low inlet water pressure or no water Low-pressure switch failure, cannot connect the power source High-pressure switch cannot be restored Switch Mode Power Supply is burned out 	<ul style="list-style-type: none"> Check the power source or the power source plug Check the inlet water pressure After connecting the inlet water, measure the resistance, replace After letting off the pressure, measure the resistance, replace Measure the output voltage, replace
The high pressure pump is working properly, but no water is being produced	<ul style="list-style-type: none"> High-pressure pump has lost pressure Inlet water solenoid valve is faulty, no water can get in (no pure water) A pre-filter is blocked Check valve is blocked (waste water, no pure water) The RO Membrane is plugged 	<ul style="list-style-type: none"> Measure the water pump pressure, replace Replace the solenoid valve Observe the pure water and waste water, replace the pre-filter Replace the check valve Clean or replace the RO membrane
The storage tank is full but no pure water is flowing out	<ul style="list-style-type: none"> Storage tank doesn't have enough pressure Post-activated carbon filter is plugged 	<ul style="list-style-type: none"> Inflate the storage bucket, empty tank pressure should be between 0.05 and 0.07MPa Replace the post-activated carbon filter
The machine is turned off but waste water has not stopped	<ul style="list-style-type: none"> Inlet solenoid valve failed, cannot effectively cut off the water supply Check valve has lost pressure (small W.W. flow rate) 	<ul style="list-style-type: none"> Observe the waste water, replace the inlet solenoid valve Observe the waste water, replace the check valve
After the machine is filled with water, the machine starts repeatedly	<ul style="list-style-type: none"> Check valve has lost pressure High-pressure switch failure System is exhibiting a loss of pressure 	<ul style="list-style-type: none"> Replace the check valve Replace the high pressure switch After checking the non return valve, check whether there is water leakage in the pipelines
The pure water flow is small or not flowing	<ul style="list-style-type: none"> Pre-filter is plugged RO membrane is plugged Inlet solenoid valve failure Check valve is plugged Post-carbon filter is plugged High pressure pump pressure is not enough 	<ul style="list-style-type: none"> Replace the pre-filter Wash or replace the RO membrane Replace the inlet solenoid valve Replace the check valve Replace the post-carbon filter Measure the high pressure pump water pressure, replace



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