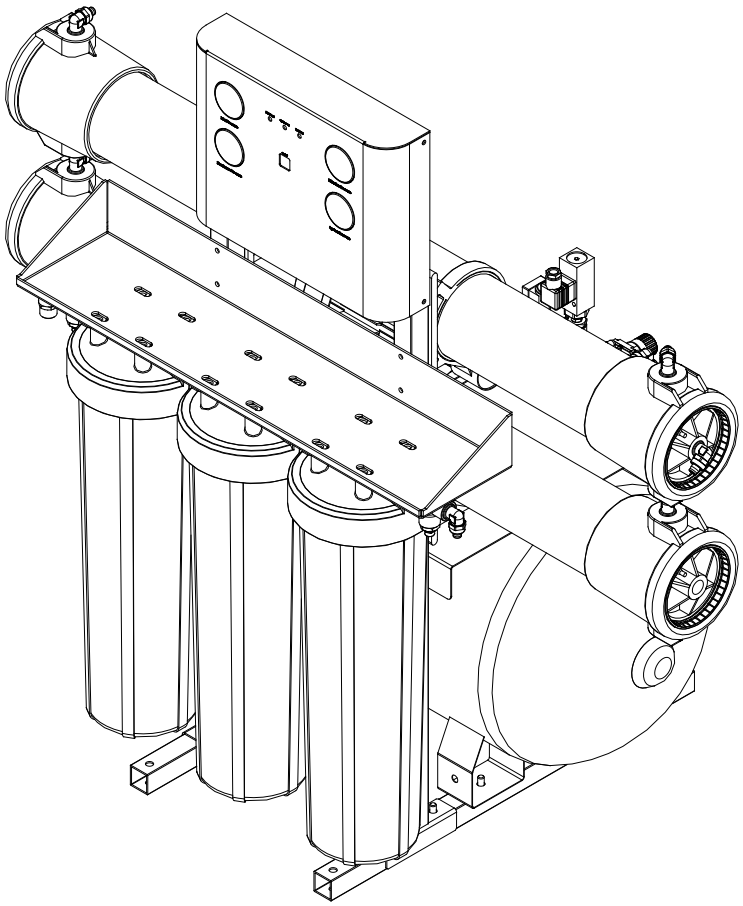
Version 1.22 (UK) 15.04.15

RO SERIES



TECHNICAL MANUAL

Installation, Commisioning, Operation and Maintenance
PureFlo RO-100, RO-250 & RO-500

Humidification and Evaporative Cooling

condair

Thank you for choosing Condair

Installation date (MM/DD/YYYY):
Commissioning date (MM/DD/YYYY):
Location ref.:
Model:
Serial number:

Manufacturer

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Littlehampton, West Sussex.
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1.0 Foreword:

This manual has been written to ensure the safe use, performance and longevity of the equipment and is intended for use by engineers and properly trained technical personnel.

Please read this manual thoroughly before specifying, designing or installing a RO system. Retain for reference.

Condair plc policy is one of continuous research and development. Condair plc reserves the right to amend, without notice, the specifications provided in this document.

Condair plc does not guarantee, or accept liability for, the accuracy of information in this document.

1.1 Health and Safety:

Installation, maintenance, repair work or de-commissioning should only be carried out by appropriately qualified and properly trained technical personnel. It is the customers responsibility to ensure their suitability. The customer is responsible for ensuring that the installation of the equipment complies with all local regulations.

Any risks or hazards relating to the system, including during installation and maintenance, should be identified by a competent Health & Safety representative who shall be responsible for introducing effective control measures as necessary.

WARNING:

Always isolate all supplies to the system before commencing any maintenance or repair.

COSHH and Personal Protective Equipment:

Refer to HSE for information on the Control Of Substances Hazardous to Health and recommendations with regard to Personal Protective Equipment including Respiratory Protective Equipment.

Hygiene:

Your attention is drawn to the local Health & Safety Executive's technical guidance on the control of Legionellosis in water systems. If inadequately maintained, water systems, of which any RO or humidifier is a part, can support the growth of micro-organisms, including the bacterium that causes Legionnaires' disease. Condair plc has considered all aspects of this equipment to reduce as far as possible the risk of Legionnaires' disease and other similar conditions, but it is important that users are aware of their responsibilities under the ACoP in reducing the risk of Legionellosis.

Hygiene Cont:

To prevent the growth of Legionella, users are required to:

1. Carry out a risk assessment of the water system using a competent person, and implement an appropriate monitoring and control regime.
2. Avoid water temperatures which favour the growth of Legionella.
3. Avoid water stagnation.
4. Clean and disinfect the system in accordance with the Health & Safety Executives technical guidance and instructions in this manual.
5. The water treatment system MUST be connected to a clean, potable mains water supply. It is the responsibility of the user to ensure that the water system complies with local regulations and bylaws, particularly those for the control of Legionella bacteria (such as the HSE ACoP L8, The control of Legionella bacteria in water systems). The use of mains water fed tanks and reservoirs is only permitted as part of a managed water treatment system.

WARNING:

This system must be installed, operated and maintained in accordance with this manual. Failure to do so could result in contamination that might cause Legionnaires' disease, which can be fatal.

Correct Use:

The RO water treatment unit is designed to filter mains potable water for the purposes of humidification. Any other, or further, application is not considered use for the intended purpose. Condair plc cannot be made liable for any damage or injury attributable to inattentive, inappropriate, negligent or incorrect operation of the equipment whether or not caused deliberately.

CAUTION:

To prevent water stagnation and bacterial contamination, this system should be left switched on continuously. If the system is switched off for prolonged periods, the pipework should be disinfected as per instructions and a full risk assessment undertaken to ensure safe operation.

Warranty:

Parts are warranteed for 1 year from invoice date with the exception of replacement items listed in the routine maintenance section. Failure to observe the manufacturers installation and maintenance recommendations and instructions will invalidate the warranty. Condair plc cannot be made liable for damage or injury attributable to failure to observe the manufacturers installation and maintenance recommendations and instructions.

Contents

Guide to symbols used within this manual

WARNING:

Instructions relating to safety.

CAUTION:

Instructions relating to the correct operation of the unit.

1.3 Delivery, Storage and Handling

Delivery and Storage

To ensure consistent quality and maximum reliability, each **PureFlo RO** is inspected before leaving the factory. If the **PureFlo RO** is to be put into storage prior to installation, it must be stored under cover and protected from physical damage, dust, frost and rain.

It is recommended that the **PureFlo RO** be kept in its transit packaging for as long as possible prior to installation.

Inspection and Handling

CAUTION:

Inspection: Upon receipt, remove the transit packaging and inspect the unit to ensure that no damage has occurred during transit. Any visible damage must be reported to the distributor immediately. The PureFlo RO must always be handled with care.

Correct Method of Lifting

WARNING:

Lifting or handling must only be carried out by trained and qualified personnel. Ensure that the lifting operation has been properly planned, risk assessed and that all equipment has been checked by a skilled and competent Health & Safety representative. Effective control measures should be put in place.

It is the customer's responsibility to ensure that operators are trained in handling heavy goods and to enforce the relevant lifting regulations.

The packaged RO unit is advised to be carried by a fork lift from the underside, but caution should be exercised to ensure that the load is balanced before lifting. Refer to weights and measures section for system weight.

Any personnel handling or lifting the PureFlo RO system must follow the Lifting Operations and Lifting Equipment Regulations 1998 and Approved Code of Practice L113. The regulation imposes duties on employers and self employed persons and persons who have control, to any extent of lifting equipment.

Caution should be exercised to ensure that the load is balanced before lifting. Refer to specification for system weight.

WARNING:

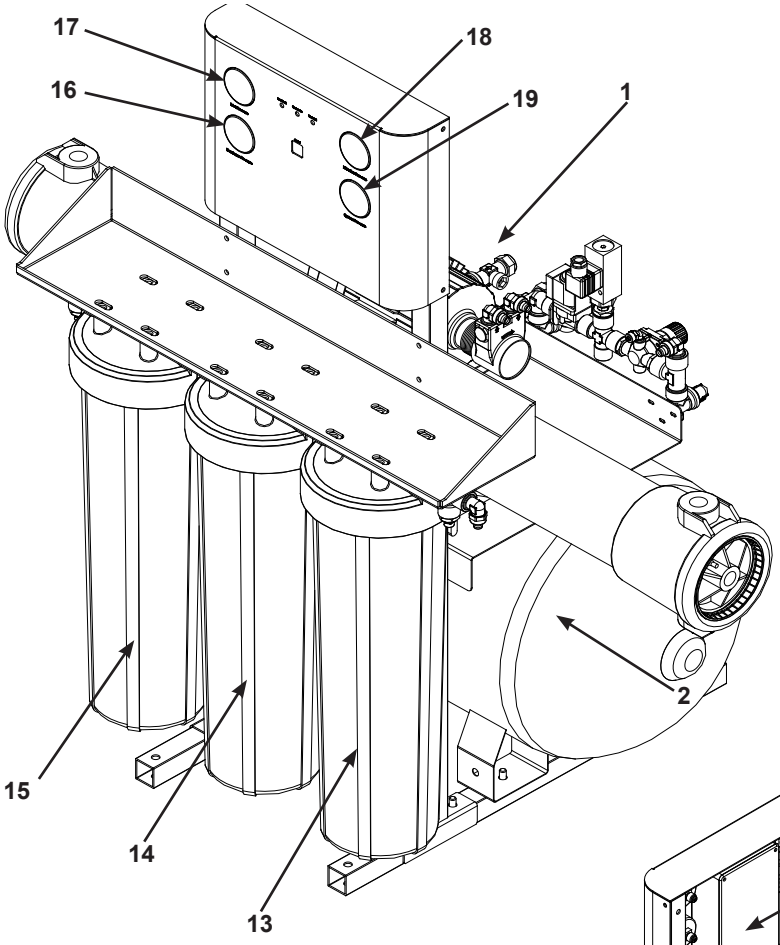
All work concerned with the installation of the system MUST only be performed by skilled and qualified technical personnel. (e.g. Fitters, electricians, plumbers or technicians with appropriate training). The customer MUST be responsible for ensuring their suitability.

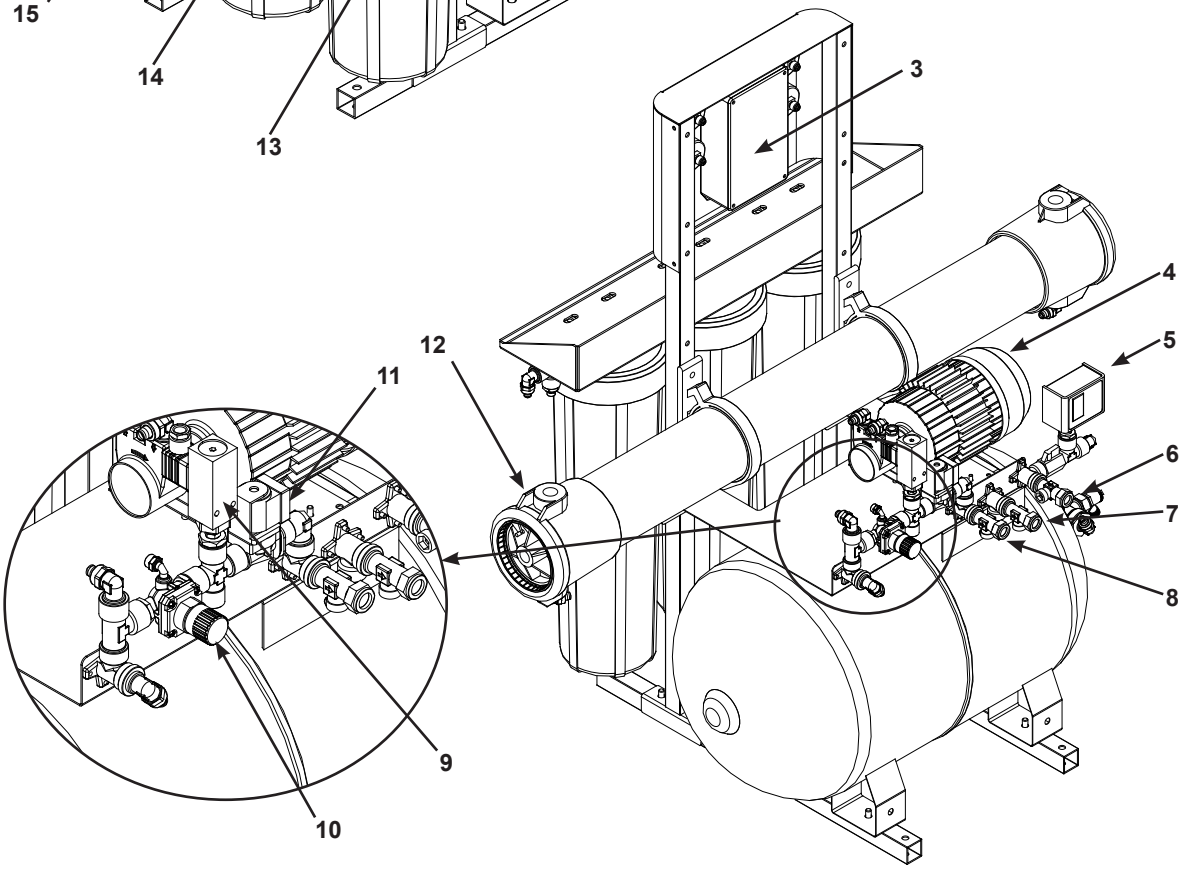
Local Regulations

All installation work must comply with local regulations.

The installation of the system should require no more than the tools in a fitters tool kit.

1.4 System Overview





1. Inlet water booster pump
2. Product water storage vessel
3. RO controller
4. Pump motor
5. Product water pressure switch
6. Product water outlet connection
7. Drain water connection
8. Water inlet connection point
9. Inlet water pressure switch
10. Pump pressure valve
11. Inlet solenoid valve
12. Membrane housings
13. 1 micron sediment filter
14. Carbon filter
15. 5 micron sediment filter
16. Membrane pressure gauge
17. Inlet water pressure gauge
18. Filtration pressure gauge
19. System pressure gauge

Key:
PG1 = Inlet Pressure Gauge
PG2 = Filtration Pressure Gauge
PG3 = Membrane Pressure Gauge
PG4 = System Pressure Gauge

K1 = Inlet Solenoid Valve
K2 = Pressure Relief Valve (9bar)

PV1 = Permeate Water Storage Pressure Vessel

A = Isolation Valve. (Supplied by others).
B = Test Point Isolation Valve
C = Drain Flow Restrictor

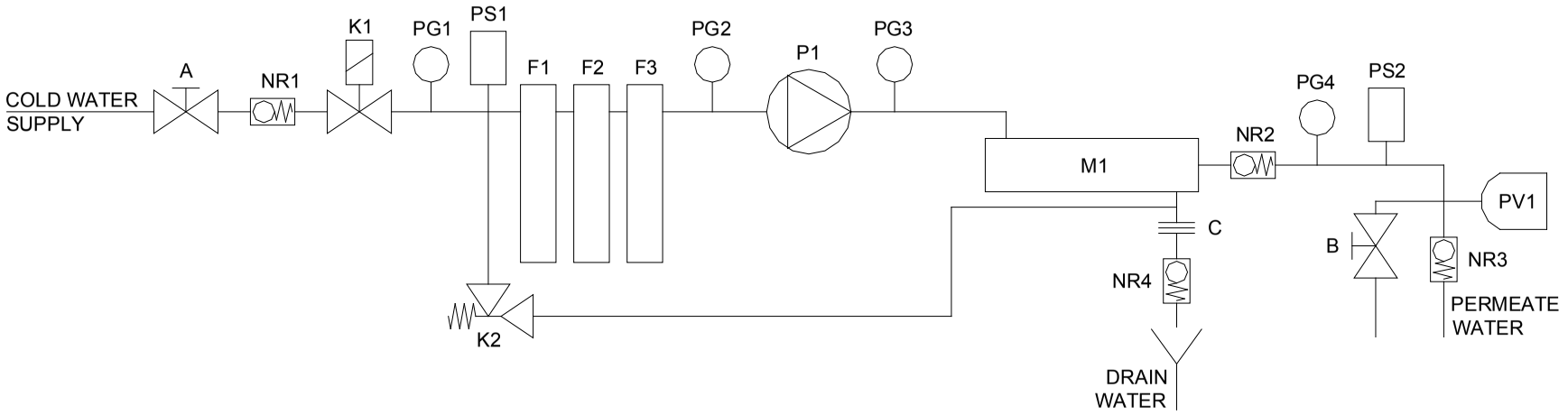
NR1 = Inlet Non Return Valve
NR2 = Permeate Non Return Valve
NR3 = Outlet Non Return Valve
NR4 = Drain Non Return Valve

F1 = 5 Micron Sediment Filter
F2 = Chlorplus Filter
F3 = 1 Micron Sediment Filter

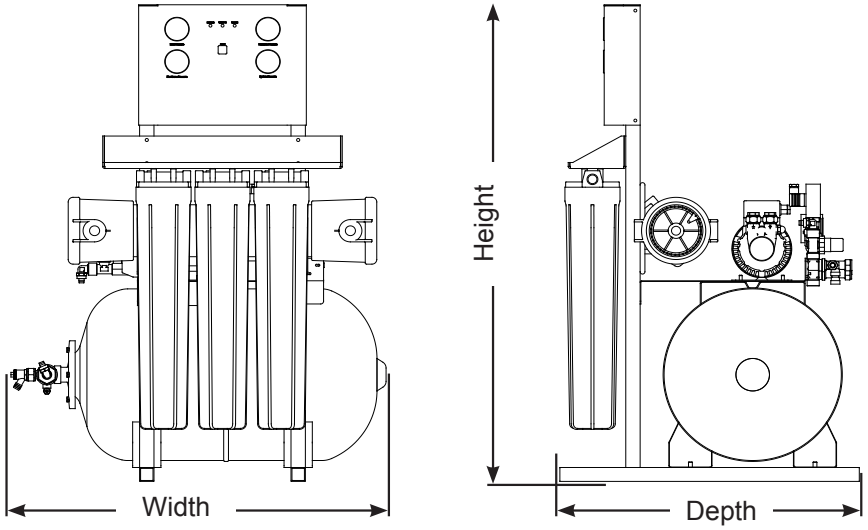
M1 = Reverse Osmosis Membrane

PS1 = Inlet Pressure Switch
PS2 = System Pressure Switch

P1 = Pump



1.6 RO-100, 250 and 500 Specification



Specifications

Performance	**RO-100**	**RO-250**	**RO-500**
Product water flow output (l/h)....	100	250	500
Product water pressure output (bar)....	1-3	1-3	1-3
Rejection (typical) TDS (%)....	95	95	95
Recovery (%)....	50	50	50
Integral water storage (litres)....	23	23	23
Water inlet requirements			
Water inlet pressure (bar)....	2-6	2-6	2-6
Water inlet temperature (°C)....	10+	10+	10+
Inlet water quality TDS (ppm)....	50-700	50-700	50-700
Maximum water consumption (l/h)....	210	540	1030
Max feed water turbidity (NTU)....	1	1	1
Max feed silt density index (SDI)....	5	5	5
PH range....	2-11	2-11	2-11
Water hardness (ppm)....	0-140	0-140	0-140
(>140ppm - Assess suitability of optional water softener)			
Colony count (cfu/ml)....	<1000	<1000	<1000
Iron (mg/l)....	<0.5	<0.5	<0.5
Manganese (mg/l)....	<0.1	<0.1	<0.1
Electrical requirements			
Voltage (V)....	230	230	230
Power (kW)....	0.35	0.35	0.35
Fuse rating (Amps)....	5	5	5
Dimensions and weights			
Dry Weight (kg)....	46	64	73
Operating Weight (kg)....	73	92	99
Water inlet connection (mm)....	15	15	22
Drain connection (mm)....	15	15	15
Product water connection (mm)....	15	15	15
Height (mm)....	1065	1065	1065
Width (mm)....	785	1129	1129
Depth (mm)....	610	670	670
Default pressure settings			
Inlet pressure switch (bar)....	1	1	1
Product water pressure switch (bar)....	3	3	3
Product water pressure switch differential (bar)....	1.5	1.5	1.5
Vessel bladder pressure (bar)....	1.3	1.3	1.3

1.7 Principle of operation

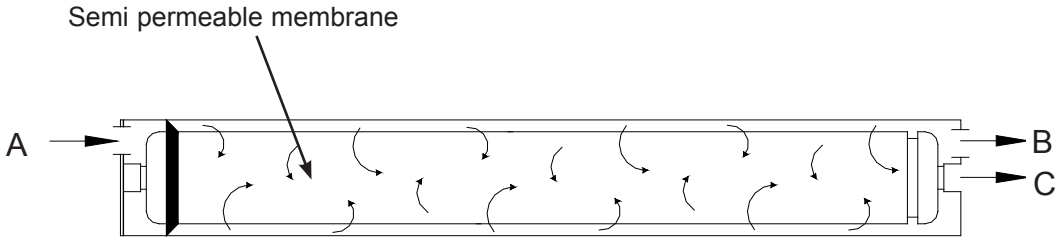
The PureFlo Reverse Osmosis unit is designed to produce high quality water for various applications. The Reverse Osmosis process is capable of rejecting bacteria, salts, sugars, proteins and dyes.

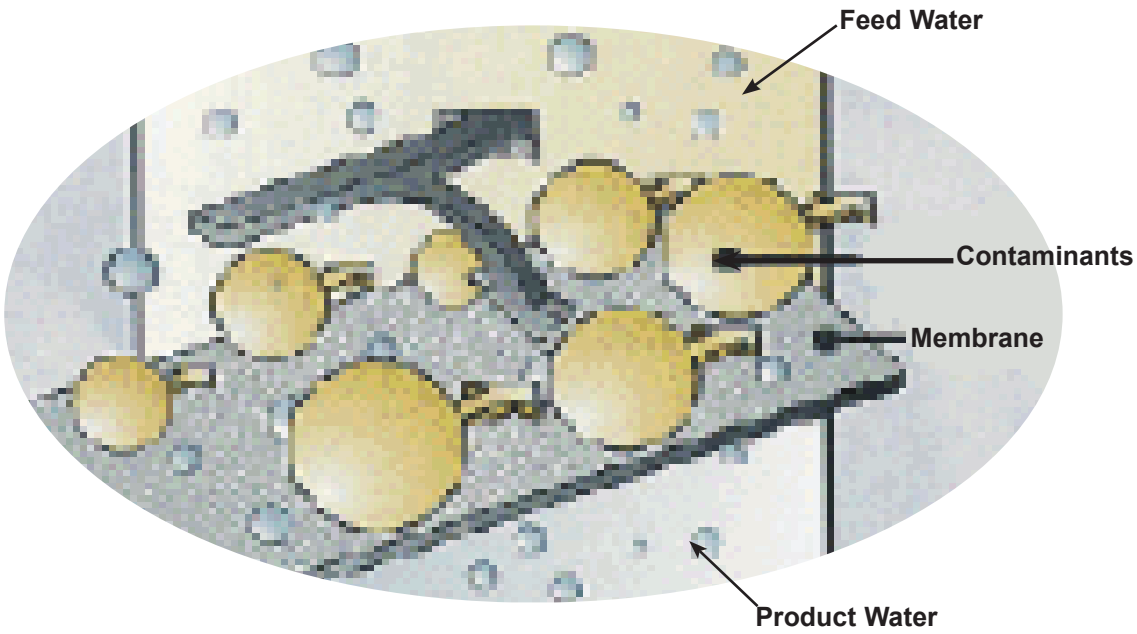
Reverse Osmosis is a separation process. Mains water is forced under pressure through a semi-permeable membrane. The membrane allows water to pass through it but prevents the path of dissolved solids and suspended particles. A proportion of the mains water is used to continually carry away contaminates to waste.

A: Feed Water.

B: Drain water including solids and suspended particles are carried to waste (concentrate)

C: Pure product water (Permeate).





2.1 PureFlo RO Installation Overview

Step 1 - Positioning the RO unit
Step 2 - Plumbing water connections
Step 3 - Electrical connections

Note: Condair plc offers an installation and commissioning service.

Services available include:

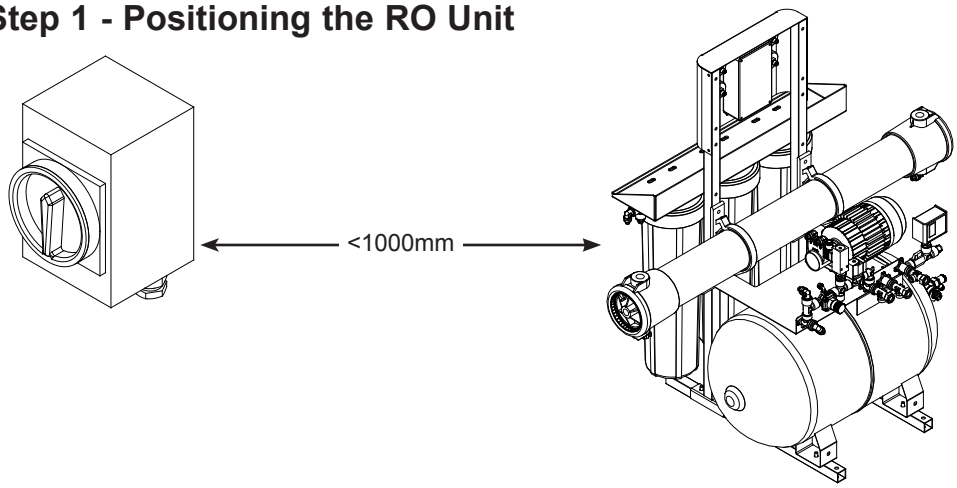
- Site surveys.
- Turnkey packages.
- Contract management.
- Management of site health & safety.
- Risk management.
- Preparation of operation & maintenance documentation & drawings.
- Client demonstration and hand over.

In accordance with the Health & Safety at Work Act 1974 and subsidiary regulations, only trained operatives meeting the health and safety standards dictated by Construction Skills Certification Scheme (CSCS) are used on contracts.

Condair plc are compliant with the government's "Contractors Health & Safety Assessment Scheme" (CHAS), and meet the requirements of "SAFE", the contractor accreditation scheme for business.

For further information, please contact your local areas sales manager.

2.2 Step 1 - Positioning the RO Unit



WARNING:

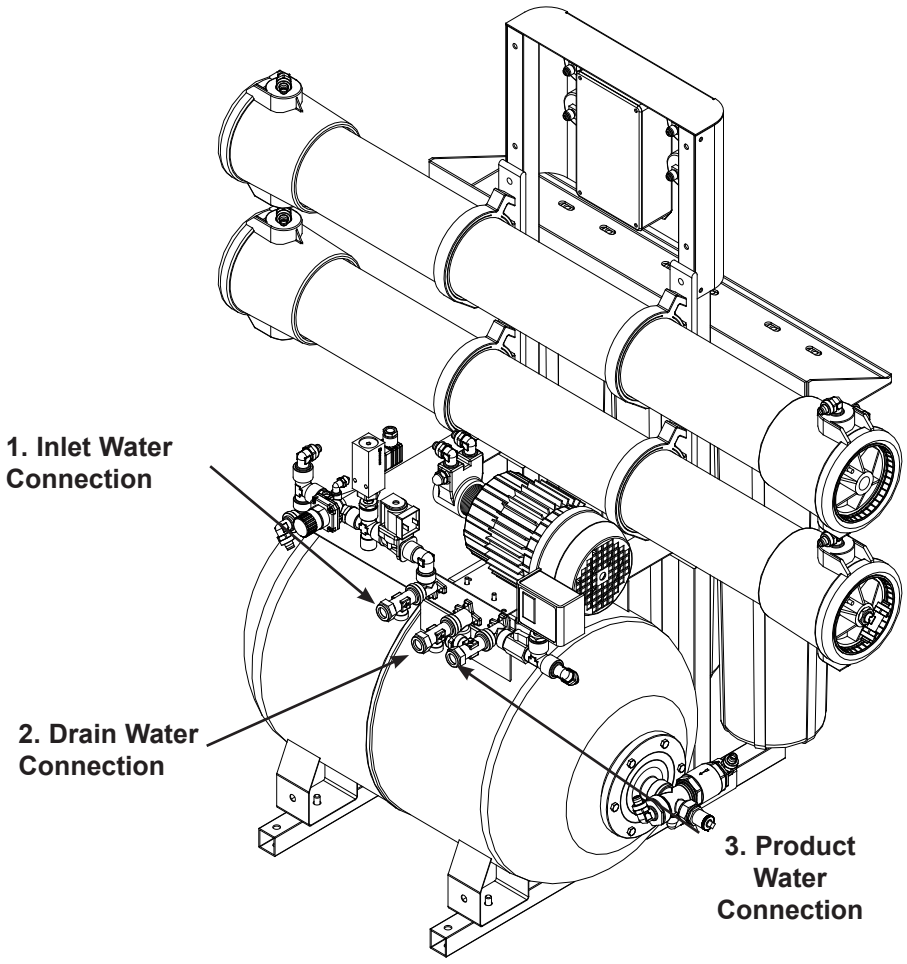
A fused isolator MUST be fitted within 1m of the unit.

CAUTION:

The RO must be positioned in a bunded area with a fitted drain.

2.3 Step 2 - Plumbing Water Connections

1. Water inlet connection: RO-100 - 15mm RO-250 - 15mm RO-500 - 22mm



CAUTION:

Before connecting the water line to the control panel purge the line to ensure any flux or foreign matter left over from the installation is removed. Failure to do so could cause component failure or result in water filter damage.

It is recommended that an additional isolator and tee point is fitted before the RO unit to allow the water supply line to be flushed, or for routine water sampling and cleaning / disinfection.

CAUTION:

Pressure (Min/Max): 2-6 Bar.

Water Supply: The PureFlo reverse osmosis unit MUST be connected to a clean, potable (wholesome) mains water supply. It is the responsibility of the user to ensure that the water system complies

with local regulations and bylaws, particularly those for the control of Legionella bacteria (such as the HSE ACoP L8, The control of Legionella bacteria in water systems). The use of mains water fed tanks and reservoirs is only permitted as part of a managed water treatment system.

2. **Drain water connection - 15mm compression connection**

3. **Product water connection - 15mm compression connection**

CAUTION:

Stainless steel or plastic pipework must be used on the product water pipework due to the aggressive nature of RO water. Copper, iron, steel or galvanised pipe is not permitted.

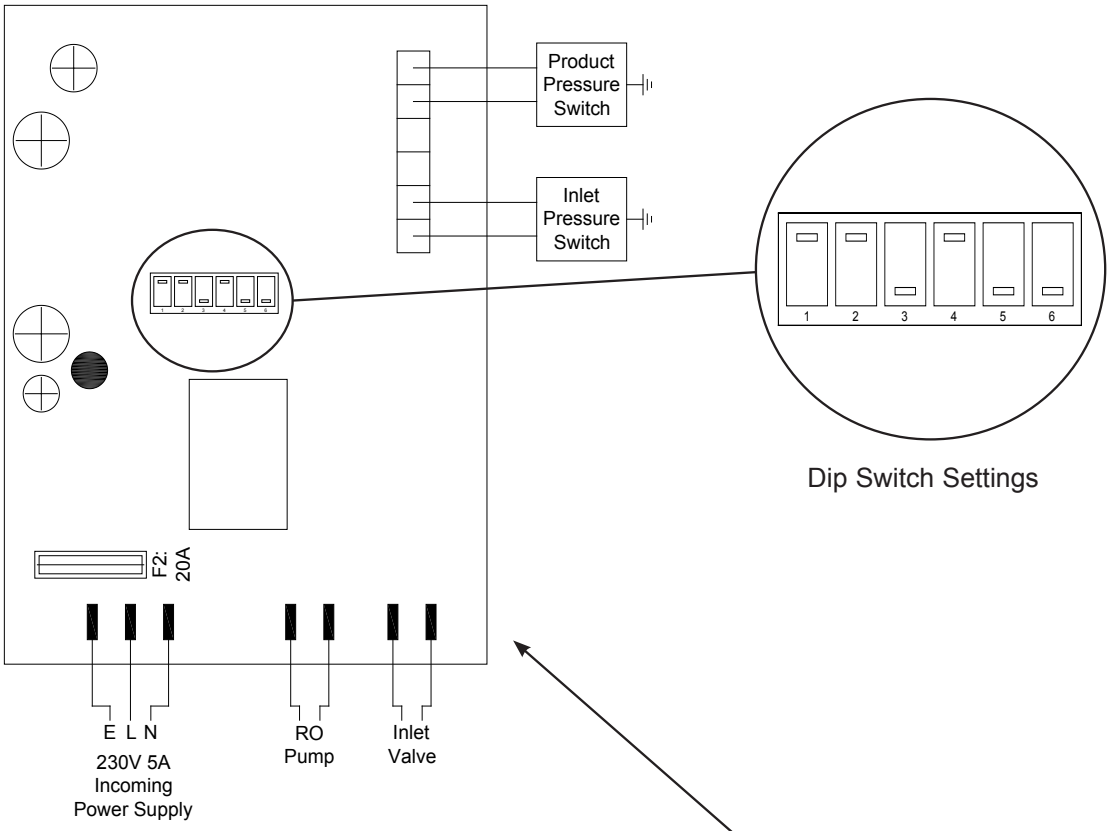
CAUTION:

It is recommended that an additional isolator and tee point is fitted after the RO unit to allow the water supply line to be flushed, or for routine water sampling and cleaning, disinfections and drain downs.

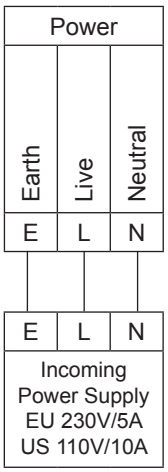
2.4 Step 3 - Electrical Connection

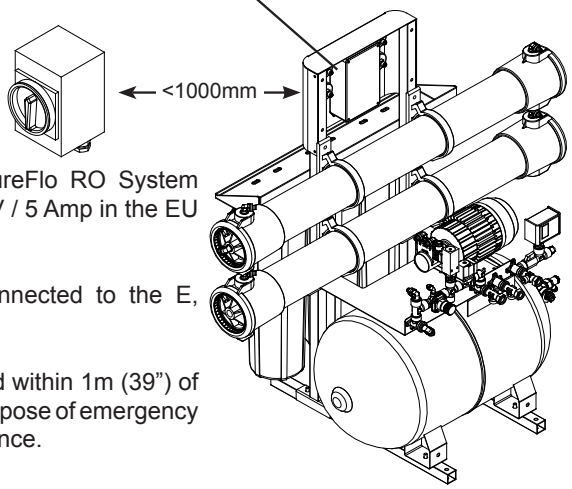
WARNING:

All work concerned with electrical installation must only be performed by skilled and qualified technical personnel (e.g. electrician or technicians with appropriate training). The customer must be responsible for ensuring their suitability. Please observe the local regulations concerning the provision of electrical installations.



Dip Switch Settings





The electrical power cable to PureFlo RO System should be suitably rated for a 230V / 5 Amp in the EU or 110V / 10 Amp load in the US.

The power supply should be connected to the E, L and N terminals as shown.

The power supply must be isolated within 1m (39”) of the management system for the purpose of emergency shut down or for system maintenance.

3.0 Pre-Commissioning Checklist

1. Ensure the water system in the building has been subject to a Risk Assessment. The reverse osmosis system MUST be connected to a clean, potable mains water supply. It is the responsibility of the user to ensure that the water system complies with local regulations and bylaws, particularly those for the control of Legionella bacteria (such as the HSE ACoP L8, The control of Legionella bacteria in water systems). The use of mains water fed tanks and reservoirs is only permitted as part of a managed water treatment system.

2. Ensure the water supply has been completely flushed prior to connection to the reverse osmosis unit. The water supply must be flushed to prevent water stagnation and to clear any flux or foreign matter. This must be done carefully without creating splashing or aerosols.

3. Ensure that the power supply is compatible with the CE label and is both fused and isolated within 1 meter of the unit. Check wiring connections are secure.

4. Check the inlet water pressure is between 2-6bar.

5. Check the drain has been connected and suitable size for fill drain flow.

6. Check the product water connection has been connected to the application in either stainless steel or plastic piping.

7. Check the RO is positioned in a bunded and drain area.

CAUTION:

3.1 Commissioning

Important! If the system is supplying a cold water humidifier a disinfection must be carried out as per the instructions in this manual.

If the system is supplying a steam humidifier a disinfection will not be necessary.

For any other applications a risk assessment should be carried out to determine if a disinfection of the reverse osmosis system is needed before putting it into operation.

1. Ensure the inlet pressure switch is set at 2bar. Refer to the system overview to identify the inlet pressure switch if necessary.

2. Switch on the power supply to the unit and switch on at the on/off switch located on the control panel.

3. Turn on the water supply to the unit. Check for leaks.

4. Discard the product water to drain at the application. The first 20litres of product water should not be used as it may contain some residue of the membrane preservation fluid.

Pre-Commissioning Checklist Cont.

5. Ensure the RO unit switches on again when the product water pressure drops to 2 bar. These outlet water pressure's may be adjusted if necessary. For example: when serving a JetSpray the outlet pressure tolerances will need to be closer.

6. Check the operation of the inlet water pressure by isolating the inlet water supply and checking the unit switches off.

7. Check the product water TDS quality against that of the inlet water supply.

8. Check the filling time of the unit is approximately as below when the application being served is isolated.
   - RO-100 - 14mins
   - RO-250 - 6mins
   - RO-500 - 3mins

4.0 Maintenance

Introduction

Please note that the information given below is only to act as a guide and the frequency of maintenance may depend upon the unit's age, usage and water quality. Correct maintenance is vital to ensure optimum output and reliability.

All water treatment units will form part of your hot and cold water system and as such require you to undertake certain duties with regards to "The control of Legionella bacteria in water systems" (L8). Your water sampling/ testing and disinfection regime must be based on details in this manual and from results of a site specific risk assessment.

If any further assistance is required or you are interested in a planned maintenance quote, please contact your distributor.

Maintenance Frequency

Visual check for leaks and operation etc - Monthly
Check product water TDS. - Annually
Replace membranes. - 1-3years
Disinfection. - For cold water humidifiers - 6 monthly intervals or as specified by risk assessment.
- All other applications as per risk assessment.

	RO-100	RO-250	RO-500
Replace 1 micron sediment filter	Annually	Annually	6 Monthly
Replace carbon filter	Annually	Annually	6 Monthly
Replace 5 micron sediment filter.	Annually	Annually	6 Monthly

4.1 Replacing the pre-filters

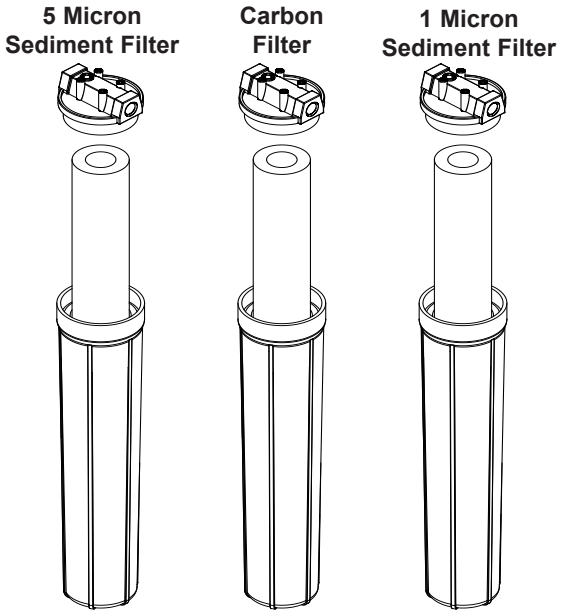
WARNING:

Please use gloves

1. Isolate the water supply to the unit and switch off the power supply.

2. Unscrew the filter housing anti-clockwise and replace the prefilter as shown in the diagram opposite.

3. Switch on the water supply and check for leaks.

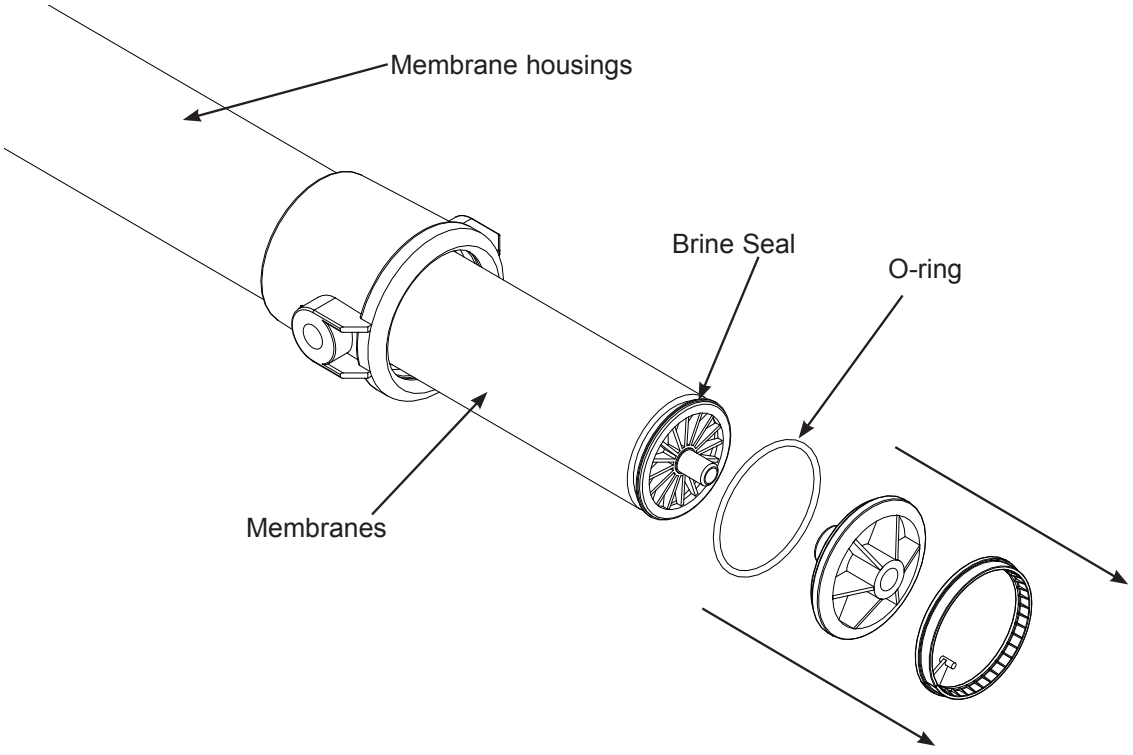


4.3 Membrane replacement

WARNING:

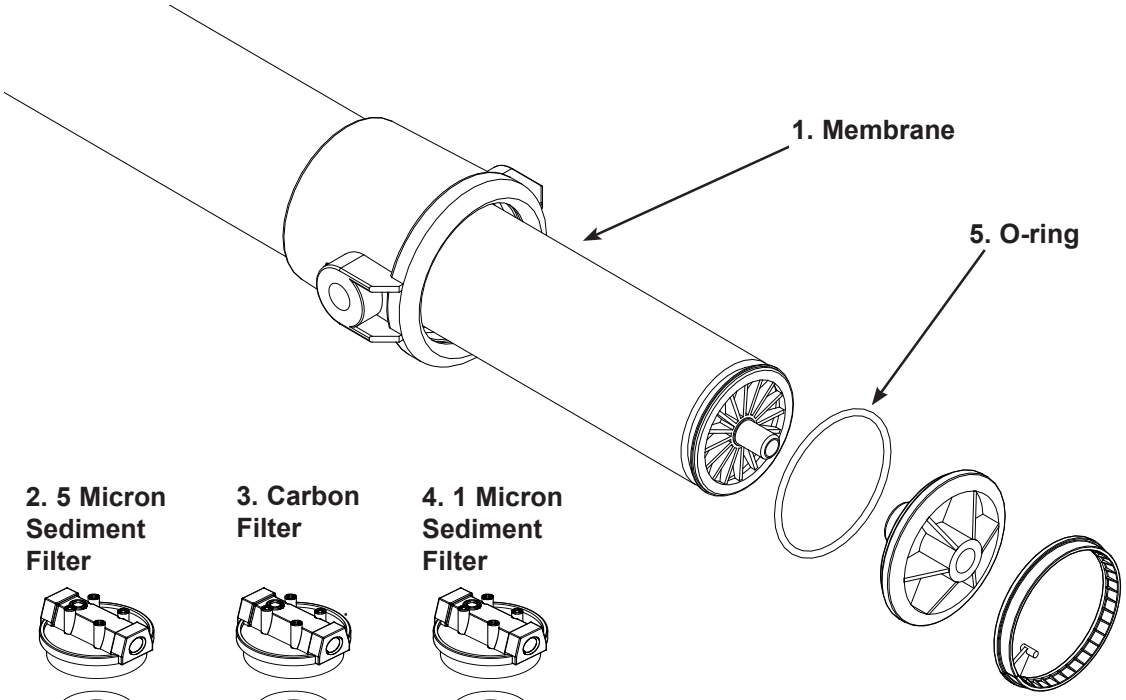
Please use gloves

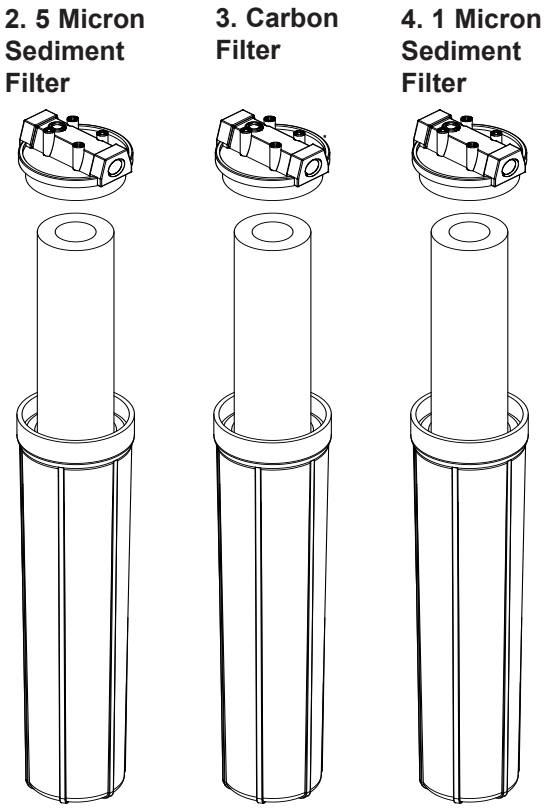
1. Isolate the water supply and the power supply to the unit.
2. Release the flexible hoses at the bottom of the membrane housings by unscrewing the compression nuts.
3. Unbolt and remove the entire membrane housing assembly.
4. Unclip and remove membrane housing ends.
5. Remove the existing membranes and replace with new ones.
6. Ensure the membrane brine seal is at the water inlet end of the membrane housing.
7. Check the O-rings for wear, replace if necessary.
8. Check the smaller O-rings inside the housing end caps for wear, replace if necessary.
9. Apply lubricant grease to all O-rings.
10. Replace the housing end caps and clips at their respective ends of the membrane housing.

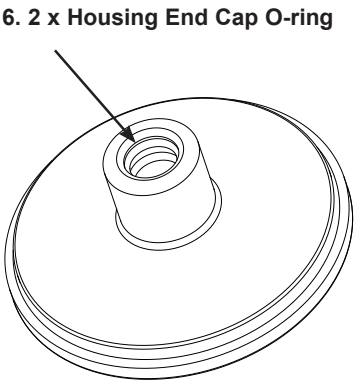


4.4 Consumable Spares list

No	Description	RO-100	RO-250	RO-500
1	Membrane	1 x MEM4021	1 x MEM4040	2 x MEM4040
2	1 Micron Sediment Filter	1 x PX01/20	1 x PX01/20BB	1 x PX01/20BB
3	Carbon Filter	1 x CHLORPLUS20	1 x CHLORPLUS20BB	1 x CHLORPLUS-20BB
4	5 Micron Sediment Filter	1 x PX05/20	1 x 1201459	1 x 1201459
5	O-ring	2 x ORING4	2 x ORING4	4 x ORING4
6	Housing End Cap O-ring	4 x ORING1/2	4 x ORING1/2	8 x ORING12

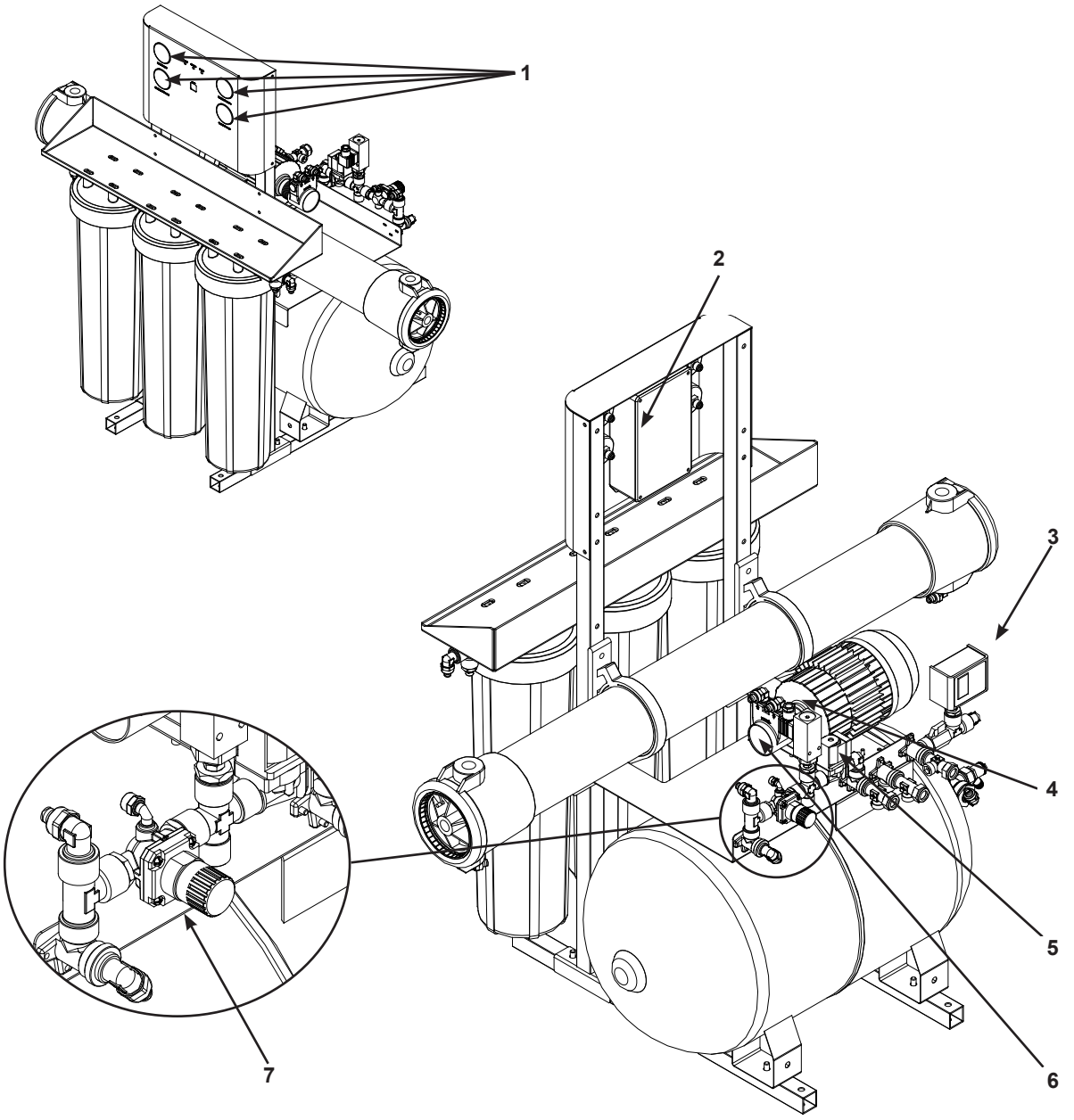






4.5 Critical Spares list

No	Description	RO-100	RO-250	RO-500
1	Pressure Gauge	1 x 01043	1 x 01043	1 x 01043
2	RO Controller	1 x ROCONTROLLER	1 x ROCONTROLLER	1 x ROCONTROL-LER
3	Pressure Switch	1 x 01400	1 x 01400	1 x 01400
4	Pump Motor	1 x F110380.19	1 x F110380.19	1 x F110380.19
5	Inlet Solenoid Valve	1 x 04492	1 x 04492	1 x M89282
6	Inlet Booster Pump	1 x FP1001	1 x FP1001	1 x FP1001
7	Pump Pressure Valve	1 x 02078	1 x 02078	1 x 02078



4.6 Water Sampling

Water sampling must be included as part of the maintenance schedule. The TDS of the sample should be tested and a dip slide used to indicate the total number of coliforming units per millilitre (cfu/ml). Generally, levels of 1 x 10^4cfu/ml may be considered acceptable for this type of humidifier provided the species of bacteria and/or fungi involved are themselves not considered to be harmful. If you are unsure of the quality of your water please consult your distributor for advice.

Failure to ensure that the system is free from contamination may lead to a significant risk to health and safety.

Water Sampling and Testing
On commissioning and every three months thereafter, test for possible water contamination using Dip slides. Take samples from the water supply to the system and the from the water tank. The Dip slides should be incubated for 2 days at 30°C.

1. If the microbial count from the water tank exceeds 1 x 10^4cfu/ml, the system should be turned off and disinfected using a 50 ppm chlorine solution for one hour before being put back into use.
2. If the microbial count in the water supply to the system exceeds 1 x 10^3cfu/ml, this suggests contamination of the water system within the building. The system should be turned off and you should seek specialist advice on cleaning your water supply.
3. If the water temperature anywhere in the system regularly exceeds 20°C, carry out this test monthly. The frequency may be reduced if successive tests show a consistent level below 1 x 10^3cfu/ml.

Health and Safety Requirements
Every 6 months, users are required by the Health & Safety Executive, Approved Code of Practice (ACoP) to take samples for Legionnella analysis. Samples should be taken from the same places as described above, and the analysis carried out by a UKAS accredited laboratory which is part of the Legionnella AQS Scheme. In the event that the Legionnella content exceeds 1 x 10^3cfu/l, the system should be switched off and specialist advice sought regarding its disinfection.

4. If biofilm (a slimy or gel-like deposit when wet, which might be dry and crisp in a dry system) is found during any inspection of the humidifier or water system, the system MUST be switched off and not put back into operation until the system has been thoroughly cleaned with a suitable biocide. This work should only be carried out by fully trained specialist organisations or individuals.
5. **This RO system is designed to be left switched on continuously.** If the system is turned off for prolonged periods, water stagnation might occur and bacterial contamination result, so the system, including any storage tanks or vessels should be drained and left dry.

Before putting the system back into service, a full risk assessment should be undertaken to ensure safe operation, with particular attention paid to water supply quality.

The water pipework supplying the system should be purged carefully, avoiding the creation of aerosols by splashing, and a water sample should be taken to ensure cleanliness.

Always call your distributor for advice on water sampling and analysis, disinfection of systems, service and maintenance contracts.

4.7 Cleaning and Disinfection

All surfaces requiring disinfection or cleaning must be in contact with the appropriate concentration of disinfection solution for at least one hour.

1. Complete Disinfection

It is recommend that “Complete Disinfection” should take place in the following situations:

- At initial commissioning if the RO unit is supplying a cold water humidifier or any other application that is deemed a risk by the water system risk assessment.
- Where routine monitoring and control regime or risk assessment shows it to be necessary.
- If the system or part of it has been shutdown and/or substantially altered creating a risk of contamination.
- During or following an outbreak or suspected outbreak of Legionellosis.

2. Routine Disinfection

A “Regular Routine Disinfection” should be carried out when required as part of a maintenance schedule.

This recommendation is in accordance with the HSE’s Approved Code of Practice (ACoP) L8.

Cleaning and Disinfection Method Statement

Routine disinfection
(*To be done as part of a routine maintenance schedule*)

Ensure the application is isolated unless this is to be disinfected as well.

Step 1 - Refer to the Risk Assessment.

- Refer to the Manufacturers instructions and safety advice.
- Ensure the area is well ventilated.

Step 2 - **Mix Disinfection Solution.**

- Disinfection solution following the manufacturers instructions. L8 recommends 50ppm Chlorine solution used for 1 hour.
- Calculate the total water volume of the system and allow for additional water purged from the end of line.

  Note: - Solution loses strength over time.

Step 3 - Pressurise disinfection solution within system.

- Utilise the blend water inlet point as a injection point to pressurise the system with the disinfection solution.
- Allow to remain at pressure for a period of time in accordance with the manufacturers guidelines.

Cleaning and Disinfection Method Statement

Step 4 - Drain unit.

- After the time period has elapsed, drain system fully, into appropriate container and neutralise if necessary before disposing into appropriate drain.
- Calculate the required strength of neutraliser required from the manufacturers information sheet.
- Disconnect pump and re-connect fresh water supply. Ensure fresh water supply is clean.

Step 5 - Flush pipe-work.

- Flush pipe work with fresh cold water and test until chlorine is completely flushed.

Complete disinfection (*To be done when a disinfection is deemed necessary as part of a risk assessment*)

Ensure the application is isolated unless this is to be disinfected aswell.

Step 1 - Refer to the Risk Assessment.

- Refer to the Manufacturers instructions and safety advice.
- Ensure the area is well ventilated.

Step 2 - **Mix Disinfection Solution.**

- Disinfection solution following the manufacturers instructions. L8 recommends 50ppm Chlorine solution used for 1 hour.
- Calculate the total water volume of the system and allow for additional water purged from the end of line.

  Note: - Solution loses strength over time.

Step 3 - Remove membranes.

- Remove membranes from housings and re-assemble with housings empty.
- Isolate and disconnect the water supply to the RO unit.

Step 4 - Pressurise disinfection solution within system.

- Power on RO unit to allow the inlet valve to open.
- Inject disinfection solution at the water inlet point of the unit. Allow the pumps to run and the system will pressurise.
- Allow to remain at pressure for a period of time in accordance with the manufacturers guidelines.

Step 5 - Drain unit.

- After the time period has elapsed, drain system fully, into appropriate container and neutralise if necessary before disposing into appropriate drain.
- Calculate the required strength of neutraliser required from the manufacturers information sheet.
- Disconnect pump and re-connect fresh water supply. Ensure fresh water supply is clean.

Step 6 - Flush pipe-work.

- Flush pipe work with fresh cold water and test until chlorine is completely flushed.

NOTES:

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