Compact RO

Installation Operation Maintenance Manual

Compact Reverse Osmosis Systems
With EWS 'OS3030' controller

Single phase and three phase versions

Models

C1000A
C2000A
C4000A
C6000A
C8000A
C10000A

Rev 9.0 **21/12/11**

1.0 GENERAL NOTES

These instructions cover the Compact Range of Commercial Reverse Osmosis Systems, which includes models with nominal outputs ranging from 6,000 to 32,000 litres per day.

It is recommended that these instructions are read throughout before commencing any work on the unit, particularly if you have no previous experience of installing and using a high pressure Reverse Osmosis System.

The instructions have been written in such a manner that the vast majority of the text applies to all the models in the range. However, in some cases, there are differences between different models, and when these result in a requirement to undertake a task in a different way, individual sections have been written to cover each case. These are clearly marked, and should be easy to identify.

2.0 THE REVERSE OSMOSIS PROCESS

2.1 Introduction

Osmosis is a natural process involving fluid flow across a semi-permeable membrane barrier. It is the process by which nutrients feed the cells in our bodies and how water gets to the leaves at the top of trees.

If you separate a solution of salts from pure water using a basic thin semi-permeable membrane like a sausage skin, the pure water passes through the membrane and tries to dilute the salt solution. If the salt solution is connected to a vertical pipe then the progressively diluted solution will fill the pipe until the 'osmotic pressure' drawing the pure water though the membrane is the same as the head of solution.

This process can be reversed - hence 'Reverse Osmosis' - by applying a higher pressure to the salt solution. Pure water will then pass the other way through the membrane in a process that is easy to visualise as 'filtration' where the filter will only let through the small water molecules and retain almost all of the other molecules.

The mechanism of water and salt separation by reverse osmosis is not fully understood at the 'atomic' level. Current scientific thinking suggests two transport models: porosity and diffusion. That is, transport of water through the membrane may be through physical pores present in the membrane (porosity), or by diffusion from one bonding site to another within the membrane. The theory suggests that the chemical nature of the membrane is such that it will absorb and pass water preferentially to dissolved salts at the solid/liquid interface. This may occur by weak chemical bonding of the water to the membrane surface or by dissolution of the water within the membrane structure. Either way, a salt concentration gradient is formed across the solid/liquid interface. The chemical and physical nature of the membrane determines its ability to allow for preferential transport of solvent (water) over solute (salt ions).

2.2 Membrane construction

The semi-permeable membrane for reverse osmosis applications consists of a thin film of polymeric material a fraction of a millimetre thick cast on a fabric support. Commercial grade membranes have high water permeability and a high degree of

semi-permeability; that is, the rate of water transport is much higher than the rate of transport of dissolved ions.

The membranes are stable over a wide range of pH and temperature, and have good mechanical integrity. The stability of these properties over a period of time at field conditions defines the commercially useful membrane life, which is in the range of 3 to 5 years. There are a number of different materials used for membranes and several ways of constructing them. This system uses a Composite polyamide spiral wound membrane.

In a spiral wound configuration two flat sheets of membrane are separated with a permeate collector channel material to form a leaf. This assembly is sealed on three sides with the fourth side left open for permeate to exit. A feed/brine spacer material sheet is added to the leaf assembly.

A number of these assemblies or leaves are wound around a central plastic permeate tube. This tube is perforated to collect the permeate from the multiple leaf assemblies. The feed/brine flow through the element is a straight axial path from the feed end to the opposite brine end, running parallel to the membrane surface. The feed channel spacer induces turbulence and reduces concentration polarisation.

The spiral membrane is then enclosed by wrapping with glass reinforced resin into which is bonded an adapter cap at each end. Water under pressure is introduced into one end of the membrane assembly so that it runs between the feed channel spacers, with the concentrate and permeate output piped away at the other

2.3 Pressure pump

In order to develop sufficient water pressure to overcome the Osmotic Pressure of the feed water and produce an acceptable volume of permeate, a vertical multistage pump is used to boost the supply pressure by approximately 100 -150 psi which results in the system running at 140 - 200 psi in normal service.

This type of pump is both quiet and reliable in continuous applications, requiring minimal maintenance.

2.4 Recirculation

Single membranes will normally 'recover' only 10-15% permeate from the raw water without fouling. However by returning a proportion of the concentrate exiting from the membrane to the inlet of the pressure pump, the flow across the surface of the membrane is dramatically increased allowing a recovery ratio of up to 75% to be achieved without significant fouling. Recirculation also allows a higher flow of water through the pump, reducing the load on its bearings and helping the pump to run cooler. The recirculation rate on the Compact Series is adjustable but should normall set at approximately 15 litres per minute.

2.5 Recovery

The 'recovery' of a Reverse Osmosis System is a measure of the proportion of the total input water that is converted to high quality permeate. A recovery ratio of 10% means that only 1 part in ten of the input water is converted to permeate. At 50% recovery, half of the input water is converted. At 75% recovery, three quarters of the input water is converted to permeate.

The recovery ratio on the Compact Series is adjustable, and its setting will affect the final water quality. At high recovery ratios, the amount of solids in the concentrate water as it exits the membrane will be high which will result in a higher level of solids in the permeate. However by reducing the recovery, the operating pressure in the system will also be reduced, which in turn can also result in a raised level of solids in the permeate since rejection rates are better at higher pressures.

A balance of the optimum water quality and volume is usually found at recovery ratios of 50%-65%.

2.6 Rejection

The rejection ratio is a measure of the amount of solids dissolved in the raw water that are 'rejected' by the membrane. A rejection rate of 99% means that that only 1% of the dissolved solids will pass through the membrane, and these are usually of low molecular weight.

At 99% rejection on a raw water supply of 400 ppm, you would therefore expect a permeate quality of 4 ppm. However by running single membranes at high recovery levels with considerable recirculation will mean that the membrane actually 'sees' a raw water of 1000-1500 ppm which could give a product water quality of 10-15 ppm. This is still a very pure water, but may need additional polishing through a mixed bed ion exchange resin if ultra-low TDS water is needed for process.

2.7 Flush

In order to remove fouling that accumulates during service it is essential to periodically flush the membrane at a high water flow.

The controller fitted will automatically flush the membrane at the beginning and end of a production run, and also flush it periodically during standby.

3.0 UNPACKING AND IDENTIFICATION

3.1 Basic Packages

The Reverse Osmosis unit will normally be delivered as a single item strapped to a small pallet. Additional items may also be supplied if ordered, such as a product water storage tank, pre-filter or water softener. If no additional items have been ordered, then a set of level probes will also be supplied for installation in to the customer's treated water storage tank.

3.2 Unpacking notes

The unpacking of the system off of the pallet is straightforward and there are no 'hidden' items. It is advisable to keep the system on its pallet with any external wrapping until ready to complete installation to prevent dust or water ingress.

Care must be taken if carton slitters or hobby knives are used to remove any external wrapping since there are control cables and high pressure hoses routed around the system frame.

3.3 Lifting

Caution: The system will weigh between 75 and 110 kg depending on the model. It should be moved on its pallet using appropriate equipment to its point of installation. It can then be removed from the pallet by rocking and spinning on one edge of the base frame.

If the system must be lifted clear of the ground when off the pallet, suitable lifting straps must be used which will lift the system by the base without stressing components on the frame

4.0 Temporary Storage

If installation is not to start immediately after delivery, the equipment should be stored in a clean dry area, where it will not be damaged, or be subjected to temperatures below freezing.

5.0 DESCRIPTION OF SYSTEM

Single compact frame with one, two, three or four single length ESPA or ESPAfree membranes, electronic controller, flow meters, valves, Carbon filter, vertical multistage pressure pump and all interconnecting pipe work.

The inlet connection is positioned prior to the Carbon filter on a manifold with the inlet solenoid . After the filter is the low pressure switch and inlet pressure gauge line and then a flexible hose takes the supply water to the inlet of the pressure pump.

The control panel will not initiate service unless the water pressure is above the minimum set point, currently 1.0 bar. This level is set low since the high pressure pump draws water at a very high rate during flushing with the effect that the monitored inlet pressure will drop.

From the pump, high pressure water is piped from a manifold with a high pressure switch to the inlet on the bottom of the first (or only) membrane housing. The permeate outlet from the housing is connected to the inlet of the permeate flow meter. The outlet of the permeate flow meter is terminated with a 1/2" John Guest fitting.

The concentrate outlet from the membrane housing is connected to a manifold with a tee to a recirculation flow regulating valve and flow meter, pressure gauge line, tee to the flush line and tee to the pressure regulating/concentrate flow valve mounted below the concentrate flow meter. The regulating valve is used to control the back pressure in the concentrate line and the flow of concentrate to drain.

The recirculation flow valve directs a proportion of the concentrate water back to the inlet of the high pressure pump which maintains the water velocity over the surface of the membrane. Water is recirculated to help give high recovery of permeate from the concentrate water, and also to keep up the flow across the surface of the membrane to prevent fouling.

The flows have been factory tested under working conditions, but the concentrate valve may been opened prior to despatch in order to fill the membranes with preservative. The valve will need setting up on site to balance the outputs to the user's requirements depending on the incoming water pressure and quality.

Pressure gauges supplied are glycerine filled to minimise bounce and prolong the service life.

If a permeate storage tank has not been ordered, a tank 'full/restart' level sensor and flying lead has been included with the system to be installed in the permeate tank. Installation will require the tank cable to be connected via the tank connector/stuffing assembly the two core flex and two way connector to on the Reverse Osmosis system.

6.0 PRE INSTALLATION CHECKS

6.1 MECHANICAL

6.1.1 Foundations/Drainage

The Reverse Osmosis unit will not require any special foundations, provided that a firm, level area which is capable of supporting the working weight (see Engineering Data, **Section 12.2)** is available.

Reject/concentrate water from the process must flow to drain, or to a nearby storage tank where it can be utilised for other processes that do not require high quality water, such as washdown or lavatories.

If the system is simply run to waste this must be to an open drain or gully, capable of passing the necessary flow as required (see Process and Operating Data, **Section 12.1**, for relevant flows). The total flow of water to drain depends on site conditions, but will typically be between 50-100% of the product water flow. The drain must not be at a level higher than the Reverse Osmosis unit and preferably should be installed with an air break at the same height as the drain outlet.

6.1.2 Operating Space

It is difficult to be precise with regard to the floor space which will be occupied by the assembled unit, since there will usually be associated pre-treatment and product water storage. However, an idea can be gained from reference to the Engineering Data (**Section 12.2**). The RO frame built with a Grundfos pump has a 600mm W x 625mm D footprint

Access will be required to monitor the operating pressures, permeate & concentrate flows, and permeate conductivity. Access will also be needed to carry out adjustments or maintenance on the equipment. It is therefore recommended that a minimum of 500mm clearance be allowed around the base for this purpose.

6.1.3 Incoming Water

The raw water to be fed to the Reverse Osmosis unit must comply with the following:

(a) Available at all times at a flow equal to the required maximum service flow or greater.
(b) At a pressure between 2.0 and 5.0. bar at the service flow required.
(c) Temperature between 10°C and 40°C.
(d) Pre-filtered to below 5 micron nominal.
(e) Iron less than 0.2 p.p.m., Manganese less than 0.1 p.p.m.
(f) Free Chlorine less than 0.2 ppm
(g) Softened to no greater than 10ppm hardness as CaCO3 .

6.1.4 Pipework

Pipework to be connected to the Reverse Osmosis Unit should not have an excessive amount of Iron or hardness scale deposit. Piping that is heavily built up with scale or Iron deposits should be replaced.

Make sure that the pipework can be connected to the Reverse Osmosis Unit in such a way as to impose no stresses on the inlet connection, and so that it is properly aligned and supported. Excessive vibration can cause erratic operation of the solenoid valves, so, if required, a suitable vibration damper should also be installed. Final connections to the Unit should be made where possible using flexible connections to avoid stresses during operational cycles.

6.1.5 Water Supply Company Requirements

It is essential that the equipment is connected to a pressurised water supply. If connected to a mains supply the local bye laws must be adhered to. These cover both plumbing and the prevention of back flow into the mains. If there is any doubt, the local water inspector should be consulted, but in general, the installation of a 'Double check valve assembly' conforming to BS.6282 part 2 will be required in the supply pipework to the system.

6.2 ELECTRICAL

6.2.1 Single phase system

A continuous supply of 240v, 50 Hz with a rating of 13 Amps is required by the single phase Reverse Osmosis Unit. A 240/24v safety isolating transformer is fitted to the frame to provide power to the controller and a water softener/filter if required.

6.2.2 Three phase system

A continuous supply of 415v, 50 Hz three phase and neutral with motor rated 10 amp fuses is required by the three phase Reverse Osmosis Unit. A 240/24v safety isolating transformer is fitted to the frame to provide power to the controller and a water softener/filter if required.

7.0 INSTALLATION

7.1 MECHANICAL

A flow diagram showing the suggested overall layout of the system is included as Fig 14.1 ,and should be referred to for guidance.

Check all the items against the parts list and shipping documents, and ensure you have them all before starting work. In addition to the components you will require basic tools, (i.e. spanners, screwdrivers etc., and P.T.F.E. tape).

7.1.1 Inlet Pipework

Pipework should be assembled incorporating the features shown in the Flow Diagram, Fig 14.4. It is essential that an inlet isolating valve is provided, and that the water main is protected by a double check valve where appropriate (see Local Water Bye laws).

Pipework can be constructed from any normally acceptable material (Copper, Galvanised, Plastic), provided it is properly supported and aligned. Ensure that the pipe is sufficiently large to accommodate the flow of water required.

NOTE: IF BRAZED OR SOLDERED FITTINGS ARE TO BE USED, THE PIPEWORK MUST BE DISCONNECTED FROM THE SYSTEM CONNECTIONS DURING HEATING AND COOLING. EXCESS HEAT CAN CAUSE PERMANENT DAMAGE TO SOME OF THE SYSTEM COMPONENTS.

The inlet pipework should be connected to the upper left hand piping supplying the filter (3/4" BSPM.) See Drawings Section 14

7.1.2 Drain Connection

The drain pipework should be connected to the port on the lower manifold The drain outlet connection is 3/4" BSPM.

This should be run to a drain or concentrate storage tank capable of taking the maximum flow during flushing (see **Section 12.1**), using flexible tube if at all possible An air gap is necessary on the drain line from the system to prevent negative pressures acting on the membrane, which can result in membrane failure.

7.1.3 Permeate Connection

The permeate connection is made to the outlet John Guest fitting on the top of the permeate flow meter. This will accept 1/2" OD tube.

Install a suitable overflow in the permeate storage tank. This must be below the level of the permeate inlet and must also make allowance for permeate production during flushing **(see Section 7.2.3 & Drawing 14.4)**

The top of the permeate storage tank should be no higher than 500mm above the outlet fitting on the top of the membrane to prevent operating back pressure on the

membrane during production or static pressure on the membrane during standby. Back pressure during production reduces the output of the system. Static pressure on the membrane from a column of water can de-laminate the membranes during standby.

The permeate inlet to the tank must be open with no restriction. Under no circumstances must a float shut off valve be used to close off the permeate delivery line.

The permeate inlet must be at least 100 mm above the overflow level in the storage tank to prevent permeate being drawn back through the membrane by osmosis during standby.

Prior to making the permeate connection final, make a temporary pipe connection from the permeate outlet to drain so that the system can be fully flushed during commissioning.

7.2 ELECTRICAL

Electrical installation is very straightforward, but should still be carried out by a competent electrician, and must conform to the appropriate standards of safety.

7.2.1 Mains Supply

The mains supply connection should be made through a separate, switched supply, fused and earthed in accordance with Institute of Electrical Engineers Regulations. Current rating should be 13 amps (single phase system) or 10 amps (three phase system).

7.2.2 Auxiliary closedown

On special order systems supplied complete with single column water softener or backwashing particulate pre-filter, there is a low voltage interlock between the R/O controller and the softener/filter valve. This ensures that the R/O shuts down while the softener/filter is regenerating.

The feedback/shutdown cable between the softener or filter valve and the R/O controller is joined using the using same plug in connector that provides power to the valve. The feedback line uses the black cables on terminals 3&4

7.2.3 Level sensor installation

Install the level switch on the treated water storage tank. This may require the cabling to be disconnected at the 2 way plug on the end and the terminals re-made when the probes have been installed. The blue and brown wires run from terminals A and C in the sensor and are connected to the terminals L & N in the 2 way connector which plugs into the transformer enclosure on the R/O unit.

The floats for the sensor will need to be tied to hook on the underside of the sensor using the rot proof cord provided. When the second float is tied to the bottom of the first float, the R/O unit will switch off when the level reaches the middle of the upper

float, and will turn on again when the level drops to the middle of the lower float. This mean that the highest practical treated water level in the storage tank is 150mm from the top and the minimum differential is 170mm

Important: When installing the level sensor in the permeate tank, the top of the sensor must be at least 100 mm below the overflow since permeate will flow to the tank during the post-service flush.

7.2.4 BMS/Alarm connection

The controller has an integral volt free alarm contact that can be utilised to connect in to a BMS system. See controller wiring diagram in controller manual

8.0 COMMISSIONING

The membrane(s) are shipped in preservative which will need to be flushed prior to putting permeate water to service. Commissioning and flushing should take place immediately before the system is put into service

8.1 Pre Service Flush

Do not turn on the power at this point

After connecting the water inlet, run a line to drain from the concentrate and permeate outlets. Turn on the water supply to the system and check the inlet side for leaks up to the inlet solenoid.

Remove the cover from the lower control box and pull out the plug-in motor power relay to the right of the transformer (single phase systems) or press the stop button on the three phase circuit breaker. Replace the control box cover temporarily while flushing the membrane.

Turn on the power supply. Turn on the controller with the rocker switch.

The controller should default to the pre-service rinse for one minute and then Service, but if it does not then press the service button (top left of the six).

The inlet solenoid will then open allowing water to flush through the system but the pump will not operate since it has been isolated.

Open the pressure regulator by unscrewing the round knob five full turns. Leave the system like this for 5-10 minutes in order to prime the pump, fill up the membrane housings and start primary flushing.

If the system cuts out at this point because of high permeate TDS, reset the maximum threshold (see EWS OS3030 instruction manual) and continue.

Check for leaks with low pressure running in the system.

Disconnect the power supply in order to replace the motor relay or reset the three phase circuit breaker.

8.2 Pressure flush

Prior to plugging in the motor power relay (single phase system) or pressing in the start button on a three phase system, wind in the pressure regulator knob until it stops then back it off 1/4 turn. Replace the relay/press start button, turn on the power supply and ensure that the control panel is still indicating Service.

The inlet solenoid will open, then after a short delay the pump will power up and the system will run up to pressure after the pre-service rinse (1 minute).

ON THREE PHASE SYSTEMS ENSURE THAT THE PUMP IS ROTATING IN THE CORRECT DIRECTION. IF IT IS NOT, SWITCH OFF IMMEDIATELY, ISOLATE THE MAIN POWER SUPPLY AND CHANGE OVER TWO OF THE PHASE CONNECTIONS TO REVERSE THE ROTATION. IF YOU ARE UNSURE ABOUT THIS PROCEDURE, CONSULATE A QUALIFIED ELECTRICIAN.

Monitor the permeate and concentrate flows and balance with the pressure regulator so that the permeate flow is approximately the same as the concentrate flow (50% recovery) or as otherwise required.

This should give a back pressure on the pump (centre) pressure gauge of 140-200 psi depending on the raw water pressure.

Do not adjust the concentrate valve so that the pump pressure exceeds 200 psi for the C1000-6000 models, or above 230 psi for the C8000

Leave to run to drain for 30-60 minutes to flush the preservative out of the membranes. During the flush period, monitor the concentrate flow and fine tune to no more than 75% recovery (concentrate 1/3 of permeate).

If the permeate is then to the correct quality, the system can be put into service.

8.3 Service connections and checks

With the system switched off, connect the permeate tube to the storage tank. Turn the system on and leave to run to service.

Test the flush circuitry by lifting both tank switch floats. This will initiate a 'post service' flush. The pressure pump will cut out as the float switch is operated. Shortly afterwards the flush solenoid will open and then the pump will start up again. This will flush the membranes at a high flow rate for the time set in the controller. Lowering the floats will immediately switch the system back to the pre-service rinse and then service.

If the pump draws a massive amount of water during flushing it may be necessary to adjust down the low pressure threshold. Monitor the inlet pressure during flushing on the top pressure gauge

During normal production, there should be no more that 2.6 bar (40 psi) pressure difference between the feed pressure off the pump (centre gauge) and the back pressure on the membrane (bottom gauge).

The system is now commissioned.

9.0 Operation

The Compact Reverse Osmosis systems are designed to run and flush automatically and should not be turned off at the mains after a production run of permeate.

For the first few days of use, the operating pressures, permeate and concentrate flows should be monitored every few hours and the system fine tuned as the membrane settles down to its working environment.

Thereafter the flows, pressure and permeate conductivity should be monitored daily at a regular time when production is taking place. These readings will vary slightly due to variations in incoming water temperature and pressure. An example data recording sheet can be found in section 9.3

If a variation of more than 15% is noted in the permeate flow at usual operating pressures then the system should be cleaned with an appropriate recirculating cleaner. This must be done by a service technician with a thorough understanding of reverse osmosis systems and their cleaning regimes

9.1 Routine maintenance.

Daily	Monitor permeate and concentrate flow, inlet, pump and back pressures, and product water conductivity.
Weekly	Monitor raw water temperature
Monthly	Inspect system for leaks and tighten fittings where necessary
3 Monthly	Replace inlet filter cartridges
Annually	Clean membrane with a recirculating cleaner if normalised output has fallen by greater than 15%

9.2 Temporary Shutdown

If permeate is not required for up to five days then the system should be left with the permeate tank empty, the level probes disconnected and the water and power supplies turned on. The controller will automatically flush the system every 24 hours and a small amount of permeate will flow to the tank.

If the permeate tank must remain empty, then disconnect the level probe and route the permeate production line to drain.

If the system needs to be powered down for more than 7 days, then the membrane housing should be filled with an appropriate preservative. The system should then be re-commissioned prior to putting back into service. See Section 8.0

9.3 Example Data Recording Sheet

Model ....

Date installed ....

Membrane serial no(s) ....

Date	Inlet Pressure (IP)	Pump Pressure (PP)	Back Pressure (BP)	Conc Flow (CF)	Perm Flow (PF)	Total Flow (TF) = CF+PF	Recovery % (R) = (PF/TF) 100	Raw Water Temp °C (Weekly)	Operator initials

10.0 FAULT FINDING AND RECTIFICATION

Problem	Possible cause
No Power	Main fuse or supply cabling fault
Power on controller motor does not run	High level probe jammed or failed Motor failure Power relay failure Permeate quality above limit (membrane failure)
Pump motor runs low/no production	Pump motor drive loose Concentrate valve fully open Inlet filter blocked Membrane fouled Concentrate valve fully closed
Pump cuts out during flush	Inlet filter blocked Low pressure threshold too high
Pump cuts out during service	Inlet filter blocked Water supply failure
Permeate quality reads 0	Conductivity probe disconnected/failed
Permeate quality poor	Membrane fouled Concentrate valve fully closed. Permeate storage tank too small

11.0 WARRANTY AND SERVICE

11.1 AFTER SALE WARRANTY

Your Reverse Osmosis unit is covered by a parts warranty for a period of one year from installation on all mechanical and electrical components. Filters cartridges and membranes are excluded from this warranty since they can deteriorate due to operational or site conditions.

Should you have any problems with your Reverse Osmosis unit or require routine service, please contact your supplier.

12 DATA

12.1 PROCESS AND OPERATING DATA

Compact Series Reverse Osmosis Units

MODEL		**2000**	**4000**	**6000**	**8000**	**10000**
PARAMETER	**UNITS**					
Max. Output Flow*	Lit/hr	300	600	900	1,200	1,600
Min Input Flow* @ 75% recovery	Lit/hr	400	800	1,200	1,600	2,133
Max Input Flow* @ 50% recovery	Lit/hr	600	1,200	1,800	2,400	3,200
Min Cont. Flow to drain* (during service @ 75% recovery)	Lit/hr	100	200	300	400	533
Min Cont. Flow to drain* (during service @ 50% recovery)	Lit/hr	300	600	900	1,200	1,600
Max Flow to drain (during flush)	Lit/hr	1,200	1,400	1,800	2,100	2,300
Min salt Rejection	%	99	99	99	98	98
Maximum Recovery	%	75	75	75	75	75
Recommended Recovery	%	66	66	66	66	66

IMPORTANT NOTES

The data quoted in the above table is affected by the inlet pressure, raw water quality and period of usage, and so should be regarded as nominal only. * Total inlet flow and flow to drain will depend on the recovery settings chosen for the Reverse osmosis unit.

12.2 ENGINEERING DATA

Compact Series Reverse Osmosis Units

MODEL		**2000**	**4000**	**6000**	**8000**	**10000**
PARAMETER	**UNITS**					
Width	mm	600	600	600	600	600
Depth	mm	625	625	625	625	625
Height to frame	mm	1150	1150	1150	1150	1150
Height to membrane	mm	1150	1150	1150	1150	1150
Inlet Conn.	ins BSPM	3/4	3/4	3/4	3/4	1
Permeate Outlet Conn.	ins O/D	1/2	1/2	1/2	1/2	3/4
Drain Conn.	ins BSPM	3/4	3/4	3/4	3/4	1
Delivered Wt.	Kg.	80	85	100	110	140
Working Wt. (approx.)	Kg.	85	90	105	120	160
Maximum Flow to drain (during flush)	Lit/hr	1000	1100	1200	1300	1500
Single Phase Electrical						
Power	v	240	240	240	240	240
	Hz	50	50	50	50	50
	kW	0.75	1.1	1.1	2.2	2.2
FLC	Amp	4.7	6.8	6.8	12.6	12.6
Thee Phase Electrical						
Power	v	415	415	415	415	415
	Hz	50	50	50	50	50
	kW	0.75	1.1	1.1	2.2	2.2
FLC	Amp	1.86	2.65	2.68	4.75	4.75

MAXIMUM INLET PRESSURE 5.5 Bar MINIMUM INLET PRESSURE 2.0 Bar
MAXIMUM OPERATING TEMPERATURE 40.0C
HEADROOM - Allow 1000 mm greater than overall height.

12.3 PARTS DATA

Model	**2000**	**4000**	**6000**	**8000**	**10000**
Frame	BS304 Stainless Steel (all)				
Membrane no	1	2	3	4	4
Membrane type			OROM		
Membrane ref			4040		
Pump ref	1-15	1-23	1-23	3-25	3-27
Controller	EWS OS3030 (all)				
Transformer	115 VA (all)				
Voltage	240 - 24v (all)				
T/former supply mcb	6 A (all)				
T/former load mcb	6 A to controller				
Pump supply mcb	6 A (C1000/C2000 single phase units) 10 A (C4000/C6000 single phase units)				
Power Relay	Telemecanique K series (all)				
Circuit Breaker	Telemecanique GV2 (three phase units)				
Recirc F/C lpm		All adjustable			
Flush F/C lpm	15	15	15	15	15
Perm flow meter	0.7-7	2.0-20	2.0-20	8.0-38	8.0-38
Conc flow meter	0.7-7	0.7-7	2.0-20	2.0-20	2.0-20
Recirc flow meter	2.0-20	2.0-20	2.0-20	2.0-20	2.0-20
Carbon filter	20" Radial flow				

13.0 EWS OS303 CONTROLLER

13.1 Manufacturers Manual

A manufacturers manual for the EWS OS3030 controller is enclosed with the system. Please refer to this for information operation and programming of the controller.

13.2 Factory programming notes

The controller has been set up with a typical operating program suitable for a reverse osmosis system of this size and type.

The programming includes a pre-service flush, post service flush, flush during service and flush during standby.

A provision has been made in the program for a permeate dump valve to operate during the flush cycles and if the permeate conductivity exceeds a pre-set threshold. A permeate dump valve has not been physically installed on the system. If a permeate dump valve is to be connected to the system, it should be cabled to the Programmable Output 1 (OUT1) terminals in the controller via terminals 3 & 4. The OUT1 terminals are activated when the valve needs to open and dump permeate to drain.

13.3 Maintenance program

The controller has been set up with a simple 'Maintenance' program that will enable a service technician to clean the membrane(s) by connecting a cleaning tank and pump to the system inlet and outlets. During this time the conductivity limits are not queried.

The controller has **not** been programmed with a default Maintenance alarm that would put up a Maintenance signal after a pre-set number of hours.

To access the Maintenance program, switch the system to the 'Standby' or Standby Stop' phase. Press and briefly hold the maintenance (spanner) button. The program is then started by using the 'On' and 'Off' buttons. If the maintenance time programmed in has elapsed, the procedure ends automatically. The system can be switched back to 'Standby' at any time by pressing the maintenance button again.

Warning!! The Maintenance phase should only be switched on by a properly trained operator.

The first phase of the maintenance program lasts 30 seconds and opens the inlet valve, concentrate valve and permeate valve, but does not turn on the pump. This allows an initial low pressure flush to ensure the pump is filled with water.

The second phase of the Maintenance program lasts up to 500 minutes and in addition to opening the valves also powers the pump. If a long low pressure flush is required, the pump fuse or relay should be removed on single phase systems, or the circuit breaker 'stop' button pressed on three phase systems.

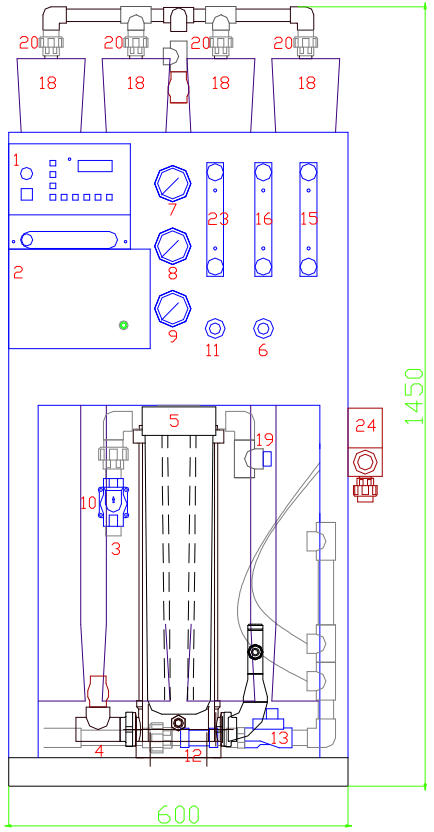
13.4 Factory programming

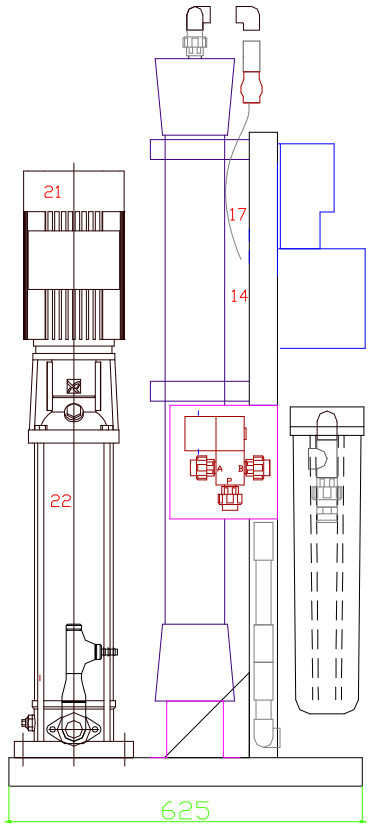
Program Step	Display	Setting	Function
1.1	Constant	0.10	Cell constant setting
1.2	Limit Min	Yes	Sets min. conductivity condition
1.3	Value Min	1.0	Sets minimum value
1.4	Switch Off	No	Not sw. off if min val. reached
1.5	Limit Max	Yes	Sets max. conductivity condition
1.6	Value Max	100.0	Set maximum value
1.7	Switch Off	Yes	Switch off is max.val. reached
1.8	Delay	60s	Delay before switching off
2.1	Temperature	25	Manual temperature comp. val.
3.1	Factor	1	Compensation correction factor
4.1		LP	Input 1 function
4.2		ST	Input 2 function
4.3		EP	Input 3 function
4.4		FU- EM- LP- STI EP-	Function activation condition
5.1	Level Switch	1	Single level switch
5.5	Delay	10s	Low water cutout delay
5.6	Switch On	4*	Number of restarts
5.7	Delay	300s	Delay between restart attempts
5.8		PI R1I R2I R3I M- S1-	Phases when pressure monitored
5.13		PI R1I R2I R3I M- S1-	Phases when stop signal monitored
5.14	Manual Start	No	Auto start after stop signal canx
5.15	Stop Power Failure	No	Auto start after Power Failure
6.1		AP	Output 1 function Permeate Valve
6.2		MF	Output 2 function Alarm Relay
6.3		PUI IVI CVI PVI MFI	Output activation state
7.6	Limit CM	80.0	Conductivity limit to open PV
7.7	Delay Open	10s	Delay opening PV
7.8	Delay Close	30s	Delay closing PV
7.9		MII MAI EM- FU-	Events triggering alarm relay
7.10		LPI ST- EPI	Events triggering alarm relay
7.11		PSI PFI MT-	Events triggering alarm relay
8.1		MII MAI EM- FU-	Events triggering alarm buzzer
8.2		LPI ST- EP-	Events triggering alarm buzzer
8.3		PSI PFI MT-	Events triggering alarm buzzer
9.1	Production 1	30s	Length of first production phase
9.2		PU- IVI CVI AP-	Functions active
9.3	Production 2	60s	Length of second production phase
9.4		PUI IVI CVI AP-	Functions active
9.5	Production 3	0s	Production phase skipped
9.7		PUI IVI CV- API	Main production phases active
10.1		IV- CV- AP-	Stop in production functions
10.2		IV- CV- AP-	Stop in rinse functions

11.1		IV- CV- AP-	Stop in alarm functions
12.1	Standby	0s	Standby stage one skipped
12.3		IV- CV- AP-	Standby functions
13.1	Rinse	Yes	Rinse after production
13.2	Rinse 1	30s	Length of post production rinse 1
13.3		PU- IVI CVI AP-	PP rinse 1 functions
13.4	Rinse 2	180s	Length of post production rinse 2
13.5		PUI IVI CVI AP-	PP rinse 2 functions
13.6	Rinse 3	0s	Length of post production rinse 3
14.1	Rinse Standby	Yes	Rinse during standby
14.2	Interval	24h	Frequency of standby rinse
14.3	Rinse 1	30s	Length of standby rinse 1
14.4		PU- IVI CVI AP-	Standby rinse 1 functions
14.5	Rinse 2	180s	Length of standby rinse 2
14.6		PUI IVI CVI AP-	Standby rinse 2 functions
14.7	Rinse 3	0s	Length of standby rinse 3
15.1	Rinse Production	Yes	Rinse during production
15.2	Interval	8h	Frequency of production rinse
15.3	Rinse 1	60s	Length of production rinse 1
15.4		PUI IVI CVI AP-	Production rinse 1 functions
15.5	Rinse 2	0s	Length of production rinse 2
15.7	Rinse 3	0s	Length of production rinse 3
16.1	Maintenence 1	30s	Length of maintenance st. 1
16.2		PU- IVI CVI AP-	Maintenance st. 1 functions
16.3	Maintenence 2	500m	Length of maintenance st. 2
16.4		PUI IVI CVI AP-	Maintenance st. 2 functions
16.5	Interval	No	Maintenance interveal set
18.1	Code Number	No	Code number not required

14 Drawings

14.1 Dimension & parts identification all Compact models

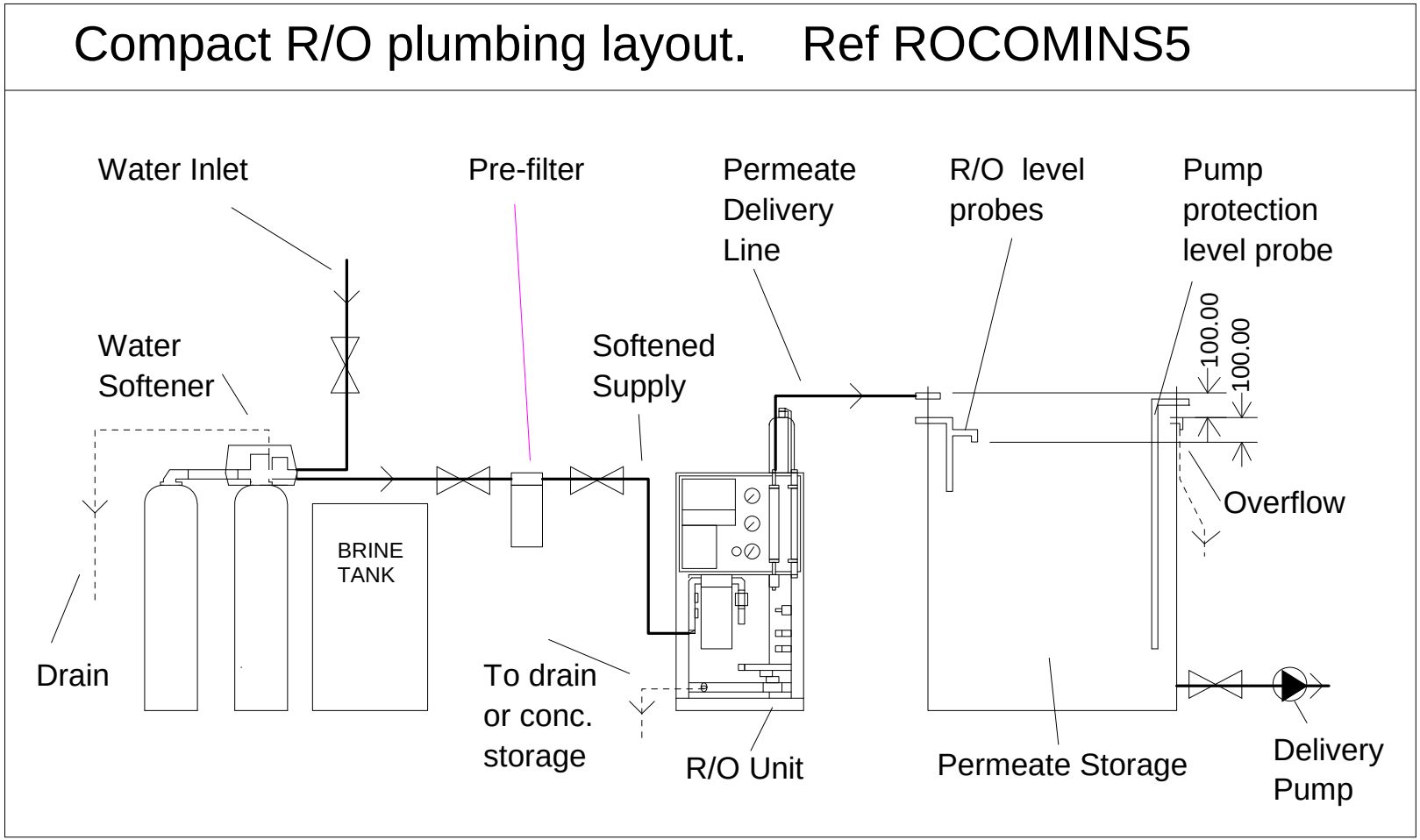




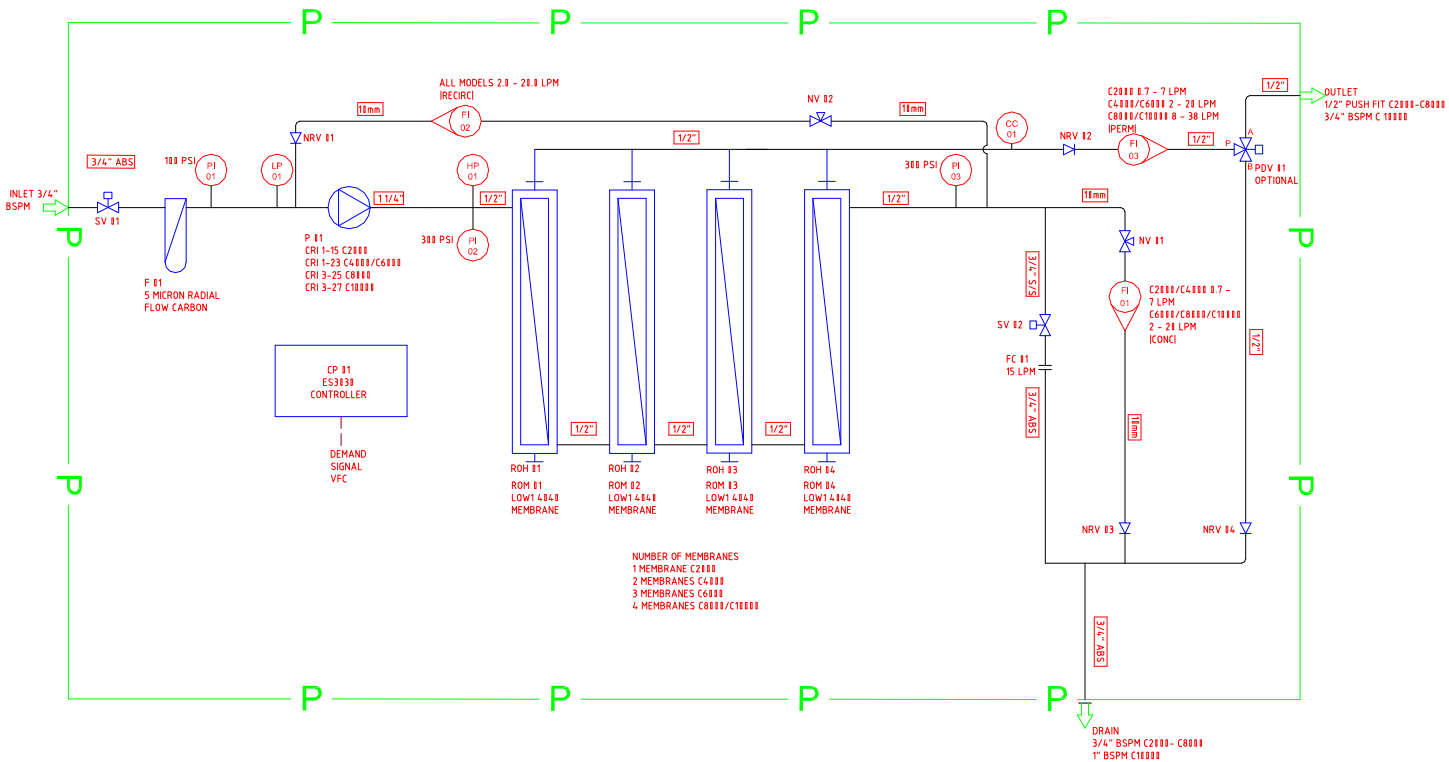
KEY

1 - CONTROLLER
2 - POWER BOX
3 - INLET
4 - DRAIN OULET
5 - GAC FILTER
6 - RECIRCULATION FLOW CONTROL
7 - INLET PRESSURE GAUGE
8 - PUMP PRESSURE GAUGE
9 - BACK PRESSURE GAUGE
10- INLET SOLENOID
11- CONCENTRATE FLOW CONTROL
12- FLUSH FLOW CONTROL
13- FLUSH SOLENOID
14- CONDUCTIVITY PROBE
15- PERMEATE FLOW METER
16- RECIRCULATION FLOW METER
17- CONCENTRATE FLOW METER
18- MEMBRANES
19- LOW PRESSURE SWITCH
20- MEMBRANE PERM CONNECTIONS
21- PUMP MOTOR
22- PUMP
23- CONCENTRATE FLOW METER
24- PERMEATE DUMP VALVE
(OPTIONAL)

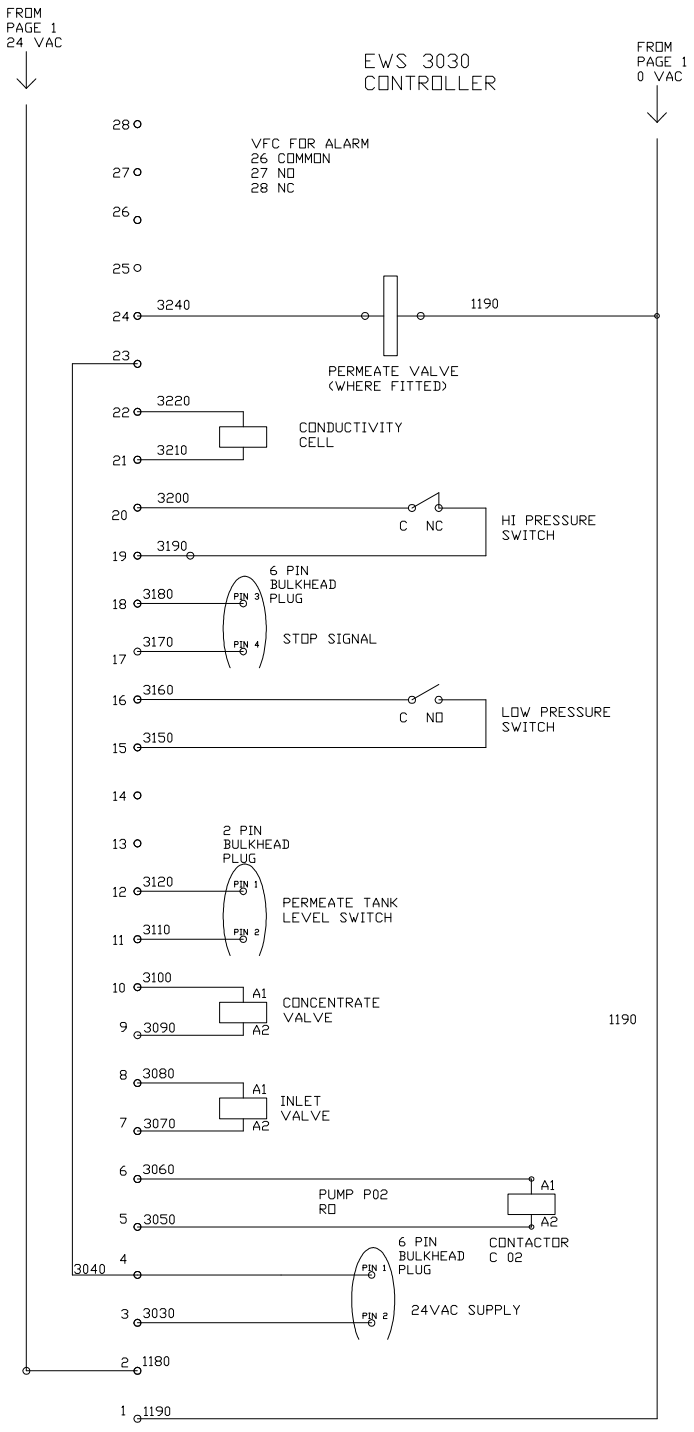
14.2 Plumbing layout



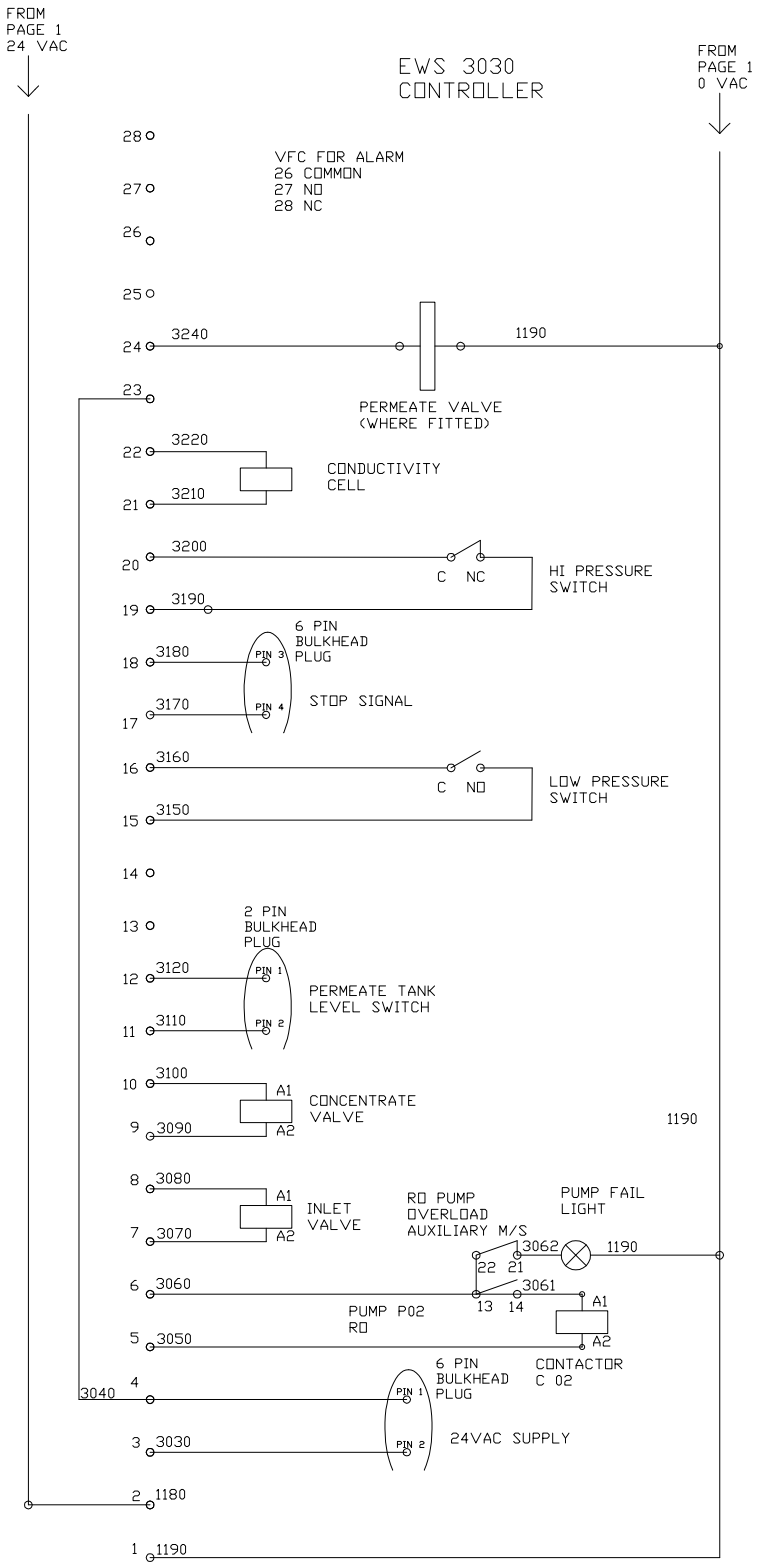
14.3 P&ID


INLET 3/4" BSPM
3/4" ABS
SV 01
100 PSI
PI 01
F 01
5 MICRON RADIAL FLOW CARBON
LP 01
NRV 01
P 01
CRI 1-15 C2000
CRI 1-23 C4000/C6000
CRI 3-25 C8000
CRI 3-27 C10000
1 1/4"
HP 01
300 PSI
PI 02
ALL MODELS 2.0 - 28.0 LPM
(RECIRC)
FI 02
18mm
1/2"
NV 02
CC 01
300 PSI
PI 03
NRV 02
C2000 0.7 - 7 LPM
C4000/C6000 2 - 20 LPM
C8000/C10000 8 - 38 LPM
(PERM)
FI 03
PDV 01
OPTIONAL
OUTLET
1/2" PUSH FIT C2000-C8000
3/4" BSPM C 10000
CP 01
ES3030
CONTROLLER
DEMAND SIGNAL VFC
ROH 01
ROM 01
LOW1 4040
MEMBRANE
ROH 02
ROM 02
LOW1 4040
MEMBRANE
ROH 03
ROM 03
LOW1 4040
MEMBRANE
ROH 04
ROM 04
LOW1 4040
MEMBRANE
NUMBER OF MEMBRANES
1 MEMBRANE C2000
2 MEMBRANES C4000
3 MEMBRANES C6000
4 MEMBRANES C8000/C10000
NV 01
3/4" - 5/8"
SV 02
FC 01
15 LPM
3/4" - ABS
FI 01
C2000/C4000 0.7 - 7 LPM
C4000/C8000/C10000 2 - 20 LPM
(CONC)
1/2"
15mm
NRV 03
NRV 04
3/4" - ABS
DRAIN
3/4" BSPM C2000- C8000
1" BSPM C10000

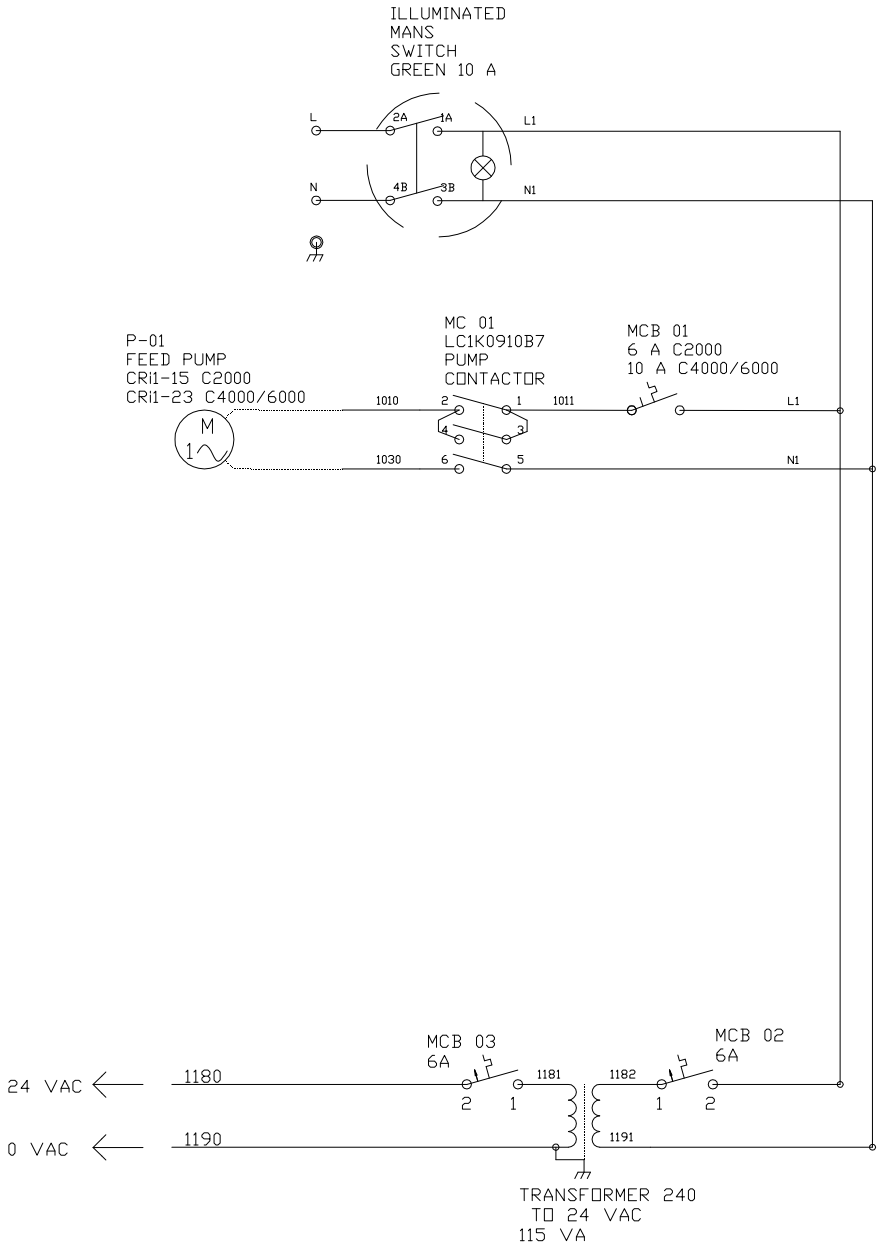
14.4 General cabling diagram Single Phase



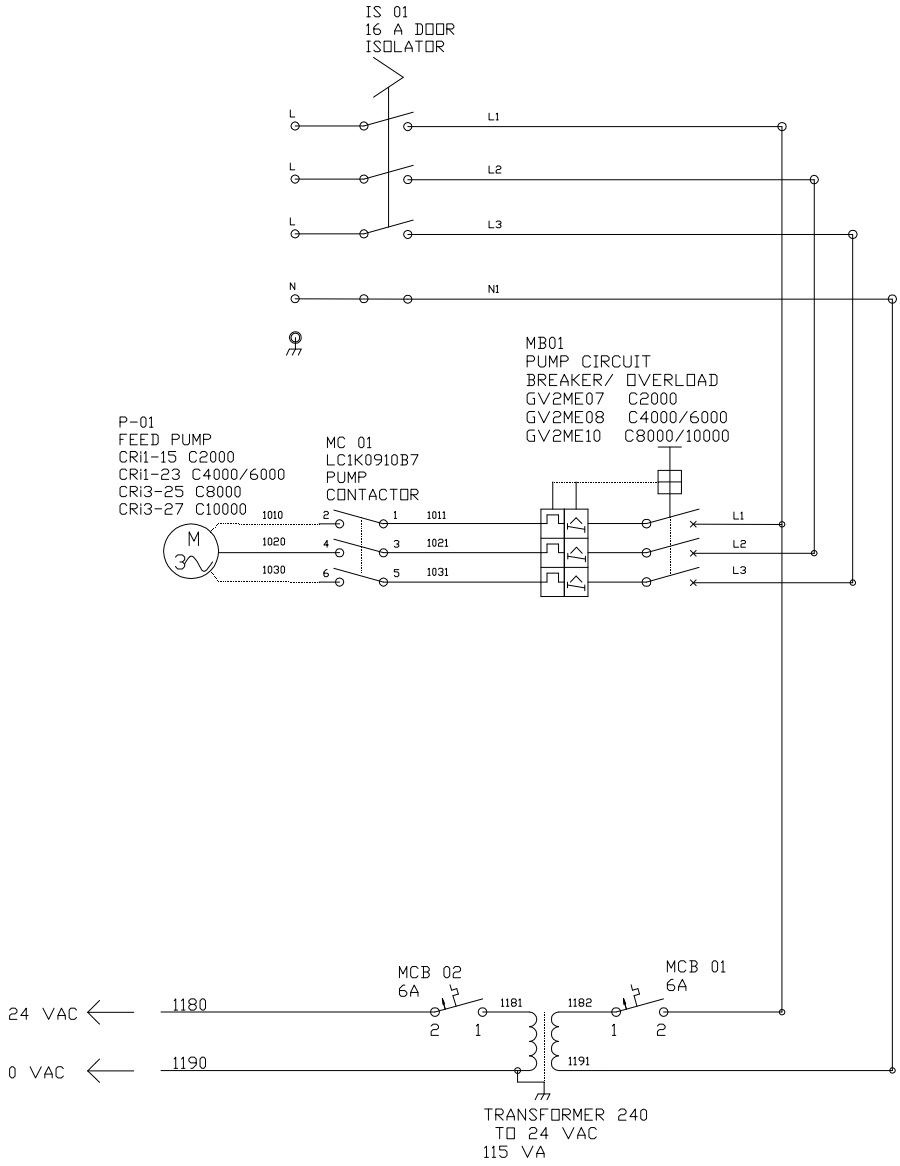
14.5 General cabling diagram Three Phase



14.6 Transformer enclosure cabling diagram 24v softener output Single phase power supply



14.7 Transformer enclosure cabling diagram 24v softener output Three phase power supply



Manufacturer's Declaration of Conformity

We the undersigned

EURAQUA UK, HITCHIN, ENGLAND

Certify that the product

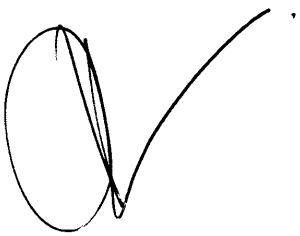
---

type: Compact Automatic Series Reverse Osmosis Unit
Models C1000, C2000, C4000, C6000, C8000 C10000 with EWS 'OS3030' controller

---

has been designed and manufactured in accordance with the specifications of the following:

Directive	**Standard**
Machinery Directive 89/392/EEC	EN 292-1, EN 292-2
Low Voltage Directive 73/23/EEC	EN 60 335-1
EMC-Directive 89/336/EEC	EN 55 014



RT Adam
Director

Hitchin, England 21/12/11
Issue place & date