RO Plant Size and Technical Specification

COMPACT	C1000	C2000	C4000	C6000	C8000
Output per 22 Hrs. litre/day	1,900	4,000	8,000	14,400	20,000
Input litres/day - 75% Recovery	2,500	5,300	10,600	19,200	26,666
Membrane (ESPA-1)	4,021	4,040	2 x 4040	3 x 4040	4 x 4040
Pump Power	0.375	0.75	1.00	1.00	2.2 (3 phase)

RO-PRO MODEL	4-26	4-32	4-38
Output litre/hour	1,200	1,500	1,800
Input litre/hour - 75% Recovery	1,600	2,000	2,400
Membranes	..... Hydranautics ESPA1-4040		
No Membranes	4	5	6
Pump Pressure (bar)	12.7	13.0	13.5
Pump Power KW	2.2	3.0	3.0

RO-PRO MODEL	8-50	8-75	8-100	8-150	8-200	8-250	8-300	8-400
Output litre/hour	2,500	3,750	5,000	7,500	10,000	12,500	15,000	20,000
Input litre/hour - 75% Recovery	3,300	5,100	6,700	10,000	13,500	16,900	20,250	27,000
Membranes	.....	.....	.....	Hydranautics	ESPA1-8040	.....	.....	.....
No Membranes	2	3	4	6	8	9	12	15
Pump Pressure (bar)	12.4	12.7	12.7	13.1	13.7	14.1	14.1	14.5
Pump Power KW	5.5	5.5	7.5	7.5	9.2	13	13	15

All flow rates quoted are on softened towns mains water @ ambient temperature and running at 75% recovery - Actual flow rates will depend on a number of factors including temperature, quality, feed pressure, pre-treatment and age of RO plant

Softener and carbon Filter sizing - Softeners are all based on Duplex valves and capacities quoted are per vessel.
Please call if you require further clarification or assistance on the RO plant pre-treatment sizing.

Softener Size (litres of resin)	10	14	20	25	30	40	50	60	75	80	100	120	140	190	250	350	500
Flow Rate Information																	
Capacity at 300ppm Total Hardness (m^3)	1.67	2.34	3.34	4.18	5.01	6.68	8.35	10.02	12.53	13.36	16.70	20.04	23.38	31.73	41.75	58.45	83.50
Service Flow m^3/hour	0.40	0.56	0.80	1.00	1.20	1.60	2.00	2.40	3.00	3.20	4.00	4.80	5.60	7.60	10.00	14.00	20.00
Valve Specifications																	
Fleck 9000 - 3/4" Connections: 1" BSP inlet & outlet. 1/2" hose barb drain	Maximum Flow Rated at 4.00m^3 per hour																
Fleck 9000 - 1" Connections: 1" BSP inlet & outlet. 1/2" hose barb drain	Maximum Flow Rated at 4.70m^3 per hour																
Fleck 9500 Connections: 1.5" BSP inlet & outlet. 1/2" hose barb drain	Maximum Flow Rated at 9.60m^3 per hour																
Fleck 2900 Connections: 2" BSP inlet & outlet. 1" BSP drain	Maximum Flow Rated at 23.00m^3 per hour																

PLEASE NOTE: When sizing softeners, please ensure that the valve being used is able to handle the flow rate required by the system.

Activated carbon Filters

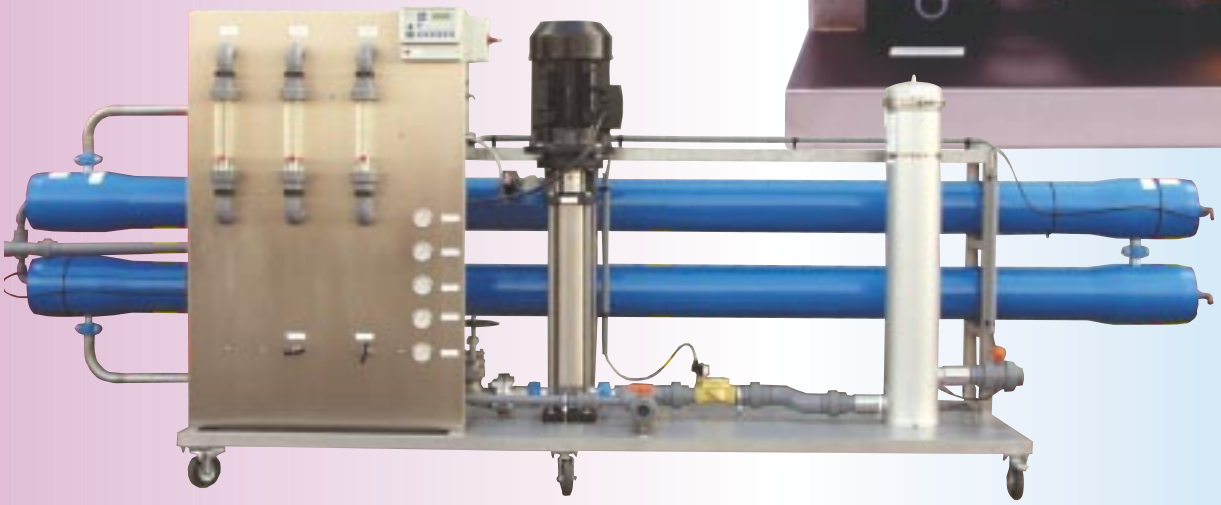
Stock Code	FA1054	FA1248	FA1354	FA1465	FA1665	FA1865	FA2160	FA2469	FA3072	FA3672	FA4278	FA4882
Flow Rate Information												
m^3/hour	1	1.25	1.75	2.5	3.5	4.75	5.5	6	11	18	20	23
BW Rate												
m^3/hour	0.5	0.9	1	1.2	1.5	2.2	2.6	3.4	5.3	7.7	10.5	13.7
Valve												
	F2510	F2510	F2510	F2510	F2510	F2750	F2750	F2750	F2850	F3150	F3150	F3510
Connections												
Inlet/Outlet	1" BSP	1" BSP	1" BSP	1" BSP	1" BSP	1" BSP	1" BSP	1" BSP	1.5" BSP	2" BSP	2" BSP	2" BSP

Flow rates advised are for de-chlorination of the feed water only. If organic reduction is required please call for sizing assistance.

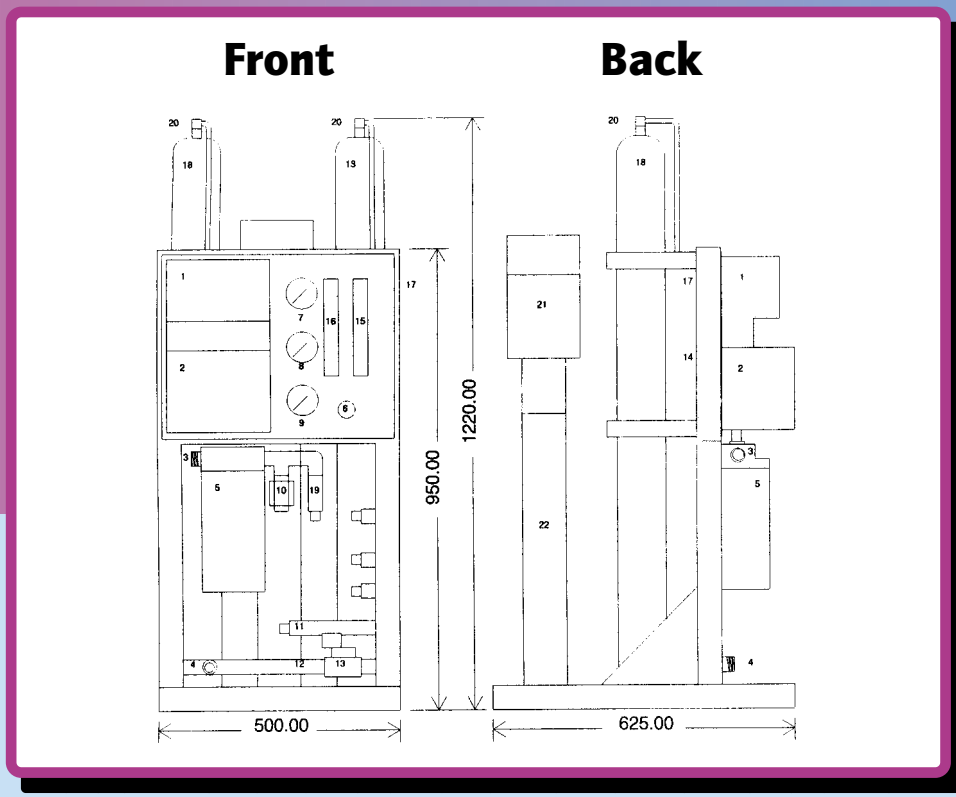
Reverse Osmosis

The Technology & Plant specification

from the water treatment specialists



The Basics



1. Controller
2. Transformer/relay
3. Inlet 3/4" BSPM
4. Drain Outlet 3/4" BSPM
5. GAC Filter
6. Pressure control
7. Low pressure gauge
8. Pump pressure gauge
9. Back pressure gauge
10. Inlet solenoid
11. Recirculation flow control
12. Flush flow control
13. Flush solenoid
14. Conductivity probe
15. Permeate flow meter
16. Concentrate flow meter
17. Permeate outlet 1/2"
18. Membrane
19. Low pressure switch
20. Membrane connections
21. Pump motor
22. Pump

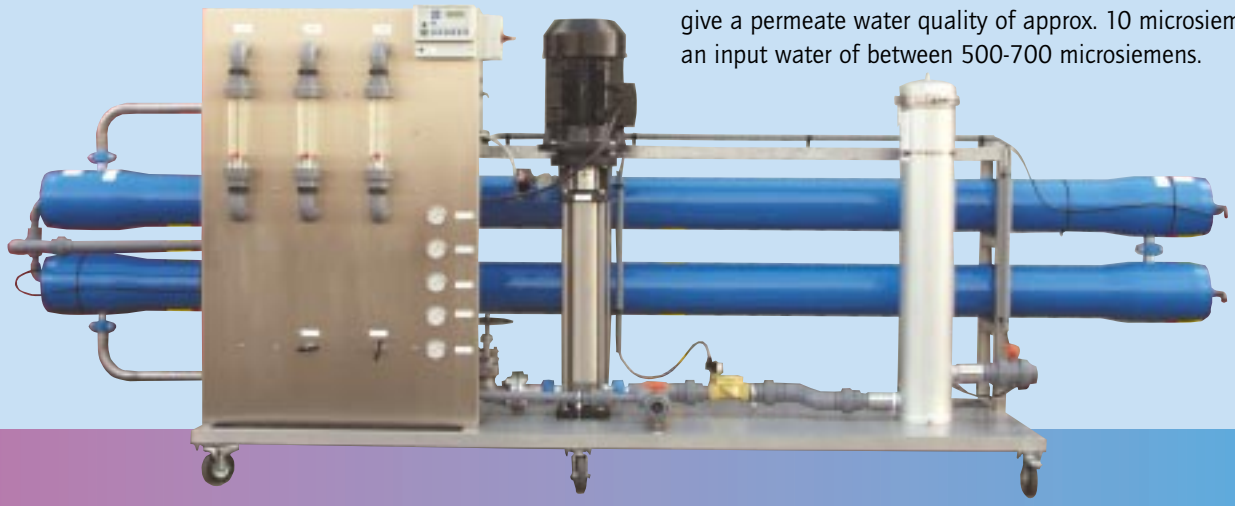
Reverse Osmosis is a process that is used to remove a wide range of salts to give water of a high purity - Osmosis is a natural process involving fluid flow across a semi-permeable membrane barrier. It is the process by which nutrients feed the cells in our bodies and how water gets to the leaves at 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 pressure of the diluted 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. This means that water containing a high level of natural salts can be purified without the need for chemical regenerants such as the acid and caustic used in demineralisation plants.

Reverse Osmosis is therefore considered a much safer route of producing pure water for many commercial and industrial applications, and additionally the plant does not need to be taken out of service for regeneration as a Demin plant does.

Rejection rates of salts from water is generally in the region of 95-99.5% dependent upon the membrane type used and the raw water feed quality. RO systems can be designed to utilise the wide range of membranes available, which will give different permeate water qualities. Standard designed RO's are manufactured utilising the Low Energy Membranes which will give a permeate water quality of approx. 10 microsiemens from an input water of between 500-700 microsiemens.



RO System Management

Reverse Osmosis systems, in their basic form, consist of a pressure pump, housing and the membrane. Water is forced into the housing under pressure and the pure water (or permeate) is collected and passed to service.

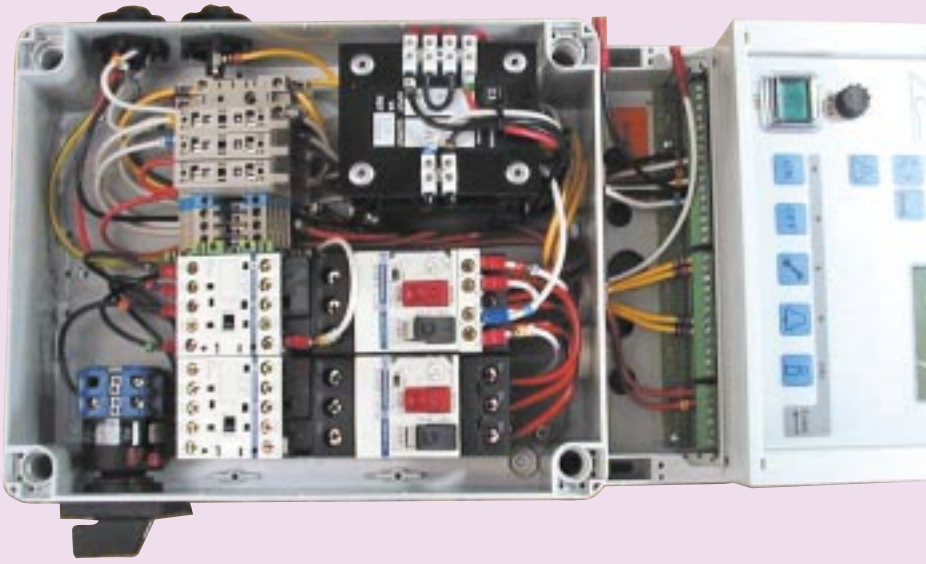
Reject water (or concentrate) is collected from another outlet and routed to drain, with a portion of the concentrated water recycled back to the inlet of the pump. This means that the portion of water sent to drain is kept to a minimum allowing a recovery ratio of approx. 75% to be achieved without significant fouling of the membrane. The recirculation allows a higher flow of water through the pump reducing the load on its bearings and keeping the pump's cooler running. The recirculation on a Compact unit is fixed and on the **Pro 4** and **Pro 8** ranges it is variable.

The controller used on the RO system constantly monitors the quality of the permeate water and is also linked with safety controls on the system, to ensure the unit cuts out on low & high pressure, high & low conductivity and full permeate tank signal. It will also run various pre & post flush cycles to maximise the life time of the membrane. The constant monitoring is automatic and the programming is all pre-set to ensure protection of the system at all times and to maximise the quality of the pure water.

RO plants must be supplied with softened, de-chlorinated water. A duplex softener is recommended for continuous operation. Utilising softened water for the feed to the RO will reduce the scaling potential on the membrane and therefore lengthen it. De-chlorination of the feed will reduce oxidation damage to the surface of the membrane. High output reverse osmosis plant offers considerable advantages over traditional deionisation systems, with no acid/caustic consumables nor problems with COSHH compliance. If softened service water is needed elsewhere on the same installation site, concentrate water can be returned to a softened water holding tank, eliminating water wastage.

Nominal Element Performance - ESPA

Element Type	Minimum Salt Rejection, %	Permeate Flow, GPD	(m^3/d)
ESPA1	99.0	12,000	45.4
ESPA2	99.6 (avg.)	9,000	34.1
ESPA3	98.0	14,000	53.0
ESPA4	99.2	12,000	45.4
ESPA1-4040	99.0	4,000	15.1
ESPA2-4040	99.4	3,000	11.4
ESPA3-4040	98.0	4,500	17.0
ESPA4-4040	99.2 (avg.)	2,500	9.46



Specifying and Sizing

RO Dimensions	Width mm	Depth mm	Height mm
RO Compact 1000-6000	500	625	950
RO Compact 8000	600	625	1150
RO Pro4 Range	1120	725	1525
RO Pro Range 8-50	2200	900	1525
RO Pro 8-75 & 8-150	4100	1100	1700
RO Pro 8-100	3000	1100	1700
RO 8-250	3900	1100	1711
RO Pro 8-200 & 8-300	4900	1100	1711
RO Pro 8-400	5900	1100	1711

The size of the RO and choice of membrane will be determined by the permeate quantity required, feed water salinity and permeate quality expected. Low energy membranes allow the units to run at pressures around 150-200psi, and as such the pressure booster pumps required to generate the pure water are smaller, and the power consumption is reduced significantly.

These membranes will produce water quality of approx. 10 microsiemens from an input water of between 500-700 microsiemens. If higher permeate quality is required a different range of membranes can be used.

RO units are normally built and used as single units producing the quantity required during the working day. If circumstances demand, the RO units can be duplexed with a central control panel being used to allow manual or automatic switching of the RO plant in service, and will also allow the units to run in parallel when the demand for water is higher, thus doubling the permeate production.

Also for very high purity waters the RO can be manufactured in "double pass mode" - This means the permeate water from the first unit is fed as raw water into the second pass of the RO - This already high quality water will then be improved and a very pure water is produced, typically 14 microsiemens.

When sizing the pre-treatment system the quantity of water available on the raw water feed side needs to be checked carefully as the RO system needs a higher feed flow, as the recovery of the units is approx. 75% for the pure water. The 25% concentrate that is rejected by the RO can be used for any application where soft water is required such as wash water, grey water for toilet flushing or in some cases cooling tower make-up. The use of this water minimises any waste from the feed supply.