

SAL

Extra Low Energy, Excellent Productivity Heat Sanitizable Fullfit Element Brackish Water RO elements

The Oltremare SAL series of brackish water RO membranes is ideal for water purification applications. Heat sanitizable elements produce high quality water with the capability to withstand sanitization with hot water. Hot Water sanitization reduces the need of chemical sanitizers. Fullfit configuration improves cleaning, sanitizing and bio-control eliminating “stagnant” flow areas that are potential breeding grounds for bacterial growth and ensures maximum ion removal with minimal fouling. Upon customer’s request we can realize different configurations for dimensions, materials, brine spacer, etc.

MEMBRANE CHARACTERISTICS

Membrane	RO – HS Fullfit Net Wrapped
Membrane Type	Polyamide
Stabilized Salt Rejection (%)	99.2 ^(b) - 99 ^(c)
Minimum Salt Rejection (%)	99.0 ^(b) – 98 ^(c)

DESIGN INFORMATION	Permeate Flow m ³ /day (gpd) ^(a)	Maximum Feed Flow m ³ /h (gpm)	Membrane Area m ² (ft ²)
Oltremare SAL4 – 4021 ^(c)	3.88 (1025)	2.95 (13)	3.2 (35)
Oltremare SAL4 – 4040 ^(b)	9.8 (2600)	3.6 (16)	7.9 (85)
Oltremare SAL4 – 8040 ^(b)	45.4 (12000)	17 (75)	37.2 (400)

OPERATING PARAMETERS

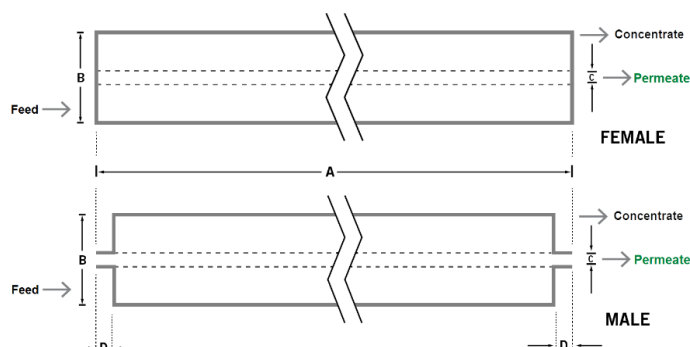
Maximum Operating Pressure	41 bar (600 psi)
Maximum Operating Temperature	45 °C (113 °F) / 35°C (95°F)@pH>10
Maximum Sanitizing Temperature	85°C (185°F)
Cleaning pH Range ^(d)	1.0 – 12.0
Chlorine Tolerance ^(e)	< 0.1 ppm
Maximum Pressure Drop	0.7 bar (10 psi) per element; 4 bar (60 psi) per housing
Maximum SDI ₁₅	5.0
Maximum Turbidity	1 NTU

- a. Test conditions: 500 ppm NaCl, 6.9 bar (100 psi), 25°C (77°F), 15% recovery for 4040 and 8040, 10% for 4021, pH 8.0, 30 minutes operation. Flow rates will be no more than 15% below the values shown. Product specifications may change without notice as design revisions occur. Permeate flow is before heat preconditioning. A loss of flow is expected after first heat sanitization cycle. Heat-setting procedure must be performed prior to initial use of elements. Refer to Element Start-Up Guide - Heat-Sanitizable Elements (TSG-O-004).
- b. Minimum and stabilized salt rejection for modules from 8040 and 4040.

- c. Minimum and stabilized salt rejection for modules 4021.
- d. Refer to temperature and pH limits in Membrane Cleaning Guide - Water Application Elements (TSG-C-001).
- e. Pretreatment is recommended for the removal of free chlorine and other oxidizing agents to prevent damage to membranes. Oxidizing agents, such as free chlorine, in contact with polyamide membranes may result in shortened operating life or membrane failure. Such oxidation damage is excluded from warranty. Refer to Membrane Operating Guide - Recommendations for Water Purification (TSG-O-012).

PHYSICAL DIMENSIONS	Element Weight kg (lb) ^(f)	Dim. A mm (inches)	Dim. B mm (inches)	Dim. C ^(g) mm (inches)	Permeate Tube ^(h)
Oltremare SAL4 - 4021	1.6 (3.52)	533.4 (21)	101 (3.98)	19.1 (0.75)	Male
Oltremare SAL4 - 4040	3.2 (7)	1016 (40)	101 (3.98)	19.1 (0.75)	Male
Oltremare SAL4 - 8040	15 (33)	1016 (40)	200 (7.89)	28.6 (1.125)	Female

f. Shipping weight is dependent on packaging material and quantity shipped.
g. For female elements, "C" is the inner diameter. For male elements, "C" is the outer diameter.
h. Male elements have a protruding permeate tube, indicated as "D" in the diagram.
Dimension "D" is 30.5 mm (1.2 in) for modules 4021. For 4040 module is 26.7 mm (1.05 in).



Customizable specialty elements

MANN+HUMMEL offers a full range of membranes and element designs for challenging water and process applications. Technologies include low-fouling RO, submerged UF, continuous high temperature, ultra-high pressure, unique sanitary designs and more. Contact us to customize a product that satisfies your specific requirements.

IMPORTANT INFORMATION

Start-up: We recommend flushing elements for 30 minutes at low pressure and discarding permeate during the flush prior to operation. For further information, please see Element Start-Up Guide - System Start-Up (TSG-O-005).

Heat precondition procedure

New heat sanitizable spiral elements must be pre-conditioned prior to initial use by exposure to hot water. Suitable quality water must be used during all pre-conditioning steps. This water is chlorine-free, non-scaling/fouling water. RO permeate is preferred, but the RO membrane must have been in operation for at least 24 hours before permeate water is used for preconditioning. Alternatively, prefiltered feedwater may be used.

An appropriate conditioning procedure consists of the following:

1. Flush to drain with suitable quality water at low pressure and low permeate flow rate.
2. Recycle warm water (45°C or less) at very low pressure (< 25 psig trans-membrane pressure with a maximum feed pressure of 45 psig (3 bar)).
3. Introduce hot water to the system to increase temperature to 80°C (176°F).
4. Keep trans-membrane pressure below 25 psig (1.7 bar) when warm or hot water (45°C or higher) is being fed to the membranes.
5. Maintain temperature for 60-90 minutes.
6. Allow system to cool to 45°C or below.
7. Flush to drain with suitable water quality at very low pressure (< 25 psig trans-membrane pressure with maximum feed pressure of 45 psig (3 bar)).

Increase temperature up to 85°C as required at a rate not to exceed 4°C/minute. Cool system at a rate not exceeding 7°C/minute.

Permeate should not be recycled during the procedure or fed to a second pass RO

Loss of Permeate Flow following repeated sanitization cycles: due to various reasons which cannot be predicted or simulated, it is almost impossible to predict the loss of flow resulting from repeated hot water sanitization cycles. Likely factors which greatly influence the loss in flow are rate of temperature increase or decrease, feed water type, presence of foulants and scale on the surface of membrane, flow rates and pressure etc. Normally 25+50% of loss in flow is observed, 90% of which occurs during the first heat sanitization. Sanitization of nanofiltration elements can cause increase in salt rejection and thus should be carried out only if it is necessary.

Cleaning: During the cleaning check the temperature and pH. Temperature lower than 25°C, range of pH 1-11, if the temperature rises the range of pH changes, at 45°C pH max 10.5.

Storage: Oltremare membrane elements must be stored appropriately to ensure proper operation and to prevent membrane damage. Please see Element Storage Guides (TSG-O-009 & TSG-O-010)

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