



## The First Choice in Seawater Desalination

### SWC - Seawater Composite Membrane Elements

Hydranautics is the world leader in seawater desalination, producing over 500 million gallons per day (2 million m<sup>3</sup>/d) of purified water. With more installed capacity than any other competitor, the SWC membrane provides unparalleled and consistent operating performance.

SWC elements are available from Hydranautics in both 4-inch and 8-inch diameters by 40-inch long spiral wound configurations for all desalination applications. Smaller diameter seawater elements are also available from Hydranautics' licensed manufacturer Oltremare, located in Fano, Italy. The high productivity SWC elements offer the highest levels of salt rejection with a consistently pure end product. The patented membrane formulations have been designed to accommodate varying levels of seawater salinities worldwide with reliable field-proven performance. The SWC5, for example, is state-of-the-art for seawater desalination providing the best combination of energy savings and high rejection. The SWC5 can be used in combination with the ESPA-B in a second pass to achieve stringent boron requirements. This combination of membrane element types is one example of our Integrated Membrane Solution® (IMS) which combines a range of RO, NF, UF and MF membrane technologies to achieve the most comprehensive, effective, low-cost results in the industry.

### Hydranautics' SWC membrane elements include:

#### SWC1 - 4 inch

The trusted barrier for making drinking water from seawater on-board ships

#### SWC3+

Offers high productivity resulting in lower operating pressure and a substantial cost savings

#### SWC4+

Ideal for warm water applications with the highest salt rejection in a high surface area membrane and the highest boron rejection available

#### SWC5

Offers the perfect combination of high flow, superior salt and boron rejection with low operating pressures



### Performance for Seawater Membranes

Element Type	Min. Salt Rej., %	Nom. Salt Rej., %	Permeate Flow GPD	(m3/d)
SWC1-4040	99.5	99.6	1,200	(4.6)
SWC3+	99.7	99.8	7,000	(26.5)
SWC4+	99.7	99.8	6,500	(24.6)
SWC5	99.7	99.8	9,000	(34)

### Test Conditions for SWC

The stated performance is initial (data taken after 30 minutes of operation), based on the following conditions:

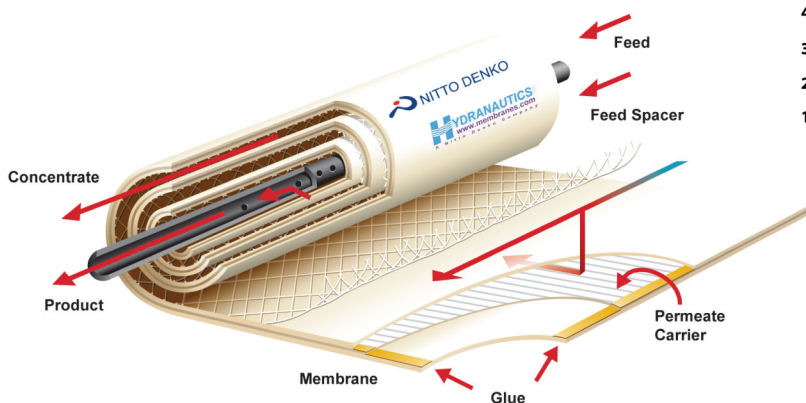
NaCl Solution, PPM	32,000
Applied Pressure, psig (MPa)	800 (5.5)
Operating Temperature, °F(°C)	77° (25°)
Permeate Recovery	10%
pH Range	6.5-7.0
Application Data*	
Maximum Applied Pressure, psig (MPa) 8-inch	1200 (8.27)
Maximum Applied Pressure, psig (MPa) 4-inch	1000 (6.9)
Maximum Feed Flow, GPM (m³/h)	4 inch -16 (3.6), 8 inch - 75 (17)
Maximum Operating Temperature, °F(°C)	113° (45°)
Feedwater pH Range†	3.0-10.0
Maximum Feedwater Turbidity, NTU	1.0
Maximum Feedwater SDI (15 mins)	5.0
Maximum Chlorine Concentration, PPM	<0.1
Minimum Ratio of Concentrate to Permeate Flow for any 8 inch Element	5:1
Maximum Pressure Drop for Each Element, psig	10

\*The limitations shown here are for general use. The values may be more conservative for specific projects to ensure the best performance and longest life of the membrane.

†See technical literature for extended pH limits

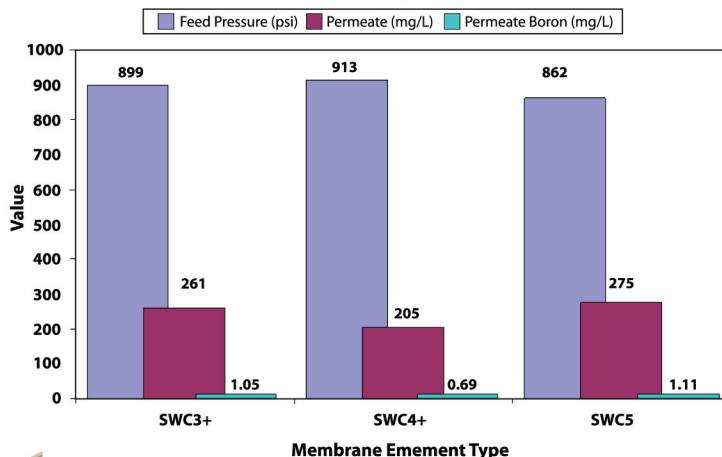
### Selected SWC Project References:

Fujairah, UAE	45 MGD (170,000 m3/d) of potable water from the Persian Gulf
Carboneras, Spain	32 MGD (120,000 m3/d) of potable water from the Mediterranean Sea
Cartagena, Spain	17 MGD (65,000 m3/d) of potable water from the Mediterranean Sea



SWC3 membrane installation, 45 MGD (170,000 m³/d) in Fujairah, U.A.E.

### Comparative Performance of Hydranautics Seawater Products (40,000 mg/L Feed, 45% recovery, 25 deg C, 8 gfd flux, pH 8)



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