

SWSR Series

Seawater Sulfate Removal Nanofiltration Elements

The GE SWSR-Series is our latest nanofiltration (NF) innovation. With nearly 30-years' experience in NF membrane manufacturing, GE has advanced the DK NF membrane, recognized for its low fouling properties. This is a result of an extremely smooth surface enabled by our unique 3-layer membrane design.

The SWSR-Series is designed to produce consistently low sulfate water for injection, helping to:

- Prevent strontium and barium sulfate scale in injection wells
- Better mitigate well souring by reducing sulfate; the substrate for sulfate reducing bacteria and H₂S production

The SWSR-Series incorporates a true Nanofiltration membrane that features:

- High rejection of sulfate and hardness meeting reservoir injection requirements
- High transmission of sodium chloride into the permeate minimizing the operating pressure
- Physical barrier for any suspended particles, bacteria, pyrogens and colloids

The SWSR-Series can be stored for a period of 12 months in its original packaging at ambient temperature up to 100°F (38°C). This represents important benefits unique to the Oil & Gas Industry as illustrated on the next page.



Figure 1: SWSR elements

Table 1: Element Specification

Membrane	SWSR-Series, Thin-film membrane (TFM*)			
Model	Permeate flow gpd (m ³ /day)		Typical rejection	
	Average Flow NF Testing ^{1,2}	Typical Flow on Seawater ^{1,3}	Sulfate ^{1,2,3}	Chloride ^{1,3}
SWSR-90	2,100 (7.9)	1,700 (6.5)	99.6%	20%
SWSR-400	9,500 (36.0)	7,700 (29.0)	99.6%	20%
SWSR-440	10,500 (39.7)	8,500 (32.1)	99.6%	20%

¹ Average salt rejection after 24 hours operation. Individual flow rate may vary ±25%

² NF Testing conditions: 2,000ppm MgSO₄ solution at 110psi (760kPa) operating pressure, 77 °F (25°C), 15% recovery

³ Experimental data collected on synthetic seawater containing 2500ppm SO₄ at 225psi (1,550kPa) operating pressure, 77 °F (25°C), 20% recovery

Model	Spacer mil (mm)	Active area ft ² (m ²)	Outer wrap	Part number
SWSR-90	31 (0.79)	90 (8.4)	Fiberglass	TBD
SWSR-400	34 (0.86)	400 (37.2)	Fiberglass	3145520
SWSR-440	28 (0.71)	440 (40.9)	Fiberglass	3145521



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Ambient Temperature Storage Benefits

Rather than inhibit bio-growth using chemical preservation methods, GE elements are stored with extremely low oxygen concentrations preventing mold and bacteria growth; oxygen absorbing packets reduce oxygen inside the sealed, vapor-air barrier bag.

- **Performance** - Ideal method for maximizing element performance throughout storage
- **Energy Savings** - eliminates requirement to store elements in refrigerated storage rooms
- **Transport** - facilitated transport of elements over long distances where refrigerated transport is unavailable.
- **Availability** - enables delivery to any warehouse since refrigeration is not a criteria anymore
- **Start Up** - Eliminates the need for extensive rinsing and re-wetting of new elements
- **Safety** - Reduce chemical usage and exposure

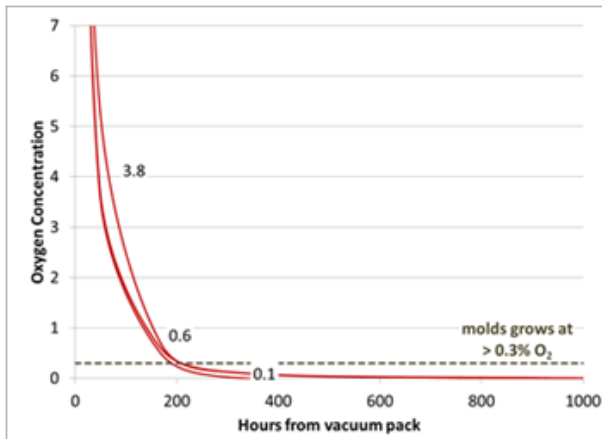


Figure 2: Rate of Oxygen Absorption

Element Parameters

Table 2: Operating and CIP parameters

Typical Operating Flux	5 - 20 GFD (8 - 34 LMH)
Maximum Operating Pressure	600psi (4,137kPa)
Maximum Temperature	Continuous operation: 113°F (45°C) Clean-In-Place (CIP): 95°F (35°C)
pH Range	Continuous operation: 5-9 Clean-In-Place (CIP): 2-11
Maximum Pressure Drop	Over an element: 10psi (69kPa) Per housing: 60psi (414kPa)
Chlorine Tolerance	0 ppm dechlorination required

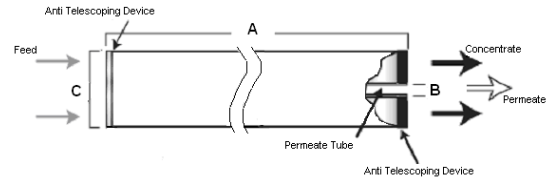


Figure 3: Element Dimensions Diagram - Female

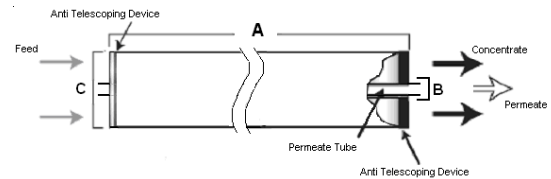


Figure 4: Element Dimensions Diagram - Stinger

Table 3: Dimensions and Weight

Model ¹	Dimensions, inches (cm)			Boxed Weight lbs (kg)
	A	B ²	C ³	
SWSR-90 Stinger	40.0 (101.6)	0.75 (1.90) OD	3.9 (9.9)	9 (4.1)
SWSR-400	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	35 (16)
SWSR-440	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	35 (16)

¹These elements are drip dried then bagged before shipping.

²Internal diameter unless specified OD (outside diameter).

³The element diameter (dimension C) is designed for optimum performance in GE pressure vessels. Other pressure vessel dimension and tolerance may result in excessive bypass and loss of capacity.

Contact Us

If you would like more information about GE's sulfate removal technologies, please contact your GE account representative or visit gewater.com/EOR.