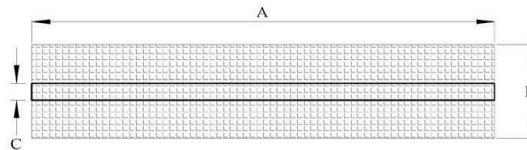


## FG-SpiraCore™ S-RO-HR-Pol Membrane Series

<b>Membrane material:</b>	PA (polyamide) TFC (thin-film composite)
<b>Nominal salt rejection:</b>	99.5% NaCl
<b>Test conditions:</b>	25°C (77°F), pH 8.0, 2,000 mg NaCl/L, 225 psi (11.5 bar), 15% recovery, 35 LMH (20.6 GFD) ± 25%
<b>Typical applications:</b>	Recovery of RO/NF permeate and/or evaporator concentrate
<b>Outer wrap:</b>	Net
<b>Compliance:</b>	3A Standard, FDA21CFR 177.2550 and EU Directive 10/2011



### Membrane Element Specifications



Size	Nominal dimensions [in (mm)]			Feed spacer [mil]	Membrane area [ft² (m²)]
	A	B	C		
2540	40 (1,016)	2.4 (61)	0.750 (19.1)	31	16 (1.5)
4040	40 (1,016)	3.9 (99)	0.625 (15.9)	31	75 (7.0)
8040	40 (1,016)	7.9 (200)	1.125 (28.6)	31	350 (32.5)

### Recommended Operating Conditions

Typical operating pressure [psi (bar)]	Maximum operating pressure [psi (bar)]	Maximum temperature [°C (°F)]	pH range [-]	Chlorine tolerance [ppm x days]	Maximum pressure drop [psi (bar)]
200-500 (13.8-34.5)	600 (41.4)	Operation: 50 (122) Cleaning: 85 (185)	Operation: 3-10 Cleaning: 2-11.5 at 50°C (122°F), 1-12 at 25°C (77°F)	None, dichlorination required	15 (1.0)

### Ordering Information

Type	Size	Salt rejection	Maximum pressure	Feed spacer	Special execution code
R	2540 4040 8040	-995 = 99.5% NaCl	060 = 600 psi (41.4 bar)	-31 = 31 mil	(nothing) = standard version

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### Important Information

- FG-SpiraCore™ membrane elements are to be stored in a dry environment with an ambient temperature of 20-35°C (68-95°F), and protected by direct sunlight, strong wind and dirt;
- Once membrane elements are wetted, keep them always wet in order to prevent any decline in production capacity;
- The maximum allowable dynamic and static backpressure on the permeate side should be zero. Meaning that permeate side pressure should never exceed feed/concentrate side pressure, while in operation or while plant is stopped;
- PCI Membranes reserve the rights to limit warranty in full if the operating parameters applied to the membrane elements are not strictly followed;
- See the PCI FG-SpiraCore™ Membrane Element Warranty document for more details about applied warranties.

### Installation Information

- Before installing new FG-SpiraCore™ membrane elements, the inlet/outlet piping as well as the pressure vessels are to be flushed in order to ensure that any contaminant is removed;
- New membrane elements are to be cleaned prior to the first use. For more details, refer to the Cleaning Guidelines below;
- Use a rigid, stainless-steel end ATD (Anti-Telescoping Device) at a housing outlet/inlet;
- The inner diameter of the membrane housing should be ca. 0.08" (2 mm) larger than the outer diameter of the membrane elements to be installed.

### Operating Guidelines

PCI Membranes recommend the following start-up procedure from standstill to operating condition:

- The unpressurized plant should be refilled with warm water (20-45°C, 68-113°F);
- The feed pressure should be gradually increased over a 30-60 seconds time scale;
- Before initiating crossflow at high permeation, the set feed pressure should be maintained for 5-10 minutes;
- Gradually increase the crossflow velocity over a period of 15-20 seconds, until the set operating point is achieved;
- Any temperature variation should be gradually implemented over a period of 3-5 minutes;
- Avoid any abrupt pressure or crossflow variation on the FG-SpiraCore™ membrane elements during start-up, operation, shutdown, cleaning or any other sequence in order to prevent any possible damage.

### Cleaning Guidelines

PCI Membranes recommend cleaning and flushing the membrane with either deionized or Reverse Osmosis (RO) permeate water.

The following reference CIP guidelines are to be adapted based on the specific application, feed fluid and operating parameters:

- Flush the membranes with hot water (45-50°C, 113-122°F) for 15-30 min at 1-3 bar (15-44 psi);
- Prepare a caustic solution at a pH of 11.0-11.5 and 45-50°C (113-122°F);
- Circulate the caustic solution for 30-60 minutes at 1-3 bar (15-44 psi);
- Displace the caustic solution from the system;
- Flush with sufficient hot water (45-50°C, 113-122°F) to remove all traces of the cleaning solution;
- If needed, prepare an acidic solution to get a pH of 2.0-2.2 at 45-50°C (113-122°F);
- Circulate the acidic solution for 30 minutes at 1-3 bar (15-44 psi);

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- Displace the acidic solution from the system;
- Flush with sufficient hot water (45-50°C, 113-122°F) to remove all traces of the cleaning solution;
- Clean with hot water (85°C, 185°F) for 20-30 min at 1-3 bar (15-44 psi) for disinfection.

**Table 1.** Service water specifications for flushing and cleaning solution make-up:

Parameter	Value
Electrical Conductivity (EC)	≤ 50 μS/cm
Turbidity	≤ 1 NTU
Total Suspended Solids (TSS)	≤ 0.1 mg/L
Hardness	≤ 30 mg/L
Iron	≤ 0.05 mg/L
Manganese	≤ 0.02 mg/L
Silica (as SiO <sub>2</sub> )	≤ 5 mg/L

**Table 2.** Membrane cleaning agents:

Source of fouling	0.1% wt. NaOH or KOH or 0.1% wt. Na <sub>4</sub> EDTA at pH = 11.0 and 50°C (122°F)	0.1% wt. NaOH or KOH or 0.025% wt. Na-SDS at pH = 11.0 and 50°C (122°F)	0.2% wt. HCl or HNO <sub>3</sub> at pH = 2.0 and 50°C (122°F)	2.0% wt. citric acid at 50°C (122°F)
Organic matter	Best as first step	Best as first step	Best as second step	Best as second step
Metals and inorganic compounds			Best	Can be used
Colloids	Can be used	Can be used		
Microorganisms and silica	Can be used	Can be used		
Inorganic matter	Can be used	Can be used		

**Notes:**

- The duration of a CIP phase depends on the type of fouling on the membrane layer, and it lasts 2 hours or more;
- The use of any incompatible CIP chemical can affect FG-SpiraCore™ membrane elements and is out of PCI Membranes' responsibility.

### Preservation Guidelines

- When stopping the membrane filtration unit for up to 48 hours, FG-SpiraCore™ membrane elements are to be flushed with RO permeate grade water for 5-10 min every 24 hours in order to prevent any biological growth on the membrane surface;
- When stopping the membrane filtration unit for more than 48 hours, membrane elements are to be cleaned (for more details, refer to the Cleaning Guidelines below) and to be preserved with 1.5% wt. food-grade sodium bisulfite in order to prevent any biological growth on the membrane surface. Every 3 months, the pH is to be checked and, when it is lower than 3.0, the preservation solution needs to be replaced.

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### Installation Accessories

Pressure vessels:

	Material	Diameter	Length	Maximum pressure	Feed/concentrate ports configuration	Connections type
MH	S0 = SS AISI316L	-25 = 2.5"	1E = elements	120 = 1,200 psi (82.7 bar)	-O = 2 side ports, opposite side -S = 2 side ports, same side -E = 4 side ports (2 each side) -F = 2 front ports, opposite side	B = threaded FBSP
		-40 = 4.0"	...			N = threaded NPT
		-80 = 8.0"	6E = 6 elements			T = tri-clamp V = Victaulic

ATD (Anti-Telescoping Devices):

	Material	Diameter	Thickness	Permeate tube internal diameter	Seal type
MA	S0 = SS AISI316L	-25 = 2.5"	E.g., 080 = 8.0 mm	-0625 = 0.625"	-L = lip seal -O = O-ring
		-40 = 4.0"		-0750 = 0.750"	
		-80 = 8.0"		-1125 = 1.125"	

End plugs:

	Material	Permeate tube internal diameter	Seal type
ME	S0 = SS AISI316L	-0625 = 0.625"	-L = lip seal -O = O-ring
	P0 = PPS	-0750 = 0.750"	
		-1125 = 1.125"	

O-rings:

	Material	Diameter	Thickness	Shore A hardness
MO	E = EPDM	E.g., -0170 = 17.0 mm	E.g., x020 = 2.0 mm	E.g., -070 = 70
	N = NBR			
	V = Viton			
	S = Silicon			
	P = PTFE			

Lip seals:

	Material	Standard	Permeate tube internal diameter
ML	E = EPDM	S = Sanitary (FDA)	-0625 = 0.625"
	V = Viton	I = Industrial (non-FDA)	-0750 = 0.750"
			-1125 = 1.125"

**Disclaimer:** Filtration data presented is representative of performance observed in controlled laboratory testing. It is not given as a warranty, specification or statement of fitness for use. Specific performance can vary widely depending on contaminant type, fluid properties, flow rates and environmental conditions. It is recommended that users conduct thorough qualification testing to ensure the product functions as required.

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