

# Duratherm\* PRO Series

## Industrial High Temperature Elements

### Description and Use

The Duratherm\* PRO Series includes RO and NF membrane elements. This Series is specifically designed to maximize the benefits of hot water sanitization for industries relying on chemical-free sanitization for product quality and/or industry compliance standards.

The separation system sanitization protocol is performed via periodic exposure to temperature as high as 194°F (90°C) at minimum feed pressure to kill microorganisms by denaturation and coagulation of the proteins chains.

The Duratherm PRO Series are also suitable for separation systems at temperature up to 158°F (70°C).

All element constructions include polysulfone ATD and central tube and a patented Durasan\* Cage outer wrap.

### Features and benefits

- Kill bacteria
- Prevent bio-fouling development
- No disposal costs
- 100% wet testing Quality Assurance
- Durable construction
- Sanitization on the permeate side

### Markets

- Food / Beverage
- BioPharm
- Chemical
- Medical / Dialysis
- Electronics

a product of  
**ecomagination**<sup>SM</sup>



Table 1: Element Specification

Membrane	Thin-film membrane (TFM*)		
Model	Maximum crossflow gpm (m3/h)	Recommended crossflow	Salt rejection
Duratherm PRO RO8038	100 (22.7)	Figure 7	Figure 2 (HR)
Duratherm PRO RO8040	100 (22.7)	Figure 7	Figure 2
Duratherm PRO NF3840HR	35 (7.9)	Figure 6	Figure 3, 4 & 5
Duratherm PRO NF8040HR	100 (22.7)	Figure 7	Figure 3, 4 & 5
Duratherm PRO NF8040HF	100 (22.7)	Figure 7	Figure 3, 4 & 5

Model	Spacer mil (mm)	Active area ft <sup>2</sup> (m <sup>2</sup> )	Part number
Duratherm PRO RO8038	50 (1.27)	274 (25.5)	3006579
Duratherm PRO RO8040	50 (1.27)	243 (22.6)	1231723
Duratherm PRO NF3840HR	50 (1.27)	55 (5.1)	1228269
Duratherm PRO NF8040HR	50 (1.27)	252 (23.4)	1228266
Duratherm PRO NF8040HF	50 (1.27)	264 (24.5)	1228247

Table 2: Maximum Pressure Drops

Range	0°C-50°C psig (kPa)	51°C-65°C psig (kPa)	66°C-70°C psig (kPa)
Over an element	15 (103)	7 (48)	4 (28)
Per housing	60 (414)	30 (207)	15 (103)

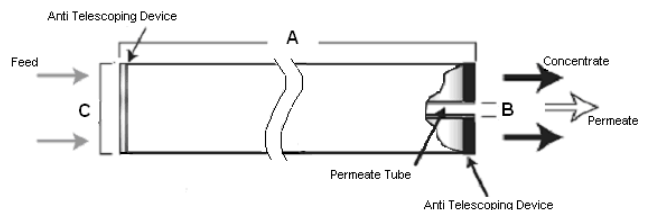


Figure 1a: Element Dimensions Diagram – 8040

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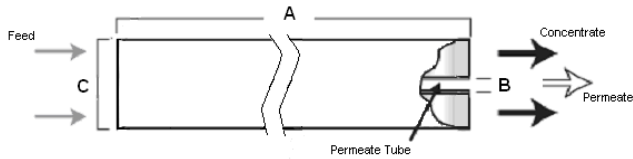


Figure 1b: Element Dimensions Diagram – 3840/8038

Table 3: Dimensions and Weight

Model <sup>2</sup>	Dimensions, inches (cm)			Boxed Weight lbs (kg)
	A	B <sup>1</sup>	C	
XX3840	38.75 (98.4)	0.833 (2.12)	3.8 (9.6)	9 (4.1)
XX8038	38.00 (96.5)	1.125 (2.86)	7.9 <sup>3</sup> (20.1)	29 (13.2)
XX8040	40.0 (101.6)	1.125 (2.86)	7.9 <sup>3</sup> (20.1)	29 (13.2)

<sup>1</sup> Internal diameter.

<sup>2</sup> These elements are dried then bagged before shipping.

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

Table 4: Operating and CIP parameters

Do not exceed 20 GFD (33 LMH) or 2,000 Wagner units under any circumstance.

Typical Operating Pressure	Figures 9 & 10		
Maximum Operating Pressure	1,200 psi (8,273 kPa)	32 – 77°F (0 – 25°C)	
	600 psi (4,137 kPa)	78 – 122°F (26 – 50°C)	
	400 psi (2,758 kPa)	123 – 158°F (51 – 70°C)	
	Hot Water Sanitizing	159 – 194°F (71 – 90°C)	
Maximum Temperature	Continuous operation: 158°F (70°C) Cleaning-In-Place (CIP): 104°F (40°C) Hot Water Sanitizing: 194°F (90°C)		
pH Range	Continuous operation: 3-9 Clean-In-Place (CIP): 2.0-10.5		
Chlorine Tolerance	500+ ppm hours, dechlorination recommended		
Feedwater	NTU < 1 SDI < 5		

## Hot Water Sanitization recommendations:

For optimal performance, Duratherm PRO elements should always be cleaned using approved CIP procedures and flushed with fouling free water before the sanitization process. Feed pressure during sanitization should not exceed 40psi (275kPa) and the crossflow should not incur a pressure drop greater than 2psi (14kPa) per element. Heating rate to sanitizing temperature and cool down should not be faster than 41°F (5°C)/minute. Maximum sanitization temperature is 194°F (90°C).

## Loss of permeate flow after repeated 90°C sanitization cycles:

It is almost impossible to exactly predict the percentage of permeate flow rate lost from the high temperature sanitations, which among other factors depends on:

- The rate of temperature increase and decrease.
- The presence of other species like organics, ionic and metallic compounds that could locally decrease or increase the temperature at the surface of the membrane.
- The feed flow rate and specifically the heat transfer rate to the membrane surface.
- The thickness and geometry of the feed spacer used.

At optimum conditions measured in controlled environment with deionized water, between 30% and 50% of the original permeate flow rate was lost before the element performance had stabilized after repeated heat treatments (over 90% of this flow reduction occurred during the first heat treatment). With the loss of permeate flow rate, the salt rejection increases. The rate of cooling and heating was not more than 5°C per minute, and the differential pressure drop per element did not exceed 2 psi.

Pilot testing based on the criteria noted above will give the best operating parameters for any specific application.

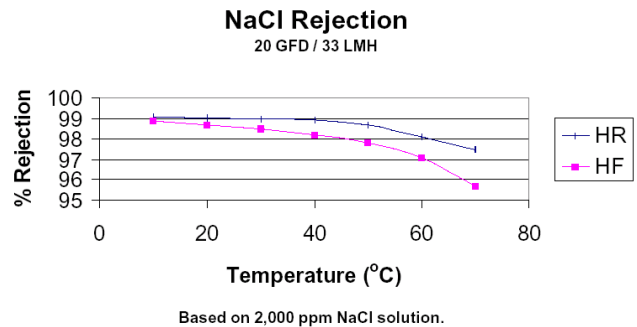


Figure 2: Typical NaCl rejection dependence on Temperature of Duratherm PRO RO elements

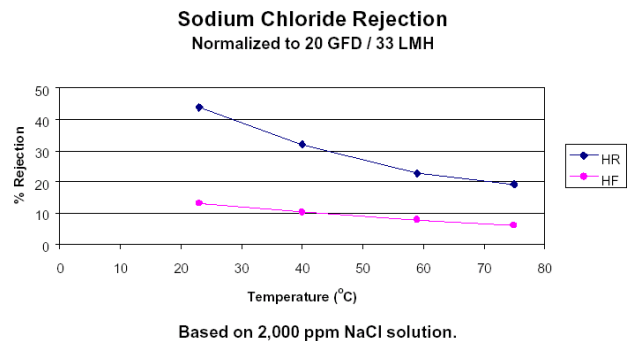


Figure 3: Typical NaCl rejection dependence on Temperature of Duratherm PRO NF elements

**Magnesium Sulfate Rejection**  
Normalized to 20 GFD / 33 LMH

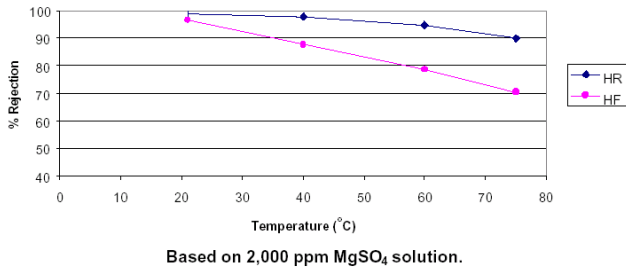


Figure 4: Typical MgSO<sub>4</sub> rejection dependence on Temperature of Duratherm PRO NF elements

**Disaccharide Rejection**  
Normalized to 20 GFD / 33 LMH

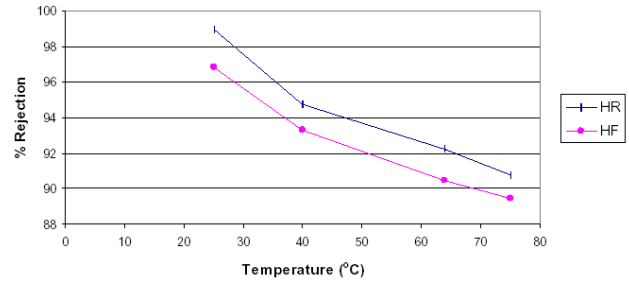


Figure 5: Typical Disaccharide rejection dependence on Temperature of Duratherm PRO NF elements

**Pressure Drop vs Flow**

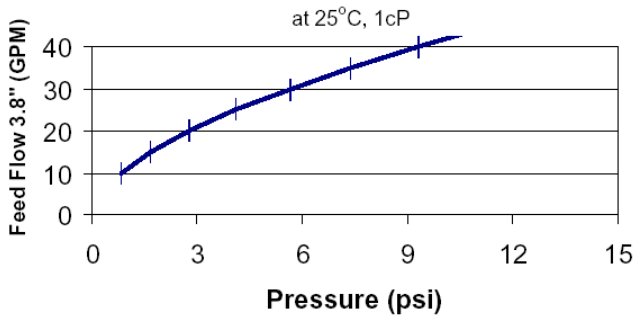
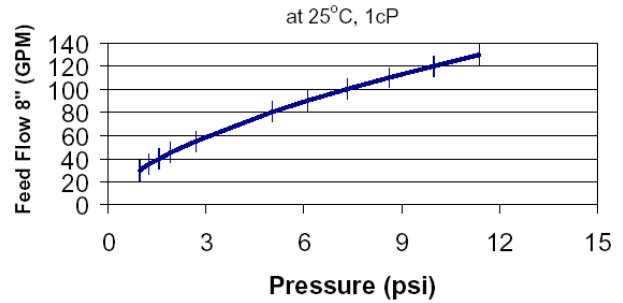


Figure 6: Pressure Drop for 3.8in elements

**Pressure Drop vs Flow**



\* Based on Osmonics 8" Housings  
\* Use as a guideline, delta P will vary based on tolerances of housing

Figure 7: Pressure Drop for 8in elements

**Net Driving Pressure**  
for 20 GFD / 33 LMH

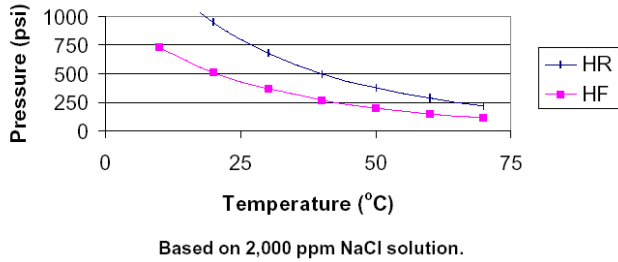


Figure 8: Net Driving Pressure for Duratherm PRO RO Element

**Net Driving Pressure**  
for 20 GFD / 33 LMH

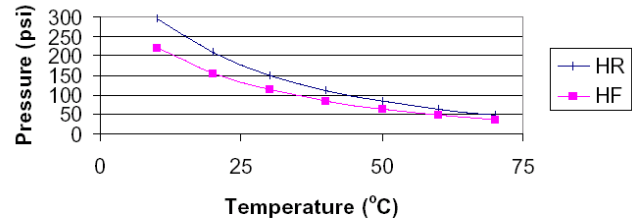


Figure 9: Net Driving Pressure for Duratherm PRO NF Element

**Wagner Diagram**

