Duratherm* STD Series

High Temperature Pure Water Elements

Description and Use

The Duratherm* STD Series is specifically designed to maximize the benefits of continuous high temperature operation as well as hot water sanitization for industries willing to maximize energy recovery and use hot purified water.

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

The Duratherm STD are suitable for separation systems purifying water at temperature up to 70°C (158°F) in low crossflow environment and no suspended solids.

This Series includes a variety of size 8” and 4” diameters. All element constructions include Durasan* Cage outer wrap, Polysulfone ATD and central tube.

Features and benefits

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

Markets

- Food / Beverage
- BioPharm
- Electronics
- Chemical

Table 1: Element Specification

Membrane	A-Series, Thin-film membrane (TFM*), PES

Model	Maximum crossflow gpm (m^3/h)	Average permeate flow gpd (m^3/day)	Average NaCl Rejection
Duratherm STD RO4040[1,2]	20 (4.5)	2,250 (8.5)	99.5%
Duratherm STD RO8040[1,2]	65 (14.8)	9,000 (34.1))	99.5%
Duratherm STD UF8040HR	65 (14.8)	-	5,000Da

[1] Testing conditions: 2,000ppm NaCl solution at 225psig (1,550kPa) operating pressure, (25°C) 77°F, pH7.5 and 15% recovery before any hot water sanitization.

[2] Average salt rejection after 24 hours operation. Individual flow rate may vary +25%/-15%. Final permeate flow rate is subject to variations in the heat treatments. In most cases, the permeate flow rate after heat treatments will stabilize at 30-50 percent below the nominal flowrate before heat treatment. For a conservative design, consider a permeate flow reduction of 50%.

Model	Active area ft² (m^2)	Outer wrap	Part number
Duratherm STD RO4040	89 (8.3)	Cage	1228197
Duratherm STD RO8040	374 (34.8)	Cage	1228225
Duratherm STD UF8040HR	348 (32.3)	Cage	1207315

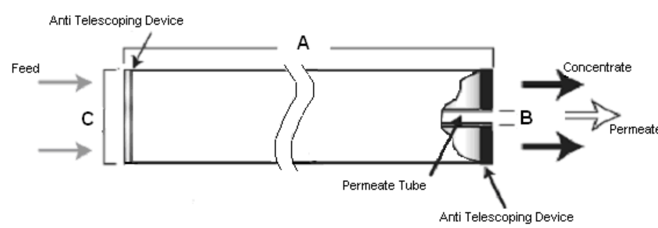

Figure 1: Element Dimensions Diagram (Female)

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Table 2: Dimensions and Weight

Model[1]	Dimensions, inches (cm)			Boxed
	A	B[2]	C[3]	Weight lbs (kg)
Duratherm STD RO4040	40.0 (101.6)	0.625 (1.59)	3.9 (9.9)	9 (4.1)
Duratherm STD RO8040	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	29 (13.2)
Duratherm STD UF8040HR	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	29 (13.2)

[1] These elements are dried and bagged before shipping.
[2] Internal diameter unless specified OD (outside diameter).
[3] The 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

Table 3: Temperatures

Do not exceed 20 GFD (34LMH) in any circumstances

Model	Maximum operating temperature	Maximum cleaning temperature	Maximum sanitization temperature
Duratherm STD RO	158°F (70°C)	122°F (50°C)	194°F (90°C)
Duratherm STD UF	158°F (70°C)	122°F (50°C)	194°F (90°C)

Table 4: Pressures and operating parameters

Model	Max operating pressure		Rec. element recovery	Typical operating flux
	41–122°F (5–50°C)	124–158°F (51–70°C)		
Duratherm STD RO	600psi (4,137kPa)	400psi (2,758kPa)	<15%	10-18GFD (17-31LMH)
Duratherm STD UF	600psi (4,137kPa)	80psi (522kPa)	<15%	10-25GFD (17-40LMH)

Table 5: Operating and CIP parameters

Model	pH range		Chlorine tolerance	Feed water
	Continuous operation	Clean-In-Place (CIP)		
Duratherm STD RO	4.0 – 11.0	2.0-11.5	500 ppm-hours, dechlorination recommended	NTU < 1 SDI < 5
Duratherm STD UF	4.0 – 11.0	2.0-11.5	5,000 ppm-days, dechlorination recommended	NTU < 1 SDI < 5

Hot Water Sanitization recommendations:

For optimal performance, Duratherm STD 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 5°C (9°F) per minute. Maximum sanitization temperature is 90°C (194°F).

Loss of permeate flow after repeated 90°C (194°F) 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:

1) Rate of temperature increase and decrease.
2) Presence of other species like organics, ionic and metallic compounds that could locally decrease or increase the temperature at the surface of the membrane.
3) Feed flow rate and specifically the heat transfer rate to the membrane surface.
4) 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 (41°F) 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.

Salt Rejection

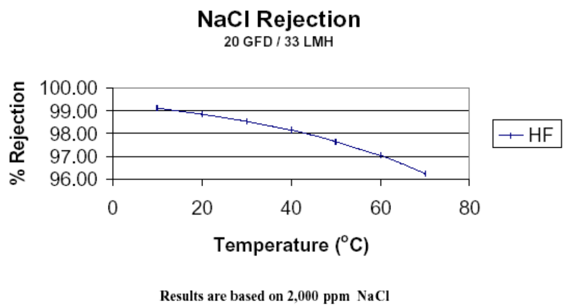

Figure 2: NaCl rejection for STD RO element

Pressure Drop

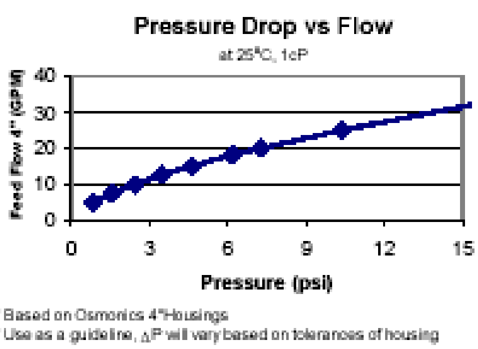

Figure 3: Pressure drop for STD 4040 elements

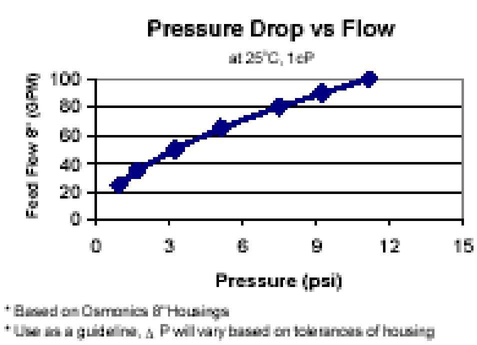

Figure 4: Pressure drop for STD 8040 elements

Net Driving Pressure

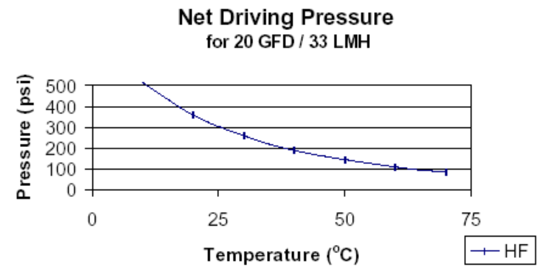

Figure 5: Net Driving Pressure for STD RO elements