

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	average permeate flow gpd (m ³ /day)	average nacl rejection
Duratherm STD R04040 ^{1,2}	2,300 (8.7)	99.5%
Duratherm STD R08040 ^{1,2}	9,000 (34.1)	99.5%
Duratherm STD UF8040HR	-	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 of operation. Individual flow rate may vary +/-20%. 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 25% below nominal flow rate before heat treatment for the Duratherm STD R0. This is taken into consideration in Winflows Database 3.07 and later.

model	active area ft ² (m ²)	outer wrap	part number
Duratherm STD R04040	90 (8.4)	Cage	1228197
Duratherm STD R08040	374 (34.9)	Cage	1228225
Duratherm STD UF8040HR	348 (32.5)	Cage	1207315

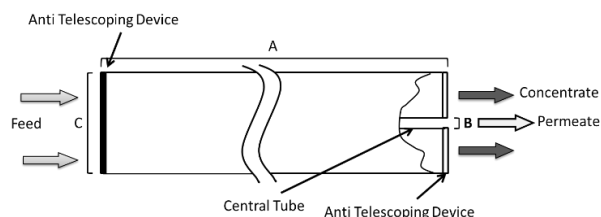


figure 1: element dimensions diagram (female)

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table 2: dimensions and weight

model ¹	dimensions, inches (cm)			boxed weight lbs (kg)
	a	b ²	c	
STD 4040 models ¹	40.0 (101.6)	0.625 (1.59)	3.9 (9.9)	9 (4.1)
STD 8040 Models	40.0 (101.6)	1.125 (2.86)	7.9 (20.1)	35 (16)

¹“A” includes the interconnector.

²Internal diameter unless specified OD (outside diameter).

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: operating parameters – Duratherm STD RO

Operating Temperature	41–122°F (5–50°C)	122–158°F (50–70°C)
Typical Operating Flux	10-18GFD (17-31LMH)	10-18GFD (17-31LMH)
Max. Operating Pressure	600 psi (4,137 kPa)	400psi (2,758kPa)
Recommended. Crossflow	STD 4040 Models: 20 GPM (4.5 m ³ /hr) STD 8040 Models: 65 GPM (14.8 m ³ /hr)	
Max. Pressure Drop: Over an element Per Housing	15 psig (103kPa) 60 psig (414kPa)	7.5 psig (51kPa) 30 psig (207kPa)
pH range: Continuous operation Clean-In-Place (CIP)	4.0-11.0 2 – 11.5	4.0-11.0 Not Allowed
Chlorine Tolerance	500 ppm-hours, dechlorination recommended	
Feedwater	NTU < 1 SDI ₁₅ < 5	

table 5: operating parameters – Duratherm STD UF

Operating Temperature	41–122°F (5–50°C)	122–158°F (50–70°C)
Typical Operating Flux	10-25GFD (17-40LMH)	10-25GFD (17-40LMH)
Max. Operating Pressure	600 psi (4,137kPa)	80psi (522kPa)
Recommended. Crossflow	STD 4040 Models: 20 GPM (4.5 m ³ /hr) STD 8040 Models: 65 GPM (14.8 m ³ /hr)	
Max. Pressure Drop: Over an element Per Housing	15 psig (103kPa) 60 psig (414kPa)	7.5 psig (51kPa) 30 psig (207kPa)
pH range: Continuous operation Clean-In-Place (CIP)	4.0-11.0 2 – 11.5	4.0-11.0 Not Allowed
Chlorine Tolerance	5,000 ppm-hours, dechlorination recommended	
Feedwater	NTU < 1 SDI ₁₅ < 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, 25% 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 5C (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

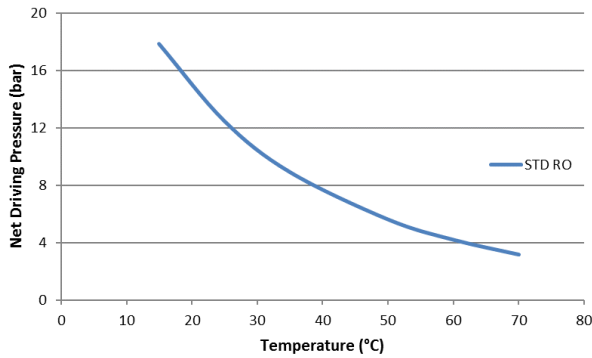


figure 2: simulated NaCl rejection for STD RO element with 2000 ppm NaCl at 15% recovery and 33 LMH

pressure drop

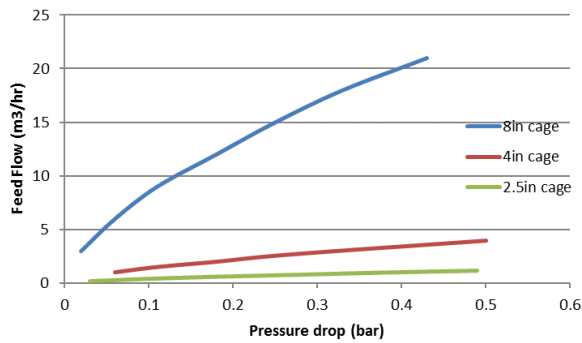


figure 3: simulated pressure drop

net driving pressure

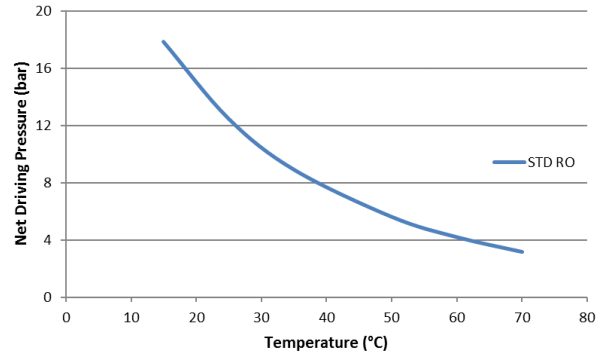


figure 4: simulated net driving pressure for STD RO elements with 2000 ppm NaCl at 15% recovery and 33 LMH