



PRODUCT SPECIFICATION

8" ACM RO High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-M2G4T9 | 9,400 (35.0) | 99.00 | 98.00 |

Performance is based on the following test conditions: 2,000.00 ppm NaCl, 225.00 psi, 25°C, 15% recovery, pH 8.00, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|----------------------------------------------------------|
| Membrane Type..... | ACM Fully Aromatic Polyamide Advanced Composite Membrane |
| Configuration..... | Spiral Wound, High Temperature Turboclean Shell |
| Active Membrane Area..... | 355 ft ² (32.6 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 80 GPM (18 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | RO Permeate Polishing |



Element Weight : 45 (20)
 Length (A) : 40.00 (1,016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

8" X-20 Low Fouling RO Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-N1F3T7 | 9,400 (35.0) | 99.50 | 98.50 |

Performance is based on the following test conditions: 2,000.0 ppm NaCl, 225.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------------|
| Membrane Type..... | X20 Fully Aromatic Polyamide-Urea Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell with FoulGuard Technology |
| Active Membrane Area..... | 355 ft ² (32.6 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 113°F (2 - 45°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 80 GPM (18 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 2 NTU |
| Application..... | Waste Water, High Pressure |



Element Weight : 45 (20)
 Length (A) : 40.0 (1,016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

8" X-20 RO Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-N1F3X5 | 7,100 (26.0) | 99.00 | 98.00 |

Performance is based on the following test conditions: 2,000.0 ppm NaCl, 225.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------------|
| Membrane Type..... | X20 Fully Aromatic Polyamide-Urea Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell with FoulGuard Technology |
| Active Membrane Area..... | 270 ft ² (24.8 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 800 psi (55 bar) |
| Recommended Operating Temperature..... | 35 - 104°F (2 - 45°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 95 GPM (22 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 2 NTU |
| Application..... | Waste Water, High Pressure |



Element Weight : 40 (18)
 Length (A) : 40.0 (1,016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.046" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

8" X-20 Low Fouling RO Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-N1G3T4 | 7100 (26.0) | 99.00 | 98.00 |

Performance is based on the following test conditions: 2000 ppm NaCl, 225 psi, 25°C, 15% recovery, pH 8, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------------|
| Membrane Type..... | X20 Fully Aromatic Polyamide-Urea Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell with FoulGuard Technology |
| Active Membrane Area..... | 270 ft ² (24.8 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 113°F (2 - 45°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 95 GPM (22 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 2 NTU |
| Application..... | Whey Electro Dialyses Recovery |



Element Weight : 40 (18)
 Length (A) : 40 (1016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.047" thick parallel spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



TurboClean™ Sanitary Elements for Food Applications

The TurboClean® element can reduce by-pass flow by 35% - 44% when compared to commercially available sanitary membrane elements. This improves overall hydraulic control in the pressure vessels, resulting in energy savings, improved membrane life, and significant improvements in processing and cleaning efficiency. The TurboClean® element was developed by TriSep Corporation as a sanitary membrane that uses a hard outer shell.

A basic design requirement of a sanitary element is that it has no 'dead zones', or non-flow areas. Conventional spiral wound elements use a 'brine,' or peripheral seal, to prevent feed water from bypassing through the annular area formed between the pressure vessel inner diameter and the element outer diameter. This results in a dead zone or stagnant area between the outside of the element and the inside of the pressure vessel.

For food and dairy applications, it is a requirement that some of the process fluid must by-pass, or flow around the outside of the element, to insure that this annular area is continuously flushed and that there are no areas in which product can become stagnant or which are not fully exposed to cleaning agents. Different manufacturers employ different means of enclosure in an attempt to provide mechanical stability for the element while assuring this by-pass flow.

These methods include a 'cage' wrap, or alternatively, a "net" wrap around the outer diameter of the element. Either is considered 'soft wrapped' and allows a significant amount of the feed flow to by-pass around the outside of the element.

A third method, the hard shell TurboClean® design by TriSep Corporation, incorporates an impermeable hard plastic shell with a machined groove that spirals around the shell from end to end to allow bypass flow.

In the food and dairy industry, membranes are installed in multi-stage, continuous recirculation systems. The variation in the specific permeate flux at different concentration levels, changing viscosities, and different fouling characteristics of the process streams, requires high recirculation flows to insure adequate feed flow through the membrane element.

A constant velocity over the membrane surface of the process liquid is maintained by a recirculation pump in each stage. Stages contain a number of pressure vessels, all connected in parallel to a main feed manifold. Conventional sanitary elements have significant clearances between the "soft wrap" and the inside of the pressure vessel, resulting in by-pass of feed flow around the element of 40% - 60%. This adds to the required recirculation flow.

Comparative tests at a major California Cheese producer were performed to compare the by-pass flow of the TurboClean® element to a standard "net" wrap element, by isolating one pressure vessel in a continuous recirculation stage. The vessel was equipped with flow control valves on the feed and concentrate side, pressure gauges on feed and concentrate, and flow meters to measure the concentrate and permeate flow. The tests showed a reduction in feed flow rate of 44 % when comparing the TurboClean® elements versus conventional "soft-wrapped" elements. What effect will this new element design have on the food and dairy industry? The hard shell TurboClean® energy savings can be as high as 44% of the required recirculation flow, and in certain application, a corresponding decrease in required cooling energy.

Improved hydraulic flow control may also lead to increased membrane life and improved membrane cleaning efficiencies. Although initial tests tend to support this hypothesis, conclusive data is still pending.

Effects of improved hydraulic flow control may result in improved separation efficiencies, since the effect of high by-pass flow is to reduce membrane cross flow and increase concentration polarization (a higher solute concentration at the membrane surface than in the bulk stream) on the membrane surface. Reduction of concentration polarization is directly related to cross flow rates in the membrane element.

Following, are a list of TriSep TurboClean products specifically designed for the food industry.



PRODUCT SPECIFICATION

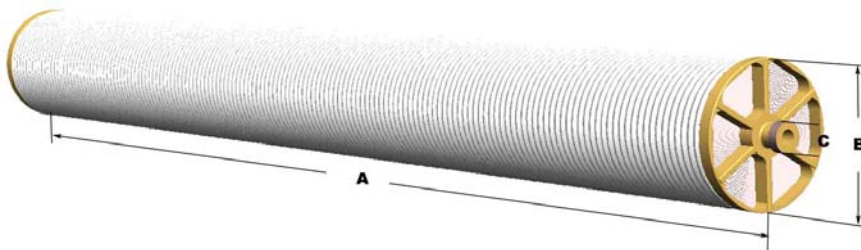
3.8" X-20 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3838-N1E8U8 | 1,700 (6.0) | 99.50 | 98.50 |

Performance is based on the following test conditions: 2,000.0 ppm NaCl, 225.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------------|
| Membrane Type..... | X20 Fully Aromatic Polyamide-Urea Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell with FoulGuard Technology |
| Active Membrane Area..... | 68 ft ² (6.2 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 20 GPM (4.5 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Egg Concentration |



Element Weight : 12 (5.4)
 Length (A) : 38.0 (965) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

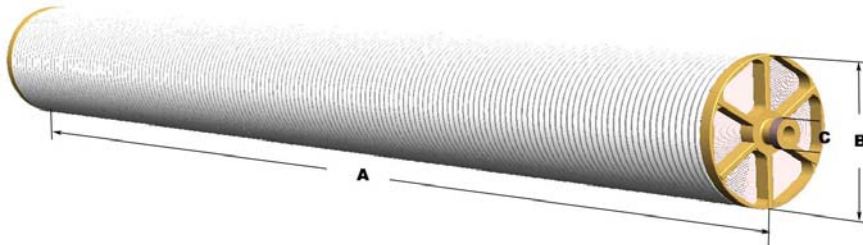
3.8" XN45 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3838-N2E7U8 | 1,700 (6.0) | 95.00 | 92.00 |

Performance is based on the following test conditions: 2,000.0 ppm MgSO₄, 110.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|-------------------------------------------------|
| Membrane Type..... | XN45 Polyamide Advanced Nanofiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 68 ft ² (6.2 m ²) |
| Recommended Applied Pressure..... | 40 - 200 psi (3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 0.5 ppm nominal, 1.0 ppm max |
| Maximum Feed Flow..... | 20 GPM (4.5 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Coffee Extract Concentration |



Element Weight : 15 (7)
 Length (A) : 38.0 (965) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

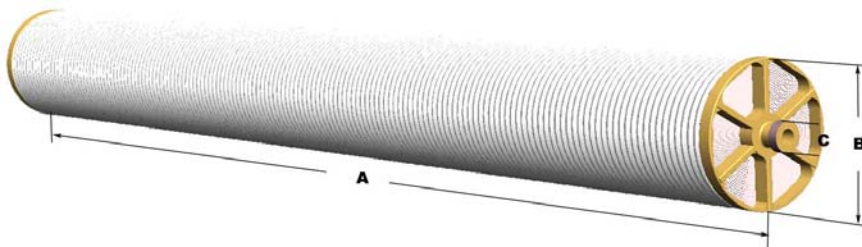
3.8" XN45 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3838-N2E8V6 | 1300 (4.0) | 95.00 | 92.00 |

Performance is based on the following test conditions: 2000 ppm MgSO₄, 110 psi, 25°C, 15% recovery, pH 8, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|-------------------------------------------------|
| Membrane Type..... | XN45 Polyamide Advanced Nanofiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 53 ft ² (4.9 m ²) |
| Recommended Applied Pressure..... | 40 - 200 psi (3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 0.5 ppm nominal, 1.0 ppm max |
| Maximum Feed Flow..... | 25 GPM (5.6 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Egg Concentration |



Element Weight : 15 (7)
 Length (A) : 38 (965) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.045" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

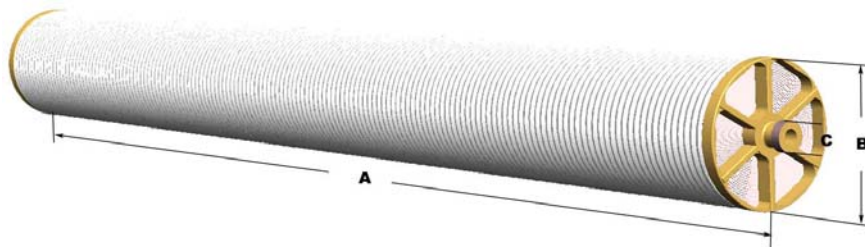
3.8" XN45 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3838-N2F6U8 | 1700 (6.0) | 95.00 | 92.00 |

Performance is based on the following test conditions: 2000 ppm MgSO4, 110 psi, 25°C, 15% recovery, pH 8, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|-------------------------------------------------|
| Membrane Type..... | XN45 Polyamide Advanced Nanofiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 68 ft ² (6.2 m ²) |
| Recommended Applied Pressure..... | 40 - 200 psi (3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 0.5 ppm nominal, 1.0 ppm max |
| Maximum Feed Flow..... | 20 GPM (4.5 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Sugar Concentration |



Element Weight : 15 (7)
 Length (A) : 38 (965) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

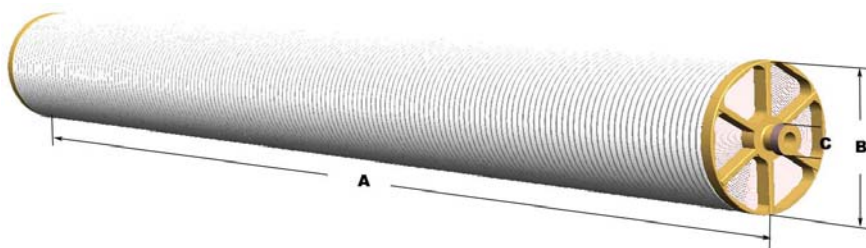
3.8" XN45 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3838-N2P1U9 | 1,300 (4.0) | 95.00 | 92.00 |

Performance is based on the following test conditions: 2,000.00 ppm MgSO₄, 110.00 psi, 25°C, 15% recovery, pH 8.00, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|-------------------------------------------------|
| Membrane Type..... | XN45 Polyamide Advanced Nanofiltration Membrane |
| Configuration..... | Spiral Wound, High Temperature Turboclean Shell |
| Active Membrane Area..... | 53 ft ² (4.9 m ²) |
| Recommended Applied Pressure..... | 40 - 200 psi (3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 0.5 ppm nominal, 1.0 ppm max |
| Maximum Feed Flow..... | 25 GPM (5.6 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Animal Feed |



Element Weight : 15 (7)
 Length (A) : 38.00 (965) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres. Dim "A" does not include ATD.
 Mechanical Configuration: Sanitary Style Core Tube ATD not included with element
 Feed Spacer: 0.047" thick parallel spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



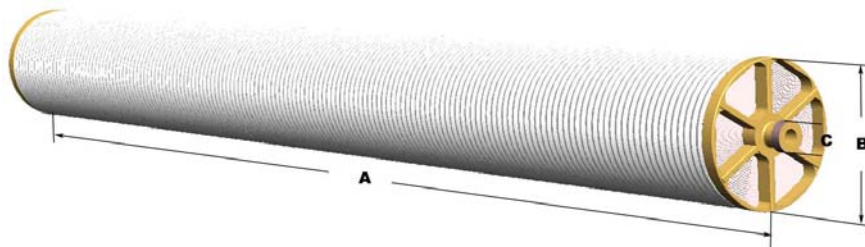
PRODUCT SPECIFICATION

3.8" AUM High Temperature UF Turboclean Element

| Model | | M.W.C.O. |
|-------------|-------------|----------|
| 3838-N6F7V8 | 2700 (10.0) | 10,000 |

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|------------------------------------------|
| Membrane Type..... | AUM Advanced Ultrafiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 67 ft ² (6.2 m ²) |
| Recommended Applied Pressure..... | 5 - 200 psi (0.3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 10.0 ppm |
| Maximum Feed Flow..... | 20 GPM (4.5 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Sugar Refining / Starch Removal |



Element Weight : 12 (5.4)
 Length (A) : 38 (965) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

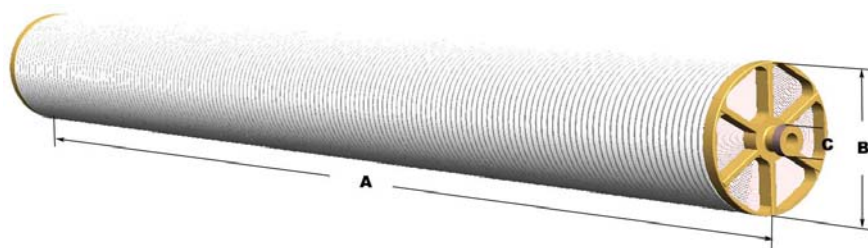
3.8" XN45 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3840-N2E7U8 | 1,750 (6.0) | 95.00 | 92.00 |

Performance is based on the following test conditions: 2,000.0 ppm MgSO₄, 110.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|-------------------------------------------------|
| Membrane Type..... | XN45 Polyamide Advanced Nanofiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 70 ft ² (6.4 m ²) |
| Recommended Applied Pressure..... | 40 - 200 psi (3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 0.5 ppm nominal, 1.0 ppm max |
| Maximum Feed Flow..... | 20 GPM (4.5 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Coffee Extract Concentration |



Element Weight : 15 (7)
 Length (A) : 38.8 (984) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

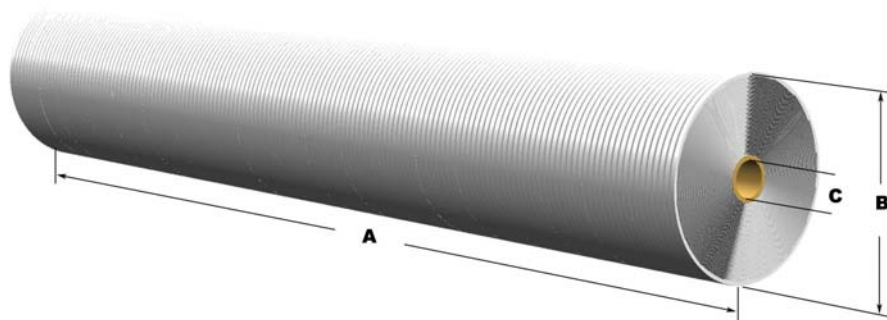
6.3" AUM High Temperature UF Turboclean Element

| Model | M.W.C.O. |
|-------------|----------|
| 6338-N6P5V9 | 10,000 |

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|-------------------------------------------------|
| Membrane Type..... | AUM Advanced Ultrafiltration Membrane |
| Configuration..... | Spiral Wound, High Temperature Turboclean Shell |
| Active Membrane Area..... | 157 ft ² (14.7 m ²) |
| Recommended Applied Pressure..... | Not applicable |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 176°F (2 - 80°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 10.0 ppm |
| Maximum Feed Flow..... | 70 GPM (15.8 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Meat Processing |

U.S.D.A.
APPROVED



Element Weight : 30 (14)
 Length (A) : 38.00 (965) Diameter (B) : 6.3 (160) Permeate Tube (C) : 1.14 (29.0)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres. Dim "A" does not include ATD.
 Mechanical Configuration: Sanitary Style Core Tube ATD not included with element
 Feed Spacer: 0.045" thick diamond spacer



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

8" ACM RO Turboclean Element Series

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-M1F6T6 | 7500 (28.0) | 99.50 | 98.50 |

Performance is based on the following test conditions: 2000 ppm NaCl, 225 psi, 25°C, 15% recovery, pH 8, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|----------------------------------------------------------|
| Membrane Type..... | ACM Fully Aromatic Polyamide Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 355 ft ² (32.6 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 113°F (2 - 45°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 80 GPM (18 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Sugar Concentration |



Element Weight : 45 (20)
 Length (A) : 40 (1016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

8" ACM RO High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-M2D6S4 | 7,200 (27.0) | 99.00 | 98.00 |

Performance is based on the following test conditions: 2,000.0 ppm NaCl, 225.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|----------------------------------------------------------|
| Membrane Type..... | ACM Fully Aromatic Polyamide Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 270 ft ² (24.8 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 95 GPM (22 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Steam Recovery |



Element Weight : 40 (18)
 Length (A) : 40.0 (1,016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.047" thick parallel spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

8" X-20 RO High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-N1C8S4 | 7,100 (26.0) | 99.00 | 98.00 |

Performance is based on the following test conditions: 2,000.00 ppm NaCl, 225.00 psi, 25°C, 15% recovery, pH 8.00, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------------|
| Membrane Type..... | X20 Fully Aromatic Polyamide-Urea Advanced Composite Membrane |
| Configuration..... | Spiral Wound, High Temperature Turboclean Shell |
| Active Membrane Area..... | 270 ft ² (24.8 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 1000 psi (69 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 95 GPM (22 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 2 NTU |
| Application..... | Evaporator Condensate Recovery |



Element Weight : 40 (18)
 Length (A) : 40.00 (1,016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.047" thick parallel spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

8" X-20 RO High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-N1F3S4 | 7,100 (26.0) | 99.00 | 98.00 |

Performance is based on the following test conditions: 2,000.0 ppm NaCl, 225.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------------|
| Membrane Type..... | X20 Fully Aromatic Polyamide-Urea Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell with FoulGuard Technology |
| Active Membrane Area..... | 270 ft ² (24.8 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 95 GPM (22 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 2 NTU |
| Application..... | General Food Waste Water |



Element Weight : 40 (18)
 Length (A) : 40.0 (1,016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.047" thick parallel spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

8" X-20 Low Fouling RO Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-N1P7T6 | 9,400 (35.0) | 99.50 | 98.50 |

Performance is based on the following test conditions: 2,000.0 ppm NaCl, 225.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------------|
| Membrane Type..... | X20 Fully Aromatic Polyamide-Urea Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell with FoulGuard Technology |
| Active Membrane Area..... | 355 ft ² (32.6 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 113°F (2 - 45°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 80 GPM (18 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 2 NTU |
| Application..... | Tea Concentration |



Element Weight : 45 (20)
 Length (A) : 40.0 (1,016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



TurboClean™ Sanitary Elements for Pharmaceutical Applications

TurboClean elements have been used extensively in the pharmaceutical market for USP and WFI water purification and down stream process purification. Although not required by law by the FDA, contamination of pharmaceutical USP and WFI water can result in contaminated products.

The sanitary nature of the TurboClean element provides a continuous by-pass flow around the outside of the element. This eliminates the stagnant area normally present on standard brine seal elements, which can result in bio-growth that can contaminate the pharmaceutical product. This stagnant area is difficult to clean or sanitize in place, as there is no flow of cleaning or sanitizing chemicals into this area. If cleaning or sanitizing chemicals do get into this area, it is difficult to predict the rinse out time for these chemicals.

Standard net wrap sanitary elements have traditionally been used in food and dairy applications. Due to the high by-pass flow inherent with these designs, food and dairy systems incorporate large recirculation pumps to insure a certain minimum flow through the elements. These net wrap elements cannot be used in standard 2-1 arrays normally used in water applications.

The TurboClean element minimized by-pass flow to 15-20% of the feed flow. This allows the TurboClean element to be used in standard water type applications like dialysis water make-up. Following are some TriSep TurboClean elements specifically engineered for the pharmaceutical water market.



PRODUCT SPECIFICATION

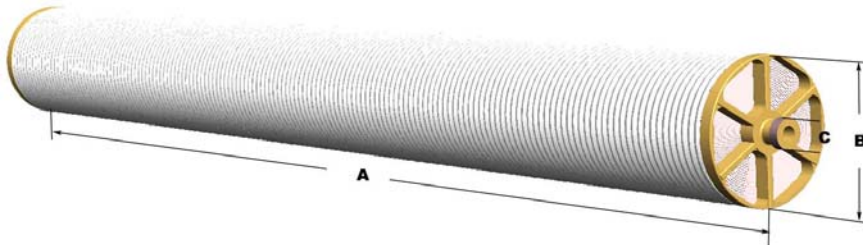
3.8" AUM UF High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | M.W.C.O. |
|-------------|--------------------------------|----------|
| 3838-M8P4V6 | 1,700 (6.0) | 3,500 |

Performance is based on the following test conditions: 500.0 ppm Dextran, 110.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|-------------------------------------------------|
| Membrane Type..... | AUM Advanced Ultrafiltration Membrane |
| Configuration..... | Spiral Wound, High Temperature Turboclean Shell |
| Active Membrane Area..... | 53 ft ² (4.9 m ²) |
| Recommended Applied Pressure..... | 20 - 200 psi (1.4 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 10.0 ppm |
| Maximum Feed Flow..... | 25 GPM (5.6 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Pharmaceutical Separations |



Element Weight : 12 (5.4)
 Length (A) : 38.0 (965) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.045" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

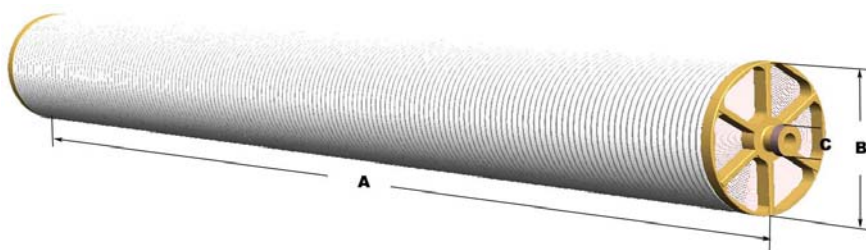
3.8" X-20 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3838-N1J4U9 | 1,300 (4.0) | 99.50 | 98.50 |

Performance is based on the following test conditions: 2,000.0 ppm NaCl, 225.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------------|
| Membrane Type..... | X20 Fully Aromatic Polyamide-Urea Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell with FoulGuard Technology |
| Active Membrane Area..... | 53 ft ² (4.9 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 25 GPM (5.6 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Peptide Concentration |



Element Weight : 12 (5.4)
 Length (A) : 38.0 (965) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.047" thick parallel spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

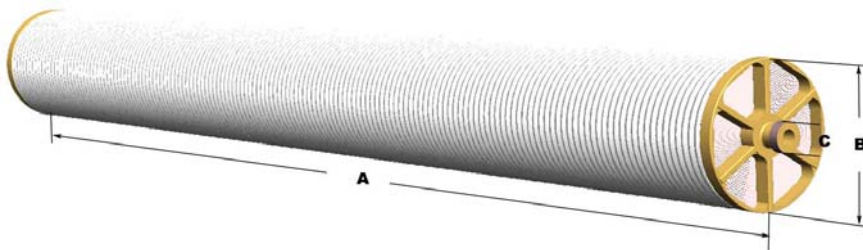
3.8" XN45 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3838-N2J4U8 | 1,700 (6.0) | 95.00 | 92.00 |

Performance is based on the following test conditions: 2,000.0 ppm MgSO₄, 110.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|-------------------------------------------------|
| Membrane Type..... | XN45 Polyamide Advanced Nanofiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 68 ft ² (6.2 m ²) |
| Recommended Applied Pressure..... | 40 - 200 psi (3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 0.5 ppm nominal, 1.0 ppm max |
| Maximum Feed Flow..... | 20 GPM (4.5 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Peptide Demineralization |



Element Weight : 15 (7)
 Length (A) : 38.0 (965) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

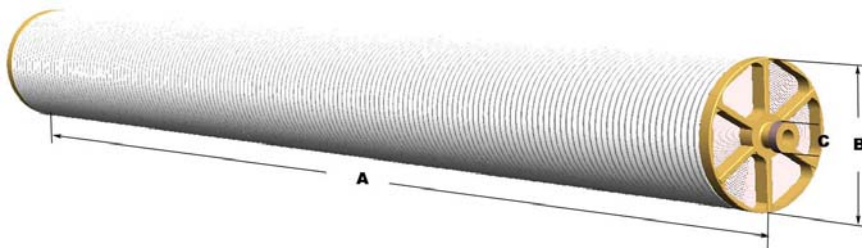
3.8" TS-80 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3840-M7P4U8 | 1,800 (6.0) | 99.00 | 97.00 |

Performance is based on the following test conditions: 2,000.00 ppm MgSO4, 110.00 psi, 25°C, 15% recovery, pH 8.00, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------|
| Membrane Type..... | ANM Aromatic Polyamide Advanced Nanofiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 70 ft ² (6.4 m ²) |
| Recommended Applied Pressure..... | 40 - 200 psi (3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 25 GPM (5.6 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Pharmaceutical Separations |



Element Weight : 12 (5.4)
 Length (A) : 38.75 (984) Diameter (B) : 3.80 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

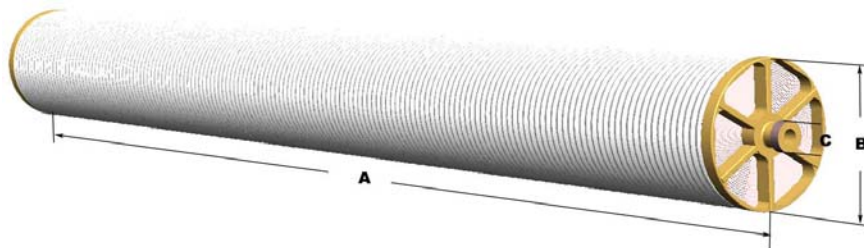
3.8" TS-80 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3840-M7P4V6 | 1,700 (6.0) | 99.00 | 97.00 |

Performance is based on the following test conditions: 2,000.00 ppm MgSO₄, 110.00 psi, 25°C, 15% recovery, pH 8.00, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|---------------------------------------------------------|
| Membrane Type..... | ANM Aromatic Polyamide Advanced Nanofiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 53 ft ² (4.9 m ²) |
| Recommended Applied Pressure..... | 40 - 200 psi (3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 25 GPM (5.6 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Pharmaceutical Separations |



Element Weight : 12 (5.4)
 Length (A) : 38.75 (984) Diameter (B) : 3.80 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.045" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

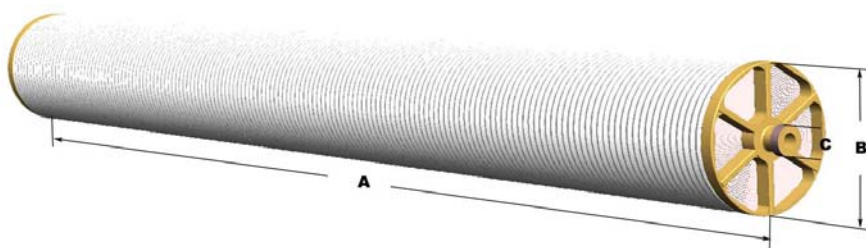
3.8" XN45 High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 3840-N2J4U9 | 1,300 (4.0) | 95.00 | 92.00 |

Performance is based on the following test conditions: 2,000.0 ppm MgSO₄, 110.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|-------------------------------------------------|
| Membrane Type..... | XN45 Polyamide Advanced Nanofiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 53 ft ² (4.9 m ²) |
| Recommended Applied Pressure..... | 40 - 200 psi (3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 140°F (2 - 60°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 0.5 ppm nominal, 1.0 ppm max |
| Maximum Feed Flow..... | 25 GPM (5.6 m ³ /hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Peptide Demineralization |



Element Weight : 15 (7)
 Length (A) : 38.8 (984) Diameter (B) : 3.8 (96) Permeate Tube (C) : 0.83 (21.2)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Sanitary Style Core Tube
 Feed Spacer: 0.047" thick parallel spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

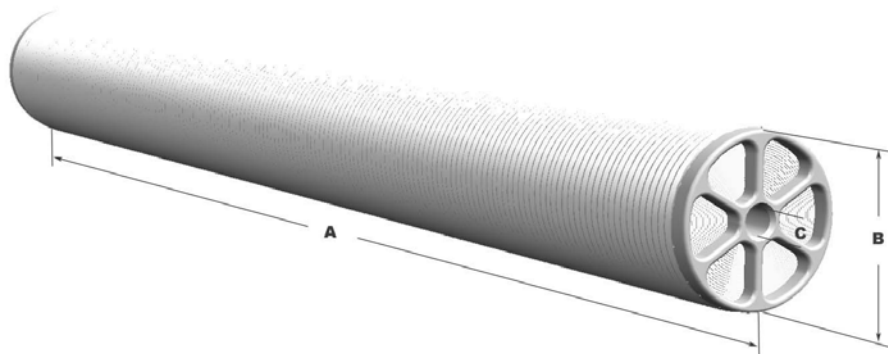
4" ACM RO Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 4040-M2Q3U5 | 2,400 (9.0) | 99.50 | 98.50 |

Performance is based on the following test conditions: 2,000.00 ppm NaCl, 225.00 psi, 25°C, 15% recovery, pH 8.00, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|----------------------------------------------------------|
| Membrane Type..... | ACM Fully Aromatic Polyamide Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 85 ft ² (7.9 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 113°F (2 - 45°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 20 GPM (4.5 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Pharm. Make Up Water |



Element Weight : 15 (7)
 Length (A) : 40.00 (1,016) Diameter (B) : 4.00 (101) Permeate Tube (C) : 0.62 (15.9)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Desal/DuPont Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

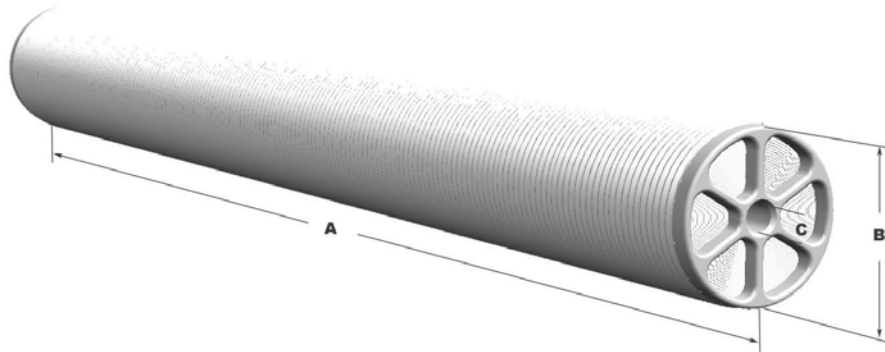
4" AUM Ultrafiltration Turboclean Element Series

| Model | Permeate flow GPD (m3/day)* | M.W.C.O. |
|-------------|--------------------------------|----------|
| 4040-N6P4X4 | 3,100 (11.0) | 10,000 |

Performance is based on the following test conditions: 500.00 ppm PEG, 30.00 psi, 25°C, 15% recovery, pH 8.00, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|------------------------------------------|
| Membrane Type..... | AUM Advanced Ultrafiltration Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 78 ft ² (7.2 m ²) |
| Recommended Applied Pressure..... | 5 - 200 psi (0.3 - 14 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 113°F (2 - 45°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | 10.0 ppm |
| Maximum Feed Flow..... | 20 GPM (4.5 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | General Pharmaceutical |



Element Weight : 12 (5.4)
 Length (A) : 40.00 (1,016) Diameter (B) : 4.00 (101) Permeate Tube (C) : 0.62 (15.9)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Desal/DuPont Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

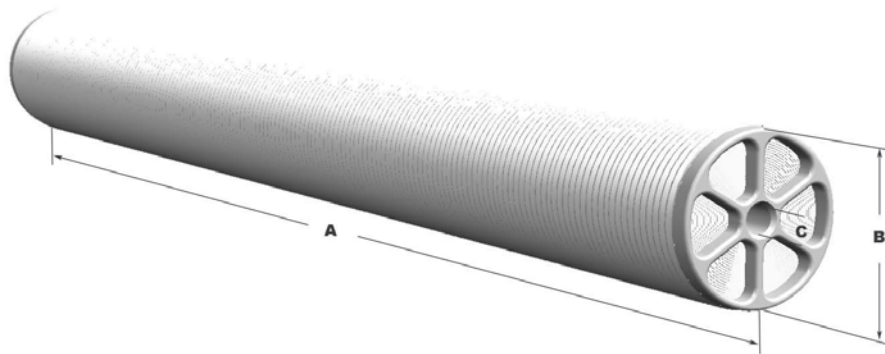
4" ACM High Temperature Turboclean Element

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 4040-O6Q3U8 | 1,400 (5.0) | 99.50 | 98.50 |

Performance is based on the following test conditions: 2,000.00 ppm NaCl, 225.00 psi, 25°C, 15% recovery, pH 8.00, 30 minutes operation. Permeate flow rate is after thermal set.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|----------------------------------------------------------|
| Membrane Type..... | ACM Fully Aromatic Polyamide Advanced Composite Membrane |
| Configuration..... | Spiral Wound, High Temperature Turboclean Shell |
| Active Membrane Area..... | 80 ft ² (7.4 m ²) |
| Recommended Applied Pressure..... | 100 - 200 psi (7 - 14 bar) |
| Maximum Applied Pressure..... | 200 psi (14 bar) at 70°C |
| Recommended Operating Temperature..... | 35 - 160°F (2 - 70°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 20 GPM (4.5 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Pharmaceutical Makeup Water |



Element Weight : 15 (7)
 Length (A) : 40.00 (1,016) Diameter (B) : 4.0 (101) Permeate Tube (C) : 0.62 (15.9)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Desal/DuPont Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



PRODUCT SPECIFICATION

8" ACM RO Turboclean Element Series

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-M2C2T6 | 9,400 (35.0) | 99.50 | 98.50 |

Performance is based on the following test conditions: 2,000.0 ppm NaCl, 225.0 psi, 25°C, 15% recovery, pH 8.0, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

| | |
|--------------------------------------------|----------------------------------------------------------|
| Membrane Type..... | ACM Fully Aromatic Polyamide Advanced Composite Membrane |
| Configuration..... | Spiral Wound, Turboclean Shell |
| Active Membrane Area..... | 355 ft ² (32.6 m ²) |
| Recommended Applied Pressure..... | 100 - 300 psi (7 - 21 bar) |
| Maximum Applied Pressure..... | 600 psi (41 bar) |
| Recommended Operating Temperature..... | 35 - 113°F (2 - 45°C) |
| Feedwater pH Range..... | 2 - 11 continuous |
| Chlorine Tolerance..... | <0.1 ppm |
| Maximum Feed Flow..... | 80 GPM (18 m3/hr) |
| Minimum Brine Flow/Permeate Flow Ratio.... | 5:1 |
| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | Pharm Process Water |



Element Weight : 45 (20)
 Length (A) : 40.0 (1,016) Diameter (B) : 7.9 (200) Permeate Tube (C) : 1.12 (28.6)
 Units in pounds and inches, units in paranthesis in kilograms and millimetres.
 Mechanical Configuration: Filmtec Style Core Tube
 Feed Spacer: 0.031" thick diamond spacer

* Permeate flow is clean water flux at standard conditions above. Not applicable for all feedwater conditions. Individual element's permeate flow may vary +/- 15%.



Engineered Membrane
SOLUTIONS



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8" ACM RO Turboclean Element Series

| Model | Permeate flow GPD (m3/day)* | Average Salt Rejection (%) | Minimum Salt Rejection (%) |
|-------------|--------------------------------|-------------------------------|-------------------------------|
| 8040-M2P4T6 | 9,400 (35.0) | 99.50 | 98.50 |

Performance is based on the following test conditions: 2,000.00 ppm NaCl, 225.00 psi, 25°C, 15% recovery, pH 8.00, 30 minutes operation.

OPERATIONAL AND DESIGN DATA

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| Maximum SDI (15 minutes) | 5.0 |
| Maximum Turbidity..... | 1 NTU |
| Application..... | General Pharmaceutical |



Element Weight : 45 (20)
 Length (A) : 40.00 (1,016) Diameter (B) : 7.90 (200) Permeate Tube (C) : 1.12 (28.6)
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