Product Datasheet

TORAY
Innovation by Chemistry

TM700D Series

High-Rejection Brackish Water Reverse Osmosis Membrane Element with Enhanced Chemical Tolerance

Toray's reverse osmosis membrane technology applies decades of R&D and precision automated manufacturing under ISO 9001 for consistency in product quality. State-of-the-art cross-linked fully aromatic polyamide composite membranes produce high-quality permeate and robust membrane chemistry for improved performance and longer membrane life.

Product Specifications	Unit	TM710D	TM720D-400	TM720D-440
Size		4040	8040	8040
Membrane Area	ft^2 (m^2)	87 (8)	400 (37)	440 (41)
Nominal Salt Rejection	%	99.8	99.8	99.8
Minimum Salt Rejection	%	99.65	99.65	99.65
Product Flow Rate	gpd (m^3/d)	2,600 (9.8)	11,000 (41.6)	12,100 (45.8)
Minimum Product Flow Rate	gpd (m^3/d)	2,150 (8.2)	8,900 (33.6)	9,800 (37.0)
Feed spacer thickness	mil	31	34	28

Test Conditions: Feed water pressure 225 psi (1.55 MPa); Feed water temperature 77 °F (25°C); Feed water concentration 2,000 mg/L as NaCl; Recovery rate 15%; Feed water pH 7

Applications

Municipal drinking water, Industrial process water, Water reuse

Products manufactured at our U.S. facility (TMUS) are certified to NSF/ANSI 61 for drinking water applications.

Figure 1: 4040 elements

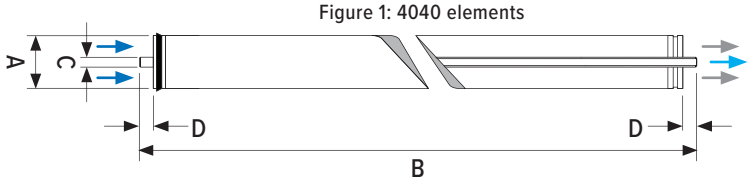
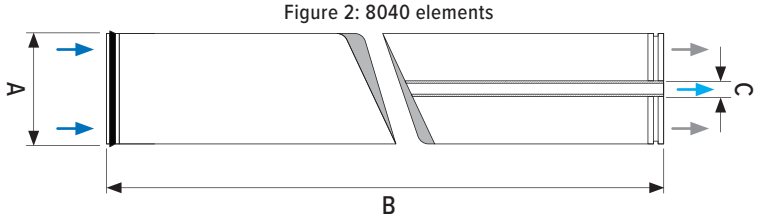


Figure 2: 8040 elements



Dimensions in. (mm)		
Size	4040	8040
A	4.0 (101)	7.9 (201)
B	40 (1,016)	40 (1,016)
C	0.75 (19)	1.125 (29)
D	1.05 (26)	—

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TM700D Series

High-Rejection Brackish Water Reverse Osmosis Membrane Element with Enhanced Chemical Tolerance

Operating Limits		Unit	Value
Maximum operating pressure[6]		psi (MPa)	600 (4.1)
Maximum feed water temperature		°F (°C)	113 (45)
Maximum feed water SDI_{15}			5
Feed water chlorine concentration		ppm	< 0.1
Feed water pH range	Continuous operation		2–11
	Chemical cleaning		1–13
Maximum pressure drop per element		psi (MPa)	15 (0.10)
Maximum pressure drop per vessel		psi (MPa)	50 (0.34)

Operating Information

1. Please consult the latest Toray technical bulletin, design guidelines, computer design program, or call an application specialist for the recommended design range. Not strictly following the operating limits stated in this bulletin will void and nullify the Limited Warranty.
2. All RO elements are wet tested treated with a 1 percent by weight sodium bisulfite storage solution. Afterward, the RO elements are vacuum packed in oxygen barrier bags or treated with a tested feed water solution, and then vacuum sealed in oxygen barrier bags with deoxidant inside. Toray recommends flushing Toray RO elements for 30 to 60 minutes once every two days with sufficient quality flushing water, such as pre-treated feed water, to prevent biological growth during system shutdown. Please refer to the Toray RO Handling Manual for suggested flushing water quality.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals that act as oxidation catalysts in the feed water, will cause unexpected oxidation of the membrane. Toray strongly recommends removing these oxidizing agents contained in feed water before operating the RO system.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.
6. Maximum operating pressure will vary depending on feed temperature. Please ask for detailed information from Toray if needed.

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Product Datasheet

TORAY
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TMG(D) Series

Low-Pressure Brackish Water Reverse Osmosis (RO) Membrane Element with Enhanced Chemical Tolerance

Toray's reverse osmosis membrane technology applies decades of R&D and precision automated manufacturing under ISO 9001 for consistency in product quality. State-of-the-art cross-linked fully aromatic polyamide composite membranes produce high-quality permeate and robust membrane chemistry for improved performance and longer membrane life.

Product Specifications	Unit	TMG10D	TMG20D-400	TMG20D-440
Size		4040	8040	8040
Membrane Area	ft^2 (m^2)	87 (8)	400 (37)	440 (41)
Nominal Salt Rejection	%	99.7	99.7	99.7
Minimum Salt Rejection	%	99.5	99.5	99.5
Product Flow Rate	gpd (m^3/d)	2,650 (10.0)	12,100 (45.8)	13,300 (50.3)
Minimum Product Flow Rate	gpd (m^3/d)	2,120 (8.0)	10,300 (39.0)	11,200 (42.4)
Feed spacer thickness	mil	34	34	28

Test Conditions: Feed water pressure 150 psi (1.03 MPa); Feed water temperature 77 °F (25°C); Feed water concentration 2,000 mg/L as NaCl; Recovery rate 15%; Feed water pH 7

Applications

Municipal drinking water, Industrial process water, Water reuse

Products manufactured at our U.S. facility (TMUS) are certified to NSF/ANSI 61 for drinking water applications.

Dimensions in. (mm)		
Size	4040	8040
A	4.0 (101)	7.9 (201)
B	40 (1,016)	40 (1,016)
C	0.75 (19)	1.125 (29)
D	1.05 (26)	—

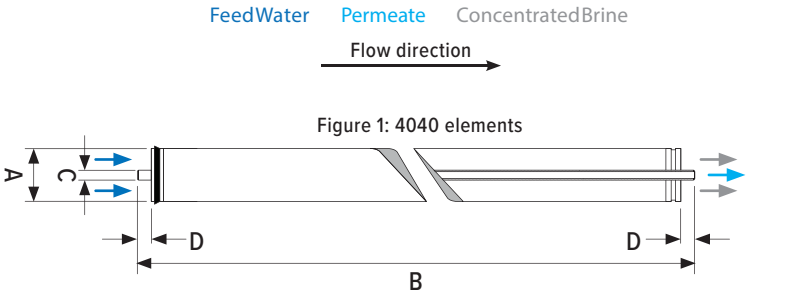

Figure 1: 4040 elements

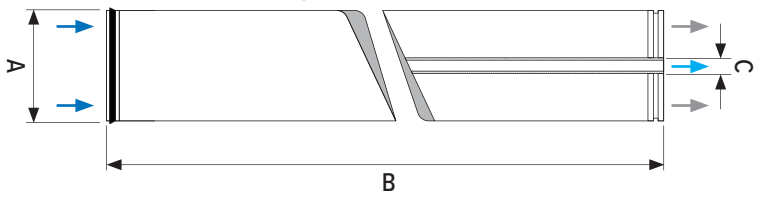

Figure 2: 8040 elements

Product Datasheet

TORAY
Innovation by Chemistry

TMG(D) Series

Low Pressure Brackish Water Reverse Osmosis (RO) Membrane Element with Enhanced Chemical Tolerance

Operating Limits		Unit	Value
Maximum operating pressure[6,7]		psi (MPa)	600 (4.1)
Maximum feed water temperature		°F (°C)	113 (45)
Maximum feed water SDI_{15}			5
Feed water chlorine concentration		ppm	< 0.1
Feed water pH range	Continuous operation		2–11
	Chemical cleaning		1–13
Maximum pressure drop per element		psi (MPa)	15 (0.10)
Maximum pressure drop per vessel		psi (MPa)	50 (0.34)

Operating Information

1. Please consult the latest Toray technical bulletin, design guidelines, computer design program, or call an application specialist for the recommended design range. Not strictly following the operating limits stated in this bulletin will void and nullify the Limited Warranty.
2. All RO elements are wet tested treated with a 1 percent by weight sodium bisulfite storage solution. Afterward, the RO elements are vacuum packed in oxygen barrier bags or treated with a tested feed water solution, and then vacuum sealed in oxygen barrier bags with deoxidant inside. Toray recommends flushing Toray RO elements for 30 to 60 minutes once every two days with sufficient quality flushing water, such as pre-treated feed water, to prevent biological growth during system shutdown. Please refer to the Toray RO Handling Manual for suggested flushing water quality.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals that act as oxidation catalysts in the feed water, will cause unexpected oxidation of the membrane. Toray strongly recommends removing these oxidizing agents contained in feed water before operating the RO system.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.
6. Recommended process / operation pressure is < 2.0 MPa (for details, and in special cases, please consult the projection design guideline or contact your membrane supplier).
   a) Low-pressure elements will perform best with low salinity brackish water
   b) Maintain the above pressure range at low temperatures.
7. Maximum operating pressure will vary depending on feed temperature. Please ask for detailed information from Toray if needed.

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Product Datasheet

TORAY
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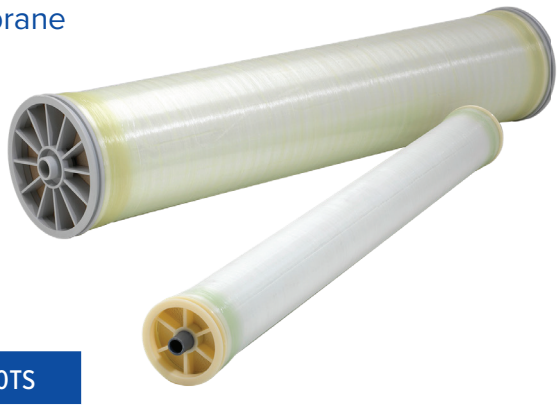
TS SU Type

Heat-Sanitized Brackish Water Reverse Osmosis Membrane Element with Outer Permeate Tube Connection



Toray's Heat-sanitized RO membrane elements provide superior permeate quality for applications requiring hot water sanitization. Using heat-sanitized RO elements eliminates the need for chemical sanitization, further reducing maintenance costs. RO elements use cross-linked fully aromatic polyamide composite membranes.

Product Specifications	Unit	SU-710T	SU-720TS
Size		4040	8040
Membrane Area	ft^2 (m^2)	75 (7)	
Nominal Salt Rejection	%	99.4	99.4
Min. Salt Rejection	%	99.0	99.0
Nominal Product Flow Rate	gpd (m^3/d)	1,720 (6.5)	6,900 (26.0)
Min. Product Flow Rate	gpd (m^3/d)	1,450 (5.5)	5,810 (22.0)

Test Conditions: Feed water pressure 220 psi (1.5 MPa); Feed water temperature 77 °F (25°C); Feed water concentration 1,500 mg/L as NaCl; Brine flow rate 20 l/min (5.3 gpm) for SU-710T, 80 l/min (21.1 gpm) for SU-720TS; Feed water pH 6.5

Applications

Municipal drinking water, Industrial process water

Dimensions in. (mm)		
Size	4040	8040
A	4.0 (101)	7.9 (201)
B	40 (1,016)	40 (1,016)
C	0.83 (21)	1.26 (32)
D	0.59 (15)	0.43 (11)

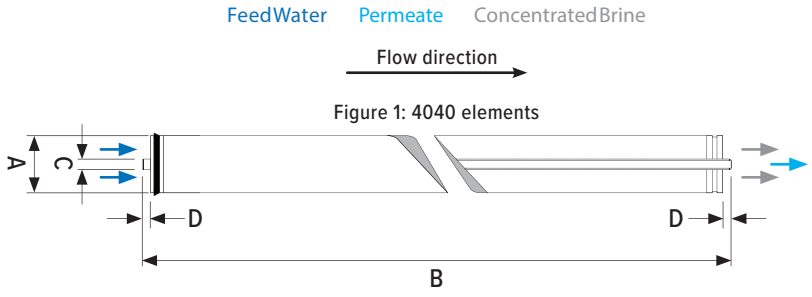


Figure 1: 4040 elements

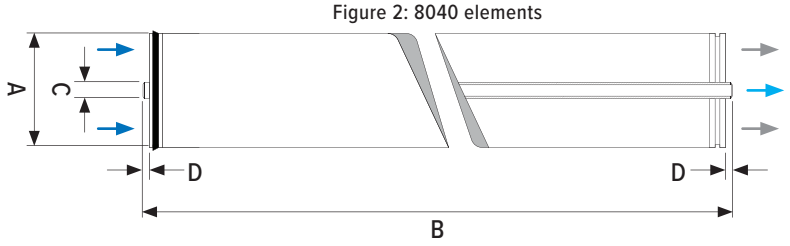


Figure 2: 8040 elements

Product Datasheet

TORAY
Innovation by Chemistry

TS SU Type

Heat-Sanitized Brackish Water Reverse Osmosis Membrane Element with Outer Permeate Tube Connection

Design Conditions		Unit	Recommended[1]	
Model			SU-710T	SU-720TS
Feed water pressure[2,3]		MPa (psi)	< 2.0 (286)	
Feed water temperature[4]		°C (°F)	< 35 (95)	
Feed water turbidity (SDI)[2,5]			< 4	
Feed water pH range	Continuous operation[6]		3–9	
	Chemical cleaning[7]		2–10	2–11
Feed flow rate per vessel		l/min (gpm)	<50 (13)	<200 (52.8)
Brine flow rate per vessel[9]		l/min (gpm)	>10 (2.6)	>40 (10.6)
Brine/Permeate flow ratio[8,9]			> 6	
Pressure drop per element[10]		MPa (psi)	< 0.1 (14)	
Pressure drop per vessel[10]		MPa (psi)	< 0.2 (29)	

1. The recommended design range is operational and design conditions under not so much fouling and scaling. If the SU-series element are operated outside of the recommended design range, the effective membrane life may be reduced. Refer to Toray's membrane manuals on our website (www.water.toray), or contact Toray or a local distributor for design guidelines and further information.
2. High flux operation (under high permeate flow rate per single element) on feed water turbidity greater than 3 or 4 SDI generally results in frequent cleaning requirements. Operating pressure should be selected to maintain the flux rate, or permeate flow rate per single element.
3. Maximum Feed Water Pressure 4.1 MPa (600 psi)
4. Maximum Sanitization Temperature is 90 °C (194 °F) for SU-710T and 85 °C (185 °F) for SU-720TS.
5. SDI = Silt Density Index measured according to ASTM D4189.
6. Feed and brine water must meet these range.
7. Cleaning chemicals shall be followed to Toray's technical bulletins.
8. Ratio at last element.
9. This figure is reducible when there is less possibility of fouling and scaling.
10. Element(s) must be cleaned when pressure drop increases up to 1.5 times of initial value.

Sanitization must follow guidances in Toray's membrane manuals on our website (www.water.toray)

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Product Datasheet

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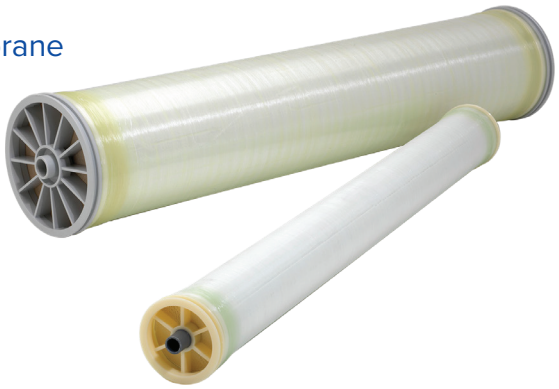
TS SUL Type

Heat-Sanitized Brackish Water Reverse Osmosis Membrane Element with Outer Permeate Tube Connection



Toray's Heat-sanitized RO membrane elements provide superior permeate quality for applications requiring hot water sanitization. Using heat-sanitized RO elements eliminates the need for chemical sanitization, further reducing maintenance costs. RO elements use cross-linked fully aromatic polyamide composite membranes.

Product Specifications	Unit	SUL-G10TS	SUL-G20TS	SUL-G20FTS
Size		4040	8040	8040
Membrane Area	ft^2 (m^2)	75 (7.0)		
Nominal Salt Rejection	%	99.5	99.5	99.5
Min. Salt Rejection	%	99.0	99.0	99.0
Nominal Product Flow Rate	gpd (m^3/d)	1,300 (5.0)	7,900 (30.0)	9,500 (36.0)
Min. Product Flow Rate	gpd (m^3/d)	1,100 (4.3)	6,320 (24.0)	7,660 (29.0)

Test Conditions: Feed water pressure 110 psi (0.75 MPa); Feed water temperature 25°C (77 °F); Feed water concentration 500 mg/L as NaCl; Brine flow rate 20 l/min (5.3 gpm) for SUL-G10TS, 80 l/min (21.1 gpm) for SUL-G20TS and SUL-G20FTS; Feed water pH 6.5

Applications

Municipal drinking water, Industrial process water

Dimensions in. (mm)		
Size	4040	8040
A	4.0 (101)	7.9 (201)
B	40 (1,016)	40 (1,016)
C	0.83 (21)	1.26 (32)
D	0.59 (15)	0.43 (11)

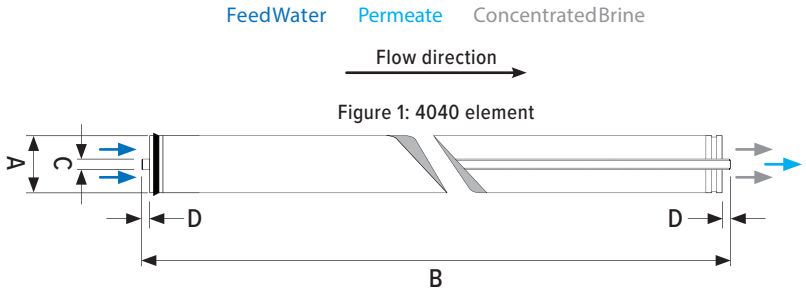


Figure 1: 4040 element

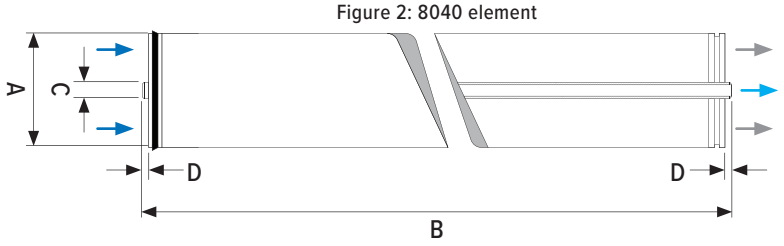


Figure 2: 8040 element

Product Datasheet

TORAY
Innovation by Chemistry

TS SUL Type

Heat-Sanitized Brackish Water Reverse Osmosis Membrane Element with Outer Permeate Tube Connection

Design Conditions		Unit	Recommended[1]		
Model			SUL-G10TS	SUL-G20TS	SUL-G20FTS
Feed water pressure[2,3]		MPa (psi)		< 1.0 (150)	
Feed water temperature[4]		°C (°F)		< 35 (95)	
Feed water turbidity (SDI)[2,5]				< 4	
Feed water pH range	Continuous operation[6]			3–9	
	Chemical cleaning[7]			2–11	
Feed flow rate per vessel		l/min (gpm)	<50 (13)	<200 (52.8)	
Brine flow rate per vessel [9]		l/min (gpm)	>10 (2.6)	>40 (10.6)	
Brine/Permeate flow ratio [8,9]				> 6	
Pressure drop per element [10]		MPa (psi)		< 0.1 (14)	
Pressure drop per vessel [10]		MPa (psi)		< 0.2 (29)	

1. The recommended design range is operational and design conditions under not so much fouling and scaling. If the SUL-series element are operated outside of the recommended design range, the effective membrane life may be reduced. Refer to Toray's membrane manuals on our website (www.water.toray), or contact Toray or a local distributor for design guidelines and further information.
2. High flux operation (under high permeate flow rate per single element) on feed water turbidity greater than 3 or 4 SDI generally results in frequent cleaning requirements. Select the operating pressure to maintain the flux or permeate flow rates per single element.
3. The maximum Feed Water Pressure is 4.1 MPa (600 psi)
4. The maximum Sanitization Temperature is 85 °C (185 °F).
5. SDI = Silt Density Index measured according to ASTM D4189.
6. Feed and brine water must meet these ranges.
7. Only use cleaning chemicals that adhere to Toray's technical bulletins.
8. The ratio at last element.
9. This figure is reducible when there is less possibility of fouling and scaling.
10. Element(s) must be cleaned when the pressure drop increases to 1.5 times of initial value.

Sanitization must follow guidances in Toray's membrane manuals on our website (www.water.toray)

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Product Datasheet

Innovation by Chemistry

TMHA Series

Ultra-Low Pressure Brackish Water Reverse Osmosis (RO) Membrane Element

Toray's reverse osmosis membrane technology applies decades of R&D and precision automated manufacturing under ISO 9001 for consistency in product quality. State-of-the-art cross-linked fully aromatic polyamide composite membranes produce high-quality permeate and robust membrane chemistry for improved performance and longer membrane life.

Product Specifications	Unit	TMH10A	TMH20A-400C	TMH20A-440C
Size		4040	8040	8040
Membrane Area	ft^2 (m^2)	87 (8)	400 (37)	440 (41)
Nominal Salt Rejection	%	99.3	99.3	99.3
Minimum Salt Rejection	%	99.0	99.0	99.0
Product Flow Rate	gpd (m^3/d)	2,400 (9.1)	11,000 (41.6)	12,100 (45.7)
Min. Product Flow Rate	gpd (m^3/d)	1,900 (7.2)	8,800 (33.3)	9,700 (36.7)
Feed spacer thickness	mil	31	34	28

Test Conditions: Feed water pressure 100 psi (0.69 MPa); Feed water temperature 77 °F (25°C); Feed water concentration 500 mg/L as NaCl; Recovery rate 15%; Feed water pH 7

Applications

Municipal drinking water, Industrial process water, Water reuse

Products manufactured at our U.S. facility (TMUS) are certified to NSF/ANSI 61 for drinking water applications.

Dimensions in. (mm)		
Size	4040	8040
A	4.0 (101)	7.9 (201)
B	40 (1,016)	40 (1,016)
C	0.75 (19)	1.125 (29)
D	1.05 (26)	

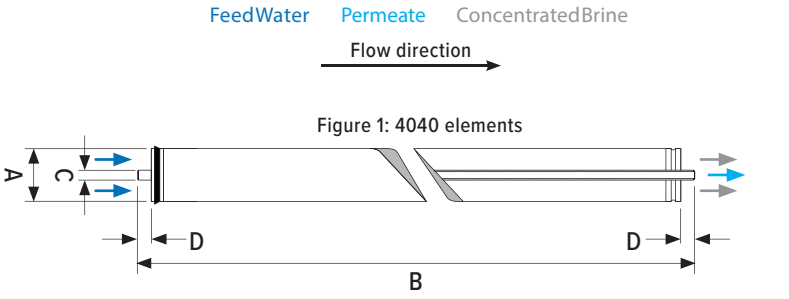

Figure 1: 4040 elements

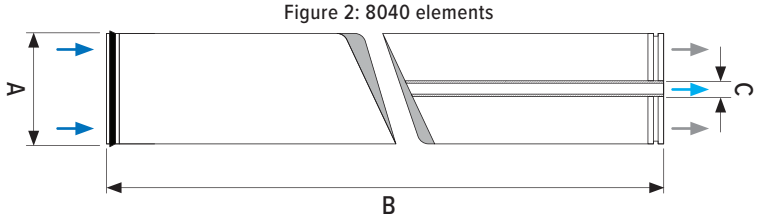

Figure 2: 8040 elements

Product Datasheet

TORAY
Innovation by Chemistry

TMHA Series

Ultra-Low Pressure Brackish Water Reverse Osmosis Membrane Element

Operating Limits		Unit	Value
Maximum operating pressure[6]		psi (MPa)	365 (2.5)
Maximum feed water temperature		°F (°C)	113 (45)
Maximum feed water SDI_{15}			5
Feed water chlorine concentration		ppm	Not detectable
Feed water pH range	Continuous operation		2–11
	Chemical cleaning		1–12
Maximum pressure drop per element		psi (MPa)	15 (0.10)
Maximum pressure drop per vessel		psi (MPa)	50 (0.34)

Operating Information

1. Please consult the latest Toray technical bulletin, design guidelines, computer design program, or call an application specialist for the recommended design range. Not strictly following the operating limits stated in this bulletin will void and nullify the Limited Warranty.
2. All RO elements are wet tested treated with a 1 percent by weight sodium bisulfite storage solution. Afterward, the RO elements are vacuum packed in oxygen barrier bags or treated with a tested feed water solution, and then vacuum sealed in oxygen barrier bags with deoxidant inside. Toray recommends flushing Toray RO elements for 30 to 60 minutes once every two days with sufficient quality flushing water, such as pre-treated feed water, to prevent biological growth during system shutdown. Please refer to the Toray RO Handling Manual for suggested flushing water quality.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals that act as oxidation catalysts in the feed water, will cause unexpected oxidation of the membrane. Toray strongly recommends removing these oxidizing agents contained in feed water before operating the RO system.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.
6. Maximum operating pressure will vary depending on feed temperature. Please ask for detailed information from Toray if needed.

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Product Datasheet

TORAY
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TM800K Series

Highest Rejection Sea Water Reverse Osmosis (RO) Membrane Element

Toray's reverse osmosis membrane technology applies decades of R&D and precision automated manufacturing under ISO 9001 for consistency in product quality. State-of-the-art cross-linked fully aromatic polyamide composite membranes produce high-quality permeate and robust membrane chemistry for improved performance and longer membrane life.

Product Specifications	Unit	TM820K-400	TM820K-440
Membrane Area	ft^2 (m^2)	400 (37)	440 (41)
Nominal Salt Rejection	%	99.86	99.86
Minimum Salt Rejection	%	99.50	99.50
Product Flow Rate	gpd (m^3/d)	5,800 (21.9)	6,400 (24.2)
Min. Product Flow Rate	gpd (m^3/d)	4,600 (17.4)	5,100 (19.3)
Feed spacer thickness	mil	34	28

C SA US

Products manufactured at our U.S. facility (TMUS) are certified to NSF/ANSI 61 for drinking water applications.

Test Conditions: Feed water pressure 800 psi (5.52 MPa); Feed water temperature 77 °F (25°C); Feed water concentration 32,000 mg/L as NaCl; Recovery rate 8%; Feed water pH 7

Typical Boron Rejection: 96% at pH 8 (5 mg/L Boron added to feed water)

Applications

Seawater desalination, High salinity feed water, Industrial wastewater, High recovery RO systems

Dimensions in. (mm)	
A	7.9 (201)
B	40 (1,016)
C	1.125 (29)

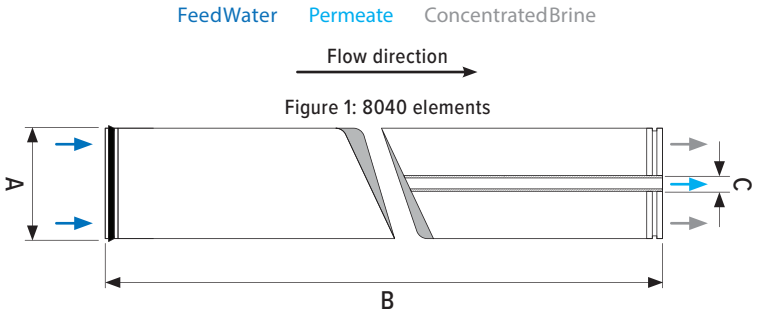

Figure 1: 8040 elements

Product Datasheet

TORAY
Innovation by Chemistry

TM800K Series

Highest Rejection Sea Water Reverse Osmosis (RO) Membrane Element

Operating Limits		Unit	Value
Maximum operating pressure[6]		psi (MPa)	1,200 (8.3)
Maximum feed water temperature		°F (°C)	113 (45)
Maximum feed water SDI_{15}			5
Feed water chlorine concentration		ppm	Not detectable
Feed water pH range	Continuous operation		2–11
	Chemical cleaning		1–12
Maximum pressure drop per element		psi (MPa)	15 (0.10)
Maximum pressure drop per vessel		psi (MPa)	50 (0.34)

Operating Information

1. Please consult the latest Toray technical bulletin, design guidelines, computer design program, or call an application specialist for the recommended design range. Not strictly following the operating limits stated in this bulletin will void and nullify the Limited Warranty.
2. All RO elements are wet tested treated with a 1 percent by weight sodium bisulfite storage solution. Afterward, the RO elements are vacuum packed in oxygen barrier bags or treated with a tested feed water solution, and then vacuum sealed in oxygen barrier bags with deoxidant inside. Toray recommends flushing Toray RO elements for 30 to 60 minutes once every two days with sufficient quality flushing water, such as pre-treated feed water, to prevent biological growth during system shutdown. Please refer to the Toray RO Handling Manual for suggested flushing water quality.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals that act as oxidation catalysts in the feed water, will cause unexpected oxidation of the membrane. Toray strongly recommends removing these oxidizing agents contained in feed water before operating the RO system.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.
6. Maximum operating pressure will vary depending on feed temperature. Please ask for detailed information from Toray if needed.

Toray RO membrane TM800K series is only applicable for selected projects.

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Product Datasheet

TORAY
Innovation by Chemistry

TM800M Series

Standard Sea Water Reverse Osmosis (RO) Membrane Element

Toray's reverse osmosis membrane technology applies decades of R&D and precision automated manufacturing under ISO 9001 for consistency in product quality. State-of-the-art cross-linked fully aromatic polyamide composite membranes produce high-quality permeate and robust membrane chemistry for improved performance and longer membrane life.

Product Specifications	Unit	TM820M-400	TM820M-440
Membrane Area	ft^2 (m^2)	400 (37)	440 (41)
Nominal Salt Rejection	%	99.8	99.8
Minimum Salt Rejection	%	99.50	99.50
Product Flow Rate	gpd (m^3/d)	7,000 (26.5)	7,700 (29.2)
Min. Product Flow Rate	gpd (m^3/d)	5,600 (21.2)	6,200 (23.5)
Feed spacer thickness	mil	34	28

C SA US

Products manufactured at our U.S. facility (TMUS) are certified to NSF/ANSI 61 for drinking water applications.

Test Conditions: Feed water pressure 800 psi (5.52 MPa); Feed water temperature 77 °F (25°C); Feed water concentration 32,000 mg/L as NaCl; Recovery rate 8%; Feed water pH 7

Typical Boron Rejection: 95% at pH 8 (5 mg/L Boron added to feed water)

Applications

Seawater desalination, High salinity feed water, Industrial wastewater, High recovery RO systems

Dimensions in. (mm)	
A	7.9 (201)
B	40 (1,016)
C	1.125 (29)

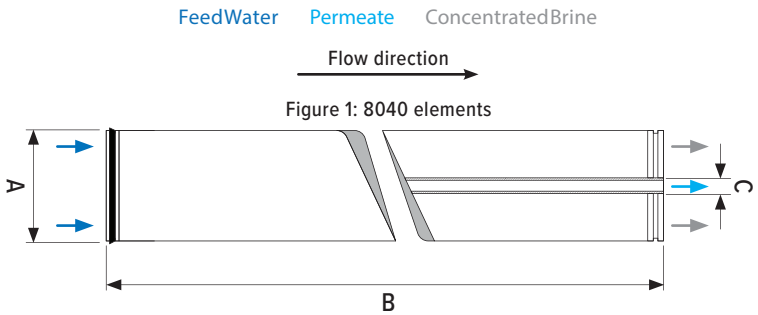

Figure 1: 8040 elements

Product Datasheet

TORAY
Innovation by Chemistry

TM800M Series

Standard Sea Water Reverse Osmosis (RO) Membrane Element

Operating Limits		Unit	Value
Maximum operating pressure[6]		psi (MPa)	1,200 (8.3)
Maximum feed water temperature		°F (°C)	113 (45)
Maximum feed water SDI_{15}			5
Feed water chlorine concentration		ppm	Not detectable
Feed water pH range	Continuous operation		2–11
	Chemical cleaning		1–12
Maximum pressure drop per element		psi (MPa)	15 (0.10)
Maximum pressure drop per vessel		psi (MPa)	50 (0.34)

Operating Information

1. Please consult the latest Toray technical bulletin, design guidelines, computer design program, or call an application specialist for the recommended design range. Not strictly following the operating limits stated in this bulletin will void and nullify the Limited Warranty.
2. All RO elements are wet tested treated with a 1 percent by weight sodium bisulfite storage solution. Afterward, the RO elements are vacuum packed in oxygen barrier bags or treated with a tested feed water solution, and then vacuum sealed in oxygen barrier bags with deoxidant inside. Toray recommends flushing Toray RO elements for 30 to 60 minutes once every two days with sufficient quality flushing water, such as pre-treated feed water, to prevent biological growth during system shutdown. Please refer to the Toray RO Handling Manual for suggested flushing water quality.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals that act as oxidation catalysts in the feed water, will cause unexpected oxidation of the membrane. Toray strongly recommends removing these oxidizing agents contained in feed water before operating the RO system.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.
6. Maximum operating pressure will vary depending on feed temperature. Please ask for detailed information from Toray if needed.

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Product Datasheet

TORAY
Innovation by Chemistry

TM800V Series

Low-Energy Sea Water Reverse Osmosis (RO) Membrane Element

Toray's reverse osmosis membrane technology applies decades of R&D and precision automated manufacturing under ISO 9001 for consistency in product quality. State-of-the-art cross-linked fully aromatic polyamide composite membranes produce high-quality permeate and robust membrane chemistry for improved performance and longer membrane life.

Product Specifications	Unit	TM810V	TM820V-400	TM820V-440
Size		4040	8040	8040
Membrane Area	ft^2 (m^2)	87 (8)	400 (37)	440 (41)
Nominal Salt Rejection	%	99.8	99.8	99.8
Minimum Salt Rejection	%	99.50	99.50	99.50
Product Flow Rate	gpd (m^3/d)	1,900 (7.2)	9,000 (34.1)	9,900 (37.5)
Min. Product Flow Rate	gpd (m^3/d)	1,550 (5.9)	7,500 (28.4)	8,250 (31.2)
Feed spacer thickness	mil	28	34	28

Test Conditions: Feed water pressure 800 psi (5.52 MPa); Feed water temperature 77 °F (25°C); Feed water concentration 32,000 mg/L as NaCl; Recovery rate 8%; Feed water pH 7

Typical Boron Rejection: 92% at pH 8 (5 mg/L Boron added to feed water)

Applications

Seawater desalination, High salinity feed water, Industrial wastewater, High recovery RO systems

Products manufactured at our U.S. facility (TMUS) are certified to NSF/ANSI 61 for drinking water applications.

Dimensions in. (mm)		
Size	4040	8040
A	4.0 (101)	7.9 (201)
B	40 (1,016)	40 (1,016)
C	0.75 (19)	1.125 (29)
D	1.05 (26)	

FeedWater Permeate ConcentratedBrine

Flow direction

Figure 1: 4040 elements

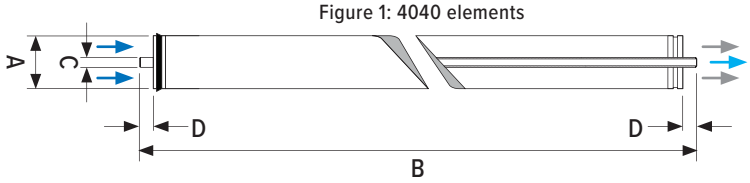
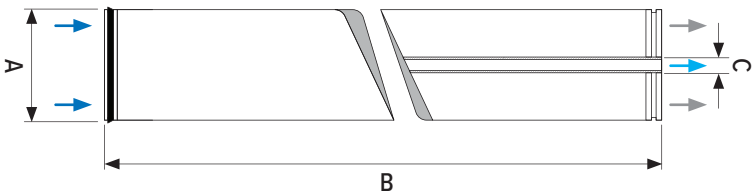


Figure 2: 8040 elements



Product Datasheet

TORAY
Innovation by Chemistry

TM800V Series

Low-Energy Sea Water Reverse Osmosis (RO) Membrane Element

Operating Limits		Unit	Value
Maximum operating pressure[6]		psi (MPa)	1,200 (8.3)
Maximum feed water temperature		°F (°C)	113 (45)
Maximum feed water SDI_{15}			5
Feed water chlorine concentration		ppm	Not detectable
Feed water pH range	Continuous operation		2–11
	Chemical cleaning		1–12
Maximum pressure drop per element		psi (MPa)	15 (0.10)
Maximum pressure drop per vessel		psi (MPa)	50 (0.34)

Operating Information

1. Please consult the latest Toray technical bulletin, design guidelines, computer design program, or call an application specialist for the recommended design range. Not strictly following the operating limits stated in this bulletin will void and nullify the Limited Warranty.
2. All RO elements are wet tested treated with a 1 percent by weight sodium bisulfite storage solution. Afterward, the RO elements are vacuum packed in oxygen barrier bags or treated with a tested feed water solution, and then vacuum sealed in oxygen barrier bags with deoxidant inside. Toray recommends flushing Toray RO elements for 30 to 60 minutes once every two days with sufficient quality flushing water, such as pre-treated feed water, to prevent biological growth during system shutdown. Please refer to the Toray RO Handling Manual for suggested flushing water quality.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals that act as oxidation catalysts in the feed water, will cause unexpected oxidation of the membrane. Toray strongly recommends removing these oxidizing agents contained in feed water before operating the RO system.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.
6. Maximum operating pressure will vary depending on feed temperature. Please ask for detailed information from Toray if needed.

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Product Datasheet

Innovation by Chemistry

TSW-LE Series

Super Low-Energy Sea Water Reverse Osmosis (RO) Membrane Element

Toray's reverse osmosis membrane technology applies decades of R&D and precision automated manufacturing under ISO 9001 for consistency in product quality. State-of-the-art cross-linked fully aromatic polyamide composite membranes produce high-quality permeate and robust membrane chemistry for improved performance and longer membrane life.

Product Specifications	Unit	TSW-400LE		TSW-440LE	
Membrane Area	ft^2 (m^2)	400 (37)		440 (41)	
Feed spacer thickness	mil	34		28	
Feed water pressure	psi (MPa)	600 (4.14)	800 (5.52) *	600 (4.14)	800 (5.52) *
Nominal Salt Rejection	%	99.6	99.8	99.6	99.8
Min. Salt Rejection	%	99.3	99.6	99.3	99.6
Product Flow Rate	gpd (m^3/d)	6,100 (23.0)	12,100 (45.8)	6,700 (25.3)	13,000 (49.2)
Min. Product Flow Rate	gpd (m^3/d)	5,200 (19.6)	10,300 (39.0)	5,700 (21.5)	11,000 (41.8)

*Referential performance at 800 psi (5.52 MPa)

Test Conditions: Feed water temperature 77 °F (25°C); Feed water concentration 32,000 mg/L as NaCl; Recovery rate 8%; Feed water pH 7

Typical Boron Rejection: 84% at pH 8 (5 mg/L Boron added to feed water); 90% at pH 8 (5 mg/L Boron added to feed water)*

Applications

Seawater desalination, High salinity feed water, Industrial wastewater, High recovery RO systems

Products manufactured at our U.S. facility (TMUS) are certified to NSF/ANSI 61 for drinking water applications.

Dimensions in. (mm)	
A	7.9 (201)
B	40 (1,016)
C	1.125 (29)

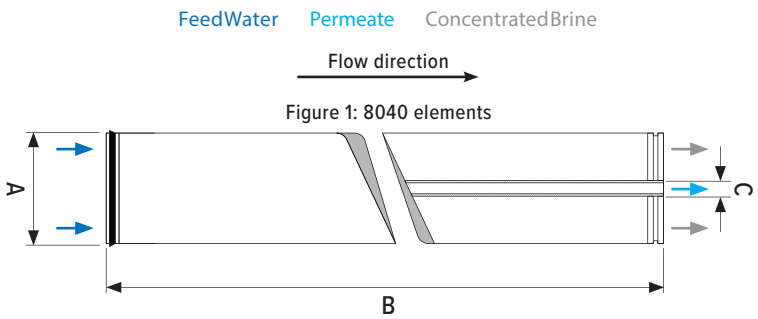

Figure 1: 8040 elements

Product Datasheet

TORAY
Innovation by Chemistry

TSW-LE Series

Super Low-Energy Sea Water Reverse Osmosis (RO) Membrane Element

Operating Limits		Unit	Value
Maximum operating pressure[6]		psi (MPa)	1,200 (8.3)
Maximum feed water temperature		°F (°C)	113 (45)
Maximum feed water SDI_{15}			5
Feed water chlorine concentration		ppm	Not detectable
Feed water pH range	Continuous operation		2–11
	Chemical cleaning		1–12
Maximum pressure drop per element		psi (MPa)	15 (0.10)
Maximum pressure drop per vessel		psi (MPa)	50 (0.34)

Operating Information

1. Please consult the latest Toray technical bulletin, design guidelines, computer design program, or call an application specialist for the recommended design range. Not strictly following the operating limits stated in this bulletin will void and nullify the Limited Warranty.
2. All RO elements are wet tested treated with a 1 percent by weight sodium bisulfite storage solution. Afterward, the RO elements are vacuum packed in oxygen barrier bags or treated with a tested feed water solution, and then vacuum sealed in oxygen barrier bags with deoxidant inside. Toray recommends flushing Toray RO elements for 30 to 60 minutes once every two days with sufficient quality flushing water, such as pre-treated feed water, to prevent biological growth during system shutdown. Please refer to the Toray RO Handling Manual for suggested flushing water quality.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals that act as oxidation catalysts in the feed water, will cause unexpected oxidation of the membrane. Toray strongly recommends removing these oxidizing agents contained in feed water before operating the RO system.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.
6. Maximum operating pressure will vary depending on feed temperature. Please ask for detailed information from Toray if needed.

Toray RO membrane TSW-LE series is only applicable for selected projects.

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Product Datasheet

TORAY
Innovation by Chemistry

TLF Series

Ultra Low-Pressure and Low-Fouling Reverse Osmosis Membrane Element

Toray's TLF reverse osmosis membrane features an improved cross-linked hydrophilic polymer layer that minimizes the accumulation of foulants on the membrane surface. The membrane coating helps RO plants reduce frequent chemical cleanings while converting wastewater into a reusable water source by producing high-quality permeate at low energy.

Product Specifications	Unit	TLF-400DG
Membrane Area	ft^2 (m^2)	400 (37)
Nominal Salt Rejection	%	99.5
Minimum Salt Rejection	%	99.2
Product Flow Rate	gpd (m^3/d)	11,500 (43.5)
Min. Product Flow Rate	gpd (m^3/d)	9,300 (35.2)
Feed spacer thickness	mil	34

C US

Products manufactured at our U.S. facility (TMUS) are certified to NSF/ANSI 61 for drinking water applications.

Test Conditions: Feed water pressure 150 psi (1.05 MPa); Feed water temperature 77 °F (25°C); Feed water concentration 2,000 mg/L as NaCl; Recovery rate 15%; Feed water pH 7

Applications

High fouling tendency feed water, Municipal drinking water, Industrial process water, Water reuse

Dimensions in. (mm)	
A	7.9 (201)
B	40 (1,016)
C	1.125 (29)

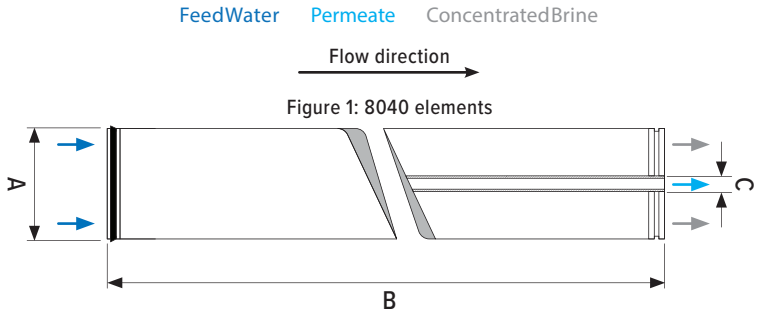

Figure 1: 8040 elements

Product Datasheet

TORAY
Innovation by Chemistry

TLF Series

Ultra Low-Pressure and Low-Fouling Reverse Osmosis Membrane Element

Operating Limits		Unit	Value
Maximum operating pressure[6,7]		psi (MPa)	600 (4.1)
Maximum feed water temperature		°F (°C)	113 (45)
Maximum feed water SDI_{15}			5
Feed water chlorine concentration[3]		ppm	< 0.1
Feed water pH range	Continuous operation		2–11
	Chemical cleaning		1–13
Maximum pressure drop per element		psi (MPa)	15 (0.10)
Maximum pressure drop per vessel		psi (MPa)	50 (0.34)

Operating Information

1. Please consult the latest Toray technical bulletin, design guidelines, computer design program, or call an application specialist for the recommended design range. Not strictly following the operating limits stated in this bulletin will void and nullify the Limited Warranty.
2. All RO elements are wet tested treated with a 1 percent by weight sodium bisulfite storage solution. Afterward, the RO elements are vacuum packed in oxygen barrier bags or treated with a tested feed water solution, and then vacuum sealed in oxygen barrier bags with deoxidant inside. Toray recommends flushing Toray RO elements for 30 to 60 minutes once every two days with sufficient quality flushing water, such as pre-treated feed water. Please refer to the Toray RO Handling Manual for suggested flushing water quality.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals that act as oxidation catalysts in the feed water, will cause unexpected oxidation of the membrane. Toray recommends flushing Toray RO elements for 30 to 60 minutes with sufficient quality flushing water, such as pre-treated feed water, to prevent biological growth during system shutdown. Please refer to Toray's RO Element Three-Year Prorated Limited Warranty.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.
6. Recommended process / operation pressure is < 2.0 MPa (for details, and in special cases, please consult the projection design guideline or contact your membrane supplier).
   a) Ultra low-pressure elements will perform best with low salinity brackish water
   b) Maintain the above pressure range at low temperatures.
7. Maximum operating pressure will vary depending on feed temperature. Please ask for detailed information from Toray if needed.

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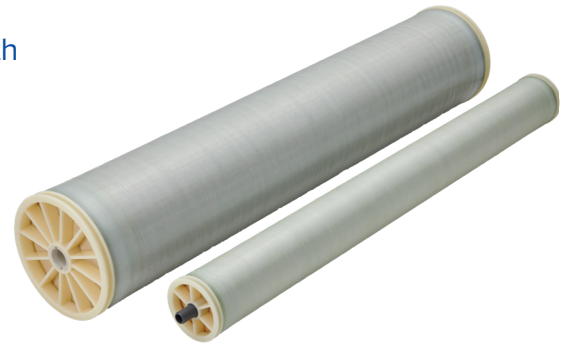
Product Datasheet

TORAY
Innovation by Chemistry

TML(D) Series

Low-Fouling Reverse Osmosis Membrane Element with High Chemical Tolerance



Toray's reverse osmosis membrane technology applies decades of R&D and precision automated manufacturing under ISO 9001 for consistency in product quality. State-of-the-art cross-linked fully aromatic polyamide composite membranes produce high-quality permeate and robust membrane chemistry for improved performance and longer membrane life.

Product Specifications	Unit	TML10D	TML20D-400
Size		4040	8040
Membrane Area	ft^2 (m^2)	73 (7)	400 (37)
Nominal Salt Rejection	%	99.8	99.8
Minimum Salt Rejection	%	99.65	99.65
Product Flow Rate	gpd (m^3/d)	1,900 (7.2)	10,500 (39.7)
Min. Product Flow Rate	gpd (m^3/d)	1,500 (5.7)	8,400 (31.8)
Feed spacer thickness	mil	34	34

C SA US

Products manufactured at our U.S. facility (TMUS) are certified to NSF/ANSI 61 for drinking water applications.

Test Conditions: Feed water pressure 225 psi (1.55 MPa); Feed water temperature 77 °F (25°C); Feed water concentration 2,000 mg/L as NaCl; Recovery rate 15%; Feed water pH 7

Applications

Feed water sources with high fouling tendency, Municipal drinking water, Industrial process water, Water reuse

Dimensions in. (mm)		
Size	4040	8040
A	4.0 (101)	7.9 (201)
B	40 (1,016)	40 (1,016)
C	0.75 (19)	1.125 (29)
D	1.05 (26)	

FeedWater Permeate ConcentratedBrine

Flow direction

Figure 1: 4040 elements

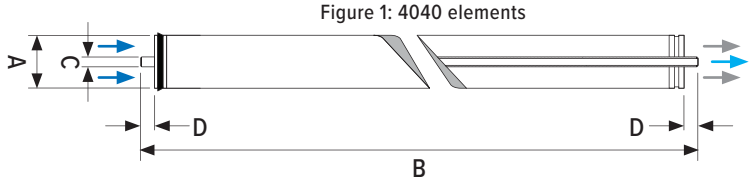
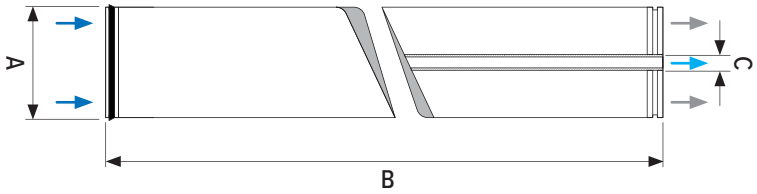


Figure 2: 8040 elements



Product Datasheet

TORAY
Innovation by Chemistry

TML(D) Series

Low-Fouling Reverse Osmosis Membrane Element with High Chemical Tolerance

Operating Limits		Unit	Value
Maximum operating pressure[6,7]		psi (MPa)	600 (4.1)
Maximum feed water temperature		°F (°C)	113 (45)
Maximum feed water SDI_{15}			5
Feed water chlorine concentration[3]		ppm	< 0.1
Feed water pH range	Continuous operation		2–11
	Chemical cleaning		1–13
Maximum pressure drop per element		psi (MPa)	15 (0.10)
Maximum pressure drop per vessel		psi (MPa)	50 (0.34)

Operating Information

1. Please consult the latest Toray technical bulletin, design guidelines, computer design program, or call an application specialist for the recommended design range. Not strictly following the operating limits stated in this bulletin will void and nullify the Limited Warranty.
2. All RO elements are wet tested treated with a 1 percent by weight sodium bisulfite storage solution. Afterward, the RO elements are vacuum packed in oxygen barrier bags or treated with a tested feed water solution, and then vacuum sealed in oxygen barrier bags with deoxidant inside. Toray recommends flushing Toray RO elements for 30 to 60 minutes once every two days with sufficient quality flushing water, such as pre-treated feed water, to prevent biological growth during system shutdown. Please refer to the Toray RO Handling Manual for suggested flushing water quality.
3. The presence of free chlorine and other oxidizing agents under certain conditions, such as heavy metals that act as oxidation catalysts in the feed water, will cause unexpected oxidation of the membrane. Toray strongly recommends removing these oxidizing agents contained in feed water before operating the RO system. Please refer to Toray's RO Element Three-Year Prorated Limited Warranty.
4. Permeate from the first hour of operation shall be discarded.
5. The customer is fully responsible for the effects of chemicals that are incompatible with the elements. Their use will void the element Limited Warranty.
6. Recommended process / operation pressure is < 2.0 MPa (for details, and in special cases, please consult the projection design guideline or contact your membrane supplier).
   a) Low-fouling brackish water elements will perform best with low salinity brackish water
   b) Maintain the above pressure range at low temperatures.
7. Maximum operating pressure will vary depending on feed temperature. Please ask for detailed information from Toray if needed.

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Product Datasheet

TORAY
Innovation by Chemistry

NHP210 Series

Submerged Flat-sheet Membrane Bioreactor (MBR) for Biological Wastewater Treatment

The NHP series incorporates thin membrane sheets for improved flexibility, allowing for more space between the flat sheets. This feature increases the range of movement and vibrations during air scouring, helping to dislodge sludge and improve cleaning efficiency with less energy consumption.

Pictured above: NHP210-300S

Flat Sheet Element		Units	Value
Model			TSP-50080
Nominal Pore Size		µm	0.08
Materials	Membrane		PVDF and PET non-woven fiber
	Nozzle		PE
Effective Membrane Area		m^2 (ft^2)	0.7 (7.5)
Dimensions (w x l x thk)		mm (in.)	480 x 800 x 1.8 (18.9 x 31.5 x 0.07)
Weight: dry / wet (reference)		kg (lbs.)	0.25 / 0.5 (0.6 / 1.1)

Module Characteristics

Model	No. of Elements	Structure: Cassette x Deck	Total Membrane Area m^2 (ft^2)	Dimensions (w x l x h)*	
				Millimeters	Inches
ECS035 (Cassette)	50	–	35 (377)	485 x 440 x 820	19.1 x 17.3 x 32.3
NHP210-300S	300	3 x 2	210 (2,260)	770 x 1,635 x 2,175	30.3 x 64.4 x 85.6
NHP210-600D	600	3 x 4	420 (4,521)	770 x 1,635 x 3,845	30.3 x 64.4 x 151.4

*Measurements include filtrate header and air diffuser pipes.

Weight - kg (lbs.)	Aeration block (dry)	Cassette / Element block (dry)	Module (dry)
ECS035 (Cassette)	—	17 (37)	—
NHP210-300S	40 (88)	195 (430)	235 (518)
NHP210-600D	40 (88)	390 (860)	430 (948)

Scouring Air Flow Rate[1]	NL/min/Module[2]
NHP210-300S	1,000–2,000
NHP210-600D	1,300–2,000

[1] The air supply equipment such as blower shall be designed based on the standard operating conditions.

[2] Air volume as being 0 degree C and 101.325 kPa (1 atm).

Applications

Sewage wastewater, Industrial wastewater, Food processing wastewater, Sludge thickening process

Product Datasheet

TORAY
Innovation by Chemistry

NHP210 Series

Submerged Flat-sheet Membrane Bioreactor (MBR) for Biological Wastewater Treatment

Operating Range	
Temperature	5–40 °C (41–104 °F)
pH of Liquid[3]	5–10
Mixed Liquor Suspended Solids	Not higher than 18,000 mg/L
Transmembrane Pressure	Not higher than 20 kPa (2.9 psi)
Cleaning Chemical Feed Pressure	Not higher than 10 kPa (1.45 psi)
Cleaning Chemicals and Concentrations	Sodium hypochlorite: 2,000–6,000 mg/L (10 < pH < 12)
	Oxalic acid: 0.5–1.0 wt% / Citric acid: 1.0–3.0 wt%
Materials	
Frame	304 stainless steel (316 SS optional)
Manifold	Polypropylene or ABS
Air Diffuser	Polypropylene (SS optional)
Connection[4]	
Manifold	ANSI 1 1/2 inch flange or socket
Air Diffuser	ANSI 1 1/2 inch flange

[3] Except when chemical cleaning with designated chemical agents.
[4] UNI (ISO) flange is optional.

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Product Datasheet

TORAY
Innovation by Chemistry

TMR090 Series

Submerged Flat-sheet Membrane Bioreactor (MBR) for Biological Wastewater Treatment

Toray's PVDF membrane has numerous pores with uniform sizes evenly distributed across the membrane surface. The TMR090 series is an effective barrier against solids and bacteria to meet increasingly stringent water quality requirements and turn wastewater into a viable resource. The TMR090 series is suitable for small facilities, containerized package plants, and spaces with height limitations.

Pictured above: TMR090-100S

Flat Sheet Element		Units	Value
Model			TSP-50100
Nominal Pore Size		µm	0.08
Materials	Membrane		PVDF and PET non-woven fiber
	Supporting Panel		ABS
Effective Membrane Area		m^2 (ft^2)	0.9 (9.7)
Dimensions (w x l x thk)		mm (in.)	515 x 1,059 x 13.5 (20.3 x 41.7 x 0.5)
Weight: dry / wet (reference)		kg (lbs.)	3.0 / 5.0 (6.6 / 11)

Module Characteristics — TMR090-100S

Total Membrane Area m^2 (ft^2)	No. of Elements	Element block (EBL) structure	Module dry weight - kg (lbs.)	Dimensions (w x l x h)*	
				Millimeters	Inches
90 (970)	100	1 deck + 1 row	460 (1,014)	730 x 1,720 x 1,470	28.7 x 67.7 x 57.9

*Measurements exclude connection tube

Scouring Air Flow Rate[1]: 1,000–1,300 NL/min/Module[2]

[1] The air supply equipment such as blower shall be designed based on the standard operating conditions.

[2] Air volume as being 0 degree C and 101.325 kPa (1 atm).

Applications

Sewage wastewater, Industrial wastewater, Food processing wastewater, Sludge thickening process

Product Datasheet

TORAY
Innovation by Chemistry

TMR090 Series

Submerged Flat-sheet Membrane Bioreactor (MBR) for Biological Wastewater Treatment

Operating Range	
Temperature	5–40 °C (41–104 °F)
pH of Liquid*[1]	5–10
Mixed Liquor Suspended Solids	Not higher than 18,000 mg/L
Transmembrane Pressure	Not higher than 20 kPa (2.9 psi)
Cleaning Chemical Feed Pressure	Not higher than 10 kPa (1.45 psi)
Cleaning Chemicals and Concentrations	Sodium hypochlorite: 2,000–6,000 mg/L (10 < pH < 12)
	Oxalic acid: 0.5–1.0 wt% / Citric acid: 1.0–3.0 wt%
Materials	
Frame	304 stainless steel (316 SS optional)
Manifold	304 stainless steel (316 SS optional)
Air Diffuser	EPDM rubber / PVC / 304 SS (316 SS optional)
Connection[4]	
Manifold	ANSI 2-inch
Air Diffuser	NTP 1 ½-inch screw

[1] Except when the chemical cleaning with the designated chemical agents

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Product Datasheet

TORAY
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TMR140 Series

Submerged Flat-sheet Membrane Bioreactor (MBR) for Biological Wastewater Treatment

Toray's PVDF membrane has numerous pores with uniform sizes evenly distributed across the membrane surface. The TMR140 series is an effective barrier against solids and bacteria to meet increasingly stringent water quality requirements and turn wastewater into a viable resource.

Pictured above: TMR140-100S

Flat Sheet Element		Units	Value
Model			TSP-50150
Nominal Pore Size		µm	0.08
Materials	Membrane		PVDF and PET non-woven fiber
	Supporting Panel		ABS
Effective Membrane Area		m^2 (ft^2)	1.4 (15.1)
Dimensions (w x l x thk)		mm (in.)	515 x 1,608 x 13.5 (20.3 x 63.3 x 0.5)
Weight: dry / wet (reference)		kg (lbs.)	4.8 / 8.0 (11 / 18)

Module Characteristics

Model	No. of Elements	Element block (EBL) structure	Total Membrane Area m^2 (ft^2)	Dimensions (w x l x h)*	
				Millimeters	Inches
TMR140-100S	100	1 EBL	140 (1,510)	810 x 1,620 x 2,100	31.9 x 63.8 x 82.7
TMR140-200D	200	Double deck + 2 EBL	280 (3,010)	810 x 1,620 x 4,160	31.9 x 63.8 x 163.8
TMR140-400DW	400	Double deck + 4 EBL	560 (6,030)	840 x 3,260 x 4,160	33.1 x 128.3 x 163.8

*Measurements exclude connection tube

Weight - kg (lbs.)	Aeration block (dry)	Cassette / Element block (dry)	Module (dry)
TMR140-100S	65 (143)	630 (1,389)	695 (1,532)
TMR140-200D	65 (143)	1,300 (2,866)	1,365 (3,009)
TMR140-400DW	150 (331)	2,560 (5,644)	2,710 (5,975)

Scouring Air Flow Rate[1]	NL/min/Module[2]
TMR140-100S	1,000–2,000
TMR140-200D	1,300–2,000
TMR140-400DW	2,600–4,000

[1] The air supply equipment such as blower shall be designed based on the standard operating conditions.

[2] Air volume as being 0 degree C and 101.325 kPa (1 atm).

Applications

Sewage wastewater, Industrial wastewater, Food processing wastewater, Sludge thickening process

Product Datasheet

TORAY
Innovation by Chemistry

TMR140 Series

Submerged Flat-sheet Membrane Bioreactor (MBR) for Biological Wastewater Treatment

Operating Range	
Temperature	5–40 °C (41–104 °F)
pH of Liquid*[1]	5–10
Mixed Liquor Suspended Solids	Not higher than 18,000 mg/L
Transmembrane Pressure	Not higher than 20 kPa (2.9 psi)
Cleaning Chemical Feed Pressure	Not higher than 10 kPa (1.45 psi)
Cleaning Chemicals and Concentrations	Sodium hypochlorite: 2,000–6,000 mg/L (10 < pH < 12)
	Oxalic acid: 0.5–1.0 wt% / Citric acid: 1.0–3.0 wt%
Materials	
Frame	304 stainless steel (316 SS optional)
Manifold	Polypropylene or ABS (SS optional)
Air Diffuser	Polypropylene (SS optional)
Connection[4]	
Manifold	ANSI 2-inch (3-inch for TMR140-400DW)
Air Diffuser	ANSI 1 ½-inch flange (2-inch for TMR140-400DW)

[1] Except when the chemical cleaning with the designated chemical agents

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Product Datasheet

TORAY
Innovation by Chemistry

HFU-1010N

Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Toray's PVDF membrane construction is highly resistant to chlorine and strong acids, which allows for better cleaning and optimization of filtration flux rates after cleaning. The hollow fiber modules effectively remove suspended solids, viruses, and bacteria and are certified for drinking water applications. The HFU-1010N model is ideal for small capacity equipment.

Membrane Characteristics		Units	Value
Membrane Material			PVDF (Polyvinylidene fluoride)
Nominal Pore Size		µm	0.01
Outer Membrane Surface Area		m^2 (ft^2)	7 (75)
Operating Parameters		**Units**	**Value**
Maximum Feed water / Filtrate Flow		m^3/h (gpm)	1.2 (5.1)
Maximum Backwash Flow		m^3/h (gpm)	1.3 (5.7)
Maximum Air Flow		Nm^3/h (scfm)	2.2 (1.3)
Maximum Inlet Pressure		kPa (psi)	300 (43.5)
Maximum Backwash Pressure		kPa (psi)	300 (43.5)
Normal Operating Transmembrane Pressure		kPa (psi)	0–200 (0–29)
Operating Temperature Range		°C (°F)	0–40 (32–104)
pH Range	During Filtration		1–10
	During Cleaning		0–12

*Please contact Toray for operating manual and preliminary design, as capacity per module is highly dependent on feed water quality.

Product Certifications & Compliances

- Association of Membrane Separation Technology of Japan

Applications

Drinking water, Industrial process water, Pretreatment for seawater RO desalination, Tertiary wastewater

Product Datasheet

Innovation by Chemistry

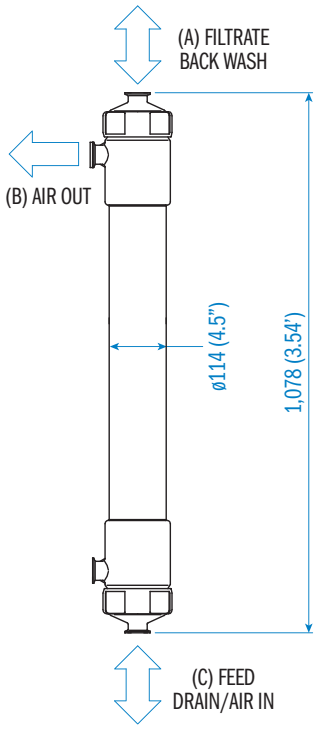
HFU-1010N

Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Dimensions and Weight		Unit	Value
Diameter		mm (in)	114 (4.49)
Length		mm (ft)	1,078 (3.537)
Weight	Full of Water	kg (lbs)	15 (33)
	After Draining	kg (lbs)	9 (20)

Connections	Value
(A) Filtrate Outlet	IDF/ISO Clamp Union Fitting 1.5S
(B) Air Outlet	IDF/ISO Clamp Union Fitting 1.5S
(C) Feed Water / Air Inlet	IDF/ISO Clamp Union Fitting 1.5S

Material Specifications	
Description	Material
Casing	uPVC
Cap	uPVC
Potting	Epoxy
O-ring	NBR



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Product Datasheet

TORAY
Innovation by Chemistry

HFU-1020AN

Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Toray's hollow fiber PVDF UF membrane module effectively removes suspended solids and microorganisms such as pathogens when used for various types of water treatment. The flux rates of HFU-1020AN modules are ideal for smaller commercial systems.

Membrane Characteristics		Unit	Value
Membrane Material			PVDF (Polyvinylidene fluoride)
Nominal Pore Size		µm	0.01
Outer Membrane Surface Area		m^2 (ft^2)	29 (312)
Operating Parameters		**Unit**	**Value**
Maximum Feed water / Filtrate Flow		m^3/h (gpm)	4.8 (21)
Maximum Backwash Flow		m^3/h (gpm)	5.4 (23)
Maximum Air Flow		Nm^3/h (scfm)	9.0 (5.3)
Maximum Inlet Pressure		kPa (psi)	300 (43.5)
Maximum Backwash Pressure		kPa (psi)	300 (43.5)
Normal Operating Transmembrane Pressure		kPa (psi)	0–200 (0–29)
Operating Temperature Range		°C (°F)	0–40 (32–104)
pH Range	During Filtration		1–10
	During Cleaning		0–12

*Please contact Toray for operating manual and preliminary design, as capacity per module is highly dependent on feed water quality.

Product Certifications & Compliances

- NSF/ANSI 61 for drinking water applications
- NSF/ANSI 419 to comply with the U.S. EPA's Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), which allows membrane manufacturers to prove Cryptosporidium reduction.
- Association of Membrane Separation Technology of Japan

Applications

Drinking water, Industrial process water, Pretreatment for seawater RO desalination, Tertiary wastewater

Product Datasheet

TORAY
Innovation by Chemistry

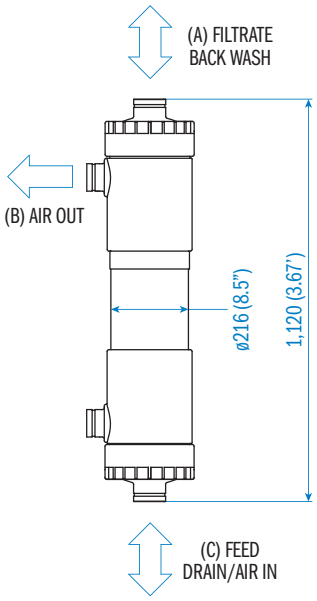
HFU-1020AN

Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Dimensions and Weight		Unit	Value
Diameter		mm (in)	216 (8.5)
Length		mm (ft)	1,120 (3.675)
Weight	Full of Water	kg (lbs)	51 (112)
	After Draining	kg (lbs)	32 (71)

Connections	Value
(A) Filtrate Outlet	80A
(B) Air Outlet	65A
(C) Feed Water / Air Inlet	80A

Material Specifications	
Description	Material
Casing	uPVC
Cap	uPVC
Potting	Epoxy resin
O-ring	EPDM



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Product Datasheet

TORAY
Innovation by Chemistry

HFU-2020AN

Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Toray's PVDF membrane construction is highly resistant to chlorine and strong acids, which allows for better cleaning and optimization of filtration flux rates after cleaning. The hollow fiber modules effectively remove suspended solids, viruses, and bacteria and are certified for drinking water applications.

Membrane Characteristics		Unit	Value
Membrane Material			PVDF (Polyvinylidene fluoride)
Nominal Pore Size		µm	0.01
Outer Membrane Surface Area		m^2 (ft^2)	72 (775)
Operating Parameters		**Unit**	**Value**
Maximum Feed water / Filtrate Flow		m^3/h (gpm)	12 (53)
Maximum Backwash Flow		m^3/h (gpm)	13.5 (59)
Maximum Air Flow		Nm^3/h (scfm)	9.0 (5.3)
Maximum Inlet Pressure		kPa (psi)	300 (43.5)
Maximum Backwash Pressure		kPa (psi)	300 (43.5)
Normal Operating Transmembrane Pressure		kPa (psi)	0–200 (0–29)
Operating Temperature Range		°C (°F)	0–40 (32–104)
pH Range	During Filtration		1–10
	During Cleaning		0–12

*Please contact Toray for operating manual and preliminary design, as capacity per module is highly dependent on feed water quality.

Product Certifications and Compliances

- NSF/ANSI 61 for drinking water applications
- NSF/ANSI 419 to comply with the U.S. EPA's Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), which allows membrane manufacturers to prove Cryptosporidium reduction.
- Association of Membrane Separation Technology of Japan

Applications

Drinking water, Industrial process water, Pretreatment for seawater RO desalination, Secondary and Tertiary wastewater

Product Datasheet

Innovation by Chemistry

HFU-2020AN

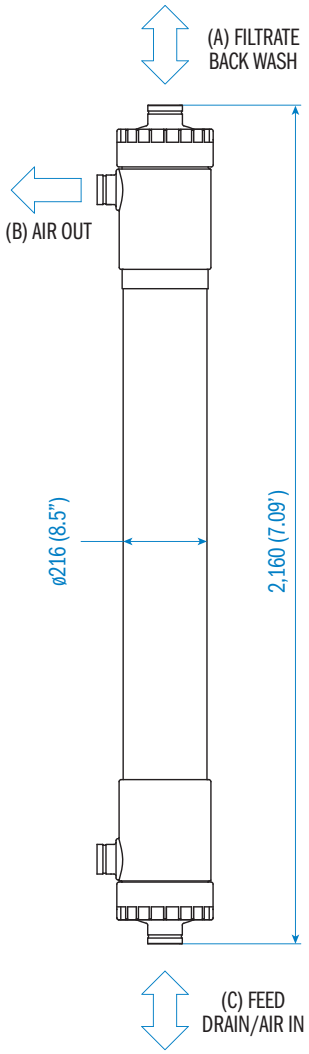
Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Dimensions and Weight		Unit	Value
Diameter		mm (in)	216 (8.5)
Length		mm (ft)	2,160 (7.087)
Weight	Full of Water	kg (lbs)	92 (203)
	After Draining	kg (lbs)	49 (108)

Connections	Value
(A) Filtrate Outlet	80A
(B) Air Outlet	65A
(C) Feed Water / Air Inlet	80A

Material Specifications	
Description	Material
Casing	uPVC
Cap	uPVC
Potting	Epoxy resin
O-ring	EPDM

Please contact Toray for more detailed drawing and dimensions.



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Product Datasheet

TORAY
Innovation by Chemistry

HFU-B2315AN

Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

The HFU-B2315AN module features Toray's proven durable PVDF hollow fiber membrane with a high packing density per module resulting in a compact system design and lower capital footprint.

Membrane Characteristics		Units	Value
Membrane Material			PVDF (Polyvinylidene fluoride)
Nominal Pore Size		µm	0.01
Outer Membrane Surface Area		m^2 (ft^2)	60 (646)
Operating Parameters		**Units**	**Value**
Maximum Feed water / Filtrate Flow		m^3/h (gpm)	10.0 (44)
Maximum Backwash Flow		m^3/h (gpm)	11.2 (49)
Maximum Air Flow		Nm^3/h (scfm)	6.7 (3.9)
Maximum Inlet Pressure		kPa (psi)	300 (43.5)
Maximum Backwash Pressure		kPa (psi)	300 (43.5)
Normal Operating Transmembrane Pressure		kPa (psi)	0–200 (0–29)
Operating Temperature Range		°C (°F)	0–40 (32–104)
pH Range	During Filtration		1–10
	During Cleaning		0–12

*Please contact Toray for operating manual and preliminary design, as capacity per module is highly dependent on feed water quality.

Product Certifications & Compliances

- NSF/ANSI 61 for drinking water applications
- NSF/ANSI 419 to comply with the U.S. EPA's Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), which allows membrane manufacturers to prove Cryptosporidium reduction.

Applications

Drinking water, Industrial process water, Pretreatment for seawater RO desalination, Tertiary wastewater

Product Datasheet

TORAY
Innovation by Chemistry

HFU-B2315AN

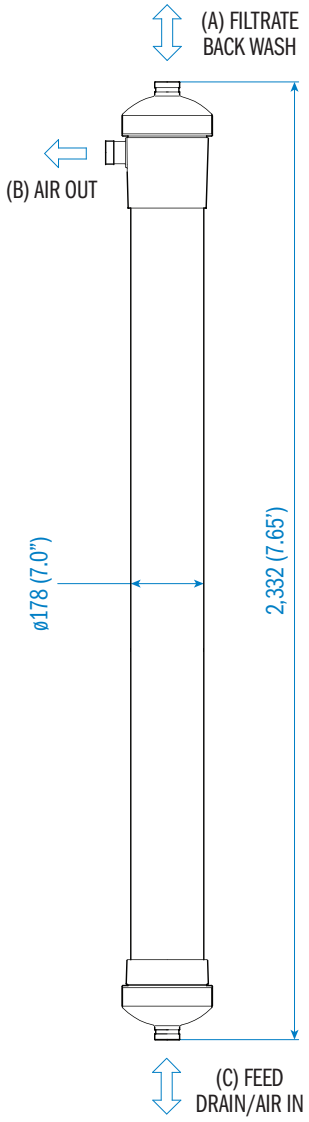
Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Dimensions and Weight		Unit	Value
Diameter		mm (in)	178 (7.01)
Length		mm (ft)	2,332 (7.651)
Weight	Full of Water	kg (lbs)	65 (143)
	After Draining	kg (lbs)	35 (77)

Connections	Value
(A) Filtrate Outlet	50A
(B) Air Outlet	Φ57.91 mm x P3
(C) Feed Water / Air Inlet	50A

Material Specifications	
Description	Material
Casing	uPVC
Cap & Sockets	uPVC
Potting (Adhesive)	Epoxy
O-ring	EPDM

Please contact Toray for more detailed drawing and dimensions.



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Product Datasheet

TORAY
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HFUG-2020AN

Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

The HFUG-2020AN module is Toray's latest UF innovation that features hollow fibers with a smaller diameter but with improved membrane durability and performance. The result is an increased surface area per module for more production output.

Membrane Characteristics		Unit	Value
Membrane Material			PVDF (Polyvinylidene fluoride)
Nominal Pore Size		µm	0.01
Outer Membrane Surface Area (module)		m^2 (ft^2)	90 (969)
Operating Parameters		**Unit**	**Value**
Maximum Feed water / Filtrate Flow		m^3/h (gpm)	15 (66)
Maximum Backwash Flow		m^3/h (gpm)	16.8 (74)
Maximum Air Flow		Nm^3/h (scfm)	9.0 (5.3)
Maximum Inlet Pressure		kPa (psi)	300 (43.5)
Maximum Backwash Pressure		kPa (psi)	300 (43.5)
Normal Operating Trans-membrane Pressure		kPa (psi)	0–200 (0–29)
Operating Temperature Range		°C (°F)	0–40 (32–104)
pH Range	During Filtration		1–10
	During Cleaning		0–12

*Please contact Toray for operating manual and preliminary design, as capacity per module is highly dependent on feed water quality.

Product Certifications & Compliances

- NSF/ANSI 61 for drinking water applications
- NSF/ANSI 419 to comply with the U.S. EPA's Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), which allows membrane manufacturers to prove Cryptosporidium reduction.
- Association of Membrane Separation Technology of Japan

Applications

Drinking water, Industrial process water, Pretreatment for seawater RO desalination, Secondary and Tertiary wastewater

Product Datasheet

Innovation by Chemistry

HFUG-2020AN

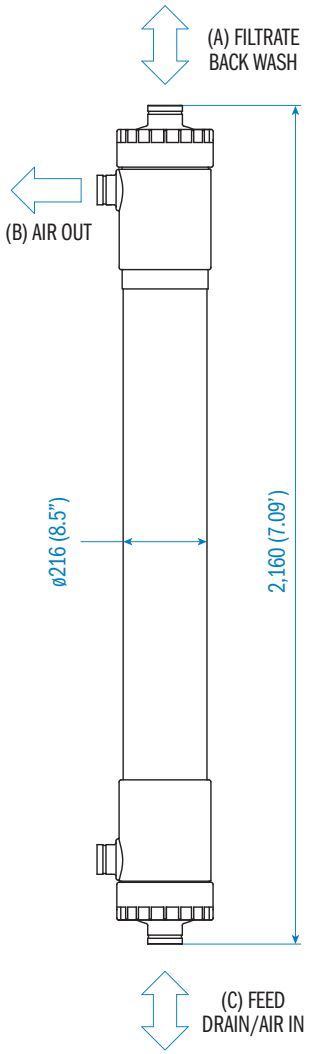
Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Dimensions and Weight		Unit	Value
Diameter		mm (in)	216 (8.5)
Length		mm (ft)	2,160 (7.087)
Weight	Full of Water	kg (lbs)	92 (203)
	After Draining	kg (lbs)	49 (108)

Connections	Value
(A) Filtrate Outlet	80A
(B) Air Outlet	65A
(C) Feed Water / Air Inlet	80A

Material Specifications	
Description	Material
Casing	uPVC
Cap	uPVC
Potting	Epoxy resin
O-ring	EPDM

Please contact Toray for more detailed drawing and dimensions.



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Product Datasheet

TORAY
Innovation by Chemistry

HFU-2020HN

Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Toray's hollow fiber PVDF UF membrane module effectively removes suspended solids and microorganisms such as pathogens when used for various types of water treatment. The HFU-2020HN module is a high-pressure resistant UF membrane module ideal for direct coupling to a RO system.

Membrane Characteristics		Unit	Value
Membrane Material			PVDF (Polyvinylidene fluoride)
Nominal Pore Size		µm	0.01
Outer Membrane Surface Area		m^2 (ft^2)	72 (775)
Operating Parameters		**Unit**	**Value**
Maximum Feed water / Filtrate Flow		m^3/h (gpm)	12 (53)
Maximum Backwash Flow		m^3/h (gpm)	13.5 (59)
Maximum Air Flow		Nm^3/h (scfm)	9.0 (5.3)
Maximum Inlet Pressure		kPa (psi)	600 (87.0)
Maximum Backwash Pressure		kPa (psi)	300 (43.5)
Normal Operating Transmembrane Pressure		kPa (psi)	0–200 (0–29)
Operating Temperature Range		°C (°F)	0–40 (32–104)
pH Range	During Filtration		1–10
	During Cleaning		0–12

*Please contact Toray for operating manual and preliminary design, as capacity per module is highly dependent on feed water quality.

Applications

Drinking water, Industrial process water, Pretreatment for seawater RO desalination, Secondary and Tertiary wastewater

Product Datasheet

TORAY
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HFU-2020HN

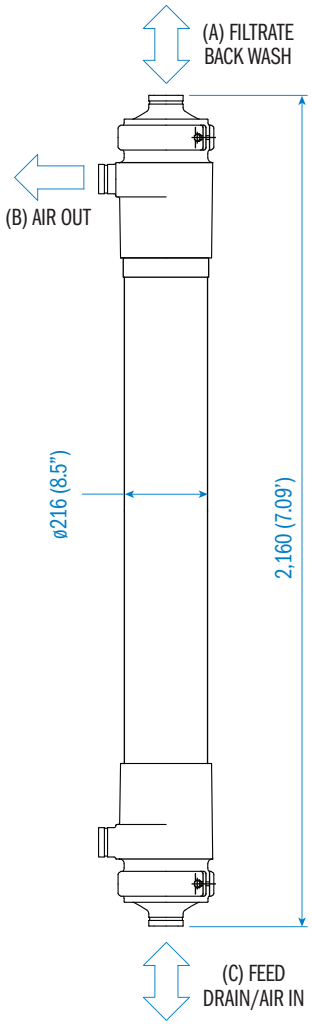
Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Dimensions and Weight		Unit	Value
Diameter		mm (in)	216 (8.5)
Length		mm (ft)	2,160 (7.087)
Weight	Full of Water	kg (lbs)	110 (243)
	After Draining	kg (lbs)	67 (148)

Connections	Value
(A) Filtrate Outlet	80A
(B) Air Outlet	65A
(C) Feed Water / Air Inlet	80A

Material Specifications	
Description	Material
Casing	uPVC
Cap	uPVC
Potting	Epoxy resin
O-ring	EPDM

Please contact Toray for more detailed drawing and dimensions.



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For more info, please visit
water.toray

Product Datasheet

TORAY
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HSU-1515

Submerged Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

The submerged filtration method is ideal for treating feed water with high turbidity because of effective drainage and sludge removal. No pressure casing, less piping, and fewer valves can reduce capital costs and minimizes footprint requirements.

Membrane Characteristics		Units	Value
Membrane Material			PVDF (Polyvinylidene fluoride)
Nominal Pore Size		µm	0.01
Outer Membrane Surface Area		m^2 (ft^2)	20 (215)
Operating Parameters		**Units**	**Value**
Maximum Feed water / Filtrate Flow		m^3/h (gpm)	2.0 (8.8)
Maximum Backwash Flow		m^3/h (gpm)	3.0 (13.2)
Maximum Air Flow		Nm^3/h (scfm)	4.5 (2.6)
Maximum Backwash Pressure		kPa (psi)	200 (29.0)
Normal Operating Transmembrane Pressure		kPa (psi)	0–100 (0–14.5)
Operating Temperature Range		°C (°F)	0–40 (32–104)
pH Range	During Filtration		1–10
	During Cleaning		0–12

*Please contact Toray for operating manual and preliminary design, as capacity per module is highly dependent on feed water quality.

Applications

Drinking water, Industrial process water, Pretreatment for seawater RO desalination, Tertiary wastewater

Product Datasheet

TORAY
Innovation by Chemistry

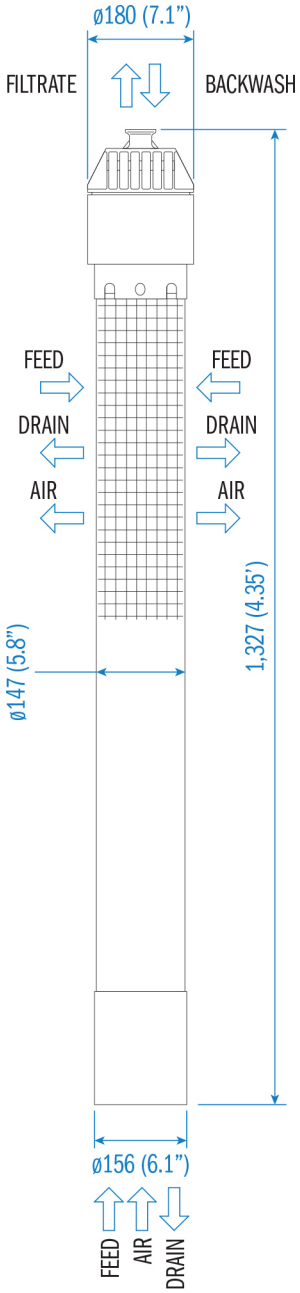
HSU-1515

Submerged Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

Dimensions & Weight		Unit	Value
Diameter		mm (in)	147 (5.79)
Length		mm (ft)	1,327 (4.35)
Weight	Wet Condition	kg (lbs)	18 (40)

Connections	Value
Filtrate Outlet	IDF/ISO Clamp Union Fittings 1.5s

Material Specifications	
Description	Material
Cap / Protective Cylinder	ABS / PE
Potting	Epoxy
O-ring	EPDM



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