Product Datasheet

TORAY
Innovation by Chemistry

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)	—

Feed Water Permeate Concentrated Brine

Flow direction

Figure 1: 4040 elements

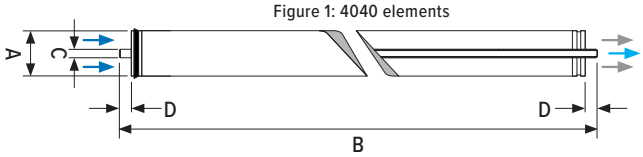
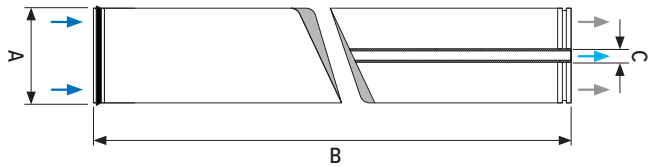


Figure 2: 8040 elements



Artículo 123 # 1316 Nte.,
Col. Talleres, Monterrey, N.L.
www.productospolo.com
818-333-9896, 818-333-9696
ventas@productospolo.com

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 fee 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.

Toray accepts no responsibility for results obtained by the application of this information or the safety or suitability of Toray's products, either alone or in combination with other products. Users are advised to make their own tests to determine the safety and suitability of each product combination for their own purposes.

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Headquarters
Japan +81 3 3245 4540

Asia Pacific
China (TBMC) +86 10 8048 5216
Singapore (TAS) +65 6226 0525
Korea (TAK) +82 2 3279 1000

Americas (TMUS)
California +1 (858) 218 2360

Europe & Sub-Saharan Africa (TMEU)
Switzerland +41 61 415 8710

Middle East (TMME)
Saudi Arabia +966 13 568 0091
U.A.E. +971 4 392 8811

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TORAY
Innovation by Chemistry

Product Datasheet

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.

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)	—

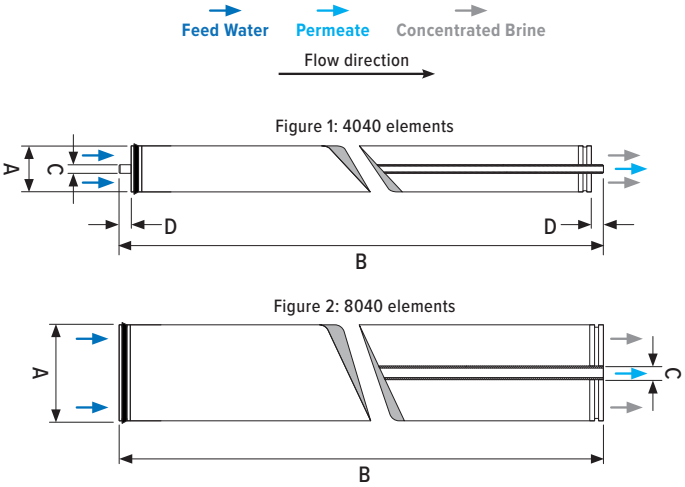

Figure 1: 4040 elements

Figure 2: 8040 elements

Artículo 123 # 1316 Nte.,
Col. Talleres, Monterrey, N.L.
www.productospolo.com
818-333-9896, 818-333-9696
ventas@productospolo.com

Product Datasheet

TORAY
Innovation by Chemistry

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 fee 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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Headquarters
Japan +81 3 3245 4540

Asia Pacific
China (TBMC) +86 10 8048 5216
Singapore (TAS) +65 6226 0525
Korea (TAK) +82 2 3279 1000

Americas (TMUS)
California +1 (858) 218 2360

Europe & Sub-Saharan Africa (TMEU)
Switzerland +41 61 415 8710

Middle East (TMME)
Saudi Arabia +966 13 568 0091
U.A.E. +971 4 392 8811

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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 SP 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)

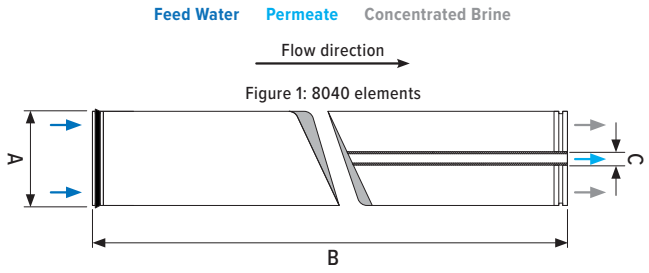

Figure 1: 8040 elements

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Col. Talleres, Monterrey, N.L.
www.productospolo.com
818-333-9896, 818-333-9696
ventas@productospolo.com

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 fee 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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Headquarters
Japan +81 3 3245 4540

Asia Pacific
China (TBMC) +86 10 8048 5216
Singapore (TAS) +65 6226 0525
Korea (TAK) +82 2 3279 1000

Americas (TMUS)
California +1 (858) 218 2360

Europe & Sub-Saharan Africa (TMEU)
Switzerland +41 61 415 8710

Middle East (TMME)
Saudi Arabia +966 13 568 0091
U.A.E. +971 4 392 8811

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Product Datasheet

TORAY
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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

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

C SA US

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

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)

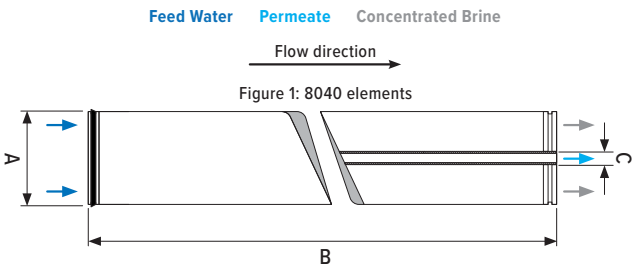

Figure 1: 8040 elements

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Col. Talleres, Monterrey, N.L.
www.productospolo.com
818-333-9896, 818-333-9696
ventas@productospolo.com

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 fee 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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Japan +81 3 3245 4540

Asia Pacific
China (TBMC) +86 10 8048 5216
Singapore (TAS) +65 6226 0525
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Americas (TMUS)
California +1 (858) 218 2360

Europe & Sub-Saharan Africa (TMEU)
Switzerland +41 61 415 8710

Middle East (TMME)
Saudi Arabia +966 13 568 0091
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Product Datasheet

TORAY
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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

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

C SA US

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

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)	

Feed Water Permeate Concentrated Brine

Flow direction

Figure 1: 4040 elements

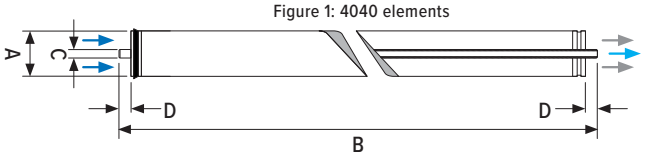
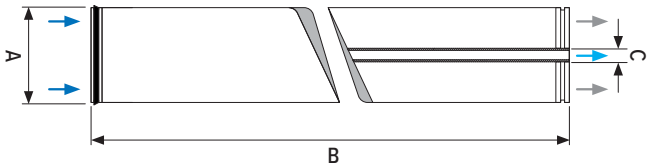


Figure 2: 8040 elements



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Col. Talleres, Monterrey, N.L.
www.productospolo.com
818-333-9896, 818-333-9696
ventas@productospolo.com

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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 fee 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.
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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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Headquarters
Japan +81 3 3245 4540

Asia Pacific
China (TBMC) +86 10 8048 5216
Singapore (TAS) +65 6226 0525
Korea (TAK) +82 2 3279 1000

Americas (TMUS)
California +1 (858) 218 2360

Europe & Sub-Saharan Africa (TMEU)
Switzerland +41 61 415 8710

Middle East (TMME)
Saudi Arabia +966 13 568 0091
U.A.E. +971 4 392 8811

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Product Datasheet

TORAY
Innovation by Chemistry

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

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Col. Talleres, Monterrey, N.L.
www.productospolo.com
818-333-9896, 818-333-9696
ventas@productospolo.com

TORAY
Innovation by Chemistry

Product Datasheet

HFUG-2020AN

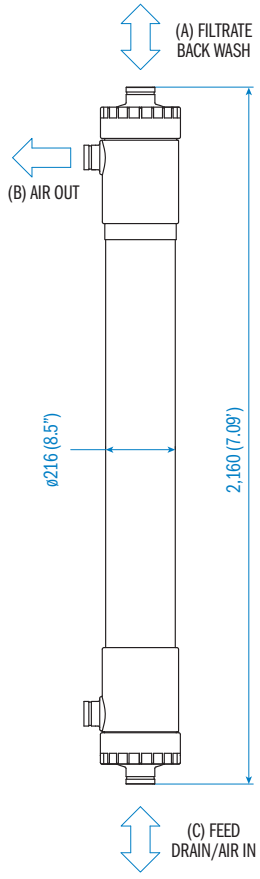
Pressurized Outside to In / Dead-end Filtration Ultrafiltration (UF) Membrane Module

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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Headquarters
Japan +81 3 3245 4542

Asia Pacific
China (TBMC) +86 10 8048 5216
Singapore (TAS) +65 6226 0525
Korea (TAK) +82 2 3279 7365

Americas (TMUS)
USA +1 (858) 218 2360

Europe & Sub-Saharan Africa (TMEU)
Switzerland +41 61 415 8710

Middle East (TMME)
Saudi Arabia +966 13 568 0091
U.A.E. +971 4 392 8811

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Product Datasheet

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

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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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