

S E S E N V I R O N M E N T A L

SES ENVIRONMENTAL PROTECTION PTY LTD.

Membrane Component



SEIP



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1 Membrane Component Performance Parameters Table

1.1 RO Membrane Components Performance Parameters

Membrane Component Category	Membrane component model	Stabilized salt removal rate (%)	Average water output GPD (m ³ /d)	Membrane area ft ² (m ²)	Water inlet grid (mil)	Test condition		
						Test pressure psi (MPa)	Test solution concentration NaCl (ppm)	Recycle rate (%)
Helixfilx enhanced RO membrane	LP400-LD	99.7	10500(39.7)	400(37.2)	34-LD	225(1.55)	2000	15
	LP440-MAX	99.7	12500(47.3)	440(40.9)	28			
	ULP400-LD	99.5	10500(39.7)	400(37.2)	34-LD	150(1.03)	1500	15
	ULP440-MAX	99.5	12000(45.4)	440(40.9)	28			
	PURO-FRLE	99.6	10500(39.7)	400(37.2)	34-LD	150(1.03)	2000	15
	PURO-I	99.8	10500(39.7)	400(37.2)	34	225(1.55)	2000	15
	PURO-II	99.8	11500(43.5)	400(37.2)	34-LD			
Zero discharge ZERO series	ZERO-FR10	99.7	11500(43.5)	400(37.2)	34	225(1.55)	2000	15
	ZERO-HP70	99.8	8800(33.3)	400(37.2)	34	800(5.52)	32000	8
	ZERO-UHP120	99.7	7400(28.0)	400(37.2)	34			
	ZERO-XS90	99.0	8300(31.4)	400(37.2)	34	100(0.69)	2000 MgSO ₄	15
RO membrane for ultra pure water	LE-8040UE	99.5	11500(43.5)	400(37.2)	34	150(1.03)	1500	15
	LE440-UE	99.3	12000(45.4)	440(40.9)	28			
	PURO-UE	99.6	11500(43.5)	400(37.2)	34	225(1.55)	2000	15
Specific membrane for food and beverage	LP400-SP	99.7	10500(39.7)	400(37.2)	34-LD	225(1.55)	2000	15
	ULP400-SP	99.5	10500(39.7)	400(37.2)	34-LD	150(1.03)	1500	
	SEP-NF400-SPHL	96.0	12500(47.3)	400(37.2)	28	70(0.48)	2000 MgSO ₄	
Low pressure RO membrane	LP22-8040	99.7	10500(39.7)	400(37.2)	28	225(1.55)	2000	15
	LP22-8040PRO	99.7	11000(41.6)	400(37.2)	28			
	LP22-8040/31	99.7	10500(39.7)	400(37.2)	31			
	LP22-8040-440	99.7	11500(43.5)	440(40.9)	28			
	LP21-4040	99.6	2800(10.6)	100(9.3)	28			
Ultra low pressure RO membrane	ULP22-8040	99.0	12100(45.8)	400(37.2)	28	150(1.03)	1500	15
	ULP32-8040	99.5	10500(39.7)	400(37.2)	28			
	ULP32-8040/31	99.5	10500(39.7)	400(37.2)	31			
	ULP32-8040-440	99.3	12650(47.9)	440(40.9)	28			
	ULP21-4040	99.5	2600(9.8)	100(9.3)	28			
	ULP31-4040	99.6	2000(7.6)	100(9.3)	28			
	ULP21-4021	99.0	950(3.6)	36(3.3)	28			8
	ULP21-2521	99.0	300(1.1)	14(1.3)	28			
Low energy consumption RO membrane	ULP21-2540	99.0	750(2.8)	30(2.8)	28	150(1.03)	500	15
	XLE-4040HR	99.0	3500(13.2)	100(9.3)	28			
	XLE-4040HF	98.2	4200(15.9)	100(9.3)	28			
Ultra low pressure RO membrane	XLE-4040	98.5	3500(13.2)	100(9.3)	28	100(0.69)	500	15
	XLP12-8040	99.2	12800(48.4)	400(37.2)	28			
	XLP11-4040	99.2	2600(9.8)	100(9.3)	28			

Membrane Component Category	Membrane component model	Stabilized salt removal rate (%)	Average water output GPD (m ³ /d)	Membrane area ft ² (m ²)	Water inlet grid (mil)	Test condition		
						Test pressure psi (MPa)	Test solution concentration NaCl (ppm)	Recycle rate (%)
Anti-pollution RO membrane	FR12-8040	99.5	10500(39.7)	400(37.2)	34	225(1.55)	2000	15
	FR22-8040PRO	99.7	11000(41.6)	400(37.2)	34			
	FR400-LD	99.6	10500(39.7)	400(37.2)	34			
	FR11-4040	99.5	2200(8.3)	90(8.4)	34			
Antioxidant RO membrane	HOR22-8040	99.5	9000(34.0)	400(37.2)	28	225(1.55)	2000	15
	HOR21-4040	99.5	2200(8.3)	90(8.4)	28			
Sea water desalination membrane	SW8040XHR-400	99.85	6000(22.7)	400(37.2)	28	800(5.52)	32000	8
	SW8040XHR-440	99.85	6600(25.0)	440(40.9)	28			
	SW8040FR-400	99.8	8200(31.0)	400(37.2)	34			
	SW8040HR-400	99.8	7500(28.4)	400(37.2)	28			
	SW8040HR-440	99.8	8250(31.2)	440(40.9)	28			
	SW8040LE-400	99.8	9000(34.0)	400(37.2)	28			
	SW8040LE-440	99.8	9500(35.9)	440(40.9)	28			
	SW8040XLE-400	99.7	11000(41.6)	400(37.2)	28			
	SW8040XLE-440	99.7	12100(45.8)	440(40.9)	28			
	SW4040HR	99.8	1600(6.1)	90(8.4)	28			
	SW4040LE	99.7	1900(7.2)	90(8.4)	28			
	SW11-4021	99.5	750(2.8)	33(3.1)	28			4
	SW11-2521	99.5	270(1.0)	12(1.1)	28			
	SW11-2540	99.5	600(2.3)	28(2.6)	28			8
SW21-2540	99.7	700(2.6)	28(2.6)	28				
Thermal disinfection RO membrane	VHD-8040/34G	98.0	9000(34.0)	400(37.2)	34	150(1.03)	2000	15
	VHD-4038G	98.0	2100(7.9)	90(8.4)	28			
Membrane Component Category	Membrane component model	Stabilized salt removal rate (%)	Average water output GPD (m ³ /d)	Membrane area ft ² (m ²)	Water inlet grid (mil)	Test condition		
						Test pressure psi (MPa)	Test solution concentration NaCl (ppm)	Recycle rate (%)
Specific membrane for food and beverage	SEP-UF400-SP/2K	2000	5000(20.8)	400(37.2)	31	80(0.56)	PEG 2000	15
	SEP-UF400-SP/6K	6000	6500(24.6)	400(37.2)	31	60(0.41)	PEG 6000	
	SEP-UF400-SP/10K	10000	7000(26.5)	400(37.2)	31	40(0.28)	PEG 10000	
	SEP-UF400-SP/20K	20000	10500(39.7)	400(37.2)	31		PEG 20000	

1.2 NF Membrane Components Performance Parameters

Membrane Component Category	Membrane component model	Stabilized salt removal rate (%)	Average water output GPD (m ³ /d)	Membrane area ft ² (m ²)	Water inlet grid (mil)	Test condition		
						Test pressure psi (MPa)	Test solution concentration NaCl (ppm)	Recycle rate (%)
Water treatment NF membrane	SEP-NF1-8040	98.0	10000(37.9)	/	28	100(0.69)	2000 MgSO ₄	15
	SEP-NF2-8040	97.0	10500(39.7)	/	28			
	SEP-NF1-4040	98.0	2000 (7.5)	/	28			
	SEP-NF2-4040	97.0	2400 (9.1)	/	28			
	SEP-NF1-2540	98.0	650 (2.46)	/	28			
	SEP-NF2-2540	97.0	750 (2.84)	/	28			
Civil NF membrane	TAPU-LS	95.0	12000(45.4)	/	34-LD	70(0.48)	Mix solution of NaCl, MgSO ₄ , CaCl ₂	15
	TAPU-MS	95.0	9000(34.1)	/	34-LD			
	TAPU-HS	95.0	8000(30.3)	/	34-LD			
	TAPU4040-LS	95.0	2200(8.3)	/	34-LD			
	TAPU4040-MS	95.0	2000(7.6)	/	34			
	TAPU4040-HS	95.0	1700(6.4)	/	34-LD			
Material separation NF membrane	MASE-SP	92.0	12000(45.4)	/	34-LD	100(0.69)	2000 MgSO ₄	15
	MASE-SL	98.0	12000(45.4)	/	34-LD			
	MASE-PS	98.5	12000(45.4)	/	34-LD			
	MASE-CR	95.0	12000(45.4)	/	34-LD			
High pressure NF membrane	MASE-SL 80	98.0	8200(31.0)	/	28	100(0.69)	2000 MgSO ₄	15
	MASE-CR 80	95.0	9500(35.9)	/	28			
Acid resistant NF membrane	Acidstab NF-8040	97.0	3700(14.0)	/	Customized	110(0.76)	2000 MgSO ₄	15
	Acidstab NF-4040	97.0	900(3.4)	/	Customized			
	Acidstab NF-2540	97.0	200(0.76)	/	Customized			
Alkali resistant NF membrane	Alkalistab NF-8040	97.0	3600(13.6)	/	Customized	110(0.76)	2000 MgSO ₄	15
	Alkalistab NF-4040	97.0	800(3.0)	/	Customized			
	Alkalistab NF-2540	97.0	190(0.72)	/	Customized			

1.3 UF Membrane Components Performance Parameters

Membrane component category	Membrane component model	Average output amount GPD (m ³ /d)	Test condition			
			Test pressure psi(MPa)	Test solution category	Test solution concentration (ppm)	Recycle rate (%)
Roll type UF membrane	SEP-UF8040-4K/31F	6000(22.7)	60(0.41)	PEG 4000	1000	15
	SEP-UF8040-6K/31F	6500(24.6)		PEG 6000		
	SEP-UF8040-8K/31F	9500(35.9)		PEG 8000		
	SEP-UF8040-10K/31F	7000(26.5)	40(0.28)	PEG 10000	1000	15
	SEP-UF8040-20K/31F	10500(39.7)		PEG 20000		
	SEP-UF8040-67K/31F	25000(94.6)	40(0.28)	Bovine serum protein	300	15

Membrane component category	Membrane component model	Effective membrane area (m ²)	Weight (kg)	LxWxH (mm)	Average pore diameter
Roll UF membrane	SEP-MR 88	0.88	2.34	490×1000×7	0.1
	SEP-VMR 160	1.6	3.73	515×1750×7	0.1

Membrane component category	Membrane component model	Effective membrane area (m ²)	Designed flux LMH	Nominal pore diameter (μm)	Membrane material	Production process
Hollow fiber pressure UF membrane	SEP-UF-2860	51	30~120	0.02	PVDF	NIPS
	SEP-UF-2880	77	30~120	0.02	PVDF	NIPS
	SEP-UF-2860T	51	35~120	0.08	PVDF	TIPS
	SEP-UF-2880T	77	35~120	0.08	PVDF	TIPS
	SEP-UF-i1066	50	40~200	0.02	PES	NIPS
	SEP-UF-i1066X	60	40~200	0.02	PES	NIPS
Hollow fiber MBR membrane	SEP-UF-ME32	32	5~30	0.03	PVDF+PET	NIPS
	SEP-UF-ME34	34.4	5~30	0.03	PVDF+PET	NIPS
	SEP-UF-ME40	40	5~30	0.03	PVDF+PET	NIPS
Hollow fiber submerged UF membrane	SEP-UF-S35	35	25~60	0.02	PVDF	NIPS

2 Reverse osmosis Membrane Selection Guide

2.1 RO Membrane Component

Enhanced RO membrane component Helixfil series

The LP400-LD and ULP400-LD membrane components utilize a brand-new low differential pressure 34mil inlet grid, which improves the turbulent fluid state on the membrane surface, effectively reduces the risk of colloidal fouling and blockage, and decreases the frequency of cleaning.

While maintaining the original removal rate, the ULP440-MAX and LP440-MAX membrane elements have increased water production by 15% and 20% compared to conventional products.

The PURO-I membrane component improves the cross-linking strength of the polyamide desalination layer, has a wider range of acid and alkali resistant cleaning, and enhances the anti-pollution ability of the membrane element.

The PURO-II membrane component increases chemical cleaning resistance and adopts a new LD low differential pressure grid design, significantly improving the anti-pollution ability of the membrane component.

PURO-FRLE is an ultra-low pressure anti-fouling reverse osmosis membrane that provides a low-energy product selection while maintaining the characteristics of anti-fouling membrane, suitable for the purification treatment of industrial water, such as electronic industry wastewater and surface water.

The PURO-FRLE is an ultra-low pressure anti-fouling reverse osmosis membrane that provides a low-energy product selection while maintaining the

characteristics of anti-fouling membrane, suitable for the purification treatment of industrial water, such as electronic industry wastewater and surface water.

Model	Water production amount		Stabilized removal rate	Membrane area		Inlet grid
	GPD	m ³ /d		ft ²	m ²	
LP440-MAX	12500	47.3	99.7	440	40.9	28
LP400-LD	10500	39.7	99.7	400	37.2	34-LD
ULP440-MAX ¹	12000	45.4	99.5	440	40.9	28
ULP400-LD ¹	10500	39.7	99.5	400	37.2	34-LD
PURO-I	10500	39.7	99.75	400	37.2	34
PURO-II	11500	43.5	99.8	400	37.2	34-LD
PURO-FRLE ²	10500	39.7	99.6	400	37.2	34-LD

Test condition:

Operation pressure 225 psi (1.55 MPa), 2000 mg/L NaCl, temperature 25°C, pH 7.0±0.5, recycle rate: 15%

Operation pressure 150 psi (1.03 MPa), 1500 mg/L NaCl, temperature 25°C, pH 7.0±0.5, recycle rate: 15%

Operation pressure 150 psi (1.03 MPa), 2000 mg/L NaCl, temperature 25°C, pH 7.0 ± 0.5, recycle rate 15%, minimum desalination rate LP440-MAX: 99.6, LP400-LD: 99.4%, ULP440-MAX: 99.3%

ULP400-LD: 99.45%, PURO-I、 PURO-II、 PURO-FRLE: 99.5%

Use condition:

Max. operation pressure	600 psi (4.14 MPa)		
Max. inlet water	45°C		
Max. water inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Single membrane component max. pressure	15 psi (0.1 MPa)		
Chemical cleaning pH range	1-13	Operating inlet pH range	2-11
¹ Chemical cleaning pH range	2-12	¹ Operating inlet pH range	3-10

Note: single membrane component water production amount ±15%

¹ single membrane component water production amount ±20%

2.2 Zero Discharge Series

ZERO-FR10 is a highly anti-fouling membrane component. A low differential pressure, long cleaning cycle, and high chemical resistance cleaning membrane product has been developed based on the new generation membrane separation layer technology and component structure to meet the zero discharge demand for TDS 5-15g/L high salt and high COD wastewater reuse.

ZERO-HP70 high-pressure RO membrane component. A type of high desalination membrane developed to meet the demand for concentration and reduction of influent TDS 15-35g/L concentrated salt water. Based on SW membrane components, the pressure bearing capacity is improved, and the membrane Zeta potential and hydrophilicity are enhanced.

ZERO-UHP120 ultra-high pressure RO membrane component. A type of membrane product developed for the concentration and reduction of influent TDS 35-70g/L saltwater, with a maximum operating pressure of 120bar, suitable for zero discharge high saltwater concentration and reduction..

ZERO-XS90 salt separation and NF membrane component. A type of highly selective anti-pollution NF membrane developed for the low-energy consumption and resource recycling of sodium chloride and sodium sulfate. Suitable for selective separation of zero emission high pollution concentrated salt water with TDS 35-70g/L inflow, as well as denitrification in chlor-alkali, desulfurized wastewater, and printing and dyeing wastewater.

Model	Water output		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
ZERO-FR10	11500	43.5	99.7	400	37.2	34
ZERO-HP70 ¹	8800	33.3	99.75	400	37.2	34
ZERO-UHP120 ²	7400	28.0	99.7	400	37.2	34
ZERO-XS90 ³	8300	31.4	99.0	400	37.2	34

Test condition:

Operating pressure 225 psi (1.55 MPa), 2000 mg/L NaCl, temperature 25°C, pH 7.0 ±0.5, recycle rate: 15%

Operating pressure: 800 psi (5.52 MPa), 32000 mg/L NaCl, temperature 25°C, pH 8, recycle rate: 8%

Operating pressure 100 psi (0.69 MPa), 2000 mg/L MgSO₄ solution, temperature 25 °C, pH 7.0 ± 0.5, recycle rate 15%, min. salt removal rate ZERO-FR10: 99.6%, ZERO-HP70: 99.7%, ZERO-UHP120: 99.65%

Use condition:

Max. operation pressure	600 psi (4.14 MPa) 1200 psi (8.28 MPa) 1740psi (12.0 MPa)		
Max. inlet water	45°C		
Max. water inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Single membrane component max. pressure	15 psi (0.1 MPa)		
Chemical cleaning pH	1-13	Operating inlet pH range	1-13
Chemical cleaning pH	3-10	Operating inlet pH range	2-11

Note: Water production amount ±20% for single membrane component

2.3 Ultrapure RO Membrane Component UE Series

LE-8040UE is a type of RO membrane component developed based on the characteristics of ultrapure water preparation. It has excellent TOC removal rate and lower TOC dissolving-out amount. The product meets the requirements of the Technical Requirements for Certification of Roll-type Reverse Osmosis Membrane Components for Ultra pure Water Preparation in the Semiconductor Industry and is suitable for ultrapure water preparation in the semiconductor and pharmaceutical industries.

LE440-UE has a larger effective membrane area, which can meet the requirements of ultrapure water applications while reducing the cost of ultrapure water preparation.

PURO-UE is designed specifically for ultra pure water reuse processes, targeting highly polluting wastewater such as semiconductor industry cleaning

Model	Water production amount		Stabilized salt removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
LE-8040UE	11500	43.5	99.5	400	37.2	34
LE440-UE	12000	45.4	99.3	440	40.9	28
PURO-UE 1	11500	43.5	99.6	400	37.2	34

wastewater, with better resistance to pollution.

Test condition:

Operating pressure 150 psi (1.03 MPa), 1500 mg/L NaCl, 100 mg/L isopropanol, TOC removal rate 90%, temperature 25°C, pH 7.0±0.5, removal rate:

15%

Operating pressure 225 psi (1.55 MPa), 2000 mg/L NaCl, 100 mg/L isopropanol, TOC removal rate 95%, temperature 25°C, pH 7.0±0.5, recycle rate:

15%

Min. salt removal rate LE-8040UE, LE440-UE 99.0%, PURO-UE: 99.3%

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)		
Max. water inlet	45°C		
Max. Water inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	2-12	Operating inlet pH range	1-13
Chemical cleaning pH range	3-10	Operating inlet pH range	2-11

Note: water production amount ± 15% for single membrane component

2.4 Specific Membrane Component SP Series for Food and Beverage

LP400-SP and ULP400-SP are specially designed RO membrane components for the food and beverage industry, with materials that meet the requirements of the Hygienic and Safety Evaluation Specification for Drinking Water Transmission and Distribution Equipment and Protective Materials (2001).

The SEP-NF400-SPHL nanofiltration membrane component removes sulfates and moderately retains minerals, suitable for the processing and preparation of functional beverages. The SEP-UF400-SP roll type ultrafiltration membrane component includes four types of molecular weight cut-off products: 2K, 6K, 10K and 20K, which meet the purification and preparation needs of different functional beverages.

Model	Water production amount		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
LP400-SP1	10500	39.7	99.7	400	37.2	34-LD
ULP400-SP2	10500	39.7	99.5	400	37.2	34-LD
SEP-NF400-SPHL3	12500	47.3	96.0	400	37.2	28
Model	Water production amount		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		Da	ft ²	
SEP-UF400-SP/2K4	5000	20.8	2000	400	37.2	31
SEP-UF400-SP/6K5	6500	24.6	6000	400	37.2	31
SEP-UF400-SP/10K6	7000	26.5	10000	400	37.2	31
SEP-UF400-SP/20K6	10500	39.7	20000	400	37.2	31

Test condition:

Operation pressure 225 psi (1.55 MPa), 2000 mg/L NaCl, temperature 25°C,
 pH 7.0±0.5, recycle rate: 15%

Operation pressure 150 psi (1.03 MPa), 1500 mg/L NaCl, temperature 25°C,
 pH 7.0±0.5, recycle rate: 15%

Operation pressure 70 psi (0.48MPa), 2000 mg/L MgSO₄, temperature 25°C,
 pH 7.0±0.5, recycle rate: 15%

Operation pressure 80 psi (0.56MPa), 1000 mg/L PEG test solution,
 temperature 25°C, recycle rate: 15%

Operation pressure 60 psi (0.41MPa), 1000 mg/L PEG test solution,
 temperature 25°C, recycle rate: 15%

Operation pressure 40 psi (0.28MPa), 1000 mg/L PEG test solution,
 temperature 25°C, recycle rate: 15%, min. desalination rate LP400-SP: 99.4%,
 ULP400-SP: 99.45%

Use condition:

Max. operating pressure	600 psi (4.14 MPa) ^{1 2 3} 300 psi (2.07 MPa) ^{4 5 6}		
Max. inlet temperature	45°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	1-13 ¹ 2-12 ^{2 3 4 5 6}	Operating inlet pH range	2-11 ¹ 3-10 ^{2 3 4 5 6}

Note: ¹ water production amount ±15% for single membrane component

^{2 3 4 5 6} water production amount ±20% for single membrane component

2.5 Anti-fouling RO Membrane Component FR Series

The FR series anti-pollution reverse osmosis membrane components adopt a kind of special membrane manufacturing process to improve the hydrophilicity, charge and roughness of the membrane surface, thereby reducing the growth and adsorption of pollutants and microorganisms on the membrane surface.

Model	Water production amount		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
FR12-8040	10500	39.7	99.5	400	37.2	34
FR22-8040PRO	11000	41.6	99.7	400	37.2	34
FR400-LD	10500	39.7	99.6	400	37.2	34
FR11-4040	2200	8.3	99.5	90	8.4	34

Test condition:

Operating pressure 225 psi (1.55 MPa), 2000 mg/L NaCl solution, temperature 25°C, pH 7.0±0.5, recycle rate: 15%, minimum desalination rate
 FR12-8040, FR11-4040: 99.3%, FR22-8040PRO: 99.6%, FR400-LD: 99.5%

Use condition:

Max. operating pressure	600 psi (4.14 MPa)		
Max. inlet temperature	45°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	1-13	Operating inlet pH range	2-11

Note: Water production amount ±15% for single membrane component

2.6 Low Pressure RO Membrane Component LP Series

Low pressure series membrane components are mainly used for desalination of brackish water, with the characteristics of low pressure operation, high water production, and good desalination performance. It has high performance in removing soluble salts, TOC, and SiO₂, and is suitable for the preparation of high-purity water in the electronics and power industries.

Model	Water production amount		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
LP22-8040-440	11500	43.5	99.7	440	40.9	28
LP22-8040	10500	39.7	99.7	400	37.2	28
LP22-8040PRO	11000	41.6	99.7	400	37.2	28
LP22-8040/31	10500	39.7	99.7	400	37.2	31
LP21-4040	2800	10.6	99.6	100	9.3	28

Test condition:

Operating pressure 225 psi (1.55 MPa), 2000 mg/L NaCl solution, temperature 25 °C, pH 7.0 ± 0.5, recycle rate: 15%, min. desalination rate LP22-8040, LP22-8040/31, LP21-4040: 99.4%, LP22-8040PRO 99.6%, LP22-8040-440: 99.5%

Use condition:

Max. operating pressure	600 psi (4.14 MPa)		
Max. inlet temperature	45°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	1-13	Operating inlet pH range	2-11

Note: Water production amount ±20% for single membrane component

2.7 Ultra-low Pressure RO Membrane Component ULP Series

The ultra-low pressure series membrane components can achieve the same high water flux and high removal rate as conventional low-pressure membranes under ultra-low operating pressure conditions. Its operating pressure is about 2/3 of the conventional low-pressure membrane operating pressure, and the removal rate can reach 99.5%.

Model	Water production amount		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
ULP32-8040-440	12650	47.9	99.3	440	40.9	28
ULP22-8040	12100	45.8	99.0	400	37.2	28
ULP32-8040	10500	39.7	99.5	400	37.2	28
ULP32-8040/31	10500	39.7	99.5	400	37.2	31
ULP21-4040	2600	9.8	99.5	100	9.3	28
ULP31-4040	2000	7.6	99.6	100	9.3	28
ULP21-4021 ¹	950	3.6	99.0	36	3.3	28
ULP21-2540	750	2.8	99.0	30	2.8	28
ULP21-2521 ¹	300	1.1	99.0	14	1.3	28

Test condition:

Operating pressure 150 psi (1.03 MPa), 1500 mg/L NaCl solution, temperature 25 °C, pH 7.0 ±0.5, recycle rate: 15%

¹Operating pressure 150 psi (1.03 MPa), 1500 mg/L NaCl solution, temperature 25 °C, pH 7.0 ±0.5, recycle rate: 8%

Min. desalination rate:

ULP22-8040, ULP21-4021, ULP21-2521, ULP21-2540: 98.5%

ULP32-8040, ULP32-8040/31, ULP21-4040: 99.0%

ULP32-8040-440: 99.1% ULP31-4040: 99.3%

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)		
Max. inlet flow	8040-75 gpm (17 m ³ /h) 4040-4021-16 gpm (3.6 m ³ /h) 2521、2540-6 gpm (1.4 m ³ /h)		
Max. inlet temperature	45°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	2-12	Operating inlet pH range	3-10

Note: Water production amount ±20% for single membrane component

2.8 Low Energy Consumption RO Membrane Component XLE Series

The XLE series membrane components are suitable for desalination treatment of municipal water supply, RO production water and other water sources with salt content below 500mg/L, and have the characteristics of low pressure, low energy consumption, and high water flux. Its operating pressure is about 2/3 of the operating pressure of conventional low-pressure membranes, and it can achieve higher water flux than ultra-low pressure membranes under ultra-low operating pressure conditions.

Model	Water production amount		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
XLE-4040HR	3500	13.2	99.0	100	9.3	28
XLE-4040HF	4200	15.9	98.2	100	9.3	28
XLE-4040	3500	13.2	98.5	100	9.3	28

Test condition:

Operating pressure 150 psi (1.03 MPa), 500 mg/L NaCl solution, temperature 25°C, pH 7.0 ±0.5, recycle rate: 15%

Min. desalination rate XLE-4040HR: 98.5%, XLE-4040HF: 97.5%, XLE-4040: 98%

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)
Max. inlet flow	4040-19.46 gpm (4.42 m ³ /h)
Max. inlet temperature	45°C

Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane component	15 psi (0.1 MPa)		
Chemical cleaning pH range	2-12	Operating inlet pH range	3-10

Note: Water production amount $\pm 20\%$ for single membrane component

2.9 Ultra-low Pressure RO Membrane XLP Series

The ultra-low pressure series membrane components can achieve the same high water flux and high removal rate as conventional low-pressure membranes under extremely low operating pressure conditions, and their operating pressure is about half of the operating pressure of conventional low-pressure membranes.

Model	Water production amount		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		Ft ²	m ²	
XLP12-8040	12800	48.4	99.2	400	37.2	28
XLP11-4040	2600	9.8	99.2	100	9.3	28

Test condition:

Operating pressure 100 psi (0.69 MPa), 500 mg/L NaCl solution, temperature 25°C, pH 7.0 \pm 0.5, recycle rate: 15%, minimum desalination rates for XLP12-8040, XLP11-404: 97.5%

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)	
Max. inlet flow	8040-75 gpm (17 m ³ /h)	4040-16 gpm (3.6 m ³ /h)

Max. inlet temperature	45°C		
Max. Inlet SDI15	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	2-12	Operating inlet pH range	3-10

Note: Water production amount $\pm 20\%$ for single membrane component



2.10 Anti-oxidant RO Membrane Component HOR Series

The antioxidant series membrane components are polyamide RO membrane components independently developed by SEP. To solve the disadvantage of ordinary polyamide RO membranes not being resistant to oxidation, a kind of special synthesis process is adopted to enhance the antioxidant properties of membrane components, allowing fungicides to be directly added to the membrane components online, achieving complete bacteria-free status of the reverse osmosis host.

Model	Water production amount		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
HOR22-8040	9000	34.0	99.5	400	37.2	28
HOR21-4040	2200	8.3	99.5	90	8.4	28

Test condition:

Operating pressure 225 psi (1.55 MPa), 2000 mg/L NaCl solution, temperature 25°C, pH 7.0 ±0.5, recycle rate: 15%, min. Desalination rate HOR22-8040 99.4%, HOR21-4040: 99.2%

Use condition:

Max. Operating	600 psi (4.14 MPa)				
Max. inlet flow	4040-16 gpm (4.42 m ³ /h)				
Max. inlet temperature	45°C				
Max. Inlet SDI15	5				
Inlet free chlorine concentration	<0.1 mg/L				
Max. pressure difference for single	15 psi (0.1 MPa)				
Chemical cleaning pH range	2-12	Operating inlet pH range	3-10		

Note: Water production amount ±20% for single membrane component

2.11 RO Membrane Component SW Series for Seawater Desalination

The membrane components series for seawater desalination achieve a performance balance between desalination rate and water production amount through precise control of layer separation. They optimize configuration design of membrane components, and improve component pressure bearing capacity. With the characteristics of stable performance, low voltage energy saving, and complete specifications, these series can be used for small-scale seawater desalination equipment, large-scale seawater desalination projects, high salt water concentration reduction, and concentration of high concentration materials.

Model	Water production amount		Stabilized removal	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
SW8040XHR-400	6000	22.7	99.85	400	37.2	28
SW8040XHR-440	6600	25.0	99.85	440	40.9	28
SW8040FR-400	8200	31.0	99.8	400	37.2	34
SW8040HR-400	7500	28.4	99.8	400	37.2	28
SW8040HR-440	8250	31.2	99.8	440	40.9	28
SW8040LE-400	9000	34.0	99.8	400	37.2	28
SW8040LE-440	9500	35.9	99.8	440	40.9	28
SW8040XLE-400	11000	41.6	99.7	400	37.2	28
SW8040XLE-440	12100	45.8	99.7	440	40.9	28
SW4040HR	1600	6.1	99.8	90	8.4	28
SW4040LE	1900	7.2	99.7	90	8.4	28
SW11-40211	750	2.8	99.5	33	3.1	28
SW11-25211	270	1.0	99.5	12	1.1	28
SW11-2540	600	2.3	99.5	28	2.6	28
SW21-2540	700	2.6	99.7	28	2.6	28

Test condition:

Operating pressure 800 psi (5.52 MPa), 32000 mg/L NaCl solution, temperature 25°C, pH 8, recycle rate: 8%. Operating pressure 800 psi (5.52 MPa), 32000 mg/L NaCl solution, temperature 25°C, pH 8, recycle rate: 4%

Min. desalination rate

SW8040XHR-400, SW8040XHR-440: 99.75%

SW8040FR-400, SW804HR-400, SW8040HR-440, SW8040LE-400, SW8040LE-440, SW4040HR: 99.7% SW8040XLE-400, SW8040XLE-440, SW4040LE, SW21-2540: 99.6%

SW11-4021, SW11-2521, SW11-2540: 99.3%

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)		
Max. inlet flow	8040-75gpm(17m ³ /h) 4040、4021-16gpm(3.6m ³ /h)2521、2540-6gpm(1.4m ³ /h)		
Max. inlet temperature	45°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	1-13	Operating inlet pH range	2-11

Note: Water production amount ±20% for single membrane component

2.12 Hot Disinfection RO Membrane SHD Series

SHD hot disinfection reverse osmosis membrane is a type of product developed for the use of pasteurization in the food and pharmaceutical industries. The product uses a hygienic grid shell and accessories, which can eliminate the dead water zone between the membrane component and the membrane shell. The product has obtained the Hygiene License for Drinking Water Hygiene and Safety Products.

Model	Water production amount		Stabilized removal rate	Membrane area		Water inlet grid
	GPD	m ³ /d		ft ²	m ²	
VHD-8040/34G	9000	34.0	98.0	400	37.2	34
VHD-4038G	2100	7.9	98.0	90	8.4	28

Test condition:

Operating pressure of 150 psi (1.03 MPa), 2000 mg/L NaCl solution, temperature 25°C, pH 7.0 ± 0.5, recovery rate: 15%

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)		
Max. inlet flow	8040-75 gpm (17 m ³ /h) 4038-16 gpm (3.6 m ³ /h)		
Max. inlet temperature	85°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	2-12	Operating inlet pH range	3-10

Note: Water production amount ±20% for single membrane component

3 Nanofiltration Membrane Component

3.1 Municipal NF Membrane Component Tapurim Series

The Tapurim series nanofiltration membrane components can remove organic matter, microorganisms, viruses, and most divalent and above metal ions from water, while retaining some sodium, potassium, calcium, and magnesium ions.

TAPU-LS is mainly used for the removal of organic matter, retaining most of the monovalent ions in water, and is suitable for low salt concentration water sources.

TAPU-MS improves the removal of monovalent ions while ensuring the removal rate of organic matter, making it suitable for the removal of organic and inorganic matter in medium salt concentration water sources.

TAPU-HS chloride removal rate is 80-95%, suitable for the removal of organic and inorganic substances in water sources with medium and high salt concentrations.

- Controllable separation layer pore size technology, developing membrane components suitable for different water qualities to meet the needs of healthy drinking water.

- Adopting a brand new LD low pressure difference 34mil inlet grid, it improves pollution resistance while reducing energy consumption.

- The entire series has obtained the Hygiene License Approval for Drinking Water Hygiene and Safety, ensuring the safe use of membrane components.

Model	Water production amount		Sulfate removal rate	TOC removal rate	Membrane area	
	GPD	m ³ /d	%	%	ft ²	m ²
TAPU-LS	12000	45.5	95	90	400	37.2
TAPU-MS	9000	34.1	95	90	400	37.2
TAPU-HS	8000	30.3	95	90	400	37.2
TAPU4040-LS	2200	8.3	95	90	85	7.9
TAPU4040-MS	2000	7.6	95	90	85	7.9
TAPU4040-HS	1700	6.4	95	90	85	7.9

Test condition:

Operating pressure of 70 psi (0.48 MPa), mixed solution of NaCl, MgSO₄ and CaCl₂, temperature 25°C, pH 7.0±0.5, recycle rate: 15%

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)		
Max. inlet flow	8040-75 gpm (17 m ³ /h), 4040-16 gpm (3.6 m ³ /h)		
Max. inlet temperature	45°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	<0.1 mg/L		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	2-12	Operating inlet pH range	3-10

Note: Water production amount ±20% for single membrane component

3.2 Material Separation NF Membrane Component MASE Series

Material separation nanofiltration membrane is mainly used for the separation, hardness removal, and denitrification of monovalent and divalent salts in aqueous solutions, as well as the separation and concentration of liquid materials, with a molecular weight cutoff of 200-800 daltons.

MASE-SP intercepts some multivalent ions while allowing monovalent ions to pass through, making it suitable for purifying high concentration saltwater.

MASE-SL allows monovalent ions to pass through while removing multivalent ions and organic matter, making it suitable for the purification, decolorization, and organic matter removal of high concentration saltwater.

MASE-PS has a moderate removal rate for monovalent ions and is suitable for removing organic compounds such as insecticides and herbicides in high salinity water. MASE-CR has a high removal rate for monovalent ions and is suitable for reverse osmosis concentrated water recovery with salt content of 5000-10000mg/L.

- The patented U-shaped water distribution end cover allows a more even distribution of hydraulic load on the end face, reducing the accumulation of pollutants.
- The new LD low pressure difference 34mil inlet grid improves pollution resistance while reducing energy consumption.
- The end cap adopts hot melt rotary welding technology to enhance the

structural strength of membrane component to ensure its stable operation in high-pressure environments.

- High precision rolling technology, low resistance structure during water production, reduces the overall pollution rate of membrane components. Maximize membrane component efficiency and effectively reduce operating costs.

Model	Water production amount		Removal rate	Membrane area	
	GPD	m ³ /d	%	ft ²	m ²
MASE-SP	12000	45.4	92	400	37.2
MASE-SL	12000	45.4	98	400	37.2
MASE-PS	12000	45.4	98.5	400	37.2
MASE-CR	12000	45.4	95	400	37.2

Test condition:

Operating pressure 100 psi (0.69 MPa), 2000 mg/LMgSO₄ solution, temperature 25°C, pH 7.0±0.5, recycle rate: 15%

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)
Max. inlet flow	75 gpm (17 m ³ /h)
Max. inlet temperature	45°C
Max. Inlet SDI ₁₅	5
Inlet free chlorine concentration	<0.1 mg/L
Max. pressure difference for single membrane	15 psi (0.1 MPa)

Chemical cleaning pH range	2-12	Operating inlet pH range	3-10
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Note: Water production amount $\pm 20\%$ for single membrane component



SEP

3.3 High Pressure NF Membrane Component MASE 80 Series

The MASE 80 series high-pressure nanofiltration membrane components are suitable for the purification, separation, and concentration of high concentration saltwater, with an operating pressure of up to 80 bar.

Model	Water production amount		Removal rate	Membrane area	
	GPD	m ³ /d	%	ft ²	m ²
MASE-SL 80	8200	31.0	98	370	34.5
MASE-CR 80	9500	35.9	95	370	34.5

Test conditions:

Operating pressure 100 psi (0.69 MPa), 2000 mg/L MgSO₄ solution, temperature 25°C, pH 7.0±0.5, recovery rate: 15%.

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)				
Max. inlet flow	75 gpm (17 m ³ /h)				
Max. inlet temperature	45°C				
Max. Inlet SDI ₁₅	5				
Inlet free chlorine concentration	<0.1 mg/L				
Max. pressure difference for single membrane	15 psi (0.1 MPa)				
Chemical cleaning pH range	2-12	Operating inlet pH range	3-10		

Note: Water production amount ±20% for single membrane component

3.4 SEP-NF Series of NF Membrane Components for Water Treatment

Water treatment nanofiltration membrane components are mainly used for purification of drinking water and industrial water, as well as wastewater purification treatment.

Model	Water production amount		Removal rate	Membrane area	
	GPD	m ³ /d		ft ²	m ²
SEP-NF1-8040	10000	37.9	≥ 98	400	37.2
SEP-NF2-8040	10500	39.7	≥ 97	400	37.2
SEP-NF1-4040	2000	7.5	≥ 98	90	8.4
SEP-NF2-4040	2400	9.1	≥ 97	90	8.4
SEP-NF1-2540	650	2.46	≥98	28	2.6
SEP-NF2-2540	750	2.84	≥97	28	2.6

Test condition:

Operating pressure 100 psi (0.69 MPa), 2000 mg/LMgSO₄ solution, temperature 25°C, pH 7.0±0.5, recycle rate: 15%

Use condition:

Max. Operating pressure	600 psi (4.14 MPa)
Max. inlet flow	8040-75 gpm (17 m ³ /h) 4040-16 gpm (3.6 m ³ /h) 2540-6 gpm (1.4 m ³ /h)
Max. inlet temperature	45°C
Max. Inlet SDI ₁₅	5
Inlet free chlorine concentration	<0.1 mg/L

Max. pressure difference for single membrane component	15 psi (0.1 MPa)		
Chemical cleaning pH range	2-12	Operating inlet pH range	3-10

Note: Water production amount $\pm 20\%$ for single membrane component



3.5 Acid Resistant NF Membrane Component Acidstab NF Series

The Acidstab NF series acid resistant nanofiltration membrane is mainly used for separating metal ions/inorganic salts in acid solutions, achieving purification and recovery of acid solutions, suitable for use in 20% ($\omega/\%$) hydrochloric acid, nitric acid, and sulfuric acid, with a cut-off molecular weight of around 200 daltons.

Model	Water production amount		Removal rate	Membrane area	
	GPD	m ³ /d		ft ²	m ²
Acidstab NF-8040	3700	14.0	97	350	32.5
Acidstab NF-4040	900	3.4	97	83	7.7
Acidstab NF-2540	200	0.76	97	25	2.3

Test conditions:

Operating pressure 110 psi (0.76 MPa), 2000 mg/L MgSO₄ solution, temperature 25°C, pH 7.0±0.5, recovery rate: 15%.

Use condition:

Max. Operating pressure	510 psi (3.5 MPa)		
Max. inlet flow	8040-75 gpm (17 m ³ /h) 4040-16 gpm (3.6 m ³ /h) 2540-6 gpm (1.4 m ³ /h)		
Max. inlet temperature	45°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	< 0.1 ppm		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	0-11	Operating inlet pH range	0-11

Note: Water production amount ± 15% for single membrane component

3.6 Alkali Resistant NF Membrane Component Alkalistab NF Series

The Alkalistab NF series nanofiltration membrane is suitable for treating solutions with pH 5~14 and not suitable for extreme liquid indicated with pH. The Alkalistab NF series nanofiltration membrane can realize stable separation in strong alkaline solutions such as 20% ($\omega/\%$) NaOH and KOH, and has a unique patented membrane polymerization process and large flux design, ensuring the economic and environmental benefits for enterprises.

Model	Water production amount		Removal rate	Membrane area	
	GPD	m ³ /d		ft ²	m ²
Alkalistab NF-8040	3600	13.6	97	350	32.6
Alkalistab NF-4040	800	3.0	97	83	7.7
Alkalistab NF-2540	190	0.72	97	24	2.2

Test conditions:

Operating pressure 110 psi (0.76 MPa), 2000 mg/LMgSO₄ solution, temperature 25°C, pH 7.0±0.5, recycle rate: 15%

Use condition:

Max. Operating pressure	510 psi (3.5 MPa)		
Max. inlet flow	8040-75 gpm (17 m ³ /h)		4040-16 gpm (3.6 m ³ /h)
	2540-6 gpm (1.4 m ³ /h)		
Max. inlet temperature	45°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	< 0.1 ppm		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	0-14	Operating inlet pH range	0-14

Note: Water production amount ±15% for single membrane component

4 Ultrafiltration Membrane Component

4.1 SEP-UF Series Roll Type UF Membrane Component

The roll-type ultrafiltration membrane component is mainly used for the separation and concentration of specific materials. The product has a molecular weight cut-off of 4k, 6k, 8k, 10k, 20k, 67k daltons. The inlet grid includes 31, 46 and 90 mil, and can be selected from conventional fiberglass shell and sanitary shell.

Model	Water production amount		Membrane area		Test solution type
	GPD	m ³ /d	ft ²	m ²	
SEP-UF8040-4K/31F	6000	22.7	400	37.2	PEG4000
SEP-UF8040-6K/31F	6500	24.6	400	37.2	PEG6000
SEP-UF8040-8K/31F	9500	35.9	400	37.2	PEG8000
SEP-UF8040-10K/31F 1	7000	26.5	400	37.2	PEG10000
SEP-UF8040-20K/31F 1	10500	39.7	400	37.2	PEG20000
SEP-UF8040-67K/31F 2	25000	94.6	400	37.2	Bovine serum protein

Test condition:

Operating pressure 60 psi (0.41MPa), 1000 mg/L test solution, temperature 25°C, recovery rate: 15%

¹Operating pressure 40 psi (0.28 MPa), 1000 mg/L test solution, temperature 25°C, recovery rate: 15%

²Operating pressure 40 psi (0.28 MPa), 300 mg/L test solution, temperature 25°C, recovery rate: 15%

Use condition:

Max. Operating pressure	300 psi (2.07 MPa)		
Max. inlet flow	84 gpm (19 m ³ /h)		
Max. inlet temperature	40°C		
Max. Inlet SDI ₁₅	5		
Inlet free chlorine concentration	< 0.1 ppm		
Max. pressure difference for single membrane	15 psi (0.1 MPa)		
Chemical cleaning pH range	2-12	Operating inlet pH range	3-10

Note: Water production amount ±20% for single membrane component

4.2 SMR Series Flat UF Membrane Component

The SMR series flat membrane component consists of filter membrane, guide cloth, and guide plate. A water outlet is set at the top of the guide plate, and porous filter membrane made of polyvinyl chloride with a pore size of 0.1um is welded on both sides of the guide plate. The filtered water is extracted from the water outlet.

Model	SMR 88	SMR160
Effective membrane area (m ²)	0.88	1.6
Width × Height × Thickness (mm)	490×1000×7	515×1750×7
Weight (kg)	2.34	3.73
Average pore diameter (μm)	0.1	
Water output L/(pcs/day)	350~520	640~960
Aeration L/(pcs/day)	≥8	
pH	3~12	
Effluent turbidity [NTU]	<1.0	
Suspended solids in effluent [SS]	≤ 1	

Note: This parameter refers to the initial filtration flux of a single membrane component when MBR is used to treat municipal wastewater under conditions of 25°C and vacuum suction condition less than -20KPa. The unit is liter/(pcs/day).

4.3 SEP-UF Series Hollow Fiber Pressure UF Membrane Component

Hollow fiber ultrafiltration membranes are mainly used to remove suspended solids, colloids, microorganisms, macromolecular organic compounds, bacteria, viruses and etc. from aqueous solutions. They are widely used in purification treatments such as tap water, seawater desalination, and purification treatment before wastewater reuse.

Performance parameter table of external pressure ultrafiltration membrane

Membrane component model	Effective membrane area	Designed flux	Nominal pore diameter	Membrane material	Production process
	m ²	LMH	μm		
SEP-UF-28601	51	30~ 120	0.02	PVDF	NIPS
SEP-UF-28801	77	30~ 120	0.02	PVDF	NIPS
SEP-UF-2860T2	51	35~ 120	0.08	PVDF	TIPS
SEP-UF-2880T2	77	35~ 120	0.08	PVDF	TIPS

Use condition:

Max. operating pressure	0.60 MPa
Max. backwash pressure	0.25 MPa
Max. inlet temperature	40°C
¹ Max. transmembrane pressure difference	0.20 MPa
² Max. transmembrane pressure difference	0.30 MPa
pH range	2-11

Performance parameter table of internal pressure ultrafiltration membrane

Membrane component model	Effective membrane area	Designed flux	Nominal pore diameter	Membrane material	Production process
	m ²	LMH	μm		
SEP-UF-i1066	50	40~200	0.02	PES	NIPS
SEP-UF-i1066X	60	40~200	0.02	PES	NIPS

Use condition:

Max. operating pressure	0.50 MPa
Max. backwash pressure	0.25 MPa
Max. inlet temperature	40°C
Max. transmembrane pressure difference	0.20 MPa
pH range	2-11

4.4 SEP-UF Series Hollow Fiber MBR Membrane

Membrane component model	Effective membrane area	Designed flux	Nominal pore diameter	Membrane material	Production process
	m ²	LMH	μm		
SEP-UF-ME32	32	5~30	0.03	PVDF+PET	NIPS
SEP-UF-ME34	34.4	5~30	0.03	PVDF+PET	NIPS
SEP-UF-ME40	40	5~30	0.03	PVDF+PET	NIPS

Use condition:

Max. inlet temperature	40°C
Range of membrane pressure difference	0.20 MPa
pH tolerance range	2-11

4.5 SEP-UF Hollow Fiber Submerged UF Membrane

Membrane component model	Effective membrane area	Designed flux	Nominal pore diameter	Membrane material	Production process
	m ²	LMH	μm		
SEP-UF-S35	35	25~60	0.02	PVDF	NIPS

Use condition:

Max. inlet temperature	40°C
Range of membrane pressure difference	90 kPa
pH tolerance range	2-12

5 Notes on Membrane Component Storage and Usage

5.1 Dry Roll Type Membrane Component

SES Environmental Protection Co., Ltd. (hereinafter referred to as "SEP") provides a full range of dry membrane components. Compared with wet membrane components, the advantage of dry membrane components is that they are easy to transport and install, and have a longer shelf life than wet membrane components.

Comparison between Dry and Wet Membrane Components

	Dry Membrane Component	Wet Membrane Component
Protection liquid	No need	1% (w/%) sodium hydrogen sulfite, need to replace regularly (90 days or shorter time)
Storage temperature	Less than 45°C	0°C~45°C
Micro-organisms breeding	No	Easy to breed (if protection liquid is not replaced in time)
Transport and others	Light weight, easy for transportation, low cost	Heavy, not convenient for transportation, high cost

5.2 Precautions for Dry Membrane Components Usage

(1) 5.2.1 Storage of Dry Membrane Component

1. There shall be dry and cool, no direct sunlight in the storage place.
2. The temperature of storage place shall be no higher than 45°C.

(2) 5.2.2 Notes

- Dry membrane components need to be used for at least 6 hours before they can be disinfected with formaldehyde;
- The extreme use conditions and design guidelines for dry membrane components are the same as those for wet membrane components of the same model;
- Once the dry membrane component becomes wet and transforms into a wet membrane component, it should always be kept moist, and its storage, protection, and cleaning should be carried out according to the processing methods for wet membrane component;
- The initial debugging and operation steps of reverse osmosis system should follow the instructions in the Use and Maintenance of Reverse Osmosis System section of SES Environmental Protection Product and Technical Manual. The produced water and concentrated water should be discharged within the first hour of operation;
- During the continuous operation of reverse osmosis membrane series, when the pH value is larger than 10, the maximum inlet water temperature shall not exceed 35°C;



- For the recommended design scope, please refer to the latest version of SES Environmental Protection's technical manual and design guidelines, or consult with membrane technology experts. If the user does not strictly follow the operating conditions provided in this sample, SEP will not bear any consequences arising therefrom;
- It is prohibited to add any chemical agents that may affect the membrane components during storage and operation. If such chemical agents are used in violation, SEP will not bear any consequences arising therefrom;
- The data and information provided by SEP in this sample have been obtained through long-term experiments, and we are confident that these data and information are accurate and effective. Customers are requested to strictly follow the design, usage, and maintenance requirements of the product and keep relevant data records; SEP shall not be liable for any consequences arising from customers' failure to use and maintain the product in accordance with the conditions provided in this sample;
- When using membrane components for the first time, it is recommended to first rinse them with low pressure for 15-25 minutes (not suitable for soaking or overnight soaking), and then rinse them with high pressure for 60-90 minutes (the water production amount should not be less than 50% of the system's designed water production amount). During the first hour of membrane component



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operation, all produced and concentrated water should be discharged;

- It is prohibited to add any chemical agents that may affect the membrane components during storage and operation. If such chemical agents are used in violation, SEP will not bear any consequences arising therefrom;
- Due to technological advancements and product updates, product information may change at any time without prior notice.



6 Quality Assurance and Service

6.1 3-year Quality Assurance Certificate for Reverse Osmosis Membrane Components

SEP provides guarantee service for the quality of reverse osmosis membrane components produced and sold by us, and provide a 3-year limited quality guarantee, on the condition that the use comply with the design and operating conditions proposed by SEP.

6.2 Guarantee of Manufacturing Process and Materials

SEP guarantees that the reverse osmosis components it produces and sells are in good condition in terms of manufacturing processes and materials. Under the condition that the buyer correctly uses and maintains the membrane components based on the technical documents provided by SEP, if there are quality problems in the manufacturing process and materials, SEP shall bear the guarantee obligation of 12 months from the arrival of the product at the buyer's designated location or port. When SEP discovers defects during inspection according to this clause, the company shall provide a solution after product identification.

6.3 Performance Guarantee

1. According to the test conditions specified in the product sample, the new membrane product has the initial performance specified in the product sample;

2. SEP provides a 3-year warranty period for the performance of membrane components, starting from the date when the reverse osmosis membrane components are put into use or from the date when the membrane

components are shipped and shipped for 6 months (whichever is earlier).

During this period, SEP provides the following guarantees:

Performance during the 3-year limited warranty period

(1) When used or tested under the standard testing conditions specified in the product manual of SEP, the salt passage shall not exceed twice the minimum value specified in the product manual under pressure conditions that reach the initial average water production rate.

(2) When used or tested under the testing conditions specified in the product manual of SEP, the average water production shall not be less than 70% of the minimum value specified in the product manual.

Initial performance

The minimum water production amount and removal rate of membrane components guaranteed by SEP are listed in the product manual, and these parameters are obtained under the standard testing conditions specified by SEP. If test data of membrane components does not reach the specified minimum value, SEP will repair or refund the purchase cost of defective components after confirming the performance defect. In this case, the shipping cost will be paid by SEP.

If any of the following situations are not met by the buyer, SEP will not fulfill the 3-year limited warranty liability mentioned above:

(1)The turbidity of membrane component' s feedwater is ≤ 1.0 NTU, SDI15 is ≤ 5 (15min, 30psi), and the feedwater temperature is $\leq 45^{\circ}\text{C}$;

(2) The feed water for membrane components should not contain harmful substances that may cause physical and chemical damage to membrane components;

(3) Before installation or use, the membrane components should be stored in their original vacuum packaging bags, away from direct sunlight. The storage temperature for unused dry membrane components should be $\leq 45^{\circ}\text{C}$, and the storage temperature for wet membrane components should be between 0°C and 45°C ; When the temperature is low, during the shutdown of reverse osmosis system, the membrane components inside the system should be avoided from freezing;

(4) During normal operation, the pH range of membrane component inlet water is 3-10 (based on the pH range specified in the latest product manual); During the short-term chemical cleaning period, the pH range of inlet water for membrane component is 2-12 (based on the pH range specified in the latest product manual);

(5) The water supply for membrane components should not contain oxidizing substances such as chlorine gas, potassium permanganate, and hypochlorite ions (note: for this clause, HOR anti-oxide membrane components shall comply with the water supply requirements for anti-oxide film components);

(6) The maximum operating pressure of membrane components is shown in the following table (unless otherwise specified in the product description):



Membrane series	Max. Operation pressure
XLP series ultra low voltage membrane components	600 psi
ULP series ultra low voltage membrane components	600 psi
LP series low voltage membrane components	600 psi
SW series seawater desalination membrane components	1200 psi
ZERO-HP series high-pressure reverse osmosis membrane components	1200 psi
FR&PURO series low pollution membrane components	600 psi
HOR series anti-oxidation membrane components	600 psi
ZERO-UHP series ultra-high pressure reverse osmosis membrane components	1740psi

(7) In any case, the back pressure generated on the membrane component shall not exceed 5 psi, and water hammer impact on the membrane component shall be avoided during system operation;

(8) When the system performance degrade by 10% under standard conditions, or when membrane fouling or scaling occurs, it should be cleaned promptly according to the defined procedures;

(9) The system composition and design parameters such as membrane components arrangement, instrument configuration, and recovery rate should be consistent with reasonable engineering design; SEP shall not be held responsible for any damage to the membrane components caused by improper

installation by the buyer;

(10) The seller is responsible for providing users with system operation and maintenance manuals, and providing corresponding training for operation and management personnel to ensure that users have the ability to clean the system, restore other system performance, and diagnose faults;

(11) Users must regularly and systematically record standardized performance data for the entire system and subsystems, ensuring that the data is true, complete, and continuous, and archive the data for future reference. When making a claim for compensation to SEP in accordance with warranty terms, these materials will be the basis for SEP to fulfill its performance guarantee.

The composition conditions of reverse osmosis (RO) system:

① The complete and effective pre-treatment, arrangement of membrane components, setting of instruments and gauges, design standards and accessories of equipment should all comply with SEP reverse osmosis membrane design guidelines and relevant technical standards. SEP has the right to inspect whether the design complies with the design guidelines and relevant technical standards.

② The reverse osmosis system should have appropriate devices and protective measures to prevent the generation of microorganisms and other pollutants during operation and shutdown storage.

Raw water condition:

① The inlet of the reverse osmosis system must ensure that there are no colloidal substance, microorganisms, or other sediments adhering to the surface of reverse osmosis membrane.

② Reverse osmosis membranes should not be damaged by harmful chemicals such as non-ionic or cationic surfactants, organic solvents, oils and grease, polymers, etc.

③ Raw water should not contain strong oxidizing substances such as ozone, chlorine, potassium permanganate, etc.

④ The temperature of the incoming water should be below 45°C.

⑤ The SDI15 of raw water entering reverse osmosis system should always be less than 5, the maximum turbidity of feed water should be less than 1.0 NTU, and the turbidity of feed water during continuous operation should be controlled between 0.3~0.5NTU. SDI15<3 is better.

⑥ Raw water should not contain gelatinous sulfur.

Operation condition:

① The most suitable system water recovery rate for reverse osmosis equipment during operation should be determined based on the precipitation of insoluble substances.

② The RO system should ensure that calcium, magnesium, barium, strontium, silicon, etc. do not form dirt in the membrane system during operation.

③The RO system should have a dedicated device to prevent water hammer from the high-pressure pump from acting on the reverse osmosis membrane during start-up and operation.

④ The reverse osmosis system should use chemical agents recommended or allowed by SEP. If chemical agents not recommended by SEP are used, the consent of SEP should be obtained first.

Cleaning condition:

Please refer to the membrane component cleaning guidelines

Precautions during the use of reverse osmosis membranes:

For the recommended design scope, please refer to the latest version of SEP technical manual and design guidelines, or consult with membrane technology experts. If the user does not strictly follow the operating conditions provided in this sample, SEP will not afford any consequences arising therefrom.

The storage of membrane components should comply with the regulations in the product manual, and dry membrane components should be kept moist at all times after being wetted; The wet membrane component is stored using sodium hydrogen sulfite protection solution that is configured with RO produced water and 1.0% food grade sodium hydrogen sulfite (adding 10% propylene glycol antifreeze in winter), and then vacuum packaged. To prevent the growth of microorganisms during short-term storage, transportation, and system standby, it is recommended to soak the components in a protective

solution containing 1.0% sodium hydrogen sulfite (food grade) (prepared with RO produced water).

The RO produced water and concentrated water in the first hour of operation should be discharged.

It is prohibited to add any chemical agents that may affect the membrane components during storage and operation. SEP will not be held responsible for any consequences arising from the violation of using such chemical agents.

For the first-time flushing of membrane components, it is recommended to use qualified pre-treated water for low-pressure flushing for 15-25 minutes (not suitable for soaking or overnight soaking), and then high-pressure flushing for 60-90 minutes (with a water production amount no less than 50% of system designed water production amount). During low-pressure flushing, it is not allowed to add scale inhibitors. During high-pressure operation flushing, scale inhibitors should be added. During the flushing process, the produced water and concentrated water should be discharged.

Guarantee Notice:

Any failure or refusal to provide complete usage and operating parameters of SEP reverse osmosis membrane products to SEP will cause all warranties invalid except for material and manufacturing guarantees.

The warranty excludes any indirect, punitive, consequential, joint or special liability for damages.

7 Repair and Return Procedure

If the customer really needs to repair and return the reverse osmosis components, please follow the procedures of SEP below:

7.1 Membrane Component Repair Procedure:

Before repairing, it is necessary to contact the regional sales manager of SEP and obtain their approval before proceeding.

The repair, return, and inspection procedures can be divided into 2 ways: technical staff from SEP will go to the customer's site for inspection, or the customer send the membrane components back to SEP for inspection.

1. If technical staff from SEP will go to the customer's site for inspection, then:

(1) After testing, if the problems are indeed caused due to the membrane materials and production process by SEP during the warranty period, SEP will afford all the testing costs, and the customer can receive membrane components from SEP that meet technical standards for compensation. The shipping cost will be afforded by SEP.

(2) After testing, for any problems caused by non-SEP membrane materials and production processes during warranty period, the customer shall bear all the costs of testing and replacing membrane components, and the shipping cost shall be afforded by the customer.

(3) For membrane components that exceed the warranty period, the customer shall bear all the costs of testing, replacing the membrane

components, and shipping.

2. If the customer sends the membrane components back to SEP, then:

(1) Customers should fill out the Registration Form for Repair, Return, and Exchange of Membrane Components and return it to SEP Regional Sales Manager via email or fax. After confirmation by the Regional Sales Manager of SEP, customers will be notified by fax to return the membrane components.

(2) When returning the membrane components, customer should also provide the following information:

- Membrane component model, serial number, and purchase contract number;
- Detailed fault description;
- All data with regard to the performance of returned membrane components, such as removal rate, temperature, pressure, salt concentration in feed water, flow rate of produced water and etc.

7.2 Package and Transportation

① Before transportation, customers should protect and store different types of membrane components according to the terms and conditions specified in the technical notice of SEP.

② During transportation, membrane components should be packed in sealed plastic bags and placed in cardboard boxes to avoid mechanical damage. At the same time, moisture-proof and sun protection measures should be taken.

③ Customers should send out the membrane components as soon as possible after receiving the repair notice from SEP to avoid any changes in membrane component performance caused by prolonged storage time.

7.3 Test Procedure

① If it is necessary to conduct destructive experiments on the returned membrane components for technical testing, the regional sales manager of SEP will contact the customer and conduct destructive experiments after obtaining their authorization.

② For membrane components during the warranty period, if the test results show that the problem is not caused by the membrane material or production process, the customer will afford all the testing costs on their own and will not receive compensation from SEP. SEP will handle the membrane components according to customer instructions or send them back at the customer's expense.

③ If the test results show that there are indeed material and production process defects existing, SEP will afford the test costs. At the same time, customers can receive membrane component for compensation from the company that meet technical standards, and the shipping costs will be borne by SEP.

④ For membrane components that exceed the warranty period, the customer shall afford all the costs of testing, replacing the membrane components, and shipping.

7.4 Appendix

① If SEP does not receive the membrane components within the specified time, the customer will be notified that the repair procedure has ended. The specified time is within 30 days after the customer receives the Registration Form for Repair, Return, and Exchange of Membrane Components signed by regional sales manager.

② If any of the following situations occur, the quality assurance will be invalidated:

- There is no SEP serial number on the membrane component;
- It can be seen that the membrane components are significantly contaminated by water quality in use;
- Visible mechanical damage caused by membrane components in use;
- Damage to membrane components caused by improper storage and transportation;
- The membrane components were modified without authorization from SEP.



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