BRACKISH WATER RO MEMBRANES

ESPA®

Performance for Ultra Low Pressure Membranes

Element Type	Min. Salt Rej.,%	Nom. Salt Rej.,%	Permeate Flow GPD	(m3/d)
ESPA1-4040	99.0	99.3	2,600	(9.8)
ESPA2-4040	99.4	99.6	1,900	(7.2)
ESPA3-4040	98.0	98.5	3,000	(11.4)
ESPA4-4040	99.0	99.2	2,500	(9.4)
ESPA1	99.0	99.3	12,000	(45.4)
ESPA2	99.5	99.6	9,000	(34.1)
ESPA2-365	99.5	99.6	8,200	(31.0)
ESPA2+*	99.5	99.6	12,000	(45.4)
ESPA3	98.0	98.5	14,000	(53.0)
ESPA4**	99.0	99.2	12,000	(45.4)
ESPA-B*	99.0	99.2	8,600	(32.6)

*Boron Rej. @ pH = 10 is 93% for ESPA2+ and 96% for ESPA-B
**ESPA4 NaCl Solution tested at 500 PPM; tested at 100 psig

Selected ESPA Project References:

Ulu Pandan, Singapore	44 MGD (167,000 m3/d) of industrial water from a waste water source
Orange County, California	70 MGD (265,000 m3/d) of reclaimed wastewater for a seawater intrusion barrier
Alameda County Water	8 MGD (30,200 m3/d) of potable water from a well water source

LFC®

Performance for Low Fouling Membranes

Element Type	Min. Salt Rej.,%	Nom. Salt Rej.,%	Permeate Flow GPD	(m3/d)
LFC1	99.2	99.5	11,000	(41.63)
LFC3	99.5	99.7	9,500	(35.96)
LFC3-LD	99.5	99.7	11,000	(41.6)

Selected LFC Project References:

Kranji, Singapore	10.5 MGD (40,000 m3/d) of industrial water from a wastewater source
Bedok, Singapore	8.5 MGD (32,000 m3/d) of industrial water from a wastewater source
LaSolana, Spain	1.3 MGD (4,800 m3/d) of industrial water from a surface water source

CPA

Performance for High Rejection Membranes

Element Type	Min. Salt Rej.,%	Nom. Salt Rej.,%	Permeate Flow GPD	(m3/d)
CPA2-4040	99.2	99.5	2,250	(8.5)
CPA2	99.5	99.7	10,000	(37.9)
CPA3	99.6	99.7	11,000	(41.6)
CPA4	99.5	99.7	6,000	(22.7)

Selected CPA Project References:

Kill Devil Hills, NC	2 MGD (7,600 m3/d) of potable water from a brackish well water source
Englewood Water District, FL	4 MGD (15,000 m3/d) of potable water from a brackish well water source
Muznib, KSA	3.2 MGD (12,000 m3/d) of potable water from a brackish ground water source

Test Conditions for ESPA, LFC and CPA

The stated performance is initial (data taken after 30 minutes of operation), based on the following conditions:

NaCl Solution, PPM*	1500
Applied Pressure, LFC, CPA, psig (MPa)	225 (1.55)
Applied Pressure ESPA, psig (MPa)	150 (1.05)
Applied Pressure ESPA4, psig (MPa)	100 (0.69)
Operating Temperature, °F(°C)	77° (25°)
Permeate Recovery	15%
pH Range	6.5-7.0

Application Data

Maximum Applied Pressure psig (MPa)	600 (4.16)
Maximum Feed Flow, GPM (m^3/h)	4 inch -16 (3.6), 8 inch -75 (17.0)
Maximum Operating Temperature, °F(°C)	113° (45°)
Feedwater pH Range**	3.0-10.0
Maximum Feedwater Turbidity, NTU	1.0
Maximum Feedwater SDI (15 mins)	5.0
Maximum Chlorine Concentration, PPM	<0.1
Minimum Ratio of Concentrate to Permeate Flow for any Element	5:1
Maximum Pressure Drop for Each Element, psig	10

*ESPA4 NaCl Solution tested at 500 PPM
**See technical literature for extended pH tolerance

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Brackish Water Nanofiltration Membranes

Seawater RO Membranes

ESNA®

Performance for Low Fouling Membranes

Element Type	Min. Salt Rej.,%	Nom. Salt Rej.,%	Ca Rej. Brackish Water,%	Permeate Flow GPD	(m3/d)
ESNA1-LF-4040	80-95	89	96.0	1,750	6.6
ESNA1-LF	80-95	89	96.0	8,200	31
ESNA1-LF2	80-92	86	93.0	10,500	39.7

Test Conditions

$CaCl_2$ Solution, PPM	500
Applied Pressure, psig (MPa)	75 (0.52)
Operating Temperature, °F(°C)	77° (25°)
Permeate Recovery	15%
pH Range	6.5-7.0

Application Data

Maximum Applied Pressure, psig (MPa)	600 (4.16)
Maximum Chlorine Concentration, PPM	<0.1
Maximum Operating Temperature, °F(°C)	113° (45°)
Feedwater pH Range	3.0-10.0
Maximum Feedwater Turbidity, NTU	1.0
Maximum Feedwater SDI (15 mins) ESNA1-LF	5.0
Maximum Feedwater SDI (15 mins) ESNA1-LF2	4.0
Maximum Feed Flow, GPM (m^3/h) - 8 inch	75 (17)
Maximum Feed Flow, GPM (m^3/h) - 4 inch	16 (3.6)
Minimum Ratio of Concentrate to Permeate Flow for any Element	5:1
Maximum Pressure Drop for Each Element, psi	10

Selected ESNA Project References:

Boca Raton, Florida	40 MGD (151,500 m3/d) of potable water from a well water source
Hollywood, Florida	18 MGD (68,000 m3/d) of potable water from a well water source
Deerfield Bch., Florida	12 MGD (45,500 m3/d) of potable water from a well water source
Pompano Bch., Florida	10 MGD (37,800 m3/d) of potable water from a well water source
Fort Myers, Florida	12 MGD (45,400 m3/d) of potable water from a well water source

SWC membrane installation, 45 MGD (170,000 m^3/d) in Fujairah, U.A.E.

SWC®

Performance for Seawater Membranes

Element Type	Min. Salt Rej.,%	Nom. Salt Rej.,%	Permeate Flow GPD	(m3/d)
SWC1-4040	99.5	99.6	1,200	(4.6)
SWC3	99.5	99.7	5,900	(22.3)
SWC3+	99.7	99.8	7,000	(26.5)
SWC4+	99.7	99.8	6,500	(24.6)
SWC5	99.7	99.8	9,000	(34)

Test Conditions

The stated performance is initial (data taken after 30 minutes of operation), based on the following conditions:

NaCl Solution, PPM	32,000
Applied Pressure, psig (MPa)	800 (5.5)
Operating Temperature, °F(°C)	77° (25°)
Permeate Recovery	10%
pH Range	6.5-7.0

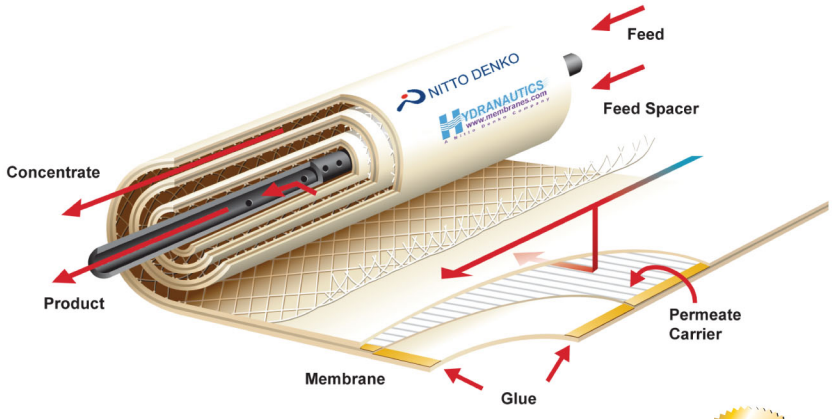
Application Data

Maximum Applied Pressure, 8 inch - psig (MPa)	1200 (8.27)
Maximum Applied Pressure, 4 inch - psig (MPa)	1000 (6.9)
Maximum Feed Flow, GPM (m^3/h)	4 inch: 16 (3.6), 8 inch: 75 (17)
Maximum Operating Temperature, °F(°C)	113° (45°)
Feedwater pH Range*	3.0-10.0
Maximum Feedwater Turbidity, NTU	1.0
Maximum Feedwater SDI (15 mins)	5.0
Maximum Chlorine Concentration, PPM	<0.1
Minimum Ratio of Concentrate to Permeate Flow for any 8 inch Element	5:1
Maximum Pressure Drop for Each Element, psig	10
Minimum Recovery for any Element (4 inch)	10%

*see technical literature for extended pH limits

Selected SWC Project References:

Beni Saf, Algeria	53 MGD (200,000 m3/d) of potable water from the Mediterranean Sea
Escombreras, Spain	17 MGD (65,000 m3/d) of potable water from the Mediterranean Sea
Fujairah, UAE	45 MGD (170,000 m3/d) of potable water from the Persian Gulf
Carboneras, Spain	32 MGD (120,000 m3/d) of potable water from the Mediterranean Sea
Cartagena, Spain	17 MGD (65,000 m3/d) of potable water from the Mediterranean Sea



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Hydranautics Corporate Office: 401 Jones Road, Oceanside, CA 92054
1-800-CPA-PURE Phone: 760-901-2500 Fax: 760-901-2578
E-mail: info@hydranautics.com, Website: www.membranes.com

Purchase mini elements from Hydranautics' licensed manufacturer:
Oltremare, Via Della Pineta, 23. 61032 Fano (PU) Italy
Tel: +39-0721-1796201 Fax: +39-0721-1796229
E-mail: info@oltremaremembrane.com Website: www.oltremaremembrane.com