

	X2 –3280 Written Specifications			
	Product Specification Number	ENG – XXX	Rev.	A
	Product Description	X2 – 3280 R.O. SYSTEM		
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General Description

The AXEON X2 – Series is designed to be a cost-effective reverse osmosis (RO) system for light industrial, 8” membrane applications with a capacity of 30 gallons per minute (GPM) or 43,200 gallons per day (GPD).

X2 – Series Models		
Model Number	Product Flow Rate*	Product Flow Rate*
X2-3280	30 GPM	43,200 GPD

*Product flow rates are based on 16.36 GFD flux for well water. These product flow rates may not be appropriate for other feedwater conditions. Warmer or colder water or use of different membrane elements may require a different pump.

The X2 – Series system is a mid-range model designed for OEMs and distributors servicing the water treatment industry. Certain models come with options from a select list of add-ons and upgrades, although some of the options are not included on this model.

The X2 – Series systems come pre-assembled and pre-wired for ease of installation and servicing. The simple design of the X2 – Series systems make them easy to use, cost effective and reliable water purification systems.

The X2 – Series systems are designed to treat brackish feedwater sources drawn from well water with total dissolved solids (TDS) levels of 7,000 ppm. The X2 – Series are built with SS Schedule 40 piping on the high pressure side. The equipment and components are recommended not to exceed the maximum operating pressure of 400 psi.

The production flow rate and corresponding feed pump pressure is based upon running RO projection software assuming a feedwater quality of total dissolved solids (TDS) levels of <7,000 PPM TDS at an inlet temperature of 77°F (25°C) with a silt density index (SDI) rating of less than 3 and turbidity below 1 NTU. An inlet feed pressure of at least 45 psi is assumed. A somewhat conservative average flux rate of 16.36 gpd per SF (GFD) was used assuming the typical membranes used will be 8” elements each with 440 SF.

Design Parameters

Configuration	Single Pass
Inlet Pressure Minimum / Maximum (PSI)	45 / 85
Design Feedwater Temperature (°F / °C)	77 / 25
Feedwater Source**	Product Flow rate for each model based on a nominal TDS of 7,000 ppm
Nominal Pre – Filtration Requirements	5 Micron Nominal
Feedwater Silt Density Index (SDI)	< 3
Nominal Membrane Salt Rejection (%)	99.8
Nominal System Recovery (%)	58 – 73

**Treatment ability of the reverse osmosis system is dependent on feedwater quality. Performance projections must be run for each installation.

Maintaining the minimum recommended concentrate flow generally establishes the system recovery rate. The recovery rate can be increased with the addition of the optional concentrate recycle loop. (Note: the recycle of

concentrate increases the feed TDS and therefore will have a somewhat “negative” impact on the production rate and quality of the permeate.)

Summary of Nominal Recovery Rate

Model Number	Standard Recovery (%)	Recovery w/Recycle (%)
X2-3280	70	N/A

Based on the RO projections for each model, the feed pump pressure was selected at 325 PSI (750 Ft. H2O). Assuming a minimum inlet pressure of 45 PSI and a maximum pressure drop of 15 PSI across the filter housing, the RO feed pump pressure would increase by at least 30 PSI to 355 PSI. If the inlet pressure were at 85 PSI, then the available RO feed pump pressure would be 400 PSI (maximum allowable operating pressure).

Basis for Pump Selection

The X2 – Series models come standard as 380V, 3PH, 50 HZ. Alternative options are as follows:

Model Number	Feed Flow Rate (GPM)	Pressure (ft H2O)	Grundfos Model (HP)
X2-3280	45	750	CRN15-17 A-FGJ-G-E-HQQE (20)

The performance of a membrane is characterized by its water permeability and salt rejection. The properties of a membrane are impacted by four parameters: the ppm TDS and temperature of the feedwater and the recovery and pressure that the RO system is operating at.

By design, the pump pressure will be generally limited to the range of ~ 345 to 400 PSI (depending on the inlet pressure.) Feedwater at a higher TDS than 7,000 ppm and/or at a colder temperature than 25°C (77°F) will require more pressure than the nominal conditions of 7,000 ppm and 25°C (77°F) and therefore produce a lower product flow rate (GPM).

Feedwater Requirements***

Maximum SDI Rating	< 3
Maximum Turbidity	1 NTU
Maximum Free Chlorine and/or Chloramines	0 ppm
pH (Continuous)	2 – 11
pH (Cleaning for 30 minutes)	1 – 13

***If any of the feedwater parameters are not within the limits given, consult Application Engineering for assistance.

Environment Parameters

Min Ambient Temperature °F (°C)	40 (4.4)
Max Ambient Temperature °F (°C)	120 (48.9)

Operating Parameters***

Feed Temperature °F (°C)	50 to 85 (10 to 30)
System Inlet Pressure (PSI)	45 to 85
Maximum Operating Pressure (PSI)	400

***If any of the feedwater parameters are not within the limits given, consult Application Engineering for assistance.

Regulations and Standards

Frame Welding	Plant standard
Seismic Rating	None
Piping	Unit is fully tested for normal operation and conditions

Mechanical Description

The major components of the system are supported by a 304 stainless steel frame and designed to provide ease of access for servicing, maintenance and monitoring system performance.

X2 – Series system model X2–3280 has a 2” plastomatic motorized valve, followed by a 316 SS Shelco filter housing containing four AXEON 5–micron 2.5” x 30” sediment filters. AXEON pressure gauges monitor filter inlet and outlet pressures. Following the pre–filter, a low pressure switch protects the pump from potential cavitation damage. If the pre–filter outlet pressure is satisfactory, the RO pump will turn on and the pressurized water will flow through the Filmtec HRLE-440 low energy membrane elements. 316 Stainless steel globe valves are used to throttle back the feed pump as necessary and control the flow of concentrate to drain. A high pressure switch protects the pump from deadheading.

Grundfos vertical multi–stage pumps are constructed with 316 stainless steel housings as well as impeller and diffuser stage assemblies. Pumps are equipped with TEFC motors wired for 380/415 VAC voltage and rated for full load, continuous duty.

Fiberglass (FRP) vessels, rated at 450 PSI, house the 8” membrane elements. These vessels have 316 SS side ports for the feed and concentrate but are not ASME code stamped.

X2 – Series system model X2–3280 monitor RO permeate flow and concentrate flow utilizing digital flow meters. AXEON pressure gauges monitor the pump and concentrate pressures. Digital TDS probes are used to monitor the TDS of the feedwater and the permeate water.

A chemical injection port for the addition of chemical feed and two valves for connecting a CIP skid to the unit are included as standard.

Electrical Description

X2 – Series are offered standard at 380V 50hz 3ph. Other voltages are available as options.

X2 – Series model X2–3280 comes with the S–200 computer controller. The S–200 controller is equipped with a LCD backlit display, pre–treatment lockout, tank level input, low pressure monitoring and alarm and dual TDS monitoring. The S–200 controller displays the permeate and feed TDS/conductivity, rejection percentage, recovery percentage, total flows for permeate and concentrate, water temperature and operating hours along with the operating status of the RO system. The S–200 monitors the low pressure switch, tank levels and pre–treatment equipment. It provides outputs for the RO high pressure pump via VFD, inlet motorized valve, permeate divert or remote alarm and auxiliary outputs. The S–200 multifunction keypad, TDS/conductivity and temperature values, visual and audible alarm with alarm silence key, programmable time delays, set points, programmable flush mode and low pressure automatic reset. The enclosure is NEMA 4X indoor rated, UL, CUL listed.

The X2–Series panel has two enclosures. The upper enclosure includes the S–200 controller. The lower enclosure houses the Titan VFD. The second enclosure was also included as standard for the model in order to easily accommodate the VFD.

The main breaker is equipped with an overload relay with adjustable current setting for overload protection.

The Titan P – Series VFD has a 32–character keypad, circuit breaker disconnect, ramp up control, selectable voltage/frequency and sensorless vector control.

Documentation Package

Documents	Installation procedures, start–up procedures, operation procedures, functional description, flow rate chart, specifications and spare parts list
Drawings	Process and Instrumentations (P&ID), Electrical drawings, and General Arrangement drawings
Quality Documents	Performance Test Sheet

X2 – SPECIFICATIONS
MODEL: X2-3280

System Production Flow Rate Specifications (GPM)

Model Number	X2-3280
Feed (Maximum)	70
Permeate (Maximum)	30
Concentrate (Minimum)	16

Unit Configuration Specifications

Model Number	X2-3280
Vessel Array	1:1:1
Vessel Quantity	3
Membrane Quantity	6

Model Number	X2-3280
Frame	
Materials	304 Stainless Steel
Paint	N/A
Color	N/A
Pump	
Manufacturer	Grundfos
Model	CRN15-17 A-FGJ-G-E-HQQE
Materials	316 Stainless Steel
Connection Type	2" Flange
Pump Motor	
Manufacturer	Grundfos
Type	TEFC
RPM@60Hz	2900
Power (Hp)	20
Rated Voltage	380-415D / 660-690Y VAC
FLA	28-26 / 16.2-15.6
Phase/Hz	3/50
Membranes	
Manufacturer	FILMTEC
Model	HRLE-440
Materials	Polyamide Composite
Pressure Vessels	
Supplier	Protec Arisawa
Model	PRO-8-450-SP-USA
Materials	Fiberglass
Rating	450 PSI Non-ASME Code Stamped
Permeate Connection	1-1/2 Sanitary

Concentrate Connection	1-1/2" and 2" Victaulic
Piping Systems	
Feed	Schedule 80 PVC
High Pressure	Schedule 40 SS
Permeate	Sanitary 316L SS
Prefilter Housings	
Manufacturer	Shelco
Model	4FOS3
Size	4X (2.5" X 30")
Material	316 SS
Prefilter	
Manufacturer	AXEON
Model	SDF-25-3005
Media	Polypropylene Fibers
Micron Rating	5
Automatic Process Valves	
Feed Valve	2" FNPT Motorized valve
Manual Valves	
Concentrate Throttling	1" Globe Valve 316SS
Pump Throttling	N/A

Pressure	
Pump Pressure Gauge	2-1/2", Liquid Filled, SS Case with Brass Wetted Parts, 0-600 PSI
Concentrate Pressure Gauge	2-1/2", Liquid Filled, SS Case with Brass Wetted Parts, 0-600 PSI
Filter Inlet Gauge	2-1/2", Liquid Filled, SS Case with Brass Wetted Parts, 0-100 PSI
Filter Outlet Gauge	2-1/2", Liquid Filled, SS Case with Brass Wetted Parts, 0-100 PSI
Low Feed Pressure Switch	15 PSI, 1/4" FNPT
High Feed Pressure Switch	300-1200 PSI, 1/4" FNPT

Flow	
Permeate Flow Indicator	4 -100 GPM Digital, Flow Meter, Construction, 1.5" Sanitary Connections

Concentrate Flow Indicator	4 - 40 GPM Digital, Flow Meter, Acrylic Construction, 1.5" MNPT Connections
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Skid Process Connection Specifications

Model Number	X2-3280
Feed Inlet	2" FNPT
Permeate Outlet	1-1/2" Sanitary
Concentrate Outlet	1-1/2" FNPT
CIP Connections	1-1/2" FNPT
Chemical Feed Port	1/2" NPT

Skid Physical Dimensions Specifications¹

Model Number	X2-3280
Depth (in)	35
Width (in)	112
Height (in)	74
Shipping Weight (lbs)	2800

¹Does not include operating space requirements.

Skid Process Connection Specifications

Model Number	X2-3280
Feed Inlet	2" FNPT
Permeate Outlet	1.5" Sanitary
Concentrate Outlet	1-1/2" FNPT
CIP Connections	1.5" FNPT
Chemical Feed Port	1/2" NPT

Skid Physical Dimensions Specifications¹

Model Number	X2-3280
Depth (in)	41
Width (in)	194
Height (in)	78
Shipping Weight (lbs)	4150

¹Does not include operating space requirements.

STANDARD FEATURES:

Model Number	X2-3280
Controls	
Controller	S-200
Variable Frequency Drive	
Feed Solenoid Valve	
Feed Motorized Ball Valve	X
Feed Low Pressure Switch	X
Pump High Pressure Switch	X
Instrumentation	
Permeate Flow Meter	
Permeate Flow Sensor	X
Concentrate Flow Meter	
Concentrate Flow Sensor	X
Feed TDS Sensor	X
Permeate TDS Sensor	X
Pre-Filter In Gauge	X
Pre-Filter Out Gauge	X
Pump Pressure Gauge	X
Concentrate Pressure Gauge	X
Standard Features	
Filmtec HRLE-440 Membranes	X
5 Micron Sediment Filter	X
Chemical Injection Ports	X
Chemical System 220V Outlet	X
Clean-In-Place (CIP) Ports with Valves	X
Permeate Sample Ports	
Standard Voltage	
380VAC 3PH 50HZ	X
Voltage Options	
220VAC 3PH 50Hz	X

OPTIONAL FEATURES: (Ordered Separately)

Model Number	X2-3280
pH and/or ORP sensor	X
CIP Skid-Mounted System	X
Permeate Divert	X
Permeate Flush	X
Chemical Feed System	X
PLC w/Touch Screen	X

DOCUMENT REVISION HISTORY

Revision	Revision Comments	Approval Date
A	New document	7/14/17