

Product Description / Equipment Specifications

Ultrapure & Industrial Services Reverse Osmosis Products

General Description:

Ultrapure & Industrial Maintenance reverse osmosis units are designed and manufactured for sea water applications. They are horizontal configurations utilizing horizontal high-rpm centrifugal pumps. They are pre-engineered, pre-assembled units that minimize installation and start-up costs. They are fully tested at the factory and require simple utility connections and with minor set up and adjustment are ready for immediate on-line service. Their simple designs maximize reliability of the Reverse Osmosis unit.

Each unit is a single pass RO system mounted on a polyurethane coated structural steel frame. The RO unit includes a high pressure feed pump, FRP, side entry pressure vessels, spiral wound thin film composite RO membranes, PVC low pressure feed piping, stainless high pressure piping, PVC reject and recycle piping, PVC product piping, and a programmable logic controller.

Mechanical Description:

The major components of the *Ultrapure & Industrial Maintenance* are supported by the polyurethane coated carbon steel frame and designed in such a way to provide easy access for servicing, maintenance, and monitoring system performance.

The feed, low-pressure reject and product piping is Sch 80 PVC. The high-pressure piping is constructed of welded Sch10 Stainless Steel. The piping connections on the high-pressure manifold are Victaulic and threaded NPT. The inlet and outlet piping connections to the unit are PVC flanges. A single stainless steel valve is used for pump discharge flow control and a single stainless steel valve is used for reject flow control. Sample valves are provided for the RO unit's feed and product lines. An individual sample valve is also located on the product line of each pressure vessel for analyzing individual vessel performance. Cleaning connections are provided to clean the RO membranes. All of the cleaning connections are Victaulic rolled groove type.

Electrical Description:

To control the operational sequences of the *Ultrapure & Industrial Maintenance* Reverse Osmosis unit, a highly reliable programmable logic controller (PLC) is employed that monitors and protects the system from damage to itself or nearby equipment systems and/or personnel. The motor starter and controller are housed in separate NEMA 4 enclosures.

Operational Description:

Ultrapure & Industrial Maintenance Reverse Osmosis systems operate continuously and are monitored by the instruments and microprocessor. The microprocessor will alarm on non-critical conditions such as poor quality or shut down the RO system on critical conditions such as low suction pressure or high discharge pressure. All alarm and shut down conditions are indicated on the microprocessor. Contacts are provided to start and stop chemical feed or pretreatment equipment and confirm the operation of the pretreatment equipment. Contacts are provided that will put the RO into a stand-by mode such as a high level in a storage tank. During the standby mode, the RO will flush with feed water (the high pressure pump is not running) to displace the stagnant water in the RO system.

Design Parameters:

Configuration	Multi-Stage, Single Pass
Inlet Pressure Requirements	25-60 PSIG
Feed Water Temperature	15 °C (60 °F)
Feed Water Source	Filtered Sea Water
Pre-Filtration Requirements	5 μ nominal
Feed Water Fouling Index	Silt Density Index (SDI) < 5
System Recovery (Nominal)	49%
Product Pressure Available	25 PSIG
Membrane Salt Rejection	99% nominal Based on 35,000ppm Sea Water @ 800 PSI, 77 degrees F, pH 8, and 10% recovery
Performance Basis	A specific computer projection must be run for each individual application

General Specifications:

Frame	
Materials	Structural carbon steel and clamp type strut
Paint	Polyurethane coated, textured finish
Color	Blue, Federal Standard 25052
Pump	
Manufacturer	Sunflo P-2000 & P-3000 series, ANSI flange connections
Materials	Stainless steel
Motor	High efficiency, 3500 RPM, TEFC
Membranes	
Manufacturer	FilmTec
Model	SW30-8040
Materials	Thin Film Composite (TFC)
Type	Spiral wound
Pressure Vessels	
Manufacturer	Codeline
Model	8" Diameter, 80E100 Series or equal
Materials	Fiberglass reinforced plastic (FRP)
Rating	1,000 PSIG Non-Code
Process Connections	Side entry feed/concentrate Victaulic
Piping Systems	
Feed piping	PVC, Schedule 80, Solvent weld w/ minimal threads
High pressure piping	904 L SS, Schedule 10, butt-welded w/ minimal threads
Product piping	PVC, Schedule 80, Solvent weld w/ minimal threads
Cleaning connections	Victaulic- feed & high pressure (product is field installed)
Automatic Process Valves	
Inlet valve	(½"-2") Actuated ball, spring assist closed (>2") Actuated butterfly, spring assist closed
Product valve	Not included with unit – to be purchased separately, pilot solenoid valve and control logic is included with the unit (pneumatic - AO/SC)
Product rinse valve	Not included with unit – to be purchased separately, pilot

	solenoid valve and control logic is included with the unit (pneumatic - AC/SO)
Manual Valves	
Pump throttling valve	Apollo SST Ball Valve, socket weld, manual
Reject valve	Sam Flow 60-700 series, globe type, SS, manual
Reject recycle valve	Sam Flow 60-700 series, globe type, SS, manual
Sample valve (feed)	Asahi ¼ PVC spigot
Sample valve (high pressure)	Nupro ¼", 316SST plug valve
Sample valve (product)	Asahi ¼ PVC spigot (One on each product tube and one common)

Instrumentation Specifications:

Pressure	
Indicators	Ashcroft SL1008 series, SS, 63mm dial, glycerin filled, ¼" NPT
Low Feed Switch	Ashcroft B24 series, SS / Buna, 120VAC, 0-30 PSIG, ¼" MNPT
High Discharge Switch	Ashcroft B24 series, SS / Buna, 120VAC, 0-600 PSIG, ¼" MNPT
Quality	
Conductivity monitor	Thornton 200CR series
Conductivity sensor (feed)	Thornton 240-201 ¾" MNPT
Conductivity sensor (product)	Thornton 240-201 ¾" MNPT
Flow	
Flow monitor (feed / reject)	Thornton 200F series
Flow indicator (product)	Displayed on flow monitor (calculated – feed minus reject)
Flow sensor (feed and reject)	Fluidyne 2300-A, vortex shedding type, PVDF body, pulse output
Flow indicator (reject recycle)	Blue White 451 series, PVC/acrylic construction, 1" FPT connections (Only utilized on units with reject recycle – see flow rate specifications)

Controls Specifications:

Main control panel	Steel enclosure, frame mounted, ANSI 61 gray
Motor starter panel	Steel enclosure, NEMA 4, ANSI 61 gray
Programmable Logic Controller (PLC)	Allen-Bradley MicroLogix 1000, 24VDC, fixed I/O type
PLC input/output	Discrete 32 point (20 input and 12 output)
Warning alarms	Low quality product Low feed pressure High pump discharge pressure High feed water temperature
Shutdown alarms	Low feed pressure High pump discharge pressure Low product quality Pretreatment out of service Storage Tank Full (non-alarming start and stop condition)
Status indicator lights	Low feed pressure Low quality

	Flow Alarm High pump discharge pressure High feed water temperature Product divert to drain valve open Pretreatment lockout Storage Tank Full
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Miscellaneous controls	Elapsed run time indicator Alarm horn Chemical pump receptacles Convenience outlet- 120VAC (10 amp maximum) Auxiliary contacts – three sets (10 amp maximum)
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Interface Communication Specifications:

Pretreatment system - out of service	120VAC discrete input - Note: Activation of this signal confirms that the pretreatment equipment is available to deliver water to the RO unit. (Dry contacts)
Call-for-water signal	120VAC discrete input - Note: Activation of this signal confirms that the post treatment equipment (storage tank or other equipment) is requesting RO product water. (Dry contacts)

Operating Limits:

Feed Temperature*	60 – 113 °F
Feed Pressure	25 – 90 PSIG

*Lower temperature may require larger booster pump

Feedwater Requirements:*

Maximum SDI Rating	5
Maximum Turbidity	1 NTU
Maximum Free Chlorine and/or chloramine	<0.1 PPM
pH (continuous)	4 – 11
pH (cleaning - 30 min.)	1 – 12

Factory Procedures:

Assembly	Fully assembled at the factory
Wiring	Fully wired at the factory
Testing	Hydrostatic pressure test, Electrical integrity test, Factory simulated functional test
Membrane Elements	Membrane elements are shipped in their original packaging for installation on site at time of start-up
Membrane Shipping Condition	Dry
Shipping preparation	Heat shrink protection (some components may be removed for protection prior to shipment)

Regulations and Standards:

Quality System	ISO 9001, certified by British Standards Institute (BSI)
Stainless Steel Pipe Finish	Interior - Mill Finish, Exterior – Mill Finish with brushed welds
Frame Welding	Plant standard
Electrical and Controls	Underwriters' Laboratory (UL), National Electrical Code (NEC)
NEMA rating	NEMA 4
Seismic rating	None

Documentation Package:

Documents	Installation procedures, start-up procedures, operation procedures, functional description, flow rate chart, specifications, Spare parts list, Technical Service and Support services,
Drawings	Process and Instrument diagram (P&ID), Equipment specification drawing, electrical schematics
Software	Installed at factory prior to testing
Quality Documents	Quality Assurance data reports

Note: All equipment is custom designed for the specific application for which it is required. For detailed specifications/design contact an Ultrapure & Industrial Services Representative.