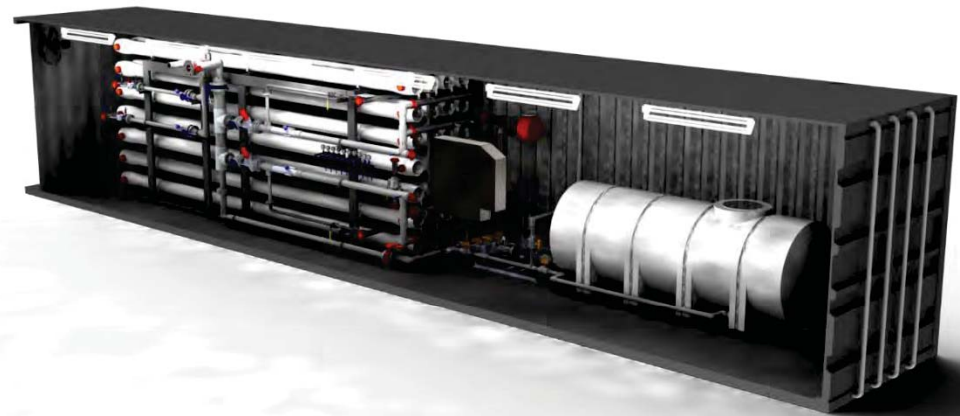


RO Module with Clean-In-Place Skid

AQUEN USA offers a Reverse Osmosis module that includes two RO systems designed to produce 315gpm each of high purity water at a recovery rate of 80%. Each system array is 8:4:2. Currently the final two vessels have been isolated internally to create 8:4 arrays for proper hydraulic flows at lower recovery rates. This module is designed to operate in conjunction with the booster pumps located in the Blending Module. Booster pumps can be moved back into the RO module but would require removal of the CIP system. Recovery rate and permeate bypass valves are automated by the PLC.

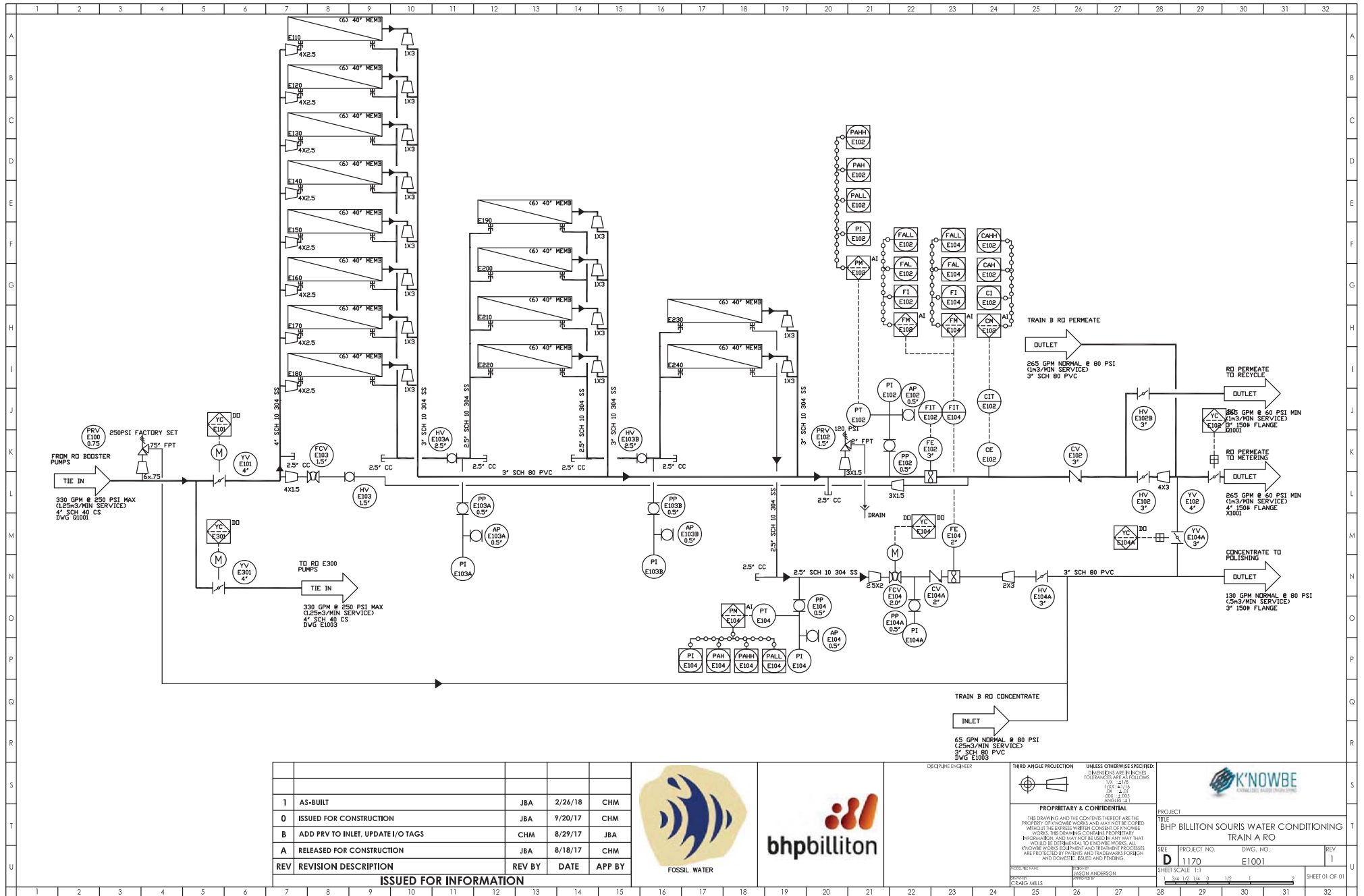
Included in the module is an RO Clean-In-Place skid that is connected to the RO systems with quick disconnect hoses.

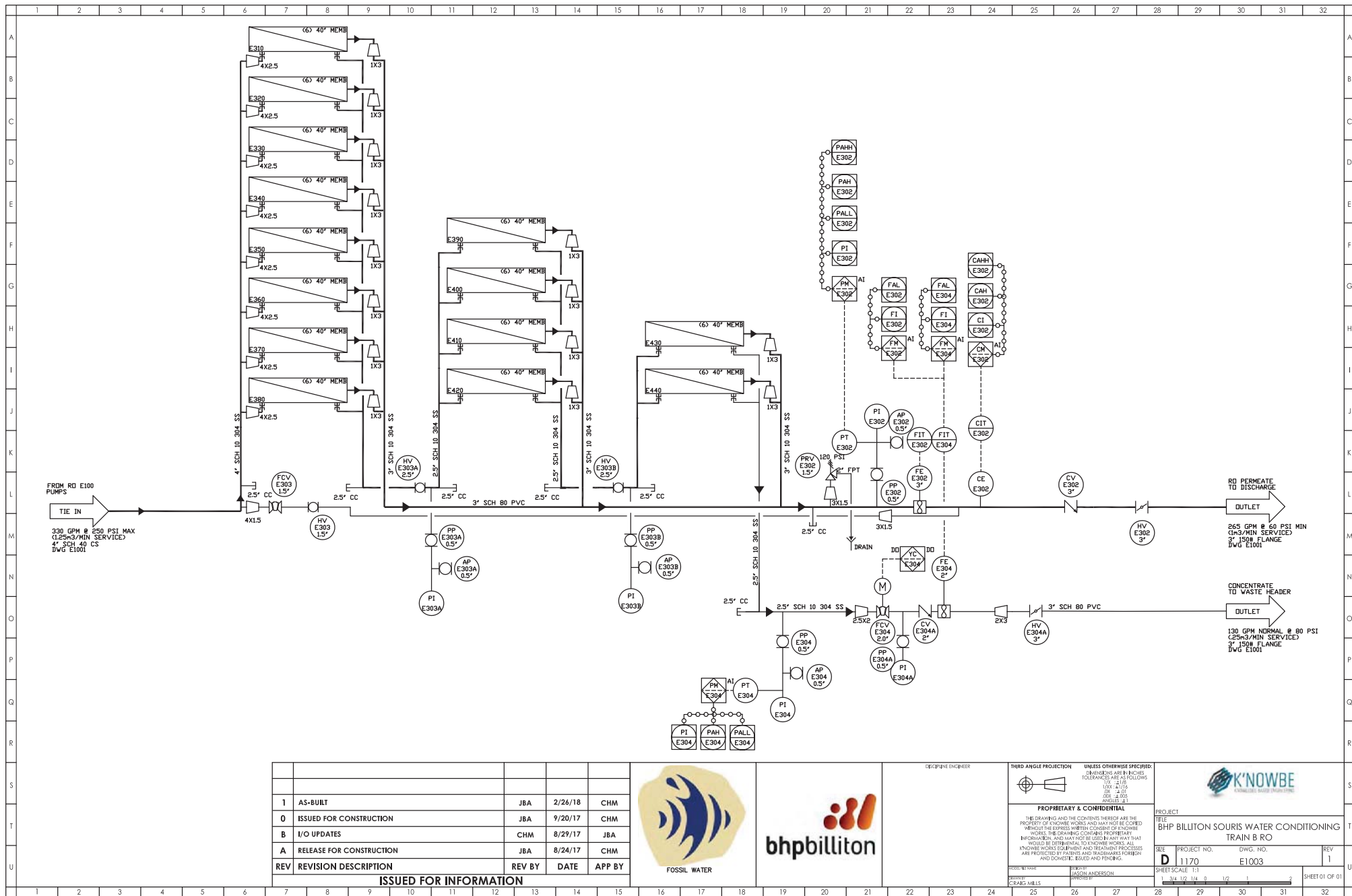
The system is enclosed in a 53' shipping container. The container has been insulated and modified to include a 36" man door, utility outlets, lights, electric heat and ventilation. Container requires 480VAC 2ph and 208VAC 1ph supply power.



- 28ea Wave Cyber 450psi Pressure Vessels (non-Code)
- Toray TMG20D-400 Membranes
- IFM Pressure Transmitters
- Signet Flow Transmitters

- Signet Conductivity Transmitters
- Automation Direct PLC w/C-More HMI
- Compressor for air actuated valves

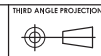




1	AS-BUILT	JBA	2/26/18	CHM
0	ISSUED FOR CONSTRUCTION	JBA	9/20/17	CHM
B	I/O UPDATES	CHM	8/29/17	JBA
A	RELEASE FOR CONSTRUCTION	JBA	8/24/17	CHM
REV	REVISION DESCRIPTION	REV BY	DATE	APP BY
ISSUED FOR INFORMATION				



DESIGNED BY



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ARE AS FOLLOWS:
XXX ±.015
XXX ±.010
XXX ±.005
XXX ±.002

PROPRIETARY & CONFIDENTIAL

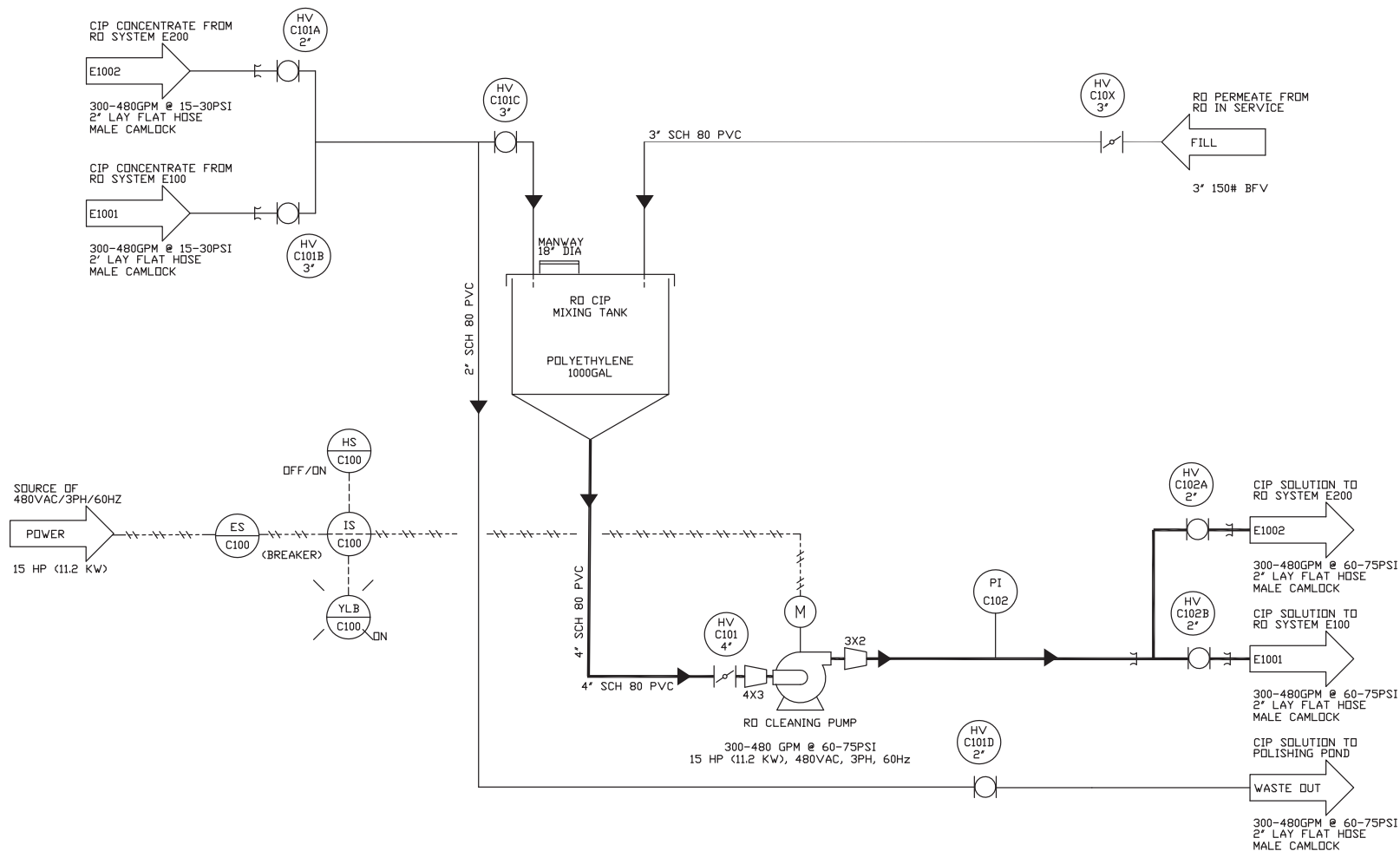
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DESIGNED BY: JASON ANDERSON
DRAWN BY: JASON ANDERSON
CHECKED BY: JASON ANDERSON
APPROVED BY: JASON ANDERSON



PROJECT			
TITLE: BHP BILLITON SOURIS WATER CONDITIONING TRAIN B RO			
SHEET NO. D 1170	PROJECT NO. E1003	DWG. NO. E1003	REV 1
SHEET SCALE: 1:1		SHEET 01 OF 01	

SYSTEM AREAS INCLUDED IN CONTAINER M9701

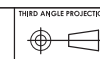


RO CONTAINER VENTILATION WHILE CLEANING

1	AS-BUILT	JBA	2/26/18	CHM
0	ISSUED FOR CONSTRUCTION	JBA	09/01/17	CHM
A	PRELIMINARY	CHM	07/24/17	CHM
REV	REVISION DESCRIPTION	REV BY	DATE	APP BY
ISSUED FOR INFORMATION				



DESIGNED BY



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES ARE AS FOLLOWS:
1/16" - 2/16"
2/16" - 3/16"
3/16" - 1/2"
1/2" - 3/4"
3/4" - 1"
1" - 1 1/2"
1 1/2" - 2"
2" - 3"
3" - 4"
4" - 6"
6" - 12"
12" - 24"
24" - 48"
48" - 96"
96" - 192"
192" - 384"
384" - 768"
768" - 1536"
1536" - 3072"
3072" - 6144"
6144" - 12288"
12288" - 24576"
24576" - 49152"
49152" - 98304"
98304" - 196608"
196608" - 393216"
393216" - 786432"
786432" - 1572864"
1572864" - 3145728"
3145728" - 6291456"
6291456" - 12582912"
12582912" - 25165824"
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100663296" - 201326592"
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402653184" - 805306368"
805306368" - 1610612736"
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3221225472" - 6442450944"
6442450944" - 12884901888"
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25769803776" - 51539607552"
51539607552" - 103079215104"
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System Overview Report

Project	89:BHP Dewatering Project
Case	1 8.4:2 6M 34F 79% Recovery 350gpm Feed
Revision	RO Report for 2ea 8.4:2 8M arrays. Ion levels used were the maximum from each analysis provided by BHP multiplied by 120%. Concrete water not used in this calculation. The balance came from the Effluent Storage Pond (ESF). Orig run: 2/15/2016
Feed Water Type	Brackish Surface, Note: Auto Balance is ON
Warnings and Errors	Warnings:2, Errors:0. See Important Notes at end /E
Database Info :	Project Database : C:\Users\craig.mills.AQUEN\Documents\TorayDS2 VApp_Data\DS2.sdf Membrane Database (V.20143) ::

		Overall	Pass 1
Raw water TDS	mg/l	3,553.2	3,553.2
Feed EC @77F / @34.00F	uS	4,677.8 / 2,171.2	4,677.8 / 2,171.2
Feed Pressure	psi	0.0	242.3
Temperature	deg F	34.00	
Total DP	psi	62.58	62.58
Brine Pressure	psi	179.7	179.7
Fouling Max	3.00 yrs		0.809
SP % Increase (Max)	3.00 yrs		52.09%
Recovery	%	80.99%	79.0%
Feed Flow	gal/min	390.0	353.0
Product Flow	gal/min	315.9	278.9
Average Flux	gfd	8.961	8.961
Concentrate Flow	gal/min	74.14	74.14
Product TDS	mg/l	438.6	25.40
Concentrate TDS	mg/l	16,811	16,811
Primary HP Pump kW	kilowatt	50.49	50.49
Power Consumption	kWh/m^3	0.704	0.797
Ions	Feed	Net Feed	Conc
Ca	mg/l	232.8	1,105
Mg	mg/l	172.8	820.1
Na	mg/l	584.2	2,761
K	mg/l	18,000	84.74
Ba	mg/l	0.0	0.0
Sr	mg/l	1,700	8,068
NH4	mg/l	1,200	5,649
Fe	mg/l	0.0	0.0
HCO3	mg/l	331.2	1,527
CO3	mg/l	5,500	44.82

Product Flow	gal/min	3.795	2.471	1.262
Product TDS	mg/l	5.717	26.79	86.50
Flux	gfd	13.659	8.892	4.541
Last Element	Pass 1	Stage 1	Stage 2	Stage 3
Product Flow	gal/min	2.538	1.319	0.481
Product TDS	mg/l	24.84	82.07	242.4
Brine/Product Ratio	ratio	7.283	16.600	77.13
Brine Flow	gal/min	18.486	21.90	37.07
Net Driving Pressure	psi	99.40	51.27	18.404
Beta		1.329	1.146	1.037

Chemicals 100%. Disclaimer: These estimated dose rates are provided as a courtesy to Toray DS2 users and are not guaranteed.

No Chemicals Added

Warnings

1. Conc Stiff Davis Index = 1.91 Warning - the Stiff Davis Index (SDSI) is greater than 0. Scale inhibitor required.
2. Conc CaSO4 % Satn = 324.12 Warning - concentrate calcium sulfate exceeds saturation.

Errors

Disclaimer :

The program is intended to be used by persons having technical skill, at their own discretion and risk. The projections, obtained with the program, are the expected system performance, based on the average, nominal element-performance and are not automatically guaranteed. Toray shall not be liable for any error or miscalculation in the program. The obtained results cannot be used to raise any claim for liability or warranty. It is the users responsibility to make provisions against fouling, scaling and chemical attacks, to account for piping and valve pressure losses, feed pump suction pressure and permeate backpressure. For questions please contact us:

Toray Industries, Inc., Water Treatment Division, RO Membrane Products Dept.
1-1, Nihonbashi-muromachi 2-chome, Chuo-ku, Tokyo 103-8666, Japan
TEL +81-3-3245-4540 FAX +81-3-3245-4913

Toray Membrane USA, Inc.
13435 Danielson St., Poway, CA, 92064, USA
TEL +1-858-218-2390 FAX +1-858-486-3063

Toray Membrane Europe AG
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TEL +41-61-415-8710 FAX +41-61-415-8720

Toray Asia Pte. Ltd. / TEL +65-6725-6450 FAX +65-6725-6363
27F Prudential Tower, 30 Cecil Street, Singapore 049712

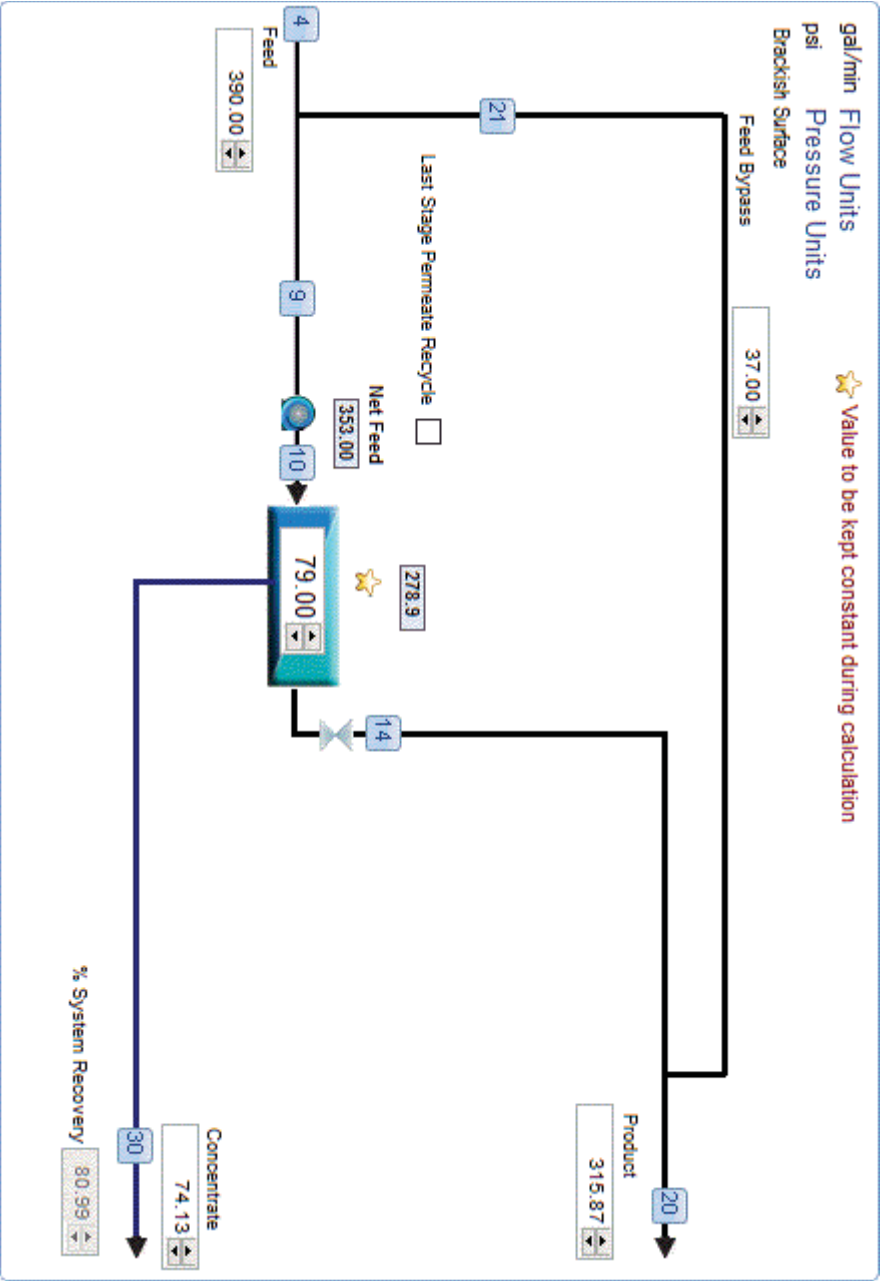
Toray Bluestar Membrane Co., Ltd. /Tel +86-10-80485216 Fax +86-10-80485217
Zone B, Tianzhu Airport Industrial Zone, Beijing 101318, China

<http://www.toraywater.com/>

Date/Time :	3/21/2016 2:21:49 PM
Project	89:BHP Dewatering Project

Case :	1:8:4:2 6M 34F 79% Recovery 350gpm Feed
Revision :	0:RO Report for 2ea 8:4:2 8M arrays. Ion levels used were the maximum from each analysis provided by BHP multiplied by 120%. Concrete water not used in this calculation. The balance came from the Effluent Storage Pond (ESF).; Orig run: 2/15/2016
User name :	AQUEN\craig.mills
Prepared for :	
Notes :	
Membrane Database	
Version Number:	20143
ReleaseDate:	7/28/2015
UpdateBy:	HirooT
Toray DS2 version :	2.0.4.117

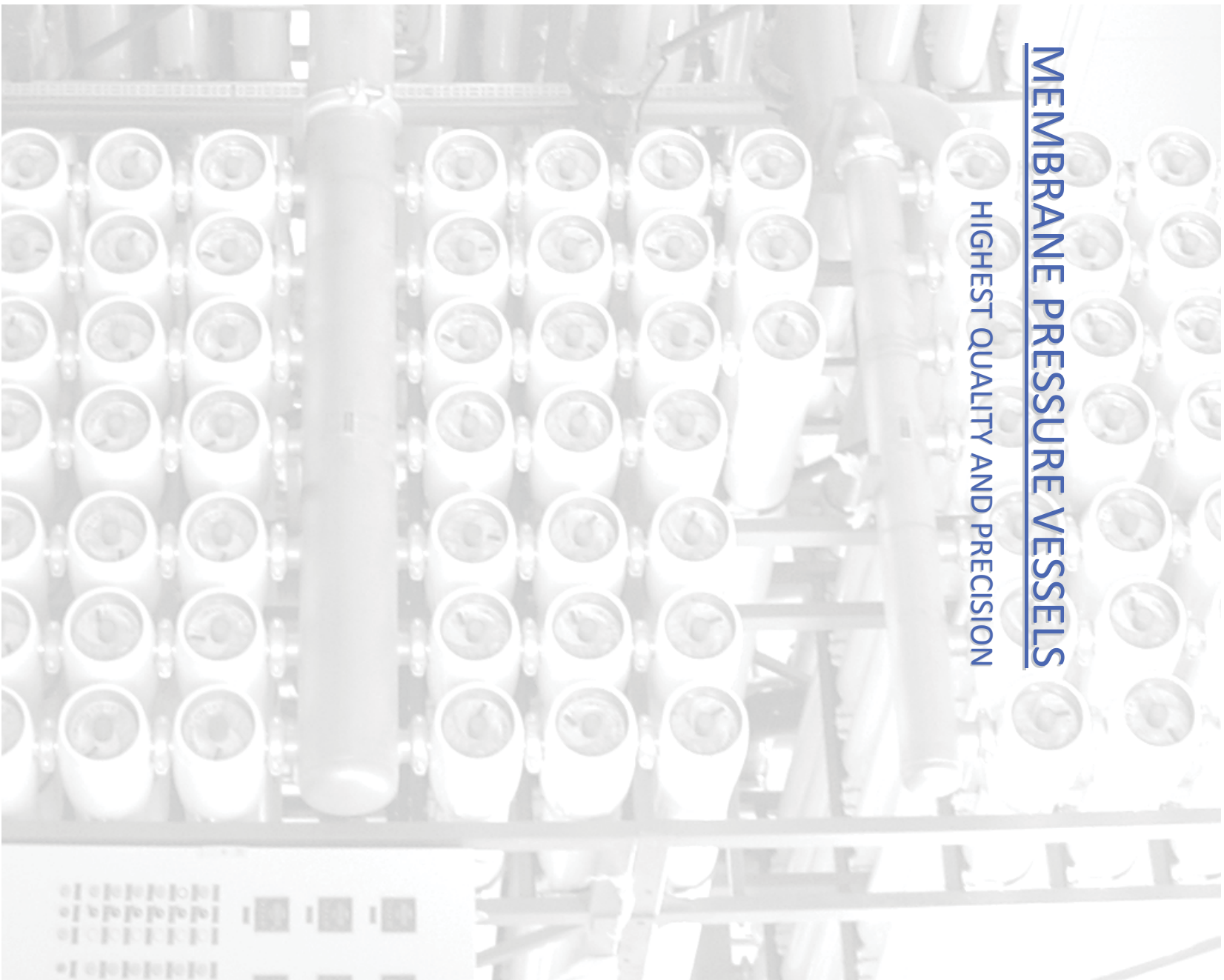
Flow Diagram:



Stream Details					
Stream Number	Flow	Pressure	TDS	Est uS	pH
20. Final Product	315.9	0.0	438.6	752.9	7.430
14. Pass 1 Permeate	278.9	60.00	25.40	43.5	6.374
4. Feed Net	390.0	0.0	3,553.15	4,677.8	8.420
21. Feed to Blend	37.00	0.0	3,553.15	4,677.8	8.420
10. Feed to Pass 1	353.0	242.3	3,553.15	4,677.8	8.420
30. Conc to brine	74.14	179.7	16,811.03	18,344.5	8.575

MEMBRANE PRESSURE VESSELS

HIGHEST QUALITY AND PRECISION



Introduction

The Company

Wave Cyber (Shanghai) Co., Ltd. is wholly owned by Wave Cyber Limited, a British company found in 2001. Wave Cyber adopts the world advanced technology and techniques to manufacture state-of-the-art pressure vessel products. We offer variety of membrane pressure vessels made from series of new composite materials to protect water treatment equipment of our customers from environmental deterioration.

Choice of membrane pressure vessel from

- ✧ 2.5" End port,
- ✧ 4" end port
- ✧ 4" Side port
- ✧ 8" End port,
- ✧ 8" Side port

Product Integrity

Wave Cyber Membrane Pressure Vessels are precision engineered to improve the overall design and overall performance of your system. Wave Cyber purchases the most advanced computerized winding technology and manufacturing equipment to achieve highest integrity of the membrane pressure vessels, smooth inner surface, accurate dimensions and precise tolerance on the pressure tube body as well as the accessories from the feed ports to a single 'O' ring seal. These uniform dimensions provide and ensure the tightest membrane element seal, eliminate any possibility of leak and improve durability of your system.

No matter your application requires low pressure or high pressure, our products line and options allow it easy to find the perfect fit to your machine or system.

Why Wave Cyber?

- ✧ ISO9001:2000 certified manufacturer
- ✧ ASME RP certified facility
- ✧ TUV - KTW certificate for drinking water application
- ✧ Continuing innovation in membrane pressure vessel products
- ✧ Regional service available through worldwide distributors
- ✧ Delivery in 1 to 4 weeks
- ✧ 20 years experienced expert in pressure vessel manufacturing as team leader.
- ✧ A team of talented engineers
- ✧ Quick after sale service response

Quality Assurance

- ✧ 100,000 times cycle test
- ✧ Burst test with 6 times of its operating pressure
- ✧ 100% QA test with 1.1 times stage elevation of hydraulic pressure.
- ✧ 100% QA inspection and cleaning before final packaging and delivery to customers.
- ✧ Submitted for NSF standard 61

Products

Available Membrane Pressure Vessel Products

Pressure	2.5" End port	4" End port	4" Side port	8" End port	8" Side port
150 psi				A	A
300 psi	A	A	A	A	A
450 psi		A	A	A	A
600 psi				A	A
1000 psi	A	A	A	A	A
1200 psi				A	A

A – Available pressure rating

Features

2.5 And 4 inches Membrane Pressure Vessels

- ✧ High strength, smooth inner surface and durable FRP shell.
- ✧ Length available:
 - ✧ Single element of 14", 21" and 40" to 2 element;
 - ✧ Single element of 21" and 40" up 6 elements to 6 element
- ✧ SS 316 head locking baffle for simple and safe head assembling for 300 and 450 psi vessels. Three turns locking ring design for 1000 psi vessels
- ✧ Insert plastic permeate port material
- ✧ Polyurethane outermost coating provides extra protection to environment and good appearance.
- ✧ White color is as standard. Other colors are also available.



Side Port Type

- ✧ Feed/ concentrate port - 1" SS 316 mechanical coupling connection for 300 and 450 psi vessels, 1" duplex SS mechanical coupling for 1000 psi vessels.
- ✧ 1/2" NPT or BSP permeate port connection

End Port Type

- ✧ Insert plastic head material; EPDM O-ring seal
- ✧ Feed/ concentrate port connection
 - 4" vessels: 3/4" or 1/2" FNPT or BSP PVC for 300 and 450 psi vessels;
 - 3/4" MNPT duplex steel for 1000 psi vessels;
 - 2.5" vessels: 1/4" or 3/8" FNPT or BSP PVC for 300 psi vessels;
 - 1/4" or 3/8" FNPT or BSP duplex steel for 1000 psi vessels;
- ✧ Permeate port connection
 - 4" vessels: 1/2" NPT or BSP;
 - 2.5" vessels: 1/4" NPT or BSP

8 inches Membrane Pressure Vessels

- ✧ High strength and durable FRP shell
- ✧ ASME manufacture process,
- ✧ One piece molded lock thrust cone design reduces pressure drop with highest water flow. Cone shape design provides highest pressure tolerance up to 275 Kg/cm².
- ✧ SS 316 three turn spiral lock ring for easy and safe head assembly.
- ✧ assemble and disassemble
- ✧ ABS permeate adaptor. OD 1.125" is standard. Different ODs are available for retrofit membrane element with different permeate tube dimensions.
- ✧ Polyurethane outermost coating provides extra protection to environment and good appearance.
- ✧ Length available from 1 element through 8 elements
- ✧ White color is as standard. Other colors are also available.
- ✧ ASME Code stamp available upon request



Side Port Type

- ✧ Feed/conc port size available in 1.5" MC(standard), 2" MC and 2-1/2" MC, 3" MC(mechanical coupling connection)
- ✧ 2 side ports are offered as standard, multi-port with different clocking are available.
- ✧ 1" PVC pipe union Permeate connection is standard. Other custom permeate connectors are available on request.
- ✧ For seawater vessels, side port material standard is Duplex, Super Duplex (4%/6% Mo) available upon request.

End Port Type

- ✧ Feed/concentrate port size available in 1.5" MC (standard)
- ✧ 1" PVC pipe union Permeate connection is standard. Other custom permeate connectors are available on request

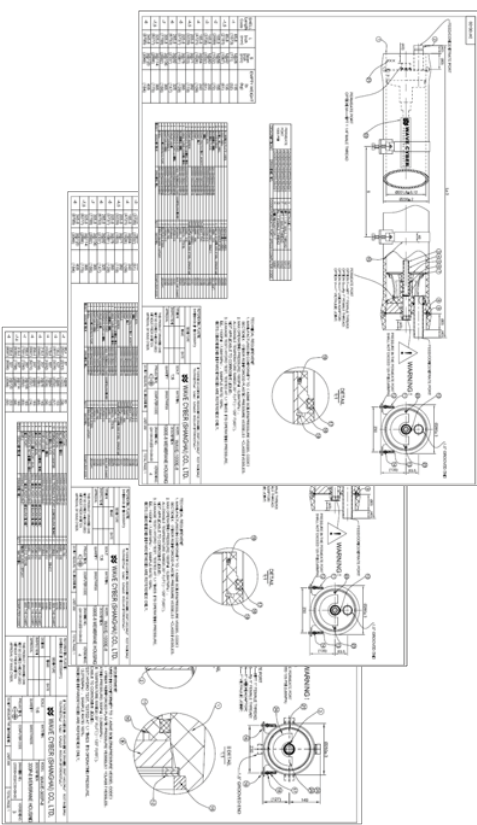
Permeate port options

Various options of permeate connections are provided to suit different installation requirement.

Option	Description
J	Socket Union Adaptor, PVC, 1.32" O.D. Pipe
H	Socket Union Adaptor, PVC, 32 mm O.D. Pipe
V	Mechanical Coupling 1"-PVC
S	Mechanical Coupling 1"-SS
M	Male thread NPT 1 1/4"
N	Male thread NPT 1 1/2"
F	Female thread NPT 1"
G	Female thread Rp 1"
UF	Connected to Victualic Fitting
W	Sanitary Connection 1"
K	Sanitary Connection 1.5"

(All the mechanical coupling connection is additional charged)

Services



Wave Cyber provides technical materials and information for product selection such as product selection guide, technical drawings, pressure drop curve for side port selections, recommended spare parts and Operation & Maintenance manual etc.

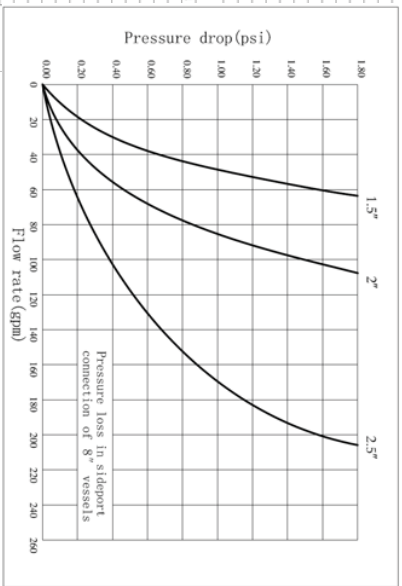
The information is also available on our web site: www.wave-cyber.com.

Wave Cyber 4 Inches Membrane Pressure vessel – Spare Part List 1/4

I. side port

I.A. 300 psi side port, Drawing # 21300-00			
Description	P/N	Qty req'd vessel	
1. Membrane vessel	21100-01	1	
2. Side port seal, EPDM 512	21100-15	2	
3. Pin, side port, anti-rotate, SS304	21100-33	2	
4. Side port, SA-312, SS316	21100-04	2	
5. Retaining ring, AS20, SS316	21100-14	2	
6. Retainers, AS20, SS316	21100-05	2	
7. Bush, AS20, SS316	21100-12	4	
8. Retainer pin, ABS	21100-12	2	
9. Head seal, EPDM 512	22100-06	2	
10. MPV seal, EPDM 512	22100-09	2 of 3	
11. Strip, protective jacket, with PVC	22100-07	2 of 3	
12. Strip, AS66, SS304	22100-07	2 of 3	
13. Allen screw, MPV-50 SS	11455	4 of 6	
14. Strip nut, H4050-1	22100-08	4 of 6	
15. Saddle, polyurethane	22100-05	2 of 3	
16. Allen Screws, MPV-20 grade 8	11446	4	

I.B. 400 psi side port, Drawing # 21400-00			
Description	P/N	Qty req'd vessel	
1. Membrane vessel	211400-01	1	
2. Side port seal, EPDM 512	21100-15	2	
3. Pin, side port, anti-rotate, SS304	21100-33	2	
4. Side port, SA-312, SS316	21100-04	2	
5. Retaining ring, AS20, SS316	21100-14	2	
6. Retainers, AS20, SS316	21100-05	2	
7. Bush, AS20, SS316	21100-12	4	
8. Retainer pin, ABS	21100-12	2	
9. Head seal, EPDM 512	22100-06	2	
10. MPV seal, EPDM 512	22100-09	2 of 3	
11. Strip, protective jacket, with PVC	22100-07	2 of 3	
12. Strip, AS66, MPV-50 grade 8	22100-07	2 of 3	
13. Allen screw, MPV-50	11455	4 of 6	
14. Strip nut, H4050-1	22100-08	4 of 6	
15. Saddle, polyurethane	22100-05	2 of 3	
16. Allen Screws, MPV-20 grade 8	11446	4	



Customer Satisfaction

Over 30 Billion cubic meters of purified water has been produced per year by the Membrane Systems using Wave Cyber membrane pressure vessels around the World.



90000 CMD Municipal RO Plant (2008): Courtesy, MPE

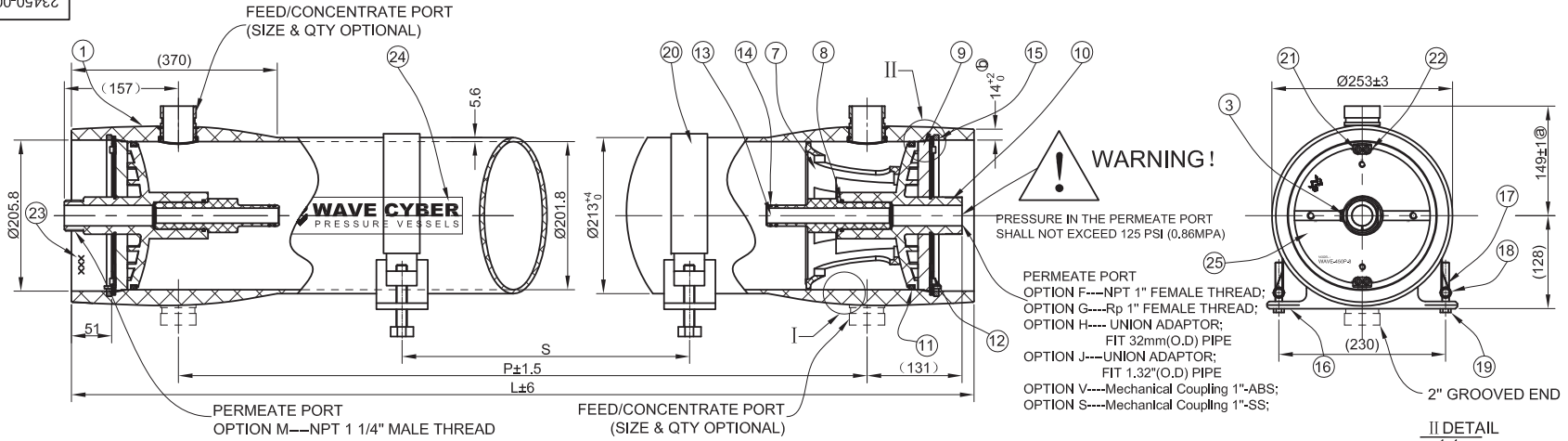
Partial China Customers

Peninsula Water Tech, Guizhou Jin Yi Caustic Mfg, Nanning Petrochemical Corp, Shandong Textile, Shandong Zibo, Shangdong Jinling Coal Mine, Omex – Dow Chemical, Shandong Fei Cheng Coal Mine, Shanghai Fan Xiang Power Plant Shandong ShanQin Food Stuff, Liudi Lin Steel Corp, Zhuhai Wei Chong Electronics, Zhejiang Great Petrochemical, CoCa Cola, Asian Tec, F uYang Power Plan, Guangzhou HengWen Power Plant, Shanghai Bao Steel, Hang Zhou Wahaha, Ma On Shan Steel,. Pall Corp (China),

Partial International Customers

Sual Power Plant – Philippines, FAJ Petrochemical Complex (Iran), GE Infrastructure Water & Process Technologies, Iran Department of Agriculture, Lapsi Sea Water Desalination Plant (Malta), Cirkewwa Sea Water Desalination Plant (Malta), Pembroke Sea Water Desalination Plant (Malta), Toray Membrane, Eurotrol S.P.A., Kirikkale City Municipality (Turkey), VA-Tech – Wabag (India), Hyundai Steel (Korea), Sharp (Japan), Culligan International,

00-05432



SIDEPORT	23450-02-02	T	2.5"	20088
	23450-02-01	S	2"	20087
	23450-02-03	R	1.5"	20089
SIDEPORT O RING	Ø70(LD)Ø2		2.5"	10425
	Ø55(LD)Ø2		2"	10424
	Ø42(LD)Ø2		1.5"	10423
SHELL	(23450-01-02)EC45-08-01/2		2.5"	
	(23450-01-01)EC45-08-01/1		2"	
	(23450-01-03)EC45-08-01/3		1.5"	
CURVED SIDEPORT SEAL	23300-04-02-01		2.5"	10614
	23300-04-01-01		2"	10613
	23300-04-03-01		1.5"	10615
SIDE PORT RETAINING RING	(23300-06-02)EC30-08-06/2		2.5"	20112
	(23300-06-01)EC30-08-06/1		2"	20111
	(23300-06-03)EC30-08-06/3		1.5"	20113
DESCRIPTION	DRAWING NO.	CODE	SIZE	COMPUTER CODE

- 1.Flexible piping should be used on permeate connection to manifold.
- 2.Side port misalignment can not exceed 0.7mm in any direction.
- 3.MPV is not designed for negative pressures.

BEARING PLATE	23450-09-01	SB-209.6061-T651	20314	ASME CODE PRODUCT
DESCRIPTION	DRAWING NO.	MATERIAL	COMPUTER CODE	REMARK

PERMEATE PORT 450 PSI	23300-10-08	UF	CONNECTED WITH VICTAULIC	10502
	23300-10-09	N	NPT 1 1/2" MALE THREAD	10845
	23300-10-06	M	NPT 1 1/4" MALE THREAD	10086
	23300-10-05	S	MECHANICAL COUPLING 1"-SS	10071
	23300-10-05	V	MECHANICAL COUPLING 1"-ABS	10071
	23300-10-05	J	UNION ADAPTOR(American Standard)	10071
	23300-10-05	F	NPT 1" FEMALE THREAD	10071
	23300-10-05	G	Rp 1" FEMALE THREAD	10071
	23300-10-05	H	UNION ADAPTOR(National Standard)	10071
DESCRIPTION	DRAWING NO.	CODE	PERMEATE PORT SPECS	COMPUTER CODE

SHELL Length Code	L Inch (mm)	P Standard Inch (mm)	S Span Inch (mm)	Shell Weight lb (kg)
-1	58.7 (1491)	47 (1194)	1@28 (711)	57.2 (26)
-1.5	78.7 (1999)	67 (1702)	1@42 (1067)	67.1 (30.5)
-2	98.7 (2507)	87 (2210)	1@56 (1422)	74.8 (34)
-3	138.7 (3523)	127 (3226)	1@80 (2032)	92.4 (42)
-4	178.7 (4539)	167 (4242)	2@64 (1626)	110 (50)
-5	218.7 (5555)	207 (5258)	2@78 (1981)	127.6 (58)
-6	258.7 (6571)	247 (6274)	2@92 (2337)	145.2 (66)
-7	298.7 (7587)	287 (7290)	2@106 (2692)	162.8 (74)
-7.5	318.7 (8095)	307 (7798)	2@114 (2896)	172.7 (78.5)
-8	338.7 (8603)	327 (8306)	2@120 (3048)	180.4 (82)

26	ALUMINUM PLATE LABEL		2	ADHESIVE LABEL	40843
24	LOGO LABEL		2	ADHESIVE LABEL	40255
23	SERIAL NO. LABEL		1	ARTPAPER 20"53	40425
22	RETAINING BLOCK	23300-36-01	4	316	20183-1
21	SCREW	G8B19-85	8	M5*14 STAINLESS STEEL	20833
20	STRAP PROTECTIVE JACKET	(23300-19)EC30-08-19	2or3	S03T PVC	10188
19	STRAP SCREW		4or6	M6*90 STAINLESS STEEL GRADE 8.8	20129
18	STRAP NUT	(23300-18)EC30-08-18	4or6	HPB51-9	20123
17	STRAP	(23300-17)EC30-08-17	2or3	AB66_304	20123
16	SADDLE	(23300-16)EC30-08-16	2or3	TPJ (S80D)	10141
15	EMBEDDED RING	(23450-15)EC45-08-15	2	SA-213, TP316L	20073
14	ADAPTOR O RING	(23300-14)EC30-08-14	4	EPDM	10182
13	ADAPTOR(Ø23.1)	(23300-13)EC30-08-13	2	ABS CHIMEL757K	10126
12	RETAINING RING	(23300-12)EC30-08-12	2	SA-479.316	20026
11	HEAD SEAL	23300-26	2	EPDM	10175
10	PERMEATE PORT(450PSI)	SEE "PERMEATE PORT CONFIGURATIONS"	2	PF062-3	SEE THE CHART
9	BEARING PLATE	SEE "BEARING PLATE CONFIGURATIONS"	2	SEE "BEARING PLATE CONFIGURATIONS"	SEE THE CHART
8	PERMEATE PORT O RING	SEE "SIDE PORT CONFIGURATIONS"	2	EPDM	10181
7	THRUST CONE	(23300-07)EC30-08-07	1	PF062-3	10192
6	SIDE PORT RETAINING RING	SEE "SIDE PORT CONFIGURATIONS"	4	SA-479.316	SEE THE CHART
5	SIDE PORT O RING	SEE "SIDE PORT CONFIGURATIONS"	2	EPDM	SEE THE CHART
4	CURVED SIDE PORT SEAL	SEE "SIDE PORT CONFIGURATIONS"	2	EPDM	SEE THE CHART
3	PERMEATE RETAINING RING	(23300-03)EC30-08-03	2	AS80_316	20107
2	SIDE PORT	SEE "SIDE PORT CONFIGURATIONS"	2	SA-213, TP316L	SEE THE CHART
1	SHELL	SEE "SIDE PORT CONFIGURATIONS"	1	FIBER GLASS + EPOXY	SEE THE CHART
ITEM	DESCRIPTION	DRAWING NO.	QTY	MATERIAL	COMPUTER CODE

TECHNICAL REQUIREMENT

1. MANUFACTURED IN CONFORMITY TO « ASME BOILER&PRESSURE VESSEL CODE » SECTION X: « FIBER REINFORCED PLASTIC PRESSURE VESSELS » -CLASS I VESSELS;
 2. MAX OPERATING PRESSURE: 450Psi (3.1026MPa), ALLOWABLE TEMPERATURE RANGE: 20°F(-7°C)~120°F(49°C), NOT APPLICABLE TO CORROSIVE LIQUID;
 3. LEAKAGE TEST: HYDRO TEST, TESTED AT 1.1 TIMES ITS OPERATING PRESSURE, I.E.: 495Psi (3.4129MPa), SAMPLE RATE: 100%;
- NOTE: DIMENSIONS IN PARENTHESIS ARE REFERENCE ONLY.

16	ADD THE NOTES:			2013/02/06
15	RETAINING BLOCK AND SCREW CHANGED: HEAD SEAL CHANGED:			2012/09/04
14	INCREASE TOLERANCE:			2011/07/04
13	HEAD SEAL CHANGED:			2011/02/11
REVISION	DESCRIPTION	SIGNATURE	DATE	
REFERENTIAL PLASTIC SHRINKAGE (IF NECESSARY):		THE DIMENSIONS ARE FOR REFERENCE ONLY		
SIGNATURE		WAVE CYBER (SHANGHAI) CO., LTD.		
DESIGN	NAME	DATE	SCALE	MATERIAL
INSPECTION			1:6	
APPROVAL			QUANTITY	SMOOTHNESS
THIS PRODUCT DRAWING CAN NOT BE COPIED AND/OR USED WITHOUT PRIOR WRITTEN APPROVAL OF WAVE CYBER.			COMPUTER CODE	MODEL WAVE-450P-8
			DRAWING NO.	DESCRIPTION
			23450-00)EC45-08-00	450P-8 MEMBRANE HOUSING
			VERSION NO.	
			16	
			DO NOT MEASURE THE DIMENSIONS.	UNIT: MM
			TOTAL PAGE: 1	

+GF+SIGNET 515 and 3-8510 Rotor-X Flow Sensor

ENGLISH



P51590-1



J (5/97) English

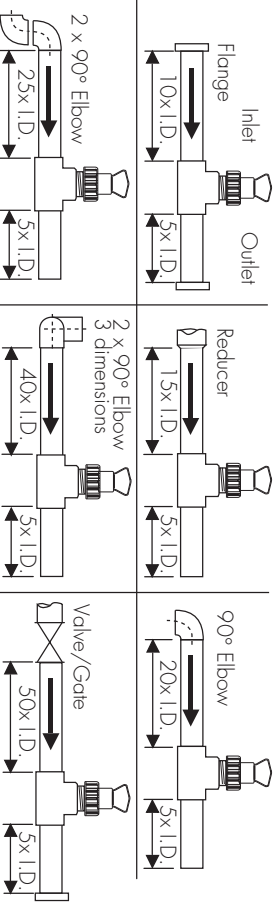
SAFETY INSTRUCTIONS



1. Do not remove from pressurized lines.
2. Do not exceed maximum temperature/pressure specifications.
3. Do not install/service without following installation instructions.
4. Wear safety goggles and faceshield during installation/service.
5. Do not alter product construction.
6. Failure to follow safety instructions could result in severe personal injury!

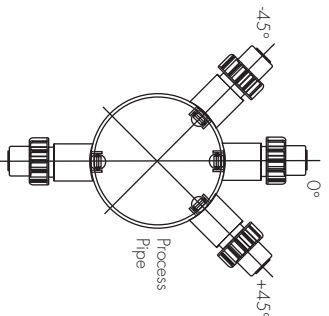
1. Location of Fitting

Recommended sensor upstream/downstream mounting requirements



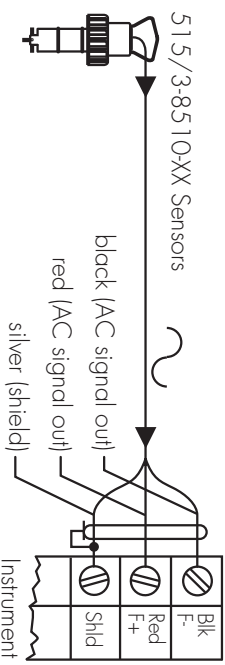
2. Sensor Mounting Position

- Horizontal pipe runs: Mount sensor in the upright (0°) position for best overall performance. Mount at a maximum of 45° when air bubbles are present. Do not mount on the bottom of the pipe when sediments are present.



- Vertical pipe runs: Sensor must be mounted in lines with UPWARD flow only.

3. Sensor Wiring



Technical Notes

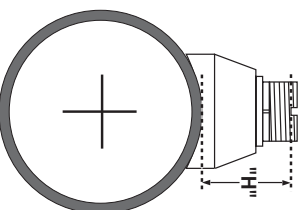
- Use 2-conductor shielded cable for cable extensions up to 60 m (200 ft).
- Cable shield must be maintained through cable splice.
- Refer to your instrument manual for specific wiring details.

4. +GF+ SIGNET Fittings

Type	Description	Type	Description
Plastic tees	<ul style="list-style-type: none">• 0.5 to 4 in. versions• PVC or CPVC• Mounts via glueon fittings		<ul style="list-style-type: none">• Metric plastic saddle• For pipes DN 6.5 to 200 mm• Requires a 30 mm diam. hole in the pipe• Wedge and saddle arrows must match
PVC saddles	<ul style="list-style-type: none">• 2 to 4 in., cut 1-7/16 in. hole in pipe• 6 to 8 in., cut 2-1/4 in. hole in pipe• Align wedge arrows with saddle arrows during assembly.• Pipes over 8 in., use iron saddle		<ul style="list-style-type: none">• Metric water fitting• For pipes DN 6.5 to 200 mm• Follow the recommended installation guidelines
Iron strap saddles	<ul style="list-style-type: none">• 2 to 4 in., cut 1-7/16 in. hole in pipe• Over 4 in., cut 2-1/4 in. hole in pipe• Special order over 12 in.		<ul style="list-style-type: none">• Metric union fitting• For pipes from DN 1.5 to 50 mm• PP or PVDF• Follow the recommended installation guidelines
Carbon steel weldon weldlets	<ul style="list-style-type: none">• 2 to 4 in., cut 1-7/16 in. hole in pipe• Over 4 in., cut 2-1/4 in. hole in pipe• Remove insert before welding• Installed by certified welder only• Special order over 12 in.		
Carbon steel threaded tees	<ul style="list-style-type: none">• 0.5 to 2 in. versions• Mounts on threaded pipe ends		

5. H-Dimensions

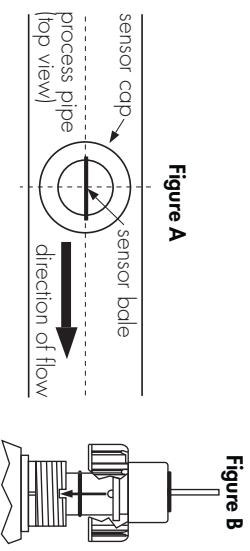
The plastic sensor insert in the Weldolet fitting **MUST** be removed during the welding process. When reinstalled, it is important that the insert be threaded to the proper height ("H" dimension).



Weldolet port number	"H" dimension inches	Weldolet port number	"H" dimension inches
CS4W020	2.38	CS4W240	4.16
CS4W025	2.33	CS4W360	4.10
CS4W030	2.32		
CS4W040	2.30		
CS4W050	3.09		
CS4W060	2.96		
CS4W080	2.73		
CS4W100	5.48		
CS4W120	5.25		
CS4W140	5.10		
CS4W160	4.85		
CS4W180	4.60		
CS4W200	4.38		

6. Standard Sensor Installation

1. Lubricate the sensor O-rings with a silicone lubricant (e.g. GE silicone compound #G632 or equivalent). Do not use any petroleum based lubricant that will attack the O-rings.
2. Using an alternating/twisting motion, lower the sensor into the fitting, making sure the installation arrows on the black cap are pointing in the direction of flow, **see Figure A.**
3. Engage one thread of the sensor cap then turn the sensor until the alignment tab is seated in the fitting notch. **Hand tighten the sensor cap. DO NOT** use any tools on the sensor cap or the cap threads and/or fitting flange threads will be damaged, **see Figure B.**

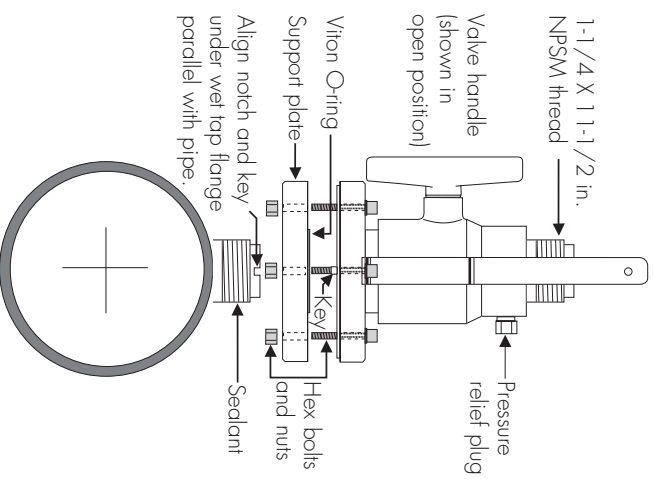


7. Wet-Tap Installation

The +GF+ SIGNED 319 Wet-Tap Assembly attaches directly onto any +GF+ Signet fitting to enable sensor removal without system shutdown. It consists of a flange and support plate which thread onto the pipe fitting insert, and a PVC ball valve through which an extended length 515 sensor is inserted into the pipe.

Procedure

1. Remove six hex nuts and bolts from the Wet-Tap flange. Separate the support plate from the main assembly. Be sure that the Vion O-ring is properly seated in the support plate groove.
2. Apply sealant to the pipe fitting insert threads to prevent leaks.
3. Screw support plate onto pipe fitting insert. It must be threaded completely down until the notches at the top of the pipe fitting insert are exposed.
4. Mount the main Wet-Tap Assembly on the support plate. Make certain the alignment keys on the flange mate with the notches on the pipe fitting insert.
5. Replace the six hex nuts and bolts to secure the Wet-Tap Assembly in place. Adjust the support plate position as necessary to align screws.
6. Check the pressure relief plug on Wet-Tap Assembly. It must be closed finger tight to prevent leaks.
7. Close ball valve by turning the orange handle to the fully closed position (parallel with pipe).

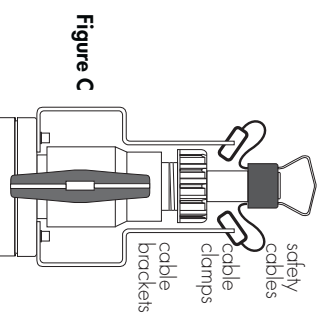


8. Wet-Tap Sensor Installation

The 319 Wet-Tap Assembly allows installation into pressurized pipes without system shutdown. **+GF+ Signet recommends reducing flow system pressure to 25 psi or less during sensor installation in a pressurized pipe.**

Non-Pressurized Installation

Open the orange ball valve handle to the full open position. Follow the steps 1-3 outlined in section 6. Attach the cable clamps and safety cables to the cable brackets. Verify the relief valve is closed before system operation, **see Figure C.**

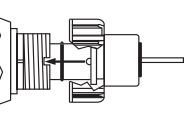
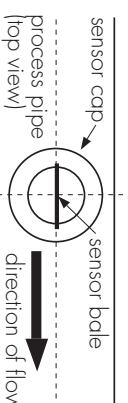
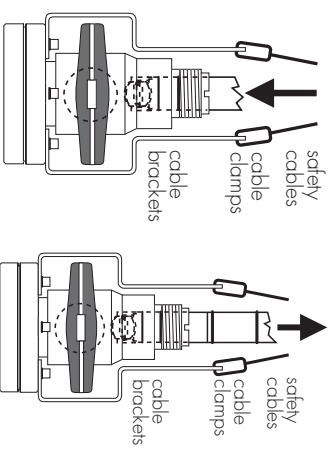


Pressurized Installation

1. Lubricate the sensor O-rings with a silicone lubricant (e.g. GE silicone compound #G632 or equivalent) / Do not use any petroleum based lubricant that will attack the O-rings.
2. Being careful not to bump the sensor rotor against the closed ball valve orifice, gently insert the extended 515 sensor into the 319 Assembly until the first two O-rings seat inside the bore, **see Figure D.**
3. Attach the cable clamps on each of the sensor's safety cables to the 319 assembly cable brackets (Hand tighten only), **see Figure D.**
4. Pull the flow sensor upward to remove slack in the safety cables, **see Figure E**
5. Reduce system pressure to 25 psi or less.
6. **Wearing safety face protection**, slowly open the ball valve to the full open position (perpendicular to pipe).
7. Using an alternating/twisting motion, push the extended sensor into the 319 assembly, making sure the sensor's installation decal is pointing in the direction of flow and the alignment tab seats into the fitting notch, **see Figure F.** Align the tab under the red sensor cap in the notches on the fitting insert. Hand tighten the red sensor cap, **see Figure G.** DO NOT use any tools on the red sensor cap or the cap threads and/or fitting flange threads will be damaged.

Figure D

Figure E



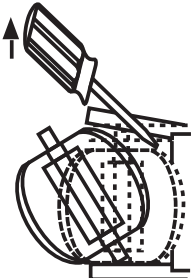
CAUTION: Maximum 319 Wet-Tap operating pressure: 7 bar (100 psi) @ 20 °C (68 °F)
Maximum 515 sensor installation/removal pressure: 1.7 bar (25 psi) @ 22 °C (72 °F)

10. Order Information

Standard 515 Rotor-X Paddlewheel Flow Sensors						All O-rings are Viton®	
						Order No.	
Order No.	Sensor Body	Rotor Pin	Rotor	Pipe Size	Code	Order No.	
P51530-P0	Polypro.	Titanium	PVDF (block)	0.5 to 4.0 in.	198 801 620	O-Rings	
P51530-P1	Polypro.	Titanium	PVDF (block)	5.0 to 8.0 in.	198 801 621	M1538-2	Material PVDF (std.)
P51530-P2	Polypro.	Titanium	PVDF (block)	10 to 36 in.	198 801 622	M1538-4	Code 198 820 018
P51530-V0	PVDF (Inteural)	Hostelloy C	PVDF (Inteural)	0.5 to 4.0 in.	198 801 623	P51546	Material Teitel with sleeve
P51530-V1	PVDF (Inteural)	Hostelloy C	PVDF (Inteural)	5.0 to 8.0 in.	198 801 624		Code 198 820 017
P51530-V2	PVDF (Inteural)	Hostelloy C	PVDF (Inteural)	10 to 36 in.	198 801 625	P51550-3	Material PVDF (Inteural)
P51530-T0	PVDF (Inteural)	PVDF (Inteural)	PVDF (Inteural)	0.5 to 4.0 in.	198 801 663	+ Rotor Pin	Code 198 820 043
P51530-T1	PVDF (Inteural)	PVDF (Inteural)	PVDF (Inteural)	5.0 to 8.0 in.	198 801 664		P51550-3
P51530-T2	PVDF (Inteural)	PVDF (Inteural)	PVDF (Inteural)	10 to 36 in.	198 801 669		+ Rotor
319 WeiTap Assembly Including Extended 515 Sensor						Order No.	
						O-rings	
						112200021	Material Viton® (std.)
						122400021	Code 198 801 186
						122800021	Material EPR
							Code 198 820 006
							198 820 007
						Order No.	
						P31542	Material Titanium
						P31536	Material Titanium
						P31536-2	Material Titanium
							Material Stainless steel
							Material Ceramic
							Material PVDF (Inteural)
							+ Rotor
						Order No.	
						P31542	Description Sensor cap, PP
						P31536	Plug, PP
						P31536-2	Plug, PVDF (Int.) with std. cap
							Code 198 801 630
							198 840 201
							198 840 202
319 WeiTap Without 515 Sensor							
Order No.	Material	Description					
P31940	PVC	319 WeiTap					
Extended 515 Sensors for 319 WeiTap							
Order No.	Sensor Body	Rotor Pin	Rotor	Pipe Size	Code	Order No.	
P51530-P3	Polypro.	Titanium	PVDF (block)	0.5 to 4.0 in.	198 840 310	3-8510-P0	Description Integral sensor, Polypro.
P51530-P4	Polypro.	Titanium	PVDF (block)	5.0 to 8.0 in.	198 840 311	3-8510-P1	Code 198 840 504
P51530-P5	Polypro.	Titanium	PVDF (block)	10 to 36 in.	198 840 312	3-8510-V0	Description Integral sensor, PVDF (Inteural)
							Code 198 840 505
							198 840 506

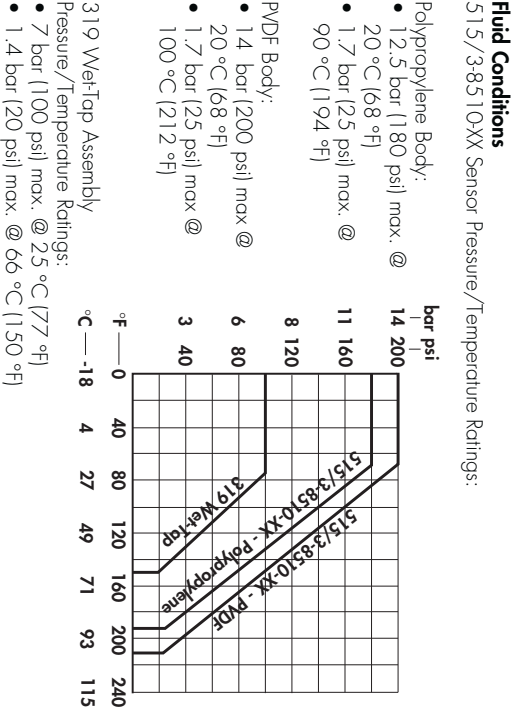
11. Rotor Replacement Procedure

- To remove the rotor, insert a small screwdriver between the rotor and the ear of the sensor.
- Twist the screwdriver blade to flex the ear outward enough to remove one end of the rotor and pin. **DO NOT** flex the ear any more than necessary! If it breaks, the sensor cannot be repaired.
- Install the new rotor by inserting one ear into the hole, then flex the opposite ear back enough to slip rotor into place.



12. Specifications

General Data	
Flow Rate Range:	0.3 to 6 m/s (1 to 20 ft/s)
Linearity:	±1% of maximum range
Repeatability:	±0.5% of maximum range
Pipe Size Range:	1.5 to 900 mm (0.5 to 36 in.)
Cable length:	7.6 m (25 ft) can splice up to 60 m (200 ft) without amplification
Cable type:	2-conductor twisted pair with shield
Materials	
Sensor Assembly:	Various thermoplastics available. Refer to section 10 for details.
Electrical	
Source Impedance:	8 kΩ
Quality Standards	
• FM, CE	
• Manufactured under ISO 9001	



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P51590-1/U-5/97) English

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Signet 8900 Multi-Parameter Controller

+GF+

Member of the ProcessPro® Family of Instruments



The Signet 8900 Multi-Parameter Controller takes the concept of modularity to the extreme. Each 8900 is field commissioned with the users specified combination of inputs, outputs, and relays using simple-to-install modular boards into the base unit. Configure the system by selecting either two, four, or six input channels which accepts any of the Signet sensors listed below, and/or other manufacturer's sensors via a 4 to 20 mA signal converter (Signet Model 8058). To complete your unit, choose a power module with universal AC line voltage or 12 to 24 VDC $\pm 10\%$, regulated.

If more features are needed, analog output and relay modules are available and easily installed. Plus, the 8900 will support four additional relays via an external relay module. There are other notable features that the 8900 offers. For instance, digital input to the 8900 enables longer cable runs and simplified wiring with minimal noise interference. Advanced relay logic allows users to select up to 3 measurement sources to trigger 1 relay. Derived measurements include difference, sum, ratio, percent recovery, percent rejection, percent passage and BTU. The menu system can be programmed to display in multi-languages including English, German, French, Spanish, Italian, and Portuguese.

Features

- Measures Flow, pH, ORP, Conductivity, Pressure, Level and Temperature
- Multi-language display
- ½ DIN enclosure
- Up to 4 analog outputs
- Up to 8 relays
- 12 to 24 VDC or 100 to 240 VAC $\pm 10\%$, regulated power
- Digital communication allows for extended cable lengths and easy wiring
- Accepts 3rd party 4 to 20 mA output devices when used with 8058 signal converter
- Available with 2 to 6 channels
- Simultaneous BTU Calculations with Heating & Cooling Totalizers per calculation



Applications

- RO/DI System Control
- Media Filtration
- Pure Water Production
- Demineralizers
- Chemical Processing
- Metal & Plastics Finishing
- Fume Scrubbers
- Proportional Chemical Addition
- Cooling Tower & Boiler Protection
- Wastewater Treatment
- Aquatic Animal Life Support Systems
- Rinse Tank

Specifications

General		
Compatibility	Modular (completely field-commissionable)	
No. of Input Channels	2, 4, or 6	
Compatible Sensors	See System Overview	
Input Signal Types	Digital (S ³ L)	Serial ASCII, TTL level 9600 bps
	Frequency	0.5% of reading
Measurement Types	Flow, pH, ORP, Conductivity/Resistivity, Pressure, Temperature, Level, or 3 rd party devices with a 4 to 20 mA output	
Derived Measurements	Sum, difference, ratio, % recovery, % reject, % passage, power (BTU)	
No. of Relays Supported	Available: 2, 4, 6 or 8 (8 dry-contact or 4 solid state and 4 dry- contact)	
No. of Analog Outputs	Available in pairs: 2 or 4 (active and/or passive 4 to 20 mA); and/or 2 (0 to 5/10 VDC)	
Enclosure and Display		
Enclosure Rating	NEMA 4X/IP65 (front face only)	
Case Material	PBT	
Panel Gasket	Silicone Sponge	
Window	Self-healing polyurethane-coated polycarbonate	
Keypad	4-buttons, highly tactile and audible injection-molded silicone rubber seal	
Display	Alphanumeric 2 x 16 back-lit LCD	
Update Rate	1 second	
Accuracy	Sensor dependent	
LCD Contrast	4 settings	
Languages Available	English, French, Spanish, German, Italian and Portuguese	
Display Ranges (see sensor specifications for actual measurement limits)		
pH	-2.00 to 15.00 pH	
pH Temperature	-40 °C to 150 °C	-40 °F to 302 °F
ORP	-9999 to +9999 mV	
Flow Rate	0.0000 to 999999 units per second, minute, hour or day	
Totalizer	0.00 to 99999999 units	
Conductivity	0.0000 to 999999 µS, mS, PPM & PPB (TDS), kΩ, MΩ	
Conductivity Temperature	-99.9 °C to 250 °C	-148 °F to 482 °F
Temperature	-99.9 °C to 999.9 °C	-148 °F to 999.9 °F
Pressure	-99.99 to 9999 psi, kPa, bar	
Level	-99999 to 99999 m, cm, ft, in., %	
Volume	-99999 to 999999 m ³ , ft ³ , in ³ , cm ³ , gal, L, kg, lb, %	
Other (4 to 20 mA)	-99999 to 999999 user selectable units	
Environmental		
Ambient Operating Temperature		
Backlit LCD	-10 °C to 55 °C	14 °F to 131 °F
Storage Temperature	-15 °C to 80 °C	5 °F to 176 °F
Relative Humidity	0 to 95%, non-condensing	
Maximum Altitude	2,000 m (6,560 ft)	
4,000 m (13,123 ft): use only DC power supply and, if applicable, solid state relays to maintain UL safety standard up to this altitude		

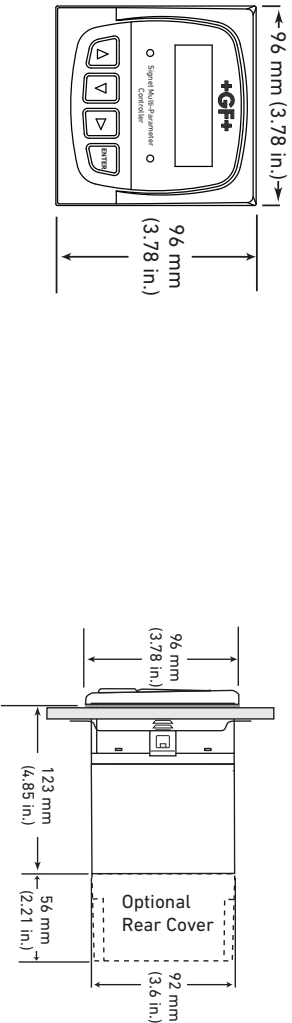
Specifications (continued)



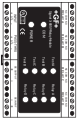
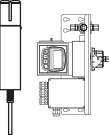
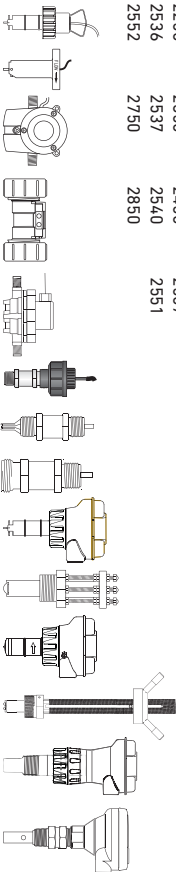
Electrical			
Power Requirements (AC or DC via Power Modules)			
Universal AC	100 to 240 VAC $\pm 10\%$, regulated 50-60 Hz, 24 VA max.		
DC	12 to 24 VDC, $\pm 10\%$, regulated recommended, 7 Watts max.		
Output Power to Sensors	5 VDC up to 40 mA total		
Terminal type	Screw-clamp, removable via plug-in modules		
Analog Outputs (via I/O Modules and Output Modules) All analog outputs are freely assignable to any channel.			
4 to 20 mA Output	Endpoints are adjustable and reversible		
Minimum Default	4.0 mA; user adjustable from 3.8 to 5.0 mA		
Maximum Default	20.00 mA; user adjustable from 19.0 to 21.0 mA		
Test Mode	Produces an adjustable 4 to 20 mA signal for functional verification of each output circuit		
Isolation	Up to 48 VAC/DC		
Error Condition	22.1 mA (default state when output source not configured)		
Update Rate	100 ms		
Accuracy	$\pm 32 \mu\text{A}$ over entire operating temperature range		
Passive 4 to 20 mA (External Power required)			
Voltage	12 to 24 VDC, $\pm 10\%$, regulated		
Max. Impedance	250 Ω @ 12 VDC	500 Ω @ 18 VDC	750 Ω @ 24 VDC
Active 4 to 20 mA (Internally Loop Powered)			
Max. Impedance	750 Ω		
0 to 5/10 VDC Output	Endpoints are adjustable and reversible		
Output Range	0 to 5 VDC or 0 to 10 VDC, software selectable		
Minimum Default	0 VDC; user programmable from 0 to 0.5 VDC		
Maximum Default	5 VDC; user programmable from 4.5 to 5.5 VDC, or 9.5 to 10.5 VDC		
Output Load	10 k Ω minimum		
Test Mode	Produces an adjustable signal for functional verification of each output circuit		
Isolation	Up to 48 VAC/DC		
Error Condition	0 VDC (default state when output source not configured)		
Update Rate	100 ms		
Accuracy	$\pm 20 \text{ mV}$ over entire operating temperature range		
Resolution	5 mV		
Power Supply Rejection	0.5 mV/V		
Relay Modules All relays are freely assignable to any channel.			
Internal relay modes of operation			
Off, Low, High, Window, Proportional Pulse, Pulse Width Modulation, USP, Volumetric, Pulse, Totalizer Volume, Advanced, % Rejection, % Recovery, % Passage			
External relay modes of operation			
Off, Low, High, Window, USP, Totalizer Volume, Advanced, % Rejection, % Recovery, % Passage			
Hysteresis	User adjustable		
Time Delay	0 to 6400 seconds		
Advanced Relay	Use "AND/OR" logic along with relay sources to trigger a relay, High/Low modes available for each of the 3 sources		
Solid State Relays	Non-mechanical switches		
Normally Open/Closed Operation	Software selectable		

Specifications (continued)

Relay Modules continued		
Maximum Voltage Rating	30 VDC or 42 VAC p-p	
Current Rating	50 mA DC or 50 mA AC RMS	
On-state Impedance	30 Ω or less	
Off-state Leakage	400 nA or less, AC or DC	
Isolation	Up to 48 VAC/DC	
Transient Protection	Embedded, up to 48 V over-voltage	
Dry-contact Relays	Mechanical contacts	
Type	SPDT	
Form	C	
Maximum Pulse Rate	600 pulses/min. (volumetric pulse & PWM modes)	
	400 pulses/min. (prop. pulse mode)	
Maximum Voltage Rating	30 VDC or 250 VAC	
Current Rating	5 A	
Shipping Weight		
Base Unit	1.00 kg	2.25 lb
Power Module	0.12 kg	0.25 lb
I/O Module	0.12 kg	0.25 lb
Output Module	0.12 kg	0.25 lb
Relay Module	0.12 kg	0.25 lb
Standards and Approvals		

Dimensions



System Overview		
<div> <div> Signalnet 8900 Multi-Parameter Controller </div>  <div> Panel Mount Select from a choice of boards Input/Output Power 2 Outputs Relay Controller </div> </div>		
Signalnet Sensors Use up to 6 inputs with one instrument from a choice of sensors 515 525 2000 2100 2250 2350 2450 2507 2536 2537 2540 2551 2552 2750 2850	Signalnet Signal Converter/ Relay Module 8058 8059  	4150 Turbidimeter 2610 Dissolved Oxygen Sensor 
Signal Fittings - See individual sensor data sheets 		
All sold separately		

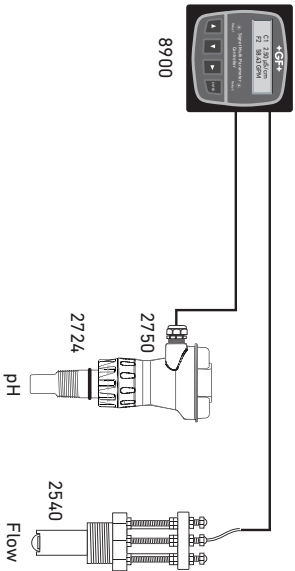
There are hundreds of system types that can be set up with the 8900. The examples below illustrate various sensors in different installation schemes. Wiring topology for point-to-point, daisy-chain, multi-drop, or a combination of these are listed in each example. Digital sensor outputs allow for long cable runs with high noise immunity. See Wiring section for allowable cable lengths.

Example 1

- 8900 input module: Two inputs
- Sensors connected: Signalnet 2750 with 2724 pH sensors and 2540 flow (frequency)
- Wiring configuration: Point-to-point

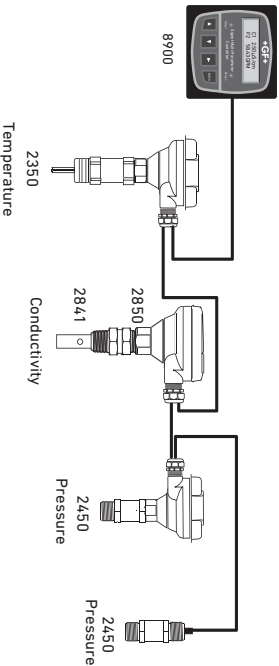
Notes

1. External relays can be used with any input module and does not consume a sensor input channel (Model 8059)
2. Model 8058 Signal Converter can be used with any input module.



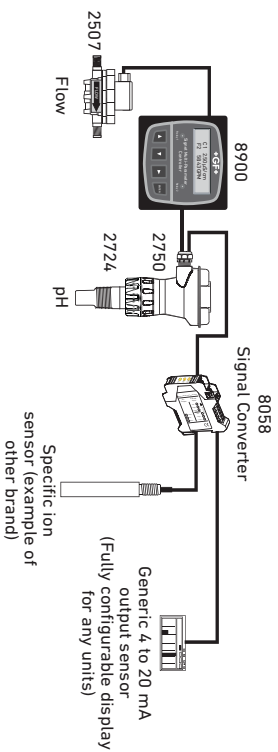
Example 2

- 8900 input module: Four inputs
- Sensors connected: Signalnet 2350 temperature sensor, 2850 with 2841 conductivity, and two 2450 pressure sensors
- Wiring configuration: Daisy-chain



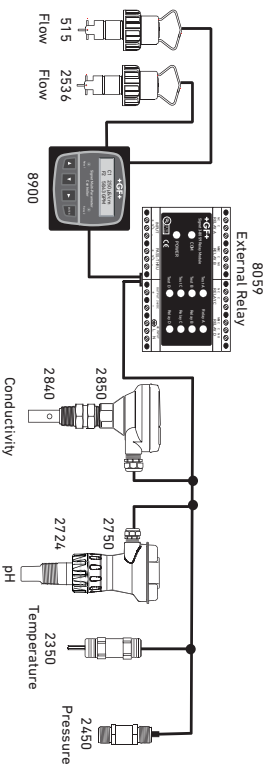
Example 3

- 8900 input module: Four inputs
- Sensors connected: Signet 2507 flow (frequency) and 2750 with 2724 pH sensors; Other manufacturers' dissolved oxygen and level sensors with 4 to 20 mA output
- External Devices: Signet 8058 signal converter - 4 to 20 mA to digital (S³L)
- Wiring configuration: Combination of point-to-point and daisy-chain



Example 4

- 8900 input module: Six inputs
- Sensors connected: Signet 2350 temperature sensor, 2850 with 2840 conductivity, 2450 pressure, 2750 with 2724 pH, and 515 and 2536 flow (frequency) sensors
- External Devices: Signet 8059 external relay module
- Wiring configuration: Combination of point-to-point and Multi-drop



Wiring Options

- **Point-to-point** wiring is direct wiring of individual devices into the controller. This wiring topology is applicable for all inputs.
- **Daisy-chain** wiring allows sequential connection from one device to the next by using junction boxes. This wiring topology is applicable for digital (S³L) inputs only.

- **Multi-drop** wiring allows drops from a single bus cable. Junction boxes can be used for the 3-way junctions that are formed with this wiring scheme. This wiring topology is applicable for digital (S³L) inputs only.

Please refer to **Wiring, Installation, and Accessories** sections for more information.

Installation of Modules with the Base Unit

3-8900

One base unit is required to build a functional 8900. It is offered with a backlit LCD display. Programming the unit is done simply via the push-button keypad.

The unit can be tailored to display in English, German, French, Spanish, Italian, and Portuguese. The two line display allows for easy programming, navigation, and viewing of each channel.

1. I/O module

One I/O module is required to build a functional 8900. I/O modules are offered for 2, 4, or 6 sensor inputs with or without two mA or voltage outputs. Users can select two additional outputs via the output module.

2. Power module

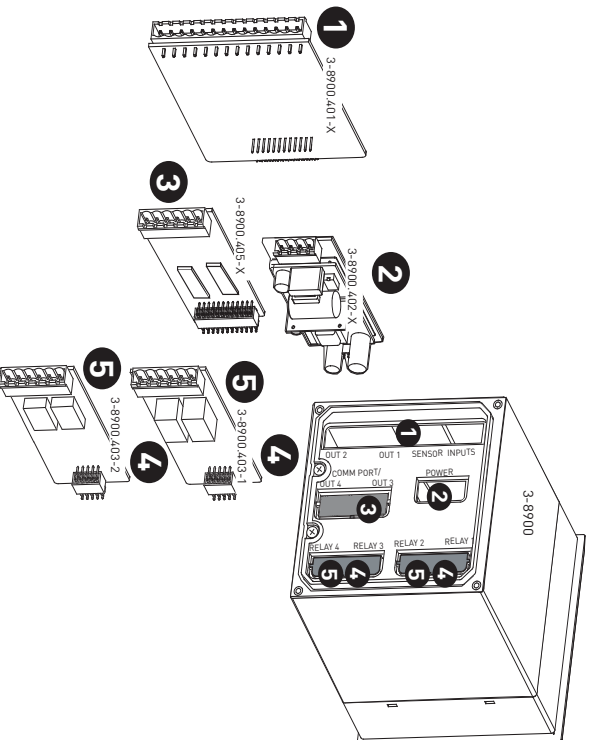
One power module is required to build a functional 8900. The power module is offered for universal 100/240 VAC or 12 to 24 VDC (This module can be powered by optional external relays (see ordering information for more details).

3. Output module

Output modules are optional when building an 8900. This module can be used in addition to other outputs that are available in the I/O modules. Active current is powered by the 8900. Passive outputs require an external 12 to 24 VDC power supply. All outputs are assignable to any input channel.

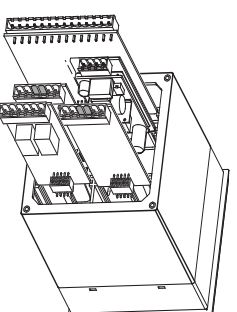
4 & 5 Relay modules

Relay modules are optional when building an 8900. Relay modes of operation include off, low, high, window, USP, totalizer volume, advanced, proportional pulse, pulse width modulation, volumetric pulse, % reject, % recovery and % passage. The advanced relay option for "AND/OR" logic is used for up to 3 conditions. For instance, a relay will go to high/low if "a" is true and "b" or "c" is false. One or two relay modules can be installed into the 8900. One additional external relay module can also be used at the same time (See optional external relay ordering information.) All relays are assignable to any input channel.



Installation of Modules:

Modules simply plug in by sliding into the base unit on rails. They are held securely in place by the rear cover. Changes and upgrades can be made in the field at any time.



Ordering Notes

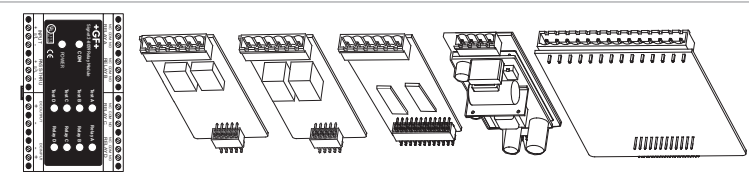
- 1) Building a functional unit requires a base unit, I/O module, and power module.
- 2) Output options are available on I/O modules and additional output modules can be used. The 8900 can support up to four outputs.
- 3) The 8900 can support up to eight relays. Up to two internal relay modules can be used simultaneously; additional external relays can also be used.

- 4) A maximum total of two frequency sensors can be used with any input card.
- 5) A total of six digit inputs or four digital inputs with two frequency inputs can be used.
- 6) The 8900 boards are field replaceable.
- 7) The 8900 can be reconfigured with new sensor types by simple reprogramming.

Ordering Information

To build a functional 8900 controller, choose the base unit, power module, and input/output (I/O) module. Additional outputs and relays are available, if needed.

Base Units, Required		
3-8900	159 000 868	Base unit with back-lit LCD
I/O (input/output) Modules, Required; Choose One		
3-8900.401-1	159 000 870	Dual (2) Input (no outputs)
3-8900.401-2	159 000 871	Dual (2) Input with Two Passive* Loop Outputs
3-8900.401-3	159 000 872	Dual (2) Input with Two Active Loop Outputs
3-8900.401-4	159 000 873	Dual (2) Input with Two Voltage Outputs
3-8900.401-5	159 000 874	Quad (4) Input (no outputs)
3-8900.401-6	159 000 875	Quad (4) Input with Two Passive* Loop Outputs
3-8900.401-7	159 000 876	Quad (4) Input with Two Active Loop Outputs
3-8900.401-8	159 000 877	Quad (4) Input with Two Voltage Outputs
3-8900.401-9	159 000 968	Six Inputs (no outputs)
3-8900.401-11	159 000 970	Six Inputs with Two Active Loop Outputs
Power Modules, Required; Choose One		
3-8900.402-1	159 000 878	110/220 VAC Power Module, $\pm 10\%$, regulated
3-8900.402-2	159 000 879	12 to 24 VDC Power Module, $\pm 10\%$, regulated
Optional Output Modules - Choose One		
3-8900.405-1	159 000 883	Two Passive* Current Loop Outputs
3-8900.405-2	159 000 884	Two Active Current Loop Outputs
Optional Relay Modules - Choose One or Two		
3-8900.403-1	159 000 880	Two Dry Contact Relays
3-8900.403-2	159 000 881	Two Solid State Relays
Optional External Relays - Choose One**		
3-8059-4	159 000 772	Four dry-contact relays; requires 12 to 24 VDC $\pm 10\%$, regulated
3-8059-4AC	159 000 773	Four dry-contact relays; requires 100 to 240 VAC $\pm 10\%$, regulated; supplies power to the 12 to 24 VDC $\pm 10\%$, regulated power host device



* Passive outputs require an external power source
** See individual product page for the 8059 External Relay Modules.

Accessories and Replacement Parts

Mfr. Part No.	Code	Description
Mounting		
3-8050.392	159 000 640	¼ DIN retrofit adapter
3-8050.395	159 000 186	Splashproof rear cover
3-0000.596-1	159 000 892	¼ DIN wall mount bracket, 6½ in. (use if no rear cover is installed)
3-0000.596-2	159 000 893	¼ DIN wall mount bracket, 9 in. (use if rear cover is installed)
3-5000.399	198 840 224	Panel adapter, 5 x 5 in. to ¼ DIN
3-5000.598	198 840 225	Surface mount bracket
3-9900.396	159 001 701	Angle adjustment adapter kit
Power Supplies		
7310-1024	159 873 004	24 VDC Power Supply, 10W, 0.42 A.
7310-2024	159 873 005	24 VDC Power Supply, 24W, 1.0 A
7310-4024	159 873 006	24 VDC Power Supply, 40W, 1.7 A
7310-6024	159 873 007	24 VDC Power Supply, 60W, 2.5 A
7310-7024	159 873 008	24 VDC Power Supply, 96W, 4.0 A
Miscellaneous		
3-8050.396	159 000 617	RC filter kit (for relay use), 2 per kit

Signet 2839 to 2842 Conductivity Sensors

English



3-2850.090

Rev F 06/03 English

WARNING



SAFETY INSTRUCTIONS

1. Depressurize and vent system prior to installation or removal.
2. Confirm chemical compatibility before use.
3. Do not exceed maximum temperature/pressure specifications.
4. Wear safety goggles or faceshield during installation/service.
5. Do not alter product construction.
6. When using chemicals or solvents care should be taken and appropriate eye, face, hand, body, and/or respiratory protection should be used.

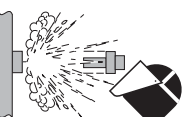


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1. Specifications

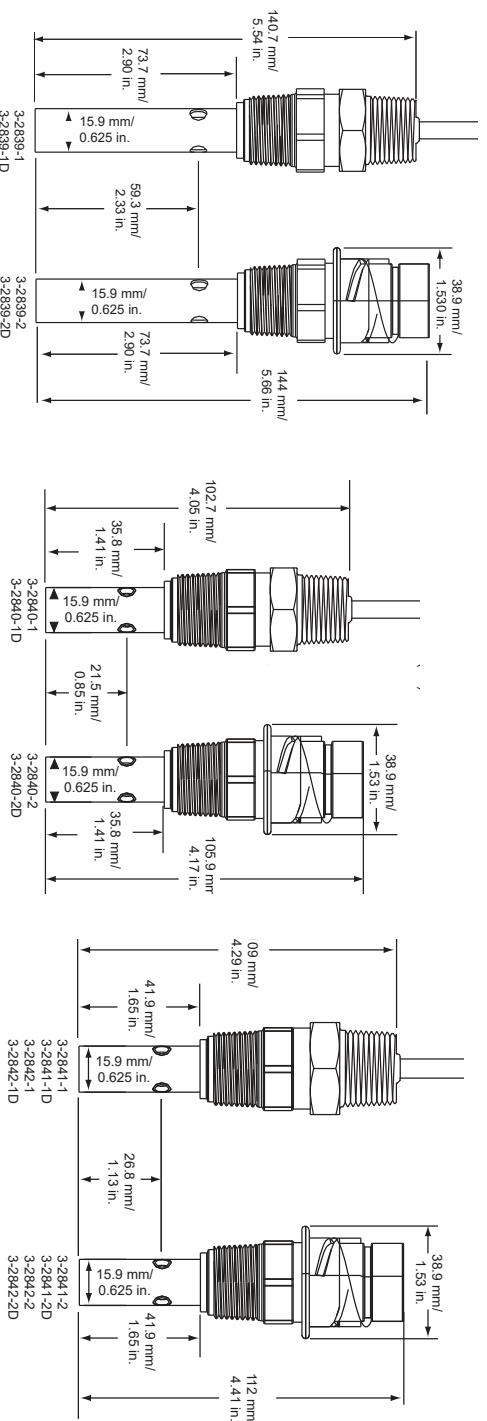
Dimensions

2839: 0.01 cell

2840: 0.1 cell

2841: 1.0 cell

2842: 10.0 cell



General

Compatibility:

	2850	5800CR	5900	8850-X	8860	8900	9050CR
CR Electrodes with Cable (-1X)		●	●	●	●	●	●
CR Electrodes with DryLoc™ (-2X)	●						●

Quality Standard:

- Manufactured under ISO 9001, ISO 14001
- CE

Shipping Weight:

2839: 0.34 kg (0.74 lb)
2840, 2841, 2842: 0.30 kg (0.66 lb)

Process connection:

-1 and -2 versions: 3/4 in. NPT
-1D and -2D versions: ISO 7/1-R3/4

Cable (28XX-1X only):

4.6 m (15 ft.) std., 3 cond w/shld 22 AWG,
max length 30 m (100 ft.)
(For resistivity measurements above 10 MΩ or
below 20°C, maximum cable length is 25 ft. (7.6 m))

Performance:

Accuracy: ±2% of cell value

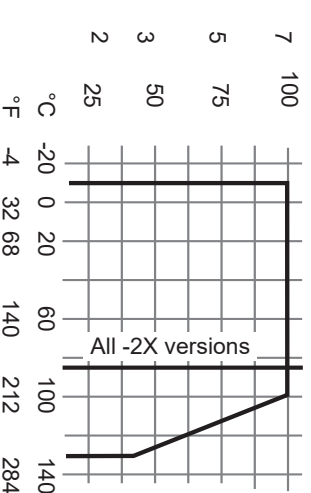
Temperature measurement:

PT 1000

Temperature response time (τ):

2839: 5 s
2841: 20 s
2840: 10 s
2842: 30 s

BAR PSI



Operating temperature/pressure:
(with thread engagement per ANSI B1.20.1)

-1X versions:

-10°C to 100°C @ 6.9 bar (14°F to 212°F @ 100 psi)
-10°C to 131°C @ 2.76 bar (14°F to 268°F @ 40 psi)

-2X versions:

-10°C to 85°C @ 6.9 bar (14°F to 185°F @ 100 psi)

Storage temperature: -20°C to 131°C (-4°F to 268°F)

Wetted materials:

DryLoc connector (-2 versions only):

Threaded fitting:

Insulator:

Insulator O-ring (2841, 2842):

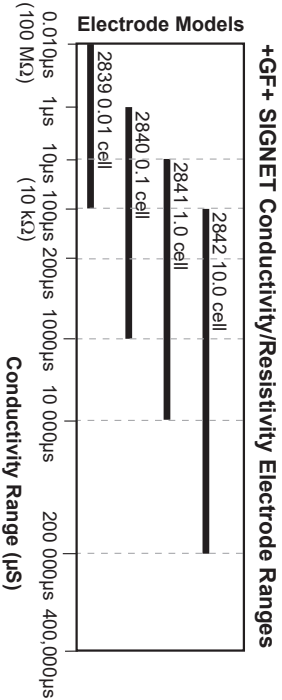
Electrode contacts:

CPVC
PEEK™
PEEK™
FPM
316L stainless steel
PEEK™ is a trademark of Victrex plc

2. Cell constant selection

The nominal process value should be near the center of the range. Ranges below are for use with +GF+ SIGNET Conductivity instruments:

- 2839 (0.01 cell): 0.010 to 100 μS (10 $\text{k}\Omega$ /to 100 $\text{M}\Omega$)
- 2840 (0.1 cell): 1 to 1000 μS (1 $\text{M}\Omega$ to 1 $\text{k}\Omega$)
- 2841 (1.0 cell): 10 to 10,000 μS
- 2842 (10.0 cell): 100 to 200,000 μS



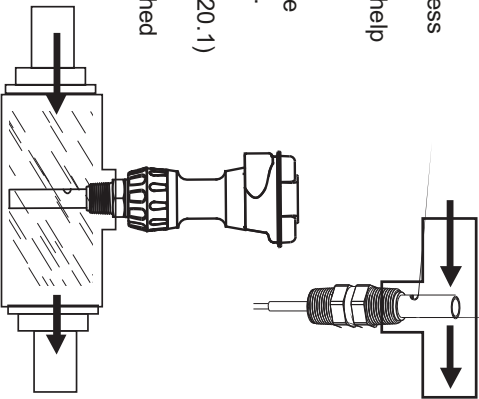
3. In-line installation for all -1X electrodes

- Inspect threads to ensure integrity. Do not install an electrode with damaged threads.
- Apply sealant or PTFE tape to threads.
- Wetted materials include 316L stainless steel, PEEK™ and FPM (FPM O-ring inside 2841, 2842). Check for chemical compatibility before installing electrode.
- The -1X electrodes are supplied with 5 m (15 ft.) of cable. It may be extended to a maximum 30 m (100 ft.)
- For resistivity measurements above 10 $\text{M}\Omega$ or below 20°C, maximum cable length is 25 ft. (7.6 m)

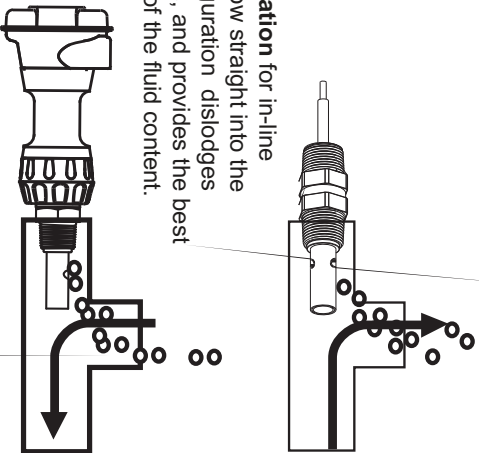
If the electrode is mounted vertically in a tee, do not recess the openings inside the tee. Mounting upside down may help prevent air entrapment.

An oversized tee may also be helpful for inline installations.

At least 4 threads (ANSI B1.20.1) must be engaged to provide pressure capacity per published specifications.



The preferred installation for in-line applications directs flow straight into the electrode. This configuration dislodges entrapped air bubbles, and provides the best continuous sampling of the fluid content.

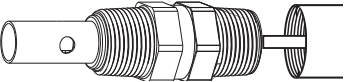


4. Submersible installation for all -1X electrodes

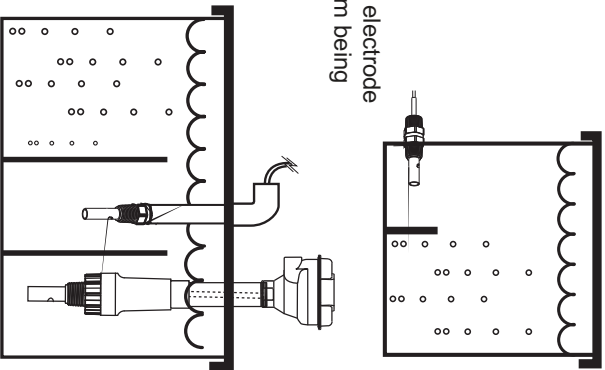
- Wetted materials include 316L stainless steel, PEEK™ (FPM O-ring inside 2841, 2842).
- Check for chemical compatibility before installing electrode.
- The -1X electrodes are supplied with 15 ft. of cable. It may be extended to a maximum 30 m (100 ft.)
- For resistivity measurements above 10 $\text{M}\Omega$ or below 20°C, maximum cable length is 25 ft. (7.6 m)

1. Feed cable into watertight conduit.
2. Apply thread sealant to the electrode before threading conduit onto electrode. Avoid twisting the cable.
3. Secure cable with conduit or cable gland.
4. For additional defense against possible accumulation of condensation at the back seal area of the electrode, fill the lower 3-4 inches (75-100 mm) of conduit or extension pipe with a flexible sealant such as silicone.

3/4 in. NPT or
ISO 7/1-R3/4



In aerated vessels install the electrode in a stillwell to prevent air from being trapped inside the electrode.



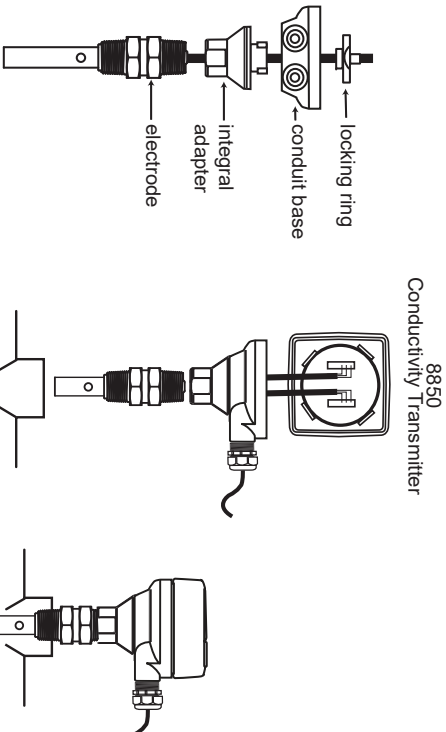
5. Wiring for all -1X electrodes

- Do not route electrode cable in conduit containing AC power wiring. Electrical noise may interfere with electrode signal.
- Routing electrode cable in grounded metal conduit will help prevent electrical noise and mechanical damage.
- Seal cable entry points to prevent moisture damage.
- For resistivity measurements above 10 MΩ or below 20°C, maximum cable length is 25 ft. (7.6 m)

Integral installation detail for all -1X electrodes

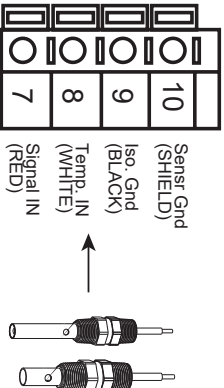
- 3-8052 Integral Kit and 3-9000.392-X Liquid Tight Connector kit are required. (See Parts and Accessories on back page)
- Cut the cable to approx. 15 cm (6 in.)
- Strip outer cable cover back 5 cm (2 in.)
- Strip each conductor to expose 1 cm (3/8 in.) of bare wire.
- Tin each conductor with solder for best results.

All -2X DryLoc electrodes connect directly to the 2850 Conductivity Sensor with no interconnecting wiring. Consult the 2850 Instruction manual for details.

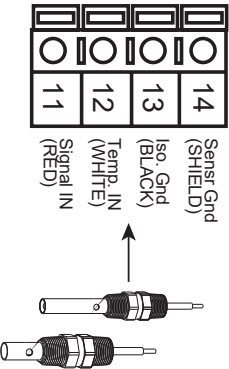


ProcessPro

To 8850-1

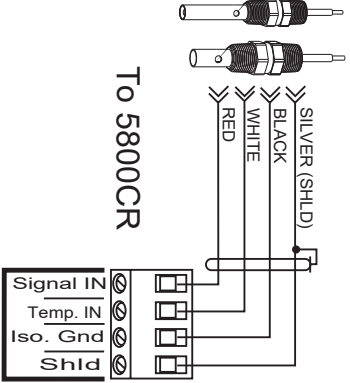


To 8850-2 and 8850-3



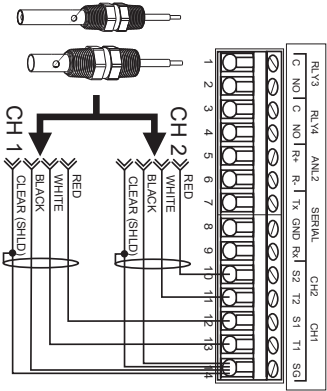
ProPoint

To 5800CR



Intelek-Pro

To 9050CR



Installation for -2X DryLoc electrodes

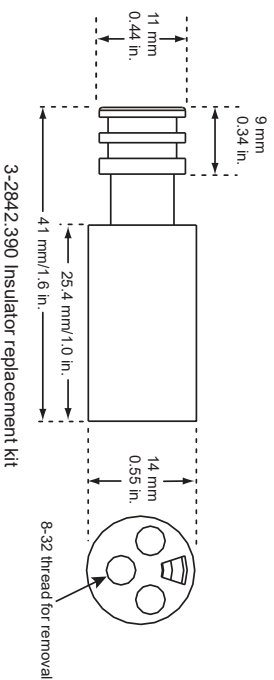
Installation instructions for the -2 DryLoc version of these electrodes is located in the associated instrument manual.

6. Maintenance

- Conductivity electrodes require little maintenance except for periodic cleaning in installations where contaminants are present.
- Keep metal surfaces clean and free of coatings.

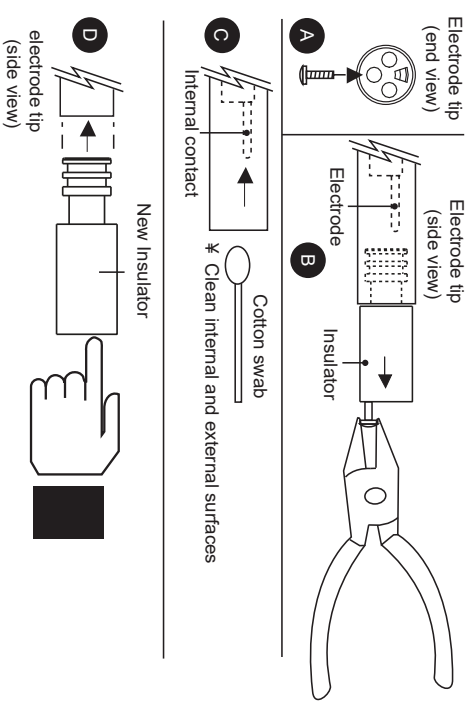
6.1 Replacement Insulator, 2842 electrode only

- 2842 electrodes have a removable insulator so the internal cavity can be cleaned.
- After the insulator snaps into position it cannot be removed without damage.
- Order insulator replacement kit 3-2842.390 before attempting maintenance.



Insulator removal and replacement

- Thread the screw into the insulator (8-32 thread)
- Pull to remove the old insulator.
- Clean any coating or deposits inside the electrode.
- Insert the new insulator and press into place.



7. Ordering Information

Mfr. Part No.	Code	Description
3-2839-1	159 000 921	Cell 0.01, 15 ft cable, NPT
3-2839-1D	159 000 923	Cell 0.01, 15 ft cable, ISO
3-2840-1	159 000 786	Cell 0.1, 15 ft cable, NPT
3-2840-1D	159 000 788	Cell 0.1, 15 ft cable, ISO
3-2841-1	159 000 790	Cell 1.0, 15 ft cable, NPT
3-2841-1D	159 000 792	Cell 1.0, 15 ft cable, ISO
3-2842-1	159 000 794	Cell 10.0, 15 ft cable, NPT
3-2842-1D	159 000 796	Cell 10.0, 15 ft cable, ISO
3-2839-2	159 000 922	Cell 0.01, DryLoc, NPT
3-2839-2D	159 000 924	Cell 0.01, DryLoc, ISO
3-2840-2	159 000 787	Cell 0.1, DryLoc, NPT
3-2840-2D	159 000 789	Cell 0.1, DryLoc, ISO
3-2841-2	159 000 791	Cell 1.0, DryLoc, NPT
3-2841-2D	159 000 793	Cell 1.0, DryLoc, ISO
3-2842-2	159 000 795	Cell 10.0, DryLoc, NPT
3-2842-2D	159 000 797	Cell 10.0, DryLoc, ISO

Parts and Accessories

3-8052	159 000 188	3/4 in. Integral mounting kit
3-9000.392-1	159 000 839	Liquid-tight connector kit, 1 set, 1/2 in. NPT
3-9000.392-2	159 000 841	Liquid-tight connector kit, 1 set, PG 13.5
3-2842.390	159 000 925	2842 replacement insulator, PEEK™ with FPM O-ring
3-2850-1	159 000 783	Conductivity Sensor, In-line
3-2850-2	159 000 784	Conductivity Sensor, In-line w/EasyCal
3-2850-3	159 000 785	Conductivity Sensor, Submersible
3-2850-4	159 000 857	Conductivity Sensor, Submersible



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