

SUBMITTAL DATA FOR REVIEW AND APPROVAL

PROJECT: Well 35 & 38 Equipping

**Owner: City of Delano
1015 11th Avenue
Delano, CA 93215**

**Engineer: Quad Knopf, Inc
5080 California Ave, Ste. 400
Bakersfield, CA 93309**

**Contractor: Steve Dovali Construction
8461 East Olive Avenue
Fresno, CA 93727**

**Supplier: Hopkins Technical Products, Inc
2155-A Elkins Way
Brentwood, CA 94513
(925) 240-2160**

Richard Hopkins – Project Coordinator

SECTION 1

MSDS SHEETS

SODIUM HYPOCHLORITE MSDS SHEET

NOTE:

The following MSDS Sheet is for reference only. At this time we do not know the chemical supplier. Please insert Chemical Supplier MSDS Sheet into this Section.

Material Safety Data Sheet

Revision Issued: 9/24/2008

Supersedes: 9/09/2007

First Issued: 6/17/87

Section I - Chemical Product And Company Identification

Product Name: Sodium Hypochlorite

CAS Number: 7681-52-9

HBCC MSDS No. CC17000



HILL BROTHERS Chemical Co.

1675 NORTHMAIN STREET • ORANGE, CALIFORNIA 92867-3499
(714) 998-8800 • FAX: (714) 998-6310
<http://hillbrothers.com>

1675 No. Main Street, Orange, California 92867

Telephone No: 714-998-8800 | Chemtrec: 800-424-9300

Section II - Composition / Information On Ingredients

			Exposure Limits (TWAs) in Air		
Chemical Name	CAS Number	%	ACGIH TLV	OSHA PEL	STEL
Sodium Hypochlorite	7681-52-9	5-15	N/A	N/A	2mg/m ³
Sodium Hydroxide	1310-73-2	< 1	N/A	N/A	2mg/m ³

Section III - Hazard Identification

Routes of Exposure: Sodium hypochlorite may affect the body either through ingestion, inhalation, or contact with the eyes and/or skin.

Summary of Acute Health Hazards

Ingestion: May cause irritation of the membranes of the mouth and throat, stomach pain, and possible ulceration.

Inhalation: May cause burns, cough, pulmonary edema, up to 48 hours after exposure.

Skin: May cause moderate skin irritation and reddening of the skin. Prolonged exposure may cause burns, blistering.

Eyes: May cause severe irritation such as burns, and eye damage.

Summary of Chronic Health Hazards: Irritating effects increase with strength of solution and time of exposure.

Medical Conditions Generally Aggravated by Exposure: N/A

Note to Physician: The absence of visible signs of burns does NOT reliably exclude the presence of actual tissue damage.

Section IV - First Aid Measures

Ingestion: Do not give any liquid to an unconscious person. Drink large quantities of gelatin solution if able to swallow. If these are not available, drink large quantities of water. DO NOT give vinegar, baking soda or acidic antidotes. Do not induce vomiting unless directed by a Poison Control Center or Medical Doctor. GET MEDICAL ATTENTION IMMEDIATELY.

Inhalation: If adverse effects occur, remove to fresh air. Give artificial respiration if

not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. If respiration or pulse has stopped, call 911 or an ambulance, have a trained person administer Basic Life Support, Cardio-Pulmonary Resuscitation (CPR) / Automatic External Defibrillator (AED), and GET MEDICAL ATTENTION IMMEDIATELY.

Skin: Immediately flush contaminated areas with plenty of water for 15 to 20 minutes. Remove contaminated clothing, jewelry, and shoes immediately. Wash contaminated areas with soap and water. Thoroughly clean and dry contaminated clothing and shoes before reuse. GET MEDICAL ATTENTION IMMEDIATELY.

Eyes: Hold eye open and rinse slowly and gently with water for 15 to 20 minutes. GET MEDICAL ATTENTION IMMEDIATELY. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Contact lenses should not be worn when working with this chemical.

Section V - Fire Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: N/A

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

Unusual Fire and Explosion Hazards: Heat and acid contamination will produce irritating and toxic fumes. May decompose, generating irritating chlorine gas.

Extinguishing Media: Use extinguishing agents appropriate for surrounding fire.

Special Firefighting Procedures: Wear NIOSH approved positive-pressure self-contained breathing apparatus. Move container from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

Section VI - Accidental Release Measures

[Spills may need to be reported to the National Response Center (800/424-8802) DOT Reportable Quantity (RQ) is 100 pounds] Ventilate the area of the spill or leak. For large spills, evacuate the hazard area of unprotected personnel. Wear appropriate protective clothing. Dike and contain. Neutralize with sodium sulfite, bisulfite or thiosulfite. Remove with vacuum trucks or pump to storage vessels. Soak up residue with an absorbent such as clay, sand or other suitable material; place in non-leaking containers for proper disposal. Flush area with water to remove trace residue; dispose of flush solutions as above. For small spills, take up with an absorbent material and place in non-leaking containers; seal tightly for proper disposal. This material is alkaline and may raise the pH of surface waters with low buffering capacity.

Section VII - Handling and Storage

Store in vented, closed, clean non-corrosive containers in a cool, dry location away from direct sunlight and heat to avoid deterioration. Do not store adjacent to chemicals which may react with the bleach if spillage occurs. If closed containers become heated, the containers should be vented to release decomposition products (mainly oxygen under normal decomposition). Do not mix or contaminate with ammonia, hydrocarbons, acids, alcohols or ethers.

Section VIII - Exposure Controls/Personal Protection

Respiratory Protection: Not required under normal use conditions. In the case of a fire use self-contained breathing apparatus. A NIOSH approved respirator with N95

(dust, fume, mist) filters may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits, or when symptoms have been observed that are indicative of overexposure.

When decomposition products exist, acid gas cartridges are also required.

A half-piece air-purifying respirator may be used in concentrations up to 10X the acceptable exposure level and a full facepiece air-purifying respirator may be used in concentrations up to 50X the acceptable exposure level.

Supplied air should be used when the level is expected to above 50X the acceptable level, or when there is a potential for uncontrolled release.

A respiratory program that meets 29 CFR 1910.134 must be followed whenever workplace conditions warrant use of a respirator.

Ventilation: No special ventilation is required unless bleach is exposed to decomposition conditions, i.e. heat or acidic conditions.

Protective Clothing: Avoid contact with the eyes. Wear chemical goggles and/or face shield if there is the likelihood of contact with the eyes. Avoid prolonged or repeated contact with the skin. Wear chemical-resistant gloves and other clothing as required to minimize contact.

Other Protective Clothing or Equipment: Safety showers and eyewash fountains should be available in storage and handling areas.

Work / Hygienic Practices: Wash hands thoroughly with soap and water before eating, drinking, smoking or using toilet facilities. Do NOT place food, coffee or other drinks in the area where dusting or splashing of solutions is possible.

Section IX - Physical and Chemical Properties

Physical State: Liquid

pH: 12

Freezing / Melting Point / Range: -5 to -25°C

Boiling Point / Range: 40-76°C (104-169°F)
(Decomposes)

Appearance / Color / Odor: Colorless to pale yellow watery liquid with a pungent chlorine odor

Solubility in Water: 100%

Vapor Pressure(mmHg): 12-17 @ 20°C

Specific Gravity(Water=1):
1.07-1.26 @ 20°C

Molecular Weight: 75.45

Vapor Density(Air=1): 2.61

% Volatiles (by volume): Variable-Water plus products of Decomposition

How to detect this compound :
N/A

Section X - Stability and Reactivity

Stability: Unstable above 40°C, in sunlight, or in contact with acid.

Hazardous Polymerization: Will Not Occur

Conditions to Avoid: Stability decreases with concentration, heat, light exposure, decrease in pH and contamination with heavy metals, such as nickel, cobalt, copper and iron.

Materials to Avoid: Strong acids, oxidizable materials, heavy metals (which act as catalysts), reducing agents, ammonia solutions, ether, and many organic and inorganic chemicals such as paint, kerosene, paint thinners, shellac, grease and oils.

Hazardous Decomposition Products: Chlorine. Additional decomposition products which depend upon pH, temperature and time are sodium chloride, sodium chlorate and oxygen.

Section XI - Toxicological Information

Toxicity Data: By ingestion, Grade 1: oral rat LD₅₀ = 8.91 g/kg IDLH Value: Data not available

Section XII - Ecological Information

This material may be harmful to aquatic life in low concentrations.

Section XIII - Disposal Considerations

Do not contaminate food or feed by storage, disposal or cleaning of equipment. Product or rinsates that cannot be used should be diluted with water before disposal in a sanitary sewer. Can be neutralized with weak reducing agents such as sodium sulfite, bisulfite, or thiosulfite (DO NOT USE SULFATES OR BISULFATES). Dispose of in accordance with all applicable local, county, state and federal regulations.

Section XIV - Transport Information

DOT Proper Shipping Name: Hypochlorite Solutions
DOT Hazard Class/ I.D. No.: 8, UN1791, III

Section XV - Regulatory Information

Reportable Quantity: 100 Pounds (45.4 Kilograms)
NFPA Rating: Health - 2; Flammability - 0; Instability - 1
0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme
Carcinogenicity Lists: No **NTP:** No **IARC Monograph:** No **OSHA Regulated:** No
Certified to NSF/ANSI Standard 60 12.5% Solution Maximum Use 84 mg/L
Under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act, sodium hypochlorite (bleach) is registered for use as an antimicrobial pesticide, a sanitizer or disinfectant to kill bacteria, fungi, and viruses.

Section XVI - Other Information

Hazardous Ingredients: Sodium hypochlorite is manufactured only in solution form. Industrial grade sodium hypochlorite contains from 10 - 15% by weight NaOCl (10 - 17.8% available chlorine) with about 0.50-1.00% excess NaOH for stability control.

Synonyms/Common Names: Liquid Bleach

Chemical Family/Type: Halogen Compound

Sections changed since last revision: III, IV, VII, XIII, XV

IMPORTANT! Read this MSDS before use or disposal of this product. Pass along the information to employees and any other persons who could be exposed to the product to be sure that they are aware of the information before use or other exposure. This MSDS has been prepared according to the OSHA Hazard Communication Standard [29 CFR 1910.1200]. The MSDS information is based on sources believed to be reliable. However, since data, safety standards, and government regulations are subject to change and the conditions of handling and use, or misuse are beyond our control, [Hill Brothers Chemical Company](#) makes no warranty, either expressed or implied, with respect to the completeness or continuing accuracy of the information contained herein and disclaims all liability for reliance thereon. Also, additional information may be necessary or helpful for specific conditions and circumstances of use. It is the user's responsibility to determine the suitability of this product and to evaluate risks prior to use, and then to exercise appropriate precautions for protection of employees and others.

SECTION 2

CHEMICAL METERING PUMPS

Chemical Metering Pump

Specification Data Sheet

Date:	04/01/12
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano
Contractor Order #:	TBD
HTP INC Project No:	PJ-12001
Plant:	Well 35
Specification Section:	43 20 01 – Chlorination Equipment

Revision	By	Date	Description	Notes
0	RMH	04/01/12	“For Approval”	

A	Design Conditions		C	Construction	
1	Quantity	2	24	Turndown Ratio	10:1
2	Tag Number	PMP-35-01 & PMP-35-02	25	Stroking Speed	120 SPM
3	Manufacturer	ProMinent Fluid Controls	26	No. Feed / Pump	1
4	Model Number	S2CaH12050PVTs070UDC110C	27	Suction Pressure	29 PSIG
5	Type	Mechanical	28	Suction connection	3/4-Inch
6	Stroke Adjustment	Manual	29	Discharge Connection	3/4-Inch
7	Stroke Signal	N/A	30	Max. Discharge Press.	145 PSI
8	Motor Specification	1/3 Hp	31	Capacity @ Max Press	15.9 GPH
9	Speed Signal	4 – 20 mADC	32	Pump Oper. Temp	113° F
10	Materials:		33	Project Design Data:	
11	Liquid Ends	PVDF - NSF 61 Certified	34	Design Temperature	40°F to 100°F
12	Valves / Seats	PVDF/PTFE	35	Operating Temperature	Ambient
13	Check Valve Balls	Ceramic	36	Design Pressure (PSIG)	60 PSIG
14	Disc. Diaphragm	Teflon	37	Design Capacity (GPH)	15.9 GPH
15	Seals	PTFE	38	Chemical Pumped	NaOCl
16	Stroke Length	5 mm	39	Specific Gravity	1.07 – 1.26 @ 20°C
17	Housing	Cast Aluminum	40	Viscosity	
18	Coating	Glass-Filled Luranyl PPE	41		
19			42		

B	Options Included		D	Options Included	
20	Pulsation Dampeners	Yes	43	Auto Stroke Positioner	No
21	Calibration Chamber	Yes	44	Auto Stroke Controller	No
22	Relief Valves	Yes	45	Variable Speed	Yes
23	Back Pressure Valve	Yes	46	Press Gauge / Switch	Yes / No

Referenced Documents	Doc. No.	Notes
		Pump is sized for 24 PPD of Chlorine
		Previous Wells are sized for 50 PPD of Chlorine

Chemical Metering Pump

Specification Data Sheet

Date:	04/01/12
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano
Contractor Order #:	TBD
HTP INC Project No:	PJ-12001
Plant:	Well 38
Specification Section:	43 20 01 – Chlorination Equipment

Revision	By	Date	Description	Notes
0	RMH	04/01/12	“For Approval”	

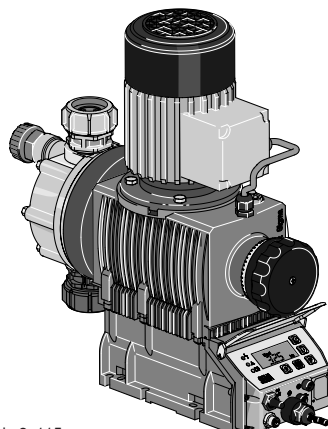
A	Design Conditions		C	Construction	
1	Quantity	2	24	Turndown Ratio	10:1
2	Tag Number	PMP-38-01 & PMP-38-02	25	Stroking Speed	120 SPM
3	Manufacturer	ProMinent Fluid Controls	26	No. Feed / Pump	1
4	Model Number	S2CaH12050PVTs070UDC110C	27	Suction Pressure	29 PSIG
5	Type	Mechanical	28	Suction connection	3/4-Inch
6	Stroke Adjustment	Manual	29	Discharge Connection	3/4-Inch
7	Stroke Signal	N/A	30	Max. Discharge Press.	145 PSI
8	Motor Specification	1/3 Hp	31	Capacity @ Max Press	15.9 GPH
9	Speed Signal	4 – 20 mADC	32	Pump Oper. Temp	113° F
10	Materials:		33	Project Design Data:	
11	Liquid Ends	PVDF - NSF 61 Certified	34	Design Temperature	40°F to 100°F
12	Valves / Seats	PVDF/PTFE	35	Operating Temperature	Ambient
13	Check Valve Balls	Ceramic	36	Design Pressure (PSIG)	60 PSIG
14	Disc. Diaphragm	Teflon	37	Design Capacity (GPH)	15.9 GPH
15	Seals	PTFE	38	Chemical Pumped	NaOCl
16	Stroke Length	5 mm	39	Specific Gravity	1.07 – 1.26 @ 20°C
17	Housing	Cast Aluminum	40	Viscosity	
18	Coating	Glass-Filled Luranyl PPE	41		
19			42		

B	Options Included		D	Options Included	
20	Pulsation Dampeners	Yes	43	Auto Stroke Positioner	No
21	Calibration Chamber	Yes	44	Auto Stroke Controller	No
22	Relief Valves	Yes	45	Variable Speed	Yes
23	Back Pressure Valve	Yes	46	Press Gauge / Switch	Yes / No

Referenced Documents	Doc. No.	Notes
		Pump is sized for 24 PPD of Chlorine
		Previous Wells are sized for 50 PPD of Chlorine

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Overview: Sigma/ 2



pk_2_115

Ideal for Economical mid-range applications

(see [page 128](#) for spare parts and [page 134](#) for control cables)

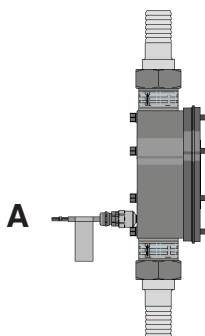
The ProMinent® Sigma/ 2 is a mechanically actuated diaphragm metering pump. It has a capacity range of 15.9-111 gph (60-420 l/h) at a maximum back pressure of 58-232 psi (16-4 bar). The pump capacity is adjusted by varying the stroke length (5 mm) in .05% increments via a self-locking adjusting knob.

The reproducible metering accuracy is better than $\pm 2\%$ providing installation has been correctly carried out, and in the stroke length range of 30-100%. (Instructions in the operating instructions manual must be followed.)

The stable, corrosion resistant metal and plastic housing is rated IP 65. To facilitate adaptation of the pumps to the widest possible range of processing requirements we offer a choice of three gearbox ratios, three liquid end sizes, two liquid end materials and either contact or analog signal (e.g., 0/4-20 mA) control options in the form of the S2Ca Sigma controller.

For safety reasons, all motor-driven metering pumps must be equipped with adequate protection against electrical overload.

All PVDF versions are NSF/ANSI 61 approved.



Diaphragm Failure Indication (A)

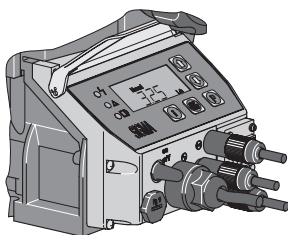
The delivery unit has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator. The diaphragm is coated with PTFE film on both sides, from the drive and working side. This guarantees that no discharge to the outside occur if the diaphragm ruptures. When the diaphragm ruptures, feed chemical enters between the diaphragm layers and triggers a mechanical indication or an alarm via the sensor area. This concept ensures reliable metering - even under critical operating conditions.

In connection with the S2Ca, continued metering, or alternatively, a stopping of the metering pump can be selected.

Sigma/ 2 Basic Type (S2Ba)

The ProMinent® Sigma Basic type is a motor driven metering pump with no internal electronic control system. The ProMinent® S2Ba offers a variety of different drive options in the single phase AC motors (56-C flange). Different flanges are available so that customers can use their own motor to drive the pump.

Sigma/ 2 Control Type (S2Ca)



The ProMinent® Sigma microprocessor version (standard IP 65) allows rapid and reliable adjustment to fluctuating metering requirements.

The controller has the same control panel as the ProMinent® gamma/ L metering pump.

The microprocessor controller of the Sigma pumps, featuring the optimum combination of variable AC frequency combined with digital stroking frequency, ensures exact metering even in the lower minimum range due to individual stroke control.

The individual pump functions are simply adjusted using the five programming keys. A backlit LCD indicates the current operating status, LED's function as operation or fault indicators and fault indicator or pacing relays monitor the pump function.

Local or remote control is possible with PROFIBUS® and/or an integrated process timer.

(see [page 134](#))

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Standard Modes and Functions

Feed rate is determined by stroke length and stroke rate. Stroke length is manually adjustable from 1 to 100% in increments of 1% via the stroke length knob.

Stroke rate can be set to a maximum of 90, 170, or 200 strokes per minute (pump dependent). An illuminated LCD displays stroke length, stroke rate and an accumulative stroke counter, that can be cleared and reset.

Pump capacity output is displayed in either U.S. gph or l/h, set by the operator. Output is accumulated and totalized capacity is also displayed in either U.S. gallons or litres.

The “i” key is used to scroll information screens for stroke rate, stroke length, stroke counter, capacity, and totalized capacity. Other information is available depending on control mode.

Control Modes

The control modes available with the Sigma/1 include manual, external contact with pulse control (multiplier/divider), batch, or analog control. The Profibus option includes all control modes, plus fieldbus connection.

In the “Manual” mode, stroke rate is controlled manually. The “Contact” external mode allows adjustments to be made externally (e.g., by means of a pulse-type water meter for proportional chemical feed.) Pulse signals are fed into the contact input of the pump by an optional control cable. Each pulse from a water meter or pulse-type controller provides the pump with an input to pump at the selected pulse ratio, up to the pump’s maximum stroke rate. Over-stroking the pump is not possible.

Standard Functions

“Calibrate”

The pump can be directly calibrated in-line to actual flow. Calibration is maintained within the stroke frequency range of 90/170/200 spm (model dependent). A warning indicator flashes when adjustments to the stroke volume are made outside the calibrated range of +/- 10%.

“Auxiliary Frequency”

An auxiliary frequency can be programmed. This default stroking rate can be enabled via the optional control cable.

“Flow”

The Sigma/2 series metering pumps will monitor their own output, with an optional adjustable flow monitor. Every fluid discharge is sensed and fed back to the electronic control circuit of the pump. If insufficient fluid is discharged for a predetermined number of strokes (up to 125), the pump automatically stops and the red LED illuminates. The optional fault relay changes state to issue an alarm or activate a standby pump.

“Float Switch”

An optional two-stage ProMinent float switch can be plugged into the pump to monitor chemical tank levels. An early warning is issued when the allowable minimum level is reached. The pump continues to operate while the display flashes, the yellow LED illuminates and an optional collective fault relay changes state to issue an alarm. If the liquid level in the supply tank drops another 3/4” (20 mm), the pump automatically shuts down, the LCD displays “Minim” and the red LED illuminates. The optional fault relay remains activated.

“Pause”

The Sigma/2 series can be remotely started and stopped via a dry contact through the optional control cable.

“Stop”

The Sigma/1 can be stopped by pressing the STOP/START key without disconnecting from the power supply.

“Prime”

Priming is activated by pressing both arrow keys at the same time while the frequency display is showing.

Function and Error Indicators

Three LED lights on the pump faceplate signal operational status. The green light flashes during normal operation, and the yellow light warns of a situation that could lead to a fault (e.g., low chemical). If a fault occurs “error” will appear on the LCD screen and the red LED illuminates.



Certified to
NSF/ANSI 61

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Optional Modes and Functions

Optional Control Modes

"Analog" Mode

With this option, the stroking rate of the Sigma/2 is directly proportional to the analog signal. For a custom range setting, the curve feature of the analog input can be selected. With this, the pump response to the analog input can be easily programmed.

"Contact" Mode with Pulse Control

This feature is used to "tune" the pump to contact generators of any kind (e.g., pulse-type water meter or process controller), and eliminate the need for a costly external control unit. The following functions can be selected by means of the keypad.

Pulse step-up (multiply) and step-down (divide)

By simply entering a factor in the 0.01-99.99 range, the step-up or step-down ratio is set.

For example:

Step-up Factor:

99.99 1 pulse = 99.99 pump strokes
10 1 pulse = 10 pump strokes

Step-down Factor:

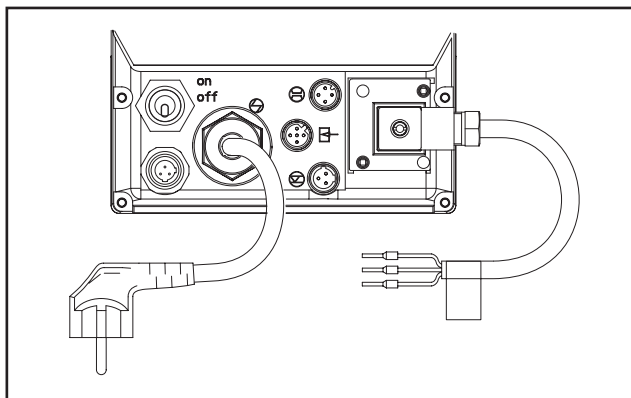
0.25 4 pulses = 1 pump stroke
0.01 100 pulses = 1 pump stroke

"Batch" Mode

The Batch mode is a variation of the contact operating mode. A number of strokes can be predetermined up to 65,535 strokes (whole numbers) or the feed quantity can be predetermined. The batch is then initiated by either pressing the "P" key on the pump face or providing a contact to the external control cable.

Access Code

A programmable access code to prevent unauthorized changes to settings is available as an option.



An external panel enables optional relays to be installed on-site.

Relay outputs

Fault annunciating relay

For low tank level (flow switch), loss of flow (flow monitor), loss of analog signal and diaphragm failure detector, system faults and fuse/power supply failure.

Fault annunciating and Pacing relay

In addition to the fault annunciating relay, a contact closure is issued with every pump stroke (contact duration 150 ms.) This allows a second ProMinent metering pump to be paced synchronously, or to totalize flow with an external stroke counter.

4-20 mA Analog Output

A 4-20 mA analog output option is available for use with pumps that operate in the manual mode or by a remote 4-20 mA analog reference signal. The 4-20 mA analog output signal is linear to pump frequency multiplied by the percentage of stroke length. The output signal is isolated and can drive up to 300 Ohms impedance. Analog output can be used for status feedback to higher level control systems for closed loop control or for monitoring chemical usage. This option is available in combination with either the fault annunciating or pacing relay.

Timer Relay

The optional integrated 2-week timer offers 81 programmable events.

It can be set to hourly, daily, work days, weekend, weekly, or two-week periods with switch-on times from 1 second to two weeks. The timer can be programmed to change operation mode, frequency, and the function of two relays. All the functions can be programmed independently of one another. Up to 13 delay times can be programmed into the timer function.

The range of applications exceeds that of a "standard timer". Typical application is disinfection in cooling towers, process water, etc., with the ability to automatically program shock dosages or increase the concentration at a certain interval.

Fieldbus connection

Monitor and control remotely via a SCADA/PLC system using the PROFIBUS®-DP system.

Note: Relay options not available with profibus and cannot be retrofitted in the field.

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Specifications

General:

Maximum stroke length: 0.196" (5.0 mm) HM; 0.6" (15 mm) HK
 Power cord: 6 feet (2 m) 2 wire + ground (supplied on control versions)
 Stroke frequency control: S2Ba: Constant speed or optional DC/SCR drive or AC inverter
 S2Ca: Microprocessor control version with innovative start/stop and variable speed control proportional to set frequency or external control signal.

Stroke counting: Standard on S2Ca

Materials of construction

Inner casing: Cast aluminum

Housing: Glass-filled Luranyl™ (PPE)

Wetted materials of construction:	Liquid End:	PVDF	316 SS
	Suct./Dis. Connectors:	PVDF	316 SS
	Seals:	PTFE	PTFE
	Check Balls:	Ceramic	SS

Drive: Cam and spring-follower (lost motion)

Lubrication: Oil lubricated

Recommended oil: ISO VG 460, such as Mobil Gear Oil 634

Oil quantity: Approximately 0.6 quart (550 mL)

Recommended oil change interval: 5,000 hours

Warranty: Two years on drive, one year on liquid end

Factory testing: **Each pump is tested for rated flow at maximum pressure.**

Industry Standard: CE approved, CSA available (standard in Canada), NSF/ANSI 61

Sigma/2 HM:

Diaphragm materials: PTFE faced EPDM with Nylon reinforcement and steel core

Liquid end options: Polyvinylidene Fluoride (PVDF) or 316 SS, with PTFE seals

Check valves: Single ball check, PVDF and SS versions.
 Optional springs available in Hastelloy C

Repeatability: When used according to the operating instructions, better than $\pm 2\%$

Max. fluid operating temperatures:	Material	Constant (Max. Backpressure)	Short Term (15 min. @ max.30 psi)
	PVDF	149°F (65°C)	212°F (100°C)
	316 SS	194°F (90°C)	248°F (120°C)

Diaphragm failure indication: Visual indicator is mandatory. The delivery unit has a patented multilayer safety diaphragm as standard and a visual diaphragm rupture indicator.

Separation of drive from liquid end: An air gap with secondary safety diaphragm separates the drive from the liquid end to prevent cross contamination of oil and process fluid (with or without optional diaphragm failure indication).

Max. solids size in fluid: 0.3 mm

Stroke length adjustment: Manual, in increments of 0.5%. Motorized stroke length adjustment is available.

Sigma/2 HK:

Piston materials: Ceramic oxide; packing rings of PTFE, packing spring of 316 SS.

Liquid end options: 316 SS with PTFE seals

Check valves: Double ball, stainless steel; optional springs (Hastelloy C4).

Repeatability: When used according to the operating instructions, better than $\pm 0.5\%$

Max. fluid operating temperatures:	Material	Constant	Short Term
	316 SS	392°F (200°C)	428°F (220°C)

Stroke length adjustment: Manual, in increments of 0.2%. Motorized stroke length control is optional.

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Specifications

~~Sigma/ 2 Basic Version~~

Motor mounting flange:	Fits all NEMA 56C frame motors (motor not included with pump)
Gear ratios and stroke frequencies (with 1725 RPM motor):	20:1 = 87 SPM, 11:1 = 156 SPM, 7.25:1 = 232 SPM
Motor coupling:	Flexible coupling included with pump
Required Motor HP:	1/3 HP (0.25 kW)
Full load RPM:	1750 RPM (60 Hz)
Stroke sensor (optional):	Hall effect - requires 5 VDC

Sigma/ 2 Control Version

<i>Control Function:</i>	At stroke frequencies equal to or greater than 33%, the integral AC variable frequency drive continuously varies the motor speed in a linear response to the incoming signal. At stroke frequencies less than 33%, the motor starts and stops according to a control algorithm to provide the desired stroke frequency. In the start-stop mode the motor speed is constant at approximately 580 RPM.
<i>Enclosure rating:</i>	NEMA 3 (IP 55)
<i>Motor data:</i>	Totally enclosed, fan cooled (IP55); class F insulation; Manufacturer ATB; 0.18 kW (0.24 HP) 230 3 phase (1.9 A)
<i>Relay load</i>	
<i>Fault relay only (options 1 & 3):</i>	Contact load: 250 VAC, 2 A, 50/60 Hz Operating life: > 200,000 switch functions
<i>Fault and pacing relay (options 4 & 5):</i>	Contact load: 24 V, 2 A, 50/60 Hz Operating life: > 200,000 switch functions Residual impedance in ON-position ($R_{DS(on)}$): < 8 Ω Residual current in OFF-position: < 1 μ A Maximum voltage: 24 VDC Maximum current: < 100 mA (for pacing relay) Switch functions: 750x10 ⁶ Contact closure: 100 ms (for pacing relay)
<i>Analog output signal:</i>	max. impedance 300 Ω Isolated 4-20 mA output signal
<i>PROFIBUS® - DP fieldbus options:</i>	Transfer: RS - 485 Wiring: 2-wired, twisted, shielded Length: 3637 ft (1200 m)/328 ft (100 m) Baudrate: 9600 bits/s; 12 Mbits/s No. of participants: 32 with 127 repeaters Topology: Line Access procedure: Master/master with token ring
<i>Relay cable (optional):</i>	6 feet (2 m) 3 wire (SPDT) 250 VAC, 2 A
<i>Pulse contact/remote pause contact:</i>	With voltage-free contact, or semiconductor sink logic control (not source logic) with a residual voltage of <700 mV. The contact load is approximately 0.5 mA at + 5 VDC. (Note: Semiconductor contacts that require >700 mV across a closed contact should not be used.)
<i>Max. pulse frequency:</i>	25 pulses/sec
<i>Contact impedance:</i>	10 kOhm
<i>Max. pulse memory:</i>	65,535 pulses
<i>Necessary contact duration:</i>	20ms
<i>Analog - current input burden:</i>	Approximately 120 Ohm
<i>Max. allowable input current:</i>	50 mA
<i>Power requirements:</i>	single phase, 115-230 VAC

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Capacity Data

Sigma/2 Basic Version

Technical data:	60 Hz (1750 RPM) operation Capacity at Maximum Pressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift (water)		Max. Suction Pressure		Suction/ Discharge Connector		Shipping Weight w/Motor	
Pump Version	psig	(bar)	U.S. gph	(l/h)	Stroke/ min	mL/ stroke	ft	(m)	psig	(bar)	DN	in	lbs	(kg)
S2Ba HM														
16050 PVT	145	(10)	15.9	(60)	87	11.4	23	(7)	44	(3)	15	1/2 MNPT	33	(15)
16050 SST	232	(12)	15.2	(57)	87	11.4	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
16090 PVT	145	(10)	28.5	(108)	156	11.4	23	(7)	44	(3)	15	3/4 MNPT	33	(15)
16090 SST	232	(12)	27	(103)	156	11.4	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
16130 PVT	145	(10)	41	(156)	232	10.9	23	(7)	44	(3)	15	3/4 MNPT	33	(15)
16130 SST	232	(12)	39.6	(150)	232	10.9	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
07120 PVT	100	(7)	38	(144)	87	27.4	16	(5)	15	(1)	25	3/4 MNPT	35	(16)
07120 SST	100	(7)	38	(144)	87	27.4	16	(5)	15	(1)	25	3/4 MNPT	53	(24)
07220 PVT	100	(7)	69.7	(264)	156	27.7	16	(5)	15	(1)	25	3/4 MNPT	35	(16)
07220 SST	100	(7)	69.7	(264)	156	27.7	16	(5)	15	(1)	25	3/4 MNPT	53	(24)
04350 PVT	58	(4)	111	(420)	232	29.4	16	(5)	15	(1)	25	1 MNPT	35	(16)
04350 SST	58	(4)	111	(420)	232	29.4	16	(5)	15	(1)	25	1 MNPT	53	(24)

Sigma/2 Control Version

Technical data:	60 Hz operation Capacity at Maximum Pressure				Max. Stroke Rate	Output per Stroke	Max. Suction Lift (water)		Max. Suction Pressure		Suction/ Discharge Connector		Shipping Weight w/Motor	
Pump Version	psig	(bar)	U.S. GPH	(l/h)	Stroke/ min	ml/ stroke	ft	(m)	psig	(bar)	DN	in	lbs	(kg)
S2Ca HM														
16050 PVT	145	(10)	15.9	(60)	90	11.4	23	(7)	44	(3)	15	1/2 MNPT	33	(15)
16050 SST	232	(12)	15.9	(60)	90	11.4	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
16090 PVT	145	(10)	28.5	(108)	160	11.4	23	(7)	44	(3)	15	3/4 MNPT	33	(15)
16090 SST	232	(12)	28.5	(108)	160	11.4	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
16130 PVT	145	(10)	34.3	(130)	200	10.9	23	(7)	44	(3)	15	3/4 MNPT	33	(15)
16130 SST	232	(12)	34.3	(130)	200	10.9	23	(7)	44	(3)	15	1/2 FNPT	44	(20)
07120 PVT	100	(7)	38	(144)	90	27.4	16	(5)	15	(1)	25	3/4 MNPT	35	(16)
07120 SST	100	(7)	38	(144)	90	27.4	16	(5)	15	(1)	25	3/4 MNPT	53	(24)
07220 PVT	100	(7)	69.7	(264)	160	27.7	16	(5)	15	(1)	25	3/4 MNPT	35	(16)
07220 SST	100	(7)	69.7	(264)	160	27.7	16	(5)	15	(1)	25	3/4 MNPT	53	(24)
04350 PVT	58	(4)	92.5	(350)	200	29.4	16	(5)	15	(1)	25	1 MNPT	35	(16)
04350 SST	58	(4)	92.5	(350)	200	29.4	16	(5)	15	(1)	25	1 MNPT	53	(24)

(Note: Capacities and suction lift refer to pumps tested on water at 115 VAC, 60 Hz, and an ambient temperature of 70° F (20° C). Higher specific gravity fluids will reduce suction lift. Capacities will be slightly reduced from published ratings if pumps are skid mounted).

Materials In Contact With Chemicals

Liquid End	Suction/Discharge connector	Valve	Seals/ ball seat	Balls
PVT	PVDF (Polyvinylidene fluoride)	PVDF (Polyvinylidene fluoride)	PTFE/PTFE	Ceramic
SST	Stainless steel	Stainless steel	PTFE/PTFE	Stainless steel

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Identcode Ordering System (S2Ba)

S2Ba	Drive Type											
	HM	Main Drive, Diaphragm										
		Version: Capacity:										
		16050*	15.9 gph (60 l/h), 145 psi (10 bar)	07120	38 gph (144 l/h), 100 psi (7 bar)							
		16090*	28.5 gph (108 l/h), 145 psi (10 bar)	07220	69.7 gph (264 l/h), 100 psi (7 bar)							
		16130*	41 gph (156 l/h), 145 psi (10 bar)	04350	111 gph (420 l/h), 58 psi (4 bar)	* For PVDF versions. Maximum 145 psig (10 bar)						
		Liquid end material:										
		PV	PVDF									
		SS	316 Stainless Steel									
		O-ring:										
		T	PTFE									
		Diaphragm type:										
		A	Safety diaphragm w/ pump stop function									
		S	Safety diaphragm w/ visual indicator									
		Liquid end version:										
		0	Without valve springs									
		1	With 2 valve springs (Hastelloy C4, 1 psig)									
		Hydraulic connections:										
		0	No nuts, No inserts									
		7	PVDF clamping nut & insert									
		8	SS clamping nut & insert									
		Logo:										
		0	Standard with logo									
		Motor mount:										
		2	Without motor, with NEMA 56C flange									
		Enclosure rating:										
		0	Standard									
		Stroke sensor:										
		0	Without stroke sensor (Standard)									
		2	With Pacing relay (Consult Factory)									
		Stroke length adjustment:										
		0	Manual (Standard)									
		1	with 3P stroke positioning motor, 230 V 50/60 Hz									
		2	with 3P stroke positioning motor, 115 V 50/60 Hz									
		4	W/ stroke positioning motor 4-20 mA, 230 V 50/60 Hz									
		6	W/ stroke positioning motor 4-20 mA, 115 V 50/60 Hz									
S2Ba	HM	12050	PV	T	0	0	7	0	2	0	0	0

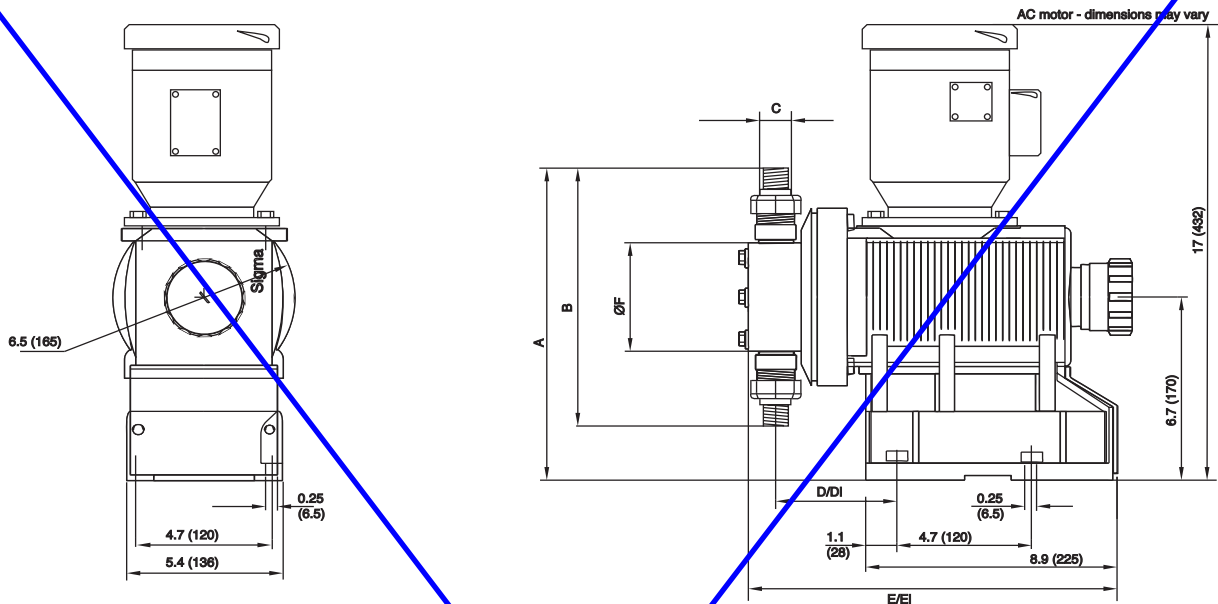
ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Identcode Ordering System (S2Ca)

S2Ca	Drive Type													
	HM	Main Drive, Diaphragm												
		Version: Capacity:												
		16050*	15.9 gph (60 l/h), 145 psi (10 bar)	07120	38 gph (144 l/h), 100 psi (7 bar)									
		16090	28.5 gph (108 l/h), 145 psi (10 bar)	07220	69.7 gph (264 l/h), 100 psi (7 bar)									* For PVDF versions. Maximum 145 psig
		16130**	34.3 gph (130 l/h), 145 psi (10 bar)	04350**	92.5 gph (350 l/h), 58 psi (4 bar)									** Maximum 200 strokes per minute
		Liquid end material:												
		PVT	PVDF with PTFE											
		SST	316 Stainless Steel with PTFE											
		Diaphragm type:												
		4	Oxide ceramics											
		A	Safety diaphragm w/ pump stop fuction											
		B	Safety diaphragm w/alarm indication											
		S	Safety diaphragm w/ visual indicator											
		Liquid end options:												
		0	Without valve springs											
		1	With 2 valve springs (Hastelloy C4, 1 psig)											
		Hydraulic connections:												
		0	No nuts, No inserts											
		7	PVDF clamping nut & insert											
		8	SS clamping nut & insert											
		Logo:												
		0	Standard with logo											
		Electrical Connection (± 10%):												
		U	1 ph, 115-230 V ± 10%, 50/60 Hz											
		Cable and plug with 6 ft (2 m) power cord, single phase:												
		A	European plug, 230 V											
		D	N. American plug, 115 V											
		U	N. American plug, 230 V											
		Relay:												
		0	No relay											
		1	Fault annunciating relay, drops out											
		3	Fault annunciating relay, pulls in											
		4	Option 1 + pacing relay											
		5	Option 3 + pacing relay											
		C	4-20 mA output, drops out											
		D	4-20 mA output, pulls in											
		E	4-20 mA output, pacing relay											
		Control variant:												
		0	Manual + External with pulse control (multiplier/divider)											
		1	Manual + External with pulse controls & analog control											
		4	Option 0 + Timer											
		5	Option 1 + Timer											
		P	Option 1 + PROFIBUS (Relay must be 0)											
		Access Code:												
		0	No access code											
		1	Access code											
		Flow monitor:												
		0	Input for metering monitor signal (pulse)											
		1	Input for maintained flow switch signal											
		Stroke length adjustment:												
		C	Manual + Calibration											
		0	stroke length adjust. Manual											
SC2a	HM	12050	PVT	0	0	0	0	U	A	0	0	0	0	C

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Dimensional Drawing: (S2Ba)



Dimensions in inches (mm)

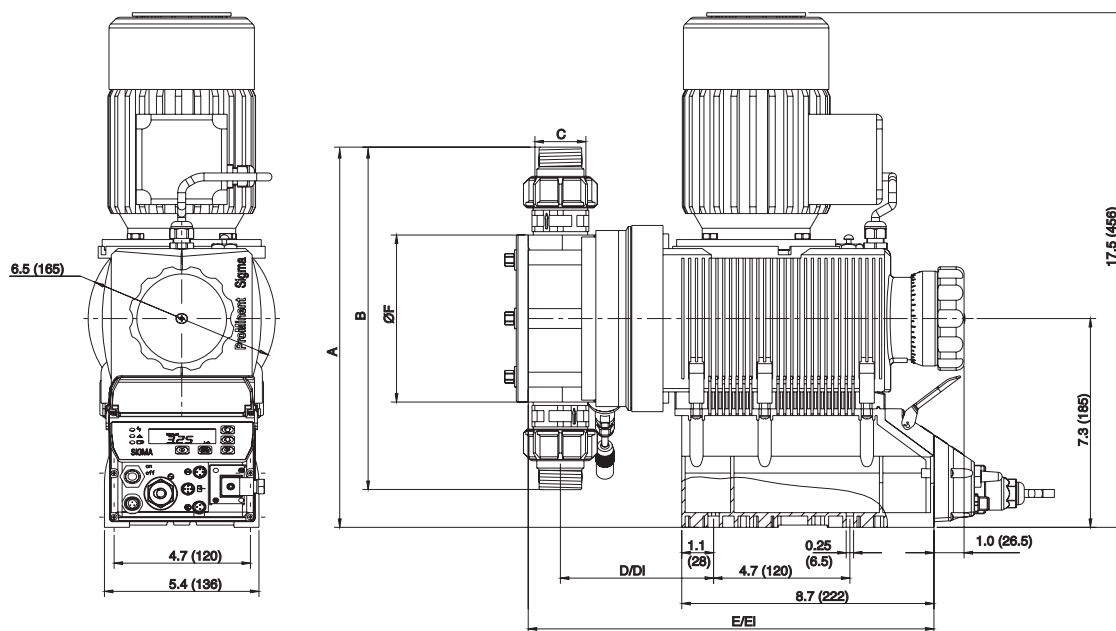
Type Sigma/ 2	A	B	Suction/ Discharge Valve Thread C*	D	D1**	E	E1**	ØF
16050, 16090, 16130								
PVT	10.1 (257)	6.95 (177)	DN 15	4.1 (104)	4.9 (124)	13.0 (329)	13.7 (349)	4.0 (101)
SST	10.9 (276)	8.2 (208)	DN 15	4.1 (104)	4.9 (124)	13.0 (329)	13.7 (349)	4.0 (101)
07120, 07220								
PVT	13.3 (337)	13.1 (332)	DN 25	4.5 (115)	5.3 (135)	13.4 (340)	14.2 (360)	5.8 (148)
SST	13.3 (337)	13.1 (332)	DN 25	4.5 (115)	5.3 (135)	13.4 (340)	14.2 (360)	5.8 (148)
04350								
PVT	14.3 (362)	14.1 (358)	DN 25	4.5 (115)	5.3 (135)	13.4 (340)	14.2 (360)	5.8 (148)
SST	14.3 (362)	14.1 (358)	DN 25	4.5 (115)	5.3 (135)	13.4 (340)	14.2 (360)	5.8 (148)

* Piping adapters provided according to technical data.

** Dimensions with diaphragm failure detector.

ProMinent® Sigma/ 2 Motor Diaphragm Metering Pumps

Dimensional Drawing: (S2Ca)



Dimensions in inches (mm)

Type Sigma/2	Suction/ Discharge Valve Thread							
	A	B	C*	D	D1**	E	E1**	ØF
16050, 16090, 16130								
PVT	10.6 (272)	6.95 (177)	DN 15	4.1 (104)	4.9 (124)	12.8 (326)	13.6 (346)	4.0 (101)
SST	10.4 (268)	8.2 (208)	DN 15	4.1 (104)	4.9 (124)	12.8 (326)	13.6 (346)	4.0 (101)
07120, 07220								
PVT	13.9 (352)	13.1 (332)	DN 25	4.5 (115)	5.3 (135)	13.3 (337)	14.1 (357)	5.8 (148)
SST	13.9 (352)	13.1 (332)	DN 25	4.5 (115)	5.3 (135)	13.3 (337)	14.1 (357)	5.8 (148)
04350								
PVT	14.9 (377)	14.1 (358)	DN 25	4.5 (115)	5.3 (135)	13.3 (337)	14.1 (357)	5.8 (148)
SST	14.9 (377)	14.1 (358)	DN 25	4.5 (115)	5.3 (135)	13.3 (337)	14.1 (357)	5.8 (148)

* Piping adapters provided according to technical data.

** Dimensions with diaphragm failure detector

Pump & Systems Accessories

Accessory Kits

Accessory kits for alpha, concept^{PLUS}, beta and gamma/L pumps with tube fittings, including 5 ft. (1.5 m) of suction tubing, 10 ft. (3 m) of discharge tubing, foot valve and injection valve.

Tubing Size (in.) (select to fit pump)	Material Code	Suction Tubing	Discharge Tubing	Part No.
1/4 x 3/16	PCB/NPB/NP3	PE	PE	7809401
1/4 x 3/16	PPE/PP1	PE	PE	7809403
1/4 x 3/16	PPB	PE	PE	7809405
1/4 x 3/16	PCE/NPE	PE	PE	7809422
1/2 x 3/8	PCB/NPB/NP1/NP3/NP6	PVC	PE	7809402
1/2 x 3/8	PPE/PP1	PVC	PE	7809404
1/2 x 3/8	PPB/PP2/PP3	PVC	PE	7809406

PVC 1/2" x 3/8" suction tubing is pliable, allowing foot valve to sink. PE discharge tubing is rigid.

Pressure ratings are: PVC: 7 psig PE: 100 psig.

Tubing, foot valves and injection valves for TT and SS pumps are not available as kits and must be ordered as separate items.

Profibus adapters

5-pin, M12 x 1 to 9 pin., Sub D-plug, length approx. 11.8" (300 mm)



Y-adapter

2 x M12 x 1 male/female, 9 pin, Sub-D plug

Part No.

1005838

Adapter

1 x M12 x 1 male, 9 pin, Sub-D plug

1005839

Control Cables

Required for external control of ProMinent metering pumps including:

- beta
- gamma/ L
- delta
- Sigma/ 1 control
- Sigma/ 2 control
- Sigma/ 3 control

Description

Part No.

Universal control cable, 5-wire, 6 ft. (2 m)

1001300

Universal control cable, 5-wire, 15 ft. (5 m)

1001301

Universal control cable, 5-wire, 30 ft. (10 m)

1001302

(SEE DETAILED WIRING DIAGRAMS NEXT PAGE)

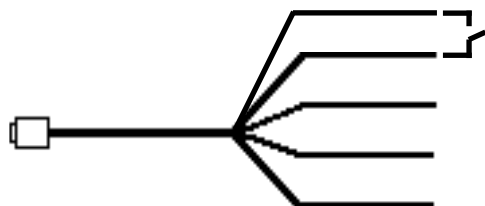
Pump & Systems Accessories

Control Cable Diagrams

Remote On/Off

BROWN and BLACK wires must be connected together via an ON/OFF contact or shorted together. When the contact is closed between the BLACK & BROWN wires, the pump will run. When the contact is open, the pump will stop.

Note: If ON/OFF control is the only control feature being used, WHITE, BLUE & GREY wires are not used and should be cut back.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Auxiliary Frequency

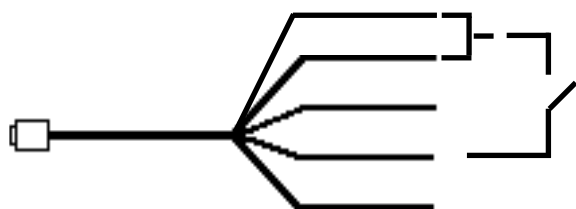
WHITE: Pulse (+)

BLUE: Analog (+)

Pulse Control

Pulse control will allow the pump to run in proportion to a pulsing potential free contact closure.

Note: BROWN and BLACK wires have to be connected together via an ON/OFF contact or shorted together. GREY wire is not used and should be cut back.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Auxiliary Frequency

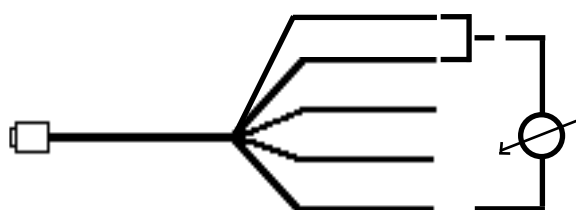
WHITE: Pulse (+)

BLUE: Analog (+)

Analog Control (not available with beta metering pumps)

Analog control runs in proportion to an analog signal such as 4 - 20 mA.

Note: BROWN and BLACK wires must be connected together via an ON/OFF contact or shorted together. The BLACK wire is negative and the BLUE wire is positive. GREY wire is not used and should be cut back.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Auxiliary Frequency

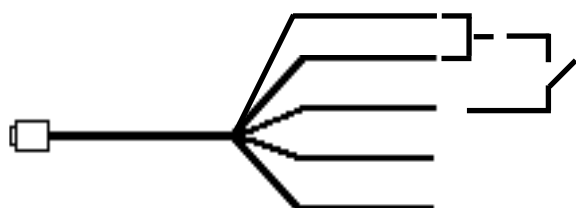
WHITE: Pulse (+)

BLUE: Analog (+)

Auxiliary Frequency

Auxiliary frequency will allow the pump to default to a predetermined stroking frequency regardless of which operating mode the pump is in. The pump defaults to this stroking frequency as long as a contact is closed between the black and grey wires of the universal control cable.

Note: BROWN and BLACK wires must be connected together via an ON/OFF contact or shorted together.



BROWN: Remote On/Off (+)

BLACK: Common

GREY: Auxiliary Frequency

WHITE: Pulse (+)

BLUE: Analog (+)

SECTION 3

DUAL PUMP METERING SKID

Dual Metering Pump Dosage Package
Specification Data Sheet

Date:	04/01/12
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano
Contractors Order No:	TBD
HTP Project No:	PJ-12001
Plant:	Well 35
Specification Section:	43 20 01 – Chlorination Equipment

Revision	By	Date	Description	Notes
0	RMH	04/01/12	“For Approval”	

Equipment Data

Manufacturer:	ProMinent Fluid Controls
Part #:	P2_S2Ca_CPVC_Dilute NaOCl
Dimensions:	60”High x 48.75” Wide x 30” Deep

A	Design Conditions				
1	Quantity	1			
2	Skid Tag Number	NaOCl-Skid-32			
3	Pump Tag Number	PMP-35-01/02			
4	Chemical	Dilute NaOCl			
5	Pipeline Size	3/4 – Inch			
6	Material	CPVC			
7	Ball Valves and Piping	CPVC			
8	Calibration Column	Clear PVC			
9	Self Filling Option	Yes			
10	Back Pressure Valve	CPVC/PTFE			
11	Y-Type Strainer	CPVC/PTFE			
12	Pulsation Dampener	PVC/Viton			
13	Pressure Gauge	Yes			
14	Multifunction Valve	No			
15	Flow Monitor	No			

B	Options Included		D	Options Included	
16			18		
17			19		
18			20		

Referenced Documents	Document Number	Notes
		Common Suction / Dual Discharge

Dual Metering Pump Dosage Package
Specification Data Sheet

Date:	04/01/12
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano
Contractors Order No:	TBD
HTP Project No:	PJ-12001
Plant:	Well 38
Specification Section:	43 20 01 – Chlorination Equipment

Revision	By	Date	Description	Notes
0	RMH	04/01/12	“For Approval”	

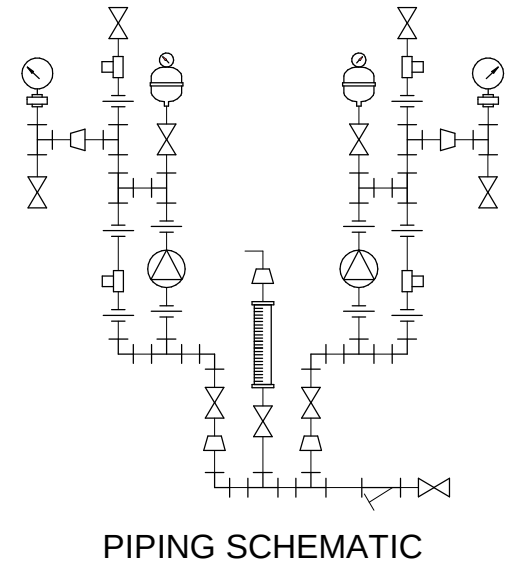
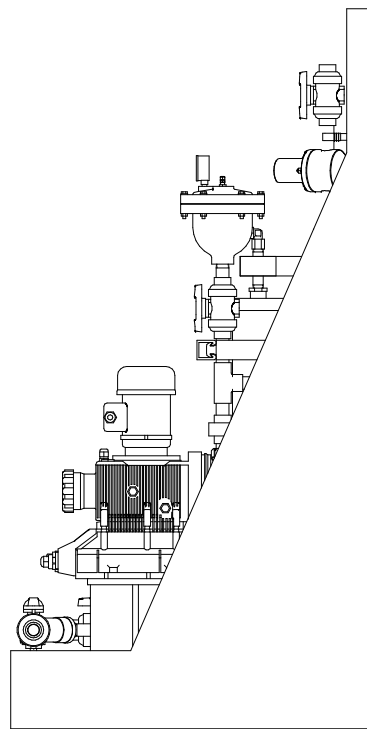
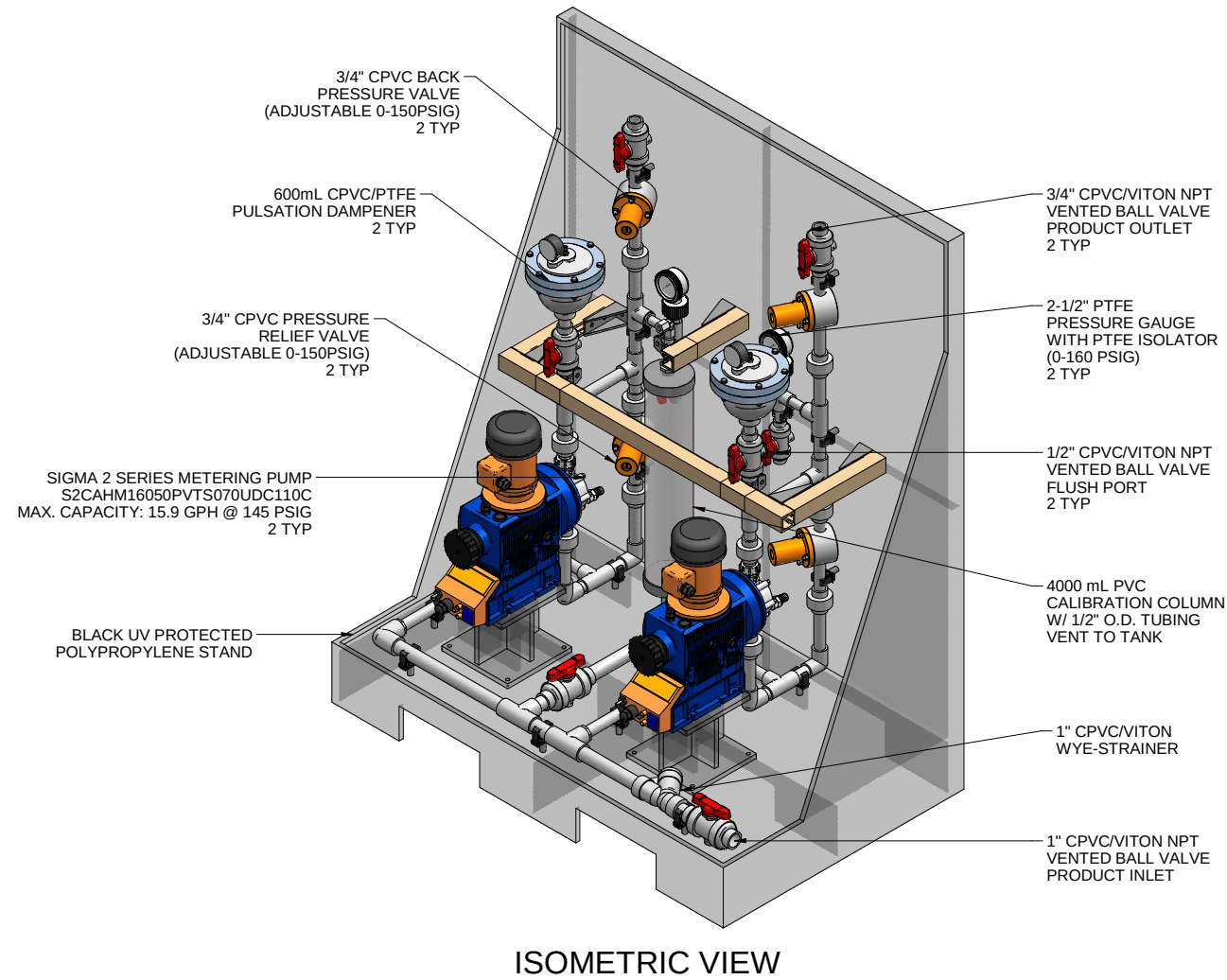
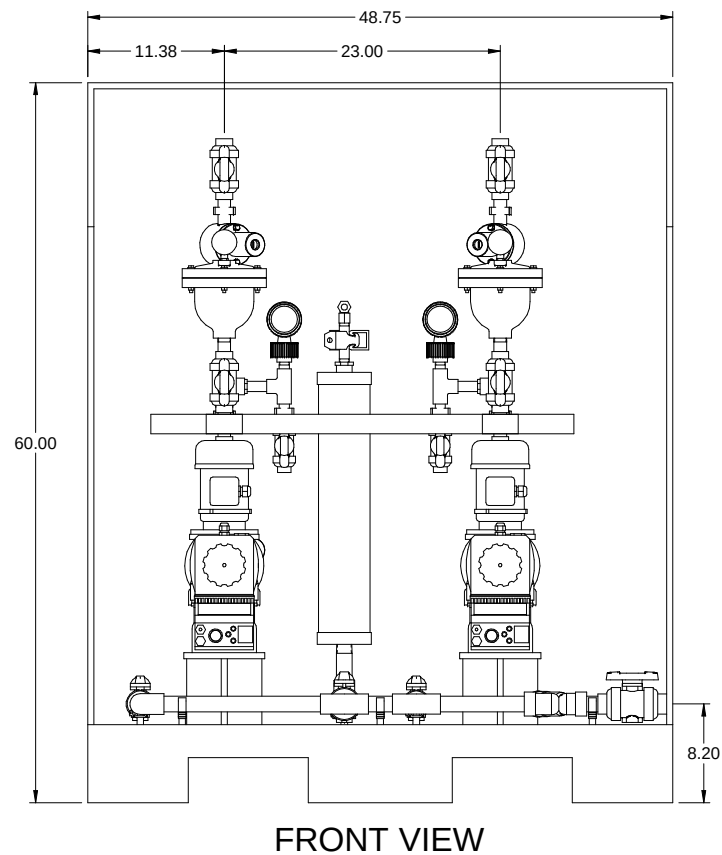
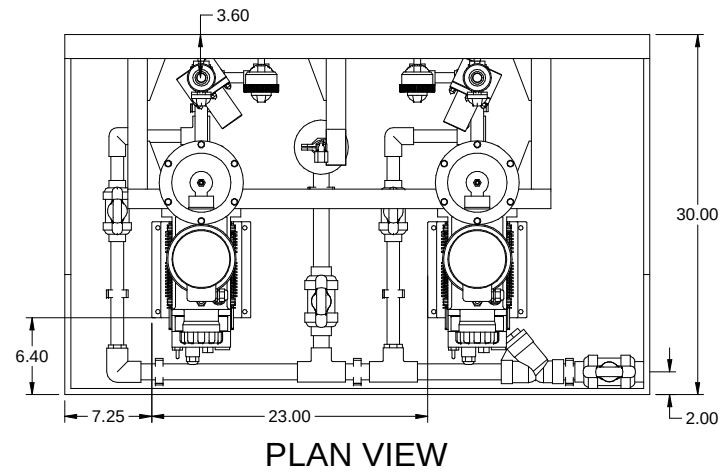
Equipment Data

Manufacturer:	ProMinent Fluid Controls
Part #:	P2_S2Ca_CPVC_Dilute NaOCl
Dimensions:	60”High x 48.75” Wide x 30” Deep

A	Design Conditions				
1	Quantity	1			
2	Skid Tag Number	NaOCl-Skid-32			
3	Pump Tag Number	PMP-38-01/02			
4	Chemical	Dilute NaOCl			
5	Pipeline Size	3/4 – Inch			
6	Material	CPVC			
7	Ball Valves and Piping	CPVC			
8	Calibration Column	Clear PVC			
9	Self Filling Option	Yes			
10	Back Pressure Valve	CPVC/PTFE			
11	Y-Type Strainer	CPVC/PTFE			
12	Pulsation Dampener	PVC/Viton			
13	Pressure Gauge	Yes			
14	Multifunction Valve	No			
15	Flow Monitor	No			

B	Options Included		D	Options Included	
16			18		
17			19		
18			20		

Referenced Documents	Document Number	Notes
		Common Suction / Dual Discharge



- NOTES:
- ALL PIPING AND FITTINGS SHALL BE 3/4" SCH. 80 CPVC SOCKET WELD WITH VITON SEALS UNLESS OTHERWISE REQUIRED BY COMPONENTS.
 - SUCTION HEADER SHALL BE 1" SCH.80 CPVC SOCKET WELD WITH VITON SEALS,
 - ALL BALL VALVES TO BE VENTED.
 - QUANTITY OF (2) CONTROL PANEL, P/N 7745682, AND (4) CONTROL CABELS, P/N 1001301, TO BE SHIPPED LOOSE WITH SKIDS.
 - ALL DIMENSIONS ARE IN INCHES AND ARE SHOWN FOR REFERENCE ONLY.
 - QUANTITY OF (2) SKIDS REQUIRED.

B	05/07/12	CHANGED PUMP		ALS			
A	04/17/12	RELEASED FOR PRODUCTION		ALS			
0	04/17/12	FIRST ISSUE		ALS			
REV	DATE	DESCRIPTION		BY	APPD	REVD	
REVISIONS							
CUSTOMER		HOPKINS TECHNICAL PRODUCTS (DELANO WELLS 35, & 38)					
JOB No		2012600260	PURCHASE ORDER No		201202194		
TITLE		P2_S2CA_CPVC_DILLUTE NaOCI DOSING SKID GENERAL ARRANGEMENT					
THIS DRAWING IS THE PROPERTY OF PROMINENT FLUID CONTROLS INC. AND SHALL NOT BE COPIED OR TRANSFERRED WITHOUT THE WRITTEN CONSENT OF PROMINENT FLUID CONTROLS INC.							
ENGINEERS SEAL		ptc ProMinent ProMinent[®] THE PROMINENT GROUP OF COMPANIES					
		PITTSBURGH, PA USA		WWW.PROMINENT.US			
		PROMINENT FLUID CONTROLS LTD. 490 SOUTHGATE DRIVE. GUELPH, ONTARIO, CANADA N1H 6J3 TEL. 519 836 5692 FAX. 519 836 5226		PROMINENT FLUID CONTROLS INC. RIDC PARK WEST 136 INDUSTRY DRIVE, PITTSBURGH P.A., USA. 15275 TEL. 412 787 2484 FAX. 412 787 0704			
		DESIGNED	ALS	APPROVED			SMC
		DRAWN	ALS	SCALE			N.T.S.
		CHECKED	SMC	DATE			04/17/12
DWG No		2012600260-200			REV B	PAGE 1/1	

Back-Pressure Valves**Specification Data Sheet**

Date:	04/01/12				
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano				
Contractor Order No:	TBD				
HTP Project No:	PJ-12001				
Plant:	Well 35				
Specification Section:	43 20 01 – Chlorination Equipment				
Revision	By	Date	Description	Notes	
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:	Griffco Valve, Inc				
Part #:	BPG075-CP-S				
Dimensions:	5.6”High x 3.5” Diameter				
A	Design Conditions				
1	Quantity	1	1		
2	Valve Tag Number	BPV-35-01	BPV-35-02		
3	Pump Tag Number	PMP-35-01	PMP-35-02		
4	Chemical	NaOCl	NaOCl		
5	Pump Capacity (GPH)	28.5 GPH	28.5 GPH		
6	Valve Set Pressure (PSIG)	50 PSIG	50 PSIG		
7	Maximum Pressure (PSIG)	150 PSIG	150 PSIG		
8	Maximum Flow Capacity (GPH)	300 GPH	300 GPH		
9	Maximum Temperature (°F)	140°F	140°F		
10	Valve Body Material	CPVC	CPVC		
11	Valve Diaphragm Material	Teflon	Teflon		
12	In / Out Connections (FNPT)	3/4 - Inch	3/4 – Inch		
13	Location	NaOCl-Skid-35	NaOCl-Skid-35		
B	Options Included		D	Options Included	
14			18		
15			19		
16			20		
17			21		
Referenced Documents		Document Number		Notes	

Back-Pressure Valves**Specification Data Sheet**

Date:	04/01/12				
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano				
Contractor Order No:	TBD				
HTP Project No:	PJ-12001				
Plant:	Well 38				
Specification Section:	43 20 01 – Chlorination Equipment				
Revision	By	Date	Description	Notes	
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:	Griffco Valve, Inc				
Part #:	BPG075-CP-S				
Dimensions:	5.6”High x 3.5” Diameter				
A	Design Conditions				
1	Quantity	1	1		
2	Valve Tag Number	BPV-38-01	BPV-38-02		
3	Pump Tag Number	PMP-38-01	PMP-38-02		
4	Chemical	NaOCl	NaOCl		
5	Pump Capacity (GPH)	28.5 GPH	28.5 GPH		
6	Valve Set Pressure (PSIG)	50 PSIG	50 PSIG		
7	Maximum Pressure (PSIG)	150 PSIG	150 PSIG		
8	Maximum Flow Capacity (GPH)	300 GPH	300 GPH		
9	Maximum Temperature (°F)	140°F	140°F		
10	Valve Body Material	CPVC	CPVC		
11	Valve Diaphragm Material	Teflon	Teflon		
12	In / Out Connections (FNPT)	3/4 - Inch	3/4 – Inch		
13	Location	NaOCl-Skid-38	NaOCl-Skid-38		
B	Options Included		D	Options Included	
14			18		
15			19		
16			20		
17			21		
Referenced Documents		Document Number		Notes	



Griffco Valve Inc.
6010 N. Bailey Ave. Suite. 1B
Amherst, NY 14226
PH: 716 835-0891
FAX: 716 835-0893

G-SERIES BACK PRESSURE VALVES



Griffco G-Series diaphragm back pressure valves are designed to enhance the performance of chemical feed systems by applying a continuous back pressure to the chemical feed pump, while also acting as an anti-siphon valve. Robust construction ensures reliability in the rigorous service of municipal and industrial applications. Wetted materials include: **PVC, CPVC, PP, PVDF, PTFE, 316 SS, A20 and Hast. C.** Available sizes: 1/2" - 4"

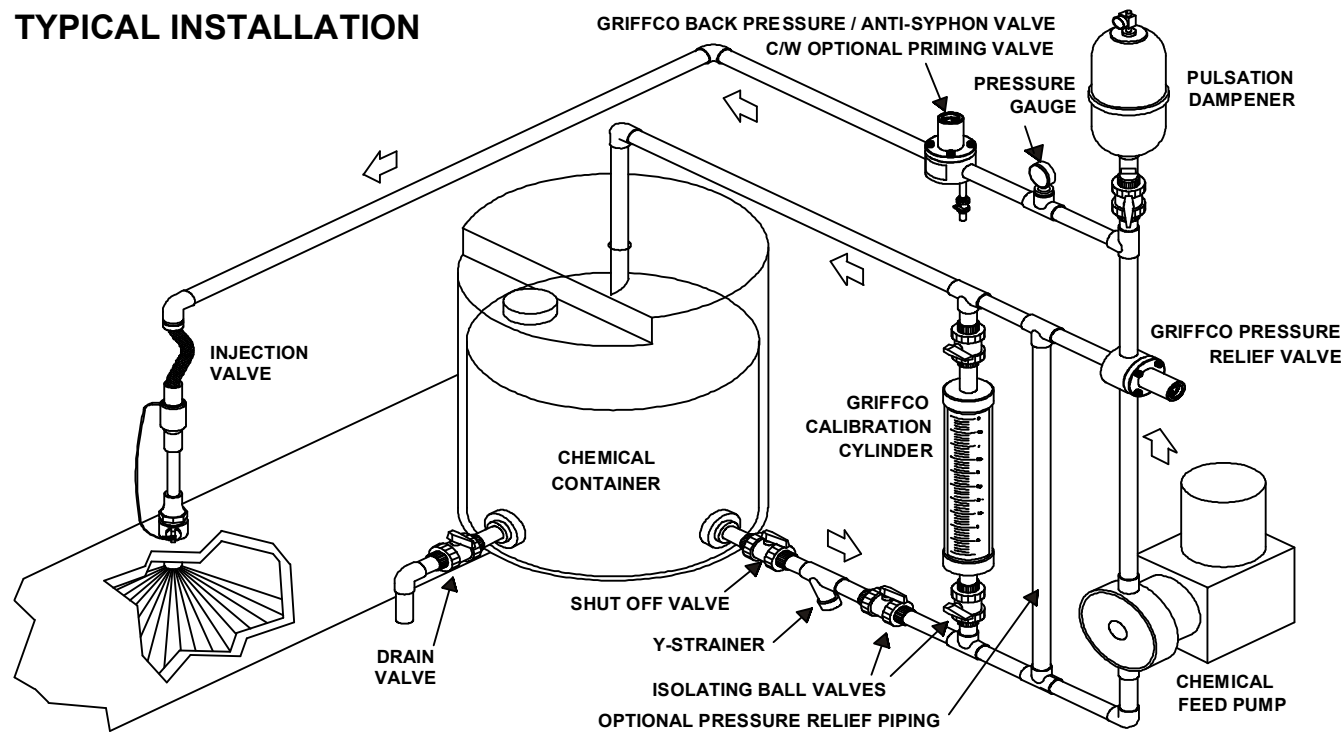
Features:

- High Reliability / Low Cost
- Vulcanised PTFE/EPDM Diaphragm
- Adjustable 0 - 250 PSI
- Optional 350 PSI Rated Valve
- Anti-Siphon Function
- Robust, Machined Construction
- Tamper Resistant Adjustment Screw
- Wide Range of Materials

Operation:

Griffco diaphragm back pressure valves apply positive discharge pressure to a metering pump system to prevent siphoning and eliminate varying dosage rates caused by fluctuating downstream pressure. The diaphragm is held against the valve seat by an internal spring. When the preset pressure is exceeded, the diaphragm is forced up and chemical flows through the valve to the injection point. The valves are preset for 50 psi, however they are field adjustable from 0 - 250 psi via the adjustment screw. Installation should be as close to the injection point as possible to prevent chemical line drainage, and it is most important that all chemical system equipment such as pulsation dampeners and pressure gauges are between the pump and back pressure valve.

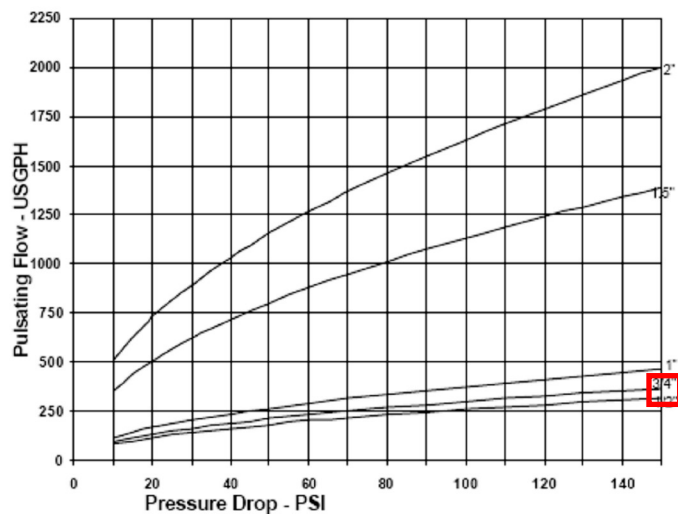
TYPICAL INSTALLATION



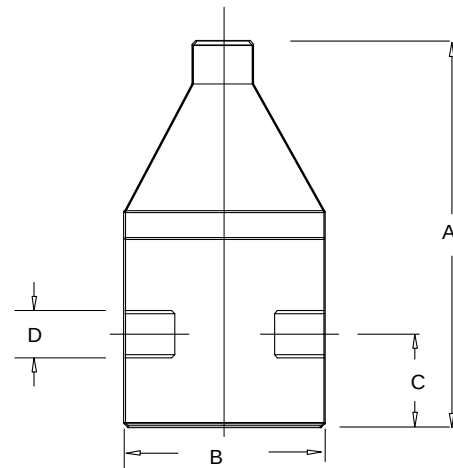
Technical Data:

Model BPG Sizes:		1/2", 3/4", 1", 1 1/2", 2", 3", 4"			
Connections:		NPT, Socket, Flange			
Pressure Adjustment		0 - 50 psi, 0 - 150 psi, 0 - 250 psi, 50 - 350 psi (optional on Metal Valves)			
Flow Rates @ 150 psi		Shipping Weight: lbs			
Size	Pulsating	Continuous	Plastic	Metal / Plastic Top	Metal / Metal Top
1/2"	300 USgph	21 USgpm	3.0	5.5	6.5
3/4"	300 USgph	21 USgpm	3.0	5.5	6.5
1"	500 USgph	26 USgpm	3.5	6.0	7.0
1 1/2"	1200 USgph	63 USgpm	9.0	18.5	26.0
2"	2350 USgph	120 USgpm	9.0	20.0	30.0
3"	5200 USgph	270 USgpm	28.0		
4"	5200 USgph	270 USgpm	30.0		
Max Temperature: (°F)		Plastic: 140° ; Metal: 300°, (Peak Short Term 390°)			
Materials of Construction:					
Diaphragm		PTFE / EPDM, Optional: Viton & PTFE / Viton			
Valve Top		Standard: PVC Optional: CPVC, 316 SS, Others on Request			
Valve Body		PVC, CPVC, PP, PTFE, PVDF, 316 SS, A 20, Hast. C, Others on Request			

Performance Curves: (3" & 4" on request)



Dimensions: (inches)



Product Codes For Ordering Back Pressure Valves:

BPG ☐ ☐ ☐ ☐ ☐
1 2 3

1 = Size

050 - 1/2"
075 - 3/4"
100 - 1"
150 - 1 1/2"
200 - 2"
300 - 3"
400 - 4"

2 = Material

P - PVC
CP - CPVC
PP - Polypropylene
T - PTFE
V - PVDF
S - 316 SS
A - Alloy 20
C - Hastalloy C

3 = Options

V - Viton Diaphragm
S - Socket Connections
F - Flanged Connections
OSS - Optional 316 SS Top
MSS - 50 - 350 psi; 316 SS Top
AR - Optional Air Release Port

D	A	B	C
1/2"	5.60	3.50	1.10
3/4"	5.60	3.50	1.10
1"	5.90	3.50	1.25
1 1/2"	8.95	4.50	2.10
2"	8.95	5.00	2.10
3" flanged	12.0	15.0	3.0
4" flanged	12.0	15.0	3.0

Pressure Relief Valves**Specification Data Sheet**

Date:	04/01/12				
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano				
Contractor Order No:	TBD				
HTP Project No:	PJ-12001				
Plant:	Well 35				
Specification Section:	43 20 01 – Chlorination Equipment				
Revision	By	Date	Description	Notes	
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:	Griffco Valve, Inc				
Part #:	BPG075-CP-S				
Dimensions:	5.6”High x 3.5” Diameter				
A	Design Conditions				
1	Quantity	1	1		
2	Valve Tag Number	BPV-35-01	BPV-35-02		
3	Pump Tag Number	PMP-35-01	PMP-35-02		
4	Chemical	NaOCl	NaOCl		
5	Pump Capacity (GPH)	28.5 GPH	28.5 GPH		
6	Valve Set Pressure (PSIG)	70 PSIG	70 PSIG		
7	Maximum Pressure (PSIG)	150 PSIG	150 PSIG		
8	Maximum Flow Capacity (GPH)	300 GPH	300 GPH		
9	Maximum Temperature (°F)	140°F	140°F		
10	Valve Body Material	CPVC	CPVC		
11	Valve Diaphragm Material	Teflon	Teflon		
12	In / Out Connections (FNPT)	3/4 – Inch	3/4 – Inch		
13	Location	NaOCl-Skid-35	NaOCl-Skid-35		
B	Options Included		D	Options Included	
14			18		
15			19		
16			20		
17			21		
Referenced Documents		Document Number		Notes	
				Back Pressure Valve is being used as Pressure Relief Valve	

Pressure Relief Valves
Specification Data Sheet

Date:	04/01/12				
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano				
Contractor Order No:	TBD				
HTP Project No:	PJ-12001				
Plant:	Well 38				
Specification Section:	43 20 01 – Chlorination Equipment				
Revision	By	Date	Description	Notes	
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:	Griffco Valve, Inc				
Part #:	BPG075-CP-S				
Dimensions:	5.6”High x 3.5” Diameter				
A	Design Conditions				
1	Quantity	1	1		
2	Valve Tag Number	BPV-38-01	BPV-38-02		
3	Pump Tag Number	PMP-38-01	PMP-38-02		
4	Chemical	NaOCl	NaOCl		
5	Pump Capacity (GPH)	28.5 GPH	28.5 GPH		
6	Valve Set Pressure (PSIG)	70 PSIG	70 PSIG		
7	Maximum Pressure (PSIG)	150 PSIG	150 PSIG		
8	Maximum Flow Capacity (GPH)	300 GPH	300 GPH		
9	Maximum Temperature (°F)	140°F	140°F		
10	Valve Body Material	CPVC	CPVC		
11	Valve Diaphragm Material	Teflon	Teflon		
12	In / Out Connections (FNPT)	3/4 – Inch	3/4 – Inch		
13	Location	NaOCl-Skid-38	NaOCl-Skid-38		
B	Options Included		D	Options Included	
14			18		
15			19		
16			20		
17			21		
Referenced Documents	Document Number	Notes			
		Back Pressure Valve is being used as Pressure Relief			
		Valve			



Griffco Valve Inc.
6010 N. Bailey Ave. Suite. 1B
Amherst, NY 14226
PH: 716 835-0891
FAX: 716 835-0893

G-SERIES BACK PRESSURE VALVES



Griffco G-Series diaphragm back pressure valves are designed to enhance the performance of chemical feed systems by applying a continuous back pressure to the chemical feed pump, while also acting as an anti-siphon valve. Robust construction ensures reliability in the rigorous service of municipal and industrial applications. Wetted materials include: **PVC, CPVC, PP, PVDF, PTFE, 316 SS, A20 and Hast. C.** Available sizes: 1/2" - 4".

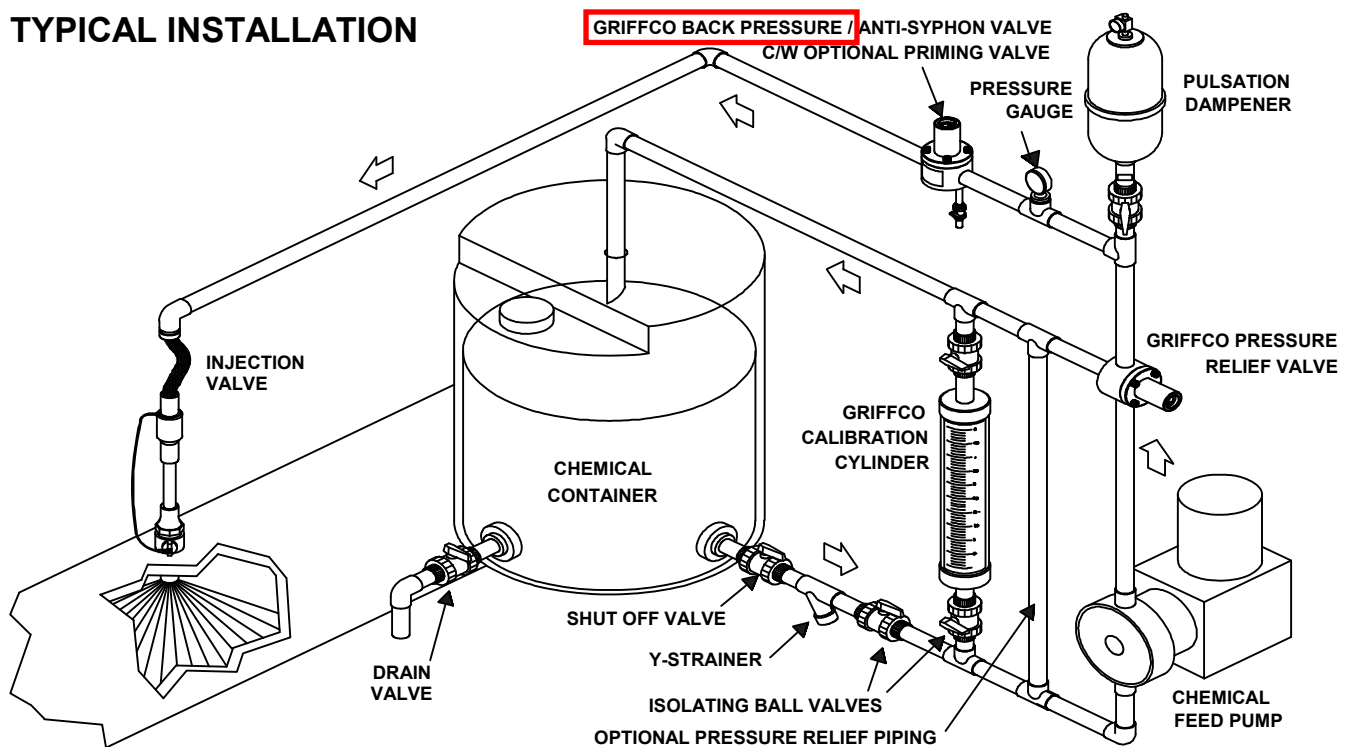
Features:

- High Reliability / Low Cost
- Vulcanised PTFE/EPDM Diaphragm
- Adjustable 0 - 250 PSI*
- Optional 350 PSI Rated Valve
- Anti-Siphon Function
- Robust, Machined Construction
- Tamper Resistant Adjustment Screw
- Wide Range of Materials

Operation:

Griffco diaphragm back pressure valves apply positive discharge pressure to a metering pump system to prevent siphoning and eliminate varying dosage rates caused by fluctuating downstream pressure. The diaphragm is held against the valve seat by an internal spring. When the preset pressure is exceeded, the diaphragm is forced up and chemical flows through the valve to the injection point. The valves are preset for 50 psi, however they are field adjustable from 0 - 250 psi via the adjustment screw. Installation should be as close to the injection point as possible to prevent chemical line drainage, and it is most important that all chemical system equipment such as pulsation dampeners and pressure gauges are between the pump and back pressure valve.

TYPICAL INSTALLATION



CALL 1 - 800 - GRIFFCO

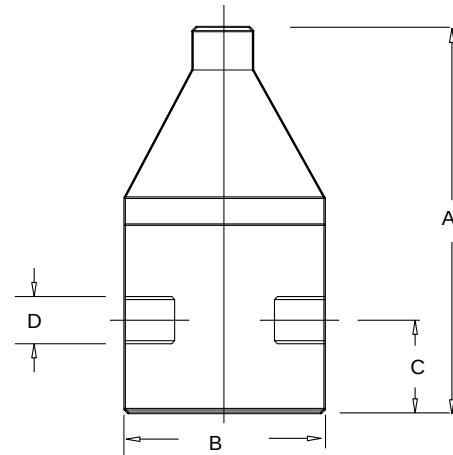
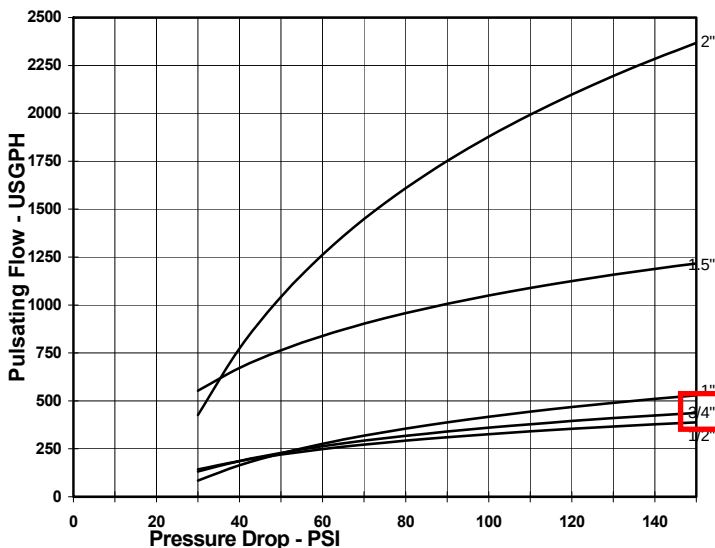
Bulletin # BPG1003-2008R4

Technical Data:

Model BPG Sizes:			1/2", 3/4", 1", 1 1/2", 2", 3", 4"		
Connections:			NPT, Socket, Union, Flange		
Pressure Adjustment			0 - 50 psi, 10 - 150 psi, 10 - 250 psi, 50 - 350 psi (option on Metal Valves) *Note: Size 1 1/2" and Larger BPG valves 10 - 150 psi Max range ONLY.		
Flow Rates @ 150 psi			Shipping Weight: lbs		
Size	Pulsating	Continuous	Plastic	Metal / Plastic Top	Metal / Metal Top
1/2"	300 USgph	21 USgpm	3.0	5.5	6.5
3/4"	300 USgph	21 USgpm	3.0	5.5	6.5
1"	500 USgph	26 USgpm	3.5	6.0	7.0
1 1/2"	1200 USgph	63 USgpm	9.0	18.5	26.0
2"	2350 USgph	120 USgpm	9.0	20.0	30.0
3"	5200 USgph	270 USgpm	28.0		
4"	5200 USgph	270 USgpm	30.0		
Max Temperature: (°F)			PVC: 140° CPVC & PP: 195°; PTFE, PVDF & Metal: 300°, (Peak 390°)		
Max Operating Pressure(psi) @ 70 Deg. F			Plastic/Noryl: 375 psi		Metal/Metal: 2000 psi
Materials of Construction:					
Diaphragm			PTFE / EPDM, Optional: Viton & PTFE / Viton		
Valve Top			Standard: 1/2" - 2" Noryl 3" & 4" PVC Optional: 316 SS		
Valve Body			PVC CPVC, PP, PTFE, PVDF, 316 SS, A 20, Hast. C, Others on Request		

Performance Curves: (3" & 4" on request)

Dimensions: (inches)



Product Codes For Ordering Back Pressure Valves:

BPG ☐ ☐ ☐ ☐ ☐
1 2 3

1 = Size

050 - 1/2"
075 - 3/4"
100 - 1"
155 - 1 1/2"
200 - 2"
300 - 3"
400 - 4"

2 = Material

P - PVC
CP - CPVC
PP - Polypro
T - PTFE
K - PVDF
S - 316 SS
A - Alloy 20
C - Hastalloy C

3 = Options

V - Viton Diaphragm
S - Socket Connections
F - Flanged Connections
U = Union Connections
B= BSP Tread Connection
OSS - Optional 316 SS Top
MSS - 50 - 350 psi; 316 SS Top
AR - Optional Air Release Port

D	A	B	C
1/2"	5.60	3.50	1.10
3/4"	5.60	3.50	1.10
1"	5.90	3.50	1.25
1 1/2"	8.35	4.90	2.10
2"	8.95	4.90	2.10
3" flanged	12.0	15.0	3.0
4" flanged	12.0	15.0	3.0

Pulsation Dampeners

Specification Data Sheet

Date:		04/01/12			
Contractor / Customer:		Steve Dovali Construction Inc / City of Delano			
Contractors Project No:		TBD			
HTP Project No:		PJ-12001			
Plant:		Well 35			
Specification Section:		43 20 01 – Chlorination Equipment			
Revision	By	Date	Description	Notes	
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:		ProMinent Fluid Controls / Blacoh Fluid Controls			
Part #:		7253233 / CT1311V			
Dimensions:		8.93” High x 7” Diameter			
Weight:		6 lbs.			
A	Design Conditions				
1	Quantity	1	1		
2	Tag Number	PD-35-01	PD-35-02		
3	Pump Tag Number	PMP-35-01	PMP-35-02		
4	<u>Service Conditions</u>				
5	Vol. / Stroke (Cubic Inches)	0.70	0.70		
6	Allowable Pulsation Amplitude	2 PSIG	2 PSIG		
7	Accumulator Size Required	18.07 Cu. In.	18.07 Cu. In.		
8	Recommended Dampener Size	36 Cu. In.	36 Cu. In.		
9	Precharge Dampener Pressure	45 PSIG	45 PSIG		
10	<u>Dampener Specs</u>				
11	Gas Volume in Cubic Inches	36 Cu. In.	36 Cu. In.		
12	Bladder Material	Viton	Viton		
13	Body Material	PVC	PVC		
14	Type	Chargeable	Chargeable		
15	Inlet Connection	¾ - Inch FNPT	¾ - Inch FNPT		
16	Air Charge Connection	Bicycle Valve	Bicycle Valve		
17	Maximum Oper. Press.	150 PSIG	150 PSIG		
18	Maximum Oper. Temp.	140°F	140°F		
19					
B	Options Included		D	Options Included	
20			23		
21			24		
22			25		

Pulsation Dampeners

Specification Data Sheet

Date:		04/01/12			
Contractor / Customer:		Steve Dovali Construction Inc / City of Delano			
Contractors Project No:		TBD			
HTP Project No:		PJ-12001			
Plant:		Well 38			
Specification Section:		43 20 01 – Chlorination Equipment			
Revision	By	Date	Description	Notes	
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:		ProMinent Fluid Controls / Blacoh Fluid Controls			
Part #:		7253233 / CT1311V			
Dimensions:		8.93” High x 7” Diameter			
Weight:		6 lbs.			
A	Design Conditions				
1	Quantity	1	1		
2	Tag Number	PD-38-01	PD-38-02		
3	Pump Tag Number	PMP-38-01	PMP-38-02		
4	<u>Service Conditions</u>				
5	Vol. / Stroke (Cubic Inches)	0.70	0.70		
6	Allowable Pulsation Amplitude	2 PSIG	2 PSIG		
7	Accumulator Size Required	18.07 Cu. In.	18.07 Cu. In.		
8	Recommended Dampener Size	36 Cu. In.	36 Cu. In.		
9	Precharge Dampener Pressure	45 PSIG	45 PSIG		
10	<u>Dampener Specs</u>				
11	Gas Volume in Cubic Inches	36 Cu. In.	36 Cu. In.		
12	Bladder Material	Viton	Viton		
13	Body Material	PVC	PVC		
14	Type	Chargeable	Chargeable		
15	Inlet Connection	¾ - Inch FNPT	¾ - Inch FNPT		
16	Air Charge Connection	Bicycle Valve	Bicycle Valve		
17	Maximum Oper. Press.	150 PSIG	150 PSIG		
18	Maximum Oper. Temp.	140°F	140°F		
19					
B	Options Included		D	Options Included	
20			23		
21			24		
22			25		

SENTRY PULSATION DAMPENERS



**DON'T
PUMP
WITHOUT
US**

BLACOH
FLUID CONTROL

601 Columbia Ave, Bldg. D, Riverside, CA 92507 • USA
Tel: (800) 603-7867 or (951) 342-3100 • Fax: (951) 342-3101
E-mail: sales@blacoh.com • Website: www.blacoh.com

SENTRY PULSATION DAMPENERS

BENEFITS & FEATURES

Positive Displacement (PD) pumps create pulsation and hydraulic shock due to the reciprocating nature of their stroking action, potentially damaging the entire pumping system. Blacoh's SENTRY® Pulsation Dampeners remove virtually all hydraulic shock, enhancing all-around performance and reliability of fluid handling equipment in industrial and chemical transfer applications.

SENTRY BENEFITS:

- Produces a near steady fluid flow up to 99%* pulsation and vibration free.
- Protects pipes, valves, fittings, meters, and in-line instrumentation from destructive pulsations, vibrations, surges, cavitation, thermal expansion, & water hammer
- Creates steady and continuous flow when dosing, blending or proportioning additives
- Insures accuracy, longevity, and repeatability of in-line meters
- Enables uniform application of material in spraying and coating systems
- Reduces product agitation, foaming, splashing and degradation of product
- Provides liquid energy storage for emergency valve closure and equipment shutdown
- Reduces overall energy cost with continuous linear flow, rather than start/ stop turbulent flow
- Operates as a reservoir for make-up fluid

SENTRY FEATURES:

- Sizes available for all positive displacement pumps with discharge sizes from 1/8" (3.18mm) to 6" (152.4mm)
- Simple, reliable design and quick installation
- Easy in-line maintenance
- Pressure ranges up to 4000 PSI (276 BAR) available from stock
- Temperature ranges from -60°F to +400°F (-51°C to +205°C) available from stock
- Custom models available up to 100 gallons (378L) and 25,000 PSI (1724 BAR)
- Bodies available in a full range of chemically resistant materials
- Bladders available for even the most corrosive application

***Let SENTRY Stand Guard Over Your System.
Increase productivity, safety, reliability and efficiency.
Decrease maintenance and operating costs.***

PROCESSES

- | | | | | |
|-------------------|--------------------|-------------------|--------------------|------------------|
| • TRANSFER | • FILTERING | • PRINTING | • DOSING | • FILLING |
| • METERING | • SPRAYING | • COATING | • INJECTING | • MIXING |

INDUSTRIES SERVED



Chemical Process



Water Treatment



Food & Beverage



Pulp, Paper & Textile



Paint & Coating



Biotech/
Pharmaceutical



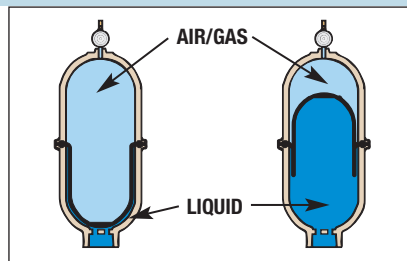
Gas, Oil, &
Petrochemical



Consumer Products

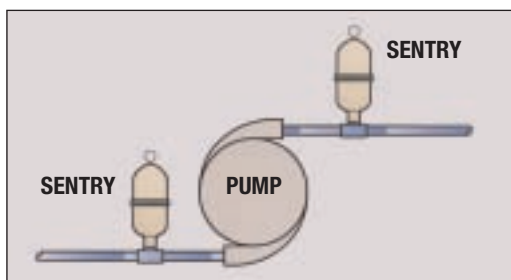
PRINCIPLES OF OPERATION

SENTRY operates on the principle that volume is inversely proportional to pressure. Compressed air or gas is introduced into the air chamber of the SENTRY Pulsation Dampener to a specified pressure. The gas is entrapped by the elastomeric bladder, which prevents contact between the process fluid and compressed gas. (Without the bladder, the gas would dissolve into the fluid and cause product contamination). During pump discharge, fluid enters the wetted chamber of the SENTRY Pulsation Dampener, displacing the bladder, compressing the gas and absorbing the shock. During pump shift, liquid pressure decreases, the dampener gas expands, pushing fluid back into the process line, eliminating up to 99% of system shock and pulsation.

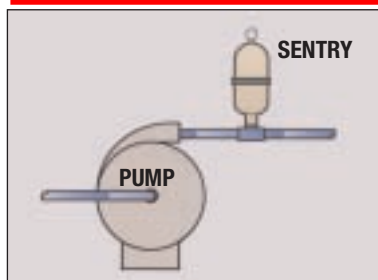


TYPICAL INSTALLATIONS

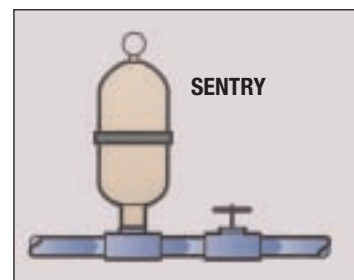
ADD, METERING, PERISTALTIC, & PISTON PUMPS



PUMP STARTUP & SHUTDOWN



QUICK CLOSING VALVES



*Requires proper sizing.

SENTRY TECHNICAL SPECIFICATIONS



SENTRY PLASTIC

Pressure Rating*:	Up to 150 PSI (10 BAR)	Temperature Range**:	-20°F to +250°F (-29°C to +121°C)
Capacities:	4 cubic inches to 5 gallons (.066 – 18L)	Inlet Ports:	Threaded: FNPT and BSP Flanged: ANSI and DIN
Shell Materials:	Polypropylene Conductive Polypropylene PVC and CPVC PVDF Conductive Acetal		



SENTRY METAL

Pressure Rating*:	Up to 4000 PSI (276 BAR)	Temperature Range**:	-60°F to +400°F (-51°C to +204°C)
Capacities:	4 cubic inches to 100 gallons (.066 - 378L)	Inlet Ports:	Threaded: FNPT and BSP Flanged: ANSI and DIN
Shell Materials:	Aluminum Carbon Steel 316L Stainless Steel Alloy 20 Hastelloy C Epoxy, PVDF and PTFE coated steel		



SENTRY SANITARY

Pressure Rating*:	Up to 1000 PSI (69 BAR)	Temperature Range**:	-20°F to +350°F (-28°C to +176°C)
Capacities:	4 cubic inches to 10 gallons (.066 - 37L)	Inlet Ports:	Tri-clamp type sanitary fitting
Shell Materials:	30 RA Polished 316L Stainless Steel Bead Blasted 316L Stainless Steel		



SENTRY PTFE

Pressure Rating*:	Up to 100 PSI (6 BAR)	Temperature Range**:	+40°F to +220°F (+4°C to +104°C)
Capacities:	4 to 370 cubic inches (.066 - 6L)	Inlet Ports:	Threaded: FNPT and BSP Flanged: ANSI and DIN Metric Flare Type
Shell Materials:	Machined PTFE		



SENTRY XP HIGH PRESSURE

Pressure Rating*:	Up to 4000 PSI (276 BAR)	Temperature Range**:	-60°F to +225°F (-51°C to +107°C)
Capacities:	8 to 24 cubic inches (.13 - .39L)	Inlet Ports:	Threaded: FNPT Flanged: ANSI
Shell Materials:	316L Stainless Steel		



SENTRY TEF-GUARD HP II

Pressure Rating*:	Up to 2000 PSI (137 BAR)	Temperature Range**:	+40°F to +220°F (+4°C to +104°C)
Capacities:	12 cubic inches (.20L)	Inlet Ports:	Threaded: FNPT Flanged: ANSI
Shell Materials:	316L Stainless Steel Carbon Steel Alloy 20 Hastelloy C		

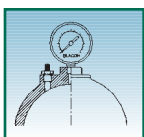
BLADDER OPTIONS

COMPOUND	TEMPERATURE LIMITS	APPLICATIONS
Neoprene	0°F to +200°F (-18°C to +93°C)	Good abrasion resistance and flex; use with moderate chemicals.
Buna	+10°F to +180°F (+12°C to +82°C)	Good flex life; use with petroleum, solvents and oil-based fluids.
EPDM	-60°F to +280°F (-51°C to +137°C)	Use in extreme cold; good chemical resistance with ketones, caustics.
Hypalon	-20°F to +275°F (-29°C to +135°C)	Excellent abrasion resistance; good in aggressive acid applications.
Viton	-10°F to +350°F (-23°C to +176°C)	Use in hot & aggressive fluids; good with aromatics, solvents, acids & oils.
Aflas	0°F to +400°F (-18°C to +204°C)	High temperature, petroleum based chemicals, strong acids and bases.
FDA Silicone	-20°F to +300°F (-29°C to +149°C)	FDA-approved food grade material; for use in food and pharmaceutical processing.
FDA Buna	+10°F to +180°F (-12°C to +82°C)	FDA-approved food grade. Similar characteristics of Silicone.
FDA Fluorel	-10°F to +350°F (-23°C to +176°C)	Fluorel is a fluorelastomer comparable to Viton.
PTFE	+40°F to +220°F (+4°C to +104°C)	Bellows design; excellent flex life; use with highly aggressive fluids.

* Maximum PSI rated for ambient temperatures.

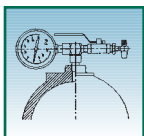
** Reflects entire temperature range for all available materials. Consult Blacoh on specific materials.

AIR CONTROL OPTIONS



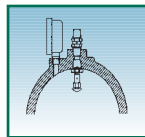
CHARGEABLE

The chargeable model has a Schrader type charging valve that allows for a predetermined pressure charge to be applied and held in the dampener. No permanent source of compressed gas is required to be attached to the unit. The chargeable models are used primarily with metering, piston and peristaltic pumps for pulsation dampening. Chargeable models are also used for surge suppression to prevent water hammer from quick closing valves, for make-up fluid to prevent pump cycling and for suppression of pump start up or shut down pressure spikes.



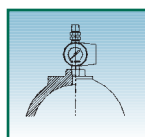
INLET STABILIZER

The patented inlet stabilizer air control (U.S. Patent No. 6,089,837) consists of a compound pressure gauge, a pressure/vacuum tight ball valve and a venturi valve. When compressed air is passed through the venturi valve at high speed, a low pressure area is created which is used to evacuate the air from the stabilizer, creating a vacuum internally. Conversely, when the flow of air through the venturi valve is diverted into the stabilizer, a pressure charge is obtained. When pump inlet conditions are optimized, pump efficiency is maximized.



AUTOMATIC

An automatic poppet type valve located in the non-wetted section of the dampener allows for an increase in compressed air pressure to balance an increase in system liquid pressure. As liquid system pressure increases, the bladder is pushed further up into the dampener until it contacts the internal automatic valve. This contact opens the valve and allows an increase of compressed air to enter the dampener. When the air pressure inside the dampener equals the system liquid pressure, the dampener is in balance and pulsations are minimized. If a change in pressure occurs this process is repeated. Automatic units are designed for use on air operated diaphragm pumps in systems with a varying discharge pressure.



ADJUSTABLE

The adjustable model uses a self-relieving regulator to set dampener pressure. A compressed air line must be permanently attached to the regulator. The regulator allows for an easy, convenient method for readjusting the dampener pressure if the system fluid pressure changes. Adjustable units are designed for use on air operated diaphragm pumps in systems with a constant discharge pressure.

APPLICATION STORIES

APPLICATION: PULSATION DAMPENING

PROBLEM: A major pulp & paper mill in the Northwest used AODD unloading pumps. The reciprocating action of these air-operated pumps created violent pulsations that caused both pipe stress and mounting fatigue. In fact, these pulsations often caused the pumps to be pulled from their cement foundations. This created significant downtime, costly foundation repair, environmental hazards, and a dangerous working environment.



SOLUTION: A Blacoh SENTRY IV Pulsation Dampener was installed in the common discharge of the pumps to dampen these pulsations.

RESULT: Pipe stress and mounting fatigue have been eliminated. Not only have the pumps not been ripped from their cement foundations, but the mill has experienced longer life from pump components such as diaphragms and ball valves.

APPLICATION: WATER HAMMER

PROBLEM: A major producer of water treatment chemicals accessed their local water supply through a 3" PVC pipe with quick-closing valves. When the desired quantity had been measured and the valve shut, a water hammer effect with pressure spikes that exceeded the PVC pipe's burst strength was created. The PVC repeatedly broke, causing the entire plant to be shut down for repair. In addition, since pipe failure occurred under a nearby highway, it also had to be closed.



SOLUTION: A Blacoh SENTRY 10 gallon Surge Suppressor was installed on the pressure side of each quick closing valve to reduce water hammer pressure spikes.

RESULT: The damaging water hammer pressure spikes are now absorbed, no pipes have ruptured, and the plant (and nearby highway) have had no downtime due to water hammer.

APPLICATION: METERING

PROBLEM: A 300 megawatt power plant required a chemical feed system to supply hydrazine to a boiler. The hydrazine acts as an oxygen scavenger, and must be delivered in a precise and consistent quantity. While metering pumps can deliver chemicals in precise amounts, their reciprocating action will not allow delivery in a smooth and consistent flow.

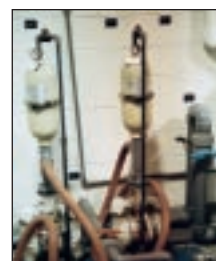


SOLUTION: A Blacoh SENTRY III Pulsation Dampener was installed in the common discharge of two metering pumps to create smooth and consistent flow.

RESULT: Hydrazine is now delivered to the boiler in a precise and consistent quantity. In addition, pipe vibration has been eliminated, gauge accuracy has been maximized, and pump component stress has been reduced.

APPLICATION: SPRAYING/ COATING

PROBLEM: A decontamination facility pumped acids and water through a series of 15° spray nozzles to rinse radiation from contaminated metals. However, the pulsating action of their reciprocating pumps caused uneven spray into the rinse tanks, and the metals were not rinsed completely.



SOLUTION: A Blacoh SENTRY 1 Pulsation Dampener was installed at each pump discharge manifold to eliminate the surging flow of the pumps and ensure complete coverage and thorough cleaning.

RESULT: The even flow ensures that the metal product is completely rinsed of radiation. Furthermore, both process time and the amount of acid required have been reduced, which increased productivity and profit.

PUMPING SYSTEM SOLUTIONS

SENTRY®

INLET STABILIZER

Extends Life Of All Inlet System Components



SENTRY®

PULSATION DAMPENER

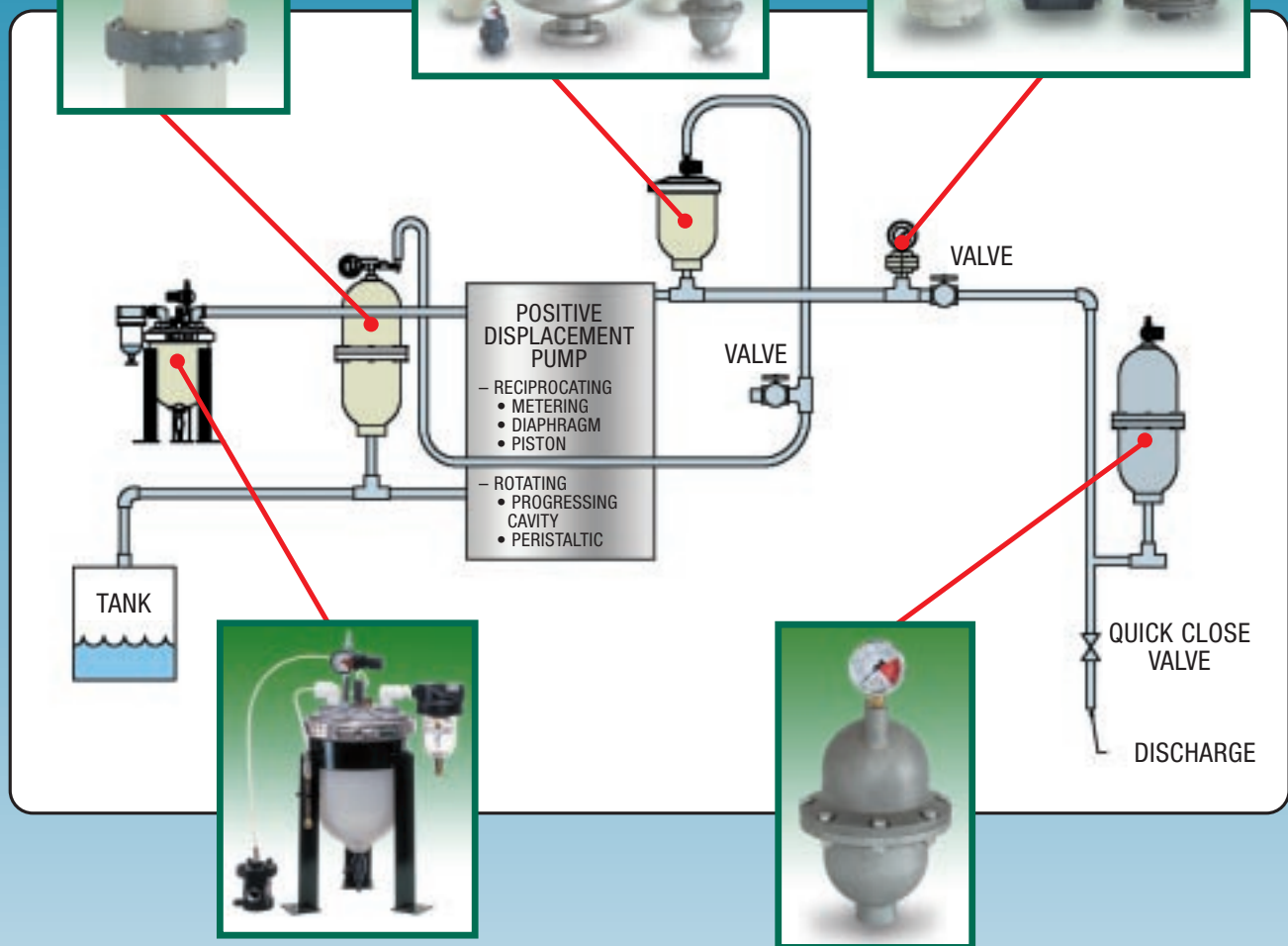
Remove Up To 99% Of System Shock



SENTINEL®

DIAPHRAGM SEALS

Protect & Isolate System Instrumentation



SPILL-STOP®

LEAK CONTAINMENT

Stops Spills Caused By Pump Diaphragm Failure



SENTRY®

SURGE SUPPRESSOR

Eliminate Hydraulic Surge & Water Hammer



UNDERSTANDING PULSATION AND WATER HAMMER CONTROL

PULSATION DAMPENING

Positive displacement pumps create pulsation and hydraulic shock purely by the reciprocating nature of the pump's stroking action. During the discharge stroke of a pump, fluid pressure takes the line of least resistance, displacing the bladder in the dampener, and compressing the trapped gas. As the pump begins its next cycle, fluid flow stops momentarily allowing the compressed gas to expand, forcing the bladder to push the accumulated

fluid back into the discharge line. This fills the void created in the pipeline by the pump's cycle shift. Whether a piston, plunger, air diaphragm, peristaltic, gear, or diaphragm metering pump, a SENTRY Pulsation Dampener placed at the pump's discharge will produce a steady fluid flow up to 99% pulsation free; protecting the entire pumping system from the damaging effects of shock.

SURGE SUPPRESSION & WATER HAMMER

When fluid in motion is abruptly stopped, a hydraulic surge is created in the system. Hydraulic surge is often referred to as "water hammer". The kinetic energy, released as pressure, can spike up to six times the system's operating pressure, destroying system instrumentation, pumps, pipes, fittings, and valves. Without a suppression device, the shock wave travels the length of the pipe back to the pump, then reverses again, oscillating back and forth until friction dissipates the pressure spike or a system component fails.

There are several major culprits that produce water hammer; quick closing valves, back surge, pump start up and pump shut down. Quick closing valves can be defined as valves that close within one and one-half seconds. Quick closing valves have the potential of stopping large volumes of energized fluid, producing violent water hammer. The pump start up also stops fluid in motion. During pump start up, fluid in a pipe is static and must be accelerated. The pumped fluid is abruptly stopped when it contacts the static fluid in the pipe, again creating a shock wave. A SENTRY Surge

Suppressor installed at the pump's discharge will provide the accumulation capacity to absorb the rapid fluid acceleration and prevent a pressure spike from occurring. As the surge enters the Suppressor, the gas inside is compressed, the fluid is accumulated and the shock wave is absorbed. When steady system flow rate is achieved, pressure and fluid are slowly released back into the system by the compressed gas.

At pump shut-down, either planned or failure, fluid flow will momentarily continue away from the pump due to momentum. As the flow continues, a void, called column separation can occur at the pump's discharge. When fluid momentum is stopped due to pipe friction, the liquid will usually reverse toward the void area of the pump discharge. The reversing fluid will slam into the check valve usually located at the pump discharge and a water hammer pressure spike will occur. Depending upon the design of the piping system and the fluid involved, the voided area can actually become sub-atmospheric which can significantly increase the pressure spike.

INLET (SUCTION) STABILIZATION

Without a sufficient supply of fluid a pump will not perform efficiently. Fluid "starvation" is caused by unbalanced hydraulics from friction, acceleration, and head. A reciprocating pump further complicates the issue by emitting high-frequency pressure waves created by the inlet valves opening and closing. In high inlet pressure situations, a pump's inlet valves create water hammer by their opening and closing action; increasing pipe and pump damage, and draining system efficiency.

In suction lift and horizontal suction applications, the pumps' inlet valve action actually decreases inlet fluid pressure. A "starved" or cavitating

pump will be unable to produce specified flow rates due to the incomplete filling of cylinders and liquid chambers. In addition, cavitation will result in the premature failure of pump parts. A SENTRY Suction Stabilizer at the pump's inlet will act as an accumulator, reducing pressure fluctuations and aid in filling the pump head with fluid during each inlet stroke. In high suction lift applications it is also important not to lose the acceleration of the fluid created with each suction stroke of the pump. A Suction Stabilizer will momentarily maintain the flow of the accelerated fluid. The fluid flows into the stabilizer as the pump shifts, and then out as the inlet valve re-opens, maintaining even pressure and steady flow, minimizing cavitation.

THERMAL EXPANSION

Many fluids change volume due to temperature changes. As the temperature of a fluid rises, the fluid expands. In a closed or loop system a volumetric increase in fluid can create a rise in pressure beyond the limits of safety. The increase in pressure can result in ruptured pipes and fittings,

destroyed in-line instrumentation, burst pressure relief valves and contaminated surroundings. A SENTRY Thermal Expansion Chamber installed in the pipeline will accumulate the expanded fluid, eliminating a dangerous rise in pressure.

ACCUMULATORS, AUXILIARY ENERGY, FLUID MAKE-UP & TRANSFER BARRIER

Fluids flowing in a system can be accumulated during one part of the process cycle, and then released when needed during another part of the cycle. The release can be based upon the pressure of the system or by the opening/closing of a valve. The SENTRY Accumulator can be used to maintain process line pressure and store fluid for other uses, such as to back flush filters or to draw off sample fluid.

Accumulators can be used as a Transfer Barrier where pressure on one side of a system needs to be transferred to another side without the mixing of the fluids. The accumulator is installed in-line with the two fluids entering at opposite ends, separated by the bladder. As the pressure of one fluid increases, it pushes the bladder against the other fluid, transferring the increase in pressure.

Please call your local distributor:

BLACOH
FLUID CONTROL

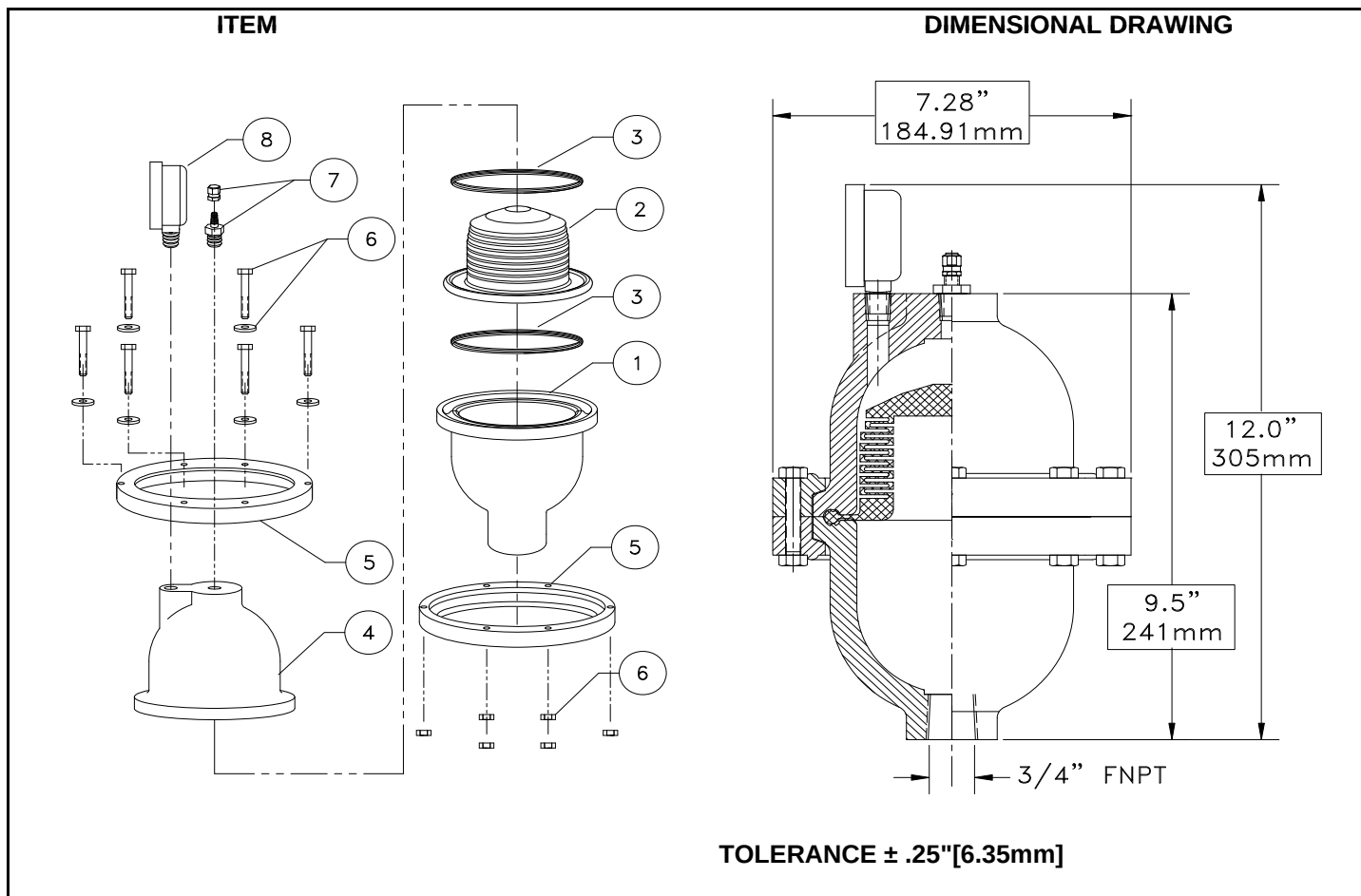
601 Columbia Ave, Bldg. D, Riverside, CA 92507 • USA
Tel: (800) 603-7867 or (951) 342-3100 • Fax: (951) 342-3101
E-mail: sales@blacoh.com • Website: www.blacoh.com

SENTRY MODEL #:	CT311T
MAXIMUM PRESSURE:	150 PSI/10 BAR
CAPACITY:	85 CUBIC INCHES/1.39 LITERS
WETTED HOUSING:	PVC
NONWETTED HOUSING:	PVC
BLADDER:	PTFE
INLET:	3/4" FNPT
AIR CONTROL:	CHARGEABLE

ALTHOUGH THE INFORMATION ON THIS SHEET IS BELIEVED TO HAVE BEEN ACCURATE WHEN THE SHEET WAS FIRST PREPARED, SOME INFORMATION ON THIS SHEET MAY NOT BE ENTIRELY ACCURATE NOW. PLEASE VERIFY MATERIAL COMPONENTS, DIMENSIONS, AND PRESSURE RATING ON THE CURRENT BROCHURE FOR THIS PRODUCT BY BLACOH FLUID CONTROL, INC. ("BLACOH") OR, IF NECESSARY, CONTACT BLACOH DIRECTLY. PRESSURE TOLERANCES, INCLUDING BUT NOT LIMITED TO, ON MODELS MADE OF PLASTIC, MAY BE REDUCED BY TEMPERATURE VARIATION AND BY THE COMPOSITION OF THE SUBSTANCE BEING PUMPED.

USE OF AN INCOMPATIBLE OR UNSUITABLE DAMPENER ON A PUMP MAY BE DANGEROUS TO PERSONS AND PROPERTY. BY WAY OF EXAMPLE BUT NOT LIMITATION, USE OF AN INCOMPATIBLE OR UNSUITABLE DAMPENER MAY RESULT IN EXPLOSIONS, LEAKAGE OF LIQUIDS OR GASES (WHICH MAY BE HAZARDOUS), OR MALFUNCTIONING EQUIPMENT.

THE USER IS SOLELY RESPONSIBLE FOR (AND BLACOH IS NOT RESPONSIBLE FOR) VERIFYING THE COMPATIBILITY AND SUITABILITY OF A PARTICULAR DAMPENER FOR A PARTICULAR PUMP AND APPLICATION. AS WELL AS DETERMINING WHETHER TESTING OF A DAMPENER IS ADVISABLE PRIOR TO USE IN A PARTICULAR APPLICATION.



BLACOH FLUID CONTROL, INC

RIVERSIDE, CALIFORNIA USA

TEL: 800.603.7867 or 951.342.3100 Fax: 951.342.3101

E-mail: sales@blacoh.com web site: www.blacoh.com

Pulsation Dampeners**Specification Data Sheet**

Date:	04/01/12				
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano				
Contractors Project No:	TBD				
HTP Project No:	PJ-12001				
Plant:	Well 35				
Specification Section:	43 20 01 – Chlorination Equipment				
Revision	By	Date	Description	Notes	
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:	ProMinent Fluid Controls / Blacoh Fluid Controls				
Part #:	7253233 / CT1311V				
Dimensions:	8.93” High x 7” Diameter				
Weight:	6 lbs.				
A	Design Conditions				
1	Quantity	1	1		
2	Tag Number	PD-35-01	PD-35-02		
3	Pump Tag Number	PMP-35-01	PMP-35-02		
4	Service Conditions				
5	Vol. / Stroke (Cubic Inches)	0.70	0.70		
6	Allowable Pulsation Amplitude	2 PSIG	2 PSIG		
7	Accumulator Size Required	18.07 Cu. In.	18.07 Cu. In.		
8	Recommended Dampener Size	36 Cu. In.	36 Cu. In.		
9	Precharge Dampener Pressure	45 PSIG	45 PSIG		
10	Dampener Specs				
11	Gas Volume in Cubic Inches	36 Cu. In.	36 Cu. In.		
12	Bladder Material	Viton	Viton		
13	Body Material	PVC	PVC		
14	Type	Chargeable	Chargeable		
15	Inlet Connection	¾ - Inch FNPT	¾ - Inch FNPT		
16	Air Charge Connection	Bicycle Valve	Bicycle Valve		
17	Maximum Oper. Press.	150 PSIG	150 PSIG		
18	Maximum Oper. Temp.	140°F	140°F		
19					
B	Options Included		D	Options Included	
20			23		
21			24		
22			25		

Pulsation Dampeners

Specification Data Sheet

Date:		04/01/12			
Contractor / Customer:		Steve Dovali Construction Inc / City of Delano			
Contractors Project No:		TBD			
HTP Project No:		PJ-12001			
Plant:		Well 38			
Specification Section:		43 20 01 – Chlorination Equipment			
Revision	By	Date	Description		Notes
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:		ProMinent Fluid Controls / Blacoh Fluid Controls			
Part #:		7253233 / CT1311V			
Dimensions:		8.93” High x 7” Diameter			
Weight:		6 lbs.			
A	Design Conditions				
1	Quantity	1	1		
2	Tag Number	PD-38-01	PD-38-02		
3	Pump Tag Number	PMP-38-01	PMP-38-02		
4	<u>Service Conditions</u>				
5	Vol. / Stroke (Cubic Inches)	0.70	0.70		
6	Allowable Pulsation Amplitude	2 PSIG	2 PSIG		
7	Accumulator Size Required	18.07 Cu. In.	18.07 Cu. In.		
8	Recommended Dampener Size	36 Cu. In.	36 Cu. In.		
9	Precharge Dampener Pressure	45 PSIG	45 PSIG		
10	<u>Dampener Specs</u>				
11	Gas Volume in Cubic Inches	36 Cu. In.	36 Cu. In.		
12	Bladder Material	Viton	Viton		
13	Body Material	PVC	PVC		
14	Type	Chargeable	Chargeable		
15	Inlet Connection	¾ - Inch FNPT	¾ - Inch FNPT		
16	Air Charge Connection	Bicycle Valve	Bicycle Valve		
17	Maximum Oper. Press.	150 PSIG	150 PSIG		
18	Maximum Oper. Temp.	140°F	140°F		
19					
B	Options Included		D	Options Included	
20			23		
21			24		
22			25		

High Flow Pump Accessories: Calibration Columns

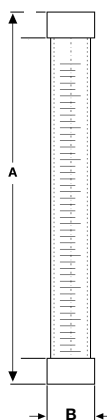
Description

Part No.

Calibration columns

Clear PVC calibration columns

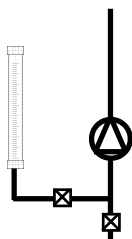
Cylinder size	Fitting size	Dimension (inches)		Threaded base, removable top	Threaded both ends
		A	B		
100 mL	1/2" NPT	10.75	1.39	7500137	7500127
250 mL	1/2" NPT	11.51	1.89	7350138	7500128
500 mL	1/2" NPT	12.75	2.39	7350139	7500129
1000 mL	1/2" NPT	16.75	2.77	7350130	7500135
2000 mL	1" FNPT	20.67	3.52	7500140	7500131
4000 mL	1" FNPT	22.66	4.52	7500141	7500132
10,000 mL	2" FNPT	23.16	6.91	7500134	7500133
20,000 mL	2" FNPT	42.69	6.91	7500142	7500136



Typical Application of Calibration Columns

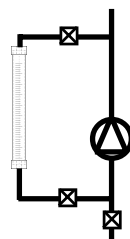
Column w/removable top

Note: Top must be removed during calibration



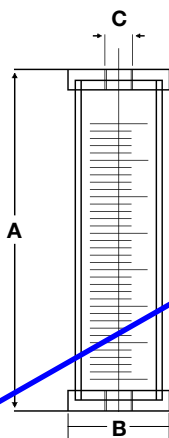
Column threaded both ends

Note: If plumbed as shown, a vent hole must be drilled into the top of the calibration column



Borosilicate Glass calibration columns with Viton® seals for Sulfuric Acid Applications

Glass cylinder with acrylic outer shield and 1/2" (316 SS) or 3/4" (PVDF, PVC) thick end flanges. All cylinders are bolted together using stainless steel rods with Viton O-rings for the glass seal and Buna N O-rings for the acrylic seal.



Cylinder size	Fitting size	Dimensions (inches)			Part No.
		A	B	C	
100 mL	1/2" CPVC	10.0	3.0	1/2	7500151
100 mL	1/2" PVDF	10.0	3.0	1/2	7500152
100 mL	1/2" SS	9.5	3.0	1/2	7500153
250 mL	1/2" CPVC	12.5	3.5	1/2	7500154
250 mL	1/2" PVDF	12.5	3.5	1/2	7500155
250 mL	1/2" SS	12.0	3.5	1/2	7500156
500 mL	1/2" CPVC	14.5	4.0	1/2	7500157
500 mL	1/2" PVDF	14.5	4.0	1/2	7500158
500 mL	1/2" SS	14.0	4.0	1/2	7500159
1000 mL	1/2" CPVC	16.75	4.75	1/2	7500160
1000 mL	1/2" PVDF	16.75	4.75	1/2	7500161
1000 mL	1/2" SS	16.25	4.75	1/2	7500162
2000 mL	1" CPVC	18.75	5.5	1	7500163
2000 mL	1" PVDF	18.75	5.5	1	7500164
2000 mL	1" SS	18.25	5.5	1	7500165
4000 mL	1" CPVC	22.5	6.5	1	7500166
4000 mL	1" PVDF	22.5	6.5	1	7500167
4000 mL	1" SS	22.0	6.5	1	7500168



ACCUDRAW® Calibration Cylinders



Polypropylene



PVC



Glass



- PVC with removable "O" ring sealed top for easy cleaning
- yellow polypropylene level indicator float for high visibility

ACCUDRAW® has been developed for the accurate calibration of metering pumps. Standard features include:

- translucent
- chemical resistant
- break resistant
- threaded, socket or flanged
- colored graduations and lettering
- **PVC has dual scale USGPH & ml**
- PVC sizes 100 - 20000 ml
- POLY sizes 100 - 4000 ml
- POLY meets ISO standards
- Glass sizes 100 - 20000 ml
- custom designs available

For detailed product information visit our website: primaryfluid.com





ACCUDRAW® Calibration Cylinders

"For Accuracy That Counts"

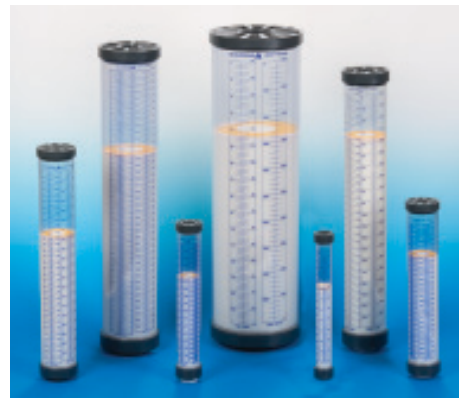
For complete product information visit our website: primaryfluid.com



Flanged: Glass, PVC



Flanged: PVC



PV#4

Sizing and Ordering Information:

ACCUDRAW Standard Materials of Construction

AC = All polypropylene construction (see below for options)
PV = All polyvinylchloride construction (see below for options)
ACS = Glass*

Example: AC#1-1000B

AC = PP (polypropylene)
#1 = Bottom threaded connection only
1000 = 1000 ml
B = BSP Thread

Note: Cylinders are NOT pressure vessels

e.g. Part # **AC #1 - 1000 B**

Type:

AC = Polypropylene
PV = PVC
ACS = Glass

Style:

1 = Bottom threaded conn. only
2 = Top and Bottom threaded conn.
3 = Bottom threaded conn. c/w removable vented dust cap
4 = Top/Bottom threaded conn. c/w removable "O" ring sealed top and float ring level indicator

*Glass calibration cylinders available in Style 2 only

Graduation Scale:

PP - ml only
PVC - ml and GPH
Glass - ml only

Std. connection is NPT thread

Optional: add suffix as follows

S = Socket weld connection (PVC only)
GTV = Glass/TFE construction
GKV = Glass/PVDF construction
GCV = Glass/CPVC construction
GSV = Glass/SS construction
B = BSP Thread
F = Flanged

Substitute **E** for **V**
for **EPDM** wetted "O" ring seal

Sizes:

100 = 100 ml (1.6 GPH)
250 = 250 ml (4 GPH)
500 = 500 ml (8 GPH)
1000 = 1000 ml (16 GPH)
2000 = 2000 ml (32 GPH)
4000 = 4000 ml (64 GPH)

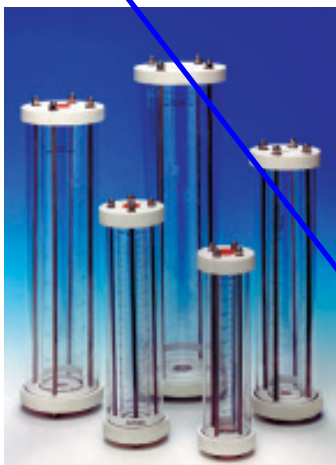
Material

PP, PVC, Glass
PP, PVC, Glass
PP, PVC, Glass
PP, PVC, Glass
PP, PVC, Glass
PP, PVC, Glass
Glass only
Glass only
PVC, Glass
PVC, Glass

Custom sizes and materials available.



ACCUDRAW® Calibration Cylinders



ACCUDRAW® Glass Calibration Cylinders are ideal for the calibration of metering pumps, batch systems and for handling hazardous chemicals.

- volumes calibrated in ml
- construction materials available include TFE, PVDF, CPVC and 316 stainless steel
- sealing "O" rings are Viton and Buna N
- outer shield of acrylic construction
- port connections in NPT, metric or flanged
- standard sizes 100 - 20,000 ml
- custom designs available to your specifications

Sizing and Ordering Information: Glass Construction

Size	Conn.	Model # For TFE End Flgs	Model # For 316 S/S End Flgs	Model # For PVDF End Flgs	Model # For CPVC End Flgs
100 ml	1/2" NPT	ACS#2-100-GTV	ACS#2-100-GSV	ACS#2-100-GKV	ACS#2-100-GCV
250 ml	1/2" NPT	ACS#2-250-GTV	ACS#2-250-GSV	ACS#2-250-GKV	ACS#2-250-GCV
500 ml	1/2" NPT	ACS#2-500-GTV	ACS#2-500-GSV	ACS#2-500-GKV	ACS#2-500-GCV
1000 ml	1/2" NPT	ACS#2-1000-GTV	ACS#2-1000-GSV	ACS#2-1000-GKV	ACS#2-1000-GCV
2000 ml	1" NPT	ACS#2-2000-GTV	ACS#2-2000-GSV	ACS#2-2000-GKV	ACS#2-2000-GCV
4000 ml	1" NPT	ACS#2-4000-GTV	ACS#2-4000-GSV	ACS#2-4000-GKV	ACS#2-4000-GCV
6000 ml	1" NPT	ACS#2-6000-GTV	ACS#2-6000-GSV	ACS#2-6000-GKV	ACS#2-6000-GCV
8000 ml	2" NPT	ACS#2-8000-GTV	ACS#2-8000-GSV	ACS#2-8000-GKV	ACS#2-8000-GCV
10000 ml	2" NPT	ACS#2-10000-GTV	ACS#2-10000-GSV	ACS#2-10000-GKV	ACS#2-10000-GCV
20000 ml	2" NPT	ACS#2-20000-GTV	ACS#2-20000-GSV	ACS#2-20000-GKV	ACS#2-20000-GCV

Descriptions:

TFE, PVDF and CPVC End Flanges:

Glass cylinder with acrylic outer shield and 3/4" thick (TFE, PVDF or CPVC) end flanges

316 S/S End Flanges:

Glass cylinder with acrylic outer shield and 1/2" thick 316 Stainless Steel end flanges

Cylinders are bolted together using stainless steel rods with Viton "O" rings for the glass seal and Buna N "O" rings for the acrylic seal. For EPDM "O" rings, substitute "E" for "V".

Options available: (may affect price and delivery)

- different type or size of thread connection, different "O" ring material, different flange material

Glass Dimensional Information

Note: Cylinders are not pressure vessels.

Dimensions subject to change without notice.

Glass cylinders with TFE, PVDF or CPVC End Flanges

Size ml	DIV ml	A inches	B inches	C inches	D inches	E thread
100	1.00	10.00	11.00	3.00	2.50	1/2" FNPT
250	2.00	12.75	13.50	3.50	3.00	1/2" FNPT
500	5.00	14.50	15.50	4.00	3.50	1/2" FNPT
1000	10.00	16.75	17.75	4.75	4.25	1/2" FNPT
2000	20.00	18.75	19.75	5.50	5.00	1" FNPT
4000	25.00	22.50	23.50	6.50	6.00	1" FNPT
6000	50.00	20.13	21.16	8.00	7.50	1" FNPT
8000	50.00	24.63	25.66	8.00	7.50	2" FNPT
10000	50.00	30.13	31.16	8.00	7.50	2" FNPT
20000	200.00	43.25	44.25	9.00	8.50	2" FNPT

Glass cylinders with 316 Stainless Steel End Flanges

Size ml	DIV ml	A inches	B inches	C inches	D inches	E thread
100	1.00	9.50	10.50	3.00	2.50	1/2" FNPT
250	2.00	12.25	13.00	3.50	3.00	1/2" FNPT
500	5.00	14.00	15.00	4.00	3.50	1/2" FNPT
1000	10.00	16.25	17.25	4.75	4.25	1/2" FNPT
2000	20.00	18.25	19.25	5.50	5.00	1" FNPT
4000	25.00	22.00	23.00	6.50	6.00	1" FNPT
6000	50.00	19.63	20.66	8.00	7.50	1" FNPT
8000	50.00	24.13	25.16	8.00	7.50	2" FNPT
10000	50.00	29.63	30.66	8.00	7.50	2" FNPT
20000	200.00	42.75	43.75	9.00	8.50	2" FNPT

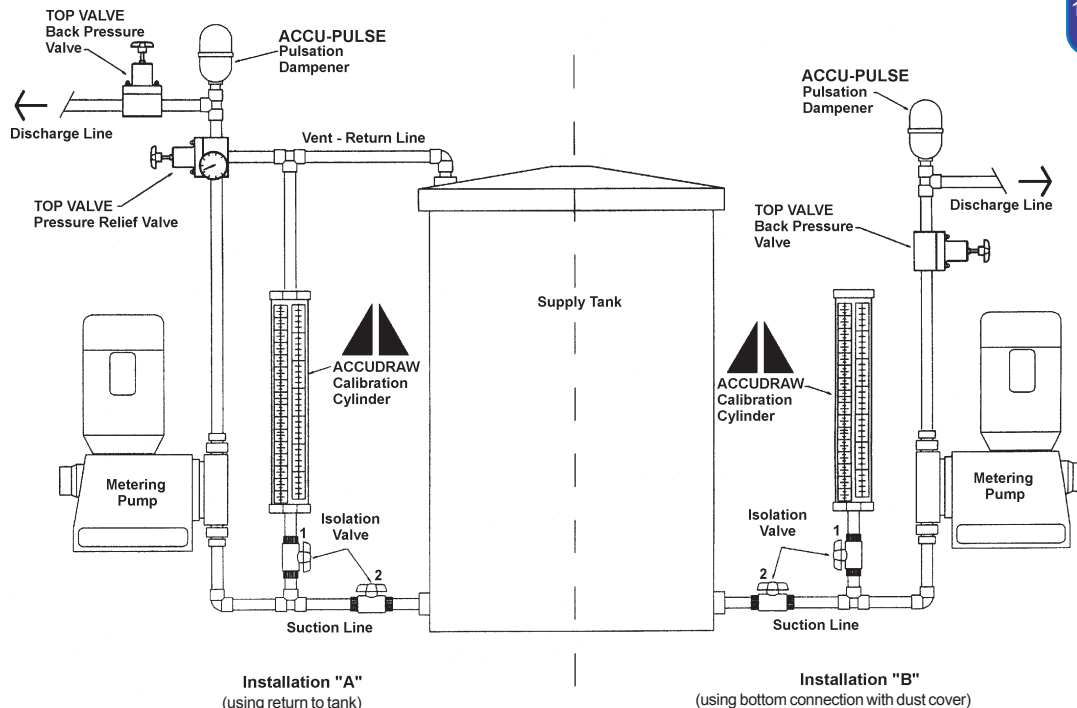


ACCUDRAW® Calibration Cylinders

Installations

Conversion Factors

1 ml = 1 cc
 1000 ml = 1 liter
 ml/sec X 60 = ml/min
 1 US gal/min X 0.063 = liters/sec
 1 US gal = 3.786 liters



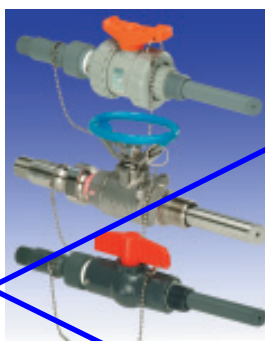
Other available products at www.primaryfluid.com

TOP VALVE Back Pressure/Pressure Relief



- long life diaphragm
- range of 15 - 350 PSIG
- air release, optional gauge port
- PVC, CPVC, PVDF, Teflon, polypropylene, stainless, Alloy 20 and Hastelloy C
- 7 sizes 1/4" - 2" NPT
- color coded handles indicate size
- higher pressure & temperature available

PFS Corporation Stops



Designed to inject chemical into the center stream of process.

- isolation valve allows for ease of maintenance
 - available in 6 materials of construction
 - wetted components have comparable or greater chemical resistance than quill construction material
 - standard and custom lengths available
 - connection in NPT, metric or flanged
- Custom built in other sizes & materials.**

ACCUPULSE Pulsation Dampeners



Designed to remove pulsating flows from positive displacement pumps.

- increase system efficiency and pump life; decrease maintenance and costs
- protect pipes, meters, valves and instrumentation from pulsation and vibration
- ensure meter accuracy, longevity and repeatability
- prevent foaming and splashing
- extensive range of materials and sizes with lightweight, compact design

Distributed By:



PRIMARY FLUID
SYSTEMS INC.

Call Toll Free 1-800-776-6580

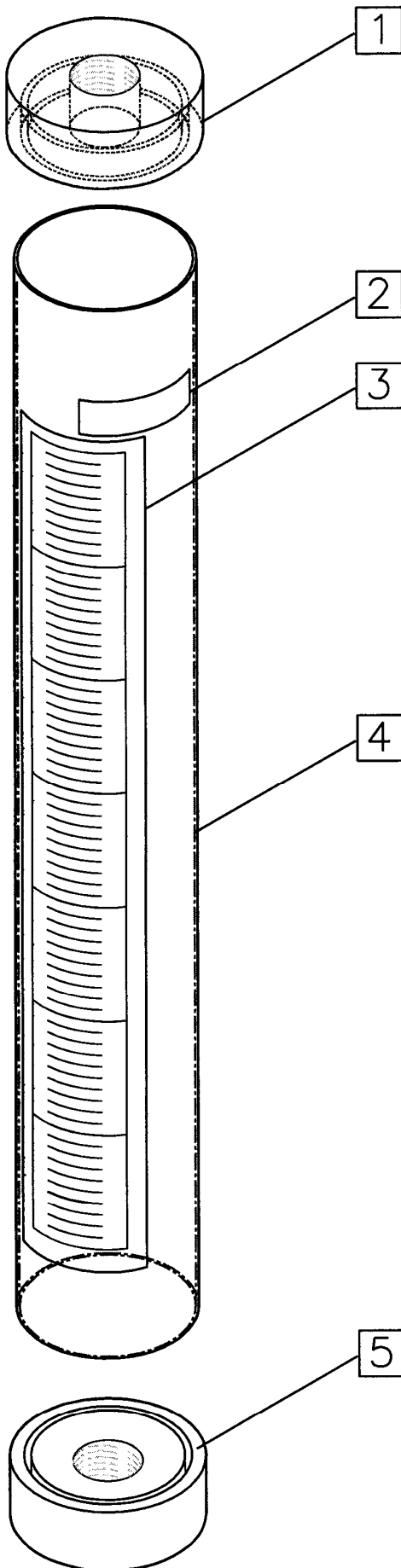
Tel: (905) 333-8743

Fax: (905) 333-8746

Distribution Territories Available

E-Mail: primary@primaryfluid.com
www.primaryfluid.com





"CAUTION: NOT A PRESSURE VESSEL" STICKER

CALIBRATION SCALE STICKER

SIZE/MATERIAL CODING

X = 100 = (100 mL)
 X = 250 = (250 mL)
 X = 500 = (500 mL)
X = 1000 = (1000 mL)
 X = 2000 = (2000 mL)
 X = 4000 = (4000 mL)
 X = 10000 = (10000 mL)
 X = 20000 = (20000 mL)

ITEM #	DESCRIPTION	PART#
1	END CAP, PVC	PV-THRD-X
2	LABEL, ACCUDRAW CAUTION	ACCUDRAW-LABELC
3	LABEL, GRADUATED	PV-LABEL-X
4	TUBE, PVC	PV-X-TUBE
5	END CAP, PVC	PV-THRD-X

DO NOT COPY WITHOUT PRIOR WRITTEN APPROVAL FROM PRIMARY FLUID SYSTEMS. ACCEPTABILITY OF SPECIFICATIONS ARE THE CLIENT'S RESPONSIBILITY.

Primary Fluid Systems Inc.

ACCUDRAW Calibration Cylinder - PV#2
EXPLODED PARTS VIEW

SCALE	NTS	DISC	DRAWN BY	BCB
DATE	04 02 20	APPROVED	DWG NO.	EXPV2
PROJECT				REV.# 0

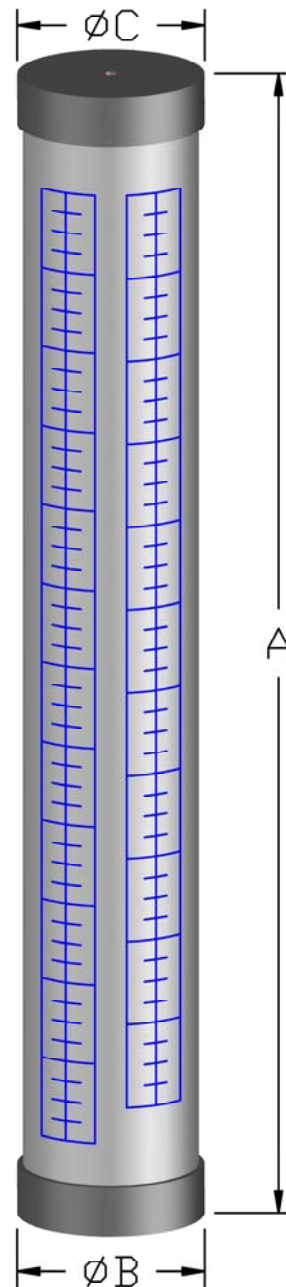
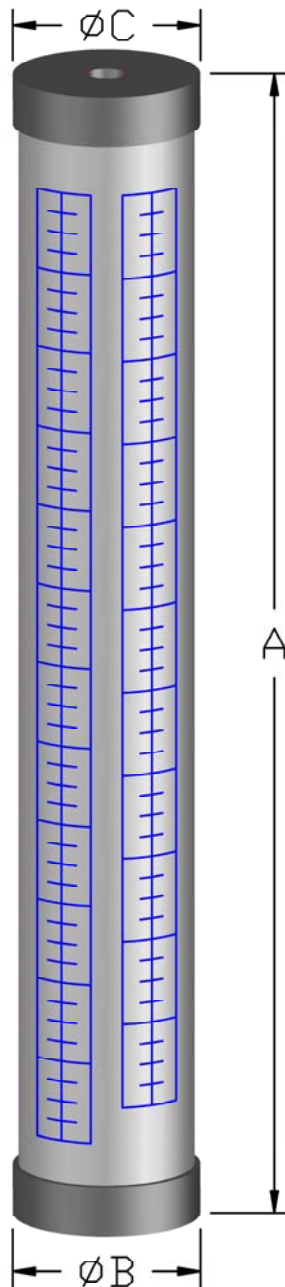
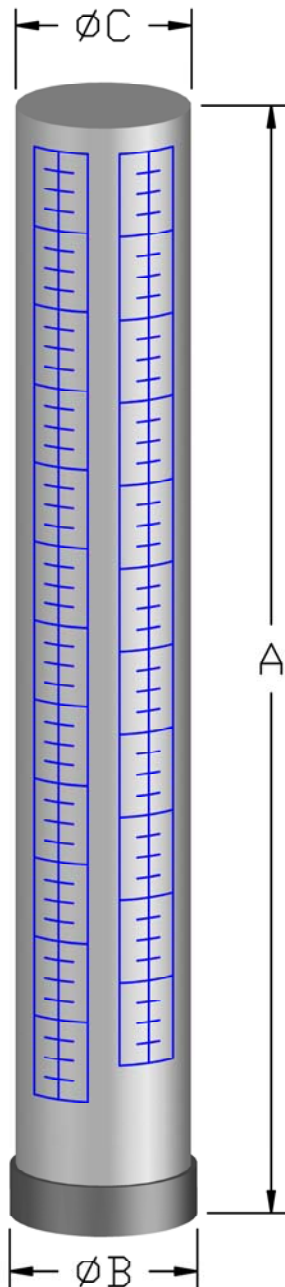
ACCUDRAW®

PV#1

PV#2

PV#4

PV#3



MODEL	SIZE ml(GPH)	DIV ml(GPH)	A (In.)	ØB (In.)	ØC (In.)	Connection	Top Conn.
PV#1	100 (1.60)	1.0 (0.02)	10.24	1.39	1.13	1/2" (DN 15)	OPEN
	250 (4.00)	2.0 (0.05)	11.04	1.89	1.63		
	500 (8.00)	5.0 (0.05)	12.25	2.39	2.13		
	1000 (16.0)	10.0 (0.125)	16.24	2.77	2.50	1" (DN 25)	
	2000 (32.0)	20.0 (0.25)	20.16	3.52	3.13		
	4000 (64.0)	25.0 (0.25)	22.16	4.52	4.13	2" (DN 50)	
	10000 (160)	200.0 (2.00)	22.64	6.91	6.50		
	20000 (320)	200.0 (2.00)	42.19	6.91	6.50		
PV#2 & PV#4	100 (1.60)	1.0 (0.02)	10.75	1.39	1.39	1/2" (DN 15)	1/2" (DN 15)
	250 (4.00)	2.0 (0.05)	11.51	1.89	1.89		
	500 (8.00)	5.0 (0.05)	12.75	2.39	2.39		
	1000 (16.0)	10.0 (0.125)	16.76	2.77	2.77		
	2000 (32.0)	20.0 (0.25)	20.67	3.52	3.52	1" (DN 25)	1" (DN 25)
	4000 (64.0)	25.0 (0.25)	22.66	4.52	4.52		
	10000 (160)	200.0 (2.00)	23.16	6.91	6.91	2" (DN 50)	2" (DN 50)
20000 (320)	200.0 (2.00)	42.69	6.91	6.91			
PV#3	100 (1.60)	1.0 (0.02)	10.75	1.39	1.39	1/2" (DN 15)	DUST CAP
	250 (4.00)	2.0 (0.05)	11.51	1.89	1.89		
	500 (8.00)	5.0 (0.05)	12.75	2.39	2.39		
	1000 (16.0)	10.0 (0.125)	16.76	2.77	2.77	1" (DN 25)	
	2000 (32.0)	20.0 (0.25)	20.67	3.52	3.52		
	4000 (64.0)	25.0 (0.25)	22.66	4.52	4.52	2" (DN 50)	
	10000 (160)	200.0 (2.00)	23.16	6.91	6.91		
	20000 (320)	200.0 (2.00)	42.69	6.91	6.91		

NOTE:
PV#4 CALIBRATION CYLINDERS HAVE
REMOVABLE TOP CAPS.

DO NOT COPY WITHOUT PRIOR WRITTEN APPROVAL FROM PRIMARY FLUID SYSTEMS INC.		
PRIMARY FLUID SYSTEMS INC.		
1050 Cooke Blvd., Burlington, Ontario L7T 4A8		
ACCUDRAW PV-SERIES CALIBRATION CYLINDERS (PVC)		
DATE ISSUED: 23-JUN-09	SCALE: NTS	SHEET: 1 OF 1
PROJECT: ACCUDRAW PV-SERIES DRAWN BY: VV		
APPROVED BY:	DWG NO: ADV_PV_CALCUL1	REV.#: 1

Pressure Gauge & Switch
Specification Data Sheet

Date:	04/01/12
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano
Contractor Order No:	TBD
HTP Project No:	PJ-12001
Plant:	Well 35
Specification Section:	43 20 01 – Chlorination Equipment

Revision	By	Date	Description	Notes
0	RMH	04/01/12	“For Approval”	

A	Design Conditions				
1	Quantity	1	1		
2	Chemical	NaOCl	NaOCl		
3	Tag Number	PI-35-01	PI-35-02		
4	Pump Tag Number	PMP-35-01	PMP-35-02		
5	Line Size	½ Inch	½ Inch		
6	Gauge Size	2-1/2 Inch	2-1/2 Inch		
7	Range	0 – 160 PSI	0 – 160 PSI		
8	End Connections	½ Inch 316 SS	½ Inch 316 SS		
9	Case Fill	Glycerine	Glycerine		
10	Switch Contacts	N/A	N/A		
11	Number of Contacts	N/A	N/A		
12	Contact Function	N/A	N/A		
13	Isolator Material	CPVC	CPVC		
14	Inlet Size	½ Inch	½ Inch		
15	Diaphragm	PFTE Overlay	PFTE Overlay		
16					
17					

B	Options Included		D		
18			22		
19			23		
20			24		
21			25		

Referenced Documents	Document Number	Notes

Chemical Service Legend			
Abbreviation	Chemical Service	Abbreviation	Chemical Service
NaOCl	Sodium Hypochlorite		

Pressure Gauge & Switch
Specification Data Sheet

Date:	04/01/12
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano
Contractor Order No:	TBD
HTP Project No:	PJ-12001
Plant:	Well 38
Specification Section:	43 20 01 – Chlorination Equipment

Revision	By	Date	Description	Notes
0	RMH	04/01/12	“For Approval”	

A	Design Conditions				
1	Quantity	1	1		
2	Chemical	NaOCl	NaOCl		
3	Tag Number	PI-38-01	PI-38-02		
4	Pump Tag Number	PMP-38-01	PMP-38-02		
5	Line Size	½ Inch	½ Inch		
6	Gauge Size	2-1/2 Inch	2-1/2 Inch		
7	Range	0 – 160 PSI	0 – 160 PSI		
8	End Connections	½ Inch 316 SS	½ Inch 316 SS		
9	Case Fill	Glycerine	Glycerine		
10	Switch Contacts	N/A	N/A		
11	Number of Contacts	N/A	N/A		
12	Contact Function	N/A	N/A		
13	Isolator Material	CPVC	CPVC		
14	Inlet Size	½ Inch	½ Inch		
15	Diaphragm	PFTE Overlay	PFTE Overlay		
16					
17					

B	Options Included		D		
18			22		
19			23		
20			24		
21			25		

Referenced Documents	Document Number	Notes

Chemical Service Legend			
Abbreviation	Chemical Service	Abbreviation	Chemical Service
NaOCl	Sodium Hypochlorite		

Our '300' series gauge line is a high quality line of stainless steel gauges. Hermetically sealing the gauge prevents dust, dirt or other contaminants from entering the case of the gauge and attacking the movement or internals of the gauge. Keeping out such contaminants prolongs the life of the gauge.

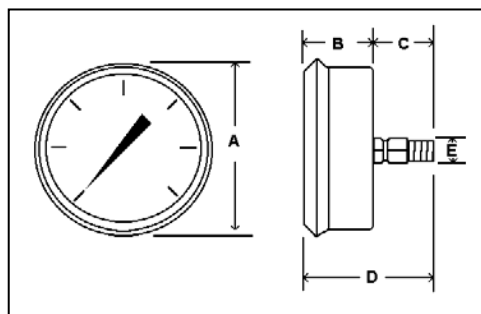
This gauge has been specifically designed with original equipment manufacturers in mind. It is typically used in chemical processing or food processing applications as well as any commercial or industrial application where stainless steel components are required.

SPECIFICATIONS:

- Available Dial Sizes: 1 ½", 2", 2 ½", 3 ½", 4"
- Available Connection Sizes:
1/8"MNPT on 1 ½" and 2"
1/4"MNPT on 2", 2 ½", 3 ½" and 4"
- Stainless Steel Case And Bezel
- SS Internals & Connection
- Connection Welded at Case
- 316SS Bourdon Tube
- Liquid Filled (Dry Available) (GLYCERINE)
- Accuracy : 1.5 % Full Scale
(Special Accuracy Available Upon Request)
- Dual Scale: PSI & Bar (x100=kPa)
Single Scale available from stock
- Ambient temperature: FILLED: 30°F to 160°F
DRY: -30°F to 180°F



RANGE	CODE	Major In	Minor In
30/0"VAC	A	5	0.5
30/0/15	CB	5	0.5
30/0/30	CC	10	1
30/0/60	CD	10	1
30/0/100	CE	20	2
30/0/150	CF	20	2
30/0/300	CH	50	10
0/15	B	2	0.2
0/30	C	5	0.5
0/60	D	10	1
0/100	E	20	2
0/160	F	20	2
0/200	G	40	5
0/300	H	50	5
0/400	I	50	5
0/600	K	100	10
0/1000	M	200	20
0/1500	N	200	20
0/2000	O	400	50
0/3000	P	500	50
0/5000	R	1000	100
0/10,000	U	1000	100
0/15,000	V	2000	200



		A	B	C	D	E	F	G
1 ½"	In	1.88	1.06	.89	1.95	1/8"	2.63	1.63
Dial	MM	48	27	23	50	NPT	67	42
2"	In	2.23	1.09	.71	1.99	1/8" OR	2.81	2.00
Dial	MM	57	28	23	51	1/4"NPT	72	51
2 ½"	In	2.80	1.28	1.19	2.46	1/4"	3.48	2.50
Dial	MM	71	33	30	63	NPT	88	64
3 ½"	In	3.83	1.14	1.08	2.20	1/4"	3.70	3.5
Dial	MM	97	29	27	56	NPT	94	89
4"	In	4.32	1.63	1.14	2.77	1/4"	5.20	3.87
Dial	MM	110	42	29	71	NPT	132	98

Note:

All Dial Size Gauges are Center Back Connection Except 3 ½" Dial Size which are Lower Back Connection

GUARANTEED PROTECTION!

SENTINEL DIAPHRAGM SEALS

Unconditionally **GUARANTEED**
for three years!

***Blacoh GUARANTEES** it's Sentinel Diaphragms and Seal bodies for three years from the date of purchase. If any failure occurs, Blacoh will replace your Diaphragm Seal at no cost to you!

(Guarantee does not apply to gauges or custom models)

SENTINEL DIAPHRAGM SEAL ►

Available in a variety of chemically resistant plastics and metals

▲ SENTINEL DIAPHRAGM SEAL

Protect & isolate all forms of system instrumentation from hazardous and corrosive process fluids

SENTINEL FLOW THRU ►

Prevents clogging of viscous process fluids

NEW

◀ SENTINEL "REVOLUTION"

All PVC construction and threaded housings are ideal for corrosive environments



USE A DIAPHRAGM SEAL TO:

- Protect & isolate all forms of system instrumentation from hazardous and corrosive process fluids
- Ensure gauge and switch accuracy
- Smooth out erratic pressure surges
- Extend the life of pressure instrumentation
- Protect gauges from freezing and slurries
- Receive accurate and consistent readings when working with corrosive or solids-laden fluids
- Replace expensive gauges with low cost utility gauges

SENTINEL FEATURES:

- Three year guarantee on diaphragms & seal bodies
- Accuracy of $\pm 2\%$ full deflection or better
- Pressure ranges up to 1000 PSI (68.95 BAR)
- 1/4" (6.35 mm) up to 3/4" (19.05 mm) inlet ports
- All standard models available from stock
- Bodies available in a full range of chemically resistant materials
- Custom models available

(800) 603-7867
www.Blacoh.com

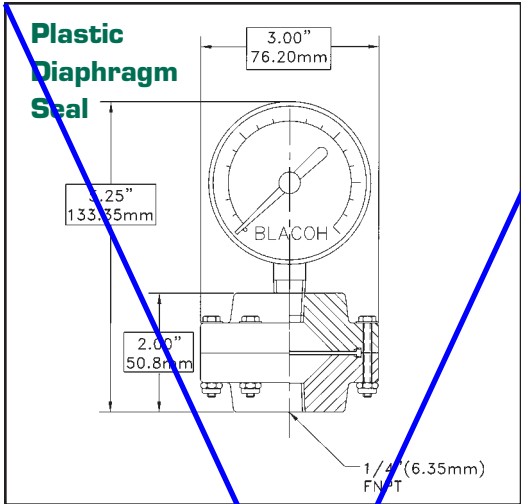
BLACOH
FLUID CONTROL

Member of
Hydraulic



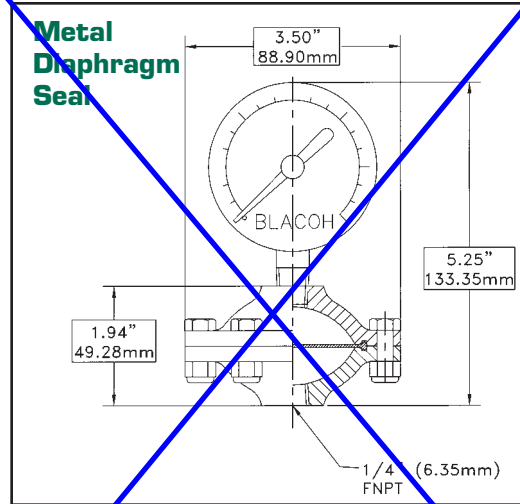


SENTINEL DIAPHRAGM SEALS



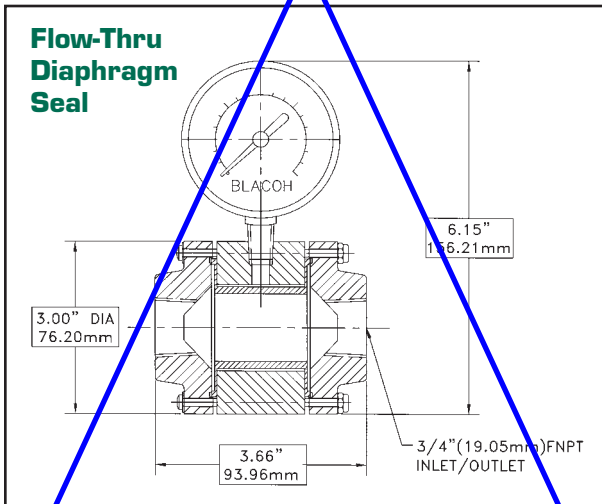
BODY MATERIALS:
POLYPROPYLENE
PVC
PVDF

DIAPHRAGM MATERIALS:
PTFE
EPDM
VITON



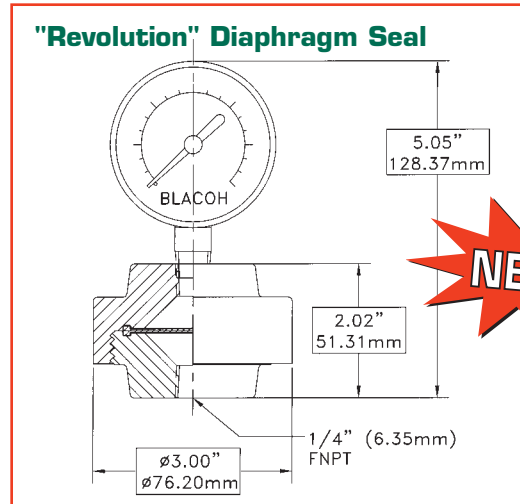
BODY MATERIALS:
316 STAINLESS STEEL
ALLOY 20
HASTELLOY C

DIAPHRAGM MATERIALS:
PTFE
EPDM
VITON



BODY MATERIALS:
PVC
POLYPROPYLENE

TUBE DIAPHRAGM MATERIALS:
EPDM
VITON



BODY MATERIALS:
PVC

DIAPHRAGM MATERIALS:
EPDM
VITON

Please call your local distributor:



Call for your **FREE**
Demonstration CD

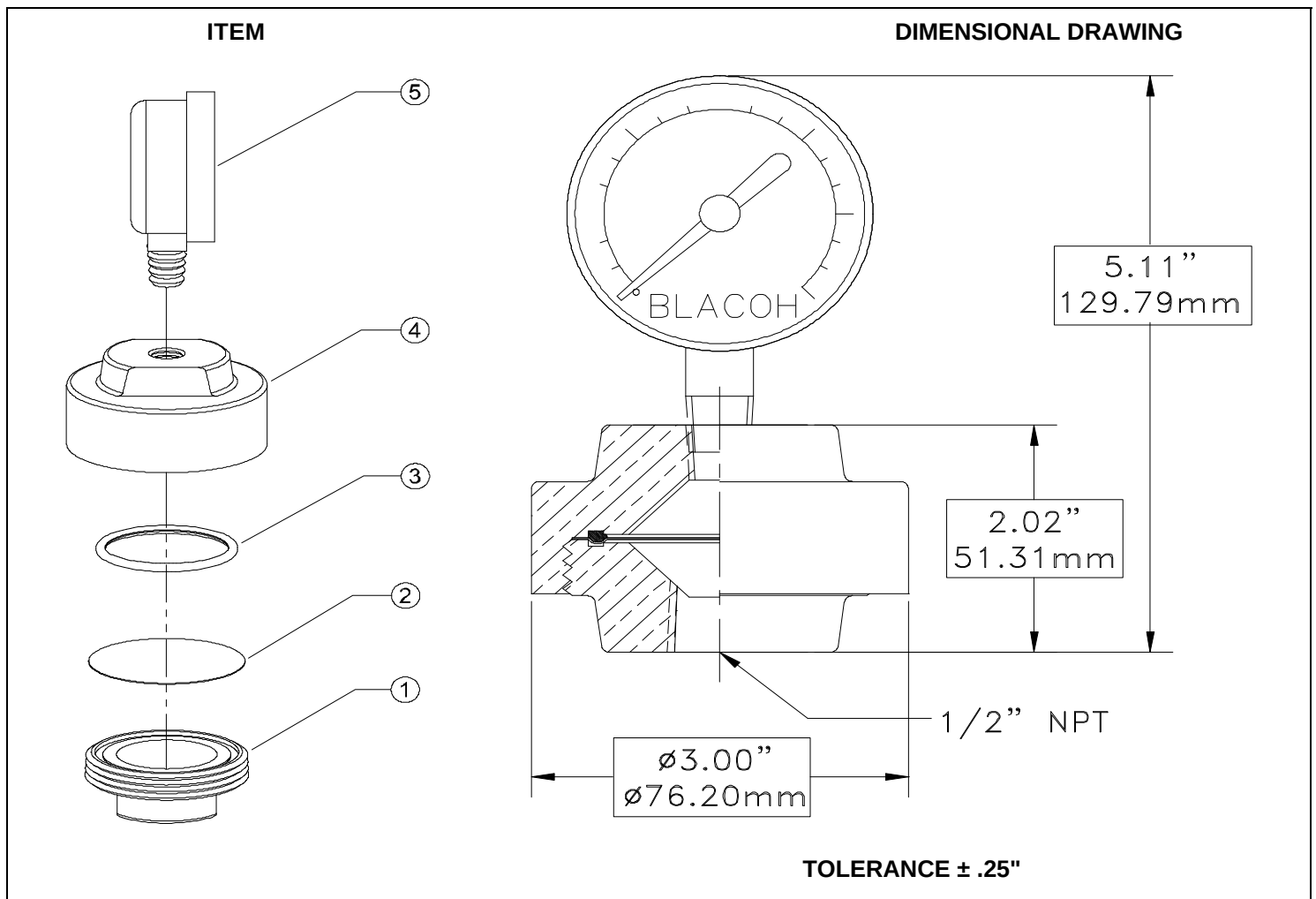
BLACOH
FLUID CONTROL

601 Columbia Ave., Bldg. D, Riverside, CA 92507 • USA
Tel: (800) 603-7867 or (951) 342-3100 • Fax: (951) 342-3101
E-mail: sales@blacoh.com • Website: www.blacoh.com

SENTINEL MODEL #:	RC00T-18-5
MAXIMUM PRESSURE:	200 PSI
WETTED HOUSING:	CPVC
NONWETTED HOUSING:	CPVC
FILL	GLYCERIN
DIAPHRAGM MATERIAL	PTFE
INLET:	1/2" FNPT

DESCRIPTION				
ITEM	PART #	QTY	Component	Material
1	11-27-5	1	Wetted Housing	CPVC
2	11-10	1	Diaphragm	PTFE
3	11-12	1	O-Ring	EPDM
4	11-24	1	Nonwetted Housing	CPVC
5	G18	1	Gauge	Stainless Steel -Brass - Liquid Filled

1/16/2008



BLACOH FLUID CONTROL, INC

RIVERSIDE, CA 92507 USA

TEL: 800.603.7867 or 951.342.3100 Fax: 951.342.3101

E-mail: sales@blacoh.com web site: www.blacoh.com

Wye-Strainer
Specification Data Sheet

Date:	04/01/12
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano
Contractor Order No:	TBD
HTP Project No:	PJ-12001
Plant:	Well 35
Specification Section:	43 20 01 – Chlorination Equipment

Revision	By	Date	Description	Notes
0	RMH	04/01/12	“For Approval”	

A	Design Conditions				
1	Quantity	1			
2	Chemical	NaOCl			
3	Model Number	YS10075S			
4	Tag Number	YS-35-01			
5	Pump Tag Number	PMP-35-01/02			
6	Line Size	3/4 - Inch			
7	Material	CPVC			
8	End Connections	Socket			
9	Seal Material	Viton			
10	Cv Factor	6.8			
11	Pressure Drop	0.03			
12	Perf Plastic Basket	1/32			
13					
14					
15					
16					
17					

B	Options Included	D	
18		22	
19		23	
20		24	
21		25	

Referenced Documents	Document Number	Notes
		With thread end the Sodium Hypochlorite may leach Out through the threads. We recommend Socket-Weld

Chemical Service Legend			
Abbreviation	Chemical Service	Abbreviation	Chemical Service
NaOCl	Sodium Hypochlorite		

Wye-Strainer
Specification Data Sheet

Date:	04/01/12
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano
Contractor Order No:	TBD
HTP Project No:	PJ-12001
Plant:	Well 38
Specification Section:	43 20 01 – Chlorination Equipment

Revision	By	Date	Description	Notes
0	RMH	04/01/12	“For Approval”	

A	Design Conditions				
1	Quantity	1			
2	Chemical	NaOCl			
3	Model Number	YS10075S			
4	Tag Number	YS-3801			
5	Pump Tag Number	PMP-38-01/02			
6	Line Size	3/4 - Inch			
7	Material	CPVC			
8	End Connections	Socket			
9	Seal Material	Viton			
10	Cv Factor	6.8			
11	Pressure Drop	0.03			
12	Perf Plastic Basket	1/32			
13					
14					
15					
16					
17					

B	Options Included	D	
18		22	
19		23	
20		24	
21		25	

Referenced Documents	Document Number	Notes
		With thread end the Sodium Hypochlorite may leach Out through the threads. We recommend Socket-Weld

Chemical Service Legend			
Abbreviation	Chemical Service	Abbreviation	Chemical Service
NaOCl	Sodium Hypochlorite		



Y Strainers

1/2" to 4" - PVC and Corzan® CPVC



Features

- Rated to 150 PSI
- Viton® Seals
- Standard 1/32" perf screen
- All-Plastic Construction
- Easy Screen Access
- Can Be Used in Horizontal or Vertical Position

Options

- Stainless Steel Strainer Screens

Economical Protection

Hayward Y Strainers protect piping system components from damage caused by dirt or debris in the process media. They cost less than other types of strainers and are light-weight and very compact. Because they can often be supported by the pipeline alone, they work in applications where other strainers cannot.

Rugged Plastic Screens

Hayward Y Strainers are supplied with a 1/32" perforated plastic screen. This screen is ultrasonically welded, not glued, for superior strength. Screens fabricated from type 316 stainless steel are also available in openings from 1/2" down to super fine 325 mesh. All screens have an open area at least twice that of the equivalent pipe size cross-sectional area to minimize pressure drop.

Easy Clean Out

All sizes of Hayward Y Strainers feature a heavy-duty hex cap that permits quick and easy removal of the strainer screen when cleanout becomes necessary.

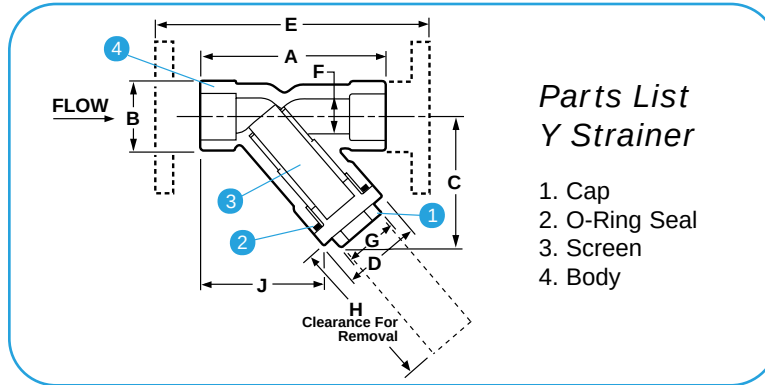
Adaptable Design

Hayward Y Strainers will work equally well in the horizontal or vertical position, simplifying piping system layout.

All Plastic Construction

Hayward Plastic Y Strainers will never rust or corrode – and they don't require painting or coating to survive corrosive environmental conditions.

Technical Information



Dimensions - Inches / Millimeters

Size	A	B	C	D	E	F	G	H	J	Weight (lb / kg)	
										Skt / Thd	Flg
1/2"	3.38 / 86	1.38 / 35	2.25 / 57	1.50 / 38	N/A	0.56 / 14	1.00 / 25	2.13 / 54	2.50 / 64	0.25 / .11	N/A
3/4"	4.18 / 106	1.69 / 43	2.88 / 73	2.00 / 51	N/A	0.81 / 21	1.25 / 32	2.75 / 70	3.00 / 76	0.63 / .29	N/A
1"	5.19 / 132	2.00 / 51	3.63 / 92	2.16 / 55	N/A	1.00 / 25	1.50 / 38	3.30 / 84	3.32 / 84	0.88 / .40	N/A
1-1/4"	6.63 / 168	2.63 / 67	4.50 / 114	2.94 / 75	N/A	1.25 / 32	2.00 / 51	4.50 / 114	4.45 / 113	1.75 / .80	N/A
1-1/2"	6.63 / 168	2.63 / 67	4.50 / 114	2.94 / 75	N/A	1.56 / 40	2.00 / 51	4.50 / 114	4.45 / 113	1.63 / .74	N/A
2"	7.63 / 194	3.38 / 86	5.38 / 137	3.75 / 95	11.00 / 279	2.00 / 51	2.38 / 60	5.06 / 129	4.88 / 124	3.00 / 1.4	5.00 / 2.3
2-1/2"	10.31 / 262	4.69 / 119	7.25 / 184	5.25 / 133	N/A	2.90 / 74	3.50 / 89	6.60 / 168	6.54 / 166	7.75 / 3.5	N/A
3"	10.31 / 262	4.69 / 119	7.25 / 184	5.50 / 140	14.37 / 365	2.90 / 74	3.50 / 89	6.60 / 168	6.54 / 166	7.50 / 3.4	12.25 / 5.7
4"	12.81 / 325	5.75 / 146	8.88 / 226	6.18 / 157	17.73 / 450	3.78 / 96	4.25 / 108	8.00 / 203	8.58 / 218	9.50 / 4.3	17.50 / 8.0

Cv Factors*

Size	Factor	Size	Factor
1/2"	4.0	2"	28
3/4"	6.8	2-1/2"	40
1"	9.0	3"	65
1-1/4"	12	4"	100
1-1/2"	28		

* With 1/32" plastic screen

Pressure Drop Calculations

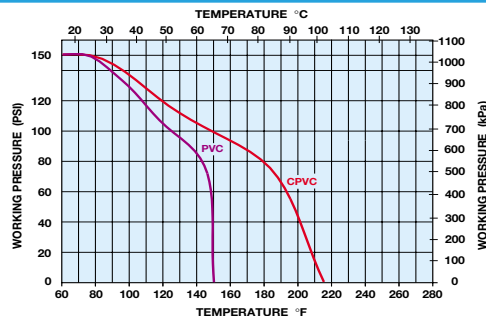
The pressure drop across the strainer, for water or fluids with a similar viscosity, can be calculated using the formula at the right:

$$\Delta P = \left[\frac{Q}{Cv} \right]^2$$

Where ΔP = Pressure Drop
Q = Flow in GPM
Cv = Flow Coefficient

The pressure loss across a valve or filter can be calculated using the system's flow rate and the Cv factor for that valve or filter. For example, a 1" strainer with a Cv factor of 8 will have a 4 psi pressure loss in a system with a 16 gpm flow rate $(16 \div 8)^2 = 4$

Operating Temperature/Pressure



Selection Chart

Size	Material	End Connection	Seal	Rating
1/2" to 4"	PVC, CPVC	Thd Skt, Flg*	Viton	150 PSI @ 70F

* 1/2" to 1-1/2" not available with flanged connections

Strainer Screen Selection

- Y Strainers are furnished with a 1/32" or 1/16" perf plastic screen.
- Stainless steel strainer screens are available in these perfs: 1/32", 3/64", 1/16", 5/64", 7/64", 1/8", 5/32", 3/16", 1/4", 3/8", 1/2"; and in mesh sizes: 20, 40, 60, 80, 100, 200, 325



HAYWARD®

Hayward Industrial Products, Inc.

One Hayward Industrial Drive, Clemmons, NC 27012
Tel: 1-888-429-4635 (1-888-HAYINDL) • Fax: 1-888-778-8410
E-mail: industrial@haywardnet.com
Web Site: <http://www.haywardindustrial.com>

Hayward Industrial Products Canada Inc.

2880 Plymouth Drive, Oakville, Ontario L6H 5R4
Tel: 905 829-2880 • Fax: 905 829-3636

Hayward Industrial Products (UK) Ltd.

Unit 2, Crowngate, Wyncolls Road, Colchester, Essex CO4 4HT
Tel: 441-206-854454 • Fax: 441-206-851240

PIPING
AND
SOLVENT CEMENT
INFORMATION



PVC & CPVC
Schedule 80 Fittings,
Unions, Tank Adapters,
Expansion Joints
& Saddles



TECHNICAL INFORMATION
WEIGHTS & DIMENSIONS

June 1, 2010

SUPERSEDES ALL PREVIOUS EDITIONS



Quality Systems Certificate No. 293
Corporate Facilities, Sylmar, CA
Assessed to ISO 9001: 2008

Visit our web site

www.spearsmfg.com

80-4-0610

Additional Technical Publications

THERMOPLASTIC VALVES • PRODUCT GUIDE & ENGINEERING SPECIFICATIONS.....	V-4
ACTUATED VALVES • PRODUCT GUIDE & ENGINEERING SPECIFICATIONS.....	AV-4
PVC SCHEDULE 40 FITTINGS•WEIGHTS & DIMENSIONS.....	40-4
CPVC CTS FITTINGS COPPER-TUBE-SIZE • WEIGHTS & DIMENSIONS.....	CTS-4
CPVC LABWASTE™ FITTINGS• TECHNICAL INFORMATION.....	LW-4
LXT FITTINGS & VALVES • WEIGHT & DIMENSIONS.....	LXT-4
THERMOPLASTIC FLANGES • TECHNICAL INFORMATION/WEIGHTS & DIMENSIONS.....	FL-4
PVC MOLDED DWV •TECHNICAL INFORMATION.....	MDWV-4
PVC INSERT FITTINGS FOR USE WITH POLYETHYLENE PIPE • WEIGHTS & DIMENSION.....	INS-4

The information contained in this publication is based on current information and Product design at the time of publication and is subject to change without notification. Our ongoing commitment to product improvement may result in some variations. No representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications or results to be obtained therefrom. For verification of technical data or additional information not contained herein, please contact Spears® Technical Services Department [West Coast: (818) 364-1611 — East Coast: (678) 985-1263].

General Information

Recommendations For Installers And Users

Plastic piping systems should be ENGINEERED, INSTALLED and OPERATED in accordance with ESTABLISHED DESIGN AND ENGINEERING STANDARDS AND PROCEDURES for plastic piping systems. Suitability for the intended service application should be determined by the installer and/or user prior to installation of a plastic piping system. PRIOR TO ASSEMBLY, all piping system components should be inspected for damage or irregularities. Mating components should be checked to assure that tolerances and engagements are compatible. Do not use any components that appear irregular or do not fit properly. Contact the appropriate manufacturer of the component product in question to determine usability. Consult all applicable codes and regulations for compliance prior to installation.

WARNING: Spears® Manufacturing Company DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases, in above and below ground locations. The use of Spears® product in compressed air or gas systems automatically voids Spears® warranty for such products, and their use against our recommendation is entirely the responsibility and liability of the installer. Spears® Manufacturing Company will not accept responsibility for damage or impairment of its products, or other consequential or incidental damages caused by misapplication, incorrect assembly and/or exposure to harmful substances or conditions.

Solvent Weld Connections — Use quality solvent cements and primers formulated for the intended service application, pipe size and type of joint. While the pipe and fitting materials may be compatible with the intended medium, the solvent cement may not be. Consult the manufacturers for suitability of use. Read and follow the cement and primer manufacturers' applications and cure time instructions thoroughly. Be sure to use the correct size applicator.

Threaded Connections — Use a quality grade thread sealant. **WARNING:** SOME PIPE JOINT COMPOUNDS OR TEFLON PASTES MAY CONTAIN SUBSTANCES THAT COULD CAUSE STRESS CRACKING TO PLASTIC. Spears® Manufacturing company recommends the use of Spears® BLUE 75™ Thread Sealant which has been tested for compatibility with Spears® products. Please follow the sealant manufacturers' application/installation instructions. Choice of an appropriate thread sealant other than those listed above is at the discretion of the installer. 1 to 2 turns beyond FINGER TIGHT is generally all that is required to make a sound plastic threaded connection. Unnecessary OVERTIGHTENING will cause DAMAGE TO BOTH PIPE AND FITTING.

Viton® is registered trademark of DuPont Dow Elastomers.

Standards and Specifications

Molded Schedule 80 PVC products are manufactured to ASTM D 2467 for use with pipe manufactured to ASTM D 1785. Molded Schedule 80 CPVC products are manufactured to ASTM F 439 for use with pipe manufactured to ASTM F 441. Certain products carry reduced pressure handling capability and have maximum internal pressure ratings at 73° F noted.

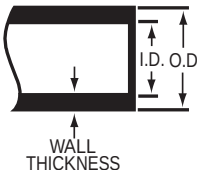
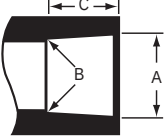
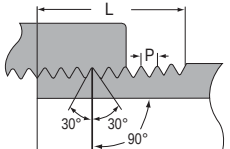
Fabricated Schedule 80 PVC pressure fittings (part numbers ending with "F") are manufactured to Spears® specifications for use with pipe manufactured to ASTM D 1785. Schedule 80 CPVC fabricated fittings for use with pipe manufactured to ASTM F 441. See publication FAB-7, General Specifications for Standard Fabricated Fittings for additional information.

All specified Schedule 80 PVC and CPVC products are manufactured from materials certified by NSF for use in potable water service.

PVC & CPVC SCHEDULE 80 FITTINGS, UNIONS, TANK ADAPTERS, EXPANSION JOINTS & SADDLES



ASTM STANDARD DIMENSIONS

SCHEDULE 80 PIPE DIMENSIONS ASTM D 1785				SCHEDULE 80 SOCKET DIMENSIONS ASTM D 2467				AMERICAN NATIONAL STANDARD TAPER PIPE THREADS (NPT) ANSI B1 .20.1 ASTM F 1498				
												
Nominal Pipe Size In.	Mean Outside Diameter In.	O. D. Tolerance In.	Minimum Wall Thickness In.	Nominal Size In.	Diameter			Socket Length Minimum C	Nominal Size In.	Threads Per Inch	Effective Thread Length L	Pitch Of Thread P
					Entrance A	Bottom B	Tolerance A					
1/8	0.405	± 0.004	0.095	1/8	0.417	0.401	± 0.004	0.500	1/8	27	0.2639	0.03704
1/4	0.540	± 0.004	0.119	1/4	0.552	0.536	± 0.004	0.625	1/4	18	0.4018	0.05556
3/8	0.675	± 0.004	0.126	3/8	0.687	0.671	± 0.004	0.750	3/8	18	0.4078	0.05556
1/2	0.840	± 0.004	0.147	1/2	0.848	0.836	± 0.004	0.875	1/2	14	0.5337	0.07143
3/4	1.050	± 0.004	0.154	3/4	1.058	1.046	± 0.004	1.000	3/4	14	0.5457	0.07143
1	1.315	± 0.005	0.179	1	1.325	1.310	± 0.005	1.125	1	11-1/2	0.6828	0.08696
1-1/4	1.660	± 0.005	0.191	1-1/4	1.670	1.655	± 0.005	1.250	1-1/4	11-1/2	0.7068	0.08696
1-1/2	1.900	± 0.006	0.200	1-1/2	1.912	1.894	± 0.006	1.375	1-1/2	11-1/2	0.7235	0.08696
2	2.375	± 0.006	0.218	2	2.387	2.369	± 0.006	1.500	2	11-1/2	0.7565	0.08696
2-1/2	2.875	± 0.007	0.276	2-1/2	2.889	2.868	± 0.007	1.750	2-1/2	8	1.1375	0.12500
3	3.500	± 0.008	0.300	3	3.516	3.492	± 0.008	1.875	3	8	1.2000	0.12500
4	4.500	± 0.009	0.337	4	4.518	4.491	± 0.009	2.250	4	8	1.3000	0.12500
5	5.563	± 0.010	0.375	5	5.583	5.553	± 0.010	2.625	5	8	1.4063	0.12500
6	6.625	± 0.011	0.432	6	6.647	6.614	± 0.011	3.000	6	8	1.5125	0.12500
8	8.625	± 0.015	0.500	8	8.655	8.610	± 0.015	4.000	8	8	1.7125	0.12500
10	10.750	± 0.015	0.593	10	10.780	10.735	± 0.015	5.000				
12	12.750	± 0.015	0.687	12	12.780	12.735	± 0.015	6.000				

STANDARD COMPARISONS

SPEARS® IPS-to-Metric transition unions are listed by nominal size. The chart below compares nominal and actual* pipe O.D. for each size according to the designated standard.

JIS K6741 (mm)		DIN 8062 (mm)		ASTM D1785 (in.)		NPT—ANSI B1.20.1** Tapered Thread		BSP—BS21, DIN 2999, ISO 7/1 Thread	
Nominal	Actual*	O.D.	Actual*	Nominal	Actual*	Designation	Threads/in.	Designation	Threads/ 25.4mm
16	22	15	20	1/2	.840	1/2	14	1/2	14
20	26	20	25	3/4	1.050	3/4	14	3/4	14
25	32	25	32	1	1.315	1	11.5	1	11
30	38	38	40	1-1/4	1.660	1-1/4	11.5	1-1/4	11
40	48	40	50	1-1/2	1.900	1-1/2	11.5	1-1/2	11
50	60	50	63	2	2.375	2	11.5	2	11
75	89	80	90	3	3.500	3	8	3	11
100	114	100	110	4	4.500	4	8	4	11

*Specified dimension, certain tolerances apply

**NPT and BSP have different thread angles and not compatible.



PVC & CPVC SCHEDULE 80 FITTINGS, UNIONS, TANK ADAPTERS, EXPANSION JOINTS & SADDLES

Injection Molded Dimensions References:

G = (LAYING LENGTH) intersection of center lines to bottom of socket/thread; 90° elbows, tees, crosses; $\pm 1/32$ inch.
H = Intersection of center lines to face of fitting; 90° elbow tees, crosses; $\pm 1/32$ inch.
J = Intersection of center lines to bottom of socket/thread; 45° elbows; $\pm 1/32$ inch

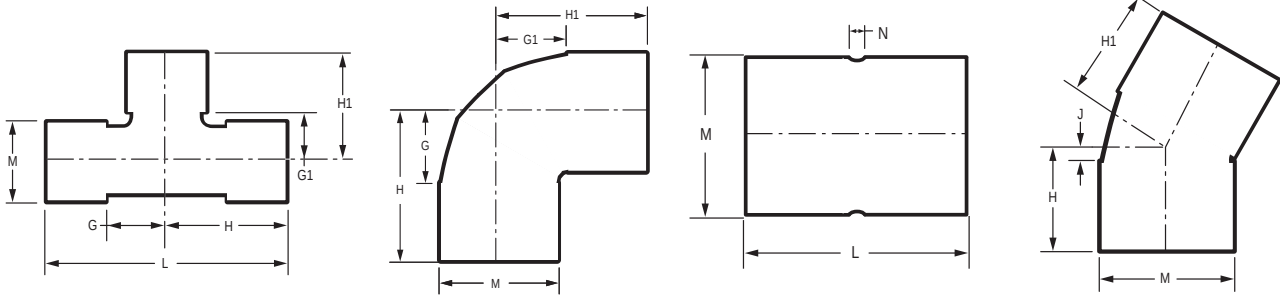
L = Overall length of fittings; $\pm 1/16$ inch.
H = Outside diameter of socket/thread hub; $\pm 1/16$ inch.
N = Socket bottom to socket bottom; couplings; $\pm 1/16$ inch
W = Height of cap; $\pm 1/16$ inch.

Fabricated Dimension References:

G = (LAYING LENGTH) intersection of center lines to bottom of socket/thread; 90° elbows, tees, crosses $\pm 1/4$ inch; 14" & larger $\pm 1/2$ inch.
H = Intersection of center lines to face of fitting; 90° elbows $\pm 1/4$ inch, 14" & larger $\pm 3/4$ inch; wyes $\pm 1/2$ inch; tees, crosses $\pm 1/4$ inch; 14" & larger $\pm 1/2$ inch.
J = Intersection of center lines to bottom of socket/thread; 45° elbows; $\pm 1/4$ inch; 14" & larger $\pm 1/2$ inch.

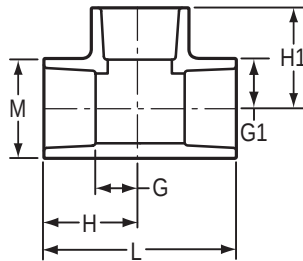
L = Overall length of fittings; $\pm 1/2$ inch; 14" & larger ± 1 inch; wyes ± 1 inch.
M = Outside diameter of socket/thread hub; $\pm 1/4$ inch.
N = Socket bottom to socket bottom; couplings; $\pm 1/2$
W = Height of cap; $\pm 1/4$ inch.

Typical Fabricated Dimension References



TEE

Socket x Socket x Socket



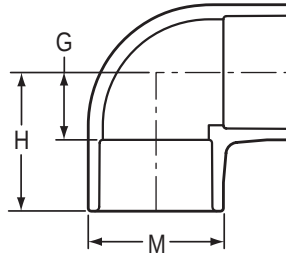
Part Number		Size	G	G1	H	H1	L	M	Approx. Wt. (Lbs.)	
PVC	CPVC								PVC	CPVC
801-002	801-002C	1/4	5/16	5/16	31/32	31/32	1-15/16	27/32	.04	.04
801-003	801-003C	3/8	15/32	15/32	1-1/4	1-1/4	2-1/2	31/32	.06	.06
801-005	801-005C	1/2	9/16	9/16	1-1/2	1-1/2	2-15/16	1-3/16	.10	.11
801-007	801-007C	3/4	21/32	21/32	1-11/16	1-11/16	3-13/32	1-13/32	.16	.18
801-010	---	1	27/32	27/32	2	2	4	1-11/16	.26	---
---	801-010C	1	27/32	27/32	2	2	3-31/32	1-23/32	---	.29
801-012	801-012C	1-1/4	1-1/32	1-1/32	2-9/32	2-9/32	4-19/32	2-3/32	.39	.40
801-015	801-015C	1-1/2	1-3/16	1-3/16	2-9/32	2-9/32	5-1/8	2-3/8	.52	.57
801-020	801-020C	2	1-11/32	1-11/32	2-15/16	2-15/16	5-27/32	2-7/8	.80	.85
801-025	---	2-1/2	1-3/4	1-3/4	3-1/2	3-1/2	7-1/32	3-15/32	1.46	---
---	801-025C	2-1/2	1-23/32	1-23/32	3-1/2	3-1/2	7	3-15/32	---	1.62
801-030	801-030C	3	2-3/32	2-3/32	3-31/32	3-31/32	7-15/16	4-3/16	2.16	2.43
801-040	801-040C	4	2-1/2	2-1/2	4-3/4	4-3/4	9-1/2	5-1/4	3.52	4.16

PVC & CPVC SCHEDULE 80 FITTINGS, UNIONS, TANK ADAPTERS, EXPANSION JOINTS & SADDLES



90° ELBOW

Socket x Socket



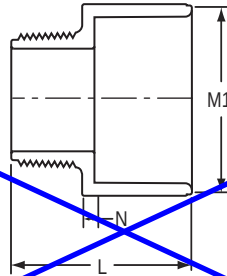
Part Number		Size	G	H	M	Approx. Wt. (Lbs.)	
PVC	CPVC					PVC	CPVC
806-002	806-002C	1/4	11/32	1	13/16	.03	.03
806-003	806-003C	3/8	15/32	1-1/4	31/32	.05	.05
806-005	806-005C	1/2	9/16	1-15/32	1-3/16	.08	.09
806-007	806-007C	3/4	11/16	1-11/16	1-7/16	.12	.13
806-010	806-010C	1	7/8	2	1-3/4	.20	.21
806-012	806-012C	1-1/4	1	2-9/32	1-31/32	.30	.31
806-015	806-015C	1-1/2	1-1/8	2-1/2	2-3/8	.38	.39
806-020	806-020C	2	1-13/32	2-15/16	2-7/8	.60	.66
806-025	806-025C	2-1/2	1-9/16	3-11/32	3-15/32	1.09	1.15
806-030	806-030C	3	2-1/16	3-31/32	4-3/16	1.55	1.65
806-040	806-040C	4	2-5/8	4-7/8	5-7/32	2.78	2.93
806-045F	---	4-1/2	6-1/2	9	5-5/8	4.58	---
806-050	806-050C	5	3-1/8	5-3/4	6-3/8	4.42	4.73
806-050F	---	5	5-1/2	8-1/2	6-5/16	6.23	---
---	806-050CF	5	6-9/16	9-9/16	6-5/16	---	12.04
806-060	---	6	3-3/4	6-3/4	7-19/32	7.47	---
---	806-060C	6	3-3/4	6-3/4	7-19/32	---	7.43
806-080	806-080C	8	4-3/4	8-3/4	9-3/4	14.31	15.83
806-080F	---	8	7-7/8	12-1/8	9-5/8	17.47	---
---	806-080CF	8	9-1/4	13-1/2	9-5/8	---	22.53
806-100	806-100C	10	5-25/32	11-11/32	12-1/16	28.19	28.74
806-100F	---	10	10	15-1/4	11-15/16	31.86	---
---	806-100CF	10	11-13/16	17	11-15/16	---	40.28
806-120	806-120C	12	6-7/8	13-7/16	14-5/16	43.94	47.93
806-120F	---	12	11-1/2	17-3/4	14-1/8	60.28	---
---	806-120CF	12	13-5/8	19-7/8	14-1/8	---	63.96
806-140F	---	14	13-1/4	20-1/4	15-1/2	82.49	---
---	806-140CF	14	16-1/4	23-1/4	15-1/2	---	86.72
806-160F	---	16	14-3/4	22-3/4	17-3/4	101.71	---
806-180F	---	18	16-3/4	25-3/4	20	167.49	---
---	806-180CF	18	20-7/8	29-7/8	19-7/8	---	175.62
806-200F	---	20	18-1/2	28-1/2	22-1/16	256.44	---
---	806-200CF	20	21-9/16	31-9/16	22-1/16	---	250.00
806-240F	---	24	23	35	26-7/16	403.66	---
---	806-240CF	24	26-7/16	38-7/16	26-7/16	---	---

PVC & CPVC SCHEDULE 80 FITTINGS, UNIONS, TANK ADAPTERS, EXPANSION JOINTS & SADDLES



REDUCING MALE ADAPTER

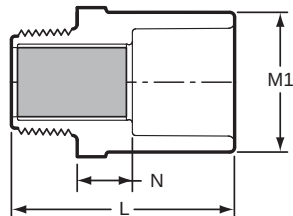
Mipt x Socket



Part Number		Size	L	M1	N	Approx. Wt. (Lbs.)	
PVC	CPVC					PVC	CPVC
836-053	---	3/8x1/2	1-11/16	1-3/16	1/4	.04	---
836-102	---	3/4x1	2-9/32	1-3/4	17/32	.10	---
836-131	---	1x3/4	2-1/16	1-7/16	1/4	.07	---

REINFORCED MALE ADAPTER

Rmipt x Socket



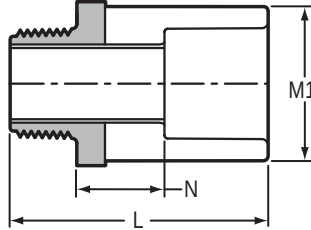
Part Number		Size	L	M1	N	Approx. Wt. (Lbs.)	
PVC	CPVC					PVC	CPVC
836-005R	836-005CR	1/2	2-3/32	1-5/32	9/16	.05	.06
836-007R	836-007CR	3/4	2-1/4	1-3/8	9/16	.08	.09
836-010R	836-010CR	1	2-21/32	1-23/32	11/16	.15	.15



PVC & CPVC SCHEDULE 80 FITTINGS, UNIONS, TANK ADAPTERS, EXPANSION JOINTS & SADDLES

TRANSITION MALE ADAPTER

Brass Mipt x Socket

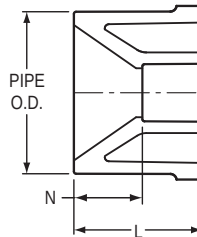


Part Number		Size	L	M1	N	Approx. Wt. (Lbs.)	
PVC	CPVC					PVC	CPVC
836-005BR	836-005CBR	1/2	2-13/32	1-9/32	27/32	.19	.20
836-007BR	836-007CBR	3/4	2-17/32	1-13/32	13/16	.26	.26
836-010BR	836-010CBR	1	2-15/16	1-23/32	29/32	.43	.43
836-012BR	836-012CBR	1-1/4	3-1/8	2-3/32	31/32	.66	.66
836-015BR	836-015CBR	1-1/2	3-9/32	2-11/32	1	.79	.80
836-020BR	836-020CBR	2	3-7/16	2-27/32	31/32	1.05	1.07

REDUCER BUSHING

Flush Style

Spigot x Socket



Part Number		Size	L	N	Approx. Wt. (Lbs.)	
PVC	CPVC				PVC	CPVC
837-052	837-052C	3/8x1/4	31/32	5/16	.01	.01
837-072	837-072C	1/2x1/4	1-3/32	13/32	.02	.02
837-073	837-073C	1/2x3/8	1-1/8	11/32	.01	.02
837-101	837-101C	3/4x1/2	1-1/16	3/16	.02	.03
837-129 ¹	837-129C ¹	1x3/8	1-5/8	27/32	.09	.10
837-130	837-130C	1x1/2	1-3/8	1/2	.06	.07
837-131	837-131C	1x3/4	1-1/4	1/4	.04	.04
837-166	837-166C	1-1/4x1/2	1-9/16	21/32	.11	.11
837-167	837-167C	1-1/4x3/4	1-1/2	1/2	.10	.10
837-168	837-168C	1-1/4x1	1-19/32	15/32	.06	.09
837-209	837-209C	1-1/2x1/2	1-23/32	13/16	.17	.18
837-210	837-210C	1-1/2x3/4	1-3/4	11/16	.19	.19
837-211	837-211C	1-1/2x1	1-5/8	1/2	.13	.15
837-212	837-212C	1-1/2x1-1/4	1-5/8	3/8	.07	.07
837-247	837-247C	2x1/2	1-29/32	1	.27	.30
837-248	837-248C	2x3/4	1-15/16	1	.26	.27

¹ Outlet sized with bushing

PVC & CPVC SCHEDULE 80 FITTINGS, UNIONS, TANK ADAPTERS, EXPANSION JOINTS & SADDLES



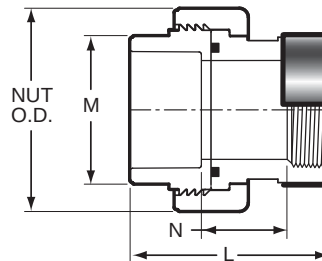
SPECIAL REINFORCED UNION (Old style)

Socket x SR Fipt

Dimensions Also Applicable to

899-XXXSR EPDM O-ring Seal Units

235 psi @ 73°F



Part Number w/Viton® O-ring Seal		Size	L	M	N	Nut O.D.	Approx. Wt. (Lbs.)	
PVC	CPVC						PVC	CPVC
859-002SR	859-002CSR	1/4	2-1/16	15/16	25/32	1-21/32	.09	.10
859-003SR	859-003CSR	3/8	2-9/32	1-1/32	29/32	1-25/32	.13	.15
859-005SR	859-005CSR	1/2	2-9/32	1-9/32	21/32	1-31/32	.17	.19
859-007SR	859-007CSR	3/4	2-19/32	1-17/32	25/32	2-1/2	.28	.27
859-010SR	859-010CSR	1	2-15/16	1-27/32	25/32	2-7/8	.40	.42
859-012SR	859-012CSR	1-1/4	3-5/32	2-7/32	29/32	3-5/16	.55	.59
859-015SR	859-015CSR	1-1/2	3-13/32	2-9/16	1-1/32	3-9/16	.67	.71
859-020SR	859-020CSR	2	4-3/32	3-1/32	1-19/32	4-3/16	1.12	1.21
859-030SR	859-030CSR	3	5-1/4	4-3/8	1-11/16	5-3/4	2.50	2.60
859-040SR	859-040CSR	4	5-7/8	5-13/32	2-1/8	7-3/32	3.96	4.21

1) For (Socket X SR Fipt) Unions Equipped With EPDM O-ring, Replace The 859 With An 899 Before The Dash.

e.g. Part Number 899-002SR = 1/4" PVC, Union, Socket x SR Fipt, With EPDM O-rings.

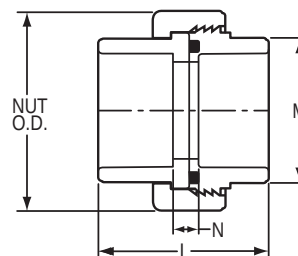
UNION 2000

Socket x Socket

Dimensions Also Applicable to

8097-XXX EPDM O-ring Seal Units

1/2" - 4" 235 psi @ 73°F
6" 150 psi @ 73°F



Part Number w/Viton® O-ring Seal		Size	L	M	N	Nut O.D.	Approx. Wt. (Lbs.)	
PVC	CPVC						PVC	CPVC
8057-005	8057-005C	1/2	2-3/32	1-3/16	11/32	1-7/8	.12	.08
8057-007	8057-007C	3/4	2-3/8	1-13/32	3/8	2-9/32	.17	.19
8057-010	8057-010C	1	2-11/16	1-23/32	7/16	2-9/16	.28	.17
8057-012	8057-012C	1-1/4	2-15/16	2-3/32	7/16	3-3/32	.36	.40



IPS®

WELD-ON

PRODUCT BULLETIN • SPECIFICATIONS

724

CPVC Chemical Resistant Solvent Cement

GENERAL DESCRIPTION:

Weld-On 724 is a gray, reduced VOC emissions, heavy bodied, medium setting, high strength CPVC solvent cement for all classes and schedules of pipe and fittings with interference fit, including Schedule 80 through 12" diameter. Formulated for improved chemical resistance to caustics including hypochlorite solutions. Approved for Corzan™ Industrial Systems. **May be used on PVC industrial piping systems for chemical applications.**

APPLICATION:

Weld-On 724 is for use on CPVC and PVC industrial piping systems. It is especially for systems requiring chemical resistance to caustics, including hypochlorite solutions. It can also be used in systems for mineral acids, aggressive water and aqueous salt solutions.

Detailed directions on making solvent cemented joints are printed on the container label. An installation DVD/CD covering solvent cementing is available. It not only describes the basic principles of solvent cementing, but also covers the handling, storage and use of our products. It is highly recommended that the installer review the instructions supplied by the pipe and fitting manufacturer. **NOTE:** IPS Weld-On solvent cements must never be used in a CPVC or PVC system using or being tested by compressed air or gases.

AVAILABILITY:

This product is available in pint, quart and gallon metal cans. For detailed information on containers and applicators, see our current Price List.

STANDARDS AND APPROVALS:

Weld-On 724 meets ASTM F-493 and SCAQMD Rule 1168/316A. It is listed by NSF International for potable water, sewer, drain, waste and vent systems.

SPECIFICATIONS:

COLOR:	Gray
RESIN:	CPVC
SPECIFIC GRAVITY:	0.982 ± 0.040
BROOKFIELD VISCOSITY:	Minimum 1,800 cps @ 73 ± 2°F
MAX VOC EMISSIONS:	490 G/L, per SCAQMD Rule 1168, Method 316A

SHELF LIFE:

2 years expectancy in tightly sealed containers. The date of manufacture is stamped on the bottom of the container. Stability of the product is limited by the permanence of the container and the evaporation of the solvent when container is open. Evaporation of solvent will cause the cement to thicken and reduce its effectiveness. Adding of thinners to change viscosity is not recommended.

SHIPPING:

Shipping Information for Liter and Above: Proper Shipping Name: Adhesive. Hazard Class: 3. Identification Number: UN 1133. Packing Group: II. **Label Required:** Flammable Liquid.
Shipping Information for Less than One Liter: Proper Shipping Name: Consumer Commodity. Hazard Class: ORM-D.



Type 21 Ball Valve

Standard Features (Sizes 1/2" – 6")

- Pressure rated up to 230 psi (PVC, CPVC, PVDF)
- Double O-ring seals on stem for an added protection.
- Full bore, sizes 1/2" – 2"
- Full vacuum rated, all sizes
- Blocks in two directions, upstream and downstream, leaving full pressure on the opposite end of the valve
- Integrally molded ISO mounting pad for both manual and actuated operations
- Integrally molded base pad to mount valves securely or panel mounting
- PTFE seats with elastomeric backing cushions ensure bubble-tight shut-off and a low fixed torque, while at the same time compensating for wear
- True Union design for easier installation or repairs without expanding the pipe system
- Built-in spanner wrench on the handle for valve disassembly and assembly
- Two sets of end connectors (socket and threaded) included with all PVC and CPVC valves in sizes 1/2" – 2"
- CPVC threaded end connectors on sizes 1/2" – 1" come with stainless steel reinforcing rings

Options

- Pneumatic and electric actuators & accessories
- Stem extensions
- 2" square operating nut or "T" nut
- Locking and/or spring return handles
- Limit switches

Specifications

Sizes: 1/2" – 6"
Models: PVC & CPVC: Socket, Threaded and Flanged (ANSI)
 PP & PVDF: IPS and Metric (DIN)
 Socket, Threaded, Butt and Flanged (ANSI)
Bodies: PVC, CPVC, PP and PVDF
Seats: PTFE backed with EPDM or Viton®†
Seals: EPDM or Viton®† or AFLAS®‡

† Trademarks of E. I. du Pont de Nemours and Company

‡ Trademark of Asahi Glass Co., Ltd.

Parts List (Sizes 1/2" – 2")

PARTS			
NO.	DESCRIPTION	PCS.	MATERIAL
1	Body	1	PVC, CPVC, PP, PVDF
2	Ball	1	PVC, CPVC, PP, PVDF
3	Carrier	1	PVC, CPVC, PP, PVDF
4	End Connector	2	PVC, CPVC, PP, PVDF
5	Union Nut	2	PVC, CPVC, PP, PVDF
6	Stem	1	PVC, CPVC, PP, PVDF
7	Seat	2	PTFE
8	O-Ring (A)	2	EPDM, Viton®, Others
9	O-Ring (B)	1	EPDM, Viton®, Others
10	O-Ring (C)	2	EPDM, Viton®, Others
11	O-Ring (D)	1	EPDM, Viton®, Others
12	O-Ring (E)	1	EPDM, Viton®, Others
13	Stop Ring*	2	PVDF
14	Handle	1	ABS
4a	Ring**	2	304 Stainless Steel

* Used for flanged end

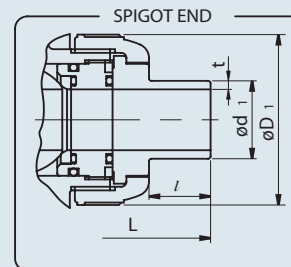
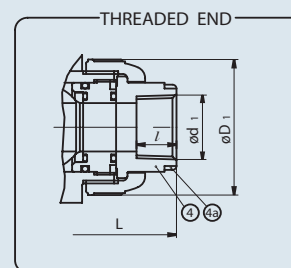
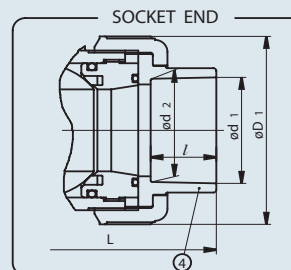
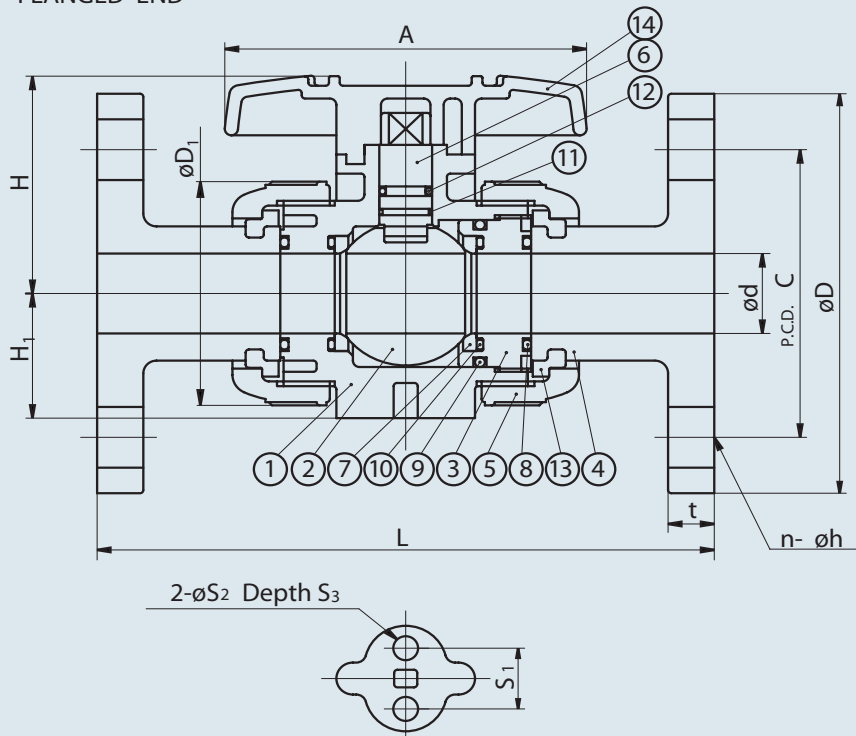
** Used for CPVC body, threaded end, 1/2" – 1"



ASAHI/AMERICA

Rev. A 01-02

FLANGED END



Dimensions (Sizes 1/2" - 2")

NOMINAL SIZE		d	FLANGED						SOCKET										
			ANSI CLASS 150				L	t	PVC, CPVC				PP, PVDF (DIN)				PP, PVDF (IPS)		
									ANSI SCH 80			L	DIN 16962			L	d1	l	L
INCHES	mm	D	C	n	h	d1	d2	l	d1	d2	l		d1	l	L				
1/2	15	0.59	3.50	2.38	4	0.62	5.63	0.47	0.848	0.836	0.875	4.45	0.768	0.760	0.57	3.90	0.83	0.87	4.45
3/4	20	0.79	3.88	2.75	4	0.62	6.77	0.55	1.058	1.046	1.000	5.08	0.965	0.957	0.63	4.49	1.03	1.00	5.08
1	25	0.98	4.25	3.12	4	0.62	7.36	0.55	1.325	1.310	1.125	5.75	1.240	1.232	0.71	4.84	1.30	1.13	5.75
1 1/4	32	1.26	4.62	3.50	4	0.62	7.48	0.63	1.670	1.655	1.250	6.46	1.553	1.543	0.81	5.47	1.65	1.25	6.46
1 1/2	40	1.57	5.00	3.88	4	0.62	8.35	0.63	1.912	1.894	1.375	7.24	1.947	1.937	0.93	5.83	1.89	1.37	7.24
2	50	2.01	6.00	4.75	4	0.75	9.21	0.63	2.387	2.369	1.500	8.23	2.461	2.445	1.08	6.93	2.36	1.50	8.23

NOMINAL SIZE		THREADED							SPIGOT (BUTT END)								
									PP, PVDF								
									DIN 3442		PP	PVDF					
INCHES	mm	d1							d1	l	t	t	L	S1	S2	S3	
1/2	15	1/2-14 NPT							0.787	0.728	0.098	0.075	4.882	0.75	0.29	0.43	
3/4	20	3/4-14 NPT							0.984	0.866	0.106	0.075	5.670	0.75	0.29	0.43	
1	25	1-11 1/2 NPT							1.260	0.886	0.118	0.094	6.063	0.75	0.29	0.43	
1 1/4	32	1 1/4-11 1/2 NPT							1.575	1.024	0.146	0.094	6.850	1.18	0.35	0.59	
1 1/2	40	1 1/2-11 1/2 NPT							1.969	1.260	0.181	0.118	7.638	1.18	0.35	0.59	
2	50	2-11 1/2 NPT							2.480	1.417	0.228	0.118	8.819	1.18	0.35	0.59	

Type 21

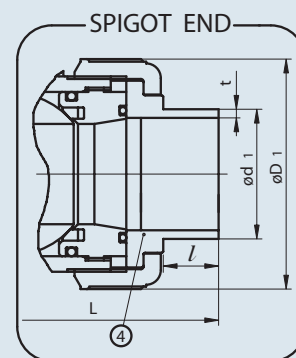
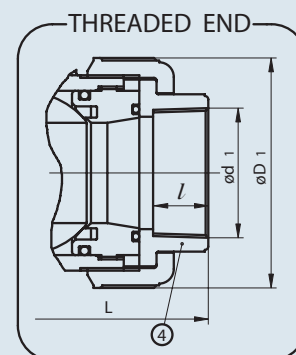
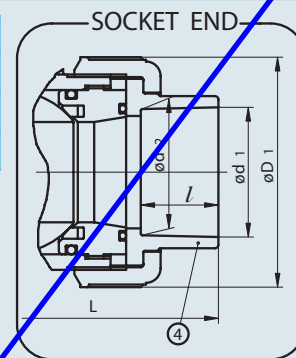
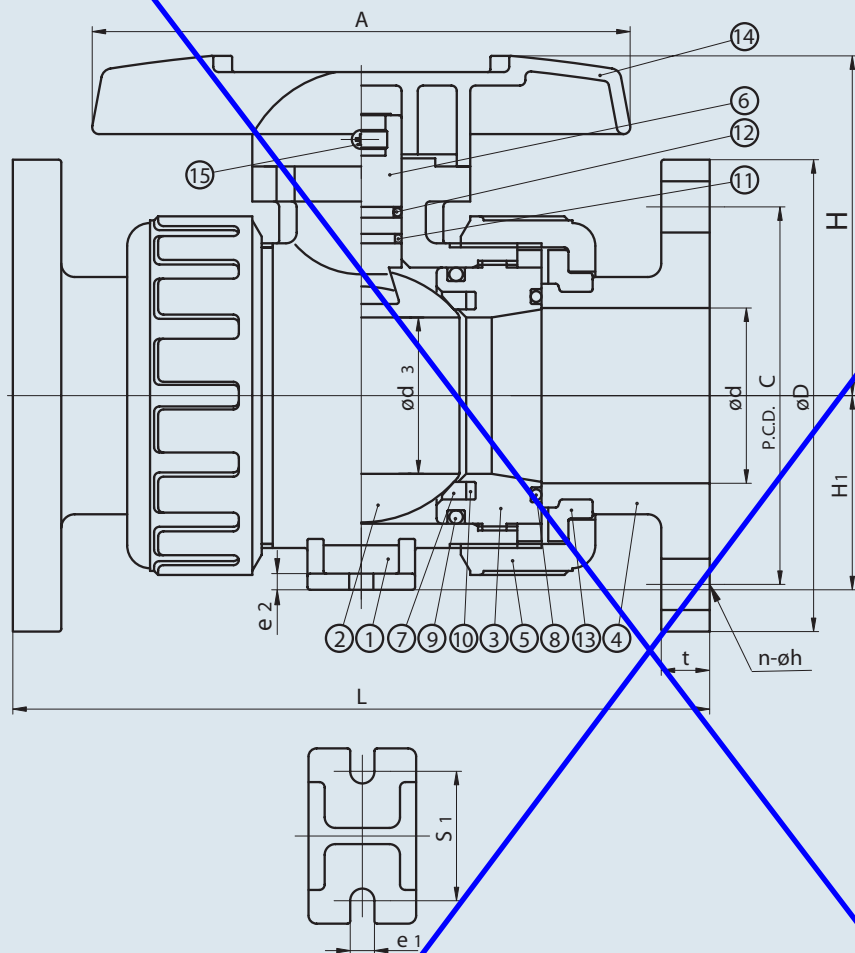
Ball Valves

FLANGED END

PARTS (DIFFERENT NUMBERS FROM 1/2" - 2")

NO.	DESCRIPTION	PCS.	MATERIAL
10	Cushion	2	EPDM, Viton®, Others
15	Screw	1	304 Stainless Steel

NOTE: Quantity on Nos. 3 and 9 (see p. 6) is 2.



Dimensions (Sizes 2 1/2" - 4") FOR 6" SIZE CONSULT FACTORY

NOMINAL SIZE		FLANGED							SOCKET										
		ANSI CLASS 150							PVC, CPVC				PP, PVDF (DIN)				PP, PVDF (IPS)		
									ANSI SCH 80				DIN 16962						
		d	D	C	n	h	L	t	d1	d2	l	L	d1	d2	l	L	d1	l	L
2 1/2	65	2.56	7	5.5	4	0.75	10.2	0.71	2.889	2.868	1.75	9.45	2.923	2.911	1.22	8.15	2.88	1.752	9.45
3	80	3.07	7.5	6	4	0.75	11.97	0.71	3.516	3.492	1.875	11.1	3.512	3.498	1.4	9.88	3.48	1.874	11.1
4	100	3.94	9	7.5	8	0.75	14.65	0.71	4.518	4.491	2	13.9	4.293	4.278	1.63	12.2	4.48	2.252	14.37

NOMINAL SIZE		THREADED							SPIGOT (BUTT END)										
									PP, PVDF										
INCHES	mm	d1	l	L	d3	D1	H	H1	A	d1	l	t	t	L	e1	e2	S1		
2 1/2	65	2 1/2 - 8NPT	1.26	8.46	2.28	5.24	4.96	2.83	7.87	2.953	1.496	0.272	0.142	9.72	0.35	0.24	1.89		
3	80	3 - 8NPT	1.38	10.39	2.70	5.98	5.51	3.35	9.45	3.543	1.496	0.323	0.169	11.61	0.43	0.28	2.17		
4	100	4 - 8NPT	1.77	14.17	3.54	8.27	7.01	4.33	11.81	4.331	1.752	0.394	0.209	12.72	0.43	0.31	2.56		

Pressure vs. Temperature (PSI, WATER, NON-SHOCK)

NOMINAL SIZE		PVC				CPVC						PP				PVDF				
		30° F 70° F	71° F 105° F	106° F 120° F	121° F 140° F	30° F 70° F	71° F 105° F	106° F 120° F	121° F 140° F	141° F 175° F	176° F 195° F	-5° F 85° F	86° F 120° F	121° F 140° F	141° F 175° F	-5° F 70° F	71° F 105° F	106° F 140° F	141° F 175° F	176° F 210° F
1/2-2	15-50	230	170	150	30	230	170	150	120	75	55	150	110	90	55	230	185	150	115	85
2 1/2	65	230	170	150	NA	230	170	150	120	75	55	150	95	70	40	230	185	150	115	85
3	80	230	170	150	NA	230	170	150	85	55	40	150	95	70	40	230	185	150	100	70
4-6	100-150	150	150	150	NA	150	150	150	85	55	40	150	95	70	40	150	150	150	100	70

Sample Specification

All TYPE 21 Ball Valves, sizes 1/2" to 4", shall be of true union design with two-way blocking capability. All O-rings shall be EPDM or Viton® with PTFE seats. PTFE seats shall have elastomeric backing cushion of the same material as the valve seals. Stem shall have double O-rings and be of blowout-proof design. The valve handle shall double as carrier removal and/or tightening tool. ISO mounting pad shall be integrally molded to valve body for actuation. PVC conforming to ASTM D1784 Cell Classification 12454-A, CPVC conforming to ASTM D1784 Cell Classification 23567-A, PP Conforming to ASTM D4101 Cell Classification PP0210B67272 and PVDF conforming to ASTM D3222 Cell Classification Type II. The ball valves, except PP, shall have a pressure rating of 230 psi for sizes 1/2" to 3" and 150 psi for 4" (150 psi for PP, all sizes) at 70 ° F. Type 21 Ball Valves must carry a two-year guarantee, as manufactured by Asahi/America, Inc.

Cv Values

NOMINAL SIZE		Cv
INCHES	mm	
1/2	15	14
3/4	20	29
1	25	47
1 1/4	32	72
1 1/2	40	155
2	50	190
2 1/2	65	365
3	80	410
4	100	680

Weight (POUNDS)

NOMINAL SIZE		SOCKET THREADED	FLANGED
INCHES	mm		
1/2	15	0.44	1.10
3/4	20	0.66	1.54
1	25	1.10	2.70
1 1/4	32	1.54	3.30
1 1/2	40	2.64	4.40
2	50	4.40	8.15
2 1/2	65	6.17	8.80
3	80	9.70	13.00
4	100	24.00	26.67

Caution

- Never remove valve from pipeline under pressure.
- Always wear protective gloves and goggles.
- Watch out for trapped fluid in valve. It is safe to close valve before removing it from the pipeline.

Caution

- Do not use ball valves where media has suspended particles. Use the following valves:
Butterfly Valves – PVDF disc is most abrasion resistant and make sure of chemical compatibility.
Diaphragm Valves – Elastomeric diaphragm is designed for handling suspended particles.
- Volatile fluids such as sodium hypochlorite (NaClO) and hydrogen peroxide (H₂O₂) could be trapped and gasified within the valve. We can provide you with a Type 21 ball valve with a *vented ball* to relieve pressure build-up inside the valve.

Troubleshooting

What if the fluid still flows when valve is closed?

- Carrier is not properly tightened. Tighten it.
- PTFE seat is damaged or worn. Replace seat.
- Foreign material is caught between ball and PTFE seat. Remove material and clean.
- Ball is damaged or worn. Change ball.

What if fluid leaks outside of valve?

- Union nut not properly tightened. Retighten.
- Carrier is not properly tightened. Thread it in firmly.
- Carrier or face O-ring is damaged, worn, or missing. Replace O-ring.

What if handle does not rotate smoothly?

- Foreign material has formed on the ball or seat. Clean both.
- Internal part(s) chemically attacked or swollen. Refer to Asahi/America Chemical Resistance Chart for compatibility. Replace part(s) as required.
- Carrier over-tightened. Retighten properly.

What if handle rotates too freely?

- Stem is damaged. Replace stem.
- Handle is not engaged with stem. Disassemble and reengage. Inspect.
- Engaging part of stem and/or ball is damaged. Change stem and/or ball.

SAFETY PRECAUTIONS:

This product is flammable and considered a hazardous material. In conformance with the Federal Hazardous Substances Labeling Act, the following hazards and precautions are given. Purchasers who repackage this product must also conform to all local, state and federal labeling, safety and other regulations.

**DANGER - EXTREMELY FLAMMABLE – VAPOR HARMFUL – MAY BE
HARMFUL IF SWALLOWED – MAY IRRITATE SKIN OR EYES**

Keep out of reach of children. Do not take internally. Keep away from heat, spark, open flame and other sources of ignition. Vapors may ignite explosively. Solvent cement vapors are heavier than air and may travel to source(s) of ignition at or near ground or lower level(s) and flash back. Keep container closed when not in use. Store between 40°F (5°C) and 90°F (33°C). Avoid breathing of vapors. Use only in well-ventilated area. If confined or partially enclosed, use forced ventilation. When necessary, use local exhaust ventilation to remove harmful airborne contaminants from employee breathing zone and to keep contaminants below 25 ppm TWA. Atmospheric levels must be maintained below established exposure limits contained in Section II of the Material Safety Data Sheet. If airborne concentrations exceed those limits, use of a NIOSH approved organic vapor cartridge respirator with full face-piece is recommended. The effectiveness of an air-purifying respirator is limited. Use it only for a single short-term exposure. For emergency and other conditions where short-term exposure guidelines may be exceeded, use an approved positive pressure self-contained breathing apparatus. Do not smoke, eat or drink while working with this product. Avoid contact with skin, eyes and clothing. May cause eye injury. Protective equipment such as gloves, goggles and impervious apron should be used. Carefully read Material Safety Data Sheet and follow all precautions. Do not use this product for other than intended use. "SARA Title III Section 313 Supplier Notification": This product contains toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and of 40CFR372. This information must be included in all MSDSs that are copied and distributed for this material.

FIRST AID:

Inhalation: If ill effects from inhalation, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call physician.

Eye Contact: Flush with plenty of water for 15 minutes and call a physician.

Skin Contact: Wash skin with plenty of soap and water for at least 15 minutes. If irritation develops, get medical attention.

Ingestion: If swallowed, give 1 or 2 glasses of water or milk. Do not induce vomiting. Contact physician or poison control center immediately.

SPECIAL PRECAUTION:

Do not use a dry granular calcium hypochlorite as a disinfecting material for water purification in potable water piping systems. The introduction of granules or pellets of calcium hypochlorite with PVC and CPVC solvent cements and primers (including their vapors) may result in a violent chemical reaction if a water solution is not used. It is advisable to purify lines by pumping chlorinated water into the piping system – this solution will be nonvolatile. Furthermore, dry granular calcium hypochlorite should not be stored or used near solvent cements and primers.

QUALITY ASSURANCE:

Every batch of this product is checked to assure that consistent quality is maintained. An infrared absorption curve is recorded for each batch to ensure that this product was properly formulated. Samples are taken from all batches and are kept for a period of at least one year. A batch identification code is stamped on each can.

IMPORTANT NOTE:

This product is intended for use by skilled individuals at their own risk. These suggestions and data are based on information we believe to be reliable. Installers should verify for themselves that they can make satisfactory joints under varying conditions. Toward this end, it is highly desirable that they receive personal instruction from trained instructors or competent, experienced installers. Contact IPS or your supplier for additional information or instructions.

WARRANTY:

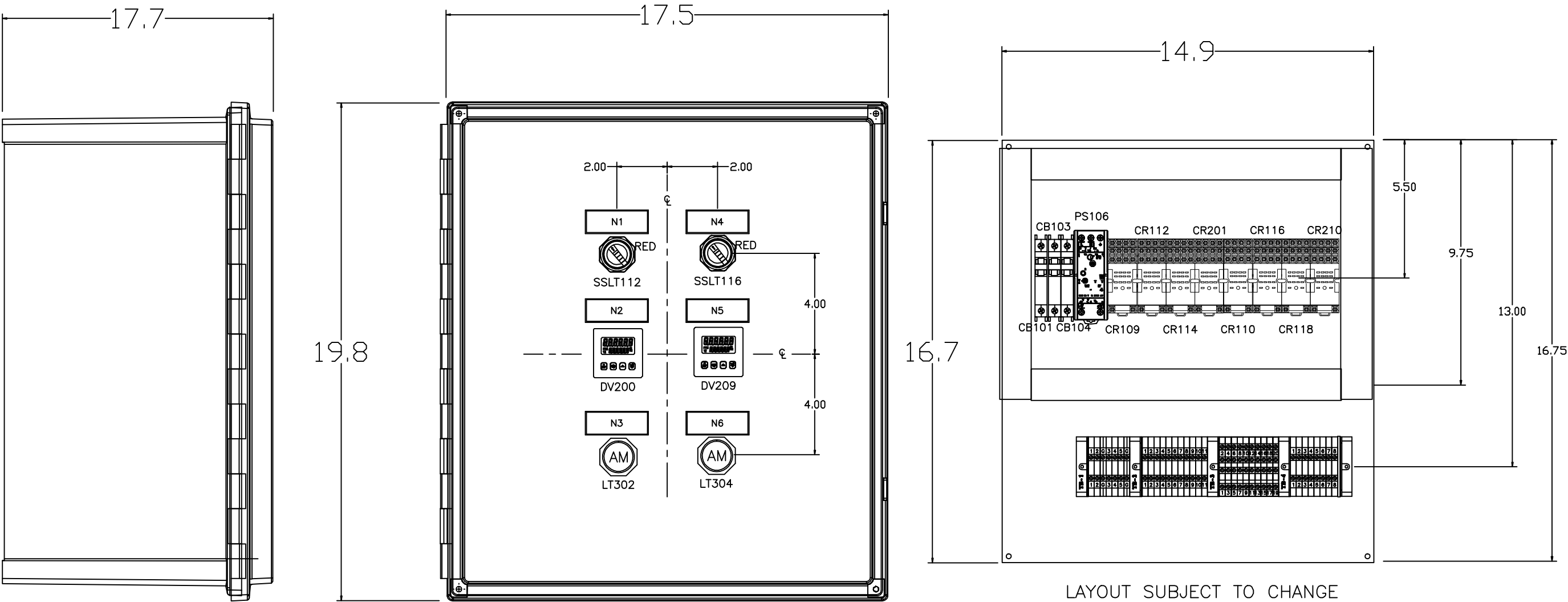
Warranty is limited to the replacement of defective IPS material.

SECTION 4

DUAL PUMP CONTROL PANEL

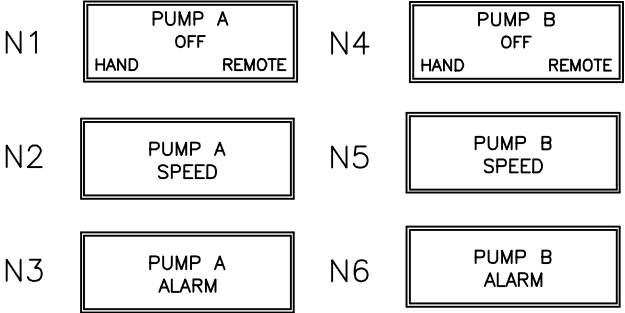
Well 35

Well 38

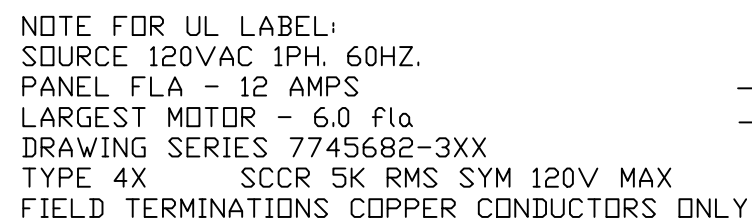


LAYOUT SUBJECT TO CHANGE

LABEL LEGEND

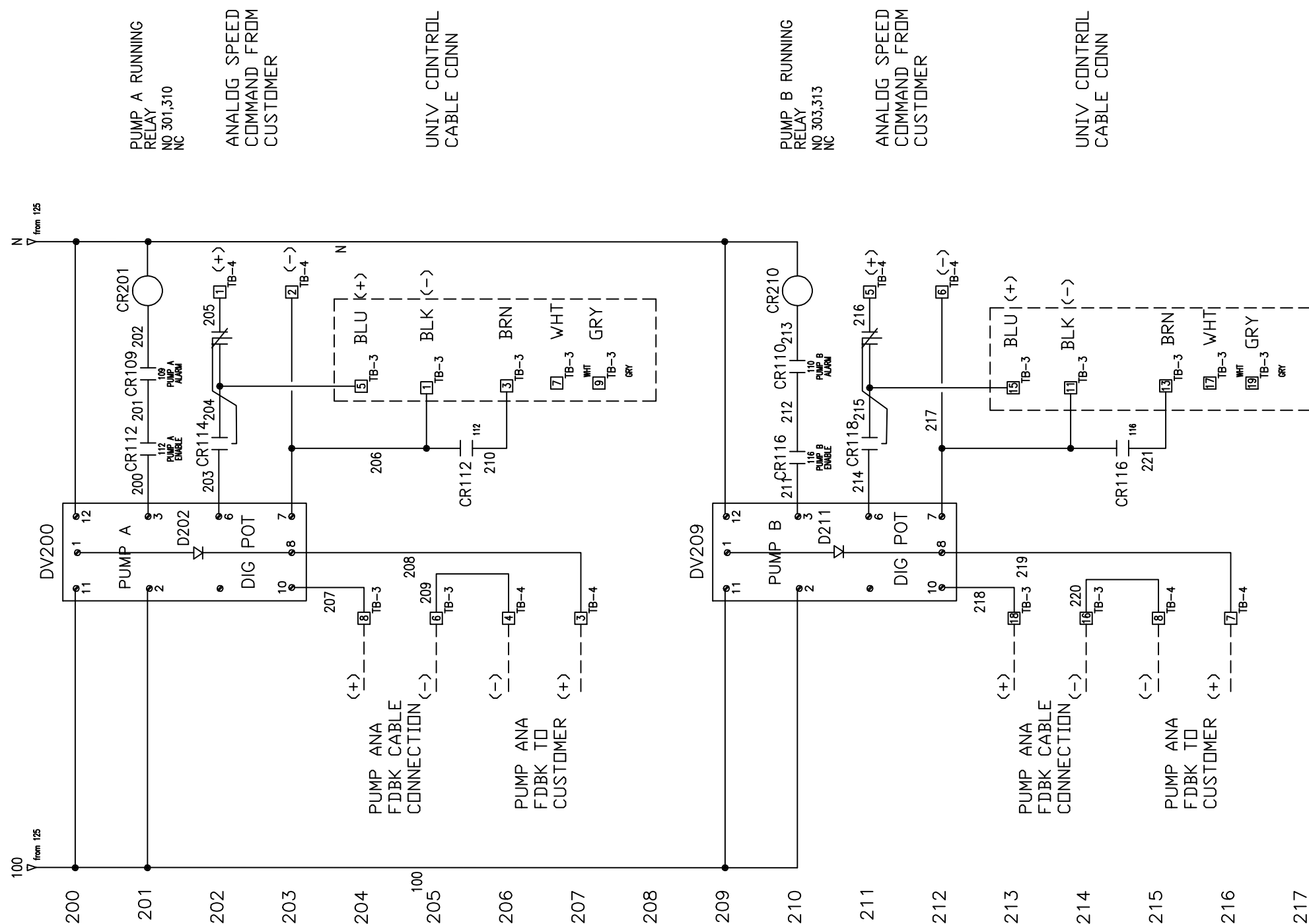


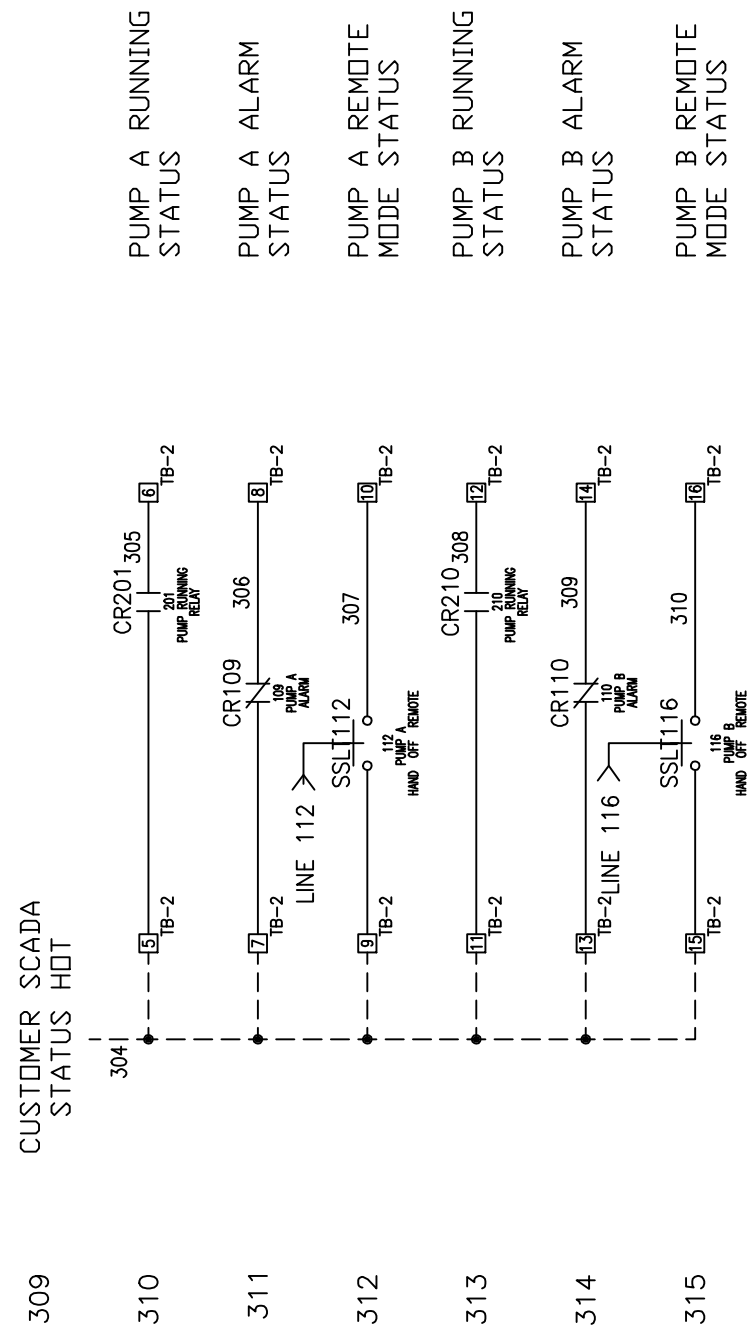
					ENGINEERS SEAL		pfc ProMinent ProMinent® THE PROMINENT GROUP OF COMPANIES					
							PITTSBURGH, PA USA					
0 06-29-09 30MM DEVICE DESIGN GB					THIS DRAWING IS THE PROPERTY OF PROMINENT FLUID CONTROLS, INC. AND SHALL NOT BE COPIED OR TRANSFERRED WITHOUT THE WRITTEN CONSENT OF PROMINENT FLUID CONTROLS, INCORPORATED.		PROMINENT FLUID CONTROLS LTD. 490 SOUTHGATE DRIVE. GUELPH, ONTARIO, CANADA N1H 6J3 TEL. 519 836 5692 FAX. 519 836 5226		PROMINENT FLUID CONTROLS, INC. RDC PARK WEST 136 INDUSTRY DRIVE PITTSBURGH, PA 15275 USA TEL. 412 787 2484 FAX. 412 787 0704			
REV DATE		DESCRIPTION		BY APPD			DESIGNED GB		APPROVED			
REVISIONS							DRAWN GB		SCALE NTS			
CUSTOMER							CHECKED GB		DATE 06-29-09			
JOB No 7745682 PURCHASE ORDER No XX					DWG No		7745682-310		REV 0		PAGE 1/1	
TITLE DUAL PUMP CONTROL w/ ANALOG OUTPUT ENCLOSURE AND SUB PANEL LAYOUT												



_____ CP WIRE
 - - - - - SKID OR FIELD WIRE

[illegible]

[illegible]

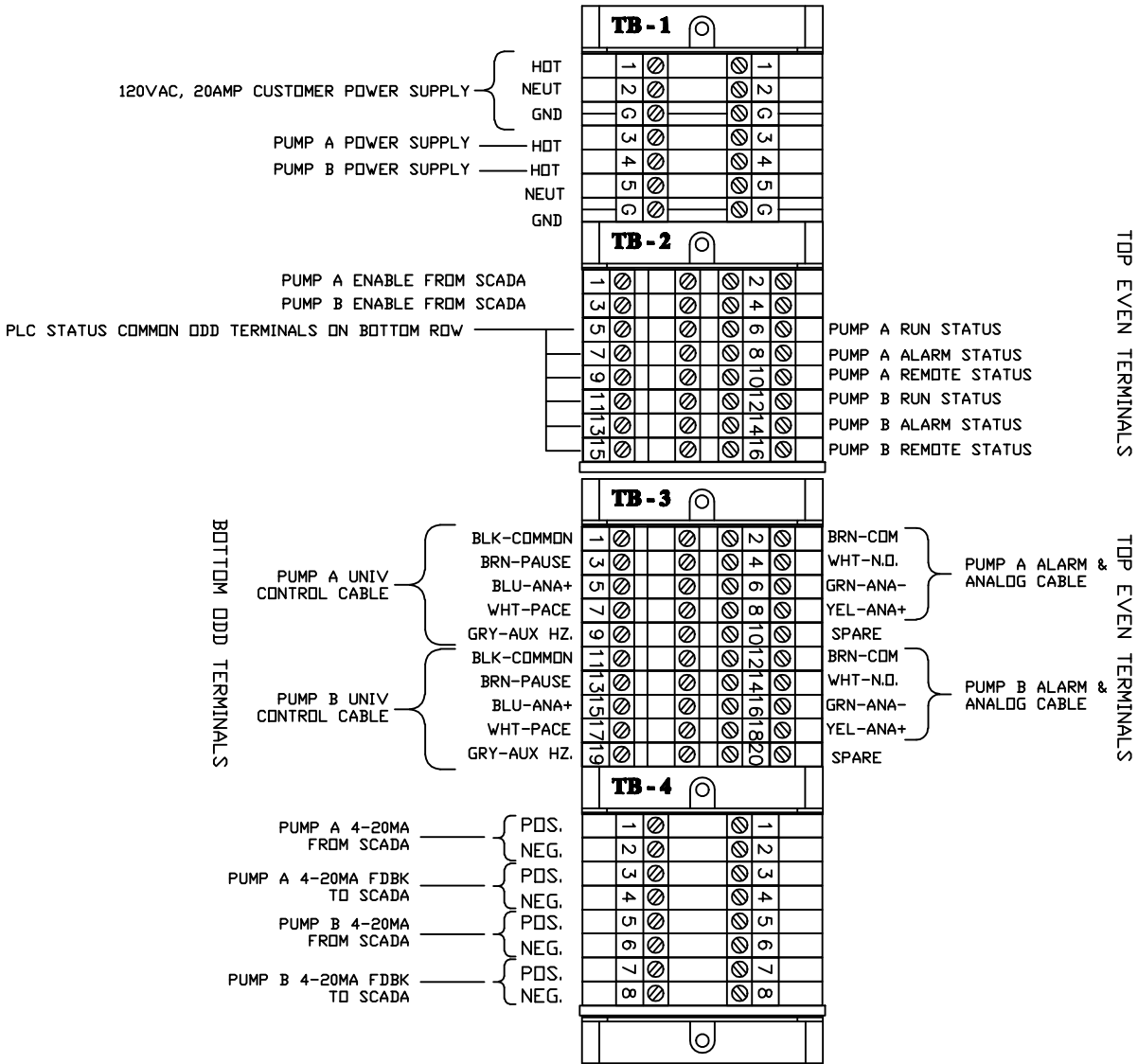
[illegible]

BILL OF MATERIAL

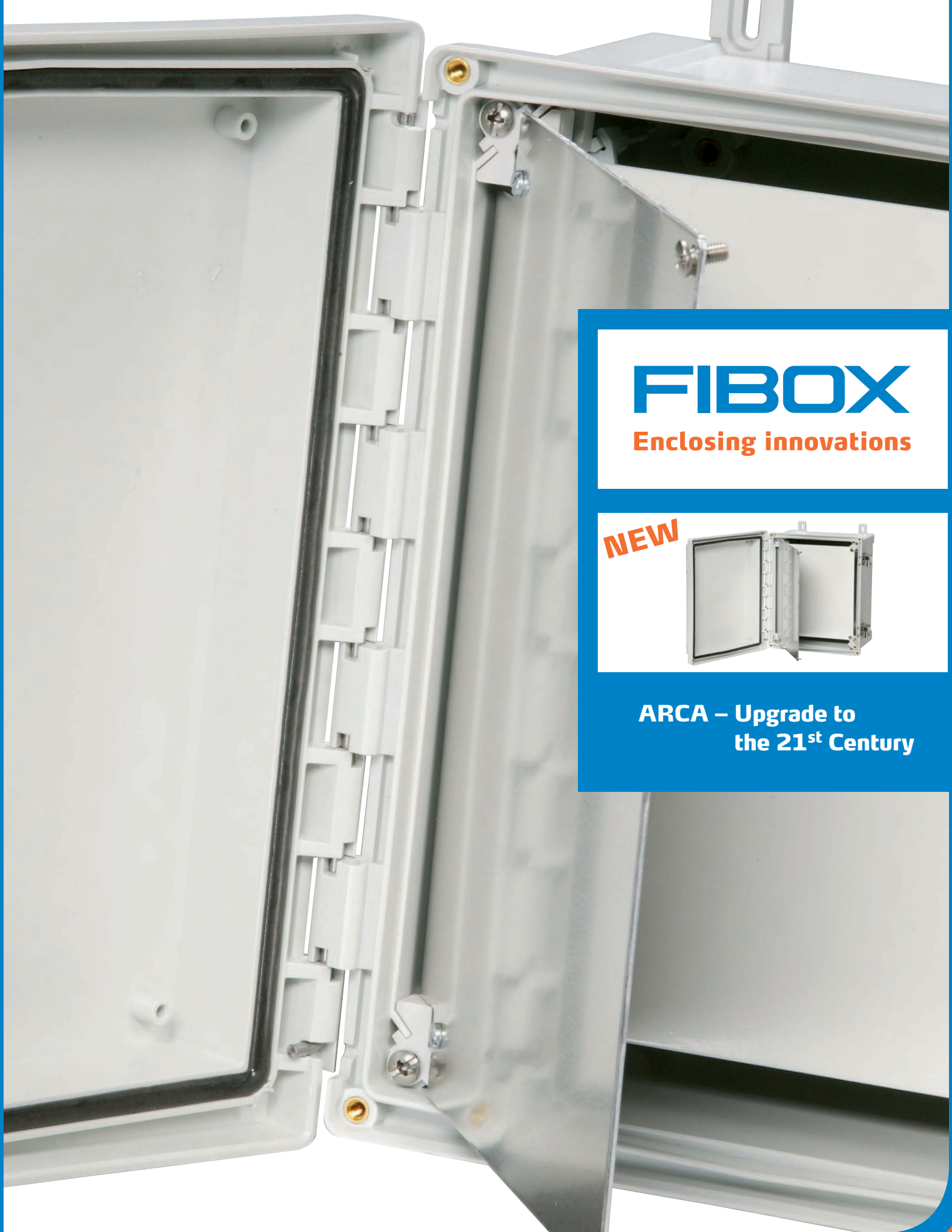
TAGS	QTY	SUB	CATALOG	MFG	DESCRIPTION
	1		7746231	FIBOX	POLYCARBONATE TYPE 4X ENCLOSURE WALL-MOUNT ENCLOSURE NEMA 3, 3R, 4, 4X, 12, 13 18 x 16 x 10 IN, WATER/DUST-TIGHT SEAL
	1		7746232	FIBOX	SUB PANEL WHITE PAINT
CB103 CB104	2		7746222	CBI	CIRCUIT BREAKER - MINIATURE 1-POLE CIRCUIT BREAKER 15 AMPS,120 VAC 10KAIR UL 489 PFC# 7746222
CB101	1		7746223	CBI	CIRCUIT BREAKER - MINIATURE 1-POLE CIRCUIT BREAKER 20 AMPS,120 VAC 10KAIR UL 489 PFC# 7746223
CR201 CR210	2	*1	7746413	SQ D	RELAY - GENERAL PURPOSE 4PDT 5 AMP 110/120 VAC
CR109 CR110 CR112 CR114 CR116 CR118	6	*1	7746414	SQ D	RELAY - GENERAL PURPOSE 4PDT 5 AMP 24 VDC COIL
		*1	7746415	SQ D	RELAY SOCKET USE WITH DPDT/4PDT 5 AMP
DV200 DV209	2		7745292	REDLION	PROCESS CONTROLLER 85-250 VAC , 15VA USED AS DIGITAL POT PFC# 7745292
LT302 LT304	2		7746393	SQD	AMBER PILOT LIGHT - STANDARD, NEMA 4/4X/13 30.5mm, 24VAC/VDC FULL VOLT PLASTIC FRESNEL LENS CORROSION RESISTANT
PS106	1		7746274	IDEC	24 VDC POWER SUPPLY 30 WATT OUTPUT 120 VAC, 60 HZ INPUT ADJUSTABLE 24 VDC OUTPUT
SSLT112 SSLT116	4		7746389	SQD	3 POSITION ILLUMINATED MAINTANED 30 mm HEAVY DUTY, OIL TIGHT TYPE 4X ILLUMINATED 28VDC LAMP TYPE C CAM, 2 KA1 CONTACT BLOCKS
TB-1	2		7745704	WEIDMULLER	STANDARD DESIGN PROTECTIVE CONDUCTOR TERMINAL - WPE 4, GROUND TERMINAL GREEN/YELLOW WEMID, 22-10AWG SERIE W - SCREW CLAMP, MOUNTS ON DIN RAIL
TB-1 TB-2 TB-4	13		7745700	WEIDMULLER	STANDARD DESIGN TERMINAL BLOCK - WDU 4 FEED-THROUGH, 35AMPS DARK BEIGE WEMID, 600V, 22-10AWG SERIE W - SCREW CLAMP, MOUNTS ON DIN RAIL
TB-3	18		7745702	WEIDMULLER	COMPACT-DESIGN TERMINAL BLOCK - WDK 4N MULTI-LEVEL, 35AMPS DARK BEIGE WEMID, 600V, 26-10AWG SERIE W - SCREW CLAMP, MOUNTS ON DIN RAIL
		*2	7745703	WEIDMULLER	WAP, END PLATE FOR DBL STACK DARK BEIGE WEMID, THICKNESS 1.5MM USED W/ WDK 2.5N
	5		7745699	WEIDMULLER	END BRACKET - WEW 35/2 BEIGE PA, THICKNESS 8MM USED W/ WDU 2.5...10
	6		7745691	PFC	PLASTIC LAMINANT LEGEND PLATES WHITE WITH BLACK TEXT

NOTE: ALL ELECTRICAL COMPONENTS ARE CSA & UL LISTED OR RECOGNIZED.
PFC RESERVES THE RIGHT TO MAKE EQUIVALENT SUBSTITUTIONS AS NECESSARY.

PANEL TERMINAL STRIPS



ENGINEERS SEAL				 ProMinent [®] THE PROMINENT GROUP OF COMPANIES	
PITTSBURGH, PA USA				PITTSBURGH, PA USA	
PROMINENT FLUID CONTROLS LTD. 490 SOUTHGATE DRIVE. GUELPH, ONTARIO, CANADA N1H 6J3 TEL. 519 836 5692 FAX. 519 836 5226				PROMINENT FLUID CONTROLS, INC. RIDC PARK WEST 136 INDUSTRY DRIVE PITTSBURGH, PA 15275 USA TEL. 412 787 2484 FAX. 412 787 0704	
DESIGNED GB				APPROVED	
DRAWN GB				SCALE NTS	
CHECKED GB				DATE 06-29-09	
JOB No 7745682 PURCHASE ORDER No XX				DWG No 7745682-312	
TITLE DUAL PUMP CONTROL w/ ANALOG OUTPUT TERMINAL STRIP DETAIL & BILL OF MATERIAL				REV 0 PAGE 1/1	
CUSTOMER PROMINENT FLUID CONTROLS				THIS DRAWING IS THE PROPERTY OF PROMINENT FLUID CONTROLS, INC. AND SHALL NOT BE COPIED OR TRANSFERRED WITHOUT THE WRITTEN CONSENT OF PROMINENT FLUID CONTROLS, INCORPORATED.	
REV 0 06-29-09 30MM DEVICE DESIGN GB					
REVISIONS					



FIBOX

Enclosing innovations

NEW



**ARCA – Upgrade to
the 21st Century**

ARCA Enclosures – Upgrade to the 21st Century



Fibox's new ARCA non-metallic enclosures provide users of classic electrical junction boxes an easy upgrade path to a high performance enclosure featuring 21st century technology. Precision, injection molded, ARCA enclosures feature superior chemical resistance and the wide temperature utilization range of polycarbonate plastic. Available in classic sizes, these enclosures feature industry standard dimensions and panels.

ARCA enclosures advance beyond tradition to meet and exceed the growing demands of 21st century applications. ARCA's rugged construction achieves a unique appearance without sacrificing robustness. The stylized cover features an overlapping design providing superior protection of the formed-in-place PUR gasket.

ARCA enclosures are available as a screw cover enclosure, a hinged screw cover enclosure, or a hinged enclosure with latches. Select from a variety of latch options. Enclosure covers are available as either opaque or transparent clear. Complete ranges of mounting plates, fixed inner panels and hinged inner panels are available, in metal or non-metallic versions.

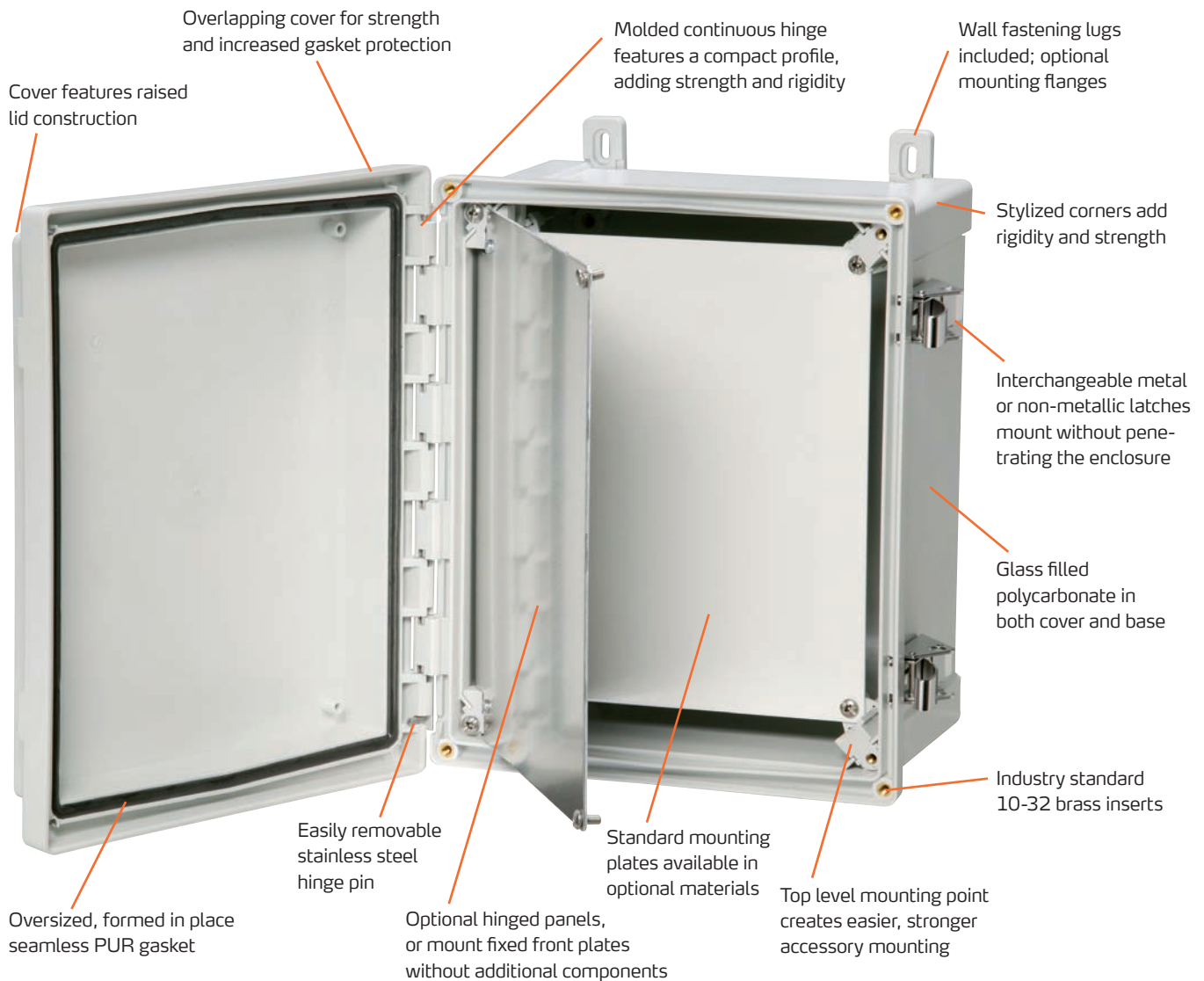
ENCLOSURES

Catalog Number			Enclosure Size A x B x C	Panel Catalog Number	Panel Size h x w	Enclosure Mounting F x G	Exterior Overall H x W x D
Screw Cover	Hinged Screw Cover	Hinged with Latch*					
AR664SC	AR664CHSC	AR664CHSSL	6.0 x 6.0 x 4.0	ABP66	4.9 x 4.9	6.7 x 4.0	7.6 x 7.4 x 4.7
AR664SCT	AR664CHSCT	AR664CHSSLT	(152 x 152 x 102)		(124 x 124)	(170 x 102)	(192 x 188 x 120)
AR865SC	AR865CHSC	AR865CHSSL	8.0 x 6.0 x 5.0	ABP86	6.7 x 4.9	8.7 x 4.0	9.5 x 7.4 x 5.7
AR865SCT	AR865CHSCT	AR865CHSSLT	(203 x 152 x 127)		(171 x 124)	(220 x 102)	(242 x 189 x 145)
AR1086SC	AR1086CHSC	AR1086CHSSL	10.0 x 8.0 x 6.0	ABP108	8.9 x 6.9	10.7 x 6.0	11.5 x 9.3 x 6.7
AR1086SCT	AR1086CHSCT	AR1086CHSSLT	(254 x 203 x 152)		(225 x 175)	(271 x 152)	(291 x 237 x 171)
AR12106SC	AR12106CHSC	AR12106CHSSL	12.0 x 10.0 x 6.0	ABP1210	10.8 x 8.9	12.7 x 8.0	13.5 x 11.4 x 6.7
AR12106SCT	AR12106CHSCT	AR12106CHSSLT	(305 x 254 x 152)		(275 x 225)	(322 x 203)	(342 x 289 x 171)
AR14127SC	AR14127CHSC	AR14127CHSSL	14.0 x 12.0 x 7.0	ABP1412	12.8 x 10.8	14.8 x 10.0	15.5 x 13.3 x 7.7
AR14127SCT	AR14127CHSCT	AR14127CHSSLT	(356 x 305 x 178)		(324 x 275)	(375 x 254)	(393 x 339 x 196)
AR16148SC	AR16148CHSC	AR16148CHSSL	16.0 x 14.0 x 8.0	ABP1614	14.8 x 12.9	16.7 x 12.0	17.8 x 15.5 x 8.7
AR16148SCT	AR16148CHSCT	AR16148CHSSLT	(406 x 356 x 203)		(376 x 328)	(424 x 305)	(452 x 394 x 221)
AR181610SC	AR181610CHSC	AR181610CHSSL	18.0 x 16.0 x 10.0	ABP1816	16.7 x 14.9	18.7 x 14.0	19.8 x 17.5 x 10.7
			(457 x 406 x 254)		(424 x 378)	(475 x 356)	(503 x 444 x 272)

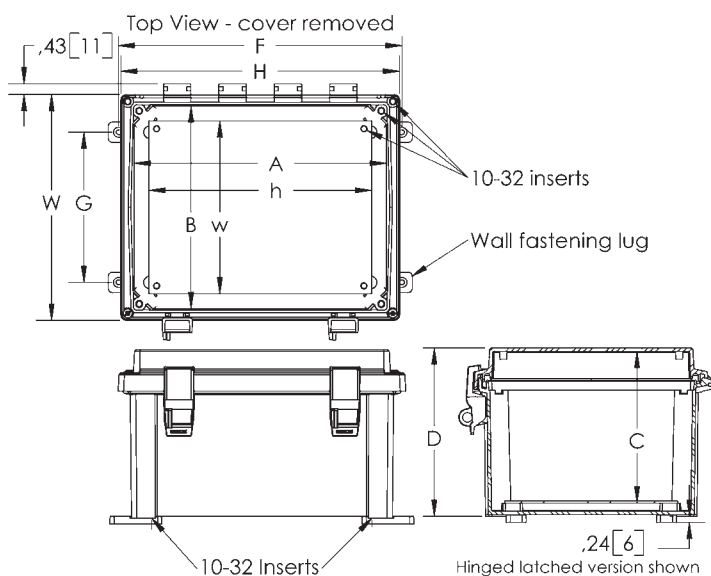
* Latch options available - metallic latch shown

P/N suffix T denotes transparent cover

ARCA is a trademark of Fibox Inc.



DRAWINGS



TECHNICAL INFORMATION

PROPERTY

Environmental ingress	UL Type 4, 4X, 6, 6P, 12 and 13
Impact resistance	Impact rating per UL 508/UL 50
NRTL Listing	Underwriters Laboratories UL, cUL Listed under UL 508
Temperature Range: °Celsius	-40° ... +140°C
Short term °Fahrenheit	-40° ... +284°F
Temperature Range: °Celsius	-40° ... +80°C
Long term °Fahrenheit	-40° ... +175°F
Electrical insulation	Totally insulated
Color	RAL 7035 - Light gray
Cover screws and hardware	10-32, stainless steel
Accessory mounting screws	10-32, stainless steel
Gasket	Formed in place polyurethane (PUR)
Flammability rating	Enclosure flammability rating per UL 508
Toxicity	Non-Toxic, halogen free, RoHS compliant

Data subject to change without notice.

Fibox Enclosures

Fibox, a privately owned Finnish company, is one of the largest enclosure manufacturers in the world, and is the market leader in thermoplastic enclosures used for protecting electrical and electronic components operating in hostile environments. Fibox enclosures are manufactured in modern factories located in Finland, Germany, China and Republic of Korea.

Fibox Inc.
810 Cromwell Park Drive
Suite R
Glen Burnie, MD 21061

Tel (+1) 410 760 9696
Toll-free USA 1 888 342 6987
Fax (+1) 410 760 8686
E-mail sales@fiboxusa.com

www.fiboxusa.com

ABOUT FIBOX

1000 CHOICES TO MEET YOUR DEMANDING ENVIRONMENTS

The Fibox range of standard enclosures provides the designer with over 1000 choices for packaging electrical and electronics equipment operating in hostile environments. Fibox enclosures comply with UL 50/508 and EN 60529. Most of our enclosures have achieved Type ratings of NEMA 4X, 6 and 6P, and Ingress ratings of IP 66/IP 67. Enclosure performance is verified by independent laboratory testing and on-going monitoring of production. Fibox brand accessories make our enclosures more functional and are easy to use. Standard solutions exist for panel management, hinged inner doors, and air ventilation.

CUSTOMIZED ENCLOSURES TO EXPAND YOUR OPTIONS

To increase the range and flexibility of our packaging solutions, Fibox has developed a comprehensive range of services, permitting cost effective customization for specific applications. The two most important of these are machining services and customized tooling. Our advanced CNC machinery can supply enclosures with holes, cutouts and openings to your specification. For large OEM volumes, our sophisticated, multiple slide tooling permits cost effective modification of any side of the enclosure. CAD drawings of standard enclosures are available at www.fiboxusa.com to aid the engineer in creating the most cost effective customization.

MODELS T16 & P16 - TEMPERATURE/PROCESS CONTROLLERS



- PID CONTROL WITH REDUCED OVERSHOOT
- T16 ACCEPTS TC AND RTD
- P16 ACCEPTS 0-10 V AND 0/4-20 mA SIGNALS
- ON DEMAND AUTO-TUNING OF PID SETTINGS
- DC ANALOG OUTPUT (OPTIONAL)
- USER PROGRAMMABLE FUNCTION BUTTON
- PC OR FRONT PANEL PROGRAMMING
- PC CONFIGURABLE WITH TP16KIT



UL Recognized Component,
File #E156876



EMC
COMPLIANT



NEMA 4X/
IP65



PARAMETER
LOCKOUT



PROGRAMMING
SOFTWARE



FRONT PANEL
PROGRAMMABLE



ALARMS



ANALOG
OUTPUT



PC
CONFIGURABLE



FAX/WEB
DOC # 05019

Product Features

GENERAL DESCRIPTION

The Model T16 Controller accepts signals from a variety of temperature sensors (thermocouple or RTD), while the Model P16 Controller accepts either a 0 to 10 VDC or 0/4 to 20 mA DC input signal. Both controllers can provide an accurate output control signal (time proportional or DC Analog Output) to maintain a process at a setpoint value. Dual 4-digit displays allow viewing of the process/temperature and setpoint simultaneously. Front panel indicators inform the operator of the controller and output status. The comprehensive programming allows these controllers to meet a wide variety of application requirements.

MAIN CONTROL

The controller operates in the PID Control Mode for both heating and cooling, with on-demand auto-tune, that establishes the tuning constants. The PID tuning constants may be fine-tuned through the front panel and then locked out from further modification. The controller employs a unique overshoot suppression feature, that allows the quickest response without excessive overshoot. Switching to Manual Mode provides the operator direct control of the output. The controller may also be programmed to operate in On/Off mode with adjustable hysteresis.

ALARMS

Optional alarm(s) can be configured independently for absolute high or low acting with balanced or unbalanced hysteresis. They can also be configured for deviation and band alarm. In these modes, the alarm trigger values track the setpoint value. Adjustable alarm trip delays can be used for delaying

output response. The alarms can be programmed for Automatic or Latching operation. A selectable standby feature suppresses the alarm during power-up until the temperature stabilizes outside the alarm region.

ANALOG OUTPUT OPTION

The optional DC Analog Output (10 V or 20 mA) can be configured and scaled for control or re-transmission purposes. The programmable output update time reduces valve or actuator activity.

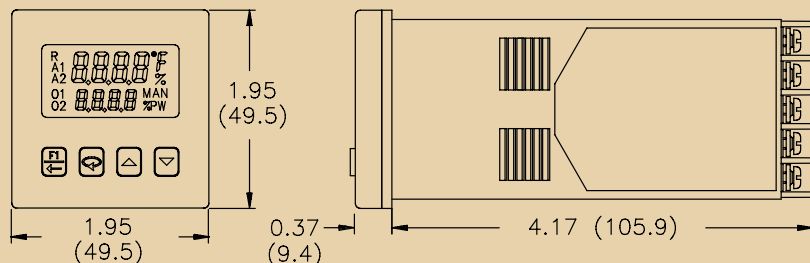
PC PROGRAMMING KIT

The optional TP16KIT contains a programming module with a 9 pin RS232 connector, cable and Windows® based configuration software. The software allows downloading, uploading and storage of T16 and P16 program files. All controllers have a communications port that allows configuration by PC even without controller power connected. Controller calibration is also possible using the software when the proper calibration equipment and controller power is connected.

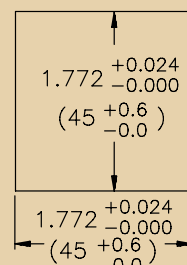
CONSTRUCTION

The controller is constructed of a lightweight, high impact, black plastic textured case and bezel with a clear display window. The front panel meets NEMA 4X/IP65 specifications when properly installed. In applications that do not require protection to NEMA 4X, multiple controllers can be stacked horizontally or vertically. Modern surface-mount technology, extensive testing, plus high immunity to noise interference makes the controller extremely reliable in industrial environments.

DIMENSIONS In inches (mm)



PANEL CUT-OUT

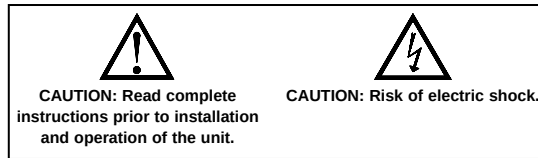


Product Features Continued

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not use the controller to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the controller. An independent and redundant temperature limit indicator with alarm outputs is strongly recommended.



General Specifications

- DISPLAY:** 2 Line by 4-digit, LCD negative image transmissive with backlighting.

Top (Process) Display: 0.3" (7.6 mm) high digits with red backlighting.

Bottom (Parameter) Display: 0.2" (5.1 mm) high digits with green backlighting.

- ANNUNCIATORS:**

Status Annunciators:

- O1 - Main control output is active.
- O2 - Cooling output is active (when Alarm 2 is used for cooling).
- A1 - Alarm 1 output is active.
- A2 - Alarm 2 output is active.
- °F, °C - Temperature units.
- %PW - Output power percentage is shown in Bottom display.
- MAN - Controller is in Manual Mode.
- R - Ramping Setpoint indicator.
- % - Percent indicator (P16 models only).

Display Messages:

- OL OL - Measurement exceeds + sensor range
- UL UL - Measurement exceeds - sensor range
- OPEN - Open sensor is detected (T16 only)
- SHRT - Shorted sensor is detected (RTD only)
- ERR5 - Measurement exceeds controller limits (P16 only)
- dddd - Display value exceeds + display range
- ddd - Display value exceeds - display range

- POWER:**

Line Voltage Models:

85 to 250 VAC, 50/60 Hz, 8 VA

Low Voltage Models:

DC Power: 18 to 36 VDC, 4 W

AC Power: 24 VAC, ±10%, 50/60 Hz, 7 VA

- CONTROLS:** Three rubber push buttons for modification and setup of controller parameters. One additional button (F1) for user programmable function. One external user input (models with alarms) for parameter lockout or other user programmable functions.

- MEMORY:** Nonvolatile E²PROM retains all programmable parameters.

- ISOLATION LEVEL:**

AC power with respect to all other I/O: 250 V working (2300 V for 1 minute)

Sensor input to analog output: 50 V working (500 V for 1 minute)

Relay contacts to all other I/O: 300 V working (2300 V for 1 minute)

DC power with respect to sensor input and analog output: 50 V working (500 V for 1 minute)

- CERTIFICATIONS AND COMPLIANCES:**

SAFETY

UL Recognized Component, File #E156876, UL873, CSA 22.2 No. 24

Recognized to US and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.

Type 4X Enclosure rating (Face only), UL50

IEC 1010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part I

IP65 Enclosure rating (Face only), IEC 529

ELECTROMAGNETIC COMPATIBILITY

Immunity to EN 50082-2

Electrostatic discharge	EN 61000-4-2	Level 2; 4 kV contact Level 3; 8 kV air
Electromagnetic RF fields	EN 61000-4-3	Level 3; 10 V/m ¹ 80 MHz - 1 GHz
Fast transients (burst)	EN 61000-4-4	Level 4; 2 kV I/O Level 3; 2 kV power
RF conducted interference	EN 61000-4-6	Level 3; 10 V/rms ² 150 KHz - 80 MHz

Emissions to EN 50081-2

RF interference	EN 55011	Enclosure class A Power mains class A
-----------------	----------	--

Notes:

¹ Self-recoverable loss of performance during EMI disturbance at 10 V/m:

Measurement input signal may deviate during EMI disturbance.

For operation without loss of performance:

Install one ferrite core one turn, RLC #FCOR0000 or equivalent, to I/O cables at unit.

² Self-recoverable loss of performance during EMI disturbance at 10 Vrms:

Process and analog output signal may deviate during EMI disturbance.

For operation without loss of performance:

Install one ferrite core one turn, RLC #FCOR0000 or equivalent, to I/O cables and power cable at unit.

Refer to the EMC Installation Guidelines section of this bulletin for additional information.

- ENVIRONMENTAL CONDITIONS:**

Operating Temperature Range: 0 to 50°C

Storage Temperature Range: -40 to 80°C

Operating and Storage Humidity: 85% max relative humidity (non-condensing) from 0°C to 50°C

Altitude: Up to 2000 meters

- CONNECTION:** Wire-clamping screw terminals

CONSTRUCTION: Black plastic alloy case and collar style panel latch. Panel latch can be installed for vertical or horizontal instrument stacking. Black plastic textured bezel with transparent display window. Controller meets NEMA 4X/IP65 requirements for indoor use when properly installed. Installation Category II, Pollution Degree 2.

- WEIGHT:** 6.3 oz (179 g)

Input Specifications

1. SENSOR INPUT:

Sample Period: 100 msec (10Hz rate)

Step Response Time: 300 msec typical, 400 msec max to within 99% of final value with step input.

Failed Sensor Response:

Main Control Output(s): Programmable preset output
Display: "OPEN"

Alarms: Upscale drive

Analog Output: Upscale drive when assigned to retransmitted input.

Normal Mode Rejection: >40 dB @ 50/60 Hz

Common Mode Rejection: >120 dB, DC to 60 Hz

Overvoltage Protection: 120 VAC @ 15 sec max

2. THERMOCOUPLE INPUTS: (T16 only)

Types: T, E, J, K, R, S, B, N, C, and Linear mV

Input Impedance: 20 MΩ for all types

Lead Resistance Effect: 0.25 μV/Ω

Cold Junction Compensation: Less than ±1°C typical (1.5°C max) error over ambient temperature range.

Resolution: 1° for types R, S, B and 1° or 0.1° for all other types

TYPE	DISPLAY RANGE	WIRE COLOR		STANDARD
		ANSI	BS 1843	
T	-200 to +400°C -328 to +752°F	(+) Blue (-) Red	(+) White (-) Blue	ITS-90
E	-200 to +750°C -328 to +1382°F	(+) Violet (-) Red	(+) Brown (-) Blue	ITS-90
J	-200 to +760°C -328 to +1400°F	(+) White (-) Red	(+) Yellow (-) Blue	ITS-90
K	-200 to +1250°C -328 to +2282°F	(+) Yellow (-) Red	(+) Brown (-) Blue	ITS-90
R	0 to +1768°C +32 to +3214°F	No standard	(+) White (-) Blue	ITS-90
S	0 to +1768°C +32 to +3214°F	No standard	(+) White (-) Blue	ITS-90
B	+149 to +1820°C +300 to +3308°F	No standard	No standard	ITS-90
N	-200 to +1300°C -328 to +2372°F	(+) Orange (-) Red	(+) Orange (-) Blue	ITS-90
C W5/W6	0 to +2315°C +32 to +4199°F	No standard	No standard	ASTM E988-96
mV	-5.00 mV to 56.00 mV	N/A	N/A	N/A

3. RTD INPUTS: (T16 only)

Type: 2 or 3 wire

Excitation: 150 μA typical

Lead Resistance: 15 Ω max per input lead

Resolution: 1° or 0.1° for all types

TYPE	INPUT TYPE	RANGE	STANDARD
385	100 Ω platinum, Alpha = .00385	-200 to +600°C -328 to +1112°F	IEC 751
392	100 Ω platinum, Alpha = .003919	-200 to +600°C -328 to +1112°F	No official standard
672	120 Ω nickel, Alpha = .00672	-80 to +215°C -112 to +419°F	No official standard
Ohms	Linear Resistance	0.0 to 320.0 Ω	N/A

4. TEMPERATURE INDICATION ACCURACY: (T16 only)

± (0.3% of span, +1°C) at 23 °C ambient after 20 minute warm up. Includes NIST conformity, cold junction effect, A/D conversion errors and linearization conformity.

Span Drift (maximum): 130 PPM/°C

5. SIGNAL INPUT: (P16 only)

INPUT RANGE	ACCURACY *	IMPEDANCE	MAX CONTINUOUS OVERLOAD	RESOLUTION
10 VDC (-1 to 11)	0.30 % of reading +0.03V	1 MΩ	50 V	10 mV
20 mA DC (-2 to 22)	0.30 % of reading +0.04mA	10 Ω	100 mA	10 μA

* Accuracies are expressed as ± percentages over 0 to 50 °C ambient range after 20 minute warm-up.

6. USER INPUT: (Only controllers with alarms have a user input terminal.) Internally pulled up to +7 VDC (100 KΩ), $V_{IN\ MAX} = 35\ V$, $V_{IL} = 0.6\ V$ max, $V_{IH} = 1.5\ V$ min, $I_{OFF} = 40\ \mu A$ max

Response Time: 120 msec max

Functions: Programmable

Output Specifications

1. CONTROL AND ALARM OUTPUTS:

Relay Output:

Type: Form A

Contact Rating: 3 A @ 250 VAC or 30 VDC; 1/10 HP @ 120 VAC (inductive load)

Life Expectancy: 100,000 cycles at max. load rating
(Decreasing load and/or increasing cycle time, increases life expectancy)

Logic/SSR Output (main control output only):

Rating: 45 mA max @ 4 V min., 7 V nominal

2. MAIN CONTROL:

Control: PID or On/Off

Output: Time proportioning or DC Analog

Cycle Time: Programmable

Auto-Tune: When selected, sets proportional band, integral time, derivative time, and output dampening time. Also sets input filter and (if applicable) cooling gain.

Probe Break Action: Programmable

3. ALARMS: (optional) 2 relay alarm outputs.

Modes:

None

Absolute High Acting (Balanced or Unbalanced Hysteresis)

Absolute Low Acting (Balanced or Unbalanced Hysteresis)

Deviation High Acting

Deviation Low Acting

Inside Band Acting

Outside Band Acting

Heat (Alarm 1 on Analog Output models only)

Cool (Alarm 2)

Reset Action: Programmable; automatic or latched

Standby Mode: Programmable; enable or disable

Hysteresis: Programmable

Sensor Fail Response: Upscale

Annunciator: "A1" and "A2" programmable for normal or reverse acting

4. COOLING: Software selectable (overrides Alarm 2).

Control: PID or On/Off

Output: Time proportioning

Cycle Time: Programmable

Proportional Gain Adjust: Programmable

Heat/Cool Deadband Overlap: Programmable

5. ANALOG DC OUTPUT: (optional)

Action: Control or retransmission

Update Rate: 0.1 to 250 sec

OUTPUT RANGE **	ACCURACY *	COMPLIANCE	RESOLUTION
0 to 10 V	0.3% of FS + ½ LSD	10 kΩ min	1/8000
0 to 20 mA	0.3% of FS + ½ LSD	500 Ω max	1/8000
4 to 20 mA	0.3% of FS + ½ LSD	500 Ω max	1/6400

* Accuracies are expressed as ± percentages over 0 to 50 °C ambient range after 20 minute warm-up.

** Outputs are independently jumper selectable for either 10 V or 20 mA. The output range may be field calibrated to yield approximately 5% overrange and a small underrange (negative) signal.

Ordering Information

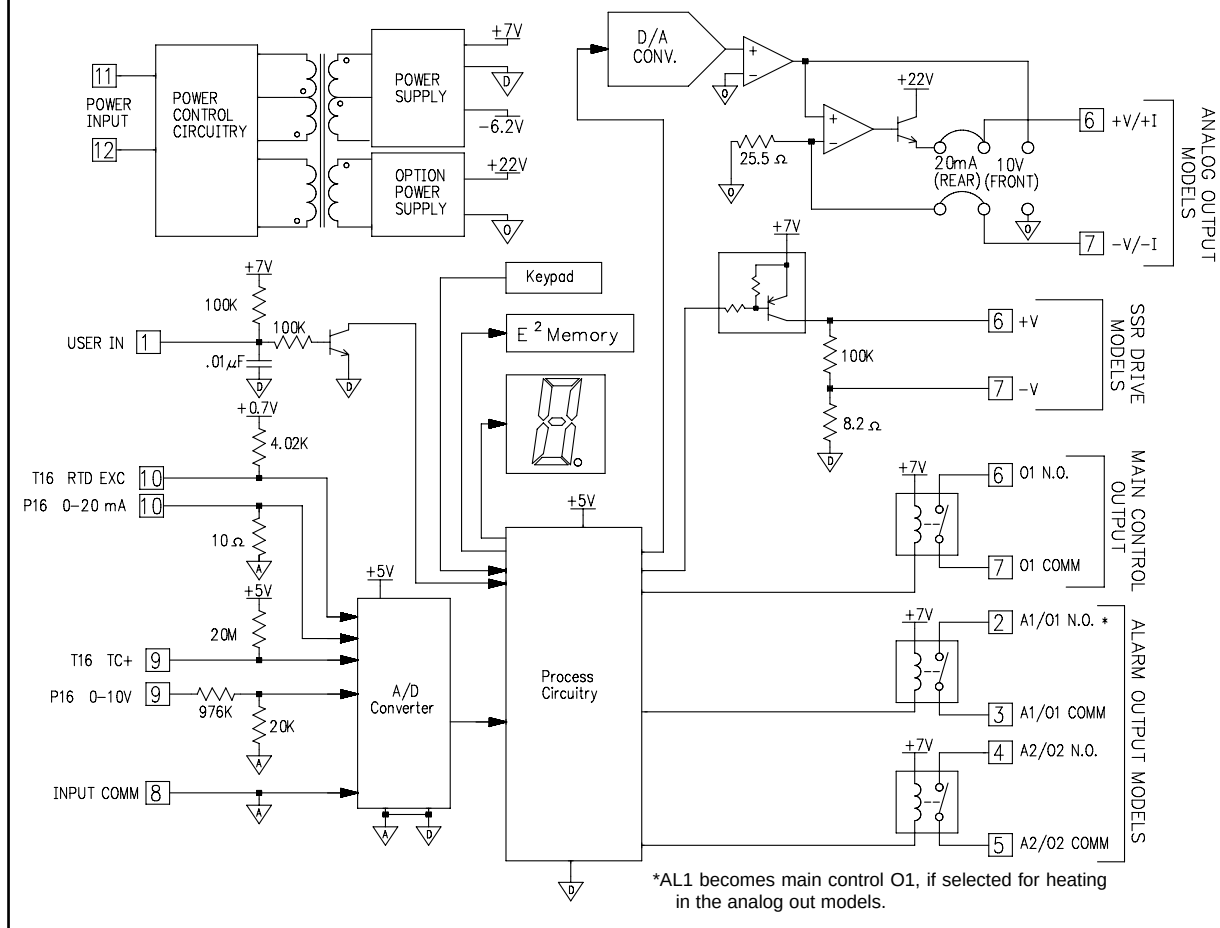
MODEL NO.	MAIN CONTROL	2 ALARMS & USER INPUT	PART NUMBERS	
			18-36 VDC/24 VAC	85 to 250 VAC
T16	Relay	—	T1610010	T1610000
	Relay	Yes	T1611110	T1611100
	Logic/SSR	—	T1620010	T1620000
	Logic/SSR	Yes	T1621110	T1621100
	Analog Out *	Yes	T1641110	T1641100
P16	Relay	—	P1610010	P1610000
	Relay	Yes	P1611110	P1611100
	Logic/SSR	—	P1620010	P1620000
	Logic/SSR	Yes	P1621110	P1621100
	Analog Out *	Yes	P1641110	P1641100

* Analog out may be used for retransmitted signals. When using analog output for retransmitted signals, AL1 becomes main control O1, if selected for heating in the analog out models.

ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBERS
TP16	Programming Kit 1 : Includes Software, Comms Module w/ 9-pin connector and cable, and 115 VAC Power Adapter	TP16KIT1
	Programming Kit 2 : Includes Software, Comms Module w/ 9-pin connector and cable	TP16KIT2
RLY	External SSR Power Unit (for Logic/SSR models)	RLY50000
	Single Phase Din Rail Mount Solid State Relay	RLY60000
	Three Phase Din Rail Mount Solid State Relay	RLY70000

BLOCK DIAGRAM



Q-Series Miniature Circuit Breakers



Product Type		QL	QY	QZ	QDC	
Standard Ampere Ratings (A)			0.1 – 63 (1 pole)	0.1 – 60 (UL 1077)	0.1 – 63 (1 pole)	
			0.1 – 50 (2 poles)	5 – 50 (IEC 60947-2)	0.1 – 50 (2 poles)	
		0.1 – 25	20 – 100 (2p parallel)		20 – 100 (2p parallel)	
			110 – 150 (3p parallel)		110 – 150 (3p parallel)	
Number of Poles		1, 2, 3, 1+N, 3+N	1, 2	1, 2, 3, 1+N, 3+N	1, 2	
			2, 3p parallel		2, 3p parallel	
					2 poles in series	
Rated Voltage (V)		120V AC (1p)	80V DC	120V AC (1p)	80V DC	
		120/240V AC(2p)	125V DC (1, 2p & 2p	240V AC (1p)	125V DC (1, 2p & 2p	
		240V AC (1p)	parallel)	240/415V AC (2, 4p)	parallel)	
		240/415V AC 2, 4p)	Polarity sensitive	277V AC (1p)	250V DC (2p in series)	
Approvals & Interrupt. Capacity (kA)				277/480V AC (2, 3p)	Polarity sensitive	
		VDE (EN 60947-2)	6kA (240/415V AC)	10kA	3kA (240/415V AC)	10kA
		CE	✓	✓	✓	✓
		cULus (UL489_CSA)	10kA (120/240V AC)			
		UL489A	✓	10kA		
Mounting Options	cURus (UL1077_CSA)	✓		5kA (1p, 120V ac)		
				5kA (277/480V ac)		
	Dual Mounting (DIN & Mini)	✓	✓	✓	✓	
	DIN Rail	✓	✓	✓	✓	
	Surface Clip	✓	✓	✓	✓	
	Plug-in		✓		✓	
Tripping curves		1, 9, KM	OP, U2, I, 9	1, 2, 3, 9	OP, U2, I, 9	
Resistance to shock			IEC 60068-2-27, 5G/30ms half sine wave			
Vibration			IEC 77/IEC 60068-2-6, 3G/10-150Hz			
Operating temperature			-40°C to +65°C			
Optional Accessories		– Aux. switch		– Trip alarm		
		– Aux. switch + trip alarm		– Bus bar		
		– Handle lock				
Features		– Compact 13mm/module width		– Hydraulic-magnetic technology		
		– Precision tripping		– Suitable for isolation		
		– Temperature independent trip point		– Mid trip handle		

Q-Series Miniature Circuit Breakers

Features



QL

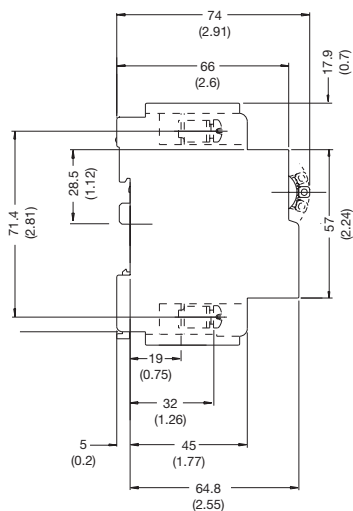
- AC circuit breaker
- UL 489 Listed
- VDE, CSA, CE Approved
- One and two pole units
- Current ratings up to 25A

QY

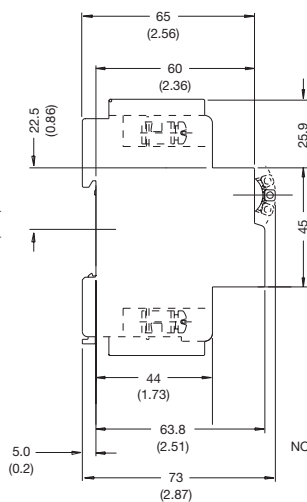
- DC circuit breaker
- UL 489A listed
- VDE & CE Approved
- One and two pole units
- Current ratings up to 150A
- 80V dc & 125V DC

QDC

- DC circuit breaker
- VDE and CE Approved
- One and two pole units
- Current ratings up to 150A
- 80V DC 125V DC and 250V DC (250V DC 2 poles in series)



DUAL MOUNT



DIN RAIL MOUNT

NOTE: DIMENSIONS IN BRACKETS ARE IN "INCHES"

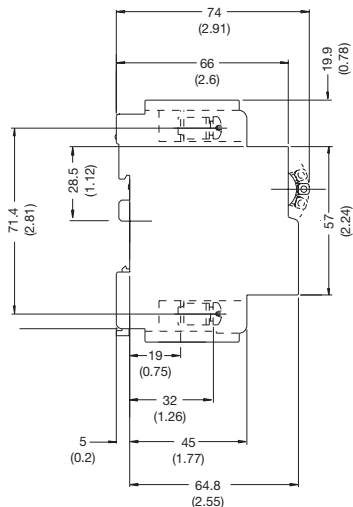
**QY/QDC, 2 & 3 POLES
BRIDGED IN PARALLEL**

Features

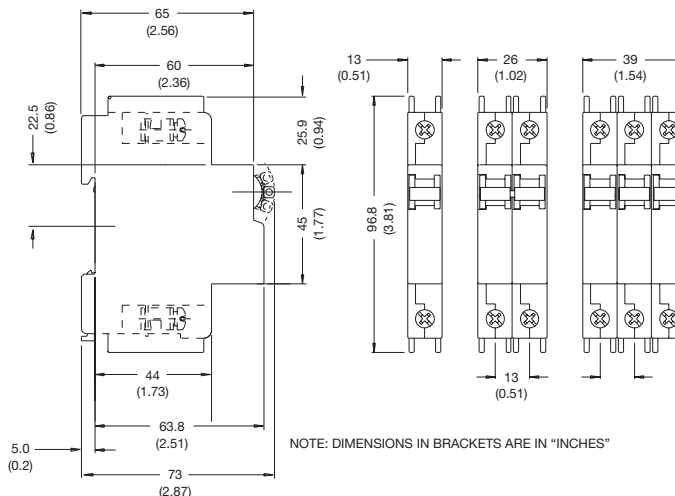


QZ

- AC circuit breaker
- UL 1077 Recognized
- VDE, CE, CSA certified
- One, two and three pole units
- Current ratings up to 60A



DUAL MOUNT



DIN RAIL MOUNT

NOTE: DIMENSIONS IN BRACKETS ARE IN "INCHES"

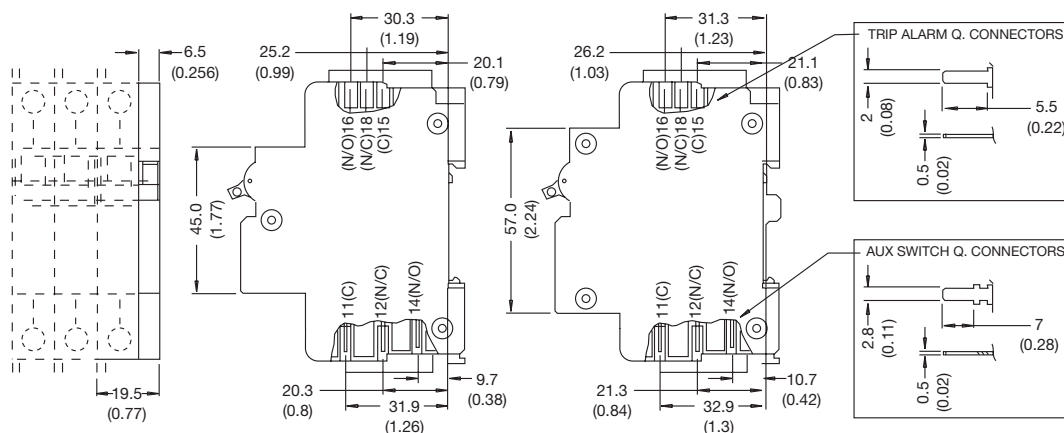
Q-Series Miniature Circuit Breakers

Features



Auxiliary switch, Trip alarm, Combo

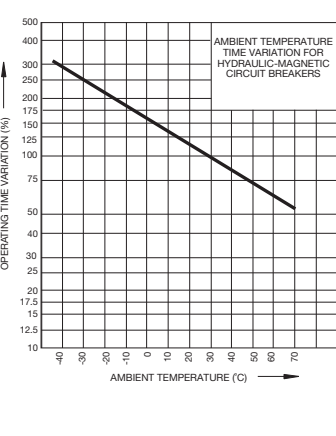
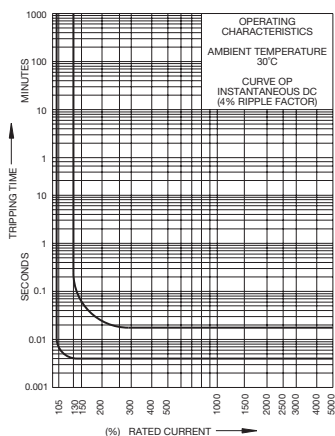
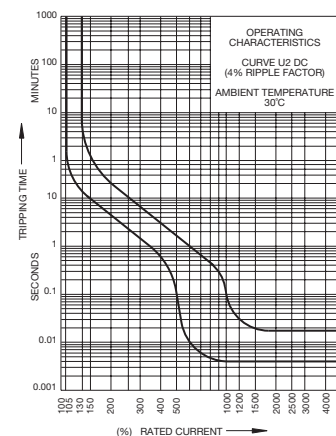
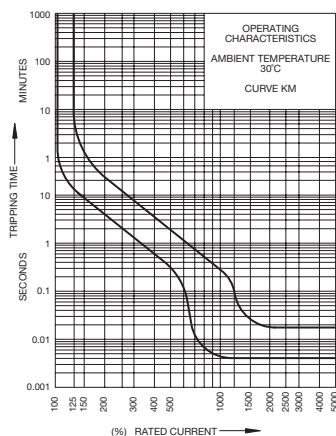
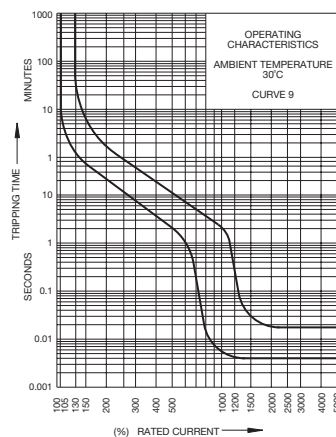
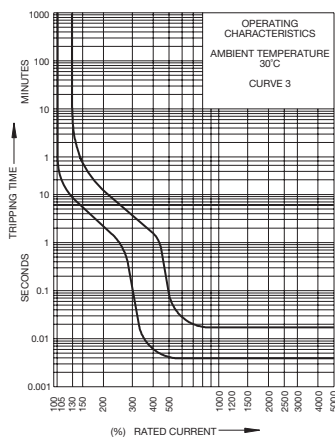
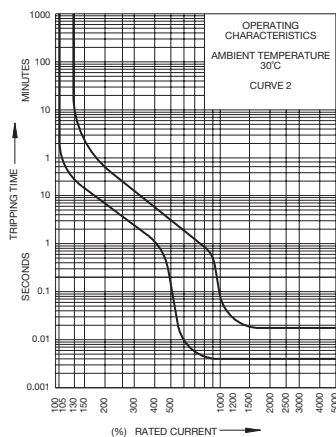
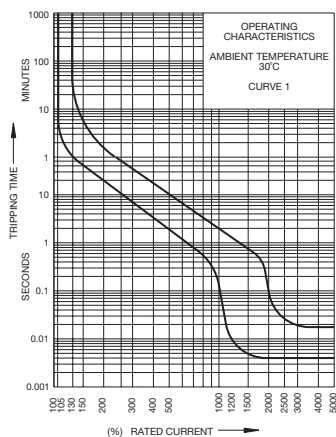
- AC and DC voltages
- UL 489 listed
(5A, 250V AC; 0.5A, 80V DC Auxiliary; 0.5A, 125V DC Trip alarm)
- IEC 60947-5-1 approved
(5A, 250V AC; 0.5A, 110V DC Auxiliary; 0.5A, 125V DC Trip alarm)
- Factory fitted
- Compact 6.5mm width
- Attached to right hand side of circuit breaker
- Available on Dual and DIN rail mounting



DIN RAIL MOUNT

DUAL MOUNT

Standard Time Delay Curves



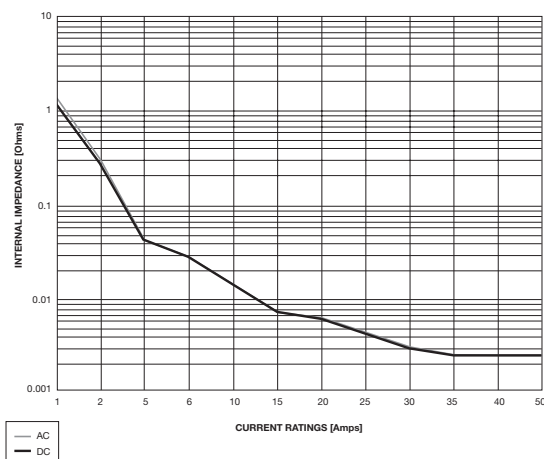
Q-Series Miniature Circuit Breakers

Long Code

Long Code			
Group 1: Frame Type	Code	Frequency	Approvals
	QL	AC	UL 489
	QY	DC	UL489A,VDE, CE
	QZ	AC	CURus,VDE,CE
	QDC	DC	EN 60947-2, CE
Group 2:	Code	Description	Comments
	N	Neutral	Leave blank if not applicable
	S	Switch	
Group 3: Auxiliary	Code	Description	Comments
	A	Auxiliary Switch	Leave blank if not applicable
	T	Trip Alarm	
	AT	Auxiliary Switch + Trip Alarm	
Group 4: Number of Poles	Code	Description	Comments
	1	Single Pole	
	2	Double Pole	
	3	Triple Pole	
	4	Four Pole	
Group 5: Module width	Code	Description	Comments
	13	13mm	
	18	18mm	
	19	19.5mm	
	26	26mm	
Group 6: Mounting	Code	Description	Comments
	D	DIN – 45mm Escutcheon	
	DM	Dual Mount – DIN & Mini-Rail, 57mm Escutcheon	
	PI	Plug-in, DIN	
	P2	Plug-in, Dual Mount	
Group 7: Time Delays	Code	Description	Comments
	1	Curve 1	
	2	Curve 2	
	3	Curve 3	
	9	Curve 9	
	U2	Curve U2	
	KM	Curve KM	
	OP	Instantaneous	
Group 8: Current Ratings	Code	Description	Comments
	0.1	0.1A	
	0.2	0.2A	
	0.5	0.5A	
	01	1A	
	1.5	1.5A	
	02	2A	
	2.5	2.5A	
	03	3A	
	04	4A	
	05	5A	
	06	6A	
	10	10A	
	15	15A	
	16	16A	
	20	20A	
	25	25A	
	30	30A	
	32	32A	
	35	35A	
	40	40A	
	45	45A	
	50	50A	
	60	60A	
	63	63A	
	70	70A	
	80	80A	
	100	100A	
	125	125A	
	150	150A	
Group 9:	Code	Description	Comments
	B0	80V DC Bottom Connected (Positive at bottom)	Leave blank if not applicable
	B1	125V DC Bottom Connected (Positive at bottom)	
	B2	250V DC Bottom Connected (Positive at bottom)	
	Z	DC – Bridged (Link not supplied)	

Example codes: QY-1(13)-D-U2-20A-B1
QDC-2(13)-DM-U2-50A-B2
QL-A-2(13)-D-9-25A
QZ-N-AT-4(13)-DM-60A

INTERNAL IMPEDANCE vs CURRENT RATING



A member of the REUNERT Group

South Africa

CBI-electric: low voltage
Tripswitch Drive Elandsfontein
Gauteng South Africa
Tel: +27 11 928 2000
Fax: +27 11 392 2354
E-mail: cbi@cbi-electric.com
Website: www.cbi-electric.com

Germany

Circuit Breaker Industries GmbH
Postfach 101240 D-86882
Landsberg Germany
Tel: +49 8191 9472900
Fax: +49 8191 94729011
E-mail: office@cbibreakers.de
Website: www.cbibreakers.com

USA

Circuit Breaker Industries Inc
35E Uwchlan Ave Suite 328
Exton PA 19341 USA
Tel: +91 610 524 9949
Fax: +91 610 524 9945
E-mail: info@cbibreakers.com
Website: www.cbibreakers.com

Australia

Heinemann Electric (Pty) Ltd
821 Springvale Road Mulgrave Melbourne
Victoria 3170 Australia
Tel: +61 3 9560 3522
Fax: +61 3 9562 0420
E-mail: heinelec@heinelec.com.au
Website: www.heinemannelectric.com.au

**General ordering data**

Material No.	1010100000
Short text for material	WPE 4
Description of part	PE terminals
EAN	4008190039820

Approvals

Approvals

**CSA rating data**

Max. rated cross-section (CSA)	AWG 10
Min. rated cross-section (CSA)	AWG 26

Dimensions

Width	6.1 mm
TS 35 offset	11 mm
Height of lowest version	47 mm
Length	60 mm

PE rating data

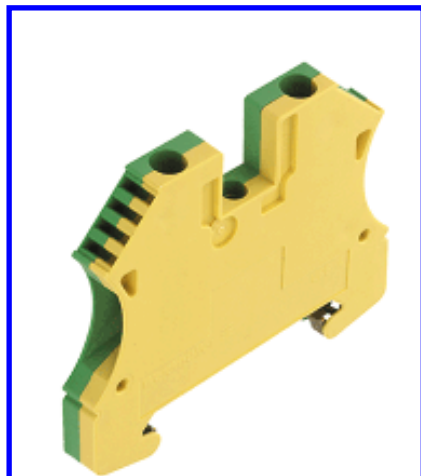
Torque rating with electric screwdriver type DMS 2	
Rated short-time current	480 A (4 mm ²)
Centre screw on PE terminals	M 3
Pollution severity	3
Rated impulse voltage for adjacent terminal	8 kV
PEN-Function	no
Tightening torque range fixing screw	0.5...0.8 Nm
Rated cross-section	4 mm ²
Rated voltage for adjacent terminal	800 V
Norm	IEC 60947-7-2

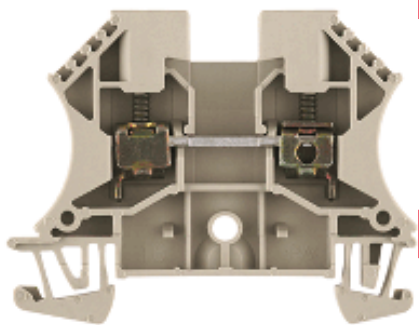
Rating data EN 60079-7

Marking Ex-RL 94/9 EEC	Ex II 2 G D
Marking Ex-RL 94/9 EEC	II 2 G D
Marking EN 60079-7	Ex e II
EC conformity verification certificate	KEMA 98ATEX1683 U

UL rating data

Max. conductor cross-section (UL)	AWG 10
Min. conductor cross-section (UL)	AWG 22





General ordering data

Material No.	1020100000
Short text for material	WDU 4
Description of part	Feed-through terminal 4 mm ²
EAN	4008190150617

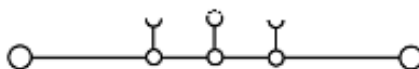
Approvals

Approvals



CSA rating data

CSA current	35 A
Max. rated cross-section (CSA)	AWG 10
Min. rated cross-section (CSA)	AWG 26
Voltage CSA	600 V



Conductors for clamping (2) with equal cross-section (rated connection)

Flexible, min.	0.5 mm ²
Flexible with ferrule, min. (DIN 46228 pt 1)	0.5 mm ²
Solid, min.	0.5 mm ²
Solid, max.	2.5 mm ²
Flexible, max.	1.5 mm ²
Flexible with ferrule, max. (DIN 46228 pt 1)	1.5 mm ²

Dimensions

TS 35 offset	15 mm
Width	6.1 mm
Height of lowest version	47 mm
Length	60 mm
Weight	10.40 g

Rating data EN 60079-7

Marking EN 60079-7	Ex e II
Current EEx e	28 A
Voltage at cross-connection DU+QV/PE	420 V
EC conformity verification certificate	KEMA 98ATEX1683 U
Voltage EEx e	690 V
Voltage at cross-connection DU+QV/PE with AP	750 V
Voltage EEx i EN 50020	60 V
Voltage at cross-connection DU+QV/DU	750 V
Marking Ex-RL 94/9 EEC	Ex II 2 G D
Marking Ex-RL 94/9 EEC	II 2 G D
Voltage at cross-connection DU+QV skipping	110 V

UL rating data

Current (UL)	35 A
Max. conductor cross-section (UL)	AWG 10
Min. conductor cross-section (UL)	AWG 22
Voltage UL	600 V

additional technical data

Type of connection	screwed
No. of identical terminals	1
Version	Feed-through terminal
End plate required	yes
Explosion-tested version "EEx e"	yes
Number of terminal strips per level	2
Levels, internally cross connected	no
Type of mouting	clipped
Flammability class of insulation material acc. to UL 94	V-0
Installation advice	TS 35
Colour of insulating material	dark beige
Insulation material	Wemid
Open sides	right
Range of operating temperature	- 50 °C, + 120 °C
Connection direction	sideways
Product family	W-Series
Number of levels	1



Two-tier modular terminals

In the WDK two-tier modular terminals two potentials are fed through one terminal.

The following versions are available:

- feed-through two-tier modular terminal (WDK ...)
- interconnected version with internal bridging of both levels (WDK ... V)
- combined feed-through/PE system terminal (WDK... DU-PE)
- two-tier terminal with electronics (WDK.../D - diode, LD - LED, R - resistor)

Another distinguishing feature is the availability of different types of cross-connection for potential distribution: screw (WQV) or plug-in (ZQV).

Products

Material No.	Short text for material	Rated cross-section
1041600000	WDK 2.5N	2.5 mm ²
1041650000	WDK 2.5N DU-PE	2.5 mm ²
7916730000	WDK 2.5N DU-PE/E	2.5 mm ²
1041610000	WDK 2.5N V	2.5 mm ²
7916720000	WDK 2.5N V/E	2.5 mm ²
1812570000	WDK 2.5N V/E BL	2.5 mm ²
1041800000	WDK 2.5N/10	
1041700000	WDK 2.5N/10 (0-9)	
1041680000	WDK 2.5N BL	2.5 mm ²
7916690000	WDK 2.5N/E	2.5 mm ²
7916700000	WDK 2.5N/E BL	2.5 mm ²
1041660000	WDK 2.5N OR	2.5 mm ²
1041900000	WDK 4N	4 mm ²
1041980000	WDK 4N BL	4 mm ²
1041950000	WDK 4N DU-PE	4 mm ²
7916780000	WDK 4N DU-PE/E	4 mm ²
1041960000	WDK 4N OR	4 mm ²
1041910000	WDK 4N V	4 mm ²

General ordering data

Material No.	1041900000
Short text for material	WDK 4N
Description of part	Feed-through terminals
EAN	4032248138814

Approvals

Approvals

**CSA rating data**

CSA current	30 A
Max. rated cross-section (CSA)	AWG 10
Min. rated cross-section (CSA)	AWG 26
Voltage CSA	300 V

Conductors for clamping (2) with equal cross-section (rated connection)

Flexible, min.	0.5 mm ²
Flexible with ferrule, min. (DIN 46228 pt 1)	0.5 mm ²
Solid, min.	0.5 mm ²
Solid, max.	1.5 mm ²
Flexible, max.	1.5 mm ²
Flexible with ferrule, max. (DIN 46228 pt 1)	1.5 mm ²

Dimensions

Width	6.1 mm
TS 35 offset	13 mm
Height of lowest version	64.1 mm
Length	60.7 mm

Rating data EN 60079-7

Voltage EEx e	550 V
Voltage EEx i EN 50020	60 V
Voltage at cross-connection DU+QV/DU	550 V
Marking Ex-RL 94/9 EEC	II 2 G D
Voltage at cross-connection DU+QV skipping	275 V
Voltage at cross-connection DU+QV/PE	550 V
Marking Ex-RL 94/9 EEC	Ex II 2 G D
Marking EN 60079-7	Ex e II
Current EEx e	28 A
EC conformity verification certificate	KEMA 00ATEX2061 U

UL rating data

Current (UL)	35 A
Max. conductor cross-section (UL)	AWG 10
Min. conductor cross-section (UL)	AWG 26
Voltage UL	600 V

rating data

Rated cross-section	4 mm ²
Rated voltage	800 V
Rated impulse voltage	8 kV
Rated current	32 A
Norm	IEC 60947-7-1
Current for max. conductor	35 A
Pollution severity	3

information boxes, print catalogue

Notes, technical data

Rated voltage 400 V when using cross-connection ZQV
2 conductors 1.5mm², solid, require a tightening torque of 0.6 Nm.

isolating terminals

Torque rating with electric screwdriver type DMS 2

Related products

Material No.	Short text for material	Rated cross-section
1041600000	WDK 2.5N	2.5 mm ²
1041650000	WDK 2.5N DU-PE	2.5 mm ²
7916730000	WDK 2.5N DU-PE/E	2.5 mm ²
1041610000	WDK 2.5N V	2.5 mm ²
7916720000	WDK 2.5N V/E	2.5 mm ²
1812570000	WDK 2.5N V/E BL	2.5 mm ²
1041800000	WDK 2.5N/10	
1041700000	WDK 2.5N/10 (0-9)	
1041680000	WDK 2.5N BL	2.5 mm ²
7916690000	WDK 2.5N/E	2.5 mm ²
7916700000	WDK 2.5N/E BL	2.5 mm ²
1041660000	WDK 2.5N OR	2.5 mm ²
1041980000	WDK 4N BL	4 mm ²
1041950000	WDK 4N DU-PE	4 mm ²
7916780000	WDK 4N DU-PE/E	4 mm ²
1041960000	WDK 4N OR	4 mm ²
1041910000	WDK 4N V	4 mm ²



General ordering data

Material No.	1061200000
Short text for material	WEW-35/2
Description of part	End bracket for TS 35
EAN	4008190030230

Approvals

Approvals



Related products

Material No.	Short text for material
0383560000	EW 35
1805610000	MEW 35/1
1059000000	WEW 35/1
9540000000	ZEW 35
8630740000	ZEW 35/2



General ordering data

Material No.	1050000000
Short text for material	WAP 2.5-10
Description of part	End plate, Wemid
EAN	4008190103149

Approvals

Approvals



Dimensions

Width	1.5 mm
Length	56 mm

additional technical data

Flammability class of insulation material acc. to UL 94

end cover plate

Colour	dark beige
Width	1.5 mm
Length	56 mm
Can be snapped in	no
Height	34 mm
Function	End plate
Material	Wemid
Flammability class of insulation material acc. to UL 94	

Related products

Material No.	Short text for material
1050080000	WAP 2.5-10 BL
1050070000	WAP 2.5-10 BR
1050020000	WAP 2.5-10 GE
1072200000	WAP 2.5-10 GN
1050050000	WAP 2.5-10 GR
1050060000	WAP 2.5-10 OR
1050040000	WAP 2.5-10 RT
1050010000	WAP 2.5-10 SW
1072210000	WAP 2.5-10 VI
1050090000	WAP 2.5-10 WS

General ordering data

Material No.	1084000000
Short text for material	WAP WDK2.5/4 N
Description of part	End plate
EAN	4032248127351

Approvals

Approvals	n.a.
-----------	------

Dimensions

Width	1.5 mm
Length	60 mm

additional technical data

Flammability class of insulation material acc. to UL 94

end cover plate

Can be snapped in	no
Width	1.5 mm
Flammability class of insulation material acc. to UL 94	
Colour	dark beige
Function	End plate
Height	54 mm
Length	60 mm
Material	Wemid

Related products

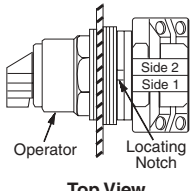
Material No.	Short text for material
1084080000	WAP WDK2.5/4 N BL
1084060000	AP WDK2.5/4N OR

Push Buttons—Class 9001 Type SK—30 mm

Corrosion Resistant Selector Switches

Illuminated 3 Position Selector Switch Operators—UL Types 4, 4X, 13/NEMA 4, 4X, 13

For use in hazardous locations—See page 17-79.
Legend plate and contact block not included unless noted.

CONTACT BLOCK REQUIRED				1—Contact Closed 0—Contact Open									
Contact Block Position	Quantity and Type	Mount on Side		Center		Center		Center		Center		Center	
				Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
 Top View	KA1	KA3	KA1 #2	1	0	0	1	0	0	1	0	0	1
	KA2	KA3	KA2 #2	0	1	1	0	0	1	0	1	0	0
	KA1	KA3	KA1 #1	0	0	1	1	0	0	1	0	0	1
	KA2	KA3	KA2 #1	1	1	0	0	0	1	0	1	0	0
Cam (see page 17-64)				B	C	D	E	F	G	J	L	M	
Illuminated Operators				Type	Type	Type	Type	Type	Type	Type	Type	Type	Price
Manual Return ▲ Without Knob, 110–120 V 50–60 Hz Transformer With Standard Red Knob, 110–120 V 50–60 Hz Transformer Without Knob and Other Voltage Transformer, Flashing or LED ★ Without Knob, Full Voltage Neon or Resistor ▼ With Other Color Knob and Transformer, Flashing or LED ★ With Other Color Knob, Full Voltage Neon or Resistor ▼				SK42J1 SK42J1R SK42J SK42J1R SK42J1R	SK43J1 SK43J1R SK43J SK43J1R SK43J1R	SK44J1 SK44J1R SK44J SK44J1R SK44J1R	SK45J1 SK45J1R SK45J SK45J1R SK45J1R	SK46J1 SK46J1R SK46J SK46J1R SK46J1R	SK47J1 SK47J1R SK47J SK47J1R SK47J1R	SK49J1 SK49J1R SK49J SK49J1R SK49J1R	SK401J1 SK401J1R SK401J SK401J1R SK401J1R	SK402J1 SK402J1R SK402J SK402J1R SK402J1R	\$105. 111. 105. 86. 111. 92.
Spring Return Left To Center ▲ Without Knob, 110–120 V 50–60 Hz Transformer With Standard Red Knob, 110–120 V 50–60 Hz Transformer Without Knob and Other Voltage Transformer, Flashing or LED ★ Without Knob, Full Voltage Neon or Resistor ▼ With Other Color Knob and Transformer, Flashing or LED ★ With Other Color Knob, Full Voltage Neon or Resistor ▼				SK62J1 SK62J1R SK62J SK62J1R SK62J1R	SK63J1 SK63J1R SK63J SK63J1R SK63J1R	SK64J1 SK64J1R SK64J SK64J1R SK64J1R	SK65J1 SK65J1R SK65J SK65J1R SK65J1R	SK66J1 SK66J1R SK66J SK66J1R SK66J1R	SK67J1 SK67J1R SK67J SK67J1R SK67J1R	SK69J1 SK69J1R SK69J SK69J1R SK69J1R	SK601J1 SK601J1R SK601J SK601J1R SK601J1R	SK602J1 SK602J1R SK602J SK602J1R SK602J1R	123. 131. 123. 105. 131. 111.
Spring Return Right To Center ▲ Without Knob, 110–120 V 50–60 Hz Transformer With Standard Red Knob, 110–120 V 50–60 Hz Transformer Without Knob and Other Voltage Transformer, Flashing or LED ★ Without Knob, Full Voltage Neon or Resistor ▼ With Other Color Knob and Transformer, Flashing or LED ★ With Other Color Knob, Full Voltage Neon or Resistor ▼				SK72J1 SK72J1R SK72J SK72J1R SK72J1R	SK73J1 SK73J1R SK73J SK73J1R SK73J1R	SK74J1 SK74J1R SK74J SK74J1R SK74J1R	SK75J1 SK75J1R SK75J SK75J1R SK75J1R	SK76J1 SK76J1R SK76J SK76J1R SK76J1R	SK77J1 SK77J1R SK77J SK77J1R SK77J1R	SK79J1 SK79J1R SK79J SK79J1R SK79J1R	SK701J1 SK701J1R SK701J SK701J1R SK701J1R	SK702J1 SK702J1R SK702J SK702J1R SK702J1R	123. 131. 123. 105. 131. 111.
Spring Return Both Sides To Center ▲ Without Knob, 110–120 V 50–60 Hz Transformer With Standard Red Knob, 110–120 V 50–60 Hz Transformer Without Knob and Other Voltage Transformer, Flashing or LED ★ Without Knob, Full Voltage Neon or Resistor ▼ With Other Color Knob and Transformer, Flashing or LED ★ With Other Color Knob, Full Voltage Neon or Resistor ▼				SK52J1 SK52J1R SK52J SK52J1R SK52J1R	SK53J1 SK53J1R SK53J SK53J1R SK53J1R	SK54J1 SK54J1R SK54J SK54J1R SK54J1R	SK55J1 SK55J1R SK55J SK55J1R SK55J1R	SK56J1 SK56J1R SK56J SK56J1R SK56J1R	SK57J1 SK57J1R SK57J SK57J1R SK57J1R	SK59J1 SK59J1R SK59J SK59J1R SK59J1R	SK501J1 SK501J1R SK501J SK501J1R SK501J1R	SK502J1 SK502J1R SK502J SK502J1R SK502J1R	123. 131. 123. 105. 131. 111.

- ▲ These operators can be ordered complete with contact blocks. For maximum block usage, see page 17-85. Add the "H" number chosen from page 17-80 to the end of the operator type number and add the cost of the "H" number to the operator cost.
■ Add the voltage assembly code as chosen from table on page 17-77.
EXAMPLE: SK43J1 with 60 Vac/dc = SK43J37.
◆ Add the color as chosen from knob color table on page 17-75.
EXAMPLE: SK43J35 with a green gloved-hand knob = SK43J35FG.
★ The knob must be the same color as the LED light module chosen, e.g., for red LED, use red knob.
▼ On neon light modules, use clear knobs only.

Two Color Selector Switch

Used to indicate red in left position and green in right position on illuminated operators.

Knob	Factory Assembled Form Number ^Δ	Price Adder
Standard	Y178	\$19.
Gloved-Hand	Y1781	19.

^Δ Add form number to standard Type number, e.g., Type SK43J1 Form Y178.

Light Modules	page 17-77
Contact Blocks	page 17-78
H Contact Block Assembly Codes	page 17-80
Legend Plates	page 17-81
Accessories	page 17-83
Replacement Parts	page 17-86

For additional information, reference Catalog #9001CT0301.

Push Buttons—Class 9001 Type SK—30 mm

Corrosion Resistant Pilot Lights

SQUARE D
www.SquareD.com
For the most up-to-date information

Pilot Lights—UL Types 4, 4X, 13/NEMA 4, 4X, 13

For use in hazardous locations—See page 17-79.
Legend plate not included.

Description	Voltage	Style	With Red Fresnel Color Cap	With Green Fresnel Color Cap	With Other Color Cap	Price	Without Color Cap	Price
 9001SKP1	110–120 V, 50–60 Hz	Transformer	SKP1R31	SKP1G31	SKP1■	\$102.	SKP1	\$95.
	220–240 V, 50–60 Hz	Transformer	SKP7R31	SKP7G31	SKP7■	102.	SKP7	95.
	24–28 Vac/dc	Full Voltage	SKP35R31	SKP35G31	SKP35■	83.	SKP35	77.
	For other voltages see Table ▲	Transformer, Flashing or LED◆	SKP▲R31	SKP▲G31	SKP▲■	102.	SKP▲	95.
		Full Voltage, Neon or Resistor★	SKP▲R31	SKP▲G31	SKP▲■	83.	SKP▲	77.
 9001SKT1	110–120 V, 50–60 Hz	Transformer	SKT1R31	SKT1G31	SKT1■	131.	SKT1	123.
	220–240 V, 50–60 Hz	Transformer	SKT7R31	SKT7G31	SKT7■	131.	SKT7	123.
	24–28 Vac/dc	Full Voltage	SKT35R31	SKT35G31	SKT35■	111.	SKT35	105.
	For other voltages see Table ▲	Transformer, Flashing or LED◆	SKT▲R31	SKT▲G31	SKT▲■	131.	SKT▲	123.
		Full Voltage, Neon or Resistor★	SKT▲R31	SKT▲G31	SKT▲■	111.	SKT▲	105.
 9001SKTR38	120 Vac Only	Resistor	SKTR38R31	SKTR38G31	SKTR38■	131.	SKTR38	123.
	24–28 Vac Only	Full Voltage	SKTR35R31	SKTR35G31	SKTR35■	131.	SKTR35	123.
	For other voltages see Tables ▲■▼	Full Voltage or Resistor ▼	SKTR▲R31	SKTR▲G31	SKTR▲■	131.	SKTR▲	123.
 Pilot Light For Intrinsically Safe Circuits (NEMA 4X)	Intrinsically safe equipment must not release electrical or thermal energy capable of igniting certain explosive or combustible hazardous atmospheres, for which the equipment has been tested. These pilot lights are intrinsically safe when used with suitable approved barrier or barrier relay. These pilot lights are Factory Mutual (FM) approved. Consult your local Square D sales office for further details. These pilot lights are fully encapsulated—there are no replaceable parts—except for the SK40 ring nut. Use KN100 series plastic legend plates as shown on Pages 17-81 and 17-82.		KP44R	KP44G	KP44Y (Yellow Color Cap)	119.	...	...
	Operating Voltage Range	Nominal Current						
	20–30 Vac/dc	25 mA						
			V max = 32 V I max = 165 mA					

▲ Add the voltage assembly code as chosen from table, page 17-77.

EXAMPLE: SKT▲R31 with 60 Vac red LED voltage = SKT37LRR31.

■ Add the color code as chosen from the color cap table below.

EXAMPLE: SKP1■ with a blue fresnel cap = SKP1L31.

◆ The cap must be the same color as the LED light module chosen, e.g., for green LED, use green color cap.

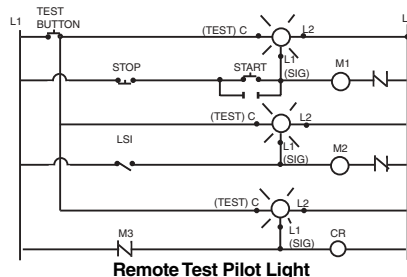
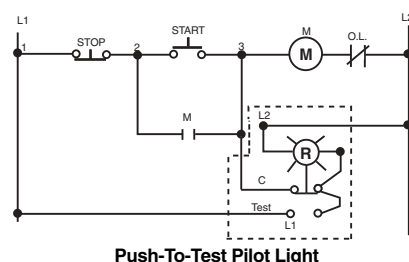
★ On neon light modules, use clear color caps only.

▼ Use only full voltage or resistor voltage assembly codes on remote test pilot lights. Do not choose LED, neon or transformer codes. For AC use only.

Color Caps

Color	■ Plastic Fresnel	■ Plastic Domed
Amber	A31	A9
Blue	L31	L9
Clear	C31	C9
Green	G31	G9
Red	R31	R9
White	W31	W9
Yellow	Y31	Y9

Typical Wiring Diagram



Light Modulespage 17-77
Contact Blockspage 17-78
H Contact Block Assembly Codespage 17-80
Legend Platespage 17-81
Accessoriespage 17-83
Replacement Partspage 17-86

For additional information, reference Catalog #9001CT0301.

Standard Light Modules for Types K, SK, and KX Control Units ★

For use in hazardous locations—See page 17-79.

- Neon type light modules—use CLEAR color caps only.
- LED light modules require that the color cap and the LED be the same color, or use a clear color cap.



Voltage	Description	For Use With Single Lamp III. Operators as Indicated ▲	Light Module Type ♦	Price of Light Module	Voltage Assembly Code	Rating	Replacement Lamp Part Number ♦ ▼	Price of Replacement Lamp
6 Vac/dc	Full Voltage	All	KM31	\$57.	31	.9 VA	2550101020	\$8.30
12–14 Vac/dc	Full Voltage	All	KM32	57.	32	1.2 VA	2550101037	8.30
18 Vac/dc	Resistor	All	KM33	57.	33	1.4 VA	2550101037	8.30
24–28 Vac/dc	Full Voltage	All	KM35	57.	35	1.2 VA	2550101002	8.30
24–28 Vac/dc	LED Red	All Except ■	KM35LR	77.	35LR	.28 VA	6508805210	28.50
24–28 Vac/dc	LED Green	All Except ■	KM35LG	77.	35LG	.28 VA	6508805212	28.50
24–28 Vac/dc	LED Yellow	All Except ■	KM35LY	77.	35LY	.28 VA	6508805211	28.50
24–28 Vac/dc	LED White	All Except ■	KM35LW	77.	35LW	.28 VA	6508805214	28.50
24–28 Vac/dc	LED Blue	All Except ■	KM35LL	77.	35LL	.28 VA	6508805213	28.50
48 Vac/dc	Full Voltage	All	KM36	57.	36	2.6 VA	2550101025	8.30
110–120 V, 50–60 Hz	Transformer	All Except ■	KM1	77.	1	2.4 VA	2550101020	8.30
110–120 V, 50–60 Hz	Flashing	All Except ■	KMF1	77.	F1	.85 VA	2550101036	11.00
120 Vac/dc	Resistor	All	KM38	57.	38	3.0 VA	2550101027	8.30
120 Vac/dc	Full Voltage	All	KM38	57.	38	3.0 VA	2550101027	8.30
120 Vac/dc	Neon	All Except ■	KM11	57.	11	0.2 VA	2550101013	21.90
120 Vac/dc	LED Red	All Except ■	KM38LR	77.	38LR	1.4 VA	6508805210	28.50
120 Vac/dc	LED Green	All Except ■	KM38LG	77.	38LG	1.4 VA	6508805212	28.50
120 Vac/dc	LED Yellow	All Except ■	KM38LY	77.	38LY	1.4 VA	6508805211	28.50
120 Vac/dc	LED White	All Except ■	KM38LW	77.	38LW	1.4 VA	6508805214	28.50
120 Vac/dc	LED Blue	All Except ■	KM38LL	77.	38LL	1.4 VA	6508805213	28.50
208–220 V, 50–60 Hz	Transformer	All Except ■	KM3	77.	3	2.5 VA	2550101020	8.30
220–240 V, 50–60 Hz	Transformer	All Except ■	KM7	77.	7	2.0 VA	2550101020	8.30
240 Vac/dc	Resistor	All Except ■	KM25	57.	25	6.0 VA	2550101027	8.30
240 Vac/dc	Neon	All Except ■ and KX	KM12	57.	12	0.3 VA	2550101013	21.90
277 V, 50–60 Hz	Transformer	All Except ■	KM8	77.	8	2.4 VA	2550101020	8.30
380–480 V, 50–60 Hz	Transformer	All Except ■	KM5	77.	5	2.8 VA	2550101020	8.30
480 Vac/dc	Neon	All Except ■ and KX	KM14	57.	14	0.5 VA	2550101013	21.90
550–600 V, 50–60 Hz	Transformer	All Except ■	KM6	77.	6	2.5 VA	2550101020	8.30

Note: Standard light modules are available in other voltages. Contact your nearest Square D/Schneider Electric sales office for details.

Shallow Depth Light Modules For Types K and SK Control Units ★

For use in hazardous locations—See page 17-79. Reduces the depth of illuminated push buttons with contact blocks by over 33%.



Voltage	Description	Light Module Type ♦	Price of Light Module	Voltage Assembly Code	Rating	Replacement Lamp Part Number ♦	Price of Replacement Lamp
24–28 Vac/dc	Full Voltage	KM55	\$57.	55	1.2 VA	2550101002	\$8.30
110–120 Vac/dc	Full Voltage	KM58	57.	58	3.0 VA	2550101027	8.30

- ▲ 9001K, SK, KX.
- Do not use on any remote test version pilot light.
- ♦ All light modules with an LED above 12 V use a 14 V bipolar LED.
- ★ For use with all operators except KX and remote test pilot.
- ▼ Check light module label for series and replacement number.



File E42259
CCN NKCR



File LR25490
Class 3211 03



marked

For additional information, reference Catalog #9001CT0301.

Slim Line Power Supplies PS5R-S

Features

- Lightweight and Compact in size
- Wide Power Range: 15W – 240W
- Universal Input:
15W to 90W: 85-264V AC/100-370V DC
120W and 240W: 85-264V AC/100-350V DC
- Power Factor Correction (EN61000-3-2) for 60W to 240W
- Meets SEMI F47 Sag Immunity (120W & 240W)
- NEC Class 2 rated (15W, 30W & 60W)
- Approved for Class 1, Div. 2 Hazardous Locations
- Fused input
- Overcurrent protection, auto-reset
- Overvoltage protection, shut down
- Spring-up Screw Terminal type, IP20
- DIN rail or Panel Surface Mount
- Approvals:
CE Marked, TÜV, c-UL, UL 508, UL 1310 (PS5R-SB, -SC, -SD),
UL 1604, EN 50178:1997, LVD: EN60950:2000, EMC: Directive,
EN61204-3:2000 (EMI: Class B, EMS: Industrial)



For more information on these
and other IDEC power supplies, visit:

www.idec.com/powersupply

Specifications

Specifications			New					
Part Numbers	5V DC output	PS5R-SB05	—	—	—	—	—	
	12V DC output	PS5R-SB12	PS5R-SC12	—	—	—	—	
	24V DC output	PS5R-SB24	PS5R-SC24	PS5R-SD24	PS5R-SE24	PS5R-SF24	PS5R-SG24	
Output Capacity		15W (5V Model is 10W)	30W	60W	90W	120W	240W	
Input	Input Voltage (single-phase, 2-wire)		85 to 264 VAC, 100 to 370 VDC				85 to 264V AC, 100 to 350V DC	
	Input Current (maximum)	100VAC	0.45A	0.9A	1.7A	2.3A	1.8A	3.5A
		200VAC	0.3A	0.6A	1.0A	1.4A	1.0A	1.7A
	Internal Fuse Rating		2A	3.15A	3.15A	4A	4A	6.3A
	Inrush Current (cold start)		50A maximum (at 200V AC)					
	Leakage Current (at no load)		132V AC: 0.38 mA maximum 264V AC: 0.75 mA maximum	0.75mA maximum			1mA maximum	
	Typical Efficiency	5V DC	69%	—	—	—	—	—
12V DC		75%	78%	—	—	—	—	
24V DC		79%	80%	83%	82%	84%		
Output	Output Current Ratings	5V DC	2.0A	—	—	—	—	—
		12V DC	1.2A	2.5A	—	—	—	—
		24V DC	0.65A	1.3A	2.5A	3.75A	5A	10A
	Voltage Adjustment		±10% (V. ADJ control on front)					
	Output Holding Time		20ms minimum (at rated input and output)					
	Starting Time		200ms maximum	—	—	—	650ms maximum	500ms maximum
	Rise Time		100ms maximum (at rated input and output)				200ms maximum	
	Line Regulation		0.4% maximum					
	Load Regulation		1.5% maximum					0.8% max
	Temperature Regulation		0.05% degree C maximum					
	Ripple Voltage		2% peak to peak maximum (including noise)				1% peak to peak maximum (including noise)	
	Overcurrent Protection		105% or more, auto reset			105 to 130%, auto reset		103 to 110%, auto reset
	Overvoltage Protection		120% min. SHUTDOWN					
	Operation Indicator		LED (green)					
Voltage Low Indication		LED (amber)	—	—	—	LED (amber)		

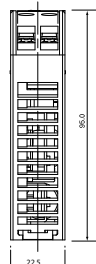
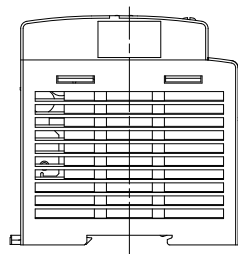
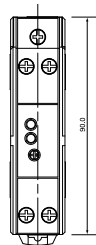
Specifications Con't

	PS5R-SB	PS5R-SC	PS5R-SD	PS5R-SE	PS5R-SF	PS5R-SG
Parallel Operation	No					
Dielectric Strength	Between Input and Ground: 2000 VAC, 1 minute*					
Insulation Resistance	Between Input & Output Terminals: 100 MΩ Min					
Operating Temperature	-10 to +65°C (14 to 149°F)	-10 to 60°C (14 to 140°F)				
Storage Temperature	-25 to 75°C (-13 to +167°F)					
Operating Humidity	20 to 90% relative humidity (no condensation)					
Vibration Resistance	Frequency 10 to 55Hz, Amplitude 0.375mm					
Shock Resistance	300m/s² (30G) 3 times each in 6 axes					
Approvals	EMC: EN61204-3 (EMI: Class B, EMS: Industrial), c-UL (CSA 22.2 No. 14), UL 1604, UL 508, LVD: EN60950, EN50178					
	UL1310 Class 2, c-UL (CSA 22.2 No. 213 and 223)			—	SEMI F47	
Harmonic Directive	N/A			EN61000-3-2 A14 class A		
Weight (approx.)	160g	250g	285g	440g	630g	1000g
Terminal Screw	M3.5 slotted-Phillips head screw (screw terminal type)					
IP protection	IP20 fingersafe					
Dimensions H x W x D (mm)	90 x 22.5 x 95	95 x 36 x 108		115 x 46 x 121	115 x 50 x 129	125 x 80 x 149.5
Dimensions H x W x D (inches)	3.54 x 0.89 x 3.74	3.74 x 1.42 x 4.25		4.53 x 1.81 x 4.76	4.53 x 1.97 x 5.08	4.92 x 3.15 x 5.89

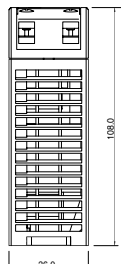
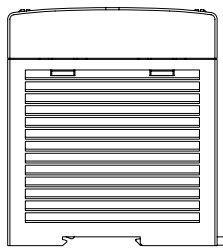
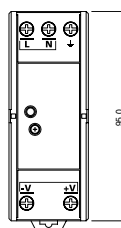
* Between input and output: 3000VAC, 1 minute; Between output and ground: 500VAC, 1 minute

Dimensions

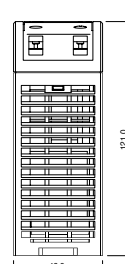
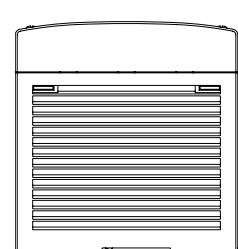
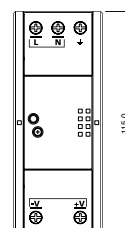
PS5R-SB



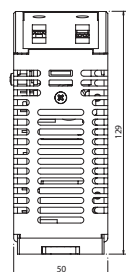
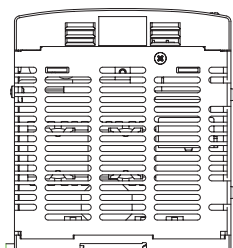
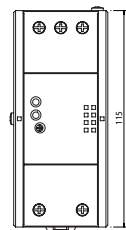
PS5R-SC
PS5R-SD



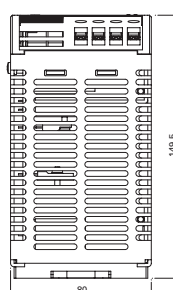
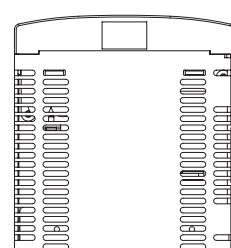
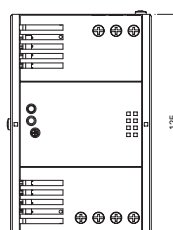
PS5R-SE



PS5R-SF



PS5R-SG



IDEC Corporation
 1175 Elko Drive Sunnyvale, CA 94089
 800-262-IDEC (4332) Fax: 408-745-5258
www.idec.com

©2007 IDEC Corporation. All Rights Reserved.
 Catalog No. PS9Y-DS100-0 04/07 10K

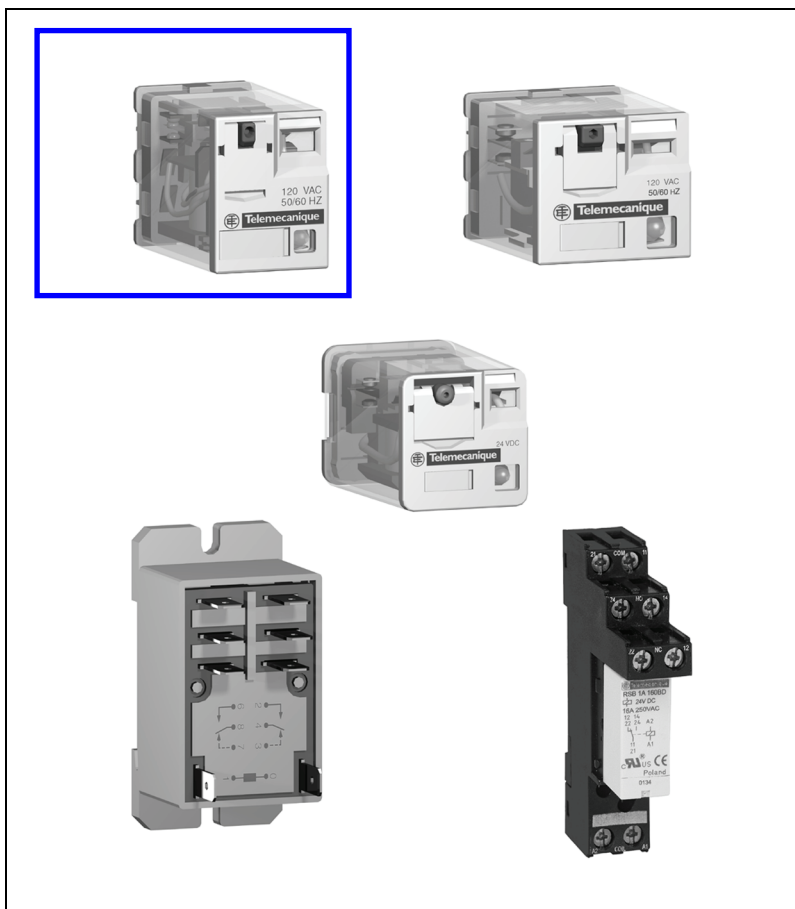
Zelio® Plug-In Relays

RXM, RPM, RUM, RPF, RSB

Class 8501

Catalog
8501CT0601R1/08

08



CONTENTS

Description	Page
Selection Guide	3
RXM Miniature Relays	4
RPM Miniature Power Relays	13
RUM Universal Relays	21
RPF Power Relays	30
RSB Interface Relays	33
General Technical Information	38
Catalog Number Index	40



RXM●AB2F7

RXM Miniature Relays (page 4)

2 pole relays; 12 A, 1/2 hp (IEC rating = 12 A)
3 pole relays; 10 A, 1/3 hp (IEC rating = 10 A)
4 pole relays; 8 A, 1/3 hp (IEC rating = 6 A)
4 pole relays; 3 A (low level), 1/16 hp (IEC rating = 3 A)

- Mechanical “relay status” indicator on all relays
- Pilot light option available
- Manual operator optional for all relays
- Built-in marking area



RPM32F7

RPM Miniature Power Relays (page 13)

1 pole relays; 15 A, 1/2 hp (IEC rating = 15 A)
2 pole relays; 15 A, 1/2 hp (IEC rating = 15 A)
3 pole relays; 15 A, 1/2 hp (IEC rating = 15 A)
4 pole relays; 15 A, 1/2 hp (IEC rating = 15 A)

- Mechanical “relay status” indicator on all relays
- Pilot light option available
- Manual operator optional for all relays
- Built-in marking area



RUM●AB2B7

RUM Universal Relays (page 21)

2 pole relays; 8-pin, tube type; 16 A, 1/3 hp (IEC rating = 10 A)
3 pole relays; 11-pin, tube type; 16 A, 1/3 hp (IEC rating = 10 A)
2 pole relays; 8 blade type; 16 A, 1/3 hp (IEC rating = 10 A)
3 pole relays; 11 blade type; 16 A, 1/3 hp (IEC rating = 10 A)

- Mechanical “relay status” indicator on all relays
- Pilot light option available
- Manual operator optional for all relays
- Built-in marking area



RPF2B●●

RPF Power Relays (page 30)

Two Form C contacts; 30 A
Two Normally Open contacts; 30 A

- DIN track mountable
- Can be mounted directly to a panel



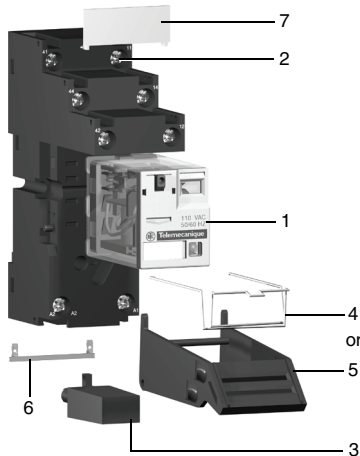
RSB1A160BD
+ RSZE1S48M

RSB Interface Relays (page 33)

Two Form C contacts; 8 A
One Form C contact; 12 A
One Form C contact; 16 A

General Technical Information (page 38)

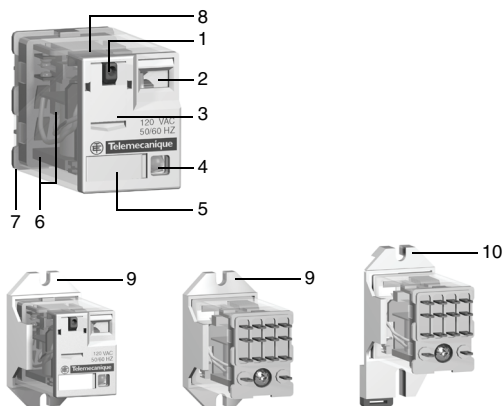
Relay contact types
Utilization categories
Protection categories
Protection modules



Product Description

The RXM miniature relay range consists of:

1. 12 A relays with DPDT contacts, 10 A relays with 3PDT contacts, 6 A relays with 4PDT contacts, and 3 A "low level" relays with 4PDT contacts. All of these relays have the same dimensions.
2. Sockets with mixed or separate contact terminals.
3. Protection modules (diode, RC circuit or varistor). All these modules are common to all sockets.
4. A metal hold-down clip for all sockets.
5. A plastic hold-down clip for all sockets.
6. A 2-pole bus jumper that can be used on sockets with separate contact terminals to simplify wiring when creating a jumper between the coil terminals.
7. Clip-in markers for all the sockets except RXZ E2M114.



Relay Description

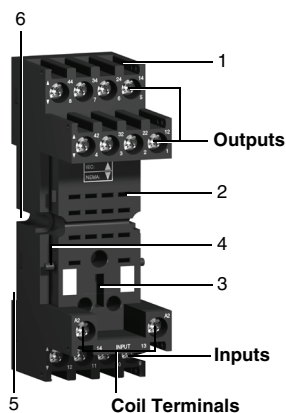
1. Spring return push button for testing the contacts (green: DC, red: AC).
2. Mechanical "relay status" indicator.
3. Optional removable lock-down door and push button, enabling forced maintaining of the contacts for test or maintenance purposes. During operation, this lock-down door must always be in the closed position.
4. Bipolar LED (depending on version) indicating the relay status.
5. Removable marker for relay identification.
6. Four notches for DIN rail mounting adapter or panel mounting adapter.
7. Eight, eleven, or fourteen pins.
8. Area by which the product can be easily gripped.
9. Mounting adapter enabling direct mounting of the relay on a panel.
10. Mounting adapter enabling direct mounting of the relay on a DIN rail.

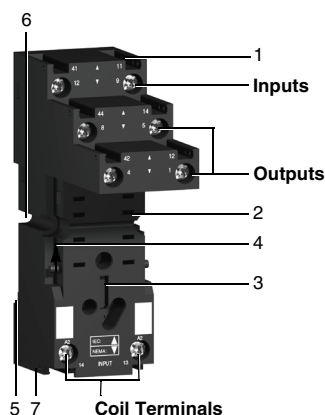
Socket Description

Sockets with Mixed Contact Terminals

1. Connection by screw clamp terminals or box lug connector.
2. Fourteen female contacts for the relay pins.
3. Location for protection modules.
4. Locking components for plastic and metal hold-down clips.
5. Locating slot for mounting on DIN rail.
6. Two or four mounting holes for panel mounting.

NOTE: The inputs are mixed with the relay coil terminals, with the outputs being located on the opposite side of the socket.





Sockets with Separate Contact Terminals

1. Box lug connector.
2. Eight, eleven, or fourteen female contacts for the relay pins.
3. Location for protection modules.
4. Locking components for plastic and metal hold-down clips.
5. Locating slot for mounting on DIN rail.
6. Two mounting holes for panel mounting.
7. Location for bus jumpers (see mounting on sockets on page 11).

NOTE: The inputs and outputs are separated from the relay coil terminals.

General characteristics

Conforming to standards		IEC/EN 61810-1 (iss. 2), UL 508, CSA C22-2 n° 14
Product certifications		cULus File E164862 CCN NLDX, NLDX7; cURus File E164862 CCN NLDX2, NLDX8; CSA pending; CE; RoHS compliant
Ambient air temperature around the device	Storage	-40—185 °F (-40—85 °C)
	Operation	-40—131 °F (-40—55 °C)
Vibration resistance	Conforming to IEC/EN 60068-2-6	> 6 gn (10–50 Hz)
Degree of protection	Conforming to IEC/EN 60529	IP 40
Shock resistance conforming to IEC/EN 60068-2-27	Opening	10 gn
	Closing	5 gn
Protection category (see page 38)		RT I
Mounting position		Any

Insulation characteristics

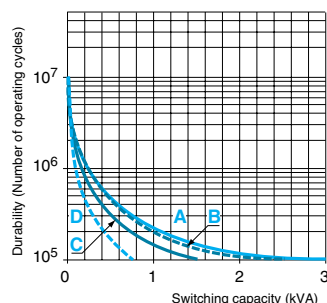
Rated insulation voltage (Ui)		250 V (IEC), 300 V (UL, CSA)
Rated impulse withstand voltage (Uimp)		3.6 kV (1.2/50 µs)
Dielectric strength (rms voltage)	Between coil and contact	2,500 Vac
	Between poles	2,500 Vac
	Between contacts	1,500 Vac

Contact characteristics

Relay type		RXM2AB●●●	RXM3AB●●●	RXM4AB●●●	RXM4GB●●●
Number and type of contacts (see page 12)		DPDT	3PDT	4PDT	4PDT
Contact materials		AgNi			AgAu–Bifurcated
Conventional thermal current (Ith)	For ambient temperature ≤ 131 °F (55 °C)	12 A	10 A	6 A	3 A
	Conforming to IEC in utilization category AC-1	N.O. 6 A	10 A 5 A	6 A 3 A	2 A 1 A
Rated operational current		Conforming to UL Resistive @277 Vac, hp @120 Vac	12 A, 1/2 hp	10 A, 1/3 hp	8 A, 1/3 hp
Maximum operating rate In operating cycles/hour	No load	18,000			
	Under load	1,200			
Switching voltage	Maximum	250 Vac/Vdc			
Switching capacity	Minimum	10 mA on 17 V			2 mA on 5 V
	Maximum	3,000 VA	2,500 VA	1,500 VA	750 VA
Utilization coefficient		20%			
Mechanical durability in millions of operating cycles		10			
Electrical durability in millions of operating cycles	Resistive load	0.1			

Electrical durability of contacts

Resistive load AC



A=RXM2AB●●● B=RXM3AB●●● C=RXM4AB●●● D=RXM4GB●●●

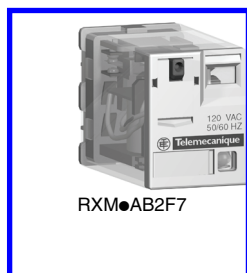
Coil characteristics

Average consumption		AC	1.2 VA								
		DC	0.9 W								
Drop-out voltage threshold		AC	≥ 0.15 Uc								
		DC	≥ 0.1 Uc								
Operating time (response time)	Between coil energization and making of the N.O. contact	AC	20 ms								
		DC	20 ms								
	Between coil de-energization and making of the N.C. contact	AC	20 ms								
		DC	20 ms								
Coil voltage Uc			12 V	24 V	48 V	110 V	120 V	125 V	220 V	230 V	240 V
Relay coil voltage codes			JD	BD	ED	FD	—	GD	MD	—	—
DC	Average resistance at 68 °F (20 °C) ± 10%		160 Ω	650 Ω	2,600 Ω	11,000 Ω	—	11,000 Ω	14,000 Ω	—	—
	Operating voltage limits	Min.	9.6 V	19.2 V	38.4 V	88 V	—	100 V	176 V	—	—
		Max.	13.2 V	26.4 V	52.8 V	121 V	—	138 V	242 V	—	—
Relay coil voltage codes			—	B7	E7	—	F7	—	M7	P7	U7
AC	Average resistance at 68 °F (20 °C) ± 15%		—	180 Ω	770 Ω	—	4,430 Ω	—	15,000 Ω	15,000 Ω	15,500 Ω
	Operating voltage limits	Min.	—	19.2 V	38.4 V	—	96 V	—	176 V	184 V	192 V
		Max.	—	26.4 V	52.8 V	—	132 V	—	242 V	253 V	264 V

Socket characteristics

Socket type		RXZE2S108M	RXZE2S111M	RXZE2S114M	RXZE2M114	RXZE2M114M
Relay types used		RXM2●●●●●	RXM3●●●●●	RXM4●●●●●	RXM2●●●●● ¹ RXM4●●●●●	RXM2●●●●● ¹ RXM4●●●●●
Product certifications		cURus File E172326 CCN SWIV2, SWIV8; CSA (pending); CE; RoHS compliant				
Conventional thermal current (Ith)		12 A	10 A			
Degree of protection	Conforming to IEC/EN 60529	IP 20				
Connection	Solid wire without cable end	1 conductor: AWG 20–12 (0.5–2.5 mm ²) 2 conductors: AWG 20–14 (0.5–1.5 mm ²)				
	Flexible wire with cable end	1 conductor: AWG 24–14 (0.2–2.5 mm ²) 2 conductors: AWG 24–16 (0.2–1.5 mm ²)				
	Flexible wire without cable end	1 conductor: AWG 24–14 (0.2–2.5 mm ²) 2 conductors: AWG 24–16 (0.2–1.5 mm ²)				
Maximum tightening torque		5.3 lbf-in (0.6 N●m) (M3 screw)				
Contact terminal arrangement		Separate			Mixed	
Bus jumper Ith: 5 A		Yes			No	

¹ When mounting relay RXM2●●●●● on socket RXZE2M●●●●●, the thermal current must not exceed 10 A.



Miniature relays with lockable test button, without LED (sold in lots of 10)

	Number and type of contacts - Thermal current (Ith)								
	DPDT - 12 A			3PDT - 10 A			4PDT - 6 A		
Coil Voltage	Catalog Number	Weight		Catalog Number	Weight		Catalog Number	Weight	
		lb.	kg		lb.	kg		lb.	kg
12 Vdc	RXM2AB1JD	0.082	0.037	RXM3AB1JD	0.084	0.038	RXM4AB1JD	0.080	0.036
24 Vdc	RXM2AB1BD	0.082	0.037	RXM3AB1BD	0.084	0.038	RXM4AB1BD	0.080	0.036
48 Vdc	RXM2AB1ED	0.082	0.037	RXM3AB1ED	0.084	0.038	RXM4AB1ED	0.080	0.036
110 Vdc	RXM2AB1FD	0.082	0.037	RXM3AB1FD	0.084	0.038	RXM4AB1FD	0.080	0.036
220 Vdc	—	—	—	—	—	—	RXM4AB1MD	0.080	0.036
24 Vac	RXM2AB1B7	0.082	0.037	RXM3AB1B7	0.084	0.038	RXM4AB1B7	0.080	0.036
48 Vac	RXM2AB1E7	0.082	0.037	RXM3AB1E7	0.084	0.038	RXM4AB1E7	0.080	0.036
120 Vac	RXM2AB1F7	0.082	0.037	RXM3AB1F7	0.084	0.038	RXM4AB1F7	0.080	0.036
230 Vac	RXM2AB1P7	0.082	0.037	RXM3AB1P7	0.084	0.038	RXM4AB1P7	0.080	0.036
240 Vac	—	—	—	—	—	—	RXM4AB1U7	0.080	0.036

Miniature relays with lockable test button, with LED (sold in lots of 10)

12 Vdc	RXM2AB2JD	0.082	0.037	RXM3AB2JD	0.084	0.038	RXM4AB2JD	0.080	0.036
24 Vdc	RXM2AB2BD	0.082	0.037	RXM3AB2BD	0.084	0.038	RXM4AB2BD	0.080	0.036
48 Vdc	RXM2AB2ED	0.082	0.037	RXM3AB2ED	0.084	0.038	RXM4AB2ED	0.080	0.036
110 Vdc	RXM2AB2FD	0.082	0.037	RXM3AB2FD	0.084	0.038	RXM4AB2FD	0.080	0.036
125 Vdc	—	—	—	—	—	—	RXM4AB2GD	0.080	0.036
24 Vac	RXM2AB2B7	0.082	0.037	RXM3AB2B7	0.084	0.038	RXM4AB2B7	0.080	0.036
48 Vac	RXM2AB2E7	0.082	0.037	RXM3AB2E7	0.084	0.038	RXM4AB2E7	0.080	0.036
120 Vac	RXM2AB2F7	0.082	0.037	RXM3AB2F7	0.084	0.038	RXM4AB2F7	0.080	0.036
230 Vac	RXM2AB2P7	0.082	0.037	RXM3AB2P7	0.084	0.038	RXM4AB2P7	0.080	0.036



Miniature relays with low level contacts, without LED (sold in lots of 10)

Number and type of contacts - Thermal current (Ith)				
4PDT - 3 A				
Coil Voltage	Catalog Number	Weight		
		lb.	kg	
12 Vdc	RXM4GB1JD	0.080	0.036	
24 Vdc	RXM4GB1BD	0.080	0.036	
48 Vdc	RXM4GB1ED	0.080	0.036	
110 Vdc	RXM4GB1FD	0.080	0.036	
24 Vac	RXM4GB1B7	0.080	0.036	
48 Vac	RXM4GB1E7	0.080	0.036	
120 Vac	RXM4GB1F7	0.080	0.036	
230 Vac	RXM4GB1P7	0.080	0.036	

Miniature relays with low level contacts, with LED (sold in lots of 10)

Number and type of contacts - Thermal current (Ith)				
4PDT - 3 A				
Coil Voltage	Catalog Number	Weight		
		lb.	kg	
12 Vdc	RXM4GB2JD	0.080	0.036	
24 Vdc	RXM4GB2BD	0.080	0.036	
48 Vdc	RXM4GB2ED	0.080	0.036	
110 Vdc	RXM4GB2FD	0.080	0.036	
24 Vac	RXM4GB2B7	0.080	0.036	
48 Vac	RXM4GB2E7	0.080	0.036	
120 Vac	RXM4GB2F7	0.080	0.036	
230 Vac	RXM4GB2P7	0.080	0.036	
240 Vac	RXM4GB2U7	0.080	0.036	



RXM2AB3F7

Miniature relays without lockable test button, with LED

		Number and Type of Contacts—Thermal Current (Ith)						
		DPDT - 12 A				4PDT - 6 A		
Coil Voltage	Catalog No.	Weight				Catalog No.	Weight	
		lb.	kg	lb.	kg			
Sold in lots of 10								
12 Vdc	RXM2AB3JD	0.082	0.037			RXM4AB3JD	0.080	0.036
24 Vdc	RXM2AB3BD	0.082	0.037			RXM4AB3BD	0.080	0.036
48 Vdc	RXM2AB3ED	0.082	0.037			RXM4AB3ED	0.080	0.036
110 Vdc	RXM2AB3FD	0.082	0.037			RXM4AB3FD	0.080	0.036
125 Vdc	—	—	—			RXM4AB3GD	0.080	0.036
24 Vac	RXM2AB3B7	0.082	0.037			RXM4AB3B7	0.080	0.036
48 Vac	RXM2AB3E7	0.082	0.037			RXM4AB3E7	0.080	0.036
120 Vac	RXM2AB3F7	0.082	0.037			RXM4AB3F7	0.080	0.036
230 Vac	RXM2AB3P7	0.082	0.037			RXM4AB3P7	0.080	0.036
Sold in lots of 100								
24 Vdc	RXM2AB3BDTQ	0.082	0.037			RXM4AB3BDTQ	0.080	0.036
24 Vac	RXM2AB3B7TQ	0.082	0.037			RXM4AB3B7TQ	0.080	0.036
230 Vac	RXM2AB3P7TQ	0.082	0.037			RXM4AB3P7TQ	0.080	0.036

**Miniature relays with low level contacts,
without lockable test button, with LED**

4PDT (low level) - 3 A			
Coil Voltage	Catalog No.	Weight	
		lb.	kg
Sold in lots of 10			
12 Vdc	RXM4GB3JD	0.080	0.036
24 Vdc	RXM4GB3BD	0.080	0.036
48 Vdc	RXM4GB3ED	0.080	0.036
110 Vdc	RXM4GB3FD	0.080	0.036
125 Vdc	—	—	—
24 Vac	RXM4GB3B7	0.080	0.036
48 Vac	RXM4GB3E7	0.080	0.036
120 Vac	RXM4GB3F7	0.080	0.036
230 Vac	RXM4GB3P7	0.080	0.036

See page 9 for sockets and accessories.



RXZ E2M114M with
relay RXM4AB2P7TQ



RXZ E2S114M with
relay RXM4AB2F7TQ



RXM 041



REXL4



RXZ400

Miniature relays with lockable test button, without LED (sold in lots of 100)

		Number and type of contacts - Thermal current (Ith)					
		DPDT - 12 A			4PDT - 6 A		
Coil Voltage	Catalog Number	Weight		Catalog Number	Weight		
		lb.	kg		lb.	kg	
12 Vdc	—	—	—	RXM4AB1JDTQ	0.080	0.036	
24 Vdc	RXM2AB1BDTQ	0.082	0.037	RXM4AB1BDTQ	0.080	0.036	
48 Vdc	—	—	—	RXM4AB1EDTQ	0.080	0.036	
110 Vdc	—	—	—	RXM4AB1FDTQ	0.080	0.036	
220 Vdc	—	—	—	RXM4AB1MDTQ	0.080	0.036	
24 Vac	RXM2AB1B7TQ	0.082	0.037	RXM4AB1B7TQ	0.080	0.036	
48 Vac	—	—	—	RXM4AB1E7TQ	0.080	0.036	
120 Vac	RXM2AB1F7TQ	0.082	0.037	RXM4AB1F7TQ	0.080	0.036	
230 Vac	RXM2AB1P7TQ	0.082	0.037	RXM4AB1P7TQ	0.080	0.036	

Miniature relays with LED (sold in lots of 100)

24 Vdc	—	—	—	RXM4AB2BDTQ	0.080	0.036
24 Vac	RXM2AB2B7TQ	0.082	0.037	RXM4AB2B7TQ	0.080	0.036
230 Vac	RXM2AB2P7TQ	0.082	0.037	RXM4AB2P7TQ	0.080	0.036

Sockets (sold in lots of 10)

Contact terminal arrangement	Connection	Relay type	Catalog Number	Weight	
				lb.	kg
Mixed	Screw clamp terminals	RXM2 1 RXM4 1	RXZE2M114 2	0.11	0.048
	Box lug connector	RXM2 1 RXM4 1	RXZE2M114M 2	0.12	0.056
Separate	Box lug connector	RXM2 1	RXZE2S108M 3	0.13	0.058
		RXM3 1	RXZE2S111M 2	0.15	0.066
		RXM4 1	RXZE2S114M 2	0.15	0.070

¹ When mounting relay RXM2 1 on socket RXZE2M 1, the thermal current must not exceed 10 A.

² Thermal current Ith: 10 A

³ Thermal current Ith: 12 A

Protection modules (sold in lots of 20)

Description	Voltage	For use with	Catalog Number	Weight	
				oz.	g
Diode	6–250 Vdc	All sockets	RXM040W	0.11	3.0
RC circuit	24–60 Vac	All sockets	RXM041BN7	0.35	10.0
	110–240 Vac	All sockets	RXM041FU7	0.35	10.0
Varistor	6–24 Vac/Vdc	All sockets	RXM021RB	1.06	30.0
	24–60 Vac/Vdc	All sockets	RXM021BN	1.06	30.0
	110–240 Vac/Vdc	All sockets	RXM021FP	1.06	30.0

Timing relays

Description	For use with	Catalog Number	Weight	
			lb.	kg
2 timed DPDT contacts (function A—On-delay)	Sockets RXZ E 1	REXL2 4	0.09	0.042
4 timed 4PDT contacts (function A—On-delay)		REXL4 4	0.09	0.042

⁴ Please refer to the Zelio® Time - Timers catalog (9050CT0001R2/05).

Accessories (sold in lots of 10)

Description	For use with	Catalog Number	Weight	
			oz.	g
Metal hold-down clip	All sockets	RXZ400	0.04	1.0
Plastic hold-down clip	All sockets	RXZR335	0.18	5.0
Bus jumper, 2-pole (Ith: 5 A)	All sockets with separate contacts	RXZS2	0.18	5.0
Mounting adapter for DIN rail ⁵	All relays	RXZE2DA	0.14	4.0
Mounting adapter for mounting directly to a panel	All relays	RXZE2FA	0.07	2.0
Clip-in markers	All relays (sheet of 108 markers)	RXZL520	2.82	80.0
	All sockets except RXZE2M114	RXZL420	0.04	1.0

⁵ Test button becomes inaccessible.

Zelio® Plug-in Relays

Dimensions

RXM Miniature Relays

Relays

RXM●●●●●●

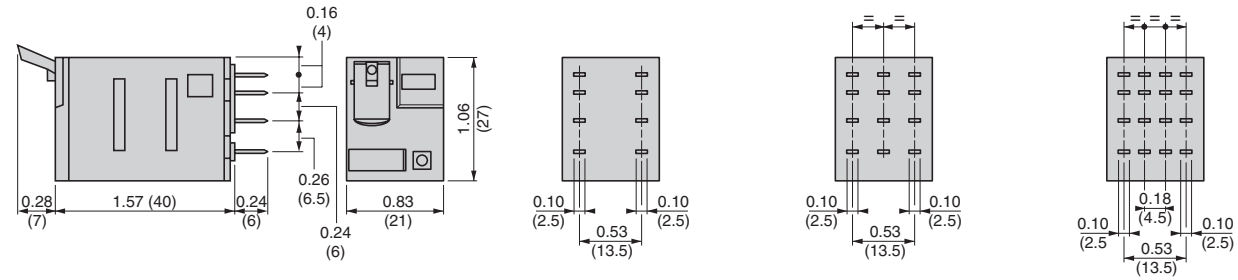
RXM2

RXM3

RXM4

Common view

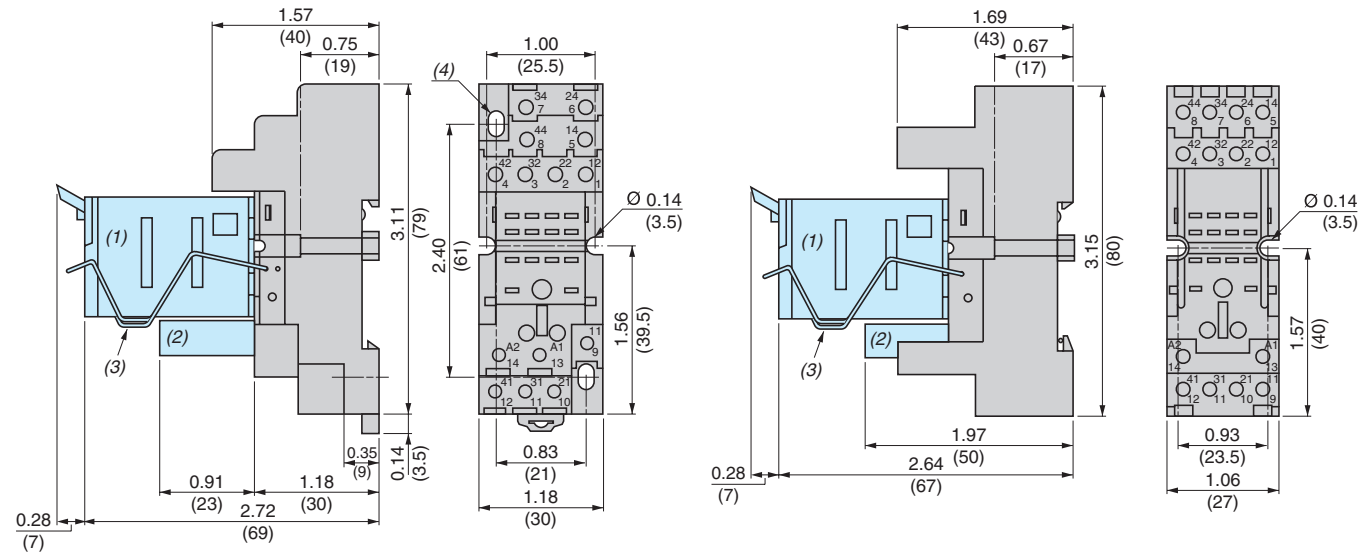
Pin side view



Sockets

RXZE2M114

RXZE2M114M



RXZE2S●●●●

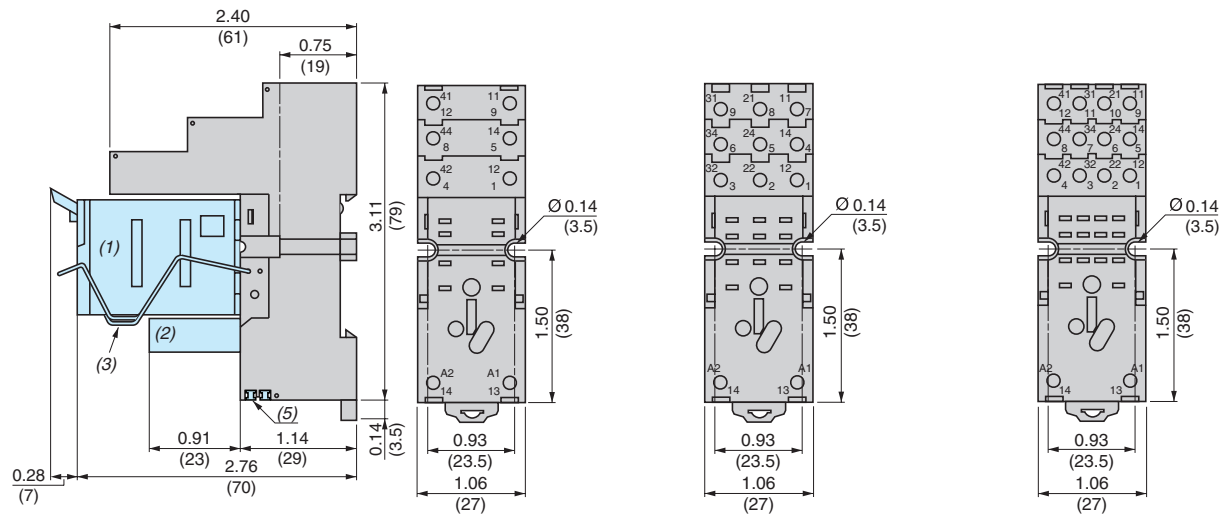
RXZE2S108M

RXZE2S111M

RXZE2S114M

Common side view

Pin side view

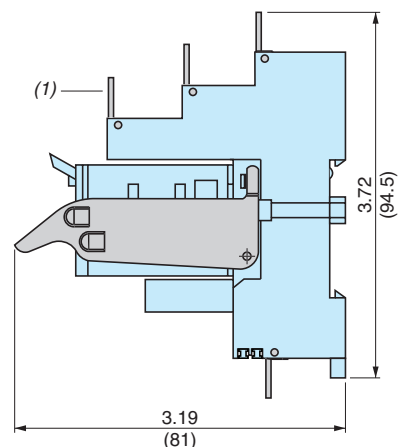
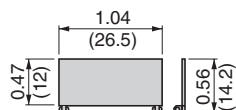
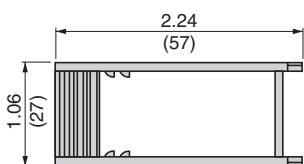


- (1) Relays
- (2) Add-on protection module
- (3) Hold-down clip
- (4) 2 elongated holes $\varnothing 0.14 \times 0.26$ (3.5 x 6.5)
- (5) 2 bus jumpers

Dimensions = Inches
(mm)

Plastic clamp and clip-in markers

RXZR335	RXZL420	Mounting on all sockets
---------	---------	-------------------------

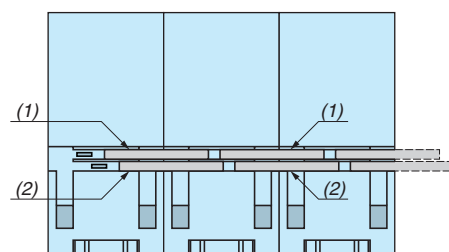
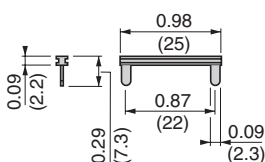


(1) Clip-in markers for all sockets except RXZE2M114.

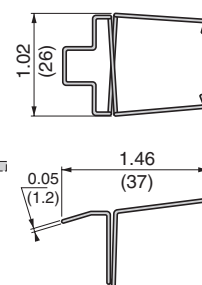
Bus jumper

RXZS2	Mounting on sockets with separate contacts (view from below)	Metal clamp RXZ400
-------	---	-----------------------

Example of bus jumper mounting on sockets

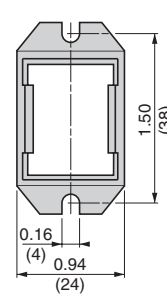
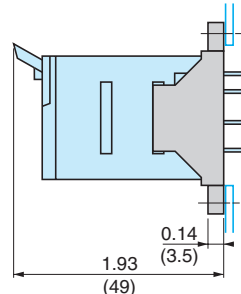
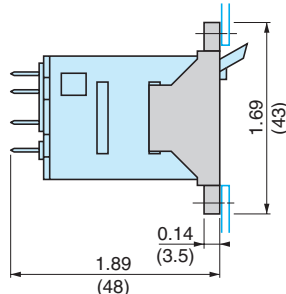
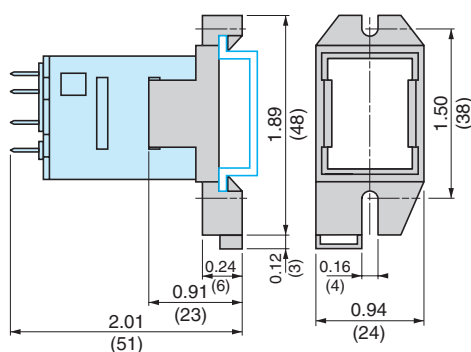


(1) 2 bus jumpers (polarity A2)
(2) 2 bus jumpers (polarity A1)



Mounting adapter for rail ¹

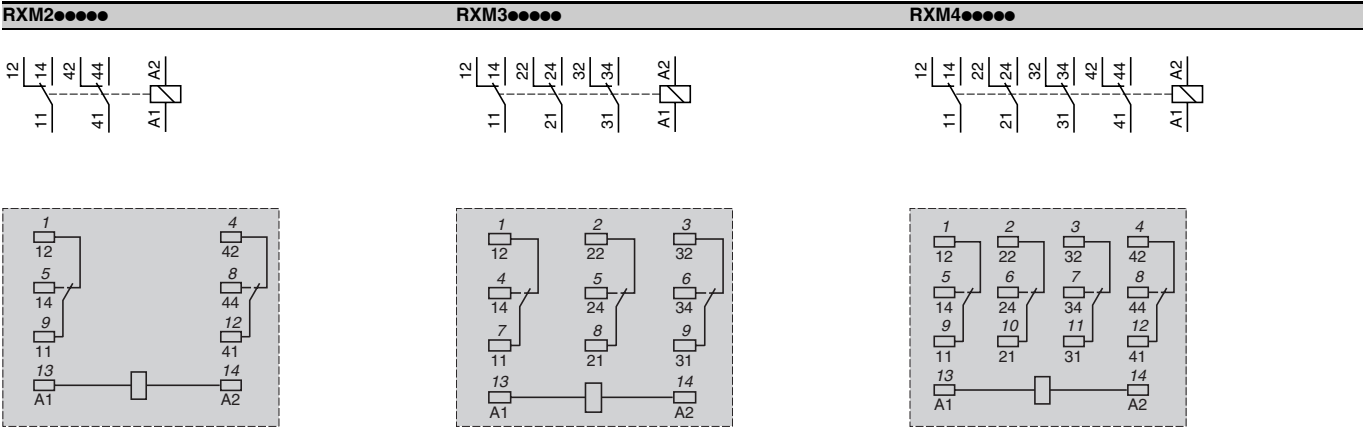
RXZE2DA	Mounting adapter for panel RXZE2FA
---------	---------------------------------------



¹ Test button becomes inaccessible

Dimensions = Inches
(mm)

Miniature relays



Numbers shown in *italics* correspond to NEMA marking. Viewed from pin end.

SECTION 5

WELL 35 SODIUM HYPOCHLORITE DILUTION SYSTEM

MERLIN DILUTION CONTROL SYSTEM WITH DUMP VALVE TO DAY TANK

JOB REF: MDS-5D-30F Delano, CA

OPTIONS:

- ☐ BACK PRESSURE / CHECK VALVE ON NEAT PUMP
- ☒ EDUCTOR ON WATER LINE
- ☐ EDUCTOR ON NEAT LINE
- ☐ RECIRCULATION PUMP FOR DAY TANK
- ☐ OK TO BATCH SENSOR

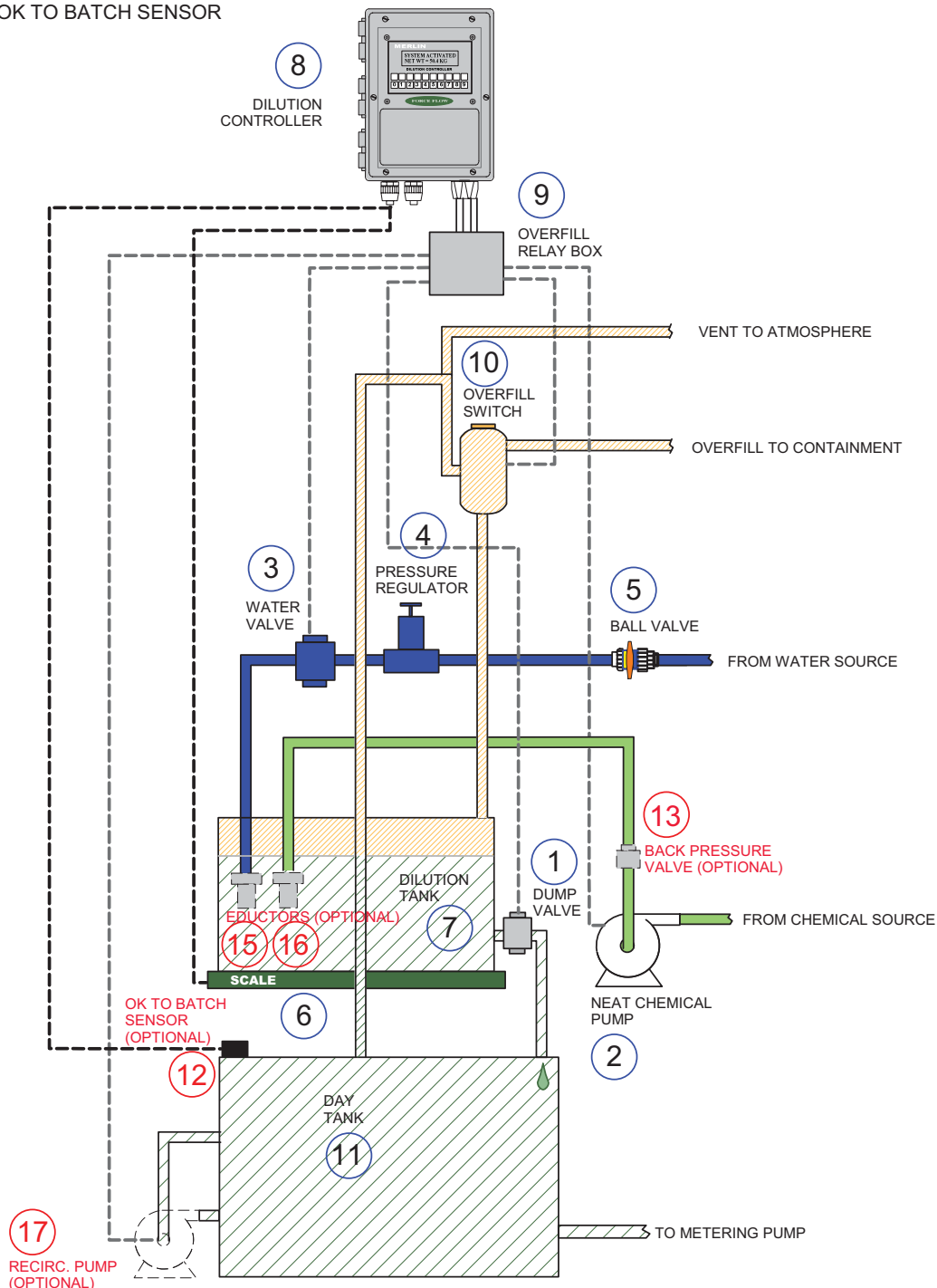
LEGEND: NEAT CHEMICAL

WATER

VENT

DILUTED CHEMICAL

----- WIRING



FORCE FLOW

2430 STANWELL DR.
CONCORD, CA 94520
1-800-893-6723

REF: T4/O&M/DILUTION/DILU PKG SYS/MDS Dump System.txd
EMAIL/DRAWINGS/DILUTION/MDS Dump System.pdf



2430 Stanwell Drive, Concord, CA 94520 USA (800) 893-6723 www.forceflow.com

MERLIN DESIGN- Component List

PROJECT REFERENCE: MDS-5D-30F Delano, CA

SKID FRAMES

- ☒ 5 gal batch, 30 gal feed, stainless steel, powder coat (fabricated)
- ☐ 17 gal batch, 55 gal feed, mild steel, powder coated (fabricated)
- ☐ 55 gal batch, mild steel, powder coated (fabricated)
- ☐ 500 gal batch, back board for mounting Merlin Controller, 60x60 platform (fabricated)
- ☐

(1) DILUTE PUMP

- ☐ Barnant Peristaltic (with #18 hose & D-2533-0006 pump head) 0.166GPM
- ☐ Finish Thompson KC3 (120 VAC) DO NOT RUN DRY 10 GPM
- ☐ Finish Thompson KC6 (120 VAC) 30 GPM
- ☐ Finish Thompson KC10 (208-230/460 VAC– with starter) 65 GPM
- ☐ Finish Thompson DB11 (208-230/460 VAC– with starter) 110 GPM
- ☐

-or- DUMP VALVE

- ☐ PVC, ½" PLASTOMATIC - Model EASMT4EP12W20-PV
- ☒ PVC, ¾" PLASTOMATIC - Model EASMT5EP16W20-PV
- ☐ PVC, 1" PLASTOMATIC - Model EASMT6EP22W20-PV
- ☐ PVC, 1 ½ " PLASTOMATIC - Model PS150EPW11-PV
- ☐

(2) NEAT PUMP

- ☒ Barnant Peristaltic (with #18 hose & D-2533-0006 pump head) 0.166 GPM
- ☐ Finish Thompson KC3 (120 VAC) DO NOT RUN DRY 10 GPM
- ☐ Finish Thompson KC6 (120 VAC) 30 GPM
- ☐ Finish Thompson KC10 (208-230/460 VAC –with starter) 65 GPM
- ☐ Finish Thompson DB11 (208-230/460 VAC –with starter) 110 GPM
- ☐



2430 Stanwell Drive, Concord, CA 94520 USA (800) 893-6723 www.forceflow.com

MERLIN DESIGN- Component List (continued)

PROJECT REF: MDS-5D-30F Delano, CA

(3) WATER VALVE

- ☐ Brass, 1/4" ASCO - Model 8262G002
- ☒ Brass, 1/2" ASCO - Model 8210G094
- ☐ Brass, 3/4" ASCO - Model 8210G009
- ☐ Brass, 1" ASCO - Model 8210G004
- ☐ Brass, 1 1/2" ASCO - Model 8210G56
- ☐

NOTE: Approximate water flow rates:

1/4" water supply system	=	5 GPM
1/2" water supply system	=	20 GPM
3/4" water supply system	=	50 GPM
1" water supply system	=	100 GPM
1 1/2" water supply system	=	150 GPM

(4) PRESSURE REGULATOR

- ☐ Delrin, 1/4" McMaster-Carr 8113K11
- ☒ Brass, 1/2" WATTS – N55BUM1 1/2
- ☐ Brass, 3/4" WATTS – N55BUM1 3/4
- ☐ Brass, 1" WATTS – 25AUB-1
- ☐ Brass, 1 1/2" WATTS – 1 1/2 N55BU
- ☐

(5) BALL VALVE

- ☐ Polyethylene, 1/4" McMaster-Carr 47865K21
- ☒ Brass, 1/2" McMaster-Carr 47865K23
- ☐ Brass, 3/4" McMaster-Carr 47865K24
- ☐ Brass, 1" McMaster-Carr 47865K25
- ☐ Brass, 1 1/2" McMaster-Carr 47865K27
- ☐

(6) SCALE PLATFORM

- ☒ 12" x 12" 200 lb capacity PVC
- ☐ 17" x 17" 300 lb capacity PVC
- ☐ 27.5" x 27.5" 1000 lb capacity Force Flow Model DR10DS-HA3, Mild Steel w/ TUF-COAT
- ☐ 60" x 60" 8000 lb capacity Force Flow Model 60-DR80LP-HA4, Mild Steel w/ TUF-COAT
- ☐



2430 Stanwell Drive, Concord, CA 94520 USA (800) 893-6723 www.forceflow.com

MERLIN DESIGN- Component List (continued)

PROJECT REF: MDS-5D-30F Delano, CA

(7) DILUTION TANK

- | | |
|---|--------------------------------|
| ☒ 5 gallon Polyethylene | AMERICAN TANK - Model 0275-25 |
| ☐ 17 gallon Polyethylene | AMERICAN TANK – Model 0275-125 |
| ☐ 30 gallon Polyethylene | AMERICAN TANK – Model 0275-145 |
| ☐ 55 gallon Polyethylene | AMERICAN TANK – Model 0275-165 |
| ☐ 165 gallon Polyethylene | AMERICAN TANK – Model 085-015 |
| ☐ 500 gallon Polyethylene | AMERICAN TANK – Model 085-030 |
| ☐ 750 gallon Polyethylene | AMERICAN TANK – Model 085-045 |
| ☐ | |

(8) MERLIN DILUTION SYSTEM CONTROLLER Force Flow Model MDC 4000

(9) OVERFILL RELAY BOX Force Flow Model ORB-CJ863

(10) OVERFILL SWITCH Force Flow Model OS-PVC1

(11) DAY TANK (OPTIONAL on TRANSFER PUMP TO DAY TANK DESIGN)

- | | |
|--|--------------------------------|
| ☐ 5 gallon Polyethylene | AMERICAN TANK - Model 0275-25 |
| ☐ 17 gallon Polyethylene | AMERICAN TANK – Model 0275-125 |
| ☒ 30 gallon Polyethylene | AMERICAN TANK – Model 0275-145 |
| ☐ 55 gallon Polyethylene | AMERICAN TANK – Model 0275-165 |
| ☐ 165 gallon Polyethylene | AMERICAN TANK – Model 085-015 |
| ☐ 500 gallon Polyethylene | AMERICAN TANK – Model 085-030 |
| ☐ 750 gallon Polyethylene | AMERICAN TANK – Model 085-045 |
| ☐ | |

OPTIONAL

(12) ☐ OK TO BATCH SENSOR

(13) ☐ NEAT PUMP BACK PRESSURE/CHECK VALVE

(14) ☐ DILUTE PUMP BACK PRESSURE/CHECK VALVE (TRANSFER PUMP TO DAY TANK DESIGN ONLY)

(15) ☒ WATER LINE EDUCTOR

(16) ☐ NEAT LINE EDUCTOR

(17) ☐ DAY TANK RECIRCULATION PUMP

☐ OTHER:

☐ OTHER:

SET UP INFORMATION



MERLIN DILUTION CONTROL SYSTEM

JOB SITE: _____

MODEL NO: MDS-5D-30F _____

ADDRESS: _____

TECHNICIAN: _____

CITY/ST: Delano, CA _____

DATE TESTED: _____

CUSTOMER: _____

SERIAL NO: _____

ADDRESS: _____

SHIP DATE: _____

CITY/ST: _____

INSTALL DATE: _____

CHEMICAL DILUTED Sodium Hypochlorite (12% to 1% est.)

9080 SCALE SETUP

- Display Units KG = Yes _____ No _____
- Scale Increments = _____
- Decimal Points = _____
- Fixed Zero's = _____
- Count By = _____
- Weight = _____

9082 FEED RATE

- Display Rate = Day _____ Hour _____
- Update Period = Hour _____ Min. _____
- Update Period Hr/Min = _____
- Rate Analog FS lbs/day = _____

9084 WATER FIRST

- Water First = Yes _____ No _____

9085 BATCH INPUT

- Use Batch Input = Yes _____ No _____
- Use Mixer = Yes _____ No _____
- Mixer on Time = _____
- Mixer off Time = _____

9087 TIME & DATE

- USA Date Format = Yes _____ No _____
- (current time & date entered) Yes _____ No _____

9088 FACTORY CALIBRATION

- Cal Factors Zero = _____
- Cal Factors Span = _____

9089 MOTION DETECT & FILTERS

- Filter = _____
- Motion = _____
- Motion on Time Seconds = _____

NOTE:

These are factory settings. Please update any changes made during installation Merlin "as shipped" Setup Sheet.

9090 PASSWORDS

- User Password Number =
 - Start = Yes _____ No _____
 - Stop = Yes _____ No _____
 - Total Used = Yes _____ No _____
 - Batch Review = Yes _____ No _____
 - Neat Refill = Yes _____ No _____
 - Alarm Log = Yes _____ No _____
 - Manual Oper. = Yes _____ No _____
 - Batch Setup = Yes _____ No _____
 - Set Alarm Value = Yes _____ No _____
 - Set Scale Zero = Yes _____ No _____
 - Time & Date = Yes _____ No _____
 - Clear Totals = Yes _____ No _____
 - Review Batch = Yes _____ No _____

Neat Restrictor Size _____
Recirc. Restrictor Size _____

Menu -- Set Alarm Values

- High Level = _____
- Max Daily Neat = _____
- Slow Neat Minutes = _____
- Neat off Delay Minutes = _____
- Slow Water Minutes = _____
- Slow Dump Minutes = _____

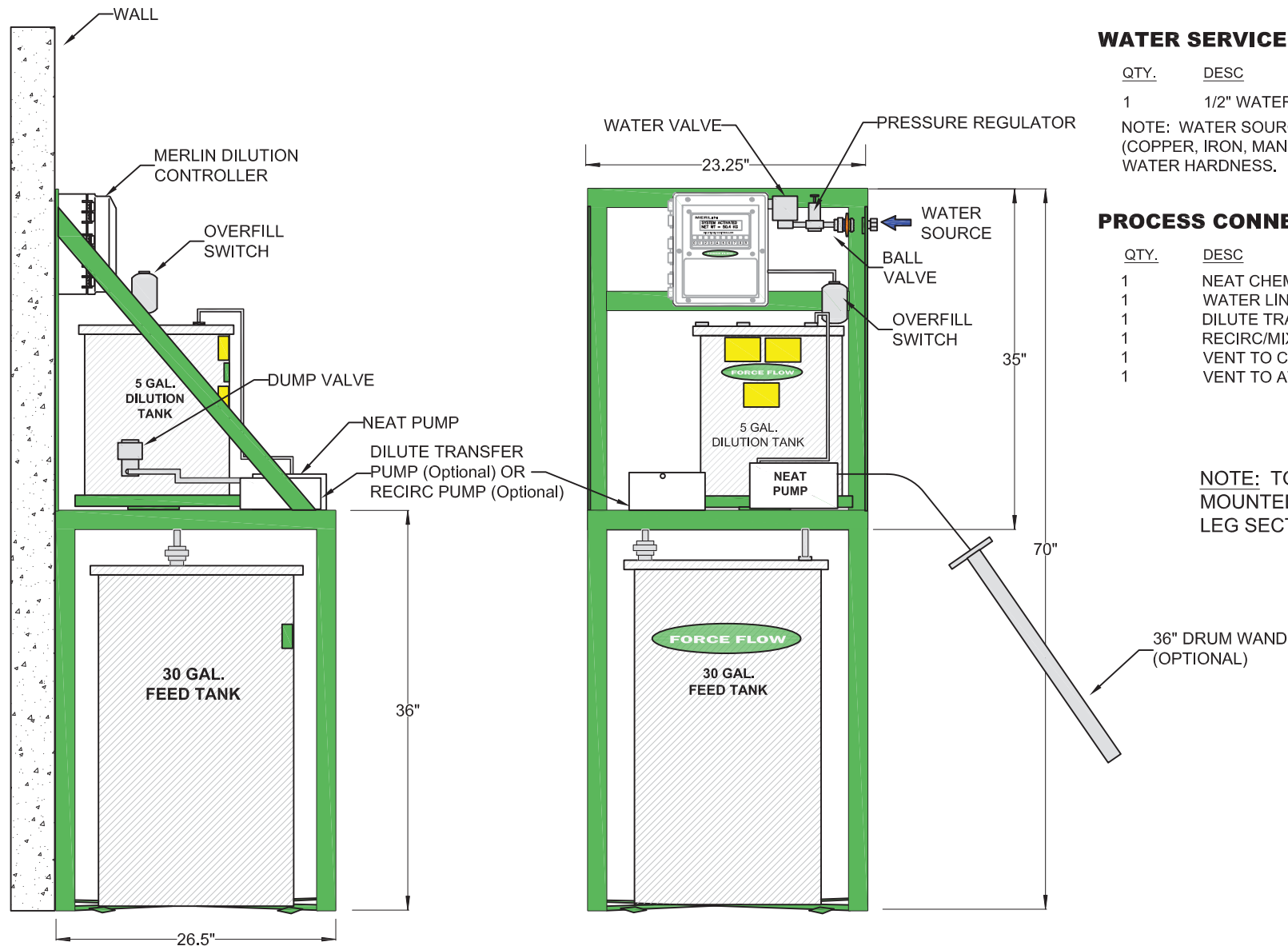
Menu -- Batch Setup

- Batch Size = _____
- Refill Level = _____
- Neat Tank Capacity = _____
- Neat Preact = _____
- Post Neat Delay = _____
- Water Preact = _____
- Water Auto Jog = Yes _____ No _____
- Tolerance = _____
- H2O On Time = _____
- H2O Off Time = _____

Batch Review

- Neat Strength % = _____
- Dilute Strength % = _____
- Batch Size = _____
- Neat Target = _____
- Water Target = _____

**MODEL MDS-5D
MERLIN DILUTION
SYSTEM**



ELECTRICAL REQUIREMENTS:

QTY. DESC

2 20 AMP CIRCUITS

NOTE: DILUTION CONTROLLER MUST BE ON SEPARATE CIRCUIT FROM PUMPS WITH SURGE PROTECTION

WATER SERVICE REQUIREMENTS:

QTY. DESC

1 1/2" WATER LINE @ 50 PSI MINIMUM

NOTE: WATER SOURCE MUST HAVE LOW HEAVY-METAL (COPPER, IRON, MANGANESE). CONTENT AND LOW TOTAL WATER HARDNESS.

PROCESS CONNECTION REQUIREMENTS:

QTY. DESC

1 NEAT CHEMICAL PUMP
1 WATER LINE
1 DILUTE TRANSFER (Optional)
1 RECIRC/MIX PUMP (Optional)
1 VENT TO CONTAINMENT
1 VENT TO ATMOSPHERE

NOTE: TOP SECTION CAN BE MOUNTED ON WALL WITHOUT LEG SECTION



2430 Stanwell Dr, Concord, Ca 94520 USA
1-800-893-6723 US & Canada, Fax: 925-686-6713
WWW.forceflow.com / Info@forceflow.com

MERLIN DILUTION CONTROL SYSTEM
Model MDS-5D
Job: MDS-5D-30F Delano, CA

Drawn by: KBV

Date: 3/11/09

Verified: 6/17/09

Scale:

Drawing Number

31483

HIGH STRENGTH HYPO GIVING YOU A HEADACHE ? 603

SOLUTION: MERLIN HYPO DILUTION SYSTEMS

ELIMINATE
VAPOR LOCKED
PUMPS

REDUCE OR
ELIMINATE
SCALING IN PIPES

SAFETY OF
LOW STRENGTH
HYPO

HIGHER PUMP
SPEEDS MEAN
BETTER CONTROL.

ELIMINATE
MESSY LEAKING
PIPE JOINTS



MAKE 0.8% HYPO AT THE TOUCH OF A BUTTON !

The MERLIN gives TOTAL flexibility by allowing you to enter any beginning hypo strength.

NEAT STRENGTH
PERCENT= 14.2

and then simply choosing a desired ending strength, such as 0.8%.

DILUTE STRENGTH
PERCENT= 0.8

As onsite hypo generators have become more common, users began to realize the benefits of feeding 0.8% Sodium Hypochlorite. Until now, however, onsite generators were the only effective way to produce this low strength hypo on site. The Merlin Hypo Dilution System gives you an alternative that is less expensive, less complicated and easier to maintain.

Sodium Hypochlorite off gasses at a much higher rate in high concentrations than it does at low concentrations, and therefore dilution can help eliminate vapor locked pumps, exploding ball valves and liquid/gas separation that causes inconsistent feed. In addition, feeding conventional strength hypo exploits weak spots in piping and joints causing leaks, which increase maintenance and operator exposure to chemicals. Feeding low strength hypo is also very effective at eliminating pipe scaling at the process injection point. By lowering the source hypo strength, the pH of the hypo is closer to that of the process water which helps reduce the dissolved solids from precipitating on piping as scale. Lastly, feeding low strength hypo can give better mixing, and better residual control by allowing you to run your metering pumps at higher speeds.



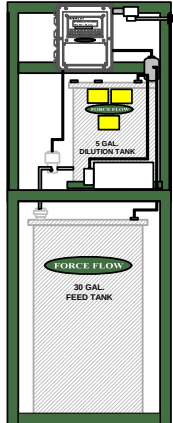
The heart of our Hypo Dilution System is the Merlin Dilution Controller.



MERLIN HYPO DILUTION SYSTEMS

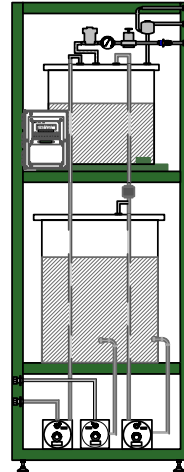
MODELS & ORDERING INFORMATION

☐ **Model: MDS-5D30F**
Capacity: 50 PPD c12



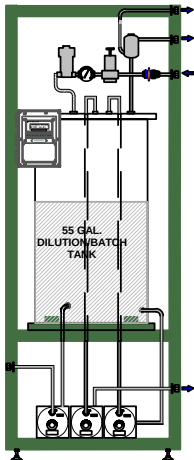
Height: 70"
Width: 22"
Depth: 26"
Batch Tank: 5 Gallon
Feed Tank: 30 Gallon

☐ **Model: MDS-17D55F**
Capacity: 200 PPD c12



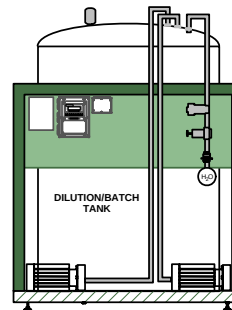
Height: 78"
Width: 29"
Depth: 31"
Batch Tank: 17 Gallon
Feed Tank: 55 Gallon

☐ **Model: MDS-55D**
Capacity: 500 PPD c12



Height: 84"
Width: 33"
Depth: 24"
Batch Tank: 55 Gallon
Feed Tank: Specify

☐ **Model: MDS-500D**
Capacity: 5000 PPD c12



Height: 56"
Width: 60"
Depth: 60"
Batch Tank: 500 Gallon
Feed Tank: Specify

TYPICAL SPECIFICATIONS

Dilution System shall use a system of automatically creating small weight based batches on demand to achieve dilution accuracies of up to 1/10th of 1%. Dilution system shall account for the difference of the specific gravity of water and the chemical used. The system shall use a microprocessor based controller to control the opening and closing of a water valve and chemical transfer pump to create a dilution batch. Dilution system shall be capable of diluting any strength of neat chemical solution to as low as a 0.1% chemical solution. Dilution system shall be pre-assembled, calibrated and tested prior to delivery. Complete dilution system shall include all necessary piping, valves, plumbing connections, transfer pumps, dilution tank, weight sensors, controller and relays necessary for sole source responsibility. System shall allow _____ (chemical type) to be delivered from supplier at _____ % strength and shall then dilute chemical to _____ % solution strength, but shall not be limited to this strength. System shall have a maximum capacity of _____ gallons of diluted chemical per day. Diluted chemical shall be automatically transferred from a _____ gallon batch tank to a _____ gallon feed tank. Force Flow, 2430 Stanwell Dr., Concord, CA 94520 USA (www.forceflow.com) or equal.

FORCE FLOW

C H E M I C A L

D I L U T I O N

S Y S T E M S



FORCE FLOW

EXPERIENCE THE BENEFITS OF AUTOMATED ONSITE C H E M I C A L D I L U T I O N

MB2 TECHNOLOGY: MASS BASED + MICRO BATCH

Like buying orange juice and detergents, water treatment chemicals are almost always less expensive to purchase in higher concentrations. Unfortunately, feeding high strength chemicals into process water can create problems for the water treatment operator. These problems may stem from things like extremely low feed rates, chemical off-gassing, ambient temperature conditions, very hard process water and safety or regulatory concerns in handling high strength chemicals.

By combining a microprocessor based controller with an instrument grade load cell, the MERLIN® automatically creates small weight-based batches on demand to achieve dilution ratios of up to 1000:1. With this "Mass Based + Micro Batch" technology, users now have a safe, easy and accurate way of diluting high strength water treatment chemicals onsite.

MERLIN® DILUTION CONTROLLER

1

NEAT STRENGTH
PERCENT= 14.2

ENTER NEAT CONCENTRATION

2

DILUTE STRENGTH
PERCENT= 0.8

ENTER DESIRED DILUTION

3



PRESS START

DILUTE 08/09/02
USED = 5877 lbs

PURE 08/09/02
USED = 2275 lbs

DILUTE RATE
lbs/DAY= 839.62

PURE RATE
lbs/DAY= 325.74

INVENTORY CONTROL & PROCESS ALARMS:

By tracking nine different variables such as chemical usage, feed rates and remaining quantities, the MERLIN gives you a full accounting of your chemical feed & dilution process. In addition, by tracking throughput and using timers to track the dilution process, six different process alarms give you early warning of potential problems with your chemical feed system that could otherwise go undetected.

ALARM SLO NEAT
12:55 09/11/02

ALARM SLO H2O
12:15 02/21/02

ALARM SLO DUMP
02:12 03/23/02

ALARM HI LEVEL
22:17 09/13/02

ALARM HI DALY
12:12 06/10/02

C
H
E
M
I
C
A
L

W
A
T
E
R



D
I
L
U
T
I
O
N

DESIGNED WITH THE USER IN MIND

ANY DILUTION STRENGTH AT THE TOUCH OF A BUTTON:

The MERLIN gives TOTAL flexibility by allowing you to enter any beginning chemical strength up to 100% and then simply choosing a desired ending strength as low as 0.1%. If your chemical supply strength ever changes or if your metering pump has slowed to a crawl, simply punch in the new chemical strengths and the MERLIN does the rest!

ON DEMAND DILUTION REQUIRES MINIMAL SPACE:

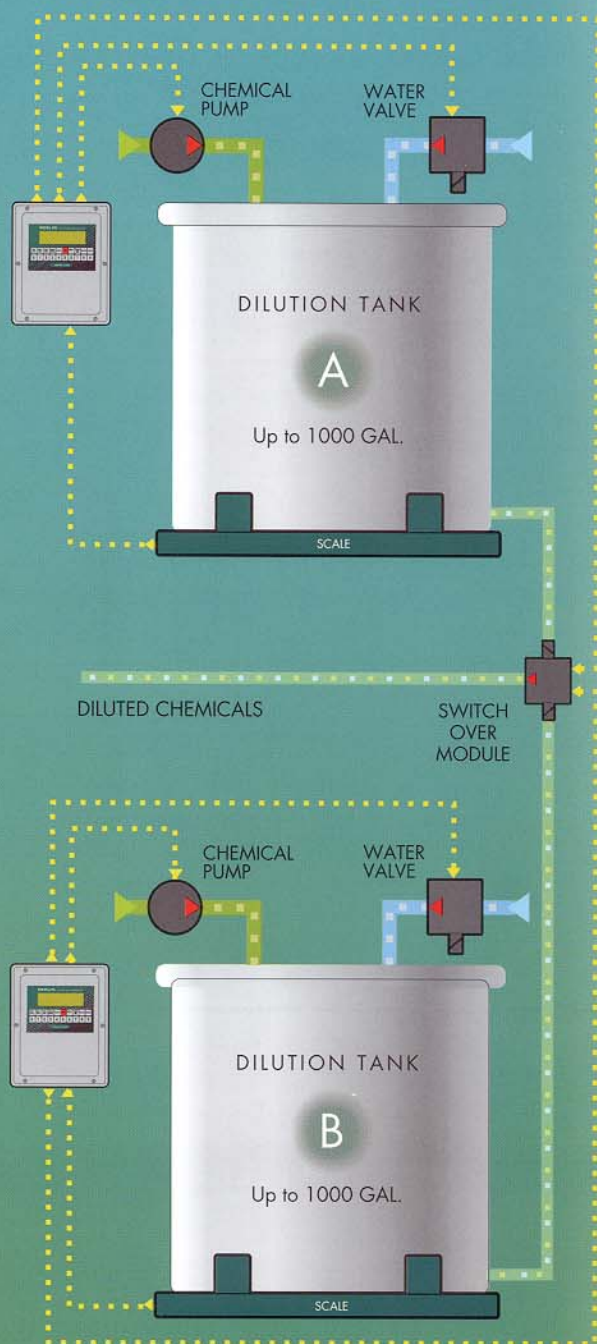
Diluting all of your chemical upon delivery requires a large building, storage tank and secondary containment area that in some cases may not be practical or safe. The MERLIN creates diluted chemical based on demand and therefore requires a fraction of the space.

HYPOTRAK™ ANALYZER:

For Sodium Hypochlorite applications, the Hypo-Trak analyzer automatically samples chemical concentration before each and every batch by analyzing the current specific gravity of the chemical. This allows accurate dilution even as the chemical supply strength degrades over time and gives the ability to automatically double check the strength of the chemical delivered by the supplier. No more messy titrations that expose operators to hypo!

LARGE PLANTS REDUNDANT SYSTEMS

Two controllers, two dilution tanks with auto switchover module



DIMENSIONS: CUSTOMER DEPENDANT
CAPACITY: CUSTOMER DEPENDENT

* BULK TANK DILUTION

Dilution Controllers are available for bulk tanks up to 20 ft. tall. The system consists of a single controller, level sensor and overflow switch. No other system components are supplied by Force Flow.

REDUCED MAINTENANCE AND CHEMICAL COSTS

BUY CHEMICALS, NOT WATER:

Chemicals are almost always cheaper to purchase in high concentrations. Instead of having your chemical supplier sell you low strength chemicals that are mostly water, blend your own concentration on site!! A Merlin dilution control system can pay for itself quickly in chemical cost savings alone.

REDUCE OFF-GASSING AND LEAKAGE:

Sodium hypochlorite and other chemicals off-gas at a much higher rate in high concentrations than they do at low concentrations. Preventing off-gassing by diluting helps eliminate vapor locked metering pumps, exploding ball valves and liquid/gas separation that can cause inconsistent feed. Feeding high strength hypochlorite also exploits weak spots in piping and joints causing leaks, which increases maintenance and operator exposure to chemicals.

SCALING:

Many chemicals such as Caustic and Sodium Hypochlorite precipitate scaling in the piping and process injection point when fed at high concentrations, ultimately causing maintenance and distribution problems. Lowering the concentration of the source chemical in many cases will alleviate this problem and thus reduce maintenance costs.

CRYSTALLIZATION:

High strength chemicals like sodium hydroxide (Caustic) begin to crystallize and become very thick at temperatures as high as 55 degrees F making them difficult to feed. Diluting these chemicals allows them to be successfully fed at ambient temperatures down to freezing and reduces the need for heat tracing on piping, valves, etc.



STOP
WASTING
MONEY



LEAKAGE



CLOGGED PIPE
DUE TO
SCALING

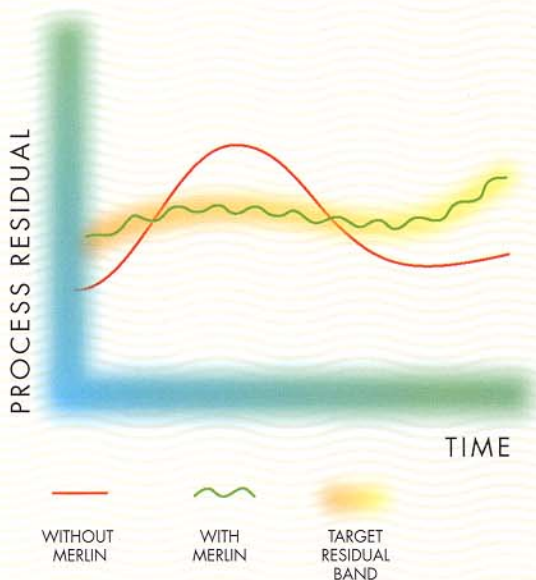
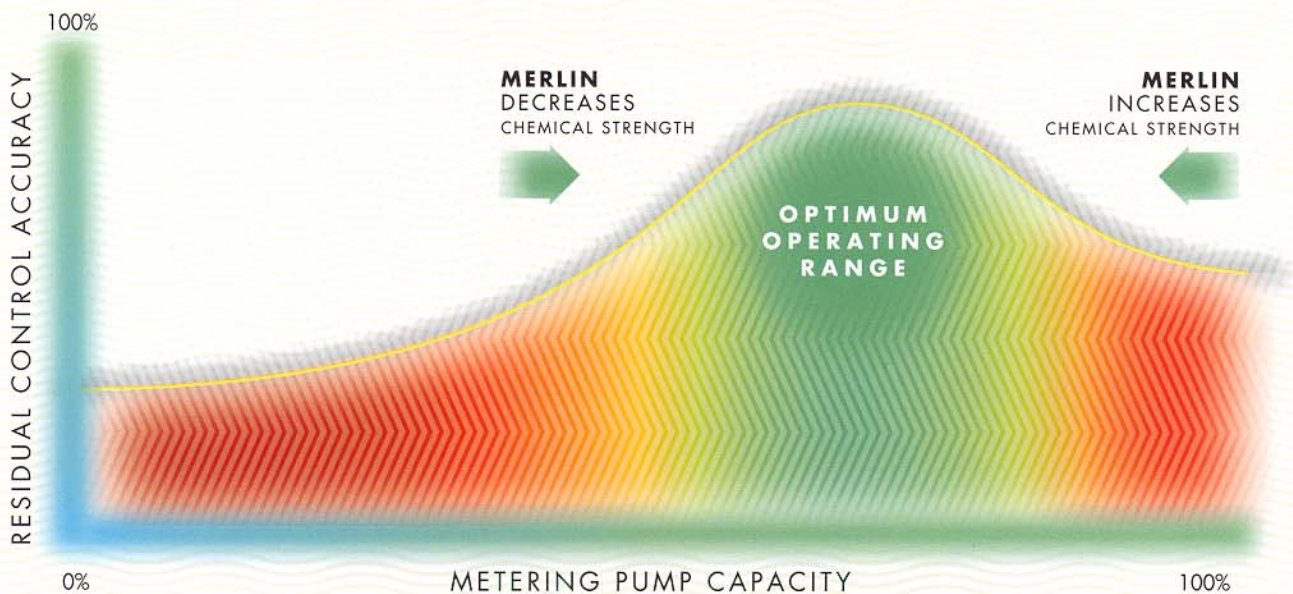
OPTIMIZE RESIDUAL LOOP CONTROL

CONTINUOUS REGULATORY COMPLIANCE:

Many states require that metering pumps be operated within a specific zone of the pump turn down range. For instance, The Wisconsin Administrative Code states "metering pumps shall operate at 30-70% of their specified range and a minimum of 12 strokes per minute. If this is not possible, dilution of the chemical will be required." The Utah Administrative Code requires "fluoride solution shall be applied by a pump having a stroke rate not less than 20 strokes per minute." With dilution ratios of up to 1000:1 possible, the Merlin can turn a pump with a 10:1 turndown into a pump with an effective turndown of 10,000:1!!!

SUPERIOR ACCURACY & REPEATABILITY:

A consistent and reliable chemical strength is paramount to achieving good residual loop control. The fully automated Merlin Dilution Controller produces accurate and consistent chemical strengths by using instrument grade load cells coupled with a microprocessor based controller. Our unique patent pending design allows us to fine tune the dilution process to accuracies greater than 1/10th of 1% for each and every batch.



HIGH VOLUME / LOW STRENGTH MEANS BETTER CONTROL:

Although many metering pumps have a broad turndown ratio, they are often more accurate and achieve better residual control when operating at the middle to upper end of the range. On demand dilution allows a higher volume/lower strength chemical to be fed. This allows for smaller incremental changes in chemical dosing, enabling tighter residual loop controls (i.e. pH., ORP, streaming current, chlorine) by reducing overshoot.

S A F E T Y

SODIUM HYPOCHLORITE

14%

USING LOWER STRENGTH CHEMICALS:

Feeding lower strength chemicals can reduce liability and increase safety. For example, operating and servicing pumps, piping and valves in a sodium hydroxide (caustic) feed system is FAR SAFER when dealing with a 5% solution strength instead of a 49% solution strength. In addition, when sodium hypochlorite is diluted to less than 1%, it is no longer even considered to be a hazardous material by government regulators!



AUTOMATION & REMOTE MONITORING REDUCES OPERATOR EXPOSURE:

Manually diluting and checking chemical inventories can create hazardous situations and inconsistent results. By automating the dilution process and outputting 4-20mA signals proportional to remaining chemical supplies, the Merlin significantly reduces operator exposure to hazardous chemical spills and splashes.



REDUNDANT CONTROLS AND ALARMS:

Overflow switches, redundant solenoid valves and six process alarms make the Merlin Dilution System safe and reliable for the most demanding chemical feed applications.

49%

SODIUM HYDROXIDE

30% FLUOSILICIC ACID

TYPICAL SPECIFICATION

FOR CHEMICAL DILUTION SYSTEM



GENERAL SCOPE: Dilution system shall use a system of automatically creating small weight based batches on demand to achieve dilution accuracies of up to 1/10th of 1%. Dilution system shall account for the difference of the specific gravity of water and the chemical used. The system shall use a microprocessor based controller to control the opening and closing of a water valve and chemical transfer pump to create the diluted batch. Dilution system shall be totally flexible and capable of diluting any strength of neat chemical solution to as low as a 0.1% chemical solutions. Dilution system shall be preassembled, calibrated and tested prior to delivery. Complete dilution system shall include all necessary piping, valves, plumbing connections, pumps, dilution tanks, weight sensors, controller, and relays necessary for sole source responsibility. Neat chemical shall be delivered in approximately____ percent _____ (chemical name) and shall be diluted to approximately____percent solution strength. System shall have a maximum capacity of _____gallons/liters of diluted chemical per day.

Optional mixers, water softeners and HypoTrak™ analyzer are available. Specify if required.



CONTROLLER OPERATION: Controller keypad shall have the ability of full password protection to restrict unauthorized operation of the dilution system. Start and Stop keys shall initiate and terminate the dilution process. In the fully automatic mode, system shall require the operator to input only neat and dilute chemical strengths and the controller shall calculate required target amounts automatically. If the neat chemical target is exceeded, controller shall automatically adjust the water input in order to maintain the desired dilution strength. For chemicals that give off an exothermic reaction, provisions shall be available to keep heat build up to a minimum. System shall have the capability of complete manual override of the dilution process.

ALARMS, OUTPUTS AND INVENTORY MANAGEMENT:

Controller shall have the capability of fully monitoring the dilution process. All alarms shall be displayed on the controller screen and a normally open, dry contact relay shall be available to indicate the following alarm conditions: Slow neat chemical transfer, slow water transfer, slow dilute chemical feed, maximum daily chemical usage, high dilution tank level and batch strength not available. An alarm log shall keep track of the time and date of the most recent 10 alarm conditions. A 4-20 mA signal shall output the amount of the remaining dilute chemical, remaining neat chemical and whether the system is activated or not. In addition, controller shall report locally all usages, feed rates, and remaining quantities of diluted chemicals. Controller shall also convert these values to a "pure" value in order to evaluate the actual "pure chemical by weight". Dilution system shall be the Merlin Automated Onsite Dilution System as manufactured by Force Flow, 1150-D Burnett Ave, Concord CA 94520 or equal.

FORCE FLOW

(800) 893-6723 1150-D BURNETT AVE., CONCORD, CA 94520 U.S.A.

FAX (925) 686-6713 WWW.FORCEFLOW.COM

E-MAIL : INFO@FORCEFLOW.COM

PATENT PENDING

SECTION 6

WELL 38 ON-SITE SODIUM HYPOCHLORITE GENERATOR

LETTER OF TRANSMITTAL

Transmittal Date: 4/30/2012

Project Name:		Well #38		Job #	n/a		Parkson			
		Delano, CA		PO#	201202964		Project #	260322		
Customer/Contractor:		Hopkins Technical Products, inc. 2155 Elkins Way Brentwood, CA 94513-4036						Description	MaximOS SH-50	
Address:								Engineer	S. Trivedi	
								Email	sttrivedi@parkson.com	
								Spec Section		
								Project #		
Attn:	Richard Hopkins			e-mail	rich@htpinc.com			Description		
Phone:	925/240-2160	Fax:	925/240-2166				Engineer			
Engineer Address:								Email		
								Spec Section		
								Project #		
								Description		
Attn:					e-mail				Engineer	
Phone:		Fax:					Email			
								Spec Section		

We are transmitting the following:

	No. Copies	Approval	Your Use	Review & Comment	As Requested
Submittal Package	4	X			
Re-Submittal					
Certified Drawings					
IOM Manuals					
Other:					

REMARKS/COMMENTS

RETURN (1) COPY TO:

Project Manager: Julie Davis
jdavis@parkson.com

Parkson Address: Parkson Corporation
1401 W Cypress Creek Rd, Suite 100
Fort Lauderdale, FL 33309-1721
(954) 974-6610

APPROVAL REQUIRED NO LATER THAN:

6/1/2012

Estimated Shipping date

_____ weeks After Drawing Approval (ADA)

PLEASE NOTE: Although every attempt will be made to ship within our quoted lead times, our estimated ship date is subject to final approval and fabricator workload at the time final approval is received by Parkson. Commencement of performance, including this submittal transmission, shall not constitute acceptance of the order. Only a signed contract, containing mutually agreeable terms and conditions, shall act as an acceptance.

DISTRIBUTION

_____ Contractor	_____ Rep 1	_____ File
_____ Engineer	_____ Rep 2	_____ Service

Rev Date 8/31/09

CC: Project Manager



Submittal #1

Well #38 Delano, CA

Table of Contents

Table of Contents	1
Sodium Hypochlorite On-Site Generator	2
General Arrangement Drawings.....	3
Process & Instrumentation Diagrams.....	11
Water Filter	27
Water Softener	34
Brine Generator	49
Oxidant Storage Tank.....	65
Hydrogen Vent	68
Ultrasonic Level Sensor	71
Spare Parts.....	75
Hydrogen Safety Paper	Appendix A
Salt Guidelines	Appendix B
MSDS Sheets	Appendix C

On-Site Generation:

Mixed Oxidant On-Site Generator

VAULT Self Cleaning Series Specifications

One (1) of Mixed-Oxidant On-Site Generator

Model #SH-50

VAULT Mixed-Oxidant On-Site Generator General Arrangement Drawings

Process & Instrumentation Drawings

Cell Control

Electrolytic Cell

NOTES:

1. UNISTRUT INSTALLATION KIT INCLUDES:
- A. EXPANSION ANCHORS
 - B. LAG BOLTS
 - C. TOGGLE BOLTS
 - D. FRAME ASSY, WALL MOUNT, VAULT SERIES (500-00452).

FOR ATTACHMENT TO APPROPRIATE WALL CONSTRUCTION.

2. MINIMUM DISTANCE REQUIRED FOR FILTER HOUSING REMOVAL.

3. WATER PRESURE REQUIREMENTS PER UNIT 30 PSI MINIMUM.

4. ELECTRIC SERVICE REQUIREMENTS:
- A. 220 VAC 1-PHASE, 30 A – M15/H25
220 VAC 1-PHASE, 60 A – M30/H50
220 VAC 1-PHASE, 90 A – M45/H75
220 VAC 1-PHASE, 120 A – M60/H100
 - B. INTERNATIONAL POWER OPTIONS AVAILABLE. CONTACT MIOX CORP FOR DETAILS.
 - C. **GROUND CONNECTION MANDATORY.

5. POWER TO CABINET PROVIDED BY OTHERS.

6. BRINE AND OXIDANT TANK SIZES VARY WITH INSTALLATION. CONTACT MIOX CORP.FOR DETAILS.

7. POWER SUPPLIES TO ELECTROLYTIC CELL AND CONTROLLER ARE INTERNAL TO MIOX SERIES SYSTEMS AND ARE SHIPPED WIRED.

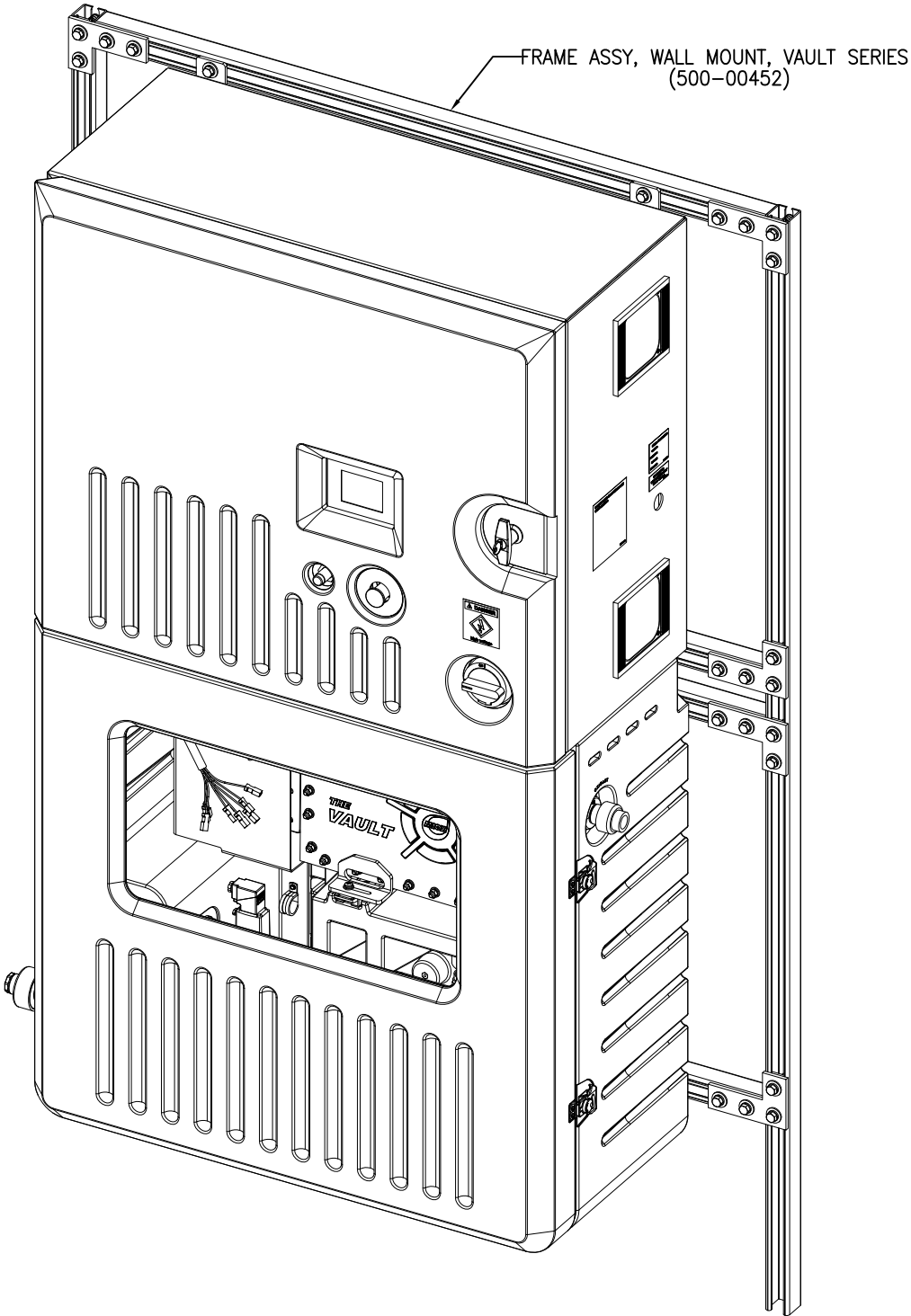
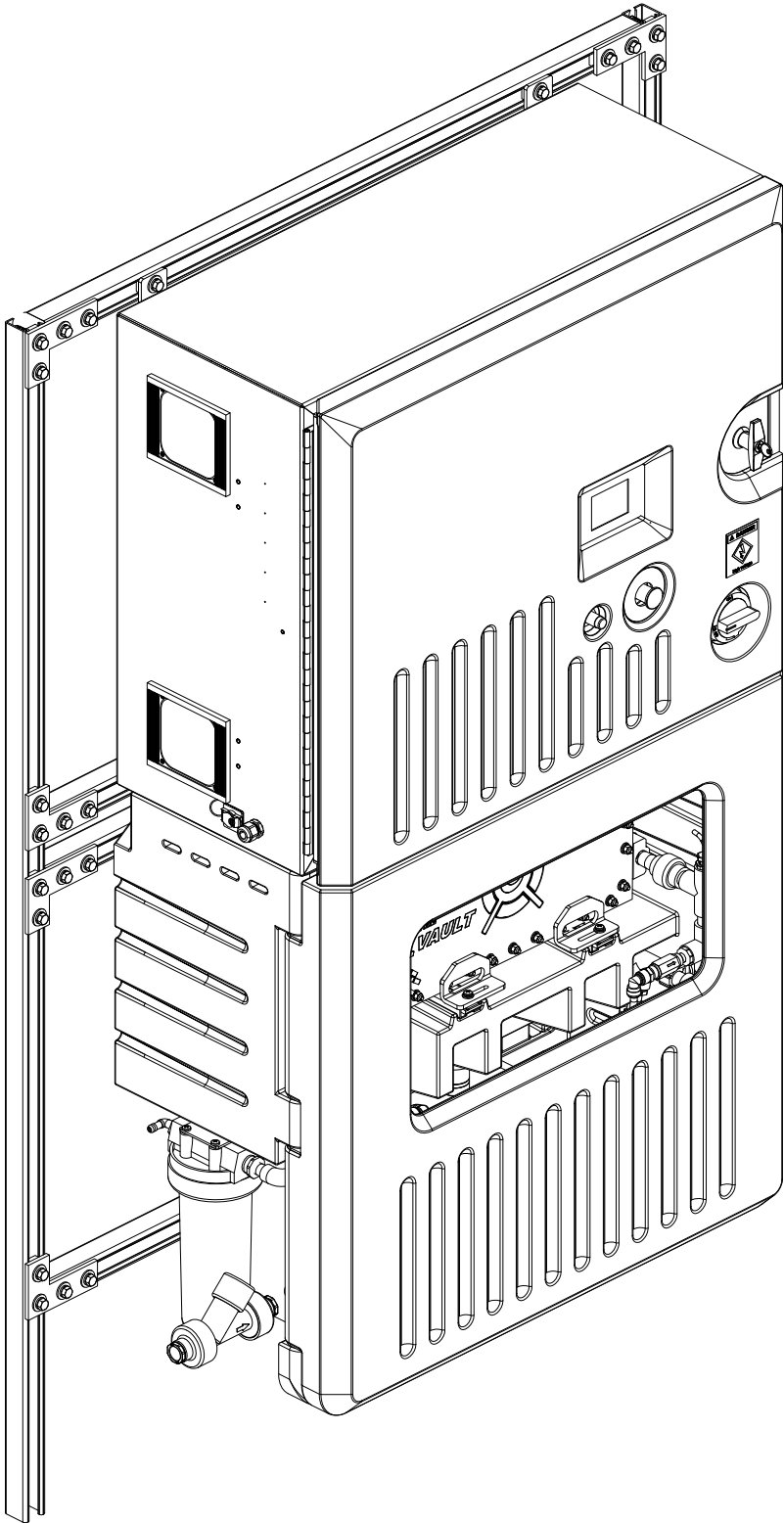
8. DIMENSIONS IN PARENTHESIS () ARE METRIC EQUIVALENT (MM).

9. ADD 1X 300-02552, 3/4" SEDIMENT STRAINER TO WATER INLET PLUMBING LINE.

10. APPROXIMATE UNIT WEIGHTS / FLOW RATES:
- | | | | |
|----------|------------|---|-------------|
| H25/M15 | : 230 lbs. | / | 22/19 (GPH) |
| H50/M30 | : 260 lbs. | / | 44/38 (GPH) |
| H75/M45 | : 290 lbs. | / | 66/57 (GPH) |
| H100/M60 | : 320 lbs. | / | 88/76 (GPH) |

11. CUSTOMER HOOK UP:
- HARD PLUMBING, SOFT PLUMBING AND Y-STRAINER HOOK UP COMPONENTS ARE SHOWN IN DETAIL VIEWS E & F. THESE COMPONENTS ARE SUPPLIED BY MIOX IN THE OPERATIONS KIT 500-00449.

12. Y-STRAINER LOCATION AND ORIENTATION TO BE DETERMINED AT INSTALLATION.



This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___PRELIMINARY ___APPROVAL
___INFORMATION ___CERTIFIED

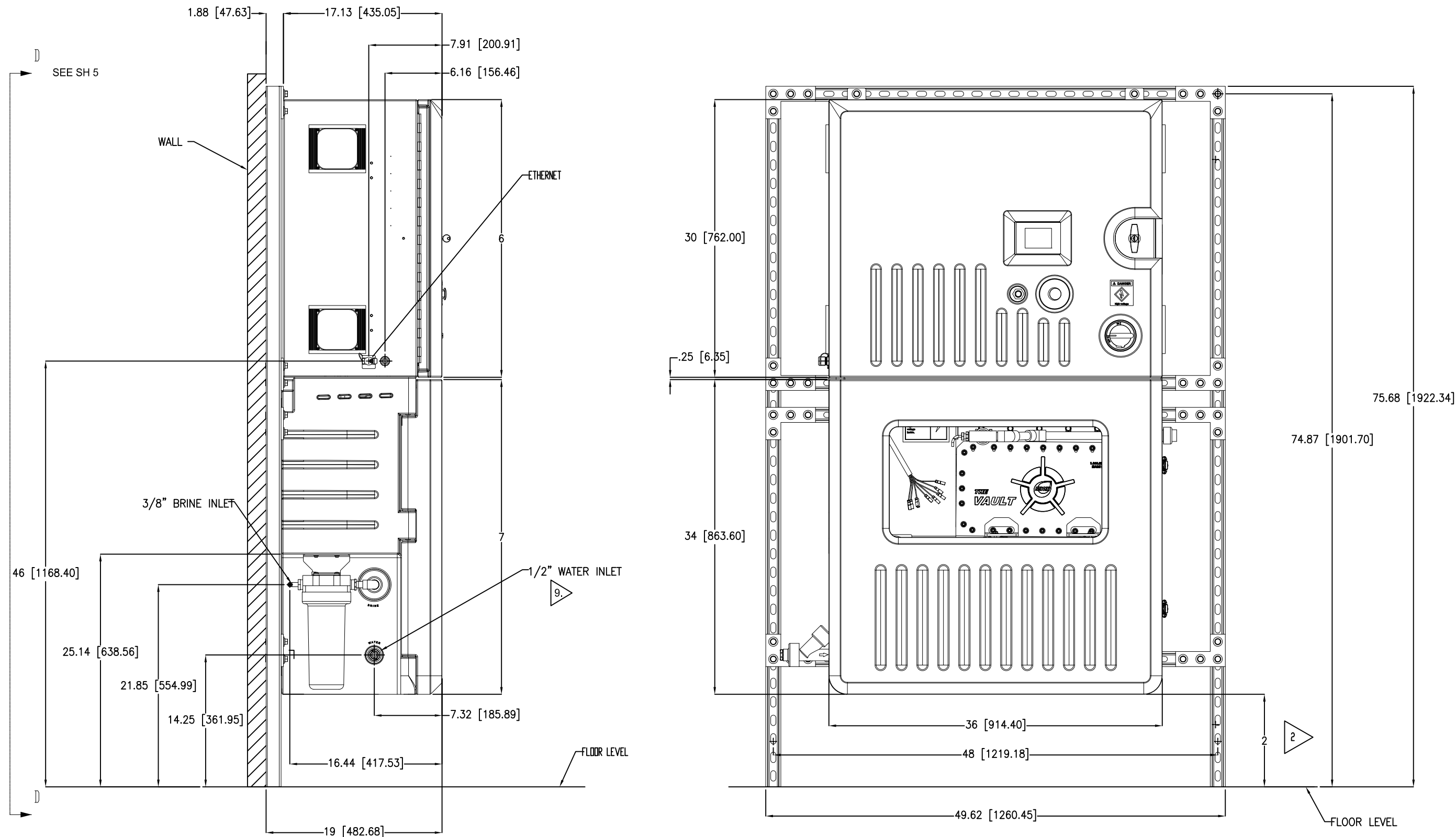
THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
ST	4/10/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE
NONE	B



PROJECT NAME
REFERENCE INFORMATION

TITLE	
MAXIMOS GENERAL ARRANGEMENT DRAWING SH/SM SERIES GENERATOR SH-50	
DRAWING NO	REV
000-00173	03
SHEET 1 OF 8	



UNISTRUT MOUNTING, CONTROL & PLUMBING ENCLOSURES LOCATION

This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

— PRELIMINARY ☒ APPROVAL
— INFORMATION — CERTIFIED

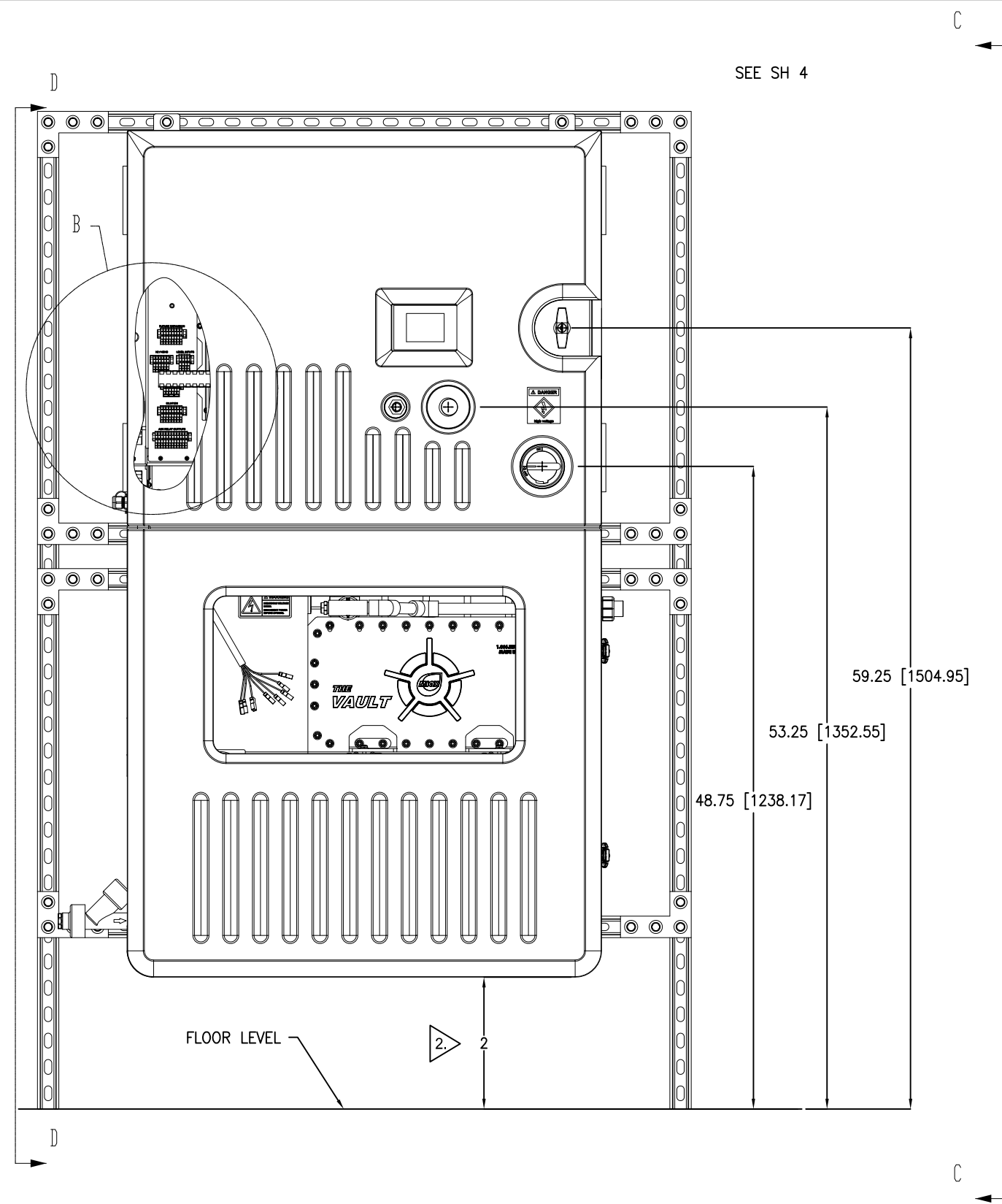
THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
ST	4/10/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE
NONE	B

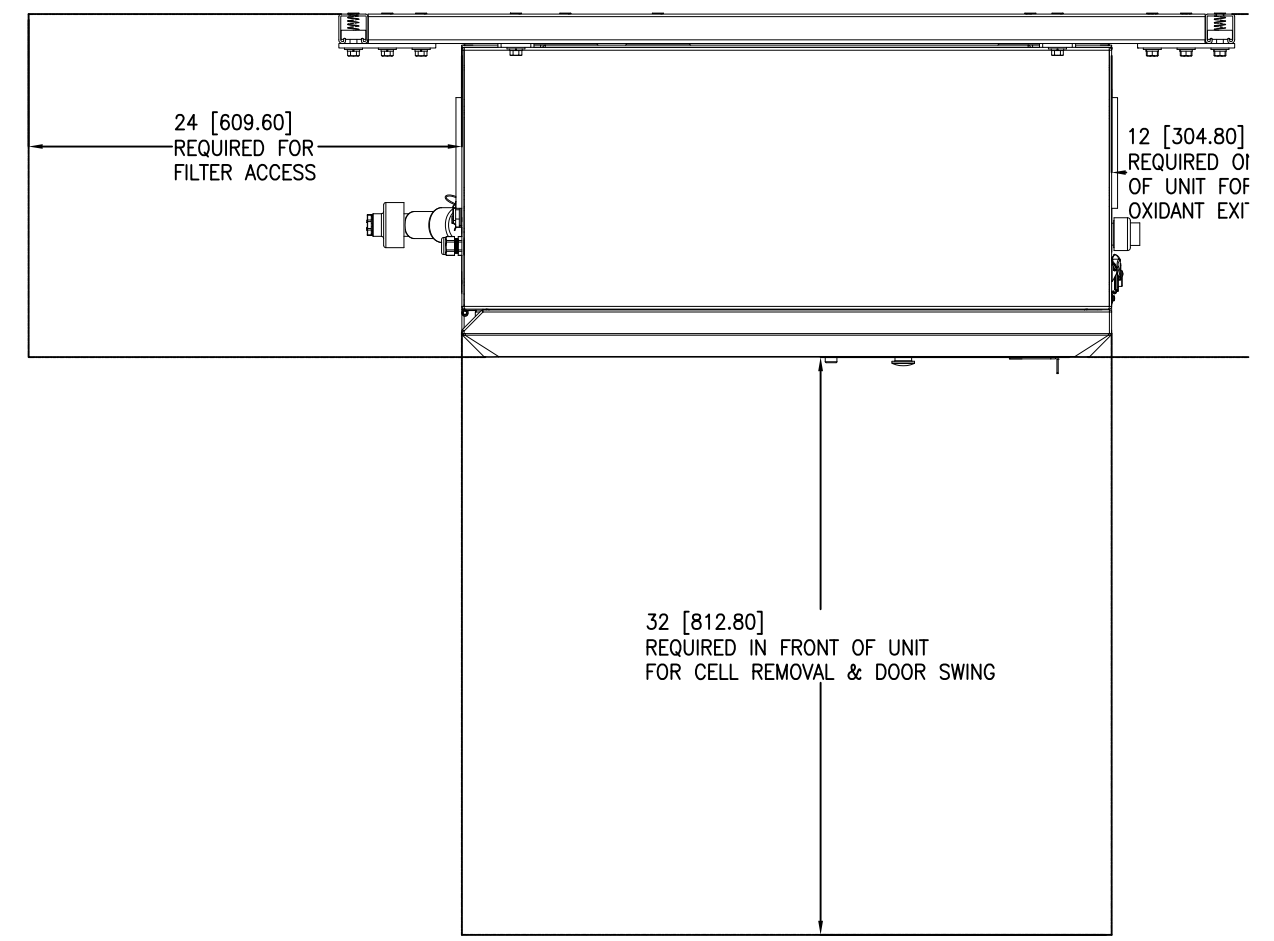


PROJECT NAME
REFERENCE INFORMATION

TITLE	MAXIMOS GENERAL ARRANGEMENT DRAWING SH/SM SERIES GENERATOR SH-50
DRAWING NO	000-00173
REV	03

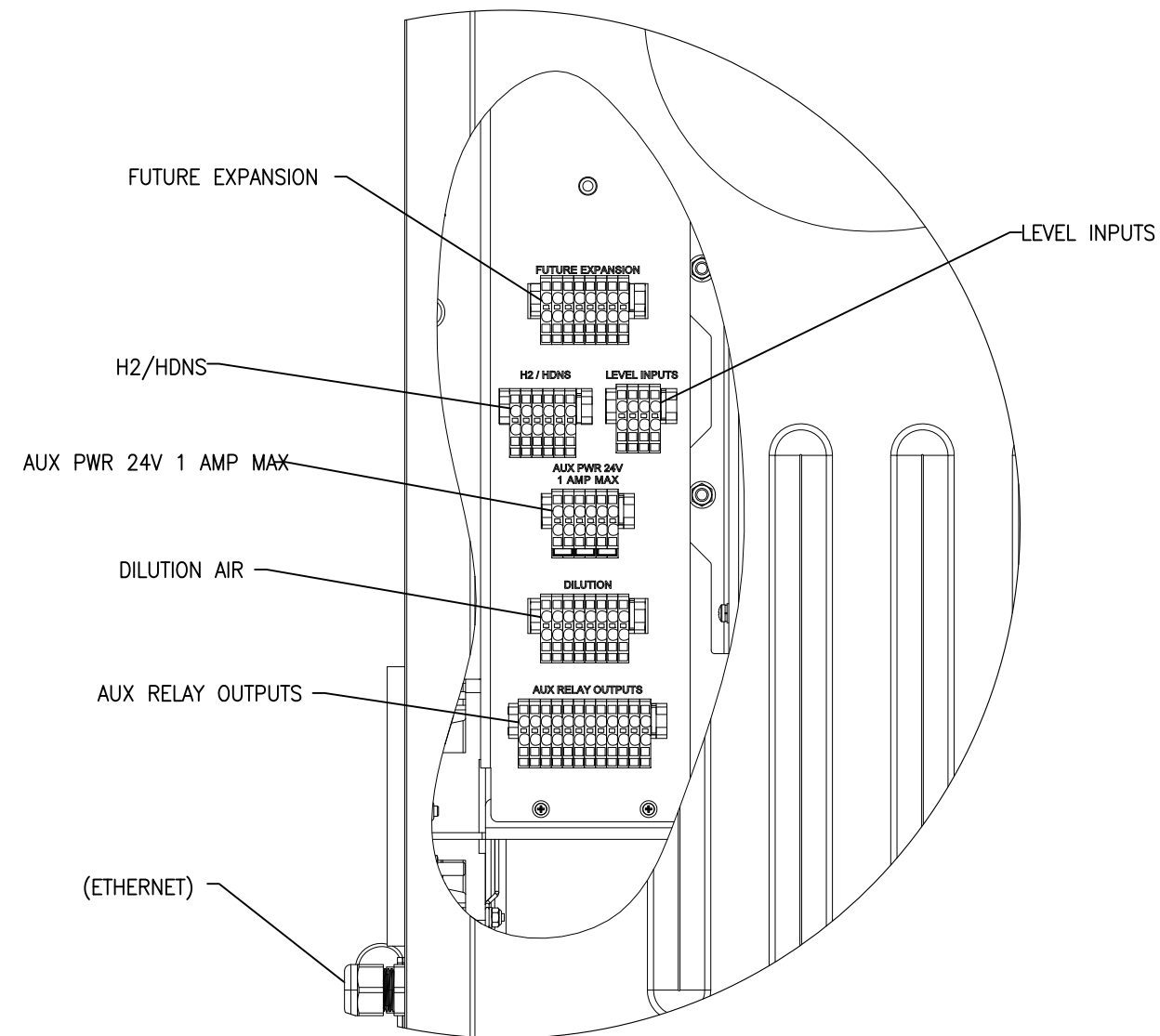


FRONT ELEVATION VIEW
(SOME COMPONENTS HIDDEN FOR CLARITY)

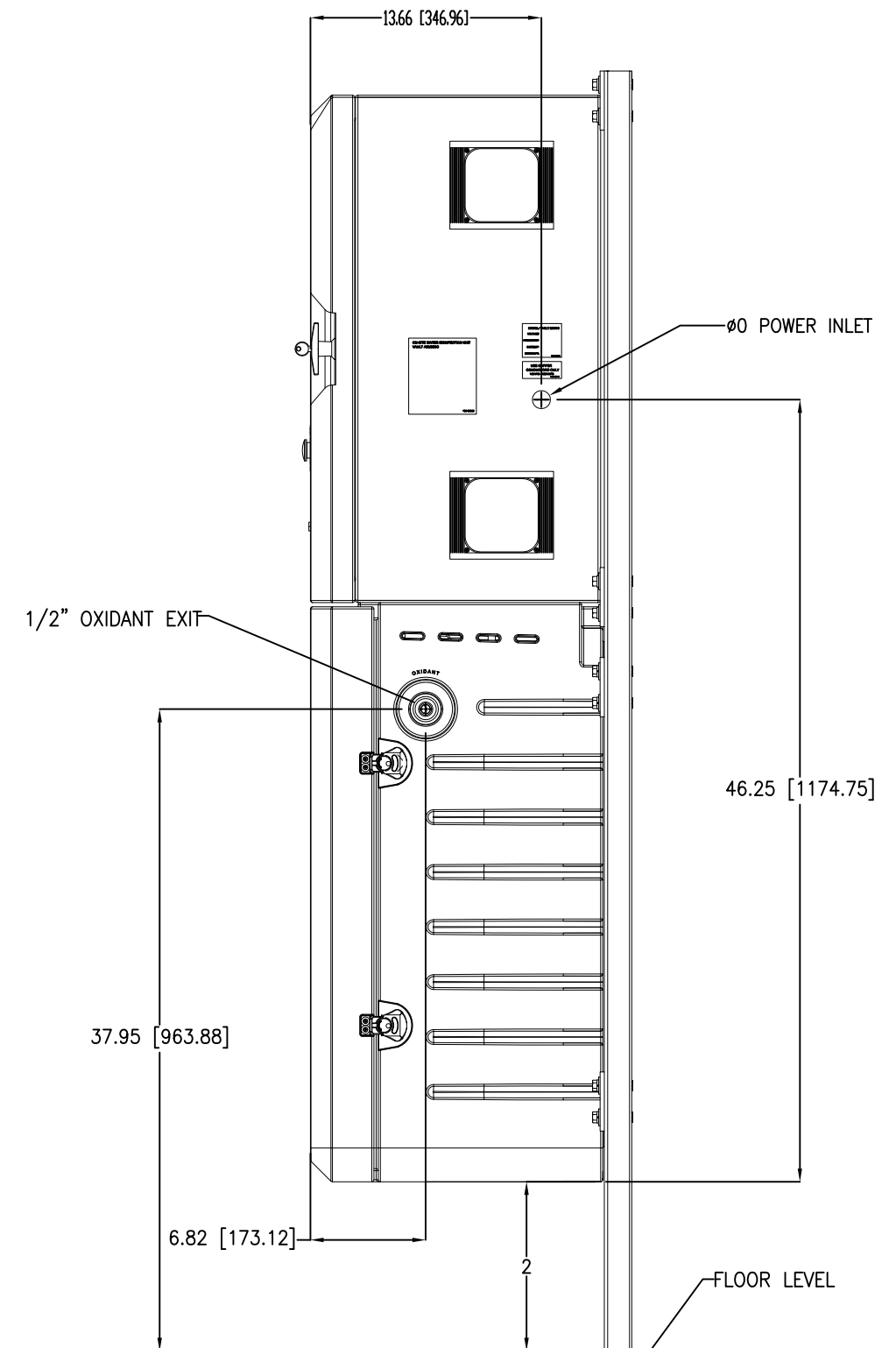


VIEW A-A
(PLAN VIEW)
(SOME COMPONENTS HIDDEN FOR CLARITY)

This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.				___PRELIMINARY ☒ APPROVAL		DRAWN BY ST		DATE 4/10/2012				PROJECT NAME		TITLE MAXIMOS GENERAL ARRANGEMENT DRAWING SH/SM SERIES GENERATOR SH-50			
				___INFORMATION ___CERTIFIED		CHECKED BY TDE		DATE 4/13/2012				REFERENCE INFORMATION		DRAWING NO 000-00173		REV 03	
				THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.		SCALE NONE		SIZE B									
				REV	DESCRIPTION	DATE	BY	SHEET 3 OF 8									



DETAIL B



VIEW C-C

This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

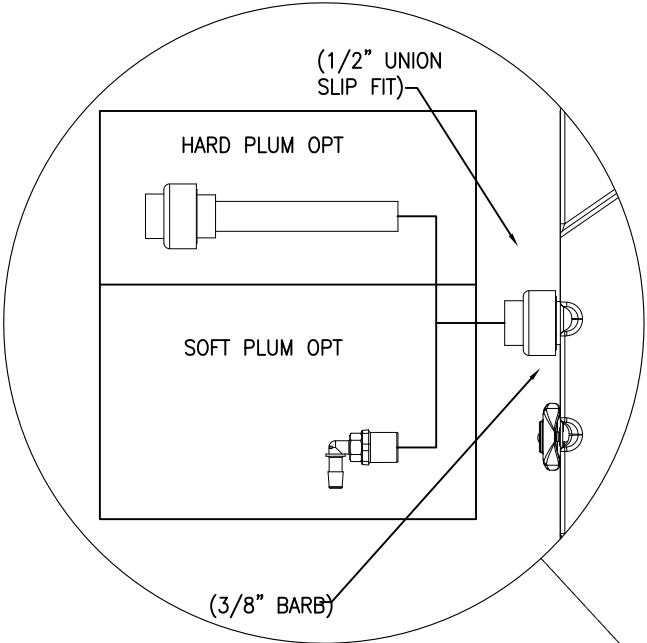
_____ PRELIMINARY ☒ APPROVAL
 _____ INFORMATION _____ CERTIFIED
 THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
ST	4/10/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE
NONE	B

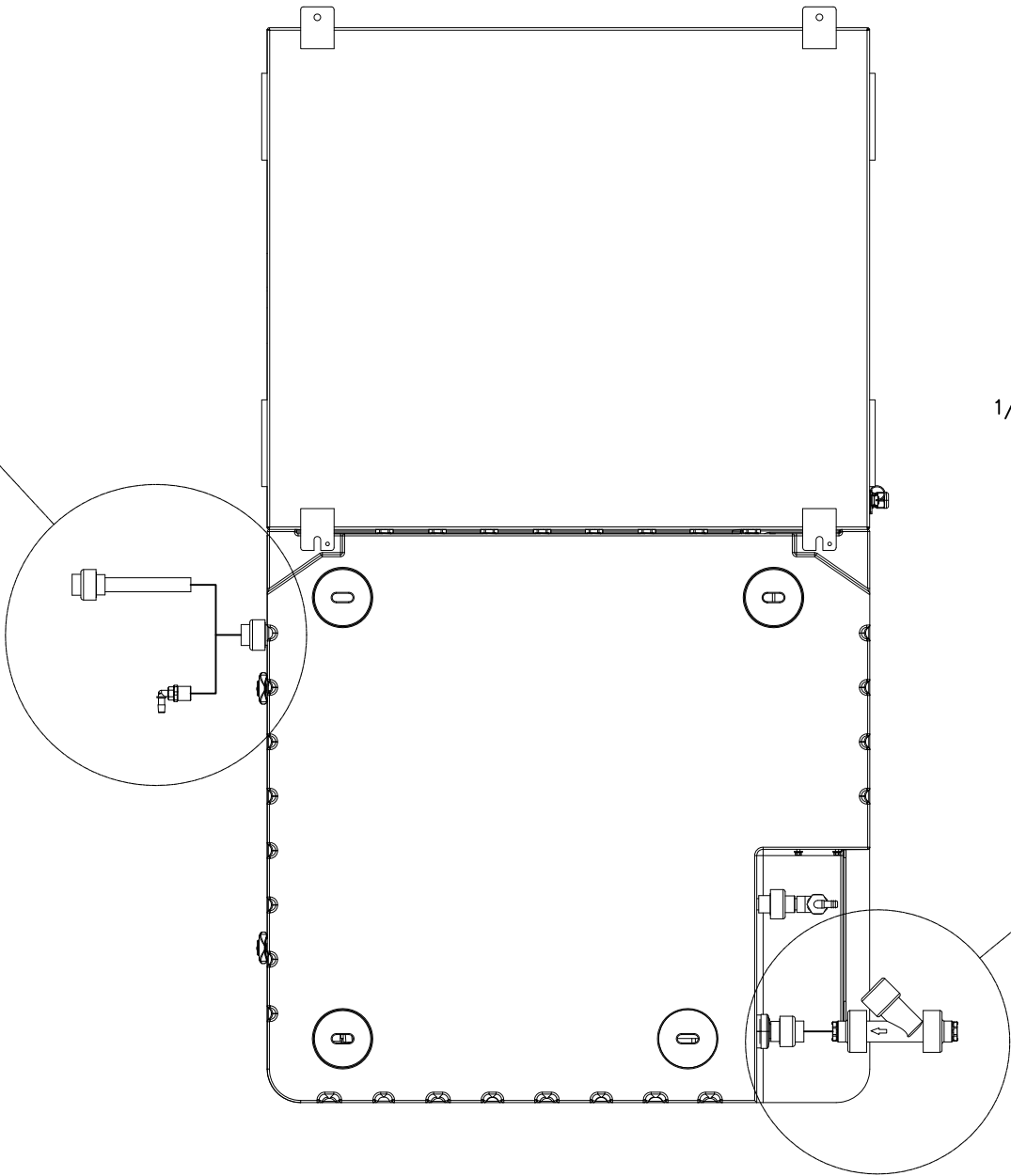


PROJECT NAME
REFERENCE INFORMATION

TITLE	
MAXIMOS GENERAL ARRANGEMENT DRAWING SH/SM SERIES GENERATOR SH-50	
DRAWING NO	REV
000-00173	03
SHEET 4 OF 8	

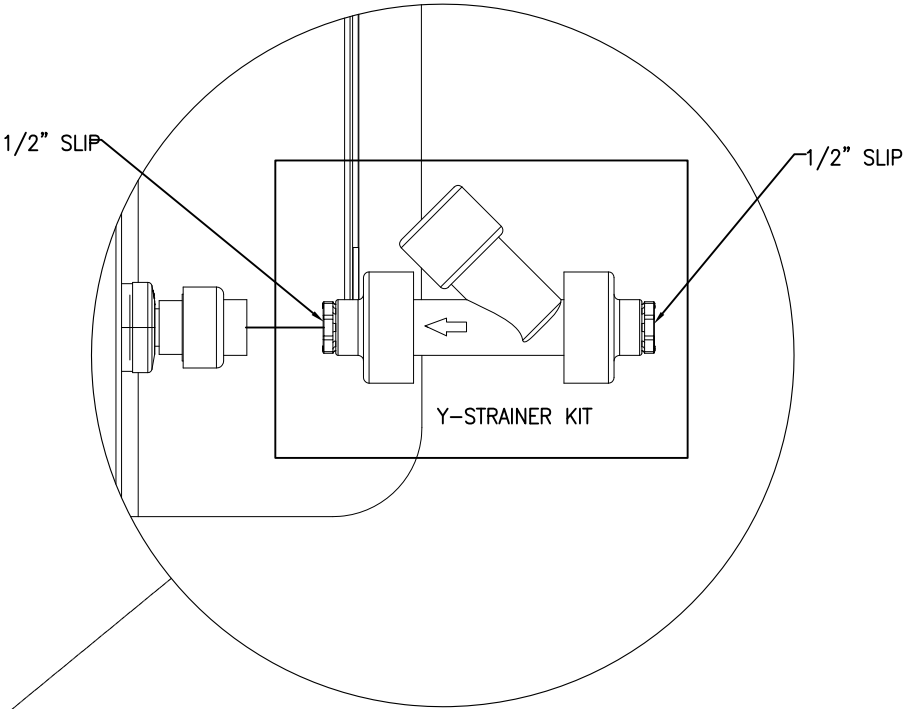


DETAIL E



VIEW D-D

(FRAME HIDDEN FOR CLARITY)



DETAIL F



This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___PRELIMINARY ☒ APPROVAL
___INFORMATION ___CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

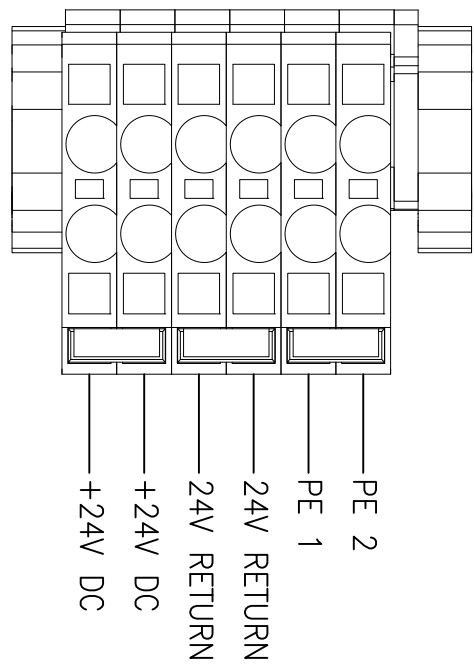
DRAWN BY	DATE
ST	4/10/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE
NONE	B



PROJECT NAME
REFERENCE INFORMATION

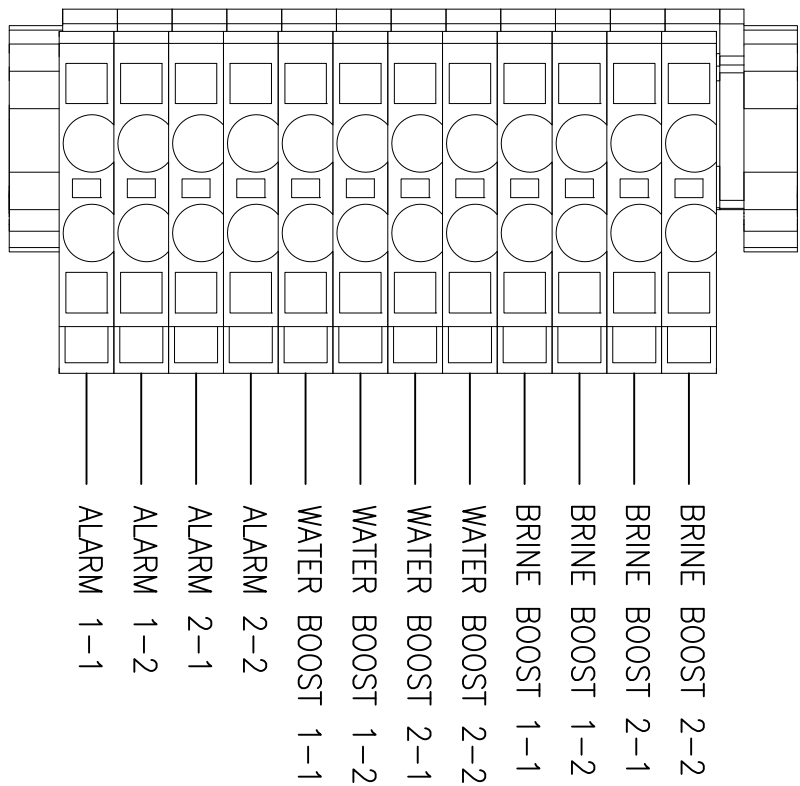
TITLE	
MAXIMOS GENERAL ARRANGEMENT DRAWING SH/SM SERIES GENERATOR SH-50	
DRAWING NO	REV
000-00173	03
SHEET 5 OF 8	

AUXILIARY POWER CONN



CONNECTION NAME	CONNECTION DESCRIPTION
+24V DC	24 VOLTS DC POWER
24V RETURN	RETURN CONNECTION FOR 24VDC POWER
PE	PHYSICAL EARTH CONNECTION

AUXILIARY RELAY CONN



CONNECTION NAME	CONNECTION DESCRIPTION
ALARM	CONTACT CLOSE WHEN SYSTEM SHUTS DOWN FOR A HARD FAULT
WATER BOOST	CONTACTS CLOSE WHEN SYSTEM STARTS UP (RUNNING)
BRINE BOOST	CONTACTS CLOSE WHEN SYSTEM STARTS UP (RUNNING)

This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

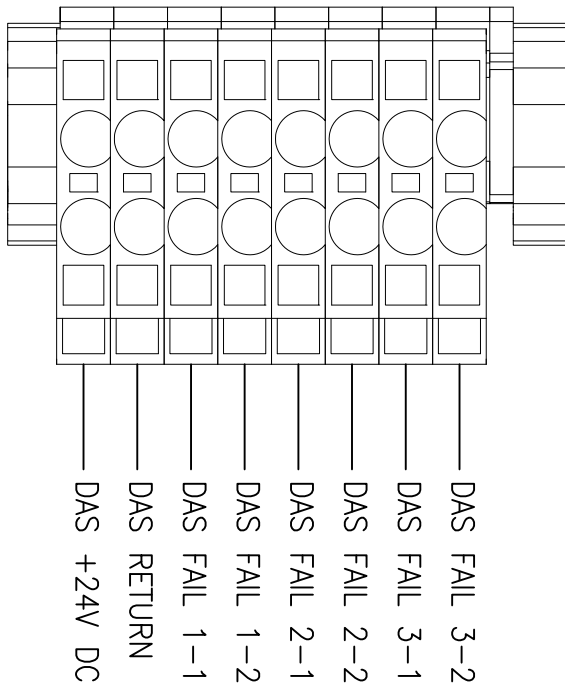
REV	DESCRIPTION	DATE	BY

___PRELIMINARY ___APPROVAL	DRAWN BY	DATE
___INFORMATION ___CERTIFIED	ST	4/10/2012
	CHECKED BY	DATE
	TDE	4/13/2012
	SCALE	SIZE
	NONE	B



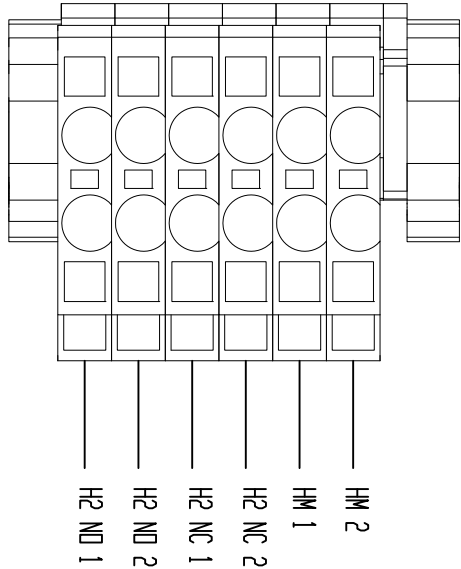
PROJECT NAME	TITLE	REV
	MAXIMOS GENERAL ARRANGEMENT DRAWING SH/SM SERIES GENERATOR SH-50	03
REFERENCE INFORMATION	DRAWING NO	
	000-00173	

DILUTION AIR CONN



CONNECTION NAME	CONNECTION DESCRIPTION
+24V DC	24 VOLTS DC POWER
24V RETURN	RETURN CONNECTION FOR 24VDC POWER
PE	PHYSICAL EARTH CONNECTION

H2 / HARDNESS CONN



CONNECTION NAME	CONNECTION DESCRIPTION
ALARM	CONTACT CLOSE WHEN SYSTEM SHUTS DOWN FOR A HARD FAULT
WATER BOOST	CONTACTS CLOSE WHEN SYSTEM STARTS UP (RUNNING)
BRINE BOOST	CONTACTS CLOSE WHEN SYSTEM STARTS UP (RUNNING)

This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___PRELIMINARY ☒ APPROVAL
___INFORMATION ___CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

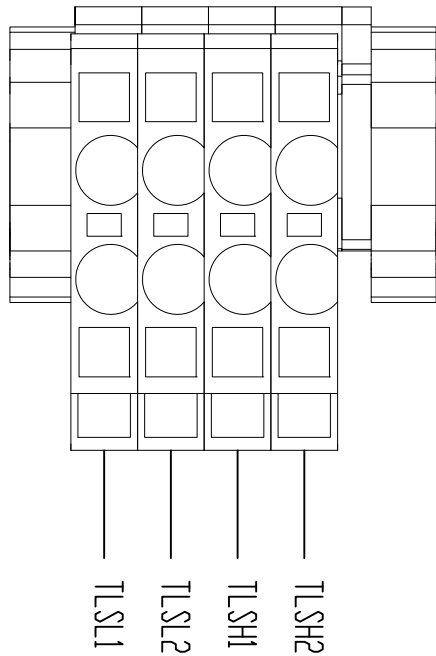
DRAWN BY	DATE
ST	4/10/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE
NONE	B



PROJECT NAME
REFERENCE INFORMATION

TITLE	
MAXIMOS GENERAL ARRANGEMENT DRAWING SH/SM SERIES GENERATOR SH-50	
DRAWING NO	REV
000-00173	03
SHEET 7 OF 8	

LEVEL INPUT CONN



CONNECTION NAME	CONNECTION DESCRIPTION
+24V DC	24 VOLTS DC POWER
24V RETURN	RETURN CONNECTION FOR 24VDC POWER
PE	PHYSICAL EARTH CONNECTION

This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___PRELIMINARY ☒ APPROVAL
___INFORMATION ___CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
ST	4/10/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE
NONE	B



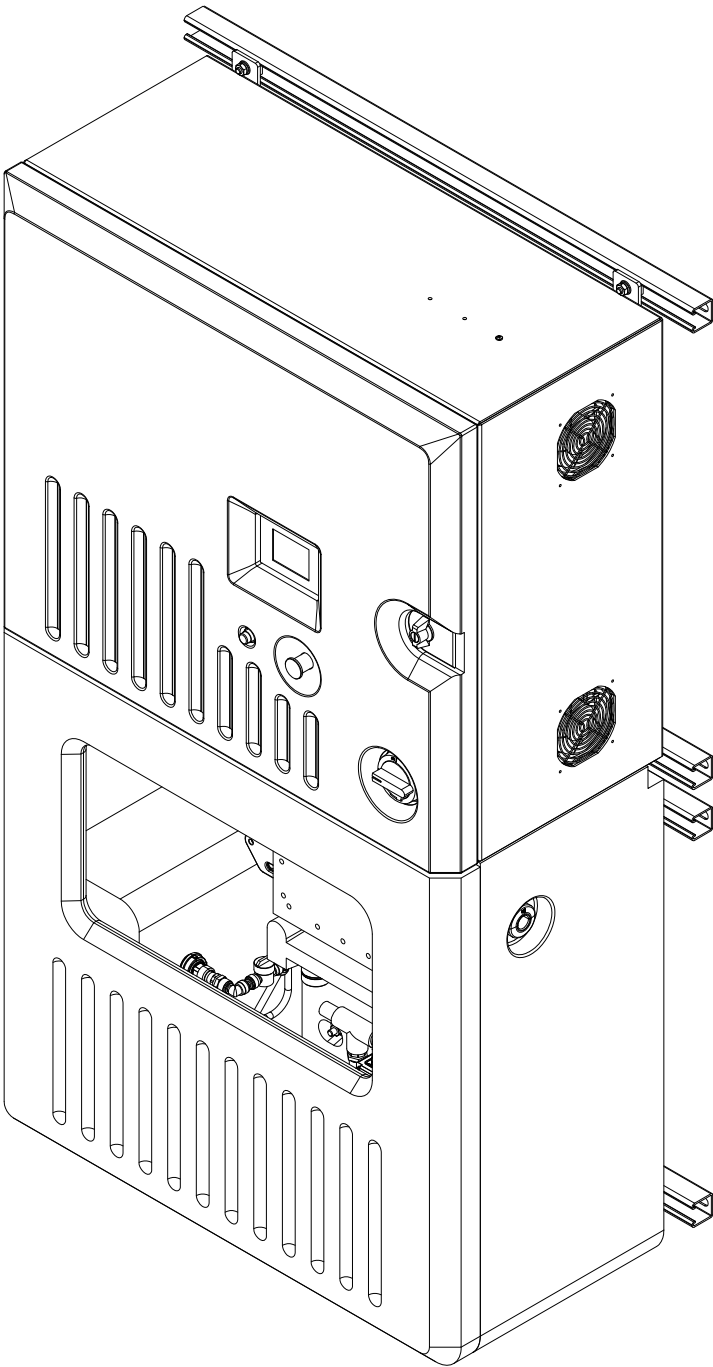
PROJECT NAME
REFERENCE INFORMATION

TITLE	MAXIMOS GENERAL ARRANGEMENT DRAWING SH/SM SERIES GENERATOR SH-50
DRAWING NO	000-00173
REV	03

PARKSON SODIUM HYPOCHLORITE GENERATION EQUIPMENT

INDEX

26032201-01	TITLE PAGE & INDEX
26032201-02	LEGEND & SYMBOLS
26032201-03	PROCESS & PIPING DIAGRAM 1
26032201-04	PROCESS & PIPING DIAGRAM 2
26032201-05	PROCESS & INSTRUMENTATION DIAGRAM 1
26032201-06	PROCESS & INSTRUMENTATION DIAGRAM 2



This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___PRELIMINARY ☒ APPROVAL
___INFORMATION ___ CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
ST	4/12/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE



PROJECT NAME
260322 WELL #38 DELANO, CA
REFERENCE INFORMATION

TITLE		
MAXIMOS SCH-50		
TITLE PAGE AND SHEET INDEX		
DRAWING NO	26032201-01	REV 0
SHEET 1 OF 6		

VALVE SYMBOLS

	TRUE UNION ISOLATION VALVE
	BALL VALVE
	THREE-WAY VALVE
	SOLENOID VALVE
	CHECK VALVE
	METERING VALVE
	PRESSURE RELIEF VALVE, 3--PORT
	INJECTOR WITH CHECK VALVE
	BACK PRESSURE/ PRESSURE RELIEF
	RUPTURE DISK
	BUTTERFLY DAMPER
	NEEDLE VALVE

PRIMARY ELEMENT SYMBOLS

	PRESSURE SENSOR
	FLOW METER
	FLOW REGULATOR
	ELECTROMAGNETIC FLOWMETER
	ORIFICE PLATE
	DIFFERENTIAL PRESSURE SWITCH
	ULTRASONIC LEVEL CONTROL
	SALT LEVEL INDICATOR
	HAND SWITCH (HAND-OFF-AUTO)
	REMOTE SENSOR
	TEMPERATURE SWITCH
	TEMPERATURE SWITCH

TAG NUMBERS AND ABBREVIATIONS

	PARKSON ON-SITE GENERATOR
	WATER FILTER
	WATER SOFTENER
	CENTRIFUGAL WATER PUMP
	PRESSURE GUAGE (H2O) 0-100 PSI
	SAMPLE PORT SOFT WATER
	BRINE FILTER
	BRINE GENERATOR
	BRINE LEVEL SWITCH
	CENTRIFUGAL BRINE PUMP
	PRESSURE GUAGE W/ISOLATOR (BRINE) 0-30 PSI
	SAMPLE PORT BRINE SOLUTION
	SOLUTION TANK
	SOLUTION LEVEL SWITCH
	ULTRASONIC TRANSDUCER
	ULTRASONIC TRANSDUCER CONTROLLER
	VALVE OPEN CENTER 3-WAY
	INJECTOR
	GAS MONITOR
	HARDNESS MONITOR
	CHLORINE ANALYZER
	CARBON FILTER

LINE TYPE REFERENCE

_____ DATA COMMUNICATION
 _____ INSTRUMENT SIGNALS
 _____ PROCESS FLOW, PIPING
 ► PROCESS FLOW DIRECTION

POWER

120/1/5 VOLTAGE AND POWER
SUPPLY, PHASE AND AMPERAGE
OR WATT AS NOTED

INTERFACE SYMBOLS

▲	ANALOG IN
▼	ANALOG OUT
△	DIGITAL IN
▽	DIGITAL OUT
	PLC OR REMOTE I/O TERMINAL
	HMI OR OIT FUNCTION

ADDITIONAL DEFINITIONS

Diagram illustrating the terminal block configuration for a 4-wire device. The terminal block is shown with two rows of terminals. The top row is labeled "TERMINAL BLOCK SIGNAL" and the bottom row is labeled "TERMINAL BLOCK NUMBER LOCATION". The top row contains terminals labeled "XXX" and "000". The bottom row contains terminals labeled "XXX" and "000". The "XXX" terminals are labeled "SIGNAL" and the "000" terminals are labeled "LOOP ID IF USED".

PROCESS DEVICE SYMBOLS

	CALIBRATION COLUMN
	VENT SCREEN
	WATER HEATER
	WATER CHILLER
	REDUCER
	PRESSURE REGULATOR
	FILTER
	PRESSURE GAUGE
	GAUGE ISOLATOR
	PULSATION DAMPENER
	TEE
	PRIMING BULB
	Y-STRAINER
	DRAIN

PUMP SYMBOLS

	BLOWER
	PERISTALTIC PUMP
	CENTRIFUGAL PUMP
	DIAPHRAGM PUMP

MISCELLANEOUS SYMBOLS

PS POWER SUPPLY

CURRENT SENSOR

VENT STRAINER

This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to the understanding that it is not to be reproduced, copied, loaned, revealed or used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

☐ PRELIMINARY ☒ APPROVAL
☐ INFORMATION ☐ CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN,
GENERAL ARRANGEMENT AND CLEARANCE. NO
RESPONSIBILITY IS ACCEPTED BY PARKSON
CORPORATION FOR OTHER DIMENSIONS, QUANTITIES,
OR COORDINATION WITH OTHER EQUIPMENT OR
DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY ST	DATE 4/12/2012
CHECKED BY TDE	DATE 4/13/2012
SCALE	SIZE



PROJECT NAME	260322 WELL #38 DELANO, CA
REFERENCE INFORMATION	

TITLE		MAXIMOS SCH-50 LEGEND & SYMBOLS
DRAWING NO	26032201-02	REV 0

MINIMUM REQUIREMENTS BY OTHERS:

- 1

(1) NIPPLE – 3/4”T x 8”
(2) ELBOW – 3/4”S x 1/2”S x 3/4”S
- 2

(1) REDUCER – 3/4”S x 1/2”S
- 3

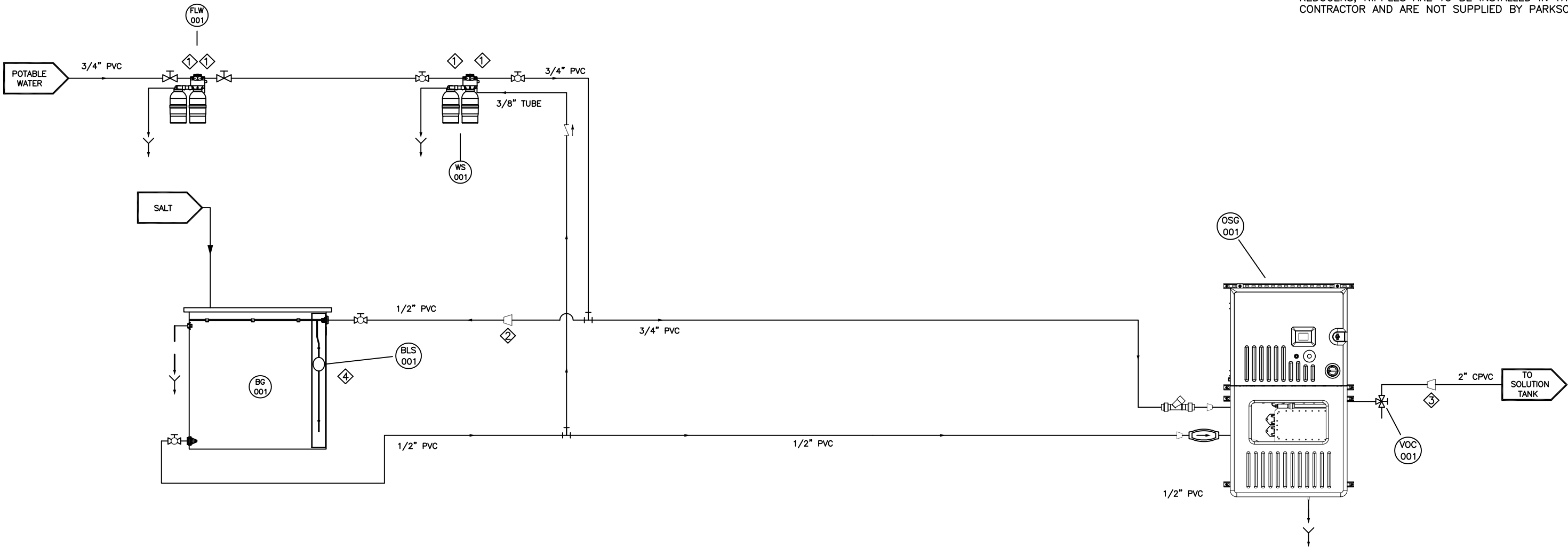
(1) REDUCER – 1/2”S x 2”S
- 4

BRINE LOW LEVEL FLOAT SHALL BE SET ABOVE
BRINE FILTER INLET TO INSURE FLOODED SUCTION.
NO SECTION OF BRINE LINE SHALL RISE ABOVE
FILTER INLET OR A BRINE BOOST PUMP MAY
BE REQUIRED.

NOTES:

EQUIPMENT PROVIDED WITH ON-SITE GENERATOR
INSTALLED, PLUMBED, WIRED AND STARTED BY CONTRACTOR

ALL INTERCONNECTING PIPING, INCLUDING BUT NOT LIMITED
REDUCERS, NIPPLES ARE TO BE INSTALLED IN THE FIELD BY
CONTRACTOR AND ARE NOT SUPPLIED BY PARKSON.



This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY	

___PRELIMINARY ☒ APPROVAL
___INFORMATION ___CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN,
GENERAL ARRANGEMENT AND CLEARANCE. NO
RESPONSIBILITY IS ACCEPTED BY PARKSON
CORPORATION FOR OTHER DIMENSIONS, QUANTITIES,
OR COORDINATION WITH OTHER EQUIPMENT OR
DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
ST	4/12/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE



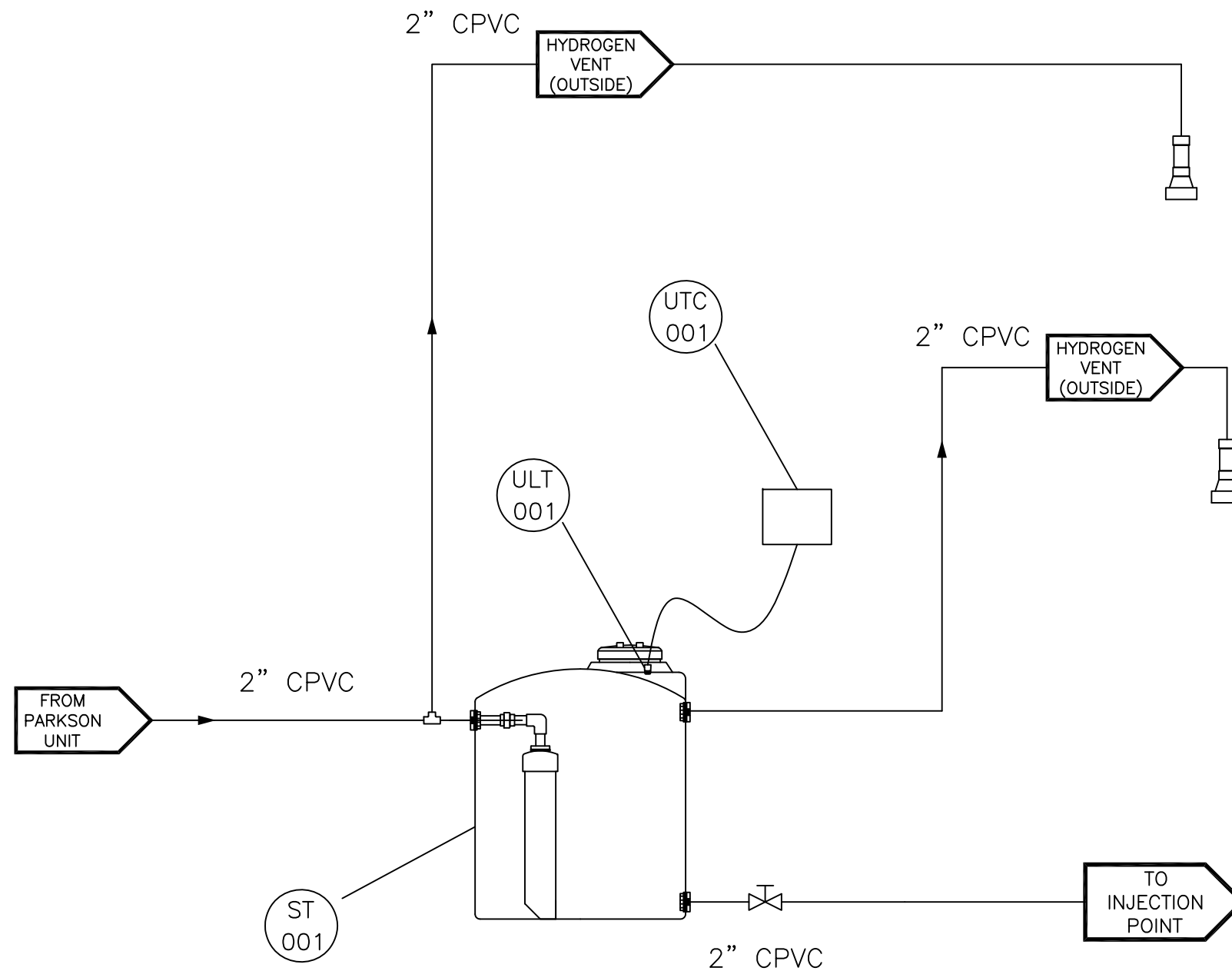
PROJECT NAME
260322 WELL #38 DELANO, CA
REFERENCE INFORMATION

TITLE
MAXIMOS SCH-50 PROCESS & PIPING DIAGRAM – 1
DRAWING NO
26032201-03
REV
0

NOTES:

EQUIPMENT PROVIDED WITH ON-SITE GENERATOR
INSTALLED, PLUMBED, WIRED AND STARTED BY CONTR

ALL INTERCONNECTING PIPING, INCLUDING BUT NOT LIMITED TO ELBOWS, REDUCERS, NIPPLES ARE TO BE INSTALLED IN THE FIELD BY THE FIELD CONTRACTOR AND ARE NOT SUPPLIED BY PARKSON.



This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

I,			
W			
II			
REV	DESCRIPTION	DATE	BY

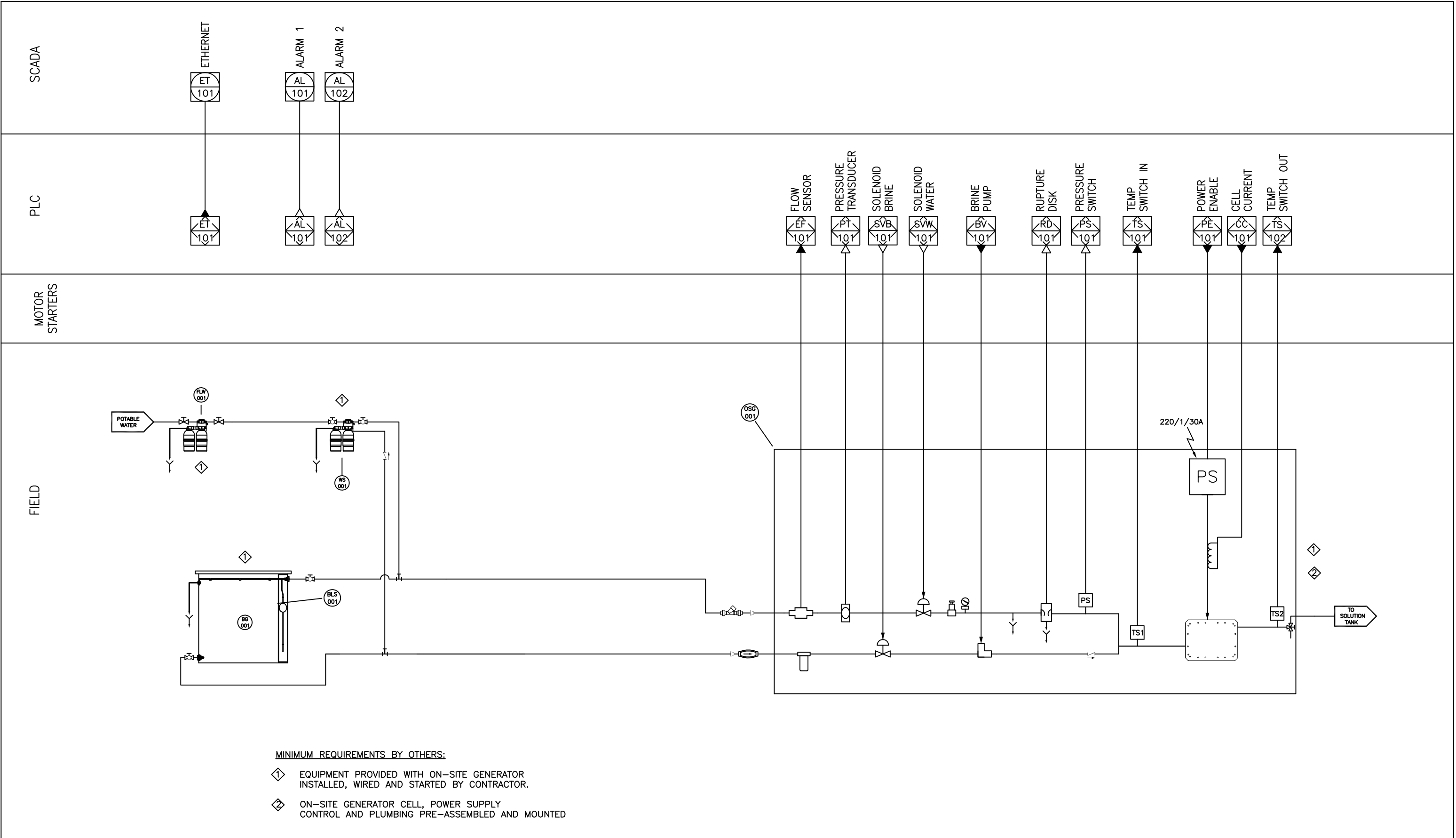
☐ PRELIMINARY ☒ APPROVAL
☐ INFORMATION ☐ CERTIFIED

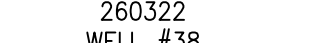
THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN,
 GENERAL ARRANGEMENT AND CLEARANCE. NO
 RESPONSIBILITY IS ACCEPTED BY PARKSON
 CORPORATION FOR OTHER DIMENSIONS, QUANTITIES,
 OR COORDINATION WITH OTHER EQUIPMENT OR
 DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY ST	DATE 4/12/2012
CHECKED BY TDE	DATE 4/13/2012
SCALE	SIZE



PROJECT NAME 260322 WELL #38 DELANO, CA	TITLE MAXIMOS SCH-50 PROCESS & PIPING DIAGRAM - 2	
REFERENCE INFORMATION	DRAWING NO 26032201-04 SHEET 4 OF 6	REV 0



This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.					___PRELIMINARY ☒ APPROVAL	DRAWN BY ST	DATE 4/12/2012		PROJECT NAME 260322 WELL #38 DELANO, CA		TITLE MAXIMOS SCH-50 PROCESS & INSTRUMENTATION DIAGRAM - 1	
					___INFORMATION ___ CERTIFIED	CHECKED BY TDE	DATE 4/13/2012					
					THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.					REFERENCE INFORMATION		
	REV	DESCRIPTION	DATE	BY						DRAWING NO 26032201-05		REV 0

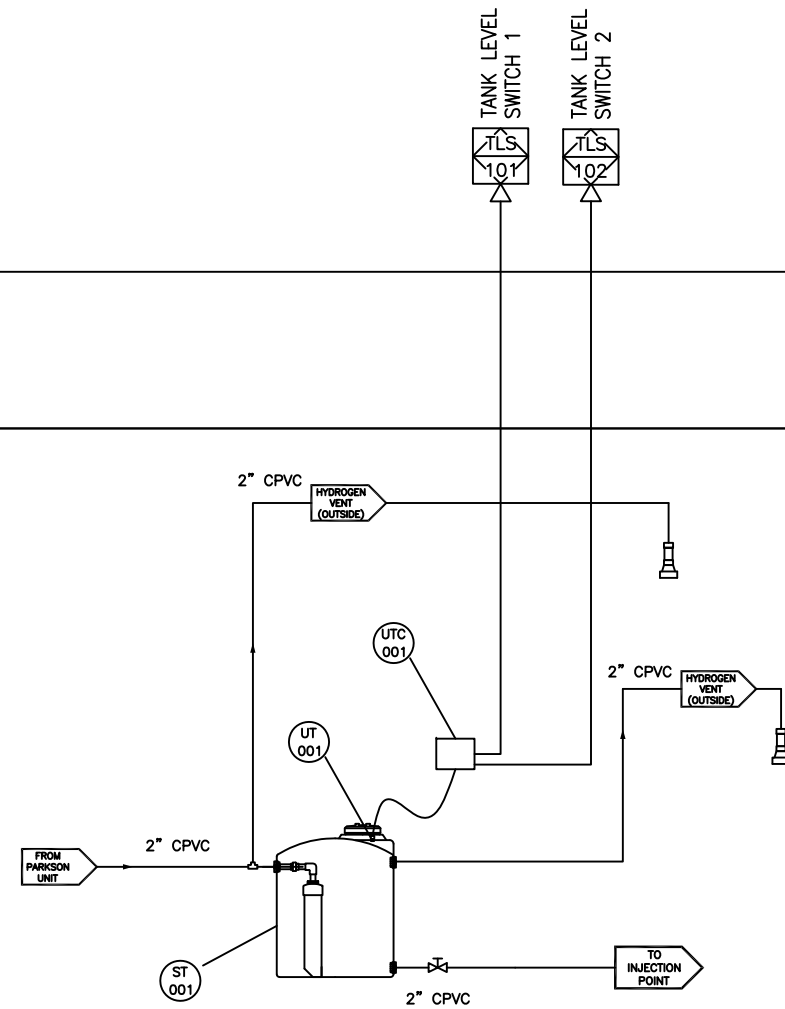
SHEET 5 OF 6

SCADA

PLC

MOTOR STARTERS

FIELD



MINIMUM REQUIREMENTS BY OTHERS:

- ① EQUIPMENT PROVIDED WITH ON-SITE GENERATOR
INSTALLED, WIRED AND STARTED BY CONTRACTOR.

NOTES:

INJECTION SYSTEM CONFIGURATIONS ARE
RECOMMENDATIONS ONLY

This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

☐ PRELIMINARY ☒ APPROVAL
☐ INFORMATION ☐ CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN,
GENERAL ARRANGEMENT AND CLEARANCE. NO
RESPONSIBILITY IS ACCEPTED BY PARKSON
CORPORATION FOR OTHER DIMENSIONS, QUANTITIES,
OR COORDINATION WITH OTHER EQUIPMENT OR
DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

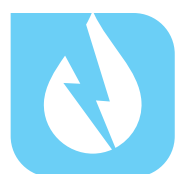
DRAWN BY	DATE
ST	4/12/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE



PROJECT NAME	260322 WELL #38 DELANO, CA
REFERENCE INFORMATION	

TITLE		MAXIMOS SCH-50 PROCESS & INSTRUMENTATION DIAGRAM - 2
DRAWING NO	26032201-06	REV 0

SHEET 6 OF 6



MaximOs™

On-site water disinfection technology

- Easy to install, operate and maintain
- Lower lifecycle cost
- Small footprint, adaptable and expandable
- Proven safety record
- Advanced chemistry

Disinfect the safe, easy and economic way

MaximOS™ uses a patented and award-winning on-site water disinfection technology that safely and economically generates sodium hypochlorite using just salt, water and power, replacing the need to purchase, transport and store dangerous chemicals. On-site generation cuts back transportation requirements by up to 80%, reduces carbon emissions and fuel consumption, and eliminates the storage and disposal of chemical containers.

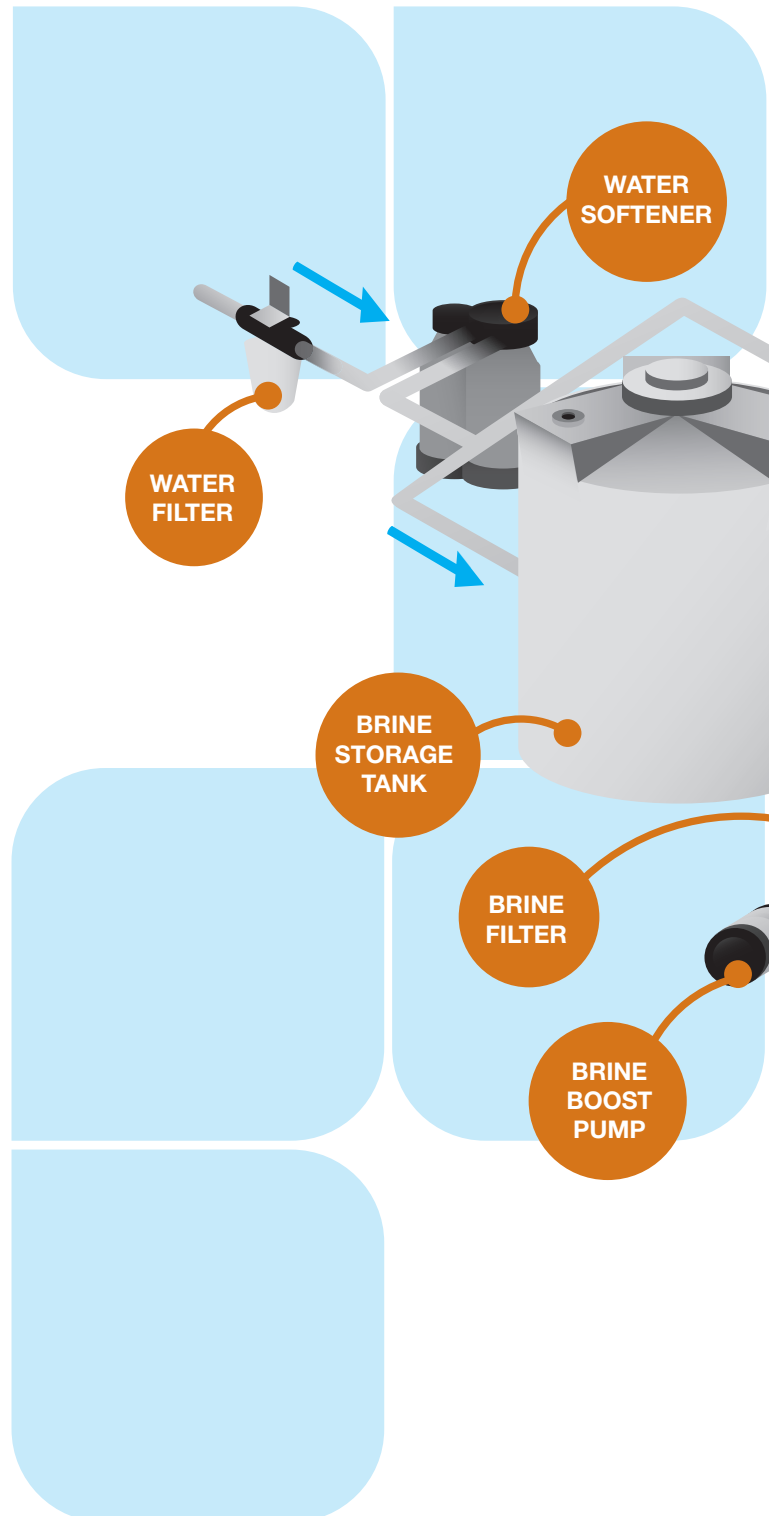
MaximOS™ is used in more than 1,500 installations in hundreds of U.S. communities and over 30 countries, safely disinfecting more than 6.5 billion gallons of water per day. Parkson is committed to providing millions of customers with the safest water in the world.

With demonstrable cost-effectiveness and an environmentally friendly process, MaximOS™ is the safest investment you can make for your water treatment needs.

MaximOS™ comes in different capacities with unique features like a self-cleaning electrolytic cell, self-adjusting flow control, remote monitoring, and gives the customer the flexibility to upgrade to the superior mixed oxidant chemistry.



100 lbs./day
self-cleaning
electrolytic cell

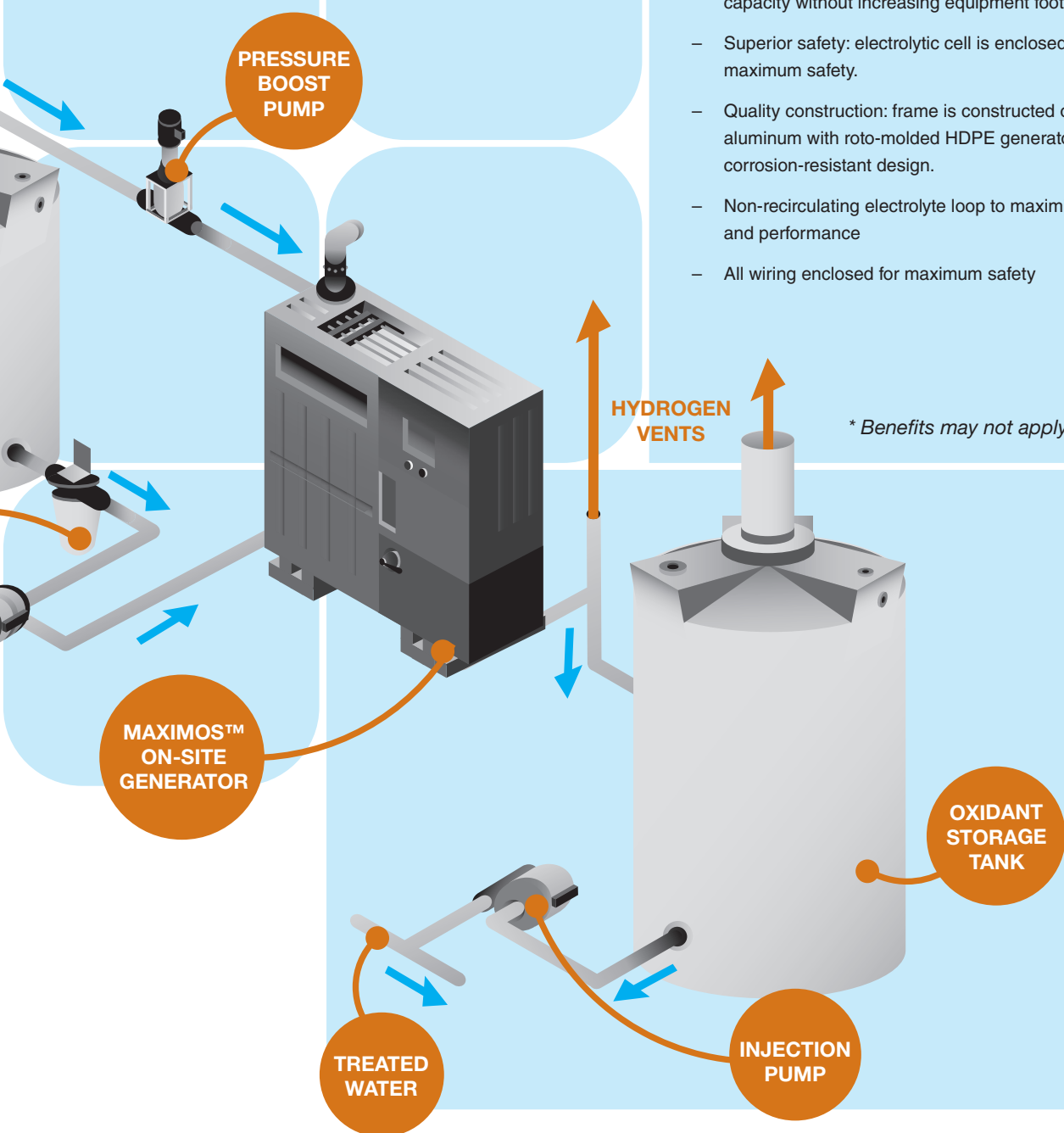




Benefits*

- Ease of maintenance: self-cleaning system doesn't require acid washing as a normal maintenance task
- Improved functionality/human interface: new touch screen display creates a common interface for all Parkson disinfection systems; Remote monitoring capability; SCADA-ready
- Lower lifecycle cost: less maintenance means less labor required for system operation
- Durability: decreased sensitivity to contaminants due to self cleaning capability
- Adaptability: convertible between mixed oxidant and hypochlorite chemistries with minimal changes
- Expandability: modular cell packs allow for expansion of chlorine capacity without increasing equipment footprint
- Superior safety: electrolytic cell is enclosed in HDPE cabinet for maximum safety.
- Quality construction: frame is constructed of powder-coated aluminum with roto-molded HDPE generator panels for a true corrosion-resistant design.
- Non-recirculating electrolyte loop to maximize cell module lifetime and performance
- All wiring enclosed for maximum safety

** Benefits may not apply to every model*



We know all treatment needs are not alike. For standard disinfection needs, we offer a state-of-the-art on-site hypochlorite generator engineered with superior salt and energy efficiencies. For more advanced treatment needs, mixed oxidant solution offers all the disinfection power of hypochlorite with additional treatment benefits.

Sodium Hypochlorite



	SH-Series	MH- Series	LH- Series
Rated FAC Capacity	25 -100 lbs/day	100 - 500 lbs/day	1,550 lbs/day
	11.3 - 45.4 kg/day	45 - 227 kg/day	703 kg/day
Self Cleaning	Available	NO	NO
Salt Conversion (SCE) *		3.0 lb salt / lb FAC (3.0 kg salt / kg FAC)	
Energy Conversion (ECE) *		2.0 kW-hr / lb FAC (4.4 kW-hr / kg FAC)	
FAC Concentration *	6,500 or 8,000 mg/L	8,000 mg/L	8,000 mg/L
Flow Rate	19 - 76 gph (± 15%)	75 - 375 gph	1,200 gph
	71.25 - 285 lph (± 15%)	284 - 1420 lph	4,543 lph
Electrical Service	220 VAC, 1 ph, 30A per module	480 VAC, 3 ph, 100A main	480 VAC, 3 ph, 400A main

Mixed Oxidant Solution

	SM-Series	MM-Series	LM-Series
Rated FAC Capacity	15 - 60 lbs/day	60 - 300 lbs/day	1,000 lbs/day
	6.8 - 27.2 kg/day	27 - 136 kg/day	453 kg/day
Self Cleaning	YES	NO	NO
Salt Conversion (SCE) *	3.0 lb salt / lb FAC (3.0 kg salt / kg FAC)	2.5 lb salt / lb FAC (2.5 kg salt / kg FAC)	3.0 lb salt / lb FAC (3.0 kg salt / kg FAC)
Energy Conversion (ECE) *	3.0 kW-hr/lb FAC (6.6 kW-hr/kg FAC)	3.5 kW-hr / lb FAC (7.7 kW-hr / kg FAC)	3.0 kW-hr/lb FAC (6.6 kW-hr/kg FAC)
FAC Concentration*	4,500 mg/L		
Flow Rate	20 - 80 gph (± 15%)	75 - 375 gph	1,200 gph
	75 - 300 lph (+/- 15%)	284 - 1420 lph	4,543 lph
Electrical Service	220 VAC, 1 ph, 30A per module	480 VAC, 3 ph, 100A main	480 VAC, 3 ph, 400A main

* Performance may vary depending on salt quality, water quality, and temperature.

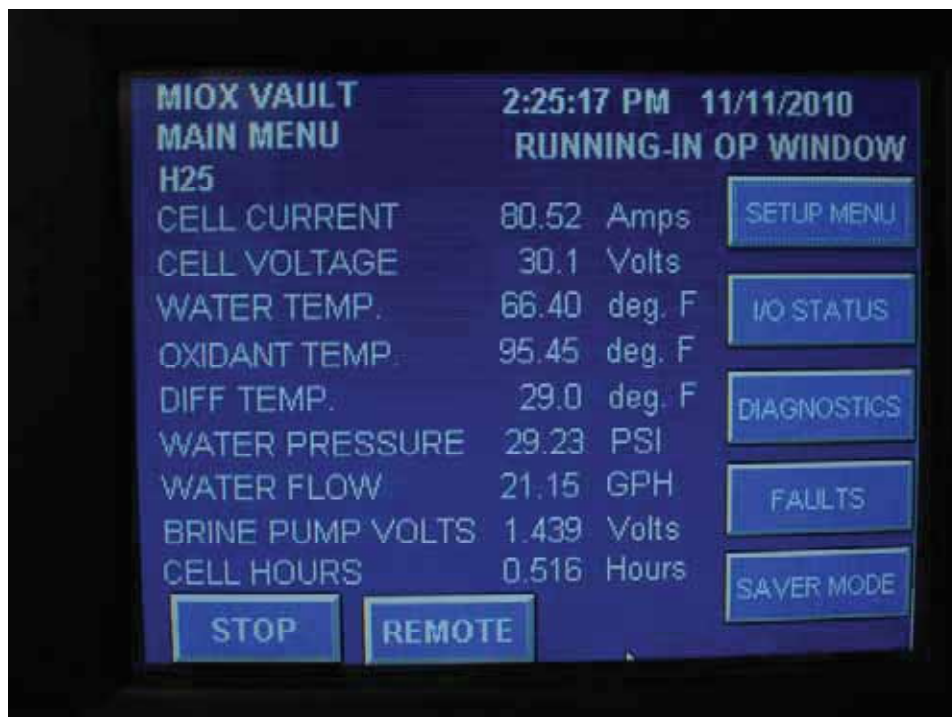
MaximOS Series Control:

MaximOS Controls

The MaximOS Series on-site generator cabinet houses the Process Controller, Operator Interface, Ethernet Interface, and I/O Interface Module.

The MaximOS Series PLC is an Allen Bradley MicroLogix 1400 Programmable Logic Controller with a 4-Channel Analog Input card included. The control enclosure is located in the upper cabinet behind the color touch-screen interface. The power supply for this equipment is also located in the upper cabinet and all is accessible by opening the hinged enclosure door.

If multiple OSG's are to be used in a single installation, various operating configurations are possible. Individual OSG's can be selected for alternating operation by using the touch-screen interface.



MaximOS System Status Parameters

ALL MaximOS systems provide an Ethernet interface to Plant control systems. The interface is designed for **monitoring** of the MaximOS system status **only**.

The following system parameters can be read:

PARAMETER	DATA TYPE	RANGE OR STATUS
CELL CURRENT	ANALOG	0-999.9
CELL VOLTAGE	ANALOG	0-99.9
BRINE PUMP VOLTS	ANALOG	0-4.999
SYSTEM HOURS	ANALOG	0-9999999.9
WATER PRESSURE	ANALOG	0-999.9
CELL HOURS	ANALOG	0-9999999.9
WATER TEMPERATURE	ANALOG	0-999.9
OXIDANT TEMPERATURE	ANALOG	0-999.9
OPERATION WINDOW	DIGITAL	1=OP WINDOW
UPPER LEVEL SWITCH	DIGITAL	0= UP; 1= DOWN
LOWER LEVEL SWITCH	DIGITAL	0= UP; 1= DOWN
WATER PRESSURE SWITCH	DIGITAL	0= NOT OK; 1 = OK

Soft Faults – The system shuts down if a soft fault condition is present and will return to function normally without manual intervention when the soft fault input returns to the non-fault state. Exception- the Run/Stop switch must be manually operated.

The following soft fault conditions can be monitored remotely:

SOFT FAULT TYPE	CAUSE
RUN/STOP	RUN/STOP SWITCH IS IN THE STOP POSITION.
OXIDANT TANK FULL	TANK IS FULL.
UNDEFINED TANK LEVEL INPUTS	TANK LEVEL INPUTS ARE INVALID.
HARDNESS MONITOR	OPTIONAL EXTERNAL HARDNESS MONITOR INDICATES SOFTENER FAILURE.
HYDROGEN MONITOR	OPTIONAL EXTERNAL HYDROGEN MONITOR INDICATES HYDROGEN IN SENSOR AREA.

Hard Faults – The system shuts down if a hard fault condition occurs and will require manual intervention (power cycle) to reset the fault.

The following hard fault conditions can be monitored remotely:

HARD FAULT TYPE	CAUSE
VERY HIGH CURRENT	CURRENT REACHED AN EXCESSIVE LEVEL.
LOW CELL VOLTAGE	CELL VOLTAGE IS TOO LOW.
VERY HIGH OX TEMP	OXIDANT TEMPERATURE IS TOO HIGH.
HIGH PUMP VOLTAGE	PUMP CANNOT MEET DEMAND FOR BRINE.
HIGH CELL CURRENT	CURRENT PERSISTS AT AN ELEVATED LEVEL.
LOW WATER PRESSURE	INLET WATER PRESSURE IS TOO LOW.
LOW FEED WATER TEMP	INLET WATER TEMPERATURE IS TOO LOW.
CURRENT VARIATION	CURRENT IMBALANCE EXISTS IN CELL.



MicroLogix 1400



Small Programmable Logic Controller

Features and Benefits

- Expand your application capabilities with up to 7 expansion I/O modules for a maximum of 256 discrete I/O
- Up to 6 embedded 100 kHz highspeed counters (on controllers with dc inputs)
- 2 Serial ports with DF1/ DH485/ Modbus RTU/DNP3/ASCII protocol support
- Ethernet port provides you with EtherNet/IP, DNP3 over IP and Modbus TCP/IP protocol support as well as web server and email capabilities
- Built-in LCD with backlight allows you to view controller and I/O status, and provides a simple interface for messages, bit / integer monitoring and manipulation



Product Description

The Allen-Bradley® MicroLogix™ 1400 from Rockwell Automation complements the existing MicroLogix family of small programmable logic controllers. MicroLogix 1400 combines the features you demand from MicroLogix 1100, such as EtherNet/IP, online editing, and a built-in LCD, plus provides you with enhanced features, such as: higher I/O count, faster High Speed Counter/PTO and enhanced network capabilities

Take advantage of the built-in LCD with back lighting to set the Ethernet network configuration, display floating point values on a user configurable display, display OEM logos at startup and read or write any binary, integer and long file elements in the data table.

Three embedded communication ports provide you with excellent communications capabilities. MicroLogix 1400 offers an isolated RS232C/RS485 combination port; a non-isolated RS232C port; and an RJ-45 port for 10/100 Mbps EtherNet/IP peer-to-peer messaging, DNP3 over IP and Modbus TCP/IP protocol.

Similar to the rest of the MicroLogix family, MicroLogix 1400 is programmed with RSLogix 500 programming software (Version 8.1 and above) as well as RSLogix Micro programming software.

LISTEN.
THINK.
SOLVE.®

Product Specifications

MicroLogix	1766-L32BWA	1766-L32AWA	1766-L32BxB	1766-L32BWAA	1766-L32AWAA	1766-L32BXBA
Input Power	120/240 V AC		24V DC	120/240 V AC		24V DC
Memory	non-volatile battery backed RAM					
User Program / User Data Space	10K / 10K configurable					
Data Logging / Recipe Storage	128 K (without Recipe) / up to 64 K (after subtracting Data Logging)					
Battery Back-up	Yes					
Back-up Memory Module	Yes					
Digital Inputs	(12) Fast 24VDC (8) Normal 24VDC	(20) 120VAC	(12) Fast 24VDC (8) Normal 24VDC	(12) Fast 24VDC (8) Normal 24VDC	(20) 120VAC	(12) Fast 24VDC (8) Normal 24VDC
Digital Outputs	(12) Relay	(12) Relay	(6) Relay (3) Fast DC (3) Normal DC	(12) Relay	(12) Relay	(6) Relay (3) Fast DC (3) Normal DC
Analog Inputs / Outputs	None			(4) Voltage Inputs / (2) Voltage Outputs		
Serial Ports	(1) RS232C/RS485* , (1) RS232C**					
Serial Protocols	DF1 Full Duplex, DF1 Half Duplex Master/Slave, DF1 Radio Modem, DH-485, Modbus RTU Master/Slave, ASCII, DNP 3 Slave					
Ethernet Ports	(1) 10/100 EtherNet/IP port					
Ethernet Protocols	EtherNet/IP messaging, DNP3 over IP and Modbus TCP/IP					
Trim Potentiometers	2 Digital					
High-Speed Inputs	Up to 6 channels @ 100 kHz	N/A	Up to 6 channels @ 100 kHz	Up to 6 channels @ 100 kHz	Up to 6 channels @ 100 kHz	Up to 6 channels @ 100 kHz
Real Time Clock	Yes, embedded					
PID	Yes (limited by loop and stack memory)					
PWM /PTO	N/A		3 channel PTO (100kHz)\PWM (40kHz)	N/A		3 channel PTO (100kHz)\PWM (40kHz)
Embedded LCD	Yes					
Floating Point Math	Yes					
Online Editing	Yes					
Operating Temperature	-20°C...+60°C					
Storage Temperature	-40°C (or -30°C)...+85°C					

* Isolated, RS232/RS485 combo port. Same as MicroLogix 1100 Comm 0

** Non-isolated RS232, standard D-sub connector.



Rockwell Automation is an official ENERGY STAR® Industrial Service and Product Provider. It has proven it provides energy efficiency services and/or products to commercial buildings and industrial manufacturing plants in the United States by collaborating with an ENERGY STAR Industrial Partner to submit a teaming profile that outlines the scope and resulting savings from energy efficiency-driven projects. For more information, visit ENERGY STAR for Industry at www.energystar.gov/index.cfm?c=industry.bus_industry

Allen-Bradley, MicroLogix and RSLogix are trademarks of Rockwell Automation, Inc. Trademarks not belonging to Rockwell Automation are property of their respective companies.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

Water Conditioning:

Water Filtration

Water Filtration General Arrangement Drawing

Kinetico CP 2100f OD (Macrolite)

Media Vessel: Wrapped Polyethylene

Media: 0.7 ft³, 40 x 60 Mesh Macrolite

Inlet/Outlet: Custom Adapter and E-Clip

Drain Connection: 1/2" tube

Secondary Drain: 3/8" tube

Complete System: 60" tall by 21" wide

One (1) of Part Number # 11146A

Spears True Union Standard Ball Valves

PVC Body, Stem, Handle, Ball & Connection Ends

Teflon Seat with Viton O-rings

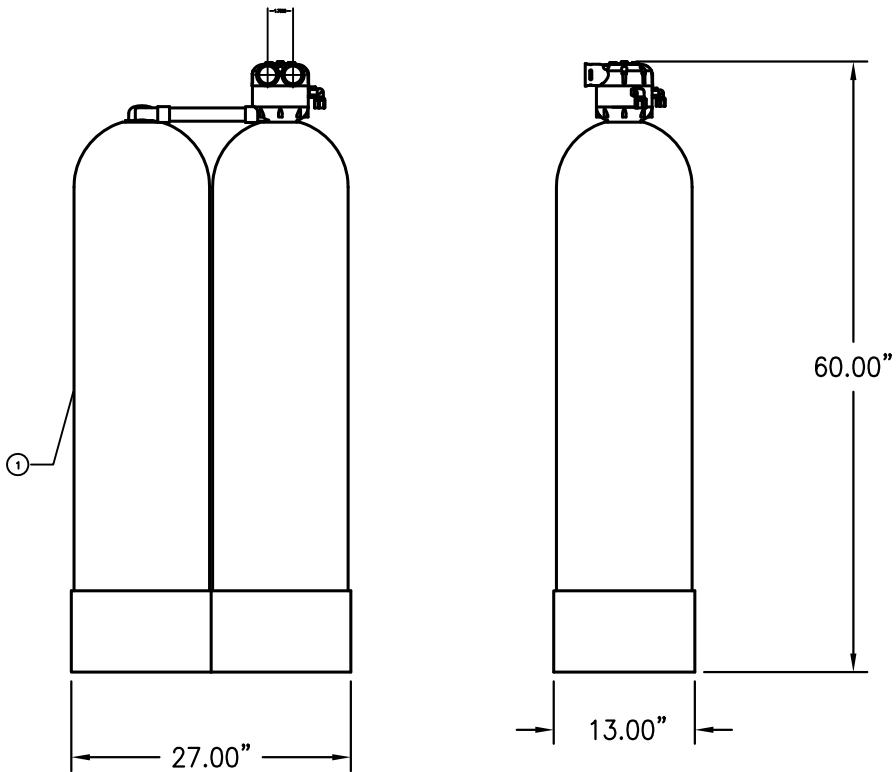
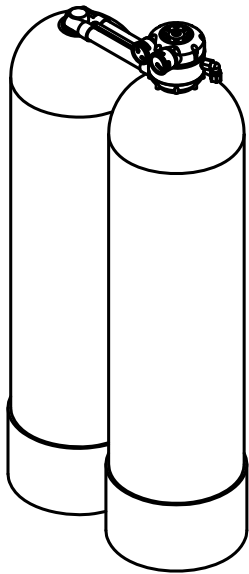
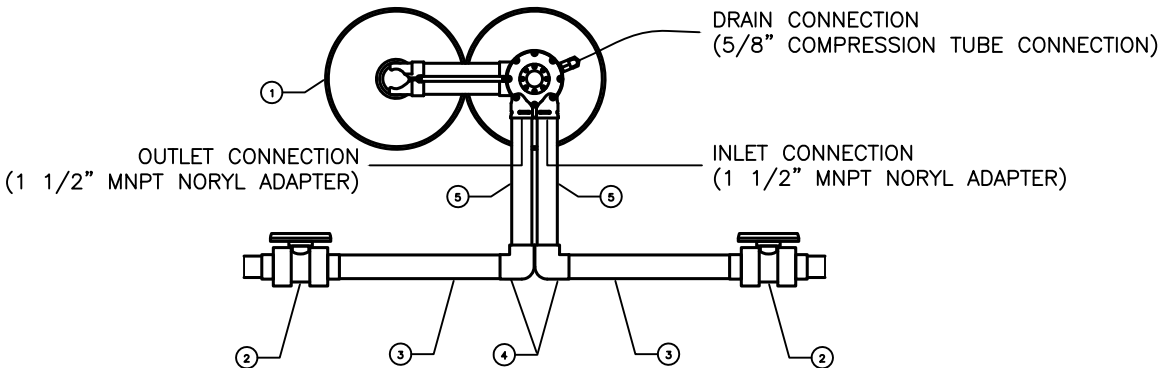
3/4" Union Connections

Two (2) of Model # 3639-007 (Socket)

NOTES:

1. ALL DIMENSIONS ARE IN INCHES,
[] INDICATE (MM) METRIC DIMENSIONS.

IT.	QTY	DESCRIPTION	REFERENCE	MAT'L
1	1	KINETICO 2100f FILTER		WRAPPED POLYETHYLENE
2	2	ISOLATION VALVE 3/4"		PVC
3	2	3/4" PVC PIPE		PVC
4	2	3/4" ELBOW		PVC
5	2	NIPPLE 3/4" MTx MT		PVC



This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___PRELIMINARY ___APPROVAL
___INFORMATION ___CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
ST	4/17/2012
CHECKED BY	DATE
TDE	4/18/2012
SCALE	SIZE



PROJECT NAME
260322 WELL #38 DELANO, CA
REFERENCE INFORMATION

TITLE
MAXIMOS SCH-50 WATER FILTER GENERAL ARRANGEMENT
DRAWING NO
26032202
REV
0

Kinetico 2100f OD (Macrolite®)

System Components

Media Vessel (Qty.) Size	(2) 10" x 54"
Media Vessel Construction	Wrapped Polyethylene
Empty Bed Volume	2.19 ft ³
Media	40 x 60 Mesh Macrolite
Media Volume	0.7 ft ³
Under bedding (each tank)	¾ x ¼ Gravel
Under bedding Volume (each tank)	0.25 ft ³ (25 lbs.)
Riser Tube	1" ABS
Distributor Upper	None
Lower	0.007" Slots, Engineered Plastic Basket
Regeneration Control	Non-electric Use Meter
Service	Downflow
Backwash	Upflow
Meter Type	0.30 - 25.00 gpm Polypropylene Turbine

Inlet Water Quality

Pressure Range	15 – 125 psi Dynamic Pressure
Temperature Range	35 – 120° F
pH Range	5 – 10 SU

Operating Specs

Service Flow Rate (15 – 30 psig)	10.0 – 18.0 gpm
Optimal Media Flow Rate (Service)	10.0 gpm
Flow Configuration	Overdrive®
Dimensions (Width x Depth x Height)	21" x 10" x 60"
Weight (Operating / Shipping)	450 / 190 lbs.

Connections

Inlet / Outlet Connections	Custom Adapter and E-clip
Drain Connection	½" Tube
Secondary Drain Connection	¾" Tube
Power	None

System Part Numbers

Kinetico 2100f Overdrive, Macrolite Filter	11146A
Kinetico 2100f Overdrive, No Media	11134A

Accessory:

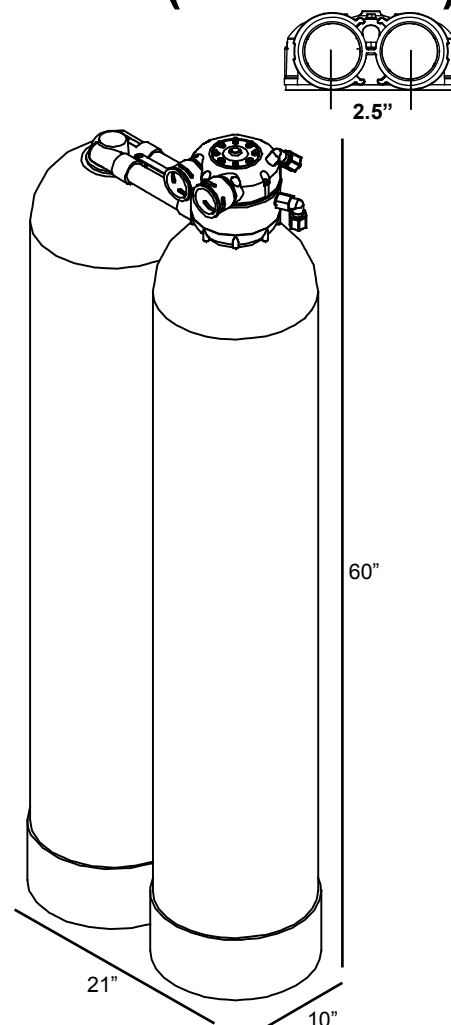
Lock-out Kit (for installation with a softener)	8070A
---	-------

Regeneration Specifications

Backwash Volume	130 gallons
Backwash Time	20 minutes
Backwash Flow Control	6.00 gpm

Disc Selection

	1	2	3	4	5	6	7	8
Usable Gallons between Backwash	2,168	1,084	723	542	434	361	310	271



Kinetico 2100f OD (Macrolite)

Operating Profile

The filter shall remove suspended solids to a nominal rating of 5 micron. Ceramic based non-consumable media shall be used for the filtration process. The system shall provide continuous filtered water through the use of a duplex (two tank) configuration. System backwashes shall be initiated by a water meter. The water meter shall measure the processed volume and be adjustable.

Backwash Control Valve

The backwash control valve shall be top mounted (top of media tank), and manufactured from non-corrosive materials. Control valve shall not weight more than four pounds. Control valve shall provide service and backwash control for two media tanks. Inlet and outlet ports shall accept a quick connect, double O-ring sealed adapter. Interconnection between tanks shall be made through the control valve with a quick connect adapter. Control valve shall operate using a minimum inlet pressure of 15 psi. Pressure shall be used to drive all valve functions. No electric hook-up shall be required. Control valve shall incorporate three operational cycles including; service, backwash and service flow rinse. The control valve will prevent the by-pass of unfiltered water to service during the backwash cycle.

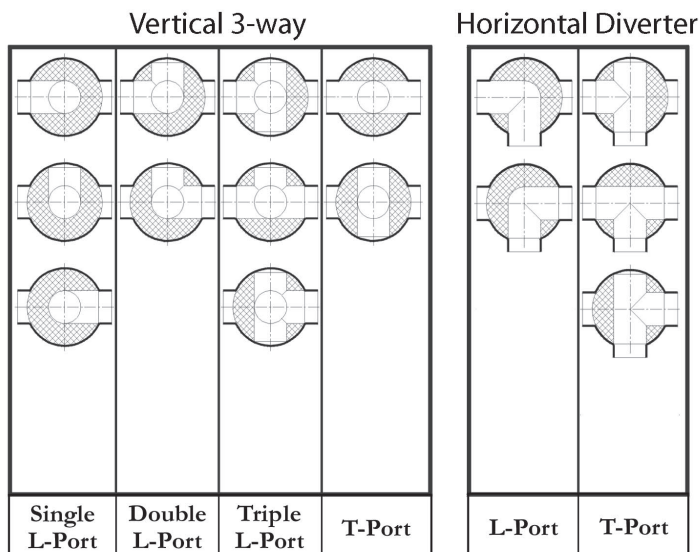
Media Tanks

The tanks shall be designed for a maximum working pressure of 125 psi (8.8 kg/cm²) and hydrostatically tested at 300 psi. Tanks shall be made of fiberglass-reinforced polypropylene with a 2.5" threaded top opening. Each tank shall be NSF approved. Upper and lower distribution system shall be of a slot design. They will provide even distribution of regeneration water and the collection of processed water.

Filtration Media

Each system shall use ceramic based filter media capability of operating in an average service flow of 10 gpm per square foot of media. The media shall be solid, of a proper particle size, 40-70 mesh. A minimum 24" bed depth shall be used with the system. Backwash shall produce a minimum of 50% bed expansion at a flow rate of 8 gpm per square foot of media.

3-Way Port Options



True Union 2000 Actuated Valves

Universal ISO Actuator Mounting Pattern Option

Spears® offers optional actuator mounting with standard ISO Mounting Pattern for user actuation of True Union 2000 Ball Valves.

Factory Actuated Valve Packages

Spears® Electric or Pneumatic Actuation Packages eliminate customer's having to determine proper valve and actuator mating. Pre-matched packages insure proper torque, coupling and mount for optimum performance - all factory installed and tested for proper alignment and operation. Actuation packages can be custom built to user specifications from Spears® wide selection of options, voltages and accessories. Contact Spears® for additional information.



Foot Valve Screens

- Easily converts Ball Check Valve to a Foot Valve.
- Standard IPS spigot connection fits slip-socket valve end connector.
- Enlarged screen provides open area equivalent to valve for optimum flow characteristics.
- Chemical and corrosion resistant PVC or CPVC construction.



Typical Application
(VALVE NOT
INCLUDED)



Split Nut Kit for True Union 2000 Valves & Union 2000 Schedule 80 Fittings

Split Nut Kits are designed to replace broken union nuts on Spears® True Union 2000 Ball Valves and Union 2000 Schedule 80 Unions. Kit includes SS316 Gear Clamp and 2-Split Nut halves. Can also be used if nut was not in place during end connector installation. Split Nut is fully serviceable to original valve pressure rating.

NOT FOR USE WITH COMPRESSED AIR OR GASES

Spears® Manufacturing Company DOES NOT RECOMMEND the use of thermoplastic products to transport or store compressed air or gas.

Viton® is a registered trademark of DuPont Dow Elastomers



SPEARS® MANUFACTURING COMPANY • CORPORATE OFFICE

15853 Olden St., Sylmar, CA 91342 • PO Box 9203, Sylmar, CA 91392

(818) 364-1611 • www.spearsmfg.com



True Union 2000 Industrial Ball Check Valve

- Industrial Grade
- Flow-Tested for Minimum Turbulence
- Fully Serviceable, Replaceable Components, uses Standard O-ring Seat
- Safe-T-Blocked® Seal Carrier - Full Rated Pressure
- Easily Converted to Foot Valve
- NSF Certified for Potable Water Use
- Also Available in **SPEARS® LXT™** High Purity, Low Extractable PVC Material
- Sizes 1/2" - 2" pressure rated to 235 psi @ 73°F, sizes 2-1/2" - 6" and all flanged to 150 psi @ 73°F
- Produced in IPS sizes 1/2" - 6" with Socket, Flanged or optional SR Threaded End Connectors
- Also available in PVC White



Check Valve Size	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6
C_v	6.3	17	25	65	86	130	200	275	500	800

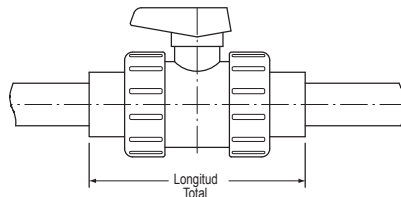
Economical True Union 2000 Standard Ball Valve

- High quality Standard Ball Valve
- Allows future system upgrade
- Excellent for OEM Applications
- Replaceable Seats
- Safe-T-Blocked® Seal Carrier - Full Rated Pressure
- Spears® Safe-T-Shear® Stem
- Self Adjusting Floating Seat
- Sizes 1/2" - 2" pressure rated to 235 psi @ 73°F, sizes 2-1/2" - 4" and all flanged to 150 psi @ 73°F
- NSF Certified for Potable Water Use
- Produced in IPS sizes 1/2" - 4" with Socket, Flanged or SR Threaded End Connectors
- Also available in PVC White

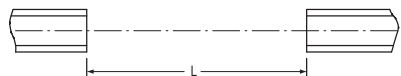


True Union 2000 Retrofit Valves or Kits

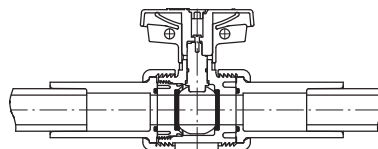
Easily converts any system over to all True Union 2000 style valves for consistent valve type and uniform maintenance. Special extended socket style End Connectors (2) allow retrofit replacement of other brand valves in existing piping systems with a new True Union 2000 valve. Simply cut out old valve according to specified dimension and install retrofit end connectors. End connectors are provided with either EPDM or genuine Viton® O-rings. Can be ordered as End Connector Kit or fully assembled Retrofit Valve.



BALL VALVE FOR REPLACEMENT



PIPE LAYING LENGTH AFTER CUTTING



TRUE UNION 2000 BALL VALVE INSTALLED WITH RETROFIT KIT

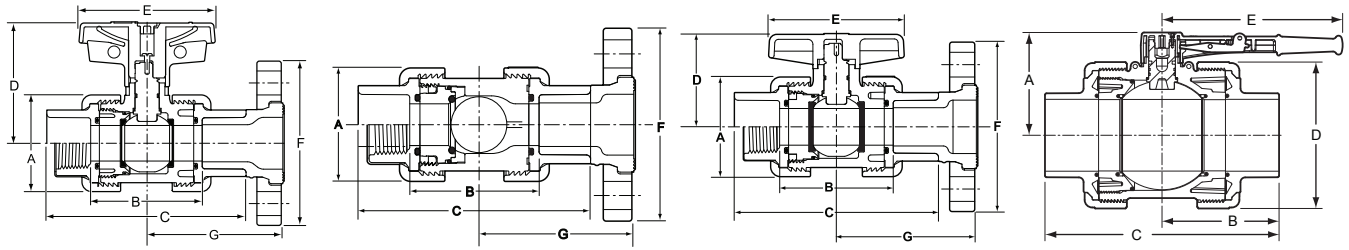
Size	1/2	3/4	1	1-1/4	1-1/2	2	2-1/2	3	4	6
L	4-29/32	5-7/16	6-3/32	7-1/4	7-1/2	8-17/32	10-3/4	11-7/16	14-5/16	N/A

L ± 1-1/16

Contact Spears® for Special Kits/Valves to replace older Spears® Regular True Union Ball Valves

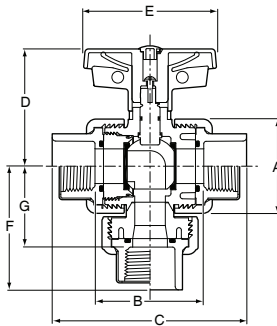
True Union 2000 Valve Dimensional Data

Industrial Ball Valve, Ball Check Valve, Standard Ball Valve & 6" Industrial Lever Handle



Nominal Size	A	Dimensions Reference (inches, ±1/16)										F	G
		B		C			D		E				
		Soc/Thd	Spigot	Socket	Thread	Spigot	Industrial	Standard	Industrial	Standard			
1/2	1-7/8	2-3/8	2-7/8	4-3/16	3-3/16	4-5/8	2-9/16	1-5/8	2-13/16	2-1/2	3-1/2	2-31/32	
3/4	2-1/4	2-3/4	3-1/4	4-3/4	4-1/4	5-1/4	2-7/8	2	3-3/8	3	3-7/8	3-5/16	
1	2-1/2	2-7/8	3-1/2	5-1/8	4-11/16	5-3/4	3-1/8	2-5/16	3-7/16	3-7/16	4-1/2	3-5/8	
1-1/4	3-1/16	3-1/4	3-13/16	5-3/4	5-3/16	6-5/16	3-5/8	2-13/16	3-7/8	3-9/16	4-5/8	3-31/32	
1-1/2	3-1/2	3-1/2	4	6-1/4	5-7/16	6-3/4	4	3-1/16	4-3/16	3-7/8	5	4-3/8	
2	4-1/4	4-3/4	5-3/16	7-3/4	6-3/4	8-1/4	4-1/2	3-3/4	5-1/8	5	6	5-1/4	
2-1/2	5-3/8	6-7/8	7-13/16	10-7/16	9-11/16	11-3/8	5-1/8	5-7/8	6-1/4	7-5/8	7-1/2	6	
3	6-3/16	7	7-13/16	10-11/16	9-7/8	11-9/16	5-7/8	5-7/8	7-5/8	7-5/8	7-1/2	6-13/16	
4	7-5/8	7-5/16	8-1/4	11-7/8	10-1/4	12-3/4	6-3/4	6-3/4	9-3/16	6-3/4	9	7-1/2	
6	11-5/8	11-1/16	13	17-1/16	15-3/4	18-1/2	8-1/8	---	14-5/16	---	11-1/4	10-3/16	

Industrial 3-Way Ball Valve

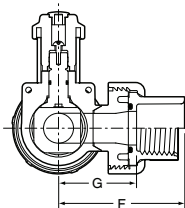
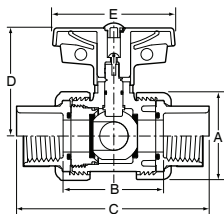


Vertical 3-Way Ball Valves ³															Oper. ² Torque (in.lbs.)
Nominal Size	A	B ¹		C			D	E	F			G			
		Soc/SR	Spig	Soc	SR	Spig			Soc	SR	Spig	Soc/SR	Spig		
1/2	1-7/8	2-7/16	2-15/16	4-1/4	3-27/32	4-3/4	2-9/16	2-13/16	2-3/4	2-3/8	2-13/16	1-11/16	2	12	
3/4	2-1/4	2-3/4	3-5/16	4-3/4	4-1/4	5-3/8	2-7/8	3-5/16	3	2-3/4	3-5/16	2	2-5/16	12	
1	2-1/2	2-7/8	3-1/2	5-1/8	4-11/16	5-3/4	3-1/8	3-7/16	3-1/4	3	3-9/16	2-1/8	2-7/16	20	
1-1/4	3-1/16	3-1/4	3-13/16	5-3/4	5-3/16	6-5/16	3-5/8	3-13/16	3-3/4	3-3/8	4-1/16	2-3/8	2-13/16	25	
1-1/2	3-1/2	3-1/2	4	6-1/4	5-7/16	6-3/4	4	4-3/16	4-3/16	3-13/16	4-1/2	2-3/16	3-1/8	40	
2	4-1/4	4-3/4	5-3/16	7-3/4	6-3/4	8-1/4	4-1/2	5-1/8	5	4-1/2	5-5/16	3-1/2	3-3/4	67	
2-1/2	5-3/8	5-7/8	7-13/16	9-5/16	8-1/2	11-3/8	5-1/8	6-1/4	5-7/8	5-1/2	6-7/16	4-1/8	5-5/16	120	
3	6-3/16	6-7/8	7-13/16	10-11/16	9-3/4	11-9/16	5-7/8	7-5/8	6-11/16	6-3/16	7-3/16	4-3/4	5-5/16	120	
4	7-1/2	7-1/4	8-1/4	11-13/16	10-1/4	12-13/16	6-3/4	9-3/16	7-1/8	6-3/4	8-3/4	5-7/8	6-1/2	336	

1: Valve Lay Length

2: Torque required at valve maximum internal pressure rating, 5ft/sec. Flow velocity; due to adjustment differences during installation, actual values may vary.

3: Diverter style valve, no shutoff on branch



Horizontal Diverter Ball Valves ³														Oper.2 Torque (in.lbs.)
Nominal Size	A	B ¹		C			D	E	F			G		
		Soc/SR	Spig	Soc	SR	Spig			Soc	SR	Spig	Soc/SR	Spig	
1/2	1-3/16	2-7/16	2-15/16	4-3/16	3-13/16	4-3/4	2-9/16	2-13/16	2-9/16	2-3/8	2-13/16	1-11/16	2	12
3/4	2-1/4	2-3/4	3-5/16	4-3/4	4-1/4	5-3/8	2-7/8	3-5/16	3	2-3/4	3-5/16	2	2-5/16	12
1	2-1/2	2-7/8	3-1/2	5-1/8	4-11/16	5-3/4	3-1/8	3-7/16	3-1/4	3	3-9/16	2-1/8	2-7/16	20
1-1/4	3-1/16	3-1/4	3-13/16	5-3/4	5-3/16	6-5/16	3-5/8	3-13/16	3-3/4	3-3/8	4-1/16	2-3/8	2-13/16	25
1-1/2	3-1/2	3-1/2	4	6-1/4	5-7/16	6-3/4	4	4-3/16	4-3/16	3-13/16	4-1/2	2-3/16	3-1/8	40
2	4-1/4	4-3/4	5-3/16	7-3/4	6-3/4	8-1/4	4-1/2	5-1/8	5	4-1/2	5-5/16	3-1/2	3-3/4	67
2-1/2	5-3/8	5-7/8	7-13/16	9-5/16	8-1/2	11-3/8	5-1/8	6-1/4	5-7/8	5-1/2	6-7/16	4-1/8	5-5/16	120
3	6-3/16	6-7/8	7-13/16	10-11/16	9-3/4	11-9/16	5-7/8	7-5/8	6-11/16	6-3/16	7-3/16	4-3/4	5-5/16	120
4	7-1/2	7-1/4	8-1/4	11-13/16	10-1/4	12-13/16	6-3/4	9-3/16	7-1/8	6-3/4	8-3/4	5-7/8	6-1/2	336

1: Valve Lay Length

2: Torque required at valve maximum internal pressure rating, 5ft/sec. Flow velocity; due to adjustment differences during installation, actual values may vary.

3: Diverter style valve, no shutoff on branch

Water Conditioning:

Water Softening

Water Softener General Arrangement Drawing

Kinetico Water Softener

Hydraulically Driven

Automatic On-Demand Counter-Flow Regeneration

Fiberglass Twin Towers

Internal 2 gallon per minute Backwash Flow Control

Single Tower: 13" diameter by 54" tall

Twin Tower & Valve: 27" wide by 13" deep by 60" high

One (1) of Kinetico CP-213s Model # 11190

with 1 ¼" Inlet/Outlet Pipe Connections

Dow DOWEX HCR Softening Resin

8% Cross-Linked; Strong Acid Cation Exchange Resin

Spherical Beads

2.50 ft³ of Resin per Water Softener Tower

5.00 ft³ of Resin per Water Softener

SMC Check Valve

Black Polypropylene Body & Poppet with Viton Seals

1/4" FNPT Inlet & Outlet Connections

1/3 psi Stainless Steel Spring

One (1) of Model # 9223

System Components

Media Vessel (qty) Size	(2) 13 x 54"
Media Vessel Construction	Wrapped Polyethylene
Empty Bed Volume	3.68 ft ³
Media	2.50 ft ³ Non Solvent Cation Resin
Bed Depth / Free Board	42" / 12"
Riser Tube	1" ABS
Distributor	Upper 0.014" Slots, ABS Basket
	Lower 0.014" Slots, ABS Basket
Under bedding	0.24 ft ³ (24 lbs), 1/4 x 1/8 Gravel
Regeneration Control	Non-electric Use Meter
Regeneration Type	Countercurrent
Meter Type	0.75 - 40.00 gpm Polypropylene Turbine (Kinetico Full Louver Flow Nozzle)
Optional Meter	0.05 - 5.00 gpm Polypropylene Turbine (Kinetico Micro Flow Nozzle)
	0.5 - 25.00 gpm Polypropylene Turbine (Kinetico Half Louver Flow Nozzle)

Inlet Water Quality

Pressure Range	25 - 125 psi Dynamic Pressure
Temperature Range	35 - 120° F
pH Range	5 - 10 SU
Free Chlorine Cl ₂ (Max.)	2.0 mg/l

Operating Specs

Flow, Half and Full Louver (15 psig)	20 gpm
Flow, Micro Nozzle (15 psig)	5.0 gpm
Dimensions (width x depth x height)	27 x 13 x 60"
Weight (Operating / Shipping)	450 / 300 lbs.

Connections

Inlet / Outlet Connections	Custom Adapter and E-Clip (1 1/2" Brass Sweat Fittings Included)
Drain Connection	0.625" Tube
Brine Line Connection	0.375" Tube
Power	None

System Part Numbers

CP 213s OD, no brine tank, media separate	11153
CP 213s OD, no brine tank	11190
Brine Venturi Nozzle - clear (for central brining)	2379
Micro Nozzle (for low flow applications)	10880

Brine Tank Options

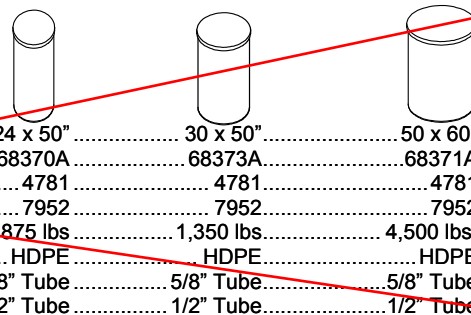
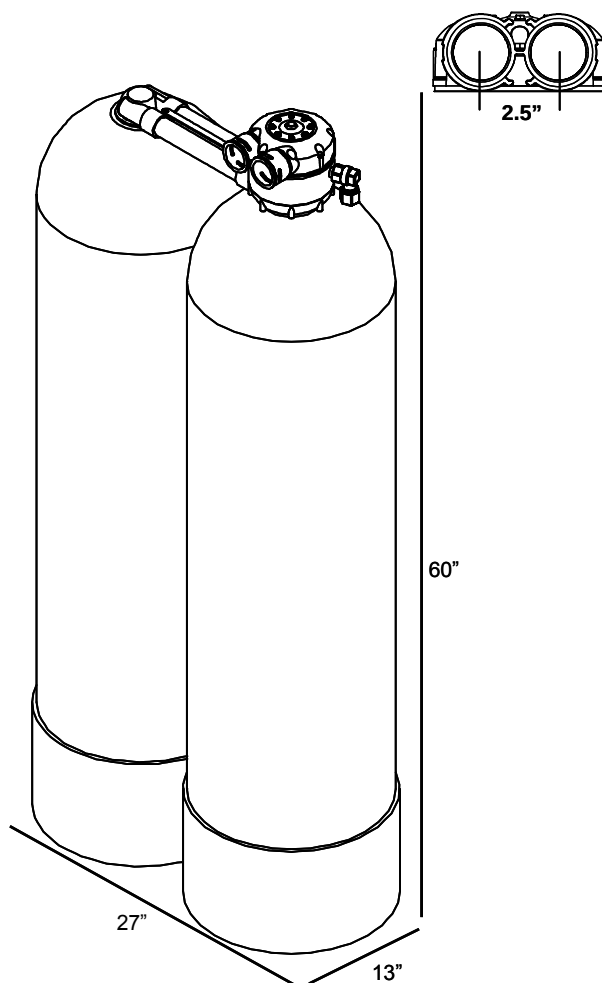
Tank Description	24 x 50"	30 x 50"	50 x 60"
Brine Tank Part Number	68370A	68373A	68371A
Brine Tank Internals	4781	4781	4781
Brine Line Check Valve (1 for each softener in parallel)	7952	7952	7952
Salt Capacity	875 lbs.	1,350 lbs.	4,500 lbs.
Material	HDPE	HDPE	HDPE
Overflow Connection	5/8" Tube	5/8" Tube	5/8" Tube
Brine Connection	1/2" Tube	1/2" Tube	1/2" Tube

Regeneration Specifications

Regeneration Volume / Time	142 gallons / 90 minutes
Backwash Flow Control	5.00 gpm
Brine Refill Flow Control	0.70 gpm

Alternating Operation with Central Brining

Setting	Capacity	Efficiency	Dosing	Nozzle	1	2	3	4	5	6	7	8
19 lbs.	66,500 grains	3,500 gr./lb.	7.6 lbs./ft ³	Full Louver	6	13	19	25	32	38	44	50
			Gallons/Regeneration:		8,922	4,461	2,974	2,231	1,784	1,487	1,275	1,115
19 lbs.	66,500 grains	3,500 gr./lb.	7.6 lbs./ft ³	Micro Nozzle	30	60	85	110	130	150	165	180
			Gallons/Regeneration:		1,688	844	563	422	338	281	241	211
19 lbs.	66,500 grains	3,500 gr./lb.	7.6 lbs./ft ³	Half Nozzle	16	31	44	57	70	81	92	102
			Gallons/Regeneration:		4,019	2,010	1,340	1,005	804	670	574	502



Disc Selection

(Compensated Hardness*)

1	2	3	4	5	6	7	8
6	13	19	25	32	38	44	50
8,922	4,461	2,974	2,231	1,784	1,487	1,275	1,115
30	60	85	110	130	150	165	180
1,688	844	563	422	338	281	241	211
16	31	44	57	70	81	92	102
4,019	2,010	1,340	1,005	804	670	574	502

*Compensated hardness in gpg = Hardness + (3 x Fe in mg/l)



CP 213s, central brining

Operating Profile

Softener shall remove hardness to less than 1/2 gpg when operated in accordance with the operating instructions. The system shall include two tanks. This duplex configuration shall operating in an alternating mode with one tank will be on-line during service. During regeneration cycles, one tank shall provide water to service and to the regenerating tank. A water meter shall initiate system regeneration. The water meter shall measure the processed volume and be adjustable. Service flow shall be down-flow and regeneration flow shall be up-flow.

Regeneration Control Valve

The regeneration control valve shall be top mounted (top of media tank), and manufactured from non-corrosive materials. Control valve shall not weigh more than four pounds. Control valve shall provide service and regeneration control for two media tanks. Inlet and outlet ports shall accept a quick connect, double o-ring sealed adapter. Interconnection between tanks shall be made through the regeneration valve with a quick connect adapter. Control valve shall operate using a minimum inlet pressure of 25 psi. Pressure shall be used to drive all valve functions. No electric hook-up shall be required. Control valve shall incorporate three operational cycles including; service, brine draw and a combined fast rinse and brine refill. Service cycle shall operate in a down-flow direction. The brine cycle shall flow up-flow, opposite the service flow, providing a countercurrent regeneration. Control valve shall contain a fixed orifice eductor nozzle and self-adjusting backwash flow control. The control valve will prevent the bypass of hard water to service during the regeneration cycle.

Media Tanks

The tanks shall be designed for a maximum working pressure of 125 psi and hydrostatically tested at 300 psi. Tanks shall be made of polyethylene and reinforced with a fiberglass wrapping. Each tank shall include a 2.5 in. threaded top opening. Each tank shall be NSF approved. Upper and lower distribution system shall be of a slot design. Distributors will provide even flow of regeneration water and the collection of processed water.

Conditioning Media

Each softener shall include a non-solvent, high capacity cation resin having a minimum exchange capacity of 30,000 grains/ft³ when regenerated with 15.0 lbs/ft³. The media shall be solid, of a proper particle size and shall contain no plates, shells, agglomerates or other shapes, which might interfere with the normal function of the water softener.

Brine System

System is designed to work with a central brining system, utilizing a continuous brine make-up. Brine tank is recommended to include a safety overflow connection to be plumbed to a suitable drain.

Poly Glass™ Vessels

Product Features

- For residential and light commercial water softener/filtration applications
- Slim diameter with capacities from 2 to 49 gallons
- Unmatched for strength and chemical resistance
- 10-year warranty for 6" - 13" vessels
- 5-year warranty for 14" - 16" vessels

Material of Construction

- Inner shell of polyethylene
- Threaded inlet in various sizes

Operating Parameters

- Maximum operating pressure: 150 psi
- Maximum operating temperature: 120°F

Pentair Design Parameters

- Safety factor: 4:1
- Minimum burst at 600 psi
- Tested to 250,000 cycles without leakage

NSF Design Parameters

- Safety factor: 4:1
- Minimum burst at 600 psi
- Tested to 100,000 cycles without leakage



Specifications

	Part No.	Description	Size (Inches)	System Connection	Height w/ Base Inches / mm	Height w/o Base Inches / mm	Capacity Gallons / Liters	Cubic Feet
6" Dia.	30109	0613 PG 2.5"T	06 x 13	2.5" Threaded	13.2 / 335	12.6 / 320	1.1 / 4.2	0.15
	30127	0618 PG 2.5"T	06 x 18	2.5" Threaded	18.6 / 472	18.0 / 457	1.8 / 6.8	0.24
	30151	0635 PG 2.5"T	06 x 35	2.5" Threaded	35.8 / 909	35.2 / 894	3.8 / 14.4	0.51
7" Dia.	30190	0735 PG 2.5"T	07 x 35	2.5" Threaded	35.6 / 904	35.3 / 897	5.2 / 19.7	0.7
	30213	0744 PG 2.5"T	07 x 44	2.5" Threaded	43.7 / 1110	43.4 / 1102	6.7 / 25.4	0.9
8" Dia.	31835	0818 PG 2.5"T	08 x 18	2.5" Threaded	18.8 / 478	18.5 / 470	3.28 / 12.0	0.44
	31836	0830 PG 2.5"T	08 x 30	2.5" Threaded	30.43 / 772	30.13 / 765	5.4 / 2.04	0.72
	30264	0835 PG 2.5"T	08 x 35	2.5" Threaded	35.6 / 904	35.3 / 897	6.6 / 25.0	0.88
	30286	0840 PG 2.5"T	08 x 40	2.5" Threaded	40.2 / 1021	39.9 / 1013	7.8 / 29.5	1.04
	30305	0844 PG 2.5"T	08 x 44	2.5" Threaded	44.4 / 1128	44.1 / 1120	8.7 / 32.9	1.16
9" Dia.	30317	0918 PG 2.5"T	09 x 18	2.5" Threaded	18.6 / 472	18.0 / 457	3.9 / 14.8	0.52
	30347	0935 PG 2.5"T	09 x 35	2.5" Threaded	35.6 / 904	35.3 / 897	8.3 / 31.4	1.11
	30360	0940 PG 2.5"T	09 x 40	2.5" Threaded	40.2 / 1021	39.9 / 1013	9.5 / 31.4	1.27
	30367	0942 PG 2.5"T	09 x 42	2.5" Threaded	42.4 / 1077	42.1 / 1069	10.9 / 41.2	1.46
	30383	0948 PG 2.5"T	09 x 48	2.5" Threaded	48.2 / 1224	47.9 / 1217	11.8 / 44.7	1.58
10" Dia.	30460	1035 PG 2.5"T	10 x 35	2.5" Threaded	35.6 / 904	35.3 / 897	10.2 / 38.6	1.36
	32266	1035 PG 2.5"T 1.25"TDH LOC A	10 x 35	2.5" Threaded 1.25 TDH	35.6 / 904	35.3 / 897	10.2 / 38.6	1.36
	32346	1035 PG 2.5"T 1.25"TDH LOC B	10 x 35	2.5" Threaded 1.25 TDH	35.6 / 904	35.3 / 897	10.2 / 38.6	1.36
	33018	1035 PG 2.5"T 1.25"TDH LOC C	10 x 35	2.5" Threaded 1.25 TDH	35.6 / 904	35.3 / 897	10.2 / 38.6	1.36
	30491	1040 PG 2.5"T	10 x 40	2.5" Threaded	40.3 / 1024	40.1 / 1018	11.5 / 43.5	1.54
	32150	1040 PG 2.5"T 1.25"TDH LOC A	10 x 40	2.5" Threaded 1.25 TDH	40.3 / 1024	40.1 / 1018	11.5 / 43.5	1.54
	32347	1040 PG 2.5"T 1.25"TDH LOC B	10 x 40	2.5" Threaded 1.25 TDH	40.3 / 1024	40.1 / 1018	11.5 / 43.5	1.54
	32992	1040 PG 2.5"T 1.25"TDH LOC C	10 x 40	2.5" Threaded 1.25 TDH	40.3 / 1024	40.1 / 1018	11.5 / 43.5	1.54
	30523	1044 PG 2.5"T	10 x 44	2.5" Threaded	44.6 / 1133	44.4 / 1128	13.1 / 49.6	1.75
	32993	1044 PG 2.5"T 1.25"TDH LOC A	10 x 44	2.5" Threaded 1.25 TDH	44.6 / 1133	44.4 / 1128	13.1 / 49.6	1.75
	32994	1044 PG 2.5"T 1.25"TDH LOC B	10 x 44	2.5" Threaded 1.25 TDH	44.6 / 1133	44.4 / 1128	13.1 / 49.6	1.75
	32995	1044 PG 2.5"T 1.25"TDH LOC C	10 x 44	2.5" Threaded 1.25 TDH	44.6 / 1133	44.4 / 1128	13.1 / 49.6	1.75
	30546	1047 PG 2.5"T	10 x 47	2.5" Threaded	47.4 / 1204	46.9 / 1191	15.1 / 57.0	2.02
	30579	1054 PG 2.5"T	10 x 54	2.5" Threaded	54.8 / 1392	54.6 / 1387	16.4 / 62.0	2.19
	32065	1054 PG 2.5"T 1.25"TDH LOC A	10 x 54	2.5" Threaded 1.25 TDH	54.8 / 1392	54.6 / 1387	16.4 / 62.0	2.19
	32345	1054 PG 2.5"T 1.25"TDH LOC B	10 x 54	2.5" Threaded 1.25 TDH	54.8 / 1392	54.6 / 1387	16.4 / 62.0	2.19
	32997	1054 PG 2.5"T 1.25"TDH LOC C	10 x 54	2.5" Threaded 1.25 TDH	54.8 / 1392	54.6 / 1387	16.4 / 62.0	2.19
12" Dia.	30615	1242 PG 2.5"T	12 x 42	2.5" Threaded	42.8 / 1087	42.2 / 1072	19.1 / 72.0	2.55
	30617	1242 PG 4.5"T (BTRS)	12 x 42	4.5" Threaded (BTRS)	42.8 / 1087	42.2 / 1072	19.1 / 72.0	2.55
	30646	1248 PG 2.5"T	12 x 48	2.5" Threaded	48.8 / 1240	48.4 / 1229	20.6 / 78.0	2.75
	30666	1252 PG 2.5"T	12 x 52	2.5" Threaded	52.9 / 1344	52.4 / 1331	22.2 / 84.0	2.97
	30669	1252 PG 4"T	12 x 52	4.0" Threaded	52.9 / 1344	52.4 / 1331	22.2 / 84.0	2.97
	32127	1252 PG 4.5"T (BTRS) New	12 x 52	4.5" Threaded (BTRS)	52.9 / 1344	52.4 / 1331	22.2 / 84.0	2.97
13" Dia.	30721	1354 PG 2.5"T	13 x 54	2.5" Threaded	54.6 / 1387	53.9 / 1369	27.5 / 104.0	3.68
	30724	1354 PG 4"T	13 x 54	4.0" Threaded	54.6 / 1387	53.9 / 1369	27.5 / 104.0	3.68
	32890	1354 PG 2.5"T 1.25"TDH LOC A	13 x 54	2.5" Threaded 1.25 TDH	54.6 / 1387	53.9 / 1369	27.5 / 104.0	3.68
	32891	1354 PG 2.5"T 1.25"TDH LOC B	13 x 54	2.5" Threaded 1.25 TDH	54.6 / 1387	53.9 / 1369	27.5 / 104.0	3.68
	32892	1354 PG 2.5"T 1.25"TDH LOC C	13 x 54	2.5" Threaded 1.25 TDH	54.6 / 1387	53.9 / 1369	27.5 / 104.0	3.68
14" Dia.	30745	1447 PG 4"T	14 x 47	4.0" Threaded	46.5 / 1181	46.0 / 1168	27.5 / 104.0	3.68
	31389	1447 PG 2.5"T	14 x 47	2.5" Threaded	46.5 / 1181	46.0 / 1168	27.5 / 104.0	3.68
	32006	1447 PG 4.5"T (BTRS) New	14 x 47	4.5" Threaded (BTRS)	46.5 / 1181	46.0 / 1168	27.5 / 104.0	3.68
	30783	1465 PG 2.5"T	14 x 65	2.5" Threaded	64.6 / 1641	64.3 / 1633	40.6 / 154.0	5.43
	30785	1465PG 4"T	14 x 65	4.0" Threaded	64.6 / 1641	64.3 / 1633	40.6 / 154.0	5.43
16" Dia.	30912	1665 PG 4"T	16 x 65	4.0" Threaded	64.6 / 1641	64.3 / 1633	49.0 / 185.0	6.55
	31627	1665 PG 2.5"T	16 x 65	2.5" Threaded	64.6 / 1641	64.3 / 1633	49.0 / 185.0	6.55

Color Options: AL - Almond  BL - Blue  BK - Black  GR - Gray  NA - Natural 

Part no. 40845 9/05

Requirements for POE Water Softeners under NSF/ANSI 44

By Rick Andrew

Cation exchange water softening is a well-known, well-understood technology that is successfully employed in many hard-water regions of North America as well as internationally. There is an American National Standard for testing and certification of these products—*NSF/ANSI 44*. Many readers may be familiar with the concepts of softening capacity, pressure drop, accuracy of the brining system and other requirements of this standard. But do you know the details?

This column will help to provide those details, including the conservative testing requirements and nuances of scope present in the standard. As you will see, the requirements are well thought out based on the considerations involved with the safety and operation of residential water softeners.

A question of scope

NSF/ANSI 44 defines a residential softener as a regenerable cation exchange system with conventional plumbing fittings not exceeding 1.25-inch (31.75 mm) NPS (nominal pipe size). Any softener with an inlet exceeding 1.25 inches is not considered residential, at least for purposes of *NSF/ANSI 44* and falls outside the scope of the standard.

Notice that the definition is not related to resin tank size, amount of cation exchange resin or system salt settings, but is based solely on the inlet size of the control valve. Also note that any physical or magnetic water conditioning systems are outside the scope of *NSF/ANSI 44*, because the standard is limited to cation exchange systems.

Disposable cartridge filters containing cation exchange resin fall outside the scope of the standard. This is because, although some do use cation exchange technology, they are not regenerable.

POE systems under NSF/ANSI 61

In late 2007, the scope of *NSF/ANSI 61* was revised to include POE systems and components. This means that water softeners can be certified either to *NSF/ANSI 44*, *NSF/ANSI 61* or both.

The main difference is that *NSF/ANSI 61* requires only conformance to the material safety requirements. *NSF/ANSI 44* requires conformance to material safety, structural integrity, pressure drop, softening capacity, softening performance, brine accuracy and product literature requirements.

Obviously, *NSF/ANSI 44* is a much more comprehensive standard for POE water softeners than *NSF/ANSI 61*. For

this reason, NSF recommends that POE softeners be certified to *NSF/ANSI 44*.

A multitude of tests

A summary of the testing requirements of *NSF/ANSI 44* is included in Figure 1. A formulation review for all materials in contact with drinking water and material extraction test is required to establish that no contaminants leach from the softener at concentrations of toxicological concern.

A total of 100,000 cyclic and 15-minute hydrostatic tests are required to establish the long-term durability of the system as well as its resistance to pressure spikes. A pressure drop test confirms that the softener will not cause a drop of more than 15 psi in line pressure when operated at the manufacturer's rated service flow.

Softener capacity is determined by testing at one half of the manufacturer's rated service flow. The feed water must have a hardness of $20 \pm$ two grains per gallon. Capacity testing is required at the lowest and highest salt settings and the setting closest to the midpoint of the range of salt settings.

Capacity for other non-tested salt settings is interpolated from the three measured capacities. Extrapolation is not allowed, so testing at the low and high salt settings is critical. Each test of capacity is conducted by first regenerating with a precisely measured amount of saturated brine. The softener's brine system is not utilized due to potential variation in the amount of regenerant salt.

The endpoint of the test is defined as one grain per gallon breakthrough in the softened water. The hardness leakage

Figure 1. NSF/ANSI 44 test descriptions

Requirement	Test description
Material safety	Formulation review for all wetted materials + extraction testing
Structural integrity	100,000 cyclic and 15-minute hydrostatic pressure testing
Pressure drop	Differential pressure between inlet and outlet may not exceed 15 psig at rated service flow
Exchange capacity	Softener challenged at one half of rated service flow with 20 grain per gallon feed water, endpoint when treated water reaches one grain per gallon
Rinse effectiveness	Net chloride in softened water must not exceed 100 mg/L after regeneration
Softening performance	System must produce soft water at rated service flow for 10 minutes after regeneration
Accuracy of the brine system	Salt used for regeneration must be within 15 percent of nominal salt setting

throughout the run is subtracted off when the capacity is determined, so that capacity is reflective of the exact amount of hardness removed. Three successive runs within 10 percent of the average of the three runs are required, with the average value being considered the official capacity at that salt setting. See Figure 2 for a graph of an example capacity run.

During capacity testing, the amount of residual chloride in the softened water is measured after regeneration. The net increase in chloride concentration from the softener may not exceed 100 mg/L. This indicates that the rinse is sufficient to rid the softened water of excess salt.

A separate test known as 'softening performance' is required. This test involves regeneration of the softener at the lowest salt setting and operation at the manufacturer's rated service flow. Samples of product water are taken each minute for 10 minutes and the hardness of the water may not exceed one grain per gallon for any of these samples.

Because the brine system is not used when conducting capacity testing, accuracy of the brine system must be determined through a separate test. This testing is conducted at the lowest and highest salt settings and the setting closest to the midpoint of the range. It involves weighing the brine tank before and after regenerations and three successive runs within 15 percent of the nominal salt setting must be achieved.

For example, a 10-pound salt setting successful brine accuracy test would require the weight

of the brine tank to decrease by 8.5 to 11.5 pounds after each regeneration, for a series of three regenerations. There is an alternate procedure that may be used for time-controlled brine systems, involving calculations based on saturated brine.

Softener efficiency

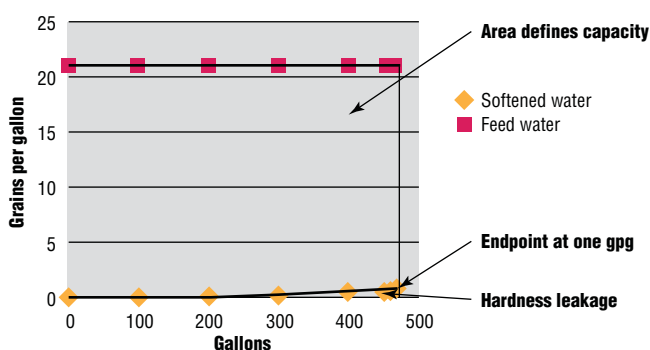
In this day and age of potential bans on water softeners due to concerns about salinity, efficiency is a very hot topic. Although efficiency is not required for certification to *Standard 44*, it may be required by state or local regulations.

This is true especially in western states like California that have water salinity problems. And states that currently do not have efficiency requirements for softeners may be moving in that direction.

Efficiency is based on the amount of hardness capacity per amount of regenerant salt and per volume of regenerant water. Efficient softeners require less salt and/or regenerant water to achieve the same amount of softening capacity as less efficient softeners. This results in less water consumption and less salinity added to the environment.

The efficiency of softeners varies with the amount of salt used for regeneration. The higher the salt dosage, the lower the salt efficiency. There are diminishing returns in terms of softening capacity for regenerating with more and more salt. In fact, there is a point at which additional salt used in regeneration will not achieve any more softening

Figure 2. Typical capacity test



capacity and will simply be rinsed out of the system.

Efficiency is calculated from data measured and recorded during capacity testing. The requirements for efficiency are included in Figure 3. Only demand initiated regeneration (DIR) softeners may claim efficiency. A softener must achieve both salt efficiency and water efficiency in order to be 'efficiency rated.'

Figure 3. NSF/ANSI 44 efficiency requirements for DIR softeners only

Parameter	Efficiency requirement
Salt efficiency	At least 3,350 grains of capacity per pound of regenerant salt
Water efficiency	At least 1,000 grains of capacity per five gallons of regeneration water

Also any efficiency specifications or statements must refer to the salt setting at which the efficiency was achieved. The State of California has a more stringent requirement for salt efficiency ratings than does *Standard 44*, requiring at least 4,000 grains of capacity per pound of regenerant salt.

Conformance by calculation—certification of families of softeners

Standard 44 includes procedures to calculate pressure drop, capacity and efficiency for softeners that are similar to the test unit. There are specific requirements for softeners to be considered 'similar,' including:

- same control valve
- same distributor (length of distributor tube can vary with size of resin tank)
- limitations on variation in cation exchange resin specifications
- limitations on amounts of resin
- limitations on resin tank size
- limitations on regeneration volumes

- limitations on flow rates
- limitations on salt dosages

The concept is that a line of softeners built with the same control valve can be certified based on testing one or a few of them and then using calculations included in the standard to calculate pressure drop, capacity and efficiency for the non-tested models. The limitations are designed to keep only softeners that function similarly in the same family.

The equations used for calculations have proven accurate in practice. Conformance by calculation allows manufacturers to certify broad lines without unnecessarily

testing each one of many very similar softeners.

A comprehensive standard

As you can see from this brief overview, *Standard 44* requires testing all relevant aspects of water softeners, from material safety to accuracy of the brine system. This means that a number of tests are required, each one designed to evaluate different aspects.

This is in contrast to *Standard 61*, which requires an evaluation for material safety only. Although POE softeners may be evaluated under and certified to either one, the comprehensiveness of *Standard 44* makes it the clear choice.

About the author

♦ Rick Andrew is the Operations Manager of the NSF Drinking Water Treatment Units Program for certification of POE and POU systems and components. Prior to joining NSF, his previous experience was in the area of analytical and environmental chemistry consulting. Andrew has a Bachelor's Degree in chemistry and an MBA from the University of Michigan. He can be reached by phone at 1-800-NSF-MARK or by email at Andrew@nsf.org.



DOWEX™ HCR-S

A High Capacity Cation Exchange Resin for Softening and Demineralization Applications

Product	Type	Matrix	Functional group
DOWEX™ HCR-S	Strong acid cation	Styrene-DVB gel	Sulfonic acid

Guaranteed Sales Specifications		Na ⁺ form	H ⁺ form
Total exchange capacity, min.	eq/L	2.0	1.8
	kgr/ft ³ as CaCO ₃	43.7	39.3
Bead size distribution range†			
300 - 1,200 µm, min. (50 mesh - 16 mesh)		90	90
Acidity range		pH	7.0 - 10.5
Color throw, as packaged, max.		APHA	20

Typical Physical and Chemical Properties		Na ⁺ form	H ⁺ form
Water content	%	44 - 48	50 - 56
Whole uncracked beads	%	90 - 100	90 - 100
Total swelling (Na ⁺ → H ⁺)	%	8	8
Particle density	g/mL	1.28	1.22
Shipping weight	g/L	820	780
	lbs/ft ³	51	49

Recommended Operating Conditions

- Maximum operating temperature: 120°C (250°F)
- pH range: 0 - 14
- Bed depth, min.: 800 mm (2.6 ft)
- Flow rates:
 - Service/fast rinse: 5-50 m/h (2-20 gpm/ft²)
 - Backwash: See figure 1
 - Co-current regeneration/displacement rinse: 1-10 m/h (0.4-4 gpm /ft²)
- Total rinse requirement: 3 - 6 Bed volumes
- Regenerant: 1-8% H₂SO₄, 4-8% HCl or 8-12% NaCl

† For additional particle size information, please refer to Particle Size Distribution Cross Reference Chart (Form No. 177-01775).

Typical Properties and Applications

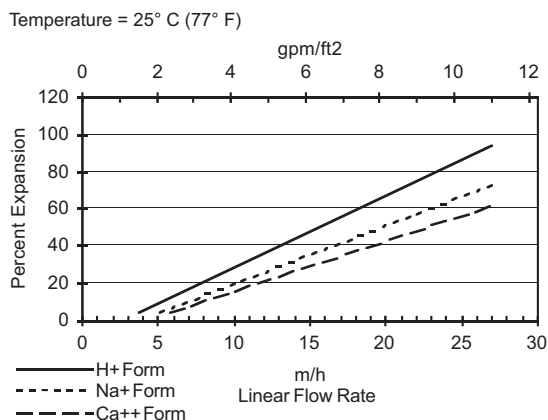
DOWEX™ HCR-S cation exchange resin is a high capacity resin with excellent kinetics and good physical, chemical and thermal stability.

DOWEX HCR-S cation exchange resin is well suited for industrial water softening and demineralization in the co-current mode of regeneration.

Packaging

25 liter bags or 5 cubic feet fiber drums

Figure 1. Backwash Expansion Data

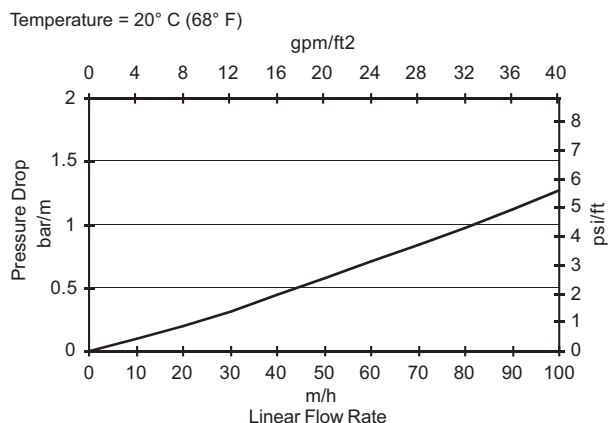


For other temperatures use:

$$F_T = F_{77^\circ\text{F}} [1 + 0.008 (T_{\text{F}} - 77)], \text{ where } F = \text{gpm/ft}^2$$

$$F_T = F_{25^\circ\text{C}} [1 + 0.008 (1.8T_{\text{C}} - 45)], \text{ where } F = \text{m/h}$$

Figure 2. Pressure Drop Data



For other temperatures use:

$$P_T = P_{20^\circ\text{C}} / (0.026 T_{\text{C}} + 0.48), \text{ where } P = \text{bar/m}$$

$$P_T = P_{68^\circ\text{F}} / (0.014 T_{\text{F}} + 0.05), \text{ where } P = \text{psi/ft}$$

Note: These resins may be subject to drinking water application restrictions in some countries: please check the application status before use and sale.

DOWEX™ Ion Exchange Resins
For more information about DOWEX resins, call the Dow Water Solutions business:

North America: 1-800-447-4369
Latin America: (+55) 11-5188-9222
Europe: (+32) 3-450-2240
Pacific: +60 3 7958 3392
Japan: +813 5460 2100
China: +86 21 2301 9000

<http://www.dowex.com>

Warning: Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

Notice: No freedom from any patent owned by Seller or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other governmental enactments. Seller assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.





Effective Date: December 20, 2007

Supersedes: August 28, 2007

FOOD ADDITIVE STATUS

Product	Product Code
DOWEX™ 50WX4 20-50 Mesh (Na) Cation Exchange Resin	23030
DOWEX 88 (Na) Cation Exchange Resin	37067
DOWEX 88MB (Na) Cation Exchange Resin	23073
DOWEX CM-15 (Na) Cation Exchange Resin	03780
DOWEX HCR-S (Na) Cation Exchange Resin	63145
DOWEX HCR-SL (Na) Cation Exchange Resin	10193
DOWEX HCR-S/S (Na) Cation Exchange Resin	03789
DOWEX HCR-S/S CR (Na) Cation Exchange Resin	05305
DOWEX HGR (Na) Cation Exchange Resin	63151
DOWEX MARATHON™ C (Na) Cation Exchange Resin	39935
DOWEX MARATHON C-10 (Na) Cation Exchange Resin	69048
DOWEX MARATHON MSC (Na) Cation Exchange Resin	63028
DOWEX MONOSPHERE™ C-350 Cation Exchange Resin	08530
DOWEX MONOSPHERE C-400 Cation Exchange Resin	08531
DOWEX MONOSPHERE 88 (Na) Cation Exchange Resin	30267
DOWEX MONOSPHERE C-600 B Cation Exchange Resin	43966
DOWEX N278 (Na) Cation Exchange Resin	52155
DOWEX N279 (Na) Cation Exchange Resin	52156
DOWEX UPCORE™ Mono C-600 (Na) Cation Exchange Resin	52221
XUS 43595.00 Developmental Cation Exchange Resin	80065
XUS 43598.00 Developmental Cation Exchange Resin	148757

Food and Drug Administration (FDA)

These products comply with the U.S. Food and Drug Administration's Food Additive Regulation 21 CFR § 173.25(a)(1).

Use of this product is subject to good manufacturing practices and any limitations which are part of the regulations. The regulations should be consulted for complete details.

If you have any questions or require further information, please contact us via our web site at www.dow.com/perfchem.

Sincerely,



Connie Deford
Global Director for Product Regulatory Management
The Dow Chemical Company
www.dow.com/perfchem (Dow Answer Center)

This information is considered accurate and reliable as of the date appearing above and is presented in good faith. Because use conditions and applicable laws may differ from one location to another and may change with time, Recipient is responsible for determining whether the information in this document is appropriate for Recipient's use. Since Dow has no control over how this information may be ultimately used, all liability is expressly disclaimed and Dow assumes no obligation or liability therefore. No warranty, express or implied, is given nor is freedom from any patent owned by Dow or others to be inferred.



Maximum Operating Pressure - 125 psi
 Maximum Operating Temperature - 140 Degrees F
 Seat Area Open Diameter - .438

694 SERIES CHECK VALVE

694 Poppet Check Valve Design Considerations

The 687 Series Poppet Check Valve incorporates a thin elastomer disc supported by a poppet that seals on the seat. Pressure in the flow direction moves the seal off the seat first before pressure builds enough to move the poppet away from the seat. The 687 Series Check Valve maximum operating pressure of 125 psi covers a wide range of air and fluid applications. The 687 Check is a compact design with a light cracking pressure, high flow rate, and a positive seal at very low back pressure or slight vacuum. For higher cracking pressure applications, an embedded o-ring poppet is substituted for the standard elastomer disc poppet.

Example:

Body Material	Inlet End	Outlet End	Seal	Spring
White Filled Poly	1/4 FNPT	1/4 FNPT	Viton®	1 psi, O-ring

SMC Part Number: WFP CHK 694-4F4F-F,1# O-Ring

The flow arrow on the body will point from Inlet to Outlet. SMC Part Numbers are a description of the valve as read left to right, Inlet to Outlet.

Example: WFP CHK 694-4F4F-F,1# O-Ring = 1/4 FNPT Inlet x 1/4 FNPT Outlet

694 Series Options

Material Options

Black Polypropylene Body & Poppet
 White Polypropylene Body & Poppet

Seal Options

Buna-N, Ethylene Propylene, Fluoroelastomer (Viton®)

End Options

1/4 Female NPT X 1/4 Female NPT

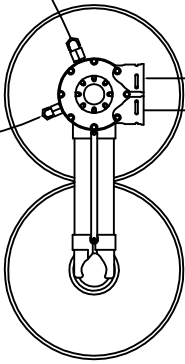
Cracking Pressure

302 Stainless Spring - 1/3 psi (Standard), 1, 7 psi

SMC will quote alternate materials or customize our standard products when quantities ensure competitive pricing.
 Contact Customer Service at (651) 653-0599, FAX - (651) 653-0989, E-Mail - info@specialtymfg.com

(3/8" COMPRESSION TUBE CONNECTION)

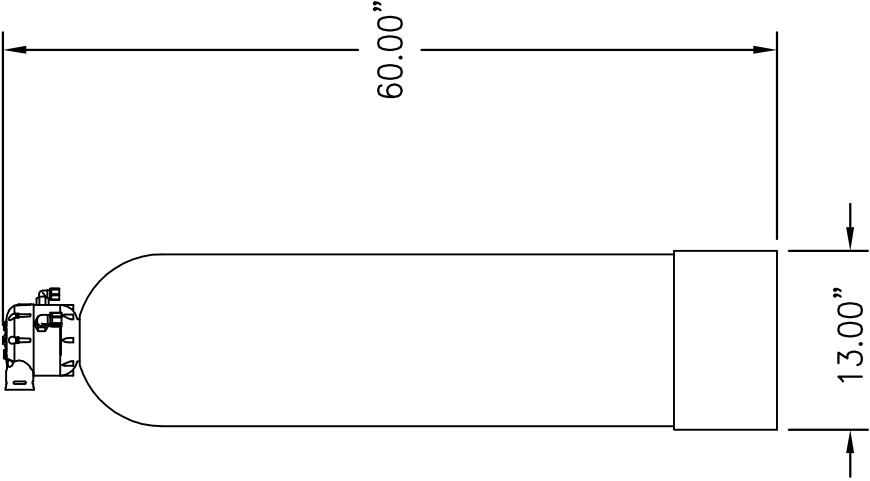
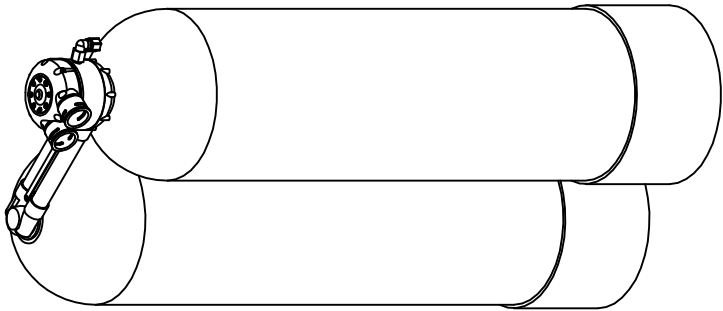
BRINE CONNECTION



DRAIN CONNECTION
(5/8" COMPRESSION TUBE CONNECTION)

OUTLET CONNECTION
(1 1/2" MNPT NORYL ADAPTER)

INLET CONNECTION
(1 1/2" MNPT NORYL ADAPTER)



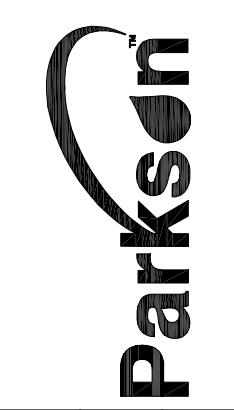
This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___ PRELIMINARY	☒ APPROVAL
___ INFORMATION	___ CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
TDE	9/5/2011
CHECKED BY	DATE
SCALE	SIZE
3/32"=1"	B



PROJECT NAME		TITLE
WATER SOFTENER KINETICO CP213S GENERAL ARRANGEMENT		
REFERENCE INFORMATION	DRAWING NO	REV
	500-00112	0
SHEET 1 OF 1		

Brine Generation:

Brine Generator

Brine Generator General Arrangement Drawing

Open Top Cylindrical Tank & Lid

Translucent Linear Polyethylene Tank & Lid

Capacity: 3240 Pounds Salt Storage

Volume: 360 Gallons Liquid Storage

48" Inner Diameter by 48" Depth

52" Diameter (with Lid) by 49- ½" Total Height

One (1) of Tank with Lid Model # 360 Gallons

Kinetico Float Valve Assembly

(Concentrated Brine Level Control)

Level Float, Brine Well, Spray Ring, Distributor

One (1) of Model # 4781

Spears 2000 Compact Ball Valve

PVC Body, Stem, Handle, Ball

Viton Connection Ends

½" Threaded Connections

One (1) of Model # 4970.005

Spears Utility Ball Valve

PVC Body, Stem, Handle, Ball & Connection Ends

Teflon Seat with EPDM O-ring Seals

$\frac{3}{4}$ " Threaded Connections

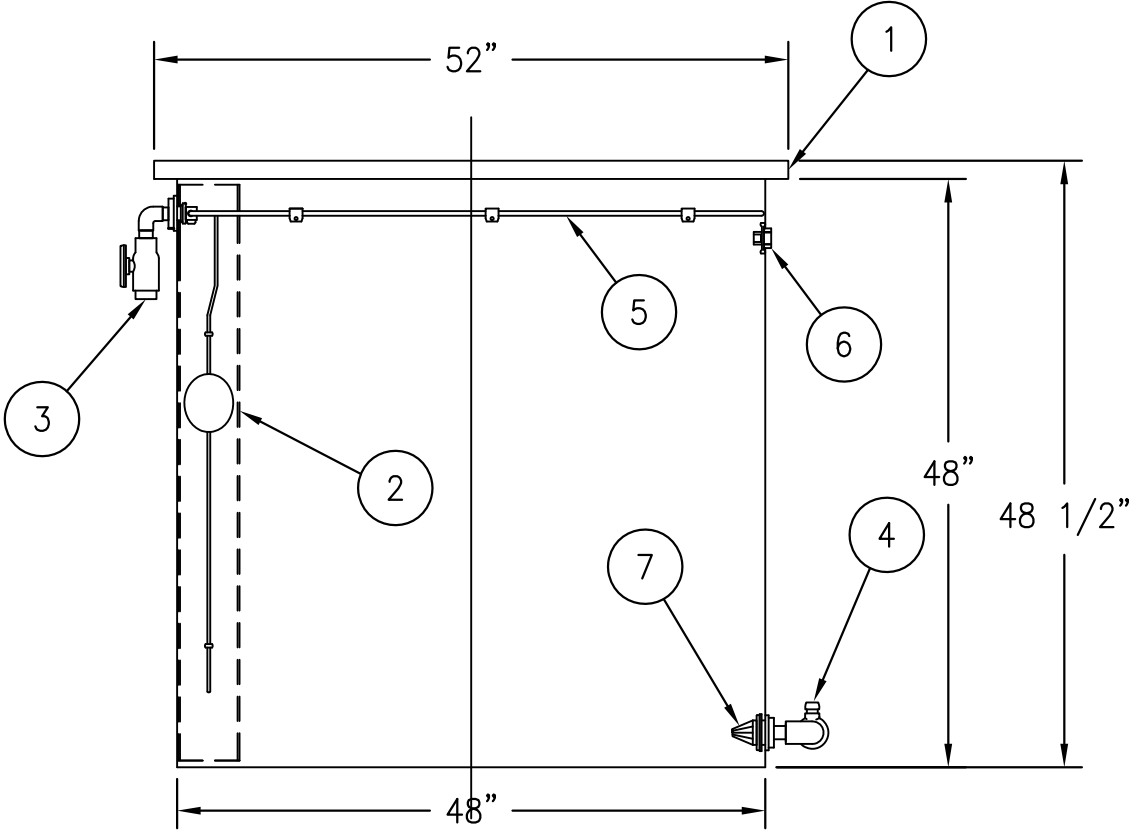
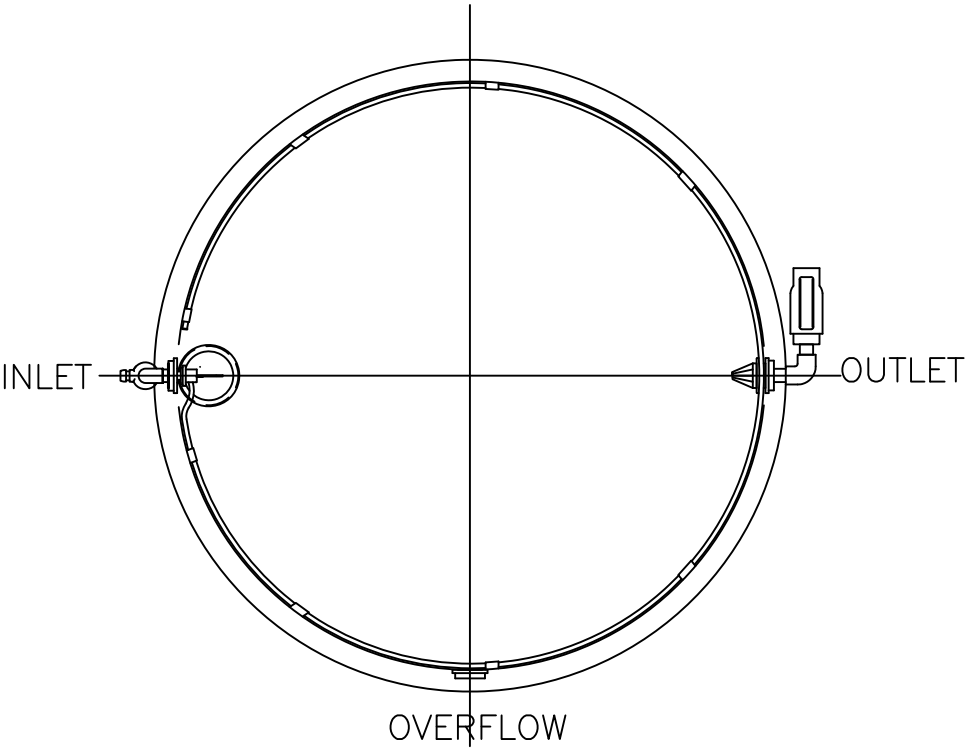
One (1) of Model # 5041S.007

Quartz Rock Filter Bed (Shipped Loose)

Eight (8) of $\frac{1}{8}$ " x $\frac{1}{4}$ " NSF 61 Washed Rock

Eight (8) of $\frac{1}{4}$ " x $\frac{1}{2}$ " NSF 61 Washed Rock

(Reference O&M For Proper Bed Thickness)



IT.	QTY	DESCRIPTION	REFERENCE	MAT'L
1	1	TANK WITH LID		
2	1	FLOAT VALVE ASSEMBLY, BRINE WELL		
3	1	BALL VALVE, 1/2"		
4	1	BALL VALVE, 3/4"		
5	1	SPRAY RING		
6	1	OVERFLOW PORT, 3/4"		
7	1	BRINE OUTLET		

TANK SIZING CHART			
TANK SIZE		SALT STORAGE	
GALLONS	LITERS	LBS.	KG.
360 GAL	1362.7	3240 LBS	1469.6 kg

- NOTES:
1. CUSTOM DIMENSIONS ARE AVAILABLE UPON REQUEST. CONTACT PARKSON CORPORATION FOR DETAILS.
 2. FOR SITES USING GRANULAR OR FOOD GRADE SALT, A GRANULAR SALT FILTER MUST BE USED.

This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___PRELIMINARY ☒ APPROVAL
___INFORMATION ___ CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
TDE	8/25/11
CHECKED BY	DATE
FJC	8-26-11
SCALE	SIZE
1/16"=1"	B



PROJECT NAME
REFERENCE INFORMATION

TITLE		
360 GALLON WITH LID OPEN TOP BRINE TANK, LPE GENERAL ARRANGEMENT		
DRAWING NO	500-00282	REV D
		SHEET 1 OF 1

ECONOMY MOLDED PLASTIC TANKS

CYLINDRICAL TANKS, HEAVY-DUTY, CALIBRATED



NOTE: The tank weights and wall thicknesses listed in this section are approximate.



HINGED INSIDE COVER

- Made from Polypropylene sheet.
- Fits into top rim flange.
- Flexible long Polyolefin hinge.
- Provides 50% access when open (standard).
- Custom designs available.



FLAT BOLTED COVER

- 304 SS bolts, nuts, and washer.
- Vinyl gasket.
- Three bead welded joints.
- Flat Polypropylene sheet.
- Shown with optional threaded access port.

770.110.120 Covers

FEATURES

- Every tank on this page has rigid, extra-heavy walls to assure maximum strength and durability under severe conditions, making them ideal for a wide variety of applications. They can safely handle a variety of corrosive liquids. The visible liquid level and calibration in gallons allows for convenient reading of contents. The rim flange provides extra strength and ease of handling. The tanks are leak-proof and the one-piece construction eliminates seams, joints and welds, and cleaning is accomplished quickly and easily.

CYLINDRICAL TANKS, LINEAR POLYETHYLENE

- These rigid, self-supporting tanks have excellent resistance to chemicals, impact and abrasion. They withstand continuous operating temperatures up to 180°F; intermittent service to 212°F.

ORDER: 7110.(Size No.) CYLINDRICAL TANK, LINEAR POLYETHYLENE

Size No.	Cap. (gal.)	I.D. x Depth (in.)	Approx. Wall Thick. (in.)	7110 Tanks	7113 Standard Covers	7122 Hinged Covers	7123 Bolted Covers
001	5	11 x 14	1/4				
501	7.5	12 x 16	1/4				
002	10	13 x 20	1/4				
003	15	15 x 21	1/4				
503	17	18 x 16	1/4				
006	30	18 x 29	1/4				
011	55	22 x 34	1/4				
016	80	24 x 48	1/4				
020	100	27 x 48	1/4				
030	150	31 x 48	1/4				
040	200	36 x 48	5/16				
055	275	42 x 48	3/8				
072	360	48 x 48	3/8				
100	500	52 x 60	3/8				
110	550	48 x 72	3/8				
115	575	60 x 46	3/8				
116	575	42 x 96	3/8				
130	650	48 x 84	3/8				
135	675	66 x 46	3/8				
140	700	55 x 70	3/8				
160	800	72 x 46	3/8				
161	800	60 x 66	3/8				
200	1000	66 x 72	3/8				
201	1000	84 x 46	3/8				
220	1100	60 x 90	7/16				
250	1250	69 x 84	7/16				
270	1350	82 x 59	7/16				
300	1500	73 x 84	7/16				
370	1850	82 x 83	7/16				
400	2000	84 x 84	7/16				
401	2000	82 x 90	7/16				
595	2975	95 x 97	1/2				
850	4250	120 x 87	1/2				
114	5700	120 x 117	5/8				
128	6400	120 x 131	5/8				

770.110.130 Linear PE

CYLINDRICAL TANKS, POLYPROPYLENE

- These products withstand continuous operating temperatures up to 230°F, and have generally greater resistance to chemicals than the other tanks listed. However, they're not recommended for use at temperatures below freezing.

ORDER: 7120.(Size No.) CYLINDRICAL TANK, POLYPROPYLENE

Size No.	Cap. (gal.)	I.D. x Depth (in.)	Approx. Wall Thick. (in.)	7120 Tanks	7113 Standard Covers	7122 Hinged Covers	7123 Bolted Covers
001	5	11 x 14	1/8				
501	7.5	12 x 16	1/8				
002	10	13 x 20	1/8				
003	15	15 x 21	1/8				
503	17	18 x 16	1/4				
006	30	18 x 29	1/4				
011	55	22 x 34	1/4				
016	80	24 x 48	1/4				
020	100	27 x 42	1/4				
030	150	31 x 48	1/4				
040	200	36 x 48	5/16				
053	275	42 x 48	3/8				
063	315	48 x 42	3/8				
065	325	36 x 74	3/8				
066	330	45 x 48	3/8				
072	360	48 x 48	3/8				
088	440	52 x 48	3/8				
100	500	52 x 60	3/8				
110	550	48 x 72	3/8				

* Part Number 7113.055. NOTE: Polypropylene tanks do not have the impact resistance nor the clean, smooth appearance of Polyethylene tanks.

770.130.120 PP Tanks



INDUSTRIAL WATER PROCESSING SYSTEMS

CENTRAL BRINE DRUM INSTALLATION INSTRUCTIONS

Manufactured by:
Kinetico Incorporated
Newbury, OH 44065
440.564.9111

The pioneer in non-electric water processing systems.

CAUTION



The central brine refill valve (part number 4967) has a maximum operating pressure of 80 psi (5.5 bar). If the system pressure exceeds 80 psi (5.5 bar), a pressure regulator must be installed on the central brine drum's refill line. Failure to do so will result in erratic brine valve operation, which can result in brine tank overflow, hardness breakthrough, and other issues.



Step 1 – Check contents. Before you begin the assembly, inventory all parts to be sure nothing is missing

Brine Drum	
#4724	24 x 48 w/Lid
#4726	39 x 60 w/Lid
#4728	50 x 60 w/Lid

Internals Assembly		
Part No.	Description	Qty.
1138	Elbow, Overflow	1
1139	Nut, Overflow	1
1869	C/B Screw, 10/32" x 1/2"	10
1870	C/B 3/8" PVC Coupling	1
2360	C/B Brass Collar	2
2361	C/B Brass Rod, 3'	1
2944A	C/B Bulkhead with Distributor	1
57054	C/B Bulkhead Fitting, 3/4"	1
4967	C/B Brine Refill Valve, 1/4"	1
3406	C/B Plastic Nipple	1
3407	C/B Plastic Elbow	1
3408	C/B Adapter, Float Rod	1
3430	C/B Brass Nut, 10/32"	10
3431	C/B Clamp, 3/8"	10
3793	C/B Cover, Brine Well	1
4731	C/B Float Ball 4 1/2"	1
4756	C/B Tubing, 13' x 3/8" Drilled	1
4758	C/B Brine Well 5" x 57" Drilled	1
4759	C/B Plug 3/4" JACO	1
4761	C/B Spray Tubing End Fitting	2
4762	C/B Plug 1/4" JACO	1

Brine Drum	
#7737	22 x 36 w/Lid

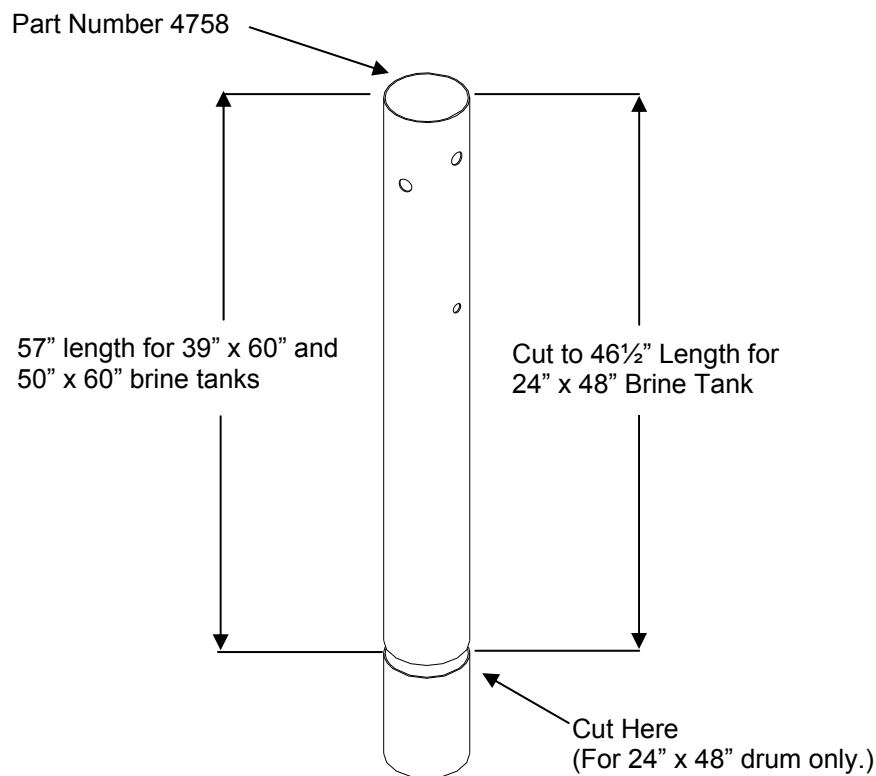
Internals Assembly		
Part No.	Description	Qty.
7739	C/B Brass Rod 31" (22 x 36 only)	1
7740	C/B Brine Well 5" (22 x 36 only)	1

Step 2 – Cut brine well. If you are using 24" x 48" brine tank (part number 4724), you must shorten the brine well (part number 4758).

The brine well has a standard length of 57". For use with the brine tank (part number 4724), this length must be reduced to 46½".

Well is to be shortened on the opposite end of holes when necessary. Refer to Figure 1.

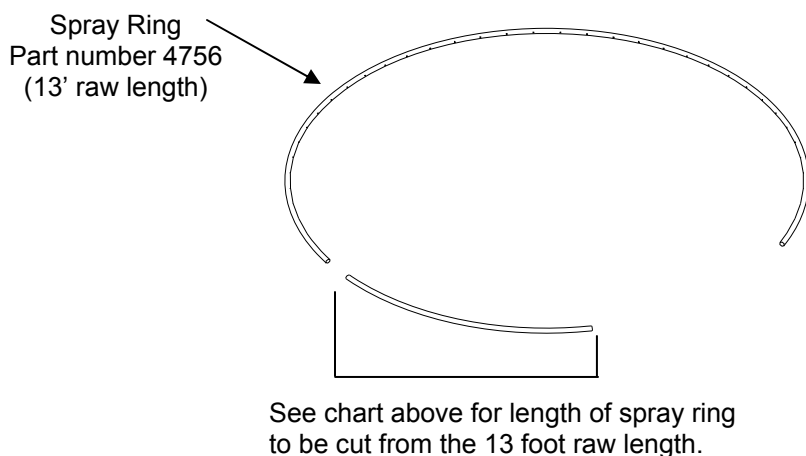
Figure 1



Step 3 – Cut the spray ring to proper length. See table below.

Brine Tank Size	Part Number	Spray Ring Length
22" Dia. x 36" H	7737	60" = 5'
24" Dia. x 48" H	4724	66" = 5' 6"
39" Dia. x 60" H	4726	114" = 9' 6"
50" Dia. x Height	4728	153" = 12' 9"

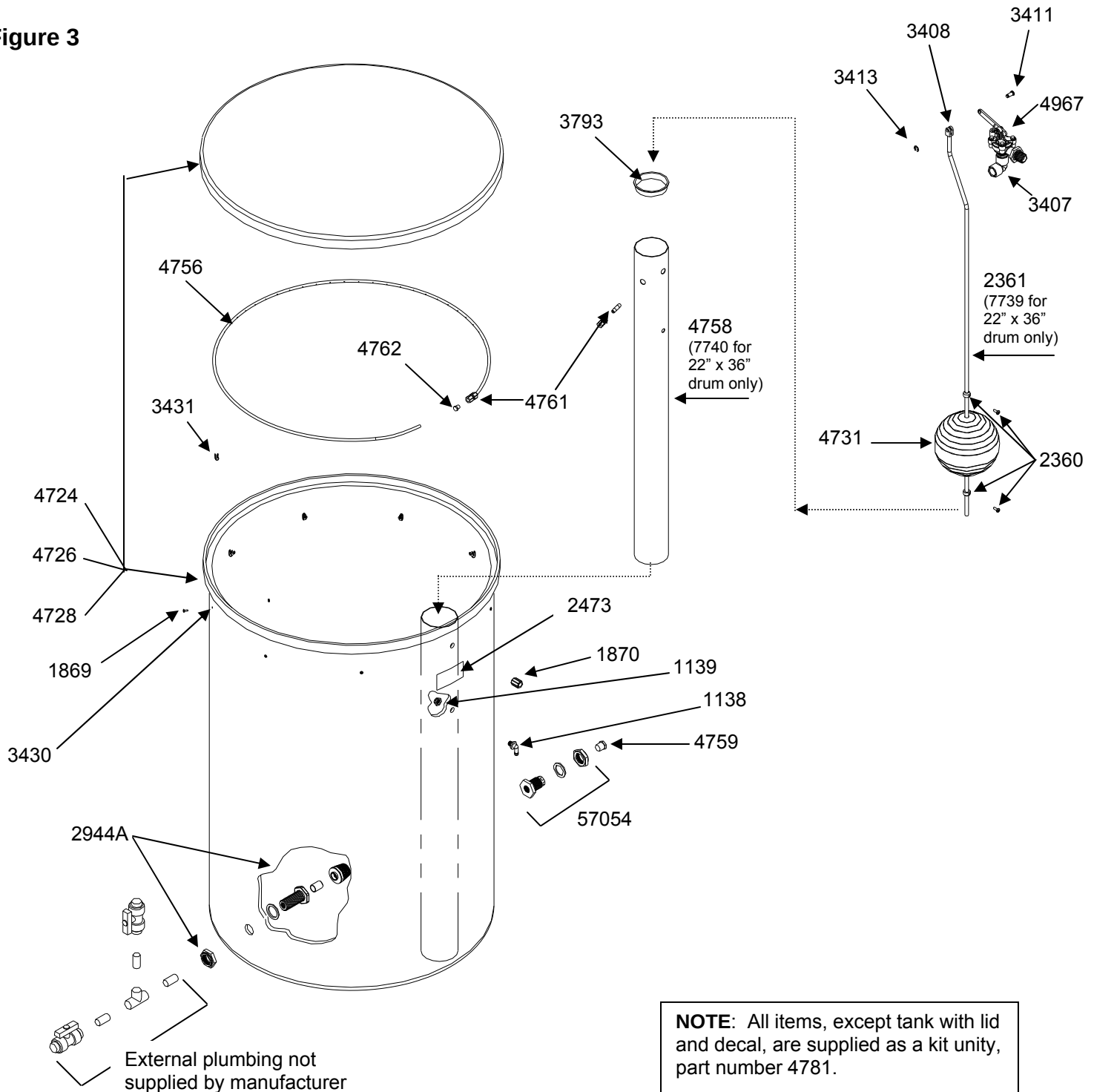
Figure 2



Step 4 – Assemble the internals package and attach it into the brine drum as shown in Figure 3. Use detailed instruction sheet if required (Step 8).

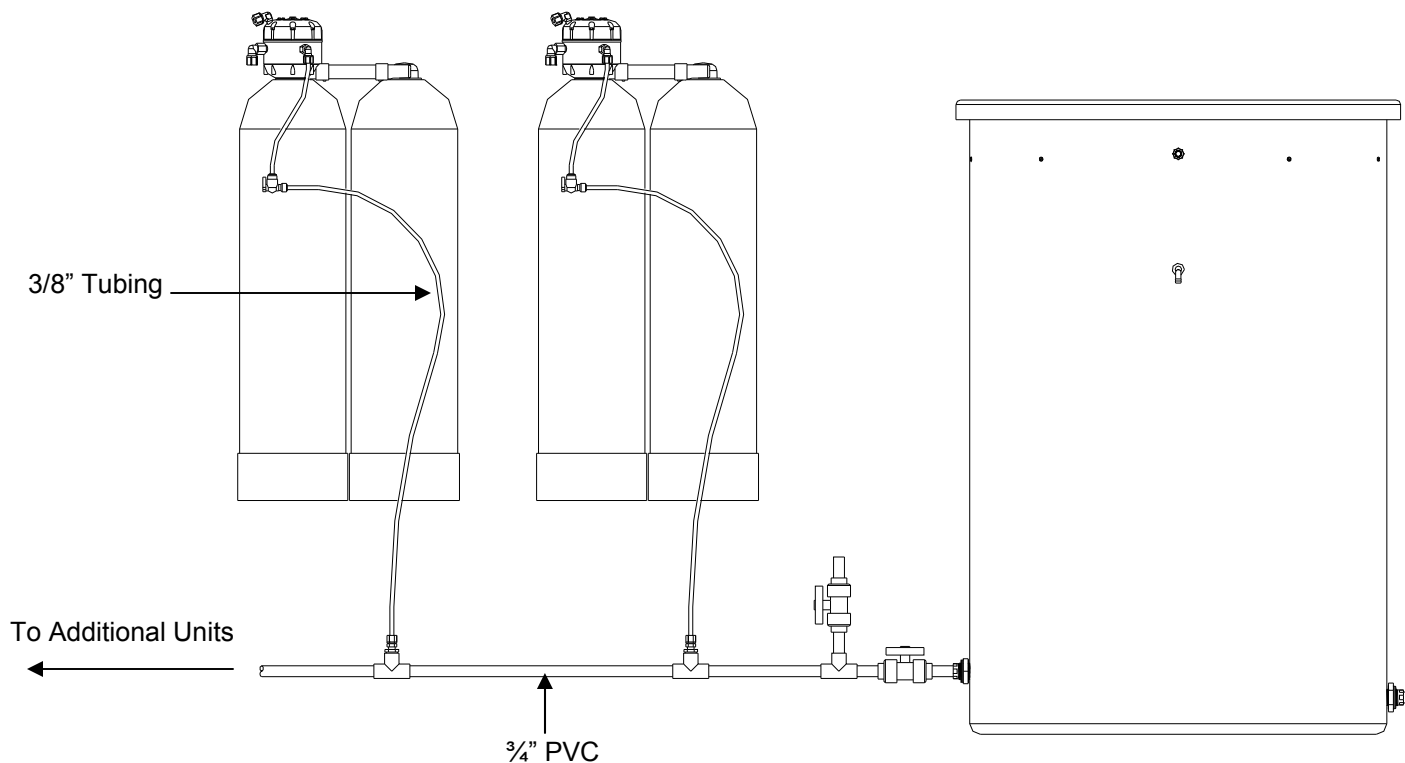
NOTE: Be sure to place part number 57054 in the bottom hole on the brine tank. This is used for clean out purposes, so install plug (part number 4759), or add a shut-off valve. Part number 2944A should be inserted into the opening that is located 6" from the floor. This is the brine feed to the softeners. For 22" x 36" drum, install part number 2944A in either hole.

Figure 3



Step 5 – Brine Distribution Piping – The distribution piping from the brine tank to the brine check valve is not included with this system (refer to Figure 4). This represents our recommended layout for this piping.

Figure 4

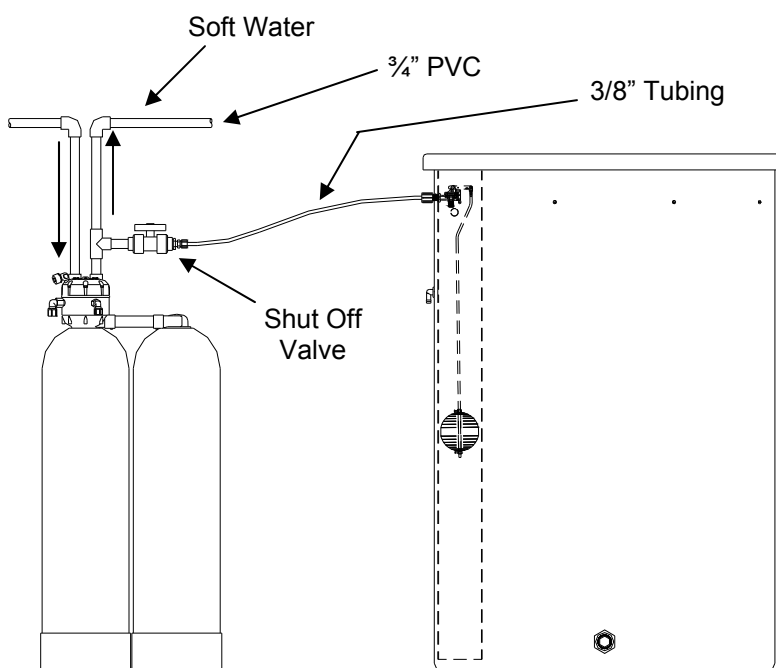


Step 6 – Inlet Connection – When the brine discharge piping is complete, install a feed line to the brine spray valve. This feed line should connect to a soft water line. Refer to water softener instruction.

The inlet tubing and fittings are not part of the system. This represents our recommended layout for the system

Use flexible 3/8" tubing. Be sure to install a shut-off valve. Refer to Figure 5.

Figure 5



Step 7 – Start-up

1. Open inlet valve slowly.
2. Check spray valve for correct operation.
3. Let water level cover brine discharge fitting.
4. Shut off water.
5. Check brine discharge fitting for leaks.
6. Check clean-out fitting for leaks.
7. Add sale to spray ring opening.
8. Open inlet valve.

9. Water level should shut off approximately 24" down the brine well.

Step 8 – Detailed Assembly Instructions for Brine Drum Assembly

NOTE: Use teflon tape for all threaded pipe connections.

A. For 39" and 50" Diameter Drums

1. Assemble bulkhead fittings to brine drum as shown, with the rubber washer on the inside. Be sure the washer does not squeeze out while tightening.
2. Mount the brine well (part number 4758) to the drum using overflow fitting (part number 1138) and nut (part number 1139).
3. Assemble 90° elbow (part number 3407) and nipple (part number 3406) to refill valve (part number 4967)
4. Install top collar (part number 2360) on bent float rod and position it 14" from straight end and secure. Slide ball on rod. Position lower collar (part number 2360) on rod and secure it approximately 2" from end of rod. Top collar for 22" x 36" should be installed 9" from end of rod.
5. Screw float to valve adapter fitting (part number 3408) to float rod. **DO NOT OVERTIGHTEN.**
6. Using pin (part number 3411) and E-ring (part number 3413), attach rod and float assembly to valve (part number 4967) activator arm.
7. Lower float rod and valve assembly into brine well. Mount valve to tank through hole in brine well.
8. Assemble tube to nipple fitting (part number 4761) to nipple (part number 3406) through hole in the brine wall.
9. Connect spray tube (part number 3431) to fitting (part number 4761) leading to valve and add end plug fitting to spray tube. Plug fitting consists of hose to female thread fitting (part number 4761) and 1/4" pipe plug (part number 4762).
10. Using the 8 hangers (part number 3431), screws (part number 1869) and nuts (part number 3430), mount spray tube to drum using holes provided. Spray holes should be angled down toward salt.

B. For 24" Drum

The procedures are identical to those listed, except the shorter 46½" brine well is used. Also, only 6 hangers are needed to mount the spray tube (part number 4756).

C. For 22" Drum

Same as above. Only difference is a different brine well is used (part number 7740).



PVC & CPVC COMPACT 2000 BALL VALVES

CB2000-2-0604

Industrial Grade, Maintenance-Free Sealed Unit New Lower-Profile, More Compact Design Provides Even Greater Space-Savings



- New Actuation-Ready Body – Accepts Spears® Improved Mini-Mount Actuator Mounting Kits
- New Double O-ring Stem Seal
- Spears® Safe-T-Shear Stem
- PTFE Self Adjusting Floating Seats
- EPDM or Viton® O-ring Seals
- Full 235 psi Pressure Rating @ 73°F
- NSF Certified for Use with Potable Water
- Suitable for Vacuum Service
- Produced in ASTM IPS sizes 1/2" - 2" with Socket or Threaded End Connectors

Corrosion Resistant PVC or CPVC Construction, Silicone Free Assembly

Spears® Compact 2000 Ball Valves never rust, scale, or pit, providing exceptional chemical and corrosion resistance. Assembled with water soluble, silicone free lubricant.

Actuation-Ready Body Mounting Lugs

Valve body has built-in mounting lugs for direct attachment to Spears® improved Mini-Mount actuator mounting kits.

PTFE Ball Seats

Spears® PTFE floating seat design reduces seat wear for extended valve life, smooth operation, and bubble-tight shutoff. 100% factory tested.

EPDM or Viton® O-ring Options

Available with high grade, abrasion resistant EPDM or Viton® elastomer O-ring seals. Allows application specific selection for optimum chemical resistance.

High Impact Polypropylene Handle

Low profile, double stop design. Exhibits excellent resistance to most chemical environments.

Sample Engineering Specification

All thermoplastic ball valves shall be Compact 2000 sealed unit type manufactured to ASTM F 1970 and constructed from PVC Type I, ASTM D 1784 Cell Classification 12454 or CPVC Type IV, Cell Classification 23447. All Valve bodies shall have actuation mounting lugs. All O-rings shall be EPDM or Viton®. All valves shall have Safe-T-Shear® stem with O-ring stem seal and double-stop Polypropylene handle. All valves shall be listed by NSF International for use in potable water service. All 1/2" - 2" valves shall be pressure rated at 235psi, for water at 73°F, as manufactured by Spears® Manufacturing Company.

Full Schedule 80 Bore

In open position, full-bore provides optimum flow with pressure drop equal to that of an equivalent length of Schedule 80 pipe.

Suitable for Vacuum Service

Compact 2000 Ball Valves have been tested at 26 in-Hg. vacuum for one hour with less than 1-in. Hg loss.

NSF Certified for Potable Water

All Compact 2000 Ball Valves are NSF Certified for use in potable water systems.

Optional Accessories

- Round Safety Handle
- Stem Extension Kit
- Mini-Mount Actuation Mounting Kit (AMB3 Series)
- 2" Square/T-Style Operator Nut

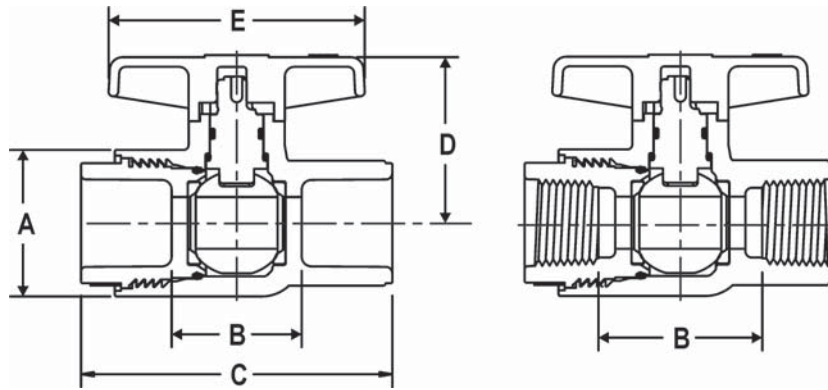


Viton® is a registered trademark of Dupont Dow Elastomers.

PROGRESSIVE PRODUCTS FROM SPEARS® INNOVATION & TECHNOLOGY

Visit our web site: www.spearsmfg.com

Technical Information



Dimensions

Size	Dimension Reference (inches, $\pm 1/16$)					
	A	B ¹		C	D	E
		Socket	Threaded			
1/2	1-7/16	1-1/4	1-5/8	3-1/16	1-5/8	1-5/8
3/4	1-13/16	1-1/2	2-1/16	3-9/16	2	2
1	2-1/16	1-3/4	2-3/16	4	2-5/16	2-5/16
1-1/4	2-5/8	2-1/6	2-3/4	4-5/8	2-13/16	2-13/16
1-1/2	3	2-1/2	3-3/8	5-5/16	3-1/16	3-1/16
2	3-5/8	3	4	6	3-3/4	3-3/4

1: Valve Lay Length

Temperature Pressure Rating

System Operating Temperature °F (°C)		100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)	200 (93)	210 (99)
Valve Pressure Rating psi (MPa)	1/2" - 2"	PVC	235 (1.62)	211 (1.45)	150 (1.03)	75 (.52)	50 (.34)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)
		CPVC	235 (1.62)	219 (1.51)	170 (1.17)	145 (1.00)	130 (.90)	110 (.76)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	50 (.34)

NOT FOR USE WITH COMPRESSED AIR OR GASES

Spears® Manufacturing Company DOES NOT RECOMMEND the use of thermoplastic piping products for systems to transport or store compressed air or gases, or the testing of thermoplastic piping systems with compressed air or gases in above and below ground locations. The use of our product in compressed air or gas systems automatically voids any warranty for such products, and its use against our recommendation is entirely the responsibility and liability of the installer.

WARNING: DO NOT USE COMPRESSED AIR OR GAS TO TEST ANY PVC OR CPVC THERMOPLASTIC PIPING PRODUCT OR SYSTEM, AND DO NOT USE DEVICES PROPELLED BY COMPRESSED AIR OR GAS TO CLEAR SYSTEMS. THESE PRACTICES MAY RESULT IN EXPLOSIVE FRAGMENTATION OF SYSTEM PIPING COMPONENTS CAUSING SERIOUS OR FATAL BODILY INJURY.

Prices subject to change without notice. Possession of this price schedule shall not be construed as an offer to sell the products listed. Product drawing(s) and/or photograph(s) are representative and may not fully reflect product configuration.

Viton® is a registered trademark of DuPont Dow Elastomers.



SPEARS® MANUFACTURING COMPANY • CORPORATE OFFICE

15853 Olden St., Sylmar, CA 91342 • PO Box 9203, Sylmar, CA 91392

(818) 364-1611 • www.spearsmfg.com



PACIFIC SOUTHWEST

15860 Olden St.
Sylmar (Los Angeles), CA 91342
(818) 364-1611 • (800) 862-1499
Fax (818) 367-3014

ROCKY MOUNTAIN

4880 Florence St.
Denver, CO 80238
(303) 371-9430 • (800) 777-4154
Fax (303) 375-9546

UTAH

5395 West 1520 South
Salt Lake City, UT 84104
(303) 371-9430 • (800) 777-4154
Fax (303) 375-9546

SOUTHEAST

4205 Newpoint Pl., Suite 100
Lawrenceville (Atlanta), GA 30043
(678) 985-1263 • (800) 662-6326
Fax (678) 985-5642

MIDWEST

1 Gateway Ct., Suite A
Bolingbrook (Chicago), IL 60440
(630) 759-7529 • (800) 662-6330
Fax (630) 759-7515

NORTHWEST

4103 C St. NE Suite 200
Auburn (Seattle), WA 98002
(253) 939-4433 • (800) 347-7327
Fax (253) 939-7557

SOUTH CENTRAL

1000 Lakeside Parkway
Flower Mound, TX 75028
(469) 528-3000 • (800) 441-1437
Fax (469) 528-3001

NORTHEAST

590 Industrial Dr., Suite 100
Lewisberry (Harrisburg), PA 17339-9532
(717) 938-8844 • (800) 233-0275
Fax (717) 938-6547

FLORIDA

9563 Parksouth Court
Orlando, FL 32837
(407) 843-1960 • (800) 327-6390
Fax (407) 425-3563

INTERNATIONAL SALES

15853 Olden St.
Sylmar (Los Angeles), CA 91342
(818) 364-1611 • Fax (818) 898-3774



PVC & CPVC UTILITY BALL VALVES

UT-2-1101

Economy, Utility and Quality



A high quality, economical, quarter-turn shut off valve designed for irrigation, pool and spa applications. Available in IPS sizes 1/2" through 4", with choice of either socket or threaded end connectors, plus 6" socket.

PVC or CPVC Construction

Excellent companion for PVC systems such as lawn sprinklers, pools, spas, water gardens and other light-duty applications.

One-Piece Sealed Unit

Never requires adjustment.

Teflon® Ball Seats

Smooth operating PTFE floating seat design reduces wear.

EPDM O-ring Seals

High grade, abrasion resistant EPDM elastomer O-rings.

Full Schedule 80 Bore

In full open position, full bore virtually eliminates pressure drop, providing optimum flow.

Sample Engineering Specifications

All thermoplastic ball valves shall be Utility sealed unit type constructed from PVC Type I Cell Classification 12454 or CPVC Type IV Cell Classification 23447. All O-rings shall be EPDM. All valves shall have Safe-T-Shear® stem and double stop Polypropylene handle. All valves shall be listed by NSF for use in potable water service. All valves shall be pressure rated at 150 psi for water at 73°F, as manufactured by Spears® Manufacturing Company.

High Impact Polypropylene Handle

Features double-stop engagement.

Safe-T-Shear® Stem

Developed to help prevent line fluids from leaking out in the event of ball valve stem damage. Engineered for high strength, the stem incorporates a special shear point to control accidental breakage. Over-torquing breaks occur above the stem O-ring leaving the seal intact until replacement can be made.

150 psi Pressure Rating

Maximum Internal Pressure at 73°F for a variety of applications.

Certified by NSF for Potable Water

All Utility Ball Valves are Certified by NSF International for potable water use.

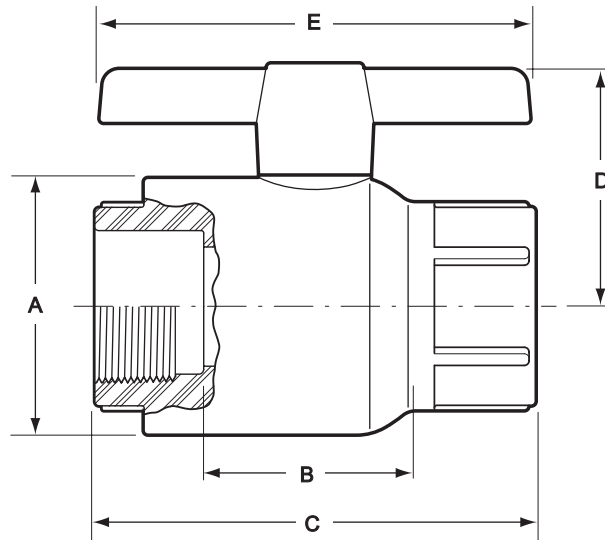
For additional information, please refer to Spears® THERMOPLASTIC VALVES & ACCESSORIES PRODUCT GUIDE & ENGINEERING SPECIFICATIONS, V-4 and THERMOPLASTIC VALVES & ACCESSORIES Price Schedule V-1.



PROGRESSIVE PRODUCTS FROM SPEARS® INNOVATION & TECHNOLOGY

Visit our web site: www.spearsmfg.com

Teflon® is a registered trademark of Dupont Company.



Dimensions, Weights & C_v Values

Nominal Size	Dimension Reference (inches, ± 1/16)					Approx. Wt. (Lbs.)		C _v ² Values
	A	B ¹	C	D	E ³	PVC	CPVC	
1/2	1-9/16	1-5/16	2-3/4	1-9/16	2-11/16	.17	.20	46
3/4	1-15/16	1-9/16	3-1/16	2	3-3/16	.28	.31	91
1	2-3/16	1-15/16	3-9/16	2-5/16	3-1/2	.40	.43	160
1-1/4	2-5/8	2-1/8	4-1/32	2-11/16	3-3/4	.60	.63	306
1-1/2	3-1/32	2-1/2	4-11/16	3-1/8	4-1/4	.93	.95	429
2	3-7/8	3-3/32	5-3/8	3-3/4	4-11/16	1.87	1.90	755
2-1/2	4-5/16	3-17/32	7-1/32	4-5/32	5-9/16	2.31	---	1126
3	6	5-1/8	8-5/8	5-3/4	9-7/8	5.92	---	1660
4	7-3/8	6-5/32	10-5/32	6-5/8	10-27/32	9.50	---	3129
6	9-29/32	8-3/32	14-3/16	6-15/32	10-13/16	21.48	---	7942

1: Valve Lay Length

2: Gallons per minute at 1 psi pressure drop. Values calculated from valve laying length, based on derivative of Hazen-Williams equation with surface roughness factor of C=150.

3: 6" Valve has lever handle, dimension is from valve stem centerline (not illustrated).

Temperature Pressure Rating

System Operating Temperature °F (°C)		73 (23)	100 (38)	110 (43)	120 (49)	130 (54)	140 (60)	150 (66)	160 (71)	170 (77)	180 (82)	190 (88)
Valve Pressure Rating psi (MPa)	PVC	150 (1.03)	124 (.85)	100 (.69)	75 (.52)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)	-0- (-0-)
	CPVC	150 (1.03)	140 (.97)	130 (.90)	120 (.83)	110 (.76)	100 (.69)	90 (.62)	80 (.55)	70 (.48)	60 (.41)	-0- (-0-)

NOT FOR USE WITH COMPRESSED AIR OR GASES



SPEARS® MANUFACTURING COMPANY

CORPORATE OFFICE

15853 Olden St., Sylmar, CA 91342 • PO Box 9203, Sylmar, CA 91392

(818) 364-1611 • www.spearsmfg.com



Oxidant Storage Tank:

General Arrangement Drawing

PolyProcessing Oxidant Storage Tank

905 Gallon Upright Crosslinked Polyethylene Tank

Overall height 7'-0", Outer Diameter 5'4"

One (1) of Part Number # 1000905

Echopod Ultrasonic Level Transmitter

General Purpose, non contact ultrasonic switch

PVDF housing, Range: 49.2", Accuracy: 0.125"m

Resolution: 0.019", Beam Width 2", Dead Band 2"

One (1) of Model Number # DL14-01

Flowline Level Controller

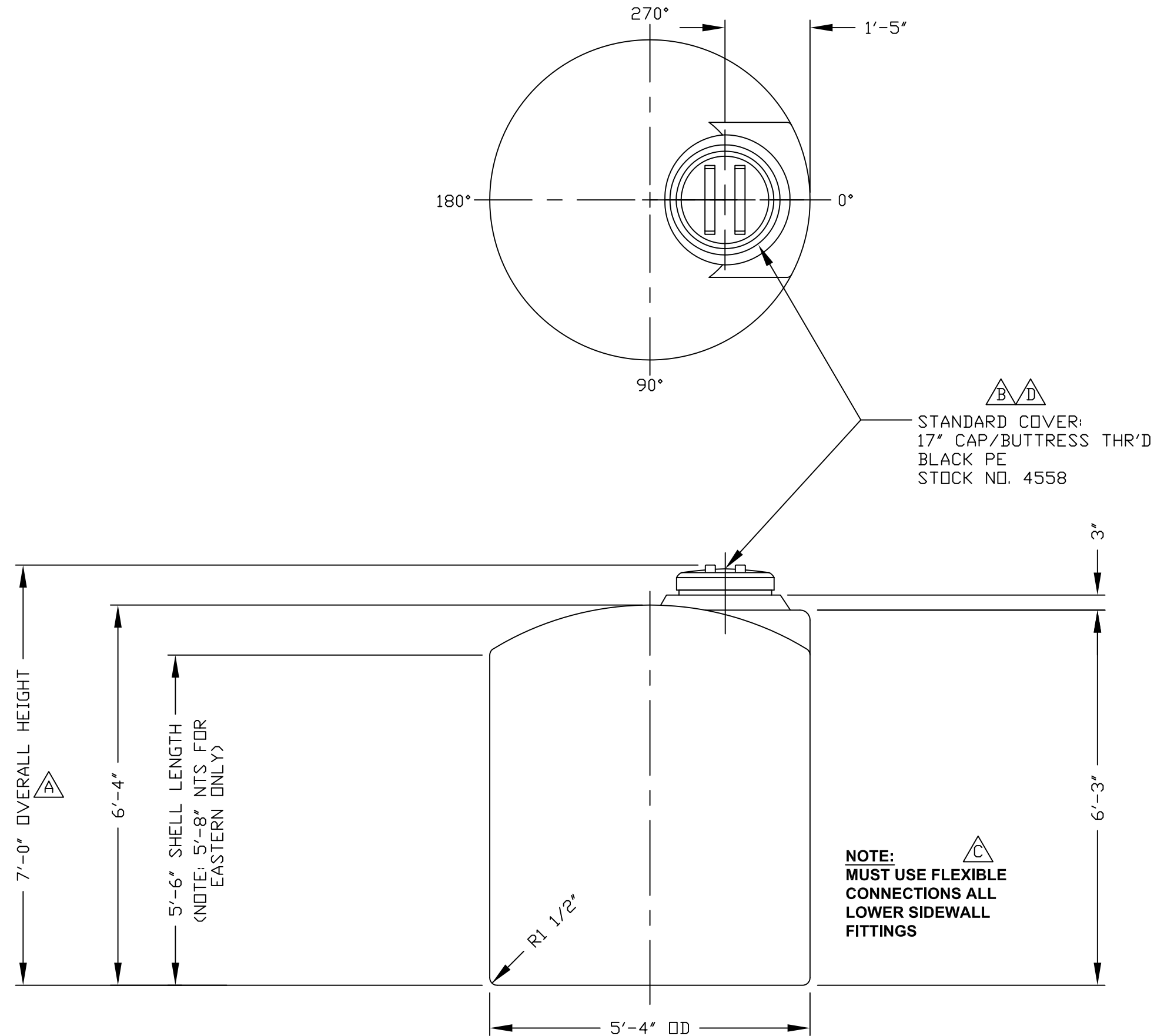
Flowline Signal Ch Meter w/ 2 relays

6-digit LED display

1/8 DIN enclosure with NEMA 4X faceplate

Isolated 4-20 mA repeater output with 40 mA internal
power supply

One (1) of Model Number # LI55-1201



NOZZLE SCHEDULE & ACCESSORIES						
SERVICE	MK	STOCK NO.	SIZE	FITTING	DEG	ELEV

- NOTES
- 1. THIS IS A COMPUTER GENERATED DWG. DO NOT REVISE BY HAND.
 - 2. DIMENSIONS WILL VARY ±3% DUE TO VARIATIONS IN MULTIPLE MOLDS & CONDITIONS PREVALENT DURING MANUFACTURE & USAGE.
 - 3. MOLDED IN GALLONAGE MARKERS @ APPROX. 9° IN 100 GAL INCREMENTS UP TO 900 GAL W/TIC MARKS INBETWEEN. CENTRAL REGION.
 - 4. 5" WIDE MOLDED IN GALLONAGE MARKERS @ APPROX. 13° IN 50 GAL. INCREMENTS UP TO 900 GAL. AVOID WHEN FITTING. EASTERN REGION.

CALCULATED CAPACITIES/ VOLUME IN U.S. GALLONS		
DESIGN CAP	DOME VOL	TOTAL VOL
907	61	968

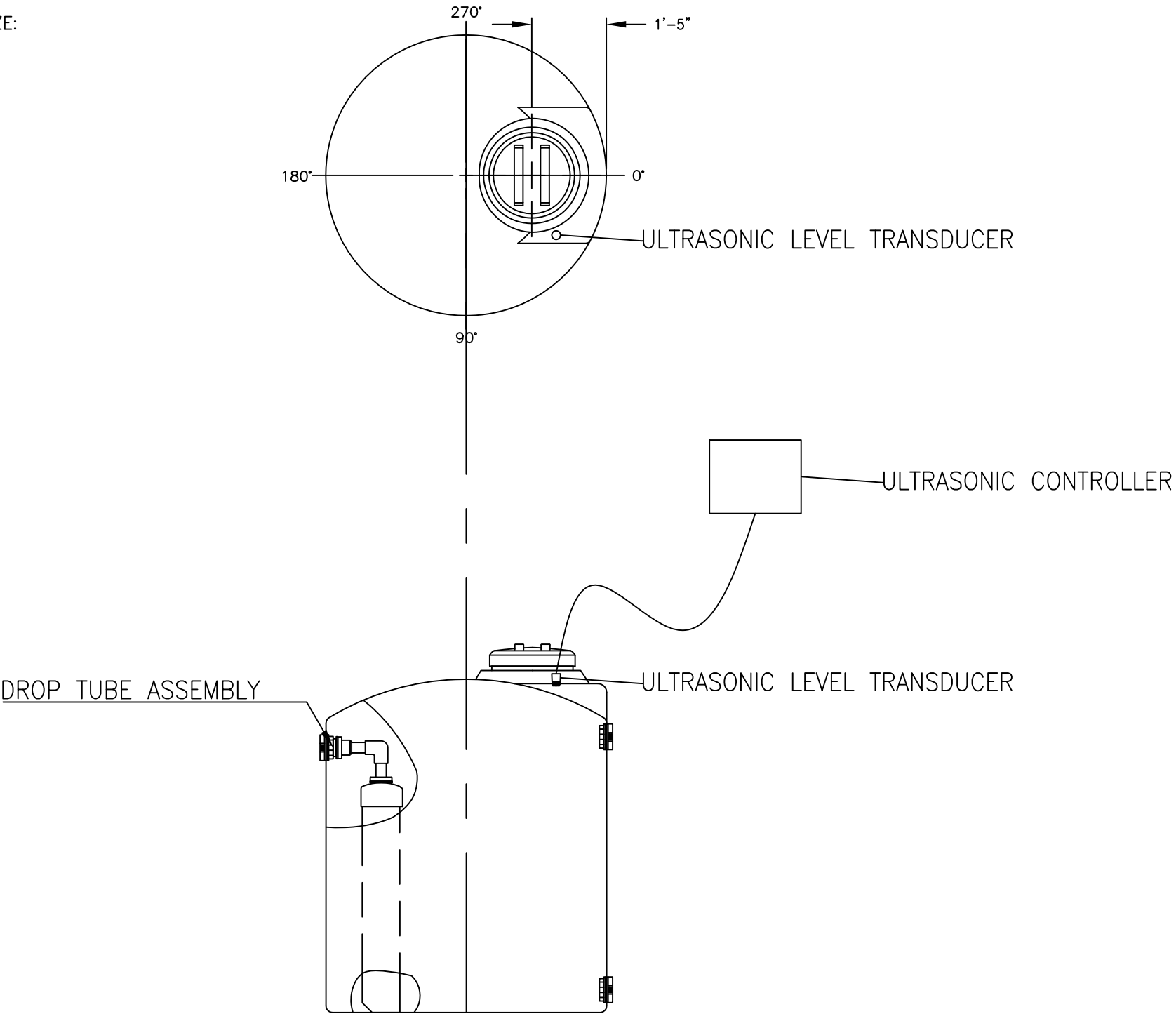
CONFIDENTIAL PROPERTY OF
POLY PROCESSING COMPANY
NOT FOR REPRINT OR USE
WITHOUT PERMISSION

REV "D" REVISED COVER BY:JB 7/24/09 CK:WM	REV "C" ADDED FITTING NOTE BY:MBW 2/11/03 CK:JB
REV "B" REVISED LID BY:MBW 2/11/03 CK:JB	REV "A" ADDED DIMENSION CK:JB 10/15/02 CK:MBW
REV "E" REVISED MANWAY CONFIGURATION BY:JB 1/6/11 CK:WM	

DWG TITLE				
905 GALLON UPRIGHT TANK				
SCALE: 1/2"=1'-0"	 POLYPROCESSING SOLUTIONS, SIMPLIFIED.	Central Region P.O. Box 4150 (71211) 2201 Old Sterlington Rd. Monroe, LA 71203 (318) 343-7565 FAX (318) 343-8795	DR: MB WILKERSON	
DATE: 9/21/99			CK: J. BRANTLEY	
		SHEET 1 OF 1	COMPUTER FILE 1000905	REV E

NOTE:

1. OXIDANT TANK AND HYDROGEN VENT PLUMBING CONNECTIONS DEPENDENT UPON PARKSON SYSTEM SIZE AND TANK SIZE.
2. OXIDANT INLET, HYDROGEN VENT, AND OUTLET ASSEMBLY PLUMBING SIZE:
2” INLET, 4” HYDROGEN VENT
3. FOR HYDROGEN VENT ASSEMBLY DETAILS, SEE NEXT SHEET.
4. DROP TUBE ASSEMBLY PIPING SIZE DETERMINED BY SYSTEM SIZE. THIS PROJECT REQUIRES A 4” DROP TUBE.



This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___PRELIMINARY ☒ APPROVAL
___INFORMATION ___ CERTIFIED

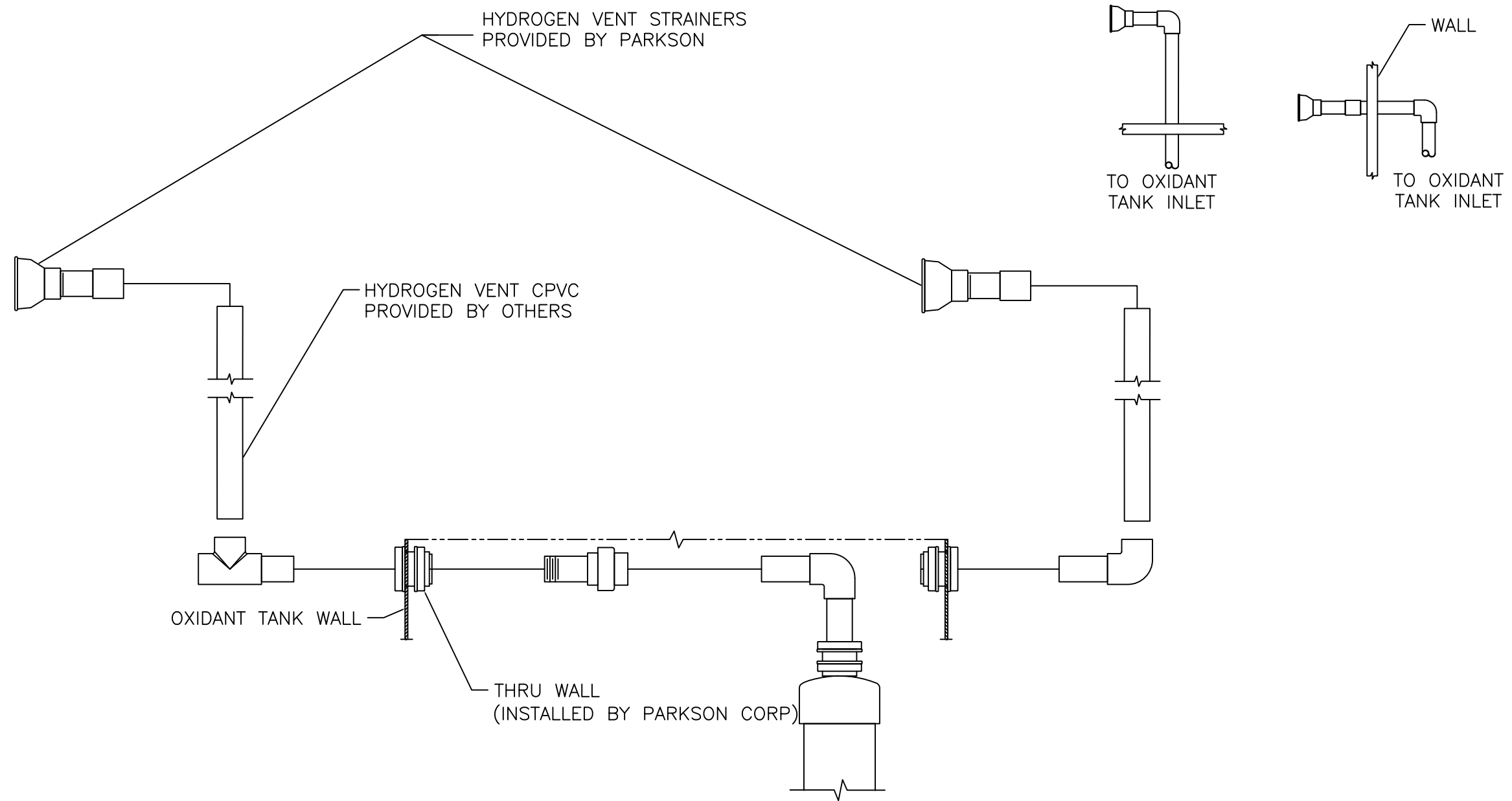
THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
ST	4/12/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE



PROJECT NAME
260322 WELL #38 DELANO, CA
REFERENCE INFORMATION

TITLE	MAXIMOS SCH-50 OXIDANT TANK GENERAL ARRANGMENT
DRAWING NO	26032203
REV	0



This drawing and all appurtenant matter contains information proprietary to PARKSON CORPORATION and is loaned subject to return upon demand and must not be reproduced, copied, loaned, revealed, nor used for any purpose other than that for which it is specifically furnished without expressed written consent of PARKSON CORPORATION. The Owner, Project Engineer, and all others involved with the project design must implement and follow all safety standards required by local, state and federal laws when incorporating Parkson Corporation equipment into the overall project design. Parkson Corporation will not be responsible for location and/or placement of equipment in the plant design, nor is Parkson Corporation responsible for plant safety design and for the failure to follow appropriate safety precautions in the operation and maintenance of Parkson Corporation equipment.

REV	DESCRIPTION	DATE	BY

___PRELIMINARY ☒ APPROVAL
___INFORMATION ___CERTIFIED

THIS DRAWING IS LIMITED TO FUNCTIONAL DESIGN, GENERAL ARRANGEMENT AND CLEARANCE. NO RESPONSIBILITY IS ACCEPTED BY PARKSON CORPORATION FOR OTHER DIMENSIONS, QUANTITIES, OR COORDINATION WITH OTHER EQUIPMENT OR DRAWINGS EXCEPT AS STATED IN PURCHASE ORDER.

DRAWN BY	DATE
ST	4/12/2012
CHECKED BY	DATE
TDE	4/13/2012
SCALE	SIZE



PROJECT NAME
260322 WELL #38 DELANO, CA
REFERENCE INFORMATION

TITLE	
MAXIMOS SCH-50 OXIDANT TANK GENERAL ARRANGMENT	
DRAWING NO	REV
26032203	0
SHEET 2 OF 2	

Paxon™ 7000 Series

High Density Polyethylene Resin

Product Description	Key Features
Paxon™ 7000 series of crosslinkable mHDPE resins are designed to offer outstanding ESCR, toughness, thermal, impact and notch failure resistance. These resins are ideally suited for applications that require excellent part fill during processing and outstanding finished part performance. Paxon™ 7000 series grades are all supplied with long term UV stabilization.	AddPacks: Paxon™ 7003 (Natural) - Pellet Paxon™ 7004 (Natural) - 20 and 35 US Mesh Powders Paxon™ 7203 (Black) - Pellet Paxon™ 7204 (Black) - 20 and 35 US Mesh Powders Paxon™ 7003 (Beige, Brown, Dark Green, Gray, Red, White, Yellow) - Pellet Paxon™ 7004 (Beige, Brown, Dark Green, Gray, Red, White, Yellow) - 35 US Mesh Powder

General			
Availability ¹	Latin America	North America	South America
Applications	- Agricultural Products - Automotive Components	- Chemical Storage Tanks - Large Refuse Containers	- Marine Fuel Tanks - Recreational Vehicle - Fuel Tanks
Revision Date	March 2010		

Resin Properties	Typical Value (English)	Typical Value (SI)	Test Based On
Crosslink Potential		2.5	ExxonMobil Method

Thermal	Typical Value (English)	Typical Value (SI)	Test Based On
Deflection Temperature Under Load (DTUL) at 66psi - Unannealed			ASTM D648
--	142 °F	61.0 °C	
Deflection Temperature Under Load (DTUL) at 264psi - Unannealed			ASTM D648
--	99.0 °F	37.2 °C	

Molded Properties	Typical Value (English)	Typical Value (SI)	Test Based On
Tensile Strength at Yield	2830 psi	19.5 MPa	ASTM D638
Elongation at Yield	18 %	18 %	ASTM D638
Elongation at Break	700 %	700 %	ASTM D638
Flexural Modulus - 1% Secant	86700 psi	598 MPa	ASTM D790B
Environmental Stress-Crack Resistance			ASTM D1693A
10% Igepal, F50	> 1000 hr	> 1000 hr	
100% Igepal, F50	> 1000 hr	> 1000 hr	

Impact	Typical Value (English)	Typical Value (SI)	Test Based On
Notched Izod Impact (-40°F (-40°C))	4.3 ft-lb/in	230 J/m	ASTM D256
Impact Strength			ARM
-40°F (-40°C), 0.125 in (3.18 mm)	74 ft-lb	101 J	
-40°F (-40°C), 0.250 in (6.35 mm)	184 ft-lb	250 J	

Additional Information
•All physical properties were measured on 3 mm rotomolded samples unless a different value is shown, except for ESCR, which was

Typical properties: these are not to be construed as specifications.

© 2011 Exxon Mobil Corporation. To the extent the user is entitled to disclose and distribute this document, the user may forward, distribute, and/or photocopy this copyrighted document only if unaltered and complete, including all of its headers, footers, disclaimers, and other information. You may not copy this document to a Web site. ExxonMobil does not guarantee the typical (or other) values. Analysis may be performed on representative samples and not the actual product shipped. The information in this document relates only to the named product or materials when not in combination with any other product or materials. We based the information on data believed to be reliable on the date compiled, but we do not represent, warrant, or otherwise guarantee, expressly or impliedly, the merchantability, fitness for a particular purpose, suitability, accuracy, reliability, or completeness of this information or the products, materials, or processes described. The user is solely responsible for all determinations regarding any use of material or product and any process in its territories of interest. We expressly disclaim liability for any loss, damage, or injury directly or indirectly suffered or incurred as a result of or related to anyone using or relying on any of the information in this document. There is no endorsement of any product or process, and we expressly disclaim any contrary implication. The terms, "we", "our", "ExxonMobil Chemical", or "ExxonMobil" are used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates they directly or indirectly steward. ExxonMobil, the ExxonMobil Chemical Emblem, the "Interlocking X" Device, Enable, Exceed, Exact, Exxco, Escorene, Escor, Iotek, NTX, Polybilt, Paxon and Optema are trademarks or service marks of Exxon Mobil Corporation.

ExxonMobil Chemical Paxon™ 7000 Series High Density Polyethylene Resin

- Test procedures may be modified to accommodate operating conditions or facility limitations.

Legal Statement

This product is not intended for use in food contact application.

This product is not intended for use in medical applications and should not be used in any such applications.

Notes

¹ Product may not be available in one or more countries in the identified Availability regions. Please contact your Sales Representative for complete Country Availability.

For additional technical, sales and order assistance:

Worldwide and the Americas
ExxonMobil Chemical Company
13501 Katy Freeway
Houston, TX 77079-1398
USA
1-281-870-6050

Asia Pacific
ExxonMobil Chemical Singapore Pte. Ltd.
1 HarbourFront Place
#06-00 HarbourFront Tower One
Singapore 098633
86 21 240-75380

Europe, Middle East and Africa
ExxonMobil Chemical Europe
Hermeslaan 2
1831 Machelen, Belgium

Typical properties: these are not to be construed as specifications.

© 2011 Exxon Mobil Corporation. To the extent the user is entitled to disclose and distribute this document, the user may forward, distribute, and/or photocopy this copyrighted document only if unaltered and complete, including all of its headers, footers, disclaimers, and other information. You may not copy this document to a Web site. ExxonMobil does not guarantee the typical (or other) values. Analysis may be performed on representative samples and not the actual product shipped. The information in this document relates only to the named product or materials when not in combination with any other product or materials. We based the information on data believed to be reliable on the date compiled, but we do not represent, warrant, or otherwise guarantee, expressly or impliedly, the merchantability, fitness for a particular purpose, suitability, accuracy, reliability, or completeness of this information or the products, materials, or processes described. The user is solely responsible for all determinations regarding any use of material or product and any process in its territories of interest. We expressly disclaim liability for any loss, damage, or injury directly or indirectly suffered or incurred as a result of or related to anyone using or relying on any of the information in this document. There is no endorsement of any product or process, and we expressly disclaim any contrary implication. The terms, "we", "our", "ExxonMobil Chemical", or "ExxonMobil" are used for convenience, and may include any one or more of ExxonMobil Chemical Company, Exxon Mobil Corporation, or any affiliates they directly or indirectly steward. ExxonMobil, the ExxonMobil Chemical Emblem, the "Interlocking X" Device, Enable, Exceed, Exact, Exxco, Escorene, Escor, Iotek, NTX, Polybilt, Paxon and Optema are trademarks or service marks of Exxon Mobil Corporation.

ECHOPOD™ ULTRASONIC LEVEL CONTROLLER AND TRANSMITTER



EchoPod™ replaces floats, conductance and pressure sensors that are sensitive to dirt, sticking and scaling. Perfect for small tanks/vessels 49.2" (1.25m) or less. EchoPod, a general purpose sensor, combines non-contact switch, controller and transmitter capabilities in one package. Combining 4 relays, 4-20mA output and pump/valve control in one small sensor. EchoPod is well suited for corrosive and dirty applications with its non-metallic housing and transducer.

FEATURES

- General purpose, non-contact ultrasonic level switch, controller and transmitter capabilities in one package.
- Compact sensor with 2" dead band and beam width optimized for small tank applications 49.2" (1.25m) or less.
- Replacement for multi-point float, conductivity, and pressure level switches.
- Well suited for integrating process or control automation of small tanks mounted on tools, skids or machines.
- Rugged PVDF for a wide range of corrosive, waste or slurry-type media.
- Level indication can be monitored via a local display or through a PLC.
- Maximum cable length is 4 feet (1.2meters).

APPLICATIONS

- Day tanks.
- Process vessels or dispensers.
- Pump lift stations.
- Waste sumps.

SPECIFICATIONS

- | | | | |
|----------------------|-------------------------------------|--------------------------------------|---------------------|
| • Range: | 49.2" (1.25m). | • Configuration: | WebCal® PC Windows® |
| • Accuracy: | 0.125" (3mm). | • Software interface. | |
| • Resolution: | 0.019" (0.5mm). | • Temp. Comp.: Automatic over range. | |
| • Beam Width: | 2" (5cm). | • Temperature: | F: 20° to 140° |
| • Dead Band: | 2" (5cm). | • C: | -7° to 60°. |
| • Supply Voltage: | 24 VDC (loop). | • Pressure: | Atmospheric. |
| • Loop Resistance: | 400Ω max. | • Enclosure: | NEMA 6P. |
| • Consumption: | 0.5 W. | • Encl. Material: | PC/ABS FR. |
| • Signal Output: | 4-20 mA, 2-wire | • Strain Relief Mat.: Santoprene. | |
| | (when loop powered). | • Trans. Material: | PVDF. |
| • Contact Type: | (4) SPST relays 1A | • Maximum Cable Length: | 4' (1.2m). |
| • Loop Fail-safety: | 4 mA, 20 mA, 21 mA, | • Cable Jacket Mat.: PVC. | |
| | 22 mA or hold last. | • Process Mount: | 1" NPT (1" G). |
| • Relay Fail-safety: | Power loss: Hold last | • Mounting Gasket: | Viton®. |
| | Power on: Open, close or hold last. | • Classification: | General purpose. |
| • Hysteresis: | Selectable. | • Approvals: | CE, cFMus. |



EchoPod ultrasonic level controller provides a total solution for fluid handling and automation.



ALSO AVAILABLE FROM FLOWLINE...

DL10 ULTRASONIC LEVEL TRANSMITTER



This compact transmitter provides a two-wire 4-20 mA analog output. Easily configurable via WebCal software, the DL10 is ideal for small tank applications.

DX10 ULTRASONIC LEVEL FREQUENCY TRANSMITTER



This transmitter provides the user with either a frequency or voltage output. Configured via WebCal software on a PC, the DX10 easily replaces multi-point float, conductivity and level switches.

DS14 ULTRASONIC LEVEL SWITCH AND CONTROLLER



This unit provides switch and control capabilities in a small, maintenance free package. Easily configured using WebCal software, the DS14 provides you simplicity as well as cost savings.

Contact your local Ryan Herco Flow Solutions Service Center at 1-800-848-1141 for more information about these new level control solutions from Flowline.

Introducing EchoPod

The general purpose, ultrasonic sensor provides non-contact level detection up to 49.2" (1.25m) with 4 SPST 60 VA 1A relays and a two-wire 4-20 mA level measurement output. Each relay can be configured on a single set point alarm or latched on two sets for automatic fill or empty in simplex or duplex control modes with fail-safe logic. The embedded controller can replace external control hardware. The sensor is well suited for a wide range of corrosive, sticky or dirty type media. EchoPod is broadly selected for small atmospheric day tank, skid or process vessel, lift station, IBC, drum and sump applications. To configure EchoPod, download our free WebCal software and purchase one USB interface tool.

Specifications

Range:	49.2" (1.25 m)
Accuracy:	0.125" (3 mm)
Resolution:	0.019" (0.5 mm)
Beam width:	2" (5 cm)
Dead band:	2" (5 cm)
Supply voltage:	24 VDC (loop)
Loop resistance:	400Ω max
Consumption:	0.5W
Signal output:	4-20 mA, two-wire (when loop powered)
Contact type:	(4) SPST relays 1A
Loop fail-safety:	4 mA, 20 mA, 21 mA, 22 mA or hold last
Relay fail-safety:	Power loss: Hold last Power on: Open, close or hold last
Hysteresis:	Selectable
Configuration:	WebCal® PC Windows® USB 2.0
Temp. comp.:	Automatic over range
Process Temp.:	F: 20° to 140° C: -7° to 60°
Ambient Temp.:	F: -31° to 140° C: -35° to 60°
Pressure:	MWP = 30 PSI
Enclosure:	Type 6P encapsulated, corrosion resistant & submersible
Encl. material:	PC/ABS FR
Strain relief mat.:	Santoprene
Trans. material:	PVDF
Cable length:	48" (1.2 m)
Cable jacket mat.:	Polyurethane
Process mount:	1" NPT (1" G)
Mount. gasket:	Viton®
Classification:	General purpose
Approvals:	CE, cFMus



Features

- ✓ Multi-function sensor provides 4-20 mA measurement, relay switch and control functions
- ✓ Compact sensor with 2" beam width and 2" dead band optimized for small tank applications
- ✓ Four 1A relays programmable for switch or advanced pump or valve control and fail-safety
- ✓ Control / switch point functions include:
 - 2 pumps with 2 alarms
 - 1 pump with 3 alarms
 - 2 pumps (lead-lag) with 2 alarms
 - 2 pumps (duplexing) with 2 alarms
 - 4 independent switch point alarms
- ✓ Rugged PVDF transducer and polycarbonate enclosure rated 6P for corrosive media

Configuration

EchoPod is configured using Flowline's WebCal software and Fob, a USB® interface tool. A single configuration can be easily created, saved, duplicated, emailed or modified. Take control of your level process with WebCal's intuitive interface, pre-programmed menus, tank set point graphics and custom wiring diagrams for each of your configurations. It's level configuration made simple.



WebCal Software



LI99-1001 Shown



EchoPod®

Ordering

DL14-	☐	☐
Process mount (1)		
0	NPT (US)	
1	G (Metric)	
Fob USB interface (2)		
0	Without Fob	
1	With Fob	

Ordering Notes

- 1) EchoPod can not be configured without the Fob USB interface tool (LI99-1001) and WebCal. One Fob will configure all EchoPods.
- 2) WebCal is a free download from our website at www.flowline.com/webcal (Windows® XP Compatible, USB 2.0).

FLOWLINE LEVEL CONTROLLERS

DATALOOP™ INTRINSICALLY SAFE METER

NEW!

FEATURES

- Offered in intrinsically safe and general purpose configurations.
- Large 5 digit LCD main display with secondary unit and bar graph display.
- Intuitive push button menu makes configuration fast and easy.
- 1/8 DIN enclosure with NEMA 4X faceplate and shallow depth case.
- Linear, square root and programmable exponent functions.
- Non-volatile memory ensures program and set point retention.
- Accessory NEMA 4X windowed enclosure for field installation.



- Voltage drop: 2.0 VDC w/o backlight
5.7 VDC w/ backlight
- Ambient temp.: F: -22° to 149°
C: -30° to 65°
- Enclosure Type: 1/8 DIN, panel mount
Rating: NEMA 4X (IP65) faceplate
- Material: Polycarbonate
- Classification: LI25-2001: Intrinsically safe
LI25-1001: General purpose
- Approvals: FM; CSA: Class I, Div. I, Groups A, B, C, D; Class II, Div I, Groups E, F, G; Class III, Div I; Class I, Zone 0, Group IIC; T-code - T4

SPECIFICATIONS

- Display: Type: LCD, 5-digit
Units: Engineering
Decimal Point: Floating
Output: -99999 to 999999
- Height: 0.6" (15 mm)
- Backlight: LED, bright orange
- User interface: Four push button
- Sensor Input: (1) 4-20 mA transmitter
- Loop Power: 12-30 VDC
- Memory: Non-volatile

DATAVIEW™ METER WITH RELAYS

NEW!

FEATURES

- Bright 6-digit LED main display and secondary unit display with relay status indicators.
- 1/8 DIN enclosure with NEMA 4X faceplate and shallow depth case.
- 32-point linearization function for volumetric tank measurement.
- Non-volatile memory with security password protected lock out.
- **Isolated** 4-20 mA repeater output with 40 mA internal power supply.



- Supply Voltage: 85-265 VAC @ 50-60 Hz
- Consumption: 20 watts max.
- Sensor supply: 24 VDC ±5% @ 200 mA
- Repeater output: 4-20 mA, 24 VDC ±5% @ 40 mA
- Contact type: 12_1: (2) SPDT (Form C)
14_1: (4) SPDT (Form C)
- Contact rating: 3A @ 30 VDC or 250 VAC resistive load
- Ambient temp.: F: -40° to 149°
C: -40° to 65°
- Enclosure Type: 1/8 DIN, panel mount
Rating: NEMA 4X (IP65) faceplate
- Material: Polycarbonate
- Compliance: CE: EN61010-1:2001
- Classification: General purpose
- Approvals: cULus, UL508

SPECIFICATIONS

- Display: Type: LCD, 6-digit
Units: Engineering
Decimal Point: Floating
Output: -99999 to 999999
Height: Main: 0.6" (15 mm)
Second: 0.46" (12 mm)
- LED indication: Relay status
- User interface: Four push button
- Linearization: 2-32 point function
- Memory: Non-volatile
- Sensor Input: (1) 4-20 mA or 0-10 VDC transmitter

CAUTION

- NO SMOKING, OPEN FLAMES, OR ANY OTHER IGNITION SOURCES IN THE VICINITY OF THIS TANK OR VENT
- PERMIT REQUIRED CONFINED SPACE, USE CONFINED SPACE PROCEDURES PER OSHA STANDARD 1910.146
- DO NOT ADD OTHER CHEMICALS TO THE TANK OR VENT
- REFER TO MIOX OPERATOR'S MANUAL FOR OTHER SAFETY RELATED PRECAUTIONS

This Tank or Vent May Contain	Statement of Hazards
• Hydrogen Gas with a Hazard Rating Identification of (0-4-0-Null)	• Flammable Gas present • Fire & Explosion Hazard present • Simple Asphyxiate Gas present
• Dilute (<1% by volume) Sodium Hypochlorite Solution with a Hazard Rating Identification of (2-0-1-Null)	• Moderate Health Hazard present • Incompatible and/or hazardous reactions can occur with addition of other chemicals, such as strong acids, strong reducing agents, amines, ammonium salts, metals, methanol, phenylacetoneitrile, formic acid, and ammonia



Spare Parts List – Part #500-00447-A

	ITEM NUMBER	DESCRIPTION	QTY
1	301-00207	PUMP, BRINE 50 ML/MIN (3MM), GEAR TYPE, MAGNETICALLY COUPLED	1
2	300-02545	SENSOR FLOW LOW PVDF BODY, FPM O-RING, 0.1-1 GPM	1
3	300-01866	ADAPTER ELL 3/4 MT X 3/8 BARB PVDF, #L12-6 NK	1
4	300-01354	ADAPTER PUSH 1/4 MT X 3/8 TB PVDF	1
5	300-01644	FILTER CARTRIDGE, 9.75" 5 MIC GRADED, DENSITY PP	6

Appendix A

**MIOX Corporation
Hydrogen Safety White Paper**



*The **SAFEST WATER** In The World*

MIOX Corporation

Hydrogen Safety White Paper

4/12/2012

Table of Contents

INTRODUCTION – GENERAL HYDROGEN SAFETY PRECAUTIONS	4
GENERAL HYDROGEN FACTS.....	5
MIOX CELL DESIGN MITIGATES HYDROGEN RISK	6
MIOX OSG ENCLOSURES LOWER HYDROGEN RISK.....	7
LIQUID BARRIER HYDROGEN VENT SYSTEM	9
DILUTION AIR VENTILATION SYSTEMS.....	14
STANDPIPE HYDROGEN MITIGATION SYSTEM.....	18
RIO ZUNI SERIES - LIQUID BARRIER HYDROGEN VENT SYSTEM	19
ADDITIONAL HYDROGEN RISK MITIGATION OPTIONS.....	20
LABELING REQUIREMENTS	21
CODE COMPLIANCE	22
ADDITIONAL INFO	23
APPENDIX A – Vent System Piping Diameters for Drop Tubes, Oxidant Transfer, and Oxidant Tank Vent Pipes.....	24
APPENDIX B. Dilution Air Blower Requirements.....	26
APPENDIX C – Maximum Number of On-Site Generators Routed into a Single Oxidant Tank Not Requiring a Standpipe System	28

System	Max Number of On-Site Generators	Capacity (lb/day)
AE-4	400	1600
SAL80	160	1600
OxCell	150	2250
MIOX 251	58	1450
MIOX 501	35	1750
MIOX 1001	17	1700
MIOX 2501	7	1750
MIOX 5001	3	1500
M15X1 SC	125	1875
M30X1 SC	60	1800
M45X1 SC	40	1800
M60X1 SC	30	1800
M1X1	32	1920
M2X1	16	1920
M3X1	10	1800
M4X1	8	1920
M5X1	6	1800
M1000X1	2	2000
HYPO 20	195	3900
HYPO 504	77	3850
HYPO 1001	38	3800
HYPO 2001	19	3800
HYPO 5001	7	3500
H25X1 SC	100	2500
H50X1 SC	50	2500
H75X1 SC	35	2625
H100X1 SC	25	2500
H25X1 SC	100	2500
H50X1 SC	50	2500
H75X1 SC	35	2625
H100X1 SC	25	2500
H1X1	32	3200
H2X1	16	3200
H3X1	10	3000
H4X1	8	3200
H5X1	6	3000
H1550X1	2	3100

..... 28

INTRODUCTION – GENERAL HYDROGEN SAFETY PRECAUTIONS

Introduction

All electrolytic cells that utilize water as a component of the electrolyte generate hydrogen gas in the cell. MIOX manages the risk associated with this hydrogen by engineering safety barriers into all phases of equipment design. These multiple safety barriers have been proven to significantly reduce hydrogen risk and ensure safety, reliability and cost-effectiveness. This

document details the advantages of the engineered safety barriers designed to mitigate hydrogen by system component.

MIOX has an outstanding hydrogen safety record, and has been recognized by Hydrogen Safety, LLC as the leader in hydrogen safety for the On-Site Generator (OSG) market.

General Hydrogen Safety Precautions:

- HYDROGEN GAS IS PRODUCED IN ANY ELECTROLYTIC PROCESS AND SHOULD BE ASSUMED TO BE PRESENT IN THE OXIDANT TANK AND ROOM WHERE THE OXIDANT GENERATOR IS LOCATED.
- NO SMOKING OR IGNITION SOURCES IN VICINITY OF THE OXIDANT TANK.
- REMOVE THE OXIDANT TANK LID AND VENT THE TANK AT LEAST ONE HOUR PRIOR TO TANK MAINTENANCE. ENSURE ADEQUATE FACILITY VENTILATION.
- USE OSHA CONFINED SPACE PROCEDURES WHEN ENTERING ANY OXIDANT TANK.
- VERIFY INTEGRITY OF THE LIQUID BARRIER, DILUTION AIR, OR STANDPIPE SYSTEMS TO THE OUTSIDE OF BUILDING.
- THE DROP TUBE SYSTEM INSIDE THE OXIDANT TANK(S) MUST BE IN PLACE PRIOR TO SYSTEM OPERATION.
- HYDROGEN VENT PIPING SHALL HAVE NO VALVES, DROP LEGS (FOR ACCUMULATION OF LIQUID) OR OTHER BLOCKAGE AND SHALL BE ADEQUATELY SIZED TO AVOID BACKPRESSURE.
- IF THE ON-SITE GENERATOR IS MODIFIED OR EXPANDED, CONSULT MIOX OR TECHNICAL EXPERT TO ENSURE TANK VENT MEETS NEW SYSTEM CAPACITY.

- FOR MULTIPLE OXIDANT TANK SYSTEMS, ENSURE THE LIQUID BARRIER HYDROGEN VENT SYSTEM IS NOT CROSS VENTILATED BETWEEN TANKS .
- FOR THE DILUTION AIR VENTILATION SYSTEM, CROSS VENTILATION, OR SERIES VENTILATION, IS ACCEPTABLE. HOWEVER, DO NOT CROSS CONNECT THE LIQUID BARRIER VENT SYSTEM WITH THE DILUTION AIR SYSTEM. THE VENT SYSTEMS MUST BE VENTED SEPARATELY TO THE OUTSIDE OF THE FACILITY.
- DO NOT ADD CHEMICALS OTHER THAN OXIDANT TO THE OXIDANT TANK.
- ENSURE INSTALLATION AND FACILITY DESIGN IS IN CONFORMANCE WITH STATE AND NATIONAL BUILDING AND SAFETY CODES.

GENERAL HYDROGEN FACTS

Hydrogen has flammability limits which are considerably wider than for most other flammable gasses. The lower explosive limit (LEL) of hydrogen is 4.1% by volume in air. A concentration of hydrogen in air less than 4.1% will not be explosive because it is too “lean” in fuel. Likewise, the upper explosive limit (UEL) of hydrogen is 74.2% by volume in air. Therefore a mixture of air containing greater than 74.2% hydrogen will not be explosive, it is too “rich” in fuel. The energy to ignite hydrogen in air is also very low at .017 mJ.

Hydrogen gas (H₂) is the lightest of the gases with a vapor density of 0.069 (relative

to that of air taken to be 1.0), and smallest in molecular size, making hydrogen gas difficult to contain. As such, hydrogen gas will tend to rise rapidly in a normal room atmosphere, seek the highest point in a room or container, and tend to diffuse through most materials of building construction.

For an electrolytic cell, the calculated hydrogen generation rate is 6.96 milliliter per amp-minute for each active anode electrode at standard temperature (0 °C) and pressure (1 atmosphere pressure).

MIOX CELL DESIGN MITIGATES HYDROGEN RISK

MIOX Corporation's electrolytic cells are designed for minimum cell dead volume. Excess space in the cell provides space for hydrogen gas to accumulate. By keeping the available gas volume to a minimum, the risk of creating an explosive condition is minimized. Figure 1 shows the relative gas volumes available in MIOX cells versus conventional circular cell configurations.

All MIOX cells are designed for low rupture pressure. The cells are typically operated at

15 psi or less and each cell is leak tested to 25 psi. By keeping the rupture pressure of the cell relatively low, less pressure can develop before a cell breach occurs should a hydrogen incident happen. To ensure a low pressure system, a rupture disk is located on the cell inlet. When cell pressure exceeds 28 psi the rupture disk will fail and the system will fault. This failure provides a release path for built up pressure in the cell, greatly decreasing the severity of an overpressure event in the cell.

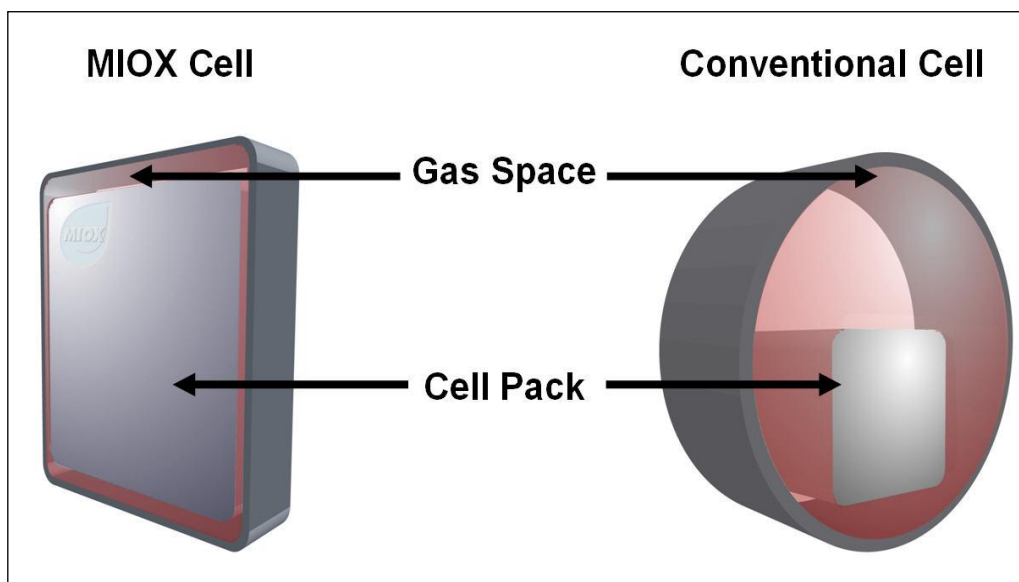


Figure 1. Gas Volume Space in MIOX vs. Conventional Circular Cells.

MIOX OSG ENCLOSURES LOWER HYDROGEN RISK

The RIO Enclosure (Applies to RIO M1-M5 and H1-H5 systems)

To protect operators from a hydrogen or pressure event that may occur within the cell, the larger MIOX systems (whether mixed-oxidant or sodium hypochlorite generators) are housed in an aluminum frame structure combined with rotational-molded, double-walled, linear polyethylene close-out panels that are attached on all sides using ¼-20 stainless-steel fasteners. No latches are employed on the cell compartment access panels. The cell is positioned on a rotational-molded tray that provides downward impact resistance due to the material flexibility. The panels are configured to be hollow with 1/8 inch thick wall sections that are spaced variously (wall to wall spacing) up to 3.00 inches providing flexibility and overpressure expansion allowance to contain any loose components that may be ejected from a ruptured cell. The panels not only provide double wall flexible impact resistance, but the windows in the cell compartment are polycarbonate (Lexan) to provide additional flexibility and safety, and are adhesive bonded to the inner window frame section. The upper cell close-out panel includes a vented window that is attached from the outside with nylon cap-head screws to provide an immediate blow-out path. The removable panels incorporate

vent holes within the panels to exhaust gases that may be ejected in a cell detonation event. To verify the integrity of this design concept, the system was rigorously safety tested.



Figure 2 – RIO Enclosure

Stainless Steel Mid and Large Series Enclosures

(Applies to MIOX-25X, MIOX-50X, MIOX-100X, MIOX-250X MIOX-500X, HYPO-50X, HYPO-100X, HYPO-200X, HYPO-500X)

As discussed in the previous section, to protect operators from a hydrogen event that may occur within the cell, the larger MIOX systems (whether mixed-oxidant or sodium hypochlorite generators) are enclosed in stainless steel cabinets (See Figure 3). The front doors of the cabinets are double latched and incorporate internally mounted Lexan® windows that will contain any loose components that may be ejected from a ruptured cell.

The backs of the cabinets have removable panels for rear access. The removable panels incorporate vent holes within the panels to exhaust gases that may be ejected in a cell detonation event. In some systems, the rear panel is a plastic see-through panel held in place with plastic screws. In the case of a cell detonation event, the plastic panel acts as a blast panel to the rear of the cabinet. To verify the integrity of this design concept, the system was rigorously safety tested.



Figure 3 – Stainless Steel Enclosure

LIQUID BARRIER HYDROGEN VENT SYSTEM

The Liquid Barrier Hydrogen Vent (LBS) system (see Figure 3) uses a gas trap system to prevent hydrogen gas produced during the electrolysis process from entering the oxidant storage tank. Each oxidant tank is equipped with a drop tube in the oxidant tank that hydraulically locks the oxidant solution similar to a “P-trap” system in household plumbing. The hydraulic lock creates a liquid barrier preventing hydrogen gas from entering the oxidant storage tank.

The materials of construction for Oxidant Tank Vent and the Liquid Barrier Hydrogen

Vent must be CPVC piping as specified by MIOX, and they should be run at least 12” clear of any heat or electrical sources, such as overhead lights or control boxes. No metal piping material may be used for these vents.

The generally accepted limit for hydrogen accumulation is 25% of the LEL, or 1% hydrogen by volume. These limits are easily maintained with the Liquid Barrier Hydrogen Vent System, and have been validated through rigorous testing.

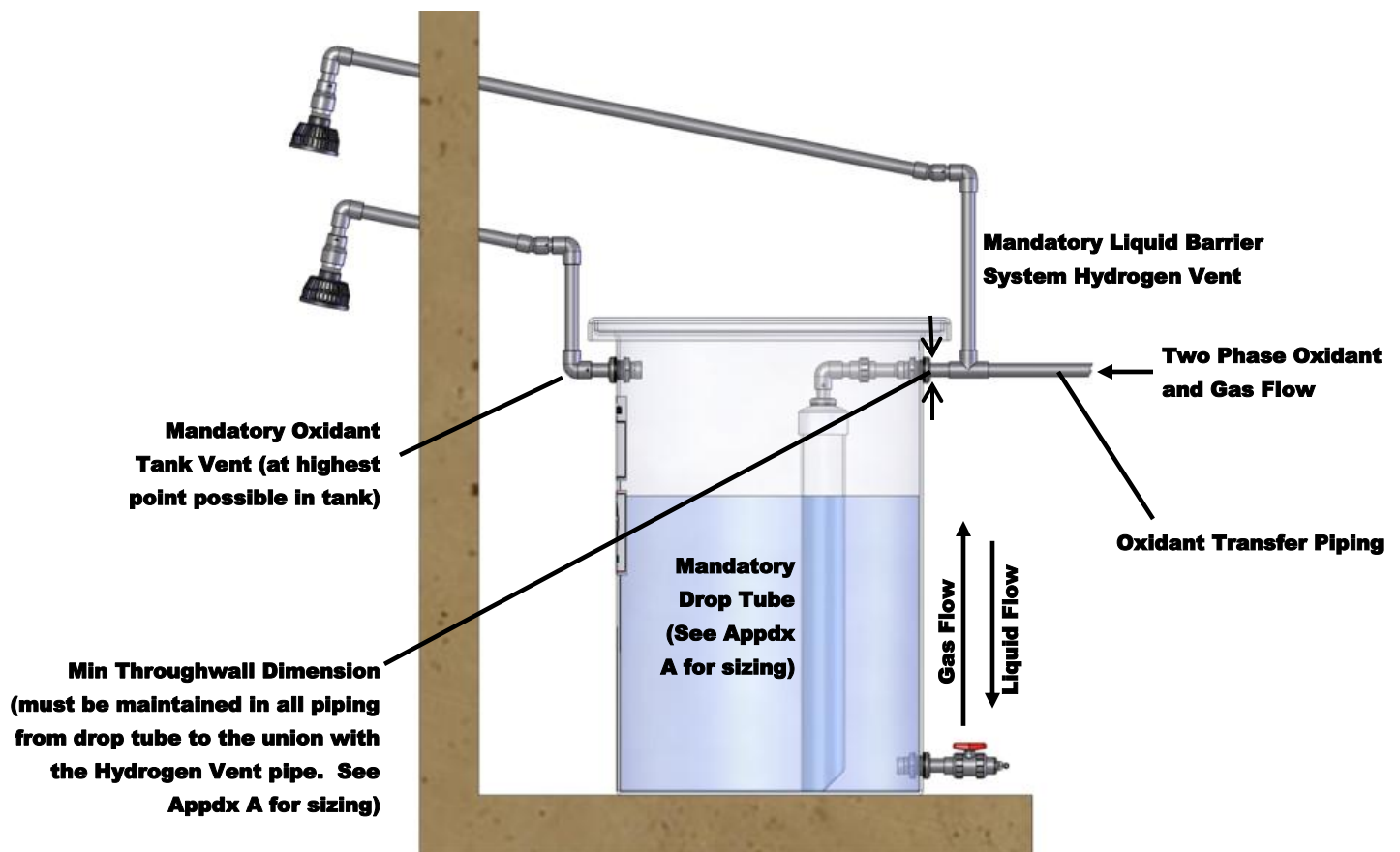


Figure 3. Liquid Barrier Hydrogen Vent System

Drop Tubes

The drop tubes are sized for each system to ensure hydrogen gas separation. The drop tube diameter must be of adequate volume to ensure that the downward velocity of fluid is slower than the upward flow of bubbles in the liquid stream (See Appendix A for proper sizing). Additional new oxidant generation capacity will increase the volume of fluid entering the drop tube. This may require that the drop tube diameter be increased to ensure effectiveness of the system. The drop tube in the oxidant tank rests on the bottom of the tank. The bottom of the drop tube requires a notch with a 45 degree cut half way to the center of the pipe. The highest point in the drop tube notch must not extend more than 3 to 4 inches above the bottom of the tank to ensure that hydraulic "lock" occurs at a low liquid level in the bottom of the oxidant tank. The drop tube diameter should be maintained within the oxidant tank, through the penetration in the tank and just to the outside of the tank. The oxidant feed line from the on-site generator, as well as the liquid barrier system hydrogen vent lines, need to be plumbed into the larger diameter drop tube piping on the outside of the oxidant tank. This design allows the larger diameter drop tube piping external to the oxidant tank to act as a stagnation chamber for better separation of the liquid oxidant from the hydrogen gas. Most of the

hydrogen gas will be trapped and vented through the liquid barrier system hydrogen vent that discharges external to the building.

Oxidant Tank Vent

During initial startup the drop tube system will not be hydraulically "locked" until the bottom of the drop tube is sufficiently covered by liquid. During this period, some residual hydrogen may enter the oxidant tank. Also, a very small amount of hydrogen will be dissolved in the oxidant solution; the amount is a function of the temperature of the oxidant. Over time, this dissolved hydrogen will evolve from the solution into the oxidant tank space. For these reasons, a separate oxidant tank vent connected to the oxidant tank at the highest point in the tank is required. This oxidant tank vent line should be routed separately to the outside of the facility to avoid any possibility of cross ventilation between the drop tube and hydrogen vent systems. On multiple oxidant tank systems, the vent systems from each tank should be routed separately to the outside of the facility. In this manner, a tank that has been drained for service or cleaning will not have a common hydrogen vent header that could possibly allow hydrogen from the active oxidant tank to be transferred through common vent piping to the tank that is drained for service.

In general, the oxidant transfer piping between the on-site generator and the oxidant storage tank must be adequately sized to maintain a reasonably low velocity of the two-phase flow of fluid and gas within the piping to the oxidant storage tank. The piping diameter must be adequately sized for the flow from all of the cell modules tied to the manifold, whether or not all of the cell modules are intended to be operated at the same time (see Appendix A for details). Improperly sized oxidant transfer piping can cause backpressure in the system that can adversely affect the pressure within the cell as well as the proper flow rate in the cell. This can lead to cell damage. Improper oxidant transfer piping size can also cause high velocities within the piping that can entrain liquids into the hydrogen vent piping. The result is that liquid is carried out of the hydrogen vent piping which can cause oxidation damage to facilities and/or vegetation where the liquid drips from the end of the hydrogen vent piping outside the facility. This problem is particularly evident when water softener salt pellets are used in the system bring generator. Water softener salt pellets typically contain surfactants that can cause bubbles in the oxidant piping.

Oxidant Transfer Piping

It is usually desirable to have a sample port in the oxidant transfer piping in order to obtain oxidant samples for analysis. MIOX provides special OPEN-CENTER three-way ball valves with each cell module for this purpose. In addition, special Viton seat diaphragm check valves are supplied with all of the larger cell modules (25 pound per day production and greater) to prevent back flow of oxidant to the cell module when the specific cell module is in standby and other cell modules on the same oxidant manifold are operational.

To avoid shutoff of oxidant from the electrolytic cell during operation, it is important that no two-way valves or dead center three-way valves be installed in any portion of the oxidant transfer piping. This includes air or solenoid operated valves. Inadvertent closure of these valves during cell operation can cause immediate cell damage. Special open-center three way valve configurations can be assembled to allow selective transfer of oxidant from the oxidant manifold to any of several oxidant tanks. Consult MIOX Corporation for details.

Liquid Barrier System Hydrogen Vent

Liquid Barrier Hydrogen Vent piping (See Figure 3) must be properly sized to prevent high velocity liquid flow within the piping (See Appendix A). High velocity flow will prevent gas from separating from liquid in the drop tube, reducing the efficacy of the Liquid Barrier system. High velocities within the vent piping can cause backpressure and can decrease the effectiveness of the overall system. Liquid Barrier Hydrogen Vent piping must not incorporate any restrictions to flow in the pipe or flow restrictions at the discharge of the pipe (See Figure 4 and 5). No valves of any type are permitted in the vent piping. In addition, the hydrogen or dilution air vent piping

must be routed to avoid any liquid traps in the plumbing. If the piping includes low points, liquid can accumulate in the low points and act as a hydraulic lock to prevent free flow of gases. Under cold weather conditions oxidant vapor or liquid in the vent pipe could freeze and block flow. In freezing climates, the exit of the vent stack outside the facility should be evaluated to ensure that it is not subject to blockage from cold weather conditions. Vent piping should be routed straight up out of the facility or at a high point through a wall. The hydrogen vent piping should slope back towards the oxidant tank so that liquids can run back to the oxidant tanks.

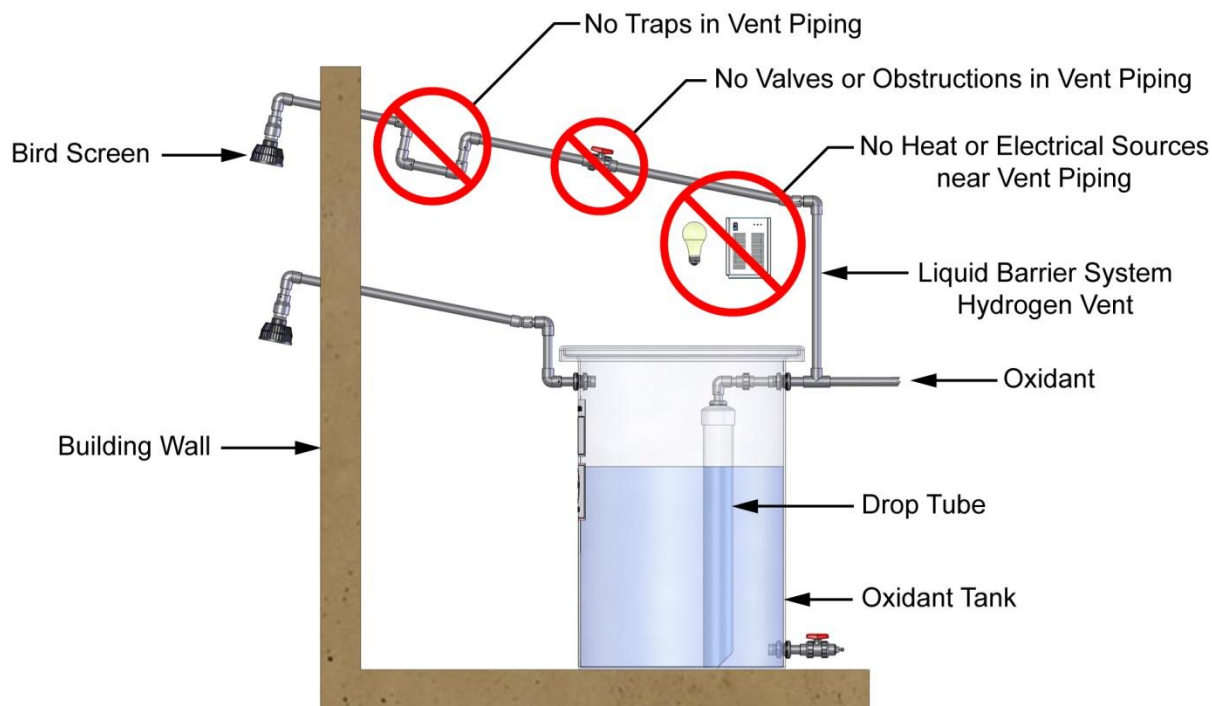
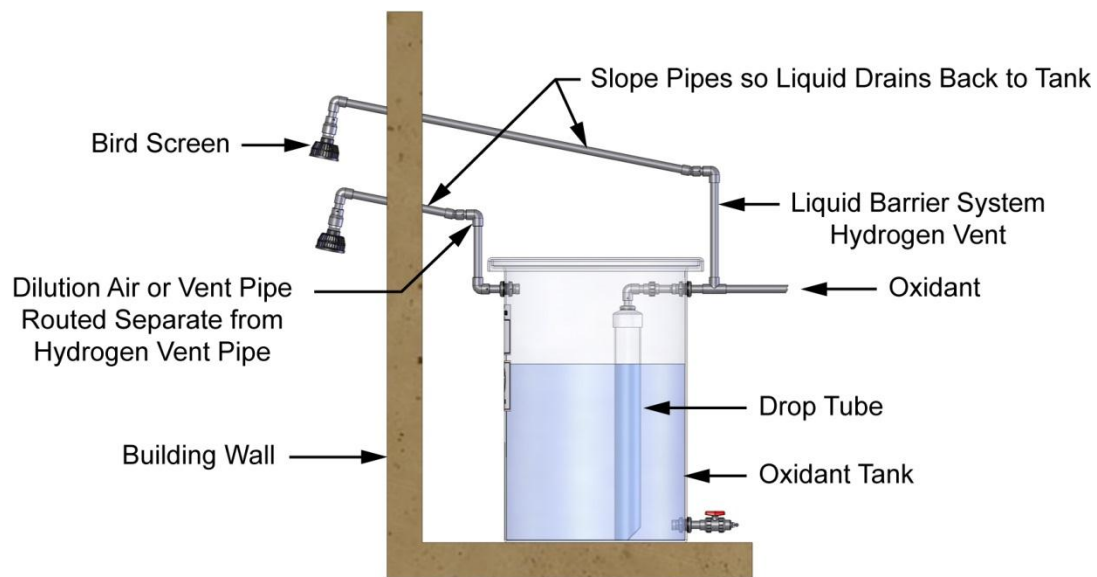


Figure 4 – Liquid Barrier Hydrogen Vent Piping “Don’ts”



Use CPVC Piping in the diameter Specified by MIOX
for Vent Piping

Figure 5. Liquid Barrier Hydrogen Vent Piping "Do's"

DILUTION AIR VENTILATION SYSTEMS

Dilution Air Vent System Principles.

Dual fan-driven Dilution Air Ventilation systems are offered as a supplement to the standard Liquid Barrier Hydrogen vent system. All dilution air systems utilize redundant fans which blow air into the oxidant tank. The flow of the air into and out of the oxidant tank is enough to dilute the hydrogen concentration in the oxidant tank below 25% of the LEL. Thus, the gas in the oxidant tank would not ignite even in the presence of an ignition source. To provide discharge ventilation for the dilution air system, the oxidant tank incorporates a separate vent pipe (separate from the drop tube hydrogen vent pipe) at the top of the oxidant tank that is routed separately to the outside of the building.

By necessity, all dilution air vent systems operate under positive air pressure within the oxidant tank. Due to these conditions, the oxidant tank must be sealed. Many oxidant tanks come with vented covers. These vents must be sealed to prevent dilution air from exiting the oxidant tank. In addition, oxidant tanks may incorporate oxidant overflow ports. These ports may represent a source of dilution air discharge from the oxidant tank. To avoid this situation and still maintain the overflow, the overflow piping can incorporate a drop tube inside the oxidant tank. Internal to the oxidant tank, the overflow port should be plumbed with an elbow fitting and pipe extending down to the bottom of the oxidant tank. The end of the drop pipe

should have a 45 degree angle cut in order to allow free flow of liquid in the pipe.

External Dilution Air Ventilation System

The External Dilution Air Ventilation system is configured as a dual fan system with check valves and an air flow switch to provide indication of loss of air flow, and alternate backup fan. The air flow switch is installed in the discharge piping downstream for the oxidant storage tanks just before the piping exits the facility. With the air flow switch located downstream, a leak in the oxidant tank or piping (such as a tank cover being removed) is indicated, and the system will shut down to prevent hydrogen accumulation inside the facility.

The external air vent system utilizes a separate air fan duct and plenum located external to the oxidant tank and low to the ground. The fan is a normal industrial fan that can be configured in most common electrical power arrangements. With the fan low to the ground and external to the duct, the possibility of introducing an electrical arc as an ignition source for hydrogen in the oxidant tank is minimized. The dilution air duct runs up the side of the oxidant tank and enters the oxidant tank near the top edge of the tank or on a “flat” on the top dome of the tank, or in the case of FRP tanks, in to the appropriate flange connection on the top of the tank. Information regarding Dilution Air Sizing can be found in Appendix B.

Dilution Air Ventilation systems are sized for the size of the installation, and therefore are available in a variety of ductwork pipe diameters. The duct size for the dilution air blower system is a function of pressure loss in the ductwork. As backpressure increases, blower output volume decreases. As such, backpressure must be minimized in order to maintain flow volume. An on-line program that can calculate the pressure loss in PVC ducting is located at:

<http://www.freecalc.com/gasfram.htm>

MIOX Corporation has selected the minimum size duct based on the appropriate flow rate and assumes 100 feet (33m) of duct piping, 6 long sweep ells, and air flow check valves. More complex duct routing systems may need to be evaluated for the specific application. A graphical representation of both the Liquid Barrier Vent System and External Dilution Air vent system is shown in Figure 6.

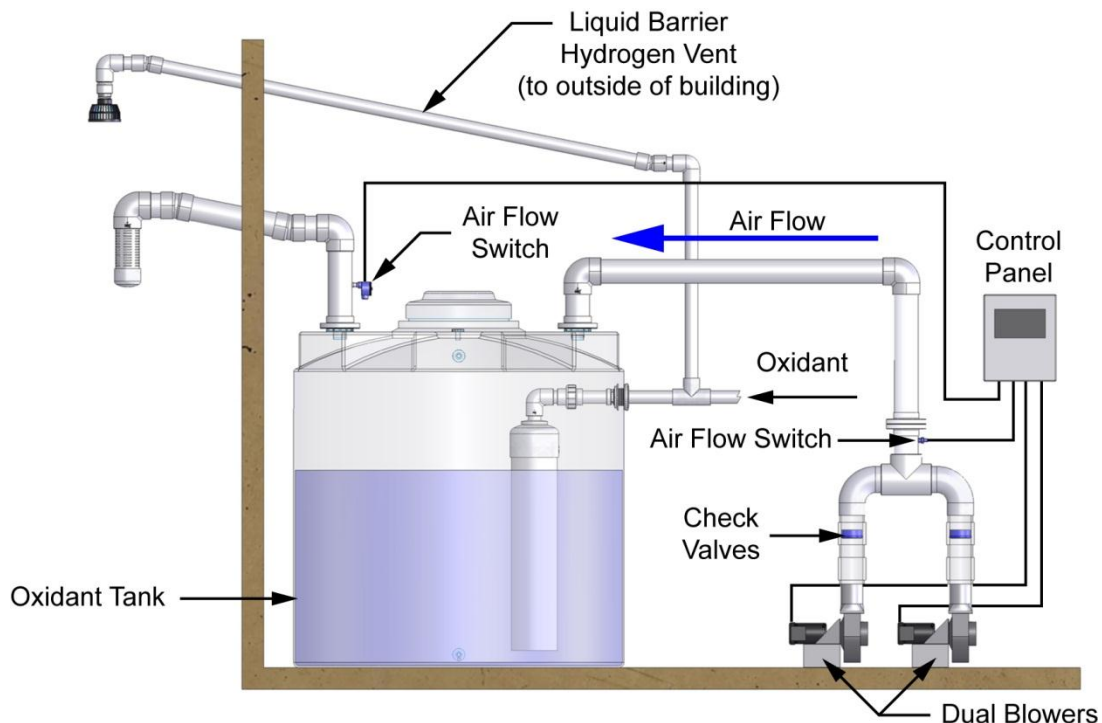


Figure 6. Dilution Air Vent System with Liquid Barrier System

External Dilution Air Vent Controls

The MIOX external dilution air control system consists of a stainless steel control cabinet and a separate blower manifold with dual blowers. The control cabinet is designed to be utilized for all size systems. Slightly different versions of the control cabinet are available for different fan motor voltages. Models available include 110VAC 1phase, 240VAC 3 phase and 480 3 phase. The dilution air system blower and duct sizes are chosen based upon the size and configuration of the particular system.

The control panel incorporates the following functions:

- On first time power up, it performs a test to determine if each blower is operational. Also, during operation the control panel monitors the selected blower. If a blower fails, it is deactivated and the other blower is selected. Failure is detected by the absence of flow from a flow switch installed in the blower manifold.
- Upon detection of a failed blower, a fail light is lit on the front panel of the control panel for the corresponding blower. If both blowers fail both fail indicator lights will flash off and on.
- In addition to the fail indication lights, two relay outputs are provided, one that cycles off and on to indicate a single blower failure or on continuously indicating both blowers failed. This output could be used to drive a two tone buzzer or switch a remote light. The other relay turns on only when both blowers have failed. It could be used to shut down the on-site generator in the event of a double failure or switch a light or alarm. Alternatively these signals could be connected to a SCADA system for remote monitoring. The MIOX RIO system supports direct connectivity to the external Dilution air control system and will automatically suspend operation if a failure is detected. The RIO system provides the run command and three failure inputs, one for the dilution air controller and two optional inputs to support other vent system sensors where required.
- All alarm outputs have dual relay contacts and normally open and normally closed contacts to support different system interface requirements.
- The blower is turned on by applying 24v to the run input.
- The control panel has additional terminal block capacity to support a single point connection to SCADA from other possible hydrogen vent system sensors (i.e. flow switches, etc... as required)
- The system controller has a dip switch with selectable blower shutdown delay from 0 minutes to 45 minutes in 3 minute intervals. This allows the blowers to continue to run after the on-site generator is shut down to assure all hydrogen is purged from the oxidant tanks. The

default setting is 15 minutes. The switch is located inside the system controller box.

- The control system randomly selects which blower to turn on each time the command to run is received, to prevent one blower from wearing faster than the other.
- The system incorporates a manual override for maintenance and service functions. This override allows the user to select a blower. In manual mode the control module is bypassed so alarm outputs are inactive

STANDPIPE HYDROGEN MITIGATION SYSTEM

For larger installations (see Appendix C for specific installation sizes), MIOX requires a Standpipe Hydrogen Mitigation System. A depiction of this system is shown below in Figure 8. In this configuration, a relatively small external standpipe to the oxidant tank is utilized similar to the drop tube in a Liquid Barrier system. Hydrogen gas is separated from oxidant in the standpipe, and then is diluted below its lower explosive limit with a Dilution Air Blower and blown outside the building. Contact MIOX for more details on this system.

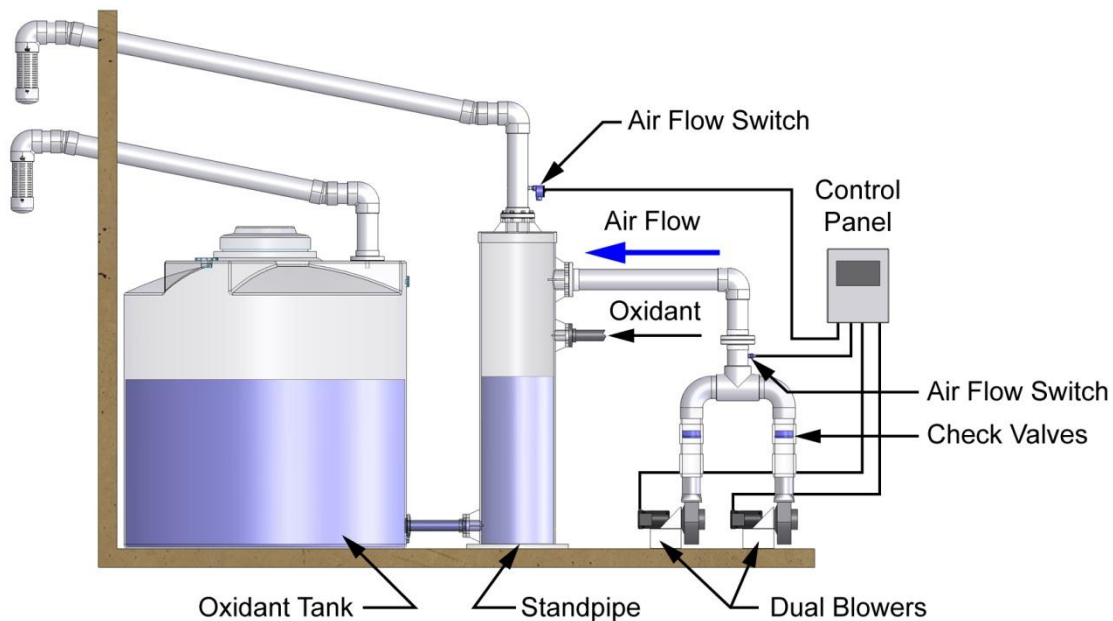


Figure 7. Dilution Air Vent System with Liquid Barrier System

RIO ZUNI SERIES - LIQUID BARRIER HYDROGEN VENT SYSTEM

In 2011, MIOX began to offer for sale the Rio Zuni series of On-Site Generators. On a relative basis, the Rio Zuni series of On-Site Generators generate a small amount of hydrogen. Thus, it is approved to route and connect the Oxidant Tank Vent to the Liquid Barrier System Hydrogen Vent. This is only approved on single Rio Zuni On-Site generator feeding single oxidant tank systems. In the case of multiple oxidant tank and/or multiple on-site generator systems, each tank must be vented independently. In all cases, all other requirements described in earlier in the section "LIQUID BARRIER HYDROGEN VENT SYSTEM" must be met.

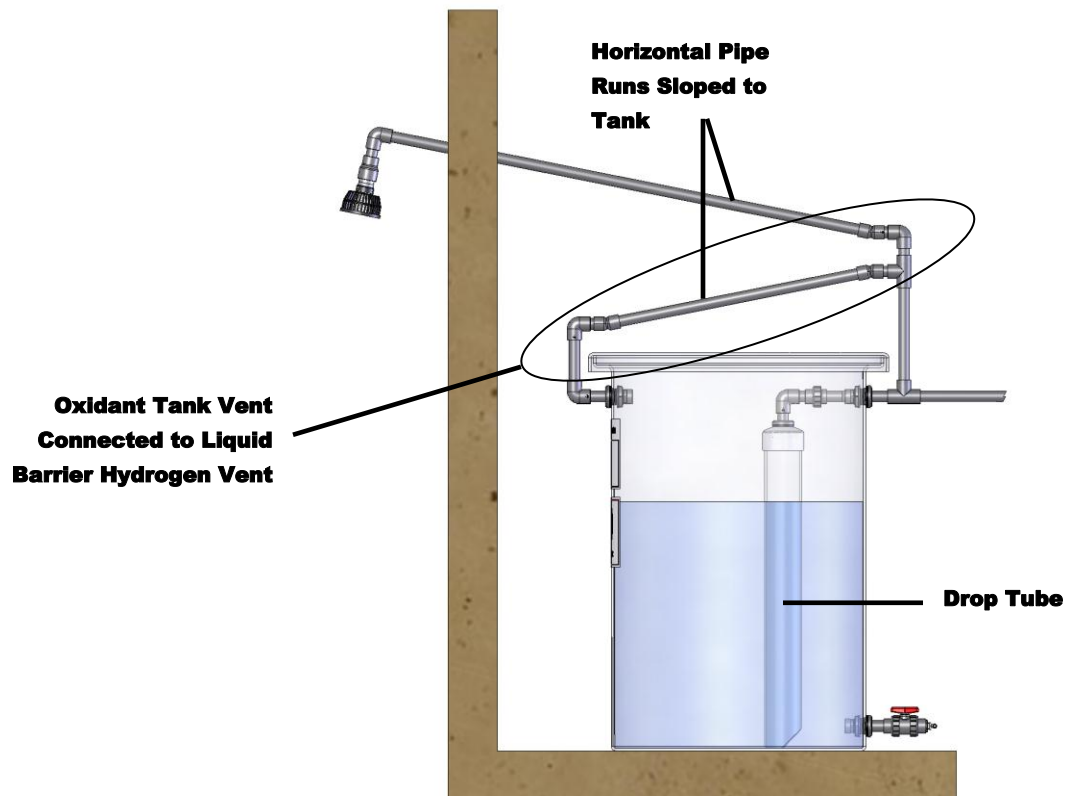


Figure 7. Liquid Barrier Hydrogen Vent System Approved for Single Rio Zuni Single Oxidant Tank Installations.

ADDITIONAL HYDROGEN RISK MITIGATION OPTIONS

HYDROGEN MONITOR

MIOX Corporation offers Mine Safety Appliance (MSA) hydrogen monitors as an optional accessory to detect and alarm the presence of hydrogen within the facility. These systems provide contact closure or 4-20 ma outputs to SCADA or other monitoring systems depending on the desired control configuration. The sensor component of the hydrogen monitor should be mounted high in the facility ceiling in an area where hydrogen gas could be trapped.

LABELING REQUIREMENTS

Safety labels and No Smoking Signs are required ON ALL OXIDANT TANKS as well as ALL HYDROGEN VENTS (Liquid Barrier Hydrogen Vents, Dilution Air Vents, and Oxidant Tank Vents) OPENINGS external to the building. These labels identify safety issues specific to on-site generated solution, as well as no smoking signs. These labels are available from MIOX Corporation, but examples are shown below in figure 9. Oxidant Tanks and Hydrogen Vents must be labeled such that the labels are clearly visible in all directions. More details on this requirement can be found in the installation guide.

CAUTION

- NO SMOKING, OPEN FLAMES, OR ANY OTHER IGNITION SOURCES IN THE VICINITY OF THIS TANK OR VENT
- PERMIT REQUIRED CONFINED SPACE, USE CONFINED SPACE PROCEDURES PER OSHA STANDARD 1910.146
- DO NOT ADD OTHER CHEMICALS TO THE TANK OR VENT
- REFER TO MIOX OPERATOR'S MANUAL FOR OTHER SAFETY RELATED PRECAUTIONS

This Tank or Vent May Contain	Statement of Hazards
• Hydrogen Gas with a Hazard Rating Identification of (0-4-0-Null)	• Flammable Gas present • Fire & Explosion Hazard present • Simple Asphyxiate Gas present
• Dilute (<1% by volume) Sodium Hypochlorite Solution with a Hazard Rating Identification of (1-0-0-Null)	• Moderate Health Hazard present • Incompatible and/or hazardous reactions can occur with addition of other chemicals, such as strong acids, strong reducing agents, amines, ammonium salts, metals, methanol, phenylacetonitrile, formic acid, and ammonia



NO SMOKING

CODE COMPLIANCE

All on-site generation equipment produces hydrogen gas which is normally contained in the piping and vent systems.

Classification of facilities housing on-site generation equipment is determined by the authority having jurisdiction (AHJ). The AHJ may be a state, county, or city agency responsible for safety issues in the community. **MIOX Corporation does not make a determination of the classification for any particular installation.** This is the responsibility of the local authority having jurisdiction. Local engineering firms familiar with the codes and standards in their region are responsible for being sure that local codes are followed in their designs. Selected excerpts from The National Electrical Code, 2008 Edition are included below:

500.5 Classifications of Locations.

(A) Classification of Locations:

Locations shall be classified depending on the properties of the flammable gas, flammable liquid-produced vapor, combustible-liquid produced vapors, combustible dusts, or fibers/flyings that may be present, and the likelihood that a flammable or combustible concentration or quantity is present...

(2) Class I, Division 2. A Class I, Division 2 location is a location

(1) In which volatile flammable gases, flammable liquid-produced vapors, or combustible liquid-produced

vapors are handled, processed, or used, but in which the liquids, vapors, or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operation of equipment, or

(2) In which ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are normally prevented by positive mechanical ventilation and which might become hazardous through failure or abnormal operation of the ventilating equipment, or

FPN No. 1: This classification usually includes locations where volatile flammable liquids or flammable gases or vapors are used but that, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of flammable material that might escape in case of accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that merit consideration in determining the classification and extent of each location.

ADDITIONAL INFO

UPSIZING CAPACITY

Since the Liquid Barrier Hydrogen vent, Dilution Air vent, and Stand-Pipe systems are sized based on the capacity of the on-site generator system, the size of the hydrogen containment systems, liquid barrier or dilution air, need to be re-evaluated if modifications are made to the system, particularly if system capacity is increased either by scaling up the electrolytic cell size or adding additional cell modules to the system.

OXIDANT TANKS

It is mandatory that the engineering parameters defined in this document in terms of hydrogen vent piping be complied with by customers and/or contractors during installation of oxidant storage tanks to ensure personnel safety.

Safety labels are also required on all oxidant tanks and vents (see above section) in addition to the labels normally provided by the tank suppliers. These labels identify safety issues specific to on-site generated solution, as well as no smoking signs. These labels are available from MIOX Corporation.

OXIDANT TANK MAINTENANCE

Periodically, oxidant tanks may need to be cleaned out, or the tank may need maintenance for leaks. Do not use any cleaning or pumping devices that can act as an ignition source to gases that may be in the oxidant tank. When tank entry is required, comply with requirements for Occupational Safety and Health Administration (OSHA) section 1910.146,

Permit-required Confined Space. OSHA Section 1910.146, Appendix A has a decision tree for the requirements for entry into confined spaces. Refer to the OSHA web site:
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9797

APPENDIX A – Vent System Piping Diameters for Drop Tubes, Oxidant Transfer, and Oxidant Tank Vent Pipes

System	Min Oxidant Transfer Pipe Diameter (in)	Min LBS Vent Pipe (in) and Oxidant Tank Vent Pipe(Notes 1&2)	Min Tank Throughwall to Vent pipe (in)	Min Drop Tube Pipe (in)
RIO Zuni - 0.5	0.25	0.25	0.25	0.38
RIO Zuni - 1.0	0.25	0.25	0.25	0.38
RIO Zuni - 2.0	0.25	0.25	0.38	0.38
S-30	0.38	1	1	2
AE-4	0.38	1	1	2
AE-6	0.38	1	1	2
AE-8	0.38	1	1	2
S-40	0.38	1	1	2
S-80	0.38	1	1	2
DUAL S-80	0.50	1	1	2
OxCell	0.38	1	1	2
MIOX 251	0.75	2	2	2
MIOX 252	0.75	2	2	2
MIOX 253	0.75	2	2	4
MIOX 254	0.75	2	3	4
MIOX 501	1	2	2	4
MIOX 502	1	2	3	4
MIOX 503	1	2	3	4
MIOX 504	1	2	3	4
MIOX 1001	2	2	3	4
MIOX 1002	2	2	3	4
MIOX 1003	3	3	4	6
MIOX 1004	3	3	5	6
MIOX 2501	4	4	4	6
MIOX 2502	4	4	5	6
MIOX 2503	4	4	6	6
MIOX 2504	4	4	8	8
MIOX 5001	4	4	6	6
MIOX 5002	4	4	8	8
MIOX 5003	4	4	8	8

System	Min Oxidant Transfer Pipe Diameter (in)	Min LBS Vent Pipe (in) and Oxidant Tank Vent Pipe(Notes 1&2)	Min Tank Throughwall to Vent pipe (in)	Min Drop Tube Pipe (in)
VaultM15SCX1	2	2	1	4
VaultM15SCX2	2	2	2	4
VaultM15SCX3	2	2	2	4
VaultM15SCX4	2	2	2	4
VaultM30SCX1	2	2	2	4
VaultM30SCX2	2	2	2	4
VaultM30SCX3	2	2	2	4
VaultM30SCX4	2	2	3	4
VaultM45SCX1	2	2	2	4
VaultM45SCX2	2	2	2	4
VaultM45SCX3	2	2	3	4
VaultM45SCX4	2	2	3	4
VaultM60SCX1	2	2	2	4
VaultM60SCX2	2	2	3	4
VaultM60SCX3	2	2	3	4
VaultM60SCX4	2	3	4	4
RIO M1X1	1	2	2	4
RIO M1X2	1	2	3	4
RIO M1X3	1	2	3	4
RIO M1X4	1	2	4	4
RIO M2X1	2	2	3	4
RIO M2X2	2	2	4	4
RIO M2X3	2	2	4	4
RIO M2X4	2	2	5	6
RIO M3X1	2	3	3	6
RIO M3X2	2	3	4	6
RIO M3X3	2	3	5	6
RIO M3X4	2	3	6	6
RIO M4X1	2	3	4	6
RIO M4X2	2	3	5	6
RIO M4X3	4	3	6	6
RIO M4X4	4	3	6	6
RIO M5X1	4	4	4	8
RIO M5X2	4	4	5	8
RIO M5X3	4	4	6	8
RIO M5X4	4	4	8	8
M1000X1	4	4	8	8
M1000X2	4	4	8	8
M1000X3	4	N/A	N/A	N/A
M1000X4	4	N/A	N/A	N/A

Note 1. If Dilution Air System is being used, the Oxidant Tank Vent Pipe must be larger than specified on this table. Contact MIOX for details.

Note 2. See section on Liquid Barrier Vent System for more details.

System	Min Oxidant Transfer Pipe Diameter (in)	Min LBS Vent Pipe (in) and Oxidant Tank Vent Pipe(Notes 1&2)	Min Tank Throughwall to Vent pipe (in)	Min Drop Tube Pipe (in)
H-5	0.38	1	1	2
H-10	0.38	1	1	2
H-20	0.38	1	1	2
H-40	0.50	1	1	2
HYPO 501	0.75	2	2	2
HYPO 502	0.75	2	2	2
HYPO 503	0.75	2	2	4
HYPO 504	1.00	2	3	4
HYPO 1001	1	2	2	4
HYPO 1002	1	2	3	4
HYPO 1003	1	2	3	4
HYPO 1004	2	2	3	4
HYPO 2001	2	2	3	4
HYPO 2002	2	2	3	4
HYPO 2003	3	3	4	6
HYPO 2004	3	3	5	6
HYPO 5001	4	4	4	6
VaultH25SCX1	2	2	1	4
VaultH25SCX2	2	2	2	4
VaultH25SCX3	2	2	2	4
VaultH25SCX4	2	2	2	4
VaultH50SCX1	2	2	2	4
VaultH50SCX2	2	2	2	4
VaultH50SCX3	2	2	3	4
VaultH50SCX4	2	2	3	4
VaultH75SCX1	2	2	2	4
VaultH75SCX2	2	2	3	4
VaultH75SCX3	2	2	3	4
VaultH75SCX4	2	2	3	4

System	Min Oxidant Transfer Pipe Diameter (in)	Min LBS Vent Pipe (in) and Oxidant Tank Vent Pipe(Notes 1&2)	Min Tank Throughwall to Vent pipe (in)	Min Drop Tube Pipe (in)
VaultH100SCX1	2	2	2	4
VaultH100SCX2	2	2	3	4
VaultH100SCX3	2	2	3	4
VaultH100SCX4	2	2	4	4
VaultH25X1	2	2	1	4
VaultH25X2	2	2	2	4
VaultH25X3	2	2	2	4
VaultH25X4	2	2	2	4
VaultH50X1	2	2	2	4
VaultH50X2	2	2	2	4
VaultH50X3	2	2	2	4
VaultH50X4	2	2	3	4
VaultH75X1	2	2	2	4
VaultH75X2	2	2	2	4
VaultH75X3	2	2	3	4
VaultH75X4	2	2	3	4
VaultH100X1	2	2	2	4
VaultH100X2	2	2	3	4
VaultH100X3	2	2	3	4
VaultH100X4	2	2	4	4
RIO H1X1	1	2	2	6
RIO H1X2	1	2	3	6
RIO H1X3	2	2	3	6
RIO H1X4	2	2	4	6
RIO H2X1	2	2	3	6
RIO H2X2	2	2	4	6
RIO H2X3	3	3	4	6
RIO H2X4	3	3	5	6
RIO H3X1	3	3	3	6
RIO H3X2	3	3	4	6
RIO H3X3	3	3	5	6
RIO H3X4	4	3	6	6
RIO H4X1	4	3	4	6
RIO H4X2	4	3	5	6
RIO H4X3	4	3	6	6
RIO H4X4	4	4	6	6
RIO H5X1	4	4	4	6
RIO H5X2	4	4	5	6
RIO H5X3	4	4	6	6
RIO H5X4	4	4	7	8
H1550X1	4	4	7	8
H1550X2	4	4	8	8
H1550X3	4	N/A	N/A	N/A
H1550X4	4	N/A	N/A	N/A

Note 1. If Dilution Air System is being used, the Oxidant Tank Vent Pipe must be larger than specified on this table. Contact MIOX for details.

Note 2. See section on Liquid Barrier Vent System for more details.

APPENDIX B. Dilution Air Blower Requirements

System	Gas Flow Generated (cfm)	Minimum Dilution Air Blower Requirement (cfm)
RIO Zuni - 0.5	0.0044	0.47
RIO Zuni - 1.0	0.0074	0.78
RIO Zuni - 2.0	0.0147	1.6
S-30	0.0172	1.8
AE-4	0.0295	3
AE-6	0.0369	4
AE-8	0.0442	5
S-40	0.0221	2
S-80	0.044	5
DUAL S-80	0.09	9
OxCell	0.08	8
MIOX 251	0.13	14
MIOX 252	0.27	28
MIOX 253	0.40	42
MIOX 254	0.53	56
MIOX 501	0.22	23
MIOX 502	0.44	47
MIOX 503	0.66	70
MIOX 504	0.88	93
MIOX 1001	0.44	47
MIOX 1002	0.88	93
MIOX 1003	1.33	140
MIOX 1004	1.77	186
MIOX 2501	1.55	163
MIOX 2502	3.10	326
MIOX 2503	4.65	489
MIOX 2504	6.19	652
MIOX 5001	3.10	326
MIOX 5002	6.19	652
MIOX 5003	9.29	978

System	Gas Flow Generated (cfm)	Minimum Dilution Air Blower Requirement (cfm)
VaultM15SCX1	0.09	10
VaultM15SCX2	0.18	20
VaultM15SCX3	0.28	31
VaultM15SCX4	0.37	41
VaultM30SCX1	0.18	20
VaultM30SCX2	0.37	41
VaultM30SCX3	0.55	61
VaultM30SCX4	0.74	82
VaultM45SCX1	0.28	31
VaultM45SCX2	0.55	61
VaultM45SCX3	0.83	92
VaultM45SCX4	1.11	123
VaultM60SCX1	0.37	41
VaultM60SCX2	0.74	82
VaultM60SCX3	1.11	123
VaultM60SCX4	1.47	164
RIO M1X1	0.34	36
RIO M1X2	0.69	72
RIO M1X3	1.03	109
RIO M1X4	1.38	145
RIO M2X1	0.69	72
RIO M2X2	1.38	145
RIO M2X3	2.06	217
RIO M2X4	2.75	290
RIO M3X1	1.03	109
RIO M3X2	2.06	217
RIO M3X3	3.10	326
RIO M3X4	4.13	435
RIO M4X1	1.38	145
RIO M4X2	2.75	290
RIO M4X3	4.13	435
RIO M4X4	5.51	580
RIO M5X1	1.72	181
RIO M5X2	3.44	362
RIO M5X3	5.16	543
RIO M5X4	6.88	724
M1000X1	5.51	580
M1000X2	11.01	1223
M1000X3	16.52	1835
M1000X4	22.02	2447

Note 1. The Minimum Dilution Air Blower Requirement is as measured at the exit of the Dilution Air Vent Pipe from the building. This requirement must be met regardless of the backpressure in the Dilution Air System, and duct sizes must be sized accordingly.

System	Gas Flow Generated (cfm)	Minimum Dilution Air Blower Requirement (cfm)
H-5	0.05	6
H-10	0.07	7
H-20	0.13	15
H-40	0.27	29
HYPO 501	0.40	44
HYPO 502	0.80	88
HYPO 503	1.19	133
HYPO 504	1.59	177
HYPO 1001	0.74	82
HYPO 1002	1.47	164
HYPO 1003	2.21	246
HYPO 1004	2.95	328
HYPO 2001	1.47	164
HYPO 2002	2.95	328
HYPO 2003	4.42	492
HYPO 2004	5.90	655
HYPO 5001	3.10	344
VaultH25SCX1	0.13	14
VaultH25SCX2	0.26	29
VaultH25SCX3	0.39	43
VaultH25SCX4	0.52	57
VaultH50SCX1	0.26	29
VaultH50SCX2	0.52	57
VaultH50SCX3	0.77	86
VaultH50SCX4	1.03	115
VaultH75SCX1	0.39	43
VaultH75SCX2	0.77	86
VaultH75SCX3	1.16	129
VaultH75SCX4	1.55	172

Note 1. The Minimum Dilution Air Blower Requirement is as measured at the exit of the Dilution Air Vent Pipe from the building. This requirement must be met regardless of the backpressure in the Dilution Air System, and duct sizes must be sized accordingly

System	Gas Flow Generated (cfm)	Minimum Dilution Air Blower Requirement (cfm)
VaultH100SCX1	0.52	57
VaultH100SCX2	1.03	115
VaultH100SCX3	1.55	172
VaultH100SCX4	2.06	229
VaultH25X1	0.13	14
VaultH25X2	0.26	29
VaultH25X3	0.39	43
VaultH25X4	0.52	57
VaultH50X1	0.26	29
VaultH50X2	0.52	57
VaultH50X3	0.77	86
VaultH50X4	1.03	115
VaultH75X1	0.39	43
VaultH75X2	0.77	86
VaultH75X3	1.16	129
VaultH75X4	1.55	172
VaultH100X1	0.52	57
VaultH100X2	1.03	115
VaultH100X3	1.55	172
VaultH100X4	2.06	229
RIO H1X1	0.55	61
RIO H1X2	1.11	123
RIO H1X3	1.66	184
RIO H1X4	2.21	246
RIO H2X1	1.11	123
RIO H2X2	2.21	246
RIO H2X3	3.32	369
RIO H2X4	4.42	492
RIO H3X1	1.66	184
RIO H3X2	3.32	369
RIO H3X3	4.98	553
RIO H3X4	6.64	737
RIO H4X1	2.21	246
RIO H4X2	4.42	492
RIO H4X3	6.64	737
RIO H4X4	8.85	983
RIO H5X1	2.77	307
RIO H5X2	5.53	614
RIO H5X3	8.30	922
RIO H5X4	11.06	1229
H1550X1	8.85	983
H1550X2	17.70	1966
H1550X3	26.54	2949
H1550X4	35.39	3932

APPENDIX C – Maximum Number of On-Site Generators Routed into a Single Oxidant Tank Not Requiring a Standpipe System

System	Max Number of On-Site Generators	Capacity (lb/day)
AE-4	400	1600
SAL80	160	1600
OxCell	150	2250
MIOX 251	58	1450
MIOX 501	35	1750
MIOX 1001	17	1700
MIOX 2501	7	1750
MIOX 5001	3	1500
M15X1 SC	125	1875
M30X1 SC	60	1800
M45X1 SC	40	1800
M60X1 SC	30	1800
M1X1	32	1920
M2X1	16	1920
M3X1	10	1800
M4X1	8	1920
M5X1	6	1800
M1000X1	2	2000
HYPO 20	195	3900
HYPO 504	77	3850
HYPO 1001	38	3800
HYPO 2001	19	3800
HYPO 5001	7	3500
H25X1 SC	100	2500
H50X1 SC	50	2500
H75X1 SC	35	2625
H100X1 SC	25	2500
H25X1 SC	100	2500
H50X1 SC	50	2500
H75X1 SC	35	2625
H100X1 SC	25	2500
H1X1	32	3200
H2X1	16	3200
H3X1	10	3000
H4X1	8	3200
H5X1	6	3000
H1550X1	2	3100



*The **SAFEST WATER** In The World*

**For more information please
contact MIOX at:**

MIOX Corporation

5601 Balloon Fiesta Parkway NE
Albuquerque, NM 87113

Ph: **(505) 343-0090**

Toll-free: **(800) 646-9426**

Fax: **(505) 343-0093**

E-mail: **info@miox.com**

Web Site: **www.miox.com**

Appendix B

MIOX Corporation Salt Guidelines



*The **SAFEST WATER** In The World*

MIOX SALT GUIDELINES

Revised September 14, 2011

MIOX P/N: 106-00008-B

MIOX Corporation 5601 Balloon Fiesta Parkway, Albuquerque, NM 87113
505-343-0090 888-646-9420 Fax: 505-343-0093 info@miox.com www.miox.com



*The **SAFEST WATER** In The World*

SALT GUIDELINES FOR MIOX GENERATORS

General Information

MIOX Corporation (MIOX) places importance on the quality of salt used in operating on-site generation equipment. High quality salt minimizes expense and customer equipment maintenance issues while maximizing the quality of the water treated using MIOX equipment. MIOX recommends food grade salt to help optimize MIOX system performance. Because contaminants can vary widely, even within the same mine, it is vital to request the most recent site specific contaminant analysis. The contaminant analysis should document the date that quality control was performed and the physical location where the salt was mined and processed. MIOX recommends that our customers regularly request salt product data sheets from the manufacturer to ensure consistent quality control. A reputable supplier will include the date of the quality analysis on the specification sheet in addition to the salt mine location. Please note, higher quality salt alone will not ensure reduced maintenance. Water used by the MIOX system must be softened adequately as well.

Warranty

MIOX continually strives to review and address all warranty claims in an equitable manner. It is important for our customers to understand that the use of poor quality salt may impact warranty claims. MIOX does not accept liability for any salt selected by the customer for use in MIOX equipment. MIOX reserves the right to deny any claims that could be considered under warranty if the equipment or electrolytic cell is performing below specification or is damaged due to contamination caused by, but not limited to, calcium, magnesium and insoluble material in a salt selected by the customer. NOTE: self-cleaning MIOX systems require the use of salt with a purity of 99.5% NaCl or greater (typically food grade) as described in the "Salt Purity" section below or the warranty is void.

Salt Purity

For all **self-cleaning systems (the self-cleaning VAULT™)**, only salt with a purity greater than 99.5% may be used (typically food grade) or the warranty is void. For all **non-self-cleaning systems (all other MIOX OSGs)**, MIOX recommends salt with a purity level of 99.5% NaCl or greater. Below is a table depicting what MIOX recommends for **non-self-cleaning systems** and what MIOX requires to keep the warranty intact for **self-cleaning systems**.

MIOX P/N: 106-00008-B



*The **SAFEST WATER** In The World*

Component	Percent Minimum
NaCl (dry)	99.5
Impurity	Percent Maximum
Calcium (in all forms)	0.01
Magnesium (in all forms)	0.01
Manganese	0.00002
Iron (as Fe)	0.0005
Insolubles	0.005
Additives	0.0001

For several reasons, salt quality is highly variable and MIOX cannot control the quality processes at salt manufacturing sites. Typically, salts with fewer contaminants are more expensive because of additional purification steps during processing. Salt manufacturers usually provide salt product data sheets that list contaminants of concern in each type of salt they sell. Customers assume that the delivered salt will meet the specifications provided by the manufacturers. However, not all contaminants of concern for a specific application will be listed. For example, bromide in salt used for electrolysis can elevate the concentration of bromate in the treated water. Bromate is a water quality concern in drinking water applications, but not necessarily industrial applications.

There are three primary contaminants commonly listed in a salt product data sheet that impact the electrolytic cell; calcium (Ca), magnesium (Mg) and insoluble material. High calcium and magnesium salt concentrations cause accumulation of calcium/magnesium carbonate and magnesium hydroxide in the electrolytic cell. Fouling by these deposits in the cell is the single largest cause of maintenance issues. Insoluble material or solids present in the salt that do not dissolve in water can also deposit in the cell along with carbonates. This co-deposition tends to reduce the effectiveness of acid to remove the carbonates. As a result, longer acid wash times and sometimes physical scrubbing of the cell plates is required to remove the deposit. Other contaminants, such as manganese (Mn) and iron (Fe), are known to affect cell performance by producing an oxide layer that increases the degradation rate of the plates. MIOX recommends that the manganese and iron concentrations in salt not exceed 20 parts per billion in the electrolyte solution entering the cell. Manganese and iron are not included in MIOX's salt specification maintenance worksheet because they are not often reported on salt product data sheets. However, low concentrations of Mg and Ca are associated with low concentrations of Mn and Fe.

MIOX's Salt Specification Maintenance Worksheet versus Salt Manufacturer's Product Data Sheets

Although MIOX makes recommendations on the ideal salt for use in the on-site generation process, it is the customer's responsibility to obtain a salt quality analysis (salt specification or product data sheet) from the supplier and determine its suitability for their situation, region and application.

MIOX P/N: 106-00008-B



*The **SAFEST WATER** In The World*

The salt manufacturer's product data sheet should contain information regarding the amount of calcium, magnesium and insoluble material in the salt at a minimum. MIOX and its customers use this standard information to estimate the amount of maintenance that is associated with these contaminants. This salt specification maintenance table is shown below.

	Lower Limit	Upper Limit	Maintenance
Calcium (Ca) (%)	0	0.020%	Acid wash for 20 min at 3000 hrs / quarterly
	0.020%	0.05%	Acid wash for 20 min at 750 hrs / monthly
	0.050%	0.08%	Acid wash twice for 20 min each at 24 hrs / daily
	0.080%	---	Calcium too high
Magnesium (Mg) (%)	0	0.020%	Acid wash for 20 min at 3000 hrs / quarterly
	0.020%	0.05%	Acid wash for 20 min at 750 hrs / monthly
	0.05%	0.08%	Acid wash twice for 20 min each at 24 hrs / daily
	0.08%	---	Magnesium too high
Insolubles (%)	0	0.01%	Change brine filter at 750 hrs / monthly
	0.010%	0.05%	Change brine filter at 325 hrs / biweekly
	0.050%	0.1%	Change brine filter at 24 hrs / daily
	0.10%	---	Insolubles too high

Please note that the manufacturer's product data sheets do not always give these contaminant concentrations in a standard form and the listing may refer to a brand of salt sourced from different salt mines. Different salt mines have different quality parameters. Be sure to request the salt product data sheet that is specific to the salt you will use in the MIOX system, including the mine location. For drinking water applications, the amount of bromide that may be present in certain salts should be evaluated because bromide can be converted to bromate in the cell.

Additives

Most salts have four basic types of additives:

- Hardening agent (Sodium Hexametaphosphate or SHMP)
- Cleanser (Citric Acid based)
- Free flowing/anti-caking agent (Yellow Prussiate of Soda or YPS)
- Detergents/surfactants

MIOX does not recommend the use of salt with additives. However, some customers have successfully used salts with these additives. Note that detergents/surfactants in the salt may cause foaming in the oxidant tank and reduce the effectiveness of the hydrogen venting system due to foam. It may be necessary to increase the vent pipe size. Organic additives such as citric acid can also be a source for additional trihalomethanes and haloacetic acids.

MIOX P/N: 106-00008-B



*The **SAFEST WATER** In The World*

Physical Salt Size

Salt that is coarse or extra coarse is preferred. Granular or pelletized salt can be used equally well but requires some extra attention. Pellets that are larger than about ½ inch in size dissolve slowly and can contribute to poor brine concentration in the brine tank, particularly when the salt level is low in the tank. For this reason, it is important to keep the brine generator filled at all times. Also, pelletized salt is too heavy to be pneumatically blown into large bulk brine generators.

Brine Filtration

Higher purity salt is often table quality, or food grade salt, in granular form. While this salt will work well, it requires an adaptation for both types of brine generators sold by MIOX, including the ton-sized bulk brine generators and the smaller brine generators with up to 1,000 gallons capacity. The large bulk brine generators must be filled with a two-layer washed quartz rock bed to avoid clogging of the brine intake port. The bottom layer should be 7 inches of quartz rock deep, using rock sizes between ¼ and ½ inch. The top layer should be 5 inches of quartz rock deep, using rock sizes between 1/8 and ¼ inch in size.

For smaller brine generators that utilize granular (fine grain) salt, a special in-tank roughing filter assembly must be used. Contact MIOX for details on this filter assembly. External to the brine generator and prior to the MIOX on-site generator cabinet, a 5-micron filter is required. This usually takes the form of a 10-inch standard filter housing with a 5-micron pleated filter cartridge element. A dual filter housing arrangement is also available to facilitate filter change-out while the systems are operational.

NSF Standard 60 Salt

Several state regulatory agencies are now requiring that the source material feeding on-site generators (i.e., salt) must be NSF-60 listed to ensure that no hazardous materials ultimately enter the drinking water supply. NSF-60 ensures that chemicals in contact with drinking water are safe and non-toxic to the drinking water supply. For a list of salt suppliers that offer NSF-60 listed salt, refer to the NSF web site at www.nsf.org. Product and service listings may be found at http://www.nsf.org/business/search_listings/.

MIOX P/N: 106-00008-B

Appendix C

MSDS Sheets



MIOX Corporation
5601 Balloon Fiesta Parkway
Albuquerque, New Mexico 87113

Material Safety Data Sheet

SECTION 1 – CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: On-Site Generated Mixed Oxidant Solution or
On-Site Generated Sodium Hypochlorite Solution

Synonyms: Hypochlorite Solution, Mixed Oxidant Solutions,

Part Number: none

Chemical Family: Sodium Hypochlorite < 0.9%

Manufacturer's Name: MIOX Corporation

Address: 5601 Balloon Fiesta Parkway

Product Information Phone Number: 1-866-MIOX-HLP (866-646-9457)

Revision Date: 1/24/2011

SECTION 2 – COMPOSITION INFORMATION

Chemical Name	Percent by Weight	CAS#
Water	> 96.1%	7732-18-5
Sodium chloride	< 3.0%	7647-14-5
Sodium hypochlorite	< 0.9%	7681-52-9
Other Oxidant Species	trace	N/A

SECTION 3 – HAZARDS IDENTIFICATION

Appearance & Odor: Colorless to light yellow-green liquid with chlorine-like odor.

Emergency Overview: Information reported in this MSDS is based on the presence of sodium hypochlorite in the solution. Although concentrated sodium hypochlorite is a corrosive chemical, a <0.9% solution (as Free Available Chlorine (mass/volume)) is not expected to cause more than mild irritation to normal, undamaged skin but severe irritation to eyes, respiratory tract, and digestive system. Acid contamination will produce irritating chlorine fumes.

Fire & Explosion Hazards: This product is non-flammable and non-combustible. Vigorous reaction is possible with organic materials or strong reducing agents that may result in fire.

Primary Route(s) of Exposure: skin and eye contact, ingestion, inhalation of vapors

Inhalation – Acute Effects: Inhalation of vapors causes coughing and choking, burning sensation, labored breathing, shortness of breath, severe respiratory tract irritation, and pulmonary edema.

Skin Contact – Acute Effects: Skin contact may cause severe irritation, redness, blisters and dermatitis.

Eye Contact – Acute Effects: Eye contact causes severe irritation with redness and pain.

Ingestion – Acute Effects: Ingestion may cause pain and inflammation of the digestive tract; erosion of mucous membranes; vomiting; cold and clammy skin; shallow respiration; confusion; delirium and coma. See Section 11 for additional information.

Other Hazards: Hazards associated with On-Site Generation of chemicals are largely associated with the hydrogen gas that is generated during the electrolytic process. Please consult MIOX for more information on hydrogen safety, as it is outside of the scope of this document.

SECTION 4 – FIRST AID MEASURES

Inhalation: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, provide oxygen. Get medical attention immediately.

Ingestion: If swallowed, do not induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact: Immediately remove clothing from affected area and wash skin for 15-20 minutes with flowing water. Clothing should be discarded or washed before reuse. Obtain medical attention if irritation occurs. Do not instruct person to neutralize affected skin area.

Eye Contact: Immediately flush eyes with plenty of water for at least 15 minutes, while holding eyes open. Contacts should be removed before or during flushing. Do not instruct person to neutralize. Get medical attention immediately.

Note to Physician: Sodium hypochlorite is an alkaline corrosive. For exposure by ingestion do not use emesis, lavage or acid antidotes. Dilute immediately by giving milk, melted ice cream, beaten egg white, starch paste or antacids such as milk of magnesia, aluminum hydroxide gel, or magnesium trisilicate gel. Avoid sodium bicarbonate because of carbon dioxide release. Sodium thiosulfate solution may prove beneficial by reducing unreacted material.

SECTION 5 – FIRE FIGHTING MEASURES

Flash Point/Method: N/A

Auto Ignition Temperature: N/A

Upper/Lower Explosion Limits: N/A.

Extinguishing Media: Use media appropriate for surrounding fire.

Fire Fighting Procedures: Use self-contained breathing apparatus and full protective equipment. Acid contamination will produce irritating chlorine-like fumes.

Fire & Explosion Hazards: This product is non-flammable and non-combustible. Vigorous reaction is possible with organic materials or strong reducing agents that may result in fire.

Hazardous Products of Decomposition and/or Combustion: Oxygen and chlorine are hazardous products of decomposition of sodium hypochlorite.

Special Information: Hazards associated with On-Site Generated Mixed Oxidant Solution or On-Site Generated Sodium Hypochlorite Solution are largely associated with the hydrogen gas that is generated during the electrolytic process. Please consult MIOX for more information about hydrogen safety, as it is outside of the scope of this document.

NFPA Ratings: Health-1 Flammability-0 Reactivity-0 Other-None

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Collect liquid in an appropriate container or absorb with an inert material (e. g., dry sand, vermiculite, earth). Ventilate area of leak or spill, and prevent contact with incompatibles. Clean up spills immediately and wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible, and dispose of in compliance with all Federal, State, Local, and Provincial laws and regulations (Regulations may vary in different locations). Do not allow to enter streams, rivers, lakes, or other similar bodies of water. Waste characterization and compliance with applicable laws are the responsibility of the waste generator.

SECTION 7 – HANDLING AND STORAGE

Handling: Wear appropriate personal protective equipment. Avoid contact with materials that are incompatible or prone to corrosion. Avoid breathing vapor, mist, or gas. Prevent contact with eyes, on skin, or on clothing. Do not ingest or inhale. Use with adequate ventilation.

Storage: Store in a cool, dry, well-ventilated area away from incompatible substances. Do not store near chemicals that may react if spillage/leakage occurs. Keep container tightly closed.

Other Comments: This substance can decompose on heating or on contact with acids or reducing materials, producing corrosive gases including chlorine. This substance is a strong oxidant.

SECTION 8 – PERSONAL PROTECTION/ EXPOSURE CONTROL

Personal Respirator: None required under normal use conditions. Use NIOSH/MSHA approved organic vapor-acid-gas respirator with filter (qualified to wear respirator) during large spill clean-up or other conditions that might produce irritating chlorine-like fumes (e.g., reactions with incompatibles).

Skin Protection: Wear latex, neoprene, or rubber gloves and other protective clothing as appropriate to prevent skin contact.

Eye Protection: Safety glasses with face shield is recommended.

Ventilation Protection: Use local exhaust at points of vapor emission.

Other Protection: Safety showers and eye wash fountains, or other means of washing the eyes with a gentle flow of cool to tepid tap water should be readily available in all areas where this material is handled or stored.

Exposure Limits: No exposure limits have been developed for sodium chloride or sodium hypochlorite.

SECTION 9 – PHYSICAL AND CHEMICAL PROPERTIES

Appearance & Odor: Colorless to light yellow-green liquid with chlorine-like odor.

Vapor Pressure and Density: not determined

Boiling Point: decomposes above 110°C

Melting Point: N/A

Specific Gravity: 1.03 @ 20°C

Solubility in Water: complete

Volatile Percentage: not determined

pH: 8 – 10.0

Flash Point/method: N/A

Auto Ignition Temperature: N/A

Upper/Lower Explosion Limits: N/A

SECTION 10 – STABILITY AND REACTIVITY

Stability: Stable under normal pressures and temperatures. Slowly decomposes on contact with air.

Decomposition rate increases with concentration, decreased pH, and elevated temperature. Exposure to sunlight and heavy metals also accelerate decomposition.

Hazardous Decomposition Products: Oxygen and Chlorine Gas.

Hazardous Polymerization: Not Expected

Incompatibilities: This material is incompatible with strong oxidizing agents, acids, heavy metals, reducing agents, organics, ether, and ammonia.

Conditions to Avoid: Avoid using combustible materials to absorb large spills. Avoid excessive heat or light exposure and contact with incompatibles.

SECTION 11 – TOXICOLOGICAL INFORMATION

Inhalation – Acute: Inhalation of vapors causes coughing and choking, burning sensation, labored breathing, shortness of breath, severe respiratory tract irritation, and pulmonary edema.

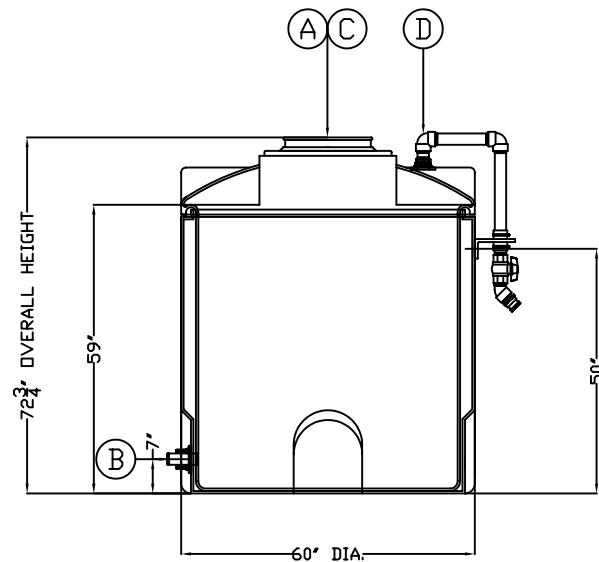
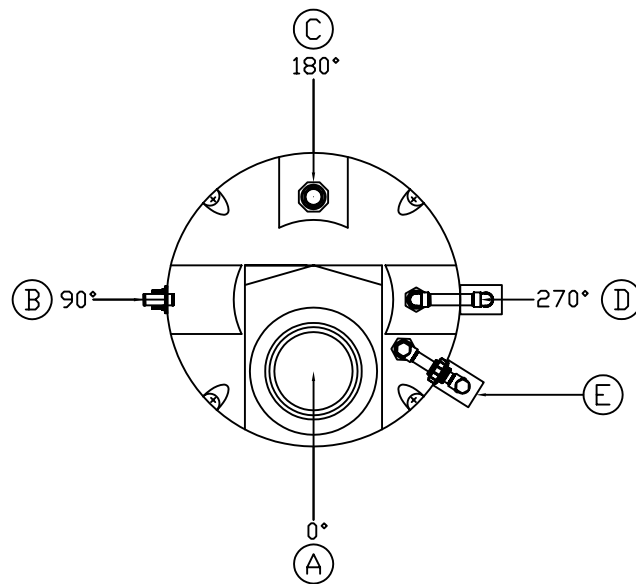
Inhalation – Chronic: No chronic inhalation effects of this product are known.

Skin Contact – Acute: Skin contact may cause severe irritation, redness, blisters and dermatitis.

Skin Contact – Chronic: Repeated or prolonged skin contact may cause skin sensitization.

SECTION 7

550 – GALLON CHEMICAL STORAGE TANK



ACCESSORIES					
MK	SIZE	DESCRIPTION	DEG	ELEV	DOM
A	16"	LEVER LOCK COVER	0°	-	X
B	2"	TITANIUM DW DM W/ VITON (OUTLET)	90°	7"	-
C	3"	PVC BHF W/ VITON (VENT)	180°	-	X
D	2"	PVC BHF W/ VITON & PVC FILL LINE ASSEMBLY W/ TITANIUM-VITON (FILL)	270°	-	X
E	2"	REVERSE FLOAT LEVEL INDICATOR	300°	-	X
F	-	GALVANIZED SEISMIC RESTRAINT (REFER TO TDA 003)	-	-	-

NOTES:

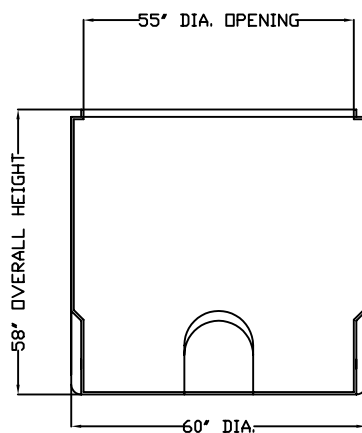
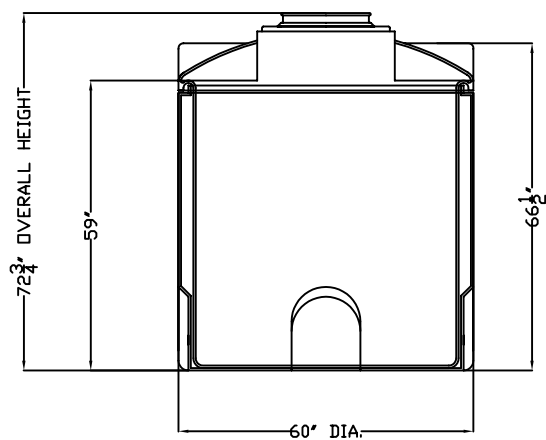
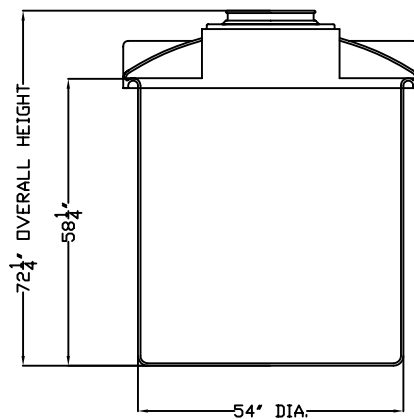
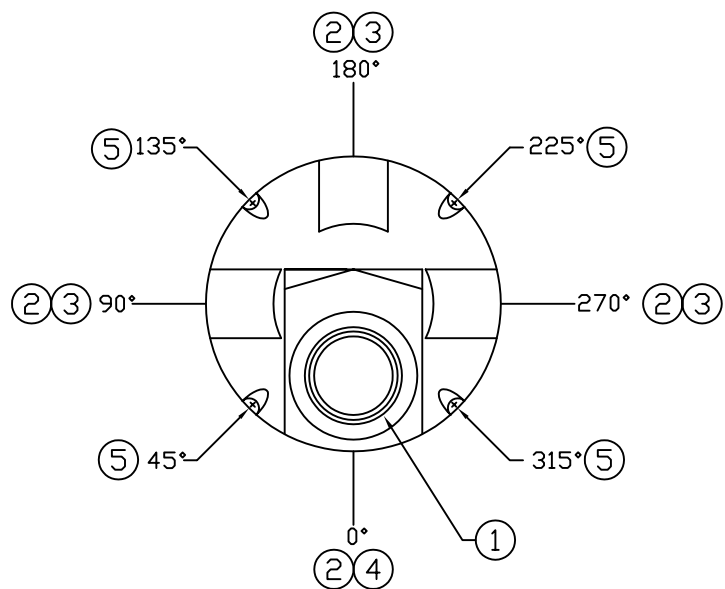
- 1 LOCATE FITTINGS FROM PLAN VIEW.
- 2 TANK(S) MUST BE INSTALLED PER ASSMANN CORPORATION USAGE & GUIDELINES.
- 3 FLEXIBLE EXPANSION JOINTS MUST BE USED ON ALL SIDEWALL CONNECTIONS.
- 4 TANKS ARE BUILT PER ASTM D 1998.

Released for Production:

Released By: M.COMBS

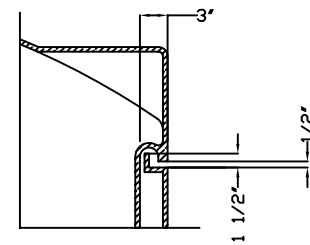
Date: 11/16/2011

REV	REVISION DESCRIPTION				REV DATE	
 Assmann CORPORATION OF AMERICA 300 N TAYLOR ROAD GARRETT, IN 46738 PHONE: (260) 357-3181 FAX: (260) 357-3738					SALES ORDER 60918	
OVERALL TANK WEIGHT 260 LBS.						
PRIMARY VESSEL		SPECIFIC GRAVITY 1.9 SP.G. MAX		SECONDARY VESSEL		
RESIN USED: SCHULINK XL 350		TANK WEIGHT 130 LBS.		RESIN USED: SCHULINK XL 350		
CROSSLINK POLYETHYLENE		TANK COLOR NATURAL		CROSSLINK POLYETHYLENE		
				TANK COLOR NATURAL		
TITLE IMT 550				DRAWN BY: M.COMBS		
DOUBLE WALL STORAGE TANK				DRAWN DATE: 11/16/2011		
HOPKINS TECHNICAL PRODUCTS				DWG NUMBER: 201110740		
ALL DIMENSIONS ARE IN INCHES AND ARE ±3%				REV -		

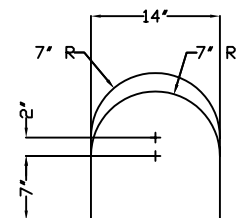
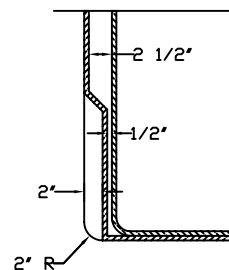


ACCESSORIES

MK	SIZE	DESCRIPTION	DEG	ELEV	DOVE



LIP DETAIL



FLAT SPOT DETAIL

NOTES:

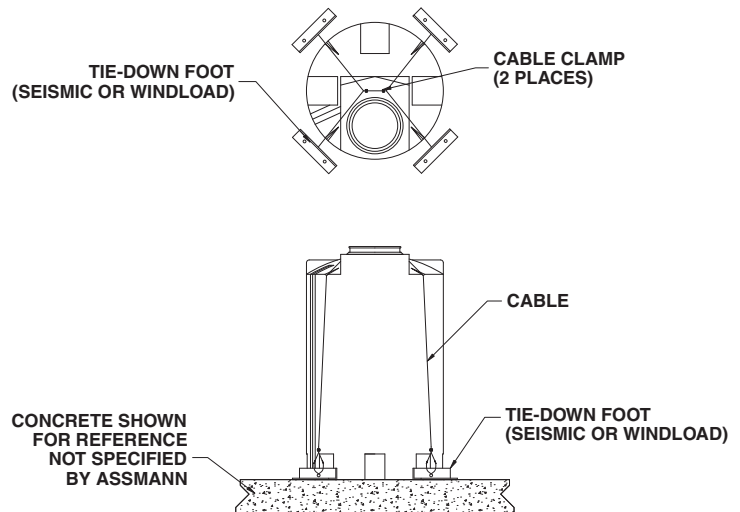
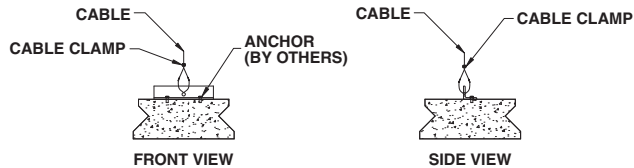
- 1 16" MANWAY W/ LEVER LOCKING COVER
OPTIONAL 21" THREADED
- 2 LOWER FLAT SPOT (4 PLACES)
- 3 14" X 14" DOME FLAT SPOT (3 PLACES)
- 4 28" X 30" MANWAY FLAT
- 5 LIFTING LUG ASSEMBLY (4 PLACES)

A	INSERTED A NEW TITLE BLOCK			06/12/08 MG	
REV	REVISION DESCRIPTION			REV DATE	
 Acor Mann CORPORATION OF AMERICA 300 N TAYLOR ROAD GARRETT, IN 46738 PHONE: (260) 357-3181 FAX: (260) 357-3738				SALES ORDER	
				OVERALL TANK WEIGHT	- LBS.
PRIMARY VESSEL		SPECIFIC GRAVITY -	SP.G. MAX	SECONDARY VESSEL	
RESIN USED		TANK WEIGHT	- LBS.	RESIN USED	
- POLYETHYLENE		TANK COLOR	-	TANK WEIGHT - LBS.	
				TANK COLOR -	
				- POLYETHYLENE	
TITLE IMT 550				DRAWN BY: D. CRAGER	DRAWN DATE: 10/01/96
DOUBLE WALL STORAGE TANK				DWG NUMBER:	REV
				IMT 550 A	
ALL DIMENSIONS ARE IN INCHES AND ARE ±3%					

Tie-Down Assemblies

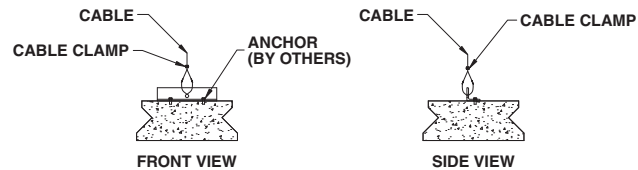
Seismic Zone 4

Seismic restraint assemblies are designed to handle seismic loads up to and including zone 4. Materials of construction consist of: 316 Stainless Steel or Mild Steel with epoxy coating and galvanized cables.

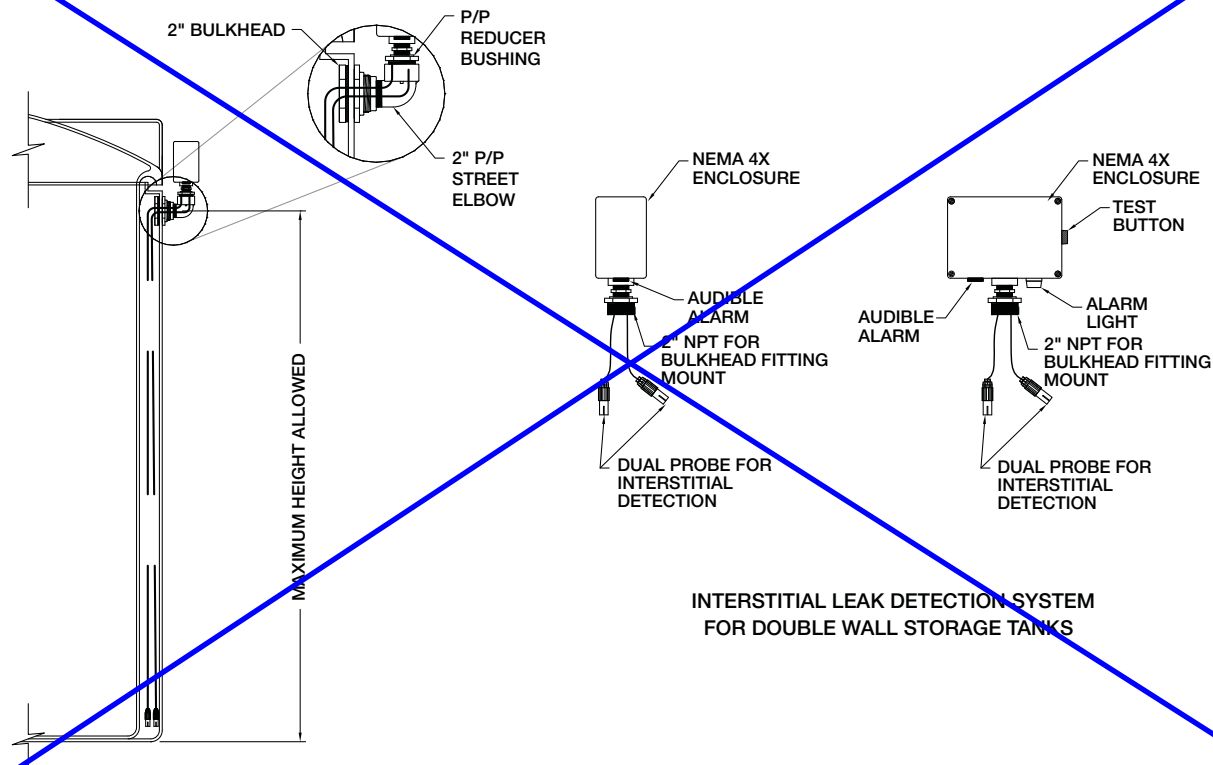


120 MPH Wind Load

Wind load tie down assemblies are capable of handling winds up to and including 120 MPH. Materials of construction consist of: 316 Stainless Steel or Mild Steel with epoxy coating and galvanized cables.



Leak Detection



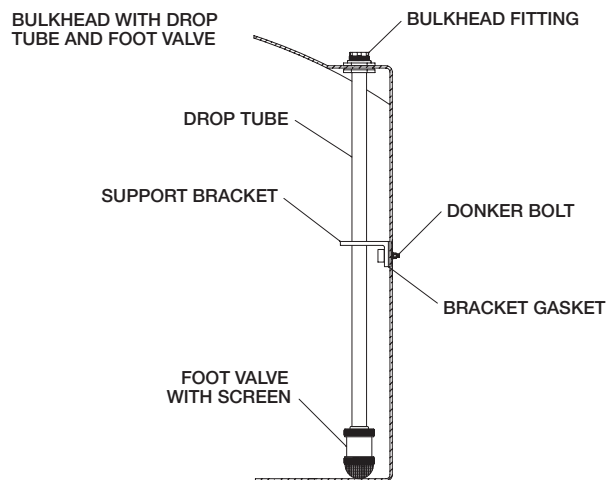
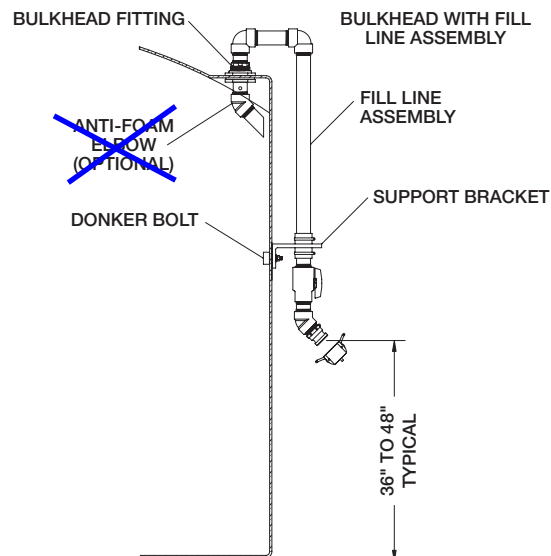
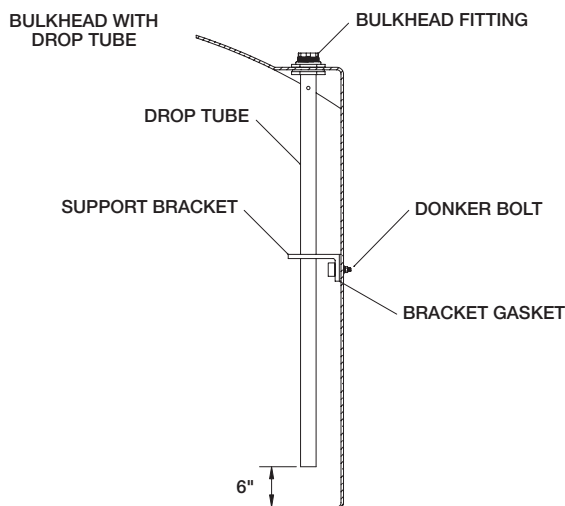
INTERSTITIAL LEAK DETECTION SYSTEM
FOR DOUBLE WALL STORAGE TANKS

- **Fill Line Assemblies**
- **Drop Tube Assemblies**

These assemblies make it possible to fill the tank from a convenient position outside the tank. They do not include through-wall fittings. The fill line consists of an exterior drop tube, 90° elbow, ball valve, male quick disconnect coupling, dust cap and exterior pipe support bracket. The interior assembly consists of drop tube and pipe support bracket. Gasket and bolts must be ordered separately.

Optional union may be ordered with exterior fill line. When ordering exterior fill line and interior drop tube together, order one gasket and one set of two bolts.

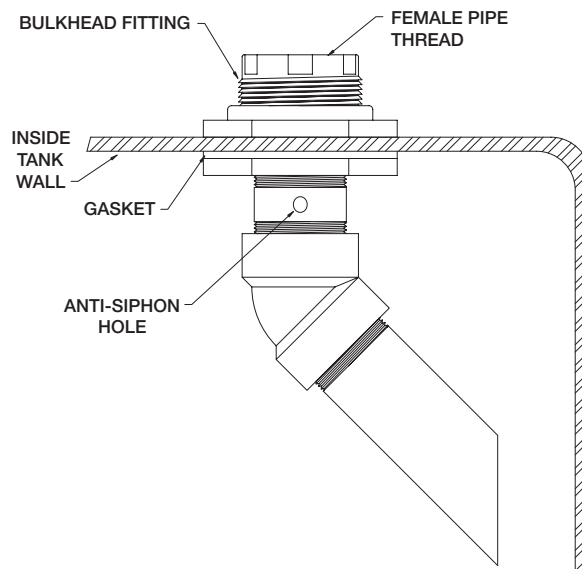
Fill Line and Drop Tube Assemblies Available Sizes (inches)			
Size	1	2	3



Anti-Foam Elbow

This assembly with 45° elbow and nipple extends to within 3" of the tank wall, directs liquid to run smoothly down the interior surface of the tank. This will reduce the generation of foam on the surface of the contents. Through-wall fitting is not included and must be ordered separately.

Anti-Foam Elbow Available Sizes (inches)				
Size	1	2	3	4



These unique tanks are built to last!

Reverse Float Level Indicator

Designed to show liquid level in the tank without having chemical outside the secondary containment. System has a large rotationally molded float that rides within the primary tank and a bright orange target that shows the liquid level on the exterior of the tank.

This design works in reverse. When the chemical tank is full, the exterior target will be at the base of the tank. When empty, the bright orange target is at the top of the tank, where clearly visible.



Double Wall Tank Metallic Nozzles

Assmann designed bottom outlets, along with molded-in lower fitting flats, reduce the cost of expensive double wall outlets. These all metallic nozzles available in 316 stainless steel, Titanium or Hastelloy C-276. These fittings provide the through tank wall connection for applications where tank cross section should not be exposed.

There are three types available in nine sizes:

Male Fitting: Male pipe thread outside tank wall only.

Female Fitting: Female pipe thread inside and outside of tank wall.

Double Male Fitting: Male pipe thread inside and outside of tank wall.

The flange adapter and siphon drain (if applicable) can be applied to all three fitting types listed above.



Fiberglass Reinforced Ladder Assemblies

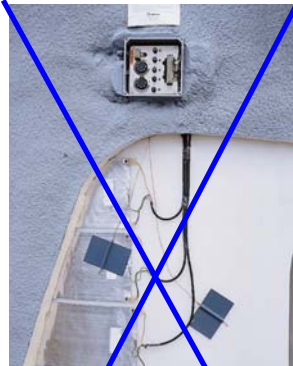
FRP Ladders conform to OSHA requirements. Ladder assemblies are available in three configurations: ladder w/platform, straight ladder w/cage and ladder w/cage and platform.

These ladders are designed to terminate 48" below the tank roof. This allows personnel to view the roof of the tank, but deters them from walking on or entering the tank.



Ultrasonic Level Indicating Device

Liquid level indication with digital display in gallons.



Heat Tracing & Insulation

Available for use with temperature sensitive chemicals.

Contact Assmann today.
Call, fax, e-mail or visit us on the internet.



Certified to NSF/ANSI 61



Assmann Corporation of America
300 N. Taylor Road, Garrett, IN 46738

Phone: 888-357-3181 • Fax: 888-Tank Fax (826-5329)

Phone: 260-357-3181 • Fax: 260-357-3738

E-mail: info@assmann-usa.com

Internet: www.assmann-usa.com

Manufacturing facilities in Garrett, IN and Marshall, TX

Authorized Distributor:

SECTION 8

CHLORINE RESIDUAL ANALYZERS

Chlorine Residual Analyzer**Specification Data Sheet**

Date:	08/17/11				
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano				
Contractor Order No:	1108.1				
HTP Project No:	PJ-11008				
Plant:	See Below				
Specification Section:	11530 - Hypochlorite Dilution System				
Revision	By	Date	Description	Notes	
0	RMH	08/17/11	"For Approval"		
A	Design Conditions				
1	Quantity	1	1	1	
2	Analyzer Tag Number	AE/AIT-30	AE/AIT-32	AE/AIT-33	
3	Location	Well 30	Well 32	Well 33	
4	Model Number	D1CBW	D1CBW	D1CBW	
5	Chemical Residual	Cl ₂	Cl ₂	Cl ₂	
6	Power Requirements	120 VAC	120 VAC	120 VAC	
7	Sensor Connection	Standard	Standard	Standard	
8	Correcting Value	No	No	No	
9	Feed Forward Control	No	No	No	
10	Pause Control	No	No	No	
11	Signal Output	4 – 20 mADC	4 – 20 mADC	4 – 20 mADC	
12	Relay Output	Alarm Relay	Alarm Relay	Alarm Relay	
13	Pump Pacing	None	None	None	
14	Control Action	Measured Value	Measured Value	Measured Value	
14	Probe Housing	DGMA	DGMA	DGMA	
15	Probe Type	CLO	CLO	CLO	
16	Mounting	PP Backboard	PP Backboard	PP Backboard	
17					
B	Options Included		D		
15			18		
16			19		
17			20		
18			21		
Referenced Documents		Document Number		Notes	
				10PPM probe will be supplied but system will be	
				Ranged 0 - 5 PPM	
Chemical Service Legend					
Abbreviation	Chemical Service		Abbreviation	Chemical Service	
Cl ₂	Chlorine				

8.3 DULCOMETER® Single-channel measuring and control unit, type D1Cb, for all measured variables

8.3.1

Single-channel controller, type D1Cb, for all measured variables

NEW

- flexible upgradability thanks to subsequent release option for functions via activation key (s. D1Ub upgrade Identcode Chap. 8.2.3)
- equipped for the most important basic requirements in water treatment
- large, illuminated graphic display
- operator guidance with full text menu in 14 languages integrated in the controller
- automatic puffer detection for pH

Standard configuration

The following functions are included in the D1Cb controller (the measured variables depend on the type of connection of the measured variable)

- all 23 operator languages in the memory
- type of connection mV: changeover between pH and ORP
- type of connection standard signal: all 8 amperometric measured variables such as chlorine, chlorine dioxide ect. and pH, ORP and conductivity via mA in memory
- 2 power relays for limit value monitoring or timer function
- metering time monitoring with deactivation of the controller output
- extended range voltage supply: 90-253 V, 50/60 Hz
- mA sensor input protected against short-circuit and polarisation reversal

Applications

- Waste water treatment
- Cooling water treatment
- Drinking water treatment
- Neutralisation

8.3 DULCOMETER® Single-channel measuring and control unit, type D1Cb, for all measured variables



P_DM_0016_SW

Technical Data

Measurement range

Type of connection mV:

pH 0.00 ... 14.00

ORP - 1000 ... +1000 mV

Type of connection mA:

Chlorine: 0.00...~~0.500/2.00/5.00/10.0/20.0/50.0/100.0~~ ppm

Chlorine dioxide: 0.00...0.500/2.00/10.0/20.0 ppm

Chlorite: 0.02...0.50/0.1...2 ppm

Bromine: 0.02...2.0/0.1...10.0 ppm

Ozone: 0.00...2,00 ppm

Hydrogen peroxide, sensor PER1: 2.0...200.0/20...2,000 ppm

Hydrogen peroxide, sensor PEROX: 0...20/200/2,000 ppm, 1 vol. %

Peracetic acid: 1...20/10...200/100...2,000 mg/l

Dissolved oxygen: 0.1...10/0.1...20 ppm

pH: 0.00...14.00

ORP: 0...+1.000 mV

Conductivity: 0...20/200/1,000 mS/cm

Temperature: 0...100°C

Resolution

pH: 0,01 pH

ORP: 1 mV

Amperometric (e. g. chlorine): 0,001/0,01 ppm, 0,01 Vol. %

Accuracy

0.5 % of measuring range

Measurement input

SN6 (input resistance > 0.5 x 10¹² Ω)

Correction variable

Temperature via Pt 100/Pt 1000

Correction range

0 ... 100 °C

Disturbance signals

-

Control characteristic

P/PID control

Control

2-way control

Signal current output

1 x 0/4-20 mA galvanically isolated

max. load 600 Ω

Adjustable range and allocation (measured variable, correction variable, controlled variable)

Control outputs

2 pulse frequency outputs for metering pump actuation

2 relays (limit value or pulse length)

1 x 0/4 ... 20 mA

Alarm relay

250 V ~ 3 A, 700 VA changeover contact

Electrical connection

90 - 253 V, 50/60 Hz

Ambient temperature

Wall mounting: -5 ... 50 °C

Enclosure rating

Wall mounting: IP 65

Dimensions

Wall mounting: 198 x 200 x 76 mm (WxHxD)

Order no.

Mounting kit for control panel installation

792908

A complete measurement station comes with:

- Measuring transducer/controller D1Cb (see Identcode)
- Fitting: DGMa..., DLG III ..., immersed fitting
- pH sensor (corresponding to Identcode)
- ORP sensor (corresponding to Identcode)
- Chlorine, chlorine dioxide, chlorite, bromine, dissolved oxygen sensor
- Transducer for pH or ORP (corresponding to Identcode)
- Sensor cable

Accessories

Order no.

Cable combination coax 0.8 m - pre-assembled

1024105

Cable combination coax 2 m- SN6 - pre-assembled

1024106

Cable combination coax 5 m- SN6 - pre-assembled

1024107

SN6 connection, refitting

1036734

8.3 DULCOMETER® Single-channel measuring and control unit, type D1Cb, for all measured variables

8.3.2 Identcode Ordering System – Basic Single Channel Controller

DULCOMETER® Controller D1Cb Series

D1Cb	Installation	W	Wall mounting (IP 65)
	Version	00	With ProMinent logo
	Power supply	6	90...253 V, 48/63 Hz (wide-range power supply)
	Approvals	01	CE approval
	Hardware add-on I	0	None
	Hardware add-on II	0	none
	External connection	0	None
	Software defaults	U	No default setting (all of the following selection options are automatically set to the basic setting)
	Software pre-set	V	Software pre-set
	Measured variable presetting		
		0	universal
		A	Peracetic acid
		B	Bromine
		C	Chlorine
		D	Chlorine dioxide
		F	Fluoride
		H	Hydrogen peroxide
		I	Chlorite
		P	pH
		R	ORP
		S	0/4...20 mA Standard signal, general
		T	Temperature
		X	Dissolved oxygen
		Z	Ozone
		L	conductivity
	Measured variable connection	1	Standard signal 0/4-20 mA, all measured variables
		5	mV input for pH/ORP via terminal
	Correction variable	0	None
		2	Temperature Pt 100 via terminal (for pH and conductivity)
		4	Manual temperature entry (for pH and conductivity)
	Control input	0	None
		1	Pause
		2	Pause or disturbance flow rate via frequency
	Signal output	0	None
		1	1 Analogue signal output 0/4...20 mA
	Relay control	G	Alarm and 2 limit value relays or 2 timer relays
		M	Alarm and 2 solenoid valve relays or 2 timer relays
	Pump control	0	None
		2	2 pumps via pulse frequency
	Control characteristic	0	None
		1	P-control
		2	PID control
	Language		
		00	no default
		DE	German
		EN	English
		ES	Spanish
		SV	Swedish
		PT	Portuguese
		CN	Chinese
		FR	French
		CZ	Czech
		JP	Japanese
		KR	Korean
		NL	Dutch
		NO	Norwegian
		PL	Polish
		RU	Russian
		TH	Thai
		HU	Hungarian
		IT	Italian
		DK	Danish
		FI	Finish
		GR	Greek

This Page intentionally left blank

ProMinent® DULCOTEST® accessories

pH, redox and chlorine sensor housings

Description

Part No.

DGM modular in-line sensor housings

These sensor housings may be ordered individually for single sensors, or connected together for multiple sensor applications. An optional flow meter (rotameter) is used for setting sample flow, and the optional flow sensor attachment to the flow meter has an adjustable switch that signals loss of flow. A flow control valve is standard with every housing, whether one module or multiple module. Other options include a sampling tap, calibration cup, bubble dispenser and reference potential plug.

The housings are ordered by identity code, page 35. Add mounting adapters as needed for PHEP sensors (15 mm) or CLE, CTE, CGE, CDE, CDP or OZE sensors (25 mm).

Specifications:

Weight: 0.55 lb. (249 g) (13.5 mm module)
1.05 lb. (475 g) (25 mm module)

Material: PVC/Viton®

Max. Temperature: 140°F (60°C)

Max. Pressure: 87 psig (6 bar) at 86°F (30°C)
14.5 psig (1 bar) at 140°F (60°C)
29 psig (2 bar) with flow monitor

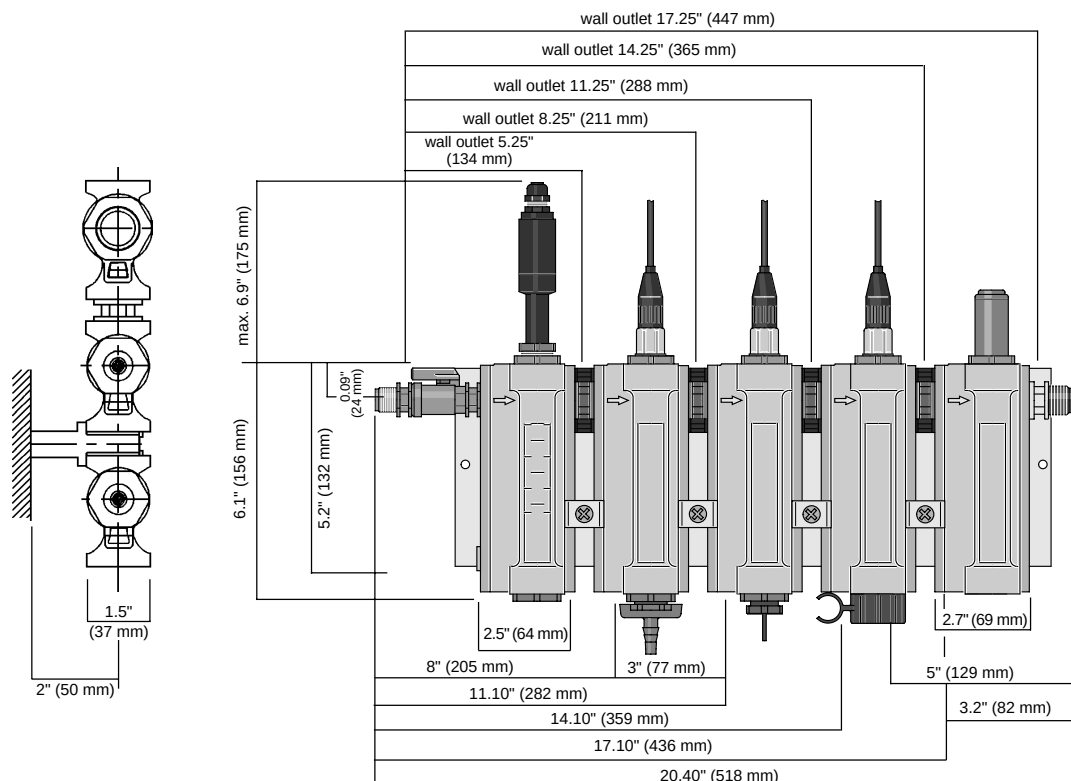
Recommended Sample Flow: 10.5 gph (40 l/h)

~~Flow Sensor Switch: Reed switch (max. making and breaking capacity 3W
max. switching voltage 175 V
max. switching current 0.25 A
max. permanent current 1.2 A
max. contact resistance 150 mOhm) n/o or n/c~~

In processes for water with a lot of air or pressure changes an accumulator should be used on the inlet of the DGMa probe holder.

Accumulator (10 cu. in.)

7253216



Identity code ordering system for ProMinent® DGM in-line sensor housings

ProMinent®

DGM	Series: In-line sensor housing	
A	Series version: Standard	
	Module for flow measurement (Rotameter): 0 None 1 With scale L/h 2 With scale gph 3 With flow sensor, scale L/h 4 With flow sensor, scale gph	
	Number of modules with PG 13.5 thread (pH, ORP, PT 100, conductivity sensors, or PHEP sensor with optional mounting set): 0 None 1 One module, PG 13.5 2 Two modules, PG 13.5 3 Three modules, PG 13.5 4 Four modules, PG 13.5 Note: Add 15 mm mounting set for PHEP/RHEP sensor, if used.	
	Number of modules with 25 mm thread (CLE, CTE, CGE, CDE, CDP or OZE sensors) 0 None 1 One module, 25 mm * 2 Two modules, 25 mm * * 25 mm mounting set necessary	
	Material: T PVC-transparent Note: Other materials by request	
	Sealing material: 0 Viton® Viton® is a registered trademark of DuPont Dow Elastomers	
	Connection type: 0 1/2" x 3/8" tubing adapters 1 PVC half-union connections with 1/4" MNPT adapters	
	Version: 0 Standard	

Recommended accessories:

Part No.

Mounting set for sensor 15 mm (PHEP/RHEP):	791219
Mounting set for sensor 25 mm (CLE, CTE, CGE, CDE, CDP, OZE):	791818
If liquid reference potential is necessary Reference potential plug w/SS pin	791663
Flow Sensor (spare)	791635
Calibration Cup (spare)	791229
Bubble disperser for Cl sensor	740207
Bubble disperser for pH, Redox sensors	791703
PG 13.5 Sampling Tap	1004737
25 mm Sampling Tap	1004739

DGM A 1 1 0 T 0 0 0

DULCOTEST® Chlorine sensors

Description

Part No.

DULCOTEST® total chlorine sensor (CTE)



CTE 1 - mA

Membrane-covered amperometric sensor for determining free chlorine plus combined chlorine in water. Total chlorine equals free chlorine plus combined chlorine. The sensor has an integrated preamplifier including automatic temperature correction. The zero stability is very high so that a zero calibration is not necessary.

The CTE 1-mA sensor is equipped with a passive 4-20 mA interface for two-wire connection on controllers with a supply voltage of 16-24 VDC (e.g. D1C). The sensor is also equipped with a terminal strip and cable gland for cable connection. **Without cable and holder.**

The CGE 2-4P sensor has a 4-pole plug-in connector and is used with the CLWS series controller and CLD pump. **Without cable and holder.**

pH range:	pH 5.5-9.5
Temperature:	41-115°F (5-45°C)
Max. pressure:	40 psig (3 bar), 14.5 psig (1 bar) recommended
Flow rate:	8-16 GPH (30-60 L/h) minimum recommended in "in-line" sensor housing type DLG III or DGM

The 4-20 mA output corresponds to approx. chlorine value (not calibrated), it roughly corresponds to the sensor signal at pH 7.2 in new condition. The slope calibration (DPD 4) then takes place on the controller.

Type CTE 1 - mA

Complete with electrolyte (50 mL) and membrane cap

4-20 mA (DIC)	Measuring Range	
Type CTE 1 - mA - 10 ppm	0.1 - 10 mg/L	740684
Type CTE 1 - mA - 5 ppm	0.05 - 5 mg/L	1003203
Type CTE 1 - mA - 2 ppm	0.02 - 2 mg/L	740685
Type CTE 1 - mA - 0.5 ppm	0.01 - 0.5 mg/L	740686

Type CGE 2 - 4P

Complete with electrolyte (50 mL) and membrane cap

4-pole (WS)		
Type CGE 2 - 4P	0.1 - 10 mg/L	792838

For installation in the DGMa or DLG housing, a threaded adapter set is required (see sensor housing section).

Consumable material:

For 2 ppm, 5 ppm and 10 ppm sensors:

Spare parts kit (2 membrane caps and 50 mL electrolyte)	740048
Membrane Cap (color: orange)	792862
Electrolyte (50 mL)	792892

For 0.5 ppm sensor:

Spare parts kit (2 membrane caps and 50 mL electrolyte)	741277
Membrane Cap (color: blue)	741274
Electrolyte (50 mL)	792892

NOTE: The CTE total chlorine sensors are interchangeable with the ProMinent European CGE 2 "organic chlorine" sensors.

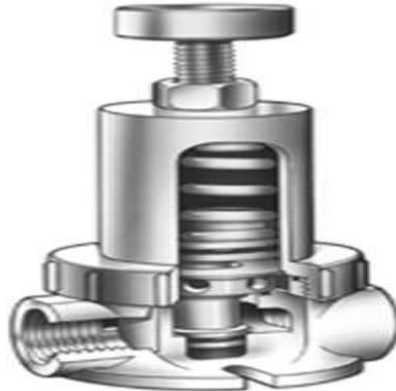


CGE 2-4P

This Page intentionally left blank

RK Industriesphone: (909) 947-5227
fax: (909) 947-3039**LPR**

PATENT NO. 4,276,902

Design Features

The R-K LPR series low pressure fluid pressure regulator is designed to protect piping systems and equipment from pressure changes.

The adjustable screw and lock nut makes it easy to convert varying upstream pressure into accurate pre-set downstream pressure.

Outlet pressure should be adjusted in a closed loop system within a range of 5-50 PSI.

Provides excellent flow at low range settings.

Top entry and parallel inlet and outlet ports to facilitate installation and avoid piping problems/ This patented pressure reducing valve is designed to keep the stainless steel spring totally isolated from the fluid chamber insuring no metal contact with the fluid.

It is ideally suited for most harsh chemicals, and for systems that require additional pressure protection.

Low Pressure Fluid Pressure Regulator**Specifications**

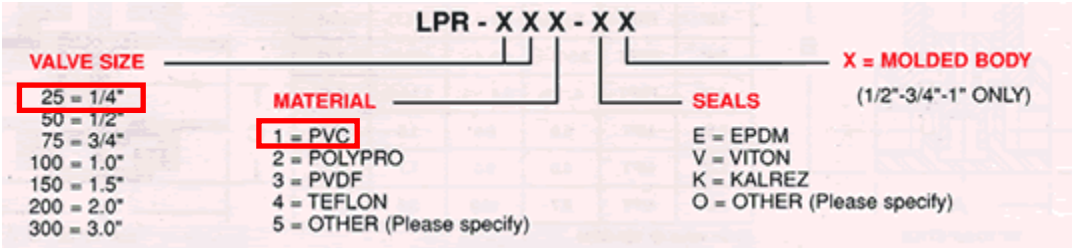
Upstream Pressure	Vacuum to 150 PSIG	
Regulated Pressure	5 to 50 PSIG	
Material	ValveBody	PVC Type 1, Grade 1
		Polypropylene
		PVDF
	Seal	Teflon
		EPDM
		Viton(R)
		Kalrez(R)
Temperature Range	0 F to 140 for PVC 0 F to 180 F for POLYPRO 0 F to 280 F for PVDF 0 F to 340 F for TEFLON	
Valve ports	1/4" to 1" Valve FNPT 1.5" to 2" Valve MPT All valves are fully ported	
Mounting Method	(4) 1/4" -20 tapped holes for standard machine valve body.	

(1/4" to 1.00")
(2) cut-out slots on molded
valve body (1/2" to 1.00")

Kalrez® and Viton® are registered trademarks of DuPont Dow Elastomers.

Order Information

The chart below will specify R-K standard valves regarding valve size, valve material,
and seal material.
For special orders, please consult the factory for pricing and delivery information.



Copyright © 2000 R-K INDUSTRIES [Buck Jariwala](#)

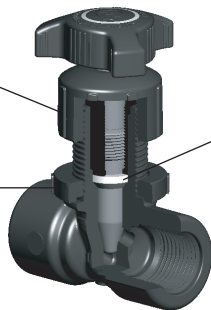
Features

□ Benefits

- **Needle Finish, SPI/SPE # 1**
Bubble tight, low torque shut-off
- **Proven three prong, star handle.**
Tri-Oval geometry
Fast open/close operation
Fine metering control
- **24 pitch metering thread**
20% finer control adjustment
- **Integrally designed panel mounting**
No fasteners required
Mounts to panel thicknesses
from 1/32" to 1/2"
- **PTFE, Teflon® sealed**
Chemical resistance
High Purity
- **No Elastomers (O-rings), metals or lubricants**
No corrosion
No contamination
- **Materials of Construction**
PVC is NSF Std 14 & 61 Rated
CPVC is NSF Std 14 & 61 Rated
PP is natural (unpigmented), reinforced
PVDF is NSF Std 14 & 61 Rated

Cap acts as
a gland nut. Any
seal wear is
compensated for
by simple hand
tightening.

Panel Nut Ring
for easy
mounting to
bracket or
panel.

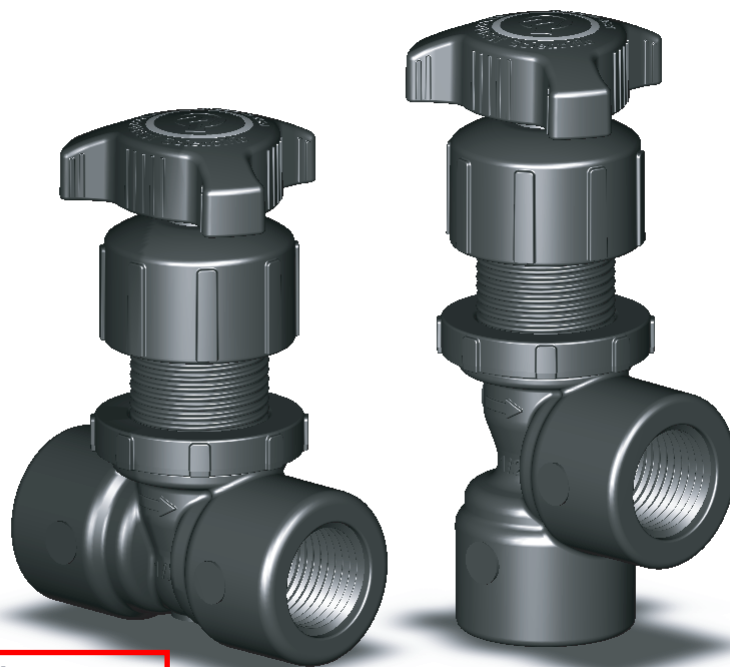


**Teflon® PTFE
Seal** isolates
stem threads
from fluid.

Materials: **PVC**, CPVC, PP, & PVDF

Connection Sizes: **1/4"**, 3/8", 1/2" FNPT

Tubing Connections Available!



Globe Pattern

Angle Pattern

Why Marquest Scientific Throttle Master Needle Valves?

The Throttle Master Line represents the latest in computer generated solid modeling and flow analysis. The developed metering chamber provides for the most reliable stabilization and linearity of flow. Ultimate cross sectional geometry allows the manufacturing process to attain full material property potentials for the most demanding applications.



Custom Handles & Colored Ring Inserts are Available.
Please Contact our Sales Department



MARQUEST S C I E N T I F I C
F L U I D H A N D L I N G P R O D U C T S

Body

- **PVC:** Polyvinyl Chloride
- **CPVC:** Chlorinated Polyvinyl Chloride
- **PP:** Polypropylene, unpigmented homopolymer, glass & mineral reinforced

Seal

- Virgin PTFE, Teflon®

Choice of three sizes

- 1/4" x 1/4" FNPT
- 3/8" x 3/8" FNPT
- 1/2" x 1/2" FNPT



Tubing Connections are available. Please visit www.marquestscientific.com for more info.

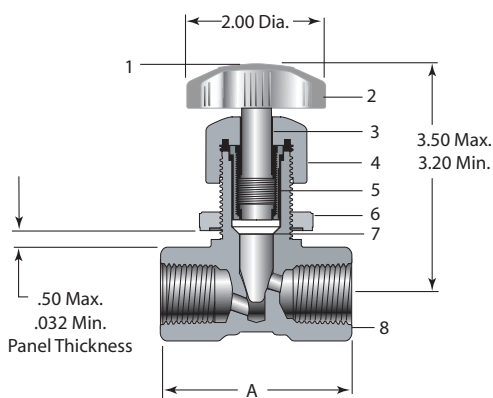
DIMENSIONAL DATA - inches

Dimensions

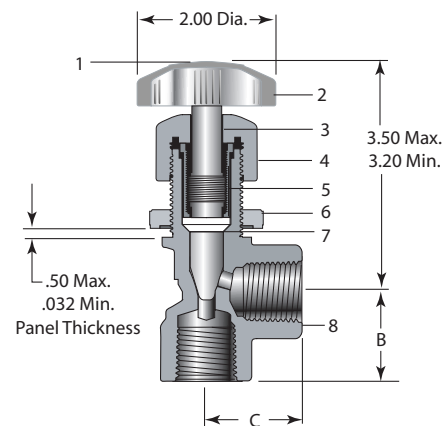
Size	A	B	C
1/4" FNPT	2.31	1.16	1.17
3/8" FNPT	2.39	1.19	1.21
1/2" FNPT	2.65	1.31	1.32

Parts List

1. Colored Ring Insert
2. Handle
3. Needle
4. Cap
5. Threaded Ring Insert
6. Panel Nut
7. PTFE Teflon Seal
8. Body



Globe Pattern

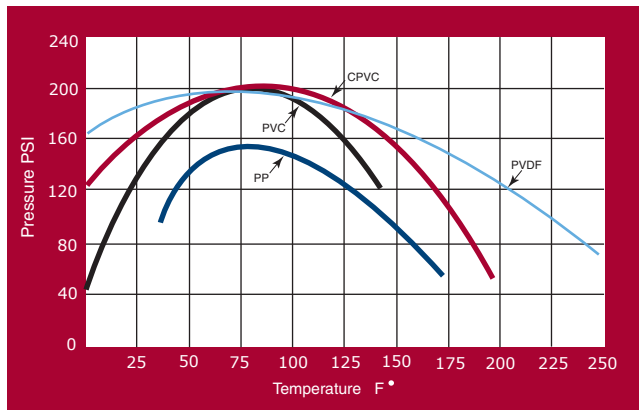


Angle Pattern

PRESSURE/TEMPERATURE RANGE

HOW TO ORDER

Non-Shock



Flow Data

	1/4"	3/8"	1/2"
	Globe Pattern	Angle Pattern	Globe Pattern
Orifices			
Inlet	0.187"	0.250"	0.218"
Outlet	0.187"	0.187"	0.218"
Cv	0.310	0.426	0.780

NG

500

PVC

Model Number

NG = Globe Pattern
NA = Angle Pattern

Connections

250 = 1/4" FNPT
375 = 3/8" FNPT
500 = 1/2" FNPT

Body Material

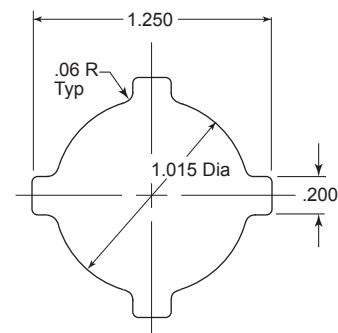
PVC = Polyvinyl Chloride
CPV = Chlorinated Polyvinyl Chloride
PPR = Polypropylene, unpigmented homopolymer, glass & mineral reinforced

Example Part Number **NG-500-PVC**

Globe pattern with 1/2" FNPT connections and a Polyvinyl Chloride Body

Mounting Template

When required, the template provides the outline of the hole and orientation slots for a panel or bracket mounting. The orientation slots may be cut in multiple positions to allow versatility in mounting the valve to accommodate the piping alignment requirements.



Come Visit Us

WWW.MARQUESTSCIENTIFIC.COM
WWW.NEEDLEVALVES.US



MARQUEST SCIENTIFIC

Fluid Handling Products

1702 East Via Burton Street Anaheim, CA 92806

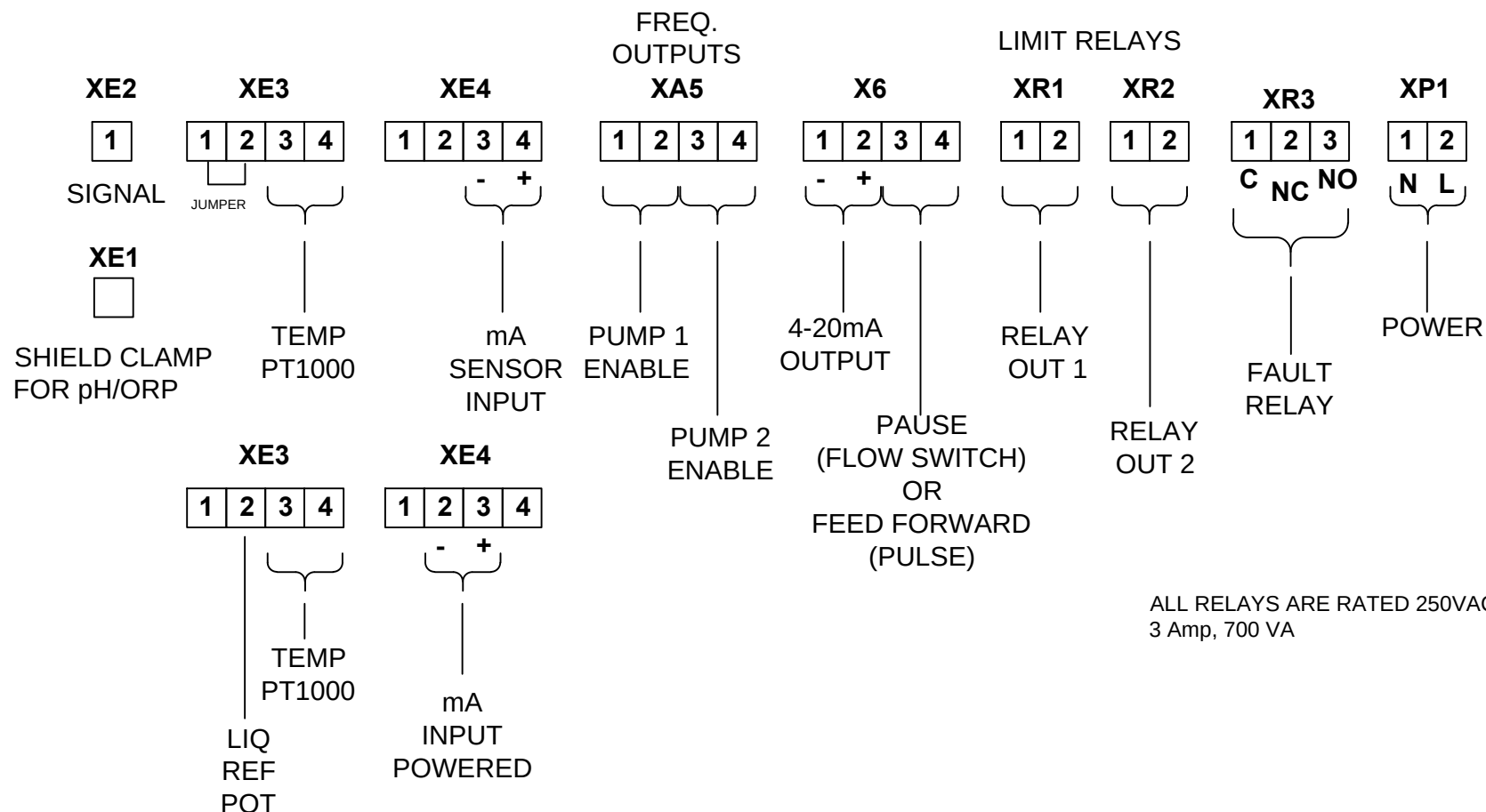
714-491-9191 Fax: 714-491-9199

e-mail: sales@marquestscientific.com



This Page intentionally left blank

D1CB CONTROLLER



NOTES:

1. Redox and pH must use the signal transducer for mA connection.
Part # pH-809126, Redox-809127

Warning:

If the D1C was calibrated in the Complete Menu the Zero point could change and the message "Slope Too Low" could appear during calibration.

Always calibrate in the Reduced Menu. See the instruction sheet on how to correct the problem.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

This Page intentionally left blank

Eye Contact – Acute: Eye contact causes severe irritation with redness and pain.

Ingestion – Acute: Ingestion may cause pain and inflammation of the mouth, pharynx, esophagus, and stomach; erosion of mucous membranes; vomiting; hemorrhage; circulatory collapse; cold and clammy skin; cyanosis and shallow respiration; confusion; delirium; coma; edema of pharynx, glottis and larynx with stridor and obstruction; and perforation of esophagus or stomach.

Ingestion – Chronic: No chronic ingestion effects of this product are known.

Carcinogenicity/Mutagenicity: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Reproductive Effects: No reproductive effects for this product are known

Neurotoxicity: None are known.

Other Effects: None are known.

Target Organs: skin, eyes, respiratory tract, and digestive system

SECTION 12 – ECOLOGICAL INFORMATION

This product is toxic to aquatic organisms. Do not allow to enter streams, lakes, etc.

SECTION 13 – DISPOSAL CONSIDERATIONS

Material that cannot be used or reprocessed for use, and empty containers should be disposed of in accordance with all applicable Federal, State, Local, and Provincial regulations. Product containers should be thoroughly emptied before disposal. NOTE: State and local regulations may be more stringent than federal regulations.

SECTION 14 – TRANSPORTATION INFORMATION

DOT Shipping Description: See product label and Bill of Lading.

SECTION 15 – REGULATORY INFORMATION

CERCLA SECTION 103 (40CFR302.4): yes CAS# 7681-52-9 RQ: 100 lbs.

SARA SECTION 302 (40CFR355.30): no

SARA SECTION 304 (40CFR355.40): no

SARA SECTION 313 (40CFR372.65): no

OSHA PROCESS SAFETY (29CFR1910.119): no

CALIFORNIA PROPOSITION 65: no

SECTION 16 – OTHER INFORMATION

Disclaimer: MIOX Corporation provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. It is the buyer's and/or user's responsibility to ensure that its activities comply with federal, state, provincial and local laws. MIOX CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MIOX CORPORATION WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

SECTION 9

CORPORATION
STOP

Corporation Stop**Specification Data Sheet**

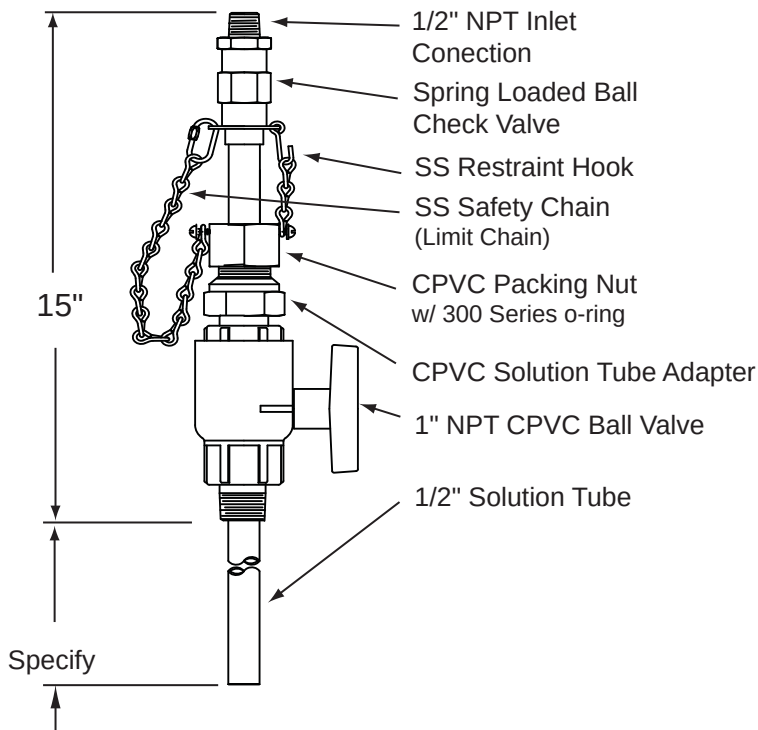
Date:	04/01/12				
Contractor / Customer:	Steve Dovali Construction Inc / City of Delano				
Contractor Order No:	TBD				
HTP Project No:	PJ-12001				
Plant:	Well 35 & Well 38				
Specification Section:	43 20 01 – Chlorination Equipment				
Revision	By	Date	Description	Notes	
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:	Saf-T-Flo				
Part #:	EB-164-CP-CP-6-CV-NL				
A	Design Conditions				
1	Quantity	1	1		
2	Tag Number	INJ-35	INJ-38		
3	Location	Well 35	Well 38		
4	Pump Tag Number	PMP-1/2	PMP-1/2		
5	Chemical	NaOCl	NaOCl		
6	Inlet Connection	1/2 - Inch	1/2 - Inch		
7	Corp Stop Size	1 – Inch	1 – Inch		
8	Process Pipe	CPVC	CPVC		
9	Solution Tube Size	1/2 - Inch	1/2 - Inch		
10	Saf-T-Seal	Viton	Viton		
11	Solution Tube Length	6-Inch	6-Inch		
12					
13					
B	Options Included		D	Options Included	
14			18		
15			19		
16			20		
17			21		
Referenced Documents		Document Number		Notes	
				Please Verify Solution Tube Length	
				Supplied unit meets the Zero Lead Rule for California	



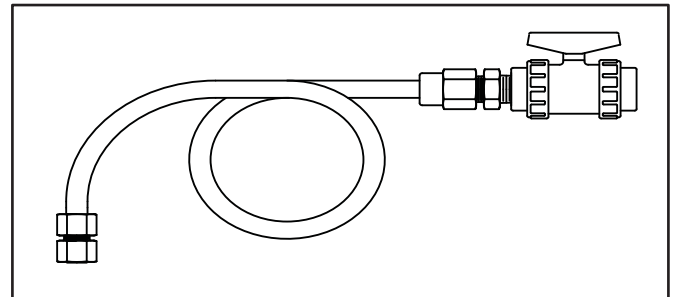
EB-164

1" All PVC Chemical Injection Assembly

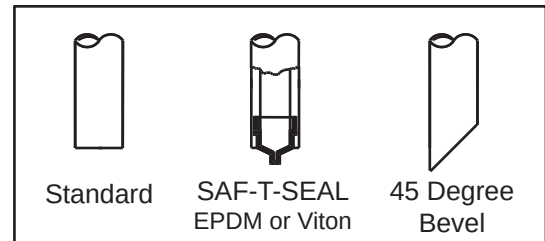
RATED TO 150 PSI.



Optional Flexible Hose Assembly



Tip Configuration



SAMPLE PART NUMBER

EB-164-CP-P-6-0-ASSY

BALL VALVE & COMPRESSION NUTS

CP = CPVC

SOLUTION TUBE MATERIAL

P = PVC

CP = CPVC

LENGTH OF SOLUTION TUBE INTO MAIN

Specify length in inches

ASSEMBLY OPTION

Includes fittings, tubing,
and ball valve
(O.D. or I.D. tubing to be specified)

TIP CONFIGURATION

0 = Standard

B = 45 Degree Bevel

CE = SAF-T-SEAL Tip (EPDM)

CV = SAF-T-SEAL Tip (Viton)

SECTION 10

CIRCULAR CHART RECORDER

Circular Chart Recorder
Specification Data Sheet

Date:		04/01/12			
Contractor / Customer:		Steve Dovali Construction Inc / City of Delano			
Contractor Order No:		TBD			
HTP Project No:		PJ-12001			
Plant:		Well 35 & Well 38			
Specification Section:		43 20 01 – Chlorination Equipment			
Revision	By	Date	Description		Notes
0	RMH	04/01/12	“For Approval”		
Equipment Data					
Manufacturer:		Honeywell			
Part #:		DR45AT-1000-00-000-0-000P0E-0			
A	Design Conditions				
1	Quantity	1	1		
2	Tag Number	AE/AIT-35	AE/AIT-38		
3	Location	Well 35	Well 38		
4	Chemical	NaOCl	NaOCl		
5	Power Requirements	120 Vac, 60 Hz	120 Vac, 60 Hz		
6	Signal Input	4 - 20 mADC	4 - 20 mADC		
7	Number of Inputs	1	1		
8	UL Listed	Yes	Yes		
9					
10					
11					
12					
13					
14					
B	Options Included		D	Options Included	
15			18		
16			19		
17			20		
18			21		
Referenced Documents		Document Number		Notes	

DR4500A Truline® Circular Chart Recorder

Specification

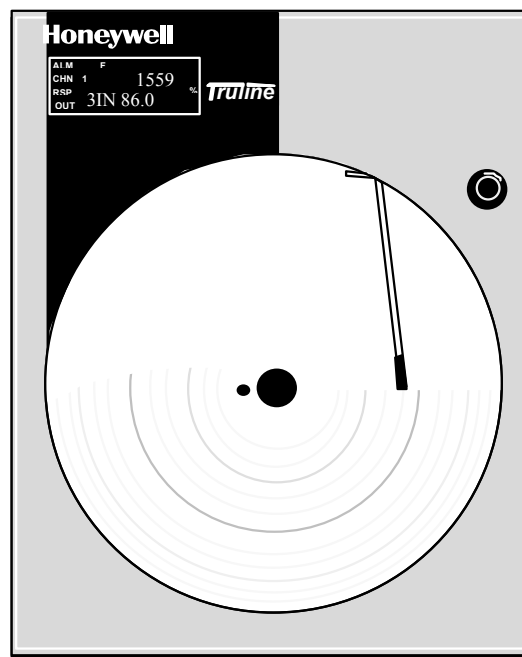
Function

Honeywell's Truline recorder is a one to four-channel, microprocessor-based, circular chart recorder. Its "one-pen" stylus printhead produces up to four analog traces and prints alphanumeric chart data on a blank heat-sensitive chart. All four traces share the *same time line* reference which the Truline prints. This eliminates the error caused by pen alignment offsets in conventional pen designs. Since the Truline prints the chart and generates the analog traces at the same time, there is no error due to variations in chart size caused by changes in temperature and humidity. With microprocessor electronics and single printhead, the Truline recorder is easily configured by users to meet a variety of application requirements - from metals to food processing. Models with up to four input channels accept inputs from any one of a variety of sensors or transmitters within the configurable range limits.

Also, models are available with one or two independent digital controllers to generate controlled output signals which will operate valves, dampers, heating elements, etc. for process control.

Features

- **User Configurable** — means that users, using English language prompts, can set and/or alter operating parameters to fit their requirements, including type of input, without recalibration.
- **Operator Interface** — includes clear, brilliant alphanumeric displays; indicators; deviation bargraph; and keypad for visual and tactile interaction.
- **All-Purpose Chart** — blank chart eliminates the need for ordering and stocking several types of charts. And, users can design the chart to match specific applications.
- **Four Channels** — up to four channels that monitor process variables from a variety of sensors reduce panel space requirements.



20889

Figure1 - Truline recorder provides printed chart data and continuous digital indication of process variable value.

Features, continued

- **"One-pen" Printer** — prints configurable alphanumeric chart data including time and trend lines. This automatically compensates for chart width variations caused by changes in the ambient relative humidity.
- **Control Output** — up to two versatile PID digital controllers let users configure the exact control action needed for their process.
- **Time/Date** — real-time, clock, dates, time of printing (hour, minutes, date and year) and any operator changes in real time guard against unauthorized chart advancement. There is a 10-year life battery backup.
- **Accutune II™** — This standard feature provides a new, truly plug and play tuning algorithm, which will, at the touch of a button or through a digital input, accurately identify and tune any process including those with deadtime and integrating processes. This speeds up and simplifies start-up plus allows re-tuning at any setpoint.

Features, continued

- **Fuzzy Logic** — This standard feature uses fuzzy logic to suppress process variable overshoot due to SP changes or externally induced process disturbances. It operates independently from AccutuneII™ tuning. It does not change the PID constants, but temporarily modifies the internal controller response to suppress overshoot. This allows more aggressive tuning to co-exist with smooth PV response. It can be enabled or disabled depending on the application or the control criteria.
- **Setpoint Ramp** — a single set point ramp is user programmable and is easily repeated and activated through the Run/Hold key.
- **Setpoint Rate** — lets you define a ramp rate applied to any local setpoint change. A separate upscale or downscale rate is configurable.

Features, continued

• Set Point Ramp/Soak

Programming — Lets users program and store 18 ramp and 18 soak segments. Run or Hold of program is keyboard or remote switch selectable. Each Control Loop can run one of the 6 profiles using any number of consecutive segments of the program. You can select a recovery mode for power-up.

• **Event Messages** — up to six event messages can be printed on designated areas of the chart and can be triggered by a specific selectable event.

External Interface Selections

• **Auxiliary Output** — there is also a 4 to 20 mA current output available. It can be used to retransmit a process variable.

In addition, the 4-20 outputs on the control board can be used as an auxiliary output if not used for control.

• **Modbus™ Communications** — option allows you to network your recorders to take advantage of overall monitoring of the system using an RS485 network.

• **Six Alarms** — up to six integral "soft" alarms are easily set by users to announce selected, out-of-limit conditions.

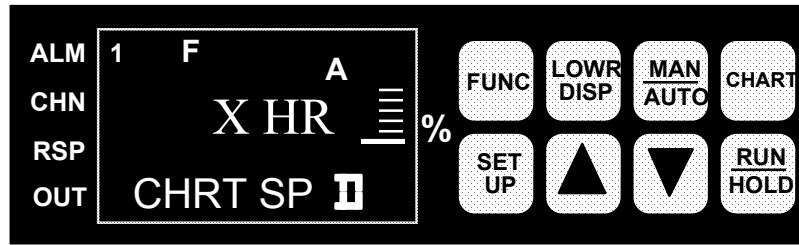
• **Timer** — This optional feature provides a configurable time period of 0 to 99 hours, 59 minutes or units of minutes and seconds. It can be started via the keyboard, alarm 2, or by a digital input. The timer output is Alarm 1 that energizes at the end of the Timer Period. Alarm 1 can be automatically reset. The Timer Period can be changed between each batch. Status is shown on the lower display. •

• **Digital Input** — Allows users to initiate from a remote location through two dry contact closures, selected recorder functions, such as automatic to manual control mode, direct to reverse controller action, or initiate autotune.

Options*

• **CE Mark** — Conformity with 73/23/EEC, Low Voltage Directive and 89/336/EEC EMC Directive.

• **Chart Illumination** — Lights the chart area to improve readability in lower light areas.



20951

Figure 2 - Operator interface includes displays and keypad for comprehensive interaction with the recorder and the process.

Options*, continued

• **Two Totalizers** — one or two totalizers are available. Eight digit totals with multiplier on digital display. Fourteen digits totalization print out on chart; a grand total can be printed.

• Math Functions

Algorithms — pre-configured algorithms for easy implementation into other control loop with Ratio and Bias.

Summer - will add three inputs with the result as the derived PV.

Multiplier/Divider - uses three analog inputs to calculate a derived PV with or without square root.

Multiplier - will multiply three inputs with the result as the derived PV with or without square root.

Subtractor/Multiplier - the difference between input 1 and input 2 is multiplied by input 3.

Input High/Low Select - specifies the PV as the higher or lower of two inputs.

Polynomial Curve Characteristics -- A fifth order polynomial equation can be used on any one of the analog inputs.

• **Door Options** — Choice of gray, black or blue doors with standard latch or optional lock. Optional UL and FM approved NEMA4X door available.

• **Approval Body Options** — FM approval, CSA certification and UL Listing or a combination is available.

• **Customer ID Tag** — (30 characters max.)

*Restrictions apply -- Not all of the options can be supplied together.

User Configurable

In the DR4500A Series recorder, microprocessor control replaces conventional electromechanical recording techniques. This means that its software now primarily determines the recorder's capabilities. Since Honeywell has preprogrammed a variety of functional capabilities into the recorder, a user only has to configure those functions that are specific for the given application.

Operator Interface

Two digital displays present the process variable (PV) value and by key selection, the controller set point; controller output; deviation from reference input; dry bulb temperature; totalization value; or engineering units as desired. The lower display can also be set to scroll or hold.

In configuration mode, digital displays are pre-empted by English language prompts and values that you use to enter configuration data (type of input, chart speed, chart range, alarm settings, tuning constants, etc.) and then stored in nonvolatile memory for safe keeping in the event of a power failure.

Indicators light to show alarm conditions, which channel PV is on display, use of remote set point, which output relay is on, selected temperature unit, and controller's mode of operation. A deviation bargraph lets operators tell at a glance if the process variable is at, above, or below the controller's set point.

The keypad through which configuration data is entered also serves as an integral automatic/manual station that provides bumpless transfer for controllers.

Microprocessor Controlled Recording and Printing

Both the chart and the printhead are driven by the stepper motors, which are controlled by the microprocessor. The microprocessor uses the configured chart range data as well as the input data to determine the proper printhead position. The stepper motor accurately positions the printhead drive.

Since chart speed is configurable, users can easily alter the chart speed through the keypad. Gear changing or additional motors are no longer required.

By using a "one-pen" printhead that is capable of printing alphanumeric characters, users can now set various "printed" chart data through configuration. This means that such chart data as range marking in engineering units; digital values for process variables, and trace identification are easily personalized for the application.

This data, plus printed time lines and engineering units of scale eliminate the need to maintain an inventory of a variety of preprinted charts.

The Truline recorder uses a dot fill technique from a microprocessor algorithm to produce a continuous analog trace of a process variable.

Input Processing

The input can be one of many standard low-level electrical signals. Since inputs are isolated, users can connect different types of input signals to multi-channel models in any combination. And, for models with 2 or more channels, a relative humidity (wet/dry bulb) actuation is available using 100 ohm platinum bulbs ($\alpha = 0.00385$).

The input type and range are user configurable. Ranges are easily expanded and compressed within their span limitations to meet specific measurement needs. Users can select upscale or downscale sensor break protection for many of the actuations.

An integral 24 Vdc power supply, along with 4-20 mA input configuration, allows direct operation with up to two transmitters without the need for any additional/external transmitter power supply.

To totalize a variable, such as a flow signal, users select the applicable input and set the digital display scaling factor through configuration. This eliminates the need for additional integration hardware including a mechanical counter. The totalizer has an eight digit display and 14 digit printing on the chart.

Also, there is the capability to reset the totalizer remotely with digital inputs and a low flow cutoff can be set, in percent of range, below which the applicable totalizer does not increment. Elapsed time can also be totalized. A grand total can be enabled to print the sum of all the totalizers.

Digital Controller

The DR4500A Series recorder controller (1 or 2 loops) includes an integral microprocessor-based, PID controller. A variety of output types, including a duplex variation for heat-cool applications, lets users select the output that is right for their final control element.

Depending on the output type, users can configure the control action as On-Off, PID-A, PID-B, PD with Manual Reset or 3 Position Step control.

As with the record functions, English language prompts quickly guide users through the entry of all the controller's configurable parameters.

Diagnostics

All DR4500A Series recorders include self-diagnostic systems that check critical operations and provide error messages to alert users about detected faults.

Power-up self-diagnostics is a microprocessor controlled diagnostic program that runs tests on selected circuitry when the recorder is powered up. A "key" test allows a user to initiate, on demand, a self-diagnostic routine that checks the keypad and front panel displays.

Construction

The DR4500A Series recorder is housed in a molded case, which can be panel or surface, mounted. A glass or optional acrylic window, gasketed door protects internal components from harsh industrial environments while allowing easy access to the chart and operator interface. A UL and FM approved NEMA4X door is also available. Circuitry is partitioned on printed circuit boards for ease of service.

Process Interface

Power, input, and output wiring connect to terminations inside the case. Knockouts in the sides and bottom of the case accept conduit connections for convenient wire entry.

Specifications

Design					
Digital Indication Accuracy		1 digit			
Minimum Input Span		Range is fully configurable with span limitation of the operating range selected			
Input Impedance		4-20 mA dc: 250 ohms 0-10 Vdc: 200K ohms All others: 10 Megohms			
Source Impedance		RTD: 100 ohms per lead maximum			
Sampling Rate		Each input sampled 3 times a second (1 or 2 inputs); 3 times in 2 seconds (3 or 4 inputs)			
Input Filter		Software: Single pole low pass section with selectable time constants (off to 120 seconds)			
Digital Displays		Vacuum fluorescent, alphanumeric. A six-digit display dedicated to the process variable. Alternate information displayed during configuration mode. An eight-digit display shows key selected operating parameters. Also provides guidance during configuration.			
Indicators		Channel PV display (CHN 1, 2, 3, or 4) Alarm status (ALM 1, 2) Controller Output (OUT 1 or 2) Remote Set Point (RSP) Temperature unit (F or C) or Engineering units Controller's mode (A or MAN)			
Deviation Bargraph		21 segment, color coded deviation bargraph: Green (large) = On Control Green (Small) = Deviation to ± 10% of PV			
Controller Modes of Operation		Manual Operation Automatic with local set point Automatic with remote set point			
Transmitter Supply Voltage		22 to 26 Vdc at input terminals (50 mAdc at 24 Vdc)			
Performance					
Number of Inputs	One channel model: One input Two channel model: Two inputs Three channel model: Three inputs Four channel model: Four inputs				
Types of Input Actuation ¹	Range		Reference Accuracy		Temp. Stability ± Degrees Error Per 1 Degree ΔT
	°F	°C	± °F	± °C	
Thermocouples ² B	105 to 3300	41 to 1816			
	105 to 150	41 to 66	42.00	23.00	2.00
	150 to 500	66 to 260	14.00	7.70	2.00
	500 to 1000	260 to 538	3.00	1.70	0.50
	1000 to 3300	538 to 1816	1.50	0.80	0.20
E	-454 to 1832	-270 to 1000			
	-454 to -202	-270 to -130	18.00	10.00	0.70
	-202 to 1832	-130 to 1000	1.00	0.55	0.35
E (low)	-200 to 1100	-129 to 593	0.50	0.30	0.20
J	0 to 1600	-18 to 871	0.40	0.22	0.06
J (low)	20 to 770	-7 to 410	0.20	0.11	0.04

Specifications, continued

Types of Input Actuation ¹	Range		Reference Accuracy		Temp. Stability ± Degrees Error Per 1 Degree ΔT
	°F	°C	± °F	± °C	
K	-320 to 2500 -320 to 0 0 to 2500	-196 to 1371 -196 to -18 18 to 1371	1.25 0.60	0.70 0.35	0.18 0.09
K (low)	-20 to 1000	-29 to 538	0.30	0.16	0.05
NNM (Ni Ni Moly)	32 to 2500 32 to 500 500 to 2500	0 to 1371 0 to 260 260 to 1371	0.75 0.50	0.40 0.30	0.09 0.07
NIC (Nicrosil Nilil)	0 to 2372	-18 to 1300	1.0	0.55	0.01
R	0 to 3100 0 to 500 500 to 3100	-18 to 1704 -18 to 260 260 to 1704	2.00 1.00	1.10 0.55	0.25 0.13
S	0 to 3100 0 to 500 500 to 3100	-18 to 1704 -18 to 260 260 to 1704	2.00 1.00	1.10 0.55	0.23 0.13
T	-300 to 700	-184 to 371	0.60	0.35	0.07
T (low)	-200 to 600	-129 to 316	0.40	0.22	0.07
W5W26	0 to 4200 0 to 600 600 to 3600 3600 to 4200	-18 to 2315 -18 to 316 316 to 1982 1982 to 2315	1.40 1.30 1.60	0.77 0.70 0.90	0.17 0.17 0.29
W5W26 (low)	0 to 2240 0 to 600 600 to 2240	-18 to 1227 -18 to 316 316 to 1227	1.10 1.00	0.60 0.55	0.14 0.10
Radiamatic (RH)	1400 to 3400	760 to 1871	1.00	0.55	0.10
RTDs²					
Platinum					
100 ohms	-300 to 900	-184 to 482	0.40	0.22	0.05
200 ohms (High)**	32 to 752	0 to 400	0.30	0.16	0.05
200 ohms (Low)**	32 to 392	0 to 200	0.20	0.12	0.05
500 ohms	-300 to 900	-184 to 482	0.20	0.11	0.05
Linear					
Milliamperes dc	4 to 20	--	0.10%	--	0.004% /°F
Millivolts dc	0 to 10 10 to 50	-- --	0.05% 0.05%	-- --	0.004% /°F 0.004% /°F
Volts dc	1 to 5 (can be calibrated 0 to 5) 0 to 10	-- --	0.05% 0.10%	-- --	0.004% /°F 0.004% /°F
Relative Humidity					
Platinum Wet/Dry Input	-130 to 392	-90 to 200	0.30	0.16	0.03
100 ohm Wet/Dry Bulb*	Measured %RH	Dry Bulb Range °F	°C	Reference Accuracy ± °F ± °C	Temp. Stability 53 to 104°F/ 12 to 40°C
%RH³	0 to <20 20 to 100	-103 to 212 35 to 40 >40 to 100 100 to 212	-75 to 100 2 to 4 >4 to 38 38 to 100	2% RH 2% RH 1% RH 1% RH	0.11% RH/°F 0.11% RH/°F 0.06% RH/°F 0.03% RH/°F

¹Not all Input Actuators are available on all models of the Truline Recorder. Consult Model Selection Guide for information.²Includes reference junction calibration of ± 0.01degrees using standard "ice bath" method of calibration. Factory calibration at reference ± 1.2°F. Note that factory calibration may vary by as much as ± 10 microvolts or ± 0.3 ohms for RTDs which means recalibration may be required to achieve stated accuracy.³The RH calculation is inoperative when temperature goes below 32°F (0°C) or above 212°F (100°C). However, the dry bulb temperature will be monitored to -103°F (-75°C). Accuracy stated is for Truline Recorder only and does not include remaining system accuracies.

*IEC Alpha (α) = 0.00385 Ω/Ω/°C

**Only available with Model DR45AR

Specifications, continued

Configurable Parameters: These parameters can be set through the keypad for Recorder DR45AT -- Different parameters apply for DR45AR, DR45AW, DR45AH, and DR45AP Models.			
Group	Parameters	Setting Range or Selection	Resolution
INPUT 1	Decimal point location Units Engineering Units Actuation type Transmitter characterization High range value Low range value Low Flow Cutoff Input compensation Filter 1 Sensor break protection Emissivity	None, 1 (XXX.X) or 2 (XX.XX) -- one decimal place only for non-linear inputs °F, °C or engineering units A to Z, 0 to 9, +, -, \ . See input types All non-linear input types, linear, square root -999.0 to 9999 -999.0 to 9999 0 to 100% of input range -999.0 to 9999 0 to 120 None, Up or Down(burnout) .01 to 1.00	 0.1 0.1 0.1 1.0 0.01
INPUT 2	SAME AS INPUT 1		
INPUT 3	SAME AS INPUT 1		
INPUT 4	SAME AS INPUT 1		
PEN 1	Pen 1 Pen 1 input Chart 1 high range value Chart 1 low range value Major chart division Minor chart division Range 1 Tag Pen 1 On Pen 1 Off	Disable or Enable Input 1,2,3,or 4, Output 1, SP 1, Dgtl1, Dgtl2, Output 2, SP 2, RH, PV1 -999.0 to 999 -999.0 to 999 2 to 10 2 to 10 Up to five characters 0 to 100% of chart 0 to 100% of chart	 0.1 0.1 1 1
PEN 2	Same as PEN 1		
PEN 3	Same as PEN 1		
PEN 4	Same as PEN 1		
CHART	Chart speed Hours per revolution Time Div Minor Div Continue Chart Name Header Rem Chart Wake Minute Wake Hour Wake Day Wake Month	8 hrs, 12 hrs, 24 hrs, 7 days, or selected hours per revolution 6 to 744 hrs* (12 hrs. for Abrasion Resistant Pen) 8 to 24 4 or 8 Yes or No (Chart rotation beyond 360 degrees) Up to six characters Yes or No None, Extsw1, Extsw2, Alarm1,2, 3, 4, 5, or 6, Time 0 to 59 0 to 23 0 to 31 0 to 12 * Below 8 hrs. chart speed and 24 hrs. chart speed with Abrasion Resistant Pen, printing may be degraded.	
TIME	Minutes Hours Day Month Year Day	1 to 59 0 to 23 1 to 31 1 to 12 4-digits Monday to Sunday	
TOTAL 1	Totalized Value (Read only) Reset total Total 1 Total engineering units Rate Scaling factor Resettable	(8 digits displayed, 14 digits printed on chart) Yes or No Input 1, 2, 3, 4, PV1. ETime Desired alphanumeric title Second, Minute, Hour, Day or Million/Day 1, 10, 100, 1000, 10,000, 100,000 or 1E6 No, Local, EXT SW1, EXT SW2	

Specifications, continued

Group	Parameters	Setting Range or Selection	Resolution
TOTAL 2	SAME AS TOTAL 1		
Controller			
Input Algorithm	Input Algorithm	Summer w/ratio-bias, multiplier with or without square root, multiplier/divider with or without square root, subtractor multiplier, or High/Low Select.	
	K Coefficient	00.000 to 1000	
	PV High Limit	-999 to 9999	
	PV Low Limit	-999 to 9999	
	Ratio A	-20 to +20	
	Bias A	-999 to 9999	
	Ratio B	-20 to +20	
	Bias B	-999 to 9999	
	Ratio C	-20 to +20	
	Bias C	-999 to 9999	
	Polynomial Characterization	None, Input 1, Input 2, Input 3, Input 4	
	Polynomial coefficient C0	-99.99 to 99.99	
	Polynomial coefficient C1, C2, C3, C4, and C5	-9.999 to 9.999	
Control 1 (2)	PID tuning sets	1 or 2 (keyboard or automatic switchover)	
	Set point source	Local, Remote* (Control 1 only), 2 Local, or Control Loop 2 output	
	Ratio (input 2)	-20.00 to 20.00	0.01
	Bias	-999 to 9999	1.0
	SP tracking	None or RSP (Control 1 only)	
	Power-up mode recall	Manual, Auto LSP, Auto RSP, AMSP, or AMLSP	
	Power Out	Last or Failsafe	
	High and low SP limits	0 to 100% of span in engineering units	
	Action	Direct or reverse	
	High and low output limits	-5 to 105% of output	1.0
	Dropoff value	-5 to 105% of output	1.0
	Deadband	-5.0 to 25%	0.1
	Output Hyst	0.0 to 5.0	0.1
	Failsafe output value	Within the output limits	1.0
	Remote Switching	None, ToMan, ToLSP, To2SP, ToDir, RN/HLD, TUNE	
	Man Key	Disable or Enable	
	PB or Gain	Proportional band (%) or gain	1.0
	Reset units	Repeats/minute or minutes/repeat	
	Control 1 Algorithm	PIDA, PIDB, PD + MR, ON-OFF, 3 Position Step	
	Output 1 Algorithm	Current, Position Prop, TimeD, Cur TI, TI Cur, Time	
TUNING 1(2)	Gain (or Prop Band)	0.1 to 1000	0.1
	Rate Min (or RPM)	0.00 to 10.00	0.01
	Reset Min (or RPM)	0.02 to 50.00	0.01
	Man Rset	-100 to 100% output	1
	Cyc Sec	1 to 120 sec.	1
SPRAMP 1(2)	SP Ramp (1 or 2)	Disable or Enable	
	Time Min	0 to 255	
	Final SP	0 to 100% of Span	
	SPRate	Enable or Disable	
	EU/HR UP	0 to 9999	
	EU/HR DN	0 to 9999	
	SP Program	Disable or Enable	
	Recycles	0 to 99	
	Soak Deviation	0.0 to 99.0	
	Profile	1 to 6	
	State	Disable or Hold	
	Recovery	Enable or Disable	
	Program End	Last Setpoint or Failsafe	

* For Remote Setpoint Input #3 is automatically assigned as your RSP source for Control #1; Input #4 is assigned for Control #2. However, if the recorder has only 2 inputs, then the RSP will be on Input #2.

* *Communications only

Specifications, continued

Controller (continued)			
Group	Parameters	Setting Range or Selection	Resolution
SPPSEGS	Profile Start Segment Profile End Segment Ramp Unit Synchronize Profiles Segment X Ramp Segment X Setpoint Segment X Time	Ramp 1 to Ramp 35 Soak 2 to Soak 36 Time or Rate Enable, Disable 0.00 to 99:59 within High/Low Range Limits 0.00 to 99.59	
SPP EVENT	Segment X Event	None, Alarm 1, 2, 3, 4, 5, or 6	
TIMER	Timer Period Start Ldisplay Reset Increment	Enable/Disable 0.00 to 99:59 Run/Hold Key or Alarm 2 Time Remaining or Elapsed Time Run/Hold key or Alarm 1 Minute or Second	
OPTIONS	Reject Frequency Relative Humidity Atm. Pressure Scroll Grand Totalizer Deviation Deviation Setpoint	60 or 50 Hz Yes or No 590 to 800 None, 1 sec, 2 sec, 3 sec Enable or Disable (Prints sum of all active totalizer at each major time line) None, SetPnt, Chan 1 -999.0 to 9999	
ALARMS (1, 2, 3, 4, 5, 6)	SP Value SP Type Alarm Type Alarm Scaling Multiplier for Totalizer Alarm Alarm Hysteresis	-999 to 9999 None, Input 1 (2, 3, 4), RH/PV, Dev, Output, Dev2, Out2, Event, Total 1, Total 2 High or Low 1, 10, 100, 1000, 10000, 100000, 1E6 0.0 to 100% of span or full output	0.1
AUXILIARY OUTPUT	Aux Output 4mA Val 20mA Val	Disable, IN1, IN2, PV1, PV2, Dev1, Dev2, Out1(2),SP1 (2) Low scaling factor High scaling factor	
MODBUS	Communications State Communications Address Baud Transmit Delay	Enable/Disable 1 to 99 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 None, 10msec, 20msec, 30msec, 40msec, 50msec.	
ADJUST PRINTING	Trace Line Grid Line Pen Type	Dark, Medium, Light Dark, Medium, Light Normal, Jewel	
EVNT MSG	Event 1 (2,3,4,5,6) MESSAGE 1 (2,3,4,5,6) POSITION 1 (2,3,4,5,6)	EXTSW1, EXTSW2, ALARM 1, ALARM 2, ALARM 3, ALARM 4, ALARM 5, ALARM6 Message for event (up to 6 characters) Chart position for message printing (0 to 100%)	
LOCKOUT	Password Lockout (software and/or hardware) Change	Up to four characters None, Calib, +Conf, Max (hardware configuration lockout-option) Used if changing Password	
STATUS	Version Failsafe RAM Test Configuration Test Calibration Test * Comm Test Fact CRC (Factory Set Input Constants) Battery test	Latest Software Version Yes or No Pass or Fail Pass or Fail Pass or Fail Pass or Fail Pass or Fail Pass or Fail	

* Communications only

Specifications, continued

Controller (continued)	
Controller Output¹ (Optional)	• <i>On-Off or Time Proportional</i> One SPST electromechanical relay. Control action can be set for direct or reverse; N.O. or N.C. contact selectable. • <i>On-Off Duplex , 3 Position Step, or Time Proportional Duplex</i> Two SPST electromechanical relays. Control action can be set for direct or reverse; N.O. or N.C. contact selectable. • <i>Current Proportional</i> 21 mAdc maximum into a negative or positive grounded or non-grounded load of 0 to 1000 ohms. Output range can be set between 4 and 20 mA, and as direct or reverse action. Resolution: 10 bits Accuracy: 0.5% full scale FM Approved Output (Optional) • <i>Position Proportional</i> Two SPST electromechanical relays operate motor having a 100 ohm to 1000 ohm slidewire. • <i>Current/Time Duplex and Time /Current Duplex</i> Variation of time proportional duplex for Heat/Cool applications. Time proportional output (heat or cool) is a SPST electromechanical relay. Current proportional output (heat or cool) is a 4-20 mA signal that can be fed into a negative or positive grounded load of 0 to 1000 ohms and is operational over 50 % of range or the entire range. Time Proportional Relay Resolution: 4.4 mSec. Relay Contact Ratings: Resistive Load: 5A @ 120 Vac, 2.5A @ 240 Vac Inductive Load: 50 VA @ 120 Vac or 240 Vac Cycle Time: 1 to 120 seconds Current Proportional : Resolution: 10 bits Accuracy: 0.5% full scale
CE Conformity (Europe) (Optional) <i>Product Classification:</i> <i>Enclosure Rating:</i> <i>Installation Category (Over-voltage Category)</i> <i>Pollution Degree:</i> <i>EMC Classification</i> <i>Method of EMC Assessment</i> <i>Declaration of Conformity</i>	This product is in conformity with the protection requirements of the following European Council Directives: 73/23/EEC, the Low Voltage Directive, and 89/336/EEC, the EMC Directive. Conformity of this product with any other "CE Mark" Directive(s) shall not be assumed. Class I: Permanently Connected, Panel Mounted Industrial Control Equipment with protective earthing (grounding). (EN 61010-1) Panel Mounted Equipment, IP 00, this recorder must be panel mounted. Terminals must be enclosed within the panel. Front panel IP 65 (IEC 529) Category II: Energy-consuming equipment supplied from the fixed installation. Local level appliances, and Industrial Control Equipment. (EN 61010-1) Pollution Degree 2: Normally non-conductive pollution with occasional conductivity caused by condensation. (Ref. IEC 664-1) Group 1, Class A, ISM Equipment (EN 55011, emissions), Industrial Equipment (EN 50082-2, immunity) Technical File (TF) 51197639-000
Case/Door	Molded, foamed-Noryl* with gasketed door to meet NEMA 3 enclosure requirements. Panel gasket available separately. An optional UL and FM approved NEMA4X door is also available.
Chart	12-inch (304.8mm) diameter chart. Plain thermal-sensitive paper.
Wiring Connections	Terminals inside the case
Color	Case: Black Door (standard): Caribbean Blue, Black or Gray
Approval Bodies	U.L. approval depending on model. Consult Model selection Guide for information. FM approved for Class I, Div 2, Groups A, B, C, D areas depending on model.
Dimensions	See Figure 3
Weight	13.2 lb. (6 kg)
Mounting	Panel or surface mounted. Some adapter kits are available for existing panel cutouts.

* Registered Trademark -- General Electric Co.

1. Not all controller outputs are available on all models of the Truline Recorder. Consult Model Selection Guide for information.

Specifications, continued

Options	
Alarm Output	Two, four or six relays available. Relays 3 through 6 available if not used for control outputs. <i>Relay Contact Ratings:</i> First Relays, Resistive Load: 1A @ 120 Vac, 1/2A @ 240 Vac. Relays 3 through 6, Resistive Load: 5A @ 120 Vac, 2.5A @ 240 Vac.
Auxiliary Linear Output (Optional)	Three Auxiliary Outputs are available: 21 mA dc maximum into a negative or positive grounded load or non-grounded load of 0 to 1000 ohms. Output range can be set between 2 to 21 mA, and as direct or reverse action. It can be configured to represent any one of 12 parameters: Input 1-4, PV 1-2, Deviation 1-2, Output 1-2, Setpoint 1-2. The range of the auxiliary output, as a function of the selected variable, can be scaled. Auxiliary Output 2 and Auxiliary Output 3 use Control Current Output 1 and Control Current Output 2 if Control "OUTALG" is not set to "CURRENT" or "POSITION".. <i>Resolution:</i> 12 bits over 0 to 21 mA (10 bits for Auxiliary Output 2 and 3) <i>Accuracy:</i> 0.2% of full scale <i>Temperature Stability:</i> 0.03% F.S. / °C
Digital Input	+20 Vdc source for external dry contact or isolated solid state contacts. Selects one configured input.
Totalizers	One or two totalizers on DR45A1, DR45A2, DR45AT and DR45AR Models. Up to four totalizers on DR45AW Model. Eight digit "totals" with multiplier on digital display; 14-digit totalization printout on chart. Grand total can be printed at each major time line.
Calculations	F _O calculation available on DR45AR Model. Open channel flow calculations available on DR45AW Model.
Math Algorithms	Eight algorithms are available: A + B + C (summer with ratio and bias) $\sqrt{A \cdot B/C}$ (square root multiplier/divider) $\sqrt{A \cdot B \cdot C}$ (square root multiplier) A • B/C (multiplier/divider) A • B • C (multiplier) (A-B) • C (difference multiplier) where: A = Input 1 • ratio A + bias A B = Input 2 • ratio B + bias B C = Input 3 • ratio C + bias C Limit of Ratio = -20 to +20 Limit of Bias = -999 to +9999 High/Low Select between Input 1 and Input 2 Polynomial Equation – Fifth order provides equation
Miscellaneous	• UL and FM approved NEMA4X door • Door Lock • Chart Illumination • U.L. Listing, FM Approval, CSA, CE Conformity • Control with Accutune II Tuning Capability • Auxiliary 4-20 mA output • Glass or Acrylic Window • Customer ID Tag • 2 Pulse output counter alarm functions on DR45AW Model • Lead seal provisions
RS485 Modbus® RTU Communications	<i>Baud Rate:</i> 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 <i>Protocol:</i> RS485 Modbus RTU Communications <i>Length of Link:</i> 4000 ft (1,219 m) maximum <i>Link Characteristics:</i> Two wire, multidrop

Specifications, continued

Environmental and Operating Conditions				
Parameter	Reference	Rated	Extreme	Transport and storage
Ambient Temperature	67 to 77 °F 19 to 25 °C	58 to 131 °F 15 to 55 °C	32 to 131 °F 0 to 55 °C	−40 to 151 °F −40 to 66 °C
Relative Humidity (%RH)	0 to 55*	10 to 90*	5 to 90*	5 to 95*
Vibration				
Frequency (Hz)	0	0 to 70	0 to 200	0 to 200
Acceleration (g)	0	0.1	0.2	0.5
Mechanical Shock				
Acceleration (g)	0	1	5	20
Duration (ms))	0	30	30	30
Mounting Position from Vertical				
Tilted Forward	5°	5°	5°	Any
Tilted Backward	5°	30°	90°	Any
Tilted to Side (±)	5°	10°	20°	Any
Power Requirements				
Voltage (VRMS)	119 to 121 238 to 242	102 to 132 204 to 264	102 to 132 204 to 264	N/A N/A
Frequency (Hz)	49.8 to 50.2 59.8 to 60.2	49 to 51 59 to 61	48 to 52 58 to 62	N/A N/A
Power Consumption	20 VA maximum			
General Reference Data				
Stray Rejection	Common Mode Rejection Ratio: 120dB or 1 LSB (whichever is greater) at 60 Hz with maximum source impedance of 100 ohms. Normal Mode Rejection Ratio: 60dB with a 100% span peak-to-peak maximum at 60 Hz.			
Static Charge Effects	Exposed panel surfaces capable of withstanding a discharge from a 250pf capacitor charged to 10KV through 100 ohms.			
Line Noise Effects	Field terminals for connecting power line to recorder can withstand the IEEE Surge Withstanding Capability Test to a level of 2.5KV.			
Stylus Life	Typically capable of printing one chart per day for five years under clean room conditions.			
Technical Assistance	Toll-free 800 number puts technical assistance only a phone call away.			

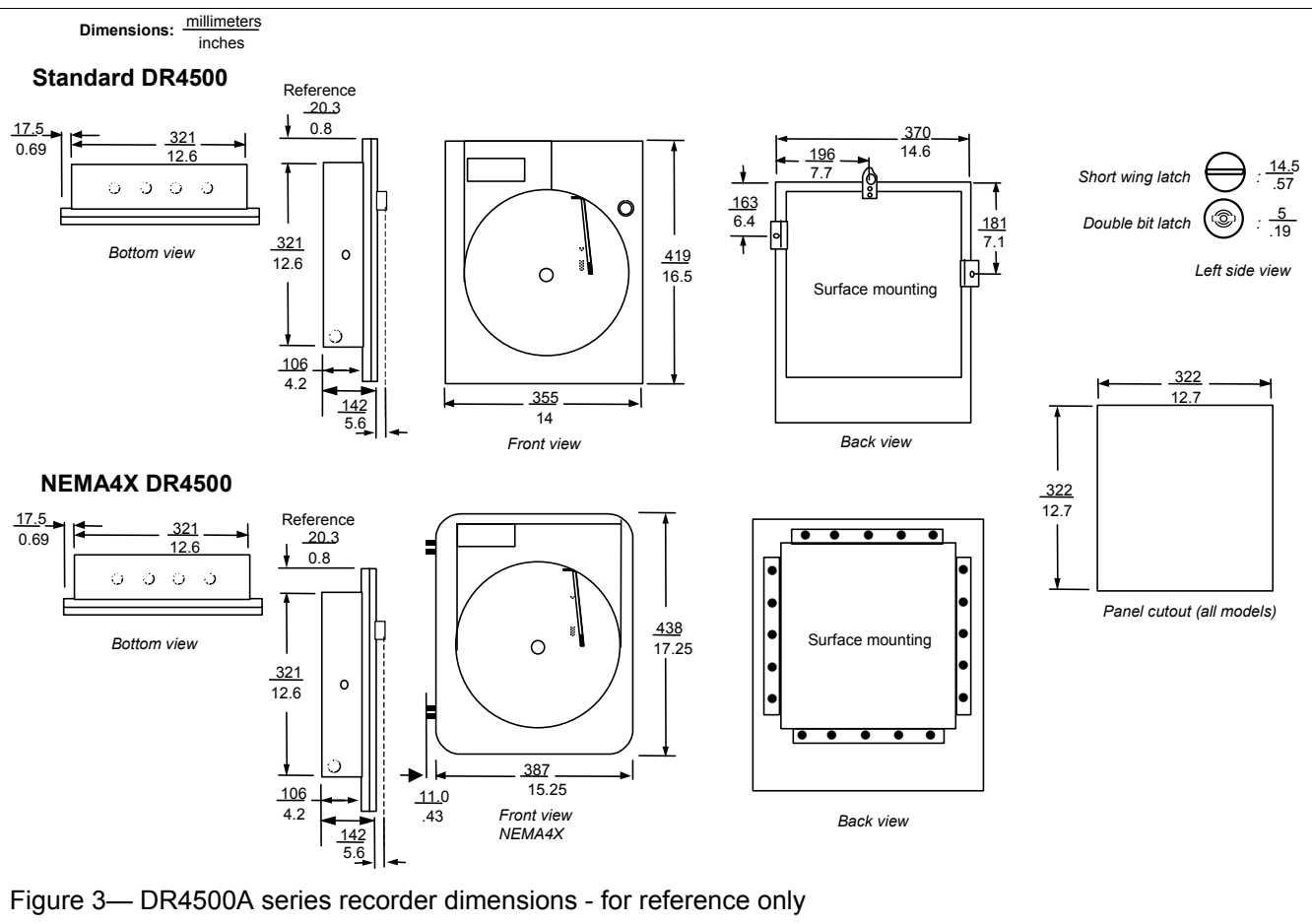
* The maximum rating only applies up to 104°F (40°C). For higher temperatures, the RH specification is derated to maintain constant moisture content.

Reference Specifications	
44-45-03-11	DR45AW Flow Model for Weir, Parshall flume or Palmer-Bowles flume calculations and up to 4 totalizers
44-45-03-12	DR45AR Model for up to 6 relays, special RTD ranges, and F _O calculation
44-45-03-16	DR45AH High Temperature Short Time (HTST) DR45AS Safety Thermal Limit Recorder (STLR) DR45AP Model for Dairy Flow/Timing Applications for the dairy industry with lead seal provisions and FDA compliance

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Contact your local sales office for warranty information. If warranted goods are returned to Honeywell during the period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.** Specifications may change without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

While we provide application assistance personally, through our literature and the Honeywell web site, it is up to the customer to determine the suitability of the product in the application.



Ordering Information

For complete ordering information, request Model Selection Guide 44-45-16-07 for DR4500A Series Circular Chart Recorder. Honeywell offers a full line of sensors and transmitters that produce compatible range of dc voltage or current signals.

Honeywell

Industrial Measurement and Control

Honeywell
1100 Virginia Drive
Fort Washington, PA 19034

44-45-03-14 0802 Printed in USA

www.honeywell.com/imc/

SECTION 11

CLARIFICATIONS

1. The specified Metering pumps we believe are too small. At 15.9 gallons per hour of diluted chemical the district would be able to feed 24 PPD of available chlorine. We believe the pumps should be upsized to either 28.5 or 34.3 gallons per hour. This would allow the district to feed 50 PPD of available chlorine and would match the capacity of the specified systems. No cost adder.
2. We are submitting on Assmann-USA Chemical Storage tanks. We have supplied these tanks on the previous Districts well sites.
3. Honeywell Chart recorder is specified as a 3-pen recorder. Is this correct? The previous well sites required a single pen recorder.

SECTION 12

DELIVERY CHECKLIST
STORAGE REQUIREMENTS
PRE-INSTALL
CHECKLIST
WARRANTY

!!! IMPORTANT – PLEASE READ !!!

ProMinent® SYSTEMS

SITE DELIVERY AND STORAGE CHECKLIST

- 1. Check packing list for completeness and note any missing items immediately.**
- 2. The skid may have been jarred during shipping. Inspect equipment and shipping container for damage before accepting delivery. Make note on the carrier's bill-of-lading the extent of the damage, if any, and notify the carrier. Save the shipping container until your system is started up.**
- 3. Store equipment on firm level surface in original packing container. Do not store equipment where it may be exposed to extreme temperatures, precipitation, humidity, or dust. Avoid direct sunlight that could overheat and damage equipment.**

WARNING – PUMPS MAY BE FILLED WITH OIL WHICH COULD LEAK IF TILTED

Ambient Conditions for storage and transport:

Temperature:	14°F to 120°F
Air humidity:	max. 95% relative humidity, non-condensing

Please call if you have questions.

**ProMinent Fluid Controls, Inc.
RIDC Park West
136 Industry Drive
Pittsburgh, PA 15275-1014
Phone: (412) 787-2484
Fax: (412) 787-0704**

!!! IMPORTANT – PLEASE READ !!!

ProMinent® SYSTEMS

PRE-INSTALLATION CHECKLIST

1. Mount equipment on hard flat level surface. Stainless steel or FRP angle may be used to fasten skids down.
2. Do not install equipment in areas of extreme heat, cold, dust or humidity. Avoid areas where objects or fluids can drop from overhead.
3. Install piping so connections properly meet skid termination points. Do not “stretch” field installed piping to meet skid termination points. Stressed plastic piping will fail!
4. Check the tightness on all unions. Hand tighten only - no tools. Unions incorporate an o-ring seal. Ensure that the o-ring is seated properly before tightening.
5. Check the piping for breakage. The skid may have been jarred during shipping.
6. Allow provisions for draining the system piping. Skid components will require maintenance. Ensure that chemicals can be evacuated from skid piping and components.
7. Do not down-size piping to or from system. Piping should be at least equal in diameter to piping on skid and one or two sizes larger for long runs.
8. Install suction line strainer if one was not included with your packaged system
9. Avoid getting dirt in piping during installation. Plug ends of piping with rags if construction activities are underway. All debris must be flushed from piping before system start-up.
10. Check electrical connections to be sure proper voltage is supplied to unit.

Please call if you have questions.

ProMinent Fluid Controls, Inc.
RIDC Park West
136 Industry Drive
Pittsburgh, PA 15275-1014
Phone: (412) 787-2484
Fax: (412) 787-0704

!!! IMPORTANT – PLEASE READ !!!

ProMinent® SYSTEMS QUICK START GUIDE

1. Pressure Relief Valves and Back Pressure Valves (PRV's/BPV's) are NOT pre-adjusted. ProMinent adjusts valves for QC purposes, but valves must be opened before shipping to allow water to be drained out.
2. The PRV's should be set no higher than the lowest rated component – typically the pump. In any case, do not exceed 150 psi with plastic piping. Tighten the PRV only with the furnished adjusting wrench. A metal wrench will damage the valve adjustment screw.

No extraordinary start-up procedures are required. However, the following steps are recommended. WEAR SAFETY GLASSES WHILE WORKING ON CHEMICAL FEED EQUIPMENT!

- a. Unions tagged with Red Tape are purposely loosened prior to shipping. Check ALL unions for tightness and insure O-ring is properly seated before tightening. DO NOT OVERTIGHTEN! Hand tighten initially, and if necessary, apply one-eighth to one-quarter turn with properly sized wrench. DO NOT OVERTIGHTEN!
- b. Start the pumps in manual control mode with water – DO NOT APPLY SYSTEM PRESSURE. CHECK MOTOR ROTATION! (clockwise, looking down towards pump). Open oil vent, if applicable. Check for leaks.
- c. Check pulsation dampener fastener bolts' torque and inflate dampeners before applying system pressure (~80% of System Pressure). Set BPV for at least 15 psi pressure. Set PRV for rated pressure of weakest link in system.
- d. Run the system in manual mode with water. Build pressure. Check for leaks! Correct all leaks before introducing chemical into the system.
- e. Familiarize yourself with controls, check functionality of instruments, and verify correct pump output.
- f. Run the system in automatic mode with water. Verify functionality of alarms and safety devices. Verify correct pump output and functionality of instruments.
- g. Run the system in automatic mode with chemicals. Allow system to build pressure and check for leaks.

Please call if you have questions.

ProMinent Fluid Controls, Inc.
RIDC Park West
136 Industry Drive
Pittsburgh, PA 15275-1014
Phone: (412) 787-2484
Fax: (412) 787-0704

ProMinent Warranty

1) WARRANTY, REMEDY, DISCLAIMER: The warranties set out in this clause shall be conditional upon fulfillment of the Purchaser's contractual obligations, including all terms of payment. For sales of completed pumps and controllers, the warranty shall be conditional upon the Purchaser completing and returning the attached Warranty Validation Card. Seller warrants that the Drive Units and DULCOMETER Controllers will be of good workmanship and material for two (2) years from the date of purchase by owner of new equipment from an authorized distributor of manufacturer, but no longer than two and one-half (2-1/2) years from the date of shipment by manufacturer. ~~All Dulcotest sensors are warranted for (6) months from the date of shipment by manufacturer.~~ For sales of liquid ends, ~~Bello Zon, Bono Zon~~, pump accessories, standard engineered products, custom designed items and items not manufactured by ProMinent, Seller warrants that the products will be of good workmanship and material for one (1) year from the date the goods are shipped by Seller. If purchaser claims that the goods are defective, he must permit Seller's personnel at Seller's option to inspect the goods on Purchaser's property. Purchaser shall not return the goods to Seller unless Purchaser obtains prior written approval of such from Seller. If, after inspection, Seller determines that the goods are defective, Seller will repair or replace goods at Seller's option and at Seller's cost. THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS, IMPLIED AND STATUTORY INCLUDING THE WARRANTIES OF FITNESS FOR PURPOSE AND MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. The warranty provided for herein shall not apply to any goods that become defective for the following reason:

- (a) unsuitable or unreasonable use
- (b) faulty assembly, installation or servicing by the Purchaser or any third party
- (c) faulty or careless handling

2) DISCLAIMER OF TORT LIABILITY: PURCHASER SPECIFICALLY UNDERSTANDS AND AGREES THAT SELLER SHALL NOT BE LIABLE IN TORT, WHETHER BASED ON NEGLIGENCE, STRICT LIABILITY OR ANY OTHER THEORY OF TORT LIABILITY, FOR ANY ACTION OR FAILURE TO ACT IN RESPECT TO THE MANUFACTURE, PREPARATION FOR SALE, OR DELIVERY OF THE GOODS. IT IS THE PARTIES' INTENT AND THE INTENT OF THIS PARAGRAPH TO ABSOLVE AND PROTECT SELLER FROM ANY AND ALL TORT LIABILITY.

3) EXCLUSIVE REMEDY: PURCHASER SPECIFICALLY UNDERSTANDS AND AGREES THAT PURCHASER'S SOLE AND EXCLUSIVE REMEDY FOR BREACH OF WARRANTY, TORTIOUS CONDUCT OR ANY OTHER CAUSE OF ACTION AGAINST SELLER SHALL BE THE REMEDY PROVIDED IN PARAGRAPH TWO (2) ABOVE.

4) EXCLUSION OF CONSEQUENTIAL DAMAGES: PURCHASER SPECIFICALLY UNDERSTANDS AND AGREES THAT UNDER NO CIRCUMSTANCES WILL SELLER BE LIABLE TO PURCHASER FOR ECONOMIC, SPECIAL INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES OF ANY KIND WHATSOEVER, INCLUDING BUT NOT LIMITED TO, LOSS OF ANTICIPATED PROFITS AND ANY OTHER LOSS CAUSED BY REASON OF THE NON-OPERATION OF THE GOODS. THIS EXCLUSION IS APPLICABLE TO CLAIMS FOR BREACH OF WARRANTY, TORTIOUS CONDUCT OR ANY OTHER CAUSE OF ACTION AGAINST SELLER.

5) ALL TERMS AND CONDITIONS OF SALE CONTAINED IN SELLER'S ACKNOWLEDGMENT/OFFER TO SELL APPLY AND ARE IN NO WAY ALTERED BY THIS WARRANTY VALIDATION CARD.

ProMinent Fluid Controls
RIDC Park West
136 Industry Drive
Pittsburgh, PA 15275-1014
(412)787-2484