



APPENDIX A

Siemens Operation & Maintenance Manual

OPERATION & MAINTENANCE MANUAL

FOR

**HP1220
GRANULAR ACTIVATED CARBON
ADSORPTION SYSTEM**

SIEMENS

**Spinnaker Holdings
Roosevelt Irrigation District
Well Site 95
Phoenix, AZ**

BY

Siemens Industry Inc.

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1.0 INTRODUCTION

This manual covers a general description of the equipment and operating procedures for a HP1220 High Pressure Carbon Adsorption Systems. The Carbon Systems are designed to provide many years of trouble free service. To achieve this, the Carbon System equipment must be properly handled and installed to obtain the desired results. Failure to do so can cause premature equipment malfunctions and/or undesirable System performance.

Siemens Industry Inc. shall deliver the Carbon System equipment and install the ACNS activated carbon. Unknown situations or conditions not covered in this manual are the responsibility of the Purchaser.

Section 1.4 provides helpful information for the receiving, unloading, handling and installation of the Carbon System equipment.

1.1 GLOSSARY

Adsorber - A vessel designed to hold activated carbon.

Backwash - Performed prior to placing system on-line to cleanse the carbon bed of fines entrapped air and stratify bed depth. Also used during normal operations to remove particulate build up.

Backflush - Performed during normal operations to remove entrapped air from the carbon bed.

Bulk Transport Trailer - Hopper type trailer used to transport carbon, slurry in fresh carbon, and remove spent carbon from adsorbers.

Carbon Rinse - Plant water used to rinse from the interior surface of the adsorber during carbon change-out.

GAC - Granular Activated Carbon.

Heel - Any spent carbon not removed from an adsorber before adding fresh carbon.

Lead Adsorber - The first bed of carbon through which a process or a waste stream is passed. (Also called Primary Adsorber.)

Polishing Adsorber - The second or last bed of carbon through which a process or a waste stream is passed. (Also called Secondary Adsorber.)

Pneumatic Port – The air and water connection for service and wash-down of vessel.

Pressure Port - The air and water connection for service and wash-down of vessel.

Rupture Disk - A relief disk to prevent over pressurization of a vessel.

Reactivated Carbon - Previously used carbon that has been thermally reactivated.

Spent Carbon - Carbon that has adsorbed the maximum amount of organic material.

Underdrain - Device designed to permit an evenly distributed flow of water but retain carbon in vessel.

Utility Port - The air and water connection for service and wash-down of vessel.

Vent - A line from each adsorber with automatic vacuum/air release valve (APCO).

Water Cushion - The water added to an adsorber before charging it with carbon to protect under drain and lining.

1.2 IMPORTANT MESSAGES AND WARNINGS

This Manual should be in the possession of the personnel who operate and maintain the Carbon System. The purpose of this manual is for instruction and to advise operators and maintenance personnel. This manual will remain a valuable resource for the safe, economical, efficient operation and maintenance of the Carbon System.

Failure to properly follow instructions, failure to take notice of warnings, and failure to take proper precautions and preventive measures may be dangerous and could cause serious injury, equipment damage, and environmental problems.

Mechanical modifications or substitutions of parts on equipment that may affect structural or operational safety shall not be made without prior manufacturer's approval or engineer's advice. Modifications other than those approved may defeat protective features originally designed into the equipment and its controls; and therefore, shall not be made.

Unauthorized personnel should be kept away from this equipment at all times. Only qualified personnel who have been properly instructed in this equipment's proper operation and maintenance requirements and in its potential hazards shall be allowed to operate and maintain it.

IMPORTANT

Siemens Industry Inc. makes no warranty of any kind with regard to the material contained in this manual, including, but not limited to, implied warranties or fitness for a particular purpose. Siemens Industry Inc. shall not be liable for errors contained herein or for incidental or consequential damages in connection with the performance or use of this material.

This manual contains certain proprietary criteria, ideas and designs as an instrument or professional service and shall not be reprinted in whole or in part without expressed written authorization from Siemens Industry Inc..

1.3 RECEIVING

Immediately upon receipt and prior to removal from the truck trailer, railcar or shipping container, inspect the Carbon System equipment for damage. Claiming any damage that may have occurred in transit should be filed promptly with the delivering carrier. The unloading operation should be delayed until the carrier's representative has completed his inspection of the damaged equipment, otherwise a damage claim may not be honored. The inspection should include as a minimum:

1. External surface damage.
2. Damage such as broken nozzles, valves, pipes, underdrain, etc.
3. Equipment damage at contact points.
4. Unpacking and inspection of all packaged equipment and accessories.
5. Internal lining.

1.4 UNLOADING AND HANDLING

When unloading and handling the Carbon System equipment, extreme care should be taken as not to damage it.

Regardless of the type of equipment being handled, certain precautionary measures must be implemented such as:

1. Insure the lifting equipment can withstand the total intended load.
2. Always use lifting eyes and brackets.
3. Never position the lifting equipment where damage to the equipment load may occur.
4. When using a forklift, make sure the forks are long enough to extend past the intended load. This prevents accidental punctures on the underside of the equipment crates, boxes and skids that may damage the equipment itself.
5. Use spreader bars.
6. Do not slide, drag or push equipment across surfaces. Always lift to move into position.
7. Do not roll, drop or throw equipment or accessories.
8. Lifting cables and/or straps must not be attached to, or permitted to come in contact with nozzles, flanges, gussets, pipes, shafts, painted surfaces, or any other accessory that may be damaged by contact.
9. When equipment is being lifted, proper rigging practices should be observed and a guide- line should be attached to prevent impact damage caused by swinging into contact with other object.
10. Never set on or roll over an equipment fitting and never use a fitting as a lifting point.
11. Prevent tools, hooks, etc. from striking the Carbon System equipment.

1.5 ASSEMBLY INSTRUCTIONS

The Carbon System has been shipped pre-assembled to the greatest extent possible. The attached drawing shows the system after assembly. The piping module skid and vessel skids have drilled holes for placement and mounting. The site foundation should be level, but most importantly flat. Check to see if any bolts that may have come loose during shipment, if so, tighten them. The internal nozzles have been shipped installed. Be sure to use proper flange tightening procedures when assembling the piping.

Each Carbon System should be assembled in the following order:

1. Mark the foundation with guide-lines in order to place the vessels in a straight line.
2. Locate the vessels spaced as shown on drawing.
3. Place the piping module appropriately between the face piping connections.
4. If alignment is off, make sure the vessels and piping module are level and in the correct positions. Some shimming of the vessels and piping module may be required.
5. Bolt Tank A to the piping module (bolt loosely until system is fully assembled).
6. Bolt Tank B to the piping module (bolt loosely until system is fully assembled).
7. If alignment is acceptable, tighten all the bolts.
8. Secure the vessels and piping module to the foundation.
9. Assembly is complete.

2.0 EQUIPMENT DESCRIPTION

2.1 GENERAL DESCRIPTION

Well site 95 includes (2) HP1220 System. Each HP1220 Carbon System consists of (2) two carbon adsorber vessels, face piping, and piping module with support skid. Each piping module comes complete with influent, effluent, backwash, air vent line, carbon fill, carbon removal, compressed air, and sampling connections.

The carbon steel adsorbers are vertical cylindrical pressure vessels with elliptical tops and bottoms manufactured for a maximum operating pressure of 125 PSIG. The adsorbers are designed for down flow operation with a specially designed underdrain collection system to maximize the utilization of carbon as well as allow for efficient and rapid removal of the spent carbon. Three sample valves are used for sampling treated water at various levels through the adsorber.

The adsorbers are designed with sufficient free board volume to allow for full fluidization during back washing of the carbon bed during start up and in the event an unacceptable pressure drop develops across the bed due to any filterable solids entering the vessels.

The process and utility piping to operate the system are mounted on the adsorbers and piping module. The piping options include valving to operate the adsorbers in parallel or series (lead/lag) flow configuration. Each adsorber has its own carbon fill, discharge and vent lines. The process piping is equipped with pressure gauges and sample ports at the inlet and outlet of each adsorber. Compressed air connections are provided for use during carbon transfer.

2.2 PROCESS DESCRIPTION

Each Carbon System is designed to remove dissolved organic compounds from contaminated feed water using granular activated carbon. The feed water to be treated will be pumped by the client at a controlled rate through the adsorbers in a series or parallel configuration.

Each adsorber shall contain 20,000 lbs. of granular activated carbon, which will provide sufficient contact time at the design flow rate to remove the organics in the feed water.

Feed water enters the adsorber from the top and flows down through the carbon bed. The treated water is collected in the underdrain system and discharged through the effluent piping.

When the System is piped in the series configuration, and the lead adsorber becomes saturated (exhausted) it's taken off-line for replacement of the spent carbon. The feed water is directed to the second adsorber, allowing the system to remain in service. The lead adsorber is then pressurized up to 30 psig with air. With the addition of utility water, the spent carbon is pneumatically displaced as slurry to a bulk transport trailer. The dewatered spent carbon is reactivated.

To refill the adsorber with fresh carbon, the carbon in the trailer is slurried, using clean water, pressurized up to 15 psig and then transferred to the empty adsorber.

Once the fresh carbon is placed in the vessel, it must be soaked and backwashed before the appropriate valves will be opened, placing the vessel with the fresh carbon in the secondary position, if operated in series configuration.

2.3 DESIGN AND OPERATING CONDITIONS

EACH VESSEL:

Vessel Diameter	144"
Side Shell Height	60"
Overall Height (Approx.)	15' 10"
Working Pressure	125 psi @ 150 °F
Manway:	
Flanged at side shell	20"
Elliptical type at head	14" x 18"
Vessel Volume	7520 gal.
Vessel Carbon Capacity	20,000 lbs.
Carbon Bed Volume-Typical	678 Ft ³
Maximum Flow Rate Typical	1000 GPM
Design Criteria	ASME
Code Stamping	YES
Material	Carbon Steel
Supports	Wide Flange Legs
Lifting	Lifting Lugs
Seismic	CBC 2007
Interior Surface Prep	SSPC-SP5
Interior Surface Coating	Plasite 4110 35 mil dft min
Exterior Surface Primer	Epoxy 4 mil min dft
Exterior Surface Coating	Urethane 3mil min dft
Standard Color	Carboline #9225-Cashew

UNDERDRAINS:

External ring header	Carbon Steel
Septa Screens	8 ea-316L Stainless Steel V-Wire Screens 4 ½" Dia x 10"

VALVE ASSEMBLY AND PIPING:

Piping:	
Process Piping	8" Schedule 40 Carbon Steel
GAC Transfer Piping	4" Sch 10 304L Stainless Steel
Valves:	
Process	8" Butterfly, Cast Iron Body w/SS Disk, Gear Operator
GAC Transfer	4" Fanged 316 Stainless Steel Full Port Ball Valve
Vent/Wash	2" Bronze Ball Valve
Sample Ports (3)	1/2" Bronze Ball Valve

SYSTEM WEIGHT:

System Shipping weight	45,000 lb
System Carbon Weight	20,000 lb
System Operating Weight	185,000 lb

2.4 GENERAL PROCESS COMMENTS

OPERATIONAL CHANGES

Optimum operation of the system is obtained if changes to the system occur slowly. Rapid changes in flow will cause upsets to the adsorbers, which could adversely affect the operation. Valves should be turned slowly at all times to prevent hydraulic shock.

3.0 START-UP

3.1 SAFETY

Any piece of equipment can be dangerous if operated improperly. Safety is ultimately the responsibility of those operating and maintaining the equipment. All personnel operating and maintaining the Carbon System and its proper implementation must be familiar with all of the Carbon System components, and observe all OSHA, federal, state and local safety codes and requirements. The personnel should also be active participants in an approved plant-wide health and safety program.

Failure to properly follow instructions and failure to take proper safety precautions is dangerous and can cause serious personal injury, needless equipment damage, and unnecessary environmental harm. Mechanical modifications and/or substitutions of parts on equipment that will affect structural, operational, or environmental safety should not be made. Modifications may defeat protective features originally designed into the equipment and control; and therefore, should not be made.

The following is a partial list of precautions to follow but in no case is the list exhaustive nor is it intended to be. Operators and maintenance personnel should expand on this list after first reviewing the entire Carbon System and its operation with the appropriate health and safety authorities.

- Keep areas clean. A clean work area is a much safer area.
- Keep all equipment guards in place. If removed to service the equipment, make sure the guards are replaced properly.
- Wear eye and face protection around rotating and pumping equipment and whenever working around or handling chemicals. Be especially cautious for splash when disconnecting piping, valves and fittings.
- Wear ear protection if necessary.
- Wear proper apparel. Do not wear loose clothing, or jewelry, which could be caught in machinery.
- Wear a proper respirator around chemicals and in areas where vapors and/or gases may be present.
- Non-skid footwear is recommended and always wear protective gloves when feasible.
- Remove adjusting screws or wrenches. Form a habit of checking to see that all tools are removed from equipment.
- Make sure all personnel are familiar with OSHA approved Material Safety Data

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Sheets for all hazardous materials they may come in contact with.

STAY ALERT

WATCH WHAT YOU ARE DOING

USE COMMON SENSE

**DO NOT PERFORM OPERATION OR MAINTENANCE FUNCTIONS
WHEN YOU
ARE TIRED OR GROGGY**

**DO NOT ATTEMPT TO SERVICE OR OPERATE MACHINERY YOU ARE
NOT
FULLY FAMILIAR WITH**

DO NOT TAKE CHANCES

ASK FOR ASSISTANCE IF IN DOUBT

DO NOT TRY TO DO IT ALONE

THINK BEFORE YOU ACT AND BE CAREFUL

3.2 OXYGEN DEMAND CREATED BY ACTIVATED CARBON IN CONFINED VESSELS

Research efforts have confirmed that wet granular activated carbon confined in large vessels creates an oxygen demand, which is hazardous to human health and can cause death unless proper safety precautions are observed.

Studies conducted have shown that low oxygen content exists in vessels containing wet carbon. Laboratory experiments conducted since that time also have revealed that commercial activated carbons in a wet or moist condition will lower the oxygen content of an isolated space. Preliminary indications of this research are:

1. The phenomenon occurs with wet activated carbon of all common types.
2. The rate of oxygen uptake naturally varies with the degree of exposure of the wet carbon to the air. Thus, it is relatively rapid in a drained bed.
3. There is some indication of a limit to carbon's capacity for oxygen, but until more is known, it would be prudent to assume that all carbon (fresh, used, reactivated) will also exhibit this characteristic. Similarly, although these tests were run with water, it should be assumed that the phenomenon will occur in other liquid and vapor systems.

NOTE:

ALL CONFINED SPACES, INCLUDING THOSE CONTAINING ACTIVATED CARBON, SHOULD BE PRESUMED TO BE HAZARDOUS. APPROPRIATE SAFETY MEASURES SHOULD ALWAYS BE TAKEN BEFORE ENTERING, AS WELL AS WHEN WORKERS ARE IN A CONFINED SPACE. OSHA REGULATIONS APPLICABLE TO RESPIRATORY PROTECTION IN OXYGEN-DEFICIENT ATMOSPHERES SHOULD BE STRICTLY FOLLOWED.

3.3 DISINFECTING THE ADSORBERS PRIOR TO FILLING WITH ACTIVATED CARBON

For drinking water applications the adsorbers must be disinfected prior to filling the adsorbers with activated carbon. Refer to section 8 for equipment disinfection procedure.

3.4 FILLING THE ADSORBERS

BULK BAGS

When filling the adsorbers with Bulk Bags the following steps are to be followed:

1. Remove the manway cover in adsorber head (top).
2. Open Vent Valve.
3. Make certain all remaining valves are closed.
4. Fill each adsorber to approximately half capacity with water.
5. Carefully empty the bulk bags into the adsorbers. After emptying eight bags of carbon, check the water level. If carbon is above the water level, add more water as necessary. Carbon should always be placed into the adsorber with a water cushion.
6. After all carbon has been loaded, fill the vessel with water and reinstall the manway cover.
7. With the carbon bed totally covered with water, let carbon bed soak approximately 24 hours to totally dissipate air from the carbon **with vent line open**.

SLURRY

Carbon is transferred into the vessels from a bulk pneumatic trailer as slurry through the carbon slurry inlet transfer lines on the vessels. The vessels must have a water cushion before carbon is transferred. The trailer must be filled with water prior to beginning the transfer sequence. The bulk pneumatic trailer is then pressurized to 15 psig. Slowly fully open the appropriate carbon slurry inlet line. While transferring the carbon, the vent lines shall be fully open. All other valves should be in the closed position. The carbon must be soaked for approximately 24 hours **with the vent line open** to totally dissipate air from the carbon bed.

3.5 INITIAL BACKWASH

The adsorbers should be backwashed after soaking and prior to being placed in service, to remove carbon fines, entrapped air and to fully stratify the carbon bed. To backwash the adsorption tank, the procedure is described below.

The Purchaser is responsible for performing the initial backwash and providing an ample water supply. The water should be **clean** water (free of solids and organics) and the flow rate should be high enough to achieve approximately 25% bed expansion. The backwash flow rate is dependent upon carbon type, mesh size and water temperature. Siemens Industry Inc. ACNS granular activated carbon will be used in this application. Backwash rates can range from 1000-1100 GPM typical depending upon the temperature of the backwash water. Refer to the ACNS Carbon Data Sheet in Section 8.0 for proper backwash rates.

EACH ADSORBER SHOULD BE BACKWASHED SEPARATELY. (Refer to HP1220 SYSTEM FLOW DIAGRAM on page 15 and 3-TIER MANIFOLD VALVE SEQUENCE CHART on page 16 of this manual).

At the start of backwash all valves in the adsorption system are closed. To initiate backwash, refer to the valve chart. Open the valves in the sequence the water flows.

1. Engage backwash water supply.
2. Final open the backwash discharge valve to adjust backwash flow rate. Backwash ACNS activated carbon up flow at about 1100 gpm for approximately 10-15 minutes or until the water leaving the vessel is clear of carbon fines. (Flow rate may vary depending on water temperature. Refer to Data Sheet on ACNS in Section 8 of this manual).
3. Slowly close all valve in reverse order

Repete the process for each vessel with fresh carbon.

4. The system is now ready to be put on-line.

NOTE: PROVISIONS SHOULD BE MADE TO PROPERLY DISPOSE OF THE BACKWASH WATER.

3.6 PLACING THE SYSTEM IN OPERATION

Refer to HP1220 SYSTEM FLOW DIAGRAM on page 15 and 3-TIER MANIFOLD VALVE SEQUENCE CHART on page 16 of this manual.

START-UP PROCEDURE FOR SYSTEM OPERATION IN PARALLEL

Initially, all valves in the adsorption system are closed. The feed to the adsorption system is provided by the user's feed pump. The pump must be started and brought up to approximately ½ of the operating flow rate prior to placing the lead carbon adsorber in operation. When this has been accomplished, the pump discharge valve is slowly opened. The pump is then brought up to full flow. The second adsorber is then placed into operation so that the valves are configured for parallel operation. For normal operation through the adsorbers, the valve sequencing is as follows:

With feed pump connected to influent line and all valves closed bring the pump up to 50% flow:

Use the valves sequence chart and open valves slowly. Sequence valves as the water flows. First on vessel then the system mate..

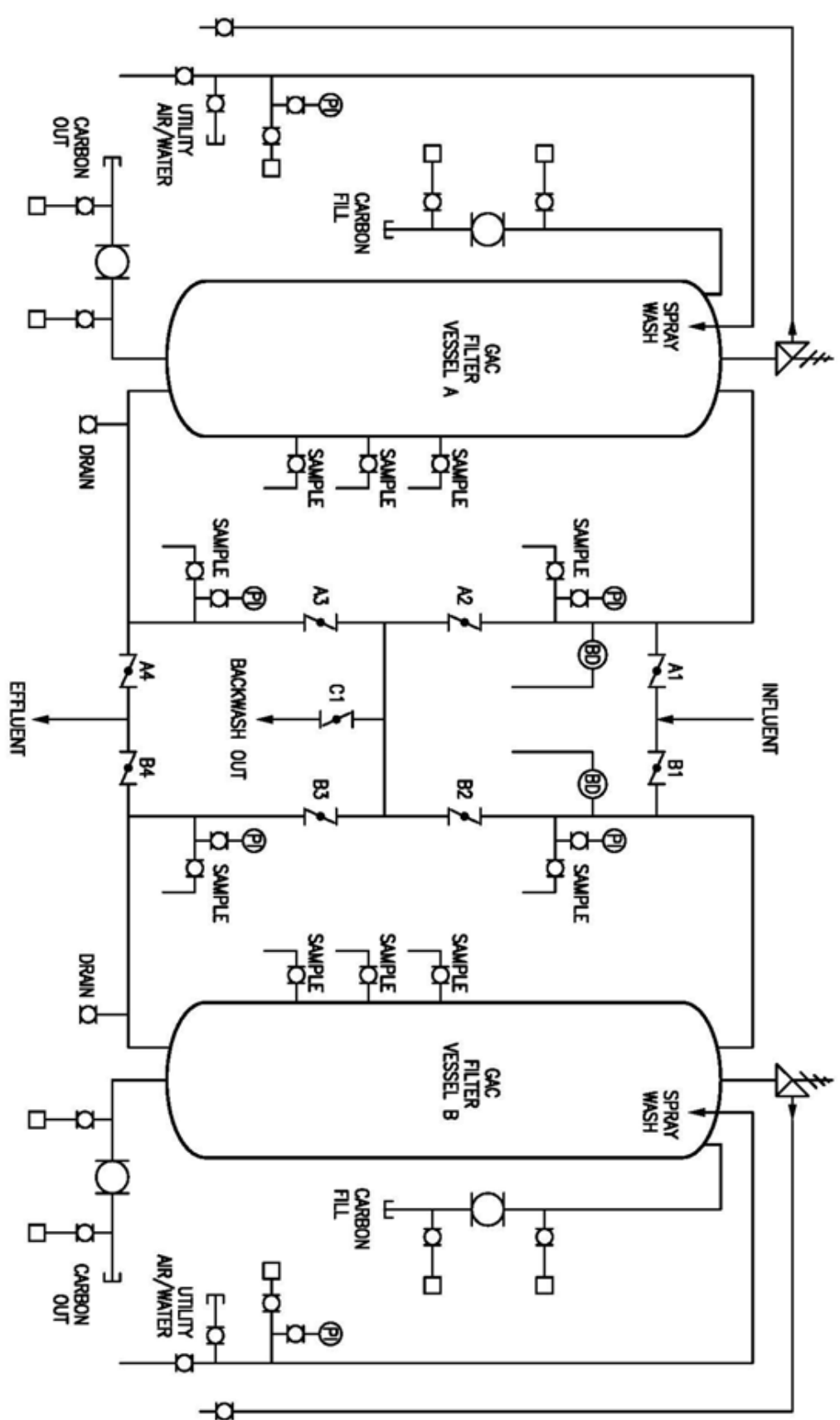
1. Air will vent from the first adsorber through the vent valve.
2. Once a vessel is full of water, slowly continue.
3. Slowly bring the feed pump up to 100% flow.
4. Air within the adsorber should vent through the Vent Valve on the second vessel.
5. Once the vessel is full of water, slowly open valves to direct flow.

START-UP PROCEDURE FOR SYSTEM OPERATION IN SERIES

The same procedure is performed for starting up the system for series operation except that the pump can be ramped up to 100% flow when placing the first adsorber online and the valves are configured for series operation per the **3-TIER MANIFOLD VALVE SEQUENCE CHART on page 16 of this manual.**

Normal operation requires no further changes until breakthrough occurs. When this happens, call **Siemens Industry Inc.** Customer Service to schedule a changeout. Refer to Section 6.4 for contact and phone number.

When particulate builds up on the carbon it becomes necessary to backwash the units. Refer to Section 3.7 for Backwash Procedure.



- LEGEND**
- BUTTERFLY VALVE
 - BALL VALVE
 - CHICAGO FITTING
 - CAM LOCK (MALE)
 - PRESSURE INDICATOR
 - BURST DISK
 - VACUUM/AIR RELIEF

GENERAL COMMENTS:
 THE ABOVE P&ID IS FOR THE STANDARD GAC 2 VESSEL PAD AND FLOW DIAGRAM.
 THIS P&ID IS SUBJECT TO CHANGE WITHOUT NOTICE.
 ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED.
 ALL MATERIALS ARE AS NOTED UNLESS OTHERWISE SPECIFIED.
 ALL CONNECTIONS ARE AS NOTED UNLESS OTHERWISE SPECIFIED.
 ALL VALVES ARE AS NOTED UNLESS OTHERWISE SPECIFIED.
 ALL FITTINGS ARE AS NOTED UNLESS OTHERWISE SPECIFIED.
 ALL SYMBOLS ARE AS NOTED UNLESS OTHERWISE SPECIFIED.
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 RED BLUFF, CA
 530-827-2884

PROJECT CODE: 2veselFTD

REV: 1 OF 1

3-TIER SYSTEM MANIFOLD VALVE SEQUENCE CHART

VALVE SEQUENCE CHART: 3-TIER SYSTEM MANIFOLD										O – OPEN	X – CLOSED
OPERATION	VALVE NUMBER										
	A1	A2	A3	A4	B1	B2	B3	B4	C1		
SERVICE: SERIES 'A' TO 'B'	O	X	O	X	X	O	X	O	X		
SERVICE: SERIES 'B' TO 'A'	X	O	X	O	O	X	O	X	X		
SERVICE: 'A' ONLY	O	X	X	O	X	X	X	X	X		
SERVICE: 'B' ONLY	X	X	X	X	O	X	X	O	X		
SERVICE: PARALLEL 'A' AND 'B'	O	X	X	O	O	X	X	O	X		
BACKWASH: 'A' ONLY	X	O	X	O	X	X	X	X	O		
BACKWASH: 'B' ONLY	X	X	X	X	X	O	X	O	O		
BACKWASH 'A' FROM SERVICE 'B' ¹	X	O	X	O	O	X	X	O	O		
BACKWASH 'B' FROM SERVICE 'A' ¹	O	X	X	O	X	O	X	O	O		
BACKWASH: PARALLEL 'A' AND 'B'	X	O	X	O	X	O	X	O	O		

¹ REQUIRES VALVE BY OTHERS ON EFFLUENT WATER PIPE TO BE CLOSED.

3.7 BACKWASH

If the pressure drop across an adsorber becomes too high (doubling clean bed pressure drop), backwashing may be necessary. Generally, the cause of high-pressure drop is solids depositing in the carbon bed. This can not only lead to high pressure drop, but can cause channeling in the carbon bed and lead to premature breakthrough of organic contaminants.

It is the Purchaser's responsibility to backwash an adsorber and to provide ample water for backwashing. The water should be **clean** water (free of solids and organics) and the flow rate should be high enough to achieve approximately 25% bed expansion.

Backwashing with water containing solids is highly discouraged. If the solids are smaller than the slot opening size of the septa, they will be introduced into the carbon bed via the underdrain septa screens. If the solids are larger than the slot opening size of the septa, then there is a strong possibility that these solids may become trapped in the septa slots resulting in lugging. Plugging of the septa slots will decrease the open area for flow resulting in a high pressure drop. These solids may become so tightly wedged in the septa openings that the only remedy for their removal is to remove the septa screens and either clean them or replace them.

Backwashing with water containing organics is also highly discouraged. Normal operation for organic removal is down flow. In down flow operation, the mass transfer zone (volume of carbon in the bed where organics are being removed) moves down through the bed. The volume of carbon above the mass transfer zone is spent and the volume of carbon below the mass transfer zone is available for adsorption. If the bed is backwashed with water containing organics, then organics are adsorbed below the mass transfer zone. When the bed is placed in normal down flow operating mode, those organics will desorb and premature breakthrough may occur.

The backwash flow rate is dependent upon carbon type, mesh size and water temperature. Siemens Industry Inc. ACNS coconut based granular activated carbon will be used in this application. Backwash rates can range from 1000-1100 gpm depending upon the temperature of the backwash water. Refer to ACNS Carbon Data Sheet attached for backwash rate.

EACH ADSORBER SHOULD BE BACKWASHED SEPARATELY.

1. Isolate the vessel to be backwashed from the process stream.
2. To initiate backwash, follow the valve sequence chart and the backwash procedure in Section 3.5 above.
3. Backwash for 10 - 15 minutes until backwash water is clear. Make sure backwash valves are open for entire cycle.
4. If pressure drop is still unacceptable, repeat backwash or call **Siemens Industry Inc.** Customer Service. Refer to Section 6.4 for contact and phone number.

NOTE: PROVISIONS SHOULD BE MADE TO PROPERLY DISPOSE OF THE BACKWASH WATER.

3.8 SPENT CARBON REMOVAL

When the activated carbon becomes saturated (exhausted), the system is taken off-line for replacement of the spent carbon. The first adsorber is then pressurized up to 30 psig with 100 cfm air compressor. With the addition of utility water (100 gpm minimum), the spent carbon is pneumatically displaced as slurry to a bulk transport trailer by slowly opening the slurry outlet valve. To remove 20,000 pounds of carbon approximately 5,000 gallons of water is required to keep the spent GAC in slurry to facilitate removal. This will prevent a line clogging. The procedure is repeated for the second adsorber.

To refill the adsorber with fresh carbon see **Section 3.4**.

4.0 TROUBLESHOOTING

The following tables list malfunctions, probable causes, and in most cases, possible corrective action to take for the problem at hand. By no means is this list complete. It is intended only as a guide for the maintenance personnel to help them in properly identifying and isolating equipment malfunctions. If in doubt as to the actual cause of a malfunction, consult the factory or nearest equipment representative for assistance.

ADSORPTION SYSTEM:

<u>MALFUNCTION</u>	<u>PROBLEM CAUSE</u>	<u>CORRECTION ACTION</u>
High pressure drop across adsorber	Bed not flooded Bed air bound	Check to see that the air release valve is operating. Make sure there is a constant flow before valve closes.
	Feed pump pressure too high	Throttle feed pump
	Improper valving	Check valve sequence (see Valve Sequence Chart in Section 3.6). Check for obstructions in transfer lines.
Leaking flange	Particulate build-up on carbon bed	Backwash per Section 3.7
	Loose bolts	Tighten bolts
Discharge Water From the Backwash/Vent Outlet Line	Broken Rupture Disk	Replace Rupture Disk

<u>MALFUNCTION</u>	<u>PROBLEM CAUSE</u>	<u>CORRECTION ACTION</u>
Leaking Pressure Relief Valve	Leaking or broken Relief Valve	Check to see is carbon has collected on the valve seat. Replace Relief Valve
Carbon in the effluent	Internal mechanical failure	To confirm, open effluent sample valve. Collect 1 qt. Effluent sample to check for carbon. If the test confirms internal failure, call Siemens Industry Inc.. Refer to Section 6.4 for contacts and phone number.
Premature breakthrough	Change of influent concentrations	Confirm by checking influent and effluent samples before changing carbon
	Siphoning air in	Check Air Release/Vacuum Relief Valve for correct operation
	Background TOC Colloids	Change carbon
Sudden high contamination level in effluent	Check heel due to improper carbon change-out	Call Siemens Industry Inc.. Refer to Section 6.4 for contacts and phone number.
Frozen lines, broken gauges and valves	Cold weather	Insulate piping and or heat trace process. Call Siemens Industry Inc.. Refer to Section 6.4 for contacts and phone number.
System bacteria infections	Disinfect System	See Appendix A – Disinfection Procedures and/or Tech Note 11 – Activated Carbon Disinfection.

5.0 SYSTEM MONITORING

It is responsibility of the Purchaser to monitor the Carbon System during operation. Spent carbon must be properly profiled according to all applicable regulations prior to reactivation.

The following is a suggested format for an operating log. This list is meant as a suggestion only and is by no means complete. Record each day the following items for each individual Carbon System Vessel:

1. Record all equipment maintenance, calibrations, system cleaning, repairing and any parts replacement.
2. Record any unusual occurrences, shutdowns, breakdowns, etc.
3. Record the date and time when each item is logged.
4. Record the pressure drop across the system daily to indicate if any foreign objects have entered the Carbon System.

6.0 GENERAL CARBON SYSTEM INFORMATION

6.1 TEMPORARY SHUTDOWNS:

For shutdown or intermittent operation, the Carbon System should remain completely full of water and the inlet and outlet should be sealed either by a valve or a cap. Prior to restarting the unit, the Carbon System should be backwashed using two to three bed volumes of water. Failure to backwash may result in a temporary presence of contaminated water at the outlet of the adsorber.

6.2 EXTENDED SHUTDOWNS:

If the Carbon System is shutdown for an extended period of time, the following procedure should be followed to reduce potential degradation of bed life.

Backwash the vessels using two - three bed volumes of water. Drain the Carbon System of all water. There should be no free standing water left in the vessel. All valves, manways, and vents shall be tightly sealed for the duration of the shutdown to eliminate any supply of oxygen that would promote biological growth. Prior to re-commissioning the units, follow the start-up instructions included.

6.3 EMERGENCY PROCEDURES

In the event something should occur to cause a shutdown of an adsorber, the operation shall be switched over to the other adsorber and steps shall be taken immediately to remedy the situation.

If a major leak or failure occurs which would cause the Carbon System to be inoperative, then the feed to the system should be shut down immediately. If repairs are beyond the scope of the plant operators, the customer service department at Siemens Industry Inc. should be contacted immediately.

6.4 Siemens Industry Inc. CONTACTS - HOW TO OBTAIN HELP AND INFORMATION

Red Bluff, CA	530-527-2664
Gulf Coast Region	800-659-1723
Louisiana	225-744-3153
Western Region	800-659-1771
Mid-Atlantic Region	800-659-1717
Midwest Region	708-345-7290
Northwest Region	800-659-1718
Southeast Region	225-744-3153
New England Region	800-659-1717

7.0 MAINTENANCE

7.1 MINOR MAINTENANCE

Minor maintenance is that maintenance to be performed by the plant to ensure continuous and effective operation. This maintenance includes visual check of pressure gauges, rupture disks, and adjustments to valves and regulators, tightening flanges and connections to eliminate leakage, backwashing, etc. During scheduled change-out services vessel internal parts should be inspected (underdrain screens, vessel lining, nozzles, etc.) to ensure they are in good working condition.

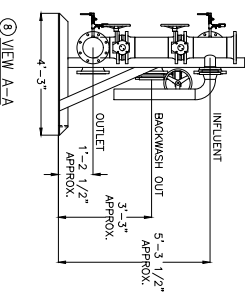
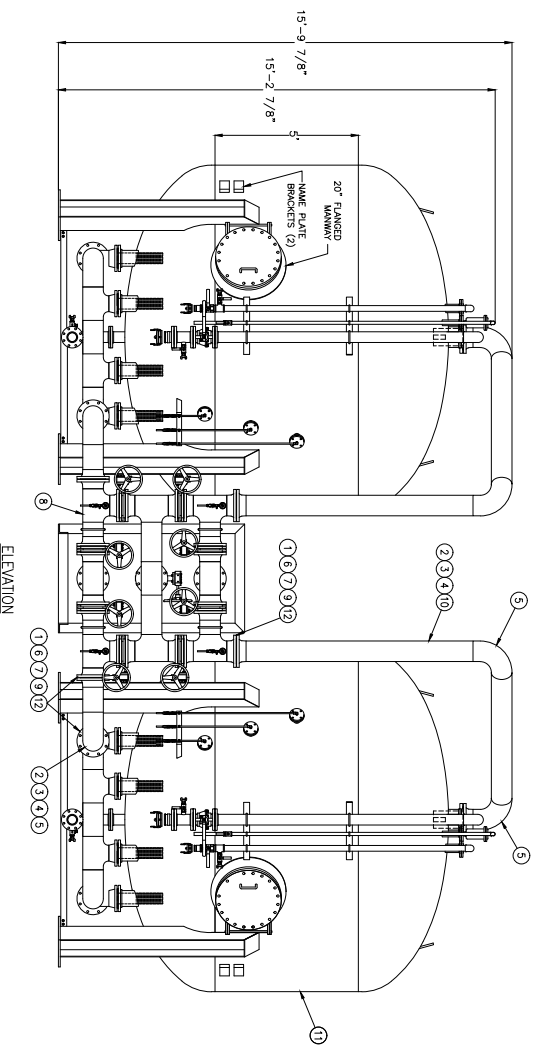
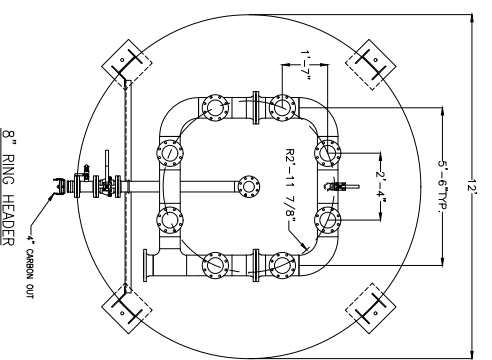
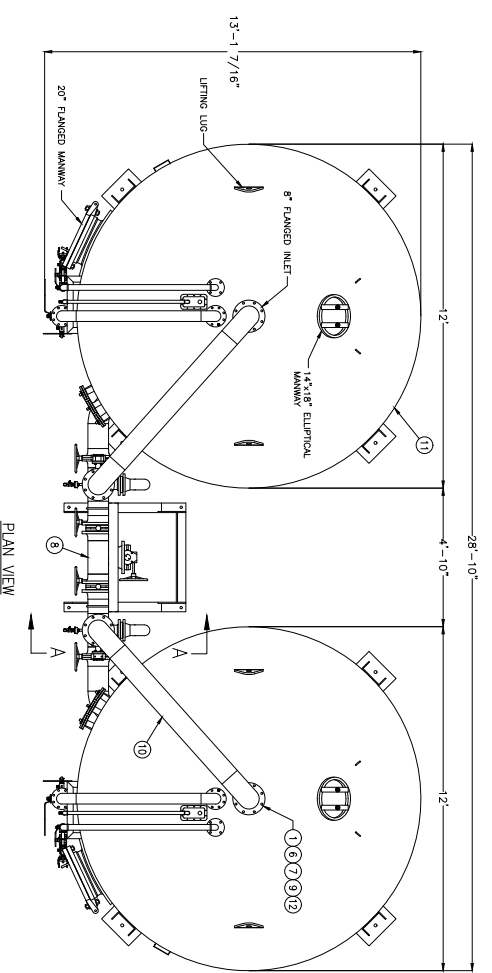
7.2 MAJOR MAINTENANCE

Major maintenance is that effort needed to repair or replace equipment in order to continue system operation. The need for major maintenance would result from a major malfunction causing the system to be inoperative. Major maintenance also refers to system design changes and/or maintenance requiring downtime. Siemens Industry Inc. can be contacted when any major maintenance is called for.

8.0 SPECIFICATION SHEETS

SCHEDULED MATERIALS

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	MARKING
1	20" FLANGED MANWAY	2	EA	20" FLANGED MANWAY
2	1/4" x 3/8" ELIPTICAL MANWAY	2	EA	1/4" x 3/8" ELIPTICAL MANWAY
3	8" FLANGED INLET	2	EA	8" FLANGED INLET
4	LIFTING LUG	2	EA	LIFTING LUG
5	20" FLANGED MANWAY	2	EA	20" FLANGED MANWAY
6	1/4" x 3/8" ELIPTICAL MANWAY	2	EA	1/4" x 3/8" ELIPTICAL MANWAY
7	8" FLANGED INLET	2	EA	8" FLANGED INLET
8	LIFTING LUG	2	EA	LIFTING LUG
9	20" FLANGED MANWAY	2	EA	20" FLANGED MANWAY
10	1/4" x 3/8" ELIPTICAL MANWAY	2	EA	1/4" x 3/8" ELIPTICAL MANWAY
11	8" FLANGED INLET	2	EA	8" FLANGED INLET
12	LIFTING LUG	2	EA	LIFTING LUG
13	20" FLANGED MANWAY	2	EA	20" FLANGED MANWAY
14	1/4" x 3/8" ELIPTICAL MANWAY	2	EA	1/4" x 3/8" ELIPTICAL MANWAY
15	8" FLANGED INLET	2	EA	8" FLANGED INLET
16	LIFTING LUG	2	EA	LIFTING LUG



- NOTES:
- THIS DRAWING IS TO SHOW PILING AND EQUIPMENT FOR CUSTOMER APPROVAL.
 - ALL WELDS SHALL BE MADE USING A 308/309 L FILL METAL, STAINLESS STEEL DISK.
 - PROVIDE 3/16 STAINLESS STEEL SEPTA UNDER DOWN SPINDLES.
 - VESSELS SHALL BE 125 PSI, ASME CODE.
 - FINISH INTERIOR WITH POLYESTER 4110, PRIMER AND APPLY RECOMMENDATIONS TO MEET 300 HOUR CORROSION PROTECTION.
 - PAINT MATERIALS SHALL MEET CS PRE ASIM A-43 GRADE B (ENV); CS FITTINGS SA-234, ASME B16.5, ASME B16.3, CS WELDS SA-508, ASME B16.5, ASME B16.3.
 - FINISH EXTERIOR WITH SPANDEX 113, PRIMER AND APPLY RECOMMENDATIONS TO MEET 300 HOUR CORROSION PROTECTION.
 - STAINLESS STEEL SHIPING WEIGHT: 40,000 LBS.
 - 3" TOLERANCE ON CONNECTION DIMENSIONS.

DATE	DESCRIPTION	BY	CHKD	APPD	REV
9-15-11	HP-1220 SYSTEM 12 FT 20K LB HP 1259S ASSEMBLY				

DATE	CHECKED	DATE	DESIGNED	SCALE
9-15-11		9-15-11		1/2" = 1'

DATE	DESIGNED	DATE	CHKD	APPD	REV
9-15-11		9-15-11			

DATE	DESIGNED	DATE	CHKD	APPD	REV
9-15-11		9-15-11			

DATE	DESIGNED	DATE	CHKD	APPD	REV
9-15-11		9-15-11			

DATE	DESIGNED	DATE	CHKD	APPD	REV
9-15-11		9-15-11			

DATE	DESIGNED	DATE	CHKD	APPD	REV
9-15-11		9-15-11			

DATE	DESIGNED	DATE	CHKD	APPD	REV
9-15-11		9-15-11			

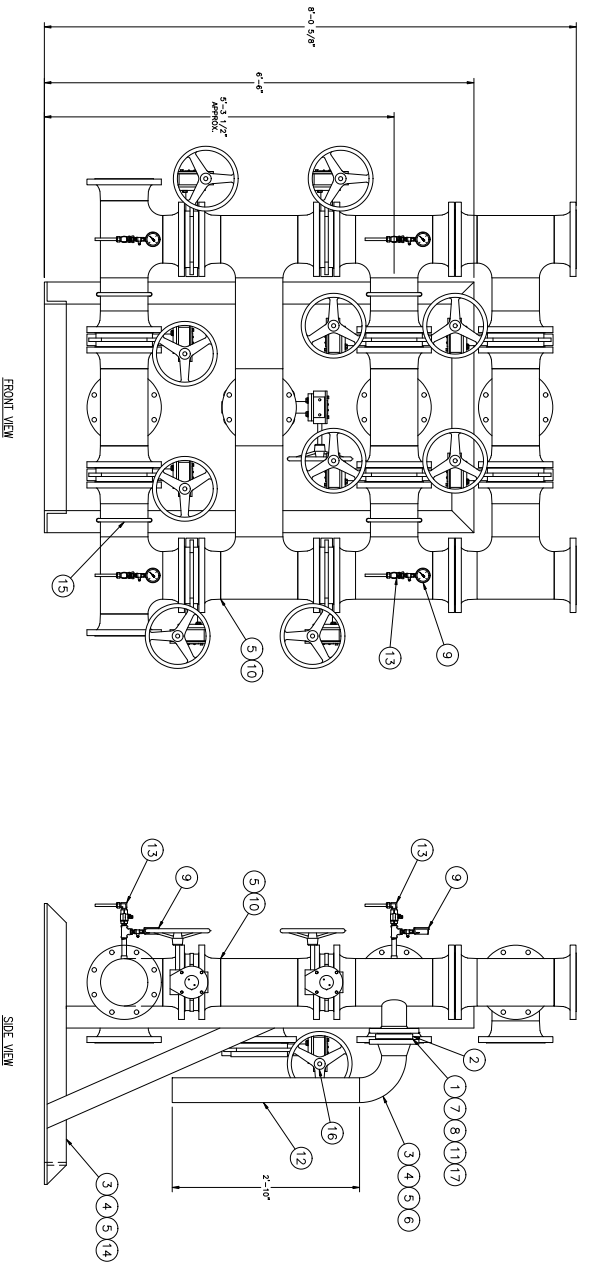
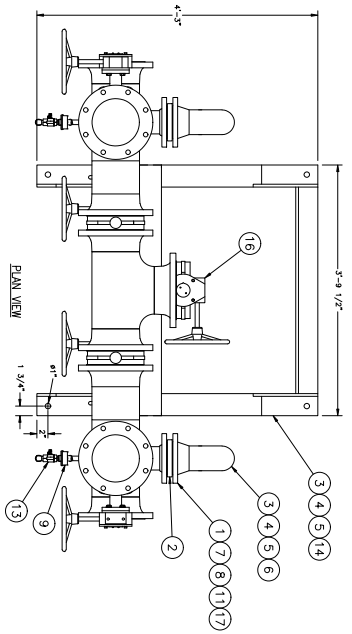
DATE	DESIGNED	DATE	CHKD	APPD	REV
9-15-11		9-15-11			

HP-1220 SYSTEM 12 FT 20K LB HP 1259S ASSEMBLY
 HP-1220S/S
 SPANNAKER HOLDINGS, L.L.C.
 ROOSEVELT IRRIGATION DISTRICT - PHOENIX, AZ

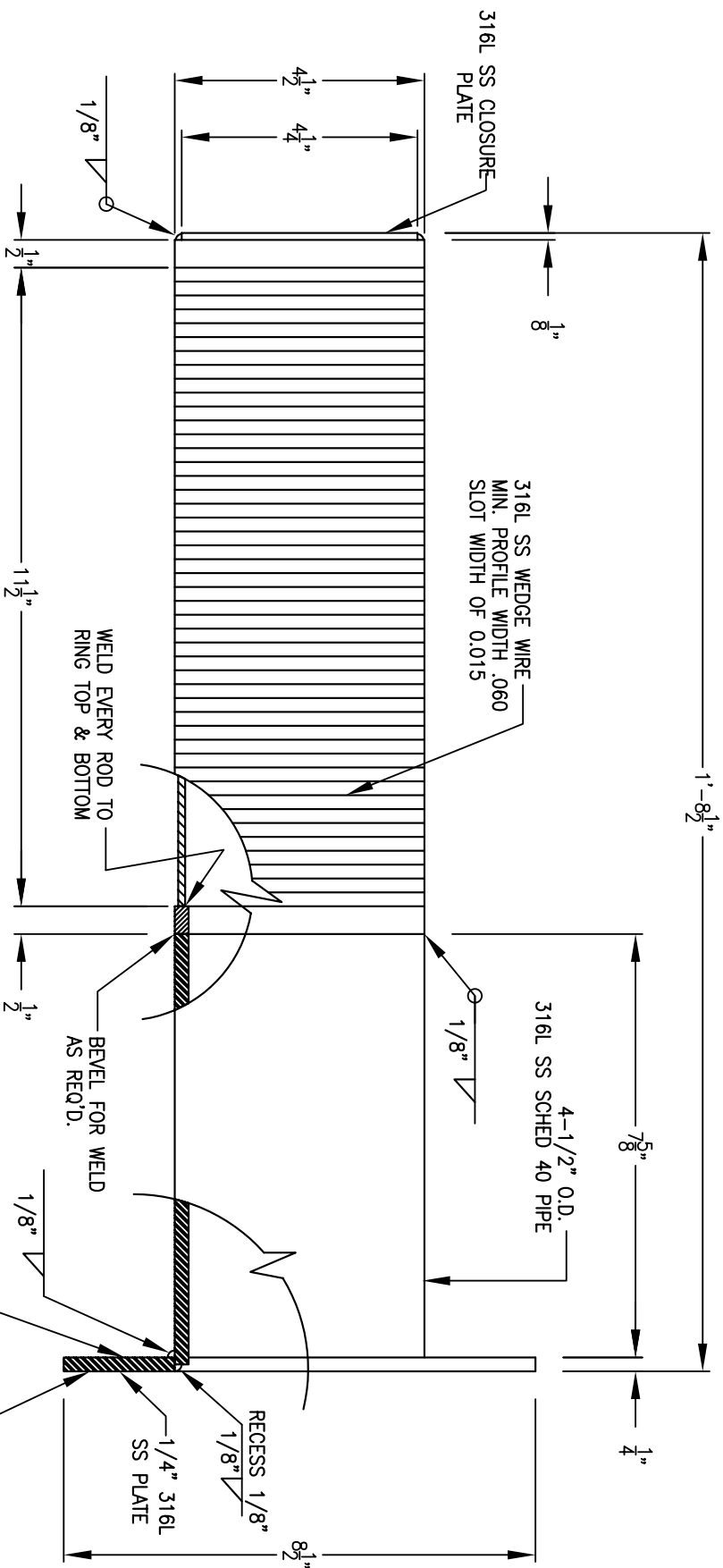
SIEMENS
 WATER METER TECHNOLOGIES
 1000 W. WASHINGTON AVENUE
 PHOENIX, AZ 85007

SCHEDULED MATERIALS

NO.	DESCRIPTION	QTY	PART NUMBER
1	FRONT PANEL	1	11000000
2	FRONT PANEL ASSEMBLY	1	11000000
3	FRONT PANEL ASSEMBLY	1	11000000
4	FRONT PANEL ASSEMBLY	1	11000000
5	FRONT PANEL ASSEMBLY	1	11000000
6	FRONT PANEL ASSEMBLY	1	11000000
7	FRONT PANEL ASSEMBLY	1	11000000
8	FRONT PANEL ASSEMBLY	1	11000000
9	FRONT PANEL ASSEMBLY	1	11000000
10	FRONT PANEL ASSEMBLY	1	11000000
11	FRONT PANEL ASSEMBLY	1	11000000
12	FRONT PANEL ASSEMBLY	1	11000000
13	FRONT PANEL ASSEMBLY	1	11000000
14	FRONT PANEL ASSEMBLY	1	11000000
15	FRONT PANEL ASSEMBLY	1	11000000
16	FRONT PANEL ASSEMBLY	1	11000000
17	FRONT PANEL ASSEMBLY	1	11000000
18	FRONT PANEL ASSEMBLY	1	11000000



STB: BOMBER-THIEF-ZAKSBU	NIL: 0001	DATE: 11/11/2010	SCALE: 1:1	REVISION:	DATE:	BY:	CHKD:	APPD:	ESN:
<p>SIEMENS Water Technologies 11000000-01 1 OF 1 0</p>									



MACHINE TOOL FINISHED W/
SPIRAL OR CONC. GROOVES ± 1/64" DEEP
ON 1/32" CENTERS

COMPANY CONFIDENTIAL
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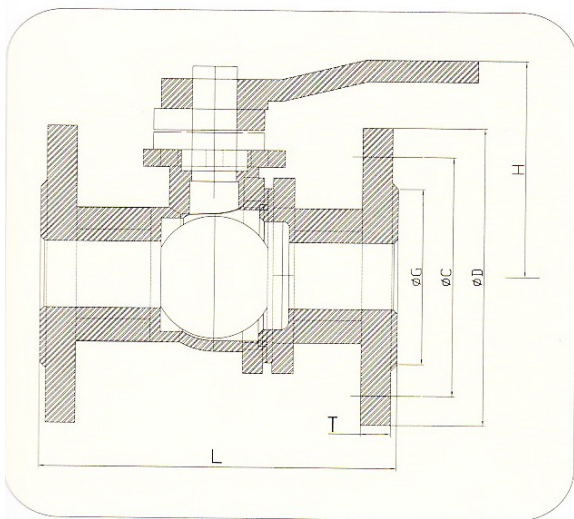
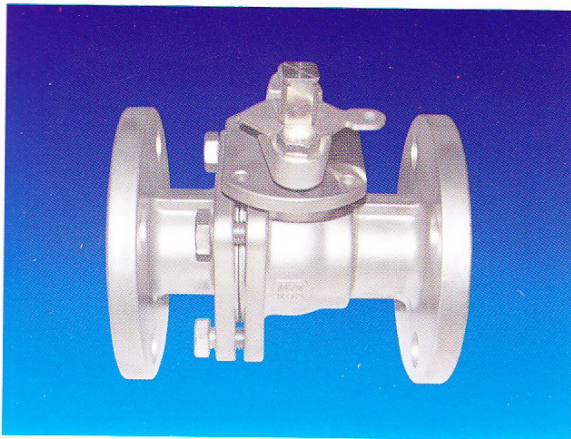
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CHECKER		DATE	
ENGINEER		DATE	
MANAGER		DATE	
FILE:			
SCALE:	1:3		

TITLE	SEPTA 4 1/2IN OD .015 SLOT
CLIENT	ESM3037
PROJECT	ESM3037.DWG
CODE	1
DRAWING	1
SHEET	1
REV	1

SIEMENS
Water Technologies
RED BLUFF, CA

FLANGED BALL VALVE

Material: 316 / 304



MATERIALS LIST

PART NAME	304	316
BODY	SCS13	SCS14
BONNET	SCS13	SCS14
BALL	SS304	SS316
STEM	SS304	SS316
SEAT	PTFE	PTFE
GASKET	PTFE	PTFE
GLAND	SS304	SS316
GLAND PACKING	PTFE	PTFE
BONNET BOLT/NUT	ASTM 194-B8	
GLAND BOLT		
STOPER	SS304	SS304
SPRING WASHER	SS41	SS41
HANDLE	WCB	WCB

TWO-PIECE BALL VALVE
JIS 10K FLANGE END

APPLICATIONS

- FACE TO FACE DIMENSIONS : JIS B2002
- END FLANGE DIMENSIONS : JIS B2239
- DESIGN : ANSI B16.34
- BLOW-OUT PROOF STEM/FULL PORT
- LEVER OPERATED OR GEAR OPERATED
- WITH ISO 5211 MOUNTING PAD
- MATERIAL : CAST IRON/FC20
CARBON STEEL/SCPH2/WCB
STAINLESS STEEL 304/SCS13
STAINLESS STEEL 304/SCS14

SHELL (BY WATER)	450PSI
	32KG/CM ²
SEAT	BY WATER
	300PSI
	21KG/CM ²
	BY AIR
	80PSI
	6KG/CM ²

DIMENSIONS

Unit: mm

SIZE	L	H	D	C	G	ISO-5211	T		
							FC	SCS	
1/2"	15.0	110.0	85.0	95.0	70.0	52.0	F04	16	11
3/4"	20.0	120.0	90.0	100.0	75.0	58.0	F04	18	14
1"	25.0	130.0	100.0	125.0	90.0	70.0	F04	18	14
1 1/4"	32.0	140.0	105.0	135.0	100.0	80.0	F05	20	16
1 1/2"	40.0	165.0	110.0	140.0	105.0	85.0	F07	20	16
2"	50.0	180.0	120.0	155.0	120.0	100.0	F07	20	16
2 1/2"	65.0	190.0	160.0	175.0	140.0	120.0	F07	22	18
3"	80.0	200.0	170.0	185.0	150.0	130.0	F10	22	18
4"	100.0	230.0	180.0	210.0	175.0	155.0	F10	24	18

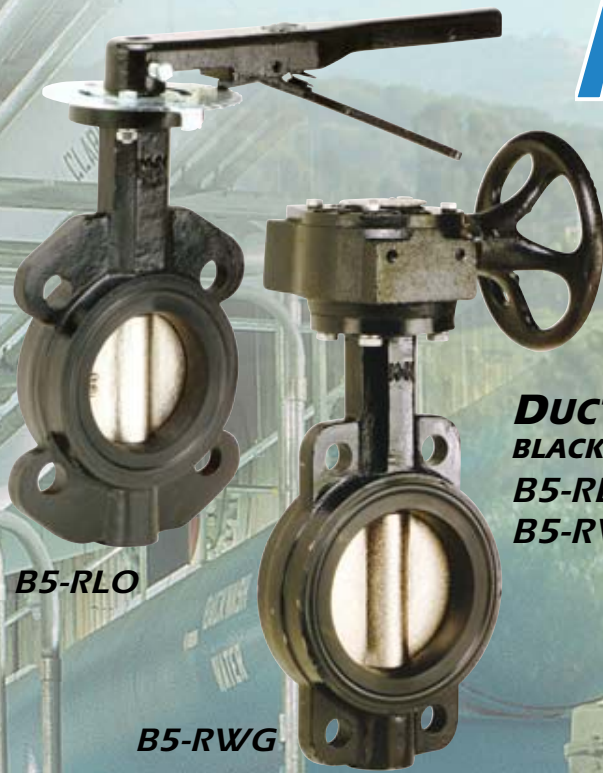


MATCO-NORCA™

B5 Butterfly Valve



Available In Wafer Style



B5-RLO

B5-RWG

DUCTILE IRON DISC
BLACK BODY - BUNA-N SEAT
B5-RLO - Lever Handle
B5-RWG - Gear Handle

B5-RLO
with 48"
extension
option

ALUMINUM BRONZE DISC
ORANGE BODY - BUNA-N SEAT
B5-RLOAB - Lever Handle
B5-RWGAB - Gear Handle



B5-RLOAB

B5-RWGAB



B5-RLOSE

STAINLESS STEEL DISC
GRAY BODY - EPDM SEAT
B5-RLOSE - Lever Handle
B5-RWGSE - Gear Handle



And Lug Style



B5-LGLAB

ALUMINUM BRONZE DISC
ORANGE BODY - BUNA-N SEAT
B5-LGLAB - Lever Handle
B5-LGGAB - Gear Handle



B5-LGLSE

STAINLESS STEEL DISC
GRAY BODY - EPDM SEAT
B5-LGLSE - Lever Handle
B5-LGGSE - Gear Handle



B5-LGLS



B5-LGGS

STAINLESS STEEL DISC
RED BODY - BUNA-N SEAT
B5-LGLS - Lever Handle
B5-LGGS - Gear Handle



B5-LGL



B5-LGG

DUCTILE IRON DISC
BLACK BODY - BUNA-N SEAT
B5-LGL - Lever Handle
B5-LGG - Gear Handle



Description

The Matco-Norca B5 Series Butterfly Valve is the newest addition to our family of high quality Iron Valves. Offered in Wafer style and Lug style, these valves are available with Ductile Iron, Aluminum-Bronze or 316 Grade Stainless Steel discs. These valves are in stock with both BUNA-N and EPDM liners. Viton liners are available upon request.

The new B5 design incorporates a one-piece stem with an important new feature. The disc is broached to accept the milled square stem which allows the disc to float, providing substantially improved torque values.

The B5 is available with lever operators and worm gear operators and features a bubble tight shut-off. The lug configuration is suitable for dead-end service. All Matco-Norca Butterfly Valves can be modified with extensions and various actuators.



Features

- ❖ *200WOG for 2" - 12", 150WOG for 14" - 24"*
- ❖ *Teflon Graphite Stem Bushing for positive stem alignment.*
- ❖ *Stem includes a snap ring to prevent inadvertent stem removal.*
- ❖ *Unique Stem to Disc design.*
- ❖ *All valves are epoxy coated.*
- ❖ *Torque Values up to 33% less than other valve designs.*
- ❖ *Precision disc machining provides bubble-tight shutoff.*
- ❖ *Top and bottom alignment holes.*
- ❖ *Ten Position lock lever handles are ideal for on-off and throttling applications.*



Applications

The Matco-Norca B5 Series Butterfly Valves are suitable for many applications. The B5 is well suited for:

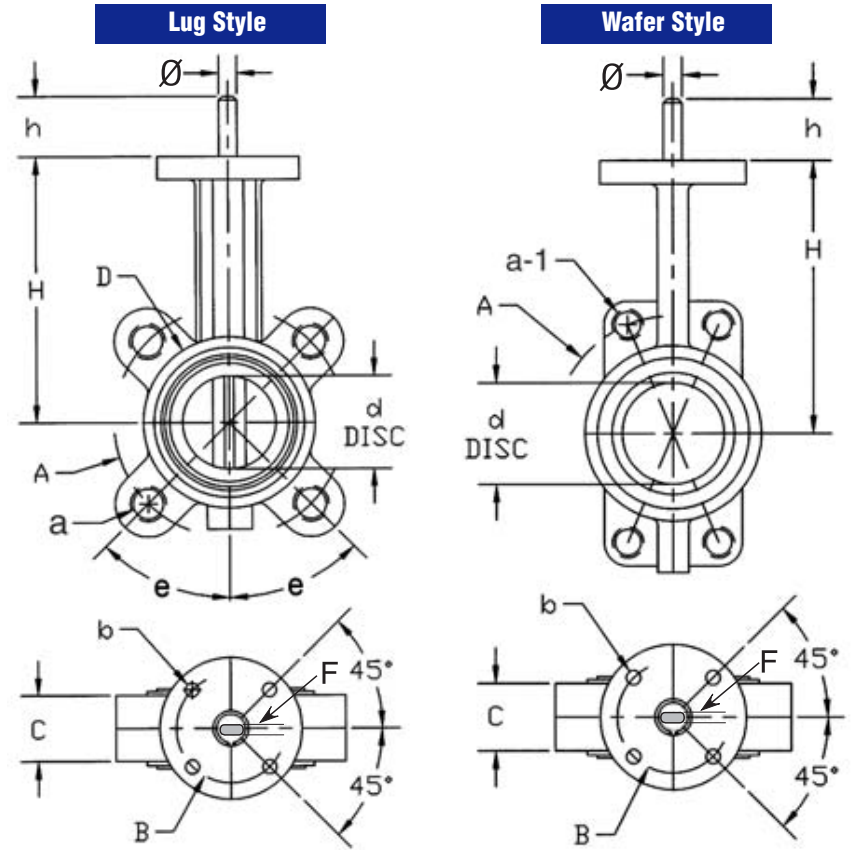
- ❖ *Agricultural and Turf Irrigation*
- ❖ *Water Distribution*
- ❖ *Waste Water Treatment*
- ❖ *Industrial Applications Including Chemical, Pulp & Paper and a Wide Array of General Industrial Mediums.*
- ❖ *Valves with BUNA-N Liners are suitable for oil and gas applications.*
- ❖ *Valves with EPDM Liners are suitable for high temperature water and air applications: 250°F.*



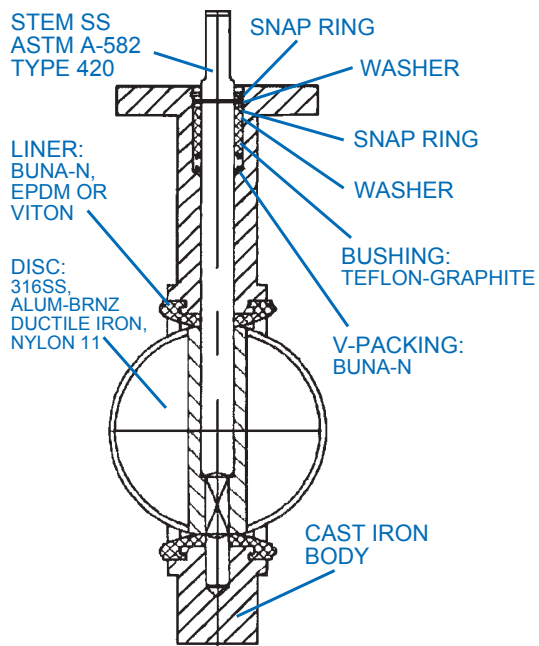


Design, Dimensions & Material Specifications Torque Chart

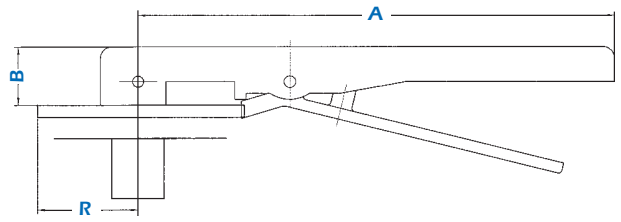
2" - 12": Inch Pounds @ 200 PSI Line Pressure		14" - 24": Inch Pounds @ 150 PSI Line Pressure	
Size	Torque	Size	Torque
2"	50	14"	2500
2.5"	50	16"	3000
3"	250	18"	3000
4"	250	24"	4250
5"	500		
6"	600		
8"	1000		
10"	1800		
12"	2000		



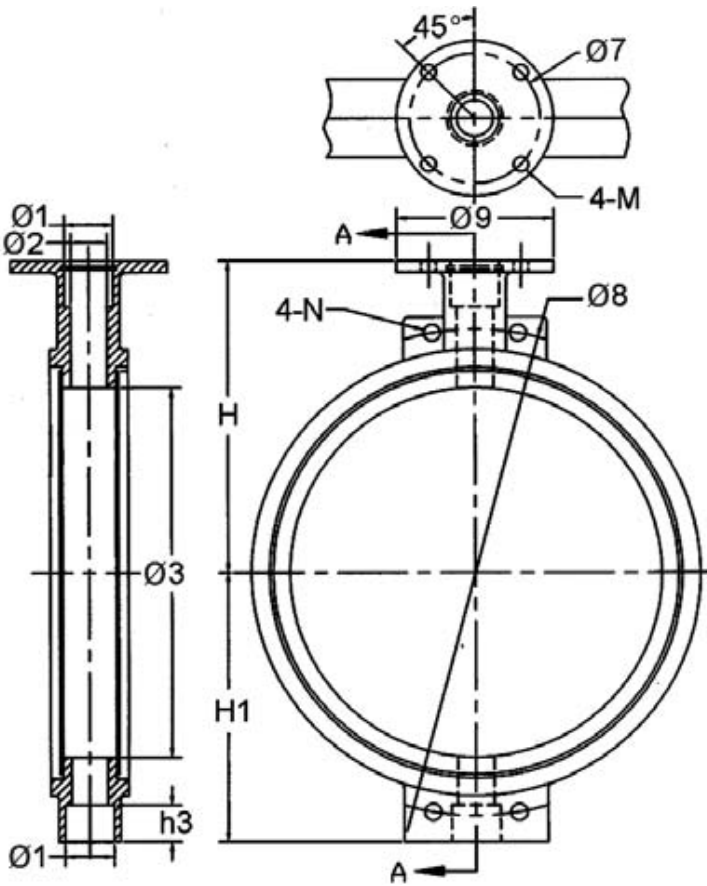
Size	H	d+.05	D	A	a	a-1	B	b	c	h	Stem Ø	F (flat)	e
2"	5.50	2.05	3.54	4.75	5/8" - 4	11/16"	2.25	.284	1.625	1.25	.564	.375	45°
2.5"	6.00	2.52	4.02	5.50	5/8" - 4	11/16"	2.25	.284	1.750	1.25	.564	.375	45°
3"	6.25	3.09	4.69	6.00	5/8" - 4	11/16"	2.25	.284	1.750	1.25	.564	.375	45°
4"	7.00	4.09	5.91	7.50	5/8" - 4	11/16"	2.75	.406	2.000	1.25	.627	.438	22.5°
5"	7.50	4.85	6.81	8.50	3/4" - 8	13/16"	2.75	.406	2.125	1.25	.752	.500	22.5°
6"	8.02	5.98	7.99	9.50	3/4" - 8	13/16"	2.75	.406	2.125	1.25	.752	.500	22.5°
8"	9.50	7.97	10.23	11.75	3/4" - 8	13/16"	3.50	.472	2.500	1.25	.880	.625	22.5°
10"	10.75	9.86	12.64	14.25	7/8" - 12	15/16"	3.50	.472	2.500	2.00	1.130	.846	15°
12"	12.25	11.87	14.57	17.00	7/8" - 12	15/16"	4.25	.472	3.000	2.00	1.130	.846	15°



Overall Dimensions of Handle Operators



Valve Size	A	B	R	Stem Size
2" - 3"	9.58	1.18	2.13	9/16"
4"	9.58	1.18	2.13	5/8"
5" - 6"	10.5	1.18	2.13	3/4"
8"	13.38	1.25	2.13	7/8"
10" - 12"	13.38	1.25	2.13	1-1/8"

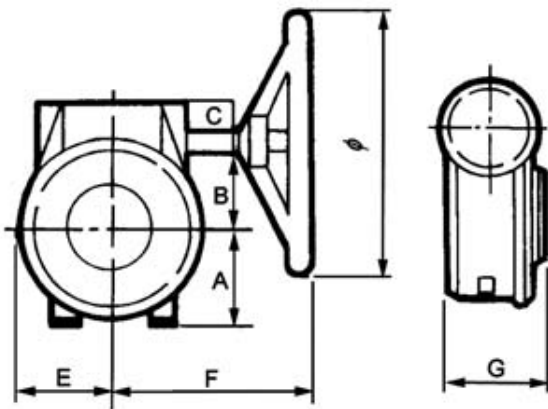


MODELS:	RLO/RWG LGL/LGG	RLOAB/RWG-AB LGLAB/LGG-AB	RLOS/RWGS LGLS/LGGS	RLOSE/RWGSE LGLSE/LGGSE
Body	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Disc	Ductile Iron	Aluminum-Bronze	SS 316	SS 316
Seat	Buna-N *	Buna-N *	Buna-N *	EPDM
Stem	420 Stainless	420 Stainless	420 Stainless	420 Stainless
O-ring	Buna-N	Buna-N	Buna-N	EPDM
Bushing	Teflon-Graphite	Teflon-Graphite	Teflon-Graphite	Teflon-Graphite
Body Color	Black	Black	Red	Gray
Snap ring	Stainless	Stainless	Stainless	Stainless
Lever	Ductile Iron	Ductile Iron	Ductile Iron	Ductile Iron
Gear	Cast Iron	Cast Iron	Cast Iron	Cast Iron

*VITON & Nylon 11 Available on Special Order

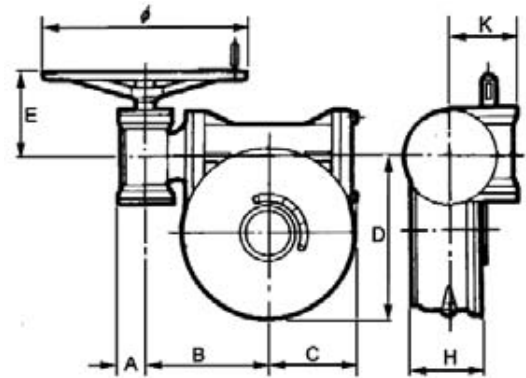
Size	Ø1	Ø2	Ø3	Ø7	Ø8	Ø9	h3	H	H1	M	N
14"	1.88	1.37	14.25	5.0	18.75	6	1.45	12.00	10.38	.56	1.06
16"	2.25	1.62	16.38	5.0	21.25	6	1.45	13.00	11.62	.56	1.06
18"	2.62	1.87	18.38	6.5	22.75	8	1.53	14.50	12.75	.81	1.19
20"	2.75	2.12	20.50	6.5	25.00	8	1.24	15.88	14.00	.81	1.19
24"	2.75	2.12	24.96	6.5	29.50	8	1.24	22.25	16.14	.81	1.38

Overall Dimensions of Worm Gear Operators



Valve Size	A	B	C	E	F	G	Ø
2" - 6"	1.97	1.65	1.22	2.07	5.81	2.95	5.91
8" - 10"	3.15	2.83	1.54	2.95	9.06	3.35	11.81
12" - 14"	3.19	2.83	1.57	3.19	9.02	3.39	11.81
16" - 20"	5.12	4.72	3.54	5.12	11.81	4.86	11.81

Overall Dimensions of 2 Stage Worm Gear Operators





COEFFICIENT OF VOLUME CV.



Valve Size Inches	Stem Diameter Inches	Free Area ft ²	Diameter in Inches	Coefficient of Volume Cv (GPM AT 1P) Disc Opening in Degrees									Nom. Pipe Area ft ²
				10	20	30	40	50	60	70	80	90	
2	.564	.0098	1.34	.119	7.17	13.46	22.44	34.00	49	57	62	62	.022
2.5	.564	.0174	1.79	.815	11.21	28.68	44.68	65.28	87	106	118	123	.034
3	.564	.0310	2.39	.267	16.14	41.30	64.35	94.20	135.3	172	208	239	.049
4	.627	.0512	3.07	.476	28.70	73.42	114.4	167.5	240.6	314	384	438	.087
5	.752	.0814	3.86	.744	44.84	114.7	178.7	261.7	375.9	503	654	817	.136
6	.752	.123	4.75	1.07	64.57	165.2	257.4	376.8	541.3	744	995	1320	.196
8	.880	.265	6.97	1.90	114.8	293.7	457.6	669.9	962.3	1367	1775	3019	.349
10	1.130	.379	8.34	2.98	179.4	458.9	714.9	1047	1504	2124	2924	3978	.545
12	1.130	.643	10.86	4.28	258.3	660.8	1030	1507	2165	3099	4458	6818	.785
14	1.250	.689	11.25	5.54	333.7	853.8	1330	1947	2798	3668	5182	7256	.939
16	1.312	.934	13.37	7.17	432.2	1106	1723	2522	3623	4857	6985	10683	1.23
18	1.500	1.260	15.20	9.13	550.6	1409	2195	3213	4616	6216	9063	13867	1.55
20	1.625	1.569	16.96	11.32	682.0	1745	2719	3980	5718	7740	11284	17193	1.93
24	2.000	2.418	21.06	16.26	980.1	2508	3907	5720	8217	11454	16803	26449	2.92



B5 EXTENSION KITS

FOR USE IN UNDERGROUND INSTALLATIONS

B5 Extensions feature one piece inner stem construction, solid outside housing with full face flanges with BUNA gaskets for water tight seal. The extensions accommodate 10 position levers or gear operators. The extension kits include all necessary hardware for proper mounting to the valve.

AVAILABLE LENGTHS

B5 extensions are available in the following lengths: 24", 36", 48", 60", 72".

EXTENSION - VALVE DIAMETER DESIGNATION

Each letter below corresponds to the valve size for which you are ordering an extension.

A	B	C	D	E	F	G	H	I
2"-3"	4"	5"-6"	8"	10"	12"	14"	16"	18"

EXAMPLE:

To order a 48" Extension for an 8" Butterfly valve, the correct product number would be:



B5-RLO-X-48D



CORPORATE HEADQUARTERS

P.O. Box 27 Route 22
Brewster, NY 10509

LOCAL:

Tel: 845-278-7570
Fax: 845-278-9056

TOLL FREE:

Tel: 800-431-2082
Fax: 800-640-2252

E-MAIL: mail@matco-norca.com

CENTRAL REGION

1150 Silber Road
Houston, TX 77055

LOCAL:

Tel: 713-680-2888
Fax: 713-680-2999

TOLL FREE:

Tel: 800-935-5456
Fax: 800-683-4247

www.matco-norca.com

WESTERN REGION

5593 Fresca Drive
La Palma, CA 90623

LOCAL:

Tel: 714-522-1889
Fax: 714-522-3828

TOLL FREE:

Tel: 866-532-8306
Fax: 866-532-8307

Selection & Specification Data

Generic Type	Epoxy Polyamide
Description	Low-temperature and rapid curing primer/finish with an extended recoat window. Provides excellent corrosion resistance as a primer, intermediate or finish on steel substrates. Self-priming on steel, galvanized steel and concrete, 888 offers user-friendly characteristics which facilitate application in a wide range of environmental conditions.
Features	<ul style="list-style-type: none"> ▪ Low temperature cure characteristics ▪ Rapid handling for in-shop applications ▪ One-year recoat window ▪ Low yellowing compared to other epoxies ▪ VOC compliant to current AIM regulations ▪ Meets the requirements of: Class "A" slip coefficient and creep testing criteria for use on faying surfaces.
Color	Red (0500); Gray (0700); White (0800); Yellow (0600)
Finish	Satin
Primers	Self-priming. May be applied over organic and inorganic zinc primers, epoxies and others as recommended. A mist coat may be required to minimize bubbling over zinc rich primers.
Topcoats	Acrylics, Epoxies, Polyurethanes
Dry Film Thickness	3.0-5.0 mils (75-125 microns) per coat Do not exceed 10 mils in a single coat.
Solids Content	By Volume: 63% ± 2% *Tested in accordance with ASTM D2697
Theoretical Coverage Rate	1,011 mil ft ² (25.0 m ² /l at 25 microns) Allow for loss in mixing and application
VOC Values	As supplied: 2.7 lbs./gal (330 g/l) Thinned: 19 oz/gal w/ #15: 3.3 lbs./gal (403 g/l) 19 oz/gal w/ #33: 3.3 lbs./gal (403 g/l) These are nominal values and may vary slightly with color.
Dry Temp. Resistance	Continuous: 200°F (93°C) Non-Continuous: 250°F (121°C) Discoloration and loss of gloss is observed above 200°F (93°C).
Limitations	Epoxies lose gloss, discolor and eventually chalk in sunlight exposure.

Substrates & Surface Preparation

General	Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating.
Steel	SSPC-SP6 <u>Surface Profile:</u> 1.5-3.0 mils (38-75 microns)
Galvanized Steel	SSPC-SP7 Consult your Carboline Sales Representative for specific recommendations.
Concrete	Concrete must be cured 28 days at 75°F (24°C) and 50% relative humidity or equivalent. Laitance, form oils, curing agents and hardeners should be removed by suitable method before coating application.

Performance Data

Test Method	System	Results	Report #
ASTM D4541 Adhesion	Blasted Steel 2 cts. 888	1167 psi (Elcometer)	L40-172
ASTM D4060 Abrasion	Blasted Steel 1 ct. 888	138 mg. loss after 1000 cycles, CS17 wheel, 1000 gm. load	03216
ASTM D4213 Scrub Resistance	Blasted Steel 1 ct. 888	Erosion rate: .0039 microliters after 100 cycles w/ Abrasive scrub medium	03403
ASTM B117 Salt Fog	Blasted Steel With organic zinc primer 2 cts. 888	No effect on plane, rust in scribe, less than 1/32" (0.7mm) undercutting at scribe after 7000 hours	03289
ASTM D2247 Humidity Test	Blasted Steel 2 cts. 888	No blistering, no rusting; color change less than 2 DE (CieLab units) after 8000 hours	03290
ASTM A-490 Slip Coefficient	Blasted Steel 1 ct. 888	Meets requirements for Class "A" rating	03315
ASTM D5894 QUV/ Prohesion	Blasted Steel 1 ct. 888	No rusting, blistering or chalking on plane; rust in scribe; less than 1/8" undercutting at scribe after 1000 hours	03435
Midwest Weathering	Blasted Steel 2 cts. 888	No effect on plane area, except #6 slight chalking after 1 year outdoor exposure at 45° angle.	L40-172
ASTM D1653 Water Vapor Transmission	2 cts. 888	WVP of 0.6 US perms. Method B – Wet cup; Condition C – R.H. 0%, Temperature 73.1°F	03468

Test reports and additional data available upon written request.

Carboguard® 888

Application Equipment

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

General Guidelines:

Spray Application (General) The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.

Conventional Spray Pressure pot equipped with dual regulators, 3/8" I.D. minimum material hose, .070" I.D. fluid tip and appropriate air cap.

Airless Spray Pump Ratio: 30:1 (min.)*
GPM Output: 3.0 (min.)
Material Hose: 3/8" I.D. (min.)
Tip Size: .017-.021"
Output PSI: 2100-2300
Filter Size: 60 mesh
*Teflon packings are recommended and available from the pump manufacturer.

Brush & Roller (General) Multiple coats may be required to obtain desired appearance, recommended dry film thickness and adequate hiding. Avoid excessive re-brushing or re-rolling. For best results, tie-in within 10 minutes at 75°F (24°C).

Brush Use a medium bristle brush.

Roller Use a short-nap synthetic roller cover with phenolic core.

Mixing & Thinning

Mixing Power mix separately, then combine and power mix. At material temperatures below 75°F sweat-in the mixed material for 30 minutes. DO NOT MIX PARTIAL KITS.

Ratio 1:1 Ratio (A to B)

Thinning May be thinned up to 19 oz/gal (15%) with Thinner #15 or Thinner #33. Use of thinners other than those supplied or recommended by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.

Carboline Thinner #236E may also be used to thin this product to minimize HAP and VOC emissions. Consult Carboline Technical Service for guidance.

Pot Life 4 Hours at 75°F (24°C)
Pot life ends when coating loses body and begins to sag. Pot life times will be less at higher temperatures.

Cleanup & Safety

Cleanup Use Thinner #2 or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used in enclosed areas and thinned, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved respirator.

Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	60°-85°F (16°-29°C)	65°-85°F (18°-29°C)	60°-90°F (16°-32°C)	0-65%
Minimum	50°F (10°C)	35°F (2°C)	35°F (2°C)	0%
Maximum	90°F (32°C)	135°F (57°C)	120°F (49°C)	85%

Industry standards are for the substrate temperatures to be 5°F (3°C) above the dew point. It is recommended to maintain this restriction during the initial curing times (see Dry to Recoat schedule). Condensation due to substrate temperatures below the dew point can cause flash rusting on prepared steel and interfere with proper adhesion to the substrate. Special application techniques may be required above or below normal application conditions.

Curing Schedule

Surface Temp. & 50% Relative Humidity	Dry to Handle	Dry to Recoat / Topcoat	Final Cure
35°F (2°C)	16 Hours	18 Hours	3 Days
50°F (10°C)	9 Hours	8 Hours	2 Days
75°F (24°C)	3 Hours	4 Hours	24 Hours
90°F (32°C)	1.5 Hour	2 Hours	12 Hours

These times are based on a 3.0-5.0 mil (75-125 micron) dry film thickness and consistent ambient conditions as stated. In practice, it may be difficult to maintain consistent curing temperatures which may and will affect the dry times as stated. Should the curing temperatures deviate during the curing cycle it is recommended to follow the dry times as stated for the lower ambient temperature reached. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure. Excessive humidity or condensation on the surface during curing can interfere with the cure, can cause discoloration and may result in a surface blush or haze. Any haze or blush must be removed by water washing before recoating. **Maximum recoat time is one year without special surface preparation.** "Loose" chalk must be removed in accordance with good painting practice. **Specific topcoat products can be used in a much shorter re-coat interval. Consult Carboline for recommendations and test results.** If the maximum recoat time has been exceeded, the surface must be abraded by sweep blasting or sanding prior to the application of additional coats. Carboguard 888 applied below 40°F (4°C) may temporarily soften for several hours, after temperatures rise to 60°F (16°C). This is a normal condition and will not affect performance.

Packaging, Handling & Storage

Shipping Weight (Approximate) 2 Gallon Kit 29 lbs (13 kg) 10 Gallon Kit 137 lbs (62 kg)

Flash Point (Setflash) Part A: 54°F (12°C)
Part B: 56°F (13°C)

Storage (General) Store Indoors.

Storage Temperature & Humidity 40° -110°F (4°-43°C)
0-100% Relative Humidity

Shelf Life Part A & B: Min. 36 months at 75°F (24°C)

*Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.



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An **RPM** Company

September 2008 replaces September 2005

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**Selection & Specification Data**

Generic Type	Aliphatic Acrylic Polyurethane
Description	High solids, high build, satin finish that provides a tough attractive finish while exhibiting outstanding performance properties. Demonstrates extremely good resistance to abrasion, corrosion and chemical exposure when applied over recommended Carboline primers and/or intermediate coats.
Features	<ul style="list-style-type: none">▪ Outstanding performance properties in virtually all industrial markets▪ High build; suitable for many two-coat systems▪ High solids formulation allows for improved edge protection▪ Suitable for application direct to inorganic and organic zinc primers▪ VOC compliant to current AIM regulations
Color *	Refer to Carboline Color Guide. Certain colors require multiple coats to hide.
Finish	Satin
Primers	Refer to <i>Substrates & Surface Preparation</i>
Topcoats	Carbothane® Clear Coats when required
Dry Film Thickness	3.0-5.0 mils (75-125 microns) per coat
Solids Content	By Volume: 72% ± 2%
Theoretical Coverage Rate	1155 mil ft ² (28.3 m ² /l at 25 microns) Allow for loss in mixing and application
VOC Values	As supplied: 1.31 lbs/gal (157 g/l)
Dry Temp. Resistance	Continuous: 200°F (93°C) Non-Continuous: 250°F (121°C) Discoloration and loss of gloss is observed above 200°F (93°C).

* The alignment of aluminum flakes in aluminum-filled finishes is very dependent on application conditions and techniques. Care must be taken to keep conditions as constant as possible to reduce variations in final appearance. It is also advisable to work from a single batch of material since variations can occur from batch to batch. For more information consult Carboline Technical Service Department.

Substrates & Surface Preparation

General	Surfaces must be clean and dry. Employ adequate methods to remove dirt, dust, oil and all other contaminants that could interfere with adhesion of the coating. For all surfaces , prime with specific Carboline primers as recommended by your Carboline sales representative.
Steel	SSPC-SP6 with a 1.5-2.5 mil (37.5-62.5 microns) surface profile for maximum protection. SSPC-SP2 or SP3 as minimum requirement.
Previously Painted Surfaces	Lightly sand or abrade to roughen surface and degloss the surface. Existing paint must attain a minimum 3B rating in accordance with ASTM D3359 "X-Scribe" adhesion test.

Carbothane® 133 VOC

Application Equipment

Listed below are general equipment guidelines for the application of this product. Job site conditions may require modifications to these guidelines to achieve the desired results.

General Guidelines:

Spray Application (General) This is a high solids coating and may require adjustments in spray techniques. Wet film thickness is easily and quickly achieved. The following spray equipment has been found suitable and is available from manufacturers such as Binks, DeVilbiss and Graco.

Conventional Spray Pressure pot equipped with dual regulators, 3/8" I.D. minimum material hose, .070" I.D. fluid tip and appropriate air cap.

Airless Spray Pump Ratio: 30:1 (min.)*
GPM Output: 3.0 (min.)
Material Hose: 3/8" I.D. (min.)
Tip Size: .015-.017"
Output PSI: 2100-2400
Filter Size: 60 mesh
*Teflon packings are recommended and available from the pump manufacturer.

Brush & Roller (General) Multiple coats may be required to obtain desired appearance, recommended dry film thickness and adequate hiding. Avoid excessive re-brushing or re-rolling. For best results, tie-in within 10 minutes at 75°F.

Brush Recommended for touch-up only. Use a medium, natural bristle brush.

Roller Use a medium-nap mohair roller cover with phenolic core.

Mixing & Thinning

Mixing Power mix separately Part A, then combine and power mix. DO NOT MIX PARTIAL KITS.

Ratio 5:1 Ratio (A to B)

Thinning Spray: Up to 19 oz/gal (13%) w/ #2
Brush: Up to 18 oz/gal (13%) w/ #215
Roller: Up to 18 oz/gal (13%) w/ #215
Use of thinners other than those supplied or recommended by Carboline may adversely affect product performance and void product warranty, whether expressed or implied.

Pot Life 6 Hours at 75°F (24°C) and less at higher temperatures. Pot life ends when coating becomes too viscous to use. MOISTURE CONTAMINATION WILL SHORTEN POT LIFE AND CAUSE GELLATION.

Cleanup & Safety

Cleanup Use Thinner #2 or Acetone. In case of spillage, absorb and dispose of in accordance with local applicable regulations.

Safety Read and follow all caution statements on this product data sheet and on the MSDS for this product. Employ normal workmanlike safety precautions. Hypersensitive persons should wear protective clothing, gloves and use protective cream on face, hands and all exposed areas.

Ventilation When used in enclosed areas, thorough air circulation must be used during and after application until the coating is cured. The ventilation system should be capable of preventing the solvent vapor concentration from reaching the lower explosion limit for the solvents used. User should test and monitor exposure levels to insure all personnel are below guidelines. If not sure or if not able to monitor levels, use MSHA/NIOSH approved supplied air respirator.

Caution This product contains flammable solvents. Keep away from sparks and open flames. All electrical equipment and installations should be made and grounded in accordance with the National Electric Code. In areas where explosion hazards exist, workmen should be required to use non-ferrous tools and wear conductive and non-sparking shoes.

August 2006 - Marine

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Application Conditions

Condition	Material	Surface	Ambient	Humidity
Normal	60°-85°F (16°-29°C)	60°-85°F (16°-29°C)	60°-85°F (16°-29°C)	40-60%
Minimum	50°F (10°C)	35°F (2°C)	35°F (2°C)	0%
Maximum	100°F (38°C)	120°F (49°C)	95°F (35°C)	80%

Industry standards are for substrate temperatures to be 5°F (3°C) above the dew point. Caution: This Product is moisture sensitive in the liquid stage and until fully cured. Protect from heavy humidity, dew and direct moisture contact until fully cured. Application and/or curing in humidities above maximum, or exposure to moisture from rain or dew may result in a loss of gloss and/or micro-bubbling of the product.

Curing Schedule

Surface Temp. & 50% Relative Humidity	Dry to Handle	Dry to Recoat	Final Cure
35°F (2°C)	36 Hours	36 Hours	14 Days
50°F (10°C)	16 Hours	16 Hours	10 Days
75°F (24°C)	8 Hours	8 Hours	7 Days
90°F (32°C)	4 Hours	4 Hours	5 Days

These times are based on a 4.0 mil (100 micron) dry film thickness. Higher film thickness, insufficient ventilation or cooler temperatures will require longer cure times and could result in solvent entrapment and premature failure.

Packaging, Handling & Storage

Shipping Weight (Approximate) 1.2 Gallon Kit 17 lbs (8 kg) 6 Gallon Kit 80 lbs (36 kg)

Flash Point (Setaflash) 71°F (22°C)

Storage (General) Store Indoors.

Storage Temperature & Humidity 40° - 110°F (4°-43°C)
0-80% Relative Humidity

Shelf Life Part A: Min. 36 months at 75°F (24°C)
Part B (Urethane Converter 811): Min. 24 months at 75°F (24°C)

***Shelf Life: (actual stated shelf life) when kept at recommended storage conditions and in original unopened containers.**



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TYPE

PLASITE 4110 is a vinyl ester resin combined with special curing system and inert flake pigment to provide outstanding chemical and physical properties. Specially formulated for excellent abrasion resistance. PLASITE 4110 meets the FDA requirements for 21 CFR, 175.300 and 177.2420.

INTENDED USE

As a high chemical abrasion-resistant thick film for tank lining service and as a maintenance coating for severe exposure.

NSF REQUIREMENTS

PLASITE 4110 is certified to NSF/ANSI Standard 61 for cold potable water when the following requirements are met:

- The tank is 3,000 gallons/11,100 liters or larger.
- PLASITE Thinner #20, up to maximum of 10% by volume, may be used for thinning purposes.
- The coating must be applied in 2 to 3 coats to a maximum DFT of 45 mils/1125 microns.
- Prior to placing the lining in service, it must be force cured at 200°F/93°C metal temperature for 4 hours.

TEMPERATURE RESISTANCE

Dry tests 380°F/193°C continuous; limited short excursions to 460°F/238°C acceptable. Wet temperature resistance depends upon concentration and reagent exposure.

COLOR Charcoal gray

FILM THICKNESS

2 to 3 multi-pass spray coats will produce the 35 to 45 mils/875 to 1125 microns dry film thickness recommended for immersion service. Consult Carboline Technical Service Department for any deviation to this film thickness. Refer to APPLICATION section.

VOC CONTENT (Determined Theoretically)

Coating as Supplied		Thinned 5% by Volume with PLASITE Thinner #20	
Lbs./Gal.	g/L	Lbs./Gal.	g/L
0.50 ± 2%	60 ± 2%	0.78 ± 2%	93 ± 2%

COVERAGE

PLASITE 4110 will cover approximately 960 mil ft.²/gal. or 86.4 sq. m. per 25 microns/gal. This is a coverage obtained from field use on small jobs and includes loss in can, spray loss, small amount of shrinkage, etc. Application by conventional spray equipment may affect coverage.

RECOATING TIME

May be recoated after initial 10 hour cure. Following coating must be applied within 30 days. Each following coat should be diluted approximately 2 to 10% with PLASITE Thinner #20.

Note: Previously applied coating exposed to an accumulation of 24 hours of sunlight or surface temperatures in excess of 130°F may result in intercoat disbondment. An applied coating film must be topcoated before an accumulation of 24 hours exposure has occurred or special procedures (such as shading with tarps) must be used.

THINNERS

Use PLASITE Thinner #20. 2 to 10% thinning may be needed to adjust coating for higher temperatures and various application conditions. Topcoating of previously coated films will require the addition of 2 to 10% thinner. Consult Carboline laboratory for unusual thinning requirements. See RECOATING TIME SECTION.

CLEANUP THINNER: Thinner #71

PRIMERS

For steel surfaces, coating is considered to be a "self-priming" system. Do not apply PLASITE 4110 directly to concrete. See reference to fillers and sealers in CONCRETE section.

PHYSICAL SPECIFICATIONS

Pigments: Inert fillers and flake.

Pot Life: 1 1/2 to 3 hours in one gallon cans and 1 1/2 to 2 hours in five gallon cans at 70 to 90°F/21-32°C MATERIAL temperature. MATERIAL temperatures in excess of 90°F will significantly reduce pot life. CAUTION! Do not attempt to extend pot life by mixing newly catalyzed coating into coating near the end of its pot life.

Shelf Life: Approximately 4 months at 75°F/24°C. Cooler storage temperatures will increase shelf life. Storage at higher temperatures can result in substantially shorter shelf life.

Film Density: 79.1 lbs./ft.³ 0.26384 lbs./ft.² at 40 mils.

Elongation: 1.7% using Method ASTM D638.

Shipping Weight: 12 lbs. per gallon kit.

Abrasion Resistance: 11 milligrams average loss per 1000 cycles Taber CS-17 Wheel, 1000 gram weight.

Surface Hardness: Konig Pendulum Hardness of 134 seconds (Glass Standard = 250 seconds); ASTM Method D4366-84.

Thermal Shock: Unaffected by minus 70°F to plus 200°F in 5 cycles, or 40 to 380°F in 10 cycles.

CHEMICAL RESISTANCE

Superior chemical resistance to organic and inorganic acids, oxidizing agents and salts.

CURING

Curing Time: 10 days at 70°F/21°C or 7 days at 90°F/32°C. Although coating may be applied at substrate temperatures as low as 60°F/16°C, the substrate temperature must be raised to at least 70°F/21°C within 12 hours and held until coating surface is tack-free (approximately 10 hours) to avoid possible loss of cure. A minimum of 70°F/21°C surface temperature is required to obtain polymerization of this coating.

Force Curing

Listed below are a few curing schedules that may be used for time and work planning. Prior to raising the metal to the force curing temperature, it is necessary that an air dry time of 2 to 5 hours at temperatures from 70°F/21°C to 100°F/38°C be allowed. After the air dry time has elapsed, the temperature should be raised in increments of approximately 30°F/17°C every 30 minutes until the desired force curing metal temperatures are reached. Any moisture from condensation of any source will kill the cure on freshly applied coating before it reaches a "non-tacky" stage. A force cure at 200°F/93°C metal temperature for 4 hours is necessary to comply with NSF Standard 61 requirements.

METAL TEMPERATURE	CURING TIME	METAL TEMPERATURE	CURING TIME
110°F/43°C	72 Hrs	160°F/71°C	4 ½ Hrs
120°F/49°C	36 Hrs	170°F/77°C	3 ½ Hrs
130°F/54°C	18 Hrs	180°F/82°C	2 ½ Hrs
140°F/60°C	10 Hrs	190°F/88°C	2 Hrs
150°F/66°C	6 Hrs	200°F/93°C	1 ¼ Hrs

PACKAGING

1 gallon unit:

- 1 one gallon can of Part A
- 1 one gallon can of Part B
- 1 small container of Part C
- 1 small container of Part D

5 gallon unit:

- 1 six gallon partially filled pail of Part A
- 1 five gallon pail of Part B
- 1 small container of Part C
- 1 small container of Part D

April 2006 replaces January 2006

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PLASITE® 4110

NSF Certified

SURFACE PREPARATION

Steel High Temperature & Immersion

All sharp edges shall be ground to produce a radius and all imperfections, such as, skip welds, delaminations, scabs, slivers and slag shall be corrected prior to abrasive blasting. Skip welds should be welded solid. Degrease surface prior to sandblasting. Organic solvents, alkaline solutions, steam, hot water with detergents or other systems that will completely remove dirt, oil, grease, etc. shall be used. Used tanks may require additional decontamination

The surface shall be blasted to SSPC SP-5/NACE No. 1 white metal blast grade using a Venturi blast nozzle with 100 psi/7 bars. Reference Joint Surface Preparation Std. SSPC SP-5/NACE 1, White Metal Blast Cleaning. A blast profile depth or "tooth" in the metal shall be a minimum of 4 mils as determined by comparing Carboline's 4000 Series Blast Comparator, using adequate light and magnification. Comparator panel available by request to Carboline Technical Service. The blast media used shall be properly graded, clean, sharp angular abrasive similar to Humble abrasive flint S7 (6 to 30 mesh), steel grit (HG25), or BLACK BEAUTY® BB1040 to produce the required blast depth.

Remove all traces of grit and dust, as well as, embedded abrasives with a vacuum cleaner and/or by brushing. Care should be taken to avoid contaminating surface with fingerprints or from detrimental material on the workers' clothes or atmospheric contamination.

The surface temperature shall be maintained at a minimum of 5°F/3°C above the dew point to prevent oxidation of the surface. The coating shall be applied within the same day that the surface has been prepared. Visible oxidation or condensation is not allowed.

Severe Corrosive Environments – Splash & Fume

Surface preparation is the same in the foregoing with the exception that NACE No. 2 or SSPC-SP10 near white metal blast may be used providing the blast profile depth as described above is achieved.

Concrete

All concrete requires abrasive blasting to remove laitance and to provide a hard, firm, clean and fully-cured concrete surface for coating. All concrete surfaces are required to be filled and sealed prior to application of PLASITE 4110. Contact Carboline for recommendations.

APPLICATION

Mixing (Note: this is a 4-component material)

Mix Part B into Part A using a mechanical high speed agitator, making sure all Part B is completely mixed with Part A. Maintain a good vortex while mixing in a smooth liquid, free of any unmixed particles of pigment, is obtained (approximately 15-30 minutes). After the pigments and liquid are thoroughly mixed, add the entire amount of the measured liquid promoter (Part D). Mix completely. (no color streaking or residue of part D should remain on the container sidewalls). Allow to cool if material temperature increases, then add Part C and necessary amount of Plasite Thinner #20. Mix an additional three to five minutes.

WARNING! The promoter (Part D) and the catalyst (Part C) must be separately mixed into the coating (Parts A&B). Any contact of unmixed Part C with Part D may lead to a fire or an explosion!

Continuous mixing during use is required. Part A, Part B and Part D may be premixed up to 72 hours prior to adding Part C. Operator should wear face mask during high speed mixing of the coating components. Avoid breathing dust.

Spray

Conventional atomizing spray system shall be equal to: Binks Model 2001 Gun with 59ASS Fluid Nozzle — 251 Air Cap, 559SS Needle. Heavy-duty trigger spring recommended. Pot pressure of approximately 50 psi/3.5 bars. Atomizing pressure of approximately 60 psi/4.1 bars. (Use standard production type pressure pot with air motor drive agitator.)

Note: Application by conventional spray equipment may affect maximum film building capabilities and coverage rates.

Applicators may prefer to apply additional coats to achieve the 40 mil/1000 microns nominal DFT. Airless spray system requires a large capacity pump with a capacity of 3 g.p.m./11.1 l.p.m. similar or equal to: Graco Bulldog with 0.025" or larger fluid nozzle; 12 in/30 cm minimum spray width is recommended. Use liquid pressure of approximately 1800 to 2200 psi/124-152 bars. All screens should be removed from pump and gun. A 3/8 in/9 mm diameter fluid line is recommended. CONTINUOUS MIXING DURING USE IS REQUIRED.

Note: Conventional spray equipment is preferred. Expect higher wear rates to airless spray equipment lower units and spray tips.

A minimum surface temperature of 70°F/21°C is required to obtain polymerization of the coating system. Coating can be applied at a surface temperature as low as 60°F/16°C but polymerization will be inhibited.

April 2006 replaces January 2006

To the best of our knowledge the technical data contained herein is true and accurate on the date of publication and is subject to change without prior notice. User must contact Carboline Company to verify correctness before specifying or ordering. No guarantee of accuracy is given or implied. We guarantee our products to conform to Carboline quality control. We assume no responsibility for coverage, performance or injuries resulting from use. Liability, if any, is limited to replacement of products. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY CARBOLINE, EXPRESS OR IMPLIED, STATUTORY, BY OPERATION OF LAW, OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Carboline® and Plasite® are registered trademarks of Carboline Company.

Succeeding coats cannot be applied without damaging the system until the surface temperature rises sufficiently to obtain partial polymerization. This will require raising to the minimum surface temperature of 70°F/21°C within 12 hours of application. Refer to CURING section. When surface temperatures are over 100°F/38°C, consult Carboline Technical Service for special instructions.

The mixed coating shall be applied utilizing a multi-pass spray system. Apply horizontal and vertical passes with 50% overlap. Special precautions are required at overlaps and welds to eliminate excessive film build. Spray gun should be perpendicular to surface at all times, approximately 14 in/36 cm from surface. For non-NSF applications, coating may be overcoated after initial "set" which will occur normally in 3 to 6 hours at 70°F/21°C with proper ventilation. Initial "set" time will decrease as surface temperature increases. Refer to RECOATING TIME section.

When physical contact (foot traffic, scaffolding, etc.) with the previously applied coating, or for NSF applications is needed, a minimum of 10 hours at 70°F/21°C substrate and air temperature with ventilation is required before proceeding. Previously applied coats must have reached a "non-tacky" state before being exposed to physical contact. This condition will occur in less time as surface temperature increases. Overcoating shall be performed as soon as possible to prevent contamination.

Brush

Brush application is not recommended, but may be used for repairs or touch-up. Continuous mixing during use is required.

LINING REPAIR

Clean damaged area, removing all contaminants and loose coating.

Abrasive blast substrate to original specification where coating has been exposed to environment and where oxidation is evident. Feather the original coating not less than 2 in/5 cm from damaged area.

If new coating is physically damaged and has not been in service, repair as shown above. For repairing holidays, sand surface and brush apply proper thickness of coating. Apply coating by brush or spray. Do not apply by brush on areas larger than 1 sq. ft./0.93 sq.m.

Warning: Contamination of previously exposed coating film may be detrimental to adhesion of the repair and may affect life expectancy.

INSPECTION

Degree of surface preparation shall conform to appropriate specifications as outlined in SURFACE PREPARATION section.

Metal temperature shall be recorded at least every 4 hours and before application of coating. Humidity (wet bulb reading) shall be taken to ensure that metal temperature is at least 5°F/3°C higher than wet bulb temperature. Dry bulb temperatures shall be recorded at the same time to ensure curing.

For immersion service, a pinhole-free film is essential and testing with Tinker & Razor Model AP-W or Stearns Model 14/20 or equivalent is required on final film. Use 3000 to 3500 volts. Allow a minimum cure of 48 hours at 70°F/21°C or 36 hours at 90°F/32°C before holiday testing. Dry film thickness shall be a nominal 40 mils/1000 microns with acceptable minimum at 35 mils/875 microns and maximum at 45 mils/1125 microns. Refer to Plasite Bulletin PA-3, Section 3, for inspection requirements.

SAFETY

READ THIS NOTICE SAFETY AND MISCELLANEOUS EQUIPMENT

For tank lining work and enclosed spaces, it is recommended that the operator provide himself with clean coveralls and rubber soled shoes and observe good personal hygiene. Certain personnel may be sensitive to various types of resins which may cause dermatitis.

THE SOLVENT IN THIS COATING IS FLAMMABLE AND CARE AS DEMANDED BY GOOD PRACTICE, OSHA, STATE AND LOCAL SAFETY CODES, ETC. MUST BE FOLLOWED CLOSELY. Keep away from heat, sparks and open flame and use necessary safety equipment such as air mask, explosion-proof electrical equipment, non-sparking tools and ladders, etc. Avoid contact with skin and breathing of vapor or spray mist. When working in tanks, rooms and other enclosed spaces, adequate ventilation must be provided. Refer to Plasite Bulletin PA-3. Keep out of the reach of children.

The catalyst (Part C) is relatively stable at room temperatures but must be protected from contamination, heat, fire and contact with promoter (in Part D). The catalyst (Part C) is classified by the Interstate Commerce Commission as an "oxidizing material." All shipping containers bear a yellow caution label. The catalyst is highly irritating if it gets into the eyes. Immediately rinse eyes thoroughly with water and get medical attention. The catalyst also can be a skin irritant and should be removed with large quantities of soap and water. Since this is an oxidizing material, it should not be allowed to accumulate or remain in soaked rags or clothing.



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An RPM Company

8" X 13" Model 242 A/EE

PROCO™ SERIES

240/242

molded expansion joints



PROCO Series 240 and Series 242 Non-Metallic Expansion Joints are designed for tough demanding industrial applications as found in: Air Conditioning-Heating and Ventilating Systems, Chemical-Petrochemical and Industrial Process Piping Systems, Power Generating Systems, Marine Services, Pulp & Paper Systems, Water-Waste-water-Sewage and Pollution Control Systems. Installed next to mechanical equipment or between the anchor points of a piping system, specify the PROCO Series 240 or 242 to: (1) Absorb Pipe/Movement/Stress, (2) Reduce System Noise, (3) Isolate Vibration, (4) Compensate Alignment/Offset, (5) Eliminate Electrolysis, (6) Protect Against Start-Up/Surge Forces. Our history in the manufacturing of expansion joint products dates back to 1930. When you need an engineered rubber solution to a piping system problem, call PROCO.

Spherical Shapes-Stronger-More Efficient. Featuring an engineered molded style single or twin sphere designed bellows, the PROCO Series 240 and Series 242 are inherently stronger than the conventional hand-built Spool Type arch. Internal pressure within a sphere is exerted in all directions, distributing forces evenly over a larger area. The spherical design "flowing-arch" reduces turbulence, sediment buildup, thrust area and the effects of thrust on the piping system equipment when compared to the "high-arch" design of hand-built standard products.

Greater Movements Are Available with the PROCO Series 240 and Series 242 when compared to the movements of conventional hand-built products. Axial compression, elongation, deflection and angular movements in the system are more readily absorbed by spherical types. These products are more forgiving and can be compressed or extended to install in non-standard openings, caused by equipment shifting or settling (Pre-compressing/extending the expansion joints for installation, may result in reduced pressure, vacuum and movement capabilities of the expansion joints. See Tables 2 and 3.)

Easy Installation With Alignable Metallic Flanges. The floating metallic flanges freely rotate on the bellows, compensating for mating flange misalignment, thus speeding up installation time (see Figures 1, 2, 3 & 4). Gaskets are also not required with the Series 240 or Series 242, provided the expansion joints are mated against a flat face flange as required in the installation instructions.

Less System Strain With Thin Wall Design. Manufactured by high pressure molding of elastomer and high-tensile fabric reinforcement, the Series 240 and Series 242 have a thinner wall section and lighter weight when compared to conventional hand-built products. Lower spring forces are therefore required, reducing piping/flange/equipment stress-strain-damage. PROCO Styles 240-C and 240-A are acceptable for use with plastic piping systems where even lower deflection forces are required.

Specifications Met. The PROCO Series 240 and Series 242 are designed to meet or exceed the pressure, movement and dimensional rating of the Spool Type arch as shown in the Rubber Expansion Joint Division, Fluid Sealing Association "Technical Handbook - Sixth Edition" Tables IV & V.

Absorbs Vibration-Noise-Shock. The PROCO quiet operating Series 240 and Series 242 are a replacement for "sound transmitting" metallic expansion joints. Sound loses energy traveling axially through the elastomer bellows. Water hammer pumping impulses and water-borne noises are cushioned and absorbed by the molded lightweight thin-wall structure. Install the Series 240 or Series 242 in a system to enable isolated equipment to move freely on its vibration mountings; or to reduce vibration transmission when the piping section beyond the expansion joint is anchored or sufficiently rigid.

Flange Materials/Drilling. All PROCO Spherical 240 and 242 connectors are furnished complete with plated carbon steel flanges for corrosion protection. Series 240 and 242 Neoprene connectors — 12" and below — are tapped to ANSI 125/150# drilling. All other connectors come with standard drilled holes to the ANSI 125/150# standards (see Table 7 and Figures 3 & 4). Stainless steel flanges and other drilling standards such as: ANSI 250/300#, BS-10, DIN NP-10 and DIN NP-16 are also available from stock and are listed on Table 7. JIS-5K and JIS-10K are also available upon request.

Chemical Service Capability At Minimal Cost. Expensive, exotic metal expansion joints for chemical service can be replaced with the PROCO Series 240 or Series 242. Molded with low cost chemical resistant elastomers such as Neoprene, Nitrile, Hypalon®, EPDM and Chlorobutyl insures an expansion joint is compatible with the fluid being pumped or piped. (See Table 1 below). Use the PROCO "Chemical/Rubber Guide" to specify an elastomer recommendation compatible for your requirement.

Wide Service Range With Low Cost. Engineered to operate up to 300 PSIG and 265°F, the PROCO Series 240 and Series 242 can be specified for a wide range of piping requirements. Compared to conventional hand-built Spool Type arch, you will invest less money when specifying the mass-produced, consistent high quality, molded single or twin sphere expansion joints.

Large Inventories Mean Same-Day Shipment. PROCO maintains the largest inventory of spherical expansion joints in the Americas. Every size listed is in stock in several elastomers and comes with a choice of drilling patterns. Shipment is based on customer need. PROCO can ship same day as order placement. In fact, when it comes to rubber expansion joints, **if PROCO doesn't have your requirement...nobody does!**

Information • Ordering • Pricing • Delivery. Day or night, weekends and holidays ... the PROCO phones are monitored 24 hours around the clock. When you have a question, you can call us. Toll-Free Phone 800 / 344-3246 USA/CANADA
International Calls 209 / 943-6088
Fax 209 / 943-0242
E-mail sales@procoproducts.com
Website www.procoproducts.com

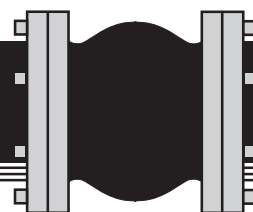
Weekday office hours are 5:30 a.m. to 5:15 p.m. (Pacific Time)

Table 1: Available Styles • Materials

For Specific Elastomer Recommendations, See:		PROCO™ "Chemical To Elastomer Guide"						
240-A	240-C	240-AV, D, E, IM	242-A, B, C	PROCO™ Material Code ¹	Cover Elastomer ²	Tube Elastomer	Maximum Operating Temp. °F	Identifying Color Band/Label
		X	X	/BB	Chlorobutyl	Chlorobutyl	250°	Black
	X	X	X	/EE	EPDM	EPDM	250°	Red
	X	X	X	/EE-9	EPDM	EPDM	265°	Red
	X	X	X	/ET-9 ³	EPDM	Teflon®	265°	Red
	X	X	X	/HH	Hypalon®	Hypalon®	230°	Green
	X	X	X	/NH	Neoprene	Hypalon®	230°	Green
	X	X	X	/NJ	Neoprene	FDA-Nitrile	230°	White
	X	X	X	/NN	Neoprene	Neoprene	230°	Blue
X	X	X	X	/NP	Neoprene	Nitrile	230°	Yellow
X	X	X	X	/NT ³	Neoprene	Teflon®	230°	Yellow

NOTES: Hypalon® is a registered trademark of DuPont Dow Elastomers. Teflon® is a registered trademark of the DuPont Company.

- All elastomers include nylon reinforcing, except EE-9 which is steel cord. All materials meet or exceed the Rubber Expansion Joint Division, Fluid Sealing Association-REJ Division requirements for Standard Class I and II. EE-9 also meets Special Class II. For more information see The FSA Technical Handbook, Table 1. Materials NN, NP and NH meet all requirements of U.S.C.G. EPDM Materials good for up to 300°F for pressures 15 PSI or less.
- Expansion joint "cover" (outside) can be Hypalon® painted on special order.
- Products with Teflon® "tube" (inside) are not to be used for vacuum service.



**Protecting Piping And
Equipment Systems
From Stress/Motion**

series 240 single sphere expansion joints

Table 2: Sizes • Movements • Pressures • Flange Standards • Weights

NOMINAL PIPE Size I.D.	Neutral Length	PROCO Style Number ¹	240 Movement Capability: From Neutral Position ²					Pressure ⁴			Standard Flange Bolting Dimensions					Weight in lbs ⁸	
			Axial Compression Inches	Axial Extension Inches	Lateral Deflection Inches	Angular Deflection Degrees	Thrust ³ Factor	Positive ⁵ PSIG	Vacuum ⁶ Inches of Hg	Flange O.D. Inches	Bolt Circle Inches	Number of Holes	Size of Holes Inches	Bolt Hole ⁷ Thread	Exp. Joint & Flanges	Control Unit Set (2 Rod)	
1	6.00	240-AV	0.500	0.375	0.500	37	4.43	225	26	4.25	3.13	4	0.500	1/2-13 UNC	3.8	3.3	
1.25	3.74	240-D	0.312	0.188	0.312	17	6.34	235	26	4.63	3.5	4	0.500	—	4.6	3.3	
	5.00	240-C	1.063	1.250	1.188	45		225	21				0.500	—	5.0		
	5.00	240-E	.500	0.375	0.500	31		225	26				0.500	—	5.0		
	6.00	240-AV	0.500	0.375	0.500	31		225	26				0.500	1/2-13 UNC	5.0		
1.5	3.74	240-D	0.375	0.188	0.312	14	6.49	225	26	5.0	3.88	4	0.500	—	5.4	4.6	
	4.00	240-M	0.375	0.188	0.312	14		225	26				0.500	—	5.5		
	5.00	240-C	1.063	1.250	1.188	45		235	18				0.500	—	5.1		
	5.00	240-E	0.500	0.375	0.500	27		225	26				0.500	—	6.0		
6.00	240-AV	0.500	0.375	0.500	27	225	26	0.500	1/2-13 UNC	6.1							
2	4.00	240-M	0.375	0.188	0.312	11	7.07	225	26	6.0	4.75	4	0.625	—	8.3	6.3	
	4.13	240-D	0.375	0.188	0.312	11		225	26				0.625	—	8.5		
	5.00	240-C	1.063	1.250	1.188	45		235	18				0.625	—	7.1		
	5.00	240-E	0.375	0.375	0.500	20		225	26				0.625	—	8.5		
	6.00	240-A	1.188	1.188	1.188	45		235	18				0.625	—	7.1		
	6.00	240-HW	0.500	0.375	0.500	20		300	26				0.625	—	11.0		
6.00	240-AV	0.500	0.375	0.500	20	225	26	0.625	5/8-11 UNC	12.3							
2.5	4.00	240-M	0.375	1.188	0.375	8	11.05	225	26	7.0	5.5	4	0.625	—	12.0	7.6	
	4.53	240-D	0.500	0.250	0.375	11		225	26				0.625	—	12.3		
	5.00	240-C	1.063	1.250	1.188	45		235	18				0.625	—	10.6		
	5.00	240-E	0.500	0.375	0.500	17		225	26				0.625	—	12.0		
	6.00	240-A	1.188	1.188	1.188	43		235	18				0.625	—	12.0		
	6.00	240-AV	0.500	0.375	0.500	17		225	26				0.625	5/8-11 UNC	12.3		
3	5.00	240-C	1.063	1.250	1.188	40	13.36	235	15	7.5	6.0	4	0.625	—	13.3	8.3	
	5.00	240-E	0.500	0.375	0.500	14		225	26				0.625	—	14.0		
	5.14	240-D	0.500	0.375	0.500	14		225	26				0.625	—	14.0		
	6.00	240-A	1.188	1.188	1.188	38		235	15				0.625	—	13.8		
	6.00	240-HW	0.500	0.375	0.500	14		300	26				0.625	—	17.5		
	6.00	240-AV	0.500	0.375	0.500	14		225	26				0.625	5/8-11 UNC	14.0		
6.00	240-AV	0.500	0.375	0.500	14	225	26	0.625	5/8-11 UNC	15.0							
3.5	6.00	240-AV	0.500	0.375	0.500	12	18.67	225	26	8.5	7.0	8	0.625	5/8-11 UNC	17.6	7.4	
4	5.00	240-C	1.063	1.250	1.188	32	22.69	235	15	9.0	7.5	8	0.625	—	16.5	7.4	
	5.00	240-E	0.750	0.500	0.500	14		225	26				0.625	—	17.0		
	5.32	240-D	0.750	0.500	0.500	14		225	26				0.625	—	17.1		
	6.00	240-A	1.188	1.188	1.188	30		235	15				0.625	—	17.5		
	6.00	240-HW	0.750	0.500	0.500	14		300	26				0.625	—	26.0		
	6.00	240-AV	0.750	0.500	0.500	14		225	26				0.625	5/8-11 UNC	18.3		
6.00	240-AV	0.750	0.500	0.500	14	225	26	0.625	5/8-11 UNC	19.3							
5	5.00	240-C	1.063	1.250	1.188	27	30.02	235	10	10.0	8.5	8	0.750	—	20.3	8.3	
	5.00	240-E	0.750	0.500	0.500	11		225	26				0.750	—	21.0		
	6.00	240-A	1.188	1.188	1.188	25		235	10				0.750	—	22.8		
	6.00	240-AV	0.750	0.500	0.500	11		225	26				0.750	3/4-10 UNC	22.8		
	6.69	240-D	0.750	0.500	0.500	11		225	10				0.750	—	23.6		
	8.00	240-AV	0.750	0.500	0.500	11		225	26				0.750	3/4-10 UNC	25.0		
6	5.00	240-C	1.063	1.250	1.188	23	41.28	225	8	11.0	9.5	8	0.750	—	22.6	10.4	
	5.00	240-E	0.750	0.500	0.500	9		225	26				0.750	—	26.0		
	6.00	240-A	1.188	1.188	1.188	21		235	10				0.750	—	24.0		
	6.00	240-HW	0.750	0.500	0.500	9		300	26				0.750	—	39.0		
	6.00	240-AV	0.750	0.500	0.500	9		225	26				0.750	3/4-10 UNC	26.8		
	7.09	240-D	0.750	0.500	0.500	9		225	26				0.750	—	29.0		
8.00	240-AV	0.750	0.500	0.500	9	225	26	0.750	3/4-10 UNC	29.1							
8	5.00	240-C	1.063	1.188	1.188	17	63.62	235	8	13.5	11.75	8	0.750	—	35.5	13.4	
	5.00	240-E	0.750	0.500	0.500	7		225	26				0.750	—	40.0		
	6.00	240-A	1.188	1.188	1.188	16		235	8				0.750	—	38.5		
	6.00	240-HW	0.750	0.500	0.500	7		300	26				0.750	—	70.0		
	6.00	240-AV	0.750	0.500	0.500	7		225	26				0.750	3/4-10 UNC	40.6		
	8.07	240-D	1.000	0.563	0.875	8		225	26				0.750	—	41.3		
10	5.00	240-C	1.063	1.188	1.188	14	103.87	235	6	16.0	14.25	12	0.875	—	49.3	21.0	
	5.00	240-E	1.000	0.625	0.750	7		225	26				0.875	—	56.0		
	8.00	240-A	1.188	1.188	1.188	13		235	6				0.875	—	53.6		
	8.00	240-AV	1.000	0.625	0.750	7		225	26				0.875	7/8-9 UNC	56.6		
	9.00	240-HW	1.000	0.625	0.750	7		225	26				0.875	7/8-9 UNC	57.0		
	9.45	240-D	1.000	0.625	0.875	7		225	26				0.875	—	58.5		
10.00	240-AV	1.000	0.625	0.750	7	225	26	0.875	7/8-9 UNC	60.5							
12	5.00	240-C	1.063	1.250	1.188	12	137.89	235	6	19.0	17.0	12	0.875	—	73.4	26.5	
	5.00	240-E	1.000	0.625	0.750	6		225	26				0.875	—	74.0		
	8.00	240-A	1.188	1.188	1.188	6		235	6				0.875	—	80.0		
	8.00	240-HW	1.000	0.625	0.750	6		275	26				0.875	—	100.0		
	8.00	240-AV	1.000	0.625	0.750	6		225	26				0.875	7/8-9 UNC	83.0		
	10.24	240-D	1.000	0.625	0.875	6		225	26				0.875	7/8-9 UNC	88.0		
8.00	240-AV	1.000	0.625	0.750	6	225	26	0.875	—	89.0							
14	8.00	240-HW	1.000	0.625	0.750	5	182.65	200	26	21.0	18.75	12	1.000	—	162.0	28.0	
	8.00	240-AV	1.000	0.625	0.750	5		150	26				1.000	—	115.0		
	9.00	240-M	1.000	0.625	0.750	5		150	26				1.000	—	117.0		
	10.43	240-D	1.000	0.625	0.875	5		150	26				1.000	—	120.0		
16	8.00	240-C	1.000	1.063	1.188	8	240.53	145	6	23.5	21.25	16	1.000	—	136.0	26.8	
	8.00	240-HW	1.000	0.625	0.750	4		175	26				1.000	—	180.0		
	8.00	240-AV	1.000	0.625	0.750	4		125	26				1.000	—	165.0		
	9.00	240-M	1.000	0.625	0.750	4		125	26				1.000	—	168.0		
	10.43	240-D	1.000	0.625	0.975	4		125	26				1.000	—	170.0		
18	8.00	240-HW	1.000	0.625	0.750	4	298.65	175	26	25.0	22.75	16	1.125	—	209.0	31.4	
	8.00	240-AV	1.000	0.625	0.750	3		125	26				1.125	—	168.0		
	9.00	240-M	1.000	0.625	0.750	3		125	26				1.125	—	169.0		
	10.43	240-D	1.000	0.625	0.875	3		125	26				1.125	—	170.0		
20	8.00	240-C	1.000	1.063	1.188	6	363.05	145	6	27.5	25.00	20	1.125	—	154.0	32.4	
	8.00	240-HW	1.000	0.625	0.750	3		175	26				1.125	—	234.0		
	8.00	240-AV	1.000	0.625	0.750	3		125	26				1.125	—	170.0		
	9.00	240-M	1.000	0.625	0.750	3		125	26				1.125	—	173.0		
10.43	240-D	1.000	0.625	0.875	3	125	26	1.125	—	175.0							
22	10.00	240-AV	1.000	0.625	0.750	3	433.74	115	26	27.5	25.0	20	1.125	—	210.0	34.5	
24	8.00	240-C	1.000	1.063	1.188	5	510.70	145	6								

series 242 twin sphere expansion joints

Table 3: Sizes • Movements • Pressures • Flange Standards • Weights

NOMINAL PIPE Size I.D.	Neutral Length	PROCO Style Number ¹	242 Movement Capability: From Neutral Position ²					Pressure ⁴		Standard Flange Bolting Dimensions					Weight in lbs ⁸	
			Axial Compression Inches	Axial Extension Inches	Lateral Deflection Inches	Angular Deflection Degrees	Thrust ³ Factor	Positive ⁵ PSIG	Vacuum ⁶ Inches of Hg	Flange O.D. Inches	Bolt Circle Inches	Number of Holes	Size of Holes Inches	Bolt Hole ⁷ Thread	Exp. Joint & Flanges	Control Unit Set (2 Rod)
1	10.00	242-C	2.000	1.188	1.750	45	4.43	225	26	4.25	3.13	4	0.500	—	5.2	3.6
1.25	7.0	242-A	2.000	1.188	1.750	45	6.34	225	26	4.63	3.5	4	0.500	1/2-13 UNC	5.3	3.5
	7.0	242-HA						300					0.500		6.5	3.5
	10.00	242-C						225					0.500		6.2	3.6
1.5	6.00	242-B	2.000	1.188	1.750	45	6.49	225	26	5.0	3.88	4	0.500	1/2-11 UNC	6.1	4.6
	6.00	242-HB						300					0.500		7.6	4.6
	7.00	242-A						225					0.500		6.8	4.8
	10.00	242-HA						300					0.500		8.3	4.8
2	6.00	242-B	2.000	1.188	1.750	45	7.07	225	26	6.0	4.75	4	0.625	5/8-11 UNC	9.0	6.6
	6.00	242-HB						300					0.625		10.5	6.6
	7.00	242-A						225					0.625		9.0	7.0
	10.00	242-HA						300					0.625		10.5	7.0
2.5	6.00	242-B	2.000	1.188	1.750	43	11.05	225	26	7.0	5.5	4	0.625	5/8-11 UNC	12.9	7.6
	6.00	242-HB						300					0.625		15.3	7.6
	7.00	242-A						225					0.625		13.3	8.0
	10.00	242-HA						300					0.625		15.8	8.0
3	7.00	242-A	2.000	1.188	1.750	38	13.36	225	26	7.5	6.0	4	0.625	5/8-11 UNC	14.3	8.6
	7.00	242-HA						300					0.625		18.2	8.6
	9.00	242-B						225					0.625		15.2	9.0
	12.00	242-C						225					0.625		15.8	9.1
3.5	10.00	242-C	2.000	1.188	1.750	34	18.67	225	26	8.5	7.0	8	0.625	—	20.6	8.1
	9.00	242-A						225					0.625		20.3	8.0
	9.00	242-HA						300					0.750		26.4	8.0
	12.00	242-C						225					0.750		21.3	8.2
4	9.00	242-A	2.000	1.375	1.562	34	22.69	225	26	9.0	7.5	8	0.750	5/8-11 UNC	26.4	8.0
	9.00	242-HA						300					0.750		21.3	8.2
	10.00	242-C						225					0.750		22.0	8.2
	12.00	242-C						225					0.750		—	—
5	9.00	242-A	2.000	1.375	1.562	29	30.02	225	26	10.0	8.5	8	0.750	—	24.5	8.3
	9.00	242-HA						300					0.750		31.4	8.3
	10.00	242-C						225					0.750		25.5	9.1
	12.00	242-C						225					0.750		26.0	9.1
6	9.00	242-A	2.000	1.375	1.562	25	41.28	225	26	11.0	9.5	8	0.750	3/4-10 UNC	29.5	11.7
	9.00	242-HA						300					0.750		38.6	11.7
	10.00	242-C						225					0.750		30.5	11.9
	14.00	242-C						225					0.750		31.0	12.0
8	9.00	242-B	2.375	1.375	1.375	19	63.62	225	26	13.5	11.75	8	0.750	3/4-10 UNC	42.3	14.5
	9.00	242-HB						300					0.750		55.4	14.5
	10.00	242-C						225					0.750		43.4	15.0
	12.00	242-C						225					0.750		44.0	15.2
10	12.00	242-B	2.375	1.375	1.375	15	103.87	225	26	16.0	14.25	12	0.875	7/8-9 UNC	64.1	23.5
	12.00	242-HB						275					0.875		86.5	23.5
	13.00	242-A						225					0.875		65.5	24.5
	14.00	242-HA						275					0.875		88.4	24.5
12	12.00	242-B	2.375	1.375	1.375	13	137.89	225	26	19.0	17.00	12	0.875	7/8-9 UNC	94.0	30.0
	12.00	242-HB						275					0.875		110.0	30.0
	13.00	242-A						225					0.875		95.0	31.0
	14.00	242-HA						275					0.875		110.0	31.0
14	12.00	242-C	1.750	1.118	1.118	9	182.65	150	26	19.0	18.75	12	1.000	—	110.0	30.5
	13.75	242-A						150					1.000		112.0	32.0
	13.75	242-HA						200					1.000		144.0	32.0
	13.75	242-C						125					1.000		—	—
16	12.00	242-C	1.750	1.118	1.118	8	240.53	125	26	23.5	21.25	16	1.000	—	124.0	28.8
	12.00	242-HC						175					1.000		160.0	28.8
	13.75	242-A						125					1.000		132.0	30.8
	13.75	242-HA						175					1.000		170.2	30.8
18	12.00	242-C	1.750	1.118	1.118	7	298.65	125	26	25.0	22.75	16	1.125	—	138.0	35.1
	13.75	242-A						125					1.125		146.0	36.1
	13.75	242-HA						175					1.125		161.2	36.1
	13.75	242-C						125					1.125		—	—
20	12.00	242-C	1.750	1.118	1.118	7	363.05	125	26	27.5	25.0	20	1.125	—	172.0	35.0
	13.75	242-A						125					1.125		182.0	35.5
	13.75	242-HA						175					1.125		182.0	35.5
	13.75	242-C						125					1.125		—	—
22	12.00	242-C	1.750	1.118	1.118	6	433.74	115	26	29.5	27.25	20	1.125	—	181.0	35.5
	12.00	242-C						110					1.125		190.0	47.0
	13.75	242-A						110					1.125		220.0	48.0
	13.75	242-HA						160					1.125		266.2	48.0
26	12.00	242-C	1.750	1.118	1.118	5	593.96	110	26	34.25	31.75	24	1.125	—	243.0	52.0
	12.00	242-C						110					1.125		—	—
	12.00	242-C						110					1.125		—	—
	12.00	242-C						110					1.125		—	—
30	12.00	242-C	1.750	1.118	1.118	4	779.31	110	26	38.75	36.0	28	1.125	—	270.0	62.0
	12.00	242-C						110					1.125		—	—
	12.00	242-C						110					1.125		—	—
	12.00	242-C						110					1.125		—	—

Standard PROCO Style 242-A Expansion Joints shown in Bold Type are considered Standards and inventoried in large quantities.

- NOTES: 1. "HA", "HB", and "HC" denote Heavy Weight Construction.
 2. Movements stated are non-concurrent.
 3. To determine End Thrust: Multiply Thrust Factor by Operating Pressure of System. This is End Thrust in pounds.
 4. Pressure rating is based on 170°F operating temperature. The pressure rating is reduced slightly at higher temperatures.
 5. Pressures shown are maximum "operating pressure." Test pressure is 1.5 times "operating pressure." Burst pressure is approximately 4 times "operating pressure."
 6. Vacuum rating is based on neutral installed length, without external load. Products should not be installed "extended" on vacuum applications.
 7. Style 240-AV/NN (Neoprene elastomer only) expansion joints 1.25" I.D. - 12.0" I.D. come with tapped holes in lieu of drilled holes.
 8. All expansion joints are furnished complete with flanges. Control units are required on applications where movements could exceed rated capabilities.

Installation Note:

Install at the neutral length dimension as shown in Tables 2 & 3. Make sure the mating flanges are **FLAT-FACE TYPE**. When attaching beaded end flanged expansion joints to raised face flanges, the use of ring gaskets are required to prevent metal flange faces from cutting rubber bead during installation. **Care must be taken when pushing the joint into the breach between the mating flanges so as not to roll the leading edge of the joint out of its flange groove.**

Precompression Note:

Joint must be precompressed approximately 1/8" to 3/16" in order to obtain a correct installed face-to-face dimension.



control units



Table 4: Control Units/Unanchored

Control Units must be installed when pressures (test • design • surge • operating) exceed rating below:

Pipe Size	Series 240 P.S.I.G.	Series 242 P.S.I.G.
1" thru 4"	180	135
5" thru 10"	135	135
12" thru 14"	90	90
16" thru 24"	45	45
26" thru 30"	35	35

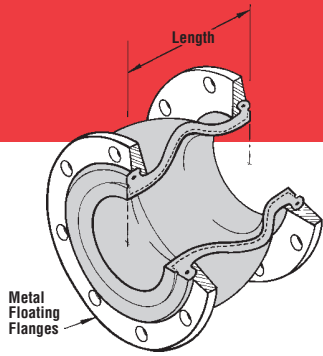


Figure 1.
Style 240
Single Sphere Connector

Table 5: Control Units

Control Rod Plate O.D. ¹ (in)	Control Rod Plate Thickness (in)	Rod Diameter ² (in)	Nominal Pipe Size (in)	Maximum Surge or Test Pressure of System/PSIG ³		
				2	3	4
8.375	0.375	0.625	1	949	—	—
8.750	0.375	0.625	1.25	830	—	—
9.125	0.375	0.625	1.5	510	—	—
10.125	0.375	0.625	2	661	—	—
11.125	0.375	1.000	2.5	529	—	—
11.625	0.375	1.000	3	441	—	—
12.625	0.375	1.000	3.5	365	547	729
13.125	0.375	1.000	4	311	467	622
14.125	0.500	1.000	5	235	353	470
15.125	0.500	1.000	6	186	278	371
19.125	0.500	1.000	8	163	244	326
21.625	0.750	1.000	10	163	244	325
24.625	0.750	1.000	12	160	240	320
26.625	0.750	1.000	14	112	167	223
30.125	0.750	1.250	16	113	170	227
31.625	0.750	1.250	18	94	141	187
34.125	0.750	1.250	20	79	118	158
36.125	1.000	1.250	22	85	128	171
38.625	1.000	1.250	24	74	110	147
40.825	1.000	1.250	26	62	93	124
44.125	1.250	1.500	28	65	98	130
46.375	1.250	1.500	30	70	105	141

NOTES: 1. Control Rod Plate O.D. installed dimension is based on a maximum O.D. PROCO would supply. (See Figures 3 & 4)
2. Control Rod diameter is based on a maximum diameter PROCO would use to design a Control Rod.
3. Rod pressure ratings are based on metal conforming to F.S.A. standards and dimensions.

Table 6: Special Construction Pressures

Pipe Size	Series 240 & 242 Heavyweight P.S.I.G.
1" thru 8"	300
10" thru 12"	275
14"	200
16" thru 20"	175
22" thru 30"	160

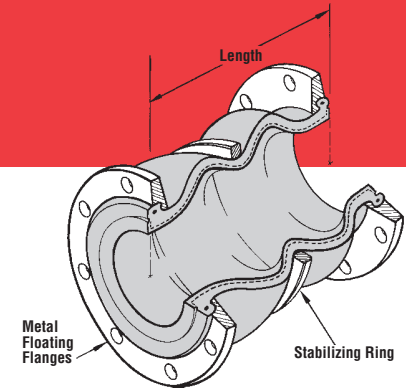
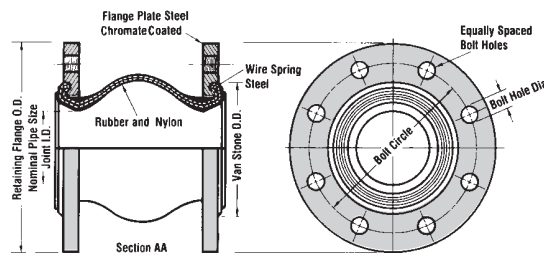


Figure 2.
Style 242
Twin Sphere Connector

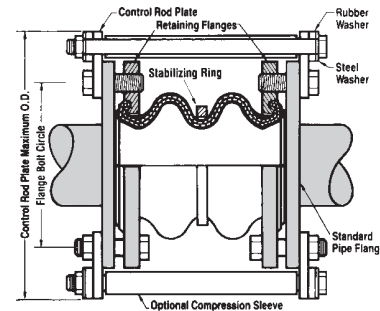
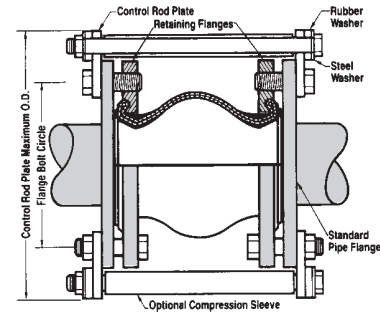
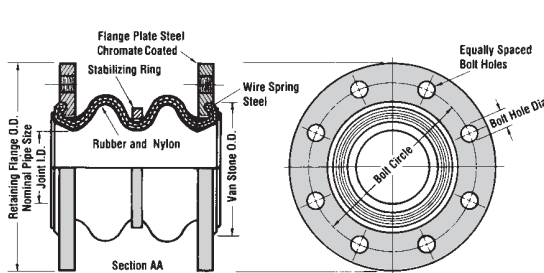
Style 240 Single Sphere Connector

Figure 3.



Style 242 Twin Sphere Connector

Figure 4.



Control Rod/Unit Applications. Control unit assemblies are designed to absorb static pressure thrust developed at the expansion joint. When used in this manner, control unit assemblies are an additional safety factor, minimizing possible failure of the expansion joint or damage to equipment. (See Tables 4 & 5).

- 1. Anchored Systems:** Control unit assemblies are not required in piping systems that are anchored on both sides of the expansion joint, provided piping movements are within the rated movements as shown in Tables 2 & 3.
- 2. Unanchored Systems:** Control unit assemblies are always required in unanchored systems. Additionally, control unit assemblies must be used when maximum pressure exceeds the limits shown in Table 4 & 5, or the movement exceeds the rated movements as shown in Tables 2 & 3.

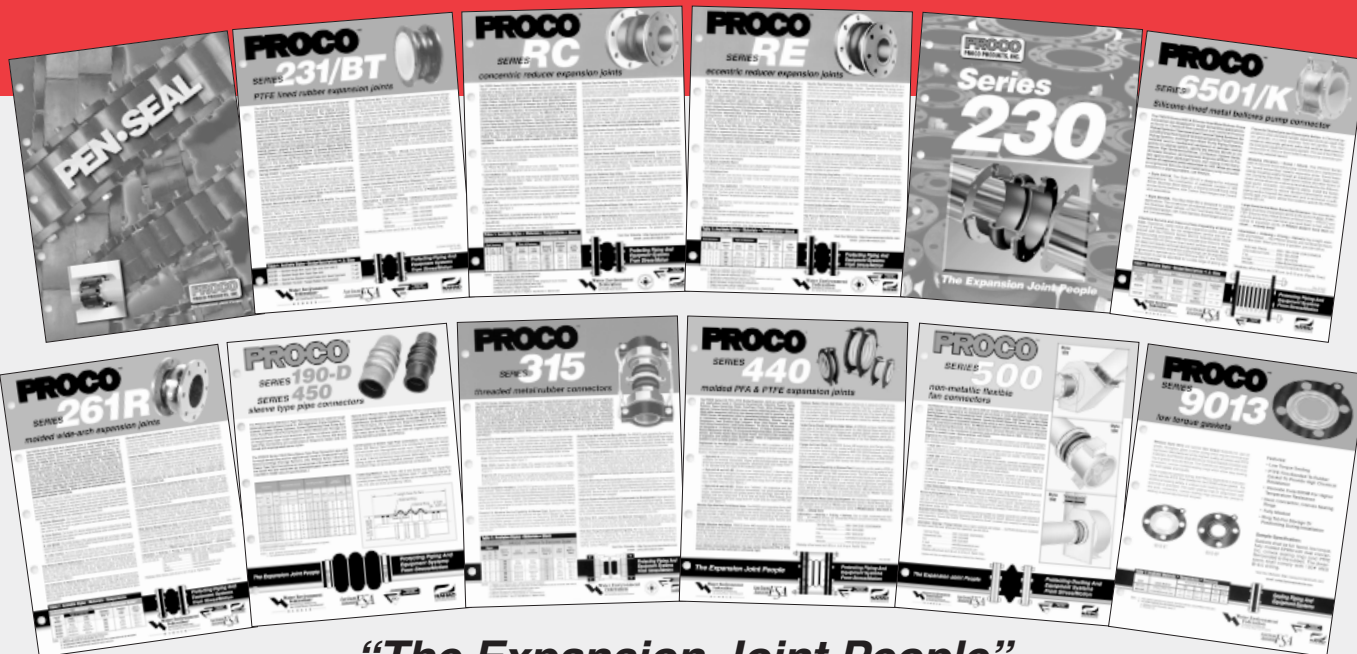
- 3. Spring-Mounted Equipment:** Control unit assemblies are always recommended for spring-mounted equipment. Additionally, control unit assemblies must be used when maximum pressure exceeds the limits shown in Tables 4 & 5, or the movement exceeds the rated movements as shown in Tables 2 & 3.

Special Applications. Certain Style 240 (Single Sphere) and 242 (Twin Sphere) expansion joints are available in High-Pressure Designs. For specific pressures, see Table 6. Style designations are listed as 240-HW (sizes stocked in Table 2) and 242-HA, 242-HB & 242-HC (sizes stocked in Table 3.) The High-Pressure Design is recommended when the connector is to be installed into ANSI 250/300# piping systems.

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Warning: Expansion joints may operate in pipelines or equipment carrying fluids and/or gases at elevated temperatures and pressures. Normal precautions should be taken to make sure these parts are installed correctly and inspected regularly. Precautions should be taken to protect personnel in the event of leakage or splash. Note: Piping must be properly aligned and anchored to prevent damage to an expansion joint. Movement must not exceed specified ratings and control units are always recommended to prevent damage in the event other anchoring in the system fails. Properties applications shown throughout this data sheet are typical. This information does not constitute a warranty or representation and we assume no legal responsibility or obligation with respect thereto and the use to which such information may be put. Your specific application should not be undertaken without independent study and evaluation for suitability.

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Nozzles
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FULL CONE NOZZLES



FEATURES AND BENEFITS

- Solid cone-shaped spray pattern with round impact area.
- Maximum liquid throughput for a given pipe size.
- Maximum free passage design minimizes clogging on HHSJX.
- Compact size enables easy installation or retrofit on most pipe systems.

HHSJ



Threaded/hex
Brass or 316 Stainless Steel
1/4" to 2" NPT or BSPT (M)

HHSJ



Threaded/flats
Cast 316 Stainless Steel
1/4" to 4" NPT or BSPT (M)

HHSJ

2"



Threaded/round
PVC or Teflon®
1/4" to 4" NPT or BSPT (M)

HHSJX



Threaded/hex
Brass
3/8" to 2" NPT or BSPT (M)

HHSJX



Threaded/flats
Cast 316 Stainless Steel
3/8" to 2" NPT or BSPT (M)

HHSJX



Threaded/round
PVC or Polypropylene
3/8" to 2" NPT or BSPT (M)

OPTIMIZATION TIPS

- See page B2 for optimization tips.

APPLICATIONS

- Aerating
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- Gas scrubbing, cooling
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FULL CONE NOZZLES

PERFORMANCE DATA

HHSJ

*At the stated pressure in psi.

Inlet Conn. (in.)	Spray Angle at 10 psi (°)					Capacity Size	Orifice Dia. Nom. (in.)	Max. Free Passage Dia. (in.)	Capacity (gallons per minute)*				
	60	90	120	150	170				10	20	40	100	400
1/4	●	●	●			07	.094	.094	.70	.99	1.4	2.2	4.4
	●	●	●	●	●	13	.125	.125	1.3	1.8	2.6	4.1	8.2
	●	●	●	●	●	20	.156	.125	2.0	2.8	4.0	6.3	12.6
3/8	●					07	.094	.094	.70	.99	1.4	2.2	4.4
	●					13	.125	.125	1.3	1.8	2.6	4.1	8.2
	●					20	.156	.125	2.0	2.8	4.0	6.3	12.6
	●	●	●	●	●	30	.188	.125	3.0	4.2	6.0	9.5	19.0
	●	●	●	●	●	40	.219	.125	4.0	5.7	8.0	12.6	25
	●	●	●	●	●	53	.250	.125	5.3	7.5	10.6	16.8	34
	●	●	●	●	●	82	.313	.125	8.2	11.6	16.4	26	52
1/2	●	●	●	●	●	120	.375	.188	12.0	17.0	24	38	76
	●	●	●	●	●	164	.438	.188	16.4	23	33	52	104
	●	●	●	●	●	210	.500	.188	21	30	42	66	133
3/4	●	●	●	●	●	210	.500	.188	21	30	42	66	133
1	●	●	●	●	●	340	.625	.250	34	48	68	108	215
	●	●	●	●	●	470	.750	.250	47	66	94	149	297
1-1/2	●	●	●	●	●	640	.875	.313	64	91	128	202	405
	●	●	●	●	●	820	1.000	.313	82	116	164	259	519
	●	●	●	●	●	960	1.125	.313	96	136	192	304	607
	●	●	●	●	●	1400	1.375	.438	140	198	280	443	885
2	●	●	●	●	●	1780	1.500	.438	178	252	356	563	1126
	●	●	●	●	●	2560	1.750	.563	256	362	512	810	1619
3	●	●	●	●	●	3360	2.000	.563	336	475	672	1063	2125
	●	●	●	●	●	5250	2.500	.625	525	742	1050	1660	3320

HHSJX

*At the stated pressure in psi.

Inlet Conn. (in.)	Spray Angle at 10 psi (°)		Capacity Size	Orifice Dia. Nom. (in.)	Max. Free Passage Dia. (in.)	Capacity (gallons per minute)*				
	90	120				10	20	40	100	400
3/8	●	●	30	.188	.188	3.0	4.2	6.0	9.5	19.0
	●	●	40	.219	.219	4.0	5.7	8.0	12.6	25
	●	●	53	.250	.250	5.3	7.5	10.6	16.8	34
	●	●	82	.313	.313	8.2	11.6	16.4	26	52
1/2	●	●	120	.375	.375	12.0	17.0	24	38	76
	●	●	164	.438	.438	16.4	23	33	52	104
3/4	●	●	210	.500	.500	21	30	42	66	133
1	●	●	340	.625	.625	34	48	68	108	215
	●	●	470	.750	.750	47	66	94	149	297
1-1/2	●	●	640	.875	.875	64	91	128	202	405
	●	●	820	1.000	1.000	82	116	164	259	519
	●	●	960	1.125	1.125	96	136	192	304	607
2	●	●	1400	1.375	1.375	140	198	280	443	885
	●	●	1780	1.500	1.500	178	252	356	563	1126

Maximum Free Passage Diameter is the maximum diameter as listed of foreign matter that can pass through the nozzle without clogging.



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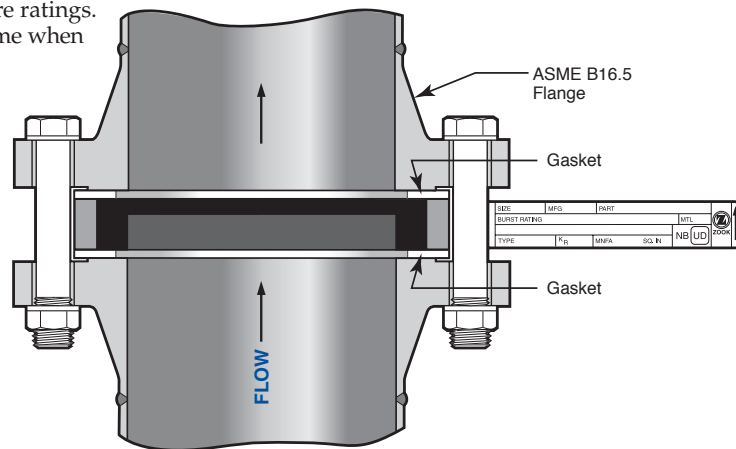
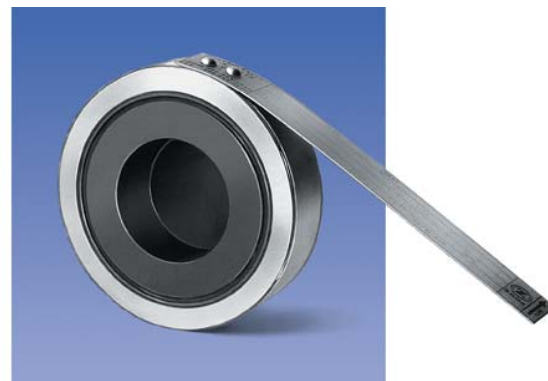
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- Note: Sizes 6" and 8" with burst ratings 125 and 150 psig @ 72°F (22°C) are stocked in INVERTED type
- ASME UD marking available



Certified Flow Resistance Factor (K_{rgl})

Support Style	K _{rgl}
MONO – no support	0.26
MONO – with bar	2.40
MONO – with cross	5.40
MONO – with ring	6.44
MONO – with plate	15.70

Required Vacuum Support Style for Full Vacuum Service

Size	Burst Rating	Support Style
1"	below 25 psig	MONO – with ring
1-1/2"	below 25 psig	MONO – with bar
2" - 14"	9 to 25 psig	MONO – with bar
2" - 14"	5 to below 9 psig	MONO – with cross
2" - 14"	below 5 psig	MONO – with plate

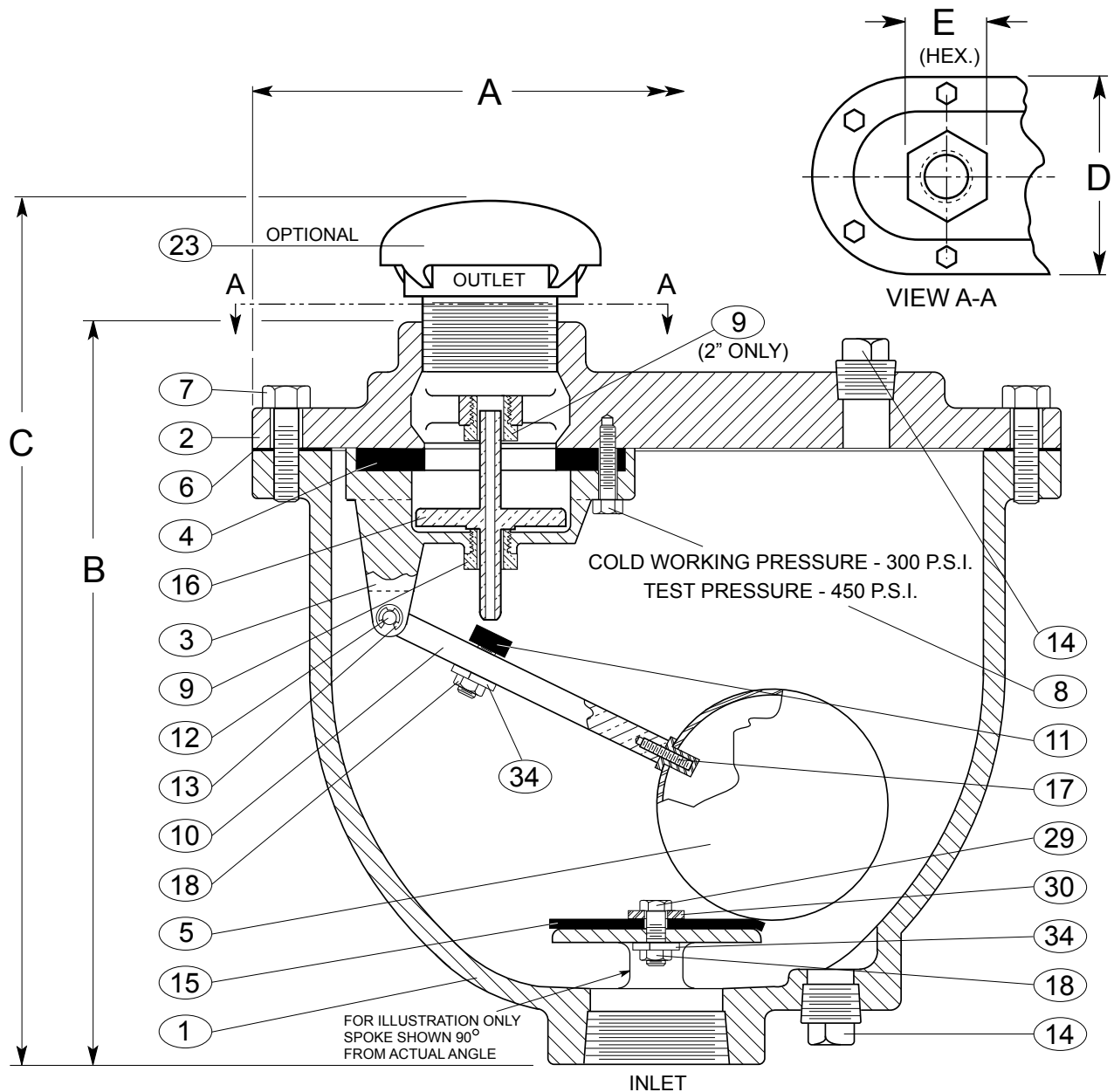
Contact ZOOK for sizes 16" and larger

Specifications – ASME B16.5 Class 150

Nominal Disk Sizes	Minimum net flow area (MNFA) Sq. inches					Disk Dimensions				Burst Ratings psig	
	Full Bore	Vacuum support style				Diameter		Thickness*		Min.	Max.
		Ring	Bar	Cross	Plate	I.D.	O.D.	Standard Disk	Insulated Unit		
1/2"	0.30	N/A	N/A	N/A	N/A	0.622"	1-3/4"	5/8"	1-3/4"	25	150
3/4"	0.53	N/A	N/A	N/A	N/A	0.824"	2-1/8"	5/8"	1-3/4"	25	150
1"	0.78	0.44	0.60	0.47	0.32	1"	2-1/2"	7/8"	2-1/4"	10	150
1-1/2"	1.76	N/A	1.34	1.05	0.72	1-1/2"	3-1/4"	7/8"	2-1/4"	7	150
2"	3.14	N/A	2.39	1.86	1.30	2"	4"	7/8"	2-1/4"	3	150
3"	7.06	N/A	5.56	4.31	2.95	3"	5-1/4"	7/8"	2-1/4"	2	150
4"	12.56	N/A	10.56	8.81	5.47	4"	6-3/4"	7/8"	2-1/4"	1.5	150
6"	28.27	N/A	22.27	17.27	12.05	6"	8-5/8"	7/8"	2-1/4"	1	100
8"	50.02	N/A	40.26	31.82	21.14	8"	10-7/8"	1-1/8"	2-3/4"	0.50	100
10"	78.53	N/A	63.53	50.78	32.66	10"	13-1/4"	1-1/2"	3-3/8"	0.25	100
12"	113.09	N/A	89.09	69.09	47.24	12"	16"	2"	4-3/8"	0.25	75
14"	137.88	N/A	108.06	83.31	58.07	13-1/4"	17-5/8"	2-1/4"	4-7/8"	0.25	50
16"	182.65	N/A	144.52	112.65	84.49	15-1/4"	20-1/8"	2-1/2"	5-3/8"	0.25	50
18"	233.70	N/A	181.95	153.70	104.31	17-1/4"	21-1/2"	2-3/4"	5-7/8"	0.25	50
20"	291.03	N/A	233.28	184.53	122.49	19-1/4"	23-3/4"	3"	6-3/8"	0.25	40
24"	424.55	N/A	354.80	294.05	190.61	23-1/4"	28-1/8"	3"	6-3/8"	0.25	25

*Standard disk thickness does not include gaskets.
 Insulated unit thickness includes all gaskets

Note: Maximum pressure rating of ASME B16.5 Class 150 flanges is 290 psig @ 100°F (38°C).
 The maximum pressure rating is lower at higher temperatures.
 Reference ASME/ANSI B16.5



- | | | | | |
|----------|--------------------|-------------------|-------------------|---------------------|
| 1 BODY | 5 FLOAT | 9 BUSHING | 13 RETAINING RING | 18 LOCK NUT |
| 2 COVER | 6 GASKET | 10 FLOAT ARM | 14 PIPE PLUG | 23 SCREENED HOOD |
| 3 BAFFLE | 7 COVER BOLTS | 11 ORIFICE BUTTON | 15 CUSHION | 29 CUSHION RETAINER |
| 4 SEAT | 8 RETAINING SCREWS | 12 PIVOT PIN | 16 PLUG | 30 WASHER |
| | | | 17 FLOAT RETAINER | 34 LOCK WASHER |

SEE DRAWING NO. VM-201C-M FOR STANDARD MATERIALS OF CONSTRUCTION.

VALVE SIZE	MODEL NO.*	A	B	C	D	E	INLET SIZE	OUTLET SIZE	ORIFICE SIZE
1"	201C.2	11 3/8"	10 1/2"	12 5/8"	6 3/8"	2"	1" N.P.T.	1" N.P.T.	5/64"
2"	202C.2	14"	13"	15 7/8"	8 1/4"	3 1/4"	2" N.P.T.	2" N.P.T.	3/32"

*Add "H" to Model No. for optional screened hood SPK-1H.

Revised 1-9-06

COMBINATION AIR VALVE (SINGLE BODY TYPE)

DATE 2-2-69

VAL-MATIC®

VALVE AND MANUFACTURING CORP.

DRWG. NO.

VM-201C

COMBINATION AIR VALVES (SINGLE BODY TYPE)

MODEL NOS. 201C.2 - 202C.2 - 203C.2 - 204C.2

STANDARD MATERIALS OF CONSTRUCTION

<u>PART NO.</u>	<u>PART NAME</u>	<u>MATERIAL</u>
1	BODY	CAST IRON ASTM A126, CLASS B
2	COVER	CAST IRON ASTM A126, CLASS B
3	BAFFLE	CAST IRON ASTM A126, CLASS B
4	SEAT	BUNA-N
5	FLOAT	STAINLESS STEEL T316, ASTM A240
6	GASKET	COMPRESSED NON-ASBESTOS FIBER
7	COVER BOLT	ALLOY STEEL SAE, GRADE 5
8	RETAINING SCREWS	STAINLESS STEEL T316, ASTM F593
9	GUIDE BUSHING	STAINLESS STEEL T316, ASTM A240
10	FLOAT ARM	STAINLESS STEEL T316, ASTM A240
11	ORIFICE BUTTON	STAINLESS STEEL & BUNA-N
12	PIVOT PIN	STAINLESS STEEL T316, ASTM A276
13	RETAINING RING	STAINLESS STEEL PH 15-7 MO
14	PIPE PLUG	STEEL
15	CUSHION	BUNA-N
16	PLUG	STAINLESS STEEL T316, ASTM A276
17	FLOAT RETAINER	STAINLESS STEEL T316, ASTM F880
18	LOCK NUT	STAINLESS STEEL T316, ASTM F594
29	CUSHION RETAINER	STAINLESS STEEL T316, ASTM F593
30	WASHER	STAINLESS STEEL T316, ASTM A240
34	LOCK WASHER	STAINLESS STEEL T316, ASTM A240

NOTE: ALL SPECIFICATIONS AS
LAST REVISED.

Revised 1-29-03

MATERIALS OF CONSTRUCTION

DATE 2/2/69

VAL-MATIC®

VALVE AND MANUFACTURING CORP.

DRWG. NO.

VM-201C-M

For Commercial and Industrial Applications

Job Name _____

Contractor _____

Job Location _____

Approval _____

Engineer _____

Contractor's P.O. No. _____

Approval _____

Representative _____

LEAD FREE*

Series LFFBV-3C, LFFBVS-3C

2-Piece, Full Port, Lead Free* Brass Ball Valves

Sizes: 1/4" – 4" (8 – 100mm)

Series LFFBV-3C 2-piece, full port, Lead Free* brass ball valves are used in commercial and industrial applications for a full range of liquids and gases. They feature a bottom-loaded blowout proof stem, virgin PTFE seats, thrust washer, and adjustable stem packing gland, stem packing nut, chrome plated Lead Free* brass ball, brass adapter, and steel handle. The Series LFFBV-3C, LFFBVS-3C features Lead Free* construction to comply with Lead Free* installation requirements.

Features

- Lead Free* brass body and adapter
- Certified to NSF/ANSI standard 61/8
- CSA approved threaded valves only 1/4" – 3" (15 – 80mm)
- UL/FM approved threaded valves 1/2" – 2" (15 – 50mm)
- UL Listed solder valves 1/2" – 2" (15 – 50mm)
- Fluorocarbon elastomer stem O-ring prevents stem leaks
- Adjustable stem packing gland
- PTFE stem packing seal, thrust washer, and seats
- Bottom loaded blowout proof stem
- Machined chrome plated Lead Free* brass ball
- Valves comply to MSS-SP-110 standard

Models

LFFBV-3C: 1/4" – 4" (8 – 100mm) with threaded connections

LFFBVS-3C: 1/2" – 3" (15 – 80mm) with solder connections

Pressure – Temperature

Temperature Range: -40°F to 400°F (-40°C to 204°C)

Pressure Ratings

LFFBV-3C: 1/4" – 2" (8 – 50mm)

600psi (41 bar) WOG, non-shock
150psi (10.3 bar) WSP

2 1/2" – 4" (65 – 100mm)

400psi (27.5 bar) WOG, non-shock
125psi (8.6 bar) WSP

LFFBVS-3C: 1/2" – 2" (15 – 50mm)

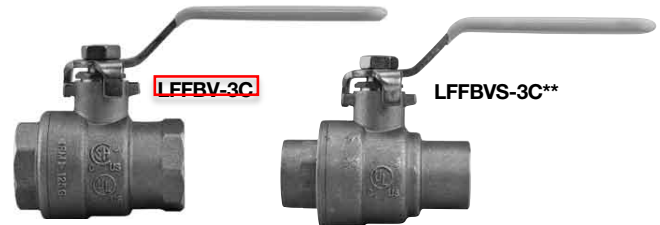
600psi (41 bar) WOG, non-shock
150psi (10.3 bar) WSP

2 1/2" – 3" (65 – 80mm)

400psi (27.5 bar) WOG, non-shock
125psi (8.6 bar) WSP

**This valve is designed to be soft soldered into lines without disassembly, using a low temperature solder to 420°F (216°C). Higher temperature solders may damage the seat material.

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.



NOTE: Apply heat with the flame directed **AWAY** from the center of the valve body. Excessive heat can harm the seats. After soldering, the packing nut may have to be tightened.

Approvals

1/4" – 4" (8 – 100mm) LFFBV-3C

Certified to NSF/ANSI standard 61/8*



1/2" – 3" (15 – 80mm) LFFBVS-3C

Certified to NSF/ANSI standard 61/8*



*Domestic cold water at 73°F (23°C)

1/2" – 2" (15 – 50mm) LFFBV-3C UL/FM approved



1/2" – 2" (15 – 50mm) LFFBVS-3C UL Listed



approved

Gas Approvals (Threaded Valves Only)

1/2" – 2" (15 – 50mm) ASME B16.33, CSA



1/2 psig, 5psig, and 125psig (14, 34 and 862 kPa)
@ -40°F to 125°F (-40°C to 52°C)

2 1/2" – 3" (65 – 80mm)

ASME B16.38, CSA



1/2 psig, 5psig, and 125psig (14, 34 and 862 kPa)
@ -40°F to 125°F (-40°C to 52°C)

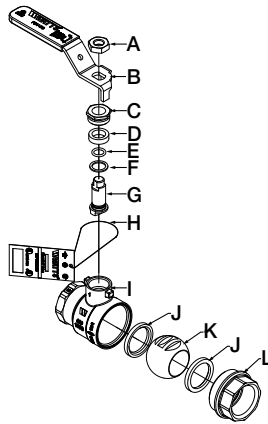
Specifications

Approved valves shall be 2-piece full port design constructed using Lead Free* brass body and end adapter. Lead Free* ball valves shall comply with state codes and standards, where applicable, requiring reduced lead content. Seats and stem packing shall be virgin PTFE. Stem shall be bottom loaded, blowout proof design with fluorocarbon elastomer O-ring to prevent stem leaks. Valve shall have chrome plated Lead Free* brass ball and adjustable packing gland. Threaded valves 1/2" – 3" shall be CSA approved to 1/2, 5, and 125psig (14, 34 and 862 kPa), UL/FM approved and certified to NSF/ANSI standard 61/8. Solder valves to be UL listed and certified to NSF/ANSI standard 61/8. Valve sizes 1/4" – 2" shall be rated to 600psi (41 bar) WOG non-shock and 150psi (10.3 bar) WSP. Valve sizes 2 1/2" – 4" threaded, shall be rated to 400psi (27.5 bar) WOG non-shock and 125psi (8.6 bar) WSP. Valve sizes 2 1/2" – 3" solder shall be rated to 400psi (27.5 bar) WOG non-shock and 125psi (8.6 bar) WSP. Valve shall be a Watts Series LFFBV-3C (threaded) or LFFBVS-3C (solder).

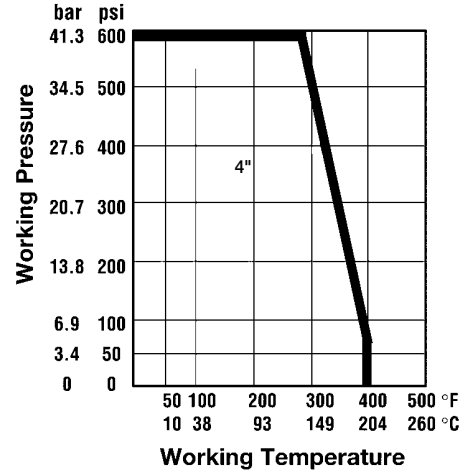
*The wetted surface of this product contacted by consumable water contains less than one quarter of one percent (0.25%) of lead by weight.

Materials

Temperature – Pressure

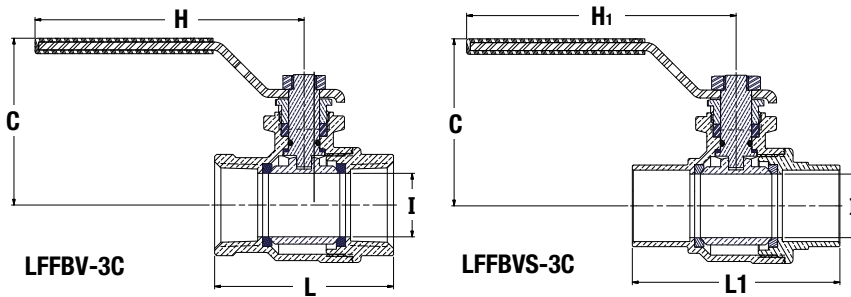


- A. Handle Nut Zinc plated carbon steel
- B. Handle Assembly Zinc plated carbon steel with vinyl insulator
- C. Packing Nut Lead Free* brass
- D. Stem Packing Virgin PTFE
- E. O-ring Fluorocarbon elastomer (FKM)
- F. Thrust Washer Virgin PTFE
- G. Stem Machined Lead Free* brass
- H. Tag Cardboard, Mylar coated both sides
- I. Body Forged Lead Free* brass
- J. Seats Virgin PTFE
- K. Ball Chrome plated Lead Free* brass
- L. Adapter Forged Lead Free* brass



*See applicable note on reverse side for solder end valves with regards to pressure/temperature rating.

Dimensions – Weights



SIZE (DN)		DIMENSIONS										WEIGHT			
in.	mm	C		H		H ₁		I		L		L ₁		lbs.	kg.
		in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm		
1/4	8	1 13/16	46	3 7/16	87	-	-	1/2	12.9	1 3/4	45	-	-	0.4	0.2
3/8	10	1 13/16	46	3 7/16	87	-	-	1/2	12.9	1 3/4	45	-	-	0.4	0.2
1/2	15	1 13/16	46	3 7/16	87	3 7/16	87	1/2	12.9	1 15/16	50	2 1/16	52	0.4	0.2
3/4	20	2 1/4	57	4	101	4	101	3/4	19.2	2 5/16	59	2 11/16	68	0.8	0.3
1	25	2 5/8	67	4 1/4	108	4 1/4	108	1	25.5	2 13/16	72	3 1/4	83	1.2	0.5
1 1/4	32	2 13/16	71	4 1/4	108	4 1/4	108	1 1/4	31.9	3 3/16	81	3 11/16	94	1.8	0.8
1 1/2	40	3 3/16	80	5 1/4	134	5 5/16	135	1 1/4	38.0	3 1/2	88	4 1/4	108	2.6	1.2
2	50	3 1/2	89	6	153	6	153	2	50.9	4 1/8	105	5 5/16	135	3.7	1.7
2 1/2	65	4 1/16	104	7 3/8	187	7 3/8	188	2 1/2	63.6	5 5/16	134	6 1/4	158	7.1	3.2
3	80	4 1/2	114	7 3/4	197	7 3/4	197	3	76.3	6 1/16	154	7 3/8	185	11.3	4.7
4	100	5 3/8	136	9 5/8	245	-	-	4	101.6	7 7/16	189	-	-	17.7	8.0



A Watts Water Technologies Company



ISO 9001-2000
CERTIFIED

USA: 815 Chestnut St., No. Andover, MA 01845-6098; www.watts.com

Canada: 5435 North Service Rd., Burlington, ONT. L7L 5H7; www.wattscanada.ca

Bourdon Tube Pressure Gauges Stainless Steel Series

Type 232.53 - Dry Case Type 233.53 - Liquid-filled Case

WIKA Datasheet 23X.53

Applications

- With liquid filled case for applications with high dynamic pressure pulsations or vibration
- Suitable for corrosive environments and gaseous or liquid media that will not obstruct the pressure system
- Process industry: chemical/petrochemical, power stations, mining, on and offshore, environmental technology, mechanical engineering and plant construction

Special features

- Excellent load-cycle stability and shock resistance
- All stainless steel construction
- Positive pressure ranges to 15,000 psi

Standard Features

Design

ASME B40.100 & EN 837-1

Sizes

2", 2½" & 4" (50, 63 and 100 mm)

Accuracy class

- 2" & 2½": ± 2/1/2% of span (ASME B40.100 Grade A)
- 4": ± 1.0% of span (ASME B40.100 Grade 1A)

Ranges

Vacuum / compound to 200 psi
Pressure from 15 psi to 15,000 psi
or other equivalent units of pressure or vacuum

Working pressure

→ 2" & 2½":	Steady:	3/4 scale value
	Fluctuating:	2/3 full scale value
	Short time:	full scale value
4":	Steady:	full scale value
	Fluctuating:	0.9 x full scale value
	Short time:	1.3 x full scale value

Operating temperature

Ambient: -40°F to +140°F (-40°C to +60°C) - dry
-4°F to +140°F (-20°C to +60°C) - glycerine filled
-40°F to +140°F (-40°C to +60°C) - silicone filled
Medium: +212°F (+100°C) maximum



Bourdon Tube Pressure Gauge Model 232.53

Temperature error

Additional error when temperature changes from reference temperature of 68°F (20°C) ±0.4% for every 18°F (10°C) rising or falling. Percentage of span.

Weather protection

Weather tight (NEMA 4X / IP65)

Pressure connection

Material: 316L stainless steel
Lower mount (LM) or center back mount (CBM)
Lower back mount (LBM) for 4" size
1/8" NPT, 1/4" NPT or 1/2" NPT limited to wrench flat area

Bourdon tube

Material: 316L stainless steel
→ 2" & 2½": ≤ 1,000 PSI: C-type,
≥ 1,500 PSI: helical type
4": ≤ 1,500 PSI: C-type,
≥ 2,000 PSI: helical type

Movement

Stainless steel

Dial

White aluminum with black lettering, 2½" with stop pin

Pointer

Black aluminum

Case

304 stainless steel with vent plug and SS crimp ring.
Welded case / socket connection

Window

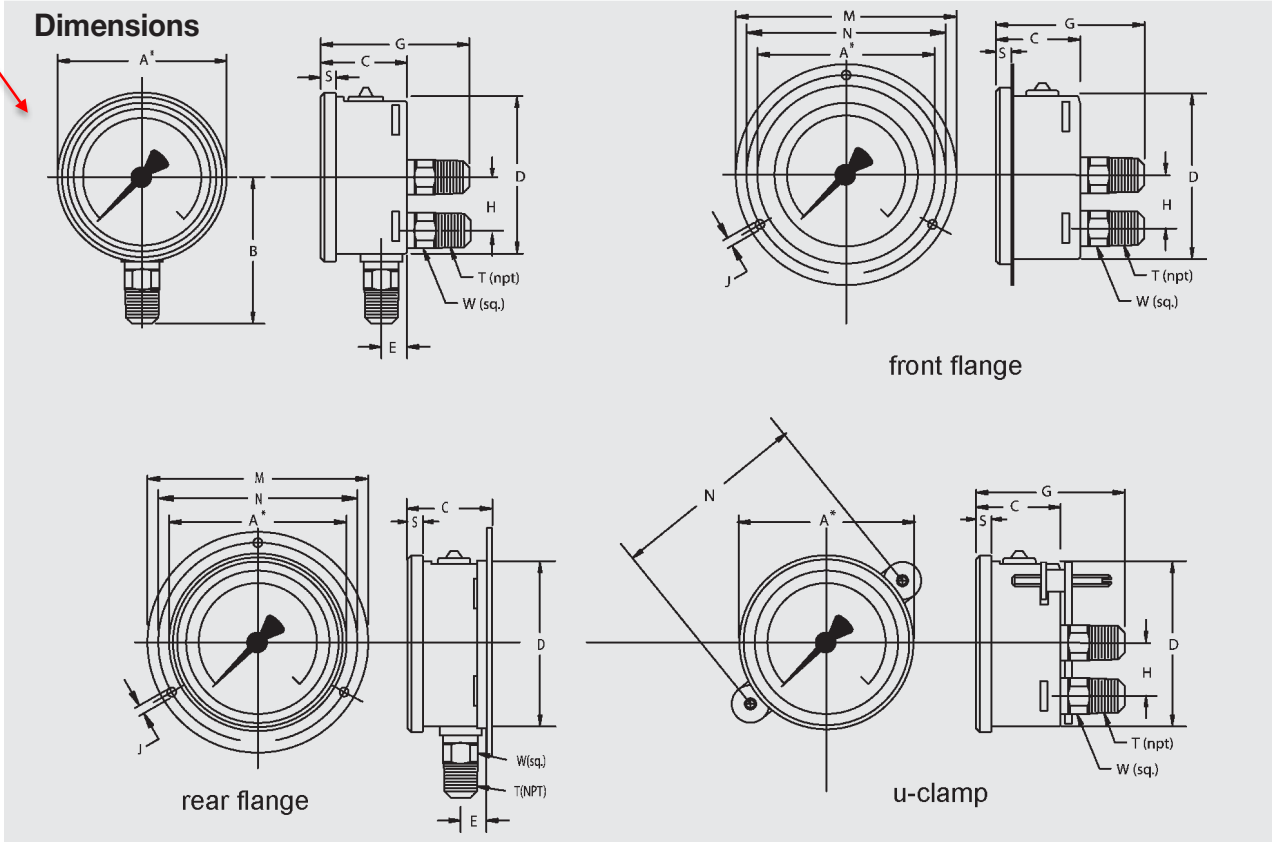
Polycarbonate

Liquid filling

Glycerine 99.7% - Type 233.53

Optional extras

- SS restrictor
- SS front or rear flanges
- Zinc-plated steel or SS u-clamp bracket (field installable)
- Cleaned for oxygen service
- Red drag pointer for mark pointer
- Other pressure connections
- Silicone or Fluorolube case filling
- Other pressure scales available:
bar, kPa, MPa, kg/cm² and dual scales



Size		A	B	C	D	E	G	H	J	K	L	M	N	S	T	W	Weight
2"	mm	55	48	30	50	12	53	-	3.6	n/a	6.5	71	60	5.5	14	0.27 lb.	dry
	in	2.17	1.89	1.18	1.97	0.47	2.09	-	0.14	n/a	0.26	2.80	2.36	0.22	1/4"	0.55	0.33 lb.
2.5"	mm	69	54	32	62	13	54	-	3.6	72	7.5	85	75	6.5	14	0.36 lb.	dry
	in	2.69	2.13	1.26	2.45	0.51	2.13	-	0.14	2.83	0.30	3.35	2.95	0.26	1/4"	0.55	0.44 lb.
4"	mm	107	87	48	100	15.5	79.5	30	4.8	109	9	132	116	8	22	1.10 lb.	dry
	in	4.21	3.43	1.89	3.91	0.61	3.13	1.18	0.19	4.29	0.35	5.20	4.57	0.31	1/2"	0.87	1.76 lb.

Recommended panel cutout is dimension D + 1 mm

Ordering information

Pressure gauge model / Nominal size / Scale range / Size of connection / Optional extras required
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.



WIKAL Instrument Corporation

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Fax (770) 338-5118
E-Mail info@wika.com
www.wika.com

AquaCarb® S Series granular reactivated carbon

AquaCarb® NS, AquaCarb® RS, AquaCarb® RSD

For Industrial and Remedial Water Treatment

Description

AquaCarb® S Series carbons are produced through thermal reactivation of approved grades of spent carbon at one of our state-of-the-art ISO 14001 certified reactivation facilities. Through careful control of the residence time in the reactivation furnace, reactivation temperature, and reactivation gas composition, adsorbed contaminants on the spent carbon are removed and destroyed, and the carbon's internal pore structure is maintained as close to virgin condition as possible. AquaCarb® S Series reactivated carbons are pooled from a variety of sources, ensuring consistent product properties. The resulting carbon serves as an excellent economic alternative to virgin carbon for the removal of a broad range of organic contaminants from wastewater, process water, and groundwater streams.

Applications

Cost effective AquaCarb® S Series reactivated carbons have been demonstrated to provide excellent performance in a variety of liquid phase treatment applications, including the following:

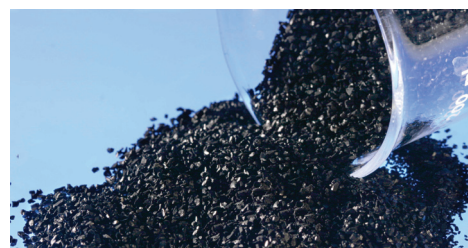
- Removal of organic contaminants
- Pesticide removal
- Groundwater remediation
- Wastewater treatment
- Industrial process water treatment
- Biological activated carbon support

Quality Control

Siemens' laboratories are fully equipped to provide complete quality control analysis

using ASTM standard test methods in order to assure the consistent quality of all Westates® activated carbons.

Our technical staff offers hands-on guidance in selecting the most appropriate system, operating conditions and carbon to meet your needs. For more information contact your nearest Siemens representative.



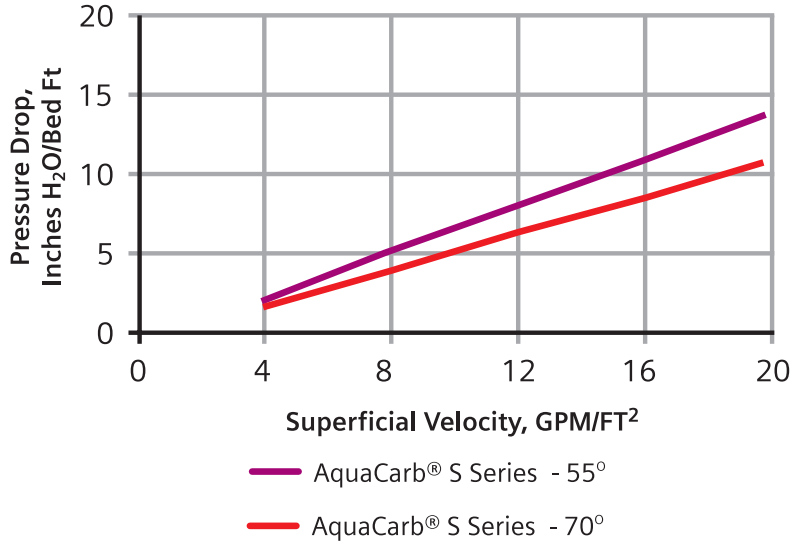
Features and Benefits:

- Reactivated carbons serve as an economical alternative to virgin carbon in many applications
- Use of reactivated carbons reduce the volume of spent carbon sent to landfill and encourages responsible usage of natural resources
- A detailed quality assurance program guarantees consistent quality from lot to lot and shipment to shipment
- Pooled reactivated carbons provide consistent properties and performance
- Reactivated carbons produced at ISO 14001 certified reactivation facilities, ensuring minimization of environmental liability and continued benchmarking against best practice standards for environmental management

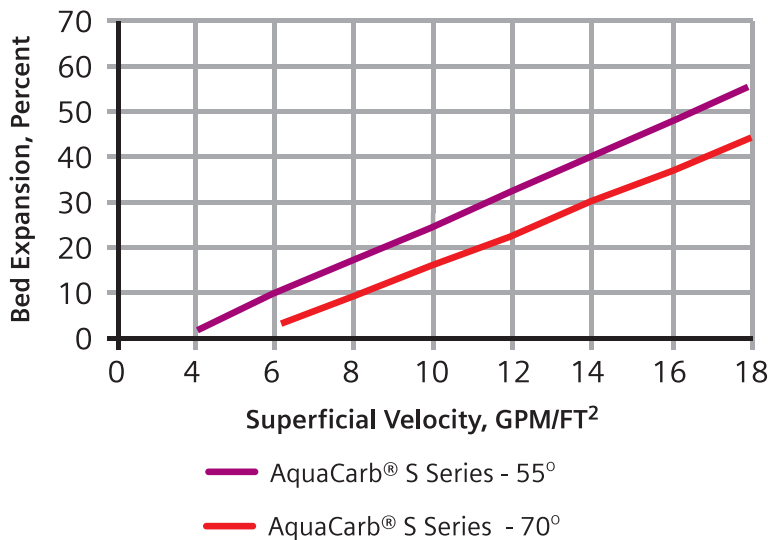
Typical Properties

Parameter	AquaCarb® S
Carbon Type	Reactivated Coconut/Coal
Mesh Size, U.S. Sieve	8 x 30
Iodine No., mg I2/g	800 -1000
Apparent Density, g/cc	0.46 -0.60
Moisture as Packed, Wt. %	2

Downflow Pressure Drop Through A Backwashed and Stratified Bed (Typical)



Percent Bed Expansion During Backwash (Typical)



Safety Note: Under certain conditions, some compounds may oxidize, decompose or polymerize in the presence of activated carbon causing a carbon bed temperature rise that is sufficient to cause ignition. Particular care must be exercised when compounds that have a peroxide-forming tendency are being adsorbed. In addition the adsorption of VOCs will lead to the generation of heat within a carbon bed. These heats of reaction and adsorption need to be properly dissipated in order to fully assure the safe operation of the bed.

Wet activated carbon readily adsorbs atmospheric oxygen. Dangerously low oxygen levels may exist in closed vessels or poorly ventilated storage areas. Workers should follow all applicable state and federal safety guidelines for entering oxygen depleted areas.

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Red Bluff, CA 96080

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APPENDIX B

Flow Meters

SITRANS F M MAGFLO®

Electromagnetic flowmeters

Sensor types MAG 1100, MAG 3100, MAG 5100 W

Transmitter types MAG 5000, MAG 6000








Technical Documentation (handbooks, instructions, manuals etc.) on the complete product range SITRANS F can be found on the internet/intranet on the following links:



English: <http://www4.ad.siemens.de/WW/view/en/10806951/133300>

Order no.: FDK-521H0723

SFIDK.PS.027.W4.02




Siemens Flow Instruments range of electromagnetic flowmeters

	MAG 1100	MAG 1100 FOOD	MAG 3100	MAG 3100 W	MAG 5100 W
					
Size [mm]	DN2-100	DN 10-100	DN 15-2000	DN25-1200	DN25-1200
Connection	Flangeless (Sandwich design)	Weld-in adapter, clamp adapter, thread adapter	Flange	Flange	Flange
Pressure [bar]	Max. 40	Max. 40	Max. 100	Max. 40	Max. 40
Temperature [°C]	-20 to 200	-30 to 150	-40 to 180	-10 to 95	-5 to 90
Liner	Zirconium oxide (Z ₂ O ₂) Ceramic (Al ₂ O ₃), PFA	Ceramic (Al ₂ O ₃), PFA	Neoprene, EPDM, Teflon (PTFE), Ebonite, Linatex®	Neoprene and EPDM	DN 25-40 & DN 350-1200 hard elastomer DN50-300 composite elastomer
Electrodes	Platinum Hastelloy C276	Platinum Hastelloy	AISI 316 Ti, Hastelloy C, Platinum/Iridium, Titanium, Tantalum, PE electrodes	AISI 316 Ti, PE electrodes	AISI 316 Ti, PE electrodes
Enclosure	IP 67	IP 67	IP 67/IP 68	IP 67/IP 68	IP 67/IP 68
Ex-version	EEx [ia] [ib] IIB T4-T6		EEx e ia IIC T3-T6 EEx d [a] [b] IIB T4-T6		

	MAG 5000	MAG 6000
		
Outputs	1 current output 1 digital output 1 relay output	1 current output 1 digital output 1 relay output
Flow direction	Uni/bidirectional	Uni/bidirectional
Communication	Optional HART®	Add-on modules
Display	3 lines 20 characters (optional without display)	3 lines 20 characters (optional without display)
Meter uncertainty	±0,5% o.r.	±0,25% o.r.
Enclosure	IP 67, IP 20	IP 67, IP 20
Custody transfer approval	PTB (cold water)	PTB OIML R75 OIML R117
Ex-version Safety barrier 19"	[EEx ia] IIC	[EEx ia ib] IIB [EEx ia] IIC
Power supply	12-24 V AC/DC 115-230 V AC	12-24 V AC/DC 115-230 V AC
Batch	No	Yes

	MAG 6000 Industry	MAG 8000 W
		
Refer to	Operating manual SFIDK.PS.026.E1.02	Operating manual SFIDK.PS.026.D2.02

2.4 Sensor MAG 5100 W


			
Type	Sensor with flanges		
Design	Straight	Coned 1 DN reduction	Straight
Nominal size mm	25-40	50-300	350-1200
Liner	Hard elastomer (hard rubber) ³⁾	Composite elastomer (hard & soft rubber) ³⁾	Hard elastomer (hard rubber) ³⁾
Liner approvals	WRc	WRc	WRc
Medium temperature	-5 to 70°C ¹⁾		
Ambient temperature			
Remote transmitter	-40 to 100°C		
Compact transmitter	-20 to 50°C		
Operating pressure	0.01 to 40 bar	0.03 to 20 bar	0.01 to 16 bar
Excitation frequency	12.5 Hz	50-65 mm: 12.5 Hz 80-150 mm: 6.25 Hz 200-300 mm: 3.125 Hz	3.125 Hz
Enclosure rating <i>Standard</i>	IP 67 to EN 60529 1 m w.g. for 30 minutes		
<i>Option</i>	IP 68 to EN 60529 10 m w.g. continuously		
Cable entries	4 Pg 13.5		
Mechanical load	18-1000 Hz random, 3.17 G rms in all directions to EN 60068-2-36		
Test pressure	1.5 × nominal pressure		
Flanges			
EN 1092-1 <i>Standard</i>	PN 40	50-150 mm: PN 16 200-300 mm: PN 10	PN 10
<i>Option</i>		200-300 mm: PN 16	PN 16
ANSI B16.5 <i>Standard</i>	Class 150 lb	Class 150 lb	14"-24": Class 150 lb 28"-48": Class D
AWWA C-207 <i>Standard</i>			
Pressure drop at 3 m/sec.	As straight pipe	Max. 25 mbar	As straight pipe
Electrodes	AISI 316 Ti (1.4571)		
PE/grounding electrodes <i>Standard</i>	AISI 316 Ti (1.4571)		
Measuring pipe/meter body	AISI 304 (1.4301)	Composite elastomer	AISI 304 (1.4301)
Flanges	Carbon steel		
Housing	Carbon steel		
Surface finish	Two component epoxy min. 150 microns	Polyester powder coat min. 100 microns	Two component epoxy min. 150 microns
Colour	Siemens 700 light basic		
Approvals <i>Conforms to</i>	PED - 97/23EC, LVD - 73/23 EEC + amendment 93/68/EEC, EMC - 89/336 EEX ²⁾		

1) Peak temperature up to +90°C (194°F) in periods < 1 hour

2) For sizes greater than 600 mm PED conformity is available as a cost added option, the basic unit will only carry the LVD (Low Voltage Directive) and EMC approval.

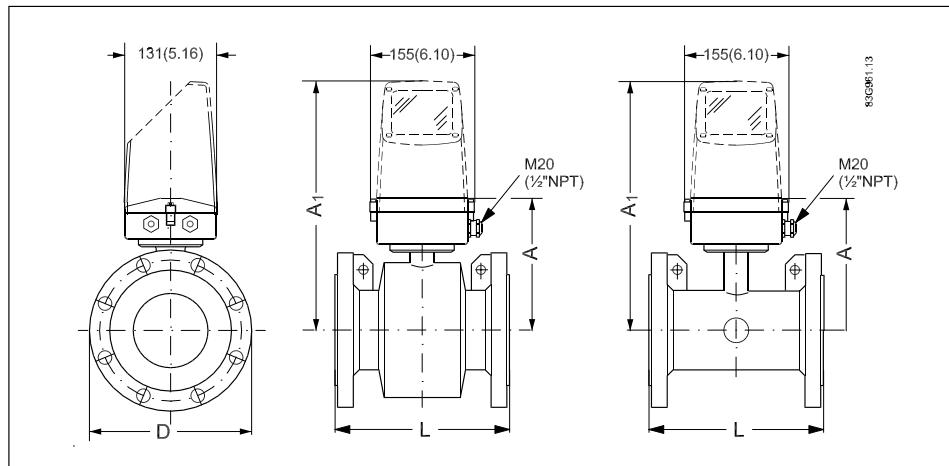
3) Nitrile, NBR

2.5.1 Transmitter MAG 5000 (DN 2 to DN 1200)

		Accuracy 0.5%
Current output		
Current	0-20 mA, 4-20 mA or 4-20 mA + alarm	
Load	< 800 ohm	
Time constant	0.1-30 s adjustable	
Digital output		
Frequency	0-10 kHz, 50% duty cycle	
Time constant	0.1-30 s adjustable	
Active	24 V DC, 30 mA, $1\text{ K}\Omega \leq R_{\text{load}} \leq 10\text{ K}\Omega$, short-circuit-protected	
Passive	3-30 V DC, max. 110 mA, $200\ \Omega \leq R_{\text{load}} \leq 10\text{ K}\Omega$	
Relay		
Time constant	Changeover relay, time constant same as current time constant	
Load	42 V AC/2 A, 24 V DC/1A	
Digital input		
Activation time	50 ms	
Current	$I_{11\text{ V DC}} = 2.5\text{ mA}$, $I_{30\text{ V DC}} = 7\text{ mA}$	
Functions		
Flow rate, 2 totalizers, low flow cut-off, empty pipe cut-off ¹⁾ , flow direction, error system, operating time, uni/bidirectional flow, limit switches, pulse output, control for cleaning unit		
Galvanic isolation		
All inputs and outputs are galvanically isolated		
Cut-off		
Low flow	0-9.9% of maximum flow	
Empty pipe	Detection of empty pipe, special cable required in separate mounted installation	
Totalizer		
Two eight-digit counters for forward, net or reverse flow		
Display		
Background illumination with alphanumerical text, 3 x 20 characters to indicate flow rate, totalized values, settings and faults		
Reverse flow indicated by negative sign		
Time constant	Time constant as current output time constant	
Zero point adjustment		
Automatic		
Electrode input impedance		
$> 1 \times 10^{14}\ \Omega$		
Excitation frequency		
Sensor size depending pulsating DC current (125 mA)		
Ambient temperature		
Display version during operation: -20 to +50°C		
Blind version during operation: -20 to +60°C		
During storage: -40 to +70°C (RH max. 95%)		
Custody transfer approval		
MAG 5000 CT	PTB (cold water)	
	6.221	
	99.19	
Communication		
Standard	Without serial communication	
Optional	HART®	
Compact		
Enclosure material	Fibre glass-reinforced polyamide	
Enclosure rating	IP 67 to EN 60529 and DIN 40050 (1 m w.g. for 30 minutes)	
Mechanical load	18-1000 Hz random, 3.17 G rms in all directions to EN 60068-2-36	
19" insert		
Enclosure material	Standard 19" insert of aluminium/steel (DIN 41494)	
	Width: 21 TE	
	Height: 3 HE	
Enclosure rating	IP 20 to EN 60529 and DIN 40050	
Mechanical load	Version: 1 G, 1-800 Hz sinusoidal in all directions to EN 60068-2-36	
EMC performance		
Emission: EN 50081-1 (Light industry)		
Immunity: EN 50082-2 (Industry)		
Supply voltage		
115-230 V AC +10% to -15%, 50-60 Hz		
11-30 V DC or 11-24 V AC		
Power consumption		
230 V AC: 17 VA		
24 V DC: 9 W, $I_N = 380\text{ mA}$, $I_{ST} = 8\text{ A}$ (30 ms)		
12 V DC: 11 W, $I_N = 920\text{ mA}$, $I_{ST} = 4\text{ A}$ (250 ms)		

1) Not remote Ex, not DN 2, 3

4.3 Sensor MAG 5100 W



D & W

Nominal size		A		L									
				PN 10		PN 16		PN 40		Class 150		AWWA	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
25	1"	187	7.4	N/A	N/A	N/A	N/A	200	7.9	200	7.9	N/A	N/A
40	1½"	197	7.8	N/A	N/A	N/A	N/A	200	7.9	200	7.9	N/A	N/A
50	2"	188	7.4	N/A	N/A	200	7.9	N/A	N/A	200	7.9	N/A	N/A
65	2½"	194	7.6	N/A	N/A	200	7.9	N/A	N/A	200	7.9	N/A	N/A
80	3"	200	7.9	N/A	N/A	200	7.9	N/A	N/A	200	7.9	N/A	N/A
100	4"	207	8.1	N/A	N/A	250	9.8	N/A	N/A	250	9.8	N/A	N/A
125	5"	217	8.5	N/A	N/A	250	9.8	N/A	N/A	250	9.8	N/A	N/A
150	6"	232	9.1	N/A	N/A	300	11.8	N/A	N/A	300	11.8	N/A	N/A
200	8"	257	10.1	350	13.8	350	13.8	N/A	N/A	350	13.8	N/A	N/A
250	10"	284	11.2	450	17.7	450	17.7	N/A	N/A	450	17.7	N/A	N/A
300	12"	310	12.2	500	19.7	500	19.7	N/A	N/A	500	19.7	N/A	N/A
350	14"	382	15.0	550	21.7	550	21.7	N/A	N/A	550	21.7	N/A	N/A
400	16"	407	16.0	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
450	18"	438	17.2	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
500	20"	463	18.2	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
600	24"	514	20.2	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
700	28"	564	22.2	700	27.6	700	27.6	N/A	N/A	N/A	N/A	700	27.6
750	30"	591	23.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	750	29.5
800	32"	616	24.3	800	31.5	800	31.5	N/A	N/A	N/A	N/A	800	31.5
900	36"	663	26.1	900	35.4	900	35.4	N/A	N/A	N/A	N/A	900	35.4
1000	40"	714	28.1	1000	39.4	1000	39.4	N/A	N/A	N/A	N/A	1000	39.4
	42"	714	28.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1000	39.4
1100	44"	765	30.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1100	43.3
1200	48"	820	32.3	1200	47.2	1200	47.2	N/A	N/A	N/A	N/A	1200	47.2

New dimension from DN 350 to DN 1200

Will be discontinued

350	14"	362	14.3	550	21.7	550	21.7	N/A	N/A	550	21.7	N/A	N/A
400	16"	387	15.2	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
450	18"	418	16.5	600	23.6	600	23.6	N/A	N/A	600	23.6	N/A	N/A
500	20"	443	17.4	625	24.6	625	24.6	N/A	N/A	680	26.8	N/A	N/A
600	24"	494	19.4	750	29.5	750	29.5	N/A	N/A	820	32.3	N/A	N/A
700	28"	544	21.4	875	34.4	875	34.4	N/A	N/A	N/A	N/A	875	34.4
750	30"	571	22.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	937	36.9
800	32"	606	23.9	1000	39.4	1000	39.4	N/A	N/A	N/A	N/A	1000	39.4
900	36"	653	25.7	1125	44.3	1125	44.3	N/A	N/A	N/A	N/A	1125	44.3
1000	40"	704	27.7	1250	49.2	1250	49.2	N/A	N/A	N/A	N/A	1250	49.2
	42"	704	27.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1250	49.2
1100	44"	755	29.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1375	54.1
1200	48"	810	31.9	1500	59.1	1500	59.1	N/A	N/A	N/A	N/A	1500	59.1

D = Outside diameter of flange, see flange tables

SITRANS F M MAGFLO® 4. Dimensions and weight

MAG 5100 W weight

Nominal size		PN 10		PN 16		PN 40		Class 150		AWWA	
mm	inch	kgs	lbs	kgs	lbs	kgs	lbs	kgs	lbs	kgs	lbs
25	1"	N/A	N/A	N/A	N/A	4	9	4	9	N/A	N/A
40	1½"	N/A	N/A	N/A	N/A	7	15	6	13	N/A	N/A
50	2"	N/A	N/A	9	20	N/A	N/A	8	20	N/A	N/A
65	2½"	N/A	N/A	10.7	24	N/A	N/A	11	24	N/A	N/A
80	3"	N/A	N/A	11.6	26	N/A	N/A	13	28	N/A	N/A
100	4"	N/A	N/A	15.2	33	N/A	N/A	19	41	N/A	N/A
125	5"	N/A	N/A	20.4	45	N/A	N/A	24	52	N/A	N/A
150	6"	N/A	N/A	26	57	N/A	N/A	29	64	N/A	N/A
200	8"	48	106	48	106	N/A	N/A	56	124	N/A	N/A
250	10"	64	141	69	152	N/A	N/A	79	174	N/A	N/A
300	12"	76	167	86	189	N/A	N/A	110	243	N/A	N/A
350	14"	104	229	125	274	N/A	N/A	139	307	N/A	N/A
400	16"	119	263	143	314	N/A	N/A	159	351	N/A	N/A
450	18"	136	299	173	381	N/A	N/A	182	400	N/A	N/A
500	20"	163	359	223	491	N/A	N/A	225	495	N/A	N/A
600	24"	236	519	338	744	N/A	N/A	320	704	N/A	N/A
700	28"	270	595	314	692	N/A	N/A	N/A	N/A	273	602
750	30"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	329	725
800	32"	346	763	396	873	N/A	N/A	N/A	N/A	365	804
900	36"	432	951	474	1043	N/A	N/A	N/A	N/A	495	1089
1000	40"	513	1130	600	1321	N/A	N/A	N/A	N/A	583	1282
	42"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	687	1512
1100	44"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	763	1680
1200	48"	643	1415	885	1948	N/A	N/A	N/A	N/A	861	1896

New weight from DN 350 to DN 1200

Will be discontinued

350	14"	100	220	116	255	N/A	N/A	131	289	N/A	N/A
400	16"	127	280	144	317	N/A	N/A	165	364	N/A	N/A
450	18"	152	335	178	393	N/A	N/A	176	388	N/A	N/A
500	20"	184	405	232	512	N/A	N/A	235	518	N/A	N/A
600	24"	258	568	343	736	N/A	N/A	345	761	N/A	N/A
700	28"	315	693	350	772	N/A	N/A	N/A	N/A	309	681
750	30"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	480	1058
800	32"	410	904	442	975	N/A	N/A	N/A	N/A	421	928
900	36"	512	1129	550	1213	N/A	N/A	N/A	N/A	539	1188
1000	40"	650	1433	732	1614	N/A	N/A	N/A	N/A	670	1477
	42"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	700	1544
1100	44"	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1100	2426
1200	48"	990	2183	1106	2439	N/A	N/A	N/A	N/A	1030	2271

The effect of temperature on working pressure MAG 5100 W

Metric (Pressures in bar)					
Sizes 25 mm, 40 mm & > 300 mm					
Flange spec.	Flange rating	Temperature °C			
		-5	10	50	90
EN 1092-1	PN 10	10.0	10.0	9.7	9.4
	PN 16	16.0	16.0	15.5	15.1
	PN 40	40.0	40.0	38.7	37.7
ANSI B16.45	150 lb	19.7	19.7	19.3	18.0
AWWA C-207	Class D	10.3	10.3	10.3	10.3
Sizes 50 mm to 300 mm					
EN 1092-1	PN 10	10.0	10.0	10.0	8.2
	PN 16	10.0	16.0	16.0	13.2
	PN 40	10.0	40.0	40.0	32.9
ANSI B16.45	150 lb	10.0	19.7	19.7	16.2

Imperial (Pressures in Psi)					
Sizes 1", 1½", & > 12"					
Flange spec.	Flange rating	Temperature °F			
		23	50	120	200
EN 1092-1	PN 10	145	145	141	136
	PN 16	232	232	225	219
	PN 40	580	580	561	547
ANSI B16.45	150 lb	286	286	280	261
AWWA C-207	Class D	150	150	150	150
Sizes 2" to 12"					
EN 1092-1	PN 10	145	145	145	119
	PN 16	145	232	232	191
	PN 40	145	580	580	477
ANSI B16.45	150 lb	145	286	286	235

D & W

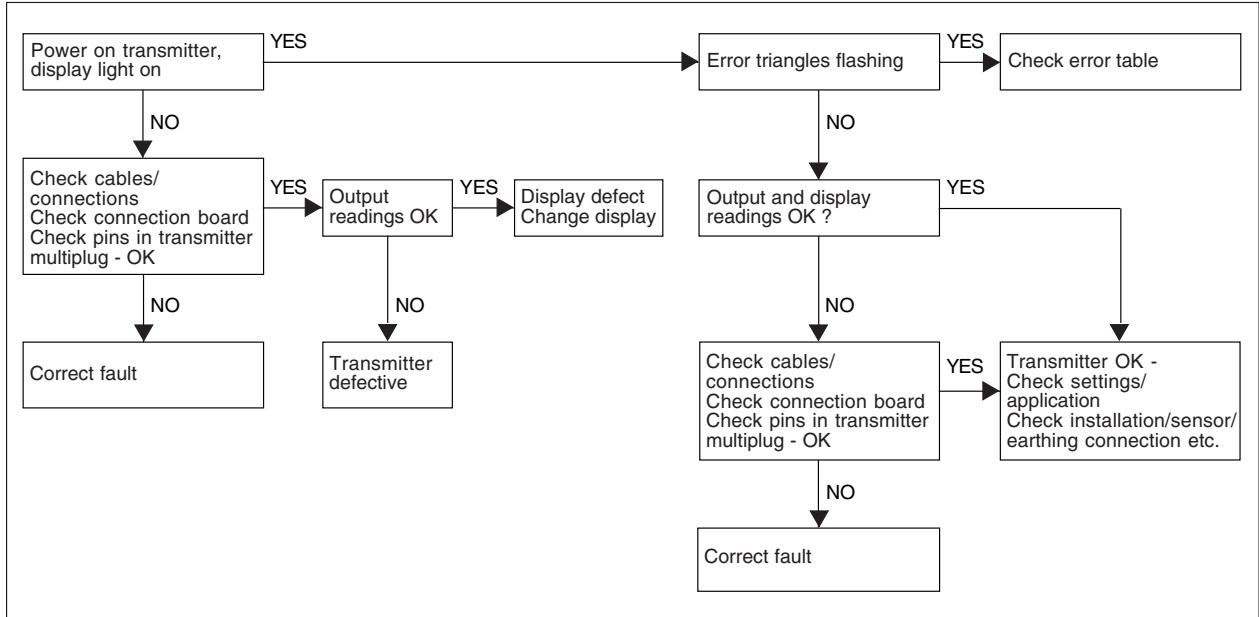
9. Service

Often problems with unstable/wrong measurements occur due to insufficient/wrong earthing or potential equalization. Please check this connection. If OK, the SITRANS F M MAGFLO® transmitter can be checked as described under 9.1 and sensor under 9.3.

9.1 Transmitter check list

When checking SITRANS F M MAGFLO® installations for malfunction the easiest method to check the transmitter is to replace it with another MAG 5000/6000 transmitter with a similar power supply. A replacement can easily be done as all settings are stored in and downloaded from the SENSORPROM® unit - no extra settings need to be made.

If no spare transmitter is available - then check transmitter according to check table.



9.2 Trouble shooting MAG transmitter

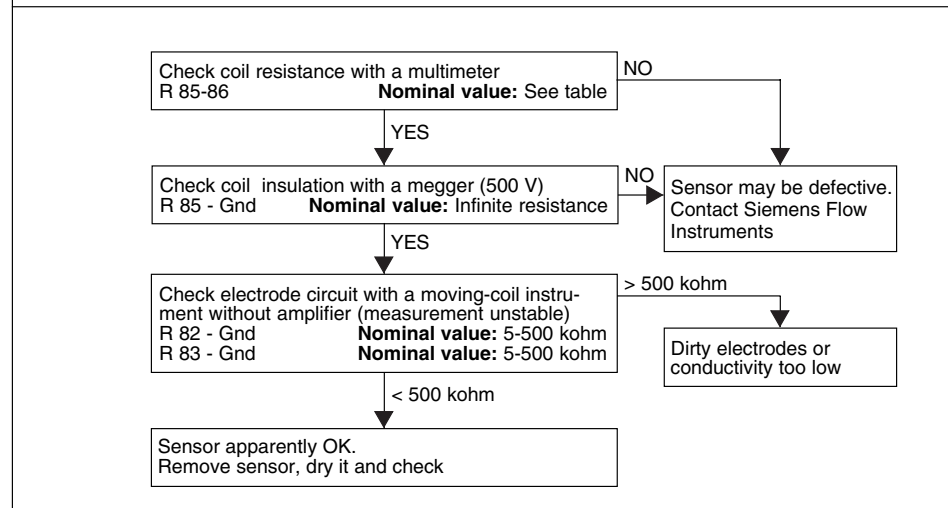
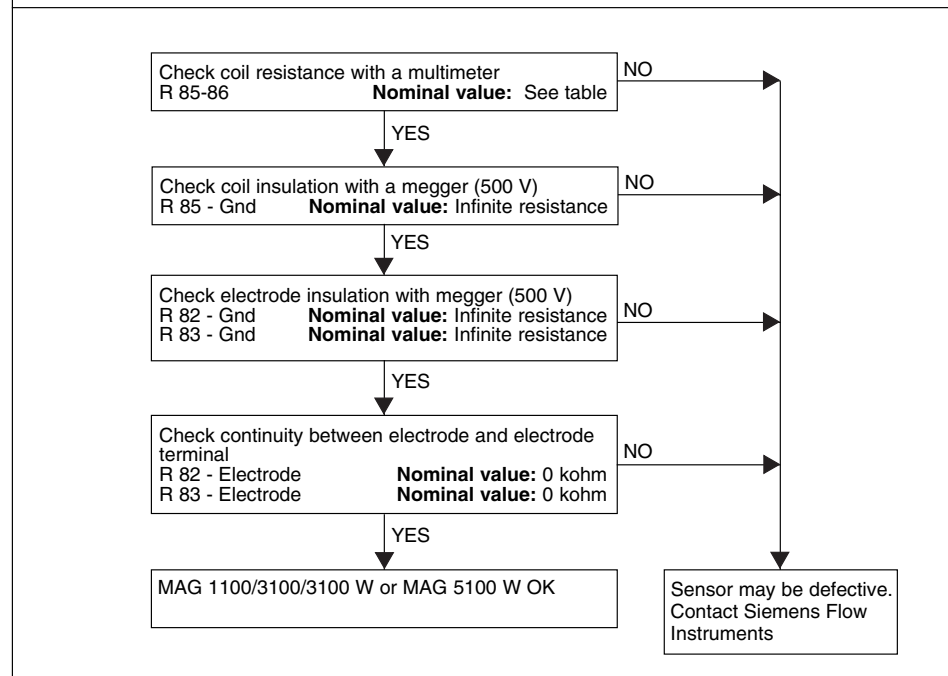
Symptom	Output signals	Error code	Cause	Remedy
Empty display	Minimum		1. No power supply	Power supply Check MAG 5000/6000 for bended pins on the connector
			2. MAG 5000/6000 defective	Replace MAG 5000/6000
No flow signal	Minimum		1. Current output disabled	Turn on current output
			2. Digital output disabled	Turn on digital output
			3. Reverse flow direction	Change direction
	Undefined	F70	Incorrect or no coil current	Check cables/connections
		W31	Measuring pipe empty	Ensure that the measuring pipe is full
		F60	Internal error	Replace MAG 5000/6000
		P42	1. No load on current output 2. MAG 5000/6000 defective	Check cables/connections Replace MAG 5000/6000
P41	Initializing error	Switch off MAG 5000/6000, wait 5 s and switch on again		
Indicates flow with no flow in pipe	Undefined		Measuring pipe empty	Select empty pipe cut-off
			Empty pipe cut-off is OFF	Ensure that the measuring pipe is full
			Electrode connection missing/ electrode cable is insufficiently screened	Ensure that electrode cable is connected and sufficiently screened
Unstable flow signal	Unstable		1. Pulsating flow	Increase time constant
			2. Conductivity of medium too low	Use special electrode cable
			3. Electrical noise potential between medium and sensor	Ensure sufficient potential equalization
			4. Air bubbles in medium	Ensure medium does not contain air bubbles
			5. High concentration of particles or fibres	Increase time constant
Measuring error	Undefined		Incorrect installation	Check installation
		P40	No SENSORPROM® unit	Install SENSORPROM® unit
		P44	CT SENSORPROM® unit	Replace SENSORPROM® unit or reset SENSORPROM® unit with MAG CT transmitter
		F61	Deficient SENSORPROM® unit	Replace SENSORPROM® unit
		F62	Wrong type of SENSORPROM® unit	Replace SENSORPROM® unit
		F63	Deficient SENSORPROM® unit	Replace SENSORPROM® unit
	Maximum	F71	Loss of internal data	Replace MAG 5000/6000
		W30	Flow exceeds 100% of Q_{max} .	Check Q_{max} . (Basic Settings)
		W21	Pulse overflow • Volume/pulse too small • Pulse width too large	Change volume/pulse Change pulse width
Measuring approx. 50%			Missing one electrode connection	Check cables
Loss of totalizer data	OK	W20	Initializing error	Reset totalizer manually
##### Signs in display	OK		Totalizer roll over	Reset totalizer or increase totalizer unit

9.3

Check list MAG sensor

ATTENTION!

If there is leakage from MAG 1100/3100/3100 W or MAG 5100 W and the unit has been used to measure inflammable/explosive liquids, there might be a risk of explosion when checking with a megger.

Disconnect all leads to MAG 1100/3100/3100 W or MAG 5100 W**MAG 1100/3100/3100 W or MAG 5100 W installed and filled with the medium:****MAG 1100/3100/3100 W or MAG 5100 W removed from system – empty and dry:**

9.4
Coil resistance

DN	Coil resistance						
	MAG 1100 Resistance	MAG 3100		MAG 3100 W		MAG 5100 W	
		Resistance	Tolerance	Ohms	Tolerance	Ohms	Tolerance
2	104 Ω +/- 5	104					
3	104 Ω +/- 5	104					
6	98 Ω +/- 4	104					
10	98 Ω +/- 4	104					
15 ¹⁾	98 Ω +/- 4	104					
25	98 Ω +/- 4	104	+/- 2	104	+/- 2	104	+/- 2
40	98 Ω +/- 4	92	+/- 2	92	+/- 2	92	+/- 2
50	98 Ω +/- 4	92	+/- 2	92	+/- 2	124	+/- 4
65	98 Ω +/- 4	100	+/- 2	100	+/- 2	127	+/- 4
80	98 Ω +/- 4	94	+/- 2	94	+/- 2	126	+/- 4
100	98 Ω +/- 4	92	+/- 2	92	+/- 2	125	+/- 4
125		92	+/- 2	92	+/- 2	126	+/- 4
150		94	+/- 2	94	+/- 2	116	+/- 4
200		90	+/- 2	90	+/- 2	109	+/- 4
250		92	+/- 2	92	+/- 2	104	+/- 4
300		100	+/- 2	100	+/- 2	108	+/- 4
350		112	+/- 2	112	+/- 2	112	+/- 2
400		100	+/- 4	100	+/- 4	100	+/- 4
450		108	+/- 4	108	+/- 4	108	+/- 4
500		122	+/- 4	122	+/- 4	122	+/- 4
600		115	+/- 4	114	+/- 4	114	+/- 4
700		128	+/- 4	112	+/- 4	112	+/- 4
750		133					
800		128	+/- 4	127	+/- 4	127	+/- 4
900		131	+/- 4	93	+/- 4	93	+/- 4
1000		131	+/- 4	103	+/- 4	103	+/- 4
1100		126					
1200		130	+/- 4	124	+/- 4	124	+/- 4
1400		130					
1500		124					
1600		133					
1800		133					
2000		147					

1) On MAG 1100 DN 15 produced as from May 1999 the coil resistance must be 86 ohm, +/- 4 ohm.

All resistance values are at 20 °C.
The resistance changes proportionally 0.4% / °C.

10. Ordering

Please look on our homepage <http://www.siemens.com/flow> under "Product Selector".

APPENDIX C

Pressure Transmitters

Pressure Measurement

Transmitters for basic requirements

SITRANS P200

2

Overview



The SITRANS P200 pressure transmitter measures the gauge and absolute pressure of liquids, gases and vapors.

- Ceramic measuring cell
- Gauge and absolute measuring ranges 1 to 60 bar (15 to 1000 psi)
- For general applications

Benefits

- High measuring accuracy
- Rugged stainless steel enclosure
- High overload withstand capability
- For aggressive and non-aggressive media
- For measuring the pressure of liquids, gases and vapors
- Compact design

Application

The SITRANS P200 pressure transmitter for gauge and absolute pressure is used in the following industrial areas:

- Mechanical engineering
- Shipbuilding
- Power engineering
- Chemical industry
- Water supply

Design

Device structure without explosion protection

The pressure transmitter consists of a piezoresistive measuring cell with a diaphragm installed in a stainless steel enclosure. It can be used with a connector per EN 175301-803-A (IP65), a round plug M12 (IP67), a cable (IP67) or a cable quick screw connection (IP67) connected electrically. The output signal is between 4 and 20 mA or 0 and 10 V.

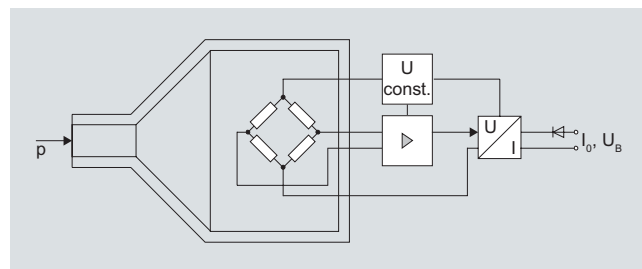
Device structure with explosion protection

The pressure transmitter consists of a piezoresistive measuring cell with a diaphragm installed in a stainless steel enclosure. It can be used with a connector per EN 175301-803-A (IP65) or a round plug M12 (IP67) connected electrically. The output signal is between 4 and 20 mA.

Function

The pressure transmitter measures the gauge and absolute pressure of liquids and gases as well as the level of liquids.

Mode of operation



SITRANS P200 pressure transmitters (7MF1565-...), functional diagram

The ceramic measuring cell has a thin-film resistance bridge to which the operating pressure p is transmitted through a ceramic diaphragm.

The voltage output from the measuring cell is converted by an amplifier into an output current of 4 to 20 mA or an output voltage of 0 to 10 V DC.

The output current and voltage are linearly proportional to the input pressure.

Pressure Measurement

Transmitters for basic requirements

SITRANS P200

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Technical specifications

Application

Gauge and absolute pressure measurement Liquids, gases and vapors

Mode of operation

Measuring principle Piezo-resistive measuring cell (ceramic diaphragm)

Measured variable Gauge and absolute pressure

Inputs

Measuring range

- Gauge pressure
 - Metric 1 ... 60 bar g (15 ... 870 psi g)
 - US measuring range 15 ... 1000 psi g

- Absolute pressure
 - Metric 0.6 ... 16 bar a (10 ... 232 psi a)
 - US measuring range 10 ... 300 psi a

Output

Current signal

- Load $(U_B - 10 \text{ V}) / 0.02 \text{ A}$
- Auxiliary power U_B DC 7 ... 33 V (10 ... 30 V for Ex)

Voltage signal

- Load $\geq 10 \text{ k}\Omega$
- Auxiliary power U_B 12 ... 33 V DC
- Power consumption $< 7 \text{ mA}$ at 10 k Ω

Characteristic curve Linear rising

Measuring accuracy

Error in measurement at 25 °C (77 °F), including conformity error, hysteresis and repeatability

- Typical: 0.25 % of full-scale value
- Maximum: 0.5 % of full-scale value

Setting time T99

Long-term drift

- Lower range value and measuring span 0.25 % of full-scale value/year

Influence of ambient temperature

- Lower range value and measuring span 0.25 %/10 K of full-scale value
- Influence of power supply 0.005 %/V

Conditions of use

Process temperature with gasket made of:

- FPM (Standard) -15 ... +125 °C (+5 ... +257 °F)
- Neoprene -35 ... +100 °C (-31 ... +212 °F)
- Perbunan -20 ... +100 °C (-4 ... +212 °F)
- EPDM -40 ... +145 °C (-40 ... +293 °F), usable for drinking water

Ambient temperature

Storage temperature

Degree of protection (to EN 60529)

- IP 65 with connector per EN 175301-803-A
 - IP 67 with M12 connector
 - IP 67 with cable
 - IP 67 with cable quick screw connection
- Electromagnetic compatibility
- acc. EN 61326-1/-2/-3
 - acc. NAMUR NE21, only for ATEX versions and with a max. measuring deviation $\leq 1 \%$

Design

Weight

Process connections

Electrical connections

Wetted parts materials

- Measuring cell
- Process connection

- Gasket

Non-wetted parts materials

- Enclosure

- Rack

- Cables

Certificates and approvals

Classification according to pressure equipment directive (PED 97/23/EC)

Lloyds Register of Shipping (LR)

Germanischer Lloyds Register of Shipping (GL)

American Bureau of Shipping (ABS)

Bureau Veritas (BV)

Det Norske Veritas (DNV)

Drinking water approval (ACS)

GOST

Explosion protection

Intrinsic safety "i" (only with current output)

EC type-examination certificate

Connection to certified intrinsically-safe resistive circuits with maximum values:

Effective internal inductance and capacity for versions with plugs per EN 175301-803-A and M12

Approx. 0.090 kg (0.198 lb)

See dimension drawings

- Connector per EN 175301-803-A Form A with cable inlet M16x1.5 or 1/2-14 NPT or Pg 11
- M12 connector
- 2 or 3-wire (0.5 mm²) cable ($\varnothing \pm 5.4 \text{ mm}$)
- Cable quick screw connection

Al₂O₃ - 96 %

Stainless steel, mat. No. 1.4404 (SST 316 L)

- FPM (Standard)
- Neoprene
- Perbunan
- EPDM

Stainless steel, mat. No. 1.4404 (SST 316 L)

Plastic

PVC

For gases of fluid group 1 and liquids of fluid group 1; complies with requirements of article 3, paragraph 3 (sound engineering practice)

Applied

Applied

Applied

Applied

Applied

Applied

Applied

Ex II 1/2 G Ex ia IIC T4 Ga/Gb
Ex II 1/2 D Ex ia IIIC T125 °C Da/Db

SEV 10 ATEX 0146

$U_i \leq 30 \text{ V DC}$; $I_i \leq 100 \text{ mA}$;
 $P_i \leq 0.75 \text{ W}$

$L_i = 0 \text{ nH}$; $C_i = 0 \text{ nF}$

Pressure Measurement

Transmitters for basic requirements

SITRANS P200

2

Selection and ordering data					Order No.	Order code
SITRANS P 200 pressure transmitters for pressure and absolute pressure for general applications					7MF1565-	
Characteristic curve deviation typ. 0.25 %						
Wetted parts materials: Ceramic and stainless steel + sealing material						
Non-wetted parts materials: stainless steel						
Measuring range	Overload limit		Burst pressure			
	Min.	Max.				
For gauge pressure						
0 ... 1 bar g (0 ... 14.5 psi g)	-0.4 bar g (-5.8 psi g)	2.5 bar g (36.26 psi g)	> 2,5 bar g (> 36.3 psi g)	▶	3 BA	
0 ... 1.6 bar g (0 ... 23.2 psi g)	-0.4 bar g (-5.8 psi g)	4 bar g (58.02 psi g)	> 4 bar g (> 58.0 psi g)	▶	3 BB	
0 ... 2.5 bar g (0 ... 36.3 psi g)	-0.8 bar g (-11.6 psi g)	6.25 bar g (90.65 psi g)	> 6,25 bar g (> 90.7 psi g)	▶	3 BD	
0 ... 4 bar g (0 ... 58.0 psi g)	-0.8 bar g (-11.6 psi g)	10 bar g (145 psi g)	> 10 bar g (> 145 psi g)	▶	3 BE	
0 ... 6 bar g (0 ... 87.0 psi g)	-1 bar g (-14.5 psi g)	15 bar g (217 psi g)	> 15 bar g (> 217 psi g)	▶	3 BG	
0 ... 10 bar g (0 ... 145 psi g)	-1 bar g (-14.5 psi g)	25 bar g (362 psi g)	> 25 bar g (> 362 psi g)	▶	3 CA	
0 ... 16 bar g (0 ... 232 psi g)	-1 bar g (-14.5 psi g)	40 bar g (580 psi g)	> 40 bar g (> 580 psi g)	▶	3 CB	
0 ... 25 bar g (0 ... 363 psi g)	-1 bar g (-14.5 psi g)	62.5 bar g (906 psi g)	> 62,5 bar g (> 906 psi g)	▶	3 CD	
0 ... 40 bar g (0 ... 580 psi g)	-1 bar g (-14.5 psi g)	100 bar g (1450 psi g)	> 100 bar g (> 1450 psi g)	▶	3 CE	
0 ... 60 bar g (0 ... 870 psi g)	-1 bar g (-14.5 psi g)	150 bar g (2175 psi g)	> 150 bar g (> 2175 psi g)	▶	3 CG	
Other version, add order code and plain text: Measuring range: ... up to... bar (psi g)					9 AA	H 1 Y
For absolute pressure						
0 ... 600 bar a (0 ... 8.7 psi a)	0 bar a (0 psi a)	3 bar a (43.51 psi a)	> 2,5 bar a (> 36.3 psi a)		5 AG	
0 ... 1 bar a (0 ... 14.5 psi a)	0 bar a (0 psi a)	2.5 bar a (36.26 psi a)	> 2,5 bar a (> 36.3 psi a)	▶	5 BA	
0 ... 1.6 bar a (0 ... 23.2 psi a)	0 bar a (0 psi a)	4 bar a (58.02 psi a)	> 4 bar a (> 58.0 psi a)	▶	5 BB	
0 ... 2.5 bar a (0 ... 36.3 psi a)	0 bar a (0 psi a)	6.25 bar a (90.65 psi a)	> 6,25 bar a (> 90.7 psi a)	▶	5 BD	
0 ... 4 bar a (0 ... 58.0 psi a)	0 bar a (0 psi a)	10 bar a (145 psi a)	> 10 bar a (> 145 psi a)	▶	5 BE	
0 ... 6 bar a (0 ... 87.0 psi a)	0 bar a (0 psi a)	15 bar a (217 psi a)	> 15 bar a (> 217 psi a)	▶	5 BG	
0 ... 10 bar a (0 ... 145 psi)	0 bar a (0 psi a)	25 bar a (362 psi a)	> 25 bar a (> 362 psi a)	▶	5 CA	
0 ... 16 bar a (0 ... 232 psi)	0 bar a (0 psi a)	40 bar a (580 psi a)	> 40 bar a (> 580 psi a)	▶	5 CB	
Other version, add order code and plain text: Measuring range: ... up to ... mbar a (psi a)					9 AA	H 1 Y
Measuring ranges for gauge pressure (only for US market)						
(0 ... 15 psi g)	(-5.8 psi g)	(35 psi g)	(> 35 psi g)		4 BB	
(3 ... 15 psi g)	(-5.8 psi g)	(35 psi g)	(> 35 psi g)		4 BC	
(0 ... 20 psi g)	(-5.8 psi g)	(50 psi g)	(> 50 psi g)		4 BD	
(0 ... 30 psi g)	(-5.8 psi g)	(80 psi g)	(> 80 psi g)		4 BE	
(0 ... 60 psi g)	(-11.5 psi g)	(140 psi g)	(> 140 psi g)		4 BF	
(0 ... 100 psi g)	(-14.5 psi g)	(200 psi g)	(> 200 psi g)		4 BG	
(0 ... 150 psi g)	(-14.5 psi g)	(350 psi g)	(> 350 psi g)		4 CA	
(0 ... 200 psi g)	(-14.5 psi g)	(550 psi g)	(> 550 psi g)		4 CB	
(0 ... 300 psi g)	(-14.5 psi g)	(800 psi g)	(> 800 psi g)		4 CD	
(0 ... 500 psi g)	(-14.5 psi g)	(1400 psi g)	(> 1400 psi g)		4 CE	
(0 ... 750 psi g)	(-14.5 psi g)	(2000 psi g)	(> 2000 psi g)		4 CF	
(0 ... 1000 psi g)	(-14.5 psi g)	(2000 psi g)	(> 2000 psi g)		4 CG	
Other version, add order code and plain text: Measuring range: ... up to ... psi g					9 AA	H 1 Y
Measuring ranges for absolute pressure (only for US market)						
(0 ... 10 psi a)	(0 psi a)	(35 psi a)	(> 35 psi a)		6 AG	
(0 ... 15 psi a)	(0 psi a)	(35 psi a)	(> 35 psi a)		6 BA	
(0 ... 20 psi a)	(0 psi a)	(50 psi a)	(> 50 psi a)		6 BB	
(0 ... 30 psi a)	(0 psi a)	(80 psi a)	(> 80 psi a)		6 BD	
(0 ... 60 psi a)	(0 psi a)	(140 psi a)	(> 140 psi a)		6 BE	
(0 ... 100 psi a)	(0 psi a)	(200 psi a)	(> 200 psi a)		6 BG	
(0 ... 150 psi a)	(0 psi a)	(350 psi a)	(> 350 psi a)		6 CA	
(0 ... 200 psi a)	(0 psi a)	(550 psi a)	(> 550 psi a)		6 CB	
(0 ... 300 psi a)	(0 psi a)	(800 psi a)	(> 800 psi a)		6 CC	
Other version, add order code and plain text: Measuring range: ... up to ... psi a					9 AA	H 1 Y

▶ Available ex stock

Pressure Measurement

Transmitters for basic requirements

SITRANS P200

2

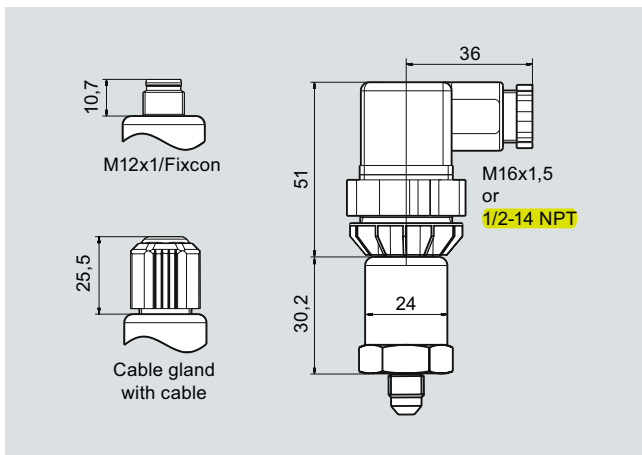
Selection and ordering data	Order No.	Order code
SITRANS P 200 pressure transmitters for pressure and absolute pressure for general applications Characteristic curve deviation typ. 0.25 % Wetted parts materials: Ceramic and stainless steel + sealing material Non-wetted parts materials: stainless steel	7MF1565-	
Output signal 4 ... 20 mA; two-wire system; power supply 7 ... 33 V DC (10 ... 30 V DC for ATEX versions) ▶ 0 ... 10 V; three-wire system; power supply 12 ... 33 V DC ▶		0 10
Explosion protection (only 4 ... 20 mA) None ▶ With explosion protection EEx ia IIC T4 ▶		0 1
Electrical connection Connector per DIN EN 175301-803-A, stuffing box thread M16 (with coupling) ▶ Round connector M12 per DIN EN 60139-9 (not for gauge pressure ranges ≤ 16 bar) Connection via fixed mounted cable, 2m (not for type of protection "Intrinsic safety i") Cable quick screw connection PG9 (not for type of protection "Intrinsic safety i") Connector per DIN EN 175301-803-A, stuffing box thread 1/2"-14 NPT (with coupling) Connector per DIN EN 175301-803-A, stuffing box thread PG11 (with coupling) Special version		1 2 0 3 0 4 5 6 9 N 1 Y
Process connection G½" male per EN 837-1 (½" BSP male) (standard for metric pressure ranges mbar, bar) ▶ G½" male thread and G1/8" female thread G¼" male per EN 837-1 (¼" BSP male) 7/16"-20 UNF male ¼"-18 NPT male (standard for pressure ranges inH ₂ O and psi) ¼"-18 NPT female ½"-14 NPT male ½"-14 NPT female 7/16"-20 UNF female M20x1.5 male Special version		A B C D E F G H J P Z P 1 Y
Sealing material between sensor and enclosure Viton (FPM, standard) ▶ Neoprene (CR) Perbunan (NBR) EPDM Special version		A B C D Z Q 1 Y
Version Standard version ▶		1
Further designs Supplement the order no. with "-Z" and add order code. Manufacturer's test certificate M per DIN 55340, Part 18 and ISO 8402 (calibration certificate) supplied Oxygen application, oil and grease-free cleaning (only in conjunction with the sealing material Viton between sensor and enclosure) ▶ Available ex stock	C11 E10	

Pressure Measurement

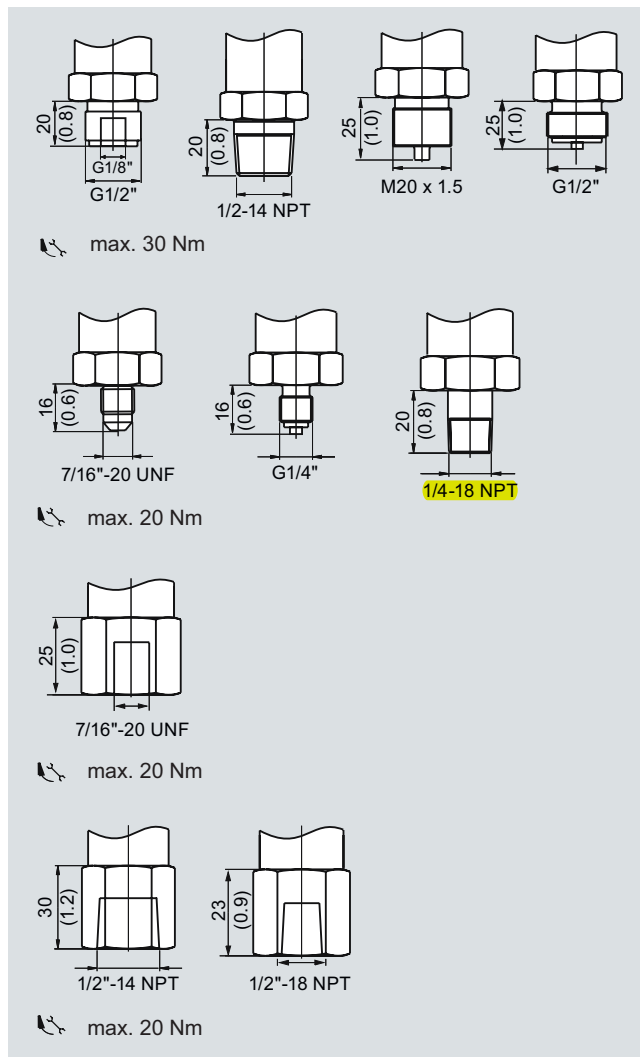
Transmitters for basic requirements

SITRANS P200

Dimensional drawings



SITRANS P200, electrical connections, dimensions in mm (inch)



SITRANS P200, process connections, dimensions in mm (inch)

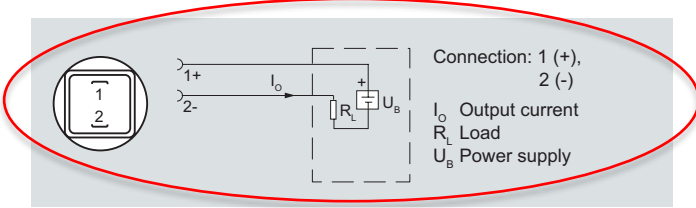
2

Pressure Measurement Transmitters for basic requirements

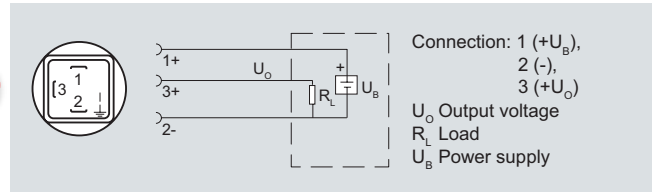
SITRANS P200

Schematics

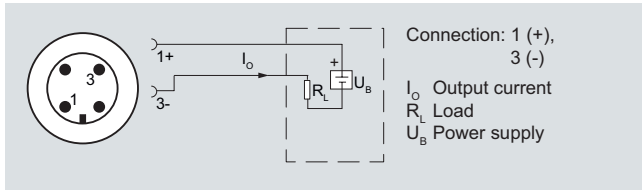
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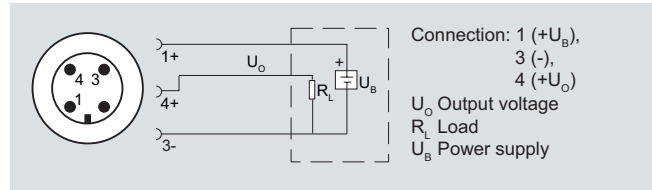
Connection with current output and connector per EN 175301



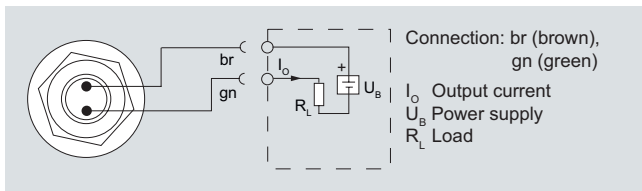
Connection with voltage output and connector per EN 175301



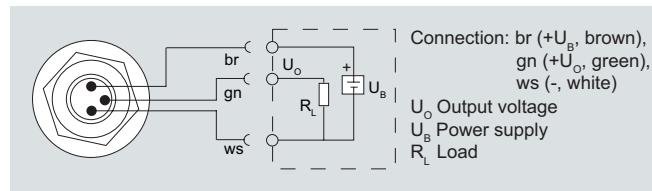
Connection with current output and connector M12x1



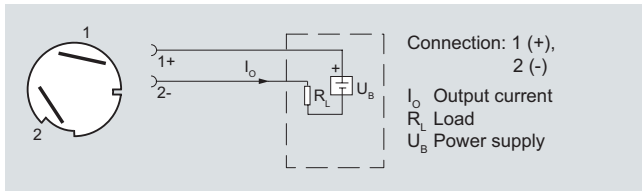
Connection with voltage output and connector M12x1



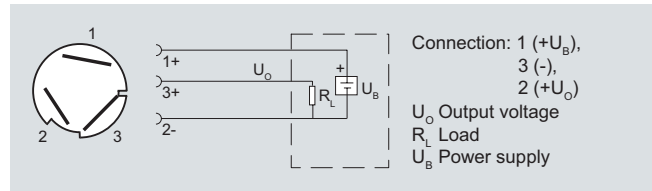
Connection with current output and cable



Connection with voltage output and cable



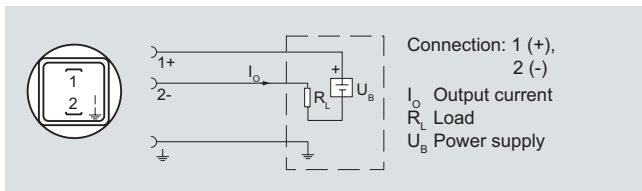
Connection with current output and cable quick screw connection



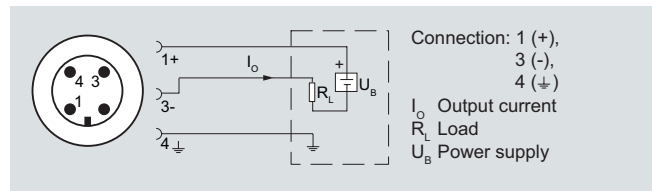
Connection with voltage output and cable quick screw connection

Version with explosion protection: 4 ... 20 mA

The grounding connection is conductively bonded to the transmitter enclosure



Connection with current output and connector per EN 175301 (Ex)



Connection with current output and connector M12x1 (Ex)

APPENDIX D

3-Way Valves

VSI

*14" ϕ 3-Wire
2-position / Electric*
SERIES 1000 ELECTRIC ACTUATORS



SERIES 1000

DESIGN FEATURES

Series 1000 On-Off Rotary Electric Actuator

Standard Features

Torque Output Range: 434in-lb to 17,700in-lb

Housing: NEMA 4, watertight, corrosion-resistant, powder coated, robust aluminum die cast

Mounting: ISO 5211 Standard mounting configurations

Electric Motor: 120VAC, single phase, 60Hz totally enclosed, non-ventilated, high starting torque, reversible induction type, Class F insulation

Thermal Overload Motor Protection: Auto reset thermal switch embedded in the motor winding - trips when the maximum winding temperature is exceeded

Position Limit Switches: 2 x SPDT for Open and Close travel limit - easily adjustable, cam operated

Position Indicator: Mechanical dome type with visible red/yellow closed/open indicator

Terminal Strip: Refer to wiring diagrams for details

Conduit Entries: 1 x 1/2" NPT for power and control wiring

Power Gears: Alloy steel spur gears to final stage aluminum bronze worm sector gear

Break: An electro-mechanical brake is NOT required. The worm gear drive prevents back driving and hunting

Bearings: High quality alloy steel sleeve and ball bearings

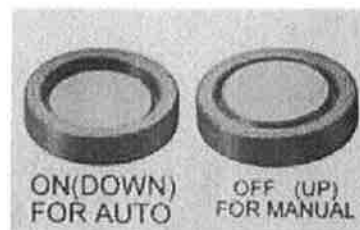
Manual Override: Allen Handle

Ambient Temperature Range: -31°F to +150°F

Certification and Approvals: CE, NEMA 4, NRTL, CSA File 226201

Internal Heater

Manual Override Power Switch: Disconnects power from the actuator without the need to disconnect power from the terminals or the panel. The power needs to be disconnected to manually operate the actuator.



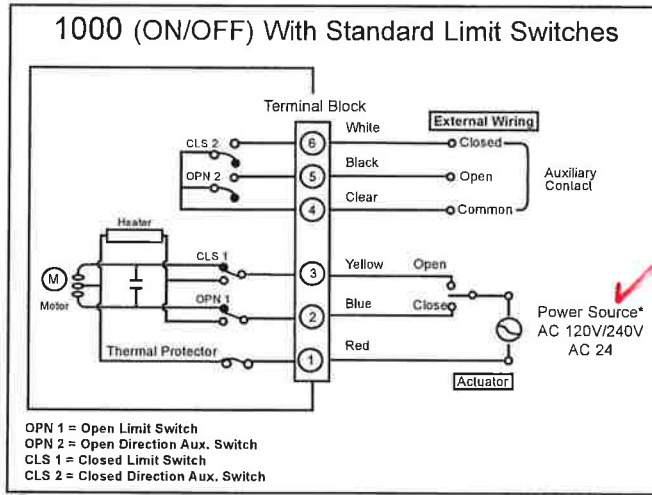
Optional Features

- 220V AC 50/60Hz power
- 24V AC 50/60Hz power - models 1005 and 1010
- 12/24V DC 1005 through 1040
- Torque Limit Switches for Close direction of travel
- Feedback Potentiometer - 1000ohm
- DeClutchable Handwheel Override

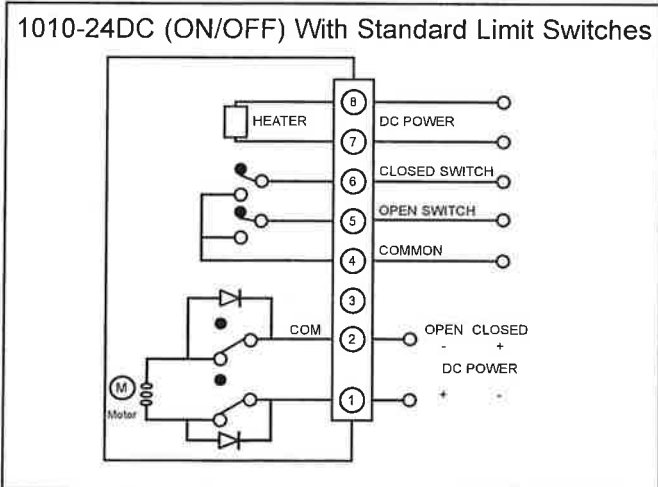
ON-OFF SPECIFICATIONS

Series 1000 On-Off Actuator Specifications

Model	1005-24VAC	1005(-F)	1010-24VAC	1010-24VDC	1010(-F)	1040(-F)	1200
Output Torque(in-lb)	487	434	1239	885	880	3520	17,700
Output Torque(Nm)	55	49	140	100	99	398	2000
Duty Cycle	75%	75%	75%	75%	75%	50%	50%
Travel Speed at 60Hz(Sec)	60	25	140	13	25	25	50
Maximum Current (Amp. @ 110/220VAC)		.35/.18			.41/.22	1.66/.90	2.40/1.21
Run Current (Amp. @ 24VAC)	.6		.6				
Maximum Current (Amp. @ 24VAC)	.9		.9				
Run Current (Amp. @ 24DC)				1.6			
Maximum Current (Amp. @ 24DC)				4			
Enclosure Rating	WATERTIGHT NEMA 4						
Weight(lb)	5.7	5.7	8.2	8.2	8.2	16.1	24.7



*Power source dependant on model



APPENDIX E

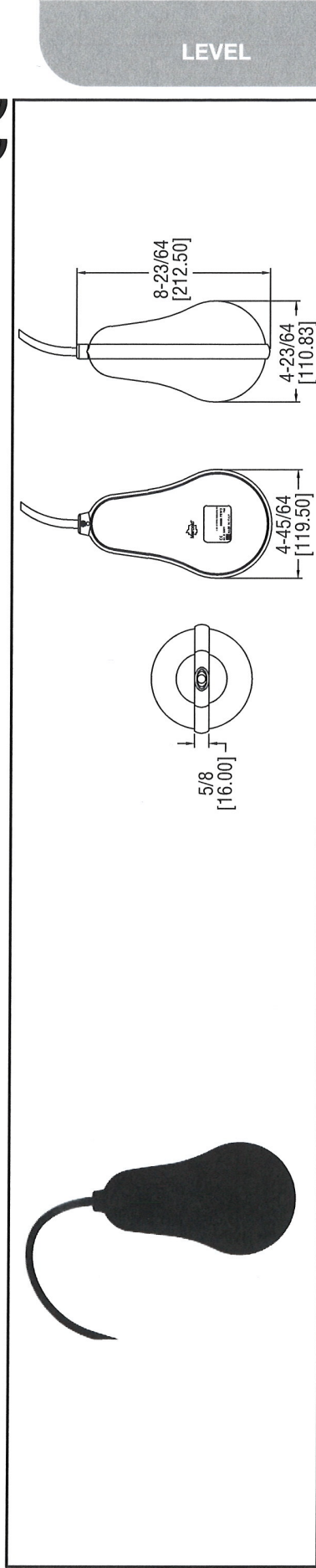
Sump Level Switches



Series
FSW2

Free-Floating Level Switch

Designed for Industrial Applications, Mercury-Free, Self Counter-Weighted



The Series FSW2 Free-Floating Level Switch is a mercury-free self counter-weighted floating switch designed for the automation of pumps, specifically filling and draining of tanks, wells, and reservoirs. The FSW2 body is free of any irregularities making it ideal for use in sewage water applications. The polypropylene body consists of a double airtight chamber with high-pressure melted polypropylene re-injection sealing to ensure a perfect seal against infiltration. Cable hangers are available to suit a variety of mounting applications. Featuring CE approval and optional cables available that include higher chemical compatibility, high temperature durability, oil resistance, and drinking water suitability. Contact factory for piggyback plug option, and cable length options ranging from 10 to 70 ft (3.04 to 21.34 m).

SPECIFICATIONS

Service: Compatible liquids, slurries.
Wetted Materials: Enclosure: Polypropylene; Cable: PVC.
Operating Temperature: -4 to 176°F (-20 to 80°C).
Pressure Limits: 29 psi (2 bar).
Enclosure Rating: IP68.

Switch Type: See model chart.
Electrical Rating: 10 (8) A @ 250 VAC.
Mounting Orientation: Vertical.
Shipping Weight: Enclosure: 2.4 lb (1100 g); Cable: 0.77 oz (21.27 g) per ft.
Agency Approval: CE.

Model	Switch Type	Cable Length	Model	Switch Type	Cable Length
FSW2-ONPN-20	SPST NO	20 ft (6.10 m)	FSW2-CNPN-40	SPST NC	40 ft (12.19 m)
FSW2-ONPN-30	SPST NO	30 ft (9.14 m)	FSW2-CNPN-50	SPST NC	50 ft (15.24 m)
FSW2-ONPN-40	SPST NO	40 ft (12.19 m)	FSW2-DNPN-20	SPDT	20 ft (6.10 m)
FSW2-ONPN-50	SPST NO	50 ft (15.24 m)	FSW2-DNPN-30	SPDT	30 ft (9.14 m)
FSW2-CNPN-20	SPST NC	20 ft (6.10 m)	FSW2-DNPN-40	SPDT	40 ft (12.19 m)
FSW2-CNPN-30	SPST NC	30 ft (9.14 m)	FSW2-DNPN-50	SPDT	50 ft (15.24 m)

ACCESSORY

Model	Description
A-459	Cable hanger

NOT USE P.S.

CALL TO ORDER: U.S. Phone 219 879-8000 • U.K. Phone (+44) (0)1494-461707 • Australia Phone (+61) (0) 2 4272 2055 319



DWYER INSTRUMENTS, INC



Cart



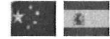
Quick Order



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- Specifications
- Options/Accessories
- Approval
- Service Manual
- Dimensional Drawings
- Catalog Pages



Series FSW2 Free-Floating Level Switch

Designed for Industrial Applications, Mercury-Free, Self Counter-Weighted



Product Specifications

- Service:** Compatible Liquids, slurries.
- Wetted Materials:** Housing: Polypropylene; Cable: PVC.
- Operating Temperature:** -4 to 176°F (-20 to 80°C).
- Pressure Limits:** 29 psi (2 bar).
- Enclosure Rating:** IP68.
- Switch Type:** See model chart.
- Electrical Rating:** 10 (8) A @ 250 VAC.
- Mounting Orientation:** Vertical.
- Shipping Weight:** Housing: 2.4 lb (1100 g); Cable: 0.77 oz (21.27 g) per foot.
- Agency Approval:** CE.



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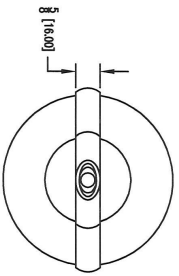
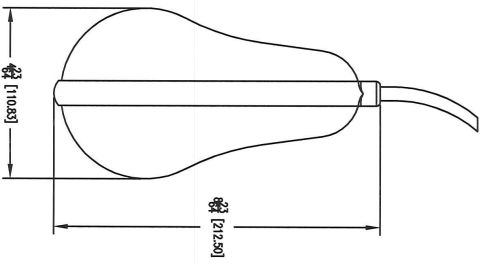
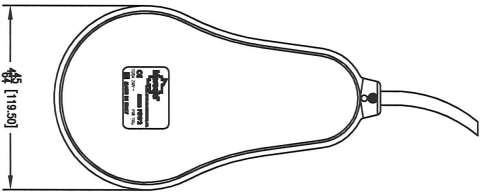
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SCALE 1:2

© - CRITICAL DIMENSION
 DIMENSIONS IN PARENTHESES ARE METRIC.
 ALL DIMENSIONS IN INCHES.

*** DWYER PURCHASING USE ONLY ***	
FR. Number	Description

NO.	QUANTITY	DATE	BY/DATE	MODEL	DESCRIPTION	APPROVAL

Items to be supplied with each order. Quantity plus size.
 Items to be supplied in limited quantities, vendor to inform DWYER when
 stock levels are low.

FR. NO. 3

DWYER INSTRUMENTS, INC.
 MICHIGAN CITY, INDIANA 46360 U.S.A.

APPENDIX F

Temperature Sensors

4-20 mA Room Temperature Sensors



Figure 1. Room Sensor.

The room housing incorporates ventilation slits around the perimeter for accurate sensing of the controlled space. The Siemens logo is also featured on the front.

The sensor mounts either directly on drywall or on a 2 x4 box with an accessory (see *Accessories Ordering Information*). No calibration or maintenance is required.

Specifications

Temperature mounting range	See Table 1.
Output signal	4-20mA
Elements	Platinum RTD
Accuracy	See Table 1.
Reference resistance at 32°F (0°C)	100 Ω

Description

The 4-20 mA room temperature sensors provide input for accurate loop powered temperature sensing (detecting) via a 20 AWG twisted, shielded cable pair. The loop current varies according to the temperature being measured. Several models are available with different temperature ranges for sensing applications.

Table 1. Sensor Specifications.

Application	Temperature Range (Transmitter and Sensor Combined)	Element Package	Product Number
Room – Sensing only	40°F to 90°F/±0.7°F (4°C to 32°C/±0.3°C)	Series 1000 Room Housing	536-752*
	20°F to 120°F/±0.7°F (-7°C to 49°C/±0.3°C)		536-753*

* Add letter suffix to indicate desired color: A = Desert Beige; B = White; BN = White, No Logo

Accessories Ordering Information

Description	Product Part Number
Blank Bezel, 25-pack, (Beige)	544-482A
Blank Bezel, 25-pack, (White)	544-482B
Single Adapter Base Kit (Beige)	544-782A
Single Adapter Base Kit (White)	544-782B
Double Adapter Base Kit (Beige)	544-783A
Double Adapter Base Kit (White)	544-783B
Non-Conduit Rough-In Kit	544-784
Extender Ring Kit (Beige)	544-785A
Extender Ring Kit (White)	544-785B

Information in this document is based on specifications believed correct at the time of publication. The right is reserved to make changes as design improvements are introduced. Product or company names mentioned herein may be the trademarks of their respective owners. © 2008 Siemens Building Technologies, Inc.



APPENDIX G

Site Security

COOPER LIGHTING - LUMARK®



DESCRIPTION

The Lumark Tribute is the most versatile, functionally designed, universally adaptable outdoor luminaire available. The Tribute brings outstanding performance to walkways, parking lots, roadways, loading docks, building areas, and any security lighting application. U.L. listed and CSA certified for wet locations.

Catalog #	MPTR-SL-150-120-LL	Type	SA
Project	RID - 95	Date	
Comments	SSS POLE 15.5 W/ 2.5' BASE		
Prepared by			

SPECIFICATION FEATURES

Construction

Rugged one-piece die-cast aluminum housing and door frame. One-piece silicone gasket protects the optical chamber from performance degrading contaminants. One (1) stainless spring latch and two (2) stainless hinges allow toolless opening and removal of door frame.

Reflector

Choice of nine (9) high efficiency optical distributions, including five (5) segmented optical systems constructed of premium 95% reflective oxidized aluminum sheet. Optical segments are rigidly mounted inside a thick gauge aluminum housing for superior protection. All segment faces are clean of rivet heads, tabs or other means of attachment which may cause streaking in the light distribution. Optical modules are

field rotatable in 90° increments and offered standard with mogul base lampholders for High Pressure Sodium and 200-400W Metal Halide assemblies or medium-base lampholders for Metal Halide 150W and below.

Electrical

Ballast and related electrical componentry are hard mounted to die-cast housing for optimal heat transfer and operating efficiency. Optional swing-down galvanized steel power tray with integral handle and quick disconnects allows tray to be completely removed from housing providing ample room for fixture installation and maintenance.

Mounting

Extruded 8" aluminum arm features internal bolt guides for easy positioning of fixture during installation to pole or wall surface.

Standard single carton packaging of housing, square pole arm and round pole adapter allow for consolidated product arrival to site. Optional internal mast arm mount accepts a 1 1/4" to 2 3/8" O.D. horizontal tenon, while a 4-bolt clamping mechanism secures fixture. Cast-in leveling guides provide +/-5° vertical leveling adjustment.

Finish

Housing and arm finished in a 5 stage premium TGIC bronze polyester powder coat paint. Optional colors include black, grey, white, dark platinum and graphite metallic. RAL and custom color matches available.



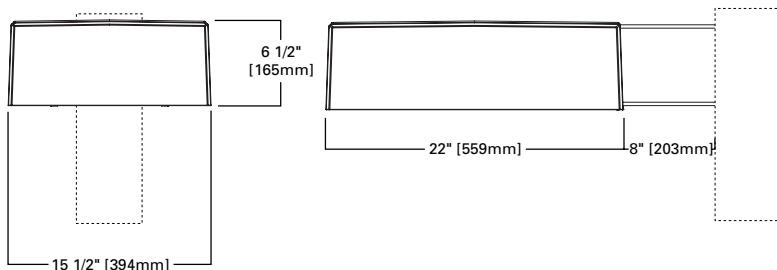
TR TRIBUTE

70 - 400W
High Pressure Sodium
Pulse Start Metal Halide
Metal Halide

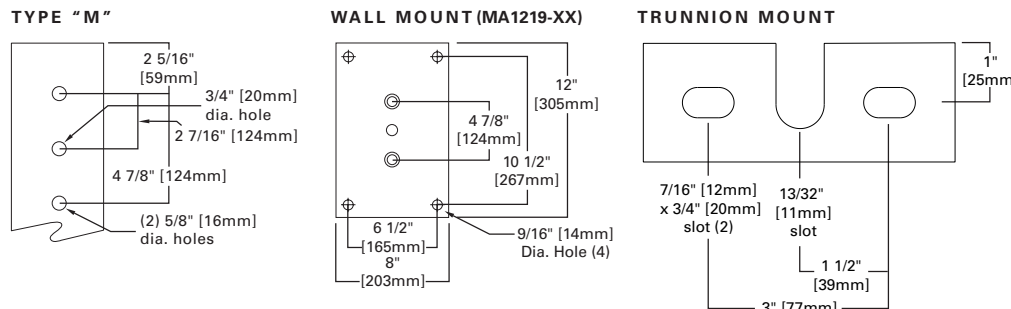
AREA LUMINAIRE



DIMENSIONS



DRILLING PATTERNS



TECHNICAL DATA

UL Wet Locations Listed
CSA Certified
EISA Compliant ©

ENERGY DATA

Hi-Reactance Ballast Input Watts

70W HPS HPF (95 Watts)
100W HPS HPF (130 Watts)
150W HPS HPF (190 Watts)
150W MP HPF (185 Watts)

CWI Ballast Input Watts

250W HPS HPF (300 Watts)

CWA Ballast Input Watts

175W MH HPF (210 Watts)
200W MP HPF (227 Watts) ©
200W HPS HPF (250 Watts)
250W MH HPF (295 Watts)
250W MP HPF (283 Watts) ©
320W MP HPF (365 Watts) ©
350W MP HPF (397 Watts) ©
400W MP HPF (452 Watts) ©
400W MH HPF (455 Watts)
400W HPS HPF (465 Watts)

EPA

Effective Projected Area: (Sq. Ft.)
Without Arm: 1.19

SHIPPING DATA

Approximate Net Weight:
39 lbs. (17.73 kgs.)



ORDERING INFORMATION

Sample Number: MHTR-SL-400-MT-LL



Lamp Type

MP=Pulse Start Metal Halide
MH=Metal Halide
HP=High Pressure Sodium

Series 1

TR= Tribute (Arm Included)

Distribution

2F=Type II Formed
2S=Type II Segmented
3F=Type III Formed
3S= Type III Segmented
4F= Type IV Formed
4S= Type IV Segmented
5F= Type V Formed
5S= Type V Segmented
SL= Spill Light Eliminator

Lamp Wattage 2

MP
70=70W
100=100W
150=150W
200= 200W
250= 250W
320= 320W
350= 350W
400= 400W³
MH
175= 175W⁴
250= 250W⁴
400= 400W^{3, 4}
HPS
70= 70W
100= 100W
150= 150W
250= 250W
400= 400W³

Voltage 5

120V=120V
208V=208V
240V=240V
277V=277V
347V=347V⁶
480V=480V
DT=Dual-Tap
MT=Multi-Tap, wired 277V
TT=Triple-Tap, ⁶wired 347V
5T=5 Tap Wired⁵ 480V

Options

F1=Single Fuse (120, 277 or 347V⁷ only)
F2=Double Fuse (208, 240 or 480V⁷ only)
Q= Quartz Restrike (Hot Strike Only)⁸
EM= Quartz Restrike with "Delay Relay" (Quartz lamp strikes at both hot and cold starts)
EM/SC= Emergency Separate⁸ Circuit
LL= Lamp Included
S= 1 1/4" - 2 3/8" Internal Mast Arm Mount
TM= Trunnion Mount
PT= Electrical Power Tray
PER= NEMA Twistlock Photocontrol Receptacle
PC= Button Type Photocontrol⁹
HS= House Side Cutoff¹⁰
LA= Less Arm (Order Mounting Separately)

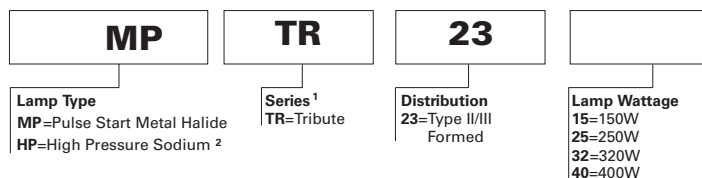
Accessories 11

MA1201-XX=Direct Wall Mount Kit
MA1218-XX=Direct Mount for Pole
MA1219-XX=Wall Mounting Plate
OA1090-XX=Adjustable slipfitter Arm for Tenon Mount 2 3/8" O.D.¹
MA1221-XX= External House Side Shield Kit (EPA= 0.38)
MA1222= Internal House Side Shield Kit for 2S/3S
MA1223= Internal House Side Shield Kit 4S
MA1224= Internal House Side Shield Kit for 2F/3F
MA1225= Internal House Side Shield Kit for 4F
MA1010-XX= Single Tenon Adapter for 3 1/2" O.D. Tenon
MA1011-XX= 2 @ 180 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1012-XX= 3 @ 120 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1013-XX= 4 @ 90 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1014-XX= 2 @ 90 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1015-XX= 2 @ 120 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1016-XX= 3 @ 90 degrees Tenon Adapter for 3 1/2" O.D. Tenon
MA1017-XX= Single Tenon Adapter for 2 3/8" O.D. Tenon
MA1018-XX= 2 @ 180 degrees Tenon Adapter for 2 3/8" O.D. Tenon
MA1019-XX= 3 @ 120 degrees Tenon Adapter for 2 3/8" O.D. Tenon
MA1045-XX= 4 @ 90 degrees Tenon Adapter for 2 3/8" O.D. Tenon
MA1048-XX=2 @ 90 degrees Tenon Adapter for 2 3/8" O.D. Tenon
MA1049-XX=3 @ 90 degrees Tenon Adapter for 2 3/8" O.D. Tenon
OA/RA1013=Shorting Cap
OA/RA1016=Photoelectric Control 105-285V NEMA Type
OA/RA1027=Photoelectric Control 480V NEMA Type
OA/RA1201=Photoelectric Control 347V NEMA Type
TR/VS=Field Installed Vandal Shield¹²

Notes: 1 8 Inch Arm and pole adapter included with fixture. Specify Less Arm "LA" option when mounting accessory is ordered separately. 2 150W and below in Metal Halide are medium base sockets. All other wattages are mogul base. 3 Requires reduced envelope lamp. 4 175W, 250W, and 400W MH available in non-U.S. markets only. 5 Products also available in non-US voltages and 50HZ for international markets. Consult your Cooper Representative for availability and ordering information. 5T only available in 400W MH. 6 88% efficient EISA Compliant MP fixtures not available in 347V or TT Voltages. 7 Must specify voltage. 8 Quartz options not available with SL optics. 9 PC not available in 480V. 10 House side shield not available on 5S, 5F, or SL optics. 11 Order separately/replace XX with color specification. 12 Not available with SLE or House Side Shield.

STOCK SAMPLE NUMBER (Lamp Included)

SAMPLE NUMBER: MPTR2340

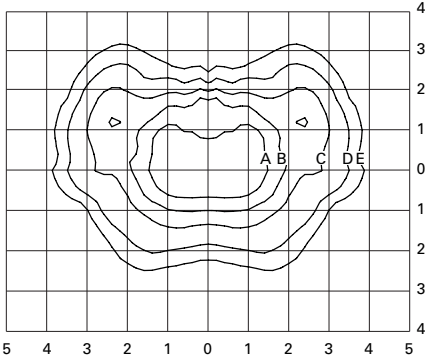


NOTES:

¹ Short logic fixtures are finished bronze include multi-tap ballast, lamp, arm and round pole adapter. Other options not available. Refer to standard ordering logic. ² Available in 150, 250 and 400 Watt. Refer to In Stock Guide for availability.

VOLTAGE CHART	
DT=Dual-Tap	120/277 (wired 277V)
MT=Multi-Tap	120/208/240/277 (wired 277V)
TT=Triple-Tap	120/277/347 (wired 347V)
5T=5-Tap	120/208/240/277/480 (wired 480V)

LAMP TYPE	WATTAGE
Pulse Start Metal Halide	70, 100, 150, 250, 320, 350, 400W
Metal Halide	175, 250, 400W
High Pressure Sodium	70, 100, 150, 250, 400W

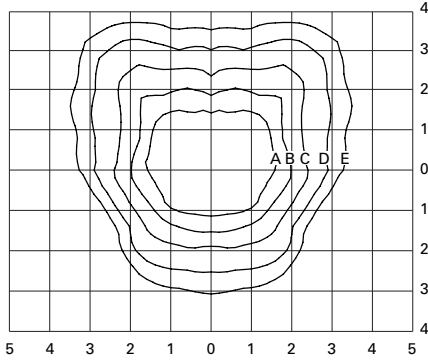


MPTR-3S-320
320—Watt MP
30,000—Lumen Clear Lamp
Type III Segmented

Footcandle Table

Select mounting height and read across for footcandle values of each isofootcandle line. Distance in units of mounting height.

Mounting Height	Footcandle Values for Isofootcandle Lines				
	A	B	C	D	E
20'	3.00	1.50	0.75	0.30	0.15
25'	2.00	1.00	0.50	0.20	0.10
30'	1.38	0.69	0.34	0.13	0.06

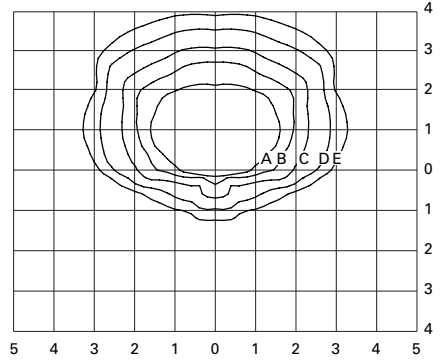


MPTR-4S-400
400—Watt MP
40,000—Lumen Clear Lamp
Type IV Segmented

Footcandle Table

Select mounting height and read across for footcandle values of each isofootcandle line. Distance in units of mounting height.

Mounting Height	Footcandle Values for Isofootcandle Lines				
	A	B	C	D	E
20'	3.00	1.50	0.75	0.30	0.15
25'	2.00	1.00	0.50	0.20	0.10
30'	1.38	0.69	0.34	0.13	0.06



MPTR-SL-400
400—Watt MP
40,000—Lumen Clear Lamp
Spill Light Eliminator

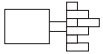
Footcandle Table

Select mounting height and read across for footcandle values of each isofootcandle line. Distance in units of mounting height.

Mounting Height	Footcandle Values for Isofootcandle Lines				
	A	B	C	D	E
20'	3.00	1.50	0.75	0.30	0.15
25'	2.00	1.00	0.50	0.20	0.10
30'	1.38	0.69	0.34	0.13	0.06

MOUNTING CONFIGURATIONS

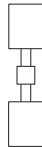
Wall Mount



Arm Mount Single
EPA: 1.62



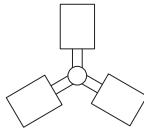
Arm Mount 2 @ 180
EPA: 3.24



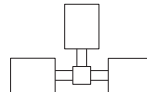
Arm Mount 2 @ 90
EPA: 3.24



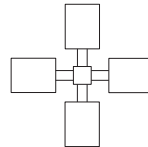
Arm Mount 3 @ 120
(Round Pole Only)
EPA: 4.43



Arm Mount 3 @ 90
EPA: 4.43



Arm Mount 4 @ 90
EPA: 5.03





APPENDIX H

Health & Safety Plan

Addendum

To The

BE&K/Terranext

SITE-SPECIFIC

HEALTH AND SAFETY PLAN

West Van Buren Area WQARF Registry Site

Phoenix, Arizona

Prepared For:

Roosevelt Irrigation District

103 West Baseline Road

Buckeye, Arizona 85326

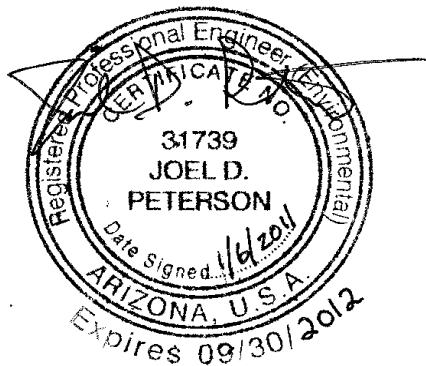
Prepared By:

Synergy Environmental, LLC

10645 North Tatum Boulevard

Suite 200-437

Phoenix, Arizona 85028



January 6, 2011

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1.0 INTRODUCTION

This document is an addendum to the BE&K/Terranext Site-Specific Health and Safety Plan for the West Van Buren WQARF Registry Site, dated September 7, 1999 (Terranext 1999). This addendum to the existing Arizona Department of Environmental Quality (ADEQ)-approved Health and Safety Plan (HASP) incorporates the provisions of the existing HASP by reference and provides additional health and safety provisions for those planned field activities not specifically addressed in the September 1999 HASP. The scope of these planned activities and a brief site description are provided in the following sections.

1.1 Scope of Work

The additional work to be undertaken in the West Van Buren Area (WVBA) WQARF Registry Site is part of the systematic investigations and response actions described in the Roosevelt Irrigation District (RID) Early Response Action (ERA) Work Plan dated February 3, 2010 (M&A, 2010) and additional Work Plans required by the ADEQ in the ERA Work Plan approval letter dated June 26, 2010 (ADEQ, 2010). Details of these activities are provided in Section 2, herein.

1.2 Site Description

The site description is provided in Section 1.0 of the Terranext HASP attached as Appendix A.

2.0 WORK OBJECTIVES

The objectives of this project consist of multiple tasks including those specified in the Terranext HASP, as follows;

- drilling and installing monitoring wells,
- soil sampling,
- groundwater sampling,
- canal sampling, and
- water level monitoring.

Additional tasks described in the ERA and associated Work Plans include;

- well equipment removal and installation,
- video and geophysical logging,
- well rehabilitation, and
- well purging and fluid movement investigation.

To address the general health and safety considerations and requirements associated with work at the WVBA Site, the provisions of Section 2 of the Terranext HASP are reiterated below:

During these activities site personnel may be exposed to a number of chemical and physical hazards. The purpose of this site-specific health and safety plan (HASP) is to [make] ... (all) ... personnel, subcontractors, and client personnel (entering work areas at the Site) aware of these hazards so as to limit the potential for exposure or injury.

The health and safety of ... project personnel, client personnel, and subcontractors involved on this project is of primary importance. Therefore, this HASP was developed and will be followed by on-site personnel. It is the responsibility of the Project Manager, Site Supervisor, and Project Safety Officer to implement and enforce the plan and any subsequent revisions during operations at the site; however, each individual is responsible for conducting themselves in a safe and reasonable manner.

(All) ... employees, visitors, and officials entering the work zone will be briefed regarding the hazards present in an on-site meeting prior to entering the site. The Project Manager, Site Supervisor, the Project Safety Officer or designated alternate will be responsible for the briefings and for maintaining records of the briefings. These briefings will include known or potential hazards, their effects, required personal protective gear and use, warning signs of exposure and overexposure, and emergency procedures.

The names and contact information for the Project Manager, Project Safety Officer and other key personnel are provided in Section 5 - Key Personnel and Emergency Contact List. Site Supervisors will vary depending on contractor personnel and will be responsible for ensuring that their field personnel follow the HASP provisions.

2.1 Canal Sampling

The health and safety provisions for collecting water samples from open RID canals are provided in Section 2.1 of the Terranext HASP, attached as Appendix A, and are incorporated into this HASP addendum by reference.

2.2 Groundwater Sampling

The health and safety provisions for collecting groundwater samples from RID production wells are similar to those in Section 2.2 of the Terranext HASP, attached as Appendix A, and are incorporated into this HASP addendum by reference.

Additional health and safety considerations and requirements are as follows:

Sample collection may involve decontamination and/or preservative chemicals in addition to the methanol, Alconox® and nitric acid solutions referenced in the Terranext HASP. Material Safety Data Sheets (MSDS) will be available on-site for all chemicals used during the conduct of work at the WVBA Site.

Purge water from sampling of RID production wells will be discharged into the existing RID water conveyance infrastructure (pipeline/receiver box, lateral or canal).

2.3 Groundwater Elevation Monitoring

The health and safety provisions for groundwater elevation monitoring are provided in Section 2.3 of the Terranext HASP, attached as Appendix A, and are incorporated into this HASP addendum by reference.

2.4 Drilling, Soil Sampling, and Well Installation

The health and safety provisions for drilling, soil sampling, and well installation are similar to those provided in Section 2.3 of the Terranext HASP, attached as Appendix A, and are incorporated into this HASP addendum by reference.

Additional health and safety considerations and requirements are as follows:

Drilling of replacement production well(s) represents increased physical hazards due to the large diameter borehole, substantial weight of well equipment, size of production well drill rigs and the complexity of well completion operations compared to drilling and installation of monitoring wells. While the provisions of the Terranext HASP are appropriate and comprehensive, additional care should be exercised due to the increased scale of these operations for drilling and installation of production wells.

2.5 Well Equipment Removal and Installation

The health and safety provisions for well equipment removal and installation are similar to those provided in Section 2.3 of the Terranext HASP, attached as Appendix A, and are incorporated into this HASP addendum by reference.

Additional health and safety considerations and requirements are as follows:

As noted in Section 2.4, above, working on production wells presents increased physical hazards due to the substantial weight of associated well equipment. Additional care should be exercised in handling this equipment and working around these large rigs.

2.6 Video and Geophysical Logging

Video and geophysical logging incorporates work that is similar in nature to groundwater elevation monitoring, described in Section 2.3 herein, in that it requires personnel to access the open well borehole and lower tools into the well for data collection. Consequently, the health and safety provisions of Section 2.3 or the Terranext HASP, attached as Appendix A, are incorporated into this HASP addendum by reference.

Additional health and safety considerations and requirements are as follows:

Due to the large borehole diameter encountered in production wells, additional caution should be taken to prevent trips and falls at the wellhead.

In addition, these down-hole logging tools typically are connected to their aboveground equipment using motorized reels and overhead pulleys to deploy and retract the sensor tools. Precautions must be taken to prevent personnel from exposure to this moving equipment that has the potential to start and stop remotely and without warning.

These logging tools also utilize higher voltages than typically encountered in groundwater elevation measurement tools. Therefore, additional precautions should be taken to prevent exposure of personnel to the power supply and associated transmission lines while the equipment is energized.

2.7 Well Rehabilitation

Various forms of well rehabilitation may be conducted on the RID production wells following video and geophysical logging, dependant on the condition of the well screens and casing. This could consist of light brushing and/or bailing or more elaborate and extensive rehabilitation involving chemical cleaning or installation of a casing liners and/or a well liner into the inside of the existing casing.

The health and safety provisions for most of these well rehabilitation methods are similar to those provided in Section 2.3 of the Terranext HASP, attached as Appendix A, and are incorporated into this HASP addendum by reference. The additional health and safety considerations and requirements noted in Section 2.4, herein, relating to these large diameter wells, also apply.

Should chemical additives be utilized in the rehabilitation process, chemical safety measures must be adhered to as indicated on the MSDS including chemical handling and storage, materials compatibility, appropriate PPE, and ready access to/maintenance of relevant MSDS information at the point of use.

2.8 Purging and Fluid Movement Investigations

The activities associated with well purging and fluid movement investigations are similar to those associated with groundwater sampling and drilling and well installation. The health and safety provisions, therefore, are similar to those provided in Section 2.2 and 2.4 of the Terranext HASP, attached as Appendix A, and are incorporated into this HASP addendum by reference. Additional considerations are also provided in sections 2.2 and 2.4 of this HASP addendum as well as Section 2.6 regarding the use of down-hole tools and energized instrumentation.

3.0 HAZARD EVALUATION

The hazard evaluation included in Section 3.0 of the Terranext HASP is incorporated by reference with the following additions:

Physical hazards included in these field activities could also warrant the use of hearing protection, machine guarding measures, traffic control measures, welding and torch cutting safety precautions and forklift safety provisions. These additional physical hazards will be considered on a case-by-case basis and the Project Safety Officer or Site Supervisor will communicate appropriate health and safety requirements to affected personnel during the on-site safety briefing or prior to initiation of activities warranting additional safety measures.

4.0 PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment (PPE) specified in section 4.0 of the Terranext HASP (Level D) is incorporated by reference with the following exceptions:

Based on the most recent characterization of VOC concentrations at the site, it is not anticipated that sustained photo-ionization detector (PID) readings of 50 parts per million (ppm) (action level for Level C PPE in Terranext HASP) or greater will be encountered. Consequently, Level C PPE (including respirators and chemical resistant suits) will not be maintained on-site. Working zone monitoring with the PID will be conducted periodically, as specified in Section 7.0 of the Terranext HASP, during activities that pose a reasonable risk of elevated levels of organic vapors in the breathing zone. Action concentrations are as follows for sustained breathing zone PID readings:

Less than 15 ppm: Continue work with Level D PPE; continue monitoring as warranted.

Greater than 15 ppm: Stop work; move upwind and away from suspected source, re-evaluate work conditions, implement appropriate engineering controls such as mechanical ventilation if concentrations greater than 15ppm persist.

First aid equipment and fire extinguishers will be identified and their locations communicated to on-site personnel during the on-site safety briefing.

5.0 KEY PERSONNEL AND EMERGENCY CONTACT LIST

The following Key Personnel and Emergency Contact information is relevant for the field activities covered by this HASP Addendum:

NOTE: Several of the Key Personnel and Emergency Contact names and phone numbers have changed since release of the Terranext HASP. Use the listed information below.

Project Manager:	Dennis Shirley	(602) 319-2977	
Project Safety Officer:	Joel Peterson	(480) 284-3518	Primary
	Andrew MacHugh	(602) 430-2785	Secondary

<u>Agency/Facility</u>	<u>Location</u>	<u>Phone Number</u>
Police Department	Multiple	911
Fire Department	Multiple	911
(Hospital Locations are Shown on Figure 2)	Hospitals	St. Joseph’s Hospital (602) 406-3000 350 W. Thomas Road
		Banner Health (602) 839-2000 1111 E. McDowell Road
		St. Luke’s Medical Center(602) 251-8100 1800 East Van Buren
Utility Bluestake	N/A	(602) 263-1100

Key Contacts

Roosevelt Irrigation District	Stan Ashby, Superintendent	(602) 809-5893
	Ken Craig, Watermaster	(623) 695-5855
Synergy Environmental	Joel Peterson, P.E.	(480) 284-3518
	Andrew MacHugh, P.E.	(602) 430-2785
	Dennis Shirley, R.G.	(602) 319-2977
Montgomery & Associates	Dennis Hall, R.G.	(480) 215-8951
	Tim Leo, R.G.	(520) 343-4990
ADEQ	Julie Riemenschneider	(602) 771-4411
	Kevin Snyder, R.G.	(602) 771-4181



6.0 EMERGENCY PROCEDURES

The emergency procedures specified in section 6.0 of the Terranext HASP are incorporated by reference with the following exceptions:

7.0 PERSONAL MONITORING

The personal monitoring provisions specified in section 7.0 of the Terranext HASP are incorporated by reference with the following exceptions:

Action concentrations are as follows for sustained breathing zone PID readings:

Less than 15 ppm: Continue work with Level D PPE, continue monitoring as warranted.

Greater than 15 ppm: stop work, move upwind and away from suspected source, re-evaluate work conditions, consider engineering controls such as mechanical ventilation if concentrations persist.

8.0 GENERAL PROJECT SAFETY REQUIREMENTS

The general project safety requirements specified in section 8.0 of the Terranext HASP are incorporate by reference with the following addition:

The signature page will be used to confirm that Site Supervisors have read and understand the WVBA HASP (both the Terranext HASP and this HASP Addendum) and will communicate and enforce the provisions of the HASP to their field personnel. The Project Safety Officer will maintain this documentation. The certification statement reads as follows:

Site Supervisors shall read or otherwise be briefed on the above plan and be familiar with its provisions. I have read or been briefed on the site-specific Health and Safety Plan (HASP) and fully understand the hazards associated with the West Van Buren Area and the work conducted therein. I will comply with these minimum health and safety requirements set forth in this site HASP. I agree to brief field personnel under my supervision on the provisions of this HASP and notify the designated responsible Project Safety Officer or their designee should I observe any unsafe acts while I am on this site.

A copy of this signature page is included as Appendix B herein.

FIGURE 1 – WEST VAN BUREN PROJECT AREA

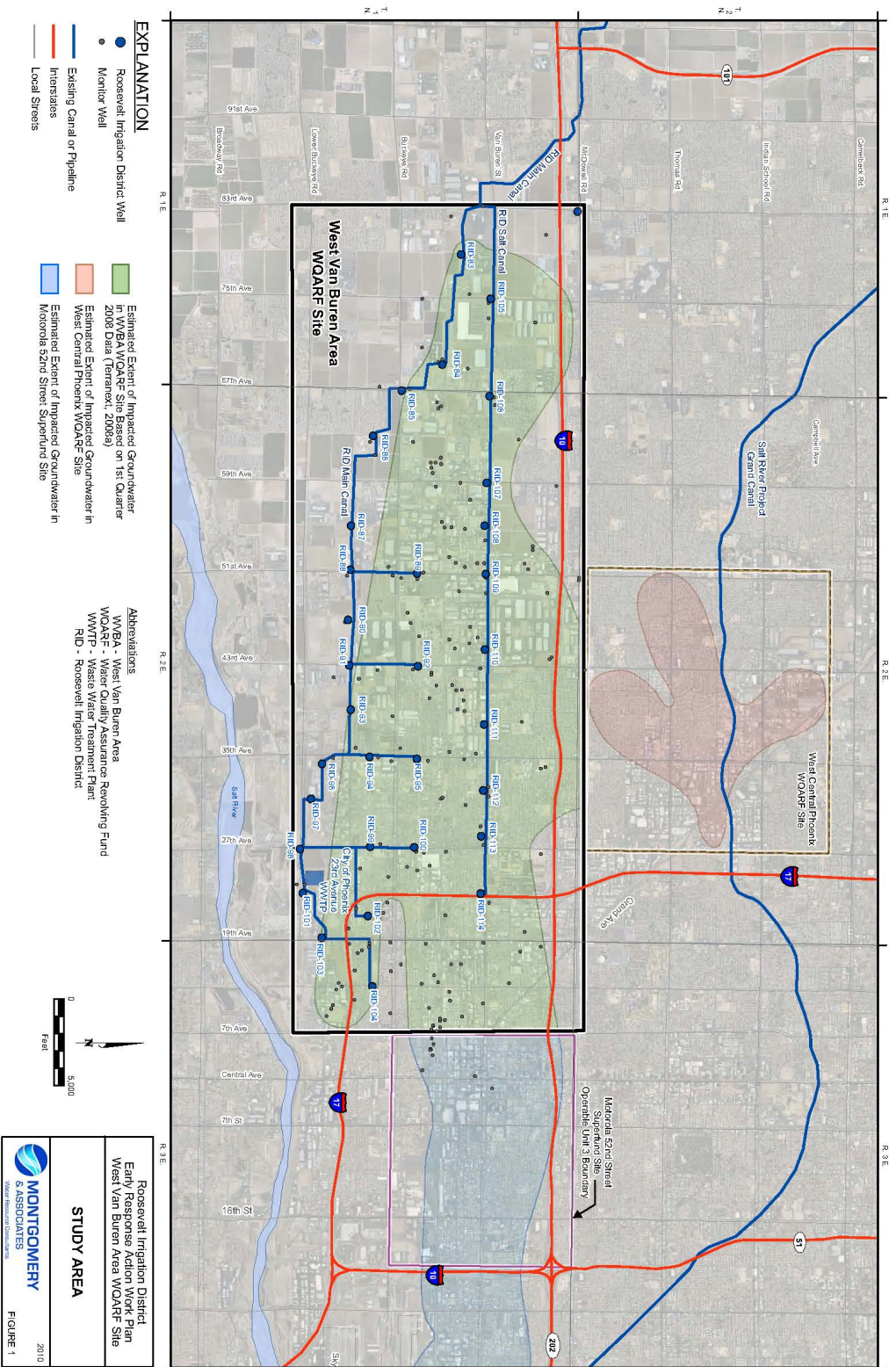
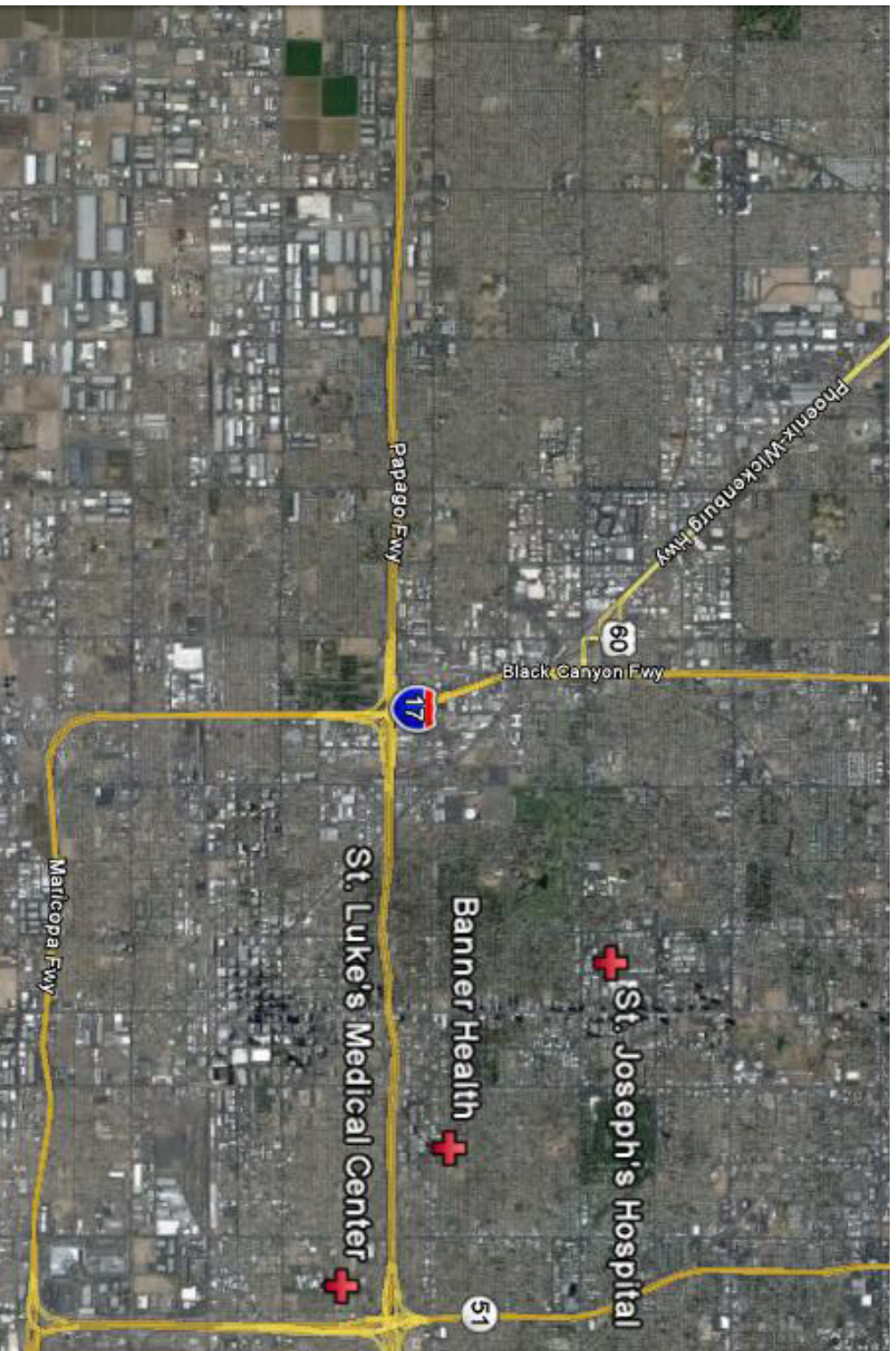


FIGURE 2 - HOSPITAL LOCATION MAP



Imagery taken from Google Earth January 7, 2011

APPENDIX A

**BE&K/Terranext
SITE-SPECIFIC HEALTH AND SAFETY PLAN
West Van Buren WQARF Registry Site
Phoenix, AZ**

[NOTE: The BE&K/Terranext HASP does not include page numbers 2 or 10 due to a page numbering error. No Plan content is omitted.]



9830 South 51st Street, Suite A-127 Phoenix, Arizona 85044
ACL # AE090871

**SITE-SPECIFIC
HEALTH AND SAFETY PLAN
West Van Buren WQARF Registry Site
Phoenix, Arizona**

BE&K/Terranext Project No. 03103102

Prepared For:

**Arizona Department of Environmental Quality
3033 N. Central Ave.
Phoenix, Arizona 85012**

September 7, 1999



9830 South 51st Street, Suite A-127 Phoenix, Arizona 85044
ACL # AE090871

**SITE-SPECIFIC HEALTH AND SAFETY PLAN
WEST VAN BUREN WQARF REGISTRY SITE
PHOENIX, ARIZONA**

Prepared By:

Matthew P. Rutkowski, GIT
Geologist

Reviewed By:

Rich Petrus
Manager, Arizona Operations

Arthur Gordon
Project Hydrogeologist

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FIGURES

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BE&K/TERRANEXT
SITE-SPECIFIC HEALTH AND SAFETY PLAN

PROJECT NAME: West Van Buren WQARF Registry Site, Phoenix, Arizona
BE&K/Terranext
PROJECT NUMBER: 03103102

PROJECT MANAGER: Rich Petrus
SITE SUPERVISOR: Matthew Rutkowski
SITE SAFETY OFFICER: Matthew Rutkowski or Chuck Gordon
CLIENT REPS: Richard Olm, P.E. (Project Manager)
Bruce Robinson, R.G. (Hydrologist)

1.0 SITE DESCRIPTION

Date: Ongoing
Location: Phoenix, AZ
Topography: Mostly flat site with uneven surfaces
Weather conditions: Warm to hot temperatures
Additional information: Heat Stress may occur at temperatures over 90° F. Watch for symptoms of heat stress. Injuries in and around soil stockpiles and excavations are common and should be watched. Drilling equipment contains many pinchpoints and associated hazards.

The West Van Buren Area (WVBA) WQARF Registry Site consists of the areal projection of the western portion of a large plume of groundwater contamination (Figure 1). The primary contaminants of concern include tetrachloroethene (PCE), trichloroethene (TCE), and chromium. Other contaminants of concern are also contained within the plume including benzene, 1,1 dichloroethene (1,1-DCE), 1,1 dichloroethane (1,1-DCA), cis 1,2 dichloroethane (cis-1,2-DCA), ethylbenzene, toluene, and xylene. Multiple confirmed and suspected source areas are located across the WVBA; in these areas soils contaminated with the above identified contaminants may be present.

2.0 WORK OBJECTIVES

The objectives of this project consist of multiple tasks including but are not limited to;

- drilling and installing monitoring wells,
- soil sampling,
- groundwater sampling,
- canal sampling, and
- water level monitoring.

During these activities site personnel may be exposed to a number of chemical and physical hazards. The purpose of this site-specific health and safety plan (HASP) is to BE&K/Terranext personnel, subcontractors, and client personnel aware of these hazards so as to limit the potential for exposure or injury.

The health and safety of BE&K/Terranext project personnel, client personnel, and subcontractors involved on this project is of primary importance. Therefore, this HASP was developed and will be followed by on-site personnel. It is the responsibility of the Project Manager, Site Supervisor, and Project Safety Officer to implement and enforce the plan and any subsequent revisions during operations at the site; however, each individual is responsible for conducting themselves in a safe and reasonable manner.

BE&K/Terranext employees, visitors, and officials entering the work zone will be briefed regarding the hazards present in an on-site meeting prior to entering the site. The Project Manager, Site Supervisor, the Project Safety Officer or designated alternate will be responsible for the briefing and for maintaining records of the briefings. These briefings will include known or potential hazards, their effects, required personal protective gear and use, warning signs of exposure and overexposure, and emergency procedures.

2.1 Canal Sampling

As part of the WVBA project, samples and readings will be taken from the Roosevelt Irrigation District canals. These canals pose a potential hazard. The currents can be swift and under-currents are present. At various locations siphons and culverts are used to transport the water under roads and other obstacles; the risk of drowning is prominent around these features. BE&K/Terranext personnel will utilize the buddy system, wear life vests, and have rescue ropes where the potential for falling into a canal is present.

If equipment falls into the canal, BE&K/Terranext personnel will not under any circumstances enter the canal to retrieve the equipment. A pole or net shall be used to attempt to retrieve any equipment that falls into the canal. Also, since the potential for VOC contamination is present in the canal water, BE&K/Terranext will utilize Nitrile® gloves (or equivalent) to prevent skin contact with the water.

2.2 Groundwater Sampling

Groundwater sampling will be conducted in the WVBA at approximately 64 wells (44 in the WVBA and 20 in the former East Washington Project Area). Since the presence of VOC contamination is documented, extreme care will be taken to minimize contact with purge water. Nitrile® gloves will be used whenever handling the pump and Kemmerer® sampling device. Purge water will be contained in 55-gallon drums or larger containers. BE&K/Terranext personnel will avoid reaching into or standing over containerized groundwater due to the potential of inhaling VOC vapors. Personnel will stand upwind of the containers and wells whenever practical. As part of sample preservation, some sample containers will contain hydrochloric acid and nitric acid, although only a small quantity will be present, care will still be taken not to inhale vapors or have contact with the skin.

Groundwater sampling involves insertion and removal of a pump from the wells. This involves a significant amount of lifting throughout the day. Proper lifting techniques will be utilized to perform this task (i.e. lift with the knees, buddy system, etc.). Whenever possible the pump shall remain in the back of the truck to minimize lifting efforts. In addition, full 55-gallon drums can exceed 450 pounds in weight; the movement of these drums will be minimized, and a drum dolly will be utilized as necessary.

For sampling certain wells, a subcontractor, THF drilling, will use a Smeal® rig to insert a 4-inch diameter multistage Grundfos pump with 1.5-inch diameter riser pipe. The installation of the pump poses an overhead hazard since the 20-foot lengths of riser pipe must be lifted by a cable winch and then lowered into the well. Hardhats, steel-toed boots, and safety glasses will be worn by BE&K/Terranext and subcontractor personnel (see section 4.0). The presence of moving parts and pinch-points exist on the Smeal® rig, care will be taken when around this equipment. The mast of the rig shall not be raised within 15 feet of overhead utilities. Special precautions will be undertaken if this distance cannot be met (i.e. the lines de-energized or shielded).

In addition to these hazards, many wells are located near major roadways, on private property, or in "high crime" areas. When working near roadways or in facilities near heavy traffic, red (high visibility) vests shall be worn. While on private property and/or in active facilities, facility specific safety precautions shall be implemented in addition to this HASP. Any necessary facility briefings shall be requested before entering the site. While in "high crime" areas, care will be taken to avoid confrontation. Activities will also be performed during daylight hours, only. If the security of site personnel is in jeopardy, or if confrontation with potentially violent or dangerous individuals is possible, a police escort will be called to provide a safe work environment.

As part of the decontamination procedures set forth in the Quality Assurance Project Plan, Methanol, Alconox®, and a one-percent nitric acid solution are used during decontamination. These products pose possible health hazards and may be dangerous if used improperly. Material Safety Data Sheets for these products are included as Appendix A.

2.3 Groundwater Elevation Monitoring

Groundwater elevation monitoring will be performed weekly on some wells during the month of September and monthly on a larger set of wells. The same precautions taken during the groundwater sampling activities will be taken during this portion of the work. Even though exposure to contaminated groundwater is reduced, therefore posing less of a hazard, appropriate precautions will be implemented.

NOTE: However simplistic a task may seem many hazards are still present so site personnel shall regard these activities, as all others, with the highest safety standards.

2.4 Drilling, Soil Sampling, and Well Installation

These activities have the greatest potential for hazards and risk of injury due to possible chemical exposure and physical injury. In any subsurface investigation the presence of chemical contamination is never truly known; therefore, subsurface material (drill cuttings) shall be treated as if contaminated. Proper PPE (see section 4.0) shall be worn while handling drill cuttings and soil samples (i.e. Nitrile® gloves and work gloves). A Photoionization Detector (PID) will be utilized to monitor the breathing zone around work areas for the presence of organic vapors (explained in more detail in Section 6.0).

Physical hazards associated with drilling activities are high. The use of heavy machinery with many moving parts present hazards from pinch-points, entanglement, dismemberment, and cuts and bruises. BE&K/Terranext and subcontractor personnel are expected to act responsibly and maturely while around the drill rig. Serious injury may result to one's self or another individual due to carelessness or unsafe work practices. Site personnel are required to wear steel-toed boots, a hardhat, safety glasses, and work and/or chemical resistant gloves. In addition, tank tops, shorts, and cut-off shirts or pants will not be allowed in the work area.

At least 72 hours before drilling activities begin, the drill site will be marked in white paint, and the Blue Stake Center will be called to clear the site. In addition, a private utility locator will check the drill site for underground utilities not marked by the utility companies. Severe injury and death can occur from striking underground utilities. Overhead utilities also pose a serious hazard; the drill rig shall not set up within 15 feet of any overhead utility. Special precautions must be undertaken if this distance cannot be met (i.e. the lines de-energized or shielded).

As with the groundwater sampling activities Methanol, Alconox®, and a one-percent Nitric acid solution are used during decontamination of sampling equipment. These products pose possible health hazards and may be dangerous if used improperly.

3.0 HAZARD EVALUATION

Various types of chemical and physical hazards may be encountered. BE&K/Terranext personnel and the Site Safety Officer are responsible for evaluating the types of respirator cartridges and protective gloves and suits required when conducting the work. The following substance(s) are known or suspected to be on site; the primary routes of exposure of each are identified.

<u>Chemical of Concern</u>	<u>Concentrations (If Known)</u>	<u>Primary Hazards</u>
Tetrachloroethene	Up to ~2800 µg/L	Inhalation, Ingestion, Absorption
Trichloroethene	Up to ~480 µg/L	Inhalation, Ingestion, Absorption
1,1-Dichloroethene	Up to ~63 µg/L	Inhalation, Ingestion, Absorption
cis-1,2-Dichloroethane	Up to ~290 µg/L	Inhalation, Ingestion, Absorption
Benzene	Up to ~5.3 µg/L	Inhalation, Ingestion, Absorption
Ethylbenzene	Up to ~71 µg/L	Inhalation, Ingestion, Absorption
Toluene	Up to ~11 µg/L	Inhalation, Ingestion, Absorption
Xylenes	Up to ~32 µg/L	Inhalation, Ingestion, Absorption

The PEL/TLV (permissible exposure limit, threshold limit value), STEL (short-term exposure limit) and IDLH (immediate danger to life and health) values for these compounds are listed in Table 1.

TABLE 1

Chemical of Concern	PEL/TLV	STEL	IDLH
Tetrachloroethene	50 ppm	100 ppm	150 ppm
Trichloroethene	N.A.	100 ppm	1000 ppm
1,1-Dichloroethene	N.A.	20 ppm	N.D.
cis-1,2-Dichloroethane	N.A.	2 ppm	50 ppm
Benzene	1 ppm	5 ppm	500 ppm
Toluene	100 ppm	150 ppm	500 ppm
Ethylbenzene	100 ppm	125 ppm	800 ppm
Xylenes	100 ppm	150 ppm	900 ppm

NOTES: N.A. – Not Available
 N.D. – Not Determined
 ppm – parts per million

PEL/TLV – Permissible Exposure Limit/Threshold Limit Value
 STEL – Short-Term Exposure Limit
 IDLH – Immediate Danger to Life and Health

Using safe work practices and PPE such as steel toe/shank boots, hard hats, gloves, etc will minimize exposure to these hazards. Level D PPE is required on site and level C PPE should be

readily available to BE&K/Terranext personnel, if required. Upgrading to level C will be based on sustained PID readings of 50 ppm.

The following additional physical hazards could be encountered:

Excavations and trenches - Personnel will not enter excavations and trenches deeper than four feet unless the walls have a 1:1 slope or have been shored. Other physical hazards include overhead hazards, slipping, tripping, falling, cuts, bruises, strains, sprains, equipment noise, vehicle traffic, and dust.

Biological Hazards - Snakes, reptiles, bees and wasps, rodents, and arachnids may be encountered in the WVBA. Due to poisonous species and the potential for individuals being allergic to specific species care should be taken when in an area less traveled or when signs of these creatures are evident.

Heat Related Hazards The three heat related hazards in order of severity are heat stress, Heat exhaustion, and heat stroke. Symptoms of heat stress include: headache, heat rash, cramps, muscle spasms, heavy perspiration, dizziness, nausea and fainting. Heat exhaustion symptoms include; headache; pale, cool, moist skin; heavy perspiration; dizziness; nausea; and fainting. First Aid/Emergency Procedures for the above two items are: Replace body fluids, take adequate rest periods, wear cooling devices, or take breaks in cooler areas. During Heat stroke, the victim suffers from red, hot, and dry skin; lack of or reduced perspiration; nausea, dizziness, and confusion; strong, rapid pulse; coma. **THIS IS A MEDICAL EMERGENCY.** First Aid/Emergency Procedures for heat stroke: Attempt to cool the person with wet towels, attempt to give small amounts of water for fluid replacement, transport to the hospital immediately.

Personnel must observe each other for the signs and symptoms of heat-related illness. In addition, pulse or blood pressure may need to be assessed at each rest period. Follow NIOSH guidelines for blood pressure, body temperature and rest period monitoring.

5.0 EMERGENCY CONTACT LIST

<u>Agency/Facility</u>	<u>Location</u>	<u>Phone #</u>
Police Dept.	multiple	<u>911</u>
Utility Bluestake	N/A	<u>1-800-362-4860 or (602) 792-4860</u>
Fire Dept.	multiple	<u>911</u>
Hospitals	St. Joseph's Hospital 350 W. Thomas Rd.	602-406-3000 (main) 602-406-3361 (emergency)
	Good Samaritan Regional 1111 E. McDowell Rd.	602-239-2000 (main)
	Phoenix Memorial Hospital 1201 S. 7 th Avenue	602-824-4600
	St. Luke's Medical Center 1800 E. Van Buren	602-251-8100

Directions to Hospital (a map is attached at the end of this document)

Due to the nature of the WVBA and the various locations for field activities, written directions to a hospital cannot be given. Therefore, before daily field activities begin, the Site Safety Officer will notify on-site personnel of the location of the nearest hospital for the day's activities (since multiple hospitals are available).

Other Important Contacts

BE&K/Terranext	Rich T. Petrus Arthur Gordon, R.G. Art Tippett	480-496-4100 480-496-4100 770-447-5594 X230
ADEQ	Richard Olm, P.E. Bruce Robinson, R.G.	602-207-4176 602-207-4186

6.0 EMERGENCY PROCEDURES

Emergency Procedures (should be modified as required for incident)

The following standard emergency procedures will be used by onsite personnel. The Site Safety Officer shall be notified of any on-site emergencies and be responsible for seeing that the appropriate procedures are followed.

Personnel Injury: The Site Safety Officer and Project Manager should evaluate the nature of the injury, and the affected person should be decontaminated to the extent possible prior to movement. The onsite Safety Officer shall initiate the appropriate first aid, and contact should be made for an ambulance and with the designated medical facility (if required).

No persons shall reenter the work zone until the cause of the injury or symptoms is identified and remedied. If the cause of the injury does not affect the performance of site personnel, operations may continue with the on-site Safety Officer initiating the appropriate first aid and necessary follow-up.

Fire/Explosion: Upon notification of a fire or explosion on site, site personnel will assemble upwind at a safe distance. The fire department shall be alerted and personnel moved to a safe distance from the involved area.

Personal Protective Equipment Failure: If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person shall immediately leave the Exclusion Zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

Other Equipment Failure: If any other equipment on-site fails to operate properly, the Project Team Leader and Site Safety Officer shall be notified and they will evaluate the effect of this failure on continuing operations on-site. If the failure affects the safety of personnel or prevents safe completion of site activity, personnel shall leave the work zone until the situation is evaluated and appropriate actions taken.

In situations when an onsite emergency results in evacuation of the Work Zone, personnel shall not reenter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed.
3. The Site Safety Plan has been reviewed.
4. Site personnel have been briefed on any changes in the Site Safety Plan.

7.0 PERSONAL MONITORING

During some operations, a portable monitoring device will be used to monitor the breathing zone to evaluate the presence of organic vapors in the atmosphere.

Photovac, Photon, Hnu, 580-B or equivalent (OVM or PID), will be used to periodically monitor the soil and atmosphere in the work zones. Use of the buddy system will be implemented for all tasks involving handling of contaminated or suspect material. Action concentrations are as follows:

Photoionization Detector:

Breathing Zone Air Monitoring

- * **Breathing Zone <15 ppm** - Continue work Level D with caution, continue breathing zone air monitoring.
- * **15 ppm < Breathing Zone <50 ppm** sustained above background – stop work, re-evaluate work conditions, potential to upgrade to Level C if vapor levels persist.
- * **50 ppm < Breathing Zone**, above background sustained – cease work immediately, move upwind and away from suspected source, re-evaluate work conditions, potential to upgrade to Level C if vapor levels persist,

Meters shall be calibrated according to manufacturer's instructions.

8.0 GENERAL PROJECT SAFETY REQUIREMENTS

The project operations shall be conducted with the following the minimum safety requirements employed:

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and ingestion of materials is prohibited in any work area except the designated break area.
- Hands must be thoroughly washed upon leaving a contaminated or suspected contaminated area before eating, drinking, smoking, or before any other activities transpire.
- Field operations personnel shall be informed to notify each other of non-visible symptoms of the presence of toxins. Such as: headaches; dizziness; nausea; blurred vision; cramps; irritation of eyes, skin, or respiratory tract; changes in complexion or skin discoloration; changes in apparent motor coordination; changes in personality or demeanor; excessive salivation; changes in pupillary response; and changes in speech ability or pattern.
- All personnel on-site are to be thoroughly briefed on the anticipated hazards, equipment requirements, safety practices, emergency procedures and communications methods, initially and in daily briefings.
- Employee vital signs may be monitored during prolonged activities in direct sunlight and/or when ambient temperatures are above 95 degrees Fahrenheit. An adequate supply of potable water shall be provided on the site.
- Portable containers used to dispense drinking water shall be capable of being tightly closed, and equipped with a tap. Water shall not be dipped from containers. Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and not used for any other purpose. Where single service cups are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided. Employees will be provided with an adequate supply of water to wash their hands with while on site.
- Ensure that all walking/working surfaces and areas are in a safe condition.
- At the beginning of the shift, all heavy equipment will be inspected to ensure all safety equipment and devices (backup alarms, brakes, control levels, fire extinguisher, etc.) are operational and ready for immediate use.

Appendix A
Material Safety Data Sheets

FLUKA CHEMICAL -- METHANOL ABSOLUTE FREE OF ACETONE, 65543
MATERIAL SAFETY DATA SHEET
NSN: 681000N046694
Manufacturer's CAGE: 63181
Part No. Indicator: A
Part Number/Trade Name: METHANOL ABSOLUTE FREE OF ACETONE, 65543

=====
General Information
=====

Company's Name: FLUKA CHEMICAL CORP
Company's Street: 980 SOUTH SECOND ST
Company's City: RONKONKOMA
Company's State: NY
Company's Country: US
Company's Zip Code: 11779
Company's Emerg Ph #: 516-467-3535
Company's Info Ph #: 516-467-3535
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 25JUN92
Safety Data Review Date: 04OCT95
MSDS Serial Number: BVHQS
Hazard Characteristic Code: F3

=====
Ingredients/Identity Information
=====

=====
Physical/Chemical Characteristics
=====

Appearance And Odor: COLORLESS LIQUID.
Boiling Point: >148F, >65C
Melting Point: -144F, -98C
Vapor Pressure (MM Hg/70 F): 97.68 @20C
Vapor Density (Air=1): 1.1
Specific Gravity: 0.791

=====
Fire and Explosion Hazard Data
=====

Flash Point: 52F, 11.1C
Lower Explosive Limit: 6%
Upper Explosive Limit: 36%
Extinguishing Media: CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: EXTREMELY FLAMMABLE. VAPOR MAY TRAVEL CONSIDERABLE DISTANCE TO SOURCE OF IGNITION AND FLASH BACK.

=====
Reactivity Data
=====

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: ACIDS, ACID CHLORIDES, ACID ANHYDRIDES, OXIDIZING AGENTS, REDUCING AGENTS, ALKALI METALS.

=====
Health Hazard Data
=====

=====
Precautions for Safe Handling and Use
=====

=====
Control Measures
=====

=====
=====
Transportation Data
==========
=====
Disposal Data
==========
=====
Label Data
=====

Label Required: YES
Technical Review Date: 27DEC93
Label Date: 16DEC93
Label Status: G
Common Name: METHANOL ABSOLUTE FREE OF ACETONE, 65543
Chronic Hazard: NO
Signal Word: DANGER!
Acute Health Hazard-Slight: X
Contact Hazard-Severe: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: EXTREMELY FLAMMABLE. ACUTE: MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. VAPOR/MIST IS IRRIT TO THE EYES, MUCOUS MEMBRANES & UPPER RESP TRACT. CAUSES SKIN IRRITATION. EXPOSURE CAN CAUSE: DAMAGE TO EYES, LIVER, HEART & KIDNEYS. GASTROINTESTINAL DISTURBANCES. MAY CAUSE CONVULSIONS. TARGET ORGANS: EYES, KIDNEYS. WARNING: CONTAINS METHANOL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. CANNOT BE MADE NONPOISONOUS. CHRONIC: NONE SPECIFIED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: FLUKA CHEMICAL CORP
Label Street: 980 SOUTH SECOND ST
Label City: RONKONKOMA
Label State: NY
Label Zip Code: 11779
Label Country: US
Label Emergency Number: 516-467-3535

CORCO CHEMICAL -- NITRIC ACID #500 - NITRIC ACID, TECHNICAL
MATERIAL SAFETY DATA SHEET
NSN: 6810002372918
Manufacturer's CAGE: 58571
Part No. Indicator: A
Part Number/Trade Name: NITRIC ACID #500

=====
General Information
=====

Item Name: NITRIC ACID, TECHNICAL
Company's Name: CORCO CHEMICAL CORP
Company's Street: TYBURN RD & CEDAR LANE
Company's City: FAIRLESS HILLS
Company's State: PA
Company's Country: US
Company's Zip Code: 19030
Company's Emerg Ph #: 215-295-5006; 215-295-5007
Company's Info Ph #: 215-295-5006; 215-295-5007
Distributor/Vendor # 1: DYNATECH SCIENTIFIC INC (504-465-9604)
Distributor/Vendor # 1 Cage: OVL27
Record No. For Safety Entry: 010
Tot Safety Entries This Stk#: 015
Status: SE
Date MSDS Prepared: 14OCT93
Safety Data Review Date: 19JUL95
Supply Item Manager: CX
MSDS Serial Number: BXPX
Specification Number: O-N-350
Hazard Characteristic Code: C1
Unit Of Issue: BT
Unit Of Issue Container Qty: 5 PT
Type Of Container: BOTTLES
Net Unit Weight: 8.0 LBS

=====
Ingredients/Identity Information
=====

Proprietary: NO
Ingredient: NITRIC ACID (SARA III)
Ingredient Sequence Number: 01
Percent: UNKNOWN
NIOSH (RTECS) Number: QU5775000
CAS Number: 7697-37-2
OSHA PEL: 2 PPM; 4 PPM STEL
ACGIH TLV: 2 PPM; 4 PPM STEL
Other Recommended Limit: NOT ESTABLISHED

=====
Physical/Chemical Characteristics
=====

Appearance And Odor: COLORLESS OR YELLOWISH, FUMING, LIQUID. CHOKING ODOR.
Boiling Point: 183F-251F
Melting Point: -42 TO -61F
Vapor Pressure (MM Hg/70 F): 2.6-103
Vapor Density (Air=1): N/A
Specific Gravity: 1.5 (H2O=1)
Evaporation Rate And Ref: N/A
Solubility In Water: MISCIBLE

=====
Fire and Explosion Hazard Data
=====

Flash Point: NOT COMBUSTIBLE
Extinguishing Media: FLOOD FIRE WITH WATER, DRY CHEMICAL, SODA ASH.
Special Fire Fighting Proc: WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE EQUIPMENT. COOL FLAME EXPOSED CONTAINERS WITH WATER UNTIL WELL AFTER FIRE IS OUT.
Unusual Fire And Expl Hazrds: VIOLENT REACTION WITH WATER AND FUELS. MAY

IGNITE COMBUSTIBLES. POWERFUL OXIDIZERS. CONTACT WITH METALS MAY LIBERATE HYDROGEN GAS.

=====
Reactivity Data
=====

Stability: YES
Cond To Avoid (Stability): HEAT, SPARKS, FLAME, STEAM. COMBUSTIBLE MATERIALS.
Materials To Avoid: COMBUSTIBLE MATTER, STRONG BASES, METAL POWDER, OXIDIZABLE MATERIAL.
Hazardous Decomp Products: TOXIC AND CORROSIVE FUMES, NOX, HYDROGEN NITRATE
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT
=====

=====
Health Hazard Data
=====

LD50-LC50 Mixture: ORAL LD50 (RAT) IS UNKNOWN
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: EXPOSURE TO NITRIC ACID REPRESENTS DUAL HEALTH HAZARD: SPECIFICALLY, TISSUE CORROSION FROM TOPICAL CONTACT AND ACUTE PULMONARY EDEMA OR CHRONIC OBSTRUCTIVE PULMONARY DISEASE FROM INHALATION.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT CARCINOGENIC.
Signs/Symptoms Of Overexp: IRRITATION OF EYES, RESPIRATORY SYSTEM. EYE BURNS. SKIN BURNS WITH YELLOWING OF SKIN. DELAYED PULMONARY EDEMA. DENTAL EROSION.
Med Cond Aggravated By Exp: EYE, SKIN, LUNGS, TEETH, RESPIRATORY SYSTEM.
Emergency/First Aid Proc: EYE, SKIN-IMMEDIATE WATER FLUSH. INHALATION-FRESH AIR, ARTIFICIAL RESPIRATION. INGESTION-CALL PHYSICIAN!!
=====

=====
Precautions for Safe Handling and Use
=====

Steps If Matl Released/Spill: ELIMINATE IGNITION SOURCES. FOR MAJOR SPILLS WEAR SELF-CONTAINED BREATHING APPARATUS & PROTECTIVE EQUIPMENT. KEEP COMBUSTIBLE AWAY FROM SPILL. FLUSH AREA WITH FLOODING AMOUNT OF WATER. NEUTRALIZE WITH SODA ASH. DO NOT USE OXIDIZABLE ABSORBENT.
Neutralizing Agent: SODA ASH
Waste Disposal Method: TO BE PERFORMED IN COMPLIANCE WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS. NOTE: EPA HAZARDOUS SUBSTANCE.
Precautions-Handling/Storing: AVOID BREATHING VAPOR. DO NOT GET LIQUID OR VAPOR IN EYES, ON SKIN, ON CLOTHING. KEEP CONTAINER CLOSED, AWAY FROM HEAT, FLAME AND COMBUST MATERIALS.
Other Precautions: OBSERVE ALL PRECAUTIONS WHEN HANDLING "EMPTY" CONTAINERS AND POSSIBLE RESIDUE THEREIN.
=====

=====
Control Measures
=====

Respiratory Protection: SELF-CONTAINED BREATHING APPARATUS @100 PPM - DO NOT USE OXIDIZABLE SORBENTS!!
Ventilation: LOCAL EXHAUST: RECOMMENDED. MECHANICAL(GENERAL): RECOMMENDED.
Protective Gloves: RUBBER.
Eye Protection: FULL FACE SHIELD, SPLASH GOGGLES.
Other Protective Equipment: PROTECTIVE COVERALLS, EYE WASH, SAFETY SHOWER.
Work Hygienic Practices: WORK SAFELY. RESPECT THE MATERIAL. WASH AFTER HANDLING.
Suppl. Safety & Health Data: NONE.
=====

=====
Transportation Data
=====

Trans Data Review Date: 95200
DOT PSN Code: KFC
DOT Proper Shipping Name: NITRIC ACID
DOT Class: 8
DOT ID Number: UN2031
DOT Pack Group: I
DOT Label: CORROSIVE
IMO PSN Code: KPF
IMO Proper Shipping Name: NITRIC ACID
IMO Regulations Page Number: 8195
IMO UN Number: 2031
IMO UN Class: 8
IMO Subsidiary Risk Label: -
IATA PSN Code: RWA
IATA UN ID Number: 2031
IATA Proper Shipping Name: NITRIC ACID
IATA UN Class: 8
IATA Label: CORROSIVE
AFI PSN Code: RWA
AFI Symbols: 0
AFI Prop. Shipping Name: NITRIC ACID
AFI Class: 8
AFI ID Number: UN2031
AFI Pack Group: I
AFI Basic Pac Ref: 12-14
MMAC Code: NR

=====
Disposal Data
==========
Label Data
=====

Label Required: YES
Technical Review Date: 19JUL95
Label Status: F
Common Name: NITRIC ACID #500
Chronic Hazard: YES
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Moderate: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: AVOID BREATHING VAPOR. DO NOT GET LIQUID OR VAPOR IN EYES, ON SKIN, ON CLOTHING. KEEP CONTAINER CLOSED, AWAY FROM HEAT, FLAME AND COMBUST MATERIALS. IN CASE OF SPILL: ELIMINATE IGNITION SOURCES. FOR MAJOR SPILLS WEAR SELF-CONTAINED BREATHING APPARATUS & PROTECTIVE EQUIPMENT. KEEP COMBUSTIBLE AWAY FROM SPILL. FLUSH AREA WITH FLOODING AMOUNT OF WATER. NEUTRALIZE WITH SODA ASH. DO NOT USE OXIDIZABLE ABSORBENT. FIRST AID: EYE, SKIN-IMMEDIATE WATER FLUSH. INHALATION-FRESH AIR, ARTIFICIAL RESPIRATION. INGESTION-CALL PHYSICIAN!!
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: CORCO CHEMICAL CORP
Label Street: TYBURN RD & CEDAR LANE
Label City: FAIRLESS HILLS
Label State: PA
Label Zip Code: 19030
Label Country: US
Label Emergency Number: 215-295-5006;215-295-5007

ALCONOX -- ALCONOX - DETERGENT, GENERAL PURPOSE
MATERIAL SAFETY DATA SHEET
NSN: 7930011986050
Manufacturer's CAGE: 17534
Part No. Indicator: A
Part Number/Trade Name: ALCONOX

=====
General Information
=====

Item Name: DETERGENT, GENERAL PURPOSE
Company's Name: ALCONOX INC.
Company's Street: 215 PARK AVE SOUTH
Company's City: NEW YORK
Company's State: NY
Company's Country: US
Company's Zip Code: 10003-1603
Company's Emerg Ph #: 212-473-1300
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SEU
Date MSDS Prepared: 01FEB91
Safety Data Review Date: 04DEC91
Supply Item Manager: CX
MSDS Serial Number: BLLFP
Hazard Characteristic Code: N1
Unit Of Issue: BX
Unit Of Issue Container Qty: 4.00 LBS
Type Of Container: BOX
Net Unit Weight: 4.00 LBS

=====
Ingredients/Identity Information
=====

Proprietary: NO
Ingredient: THE MANUFACTURER STATES THAT NO HAZARDOUS INGREDIENTS ARE
PRESENT IN THIS PRODUCT.
Ingredient Sequence Number: 01
Percent: N/A
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE
Other Recommended Limit: NONE SPECIFIED

=====
Physical/Chemical Characteristics
=====

Appearance And Odor: WHITE POWDER INTERSPERSED WITH CREAM COLORED FLAKES,
ODORLESS.
Boiling Point: N/A
Melting Point: N/A
Vapor Pressure (MM Hg/70 F): N/A
Vapor Density (Air=1): N/A
Specific Gravity: N/A
Evaporation Rate And Ref: N/A
Solubility In Water: APPRECIABLE (>10%)
Percent Volatiles By Volume: N/A
pH: N/A

=====
Fire and Explosion Hazard Data
=====

Flash Point: NONE
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: WATER, CARBON DIOXIDE, FOAM, SAND/EARTH.
Special Fire Fighting Proc: FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER
WITHOUT PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS.
Unusual Fire And Expl Hazrds: NONE

=====
Reactivity Data
=====

Stability: YES
Cond To Avoid (Stability): NONE
Materials To Avoid: STRONG ACIDS.
Hazardous Decomp Products: MAY RELEASE CARBON DIOXIDE GAS ON BURNING.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT APPLICABLE

=====
Health Hazard Data
=====

LD50-LC50 Mixture: UNKNOWN
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT APPLICABLE
Signs/Symptoms Of Overexp: INGESTION MAY CAUSE DIARRHEA.
Med Cond Aggravated By Exp: RESPIRATORY CONDITIONS.
Emergency/First Aid Proc: EYES: FLUSH WITH PLENTY OF WATER FOR 15 MIN.
SKIN: FLUSH WITH PLENTY OF WATER. INGESTION: DRINK LARGE QUANTITIES OF WATER. GET MEDICAL ATTENTION FOR DISCOMFORT.

=====
Precautions for Safe Handling and Use
=====

Steps If Matl Released/Spill: MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.
Neutralizing Agent: NONE
Waste Disposal Method: SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGENTS.
Precautions-Handling/Storing: STORE IN A DRY AREA TO PREVENT CAKING.
Other Precautions: NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

=====
Control Measures
=====

Respiratory Protection: DUST MASK.
Ventilation: NORMAL LOCAL EXHAUST.
Protective Gloves: USEFUL BUT NOT REQUIRED.
Eye Protection: USEFUL BUT NOT REQUIRED.
Other Protective Equipment: NONE REQUIRED.
Work Hygienic Practices: NO SPECIAL PRACTICES REQUIRED.
Suppl. Safety & Health Data: NONE

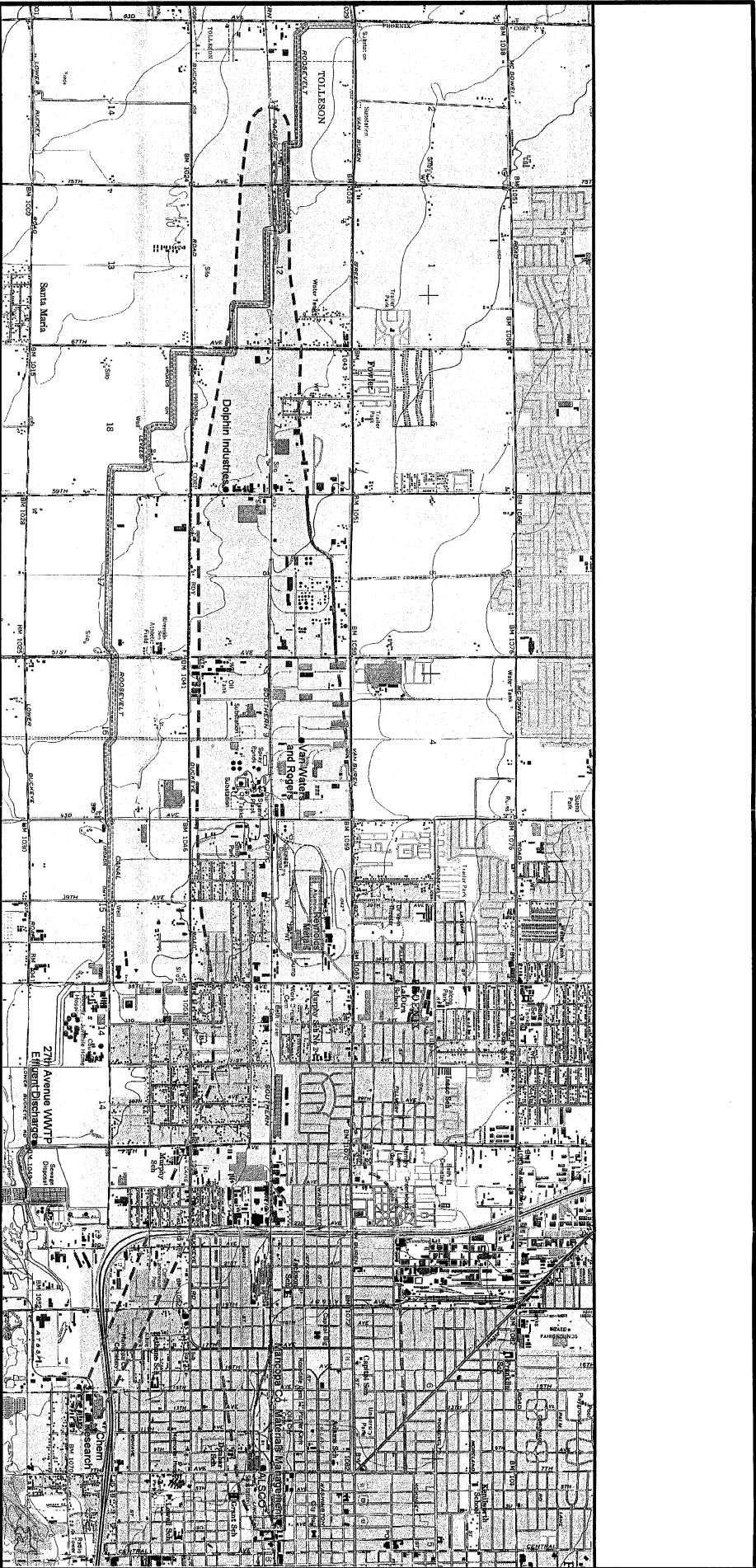
=====
Transportation Data
=====

Trans Data Review Date: 91338
DOT PSN Code: ZZZ
DOT Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
IMO PSN Code: ZZZ
IMO Proper Shipping Name: NOT REGULATED FOR THIS MODE OF TRANSPORTATION
IATA PSN Code: ZZZ
IATA Proper Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
AFI PSN Code: ZZZ
AFI Prop. Shipping Name: NOT REGULATED BY THIS MODE OF TRANSPORTATION
Additional Trans Data: NONE

=====
Disposal Data
=====

=====
=====
Label Data
=====

Label Required: YES
Technical Review Date: 04DEC91
Label Date: 04DEC91
Label Status: F
Common Name: ALCONOX
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: INHALATION OF POWDER MAY PROVE LOCALLY
IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT. STORE IN A
DRY AREA TO PREVENT CAKING. FIRST AID: EYES: FLUSH WITH PLENTY OF WATER FOR
15 MIN. SKIN: FLUSH WITH PLENTY OF WATER. INGESTION: DRINK LARGE QUANTITIES
OF WATER. GET MEDICAL ATTENTION FOR DISCOMFORT.
Protect Eye: Y
Protect Respiratory: Y
Label Name: ALCONOX INC.
Label Street: 215 PARK AVE SOUTH
Label City: NEW YORK
Label State: NY
Label Zip Code: 10003-1603
Label Country: US
Label Emergency Number: 212-473-1300



SOURCE: USGS 7.5 SERIES TOPOGRAPHIC QUADRANGLE MAPS "TOWLER" AND "PHOENIX".

KEY

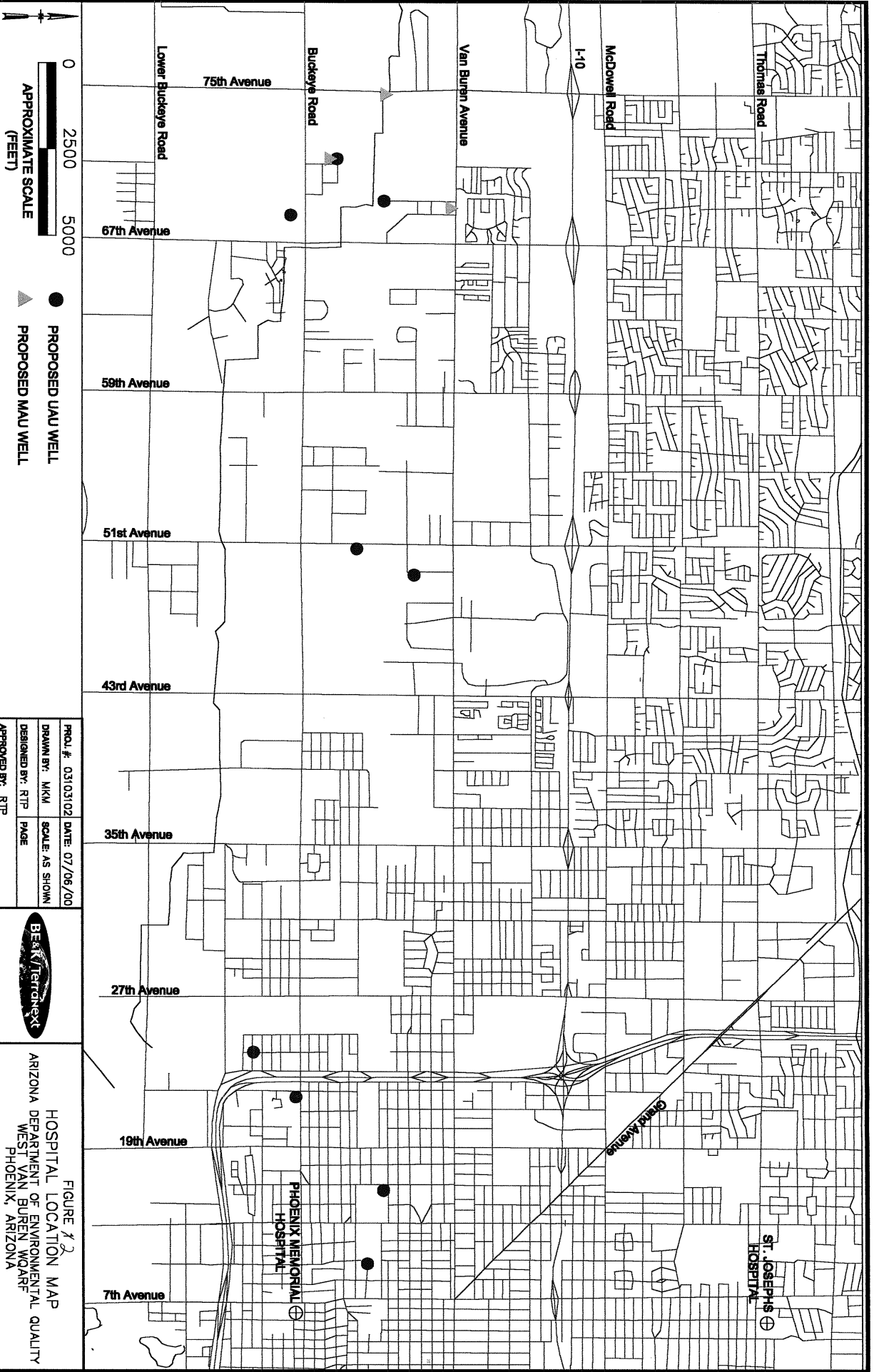
--- Site Registry Boundary
(Dashed Where Inferred)



PROJ.#: 03103102	DATE: 09/07/99
DRAWN BY: MKM	SCALE: AS SHOWN
DESIGNED BY: MKM	PAGE #:
APPROVED BY: RTP	



FIGURE 1
WOARF REGISTRY SITE
WEST VAN BUREN
PHOENIX, ARIZONA



PROJ. # 03103102 DATE: 07/06/00
 DRAWN BY: MKM SCALE: AS SHOWN
 DESIGNED BY: RTP PAGE
 APPROVED BY: RTP



FIGURE # 2
 HOSPITAL LOCATION MAP
 ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
 WEST VAN BUREN WQARF
 PHOENIX, ARIZONA

APPENDIX B

PERSONNEL CONFIRMATION OF HASP UNDERSTANDING (BLANK)



APPENDIX I

Example Chain-of-Custody Record



4620 E. Elwood Street, Suite 13, Phoenix, AZ 85040 480-968-5888 (phone) 480-966-1888 (fax)

Customer :		Page _____ of _____		AEL Lab #	
Address:		Sampler:		Phone:	
City, State, Zip:		Project Name:		Project Number:	
Contact:		P.O. Number:			
Phone:		Fax Results:			
E-Mail Address:		E-Mail Results:			
Sample Receipt		Turn Around Request			
Temperature _____ °C		24 Hours _____ 48 Hours _____			
Custody Seals: Yes _____ No _____		72 Hours _____			
Custody Seals Intact: Yes _____ No _____		5 working Day _____			
Total # of Containers: _____		Standard 10 Working Days _____			
Sample Information					
AEL		Serial #		Client's	
Lab #		Canister		Sample Identification	
		Regulator		Date	
		Model (L)		Time	
		6, 1, bag		Number of containers	
		6, 1, bag		Sample Type	
		6, 1, bag		TO-15 full list	
		6, 1, bag		TO-15 BTEX	
		6, 1, bag		TO-15 TPH(GRO)	
		6, 1, bag		8260B AZ Vapor full list	
		6, 1, bag		8260B AZ Vapor BTEX	
		6, 1, bag		8015 GRO	
		6, 1, bag		8260B Water	
		6, 1, bag			
		6, 1, bag			
		6, 1, bag			
		6, 1, bag			
Instructions / Special Requirements:					
Date:		Time:		Samples Relinquished By:	
				Received By:	

APPENDIX J

Weekly Operation & Maintenance Inspection Form

WEEKLY OPERATION AND MAINTENANCE INSPECTION FORM

RID Wellhead Treatment Systems

Rev. 7 - 7/2013

Operator/Engineer: _____
Date: _____
Weather: _____

Time In: _____
Time Out: _____

WELLHEAD TREATMENT SYSTEMS OPERATIONS DATA

RID-89

Total Flow Rate _____ gpm
Bypass Flow Rate _____ gpm
Pressure @ Well (P_{IN}) _____ psi **Monthly**
Flow (Skid 1) _____ gpm _____ AF P_{OUT} (Skid 1) _____ psi ΔP (Skid 1) _____ psi Lead Vessel _____
Flow (Skid 2) _____ gpm _____ AF P_{OUT} (Skid 2) _____ psi ΔP (Skid 2) _____ psi Lead Vessel _____
Flow (Skid 3) _____ gpm _____ AF P_{OUT} (Skid 3) _____ psi ΔP (Skid 3) _____ psi Lead Vessel _____

RID-92

Total Flow Rate _____ gpm
Bypass Flow Rate _____ gpm
Pressure @ Well (P_{IN}) _____ psi **Monthly**
Flow (Skid 1) _____ gpm _____ AF P_{OUT} (Skid 1) _____ psi ΔP (Skid 1) _____ psi Lead Vessel _____

RID-95

Total Flow Rate _____ gpm
Bypass Flow Rate _____ gpm
Pressure @ Well (P_{IN}) _____ psi **Monthly**
Flow (Skid 1) _____ gpm _____ AF P_{OUT} (Skid 1) _____ psi ΔP (Skid 1) _____ psi Lead Vessel _____
Flow (Skid 2) _____ gpm _____ AF P_{OUT} (Skid 2) _____ psi ΔP (Skid 2) _____ psi Lead Vessel _____

RID-114

Total Flow Rate _____ gpm
Bypass Flow Rate _____ gpm
Pressure @ Well (P_{IN}) _____ psi **Monthly**
Flow (Skid 1) _____ gpm _____ AF P_{OUT} (Skid 1) _____ psi ΔP (Skid 1) _____ psi Lead Vessel _____
Flow (Skid 2) _____ gpm _____ AF P_{OUT} (Skid 2) _____ psi ΔP (Skid 2) _____ psi Lead Vessel _____
Flow (Skid 3) _____ gpm _____ AF P_{OUT} (Skid 3) _____ psi ΔP (Skid 3) _____ psi Lead Vessel _____

SAMPLING AND ANALYSIS

Sampling Conducted? Y / N COC Attached? Y / N
Duplicate Collected? Y / N Duplicate Sample ID _____

GENERAL/MAINTENANCE NOTES

RID-89: _____
RID-92: _____
RID-95: _____
RID-114: _____



APPENDIX K

Monthly Progress Report Example

TABLE 1. RID WELLHEAD TREATMENT SYSTEMS METRICS

West Van Buren Area WQARF Registry Site

Reporting Period: **September 2013**

WELLHEAD TREATMENT SYSTEMS DATA					
RID-89	Volume of GW Treated, This Period:	<u>0</u>	acre-feet	Estimated Mass of Target COCs Removed, This Period:	<u>0</u> pounds
	Volume of GW Treated, Since Start-up ¹ :	<u>3,809</u>	acre-feet	Mass of Target COCs Removed, Since Start-up:	<u>406</u> pounds
	Operational Hours:	<u>0</u>	0%		
RID-92	Volume of GW Treated, This Period:	<u>0</u>	acre-feet	Estimated Mass of Target COCs Removed, This Period:	<u>0</u> pounds
	Volume of GW Treated, Since Start-up ² :	<u>1,521</u>	acre-feet	Mass of Target COCs Removed, Since Start-up:	<u>361</u> pounds
	Operational Hours:	<u>0</u>	0%		
RID-95	Volume of GW Treated, This Period:	<u>0</u>	acre-feet	Estimated Mass of Target COCs Removed, This Period:	<u>0</u> pounds
	Volume of GW Treated, Since Start-up ³ :	<u>2,825</u>	acre-feet	Mass of Target COCs Removed, Since Start-up:	<u>477</u> pounds
	Operational Hours:	<u>0</u>	0%		
RID-114	Volume of GW Treated, This Period:	<u>83</u>	acre-feet	Estimated Mass of Target COCs Removed, This Period:	<u>7</u> pounds
	Volume of GW Treated, Since Start-up ⁴ :	<u>3,437</u>	acre-feet	Mass of Target COCs Removed, Since Start-up:	<u>419</u> pounds
	Operational Hours:	<u>189</u>	25%		
TOTALS (all sites):	Volume of GW Treated, This Period:	<u>83</u>	acre-feet	Estimated Mass of Target COCs Removed, This Period:	<u>7</u> pounds
	Volume of GW Treated, This Period:	<u>27</u>	million gallons	Mass of Target COCs Removed, Since Start-up:	<u>1,662</u> pounds
	Volume of GW Treated, Since Start-Up:	<u>11,592</u>	acre-feet		
	Volume of GW Treated, Since Start-Up:	<u>3,777</u>	million gallons		

Explanation: ¹ May 24, 2012 start-up date.

² May 23, 2012 start-up date.

³ February 6, 2012 start-up date.

⁴ May 22, 2012 start-up date.