



APPENDIX E

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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Water Technologies

HP® Series Liquid Phase Adsorption Systems (ASME code)

SIEMENS

APPLICATIONS

The HP® Series Adsorption Systems are designed to remove dissolved organic contaminants from water. These systems are cost effectively used in applications including:

- Groundwater remediation
- Wastewater filtration
- Tank rinse water treatment
- Pilot testing
- Underground storage tank clean up
- Leachate treatment
- Dechlorination
- Spill cleanup
- Food grade
- Drinking water

INSTALLATION, STARTUP AND OPERATION

The HP® 810, HP® 1020 and HP® 1220 systems are shipped as separate components—two adsorbers and a piping skid module. The piping module allows the adsorbers to operate in series or parallel configurations. The systems require minimal field assembly and site connections.

Siemens can provide a total service package that includes utilizing OSHA trained personnel providing on-site carbon changeouts, packaging and transportation of spent carbon for recycling at our RCRA permitted reactivation facilities, where the contaminants are thermally destroyed.

We can provide instructions on sampling the spent carbon and completion of our spent carbon profile form. Spent carbon acceptance testing can be performed at our certified laboratory.

When requested, a certificate of reactivation will be issued.

BENEFITS AND DESIGN FEATURES:

- ASME code section VIII (stamped), carbon steel vessel.
- SSPC-SP5 surface preparation, NSF 6-approved Plasite vinyl ester lining; rust preventative epoxy/urethane exterior.
- Uniform, continuous internal lining flange to flange (HP® 1020/1220 Systems).
- Proprietary vertical 316 stainless steel externally removable septa nozzles (HP® 1020/1220 Systems) allows maintenance of underdrain without vessel entry.
- Modular design for easy handling and installation.
- Internal spray nozzle ensures complete removal of all spent carbon.
- Schedule 40 carbon steel pipe, supplied with cast iron gear/wheel operated butterfly valves with EPDM seats.
- Carbon slurry piping made from schedule 10 304 stainless steel.
- In-bed water sample collection ports —25-50-75% bed depths.
- Top and side manway allows for easy internal inspection.



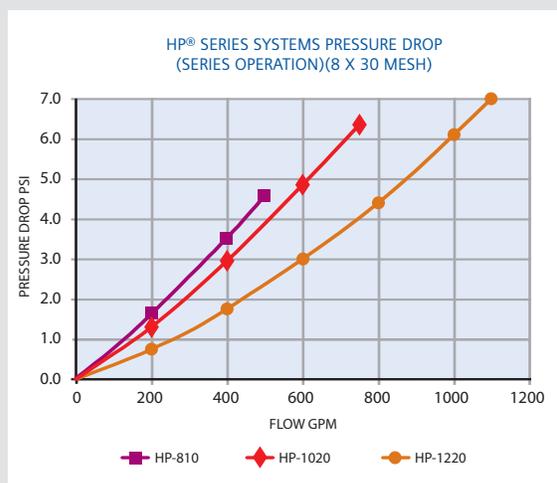
SPECIFICATIONS/TYPICAL PROPERTIES			
	HP® 810SYS	HP® 1020SYS	HP® 1220SYS
Dimensions (each adsorber)	96" x 84"	120" x 96"	144" x 60"
Overall Height	15' 5"	17' 10"	15' 4"
System Length	22' 8"	22' 2"	27' 10"
System Width	10'	12'	13' 8"
Process Piping	6"	8"	8"
Flanged Inlet/Outlet (150# ANSI)	6"	8"	8"
Carbon Fill/Discharge	4"	4"	4"
Flanged Backwash/Vent	6"	8"	8"
Manway (dia., side shell location)	20"	20"	20"
Manway (top)	14" x 18"	14" x 18"	14" x 18"
Utility Water/Air (hose connection) ¹	2"	2"	2"
Interior Coating	Vinyl Ester	Vinyl Ester	Vinyl Ester
Exterior Coating	Urethane	Urethane	Urethane
Empty Vessel Weight (lbs.)	15,500	38,500	45,000
Carbon Weight/Vessel (lbs.)	10,000	20,000	20,000
Operating Weight (lbs.)	85,000	170,000	185,000
Design Pressure (PSIG) @ 150°F	125	125	125
Max. Flow (GPM) Series/Parallel	500/1,000	750/1,500	1,100/2,200
Backwash Rate (GPM) (8 x 30 mesh @ 55°F)	450	710	1,000

(1) Kamlock type

For detailed specifications or dimensional information or drawings, contact your local Siemens sales representative.

Safety Note: 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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The information provided in this literature contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of the contract.

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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 shell20"
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 1/2" 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

Spinnaker- Roosevelt Irrigation District Well # 95
Operating Manual - HP1220 Granular Activated Carbon System

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..

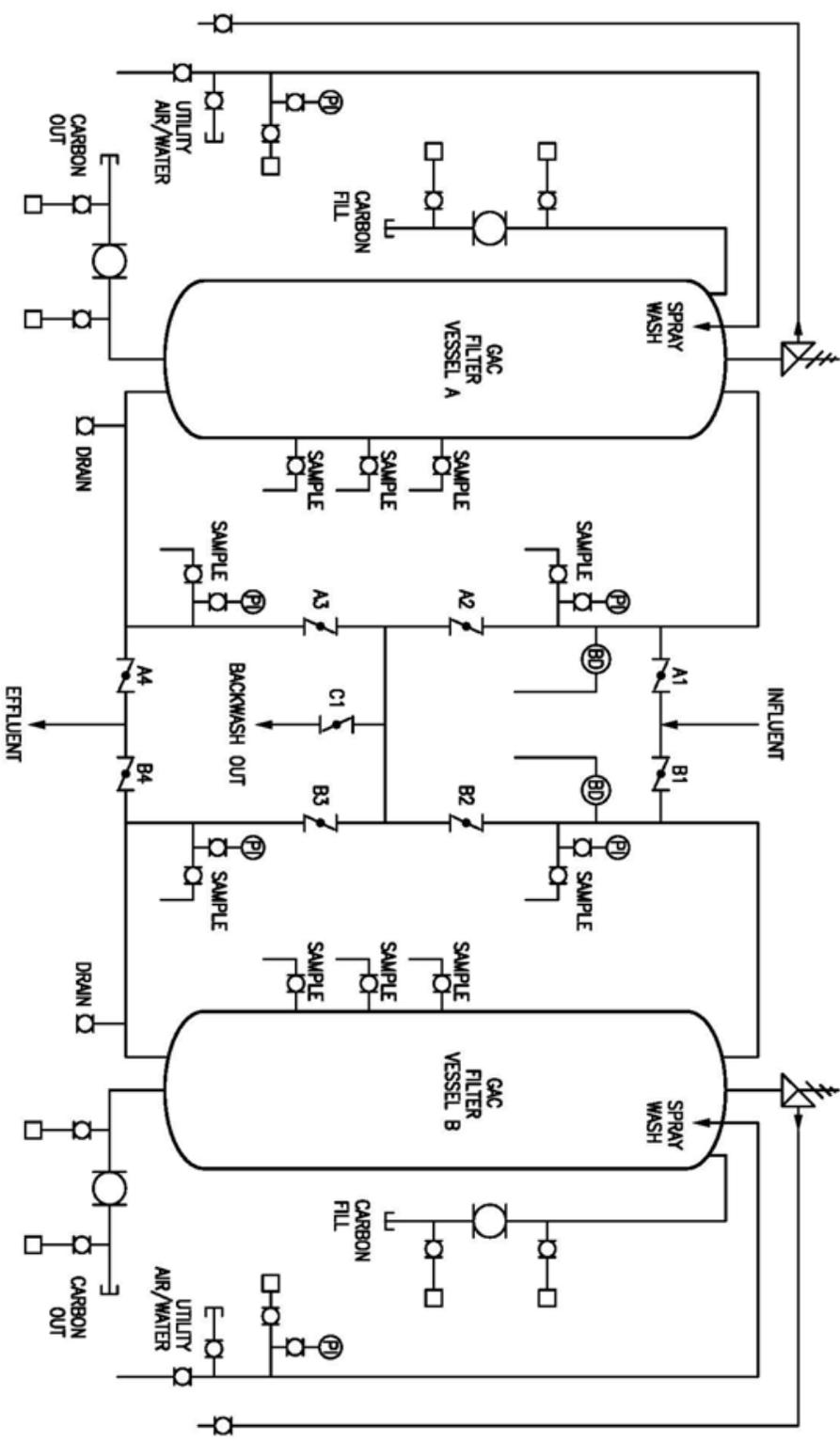
1. Air will vent from the first adsorber through the vent valve.
2. Once a vessel is full of water, slowly continue.
3. Slowly bring the feed pump up to 100% flow.
4. Air within the adsorber should vent through the Vent Valve on the second vessel.
5. Once the vessel is full of water, slowly open valves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

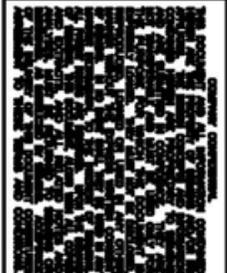
Normal operation requires no further changes until breakthrough occurs. When this happens, call **Siemens Industry Inc.** Customer Service to schedule a changeout. Refer to Section 6.4 for contact and phone number.

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



DESIGNER		DATE	TITLE	
AA	8-7-07	STANDARD GAC 2 VESSEL PARALLEL AND FLOW DIAGRAM		
CHECKER		DATE	CLIENT	
DRAWN		DATE	PROJECT	
SCALE		DATE	DRAWN BY	
<p>SIEMENS WATER TECHNOLOGIES RED BLUFF, CA 530-827-2804</p>			1	1
			0	0

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 it 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	Check to see that the air release valve is operating. Make sure there is a constant flow before valve closes.
	Bed air bound	
	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
	Broken Rupture Disk	Replace Rupture Disk
Discharge Water From the Backwash/Vent Outlet Line		

<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

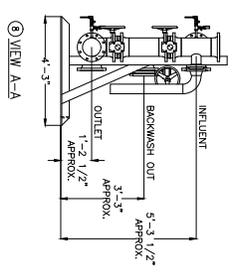
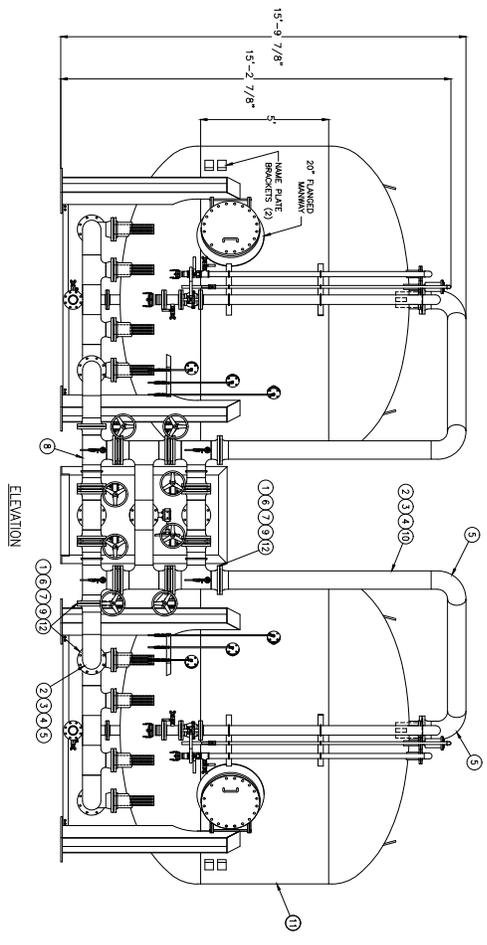
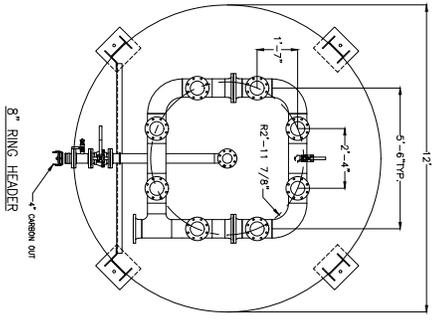
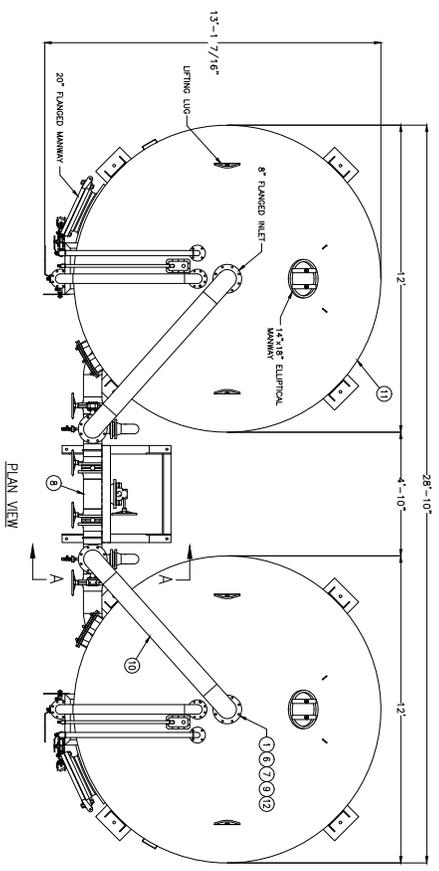
7.1 MINOR MAINTENANCE

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



- NOTES**
1. PROVIDE SHIP TO SHIP PILING AND EQUIPMENT FOR DISCHARGE APPROPRIATE TO LOCAL REGULATIONS.
 2. ALL SURFACING MATERIALS SHALL BE DUST-FREE AND NON-TOXIC.
 3. PROVIDE 316 STAINLESS STEEL SEPTA UNDER PUMP SYSTEMS.
 4. VESSELS SHALL BE 125 PSI, AISC CODE.
 5. FINISH INTERIOR WITH POLYETHYLENE GLYCOL (PEGLIN) AND APPLY PROTECTIVE COATING TO EXTERIOR SURFACES.
 6. PUMP MATERIALS SHALL MEET CS PIPE ASTM A-53 S1 STANDARD FINISHED WITH A-531 CS PER ASTM A-112. 5/8\"/>
 - 7. FINISH EXTERIOR WITH CARBONACEOUS 133 URTHANE COATING TO BE USED DIRECTLY OVER CARBONACEOUS REINFORCEMENT. SYSTEM FINISH SHALL BE 125 PSI.
 - 8. SYSTEM ESTIMATED SHIPPING WEIGHT: 40,000 LBS.
 - 9. SYSTEM SHALL BE 125 PSI.
 - 10. 5' TOLERANCE ON VERTICAL DIMENSIONS.

SCHEDULED MATERIALS

ITEM	DESCRIPTION	QTY	UNIT	REMARKS
1	316 STAINLESS STEEL SHEET	100	SQ FT	1/4\"/>

NO.	DESCRIPTION	DATE	BY	CHKD	APP'D	ENR
1	DESIGN	11/11/11				
2	CONSTRUCTION					
3	REVISION					
4	REVISION					
5	REVISION					
6	REVISION					
7	REVISION					
8	REVISION					
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17	REVISION					
18	REVISION					
19	REVISION					
20	REVISION					

SCALE: 1/2" = 1'

SIEMENS

HP 1220 SYSTEM 12 FT 20K LB HP 125P9 ASSEMBLY

DATE: 11/11/11

BY: [Signature]

CHKD: [Signature]

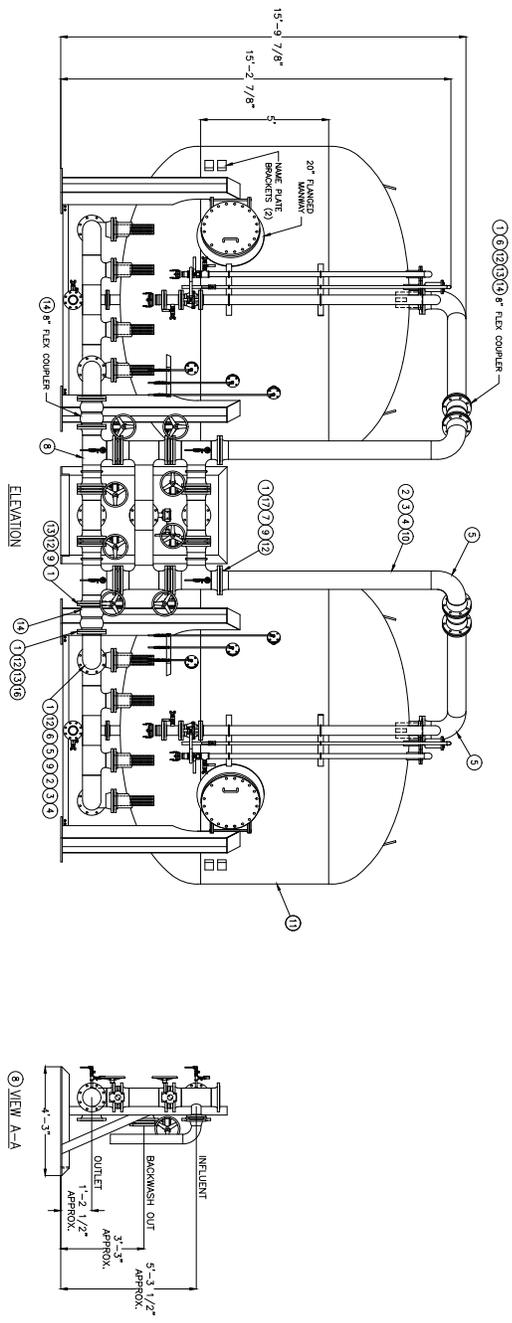
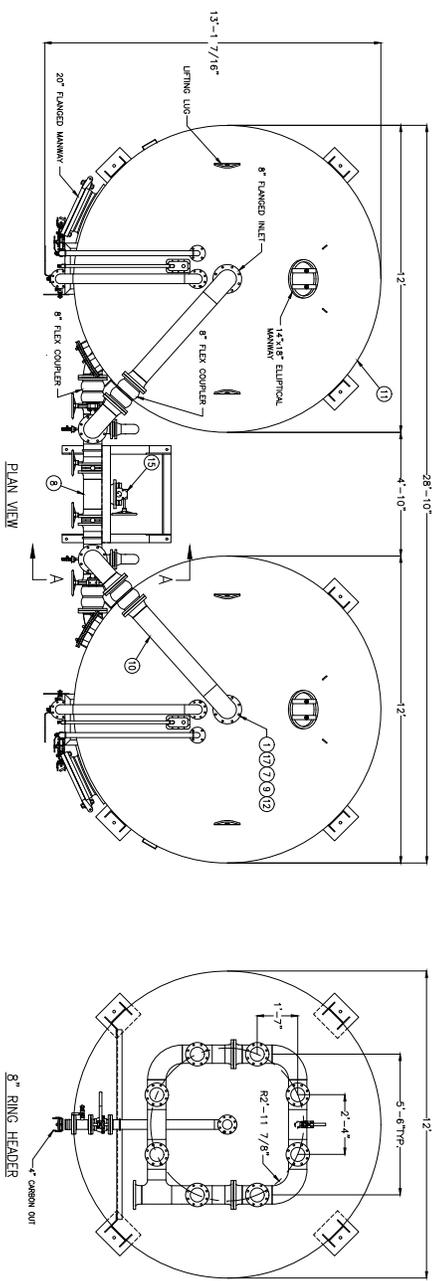
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PROJECT: HP 1220S-01

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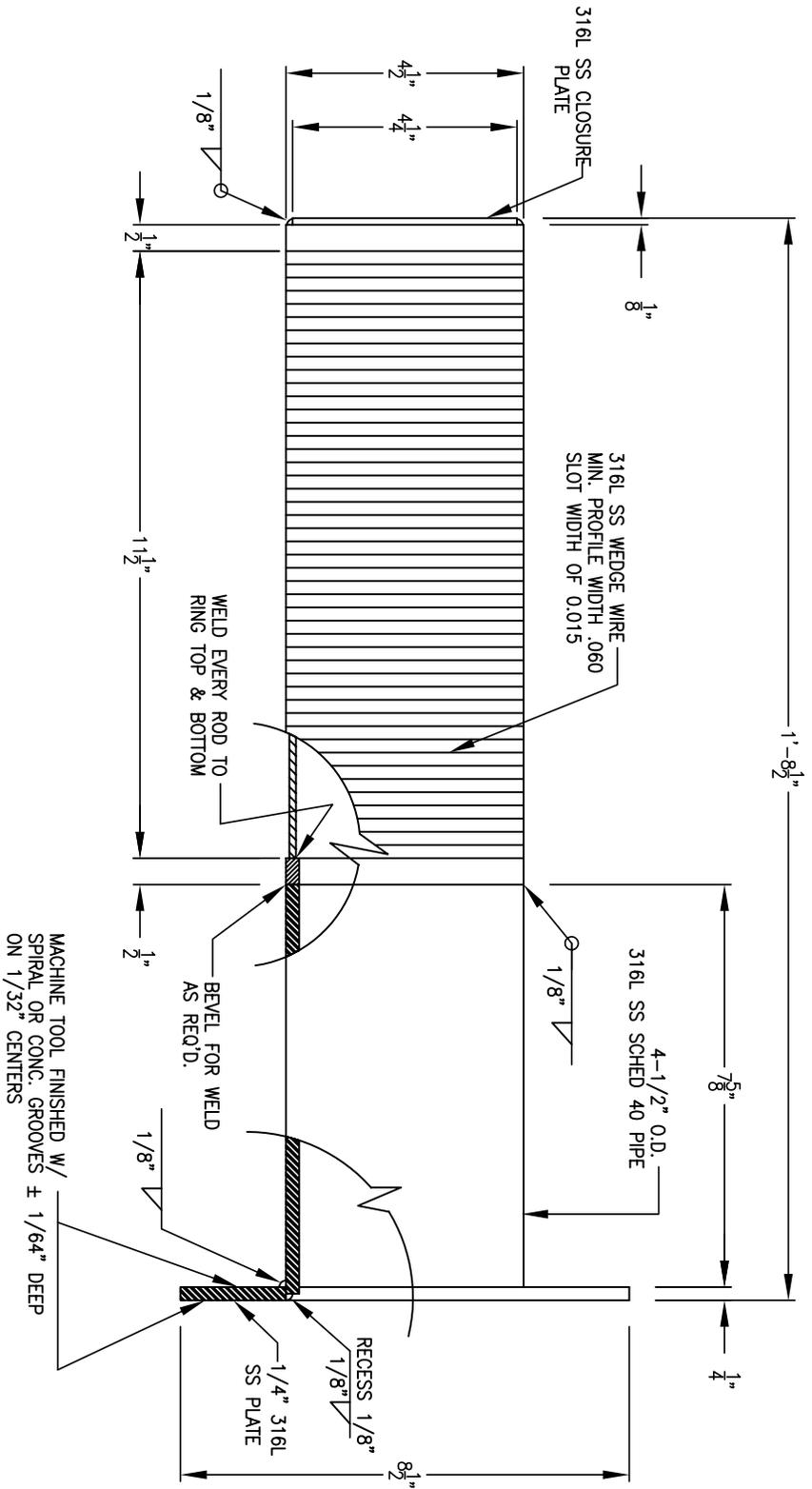
ITEM	DESCRIPTION	QTY	UNIT	MARK
1	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1
2	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1
3	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1
4	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1
5	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1
6	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1
7	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1
8	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1
9	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1
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100	1/2" SCH 40S BLACK STEEL PIPE	100	FT	1



- NOTES:
1. PROVIDE APPROX. 2' TO SHOW PIPING AND EQUIPMENT FOR
 2. ALL SURFACE WELDS ARE DOUBLE BEAD WITH STAINLESS
 3. PROVIDE 316 STAINLESS STEEL SPRAY UNDER PAINT SYSTEMS.
 4. VESSELS SHALL BE 125 PSI, ASME CODE.
 5. FINISH INTERIOR WITH POLYESTER A110, PREPARED AND APPLIED TO THE INTERIOR SURFACE OF ALL VESSELS AND PIPING.
 6. PIPING MATERIALS SHALL MEET CS PIPE ASTM A-453 S3 STANDARD SPECIFICATION FOR PIPE AND FITTINGS.
 7. FINISH EXTERIOR WITH COMPOUND 133 URNANE COLOR TO BE USE DESERT SAND OVER CARBONITE 888 RECOMMENDATION. FINISH FINISH 99129 PER SHEET.
 8. SYSTEM ESTIMATED SHIPPING WEIGHT: 40,000 LBS.
 9. SHIPPING BY OTHERS IS REQUIRED.
 10. 5' TO 1' TOLERANCE ON VERTICAL DIMENSIONS.

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TITLE: HPI 1220FX SYSTEM 12 FT 20K LB HPI 1220SI ASSSA
 DRAWN BY: SPINNAKER HOLDINGS, LLC
 CHECKED BY: ROOSEVELT IRRIGATION DISTRICT - PHOENIX, AZ
 PROJECT: HPI 1220FX SYSTEM 12 FT 20K LB HPI 1220SI ASSSA
 SHEET: 1 OF 1



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DESIGNER	AM	DATE	6-31-08
CHECKER		DATE	
ENGINEER		DATE	
DATE		DATE	
FILE			
SCALE	1:3		

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

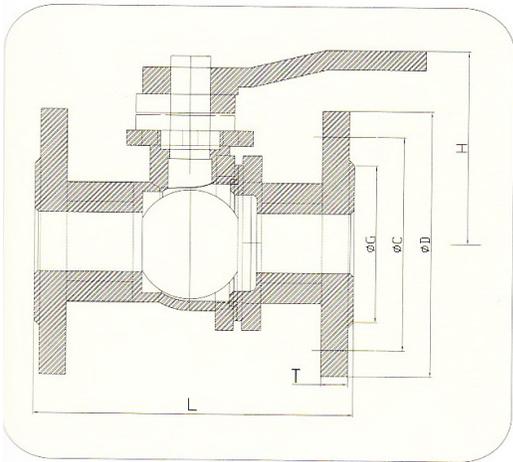
SIEMENS Water Technologies
RED BLUFF, CA

DRAWING
ESM3037.DWG

SHEET
1 OF 1

REV
1

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

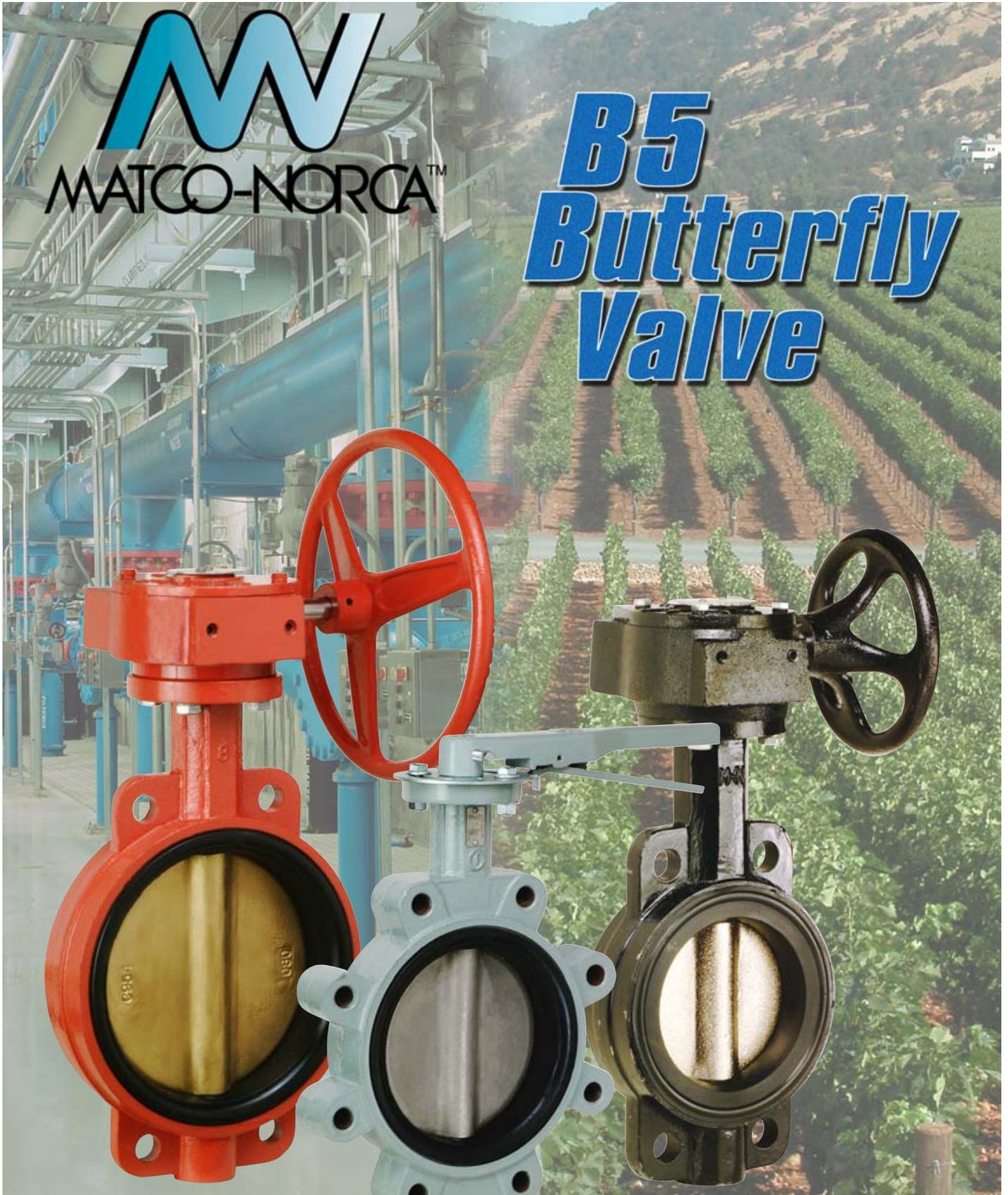
DIMENSIONS

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	F04	16	11
3/4"	20.0	120.0	90.0	100.0	75.0	F04	18	14
1"	25.0	130.0	100.0	125.0	90.0	F04	18	14
1 1/4"	32.0	140.0	105.0	135.0	100.0	F05	20	16
1 1/2"	40.0	165.0	110.0	140.0	105.0	F07	20	16
2"	50.0	180.0	120.0	155.0	120.0	F07	20	16
2 1/2"	65.0	190.0	160.0	175.0	140.0	F07	22	18

M
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:

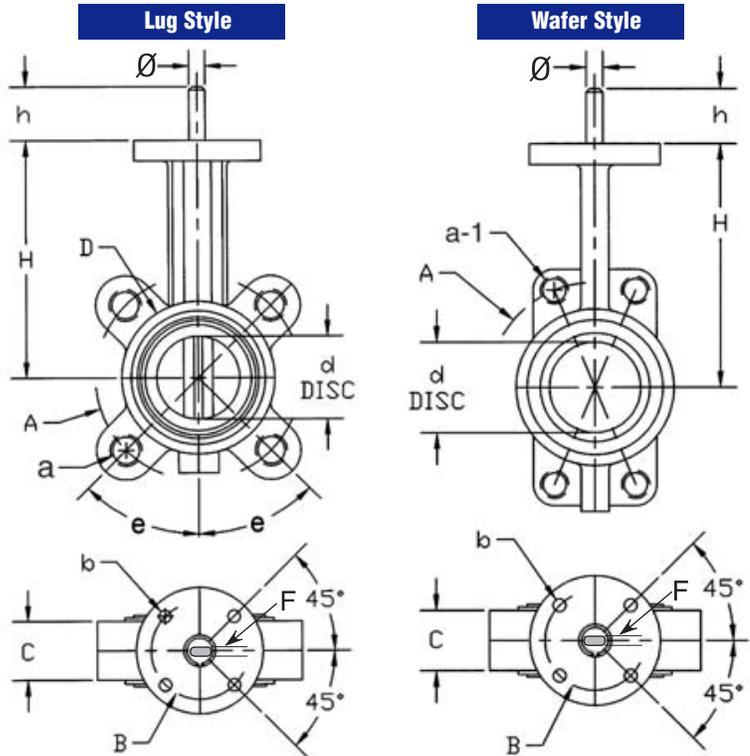
- ❖ *Agricultural and Turf Irrigation*
- ❖ *Water Distribution*
- ❖ *Waste Water Treatment*
- ❖ *Industrial Applications Including Chemical, Pulp & Paper and a Wide Array of General Industrial Mediums.*
- ❖ *Valves with BUNA-N Liners are suitable for oil and gas applications.*
- ❖ *Valves with EPDM Liners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



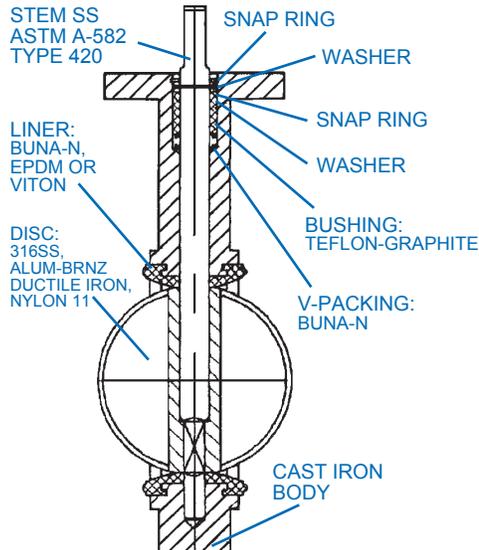


Design, Dimensions & Material Specifications Torque Chart

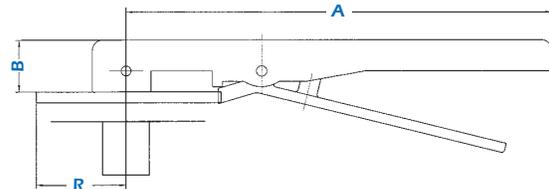
2" - 12": Inch Pounds @ 200 PSI Line Pressure		14" - 24": Inch Pounds @ 150 PSI Line Pressure	
Size	Torque	Size	Torque
2"	50	14"	2500
2.5"	50	16"	3000
3"	250	18"	3000
4"	250	24"	4250
5"	500		
6"	600		
8"	1000		
10"	1800		
12"	2000		



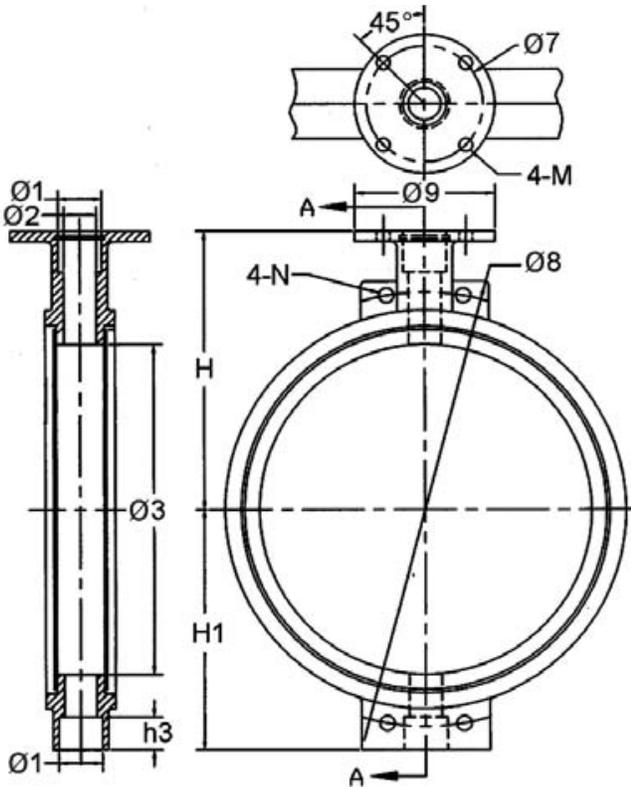
Size	H	d+.05	D	A	a	a-1	B	b	c	h	Stem Ø	F (flat)	e
2"	5.50	2.05	3.54	4.75	5/8" - 4	11/16"	2.25	.284	1.625	1.25	.564	.375	45°
2.5"	6.00	2.52	4.02	5.50	5/8" - 4	11/16"	2.25	.284	1.750	1.25	.564	.375	45°
3"	6.25	3.09	4.69	6.00	5/8" - 4	11/16"	2.25	.284	1.750	1.25	.564	.375	45°
4"	7.00	4.09	5.91	7.50	5/8" - 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"

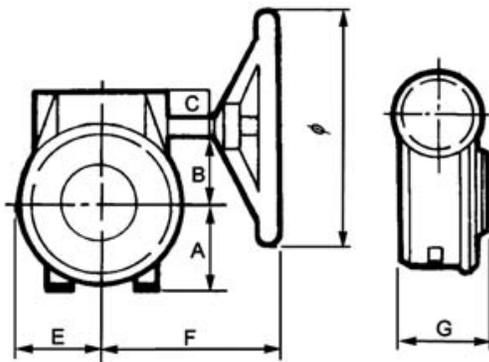


MODELS:	RLO/RWG LGL/LGG	RLOAB/RWG-AB LGLAB/LGG-AB	RLOS/RWGS LGLS/LGGS	RLOSE/RWGSE LGLSE/LGGSE
Body	Cast Iron	Cast Iron	Cast Iron	Cast Iron
Disc	Ductile Iron	Aluminum-Bronze	SS 316	SS 316
Seat	Buna-N *	Buna-N *	Buna-N *	EPDM
Stem	420 Stainless	420 Stainless	420 Stainless	420 Stainless
O-ring	Buna-N	Buna-N	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

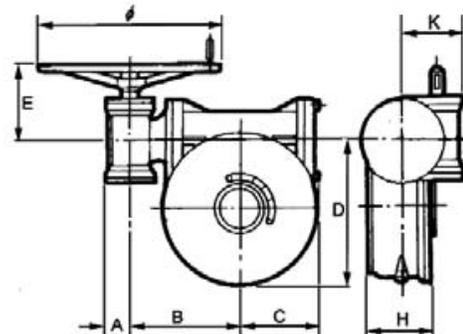
Size	Ø1	Ø2	Ø3	Ø7	Ø8	Ø9	h3	H	H1	M	N
14"	1.88	1.37	14.25	5.0	18.75	6	1.45	12.00	10.38	.56	1.06
16"	2.25	1.62	16.38	5.0	21.25	6	1.45	13.00	11.62	.56	1.06
18"	2.62	1.87	18.38	6.5	22.75	8	1.53	14.50	12.75	.81	1.19
20"	2.75	2.12	20.50	6.5	25.00	8	1.24	15.88	14.00	.81	1.19
24"	2.75	2.12	24.96	6.5	29.50	8	1.24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

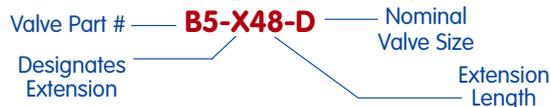
EXTENSION - VALVE DIAMETER DESIGNATION

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: <ul style="list-style-type: none"> 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.

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 #236F 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.



350 Hanley Industrial Court, St. Louis, MO 63144-1599
 314/644-1000 314/644-4617 (fax) www.carboline.com



September 2008 replaces September 2005

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.



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.

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

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

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)
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Flash Point (Setflash) 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: König 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 ¾ Hrs

PACKAGING

- | | |
|-----------------------------|--|
| <u>1 gallon unit:</u> | <u>5 gallon unit:</u> |
| 1 one gallon can of Part A | 1 six gallon partially filled pail of Part A |
| 1 one gallon can of Part B | 1 five gallon pail of Part B |
| 1 small container of Part C | 1 small container of Part C |
| 1 small container of Part D | 1 small container of Part D |

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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.

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 up 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.

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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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.

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

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

1. 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.

**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' Roof)	
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		235	26						4.6		
	5.00	240-C	1.063	1.250	1.188	45	6.34	225	21	4.63	3.5	4	0.500	—	5.0	3.3	
	5.00	240-E	0.500	0.375	0.500	31		225	26						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		225	26						5.4		
	4.00	240-M	0.375	0.188	0.312	14		225	26	5.0	3.88	4	0.500	—	5.5		
	5.00	240-C	1.063	1.250	1.188	45	6.49	225	18						5.1	4.6	
	6.00	240-AV	0.500	0.375	0.500	27		225	26				0.500	1/2-13 UNC	6.0		
2	4.00	240-M	0.375	0.188	0.312	11		225	26						8.3	6.3	
	4.13	240-D	0.375	0.188	0.312	11		225	26						8.5	6.3	
	5.00	240-C	1.063	1.250	1.188	45	7.07	225	18	6.0	4.75	4	0.625	—	7.1	6.3	
	6.00	240-AV	0.500	0.375	0.500	20		225	26				0.500	1/2-13 UNC	8.1		
2.5	4.00	240-M	0.375	0.188	0.312	8		225	26						12.0		
	4.53	240-D	0.500	0.250	0.375	11		225	26	7.0	5.5	4	0.625	—	12.3	7.6	
	5.00	240-C	1.063	1.250	1.188	45	11.05	225	18						12.0		
	6.00	240-AV	0.500	0.375	0.500	17		225	26				0.625	5/8-11 UNC	12.0		
3	5.00	240-C	1.063	1.250	1.188	40		235	15						13.3	8.3	
	5.14	240-E	0.500	0.375	0.500	14		225	26						14.0	8.3	
	6.00	240-A	1.188	1.188	1.188	38	13.36	235	15	7.5	6.0	4	0.625	—	13.8	8.3	
	6.00	240-AV	0.500	0.375	0.500	14		225	26				0.625	—	15.0	8.3	
3.5	5.00	240-C	1.063	1.250	1.188	32		235	15						16.5	7.4	
	5.32	240-D	0.750	0.500	0.500	14		225	26						17.1	7.4	
	6.00	240-A	1.188	1.188	1.188	30	22.69	235	15	8.5	7.0	8	0.625	—	17.5	7.4	
	6.00	240-AV	0.750	0.500	0.500	14		225	26				0.625	5/8-11 UNC	18.3	7.4	
4	5.00	240-C	1.063	1.250	1.188	27		235	15						18.3	7.4	
	5.32	240-D	0.750	0.500	0.500	14		225	26						19.3	7.8	
	6.00	240-A	1.188	1.188	1.188	30	22.69	235	15	9.0	7.5	8	0.625	—	26.0	7.4	
	6.00	240-AV	0.750	0.500	0.500	14		225	26				0.625	5/8-11 UNC	18.3	7.4	
5	5.00	240-C	1.063	1.250	1.188	27		235	10						20.3	8.3	
	5.00	240-E	0.750	0.500	0.500	11		225	26						22.0	8.3	
	6.00	240-A	1.188	1.188	1.188	25	30.02	235	10	10.0	8.5	8	0.750	—	21.8	8.3	
	6.00	240-AV	0.750	0.500	0.500	11		225	26				0.750	3/4-10 UNC	22.8	8.3	
6	5.00	240-C	1.063	1.250	1.188	23		225	8						22.6	10.4	
	5.00	240-E	0.750	0.500	0.500	9		225	26						26.0	10.4	
	6.00	240-A	1.188	1.188	1.188	21	41.28	235	10	11.0	9.5	8	0.750	—	24.0	10.4	
	6.00	240-AV	0.750	0.500	0.500	9		225	26				0.750	3/4-10 UNC	26.8	10.4	
8	5.00	240-C	1.063	1.250	1.188	17		225	8						29.0	10.6	
	5.00	240-E	0.750	0.500	0.500	7		225	26						29.1	10.8	
	6.00	240-A	1.188	1.188	1.188	16	63.62	235	8	13.5	11.75	8	0.750	—	35.5	13.4	
	6.00	240-AV	0.750	0.500	0.500	7		225	26				0.750	3/4-10 UNC	40.0	13.4	
10	5.00	240-C	1.063	1.188	1.188	14		235	6						49.3	21.0	
	5.00	240-E	1.000	0.625	0.750	7		225	26						56.0	21.0	
	8.00	240-A	1.188	1.188	1.188	13		235	6						53.6	21.3	
	8.00	240-AV	1.000	0.625	0.750	7		225	26				0.875	7/8-9 UNC	56.6	21.3	
12	8.00	240-C	1.000	0.625	0.750	7		225	26						57.0	22.0	
	8.00	240-E	1.000	0.625	0.750	7		225	26						58.0	22.0	
	9.45	240-A	1.000	0.625	0.750	7	103.87	225	26	16.0	14.25	12	0.875	7/8-9 UNC	58.5	22.0	
	10.00	240-AV	1.000	0.625	0.750	7		225	26				0.875	7/8-9 UNC	60.5	26.5	
14	5.00	240-C	1.063	1.250	1.188	12		235	6						73.4	26.5	
	5.00	240-E	1.000	0.625	0.750	6		225	26						74.0	26.5	
	8.00	240-A	1.188	1.188	1.188	11	137.89	235	6	19.0	17.0	12	0.875	—	80.0	27.0	
	8.00	240-AV	1.000	0.625	0.750	6		225	26				0.875	7/8-9 UNC	100.0	27.0	
16	8.00	240-C	1.000	0.625	0.750	6		225	26						83.0	27.0	
	8.00	240-E	1.000	0.625	0.750	6		225	26						88.0	27.0	
	9.00	240-A	1.000	0.625	0.875	6		225	26						89.0	28.0	
	10.43	240-AV	1.000	0.625	0.875	6		225	26				0.875	7/8-9 UNC	89.0	28.0	
18	8.00	240-C	1.000	0.625	0.750	5		200	26	21.0	18.75	12	1.000	—	162.0	28.0	
	8.00	240-E	1.000	0.625	0.750	5	182.65	150	26				1.000	—	115.0	28.0	
	9.00	240-M	1.000	0.625	0.750	5		150	26				1.000	—	117.0	29.0	
	10.43	240-AV	1.000	0.625	0.875	5		150	26				1.000	—	120.0	29.0	
20	8.00	240-C	1.000	0.625	0.750	4		175	26						136.0	26.8	
	8.00	240-E	1.000	0.625	0.750	4		175	26						186.0	26.8	
	8.00	240-A	1.000	0.625	0.750	4	240.53	125	26	23.5	21.25	16	1.000	—	165.0	26.8	
	10.43	240-AV	1.000	0.625	0.975	4		125	26				1.000	—	168.0	27.0	
22	8.00	240-C	1.000	0.625	0.750	4		175	26						170.0	27.0	
	8.00	240-E	1.000	0.625	0.750	4		175	26						209.0	31.4	
	9.00	240-M	1.000	0.625	0.750	4	298.65	125	26	25.0	22.75	16	1.125	—	168.0	31.4	
	10.43	240-AV	1.000	0.625	0.875	4		125	26				1.125	—	169.0	33.1	
24	8.00	240-C	1.000	0.625	0.750	3		175	26						170.0	33.1	
	8.00	240-E	1.000	0.625	0.750	3		175	26						170.0	33.1	
	8.00	240-A	1.000	0.625	0.750	3	363.05	125	26	27.5	25.00	20	1.125	—	173.0	34.1	
	10.43	240-AV	1.000	0.625	0.875	3		125	26				1.125	—	175.0	34.1	
26	10.00	240-C	1.000	0.625	0.750	3		175	26						210.0	34.5	
	10.00	240-E	1.000	0.625	0.750	3		175	26						214.0	44.0	
	10.00	240-A	1.000	0.625	0.750	3	510.70	110	26	32.5	29.5	20	1.250	—	255.0	45.5	
	10.47	240-AV	1.000	0.625	0.875	3		110	26				1.250	—	297.0	45.5	
30	10.00	240-C	1.000	0.625	0.750	3		175	26						265.0	46.0	
	10.00	240-E	1.000	0.625	0.750	3	593.96	110	26	34.25	31.75	24	1.375	—	270.0	46.5	
10.43	240-AV	1.000	0.625	0.750	2	779.31	110	26									

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	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	7.0	242-HA						300					6.5		3.5	
	10.00	10.00	242-C						225					6.2		3.6	
1.5	6.00	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	6.00	242-HB						300					7.6		4.6	
	7.00	7.00	242-A						225					6.8		4.8	
	7.00	7.00	242-HA						300					8.3		4.8	
2	6.00	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	6.00	242-HB						300					10.5		6.6	
	7.00	7.00	242-A						225					9.0		7.0	
	7.00	7.00	242-HA						300					10.5		7.0	
2.5	6.00	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	6.00	242-HB						300					15.3		7.6	
	7.00	7.00	242-A						225					13.3		8.0	
	7.00	7.00	242-HA						300					15.8		8.0	
3	7.00	7.00	242-B	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	7.00	242-HA						300					18.2		8.6	
	9.00	9.00	242-A						225					15.2		9.0	
	9.00	9.00	242-HB						300					15.9		9.1	
3.5	10.00	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
	10.00	10.00	242-C						225					26.4		8.0	
	10.00	10.00	242-A						300					21.3		8.2	
	12.00	12.00	242-C						225					22.0		8.2	
5	9.00	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	9.00	242-HA						300					31.4		8.3	
	10.00	10.00	242-C						225					25.5		9.1	
	12.00	12.00	242-C						225					26.0		9.1	
6	9.00	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	9.00	242-HA						300					38.6		11.7	
	10.00	10.00	242-C						225					30.5		11.9	
	12.00	12.00	242-C						225					31.0		12.0	
	14.00	14.00	242-C						225					32.0		12.0	
8	9.00	9.00	242-B	2.375	1.375	1.375	19	63.62	225	26	13.5	11.75	8	0.750	—	42.3	14.5
	9.00	9.00	242-HB						300					55.4		14.5	
	10.00	10.00	242-C						225					43.4		15.0	
	12.00	12.00	242-C						225					44.0		15.2	
	13.00	13.00	242-A						300					43.8		15.4	
10	12.00	12.00	242-B	2.375	1.375	1.375	15	103.87	225	26	16.0	14.25	12	0.875	—	64.1	23.5
	12.00	12.00	242-HB						275					86.5		23.5	
	13.00	13.00	242-A						225					65.5		24.5	
	13.00	13.00	242-HA						275					88.4		24.5	
	14.00	14.00	242-C						225					66.7		24.5	
12	12.00	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	12.00	242-HB						275					110.0		30.0	
	13.00	13.00	242-A						225					95.0		31.0	
	14.00	14.00	242-HA						275					110.0		31.0	
14	12.00	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	13.75	242-A						150					112.0		32.0	
	13.75	13.75	242-HA						200					144.0		32.0	
16	12.00	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	12.00	242-HC						175					160.0		28.8	
	13.75	13.75	242-A						125					132.0		30.8	
	13.75	13.75	242-HA						175					170.2		30.8	
18	12.00	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	13.75	242-A						125					145.0		36.1	
	13.75	13.75	242-HA						175					181.2		36.1	
20	12.00	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	13.75	242-A						125					182.0		35.5	
	13.75	13.75	242-HA						175					182.0		35.5	
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
24	12.00	12.00	242-C	1.750	1.118	1.118	5	510.70	110	26	32.5	29.5	20	1.125	—	190.0	47.0
	13.75	13.75	242-A						110					220.0		48.0	
	13.75	13.75	242-HA						160					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
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

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

PROCO PRODUCTS, INC.

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

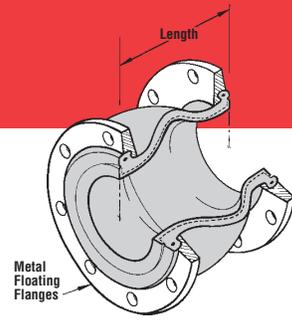


Figure 1.
Style 240
Single Sphere Connector

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		
				Number of Rods Required:		
				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

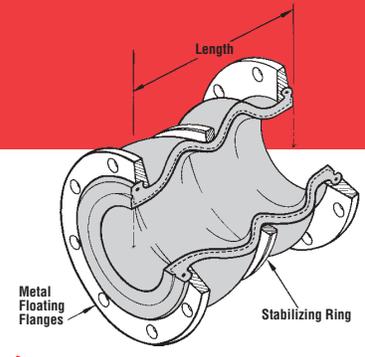
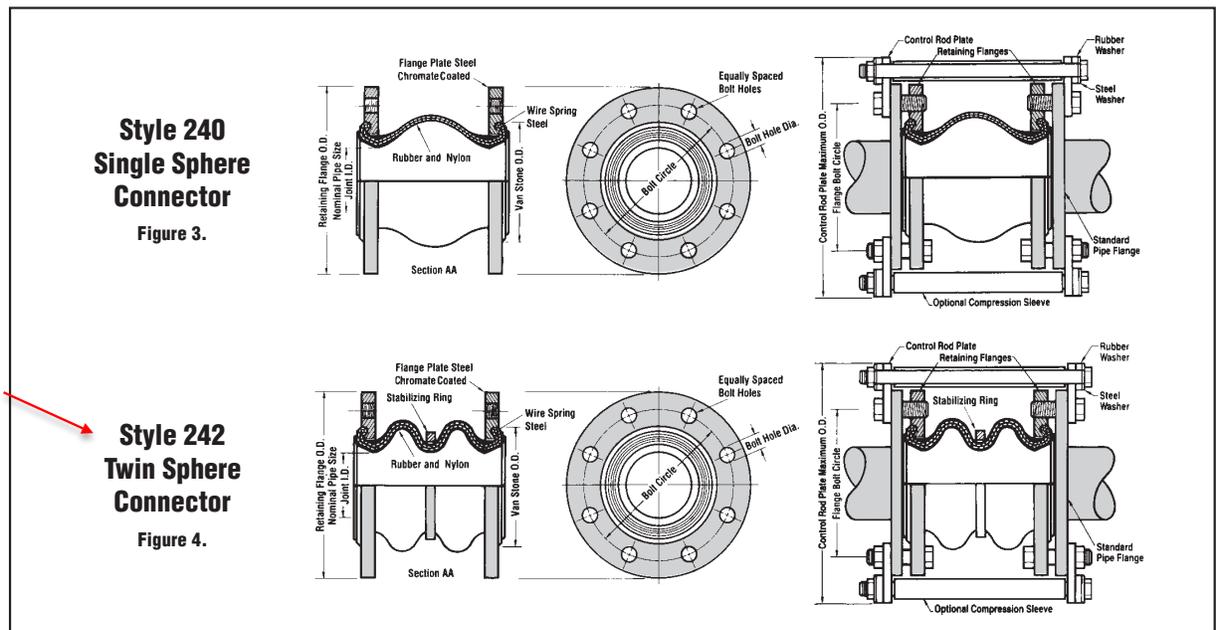


Figure 2.
Style 242
Twin Sphere Connector



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.

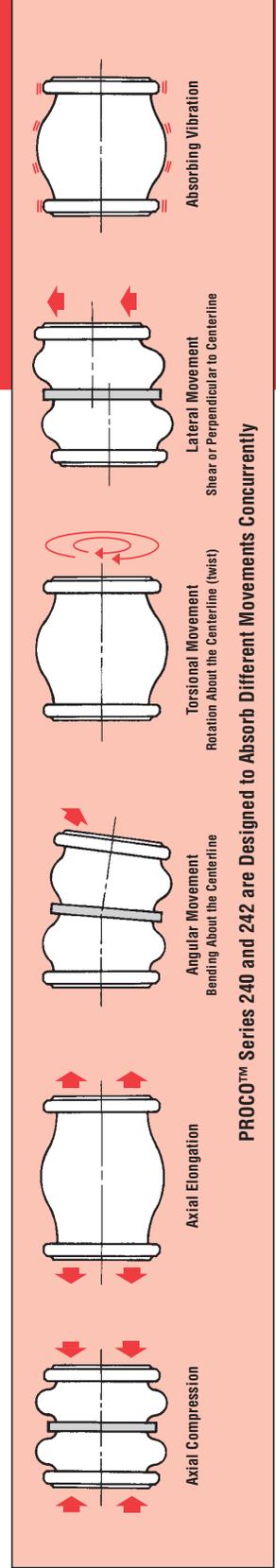
- 3. Spring-Mounted Equipment:** Control unit assemblies are always recommended for spring-mounted equipment. Additionally, control unit assemblies must be used when maximum pressure exceeds the limits shown in Tables 4 & 5, or the movement exceeds the rated movements as shown in Tables 2 & 3.

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.

drilling for series 240 and series 242 expansion joints

Table 7: Flange Drilling

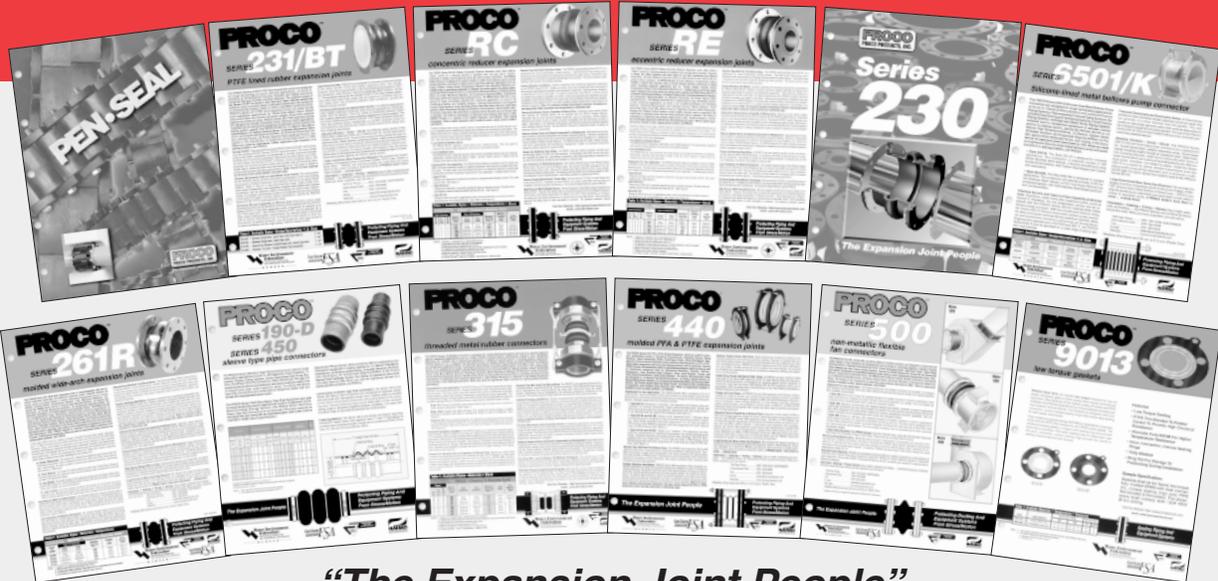
NOMINAL PIPE SIZE	American 125/150# Conforms to ANSI B16.1 and B16.5					American 250/300# Conforms to ANSI B16.1 and B16.5					British Standard 10/1962 Conforms to BS 10 Table E					Metric Series Conforms to I.S.O. 2084-1974 Table NP-10 Holes to I.S.O. /R-273					Metric Series Conforms to I.S.O. 2084-1974 Table NP-16 Holes to I.S.O. /R-273					
	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Drilled Hole Size	Threaded Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size	Flange Thickness	Flange O.D.	Bolt Circle	No. of Holes	Hole Size
1	0.55	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
2	0.63	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
3	0.71	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
4	0.71	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
5	0.71	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
6	0.71	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
8	0.87	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
10	0.95	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
12	1.02	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
14	1.02	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
16	1.10	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
18	1.18	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
20	1.18	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
22	1.18	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
24	1.18	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
26	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
30	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
36	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
42	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
48	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
54	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
60	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
66	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
72	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
78	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
84	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
90	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
96	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
102	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
108	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
114	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
120	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
126	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
132	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
138	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
144	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55
150	1.26	4.25	3.13	4	0.62	1 1/2 - 13 UNC	0.63	4.88	3.5	4	0.75	0.59	4.5	3.25	4	0.62	0.63	4.53	3.35	4	0.55	0.63	4.53	3.35	4	0.55



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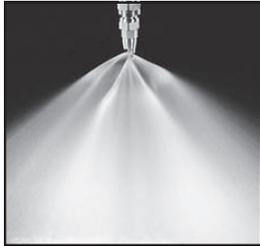


Warning: Expansion joints may operate in pipelines or equipment carrying fluids and/or gases at elevated temperatures and pressures. Normal precautions should be taken to make sure these parts are installed correctly and inspected regularly.

SpiralJet[®] SPRAY NOZZLES, STANDARD AND EXTRA LARGE FREE PASSAGE SPRAY



Spiraljet Spray
Nozzles
2-HHSJ-PVC-170-1400



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



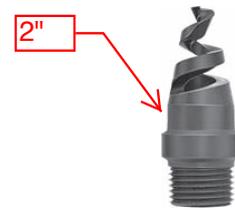
Threaded/hex
Brass or 316 Stainless Steel
1/4" to 2" NPT or BSPT (M)

HHSJ



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

HHSJ



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
- Chemical processing
- Fire suppression/prevention
- Gas scrubbing, cooling
- Washing/rinsing

SEE ALSO

- Accessories
 - Adjustable ball fittings
 - Check valves
 - Pressure gauges
 - Pressure regulators
 - Pressure relief valves
 - Solenoid valves
 - Split-eyelet connectors
 - Strainers



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SpiralJet[®] SPRAY NOZZLES, STANDARD AND EXTRA LARGE FREE PASSAGE SPRAY



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
1/2	●	●	●	●	●	82	.313	.125	8.2	11.6	16.4	26	52
	●	●	●	●	●	120	.375	.188	12.0	17.0	24	38	76
	●	●	●	●	●	164	.438	.188	16.4	23	33	52	104
3/4					●	210	.500	.188	21	30	42	66	133
	●	●	●	●	●	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
2	●	●	●	●	●	1400	1.375	.438	140	198	280	443	885
	●	●	●	●	●	1780	1.500	.438	178	252	356	563	1126
3	●	●	●			2560	1.750	.563	256	362	512	810	1619
	●	●	●			3360	2.000	.563	336	475	672	1063	2125
4	●	●	●			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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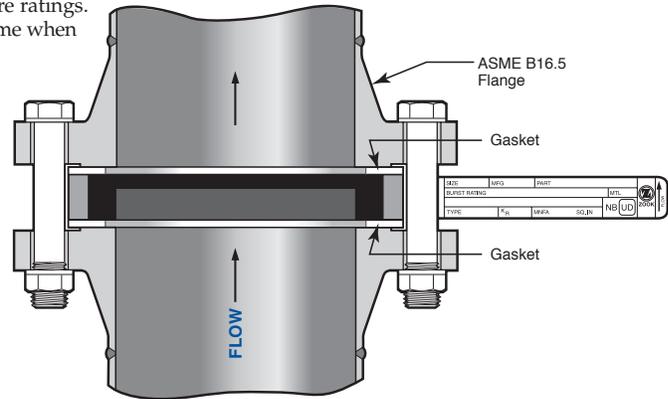
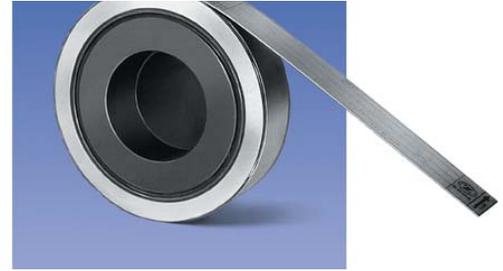
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MONO Type

the best choice for low and intermediate burst ratings

- Sizes 1/2" thru 24" diameters
 - Designed to fit ASME B16.5 Class 150 flanges (Higher ratings to fit Class 300 flanges are furnished in the INVERTED and DUPLEX Type Disks)
 - Burst ratings 0.25 to 150 psig
 - 0% manufacturing range
 - Operating pressures to 90% of the disk's marked burst pressure (Contact ZOOK for operating ratio for burst pressures below 40 psig)
 - Temperature ratings -290°F to +700°F (-179°C to +371°C). Maximum temperature rating without insulation is 430°F (221°C) or 700°F (371°C) with insulation. Contact ZOOK for higher temperature ratings. The specified temperature shall be at the disk location at the time when the disk is expected to rupture
 - Counterbored side of the disk contacts the process media
 - Vacuum supports are available for ratings below 25 psig
 - May be configured to withstand high back pressure generated in closed piping systems – request Bak-Pressure™ bulletin
 - Stocked MONO Disks, ready for immediate shipment
 - Sizes: 1", 1-1/2", 2", 3", 4", 6", 8" to fit ASME B16.5 Class 150 flanges
 - Burst Ratings: 10, 15, 20, 25, 30, 40, 50, 75, 100, 125, 150 psig @ 72°F (22°C)
- 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_{rg1})

Support Style	K_{rg1}
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

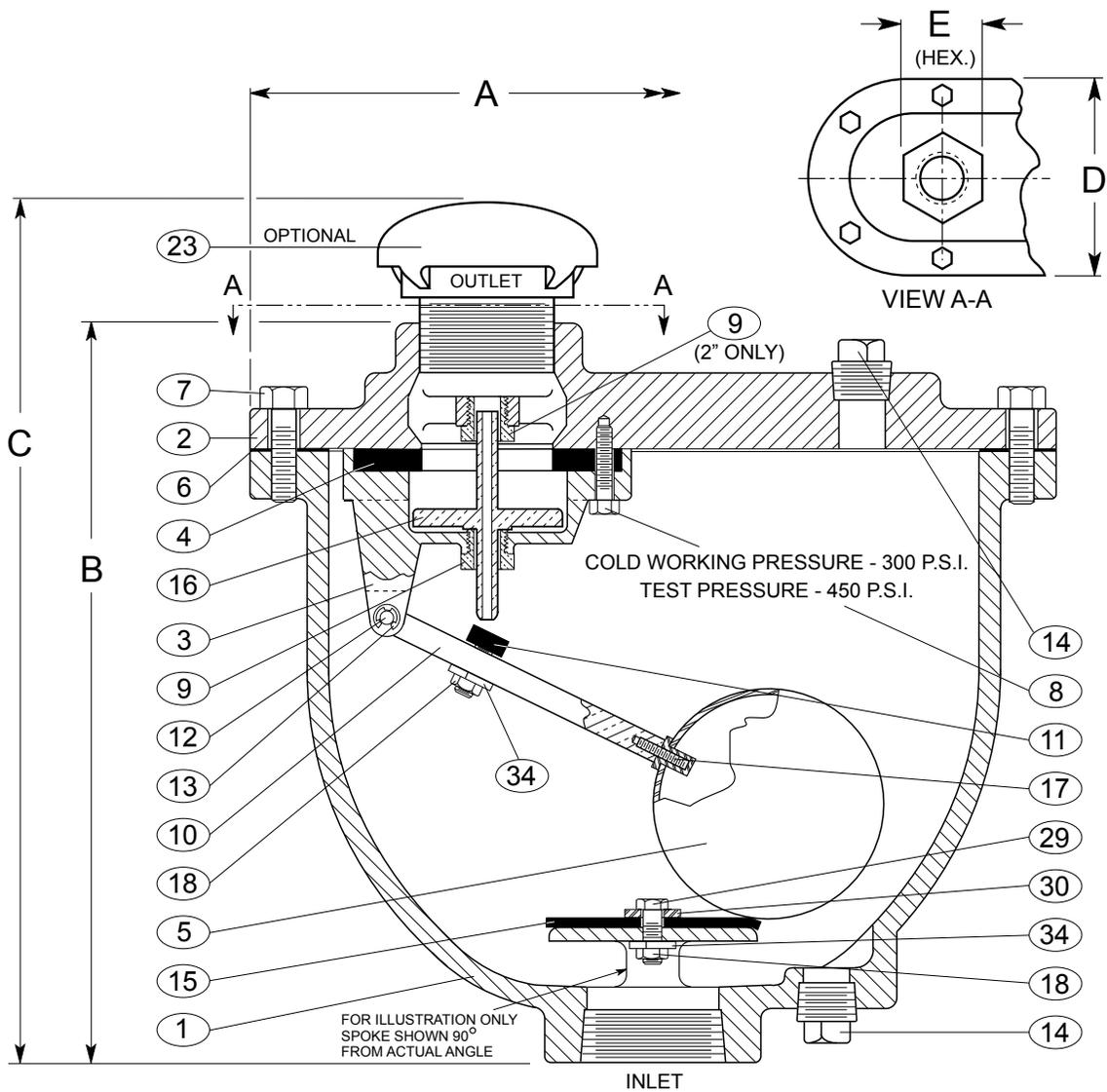
Specifications – ASME B16.5 Class 150

Nominal Disk Sizes	Minimum net flow area (MNFA) Sq. inches					Disk Dimensions				Burst Ratings psig	
	Full Bore	Vacuum support style				Diameter		Thickness*			
		Ring	Bar	Cross	Plate	I.D.	O.D.	Standard Disk	Insulated Unit	Min.	Max.
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

ZOOK service personnel are available 24 hours-a-day, 7 days-a-week, 365 days-a-year



- | | | | | |
|----------|--------------------|-------------------|-------------------|---------------------|
| 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 _____
 Job Location _____
 Engineer _____
 Approval _____

Contractor _____
 Approval _____
 Contractor's P.O. No. _____
 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)

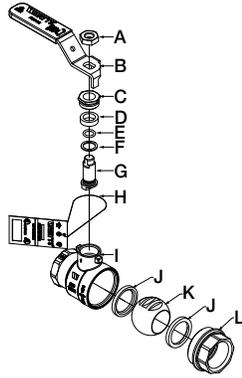
Specifications

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.

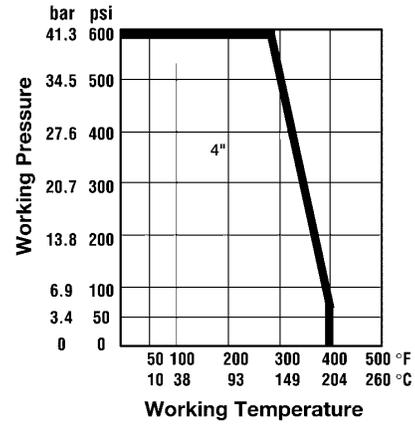


Materials



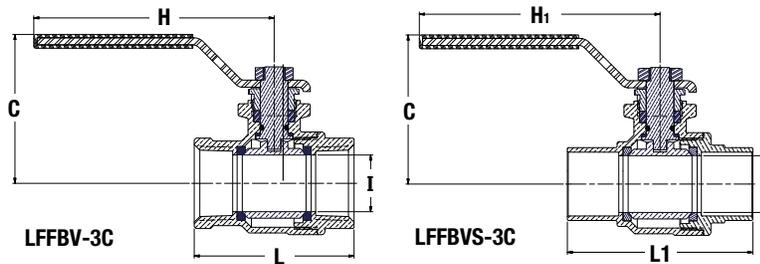
- A. Handle Nut Zinc plated carbon steel
- B. Handle Assembly Zinc plated carbon steel with vinyl insulator
- C. Packing Nut Lead Free* brass
- D. Stem Packing Virgin PTFE
- E. O-ring Fluorocarbon elastomer (FKM)
- F. Thrust Washer Virgin PTFE
- G. Stem Machined Lead Free* brass
- H. Tag Cardboard, Mylar 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

Temperature – Pressure



*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		
¼	8	1 ¹³ / ₁₆	46	3 ⁷ / ₁₆	87	-	-	½	12.9	1 ³ / ₄	45	-	-	0.4	0.2
⅜	10	1 ¹³ / ₁₆	46	3 ⁷ / ₁₆	87	-	-	½	12.9	1 ³ / ₄	45	-	-	0.4	0.2
½	15	1 ¹³ / ₁₆	46	3 ⁷ / ₁₆	87	3 ⁷ / ₁₆	87	½	12.9	1 ¹⁵ / ₁₆	50	2 ¹ / ₁₆	52	0.4	0.2
¾	20	2 ¹ / ₄	57	4	101	4	101	¾	19.2	2 ⁵ / ₁₆	59	2 ¹ / 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
1¼	32	2 ¹³ / ₁₆	71	4 ¹ / ₄	108	4 ¹ / ₄	108	1¼	31.9	3 ³ / ₁₆	81	3 ¹¹ / ₁₆	94	1.8	0.8
1½	40	3 ³ / ₁₆	80	5 ¹ / ₄	134	5 ⁵ / ₁₆	135	1½	38.0	3½	88	4¼	108	2.6	1.2
2	50	3½	89	6	153	6	153	2	50.9	4½	105	5 ⁵ / ₁₆	135	3.7	1.7
2½	65	4 ¹ / ₁₆	104	7 ³ / ₈	187	7 ³ / ₈	188	2½	63.6	5 ⁵ / ₁₆	134	6¼	158	7.1	3.2
3	80	4½	114	7¾	197	7¾	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 ¹ / 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

Pressure Measurement

Wika Pressure Gauge
232.53

WIKAI 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

Case304 stainless steel with vent plug and SS crimp ring.
Welded case / socket connection**Window**

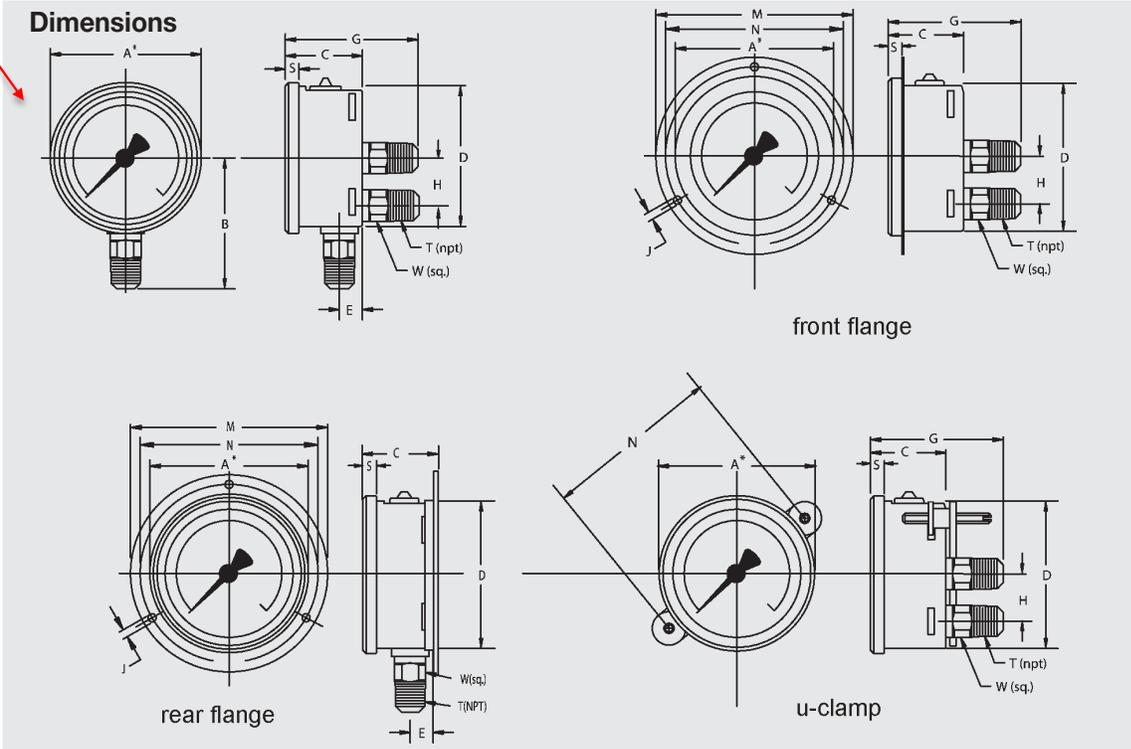
Polycarbonate

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.	filled
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.	filled
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.	filled

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.**WIKALog Instrument Corporation**1000 Wiegand Boulevard
Lawrenceville, GA 30045
Tel (770) 513-8200 Toll-free 1-888-WIKA-USA
Fax (770) 338-5118
E-Mail info@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.

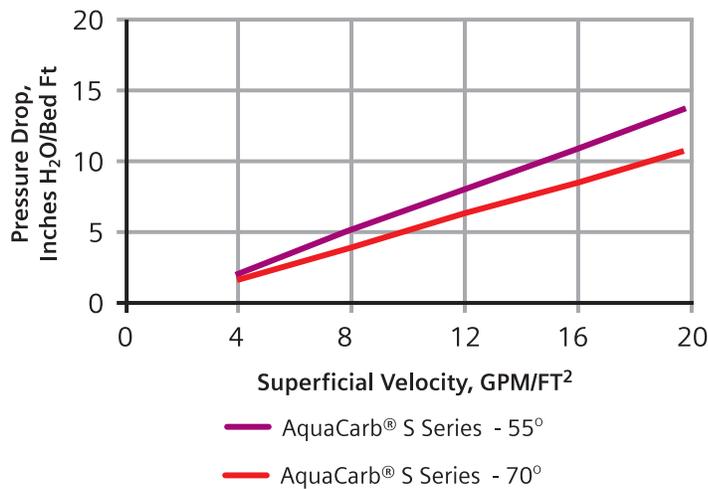


Features and Benefits:

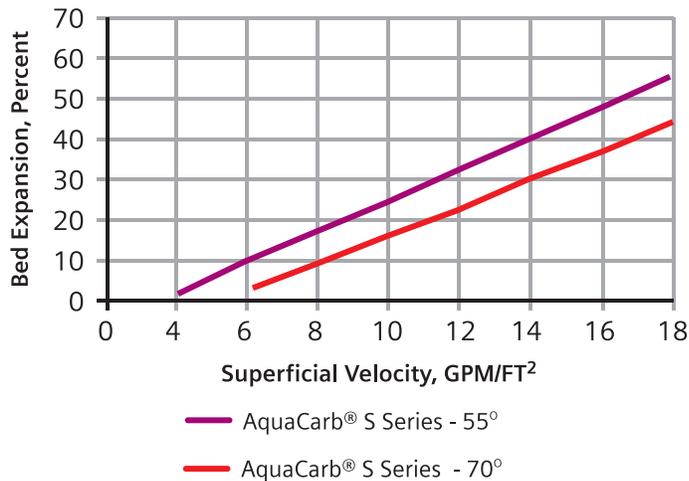
- Reactivated carbons serve as an economical alternative to virgin carbon in many applications
- Use of reactivated carbons reduce the volume of spent carbon sent to landfill and encourages responsible usage of natural resources
- A detailed quality assurance program guarantees consistent quality from 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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