DIVERSIFIED HEAT TRANSFER, INC.

UNFIRED STEAM GENERATORS
(SUPERSTEAM SERIES)
Installation, Operation and Maintenance

SERIAL No 20202

General Information

The purpose of the Installation, Operation and Maintenance Manual is a procedural guide for all DHT SuperSteam Unfired Steam Generators:

- VSGU
- HSGU
- VSGUW
- HSGUW

Energy Sources

DHT SuperSteam Unfired Steam Generators are engineered and manufactured to use one the following energy sources to produce domestic hot water:

- Steam
- Boiler Water
- High Temperature water.

Design Conditions.

Diversified Heat Transfer, Inc. has design, engineering and manufacturing capabilities to produce a product to satisfy a wide range of our customer requirements.

DHT standard design conditions for SuperSteam units are:

	Shell Side	Tube Side
Design Pressure, PSIG	150	150
Design Temperature, F	400	400

Consult the design specifications for the unit or the name plate attached to the unit and a tag on T & P Relief valve for maximum pressure for the unit.

Construction

All DHT SuperSteam units are design and manufactured from superior materials of highest quality. Each unit meets or exceeds requirements of ASME Section VIII, Div.1 Code and TEMA standards.
All DHT Units are registered with the National Board of Boiler and Pressure Vessels Inspectors and U-stamped.

- Heat exchangers: U-tube heat exchangers (TEMA BEU type)
  are manufactured with steel/brass liner or stainless steel tubesheet,
  stainless steel shell and cast iron or fabricated carbon steel head.
  Tubes are copper ,CU-NI 90/10 or stainless steel depending on tube design temperature.
- Controls and trim: DHT SuperSteam units can be equipped with
  electronically, pneumatically or piloted activated control valves,
  liquid level and high level control, blowdown system.
  DHT SuperSteam units are equipped with a control panel with graphical LCD display, easy adjustable set points, and set points for double solenoid safety system, if it is required a data port for for a communication with Building Management System.
  When applicable the SuperSteam units a equipped with double solenoid safety system.
  Standard package also includes ASME safety relief valve.
  Steam fired units are equipped with condensate line: F & T steam trap, condensate strainer and drip leg with thermodynamic steam trap with strainer.
- Insulation and Jacketing: All standard DHT SuperSteam units contain a three inches layer of fiber glass insulation between the heat exchanger and jacket. The jackets are constructed of 22 Ga. Steel painted blue

Operating Precautions.

In order to achieve maximum performance from the unit, the described below must be strictly followed:

- The unit must be used according to the specification given to DHT
- Pressure and temperatures should not exceed limits indicated on DHT name plate attached to the unit.
- Initial start up should be done according to Section: **Start Up**
- The heating and heated fluids should be free from any debris.
- The unit should operate only with fluid that it was designed for.
- Prevent evaporation of fluid on the shell side. Steam or vapor should only flow through the tubes.
- The system should be designed to prevent the unit from encountering pressure shocks.
- All strainers installed on the unit should be periodically cleaned.

Storage and Transportation

The units should be stored in a clean place away from corrosive environment or weather elements (e.g. rain, snow). During transportation, ensure that they are not exposed to mechanical damages.

Examining the Unit

After the unit has been set in place and uncrated, it should be carefully examined to ensure that neither the heat exchanger nor any of the components have been damage during shipping. If any evidence of damage is detected that could affect the safe operation of the unit, contact DHT or the authorized sales representative, to report the damage and to receive instructions on how to proceed.

After the examination has been done, we advise that all pressure and control components be checked to assure that they meet design specifications by reviewing the attached to the unit design specification, the name plate and the specification tags. In case of any discrepancy, contact DHT or an authorized sales representative, before proceeding with the installation.

Mounting the Unit

The unit should be mounted to the floor, following applicable architectural and local code requirements to assure the save operation of the unit.

Connecting Piping

- Domestic Water inlet: the exact location of this port for the unit, as well as inlet pipe diameter and thread size, can be determined for the drawing supplied with the unit. A manual shutoff valve should be installed on the inlet water source as an isolation device. All piping and fittings should be clean and free of debris.
- A manual shutoff valve should be installed on the domestic water outlet as well as an isolation device.
- Energy source (steam, boiler water or high temperature water):
  Steam, boiler water, or high temperature water can present very dangerous situation because of the high pressures temperatures.
  Follow all mandatory and recommended procedures and safety rules to avoid any hazardous situation.
  Make sure that a shutoff valve is installed up stream in the source line and works properly. All valves on the source line should be closed during the installation process. Connect the energy source to the piping leading to the control valve. Determine the exact location of the inlet connections and piping size using the attached drawing of the unit.
  Use a proper sealing compound complied with the requirements of local codes and rules applicable to the current installation.

- Return line (steam condensate line or boiler water/ high temperature water):
  a) Condensate line: Determine exact location and size of the condensate port shown on the attached drawing and connect condensate piping to the port and to the system following all applicable codes and rules to avoid creating the excessive back pressure to the unit.

Shutoff valve should be installed on the condensate return line to allow the unit to be isolated from the system.

b) Boiler water and high temperature water return: Determine the exact location and size of the return port shown on the attached drawing of the unit. Shutoff valve should be installed down stream in the water return line to allow the unit to be isolated from the system.

- Piping the Relief valve.
  All DHT SuperSteam units are equipped with pressure and temperature relief devices.
  The pressure relief valves should be manually operated at least ones a year

WARNING: Make sure that the pressure relief valve and steam purge valve is piped to a proper drain per instructions. Scalding injury and/or water damage can occur from either the manual lifting of the lever or the normal operation of the valve if it is not piped to a proper drain. Insure that the pressure relief valve piping is of the proper material and rating for the temperature and pressure of the system and that it is secured to prevent possible injury. If the valve fails to flow water or reseat, consult the factory.

Connecting Electric Devices

Consult the wiring diagram or the installation instructions contained in the Installation Manual for the component, for specific wiring instructions.
All power connections should be performed by trained, certified electricians.

Connecting Pneumatic Devices

DHT SuperSteam units can be equipped with pneumatically or electrically activated control valves. In most case they require instrument air with pressure ranges from 15 to 30 psi. Consult the supplied drawings and specific installation and operation manuals for each component to determine the requirements for that component.

Note: 1.Assure that the pneumatic feed has been shutdown, and air pressure bled from the system by acceptable methods, before attemting any connections.

2. For all pneumatic connections , the use and/or type of join compound or sealer on the joint should be determined by referring to local codes, accepted practices, or the requirements of the installing contractor.

Connecting the Drain / Blowoff Line

DHT, Inc. Unfired Steam generators are equipped with a drain blowoff line. Each generator has one or more manual blowoff valves connected to the bottom of the vessel.

The blowoff from these valves is at the pressure and temperature of the generated steam and can cause severe injury or death if not properly piped. It is recommended that the blowoff lines be connected to a DHT blowoff (CBO) tank/practices, or the requirements of the consulting engineer.

Note: 1The blowoff from the unfired steam generator can flash to steam when introduced to atmospheric pressure.

Some unfired steam generators are equipped with automatic blowoff valves. The blowoff from these valves should also be piped to the blowoff tank/condensate cooler as previously described.

The level controller line will have a blowoff valve at the low point for blowing off the level control piping. This valve should also be piped to the blowoff tank/condensate cooler as previously described

Completing Installation:

Installation of the DHT Unfired Steam Generator is now complete. All documentation supplied with the unit should be passed along to maintenance personnel for future reference.

Connecting the Drain / Blowoff Line

After all installation procedures have been completed, and all clean steam, feed water, energy source, pneumatic joints, and power connections have been double checked the units ready for operation. As a precaution, it is strongly suggested that the following startup and shutdown procedures be followed:

Startup Procedures:

1. Assure that all manual shutoff valves on clean steam, feed water, energy source and pneumatic lines are closed.
2. Because the unit is equipped with a level controller, the power and pneumatic (instrument air) sources should be turned on to allow the controls to regulate filling operations.
3. Slowly open the manual shutoff valve on the feed water inlet line, checking to assure that there are no leaks at the valve or any joints. During initial filling hold the pressure relief valve open to allow air to bleed out of the tank. This will speed the filling process.

4. The filling process should stop automatically when the correct water level has been reached. This can be verified via a gauge (level) glass located in the water column of the level controller. The filling process should stop when water is visible in approximately the bottom one-third (1/3) of the gauge glass.

If the filling process stops before water is visible in the gauge glass, or before it fills the bottom third of the gauge glass, consult page 34 of this manual for instructions. If the filling process does not stop by the time one-half (1/2) of the gauge glass is filled, shut off the feed water control valve, and turn off the power and instrument air source. After turning off the feed water, power, and instrument air, consult this manual for instructions.

If the unit has filled to the correct level, proceed to the next step.

5. Adjust the operating pressure control to the desired operating pressure. See the Submittal Sheet and the operating pressure control component manual, included with the unit, for the exact location of the control and detailed adjusting procedure.
6. Set the high pressure limit at five to ten pounds per square inch (5 to 10 psi) above the desired operating pressure. See the Submittal Sheet and the high pressure control manual, included with the unit for the exact location and detailed adjusting procedures.
7. Open the steam condensate return valve or boiler water/high temperature water return valve.
8. Slowly open the manual shutoff valves on the power source inlet

***Note: This procedure is similar for both boiler water or high temperature water energy sources.**

***Note: Steam, boiler water or high temperature water present situations that can be very dangerous because of the high temperatures and pressures. Use common sense and follow all accepted and recommended procedures when performing installation, operation, and maintenance procedures, to avoid possible injury or death.**

9. If no leaks are found, slowly continue to open the manual shutoff valves on the power source inlet and clean steam outlet.

10. As the unit is initially heating the water and creating clean steam, carefully reinspect the feed water inlet, clean steam outlet, power source inlet (steam, boiler water, or high temperature water), and condensate return lines and joints for signs of leakage.
11. As unit approaches the desired operatig pressure, check that the pressure within the unit is within the desired range. If necessary, readjust the pressure control valve. See the Submittal Sheet and the pressure control valve component manual, included with the unit, for the exact location of the valve and detailed adjusting procedures.
12. After the unit has reached operating pressure, reinspect all joints for signs of leakage. In addition, check all gauges and controls to verify that the clean steam and energy source pressures are within design specification.
13. The unit is nor ready for normal operation.

Shutdown Procedures:

1. Close all valves in the energy source inlet line (steam, boiler water or high temperature water).
2. Turn off all power to the electric control, if so equipped.
3. Turn off the pneumatic (instrument air) source.
4. When possible, relieve the pressure from the energy source line (steam, boiler water, or high temperature water), between the shutoff valve and the unit.
5. Close all remaining valves in the system in this order.
   - the clean steam outlet line.
   - the feed water inlet line; and
   - the condensate return line (or boiler/high temperature water return line).
6. Relieve the pressure within the unit by means of the pressure relief valve and vent system.
7. After the system has cooled, drain the unit by opening the tank drain valve and holding the pressure relief valve in the open position. This will prevent the formation of a vacuum and increase the drainage flow.
8. Proceed with the required maintenance or repairs.
9. After performing the required maintenance or repairs, return the unit to operation by following the startup procedures

Daily Operation – Standard Unfired Steam Generator

The clean steam and energy source pressures should be checked at the respective pressure gauges **at least twice a day.**

Depending on the options purchased with your DHT Unfired Steam Generator, two (2) additional procedures may be required on a daily basis; blowdown and feed water makeup. If the unit has been equipped with an Automatic Blowdown Timer and TDS Sampling System, these procedures are automated and need not be carried out by operating personnel.

Blowdown

DHT International, Unifired Steam Generators are equipped with a rain/blowoff line. Each generator has opne or more manual blowoff valves connected to the bottom of the vessel. The blowoff from these valves is at the pressure and temperature of the generated steam and can cause severe injury or death if not properly piped. It is recommended that the blowoff line be connected to an DHT blowoff tank/condensate cooler before being discharged to drain. Check with local codes, accepted practices, or the requirements of the consulting engineer.

Note: The blowoff from the unfired steam generator can flash to steam when introduced to atmospheric pressure.

Some unfired steam generations are equipped with automatic blowoff valves. The blowoff from these valves should also be piped to the blowoff tank/condensate cooler as previously described.

The level controller line will have a blowoff valve at the low point for blowing off the kevek control piping. This valve should also be pipped to the blowoff tank/condensate cooler as previously described.

The buildup of scale and dirt within the unit can effect operation and shorten the life of the unit. The unit should be blown down a minimum of once a day. To blowdown the unit:

1. Slowly open the blowdown valve located on the bottom of the unit.

Steam and high temperature water present situations that can be very dangerous because of the high temperature and pressures. Use common sense and follow all accepted and recommended procedures when performing blowdown activities. Failure to do so could result in possible injury or death.

2. Observe the stream of water exiting the blowoff tank / condensate cooler. If scale or dirt is evident in the stream, allow the unit to continue to drain until the water runs clear.
3. Close the blowdown valve.
4. If the unit is not equipped with an automatic feed water makeup system, follow the procedure detailed below to restore the desired water level within the unit. If the unit is equipped with an automatic feed water makeup system, the water level within the unit will automatically return the proper level. The water level can be checked via the gauge glass located on the water column of the level controller.

The frequency of necessary blowdown is directly effected by the minerals, chemicals, and containments contained in the feed water. **Depending on the water, the blowdown interval may need to be altered (either more or less frequently) for each site.**

Feed Water Makeup:

DHT, Inc., Unfired Steam Generators are equipped with a level controller which will activate a feed water valve or feed water pump to maintain the correct water level in the generator. The level controller will feed water to the generator when the level falls to a present level and will stop feeding water when the water level reaches a higher preset point. Normally there is a one to one and a half inches (1”-1/2”) water level change in the fill cycle.

The level controller also has a low water cut off position which will activate if the water falls approximately one (1”) below the water fill position. If a low after condition occurs, the control valve for source steam will be closed and if furnished, the alarm will sound.

Steam and high temperature water present situation that can be very dangerous because of the high temperatures and pressures. Use common sense and follow all accepted and recommended procedures when examining water level. Failure to do so could result in possible injury or death

Note: As the feed water level is being raised, pressure may be released from the pressure relief valve to the atmosphere.

The feed water level should be checked a minimum of twice a day.

Daily Operation – Unfired Steam Generator with Optional Equipment

No matter what optional equipment was included with the unit, the clean steam and energy source pressures should be checked at the respective pressure gauges **at least twice a day.**

The optional equipment available with DHT Unfired Steam Generator includes:

Alarm Bell;
Remote Control;
Automatic Blowdown Timer; and/or
Automatic Blowdown conductivity controlling System

The following is a short description of their function.

Alarm Bell:

The alarm bell circuit sounds an alarm bell if the water level drops below a set level or if the pressure within the system exceeds the set limit. The alarm bell itself can be turned off, but a red warning light will remain lit until the detected condition is remedied.

Remote Control

The Unfired Steam Generator can be filled with a remote control that typically would activate or deactiviate the solenoid controlling the control valve. This in effect would turn the unit on or off.

Automatic Blowdown Timer

The automatic blowdown timer is a seven (7) day, twenty-four (24) hour timer, by which the blowdown schedule can be set. It can be set in different depending on system requirements.

Automatic Blowdown TDS Sampling System

The Automatic Blowdown Automatic Blowdown conductivity controlling System serves two (2) purposes. First, it acts as a normal Automatic Blowdown Timer. Second, it samples the blowdown water and measures the level of solids (scale, dirt, chemicals, etc.) contained in the blowdown water. If excess amounts of solids are detected, the system will keep the blowdown valve open until the level of solids detected in the water is within acceptable levels.

As can be seen from the proceeding descriptions, the optional equipment available can directly affect the normal daily operation of the unit by automating many of the tasks.

Parts List

Replaceable Parts List

The following is a list of parts that are generally replaceable , by trained/certified personnel, on DHT, Inc., Unfired Steam Generators. The replaceable parts may vary, depending on the unit and the particular design specifications in which the unit was constructed. If there are questions concerning the replaceable parts for the unit, refer to the original design specifications, or contact DHT, Inc.

Please have the unit's model and serial number available when contacting DHT, Inc.

Replaceable Parts

DHT, Inc. Unfired Steam Generators – Vertical and Horizontal

Note: Replaceable Parts may vary depending on design specification of the unit.

Control Valve – Pressure
Gaskets- Coil
Heat Exchanger Coil
Level Controller
Pressure Gauge – Clean Steam
Pressure Gauge – Energy Source Steam
Relief Valve – Pressure
Solenoid Safety System
Strainer

Trap – Auxiliary
Trap – Main

Suggested Spare Parts

For One (1) Year of Duty
Because of the built-in quality and long life of DHT Unfired Steam Generator, there are no spare parts suggested for stocking during the first year of service.

For One (1) Year of Duty
It is recommended that the user stock a replacement heat exchanger coil unit and gaskets for possible replacement during the first five (5) years of duty. If suggested maintenance procedures are performed, the heat exchanger coil should not need to be replaced during the first five (5) years of duty.

For the replacement heat exchanger coil model number, refer to the nameplate mounted on the jacket of the unit.

Ordering Information

All replacement parts for DHT Unfired Steam Generators can be ordered directly from:

Diversified Heat Transfer, Inc,
1710 Flushing Avenue
Ridgewood, NY 11385
Phone: (800) 221- 1522
Phone: (718) 386-6666
Fax: (718) 386-7809

Note: Replacement parts can also be ordered through your authorized sales agent.

Please included the model and serial number of the unit for which the parts are being ordered. If ordering by phone, please have this information redily available.

Inspection

The following table summarizes the recommended time intervals fro inspections of the Unfired Steam Generator, components, feed water inlet, clean steam outlet, energy source lines (steam, boiler water, or high temperature water), and power and pneumatic connections.

Recommended Inspections

Time Interval

To Be Inspected	Per Manu. Specs.	Daily	Weekly	Monthly	Quarterly	Semi-Annually	Annually	Bi Annually
Blowdown		✓ **Minimum**						
Control Valves-Pressure	✓							
Feed Water Level		✓ **Minimum**						
Gauges-Pressure					✓			
Heat Exchanger Coil & Gaskets								✓
Level Controller	✓ **Minimum**							
Lines-Inlet, Outlet & Return					✓			
Pneumatic Connections					✓			
Pressure-Clean Steam & Energy		✓ **Minimum**			✓			

Source								
Pressure Relief Valve	✓							
Shutoff Valves- Manual								
Solenoid Safety System						✓		
Strainers					✓			
Traps- Main & Auxiliary							✓	

If any problems are detected during inspections, refer to either the Trouble shooting or Maintenance sections of this manual for specific action and instruction.

Troubleshooting

The following table summarizes problems that may be encountered over the life of an DHT Unfired Steam Generator, and the procedures to remedy those problems. The left-hand column lists the symptoms. The remaining columns are suggested procedures or "remedies" that should be followed to identify and correct the problem. If a "✓" appears I a remedy column, the corresponding procedure(s) should be followed to identify and correct the problem.

Symptom	**Probable Cause and Remedy#**										
	1	2	3	4	5	6	7	8	9	10	11
Unfired Steam Generator does not maintain the required pressure at the rated capacity	✓	✓	✓			✓	✓		✓	✓	
Feed water level incorrect or inconsistent											✓
Outlet pressure is too high.	✓		✓		✓		✓				
Outlet pressure fluctuates widely.		✓	✓		✓		✓		✓		
Excess or insufficient condensate (steam, boiler water, or high temperature water) being returned from the unit.			✓								
Steam being discharged into the condensate drain										✓	
Pressure relief valve "pops".					✓		✓	✓			
Unfired Steam Generator shuts down at or too close to (above or below) the design clean steam outlet pressure.								✓			
A loud banging in the Unfired Steam Generator, primary piping, or condensate / water return piping (not to be confused with a normal clicking noise made during operation).			✓	✓							

Probable Cause and Remedy

1. The pressure gauge is not correctly sensing the clean steam pressure.

    - Check the clean steam pressure with a pressure gauge that is k known to be correct. Replace the pressure gauge if it is found to be incorrectly sensing the clean steam pressure.

2. Inlet energy source pressure is too low.

    - Check the primary energy source pressure gauge. If the reading is low, adjust the inlet pressure to meet the design requirements. If there is a restriction in the primary energy source line, the gauge reading will d drop excessively when the generator calls for full energy, even though the pressure seems to be normal during light demand. If the primary pressure is correct, its pressure gauge reading should reach design pressure for energy source in the coil as the pressure in the unfired steam generator approaches shutoff.

3. The condensate/water return piping has not been installed properly, allowing the condensate/water to drain freely (by gravity); the condensate/water drain line is restricted; or the condensate/water check valve is leaking or has failed.

    - Reconfigure the condensate/water return piping and check valve to allow for proper drainage. Check to assure that there is not restriction in the condensate/water drain line. Replace the check valve is it is leaking or has failed. Also, check to assure that there is no restriction is in the condensate / water drain line.

4. Primary / inlet steam line is not properly trapped (steam as energy source only).

    - Reconfigure the primary/inlet steam line to allow main and auxiliary (drip) traps to function properly.

5. The primary / inlet pressure control valve is not closing properly.

    - See the adjustment and testing instructions contained in the supplied Installation / Operation Manual for the specific temperature control valve installed on the unit. Replace the value if necessary. (Reference replacement procedure on page 40.)

6. The primary / inlet pressure control valve is not opening properly.

   - See the adjustment and testing instructions contain in the supplied Installation / Operations Manual for the specific temperature control value installed on the unit. Replace the valve is necessary. (Reference replacement procedure on page 40.)

7. The energy source pressure control system is not operating properly.

   - See the adjustment and testing instructions contained in the supplied Installation/Operations Manual for the specific pressure control system installed on the unit. Replace the valve if necessary. (Reference replacement procedure on page 40.)

8. The over-pressure limit system is out of adjustment, or some component of the system has failed.

   - Check the individual components of the system and repair or replace the failed component(s) as necessary.

9. There is a leak in the heat exchanger coil or the condensate / water return line causing water to leak from the tank or energy source systems.

   - To verify the existence of a leak, shut off the primary energy source to the unit and carefully break a connection in the condensate/water return line.

   CAUTION: The system still contains the primary energy source, possibly under pressure, and could present a serious potential for injury. Use extreme caution when breaking any connection in the system.

Energy source steam condensate or boiler / high temperature water will drain from the coil initially, but the flow should stop after a short period of time. It the flow continues, water is leaking from the tank into the coil. Disassemble, inspect, repair (if possible), or replace the heat exchanger coil and reassemble the unit. (Reference heat exchanger coil replacement procedure on page 30.)

10. The heat exchanger coil is heavily scaled or damaged.

- Call DHT or your authorized representative, for instructions on repair or replacement. Refer to the nameplate for the model and serial numbers of the unit and heat exchanger coil. **Include these numbers I n all correspondence.**

11. The level controller is not functioning correctly or the floats within the controller have not retained their original position.

- Shut down the system following the shutdown procedures on pages 18 & 19. Follow the maintenance procedures on page 34 to remove the level controller and to check for correct float positioning. Readjust the floats if they are determined to be out of position, or replace the level controller if found to be defective.

Maintenance

The information contained in this section will detail service and maintenance procedures for the inspection and replacement of the components of DHT Unfired Steam Generators. Remember, this manual serves all DHT Unfired Steam Generators. Therefore, the maintenance procedures may be general in some instances. If there are any questions concerning maintenance procedures that are not clearly explained in this manual contact DHT, Inc. Be sure to have the model and serial numbers of the unit and heat exchanger coil available before making contact.

Note: Many of the maintenance procedures detailed in this section will require the unit to be taken off-line before the procedure is performed; and put back online after the procedure is completed. It is recommended that the maintenance personnel performing these procedures review the startup and shutdown procedures, detailed on pages 17 and 19 of this manual, before attempting any maintenance procedure.

Any component(s) directly connected or linked to the component being replaced should carefully be examined before maintenance procedures are started. If any of the related components show signs of wear or improper operation, they should be considered for replacement at the same time.

Power Connections – Rewiring:

If any of the power connections must be rewired at the electrically activated controls or junction boxes, follow the steps listed below:

The combination of electricity, steam, and water can pose a ***very dangerous situation***. Turn off/disconnect all electric power before attempting any maintenance procedure..

1. Follow Steps 1 through 6 of the shutdown procedure (pages 18 & 19) to take the unit off-line before attempting any electrical service.

2. After assuring the power has been turned off, disconnect and rewire the electrical connection in question.

3. Turn the power on the check that the component that has been rewired is functioning properly.

4. Follow the startup procedure o n pages 17 & 18 of this manual to return the unit to operation.

Pneumatic (instrument Air) Connections- Refitting:

If any of the pneumatic (instrument air) connections must be refit at the pneumatically activated controls, follow the steps listed below.

Instrument air, at pressures as high as 150 psi, can be required pneumatically activated controls. Air pressure at this level can pose a very **dangerous situation.** Assurance that the air source has been shutdown and that the line pressure has been bled before breaking any pneumatic connection.

1. Follow Step: 1 through 6 of the shutdown procedure (pages 18 & 19) to take the unit off-line before attempting pneumatic service.

2. After assuring the air source has been turned off, break and redo the pneumatic connections in questions.

3. Turn the air supply on and check that the component that has been reconnected is functioning properly.

4. Follow the startup procedure on pages 17 & 18 of this manual to return the unit to operation.

Heat Exchanger Coil and Gasket – Inspection and Replacement

The "U-Bend" heat exchanger coil is the heart of DHT Unfired Steam Generators. It should be removed and inspected every two (2) years. There are two (2) gaskets, one (1) between the tube face of the coil and the flange welded to the tank, and one 91) gaskets with a divider to fit between the head and the tubesheet.

Clean steam and energy source steam, boiler water, or high temperature water present situation that can be **very dangerous** because of the high temperatures and pressures. To avoid possible injury or death, use common sense and follow all accepted and recommended procedures when performing installation, operation, and maintenance procedures.

The combination of electricity, steam, and water can pose a very dangerous situation. Turn off / disconnect all electric power before attempting any maintenance procedures.

1. Follow Steps 1 through 7 of shutdown procedure (pages 18 & 19) to take the unit off-line before attempting to remove and inspect the heat exchanger.
2. Assure that the energy source, condensate / water return line, feed water inledt, and clean steam outlet have been shut off; that the pressure has been bled from both the clean steam and energy source systems; that the tank has been completely drained; and that the steam, water, all components, and surface have cooled.
3. Carefully break the join between the heat exchanger coil head and the small line leading to the energy source pressure gauge.
4. Carefully break the connections between the heat exchanger coil head and the energy source inlet and outlet lines.

Note: It may be necessary to break the lines at a second location, and for the lines to be rotated to allow clearance for the heat exchanger coil to be removed from the tank. If it is necessary, care should be taken to insure that in-line components are not damaged.

5. Remove the bolts and nuts that secure the heat exchanger coil head to the tank, and remove all bolts from the unit.
6. Carefully separate the heat exchanger coil head from the mounting flange and remove the coil assembly from the tank.

   There may still be residual steam condensate (or boiler / high temperature eater) in the coil that can run out during removal of the coil from the tank. If sufficient time has not been allowed for cooling, this residual condensate/water could resent a **danger of injury.**

7. Examine the heat exchanger coil for scale buildup and signs of leakage. If no leakage is detected, carefully clean the excess scale from the coils and prepare the heat exchanger coil for installation. If leakage is detected between the coils and water in the tank, either repair the leaking coil(s) or replace the heat exchanger coil.
8. Remove the old gaskets and completely clean the mating surfaces. Install the two 92) new gaskets: one (1) between the tube face of the coil and the flange welded to the tank, and one (1) gasket with a divider to fir between the head and the tubesheet.
9. Carefully insert the heat exchanger coil into the tank. The coil should be installed so that the divider in the head lines up with the coil, and that the divider is parallel to the horizon.
10. After assuring that the heat exchanger unit is correctly aligned, clamp the flanges together and proceed with the torque procedure detailed below.

Note: Bolts used to secure the heat exchanger unit in DHT Unfired Steam generators are rated as either Grade A or Grade 5. Grad A bolts have no marking on the had. Grade 5 bolts are designed by three (3) slash marks on the had(///).

a. Lubricate the bolt threads and the nut faces with a suitable lubricant.
b. Insert the bolts through the flanges, then start and finger tighten the nuts.
c. Number all bolts so that torquing requirements can be followed.

Note: Appendix A contains drawings depicting the typical flange configurations (number of bolts, location, tightening sequence, etc.) for DHT Unfired Steam generators. Reference the applicable drawing for the unit being serviced.

d. Apply torque in twenty percent (20%) [1/5]) steps of required final toroque, loading all bolts at each step before proceeding to the next step. The following tables list ANSI approved target torques for both Grade A and Grade 5 bolts. The correct target torque can be determined by the nominal pipe size, number and grade of bolts used to secure the flange, and the size of the bolt used.

Be sure of the bolt grade used in the unit. Do not tighten a Grade 5 bolt to the torque specification of a Grade A bolt, or vise versa. When replacing bolts, be sure to use the same type of bolt and corresponding nuts. Grade 5 bolts can be used in all cases. Grade A bolts can only be used to replace Grade a bolts.

Bolt Torque values
Grade A Bolts

.125" Ring Gaskets ANSI -150# Flanges

Nominal Pipe Size (IN)	Number of Bolts	Size of Bolts (IN)	Grade A Target Torque (FT – LBS)
2”	4	5/8”	96
2-1/2”	4	5/8”	96
3”	4	5/8”	96
3-1/2”	8	5/8”	96
4”	8	5/8”	96
5”	8	¾”	160
6”	8	¾”	160
8”	8	¾”	160
10”	12	7/8”	184
12”	12	7/8”	184
14”	12	1”	250
16”	16	1”	250

Bolt Torque values
Grade 5 Bolts

.125” Ring Gaskets ANSI – 300# Flanges

Nominal Pipe Size (IN)	Number of Bolts	Size of Bolts (IN)	Grade A Target Torque (FT – LBS)
2”	4	5/8”	96
2-1/2”	4	5/8”	96
3”	4	5/8”	96
3-1/2”	8	5/8”	96
4”	8	5/8”	96
5”	8	¾”	160
6”	8	¾”	160
8”	8	¾”	160
10”	12	7/8”	184
12”	12	7/8”	184
14”	12	1”	250
16”	16	1”	250

e. Tighten bolts in the applicable sequential order (0-180◦, 90◦ -270◦, 45◦-225◦, 135◦ - 315◦, etc.) at each step until final target torque is reached (see applicable diagram contained in Appendix A).

f. Use rotational tightening until all bolts are stable at final torque level. Two (2) complete times around is usually required.

11. Reconnect the energy source inlet and clean steam outlet lines to the heat exchanger coil. If these lines were broken at an additional location to allow for removal of the coil, be sure to also tighten those connections. Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractor practices as to the use and/or type of joint compound or sealer at the connections.
12. Reconnect the small line leading to the energy source pressure gauge.
13. Follow the startup procedures (pages 17 & 18) to put the unit back on-line. Carefully check all connections for any sign of leakage.

Level Controller – Inspection and Replacement

The level controller supplies on all Unfired Steam generators controls the level of the water within the unit, assuring that the unit will function safely and effectively. If the level controller must be removed for inspection, adjustment, or replacement, follow the steps detailed below.

Clean steam and energy source steam, boiler water, or high temperature water present situations that can be **very dangerous** because of the high temperatures and pressures. To avoid possible injury or death, use common sense and follow all accepted and recommended procedures when performing installation, operation, and maintenance procedures.

The combination of electricity, steam, and water can pose a **very dangerous situation.** Turn off / disconnect all electric power before attempting any maintenance procedures.

1. Follow Steps 1 through 7 of the shutdown procedure to take the unit off-line before attempting to remove and inspect the level controller.
2. Assure that the energy source, condensate/water return line, feed water inlet, and clean steam outlet have been shut off, that the pressure has been bled from both the

clean steam and energy source systems; that the tank has been completely drained; and that the steam, water, all components, and surfaces have cooled.

3. If equipped, slowly open the tricocks; located on the body of the level controller. Follow accepted practices in opening the tricocks. If not completely drained and bled, steam or boiling water may exit the tricocks.

Note: Throughout the removal and installation process, care should be taken to assure that the water column gauge glass is not damaged or broken.

4. Disconnect the wired leading from the level controller to the junction box at the slide connector.
5. Carefully break the join at the top of the level controller and the top of the tank.
6. With the level controller secured or held in place by an assistant, carefully break the joint at the bottom of the level controller.

Note: It may be necessary to break the lines at a second location to allow clearance for the level controller to be removed from the tank. If it is necessary, care should be taken to insure that in-line components are not damaged.

7. After breaking both the top and bottom joints, continue loosening the connections until the level controller can be removed.
8. Examine the level controller for damage or incorrect positioning of the floats. For the exact procedure for examination or repositioning the floats, refer to the manufacturer's information included with the unit.

   If the unit is fitted with and DHT Level Controller, refer to appendix B of this manual for examination and float repositioning procedures.

9. To install the level controller, align the controller with the feed lines and start the fittings. Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractors practices as to the use and/or type of join compound or sealer at the connections.
10. After assuring that the level controller is correctly aligned, tighten the fittings.
11. Follow the startup procedures (page 17 & 18) to put the unit back on-line. Carefully check all connections for any sign of leakage.

Inlet, Outlet, and Condensate / Water Return Line and Manual Shutoff valves – Replacement

If any of the inlet, outlet, return lines, or shutoff valves are damaged and must be replaced, follow the steps outlined below.

The combination of electricity, steam, and water can pose a ***very dangerous situation.*** Turn off/disconnect all electric power before attempting any maintenance Procedures.

1. Follow Steps 1 through 7 of the shutdown procedure (pages 18 & 19) to take the unit off-line before attempting to replace damaged lines or shutoff valves.

   While it might seem feasible to replace inlet, outlet, condensate / water return line, and shutoff valves without shutting down the entire unit, ***it is not advised.*** Unless the unit is completely shutdown, and the clean steam and energy source are isolated from the system, failure of a manual shutoff valve during the replacement process could result in serious injury.

2, Assure that the energy source, condensate/ water return line, feed water inlet, and clean steam outlet have been shut off; that the pressure has been bled from both the clean steam and energy source systems; that the tank has been completely drained; and that all components and surfaces have cooled.

3. Carefully break the joint between the unit and the line or valve to be replaced.
4. Remove the section of line or valve to be replaced.
5. Replace the damaged section of line or valve.
6. Reconnect the line of valve to the unit. Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractor practice4s as to the use and/or type of join compound or sealer at the connections.
7. Follow the startup procedures (pages 17 & 18) to put the unit back on-line. Carefully check all connections for any sign of leakage.

Pressure Gauge (Energy Source) – Replacement

If the pressure gauge for the energy source does not function correctly and must be replaced, follow the procedures outlined below.

The combination of electricity, steam and water can pose a ***very dangerous situation.*** Turn off / disconnect all electric power before attempting any maintenance procedure.

1. Follow Step 1 through 7 of the shutdown procedure (pages 18 & 19) to take the unit off-line before attempting to replace the energy source pressure gauge.

2. Carefully disconnect the small line connecting the pressure gauge with the head exchanger coil head from both the head and the gauge.
3. Remove the gauge from its mounting.
4. Mount the new gauge.
5. Reconnect the small line to both the heat exchanger coil head and the gauge. Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractor practices as to the use and/or type of join compound or sealer at the connections.
6. Follow the startup procedures (pages 17 & 18) to put the unit back on-line. Carefully check all connections for any sign of leakage.

Pressure Gauge (Clean Steam) – Replacement

If the pressure gauge for the water tank is not functioning correctly and must be replaced, follow the procedures outlined below.

> The combination of electricity, steam, and water can pose a ***very dangerous situation.*** Turn off/disconnect all electric power before attempting any maintenance procedures.

1. Follow Steps 1 through 7 of the shutdown procedure to take the unit off-lion before attempting to replace the clean steam pressure gauge.
2. Carefully disconnect the small line connecting the pressure gauge with the tank. This line should only be disconnected at the gauge.
3. Remove the gauge from its mounting.
4. Mount the new gauge
5. Reconnect the small line to the gauge. Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractor practices as to the use and/or type of join compound or sealer at the connections.
6. Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

Pressure Relief Valve (Tank) – Replacement

If the water pressure relief valve mounted on the tank is not functioning correctly and must be replaced, follow the procedures outlined below.

> The combination of electricity, steam, and water can pose a ***very dangerous situation.*** Turn off /disconnect all electric power before attempting any maintenance procedure.

1. Follow Steps 12 through 7 of the shutdown procedure (pages 18 & 19) to take the unit off-line before attempting to replace the water pressure relief valve.
2. After assuring that the pressure has been releived4 from the tank, disconnect the vent line leading from the pressure relief valve to atmosphere (usually through the roof) , and via a drip elbow, to drain.
3. Carefully unscrew the pressure relief valve from the port in the tank.
4. Install the new valve by screwing it into the pressure relief valve port in the tank. Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractor practices as to the use of join compound or sealer at the connections.
5. Reconnect the vent line leading from the pressure relief valve to atmosphere and, via drip elbow, to drain.
6. Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

Solenoid Safety System – Inspection and Replacement

The solenoid safety system acts as a fail-safe for DHT Unfired Steam Generators. The system requires power to operate, therefore in the case of a power failure, the system will totally shutdown the unit. If it is mandatory that the unit remain in operation during power failures, it should be wired into the buildings' emergency power system. **Before this is done, it is the duty of the installer/operator to check local codes and requirements to assure that this is an acceptable configuration.**

When power is supplies to the solenoid safety system, the system allows the electrically operated controls to feed water to the system and generate clean steam. The system should be checked semi-annually. (See manufacturer's documentation for the solenoid safety system provided with the unit for specific inspection intervals and test routine). If the system is found to be malfunctioning and must be replaced, follow the procedure outlined below.

Note: The exact location and configuration of the solenoid safety system can vary between units. Se the C.A.D. drawing supplied with the Submittal sheet and design specifications supplied with the unit for the exact placement and configuration.

The combination of electricity, steam, and water can pose a ***very dangerous situation.*** Turn off/ disconnect all electric power before attempting any maintenance procedure.

1. Follow Steps 1 through 7 of the shutdown procedure to take the unit off-line before attempting to replace the solenoid safety system.
2. Carefully disconnect the small line connecting the solenoid safety system to the energy source control valve. This line should only be disconnected at the safety.

3. Carefully disconnect the small line connecting the solenoid safety system to the tank or clean steam outlet line. This line should only be disconnected at the safety system.
4. If the system is electrically activated, turn off the power and disconnect the electric leads from the safety system.
5. If the system is pneumatically activated, turn off the instrument air source and disconnect the pneumatic lines from the solenoid safety system.
6. Remove the solenoid safety system from its mounting.
7. Mount the new safety system.
8. Reconnect the small line from the tank or clean steam outlet line to the safety system. Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractor practices as to the use and/or type of joint compound or sealer at the connections.

Note: For step 8 & 9, the use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

9. Reconnect the small line from the energy source control valve to the safety system.
10. If any were disconnected, reconnect all electric and pneumatic lines and restore power and instrument air to the system.
11. Reference the manufacturer's documentation for the safety system that was supplied with your unit for additional installation / setup instructions.

12. Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

Strainers – Inspection and Replacement

The strainers are installed upstream of the energy source shutoff valve for both the coil and the main traps. These strainers must be blown down periodically (approximately every three (3) to six (6) months) to prevent the build up of any sediment.

The combination of electricity, steam, and water can pose a ***very dangerous situation.*** Turn off / disconnect all electric power before attempting any maintenance procedures.

1. Follow Steps 1 through 7 of the shutdown procedure to take the unit off-line before attempting to replace the energy source pressure gauge.
2. The exact location of the strainers can differ between units. Reference the C.A.D. drawing supplied with the Submittal sheet for the unit to identify the location of the strainers on the unit.
3. Carefully break the line connections on the inlet side of both strainers.
4. Carefully break the line connection on the outlet side of the strainers.
5. Remove and examine the strainers

6. Remove any sediment that is present in the strainers. If they can not be satisfactory cleaned, replace with new strainers.
7. Place the strainers back-in-line in the system..
8. Reconnect the inlet and outlet lines to each strainer. Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractor practices as to the use and/or type of joint compound or sealer at the connections.
9. Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

Pressure Control Valve – Inspection and Replacement

The pressure control valve is installed upstream of the heat exchanger coil and ***must be interlocked*** with the high pressure cutoff solenoid. The manufacturer documentation included with the unit gives specifics for operation and maintenance of the control valve. The Submittal sheet and C.A.D. drawing included with the unit will give the exact location, as well as interlocks with other components. This information should be reviewed before removal/replacement of the temperature control valve.

Steam, boiler water, or high temperature water presents situations that can be ***very dangerous*** because of the high temperatures and pressures. Use common sense and follow all accepted and recommended procedures when performing installation, operation and maintenance procedures to avoid possible injury or death.

The combination of electricity, stem and water can pose a ***very dangerous situation.*** Turn off/disconnect all electric power before attempting any maintenance procedures.

1. Follow Steps 1 through 7 of the shutdown procedure to take the unit off-line before attempting to remove and inspect the temperature control valve.
2. Assure that the energy source, condensate/water return line, feed water inlet, and clean steam outlet have been shut off; that the pressure has been bled from both the steam and energy source systems; that the tank has been completely drained; and that all components and surfaces have cooled.
3. If the pressure control valve is electrically activated, turn off the power and disconnect the leads to the valve.
4. If the pressure control valve is pneumatically activated, turn off the instrument air source, bleed the pressure from the line, and disconnect the lines to the valve.
5. Carefully break the joints between the pressure control valve and feed water valve, solenoid safety unit, and auxiliary trap line.
6. Carefully break the connections between the energy source inlet line and the heat exchanger coil.

NOTE: It may be necessary to break the lines at a second location, and for the lines to be rotated to allow clearance for the temperature control valve to be removed from the system. If is is necessary, care should be taken to insure that-in-line components are not damaged.

7. Remove the pressure control valve from the system.
8. Follow the supplied manufacturer instructions for inspecting the valve. If found to be malfunctioning, replace the valve.
9. Carefully replace the pressure control valve into the system by reattaching it to the energy source inlet line and the heat exchanger coil outlet line. Follow recommendations contained I the manufacturer's documentation, local codes, or accepted contractor practices as to the use and /or type of joint compound or sealer at the connections.
10. Align the valve as it was situated before removal and tighten the connections. If lines were broken at an additional location to allow for removal of the valve, be sure to also tighten those connections.
11. Reconnect the pressure control valve to the feed water valve, solenoid safety unit, and the auxiliary trap line.
12. Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

Traps (Main and Auxiliary) – Replacement (Steam Systems Only)

The main and auxiliary traps are installed upstream of the condensate shutoff valve on units that use steam as the energy source. The traps are designed to maintain the flow of condensate with the rise and fall of the float as changes in condensate level occur within the body of the trap. If the traps are not functioning properly and must be replaced, follow the procedures outlines below.

The combination of electricity, steam, and water can pose a ***very dangerous situation.*** Turn off/ disconnect all electric powere before attempting any maintenance procedures.

1. Follow Steps 1 through 7 on the shutdown procedure to take the unit off-line before attempting to replace the main or auxiliary traps.
2. The exact location of the traps can differ between units. Reference the Submittal sheet and C.A.D. drawing supplied with the unit to identify the location of the traps on the unit.
3. Carefully break the joint on the inlet side of both traps.
4. Carefully break the joint on the outlet side of the traps.
5. Remove and examine the traps.
6. If the traps are not functioning properly, replace them with new traps.

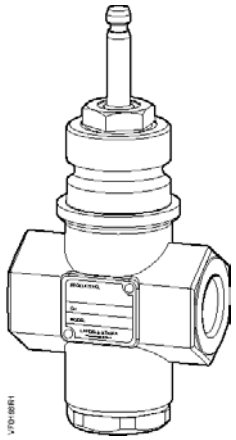
7. Place the traps back in-line in the system.
8. Reconnect the inlet and outlet line to each trap. Follow recommendations contained I the manufacturer's documentation, local codes, or accepted contractor practices as to the use and /or type of join compound or sealer at the connections.
9. Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

SIEMENS

Technical Instructions
Document No. 155-184P25
VF 599-3
August 25, 2009

Flowrite™ 599 Series

Two-Way Valves, 1/2 to 2-inch Bronze Body, ANSI 250



Description	The Flowrite 599 Series two-way valves are designed to work with either a pneumatic or electronic actuator with a 3/4-inch (20 mm) stroke. They are available in ANSI Class 250 for normally open or normally closed action.
Features	• ANSI Leakage Class IV (0.01% of Cv) • Cartridge type packing • Choice of brass or stainless steel trim • Direct-coupled universal bonnet • UF×UF connections available • Choice to two flow characteristics
Application	Flowrite valves are generally recommended for water, steam, and 50% water-glycol solutions.
Product Numbers	See Tables 1 and 2.
Ordering a Valve Plus Actuator Assembly	To order a complete valve plus actuator assembly from the factory, combine the actuator prefix code with the suffix of the valve assembly product number. See *Flowrite Technical Bulletins* (155-772 and 155-776) for complete selection procedure and ordering codes. Valve assemblies can be ordered using the numbers in Tables 1 and 2.

Specifications

	Line size	1/2 to 2-inches (15 to 50 mm)
	Capacity	See Tables 3 through 6 and Figure 3
Material	Body style	Globe style control valve with four connection options See Tables 1 and 2
	Seat style	Single seat, metal-to-metal
	Action	Normally Open (NO) Normally Closed (NC)
	Stem travel (stroke)	3/4-inch (20 mm)
	Valve body rating	ANSI Class 250; see Table 7
	Body	UNS CA 844 bronze
	Body trim	See Tables 1 and 2
	Stem	Stainless steel ASTM A582 Type 303
	Packing	
	Normal duty packing	EPDM O-ring
	Steam packing	Teflon® V-ring
Operating	Controlled medium	Saturated steam, water, 50% water-glycol solutions
	Medium temperature range	
	Normal duty packing	20°F to 250°F (–7°C to 120°C)
	Steam packing	337°F (170°C) maximum
	Maximum inlet pressure	
	Water	See Table 7
	Steam	100 psig (690 kPa)
	Maximum recommended differential pressure for modulating service	

	Brass trim	Stainless steel trim
Liquid	25 psi (173 kPa)	50 psi (345 kPa)
Steam	15 psi (103 kPa)	50 psi (345 kPa)

	Rangeability	>100:1
	Close-off pressures	See Tables 8, 9 and 10 and Figure 4
	Close-off ratings	According to ANSI/FCI 70-2
	Leakage rate	Class IV (0.01% of Cv)
	Flow characteristics	See Tables 1 and 2
	Mounting location	NEMA 1 (interior only)
Miscellaneous	Canadian Registration Numbers	0H7645.5 0C0838.9
	Dimensions	See Tables 11 and 12 and Figure 6
	Valve Weight	See Table 14

Accessories

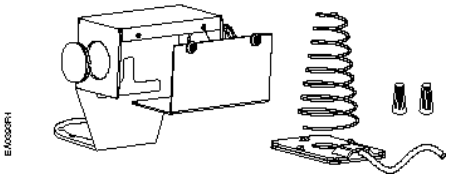


Figure 1. Packing Heating Element For Use with SKD and SQX Actuators.

599-00417 Packing heating element.

The heater allows the stem to move freely in valves that control fluids at temperatures below 32°F (0°C). It reduces ice crystal formation on the stem, which can damage the packing.

Operating Voltage	24 Vac
Heating Output	20W

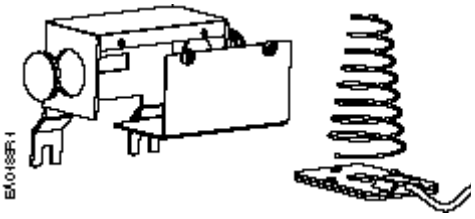


Figure 2. Packing Heating Element For Use with SKB/C and 8-inch Actuators.

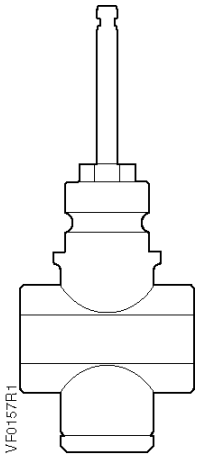
599-00418: Packing heating element.

The element allows the stem to move freely in valves that control fluids at temperatures below 32°F (0°C). It prevents ice crystal formation on the stem, which can damage the packing.

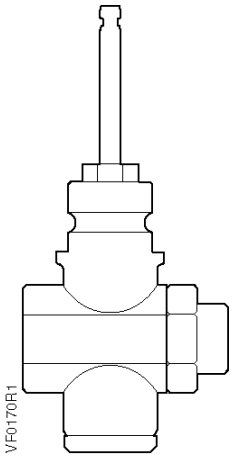
Operating Voltage	24 Vac
Heating Output	20W

Service Kits

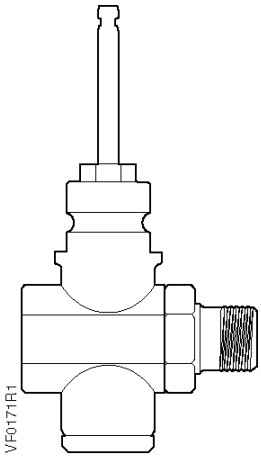
Valve packing kit	
Normal duty packing	599-03390
Steam packing	599-03391
Rebuild/repack kits	See Tables 15 and 16
Sealing rings for union valves (package of 25)	
1/2-inch (15 mm)	599-03394
3/4-inch (20 mm)	599-03395
1 inch (25 mm)	599-03396
1-1/4 inch (32 mm)	599-03397
1-1/2 inch (40 mm)	599-03398
2 inch (50 mm)	599-03399
Union Tailpiece kit (one tailpiece, one union nut, one gasket.)	
1/2-inch (15 mm) male	599-09181
3/4-inch (20 mm) male	599-09182
1 inch (25 mm) male	599-09183
1-1/4 inch (32 mm) male	599-09184
1/2-inch (40 mm) female	599-09185
3/4-inch (20 mm) female	599-09186
1 inch (25 mm) female	599-09187
1-1/4 inch (32 mm) female	599-09188
1-1/2 inch (40 mm) female	599-09189
2 inch (50 mm) female	599-09190



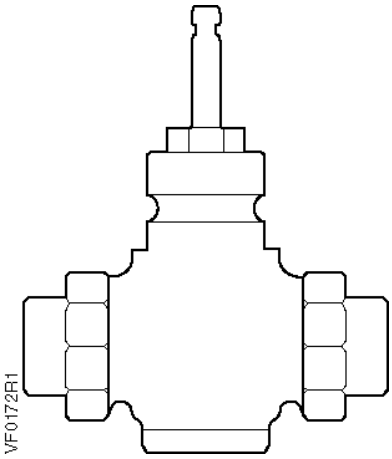
Female NPT x Female NPT FxF



Female NPT x Union Female FxUF



Female NPT x Union Male FxUM



Union Female x Union Female UFxUF

Table 2. Normally Closed Valves.

Flow Rate		Nominal Line Size		Connection	Equal Percentage		Linear	
					Stl. Steel Trim	Brass Trim	Stainless Steel Trim	
Cv	(Kvs)	Inch	(mm)		Normal Duty Packing		Normal Duty Packing	Steam Packing
1	(0.85)	1/2	(15)	FxF	599-03126	599-03180	599-03018	599-03072
				FxUF	599-03135	599-03189	599-03027	599-03081
				FxUM	599-03261	599-03279	599-03225	599-03243
1.6	(1.37)	1/2	(15)	FxF	599-03127	599-03181	599-03019	599-03073
				FxUF	599-03136	599-03190	599-03028	599-03082
				FxUM	599-03262	599-03280	599-03226	599-03244
2.5	(2.15)	1/2	(15)	FxF	599-03128	599-03182	599-03020	599-03074
				FxUF	599-03137	599-03191	599-03029	599-03083
				FxUM	599-03263	599-03281	599-03227	599-03245
4	(3.44)	1/2	(15)	FxF	599-03129	599-03183	599-03021	599-03075
				FxUF	599-03138	599-03192	599-03030	599-03084
				FxUM	599-03264	599-03282	599-03228	599-03246
6.3	(5.43)	3/4	(20)	FxF	599-03130	599-03184	599-03022	599-03076
				FxUF	599-03139	599-03193	599-03031	599-03085
				FxUM	599-03265	599-03283	599-03229	599-03247
10	(8.6)	1	(25)	FxF	599-03131	599-03185	599-03023	599-03077
				FxUF	599-03140	599-03194	599-03032	599-03086
				FxUM	599-03266	599-03284	599-03230	599-03248
16	(13.8)	1-1/4	(32)	FxF	599-03132	599-03186	599-03024	599-03078
				UFxUF	599-03141	599-03195	599-03033	599-03087
25	(21.5)	1-1/2	(40)	FxF	599-03133	599-03187	599-03025	599-03079
				UFxUF	599-03142	599-03196	599-03034	599-03088
40	(34.4)	2	(50)	FxF	599-03134	599-03188	599-03026	599-03080
				UFxUF	599-03143	599-03197	599-03035	599-03089

Table 5. Steam Capacity - Pounds per Hour.

Line Size inches	Inlet Pressure - psig																								
	2		5			10			5			25			50			75				100			
	Pressure Differential - psi																								
	1	2	3	4	5	6	8	10	9	12	15	5	15	20	15	30	32.5	20	30	40	45	30	40	50	57.5
1/2	12.0	16.6	22	25	28	34	38	42	45	50	54	41	65	72	87	115	118	119	141	157	163	162	183	199	209
	19.1	27	35	40	44	54	61	67	72	80	86	65	104	116	139	183	188	109	225	251	261	260	292	318	334
	30	42	55	62	69	85	96	104	112	125	135	101	163	181	217	287	294	296	351	392	408	406	457	497	522
	48	67	88	100	110	136	153	167	179	200	216	162	261	289	348	459	471	474	562	627	653	650	731	796	835
3/4	75	105	138	157	174	213	241	263	282	316	341	255	411	455	548	722	742	747	886	988	1029	1023	1152	1253	1315
1	120	166	219	250	275	339	382	417	447	501	541	405	653	723	870	1147	1178	1186	1406	1568	1633	1624	1828	1989	2088
1-1/4	191	266	351	400	441	542	611	667	716	801	865	648	1044	1156	1392	1835	1884	1897	2249	2509	2612	2599	2925	3182	3340
1-1/2	299	416	549	625	689	847	955	1042	1118	1252	1351	1013	1632	1806	2175	2867	2944	2964	3515	3920	4081	4061	4570	4972	5219
2	478	666	878	1000	1102	1356	1529	1667	1789	2003	2162	1620	2611	2890	3480	4587	4710	4743	5624	6272	6530	6497	7311	7956	8350

Table 6. Steam Capacity - Kilograms per Hour.

Line Size mm	Inlet Pressure - kPa											
	100			150			200			500		
	Pressure Differential - kPa											
	10	20	50	15	30	75	20	40	100	50	100	250
15	6.04	8.54	13.50	9.07	12.8	20.2	12.11	17.13	27.08	30.3	42.9	67.8
	9.66	13.6	21.61	14.5	20.5	32.4	19.37	27.40	43.32	48.51	68.60	108.47
	15	21	34	23	32	51	30	43	68	76	107	169
	24	34	54	36	51	81	48	69	108	121	172	271
20	38	54	85	57	81	128	76	108	171	191	270	427
25	60	85	135	91	128	203	121	171	271	303	429	678
32	97	137	216	145	205	325	194	274	433	485	686	1085
40	151	214	338	227	321	507	303	428	677	758	1072	1695
50	242	342	540	363	513	812	484	685	1083	1213	1715	2712

Table 7. Body Temperature-Pressure Rating.

Valve Body	Temperature °F	°C	Pressure psig (kPa)
			ANSI Class 250
Bronze	–20 to +150	(–30 to 66)	400 (2758)
	+200	(93)	385 (2655)
	+250	(121)	365 (2586)
	+300	(149)	335 (2300)
	+350	(177)	300 (2068)

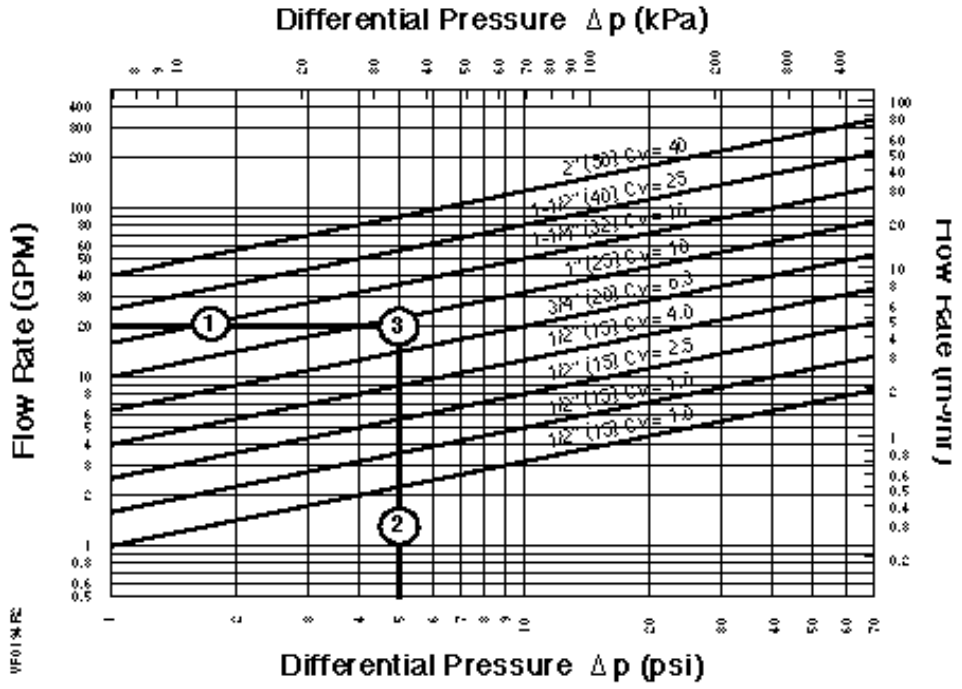


Figure 3. Water Capacity Graph.

Selection Example

Select a valve given:

1. Required flow = 20 gpm.
2. Desired pressure drop = 5 psi.
3. Select a 1-inch (25 mm) valve, Cv 10.

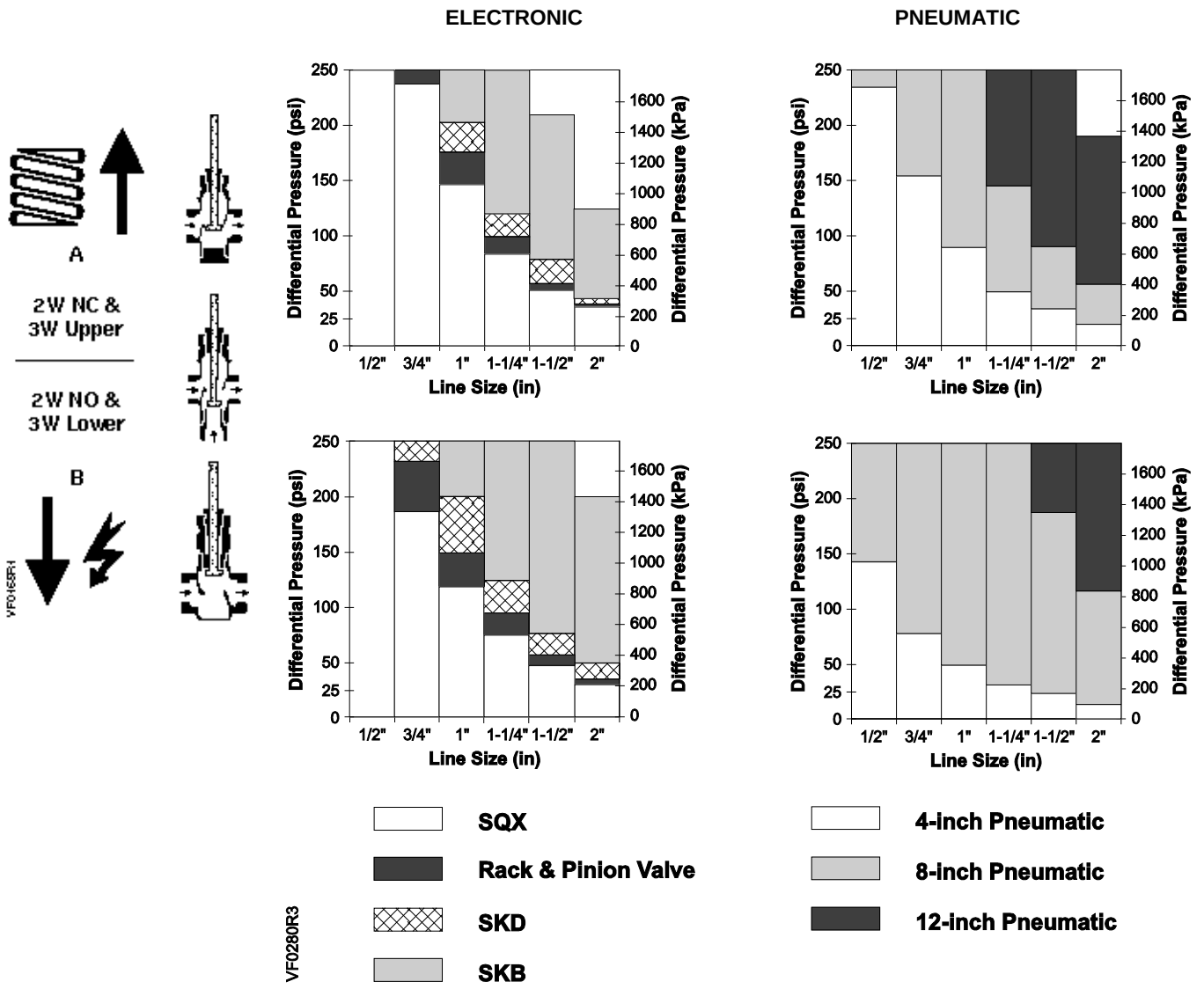


Figure 4. Close-off Pressures.

Operation

Figure 5 shows the normally open valve in the open or full flow position and the normally closed valve in the closed or zero flow position. The actuator spring provides the necessary force to hold the stem in the raised or normal position.

In the event of power failure, a spring return actuator returns the valve to its normal position. Non-spring return actuators will hold the last commanded position. See the *Technical Instructions* of the various actuators for additional information.

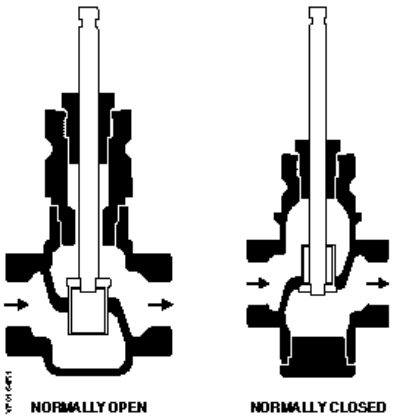


Figure 5.

Sizing

The sizing of a valve is important for correct system operation. An undersized valve will not have sufficient capacity at maximum load. An oversized valve can initiate cycling and the seat and throttling plug can be damaged because of the restricted opening. Correct sizing of the control valve for *actual expected conditions* is considered essential for good control.

The following variables must be determined:

- The medium to be controlled, such as steam, water, etc.
- The maximum inlet temperature and pressure of the medium at the valve.
- The pressure differential that will exist across the valve under maximum load demand.
- The maximum capacity the valve must deliver.
- The maximum line pressure differential the valve actuator must close against.
- See the *Control Valve Selection and Sizing (AB-1*) section *of HVAC Systems/Controls Reference Data* (125-1853) for further recommendations.
- See Tables 3 through 6 for valve capacities.

Mounting and Installation

- Install the valve so that the flow follows the direction of the arrow indicated on the valve body.
- For best performance, install the valve assembly with the actuator above the valve body. The valve and actuator can be installed in any position between vertical and horizontal. Siemens Building Technologies does not recommend installing the valve assembly so that the actuator is below horizontal or upside down.
- Allow sufficient space for servicing the valve and actuator. See Table 12 for valve body dimensions. See Figure 6 and Table 11 for dimensions of the service envelope recommended around the actuator.

NOTE: Instructions for field mounting an actuator, wiring diagrams, and start-up are covered in the Technical Instructions and Installation Instructions for each actuator.

Dimensions, continued

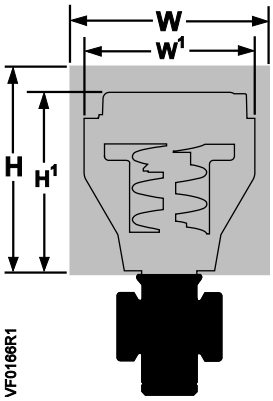


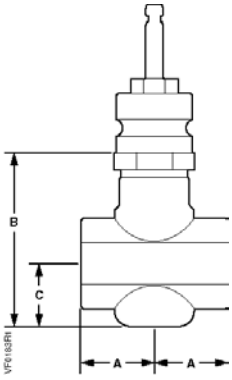
Figure 6.

The letters in Figure 6 refer to actuator and service envelope dimensions in Table 11. See Table 12 for valve body dimensions.

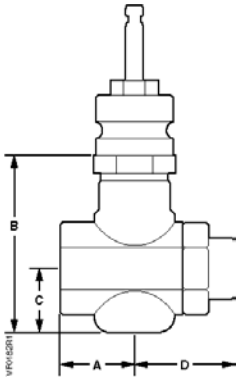
Table 10. Dimensions of the Actuator and Recommended Service Envelope. Dimensions in Inches (Millimeters).

Actuator	Actuator Prefix Code	Actual Height of Actuator H1	Service Height H	Actual Width or Diameter of Actuator W1	Service Width W
4-inch Pneumatic	268, 269 270	5-3/4 (146)	14 (350)	5-1/2 (137) diameter	18 (450)
8-inch Pneumatic	277, 278 283, 284	14-1/8 (359)	26 (660)	8-3/4 (222) diameter	21 (533)
12-inch Pneumatic	279, 285	17-7/8 (454)	30 (762)	15-1/8 (384) diameter	27 (686)
SQX	271, 272 273	8-7/8 (226)	17 (430)	5-17/32 (140) Width 4-3/8 (111) Depth	13-1/2 (340)
Rack and Pinion	298, 299	14-1/2 (368)	24-1/2 (622)	5 (127) Width* 5-1/8 (131) Depth	13 (331)
SKD	274, 275 276	11-13/16 (300)	19-3/4 (500)	5 (127) Width 6-5/8 (169) Depth	14-1/2 (360)
SKB	289, 291, 290	14-3/4 (375)	22-3/4 (578)	7 (178) Width × 8-15/16 (226) Depth	25 (635)

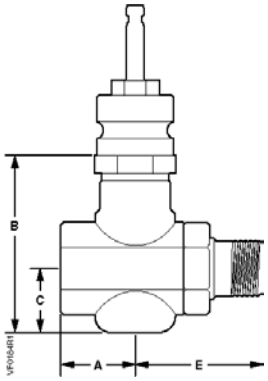
Dimensions, Continued



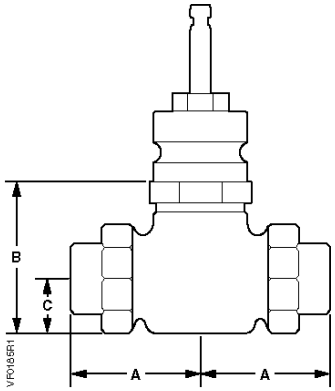
Female NPT by Female NPT FxF



Female NPT x Union Female FxUF



Female NPT x Union Male FxUM

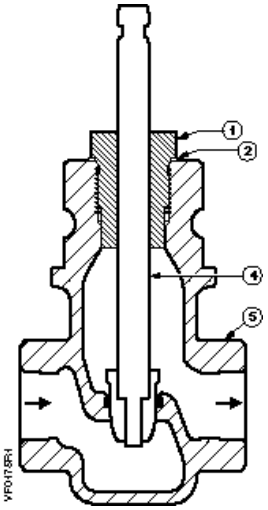


Union Female x Union Female UFxUF

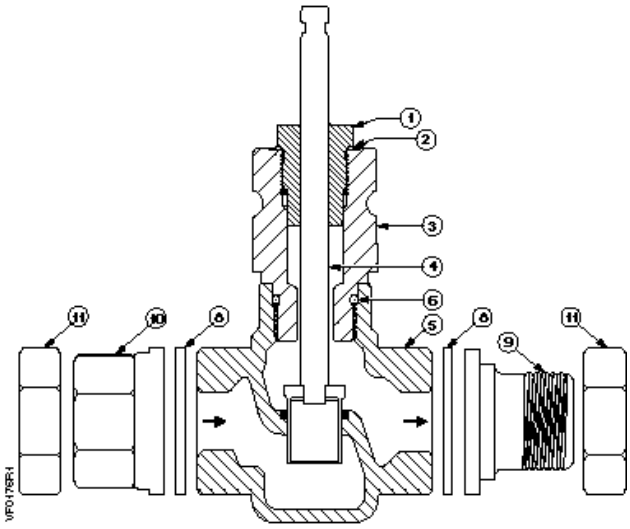
Table 11. 2-Way Valve Dimensions in Inches (Millimeters).

Valve Action	Valve Size	A		B	C	D	E
		FxF, FxUF, and FxUM	UFxUF			FxUF	FxUM
Normally Open	1/2 (15)	1-7/16 (36)	—	2-15/16 (74)	1-1/4 (31)	2-5/16 (59)	2-7/8 (73)
	3/4 (20)	1-11/16 (43)	—	3-15/16 (99)	1-7/16 (36)	2-5/8 (67)	3-3/16 (81)
	1 (25)	2 (50)	—	3-3/4 (96)	1-1/4 (32)	3 (76)	3-1/2 (89)
	1-1/4 (32)	2-1/2* (62)*	3-3/4 (95)	4-1/4** (108) **	2** (51) **	—	4-3/8 (111)
	1-1/2 (40)	2-9/16* (65)*	3-15/16 (99)	4-1/4** (108)**	2** (51)**	—	—
	2 (50)	3-1/8* (79)*	4-9/16 (115)	4-9/16** (116)**	2-1/4** (57)**	—	—
Normally Closed	1/2 (15)	1-7/16 (36)	—	3-13/16 (97)	2-3/16 (55)	2-5/16 (59)	2-7/8 (73)
	3/4 (20)	1-11/16 (43)	—	3-13/16 (97)	2-3/16 (55)	2-5/8 (67)	3-3/16 (81)
	1 (25)	2 (50)	—	3-13/16 (97)	2-3/16 (55)	3 (76)	3-1/2 (89)
	1-1/4 (32)	2-1/2* (62)*	3-3/4 (95)	3-13/16 (97)	2-3/16 (55)	—	—
	1-1/2 (40)	2-9/16* (65)*	3-15/16 (99)	3-7/8 (99)	2-1/4 (58)	—	—
	2 (50)	3-1/8* (79)*	4-9/16 (115)	4-1/2 (114)	2-9/16 (65)	—	—

* FxUF is not available as standard in 1-1/4, 1-1/2, and 2-inch valves.
FxUM is not available as standard in 1-1/2, and 2-inch-valves.
** This dimension is determined by the union nut.



1/2-inch (15 mm) Valve Size.



3/4-inch to 2-inch (20 to 50 mm) Valve Size.

Figure 7. Normally Open.

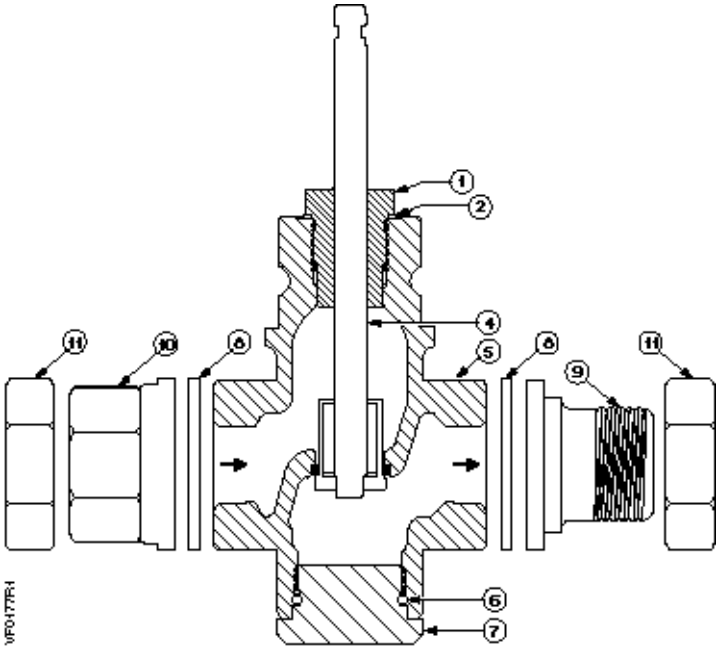


Figure 8. Normally Closed
1/2-inch to 2-inch (15 to 50 mm) Valve Size.

Parts List

Table 12. Parts List for 2-Way Bronze Valves. See Figures 7 and 8.

Item	Part Name	Part Number	Quantity				Material
			FxF	FxUF	FxUM	UFxUF	
1	Packing Cartridge Assembly	—	1	1	1	1	—
2	Gasket	—	1	1		1	Copper
3	Normally Open 3/4-inch to 2-inch Bonnet	—	1	1	1	1	Brass
4	Stem and Plug Assembly	—	1	1	1	1	Bronze or Stainless Steel
5	Valve Body	—	1	1	1	1	Bronze
6	O-ring		1	1	1	1	EPDM
7	Normally closed Cap	—	1	1	1	1	Brass
8	Gasket	—	—	1	1	2	Fiber
9	NPT Male union tail piece	—	—	—	1	—	Brass
10	Female tail piece	—	—	1	—	2	Brass
11	Union Nut	—	—	1	1	2	Brass
—	Packing Kit Normal Duty Service Steam Service	 599-03390 599-03391	—	—	—	—	Items 1 and 2
—	Rebuild/Repack Kit Normally Closed	See Tables15 and 16	—	—	—	—	Items 1, 2, 4, and 6
—	Rebuild/Repack Kit Normally Open	See Tables 15 and 16	—	—	—	–	Items 1, 2, 4, and 6

Valve Assembly Weight

Table 13. Weight in Pounds (Kilograms).

Valve Size	Normally Closed				Normally Open			
	FxF	FxUF	FxUM	UFxUF	FxF	FxUF	FxUM	UFxUF
.50 (15)	3 (1.4)	4 (1.8)	4 (1.8)	— —	3 (1.4)	3 (1.4)	3 (1.4)	— —
.75 (20)	4 (1.8)	4 (1.8)	5 (2.3)	— —	4 (1.8)	4 (1.8)	5 (2.3)	— —
1.0 (25)	5 (2.3)	5 (2.3)	5 (2.3)	— —	5 (2.3)	6 (2.7)	6 (2.7)	— —
1.25 (32)	7 (3.2)	— —	— —	9 (4.1)	7 (3.2)	— —	8 (3.6)	9 (4.1)
1.50 (40)	8 (3.6)	— —	— —	11 (5)	9 (4.1)	— —	— —	11 (5)
2.0 (50)	16 (7.3)	— —	— —	16 (7.3)	13 (5.9)	— —	— —	16 (7.3)

Service Kit

NOTE: To select the service kit, know your valve body assembly number, model number and the type of connection. Read down the *Connection* column until you find the valve body assembly number and then read to the far right to identify the correct kit. The valve body assembly number and model number are stamped on the tag on the valve body.

Table 14. Rebuild/Repack Service Kits Part Numbers. See Table 13 for Items in Kit.

Flow	Action	Valve Size	Connection				Valve Description	Model 1 Kit No.	Model 2 Kit No.
			FxF	FxUF	UFxUF	FxUM			
Linear	Normally Open	1/2 Inch	599-03000	599-03009	—	599-03216	Stainless steel 1.0 Cv O-ring	599-03300	—
			599-03001	599-03010	—	599-03217	Stainless steel 1.6 Cv O-ring	599-03301	—
			599-03002	599-03011	—	599-03218	Stainless steel 2.5 Cv O-ring	599-03302	—
			599-03003	599-03012	—	599-03219	Stainless steel 4.0 Cv O-ring	599-03303	—
		3/4-Inch	599-03004	599-03013	—	599-03220	Stainless steel O-ring	599-03304	—
		1-Inch	599-03005	599-03014	—	599-03221	Stainless steel O-ring	599-03305	—
		1-1/4 Inch	599-03006	—	599-03015	—	Stainless steel O-ring	599-03306	599-09201
		1-1/2-Inch	599-03007	—	599-03016	—	Stainless steel O-ring	599-03307	599-09202
		2-Inch	599-03008	—	599-03017	—	Stainless steel O-ring	599-03308	599-09203
	Normally Closed	1/2-Inch	599-03018	599-03027	—	599-03225	Stainless steel 1.0 Cv O-ring	599-03309	—
			599-03019	599-03028	—	599-03226	Stainless steel 1.6 Cv O-ring	599-03310	—
			599-03020	599-03029	—	599-03227	Stainless steel 2.5 Cv O-ring	599-03311	—
			599-03021	599-03030	—	599-03228	Stainless steel 4.0 Cv O-ring	599-03312	—
		3/4-Inch	599-03022	599-03031	—	599-03229	Stainless steel O-ring	599-03313	—
		1-Inch	599-03023	599-03032	—	599-03230	Stainless steel O-ring	599-03314	—
		1-1/4 Inch	599-03024	—	599-03033	—	Stainless steel O-ring	599-03315	599-09213
		1-1/2-Inch	599-03025	—	599-03034	—	Stainless steel O-ring	599-03316	599-09214
		2-Inch	599-03026	—	599-03035	—	Stainless steel O-ring	599-03317	599-09215
	Normally Open	1/2-Inch	599-03054	599-03063	—	599-03234	Stainless steel 1.0 Cv Steam	599-03318	—
			599-03055	599-03064	—	599-03235	Stainless steel 1.6 Cv Steam	599-03319	—
			599-03056	599-03065	—	599-03236	Stainless steel 2.5 Cv Steam	599-03320	—
			599-03057	599-03066	—	599-03237	Stainless steel 4.0 Cv Steam	599-03321	—
		3/4-Inch	599-03058	599-03067	—	599-03238	Stainless steel Steam	599-03322	—
		1-Inch	599-03059	599-03068	—	599-03239	Stainless steel Steam	599-03323	—
		1-1/4 Inch	599-03060	—	599-03069	—	Stainless steel Steam	599-03324	599-09204
		1-1/2-Inch	599-03061	—	599-03070	—	Stainless steel Steam	599-03325	599-09205
		2-Inch	599-03062	—	599-03071	—	Stainless steel Steam	599-03326	599-09206
	Normally Closed	1/2-Inch	599-03072	599-03081	—	599-03243	Stainless steel 1.0 Cv Steam	599-03327	—
			599-03073	599-03082	—	599-03244	Stainless steel 1.6 Cv Steam	599-03328	—
			599-03074	599-03083	—	599-03245	Stainless steel 2.5 Cv Steam	599-03329	—
			599-03075	599-03084	—	599-03246	Stainless steel 4.0 Cv Steam	599-03330	—
		3/4-Inch	599-03076	599-03085	—	599-03247	Stainless steel Steam	599-03331	—
		1-Inch	599-03077	599-03086	—	599-03248	Stainless steel Steam	599-03332	—
		1-1/4 Inch	599-03078	—	599-03087	—	Stainless steel Steam	599-03333	599-09216
		1-1/2-Inch	599-03079	—	599-03088	—	Stainless steel Steam	599-03334	599-09217
		2-Inch	599-03080	—	599-03089	—	Stainless steel Steam	599-03335	599-09218

Service Kits, Continued

Table 15. Rebuild/Repack Service Kits Part Numbers Continued. See Table 13 for Items in Kit.

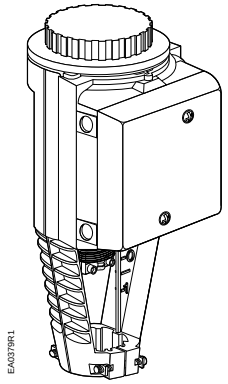
Flow	Action	Valve Size	Connection				Valve Description	Model 1 Kit No.	Model 2 Kit No.
			FxF	FxUF	UFxUF	FxUM			
Equal Percentage	Normally Open	1/2 Inch	599-03108	599-03117	—	599-03252	Stainless steel 1.0 Cv O-ring	599-03336	—
			599-03109	599-03118	—	599-03253	Stainless steel 1.6 Cv O-ring	599-03337	—
			599-03110	599-03119	—	599-03254	Stainless steel 2.5 Cv O-ring	599-03338	—
			599-03111	599-03120	—	599-03255	Stainless steel 4.0 Cv O-ring	599-03339	—
		3/4-Inch	599-03112	599-03121	—	599-03256	Stainless steel O-ring	599-03340	—
		1-Inch	599-03113	599-03122	—	599-03257	Stainless steel O-ring	599-03341	—
		1-1/4-Inch	599-03114	—	599-03123	—	Stainless steel O-ring	599-03342	599-09207
		1-1/2-Inch	599-03115	—	599-03124	—	Stainless steel O-ring	599-03343	599-09208
		2-Inch	599-03116	—	599-03125	—	Stainless steel O-ring	599-03344	599-09209
	Normally Closed	1/2-Inch	599-03126	599-03135	—	599-03261	Stainless steel 1.0 Cv O-ring	599-03345	—
			599-03127	599-03136	—	599-03262	Stainless steel 1.6 Cv O-ring	599-03346	—
			599-03128	599-03137	—	599-03263	Stainless steel 2.5 Cv O-ring	599-03347	—
			599-03129	599-03138	—	599-03264	Stainless steel 4.0 Cv O-ring	599-03348	—
		3/4-Inch	599-03130	599-03139	—	599-03265	Stainless steel O-ring	599-03349	—
		1-inch	599-03131	599-03140	—	599-03266	Stainless steel O-ring	599-03350	—
		1-1/4 Inch	599-03132	—	599-03141	—	Stainless steel O-ring	599-03351	599-09219
		1-1/2-Inch	599-03133	—	599-03142	—	Stainless steel O-ring	599-03352	599-09220
		2-Inch	599-03134	—	599-03143	—	Stainless steel O-ring	599-03353	599-09221
	Normally Open	1/2-Inch	599-03162	599-03171	—	599-03270	Bronze 1.0 Cv O-ring	599-03354	—
			599-03163	599-03172	—	599-03271	Bronze 1.6 Cv O-ring	599-03355	—
			599-03164	599-03173	—	599-03272	Bronze 2.5 Cv O-ring	599-03356	—
			599-03165	599-03174	—	599-03273	Bronze 4.0 Cv O-ring	599-03357	—
		3/4-Inch	599-03166	599-03175	—	599-03274	Bronze O-ring	599-03358	—
		1-Inch	599-03167	599-03176	—	599-03275	Bronze O-ring	599-03359	—
		1-1/4-Inch	599-03168	—	599-03177	599-03276	Bronze O-ring	599-03360	599-09210
		1-1/2-Inch	599-03169	—	599-03178	—	Bronze O-ring	599-03361	599-09211
		2-Inch	599-03170	—	599-03179	—	Bronze O-ring	599-03362	599-09212
	Normally Closed	1/2-Inch	599-03180	599-03189	—	599-03279	Bronze 1.0 Cv O-ring	599-03363	—
			599-03181	599-03190	—	599-03280	Bronze 1.6 Cv O-ring	599-03364	—
			599-03182	599-03191	—	599-03281	Bronze 2.5 Cv O-ring	599-03365	—
			599-03183	599-03192	—	599-03282	Bronze 4.0 Cv O-ring	599-03366	—
		3/4-Inch	599-03184	599-03193	—	599-03283	Bronze O-ring	599-03367	—
		1-Inch	599-03185	599-03194	—	599-03284	Bronze O-ring	599-03368	—
		1-1/4-Inch	599-03186	—	599-03195	—	Bronze O-ring	599-03369	599-09222
		1-1/2-Inch	599-03187	—	599-03196	—	Bronze O-ring	599-03370	599-09223
		2-Inch	599-03188	—	599-03197	—	Bronze O-ring	599-03371	599-09224

SIEMENS

Technical Instructions
Document No. 155-180P25
EA 599-4
June 11, 2013

Flowrite™ 599 Series

SKD6xU Electronic Valve Actuators
24 Vac Proportional Control



c UL us LISTED

Description	The Flowrite 599 Series SKD6xU Electronic Valve Actuators require a 24 Vac supply and receive a 0 to 10 Vdc or a 4 to 20 mA control signal to proportionally control a valve. These actuators are designed to work with Flowrite 599 Series valves with a 3/4-inch (20 mm) stroke.
Features	• Direct-coupled installation requires no special tools or adjustments • Visual and electronic stroke indication • Die-cast aluminum housing • Manual override • Spring return to fail-safe position or non-spring return fail-in-place • Automatic stroke calibration • Maintenance-free
Application	These electronic actuators are designed to be used with Flowrite 599 Series valves and Siemens Industry standard valves with a 3/4-inch (20 mm) stroke in liquid service and steam service applications.
Product Number	SKD62U, Spring Return (Actuator Prefix Code 274) SKD60U, Non-Spring Return (Actuator Prefix Code 267)

Warning/Caution Notations

WARNING:	⚠	Personal injury or loss of life may occur if you do not perform a procedure as specified.
CAUTION:	⚠	Equipment damage or loss of data may occur if you do not perform a procedure as specified.

Specifications

Power supply	Operating voltage	24 Vac -20%/+30%
	Frequency	50/60 Hz
	Power consumption	17 VA/12W
Control signals	Control input (Y)	
	Voltage	0 to 10 Vdc or 4 to 20 mA (DIP switch selectable)
	Maximum Impedance	0 to 10 Vdc 100K ohms 4 to 20 mA; 240 ohm
	Signal resolution	<1%
	Hysteresis	1%
	Control input (Z)	
	Resistance	0 to 1000 ohms
	Voltage	0 to 1.6V
	Control output (U) – position feedback	
	Voltage	0 to 9.8 Vdc ± 2%
	Load Impedance	>10K ohm
	Current	4 to 19.6 mA ± 2%
	Load impedance	< 500 ohms
Function	Nominal stroke	3/4-inch (20 mm)
	Run time with control operation (full stroke)	
	Pushing stroke, 0 to 100%	30 seconds
	Pulling and Spring return stroke, 100 to 0%	15 seconds
	Nominal Force	**Stroke** **Force**
	NC and 3-way upper	0% 225 lbs (1000 N)
	NO and 3-way by-pass	100% 258 lbs (1150 N)
Agency Certification	UL approval	UL873
	cUL	Certified to Canadian standard C22.2 No. 24-93
	CE conformity per the EMC directive	89/336/EEC
	Low voltage directive	73/23/EEC
Ambient conditions	Ambient temperature (Operation)	5°F to 122°F (-15°C to 50°C)
	Media temperature	-13°F to 300°F (-25°C to 150°C) <32°F (0°C) requires a Stem Heater
Housing	NEMA Rating	NEMA 1 (interior only) See *Accessories.*
Miscellaneous	Dimensions	See Figure 17
	Conduit opening	1/2-inch NPSM
	Weight	
	SKD60U	7.9 lbs (3.6 kg)
	SKD62U	8.5 lbs (3.85 kg)

Accessories

NOTE: Installation instructions are included with each accessory.

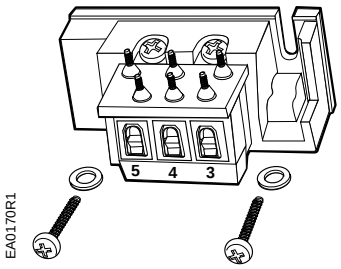


Figure 1. Auxiliary Switch.

ASC1.6 Auxiliary switch.

Sends a signal to indicate the valve is in the 0% stroke position. Switching point is fixed at the 0% stroke position.

Switching capacity	24 Vac 4A resistive 2A inductive
Lowest recommended current	10 mA

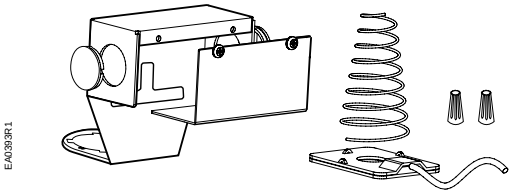


Figure 2. Packing Heating Element.

599-00417 Packing heating element.

Allows stem to move freely in valves controlling fluids at temperatures below 32°F (0°C). Reduces ice crystal formation on the stem which may damage the packing.

Operating Voltage	24 Vac
Heating Output	20 W

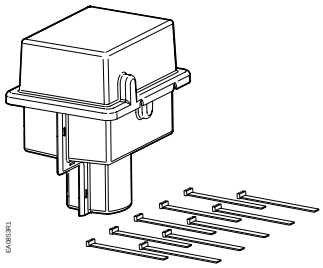


Figure 3. Weather Shield.

599-10071 Weather Shield.

See *Service Kits* for replacement ultraviolet resistant cable ties.

Service Kits

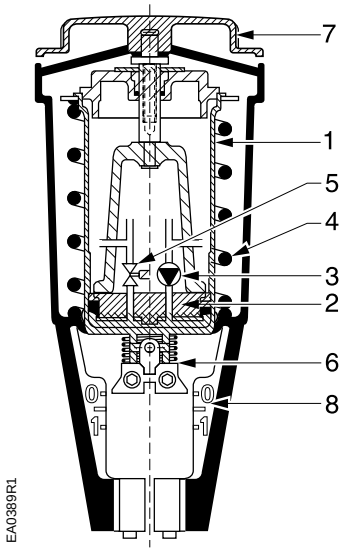
The only field serviceable part is the circuit board.

Circuit board replacement	4-668-5748-8
Plastic wiring compartment cover	4-104 5634-8
Manual Override Kit for SKD	4-268 5504-8
Ultraviolet (UV) resistant cable ties (pkg. of 10)	538-996

WARNING:

This product contains a spring under high compression. Do not attempt to disassemble the actuator.

SKD Details



Legend

1 Pressure cylinder
2 Piston
3 Oscillating pump
4 Return spring
5 Bypass valve
6 Valve stem retainer
7 Manual override knob
8 Position indicator

Figure 4. SKD6xU Details.

Operation

The actuator accepts a 0 to 10 Vdc or a 4 to 20 mA control signal. The actuator mounted on a valve, produces a stroke proportional to the input signal. When power is turned off or in the event of a power failure, the SKD62U Actuator spring returns the valve to its normal position, and the SKD60U Actuator fails in place.

Figure 5.

Figure 6.

Spring return: When power is turned off or in the event of a power failure, the actuator spring returns the valve to its normal position.

Non-spring return: When power is turned off or in the event of a power failure, the actuator maintains its position.

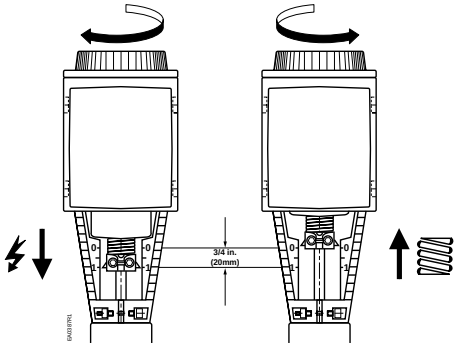


Figure 7. Valve Stem Travel Indication.

Mounting and Installation

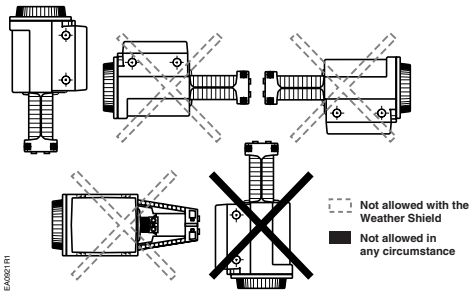


Figure 8. Acceptable Mounting Positions.

The vertical position is the recommended position for mounting. Other positions are allowed. When using the Weather Shield for NEMA 3R rating, the vertical position is required. See Weather Shield installation instructions and Figure 8.

Allow four inches (100 mm) around the sides and back of the actuator and eight inches (200 mm) above and to the front of the actuator.

See dimensions in Figure 17.

Detailed installation instructions for field mounting are shipped with the actuator.

Start-up

Check the wiring for proper connections.

NOTE: The valve body assembly determines the complete assembly action.

Stroke Calibration

To determine the stroke positions 0% and 100% in the valve, calibration is required when the valve/actuator are commissioned for the first time.

The actuator must be mechanically connected to a valve and must have a 24 Vac power supply. The calibration procedure can be repeated as often as necessary.

CAUTION:
Before starting calibration, be sure the manual adjuster is set to **Automatic** to register the actual values.

There is a slot on the printed circuit boards of the actuators. To initiate the calibration procedure, the contacts inside this slot must be short-circuited, for example, with a screwdriver (see Figure 9).

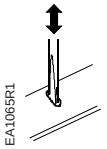


Figure 9.

Automatic calibration proceeds as follows (see Figure 10):

- Actuator runs to the 0 stroke position (1), green LED flashes.
- Actuator then runs to the 100 stroke position (2), green LED flashes.
- Measured values are stored in the EPROM.
- The actuator now moves to the position defined by control signal Y or Z (3), and the green LED now glows steadily (normal operation).
- Throughout this procedure, output U is inactive; meaning, the values only represent actual positions when the green LED stops flashing and remains on continuously.

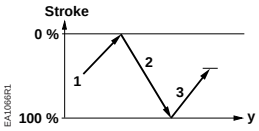


Figure 10.

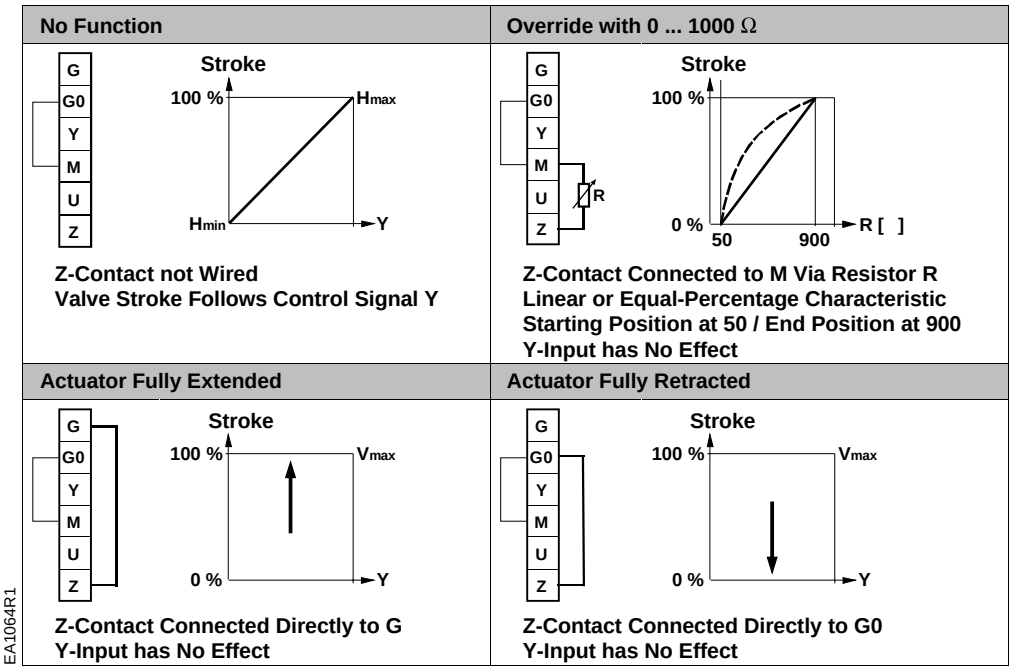
Stroke Calibration, Continued

Table 1. LED Status.

LED	Display	Function	Action
Green	ON	Normal Operation	Automatic operation
	Flashing	Stroke calibration In Progress	Wait for calibration to be completed (LED stops flashing)
Red	ON	Faulty stroke calibration Internal Error	- Check mounting - Restart stroke calibration (by short-circuiting calibration slot) - Replace electronics
	Flashing	Inner valve jammed	Check the valve
	OFF	• No power supply • Faulty electronics	-Check mains -Replace electronics

Override Control

The override control input (Z) has three modes of operation:



The Z-modes have a "direct acting" factory setting.

Start-up, Continued

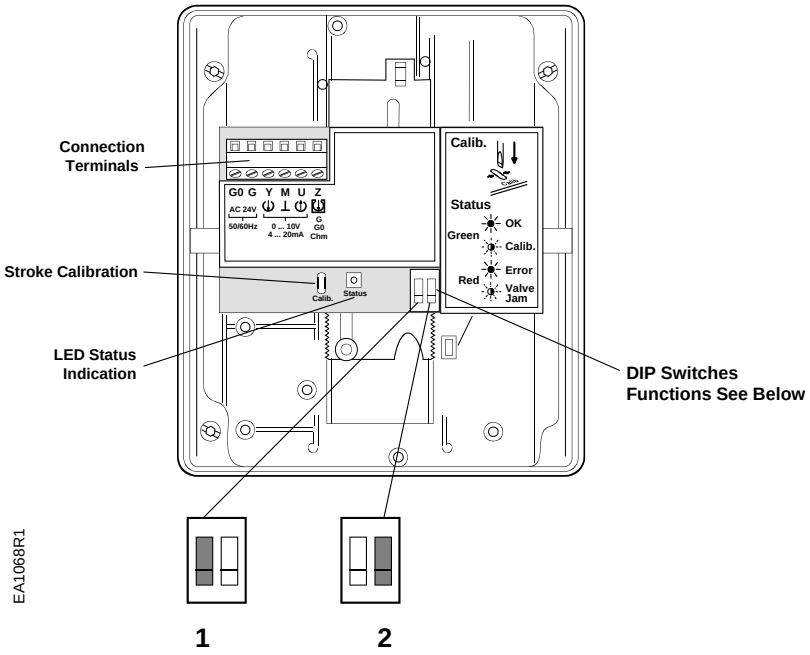


Figure 11. SKD Electronic Features.

DIP Switches (Left to right)	1 Selection of Control Signal	2 Selection of Flow Characteristic
ON	4 to 20 mA	Modified*
OFF Factory Setting	0 to 10 Vdc	Default

*Changing the default setting will modify an equal percentage valve to a linear flow characteristic. When set to default, the flow characteristic is determined by the valve body.

Normally Closed Valve

Actuator pressure cylinder moves:

- Outward (0 to 1): Valve opens.
- Inward (1 to 0): Valve closes.

Normally Open Valve

Actuator pressure cylinder moves:

- Outward (0 to 1): Valve closes.
- Inward (1 to 0): Valve opens.

Three-Way Valve

Actuator pressure cylinder moves

- Outward (0 to 1): Valve opens between port NC and C.
- Inward (1 to 0): Valve opens between ports NO and C.

The measuring voltage at terminal U provides valve stem position feedback to an indicating instrument or building automation system.

Manual Operation

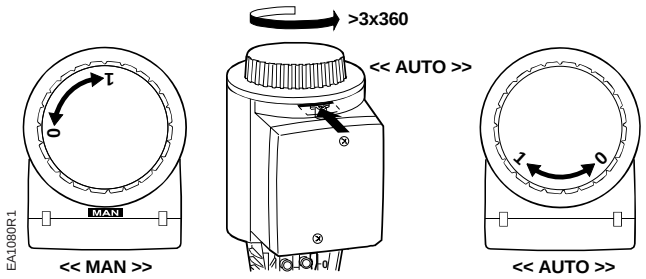


Figure 12. The Manual Setting Knob in Manual and Automatic Position.

- Turn the manual setting knob clockwise for manual operation.
- A red indicator becomes visible as you begin to crank. Each complete revolution (360°) is equal to 3/32-inch (2.5 mm) stroke.
- If a signal is sent to the actuator while it is in manual operation, the actuator will move but the control will not be accurate.
- The valve cannot be commanded to its 0% position while in manual operation.

Automatic operation

For automatic operation the manual override knob must be in the fully closed position.

Turn the manual override knob counterclockwise until the red indicator disappears.

Wiring

Do not use autotransformers. Use earth ground isolating step-down Class 2 power supplies.

Determine supply transformer rating by summing total VA of all actuators used.

The maximum rating for Class 2 step-down transformer is 100 VA.

- Since SKD6xU actuators require ≈20 VA, a maximum of four actuators can be powered by one transformer (80% of transformer VA).
- Operating more than four SKD6xU actuators requires additional transformers or separate 100 VA power supplies.
- The position output signal U will switch from 0 to 10 Vdc to 4 to 20 mA when a 4 to 20 mA input signal is selected and used on the Y terminal.

Wiring Diagrams

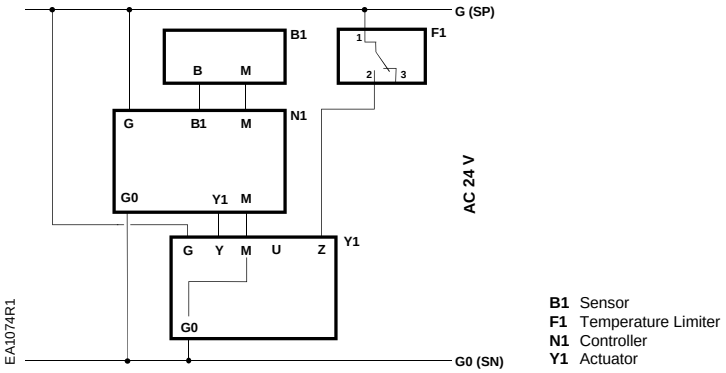


Figure 13. Connecting Terminals.

24 Vac	
G	System Potential (SP)
G0	System Neutral (SN)
Y	Control input 0 to 10 Vdc or 4 to 20 mA (DIP switch selectable)
M	Measuring neutral
U	Position indication 0 to 10 Vdc or 4 to 20 mA, (see Table 2.
Z	Override control

Table 2.

Actuator input signal	Receiving Impedance	
	Low (<500 Ohm)	High (>10K Ohm)
0 to 10 Vdc	0 to 20 mA	0 to 10 Vdc
4 to 20 mA	4 to 20 mA	2 to 10 Vdc

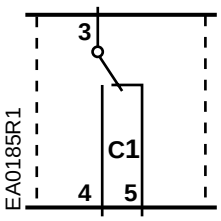


Figure 14. Auxiliary Switch ASC1.6.

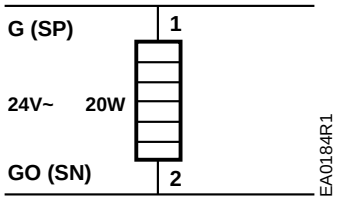


Figure 15. Packing Heating Element 599-00417.

Troubleshooting

Check that the wires are connected correctly and attached securely.

Check for adequate power supply.

Check that the actuator is set for automatic operation. See the *Start-Up* section.

Dimensions

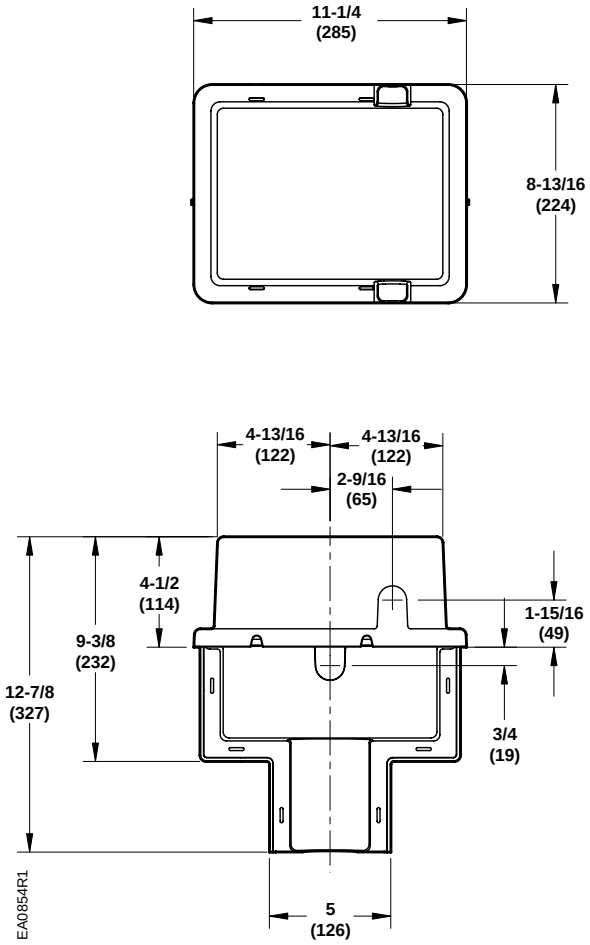


Figure 16. Dimensions of 599-10071 Weather Shield in Inches (Millimeters).

Dimensions, Continued

NOTE: The top knockout position should be used when installing the Weather Shield.

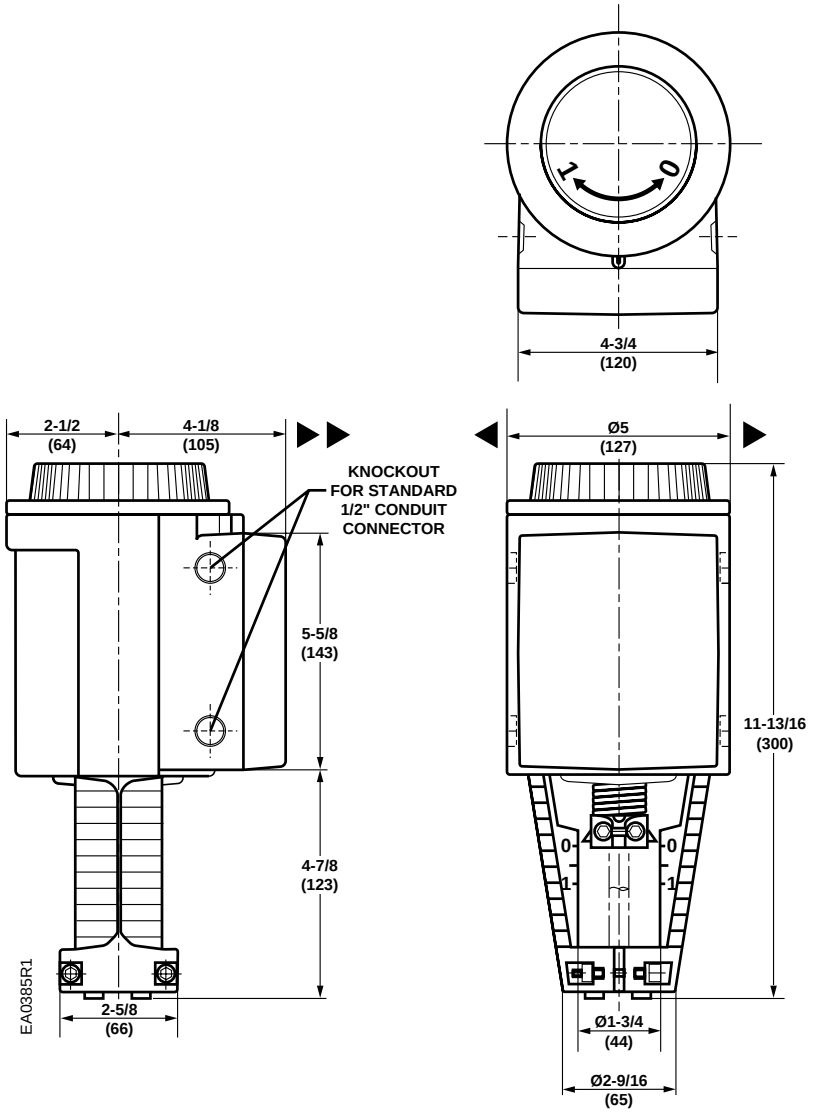


Figure 17. Dimensions of SKD6xU Actuators.

DIVERSIFIED HEAT TRANSFER
SERIES 700 'STEAM GENERATOR'
CONTROLLER INSTRUCTION MANUAL

c US *

Sigma Controls, Inc.
PROCESS CONTROLS AND INSTRUMENTATION
217 S. Fifth Street, Perkasie, PA 18944
PH: 215-257-3412 FAX: 215-257-3416

VISIT OUR WEBSITE SIGMACONTROLS.COM

TABLE OF CONTENTS

* U.L. APPLIES TO OPTIONAL ENCLOSURE

INTRODUCTION:

The Sigma 700 Series (Steam Generator) is a microcontroller based, state of the art, device offering unmatched performance and full user configurability.

The 700 Series is used with a pressure transmitter whose output signal is compatible with 4/20MA.

Process indication is displayed in alpha/numeric format on the controller's two line, alpha numeric backlit LCD display along with the current status of the unit's relay outputs. Six digital LED indicator lights (3 red and 3 green) provided for alarm and status indication.

All aspects of the unit are user configurable through the 'plain English' menus and combinations of the 3 user data key push buttons.

Available in 2 styles of mounting, ¼ DIN (4" x 4" nominal) and wall mounted Nema 4X enclosures, the 700 Series is suitable for installation in all industrial environments.

ORDERING INFORMATION:

- 1/4 DIN Case, Part No. 700X
- Wall Mount Nema 4X, Part No. 700X-N4

SPECIFICATIONS: (Base Unit)

- ANALOG INPUT 2 ea.
  Analog, 4/20MA isolated with common negative, +-0.1% accuracy.

- DIGITAL INPUTS (8 ea.)
  Digital Form 'C' dry contact

- ANALOG OUTPUT: 2 ea.
  Analog, with common negative 4/20MA

- INDICATOR LIGHTS (6 ea)
  6 LED status lights (3 red and 3 green) provided for status and alarm notification.

- RELAY OUTPUTS: (up to 4 ea.)
  SPDT, Form 'C' 5A Relay

- DISPLAY:
  2 line, 40 character backlit LCD.

- LOOP POWER:
  24VDC regulated output, 100MA max. (only with 110VAC power option)

- 3 USER KEYS:
  Up, Down, Enter

- ACCURACY:
  0.1% of calibrated span

- LOCKOUT:
  User password, user configurable

- INPUT IMPEDANCE:
  Voltage 100K, current 100 OHMS

- POWER:
  24VDC std (120VAC optional)

- ENVIRONMENTAL:
  Operating, 0-65° C
  Storage, -40° -80° C
  R.H., 0-90% non condensing

- ENCLOSURE:
  ¼ DIN, ABS plastic 96 X 96 X 110MM or Optional FRP wall mount enclosure

- FRONT PANEL:
  Gasketed Nema 4X

- ACCESS:
  Chassis & boards remove from front of case without tools.

- TERMINAL STRIP:
  2 ea. 12-position, compression style, removable for ease of wiring 28 – 16 AWG

- CONNECTIONS:
  Removable screw terminal blocks 28 – 16 AWG wire.

- CONTROL OUTPUTS:
  Up to 4 relay outputs, user programmable, SPDT Form 'C' relays 5 AMP.
  8 ea. relay driver outputs (optional).

- OUTPUT ANNUNCIATION:
  Piezo buzzer driver (optional)

- 'WATCHDOG' CPU ACTIVITY MONITOR

- PROGRAMMING:
  Menu based, all parameters and setpoints are user configurable via menu prompts and user keys. The preconfigured screens and 'pull down' sub menus with English prompts assures rapid setup and commissioning.

- 1 YEAR WARRANTY

- OPTIONS:
  I/O board includes an additional 110VAC power supply, 1 AI, 1 AO, 8 relay drivers

- MODBUS®
  Network allows multiple units to be connected together for distributed applications, remote monitoring SCADA applications (optional)..

FEATURES:

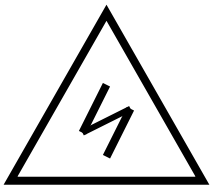
- Microprocessor Based
- Alpha Numeric 40 Character LCD Display
- 3 Function Keys
- Isolated 24VDC Sensor Power (with 110VAC power option)
- 4/20MA Input
- 1 Analog Input, 1 Additional (with option board)
- 1 Analog Output, 1 Additional (with option board)
- 8 Digital Inputs, standard
- 8 Digital Outputs, (with option board)
- 4 Form 'C' Relay Outputs
- Fully User Programmable in English
- 2 Ea. RS485 Ports, MODBUS® (option)

WIRING DETAIL

- Inputs/Output see Dwg # 02-132

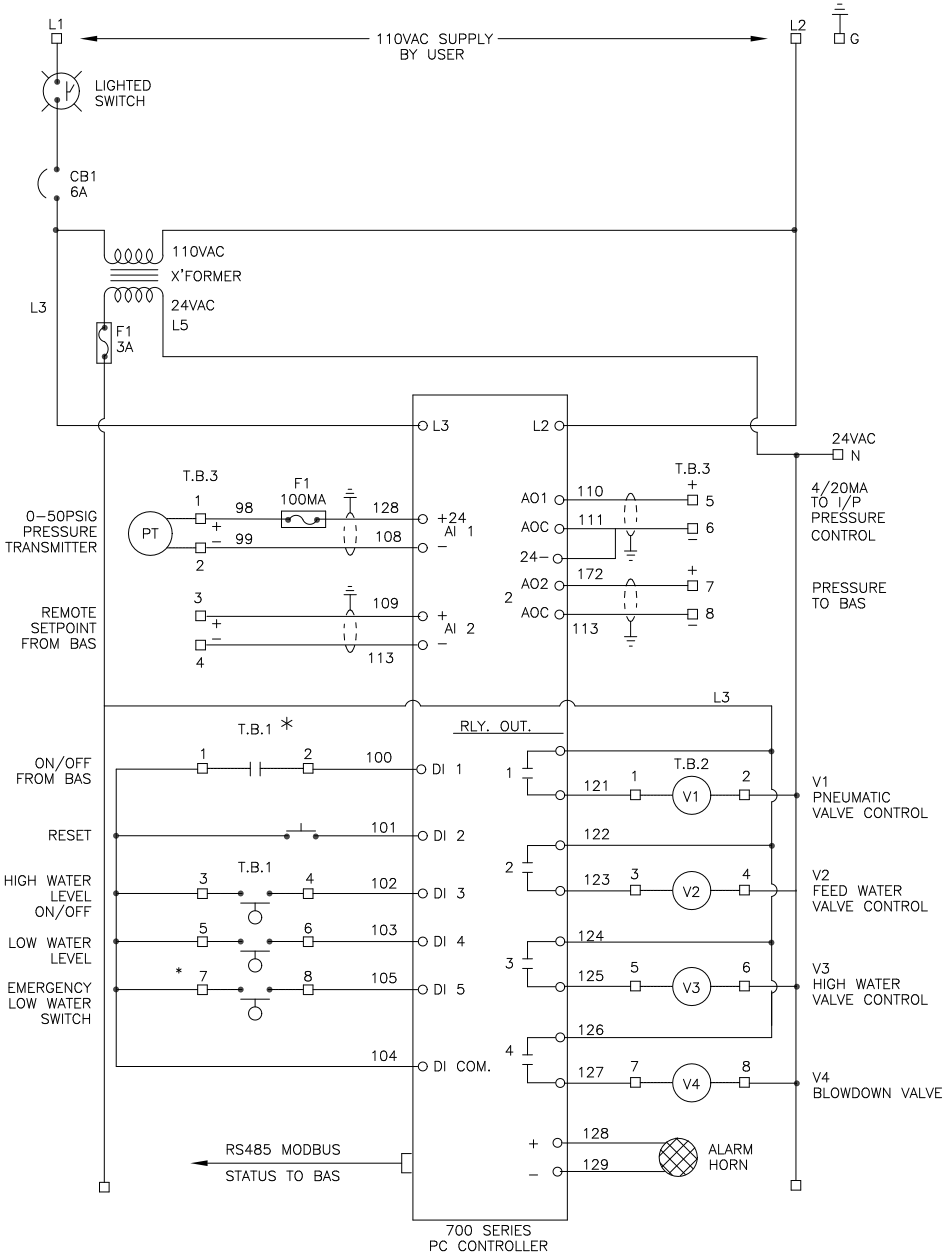
CAUTION

All electrical wiring must be in accordance with all local state and national codes that apply.
Do not exceed the rated current of the D.C. power supply (100MA) or the form 'C' relay outputs (5A/240VAC resistive).

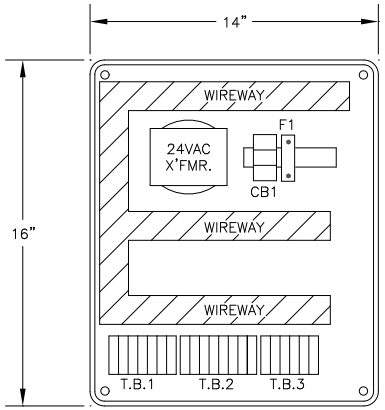


WARNING

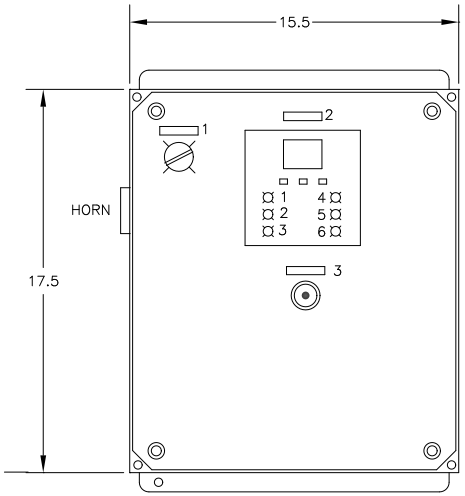
Hazardous voltages are present within the enclosure.
Installation or service should only be carried out by trained personnel.



* NOTE
EMERGENCY LOW WATER SWITCH
SHUTS DOWN VALVE V1
WITH 5 SECOND DELAY
ON MAKE:–



INTERNAL LAYOUT



PANEL FRONT VIEW
NEMA 4 ENCLOSURE

L1	L2	G	L4	N	1	2	3	4	5	6	7	8
LINE	NEUTRAL	GROUND	24VAC		ON/OFF REMOTE CONTROL FROM BAS		HIGH WATER ON/OFF LEVEL SWITCH		LOW WATER LEVEL SWITCH		EMERGENCY LOW WATER SWITCH	

TERMINAL BLOCK 1
INPUT

1	2	3	4	5	6	7	8
H	N	H	N	H	N	H	N
TO PNEUMATIC VALVE P1		TO FEEDWATER VALVE P2		TO HIGH WATER CUT OFF VALVE V3		TO BLOW DOWN VALVE V4	

TERMINAL BLOCK 2
OUTPUT

1	2	3	4	5	6	7	8
+	–	+	–	+	–	+	–
PRESS. TRANSMITTER INPUT		FROM BAS TO BAS		4–20MA TO VALVE		PRESSURE TO BAS	

TERMINAL BLOCK 3
ANALOG

LEGENDS

1.) LIGHTED SWITCH POWER ON.
2.) MYRIAD 700 SERIES.
3.) SILENCE/RESET.

CONTROLLER LED'S

RED		GREEN	
1.	HI. PRESS. ALARM.	4.	STATUS O.K.
2.	LOW PRESS. ALARM.	5.	WATER FEED.
3.	LOW WATER ALARM.	6.	BLOWDOWN.

SIGMA
CONTROLS, INC.
217 South 5th Street, Perkasie, Pa. 18944
Phone: (215) 257-3412 Fax: (215) 257-3416

700 SERIES
STEAM GENERATOR P1 CONTROLLER

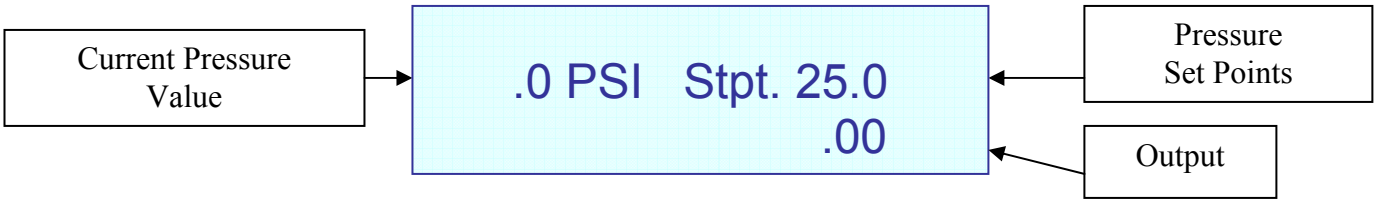
Client: DIVERSIFIED HEAT TRANSFER

Dwg. No.: 12–05	Date: 1–5–12	Rev: "A" 1–26–12 (AS BUILT)
Sheet 1 of 1	Scale: N.T.S.	
P.O. # 00001050	JOB # 1201004	

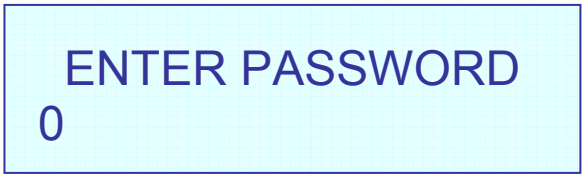
PROGRAMMING & SETUP

1) Upon power up, the opening screen shows the model number and the current revision level.

2) After the unit has completed its startup procedure, the current status screen will automatically appear.

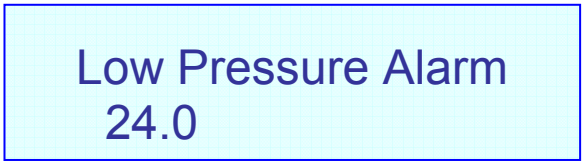


3) To begin the programming sequence, press the ❋ button and the password screen appears:--

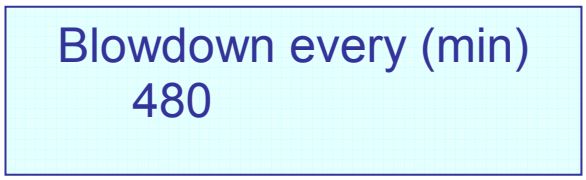


Use the ↑ ↓ buttons to enter the access password and to view a programming menu item such as “SETPOINTS”.

4) Press the ❋ button to access the ‘SETPOINTS” menu.



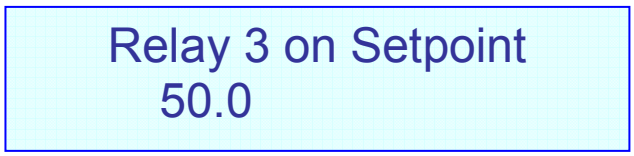
Use the ↑ ↓ buttons to change the primary alarm 'on' setpoint value, press ❋ to save and advance to the secondary alarm set points.



5) Press the up ↑ button to advance to the 'BLOWDOWN TIMING' screen to program the displayed value for the blowdown value timing.

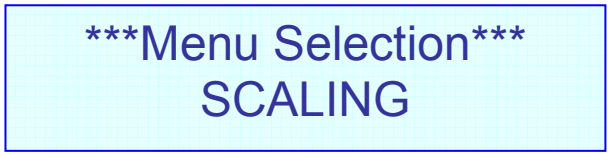
<u>HINT:</u> HOLDING THE ❋ KEY FOR 3 SECONDS WILL SHOW THE PREVIOUS SCREEN.

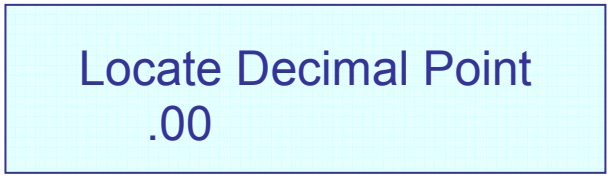
High Water Value Control



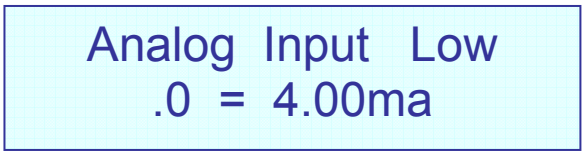
Sets pressure setpoint for the High Water Value action.

Press ❋ to enter the 'SCALING' menu.

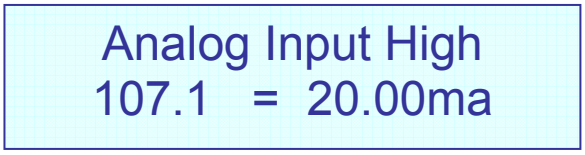




4 digits are available for the process value display, use the ↑ ↓ buttons to select the number of decimal points required after the whole number, eg. – 6.000, 60.00, 600.0, etc. Press ✱ to advance to the following scaling items and change as required: -- sets the displayed value for 4.00ma input.



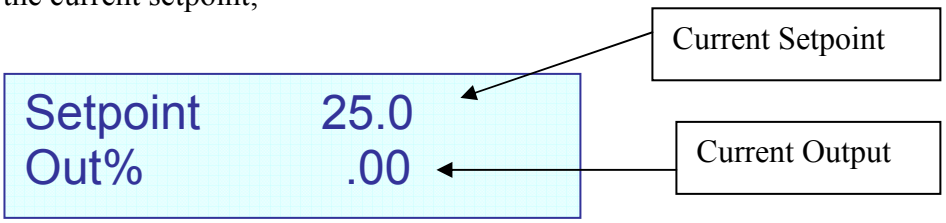
Sets the displayed value for the High Analog Input:



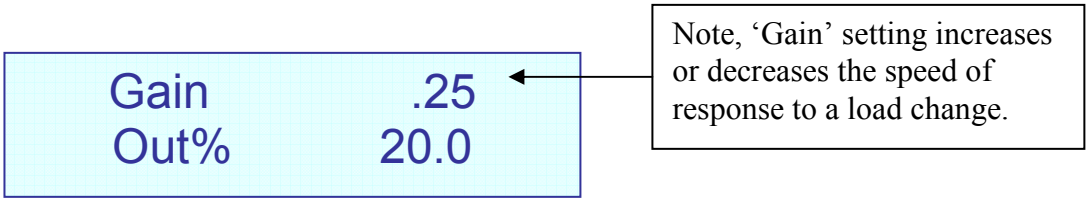
Press ✱ to save and advance to the 'Valve Output' Menu.

Press ✱ to scroll through the P.I. settings:--

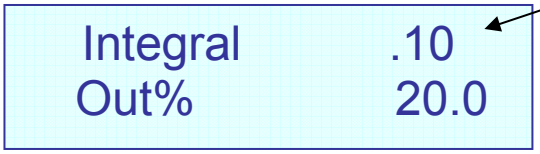
Press ✱ to view or adjust the current setpoint;



Press ✱ to view or adjust gain setting.



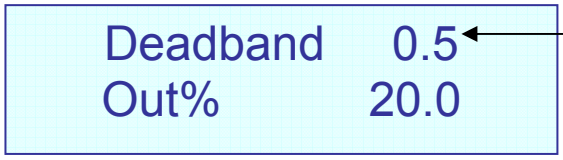
Press ✱ to view or adjust the integral setting.



Note, 'Integral' mode permits the controller to return to setpoint after a load chamge. **Make small adjustments.**

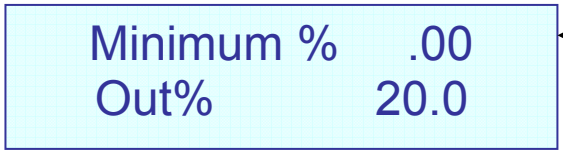
NOTE: The bottom line shows the live output to the valve. This appears on all of the valve output screens.

Press ✱ to adjust the P.I. Deadband.



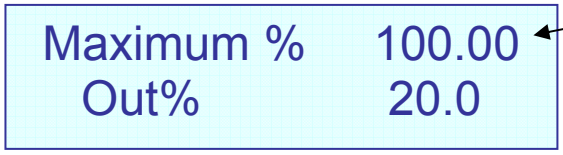
Deadband setting prevents cycling of the output around the setpoint.

Press ✱ to view and adjust the minimum output %.



The output minimum may be limited by changing this setting.

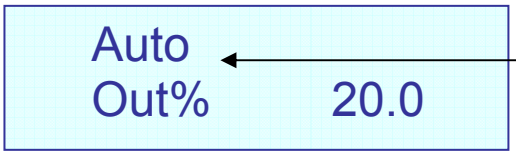
Press ✱ to view and adjust the maximum output %.



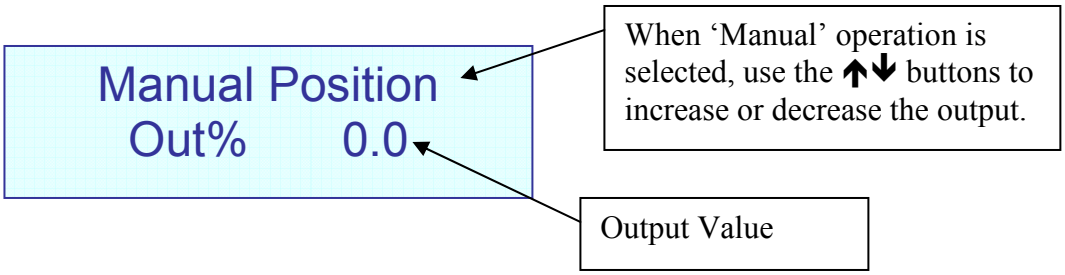
Maximum output allowed can be limited to limit cycling.

Press ✱ to view the Manual/Auto menu items. Press ↑↓ to select Automat (AUTO) or Manual Operation.

Manual Output selected.

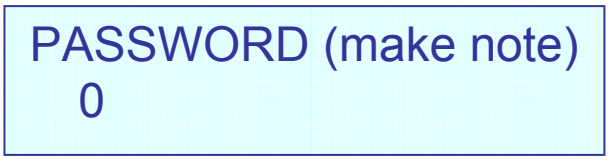


Automatic Output selected.

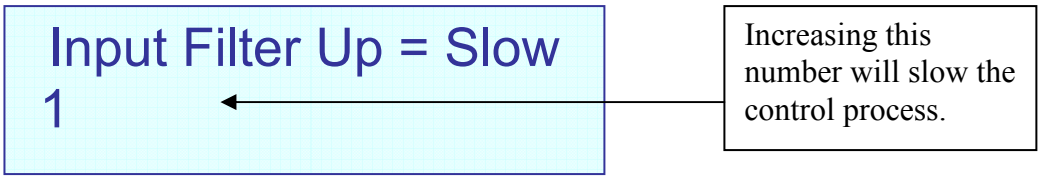


Press ❋ to view 'Set up' menu.

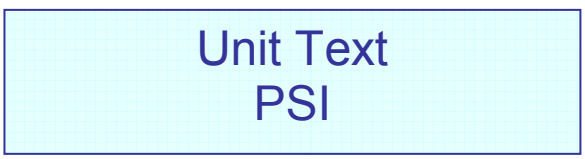
Use ↑↓ buttons to enter a password if required. **MAKE A NOTE OF IT.**



Enter a Filter number to slow the process.



Select an engineering unit from the list, use the ↑↓ buttons to scroll to the desired engineering unit.



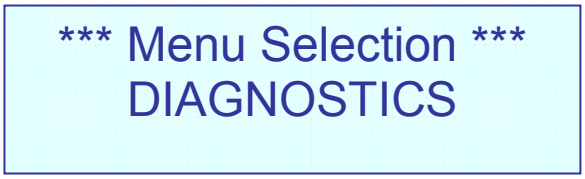
Control Action Selection

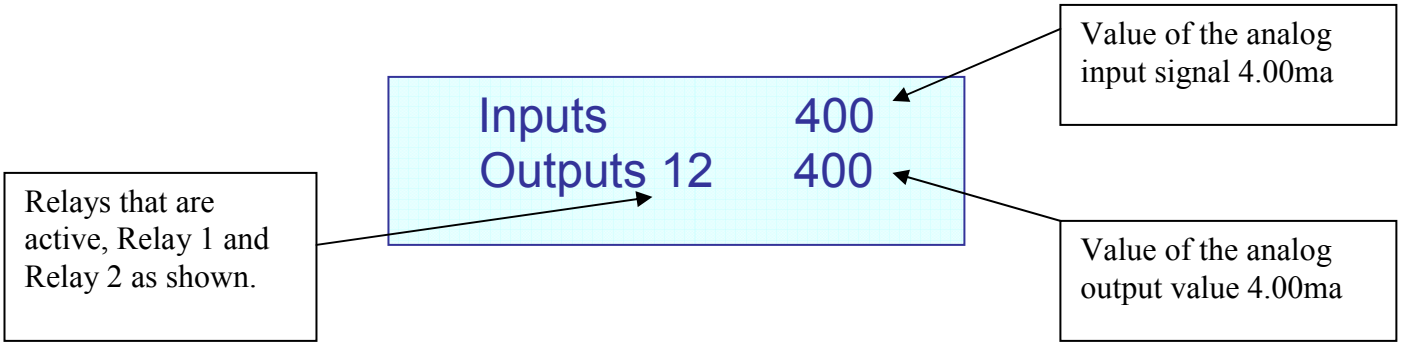
Sets the PI control action output.

'Direct' = output increases with an increase in process value.

'Reverse' = output decreases with an increase in process value.

Diagnostics





DHT STEAM GENERATOR CONTROLLER
PROGRAMMING RECORD SHEET

MODEL NUMBER: _____ SERIAL NUMBER: _____

VERSION: _____ PASSWORD: _____

SETPOINTS

PRIMARY ALARM ON AT _____

PRIMARY ALARM OFF AT _____

SECONDARY ALARM ON AT _____

SECONDARY ALARM OFF AT _____

SETPOINT

PASSWORD: _____

INPUT FILTER _____

UNIT TEXT _____

SCALING

DECIMAL POINT _____

ANALOG INPUT LOW _____

ANALOG INPUT HIGH _____

P.I. SETTINGS

SETPOINT_____

GAIN_____

INTEGRAL_____

MINIMUM OUT_____

MAXIMUM OUT_____

Sigma Controls, Inc.
PROCESS CONTROLS AND INSTRUMENTATION
217 S. Fifth Street, Perkasie, PA 18944
PH: 215-257-3412 FAX: 215-257-3416

SERIES 700 RETURN AUTHORIZATION FORM

User Company Name & Address:	Name & Phone # to contact for information:

Reason for Return:	Possible Cause of Problem:

Model #:	Serial #:

Application:

Urgency of Repair:
Calibration desired for meter:
PO # for Non-Warranty Repairs:
M.S.D.S. if applicable:

NOTE: PLEASE PACK IN ANTI STATIC PROTECTION SUITABLE FOR SENSITIVE ELECTRONIC DEVICES.

Sigma Controls, Inc.
PROCESS CONTROLS AND INSTRUMENTATION

WARRANTY

All Sigma Controls, Inc. products are warranted to be free from defective materials and workmanship for one (1) year from date of shipment. Sigma reserves the right to repair or replace at its option any product found to be defective. In no event shall Sigma Controls, Inc. be liable for any consequential, incidental, or special damages and the limit of its liability shall not exceed the purchase price of the supplied equipment.

RETURN FOR REPAIR POLICY (WARRANTY/NON-WARRANTY REPAIR)

Return status can be determined upon factory inspection of returned equipment.

A completed Return Authorization form must accompany all items returned for repair.

Repairs will be evaluated as quickly as possible. Cost for non-warranty repairs will be provided before repairs are initiated and repairs will be completed only after approval by customer.

217 S. Fifth Street, Perkasie, PA 18944 H: 215-257-3412 FAX: 215-257-3416

Mercoid®

SERIES 102 LIQUID LEVEL CONTROLS

INSTALLATION AND OPERATING INSTRUCTIONS

OPERATING CHARACTERISTICS

When the float rises to the operating point, the mercury switch or switches are actuated by the mutual attraction between a magnetic plunger attached to the float within the float chamber and a magnet attached to the switch operating assembly. When the float drops, the magnetic plunger is moved out of the field of the magnet on the switch operating assembly and the switch or switches are restored to their original position by gravity.

The magnetic plunger attached to the float moves within a tube within the switch enclosure. The switch unit is mounted on the tube.

SPECIFICATIONS

MINIMUM SPECIFIC GRAVITY	MAX. PRESS. PSIG.	MAX. TEMP. °F.	MINIMUM LIQUID LEVEL CHANGE (WATER)	MATERIAL FLOAT CHAMBER	SPECIFY CODE
0.6	300	425°	5/8"	Cast Iron*	C-60
0.6	400	425°	5/8"	Steel	C1-60
0.6	400	425°	5/8"	Stn. Steel	C2-60

Not for use with lethal or flammable substances either liquid or gaseous.

AVAILABLE CONSTRUCTION

ALL TYPES — STAINLESS STEEL REMOVABLE FLOAT AND TRIM

General Purpose (NEMA 1): Type 102G. For indoor service and other general applications. Switch assembly is enclosed in a heavy gauge steel case, finished in charcoal gray. 3/4" NPT conduit connection, can be rotated 360° to facilitate wiring.

Weather Resistant (NEMA 2, 3): Type 102W. For outdoor service and other applications. 3/4" NPT conduit connection, can be rotated 360° to facilitate wiring. Drain hole in case bottom. Neoprene gasketed cover.

Explosion-Proof (Class 1, Group C and D) (NEMA 7) Class 1, Group E, F and G (NEMA 9, 9A). Type 102E. For hazardous locations. 3/4" NPT conduit connection, can be rotated 360° to facilitate wiring.

Vapor-Proof—Explosion-Proof enclosures are identified by the letters "EV" in type number as in 102EV.

SPECIAL FEATURES

WIDE DIFFERENTIAL: Identified by the letter "D" in type number as in 102GD. Single stage only. Provides approximately double the fixed level change between "on" and "off" switch operation.

SEMI-AUTOMATIC with manual reset. Identified by the letters "RU" after type number. Example: 102G-RU. Operates automatically on level **FALL** only. Manual reset required on level **RISE.**

CIRCUITS AND ELECTRICAL RATINGS

MERCURY SWITCH CONTACTS OR SNAP-ACTION CONTACTS

SWITCH TYPE	SWITCH ACTION	ELECTRICAL RATINGS IN AMPS AC 120V	AC 240V	AC 440V†	DC 125V	DC 250V	ORDERING CODE SINGLE STAGE	TWO STAGE LOWER	TWO STAGE UPPER
Mercury Contacts	SP-ST Open on level FALL	10	5	3†	10	5	-4821	-4821	-21
	SP-ST Open on level RISE	10	5	3†	10	5	-4820	-4820	-20
	SP-DT One switch	4	2	1†	4	2	-4810	-4810	-10
	SP-DT Two switches E.I.*	10	5	3†	10	5	-4815	-4815	-15
	DP-ST Two switches E.I.* Open on level FALL	10	5	3†	10	5	-4813	-4813	-13
	DP-ST Two switches E.I.* Open on level RISE	10	5	3†	10	5	-4814	-4814	-14
	DP-DT Two SP-DT switches	4	2	1†	4	2	-4806	-4806	-06
Snap-Action Contacts	SP-DT One switch	12	5	3‡	0.5**	0.25**	-7810	-7810	-10
	DP-DT Two SP-DT switches	12	5	3†	0.5**	0.25**	-7806	-7806	-06
	DP-DT Two SP-DT switches	10	3		10‡	3‡	-9806	-9806	-06
	SP-DT One switch	10	3		10‡	3‡	-9810	-9810	-10

*Electrically Independent
‡10 Amp Inductive (Polarized) at 125V DC—for temperature limits.

†Available on special order. Change 1st digit in Ordering Code from 4 to 5 or 7 to 8 — i.e. -4820 becomes -5820; -7810 becomes -8810; etc.
**Resistive

Illustration No. 1

Dimensions
See reverse side
of this sheet

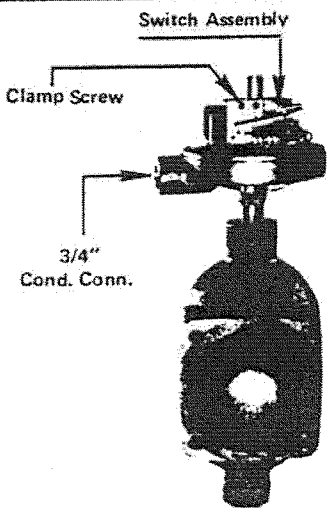


Illustration No. 2

Note. Cold shock or water hammer must be avoided, as this condition may damage the float and prevent proper operation of the control.

INSTALLATION

LOCATION – MOUNTING

Select location recommended by equipment manufacturer. Use 1" pipe and mount all controls **VERTICALLY** and be sure that control switch mechanism is **LEVEL.**

WIRING

Wire in accordance with local electrical codes or follow equipment manufacturer's instructions.

Align wiring block to face conduit opening and tighten **CLAMP** screw of switch assembly.

The 3/4" NPT conduit connection (on all types) can be rotated 360° to facilitate wiring.

Do not overload electrically. See rating stamped on nameplate.

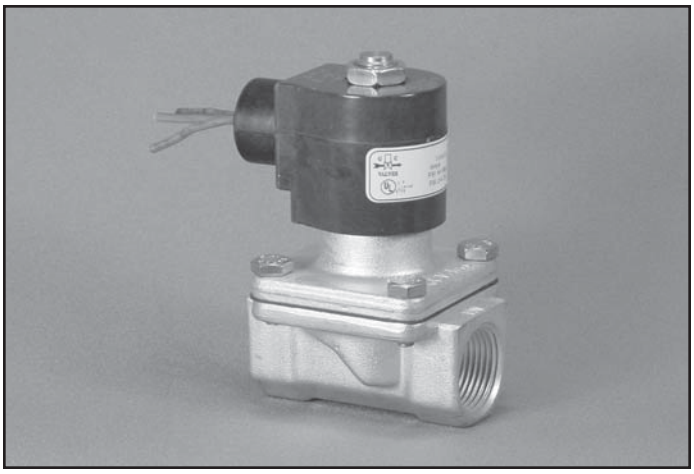
LEVEL ADJUSTMENT

See page 2

S20 Series

GC VALVES

- 3/4" NPT
- Stainless Steel Body Type 316
- 2-Way Zero Differential Piloted Diaphragm
- Normally Closed



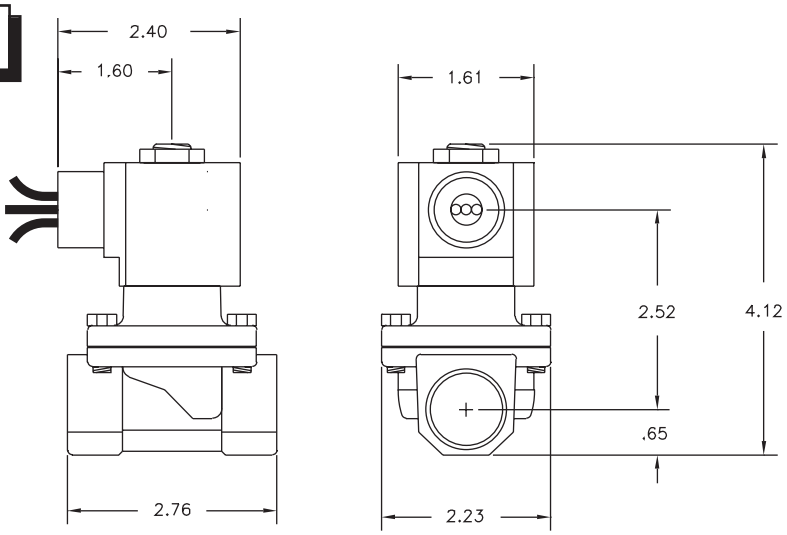
Materials	Seals:		Nitrile, Viton®, Ethylene Propylene
	Orifice:	Pilot Main	Stainless Steel Stainless Steel Ø 3/4”
Electrical	Standard Housing:		Encapsulated Waterproof Conduit (NEMA 4/4X)
	Optional Housings:		Metallic Conduit, Explosion-proof (NEMA 7), Grommet, Open Frame, Junction Box (single or dual knockouts), DIN; Contact GC Valves Customer Service for others.
	Standard Voltages:		24, 120, 240 AC 60 Hz; 50 Hz available 6, 12, 24 DC; Contact GC Valves Customer Service for Additional Voltages.
	Voltage Tolerance:		±10% of applicable voltage
	Coil Classes:		F, H, N
	Standard Lead Length:		24 inch
Operating Temperature	Ambient (Nominal):		32°F to 125°F
Mounting	Position:		Any
Approvals*	Agency:		UL Listed, UL Recognized, CSA Approved

* Not available for all variations

® Registered Trademark of DuPont Co.

Dimensions/Weight

Weight (lbs.)
2.2

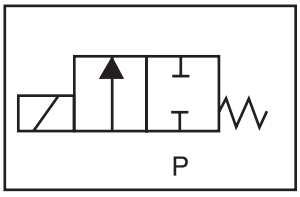


GC Valves Customer Service: 800-828-0484 (7:30am to 4pm ET) or 800-582-4232 (7:30am to 4pm PT)

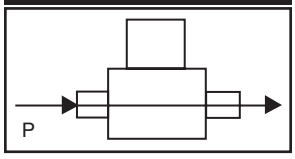
S201 – 3/4" NPT, Stainless Steel Body-Type 316, Normally Closed

Valve Selection List

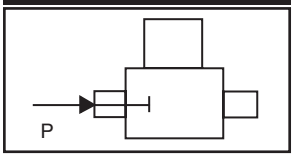
Normally Closed



Energized



De-Energized



Pipe Size NPT	Orifice Size IN	C_v	Operating Pressure Differential (psi) Minimum	Maximum Air/Gas AC	Air/Gas DC	Water AC	Water DC	Light Oil AC	Light Oil DC	Steam* AC	Max Fluid Temp. °F	Seal Material	Power Consumption (Watts) AC	Power Consumption (Watts) DC	Model Code (120V/60HZ — 110V/50HZ Shown) Stainless Steel Body Type 316
3/4	3/4	6.7	0	140	90	100	50	—	—	—	295	EPR	10	10	S201GF02E7EG5
	3/4	6.7	0	140	90	140	90	90	70	—	180	Nitrile	10	10	S201GF02J7EG5
	3/4	6.7	0	140	90	140	90	90	70	—	230	Viton	10	10	S201GF02L7EG5
	3/4	6.7	0	—	—	—	—	—	—	50*	295	EPR	10	—	S201GH02E7EG5

01

24 VAC

*** Class H Coil Recommended for Steam and Other High Temperature Applications**

Part Numbering

1 2 3	4	5	6	7 8	9	10	11	12 13
S 2 0	1	G	F	0 2	E	7	E	G 5
Series	Operating Mode	Housing*	Coil Class*	Voltage*	Seal Material	Body Material	Pipe Connection	Orifice Size
S20	1: Normally Closed	G: Conduit	F: Class F H: Class H	02: 120/60 110/50	E: EPR J: Nitrile L: Viton	7: 316 SS	E: 3/4" NPT	G5: 3/4"

* See the "Engineering Guide" for additional voltages, variations and options.

Coil Data

Coil Family

Type	Size
All	S4

		60	50
Frequency (Hz)			
Nominal Power (VA)	Inrush	46	46
	Holding	18	23

SAFETY VALVES

ASME Section I & VIII - NB Certified for Air, Gas and Steam

SIZES FROM 1/2" TO 2 1/2"
NB RATED TO 250#
TEMPERATURES TO 406°

Aquatrol's Series 560/570 valve line is a high capacity safety valve used for boilers, piping lines and vessel protection. Designed and engineered for heavy-duty industrial use. ASME approved and National Board flow-rated for capacity.

APPLICATIONS INCLUDE:
Steam Boilers, Air Compressors, Dryers, Receivers, Pressure Vessels, Piping Systems, Accumulators, Reducing Stations, Tanks, Inter/After Coolers, Cooking Equipment, Autoclaves, Sterilizers or wherever higher capacity pressure protection or relief may be required.

Series 560 & 570

Usages:

- Series 560 – Use for ASME Section I applications to pressure ratings of 250 PSI. V and NB stamped for fired vessels. Boilers, or most areas where steam safety valves are required.
- Series 570 – Use for ASME Section VIII applications to pressure ratings of 250 PSI. UV and NB stamped for unfired vessel protection. Used for many applications to protect or relieve pressure for Air, Gas and Steam.

Features:

- Designed for durability
- 6 orifices – 12 sizes of piping options
- Top guided seating and discharge
- Full nozzle; high capacity levels
- Excellent re-seating characteristics with pivoting ball-post design
- Short, tuned blow-down and can be adjusted with double ring to meet specific requirements
- Heavy duty hood and lever mechanism
- Standard 17-7 stainless steel springs

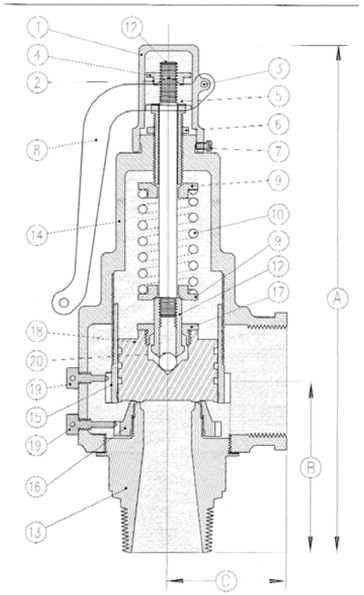
Options:

- Stainless steel whetted trimming package (seat, disk and interiors)
- O-ring seating. (Teflon, EDPM, Viton, or as specified)
- Bubble tight seating options
- Anti vibrating spring for lift lever
- Packed lift lever
- BPT pipe threading

Ordering:

- Specify series (560/570), special seating options, piping size, set pressure PSI , capacity requirements when ordering
- See opposite page for details

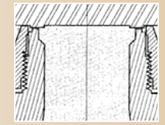
MAX TEMP BRASS BRONZE 406°



PARTS IDENTIFICATION & MATERIALS

ITEM	PART NAME	MATERIAL	ASTM
1	HOOD	CAST BRASS	
2	COTTER PIN		
3	LIFT LEVER PIN	BRASS	
4	LIFTER NUT	BRASS	B-16
5	PRESSURE SCREW	BRASS	B-16
6	LOCK NUT	BRASS	B-16
7	HOOD SCREW	BRASS	
8	LIFT LEVER	CAST BRASS	
9	SPRING PLATE	BRASS	B-16
10	SPRING	STAINLESS STEEL	
11	NAMEPLATE	ALUMINUM	
12	SPRING POST	BRASS	B-16
13	BODY	BRASS	B-16
		CAST BRASS	B-61, 62
14	BONNET	CAST BRASS	B-61, 62
15	UPPER RING	CAST BRASS	
16	LOWER RING	CAST BRASS	
17	DISC NUT	BRASS	B-16
18	DISC	BRASS	B-16
19	REGULATOR SCREW	BRASS	B-16
20	BALL BEARING	STAINLESS STEEL	

SEATING



SERIES 560/570 DIMENSIONS • AIR/GAS/STEAM

SERIES NO.	ORIFICE I.D.	ORIFICE SIZE	INLET (in)	OUTLET (in)	SIZE I.D.	----------DIMENSIONS---------- A	B	C	WEIGHT (lbs)
560	D	0.125	1/2	3/4	A	7.312	2.468	1.5	1.9
560	D	0.125	3/4	3/4	B	7.312	2.468	1.5	2.2
560	E	0.221	3/4	1	C	7.625	2.5	1.625	2.8
560	E	0.221	1	1	D	7.625	2.5	1.625	3.0
560	F	0.342	1	1 1/4	E	8.625	2.75	1.75	4.0
560	F	0.342	1 1/4	1 1/4	F	8.625	2.75	1.75	4.2
560	G	0.478	1 1/4	1 1/2	G	9.25	3.218	2.25	6.7
560	G	0.478	1 1/2	1 1/2	H	9.25	3.218	2.25	6.9
560	H	0.899	1 1/2	2	J	10.875	3.625	2.5	11.4
560	H	0.899	2	2	K	10.875	3.625	2.5	11.6
560	J	0.463	2	2 1/2	L	12.062	3.937	3.125	15.6
560	J	0.463	2 1/2	2 1/2	M	12.062	3.937	3.125	16.3

Metric Equivalents: Centimeters = Inches x 2.540 Kg = Lbs x .4536

SEATING / TRIM OPTIONS

560 BRASS/BRONZE	570 BRASS BRONZE
561 TEFLON	571 TEFLON
562 O-RING	572 O-RING
563 STAINLESS TRIM	573 STAINLESS TRIM
564 SPECIAL	564 SPECIAL

NO = 561 (Teflon Seat) **G** = Orifice **H** = Piping Size
SIZE = M x F Piping Size
SET = Set Pressure (PSI)
CAP = #/HR Steam
CAP = SCFM Air/Gas
AQC = Internal Tracking (QA)
DATE = Month/Year
V = Fired Vessel (Sec. I)
UV = Unfired Vessel (Sec. VIII)
NB = National Board Certified

Capacity ratings based on pounds per hour of saturated steam at 3% over pressure. NB certified at 90% of accumulated flow.

SERIES 560 CAPACITIES • STEAM • ASME SECTION I

Section I (V)-National Board Certified	CAPACITIES					
	ORIFICE D	ORIFICE E	ORIFICE F	ORIFICE G	ORIFICE H	ORIFICE J
SET PRESSURE PSI	.125	.221	.352	.567	.899	1.463
5*	120	211	337	542	860	1400
10*	147	260	414	667	1058	1722
15	175	309	492	792	1256	2044
20	213	377	601	967	1534	2496
25	230	406	647	1042	1653	2689
30	257	455	725	1167	1851	3012
35	285	504	802	1292	2049	3334
40	312	552	880	1417	2247	3657
45	340	601	957	1542	2445	3979
50	368	650	1035	1667	2643	4302
55	395	699	1113	1792	2842	4624
60	423	747	1190	1917	3040	4947
65	450	796	1268	2042	3238	5269
70	478	846	1347	2170	3440	5598
75	506	895	1426	2297	3642	5927
80	535	946	1507	2427	3848	6262
85	563	996	1586	2555	4050	6591
90	592	1046	1667	2685	4256	6927
95	620	1096	1746	2812	4459	7256
100	649	1147	1826	2942	4665	7591
110	705	1247	1986	3199	5073	8255
120	762	1347	2146	3457	5481	8920
130	819	1448	2306	3714	5889	9584
140	876	1548	2466	3972	6297	10248
150	932	1648	2626	4229	6706	10913
160	989	1749	2785	4487	7114	11577
170	1046	1849	2945	4744	7522	12241
180	1103	1949	3105	5002	7930	12905
190	1159	2050	3265	5259	8338	13570
200	1216	2150	3425	5517	8747	14234
210	1273	2251	3585	5774	9155	14898
220	1330	2351	3744	6031	9563	15563
230	1386	2451	3904	6289	9971	16227
240	1443	2552	4064	6546	10379	16891
250	1500	2652	4224	6804	10788	17556
260*	1557	2752	4384	7061	11196	18220
270*	1613	2853	4544	7319	11604	18884
280*	1670	2953	4703	7576	12012	19548
290*	1727	3053	4863	7834	12421	20213
300*	1784	3154	5023	8091	12829	20877

BAR = PSI x .06895 Kilograms = PPH x .4536

*Not ASME/NB over 250 PSI.

Capacity ratings based on SCFM (standard cubit feet per minute) of Air at 10% over pressure. NB certified at 90% of measured flow.

SERIES 570 CAPACITIES • AIR/GAS • ASME SECTION VIII

Section VIII (UV)-National Board Certified	CAPACITIES					
	ORIFICE D	ORIFICE E	ORIFICE F	ORIFICE G	ORIFICE H	ORIFICE J
SET PRESSURE PSI	.125	.221	.352	.567	.899	1.463
5	45	79	125	202	320	521
10	54	96	153	246	391	636
15	64	113	181	291	461	751
20	74	131	208	335	532	865
25	84	148	236	380	602	980
30	94	165	263	424	673	1095
35	104	184	294	473	750	1221
40	115	204	324	522	828	1348
45	126	223	355	571	906	1474
50	137	242	385	620	983	1600
55	147	261	415	669	1061	1726
60	158	280	446	718	1138	1853
65	169	299	476	767	1216	1979
70	180	318	506	816	1294	2105
75	191	337	537	865	1371	2231
80	201	356	567	914	1449	2358
85	212	375	598	963	1526	2484
90	223	394	628	1012	1604	2610
95	234	413	658	1061	1681	2736
100	245	432	689	1109	1759	2863
110	266	471	750	1207	1914	3115
120	288	509	810	1305	2069	3368
130	309	547	871	1403	2225	3620
140	331	585	932	1501	2380	3873
150	352	623	993	1599	2535	4125
160	374	661	1053	1697	2690	4378
170	396	699	1114	1795	2845	4630
180	417	738	1175	1892	3000	4883
190	439	776	1236	1990	3156	5135
200	460	814	1296	2088	3311	5388
210	482	852	1357	2186	3466	5640
220	503	890	1418	2284	3621	5893
230	525	928	1479	2382	3776	6145
240	547	966	1539	2480	3931	6398
250	568	1005	1600	2577	4087	6650
260*	590	1043	1661	2675	4242	6903
270*	611	1081	1722	2773	4397	7156
280*	633	1119	1782	2871	4552	7408
290*	655	1157	1843	2969	4707	7661
300*	676	1195	1904	3067	4863	7913

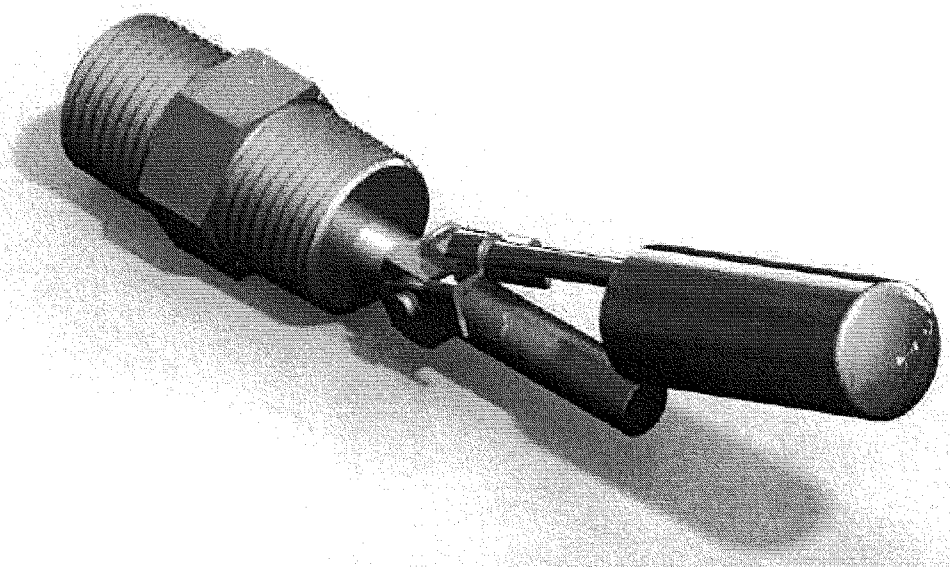
BAR = PSI x .06895 NM^3/HR = SCFM x 1.630

*Not ASME/NB over 250 PSI.

MODEL LOO7

Installation and Operating Manual

SIDE MOUNTED LIQUID LEVEL FLOAT SWITCH



Innovative Solutions

60 Great Hill Road Naugatuck, CT 06770
ph: 203-729-6434 fax: 203-729-6696

www.innovativesensing.com

3.6 Model Numbers

TECHNOLOGY TYPE

L	Liquid level sensor

FLOAT

007	Series, minimum s.g. 0.80

IDENTIFIER

-	Standard Product
C	Custom Product

MOUNTING SIZE

04	1/2" NPT threads
18	3/8"-24 threads
20	1/2"-13 threads
22	5/8"-11 threads

HOUSING / BODY MATERIAL

02	Polypropylene
08	316 Stainless Steel
05	PVC
18	Nylon
22	Polysulfone

FLOAT MATERIAL

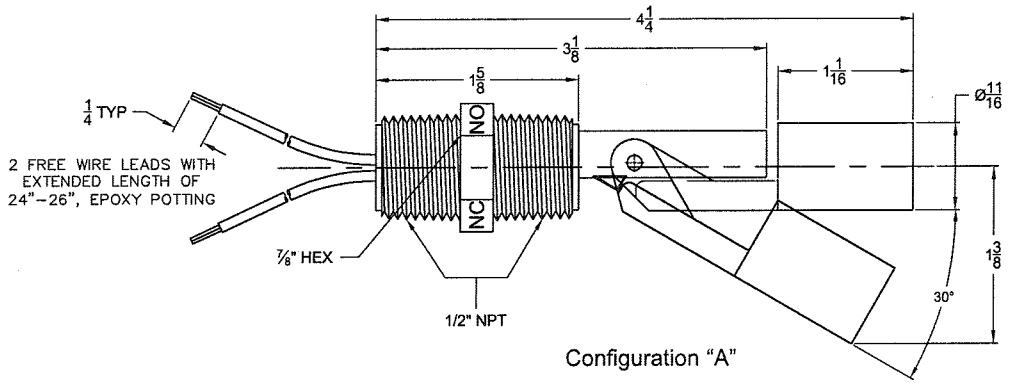
02	Polypropylene
08	316 Stainless Steel
05	PVC
18	Nylon
22	Polysulfone

ELECTRICAL OPTION

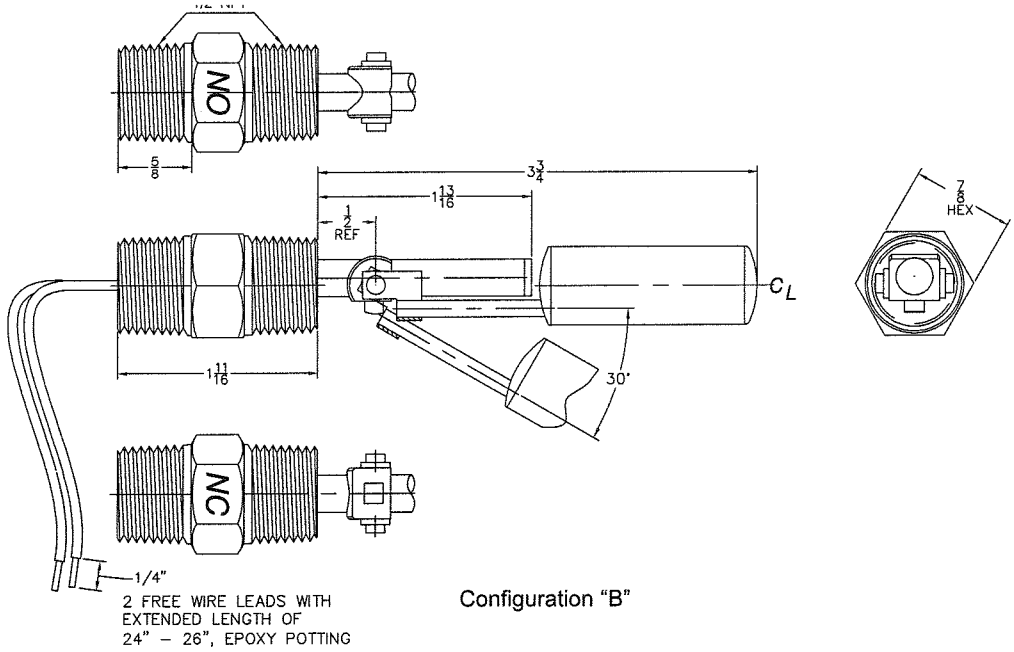
03	50VA, 240VAC/VDC max. 0.5A max
04	100VA, 240VAC/VDC max. 1A max.
06	3VA 30VAC/VDC max. 0.2A max.

L	0	0	7	A	B	B	C	C	—	D	D	E	E

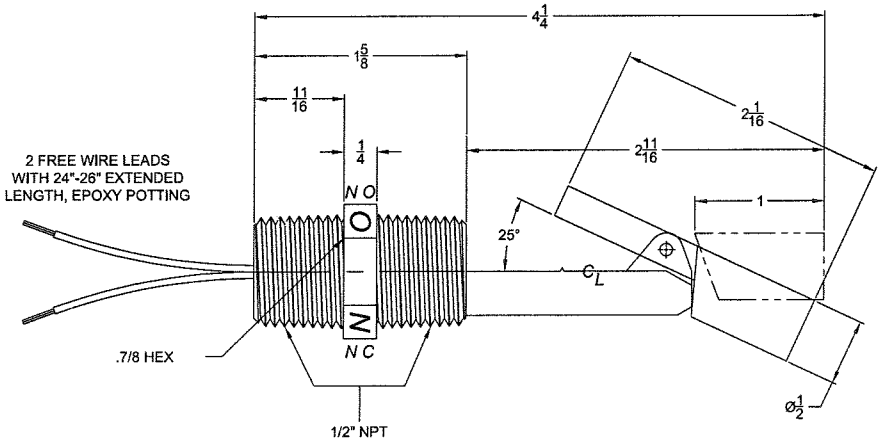
3.5.3 Dimensional Specifications – inches



Configuration "A"



Configuration "B"



Configuration "C"

FSLD3500 Series

Two Piece with ISO Mounting Pad Fire-Safe Ball Valve

FEATURES & BENEFITS

- Applications for Hydraulic, Chemical, Steam, Oil/ Gas, Oxygen, Vacuum
- API 607 Fire-Safe approved
- 2 piece screw-in & 360° fully welded design, no leakage paths through the body for maximum safety
- Thrust washer prevents galling, reduces torque and provides secondary stem seal
- Long cycle life, low uniform torques
- Adjustable stem packing
- Bottom entry blow-out proof stem design provides maximum safety
- Integral ISO-5211 mounting pad for easy automation
- Locking device available
- Investment cast body construction
- DIN EN 10204-3.1 certificate available

SPECIFICATIONS

- Construction: 2 piece screw in & 360° fully welded design
- Flow bore: Full Port
- Rating: 1/4" – 2": 2000 psi; 2-1/2" – 4": 1500 psi; 150 psi saturated steam
- Temperature: -20° F to 400° F (PTFE/TFM1600)
- Materials: ASTM, CF8M, CF8, WCB
- Size range: 1/4" – 4"

STANDARDS

- Female pipe threaded to NPT, DIN 259/2999, BS21
- Inspection & testing according to API 598
- API 607 4th Edition, Fire Safe Test approved
- PED 97/23/EC

ORDERING SCHEMATIC

Series	Body		TRIM		Port		Packing		Seat		Ends	
FSLD35	2	WCB	3	316	F	Full	G	Graphoil	TFM	Super Teflon	S	NPT
	3	316							R	RPTFE		

J Flow Controls, LLC
14 De Camp • Cincinnati, OH 45216
Phone: 513-731-2900 • Fax 513-731-6939
www.jflowcontrols.com

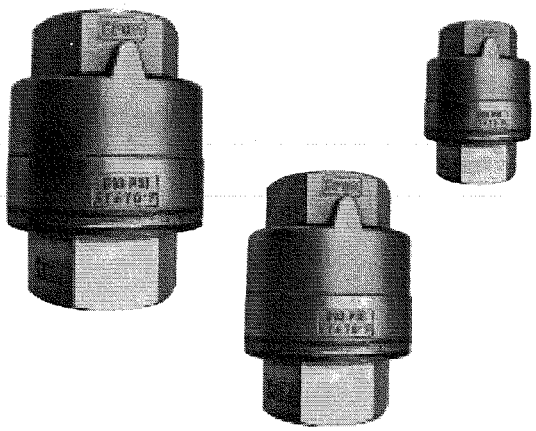
CHECK VALVES

WSSCV Series

Stainless Steel Check Valves

Revised 9/2004

Model	WSSCV
Sizes	[redacted] 3/4", 1", 1¼", 1½", 2", 3"
Connections	NPT, SW
Body Material	316 Stainless Steel
PMA Max. Allowable Pressure	750 PSIG @ 100 °F
TMA Max. Allowable Temperature	850 °F @ 420 PSIG



TYPICAL APPLICATIONS

The model **WSSCV** is an all stainless steel in-line check valve for steam, gas, or liquid service. It provides tight shut-off, minimizes water hammer and also stops recycling of pumps by preventing back flow of liquid. Used in the petrochemical, pulp and paper, textile and the food & beverage industry. The WSSCV all stainless steel check valves will operate much longer and are less problematic than bronze or cast iron check valves.

FEATURES

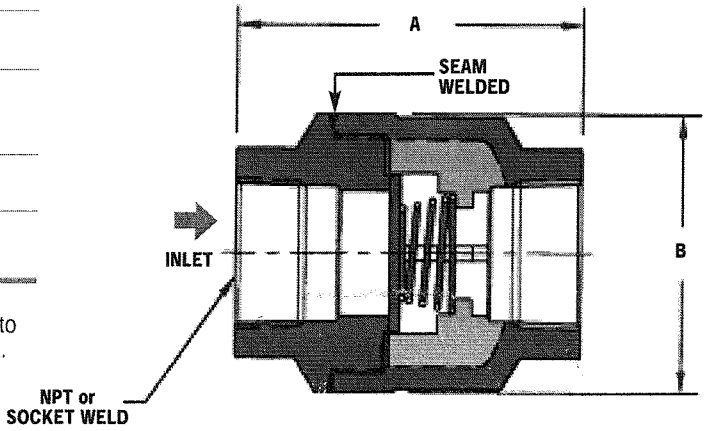
- **316 Stainless Steel Body and Internals**
- **Low cracking Pressure on spring (1/4 PSI) to minimize resistance and maximize flow.**
- **Available with NPT or SW connections.**
- **Spring made from Inconel-X-750 to handle extreme temperature as well as corrosive applications.**
- **Body is seam welded to eliminate O-rings or gasket seals which can be affected by high temperature steam or hot condensate.**
- **Spring assisted closing of check valve to minimize noise and wear.**

SAMPLE SPECIFICATION

Check valve shall have a 316 stainless steel body and disc. Spring shall be made from Inconel X-750. Check valve body to be seal welded together to eliminate need for O-ring or gasket.

MATERIALS

Body	316 Stainless Steel
Disc	316 Stainless Steel
Spring	Inconel X-750



SPECIALTY

DIMENSIONS & SPECIFICATIONS - inches/pounds

Size / MODEL	1/2" WCV-12	3/4" WCV-13	1" WCV-14	1¼" WCV-15	1½" WCV-16	2" WCV-17	3" WCV-19
A	2.69	3.00	3.32	3.81	4.75	5.03	6.87
B	1.62	2.12	2.56	3.06	3.44	4.38	6.19
Weight (lbs)	1.1	1.5	1.9	3.8	4.7	7.7	18.8
*Opening Pressure	0.4	0.3	0.3	0.4	0.2	0.2	0.3
Cv	7	13	22	39	54	93	180

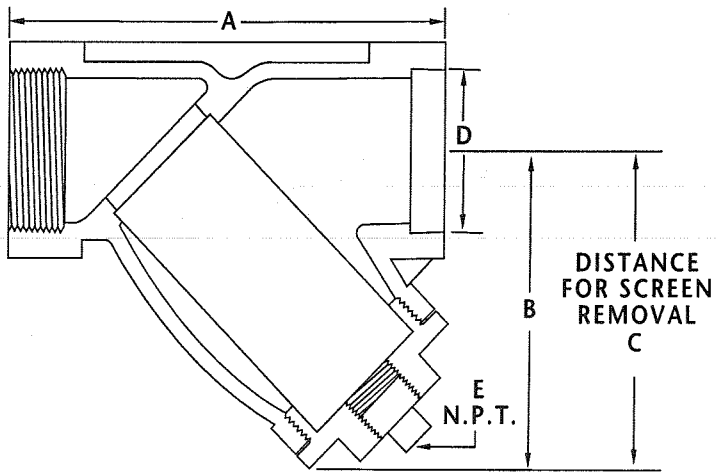
*NOTE: Pressure at which valve opens and flow occurs. (PSI)

ISLIP FLOW CONTROLS Inc.

IFC Series Y150 and Y300 Cast Steel Threaded and Socket Weld Y-Strainers

Standard Screens

Size Range	Opening
1/2"-2"	0.032 in.
10mm-50mm	0.8 mm
2 1/2"-3"	0.045 in.
65mm-80mm	1.2 mm



Dimensional Data (Class 150-300)

Size in (mm)	A in (mm)		B in (mm)		C in (mm)		D in (mm)		E NPT in (mm)		Weight Lb. (Kg.)	
	Y150	Y300	Y150	Y300	Y150	Y300	Y150	Y300	Y150	Y300	Y150	Y300
1/2	N/A	2.31	N/A	1.56	N/A	2.38	N/A	0.855	N/A	3/8	N/A	0.50
15	N/A	59	N/A	40	N/A	60	N/A	21.72	N/A	10	N/A	0.22
3/4	N/A	3.13	N/A	2.13	N/A	3.19	N/A	1.065	N/A	3/8	N/A	0.82
20	N/A	80	N/A	54	N/A	81	N/A	27.05	N/A	10	N/A	0.37
1	N/A	3.31	N/A	2.63	N/A	4.00	N/A	1.330	N/A	1/2	N/A	1.50
25	N/A	84	N/A	67	N/A	102	N/A	33.78	N/A	15	N/A	0.68
1-1/4	N/A	4.13	N/A	3.00	N/A	4.50	N/A	1.675	N/A	1/2	N/A	2.0
32	N/A	105	N/A	76	N/A	114	N/A	42.55	N/A	15	N/A	0.90
1-1/2	N/A	4.69	N/A	3.19	N/A	4.75	N/A	1.915	N/A	1/2	N/A	2.75
40	N/A	119	N/A	81	N/A	121	N/A	48.64	N/A	15	N/A	1.25
2	N/A	5.44	N/A	3.81	N/A	5.75	N/A	2.406	N/A	1/2	N/A	4.25
50	N/A	1.38	N/A	97	N/A	146	N/A	61.11	N/A	15	N/A	1.90
2-1/2	7.19	7.19	4.88	4.88	7.25	7.25	2.906	2.906	1/2	1/2	10	10
65	183	183	124	124	184	184	73.81	73.81	15	15	4.54	4.54
3	8.00	8.00	5.25	5.25	7.50	7.50	3.535	3.535	1/2	1/2	14	14
80	203	203	133	133	190	190	89.79	89.79	15	15	6.35	6.35

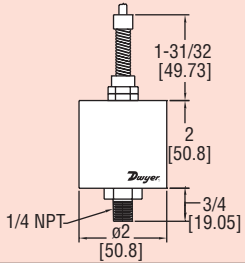
General:

1. For further optional features see page 19.
2. Other perforations and screen materials available. Please see page 20.
3. For pressure loss information see page 21 and 23.
4. For ordering information please see page 30.
5. Dimensions shown are subject to change. Contact factory for certified prints when required.

Series 682

Industrial Pressure Transmitter

±0.13% FS Accuracy, External Adjustments, 4 to 20 mA Output



The Series 682 Industrial Pressure Transmitter is designed to withstand environmental effects such as shock, vibration, temperature, and EMI/RFI. The electronics and capacitive sensor are packaged in a welded stainless steel housing and meets NEMA 4 (IP56) protection ratings. The transmitter features external zero and span adjustments and reverse polarity protection. The Series 682 delivers high performance in tough applications such as off road equipment, hydraulic systems, compressor control, industrial engines, or industrial refrigeration.

Model*	Range	Overpressure
682-1	0 to 50 psi	150 psi
682-2	0 to 100 psi	300 psi
682-3	0 to 250 psi	500 psi
682-4	0 to 500 psi	1000 psi

*Units calibrated in bar also available. Consult factory.

OPTION

For NIST traceable calibration certificate, use order code NISTCAL-PT1.

SPECIFICATIONS

Service: Compatible liquids and gases.
Wetted Parts: 17-4 PH SS.
Accuracy: ±.13% FS (includes non-linearity, hysteresis and non-repeatability).
Temperature Limits: -40 to 260°F (-40 to 125°C) 10 to 90% RH, non-condensing.
Pressure Limit: See table.
Compensated Temp. Range: -4 to 176°F (-20 to 80°C).
Thermal Effect: Zero shift: 1.0% FS/100°F span shift: ±1.5% FS/100°F.
Power Requirements: 9 to 30 VDC.
Output: 4 to 20 mA, 2-wire.
Zero and Span Adjustment: ± 0.5 mA, non-interactive.
Response Time: 5 ms.
Loop Resistance: 800 Ω.
Electrical Connections: 2 ft (51 cm) multiconductor cable.
Process Connection: 1/4˝ male NPT.
Weight: 8 oz (227 g).
Agency Approvals: CE.
Shock: 200 g operating.
Vibration: 20 g 50-2000 Hz.

STAINLESS STEEL GAUGES

316 STAINLESS STEEL OR ALLOY 20® GAUGE

AUTOMATIC

For Liquid Level Pressures up to 300 PSI

Rubber washer for:
5/8" glass - 9/16" x 7/8" x 3/8"

Rods 1-1/4" shorter than centers

Glass 2-3/4" shorter than centers

1/8" DRAIN PLUG

Furnished with a Vertical Rising Ball Check and Investment Casting

MODEL	SIZE OF NPT CONNECTION	SIZE OF GLASS O.D.
EFI 1511	1/2" 3/4"	5/8" 5/8"

NOTE: Specify material of construction when ordering.

316 STAINLESS STEEL EXPANSION TANK GAUGE

NON-AUTOMATIC

For Liquid Level Pressures up to 150 PSI

Investment Casting

Rubber washer for: 5/8" glass - 9/16" x 7/8" x 3/8"

Rods 1" shorter than centers

Glass 2-1/2" shorter than centers

MODEL	SIZE OF NPT CONNECTION	SIZE OF GLASS O.D.
EFI 00316	3/8" 1/2" 3/4" 1" (Bushings Furnished)	5/8" 5/8" 5/8" 5/8"

316 STAINLESS STEEL EXPANSION TANK GAUGE

NON-AUTOMATIC

For Liquid Level Pressures up to 250 PSI

Investment Casting

Rubber washer for: 5/8" glass - 9/16" x 13/16" x 3/8"

Rods 1" shorter than centers

Glass 2-1/2" shorter than centers

Lower valve has a hand wheel shut-off

1/8" DRAIN NEEDLE

MODEL	SIZE OF NPT CONNECTION	SIZE OF GLASS O.D.
EFI 23-651 EFI 23-654	1/2" 3/4"	5/8" 5/8"

316 STAINLESS STEEL, CARBON STEEL OR DUCTILE IRON GAUGE

AUTOMATIC

For Steam Pressures up to 250 PSI @ 406° F

For Liquid Level Pressures up to 500 PSI

Stainless Steel furnished with Investment Casting

Material used conforms with or exceeds requirements of AISI, ASTM and/or API-ASME for maximum recommended pressures and temperatures.

Rubber washer for:
5/8" glass - 9/16" x 13/16" x 3/8
3/4" glass - 23/32" x 15/16" x 3/8"

Rods 1-1/4" shorter than centers

Glass 2" shorter than centers

NOTE: Specify for steam or liquid level, as automatic balls must be removed for steam.

1/4" DRAIN

MODEL	CONSTRUCTION	SIZE OF NPT CONNECTION	SIZE OF GLASS O.D.
EFI 70A316	Stainless Steel	1/2"	5/8"
EFI 71A316	Stainless Steel	3/4"	3/4"
EFI 71ACS	Carbon Steel	3/4"	3/4"
EFI 70A	Iron	1/2"	5/8"

EFI YOUR FUTURE IS IN SIGHT®

316 STAINLESS STEEL GAUGE

AUTOMATIC

For Steam Pressures up to 250 PSI @ 406° F

For Liquid Level Pressures up to 500 PSI

Investment Casting

Conforms to ASME requirements for automatic water gauges

Rubber washer for: 5/8" glass - 9/16" x 7/8" x 3/8"
3/4" glass - 23/32" x 7/8" x 3/8"

Rods 1-1/4" shorter than centers

Glass 2" shorter than centers

1/4" BALL VALVE DRAIN

WITH 1/4" NPT BALL VALVE →

MODEL	SIZE OF NPT CONNECTION	SIZE OF GLASS O.D.
EFI 23-350 EFI 23-353	1/2" 3/4"	5/8" 3/4"

Operating pressures and temperatures are subject to the limitations of the tubular gauge glass and washer composition...consult with EFI for gauge glass ratings.

P.O. Box 925 • Farmingdale, NJ 07727-0925 • TEL (732) 938-5641 • TOLL FREE 800-992-2843 • TOLL FREE FAX 888-992-2843
E-mail: info@ernstflow.com • ernstflow.com

ICON by Industrial Controls

Model 10A
Standard Commercial Gauge

- An inexpensive utility gauge for the broad commercial and industrial markets
- Suitable for air, water, oil, gas or any other media not corrosive to brass
- Other connection locations, mounting styles and accessories are available
- Ready for quick shipment upon request

General Specifications:

- ✓ Black Steel Case with Chrome Bezel
- ✓ Brass Socket and Movement
- ✓ Phosphor Bronze Bourdon Tube
- ✓ Dry, Non-fillable
- ✓ 3-2-3% Accuracy
- ✓ Ambient Temperature: -50 to 160° F

Available Dial Sizes:

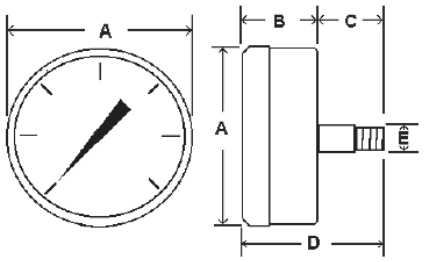
1", 1 1/2", 2", 2 1/2", 3 1/2", 4 1/2"

Available Connection Sizes:

1/8" NPT on 1 1/2" & 2" Dial Sizes
1/4" NPT on 2" Thru' 4 1/2" Dial Sizes

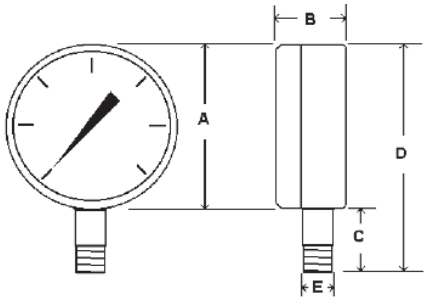
Dial Scale:

Dual Scale: PSI & BAR (x100=kPa)
Other Scales By Special Request



Back Connection Dimensions

		A	B	C	D	E
1" Dial	In.	.99	.64	.46	1.10	1/8" NPT
	MM	25	16	12	28	
1 1/2" Dial	In.	1.64	.93	.63	1.56	1/8" NPT
	MM	42	24	16	40	
2" Dial	In.	2.07	1.03	.83	1.86	1/8" or 1/4" NPT
	MM	53	26	21	47	
2 1/2" Dial	In.	2.50	1.17	.86	2.03	1/4" NPT
	MM	63	30	22	52	
3 1/2" Dial	In.	3.97	1.19	.83	2.02	1/4" NPT
	MM	101	30	21	51	
4 1/2" Dial	In.	4.5	1.34	.84	2.18	1/4" NPT
	MM	114	34	21	55	



Lower Connection Dimensions

		A	B	C	D	E
1 1/2" Dial	In.	1.64	.93	.63	2.27	1/8" NPT
	MM	42	24	16	58	
2" Dial	In.	2.07	1.03	.83	2.90	1/8" or 1/4" NPT
	MM	53	26	21	74	
2 1/2" Dial	In.	2.50	1.17	.86	3.36	1/4" NPT
	MM	63	30	22	85	
3 1/2" Dial	In.	3.53	1.14	1.02	4.55	1/4" NPT
	MM	90	29	26	116	
4 1/2" Dial	In.	4.89	1.16	1.16	6.05	1/4" NPT
	MM	124	29	30	154	

High Quality Gauges & Accessories a Day Away!

ICON by Industrial Controls

Model 10A Part Numbering System

Example: 15 10A 1B 100

Dial	Model			Connection	Range
15	1	0	A	1B	100

Dial Size

10 =	1”
15 =	1 1/2”
20 =	2”
25 =	2 1/2” (63 mm)
35 =	3 1/2”
45 =	4 1/2”

Gauge Type

1 =	Steel Case, Chrome Ring

Case Type

0 =	Plain

Tube Material & Fill

A =	Bronze Dry

Connection

1L =	1/8” Lower
1B =	1/8” Back
2L =	1/4” Lower
2B =	1/4” Back

Range

VAC = 30-0” HG Vacuum
VAC/15 = 30” HG & 0-15 psi
VAC/30 = 30” HG & 0-30 psi
VAC/60 = 30” HG & 0-60 psi
15 = 0-15 psi
30 = 0-30 psi
60 = 0-60 psi
100 = 0-100 psi
160 = 0-160 psi
200 = 0-200 psi
300 = 0-300 psi
400 = 0-400 psi
600 = 0-600 psi
1000 = 0-1,000 psi
1500 = 0-1,500 psi
2000 = 0-2,000 psi
3000 = 0-3,000 psi

The most common ranges are listed here. Call for availability of additional ranges.

Contact us for information on our complete gauge line .... Other ranges and styles are available
Stock gauges are available off the shelf .... Delivery on non-stock gauges is typically one week or less

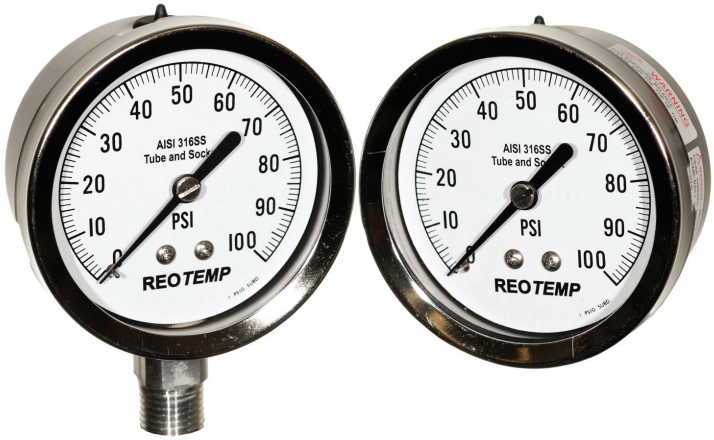
Visit us on the web at: icon-control.com • E-mail: moreinfo@icon-control.com

Series PR25

2.5" Heavy-Duty Repairable Stainless Gauge

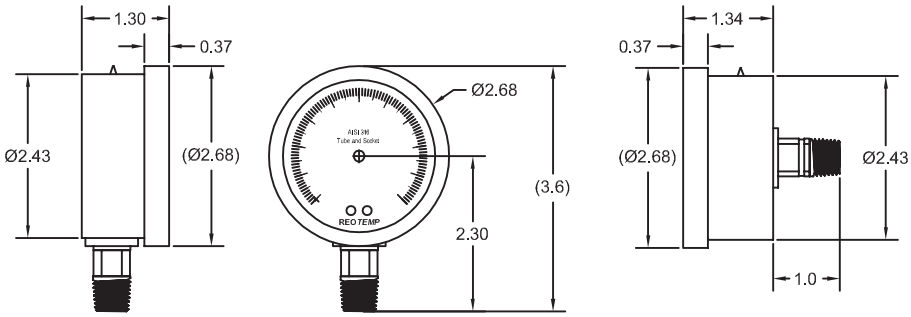
REOTEMP Instruments
Measuring your world since 1965

REO*TEMP*'s Series PR gauge offers rugged, all-welded stainless steel construction ideal for heavy-duty industrial applications. The stainless steel case, tube, and socket are welded together for superior case sealing and gauge integrity. The twist-off bayonet ring offers easy-access for field repair and calibration services. Liquid filling (at the factory or in the field) is recommended for applications involving vibration.



Features/Benefits:

- All-Welded S.S. Construction
- Removable Bayonet Ring
- Fillable Case
- Rugged, Long-Lasting Design



*dimensions in inches

Specifications:

Case:	304SS
Ring:	S.S. Twist-Off Bayonet
Wetted Material:	316SS (monel available)
Lens:	Plastic (others available)
Dial:	Aluminum, Black on White Background
Pointer	Black Aluminum, Adjustable
Accuracy:	2 - 1 - 2%, Grade A

HOW TO ORDER

PR — 25 S 1 A 4 P18 G

Dial:	Case:	Tube & Socket:	Mounting:	Connection:	Range Code:	Filling:	Options:
25 = 2.5"	**S** = 304SS	**1** = 316SS	**A** = Bottom **B** = Bottom/Rear Flange **C** = Center Back **D** = Back U-Clamp **E** = Back/Front Flange	**4** = 1/4" NPT **8** = 1/8" NPT (not standard)	*See Page 12 of Press. Product Catalog for Range Codes* Vac. to 10,000 PSI	**- -** = Dry **G** = Glycerine **S** = Silicone	■ Mini Diaph. Seal ■ Custom Dial ■ Max Pointer ■ Sanitary Tri-clamp Conn.

Distributed by:

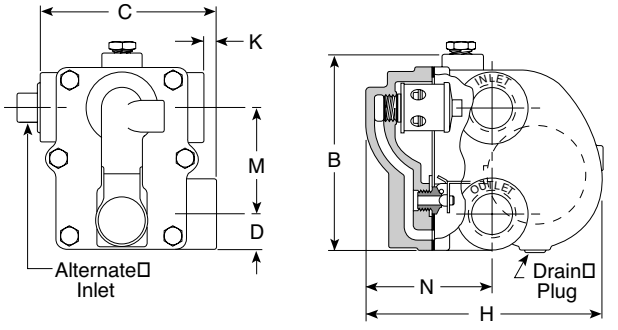
Measuring your world since 1965

REO*TEMP* Instruments
Ph (800)648-7737
Fx (858)784-0720
San Diego, CA U.S.A.
sales@reotemp.com
www.reotemp.com

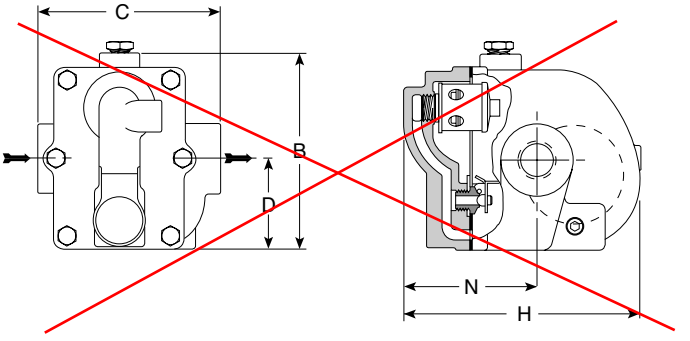
A & AI Series Float & Thermostatic Steam Trap

Cast Iron for Horizontal Installation, With Thermostatic Air Vent

For Pressures to 175 psig (12 bar)...Capacities to 8,600 lb/hr (3,900 kg/hr)



Model A Traps



Model AI Traps

Description

Armstrong A & AI Series F&T traps are for industrial service from 0 to 175 psig and feature a balanced pressure phosphor-bronze type bellows caged in stainless steel. Armstrong A & AI Series F&T traps are designed for service on heat exchange equipment where there is a need to vent air and non-condensable gases quickly.

The **AI Series F&T** traps feature the convenience of in-line connections with the same rugged internals found in the A Series.

Maximum Operating Conditions

Maximum allowable pressure (vessel design):
175 psig @ 377°F (12 bar @ 191°C)

Maximum operating pressure:

Model 30-A, AI:	30 psig (2 bar) saturated steam
Model 75-A, AI:	75 psig (5 bar) saturated steam
Model 125-A, AI:	125 psig (8.5 bar) saturated steam
Model 175-A, AI:	175 psig (12 bar) saturated steam

NOTE: Cast iron traps should not be used in systems where excessive hydraulic or thermal shock are present.

Connections

Screwed NPT and BSPT

Materials

Body and cap:	ASTM A48 Class 30
Internals:	All stainless steel—304
Valve:	Stainless steel—440
Seat:	Stainless steel—303 (ASTM A582) Stainless steel—440F in 1-1/2" and 2"
Thermostatic air vent:	Stainless steel and bronze with phosphor bronze bellows, caged in stainless steel

Options

Integral vacuum breaker. Add suffix VB to model number.

CAUTION: Do not use a conventional vacuum breaker open to the atmosphere in any system that incorporates a mechanical return system that carries pressure less than atmospheric pressure. This includes all return systems designated as vacuum returns, variable vacuum returns or subatmospheric returns. If a vacuum breaker must be installed in such a system, it should be of the type that is loaded to open only when the vacuum reaches a calibrated level well in excess of the design characteristics of the system.

Specification

Float and thermostatic steam trap, type ... in cast iron, with thermostatic air vent.

For a fully detailed certified drawing, refer to CD #1009.

How to Order

	Model		Option
75	AI	2	VB
30 75 125 175	A = Standard Connection AI = In-line Connection	3 = 3/4" 4 = 1" 5 = 1-1/4" 6 = 1-1/2" 8 = 2" 2 = 1/2" 3 = 3/4" 4 = 1"	VB = Vacuum Breaker

A & AI Series Traps

Trap Series	Model A										Model AI	
Pipe Connections	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
	3/4	20	1	25	1-1/4	32	1-1/2	40	2	50	1/2, 3/4, 1	15, 20, 25
"B" (Height)	5-1/8	130	5-1/8	130	5-13/16	148	7-7/16	189	9-3/4	248	5-1/2	140
"C" (Face to Face)	4-7/8	124	4-7/8	124	4-5/8	117	5-3/4	146	7-5/8	194	5	127
"D" (Bottom to ℄)	1	25.4	1	25.4	1-7/32	31.0	1-13/32	35.7	1-11/16	42.9	2-9/16	65.1
"H" (Width)	6-7/16	164	6-7/8	164	8-1/8	206	8-7/16	214	11-5/8	295	6-1/2	165
"K" (Connection Offset)	3/8	95.2	3/8	95.2	—	—	—	—	—	—	—	—
"M" (℄ to ℄)	3	76.2	3	76.2	3	76.2	4-3/16	106	6	152	—	—
"N" (Top to ℄)	3-3/8	85.7	3-3/8	85.7	3-3/4	95.2	3-3/4	95.2	5	127	3-11/16	93.7
Weight lb (kg)	9-1/2 (4.3)		8-1/4 (3.7)		11 (5.0)		18-3/4 (8.5)		40 (18.1)		9-3/4 (4.4)	

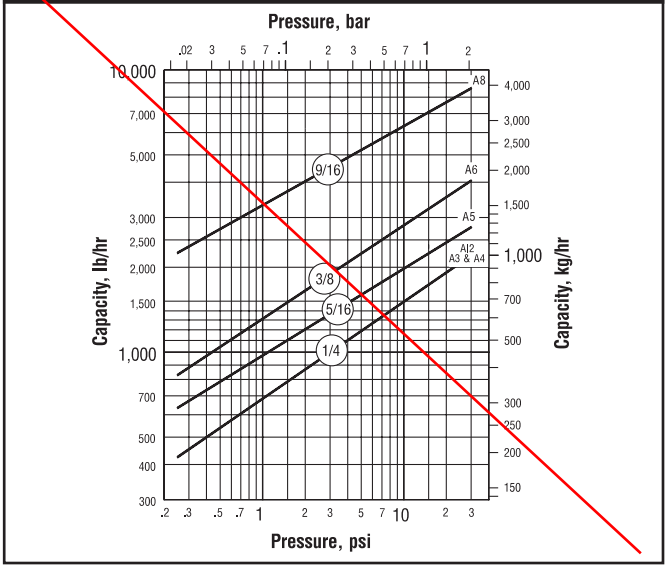
NOTE: Cast iron traps should not be used in systems where excessive hydraulic or thermal shock are present.

A & AI Series Float & Thermostatic Steam Trap

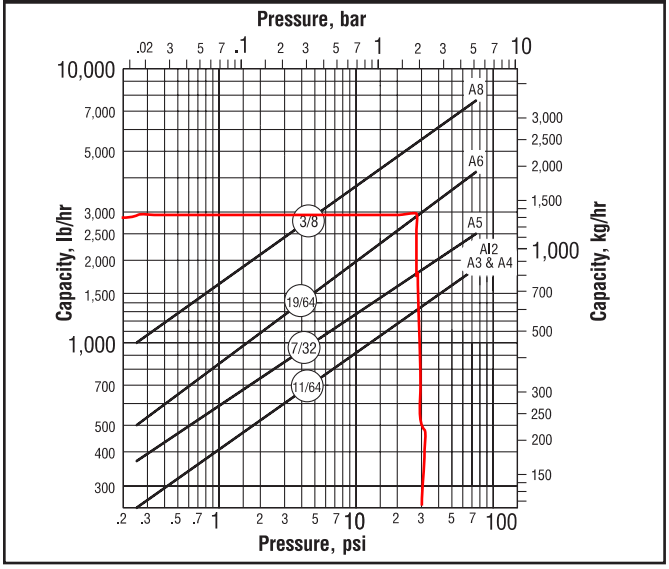
Cast Iron for Horizontal Installation, With Thermostatic Air Vent

For Pressures to 175 psig (12 bar)...Capacities to 8,600 lb/hr (3,900 kg/hr)

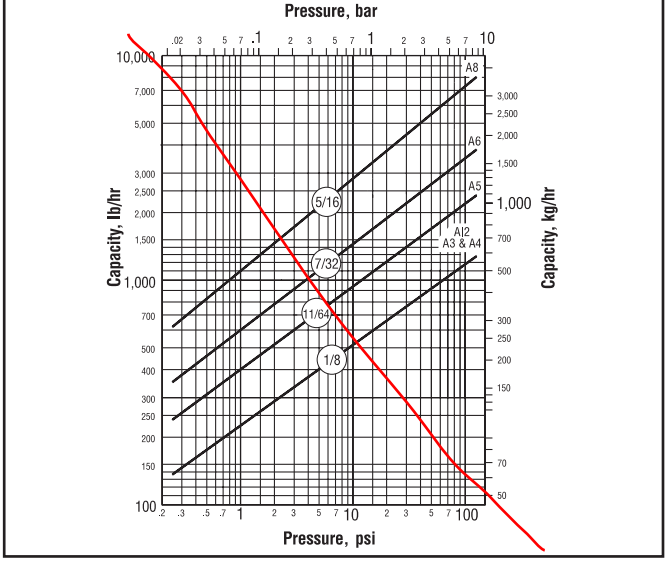
Model A & AI Series Capacity—30 psi



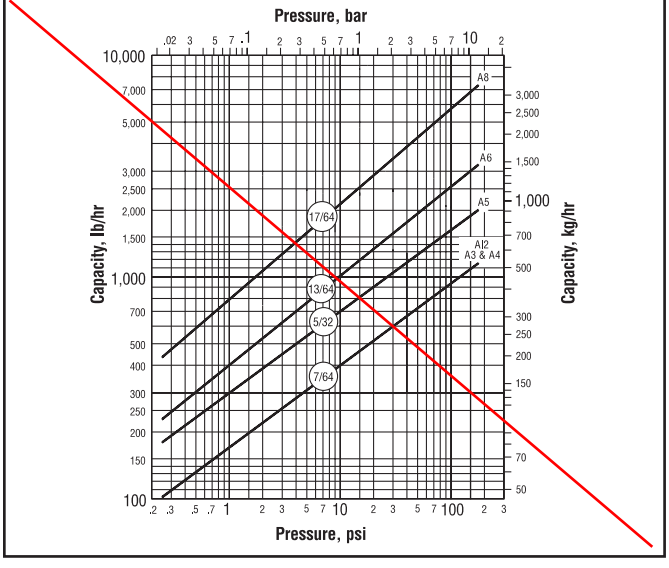
Model A & AI Series Capacity—75 psi



Model A & AI Series Capacity—125 psi



Model A & AI Series Capacity—175 psi

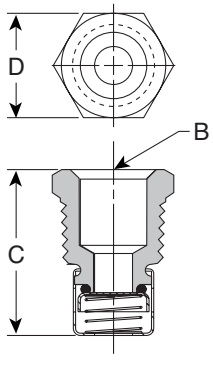


Options

Vacuum Breaker—3/8" (10 mm) and 1/2" (15 mm) NPT

Many times, condensate will be retained ahead of steam traps because of the presence of a vacuum. To break a vacuum, air must be introduced into the system by means of a vacuum breaker.

For maximum protection against freezing and water hammer in condensing equipment under modulated control, vacuum breakers are recommended. Armstrong A and AI Series F&T Traps are available with integral vacuum breakers. Maximum service pressure is 150 psig (10 bar).



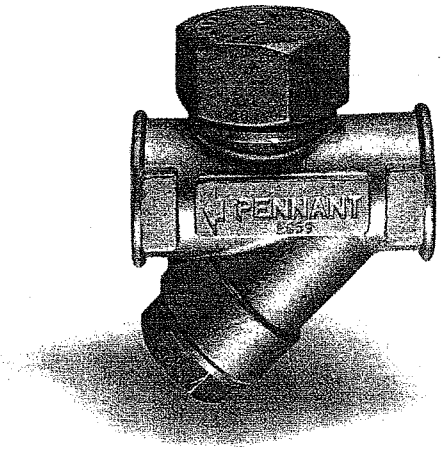
Vacuum Breaker				
Size	in	mm	in	mm
	1/2 NPT	15	3/8 NPT	10
"B" Pipe Connections	3/8 NPT	10	1/4 NPT	6
"C" Height	1-1/4	32	1-3/32	28
"D" Width	7/8 Hex	22 Hex	11/16 Hex	17 Hex

PENNANT INTERNATIONAL CORP.

PT11/PT12
Thermodynamic Steam Traps

DESCRIPTION:

Thermodynamic steam trap with inbuilt strainer, in full stainless steel construction, best suited for header and main line drains and drip legs.



FEATURES:

Complete stainless steel construction ensures better mechanical and corrosion resistance properties. The disc and seat are hardened by a special induction hardening process with seat harder than disc, to withstand continuous, prolonged operation. Condensate entry below the disc, concentric to the disc/seat ensures a clean and parallel lift of the disc with reference to the seat, eliminating localized wear and tear.

The inbuilt strainer screen is of adequately large area.

Ideal for fluctuating loads and pressures.

Perfect shut-off, no steam loss.

SIZES: PT11: ½", ¾"
PT12: 1"

CONNECTIONS: Screwed (NPT)

LIMITING CONDITIONS:

PMA: Maximum allowable pressure	600 psig
TMA: Maximum allowable temperature	800 °F
Maximum operating back pressure at the outlet should not exceed 80% of the inlet pressure.	
Minimum differential pressure for satisfactory operation	3.5 psi

INSTALLATION:

The trap will operate in any position but the preferred installation is in a horizontal position with the disc cap on the top. Full port isolating valves should be installed upstream and downstream of the trap.

MAINTENANCE:

This trap can be maintained without disturbing the piping connections. Ensure that the trap is isolated - upstream and downstream - before attempting to dismantle it. ALLOW THE TRAP TO COOL BEFORE DISMANTLING.

For trouble-free performance, periodic cleaning of the disc, seat and strainer screen is recommended.
Do not use abrasive / corrosive media for cleaning.
Only the disc and seat are subject to wear.
A worn disc can be replaced. Slight seat wear can often be corrected by resurfacing on a lap plate.

IMPORTANT:

The trap should be installed as close as possible to the line to be drained.
For new pipelines, ensure that the lines are properly flushed, prior to fitting the traps, to avoid strainer choke-up.

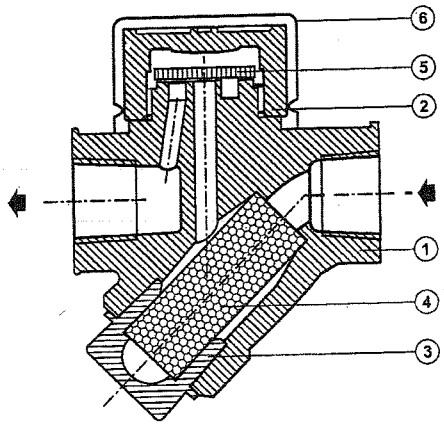
PENNANT INTERNATIONAL CORP.

PT11/PT12

Thermodynamic Steam Traps

MATERIAL:

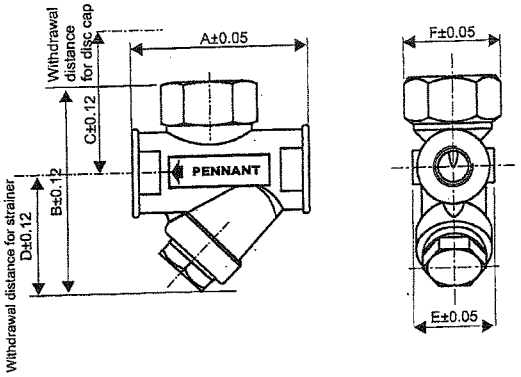
No.	PART	MATERIAL	QTY.(Nos.)
1.	BODY (Seat Hardened)	ASTM A743 Gr CA 40 (Cast Equiv. AISI 420)	01
2.	DISC CAP	ASTM A743 Gr CA 40 (Cast Equiv. AISI 420)	01
3.	STRAINER CAP	ASTM A743 Gr CA 40 (Cast Equiv. AISI 420)	01
4.	STRAINER SCREEN	AISI 304 Perforated Sheet	01
5.	DISC (Hardened)	AISI 410 / 420	01
6.*	ISOTUB	SS	01



*OPTIONAL FITTINGS

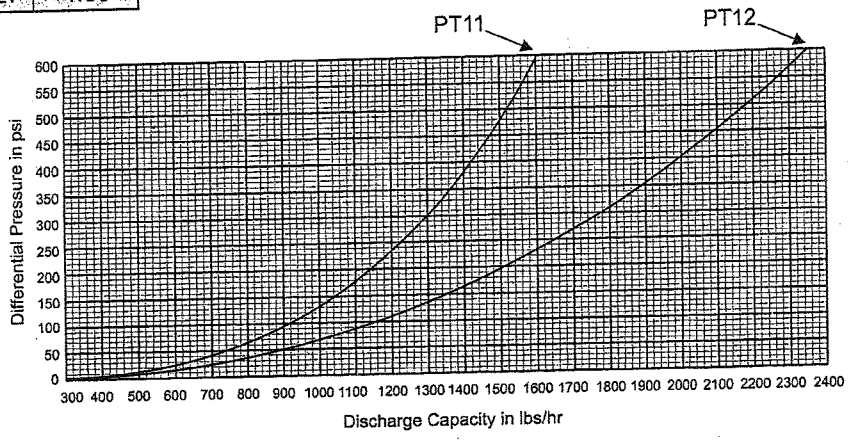
ISOTUB: An insulating cover reduces the effect of excessive heat loss resulting from low ambient temperatures, wind, rain, etc.

BLOW-OFF COCK: When the blow-off cock is opened, loose material collected in the strainer is purged.



DIMENSIONS (approx.) in inches

Model	A	B	C	D	E	F	Wt.(lbs.)
PT 11	3.15	4.00	3.19	3.54	1.60	1.91	2.2
PT 12	3.78	4.76	3.58	4.25	2.05	2.27	4.85



HOW TO ORDER:

Refer to page 44.

AVAILABLE SPARES:

Disc, Strainer Screen (Packet of 5), Blow-off Cock, Isotub

250Y1 SERIES
CAST IRON Y STRAINERS NPT

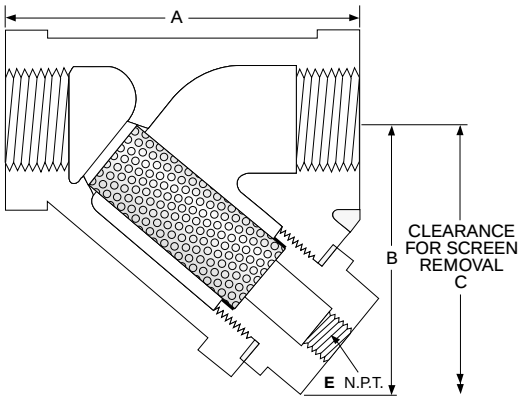
SPECIFICATION

Y Strainer shall be straight flow design with NPT inlet/outlet connections. The strainer shall be rated to ANSI 250 PSIG rating in accordance with ANSI B16.4. The Strainer shall be cast iron body and the screen shall be size _____ perf / mesh 304 SS. The strainer shall be have an inlet size of _____ and Open Area Ratio of _____. The Y Strainer shall be SSI 250Y1 Series.

MATERIALS OF CONSTRUCTION

Body A126-B
Cap/Cover A126-B
Screen[1] .....304 SS
Plug[2] A126-B
Gasket[1] .....Graphite

1. Recommended Spare Parts
2. Materials of equivalent strength may be substituted

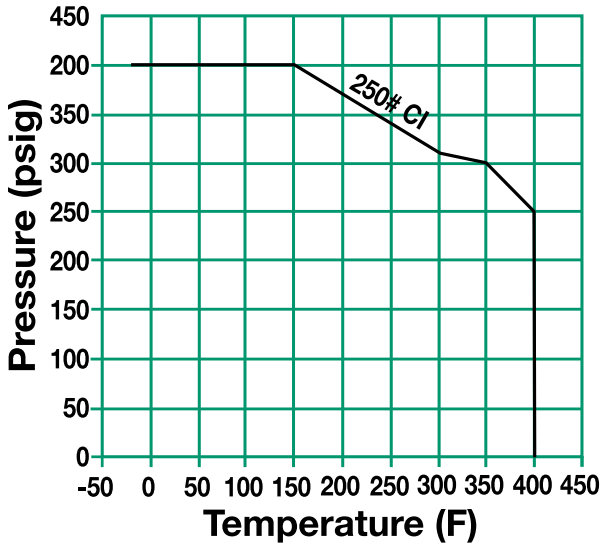


Connections: 1/4" – 3" NPT

SCREEN OPENINGS

SIZE	STANDARD SCREEN	MATERIALS
1/4"- 2"	20 Mesh	304 SS
2½"- 3"	3/64" Perf	304 SS

PRESSURE/TEMPERATURE CHART
ASME B16.4



DIMENSIONS inches (mm) AND WEIGHTS pounds (kg)

SIZE	A	B	C	E	WEIGHT
¼ (8)	3 3/16 (81)	2 (50)	3⅛ (80)	¼ (8)	1.50 (.70)
⅜ (10)	3³⁄₁₆ (81)	2 (50)	3⅛ (80)	¼ (8)	1.50 (.70)
½ (15)	3³⁄₁₆ (81)	2 (50)	3⅛ (80)	¼ (8)	1.50 (.70)
¾ (20)	3¾ (95)	2¹¹⁄₁₆ (68)	3¹¹⁄₁₆ (94)	⅜ (10)	2.50 (.50)
1 (25)	4 (102)	3 (62)	3¹¹⁄₁₆ (94)	⅜ (10)	3.00 (1.4)
1¼ (32)	5 (127)	3⅜ (87)	5⅛ (129)	¾ (20)	6.00 (1.4)
1½ (40)	5¾ (146)	3²⁵⁄₃₂ (96)	5¾ (146)	¾ (20)	8.00 (3.6)
2 (50)	7 (178)	4¹¹⁄₃₂ (110)	7¼ (184)	1 (25)	14.00 (3.6)
2½ (65)	9¼ (235)	6³⁄₃₂ (155)	8¾ (222)	1½ (40)	29.0 (10)
3 (80)	10 (254)	7¹³⁄₃₂ (188)	9 (2.29)	1½ (40)	38.0 (13.6)

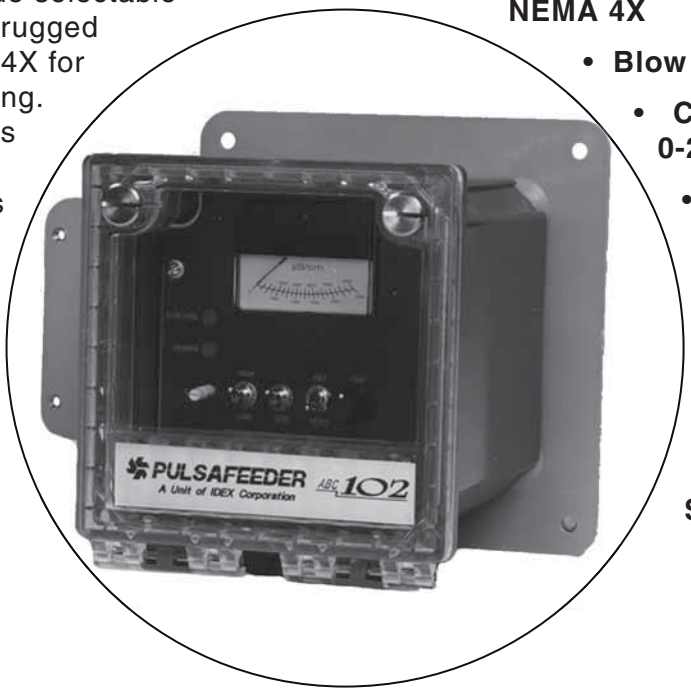
Dimensions shown are subject to change.
Contact factory for certified prints when required.

ABC Boiler
Controller Series

PULSAFEEDER®
A Unit of IDEX Corporation

ABC Boiler Controller Series

The ABC Boiler Controller Series features the latest analog technology and attractive styling. Additional features include selectable scale, easy installation and a rugged enclosure designed to NEMA 4X for reliable and accurate monitoring. This simplified design provides automated control at an economical cost. The ABC series provides electrical conduit connections as standard for blow down valve and accessory activation.



Key Features

- Weather-Tight Enclosure Designed to NEMA 4X
- Blow Down Indicator LED
- Conductivity Range 0-20,000µS
- Relay Test Switch
- Power Indicator LED
- Wall Mountable
- Front Panel Calibration
- Front Panel Dial Set-Point

Selections

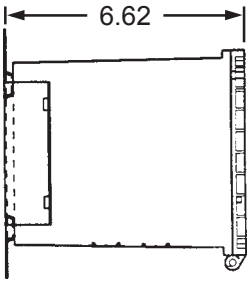
ABC Series	
102	Analog Meter Conductivity Controller Selectable Dual Scale 0-500, 0-100, 0-200, 0-5,000, 0-10,000 and 0-20,000 µS/cm
Optional Features	
P5	220V, 50Hz service
P6	220V, 60 Hz service
R	Conductivity: In-line type max. Press. 250 psi, Max Temp. 400° F with Temp. Comp. stainless steel
V	Agency Approvals US/Canada
V1	Agency Approval “CE” (Requires Option P)
W	Private Label

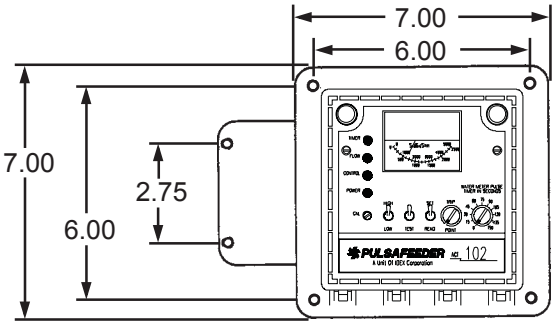
ABC Boiler

Specifications

Enclosure	NEMA 4X
Power Requirements **Optional Power**	110 VAC, 11A, @ 50/60Hz 220 VAC, 11A, @ 50/60Hz
Display	Analog Meter
Range	Front Panel Selectable 0-500, 0-1,000, 0-2,000, 0-5,000, 0-10,000 & 0-20,000 µS/cm
Differntial	6% (+/-1%) of set-point
Control Output	1 @ 5 amp each - 8 second delay
Sample Mode	Jumper Selectable, Continuous, Timed
Timed Sample Intervals	Jumper Selectable: .5, 2, 8, 24 Hours
Timed Sample Blowdown Duration	Jumper Selectable: .5, 1, 2, 4 minutes
Sensor	Molded PPS body with 316SS Electrode. 1" NPT. Rated 250 psi (17.24 Bar) @ 400ºF (204ºC)
Plumbing	1" NPT 2000 lbs. Cross
Temperature Compensation	68-392ºF (20-200ºC)
Electronic Environment	0 - 125ºF (-18 - 52ºC) 100% Humidity
Shipping Weight	8 lbs. (3.7kgs)
Controller Dimensions	7.00 in. x 7.00 in. x 6.62 in. 17.78 cm x 17.78 cm x 16.81 cm

Dimensions





9. ABC BOILER CONTROLLER SERIES

A. KEY FEATURES:

- Front panel calibration.
- Front panel dial set point.
- Conductivity ranges 0-500, 1000, 2000, 5000, 10000, and 20000 µS/cm.
- Blow down indicator LED.
- Relay test switch.
- Power indicator LED.
- Weather-tight enclosure designed to NEMA 4X.
- Wall mountable.

B. ABC MODEL STANDARD FEATURES:

- Analog meter conductivity controller, selectable scale 0-500, 1000, 2000, 5000 and 20,000 µS/cm

C. OPTIONS:

P5	230 VAC @ 50 Hz.
P6	230 VAC @ 60 Hz.
R	BN2-TC (temp. comp. probe)
V	Agency Approval US/Canada
V1	Agency Approval "CE"
W	Private Label

PULSAFEEDER®

A Unit of IDEX Corporation

27101 Airport Road
Punta Gorda, FL 33982

Toll free: 1-800-333-6677
Phone: 1-941-575-3800
Toll free Fax: 1-800-456-4085
Fax: 1-941-575-4085

PULSAFEEDER®

ANALOG BOILER CONTROLLER

MODEL ABC 102

INSTALLATION
OPERATION
MAINTENANCE
INSTRUCTION

72-500-10
E07

ABC™ FACTORY SERVICE POLICY

Your ABC™ controller is a state of the art electronic based unit. If you are experiencing a problem with your ABC™ controller, first consult the troubleshooting guide in your operation and maintenance manual. If the problem is not covered or cannot be solved, please contact our Technical Services Department for further assistance. Trained technicians are available to diagnose your problem and arrange a solution. Solutions may include purchase of replacement parts or returning unit to the factory for inspection and repair. All returns require a Return Authorization number to be issued by Pulsafeeder. Parts purchased to correct a warranty issue may be credited after an examination of original parts by Pulsafeeder. Warranty parts returned as defective which test good will be sent back freight collect. No credit will be issued on any replacement electronic parts.

Any modifications or out-of-warranty repairs will be subject to bench fees and costs associated with replacement parts.

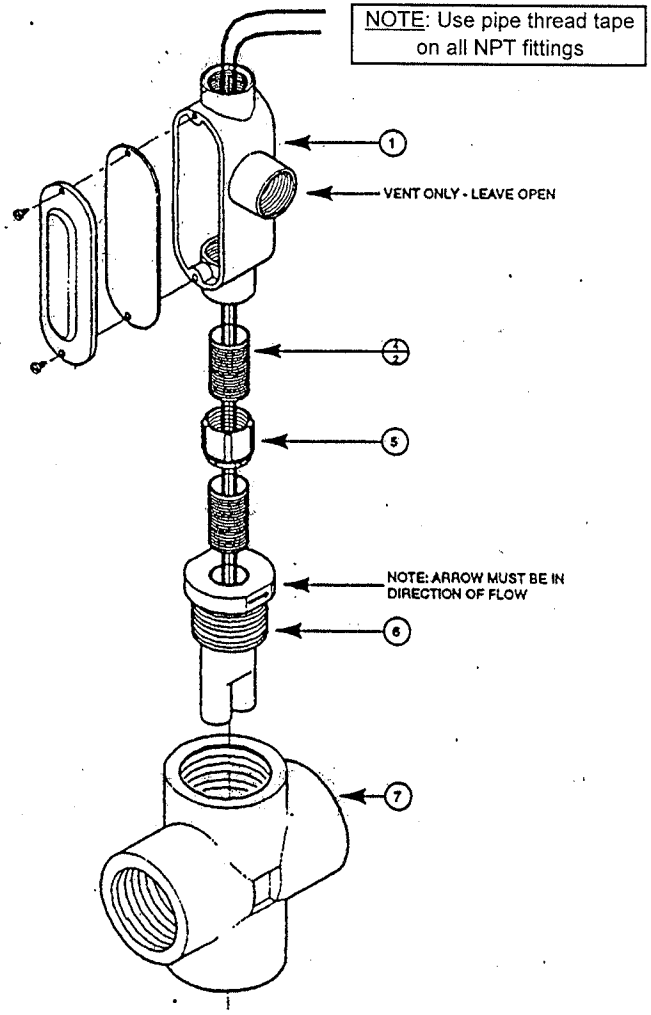
ABC™ WARRANTY

Pulsafeeder, Inc. warrants ABC™ control systems of its manufacture to be free of defects in material or workmanship. Liability under this policy extends for 24 months from date of shipment. The manufacturer's liability is limited to repair or replacement of any failed equipment or part which is proven defective in material or workmanship upon manufacturer's examination. This warranty does not include removal or installation costs and in no event shall the manufacturer's liability exceed the selling price of such equipment or part. The manufacturer disclaims all liability for damage to its products through improper installation, maintenance, use, or attempts to operate such products beyond their functional capacity, intentionally or otherwise, or any unauthorized repair. The manufacturer is not responsible for consequential or other damages, injuries, or expense incurred through the use of its products.

The above warranty is in lieu of any other warranty, whether expressed or implied. The manufacturer makes no warranty of fitness or merchantability. No agent of ours is authorized to provide any warranty other than the above.

ELECTRODE ASSEMBLY

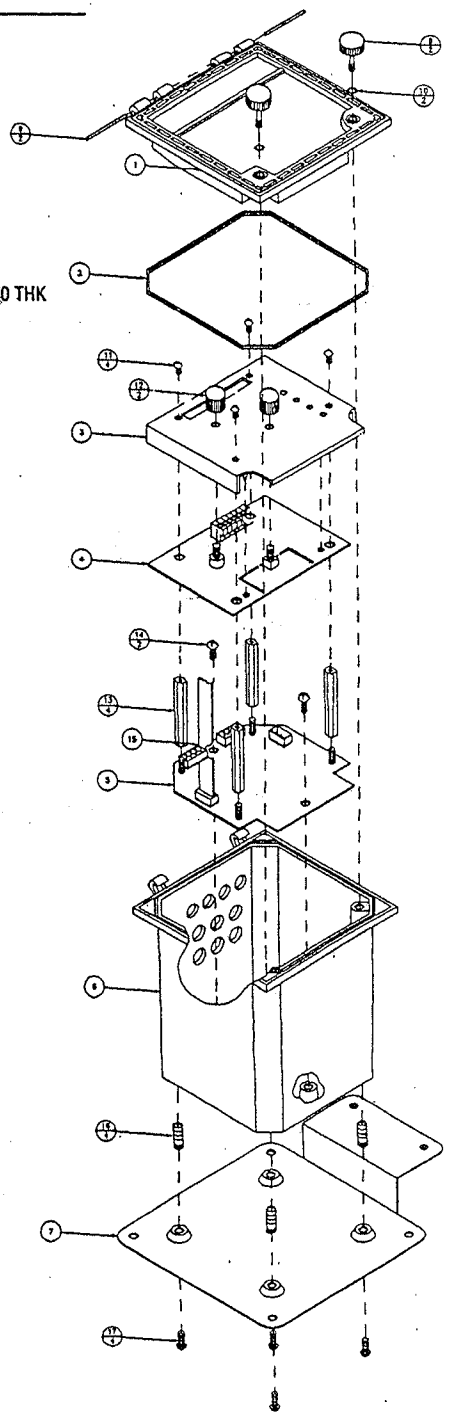
ITEM	DESCRIPTION
7	CROSS, 1" 2000LBS
6	BN-1/EH-1RS BOILER PROBE
5	UNION, BOILER, 1/2" L500
4	NIPPLE, 1/2" X CLOSE, GALVANIZED
3	GASKET, ACCESS TEE, 1/2", OLKRG
2	COVER, ACCESS TEE, 1/2" OL10
1	ACCESS TEE 1/2" OT 1



8. ENCLOSURE DIAGRAM AND PARTS LIST

ENCLOSURE ASSEMBLY

ITEM	DESCRIPTION
17	SCREW, 1/4-20 X, 500 LONG
16	INSERT, BRASS, 1/4-20
15	RIBBON CABLE
14	SCREW, 6-16 X, 1.00 LONG;SELF TAPPING
13	STANDOFF, 1/4 HEX, 1.75 LONG
12	KNOB; 1/4 INSERT W/ SET SCREW
11	SCREW, #6-32
10	O-RING, .441 OD, .301 ID, .070 THK
9	ROLL PIN
8	SCREW
7	BRACKET, WALL FLOW MTG.
6	ENCLOSURE
5	MOUNTING PANEL
4	MAIN ASS'Y ABC PCB
3	PANEL, MAIN PCB MTG.
2	GASKET, ENCLOSURE
1	COVER, CONTROLLER



PULSAFEEDER®

ANALOG BOILER CONTROLLER

MODEL ABC 102

CONTENTS

1. INTRODUCTION

The Pulsafeeder ABC Controllers are used to control total dissolved solids (TDS) in steam boiler systems, in terms of electrical conductivity measured in microsiemens per centimeter (µS/cm). They are designed using the latest technology.

The units are very accurate and easy to use. This simplified design provides automated control at an economic cost.

The ABC Series comes standard with connections for A.C. power and blow down activation.

2. Installation

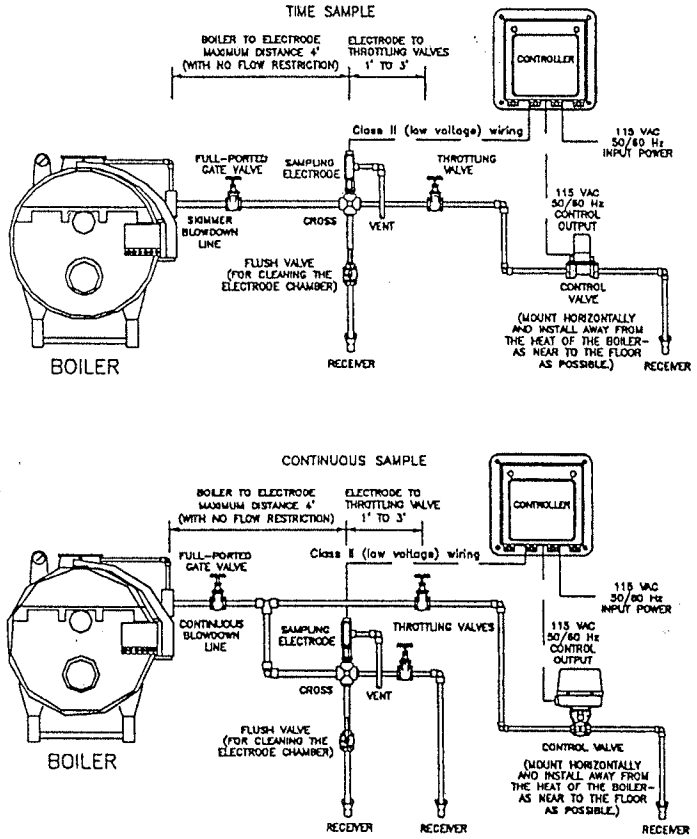


Fig. 1, Typical Installation Diagram

A. LOCATION:

The ABC Series Controllers are designed for ease of installation. Select a mounting location convenient to electrical and plumbing connections and easily accessible by the operator for cleaning and maintenance. The enclosure is corrosion resistant and will stand up to most industrial environments. Be sure unit is free from vapors and liquid spills (refer to Fig. 1, Typical Installation Diagram). Installation should comply with all national, state, and local codes.

B. MOUNTING:

Mount Controller vertically on a wall or a permanent vertical support with adequate lighting and at a comfortable level (refer to Fig. 2, Controller Dimensions).

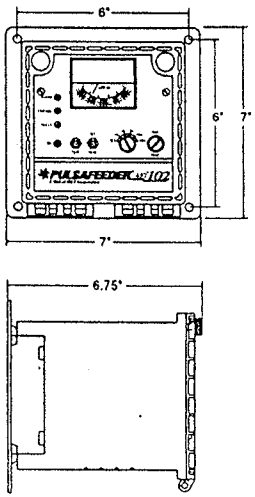


Fig. 2, Controller Dimensions

7. TROUBLE-SHOOTING GUIDE

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Power light is not on	Blown fuse	Replace fuse with Wickman 19372-041K (1 amp) or equivalent.
	No power supplied to unit	Check line circuit breaker. Fuse is "T" type.
Relay fuse blows repeatedly	External component defective	Disconnect external loads. If this prevents the fuse from blowing, plug each external load in, one-by-one, until the fuse blows. Repair or replace defective component.
	Motorized ball valve current requirements too great	Max. 5 amp resistive (Wickman 19372-063K, 5 amp or equivalent). Use a motor contactor to control the valve. Fuse is "T" type.
Control light stays on	Conductivity of water sampled is beyond range of controller	Check the conductivity of the water with a conductivity tester and compare readings.
	Probe leads shorted	Unplug probe leads, light should go off. Check lead for shorts.
	Bleed valve plugged - no bleed off	Clean or replace valve.
	Insufficient or no flow past electrode.	Remove obstruction in sample line.
	Blow down line throttled too much	Increase blow down rate.
Control light does not come on	Leaking system	Check blow down valves.
Control light goes on and off every few minutes	Electrode is airbound	Bleed air from electrode by allowing water to completely fill and flow through it to drain.
		Adjust throttling valve so that only water flows across the probe.
		Check surface skimmer 4 to 4 inches below surface
Wide variation in solution	Poor circulation through conductivity electrode	Clean electrode.
	Bleed rate exceeds make-up water rate	Decrease bleed rate.
	Bleed rate too low	Increase bleed rate.
Conductivity of solution is slowly rising	Electrode fouled or dirty	Clean or replace electrode.
	Bleed rate too low	Increase bleed rate.
Bleed-off solenoid or other electrical device being operated by the controller does not operate.	Inoperative solenoid valve	Replace valve coil or valve as required.
	Wiring between solenoid	Rewire this connection. To check solenoid valve and control defective valve, disconnect it from the controller and energize it from a separate power source.
	Improper voltage	Check for correct valve coil voltage; should be 115 VAC. (Optional 220 VAC.)
	Improper pressure differential across solenoid valve	Check piping and pressure at your location to make sure at least the minimum pressure exists across your solenoid.

5. MAINTENANCE

A. SET UP A MAINTENANCE PROGRAM FOR YOUR CONTROLLER.

Normally, the electronic circuitry in the controller will not require maintenance. However, ambient temperature, humidity changes, and aging can affect the calibration of the controller. Electrodes will become dirty over a period of time and will require cleaning. The frequency of cleaning depends on the installation and the water that comes in contact with the electrode.

During the first few months of operation, check the electrode each week. This allows you to determine how often to clean the electrode. After the first few months of operation, you will be able to establish a proper maintenance schedule for your system. Check the electrode and controller calibration at least once every two months. The more frequent the maintenance, the more assurance you have of reliable controller performance.

By observing readings before and after electrode cleaning, you can determine how often to clean the electrode. If no change or only a small change in readings occurs, clean the electrode less often. If a large change in readings occurs, clean the electrode more often. See Cleaning the Electrode on page 11 of this manual.

B. ACCURACY AND READINGS

The conductivity of any solution changes with the temperature of that solution. The ABC controllers are compensated to 20°C (63°F). In most water solutions, temperature changes affect the conductivity by about 1% per degree Fahrenheit from ambient.

Temperature compensation is effective across a range of 20° to 200°C (68° to 392°F). The controller should provide readings that are consistent with any accurate temperature compensated test instrument for this temperature range.

NOTE: Only if the probe used is a temperature compensated probe will the ABC controller yield temperature compensated readings.

6. ENVIRONMENT

The operating environment of your controller is -25°C to 55°C, 5% to 100% relative humidity, and 0.028 max moisture Kg/Kg dry, (ISA82 Class C2).

C. ACCESSORIES:

(Available through your Pulsafeeder distributor or sales representative, but not included as standard)

Boiler Conductivity Timed Sample

1. Blow down valve, solenoid and strainer or motor operated ball valve.
2. Needle Valve or orifice union and plates for throttling blow down.
3. A full-port gate valve for isolation of blow down assembly.
4. A flush valve for sensor.

Boiler Conductivity Continuous Sample

1. Blow down valve, solenoid and strainer or motor operated ball valve.
2. Two needle valves or two orifice unions and plates for throttling blow down.
3. A full-port gate valve for isolation of blow down assembly.
4. A flush valve for sensor.

D. PLUMBING:

A flow rate of at least 1 gpm (gallons per minute) at the electrode is required for proper operation.

Install hand valves on both sides of electrode to relieve pressure at the electrode for easy removal and periodic maintenance.

CAUTION: Do not inject chemical up stream of probe or sensors. This will cause inaccurate readings at the controller.

Direction of flow should be inline with the arrow on the probe assembly. Take time to review Fig. 1, Typical Installation Diagram, and note locations of hand valves, etc. for proper operation and maintenance of all components in the system loop. The throttling valve must be adjusted so that water flows across the probe, not steam.

E. ELECTRICAL:

The ABC controller has been configured to physically separate the low and high voltage connections. Use only 16 or 18 AWG wire for conduit power and load connections. Install according to IEC 1010 Clause 6.

Always use caution when making any electrical connection. Follow all applicable electrical codes. The supply power should be disconnected at the main before making any (low or high voltage) connections.

1) High Voltage Connection

Please refer to Fig. 3A and 3B, High Voltage Connections. Units must be wired by the customer in accordance with all applicable electrical codes (i.e., NEC). When maximally loaded, the unit will draw 10.5 Amps. Each relay is capable of supplying 5 Amps. Size wiring accordingly.

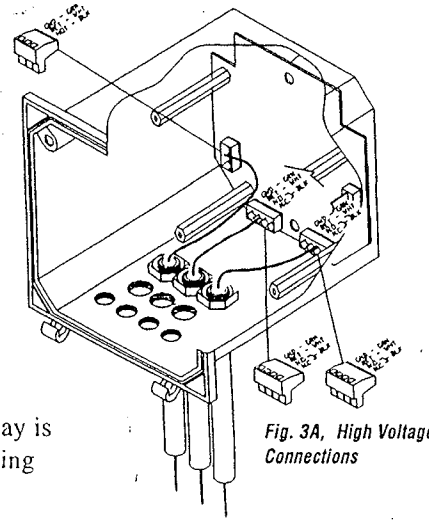


Fig. 3A, High Voltage Connections

The ABC 102 has two fuses for protection, a 1 amp fuse for the controller power supply, and a 5 amp fuse for the relay output. Part numbers can be found in the Trouble Shooting section.

Connections: Connect the supply and loads per the following table:

Circuit Designator	Connection Type
HOT or NO/NC	Line
RET	Return
⏚	Ground

Connect Supply Power to J11. Connect loads controlled by conductivity/timer to J7 and J10 (e.g., blow-down solenoid valve). The load connection can be configured to supply power in the "Normally Open" or "Normally Closed" state by attaching the Line wire to the terminal labeled NO and NC respectively.

Figure 3B at right illustrates how an actuated (motorized) ball valve, which is used for "blow down", is connected to the ABC Controller.
It employs a normally open (NO), a normally closed (NC), and common (or neutral) connections. In this example, the first device is connected at J7. Location is behind control panel (see Fig. 3A).

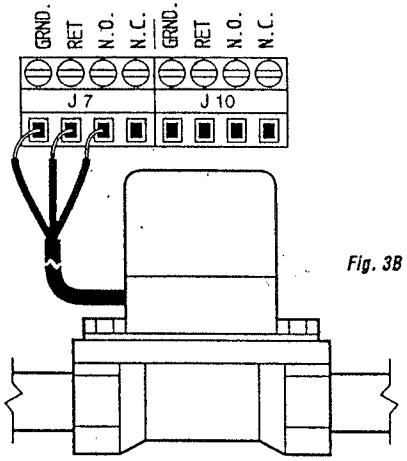


Fig. 3B

2) Low Voltage Connection

Please refer to Fig. 4, Low Voltage Connections. Generally, low voltage wires are color coded to the designators printed on the front overlay. Make these connections after making the high voltage connections and reassembling the panel to the front of the unit.

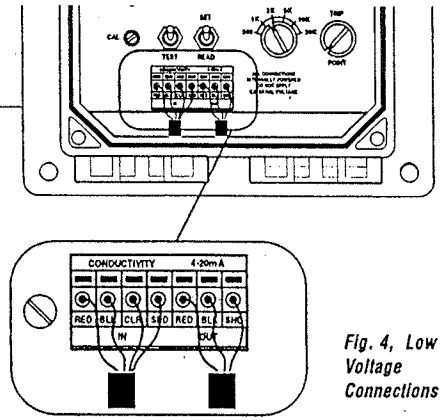


Fig. 4, Low Voltage Connections

The insulation on the low voltage wires is stripped back approximately .25 inches at the factory. To attach, push in and hold the orange tab above the socket while inserting the stripped lead. Release the orange tab and pull gently on the wire to seat it in the connector and to insure a good connection.

Note: Be careful not to push the wire too far into the socket such that the insulation is clamped by the connector.

log recorder, metering pump, or computer. The output tracks the system water conductivity. The controller is factory calibrated for 4-20mA operation. Non-standard calibration of signal is achieved by adjusting the Off-set (labeled R7) and Gain (labeled R9) potentiometers (See Fig. 10). The linearity potentiometer (labeled R12) should not be adjusted.

4. ELECTRODE REMOVAL, CLEANING, AND REINSTALLATION

A. REMOVING THE ELECTRODE

1) Remove power from the system.

2) Remove pressure by shutting hand valves on both sides of the electrode assembly (refer to Fig. 1, Typical Installation Diagram, pg. 4).

3) Open "flush" valve to drain water from the electrode piping. This will help removal of the electrode.

4) Unscrew electrode and remove electrode by pulling straight out. (See Fig. 11, Electrode)

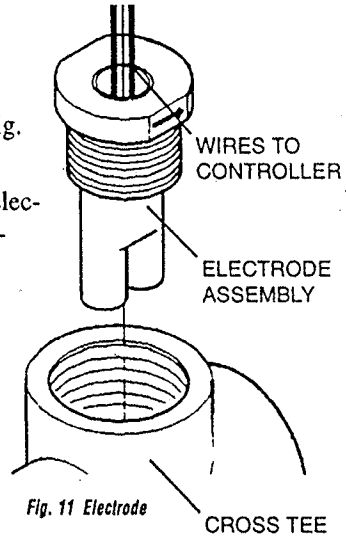


Fig. 11 Electrode

B. CLEANING ELECTRODE

1) Wipe the electrodes with a clean cloth. It is important to be sure to wipe the sides of the electrodes as well as the ends.

2) Use fine grain emery cloth for stubborn stains

3) Oils can affect probe performance. Do not touch probe surface. The probe can be agitated in a mild solution of dish washing soap and water to remove oils transferred during handling.

4) Some fouled electrodes might require dipping in a mild solution of muriatic acid to remove fouling.

NOTE: Always observe proper handling procedures when working with acids.

C. REINSTALLING ELECTRODE

1) Apply four wraps of pipe thread tape to the electrode threads.

2) Reinstall electrode paying attention to the arrow on the electrode for direction of flow.

3) Close flush valve and open hand valves to reapply pressure to the flow assembly.

NOTE: Open hand valves slowly to avoid water hammer.

4) Reapply power to the system and re-calibrate unit.

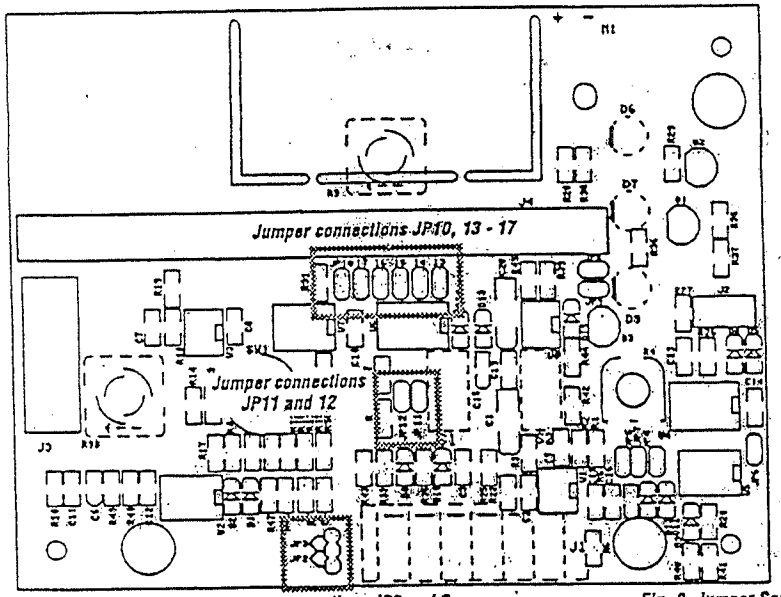


Fig. 9, Jumper Selections

JUMPER	FUNCTION	USER CHOICE
JP4,6	Selects 50 Hz. operation	Factory installed
JP5,7	Selects 60 Hz. operation	Factory installed
JP8	Selects Timed Sample Mode	Select either JP8 or JP9
JP9	Selects Continuous Sample Mode	
JP11	Selects an 8 hour time between sample intervals	Select one of JP11 - JP13
JP12	Selects a 2 hour time between sample intervals	
JP13	Selects a 30 min. time between sample intervals	
JP14	Selects a 4 min. blow down every sample interval	Select one of JP14 – JP17
JP15	Selects a 2 min. blow down every sample interval	
JP16	Selects a 1 min. blow down every sample interval	
JP17	Selects a 30 sec. blow down every sample interval	
JP2	Select for temperature compensated probe	Select either JP1 or JP3
JP3	Select for temperature non-compensated probe	

Conductivity Probe: Typically 22 AWG, 3 conductor shielded. The conductivity probe wires are color coded as follows: The probe cable length must be 3 meters or less with "V1" option.

Label Designator	Function	Probe Wire Color
RED	Probe +	Red
BLK	Probe -	Black
CLR	Probe Temp. Comp	Clear, Green or White
SHD	Probe Wire Shield	Silver (no insulation)

3. OPERATION

A. CONTROLS:

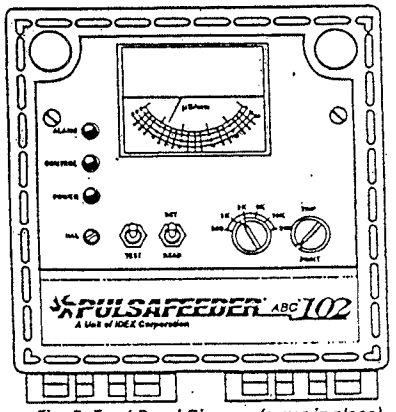


Fig. 5, Front Panel Diagram (cover in place)

Refer to Fig. 5, Front Panel Diagram and familiarize yourself with the controls of your ABC unit.

Control LED: Used during electrode calibration and to indicate conductivity trip point has been reached. Blow down solenoid relay is active.

Power LED: Indicates unit is plugged in and power is present on the circuit board.

Cal: Calibration adjustment knob used to calibrate unit conductivity.

Test Switch: Activates solenoid relay to confirm proper operation of externally connected electrical devices (eg. blow down valve). In Timed Sample Mode, the test switch initiates the blow down cycle.
Resets optional timer.

Set/Read Switch: Set position is used to set trip point. Read position is used to monitor conductivity as measured at the electrode.

Trip Point Knob: Also referred to as "set" or "control" point. With Set/Read Switch in "Set" position, use the Trip Point knob and refer to the analog scale to set desired "trip" point to activate bleed and feed. This knob and scale is also used for calibration.

Analog Scale: Used to monitor system conductivity and for calibration.
Range Switch: Used to select either the 500, 1000, 2000, 5000, 10,000, or 20,000 µS/cm range.

B. CALIBRATION

1) Make sure unit is mounted properly and all plumbing and electrical connections are secure. Apply power to the unit and depress the test switch to confirm proper operation of the controller and relays.

2) Take a sample of the boiler water and measure conductivity with calibrated hand held meter. Note reading (See Fig. 6, Steps 2a and 2b).

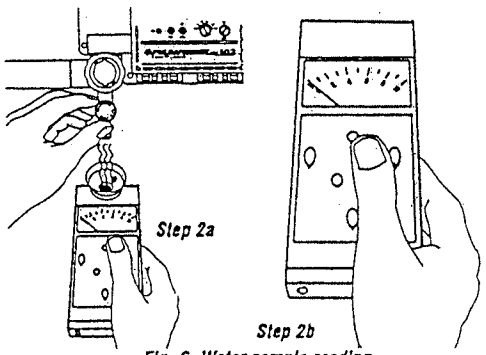


Fig. 6, Water sample reading

NOTE: Take sample at low pressure, and with water that has cooled.

3) Position Set/Read Switch in the "Read" position (See Fig. 7, Step 3).

4) Set the range switch to the correct range.

NOTE: The lower the range selected if applicable, provides more resolution.

NOTE: The range used for calibration must be the same as that to be used for control.

5) Adjust Cal Adjust knob until the meter on ABC matches the reading on the calibrated hand held meter. Your unit is now calibrated (See Fig. 7, Step 4).

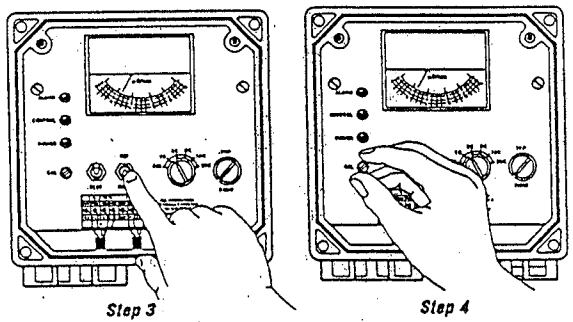


Fig. 7, System Calibration

C. SETTING CONDUCTIVITY TRIP POINT

1) With Set/Read Switch in "Set" position, turn Trip Point Knob to position needle on analog scale to desired trip point (See Fig. 8, Step 1).

2) Return the Set/Read Switch to "Read" (See Fig. 8, Step 2).

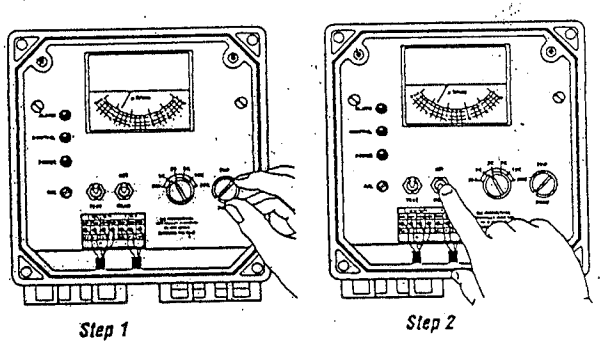


Fig. 8, Trip Point Setting

NOTE: All standard ABC units have a differential control that has been factory set to approximately 6% of the Trip Point. This important feature prevents "chattering" (the rapid on-off switching of the relay when system conductivity hovers near the trip point).
The minimum blow down interval in Continuous Sample Mode is eight seconds to allow for full movement of a ball valve.

D. JUMPER SELECTIONS

The ABC controller can be operated in either Timed or Continuous Mode, the ABC controller has jumpers for selection of the operating mode and the time intervals (Fig. 9). See Jumper Table on page 10.
For Continuous Mode operation a jumper should be installed in position JP9 and JP8 should be empty.
NOTE: The minimum blow down interval in Continuous Sample Mode is eight seconds to allow for full movement of a ball valve.

For Timed Sample Mode, a jumper should be in JP8 and JP9 should be empty. The sample intervals available are 8 hours, 2 hours, and 30 minutes.
A jumper in JP11 selects 8 hours, JP12 selects 2 hours, and JP13 selects 30 minutes. Jumper only (1) one of the positions JP10 through JP13.

In the Timed Mode, there is a choice of 30 sec., 1, 2, or 4 minute blow down intervals. A jumper in JP17 selects 30 seconds, JP16 selects 1 minute, JP15 selects 2 minutes, and JP14 selects 4 minutes. Jumper only one of the positions JP14 through JP17.
NOTE: In the timed mode, the blow down interval will be at least the time selected. If conductivity is still above the selected trip point (after selected interval time has expired), blow down will continue until conductivity drops below the selected trip point.

Jumpers JP2 and JP3 are used to select operation with either a temperature compensated probe or a non-temperature compensated probe.
Install a jumper in JP2 for a temperature compensated probe.
Install a jumper in JP3 for a non-temperature compensated probe.

Orifice Unions & Orifice Plates	
Part Number	Description
12-012-00-1	1" orifice union with set of (4) orifice plates
12-013-50	Set of four orifice plates

Orifice plate blowdown rates versus pressure in gallons per minute..

Differential Pressure	1/64	1/32	1/16	1/8	3/16	1/4
1	0.0046	0.0186	0.072	0.288	0.542	1.14
2	0.0064	0.0263	0.103	0.408	0.808	1.61
3	0.0081	0.0324	0.125	0.496	1.11	1.98
4	0.0093	0.0372	0.144	0.573	1.28	2.28
5	0.0104	0.0418	0.161	0.64	1.44	2.56
6	0.0113	0.0453	0.176	0.7	1.57	2.78
7	0.0123	0.0493	0.191	0.76	1.7	3.02
8	0.0132	0.0527	0.204	0.812	1.82	3.23
9	0.0139	0.055	0.215	0.858	1.91	3.4
10	0.0147	0.059	0.23	0.94	2.03	3.61
20	0.0209	0.0835	0.317	1.28	2.86	5.1
30	0.0253	0.102	0.392	1.56	3.51	6.23
40	0.0294	0.118	0.432	1.81	4.05	7.22
50	0.03299	0.132	0.507	2.02	4.53	8.07
60	0.0361	0.144	0.55	2.21	4.96	8.85
70	0.039	0.156	0.598	2.39	5.36	9.6
80	0.0417	0.167	0.642	2.55	5.7	10.2
90	0.044	0.1753	0.678	2.71	6.07	10.3
100	0.0465	0.1863	0.716	2.85	6.4	11.4

Pulsafeeder, Inc. is pleased to provide cost effective and efficient boiler blowdown control and chemical addition equipment. These units are technically superior management devices when installed and programmed correctly. Should you experience any problems during the installation or have any questions concerning the proper installation please contact Pulsafeeder's SPO Operations in Punta Gorda Florida at 800-333-6677 and ask for technical services.

spirax sarco®

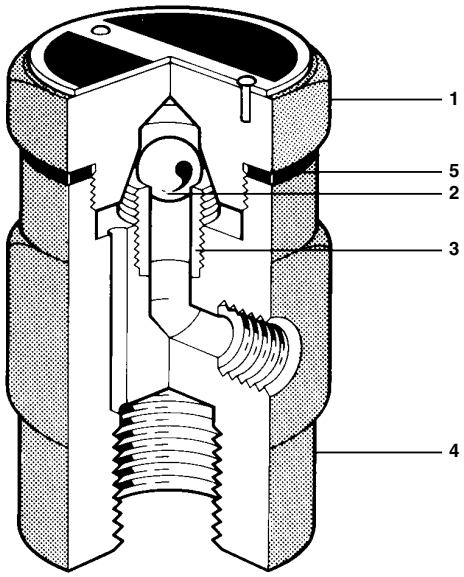
Vacuum Breaker
VB14, VB21

The VB14 and VB21 are designed to admit air to condensing vapor (steam) or liquid systems where vacuum formation may inhibit system drainage or operation.

Model ➪	VB14	VB21
Sizes	1/2" x 1/8"	
Connections	NPT	
Construction	Brass Body	Stainless Steel Body
	Stainless Steel Valve	
Options	BSP Connections	

Typical Applications

Used on steam inlet to air coils, heat exchangers, sparge systems, jacketed kettles, boiler feed water tanks, chilled water lines and liquid process lines, all of which at one time or another generate vacuum conditions which must be releived to allow proper system operation.



Construction Materials

No.	Part	Material	
1	Cap	VB14 Brass	CU ZN 39 PB2
		VB21 Stainless Steel	Type 303
2	Valve Check Ball	VB14 Stainless Steel	Z 100 CD 17
		VB21 Stainless Steel	Type 440C
3	Valve Seat	VB14 Stainless Steel	Z10 CN 18 08
		VB21 Stainless Steel	Type 303
4	Body	VB14 Brass	CU ZN 39 PB2
		VB21 Stainless Steel	Type 303
5	Gasket	VB14 Nickel Reinforced Exfoliated Graphite	
		VB21 Stainless Steel	Type 304

Limiting Operating Conditions

Max. Operating Pressure (PMO) VB14: 210 psig (*14 barg)*
VB21: 304 psig (*21 barg)*

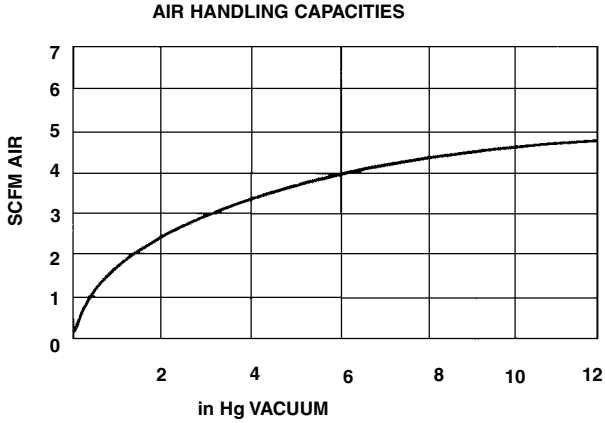
Max. Operating Temperature VB14: 500˚F *(260˚C)*
VB21: 752˚F *(400˚C)*

Pressure Shell Design Conditions

PMA Max. allowable pressure	VB14:	232 psig/0-500˚F	*16 barg/0-260˚C*
	VB21:	304 psig/0-752˚F	*21 barg/0-400˚C*
TMA Max. allowable temperature	VB14:	500˚F/0-232 psig	*260˚C/0-14 barg*
	VB21:	752˚F/0-304 psig	*400˚C/0-21 barg*

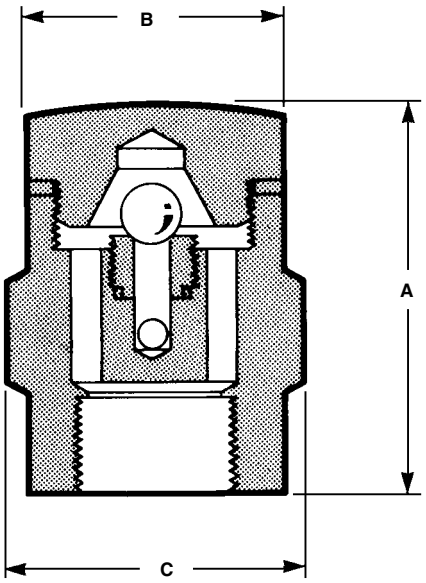
Operating Characteristics

Maximum Cv – 0.625.
Vacuum required to open – 2 in H_2O (0.15 in Hg)



Local regulation may restrict the use of this product below the conditions quoted. Limiting conditions refer to standard connections only.
In the interests of development and improvement of the product, we reserve the right to change the specification.

Vacuum Breaker
VB14, VB21



Dimensions (nominal) in inches and millimeters

Size		A	B	C	Weight
1/2"	**VB14**	**2.2**	**1.3**	**1.5**	**0.77 lb**
		55	*34*	*39*	*0.35 kg*
1/2"	**VB21**	**2.0**	**1.3**	**1.5**	**0.73 lb**
		52	*34*	*39*	*0.33 kg*

Sample Specification

Vacuum Breakers shall be used on all modulating or on/off heat exchangers and coils, except in vacuum return systems. They shall be installed in the supply side between the control valve and equipment and be of hardened ball check valve design with all working parts manufactured from stainless steel. Bodies shall be made from either brass or stainless steel depending on the application, and shall be suitable for operating conditions of 210 psig (or 304 psig) saturated steam.

Installation

Always install in a vertical position with cap at the top. Generally the device should be mounted on the highest point of the circuit. Large coils or equipment may require more than one vacuum breaker to be fitted. An isolating valve should be fitted to facilitate servicing.

Maintenance

After the vacuum breaker is isolated from system pressure, the cap can be unthreaded to examine the valve and valve seat areas for debris which can become trapped and cause breakage of system pressure during normal operation. The vacuum breaker is not repairable.

Spirax Sarco, Inc., 1150 Northpoint Blvd, Blythewood, SC 29016 Telephone: (803) 714-2000 FAX (803) 714-2222

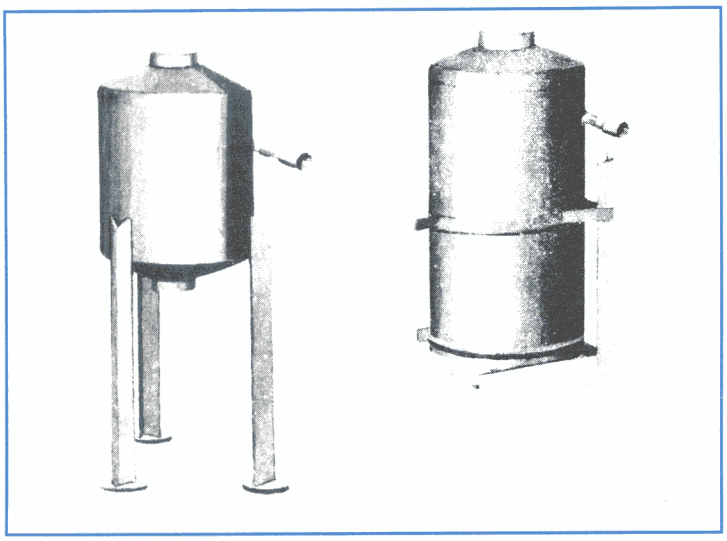
Model A14B

The unit sipped separately and installed by others.

Penn Blowdown Separator

ACCESSORIES

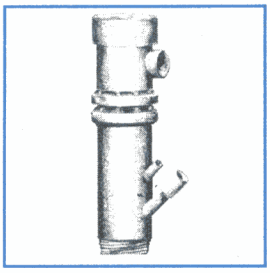
Ease of Installation Controls Thermal Contamination



LEGS WITH FLOOR PADS (three) provide an excellent means for mounting separators. Constructed of sturdy angle iron they come attached to the separator to provide an easy and expedient means of installation. Standard height to raise separator 18 inches from floor or when aftercoolers furnished additional height provided.

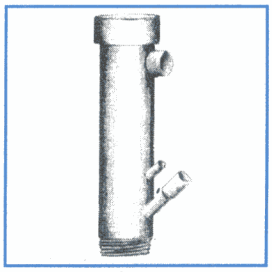
WALL BRACKETS are for wall mounting where floor space may be a factor or where desired installation is at a level higher than mounting with legs.

USE THE FOLLOWING FOR AUTOMATIC CONTROL OF DRAIN WATER TEMPERATURE



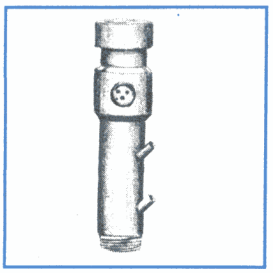
A18DF - Automatic Drain Aftercooler Fitting. Our most popular aftercooler includes middle flanges to permit rotation of connections for various pipe fitting applications. Connections come standard NPT Threaded and are provided for cold water inlet, temperature sensing bulb, and thermometer. A stainless steel mixing tongue is provided on 4" diameter and larger fittings. When ordering state drain line and cold water inlet sizes. See Chart "B" on the reverse side.

OR

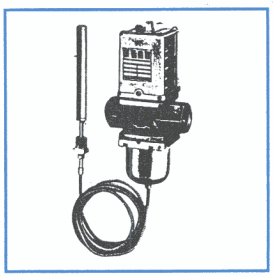


A16DS - Simplified Automatic Aftercooler. Similar to our 18DF aftercooler described above only without the middle flanges. This aftercooler accommodates the cold water line, sensing bulb, and thermometer. Sizing should match the drain line size. Cooling water selection from Chart "B" assures adequate cooling of condensate to drain.

OR

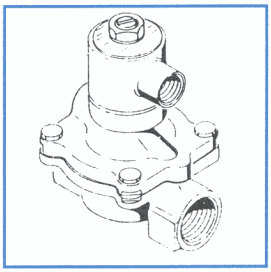


A20AO - Jacketed Automatic Aftercooler. Required in some areas this fitting has a cooling water jacket with spray holes. These holes correspond to the cold water inlet size and spray at various directions mixing with the condensate. This aftercooler has connections for the cold water line, sensing bulb, and Thermometer. Sizing should match the drain line size. Cooling water selection from Chart "B".



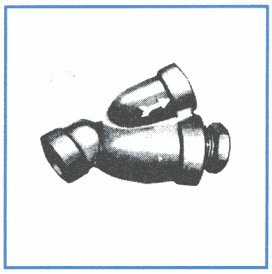
Self Actuating Temperature Regulator Valve Automatically controls the flow of cooling water to the aftercooler fittings by responding to the temperature change at the bulb. Each is factory set at 135 deg. F. with an adjustable range from 115-180 deg. F. The 6' capillary allows installation of the valve in the cold water line while the bulb is remotely located in the aftercooler. The valve size should correspond to the recommended size on Chart "B".

OR INSTEAD OF SELF ACTUATING VALVE



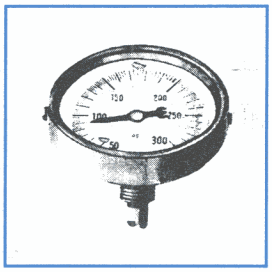
Electric Solenoid Valve and Aquastat For automatic electric control of the cooling water to the aftercooler. They are a 2 way general purpose solenoid valve 110V of piloted diaphragm construction. Valve body is a brass material with buna N Seats. A hot water control is provided with each valve to control the action of the valve based on the set temperature.

TO PROTECT COOLING WATER VALVE



"Y" Type Strainer Cast iron construction with a .033 inch stainless steel screen are recommended prior to temperature regulator valve or solenoid valve in the cold water line to protect these cold water valves.

AND

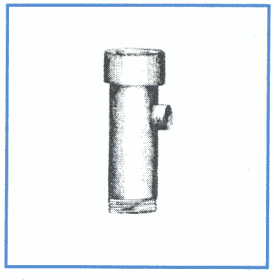


Bi-Metal Thermometer Stainless steel body in 4" or 6" stainless steel stem. 1/4" connection provided for use in the A18DF, A16DS, or A20AO aftercoolers. Graduated scale shows temperature range 50 to 300 deg. F.

NOT SHOWN OPTIONAL ITEMS

Ball Cone Check Valve - can be installed after the temperature regulator valve to prevent back flow of blowdown into the cold water line. **Pressure Gauge** - Retard gauge is required on blowdown equipment in some locations 0-30 psig range provided with iron siphon. **Pressure Reducing Valve** - Provides maximum cooling water pressure of 60 psig to the valve.

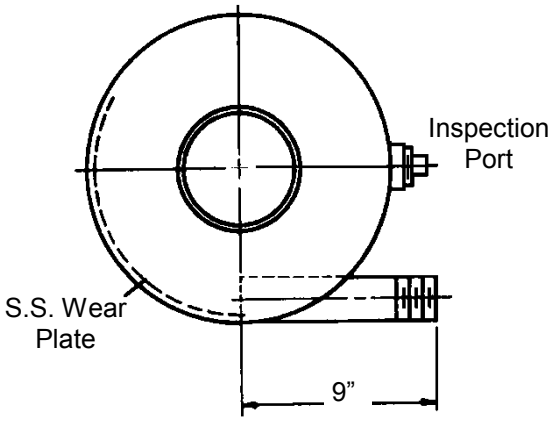
FOR MANUAL DRAIN WATER TEMPERING

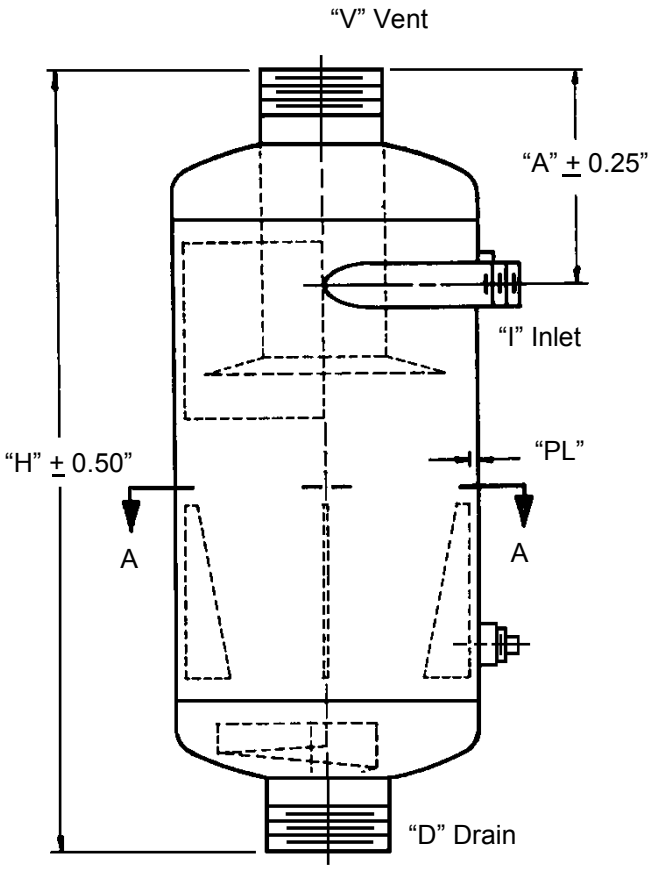


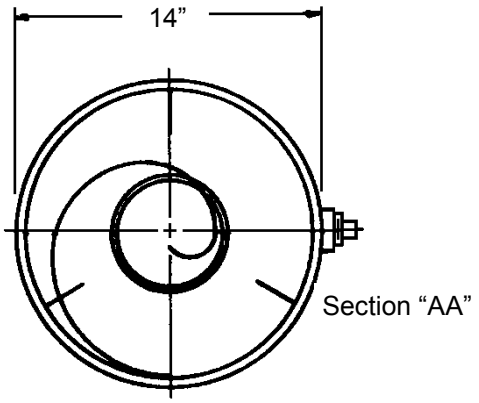
A5D - Manual Drain Cooling Fitting Is a simplified type of fitting for adding cooling water with manual control. Unit has only cold water inlet connection. Cold water inlet is sized for minimum cold water conditions of 60 deg. F. cooling water at 40 psi pressure with a 100' length of supply line. State drain line size when ordering.

PROVIDING A PRACTICAL PACKAGE

SPECIFICATION PRINT
Blowdown Separator







Model No. _____MAWP 250 PSIG @ 450ºF

All Pipe Sizes Shown Are Nominal.

MATERIALS

Heads	SA 516-70
Shell	SA 53-B
Couplings	SA 105
Wear Plate	SA 240-304
Baffles	SA 240-304
Nozzles	SA 53-B, SA 106-B
Finish	Red Shop Primer

DIMENSIONS

H	22”		34”		56”		
I	0.75”	1”	1.25”	1.50”	2”	2.50”	
D	2”	2.50”	3”	4”	5”	6”	
V	2”	2.50”	3”	4”	5”	6”	

PL	0.3125”	0.375”					
A	11”						

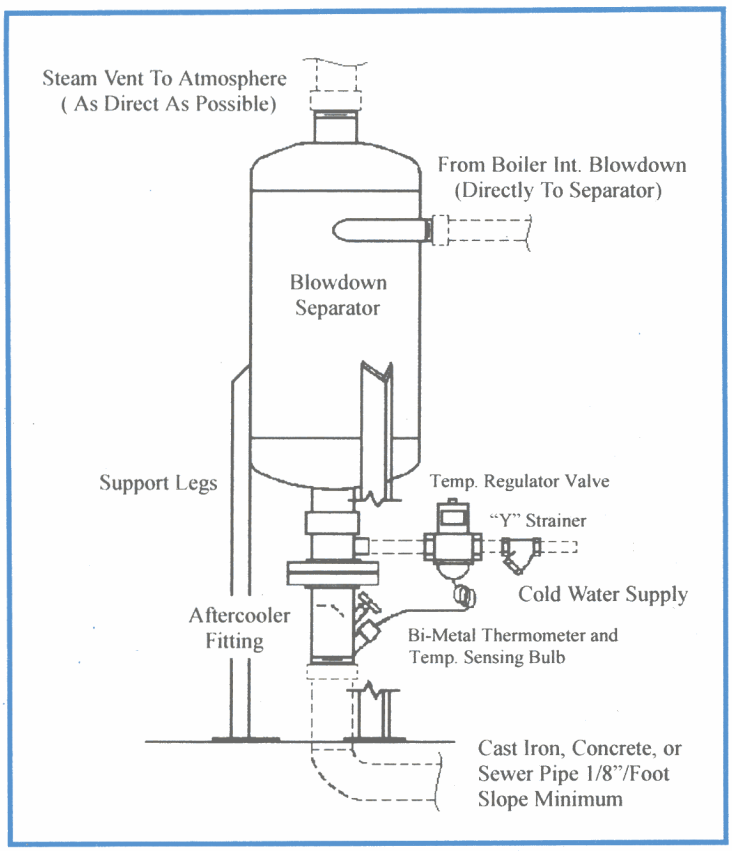
Constructed and stamped in accordance with the latest ASME Code, Sec. VIII, Div. 1, with Stamp.

Penn Separator Corp.

PO Box 340, Brookville, PA 15825

Blowdown Separator

Rev. 3 SAM 07-14-00 | A 15186



Typical Installation

Shown is a typical installation of a Blowdown Separator with Accessories. This package is shown with a A34B Separator, A18DF drain automatic aftercooler fitting with self actuating temperature regulator valve, for automatic cooling of blowdown to the drain to 140 deg. F., strainer, bi-metal thermometer to show the drain temperature, and three angle legs to lift the separator off the floor. Length is determined for each size of drain and aftercooler.

Four different separators and aftercooler packages are available all sized to calculated blowdown flows depending on the size of blowdown valve and operating pressure. Once the separator is selected no further sizing is needed and the connections can follow the sizes provided.

Other Available Accessories include wall brackets instead of angle legs,solenoid valve with aquastat instead of self actuating valve, pressure gauge with siphon, vent exhaust head, cooling water check valve and pressure reducing valve. You can choose the desired accessories from the front side to select the package for your own specific needs.

CHART B - Cooling Water and Valve Size

		BLOWDOWN VALVE SIZES														
		1"			1 1/4"			1 1/2"			2"			2 1/2"		
	PRESSURES	40	50	60	40	50	60	40	50	60	40	50	60	40	50	60
50-70 Deg. F Cooling Water	0-50	1/2	1/2	1/2	1	1	1	1 1/4	1	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/2
	51-100	1	3/4	3/4	1	1	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/4	2	2	2
	101-125	1	3/4	3/4	1 1/4	1	1	1 1/4	1 1/4	1 1/4	2	2	1 1/2	2	2	2
	126-175	1	1	1	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	2	2	2	2 1/2	2 1/2	2
	176-225	1	1	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/4	2	2	2	2 1/2	2 1/2	2
	226-250	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/4	2	2	2	2 1/2	2 1/2	2
	251-300	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/4	2	2	2	2 1/2	2 1/2	2 1/2

		BLOWDOWN VALVE SIZES														
		1"			1 1/4"			1 1/2"			2"			2 1/2"		
	PRESSURES	40	50	60	40	50	60	40	50	60	40	50	60	40	50	60
71-80 Deg. F Cooling Water	0-50	3/4	1/2	1/2	1	1	1	1 1/4	1	1	1 1/4	1 1/4	1 1/4	2	2	1 1/2
	51-100	1	3/4	3/4	1 1/4	1	1	1 1/4	1 1/4	1 1/4	2	2	1 1/2	2	2	2
	101-125	1	1	3/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	2	2	2	2 1/2	2 1/2	2
	126-175	1	1	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/4	2	2	2	2 1/2	2 1/2	2
	176-225	1	1	1	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/4	2	2	2	2 1/2	2 1/2	2 1/2
	226-250	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/4	2 1/2	2 1/2	2	2 1/2	2 1/2	2 1/2
	251-300	1 1/4	1 1/4	1 1/4	1 1/2	1 1/2	1 1/4	2	2	1 1/2	2 1/2	2 1/2	2	2 1/2	2 1/2	2 1/2

Instructions for Using Chart B

Step 1: Select the chart for the cooling water temperature available 50-70 or 71-80 deg. F.

Step 2: From this chart the blowdown valve size along the top and the boiler pressure listed vertically on the chart should be determined. You now have three valve sizes shown.

Step 3: With these three sizes the valve listed under the cooling water pressure available is the recommended size.