P-K COMPACT® Supplemental Equipment Guide

To be used in conjunction with the latest editions of:
P-K COMPACT® Semi-Instantaneous Water Heater I&OM
P-K COMPACT® Supplemental Equipment Guide

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P-K COMPACT SUPPLEMENTAL EQUIPMENT GUIDE
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NOTES:

Bell & Gossett PL Series

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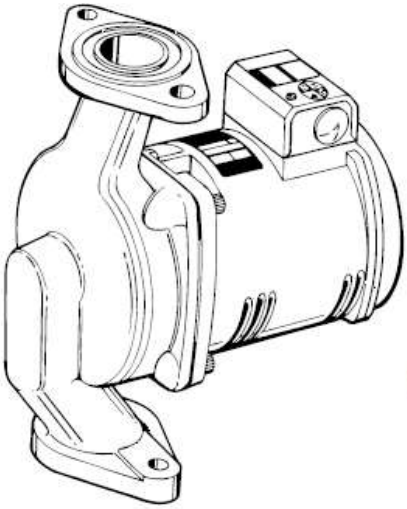
Bell & Gossett
Instruction Manual P81884



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SERIES PL™ Booster Pumps

Installation, Operation, & Service Instructions

INSTALLER: PLEASE LEAVE THIS MANUAL FOR THE OWNER'S USE.

NOTE: Bell & Gossett recommends Bronze Booster Pumps be used for pumping potable water.

This pump is nonsubmersible, for indoor use only.

⚠ SAFETY INSTRUCTIONS

This safety alert symbol will be used in this manual and on the pump safety instructions decal to draw attention to safety related instructions. When used, the safety alert symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED! FAILURE TO FOLLOW THE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.

Your Series PL™ Booster Pump should have the warning/caution label and nonsubmersible warning label (Fig. 1) displayed on the pump conduit box. If this warning and caution is missing or illegible, contact your local Bell & Gossett Representative for a replacement.

DESCRIPTION

The Series PL™ Booster Pump features permanently lubricated bearings, non-overloading permanent split capacitor motor with thermal protection and quiet operating construction.

OPERATIONAL LIMITS

These pumps are designed to pump liquids compatible with their iron or bronze body construction.

Maximum Working Pressure:	150 psi (10 bar)
Maximum Operating Temperature:	225°F (107°C)
Electrical Rating:	115V, 60 Hz, 1PH 230V, 60 Hz, 1PH

Do not exceed these values.

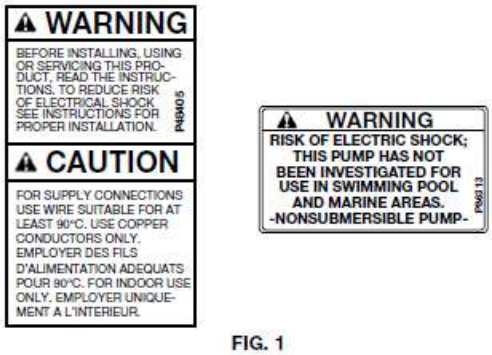

FIG. 1

PUMP APPLICATION

The Series PL™ Booster Pump may be used for water circulating applications in hydronic and solar systems.

It has not been investigated, nor is it intended for use in swimming pool and marine areas.

SAFETY REQUIREMENTS

MECHANICAL SAFETY

WARNING: EXCESSIVE SYSTEM PRESSURE HAZARD
The maximum working pressure of the pump is listed on the nameplate – DO NOT EXCEED THIS PRESSURE. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: EXCESSIVE PRESSURE HAZARD – VOLUMETRIC EXPANSION
The heating of water and other fluids causes volumetric expansion. The associated forces may cause failure of system components and the release of high temperature fluids. This can be prevented by installing properly sized and located expansion tanks and pressure relief valves. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

THERMAL SAFETY

WARNING: EXTREME TEMPERATURE HAZARD
If the pump, motor, or piping are operating at extremely high or low temperature, guarding or insulation is required. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

ELECTRICAL SAFETY

WARNING: ELECTRICAL SHOCK HAZARD
Electrical connections are to be made by a qualified electrician in accordance with all applicable codes, ordinances and good practices. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: ELECTRICAL GROUNDING HAZARD
Adequate electrical grounding is required for the safe operation of B&G Pumps. The use of grounded metal conduit assures this requirement. If the means of connection to the supply-connection box (wiring compartment) is other than grounded metal conduit, ground the pump back to the service by connecting a copper conductor at least the size of the circuit conductors supplying the pump to the green grounding screw provided within the wiring compartment. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: RISK OF ELECTRIC SHOCK
Do not install this pump in swimming pool or marine areas. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

REMOVAL OF THE PUMP FROM EXISTING SYSTEM FOR REPLACEMENT

WARNING: ELECTRICAL SHOCK HAZARD
Disconnect and lockout the power before servicing. Failure to follow these instructions could result in serious personal injury or death.

1. Close the valves on the suction and discharge sides of the pump. If no valves have been installed, it may be necessary to drain the system.

WARNING: HOT WATER HAZARD
Before draining the system, allow water to cool to 100°F max. open the drain valve (take precautions against water damage) and leave the drain valve open until servicing is complete. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: ELECTRICAL SHOCK HAZARD
Be certain the electrical power is not present at the motor leads before continuing. Failure to follow these instructions could result in serious personal injury or death.

2. Loosen the conduit box cover screw and remove the cover.

WARNING: UNEXPECTED START-UP HAZARD
Single phase motors are equipped with automatic reset overload protectors. The pump can restart without warning. Disconnect and lockout power before servicing. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

3. Disconnect the electrical supply lines to the pump.

WARNING: HIGH PRESSURE HAZARD
Pressure may be present in the pump body. This pressure can be relieved by loosening the flange bolts and shifting the pump assembly slightly to allow the pressurized water to escape. Failure to follow these instructions could result in serious personal injury or death.

4. Remove the flange bolts and nuts and then remove the pump from the piping.

PUMP INSTALLATION

Locate the pump so there is sufficient room for inspection, maintenance and service. Bell & Gossett recommends the installation of service valves on the suction and discharge of all pumps to facilitate servicing or replacement of the pump without draining the system.

Install suction and discharge flanges on the pipe ends. The use of teflon tape sealer or a high quality thread sealant is recommended.

Be sure to minimize any pipe-strain on the pump. Support the suction and discharge piping by the use of pipe hangers near the pump. Line up the vertical and horizontal piping so that the bolt-holes in the pump flanges match the bolt-holes in the pipe flanges. (DO NOT ATTEMPT TO SPRING THE SUCTION OR DISCHARGE LINES IN POSITION. THIS MAY RESULT IN UNWANTED STRESS IN THE PUMP BODY, FLANGE CONNECTIONS AND PIPING.) The code for Pressure Piping (ANSI B31.1) lists many types of supports available for various applications.

Bell & Gossett flange gaskets must be installed between the Series PL™ pump body flanges and the suction and discharge pipe flanges. Use $^{7}/_{16}$" diameter x 1$^{1}/_{2}$" long capscrew and matching nut to connect the pump to the flanges.

WARNING: HOT WATER HAZARD
When disassembling a gasketed joint, always use a new gasket upon reassembly. NEVER RE-USE OLD GASKETS. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

WARNING: HOT WATER HAZARD
Make sure that each flange gasket remains seated in the flange groove during and after installation. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

Apply torque in even increments to both flange bolts until a value of 96-132 in-lbs. is reached. Both the suction and discharge flange bolts must be torqued in this manner.

WARNING: WATER LEAKAGE HAZARD
To prevent leakage, make certain that the flange bolts have been adequately torqued. Failure to follow these instructions could result in serious personal injury and/or property damage.

WIRING INSTRUCTIONS

WARNING: ELECTRICAL SHOCK HAZARD
Disconnect and lockout the power before making electrical connections. Failure to follow these instructions could result in serious personal injury or death.

A. Loosen the screw securing the conduit box cover (wiring compartment), and remove the screw & cover.

B. Attach the appropriate size connector to the hole on the side of the conduit box.

C. Using a minimum size 14 AWG copper electrical wire (refer to your local code for wiring restrictions), wire the motor to a single phase power source as listed on the pump nameplate. See Fig. 3.

D. Connect the ground wire to the inside of the conduit box with one of the green screws provided inside the box. See Fig. 4.

NOTE: Electrical supply and grounding wires must be suitable for at least 90°C (194°F).

NOTE: Series PL™ Booster Pumps are thermally protected and do not require external overload protection.

WARNING: ELECTRICAL SHOCK HAZARD
Be certain that all connections are secure and the conduit box cover is closed before electrical power is connected. Failure to follow these instructions could result in serious personal injury, death and/or property damage.

SYSTEM PREPARATION

Prior to pump start up, closed heating and cooling systems should be cleaned, drained and refilled with clean water. System ph must be maintained between 7 and 9.

STARTUP

CAUTION: SEAL DAMAGE HAZARD
Do not run pump dry, seal damage may occur. Failure to follow these instructions could result in property damage and/or moderate personal injury.

Do not start pump until the system has been filled and vented. Air should be vented from the system by means of an air vent located at a high point in the system, or by an alternate method. The system must be completely vented prior to pump operation. Do not run pumps dry. Pump operation without water circulation could result in pump and motor damage.

WARNING: HOT WATER LEAKAGE HAZARD
Pressurize the body slowly while checking for leaks at all joints with gaskets. Failure to follow these instructions could result in serious personal injury and/or property damage.

MODE OF DISCHARGE

The Series PL™ pump can be installed to discharge up or down, horizontally, left or right, but the motor shaft must remain in the horizontal position, the arrow on the body must point in the direction of flow and the conduit box must be positioned on the top of the motor housing (see figure 2).

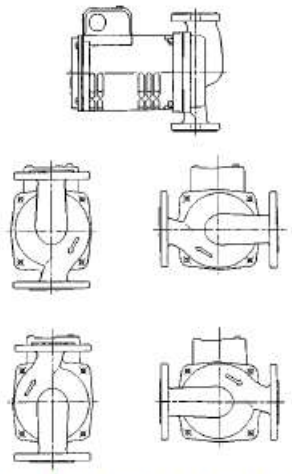

FIG. 2

PUMP BODY MAY BE ROTATED AS SHOWN, BUT CONDUIT BOX MUST REMAIN AT TOP.

TYPICAL WIRING INSTALLATION SCHEMATIC FOR 1Ø POWER SOURCE

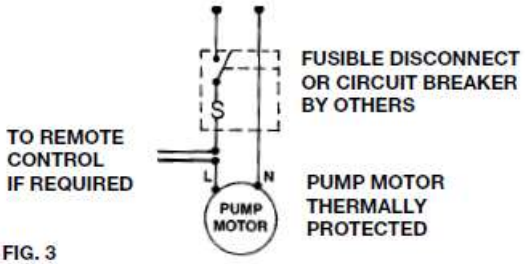

FIG. 3

CONDUIT BOX WIRING DETAIL

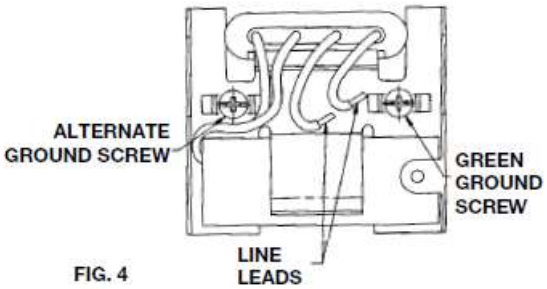

FIG. 4

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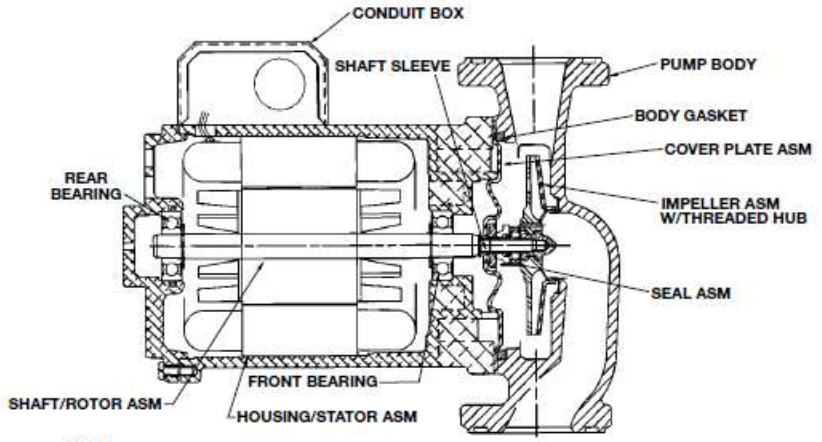
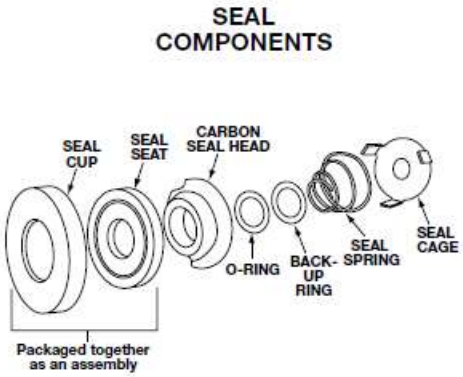


FIG. 5



INSTRUCTIONS FOR REPAIRING MECHANICAL SEAL

1. Follow steps 1 through 4 of section titled "REMOVAL OF PUMP FROM EXISTING SYSTEM FOR REPLACEMENT."
2. Loosen the four capscrews that hold the motor housing to the pump body. Remove these screws and remove the housing from the pump body.
3. Place the pump on a flat work surface and insert a screwdriver into one of the endplate ventilation slots until it engages one of the rotor cooling fins. While holding the rotor with the screwdriver, turn the impeller clockwise. Note that the impeller is molded around a metal hub with a left hand thread. Remove the impeller from the shaft.
4. Remove the seal assembly from the shaft by sliding it off the shaft sleeve.
5. Clean the seal seat with a clean rag and inspect for grooving or cracks. If it shows no grooving or cracks, it may be cleaned and reused.
6. If the seal seat is to be replaced, the face plate must be removed from the motor housing. Remove it by gently prying it away from the housing.
7. Remove the seal seat and cup. Lubricate the cup with soapy water and install new parts in the face plate recess. Reposition the face plate on the motor housing. Gently tap the face plate evenly around its diameter to drive it into the recess provided in the motor housing.
8. Clean the shaft and sleeve before installing the new seal.
9. Slide the new carbon seal head onto the shaft sleeve until it contacts the seal seat. Slide the new "O-Ring" and back-up ring along the shaft sleeve until they fit inside the counter bore in the seal head. Place the seal spring between the back-up ring and the seal cage while positioning the seal cage flush with the end of the sleeve. Place the small end of the spring against the back-up ring. The three driving legs of the seal cage should engage the three slots on the seal head. While holding the rotor assembly with the screwdriver, thread the impeller onto the shaft in a counter clockwise direction. Tighten the impeller with light hand pressure. Take care to avoid bending a rotor cooling fin or damaging the shaft sleeve.
10. Clean the recess in the pump body and install a new body gasket.
11. Install the pump in the body and secure with four capscrews. Apply torque evenly in a criss cross pattern in 40 in-lb (4.52 N•m) increments to a torque of 80 in-lb (9.04 N•m).
12. Reinstall into the system using new flange gaskets. For instructions, see sections "PUMP INSTALLATION" and "WIRING INSTRUCTIONS" on pages 2 and 3.

PERIODIC INSPECTION

Bell & Gossett Booster Pumps are designed to provide years of trouble free service. It is recommended that periodic inspections be made to check for potential problems with the pump. If any leakage or evidence of leakage is present repair or replace the unit.

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8200 N. Austin Avenue
Morton Grove, IL 60053
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Fax: (847) 966-9052
www.bellgossett.com

NOTES:

Temperature and Pressure Relief Valve

"Apollo" Valves
Made In The USA
www.apollovalves.com

MODEL TPC

COMMERCIAL ASME T&P RELIEF VALVE

(18C-500 SERIES)

Job Name:	Contractor:
Job Location:	P.O. Number:
Engineer:	Representative:
Tag:	Wholesale Distributor:

DESCRIPTION

The Apollo® TPC bronze automatic temperature and pressure relief valves are used for protection of high capacity commercial hot water heaters and storage tanks.

PROUDLY MADE IN USA — ISO 9001:2008 REGISTERED

FEATURES

- ASME Section IV Certified Capacity
- ¾" through 2" NPT Connections
- CSA Listed and Certified to ANSI Z21.22
- 125 and 150 psig Set Pressures @ 210°F max
- Coated Element Protects Against Corrosion
- SS Elements (1-1/2" and 2")

MATERIALS

Body: ASTM B584 Bronze
Seat Stem: ASTM B16, Brass
Seat disc: Silicone
Element Tube Coating: Nylon
Element Spring: Type 304 SST
Element Pin: Type 302 SST

APPROVALS

HV NB C SA US

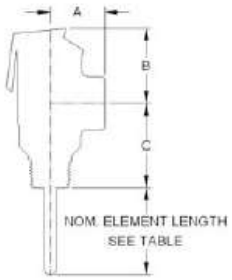
ASME Section IV Heating Boilers
Canadian Registration Number 0G1438.6C

CAPACITY

PART NUMBER	INLET SIZE	ELEM LGTH	INLET TYPE	CSA CAPACITY BTU/HR	ASME CAPACITY BTU/HR
18C5113125	¾"	3"	MALE	185,000	1,619,000
18C5113150	¾"	3"	MALE	185,000	1,912,000
18C5115125	¾"	5"	MALE	205,000	1,619,000
18C5115150	¾"	5"	MALE	205,000	1,912,000
18C5118125	¾"	8"	MALE	205,000	1,619,000
18C5118150	¾"	8"	MALE	205,000	1,912,000
18C5123125	¾"	3"	FEM	185,000	1,619,000
18C5123150	¾"	3"	FEM	185,000	1,912,000
18C5125125	¾"	5"	FEM	205,000	1,619,000
18C5125150	¾"	5"	FEM	205,000	1,912,000
18C5128125	¾"	8"	FEM	205,000	1,619,000
18C5128150	¾"	8"	FEM	205,000	1,912,000
18C5213125	1"	3"	MALE	500,000	1,825,000
18C5213150	1"	3"	MALE	500,000	2,155,000
18C5215125	1"	5"	MALE	500,000	1,825,000
18C5215150	1"	5"	MALE	500,000	2,155,000
18C5225125	1"	5"	FEM	750,000	3,070,000
18C5225150	1"	5"	FEM	750,000	3,625,000
18C5228125	1"	8"	FEM	750,000	3,070,000
18C5228150	1"	8"	FEM	750,000	3,625,000
18C5314125	1-¼"	4"	MALE	750,000	3,070,000
18C5314150	1-¼"	4"	MALE	750,000	3,625,000
18C5424125	1-½"	4"	FEM	1,200,000	5,125,000
18C5424150	1-½"	4"	FEM	1,200,000	6,050,000
18C5513125	2"	3"	MALE	1,200,000	5,125,000
18C5513150	2"	3"	MALE	1,200,000	6,050,000

DIMENSIONS

MODEL # (SERIES)	Inlet Size	Outlet Size	A in(mm)	B in(mm)	C in(mm)	Weight Lbs(kg)
TPC-34 (18C511)	¾" NPT	¾"FNPT	1.5 (38)	3.5 (87)	2.5 (63)	1.4 (.63)
TPC-1 (18C521)	1" NPT	1" FNPT	1.5 (38)	3.5 (87)	2.12 (54)	1.25 (.56)
TPC-114 (18C531)	1-1/4" NPT	1"FNPT	1.63 (42)	3.38 (86)	2.13 (54)	2.6 (1.2)
TPC-112 (18C542)	1-1/2" FNPT	1-1/2" FNPT	2.5 (63)	5.87 (147)	1.61 (41)	5.1 (2.3)
TPC-2 (18C551)	2" NPT	1-1/2" FNPT	2.5 (63)	5.87 (147)	2.6 (66)	5.4 (2.5)



Installation/Maintenance Instructions

1. Do not remove this instruction tag, keep it attached to the valve.
2. The valve shall be installed directly to the tank tapping so that the temperature-sensing element is immersed in the water within the top 6 inches (152mm) of the tank.
3. No valve is to be installed between this valve and the tank.
4. The discharge of this valve shall terminate in the vicinity of a point of drainage. The termination of the discharge piping shall be downward to allow complete drainage of both the valve and piping, and NOT directly connected to the sewer line. No reducing coupling or other restriction shall be installed in the discharge line of this valve. The discharge piping shall be independently supported or so arranged as to avoid undue stress on the valve. The discharge piping shall terminate with a non threaded end and constructed of a material suitable for exposure to temperatures of 375 deg.F or greater.
5. The valve shall be adequately insulated and located so as to be isolated from flue gas heat or other ambient conditions that are not indicative of stored water temperature.
6. Actual service pressure should not exceed that of pressure stamped on the valve minus 25 P.S.I. Temperature and Pressure settings are factory set and are not adjustable.

WARNING

This valve is designed to protect against both over-pressure and excessive temperatures and may discharge a large volume of hot water. Therefore, in an effort to protect against personal injury and property damage a discharge line must be installed and run to a safe place of disposal. UNDER NO CIRCUMSTANCES SHOULD THE VALVE OUTLET BE PLUGGED. Allow a 6" minimum air gap between the termination of the discharge piping and drain.

INSTALLATION OF CONBRACO COMBINATION TEMPERATURE AND PRESSURE RELIEF VALVES SHALL BE IN ACCORDANCE WITH ANSI Z21.22 RELIEF VALVES AND AUTOMATIC GAS SHUT-OFF DEVICES.*

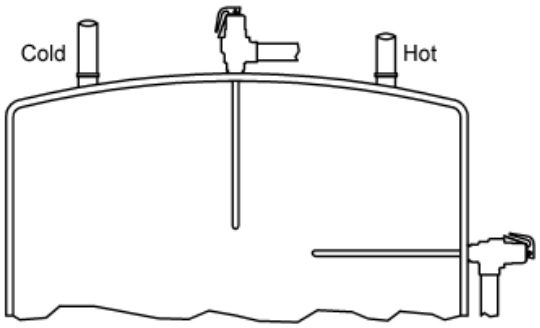
*"NRTL" Nationally Recognized Testing Laboratory

A Temperature and Pressure Relief Valve is protection against both excessive temperature and pressure. If either of these conditions develop in the system, the valve will open and discharge water. If the valve relieves from thermal expansion pressure build-up, the valve will drip slowly. If the valve relieves from excessive temperature build-up, the valve will discharge a greater volume. Therefore the valve is performing its duty to keep the system safe. In the event this happens, steps must be taken to evaluate the reason for leakage. This valve should be manually operated by a qualified service technician at least once a year, however, prior to doing so, it should be determined that the outlet is properly connected to discharge piping, otherwise, personal injury or property damage could result.

To actuate the valve hold the trip lever fully open for about 5 seconds in order to flush the valve seat free of any sediment, then permit the valve to snap shut.

This valve is designed to give years of satisfactory service when installed and maintained properly. Neither Conbraco Industries, Inc. nor its agents assume any liability for valves improperly installed or maintained.

Top & side location options



WARNING: This product contains lead, a chemical known to the state of California to cause cancer and birth defects or other reproductive harm: (Plumber: California law requires that this warning be given to the consumer)

CONBRACO INDUSTRIES INC
MATTHEWS, N.C. 28106

NOTES:

Safety Relief Valve

500 SERIES
ASME SECTION VIII
SAFETY RELIEF VALVE

Job Name:	Contractor:
Job Location:	P.O. Number:
Engineer:	Representative:
Tag:	Wholesale Distributor:

DESCRIPTION
ASME Section VIII capacity certified safety relief valve for overpressure protection of steam, air/gas and liquid systems, pressure vessels, piping and similar equipment.

FEATURES
- ASME Section VIII Certified Capacities
- 5 - 1200 psig Set Pressures @ 800F max
- 1/2" - 2" Inlet Connections
- Bronze, Carbon or Stainless Steel Construction
- Lapped Metal Seats; O-ring and PCTFE seats Optional
- Screwed Cap or Packed Lift Lever Configuration
- Directive 97/23/EC (PED) Compliance
- Directive 2002/95/CE (RoHS) Compliant
- MADE IN THE USA

MATERIALS
Body: ASTM B584 Bronze; or ASTM A216 Carbon Steel; or ASTM A351 Stainless Steel
Nozzle: ASTM B16 Brass; ASTM A479 Stainless Steel
Spring: Stainless Steel
Seat: Stainless Steel

CAPACITY, SCFM (Nm^3/Hr)
National Board Capacity Certified, Section VIII Air

Set Pressure PSIG (bar)	D ORIFICE	E ORIFICE	F ORIFICE
15 (1.03)	67 (107)	118 (189)	185 (298)
100 (6.90)	255 (409)	449 (721)	706 (1135)
500 (34.48)	1153 (1853)	2032 (3267)	3197 (5138)
	G ORIFICE	H ORIFICE	J ORIFICE
15 (1.03)	304 (488)	474 (762)	776 (1247)
100 (6.90)	1158 (1862)	1808 (2907)	2959 (4756)
500 (34.48)	5246 (8433)	8189 (13164)	13399 (21538)

DIMENSIONS

MODEL #	SIZE	INSTALLED HEIGHT
5**DCB	1/2M x 1F	6.97 (177)
5**DCD	1/2M x 3/4F*	6.97 (177)
5**DDB	3/4M x 1F	6.97 (177)
5**DDD	3/4M x 3/4F*	6.97 (177)
5**ED	3/4M x 1-1/4F	8.45 (215)
5**EE	1M x 1-1/4F	8.45 (215)
5**FE	1M x 1-1/2F	9.64 (245)
5**FF	1-1/4M x 1-1/2F	9.64 (245)
5**GF	1-1/4M x 2F	12.62 (321)
5**GG	1-1/2M x 2F	12.62 (321)
5**HG	1-1/2M x 2-1/2F	14.42 (367)
5**HH	2M x 2-1/2F	14.42 (367)
5**JH	2M x 3F	16.50 (419)

All dims in inches (mm); *Bronze Body Only

ORDER NUMBER
5 *Trim* -*Cap* -*Orifice* -*Inlet* -B -*Service* -*Seat* -*Option* -*Pressure*
Example: 513FEBKMAA0150

Trim
- ☐ 1 = bronze body/brass trim
- ☐ 2 = bronze body/stainless trim
- ☐ 3 = carbon steel body/stainless trim
- ☐ 4 = stainless steel body/stainless trim

Cap
- ☐ 1 = screwed cap
- ☐ 2 = screwed cap w/gag
- ☐ 3 = packed lever
- ☐ 4 = packed lever w/gag

Orifice ☐ D ☐ E ☐ F ☐ G ☐ H ☐ J

Inlet ☐ 1/2" ☐ 3/4" ☐ 1" ☐ 1-1/4" ☐ 1-1/2" ☐ 2"

Service
- ☐ K = ASME (VIII) AIR/GAS ☐ N = NON-CODE AIR/GAS
- ☐ L = ASME (VIII) STEAM ☐ P = NON-CODE STEAM
- ☐ J = ASME (VIII) LIQUID ☐ M = NON-CODE LIQUID

*Set Pressure** ☐ psig
*D/E orifice 5-1200; F/G orifice 5-600; H/J orifice 5-500

Options
- ☐ AA = Standard Configuration
- ☐ CE = PED compliant
- ☐ OX = Oxygen Cleaned
- ☐ HT = Hi Temp Spring (Above 550F)

NOTE: NOT ALL CONFIGURATIONS AVAILABLE TOGETHER

APPROVALS
ASME Section VIII Div 1 Pressure Vessels
Canadian Registration Number 0G8547.5C
Pressure Equipment Directive 97/23/EC (PED)

NOTES:

Bi-Metal Temperature Probe

Bi-Metal Thermometers (TBM, TNR)

Winters' bi-metal thermometers are direct sensing instruments that are hermetically sealed and thus completely waterproof and dust proof. For accurate temperature readings, the stem should be immersed past the groove on the lower portion of the stem. All bi-metallic thermometers are of 304 stainless steel construction to protect against corrosive conditions. An external adjustment screw is conveniently located on the bottom of each case for easy field recalibration of thermometers, which may have shifted out of accuracy.

Installation of Bi-Metal Thermometers

Location

Vibration and extreme ambient temperatures can affect the dial reading. These areas should be avoided as much as possible. Vibration effects can be minimized by the use of a dampening liquid such as glycerin or silicone. If vibration is extreme, then a remote reading filled thermometer should be considered.

Mounting

A suitable thread sealant is required for NPT threads such as pipe dope or PTFE tape. Never use any part of the thermometer other than the hex nut that is on the stem of the thermometer just above the NPT threads for installation. Always tighten with a wrench on the hex nut. Failure to do so will severely damage the thermometer. Typically, bimetal thermometers are connected to the process through a thermowell. This allows for the removal and testing, calibration or replacement of the instrument without affecting the process operations. The selection of thermowell material and stem lengths is critical in order to properly monitor the temperature of the process.

Operation and Maintenance of Bi-Metal Thermometers

Disassembly and Assembly / Spare Parts

It is not recommended to disassemble the thermometer for any reason. If the thermometer is not functioning properly or if the lens is broken, the thermometer should be replaced. Please contact Winters for replacement.

Inspection Frequency

These thermometers are ruggedly constructed to give a reliable process temperature reading. The frequency of inspection is dependent on how critical the reading is at that point in the process. The inspection frequency can range from monthly to annual basis.

Over Range Protection

Over range protection allows the thermometer to function within its designed parameters even when the media temperature may intermittently exceed the thermometer range. The over range protection is 50% for ranges up to 500°F (260°C) and 10% above ranges of 500°F (260°C).

Recalibration

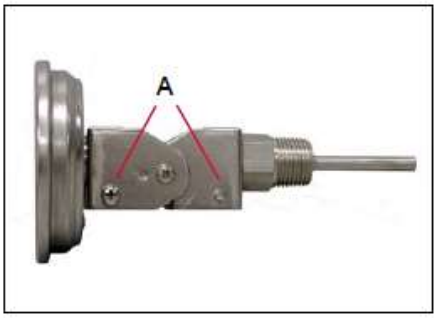
A master thermometer with a high degree of accuracy should be used for calibration. Immerse the bi-metal thermometer along side the master thermometer into an agitated liquid for at least three minutes and compare temperature readout. Note that both thermometers must be immersed at the same level. An external adjustment screw is conveniently located on the bottom of the case for easy field calibration. Winters can recalibrate and provide test certification. Please contact us for more details.

Storage

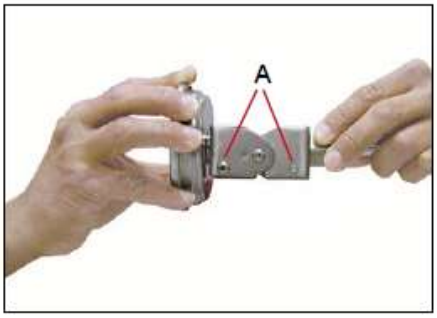
Store in a dry area at ambient temperatures not exceeding the indicator range. For example, if the indicator range is 0°C to 300°C, then the storage temperature should not exceed 300°C.

Head Rotation

NOTE: The bi-metal thermometer head can be rotated as illustrated only when in back connection position. Never rotate the thermometer head when it is in the angled position.

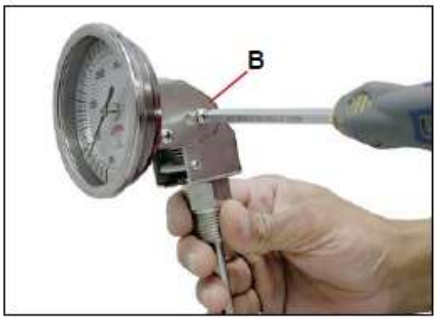


To rotate thermometer head up to 360°, make certain thermometer is in back connected position. Loosen two screws on both sides (A) until harness re-volves freely.

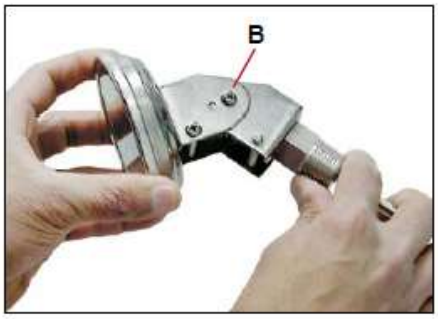


Now hold thermometer head and adjustable harness and rotate head to desired position. Retighten screws (A).

Angle Positioning



To tilt thermometer head up to a 90° angle or straighten it, loosen single screw (B) by 1/2 turn only.



Tilt to desired angle or straighten. Retighten screw (B).

NOTES:

ASCO 1/2” Dump Solenoid

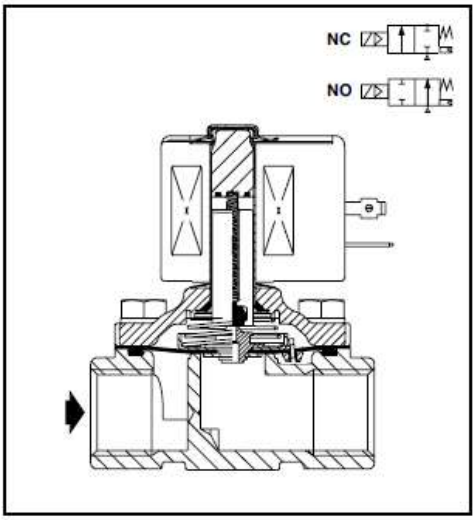
ASCO® RedHat®

Pilot Operated
General Service Solenoid Valves
Brass or Stainless Steel Bodies
3/8" to 2 1/2" NPT

2/2 SERIES 8210 — 2-WAY

Features

- Wide range of pressure ratings, sizes, and resilient materials provide long service life and low internal leakage
- High Flow Valves for liquid, corrosive, and air/inert gas service
- Industrial applications include:
  - Car wash
  - Laundry equipment
  - Air compressors
  - Industrial water control
  - Pumps



Construction

Valve Parts in Contact with Fluids		
Body	Brass	304 Stainless Steel
Seals and Discs	NBR or PTFE	
Disc-Holder	PA	
Core Tube	305 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
Springs	302 Stainless Steel	
Shading Coil	Copper	Silver

Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part Number			
		AC			General Purpose		Explosionproof	
	DC Watts	Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	-	6.1	16	40	238210	-	238214	-
F	11.6	10.1	25	70	238610	238710	238614	238714
F	16.8	16.1	35	180	272610	97617	272614	97617
F	-	17.1	40	93	238610	-	238614	-
F	-	20	43	240	99257	-	99257	-
F	-	20.1	48	240	272610	-	272614	-
H	30.6	-	-	-	-	74073	-	74073
H	40.6	-	-	-	-	238910	-	238914

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering.
Other voltages available when required.

Solenoid Enclosures

Standard: RedHat II - Watertight, Types 1, 2, 3, 3S, 4, and 4X; RedHat - Type I.

Optional: RedHat II - Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9; Red-Hat - Explosionproof and Watertight, Types 3, 4, 4X, 7, and 9.

(To order, add prefix “EF” to catalog number, except Catalog Numbers 8210B057, 8210B058, and 8210B059, which are not available with Explosionproof enclosures.)
See Optional Features Section for other available options.

Nominal Ambient Temp. Ranges

RedHat II/
RedHat AC: 32°F to 125°F (0°C to 52°C)

RedHat II DC: 32°F to 104°F (0°C to 40°C)
RedHat DC: 32°F to 77°F (0°C to 25°C)
(104°F/40°C occasionally)

8210G227 AC: 32°F to 130°F (0°C to 54°C)
DC: 32°F to 90°F (0°C to 32°C)

Refer to Engineering Section for details.

Approvals

UL listed as indicated. CSA certified.
RedHat II meets applicable CE directives.
Refer to Engineering Section for details.

2-WAY

2/2 SERIES 8210

ASCO®

Specifications (English units)

Pipe Size (Ins.)	Orifice Size (Ins.)	Cv Flow Factor	Operating Pressure Differential (psi)							Max. Fluid Temp. °F		Brass Body			Stainless Steel Body			Watt Rating/ Class of Coil Insulation ⑦	
			Min.	Max. AC			Max. DC												
				Air-Inert Gas	Water	Light Oil ⑫ 300 SSU	Air-Inert Gas	Water	Light Oil ⑫ 300 SSU	AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	3/8	1.5	①	150	125	-	40	40	-	180	150	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F
3/8	5/8	3	0	150	150	-	40	40	-	180	150	8210G093	5D	❍	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	200	150	135	125	100	100	180	150	8210G001	6D	❍	-	-	-	6.1/F	11.6/F
3/8	5/8	3	5	300	300	300	-	-	-	175	-	8210G006	5D	❍	-	-	-	17.1/F	-
1/2	7/16	2.2	①	150	125	-	40	40	-	180	150	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F
1/2	5/8	4	0	150	150	-	40	40	-	180	150	8210G094	5D	❍	-	-	-	10.1/F	11.6/F
1/2	5/8	4	0	150	150	125	40	40	-	175	150	-	-	-	8210G087	7D	●	17.1/F	11.6/F
1/2	5/8	4	5	200	150	135	125	100	100	180	150	8210G002	6D	❍	-	-	-	6.1/F	11.6/F
1/2	5/8	4	5	300	300	300	-	-	-	175	-	8210G007	5D	❍	-	-	-	17.1/F	-
1/2	3/4	4	5	-	300	-	-	300	-	130	90	8210G227	5D	❍ †	-	-	-	17.1/F	40.6/H
3/4	5/8	4.5	0	150	150	125	40	40	-	175	150	-	-	-	8210G088	7D	●	17.1/F	11.6/F
3/4	3/4	5	5	125	125	125	100	90	75	180	150	8210G009	9D	❍	-	-	-	6.1/F	11.6/F
3/4	3/4	5	0	150	150	-	40	40	-	180	150	8210G095	8D	❍	-	-	-	10.1/F	11.6/F
3/4	3/4	6.5	5	250	150	100	125	125	125	180	150	8210G003	11D	❍	-	-	-	6.1/F	11.6/F
3/4	3/4	6	0	-	-	-	200	180	180	-	77	8210B026 ② ‡	10P	-	-	-	-	-	30.6/H
3/4	3/4	6	0	350	300	200	-	-	-	200	-	8210G026 ② ‡	40P	●	-	-	-	16.1F	-
1	1	13	0	-	-	-	100	100	80	-	77	8210B054 ‡	31D	-	8210D089	15D	-	-	30.6/H
1	1	13	0	150	125	125	-	-	-	180	-	8210G054	41D	●	8210G089	45D	●	16.1/F	-
1	1	13	5	150	150	100	125	125	125	180	150	8210G004	12D	❍	-	-	-	6.1/F	11.6/F
1	1	13.5	0	300	225	115	-	-	-	200	-	8210G027 ‡	42P	●	-	-	-	20.1/F	-
1	1	13.5	10	300	300	300	-	-	-	175	-	8210G078 ②	13P	-	-	-	-	17.1/F	-
1 1/4	1 1/8	15	0	-	-	-	100	100	80	-	77	8210B055 ‡	32D	-	-	-	-	-	30.6/H
1 1/4	1 1/8	15	0	150	125	125	-	-	-	180	-	8210G055	43D	●	-	-	-	16.1/F	-
1 1/4	1 1/8	15	5	150	150	100	125	125	125	180	150	8210G008	16D	❍	-	-	-	6.1/F	11.6/F
1 1/2	1 1/4	22.5	0	-	-	-	100	100	80	-	77	8210B056 ‡	33D	-	-	-	-	-	30.6/H
1 1/2	1 1/4	22.5	0	150	125	125	-	-	-	180	-	8210G056	44D	●	-	-	-	16.1/F	-
1 1/2	1 1/4	22.5	5	150	150	100	125	125	125	180	150	8210G022	18D	●	-	-	-	6.1/F	11.6/F
2	1 3/4	43	5	150	125	90	50	50	50	180	150	8210G100	20P	●	-	-	-	6.1/F	11.6/F
2 1/2	1 3/4	45	5	150	125	90	50	50	50	180	150	8210G101	21P	●	-	-	-	6.1/F	11.6/F
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																			
3/8	5/8	3	0	150	150	125	125	125	80	180	150	8210G033	23D	●	-	-	-	10.1/F	11.6/F
3/8	5/8	3	5	250	200	200	250	200	200	180	180	8210G011 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F
1/2	5/8	4	0	150	150	125	125	125	80	180	150	8210G034	23D	●	-	-	-	10.1/F	11.6/F
1/2	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G030	37D	●	10.1/F	11.6/F
1/2	5/8	4	5	250	200	200	250	200	200	180	180	8210G012 ⑧ ⑨	39D	●	-	-	-	10.1/F	11.6/F
3/4	3/4	5.5	0	150	150	125	125	125	80	180	150	8210G035	25D	●	-	-	-	10.1/F	11.6/F
3/4	5/8	3	0	150	150	100	125	125	80	180	150	-	-	-	8210G038	38D	●	10.1/F	11.6/F
3/4	3/4	6.5	5	-	-	-	250	200	200	-	180	8210C013	24D	●	-	-	-	-	16.8/F
3/4	3/4	6.5	5	250	200	200	-	-	-	180	-	8210G013	46D	●	-	-	-	16.1/F	-
1	1	13	0	125	125	125	-	-	-	180	-	8210B057 ⑧ ⑩	34D	●	-	-	-	20/F	-
1	1	13	5	-	-	-	125	125	125	-	180	8210D014	26D	●	-	-	-	-	16.8/F
1	1	13	5	150	150	125	-	-	-	180	-	8210G014	47D	●	-	-	-	16.1/F	-
1 1/4	1 1/8	15	0	125	125	125	-	-	-	180	-	8210B058 ⑧ ⑩	35D	●	-	-	-	20/F	-
1 1/4	1 1/8	15	5	-	-	-	125	125	125	-	180	8210D018	28D	●	-	-	-	-	16.8/F
1 1/4	1 1/8	15	5	150	150	125	-	-	-	180	-	8210G018	48D	●	-	-	-	16.1/F	-
1 1/2	1 1/4	22.5	0	125	125	125	-	-	-	180	-	8210B059 ⑧ ⑩	36D	●	-	-	-	20/F	-
1 1/2	1 1/4	22.5	5	-	-	-	125	125	125	-	180	8210D032	29D	●	-	-	-	-	16.8/F
1 1/2	1 1/4	22.5	5	150	150	125	-	-	-	180	-	8210G032	49D	●	-	-	-	16.1/F	-
2	1 3/4	43	5	-	-	-	125	125	125	-	150	8210 103	30P	●	-	-	-	-	16.8/F
2	1 3/4	43	5	125	125	125	-	-	-	180	-	8210G103	50P	●	-	-	-	16.1/F	-
2 1/2	1 3/4	45	5	-	-	-	125	125	125	-	150	8210 104	27P	●	-	-	-	-	16.8/F
2 1/2	1 3/4	45	5	125	125	125	-	-	-	180	-	8210G104	51P	●	-	-	-	16.1/F	-

① 5 psi on Air; 1 psi on Water.
② Valve provided with PTFE main disc.
③ Valve includes Ultem (G.E. trademark) piston.
④ Letter "D" denotes diaphragm construction; "P" denotes piston construction.
⑤ ❍ Safety Shutoff Valve; ● General Purpose Valve.
Refer to Engineering Section (Approvals) for details.
⑧ Valves not available with Explosionproof enclosures.
⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.
⑧ AC construction also has PA seating.
⑨ No disc-holder.
⑩ Stainless steel disc-holder.
‡ Must have solenoid mounted vertical and upright.
† UL listed for fire protection systems per UL429A.

ASCO®

2/2 SERIES 8210

2-WAY

Specifications (Metric units)

Pipe Size (Ins.)	Orifice Size (mm)	Kv Flow Factor (m3/h)	Operating Pressure Differential (bar)							Max. Fluid Temp. °C		Brass Body			Stainless Steel Body			Watt Rating/ Class of Coil Insulation ⑦	
				Max. AC			Max. DC												
			Min.	Air-Inert Gas	Water	Light Oil ② 300 SSU	Air-Inert Gas	Water	Light Oil ② 300 SSU	AC	DC	Catalog Number	Const. Ref. ④	UL ⑤ Listing	Catalog Number	Const. Ref. ④	UL ⑤ Listing	AC	DC
NORMALLY CLOSED (Closed when de-energized), NBR or PTFE ② Seating																			
3/8	10	1.3	①	10	9	-	3	3	-	82	65	8210G073 ③	1P	●	8210G036 ③	1P	●	6.1/F	11.6/F
3/8	16	2.6	0	10	10	-	3	3	-	82	65	8210G093	5D	❍	-	-	-	10.1/F	11.6/F
3/8	16	2.6	0.3	14	10	9	9	7	7	82	65	8210G001	6D	❍	-	-	-	6.1/F	11.6/F
3/8	16	2.6	0.3	21	21	21	-	-	-	79	-	8210G006	5D	❍	-	-	-	17.1/F	-
1/2	11	1.9	①	10	9	-	3	3	-	82	65	8210G015 ③	2P	●	8210G037 ③	2P	●	6.1/F	11.6/F
1/2	16	3.4	0	10	10	-	3	3	-	82	65	8210G094	5D	❍	-	-	-	10.1/F	11.6/F
1/2	16	3.4	0	10	10	9	3	3	-	79	65	-	-	-	8210G087	7D	●	17.1/F	11.6/F
1/2	16	3.4	0.3	14	10	9	9	7	7	82	65	8210G002	6D	❍	-	-	-	6.1/F	11.6/F
1/2	16	3.4	0.3	21	21	21	-	-	-	79	-	8210G007	5D	❍	-	-	-	17.1/F	-
1/2	19	3.4	0.3	-	21	-	-	21	-	54	32	8210G227	5D	❍ †	-	-	-	17.1/F	40.6H
3/4	16	3.9	0	10	10	9	3	3	-	79	65	-	-	-	8210G088	7D	●	17.1/F	11.6/F
3/4	19	4.3	0.3	9	9	9	7	6	5	82	65	8210G009	9D	❍	-	-	-	6.1/F	11.6/F
3/4	19	4.3	0	10	10	-	3	3	-	82	65	8210G095	8D	❍	-	-	-	10.1/F	11.6/F
3/4	19	5.6	0.3	17	10	7	9	9	9	82	65	8210G003	11D	❍	-	-	-	6.1/F	11.6/F
3/4	19	5.1	0	-	-	-	14	12	12	-	25	8210B026 ② ‡	10P	-	-	-	-	-	30.6/H
3/4	19	5.1	0	24	21	14	-	-	-	93	-	8210G026 ② ‡	40P	●	-	-	-	16.1F	-
1	25	11	0	-	-	-	7	7	6	-	25	8210B054 ‡	31D	-	8210D089	15D	-	-	30.6/H
1	25	11	0	10	9	9	-	-	-	82	-	8210G054	41D	●	8210G089	45D	●	16.1/F	-
1	25	11	0.3	10	10	7	9	9	9	82	65	8210G004	12D	❍	-	-	-	6.1/F	11.6/F
1	25	11.5	0	21	16	8	-	-	-	93	-	8210G027 ‡	42P	●	-	-	-	20.1/F	-
1	25	11.5	0.7	21	21	21	-	-	-	79	-	8210G078 ②	13P	-	-	-	-	17.1/F	-
1 1/4	29	13	0	-	-	-	7	7	6	-	25	8210B055 ‡	32D	-	-	-	-	-	30.6/H
1 1/4	29	13	0	10	9	9	-	-	-	82	-	8210G055	43D	●	-	-	-	16.1/F	-
1 1/4	29	13	0.3	10	10	7	9	9	9	82	65	8210G008	16D	❍	-	-	-	6.1/F	11.6/F
1 1/2	32	19.5	0	-	-	-	7	7	6	-	25	8210B056 ‡	33D	-	-	-	-	-	30.6/H
1 1/2	32	19.5	0	10	9	9	-	-	-	82	-	8210G056	44D	●	-	-	-	16.1/F	-
1 1/2	32	19.5	0.3	10	10	7	9	9	9	82	65	8210G022	18D	●	-	-	-	6.1/F	11.6/F
2	44	37	0.3	10	9	6	3	3	3	82	65	8210G100	20P	●	-	-	-	6.1/F	11.6/F
2 1/2	44	39	0.3	10	9	6	3	3	3	82	65	8210G101	21P	●	-	-	-	6.1/F	11.6/F
NORMALLY OPEN (Open when de-energized), NBR Seating (PA Disc-Holder, except as noted)																			
3/8	16	2.6	0.0	10	10	9	9	9	6	82	65	8210G033	23D	●	-	-	-	10.1/F	11.6/F
3/8	16	2.6	0.3	17	14	14	17	14	14	82	82	8210G011 ⑥ ⑨	39D	●	-	-	-	10.1/F	11.6/F
1/2	16	3.4	0	10	10	9	9	9	6	82	65	8210G034	23D	●	-	-	-	10.1/F	11.6/F
1/2	16	2.6	0	10	10	7	9	9	6	82	65	-	-	-	8210G030	37D	●	10.1/F	11.6/F
1/2	16	3.4	0.3	17	14	14	17	14	14	82	82	8210G012 ⑥ ⑨	39D	●	-	-	-	10.1/F	11.6/F
3/4	19	4.7	0	10	10	9	9	9	6	82	65	8210G035	25D	●	-	-	-	10.1/F	11.6/F
3/4	16	2.6	0	10	10	7	9	9	6	82	65	-	-	-	8210G038	38D	●	10.1/F	11.6/F
3/4	19	5.6	0.3	-	-	-	17	14	14	-	82	8210C013	24D	●	-	-	-	-	16.8/F
3/4	19	5.6	0.3	17	14	14	-	-	-	82	-	8210G013	46D	●	-	-	-	16.1/F	-
1	25	11	0	9	9	9	-	-	-	82	-	8210B057 ⑥ ⑩	34D	●	-	-	-	20/F	-
1	25	11	0.3	-	-	-	9	9	9	-	82	8210D014	26D	●	-	-	-	-	16.8/F
1	25	11	0.3	10	10	9	-	-	-	82	-	8210G014	47D	●	-	-	-	16.1/F	-
1 1/4	29	13	0	9	9	9	-	-	-	82	-	8210B058 ⑥ ⑩	35D	●	-	-	-	20/F	-
1 1/4	29	13	0.3	-	-	-	9	9	9	-	82	8210D018	28D	●	-	-	-	-	16.8/F
1 1/4	29	13	0.3	10	10	9	-	-	-	82	-	8210G018	48D	●	-	-	-	16.1/F	-
1 1/2	32	19.5	0	9	9	9	-	-	-	82	-	8210B059 ⑥ ⑩	36D	●	-	-	-	20/F	-
1 1/2	32	19.5	0.3	-	-	-	9	9	9	-	82	8210D032	29D	●	-	-	-	-	16.8/F
1 1/2	32	19.5	0.3	10	10	9	-	-	-	82	-	8210G032	49D	●	-	-	-	16.1/F	-
2	44	37	0.3	-	-	-	9	9	9	-	65	8210 103	30P	●	-	-	-	-	16.8/F
2	44	37	0.3	9	9	9	-	-	-	82	-	8210G103	50P	●	-	-	-	16.1/F	-
2 1/2	44	39	0.3	-	-	-	9	9	9	-	65	8210 104	27P	●	-	-	-	-	16.8/F
2 1/2	44	39	0.3	9	9	9	-	-	-	82	-	8210G104	51P	●	-	-	-	16.1/F	-

① 0.3 bar on Air; 0.0 bar on Water.
② Valve provided with PTFE main disc.
③ Valve includes Ultem (G.E. trademark) piston.
④ Letter "D" denotes diaphragm construction; "P" denotes piston construction.
⑤ ❍ Safety Shutoff Valve; ● General Purpose Valve.
Refer to Engineering Section (Approvals) for details.
⑥ Valves not available with Explosionproof enclosures.
⑦ On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts.
⑧ AC construction also has PA seating.
⑨ No disc-holder.
⑩ Stainless steel disc-holder.
‡ Must have solenoid mounted vertical and upright.
† UL listed for fire protection systems per UL429A.

2-WAY

2/2 SERIES 8210

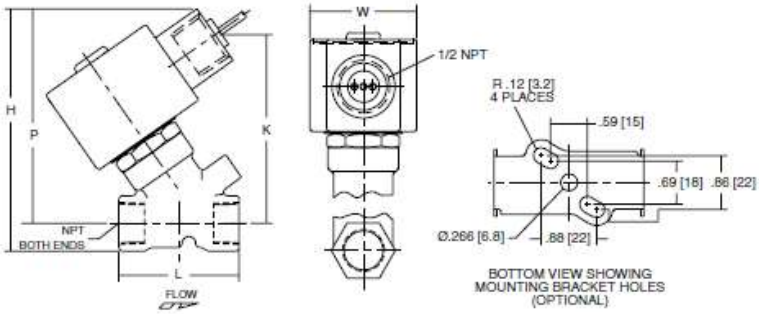
ASCO®

Dimensions: inches (mm)

Const. Ref.		H	K	L	P	W
1*	ins.	3.85	3.00	1.91	3.41	1.69
	mm	98	76	49	87	43
2*	ins.	4.17	3.25	2.28	3.63	1.69
	mm	106	83	58	92	43
5	ins.	3.84	2.31	2.75	3.28	2.28
	mm	98	59	70	83	58
6*	ins.	3.38	1.94	2.75	2.80	2.28
	mm	86	49	70	71	58
7	ins.	4.19	2.50	2.81	3.47	2.39
	mm	106	64	71	88	61
8	ins.	4.13	2.47	2.81	3.44	2.29
	mm	105	63	71	87	58
9*	ins.	3.66	2.10	2.81	2.96	2.28
	mm	93	53	71	75	58
10*	ins.	5.25	X	2.81	4.59	2.31
	mm	133	X	71	117	59
11*	ins.	4.16	2.66	3.84	3.52	2.75
	mm	106	68	98	89	70
12	ins.	5.64	3.15	3.75	4.01	3.36
	mm	143	80	95	102	85
13	ins.	4.44	3.22	3.75	4.19	5.81
	mm	113	82	95	106	147
15*	ins.	5.34	X	3.75	4.47	3.84
	mm	136	X	95	114	98
16	ins.	5.64	3.15	3.66	4.01	3.56
	mm	143	80	93	102	90
18	ins.	6.11	3.30	4.38	4.16	3.92
	mm	155	84	111	106	100
20*	ins.	7.33	3.71	5.06	4.57	4.87
	mm	186	94	129	116	124
21*	ins.	7.33	3.71	5.50	4.57	4.87
	mm	186	94	140	116	124
23	ins.	4.35	2.65	2.75	3.79	2.28
	mm	110	67	70	96	58
24	ins.	5.06	X	3.78	4.44	2.75
	mm	129	X	96	113	70
25	ins.	4.64	2.81	2.81	3.94	2.28
	mm	118	71	71	100	58
26	ins.	6.53	X	3.75	4.91	3.19
	mm	166	X	95	125	81
27	ins.	8.22	X	5.50	5.47	4.87
	mm	209	X	140	139	124
28	ins.	6.53	X	3.66	4.91	3.19
	mm	166	X	93	125	81
29	ins.	7.03	X	4.38	5.06	4.40
	mm	179	X	111	129	112

* DC dimensions slightly larger.
IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.

Const. Ref. 1, 2



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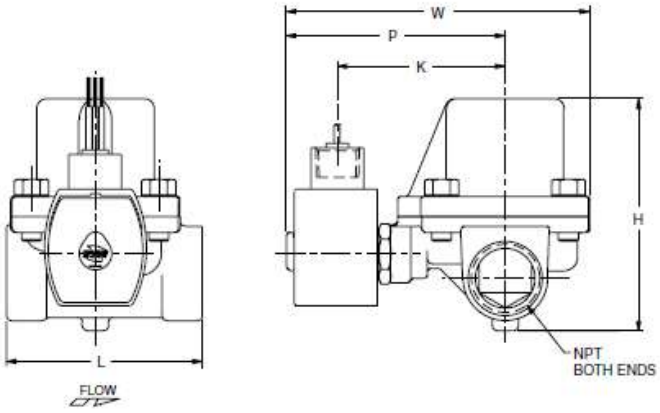
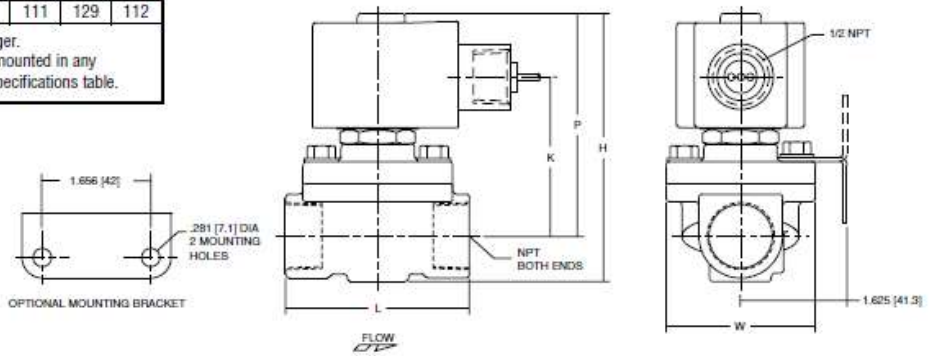


Const. Ref. 5-9, 11, 20, 21, 23 , 25, 37,38



ASCO®

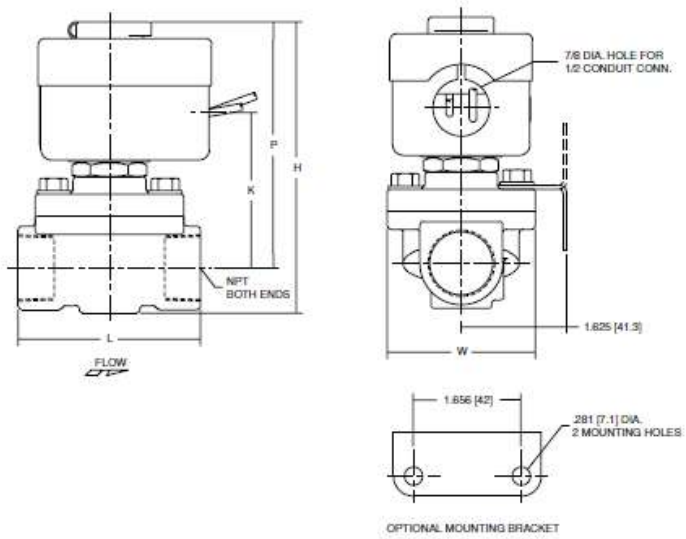
2/2 SERIES 8210 2-WAY

Dimensions: inches (mm)

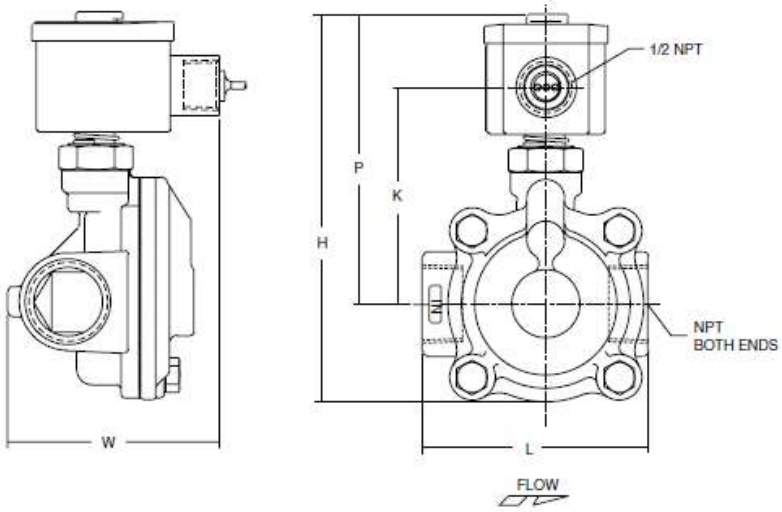
Const. Ref.		H	K	L	P	W
30	ins.	8.22	X	5.06	5.47	4.87
	mm	209	X	129	139	124
31	ins.	5.25	X	3.75	4.44	3.25
	mm	133	X	95	113	83
32	ins.	5.69	X	3.66	4.69	3.25
	mm	145	X	93	119	83
33	ins.	6.06	X	4.38	4.94	3.91
	mm	154	X	111	125	99
34	ins.	6.91	X	3.75	6.09	3.25
	mm	176	X	95	155	83
35	ins.	7.34	X	3.66	6.34	3.25
	mm	186	X	93	161	83
36	ins.	7.66	X	4.38	6.56	3.91
	mm	1.95	X	111	167	99
37	ins.	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
38	ins.	4.61	2.75	2.81	3.89	2.39
	mm	117	70	71	99	61
39	ins.	5.42	2.31	2.75	4.86	3.80
	mm	138	59	70	123	97
40	ins.	5.20	3.29	2.81	4.50	2.28
	mm	132	83	71	114	58
41	ins.	5.13	3.10	3.75	4.32	3.25
	mm	130	79	95	110	83
42	ins.	6.43	4.40	3.93	5.62	3.25
	mm	163	112	100	143	83
43	ins.	5.57	3.35	3.66	4.57	3.25
	mm	142	85	93	116	83
44	ins.	5.90	3.57	4.38	4.79	3.91
	mm	150	91	111	122	99
45	ins.	5.26	3.17	3.75	4.38	3.84
	mm	134	81	95	111	98
46	ins.	4.95	3.10	3.84	4.31	2.75
	mm	126	79	98	110	70
47	ins.	6.43	3.59	3.75	4.81	3.52
	mm	163	91	95	122	90
48	ins.	6.43	3.59	3.66	4.81	3.73
	mm	163	91	93	122	95
49	ins.	6.91	3.75	4.38	4.96	4.40
	mm	176	95	111	126	112
50	ins.	8.13	4.15	5.06	5.37	4.87
	mm	207	105	129	136	124
51	ins.	8.13	4.15	5.50	5.37	5.18
	mm	207	105	140	136	132

IMPORTANT: Valves may be mounted in any position, except as noted in specifications table.

Const. Ref. 10, 15, 24, 26-36



Const. Ref. 12, 16, 18



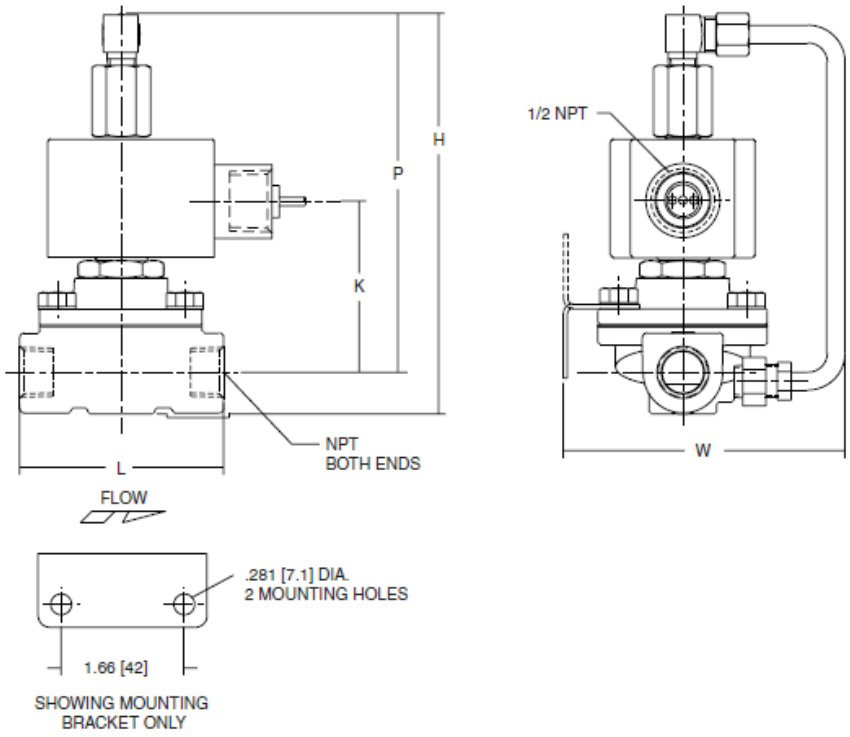
2-WAY

2/2 SERIES 8210

ASCO®

Dimensions: inches (mm)

Const. Ref. 39



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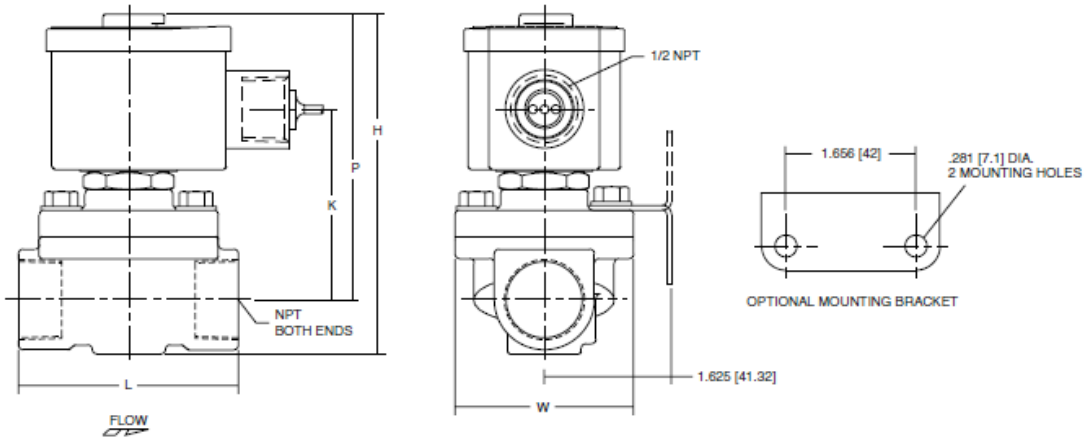


ASCO 3-Way Solenoid

ASCO® RedHat®

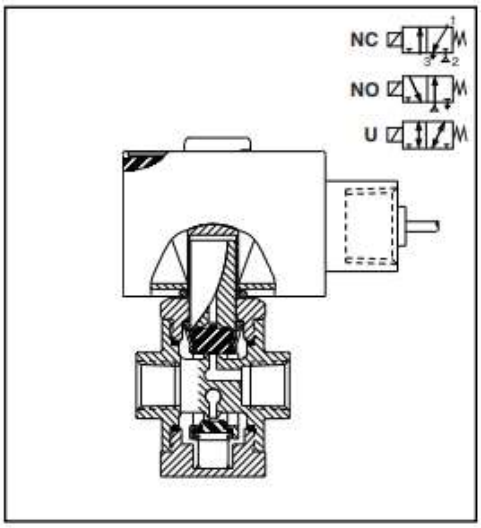
Direct Acting
General Service Solenoid Valves
Brass or Stainless Steel Bodies
1/8" to 1/4" NPT

3/2 SERIES 8320

3-WAY

Features

- All NPT connections are in the valve body to allow in-line piping
- No Minimum Operating Pressure Differential required
- Broadest range of applications
- Mountable in any position



Construction

Valve Parts in Contact with Fluids		
Body	Brass	303 Stainless Steel
Seals and Disc	NBR or Cast UR, as Listed	
Core Tube	305 Stainless Steel	
Core and Plugnut	430F Stainless Steel	
Core Springs	302 Stainless Steel	
Shading Coil	Copper	Silver
Disc-Holder	CA	
Core Guide	CA (10.1 and 17.1 Watt only)	

Electrical

Standard Coil and Class of Insulation	Watt Rating and Power Consumption				Spare Coil Part Number			
		AC			General Purpose		Explosionproof	
	DC Watts	Watts	VA Holding	VA Inrush	AC	DC	AC	DC
F	10.6	6.1	16	30	238210	238310	238214	238314
F	-	9.1	25	40	238210	-	238214	-
F	11.6	10.1	25	50	238610	238710	238614	238714
F	22.6	17.1	40	70	238610	238710	238614	238714

Standard Voltages: 24, 120, 240, 480 volts AC, 60 Hz (or 110, 220 volts AC, 50 Hz). 6, 12, 24, 120, 240 volts DC. Must be specified when ordering. Other voltages are available when required.

Solenoid Enclosures

Standard: Watertight, Types 1, 2, 3, 3S, 4, and 4X.

Optional: Explosionproof and Watertight, Types 3, 3S, 4, 4X, 6, 6P, 7, and 9. (To order, add prefix "EF" to the catalog number.)

See Optional Features Section for other available options.

Nominal Ambient Temp. Ranges

AC: 32°F to 125°F (0°C to 52°C)
DC: 32°F to 104°F (0°C to 40°C)

Note: Some stainless steel constructions are rated -40°F (-40°C). See note ④ in specifications table.

Refer to Engineering Section for details.

Approvals

CSA certified. UL listed General Purpose Valves.
Meets applicable CE directives.
SIL 3 capable per IEC 61508 on normally closed const.
Third party certification provided by EXIDA.
Refer to Engineering Section for details.
ATEX/IECEx certified with prefix "EV" as listed.
Refer to Optional Features Electrical Section for details.

3/2 SERIES 8320

ASCO®

3-WAY

Specifications (English units)

Pipe Size (in)	Orifice Size (in)	Cv Flow Factor	Operating Pressure Differential (psi) Max. AC Air-Inert Gas	Max. AC Water ⑤	Max. AC Lt. Oil @ 300 SSU	Max. DC Air-Inert Gas	Max. DC Water ⑤	Max. DC Lt. Oil @ 300 SSU	Max. Fluid Temp. °F AC	Max. Fluid Temp. °F DC	Brass Body Catalog Number	Brass Body Const. Ref.	Stainless Steel Body Catalog Number	Stainless Steel Body Const. Ref.	Watt Rating/ Class of Coil Insulation ② AC	Watt Rating/ Class of Coil Insulation ② DC
UNIVERSAL OPERATION (Pressure at any port)																
1/8	3/64	0.06	175	175	175	125	125	125	140	120	8320G130 ①	1	8320G140 ①	1	9.1F	10.6F
1/8	1/16	0.09	100	100	100	65	65	65	180	120	8320G001	1	8320G041 ③	1	9.1F	10.6F
1/8	1/16	0.09	175	175	175	125	125	125	200	150	8320G212	4	8320G221 ④⑧	4	17.1/F	22.6/F
1/8	3/32	0.12	50	50	50	50	50	50	180	120	8320G083	1	8320G087 ③	1	6.1/F	10.6/F
1/8	3/32	0.12	100	100	100	60	60	60	200	150	8320G213	4	8320G222 ④	4	17.1/F	11.6/F
1/8	1/8	0.21	30	30	30	20	20	20	180	120	8320G003	1	8320G043 ③	1	9.1/F	10.6/F
1/8	1/8	0.21	50	50	50	25	25	25	200	150	8320G214	4	8320G223 ④	4	17.1/F	11.6/F
1/4	1/16	0.09	125	130	130	75	75	75	200	150	8320G172	2	-	-	10.1/F	11.6/F
1/4	1/16	0.09	175	175	175	125	125	125	200	150	-	-	8320G230 ④⑧	3	17.1/F	22.6/F
1/4	3/32	0.12	100	100	100	60	60	60	200	150	8320G174	2	8320G200 ③④⑧	3	17.1/F	11.6/F
1/4	1/8	0.25	50	50	50	25	25	25	200	150	8320G176 ⑧	2	8320G201 ③④⑧	3	17.1/F	11.6/F
1/4	11/64	0.35	20	20	20	12	12	12	200	150	8320G178	2	-	-	10.1/F	11.6/F
NORMALLY CLOSED (Closed when de-energized) – PFD_{AVG} = 6.81 x 10^{-4}																
1/8	3/64	0.06	200	200	200	200	200	200	180	120	8320G132	1	8320G142 ③	1	6.1F	10.6/F
1/8	1/16	0.09	150	125	125	125	125	125	180	120	8320G013	1	8320G045 ③	1	6.1F	10.6/F
1/8	1/16	0.09	210	225	225	160	160	160	200	150	8320G215	4	8320G224 ④	4	17.1/F	11.6/F
1/8	3/32	0.12	100	100	100	100	100	100	180	120	8320G015	1	8320G047 ③	1	6.1F	10.6/F
1/8	3/32	0.12	150	150	150	115	115	115	200	150	8320G216	4	8320G225 ④	4	10.1/F	11.6/F
1/8	1/8	0.21	40	40	40	40	40	40	180	120	8320G017	1	8320G049 ③	1	6.1F	10.6/F
1/8	1/8	0.21	85	85	85	60	60	60	200	150	8320G217	4	8320G226 ④	4	10.1/F	11.6/F
1/4	1/16	0.09	210	225	225	160	160	160	200	150	8320G182 ⑧	2	8320G231 ④	3	17.1/F	11.6/F
1/4	3/32	0.12	150	150	150	115	115	115	200	150	8320G184	2	8320G202 ③④⑧	3	10.1/F	11.6/F
1/4	1/8	0.25	85	85	85	60	60	60	200	150	8320G186	2	8320G203 ③④⑧	3	10.1/F	11.6/F
1/4	11/64	0.35	45	45	45	25	25	25	200	150	8320G188	2	-	-	10.1/F	11.6/F
NORMALLY OPEN (Open when de-energized)																
1/8	3/64	0.06	200	200	200	200	200	200	180	120	8320G136	1	8320G146 ③	1	6.1F	10.6/F
1/8	1/16	0.09	150	125	125	125	125	125	180	120	8320G027	1	8320G051 ③	1	6.1F	10.6/F
1/8	1/16	0.09	235	250	250	160	160	160	200	150	8320G218	4	8320G227 ④	4	17.1/F	11.6/F
1/8	3/32	0.12	100	100	100	100	100	100	180	120	8320G029	1	8320G053 ③	1	6.1F	10.6/F
1/8	3/32	0.12	150	140	140	100	100	100	200	150	8320G219	4	8320G228 ④	4	10.1/F	11.6/F
1/8	1/8	0.21	40	40	40	40	40	40	180	120	8320G031	1	8320G055 ③	1	6.1F	10.6/F
1/8	1/8	0.21	70	70	70	55	55	55	200	150	8320G220	4	8320G229 ④	4	10.1/F	11.6/F
1/4	1/16	0.09	235	250	250	160	160	160	200	150	8320G192 ⑧	2	8320G232 ④	3	17.1/F	11.6/F
1/4	3/32	0.12	150	140	140	100	100	100	200	150	8320G194	2	8320G204 ③④⑧	3	10.1/F	11.6/F
1/4	1/8	0.25	70	70	70	55	55	55	200	150	8320G196	2	8320G205 ③④	3	10.1/F	11.6/F
1/4	11/64	0.35	40	40	40	30	30	30	200	150	8320G198	2	-	-	10.1/F	11.6/F

① Supplied with cast UR disc.
② On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts; the watt rating for the 9.1/F solenoid is 11.1 watts.
③ Can be used for ***dry*** natural gas service with the EF prefix.
④ Constructions standard rated -40°F (-40°C) ambient temperature. EFX prefix and TPL # not required.
⑤ Water rating, CSA certified up to 232 psi.
⑧ ATEX/IECEx certified with prefix "EV".

ASCO®

3/2 SERIES 8320

3-WAY

Specifications (Metric units)

Pipe Size (in)	Orifice Size (mm)	Kv Flow Factor (m3/h)	Operating Pressure Differential (bar) Max. AC Air-Inert Gas	Max. AC Water ⑤	Max. AC Lt. Oil @ 300 SSU	Max. DC Air-Inert Gas	Max. DC Water ⑤	Max. DC Lt. Oil @ 300 SSU	Max. Fluid Temp. °C AC	Max. Fluid Temp. °C DC	Brass Body Catalog Number	Brass Body Const. Ref.	Stainless Steel Body Catalog Number	Stainless Steel Body Const. Ref.	Watt Rating/ Class of Coil Insulation② AC	Watt Rating/ Class of Coil Insulation② DC
UNIVERSAL OPERATION (Pressure at any port)																
1/8	1.2	0.05	12	12	12	9	9	9	60	49	8320G130 ①	1	8320G140 ①	1	9.1F	10.6F
1/8	1.6	0.08	7	7	7	4	4	4	82	49	8320G001	1	8320G041 ③	1	9.1F	10.6F
1/8	1.6	0.08	12	12	12	9	9	9	93	66	8320G212	4	8320G221 ④⑥	4	17.1/F	22.6/F
1/8	2.4	0.10	3	3	3	3	3	3	82	49	8320G083	1	8320G087 ③	1	6.1/F	10.6/F
1/8	2.4	0.10	7	7	7	4	4	4	93	66	8320G213	4	8320G222 ④	4	17.1/F	11.6/F
1/8	3.2	0.18	2	2	2	1	1	1	82	49	8320G003	1	8320G043 ③	1	9.1/F	10.6/F
1/8	3.2	0.18	3	3	3	2	2	2	93	66	8320G214	4	8320G223 ④	4	17.1/F	11.6/F
1/4	1.6	0.08	9	9	9	5	5	5	93	66	8320G172	2	-	-	10.1/F	11.6/F
1/4	1.6	0.08	12	12	12	9	9	9	93	66	-	-	8320G230 ④⑥	3	17.1/F	22.6/F
1/4	2.4	0.10	7	7	7	4	4	4	93	66	8320G174	2	8320G200 ③④⑥	3	17.1/F	11.6/F
1/4	3.2	0.21	3	3	3	2	2	2	93	66	8320G176 ⑥	2	8320G201 ③④⑥	3	17.1/F	11.6/F
1/4	4.4	0.30	1	1	1	1	1	1	93	66	8320G178	2	-	-	10.1/F	11.6/F
NORMALLY CLOSED (Closed when de-energized) – PFD_{AVG} = 6.81 x 10^{-4}																
1/8	1.2	0.05	14	14	14	14	14	14	82	49	8320G132	1	8320G142 ③	1	6.1F	10.6/F
1/8	1.6	0.08	10	9	9	9	9	9	82	49	8320G013	1	8320G045 ③	1	6.1F	10.6/F
1/8	1.6	0.08	14	15	15	11	11	11	93	66	8320G215	4	8320G224 ④	4	17.1/F	11.6/F
1/8	2.4	0.10	7	7	7	7	7	7	82	49	8320G015	1	8320G047 ③	1	6.1F	10.6/F
1/8	2.4	0.10	10	10	10	8	8	8	93	66	8320G216	4	8320G225 ④	4	10.1/F	11.6/F
1/8	3.2	0.18	3	3	3	3	3	3	82	49	8320G017	1	8320G049 ③	1	6.1F	10.6/F
1/8	3.2	0.18	6	6	6	4	4	4	93	66	8320G217	4	8320G226 ④	4	10.1/F	11.6/F
1/4	1.6	0.08	14	15	15	11	11	11	93	66	8320G182 ⑥	2	8320G231 ④	3	17.1/F	11.6/F
1/4	2.4	0.10	10	10	10	8	8	8	93	66	8320G184	2	8320G202 ③④⑥	3	10.1/F	11.6/F
1/4	3.2	0.21	6	6	6	4	4	4	93	66	8320G186	2	8320G203 ③④⑥	3	10.1/F	11.6/F
1/4	4.4	0.30	3	3	3	2	2	2	93	66	8320G188	2	-	-	10.1/F	11.6/F
NORMALLY OPEN (Open when de-energized)																
1/8	1.2	0.05	14	14	14	14	14	14	82	49	8320G136	1	8320G146 ③	1	6.1F	10.6/F
1/8	1.6	0.08	10	9	9	9	9	9	82	49	8320G027	1	8320G051 ③	1	6.1F	10.6/F
1/8	1.6	0.08	16	17	17	11	11	11	93	66	8320G218	4	8320G227 ④	4	17.1/F	11.6/F
1/8	2.4	0.10	7	7	7	7	7	7	82	49	8320G029	1	8320G053 ③	1	6.1F	10.6/F
1/8	2.4	0.10	10	10	10	7	7	7	93	66	8320G219	4	8320G228 ④	4	10.1/F	11.6/F
1/8	3.2	0.18	3	3	3	3	3	3	82	49	8320G031	1	8320G055 ③	1	6.1F	10.6/F
1/8	3.2	0.18	5	5	5	4	4	4	93	66	8320G220	4	8320G229 ④	4	10.1/F	11.6/F
1/4	1.6	0.08	16	17	17	11	11	11	93	66	8320G192 ⑥	2	8320G232 ④	3	17.1/F	11.6/F
1/4	2.4	0.10	10	10	10	7	7	7	93	66	8320G194	2	8320G204 ③④⑥	3	10.1/F	11.6/F
1/4	3.2	0.21	5	5	5	4	4	4	93	66	8320G196	2	8320G205 ③④	3	10.1/F	11.6/F
1/4	4.4	0.30	3	3	3	2	2	2	93	66	8320G198	2	-	-	10.1/F	11.6/F

① Supplied with cast UR disc.
② On 50 hertz service, the watt rating for the 6.1/F solenoid is 8.1 watts; the watt rating for the 9.1/F solenoid is 11.1 watts.
③ Can be used for ***dry*** natural gas service with the EF prefix.
④ Constructions standard rated -40˚F (-40˚C) ambient temperature. EFX prefix and TPL # not required.
⑤ Water rating, CSA certified up to 16 bar.
⑥ ATEX/IECEx certified with prefix "EV".

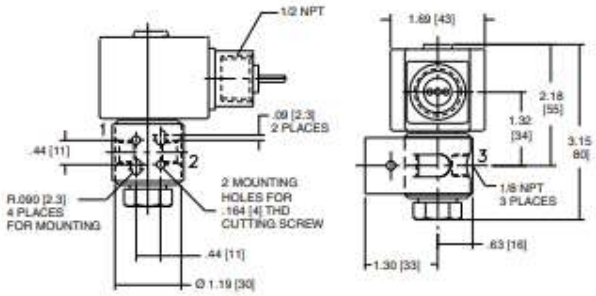
3/2 SERIES 8320

ASCO®

3-WAY

Dimensions: inches (mm)

Const. Ref. 1



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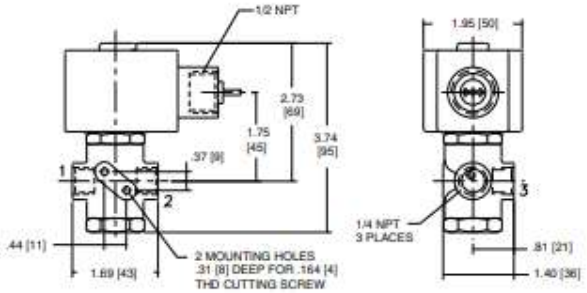

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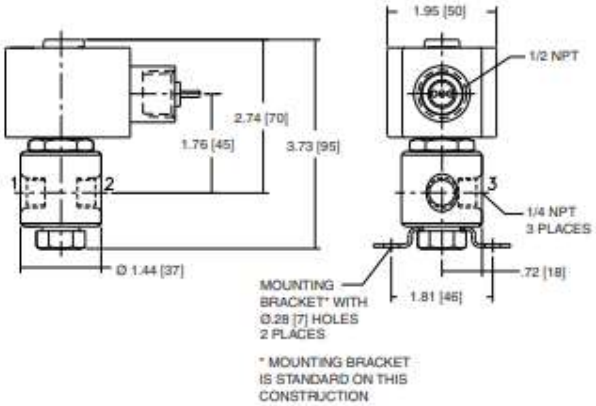
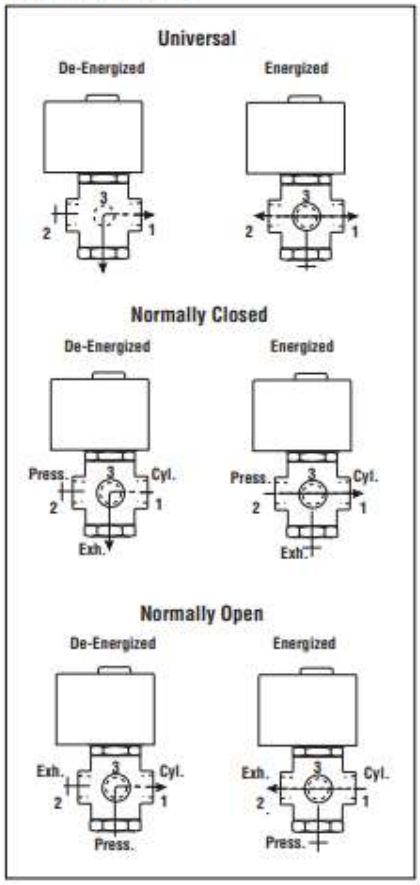


FLOW DIAGRAMS



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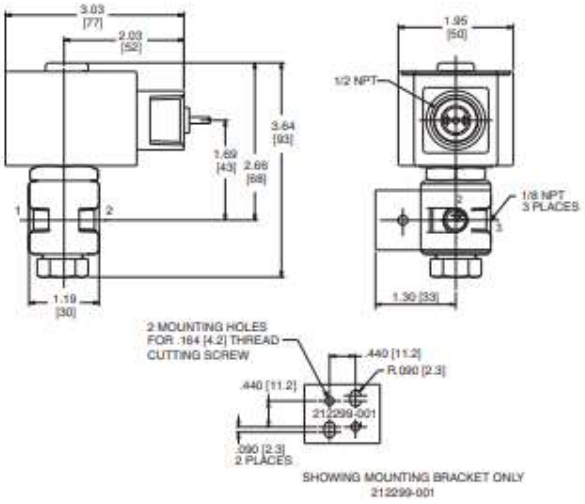
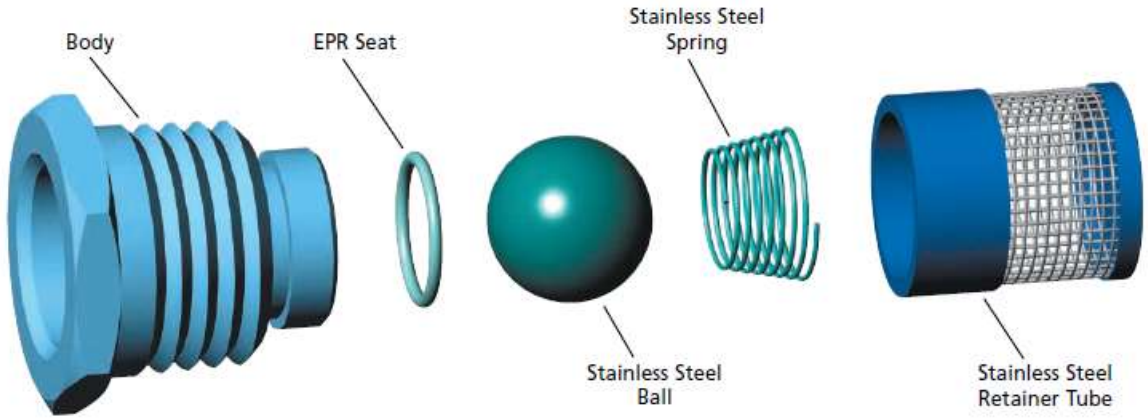


NOTES:

Vacuum Breakers

Series VB8



Fast acting, tight closing, high capacity
Kadant Johnson Vacuum Breakers provide a simple, dependable way to relieve any unwanted vacuum condition that may develop in a closed vessel or pipeline. They can be used to prevent contamination from back flowing in fluid handling systems and to protect equipment against collapse or implosion. They combine tight closing with instant response; provide large air venting capacity; are designed for easy installation and long service life.

Positive closing, low breakaway
The successful combination of the spring action on a round ball and the soft resilient seat assures positive bubble-tight closing, even at very low differential pressures. And, of course, the higher the pressure the tighter the seal.

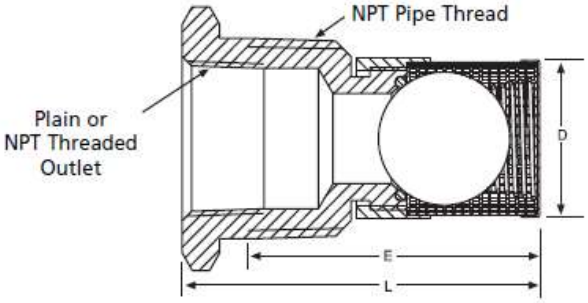
Since only slight spring pressure is needed for seating, the ball comes off the soft seat at a very low vacuum condition, providing almost instantaneous protection. Sealing is accomplished by an EPR o-ring. The supporting seat, however, is designed to assume any pressure in excess of the small amount needed for sealing, thus preventing any excessive compression of the o-ring.

Quiet, trouble-free operation
The soft resilient seat, combined with the gentle spring action, provides quiet opening and closing; chatter is completely eliminated. Corrosion-resistant seating surfaces leave little danger of any sticking or leaking. The simple design assures long and dependable service life, as proven both in the laboratory and in the field.

Easily installed, easily maintained
Kadant Johnson Vacuum Breakers have hex heads and standard NPT pipe threads, and are simply threaded into pipe fittings or available tank openings. Outlets can be threaded if desired.

Rigorously tested
In exhaustive endurance tests Kadant Johnson Vacuum Breakers have been subjected to 120 psig of steam and then vacuum, four times a minute, and still opened freely and closed bubble-tight after a million such test cycles. Every individual vacuum breaker is bubble-tested before it leaves the factory.

High pressure and temperature
Kadant Johnson Vacuum Breakers are rated for use with pressures up to 300 psig and temperatures up to 365°F. Higher operating pressures are possible, depending upon size, seal materials, and temperatures.



Size	Quick Ship No. (Brass)	Quick Ship No. (Stainless Steel)	Outlet	Outlet Size	Total Length "L"	Engaged Length "E"	O.D. of Tube "D"	Diameter of Orifice
3/8"	–	24A75500	Plain	1/4"	1-1/2"	1-1/8"	9/16"	1/4"
3/8"	24A75200	24A75600	Threaded	1/4"	1-1/2"	1-1/8"	9/16"	1/4"
1/2"	24A75900	24A76300	Plain	3/8"	1-3/4"	1-3/8"	11/16"	9/32"
1/2"	24A76000	24A76400	Threaded	3/8"	1-3/4"	1-3/8"	11/16"	9/32"
3/4"	24A76700	24A77100	Plain	1/2"	2-1/8"	1-5/8"	13/16"	13/32"
3/4"	24A76800	24A77200	Threaded	1/2"	2-1/8"	1-5/8"	13/16"	13/32"
1"	24A77500	24A77900	Plain	3/4"	2-3/8"	1-7/8"	1-1/16"	19/32"
1"	24A77600	24A78000	Threaded	3/4"	2-3/8"	1-7/8"	1-1/16"	19/32"
1-1/4"	24A78300	24A78500	Plain	1"	2-15/16"	2-5/16"	1-5/16"	3/4"
1-1/4"	24A78400	24A78600	Threaded	1"	2-15/16"	2-5/16"	1-5/16"	3/4"
1-1/2"	24A78700	24A78900	Plain	1-1/4"	3-1/16"	2-1/2"	1-9/16"	7/8"
1-1/2"	24A78800	24A79000	Threaded	1-1/4"	3-1/16"	2-1/2"	1-9/16"	7/8"

Simple Installation
The drawings at the right show how the vacuum breaker can be installed in a threaded opening in either a vertical or horizontal position. When installed in a pipeline fitting, use of a reducing bushing is required to make sure the vacuum breaker does not intrude far enough to impede flow in the line or bind against any internal wall.

Figure 1
Horizontal installation in either end or side outlet of tee, showing use of reducing bushing.

Figure 2
Vertical installation in top outlet of tee, showing use of reducing bushing.

Figure 3
Vertical installation in bottom outlet of tee, showing use of reducing bushing.

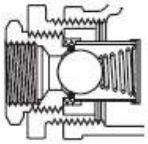


Figure 1

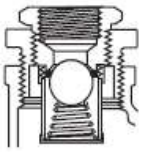


Figure 2

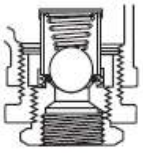


Figure 3

Vacuum Required to Open

		Horizontal	Vertical		
			Top Outlet	Bottom Outlet	No Spring
VB8-38 3/8"	In. H_2O	7.00	4.30	10.5	3.50
	In. Hg	0.51	0.32	0.77	0.26
	PSI	0.25	0.16	0.38	0.13
VB8-51 1/2"	In. H_2O	9.30	10.6	18.0	4.40
	In. Hg	0.68	0.78	1.32	0.32
	PSI	0.34	0.38	0.65	0.16
VB8-76 3/4"	In. H_2O	15.3	15.0	25.0	5.10
	In. Hg	1.13	1.10	1.84	0.37
	PSI	0.55	0.54	0.90	0.18
VB8-101 1"	In. H_2O	10.0	5.90	19.5	6.60
	In. Hg	0.73	0.43	1.43	0.48
	PSI	0.36	0.21	0.70	0.24
VB8-126 1-1/4"	In. H_2O	10.5	7.10	21.0	6.90
	In. Hg	0.77	0.52	1.54	0.51
	PSI	0.38	0.26	0.76	0.25
VB8-151 1-1/2"	In. H_2O	10.0	4.90	20.3	7.90
	In. Hg	0.73	0.36	1.49	0.58
	PSI	0.36	0.18	0.73	0.29

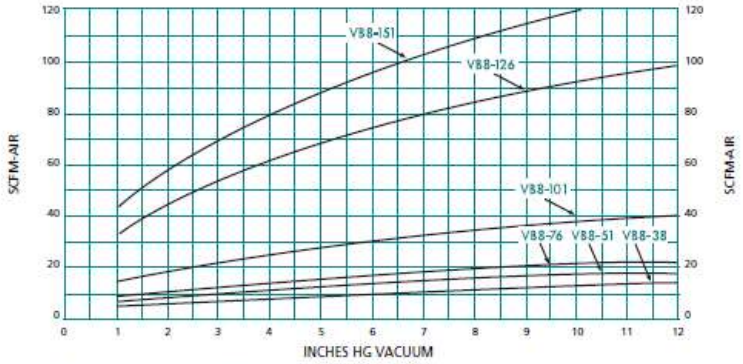
Note: Stainless Steel Ball was used to arrive at all figures. Values given are averages of test results and may vary slightly.

Kadant Johnson Vacuum Breakers

KADANT JOHNSON
AN ACCENT ON INNOVATION

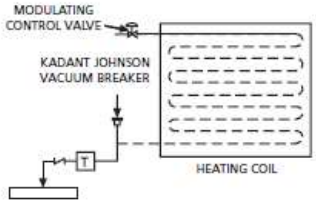
Approximate Air Handling Capacities

The air handling capacity curves were plotted from calculations using the C_V factors of the vacuum breaker. The C_V factor is a flow coefficient determined by actual test which mathematically gives the relationship between the rate of flow and the pressure drop. The flow formula used was recommended by the Fluid Controls Institute.

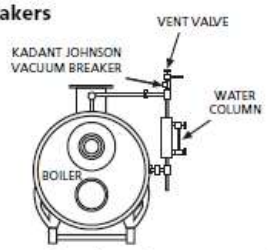


NOTE: Capacities will vary slightly due to position of installation.

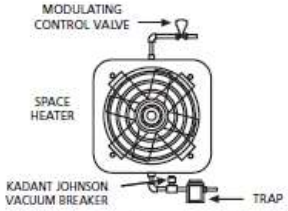
Typical Installations of Kadant Johnson Vacuum Breakers



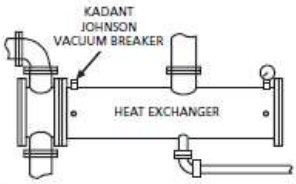
Kadant Johnson Vacuum Breaker installed on heating coil. When the modulating control valve closes, the steam in the coil will condense. A vacuum may exist in the coil even with the control valve partly open and positive pressure between the control valve and the coil.



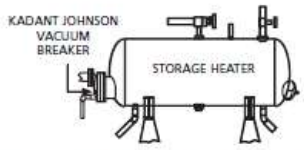
Typical application of a Kadant Johnson Vacuum Breaker as used on a steam boiler to break a vacuum imposed when a boiler is shut down, thereby condensing the steam in the boiler and creating a vacuum. This condition causes the boiler to be flooded by pulling in excess water from the return system.



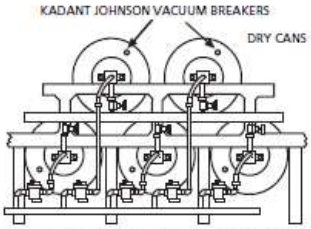
Typical space heater installation with Kadant Johnson Vacuum Breaker protection.



Typical installation of a Kadant Johnson Vacuum Breaker in a heat exchanger.



Horizontal storage heater with heating coils protected by a Kadant Johnson Vacuum Breaker.



Textile dry cans, multiple slasher cylinders, print cans, etc., can be protected against collapse with Kadant Johnson Vacuum Breakers.

Kadant Johnson is a leading provider of rotary joints, rotary unions, and precision unions for efficient fluid handling in a range of industries.

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- *Separator Stations*
- *Steam and Condensate Systems*
- *Dryer Section Surveys*
- *Dryer Management Systems*
- *Liqui-Mover® Pump*
- *Flexible Hose*
- *Sight Flow Indicators*
- *Vacuum Breakers*

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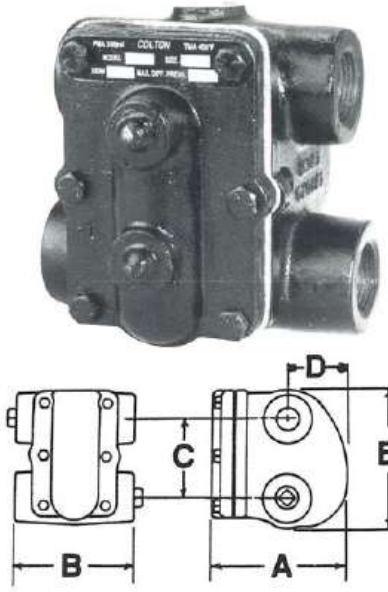
Printed in USA
VB-3000 10/2005
replaces VB-2000

NOTES:

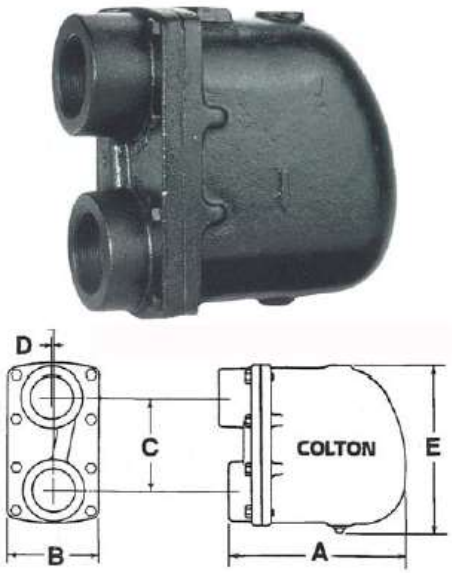
Float and Thermostatic Steam Traps

FLOAT AND THERMOSTATIC STEAM TRAPS – FTX/FTC Series

COLTON INDUSTRIES



FTX SERIES
3/4" and 1" All Ranges
1-1/4" 15 psi and 30 psi only



FTC SERIES
1-1/2" and 2" All Ranges
1-1/4" 75 psi and 125 psi only

CONSTRUCTION

Colton float and thermostatic steam traps are compact, of rugged design, and with easy access to all interior parts. The body is cast with two inlet and two outlet pipe connections that permit four combinations of pipe hook-ups for all types of applications *. All working parts are stainless steel and attached to the cover casting

* Except the 1-1/4" FTC-075, FTC-125 and all 1-1/2" and 2" models which are piped through the cover

RATINGS

PMD (maximum differential pressure):	See model selection
TMO (maximum operating temperature): temperature at operating pressure	Saturated steam
PMA (maximum allowable pressure):	250 psi
TMA (maximum allowable temperature):	450°F

MATERIALS

Part	Description
Cover	Cast Iron, ASTM-A278 Class 30
Body	Cast Iron, ASTM-A278 Class 30
Mechanism	Stainless Steel
Air Vent	Stainless Steel
Float	Stainless Steel
Gasket	Non-Asbestos Fiber
Cover Bolts	Steel, Grade 5
Plug	Cast Iron, ASTM-A278 Class 30

DIMENSIONS AND WEIGHTS

SIZE		MODELS	DIMENSIONS										WEIGHT	
			A		B		C		D		E			
mm	in		mm	in	mm	in	mm	in	mm	in	mm	in	kg	lbs
20	3/4	FTX-015, 030, 075, 125	152	6	146	5-3/4	86	3-3/8	76	3	152	6	6.35	14
25	1	FTX-015, 030, 075, 125	152	6	146	5-3/4	86	3-3/8	76	3	152	6	6.35	14
32	1-1/4	FTX-015, 030	152	6	146	5-3/4	86	3-3/8	76	3	152	6	6.35	14
32	1-1/4	FTC-075, 125	213	8-3/8	111	4-3/8	78	3-1/16	15	19/32	206	8-1/8	7	15.5
40	1-1/2	FTC-015, 030, 075, 125	213	8-3/8	111	4-3/8	78	3-1/16	15	19/32	206	8-1/8	7	15.5
50	2	FTC-015, 030, 075, 125	255	10-1/16	127	5	125	4-15/16	3	1/8	225	8-7/8	12	26.5

FLOAT AND THERMOSTATIC STEAM TRAPS – FTX/FTC Series

COLTON INDUSTRIES

CAPACITIES (SHEMA) – Lbs. condensate per hour

Pipe Size	Model No.	Pressure Differential (PSIG)						
		1/4	1/2	1	2	5	10	15
3/4	FTX-015	70	100	140	200	210	220	230
1	FTX-015	175	250	350	500	525	550	575
1-1/4	FTX-015	425	600	850	1200	1260	1320	1380
1-1/2	FTC-015	850	1200	1700	2400	2520	2640	2760
2	FTC-015	1775	2500	3550	5000	5250	5500	5750

Note On Capacity: Low pressure float & thermostatic capacities are in accordance with standards adopted by the Steam Heating Manufacturers Association (SHEMA) providing for the continuous elimination of air when the trap is operating at its maximum rating. No safety factor need be applied. *Actual capacities are significantly greater than SHEMA rating indicates*

CAPACITIES (Gross) – Lbs. condensate per hour

Pipe Size	Model No.	Pressure Differential (PSIG)														
		1/4	1/2	1	2	5	10	15	20	25	30	40	50	75	100	125
3/4	FTX-015	385	490	670	905	1075	1450	1650	—	—	—	—	—	—	—	—
1	FTX-015	385	490	670	905	1075	1450	1650	—	—	—	—	—	—	—	—
1-1/4	FTX -015	630	808	1029	1302	1880	2780	3005	—	—	—	—	—	—	—	—
1-1/2	FTC-015	1155	1785	2520	3465	5250	6930	7980	—	—	—	—	—	—	—	—
2	FTC-015	2415	2940	3780	4883	7245	9450	11445	—	—	—	—	—	—	—	—
3/4	FTX -030	293	387	513	683	900	1050	1235	1425	1540	1650	—	—	—	—	—
1	FTX -030	293	387	513	683	900	1050	1235	1425	1540	1650	—	—	—	—	—
1-1/4	FTX -030	394	525	725	956	1260	1575	1764	1890	2350	2700	—	—	—	—	—
1-1/2	FTC -030	1050	1365	1785	2415	3570	4830	5775	6300	6930	7350	—	—	—	—	—
2	FTC -030	1365	1890	2625	3570	5460	7140	8190	9030	9765	10500	—	—	—	—	—
3/4	FTX -075	240	300	420	505	630	725	820	905	980	1020	1190	1345	1645	—	—
1	FTX -075	240	300	420	505	630	725	820	905	980	1020	1190	1345	1645	—	—
1-1/4	FTC -075	535	720	970	1300	1910	2660	3050	3400	3750	4000	4390	4750	5420	—	—
1-1/2	FTC -075	535	720	970	1300	1910	2660	3050	3400	3750	4000	4390	4750	5420	—	—
2	FTC -075	893	1155	1575	2100	3225	4358	4987	5460	5775	6090	6720	7140	8085	—	—
3/4	FTX -125	225	285	350	385	455	500	535	600	650	720	850	1010	1275	1505	1640
1	FTX -125	225	285	350	385	455	500	535	600	650	720	850	1010	1275	1505	1640
1-1/4	FTC -125	380	510	675	880	1310	1700	2065	2315	2550	2710	3035	3225	3790	4200	4480
1-1/2	FTC -125	380	510	675	880	1310	1700	2065	2315	2550	2710	3035	3225	3790	4200	4480
2	FTC -125	578	709	924	1286	2048	2730	3150	3413	3675	3990	4410	4850	5775	6405	6930

Note On Capacity: Trap capacities are based on continuous discharge at steam temperature. Significantly greater capacities are realized when condensate temperature is below saturated steam temperature. Appropriate safety factors should be applied to the ratings

Note: FLOAT TRAPS are available for those applications where draining liquid is the only requirement of the trap. In those instances the thermostatic air vent is replaced by a solid plug. To order, use the previous model numbers with the prefix "FAX" or "FAC" instead of "FTX" or "FTC". All pipe sizes and pressure ratings are available.

Colton has a policy of continuous product research and improvement and reserves the right to change design and specifications without notice.

NOTES:

LOVE Control

Bulletin E-90-BPC

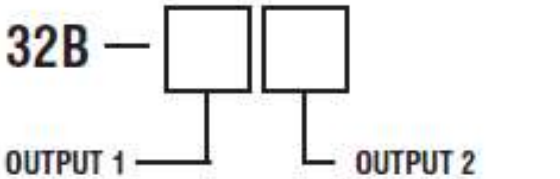
Series 4B, 8B, 16B and 32B Microprocessor Based Temperature Process Control

Specifications - Installation and Operating Instructions

LOVE CONTROLS DIVISION
DWYER INSTRUMENTS INC.
P.O. BOX 338 - MICHIGAN CITY, INDIANA 46361, U.S.A.

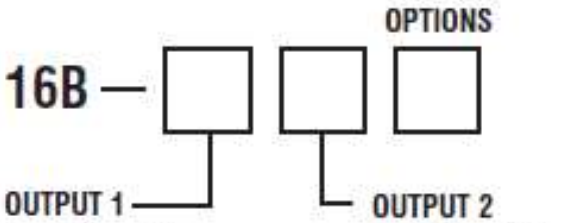
Phone: 219/879-8000 www.love-controls.com
Fax: 219/872-9057 e-mail:love@love-controls.com

MODEL NUMBER IDENTIFICATION



OUTPUT 1
2 = Voltage Pulse
3 = Relay
5 = Current
6 = Linear Voltage

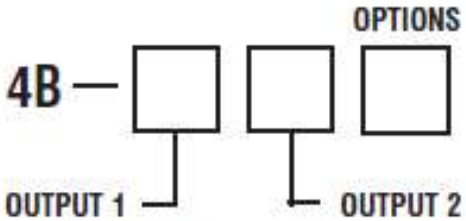
OUTPUT 2
2 = Voltage Pulse
3 = Relay



OUTPUT 1
2 = Voltage Pulse
3 = Relay
5 = Current
6 = Linear Voltage

OUTPUT 2
2 = Voltage Pulse
3 = Relay

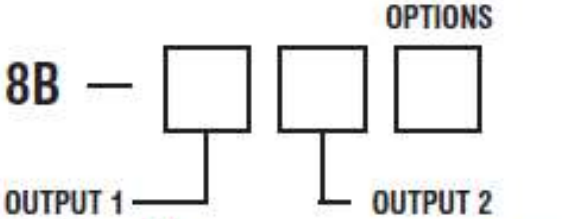
OPTIONS
Blank = none
1 = Event input
2 = Current Transformer



OUTPUT 1
2 = Voltage Pulse
3 = Relay
5 = Current
6 = Linear Voltage

OUTPUT 2
2 = Voltage Pulse
3 = Relay

OPTIONS
Blank = none
1 = Event input
2 = Current Transformer



OUTPUT 1
2 = Voltage Pulse
3 = Relay
5 = Current
6 = Linear Voltage

OUTPUT 2
2 = Voltage Pulse
3 = Relay

OPTIONS
Blank = none
1 = Event input
2 = Current Transformer

Getting Started

1. Install the control as describe.

2. Wire your control following the instruction. Please read the Precautions section located at the end of this manual before wiring the control.

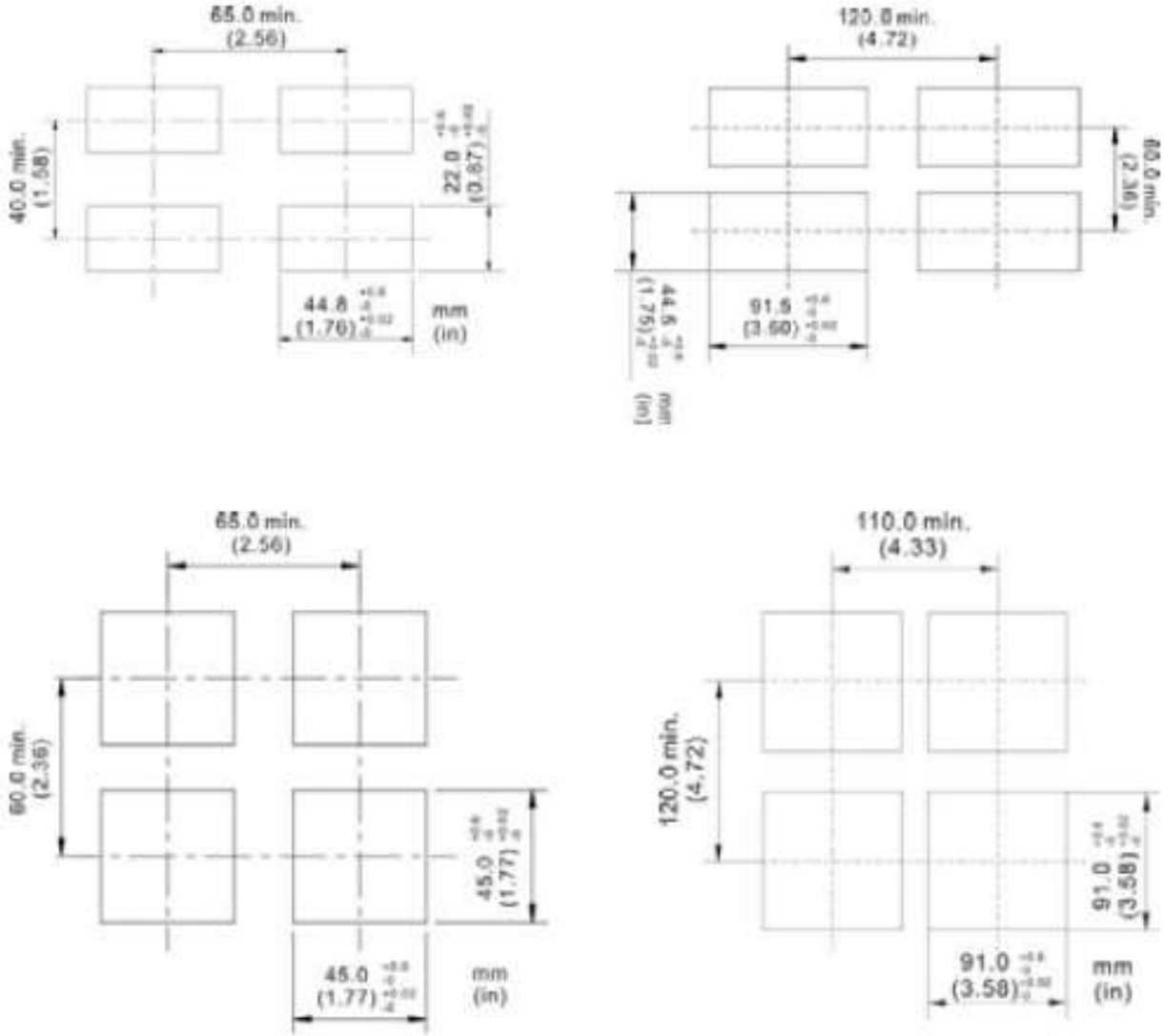
3. For best results when programming changes are necessary, make all changes to the Initial Setting mode before making changes to the Regulation Mode, or Operation Mode. If any error messages occur, check the Diagnostic Error Message Section for assistance.

Installation

Mount the instrument in a location that will not be subject to excessive temperature, shock, or vibration. All models are designed for mounting in an enclosed panel.

Select the position desired for the instrument on the panel. Prepare the panel by cutting and deburring the required opening per the panel cut out dimensions listed below. Follow the mounting instructions listed. Lastly, wire the controller per the appropriate wiring diagram.

PANEL CUTOUT DIMENSIONS



Mounting Method

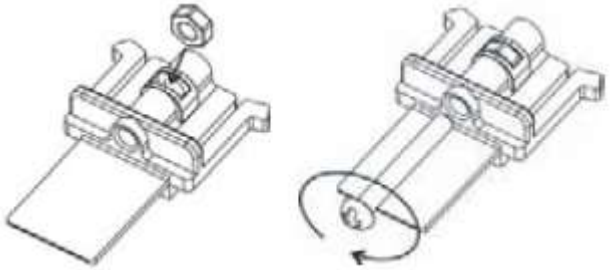
Step 1: From the front of the panel, slide the controller housing through the cut out. The housing gasket should be against the housing flange before installing.

Step 2: Insert the mounting brackets into the mounting grooves on the top and bottom of the controller (16B, 8B, and 4B). For the 32B, slide the mounting collar over the housing from the rear of the panel.

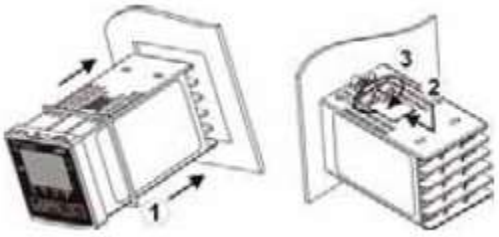
Step 3: Push the mounting brackets forward until the bracket stops at the panel wall.

Step 4: Insert and tighten the screws on the bracket to secure the controller in place. (The screw torque should be 0.8 kgf-cm).

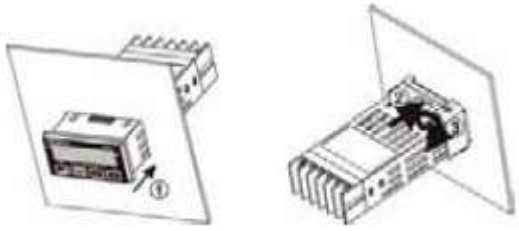
Mounting Bracket Installation



16B/4B/8B Mounting Method



32 Mounting Method



Wiring

Do not run thermocouple or other class 2 wiring in the same conduit as power leads. Use only the type of thermocouple or RTD probe for which the control has been programmed. Maintain separation between wiring of sensor, auxiliary in or out, and other wiring. See the Initial Setting Menu for input selection.

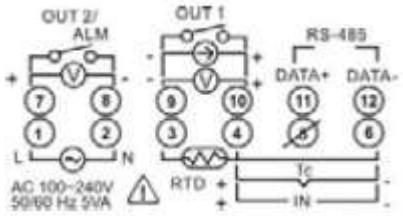
For thermocouple input always use extension leads of the same type designated for your thermocouple.

For supply connections use No. 16 AWG or larger wires rated for at least 75° C. Use conductors only. All line voltage output circuits must have a common disconnect and be connected to the same pole of the disconnect.

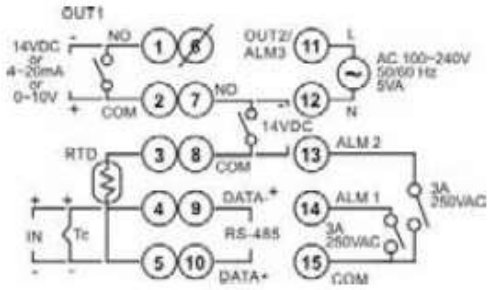
Input wiring for thermocouple, current, and RTD; and output wiring for current 14 VDC is rated CLASS 2.

Control wiring as show below:

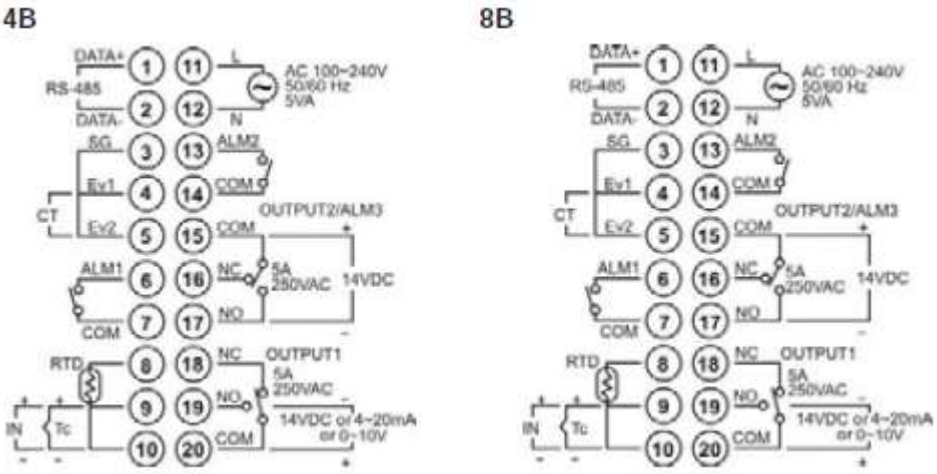
Terminal Identification
32B



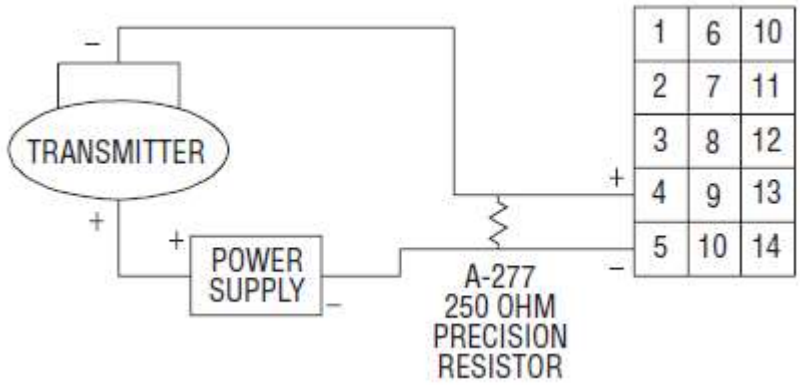
16B



Terminal Identification (Continued)



Wiring for 4 to 20 mA Transmitter Inputs



Note: 16B terminal layout used in above example. Use appropriate terminal layout for selected controller.

Front Key Functions

Key functions are as follows:

INDEX: Pressing the INDEX key advances the display to the next menu item.

UP ARROW: Increments a value or changes a menu item. If pressed during the Operation Mode, the set point value will be increased.

DOWN ARROW: Decrements a value or changes a menu item. If pressed during the **Operation Mode**, the set point value will be decreased.

ENTER: Stores the value or item change. If not pressed, the previously stored value or item will be retained. When pressed during the **Operation Mode**, the controller switches to the **Regulation Mode**. If held for more than 3 seconds during the **Operation Mode**, the controller switches to the **Initial Setting Mode**. If pressed during the **Regulation Mode** or **Initial Setting Mode**, the controller will return to the **Operation Mode**.

Security Features

The B series controller has two built in security lock settings to prevent unauthorized personnel from changing parameter settings. These parameters are set in the **Operation Mode**.

The LoC1 setting affects all parameters in the controller. If LoC1 setting is enabled, the operator will have to unlock the controller to make any changes to the controller's parameters.

The LoC2 setting affects all parameters except the set point. If LoC2 setting is enabled, the only parameter that the operator will be able to change is the set point. In order to change any other parameters, the operator will have to unlock the control before making a change.

In order to unlock the control, the operator must depress the ENTER and INDEX key simultaneously.

Control Operation Condition

The HOME display is the normal display while the control is operating. If no errors or functions are active, the HOME display will indicate the Process Variable (the temperature, pressure, flow, %RH, etc.) that is being measured on the top display and the Set Variable on the bottom display.

Items that can change the HOME display are the Ramp and Soak function and any error messages. Descriptions of these special displays follow.

If the Ramp and Soak feature is active, then bottom display will show the current execution pattern and current execution step. The UP and DOWN arrows can be pressed to change the bottom display to show the Set Point (SP) of the current execution step or the Time Remaining (r-ti) of the current execution step. After changing the bottom display to either the Time Remaining or the Set Point, the ENTER key must be pressed to display the values.

Heating, Cooling or Dual Loop Control

Temperature Control can be achieved by either heating or cooling. In the B series controllers, heating and cooling can be operated simultaneously using Dual Loop Output Control to maintain a temperature set point. When Dual Loop Output Control is used, control outputs must be connecting to the heating and cooling devices. Please refer to the following for the operation of each setting.

Control Modes are selected by changing the S-HC parameter in the Initial Setting Mode.

Select HEAt, for heating or reverse acting control for output 1. If selected, output 2 will become alarm 3.

Select CooL, for cooling or direct acting control for output 1. If selected, output 2 will become alarm 3.

Select H1C2 or C1H2 for Dual Loop Output Control for output 1 and 2. If H1C2 is selected, output 1 would be fore heating or reverse acting control and output 2 would be for cooling or direct acting control. If C1H2 is selected, output 1 would be for cooling or direct acting control and output 2 would be for heating or reverse acting control.

Setting the control mode to PID when the controller is set for Dual Loop Output Control Activates the Proportional Band Coefficient (CoEF) parameter and the Dead Band (dead) parameter.

The Proportional Band Coefficient (CoEF) sets the Proportional band value for Output 2 based on the Proportional band of output 1. The Proportional Band of Output 2 would be equal to the Proportional Band (Pn) of Output 1 multiplied by the Proportional Band Coefficient (CoEF). The Integral Time (in) and the Derivative Time (dn) will be the same for both Outputs.

The Dead Band (dEAd) parameter sets an area in which the heating and cooling outputs are operating at 0% on. The Dead Band is centered on the Set Point in Dual Loop Output Control mode. Please see the Dead Band illustrate.

RAMP/SOAK PROGRAMMING AND OPERATION

The ramp/soak feature offers a great deal of flexibility by allowing changes in the set point to be made over a predetermined period of time.

Theory of Operation

The B series controls offer a very simple approach to programming a ramp function. Rather than requiring the operation to calculate an approach rate (usually in degrees per minutes), the B series does the calculation internally. Thus, the operator only needs to program the target set point and the time desired to reach that point. When the ramp segment is executed by the control, it calculates the ramp required to move the process from the starting value (current PV) to the desired value (programmed SP) in the time allowed.

Soaks (or dwells) are ramp segments where the target set point is the same as the beginning process value. This allows for multistage ramps without wasting intermediate soak steps. Care must be taken, however, that the process does actually reach the soak value before the soak time starts. If not, the next segment will calculate a slope from the starting PV to the target SP. Depending on your process requirements, this difference may be important. Make sure to test any program for desired results before running production material.

Do not operate auto-tuning while a ramp function is operating. The ramp function will prevent self tune from operating properly. Make sure that all tuning is set up before operating ramp/soak.

Program Setup

All of the programming for the Ramp/Soak function is done in the Initial Setting Mode. You may wish to work out your program on paper before going into the programmer menu sequence.

In the Initial Setting Mode, go to the Control Mode (CtrL) parameter. Set the parameter to ProG. Press INDEX to the Pattern Editing parameter (PAtn). Use the arrows to select the desired pattern to edit. By setting the Pattern Editing parameter to off, pressing the INDEX key brings up the next parameter in the Initial Setting mode. The Ramp and Soak function is supported by 8 different patterns (pattern numbers 0 to 7). Each pattern contains 8 steps (step numbers 0 to 7) for set point and execution times, one link pattern (Linn) parameter, one cycle parameter (CyCn), and one actual step parameter (PSYn).

The default of step 0 in pattern 0 is a soak function. The control should be programmed to reach the Set Point (SV) temperature, X, after the execution time, T. The unit will control the process temperature (PV) to reach temperature X and the keep the temperature at temperature X. The execution time T is determined by the execution time (ti00) for step number 0. The target set point (SP00) for step number 0 should equal the Set Point (SV) temperature.

After the first step, program SP01 and ti01 through SP07 and ti07 for the first pattern. The target set point value (SP0n) is in actual units just like your Set Point (SV). If the control is set for temperature, then the target set point displays are in temperature. If the control is programmed for some other engineering unit, the target set point displays will be set in that unit. The target execution time (ti0n) is in units of time, (hh.mm). The step parameters will be followed by the Actual Step parameter, Cycle parameter, and the Link parameter for each pattern.

The Actual Step parameter (PSYn) sets the last executable step for the current pattern. For example, if the Actual Step parameter is set to 2 for pattern 0, then the program will only run steps 0, 1, and 2 for pattern 0.

The Cycle parameter (CyCn) determines how many times the current pattern is repeated. For example, if the Cycle parameter for pattern 0 is set to 2, the steps in pattern 0 will be repeated twice before moving on to the next pattern.

The Link parameter (Linn) assigns the next pattern for the program to execute. For example, if the Link parameter is set to 3 for pattern 0, the program will skip patterns 1 and 2 and start executing pattern 3 after pattern 0 is complete. If the Link parameter is set to oFF, the program will stop after executing the current pattern and the temperature will be maintained at the set point of the last step executed.

Execution

The execution of the ramp and soak feature is initiated through the Run/Stop parameter, (r-S) in the Operation Mode. The Run/Stop parameter has four possible values.

If the Run/Stop parameter is set to rUn, the program will start to execute in order from step 0 of the start pattern.

If the Run/Stop parameter is set to Program Stop (PStP), the program will stop and maintain the temperature of the last set point before the program was halted. When the Run/Stop parameter is restarted, the program will restart and execute from step 0 of the start pattern. The start pattern selection (Ptrn) is only available when the Run/Stop parameter is set to Program Stop.

If the Run/Stop parameter is set to Program Hold (PHod), the program will be paused and the temperature will be maintained at the set point temperature that was active prior to the program hold. Once the Run/Stop parameter is set back to run, the program will follow the step before the hold and start to execute through the rest of the program.

Display

During ramp and soak program control, the SV default display is P-XX, where P indicates the current execution pattern and XX indicates the display item to Set Point Value (SP) or Residual Time (r-ti). The Set Point Value will display the temperature set point of the current execution step in the SV display. The Residual Time will display the remaining time of the current execution step in the SV display. After selecting the Set Point Value or Residual Time, the ENTER key must be pressed to accept the display change.

Programming and Operation for PID

Theory of Operation
The PID method of control is based on the individual tuning of proportional band values, integral time values, and derivative time values to help a unit automatically compensate for changes in a control system. The proportional band is the range around the set point in which the control's proportioning takes place. The control increases or decreases the output proportionately to the process temperature's deviation from the set point. The integral time eliminates undershoot and overshoot of the set point by adjusting the proportioning control based on the amount of deviation from the set point during steady state operation. The derivative time eliminates undershoot and overshoot by adjusting the proportioning control based on the rate of rise or fall of the process temperature. The integral deviation offset correction (ioFn) improves the speed in which the process value reaches the set point value. If this parameter is set to zero, the output will be zero when the process value is equal to the set point value. If the integral time parameter is used only to eliminate steady state error, it may take a long time to reach the set point because it needs time to accumulate the error. This parameter defines the default output level on start up. When the integral time is set at 0, then the proportional derivative offset correction (PdofF) would replace the integral deviation offset correction, but serves the same function.

Program Set Up
In order to use the PID function in the B series controllers, the Control Mode will have to be set to PID in the Initial Setting Menu. After changing the Control Mode, the PID parameters can be accessed in the Regulation Menu. The PID parameters can either be programmed manually or they can be set by the controller using the auto tune function. The auto tune will use trial and error to tune the PID parameters to give the control the most precise control. Since the time to accurately tune the control may differ depending on the process, the controller can also be manually tuned to known PID values prior to running auto tune. The Run/Stop parameter must be set to run in order to start auto tuning.

The B series controller has four user-defined profiles (PID0 to PID3) of PID values along with an auto selection function (PID4). Each set of PID values includes a set point value (Svn), proportional band (Pn), integral time (in), derivative time (dn), and integral deviation setting (iofn). If PID4 is selected, the controller will pick which set of user defined parameters to use based on how close the set point value of the profile is to the current process value.

Description of Menu Structure

The programming for the controller is broken down into three menus (Operation, Regulation, and Initial Setting). Upon normal operation, control will be in the Operation Menu.

Operation Menu

Pressing the INDEX key will cycle through the below menu items. The parameter will be displayed in the top display, while its value will be displayed in the bottom display, except for the set point which is displayed in the bottom display on the Home Display. The UP and DOWN arrows change the values of the parameters. The ENTER key must be pressed after any changes.

1234		Adjust the set point value - Can be any numerical value between the upper and lower limit of the temperature range.
r-S		Select Run - Stop Output Control.
	rUn	Activates outputs and Starts Ramp/Soak.
	StoP	De-activates outputs and Stops Ramp/Soak.
	PStP	Halts Ramp/Soak program, outputs remain active. Only available during ramp/soak operation. Program restarts at Step 0 of Start Pattern.
	PHod	Pauses Ramp/Soak program, outputs remain active. Only available during ramp/soak operation. Program restarts at step prior to program being held.
Ptrn		Set Start pattern for Ramp/Soak. Only available when r - S set to PStP.
SP		Number of digits to the right of the decimal. Decimal Point Position can be set for all Inputs except for B, S, and R type thermocouples.
AL 1H		Alarm 1 High Set Point. May not appear depending on ALA1 setting in Initial Setting Menu.
AL 1L		Alarm 1 Low Set Point. May not appear depending on ALA1 setting in Initial Setting Menu.
AL2H		Alarm 2 High Set Point. May not appear depending on ALA2 setting in Initial Setting Menu.
AL2L		Alarm 2 Low Set Point. May not appear depending on ALA2 setting in Initial Setting Menu.
AL3H		Alarm 3 High Set Point. May not appear depending on ALA3 setting in Initial Setting Menu.
AL3L		Alarm 3 Low Set Point. May not appear depending on ALA3 setting in Initial Setting Menu.
LoC		Set front panel security lock.
	LOC 1	Lock all settings.
	LOC2	Lock all settings except the set point.
oUt 1		Display the % output value for output 1. In manual mode, this value can be changed using the up and down arrows.
oUt2		Display the % output value for output 2. In manual mode, this value can be changed using the up and down arrows.

Regulation Menu

Press the ENTER key while at the Home Display in order to access the Regulation Menu. Pressing the INDEX key will cycle through the below menu items. The parameter will be displayed in the top display, while its value will be displayed in the bottom display. The UP and DOWN arrows change the values of the parameters. The ENTER key must be pressed after any changes.

AT		Auto Tune. The controller will evaluate the process and select the PID values to maintain good control. Only available when the control mode is set to PID.
	on	Start learning the process. After the process has been learned the menu will revert to oFF.
	oFF	Disables Auto Tune.
P idn		Selection of PID profile. The controller can store up to 4 PID profiles. The top display will show the PID profile and the bottom display will show the target set value for that profile. When Pid4 is selected, the controller will automatically select which PID profile to use based on the target set values. Only available when control mode is set to PID. See Programming and Operation of PID function for more information. (n = 0 to 4)
	Svn	Target Set Value associated with each PID Profile. (n = 0 to 3).
	Pn	Proportional Band Setting associated with each PID Profile. (n =0 to 3).
	in	Integral time (reset time) associated with each PID Profile. (n = 0 to 3).
	dn	Derivative time (rate time) associated with each PID Profile. (n = 0 - 3).
	ioFn	Integral Deviation Offset Correction associated with each PID Profile. (n = 0 to 4)
PdoF		PD Offset Correction Setting. only available when control mode is set to PID and integral time = 0. See Programming and Operation of PID function for moving information.
HtS		Heating Hysteresis (Differential) Setting. Sets the value for the amount of difference between the turn off point (set point) and the turn on point. Figure A shows the output behavior for a heating (reverse acting) application. Only available when control mode set to on/off control.
CtS		Cooling Hysteresis (Differential) Setting. Sets the value for the amount of difference between the turn off point (set point) and the turn on point. Figure A shows the output behavior for a cooling (direct acting) application. Only available when controlmode set to on/off control.

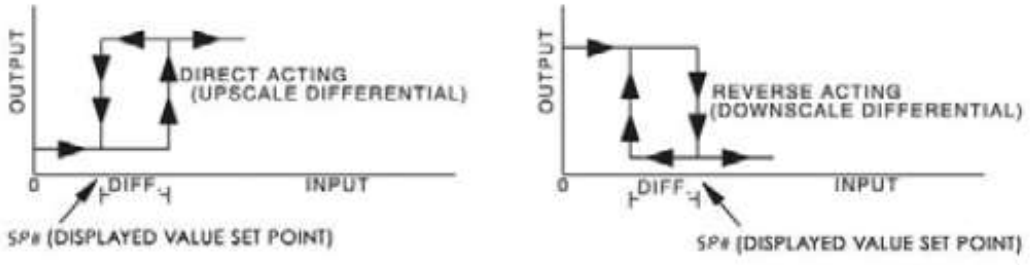
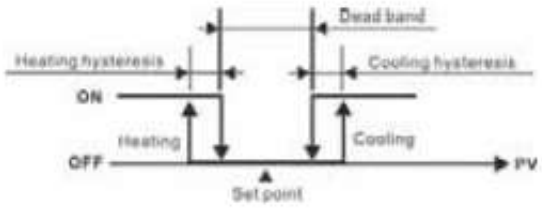


Figure A: Output behavior for Heating/Cooling On/Off Applications

HtPd	Heating Control Cycle Setting. Defines the duration for one output period or cycle for output 1. Only available when control mode is set to PID or ProG and Output 1 is set for heating.
CLPd	Cooling Control Cycle Setting. Defines the duration for one output period or cycle for output 1. Only available when control mode is set to PID or ProG and Output 1 is set for cooling.
HCPd	Control Cycle setting for output 2. Defines the duration for one output period or cycle for output 2. Only available when control mode is set to PID and Dual Loop Output Control.
CoEF	Proportional Band Coefficient. Sets the value of the proportional band for output 2. The proportional band of output 2 is equal to the proportional band of output 1 multiplied by the proportional band coefficient. This parameter is only available when the control mode is set to PID and Dual Loop Output Control.
dEAd	Dead Band. The zone centered on the set point in which the control is thought to be at the desired set level. The outputs will be turned off at this point unless there is an integral deviation offset or the dead band is negative. This parameter is only shown when the control is set to Dual Loop Output Control.



Output operation of ON/OFF control during dual loop output control.

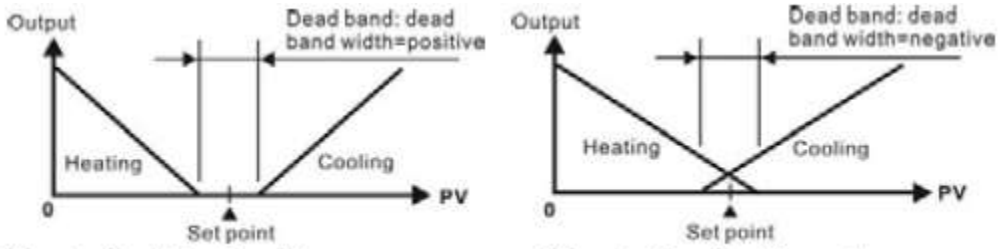


Figure B: Output Operation during dual loop control

tPoF	Process Temperature Offset. This feature allows the input value to be changed to agree with an external reference or to compensate for sensor error.
CrH ,	Analog Output High Limit: Sets the actual upper limit of the analog output when the control's output is operating at 100%. Only available for analog output models.
CrLo	Analog Output Low Limit. Sets the actual lower limit of the analog output when the control's output is operating at 0%. Only available for analog output models.

Initial Setting Menu

Press and hold the ENTER key for at least 3 seconds while at the Home Display in order to access the Initial Setting Menu. Pressing the INDEX key will cycle through the below menu items. The parameter will be displayed in the top display, while its value will be displayed in the bottom display. The UP and DOWN arrows change the values of the parameters. The ENTER key must be pressed after any changes.

inPt — Input Selection. Select one of the following input types from the below table. For Current inputs, a 250 Ohm Resistor must be wired across the input terminals.

Input Temperature Sensor Type	LED Display	Temperature Range
Thermocouple TXK type	tXK	-328 ~ 1472°F (-200 ~ 800°C)
Thermocouple U type	U	-328 ~ 932°F (-200 ~ 500°C)
Thermocouple L type	L	-328 ~ 1562°F (-200 ~ 850°C)
Thermocouple B type	b	-212 ~ 3272°F (-100 ~ 1800°C)
Thermocouple S type	S	-32 ~ 3092°F (0 ~ 1700°C)
Thermocouple R type	r	-32 ~ 3092°F (0 ~ 1700°C)
Thermocouple N type	n	-328 ~ 2372°F (-200 ~ 1300°C)
Thermocouple E type	E	-32 ~ 1112°F (0 ~ 600°C)
Thermocouple T type	t	-328 ~ 752°F (-200 ~ 400°C)
Thermocouple J type	J	-148 ~ 2192°F (-100 ~ 1200°C)
Thermocouple K type	K	-328 ~ 2372°F (-200 ~ 1300°C)
Platinum Resistance (Pt100)	Pt	-328 ~ 1472°F (-200 ~ 800°C)
Platinum Resistance (JPt100)	JPt	-4 ~ 752°F (-20 ~ 400°C)
0~50mV Analog Input	0.50	-999 ~ 9999
0V ~ 10V Analog Input	0.10	-999 ~ 9999
0V ~ 5V Analog Input	0.5	-999 ~ 9999
4 ~ 20mA Analog Input	4.20	-999 ~ 9999
0~20mA Analog Input	0.20	-999 ~ 9999

tPUn — Temperature Units. This parameter is only available for thermocouple or RTD inputs.

tP-H — Scale Hight Limit. Sets the upper limit of the temperature range. If the process temperature exceeds this setting, the display will flash an error code.

tP-L — Scale Low Limit. Sets the lower limit of the temperature range. If the process temperature exceeds this setting, the display will flash an error code.

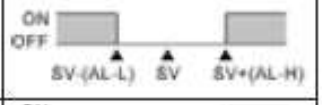
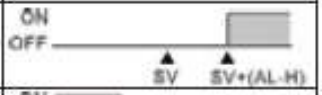
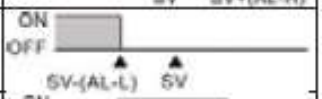
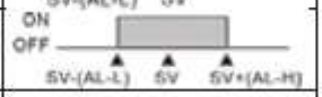
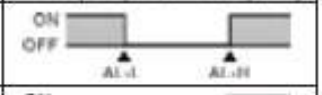
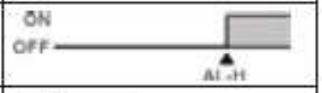
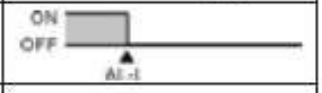
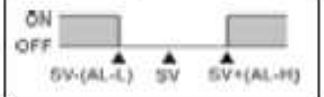
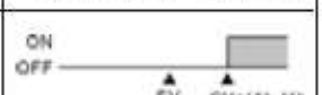
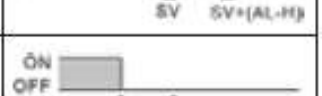
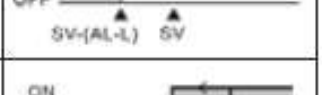
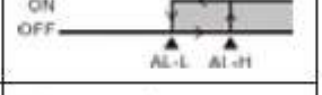
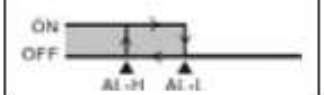
CtrL — Control Mode. Select method of control operation. Can be set to PID, On-Off, Manual, or Ramp/Soak Programming.

PAtn — Ramp/Soak Pattern Selection. Allows user to select which of the 8 ramp/soak patterns to program. Each pattern has 8 steps which gives a total of 64 possible steps in a single program. When finished programming all ramp and soak patterns, the parameter should be set to off. (n = 0 to 7)

SPny — Segment Set Point for pattern n and step y. For example the first step of the first pattern would be SP00. The last step would be SP77. (n = 0 to 7, y = 0 to 7)

tiny	Segment Time for pattern n and step y. For example the first step of the first pattern would be ti00. The last step would be Ti77. The value of this parameter will be in HH:MM. (n = 0 to 7, y = 0 to 7)
PSyn	Last Step for pattern n. Sets the last step that will be performed in the current pattern. (n = 0 to 7)
CyCn	Pattern Loop Setting for pattern n. Sets the number of times that the current pattern will be repeated. (n = 0 to 7)
Linn	Pattern Link for pattern n. Sets the next pattern that will be performed after the current pattern. When set to off, the program will end and maintain last set point. (n = to 7)
S-HC	Heat/Cool Selection. Assigns output 1 and output 2 to be either heat or cool. HEAt = Output 1 = Heating CooL = Output 1 = Cooling H1C2 = Output 1 = Heating; Output 2 = Cooling H2C1 = Output 1 = Cooling; Output 2 = Heating
ALA1	Alarm 1 Setting. Sets operation for Alarm 1. Please see selection on Alarm Outputs for description of the outputs.
ALA2	Alarm 2 Setting. Sets operation for Alarm 2. Please see selection on Alarm Outputs for description of the outputs.
ALA3	Alarm 3 Setting. Sets operation for Alarm 3. Please see selection on Alarm Outputs for description of the outputs. (not available for Dual Loop Output Control)
SALA	System Alarm Setting. Selects which of the alarm outputs is used if a system alarm occurs. They system alarms would be an input error or a process control failure. This feature can be disabled by turning this parameter to oFF.
CoSH	Communications Write Function Feature. Allows parameters to be changed via the RS-485 communications. Setting to oFF prevents any changes from remote users.
C-SL	Protocol Selection: Select whether to communicate using ASCII or RTU Protocol. This value must match the protocol used by the host computer.
C-no	Controller Address: Set from 1 to 247. This value must match the controller address used by the host computer.
LEn	Communication Data Length. Choose either 7 or 8. This value must match the communication data length of the host computer.
Prty	Communication Parity Bit. Set this value to even, odd, or none. This value must match the communication parity bit of the host computer.
StoP	Communication Stop Bit. Set this value to 1 or 2. This value must match the communication stop bit of the host computer.

Alarm Output Configuration and Operation Table.

Set Value	Alarm Type	Alarm Output Operation
0	Alarm function disabled	Output is OFF
1	Deviation upper- and lower-limit: This alarm output operates when PV value is higher than the setting value SV+(AL-H) or lower than the setting value SV-(AL-L).	
2	Deviation upper-limit: This alarm output operates when PV value is higher than the setting value SV+(AL-H).	
3	Deviation lower-limit: This alarm output operates when PV value is lower than the setting value SV-(AL-L).	
4	Reverse deviation upper- and lower-limit: This alarm output operates when PV value is in the range of the setting value SV+(AL-H) and the setting value SV-(AL-L).	
5	Absolute value upper- and lower-limit: This alarm output operates when PV value is higher than the setting value AL-H or lower than the setting value AL-L.	
6	Absolute value upper-limit: This alarm output operates when PV value is higher than the setting value AL-H.	
7	Absolute value lower-limit: This alarm output operates when PV value is lower than the setting value AL-L.	
8	Deviation upper- and lower-limit with standby sequence: This alarm output operates when PV value reaches set point (SV value)and the value is higher than the setting value SV+(AL-H) or lower than the setting value SV-(AL-L).	
9	Deviation upper-limit with standby sequence: This alarm output operates when PV value reaches set point (SV value) and the reached value is higher than the setting value SV+(AL-H).	
10	Deviation lower-limit with standby sequence: This alarm output operates when PV value reaches the set point (SV value) and the reached value is lower than the setting value SV-(AL-L).	
11	Hysteresis upper-limit alarm output: This alarm output operates if PV value is higher than the setting value SV+(AL-H). This alarm output is OFF when PV value is lower than the setting value SV+(AL-L).	
12	Hysteresis lower-limit alarm output: This alarm output operates if PV value is lower than the setting value SV-(AL-H). This alarm output is OFF when PV value is higher than the setting value SV-(AL-L).	
13	CT alarm output: This alarm operates when the current measured by transformer (CT) is lower than AL-L or higher than AL-H (This alarm output is available only for the controller with current transformer).	
14	When program control is end status, alarm output is ON.	
15	When RAMP UP status happens to PID program control, alarm output is ON.	
16	When RAMP DOWN status happens to PID program control, alarm output is ON.	
17	When SOAK status happens to PID program control, alarm output is ON.	
18	When RUN status happens to PID program control, alarm output is ON.	

(Note: AL-H and AL-L include AL1H, AL2H, AL3H and AL1L, AL2L, AL3L)

Communication Register List

1. Supporting transmission speed: 2400, 4800, 9600, 19200, 38400 bps.
2. Non-supported formats: 7, N, 1 or 8, O, 2 or 8, E, 2.
3. Communication protocol: Modus (ASCII or RTU).
4. Function code: 03H to read the contents of register (Max. 8 words). 06H to write 1 (one) word into register. 02H to read the bits data (Max. 16 bits). 05H to write 1 (one) bit into register.
5. Address and Content of Data Register:

Address	Content	Explanation
1000H	Process value (PV)	Measuring unit is 0.1, updated one time in 0.4 second. The following reading value display indicates error occurs: 8002H : Initial process (Temperature value is not got yet) 8003H : Temperature sensor is not connected 8004H : Temperature sensor input error 8006H : Cannot get temperature value, ADC input error 8007H : Memory read/write error
1001H	Set point (SV)	Unit is 0.1, oC or oF
1002H	Upper-limit of temperature range	The data content should not be higher than the temperature range
1003H	Lower-limit of temperature range	The data content should not be lower than the temperature range
1004H	Input temperature sensor type	Please refer to the contents of the "Temperature Sensor Type and Temperature Range" for detail
1005H	Control method	0: PID, 1: ON/OFF, 2: manual tuning, 3: PID program control
1006H	Heating/Cooling control selection	0: Heating, 1: Cooling, 2: Heating/Cooling, 3: Cooling/Heating
1007H	1st group of Heating/Cooling control cycle	0–99, 0:0.5 sec
1008H	2nd group of Heating/Cooling control cycle	0–99, 0:0.5 sec
1009H	PB Proportional band	0.1 – 999.9
100AH	TI Integral time	0–9999
100BH	Td Derivative time	0–9999
100CH	Integration default 0–100%, unit is 0.1%	
100DH	Proportional control offset error value, when TI = 0	0–100%, unit is 0.1%
100EH	The setting of COEF when Dual Loop output control are used	0.01 – 99.99
100FH	The setting of Dead band when Dual Loop output control are used	-999 – 9999
1010H	Hysteresis setting value of the 1st output group	0 – 9999
1011H	Hysteresis setting value of the 2nd output group	0 – 9999
1012H	Output value read and write of Output 1	Unit is 0.1%, write operation is valid under manual tuning mode only.
1013H	Output value read and write of Output 2	Unit is 0.1%, write operation is valid under manual tuning mode only.
1014H	Upper-limit regulation of analog linear output	1 Unit = 2.8uA(Current Output) = 1.3mV(Linear Voltage Output)
1015H	Lower-limit regulation of analog linear output	1 Unit = 2.8uA(Current Output) = 1.3mV(Linear Voltage Output)
1016H	Temperature regulation value	-999–+999, unit: 0.1
1017H	Analog decimal setting	0 – 3
101CH	PID parameter selection	0–4
101DH	SV value corresponded to PID value	Only valid within available range, unit: 0.1 scale
1020H	Alarm 1 type	Please refer to the contents of the "Alarm Outputs" for detail
1021H	Alarm 2 type	Please refer to the contents of the "Alarm Outputs" for detail
1022H	Alarm 3 type	Please refer to the contents of the "Alarm Outputs" for detail
1023H	System alarm setting	0 : None (default), 1–3 : Set Alarm 1 to Alarm 3
1024H	Upper-limit alarm 1	Please refer to the contents of the "Alarm Outputs" for detail
1025H	Lower-limit alarm 1	Please refer to the contents of the "Alarm Outputs" for detail

Address	Content	Explanation
1026H	Upper-limit alarm 2	Please refer to the contents of the "Alarm Outputs" for detail
1027H	Lower-limit alarm 2	Please refer to the contents of the "Alarm Outputs" for detail
1028H	Upper-limit alarm 3	Please refer to the contents of the "Alarm Outputs" for detail
1029H	Lower-limit alarm 3	Please refer to the contents of the "Alarm Outputs" for detail
102AH	Read LED status	b0 : Alm3, b1: Alm2, b2: F, b3: _, b4: Alm1, b5: OUT2, b6: OUT1, b7: AT
102BH	Read push button status	b0 : Set, b1 : Select, b2 : Up, b3 : Down. 0 is to push
102CH	Setting lock status	0 : Normal, 1 : All setting lock, 11 : Lock others than SV value
102FH	Software version	V1.00 indicates 0x100
1030H	Start pattern number	0 – 7
1040H–1047H	Actual step number setting inside the correspond pattern	0 – 7 = N, indicate that this pattern is executed from step 0 to step N
1050H–1057H	Cycle number for repeating the execution of the correspond pattern	0 – 99 indicate that this pattern has been executed for 1 – 100 times
1060H–1067H	Link pattern number setting of the correspond pattern	0 – 8, 8 indicates the program end. 0–7 indicates the next execution pattern number after executing the current pattern
2000H–203FH	Pattern 0–7 temperature set point setting Pattern 0 temperature is set to 2000H–2007H	-999 – 9999
2080H–20BFH	Pattern 0–7 execution time setting Pattern 0 time is set to 2080H–2087H	Time 0 – 900 (1 minute per scale)

6. Address and Content of Bit Register: (First bit of reading will put into LSB, Write data = FF00H for bit set, 0000H for bit clear)

Address	Content	Explanation
0810H	Communication write-in selection	Communication write in disabled: 0 (default), Communication write in enabled: 1
0811H	Temperature unit display selection	oC / linear input (default) : 1 , oF : 0
0812H	Decimal point position selection	Except for the thermocouple B, S, R type, all the other thermocouple type are valid. (0 or 1)
0813H	AT setting	OFF: 0 (default), ON : 1
0814H	Control RUN/STOP setting	0 : STOP, 1 : RUN (default)
0815H	STOP setting for PID program control	0: RUN (default), 1: STOP
0816H	Temporarily STOP for PID program control	0: RUN (default), 1: Temporarily STOP

Diagnostic Error Messages

Display Error Messages

Display		Description	Action Required
PV	b150	Display on Start Up	No Action Required
SV	rr		
PV	No	No Input Probe Connection	Verify that sensor is wired to proper terminals. Next, check that the controller is programmed for the correct input type. Most commonly seen when controller is programmed for a RTD, while a thermocouple is connected.
SV	Cont		
PV	Err	Input Error	Verify that the input is wired to the proper terminals. Next check to see if the input type is set to the proper value. Most commonly seen when controller is programmed for a 4 to 20 mA input and 0 to 20 mA signal is wired to the controller.
SV	inPt		
PV	2001	Process Value Flashes when outside of range	Input signals may normally go above or below range limits. If not check input and correct the process temperature or increase temperature range limits using tP-H and tP-L.
SV	0.0		
PV	Err	Error EEPROM	Attempt to reset the factory default settings using the instructions in the next section. If still has error, call customer service for a return goods authorization number to have the controller evaluated at the factory.
SV	Pron		

Communication Error Messages

Error Status 102EH/4750H	PV read back 1000H/4700H	Error Status
0001H	N/A	PV Unstable
0002H	8002H	Re-initialize, no temperature at this time
0003H	8003H	Input sensor did not connect
0004H	8004H	Input Signal Error
0005H	N/A	Over Input Range
0006H	8006H	ADC fail
0007H	N/A	EEPROM read/write error

Reset Factory Default Settings

Note: Resetting Factory Default Settings erases all of the values entered by the user. Record any necessary settings before proceeding.

Warning: Erasing the user entered values may result in a safety hazard and system malfunction.

The following instructions will reset the controller to the original factory default settings.

Step 1. Press the INDEX KEY while at the Home Display until the controller reads LoC in the process display. Use the UP arrow to select LoC1. Press the ENTER KEY to save this value.

Step 2. Press and hold the UP and DOWN arrows simultaneously for one second. Upon releasing the buttons, the display will read SHou in the PV display and oFF in the SV display.

Step 3. Press the INDEX key once and the controller will read PASS in the PV display and a 4321 in the SV display. Adjust the value in the SV display to 1357 using the UP and DOWN arrows. Press the ENTER KEY to save the value.

Step 4. Cycle the power on the controller. Upon power up, all of the user set values have been erased.

Specifications

Input Voltage	100 to 240VAC 50/60Hz.
Operation Voltage Range	85% to 110% of rated voltage.
Power Consumption	5VA max.
Memory Protection	EEPROM 4K bit (non-volatile memory (number of writes: 1000,000)).
Display Method	2 line x 4 character 7-segment LED display Process value (PV): Red color, Set point (SV): Green color.
Sensor Type	Thermocouple: K, J, T, E, N, R, S, B, L, U, TXK.
	3-wire platinum RTD: Pt100, JPt100.
	Analog input 0~5V, 0~10V, 0~20mA, 0~50mV.
Control Mode	PID, ON/OFF, Manual or PID program control (Ramp/Soak control).
Control Output	Relay output: SPDT (SPST: 1/16 DIN and 1/32 DIN size), Max. load 250VAC, 5A resistive load.
	Voltage pulse output: DC 14V, Max. output current 40mA.
	Current output: DC 4~20mA output (Load resistance: Max. 600).
	Linear voltage output: 0~5V, 0~10V *(B Series only).
Display Accuracy	0 or 1 digit to the right of the decimal point (selectable).
Sampling Range	Analog input: 150 msec/per scan Thermocouple or Platinum RTD: 400 msec/per scan.
RS-485 Communication	MODBUS® ASCII/RTU communication protocol.
Vibration Resistance	10 to 55Hz, 10m/s² for 10 min, each in X, Y and Z directions.
Shock Resistance	Max. 300m/s², 3 times in each 3 axes, 6 directions.
Ambient Temperature	32°F to 122°F (0°C to +50°C).
Storage Temperature	-4°F to 150°F (-20°C to +65°C).
Altitude	2000m or less.
Relative Humidity	35% tp 80% (non-condensing).

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Thermocouple Type and Temperature Range		
Input Temperature Sensor Type	LED Display	Temperature Range
Thermocouple TXK type	tXU	-328 ~ 1472°F (-200 ~ 800°C)
Thermocouple U type	U	-328 ~ 932°F (-200 ~ 500°C)
Thermocouple L type	L	-328 ~ 1562°F (-200 ~ 850°C)
Thermocouple B type	b	-212 ~ 3272°F (-100 ~ 1800°C)
Thermocouple S type	S	-32 ~ 3092°F (0 ~ 1700°C)
Thermocouple R type	r	-32 ~ 3092°F (0 ~ 1700°C)
Thermocouple N type	n	-328 ~ 2372°F (-200 ~ 1300°C)
Thermocouple E type	E	-32 ~ 1112°F (0 ~ 600°C)
Thermocouple T type	t	-328 ~ 752°F (-200 ~ 400°C)
Thermocouple J type	J	-148 ~ 2192°F (-100 ~ 1200°C)
Thermocouple K type	K	-328 ~ 2372°F (-200 ~ 1300°C)
RTD Type and Temperature Range		
Input Temperature Sensor Type	LED Display	Temperature Range
Platinum Resistance (Pt100)	Pt	-328 ~ 1472°F (-200 ~ 800°C)
Platinum Resistance (JPt100)	JPt	-4 ~ 752°F (-20 ~ 400°C)
Voltage Input Type and Input Range		
Voltage Input Range	LED DIsplay	Temperature Range
0~50mV Analog Input	n 0	-999 ~ 9999
0V ~ 10V Analog Input	0 10	-999 ~ 9999
0V ~ 5V Analog Input	0 5	-999 ~ 9999
Current Input Type and Input Range		
Current Input Type	LED Display	Temperature Range
4 ~ 20mA Analog Input	nA4	-999 ~ 9999
0~20mA Analog Input	nA0	-999 ~ 9999

PRECAUTIONS

DANGER! Caution! Electric Shock!

1. Do not touch the AC terminals while the power is supplied to the controller to prevent an electric shock.
2. Make sure power is disconnected while checking the unit inside.
3. The symbol indicates that this Controller is protected throughout by DOUBLE INSULATION or REINFORCED INSULATION (equivalent to Class II of IEC 536).

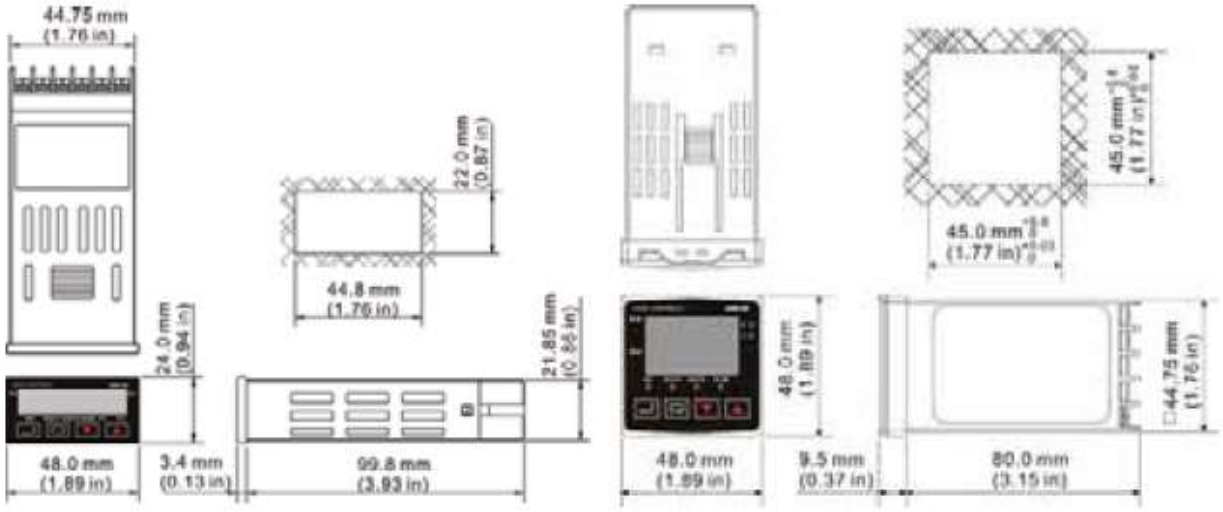
WARNING!

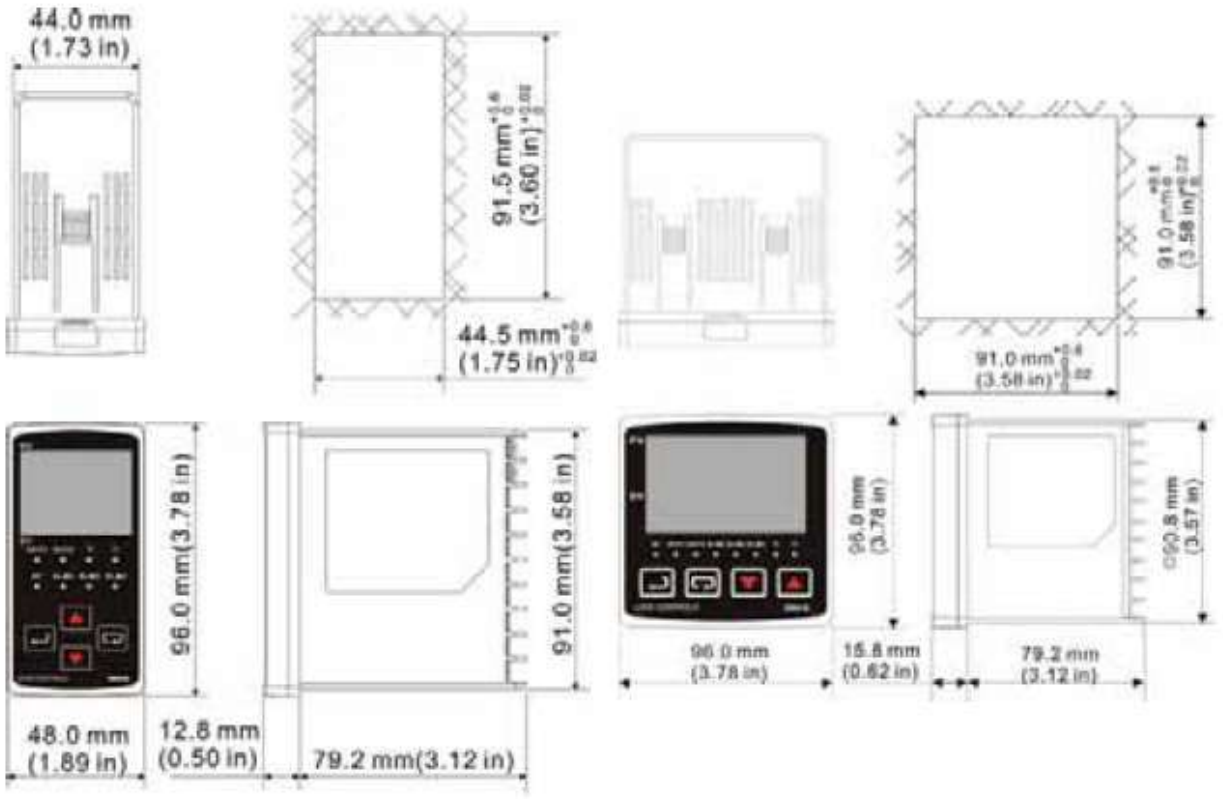
Mount the controller in a location that will not be subject to excessive temperature, shock, or vibration. All models are designed for mounting in an enclosed panel.

1. Always use recommended solder-less terminals: Fork terminals with isolation (M3 screw, width is 7.0mm (6.0mm for 32B Series), hole diameter 3.2mm). Screw size: M3 x 6.5 (With 6.8 x 6.8 square washer). Screw size for 32B Series: M3 x 4.5 (With 6.0 x 6.0 square washer). Recommended tightening torque: 0.4 N.m (4kgf.cm). Applicable wire: Solid/twisted wire of 2 mm_2, 12AWG to 24AWG. Please be sure to tighten them properly.
2. Do not allow dust or foreign objects to fall inside the controller to prevent it from malfunctioning.
3. Never modify or disassemble the controller.
4. Do not connect anything to the “No used” terminals.
5. Make sure all wires are connected to the correct polarity of terminals.
6. Do not install and/or use the controller in places subject to: Dust or corrosive gases and liquid, high humidity and high radiation, vibration and shock, high voltage and high frequency.
7. Power must be off when wiring and changing a temperature sensor.
8. Be sure to use compensating wires that match the thermocouple types when extending or connecting the thermocouple wires.
9. Please use wires with resistance when extending or connecting a platinum resistance sensor (RTD).
10. Please keep the wire as short as possible when wiring a platinum resistance sensor (RTD) to the controller and please route power wires as far as possible from load wires to prevent interference and induce noise.
11. This controller is an open-type unit and must be placed in an enclosure away from high temperature, humidity, dripping water, corrosive materials, airborne dust and electric shock or vibration.
12. Please make sure power cables and signals from instruments are all installed properly before energizing the controller, otherwise serious damage may occur.
13. Please do not use acid or alkaline liquids for cleaning. Please use a soft, dry cloth to clean the controller.
14. Wait at least one minute after power is disconnected to allow capacitors to discharge, and please do not touch any internal circuit within this period.
15. This instrument is not furnished with a power switch or fuse. Therefore, if a fuse or power switch is required, install the protection close to the instrument. Recommended fuse rating: Rated voltage 250 V, Rated current 1 A. Fuse type: Time-lag fuse.
16. Note: This controller does not provide overcurrent protection. Use of the product requires that suitable overcurrent protection device(s) must be added to ensure compliance with all relevant electrical standards and codes. (Rated 250 V, 15 Amps max). A suitable disconnecting device should be provided near the controller in the end-use installation.

External Dimensions

Dimensions are in millimeter (inch)



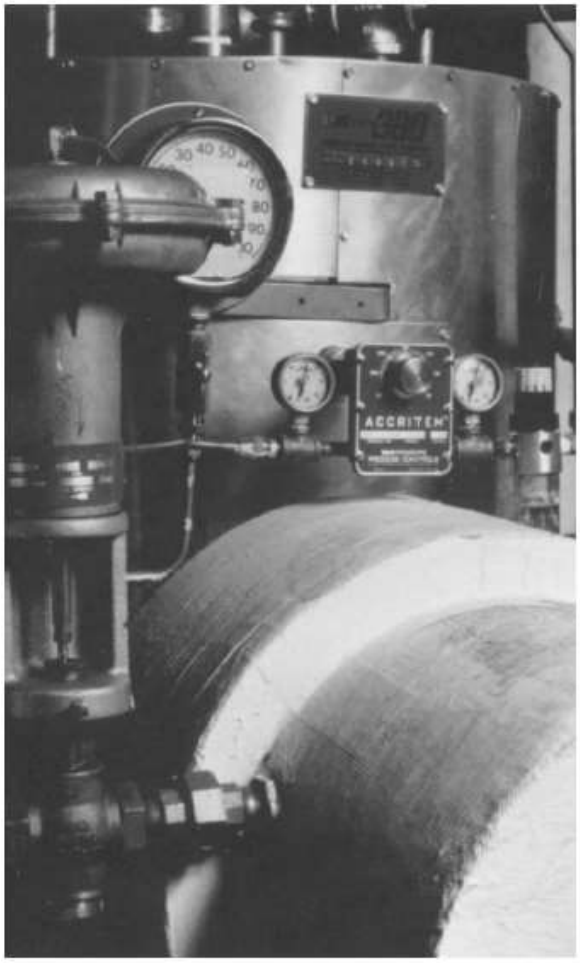


NOTES:

Accritem Controllers

Accritem Controllers are reliable, rugged, compact non-indicating controllers that accurately maintain temperatures in a wide variety of applications. The sensing element, either rigid or remote bulb, is mounted directly in the medium to be controlled, and the Accritem's response to temperature change is a proportional pneumatic signal sent to a control valve.

Typical applications are instantaneous or high capacity storage water heaters, compressors, lube oil coolers, shell and tube heat exchangers, diesel engine cooling systems, oil preheaters, 100% outside air make-up units, and specific processes such as parts washing, die casting, and plastic molding.



Why non-indicating control?

A manually controlled process with an existing thermometer is an ideal situation for a move to automatic control; an Accritem and control valve team frees personnel for more productive work. In other applications, the redundancy of a separate thermometer and controller is desirable, since failure of one would not affect the other. Non-indicating controllers are equally effective to the indicating type in many applications, with the additional advantages of lower cost and less vulnerability to adverse operating conditions.

Why Accritem control?

Accritem Controllers offer:

- precise, rapid response to temperature changes
- simple design – fewer moving parts allow trouble free, dependable operation
- available with remote or rigid bulbs in copper and stainless steel (316L) to satisfy different applications
- easy temperature adjustment
- supply and control pressure gauges included at no additional cost
- control action can be easily altered by operating personnel
- its rugged construction is very resistant to construction, and is unaffected by environmental moisture and dust. Air supply need only be clean, not instrument quality.

Select Control Action

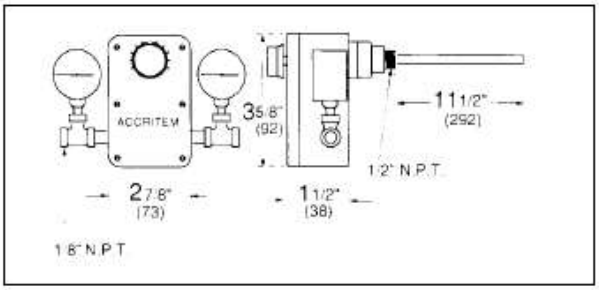
An effective system requires coordination of the control action of the Accritem, with that of the control valve, for failsafe conditions. The table below identifies which Accritem (direct or reverse acting) should be utilized for desired results in basic applications.

ACCRITEM TYPE	APPLICATION HEATING	APPLICATION COOLING	APPLICATION MIXING
Direct Acting (output pressure increases as temp. increases)	Normally Open Valve	Normally Closed Valve	Hot Piped to Normally Open Port of Valve
	Valve Opens on Air Failure	Valve Closes on Air Failure	Valve Opens to Hot Flow on Air Failure
Reverse Acting (output pressure decreases as temp. increases)	Normally Closed Valve	Normally Open Valve	Hot Piped to Normally Closed Port of Valve
	Valve Closes On Air Failure	Valve Opens on Air Failure	Valve Opens to Cold Flow on Air Failure

Accritem® Rigid Bulb Controller

- complete with pressure gauges and fitting (1/2" NPT Pipe Fitting)
- adjustable set point 50-350 F
- sensing element is bimetallic, an invar rod enclosed in copper or stainless steel bulb
- sensing element acts by differential expansion of a bimetal element, so there is no danger of leakage from the bulb
- forged brass construction with phosphor bronze internal parts special water operated model uses stainless steel internal parts

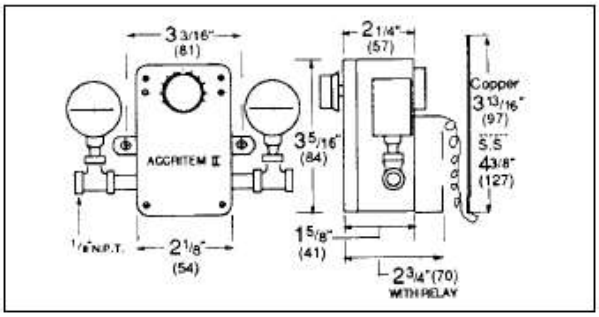
Model	Action	Product Number
Rigid Copper Bulb		
Air Operated	Direct	744-1213
	Reverse	744-1214
Water Operated	Direct	744-1217
	Reverse	744-1218
Rigid Stainless Steel Bulb		
Air Operated	Direct	744-1270
	Reverse	744-1271



Accritem® Remote Bulb Controller

- offers the reliability of the Accritem Rigid Bulb Controller with increased flexibility of remote monitoring
- 4" copper bulb capillary or 10í stainless steel bulb capillary allows the bulb to be immersed in difficult-to-access pipes, tanks and air ducts, while the instrument can be conveniently located for ease of adjustment
- compact size of the liquid filled thermal (4" long, 7/32" in diameter) allows placement in narrow pipes and the flexibility of transverse mounting for larger pipes
- compression fitting with 3/8î NPT thread allows direct mounting of bulb in pipe or tank
- easily mounted vertically or horizontally, on flat or curved surfaces, the glass filled Norel instrument body resists corrosion from moisture, caustic cleaners and many other chemical compounds
- reversible F/C degree scale plate.

Model	Action	Product Number
Remote Copper Bulb (includes 3/8" NPT brass compression fitting)		
Air Operated	Direct	744-1256
	Reverse	744-1258
Remote Stainless Bulb (includes 3/8" NPT brass compression fitting)		
Air Operated	Direct	744-1272
	Reverse	744-1273

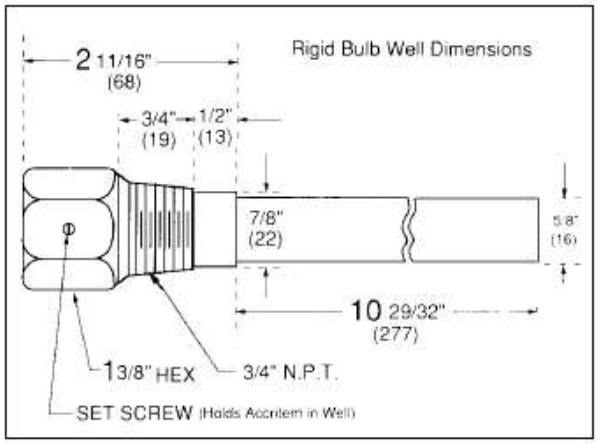


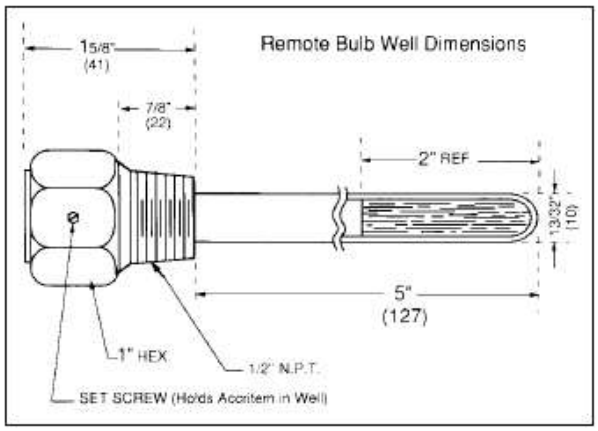
Specifications

Characteristic	Rigid Bulb	Remote Bulb
Standard Adjustment Dial Range	50°-350°F	0 to 300°F/ -20 to 150°C
Maximum Supply Pressure at Room Temp.	35psi	35psi
Maximum Operating Temp.	400°F (204°C)	350° (177°C)
Maximum Operating Pressure	250psi (1724kPa)	250psi (1724kPa)
Air Consumption (max.)	800 SCIM	200 SCIM
Adjustable Sensitivity per °F	1/4 to 2-1/4 psi	1/3 to 2 psi
Temperature Response	0.5°F	0.5°F
Sensing Element Bulb Mat.	Copper or Stainless	Copper or Stainless
Bulb Mounting Connection	1/2" NPT	1/2" NPT
Air or Water Connection	1/8" NPT	1/8" NPT
Drain Connection (water operated)	1/4" NPT	1/4" NPT
Ambient Temperature Range	NA	40-120°F
Maximum Temperature of Wells		
Stainless Steel	400°F (204°C)	400°F (204°C)
Copper	265°F (129°C)	265°F (129°C)
Maximum Pressure of Wells		
Stainless Steel	1125psi (7757kPa)	1000psi (6895kPa)
Copper	525psi (3619kPa)	400psi (2758kPa)
Shipping Weight	4 lbs.	2lbs.

Accritem Accessories

Description	Part No.	Rigid Bulb	Remote Bulb
Accessory Kit for Air/Gas Operation	744-107	X	X
Accessory Kit for Water	744-180	X	X
Union Fitting-Brass	744-106	X	X
Socket Well: Copper	744-111	X	X
Copper	744-266	X	X
Socket Well: Stainless Steel	744-082	X	X
Stainless Steel	744-199	NA	X
Duct Flange	808-517		X





NOTES:

Float & Thermostatic Steam Traps

Tunstall®
Established 1958

Float & Thermostatic Steam Traps
Series TA-FTH
(High Capacity)

Operation

Tunstall Corporation produces a full line of Float & Thermostatic Steam Traps containing a float valve mechanism which modulates to discharge condensate continuously, while non-condensable gases are released by a separate internal balanced pressure thermostatic air vent (The Tunstall Capsule®).

The "FTH" series traps are designed for use in systems that produce an exceptionally large amount of condensate (625 to 24,000 lbs. of condensate per hour). Two sizes (1-1/2" & 2") available for low, medium and high pressure applications with a "H" pattern piping connection for maximum installation flexibility.

All Tunstall float and thermostatic traps can be serviced without disturbing system piping.

Features

- Rapid condensate removal.
- Stainless steel balanced pressure thermostatic air vent (Tunstall Capsule®).
- All stainless steel internal components
- Variety of piping connections.
- Designed to withstand water hammer & high load demands.
- Designed for In-line repair.
- Made in the U.S.A.

Construction

Tunstall float and thermostatic traps feature all stainless steel interiors, heavy duty trap housings, easy access to internal parts and convenient piping connections.

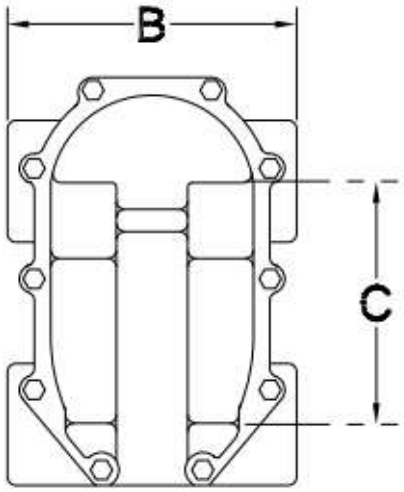
Materials of Construction	
Body & Cover	Cast Iron-ASTMA 126Cl B
Valve Head	Stainless Steel
Valve Seat	Stainless Steel
Valve Seat Gasket	Non-Asbestos
Float	Stainless Steel
Bracket & Lever Assembly	Stainless Steel
Thermostatic Air Vent	Tunstall Capsule® Stainless Steel
Cover Bolts	Carbon Steel Grade 5
Cover Gasket	Non-Asbestos
Draining Plug	Stainless Steel

Float & Thermostatic Steam Traps - *Series TA-FTH*

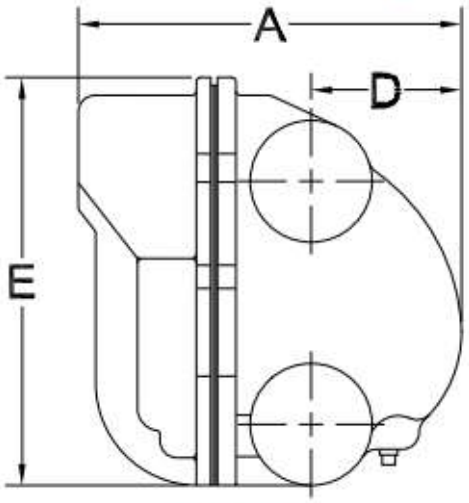
Engineering Specifications

Capacities lbs. Condensate per hour			Differential Pressure (PSI)													
Model	**Size NPT**	**PSIG Orifice**	**1/4**	**1/2**	**1**	**2**	**5**	**10**	**15**	**20**	**25**	**30**	**40**	**50**	**75**	**100**	**125**
TA-FTH6-15	1-1/2"	1.032	6400	7500	9300	13000	16500	21000	24000								
TA-FTH8-15	2"	1.032	6400	7500	9300	13000	16500	21000	24000								
TA-FTH6-30	1-1/2"	.762	2575	4500	5650	8750	11800	14500	17500	19500	20600	21600					
TA-FTH8-30	2"	.762	2575	4500	5650	8750	11800	14500	17500	19500	20600	21600					
TA-FTH6-75	1-1/2"	.500	1500	2750	3500	4750	6300	7750	9250	10500	12250	12500	13500	14500	17000		
TA-FTH8-75	2"	.500	1500	2750	3500	4750	6300	7750	9250	10500	12250	12500	13500	14500	17000		
TA-FTH6-125	1-1/2"	.328	625	825	1100	1550	2100	3000	3500	3900	4200	4400	5000	5500	6750	7750	8700
TA-FTH8-125	2"	.328	625	825	1100	1550	2100	3000	3500	3900	4200	4400	5000	5500	6750	7750	8700

All 1-1/2" & 2" SERIES TA-FTH Float & Thermostatic Traps



Front View



Side View

Model	Size	DIMENSIONS (Inches)					Weight (lbs.)	Repair Kit
		A	B	C	D	E		
TA-FTH6-15	1-1/2"	11.00	8.50	7.00	4.25	12.00	48	TA-4FPH-TA-15
TA-FTH8-15	2"	11.00	8.50	7.00	4.25	12.00	48	TA-5FPH-TA-15
TA-FTH6-30	1-1/2"	11.00	8.50	7.00	4.25	12.00	48	TA-4FPH-TA-30
TA-FTH8-30	2"	11.00	8.50	7.00	4.25	12.00	48	TA-5FPH-TA-30
TA-FTH6-75	1-1/2"	11.00	8.50	7.00	4.25	12.00	48	TA-4FPH-TA-75
TA-FTH8-75	2"	11.00	8.50	7.00	4.25	12.00	48	TA-5FPH-TA-75
TA-FTH6-125	1-1/2"	11.00	8.50	7.00	4.25	12.00	48	TA-4FPH-TA-125
TA-FTH8-125	2"	11.00	8.50	7.00	4.25	12.00	48	TA-5FPH-TA-125