

HX2 SERIES

Semi-Instantaneous Water Heaters



***TECHNICAL SUBMITTAL
PACKAGE***

RECO
USA 
The Water Heater and Pressure Vessel Experts

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The information presented herein is superseded all prior issuances.

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THE HX2 SERIES

SEMI-INSTANTANEOUS WATER HEATERS

TECHNICAL DATA

1.1 HX2 Overview

The **HX2** is RECO USA's next generation of compact, semi-instantaneous water heaters using available steam as the heating medium. Designed to the guidelines of TEMA, BOCA and IAPMO, these heaters can heat up to 150 GPM from 40 °F to 140 °F as standard, with higher capacities possible.

At the heart of the control system is the Control Master® panel with a digital PAC controller. The Control Master has an easy-to-navigate LCD panel for local and remote monitoring and set point adjustment. It accepts remote set point changes and can re-transmit water temperature by analog or digital signals via standard Modbus® or available BACnet® network communications protocols.

An electrically operated, fast-acting V-ball control valve is used to modulate the flow of the heating fluid. It has a 100:1 rangeability which gives excellent control at all flow rates. Capacitors integrated into the actuator housing close the valve in the event of loss of main power. Soft valve seats provide tight valve shut-off and prevent temperature rises at low load due to valve seat leakage.

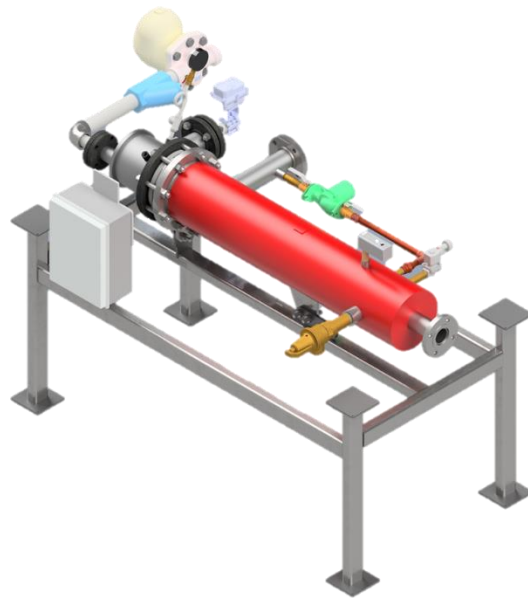


Fig. 1 – A horizontal HX2 unit (not all piping shown or insulation jacket shown)

1.2 Flow, Pressure, and Temperature Ratings

- Heated water recovery rate5 to 150 GPM
- Steam supply pressure.....Up to 100 PSIG
- Cold water inlet pressure.....Up to150 PSIG
- Heated water outlet temperature.....Up to 210 °F
- Design ratingASME Boiler & PV Code "U" stamped

1.3 Materials of Construction

The standard materials used with the HX2 Series are shown below.

TABLE 1-1 STANDARD MATERIAL SPECIFICATIONS		
Component	Material	ASME / ASTM Material Specification
Baffles	Naval brass	SB-171-C464
Couplings	Stainless steel	SA-182-F316L (shell)
	Carbon steel	SA-105 (element head)
Element head cap	Carbon steel	SA-516-70
Flanges	Stainless steel	SA-182-F316L (shell)
	Carbon steel	SA-105 (element head)
Hardware	Carbon steel	SA-193-B7 (bolts)
		SA-194-2H (nuts)
Pipe	Stainless steel	SA-312-TP316L (shell)
	Carbon steel	SA-106-B (element head)
Shell / Tank	Stainless steel	SA-312-TP316L
	Copper-nickel alloy	SB 466 (seamless) or SB 467 (welded)
Supports	Carbon steel	SA-36
Tubes	Copper	SB-111-C122 (Double wall)
		SB-75-C122 (Single wall)
Tubesheets	Stainless steel	SA-240-304/304L (inner)
	Carbon steel	SA-516-70 (outer)
	Carbon steel	SA-36 (spacer ring)
Weld cap	Stainless steel	SA-403-316L (formed 2:1 head)
	Copper-nickel alloy	SB -171-C706

1.4 Warranty

The HX2 pressure vessel is warrantied for **10 years** against defects in material and workmanship. The tube bundle is warrantied for **5 years** against failure due to defects in material, workmanship, or mechanical failure. All other components are warrantied for **1 year** after start up, or **18 months** after delivery, whichever comes first.

1.5 Heat Transfer Surface Area

Technical data for the standard HX2 heating bundles are given below. Note that tube bundles are designed in standard “U” tube arrangement, with the number of tube openings seen at the tubesheet double the amount of individual tubes actually used.

TABLE 1-2 TUBE BUNDLE HEAT TRANSFER DATA						
HX2 Size	Single Wall Tubes			Double Wall Tubes		
	Nominal O.D.	No. of Tubes	Surface Area (ft ²)	Nominal O.D.	No. of Tubes	Surface Area (ft ²)
06 030	½"	28	17.6	¾"	13	11.5
06 036			21.3			14.1
08 030	½"	51	31.7	¾"	24	21.1
08 036			38.3			25.9
10 030	½"	88	53.6	¾"	41	36.0
10 036			65.1			44.0
12 030	½"	133	82.1	¾"	59	51.5
12 036			99.5			63.1

1.6 HX2 Rating Charts

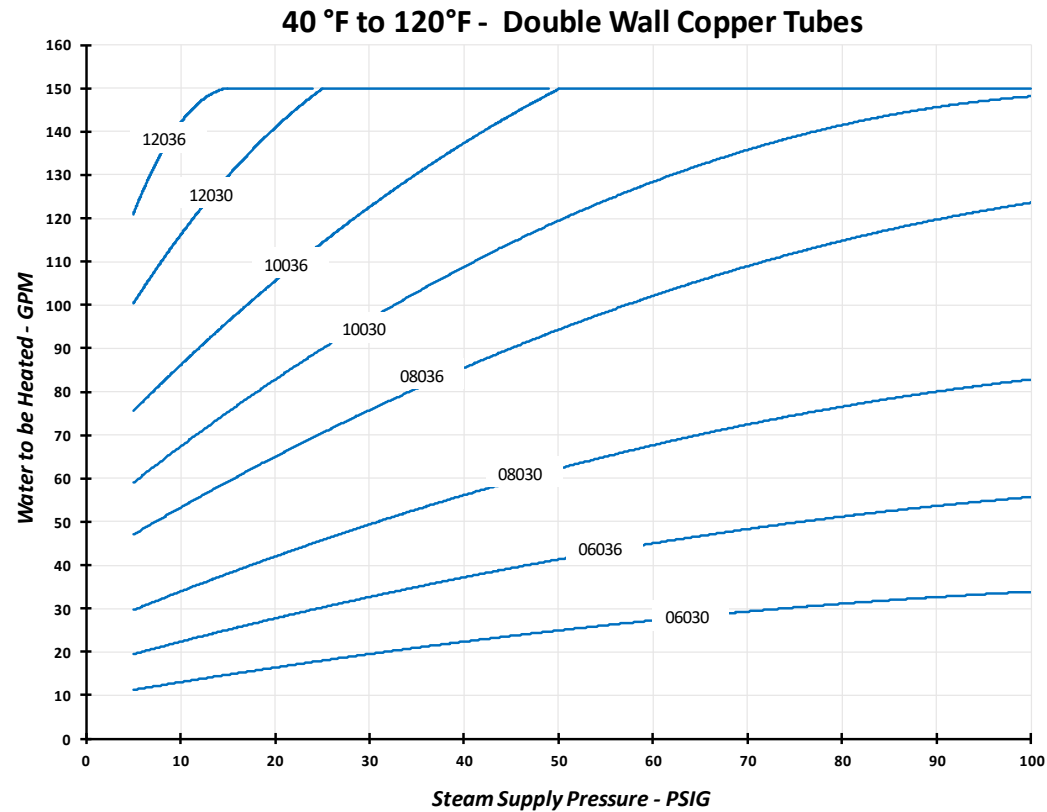
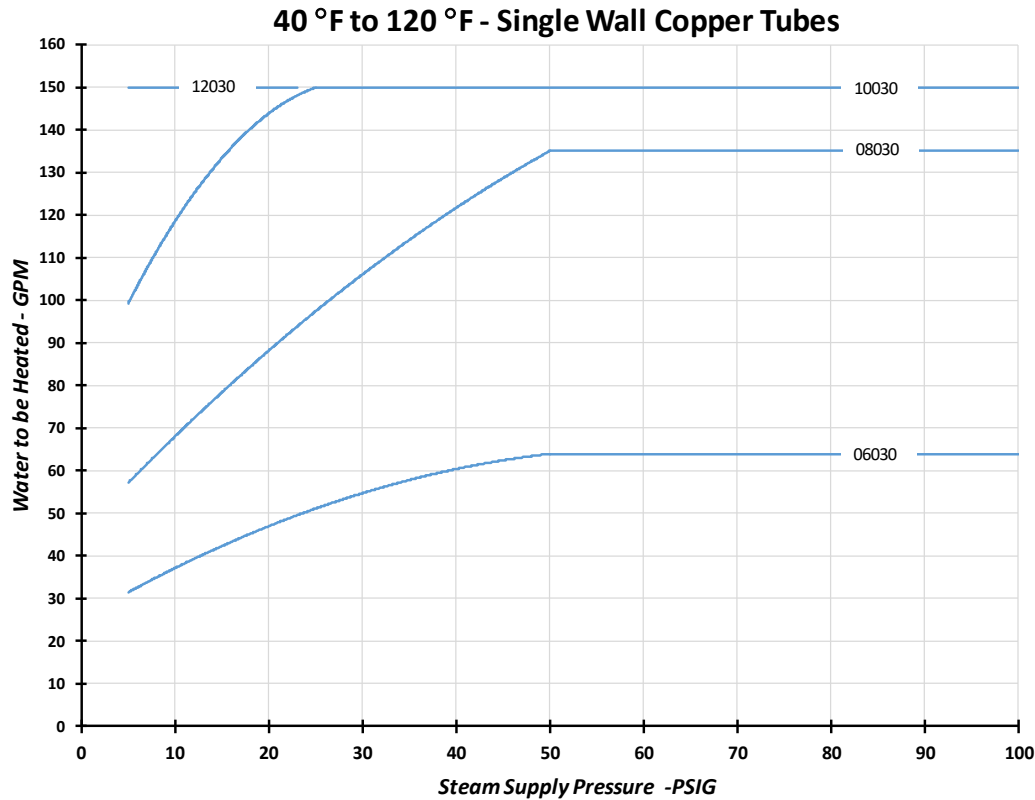
To select an HX2 the steam pressure (PSIG) available, amount of water (GPM) to be heated, and amount of heating (°F) to be done must be known. Heating is commonly specified in increments of 80 °F (40 °F to 120 °F) or 100 °F (40 °F to 140 °F).

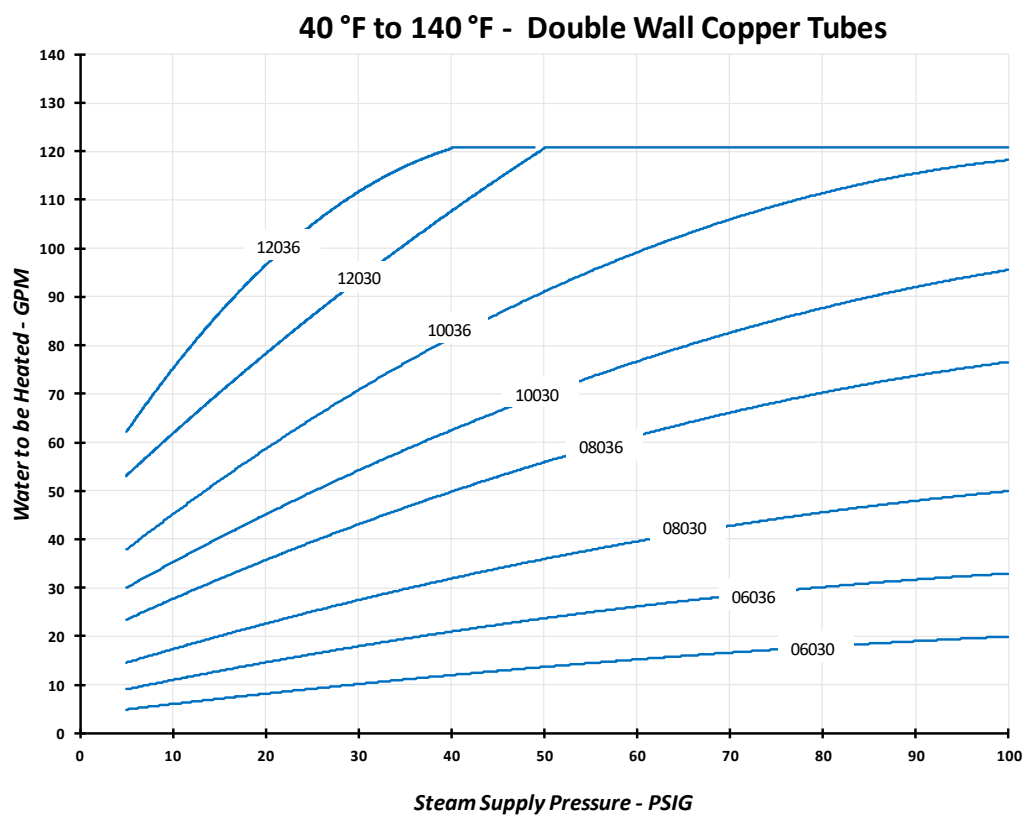
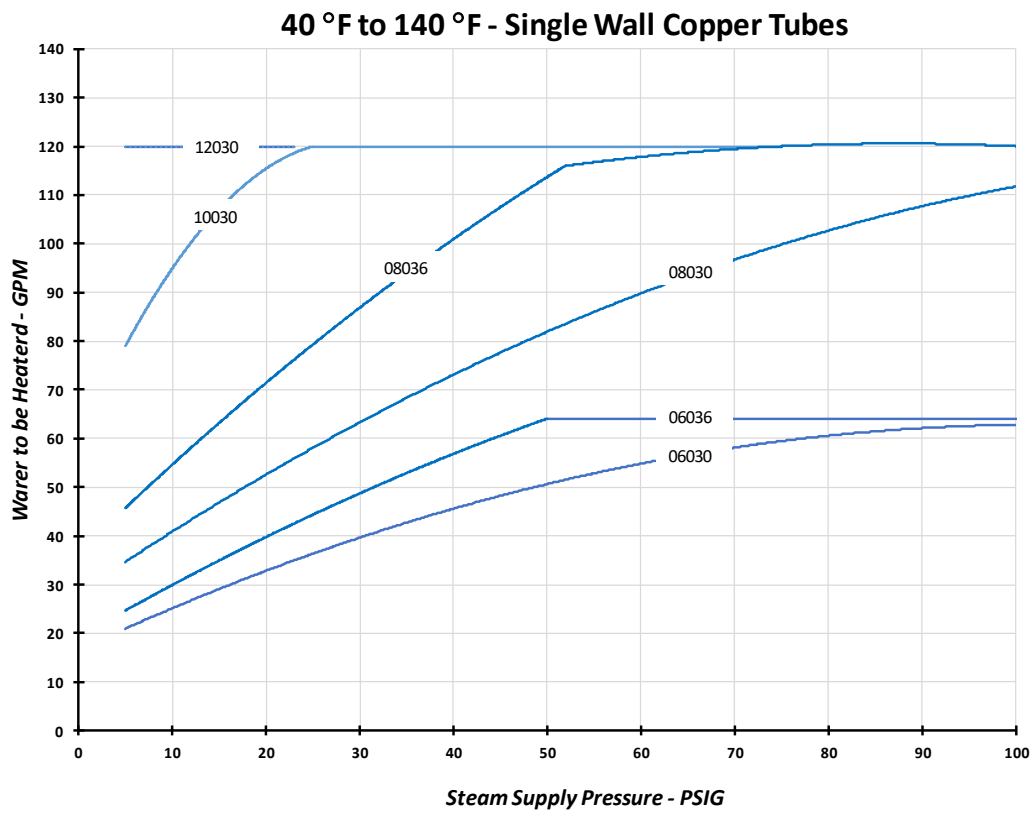
The first step is to locate the correct chart from the four that follow. Next locate the appropriate Steam Supply Pressure available (PSIG) along the X-axis, and the amount of water to be heated (GPM) along the Y-axis. Where the two intersect, find the rating curve corresponding to those conditions. If this intersection lies between two rating curves, choose the larger unit (higher curve).

Notes:

1. For copper-nickel tubes, de-rate the copper tube ratings shown by 20%.
2. The ratings curves shown assume a tube bundle fouling factor of 0.00025 (hr. x ft² x °F / BTU).
3. For applications with water as the heating source, contact RECO USA Sales Department.

1.6a Rating Charts for 80 °F Heating



1.6b Rating Charts for 100 °F Heating

1.7 General Arrangement Dimensions and Weights – Vertical Units

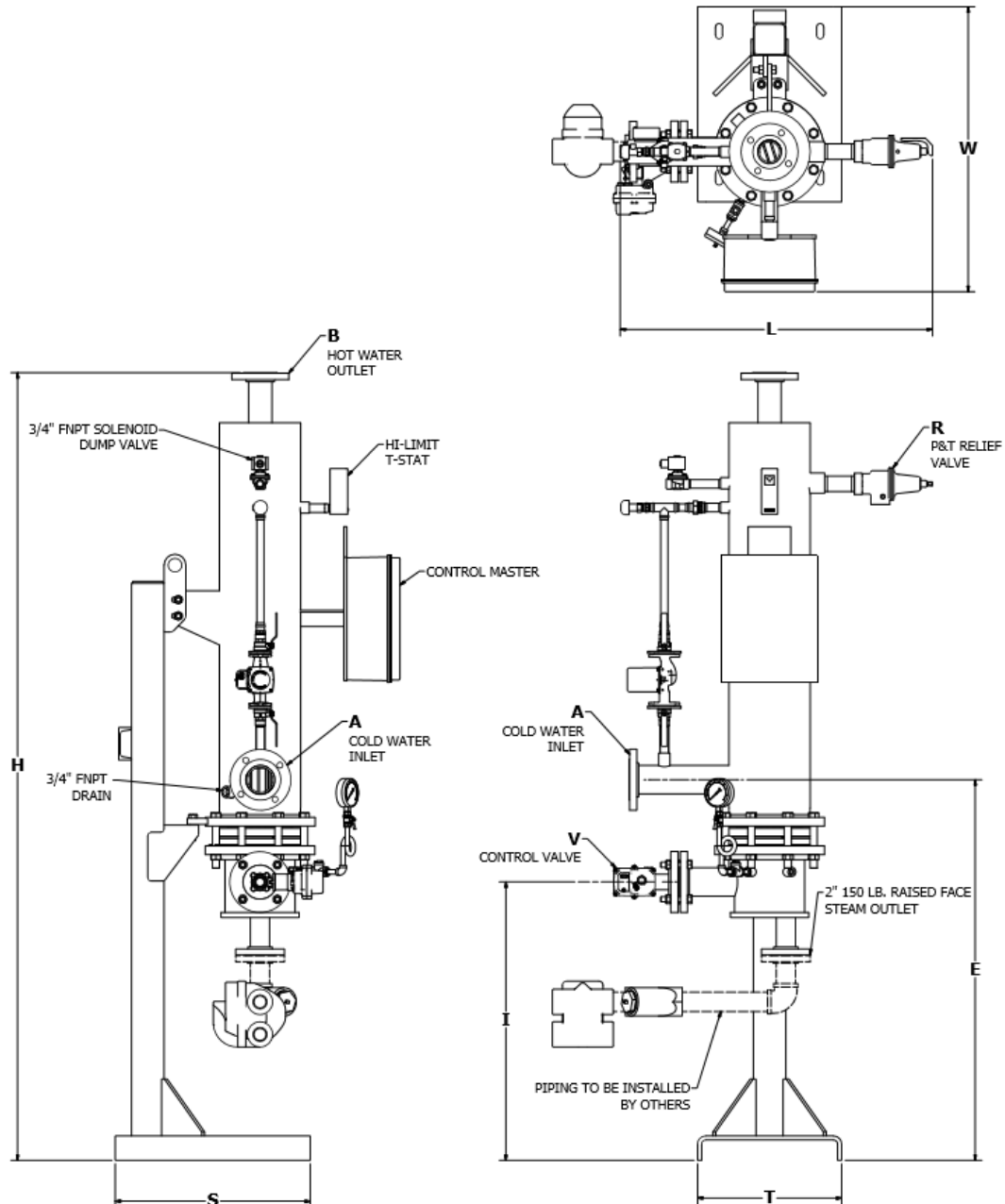


TABLE 1-3 VERTICAL UNIT DIMENSIONS

Basic Size	A	B	E	H	I	L	R	S	T	V	W	Wt. (lbs.)
06030 / 06036	2"	1 ½"	46.75	95.0	34.25	32.0	¾" NPT	24.0	17.75	1" FNPT / 1.25" FNPT	33.0	930 / 950
08030 / 08036	3"	2 ½"	46.75	97.0	34.25	38.0	1 ½" NPT	24.0	17.75	1" FNPT / 1.25" FNPT	35.0	1,125 / 1,155
10030 / 10036	4"	3"	46.75	99.0	33.75	49.0	1 ½" NPT	24.0	17.75	2 ½" 150 Lb. RFSO	37.0	1,380 / 1,420
12030 / 12036	4"	3"	46.75	100.0	33.75	51.0	1 ½" NPT	24.0	17.75	3" 150 Lb. RFSO	39.0	1,655 / 1,705

Notes:

- Dimensions "A" and "B" are nominal sizes for ANSI 150 lb. raised face, slip on (RFSO) flange.
- All dimensions in inches, unless noted otherwise.
- Weights shown are net empty weight for a standard HX2 unit. Crating or shipping materials not included.

1.8 General Arrangement Dimensions and Weights – Horizontal Units

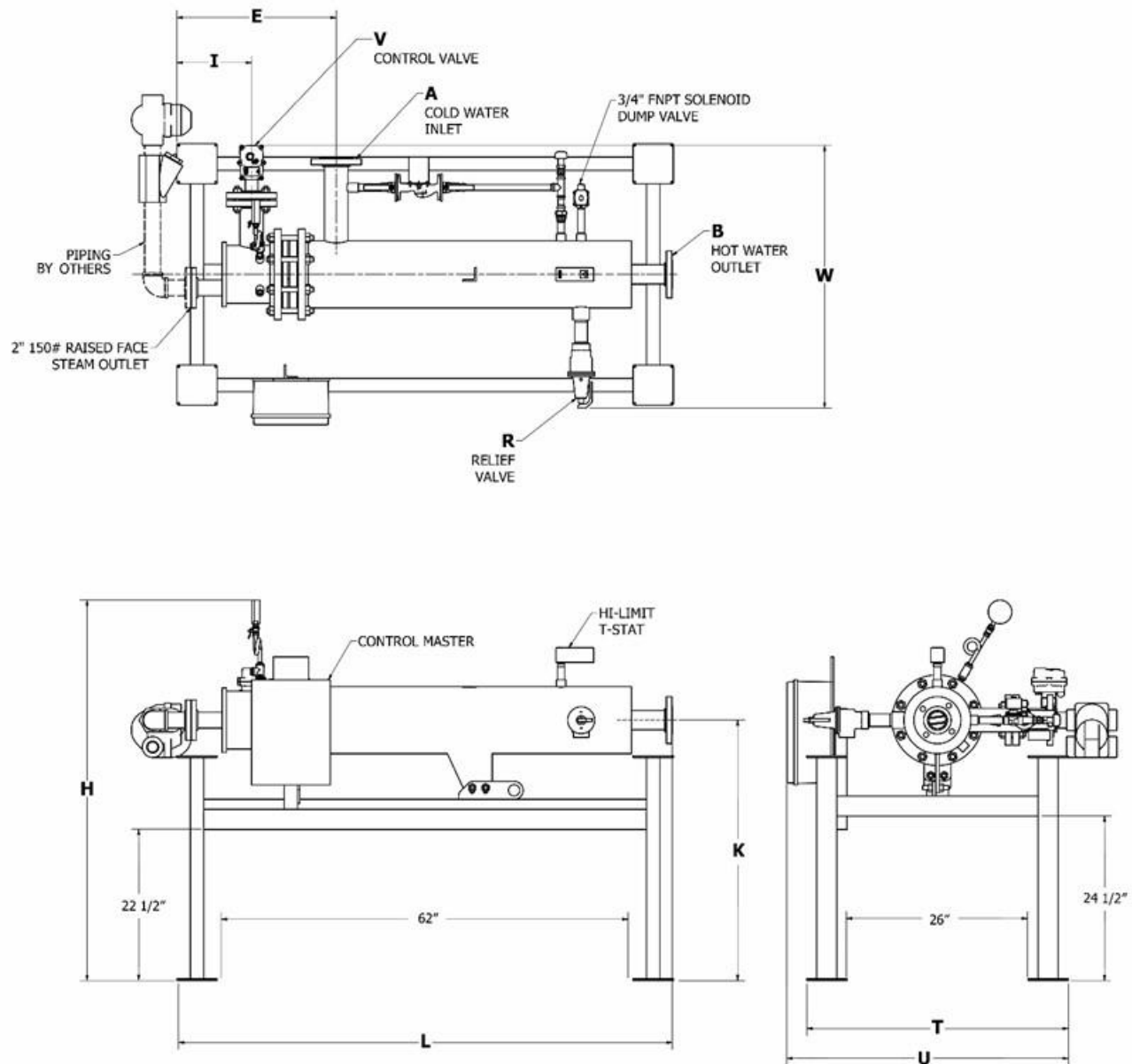


TABLE 1-4 HORIZONTAL UNIT DIMENSIONS

Basic Size	A	B	E	H	I	K	L	R	S	T	U	V	W	Wt. (lbs.)
06030 / 06036	2"	1 1/2"	23.75	95.0	34.25	37.75	71.75	3/4 FNPT	24	39	41	1" / 1.25" FNPT	33	985 / 1,005
08030 / 08036	3"	2 1/2"	23.75	97.0	34.25	38.75	73.5	1.5 FNPT	24	39	41	1.5" / 2" FNPT	35	1,180 / 1,210
10030 / 10036	4"	3"	23.75	99.0	33.75	39.75	74	1.5 FNPT	24	39	41	2.5" 150 Lb. RFSO	37	1,435 / 1,475
12030 / 12036	4"	3"	23.75	100.0	33.75	40.75	77	1.5 FNPT	24	39	41	3" 150 Lb. RFSO	39	1,710 / 1,765

Notes:

1. Dimensions "A" and "B" are nominal sizes for ANSI 150 lb. raised face, slip on (RFSO) flanges.
2. All dimensions in inches, unless noted otherwise.
3. Weights shown are net empty weight for a standard HX2 unit. Crating or shipping materials not included.
4. Allow "L" dimension plus 6 inches for tube bundle removal clearance.

1.9 How to Specify

The water heater shall be a **RECO USA Series HX2** capable of heating (x) GPM of water from 40 °F to (x) °F with (x) PSIG of incoming saturated steam. The unit shall be an ASME Code "U" stamped pressure vessel rated for safe operation to 150 PSIG and be in full accordance with the Section VIII, Division 1 of the latest ASME code. It shall be constructed with a 316L stainless steel tank, passivated for added corrosion resistance to ASTM A380 and A967 requirements, with stainless steel connections and 3/4" O.D. copper tubes. All steam and condensate piping shall be carbon steel, welded or threaded as appropriate.

The copper heating tubes shall be double walled with a vented leakage path between the heating medium and water being heated to prevent contamination of the water. All wetted parts on the water (heated) side shall be lead-free and comply with NSF Standard 61 and conform to all requirements of the U.S. Safe Drinking Water Act.

The heating bundle shall include an ASTM 304L stainless steel inner tube sheet, carbon steel spacer ring, and carbon steel outer tube sheet. For added protection and durability the element head and support stand shall be powder coated to a minimum of 5 mils dry film thickness (DFT). The heater tank shall be mounted on a rigid steel support skid and insulated with a heavy-duty silicon coated fiberglass outer jacket meeting the latest ASHRAE requirements. The tank shall also allow for easy removal and inspection of the heating bundle without the need for dismantling of the heater from the support stand.

The unit shall include a mechanical pressure/temperature (P/T) relief valve, solenoid dump valve at the tank controlled by an independent, high temperature limit switch, and automatic, fail-closed, steam inlet control valve. A continuously operating recirculation pump shall also be provided to ensure a uniform temperature distribution across all temperature sensors while preventing the build-up of sediment in the tank bottom or on the heating tubes.

An electrically operated, fast-acting V-ball control with full 100:1 rangeability shall be used to modulate the flow of heating medium to the unit. It shall provide accurate control at all heating conditions and the valve actuator shall be tied into the PID control loop to fail closed in the event of a loss of power.

The control panel shall be a complete, pre-assembled and pre-wired unit housed in a NEMA 4 enclosure with a programmable automation controller (PAC) and easy to navigate LCD panel capable of local or remote set point and alarm. It shall incorporate a PID control loop that sends a modulating signal to the steam control valve. Valve signaling shall be 0-10 VDC as standard. The control panel shall utilize RS485 communication interface for full compatibility with Modbus® and BACnet® IP or MS/TP building automation communications protocols.

The HX2 Series water heater shall carry a full **10-year warranty** against defects in material and workmanship of the pressure vessel. The tube bundle shall carry a full **5-year warranty** against failure due to defects in material, workmanship, thermal shock, or mechanical failure.

THE HX2 SERIES

SEMI-INSTANTANEOUS WATER HEATERS

INSTALLATION AND OPERATION

The following guidelines must be followed when installing a HX2 series water heater. Failure to do so can result in faulty performance, field service / support charges, and/or voiding of the warranty. Installation, operation, and/or maintenance should only be performed by trained personnel knowledgeable in proper plumbing and electrical practices, and properly trained in the operation of high-pressure steam systems.

2.1 Shipment and Storage

All products are assumed to be installed and operated soon after receipt. RECO USA does not include any special preservation for long term storage, and assumes no responsibility for storage deterioration after shipment unless explicitly agreed to in writing beforehand. All units must only be lifted by the lifting lug(s) provided, as failure to do so could result in damage to the unit.

After the unit has been uncrated, it should be carefully examined for any damage that may have occurred in transit. If any damage is found a shipping claim of damage is being made, immediately contact RECO USA or your local authorized sales, as well as the common carrier who delivered the unit(s).

2.2 Installation

- 2.2.1 The HX2 is designed for indoor use only, unless specified otherwise. Install the unit so there is adequate room around the unit for servicing. Provide clear access (see Figures 1.7 and 1.8) to permit tube bundle removal.
- 2.2.2 The unit should be level to permit proper drainage and must be anchored securely to the floor. It should be on a level surface with no more than 0.5° slope and capable of supporting the total weight of the unit when filled to capacity.
- 2.2.3 All steam, water, and condensate lines should be installed in accordance with good engineering practices. Note that the ASME code requires that no reduction in pipe size, and no valves or other restrictions may be introduced in the piping from the relief valve.
- 2.2.4 After mounting the unit in place, connect the cold-water source to the unit's cold-water inlet, and then the hot water discharge from the unit to the building hot water feed line. The locations of these are indicated on the General Arrangement drawings in Figures 1.7 and 1.8.

- 2.2.5 Next connect the steam outlet trap and strainer (supplied loose) to the unit, and connect this line to the steam condensate return line.
- 2.2.6 Pipe the relief valve, tank drain, and solenoid dump valve separately to a suitable floor drain. Do not install a valve in relief valve or solenoid valve line, as that would defeat the purpose of these drain lines.
- 2.2.7 Complete the installation by making the appropriate electrical connections to the main control panel.
- 2.2.8 A manual shut off valve of the same size as the inlet water line should be installed upstream of the cold-water supply to the unit, and kept in the closed position until the installation is complete. A shut off valve of the same size as the hot water discharge line should also be installed at the unit's hot water discharge. Together, these two valves will isolate the heated water side of the unit.
- 2.2.9 A manual shut off valve of the same size as the steam inlet line should be installed upstream of the steam supply to the unit.
- 2.2.10 The condensate return line should have a shut off valve of the same size as the line installed downstream of the unit to isolate it from the system. This valve will also prevent backflow of steam if the line is disconnected at the unit's hot water discharge.
- 2.2.11 All piping is pressure tested at the factory for leaks prior to shipment. However, piping connections can loosen during transit, and installation, resulting in leaking connections, damaged threads, etc. Once installed and started, all piping should be inspected again, and any leaks or damage corrected at the time of installation.

2.3 Major Components of the HX2

A general listing of the major, external components of an HX2, and their function, are as follows:

- 2.3.1 The solenoid valve is an electrically actuated, normally closed valve that opens to relieve tank pressure once a pre-set high temperature limit is exceeded. It should be independently piped to a suitable gravity drain using a line size of the same size as the solenoid valve discharge.
- 2.3.2 The resistance temperature detector (RTD) is a temperature probe immersed in the tank flow stream near the discharge nozzle. Under normal operation it is a self-contained device not requiring routine maintenance.
- 2.3.3 The high-limit thermostat is a primary safety feature that upon reaching a pre-set high temperature limit, interrupts power to the control valve, causing it to close, and energizes the solenoid valve to open.
- 2.3.4 The pressure/temperature (P/T) relief valve is a secondary mechanical safety device used to protect against over-pressure or over-temperature conditions within the unit tank. It should be independently piped to a suitable gravity drain using a line size of the same size as the relief valve discharge.
- 2.3.5 The circulator pump consists of a pump/motor assembly with companion flanges. It provides continuous circulation throughout the tank, which ensures a uniform temperature distribution across all temperature sensors.

- 2.3.6 An electrically operated, fast-acting V-ball control valve is used to modulate flow of heating medium to the unit. It has a 100:1 rangeability which gives excellent control at all flow rates. Capacitors integrated into the actuator housing close the valve in the event of loss of power.
- 2.3.7 The steam trap and strainer are a float and thermostatic (f & t) type steam trap and "Y" type strainer. These components are supplied loose for connection at the steam (condensate) outlet of the heating tube bundle.
- 2.3.8 The insulation jacket is a flexible, Velcro-attached design specific to the unit it insulates. All cut outs and openings for piping and instrumentation are provided for easy installation without the need for field modification.
- 2.3.9 The tube bundle is provided pre-assembled into the heating tank, with all piping and controls installed and tested, ready for start-up and operation.
- 2.3.10 The Control Master control panel is a complete, pre-assembled and pre-wired unit with a programmable automation controller (PAC) and easy to navigate LCD panel for local monitoring and set point adjustment.

2.4 Factory Pre-Sets

All temperature settings for the unit are factory set for the specified outlet temperature requirements. This is typically 120 °F or 140 °F.

- 2.4.1 The temperature pre-sets start with the RTD sensor and PID control loop tied to the control panel PAC. It is set to the specified outlet water temperature, and modulates the control valve position to maintain the inflow of steam corresponding to the demand for hot water. Upon reaching the desired water outlet temperature, the control valve will back off to the point it may fully close. Outlet water temperature is controlled to +/- 4 °F.
- 2.4.2 The PAC has a high temperature alarm set to 10 °F above the outlet temperature setting. Upon reaching this setting the control panel LCD display will blink and send an alarm signal to the BAS (if so wired). Upon returning below this high temperature setting, the system will automatically come out of alarm mode and reset itself without the need for a manual reset.
- 2.4.3 In addition to the RTD sensor and PID control loop, a separate high temperature limit switch is provided. This is pre-set to 10 °F above the high temperature alarm setting (which is 20 °F above the outlet water temperature setting). In the event the high temperature limit switch is tripped, it will cut power to the control panel. This will de-energize the steam inlet control valve, causing it to fail closed and cut off any further supply of steam to the unit, and energize the tank-mounted solenoid valve, causing it to open and relieve any pressure in the tank.
- 2.4.4 As a third safety feature, a factory pre-set pressure / temperature relief valve mounted near the tank outlet will open upon reaching its high pressure or temperature setting, relieving the contents of the tank until the internal pressure in the tank falls below the valve settings. These settings are typically 150 PSIG and 210 °F, respectively.

2.5 Flange Bolt Tightening Sequence and Torque Values

The following bolt tightening pattern and torque values should be used whenever tightening a flange. A recommended practice is to do this in (3) steps leading up to the final torque values, rather than attempting to complete this in one sequence.

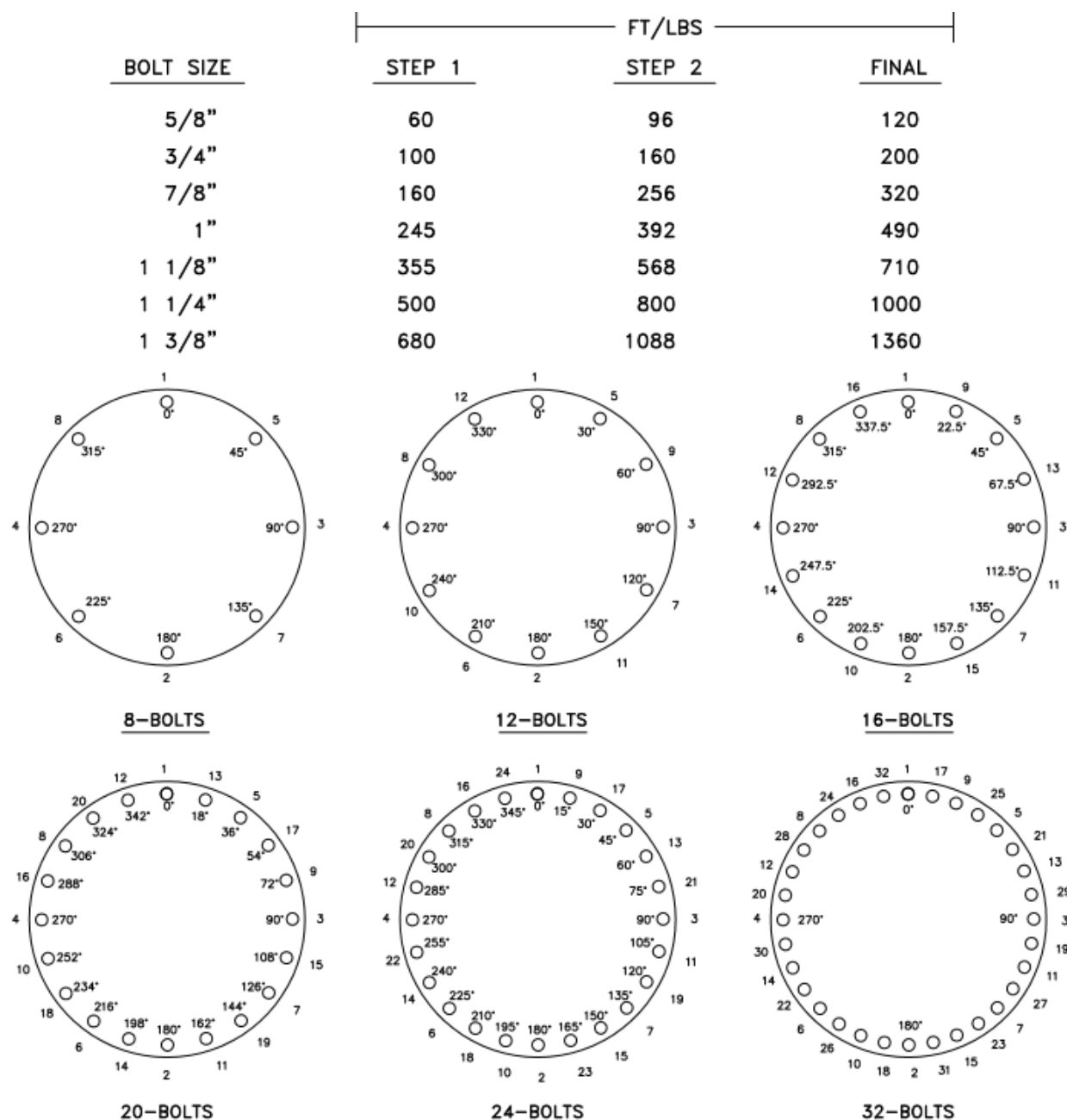


Fig 2.1 – Bolt Tightening Sequence and Torque Values

THE HX2 SERIES

SEMI-INSTANTANEOUS WATER HEATERS

THE CONTROL MASTER® CONTROL PANEL

The function of the controller is to maintain the desired water outlet and monitor its status. This is done with a PID control loop that sends a modulating signal to the steam control valve. Valve signaling is 0-10 VDC signals as standard with a 4-20mA signal also possible.

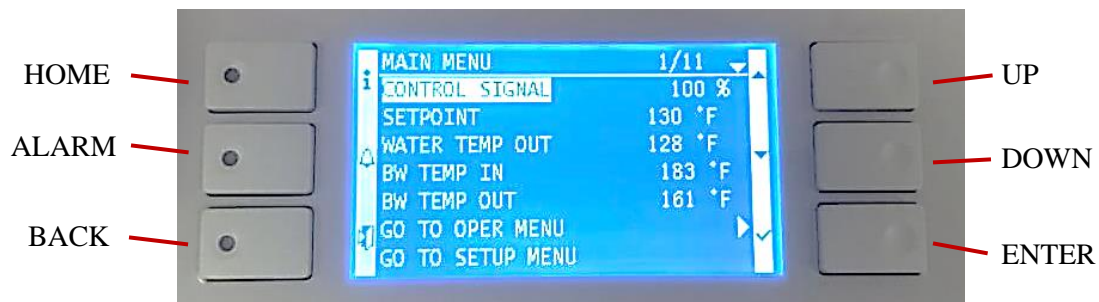
The controller also has high and low temperature alarms. In the event of a high temperature alarm, the control valve will close, shutting off steam supply and activating an alarm.

In addition to this, there is a separate high temperature sensor managed by the Control Master panel. This ties in to the solenoid dump valve to limit the introduction of over-temperature water to the system. The set points for this can be programmed at the panel, or done remotely by an analog signal input. (Selected in Menu to be either 0-10 Vdc or 4-20 mA).



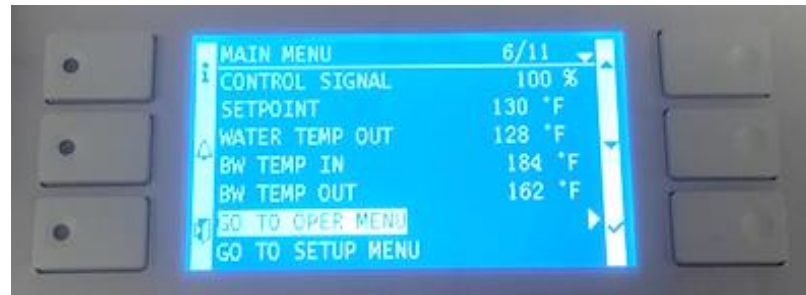
3.1 LCD Panel Display

The Control Master display and operation is shown below. Symbols shown in the border on the LCD display's left and right borders indicate the button functions. In the upper right corner, the "1/11" notation indicates the cursor is at line 1 of the 11 items on this screen menu.

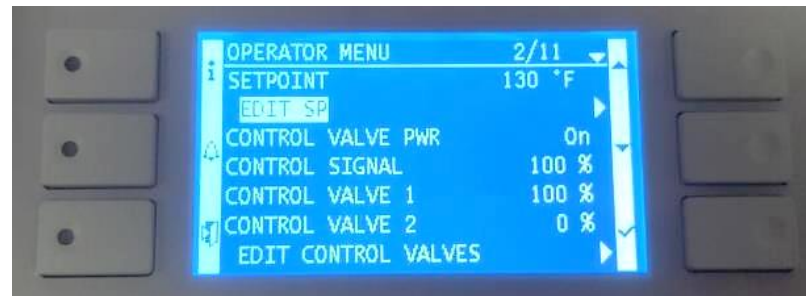


3.2 Adjusting the Set Points

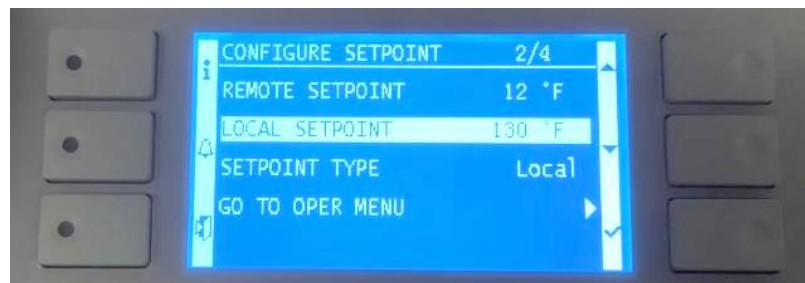
Step 1 - Access the **OPER** menu by using the down button to move the cursor to **GO TO OPER MENU** and press **ENTER**.



Step 2 - To edit the set point move to **EDIT SP** and press **ENTER**.



Step 3 - Use the **SETPOINT TYPE** to toggle between **LOCAL** or **REMOTE**. LOCAL is set at the panel and REMOTE is selected when the set point is supplied by a building automation system.



Step 4 - Use the **UP** or **DOWN** buttons to adjust and then press the **ENTER** key. Note that if the set point is changed, the high and low temperature alarm settings should be verified and adjusted as required.



3.3 Adjusting the Alarm Settings

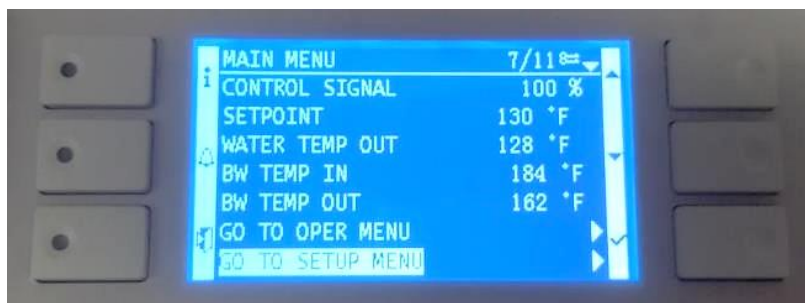
Step 1 – Access the **SET UP** menu by scrolling to the bottom of the main menu top **PASSWORD HANDLING** and press the **ENTER** key.



Step 2 - Use the **UP / DOWN** buttons to enter the password **1709**, pressing the **ENTER** key after each digit is entered, to access the Setup Menu.



Step 3 - Scroll down to **GO TO SETUP MENU** and press the **ENTER** key.



Step 4 - In the **SETUP MENU**, scroll down to **EDIT HIGHTEMPALARM** and press **ENTER**.



Step 5 – Press **ENTER** to bring up the **HIGHTEMPALARM** set point (SP) and dead band (DB) options. Press **ENTER** on the highlighted item to bring up the adjustment screen.



Step 6 - Adjust **UP** or **DOWN** and press **ENTER**.

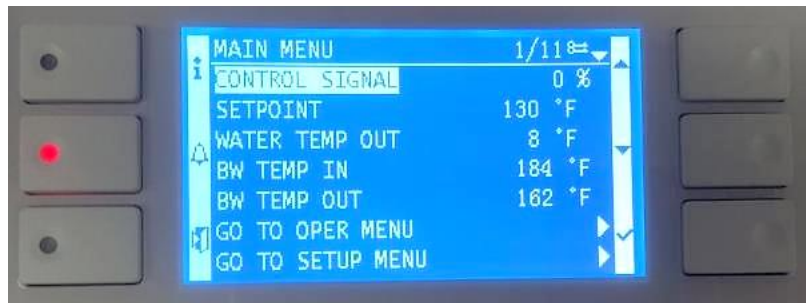


Note that the **HIGH TEMP ALARM** setting is a secondary temperature control switch. When reached it will log the event, and will automatically reset when the temperature reaches **HIGHTEMPALARM SP – HIGHTEMPALARM DB**.

These same conventions are used throughout the controller for navigating menus and adjusting settings. Use the **HOME**, **BACK**, or **GOTO** menu buttons to return to the Main Menu.

3.4 Alarm Menu

If there is an active alarm condition the red LED in the ALARM button will flash.



Step 1 - Scroll to the **ALARM HISTORY** and press **ENTER** to display the fault history. Select one of the entries and press **ENTER** for more details on the event. As the example shows below, the time and date on the screen indicates that the high temp limit switch has tripped.



The Control Master panel keeps a history log of these events. If there are no active alarms on critical items, pressing the alarm key will show this screen.



3.5 Troubleshooting and Fault Detection

As with the alarm messaging, the controller's Fault Detection provides detailed information to simplify troubleshooting. In the case of a faulty water outlet temperature sensor, the controller can distinguish between a shorted and open sensor.

A short in the sensor circuit is sensed:

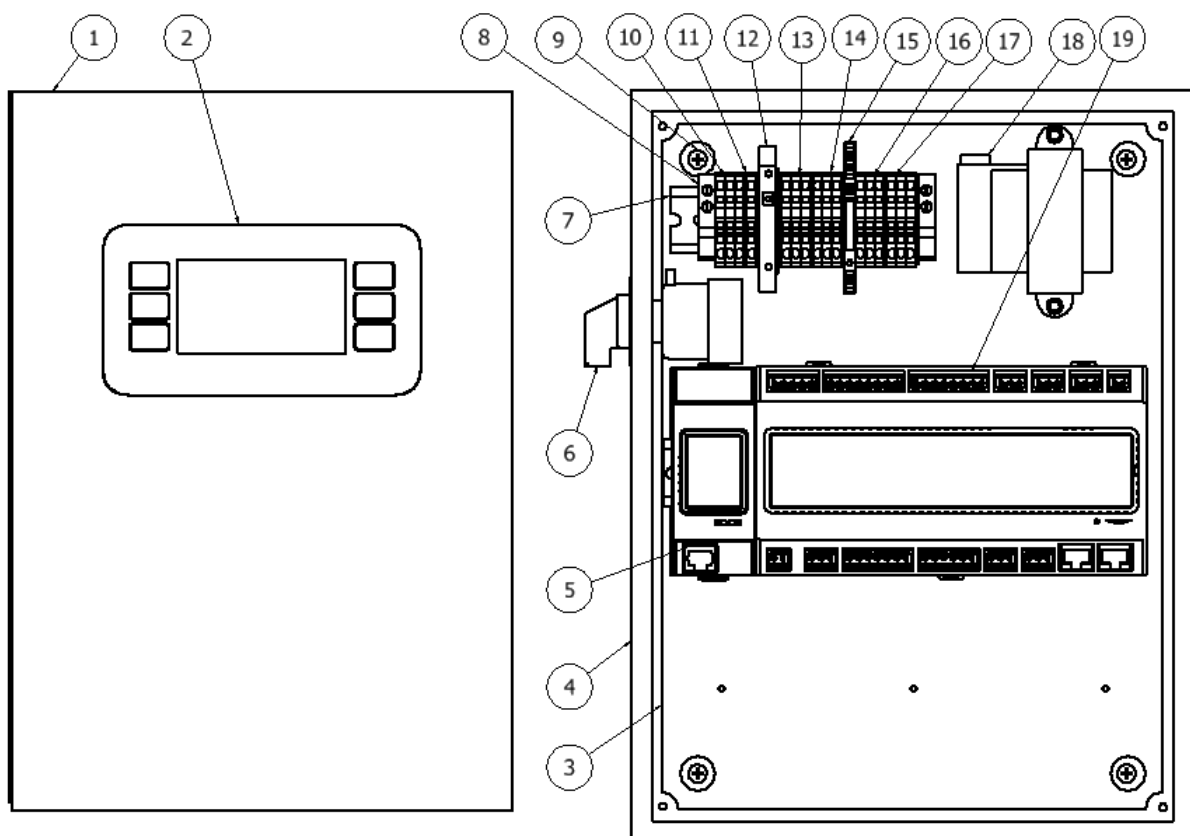


An open circuit (no sensor) is detected in the screen below.

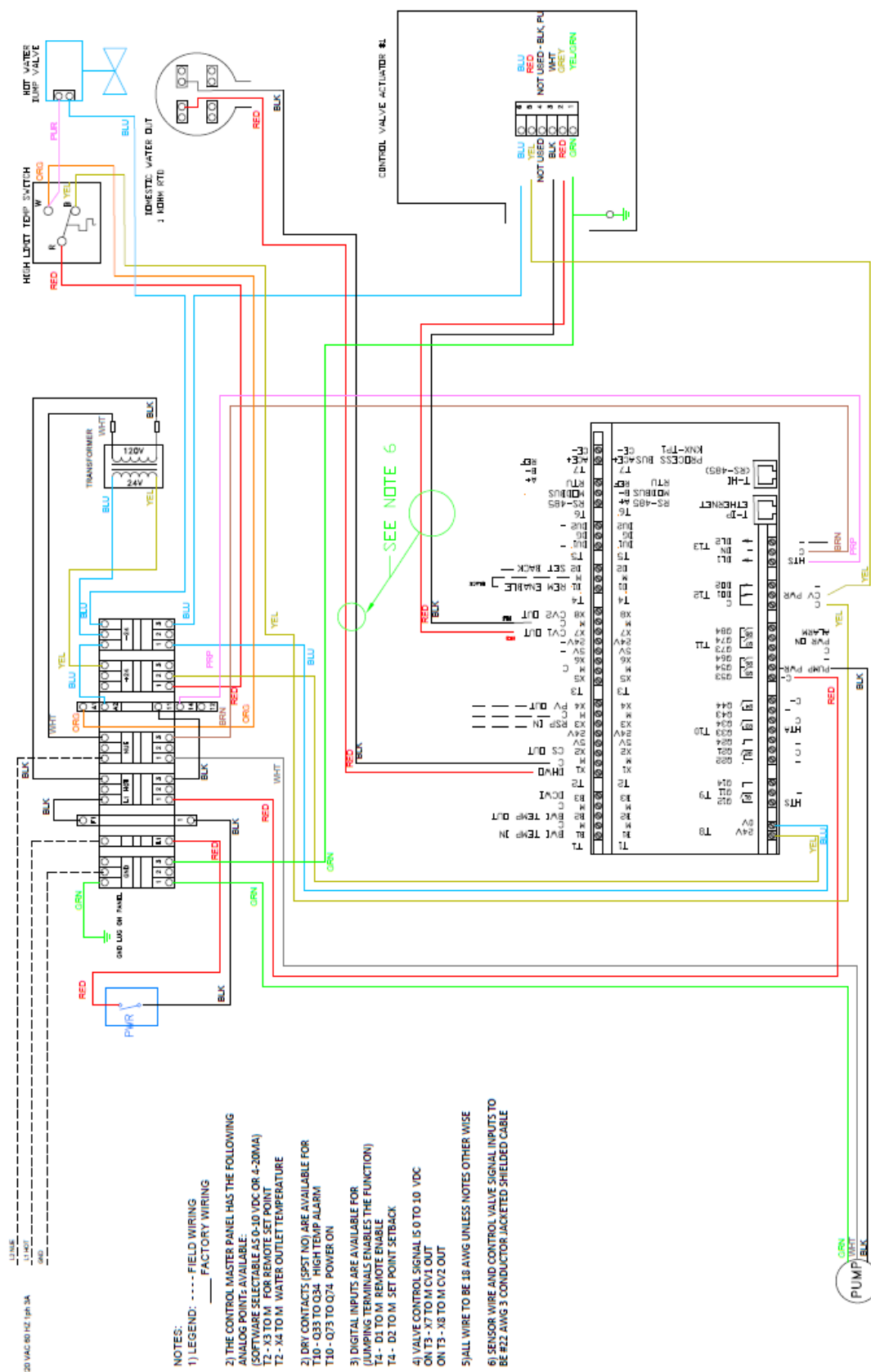


3.6 Panel Box Layout and Component Listing

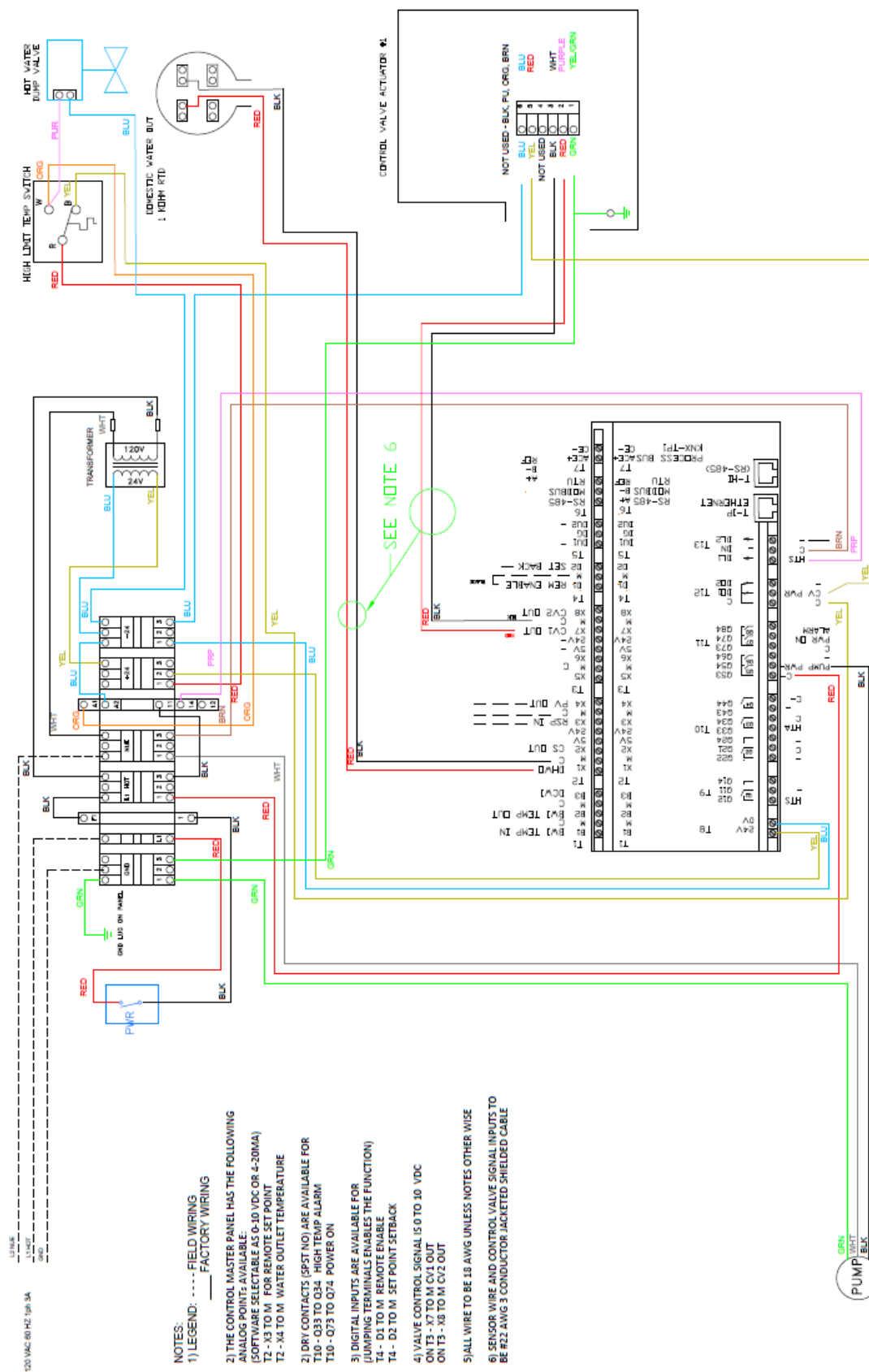
TABLE 5-1 PANEL BOX COMPONENT LAYOUT			
Item	Description	Item	Description
1	Front panel	11	120 vac l1 (hot) connection
2	HMI display	12	Fuse block
3	Internal panel	13	120 vac terminals
4	12" x 16" x 6" NEMA 4 enclosure	14	120 vac neutral terminals
5	OPTIONAL BACnet COMM MODULE	15	Hi-limit relay
6	On/off switch	16	+ 24 VAC terminals
7	DIN mounting rail	17	- 24 VAC terminals
8	Terminal block clamp	18	120 / 24 VAC transformer
9	Ground screw	19	Siemens POL687 controller
10	Ground terminals		



3.7 System Wiring Diagram - Sizes 06030 and 06036



3.8 System Wiring Diagram - Sizes 08030 through 12036



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THE HX2 SERIES

SEMI-INSTANTANEOUS WATER HEATERS

KEY SYSTEM COMPONENTS

The following is the most recent information available on the major components used in the HX2 that are outside purchased equipment. This does not include every single part or component used on the HX2, but only those that directly effect unit performance. These components include:

4.1	Circulator pump.....	2 pages
4.2	Control panel communications module (Optional BACnet MS/TP)	4 pages
4.3	Control panel communications module (Optional BACnet TCP/IP)	4 pages
4.4	Control valve actuator.....	8 pages
4.5	Control valve body.....	8 pages
4.6	High temperature sensor/switch	4 pages
4.7	Pressure / temperature relief valve	1 page
4.8	Solenoid valve.....	2 pages
4.9	Steam condensate strainer.....	2 pages
4.10	Steam trap	5 pages
4.11	Vacuum breaker.....	4 pages

Nominal sizing of the major components on the HX2 are shown below.

TABLE 4-1 OVERVIEW OF KEY COMPONENT SIZES							
HX2 Basic Size	Steam Control Valve	Steam Trap	Strainer	Vacuum Breaker	Relief Valve	Solenoid Valve	Circulator Pump & Valves
06 030	1"	2"	2"	1/2"	3/4"	3/4"	3/4"
06 036	1 1/4"						
08 030	1 1/2"	2"	2"	1/2"	1 1/2"	3/4"	3/4"
08 036	2"						
10 030	2 1/2"	2"	2"	1/2"	1 1/2"	3/4"	3/4"
10 036							
12 030	3"	2"	2"	1/2"	1 1/2"	3/4"	3/4"
12 036							

4.1 Circulator Pump – Model 007-F5-5 for All HX2 Sizes

Water Circulation Pumps & Circulators

Model 007 Cartridge Circulator

The Taco 007 Cartridge Circulator is the most popular hydronic circulator sold today. With its field serviceable cartridge design, the compact 007 provides quiet, efficient operation and unmatched reliability. The self-lubricating, maintenance free design and flow characteristics make it the ideal hydronic circulator for a wide range of applications.



Stainless Steel



Low Lead
Compliant

4.1a Circulator Pump – Model 007-F5-5 for All HX2 Sizes



Effective: June 10, 2015

Submittal Data Information

101-029

Model 007 Cartridge Circulator

Supersedes: March 25, 2013

Job: _____ Engineer: _____ Contractor: _____ Rep: _____

ITEM NO.	MODEL NO.	IMP. DIA.	G.P.M.	HEAD/FT.	H.P.	ELEC. CHAR.

Features

- Standard High Capacity Output-Compact Design
- Quiet, Efficient Operation
- Direct Drive-Low Power Consumption
- Unique Replaceable Cartridge Design-Field Serviceable
- Self Lubricating
- No Mechanical Seal
- Unmatched Reliability-Maintenance Free
- Universal Flange to Flange Dimensions
- Cast Iron or Stainless Steel Construction

Application

The Taco 007 is a cartridge style, maintenance free, wet-rotor, in-line, single stage circulator pump. It is designed for quiet operation in Hydronic heating, Radiant heating, Hydro-Air fan coils, Indirect water heaters, Chilled fresh water, and Domestic Water Recirculation systems. Available in Cast Iron or Stainless Steel construction with universal flanged connections. The unique replaceable cartridge contains all of the moving parts and allows the circulator to be easily serviced instead of replacing the entire unit. Ideal for a wide range of applications.

Pump Dimensions & Weights

Models	Casing	Flange Type*	A		B		C		D		F		G		Ship Wt.	
			in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	lbs.	kg
007-F5	Cast Iron	S	6-3/8	162	4-1/2	114	3-3/16	81	3-15/16	75	4-3/4	121	6-3/8	162	8.0	3.6
007-F5-5	Cast Iron	R	6-1/2	156	4-1/2	114	3-3/16	81	3-15/16	75	4-3/4	121	6-3/8	162	8.0	3.6
007-SF5	St. Steel	S	6-3/8	162	4-1/2	114	3-3/16	81	3-15/16	75	4-3/4	121	6-3/8	162	7.0	3.2

Materials of Construction

Casing (Volute):..... Cast Iron or Stainless Steel
 Stator Housing:..... Steel
 Cartridge:..... Stainless Steel
 Impeller:..... Non-Metallic
 Shaft:..... Ceramic
 Bearings:..... Carbon
 O-Ring & Gaskets:..... EPDM

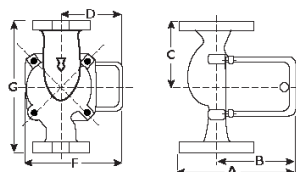
Model Nomenclature

F - Cast Iron, Flanged
 SF - Stainless Steel, Flanged

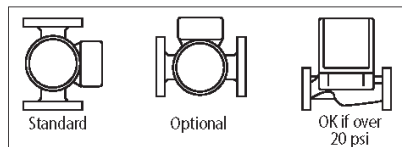
Performance Data

Max. Flow: 23 GPM
 Max. Head: 10 Feet
 Min. Fluid Temperature: 40°F (4°C)
 Max. Fluid Temperature: 230°F (110°C)
 Max. Working Pressure: 125 psi
 Connection Sizes: 3/4", 1", 1-1/4", 1-1/2" Flanged

Certifications & Listings



Mounting Positions

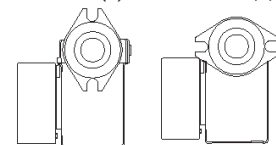


Electrical Data

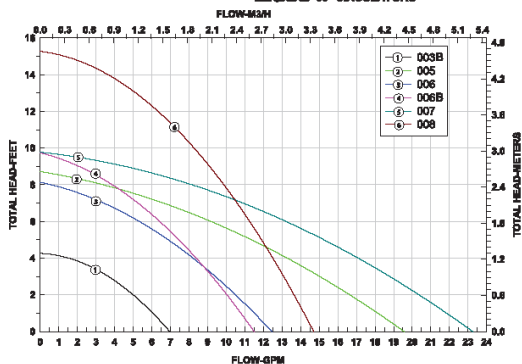
Model	Volts	Hz	Ph	Amps	RPM	HP
Cast Iron	115	60	1	.74	3250	1/25
St. Steel	115	60	1	.76	3250	1/25
Motor Type	Permanent Split Capacitor Impedance Protected					
Motor Options	220/50/1, 220/60/1, 230/60/1, 100/110/50/60/1					

*Flange Orientation Type

Standard (S) Rotated (R)



Performance Field - 60Hz **TACO** 007 CIRCULATORS



Taco, Inc., 1160 Cranston Street, Cranston, RI 02920 | Tel: (401) 942-8000 | FAX: (401) 942-2360

Taco (Canada), Ltd., 8450 Lawson Road, Suite #3, Milton, Ontario L9T 0J8 | Tel: (905) 564-9422 | FAX: (905) 564-9436

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4.2 BACnet MS/TP Communications Module (Optional, all HX2 sizes)

SIEMENS**3⁹³²**

Climatix™

Climatix communication BACnet MS/TP module

POL904.00/xxx

Communication module to connect a POL6xx.xx Climatix controller to a BACnet MS/TP network.

The POL904.00/xxx communication module offers the following features:

- Integration into a building automation and control system via BACnet MS/TP
- The module must be connected to a POL6xxx.xx controller
- Supports BACnet MS/TP (B-AAC profile) with different Baud rates
- Network parameters configurable via controller, HMI or SCOPE
- Preloaded generic BACnet server

The POL904.00/xxx communication module is part of the Climatix product range (also refer to Data Sheet 3900, Mounting Instructions M3910 and PICS document P3939en).

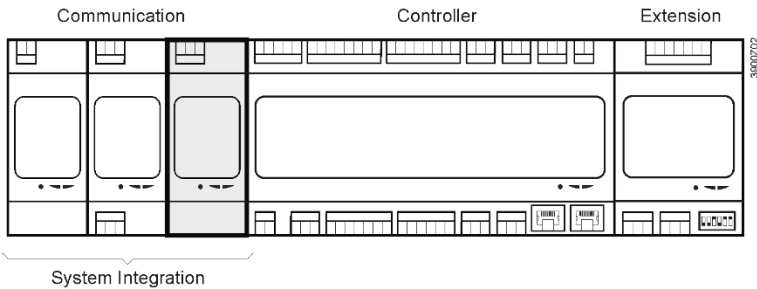
4.2a BACnet MS/TP Communications Module (Optional, all HX2 sizes)

The BACnet MS/TP protocol

BACnet, an ASHRAE building automation and control networking protocol, was designed specifically to meet the communication needs of building automation and control systems for applications such as heating, ventilation, and air conditioning control, lighting control, access control, and fire detection systems and their associated equipment. The BACnet protocol provides mechanisms by which computerized building automation devices can exchange information, regardless of the particular building service they perform. As a result, the BACnet protocol may be used by head-end workstations, general-purpose direct digital controllers, and application-specific or unitary controllers with equal effect.

MS/TP (Master-Slave/Token-Passing) is also unique to BACnet and is implemented using the EIA-485 signaling standard. This is a shielded twisted-pair (STP) LAN operating at speeds from 9.6 kbit/s up to 76.8 kbit/s. This LAN type is low cost and particularly suitable for unitary controller communications.


Installation concept



Technical data

General data	Dimensions	W x H x D: 45 x 110 x 75 mm
	Weight excl. packaging	98g
	Base	Plastic, pigeon-blue RAL 5014
	Housing	Plastic, light-grey RAL 7035
	Power supply	Via PolyCool 6XX bus connector DC 5 V (+5% / -5%), max. 270 mA

BACnet MS/TP	RS-485 (EIA-485)	
	Bus connection / electronics	Galvanically isolated
	Bus connection	A+, B-, REF (3 wires)
	Bus termination (switch by software)	680 Ω / 120 Ω +1 nF / 680 Ω


 Example FKCT	Equipped with plug	Phoenix FKCT 2,5 /3-ST
	For other types of plug (optional), refer to PolyCool range document 3900 (CB1Q3900en)	
	Solid wire	0.5...2.5 mm²
	Stranded wire (twisted or with ferrule)	0.5...1.5 mm²

COMM interface plug	Board-to-board	ZEC1,0/10-LPV-3,5 GY35AUC2C11
	 Board-to-board connector	

4.2b BACnet MS/TP Communications Module (Optional, all HX2 sizes)

System interface	Equipped with board-to-board plug	ZEC1,0/10-LPV-3,5 GY35AUC2CI1
Cable types	RS-485 interface	3-wire twisted pair, shielded
Environmental conditions	Operation Temperature Humidity Atmospheric pressure Transport Temperature Humidity Atmospheric pressure	IEC 721-3-3 -40...70 °C <90% r.h. Min. 700 hPa, corresponding to max. 3,000 m above sea level IEC 721-3-2 -40...70 °C <95% r.h. Min. 260 hPa, corresponding to max. 10,000 m above sea level
Protection	Degree of protection	IP20 (EN 60529)
Standards	Product safety Automatic electrical controls Electromagnetic compatibility Immunity Emissions CE conformity EMC directive Low-voltage directive Listings RoHS directive	EN 60730-1 EN 60730-1 +A16 EN 60730-1 +A16 2004/108/EC 2006/95/EC UL916, UL873 CSA C22.2M205 2002/95/EC (Europe) ACPEIP (China)
Ordering data	Climatix BACnet MS/TP module	POL904.00/STD

MSTP LEDs for diagnostics


 LEDs for BSP and BUS diagnostics (green, red and yellow)

Mode	BUS LED status
BACnet MS/TP running and communication ok	Green on
MS/TP not running	Yellow on
Hardware error	Red on
Mode	BSP LED status
BSP running and communication with controller	Green on
BSP running but no communication with controller	Yellow on
BSP error (software error)	Red blinking at 2 Hz
Hardware error	Red on
BSP upgrade mode	Every second alternating between red and yellow

4.2c BACnet MS/TP Communications Module (Optional, all HX2 sizes)

Engineering notes

- The communication module is attached to the controller with a board-to-board connector
- The connection to the MSTP network is made via the T1 port

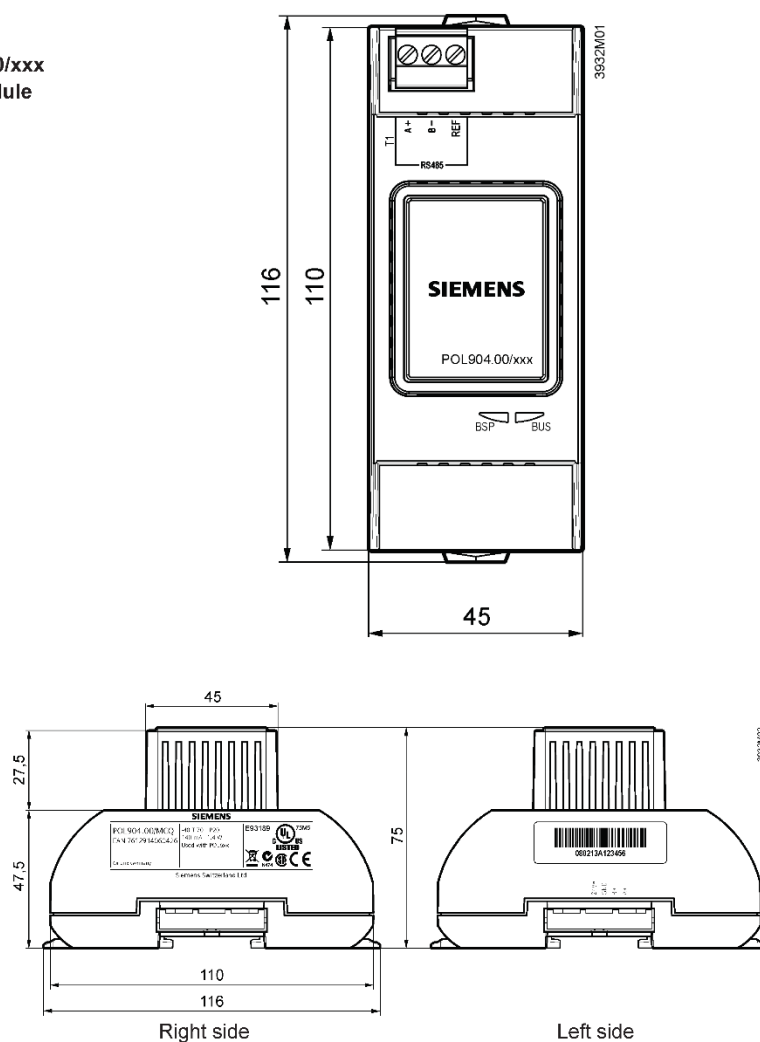
Disposal notes



The module contains electrical and electronic components and must not be disposed of together with household waste.

Local and currently valid legislation must be observed!

Layout of POL904.00/xxx
communication module



4.3 BACnet TCP/IP Communications Module (Optional, all HX2 sizes)

SIEMENS**3⁹³³**

Climatix™

Climatix communication BACnet IP module

POL908.00/xxx

Communication module to connect a POL6xx.xx Climatix controller to a BACnet IP network.

The POL908.00/xxx communication module offers the following features:

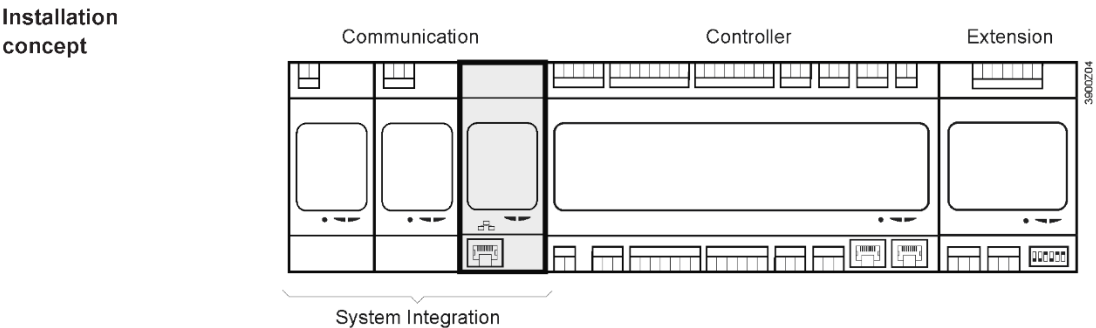
- Integration into a building automation and control system via BACnet IP
- Client communication to other BACnet devices
- Preloaded generic BACnet server
- Supports BACnet/IP (B-AAC profile and BBMD)
- Network parameters configurable via controller, HMI or SCOPE
- The module must be connected to the left side of a POL6xx.xx controller

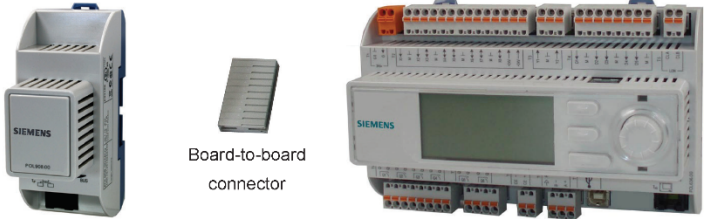
The POL908.00/xxx communication module is part of the Climatix product range (also refer Data Sheet 3900, Mounting Instructions M3910 and BACnet PICS document P3939en).

4.3a BACnet TCP/IP Communications Module (Optional, all HX2 sizes)

The BACnet / IP protocol

BACnet, an ASHRAE building automation and control networking protocol, was designed specifically to meet the communication needs of building automation and control systems for applications such as heating, ventilation, and air conditioning control, lighting control, access control, and fire detection systems and their associated equipment. The BACnet protocol provides mechanisms by which computerized building automation devices can exchange information, regardless of the particular building service they perform. As a result, the BACnet protocol may be used by head-end workstations, general-purpose direct digital controllers, and application-specific or unitary controllers with equal effect.



Technical data		
General data	Dimensions	W x H x D: 45 x 110 x 75 mm
	Weight excl. packaging	97g
	Base	Plastic, pigeon-blue RAL 5014
	Housing	Plastic, light-grey RAL 7035
	Power supply	Via system interface from controller DC 5 V (+5% / –5%), max. 270 mA
BACnet IP	Ethernet 10/100 Mbit (IEEE 802.3U)	
	Cable connection	RJ45 jack, 8 pins
	BACnet / IP interface	Supports B-AAC profile
COMM interface plug	Board-to-board	ZEC1,0/10-LPV-3,5 GY35AUC2C11
		
System interface	Equipped with board-to-board plug	
	ZEC1,0/10-LPV-3,5 GY35AUC2C11	

4.3b BACnet TCP/IP Communications Module (Optional, all HX2 sizes)

Environmental conditions	Operation	IEC 721-3-3
	Temperature	-40...70 °C
	Humidity	<90% r.h.
	Atmospheric pressure	Min. 700 hPa, corresponding to max. 3,000 m above sea level
	Transport	IEC 721-3-2
	Temperature	-40...70 °C
Protection	Humidity	<95% r.h.
	Atmospheric pressure	Min. 260 hPa, corresponding to max. 10,000 m above sea level
	Degree of protection	IP20 (EN 60529)
	Product safety	
	Automatic electrical controls	EN 60730-1
	Electromagnetic compatibility	
Standards	Immunity	EN 60730-1 +A16
	Emissions	EN 60730-1 +A16
	CE conformity	
	EMC directive	2004/108/EC
	Low-voltage directive	2006/95/EC
	Listings	
		UL916, UL873
		CSA C22.2M205
	RoHS directive	
		2002/95/EC (Europe)
Ordering data		ACPEIP (China)
	Climatix BACnet / IP module	POL908.00/STD

BACnet IP LEDs for diagnostics



LEDs for BSP and BUS diagnostics (green, red and yellow)

Mode	BUS LED status
BACnet IP running and communication ok	Green on
IP not running	Yellow on
Hardware error	Red on

Mode	BSP LED status
BSP running and communication with controller	Green on
BSP running but no communication with controller	Yellow on
BSP error (software error)	Red blinking at 2 Hz
Hardware error	Red on
BSP upgrade mode	Every second alternating between red and yellow

4.3c BACnet TCP/IP Communications Module (Optional, all HX2 sizes)

Engineering notes

- The communication module is attached to the controller with a board-to-board connector
- The connection to Ethernet is made via T-IP port (RJ45 jack)

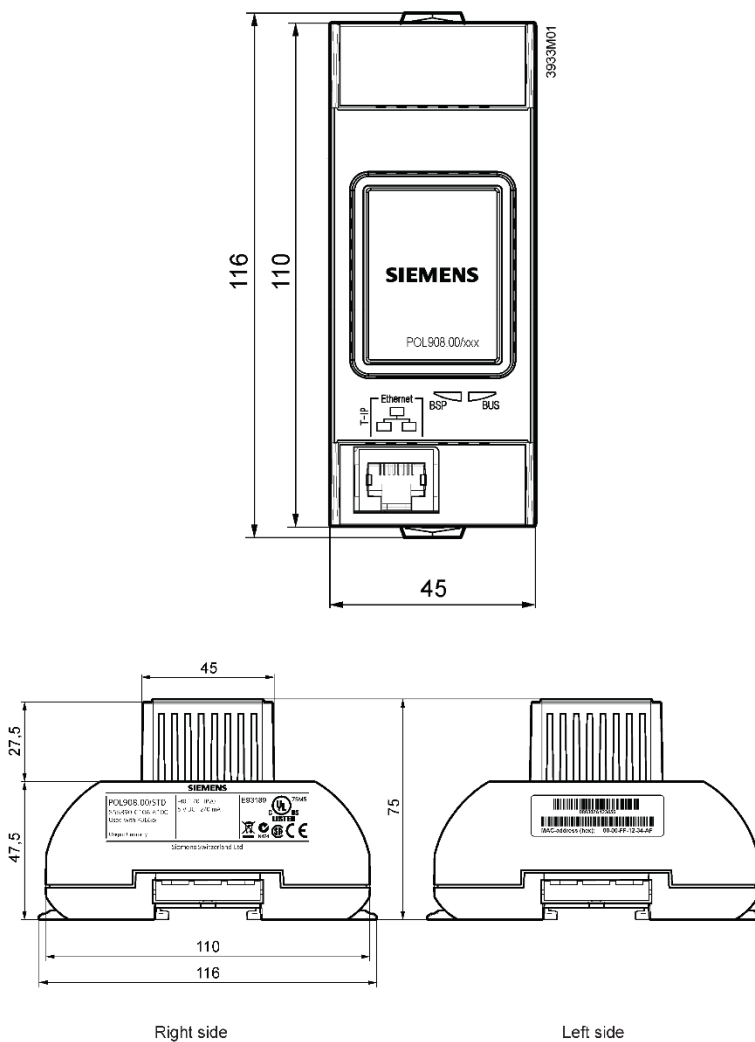
Disposal



The module contains electrical and electronic components and must not be disposed of together with household waste.

Local and currently valid legislation must be observed!

Layout of POL908.00/xxx communication module



4.4 Control Valve Actuator – All HX2 Sizes



FEATURES

JFE Series

Electric Automated
Ball Valves



- Self-locking worm drive electric actuators
- 440-17700 in-lbs torque output
- 24VAC/110VAC/220VAC, 24VDC motor voltage
- On/Off, two and three position control
- Modulating 4-20mA, 0-20mA, 0-10VDC, 0-5VDC, 1-5VDC, 2-10VDC Input
- Standard transmitter with modulating option
- Modbus Rs485, Canbus 2.0B
- Wireless LoRa, RF Ocean, distance up to 1.8 mi.
- High speed option, 2 seconds/90°
- 1.3 OLED display on Intelligent On/Off and Modulating models
- Push button manual override feature on Intelligent models
- High performance brushless motors
- Ball bearing design for high cycle applications

JFE Series

Electric Automated
Ball Valves



4665 Interstate Drive 1 866 95J FLOW
Cincinnati OH 45246 www.jflowcontrols.com

4.4a Control Valve Actuator - All HX2 Sizes

Electric Actuators

- 177-970 in-lbs torque output
- 95 - 265VAC/VDC, 24VAC/VDC motor voltage
- Super capacitor and Li-ion battery option for fail-safe and two wire operation
- On/Off, two and three position control, 90°, 180°, 270°
- Modulating 4-20mA, 0-20mA, 0-10VDC, 0-5VDC, 1-5VDC, 2-10VDC Input
- Standard transmitter with modulating option
- Modbus RS485, Canbus 2.0B
- Wireless LoRa, RF Ocean, distance up to 1.8 miles
- Timer and repeat timer option (hours, days, weeks)
- Level control option
- High speed option, 1 second / 90°
- 1.3 OLED display on Intelligent On/Off and Modulating models
- Push button manual override feature on Intelligent models
- High performance brushless motors
- Bearing design for high cycle applications

Featuring KT Fail-safe option with Super Capacitor or Li-ion battery technology!

1.3 inch OLED Display with Push Button Operation

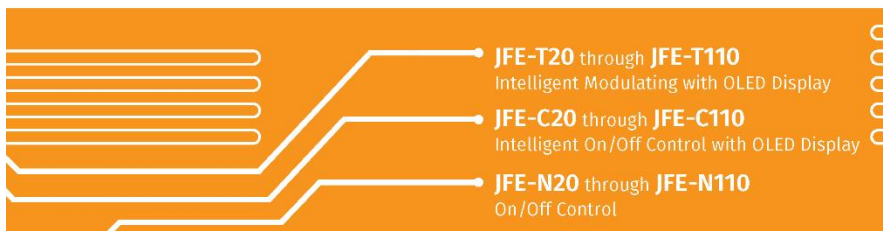


3 Position Control

Visual Dome Position Display

ISO Direct Mount

Manual Override with Wrench



4.4b Control Valve Actuator – HX2 Sixes 06030 and 06036



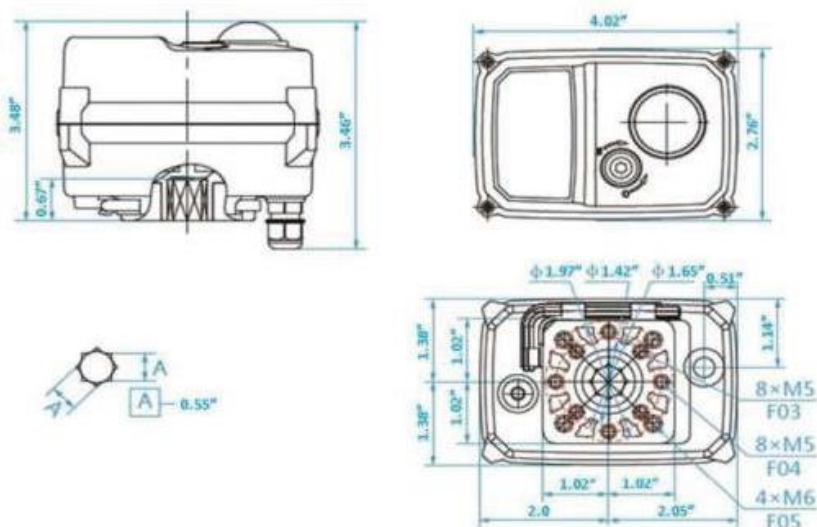
- Die-Cast Aluminum Housing
- 177 In-Lbs Torque Output
- Multi-Voltage Capability
- Bright OLED screen
- Push Button Local Control

JFE-T20 0-10VDC Smart Fail-Safe Electric Actuator

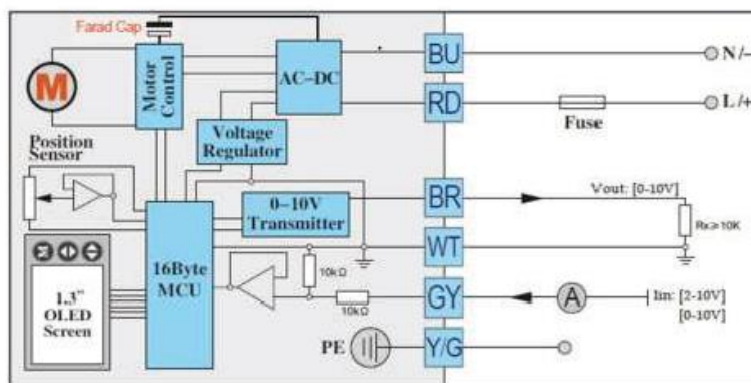
Model	JFE-T20	177in.lbs SMART FAILSAFE MODULATING ACTUATOR
	High voltage	Low voltage
Rated Voltage	120V AC/DC	24V AC/DC
Voltage Range	AC 95-265V 50/60Hz, DC 100-300V	AC 18-26V 50/60Hz, DC 22-32V
Consumption	9.6W run, 0.12W hold	9.6W run, 0.85W hold
Peak Current	35mA (AC230V), 75mA (DC110V) for 5ms	350mA (DC 24V) for 5ms
Fuse	1A	2A
Maximum Break Torque in. lbs	177	177
Manual operation	Yes, by hexagonal wrench (supplied in clip) when no power is being applied	
Control Signal input/ output	0 - 10VDC, 2 - 10VDC	
Run time	≈ 15 sec	≈ 15 sec
STANDARD FEATURES:		
Operating Frequency	100% Duty cycle, suitable for continuous running	
Position Sensing	No mechanical cams fitted; magnetic with digital sensing.	
Maximum Angle of Rotation	330°±5°	
Position Indication (Visual)	2 color (red/ yellow) dome for local visual confirmation.	
End Position Indication	2 x Electronic relay	
Mounting Restriction	None, it can be mounted at any angle. Leave space for manual operation and electrical connection.	
ISO 5211	F03 & F05 (+ F04 which mounts at 45 degrees)	
Female Drive	0.551" (14mm) octagon x 0.67" (17mm) deep	
Ingress Protection	Ip67, Type 4, 4X	
Max Media Temperature	≤ 176°F	
Ambient Temperature	-4°F to +176°F (Aluminium)	
Non-operating Temperature	≤ -40°F to ≥ 176°F	
Ambient Humidity	5-95% RH non-condensing	
Explosion Proof	Actuator is not explosion proof and should not be placed in hazardous areas.	
Shock Resistance	≥ 300m/s²	
Vibration	10 to 55Hz, 1.5mm double amplitude	
Noise level	Around 50dB	
Flame Retardant Level	V-0 rating based on UL-94 testing	
Certification	CE	
Maintenance	Maintenance free	
Cable Entry	Cable fitting provided, actuator pre-wired with approx. 20" flying lead	
Housing	Aluminum cover	
Weight	Aluminium housing 1.81lbs	

4.4c Control Valve Actuator – HX2 Sizes 06030 and 06036

DIMENSIONS: (inch) JFE-T20 177in.lbs SMART FAILSAFE MODULATING ACTUATOR



JFE-T20 MODULATING WIRING 0-10VDC



4665 Interstate Drive
Channahon, OH 46048

1-888-95J-FLOW
www.jflowcontrols.com

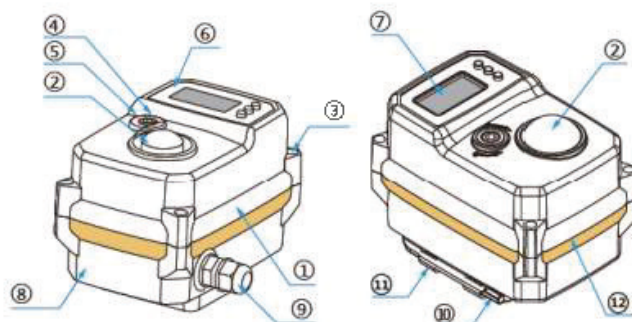
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4.4d Control Valve Actuator – HX2 Sizes 06030 and 06030

MATERIALS

JFE-T20 177in.lbs SMART FAILSAFE MODULATING ACTUATOR



No	PART	MATERIAL
1	Housing	Aluminium base, ABS cover
2	Indicator	Clear plastic
3	Cover screws	304SS
4	Override drive	304SS
5	Seal	NBR
6	Screen cover	Rubber
7	Screen	OLED
8	ID Label	PVC
9	Connector	Plastic
10	Allen key	Tool steel
11	Allen key clip	ABS
12	Cover seal	NBR

LOCAL CONTROLS

JFE-T20 177in.lbs SMART FAILSAFE MODULATING ACTUATOR

Overview: All Jflow smart electric actuators have local controls as standard. An OLED screen and 3 positive push buttons create a user friendly interface for local control and a variety of adjustments. The screen is easy to read, with bright blue letters on a black background, and the use of the push buttons to adjust settings is intuitive. The local controls require power to be applied to the actuator to operate.

Local controls:



M button is used to enter and switch menus (Hold for three seconds).

K2 is used in conjunction with K3 for adjusting the actuator settings.

K3 is used for changing settings, navigating menus, exiting and saving.

OLED Screen with clear blue letters against a black background.

Standard local control function options:

MANUAL CONTROL	The Jflow Controls smart actuator can be opened and closed using the K2 and K3 buttons (hold down K3 for three seconds to access).
DEAD BAND	Adjusts the accuracy and sensitivity of the actuator.
SPEED CONTROL	The working time can be increased either by setting a step timer {run/stop/run/stop}, or continuous running by adjusting the PWM.
CLOSED POSITION	The close position of the actuator can be adjusted by using the K2 and K3 buttons (zero adjustment).
REVERSE ACTING	Actuator closes when an open signal is received, and vice versa.
EXTEND ANGLE	Adjust the open position by adjusting the span of the actuator. Typically used to set 0-180 degree operation.
SIGNAL LOSS	Sets one of three positions the actuator takes at loss of signal control.
CURRENT ADJUST	Adjust the output current of the actuator.
FAILSAFE ACTION	Selects the actuator position when power is cut.
CAPACITOR CHARGE	Sets the value for how much the capacitor will be charged before the actuator can be used.



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Cincinnati OH 45240

1-800-85J-FLOW
www.jflowcontrols.com

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4.4e Control Valve Actuator – HX2 Sixes 08030 Through 12036



- ABS Housing
- 530/970 In-Lbs Torque Output
- Visual Dome Indicator
- Bright OLED screen
- Push Button Local Control

JFE-T60/T110 Smart Modulating Electric

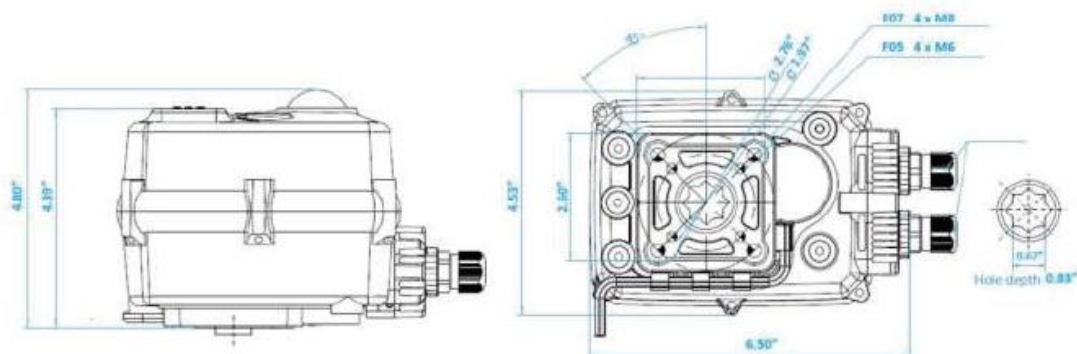
Model: JFE-T60/T110 - 530/970in.lbs SMART MODULATING FAILSAFE ACTUATOR			
	AC	AC/DC	DC
Rated Voltage	AC230V	AC/DC 24V	24VDC
Voltage Range	AC 95-265V/DC100-300V	AC18-26/DC22-32V	DC22-32V
Consumption	15W run, 2.1W hold	15W run, 2.1W hold	15W run, 2.1W hold
Peak current	0.52A @ 5ms 230V	4.5A @ 5ms 24VDC	4.5A for 5ms 24VDC
Fuse	5A	10A	10A
Maximum Break Torque in.lbs	530/974		
Run & Reset Torque in.lbs	530/974		
Manual operation	Yes, by hexagonal wrench (supplied in clip) when no power. Local control via touch buttons under power.		
Control Signal Input/ Output	0-20mA, 4-20mA, 0-5V, 1-5V, 0-10V, 2-10V		
Run time	≈ 10 sec		
STANDARD FEATURES:			
Operating Frequency	AC: 75% duty cycle DC is continuous.		
Position Confirmation	Mechanically driven dome style visual 2 color indicator		
Mounting Restriction	None, it can be mounted at any angle. Leave space for manual operation and electrical connection.		
End Position Indication	Micro-switches operated by adjustable internal cams, set slightly ahead of the final motor stop position.		
ISO 5211	F05 & F07		
Working Angle	Factory set at 90°±2°, maximum angle of rotation 330°±5°		
Failsafe Function	Internally fitted industrial battery, charged when power applied. Normally Closed, Open or Stay Put on power loss.		
Female Drive	.67" (17mm) octagon x .83" (21mm) deep		
Ingress Protection	IP67		
Max Media Temperature	176° F		
Ambient Temperature	-4° F to 176° F		
Non-operating Temperature	-40° F to 176° F		
Ambient Humidity	5-95% RH non-condensing		
Explosion Proof	Actuator is not explosion proof and should not be placed in hazardous areas.		
Housing	Plastic (ABS) cover		
Weight	Standard ABS housing 4.85lbs		

NOTE: With Series 60 110 you can select your Modulating Control (ex 4 20mA or 0 10V) via the menu system. You can also select Normally Open, Normally Closed or Keep Position on signal loss. See the User Guide for more details.

4.4f Control Valve Actuator – HX2 Sizes 08030 Through 12036

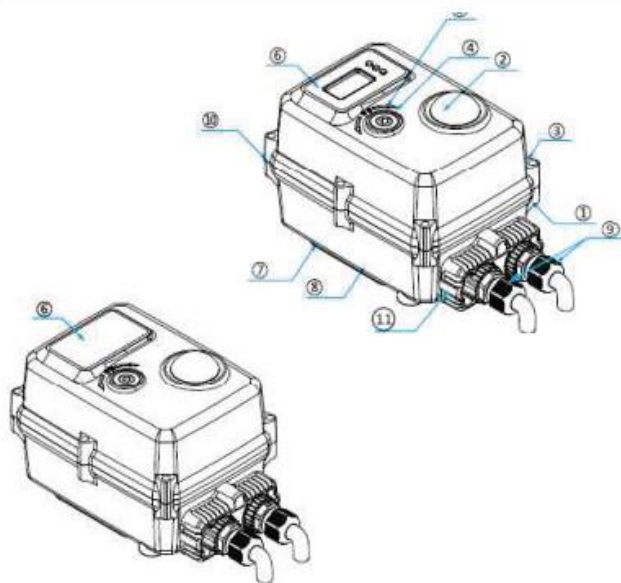
MATERIALS

JFE-T60/T110 530/970in.lbs SMART MODULATING FAILSAFE ACTUATOR



MATERIALS

JFE-T60/T110 530/970in.lbs SMART MODULATING FAILSAFE ACTUATOR



No	PART	MATERIAL
1	Housing	ABS
2	Indicator	Transparent AS
3	Cover screws	304SS
4	Override drive	304SS
5	Seal	NBR
6	Screen	OLED
7	Seal	NBR
8	Connector	Plastic
9	Cover seal	NBR
10	Seal	NBR
11	Label	PVC
12	Allen key	Tool steel
13	Terminal box	Heatproof ABS
14	Output drive	304SS

PART NUMBERS

JFE-T60/T110 530/970in.lbs SMART MODULATING FAILSAFE ACTUATOR

Model	Cycle Time	Voltage	Heater	Options
JFE-T60- JFE-T110-	1.0 Sec	V1 AC 95- 265V	H 5W/24kΩ	A Alarm Output
		V2 AC/DC 24V		



4665 Interstate Drive
Cincinnati OH 45240

1-800-85-JFLOW
www.jflowcontrols.com

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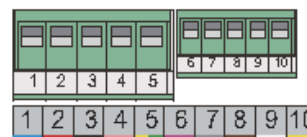
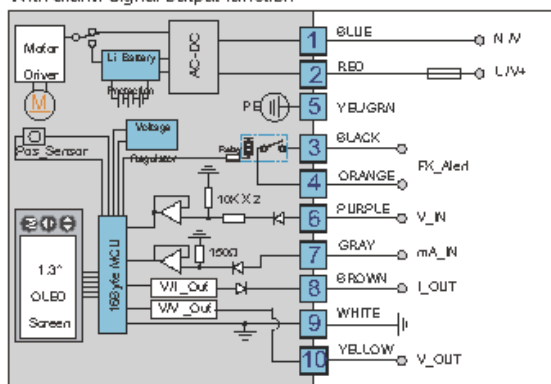
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4.4g Control Valve Actuator – HX2 Sixes 08030 Through 12036

WIRING DIAGRAM

JFE-T60/T110 530/970in.lbs SMART MODULATING FAILSAFE ACTUATOR

With alarm signal output function



NOTE: ACTUATORS SHOULD HAVE DEDICATED POWER AND CONTROL

LOCAL CONTROLS

JFE-T60/T110 530/970in.lbs SMART MODULATING FAILSAFE ACTUATOR

Overview: All Jflow smart electric actuators have local controls as standard. An OLED screen and 3 positive push buttons create a user friendly userface for local control and a variety of adjustments. The screen is easy to read, with bright blue letters on a black background, and the use of the push buttons to adjust settings is intuitive. The local controls require power to be applied to the actuator to operate.

Local controls:



- M button is used to enter and switch menus (Hold for three seconds).
- K2 is used in conjunction with K3 for adjusting the actuator settings.
- K3 is used for changing settings, navigating menus, exiting and saving.
- OLED Screen with clear blue letters against a black background.

Standard local control function options:

MANUAL CONTROL	The Jflow smart actuator can be opened and closed using the K2 and K3 buttons (hold down K3 for three seconds to access).
DEAD BAND	Adjusts the accuracy and sensitivity of the actuator.
SPEED CONTROL	The working time can be increased either by setting a step timer (run/stop/run/stop), or continuous running by adjusting the PWM.
CLOSED POSITION	The close position of the actuator can be adjusted by using the K2 and K3 buttons (zero adjustment).
REVERSE ACTING	Actuator closes when an open signal is received, and vice versa.
EXTEND ANGLE	Adjust the open position by adjusting the span of the actuator. Typically used to set 0-180 degree operation.
SIGNAL LOSS	Sets one of three positions the actuator takes at loss of signal control.
CURRENT ADJUST	Adjust the output current of the actuator.
FAILSAFE ACTION	Selects the actuator position when power is cut.
BATTERY CHARGE	Sets the value for how much the battery will be charged before the actuator can be used.



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4.5 Inlet Valve – 1" NPT for HX2 Size 06030 and 1¼" NPT for HX2 Size 06036, 1½" NPT for HX2 Size 08030 and 2" NPT for HX2 Size 08036



STANDARDS

- Valve design: ASME B16.34
- Material certification: EN10204-3.1 MTR
- End connections: ASME B16.11, ASME B1.20.1, ASME B16.25
- Steel casting: MSS SP-55
- Valve marking: MSS SP-25
- Valve test: API 598
- Direct mount: ISO 5211
- Stem Connection: DIN 3337
- Class / Pressure Rating: 800/1000 psi
- Sulfide stress cracking: NACE MR-01-75

DM4500 Series

Three Piece Direct Mount Ball Valves

FEATURES & BENEFITS

- Body and end caps quality investment casting
- With ISO 5211 mounting pad
- With locking function
- Adjustable Stem Packing
- Available in Stainless Steel or Carbon Steel
- Blow-out proof stem design
- 100% air tested under water at 100 psi
- Working pressure: Class 150 / 800 1000 psi
- End type: threaded, socket weld, butt weld or flanged end ANSI 150

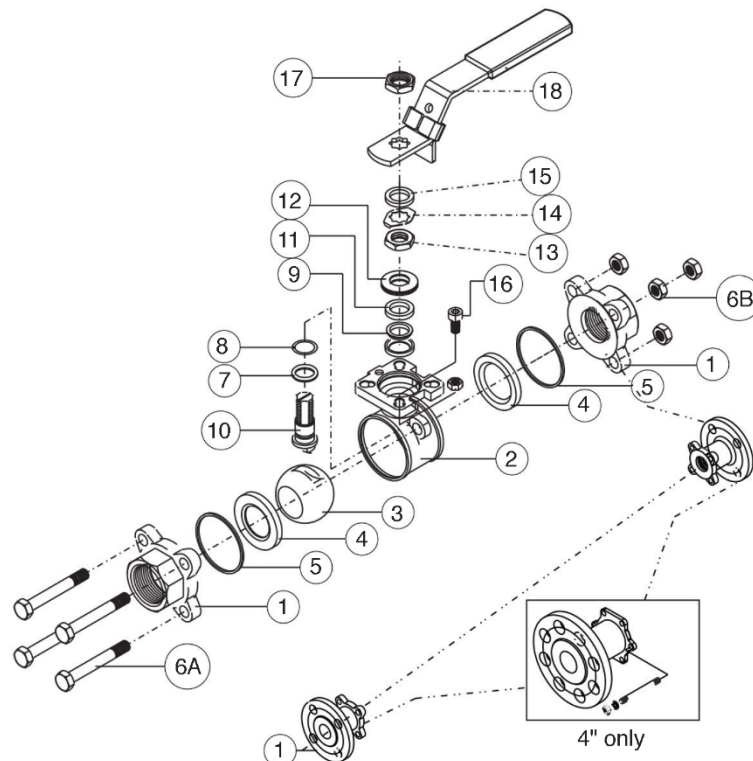
OPTIONS

- Spring return (dead man) handle
- Oval handle
- Automation applicable
- Handle with limit switch box
- Extended stem for isolation
- V-ball for control valve in 25°, 30°, 45°, 60°, 90°, slot or custom
- PTFE cavity filler
- Hastalloy C, Super Duplex, Alloy 20 and Monel
- Extended stem for isolation

**4.5a Valve Body – 1" NPT for HX2 Size 06030 and 1¼" NPT for HX2 Size 06036,
1½" NPT for HX2 Size 08030 and 2" NPT for HX2 Size 08036**

DM4500 Series Ball Valves

BILL OF MATERIALS

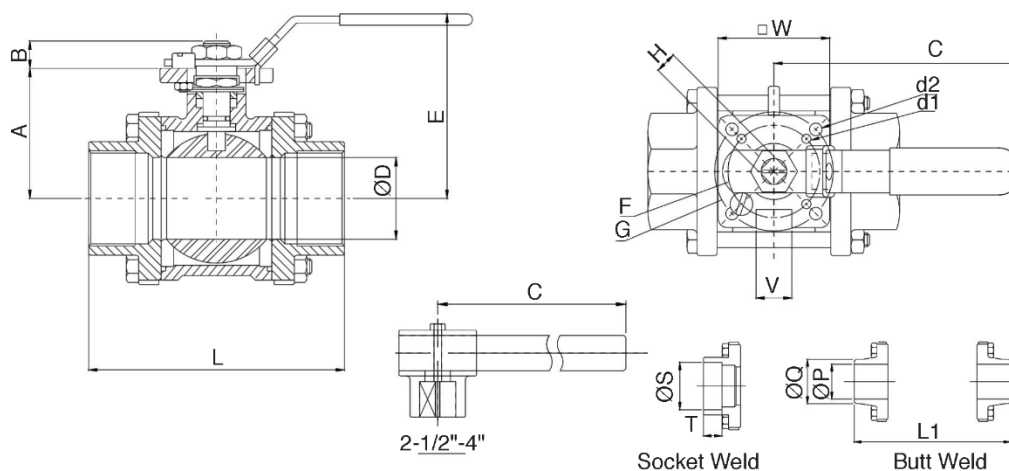


No	Part Name	Materials	No	Part Name	Materials
1	End Cap	CF8M/WCB	13	Stem Nut	SS304
2	Body	CF8M/WCB	14	Nut Stop	SS304
3	Ball	SS316	15	Space Washer	SS304
4	Seat	TFM	16	Plater	SS304
5	Gasket	TFM	17	Stop Pin	SS304
6A	Bolts	SS304	18	Handle Nut	SS304
6B	Nuts	SS304	19	Handle	SS304
7	Thrust Washer	TFM	20	Handle Cover	Plastic
8	O-Ring	Viton	21	Set Bolt	SS304
9	Stem Packing	TFM	22	Lever Head	CF8
10	Stem	SS316	23	Lever	Steel Pipe
11	Gland	SS304	24		
12	Disk Washer	SS301			

**4.5b Valve Body – 1" NPT for HX2 Size 06030 and 1¼" NPT for HX2 Size 06036,
1½" NPT for HX2 Size 08030 and 2" NPT for HX2 Size 08036**

DM4500 Series Ball Valves

DIMENSIONS (THREADED)



Size	A	B	C	D	d1	d2	E	F	G	H	L
1/4"	1.46	0.43	5.12	0.43	0.24	0.24	2.28	1.42	1.65	0.35	2.38
3/8"	1.46	0.43	5.12	0.49	0.24	0.24	2.28	1.42	1.65	0.35	2.38
1/2"	1.46	0.43	5.12	0.59	0.24	0.24	2.28	1.42	1.65	0.35	2.5
3/4"	1.57	0.43	5.12	0.79	0.24	0.24	2.52	1.42	1.65	0.35	2.97
1"	1.89	0.55	6.10	0.98	0.24	0.28	3.03	1.65	1.97	0.43	3.39
1-1/4"	2.11	0.55	6.10	1.26	0.24	0.28	3.26	1.65	1.97	0.43	3.78
1-1/2"	2.50	0.71	8.07	1.50	0.28	0.35	3.62	1.97	2.76	0.55	4.37
2"	2.83	0.71	8.07	1.97	0.28	0.35	3.94	1.97	2.76	0.55	5.08
2-1/2"	3.62	0.87	11.42	2.56	0.35	0.44	5.51	2.76	4.02	0.67	6.00
3"	4.02	0.87	11.42	3.15	0.35	0.44	5.91	2.76	4.02	0.67	6.63
4"	5.20	1.02	13.20	3.94	0.44	0.53	7.68	4.02	4.92	0.87	8.37

Size	S	T	P	Q	L1	V	W
1/4"	0.56	0.44	0.39	0.67	2.38	0.75	1.73
3/8"	0.69	0.44	0.52	0.75	2.38	0.75	1.73
1/2"	0.86	0.50	0.61	0.85	2.50	0.75	1.73
3/4"	1.07	0.56	0.81	1.08	2.97	0.75	1.73
1"	1.33	0.63	1.05	1.36	3.39	0.94	2.05
1-1/4"	1.67	0.69	1.38	1.69	4.09	0.94	2.05
1-1/2"	1.92	0.75	1.59	1.93	4.61	1.10	2.09
2"	2.41	0.87	2.06	2.40	5.43	1.10	2.09
2-1/2"	2.91	0.87	2.56	3.03	6.69	-	-
3"	3.54	1.00	3.15	3.58	7.56	-	-
4"	4.54	1.26	3.94	4.53	8.90	-	-

**4.5c Valve Body – 1" NPT for HX2 Size 06030 and 1¼" NPT for HX2 Size 06036,
1½" NPT for HX2 Size 08030 and 2" NPT for HX2 Size 08036**

DM4500 Series Ball Valves

BREAK-TORQUE VALUE (IN-LB AT 0 PSI)

Size	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
Grease	31	31	44	49	62	97	150	204	310	407	637
Non-Grease	44	44	53	62	84	142	239	266	602	752	929

Note 1: The greases J Flow Controls uses include lubricants and anti-seize that are both SILICONE-FREE

Note 2: J Flow Controls strongly suggests increasing the torque at least 30% - 40% for safety factor when mounting an actuator

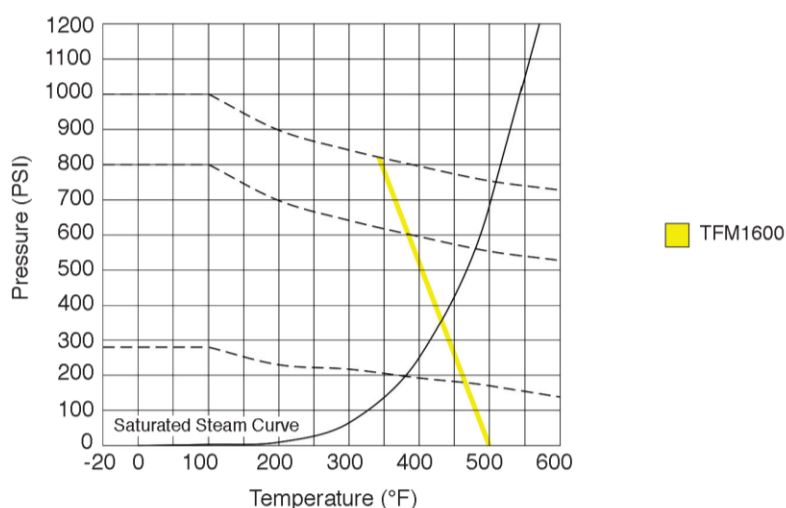
FLOW COEFFICIENT (FULL PORT VALVE)

Size	Cv Factor
1/4"	8.5
3/8"	8.5
1/2"	21
3/4"	50
1"	90
1-1/4"	110
1-1/2"	240
2"	400
2-1/2"	700
3"	980
4"	1700

4.5d Valve Body – 1" NPT for HX2 Size 06030, 1¼" for HX2 Size 06036, 1 ½" for HX2 Size 08030 and 2" for HX2 Size 08036

DM4500 Series Ball Valves

PRESSURE/TEMPERATURE CHART



HOW TO ORDER

Series	Body	Ball & Stem	Port	Packing/Body Seal Material	Seat
DM45	2 WCB/A015	3 316	FP Full Port	TM TFM1600	CF Cavity Filled (PTFE)
	3 316		15 15° V-Ball		TT PTFE
			30 30° V-Ball		TM TFM1600
			60 60° V-Ball		
			90 90° V-Ball		

End Connections	Material Options	Design Options
F15 ANSI 150 RF Flange F30 ANSI 300 RF Flange SCW Socket Weld FPT Female NPT W10 Butt Weld Sch 10 W40 Butt Weld Sch 40 W80 Butt Weld Sch 80 FSW Female NPT X Socket Weld FMT Female Metric THD	NA Standard	NA Standard

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**4.5e Valve Body – 2½" Flanged for HX2 Sizes 10030 /036,
3" Flanged for HX2 Sizes 12030 / 036**



STANDARDS

- CRN registered
- Valve Design: ASME B16.34
- Steel Casting: MSS SP-55
- Face-to-face: ASME B16.10
- Flange Connection: ASME B16.50
- Pressure Test: API 598 (ISO 5208)
- TA-Luft Low Emission
- Valve Marking: MSS SP-25
- Sulfide Stress Cracking: NACE MR-01-75

J Flow Controls DM2500/2500 Series Direct Mount 2 Piece Flanged Ball Valve

FEATURES & BENEFITS

- Body & end caps quality investment
- Available in Stainless & Carbon Steel (1/2" - 12")
- ISO 5211 mounting pad
- Adjustable stem packing
- Blow-out proof stem design
- 100% air tested under water at 60 - 100 psi
- Working pressure of Class 150 / 300
- Temperature range: -320°F to 800°F
- Fire safe: API 607 5th Edition - option
- Spring (dead man) handle - option
- PTFE cavity filler (option)
- PTFE / PFA coating (40-70 um) - option
- V-ball for control valve in 15°, 30°, 60°, 90°, slot, custom
- Cryogenic valves, metal seated valves, metal seated
- MTR reports available

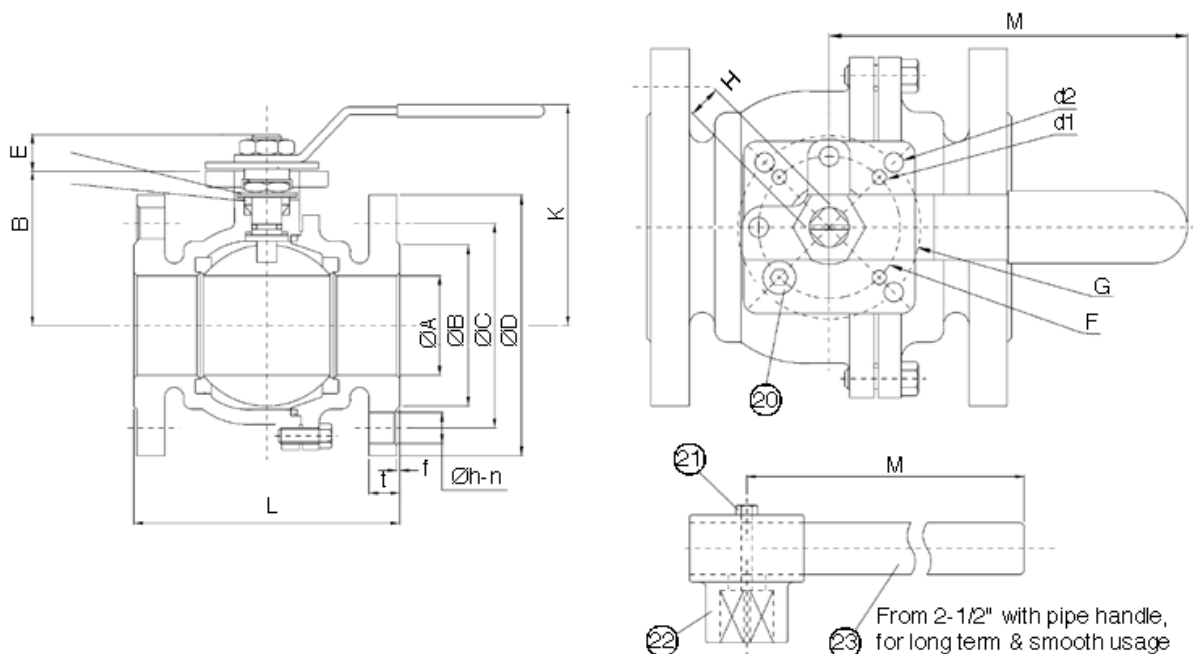
APPLICATIONS & INDUSTRIES

- Chemical & petrochemical
- HVAC applications
- Power generation plants
- Pulp & paper plants
- Ship building industries
- Fiber industries
- Steel & iron industries
- Coal & mining industries
- Food industries
- LNG, HRSG industries
- Oil refinery industries
- Desalination industries

4.5f Valve Body – 2½" Flanged for HX2 Sizes 10030 /036, 3" Flanged for HX2 Sizes 12030 / 036

DM2500 Flanged Valves

DIMENSIONS ANSI 150 (1/2" - 4")



Size (in)	A	B	E	L	H	K	M	F	G	d1	d2	Class 150# Flanged Dimensions								Wt Lbs
												D	C	h	N	t	g	f		
1/2	0.59	1.89	0.43	4.25	0.354	3.15	5.12	1.42	1.65	0.236	0.236	3.50	2.38	0.63	4	0.45	1.38	0.06	3.8	
3/4	0.79	2.09	0.43	4.61	0.354	3.15	5.12	1.42	1.65	0.236	0.236	3.86	2.76	0.63	4	0.45	1.69	0.06	4.7	
1	0.98	2.32	0.55	5.00	0.433	3.54	6.50	1.65	1.97	0.236	0.276	4.25	3.13	0.63	4	0.45	2.01	0.06	6.4	
1-1/4	1.26	2.80	0.55	5.51	0.433	4.02	6.50	1.65	1.97	0.236	0.276	4.61	3.50	0.63	4	0.50	2.52	0.06	8.8	
1-1/2	1.50	2.99	0.71	6.50	0.551	4.33	8.07	1.97	2.76	0.276	0.362	5.00	3.88	0.63	4	0.56	2.87	0.06	13	
2	1.97	3.35	0.71	7.01	0.551	4.72	8.07	1.97	2.76	0.276	0.362	5.98	4.74	0.75	4	0.63	3.62	0.06	19	
2-1/2	2.56	3.68	0.91	7.48	0.669	5.51	11.81	2.76	4.02	0.362	0.449	7.01	5.49	0.75	4	0.70	4.13	0.06	29	
3	3.15	4.06	0.91	7.99	0.669	5.91	13.39	2.76	4.02	0.362	0.449	7.48	6.00	0.75	4	0.75	5.00	0.06	38	
4"	3.94	5.20	0.98	9.02	0.866	7.09	16.54	4.02	4.92	0.449	0.51	9.02	7.50	0.75	8	0.94	6.18	0.06	64	

BREAK-TORQUE VALUE (IN-LB AT 0 PSI) - CLASS 150

Size	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"
Grease	49	64	78	115	177	212	478	549	1097
Non-Grease	64	83	117	161	266	319	841	1168	2168

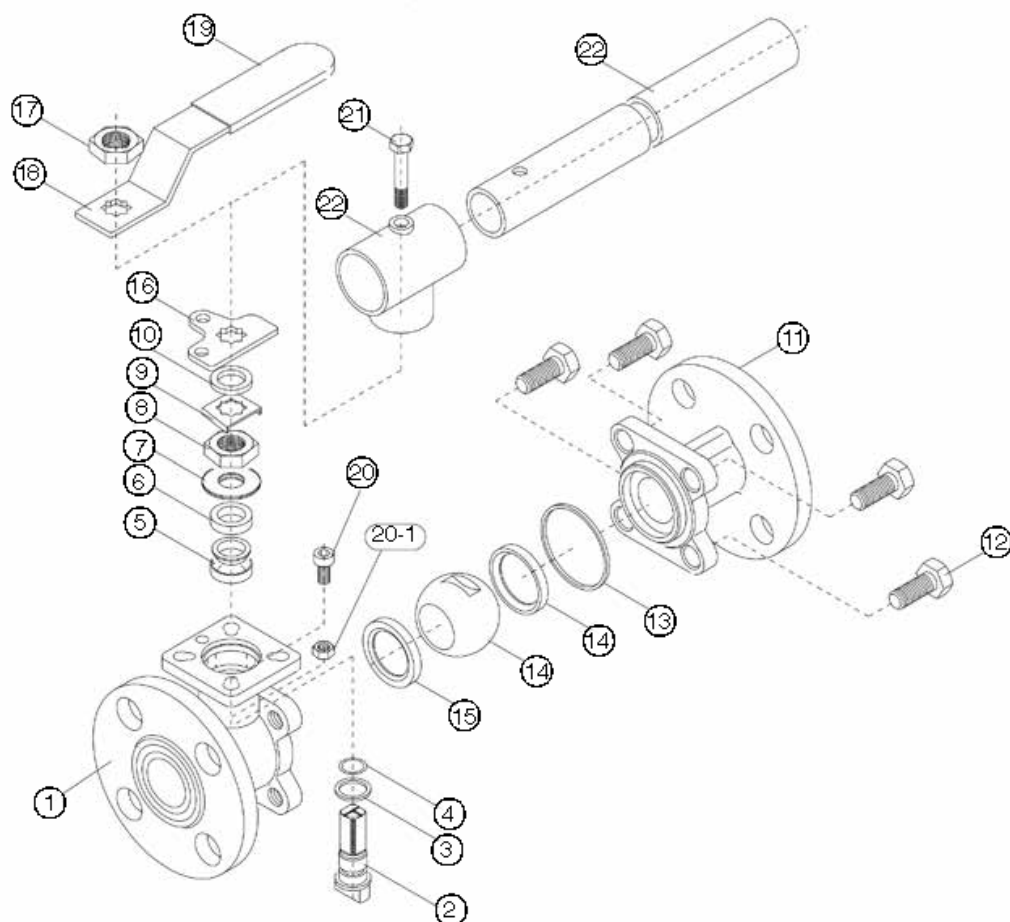
Note 1: The grease J Flow Control uses include lubricants and anti-seize grease that are both SILICONE-FREE

Note 2: J Flow Controls strongly suggests increasing the torque at least 20% - 40% (depending on seat material) for safety factor when mounting an actuator

4.5g Inlet Valve – 2½" Flanged for HX2 Size 10030 / 036, 3" Flanged for HX2 Sizes 12030 / 036

DM2500 Flanged Valves

PARTS IDENTIFICATION (1/2" - 4")



Part No.	Name	Stainless Steel	Carbon Steel	Part No.	Name	Stainless Steel	Carbon Steel
1	Body	CF8M	A216 WCB	13	Gasket	TFM	TFM
2	Stem	316SST	304SST	14	Ball	316SST	304SST
3	Thrust Washer	TFM	TFM	15	Ball Seat	TFM	TFM
4	O-ring	Viton	Viton	16	Stopper Plate	304SST	304SST
5	Stem Bearing	TFM	TFM	17	Handle Nut	304SST	304SST
6	Gland	304SST	304SST	18	Handle	304SST	304SST
7	Stem Washer	301SST	301SST	19	Sleeve	Vinyl	Vinyl
8	Stem Nut	304SST	304SST	20	Stop Pin	304SST	304SST
9	Nut Stop	304SST	304SST	21	Set Bolt	304SST	304SST
10	Washer	304SST	304SST	22	Lever Head	CF8	CF8
11	Flanged End	CF8M	A216 WCB	23	Pipe Handle	Steel Pipe	Steel Pipe
12	Bolt	304SST	304SST				

4.6 High Temperature Sensor/Switch – All HX2 Sizes

Honeywell

L6006A Aquastat® Controller

INSTALLATION INSTRUCTIONS

APPLICATION

The Honeywell SUPER TRADELINE® L6006A Controller operates in response to temperature changes in hydronic heating systems. It provides spdt switching for high limit, low limit or circulator control.

The L6006A is designed for horizontal or vertical insertion/mounting using an immersion well (not included). Refer to Wells and Fittings for Temperature Controllers, form 68-0040, for part numbers and ordering information.

A package of heat-conductive compound is included for use when the sensing bulb is inserted into a well designed for a larger bulb.

NOTE: See form 69-0955, 107408, 120650 Heat Conductive Compounds Material Safety Data Sheet (MSDS) when used with this Aquastat® Controller.

A 124904 Well Adapter, for use on old wells that do not fit the L6006A Immersion Well Clamp, can be ordered separately, see form 68-0040. A setting stop is factory-installed to prevent setting above 240°F (116°C) limit. Adjustable differential range is 5°F to 30°F (3°C to 17°C).

Table 1. Electrical Ratings (Amperes):

Type	120 Vac	240 Vac
Full Load	8	5.1
Locked Rotor	48	30.6
Millivoltage	0.25 to 0.25 to 12 Vdc	

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INSTALLATION

When Installing this Product...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.

WARNING

Electrical Shock Hazard.
Can cause serious injury, death or equipment damage.
Disconnect power supply before connecting wiring to prevent electrical shock or equipment damage.

Follow instructions furnished by the system manufacturer, if available. Otherwise, refer to the following procedure.

To install this L6006A as a replacement for other L6006A models:

1. Shut off the power and remove the old control in the existing application. If the old immersion well appears suitable and if the adapter clamp on the L6006A Aquastat Controller fits the old immersion well spud, this immersion well does not need to be replaced.
2. If the immersion well is to be replaced and if the system is filled, drain the system to a point below the boiler tapping.
3. Remove plug (or old immersion well) from boiler tapping.
4. Install new immersion well (not included). When a boiler tapping is greater than 1/2 in. or 3/4 in. NPT, use a reduction fitting to adapt the boiler opening to the 1/2 in. or 3/4 in. NPT threads that are standard with the well or fitting. Use thread seal compound or equivalent on the fitting.



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4.6a High Temperature Sensor/Switch – All HX2 Sizes

L6006A AQUASTAT® CONTROLLER

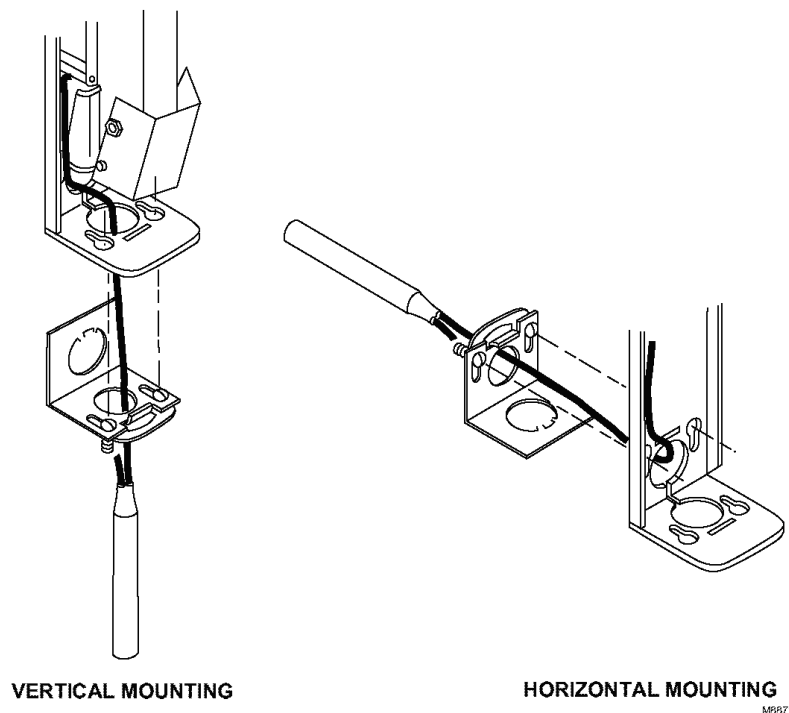
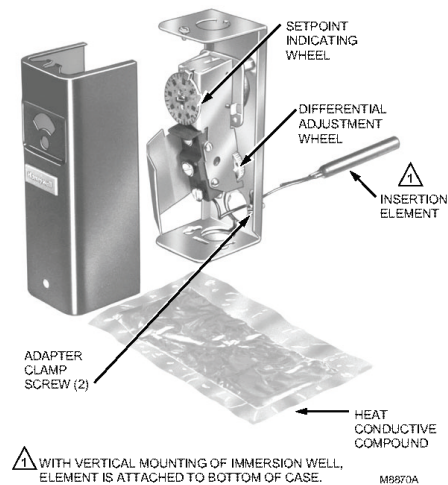
NOTE: Some models have an adjustable tubing length to 3 in. (76 mm). In these models, pull out extra tubing inside the case if needed.

5. Fill the system. Make sure that the well is screwed in tightly enough to prevent leakage. Do not tighten after controller is secured to the well, applying force to the case.
6. Loosen the screw (at the top of the case, above the scale setting), and remove the cover. Loosen the two screws that secure the adapter clamp (See Fig. 1).
7. Determine whether vertical or horizontal mounting method is desired; see Fig. 2 for mounting bracket placement.
8. Insert the sensing element into the immersion well.
9. Fasten the case of the Aquastat Controller to the well with the adapter clamp. Make certain that the clamp is properly positioned over the groove of the well spud. Also be sure the flange at the opening of the well fits snugly into the opening of the case. Be sure the sensing element bulb bottoms in the well.

Wiring

Disconnect power supply before connecting wiring to prevent electrical shock or equipment damage. Make sure all wiring complies with local electrical codes and ordinances. The case has a knockout for 1/2 in. conduit.

Fig. 3 and 4 show typical wiring diagrams of Aquastat® Controllers used in heating systems.



4.6b Aquastat High Temperature Sensor/Switch – All HX2 Sizes

L6006A AQUASTAT® CONTROLLER

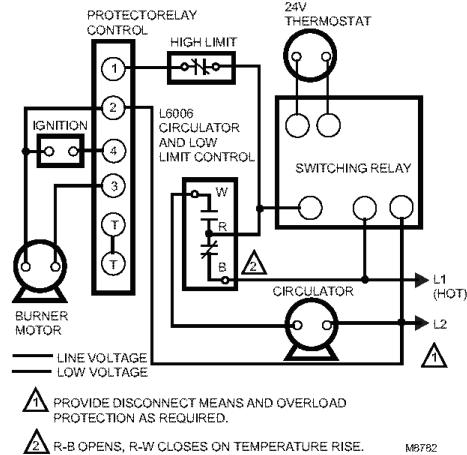


Fig. 3. Typical wiring hookup using L6006 for low limit and circulator control in oil-fired hydronic system.

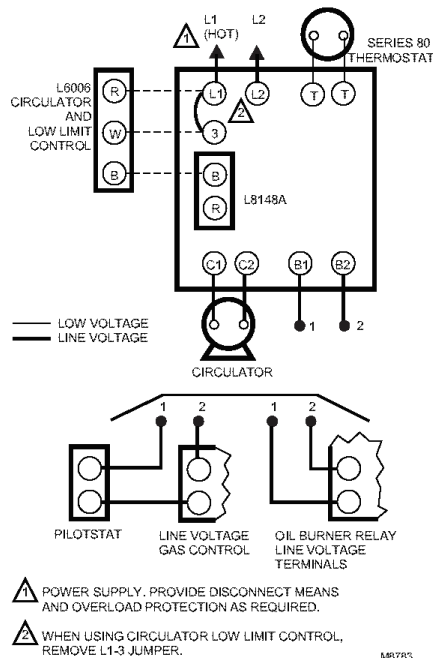


Fig. 4. Typical wiring hookup using L6006 with L8148A Aquastat Relay.

OPERATION

Select control settings according to the heating system manufacturer recommendations.

High-limit Controller—shuts off burner when water temperature exceeds high-limit setting. R-B contacts make, and burner restarts when temperature drops to high-limit setting minus the temperature differential.

Low-limit Controller—maintains minimum water temperature for domestic hot water; e.g., tankless coil in heating boiler. Makes R-B contacts at temperature setting minus differential.

Circulator Controller—prevents circulation of water that is not hot enough. Breaks R-W contacts for circulator circuit at temperature setting minus differential; remakes the R-W contacts for circuit when the temperature setting is reached.

Switching action operates as follows:

When there is a drop in water temperature (to dial setting, less differential), the R to B contacts make and the R to W contacts break, preventing circulator operation. When there is a rise in water temperature (to dial setting), R to B contacts break and R to W circulator contacts make.

ADJUSTMENT

Set the differential according to the system manufacturer recommendations. Rotate the wheel on the back of the snap switch until the desired reading is aligned with the V notch in the frame. The wheel provides an adjustment from 5°F to 30°F (3°C to 17°C). Replace the cover on the Aquastat Controller.

Adjust the control point according to the system manufacturer recommendations. To adjust, insert a screwdriver in the slotted screw type head located beneath the window in the cover. Turn the scale to the desired control point. Move the factory-set stop if desired, as shown in Fig. 5.

TO CHANGE SETTING, INSERT BENT PAPER CLIP INTO SMALL HOLE IN DIAL AND PUSH ENOUGH TO ALLOW FOR MOVEMENT OF FACTORY-SET STOP.

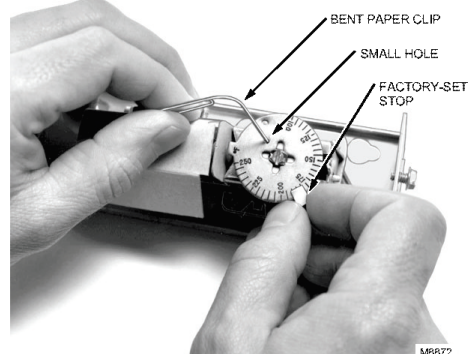


Fig. 5. Moving factory-set stop on L6006A.

4.6c Aquastat High Temperature Sensor/Switch – All HX2 Sizes

L6006A AQUASTAT® CONTROLLER

CHECKOUT

Check to make certain that the Aquastat Controller was installed and adjusted properly. Put the system into operation and observe the action of the device through several cycles to make certain that it provides proper limit and circulator control.

Honeywell

Automation and Control Solutions
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422

Automation and Control Solutions
Honeywell Limited-Honeywell Limitée
35 Dynamic Drive
Scarborough, Ontario
M1V 4Z9

69-0235—5 G.R. Rev. 12-01



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www.honeywell.com

4.7 Relief Valve – ¾" Inlet for HX2 Size 06030, 1½" All Other HX2 Sizes

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.

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

CAPACITY

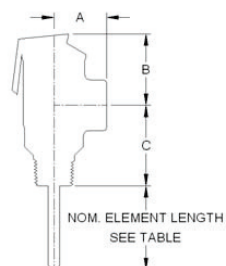
PART NUMBER	INLET SIZE	ELEM LGTH	INLET TYPE	CSA CAPACITY BTU/HR	ASME CAPACITY BTU/HR
18C5113125	¾"	3"	MALE	185,000	1,619,000
18C5113150	¾"	3"	MALE	185,000	1,912,000
18C5115125	¾"	5"	MALE	205,000	1,619,000
18C5115150	¾"	5"	MALE	205,000	1,912,000
18C5118125	¾"	8"	MALE	205,000	1,619,000
18C5118150	¾"	8"	MALE	205,000	1,912,000
18C5123125	¾"	3"	FBM	185,000	1,619,000
18C5123150	¾"	3"	FBM	185,000	1,912,000
18C5125125	¾"	5"	FBM	205,000	1,619,000
18C5125150	¾"	5"	FBM	205,000	1,912,000
18C5128125	¾"	8"	FBM	205,000	1,619,000
18C5128150	¾"	8"	FBM	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"	FBM	750,000	3,070,000
18C5225150	1"	5"	FBM	750,000	3,625,000
18C5228125	1"	8"	FBM	750,000	3,070,000
18C5228150	1"	8"	FBM	750,000	3,625,000
18C5314125	1-1/4"	4"	MALE	750,000	3,070,000
18C5314150	1-1/4"	4"	MALE	750,000	3,625,000
18C5424125	1-1/2"	4"	FBM	1,200,000	5,125,000
18C5424150	1-1/2"	4"	FBM	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

**APPROVALS**

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

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)



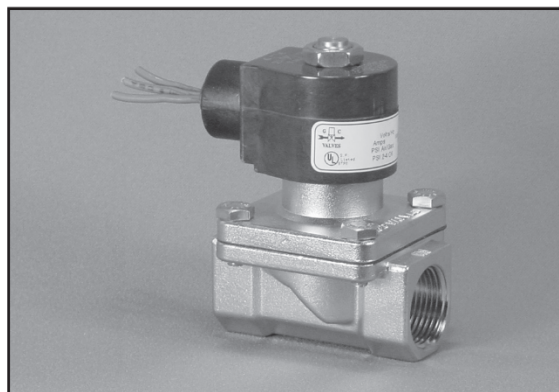
Conbraco Industries, Inc. 701 Matthews Mint Hill Rd. Matthews NC 28105 USA ; www.apollovalves.com ; 704-841-6000

This specification is provided for reference only. Conbraco reserves the right to change any portion of this specification without notice and without incurring obligation to make such changes to Conbraco products previously or subsequently sold.

4.8 Solenoid Valve – 3/4" Valve for All HX2 Sizes

S21 Series 

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



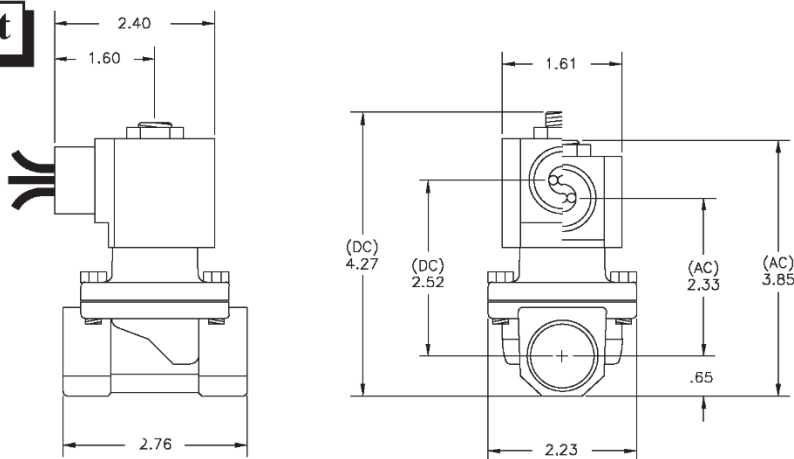
Materials	Seals:	Nitrile, Viton®, Ethylene Propylene
	Orifice: Pilot Main	Stainless Steel Stainless Steel Ø 3/4"
Electrical	Standard Housing:	Encapsulated Waterproof Conduit (NEMA 4/4X)
	Optional Housings:	Metallic Conduit, Explosion-proof (NEMA 7), Grommet, Open Frame, Junction Box (single or dual knockouts),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

* Not available for all variations

© Registered Trademark of DuPont Co.

Dimensions/Weight

Weight (lbs.)
3.3



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

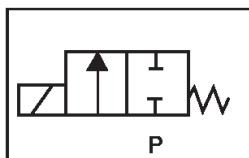
3/4-S-211-1

4.8a Solenoid Valve – 3/4" Valve for All HX2 Sizes

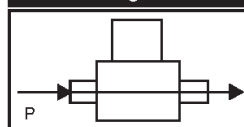
S211 – 3/4" NPT, Stainless Steel Body, Type 316, Normally Closed

Valve Selection List

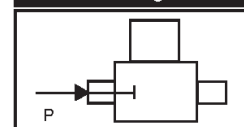
Normally Closed



Energized



De-Energized



Pipe Size	Orifice Size	C _v	Minimum	Operating Pressure Differential (psi)								Max Fluid Temp. °F	Seal Material	Power Consumption (Watts)		Model Code	
				Maximum										AC		DC	(120V/60HZ — 110V/50HZ Shown)
				Air/Gas		Water		Light Oil		Steam*							
				AC	DC	AC	DC	AC	DC	AC	DC						
NPT	IN			AC	DC	AC	DC	AC	DC	AC	DC	AC	DC	Stainless Steel Body Type 316			
3/4	3/4	6.7	4	200	150	150	100	—	—	—	—	295	EPR	8	10	S211GF02E7EG5	
	3/4	6.7	4	200	150	150	100	150	100	—	—	180	Nitrile	8	10	S211GF02J7EG5	
	3/4	6.7	4	200	150	150	100	150	100	—	—	230	Viton	8	10	S211GF02L7EG5	
	3/4	6.7	4	—	—	—	—	—	—	50*	50*	295	EPR	8	10	S211GH02E7EG5	

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

Part Numbering

1	2	3	4	5	6	7	8	9	10	11	12	13
S	2	1	1	G	F	0	2	E	7	E	G	5
Series			Operating Mode	Housing*	Coil Class*	Voltage*		Seal Material	Body Material	Pipe Connection	Orifice Size	
S21			1: Normally Closed	G: Conduit	F: Class F H: Class H	02: 120/60 110/50		E: EPR J: Nitrile L: Viton	7: 316 SS	E: 3/4" NPT	G5: 3/4"	
* See the "Engineering Guide" for additional voltages, variations and options.												

Coil Data


Coil Family	
Type	Size
AC	S3
DC	S4

Frequency (Hz)		60	50
Nominal Power (VA)		Inrush	36
		Holding	13

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

3/4-S-211-2

4.9 Steam Condensate Strainer – 2" For All HX2 Sizes




TITAN
TITAN FLOW CONTROL, INC.

"Y" (WYE) STRAINER ♦ ANSI CLASS 250
CAST IRON ♦ THREADED ENDS

YS12-0617

MODEL: YS 12-CI
(CAST IRON)




3" YS 12-CI

FEATURES

SIZE RANGE : 1/4" ~ 3"

- ♦ **LARGE STRAINING CAPACITY**
WITH ITS LARGE BODY AND SIZEABLE STRAINING ELEMENT, THE YS12 PROVIDES EXCELLENT OPEN AREA RATIOS THAT ARE TYPICALLY TWO-AND-A-HALF TIMES LARGER THAN THE CORRESPONDING PIPELINE.
- ♦ **PRECISION MACHINED SEATS**
PRECISION MACHINED SCREEN SEATS IN BOTH THE BODY AND CAP HELP TO ENSURE ACCURATE POSITIONING OF THE SCREEN DURING REASSEMBLY AFTER CLEANING. ALSO, THE MACHINED BODY SEATS ENABLE FINER FILTRATION BY PREVENTING DEBRIS BYPASS.
- ♦ **SELF-CLEANING CAPABILITY**
WITH A TAPPED NPT SLOW-OFF CONNECTION, THIS UNIT CAN BE FITTED WITH A SLOW-DOWN VALVE WHICH FACILITATES CLEANING OF THE STRAINING ELEMENT. PLEASE CONTACT FACTORY FOR MORE INFORMATION.
- ♦ **EPOXY PAINTED**
ALL UNITS ARE EPOXY PAINTED TO HELP RESIST RUST AND CORROSION.
- ♦ **POTABLE WATER/FDA APPROVED COATINGS AVAILABLE**
IN ADDITION TO ITS LEAD FREE, CAST IRON BODY, TITAN CAN PROVIDE NSF/ANSI AND FDA APPROVED EPOXY COATINGS WHICH MAKE THIS PRODUCT SUITABLE FOR POTABLE WATER AND FOOD CONTACT APPLICATIONS. NUMEROUS OPTIONS ARE AVAILABLE. PLEASE CONTACT US FOR MORE DETAILS.
- ♦ **THREADED CAP**
TITAN'S YS12 HAS STRAIGHT THREADS TO PERMIT EASY CAP REMOVAL FOR CLEANING AND PROPER ALIGNMENT WHEN REASSEMBLING STRAINER.
- ♦ **NATURAL GAS AND OTHER SPECIAL APPLICATIONS**
TITAN HAS EXTENSIVELY TESTED THE YS12 IN GAS APPLICATIONS AND DETERMINED THAT BUNA-N GASKETS PROVIDE SUPERB SEALING CAPABILITIES FOR THE SERVICE. ALWAYS SPECIFY IF A SPECIAL GASKET OR SCREEN IS REQUIRED FOR A SPECIFIC APPLICATION.



Lead Free,
Cast Iron Body

TECHNICAL

PRESSURE/TEMPERATURE RATING
CI-ASTMA126 GR. B - CLASS 250
YS 12-CI (THREADED)

WOG (Non-shock): 400 PSI @ 150 °F

- The above listed temperatures are theoretical and may vary during actual operating conditions.

APPLICATIONS

GENERAL APPLICATION: Y-STRAINERS ARE INSTALLED IN A PIPING SYSTEM TO REMOVE UNWANTED DEBRIS FROM THE PIPELINE, PROTECTING EXPENSIVE EQUIPMENT DOWNSTREAM SUCH AS PUMPS, METERS, SPRAY NOZZLES, COMPRESSORS, AND TURBINES. THEY CAN BE PLACED IN A HORIZONTAL OR VERTICAL PIPELINE AS LONG AS THE SCREEN IS IN A DOWNWARD POSITION. STRAINING IS ACCOMPLISHED VIA AN INTERNAL PERFORATED OR MESH LINED STRAINING ELEMENT, THE SIZE OF WHICH SHOULD BE DETERMINED BASED ON THE SIZE OF THE SMALLEST PARTICLE TO BE REMOVED.

SERVICING: THE STRAINING ELEMENT NEEDS REGULAR CLEANING TO PREVENT DEBRIS BUILD UP. IT IS NOT ADVISABLE TO ALLOW THE DIFFERENTIAL PRESSURE TO INCREASE BY 20 PSI. ALTHOUGH CLEANING NORMALLY REQUIRES THE REMOVAL OF THE STRAINING ELEMENT, INSTALLING AND USING A TITAN SLOW-OFF DRAIN VALVE CAN INCREASE THE TIME BETWEEN CLEANINGS.


The above data represents common markets and service applications. No representation or guarantee, expressed or implied, is given due to the numerous variations of concentrations, temperatures and flow conditions that may occur during actual service.

TITAN FLOW CONTROL, INC.
YOUR PIPELINE TO THE FUTURE!

Tel: 910-735-0000 ♦ Fax: 910-738-3848 ♦ titan@titanfci.com ♦ www.titanfci.com
290 Corporate Drive ♦ PO Box 7408 ♦ Lumberton, NC 28358

4.9a Steam Condensate Strainer – 2" For All HX2 Sizes

YS12-0617



TITAN FLOW CONTROL, Inc.
 290 Corporate Drive
 Lumberton, NC 28358
 Tel: 910.735.0000

E-mail: titan@titanfci.com
 Web: www.titanfci.com
 Fax: 910.738.3848

"Y" (WYE) STRAINER
YS 12-CI - (Cast Iron)
 Threaded Ends • Cast Iron • ANSI Class 250

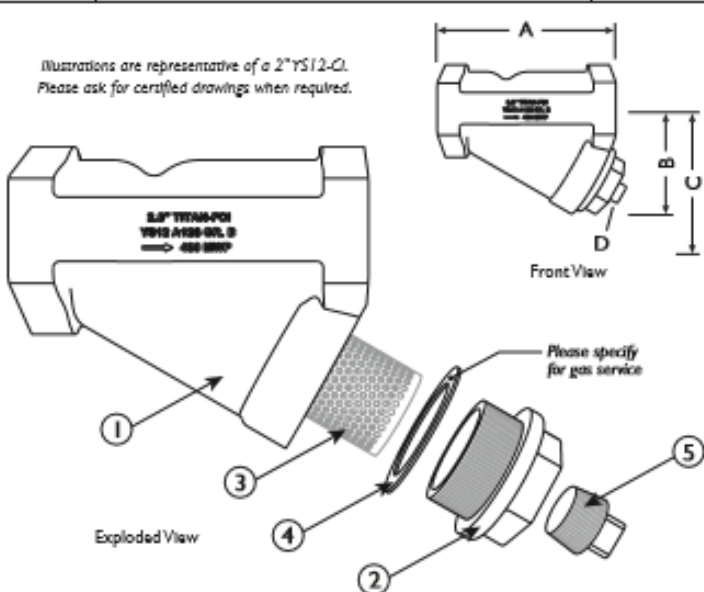
ANSI Class
250

BILL OF MATERIALS⁽¹⁾

No.	PART	YS 12-CI
1	Body ⁽²⁾	Cast Iron A126 Gr. B
2	Cap	Cast Iron A126 Gr. B
3	Straining Element ⁽³⁾	Stainless Steel ⁽⁴⁾
4	Gasket ^{(2) (5)}	Grafoil
5	NPT Plug (Blow-off) ⁽²⁾	Steel

1. Bill of Materials represents standard materials. Equivalent or better materials may be substituted at the manufacturer's discretion.
 2. All units are ascor painted.
 3. Denotes recommended spare parts.
 4. Contact Titan for special exsolute materials, including Buna-N or Viton, for natural gas, hot air, or other applications.
 5. The YS12 can be furnished with bronze blow-off plug to meet Military Specification WW-S-2739. Contact factory.
 6. Stainless Steel Straining Element is available in Type 304 and Type 316 Stainless Steel. A wide range of wire mesh and perforated screens are available. See "Standard Screen Selections" chart below for standard perforations and meshes. Please specify if a non-standard screen is required.

Illustrations are representative of a 2" YS12-CI.
Please ask for certified drawings when required.



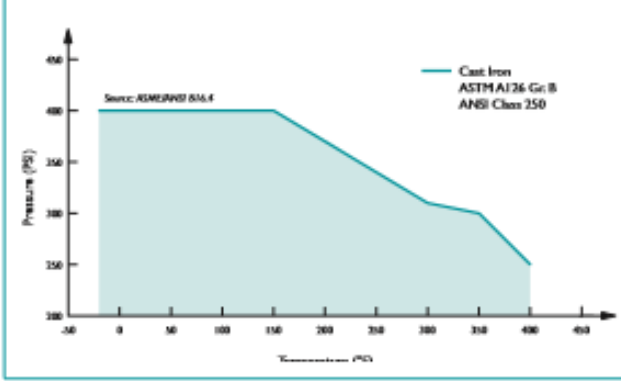
Please specify for gas service

DIMENSIONS AND PERFORMANCE DATA⁽¹⁾

SIZE	in	1/4	3/8	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3
	mm	8	10	15	20	25	32	40	50	65	80
A DIMENSION FACE TO FACE ⁽²⁾	in	3.188	3.188	3.188	3.75	4.2	5.0	5.75	7.0	9.25	10.0
	mm	81	81	81	95	107	127	146	178	235	254
B DIMENSION CENTER LINE TO BOTTOM	in	2.063	2.063	2.063	2.438	2.625	3.375	3.875	4.75	5.875	6.0
	mm	52	52	52	62	67	86	98	121	149	152
C DIMENSION SCREEN REMOVAL	in	2.375	2.375	2.375	3.0	3.25	4.25	5.0	6.125	7.875	8.0
	mm	60	60	60	76	83	108	127	156	200	203
D NPT Plug BLOW-OFF	in	1/4	1/4	1/4	3/8	3/8	3/4	3/4	1	1 1/2	1 1/2
	mm	8	8	8	10	10	20	20	25	40	40
APPROXIMATE ASSEMBLED WEIGHT	lb	1.5	1.5	1.5	2.5	3.5	6.0	9.0	14.0	25.5	32.0
	kg	0.7	0.7	0.7	1.1	1.6	2.7	4.1	6.3	11.6	14.5
Flow Coefficient	C _v	0.7	2	8	15	22	38	42	70	110	160

1. Dimensions and weights are for reference only. When required, request certified drawings.
 2. Face to face values have a tolerance of ±0.06 in (±2.0 mm).

PRESSURE - TEMPERATURE RATINGS



Source: ASME B16.4

PRESSURE - TEMPERATURE RATING

ANSI Class 250	A126 Gr. B
WOG (Non-stocked):	400 PSI @ 150 °F

STANDARD SCREEN SELECTIONS

Size	Liquid	Open Area	Steam	Open Area
1/4" - 2"	20 Mesh	51.8%	30 Mesh	44.8%
2 1/2" - 3"	1/16 (.0625)	41%	3/64 (.045)	36%

REFERENCED STANDARDS & CODES

CODE	DESCRIPTION
ASME/ANSI B16.4	Cast Iron Threaded Fittings

Titan FCI makes every effort to ensure the information presented on our literature accurately reflects exact product specifications. However, as product changes occur, there may be short-term differences between actual product specifications and the information contained within our literature. Titan FCI reserves the right to make design and specification changes to improve our products without prior notification. When required, request certified drawings.

4.10 Steam Trap – 2" NPT for All HX2 Sizes

High Capacity Float & Thermostatic Steam Traps

Key Features & Benefits

- Heavy duty construction
- Instantaneous valve action
- Water sealed valve
- High capacity air handling
- Continuous rapid flow of condensate
- Not affected by sudden pressure changes
- Energy efficient and cost effective
- Will operate against back pressure
- Conforms to federal specification WWT-696

MLFT2175-8

Maximum operating pressure (PMO) 175 PSI

Maximum operating temperature (TMO) 450 F

Body Design Conditions

Maximum allowable pressure (PMA) 200 PSI

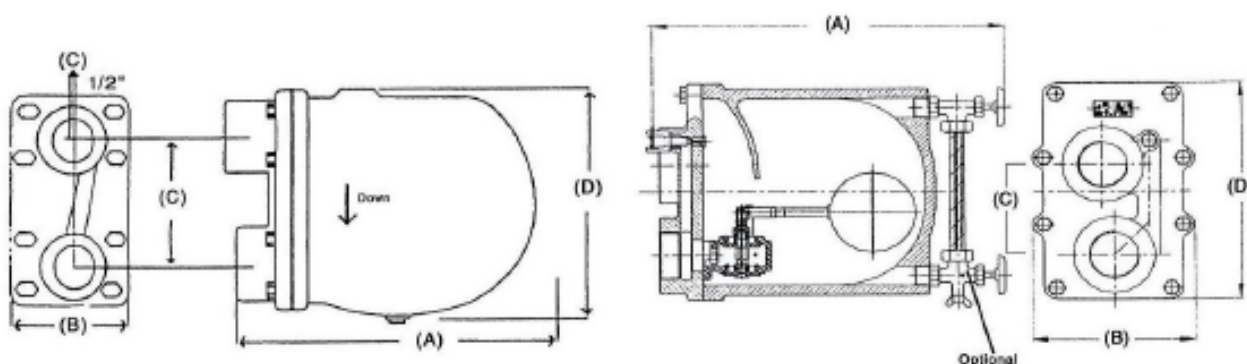
Maximum allowable temperature (TMA) 450 F

Parts	Description
Head	Class 30 Cast Iron
Body	Class 30 Cast Iron
Bolts	Carbon Steel
Gaskets	Compressed Graphite
Float	Stainless Steel
Plug	Stainless Steel
Seat	Stainless Steel
Air Vent	Stainless Steel/Phosphorus Bronze

Dimensions

Model #	A	B	C	D	LBS.
MLFT2175-8	16.50"	7.50"	4.50"	10.75"	62

"A" Dimension w/o petcock, deduct 4". Offset for all 1/2"



Size NPT	Model No.	Differential Pressure (PSIG)														
		1/2	1	2	5	10	15	20	30	40	60	75	100	125	150	175
2"	MLFT12175-8	13,192	16,710	20,218	24,771	28,775	30,902	33,030	35,675	38,105	41,938	44,039	47,044	49,796	50,987	52,609

4.11 Vacuum Breaker – 1/2" NPT for All HX2 Sizes**KADANT**

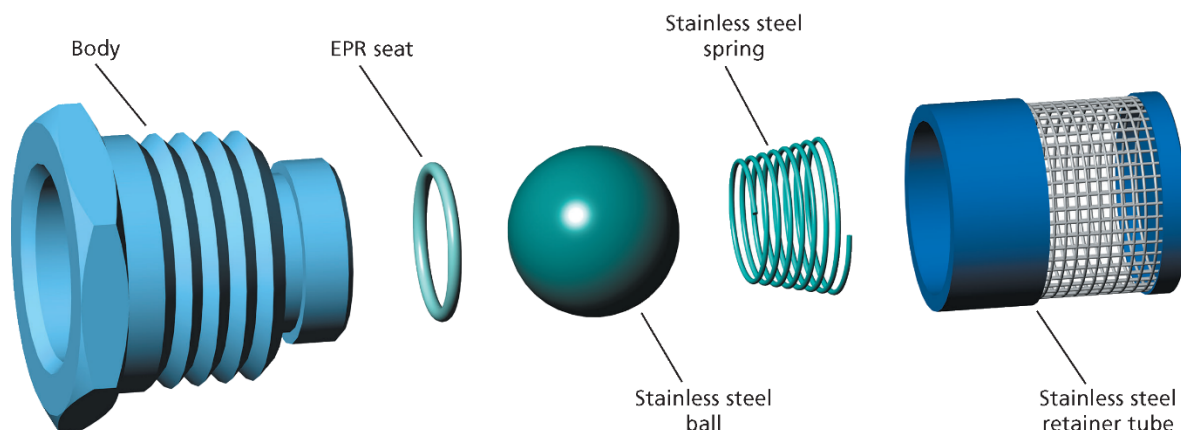
FLUID HANDLING

Vacuum Breakers

Anti-Siphoning Check Valves



- Vacuum check valves and backflow devices
- Protection against collapse or back flowing

4.11a Vacuum Breaker – ½" NPT for All HX2 Sizes**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.

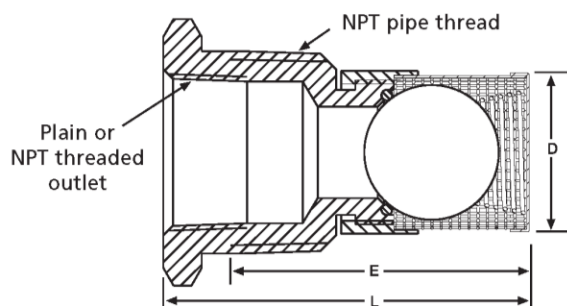
Rigorously Tested

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.

4.11b Vacuum Breaker – 1/2" NPT for All HX2 Sizes



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"	1 1/16"	9/32"
1/2"	24A76000	24A76400	Threaded	3/8"	1 3/4"	1 3/8"	1 1/16"	9/32"
3/4"	24A76700	24A77100	Plain	1/2"	2 1/8"	1 5/8"	1 3/16"	13/32"
3/4"	24A76800	24A77200	Threaded	1/2"	2 1/8"	1 5/8"	1 3/16"	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.

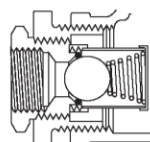


Figure 1

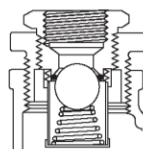


Figure 2

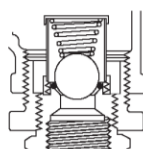





Figure 3

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.

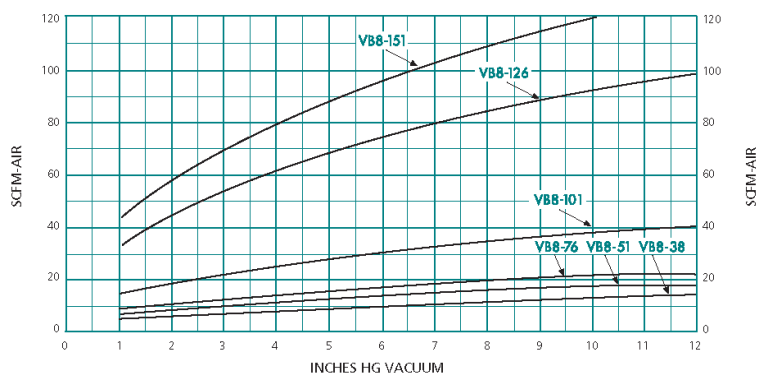
Vacuum Required to Open

		Horizontal	Vertical		
			Top Outlet	Bottom Outlet	No Spring
					
VB8-38 3/8"	In. H ₂ O	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 ₂ O	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 ₂ O	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 ₂ O	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 ₂ O	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 ₂ O	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

4.11c Vacuum Breaker – ½" NPT for All HX2 Sizes

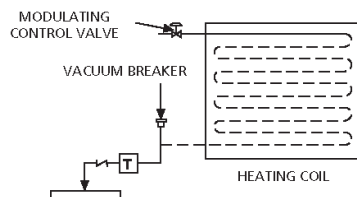
Approximate Air Handling Capacities

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.

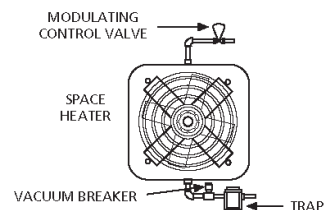


NOTE: Capacities will vary slightly due to position of installation.

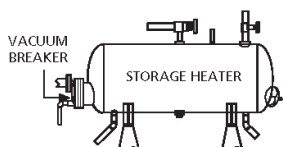
Typical Installations of Vacuum Breakers



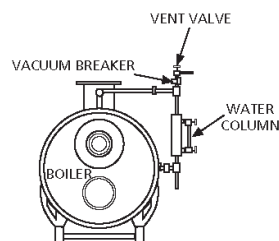
Vacuum breaker installed on heating coil. When the modulating control valve closes, the steam in the coil will condense. A vacuum may exist in the coil even with the control valve partly open and positive pressure between the control valve and the coil.



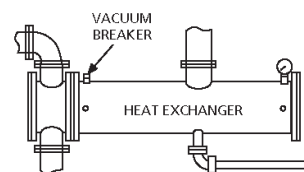
Typical space heater installation with vacuum breaker protection.



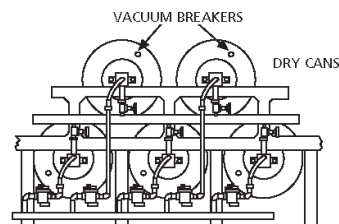
Horizontal storage heater with heating coils protected by a vacuum breaker.



Typical application of a 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 installation of a vacuum breaker in a heat exchanger.



Textile dry cans, multiple slasher cylinders, print cans, etc., can be protected against collapse with vacuum breakers.

Dimensions are for reference only and subject to change.

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