



Zone Sentry® Zone Valve

The Taco Zone Sentry® Zone Valve enhances the overall performance of any zone valve system. The unique patented technology in the Zone Sentry utilizes a microcircuit based logic to control a gear driven electronic actuator which drives a ball valve based body design. All this adds up to a zone valve that leads the industry in energy efficiency, flow capacity (C_v), shutoff pressure rating, ease of installation, diagnostic capability and the number of valves (12) that can be use on a standard 40VA transformer. The Taco Zone Sentry zone valves are available in sweat, threaded and 3-way configurations.



Submittal Data Information Zone Sentry® Ball Valve Zone Valve

Submittal Data # 101-140
Supersedes: 06/26/13

Effective: 09/01/14

Product Specifications

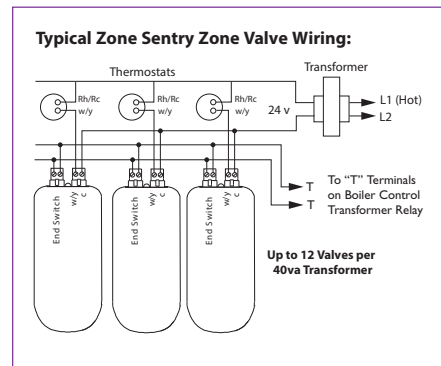
Max. Operating Pressure	..300 PSI (2100 kPa)
Max. Shutoff Pressure	.....125 PSI (875 kPa)
Max. Ambient Temp.	.....135°F
Fluid Temp. Range	.....20-240°F (7°-115°C)
Service	.....Water or Water/Glycol up to 50% Glycol Close Systems (Open System — Option Available)
Ball Rotation Speed	.....(90° turn), Approx. 5 seconds (after charge time)
Electrical Rating	.....24 VAC, 60Hz 0.48 Amps
Power Consumption (Charging)	.....11.4 W, 0.48 Amps
Power Consumption (Power On)	.....1.44W, 0.06 Amps
Heat Anticipator Setting	.....0.5 Amps
End Switch Rating	.....1 Amp @ 24 VAC

Application:

Taco Zone Sentry® Zone Valves provide on-off, normally open or normally closed control in both open and closed hydronic systems. The valves can be used in a wide variety of heating and non condensing cooling applications, primarily designed for use with baseboard, fan coils, radiators, convectors, air handlers, heat pumps and radiant applications.

Ease of Installation / Operation:

The Taco Zone Sentry is the most technologically advanced zone valve ever made. It's also simple to install and operate. The valve can be installed in any direction, in any orientation. We then went a step further, allowing the operator to be mounted to the 2-way valve body in either direction, great for those tight baseboard jobs. Snap-in quick connects on the back of the valve make for a simple, secure and fast wiring hook-up. A green LED light shows full functionality of the valve's operation and thermostat status. Under a no power situation the manual override button located on the top of the valve allows the ball to be rotated up to 90° and is also marked with a slot to indicate the position of the valve.

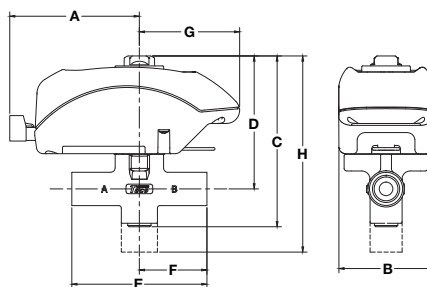


Materials of Construction, Actuator:

Body	.....High Performance Engineered Polymer
Gears	.....High Performance Internally Lubricated Engineered Polymer

Materials of Construction, Valve:

Body	.....Forged Brass
Stem	.....Brass
Press Ring	.....Brass
Ball	.....Brass (Chrome Plated)
Seat	.....Modified Teflon®
O-Rings	.....EPDM



Valve Size	2-WAY Cv (Kv) / Ft. of Pipe Equiv. †	Close-Off Pressure (kPa)	3-WAY Cv (Kv) / Ft. of Pipe Equiv. †
1/2"	4.9 (4.3) / 9.5	0-125 psi (0-862 kPa)	1.5 (1.3) / 111
3/4"	10.3 (8.9) / 8.4	0-125 psi (0-862 kPa)	3.3 (2.8) / 82
1"	8.9 (7.7) / 47.4	0-125 psi (0-862 kPa)	3.0 (2.6) / 411
Inverted Flare 3/4" sweat fitting	4.4 (3.8) / 46.2	0-125 psi (0-862 kPa)	N/A

† At 4' per second (Max. recommended residential flow rate).

Zone Sentry Dimensions: (FOR REFERENCE PURPOSES)

Valve Size	A		B		C		D		E (Sweat)		E (Threaded)		F		G		H (3-way)	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
1/2"	3"	76.2	2.375"	60.3	4.125"	104.7	3.06"	77.72	3.125"	79.3	4.750"	120.6	1.562"	39.7	2.312"	58.7	5.06"	128.5
3/4"	3"	76.2	2.375"	60.3	4.125"	104.7	3.12"	79.25	3.125"	79.3	3.312"	84.1	1.562"	39.7	2.312"	58.7	5.37"	136.4
1"	3"	76.2	2.375"	60.3	4.125"	104.7	3.12"	79.25	3.875"	98.4	3.875"	98.4	1.875"	47.6	2.312"	58.7	5.50"	139.7
Inverted Flare 3/4" sweat fitting	3"	76.2	2.375"	60.3	3.5"	99.1	3.06"	77.72	7.375**	187.33	3.5***	88.9	1.75"	44.5	3.312"	84.1	N/A	N/A

* Includes inverted flare fitting

** Less fittings

NPT Models	2-Way	Sweat Models
Z050T2	1/2" 2-way	Z050C2
Z075T2	3/4" 2 way	Z075C2
Z100T2	1" 2-way	Z100C2

Consult factory for additional model numbers.



NPT Models	3-Way	Sweat Models
Z050T3	1/2" 3-way	Z050C3
Z075T3	3/4" 3-way	Z075C3
Z100T3	1" 3-way	Z100C3

Instruction Sheet

ECM High-Efficiency Circulator

SUPERSEDES: New

EFFECTIVE: April 21, 2017

Plant ID No. 001-5001

DESCRIPTION:

The 0015e3 is a variable speed, high-efficiency, wet rotor circulator with an ECM, permanent magnet motor. With 3 easy settings, its performance curves are equivalent to the versatile Taco 0015 3-speed and ideal for hydronic systems zoned with circulators or zone valves. The 0015e3 reduces power consumption by up to 85% compared to equivalent AC permanent split capacitor circulators.

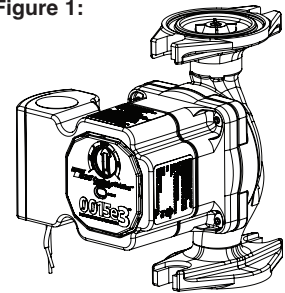
APPLICATION:

- Maximum operating pressure: 125 psi (8.6 bar)
- Maximum water temperature: 230°F (110°C)
- Electrical specifications:
 - Voltage: 110-120V, 50/60 Hz, single phase
 - Maximum operating power: 44W
 - Maximum amp rating: 0.54
- Equipped with a cast iron casing and should be used for closed loop systems only
- Not suitable for open loop potable water or chilled water systems
- Taco circulator pumps are for indoor use only – employer uniquement a l'intérieur
- Acceptable for use with water or maximum of 50% water/glycol solution

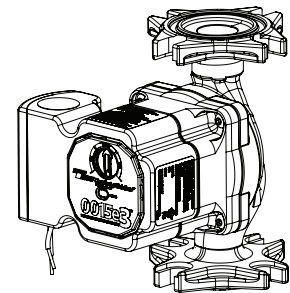
FEATURES:

- Three easy settings to match system requirements - LOW, MEDIUM, HIGH
- Replaces all single speed and 3-speed circulators in its class
- ECM performance equivalent to the versatile Taco 0015 3-speed circulator
- Multi-color LED display showing power on and error code diagnostics
- Use with a Taco ZVC Zone Valve Control or SR Switching Relay for ON/OFF operation
- Nut capture feature on flanges for easier fit up
- Dual electrical knockouts and 6" stranded wire leads for easy wiring
- Double insulated - no ground-wire required
- Whisper quiet operation
- BIO Barrier® protects the pump from system contaminants
- SureStart®- automatic unblocking and air purging mode
- Optional 2-way universal flange model for easy fit-up to any flange orientation. See Figure 1.
- Integral Flow Check (IFC®) included - Field installed
- Green Mode - active system monitoring and power optimization

Figure 1:



Standard flange model: 0015e3-2F2



Optional 2-way flange model:
0015e3-2F4



INSTALLATION:

WARNING: Do not use in swimming pool or spa areas. Pump has not been investigated for these applications.
AVERTISSEMENT : Ne pas utiliser dans une piscine ou un spa. La pompe n'a pas été étudiée pour ces applications.

CAUTION: The addition of petroleum based fluids or certain chemical additives to systems using TACO equipment voids the warranty. Consult factory for fluid compatibility.

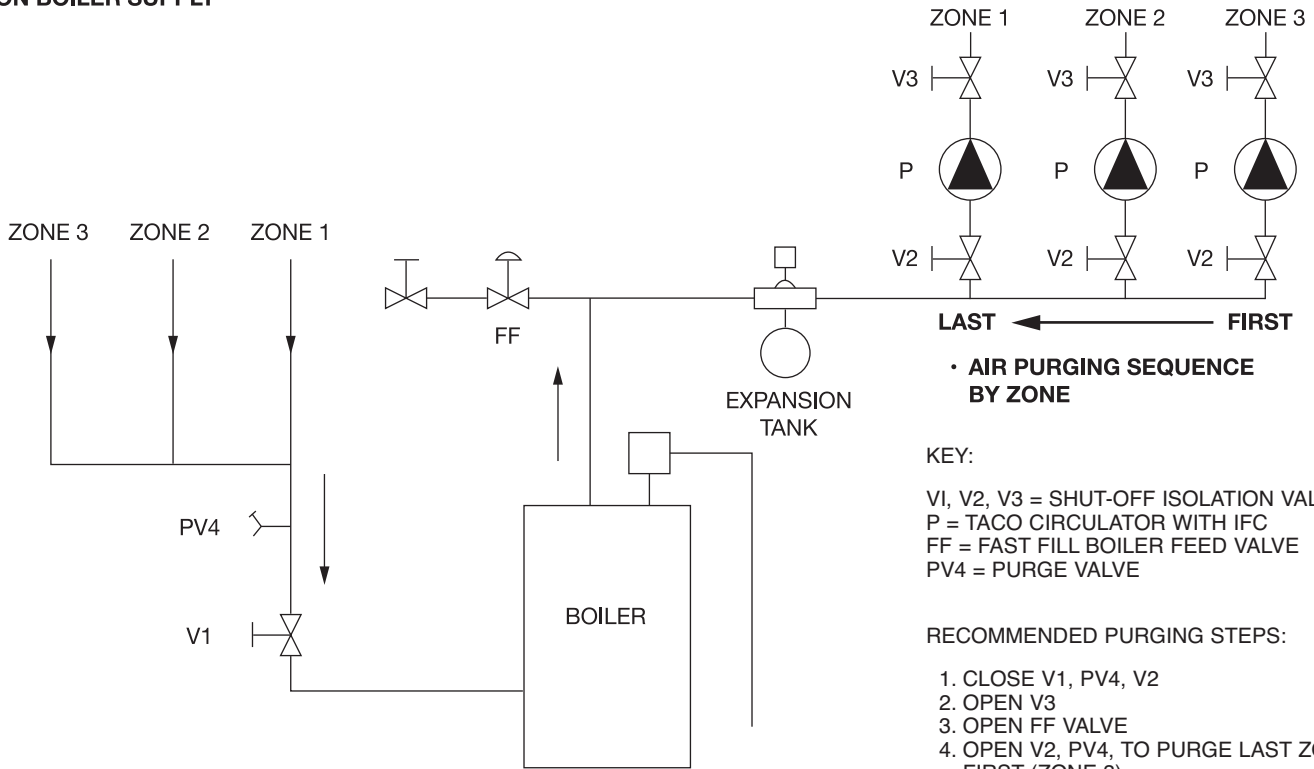
ATTENTION : L'ajout de liquides à base de pétrole ou de certains additifs chimiques à des systèmes utilisant un équipement TACO annule la garantie. Consultez le fabricant pour connaître la compatibilité de liquides.

CAUTION: Installations at elevations over 5000 feet must have higher fill pressure of 20 psi minimum to prevent pump cavitation and flashing. Premature failure may result. Adjust expansion tank pressure to equal fill pressure. A larger size expansion tank may be required.

ATTENTION : Des installations à des altitudes de plus de 1600 mètres doivent présenter une pression de remplissage plus élevée de 20 psi au minimum afin d'éviter toute cavitation ou flashing de la pompe. Une défaillance prématurée peut en résulter. Réglez la pression du réservoir d'expansion de façon qu'elle soit égale à la pression de remplissage. Un réservoir d'expansion d'une taille supérieure peut être nécessaire.

Figure 2:

PREFERRED PIPING FOR CIRCULATORS ON BOILER SUPPLY



• AIR PURGING SEQUENCE BY ZONE

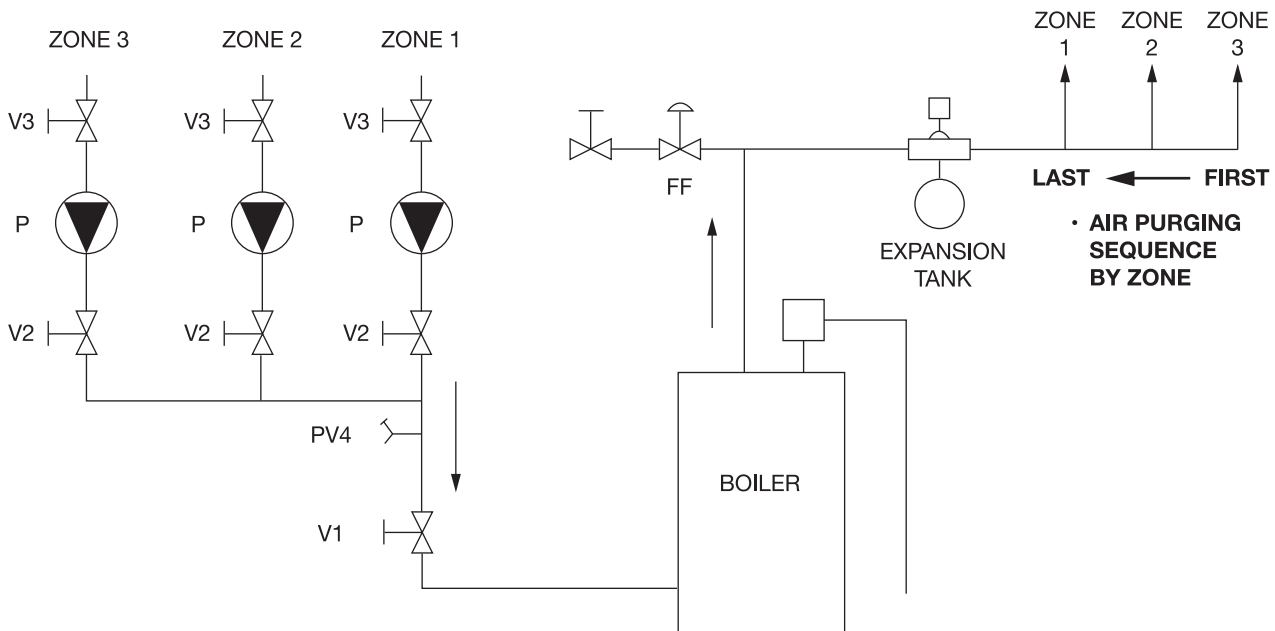
KEY:

- V1, V2, V3 = SHUT-OFF ISOLATION VALVE
- P = TACO CIRCULATOR WITH IFC
- FF = FAST FILL BOILER FEED VALVE
- PV4 = PURGE VALVE

RECOMMENDED PURGING STEPS:

1. CLOSE V1, PV4, V2
2. OPEN V3
3. OPEN FF VALVE
4. OPEN V2, PV4, TO PURGE LAST ZONE FIRST (ZONE 3)
5. CLOSE FF VALVE
6. CLOSE V2, PV4
7. REPEAT STEPS 1 TO 6 FOR EACH ADDITIONAL ZONE, PURGE ZONE 1 LAST
8. OPEN V1 WHEN ALL ZONES ARE PURGED
9. ADJUST SYSTEM TO DESIRED OPERATING FILL PRESSURE IF REQUIRED

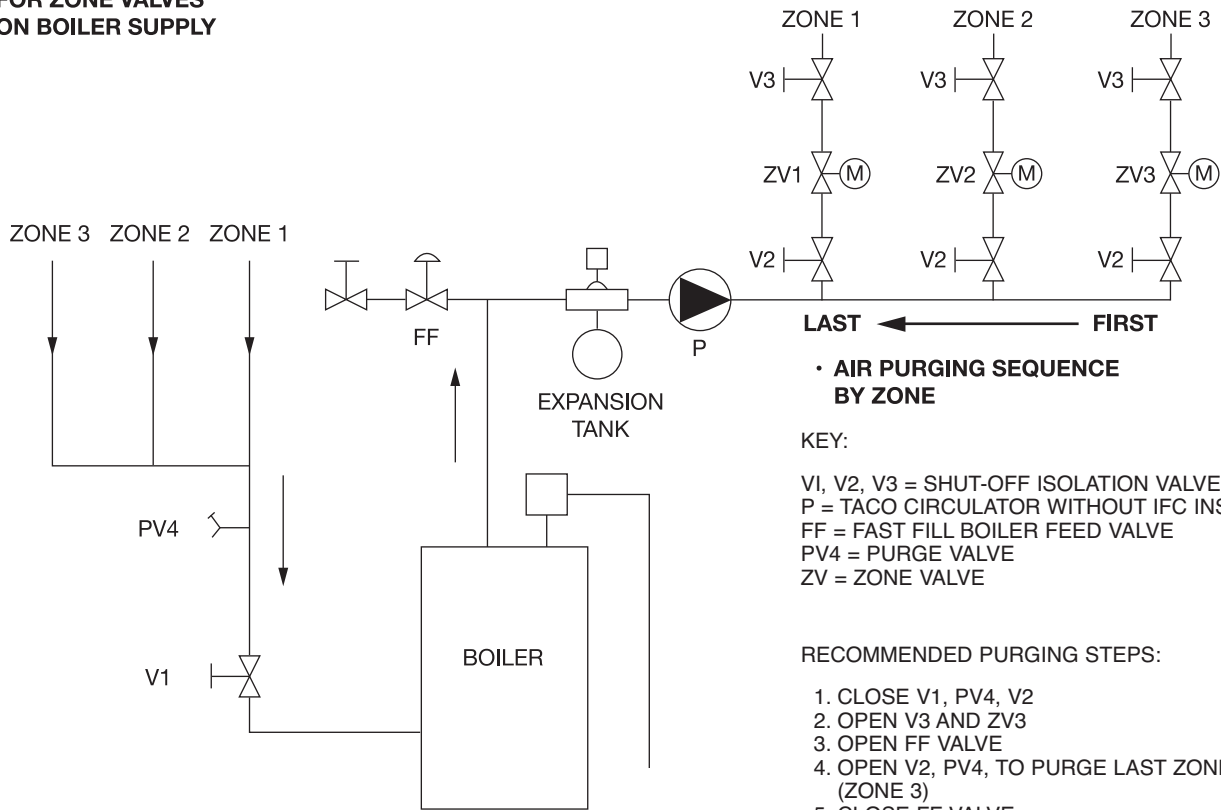
ALTERNATE PIPING FOR CIRCULATORS ON BOILER RETURN



• AIR PURGING SEQUENCE BY ZONE

Figure 3:

PREFERRED PIPING FOR ZONE VALVES ON BOILER SUPPLY



AIR PURGING SEQUENCE BY ZONE

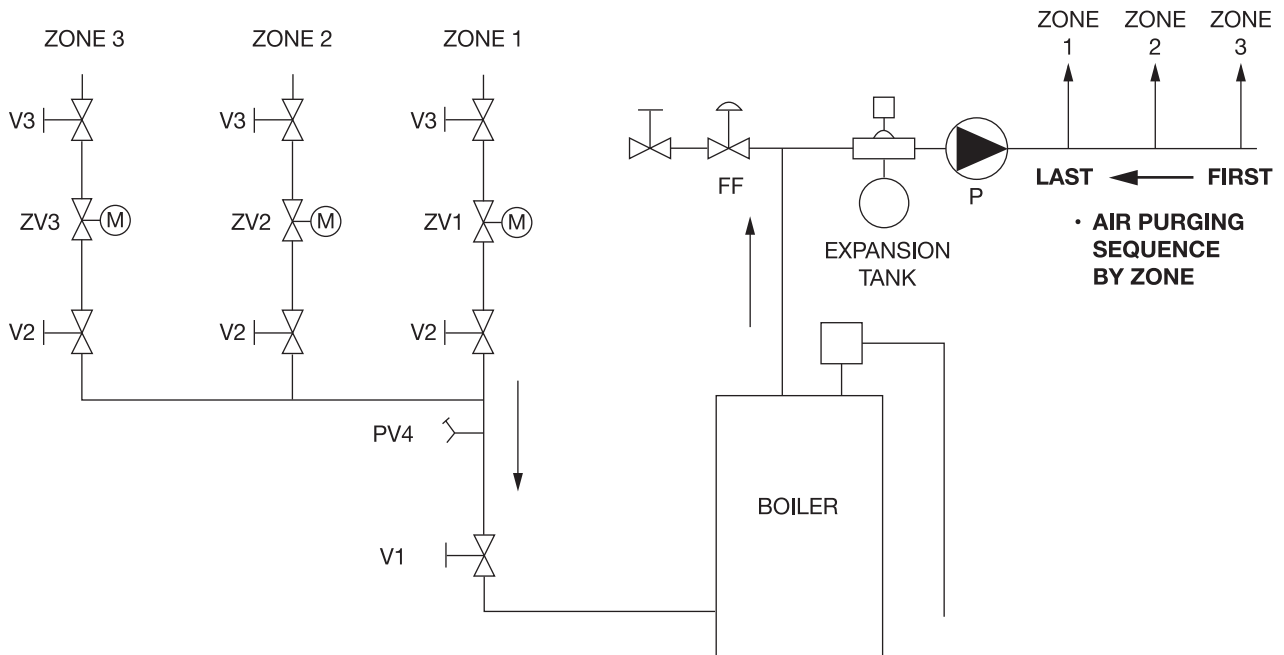
KEY:

- V1, V2, V3 = SHUT-OFF ISOLATION VALVE
- P = TACO CIRCULATOR WITHOUT IFC INSTALLED
- FF = FAST FILL BOILER FEED VALVE
- PV4 = PURGE VALVE
- ZV = ZONE VALVE

RECOMMENDED PURGING STEPS:

1. CLOSE V1, PV4, V2
2. OPEN V3 AND ZV3
3. OPEN FF VALVE
4. OPEN V2, PV4, TO PURGE LAST ZONE FIRST (ZONE 3)
5. CLOSE FF VALVE
6. CLOSE V2, PV4
7. REPEAT STEPS 1 TO 6 FOR EACH ADDITIONAL ZONE, PURGE ZONE 1 LAST
8. OPEN V1 WHEN ALL ZONES ARE PURGED
9. ADJUST SYSTEM TO DESIRED OPERATING FILL PRESSURE IF REQUIRED
10. MOVE ALL ZV TO CLOSED/AUTOMATIC POSITION

ALTERNATE PIPING FOR ZONE VALVES ON BOILER RETURN



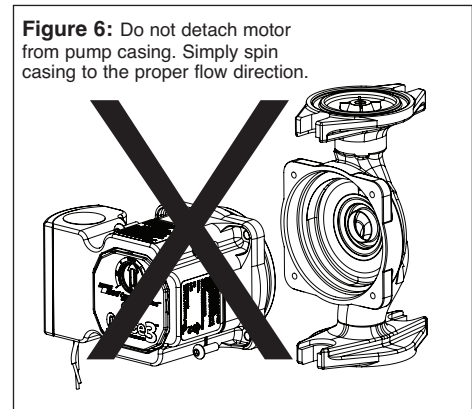
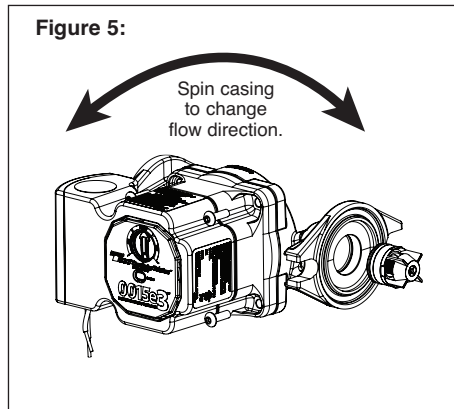
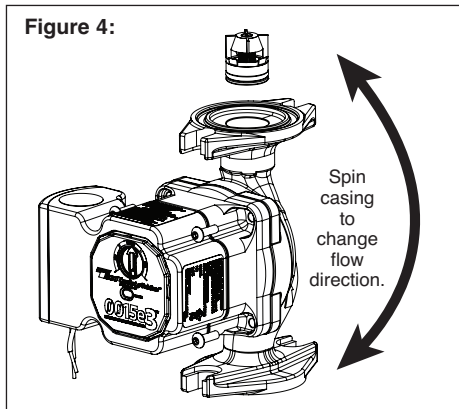
AIR PURGING SEQUENCE BY ZONE

1. **Location:** The circulator can be installed on the supply or return side of the boiler but for best system performance, it should always pump away from the expansion tank. See piping diagrams in Figure 2 and Figure 3.

CAUTION: Do not use flat rubber gaskets. Only use O-ring gaskets provided or leaks may result. Warranty will be void.

2. **Mounting position:** Circulator must be mounted with the motor in the horizontal position. See Figure 4 and Figure 5 below for acceptable motor mounting orientations.

ACCEPTABLE MOTOR MOUNTING POSITIONS AND EZ CASING ROTATION



Always install with motor in horizontal orientation. Position electrical junction box at 9 o'clock for best viewing orientation. Pump casing may be rotated to change flow direction. Locate the arrow on the casing body to determine flow direction.

To rotate the pump casing, remove the 4 motor screws. **When rotating pump casing position, DO NOT detach motor housing from the casing.** Damage to the casing O-ring and leakage may result. Simply spin casing to the proper flow direction desired as shown in Figure 4 and Figure 5. Reattach the 4 screws (1/8" allen wrench required). Be sure motor is positioned correctly and is seated evenly to prevent leakage or damage to O-ring. Tighten motor screws evenly to 25-38 in-lbs torque.

CAUTION: When rotating pump body position, do not detach motor housing from the casing. Damage to the casing O-ring and leakage may result.

Integral Flow Check (IFC®) option - An IFC® is included in carton. If required, press IFC into machined discharge port with plunger and o-ring facing in, until it snaps into place. Before installing, press IFC plunger to be sure it moves freely. See Figure 4 and Figure 5 above.

CAUTION: To reduce the possibility of noise transmission, be sure to add vibration dampeners to piping when mounting circulator to wall or floor joists.

ATTENTION : Pour réduire la possibilité de transmission de bruit, veillez à ajouter des amortisseurs de vibration à la tuyauterie lors du montage du circulateur sur des chevêtres de mur ou de plancher.

3. **Filling the system:** Fill the system with tap water or a maximum of 50% propylene-glycol and water solution. The system must be filled before operating the circulator. The bearings are water lubricated and should not be allowed to operate dry. Filling the system will result in immediate lubrication of the bearings. It is always good practice to flush a new system of foreign matter before starting the circulator.

WARNING: Risk of electric shock. To reduce the risk of electric shock, be certain that it is connected only to a properly grounded, grounding-type receptacle. Follow all local electrical and plumbing codes.

AVERTISSEMENT : Risque de choc électrique. Pour réduire le risque de choc électrique, veillez à ce qu'elle soit raccordée uniquement à un réceptacle de type mise à la terre proprement mis à la terre. Respectez tous les codes de plomberie et électriques locaux.

WARNING: Use supply wires suitable for 90°C.

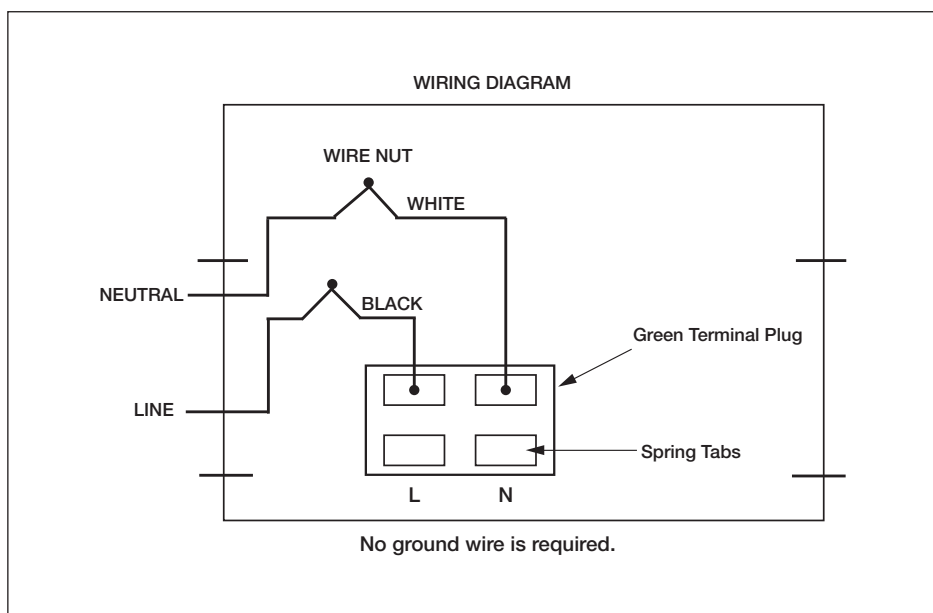
AVERTISSEMENT : Employer des fils d'alimentation adéquats pour 90°C.

WARNING: Disconnect power when servicing.
AVERTISSEMENT : Couper l'alimentation lors de l'entretien.

CAUTION: Use flexible conduit only. Not for use with rigid conduit.
ATTENTION : N'utiliser que du conduit flexible ; n'est pas fait pour du conduit rigide.

WARNING: SERVICING OF DOUBLE-INSULATED APPLIANCES. A double-insulated appliance is marked with one or more of the following: The words “DOUBLE INSULATION” or “DOUBLE INSULATED” or the double insulation symbol (square within a square). In a double-insulated appliance, two systems of insulation are provided instead of grounding. No grounding means is provided on a double-insulated appliance, nor should a means for grounding be added. Servicing a double-insulated appliance requires extreme care and knowledge of the system, and should be done by qualified service personnel. Replacement parts for a double-insulated appliance must be identical to the parts they replace.

AVERTISSEMENT : ENTRETIEN DES APPAREILS À DOUBLE ISOLATION. Un appareil à double isolation est marqué avec un ou plusieurs des éléments suivants : les mots « DOUBLE INSULATION » ou « DOUBLE INSULATED » ou le symbole de double isolation (carré dans un carré). Dans un appareil à double isolation, deux systèmes d'isolation sont fournis plutôt que la mise à la terre ; aucun moyen de mise à la terre n'est fourni ni ne doit être ajouté. L'entretien d'un appareil à double isolation exige de grandes précautions et une connaissance approfondie du système, et doit être effectué par un technicien qualifié. Les pièces de rechange pour un appareil à double isolation doivent être identiques aux pièces remplacées.



4. **Wiring the circulator:** Disconnect AC power supply. Remove terminal box cover. Attach a wiring connector into knockout hole. Use flexible conduit only. Connect Line/Hot power to the black lead, Neutral to the white lead. See wiring diagram above. The 0015e3 is a double insulated circulator; no grounding wire is necessary. Replace terminal box cover. Insert cap plug provided to cover unused knockout hole.
Note: If pigtail leads provided are not used, be sure to trim field wire to a strip length of .25" (+/- .025") to prevent exposed wire causing a short at the terminal plug. Connect line and neutral to green terminal plug as shown in diagram. Depress the spring tab with a small screwdriver to insert wire into plug. Release tabs to complete connection.
5. **Start the circulator:** When purging the system, it is recommended to run the circulator at full speed long enough to remove all remaining air from the bearing chamber. This is especially important when installing the circulator in the off-season. An orange LED will illuminate when the 0015e3 is powered on.
6. **Green Mode:** Responsive technology actively monitors system conditions and automatically adjusts to optimize power consumption.

CAUTION: Never run the circulator dry or permanent damage may result.
ATTENTION: Ne laissez jamais le circulateur tourner à sec, des dommages permanents peuvent en résulter.

Full Speed Operation:

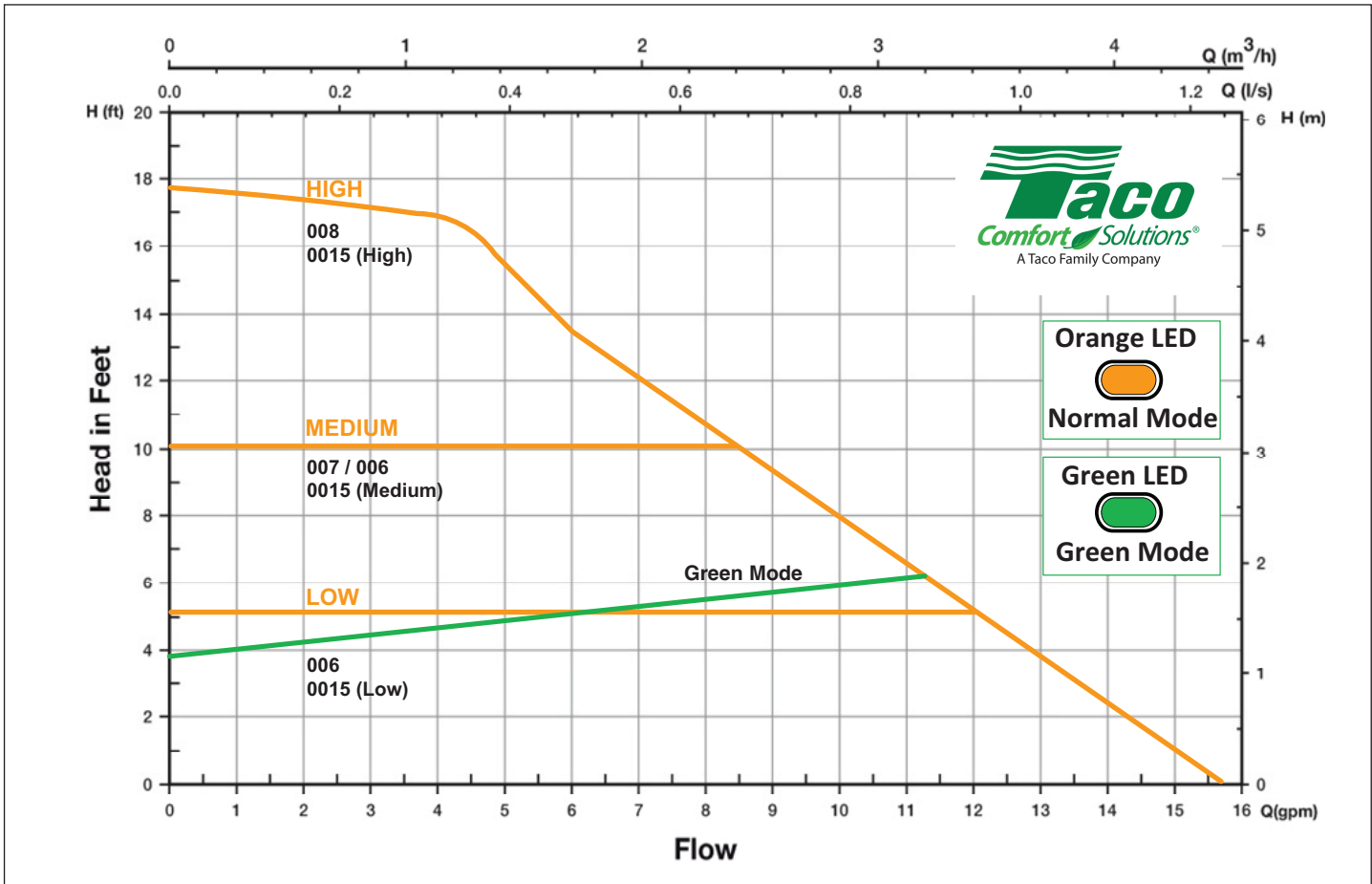
To run the pump at full speed during the fast fill, start-up and purge process, rotate dial to HIGH setting. To return to the normal operating mode, turn dial to desired LOW, MEDIUM or HIGH setting.

7. **Programming your 0015e3 circulator:** Modify the performance of the circulator as needed by rotating the dial using a flat screwdriver. An orange LED will illuminate when the circulator is powered on. The LED will flash each time a setting is changed. See diagram below to determine best setting for the system. The selection of the right operating curve depends on the characteristics of the heating system and the actual heat demand. See cross-reference replacement chart on page 8.

The 0015e3 has 3 Operating Settings:

- LOW - 5 feet of head constant pressure, variable speed.
- MEDIUM - 10 feet of head constant pressure, variable speed.
- HIGH - 18 feet of head max, full fixed speed.

0015e3 Performance Curves



Selection options are LOW, MEDIUM or HIGH. The 0015e3 circulator varies its speed in LOW and MEDIUM setting to maintain a constant pressure differential ($\Delta p-c$) in the system as heating load increases or decreases. On HIGH setting, the 0015e3 runs at full speed. If the 0015e3 detects 12 hours of constant circulation, it will automatically self-adjust to **Green Mode** for power optimization. See chart above for operating curves and equivalent 00® model at each setting.

CAUTION: Do not attempt to remove LED panel from circulator. Serious damage to circulator electronics may result.
ATTENTION: N'essayez pas de retirer le panneau de LED du circulateur. Des dommages sérieux à l'électronique du circulateur peuvent en résulter.

8. **Troubleshooting the error codes:** Listed below are potential diagnostic error codes which will appear on the LED display in case of a malfunction.

FAULTS	CONTROL PANEL	CAUSES	REMEDIES
The circulator is noisy	LED on	Suction pressure is insufficient - cavitation	Increase the system suction pressure within the permissible range.
	LED on	Presence of foreign bodies in the impeller	Disassemble the motor and clean the impeller.
Loud noises of water circulation	Flashing white LED	Air in the system. Pump may be air-bound.	Vent the system. Repeat fill and purge steps.
Circulator is not running although the electrical power supply is switched on	LED off	Lack of power supply	Verify voltage value of the electric plant. Verify the connection of the motor.
		Circuit breaker might be tripped	Check circuit breaker at panel and reset if necessary
		The circulator is defective	Replace the pump.
		Overheating	Let the pump cool down for some minutes. Then try to restart it. Verify that the water and ambient temperature are within the indicated temperature ranges.
	LED red	The rotor is blocked	Disassemble the motor and clean the impeller. See unlocking procedure below.
		Insufficient supply voltage	Verify that the power supply matches the data on the name plate.
Building does not get warm.	LED on	System may be air-bound	Vent system. Repeat fill and purge steps.

9. **Unlocking Procedure:** A red LED indicates the circulator is locked or sticking. Disconnect and connect power supply to start the automatic release process. The circulator makes 100 attempts to restart (process lasts approximately 15 minutes). Every restart is signalled by a short white flash of LED light. If the locking is not removed through the automatic release process after 100 attempts to restart the circulator, it goes into standby and the LED remains red. In this case follow the manual procedure described in the next steps: during any attempt, the red LED light keeps blinking; after that the circulator tries again to start. If the locking is not removed through the automatic release process (the warning light returns to be red), perform the manual steps described below.

1. Disconnect power supply - the warning light switches off.
2. Close both isolating valves and allow cooling. If there are no shut-off devices, drain the system so that the fluid level is beneath that of the circulator.
3. Loosen 4 motor bolts. Remove motor from casing. Carefully pull the rotor/impeller from the motor.
4. Remove impurities and deposits from the impeller and casing.
5. Reinsert the rotor/impeller into the motor.
6. Connect power supply. Check for impeller rotation.
7. If the circulator still doesn't run it will need to be replaced.

Replacement Parts List

198-213 RP	Casing O-ring
198-214 RP	Wiring plug connector (green)
198-215 RP	Terminal box cover (black)
198-217 RP	Terminal box cover screws (5 per bag)
0010-025 RP	Integral Flow Check (IFC®)
007-007 RP	Flange gasket set

0015e3™ Pump Replacement Cross Reference

Taco	Grundfos	Armstrong	Xylem/B & G	Wilo
005	UP 15-10 F	Astro 230CI	ecocirc 19-14 auto	Star S 16F
006	UP 15-10 FR	Astro 230CI-R	ecocirc 19-14 vario	Star S 16FX
007	UP 15-42 F	Astro 250CI	NRF-22	Star S 21RFC
008	UP 15-42 FR	Astro 250CI-R	NRF-25	Star S 21FX
00R	UPS 15-42 F	Astro 20	NRF-9F/LW	Star S 21F
00R 3-speed	UPS 15-58 FC	Astro 25		Stratos ECO 16 RFC
0015 3-speed	UPS 15-58 FRC	Astro 30		
	ALPHA 15-55F	Astro 30-3		
	ALPHA 15-55FR	Astro 50-3		
		Compass 20-20		

LIMITED WARRANTY STATEMENT

Taco, Inc. will repair or replace without charge (at the company's option) any Taco High-Efficiency circulator or circulator part which is proven defective under normal use within three (3) years from the date of manufacture.

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local Taco stocking distributor or Taco in writing and promptly deliver the subject product or part, delivery prepaid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local Taco stocking distributor or Taco. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any Taco product or part not installed or operated in conformity with Taco instructions or which has been subject to misuse, misapplication, the addition of petroleum-based fluids or certain chemi-

cal additives to the systems, or other abuse, will not be covered by this warranty.

If in doubt as to whether a particular substance is suitable for use with a Taco product or part, or for any application restrictions, consult the applicable Taco instruction sheets or contact Taco at (401-942-8000).

Taco reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. Taco reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

TACO OFFERS THIS WARRANTY IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ANY WARRANTY IMPLIED BY LAW INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS IS IN EFFECT ONLY FOR THE DURATION OF THE EXPRESS WARRANTY SET FORTH IN THE FIRST PARAGRAPH ABOVE.

THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR STATUTORY, OR ANY OTHER WARRANTY OBLIGATION ON THE PART OF TACO.

TACO WILL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS OR ANY INCIDENTAL COSTS OF REMOVING OR REPLACING DEFECTIVE PRODUCTS.

This warranty gives the purchaser specific rights, and the purchaser may have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts or on the exclusion of incidental or consequential damages, so these limitations or exclusions may not apply to you.



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For Residential and Commercial Applications

Job Name _____

Contractor _____

Job Location _____

Approval _____

Engineer _____

Contractor's P.O. No. _____

Approval _____

Representative _____

Series IPF

Isolation Pump Flanges for Circulator Pumps

Sizes: $\frac{3}{4}$ " – 2"

Series IPF Isolation Pump Flanges are designed to isolate circulator pumps to facilitate circulator pump replacement or repair.

Features

- Fits most circulator pumps
- Includes mounting nuts and bolts
- Durable brass body and flange
- High Pressure Rating (600 WOG for solder and threaded and 250 WOG for Press)
- Adjustable packing gland
- EPDM O-Rings to avoid leaks at installation
- Optional Tee handle included

Models

- IPF-T-M1 $\frac{3}{4}$ " – 2" NPT threaded end connection
 IPF-S-M1 $\frac{3}{4}$ " – 2" Solder end connection
 IPF-Press-M1 $\frac{3}{4}$ " - 1 $\frac{1}{4}$ " Press end connection

Specifications

Approved isolation pump flange of 2-piece design constructed of brass body and end adapter. Pump flange shall have adjustable PTFE packing and a Buna-N O-ring on a brass stem with virgin PTFE seats. Threaded and Solder valves to be pressure rated to 600psi (41.4 bar) WOG. Press valves to be pressure rated to 250psi (18 bar) CWP. Valves with lower pressure ratings are not acceptable. Approved valve is a Watts Series IPF-T-M1 (threaded) or IPF-S-M1 (solder) or IPF-PRESS-M1 (Press).



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

Apply heat with the flame directed AWAY from the center of the valve body. Excessive heat can harm the seats.

NOTICE

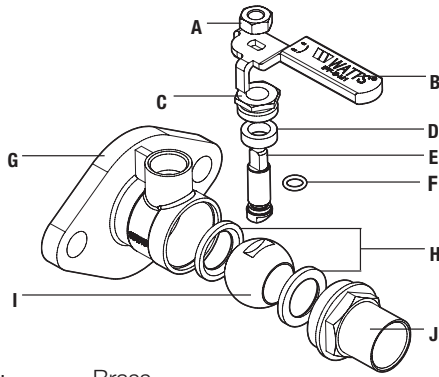
The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

NOTICE

Inquire with governing authorities for local installation requirements

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

Materials

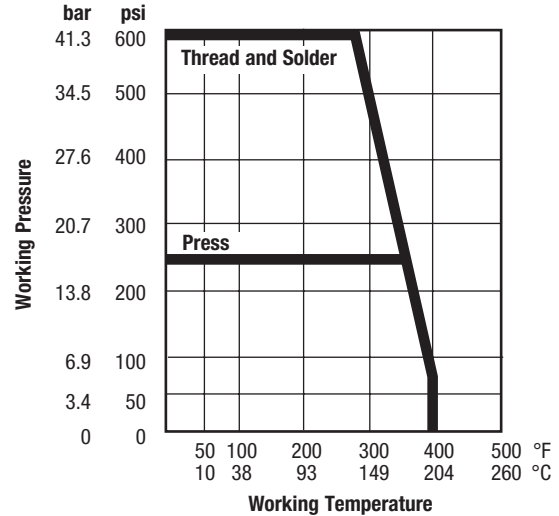


- A Handle nut: Brass
- B Handle: Steel with vinyl insulator
- C Packing Nut: Brass
- D Stem Packing: Virgin PTFE
- E Stem: Brass
- F Stem O-ring: EPDM
- G Body/Flange: Brass
- H Seats: Virgin PTFE
- I Ball: Chrome-plated Brass
- J Adapter: Brass

Pressure – Temperature

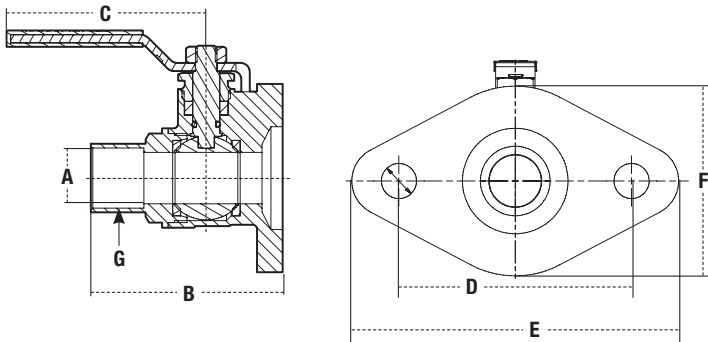
Maximum Working Pressure:
 Thread and Solder: 600psi (41.4 bar) WOG
 Press - 250psi (18 bar) CWP
 Maximum Temperature: 406°F (208°C) at 100psi (6.9 bar)

Temperature – Pressure Rating



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

Dimensions – Weights



SIZE		ORDERING CODE		DIMENSIONS								WEIGHT				
in.		in.	mm	A	B	C	D	E	F	G	lbs.	kg				
IPF-T-M1																
3/4	0068090	3/4	19	2 1/4	54	3	77	3 3/16	80	4 5/8	118	2 11/16	69	3/4" NPT	1.3	.61
1	0068091	1	25	2 5/8	63	3	77	3 3/16	80	4 5/8	118	2 11/16	69	1" NPT	1.6	.72
1 1/4	0068092	1 1/4	31	2 13/16	72	4	107	3 3/16	80	4 5/8	118	2 11/16	69	1 1/4" NPT	2.1	.97
1 1/2	0068093	1 1/2	39	3 1/4	79	4	107	3 3/16	80	4 5/8	118	2 11/16	69	1 1/2" NPT	2.5	1.13
2	0068094	1 7/8	47	3 3/4	90	4	107	3 7/16	87	4 5/8	118	2 11/16	69	2" NPT	2.5	1.16
IPF-S-M1																
3/4	0068095	3/4	19	2 1/8	54	3	77	3 3/16	80	4 5/8	118	2 11/16	69	—	1.3	.60
1	0068096	1	25	2 1/2	63	3	77	3 3/16	80	4 5/8	118	2 11/16	69	—	1.6	.72
1 1/4	0068097	1 1/4	31	2 13/16	72	4	107	3 3/16	80	4 5/8	118	2 11/16	69	—	2.1	.97
1 1/2	0068098	1 1/2	39	3 1/8	79	4	107	3 3/16	80	4 5/8	118	2 11/16	69	—	2.5	1.13
2	0068099	1 7/8	47	3 1/2	90	4	107	3 3/16	87	4 5/8	118	2 11/16	69	—	3.0	1.36
IPF-PRESS-M1																
3/4	0068087	3/4	19	3	77	3 5/8	92	3 3/16	80	4 1/8	105	2 11/16	69	Press	1.3	.60
1	0068088	1	25	3 5/16	84	4	107	3 3/16	80	4 1/8	105	2 11/16	69	Press	1.8	.79
1 1/4	0068089	1 1/4	31	3 5/8	92	5 1/16	137	3 3/16	80	4 1/8	105	2 11/16	69	Press	2.1	.97





Submittal Data Information

101-005

Boiler Feed Valves, Dual Controls, Backflow Preventers & Combination Boiler Feed & Backflow Preventer Valves

Effective: April 5, 2019

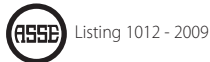
Supersedes: January 26, 2018

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

ITEM NO.	MODEL NO.	

Features

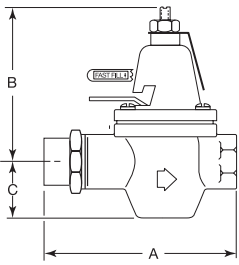
- Fast Fill Rate on All Models
- Exclusive Fast Fill Lever Lock
- Built-In Check to Prevent Emptying the System if Incoming Pressure Fails
- Adjustable Set Pressure of 10 to 25 psi
- Pressure Setting Adjustment Separated from Fast Fill Lever for Easy, Fast Adjustment
- Both the Backflow Preventer and the Combination Boiler Feed & Backflow Preventer Valve Carry These Certifications:



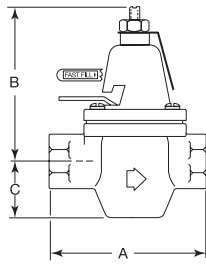
Purpose

To automatically feed water to a system whenever pressure in the system drops below the pressure setting of the valve. The dual control combines the boiler feed valve with an in-line pressure relief valve connected at the outlet end. The backflow prevents contamination of the potable water if supply pressure should fail.

Boiler Feed Valve



Models 329 & 329-T/H

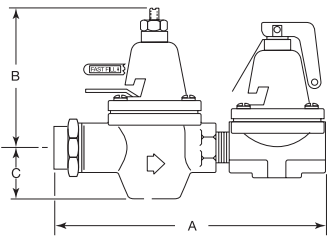


Model 335

* Dimensions for reference purposes only.

Models	Performance Data								Body	Inlet	Outlet	A		B		C		Ship Wt.	
	Max Fluid Temp		Max Supply Press.		Pressure Range		Factory Setting					in.	mm	in.	mm	in.	mm	lbs.	Kg
	F°	C°	psi	kPa	psi	kPa	psi	kPa											
329									Cast Iron	1/2" Union SWT	1/2" NPT	4-1/4	108	3-3/4	95	1-3/8	35	1.75	1.1
329-T									Cast Iron	1/2" Union NPT	1/2" NPT	4-3/4	111	3-3/4	95	1-3/8	35	1.75	1.1
329-H									Cast Iron	1/2" Union Press	1/2" NPT	5-1/2	140	3-3/4	95	1-3/8	35	1.75	1.1
335									Brass	3/4" NPT	3/4" NPT	3-3/4	95	3-3/4	95	1-3/8	35	2.4	1.1
335U-050-C	212*	100*	100	689	10-25	69-172	12	83	Brass	1/2" Union SWT	1/2" NPT	4-1/4	108	3-3/4	95	1-3/8	35	2.5	1.2
335U-050-T									Brass	1/2" Union NPT	1/2" NPT	4-1/4	108	3-3/4	95	1-3/8	35	2.5	1.2
335U-050-H									Brass	1/2" Union Press	1/2" NPT	5-1/4	133	3-3/4	95	1-3/8	35	2.5	1.2
335U-075-C									Brass	3/4" Union SWT	3/4" NPT	4-1/2	114	3-3/4	95	1-3/8	35	2.5	1.2
335U-075-T									Brass	3/4" Union NPT	3/4" NPT	4-1/4	108	3-3/4	95	1-3/8	35	2.5	1.2

Dual Controls

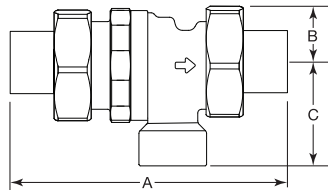


Models 334 & 334-T/H

* Dimensions for reference purposes only.

Models	Performance Data						Body	Inlet	Outlet	A		B		C		Ship Wt.	
	Max Fluid Temp		Max Supply Press.		Relief Valve Setting					in.	mm	in.	mm	in.	mm	lbs.	Kg
	F°	C°	psi	kPa	psi	kPa											
334	212°	100°	100	689	30	207	Cast Iron	1/2" Union SWT	1/2" NPT	7-1/4	184	3-3/4	95	1-3/8	35	3.9	1.8
334-T							Cast Iron	1/2" Union NPT	1/2" NPT	7-3/8	187	3-3/4	95	1-3/8	35	3.9	1.8
334-H							Cast Iron	1/2" Union Press	1/2" NPT	8-3/8	213	3-3/4	95	1-3/8	35	3.9	1.8

Backflow Preventer



Models 3192 & 3193



Listing 1012 - 2009

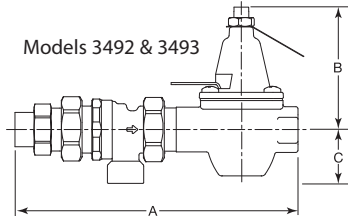


Listing B64.3 - 11

* Dimensions for reference purposes only.

Models	Performance Data						Body	Inlet	Outlet	A		B		C		Ship Wt.	
	Max Temp		Max Working Press.		Design Pressure Range					in.	mm	in.	mm	in.	mm	lbs.	Kg
	F°	C°	psi	kPa	psi	kPa											
3192-C	250°	121°	175	1206	25-250	172-1724	Brass	1/2" Union SWT	1/2" Union SWT	4-1/4	108	7/8	25	1-5/8	41	1.5	0.7
3192-T							Brass	1/2" Union NPT	1/2" Union NPT	4-1/8	105	7/8	25	1-5/8	41	1.5	0.7
3193-C							Brass	3/4" Union SWT	3/4" Union SWT	4-7/8	124	7/8	25	1-5/8	41	1.5	0.7
3193-T							Brass	3/4" Union NPT	3/4" Union NPT	4-1/8	105	7/8	25	1-5/8	41	1.5	0.7

Combination Boiler Feed & Backflow Preventer Valve



Models 3492 & 3493



Listing 1012 - 2009



Listing B64.3 - 11

* Dimensions for reference purposes only.

Models	Performance Data						Body	Inlet	Outlet	A		B		C		Ship Wt.	
	Max Fluid Temp		Max Supply Press.		Max Working Press.					in.	mm	in.	mm	in.	mm	lbs.	Kg
	F°	C°	psi	kPa	psi	kPa											
3492-050-C	212°	100°	100	689	25	172	Cast Iron/Brass	1/2" Union SWT	1/2" NPT	8-1/8	206	3-3/4	95	1-5/8	41	4	1.8
3492-050-T							Cast Iron/Brass	1/2" Union NPT	1/2" NPT	8-1/4	211	3-3/4	95	1-5/8	41	4	1.8
3492-050-H							Cast Iron/Brass	1/2" Union Press	1/2" NPT	9-3/8	238	3-3/4	95	1-5/8	41	4	1.8
3492-050-BC							Brass	1/2" Union SWT	1/2" NPT	7-7/8	199	3-3/4	95	1-5/8	41	4	1.8
3492-050-BT							Brass	1/2" Union NPT	1/2" NPT	8	203	3-3/4	95	1-5/8	41	4	1.8
3492-050-BH							Brass	1/2" Union Press	1/2" NPT	9-1/8	232	3-3/4	95	1-5/8	41	4	1.8
3493-075-BC							Brass	3/4" Union SWT	3/4" NPT	7-1/2	191	3-3/4	95	1-5/8	41	4	1.8
3493-075-BT							Brass	3/4" Union NPT	3/4" NPT	7-1/4	183	3-3/4	95	1-5/8	41	4	1.8

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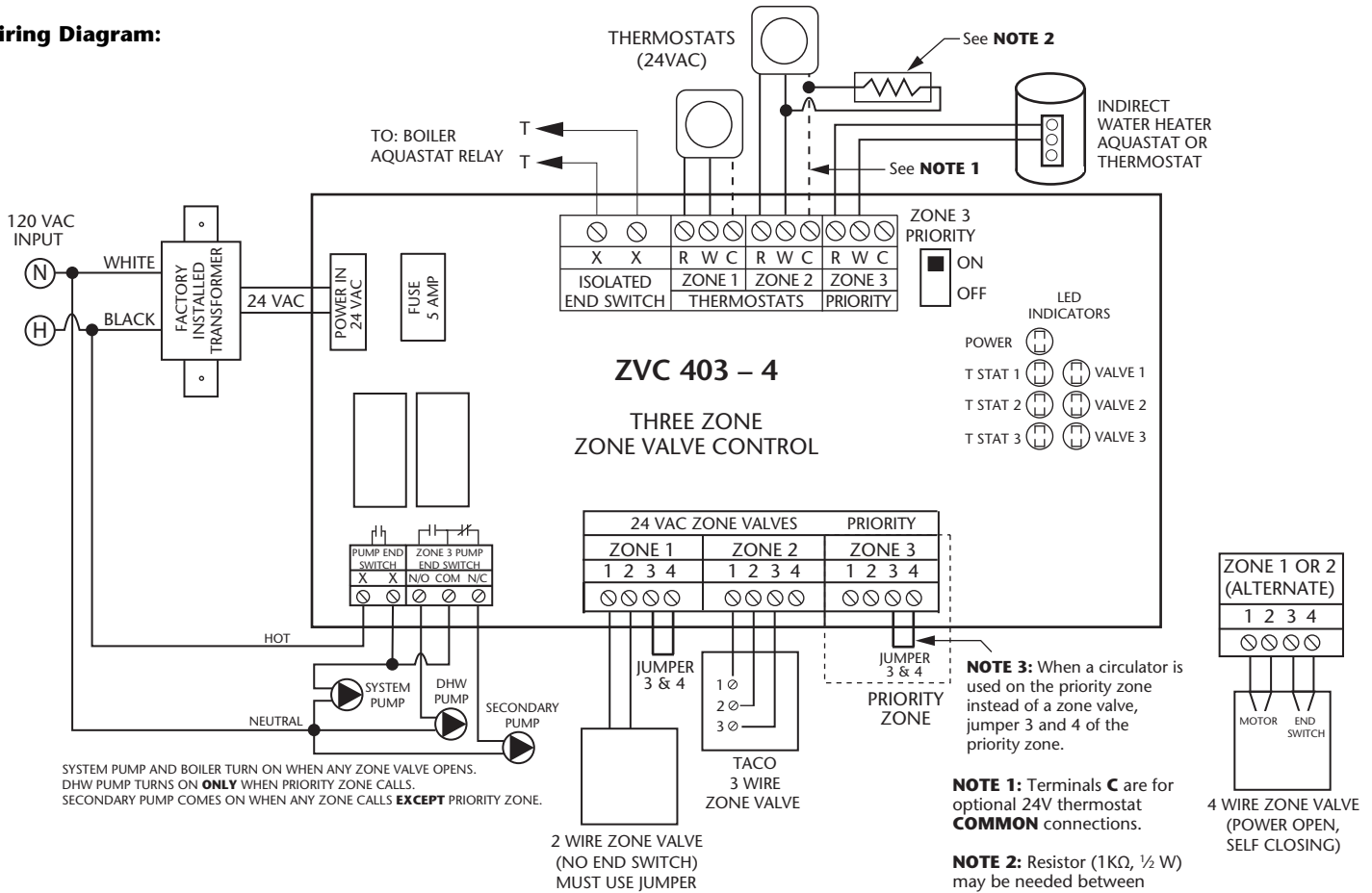
ZVC403 Zone Valve Control

SUPERSEDES: February 1, 2013

EFFECTIVE: December 20, 2013

Plant ID# 9300-2876

Wiring Diagram:



Operation/External Diagnostics: When any thermostat calls for heat, the appropriate zone valve is energized and the yellow light goes on. When the zone valve is fully open, the red light goes on and energizes the end switch relay. The green light should always be on, indicating that power is connected.

Priority Operation: When zone 3 is switched to the priority setting and is actuated, all other zones will stop operation until zone 3 is satisfied. When zone 3 is not switched to priority, all zones will operate independently. **Note:** When a circulator is used on the priority zone instead of a zone valve, jumper 3 and 4 of the priority zone.

Priority Protection Operation: When the priority zone calls continuously for more than one hour, power is returned to all the other zones, allowing each zone to function independently. Once the priority zone is satisfied, the control's auto-reset is activated and the priority zone is again allowed to have priority for up to one hour starting from when it calls next.

Specifications:

PRODUCT NUMBER	NUMBER OF ZONES	INPUT VOLTAGE	MAX 24 VAC OUTPUT @ 25°C	TYPE 1 ENCLOSURE WIDTH	HEIGHT	DEPTH
ZVC403-4	3 with Priority	120/60/1 VAC, 1.5A	24 VA per Zone 40 VA Total	10¾"	7"	2¾"

The pump end switches are rated ½ hp, 5 amps at 120 VAC. The main and priority end switch connections are rated 24 VAC, 1 amp. All thermostat and zone valve connections supply a 24 VAC class 2 output.

WARNING: Wiring connections must be made in accordance with all applicable electrical codes. Use copper wire only. 120 VAC wiring must have a minimum temperature rating of 75°C. Failure to follow this instruction can result in personal injury or death and/or property damage. 12-18 gauge wire recommended for 120 VAC connections, 14-22 gauge wire for thermostat connections, and 14-22 gauge wire for 24 VAC source connections.

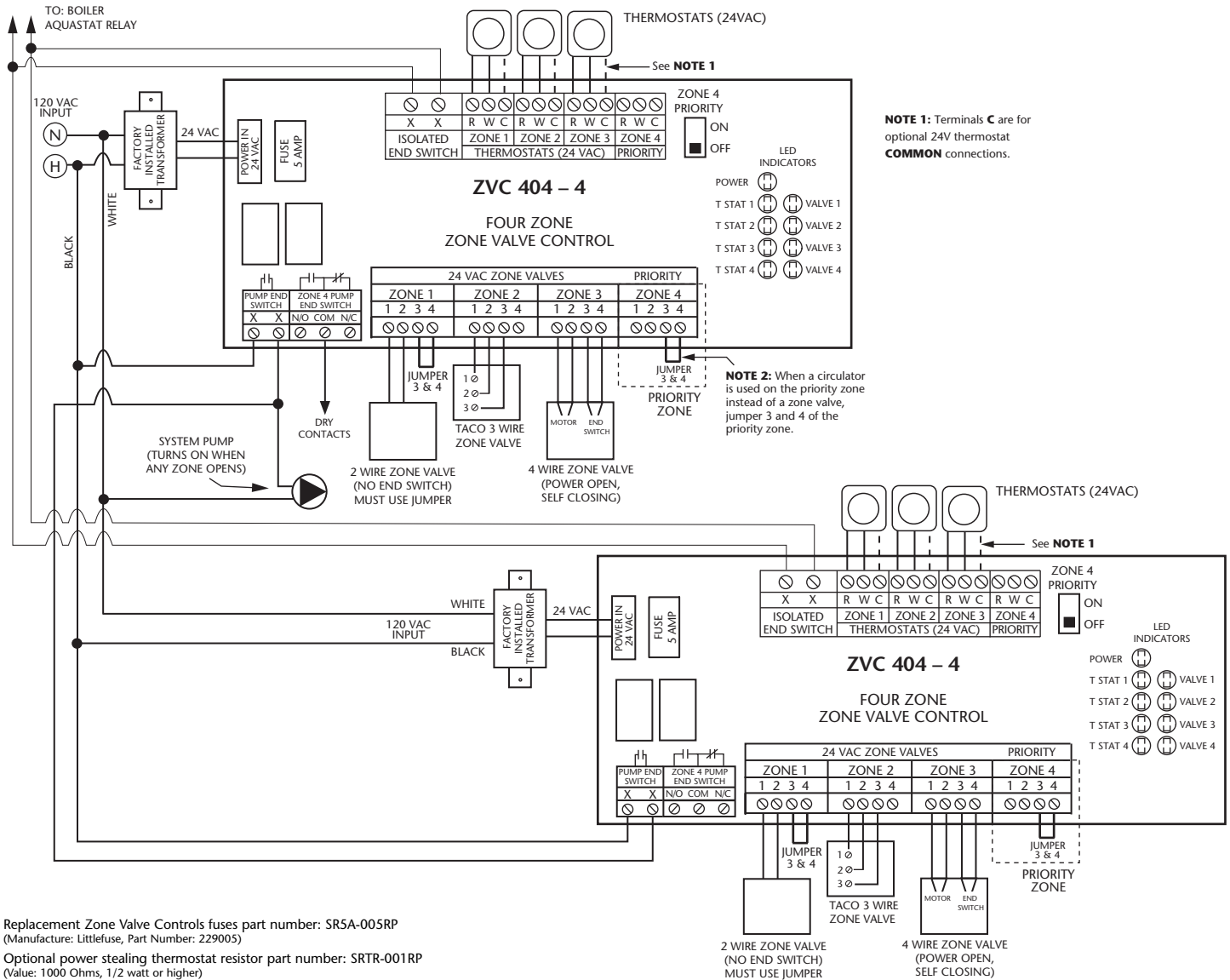
Troubleshooting:

- Problem:** Digital thermostats do not work correctly when connected to a zone valve control.
- Solution:** Some thermostats are a "Power Stealing" type which means they are powered by the zone control with just 2 wires (R & W). A resistor may be needed in order to have the thermostat work properly. This resistor should be placed between the W & C (common) terminals of the zone control. If the thermostat manufacturer does not supply a resistor, a 1000 ohm ½ watt resistor has proven to work with most models and is readily available at electronic supply outlets (e.g. Radio Shack). If the thermostat is battery powered, then check that the batteries are fresh and installed correctly.
- Problem:** No heat in a zone or room of building.
- Solution:** LED diagnostic lights will help find a component that is not working properly. The green LED should always be on, indicating that power is connected and the fuse is good. When there is a call for heat, the yellow LED will come on indicating power to the zone valve. This indicates the thermostat is working correctly. When the zone valve fully opens and its end switch makes contact, the red LED will come on, the boiler turns on and a circulator will start if connected to the zone control.

For information on Taco's Zone Valve Controls (ZVC) including catalog sheet, instruction sheets, Visio stencils and our highly praised Zone Controls Wiring Guide, scan the QR code to the right or go to our website: <http://www.taco-hvac.com>.



2 ZVC403–ZVC406 Zone Controls Connected Together with System Pump



LIMITED WARRANTY STATEMENT

Taco, Inc. will repair or replace without charge (at the company's option) any product or part which is proven defective under normal use within three (3) years from the date of start-up or three (3) years and six (6) months from date of shipment (whichever occurs first).

In order to obtain service under this warranty, it is the responsibility of the purchaser to promptly notify the local Taco stocking distributor or Taco in writing and promptly deliver the subject product or part, delivery prepaid, to the stocking distributor. For assistance on warranty returns, the purchaser may either contact the local Taco stocking distributor or Taco. If the subject product or part contains no defect as covered in this warranty, the purchaser will be billed for parts and labor charges in effect at time of factory examination and repair.

Any Taco product or part not installed or operated in conformity with Taco instructions or which

has been subject to misuse, misapplication, the addition of petroleum-based fluids or certain chemical additives to the systems, or other abuse, will not be covered by this warranty.

If in doubt as to whether a particular substance is suitable for use with a Taco product or part, or for any application restrictions, consult the applicable Taco instruction sheets or contact Taco at [401-942-8000].

Taco reserves the right to provide replacement products and parts which are substantially similar in design and functionally equivalent to the defective product or part. Taco reserves the right to make changes in details of design, construction, or arrangement of materials of its products without notification.

TACO OFFERS THIS WARRANTY IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ANY WARRANTY IMPLIED BY LAW INCLUDING WARRANTIES OF MERCHANTABILITY OR FIT-

NESS IS IN EFFECT ONLY FOR THE DURATION OF THE EXPRESS WARRANTY SET FORTH IN THE FIRST PARAGRAPH ABOVE.

THE ABOVE WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR STATUTORY, OR ANY OTHER WARRANTY OBLIGATION ON THE PART OF TACO.

TACO WILL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF ITS PRODUCTS OR ANY INCIDENTAL COSTS OF REMOVING OR REPLACING DEFECTIVE PRODUCTS.

This warranty gives the purchaser specific rights, and the purchaser may have other rights which vary from state to state. Some states do not allow limitations on how long an implied warranty lasts or on the exclusion of incidental or consequential damages, so these limitations or exclusions may not apply to you.

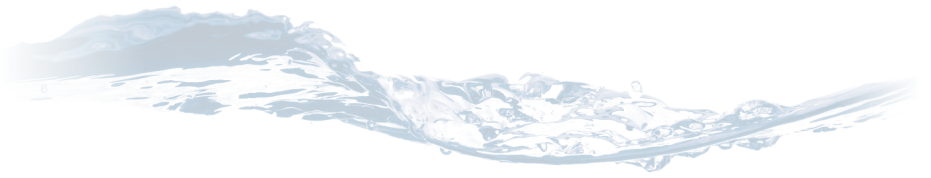
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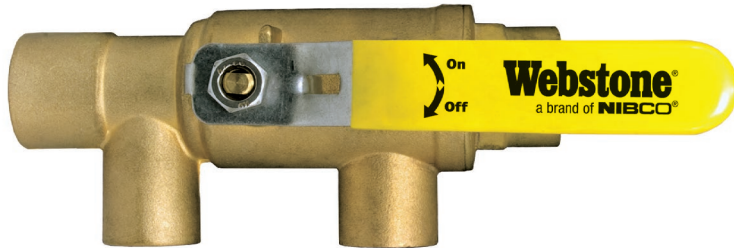
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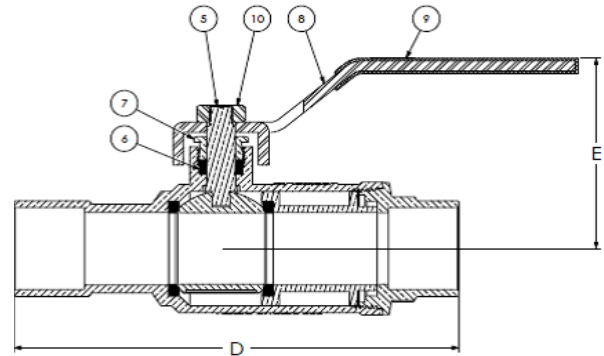
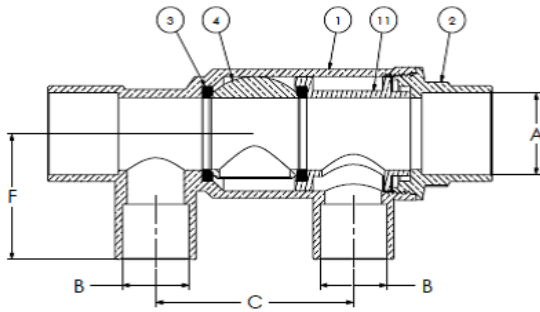
H-x864 Series

Pro-Pal Primary/Secondary Loop Purge Tee
 Full Port Forged Brass Ball Valve
 w/ Reversible Handle
 & Adjustable Packing Gland



PATENTED TECHNOLOGY

NO.	DESCRIPTION	MATERIAL
1	BODY	BRASS
2	END CAP	BRASS
3	SEAT	PTFE
4	BALL	BRASS HCP
5	STEM	BRASS
6	STEM SEAL	PTFE
7	PACKING GLAND	BRASS
8	HANDLE	STEEL CP
9	HANDLE JACKET	VINYL
10	HANDLE NUT*	STAINLESS STEEL
11	SEAT RETAINER	BRASS



Designed for residential, commercial or industrial use with water, oil or gas. This approved Webstone valve is actuated by a blowout proof stem and features an adjustable packing gland.

ITEM#	Connection Type	SIZE (in)	Pressure Rating	Max Temp	A	B	C	D	E
H-58643	SWT	1 × 3/4	600 PSI CWP Max	250°F Max	1.00	0.75	2.69	5.81	2.38
H-58644	SWT	1	600 PSI CWP Max	250°F Max	1.00	1.00	2.88	5.81	2.44
H-58653	SWT	1 1/4 × 3/4	600 PSI CWP Max	250°F Max	1.25	0.75	3.25	6.31	2.25
H-58654	SWT	1 1/4 × 1	600 PSI CWP Max	250°F Max	1.25	1.00	3.25	7.00	2.56
H-58655	SWT	1 1/4	600 PSI CWP Max	250°F Max	1.25	1.25	3.25	7.00	2.63
H-88643	Press	1 × 3/4	250 PSI CWP Max	250°F Max	1.00	0.75	2.60	7.28	2.60
H-88644	Press	1	250 PSI CWP Max	250°F Max	1.00	1.00	2.60	7.28	2.60
H-88654	Press	1 1/4 × 1	250 PSI CWP Max	250°F Max	1.25	1.00	3.11	8.62	2.95
H-88655	Press	1 1/4	250 PSI CWP Max	250°F Max	1.25	1.25	3.11	8.62	2.95

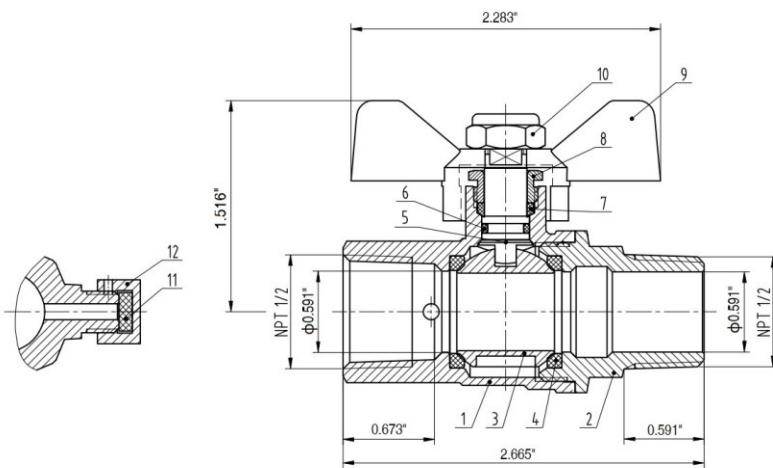


Features:

- *Lead Free
- 600 WOG
- 1/2" M X F Ball Valve with Drain
- cUPC Approved
- NSF/ANSI 61 & 372 Certified
- NPT Thread End Comply to ANSI B1.20.1
- Minimum Temperature (Water): -20 °F
- Maximum Temperature (Water): 300 °F
- Blow-out Proof Stem
- Aluminium Butterfly Handle with Red Painting



Dimensions & Materials List:



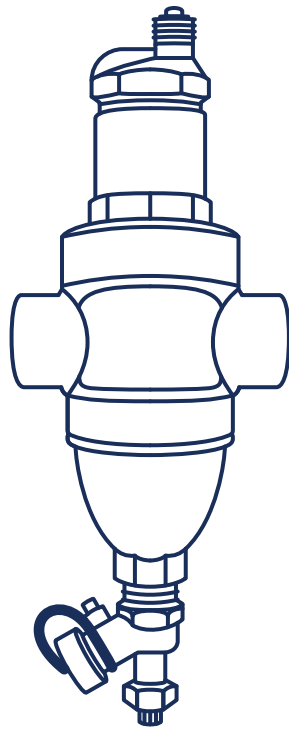
No.	Part	QTY	Material
1	Body	1	Lead Free Brass
2	Bonnet	1	Lead Free Brass
3	Ball	1	Lead Free Brass
4	Seat	2	PTFE
5	Stem	1	Brass
6	O-Ring	1	NBR
7	Packing	1	PTFE
8	Packing Nut	1	Brass
9	Handle	1	Aluminum
10	Lock Nut	1	Stainless Steel
11	Washer	1	EPDM
12	Venting Cap	1	Brass

Part#	Description	Size
4PROETBV	1/2" M x F Expansion Tank Ball Valve with Drain T-Handle	1/2"

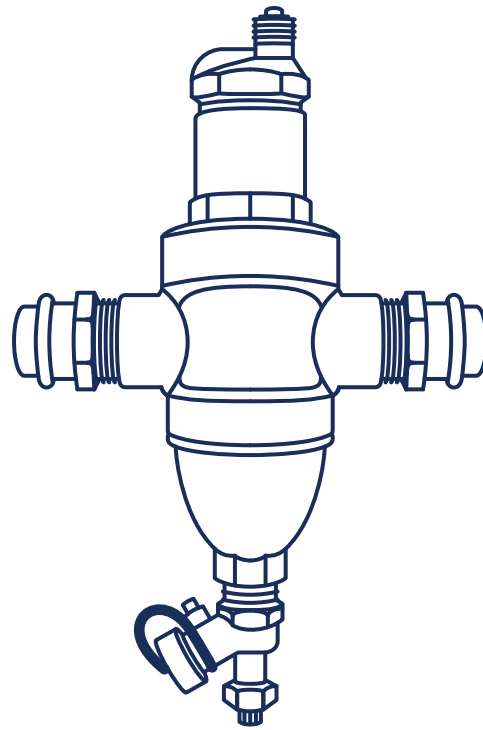
*Lead Free: weighted average lead content $\leq 0.25\%$

Air & Dirt Eliminator with magnet

For models 4PRO1IPSBADDEWM | 4PRO1PBADEWM | 4PRO114IPSBADDEWM | 4PRO114PBADEWM



IPS



Press

TECHNICAL SPECIFICATIONS

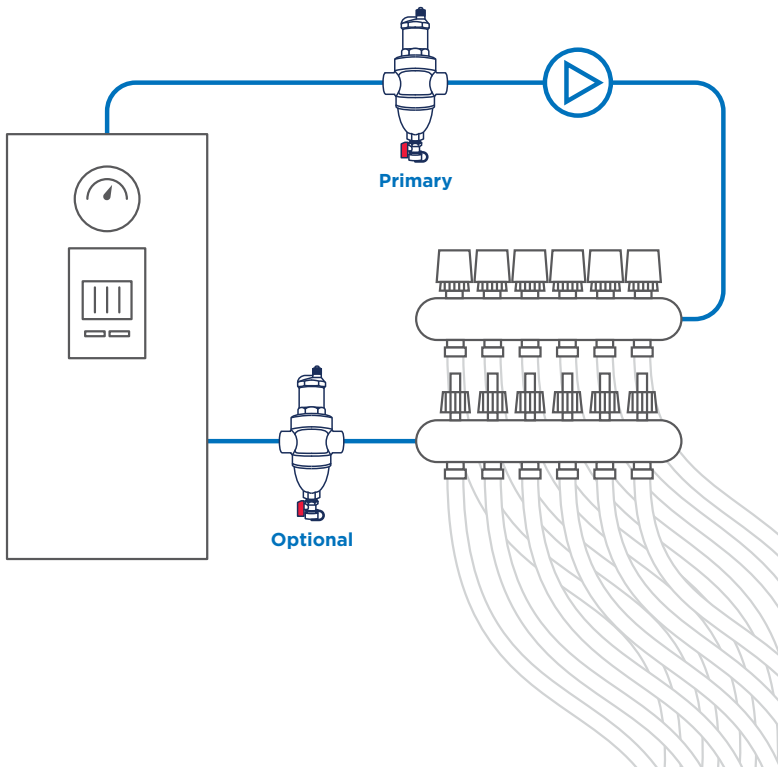
Housing	Brass
Maximum Temperature	250°F
Maximum Design Pressure	150 PSI
Automatic Air Vent	Included
Vent Pipe Connection	Equipped
Connections	IPS or Press, 1" or 1 1/4"
Coalescing Media	316 stainless steel
Adapted Fluids	Water and 50% glycol solution



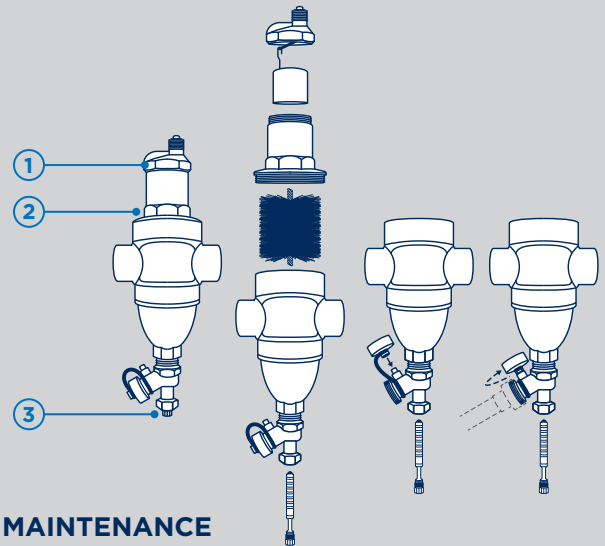
INSTALLATION

Install the 4Pro Air & Dirt Eliminator in a dry and frost-free environment on horizontal piping making sure that the air separator is placed in the upright position and the drain valve is placed down. Leave at least 100mm (4 in) free on top and on the bottom of the device to have enough space for maintenance.

The 4Pro Air & Dirt Eliminator must be installed after the boiler and preferably before the circulation pump.



AIR & DIRT ELIMINATOR INSTRUCTION



MAINTENANCE

- Visually inspect the device periodically.
- Ensure that the installation is cooled down and not under pressure when proceeding maintenance.
- To clean the float, needle and O-ring located inside the automatic air vent, unscrew the top hexagonal head at the top of the unit. ①
- To remove and clean the stainless steel bristles coalescing media, completely remove the automatic air vent from the body of the unit by unscrewing it. ②
- It is important to unscrew the magnet head (not the hexagonal ring) located at the bottom of the unit in order to completely remove the magnet. This step is essential in order to dislodge ferrous impurities. ③
- Unscrew the drain valve cap and connect a garden hose if necessary to collect water and dirt in a container.

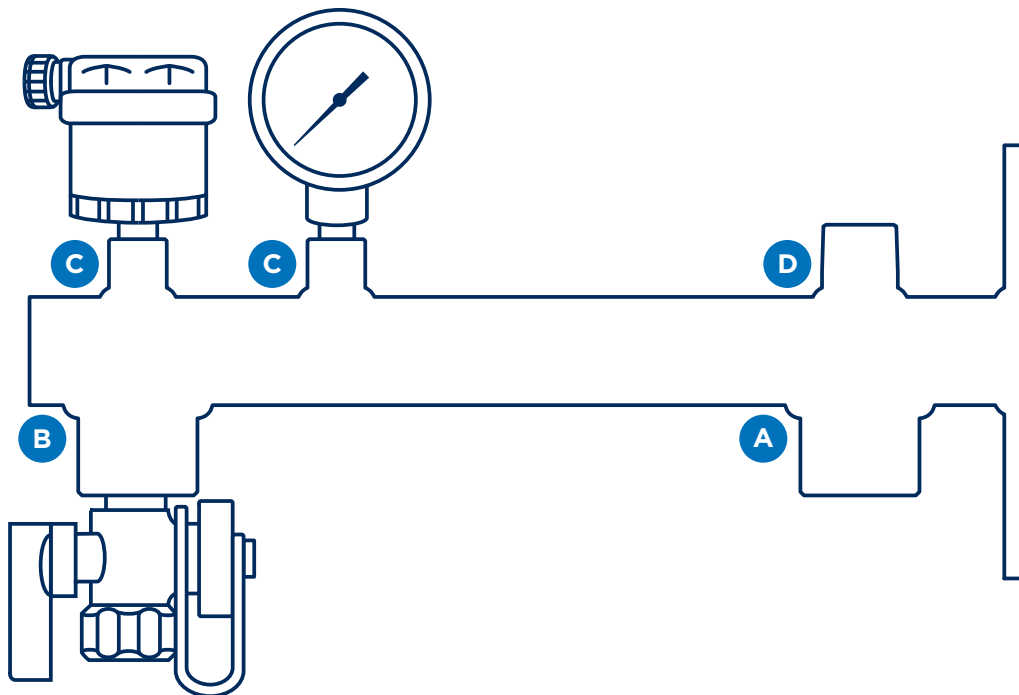
WARNING

The installation must be performed by qualified professionals in respect with current codes and law. Check that all connections are waterproof.

Hydronic Expansion Tank Bracket Kit

Model 4PROHETBRACKETKIT

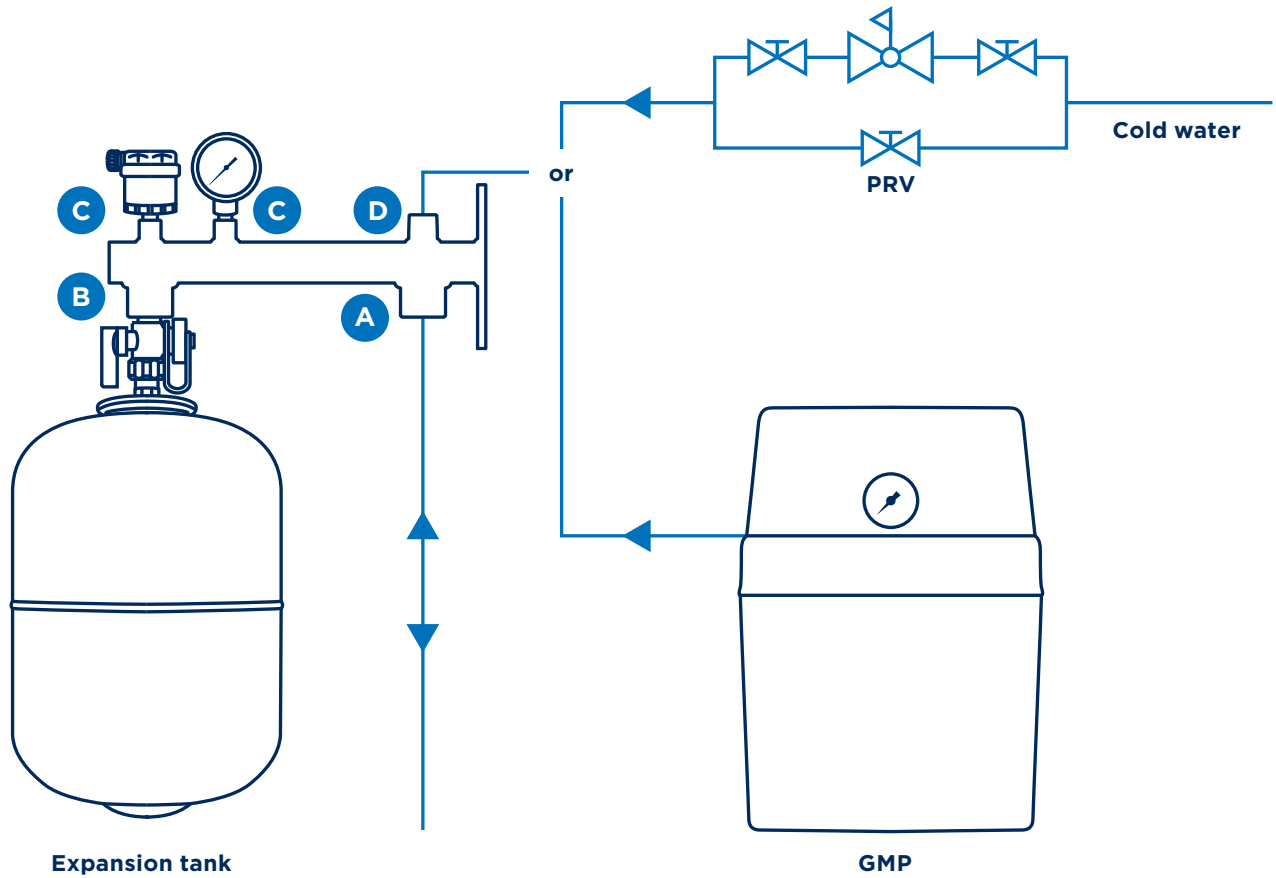
Once the 4Pro Hydronic Expansion Tank Bracket Kit is installed, you have a complete overview of the system. This makes maintenance a lot more easier!



TECHNICAL SPECIFICATIONS

Length	11 in (27.9 cm)
Width	4.5 in (11.4 cm)
Height	2 3/8 in (6 cm)
Connections	A: 1/2" FNPT B: 1/2" FNPT C: 1/8" FNPT D: 1/2" MNPT

Installation



- Link your hydronic system to the 1/2" FNPT connection **A**.
- Connect directly a hydronic expansion tank, with the service valve on the 1/2" FNPT connection **B**.
- Then, on connections **C** (1/8" FNPT), connect a hydronic automatic air vent (4PRO18AV) or a pressure gage.
- On connection **D** (1/2" MNPT), you can either connect your GMP or simply the cold water supply.

THIS SPACE FOR DESIGNER/ENGINEER APPROVAL

Job/Customer _____	Date _____	Contractor _____
Model Specified _____	Qty _____	Approved By _____
Designer/Engineer _____	Date _____	Contractor's PO# _____
Submitted by _____	Date _____	Other _____

8061W Series

**Full Port Forged Brass Ball Valves
w/ Hi-Flow Hose Drain, Adjustable Packing Gland
& Reversible Handle - LEAD FREE**

Press

250 CWP / 250°F Max

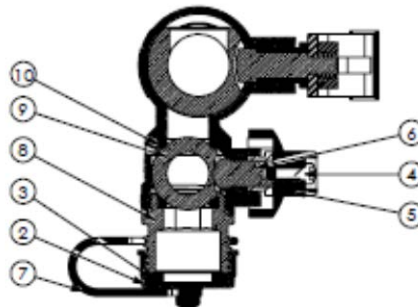
ISO 9001



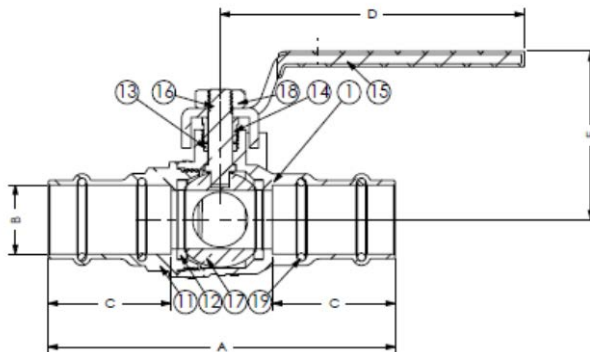
Lead Free Products are
Certified to NSF/ANSI 61
& NSF/ANSI 372



STANDARD BRASS ITEM #	LEAD FREE ITEM #	SIZE	CTN	CASE	A	B	C	D	E
80612	80612W	1/2"	4	40	3 3/4	5/8	1 3/8	3 7/8	1 15/16
80613	80613W	3/4"	4	32	4 7/16	7/8	1 9/16	3 7/8	2 1/8
80614	80614W	1"	2	20	4 13/16	1 1/8	1 9/16	4 11/16	2 5/8
80615	80615W	1 1/4"	2	16	5 1/2	1 3/8	1 3/4	4 11/16	3
80616	80616W	1 1/2"	1	8	5 7/8	1 5/8	1 13/16	5 5/8	3 9/16
80617	80617W	2"	1	6	7	2 1/8	2 1/8	5 5/8	3 15/16



NO.	DESCRIPTION	MATERIAL
1	BODY	BRASS
2	DRAIN CAP	BRASS
3	WASHER	EPDM
4	SCREW	STAINLESS STEEL
5	DRAIN HANDLE	ALUMINUM
6	DRAIN STEM	BRASS
7	STRAP	PVC
8	DRAIN END CAP	BRASS
9	DRAIN BALL	BRASS CP
10	SEAT	PTFE
11	END CAP	BRASS
12	SEAT	PTFE
13	PACKING STEM	PTFE
14	PACKING NUT	BRASS
15	HANDLE	STEEL HCP
16	STEM	BRASS
17	TEE BALL	BRASS CP
18	NUT	STAINLESS STEEL
19	O-RING	EPDM



TEMP °F	PSI
100	250
250	200

Specifications: Designed for residential, commercial or industrial use with water, oil or gas. This approved Webstone valve is actuated by a blowout proof stem and features an adjustable packing gland



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