HEAT-TIMER®

Installation and Operation Manual

Motorized Valves (2-Way and 3-Way)

For Steam and Hot Water Heating Systems

⚠ WARNING

All Heat-Timer controls and valves are strictly operating controls and valves; they should never be used as a primary limit or safety control. All equipment must have its own certified limit and safety controls required by local codes. The installer must verify proper operation and correct any safety problems prior to the installation of any Heat-Timer equipment.

059103-00 Rev. C

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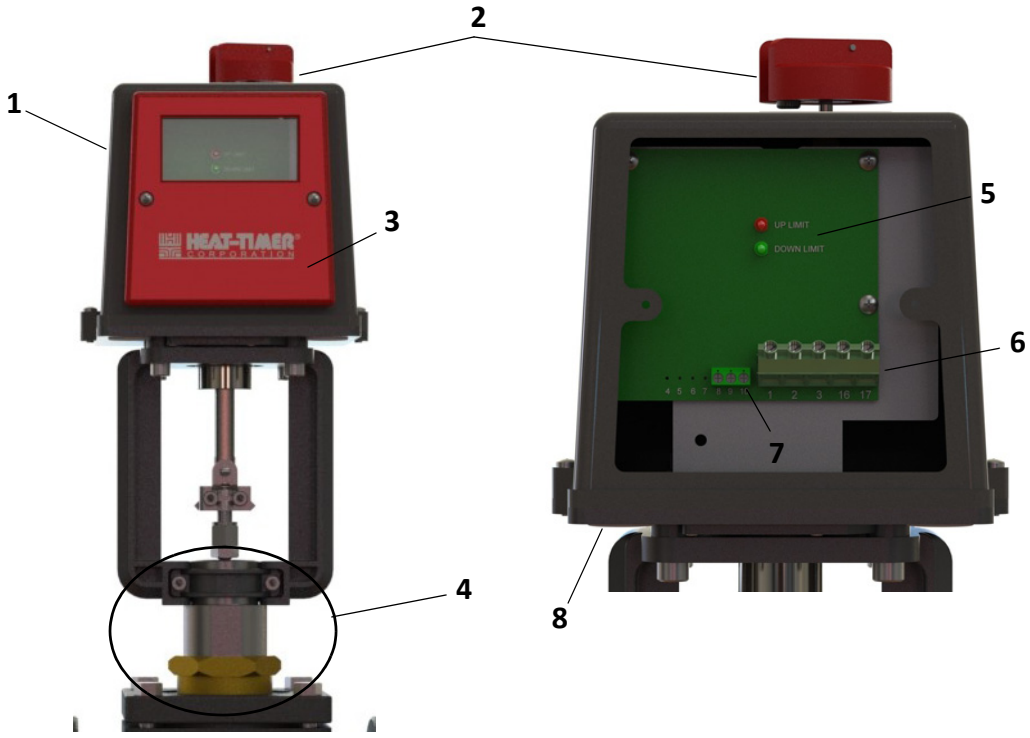
Controls, Indicators, and Connections

Figure 1: Motorized Valve Controls, Indicators, and Connections



Item	Description	Item	Description
1	Valve Actuator	5	Status Indicators • Red “Up Limit” LED lights when the Actuator shaft is moving upward and has reached the upper limit. • Green “Down Limit” LED lights when the Actuator shaft is moving downward and has reached the lower limit.
2	Actuator Manual Control	6	Power Wiring
3	Actuator Faceplate	7	Feedback Wiring
4	Actuator Valve Adaptor	8	Power Switch

Specifications

Actuator

Input Signal: . . . . . 24Vac Floating

Power Consumption: 10VA

Operating Temperature: . . . . . Ambient 15°F to 120°F (-9.5°C to 48.9°C)

Construction: . . . . . Aluminum Bracket and Housing

Locations: . . . . . NEMA type 2 / IP54 Indoor Only

Clearance: . . . . . Minimum 4" – 6" (101.6mm – 152.4mm) Above Actuator for Manual Operation

Mounting: . . . . . Vertical Above Center Line of Valve

User Interface: . . . . . Power Switch
Manual Override Crank Handle
Status Indicators (Up Limit/Down Limit LEDs)

2-Way Valve

Body: . . . . . 1 ½" – 2" (38.1mm – 50.8mm) Valves: ANSI B16.15 Bronze 250 lb Threaded (NPT)
2 ½" – 10" (63.5mm – 254mm) Valves: ANSI B16.1 Iron 125 lb Flange

Trim: . . . . . 1 ½" – 2" (38.1mm – 50.8mm) Valves: 316 Stainless Steel
2 ½" – 10" (63.5mm – 254mm) Valves: Bronze

Packing: . . . . . Long-Life Multi-Stack, EPDM Lip Packing for Temperatures up to 350°F (176.7°C)

Seat Closure: . . . . . 1 ½" – 2" (38.1mm – 50.8mm) Valves: Single-Seat ANSI Class IV and Class VI Shut-Off
2 ½" – 6" (63.5mm – 152.4mm) Valves: Single-Seat ANSI Class IV Shut-Off
8" – 10" (203.2mm – 254mm) Valves: Double-Seat ANSI Class IV Shut-Off

Temperature: . . . . . 1 ½" – 2" (38.1mm – 50.8mm) Valves: 32°F to 400°F (0°C to 204.5°C)
2 ½" – 10" (63.5mm – 254mm) Valves: 32°F to 350°F (0°C to 177°C)

3-Way Valve

Body: . . . . . 1" – 2" (25.4mm – 50.8mm) Valves: ANSI B16.15 Bronze 250 lb Threaded (NPT)
2 ½" – 8" (63.5mm – 203.2mm) Valves: ANSI B16.1 Iron 125 lb Flange

Trim: . . . . . 1" – 2" (25.4mm – 50.8mm) Valves: 316 Stainless Steel
2 ½" – 8" (63.5mm – 203.2mm) Valves: Bronze

Packing: . . . . . Long-Life Multi-Stack, EPDM Lip Packing for Temperatures up to 350°F (176.7°C)

Seat Closure: . . . . . 1" – 8" (38.1mm – 203.2mm) Valves: ANSI Class IV Shut-Off

Temperature: . . . . . 1" – 2" (25.4mm – 50.8mm) Valves: 32°F to 400°F (0°C to 204.5°C)
2 ½" – 8" (63.5mm – 203.2mm) Valves: 32°F to 350°F (0°C to 177°C)

Installation Instructions

The Motorized Valve Actuator can be installed in two different configurations:

- **With Feedback** – configuration used with the SRC Platinum control only
- **Without Feedback** – configuration can be used with HWR or MPC Platinum, or DIGI-SPAN HWE-MOV or MCF Elite controls

NOTE: The Heat-Timer Motorized Valve Actuator can be used with virtually any floating motor controller. However, it is designed to work with Heat-Timer controls. The actuator/motor uses a floating type signal (R. W. B.).

The installation process consists of the following basic steps:

1. Calculating valve sizing.
2. Mounting the Valve Actuator assembly.
3. Mounting the Actuator power transformer.
4. Connecting the control wiring.

Required Materials (Not Supplied)

The following materials/tools are required for installation, but are not supplied:

- General tool kit (screwdrivers, wire strippers, power drill, etc.)
- 18 AWG cable (Heat-Timer p/n 703001-01 or equivalent #18⁄2 cable) – used for the 24Vac Valve Actuator input power connection

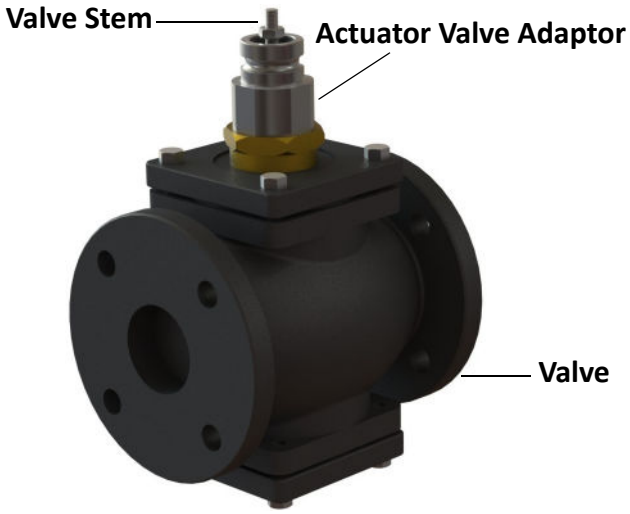
Components

The components that make up the installation are divided into a valve package and an actuator package.

Valve Package

The valve package consists of the following components:

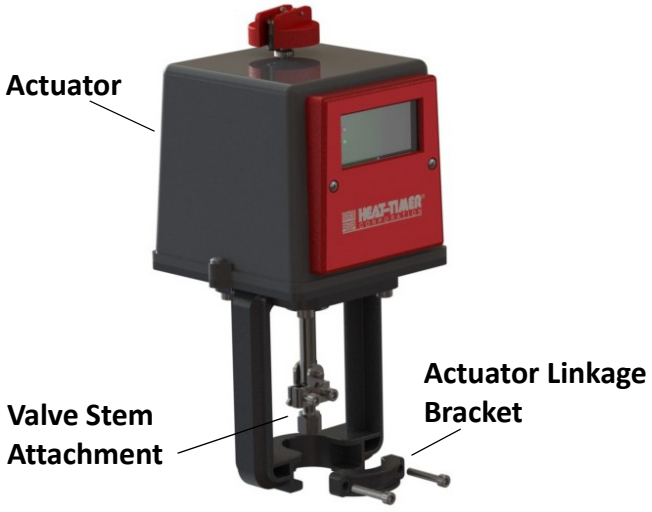
- Valve (2-way or 3-way)
- Actuator Valve Adaptor



Actuator Package

The actuator package consists of the following components:

- Actuator
- Actuator Linkage Bracket
- Hex Wrench (5mm) and 24Vac Transformer (not shown)



Calculating Valve Sizing

Motorized valves should be sized by C_v ratings (the capacity factor or flow coefficient). This is defined as the number of gallons of water at 60°F (15.6°C) which pass through a device with a 1 PSI pressure differential.

2-Way Steam Valve Sizing

The selection of a steam valve in a zoning situation should be based on minimizing the drop across a 2-way valve. In the case of heat exchangers, the objective is to allow maximum capacity flow as specified by the heat exchanger and/or pump capacity.

Use the following formula to calculate the C_v rating:

$$C_V = \frac{\text{Lb/hr.}}{2.1\sqrt{(P_1-P_2) \times (P_1+P_2)}}$$

The following example shows the C_v calculation in a system that will pass 5000 lb/hr of saturated steam when the inlet pressure is 7 PSIG and a 2 PSIG pressure drop is desired. Remember to use absolute pressures.

$$P_1 = 14.7 + 7.0 = 21.7$$

$$P_2 = P_1 - \Delta P = 19.7$$

$$C_V = \frac{5{,}000}{2.1\sqrt{(21.7-19.7) \times (21.7+19.7)}} = 262$$

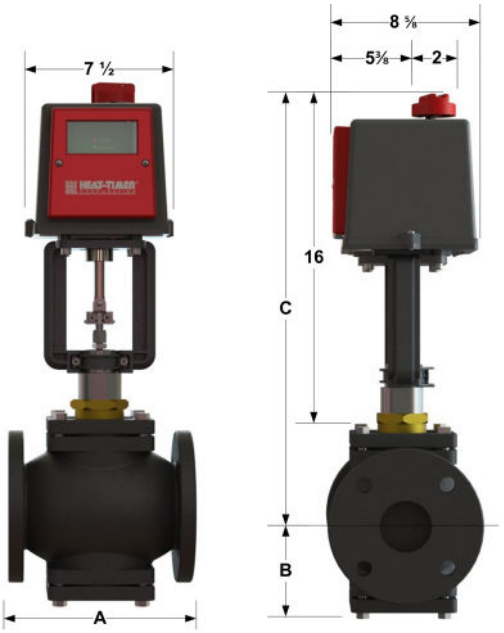


Figure 2: 2-Way Single-Seat Motorized Valves

Valve Size	Catalog Number	Flow Coefficient (C_v)	Dimensions (in)			Mount	Body	Trim	Est. Shipping Weight (lb)	Medium Temp Range (°F)
			A	B	C					
2½”	928252-50-VM	65	9	4 9/16	21⅛	Flanged	Iron	Bronze	71	32 – 300
3”	928253-00-VM	90	10	5¼	21 15/16	Flanged	Iron	Bronze	88	32 – 300
4”	928254-00-VM	170	13	6 3/16	23	Flanged	Iron	Bronze	135	32 – 300
5”	928255-00-VM	280	15¾	5⅝	23⅝	Flanged	Iron	Bronze	150	32 – 300
6”	928256-00-VM	360	17¾	6⅜	24¼	Flanged	Iron	Bronze	191	32 – 300

Figure 3: 2-Way Double-Seat Motorized Valves

Valve Size	Catalog Number	Flow Coefficient (C_v)	Dimensions (in)			Mount	Body	Trim	Est. Shipping Weight (lb)	Medium Temp Range (°F)
			A	B	C					
1½”	928051-50-VM	30	7⅜	3¾	20 7/16	NPT	Iron	S. Steel	31	32 – 300
2”	928052-00-VM	42	7⅜	3¾	20 7/16	NPT	Iron	S. Steel	35	32 – 300
2½”	928052-50-VM	70	7¾	4	20¾	Flanged	Iron	Bronze	71	32 – 300
3”	928053-00-VM	100	9	4¼	20 15/16	Flanged	Iron	Bronze	88	32 – 300
4”	928054-00-VM	200	11⅜	4⅞	22½	Flanged	Iron	Bronze	135	32 – 300
5”	928055-00-VM	260	12	6 11/16	23½	Flanged	Iron	Bronze	150	32 – 300
6”	928056-00-VM	350	14⅛	7 7/16	24⅜	Flanged	Iron	Bronze	191	32 – 300
8”	928058-00-VM	680	16¼	8 11/16	25½	Flanged	Iron	Bronze	306	32 – 350
10”	928060-00-VM	960	20	10¾	27 3/16	Flanged	Iron	Bronze	451	32 – 350

3-Way Water Valve Sizing

The selection of a Hot Water Valve should be based on a C_v rating approximately 10% greater than the calculated requirement to maintain control at the maximum flow rate.

Use the following formula to calculate the C_v rating:

$$C_v = \frac{G.P.M.}{\sqrt{\Delta P}}$$

The following example shows the C_v calculation in a system that will pass 200 GPM of water while limiting the pressure drop to 3 PSIG. The objective is to minimize the pressure drop across the valve. Remember to use absolute pressures.

$$C_v = \frac{200}{\sqrt{3}} = 115$$

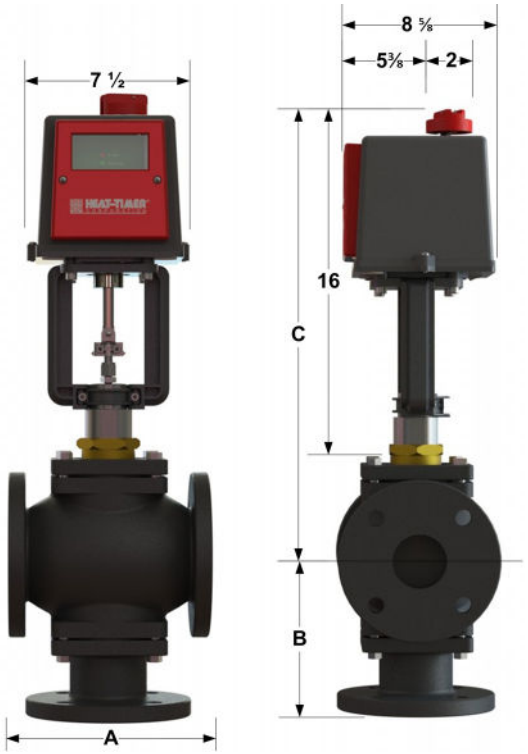


Figure 4: 3-Way Mixing Valves

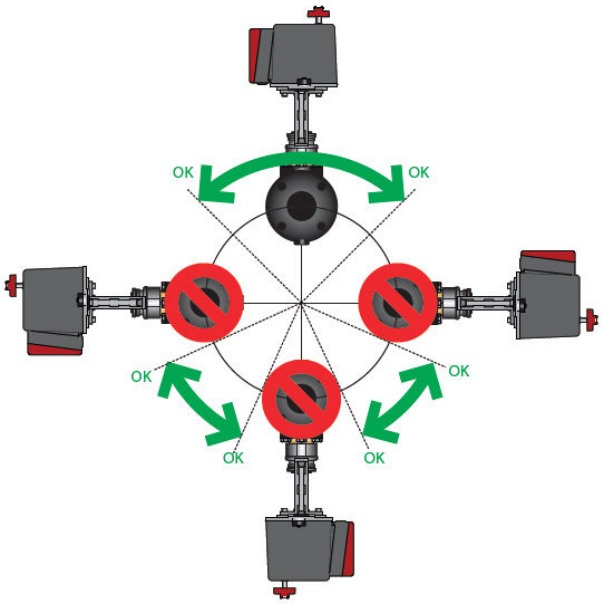
Valve Size	Catalog Number	Flow Coefficient (C_v)	Dimensions (in)			Mount	Body	Trim	Est. Shipping Weight (lb)	Medium Temp Range (°F)
			A	B	C					
1”	928301-00-VM	10	4⅞	2¾	18¾	NPT	Bronze	S. Steel	25	32 – 300
1½”	928301-50-VM	20	5¾	3 13/16	19 5/16	NPT	Bronze	S. Steel	32	32 – 300
2”	928302-00-VM	40	6½	4	19⅝	NPT	Bronze	S. Steel	36	32 – 300
2½”	928302-50-VM	69	9	7 1/16	21⅛	Flanged	Iron	Bronze	80	32 – 350
3”	928303-00-VM	86	10	7 15/16	21 15/16	Flanged	Iron	Bronze	99	32 – 350
4”	928304-00-VM	156	13	9⅞	23	Flanged	Iron	Bronze	155	32 – 350
5”	928305-00-VM	270	15¾	9¼	21⅞	Flanged	Iron	Bronze	173	32 – 350
6”	928306-00-VM	347	17¾	9⅞	22⅝	Flanged	Iron	Bronze	218	32 – 350
8”	928308-00-VM[a]	450	21⅜	14½	24 13/16	Flanged	Iron	Bronze	331	32 – 350

a. Actuator used may look different than the one shown in the image.

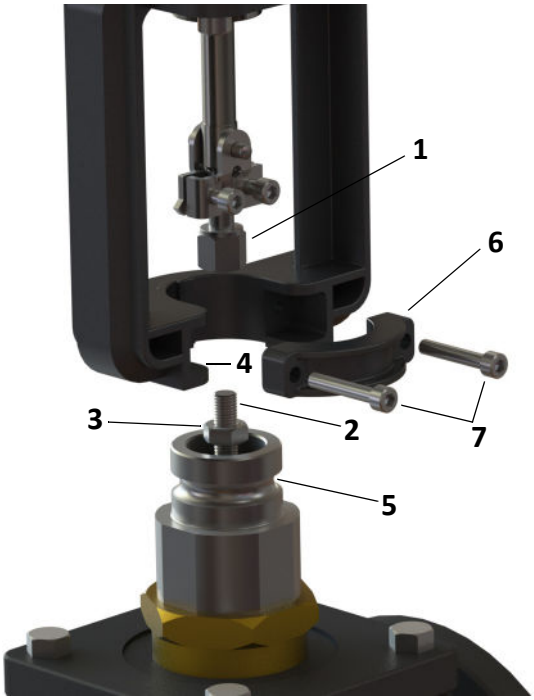
Mounting the Valve Actuator Assembly

1. Prepare to mount the valve and valve Actuator. The following precautions should be followed:
   - All debris (dirt, metal shavings, etc.) located inside the piping must be removed/flushed out prior to installing the valve.
   - The preferred installation of the valve stem and Actuator is upright. However, where space restrictions dictate, the valve assembly can be mounted diagonally as shown in the diagram.

     WARNING! Motorized valves MUST NOT be installed upside down or horizontally!
   - The installation should account for an additional clearance of 4 – 6" (101.6mm – 152.4mm) above the Actuator. This space is needed to allow for the manual operation of the Actuator. Refer to "Actuator Manual Operation" on page 22.



2. Ensure the Actuator Valve Adaptor (5) is securely screwed clockwise into the valve body.
3. Screw the Actuator Valve Stem attachment (1) onto the threaded Valve Stem (2) as far as it will go.



4. Secure the Valve Stem attachment (1) by tightening the Valve Stem nut (3) counter-clockwise.
5. Position the Actuator over the Actuator Valve Adaptor so the U-channel (4) aligns with the valve groove (5).
6. Place the clamp (6) around the Valve Stem so it also aligns with the valve groove (5), and secure it in place by tightening the two allen-head screws (7) using the supplied hex wrench.
7. Lower the Actuator stem (8) using the manual control (9) until the bracket reaches the Valve Stem attachment (1).

   Refer to "Actuator Manual Operation" on page 22 for information.
8. Tighten the two screws (10) with the supplied hex wrench so the Actuator stem (8) is securely attached to the Valve Stem attachment (1).

Mounting the Actuator Power Transformer

NOTE: Actuators must be powered using the provided 24Vac transformer(s). For configurations where a control device is operating two Actuators in series, a single transformer can be used to power both Actuators. If a control device is operating two Actuators in parallel, external double-throw relays and two transformers (one for each Actuator) must be installed. Refer to Figure 5 on page 10, Figure 6 on page 11, and Figure 8 on page 13 for examples.

1. Select an appropriate location to mount the 24Vac power transformer(s). The location must meet the following minimum requirements:
   - The location should be within close proximity of the Valve Actuator to reduce wiring.
   - The mounting surface should be flat and strong enough to hold the weight of the device.
   - DO NOT mount the device in a location where it will be exposed to extreme heat, cold, humidity, or moisture.
2. Secure the transformer(s) to the mounting surface using two screws (not supplied).

Connecting the Wiring

This section covers wiring the Valve Actuator to input power and control devices. The following configurations are shown:

- MPC Platinum Control – see page 10
- HWR Platinum Control (one Actuator and two Actuator configurations) – see page 11 and page 12
- HWE-MOV or MCF Elite Control (one Actuator and two Actuator configurations) – see page 13 and page 14
- SRC Platinum Control (with feedback) – see page 15

Preparation

⚠ WARNING

ELECTRICAL SHOCK HAZARD! For your safety, to avoid the risk of electric shock, disconnect electrical power to the device before servicing or making any electrical connections. DO NOT re-connect electrical power until ALL wiring to the Actuator is completed. Failure to do so may result in severe personal injury or death.

1. De-energize the circuit that will provide power to the Actuator transformer by turning off the appropriate circuit breaker.
2. Remove the Actuator Faceplate (1) by removing the two Faceplate screws (2).

MPC Platinum Control

Refer to the following diagram when connecting Actuators to an MPC Platinum Control.

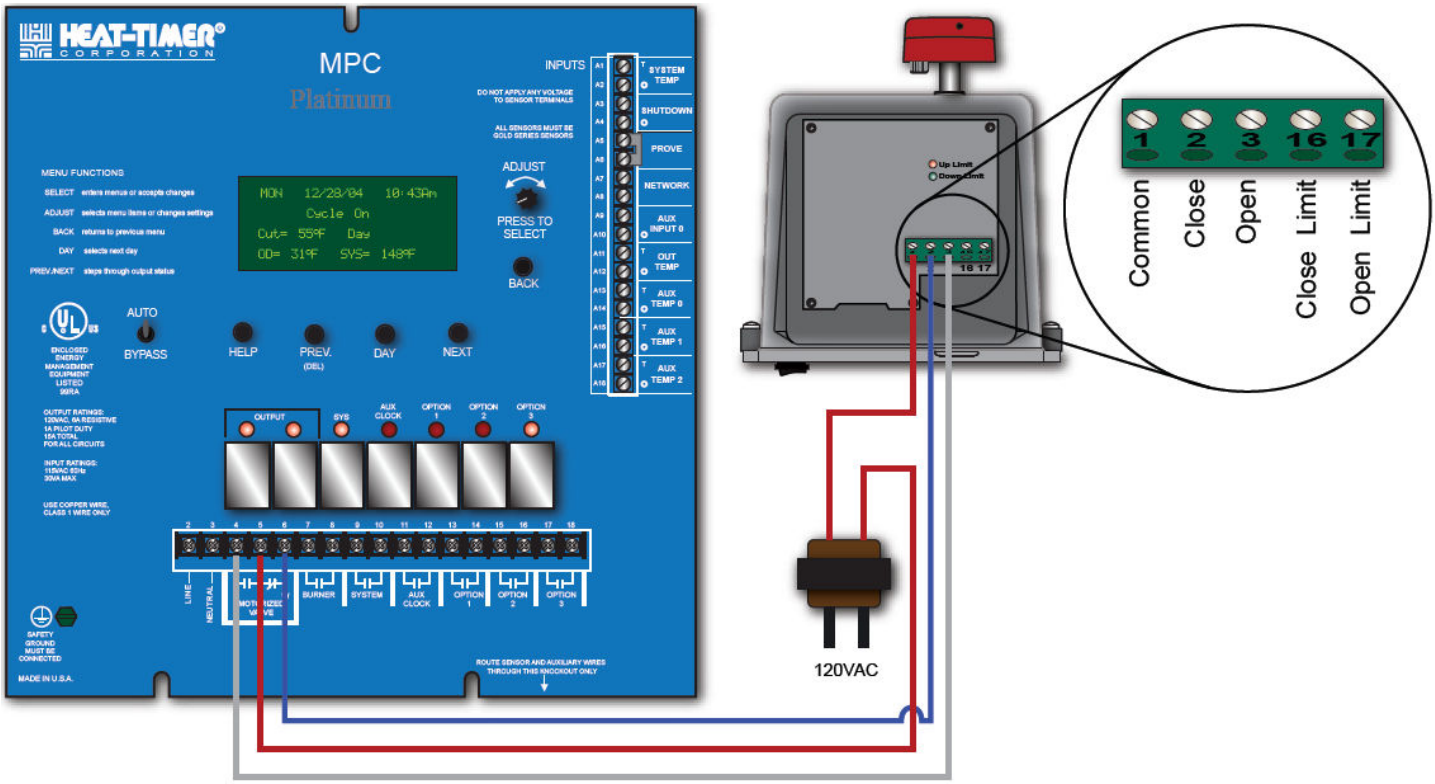


Figure 5: Valve Actuator Wiring Diagram – MPC Platinum Control

> **WARNING**
>
> **ELECTRICAL SHOCK HAZARD! For your safety, to avoid the risk of electric shock, disconnect electrical power to the device before servicing or making any electrical connections. DO NOT re-connect electrical power until ALL wiring to the Actuator is completed. Failure to do so may result in severe personal injury or death.**

1. Ensure the circuit that will provide power to the Actuator transformer is de-energized.
2. Connect one of the 24Vac transformer outputs to the Actuator Common terminal (1).
3. Connect the second 24Vac transformer output to the MPC Platinum Common Output terminal (5).
4. Connect the MPC Platinum output terminal (6) to the Actuator Close terminal (2).
5. Connect the MPC Platinum output terminal (4) to the Actuator Open terminal (3).
6. Replace the Actuator Faceplate and secure it with the two Faceplate screws.

HWR Platinum Control – One Actuator

Refer to the following diagram when connecting one Actuator to an HWR Platinum Control.

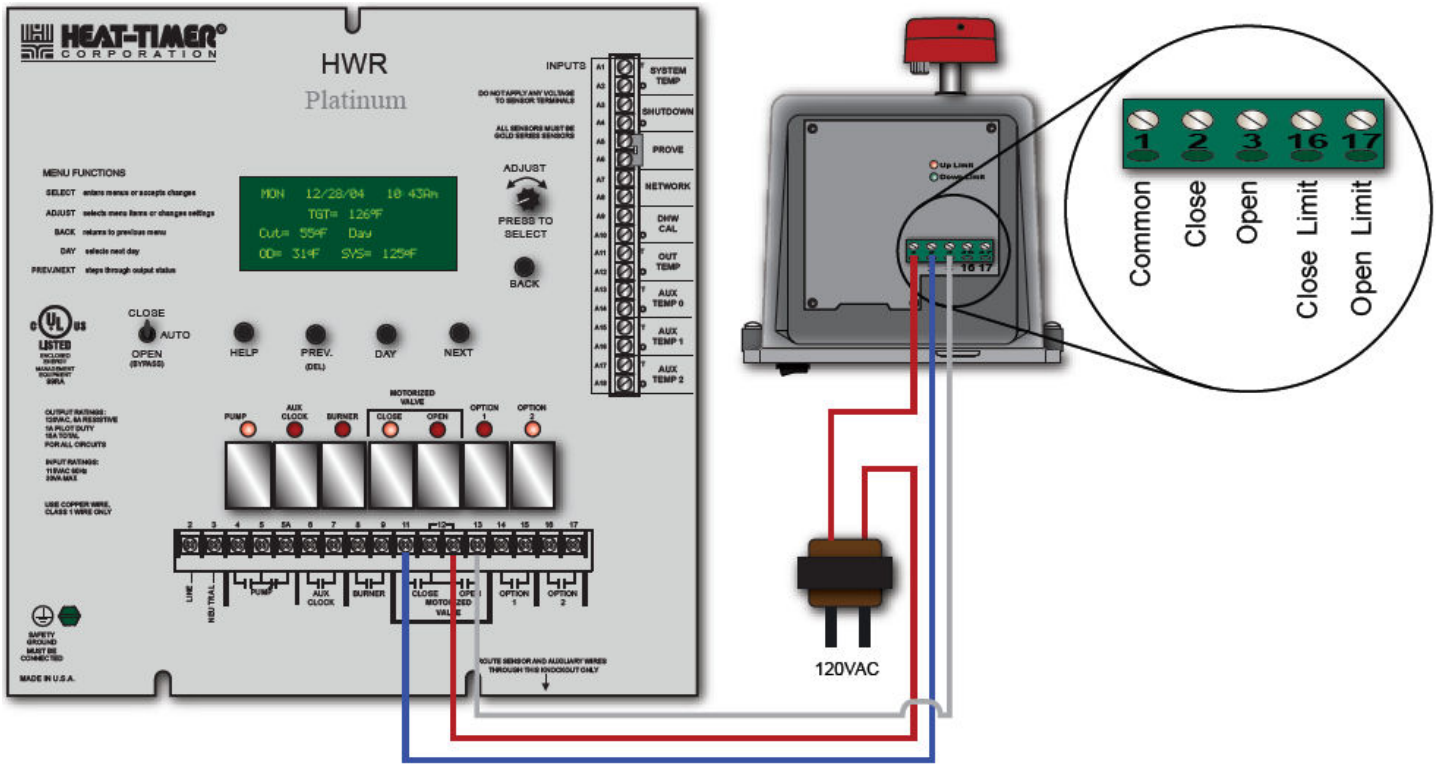


Figure 6: Valve Actuator Wiring Diagram – HWR Platinum Control (One Actuator)

> **⚠ WARNING**
>
> **ELECTRICAL SHOCK HAZARD! For your safety, to avoid the risk of electric shock, disconnect electrical power to the device before servicing or making any electrical connections. DO NOT re-connect electrical power until ALL wiring to the Actuator is completed. Failure to do so may result in severe personal injury or death.**

1. Ensure the circuit that will provide power to the Actuator transformer is de-energized.
2. Connect one of the 24Vac transformer outputs to the Actuator Common terminal (1).
3. Connect the second 24Vac transformer output to the HWR Platinum Common Output terminal (12).
4. Connect the HWR Platinum Close terminal (11) to the Actuator Close terminal (2).
5. Connect the HWR Platinum Open terminal (13) to the Actuator Open terminal (3).
6. Replace the Actuator Faceplate and secure it with the two Faceplate screws.

HWR Platinum Control – Two Actuators

Refer to the following diagram when connecting two Actuators to an HWR Platinum Control.

NOTE: In this configuration, Actuator 1 will be opened/closed before opening/closing Actuator 2.

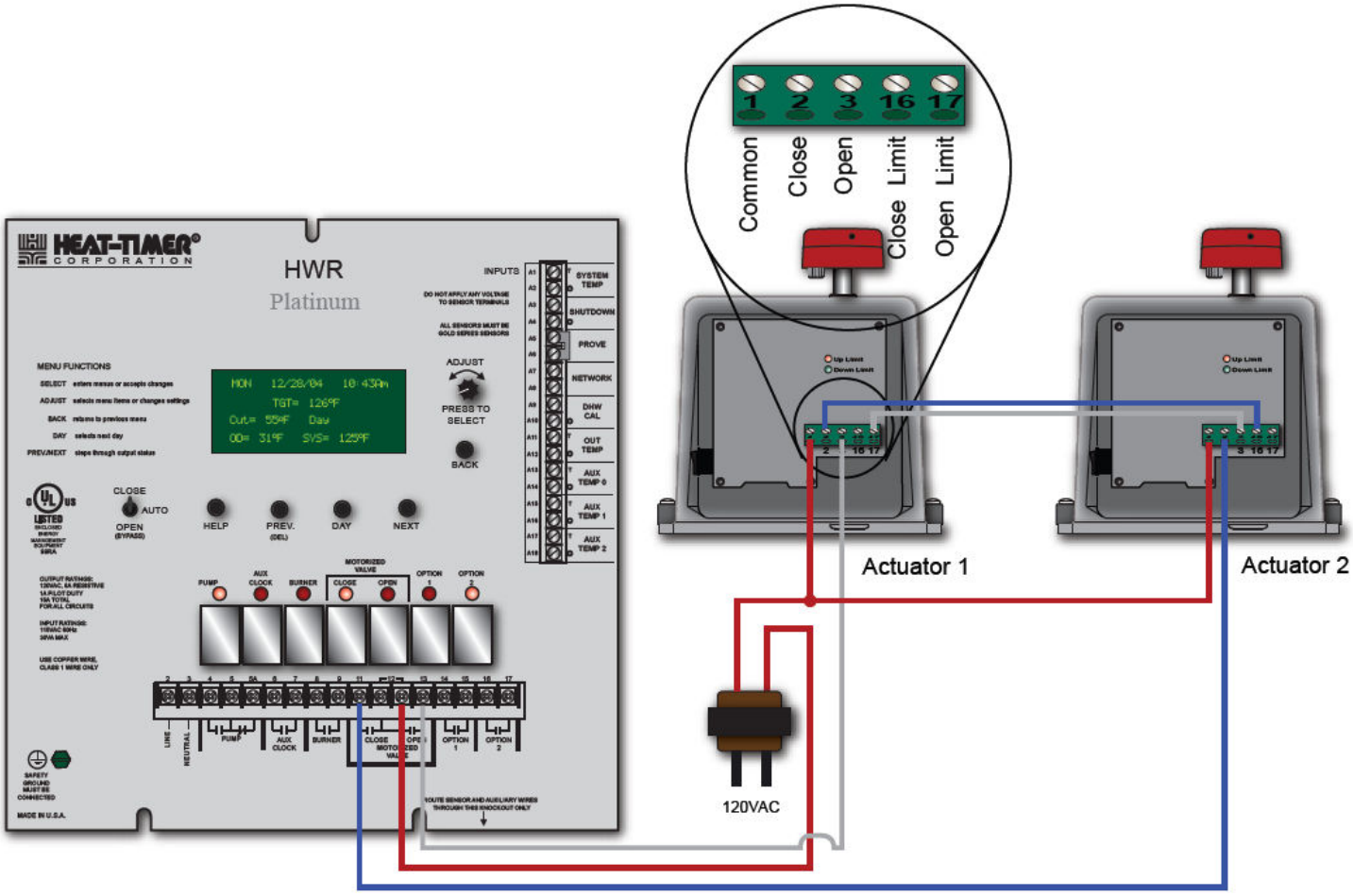


Figure 7: Valve Actuator Wiring Diagram – HWR Platinum Control (Two Actuators)

> **WARNING**
>
> **ELECTRICAL SHOCK HAZARD! For your safety, to avoid the risk of electric shock, disconnect electrical power to the device before servicing or making any electrical connections. DO NOT re-connect electrical power until ALL wiring to the Actuator is completed. Failure to do so may result in severe personal injury or death.**

1. Ensure the circuit that will provide power to the Actuator transformer is de-energized.
2. Connect one of the 24Vac transformer outputs to the Actuator 1 and Actuator 2 Common terminals (1).
3. Connect the second 24Vac transformer output to the HWR Platinum Common Output terminal (12).
4. Connect the HWR Platinum Close terminal (11) to the Actuator 2 Close terminal (2).
5. Connect the HWR Platinum Open terminal (13) to the Actuator 1 Open terminal (3).
6. Connect the Actuator 2 Open terminal (3) to the Actuator 1 Open Limit terminal (17).
7. Connect the Actuator 2 Close Limit terminal (16) to the Actuator 1 Close terminal (2).
8. Replace the Actuator Faceplates and secure them with the Faceplate screws.

HWE-MOV or MCF Elite Control – One Actuator

Refer to the following diagram when connecting one Actuator to an HWE-MOV or MCF Elite Control.

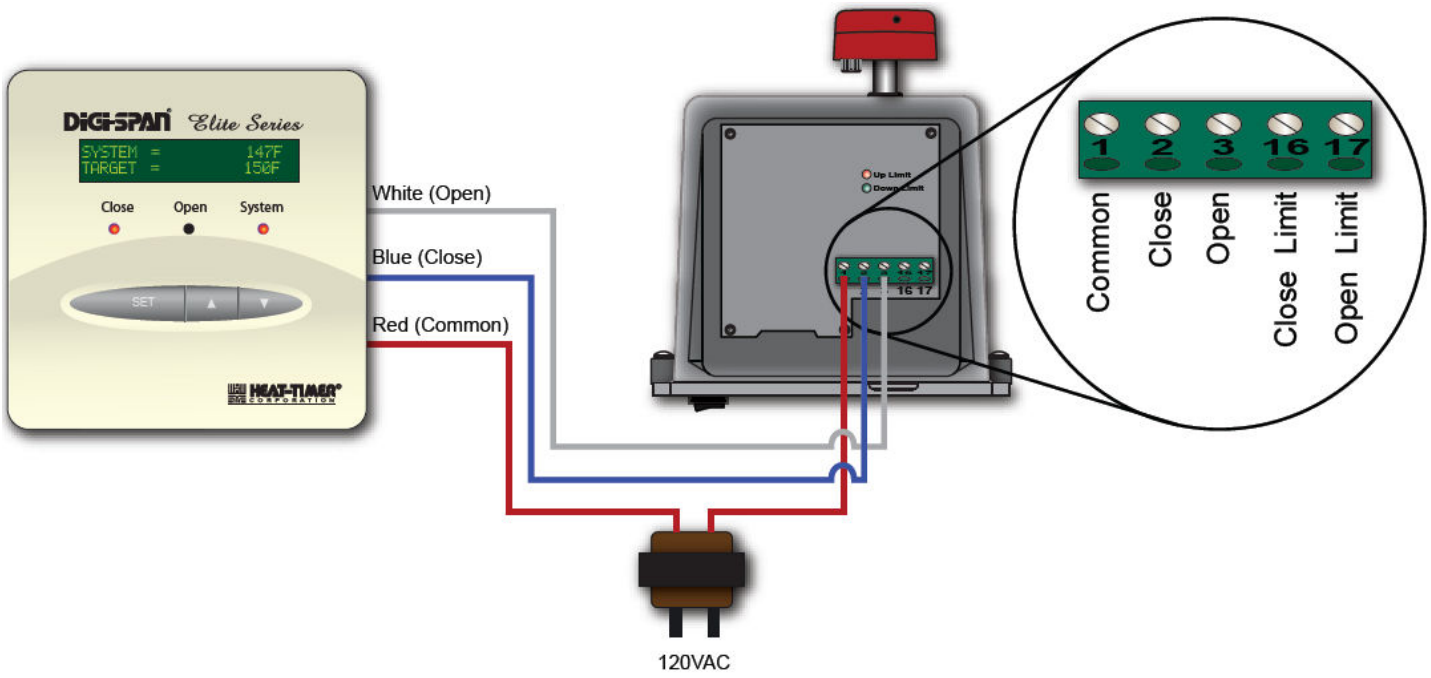


Figure 8: Valve Actuator Wiring Diagram – HWE-MOV or MCF Elite Control (One Actuator)

WARNING

ELECTRICAL SHOCK HAZARD! For your safety, to avoid the risk of electric shock, disconnect electrical power to the device before servicing or making any electrical connections. DO NOT re-connect electrical power until ALL wiring to the Actuator is completed. Failure to do so may result in severe personal injury or death.

1. Ensure the circuit that will provide power to the Actuator transformer is de-energized.
2. Connect one of the 24Vac transformer outputs to the Actuator Common terminal (1).
3. Connect the second 24Vac transformer output to the HWE-MOV or MCF Elite red wire (Common).
4. Connect the HWE-MOV or MCF Elite blue wire (Close) to the Actuator Close terminal (2).
5. Connect the HWE-MOV or MCF Elite white wire (Open) to the Actuator Open terminal (3).
6. Replace the Actuator Faceplate and secure it with the two Faceplate screws.

HWE-MOV or MCF Elite Control – Two Actuators

Refer to the following diagram when connecting two Actuators to an HWE-MOV or MCF Elite Control.

NOTE: In this configuration, Actuator 1 will be opened/closed before opening/closing Actuator 2.

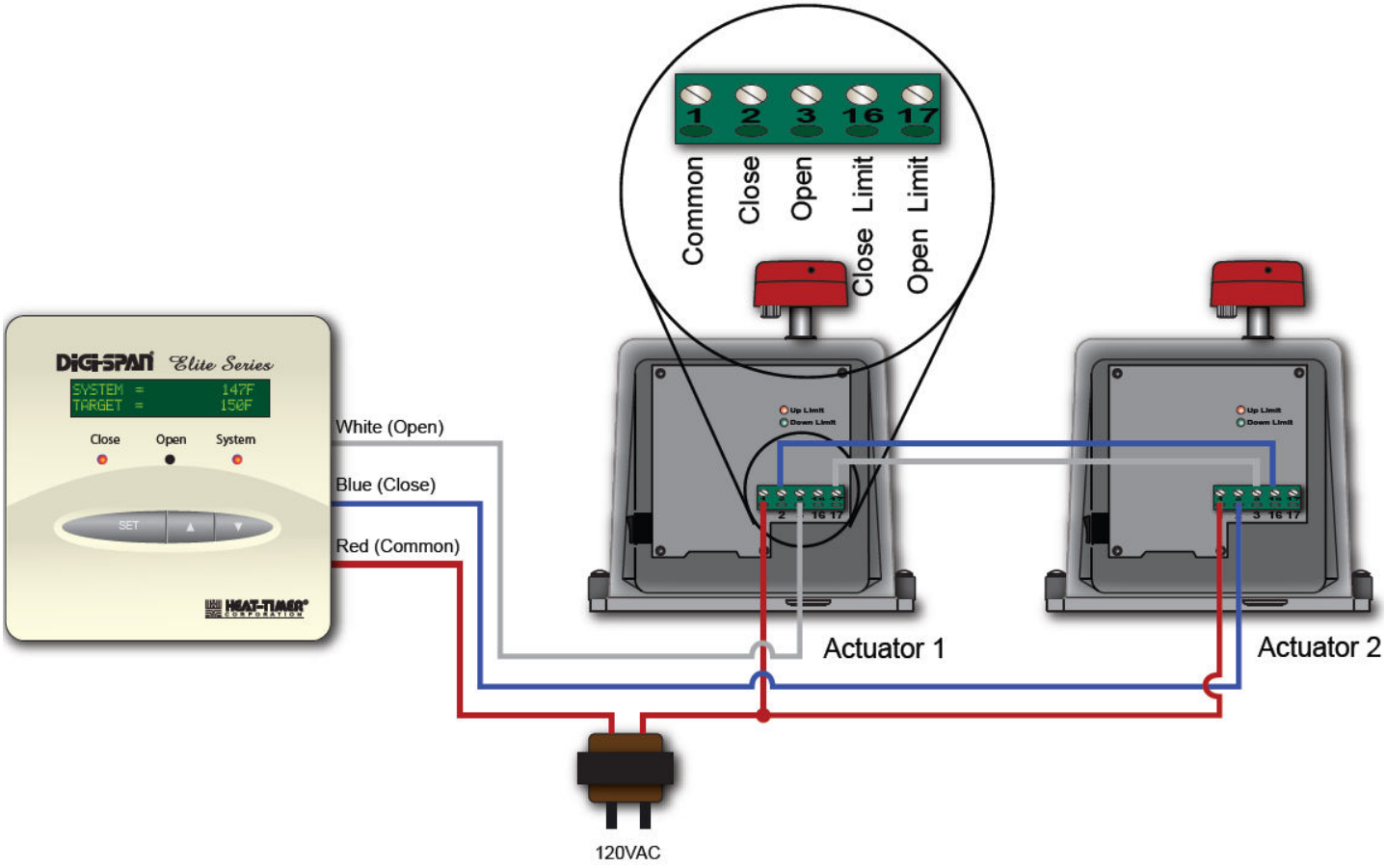


Figure 9: Valve Actuator Wiring Diagram – HWE-MOV or MCF Elite Control (Two Actuators)

> **WARNING**
>
> **ELECTRICAL SHOCK HAZARD! For your safety, to avoid the risk of electric shock, disconnect electrical power to the device before servicing or making any electrical connections. DO NOT re-connect electrical power until ALL wiring to the Actuator is completed. Failure to do so may result in severe personal injury or death.**

1. Ensure the circuit that will provide power to the Actuator transformer is de-energized.
2. Connect one of the 24Vac transformer outputs to the Actuator 1 and Actuator 2 Common terminals (1).
3. Connect the second 24Vac transformer output to the HWE-MOV or MCF Elite red wire (Common).
4. Connect the HWE-MOV or MCF Elite blue wire (Close) to the Actuator 2 Close terminal (2).
5. Connect the HWE-MOV or MCF Elite white wire (Open) to the Actuator 1 Open terminal (3).
6. Connect the Actuator 2 Open terminal (3) to the Actuator 1 Open Limit terminal (17).
7. Connect the Actuator 2 Close Limit terminal (16) to the Actuator 1 Close terminal (2).
8. Replace the Actuator Faceplates and secure them with the Faceplate screws.

SRC Platinum Control

Refer to the following diagram when connecting Actuators to an SRC Platinum Control.

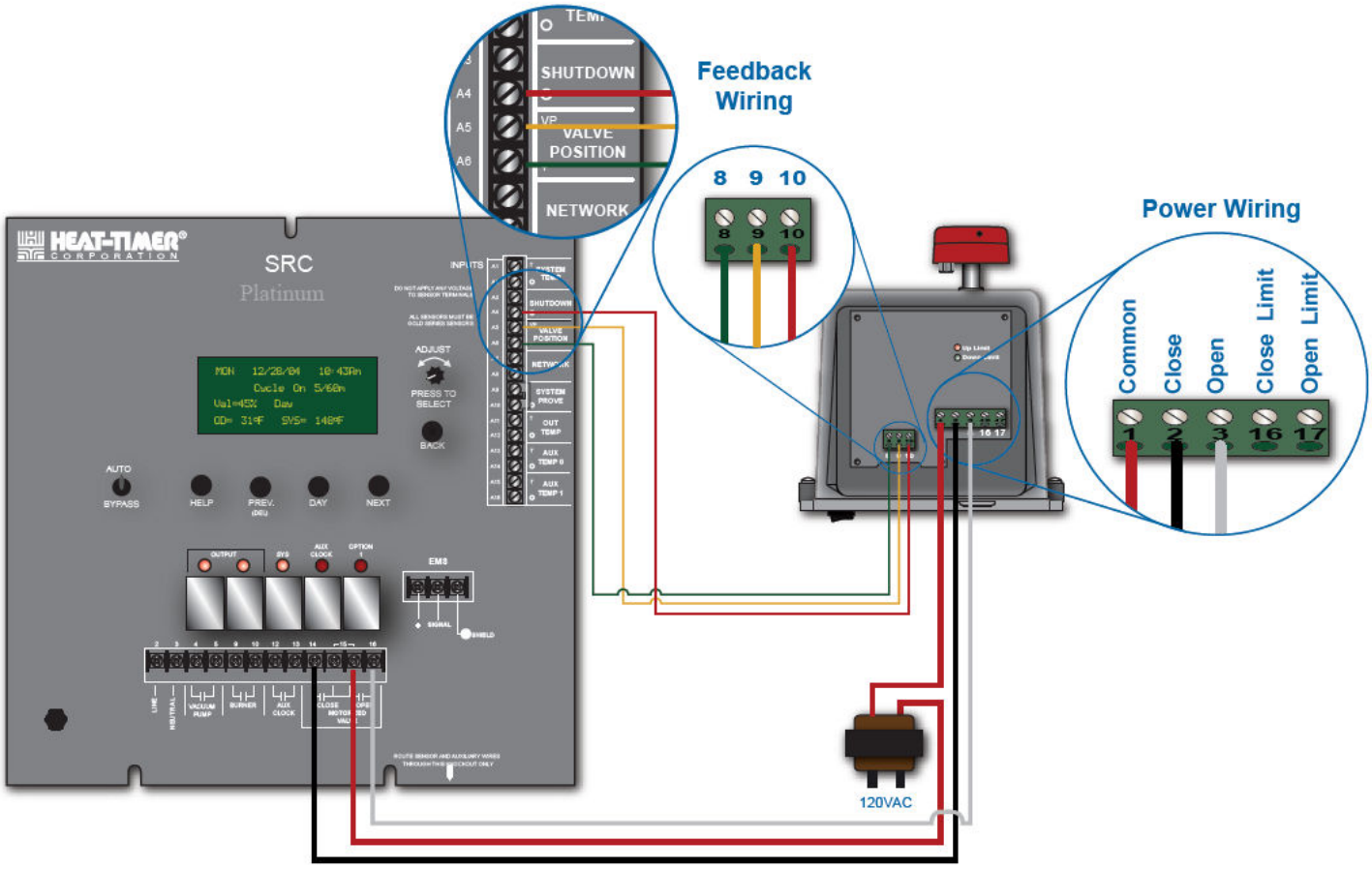


Figure 10: Valve Actuator Wiring Diagram – SRC Platinum Control

1. Ensure the circuit that will provide power to the Actuator transformer is de-energized.
2. Connect one of the 24Vac transformer outputs to the Actuator Common terminal (1).
3. Connect the second 24Vac transformer output to the SRC Platinum Common Output terminal (15).
4. Connect the SRC Platinum output terminal (14) to the Actuator Close terminal (2).
5. Connect the SRC Platinum output terminal (16) to the Actuator Open terminal (3).
6. Connect the Actuator feedback.
   a. Connect the SRC Platinum input terminal (A4) to the Actuator terminal (10).
   b. Connect the SRC Platinum input terminal (A5) to the Actuator terminal (9).
   c. Connect the SRC Platinum input terminal (A6) to the Actuator terminal (8).
   d. After all wiring is complete, replace the Actuator Faceplate and secure it with the two Faceplate screws.

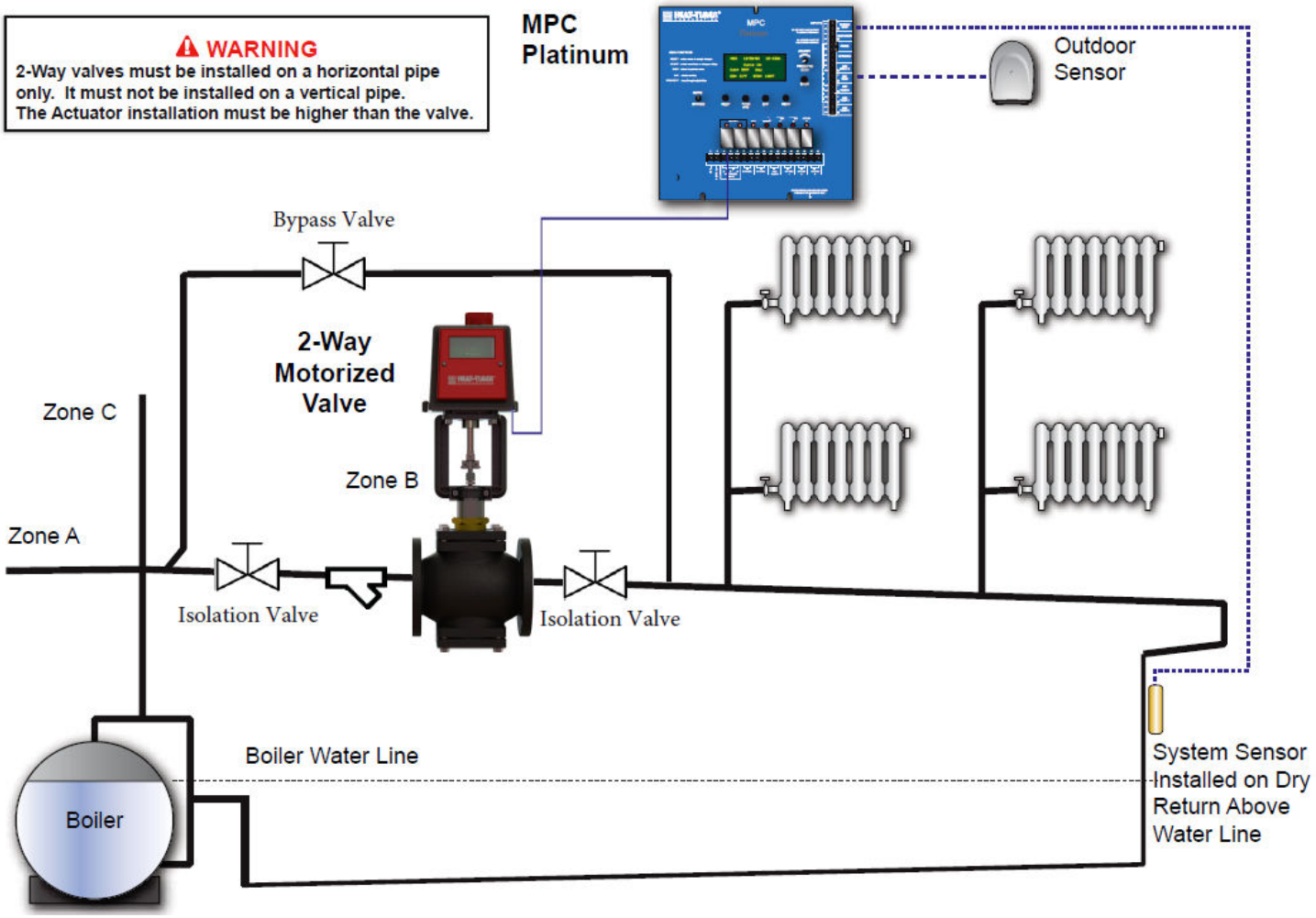
Startup Instructions

After all wiring is completed (see “Connecting the Wiring” on page 9), complete the following steps:

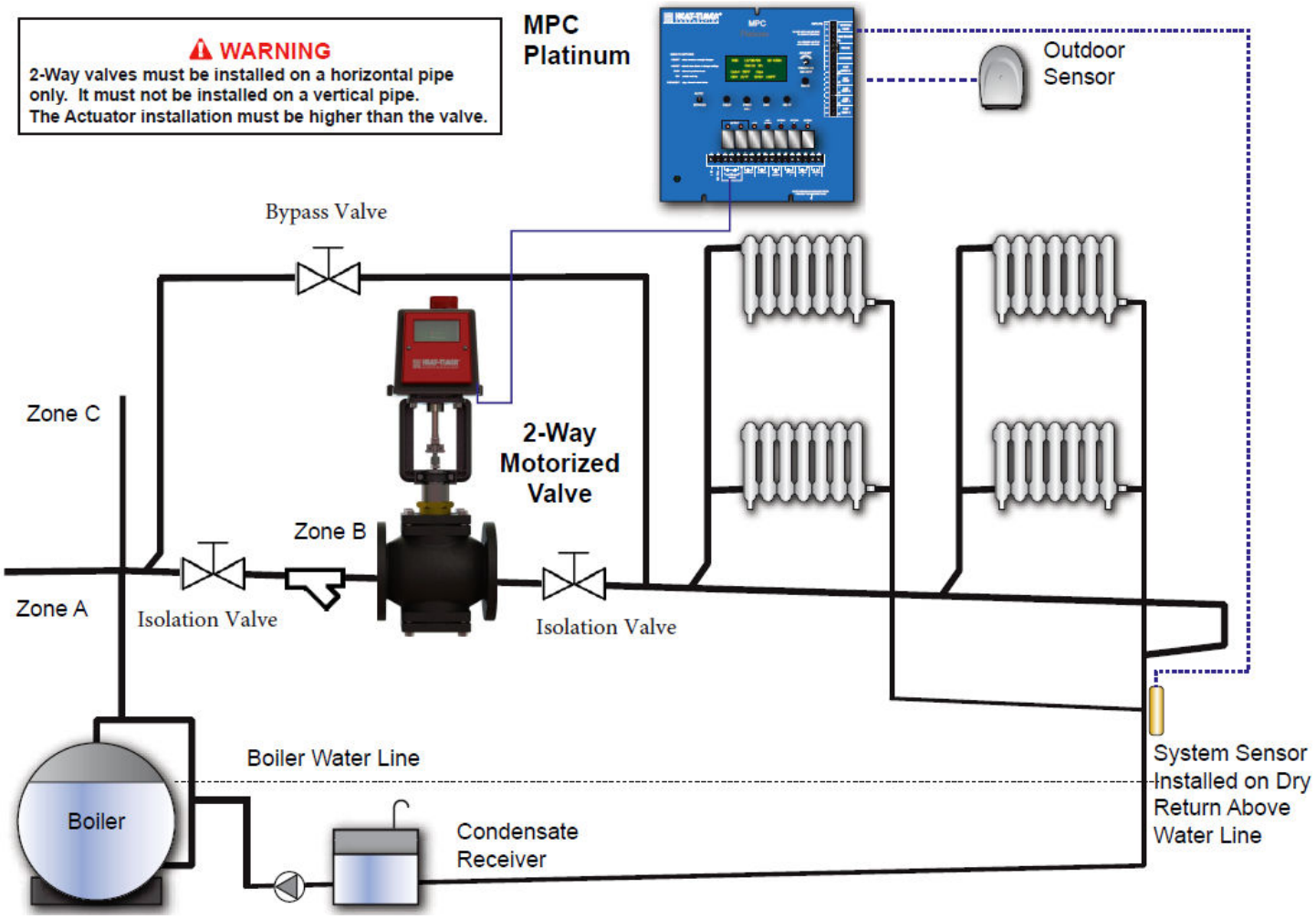
1. Turn on the Valve Actuator power switch (located under the Actuator).
   NOTE: The Valve Actuator only receives 24Vac power when the control is actively trying to open or close the valve.
2. Auto-calibrate the Control to the motorized valve. Refer to the applicable Control manual for information.

Piping Diagrams

2-Way Valve in One-Pipe Steam Heating Application

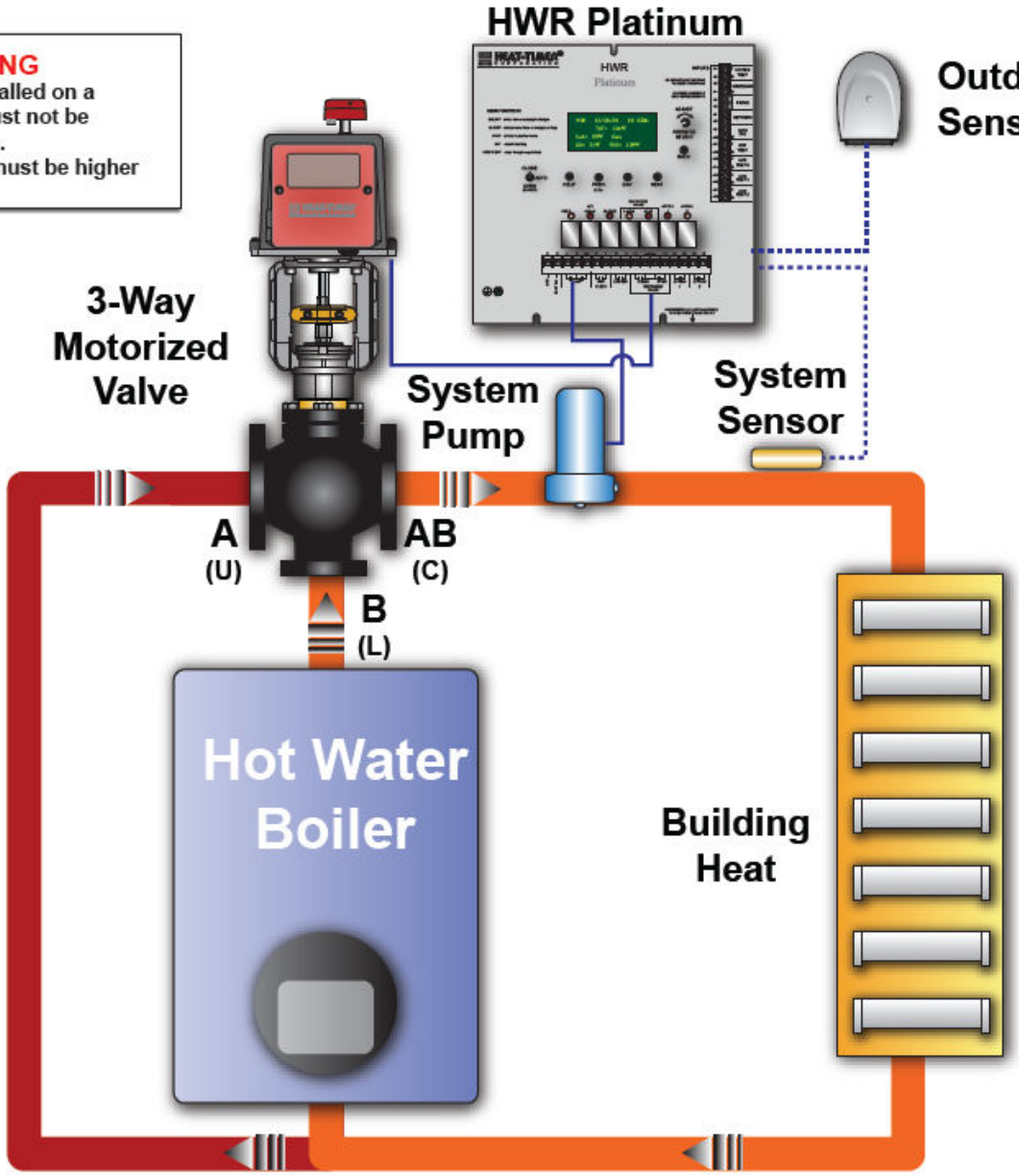


2-Way Valve in Two-Pipe Steam Heating Application



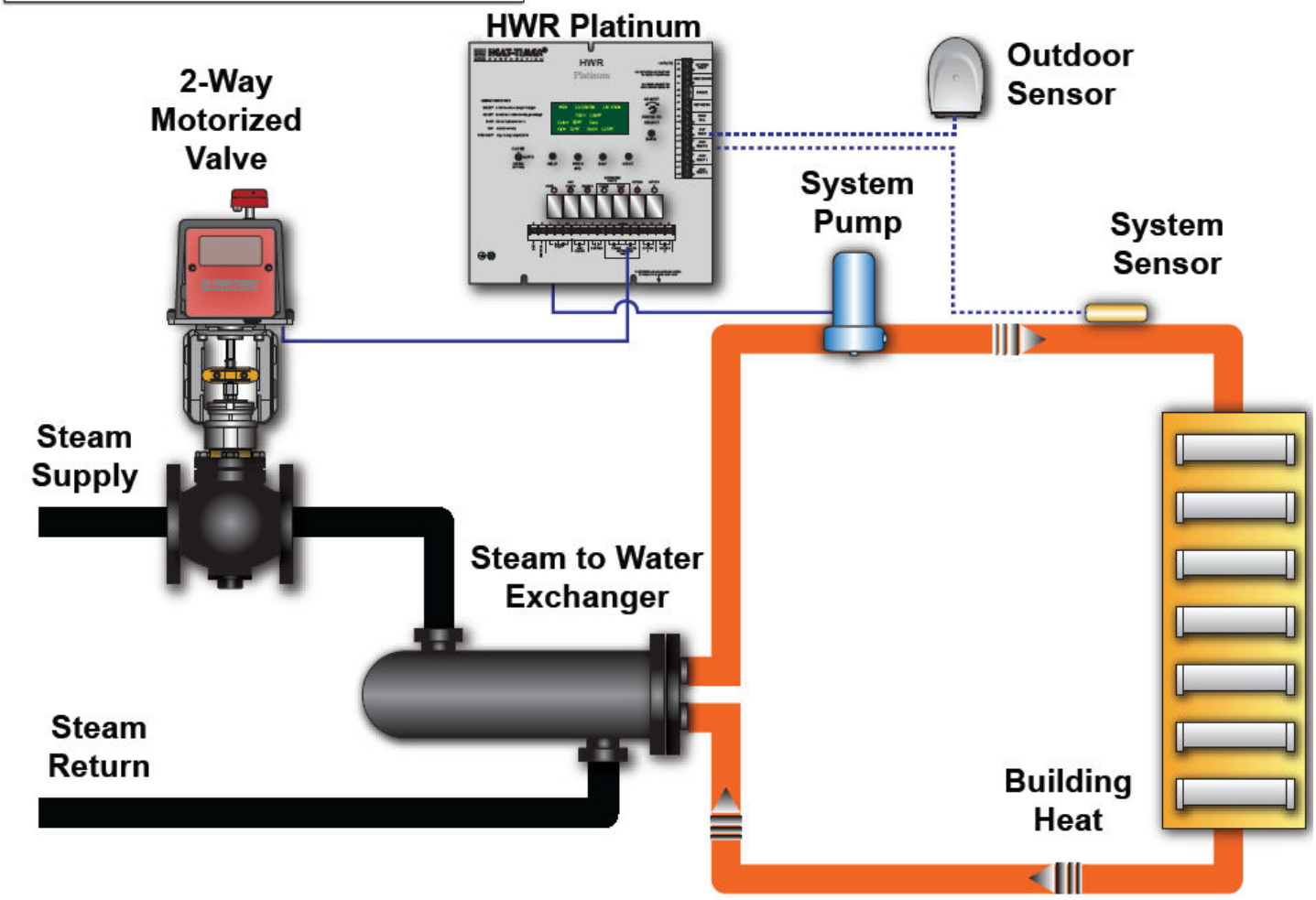
3-Way Valve in Hot Water Heating Application

⚠ WARNING
3-Way valves must be installed on a horizontal pipe only. It must not be installed on a vertical pipe.
The Actuator installation must be higher than the valve.



2-Way Valve in Steam-to-Hot Water Heating Application

⚠ WARNING
2-Way valves must be installed on a horizontal pipe only. It must not be installed on a vertical pipe.
The Actuator installation must be higher than the valve.



Detailed Operation

Applications

Hot Water Heating Applications

The 3-Way floating Motorized Mixing Valves can be used to:

- Regulate the temperature of the water in Hydronic heating applications. In this configuration, they are used with Outdoor Reset or Set Point hot water heating controls (used with Heat-Timer HWR Platinum, HWE-MOV, and MCF controls).
- Benefit two-temperature systems by reducing the water temperature in the secondary loop (as in snow melt applications). In this configuration, they are used with Heat-Timer SMC and RSM controls.
- Regulate the boiler return temperature by mixing the boiler supply with the cooler return water to protect boilers from condensation. In this configuration, they are used with Heat-Timer MCF controls.

Steam Heating Applications

The 2-Way Floating Motorized Valves can be used to modulate or turn on/off the steam to a building or process applications. In this configuration, they are used with Heat-Timer steam heating controls (MPC Platinum).

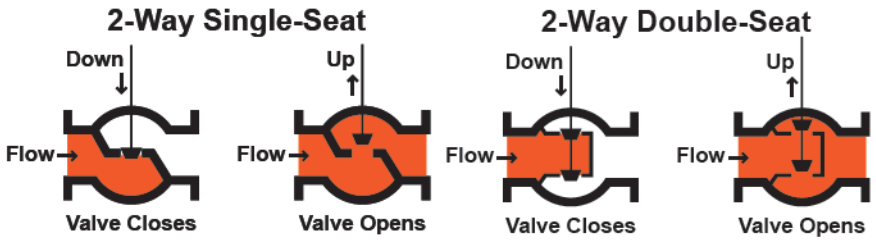
Steam-to-Hot Water Heating Applications

The 2-Way Floating Motorized Valves can be used to regulate the amount of steam entering a steam-to-hot water heat exchanger. This configuration is designed to control the temperature of the water in hydronic heated buildings using a steam boiler, and is used with Outdoor Reset or Set Point hot water heating controls (used with Heat-Timer HWR Platinum, HWE-MOV, and MCF controls).

Flow Direction

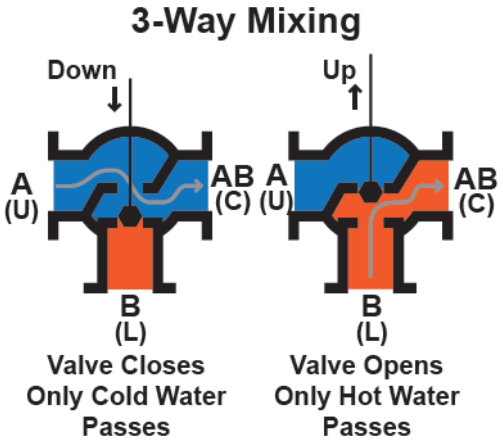
2-Way Valves

The Actuator Shaft moving *DOWN* closes the valve, moving *UP* opens the valve.



3-Way Valves

The Actuator Shaft moving *DOWN* closes the valve hot water Port B (allowing more cold water to pass), moving *UP* closes the cold water Port A (allowing more hot water to pass).



Actuator Manual Operation

Motorized Valves can be manually operated during power outages or when servicing the equipment.

1. Turn off the Power Switch, located under the Actuator.
2. Pull the Crank Handle out of the manual operation knob, rotate the Crank Handle 180° so the handle is exposed.
3. Press the Crank Handle down into the manual operation knob until it is firmly seated, and then rotate the Crank Handle to move the Actuator Shaft in the desired direction:
   - Clockwise – moves the Actuator Shaft down.
   - Counter-clockwise – moves the Actuator Shaft up.

To return the Motorized Valve to normal operation:

1. Pull the Crank Handle out of the manual operation knob, rotate the Crank Handle 180° so the handle is seated into the manual operation knob, and then press it down until it is firmly seated in place.
2. Turn on the Power Switch, located under the Actuator.

Troubleshooting

2-Way Actuator Valve Installations

Symptom	Possible Cause	Recommended Action(s)
Loud banging noise.	Valve not installed on a horizontal pipe.	Verify the valve is installed on a horizontal pipe. Refer to “2-Way Valve in One-Pipe Steam Heating Application” on page 17.
	Condensate draining back against valve when closed. This causes the steam to flash the condensate when the valve opens.	Ensure no condensate will drain back against the valve when closed.

3-Way Actuator Valve Installations

Symptom	Possible Cause	Recommended Action(s)
Water getting hotter when the valve closes.	Incorrect valve port used.	Ensure the valve was installed using the correct valve ports. Refer to “Flow Direction” on page 21.
Difficult to control water temperature.	Pump installed before any hot or cold water input ports.	Ensure the pump is installed after the valve discharge port. **CAUTION! Installing the pump before the input ports may result in pump failure or damage to the valve when the valve is either fully open or closed.** Refer to “3-Way Valve in Hot Water Heating Application” on page 19.
Valve does not close.	Pump installed before the hot water input port. Valve actuator does not have the force to close the valve against pump flow.	Ensure the pump is installed after the valve discharge port. Refer to “3-Way Valve in Hot Water Heating Application” on page 19.

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