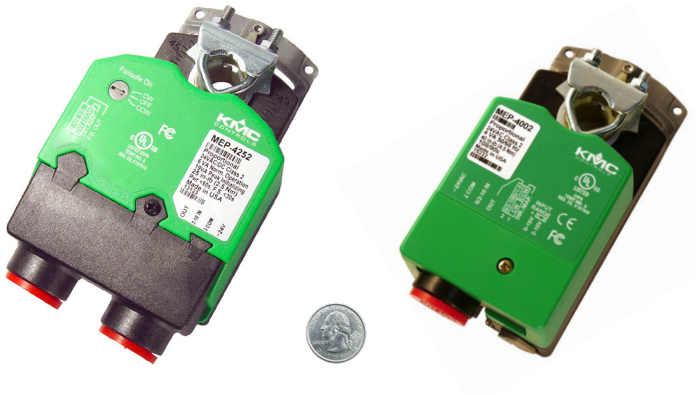
MEP-4xxx

Direct-Coupled Actuators (40 to 90 in-lb.)

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Applications Guide



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Specifications, design, and operation are subject to change without notice.

Introduction

This application guide gives torque selection, accessory, troubleshooting, and other related information.

For **general mounting, connection, and configuration details,** see the relevant model's installation guide. For **specifications and other information**, see the relevant model's data sheet and the selection guide. The latest support files are always available on the KMC Controls web site (**www.kmccontrols.com**):

- **KMC Actuators Selection Guide**
- **MEP-4000/4800** Series (90-seconds) 40/80 in-lb., proportional or tri-state actuators
- **MEP-4200/4500/4900** Series (25-80-seconds) fail-safe, 25/45/90 in-lb., proportional or tri-state/two position actuators
- **MEP-4201/4501/4901** (35-45 seconds), 25/45/90 in-lb., tri-state/two position actuators
- **MEP-46xxQ** (3-second) fail-safe or non-fail-safe, 54 in-lb., proportional/two-position actuators

NOTE: For sample proportional single-zone heating/cooling valve applications using the CTE-5202 electronic thermostat, see the **CTE-5202 Applications Guide**.

NOTE: The models **MEP-4101** (tri-state, 10 in-lb., with transluscent cover) and **MEP-4042/4842** (40/80 in-lb., proportional, with modular connectors) are quite different from the rest of the MEP-4xxx series. Also, any particular MEP-4xxx model may not have one or more features (e.g., fail-safe, auxiliary switch) described in this document. **Use only the information from this document that is relevant to the MEP-4xxx model in use.**





Important Notices

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⚠ WARNING

Risk of electrical shock in line-voltage models. Disconnect ALL power before servicing. More than one disconnect provided on models with auxiliary switches. Failure to follow electrical safety precautions with live electrical components could result in injury or death.

⚠ WARNING

If both conduit connections are used in line-voltage models, they MUST be externally connected during installation. The nonmetallic enclosure does not provide grounding connection between the two conduit connections.

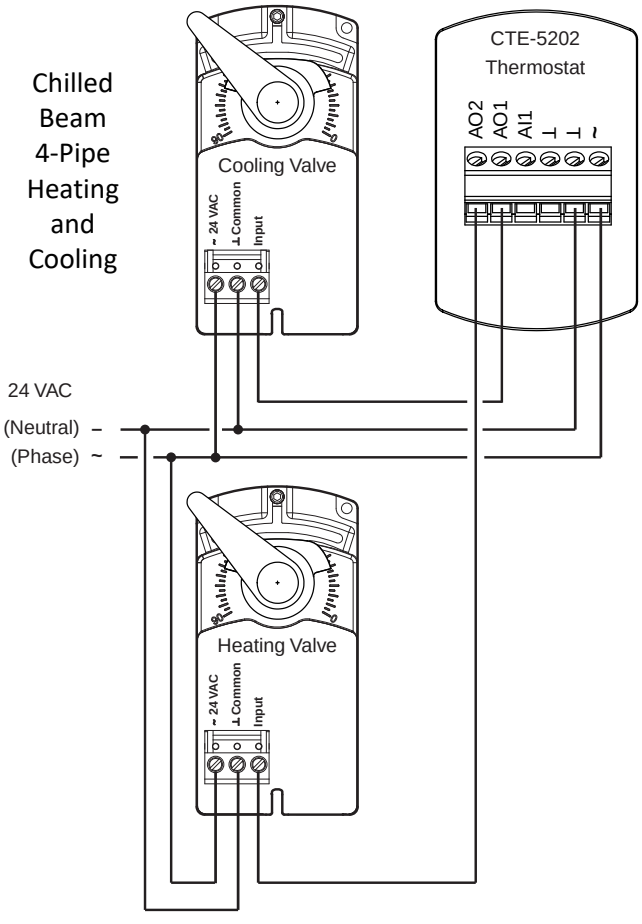
Actuator Torque Selection

Damper manufacturers should provide information about the required minimum actuator torque. If that information is not available, use the following general guidelines to calculate the required torque. (Square feet for a rectangular duct can be calculated by multiplying the height and width in inches and then dividing by 144.)

After minimum torque is known, see the actuator data sheets to select the appropriate model.

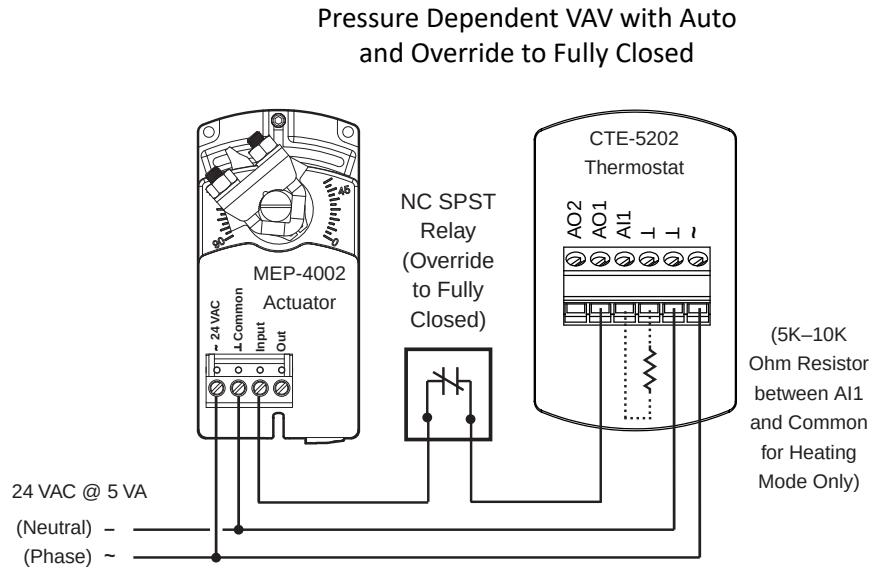
Damper Type	Up to 1000 FPM	1000 to 2500 FPM	2500 to 3000 FPM
Opposed Blades Without Seals	3 in-lb. per square foot	4.5 in-lb. per square foot	6 in-lb. per square foot
Parallel Blades Without Seals	4 in-lb. per square foot	6 in-lb. per square foot	8 in-lb. per square foot
Opposed Blades With Seals	5 in-lb. per square foot	7.5 in-lb. per square foot	10 in-lb. per square foot
Parallel Blades With Seals	7 in-lb. per square foot	10.5 in-lb. per square foot	14 in-lb. per square foot

Heat/Cool/VAV Applications (with the CTE-5202 Thermostat)



MEP-4xxx actuators can be used in single zone proportional heating (baseboard heaters) and cooling (chilled beams) with valves or SCR control as well as pressure-dependent VAV applications. For details of a variety of sample applications, see the **CTE-5202 Applications Guide**.

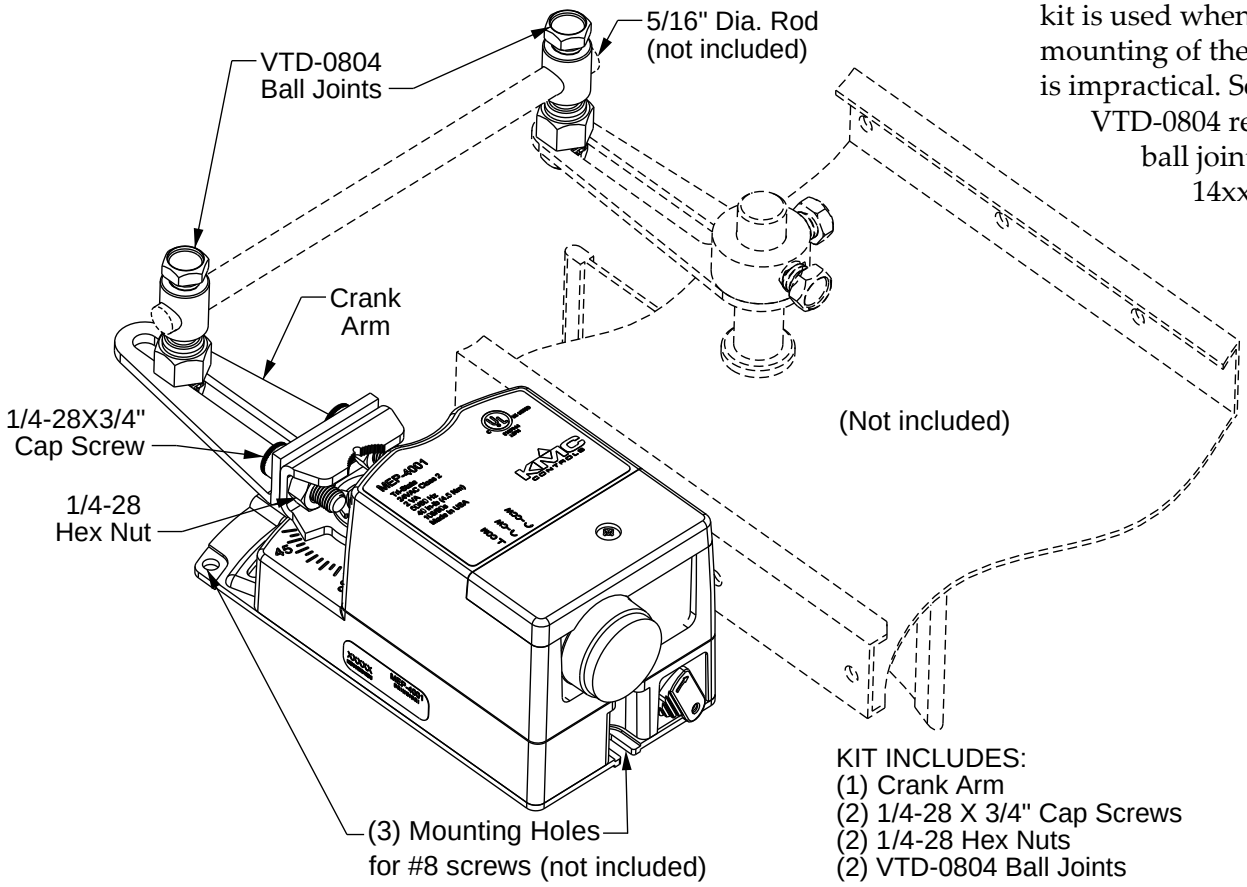
(For an example of a fail-safe application on an outside air damper, see *Fail-Safe Direction (MEP-42/45/46/49xx) on page 13*.)



Accessories

Ball Joint and Crank Arms

The **HLO-4001** crank arm kit is used when direct mounting of the actuator is impractical. See also the VTD-0804 replacement ball joint and VTD-14xx crank arms.



KIT INCLUDES:
(1) Crank Arm
(2) 1/4-28 X 3/4" Cap Screws
(2) 1/4-28 Hex Nuts
(2) VTD-0804 Ball Joints





Slotted crank arms are for attaching to dampers or other shafts, and they can be used in conjunction with the HLO-4001 crank arm kit. In the VTD-1403/1404 short crank arms, an attached ball joint (see the VTD-0804) can be adjusted from 3/4 inches (minimum) to 2-7/8 inches (maximum) from the center of the shaft. In VTD-1405/1406 long crank arms, the maximum is 4-5/8 inches.

VTD-1403	Short slotted, for 3/8" shafts
VTD-1404	Short slotted, for 1/2" shafts
VTD-1405	Long slotted, for 1/2" shafts
VTD-1406	Long slotted, for 3/8" shafts

Three-hole crank arms are for attaching to dampers or other shafts, and they can be used in conjunction with the HLO-4001 crank arm kit. An attached ball joint (see the VTD-0804) can be 1-9/16 inches (inner hole), 2-3/16 inches (middle hole), or 2-7/8 inches (outer hole) from the center of the shaft.

VTD-1414	Three-hole, for 3/8" shafts
VTD-1415	Three-hole, for 1/2" shafts

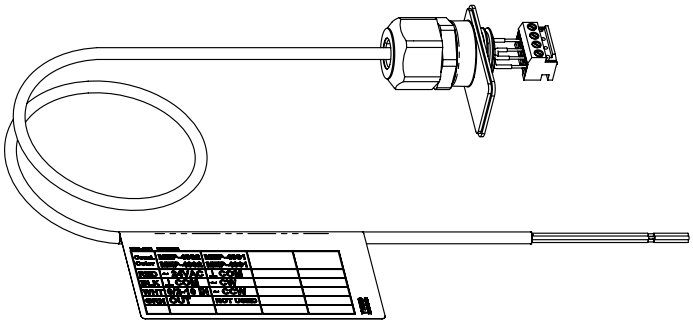
The **VTD-0804** replacement ball joint is for side-mounted 5/16" diameter rods (1/4-20 male mounting stud with locknut). See also the HLO-4001 crank arm kit.



Enclosure, Cord Grip, and Wiring Kits



The **HCO-1151** enclosure kit (consisting of a metal mounting plate, plastic cover, non-rotation bracket, plug caps, and screws) is designed to protect actuators from inclement conditions. See also the HMO-4521 liquid-tight cord grip.



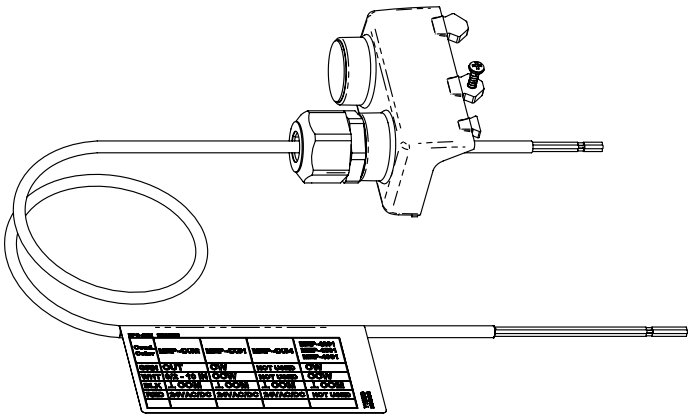
An **HPO-4001** assembled wiring kit has an HMO-4521 liquid-tight cord grip, a 3-foot plenum-rated cable, conduit fitting, and a pre-wired terminal block for the following actuators:

- MEP-4001
- MEP-4002
- MEP-4801
- MEP-4802

NOTE: It is not compatible with the MEP-40x3, MEP-402x, MEP-4813, and MEP-482x actuators. However, the HMO-4521 cord grip can be installed on those models (except for the MEP-4003) to provide IP54-rated ingress protection.



An **HMO-4521** liquid-tight cord grip threads into conduit fittings on MEP-4xxx actuators (except the MEP-4003) when an ingress protection rating of IP54 is required. The HMO-4521 accepts 0.18 to 0.40" diameter cables. There are five per pack. See also the HCO-1151, HPO-4001, and HPO-4051.

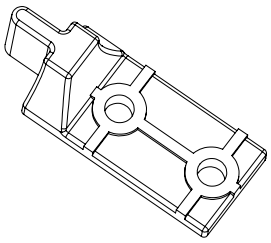


An **HPO-4051** assembled wiring kit has an HMO-4521 liquid-tight cord grip, a 3-foot plenum-rated cable, and a conduit fitting for the following actuators:

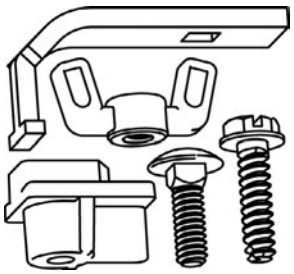
- MEP-4201
- MEP-4501
- MEP-4901
- MEP-4x51
- MEP-4x52
- MEP-4x54
- MEP-4602Q
- MEP-4652Q

NOTE: It is not compatible with MEP-4x55/4x7x and MEP-4622Q/4672Q actuators, which are pre-wired with cables. However, the HMO-4521 cord grip can be installed on those models to provide IP54-rated ingress protection.

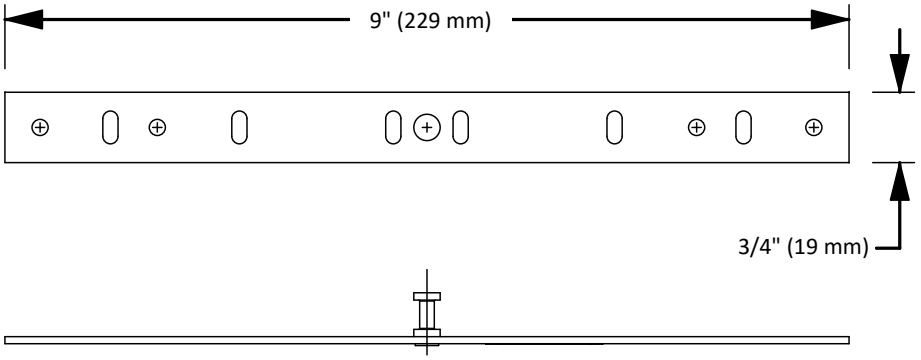
Mounting (Non-Rotation) Brackets



An **HMO-4002** non-rotation bracket is provided with MEP-40xx/48xx/425x/455x actuators (but is not for use with MEP-427x/457x/49xx models). See also the HMO-4001.



The **HMO-4004** non-rotation bracket kit is used for mounting to ball valves.



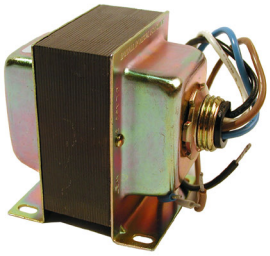
The **HMO-4001** non-rotation "T" bracket can be used instead of the HMO-4002 to span an open distance, or it can be formed (bent) into a shape that increases the distance between the mounting surface and the actuator. It is provided with MEP-427x/457x/49xx actuators.

Thermostat



For sample proportional single-zone heating/cooling and pressure-dependent VAV applications using the **CTE-5202** electronic thermostat, see the CTE-5202 Applications Guide.

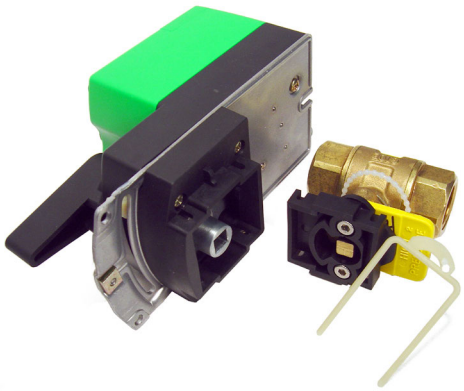
Transformers



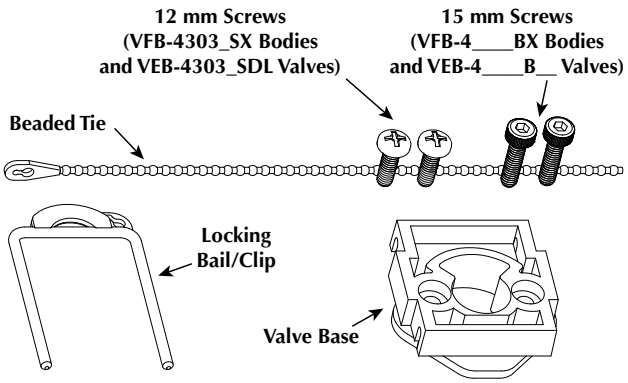
An XEE-6000 series Class-2 transformer provides 24 VAC power to the actuator:

XEE-6111-050	120 to 24 VAC, 50 VA, single-hub
XEE-6112-050	120 to 24 VAC 50 VA, dual-hub

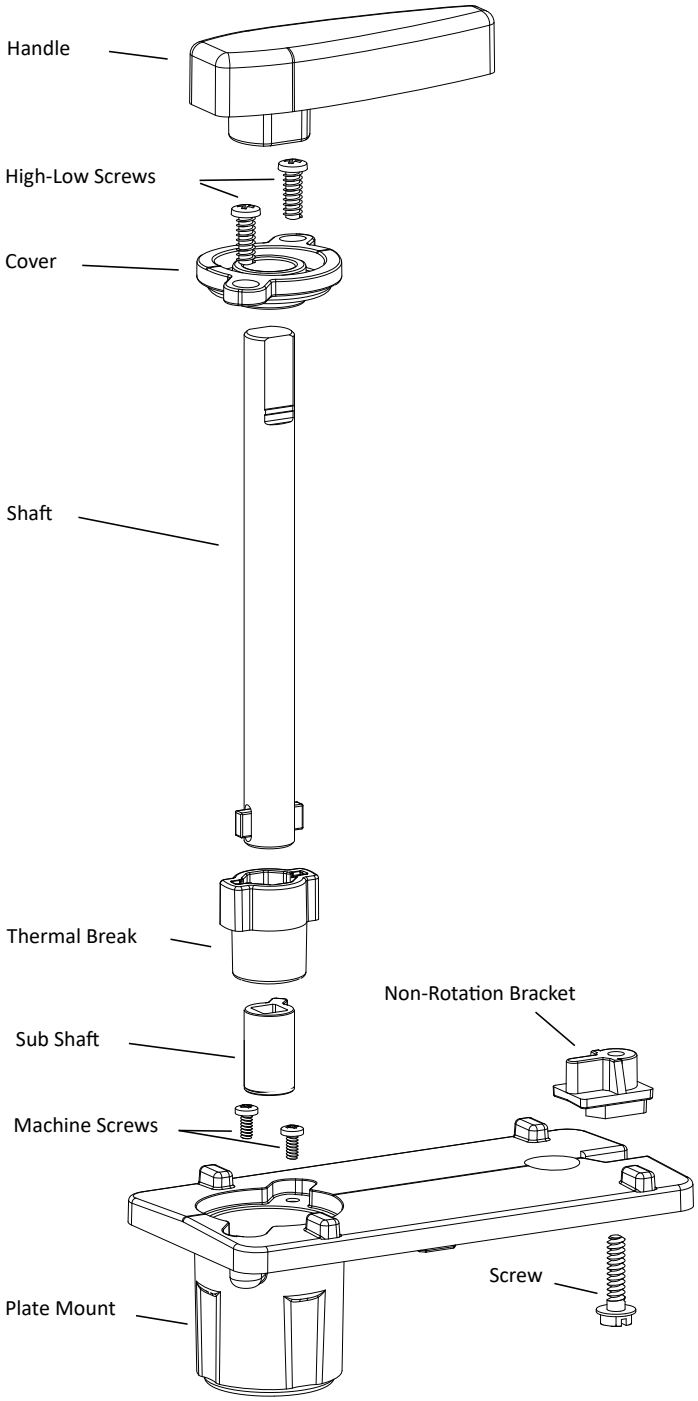
VEB-4x Series Valves Mounting/Repair Kits



HPO-5074 assembled on a Valve Body and an MEP-4xxxV Actuator



The **HPO-5074** kit is for adapting valve bodies for use with (only) "quick mounting" MEP-4xxx**V** actuators. MEP-4xxx**V** actuators have an attached handle and shaft as well as a plastic mounting bracket on the bottom of the actuator. See the relevant data sheet for more information.



The **HPO-5073** repair kit is designed to replace linkages on VEP-43/45/83/85 and VEB-43/46 **ball** valves for use with any standard (**not** quick-mounting "V" series) MEP-4xxx actuator:

- VEP-43ABB7xx through VEP-43GBB7xx
- VEP-45A1x7xx through VEP-45H4x7xx
- VEB-43/46 series ending in CK or CF

Hardware for mounting the linkage to the valve, and the actuator to the linkage, are included with the kit. The actuator must be ordered separately.

Troubleshooting

Auxiliary Switch Does Not Work

- Check the auxiliary switch setting. See *Auxiliary Switch (MEP-4x2x/4x7x) on page 12*.
- Check the wiring. (See *Wiring Issues on page 10*.)

Fail-Safe Does Not Work

- After initial connection or reconnection to power on MEP-42x2/45x2/49x2 proportional models, proper fail-safe operation might be delayed up to 30 seconds (until the capacitors are fully charged).
- Check the Fail-Safe Direction switch. See *Fail-Safe Direction (MEP-42/45/46/49xx) on page 13*.

Feedback Does Not Work

- Check the feedback switch setting. See *Proportional (MEP-4xx2) Models Setup on page 10*.
- Check the wiring. (See *Wiring Issues on page 10*.)

No Rotation

- After initial power-up, proportional fail-safe MEP-42x2/45x2/49x2 actuators delay enabling motor operation until the fail-safe capacitors are charged. No actuator rotation will take place for at least the first 30 seconds.
- Check that direction switches are fully engaged in the proper position. See *Proportional (MEP-4xx2) Models Setup on page 10* and *Tri-State/2-Position Rotation Direction on page 11*.
- Check that the shaft moves freely. (Press and hold the gear disengagement lever and manually rotate the shaft.)
- Check for a tripped circuit breaker to the transformer (or power supply).
- Check polarity and strength of input signal.
- Check for proper supply voltage from the transformer (or power supply) and that it has enough capacity (VA) for all connected devices. See their respective data sheets and **Tips for Connecting 24-Volt Power Application Note (AN0604D)**.
- Check the wiring. (See *Wiring Issues on page 10*.)

Rotation in Wrong Direction

- For proportional models, check the position of the direction switch (Switch 2). See *Proportional (MEP-4xx2) Models Setup on page 10*.
- For tri-state and tri-state/two-position models, check the CW/CCW wiring and rotation direction switch if applicable. See *Tri-State/2-Position Rotation Direction on page 11*.
- For fail-safe operation, check the Fail-Safe Direction switch. See *Fail-Safe Direction (MEP-42/45/46/49xx) on page 13*.

Stroke Range Is Wrong

- For proportional models, check the auto-mapping. See *Proportional (MEP-4xx2) Models Setup on page 10*.
- Check the adjustable stop.
- Check the voltage from the controller or thermostat.

Wiring Issues

- Check for correct wiring for the application.
- Check the wiring at the connected devices.
- Use a voltmeter and ohmmeter to check the terminals for expected values.
- See **Tips for Connecting 24-Volt Power Application Note (AN0604D)**.

NOTE: Wiring must be adequate to avoid excessive voltage drop on long runs! Allow plenty of "cushion" in measurements. A meter may be too slow to register transient dips or peaks during startup.

⚠ WARNING

Risk of electrical shock in line-voltage models. Disconnect ALL power before servicing. More than one disconnect provided on models with auxiliary switches. Failure to follow electrical safety precautions with live electrical components could result in injury or death.

⚠ WARNING

If both conduit connections are used in line-voltage models, they MUST be externally connected during installation. The nonmetallic enclosure does not provide grounding connection between the two conduit connections.

Proportional (MEP-4xx2) Models Setup

NOTE: Before Jan. 2014, **MEP-40x2/48x2 proportional** models had **0–10 VDC inputs** and **0–5 or 0–10 VDC feedback** (only). From 2014 through July 2015, they had **2–10** VDC inputs and **1–5 or 2–10** VDC (only) feedback instead. Starting in August 2015, **all** these options were available and selectable via a jumper and slide switch.

NOTE: Before August 2015, the **MEP-42xx/45xx/49xx fail-safe** proportional models had **2–10** VDC inputs and **1–5 or 2–10** VDC feedback (only). Starting in August 2015, **0–10** VDC inputs and **0–5 or 0–10** VDC feedback were also available and switch-selectable.

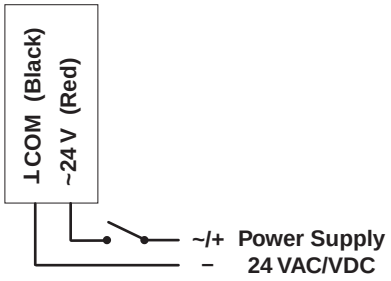
NOTE: When the **0**–10 VDC input is selected, selectable feedback options are **0**–5 or **0**–10 VDC. When the **2**–10 VDC input is selected, feedback options are **1**–5 or **2**–10 VDC.

For instructions in direction, feedback, and auto-mapping, see the relevant installation guide:

- **MEP-4000/4800** Series
- **MEP-4200/4500/4900** Series
- **MEP-46xxQ** Series

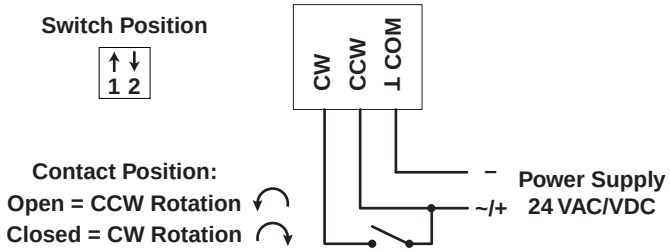
Two-Position Wiring (MEP-4001/3/4/5)

MEP-4xx4/4xx5 two-position actuators have "traditional" two wires for 24 VAC/VDC or 100–250 VAC signal/power.



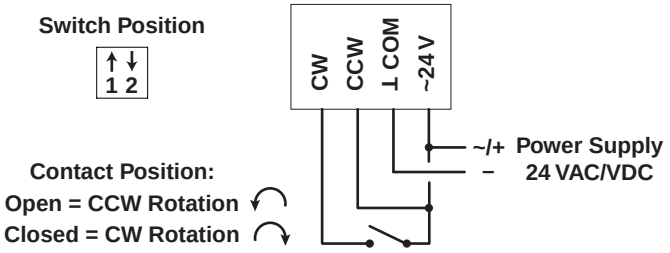
(Fail-Safe) MEP-4xx4 Two-Position 24 VAC/VDC (Two-Wire)

Starting in January 2014, **tri-state** MEP-4xx1/4xx3 models (except MEP-4003) **also offer two-position functionality** as an option. That option is dependent on wiring configuration and selector switch position. See ***Tri-State/2-Position Rotation Direction on page 11***. The (tri-state) two-position option requires "three-wire" (non-fail-safe) or "four-wire" (fail-safe) wiring configuration.



(NFS) MEP-4x01 Two-Position Control, CW Leg (Three-Wire)

See the installation guides for the **MEP-4201/4501/4901** or **MEP-4000/4800** series for more information.



(FS) MEP-4x51 Two-Position Control, CW Leg (Four-Wire)

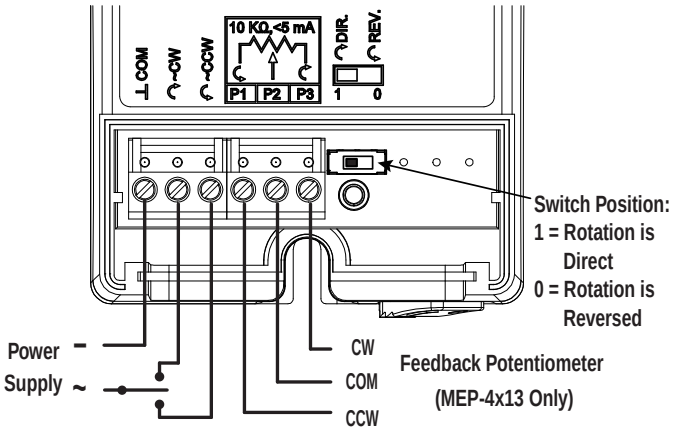
See the installation guide for the **MEP-4200/4500/4900** series for more information.

See also the two-position wiring information in the installation guide for the **MEP-46xxQ** series.

Tri-State/2-Position Rotation Direction

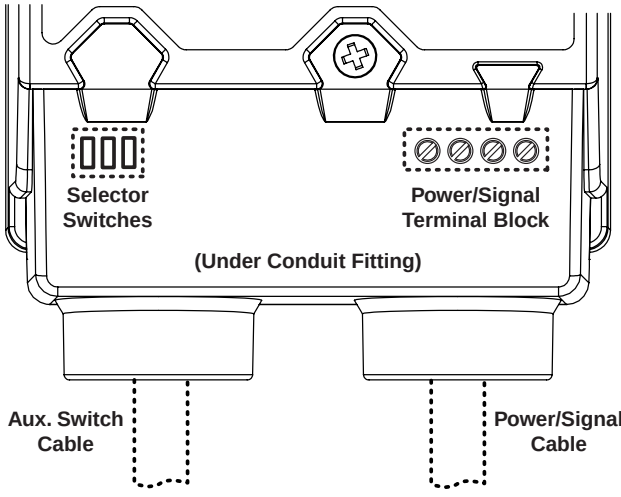
Tri-state/two-position MEP-4xx1/4xx3 models (except MEP-4003) have switches for selecting rotation direction. Be sure switches are set correctly for the application.

- Non-fail-safe MEP-4xx1/4x13 models (beginning in Jan. 2014) have a slide switch to the right of the terminal block. See the installation guide for the **MEP-4000/4800** series for more information.



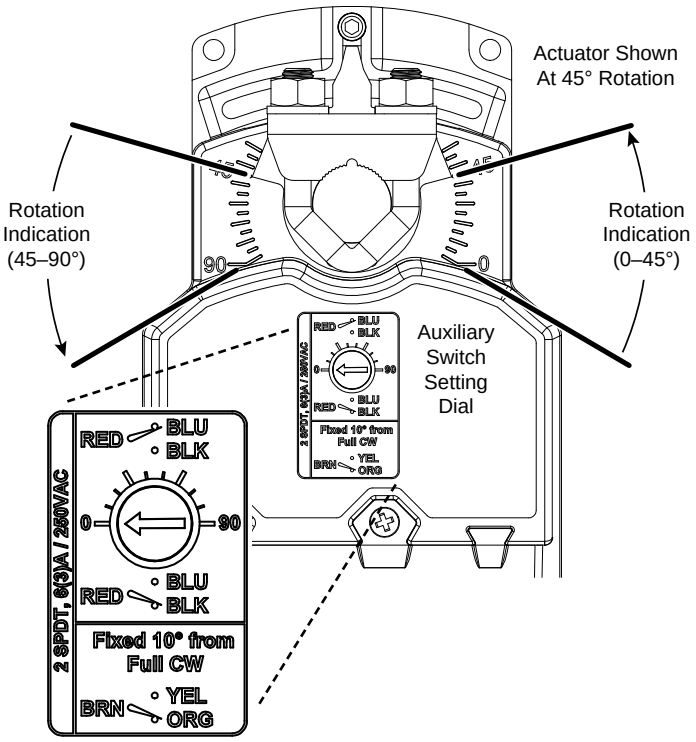
MEP-4xx1/4x13 Tri-State Wiring Configuration

- Fail-safe MEP-4x51 and fast-acting MEP-4x01 models have selector switches to the left of the terminal block. See the installation guides for the **MEP-4200/4500/4900** series or the **MEP-4201/4501/4901** for more information.



MEP-42xx/45xx/49xx Options

Auxiliary Switch (MEP-4x2x/4x7x)



Actuator Rotation and (MEP-497x) Auxiliary Switch Dial

In MEP-4x**2**x/4x**7**x models, the adjustable auxiliary SPDT switch can be set to trip anywhere between 0° (full CW rotation position) and 90° (full CCW). To adjust the auxiliary switch position, two different methods can be followed. (Method 2 is generally more precise.)

Method 1 (Setting Desired Dial Degrees)

1. While pressing the gear disengagement lever, **rotate the actuator to the full clockwise position (0°)**.
2. Using a small, flat-bade screwdriver, **adjust the rotary dial to the desired number of degrees** (as shown on the dial) at which the switch should trip. For example, if the switch is set to trip at 45° (dial halfway between 0° and 90° when actuator is at full CW position), then Red connects to Black from 0° to 45°, and Red connects to Blue from 45° to 90°. As the actuator rotates, the switch dial arrow points to the current switch position (Red connected to Blue vs. Red connected to Black).
3. Wire the desired auxiliary device(s) to the cable.

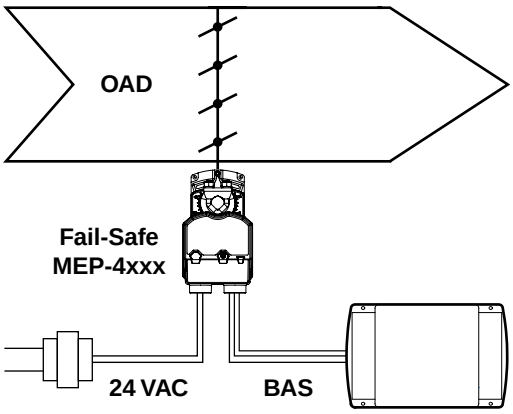
Method 2 (Setting where Rotation Trips)

1. While pressing the gear disengagement lever, **rotate the actuator to the point where the auxiliary switch should trip**.
2. Using a small, flat-bade screwdriver, **adjust the rotary dial to "0"**. For example, if the switch is set to trip (dial at "0") when the actuator rotation position is at 45°, then Red connects to Black from 0° to 45°, and Red connects to Blue from 45° to 90°. As the actuator rotates, the switch dial arrow points to the current switch position (Red connected to Blue vs. Red connected to Black).
3. Wire the desired auxiliary device(s) to the cable.

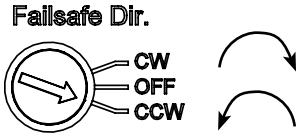
NOTE: In this method, if the dial is set to "90" instead of "0" in Step 2, switch connections will be reversed.

NOTE: On MEP-4**9**7x/4622Q/4672Q models, a second switch is **fixed** at 10° from full CW direction (Brown is connected to Orange in the 0–10° range, and Brown is connected to Yellow 11–90°). The dial adjustment has no effect on it. (The auxiliary switch cable is the left-hand cable, looking from the top.)

Fail-Safe Direction (MEP-42/45/46/49xx)



All **fail-safe** MEP-42xx/45xx/46xx/49xx models offer selectable clockwise or counterclockwise direction. (Proportional and tri-state models also offer the option to turn the fail-safe off—usually temporarily for test purposes.) Using a small, flat-bade screwdriver, adjust the switch dial to the desired CW/OFF/CCW option.



Fail-Safe Direction Switch Dial

NOTE: After initial connection or reconnection to power on MEP-42x2/45x2/4652Q/4672Q/49x2 proportional models, proper fail-safe operation might be delayed up to 30 seconds (until the capacitors are fully charged).

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