INSTALLATION

When Installing this Product...

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

⚠ CAUTION
Electrical Shock or Equipment Damage Hazard.
Low voltage can shock individuals or short equipment circuitry.
Disconnect power supply before installation.

IMPORTANT
All wiring must agree with applicable codes, ordinances and regulations.

Location

These actuators are designed to mount directly to a damper external drive shaft. The shaft coupling fastens to the drive shaft. The actuator housing includes slots which, along with an anti-rotation bracket, secure the actuator to the damper frame or duct work (see Fig. 8).

NOTES:
— When mounted correctly, these slots allow the actuator to *float* without rotating relative to the damper shaft.
— Using other brackets or linkages, the actuator can be foot-mounted or tandem-mounted.

⚠ CAUTION
Motor Damage Hazard.
Deteriorating vapors and acid fumes can damage metal parts.
Install motor in areas free of acid fumes and other deteriorating vapors.

⚠ CAUTION
Equipment Damage Hazard.
Tightly securing actuator to damper housing can damage actuator.
Mount actuator to allow it to float along its vertical axis.

Preparation

Before mounting the actuator onto the damper shaft, determine the:
— Damper/valve opening direction for correct spring return rotation. The actuator can be mounted to provide clockwise or counterclockwise spring return.
— Damper shaft size (see the Specifications section).

Determine Appropriate Mounting Orientation

The actuators are designed to open a damper by driving the damper shaft in either a clockwise ↷ or counterclockwise ↶ direction (see Fig. 2).

NOTES:
— Actuators are shipped in the fully closed (spring return) position.
— An arrow molded into the hub points to tick marks on the label to indicate the hub rotary position.

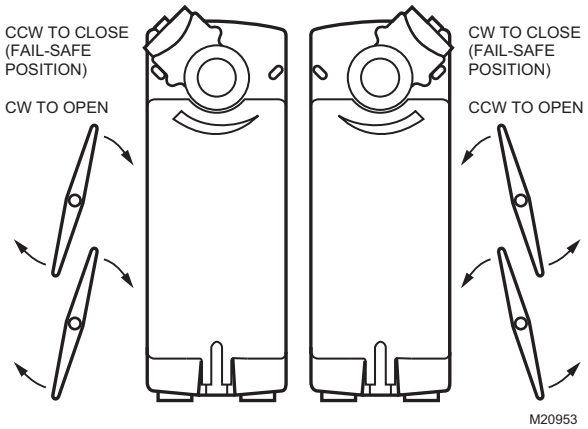


Fig. 2. Spring Return DCA mounting orientation.

Measure Damper/Valve Shaft Length

If the shaft is less than three inches in length, the shaft coupling must be located between the damper/valve and actuator housing. If the shaft length is more than three inches, the shaft coupling may be located on either side of the actuator housing.

If the coupling must be moved from one side of the actuator to the reverse, follow these instructions (see Fig. 3):
1. Remove the retainer clip from the shaft coupling and set it aside for later use.
2. Remove shaft coupling from one side of the actuator.
3. Replace the shaft coupling on the opposite side of the actuator aligning it based on the stroke labelling.
4. Replace the retainer clip on the shaft coupling using the groove of the coupling.

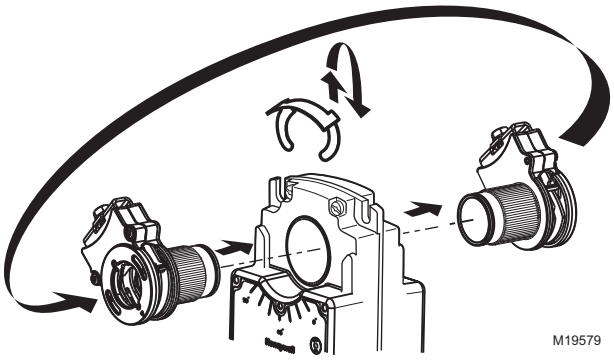


Fig. 3. Mounting shaft coupling to actuator opposite side.

Select Actuator Control Signal

MS41XX, MS71XX, MS75XX, MS81XX
These actuators are available in two control types:
— Standard: includes mode selection dial to select the desired input signal.
— Enhanced: includes different mode selection dial to select the desired input signal. Also includes dials for adjusting the input signal zero and span.

NOTE: Selections are made using a dial that appears on both the front and back of the actuator (see Fig. 4). For available options, see Table 5.

To select the control signal simply turn the mode selection dial to the desired control signal (as indicated on the device label).

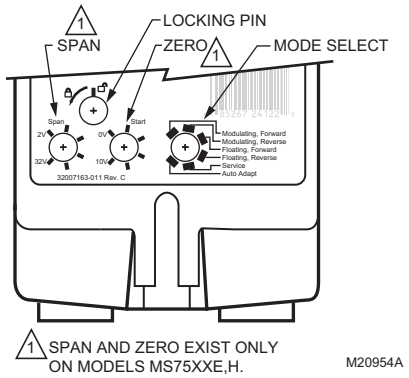


Fig. 4. Dials for control signal and zero/span.

Table 5. Actuator Control Signal Selections.

Mode Options	Standard	Enhanced	Details
Floating: forward	X[a]	X[a]	Series 60 control. Power to terminal 4 drives toward spring return position.
Floating: reverse	X[b]	X[b]	Series 60 control. Power to terminal 3 drives toward spring return position.
Modulating: 0-10 Vdc	X[c]		Series 70 control. 0 Vdc signal drives toward spring return position.
Modulating: 10-0 Vdc	X[c]		Series 70 control. 10 Vdc signal drives toward spring return position.
Modulating: 2-10 Vdc	X[c]		Series 70 control. 2 Vdc signal drives toward spring return position.
Modulating: 10-2 Vdc	X[c]		Series 70 control. 10 Vdc signal drives toward spring return position.
Modulating: forward		X	Voltage input with adjustable zero and span. Minimum signal drives toward spring return position.
Modulating: reverse		X	Voltage input with adjustable zero and span. Maximum signal drives toward spring return position.
Service		X	Actuator hub stops in place and ignores control signal changes.
Auto-adapt		X	For setup only. Rescales to allow full input signal over mechanically limited stroke.

[a] Feedback: MS75XXA,H and U.S. S… models are 2-10 Vdc, MS75XXB,E and European S… models are 0-10 Vdc.
[b] Feedback: MS75XXA,H and U.S. S… models are 10-2 Vdc, MS75XXB,E and European S… models are 10-0 Vdc.
[c] When operating in Modulating mode, the feedback signal matches the control signal.

Non-Standard Stroke

Mechanical Stroke Limit Reduction

For applications requiring a span less than 95 degrees, a simple adjustment can be made. When the rotational mounting of the shaft coupling is changed, the actuator drives less than the full 95 degrees stroke.

The stroke is adjustable in 5 degree increments. Once adjusted, the actuator drives until the shaft coupling reaches the mechanical stop (part of the housing). The stop causes the motor to discontinue driving and the shaft coupling drives no farther. When the actuator returns, it stops at the fail-safe position.

To set the fail-safe position, proceed as follows:

1. Remove the retainer clip from the shaft coupling and set it aside for later use.
2. Remove shaft coupling from the actuator.
3. Rotate the coupling to the desired fail-safe position, aligning it based on the stroke labelling. See Fig. 5.

   NOTE: The shaft coupling location determines the travel span.

   EXAMPLE: Setting shaft coupling to an approximate fail-safe position of 35 degrees (as indicated on the housing) limits stroke to 60 degrees. (See Fig. 5)

4. Install the shaft coupling at this position.
5. Replace the retainer clip on the shaft coupling using the groove of the coupling.
6. If necessary, replace the holder and position indicator on the shaft coupling.

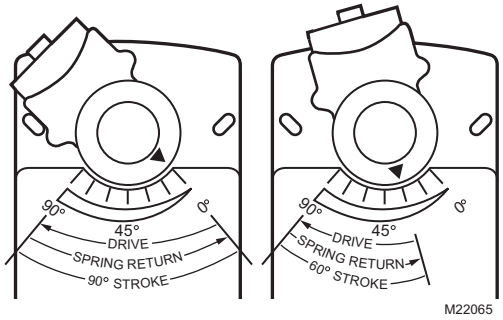


Fig. 5. Stroke reduction.

Adjustable Zero and Span (Enhanced Modulating Models *only*)

These actuators have the capability of adjustable zero and span. Fig. 4 shows the dials. These dials are present only on the Enhanced Modulating models. A basic description of these dials follows:

— Zero: Sets input voltage to define the 0% angle of rotation. It is factory set to 0 Vdc, and can be adjusted up to 10 Vdc.
— Span: Adjusts motor response to travel full stroke through the selected input span. It is factory set to 10 Vdc, and is adjustable from 2 to 32 Vdc.

SET ADJUSTABLE ZERO AND SPAN

1. Apply 24 Vac to the actuator.
2. Turn the zero dial (see Fig. 4) past the desired start point.
3. Using either a controller or signal generator, apply an input signal equal to the start point signal.
4. Slowly adjust zero toward the minimum setting until the actuator hub begins to move.
5. Turn the span dial (see Fig. 4) to the minimum setting (2 Vdc).
6. Using either a controller or signal generator, apply an input signal equal to the desired end point signal.
7. Allow the actuator to open fully.
8. Slowly adjust span toward the maximum setting until the actuator hub moves slightly from fully open.
9. Carefully adjust span knob toward minimum until the actuator hub returns to fully open.

Auto-Adapt

When using these actuators for standard stroke applications, this function can be ignored. When it is desirable to use a mechanically limited stroke (see Mechanical Stroke Limit Adjustment section), it is possible to use the Auto-Adapt feature to rescale the input signal over the new limited stroke.

1. Rotate actuator control signal dial to Auto-Adapt.

   NOTE: The actuator will drive open, then closed to establish the new open and closed positions.

2. Return the actuator control signal dial to the desired input signal position.

Manual Positioning

The actuator can be operated with no power present. Use this feature during installation or to move and lock the damper or valve shaft position when there is no power.

To operate the manual positioning:

1. If the power is on, turn it off.
2. Insert supplied hex wrench (key) as shown in Fig. 6.
3. Rotate key in the direction indicated on the cover.
4. Once the desired position is reached, hold the key to prevent the spring return from moving the actuator.
5. With the key held in place, use a screwdriver to turn the gear train lock pin in the indicated direction until the detent is reached.

   NOTE: At the detent, the pin resists further rotation.

6. Remove the key without rotating it further.

To release the manual positioning with no power present:

1. Insert supplied key.
2. Turn key 1/4 turn in the direction indicated on the cover.
3. Remove key without engaging the gear train lock pin.
4. The spring will return actuator to the fail-safe position.

   NOTE: Once power is restored, the actuator will return to normal automated control.

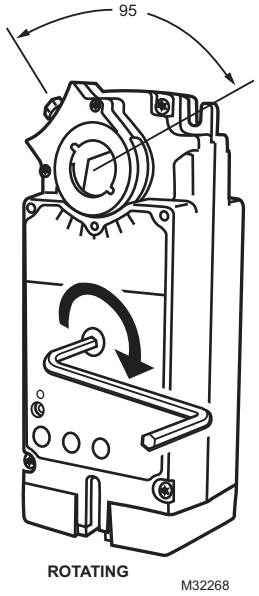


Fig. 6. Manual positioning.

Mounting

CAUTION

Device Malfunction Hazard.
Improper shaft coupling tightening causes device malfunction.
Tighten shaft coupling with proper torque to prevent damper shaft slippage.

CAUTION

Actuator Damage Hazard.
Using actuator as shaft bearing causes device damage.
Use actuator only to supply rotational torque. Avoid any side loads to actuator output coupling bearings.

⚠ CAUTION

Equipment Damage Hazard.
Can damage the motor beyond repair.
Never turn the motor shaft by hand or with a wrench. Forcibly turning the motor shaft can damage the gear train.

To mount the actuator to an external drive shaft of a damper, proceed as follows:

1. Place actuator over damper shaft; and hold mounting bracket in place. See Fig. 8.
2. Mark screw holes on damper housing.
3. Remove actuator and mounting bracket.
4. Drill or center-punch holes for mounting screws (or use no.10 self-tapping sheet metal screws).
5. Turn damper blades to desired normal (closed) position.
6. Place actuator and mounting bracket back into position and secure bracket to damper box with sheet metal screws.
7. Using 10 mm wrench, tighten shaft coupling securely onto damper shaft using minimum 120 lb-in. (13.6 Nm), maximum 180 lb-in. (20.3 Nm) torque.

NOTE: See Fig. 7 for proper mounting to a square damper shaft.

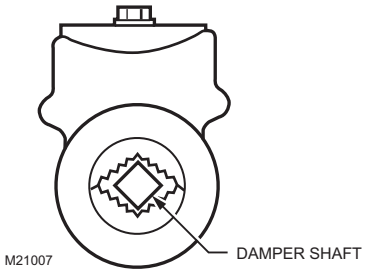


Fig. 7. Proper mounting to square damper shaft.

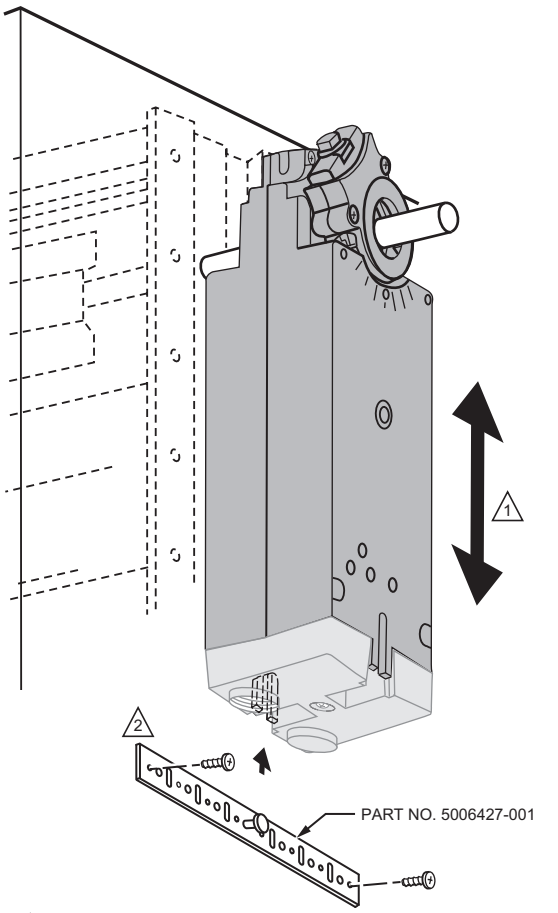


Fig. 8. Mounting actuator to damper housing.

WIRING

⚠ CAUTION

Electrical Shock or Equipment Damage Hazard.
Disconnect all power supplies before installation.
Motors with auxiliary switches can have more than one disconnect.

IMPORTANT

All wiring must comply with local electrical codes, ordinances and regulations.

Access Cover Removal (Fig. 9)

CAUTION

Equipment Damage Hazard.
Improper cover removal can damage electric connections.
Pull the cover along the axis of the actuator.
The cover contains contact sockets that must connect to actuator contact pins.
Bending these pins can permanently damage the device.

NOTE: This cover can be removed before or after actuator mounting.

In order to wire the device, the access cover must be removed as follows:

1. Remove the screw from the center of the cover, set the screw aside.
2. Pull the cover along the long axis of the actuator.
3. If the actuator is not yet mounted, set it aside.
4. Remove conduit dust covers as necessary.
5. Thread wire through conduit holes.
6. Connect wires as appropriate to the terminal block(s). (See Fig. 10 and 11.)

NOTE: With US Models, use 1/2 in. NPS strain relief gland or 1/2 in. conduit adapters. Recommend using flex conduit.
With European Models, use M16 strain relief gland.

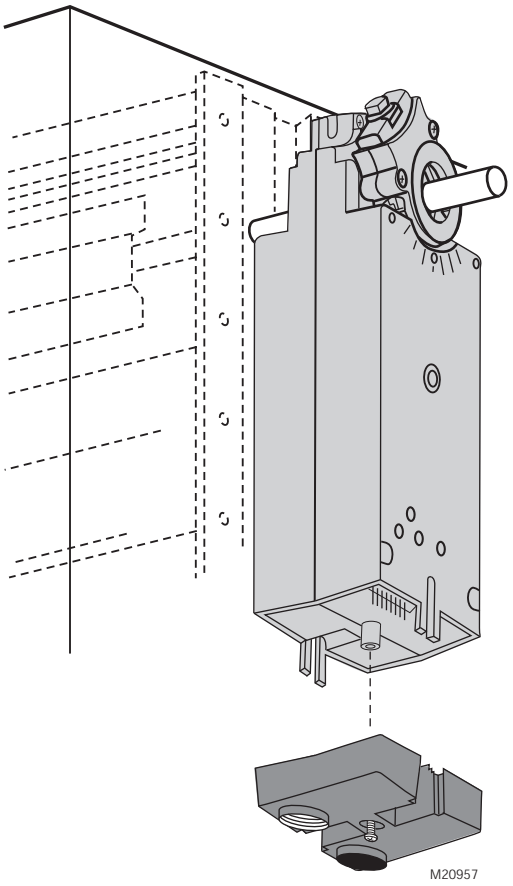


Fig. 9. Removing access cover.

WIRING

See Fig. 10 through 26 for typical wiring details for actuators without cables (whips). See Fig. 27 through 29 for wiring actuators with cables (whips).

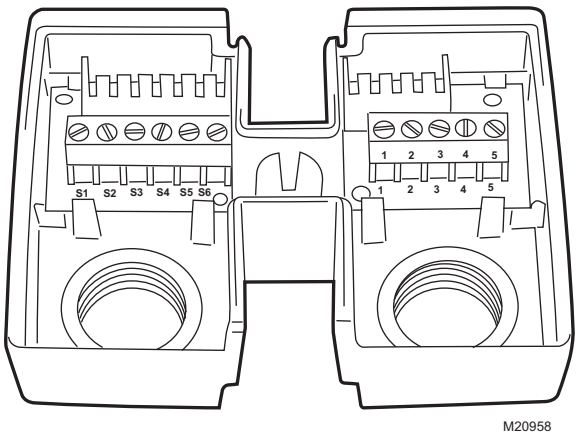
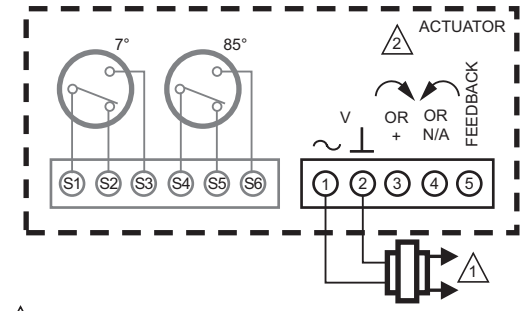


Fig. 10. Terminal block details.



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M33486

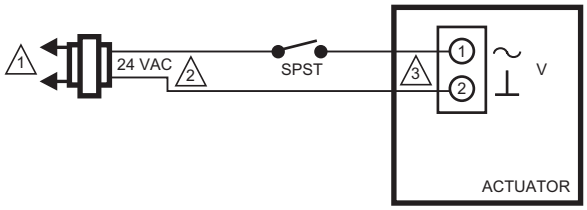
Fig. 11. Terminal block details.

Table 6. Wiring details.

Terminal	Floating	Modulating	Two-Position		Color[a]
			24 Vac	120 Vac 240 Vac	
~ 1	power	power	power	power	Red
⊥ 2	common	common	common	neutral	Black
↻ 3	cw	input	—	—	White
↻ → 4	ccw	—	—	—	—
← 5	feedback	feedback	—	—	Brown

[a]Only applies to models with wires.

Typical Wiring Without Cables



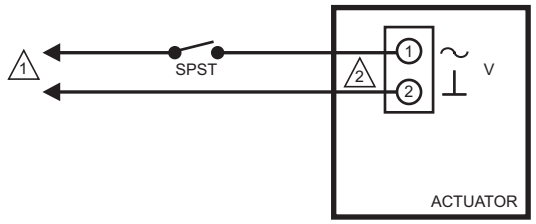
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M19718C

Fig. 12. Wiring for low-voltage two-position control.



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M22289A

Fig. 13. Wiring for line-voltage two-position control.

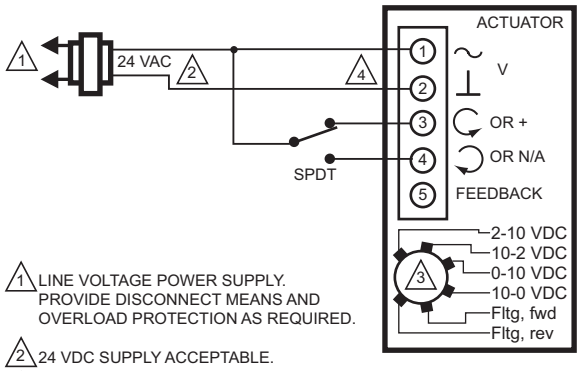


Fig. 14. Wiring for SPDT on/off control.

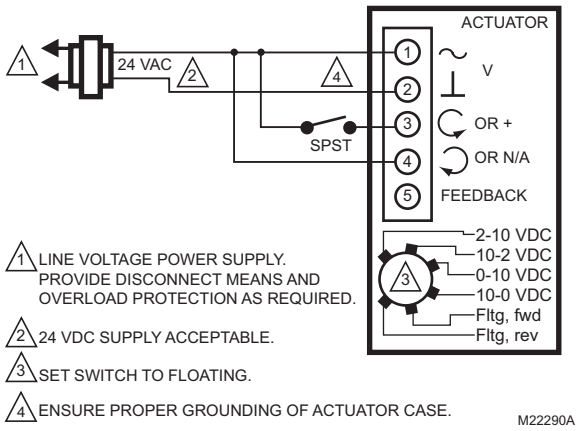


Fig. 15. Wiring for SPST on/off control.

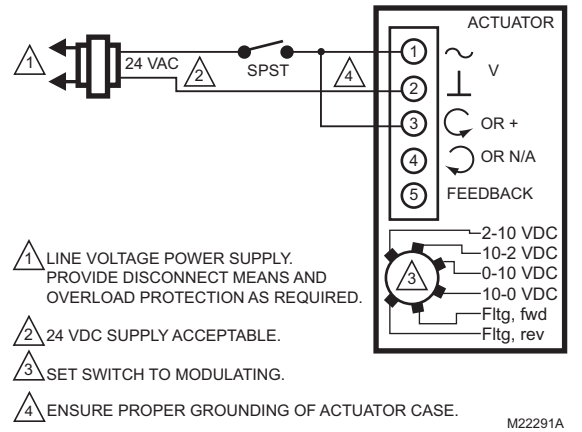


Fig. 16. Wiring for two-wire SPST on/off control.

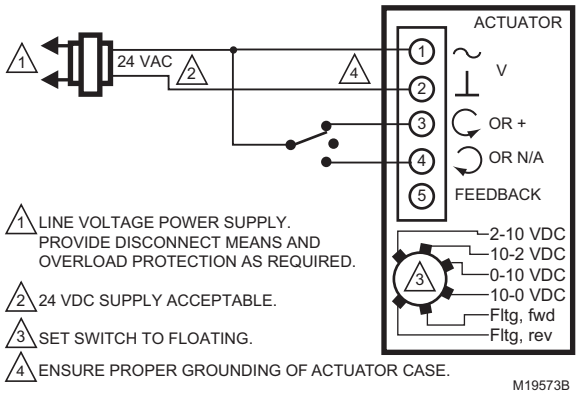


Fig. 17. Wiring for floating control.

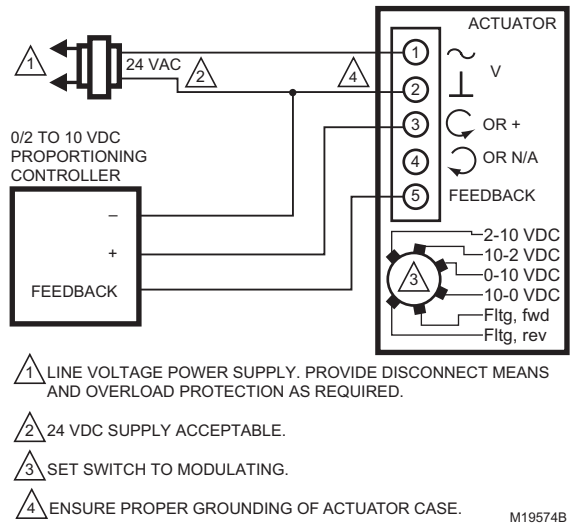


Fig. 18. Wiring for 0/2-10 Vdc proportioning controllers.

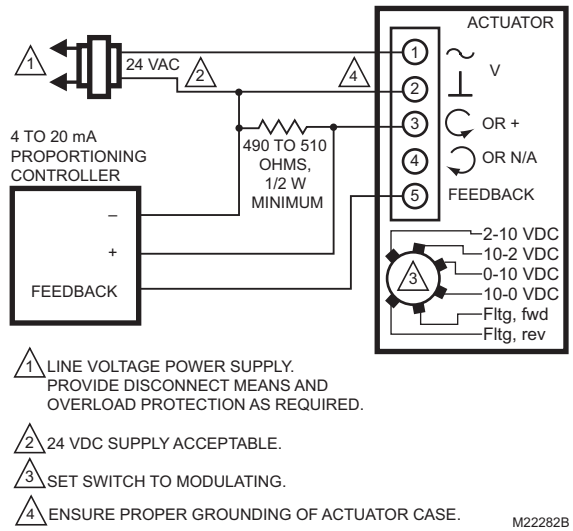
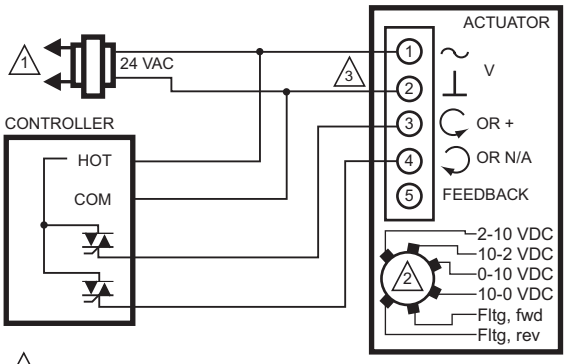


Fig. 19. Wiring for 4-20 mA proportioning controllers.



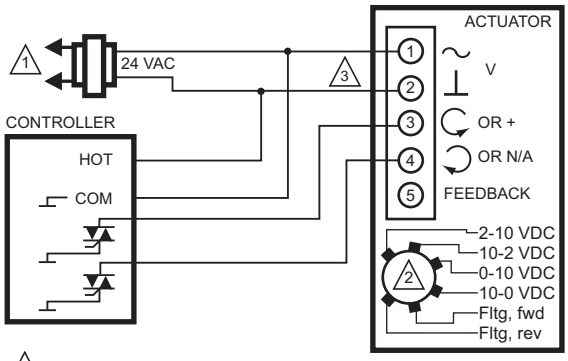
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 SET SWITCH TO FLOATING.

3 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M22283A

Fig. 20. Wiring for high side (triac source) floating control.



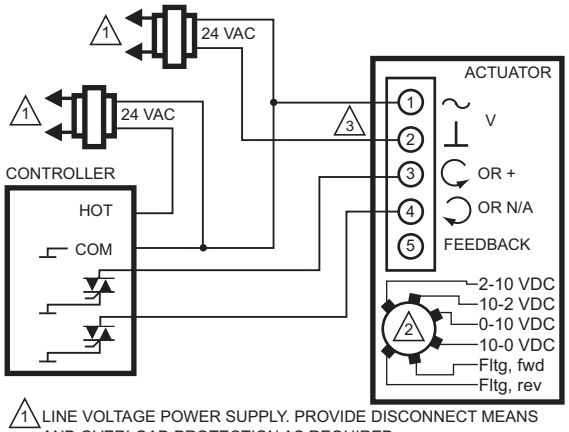
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 SET SWITCH TO FLOATING.

3 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M22284A

Fig. 21. Wiring for low side (triac sink) floating control.



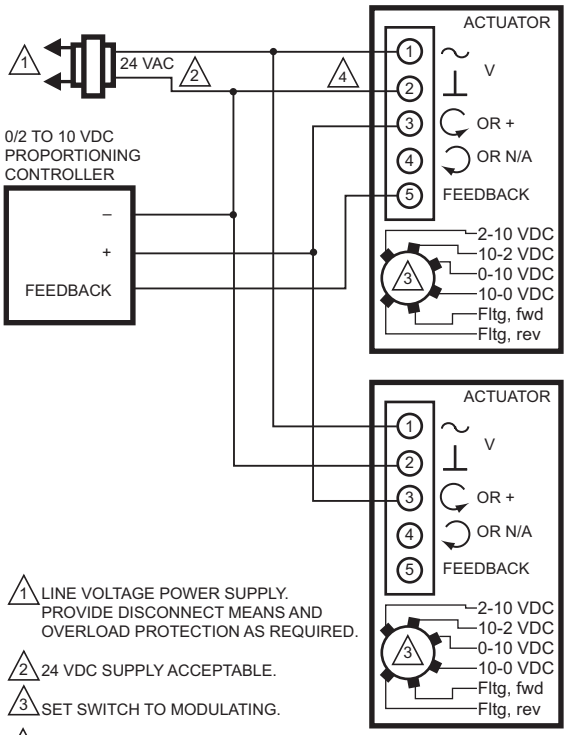
1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 SET SWITCH TO FLOATING.

3 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M22285A

Fig. 22. Wiring for low side (triac sink) floating control using separate transformers.



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

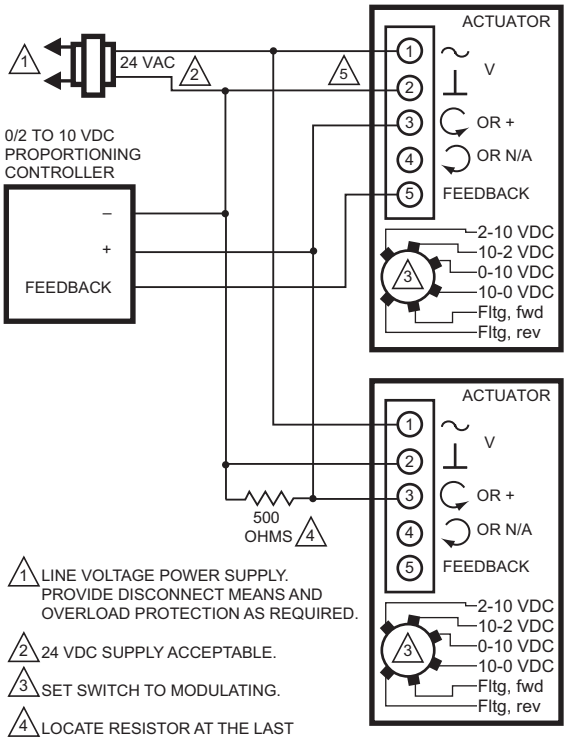
2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

4 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M19575B

Fig. 23. Wiring for 0/2-10 Vdc proportioning controller operating multiple actuators.



1 LINE VOLTAGE POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 24 VDC SUPPLY ACCEPTABLE.

3 SET SWITCH TO MODULATING.

4 LOCATE RESISTOR AT THE LAST ACTUATOR.

5 ENSURE PROPER GROUNDING OF ACTUATOR CASE.

M22286A

Fig. 24. Wiring for 4-20 mA proportioning controller operating multiple actuators.

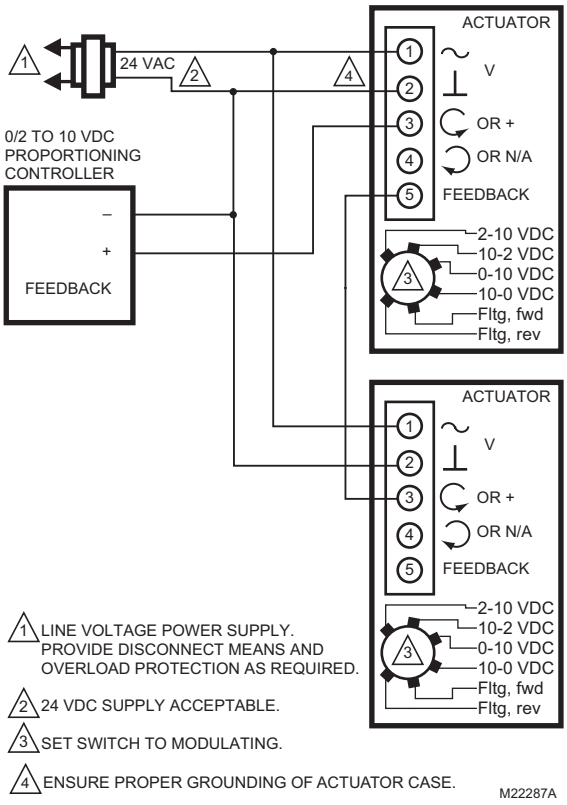


Fig. 25. Wiring for 0/2-10 Vdc proportioning controller operating multiple actuators as master/drone.

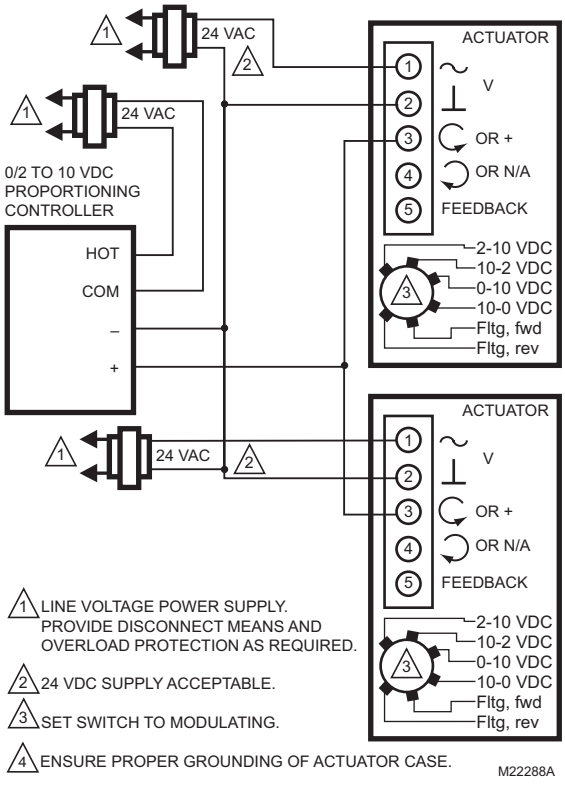


Fig. 26. Wiring for 0/2-10 Vdc proportioning controller operating multiple actuators with separate transformers.

Typical Wiring With Cables

See Fig. 27 through 29 for wiring actuators with cables (whips). See Fig. 10 through 26 for typical wiring details for actuators without cables (whips).

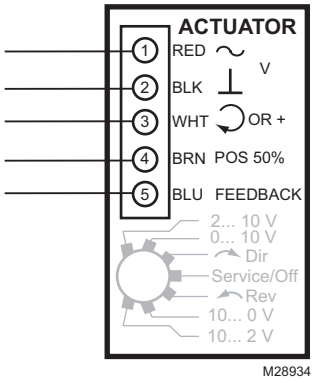


Fig. 27. MS7510W2008/2206; MS7520W2007/2205 Floating Modulating.

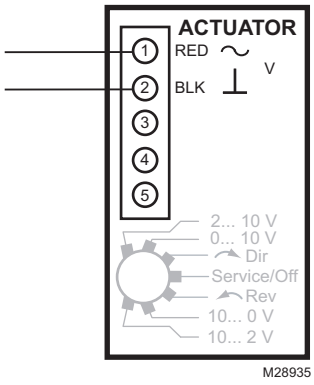


Fig. 28. MS8110W1008/1206; MS81200W1007/1205 Two Position Low.

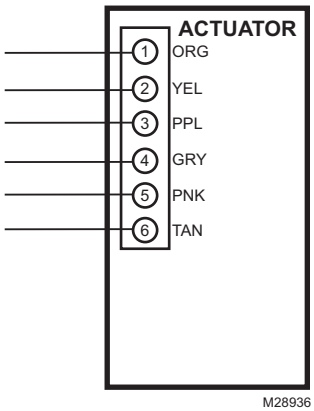


Fig. 29. Switch only models.