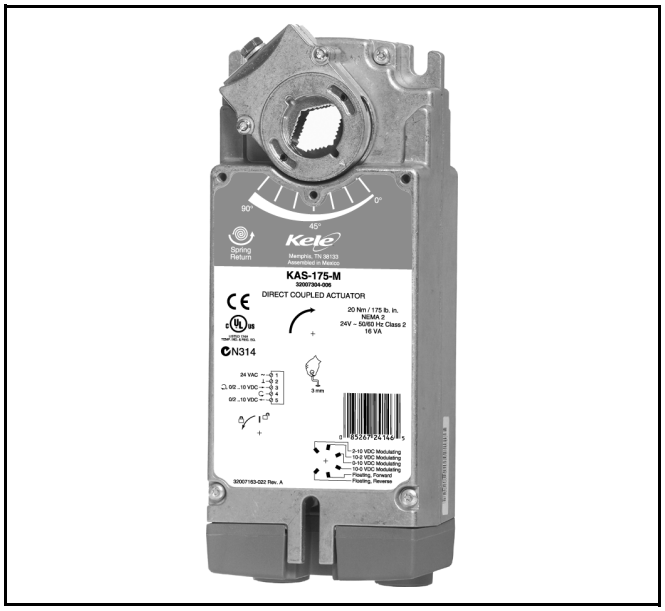
KAS Series
Spring Return Direct Coupled Actuators

KAS-44-2, KAS-44-M, KAS-88-2, KAS-88-M, KAS-88-120,
KAS-175-2, KAS-175-M, KAS-175-120

INSTALLATION INSTRUCTIONS



FEATURES

- **Brushless DC submotor with electronic stall protection.**
- **Self-centering shaft adapter.**
- **Three torque ranges: 44 lb-in. (5 N•m), 88 lb-in. (10 N•m), and 175 lb-in. (20 N•m) available.**
- **Access cover to facilitate connectivity.**
- **Metal housing with mechanical end limits.**
- **Field-installable auxiliary switches.**
- **Spring return direction field-selectable.**
- **Hub includes position indicator.**
- **Manual winding capability with locking function.**
- **Models available with combined floating/modulating control in a single device.**
- **UL (cUL) listed and CE compliant.**
- **All Models are plenum-rated per UL873.**

APPLICATION

The KAS Series Spring Return Direct Coupled Actuators (DCA) are control actuators that provide proportioning control for valves and dampers. They accept a voltage signal from a controller to position a damper or valve at any chosen point between fully open and fully closed.

The KAS-44-M, KAS-88-M, and KAS-175-M Actuators can also provide floating and two-position control capabilities.

SPECIFICATIONS

Models: See Table 1.

Dimensions: See Fig. 1.

Device Weight: 7 lb (3.2 kg).

Temperature Ratings:
Ambient: -40°F to 140°F (-40°C to 60°C).
Shipping and Storage: -40°F to 158°F (-40°C to 70°C).

Humidity Ratings: 5% to 95% RH noncondensing.

Stroke: 95° ±3°, mechanically limited.

Minimum Damper Shaft Length: 1 in. (25 mm); 3 in. (76 mm) recommended.

Timing (At Rated Torque and Voltage):
Drive Open: 90 seconds typical.
Spring Close: 20 seconds typical.

c UL US LISTED CE

Mounting: Self-centering shaft adapter.
Round Damper Shafts: 0.375 to 1.06 in. (10 to 27 mm).
Square Damper Shafts: 1/2 to 3/4 in. (13 to 19 mm).
Actuator can be mounted with shaft in any position.

IMPORTANT

For 175 lb-in. (20 N•m) models: 3/4 in. or greater shaft diameter recommended.

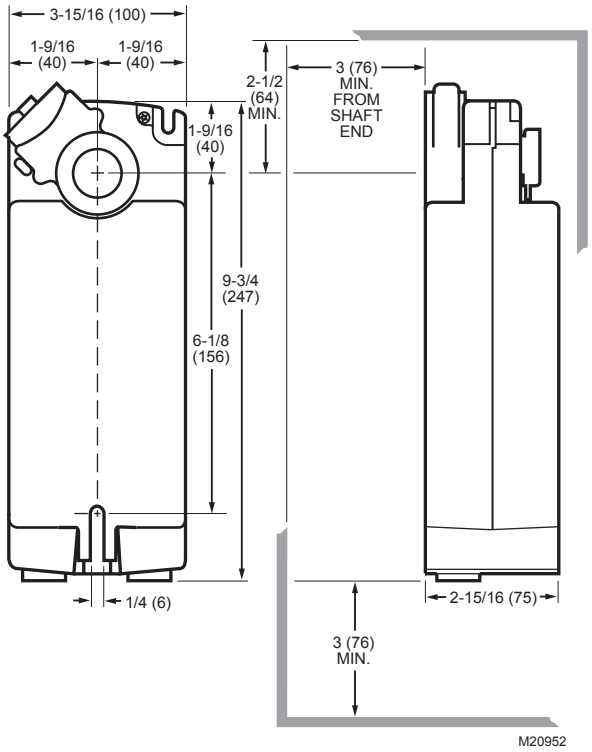


Fig. 1. Dimensional drawing of actuator in in. (mm).

Torque Ratings:
Typical Holding, Driving, Spring Return:
KAS-44: 44 lb-in. (5 N•m).
KAS-88: 88 lb-in. (10 N•m).
KAS-175: 175 lb-in. (20 N•m).
Stall Maximum (fully open at 75°F):
KAS-44: 100 lb-in. (11.3 N•m).
KAS-88: 200 lb-in. (22.6 N•m).
KAS-175: 350 lb-in. (39.6 N•m).

Electrical Ratings:
Power Input: 24 Vac ±20%, 50/60 Hz (Class 2).
Power Consumption:
KAS-44: Driving: 14 VA. Holding: 6 VA.
KAS-88: Driving: 14 VA. Holding: 6 VA.
KAS-175: Driving: 16 VA. Holding: 6 VA.

Electrical Connections:
Field wiring 14 to 22 AWG (2.0 to 0.344 mm sq) to screw terminals, located under the removable access cover.

Controller Type: See Table 1.
Input Impedance: 95K ohms minimum.
Feedback Signal: Driving current is 3 mA minimum.

Design Life (at Rated Voltage): 60,000 full stroke cycles; 1,500,000 repositions; 60,000 full stroke spring returns.

Environmental Protection Ratings: NEMA2 when mounted on a horizontal shaft with access cover below the shaft.

Approvals: See Table 2.

Noise Rating at 1m (Maximum):
Driving: 45 dBA.
Holding: 20 dBA (no audible noise).
Spring Return: 60 dBA.

Accessories:
205649 Mounting Bracket (supplied with actuator).
SW2-US Auxiliary Switch Kit.

Table 1. Actuator Catalog Numbering.

KAS	Kele Actuator, Spring Return	
44	44 lb-in. (5 N•m)	
88	88 lb-in. (10 N•m)	
175	175 lb-in. (20 N•m)	
	2	24 Vac Two-Position Control
	120	120 Vac Two-Position Control
	M	24 Vac Modulating and Floating Control

KAS	**-175**	**-M**

Table 2. Approvals.

	KAS Series
UL/cUL	X
UL873 Plenum Rating, File No. E4436; Guide No. XAPX.	X
CE	X
C-TICK	X

Sizing

Required Torque

In lieu of data from a Specification Engineer or Manufacturer, required torque for a given damper load can be determined using the following method: $T_R = T_D \times A_D$

Where:
— T_R = Required torque for the damper load.
— T_D = Damper torque rating from the manufacturer, expressed in either (lb-in.)/(sq ft) or (N•m)/(sq m). the damper load.
— A_D = Damper area expressed in either sq ft or sq m.

Actuators Required

In lieu of data from a Specification Engineer or Manufacturer, the number of required actuators for a given damper load can be determined using the following method:

$$N = \frac{T_R}{T_A \times SF}$$

Where:
— N = Number of actuators.
— T_R = Required torque for the damper load. (See above.)
— T_A = Actuator torque rating.
— SF = Safety factor.

NOTE: The safety factor accounts for variables such as misalignments, aging of the damper, etc. 0.8 is a typical safety factor.

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 adapter 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. 7).

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.

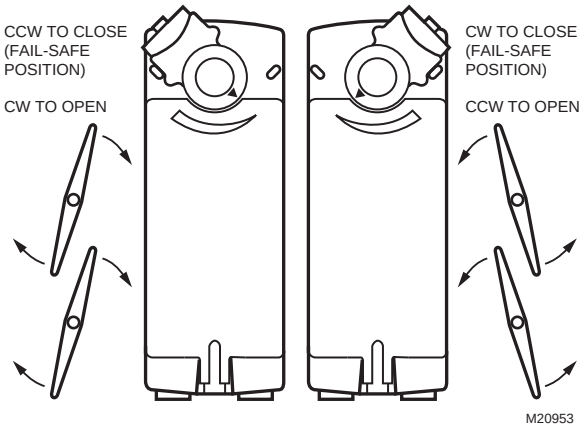


Fig. 2. Spring Return DCA mounting orientation.

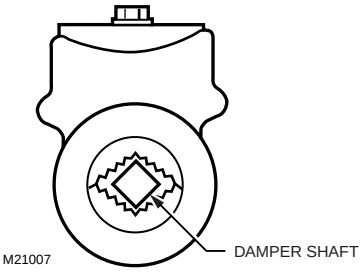


Fig. 3. Proper mounting to square damper shaft.

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. 4):

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.

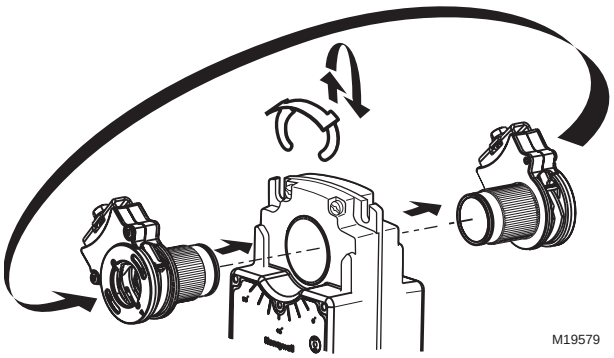


Fig. 4. Mounting shaft coupling to actuator opposite side.

Select Actuator Control Signal

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. 5). For available options, see Table 3.

Select the control signal as follows:
- Simply turn the mode selection dial to the desired control signal (as indicated on the device label).

Table 3. Actuator Control Signal Selections.

Mode Options	Standard	Details
Floating: forward	X[a]	Power to terminal 4 drives toward spring return position.
Floating: reverse	X[b]	Power to terminal 3 drives toward spring return position.
Modulating: 0-10 Vdc	X	0 Vdc signal drives toward spring return position.
Modulating: 10-0 Vdc	X	10 Vdc signal drives toward spring return position.
Modulating: 2-10 Vdc	X	2 Vdc signal drives toward spring return position.
Modulating: 10-2 Vdc	X	10 Vdc signal drives toward spring return position.

[a] Feedback is 2-10V.

[b] Feedback is 10-2V.

Manual Positioning

⚠ CAUTION

Equipment Damage Hazard.
Manual operation while powered can damage the actuator beyond repair.
Turning the shaft against the control signal can damage the gear train.

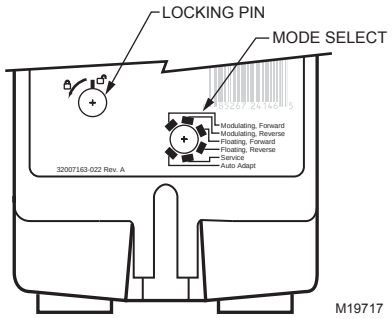


Fig. 5. Dials for control.

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.

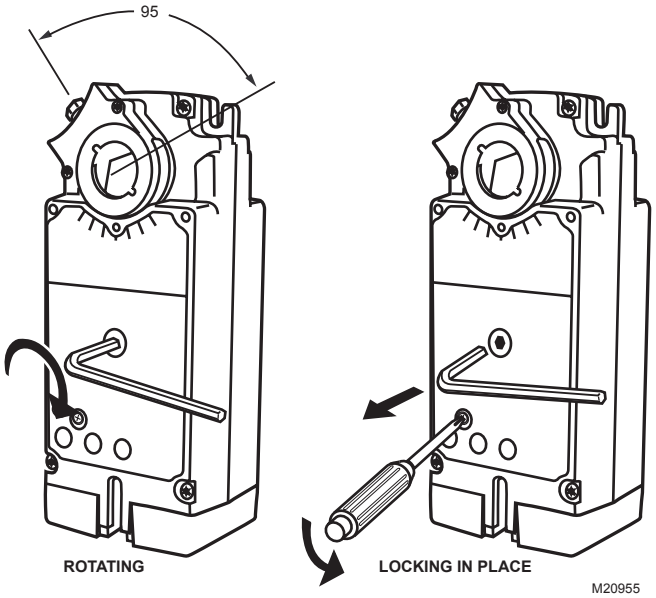


Fig. 6. Manual positioning.

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. 7.
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., maximum 180 lb-in. torque.

NOTE: See Fig. 3 for proper mounting to a square damper shaft.

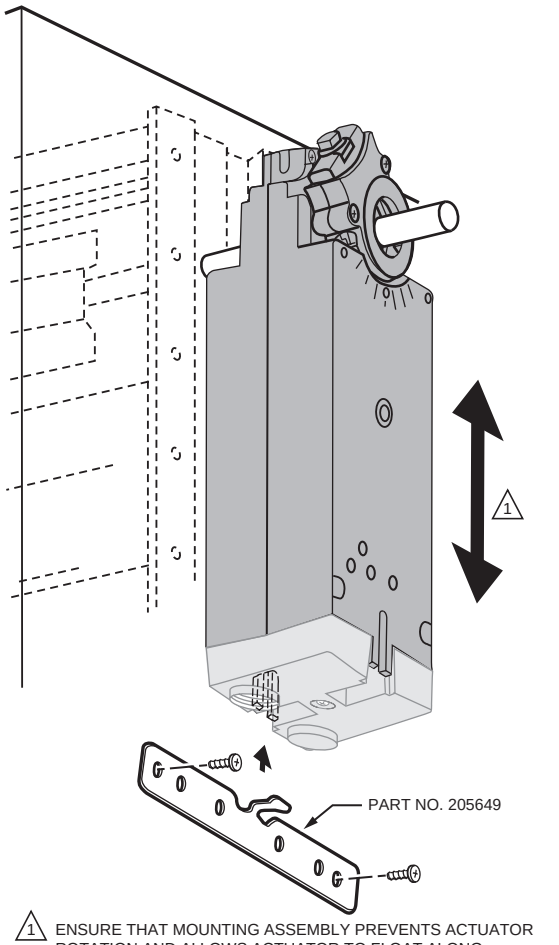


Fig. 7. Mounting actuator to damper housing.

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. 8)

⚠ 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. (See Typical Wiring.)

NOTE: Use 1/2 in. NPS strain relief gland or 1/2 in. conduit adapters. Recommend using flex conduit.

Typical Wiring

See Fig. 9 through 12 for typical wiring details.

Table 4. Wiring details.

Terminal	Floating	Modulating	Two-Position
1	power	power	power
2	common	common	common
3	cw	input	—
4	ccw	—	—
5	—	feedback	—

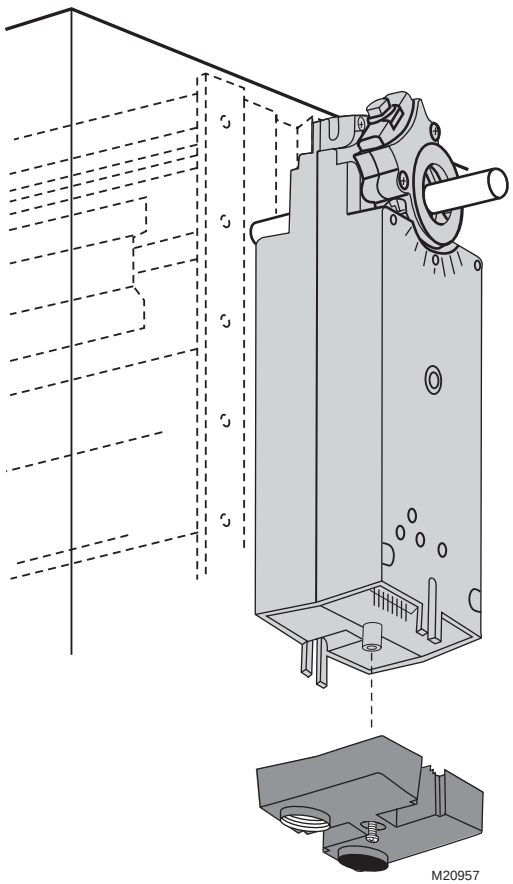


Fig. 8. Removing access cover.

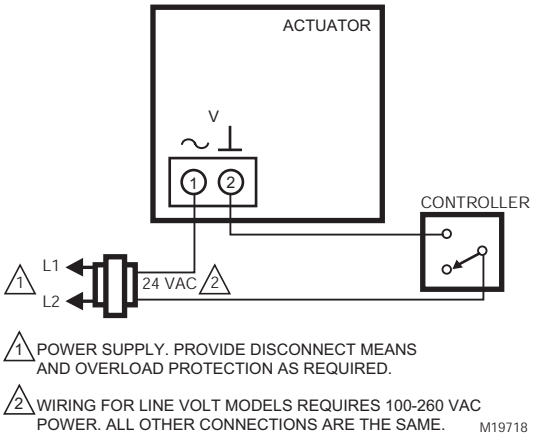


Fig. 9. Wiring for two-position control.

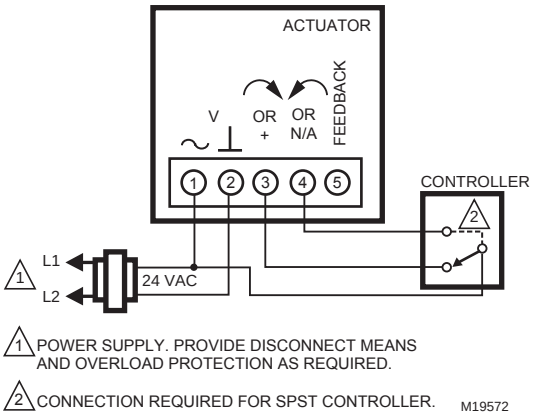


Fig. 10. Wiring for on/off control (floating mode setting).

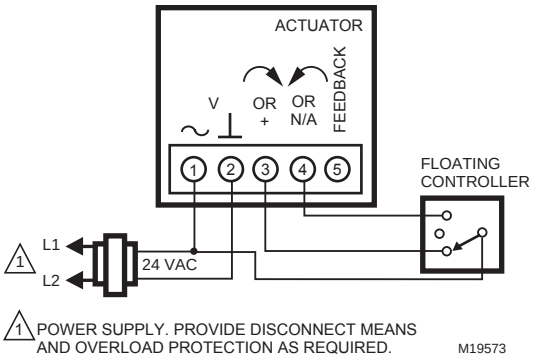


Fig. 11. Wiring for floating control (floating mode setting).

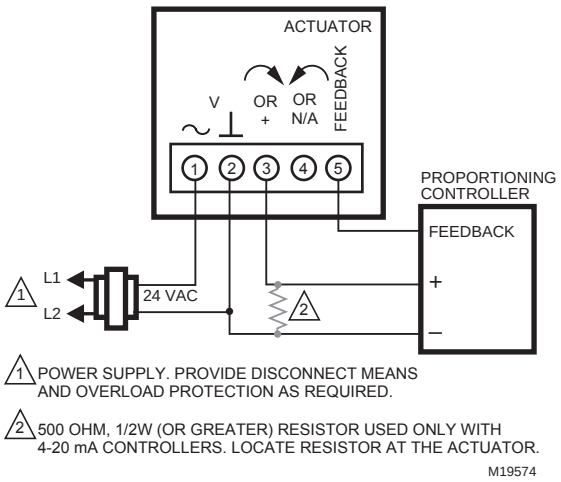


Fig. 12. Wiring for proportioning controllers (modulating mode setting).

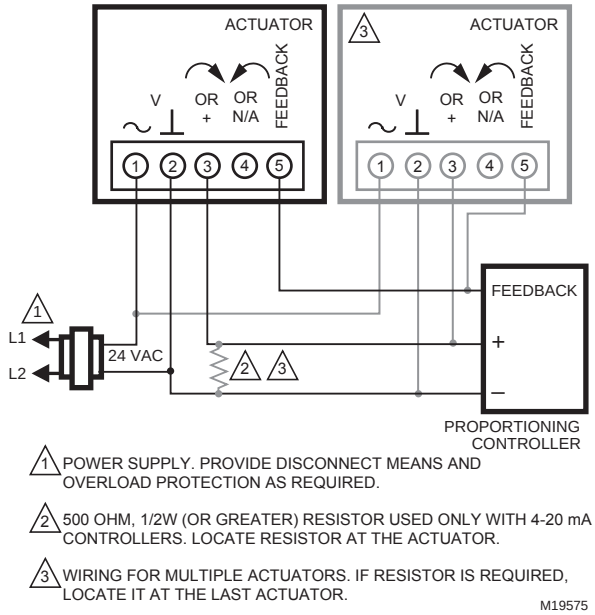


Fig. 13. Wiring for a proportioning controller operating multiple actuators (modulating mode setting).

OPERATION

The actuator is designed to be used in ventilating and air conditioning installations to operate valves, dampers, ventilation flaps and louvers requiring torque up to the rating. (For ratings, see the Specifications section.) If the power fails, the actuator will spring return to the start position.

The actuator is operated by a proportional controller. When using a proportional controller, the actuator drives toward its fully open position when the input signal increases; the actuator drives toward the fully closed position when the input signal decreases. The actuator stops when the input signal reaches the desired proportional control point.

IMPORTANT

The actuator is designed to respond to DDC Controller instantaneous contact closures. Take care not to short cycle the actuator. Unstable damper control can cause premature actuator failure.

Actuator Override (KAS-xxx-M)

To override the control signal (for freeze protection or similar applications):

1. Override to full open:
   a. Disconnect the input signal (from terminal 3).
   b. Apply 24 Vac to terminal 3.
   c. See Fig. 14.
2. Override to full closed:
   a. Disconnect the input signal (from terminal 3).
   b. See Fig. 15.

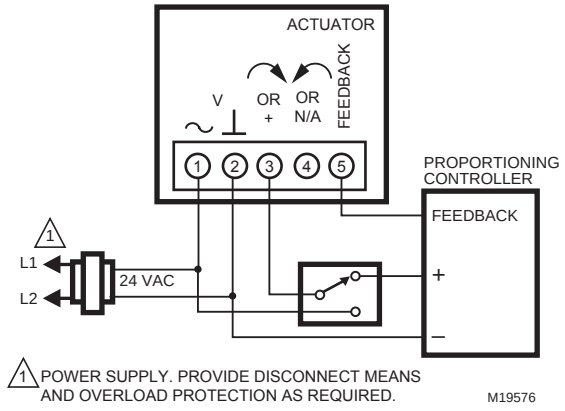


Fig. 14. Override to full open (modulating mode setting).

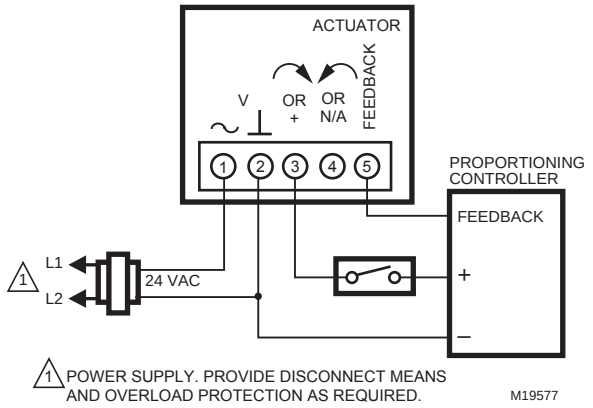


Fig. 15. Override to full close (modulating mode setting).

CHECKOUT

Modulating/Floating Operation

1. Mount actuator for required application (either clockwise ↷ or counterclockwise ↶ rotation to open the damper).
2. Connect 24 Vac power to terminals 1 and 2. (See Table 4.)
3. Set “Mode Select” dial to desired control signal. (See Fig. 5 and Table 3.)
4. Apply control signal for actuator 100% position. (See Table 4.)
   a. (0)2-10 Vdc: apply 10 Vdc signal to terminal 3.
   b. 10-(0)2 Vdc: apply (0)2 Vdc signal to terminal 3.
   c. (0)4-20 mA: apply 20 mA signal to terminal 3.
   d. 20-(0)4mA: apply (0)4 mA signal to terminal 3.
   e. Floating: apply 24 Vac to appropriate CW (3) or CCW (4) terminal.
5. Actuator drives to 100% position.
6. Apply control signal for actuator 0% position. (See Table 4.)
   a. (0)2-10 Vdc: apply (0)2 Vdc signal to terminal 3.
   b. 10-(0)2 Vdc: apply 10 Vdc signal to terminal 3.
   c. (0)4-20 mA: apply (0)4 mA signal to terminal 3.
   d. 20-(0)4mA: apply 20 mA signal to terminal 3.
   e. Floating: apply 24 Vac to appropriate CW (3) or CCW (4) terminal.
7. Actuator drives to 0% position.

Spring Return Operation

1. Mount actuator for required application (either clockwise ↷ or counterclockwise ↶ rotation to open the damper).
2. Connect power to terminals 1 and 2. (See Table 4.)

   NOTE: For two-position models skip to step 5.

3. Set “Mode Select” dial to desired control signal. (See Fig. 5 and Table 3.)
4. Apply control signal for actuator 50% position. (See Table 4.)
   a. Vdc Input Signal: apply 5-6 Vdc signal to terminal 3.
   b. mA Input Signal: apply 10-12 mA signal to terminal 3.
   c. Floating: apply 24 Vac to appropriate CW (3) or CCW (4) terminal.
5. Allow the actuator to drive to 50% position.
6. Disconnect wire from terminal 1.
7. Actuator spring returns to 0% position.
8. Re-connect wire to terminal 1, actuator drives towards 100% position.

Feedback Operation

1. Connect a multi-meter, set for Vdc, to terminals 2 and 5.
2. Apply the same signal as in step 4 of Modulating Operation.
3. The multi-meter reading increases to match the input signal as actuator drives towards 100% position.
4. Apply the same signal as in step 6 of Modulating Operation.
5. The multi-meter reading decreases to match the input signal as actuator drives towards 0% position.

Modulating/Floating Checkout

1. Mount actuator for required application (either clockwise ↷ or counterclockwise ↶ rotation to open the damper).
2. Check damper position and make sure that 24 Vac is present at the appropriate connections.
3. Apply control signal to the appropriate connections to move the damper to the opposite position. The actuator should drive the damper.
4. If actuator does not run, verify that the actuator is properly installed for either clockwise ↷ or counterclockwise ↶ rotation.
5. If actuator is correctly installed and still does not run, replace the actuator.

Two-Position Checkout

1. Mount actuator for required application (either clockwise ↷ or counterclockwise ↶ rotation to open the damper).
2. Check damper position and make sure that power is present at terminals 1 and 2.
3. Actuator drives to 100% position.
4. Disconnect power from terminals 1 and 2.
5. Actuator spring-returns to 0% position.
6. If actuator is correctly installed and does not run, replace the actuator.

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