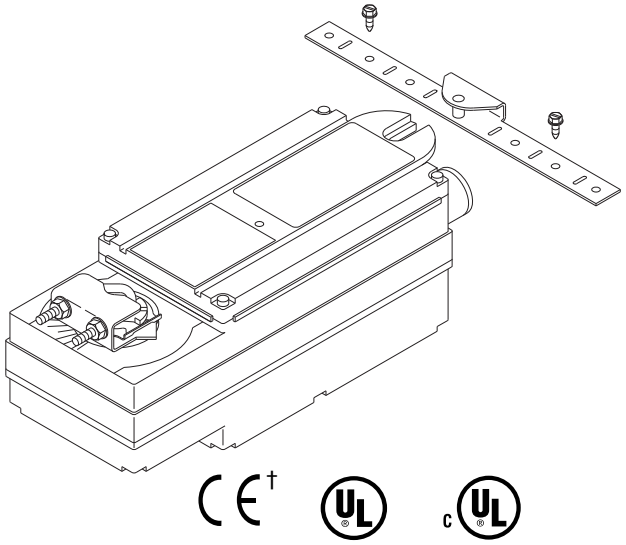
MS50-E2X01 Series

Schneider Electric UltraDrive Series
Spring Return
Direct Coupled Damper Actuator

Application

The Schneider Electric UltraDrive MS50-E2X01 series Direct Coupled Damper Actuators are over the shaft spring return actuators that are compatible with 1 to 5 Vdc or 4 to 20 mAdc control signals.



† Refer to Table-1 to identify specific models that are in conformance with CE standards.

Features

- 150 lb.-in. (17 N-m) rated torque
- NEMA Type 4 housing (IEC IP56)
- Custom automatic current sensing motor control provides extended reliability and repeatable timing
- Direct coupled to the damper shaft with dual industrial hardened universal mounting clamps
- Proportional actuator controlled by 1 to 5 Vdc or 4 to 20 mAdc
- Clockwise or counterclockwise spring return
- Accurate 93° travel digitally controlled
- Integral position indication scale

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SPECIFICATIONS

Inputs

Control Signal: 4 to 20 mAdc or 1 to 5 Vdc. See Figure-2 through Figure-2.
Power Input: See Table-1.All 24 Vac circuits are Class 2. All circuits 30 Vac and above are Class 1.
Impedance: 1 to 5 Vdc, 10k¾. 4 to 20 mAdc, 250¾.
Connections:
Power, 24 inch (61 cm) long, 18 AWG color coded pigtail leads.
Control, 24 inch (61 cm) long, 22 AWG color coded pigtail leads.

Outputs

Electrical:
Stroke, Electronically limited to 93° ±1°.
Action, Direct acting; 0° position with 4 mAdc or 1 Vdc input.
Torque See Table-1.
Duty Cycle 100%.
Timing See Table-1.
Mechanical:
Anti-Rotation Bracket,
Standard 9" long x 13/16" wide (229 x 21 mm), included with the actuator.
Optional Order AM-752 (4" long x 1-11/16" wide) for mounting the actuator in narrow spaces.
Universal Mounting Clamps, Two clamps are required for all mounting configurations.
Standard 3/8" to 1/2" (10 to 13 mm) round and square shaft mounting clamps are included with the actuator.
Optional Order AM-753 for 5/8" (16 mm) square and 3/4" to 1" (19 to 25 mm) round damper shafts, two per package.
Minimum Damper Shaft Length,
Standard Damper shaft must be at least 4-5/8" (117 mm) long for standard mounting.
Optional Shorter than standard length shafts require the AM-676 shaft extension (order separately).
Position Indicator, Scale numbered from 0 to 95°, provided for position indication.
Nominal Damper Area, Actuator sizing should be done in accordance with damper manufacturer's specifications.
Direction of Rotation, The zero (0) position on the position indicator is the normal or spring return position. Counterclockwise rotation is provided when the actuator is mounted with the "R" side facing the installer. Clockwise rotation is provided when the actuator is mounted with the "L" side facing the installer.

Environment

Ambient Temperature Limits:
Shipping & Storage, -40 to 160°F (-40 to 71°C).
Operating, -25 to 140°F (-32 to 60°C).
Humidity: 15 to 95% RH, non-condensing.
Location: NEMA Type 1. NEMA Type 4 (IEC IP56) with customer supplied water tight conduit connectors.

Agency Listings

UL 873: Underwriters Laboratories Inc. listed (File # E9429 Category Temperature-Indicating and Regulating Equipment).
CUL: UL Listed to Canadian safety standards. Canadian Standard C22.2 No. 24-93.
European Community: EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC). Machinery Directive (89/392/EEC). Safety Directive (92/59/EEC). See Table-1 for specific models.

Table-1 Model Chart.

Part Number	Actuator Power Input						Approximate 93° Rotation Timing in Seconds @ 70° F (21°C) for Rated Torque	Output Torque Rating lb.-in. (N-m)	
	Voltage	Hz		Watts	VA			Minimum	Maximum Stall
					Running	Holding			
MS50-E2301[a]	24 Vac ±20%	50	60	7.1	9.4	5.4	145	150 (17)	450 (51)
MS50-E2001	120 Vac ±10%			7.1	11.1	9.1			
MS50-E2101[a]	240 Vac ±10%			7.2	11.8	10.1			

[a] This model is in conformance with CE standards.

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ACCESSORIES

AM-676	Universal shaft extension, approximately 9-1/2" (242 mm) long for use on 3/8" to 11/16"(10 to 17 mm) round shafts, 3/8" to 9/16" (10 to 14 mm) square shafts (AM-753 clamps required)
AM-751	Standard anti-rotation bracket 9" long x 13/16" wide (229 x 21 mm), included with actuator
AM-752	Optional anti-rotation bracket 4" long x 1-11/6" wide (102 x 43 mm), for narrow spaces
AM-753	Optional universal mounting clamps for 5/8"(16 mm) square shaft, 3/4" and 1" (19 to 25 mm) round shafts (two per package)
AM-754	Standard universal mounting clamps for 3/8" to 1/2" (10 to 13 mm) round and square shafts, two included with actuator
AM-756	Metric conduit adaptor M20 x 1.5 to 1/2" NPT (two per package)
TF-711-02	1/2" Sealtight water tight conduit connector (straight)
TF-713-02	1/2" Sealtight water tight conduit connector (90°)
X-5521	1/2" Pipe plug, included with actuator

TYPICAL APPLICATIONS (wiring diagrams)

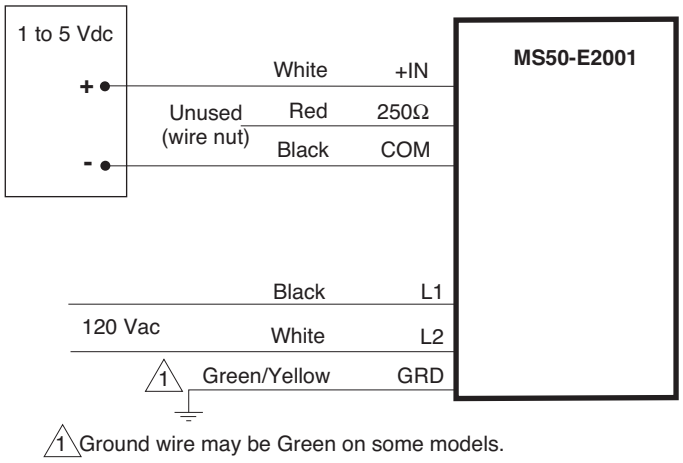

Figure-1 Typical MS50-E2001 1 to 5 Vdc Wiring Diagram.

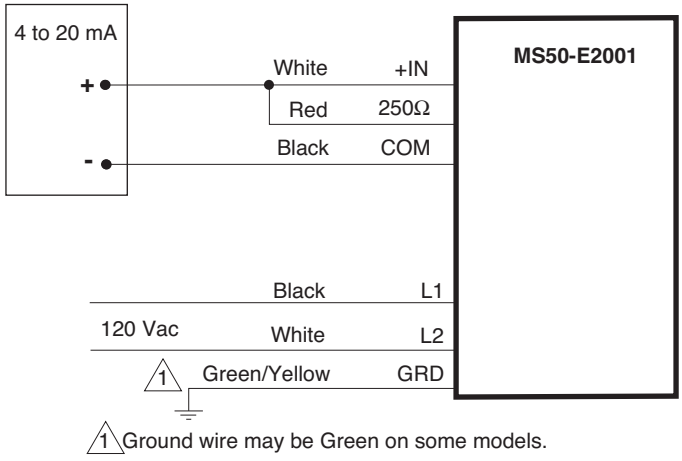

Figure-2 Typical MS50-E2001 4 to 20 mA Wiring Diagram.

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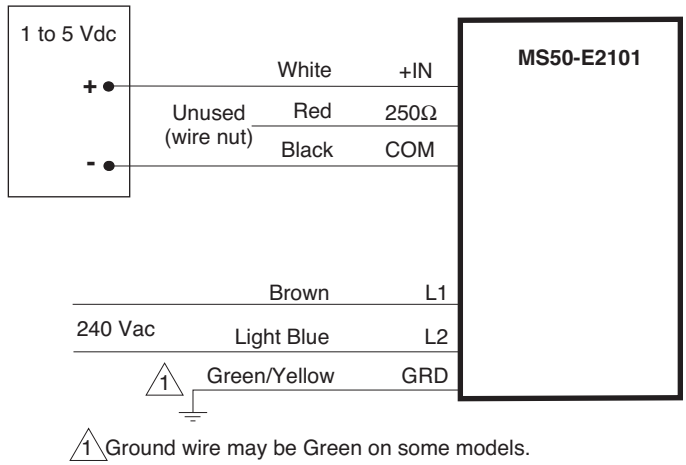

Figure-3 Typical MS50-E2101 1 to 5 Vdc Wiring Diagram.

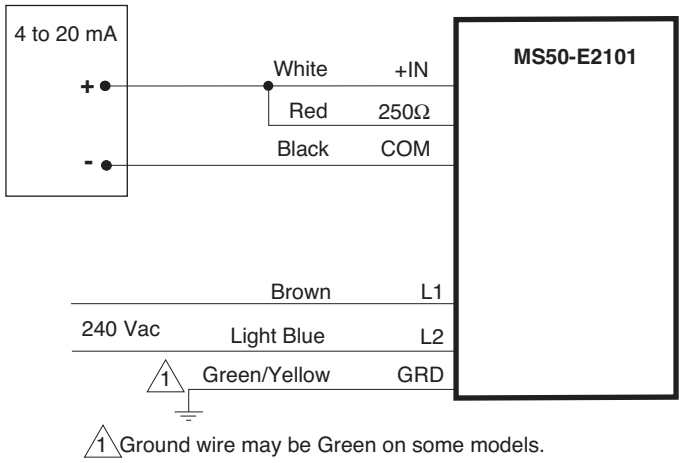

Figure-4 Typical MS50-E2101 4 to 20 mA Wiring Diagram.

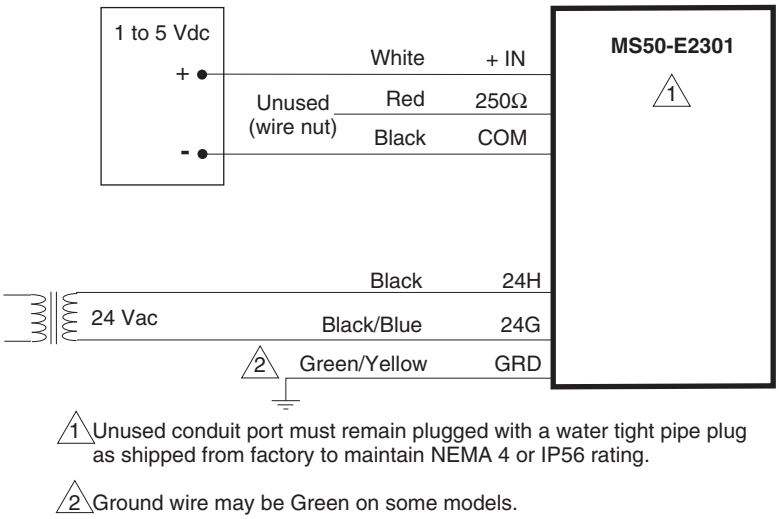

Figure-5 Typical MS50-E2301 1 to 5 Vdc Wiring Diagram.

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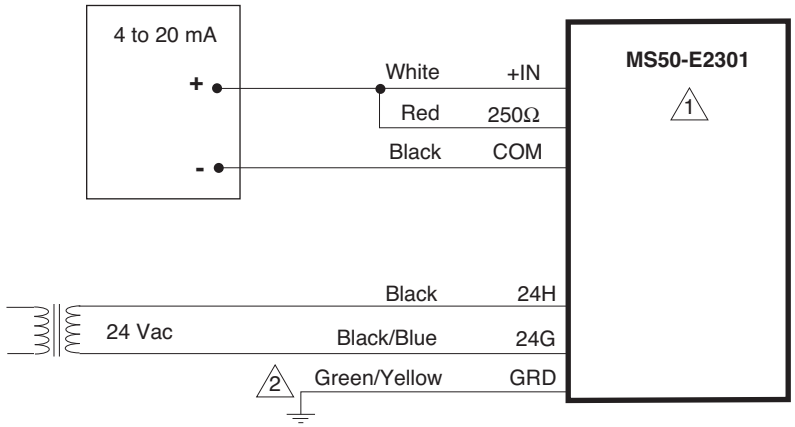
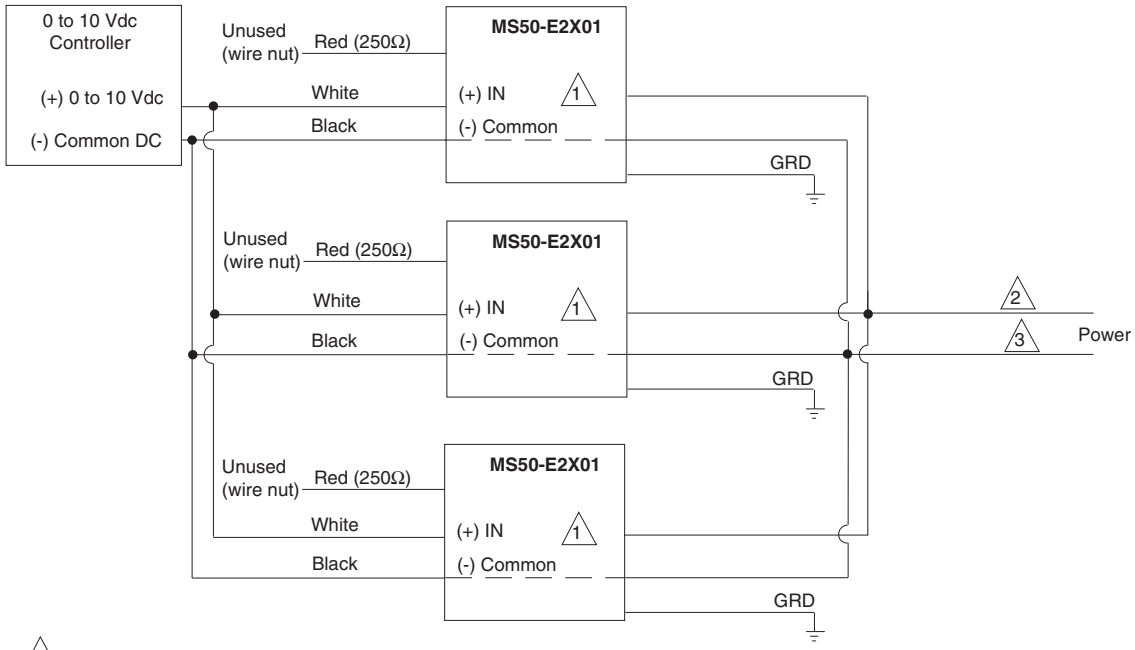


1 Unused conduit port must remain plugged with a water tight pipe plug as shipped from factory to maintain NEMA 4 or IP56 rating.

2 Ground wire may be Green on some models.

Figure-6 Typical MS50-E2301 4 to 20 mA Wiring Diagram.



1 Actuator is not recommended for applications needing multiple actuators mounted on a common jackshaft.

2 See Table for power wire designations. Ground wire may by Green or Green/Yellow on some models.

Power Wiring Identification.

Voltage	Designation	Wire Color
24	24H	Black
	24G	Black/Blue
120	L1	Black
	L2	White
240	L1	Brown
	L2	Light Blue

Figure-7 Typical 1 to 5 Vdc Control Wiring using Multiple Actuators.

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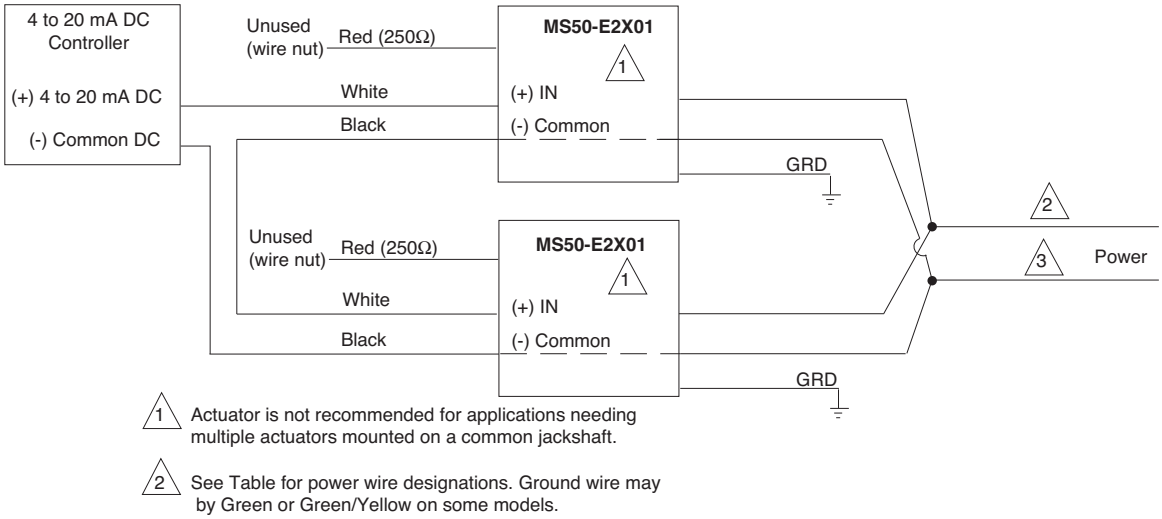

Power Wiring Identification.

Voltage	Designation	Wire Color
24	24H	Black
	24G	Black/Blue
120	L1	Black
	L2	White
240	L1	Brown
	L2	Light Blue

Figure-8 Typical 4 to 20 mAdc Control Wiring using Multiple Actuators.

INSTALLATION

Inspection

Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

Requirements

- Job wiring diagrams
- Tools (not provided)
  - Socket wrench 1/2 inch, used for universal mounting clamp nuts
  - Open-end wrench 10 mm, used for installing AM-676 universal shaft extension
  - Slotted screwdriver, used for installing anti-rotation brackets
- Appropriate accessories
  - Water tight 1/2 inch conduit seals Schneider Electric part number TF-711-02 or T&B #5332 (straight, Schneider Electric part number TF-713-02 or T&B #5352 (90°), or equivalent.
  - Water tight 1/2 inch flexible conduit (e.,g. Anaconda: Sealtight) or 20 mm flexible water tight conduit when using AM-756 metric conduit adapter with appropriate metric water tight seals.
  - Water tight 1/2" flexible conduit (Anaconda: Sealtight) or 20 mm flexible water tight conduit when using AM-756 metric conduit adaptor
  - Two #8 1/2" (13 mm) sheet metal screws for mounting (optional)
- Training: Installer must be a qualified, experienced technician

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Precautions

Warning:

- Electrical shock hazard! Disconnect the power supply (line power) before and during installation to prevent electric shock and equipment damage.
- Make all connections in accordance with the wiring diagram and in accordance with national and local electrical codes. *Use copper conductors only.*

Caution: General

- Actuator is not recommended for applications needing multiple actuators mounted on a common jackshaft.
- Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.
- Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapors are present.

Caution: NEMA 4 or IP56

- To maintain NEMA Type 4 rating, use water tight 1/2" flexible conduit only, with 1/2" conduit connector of the water tight type, Schneider Electric part number TF-711-02 or T&B #5332 (straight), Schneider Electric part number TF-713-02 or T&B #5352 (90°), or equivalent.
- For metric conduit applications using AM-756 conduit adapters, use the appropriate metric water tight seals to maintain compliance with IP56 or NEMA Type 4 rating.
- Use a water tight 1/2" pipe plug in any unused actuator conduit ports and seal with water tight tape to stay in compliance with NEMA Type 4 or IP56 rating. Use Schneider Electric part number X-5521, Grinnell #8700159257 (black), Grinnell #8700159851 (galvanized), or equivalent. Actuators with unused conduit ports are shipped with the unused port plugged.

Federal Communications Commission (FCC)

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy and may cause harmful interference if not installed and used in accordance with the instructions. Even when instructions are followed, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception— which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.

Canadian Department of Communications (DOC)

Note: This class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe B respecte toutes les exigences du Reglement sur le material broilleur du Canada.

European Standard EN 55022

Warning: This is a class B (European Classification) product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

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Mounting

Damper Actuator Sizing

Correct sizing of the actuator is necessary for proper control of dampers. The area of damper that can be controlled by a given actuator is dependent upon the quality of the damper, the pressure drop across the damper in the closed position, and the velocity of the air flow through the damper. To obtain actual damper torque requirements, contact the damper manufacturer.

Damper Shaft Sizing

Use the “Long Damper Shaft” mounting instructions if the damper shaft is at least 4-5/8" (117 mm) long.

Use the “Short Damper Shaft” mounting instructions if the damper shaft is shorter than 4-5/8" or the area around the damper shaft is too narrow to allow standard mounting, as described in the “Long Damper Shaft” mounting section. See Figure-9 for minimum shaft length.

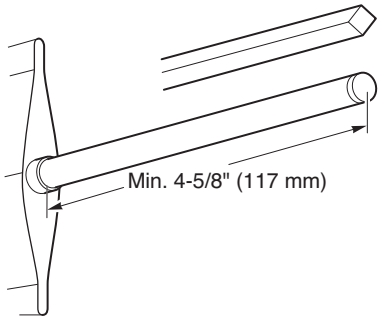

Figure-9 Long Damper Shaft Dimensions.

Caution: The MS50-E2X01 actuator is not designed to be used on aluminum damper shafts, solid steel shafts smaller than 1/2" diameter round or 1/2" square, or hollow steel shafts smaller than 3/4" round. The actuator can produce up to 450 in-lbs (51 N-m) maximum stall torque, which could result in the actuator snapping off an aluminum damper shaft or an improperly sized steel damper shaft. Refer to Table-2 for nominal damper shaft sizes.

Table-2 Steel Damper Shaft Specifications.

Damper Shaft Shape	Damper Shaft Type	O.D. (Nominal)[a]	I.D. (Maximum)
Round	Solid bar	1/2" to 1"	0
	Hollow tubing	3/4"	0.375
		13/16"	0.683
		27/32"	0.626
		7/8"	0.805
		15/16"	0.808
		1"	0.930
Square	Solid bar	1/2" to 5/8"	0

[a] Damper shaft sizes over 1/2" (13 mm) O.D. require AM-753 universal mounting clamps.

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Mounting the Actuator for Clockwise or Counterclockwise Dampers

Long Damper Shafts

1. Move the damper to the normal position (usually closed).
   - If the damper shaft rotates clockwise to the closed position, mount the actuator with the side marked “R” facing the installer. See Figure-10.
   - If the damper shaft rotates counterclockwise to the closed position, mount the actuator with the side marked “L” facing the installer. See Figure-11.

Note: The actuator comes equipped with two AM-754 universal mounting clamps. For damper shafts larger than 1/2" (13 mm) in diameter, the AM-753 universal mounting clamps are required (order separately). The AM-753 clamps accommodate round shaft sizes ranging from 3/4" to 1" (19 to 25 mm) or 5/8" (16 mm) square shafts.

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2. Slide the actuator over the shaft and into its desired final mounting position. See Figure-10 or Figure-11.
3. Hand tighten the nuts on both of the actuator’s universal mounting clamps.
4. Align the actuator at 90° (perpendicular) to the damper shaft. See Figure-12.
5. Slide the anti-rotation bracket pin into the mounting slot on the actuator and drill mounting holes. See Figure-12. For narrow spaces the AM-752 anti-rotation bracket is recommended (order separately).
6. Attach one side of the anti-rotation bracket to the mounting surface with one of the screws provided. Leave the screw loose so that the bracket can be rotated. See Figure-10 for clockwise or Figure-11 for counterclockwise spring return.
7. Pivot the anti-rotation bracket away from the actuator. See Figure-10 or Figure-11.
8. Loosen the universal mounting clamps, making sure not to move the damper shaft. Rotate the actuator approximately 5° in the direction which would open the damper. See Figure-10 or Figure-11.
9. Tighten all of the universal mounting clamp nuts with a 1/2" socket wrench. Apply 4 to 6 ft. -lbs (5 to 8 N-m) of torque.
10. Manually rotate the actuator toward the full-closed position to apply pressure to the damper seals. See Figure-10 or Figure-11.
11. Pivot the anti-rotation bracket into place and secure the other side of the bracket onto the mounting surface using the other screw provided with the actuator. See Figure-10 or Figure-11.
12. Verify that the damper is in its full-closed position and actuator at 90° (perpendicular) to the damper shaft. See Figure-10 or Figure-11.

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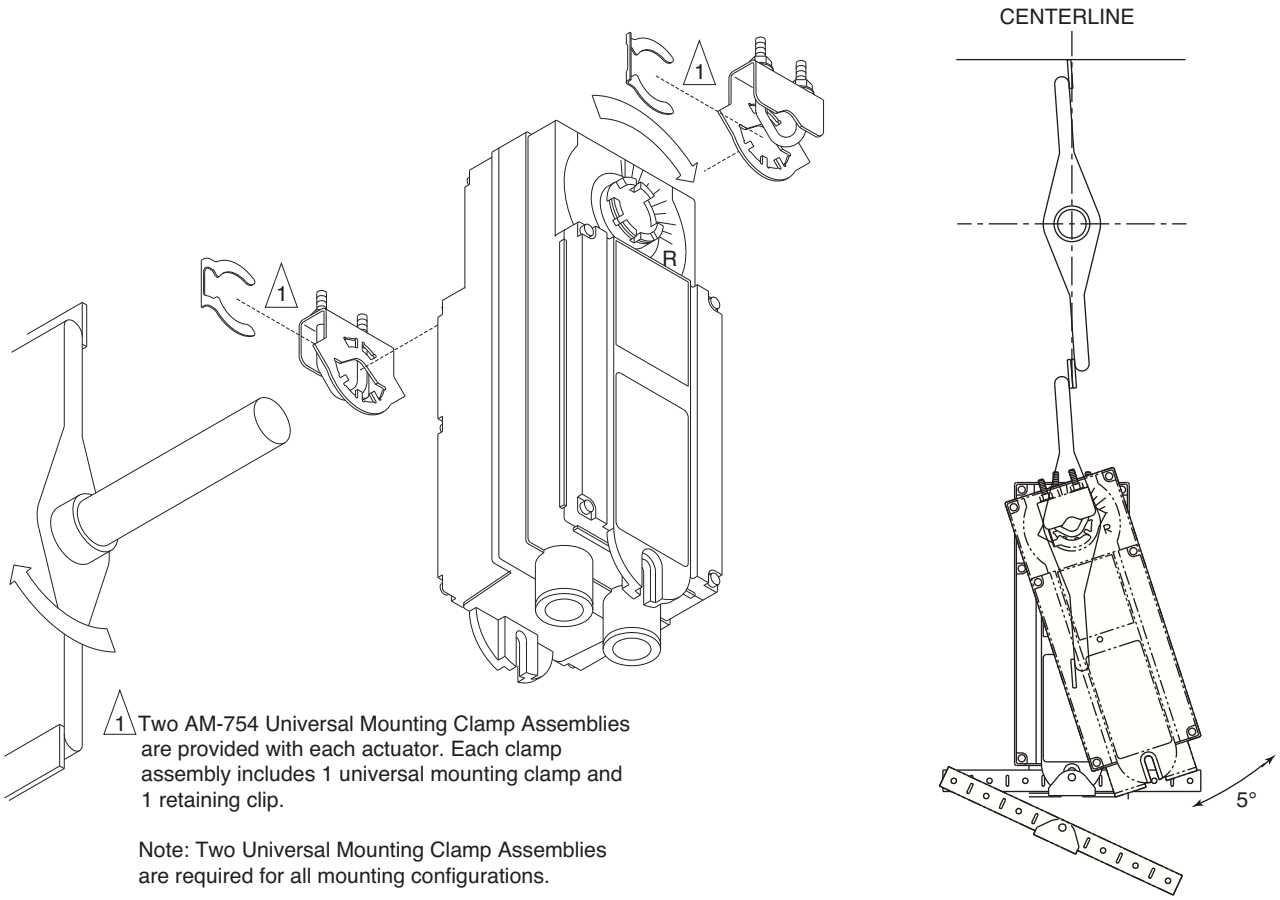

1 Two AM-754 Universal Mounting Clamp Assemblies are provided with each actuator. Each clamp assembly includes 1 universal mounting clamp and 1 retaining clip.

Note: Two Universal Mounting Clamp Assemblies are required for all mounting configurations.

Figure-10 Long Damper Shaft Mounting with Clockwise Spring Return for Normally Closed Damper.

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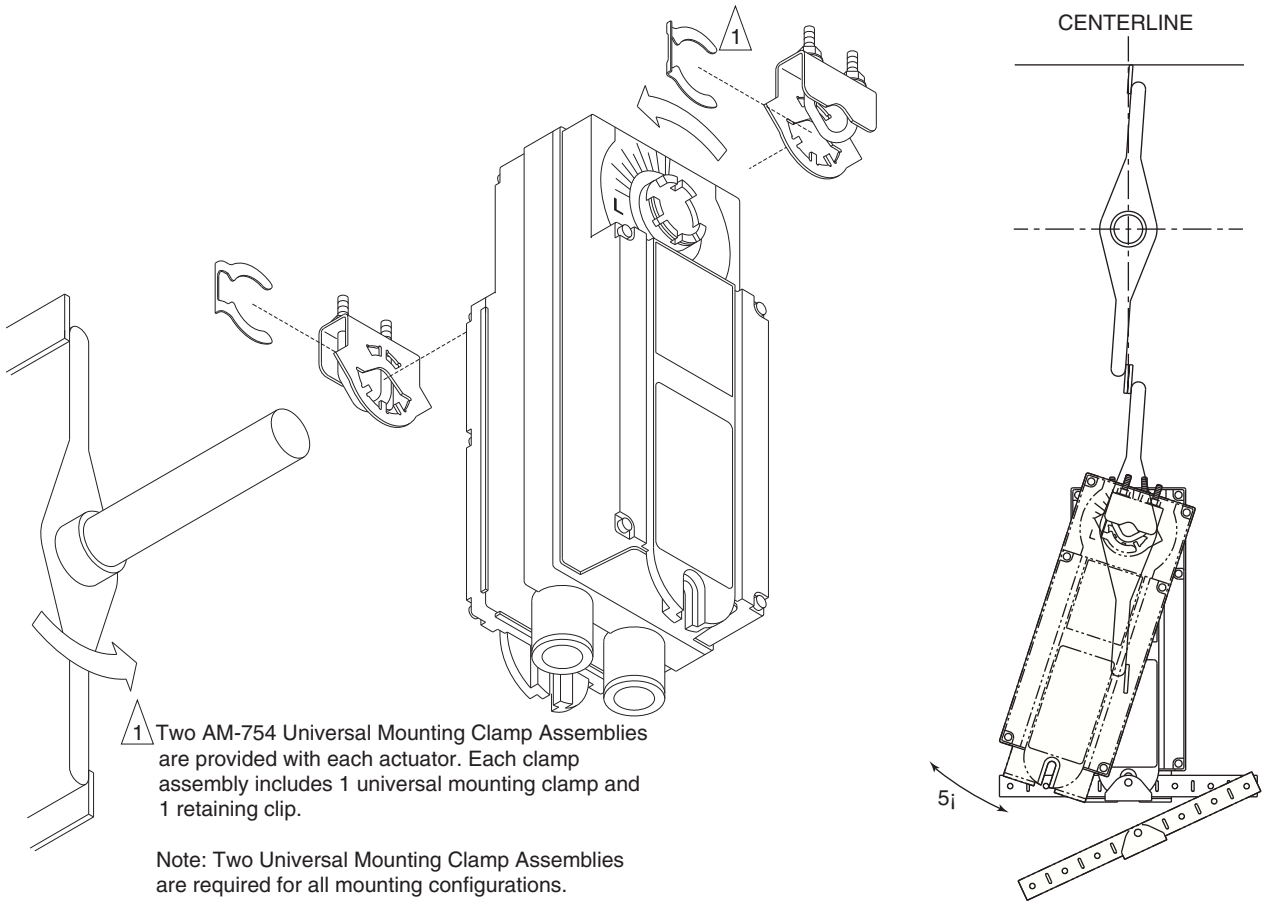

Figure-11 Long Damper Shaft Mounting with Counterclockwise Spring Return for Normally Closed Damper.

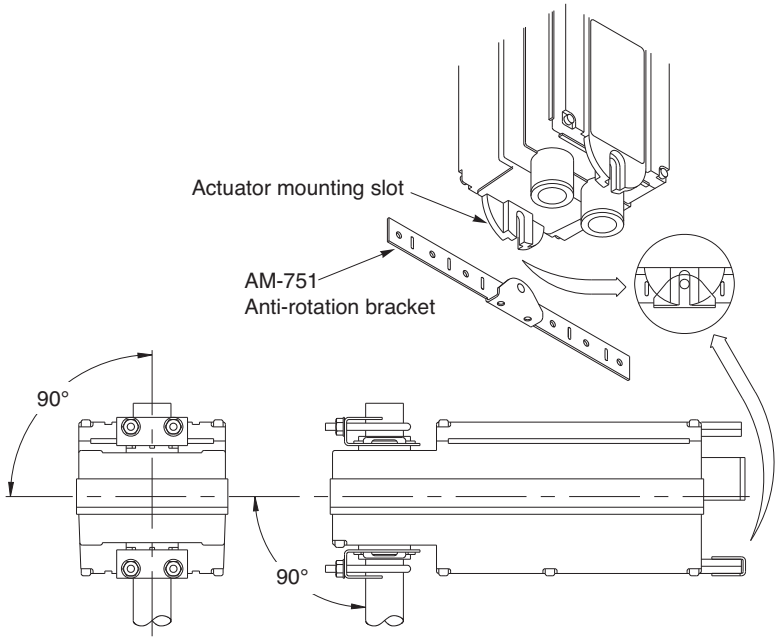

Figure-12 Mounting Anti-rotation Bracket to Actuator.

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Short Damper Shafts

See Figure-13 for installation of actuator using the AM-676 Universal Shaft Extension. Installation requires AM-676 Universal Shaft Extension and AM-753 Universal Mounting Clamps for 3/4" to 1" (19 to 25 mm) shafts, these items must be ordered separately.

1. Loosen the V-clamp nuts on the AM-676 universal shaft extension.
2. Fit the universal shaft extension fully onto the damper shaft. Tighten the universal shaft extension V-clamp nuts with a 10 mm open-end wrench. Apply 4 to 6 ft. lbs (5 to 8 N-m) of torque.
3. Move the damper to the normal position (usually closed).
   – If the damper shaft rotates clockwise to the closed position, mount the actuator with the side marked “R” facing the installer. See Figure-10.
   – If the damper shaft rotates counterclockwise to the closed position, mount the actuator with the side marked “L” facing the installer. See Figure-11.
4. Remove the mounting clamps from the actuator and replace them with the AM-753 universal mounting clamps.
5. Loosen the nuts on both of the AM-753 universal mounting clamps on the damper actuator.
6. Assemble the damper actuator onto the universal shaft extension, allowing the extension to slide through the actuator’s universal mounting clamps. Make sure the actuator is 90° (perpendicular) to the damper shaft. Then, hand tighten the nuts on both of the actuator’s universal mounting clamps. See Figure-12

Note: If the universal shaft extension protrudes excessively above the damper actuator's top universal mounting clamp:

- remove the damper actuator from the universal shaft extension,
- remove the extension from the damper shaft,
- shorten the universal shaft extension by cutting it to the desired length,
- then proceed to follow mounting instructions.

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7. Slide the anti-rotation bracket pin into the mounting slot on the actuator. See Figure-12. For narrow spaces, the AM-752 anti-rotation bracket is recommended (order separately).
8. Position the actuator and bracket in the desired final mounting position on the mounting surface and drill mounting holes. See Figure-13.
9. Attach one side of the anti-rotation bracket to the mounting surface with one of the screws provided. Leave the screw loose so that the bracket can be rotated. See Figure-10 for clockwise or Figure-11 for counterclockwise spring return.
10. Pivot the anti-rotation bracket away from the actuator. See Figure-10 or Figure-11.
11. Loosen the universal mounting clamps, making sure not to move the damper shaft. Rotate the actuator approximately 5° in the direction which would open the damper. See Figure-10 or Figure-11.
12. Tighten all of the universal mounting clamp nuts with a 1/2" socket wrench. Apply 4 to 6 ft. -lbs (5 to 8 N-m) of torque.
13. Manually rotate the actuator toward the full-closed position to apply pressure to the damper seals. See Figure-10 or Figure-11.
14. Pivot the anti-rotation bracket into place and secure the other side of the bracket onto the mounting surface using the other screw provided with the actuator. See Figure-10 or Figure-11.
15. Verify that the damper is in its full-closed position and actuator at 90° (perpendicular) to the damper shaft. See Figure-10 or Figure-11.

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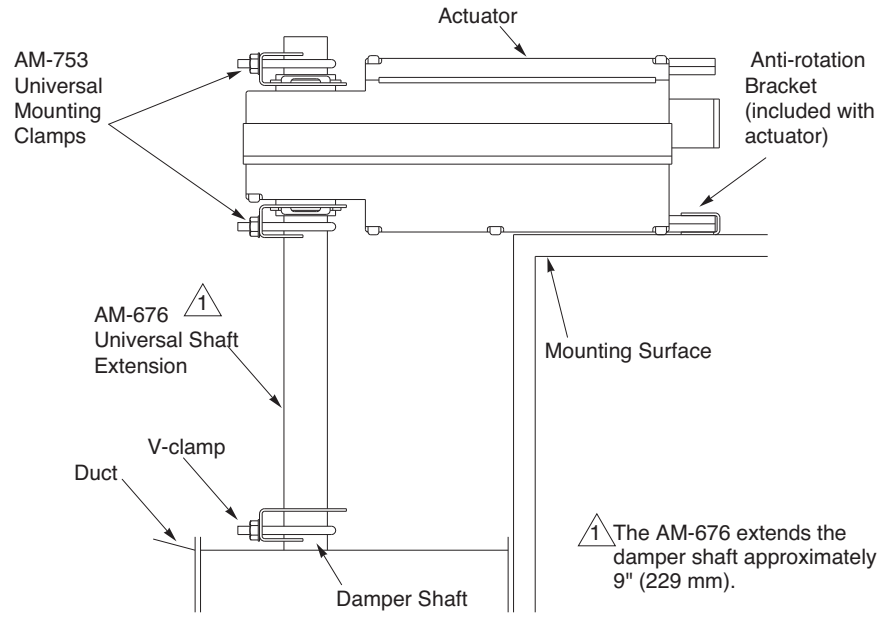

Figure-13 Installation of Universal Shaft Extension.

Wiring Requirements

Control and Power Leads

Remove blue plastic thread protectors before installing conduit fittings. See Figure-2 through Figure-2 for typical wiring applications and Table-3 for maximum wire lenghts.

Note: Class 2 control and power lead wiring must be routed separately from line voltage wiring and any other non-class 2 circuits.

Table-3 Control and Power Wiring Data.

Actuator Voltage	Part Number	Maximum Wire Run in ft. (m) (5% Voltage Drop)		
		14 AWG	16 AWG	18 AWG
24 Vac	MS50-E2301	981 (299)	617 (188)	388 (118)
120 Vac	MS50-E2001			
240 Vac	MS50-E2101			

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CHECKOUT

This procedure is for checking out a normally closed actuator that is typically mounted unpowered. It is possible to mount the actuator with power applied for special applications.

After the entire system has been installed and the actuator has been powered up, the following check can be made for proper system operation. Check for correct operation of the damper while actuator is being stroked.

1. Apply power to the actuator and control system.
2. Set the controller to cause the actuator to drive open (set override controller output to maximum).
3. Check to see that the actuator travels to the full-open position.
4. Set the controller to cause the actuator to drive closed (set override controller output to minimum).
5. Check to see that the actuator travels to the fully closed position.

Note: If anticipated damper operation does not occur, verify the Long Damper Shaft or Short Damper Shaft mounting procedures. Also, verify that the controller has the proper action (direct or reverse) to match the damper required operation.

THEORY OF OPERATION

The actuator is, by means of dual mounting clamps, directly mounted onto the damper shaft. The anti-rotation bracket supplied with the actuator prevents lateral movement of the actuator. The damper actuator is not provided with and does not require any limiting switches, but is electronically protected against overloading.

The angle of rotation is electronically limited to 93° ±1°. When reaching the damper or actuator end position, the motor stops automatically. The position of the actuator is indicated by means of scale reading 0 to 95°.

MAINTENANCE

Regular maintenance of the total system is recommended to assure sustained optimum performance. The MS50-E2X01 actuator is maintenance free.

FIELD REPAIR

None. Replace with functional actuator.

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DIMENSIONAL DATA

Figure-14 dimensions are in inches (mm).

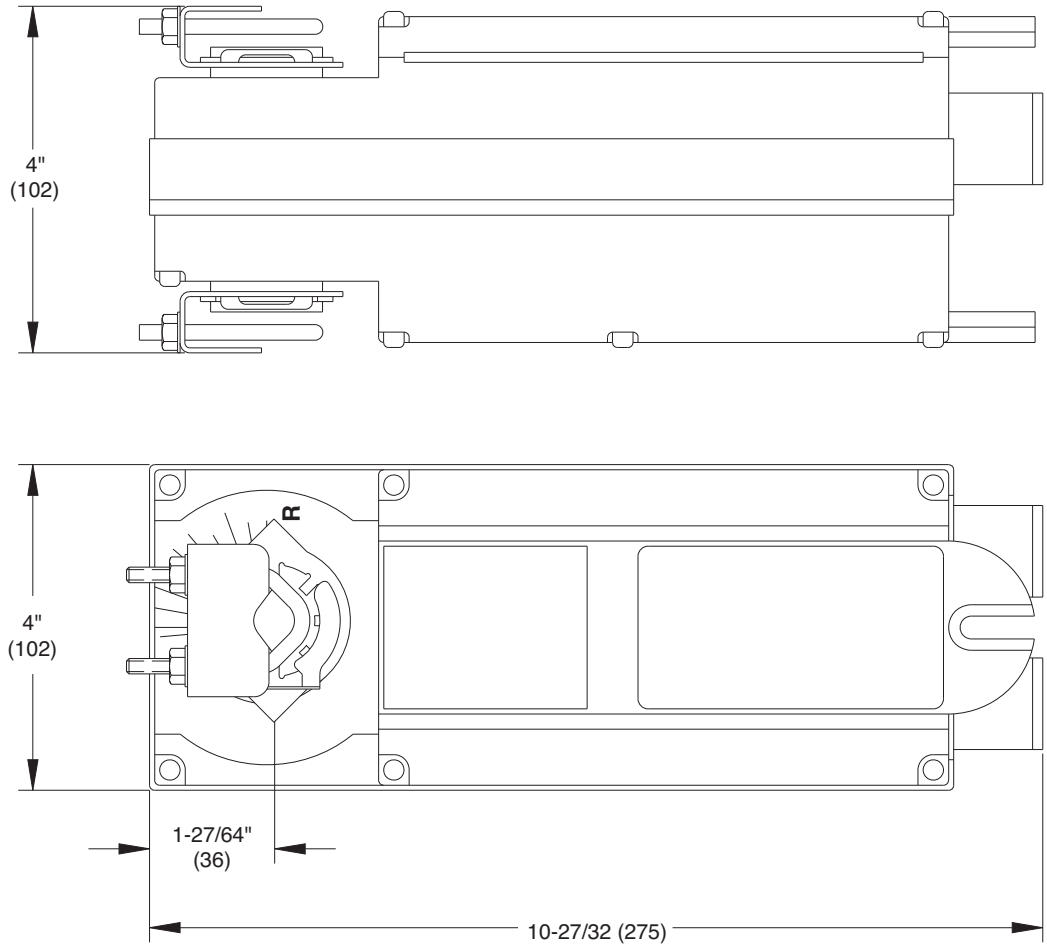

Figure-14 MS50-E2X01 Damper Actuator.

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