

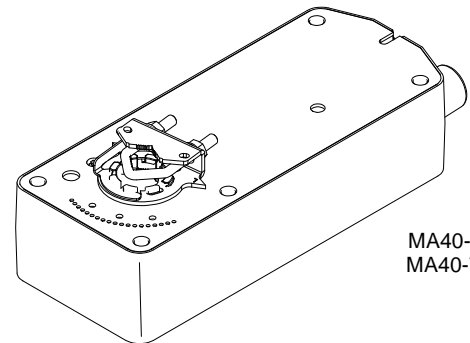
## Application

DuraDrive Direct Coupled Actuators are designed to be used in both damper and valve control applications. The follow general instructions are for damper applications, refer to the Applicable Literature table for valve literature.

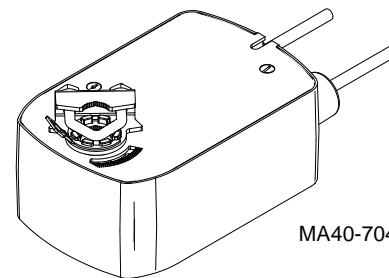
The MA40-704X, MA4X-707X and MA4X-715X series spring return actuators are used for the on-off, fail safe control of dampers and valves in HVAC systems.

## Features

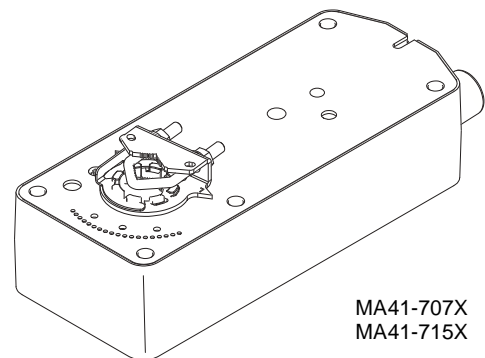
- Two-position actuator controlled by SPST controller
- 133 lb-in (15 N-m), 60 lb-in (7 N-m), and 35 lb-in (4 N-m) torque models
- 24 Vac/DC, 120 Vac, and 230 Vac models
- Rugged die cast housings rated for NEMA 2 / IP54
- Overload protection throughout rotation
- Optional built-in auxiliary switch to provide for interfacing or signaling
- Provides 95° of rotation
- Visual position indicator provided
- Provides true mechanical clockwise or counterclockwise spring return operation for reliable fail safe application and positive close-off in air tight damper applications
- Direct mount to round or square damper shafts
- Rotation limiting available
- MA4X-7153 series actuators can be double-mounted (gang mounting) to accommodate high torque application requirements
- Five year warranty
- MA41-707X-XXX and MA41-715X-XXX equipped with manual override



MA40-707X  
 MA40-715X



MA40-704X



MA41-707X  
 MA41-715X

## Applicable Literature

F-Number	Description	Audience	Purpose
F-26750	MX40-6XXX-2XX, MX4X-7XXX-2XX Series Actuator/Linkage Assemblies General Instructions	<ul style="list-style-type: none"> <li>– Sales Personnel</li> <li>– Application Engineers</li> <li>– Installers</li> <li>– Service Personnel</li> <li>– Start-up Technicians</li> </ul>	Describes the globe valve actuator/linkage assembly's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-26751	VX-2000 Series Ball Valve Assembly Installations Instructions	<ul style="list-style-type: none"> <li>– Sales Personnel</li> <li>– Application Engineers</li> <li>– Installers</li> <li>– Service Personnel</li> <li>– Start-up Technicians</li> </ul>	Describes the actuator/linkage/ball valve assembly's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-26646	MX4X-7XXX, MX40-6XXX Series DuraDrive Actuator Selection Guide	<ul style="list-style-type: none"> <li>– Sales Personnel</li> <li>– Application Engineers</li> <li>– Installers</li> <li>– Service Personnel</li> <li>– Start-up Technicians</li> </ul>	Provides actuator specifications and part number cross referencing of phased out actuators with the new Invensys Building Systems direct-coupled actuators.
F-26752	VX-2000, VX-7000 Series Ball/Linked Globe Linked Valve Assemblies Actuator/Linkage Assemblies Selection Guide	<ul style="list-style-type: none"> <li>– Sales Personnel</li> <li>– Application Engineers</li> <li>– Installers</li> <li>– Service Personnel</li> <li>– Start-up Technicians</li> </ul>	Provides part number cross referencing of phased out globe and ball valve assemblies with the new Invensys Building Systems direct-coupled actuators.
F-26080	EN-205 Water System Guidelines	<ul style="list-style-type: none"> <li>– Application Engineers</li> <li>– Installers</li> <li>– Service Personnel</li> <li>– Start-up Technicians</li> </ul>	Describes Invensys Building Systems approved water treatment practices.
F-13755	CA-28 Control Valve Sizing	<ul style="list-style-type: none"> <li>– Application Engineers</li> <li>– Installers</li> <li>– Service Personnel</li> <li>– Start-up Technicians</li> </ul>	Provides charts, equations, and diagrams to assist in the configuration of valve system applications. TOOL-150, valve sizing slide rule may be purchased separately.
F-11080	Valve Selection Chart Water		
F-11366	Valve Selection Chart Steam (two-way valves only)		

# SPECIFICATIONS

## Actuator Inputs

**Control Signal:** On-off, spring return. SPST control contacts or Triacs (500 mA rated).

**Power Input:** See Table-1. All 24 Vac circuits are Class 2. All circuits 30 Vac and above are Class 1.

**Connections:** 3 ft. (91 cm) appliance cables, 1/2 in. conduit connector. For M20 Metric conduit, use AM-756 adaptor.

## Actuator Outputs

### Electrical:

#### Auxiliary Switches,

**MA4X-715X-502 and MA4X-707X-502** Two SPDT 7A (2.5A) @250 Vac, UL listed; one fixed @ 5° and one adjustable 25 to 85°.

**MA40-7040-501 and MA40-7041 -501** One SPDT 6A (1.5A) @250 Vac, UL listed; adjustable 0 to 95° (0 to 1 scale).

**MA40-7043-501** One SPDT 6A (1.5A) @24 Vac, UL listed; adjustable 0 to 95° (0 to 1 scale).

### Mechanical:

**Stroke,** Angle of rotation  $95^\circ \pm 5^\circ$  maximum. Adjustable  $30^\circ$  to  $95^\circ$  with AM-689 installed on MA4X-715X or MA4X-707X series. Stroke limiter is standard on MA40-704X series.

#### Damper Shaft Clamp,

**MA40-704X** The factory installed universal clamp is used for shafts up to 5/8" (15 mm) diameter or up to 1/2" (13 mm) square. AM-710 accessory clamp is required when mounting actuators to shafts up to 3/4" (19 mm) diameter or up to 1/2" (13 mm) square.

**MA4X-715X or MA4X-707X** The factory installed universal clamp is used for shafts up to 3/4" (19 mm) diameter or up to 1/2" (13 mm) square. AM-687 accessory clamp is required when mounting actuators to shafts up to 1.05" (27 mm) in diameter or up to 5/8" (15 mm) square.

#### Position Indicator, Visual indicator.

**MA4X-715X and MA4X-707X,** -5 to 90° (-5° is spring return position).

**MA40-704X,** 0 to 1 (0 is spring return position).

**Nominal Damper Area,** Actuator sizing should be done in accordance with damper manufacturer's specification.

**Direction of Rotation,** Clockwise or counterclockwise rotation determined by actuator mounting.

**Manual Override,** MA41-707X and MA41-715X rotation is adjustable from -5° to 85° using manual override crank.

## Environment

### Ambient Temperature Limits:

**Shipping & Storage,** -40 F to 160°F (-40 to 71°C).

**Operating,** -22 to 140°F (-30 to 60°C).

**Humidity:** 15 to 95% RH, non-condensing.

### Location:

**MA4X-715X and MA4X-707X,** NEMA 1 (IEC IP30). NEMA 2 (IEC IP54) with conduit connector in the down position.

**MA40-704X,** NEMA 2 (IEC IP54) no restrictions.

## Agency Listings

**UL 873:** Underwriters Laboratories (File # E9429 Category Temperature-Indicating and Regulating Equipment).

**CUL:** UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24.

**European Community:** EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).

**Australia:** This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

**Table-1 Model Chart.**

Part Numbers	Actuator Power Input								Auxiliary Switch	Approximate Timing in Seconds @ 70° (21°C) <sup>a</sup>		Output Torque Rating lb-in (N-m) <sup>b</sup>		Manual Override																
	Voltage	VA		Watts				Powered		Spring Return	Minimum	Maximum Stall																		
		50 Hz	60 Hz	Running		DC Amps	Holding																							
				50 Hz	60 Hz		50 Hz	60 Hz																						
MA40-7153	24 Vac ± 20% 22-30 Vdc	9.8	9.7	7.5	7.5	0.29	2.8	2.8	No	<190	<30	133 (15)	350 (40)	No																
MA40-7153-502									Two <sup>c</sup>					No																
MA41-7153									No					Yes																
MA41-7153-502									Two <sup>c</sup>					Yes																
MA40-7150	120 Vac ±10%	11.7	10.0	8.8	8.4	—	3.6	5.0	No					<80	<40	60 (7)	250 (28)	No												
MA40-7150-502									Two <sup>c</sup>									No												
MA41-7150									No									Yes												
MA41-7150-502									Two <sup>c</sup>									Yes												
MA40-7151	230 Vac ±10%	15.5	10.6	9.5	8.5	—	4.6	3.3	No									<50	<26	35 (4)	150 (17)	No								
MA40-7151-502									Two <sup>c</sup>													No								
MA41-7151									No													Yes								
MA41-7151-502									Two <sup>c</sup>													Yes								
MA40-7073	24 Vac ± 20% 22-30 Vdc	4.8	4.8	3.2	3.2	0.13	0.8	0.8	No													<50	<26	35 (4)	150 (17)	No				
MA40-7073-502									Two <sup>c</sup>																	No				
MA41-7073									No																	Yes				
MA41-7073-502									Two <sup>c</sup>																	Yes				
MA40-7070	120 Vac ±10%	10.7	5.6	4.2	3.6	—	2.0	1.2	No	<50	<26	35 (4)	150 (17)													No				
MA40-7070-502									Two <sup>c</sup>																	No				
MA41-7070									No																	Yes				
MA41-7070-502									Two <sup>c</sup>																	Yes				
MA40-7071	230 Vac ±10%	17.0	8.0	5.1	4.0	—	2.7	1.4	No					<50	<26	35 (4)	150 (17)									No				
MA40-7071-502									Two <sup>c</sup>																	No				
MA41-7071									No																	Yes				
MA41-7071-502									Two <sup>c</sup>																	Yes				
MA40-7043	24 Vac ± 20% 22-30 Vdc	4.4	4.4	2.9	2.9	0.11	0.8	0.8	No									<50	<26	35 (4)	150 (17)					No				
MA40-7043-501									One <sup>d</sup>																	No				
MA40-7040	120 Vac ±10%	6.4	4.3	3.8	3.4	—	1.6	1.2	No																	<50	<26	35 (4)	150 (17)	No
MA40-7040-501									One <sup>d</sup>																					No
MA40-7041	230 Vac ±10%	5.8	4.6	4.1	3.9	—	1.5	1.2	No													<50	<26	35 (4)	150 (17)					No
MA40-7041-501									One <sup>d</sup>																					No

<sup>a</sup> Timing was measured with no load applied to the actuator.  
<sup>b</sup> De-rating is required at low temperatures.  
<sup>c</sup> One adjustable from 25 to 85° rotation and one set to operate @ 5° fixed.  
<sup>d</sup> One adjustable from 0 to 95° rotation (0 to 1 scale).

## **ACCESSORIES**

### **For use with MA4X-7XXX:**

AM-671	Universal Mounting Bracket, AM-693 is required
AM-672	Universal Mounting Bracket, AM-693 is required
AM-673	Mounting Bracket
AM-674	Weather Shield
AM-675	Base Mounting Plate for AM-674
AM-676	Universal Shaft Extension
AM-714	Weather Shield (polycarbonate)
AM-756	Metric Conduit Adapter M20 x 1.5 to 1/2" NPT
AM-761	7-inch Anti-rotation Bracket
AM-762	9-inch Anti-rotation Bracket

### **For use with MA40-7043:**

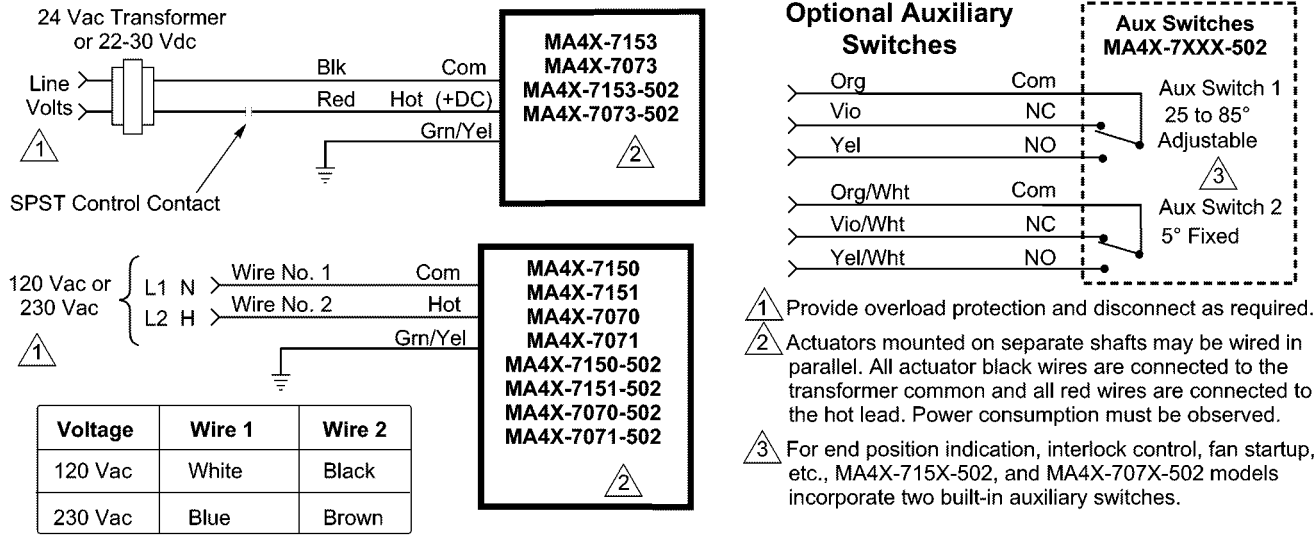
AM-709	Position Indicator and Stroke Limiter
AM-710	Universal Clamp for up to 3/4" diameter shafts
AM-711	Crankarm for up to 1/2" round shaft
AM-712	Crankarm Adapter Kit
AM-713	Mounting Bracket for Honeywell Mod IV, M6415 type actuators and new installations
AM-715	Crankarm Adapter Kit for Honeywell Mod IV, M6415 type actuators and new installations

### **For use with MX4X-7073, MX4X-7153**

AM-686	Damper Position Indicator
AM-687	Universal Clamp for up to 1.05" (27 mm) diameter shafts
AM-688	Replacement Universal Clamp
AM-689	Rotation Limiter
AM-690	Crankarm for round shafts up to 3/4" (19 mm)
AM-691	Crankarm for jackshafts up to 1.05" (27 mm)
AM-692	V-bolt Kit for AM-690 and AM-691 Crankarm
AM-693	Damper Linkage Kit
AM-758	Short "U" Mounting Bracket
AM-759	Tall "U" Mounting Bracket
AM-760	Slotted "L" Mounting Bracket
AM-763	1/8" Hex Crank for Manual Override

# TYPICAL APPLICATIONS (wiring diagrams)

Figure-1 through Figure-3 illustrate typical wiring diagrams for spring return floating actuators. See Table-1 for model selection.



MX40-707X-502 and MX40-715X-502 units manufactured prior to the date code 0141 (October 6, 2001) used the following color coding for the auxiliary switches:

### Auxiliary Switch 1

- Orange: Fixed auxiliary switch common (com)
- Yellow: Fixed auxiliary switch normally closed (NC)
- Violet: Fixed auxiliary switch normally open (NO)

### Auxiliary Switch 2

- Orange/white: Adjustable auxiliary switch common (com)
- Violet/white: Adjustable auxiliary switch normally closed (NC)
- Yellow/white: Adjustable auxiliary switch normally open (NO)

The label information on these units is incorrect. If replacing these units, the auxiliary switch operation of the replacement actuator will be per the product label.

Figure-1 Typical Wiring Diagram for 24 Vac Basic and Double Auxiliary Switch Models.

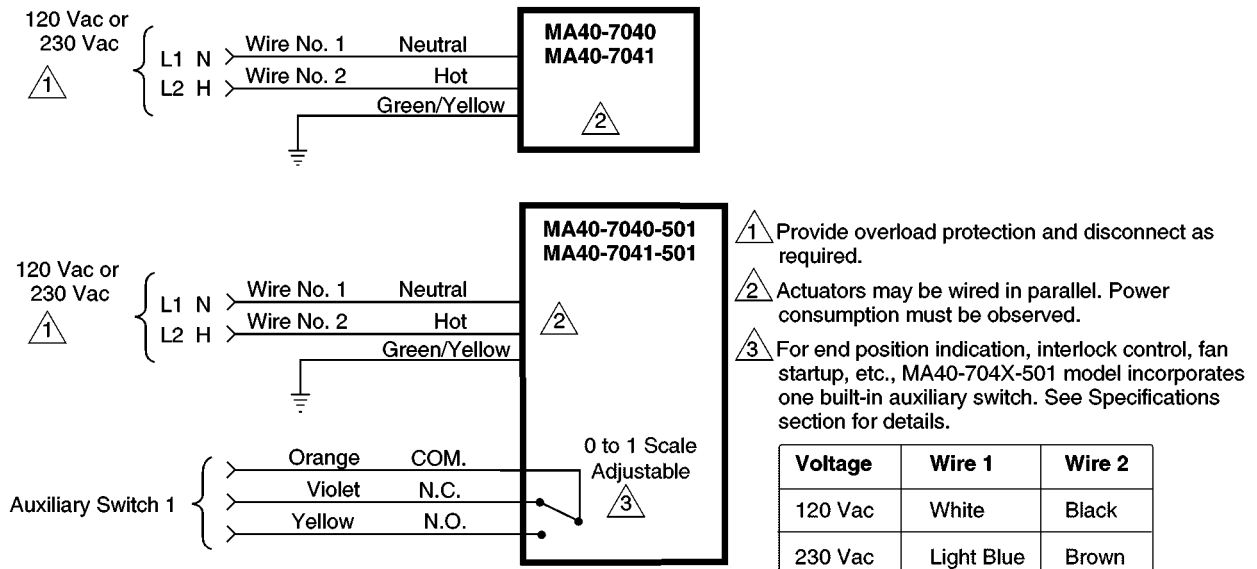


Figure-2 Typical Wiring Diagram for 120 Vac or 230 Vac Basic and Single Auxiliary Switch Models.

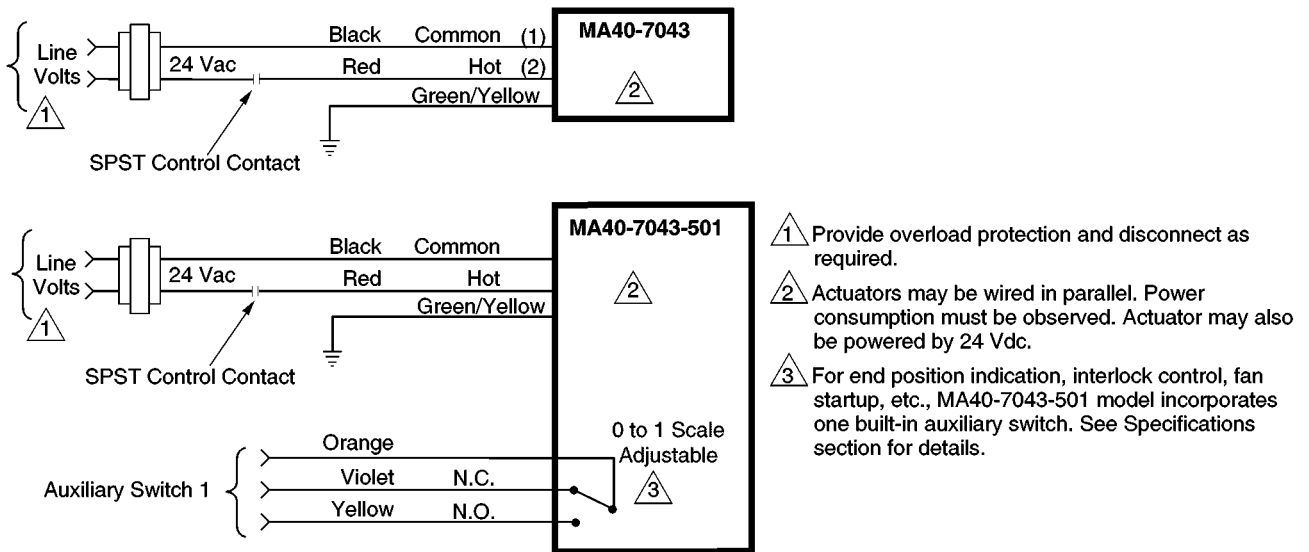


Figure-3 Typical Wiring Diagram for 24 Vac Basic and Single Auxiliary Switch Models.

## 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):
  - #8 sheet metal screws
  - 10mm open end wrench or socket wrench
  - 7/16 inch, open end wrench or socket wrench
  - 1/8 inch, allen wrench
  - Appropriate screwdriver(s)
- Appropriate accessories
- Training: Installer must be a qualified, experienced technician

## Precautions



## General

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### **Warning:**

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

### **Caution:**

- Avoid electrical noise interference. Do not install near large contactors, electrical machinery, or welding equipment.
  - Do not drill holes in actuator body. Six pre-drilled holes are located on each side, under the label, to accept #10-24 thread-forming screws for mounting accessories.
- 

**Caution:** The MX41-707X and MX41-715X actuators are equipped with a manual override.

- The manual override is to be used only when power is not applied to the unit.
  - If the universal clamp is not set to 0° on the position indicator, manually wind the actuator in the direction indicated with hex wrench from -5° to 0° and lock with a screwdriver.
  - When operating manual override, back off 5° from full open mechanical stop to ensure proper release.
  - Do not attempt to use the manual override with actuators mounted in tandem. Damage to the gear train may occur.
- 

## 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—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.
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## Canadian Department of Communications (DOC)

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

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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## European Standard EN 55022

**Warning:** This is a Class B digital (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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**Caution:** Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapors are present.

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## Location



## Mounting

**Caution:** To remain in NEMA 2/IP54 compliance, the MA4X-715X and MA4X-707X series actuators should be mounted with conduit end down.

Mount the DuraDrive Actuator directly on the damper shaft in locations that clear the maximum dimensions of the actuator case and allow the actuator to be mounted flush to the surface of the terminal box and perpendicular to the damper shaft.

**Note:** Some terminal boxes have sheet metal screw heads or other protrusions near the damper shaft. In these cases, a spacer or shim may be added under the anti-rotation bracket of the actuator to make the actuator perpendicular to the shaft.

### 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 type of damper, 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.

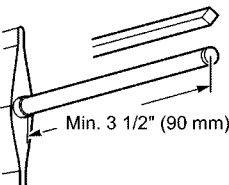
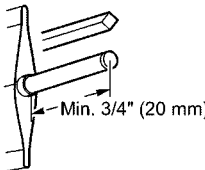
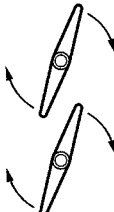
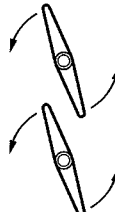
### Damper Shaft Sizing

Use the "Long Damper Shaft" mounting instructions if the damper shaft is at least 3-1/2" (90 mm) long.

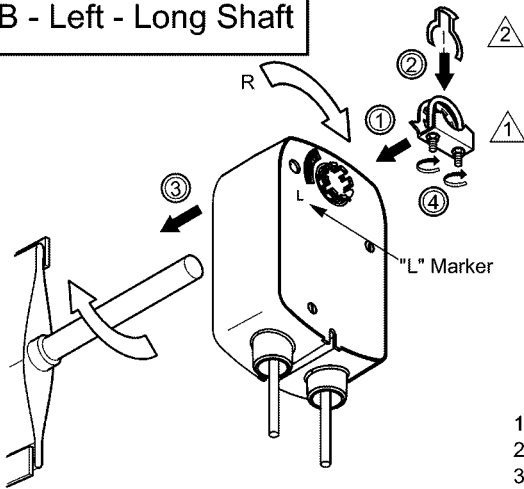
Use the "Short Damper Shaft" mounting instructions if the damper shaft is shorter than 3-1/2" (90 mm) or the area around the damper shaft is too narrow to allow standard mounting, as described in the "Short Damper Shaft" mounting section.

### MA40-704X Series Installation

**Note:** The MA40-704X series actuator comes equipped with standard universal mounting clamp. For damper shafts larger than 5/8" (16 mm) in diameter, the AM-710 universal mounting clamp is required (order separately). The AM-710 clamp accommodates shaft sizes up to 3/4" (19 mm) diameter shafts.

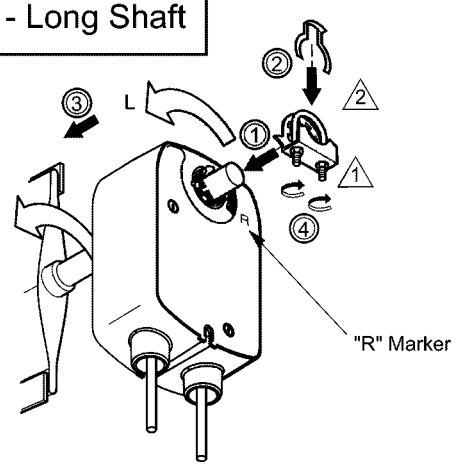
<p><b>Long Shaft</b></p>	 <p>Min. 3 1/2" (90 mm)</p> <p>3/8" to 3/4" Diameter (10 mm to 20 mm) 3/8" to 1/2" Square (10 mm to 13 mm)</p>	<p><b>Short Shaft</b></p>	 <p>Min. 3/4" (20 mm)</p>	
<p>Move the damper to its normal position. Verify the controller action is set to match the damper application.</p> <p>Normally closed damper: when damper is closed, actuator position indicator should be at 0°. When damper is open, actuator position indicator should be at 90°.</p> <p>Normally opened damper: when damper is open, actuator position indicator should be at 0°. When damper is closed, actuator position indicator should be at 90°.</p>				
<p><b>A - Left</b></p>	 <p><b>Shaft Rotates Clockwise To Open</b></p> <p>This step determines shaft rotation. Linkage may change damper direction.</p>		<p><b>A - Right</b></p>	 <p><b>Shaft Rotates Counterclockwise To Open</b></p>

### B - Left - Long Shaft



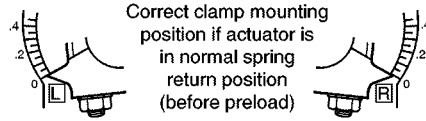
- ① Universal mounting clamp.
- ② Retaining clip.

### B - Right - Long Shaft

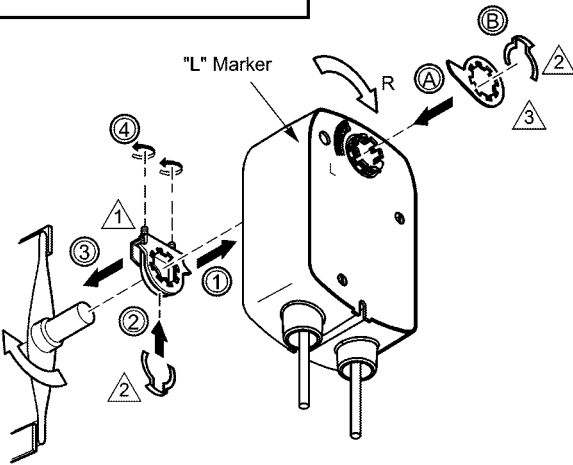


- ① Universal mounting clamp.
- ② Retaining clip.

1. Assemble mounting clamp.
2. Assemble retaining clip.
3. Place actuator over shaft.
4. Hand tighten clamp nuts.

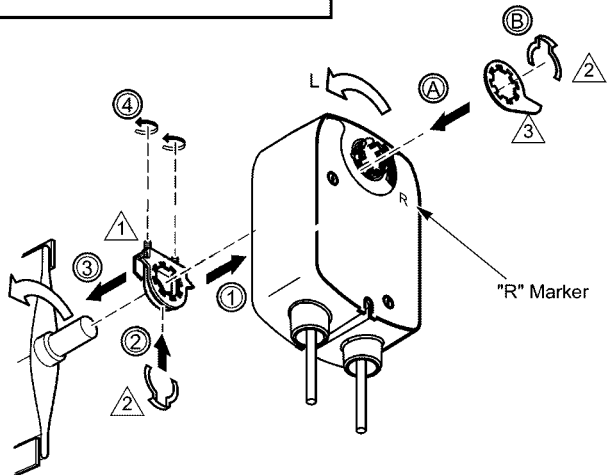


### B - Left - Short Shaft



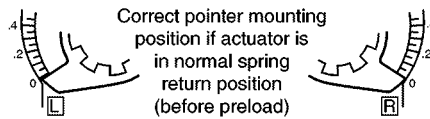
- ① Universal clamp.
- ② Retaining clip.
- ③ Damper position indicator.

### B - Right - Short Shaft

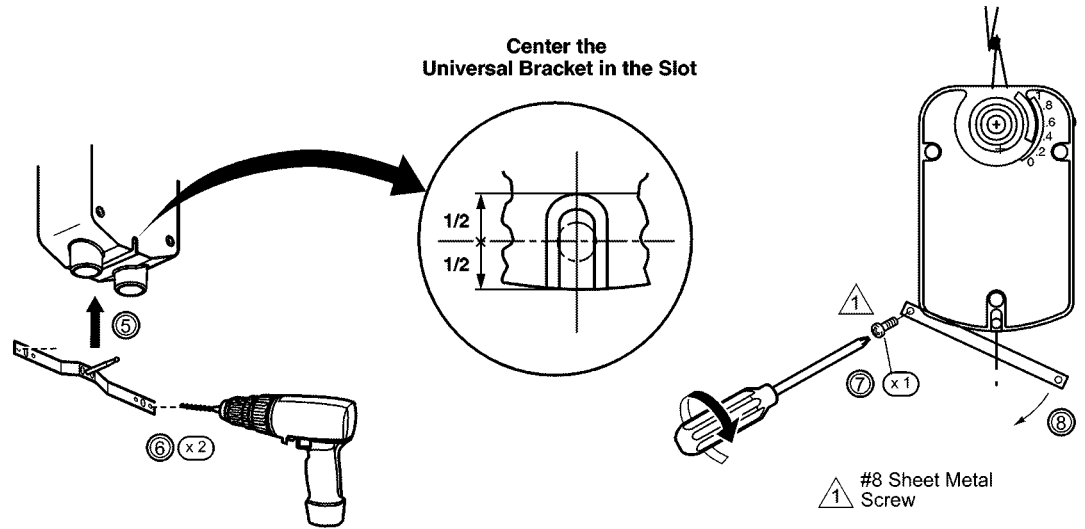


- ① Universal clamp.
- ② Retaining clip.
- ③ Damper position indicator.

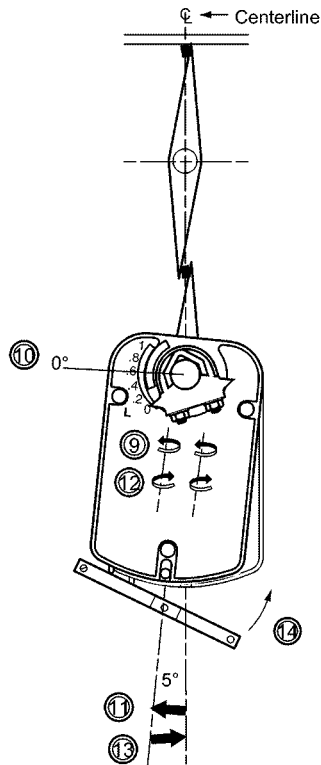
- A. Assemble damper position indicator.
- B. Assemble retaining clip.
1. Position mounting clamp.
2. Assemble retaining clip.
3. Slide actuator over shaft.
4. Hand tighten clamp nuts.



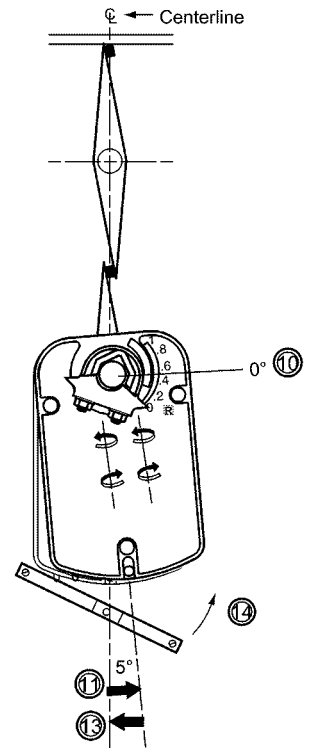
### C - Left and Right



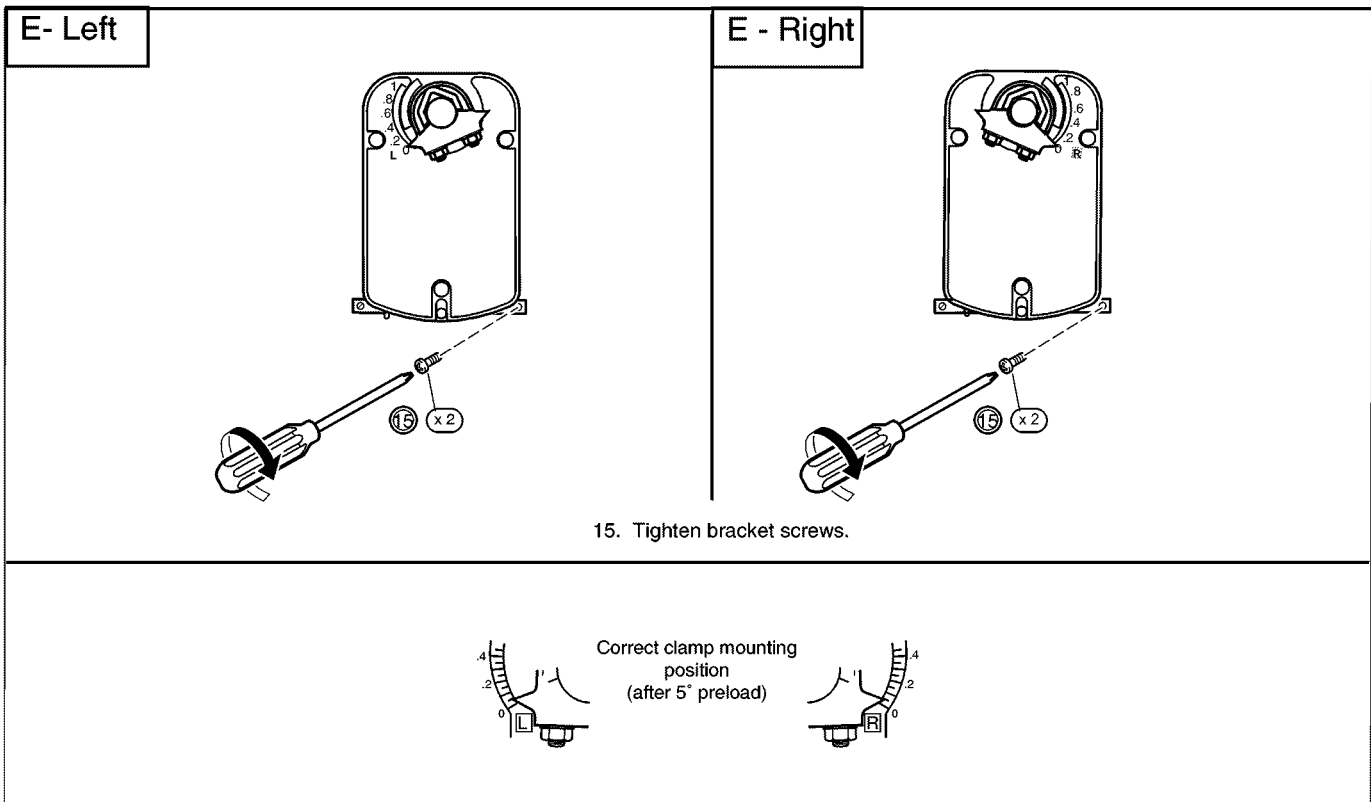
### D- Left



### D- Right



9. Loosen clamp nuts.
10. Check that the shaft is in full zero position.
11. Swing actuator 5° in the direction of travel. Do not move shaft.
12. Tighten clamp nuts to 4 to 6 lb-ft (5.4 to 8.2 N-m) of torque.
13. Move bottom of actuator back into position.
14. Pivot bracket back into position.



### MA4X-707X and MA4X-715X Series Installation

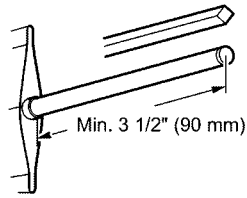
**Caution:** Do not drill additional holes in the actuator body. Six pre-drilled holes are located on each side, under the label, to accept #10-24 thread-forming screws for mounting accessories.

**Note:** The MA40-707X and MA40-715X series actuators come equipped with standard universal mounting clamp installed. For damper shafts larger than 3/4" (19 mm) in diameter, the AM-687 universal mounting clamp is required (order separately). The AM-687 clamp accommodates round shaft sizes up to 1.05" (27 mm) in diameter or 5/8" (16 mm) square shafts.

**Caution:** The MA41-707X and MA41-715X actuators are equipped with a manual override.

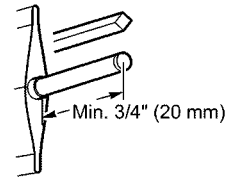
- The manual override to be used only when power is not applied to the unit.
- If the universal clamp is not set to 0° on the position indicator, manually wind the actuator in the direction indicated with hex wrench from -5° to 0° and lock with a screwdriver.
- When operating manual override, back off 5° from full open mechanical stop to ensure proper release.
- Do not attempt to use the manual override with actuators mounted in tandem. Damage to the gear train could occur.
- Using power tools to adjust the manual override will cause damage to the gears.
- To unlock manual override without power, crank the manual override in the direction indicated a minimum of 5°.

**Long Shaft**



3/8" to 3/4" Diameter (10 mm to 20 mm)  
3/8" to 1/2" Square (10 mm to 13 mm)

**Short Shaft**

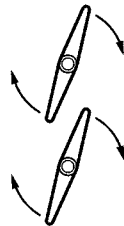


Move the damper to its normal position. Verify the controller action is set to match the damper application.

Normally closed damper: when damper is closed, actuator position indicator should be at 0°. When damper is open, actuator position indicator should be at 90°.

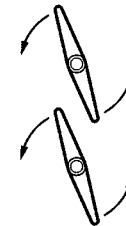
Normally opened damper: when damper is open, actuator position indicator should be at 0°. When damper is closed actuator position indicator should be at 90°.

**A - Left**



**Shaft Rotates  
Clockwise  
To Open**

**A - Right**



**Shaft Rotates  
Counterclockwise  
To Open**

This step determines shaft rotation. Linkage may change damper direction.

**B**

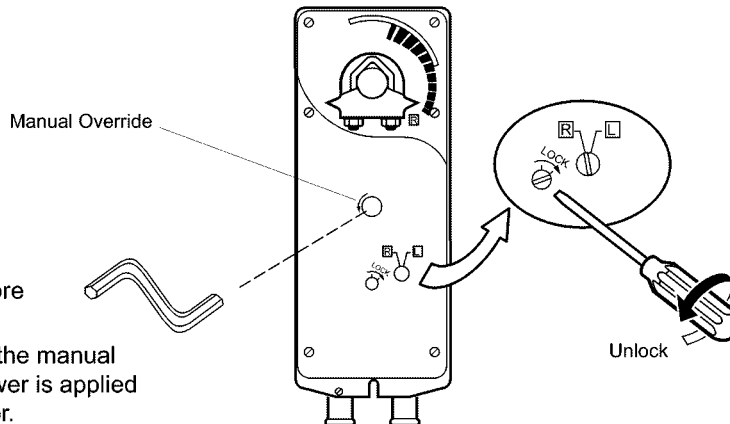
For MA41-707X and MA41-715X only (manual override).  
For MA40-707X and MA40-715X, proceed to step C.

If position indicator does not point to zero: Unlock the actuator.

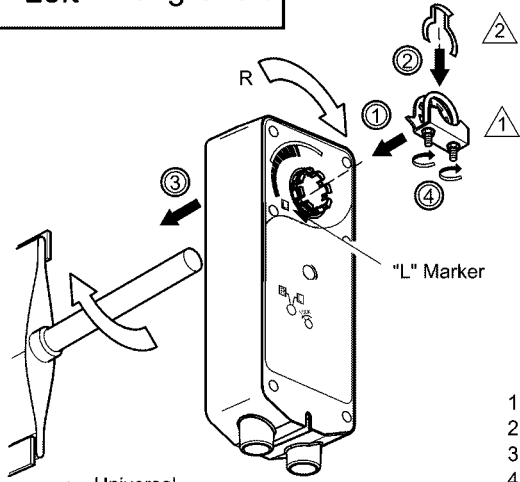
Insert hex wrench into manual override.  
Crank the actuator so the indicator points to 0°.  
Lock the actuator.

Fully engage hex wrench into manual override before winding.

**Caution:** Do not crank the manual override if power is applied to the actuator.



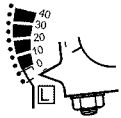
### C - Left - Long Shaft



- ① Universal mounting clamp.
- ② Retaining clip.

1. Assemble mounting clamp.
2. Assemble retaining clip.
3. Place actuator over shaft.
4. Hand tighten clamp nuts.

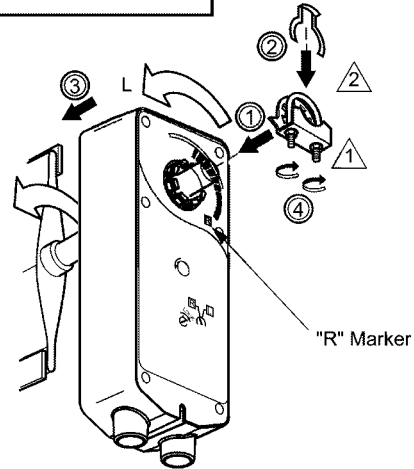
For MA40-707X and MA40-715X actuators:



Correct clamp mounting position if actuator is in normal spring return position

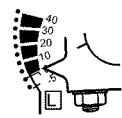


### C - Right - Long Shaft

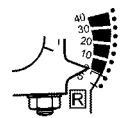


- ① Universal mounting clamp.
- ② Retaining clip.

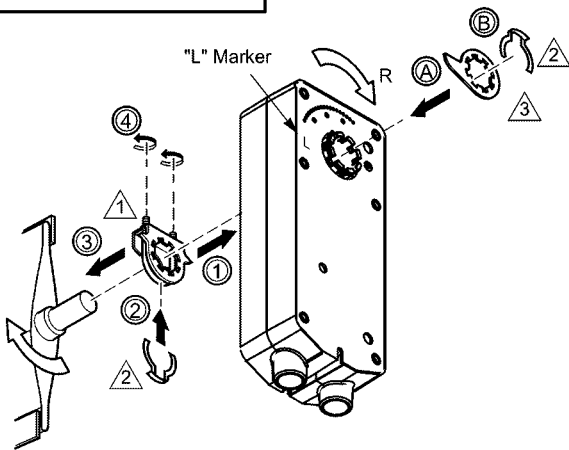
For MA41-707X and MA41-715X actuators:



Correct clamp mounting position if actuator is locked with 5° preload.



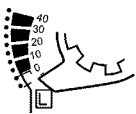
### C - Left - Short Shaft



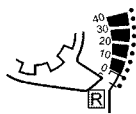
- ① Universal clamp.
- ② Retaining clip.
- ③ Damper position indicator.

- A. Assemble damper position indicator.
  - B. Assemble retaining clip.
1. Position mounting clamp.
  2. Assemble retaining clip.
  3. Slide actuator over shaft.
  4. Hand tighten clamp nuts.

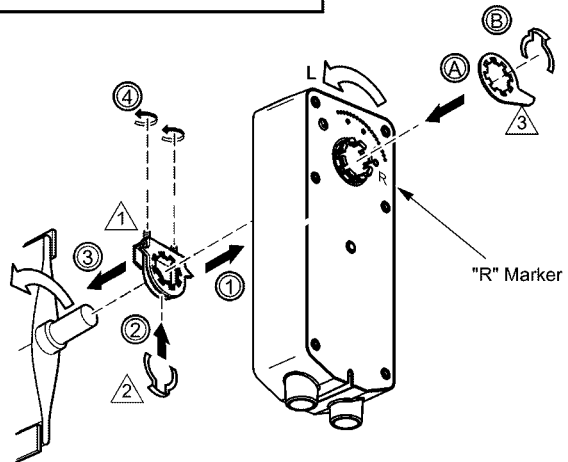
For MA40-707X and MA40-715X actuators:



Correct pointer mounting position if actuator is in normal spring return position

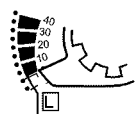


### C - Right - Short Shaft

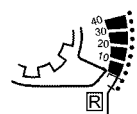


- ① Universal clamp.
- ② Retaining clip.
- ③ Damper position indicator.

For MA41-707X and MA41-715X actuators:

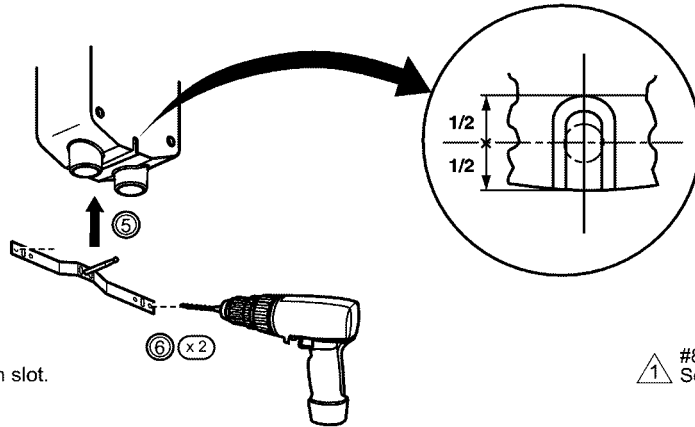


Correct pointer mounting position if actuator is locked at 5° preload.

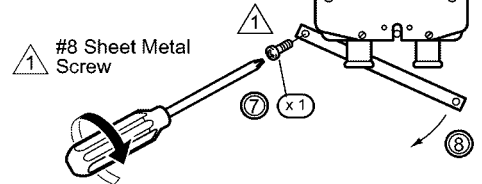


## D - Left and Right

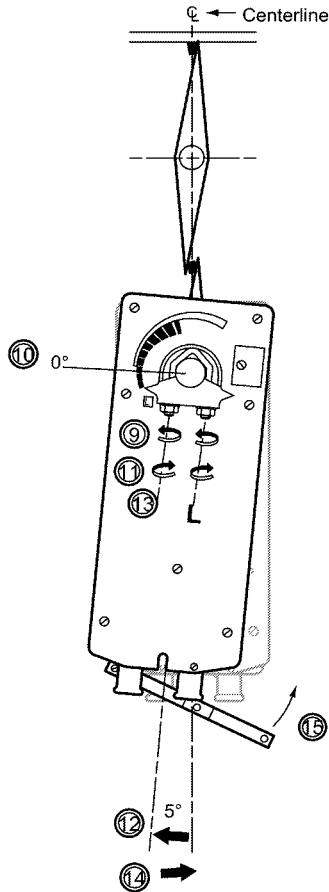
Center the  
Universal Bracket in the Slot



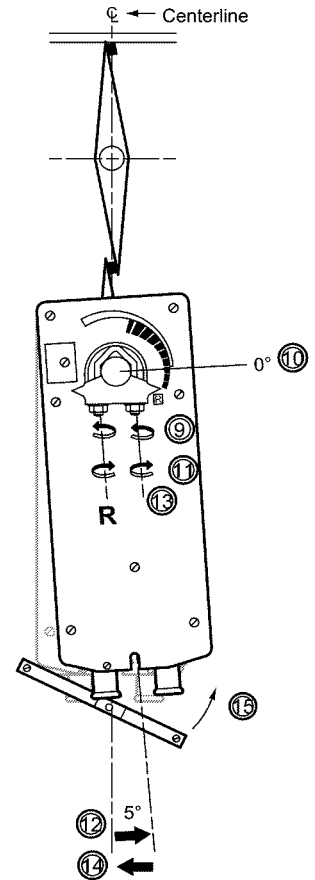
5. Center bracket in slot.
6. Drill two holes.
7. Start one screw.  
For MA41-707X and MA41-715X actuators, insert and tighten both screws.
8. Swing bracket down (MA40 actuator only).



## E- Left



## E- Right



9. Loosen clamp nuts.
10. Check that the shaft is in full zero position.

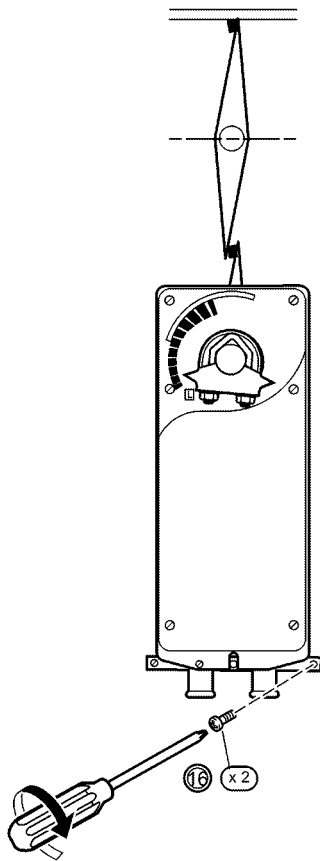
**For MA41-707X and MA41-715X only:**

11. Tighten clamp nuts to 6 - 8 in-lb (8.2 Nm).  
This completes the installation for MA41-704X  
and MA41-715X.

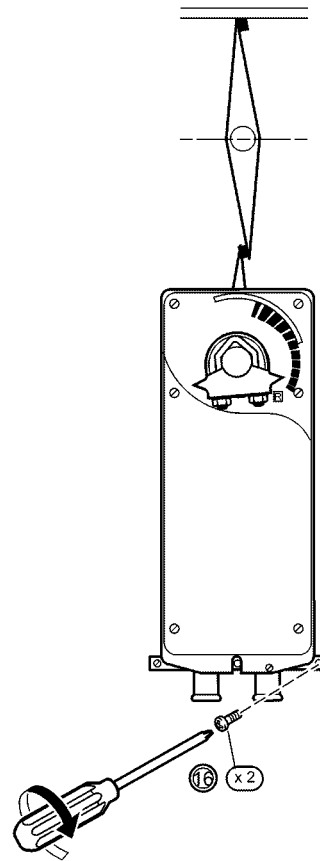
**For MA40-707X and MA40-715X only:**

12. Swing actuator 5° in the direction of travel. Do  
not move shaft.
13. Tighten clamp nuts to 6 - 8 lb-in (8.2 - 10 N-m).
14. Move bottom of actuator back into position.
15. Pivot bracket back into position.

F- Left

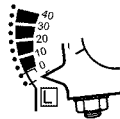


F- Right



**For MA40-707X and MA40-715X only:**  
16. Tighten bracket screws.

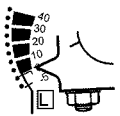
For MA40-707X and MA40-715X actuators:



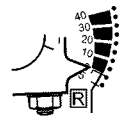
Correct pointer position  
after mounting.



For MA41-707X and MA41-715X actuators:



Correct pointer position  
after mounting.



The lock on MA41-707X and MA41-715X will release on first power-up.



## Jackshaft Installation

### (MA40-704X Series)

The MA40-704X actuator is designed for use with jackshafts up to 3/4" (19 mm) in diameter. In most applications, the MA40-704X actuator may be mounted in the same manner as a standard damper shaft application. If the jackshaft diameter is larger than 5/8" (16 mm) in diameter, the optional AM-710 universal clamp must be used.

### (MA4X-715X and MA4X-707X Series)

The MA4X-715X and MA4X-707X actuators are designed for use with jackshafts up to 1.05" (27 mm) in diameter. In most applications, the actuator may be mounted in the same manner as a standard damper shaft application. If the jackshaft diameter is larger than 3/4" (19 mm) in diameter, the optional AM-687 universal clamp must be used.

## Multiple Actuator Mounting

If more torque is required than one actuator can provide a second actuator may be mounted to the damper shaft, using the AM-673 multiple mounting bracket. See Figure-4.

Multiple actuators may be powered from one transformer provided the following rules are followed:

- The total current draw of the actuators (VA rating) is less than or equal to the rating of the transformer and less than the rating of the control circuit.
- Polarity on the secondary of the transformer is strictly followed.
  - All L2 wires from all actuators are connected to the common lead on the transformer.
  - All L1 wires from all actuators are connected to the hot lead.

---

**Caution:** Mixing the L2 and L1 wires on one lead of the transformer may result in erratic operation or failure of the actuator and/or controls.

---

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**Caution:** Do not attempt to use the manual override with actuators mounted in tandem. Damage to the gear train may occur.

---

Multiple actuators positioned by the same control signal may be powered from multiple transformers provided the following rules are followed:

- The transformers are properly sized.
- All L2 wires from all actuators are tied together and tied to the negative lead of the control signal.

**Table-2 Power Wiring Color Code.**

Part Number	L1	L2
MA4X-7XX3 MA4X-7XX3-502	Red	Black
MA4X-7XX0 MA4X-7XXX-502	Black	White
MA4X-7XX1 MA4X-7XXX-502	Brown	Light Blue

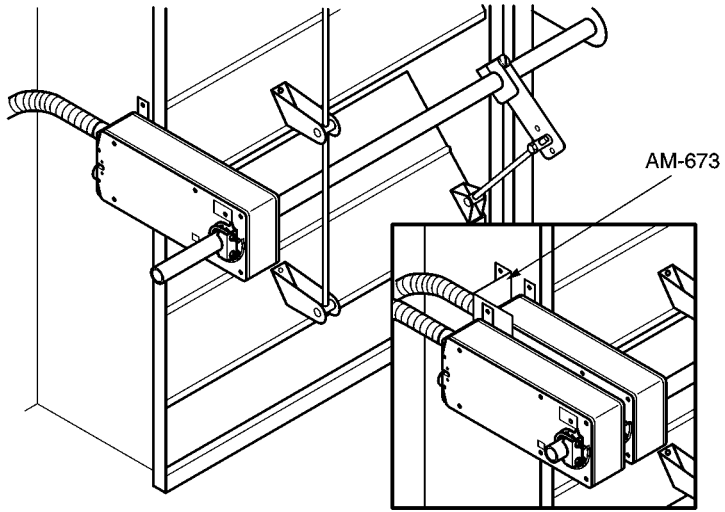


Figure-4 Mounting Multiple Actuators.

## Wiring Requirements

### Control and Power Leads

See Table-3 for power wiring data. Refer to Figure-1 through Figure-3 for typical wiring applications.

*Note:* Class 2 control and power lead wiring must be routed separately from line voltage wiring and any other non-class 2 circuits. Line voltage, auxiliary switch, and auxiliary switch leads must be connected to a class 1 circuit.

**Table-3 Power Wiring Data.**

Actuator Voltage	Part Number	Maximum Wire Run in ft. (m) (5% Voltage Drop)		
		14 AWG	16 AWG	18 AWG
24 Vac 22-30 Vdc	MA4X-7153	330 (101)	200 (61)	130 (40)
	MA4X-7153-502			
24 Vac 22-30 Vdc	MA40-7043	1100 (335)	700 (213)	440 (134)
	MA40-7043-501			
24 Vac 22-30 Vdc	MA4X-7073	600 (183)	500 (152)	254 (77)
	MA4X-7073-502			

## Auxiliary Switches

The MA40-704X-501 series actuators include one built-in SPDT auxiliary switch which can be used for interfacing or signaling (e.g., for fan start-up). The switch is adjustable between 0° and 95° of rotation (0 to 1 scale).

The MA4X-715X-502 and MA4X-707X-502 series actuators include two built-in SPDT auxiliary switches which can be used for interfacing or signaling (e.g., for fan start-up). The switch position near the normal (spring return) position is fixed at 5°. The other is adjustable between 25° and 85° of rotation.

### Adjusting the Switching Point

Refer to Table-4 for auxiliary switch rating.

#### Adjusting the switching point for MA40-704X-501

1. The actuator must be in its normal (spring return) position.
2. Use a flat screw driver to rotate the switch pointer until it is at the desired switch position on the 0 to 1 scale.

#### Adjusting the switching point for MA4X-715X-502 or MA4X-707X-502

1. The actuator must be in its normal (spring return) position.
2. Insert a 1/8" allen wrench into the hex hole located in the center of the adjustable switch pointer.
3. Rotate the wrench until the switch pointer is at the desired switch position in degrees, from 25 to 85°.

**Table-4 Auxiliary Switch Rating.**

Part Number	Voltage	Resistive Load	Inductive Load
MA40-7043-501	24 Vac	6A	1.5A
MA40-7040-501	250 Vac	6A	1.5A
MA40-7041-501			
MA4X-707X-502	250 Vac	7A	2.5A
MA4X-715X-502			

## Rotation Limitation

### Rotation Limitation for MA40-704X Series

The Stop Block is used in conjunction with the tab on the universal clamp or the AM-709 position indicator. In order to function properly, the clamp or indicator must be mounted correctly.

The Stop Block controls the rotational output of the MA40-704X and MF40-704X-501 actuators. It is used in applications where a damper has a designed rotation that is less than 90°, for example with a 45° or 60° rotating damper.

1. Determine the amount of damper rotation required. The actuator stop block provides limited rotation from 40° to 95°.
2. Loosen the screw securing the stop block to the actuator.

---

*Note:* The actuator is shipped with the Stop Block mounted to the "L" side. If the damper application requires the "R" side face the installer, simply remove the Stop Block and screw and move it to the new location.

---

3. Slide the stop block into position, so that its edge lines up with the degree graduation on the actuator face which corresponds with the required rotation. See Figure-5.
4. Secure the stop block in place.
5. Test the damper rotation by applying power. Re-adjust if necessary.

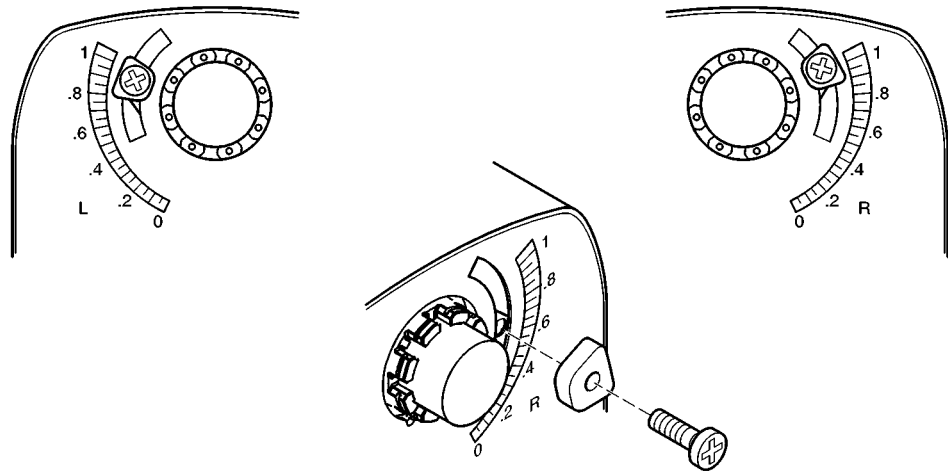


Figure-5 Adjusting Stop Block for Limited Rotation.

### Rotation Limitation for MA4X-715X and MA4X-707X Series

The AM-689 rotation limiter is used in conjunction with the tab on the universal clamp or the AM-686 position indicator which comes with the AM-689. In order to function properly, the clamp or indicator must be mounted correctly.

The AM-689 rotation limiter controls the rotational output of the MA4X-715X, MA4X-715X-502, MA4X-707X, and MA4X-707X-502 actuators. It is used in applications where a damper has a designed rotation that is less than 90°, for example with a 45° or 60° rotating damper.

1. Determine the amount of damper rotation required.
2. Locate the AM-689 rotation limiter on the actuator so that its edge lines up with the degree graduation on the actuator face which corresponds with the required rotation. See Figure-6.
3. Find the appropriate cross-hair location through the slot of the rotation limiter. This is the mounting location for the retaining screw.
4. Pierce through the label material to allow easy fastening of the retaining screw.
5. Position the rotation limiter back to the desired position, making sure the locating “teeth” on the rotation limiter are engaged into the locating holes on the actuator.
6. Fasten the rotation limiter to the actuator using the self-tapping screw provided.
7. Test the damper rotation by applying power. Re-adjust if necessary.

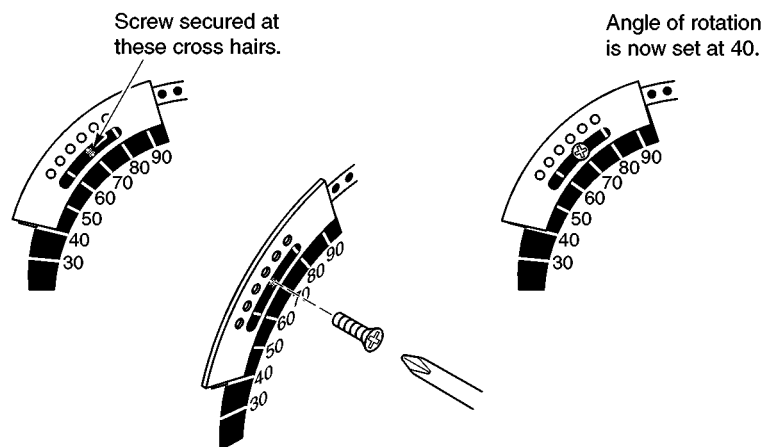


Figure-6 Securing the AM-689 Rotation Limiter.

## CHECKOUT

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. Actuator and damper should be driven to their powered position.
2. On the MA4X-7XXX-50X models, check for correct auxiliary switch operation.
3. Break power to the actuator. Actuator and damper should return to their normal, or spring return position.

**Table-5 Power Wiring Color Code.**

Part Number	L1	L2
MA4X-7XX3 MA4X-7XX3-502	Red	Black
MA4X-7XX0 MA4X-7XXX-502	Black	White
MA4X-7XX1 MA4X-7XXX-502	Brown	Light Blue

## THEORY OF OPERATION

The actuators are mounted directly onto a damper shaft using a universal V-clamp. When power is applied, the actuator rotates 95° to its powered position, at the same time tensing the spring return safety mechanism. When power is removed, the spring returns the actuator to its normal position. The actuators provide true mechanical spring return operation for reliable, positive close-off on air tight dampers.

The MA4X-707X, MA4X-707X-502, MA4X-715X, and MA4X-715X-502 actuators are equipped with a graduated position indicator showing -5° to 90°. The MA40-704X and MA40-704X-501 are equipped with a graduated position indicator showing 0 to 1.

The MA40-704X-501 models are provided with 1 built in auxiliary switch. The SPDT switch is provided for interfacing or signaling, for example, fan start-up. The switching function is adjustable between 0° to 95° rotation (0 to 1 scale).

The MA4X-715X-502 and MA4X-707X-502 models are provided with 2 built in auxiliary switches. The SPDT switches are provided for interfacing or signaling, for example, fan start-up. The switching function is adjustable on one switch between 25° to 85° rotation and the other switch is fixed at 5°.

The MA41-707X-XXX and MA41-715X-XXX actuators are equipped with a manual override mechanism. This allows the actuator to be manually positioned at any point between -5o and 85o. This mechanism is accessible on both sides of the actuator and can be used to ensure tight close-offs for valves and dampers. The manual override should not be used while a unit is powered or on units that are mounted in tandem.

## MAINTENANCE

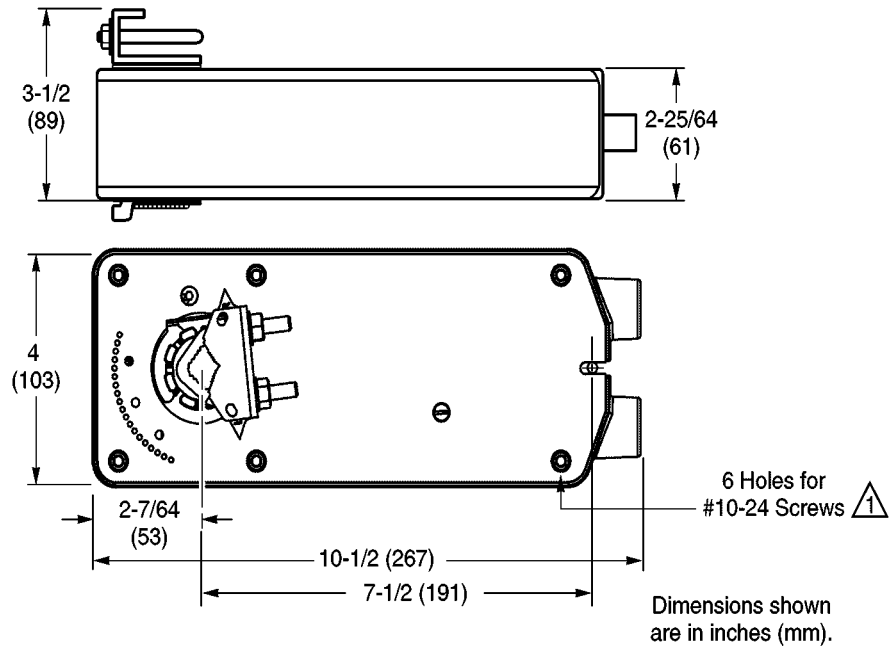
Regular maintenance of the total system is recommended to assure sustained optimum performance. The actuators are maintenance free.

## FIELD REPAIR

None. Replace with a functional actuator.

## DIMENSIONAL DATA

Figure-7 and Figure-8 dimensions are in inches (mm).




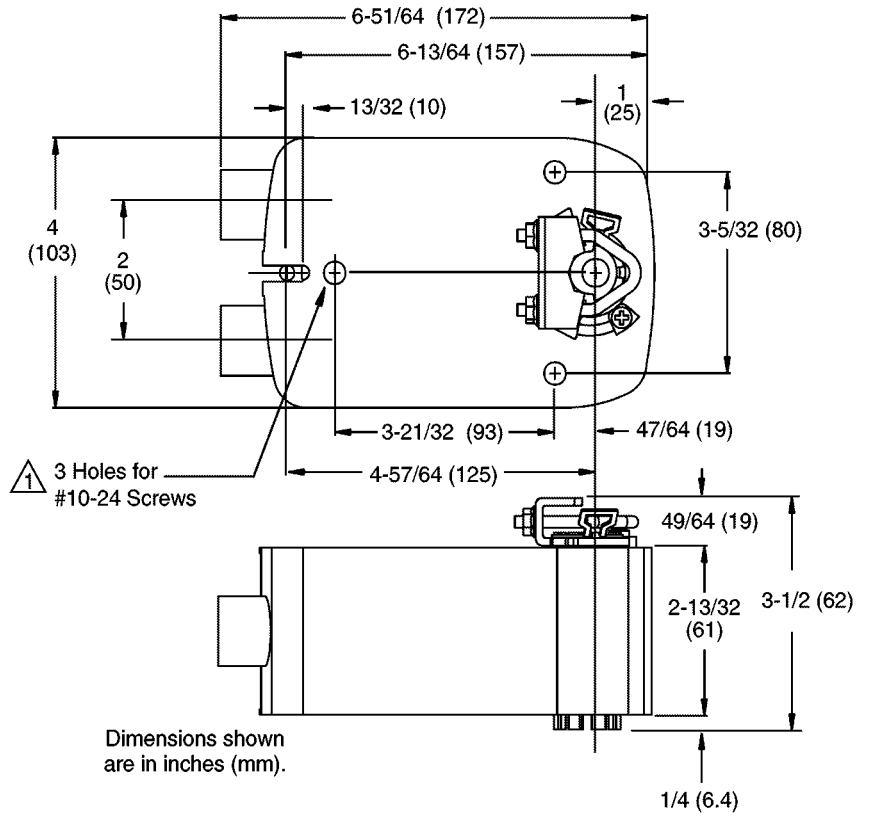
 Note: These are not through holes. Use hardware supplied in Invensys approved AM kits.

Figure-7 MA4X-707X or MA4X-715X Series Mounting Dimensions.



**1** Note: These are not through holes. Use hardware supplied in Invensys approved AM kits.

Figure-8 MA40-704X Series Mounting Dimensions.

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