



# MS-83010, MS-83040 & MS-83050 Series

## Actuators General Instructions

### APPLICATION

For electronic positive positioning proportional control of dampers, valves or butterfly valves which require the return to normal position on power interruption. MS-830X0 compatible with 2 to 15 Vdc (TAC System 8000).

### SPECIFICATIONS

**Controller Signal:** 2 to 15 Vdc from TAC System 8000 controller.

**Stroke:** Over a nominal 6 Vdc (fully retracted) to 9 Vdc (fully extended) input range. See Tables 1 and 2.

**Start Point:** Factory set at 6 Vdc, adjustable 2 to 12 Vdc.

**Input Impedance:** 10,000 ohms or greater.

**Spring Return:** Damper linkage provides return to normal position on power interruption.

**Power Requirements:** See Tables 1 and 2.

**Power Supplies:** 20 Vdc, 75 mA; 50mA available when optional auxiliary switch (AM-158) is installed.

#### Environment:

##### Ambient Temperature Limits,

**Operating Shipping and Storage** -40 to 140°F (-40 to 60°C).

**Humidity,** 5 to 95% RH, non-condensing.

**Locations,** NEMA Type 1 indoor only.

**Connections:** Color coded 6" (152 mm) leads.

**Case:** Die cast aluminum.

**Mounting:** Any position for damper actuators. In any upright position with actuator above the center of the valve body.

#### Dimensions:

**MS-8301X,** 10-1/2" high x 7-7/8" wide x 7" deep (267 mm x 200 mm x 178 mm).

**MS-8304X,** 10-1/8" high x 5-15/16" wide x 15-1/2" deep (257 mm x 151 mm x 394 mm).

**MS-8305X,** 8-3/8" high x 5-15/16" wide x 21-3/4" deep (213 mm x 151 mm x 552 mm).

#### ACCESSORIES

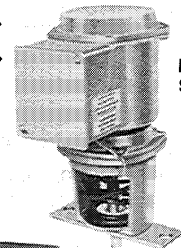
AM-158 Auxiliary switch kit; 175 VA @ 120/280Vac, 35 VA @ 24 Vac

TOOL-201 Calibration kit for TAC System 8000

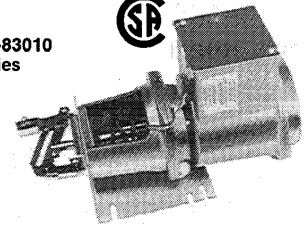
#### Damper Linkage Accessories

AM-111 Crank arm for 5/16" diameter damper shaft

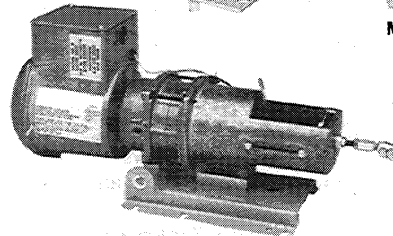
AM-112 Crank arm for 3/8" diameter damper shaft



MS-83010 Series



MS-83040 Series



MS-83050 Series



- AM-113 Crank arm for 1/2" diameter damper shaft
- AM-115 Crank arm for 7/16" diameter damper shaft
- AM-122 Linkage connector straight type
- AM-123 Damper clip
- AM-125 5/16" diameter x 20" damper rod
- AM-125-048 5/16" diameter x 48" damper rod
- AM-132 Ball joint connector
- AM-161-3 Damper linkage kit

#### For MS-8301X Series Only

- AV-430 Valve linkage
- AV-495 Valve linkage

#### For MS-8305X Series Only

- AM-301 90 degree mounting bracket for pivot mounting
- AM-530 Crank arm for 1/2" dia. damper shaft holes for 3-1/2" stroke
- AM-532 Bolt-on frame lug and damper blade clip kit
- AM-533 Actuator shaft extension
- AM-534 Pivot stud for pivot mounting
- AM-535 Clevis for pivot mounting
- AM-536 Mounting plates for pivot mounting on ducts or damper frame

Table-1 Valve Actuator Selection Specifications.

Part Number	Supply Voltage 50/60 Hz (Vac) 10 Watts	VA Rating	Output Description	Force	Valve	Timing at 70°F (21°C)	
						No Load Stroke <sup>a</sup>	Retract
MS-83010	120 (+10%, -15%)	47	Proportional 1" (25 mm) stroke	150 pounds	VB-9XXX 1-1/2 thru 4" See Table 3.	2-1/4 min. ±25 sec.	1/2 min. ±10 sec.
MS-83011	240 (+10%, -15%)	46					
MS-83013	24 (±10%)	44					

<sup>a</sup> 220 Vac at 50 Hz (+1%, -15%) the power stroke is approximately 25% slower and the VA is 20% more.

**Table-2 Damper Actuator Selection Specifications (linkage provided)**

Part Number	Supply Voltage 50/60 Hz (Vac) 10 Watts	VA Rating	Output Description	Application		Timing at 70°F (21°C)		
				Proportional Torque Rating lb.-in. (N-m) for Determining Damper Area	Proportional Control Nominal Damper Area <sup>a</sup> sq. ft. (m <sup>2</sup> )		No Load Stroke <sup>b</sup>	Retract
					Parallel	Opposed		
MS-83040	120 (+10%, -15%)	47	Proportional 2" (51 mm) stroke	75 (8.5)	42 (3.9)	54 (5)	2-1/4 min. ±25 sec.	1/2 min. ±10 sec.
MS-83041	240 (+10%, -15%)	46						
MS-83043	24 (±10%)	44						
MS-83050	120 (+10%, -15%)	47	Prop. 3-1/2" (89 mm) stroke	190 (21.5)	106 (9.8)	137 (12.7)	4 min. ±40 sec.	1-1/2 min. ±15 sec.
MS-83051	240 (+10%, -15%)	46						
MS-83053	24 (±10%)	44						

<sup>a</sup> Damper ratings are nominal and based on standard (not low leakage) dampers at 1" (25.4 mm) W.C. pressure and 2000 fpm (10 m/s) velocity.  
<sup>b</sup> 220 Vac at 50 Hz (+1%, - 15%) the power stroke is approximately 25% slower and the VA is 20% more.

**Table-3 MS-8301X Valve Body and Linkage (order separately).**

Linkage	End Fitting Size (in.)	Valve Body
AV-430	1-1/2 thru 2	VB-92X3, VB-92X4, VB-9313, VB-9314, VB-9323
	2-1/2 thru 3	VB-9323
AV-495	2-1/2 thru 4	VB-92X3, VB-9313

**PRE-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 due to shipping. Return damaged products.

**Required Installation Items**

- Wiring diagrams
- Tools (not provided):  
 Digital volt-ohm meter (DVM)  
 Appropriate drill and drill bit for mounting screws  
 Appropriate wrenches for adjustment of damper and valve linkages  
 TOOL-209, 135 ohm slidewire and 0 to 7 mA manual positioner
- Appropriate accessories
- Mounting screws or bolts (not provided)
- Wire nuts (not provided)

**INSTALLATION**

**Caution:**

1. Installer must be a qualified, experienced technician.
2. Disconnect power supply before installation to prevent electrical shock and equipment damage.
3. Make all connections in accordance with electrical wiring diagram, and in compliance with national and local codes. Use copper conductors only.
4. Do not exceed the ratings of the device.
5. Avoid locations where excessive moisture, corrosive fumes or vibration are present. NEMA Type 1 housings are intended for indoor use primarily to provide a degree of protection against contact with enclosed equipment.

**Mounting**

The actuator can be mounted in any position in a weather protected area. It is recommended that valve actuators be mounted above the centerline of the valve body. When selecting a location, allow sufficient room for accessories and for service of the product.

**MS-8301X Valve Actuators**

For the correct installation of valve linkages refer to the instruction sheets for AV-430 (F-19072) or AV-495 (F-21665) which-ever is appropriate for the particular valve body.

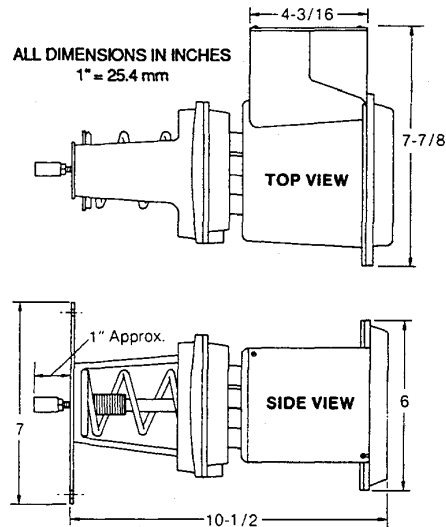


Figure-1 Dimensions for MX-830XX Series.

**MS-8304X 75 lb.-in. Damper Actuator Typical Mounting**

**Accessories typically required for mounting per Figure 3**

- Crank arm for damper shaft; AM-111, AM-112, AM-113 or AM-115
- Ball joint; AM-122 or AM-132
- Damper rod, 5/16" dia.; AM-125 or AM-125-048

## Mounting Tips

1. Select a convenient position to mount the damper actuator that will provide the desired normal position of the damper, see Figure 3.
2. The damper should be linked for angular rotation of less than 90° that will provide the required flow. This will provide the optimum close-off and controllability. Typically 60° rotation of the damper will provide almost maximum flow.
3. Damper rod that is too long is not rigid enough for good control and damper rod that is too short makes it difficult to adjust the linkage.
4. The best position for the actuator is with the actuator crank arm and the damper crank arm at 90° angle to the damper push rod when actuator is in mid-stroke, see Figure 3.

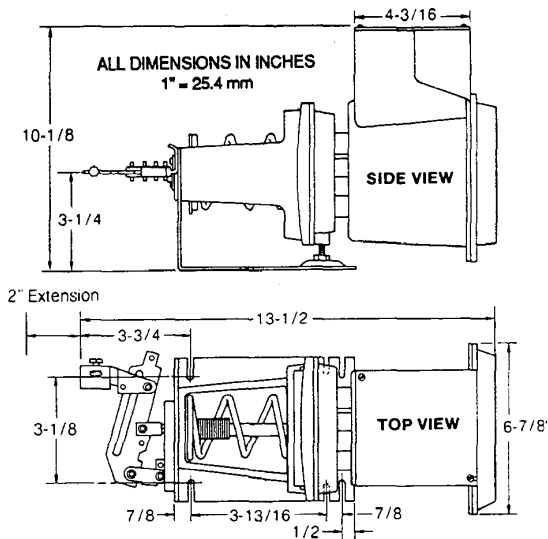


Figure-2 Dimensions for MS-8304X Series.

## Mounting Instructions (Refer to Figure 3)

1. Hold the actuator up to the duct in an appropriate position and mark the four (4) mounting hole positions.
2. With an appropriate drill or punch, pierce the mounting holes marked in step 1.
3. Using four (4) screws or bolts (not provided) mount the actuator to the duct.
4. Attach a ball joint to the slot in the damper crank arm at a position from the centerline of the shaft hole in the crank arm; position equal approximately 1-1/2" (38.1 mm) for 90° damper rotation and 2" (50.8 mm) for 60° damper rotation.
5. Rotate the damper to its normal position. Attach and secure the damper crank arm to the damper shaft at an angle (30° for 60° rotation damper and 45° for 90° rotation damper) from the mid-stroke position of the crank arm and pointing toward the actuator.
6. Slide the damper rod through the ball joint on the damper crank arm and into the connector on the actuator. Tighten the nut on the connector on the actuator. Cut off excessive damper rod.

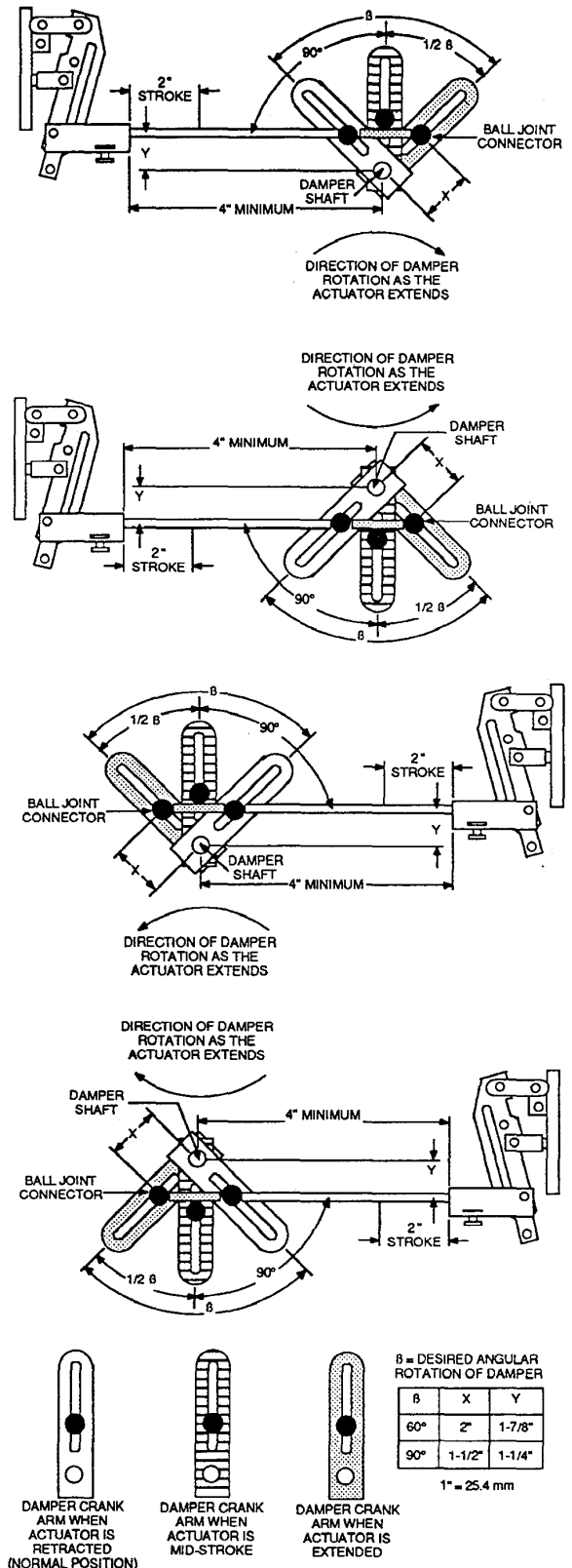


Figure-3 Typical Mounting for MS-8304X Series.

For normally open dampers, tighten the nut on the ball joint. When the damper is closed the actuator should be 1/16" (1.6 mm) from the extend end of stroke (verify in step 8).

For normally closed dampers, push the damper closed using the crank arm and tighten the nut on the ball joint while holding the damper closed. This adjustment should

be made when the actuator is powered and positioned so that it is 1/16" (1.6 mm) off its retract position so that it is 1/16" (1.6 mm) off its retract position to ensure close-off of the damper.

- After the actuator is powered and can be controlled, refer to the CHECKOUT section to ensure the damper is linked correctly.

### MS-8305X 190 lb.-in. Damper Actuator Typical Damper Duct Mounting

#### Accessories typically required for mounting per Figure 5

- Crank arm for damper shaft; AM-111, AM-112, AM-113 or AM-115
- Ball joint; AM-122 or AM-132
- Damper rod, 5/16" dia.; AM-125 or AM-125-048

ALL DIMENSIONS IN INCHES  
1" = 25.4 mm

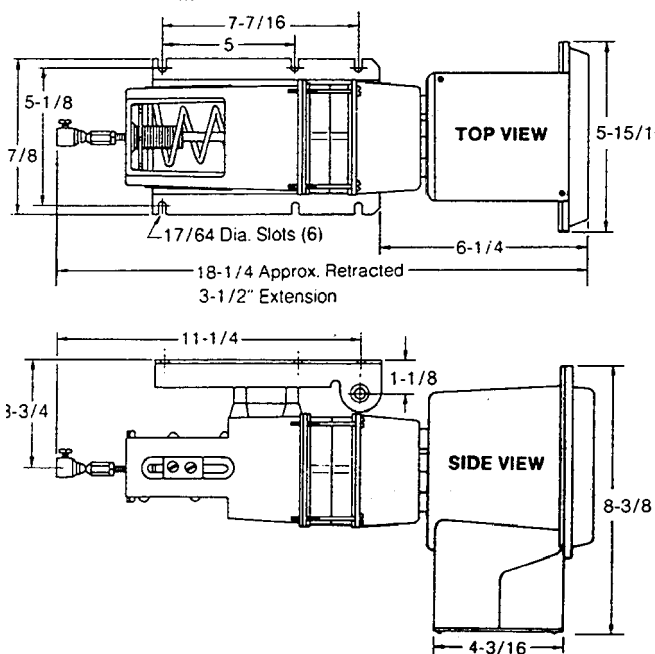


Figure-4 Dimensions for MS-8305X Series.

#### Mounting Tips

- Select a convenient position to mount the damper actuator that will provide the desired normal position of the damper, see Figure 5.
- The damper should be linked for angular rotation of less than 90° that will provide the required flow. This will provide the optimum close-off and controllability. Typically 60° rotation of the damper will provide almost maximum flow.
- A damper rod that is too long is not rigid enough for good control and a damper rod that is too short makes it difficult to adjust the linkage.
- The best position for the actuator is with the damper crank arm at a 90° angle to the damper push rod when actuator is in mid-stroke, see Figure 5.

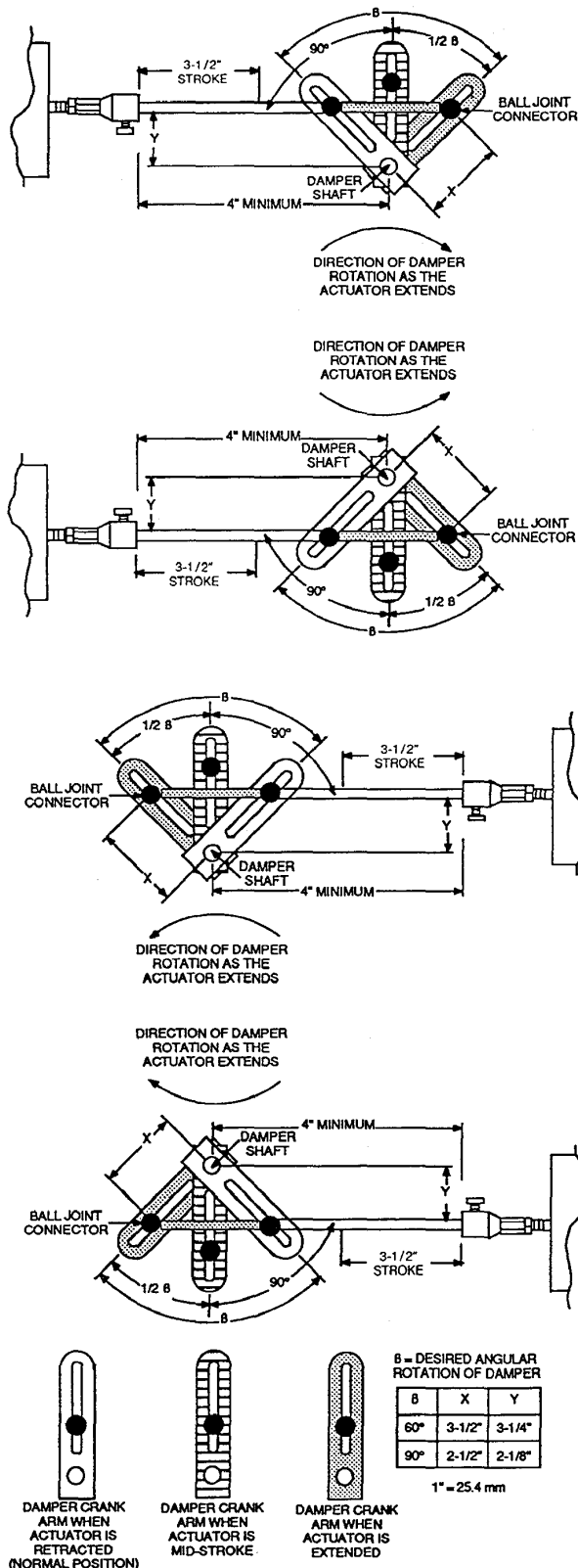


Figure-5 Typical Duct Mounting for MS-8305X Series.

### Mounting Instructions (Refer to Figure 5)

1. Hold the actuator up to the duct in an appropriate position and mark the four (4) mounting hole positions.
2. With an appropriate drill or punch, pierce the mounting holes marked in step 1.
3. Using four(4) screws or bolts (not provided) mount the actuator to the duct.
4. Attach a ball joint to the slot in the damper crank arm at a position from the centerline of the shaft hole in the crank arm; position equal approximately 2-1/2" (88.9 mm) for 60° damper rotation.
5. Rotate the damper to its normal position. Attach and secure the damper crank arm to the damper shaft at an angle (30° for 60° rotation damper and 45° for 90° rotation damper) from the mid-stroke position of the crank arm and pointing toward the actuator.
6. Slide the damper rod through the ball joint on the damper crank arm and into the connector on the actuator. Tighten the nut on the connector on the actuator. Cut off excessive damper rod.
7. For normally open dampers, tighten the nut on the ball joint. When the damper is closed the actuator should be 1/16" (1.6 mm) from the extend end of stroke (verify in step 8).  
For normally closed dampers, push the damper closed using the crank arm and tighten the nut on the ball joint while holding the damper closed. This adjustment should be made when the actuator is powered and positioned so that it is 1/16" (1.6 mm) off its retract position to ensure close-off of the damper.
8. After the actuator is powered and can be controlled, refer to the CHECKOUT section to ensure the damper is linked correctly.

### MS-8305X 190 lb.-in. Damper Actuator Typical Internal Pivot Mounting (Damper Leaf Connector)

#### Accessories typically required for mounting per Figures 6 through 9 and 12 through 14

- Frame bracket kit; AM-532 bolt-on
- Actuator shaft extension; AM-533
- Pivot stud for pivot mounting; AM-534
- Clevis for pivot mounting; AM-535
- Mounting plate for pivot mounting; AM-536
- Brace kit for pivot mounting (optional); AM-538

### Mounting Instructions (Refer to Figures 6 through 9)

1. Prepare the damper by drilling the necessary holes, etc. See Figures 8, 9 and 14 for bolt-on bracket.
2. Attach frame bracket and leaf connector to the damper.
3. Attach actuator mounting plate to the frame bracket (see Figure 6, 7 and 12).
4. Install pivot stud into the correct hole in the actuator mounting plate (see Figures 6, 7 and 12).
5. Remove the ball joint connector from the actuator.
6. Install the shaft extension onto the actuator shaft.
7. Install the clevis onto the shaft extension.

8. Install the actuator to the pivot stud.
9. Rotate the damper to its normal position.
10. For a normally open damper, adjust the clevis until the hole in the clevis aligns with the hole in the leaf connector and then install clevis pin and cotter pin. When the damper is closed the actuator should be 1/16" (1.6 mm) from the extend end of stroke (verify in step 11).  
For a normally closed damper, adjust the clevis until the hole in the clevis aligns with the hole in the leaf connector when the damper is pushed closed and then install clevis pin and cotter pin. This adjustment should be made when the actuator is powered and positioned so that it is 1/16" (1.6 mm) off its retract position to ensure close-off of the damper.
11. After the actuator is powered and can be controlled, refer to the CHECKOUT section to ensure the damper is linked correctly.

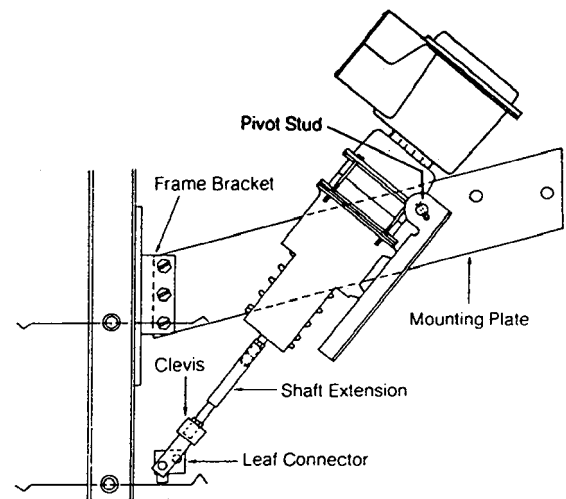


Figure-6 Typical Internal Pivot Mounting for MS-8305X Series (Damper Leaf Connector), Normally Open.

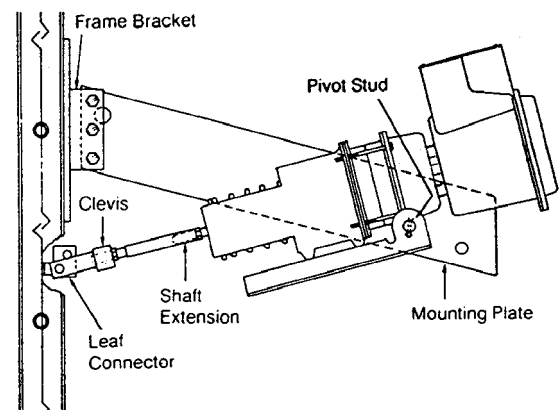


Figure-7 Typical Internal Pivot Mounting for MS-8305X Series (Damper Leaf Connector) Normally Closed.

## MS-8305X 190 lb.-in. Damper Actuator Typical External Pivot Mounting (Crank Arm)

Accessories typically required for mounting per Figures 10 through 13 and 15

- Crank arm; AM-530
- Actuator shaft extension; AM-533
- Pivot stud for pivot mounting; AM-534
- Clevis for pivot mounting; AM-535
- Mounting plate for pivot mounting; AM-536
- Brace kit for pivot mounting (optional); AM-538

### Mounting Instructions

Refer to Figures 10 through 13 and 15.

1. Attach the mounting plate to the duct or wall with the damper shaft protruding through the locator hole in the mounting plate. If this is not possible, additional shaft extensions may be used to allow locating the actuator farther from the damper shaft. Each extension provides 4" (101.6 mm) of extension to the actuator shaft.
2. Install pivot stud into the correct hole in the actuator mounting plate (see Figures 10 through 12).
3. Remove the ball joint connector from the actuator.
4. Install the shaft extension onto the actuator shaft.
5. Install the clevis onto the shaft extension.
6. Install the actuator to the pivot stud.
7. Rotate the damper to its normal position.
8. *For a normally open damper*, adjust the clevis until the hole in the clevis aligns with the correct hole in the crank arm and then install clevis pin and cotter pin. When the damper is closed the actuator should be 1/16" (1.6 mm) from the extend end of stroke (verify in step 9). *For a normally closed damper*, adjust the clevis until the hole in the clevis aligns with the correct hole in the crank arm when the damper is pushed closed and then install clevis pin and cotter pin. This adjustment should be made when the actuator is powered and positioned so that it is 1/16" (1.6 mm) off its retract position to ensure close-off of the damper.
9. After the actuator is powered and can be controlled, refer to the CHECKOUT section to ensure the damper is linked correctly.

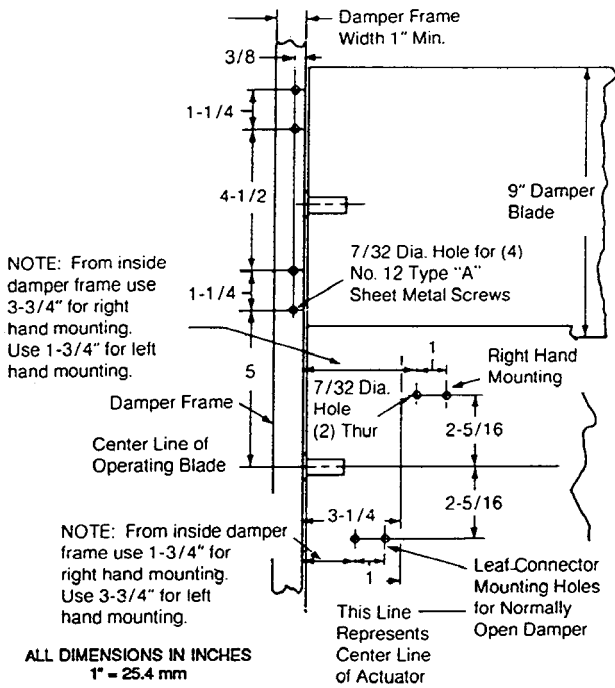


Figure-8 Typical Bolt-on Bracket Mounting (AM-532).

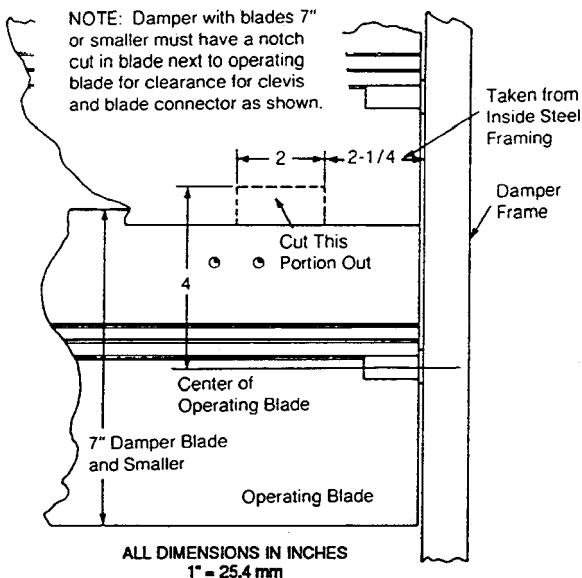


Figure-9 Installation of Damper Leaf Connector.

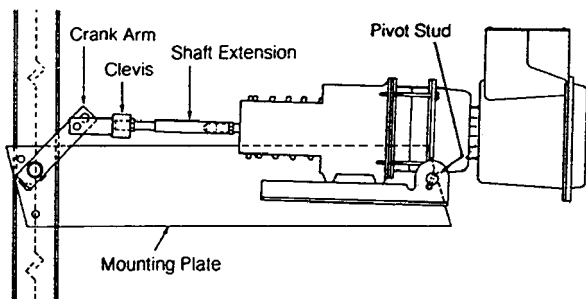


Figure-10 Typical External Pivot Mounting for MS-8305X Series (Crank Arm), Normally Closed.

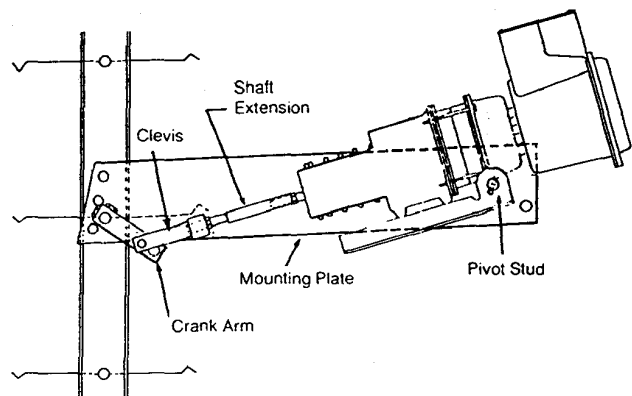


Figure-11 Typical External Pivot Mounting for MS-8305X Series (Crank Arm), Normally Open.

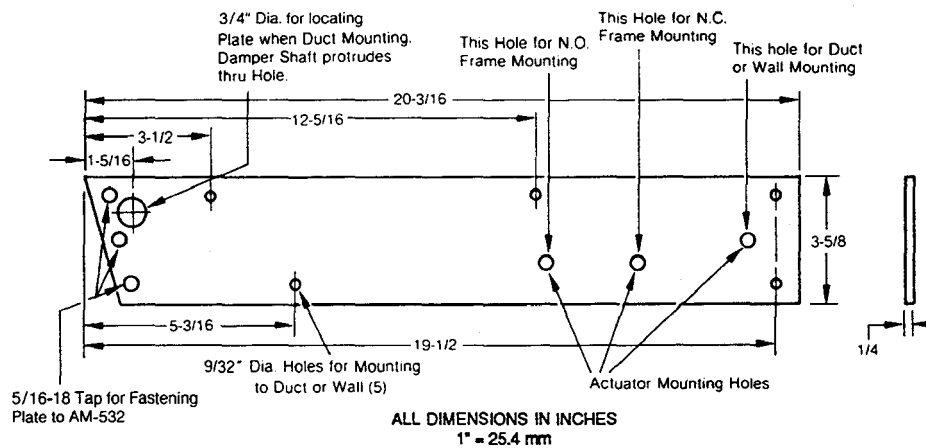


Figure-12 AM-536 Mounting Plate.

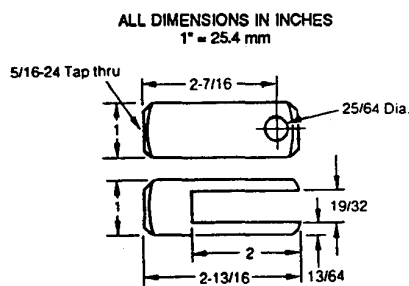


Figure-13 AM-535 Clevis.

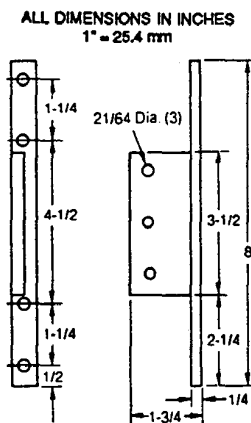


Figure-14 AM-532 Bolt-on Frame Bracket.

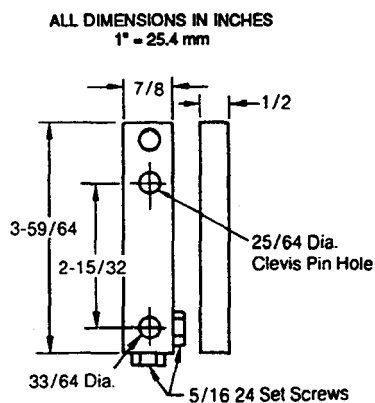


Figure-15 AM-530 Crank Arm.

### AM-538 Brace Kit for Pivot Mounted MS-8305X Actuators

The AM-538 brace kit is used with pivot mounted MS-8305X actuators when additional support is needed to stiffen the mounting bracket.

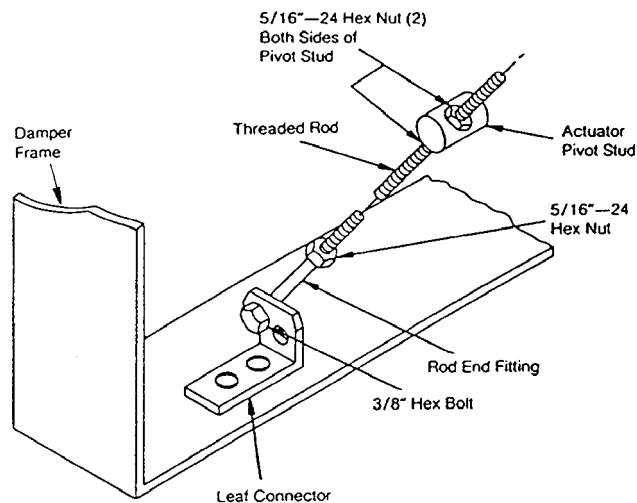


Figure-16 Installation of AM-538 Brace Kit.

### Mounting Instructions (Refer to Figure 16)

1. Thread 5/16" - 24 hex nut and then the rod end fitting onto the thread rod and secure rod end fitting by jamming lock nut against the rod end fitting.
2. Insert the 3/8" hex head bolt through the rod end fitting and then through the top hole in the leaf connector. Use lock washer and 3/8" - 16 hex nut to loosely secure.
3. Thread a 5/16" - 24 hex nut about 7" (180 mm) down the threaded rod.
4. Loosen the nuts on the pivot stud of the actuator.
5. Slide the threaded rod from the damper side through the hole in the end of the pivot stud.
6. Locate the leaf connector on the edge of the damper frame and mark the positions to drill mounting holes.
7. Drill the two (2) mount holes 7/32" (6 mm) in diameter.

8. Mount the leaf connector to the damper frame with #10 self-tapping screws that are provided.
9. Thread a 5/16" - 24 hex nut onto the threaded rod and tighten the two nuts on the threaded rod against the pivot stud.
10. Tighten the pivot stud nuts to the actuator mounting bracket and tighten the rod end bolt.

## WIRING

The wiring connections are made to 6" (152 mm) color coded leads. See Figure 17 and Tables 4 through 6 for wiring information.

**Note:** All wiring must be Class 1 circuits

### Control Leads

Use 18 gage three-conductor twisted leads (Part Number W-103) for runs up to 500 ft (157 m) between the controller and the actuator. Use a larger size for longer runs.

**Caution:** Use 18 gage shielded cable (twisted) when it is necessary to install the signal leads in the same conduit with power wiring, or when high RFI/EMI generating devices are near. Terminate the shield at the controller only on the COM (-) terminal. Never connect the shieldings to earth ground.

### Power Leads

See Table 4 for selection of proper gage wire versus voltage and length of wire run.

**Table-4 Power Wire Selection**

Actuator Part Number	Voltage	Wire Size (AWG)	Maximum Run ft. (m) (1 run has 2 wires)
MS-83013 MS-83043 MS-83053	24 Vac	14	125 (38)
		12	196 (59)
		10	310 (94)
MS-83010 MS-83040 MS-83050	120 Vac	14	2600 (792)

**Table-4 Power Wire Selection**

Actuator Part Number	Voltage	Wire Size (AWG)	Maximum Run ft. (m) (1 run has 2 wires)
MS-83011 MS-83041 MS-83051	240 Vac	14	2600 (792)

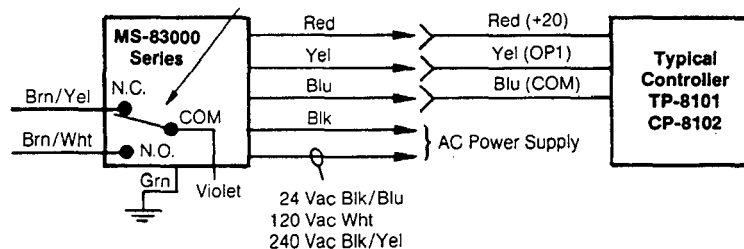
**Table-5 Valve Position Versus Input Signal (Figure 17).**

Valve Body Series	Normal Position	MS-83010 (120 Vac) MS-83011 (240 Vac) MA-83013 (24 Vac)	
		Increasing Vdc Input Signal	Normal Position Decreasing Vdc
VB-9213-0-4-P VB-9213-0-5-P VB-9214-0-4-P VB-9253-0-4-P VB-9273-0-4-P	Open	Closes Valve	Opens Valve
VB-9223-0-4-P VB-9223-0-5-P VB-9224-0-4-P VB-9224-0-4-P VB-9263-0-4-P VB-9283-0-4-P	Closed	Opens Valve	Closes Valve
VB-9313-0-4-P VB-9313-0-5-P VB-9314-0-4-P	Flow B to AB	Flow A to AB	Flow B to AB
VB-9323-0-4-P	Flow B to AB	Flow B to A	Flow B to AB
VB-9323-0-5-P	Flow C to L	Flow C to U	Flow C to L

**Table-6 Damper Position Versus Input Signal (Figure 17).**

Damper Normal Position	MS-8304X or MS-8305X	
	Increasing Vdc Input Signal	Normal Position Decreasing Vdc
Normally Open	Closes Damper	Opens Damper
Normally Closed	Opens Damper	Closes Damper

Field Installed Optional Auxiliary Switch AM-158



Optional auxiliary switch shown with actuator retracted field adjusted 0-100% of stroke.

Figure-17 Typical Wiring MX-83000 Series.



## CHECKOUT

After the entire system has been installed and actuator has been powered up, the following checks can be made for proper system operation.

### Go No Go Test (Two-Position Operation)

1. The actuator should be powered.
2. Disconnect the control leads from the controller.
3. To make the actuator shaft extend fully, short the yellow lead to the red lead.
4. To make the actuator shaft retract fully, short the yellow lead to blue lead.
5. Check for proper operation of the valve or damper as the actuator is operated.
6. Reconnect the control wiring.

### Manual Positioning with TOOL-201 (Manual Positioner)

1. The actuator should be powered.
2. Disconnect the control leads from the controller.
3. Attach the slidewire leads from TOOL-201 to the same color leads on the actuator.
4. The actuator can be manually positioned by turning the knob of TOOL-201; turning knob in the increase direction will make the shaft of the actuator retract and in decrease direction will make the shaft of the actuator extend.
5. Check for proper operation of the valve or damper as the actuator is operated.
6. Reconnect the control wiring.

### Positioning the Actuators with the Controller

If the sensed media is within the controller's setpoint range, the actuator can be positioned by adjusting the controller setpoint up and down. Check for correct operation of the actuator (valve or damper) while the actuator is being stroked.

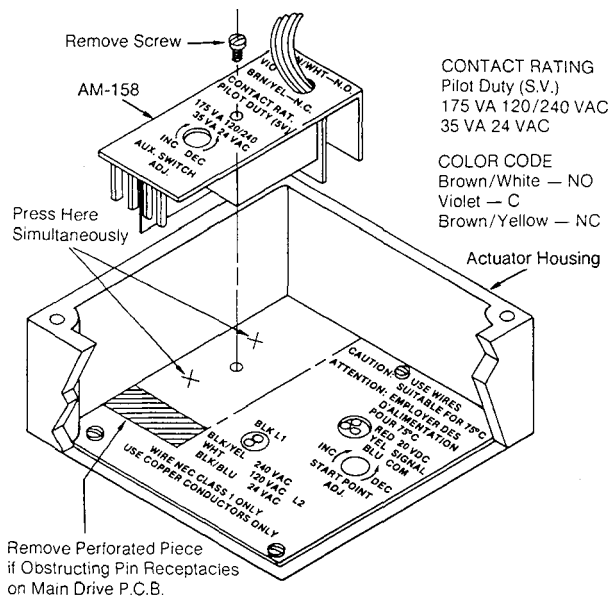


Figure-18 AM-158 Auxiliary Switch Installation.

## Auxiliary Switch Kit (AM-158) Installation (See Figures 18 and 19)

**Warning:** Risk of electrical shock - open all disconnects before servicing.

1. Remove 4 x 4 cover from the actuator. Save cover for reinstallation.
2. Remove single screw at mid-left-hand side of cavity (see Figure 18). Save screw for reinstallation.
3. Press in simultaneously on the two places indicated by "X" on Figure 18. The insulator will fold in, perpendicular to the rest of the insulator.
4. Remove small rectangular piece of insulation in lower left-hand corner (see Figure 18) if obstructing the four pin receptacles on the main drive printed circuit board (P.C.B.).
5. With insulator properly aligned on the auxiliary switch P.C.B. (see Figure 18), align the four auxiliary switch pins with the four receptacles on the main drive P.C.B.
6. Once the pins and receptacles are aligned and in contact, press the auxiliary switch assembly firmly into place. The auxiliary switch assembly should be slightly raised above the main drive P.C.B. [approximately 1/8" (3mm)].

**Warning:** Be sure no wires get pinched.

7. Reinstall screw to hold auxiliary switch assembly firmly in place.
8. After properly wiring auxiliary switch to the device to be controlled, rotate auxiliary switch adjustment potentiometer fully CCW, which will disable the auxiliary switch.
9. Apply power to actuator and adjust auxiliary switch trip point to desired position.
10. Replace 4 x 4 cover on the actuator.

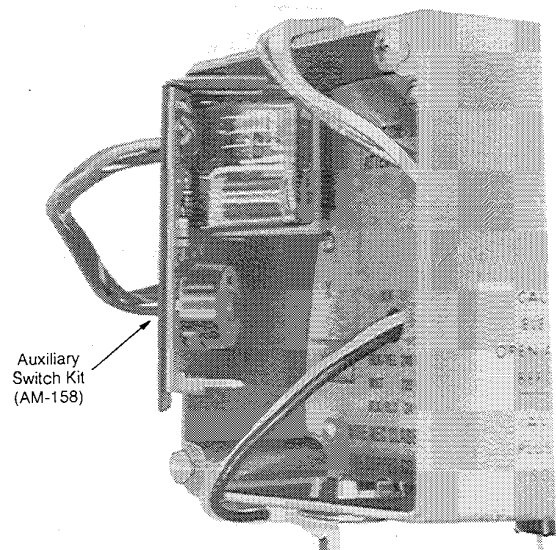


Figure-19 MS-830XX Auxiliary Switch Location.

## **MAINTENANCE**

Regular maintenance of the total system is recommended to assure sustained optimum performance.

## **FIELD REPAIR**

None. Replace with a functional actuator.



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