

## APPLICATION AND USE

Spring return rotary actuators MX41-7 have a rotary output for direct coupling to air dampers. Models are available for on/off operation from 230Vac or 24Vac power supplies and 24Vac floating point control.

- Direct coupling to all normal dampers without mounting brackets or linkage kits - saves site time;
- Universal clamp provides direct mounting to dampers shafts up to 19mm diameters up to 13mm square;
- Case IP 30 (IP 54) when conduit connector is in the down position);
- Clockwise and counterclockwise rotation available, determined by Left or Right hand mounting;
- Spring tensions whilst the damper is being operated;
- Positive spring return operation, for example under power failure;
- Provides 95° of rotation; rotation limiting available;
- Visual position indicator;
- Optional built-in auxiliary switches to provide for interfacing or switching;
- Cable gland and Blanking plugs supplied fitted;
- MS4x-7xxx series provided with Left/Right switch for selection of direct or reverse action control mode.



## TECHNICAL CHARACTERISTICS (7Nm Actuators)

Model	MA41-7071-G00	MA41-7071-G02	MA41-7073-G00	MA41-7073-G02	MF41-7073-G00	MF41-7073-G02	MS41-7073-G00	MS41-7073-G02
<b>Power supply</b>								
Voltage	230Vac ±10%		24Vac ± 20%		24Vac ± 20%		24Vac ± 20%	
VA (60Hz)	8		4.9		8.9		8.3	
VA (50Hz)	13.7		5.0		8.9		8.7	
Watts (running)	5.6		3.4		4.2		3.6	
Watts (holding)	2.9		0.8		2.3		1.6	
<b>Electrical connections</b>	0,9m cable							
<b>Auxiliary switches</b>	<b>Only for G02:</b> 2 SPST 7A (2,5A) @ 230Vac, one fixed @ 5° and one adjustable 25 to 85°.							
<b>Input control signal</b>	On-off, spring return. SPST control contacts or Triacs (500mA rated).						2±10Vcc @ 80kΩ or 4-20mAcc @ 500Ω	
<b>Action</b>	Open/Close with single pole contact control			Floating Point Control		Proportional Modulation Control		
<b>Position feedback</b>	MS41-7073: 2 to 10Vdc (max. 0.5mA) output signal for position feedback or to operate up to four additional slave actuators							
<b>Output torque</b>	7Nm (minimum)							
<b>Direction of rotation</b>	Clockwise or Counterclockwise rotation, determined by Left/Right Hand mounting							
<b>Angular stroke</b>	95° ± 5° max. regulabile							
<b>End of stroke limits</b>	Stroke limiting device. Adjustable 30° to 95° with AM 689 installed (see accessories)							
<b>Damper shaft clamp</b>	Universal mounting clamp used for shafts up to 19mm diameter, 13mm square							
<b>Nominal damper area</b>	Up to 1.39m <sup>2</sup> based on 0.042 Nm per m <sup>2</sup> of damper area (but see damper manufacturer's specifications)							
<b>Position indicator</b>	Visual Indicator -5 to 90° (-5° is spring return position)							
<b>Running time (21°C)</b>								
<b>Motor operation</b>	<80s				<195s			
<b>Spring Return</b>	<40s				<30s			
<b>Temperature</b>								
<b>Storage</b>	-40T71°C							
<b>Operating</b>	-30T50°C							
<b>Humidity</b>	15 to 95%rh non-condensing							
<b>Protection class</b>	IP 30. IP 54 with conduit connector in the down position							
<b>Agency Listings</b>	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. 24-93. European Community: EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).							
<b>Application</b>	Two-position control from a thermostat, time switch or other switching device having a mains rated change-over contact.		Two-position control from a thermostat, time switch or other switching device having a 24V rated change-over contact.		Floating Point Control		Modulating control from any controller providing a 2-10Vdc positioning signal	

## TECHNICAL CHARACTERISTICS (15Nm Actuators)

Model	MA41-7051-G00	MA41-7051-G02	MA41-7053-G00	MA41-7053-G02	MF41-7053-G00	MF41-7053-G02	MS41-7053-G00	MS41-7053-G02
<b>Power supply</b>								
Voltage	230Vac ±10%		24Vac ± 20%		24Vac ± 20%		24Vac ± 20%	
VA (60Hz)	11.1		10.4		16.9		13.0	
VA (50Hz)	15.0		10.8		16.9		14.7	
Watts (running)	8.6		6.5		8.0		6.4	
Watts (holding)	4.1		2.2		2.6		1.9	
<b>Electrical connections</b> 0,9m cable								
<b>Auxiliary switches</b> Only for G02: 2 SPTD 7A (2,5A) @ 230Vac, one fixed @ 5° and one adjustable 25 to 85°.								
<b>Input control signal</b> On-off, spring return. SPST control contacts or Triacs (500mA rated). 2÷10Vcc @ 80kΩ or 4-20mAcc @ 500Ω								
<b>Action</b> Open/Close with single pole contact control Floating Point Control Proportional Modulation Control								
<b>Position feedback</b> MS41-7073: 2 to 10Vdc (max. 0.5mA) output signal for position feedback or to operate up to four additional slave actuators								
<b>Output torque</b> 15Nm (minimo)								
<b>Direction of rotation</b> Clockwise or Counterclockwise rotation, determined by Left/Right Hand mounting								
<b>Angular stroke</b> 95° ± 5° max. regolabile								
<b>End of stroke limits</b> Stroke limiting device. Adjustable 30° to 95° with AM 689 installed (see accessories)								
<b>Damper shaft clamp</b> Universal mounting clamp used for shafts up to 19mm diameter, 13mm square								
<b>Nominal damper area</b> Up to 1.39m2 based on 0.042 Nm per m2 of damper area (but see damper manufacturer's specifications)								
<b>Position indicator</b> Visual Indicator -5 to 90° (-5° is spring return position)								
<b>Running time (21°C)</b>								
<b>Motor operation</b> <190s								
<b>Spring Return</b> <30s								
<b>Temperature</b>								
<b>Storage</b> -40T71°C								
<b>Operating</b> -30T50°C								
<b>Humidity</b> 15 to 95%rh non-condensing								
<b>Protection class</b> IP 30, IP 54 with conduit connector in the down position								
<b>Agency Listings</b> 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. 24-93. European Community: EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).								
<b>Application</b>		Two-position control from a thermostat, time switch or other switching device having a mains rated change-over contact.		Two-position control from a thermostat, time switch or other switching device having a 24V rated change-over contact.		Floating Point Control		Modulating control from any controller providing a 2-10Vdc positioning signal

### ACCESSORIES

**AM689** Rotation limiting device used to limit angle of rotation from 30° to 95° in steps of 10°.

### OPERATION

#### WARNING:

These are spring return actuators. Keep clear of all moving parts at all times.

The direction of the spring return function and motor operation of all models is determined by left hand or right hand mounting onto the damper.

All actuators are directly mounted onto the damper shaft using a universal mounting clamp and provide true mechanical spring return operation for reliable, positive close-off on air tight dampers. When the power is applied, the actuator moves to its powered position, at the same time tensing the spring return safety mechanism. When the power is removed, the spring returns the actuator to its normal position. The spring return system provides consistent torque to the damper with and without power applied to the actuator. All actuators provide 95° of rotation and are equipped with a graduated position indicator showing -5 to 90°.

Some models are provided with two built-in auxiliary switches. The SPTD switches are provided for interfacing or signalling, 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°.

### INSTALLATION AND MOUNTING

The actuator is fitted directly to the damper and the clamp tightened securely to the damper shaft. A universal anti-rotation bar is supplied with each actuator and must be fitted to prevent rotation during operation.

A stroke limiting device is available (see accessories).

### Precautions (General)

#### Warnings

MA41-7071 and MA41-7151 series actuators operate at mains voltage and therefore present a possible electrical shock hazard. Disconnect the power supply before and during installation to prevent electric shock and equipment damage. Observe local wiring regulations and earthing requirements.

If auxiliary switches are fitted and used at mains voltage, observe local wiring regulations, earthing requirements and all usual electric shock safety precautions.

#### Cautions

Where screening is required, use either screened cable or MICC. Use an isolator with a minimum contact gap of 3mm (conforming to EN 60335-1) to isolate the MA41-7071 series actuators from the main supply.

MA41-7XX1 MF41-7XX3 and MS40-7XX3 series actuators must be connected to 24Vac via a safety transformer conforming to EN 60742.

Avoid electrical noise interference. Do not install near large contactors, electrical machinery or welding equipment.

For application requiring flexible metal conduit, use reduced (thin) wall types only.

Do not exceed rating of the device(s).

#### 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 the interference will not occur in a particular situation - 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:

- re-orient or relocate the receiving antenna;
- increase the separation between the equipment and the 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.

European Standard EN55022

Caution: This is a Class B digital (European Classification) product.

**Location**

Cautions

Avoid locations where excessive moisture, corrosive fumes, vibration, or explosive vapours are present.

The actuator should only be mounted 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.

Before mounting the actuator, determine the direction of rotation and take into account the length of the damper shaft. These are covered in the following section.

**Mounting**

Caution

To remain in IP 54 compliance, these actuators should be mounted with the conduit end down.

Note: The zero (0) position on the position indicator is the normal or spring return position. When the actuator is mounted with the 'R' side facing the installer and the control system initiates actuator movement (either by applying the appropriate voltage, increasing the control signal or by driving the actuator open, as appropriate), the actuator will rotate in the counterclockwise direction. Similarly, when the actuator is mounted with the 'L' side facing the installer and the control system calls for actuator movement, the actuator will rotate in the clockwise direction.

1. Move the damper to its normal position. Check that the controller action is set to match the damper application, as follows:
  - For normally closed damper - when damper is closed, actuator position indicator should be approximately 0°. When damper is open, the actuator position indicator should be approximately 90°.
  - For normally opened damper - when damper is open, actuator position indicator should be approximately 0°. When damper is closed, the actuator position indicator should be approximately 90°.

Note: The actuator is usually shipped with the universal mounting clamp mounted to the 'L' side of the actuator.

2. Determine the direction of rotation required by the damper application and ensure that the clamp is on the correct side; if the clamp is not on the correct side, remount it as follows:
  - Find the letters 'R' and 'L' on opposite tabs on the clamp.
  - If mounting the actuator with the 'L' side out, position

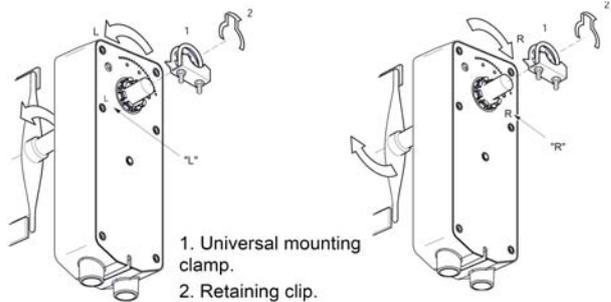
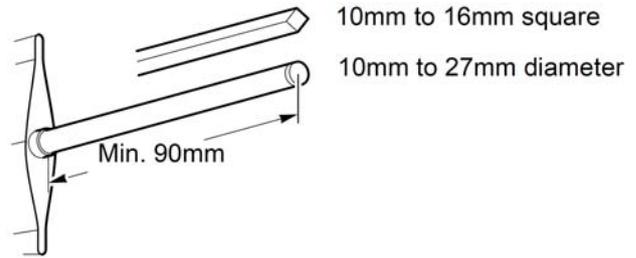
the clamp so that the pointer section of the tab with the 'L' is positioned at 0 and the spline pattern of the clamp mates with the spline of the actuator. Slip the clamp over the spline.

- If mounting the actuator with the 'R' side out, use the same procedure as for the 'L' side out, but use the 'R' tab instead of the 'L' tab.
3. Test for adequate shaft length by sliding the actuator over the shaft. The shaft should extend at least 3mm through the clamp. Long shafts should be at least 90mm, in which case the clamp should be fitted on the installer's side of the actuator, and short shafts should be at least 20mm, in which case the clamp should be fitted to the damper side of the actuator.

Note: All actuators are shipped with a standard universal mounting clamp installed.

4. On the basis of the shaft length, continue as follows.

**Long Damper Shaft Mounting**



Clockwise motor drive

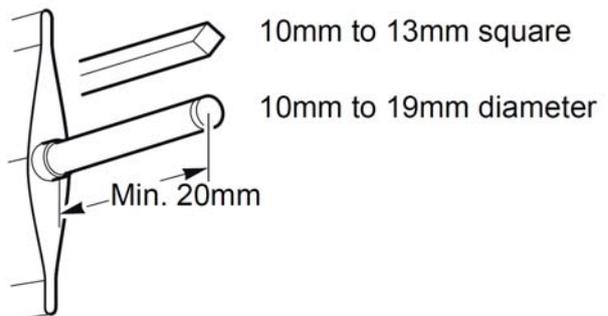
Counterclockwise spring return

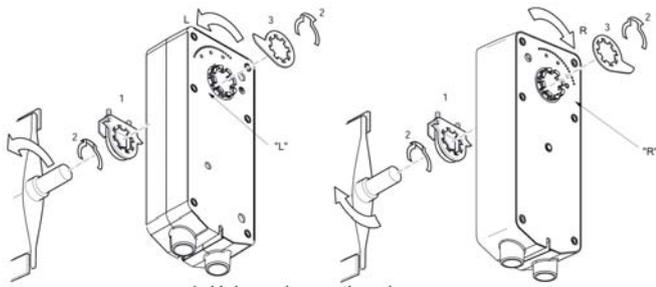
Counterclockwise motor drive

Clockwise spring return

- Secure the universal mounting clamp to the actuator using the retaining clip.
- Position the damper at its normal (spring return) position and check that it is fully closed or completely open.
- Continue from Step 5.

**Short Damper Shaft Mounting**





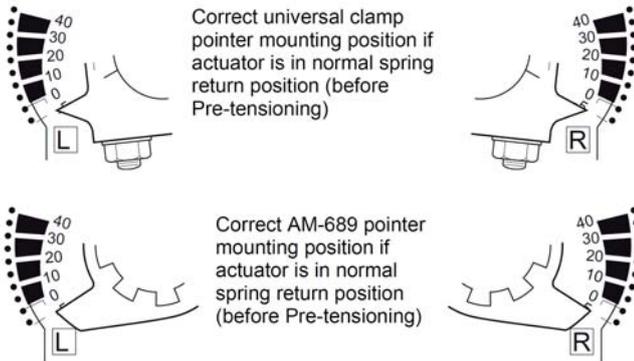
1. Universal mounting clamp.
2. Retaining clip.
3. Damper position indicator

Clockwise motor drive                      Counterclockwise motor drive  
 Counterclockwise spring return        Clockwise spring return

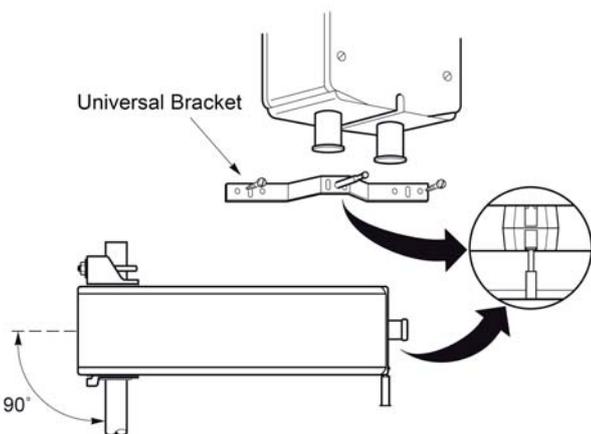
- Determine the best orientation for the universal mounting clamp on the back of the actuator. The best orientation provides the easiest access to the two nuts on the V-clamp.
- Engage the clamp to the actuator as close as possible to the determined orientation, then lock the clamp in place using the remaining retainer clip.
- Place position indicator on the actuator and secure with the retainer clip. Ensure that the position indicator is at the before Pre-tensioning position (see following illustration).
- Position the damper at its normal (spring return) position and check that it is fully closed or completely open.

**Position Indication and Pre-tensioning**

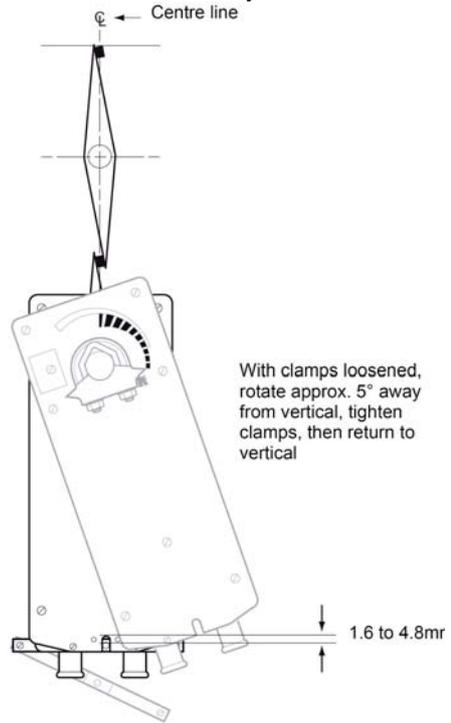
5. Slide the actuator over the shaft and verify that the position indication pointer on the universal mounting clamp is in the normal spring return position.
6. Tighten the universal mounting clamp, finger tight only.



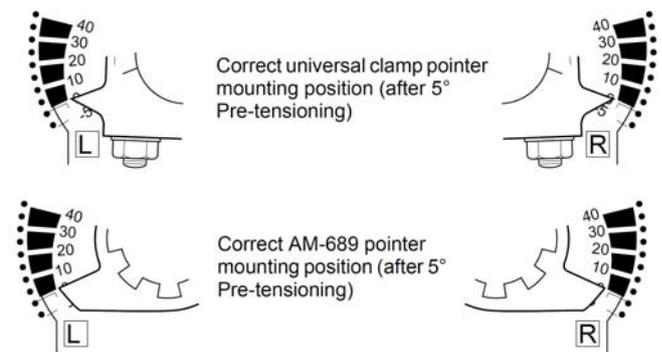
7. Align the universal bracket at the base of the actuator and drill mounting holes. Bend the bracket as needed to reach the duct.



8. Place a M8 self-tapping screw in one side of the universal bracket and mount it the duct at the base of the actuator. Do not tighten the screw.
9. Pivot the universal bracket away from the actuator.



10. Loosen the universal mounting clamp (making sure not to move the damper shaft) and rotate the actuator approximately 5° in the direction which would open the damper.
11. Tighten the universal mounting clamp to the shaft, ensuring that it is in the correct mounting position.
12. Manually rotate the actuator to align with universal bracket.
13. Pivot the universal bracket into place and secure both sides.
14. Tighten all fasteners. Tighten the two nuts on the clamp using a 7/16" spanner or socket and apply 8.2 to 10.8 Nm of torque.
15. Check that the universal clamp (or AM-689) pointer mounting position is at 5°.
16. Check that the universal mounting clamp (or AM-689) pointer mounting position is at 5° (see following illustration).



**Jackshaft Installation (MA41-7XXX, MF41-7XX3, MS41-7XX3 Series)**

The MA41-7XXX, MF41-7XX3 and MS41-7XX3 series actuators are designed for use with jackshafts up to 27mm in diameter. In most applications, the actuator may be mounted in the same manner as a standard damper shaft application.

## Manual Override

### Cautions

Only use Manual Override when the actuator drive motor is not powered. Engaging the manual override when the actuator is powered will cause damage to the gears.

Using power tools to adjust the override will cause damage to the gears.

Note: Avoid manually repositioning the actuator beyond its adjustable travel limit setting.

The actuator can be manually positioned to ease installation or for emergency positioning as follows:

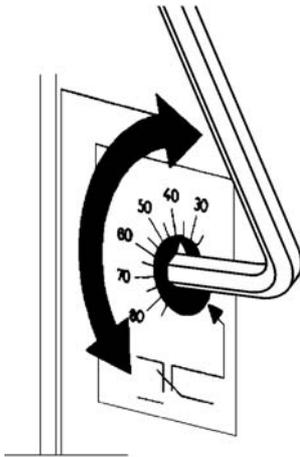
1. Using a small flat bladed screwdriver, set the locking screw to the unlocked position.
2. Insert the hexagonal wrench (supplied) into the hexagonal hole located at the centre of the actuator.
3. To engage manual override, turn the hexagonal wrench in the direction shown on the label. Set the locking screw back to the locked position.
4. Manual override is automatically disengaged by applying power to the drive open or drive closed. The actuator automatically disengages the override function and goes to the controller's desired position.

### Adjusting an Auxiliary Switch (where fitted)

The MA41-7XXX-G02, MF41-7XX3-G02 and MS41-7XX3-G02 actuators include two built-in SPDT auxiliary switches which can be used for interfacing or signalling (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.

To make an adjustment:

1. The actuator must be in its normal (spring return) position.
2. Insert a 3mm hexagonal wrench into the hexagonal hole located in the centre 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°.



### Rotation Limitation

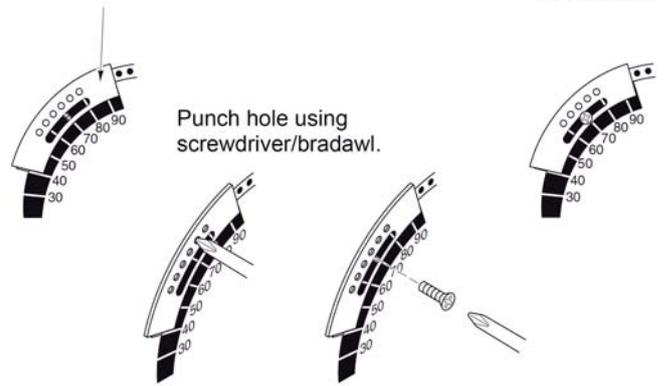
The AM-689 rotation limiter is used in conjunction with the tab on the universal clamp or the AM-686 position indicator which comes with the AM-689. In order to function properly, the clamp or indicator must be mounted correctly.

The AM-689 rotation limiter controls the actuator's rotational output and 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. It can also be used to provide a minimum damper position which is easily set, or changed, without removing the actuator from the 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.

Screw secured at these cross hairs.

Angle of rotation now set at 4



Securing the AM 689 Rotation Limiter

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 and the required control signal. Re-adjust if necessary.

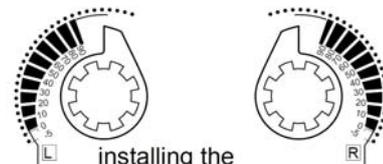
### Minimum Damper Positioning

Note: When using the AM-689 rotation limiter with an MF41-7XX3 actuator to provide a minimum damper position, the short shaft mounting procedure must be used to mount the actuator.

#### Caution

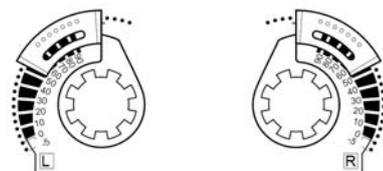
The AM-689 rotation limiter should not be used with an MF41-7XX3 actuator to provide a minimum damper position in outdoor air damper applications. The rotation limiter prevents the damper from reaching the fully-closed position and this may cause coils to freeze or may cause other system problems to occur.

1. Position the damper to its minimum position by applying power and the appropriate control signal to the or MF41-7XX3.
2. Place the position indicator onto the actuator spline in the approximate position shown. Fasten it with the retaining clip.



installing the Position Indicator

Positioning the Rotation Limitor



Note: The actuator mounting orientation is different than when mounting it for damper rotation limiting.

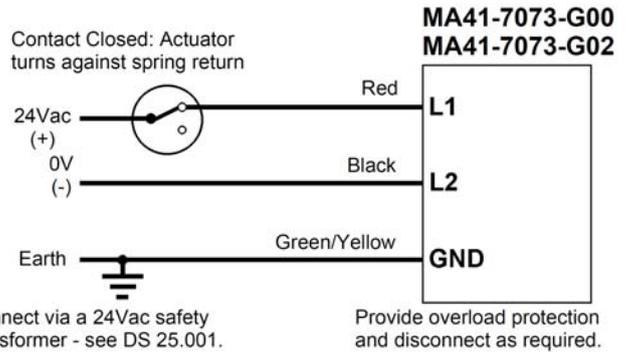
- Place the AM-689 rotation limiter on the actuator so that it either makes contact with, or is as close as possible to, the edge of the indicator.
- Make sure that the locating teeth are engaged into the locating holes on the actuator. If all of the mounting teeth do not align with the holes, the mounting location of the indicator to the spline may have to be moved. The rotation limiter would then be remounted to get the best position match of both parts.
- Find the cross-hair location through the slot of the rotation limiter. This is the mounting location for the retaining screw.
- Pierce through the label material to allow easy fastening of the retaining screw.
- Fasten the rotation limiter to the actuator using the self tapping screw provided.
- Test the damper by applying power and the required control signal. Re-adjust if necessary.

**WIRING CONNECTIONS**

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.

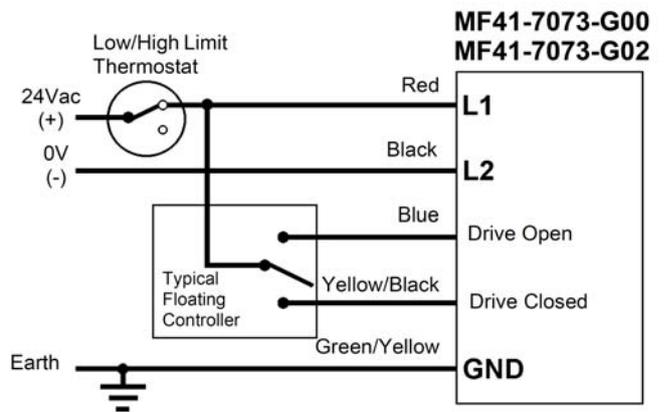
Model	Series	Max cable length (m)		
		14 AWG	16 AWG	18 AWG
24Vac	MA41-7073-G00	183	152	177
	MA41-7073-G02			
24Vac	MF41-7073-G00	183	122	76
	MF41-7073-G02			
24Vac	MS41-7073-G00	195	122	76
	MS41-7073-G02			
230Vac	MA41-7071-G00	18,837	11,857	24,4
	MA41-7071-G02			
24Vac	MA41-7153-G00	101	61	40
	MA41-7153-G02			
24Vac	MF41-7153-G00	91	61	40
	MF41-7153-G02			
24Vac	MS41-7153-G00	116	73	46
	MS41-7153-G02			
230Vac	MA41-7151-G00	10,363	6,553	4,115
	MA41-7151-G02			

**TWO POSITION CONTROL - 24V**



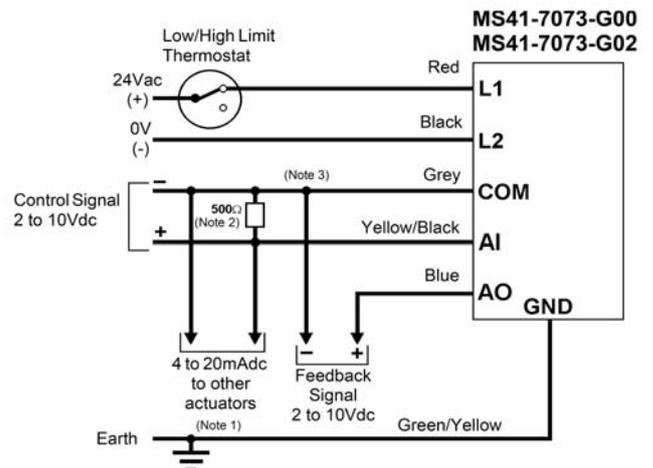
Parallel connection of several actuators is possible. Observe power consumption.

**FLOATING POINT CONTROL - 24V**



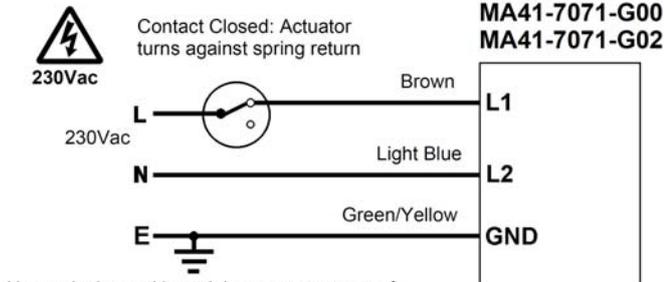
Connect via a 24V safety transformer - see DS 25.001. Provide overload protection and disconnect as required.

**MODULATING CONTROL (2-10Vdc/4 to 20mAdc)**



Connect via a 24V safety transformer - see DS 25.001. Provide overload protection and disconnect as required.

**TWO POSITION CONTROL - 230V**



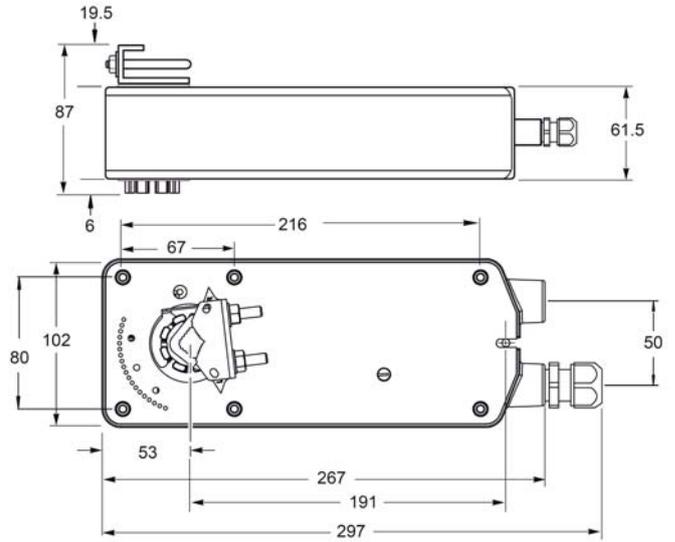
Use an isolator with a minimum contact gap of 3mm (conforming to EN 60335-1) to isolate the MA41-7071 series from the mains supply. Provide overload protection and disconnect as required.

Notes:

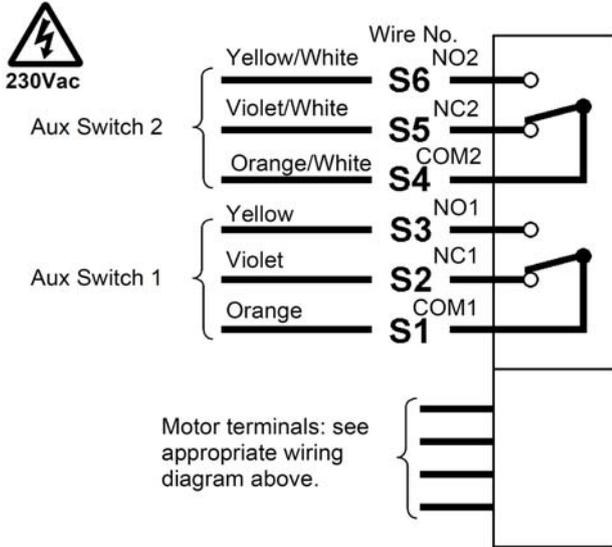
- Up to 4 actuators (mounted on separate shafts) may be connected in parallel. With four actuators mounted to one 500Ω resistor, a 2% shift of the control signal may be required. Power consumption must be observed.
- A 500Ω resistor converts the 2-10V signal to 4 to 20mA dc.
- Only connect the common (grey) to the negative leg of the control circuit.
- To reverse actuator rotation, use the reversing switch (MS40-7XXX).



OVERALL DIMENSIONS (mm)



AUXILIARY SWITCHES (IF FITTED)



Actuator types: MA41-7071-G02, MA41-7073-G02, MF41-7073-G02 and MS41-7073-G02 have two SPDT 7A (2.5A) 6A (1.5A) 230V auxiliary switches built-in for end position indication or system interlock functions.

Switching operating position: aux switch 1 5° fixed, aux. switch 2 adjustable 25° to 85°.

Use an isolator with a minimum contact gap of 3mm (conforming to EN 60335-1) to isolate the MA41-7071 series from the mains supply.

**WARNING :AUXILIARY SWITCHES MAYBE AT MAINS POTENTIAL.**



The performances stated in this sheet can be modified without any prior notice due to design improvements