Mx41-730x Series

SmartX Spring Return Damper Actuators

*

MA41-7303
MA41-7303-502
MA41-7300
MA41-7300-502
MS41-7303
MS41-7303-502*

MS41-7303-W02
MS41-7303-WH2

* MS41-7303-502 is shown (other part numbers are similar in appearance).
** The CE mark indicates RoHS2 compliance. Please refer to the CE Declaration of Conformity for additional details.

Product Description

The Mx41-730x-xxx series spring return SmartX Actuators are used with two-position and modulating controllers for positioning large dampers and other HVAC equipment.

MA41-730x-xxx Two-Position models are controlled by 24 Vac/Vdc (MA41-7303-xxx) or 100 … 240 Vac (MA41-7300-xxx).

MS41-7303-xxx Proportional models are controlled by 2 … 10 Vdc, or 4 … 20 mA with the addition of an optional AM-708 500 ohm resistor.

Features

- 270 lb-in (30 N-m) of torque with mechanical spring return and Brushless DC Motor
- Stall protected throughout rotation and reversible mounting
- Rugged die-cast housings rated for NEMA 2 / IP54, UL enclosure Type 2
- Optional models with rugged die-cast housings rated for NEMA 4 / IP66, UL enclosure Type 4
- Optional models with built-in auxiliary switches to provide for interfacing or signaling
- Direct mount to ½"… ¾" round or ½" … 11/16" square damper shafts or to ¾" … 1.05" round or to ½" … 11/16" square damper shafts with the field removal of a clamp insert
- 95° of rotation, adjustable with mechanical end stops and graduated position indicator showing 0° … 95°
- True mechanical clockwise or counterclockwise spring return operation for reliable operation and positive close-off in air-tight damper applications
- Switches on both actuator sides for selection of direct or reverse acting control mode (for MS41-7303-xxx proportional input signal models)
- Can be double-mounted (gang mounting) to accommodate high torque application requirements
- Manual override, hex crank and 9" (229 mm) long anti-rotation bracket included with actuator
- Shipped with 5° preload from the full spring return position to provide automatic compression against the damper gaskets for tight close-off

Available Products

Part Number	Description
MA41-7303	Two-position input, 24 Vac/Vdc, 50/60 Hz, NEMA 2 housing
MA41-7303-502	Two-position input, 24 Vac/Vdc, 50/60 Hz, two aux. switches, NEMA 2 housing
MA41-7300	Two-position input, 100 to 240 Vac, 100 … 125 Vdc, 50/60 Hz, NEMA 2 housing
MA41-7300-502	Two-position input, 100 to 240 Vac, 100 … 125 Vdc, 50/60 Hz, two aux. switches, NEMA 2 housing
MS41-7303	2 to 10 Vdc input, 24 Vac/Vdc, 50/60 Hz, NEMA 2 housing
MS41-7303-502	2 to 10 Vdc input, 24 Vac/Vdc, 50/60 Hz, two aux. switches, NEMA 2 housing
MS41-7303-W02	2 to 10 Vdc input, 24 Vac/Vdc, 50/60 Hz, two aux. switches, NEMA 4 housing
MS41-7303-WH2	2 to 10 Vdc input, 24 Vac/Vdc, 50/60 Hz, two aux. switches, NEMA 4 housing with heater

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Specifications

Input Power and Ratings

Part Number	Input Signal	Voltage	Transformer Sizing (VA)	Running Watts	Holding Watts	Approx. Timing in Seconds (Powered)	Approx. Timing in Seconds (Spring Return)	Aux. Sw.	NEMA 4	Heater
MA41-7303	Two Position	24 Vac ± 20%, 50/60 Hz, 24 Vdc +20%/-10%	16 VA [1]	9.5	4.5	75	<20 at -4 … 122 °F, <60 at -22 °F	-	-	-
MA41-7303-502	Two Position	24 Vac ± 20% 50/60 Hz, 24 Vdc +20%/-10%	16 VA [1]	9.5	4.5	75	<20 at -4 … 122 °F, <60 at -22 °F	2	-	-
MA41-7300	Two Position	100 to 240 Vac +10/-20% 50/60 Hz, 100 to 125 Vdc +10/-10%	21 VA at 100 Vac, 29 VA at 240 Vac	9.5	4.5	75	<20 at -4 … 122 °F, <60 at -22 °F	-	-	-
MA41-7300-502	Two Position	100 to 240 Vac +10/-20% 50/60 Hz, 100 to 125 Vdc + 10/-10%	21 VA at 100 Vac, 29 VA at 240 Vac	9.5	4.5	75	<20 at -4 … 122 °F, <60 at -22 °F	2	-	-
MS41-7303	2 to 10 Vdc[2, 3]	24 Vac ± 20% 50/60 Hz, 24 Vdc +20%/-10%	16 VA [1]	9.5	4.5	150[4]	<20 at -4 … 122 °F, <60 at -22 °F	-	-	-
MS41-7303-502	2 to 10 Vdc[2, 3]	24 Vac ± 20% 50/60 Hz, 24 Vdc +20%/-10%	16 VA [1]	9.5	4.5	150 [4]	<20 at -4 … 122 °F, <60 at -22 °F	2	-	-
MS41-7303-W02	2 to 10 Vdc[2, 3]	24 Vac ± 20% 50/60 Hz, 24 Vdc +20%/-10%	16 VA [1]	9.5	4.5	150 [4]	<20 at -4 … 122 °F, <60 at -22 °F	2	Yes	-
MS41-7303-WH2	2 to 10 Vdc[2, 3]	24 Vac ± 20% 50/60 Hz, 24 Vdc +20%/-10%	16 VA and 21 w/heater [1]	9.5 and 21 w/ heater	4.5	150 [4]	<20 at -4 … 122 °F, <60 at -40 °F w/heater	2	Yes	Yes

[1] Class 2 power source.
[2] 2 … 10 Vdc input signal has 100KΩ input impedance. Also compat ble with two-position 24 Vac/Vdc input signals. See MS41-7303-xxx Alternate Input Signals section in this document. Use optional AM-708 500 ohm resistor for 4 to 20 mA input signal.
[3] Also compat ble with floating, pulse width modulating (PWM), and other DC signal inputs with use of the BEL-ZTH US Handheld Interface Module for Field Programming.
[4] Timing field adjustable from 60 … 150 seconds with use of the BEL-ZTH US Handheld Interface Module for Field Programming.

Optional Input Signals MS41 models only	Floating, Pulse width modulating (PWM), Adjustable start point, and Span DC signal inputs with use of the BEL-ZTH US handheld interface module for field programming
Electrical Connections MA41-7303, MA41-7300, MS41-7303	3' appliance cord with 18 Ga. (0.9 mm) conductors and one 1/2" conduit connector
MA41-7303-502, MA41-7300-502, MS41-7303-502	3' appliance cord with 18 Ga. (0.9 mm) conductors and two 1/2" conduit connectors
MS41-7303-W02, MS41-7303-WH2	Removable terminal blocks for 12 (3.4 mm) to 22 (0.4 mm) Ga. wire inside junction box with six 1/2" knockouts
Electrical Outputs Position Feedback, MS41-7303, MS41-7303-502, MS41-7303-W02, MS41-7303-WH2	2 … 10 Vdc, 0.5 mA max, adjustable with optional BEL-ZTH US Handheld Interface Module for Field Programming
Auxiliary Switches, MA41-7303-502, MA41-7300-502, MS41-7303-502	2 SPDT 3 A (0.5 A) @ 250 Vac, UL approved, one fixed at 10°, one adjustable from 10° … 85°
Auxiliary Switches, MS41-7303-W02, MS41-7303-WH2	2 SPDT 3 A (0.5 A) @ 250 Vac, UL approved, one fixed at 10°, one fixed at 85°

Mechanical Stroke	Angle of rotation 95° max. (adjustable with integral end stop 35° … 95°)
Damper Shaft Clamp Size	1/2" … 3/4" round or 1/2" to 11/16" square damper shafts or to 3/4" … 1.05" round or to 1/2" … 11/16" square damper shafts with the field removal of a clamp and hub insert
Position Indicator	Graduated position indicator showing 0° … 95°; 0° is full spring return position
Nominal Damper Area	Actuator sizing should be done in accordance with damper manufacturer's specifications
Direction of Actuator Rotation	Clockwise or counterclockwise determined by the actuator mounting
Manual Override	Actuators provided with 5 mm hex crank (3/16" Allen)
Input Signal Action Switch MS41-7303, MS41-7303-502, MS41-7303-W02, MS41-7303-WH2	Provides selectable reverse acting/direct acting actuator rotation, accessible from both sides
Enclosure	Double insulated rugged aluminum die-cast and plastic casing

Weight MA41-7303, MA41-7300, MS41-7303 MA41-7303-502, MA41-7300-502, MS41-7303-502, MS41-7303-W02, MS41-7303-WH2	9.82 lbs. (4.45 kg) 10.14 lbs. (4.6 kg)
Environment Operating Temperature Range MA41-7303, MA41-7303-502, MA41-7300, MA41-7300-502, MS41-7303, MS41-7303-502, MS41-7303-W02	 -22 … 122 °F (-30 to 50 °C)
Operating Temperature Range MS41-7303-WH2 (with heater connected)	-40 … 122 °F (-40 to 50 °C)
Shipping and Storage Temperature Range	-40 … 176 °F (-40 to 80 °C)
Operating Humidity Range	0 … 95% non-condensing
Location MA41-7303, MA41-7303-502, MA41-7300, MA41-7300-502, MS41-7303, MS41-7303-502 MS41-7303-W02, MS41-7303-WH2	 NEMA 2 (IP 54) Enclosure Type 2 NEMA 4 (IP 66) Enclosure Type 4
Noise Level MS41-7303, MS41-7303-502, MS41-7303-W02, MS41-7303-WH2 MA41-7303, MA41-7303-502, MA41-7300, MA41-7300-502	≤ 45.3 dB (A) motor @ 150 seconds, run time dependent ≤ 71.4 dB (A) spring return ≤ 56.5 dB (A) motor @ 75 second ≤ 71.4 dB (A) spring return

Accessories

AM-708	500 ohm resistor kit to replace 4 … 20 mA input signals to 2 … 10 Vdc signals
AM-801	Mx41-730x-xxx actuator crank arm kit
AM-802	Mx41-730x-xxx actuator crank arm kit with actuator mounting brackets, two ball joints, and fasteners
AM-803	9-3/4” damper shaft extension for 5/16” … 1” diameter round shafts
BEL-ZTH US	Handheld interface module for field programming
AM-804	Jackshaft linkage (requires AM-805 support plate – order separately)
AM-805	Support plate for AM-804 used with Mx41-730x-xxx actuators

Agency Listings

cULus according to UL60730-1A/-2-14, CAN/CSA E60730-1:02, CE according to 2004/108/EC & 2006/95/EC, Rated Impulse Voltage 2.5kV for 100-240 Vac models (800V for 24 Vac models), Type of action 1.AA (1.AA.B for actuators with auxiliary switches)

Precautions

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK

- Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Read, understand and follow the instructions before installing this product.
- Turn off all power supplying equipment before working on or inside the equipment.
- Use a properly rated voltage sensing device to confirm power is off.

DO NOT DEPEND ON THIS PRODUCT FOR VOLTAGE INDICATION

Failure to follow these instructions will result in death or serious injury.

A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and the installation, and has received safety training to recognize and avoid the hazards involved. NEC2011 Article 100

No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

NOTICE

RISK OF EQUIPMENT DAMAGE

- Avoid electrical noise interference.
- Do not install near large contactors, electrical machinery, or welding equipment.
- Only use manual override when power is off.
- Do not use manual override with actuators mounted in tandem.

Failure to follow these instructions will result in damage to the gear train or other mechanical damage.

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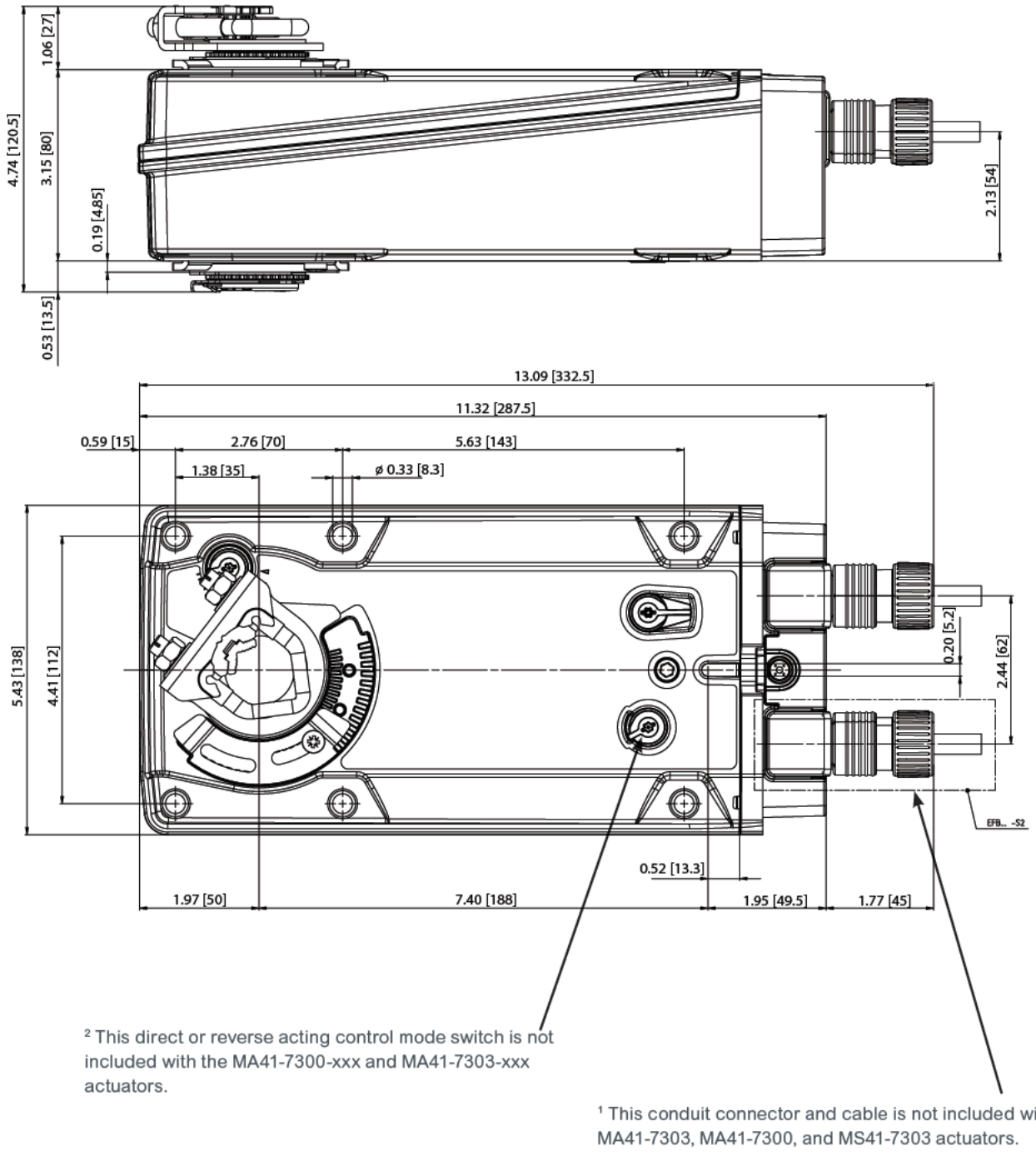
Dimensions

(inch [mm])

NEMA 2 models:

MA41-7303[1,2] MA41-7303-502[2], MA41-7300[1,2], MA41-7300-502[2], MS41-7303[1], MS41-7303-502



[2] This direct or reverse acting control mode switch is not included with the MA41-7300-xxx and MA41-7303-xxx actuators.

[1] This conduit connector and cable is not included with the MA41-7303, MA41-7300, and MS41-7303 actuators.

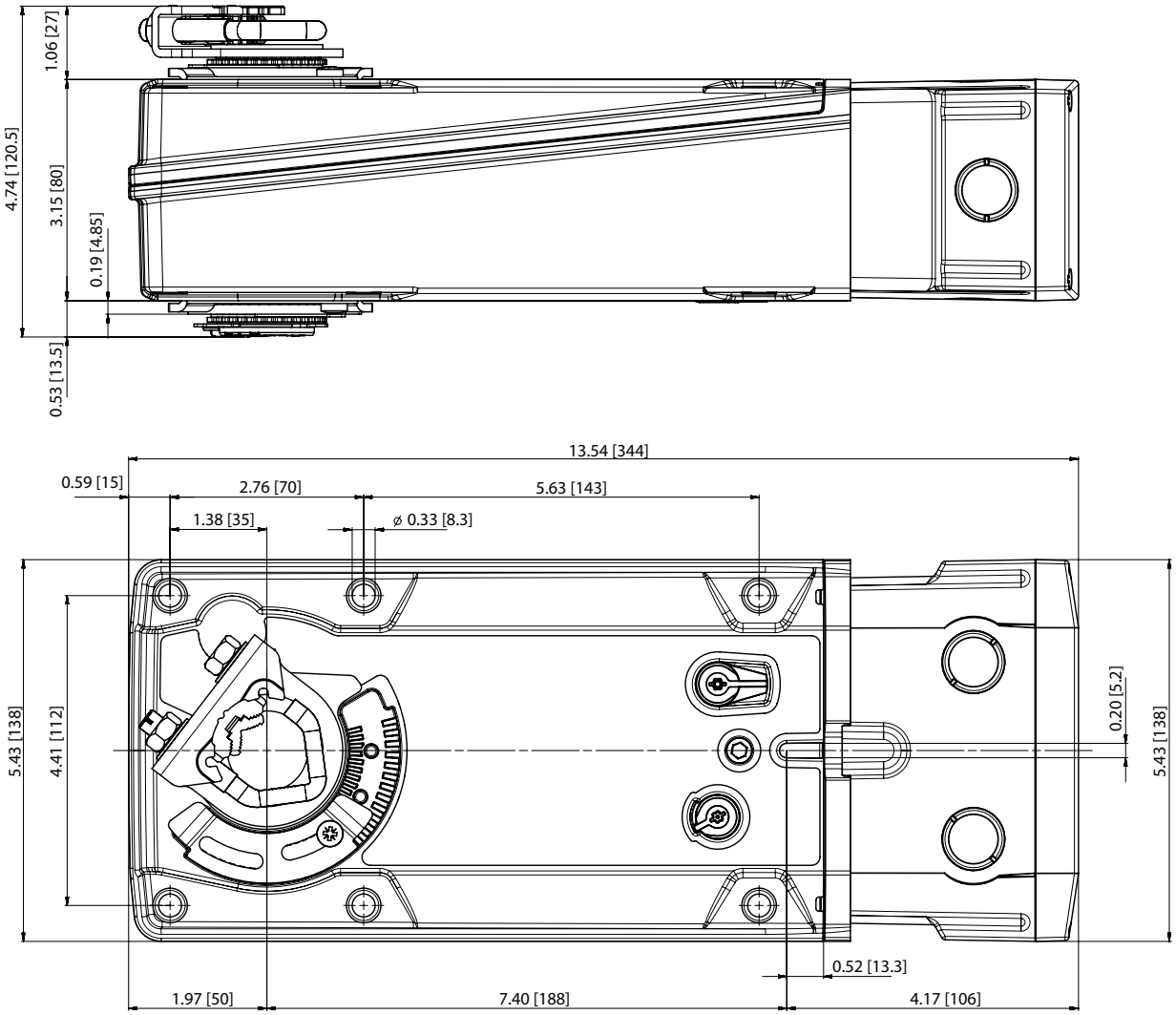
Note: The above view is with the CCW actuator side facing upward.

Dimensions

(inch [mm])

NEMA 4 models:

MS41-7303-W02, MS41-7303-WH2



Note: The above view is with the CCW actuator side facing upward.

Installation

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 (not provided with actuator):

- 13 mm hex socket
- Torque wrench
- Appropriate screwdriver(s)
- Drill and appropriate bits
- Sheet metal screws
- Appropriate accessories
- Job wiring diagrams

Installation Notes for MA41-7303, MA41-7303-502, MA41-7300, MA41-7300-502, MS41-7303, MS41-7303-502

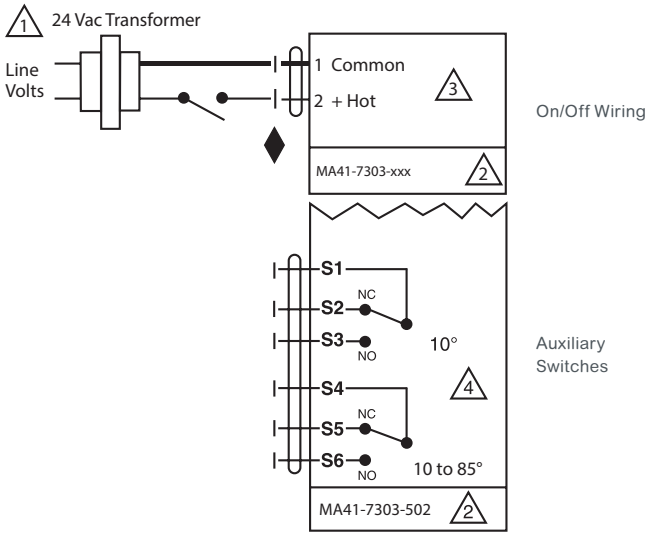
- Use flexible metal conduit.
- Push the UL listed conduit fitting device over the actuator's cable to butt against the enclosure.
- Screw in conduit connector.
- Jacket the actuator's input wiring with UL listed flexible conduit.
- Properly terminate the conduit in a suitable junction box.

Installation Notes for MS41-7303-W02, MS41-7303-WH2

- Use 60 °C/75 °C copper (Cu) conductor and wire size range 12 (0.9 mm) to 26 (0.4 mm) Ga., stranded or solid.
- If conduit is used, use UL listed and CSA certified watertight flexible metal conduit, strain relief, and conduit fitting suitable for outdoor applications, rated NEMA type 4, 4X, 6 or 6X or watertight.

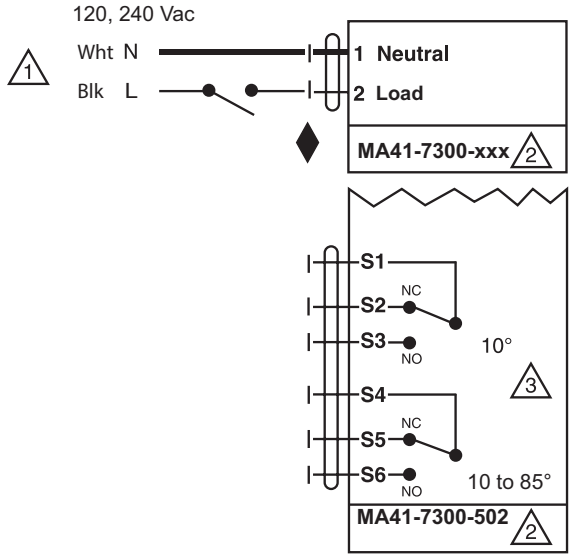
Wiring

MA41-7303, MA41-7303-502 Two Position Wiring (24 V)



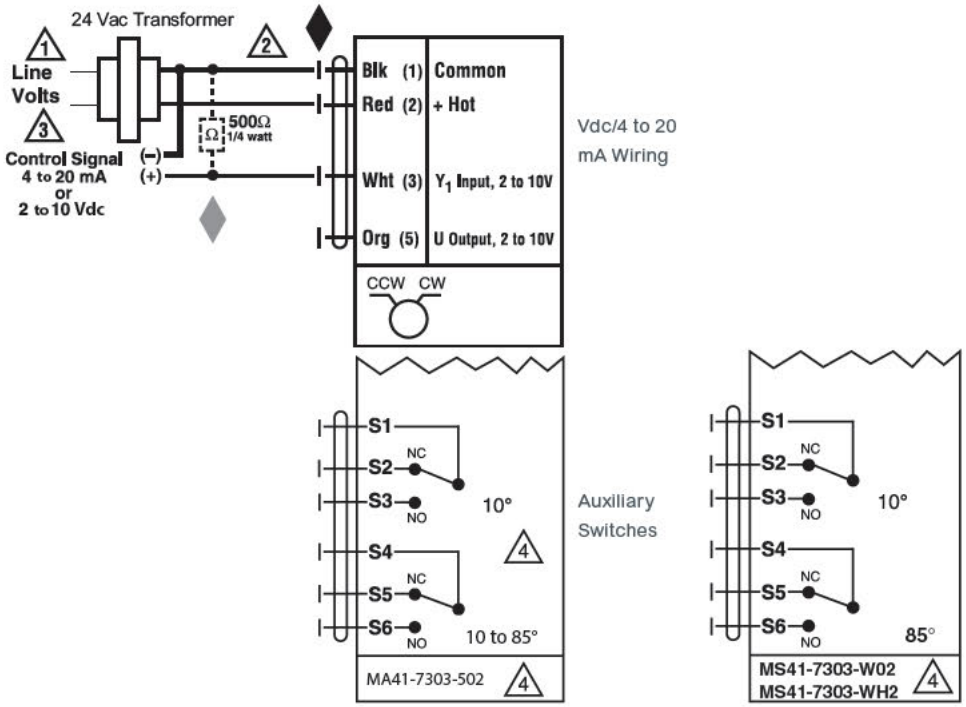
1	Provide overload protection and disconnect as required.
2	Actuators may be connected in parallel. See the Mounting Multiple Actuators on a Common Jackshaft section for complete information. Observe power consumption and input impedance.
3	Actuators may also be powered by 24 Vdc.
4	For end position indication, interlock control, fan startup, etc., MA41-7303-502 incorporates two built-in auxiliary switches: 2x SPDT, 3 A (0.5 A) @ 250 Vac, UL approved. One switch is fixed at +10° and one is adjustable from 10° … 85°.
♦	Meets cULus requirements without the need of an electrical ground connection.

MA41-7300, MA41-7300-502 Two Position Wiring (Line Voltage)

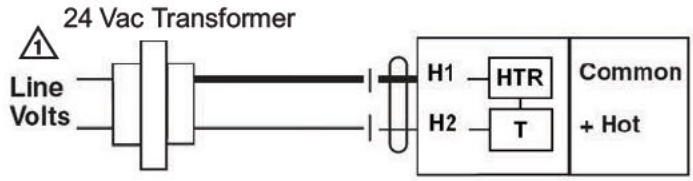


1	Provide overload protection and disconnect as required.
2	Actuators may be connected in parallel. See the Mounting Multiple Actuators on a Common Jackshaft section for complete information. Observe power consumption and input impedance.
3	For end position indication, interlock control, fan startup, etc., MA41-7300-502 incorporates two built in auxiliary switches: 2x SPDT, 3 A (0.5 A) @ 250 Vac, UL approved. One switch is fixed at +10° and one is adjustable from 10° … 85°.
♦	Meets cULus requirements without the need of an electrical ground connection.

MS41-7303-xxx Proportional Wiring (One Actuator per Jackshaft)



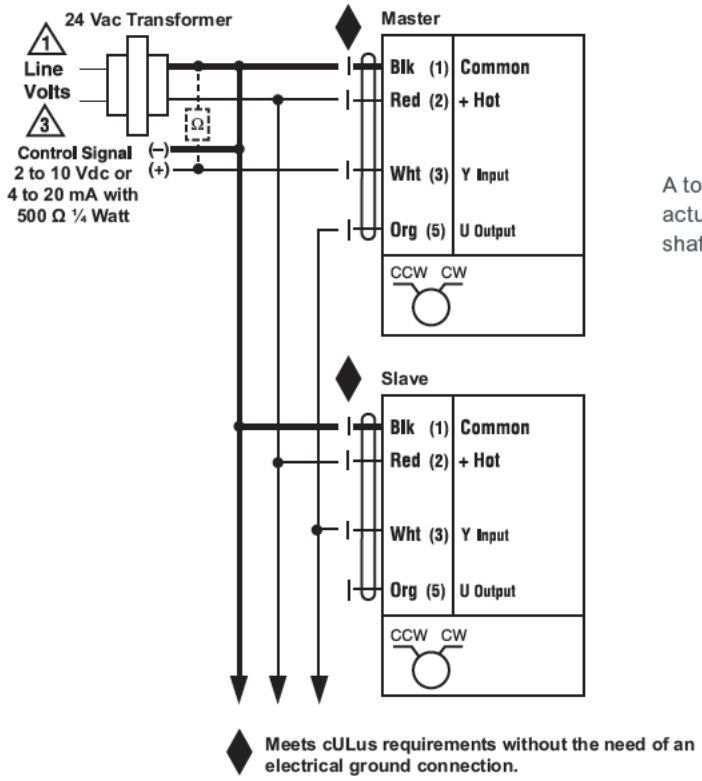
MS41-7303-WH2 Additional Wiring to NEMA 4 Heater



Connect the NEMA 4 heater for low temperature operation down to -40°C (-40°F).

1	Provide overload protection and disconnect as required.
2	Actuators may be connected in parallel. See the Mounting Multiple Actuators on a Common Jackshaft section for complete information. Observe power consumption and input impedance.
3	Actuators may also be powered by 24 Vdc.
4	For end position indication, interlock control, fan startup, etc., MS41-7303-502 incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @ 250 Vac, UL Approved, one switch is fixed at +10°, one is adjustable 10 … 85°. MS41-7303-W02 and MS41-7303-WH2 incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @250 Vac, UL Approved, one switch is fixed at +10°, the other is fixed at 85°.
◆	The AM-708 500 Ohm resistor may be used.
◆	Meets cULus requirements without the need of an electrical ground connection.

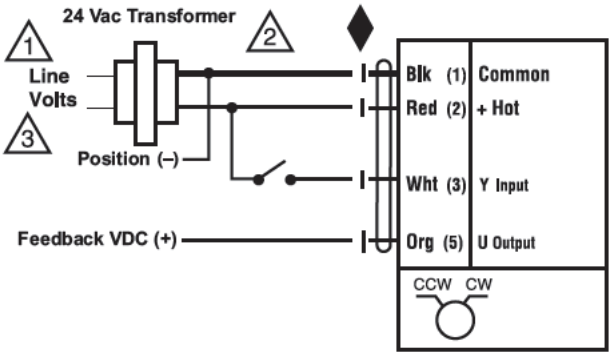
MS41-7303-xxx Proportional Wiring (More than One Actuator per Jackshaft)



A total of three MS41-7303-xxx actuators can be used on a 1" damper shaft.

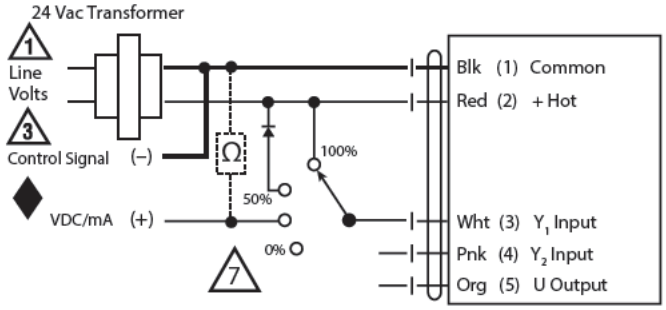
See the Multiple Actuators on a Common Jackshaft Mounting Section for more information

MS41-7303-xxx Two Position Wiring (24 V SPST Switch or Controller Output)



1	Provide overload protection and disconnect as required.
2	Actuators may be connected in parallel. See the Mounting Multiple Actuators on a Common Jackshaft section for complete information. Observe power consumption and input impedance.
3	Actuators may also be powered by 24 Vdc.
◆	Meets cULus requirements without the need of an electrical ground connection.

MS41-7303-xxx Proportional Wiring (with Forced Override Inputs)



Functions		a	b	c
Min	0% ◁			
Mid	50% ◁			
Max	100% ◁			
Normal	Control mode acc. to Y_1 ◁			

7	A 500 Ω resistor converts the 4 to 20 mA control signal to 2 to 10 Vdc

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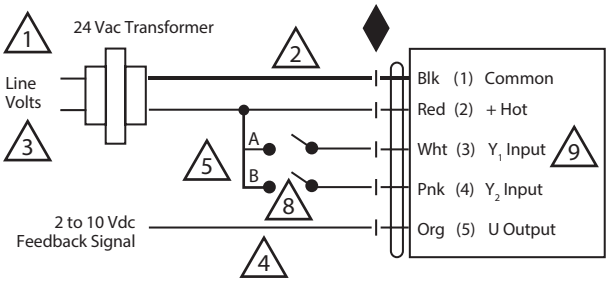
MS41-7303-xxx Alternate Input Signals

These require field programming of the actuator. The floating, PWM, and DC voltages (other than 2 … 10 Vdc) input signals require actuator re-configuration with the BEL-ZTH US.

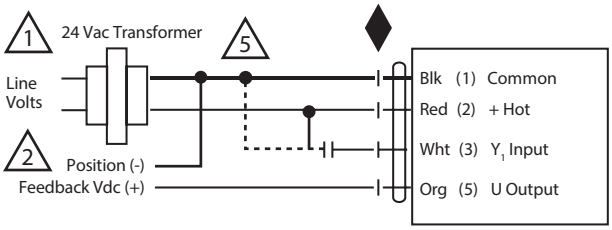
MS41-7303-xxx Four Wire Floating Sourced (Floating Point Control)*



* Requires field actuator input signal re-configuration

1	Provide overload protection and disconnect as required.
2	Actuators may be connected in parallel. See the Mounting Multiple Actuators on a Common Jackshaft section for complete information. Observe power consumption and input impedance.
3	Actuators may also be powered by 24 Vdc.
4	For end position indication, interlock control, fan startup, etc., MS41-7303-502 incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @250 Vac, UL Approved, one switch is fixed at +10°, one is adjustable 10 … 85°. MS41-7303-W02 and MS41-7303-WH2 incorporates two built-in auxiliary switches: 2 x SPDT, 3A (0.5A) @250 Vac, UL Approved, one switch is fixed at +10°, the other is fixed at 85°.
5	Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 Vac line.
8	Contact closures A & B also can be Vac triacs. Close both A & B for triac source and open them for triac sink.
9	For triac sink, connect the common connection from the actuator to the hot connection of the controller.
◆	Meets cULus requirements without the need of an electrical ground connection.

MS41-7303-xxx PWM*



* Requires field actuator input signal re-configuration for PWM ranges 0.59 … 2.93 sec, 0.02 … 5 sec, 0.1 … 25.5 sec, or adjustable 0.02 … 50.0 sec

A PWM input signal can control two MS41-7303–xxx actuators connected on a common jackshaft by configuring the master actuator with a PWM input and 2 … 10 Vdc position output and connecting the position output signal into the input of the MS41-7303–xxx slave actuator configured with a 2 … 10 Vdc input signal.

1	Provide overload protection and disconnect as required.
2	Position feedback cannot be used with a triac sink controller. The actuators' internal common reference is not compatible.
5	Control signal may be pulsed from either the Hot (source) or the Common (sink) 24 Vac line.
◆	Meets cULus requirements without the need of an electrical ground connection.

MS41-7303-xxx Adjustable Start Point and Span DC Signal Configurations

The BEL-ZTH US Handheld Interface Module for field programming allows field configuration of the MS41-7303–xxx adjustable DC signal start point and span. Control input signal start point is adjustable from 0.5 … 30 Vdc and span is adjustable from 2.5 … 32 Vdc. Position feedback output signal start point is adjustable from 0 … 8 Vdc and span from 2 … 10 Vdc.

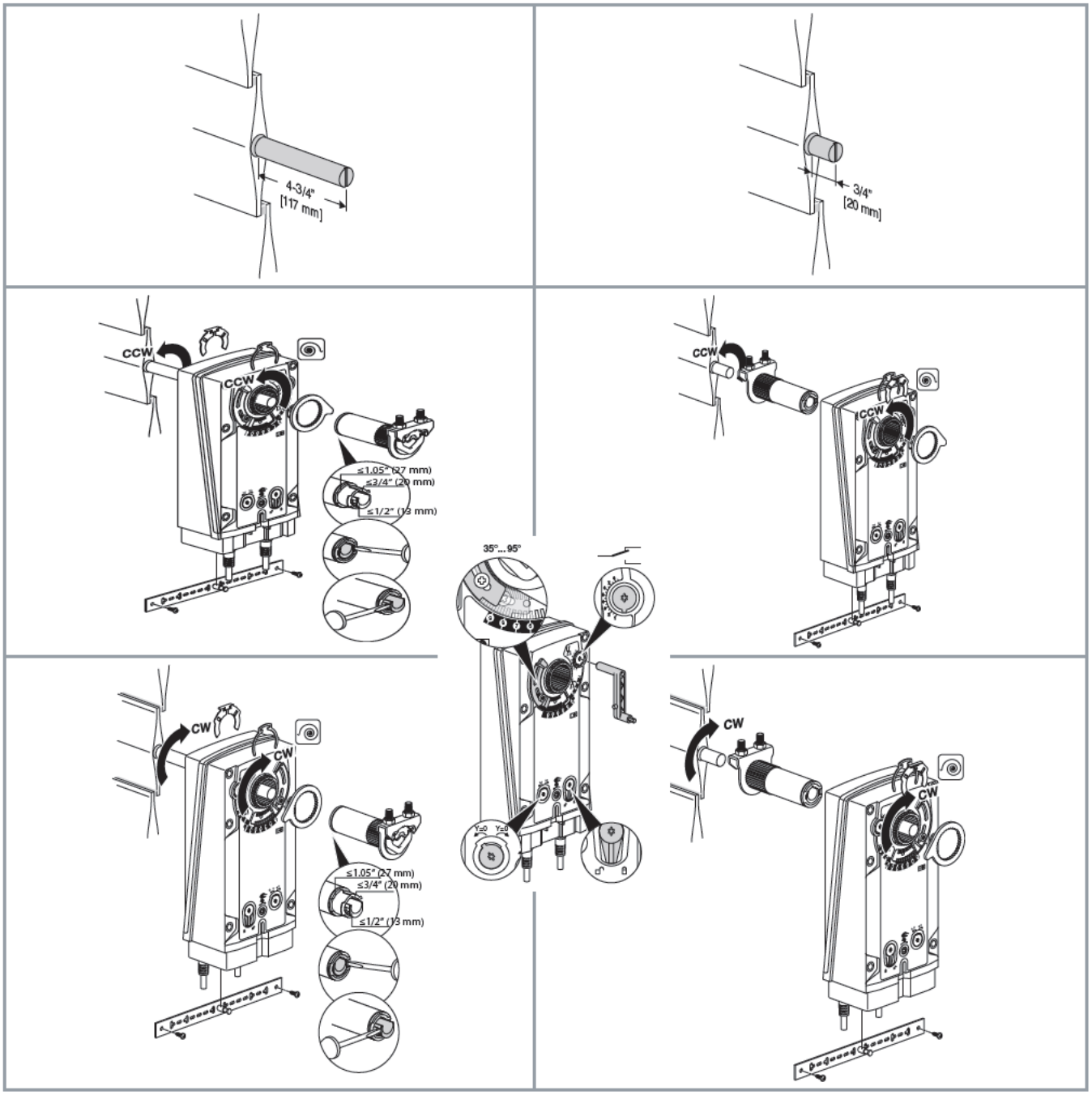
MS41-7303-xxx Other Configurations

The BEL-ZTH US Handheld Interface Module for field programming allows field configuration of the MS41-7303–xxx actuators' powered mechanical speed (adjustable from 60 … 150 seconds).

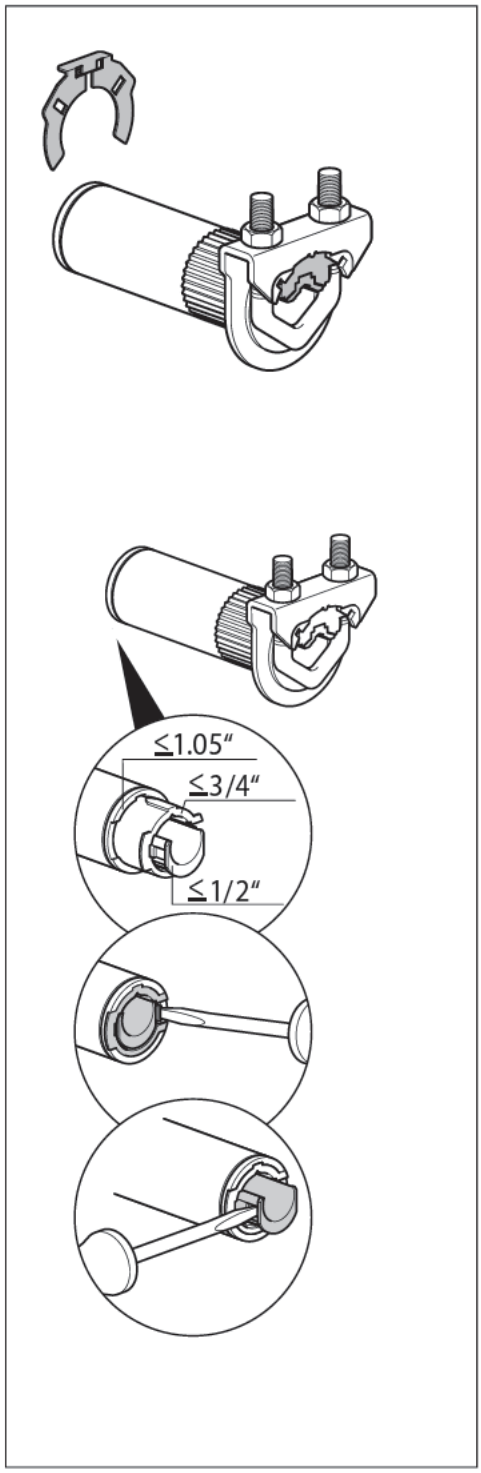
Mechanical Installation for all Models Visual Overview

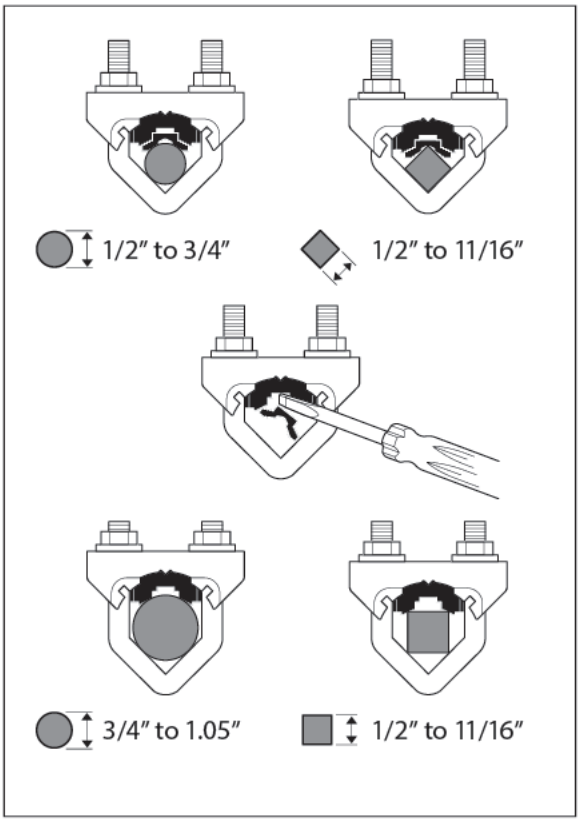
1. Rotate the damper to its desired unpowered position. If the shaft rotates counterclockwise, mount the “CCW” side of the actuator out. If it rotates clockwise, mount the actuator with the “CW” side out.
2. If the universal clamp is not on the correct side of the actuator, mount it onto the correct side.
3. Slide the actuator onto the shaft and tighten the nuts on the U-bolt with a 1/2” (13 mm) wrench to 11 ft-lb of torque or 18.5 ft-lb of torque for stainless steel shafts.
4. Slide the anti-rotation strap under the actuator so that it engages the slot at the base of the actuator. Secure the strap to the duct work with #8 self-tapping screws.

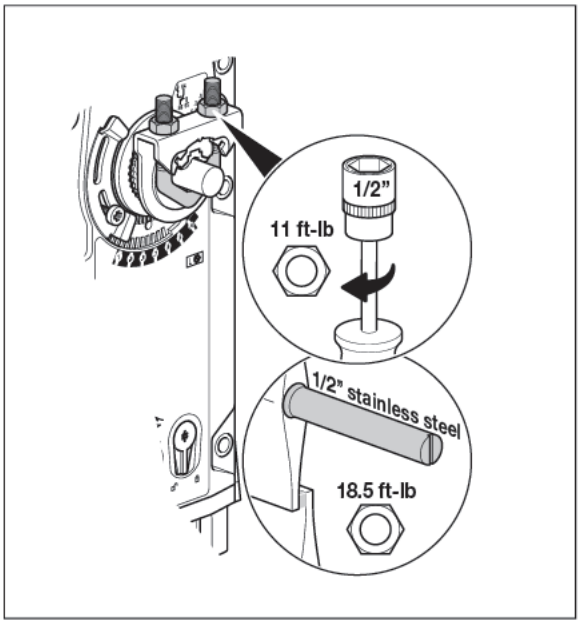
NOTE: Read the “Standard Mounting” instructions for more detailed information.



Damper Shaft Connection Visual Overview







General Information

Mount Mx41-730x-xxx series spring return SmartX Actuators in a dry, relatively clean environment free from corrosive fumes. Only the MS41-7303-W02 and MS41-7303-WH2 may be mounted outdoors without a protective enclosure.

For new construction work, order dampers with extended shafts. Instruct the installing contractor to allow space for mounting and service of the actuator installed on the shaft. The damper shaft must extend at least 4-¾" from the duct. If the shaft extends less than 4-¾" or if an obstruction blocks access, the shaft can be extended with the AM-803 shaft extension accessory or the actuator may be mounted in its short shaft configuration.

Actuator 5° Preload and Manual Override Operation

The Mx41-730x-xxx series spring return SmartX actuators provides 95° of rotation and are provided with a graduated position indicator showing 0° ... 95°. The actuators have a unique built in manual positioning mechanism that allows the setting of any damper position within its 95° of rotation. A pre-tensioned spring automatically tightens the damper when power is applied to the actuator, compensating for damper seal deterioration. The actuators are shipped at +5° (5° from full spring return) to provide automatic compression against damper gaskets for tight shut-off. When power is applied, the manual mechanism is released and the actuator drives toward the full spring return position.

Standard Mounting

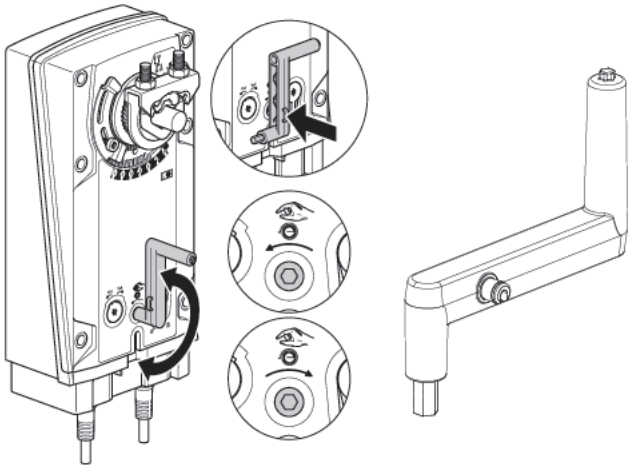
(minimum damper shaft length 4¾" (121 mm))

NOTE: The Mx41-730x-xxx series actuator is shipped with the manual override adjusted for a +5° position at the universal clamp (not at full spring return, 0°). This allows for automatic compression of damper blade seals when the actuator is in use, providing tight shut-off. This assumes that the damper is to have tight shut-off at the spring return position. If tight close-off is desired at the opposite direction, release the manual override so the actuator can be positioned to the full open position. See the manual override instructions.

1. Manually move the damper to the desired unpowered position (usually closed). If the shaft rotated counterclockwise (while looking at the end of the shaft), this is a CCW installation. If the shaft rotated clockwise (while looking at the end of the shaft), this is a CW installation. In a CCW installation, the actuator side marked "CCW" faces out, while in a CW installation, the side marked "CW" faces out. All other steps are identical.
2. The actuator is usually shipped with the universal clamp mounted to the "CCW" side of the actuator. To test for adequate shaft length, slide the actuator over the shaft with the side marked "CCW" (or the "CW" side if this is the side with the clamp). If the shaft extends at least 1/8" through the clamp, mount the actuator as follows. If not, go to the Short Shaft Mounting Installation section.

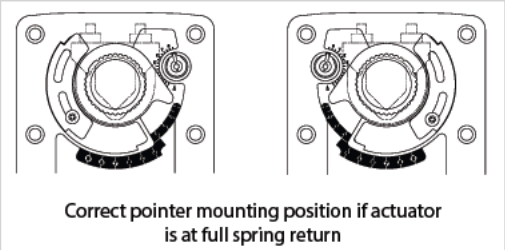
Mechanical Operation

The actuator is mounted directly to a damper shaft up to 1.05" in diameter by means of its universal clamp. A crank arm and several mounting brackets are available for applications where the actuator cannot be direct coupled to the damper shaft. The Mx41-730x-xxx series actuators provide true spring return operation for reliable operation and positive close-off on air tight dampers. The spring return system provides constant torque to the damper with, and without, power applied to the actuator. The Mx41-730x-xx2 versions are provided with two built-in auxiliary switches. These SPDT switches are provided for interfacing or signaling, for example, for fan start-up. The switching function at the spring return end is fixed at +10°, the other switch function is adjustable between +10° ... +85°C (for MS41-7303-Wx2 NEMA 4 versions, the second switch is fixed at +85°.)

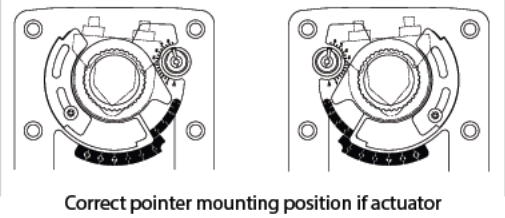


3. If the clamp is not on the correct side as determined in step #1, re-mount the clamp as follows. If it is on the correct side, proceed to step #5. Look at the universal clamp. If you are mounting the actuator with the "CCW" side out, position the clamp so that the pointer section of the tab is pointing to 0° and the spline pattern of the clamp mates with spline of the actuator. Slip the clamp over the spline. (Use the same procedure if the "CW" side is out.) If your application requires a mechanical minimum position, read the Rotation Limiter and Damper Rotation Limiting sections.
4. Lock the clamp to the actuator using the retaining clip.
5. Verify that the damper is still in its full desired unpowered position.
6. Slide the actuator over the shaft.
7. Position the actuator in the desired location.
8. Tighten the two nuts on the clamp using a 1/2" (13 mm) wrench or socket using 11 ft-lb of torque or 18.5 ft-lb of torque for stainless steel shafts.
9. Slip the stud of the anti-rotation bracket into the slot at the base of the actuator. Position the anti-rotation bracket approximately 1/16" from the closed end of the slot. Bend the bracket as needed to reach the duct. Attach the bracket to the duct with #8 self tapping screws.

NOTE: The AM-803 9-3/4" Damper Shaft Extension for 5/16" to 1" Diameter Round Shafts can be used to lengthen a short damper shaft to use the standard mounting method



Correct pointer mounting position if actuator is at full spring return



Correct pointer mounting position if actuator is at 5° preload

1. Determine the best orientation for the universal clamp on the back of the actuator. The best location is one with the easiest access to the V bolt nuts on the clamp.
2. Engage the clamp to the actuator as close as possible to the determined location.
3. Lock the clamp in place using the remaining retainer clip.
4. Verify that the damper is still in its full desired unpowered position.
5. Slide the actuator over the shaft.
6. Position the actuator in the desired location.
7. Tighten the two nuts on the clamp using a 13 mm wrench or socket using 11 ft-lb of torque or 18.5 ft-lb of torque for stainless steel shafts.
8. Slip the stud of the anti-rotation bracket into the slot at the base of the actuator. Position the anti-rotation bracket approximately 1/16" from the closed end of the slot. Bend the bracket as needed to reach the duct. Attach the bracket to the duct with #8 self tapping screws.

Short Shaft Mounting

If the shaft extends at least 3/4" (19 mm) from the duct, follow these instructions for mounting:

Mounting Multiple Actuators on a Common Jackshaft

The Mx41-730x-xxx series actuator is designed for use with jackshafts up to 1.05" in diameter. In most applications, the Mx41-730x-xxx series actuator may be mounted in the same manner as a standard damper shaft application. If more torque is required than one Mx41-730x-xxx series actuator can provide, a second Mx41-730x-xxx series actuator may be mounted to the jackshaft. See Wiring section of this document for wiring details.

NOTE: The manual positioning mechanism cannot be used in multiple actuator applications.

Schneider Electric Part Number	Maximum Number of Actuators that can be used on a 3/4" Common Jackshaft	Maximum Number of Actuators that can be used on a 1" Common Jackshaft	Required Wiring Method
MA41-7303, MA41-7303-502, MA41-7300, MA41-7300-502	2	2	Wire actuators in parallel
MS41-7303, MS41-7303-502, MS41-7303-W02, MS41-7303-WH2	2[1]	3[2]	Wire actuators in a master slave configuration[1 2]

1. When two MS41-7303 series actuators are connected to a common jackshaft, the "U" output of the master actuator is wired into the "Y1" input of the second actuator. See wiring section of this document for wiring details.
2. When three MS41-7303 series actuators are connected to a common jackshaft, the "U" output of the master actuator is wired into the "Y1" inputs of the second and third actuators.

MOUNTING: If the actuators are mounted on the opposed ends of the shaft, the actuator orientation must be selected carefully. Usually, the direction of rotation is reversed.

Rotation Limiter

The angle of rotation limiter, which is built into the actuator, is used in conjunction with the tab on the universal clamp position indicator. In order to function properly, the clamp and indicator must be mounted correctly.

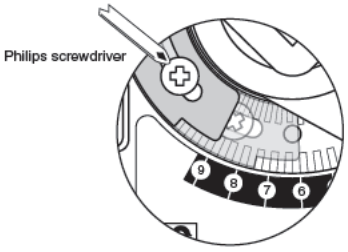
The rotation limiter may not work in certain mounting orientations using an optional Actuator Crank Arm Kit. In such cases, limiting the damper rotation must be accomplished by adjusting the crank arm linkage.

The built-in rotation limiter may be used in two ways to control the rotational output of the Mx41-730x-xxx series actuator. One use is in the application where a damper has a designed rotation less than 90°. An example would be a 45° or 60° rotating damper.

The other application would be to set a minimum damper position, which can be easily set or changed without having to remove the actuator from the damper.

Damper Rotation Limiting

1. Determine the amount of damper rotation required.
2. Locate the Angle of Rotation Limiter on the actuator adjusted using a Phillips screwdriver.
3. Position the limiter to the desired position, making sure the locating “teeth” on the limiter are engaged into the locating holes on the actuator.
4. Fasten the limiter by screwing the attached screw.
5. Test the damper rotation either manually with the manual crank or apply power and if required, a control signal. Re-adjust if necessary.



Manual Override Operation

The Mx41-730x-xxx series actuators can be manually positioned to ease installation or for emergency positioning.

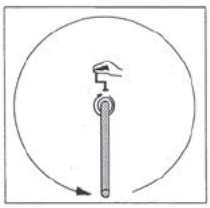
1. The manual override only works if no power is available to the actuator.
2. Insert the manual crank (shipped with the actuator) into the hexagon hole located on either side of the actuator. An illustration, located on the label, shows the location.
3. Turn the crank in the direction shown on the label (clockwise on the “CW” side, counterclockwise on the “CCW” side). It takes approximately 34 revolutions to rotate the full 95° of rotation.
4. To lock the actuator in the required position, flip the Lock switch to the lock position, located to the right of the crank on the CCW side of the actuator (left of the crank on the CW side).
5. The manual override may be disengaged in 2 ways.

   a. Flip the switch to the unlocked position and the actuator goes to its spring return position.

   b. Apply power to wire 1 and 2. The actuator automatically disengages the override function and goes to the “on” position in the case of the On/Off versions.

   In the case of the proportional versions the actuator goes to the 0 signal position and then to the position corresponding to the control signal. At this point, the actuator will work normally.

CCW Side Example:



Winding the damper actuator:
- insert crank handle
- turn handle in direction of arrow

Locking the damper actuator:
-flip the lock switch to the position pointing to the “locked” symbol

Unlocking the damper actuator (2 methods):
1. Flip the lock switch to the position
2. Remote control by supplying power to the unit for >3 sec.

Testing the Actuator Without Power

The actuator/damper installation may be tested without power at the actuator. Refer to the Manual Override Operation section of the instructions. Move the damper to its full powered position using the manual crank. Disengage the manual position mechanism and have the damper go to full desired unpowered position. Correct any mechanical problems and retest.

Auxiliary Switch Models

The Mx41-730x-xxx series actuators may be ordered with two built-in SPDT auxiliary switches used for interfacing or signaling, for example, for fan start-up. The first switch position is fixed at 10°. The second switch position is adjustable between 10° ... 85° of rotation (for NEMA 4 versions, the second switch is fixed at +85°). The crank that is supplied with the actuator is used to change the switch position.

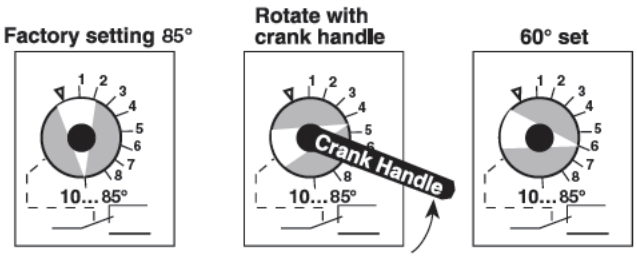
Switch rating:

Voltage	Resistive Load	Inductive Load
120 Vac	3 A	1.03 A
250 Vac	3 A	0.5 A

Two methods may be used to adjust the switching point of the adjustable switch.

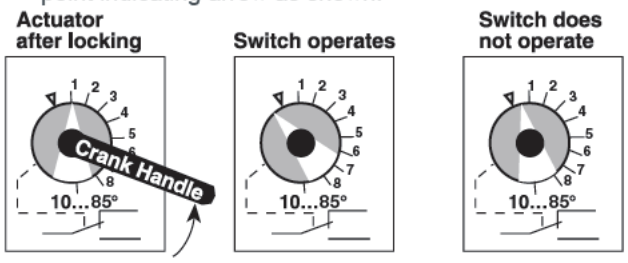
Method 1

1. The actuator must be in its spring return position.
2. Insert the crank handle into the torx shaped hole located in the center of the adjustable switch pointer.
3. Gently rotate the crank until the switch pointer is at the desired switch point in degrees as shown.



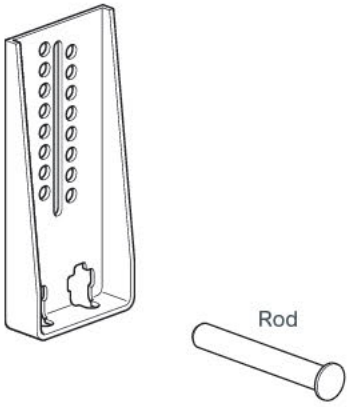
Method 2

1. Position the damper to the point at which you want the switch to activate. This may be done by using the manual override or by providing the appropriate proportional signal to MS41-730x-xxx modulating type actuators. The position of the switch pointer is not important during this step
2. Insert the crank into the hexagon shaped hole located in the center of the adjustable switch pointer.
3. Gently rotate the switch pointer to just past the switch point indicating arrow as shown.

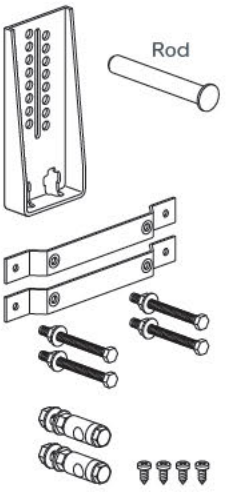


Non Direct Mounting Methods

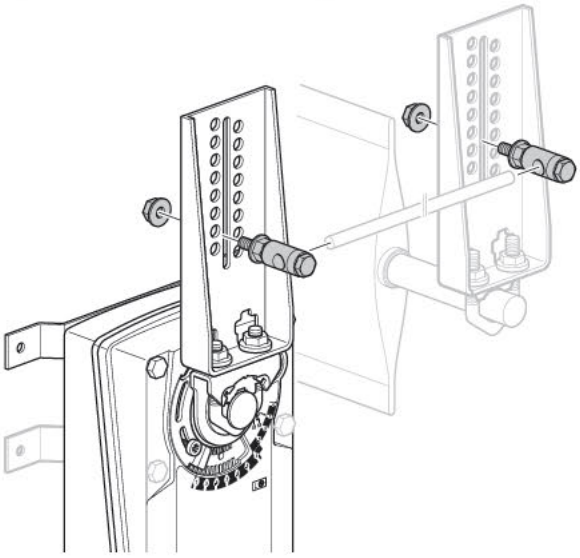
Optional AM-801 Mx41-730x-xxx Actuator Crank Arm Kit for round shafts up to 1.05" or square shafts up to 11/16"



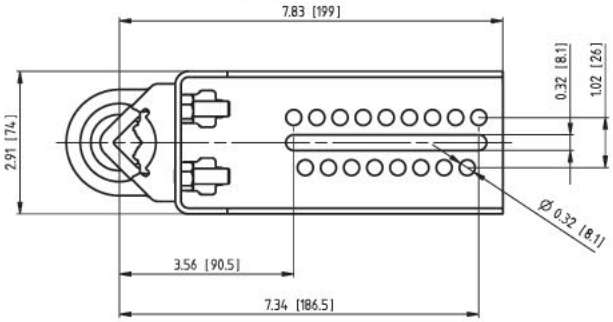
Optional AM-802 Mx41-730x-xxx Actuator Crank Arm Kit for round shafts up to 1.05" or square shafts up to 11/16", includes Actuator Mounting Bracket and Two Ball Joints.



Optional AM-802 and AM-801 Typical Installation



Crank Arm Dimensions (in [mm])

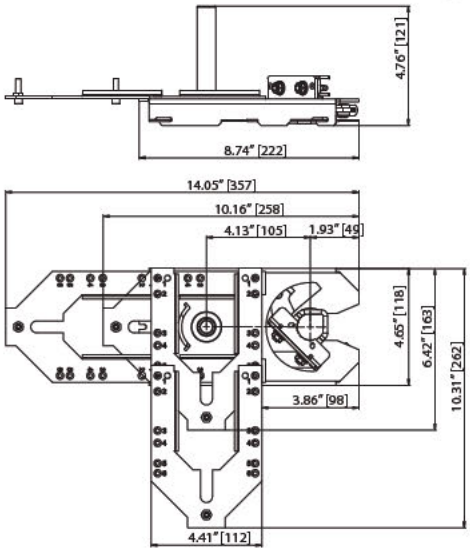


The AM-801/AM-802 crank arm is designed to attach to the actuator's clamp. Use the supplied rod when the actuator is not direct coupled onto a shaft. The AM-801 and AM-802 crank arm is used in non-direct coupled mounting applications. The AM-801 may also be used to simultaneously direct couple to a damper shaft and provide an additional crank arm connection to a second damper. The long connecting rod between the AM-801 and AM-802 is not included with the units.

Non Direct Mounting Methods

Optional AM-804 Jackshaft Linkage (requires AM-805 Support Plate – order separately) for Attachment to ½" to 1.05" Jackshafts

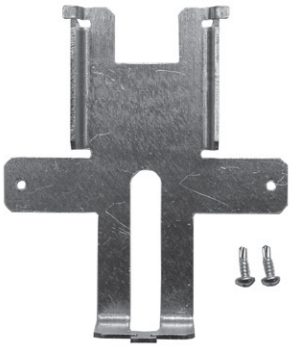
AM-804 Dimensions (in [mm])



AM-804 Description

The AM-804 Jackshaft Linkage requires the AM-805 Support Plate. Order separately for use with the Mx41-730x-xxx actuators. The ¾" diameter built-in steel shaft allows direct coupling to the damper with a torque reduction such that the Mx41-730x-xxx actuators provide 239 lb-in (27 N-m) of output torque.

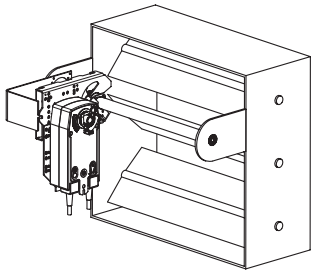
Optional AM-805 Support Plate (required when using AM-804 Jackshaft Linkage with Mx41-730x-xxx actuators)



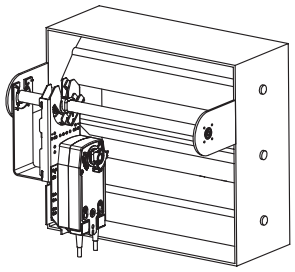
AM-804 Specifications

Shaft Diameter	1/2" ... 3/4" with insert, 1.05" without insert, galvanized steel
Material	Galvanized steel
Bearings	GF Delrin
Shaft	Steel
Maximum Torque Output	239 lb-in (27 N-m) when used with Mx41-730x-xxx actuators and the AM-805 support plate
Mechanical Angle of Rotation	90˚
Operating Temperature	-22 ... 122 ˚F (-30 … 50 ˚C)
Shipping and Storage Temperature	-40 ... 176 ˚F (-40 … 80 ˚C)
Location	NEMA 2 (IP 54) Enclosure Type 2
Weight	3.25 lbs. (1.47 Kg)

Optional AM-804 and AM-805 Standard Installation



Optional AM-804 and AM-805 Space Saving Installation



General Electrical Operation

The Mx41-730x-xxx series actuators utilize both DC Motors and brushless DC motor technology. The Mx41-730x-xxx uses this motor in conjunction with an Application Specific Integrated Circuit (ASIC). In the On/Off versions of the MA41-730x-xxx, the ASIC monitors and controls the actuator's rotation and a digital rotation sensing function to avoid damage to the actuator. The MS41-730x-xxx modulating type actuators incorporate a built in microprocessor. The microprocessor provides the intelligence to the ASIC to provide a constant rotation rate and knows the actuator's zero position.

Brushless DC Motor Operation

The brushless DC motor spins by reversing the poles of stationary electromagnets housed inside of a rotating permanent magnet. The electromagnetic poles are switched by a special ASIC circuit. Unlike the conventional DC motor, there are no brushes to wear or commutators to foul.

Overload Protection

The Mx41-730x-xxx series actuators are protected from overload at all angles of rotation. The ASIC circuit constantly monitors the rotation of the DC motor inside the actuator and stops the pulses to the motor when it senses a stall condition. The DC motor remains energized and produces full rated torque to the load. This helps ensure that dampers are fully closed and that edge and blade seals are always properly compressed.

Motor Position Detection

The brushless DC motors eliminate the need for potentiometers for positioning in modulating type actuators. Inside the motor are three "Hall Effect" sensors. These sensors detect the spinning rotor and send pulses to the microprocessor which counts the pulses and calculates the position to within 1/3 of a revolution of the motor.

The MS41-7303-xxx actuators are designed with a unique non-symmetrical deadband. The actuator follows an increasing or decreasing control signal with an 80 mV resolution (1% of input signal). If the signal changes in the opposite direction, the actuator does not respond until the control signal changes by 200 mV (2.5% of input signal). This allows these actuators to track even the slightest deviation very accurately, yet allowing the actuator to "wait" for a much larger change in control signal in the event of input control signal instability.

General Wiring Instructions

Transformers

The Mx41-730x-xxx actuators require a 24 Vac Class 2 transformer and draw a maximum of 16 VA per actuator. The heater in the MS41-7303-WH2 requires an additional 21 watts. Do not open the actuator enclosure. No user serviceable parts inside.

- EMC directive: 2004/108/EC
- Software class A: Mode of operation type 1
- Low voltage directive: 2006/95/EC

It is good practice to power electronic or digital controllers from a separate power transformer than that used for actuators or other end devices. The power supply design in our actuators and other end devices use half wave rectification. Some controllers use full wave rectification. When these two different types of power supplies are connected to the same power transformer and the DC commons are connected together, a short circuit is created across one of the diodes in the full wave power supply, damaging the controller. Only use a single power transformer to power the controller and actuator if you know the controller power supply uses half wave rectification.

Multiple Actuators with One Transformer

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

1. The TOTAL current draw of the actuators (VA rating) is less than or equal to the rating of the transformer.
2. Polarity on the secondary of the transformer is strictly followed. This means that all No. 1 wires from all actuators are connected to the common leg on the transformer and all No. 2 wires from all actuators are connected to the hot leg. Mixing wire numbers 1 and 2 on one leg of the transformer will result in erratic operation or failure of the actuator and/or controls.

Multiple Actuators with Multiple Transformers

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

1. The transformers are properly sized.
2. All number 1 wires from all actuators are tied together and tied to the negative leg of the control signal. See wiring diagram.

Maximum Wire Length

Keep power wire runs below the lengths listed shown below. If more than one actuator is powered from the same wire run, divide the allowable wire length by the number of actuators to determine the maximum run to any single actuator. Example: 3 actuators, 16 Ga. (1.4 mm) wire, 225 Ft ÷ 3 Actuators = 75 Ft maximum wire run.

Wire Gauge (AWG)	Metric Equivalent (Ø mm^2)	Maximum Distance
12	3.4	550’
14	2.1	360’
16	1.4	225’
18	0.9	145’
20	0.6	75’
22	0.4	37’

Wire Type and Wire Installation Tips

For most installations, 18 Ga. (0.9 mm) or 16 Ga. (1.4 mm) cable works well with the Mx41-730x-xxx actuators. Use code-approved wire nuts, terminal strips or solderless connectors where wires are joined. It is good practice to run control wires unspliced from the actuator to the controller. If splices are unavoidable, make sure the splice can be reached for possible maintenance. Tape and/or wire-tie the splice to reduce the possibility of the splice being inadvertently pulled apart.

The MS41-730x-xxx proportional actuators have a digital circuit that is designed to ignore most unwanted input signals (induced currents or “pickup”). In some situations the pickup may be severe enough to cause erratic running of the actuator. For example, a large inductive load (high voltage AC wires, motors, etc.) running near the power or control wiring may cause excessive pickup. To solve this problem, make one or more of the following changes:

1. Run the wire in grounded metallic conduit.
2. Re-route the wiring away from the source of pickup.
3. Use shielded wire (Belden 8760 or equal). Ground the shield to an earth ground at a single point. Do not connect it to the actuator common.

Power-up Initialization

When power is initially applied, the actuator will first release its manual preload position (this assumes a manual position has been set). The actuator will then rotate to the full spring return position. At this point the microprocessor recognizes that the actuator is at full spring return and uses this position as the base for all of its position calculations. The microprocessor will retain the initialized zero during short power failures of up to 20 seconds. The MS41-730x-xxx actuator will also try to return to its position prior to the 20-second-or-less power loss. For power failures greater than 20 seconds, the actuator would naturally return to its full spring return position prior to the microprocessor losing its memory. The actuator will also re-initialize if the manual position mechanism is used.

MS41-7303-xxx Actuators Electrical Check Out Procedure (2…10 Vdc Input Signal)

Step	Procedure	Expected Response	Gives Expected Response, Go To Step...	Does Not Give Expected Response, Go To Step...
1.	Control signal is applied to actuator.	Actuator moves to its “Control Signal” position.	Actuator operates properly, Step 7.	No response at all, Step 2. Operation is reversed, Step 3. Does not drive toward “Control Signal Position,” Step 4.
2.	Check power wiring. Correct any problems. See Note 1.	Power supply rating should be the total power requirement of the actuator(s). Minimum voltage of 19.2 Vac or 21.6 Vdc.	Power wiring corrected, actuator begins to drive, Step 1.	Power wiring corrected, actuator still does not drive, Step 4.
3.	Turn reversing switch to he correct position. Make sure the switch is turned all the way left or right.	Actuator moves to its “Control Signal” position.	Actuator operates properly, Step 7.	Does not drive toward “Control Signal Position,” Step 4.
4.	Make sure the control signal positive (+) is connected to Wire No. 3 and control signal negative (-) is connected to wire No. 1. Most control problems are caused by reversing these two wires. Verify that the reversing switch is all the way CCW or CW.	Drives to “Control Signal” position.	Actuator operates properly, Step 7.	Step 5.
5.	Check input signal with a digital volt meter (DVM). Make sure the input is within the range of the actuator. NOTE: The input signal must be above 2 Vdc or 4 mA to have the actuator move.	Input voltage or current should be ±1% of what controller’s adjustment or programming indicates.	Controller output (actuator input) is correct. Input Polarity Correct, Step 6.	Reprogram, adjust, repair, or replace controller as needed, Step 1.
6.	Check damper torque requirement to make sure hat it does not exceed the actuator’s rating.	Damper torque requirement does not exceed actuator’s torque rating.	Defective Actuator. Replace Actuator - See Note 2.	Recalculate actuator torque requirement and correct installation.
7.	Actuator works properly. Test controller by following controller manufacturer’s instructions.			

NOTE 1: Check that the transformer(s) are sized properly.

- If a common transformer is used, make sure that polarity is observed on the secondary. This means connect all No. 1 wires to one leg of the transformer and all No. 2 wires to the other leg of the transformer.
- If multiple transformers are used with one control signal, make sure all No. 1 wires are tied together and ied to control signal negative (-).
- Controllers and actuators must have separate 24 Vac/Vdc power sources.

NOTE 2: If failure occurs within five years from original purchase date, notify Schneider Electric, and give details of the application.