

M9310

Electric Non Spring Return Actuators

Product Bulletin

The M9310 Series Electric Non-Spring Return Actuators provide control of dampers in HVAC Systems with 10 Nm rated torque.

The line includes an all-in-one On/Off, Floating Point and Proportional Control with 24 Vac/Vdc power.

These bidirectional actuators do not require a damper linkage and are easily installed on round shafts or square shafts.

An accessory crank arm and remote mounting kit are available for applications where the actuator cannot be direct-coupled to the damper shaft.

An optional line voltage auxiliary switch kits can be field installed to indicate an end-stop position or perform switching functions within the selected rotation range.



- **Universal model On/Off, floating and Proportional**

Increase availability at distributors. Simplify retrofit.

- **Optional Auxiliary Switch & potentiometer feedback**

Provides line voltage capable single Pole Double-Throw (SPDT) switch and 140Ω, 1KΩ, 2KΩ or 10KΩ feedback potentiometric.

- **10 Nm Rated Torque**

Provides high torque in a compact package size to expand the range of damper applications in HVAC systems.

- **Self-Calibrating to Adjust Stroke**

Eliminates need of complex calibration procedure when adjusting stops.

- **Electronic Stall Detection**

Protects from overload at all angles of rotation. The actuator may be stalled anywhere in its rotation range without the need for mechanical end switches.

- **Microprocessor-controlled Brushless DC Motor**

Provides constant runtime independent of torque and increases life cycle by reducing wear.

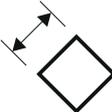
Installation

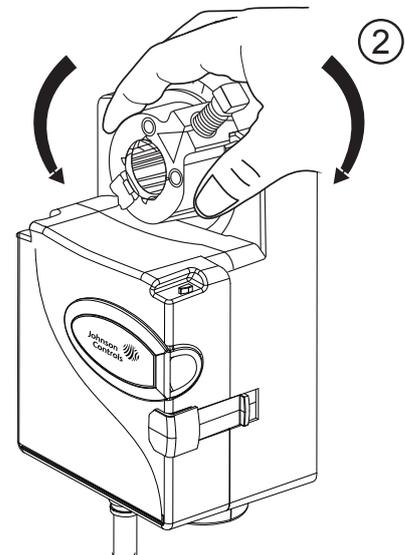
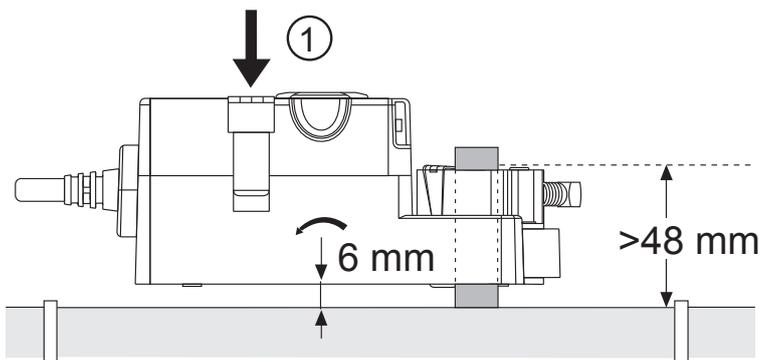
The M9310 Series Electric Non Spring Return Actuators is mounted directly to the surface in any convenient orientation using the anti-rotation bracket (parts included with the actuator).

No additional linkages or couplers are required. Electrical connections are identified with numbers and colors permanently marked on the actuator and in a label on the cable.

The Actuators can be easily installed on dampers with round shafts from 9.5mm to 16 mm or square shafts from 8mm to 12.7 mm using the standard shaft coupler included with the actuator. Removing the insert in the shaft coupler the actuator can fit round shafts from 16mm to 19 mm or square shafts from 12.7 mm to 19 mm (see table).

A push button disengages the internal gears letting the actuator to be manually override.

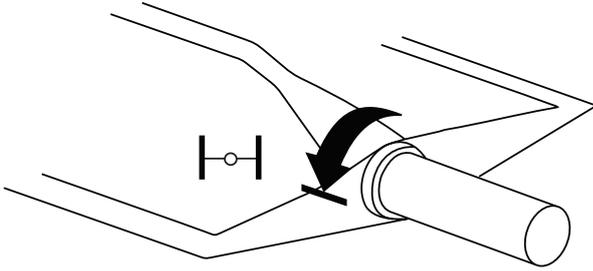
Shaft Diameter mm	With Insert		Without Insert
	MIN	MAX	MAX
	9.5	16	19
	8	12.7	16



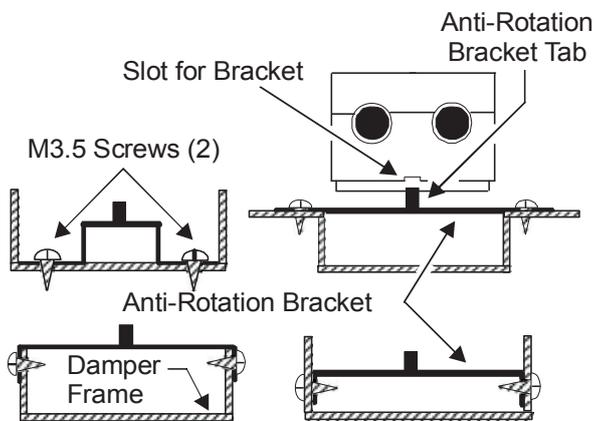
Mounting the Actuator

To mount the actuator, proceed as follows:

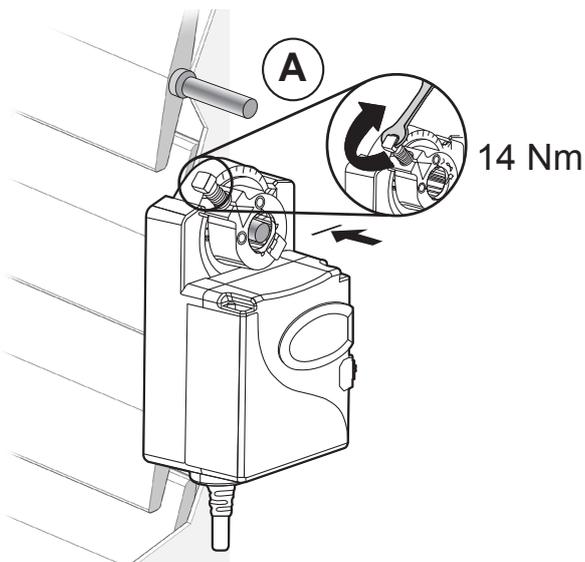
1. Position the damper until it is fully closed.



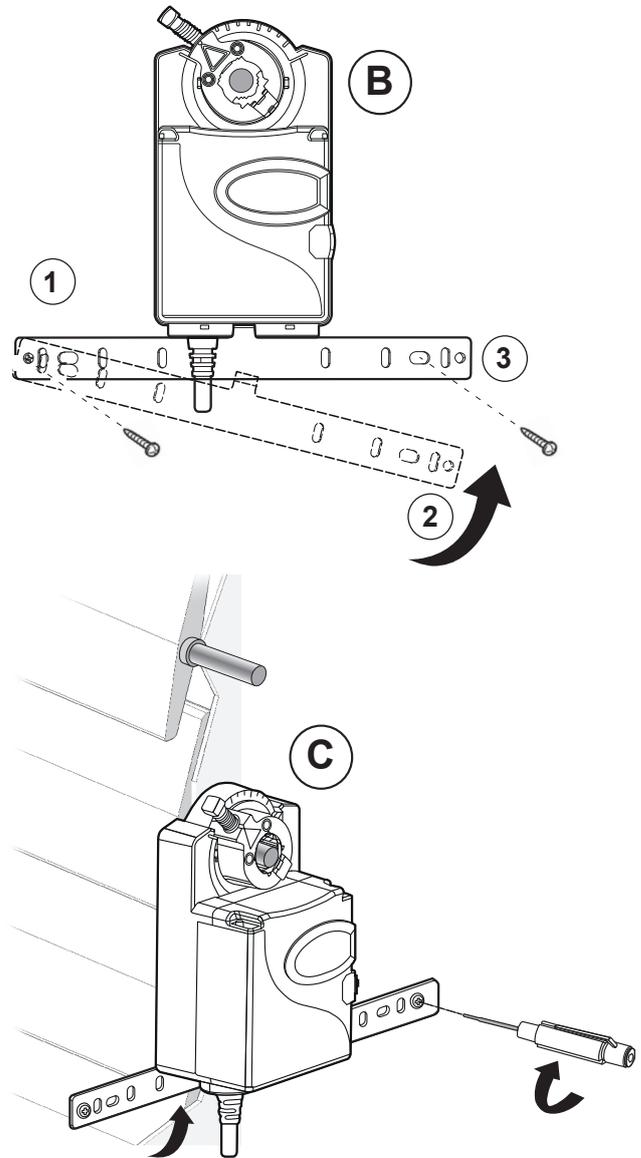
2. Bend or cut the anti-rotation bracket to fit the damper frame or duct as illustrated in figure below.



3. Load the actuator seal by rotating the shaft using the actuator (about 5 degrees).
4. Slip the actuator onto the shaft and fully tighten the set screw on the coupler.



5. Lightly tighten one side of the anti-rotation bracket to the mounting surface. Swing the anti-rotation bracket under the actuator until it reaches the middle of the slot on the bottom of the actuator.



6. Apply power long enough for the actuator to travel a full stroke. Verify that the actuator rotates freely throughout the range.

Limiting the Rotation

The actuator is factory set for 95° rotation, and its rotation range can be limited in 5° increments to a minimum of 35°.

To limit the starting point proceed as follow:

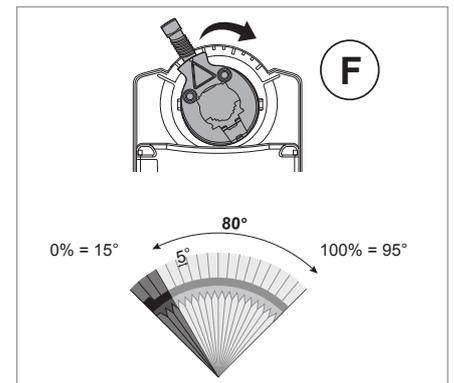
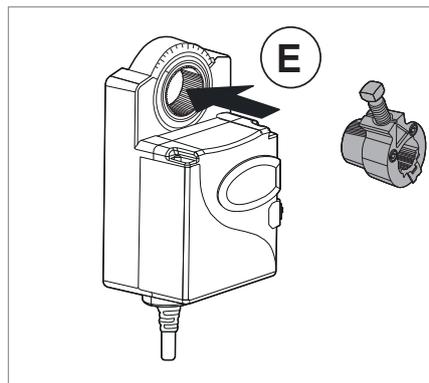
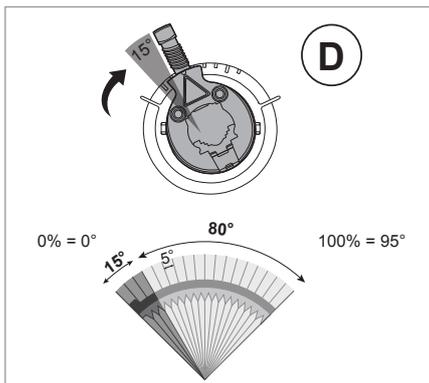
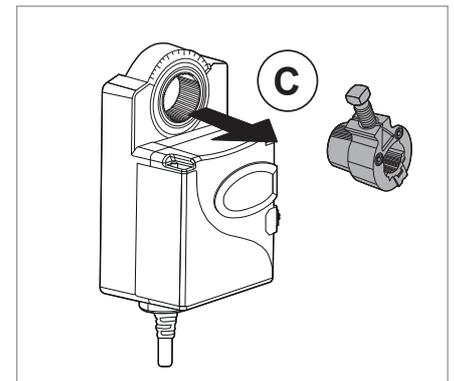
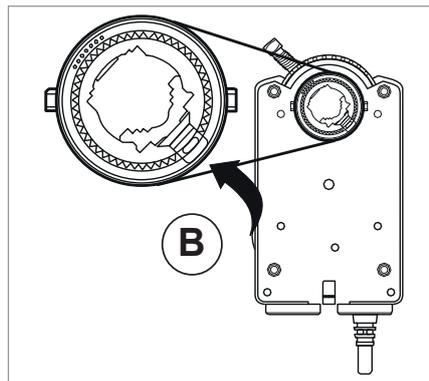
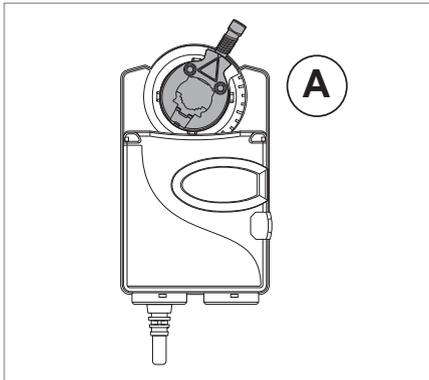
If necessary, set the shaft coupler, as shown in the pictures, by pushing the manual override button (see A).

Remove the coupler pushing the little lever on the bottom of the actuator (see B and C).

Rotate clockwise the coupler (15° degree in the sample below) and insert it in the actuator (see D and E).

Every tooth of the coupler housing correspond to 5° of rotation.

The actuator pointer shows the starting position. The actuator now perform a rotation from 15° to 95° (see F).



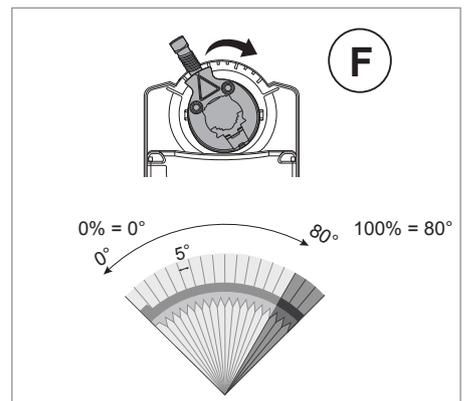
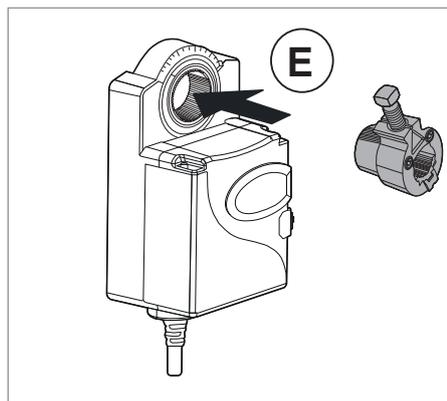
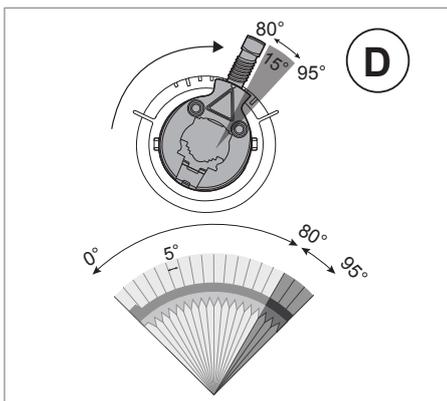
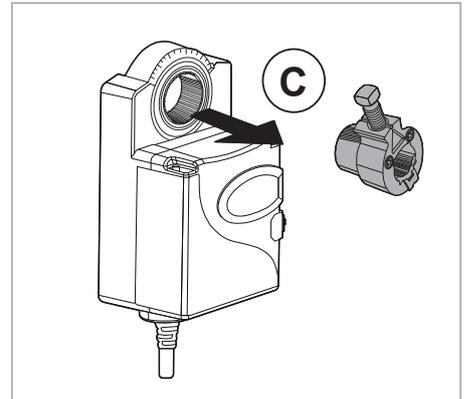
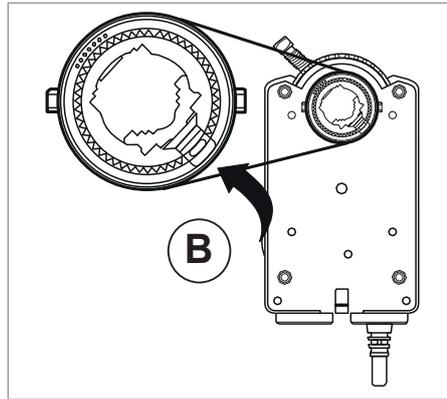
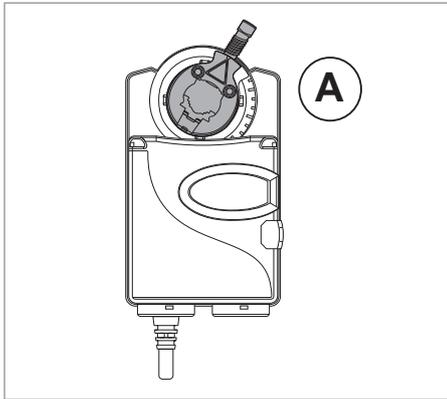
To limit the stop point proceed as follow:

If necessary, set the shaft coupler, as shown in the pictures, by pushing the manual override button (see A).

Remove the coupler pushing the little lever on the bottom of the actuator (see B and C).

Rotate the coupler counter clockwise (15° degree in the sample below) and insert it in the actuator (see D and E).

Every tooth of the coupler housing correspond to 5° of rotation.
The actuator pointer shows the end position (80° in the sample below). Set the shaft coupler to the starting point by pushing the manual override button and rotating it. The actuator now performs a rotation from 0° to 80° (see F).



Universal model

M9310-HGA-1 Actuator operates with 24 VAC/DC to provide 10 Nm rated torque. The actuator can be used with on/off, floating, or proportional controllers in HVAC systems that are controlled by an electronic controller or positioner.

The actuator has 35 seconds constant runtime for 95° rotation, independent of supply voltage frequency and load. When combined with other actuators in a control system, this option provides flexibility in synchronizing the movement of equipment driven from a single proportional command.

When the M9310-HGA-1 Series Actuators are in proportional mode, the actuator responds to 0 to 10 VDC or 2 to 10 VDC control signals. With the addition of a 500 ohm resistor, the actuator responds to a 0 to 20 mA or 4 to 20 mA signal. A 0 to 10 VDC or 2 to 10 VDC feedback signal indicates position.

Ordering Informations

Code	Description
M9310-HGA-1	All-in-one on/off, floating, and proportional control with 24 VAC/DC power supply

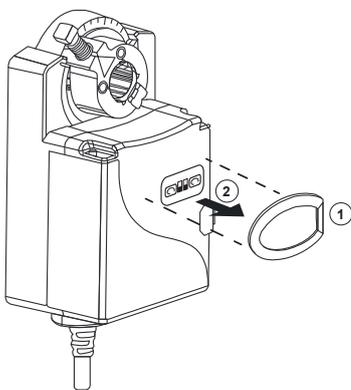
Accessing the DIP Switches and LEDs

Locate the oval cover on the front of the unit and pull the cover outward. See figure and table below for viewing the DIP switches and LEDs meaning.

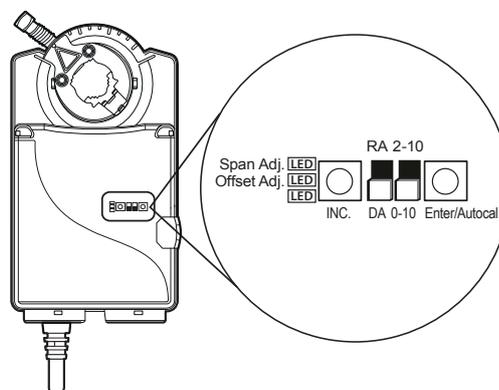
Auto Calibration Mode

The actuator enters auto calibration mode and positions the coupler to the maximum and minimum end stops to identify the range of travel. To complete the auto calibration process, press **Enter/Autocal** until all three LEDs are on.

Example	Command Signal	Feedback Signal	Setting User Interface
1	0 to 10 VDC	Direct 0 to 10 VDC	
	24 VAC Floating or ON/OFF		
2	0 to 10 VDC	Reverse 0 to 10 VDC	
	24 VAC Floating or ON/OFF		
3	02 to 10 VDC	Direct 2 to 10 VDC	
	24 VAC Floating or ON/OFF		



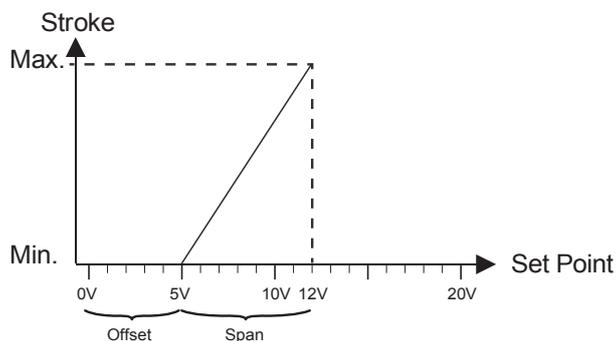
Remove the oval cover



DIP Switches and LEDs Placement

Setting the SPAN and OFFSET Proportional Command Signal to Other Values

The actuator has the possibility to adjust the input signal changing the working range and the starting point of the signal. The valid Offset values are 0 to 10 VDC and the valid Span values are 2 to 10 VDC. Adjusting span and offset the feedback voltage of the actuator is automatically set as 2-10 VDC.



Example

Command Signal	Feedback Signal	Setting User Interface
Offset = 5 Span = 7	Active 2 - 10 VDC	

1. Connect a digital multimeter between the orange (feedback) and black (common) wires. See Wiring for more wiring information.
2. Press **Enter/Autocal**.
Note: To adjust the span and offset, press but not hold **Enter/Autocal**.
Holding **Enter/Autocal** for longer than three seconds triggers an autocal.
The Offset Adj. LED turns on, and the multimeter displays the current offset value.
3. Press **INC**.
The Offset Adj. LED flashes. The voltage reading on the multimeter increases 0.5 VDC each time you press the button. Press **INC**. until you reach the desired voltage.
Once you press **INC**., if no further action is required, the Offset Adj. LED stops flashing after 10 seconds. The actuator exits the program mode and the original offset value remains unchanged.
4. Press **Enter/Autocal**.
The Offset Adj. LED turns off indicating that the desired Offset Adj. value was recorded. The Span Adj. turns on, and the multimeter displays the present SPAN value.
5. Press **INC**.
The Span Adj. LED flashes. The voltage reading on the multimeter increases by 0.5 VDC each time you press the button. Press **INC**. until you reach the desired voltage.
Once you press **INC**., if no further action is required, the Offset and Adj. LED stops flashing after 10 seconds. The actuator exits the program mode and the original offset value remains unchanged.
6. Press **Enter/Autocal**.
The Span Adj. LED turns off indicating that the desired Span Adj. setting is recored, and the actuator exits the program mode.

Reading the SPAN and OFFSET Proportional Command Signal Voltage Settings

1. Connect a digital multimeter between the orange (feedback) and black (common) wires. See Wiring for more wiring information.
2. Press **Enter/Autocal**.
The Offset Adj. LED turns on, and the multimeter displays the current offset value.

IMPORTANT: Do not press INC. Otherwise your observed offset voltage setting will change.

3. Press **Enter/Autocal**.
The Offset Adj. LED turns off, the Span Adj. LED turns on, and the multimeter displays the present SPAN value.

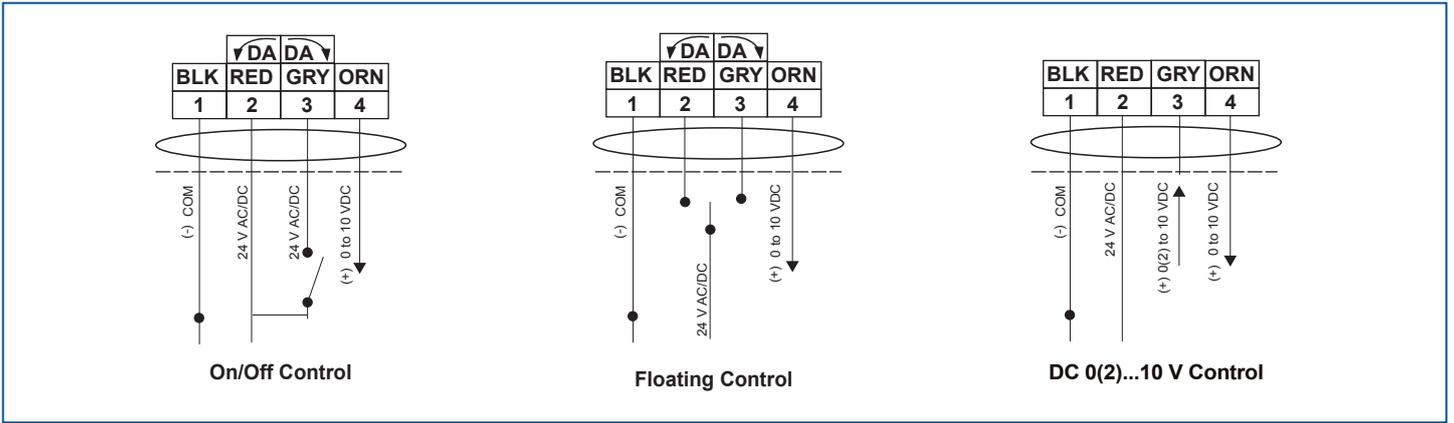
IMPORTANT: Do not press INC. Otherwise your observed SPAN voltage setting will change.

5. Press **Enter/Autocal**.
The Span Adj. LED turns off.

Clearing the SPAN and OFFSET Proportional Command Signal Voltage Setting

Cycle DIP switch two between 2 to 10 and 0 to 10. The active setting is the final state of DIP switch two.

Wiring Diagrams



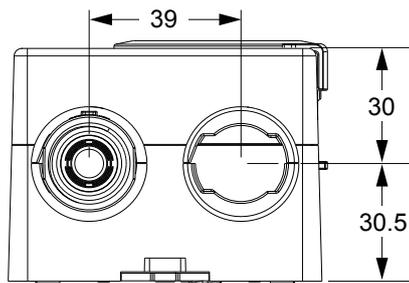
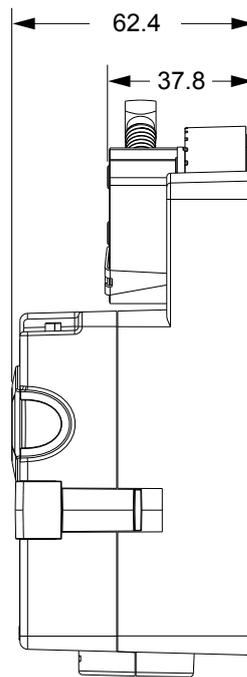
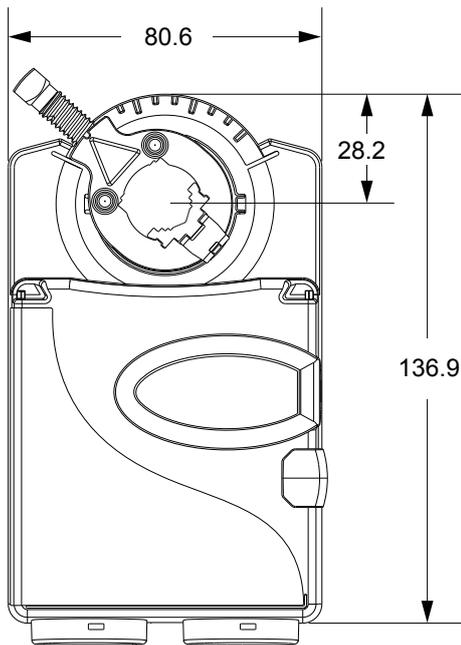
M9310-HGA-1

Technical Specifications

Product Code	M9310-HGA-1	
Control Type	On/Off and Floating Mode	Proportional Mode
Power Requirements	AC 24 V (AC 19.2 to 28.8 V) at 50/60 Hz, Class 2 (North America) or SELV (Europe), 6.2 VA Running DC 24 V (DC 21.6 to 26.4 V), Class 2 (North America) or SELV (Europe), 1.9 W Running	
Transformer Sizing requirements	<6.5 VA	
Input Signal/Adjustments	AC 19.2 to 28.8 V at 50/60 Hz or DC 24 V \pm 10% Class 2 (North America) or SELV (Europe)	DC 0 (2) to 10 V or 0 (4) to 20 mA with field furnished 500 Ohm 1/4 W resistor Offset: DC 0 to 10 V Span: DC 2 to 10 V
Control Impedance	4.7k ohm	100k ohm
Feedback Signal	DC 0 (2) to 10 V	
Running Torque	10 Nm (88 lb-in)	
Rotation Range	Mechanically Limited 35° to 95° \pm 3° in 5° increments	
Rotation Time	35 seconds	
Rotation Time Autocalibration	35 seconds	
Cycles	100,000 Full Stroke Cycles; 2,500,000 Repositions	
Audible Noise	<40 dBA at 1 m (39-13/32 in.)	
Electrical Connections	1.2 m (48 in.) Halogen Free Cable with 18 AWG (0.82 mm ²) conductors and 6 mm (0.25 in.) ferrule ends	
Ambient Conditions	Operating: -30 to 60 °C (-22 to 140 °F), 90% 95% RH, noncondensing (EN 60730-1) Storage: -40 to 85 °C (-40 to 185 °F), 95% RH, noncondensing	
Enclosure	IP54/NEMA 5	
Shipping Weight	0.9 kg (2 lb)	
Compliance	<p>United States: UL Listed, CCN XAPX, File E27734; to UL 60730-1: Automatic Electrical Controls for Household and Similar Use Part 1; and UL 60730-2-14: Part 2, Particular Requirements for Electric Actuators. Plenum Rated (UL 2043). Suitable for use in Other Environmental Air Space (Plenum) in accordance with section 300.22 (c) of the National Electrical Code.</p> <p>Canada: UL Listed, CCN XAPX7, File E27734; to CAN/CSA E60730-1:02: Automatic Electrical Controls for Household and Similar Use Part 1; and CAN/CSA-E60730-2-14: Part 2, Particular Requirements for Electric Actuators.</p> <p>Europe: CE Mark – Johnson Controls, Inc. declares that this product is in compliance with the essential requirements and other relevant provisions of the EMC Directive and Low Voltage Directive.</p> <p>Australia and New Zealand: RCM, Australia/NZ Emissions Compliant</p>	



Dimensions



Accessories

The M9310 line has several kit and accessories that can be ordered separately and mounted on site.

Code Number	Description
M9000-200	Commissioning Tool that provides a control signal to drive 24 V on/off, floating, proportional and resistive electric actuators (quantity 1)
M9000-322	NEMA 4x, IP66/67 Weathershield Kit for damper application of M9104, M9310, M9203 and M9208 Series Electric Actuators (quantity 1)
M9000-342	NEMA 4X, IP66/67 Weathershield Kit for VG1000 Series Ball application of VA9104, VA9310, VA9203 and VA9208 Series Electric Actuators (quantity 1)
M9000-400	Jackshaft Linkage Adapter Kit (quantity 1)
M9000-561	Thermal Barrier Kit. Extends the VA9104, VA9310, VA9203 and VA9208 Series Electric Non-Spring Return Actuators applications to include low pressure steam (quantity 1).
M9000-604	Replacement Anti-Rotation Bracket Kit for M9310, M9203, M9208, M9210 and M9220 Series Electric Actuators
M9000-606	Position indicator for M9300 Kits (quantity 5)
M9300-1	Auxiliary Switch Kit (one single-pole, double-throw)
M9300-2	Auxiliary Switch Kit (two single-pole, double-throw)
M9300-100	Threaded Conduit Adapters for 12.7 mm (1/2 in.) electrician's fittings (quantity 5)
M9300-140	External Auxiliary Feedback Potentiometer 140k Ohm
M9000-151	Remote Mounting Kit, with crank arm and damper linkage for M9108 (16) (24) and M9310 Series Actuators
M9300-1K	External Auxiliary Feedback Potentiometer 1k Ohm
M9300-2K	External Auxiliary Feedback Potentiometer 2k Ohm
M9300-10K	External Auxiliary Feedback Potentiometer 10k Ohm
M9310-500	Ball Valve Linkage Kit for applying M9310 Series Electric Actuators to VG1000 Series Valves (quantity 1)
M9310-600	Standard Coupler Kit, M9310 Series (9.525 to 19.05 mm - 3/8 to 3/4 in.) (9.525 to 15.875 mm - 3/8 to 5/8 in.) (quantity 1)

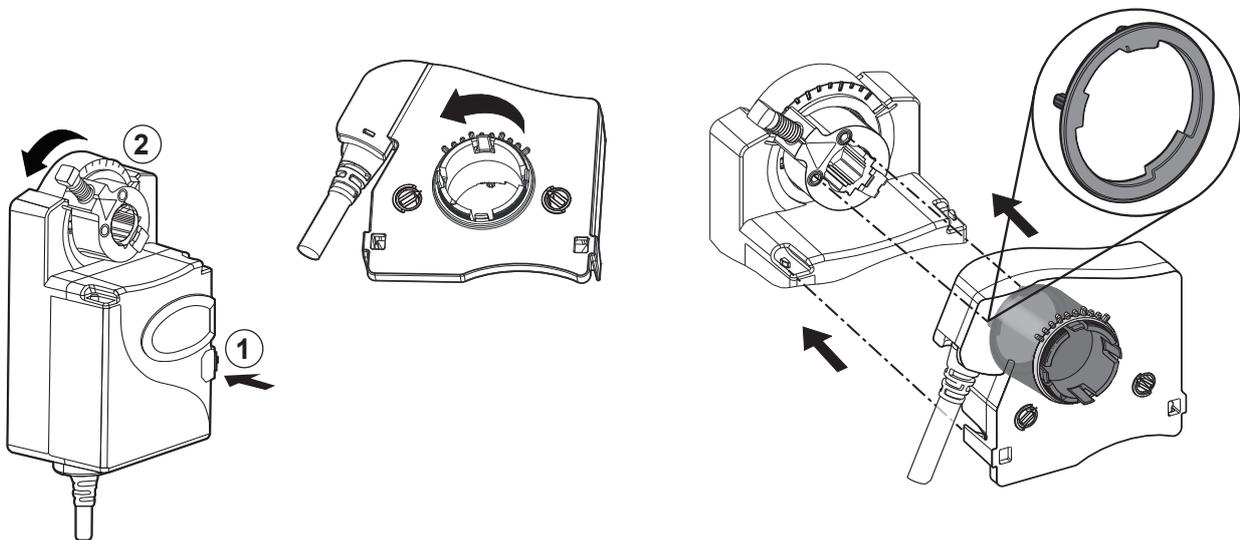
Auxiliary Switch & Potentiometer Feedback Kit

Mounting the kit, a connection is created between the shaft hub of the actuator and the kit.

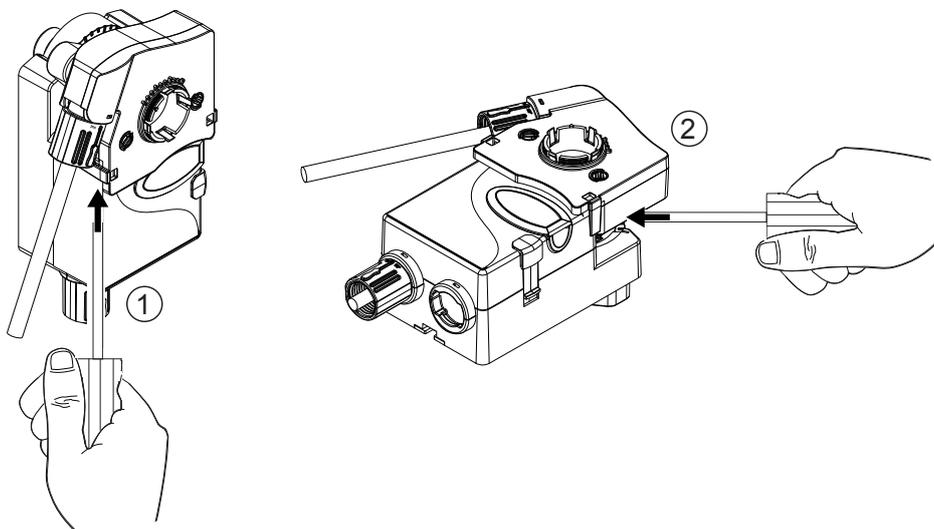
The position of the actuator is transferred to the gear's kit.



1. Before mounting the kit, rotate the actuator and the kit itself counter clock wise till the end position in order to align the holes on the coupler with the pins on the kit and snap the kit onto the M9310 actuators.

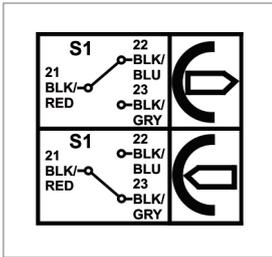


2. To remove the kit Place a screwdriver underneath the tab on each side of the actuator and firmly pull back the tab.

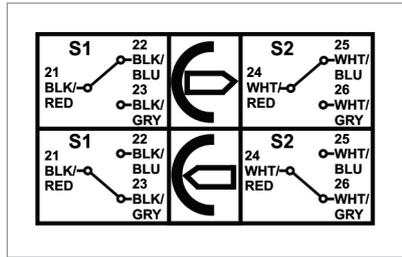


Auxiliary switches kits

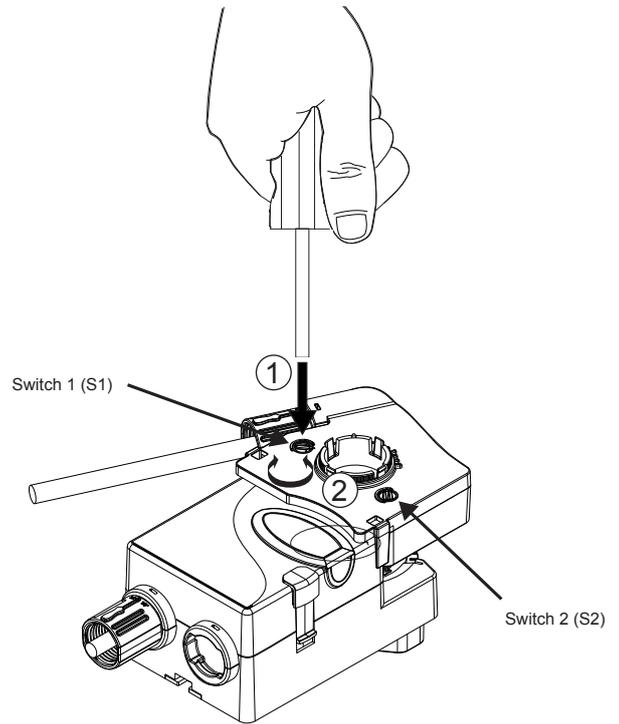
The auxiliary switches kits are used to notify starting and end position or to perform switching functions in any angular position. The switching points can be adjust by means of a dial.



M9300-1

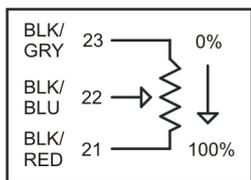


M9300-2



Feedback potentiometer kits

The feedback potentiometers are used as damper position indicators or as positioners for actuators operated in parallel.



Resistor Value

M9300-140	140 Ω
M9300-1K	1K Ω
M9300-2K	2K Ω
M9300-10K	10K Ω