M9216 Series Electric Spring Return Actuators

Installation

IMPORTANT: The M9216 Series actuator is intended to control equipment under normal operating conditions. Where failure or malfunction of an M9216 actuator could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory) intended to warn of, or protect against, failure or malfunction of an M9216 actuator must be incorporated into and maintained as part of the control system.

Parts Included

- M9216 actuator
- M9000-100 NPT conduit adaptor and nut (two included for actuators with switches or a feedback potentiometer)
- M9000-160 anti-rotation bracket
- two No. 12-24 x 1/2 in. self-tapping hex washer-head screws
- 5 mm manual crank

For GGA models:

- one M9000-106 pluggable 4-terminal block

For GGC models:

- two M9000-105 pluggable 3-terminal blocks
- one M9000-106 pluggable 4-terminal block

Special Tools Needed

- drill with a 3/16 in. (No. 15, 4.57 mm) drill bit
- torque wrench with 10 mm socket
- 7 mm and 5/16 in. (8 mm) nut driver
- DVM or M9000-200 Commissioning Tool (for HGx models with zero and span potentiometers)

Spring Return Direction

The actuator is factory set to spring return in a Counterclockwise (CCW) direction.

Clockwise (CW)

To change the spring return direction to CW, refer to Figure 1 and proceed as follows:

1. Turn the actuator over. Use a flat-blade screwdriver to release the locking clip, and remove it from the coupler.
2. Remove the coupler and sleeve from the front of the actuator, and slide the sleeve off the coupler.

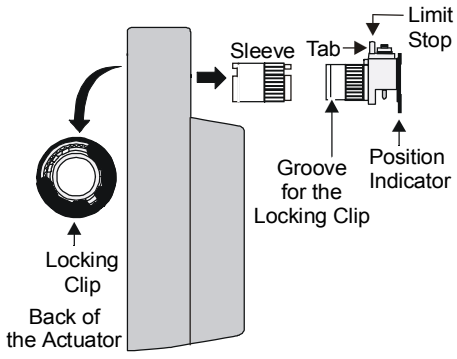


Figure 1: Changing the Spring Return Direction

3. Insert the sleeve into the back of the actuator with the smooth half of the sleeve inserted first. Make sure the gap in the sleeve rim aligns with the two guide marks on the back of the actuator shown in Figure 2.

Note: The drive direction of the actuator is reversed when the sleeve is changed from the front to the back of the actuator.

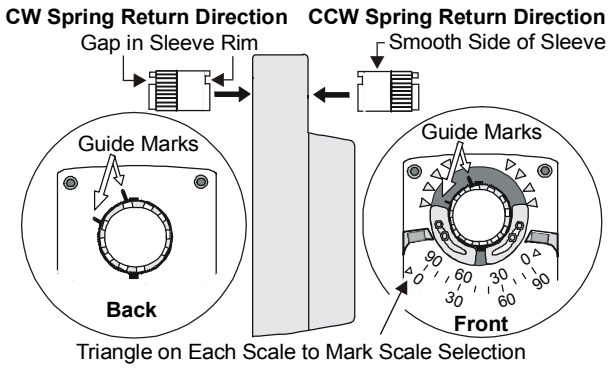


Figure 2: Location of Guide Marks

4. Align the tab on the coupler with the gap in the sleeve rim, and insert the coupler into the front of the actuator.
5. Replace the locking clip to secure the coupler and sleeve in the actuator.
6. Fill in the triangle on the actuator cover with a marking pen to indicate the scale being used.

Counterclockwise

For the actuator to spring return in a CCW direction, refer to Figure 3 and proceed as follows:

1. Turn the actuator over. Use a flat-blade screwdriver to release the locking clip, and remove it from the coupler.
2. Remove the coupler from the front of the actuator and the sleeve from the back of the actuator.
3. Insert the sleeve into the front of the actuator with the smooth half of the sleeve inserted first. (See Figure 2.)

Note: Make sure the gap in the sleeve rim aligns with the two guide marks on the front of the actuator.

4. Repeat Steps 4, 5, and 6 of the previous section.

Mounting

IMPORTANT: Make sure the space between the back of the actuator and the mounting surface is at least 5/32 in. (4 mm).

M9216 actuators may be mounted in any convenient orientation. They may be installed on a 3/8 to 3/4 in. (9.5 to 19 mm) round or a 3/8 to 5/8 in. (9.5 to 16 mm) square shaft, 3 in. (76 mm) or longer. If the shaft is less than 3 in. (76 mm) long, install an extension recommended by the damper or valve manufacturer. For 1 in. (25.4 mm) outside diameter shafts, use the M9000-154 1 in. Jackshaft Coupler.

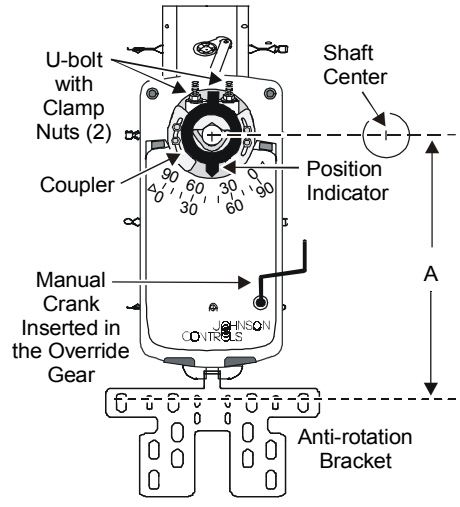
To mount the actuator, proceed as follows:

IMPORTANT: The tab on the anti-rotation bracket must fit midpoint in the actuator slot to prevent actuator binding and premature wear.

1. Refer to the "A" Dimensions in Table 1 and Figure 3 to ensure the tab on the anti-rotation bracket fits midway in the actuator slot.

Table 1: Shaft Sizes and Distances from the Anti-rotation Bracket to Shaft Center

Shaft Diameter	5/8 in.	1/2 in.	3/8 in.
"A" Dimensions	8-1/4 in.	8-5/16 in.	8-3/8 in.
(See Figure 3.)	209 mm	211 mm	213 mm



Note: "A" is the distance from the center of the holes in the anti-rotation bracket to the center of the shaft. (See Table 1.)

Figure 3: Mounting Positions

2. Bend or cut the anti-rotation bracket to fit the damper frame or duct as shown in Figure 4.

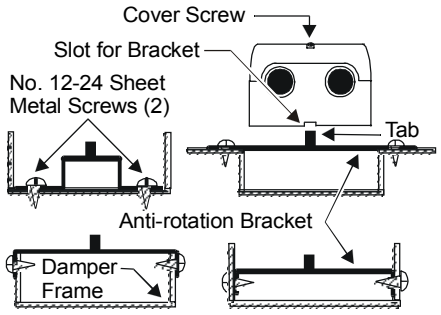


Figure 4: Anti-rotation Bracket Positions

3. Use the anti-rotation bracket as a guide, and drill the holes in the damper frame or duct for the bracket (based on the measurements obtained in Table 1 and Figure 3).

Note: When installing the actuator to a Johnson Controls damper, use the existing holes in the damper frame.

4. Attach the anti-rotation bracket to the damper frame or duct with the two self-tapping screws provided, using a 1/4 in. (7 mm) flat-blade screwdriver or 5/16 in. (8 mm) nut driver.

IMPORTANT: Do not overtighten the mounting screws to avoid stripping the threads.

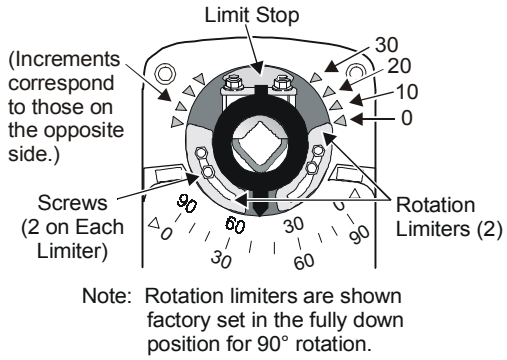
5. Slide the actuator onto the damper shaft, positioning the anti-rotation bracket tab into the slot at the bottom of the actuator. (See Figure 4.)
6. Insert the manual crank. Push it in firmly, and turn it CW four or five turns (position indicator should be between the 3 and 5° mark on the actuator scale). Turn the manual crank 1/4 turn CCW to lock this position.
7. Close the damper tightly.
8. Keeping the actuator flat, evenly hand tighten each clamp nut onto the U-bolt. Secure the U-bolt to the damper shaft to achieve a torque of 100 to 125 lb·in (11 to 14 N·m).
9. Turn the manual crank CW to release the spring, and remove the manual crank. (The actuator spring returns to its starting position.)
10. Verify that the actuator rotates freely throughout the range. (This may be done by applying a full stroke control signal or reinserting the manual crank and turning it CW to rotate the coupler to the fully open position.)

Rotation Range

The actuator is factory set for 0 to 93° rotation. The rotation range is changed by adjusting the rotation limiters. This may be done by using an input signal or the manual crank. To change the rotation range using the manual crank:

IMPORTANT: Turn the manual crank in a CW direction only, unless locking a new position.

1. Push the manual crank firmly into the manual override gear (shown in Figure 3), and wind in a CW direction until the position indicator reaches the 45° position.
2. Lock this position by winding the manual crank 1/4 turn CCW or until a slight resistance is felt.
3. Use a 7 mm nut driver to loosen the screws on the rotation limiter. (See Figure 5.)



Note: Rotation limiters are shown factory set in the fully down position for 90° rotation.

Figure 5: Rotation Limiters

4. Slide the rotation limiter to the desired position, and retighten the screws to a maximum of 30 lb·in (3.4 N·m).

   Examples of rotation limiter adjustments:

   - For a rotation range of 30°, adjust both limiters fully up.
   - For a range of 45°, adjust one rotation limiter to 30° and the other to 15°.
   - For a range of 60°, adjust one limiter to 30°, and leave the other at 0°.
5. Reinsert the manual crank into the manual override gear.
6. Repeat Steps 2 through 5 to set the rotation range for the second rotation limiter.
7. Release the manual crank spring lock by winding the crank 1/4 turn in a CW direction.

8. Remove the manual crank, and return it to its original position on the actuator cover.

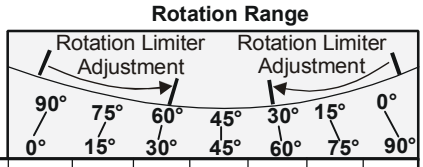
Notes: When changing the rotation range on the xGC models with auxiliary switches, one or both switches may need to be adjusted. See the *Auxiliary Switches (xGC Models)* section.

When changing the rotation range on HGx models with zero and span potentiometers, both potentiometers must be adjusted. See the *Potentiometers (HGx Models)* section.

Feedback Signal

The feedback signal varies with a change to the rotation range. The resistance feedback is reduced corresponding to the reduced rotation range for the AGD and AGE models. For the HGx and JGx models, a change to the rotation range changes the feedback signal and the operating range. This applies to the GGx models only in the fixed mode. (See Figure 6.)

Note: Refer to the *Setup and Adjustments, Fixed or Auto Mode (GGx Models)* section for the GGA and GGC models. Once calibrated, a change to the rotation range does not affect the feedback signal and operating range of the GGx models.



Direct Acting	0-10V Feedback	10.0 V	8.3 V	6.7 V	5.0 V	3.3 V	1.7 V	0.0 V
	2-10V Feedback	10.0 V	8.7 V	7.3V	6.0 V	4.7 V	3.3 V	2.0 V
Reverse Acting	0-10V Feedback	0.0 V	1.7 V	3.3 V	5.0 V	6.7 V	8.3 V	10.0 V
	2-10 V Feedback	2.0 V	3.3 V	4.7 V	6.0 V	7.3 V	8.7 V	10.0 V
Direct or Reverse Acting	0-135 ohms Feedback	135Ω	113Ω	90Ω	68Ω	45Ω	23Ω	0Ω
	0-1000 ohms Feedback	1000Ω	833Ω	667Ω	500Ω	333Ω	167Ω	0Ω

Note: 0-10 V or 2-10 V is available on GGx, HGx, and JGx models. 0-135 ohms feedback is available on AGD models and 0 to 1000 ohms feedback on AGE models. (Ω is ohms.)

Figure 6: Nominal Feedback Signal Relative to the Rotation Range

Wiring

CAUTION: Equipment Damage Hazard. Disconnect all power supplies before wiring connections are made, or prior to performing maintenance. Check all wiring connections before applying power to the system. Short-circuited or improperly connected wires will result in permanent damage to the equipment.

IMPORTANT: Install all quick-connect terminals in the same direction to prevent shorting. (See Figure 7.)

Figure 7: Orientation of Terminals

Observe the following when wiring an M9216 actuator:

- Make all wiring connections in accordance with the National Electrical Code and local regulations.
- Note that there is a 25-second delay for all models (except the BGx and GGx), before the actuator responds after power is applied.
- Do not switch 24 VAC from CW to CCW (or CCW to CW) on the AGx models in less than 0.5 seconds.

Refer to Figure 8 for the applicable M9216 actuator.

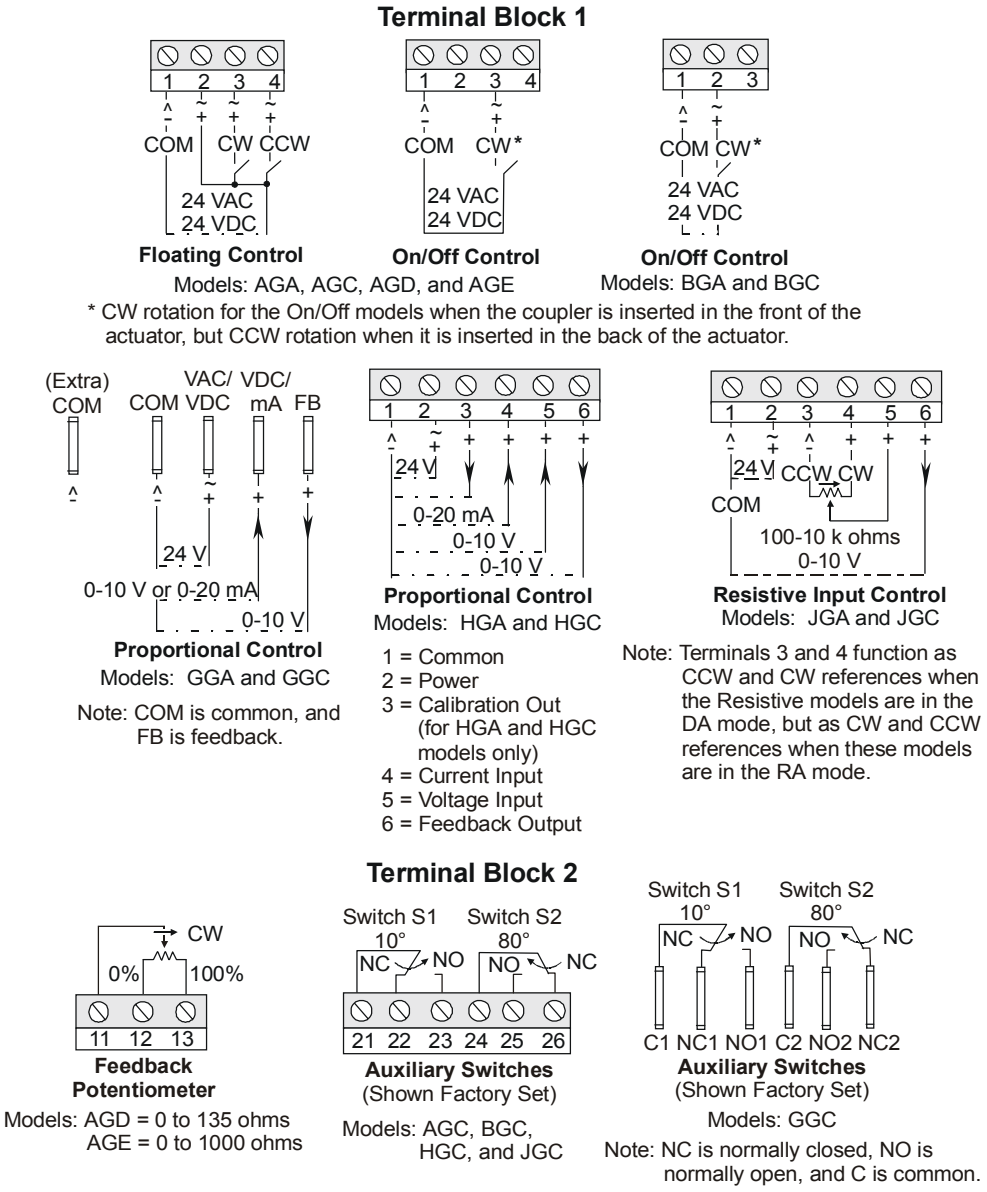


Figure 8: Wiring Diagrams for M9216 Models

Wiring is made through the conduit openings or through the conduit adaptor, which converts the opening for a threaded NPT conduit fitting.

Through the Conduit Openings

Depending on the M9216 model selected, one or both conduit openings are used. Refer to Figure 9 and proceed as follows:

1. Loosen the cover screw with a Phillips No. 2 screwdriver, and remove the actuator cover.
2. Push the plastic plug out of the conduit opening with fingertip.

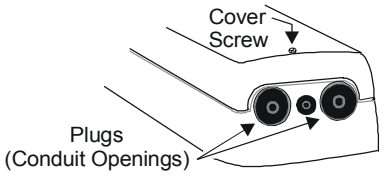


Figure 9: Location of the Conduit Openings

3. Insert the cable wires through the hole in the conduit plug, and connect to the terminals using the appropriate wiring diagrams in Figure 8.

With the M9000-100 Conduit Adaptor (Included)

To use a conduit adaptor, proceed as follows:

1. Push the plastic plug out of the conduit opening with fingertip.
2. Slide the capture nut into the slot located inside of the conduit opening. (See Figure 10.)

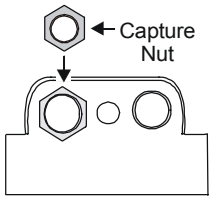


Figure 10: Capture Nut

3. Insert the conduit adaptor into the conduit opening, and hand tighten by turning in a CW direction as shown in Figure 11.

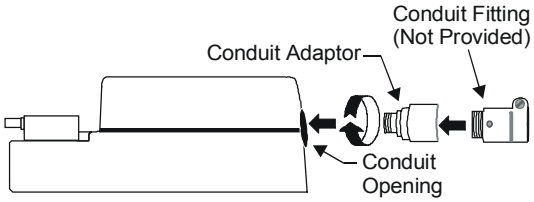


Figure 11: Conduit Adaptor Wiring

IMPORTANT: Use flexible metallic conduit or its equivalent with the fitting. Do not overtighten the conduit adaptor assembly into the actuator to avoid damaging the actuator housing.

4. Insert the conduit fitting (not provided) into the adaptor, and hand tighten in a CW direction. (See Figure 11.)
5. Insert the cable wires through the conduit adaptor assembly, and connect to the terminals using the wiring diagrams in Figure 8.
6. Tighten the clamp on the conduit fitting.

Tandem Operation

The tandem configuration provides 280 lb·in (32 N·m), twice the torque of a single unit. The actuators operate in exact synchronization, ensuring the load is split evenly between each unit.

Use two actuators from the same model group (BGx, GGx, or HGx) for tandem operation. BGx models must be wired in parallel for tandem operation. GGx models employ Mode Switch 5, and HGx models employ Jumper W4.

IMPORTANT: When connecting two actuators back-to-back on the same shaft, set the coupler on one unit to spring return in the opposite direction from the other unit. (Refer to the *Installation, Spring Return Direction* section.)

Note: Manual override does not function after the actuators configured for tandem operation are mounted to a shaft.

GGx Models

GGx models are factory set with Mode Switch 5 in the master position. Designate one unit as the master actuator. Refer to Figure 12, and proceed as follows:

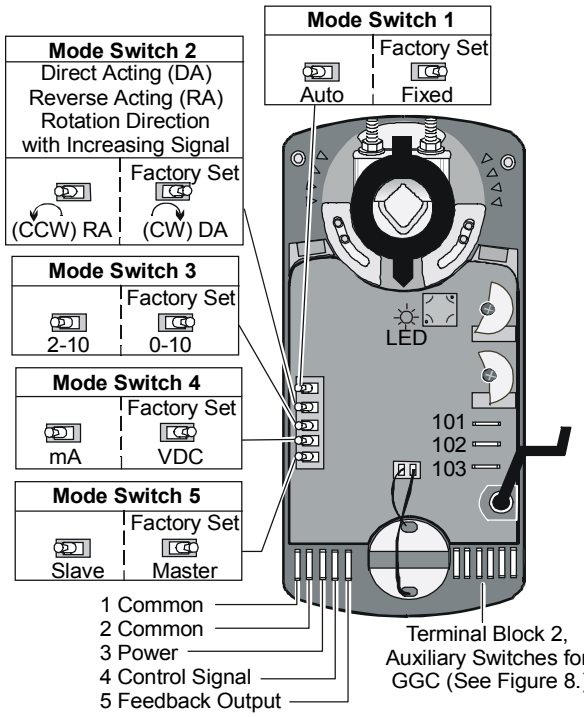


Figure 12: Mode Switch Settings for GGx Models

1. Move Mode Switch 5 on the other GGx actuator to the slave position.
2. Connect the control signal to the master actuator only, and set the remaining mode switches on the master unit according to the action and signal range desired. (Refer to the *Calibration* section.)
3. Connect Terminals 101, 102, and 103 from the master actuator to the corresponding terminals on the slave actuator. (See Figure 12.)

Note: The total wire length for these connections may be up to 30 ft (9 m).

4. Connect 24 VDC or VAC power to each actuator.

HGx Models

HGx models are factory set with Jumper W4 in the master position. Designate one unit as the master actuator. Refer to Figure 13, and proceed as follows:

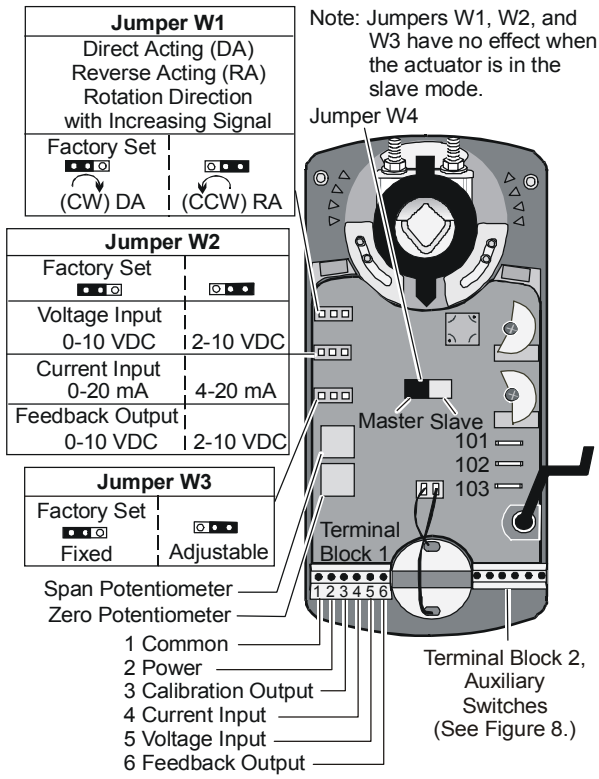


Figure 13: Settings for HGx Models

1. Move Jumper W4 on the other HGx actuator to the slave position.
2. Connect the control signal to the master actuator only, and set the remaining jumpers on the master unit according to the action and signal range desired. (Refer to the *Calibration* section.)
3. Repeat Steps 3 through 4 from the *GGx Models* section.

If the actuators configured for tandem operation stall or do not drive:

- Make sure both actuators are from the same model group.
- Make sure one actuator is set as the master and the other actuator as the slave.
- Make sure the control signal is connected to the master actuator only.
- Make sure Terminals 101, 102, and 103 are connected properly.
- Make sure the couplers are properly installed. (Refer to the *Installation, Spring Return Direction* section.)

Setup and Adjustments

Calibration

Only the actuator designated as the master needs to be calibrated when two BGx, GGx, or HGx models are used in tandem.

Direction of Action

Drive direction is dependent on the position of Jumper W1 or Mode Switch 2 and the spring return direction as shown in Table 2. To change the spring return direction, see the *Installation, Spring Return Direction* section.

Table 2: Settings for Direction of Action

Location of Jumper or Mode Switch/ Direction of Spring Return	Drive Direction with a Minimum Input Signal	Drive Direction with a Maximum Input Signal
DA/CCW	CCW	CW
RA/CCW	CW	CCW
DA/CW	CW	CCW
RA/CW	CCW	CW

To set an actuator for Reverse Acting (RA), proceed to the section for the applicable model.

AGx Models

Reverse the control wiring connections at Terminals 3 and 4 to select RA operation for the floating models. (See Terminal Block 1 in Figure 8.)

BGx Models

RA is selected by changing the actuator sleeve from the front to the back of the actuator. (See the *Installation, Spring Return Direction* section.)

GGx Models

GGx models are factory set with Mode Switch 2 in the DA mode. Move Mode Switch 2 to the RA mode. (See Figure 12.)

HGx and JGx Models

HGx and JGx models are factory set with Jumper W1 in the DA position. Move Jumper W1 to the RA position. (See Figure 13.) Apply power and a control signal to the actuator to verify proper operation. (See Table 2.)

Note: HGx models may require potentiometer settings. Proceed to the *Potentiometers (HGx Models)* section.

Fixed or Auto Mode (GGx Models)

The GGx models are factory set with Mode Switch 1 in the fixed position shown in Figure 12, where a 0 to 10 VDC input signal (selected with Mode Switches 3 and 4) corresponds with a 0 to 93° rotation. If the rotation range is reduced, the end-stop is reached with a reduced input signal. For example, if a 0 to 10 VDC input signal is selected and the rotation range is limited to 75°, the end-stop is reached at 8 VDC.

The AUTO calibration or auto mode enables the actuator to redefine the selected input signal and feedback proportionally across a reduced rotation range. The actuator stores the reduced range in nonvolatile memory (retains data when power is lost or removed).

To activate the auto mode, move Mode Switch 1 to the auto position, and leave it in this position. The actuator spring returns to the normal position, drives to the full stroke position, and stores these positions in nonvolatile memory. The actuator drives to the setpoint determined by the control signal applied after going through the auto mode. During normal operation, if the actuator stroke increases in the auto mode due to seal or seat wear, the input is redefined to the increased rotation range in approximately 2° increments.

Note: If the actuator's direction of spring return, rotation range, or the linkage is changed, respan by moving Mode Switch 1 to the fixed position for 5 seconds and then back to "auto". This reinitiates the auto mode. (The feedback output remains 0 to 10 VDC, unless Mode Switch 3 is positioned for 2 to 10 VDC.)

LED (GGx Models)

The GGx models have a Light Emitting Diode (LED) indicator shown in Figure 13. When the actuator is driving to position, the LED flashes five times every second. When the unit is AUTO calibrating, the LED flashes ten times every second. When the unit is idle, the LED flashes once every 2-1/2 seconds.

Mode Switches (GGx Models)

GGx models are factory set with Mode Switch 1 in the fixed position, Mode Switch 2 in the DA position, Mode Switch 3 in the 0 to 10 position, Mode Switch 4 in the VDC position, and Mode Switch 5 in the master position. (See Figure 12.)

Jumpers (HGx and JGx Models)

HGx models are factory set with Jumper W1 in the DA position, Jumper W2 in the 0 to 10 VDC or 0 to 20 mA position, Jumper W3 in the fixed position, and Jumper W4 in the master position. (See Figure 13.)

Note: JGx models are supplied with only one jumper, Jumper W1, to select the direction of action.

Potentiometers (HGx Models)

IMPORTANT: Both zero and span potentiometers must be adjusted for full actuator travel and complete calibration.

HGx models have two potentiometers, zero and span. These potentiometers do not require adjustment when Jumper W3 is in the fixed position (factory set). When Jumper W3 is in the adjustable (ADJ) position, proceed as follows:

Use either Terminals 3 and 5 or Terminals 3 and 4, a control signal, and a voltmeter. The zero and span potentiometers may be adjusted as follows without waiting for the actuator to drive to the final position.

Adjusting the Zero and Span

1. Verify that Jumper W2 is in the 0 to 10 VDC position, and Jumper W3 is in the ADJ position. (See Figure 13.)
2. Provide 24 VAC or 24 VDC power to Terminal 1 (Common) and Terminal 2.
3. Connect the Common from the controller to Terminal 1, and either a voltage signal to Terminal 5 or a current signal to Terminal 4.
4. Connect Terminals 1 and 3 to a voltmeter to monitor the calibration output.

5. Use a 1/8 in. (3 mm) flat-blade screwdriver to turn the zero potentiometer fully CW and the span potentiometer fully CCW.
6. Apply the minimum (zero point) control signal required for positioning the actuator at the minimum position.
7. Monitor DC calibration output. To adjust the zero potentiometer, turn it CCW until the voltmeter displays 0 volts or slightly less.
8. Adjust the control signal to the maximum voltage desired to cause full rotation. (Signals greater than 10 volts have no further effect.)
9. Monitor calibration output at Terminals 1 and 3. Adjust the span potentiometer CW to increase the calibration output to 10 volts.
10. Verify that the actuator is properly calibrated by adjusting the control signal to the minimum and maximum levels.

    Example for a zero of 3 VDC and a span of 5 VDC:

    a. Apply a 3-volt control signal to the actuator, and turn the zero potentiometer CCW until the calibration output at Terminal 3 is 0 volts.

    b. Apply maximum voltage. (In this case, it is 8 VDC, which results in a span of 5 volts.)

    c. Monitor calibration output at Terminal 3, and adjust the span potentiometer CW until 10 volts is reached.

Note: Mechanical movement is not immediate due to a delay in the actuator's response to the control signal.

Auxiliary Switches (xGC Models)

The xGC models have two built-in auxiliary switches, which may be set for any angle between 0 and 90° (factory set for 10 and 80°) using either an input signal or the manual crank. (Refer to the *Technical Data* section for auxiliary switch ratings.)

The following procedures serve as examples to change the position of the auxiliary switch angles.

Switch S1

To change the angle of Switch S1 to 20°, refer to Figure 14 and proceed as follows:

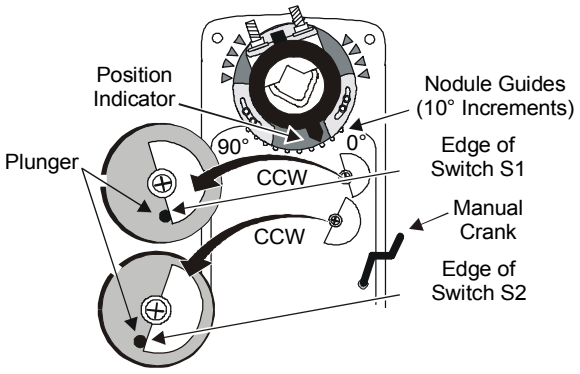


Figure 14: Switch Angle Settings

1. Insert the manual crank into the manual override gear.
2. Push in and turn the manual crank CW. Using the 0 to 90° nodule guides, rotate the coupler until the position indicator is at 20°.
3. Rotate Switch S1 CCW, aligning the edge of the switch with the plunger until the plunger rises. (See Figure 14.)

Note: The normally closed contact closes, and the normally open contact opens. (See Auxiliary Switches in Terminal Block 2 from Figure 8.)

Switch S2

To change the angle of Switch S2 to 70°, refer to Figure 14 and proceed as follows:

1. Push in and turn the manual crank CW. Using the 0 to 90° nodule guides, rotate the coupler until the position indicator is at 70°.
2. Rotate Switch S2 CCW, aligning the edge of the switch with the plunger until the plunger rises. (See Figure 14.)

Note: The normally closed contact opens, and the normally open contact closes. (See Auxiliary Switches in Terminal Block 2 from Figure 8.)

3. Turn the manual crank CW to release the spring, and remove it. (The actuator will spring return the coupler to the 0° position.)
4. Replace the actuator cover, and return the manual crank to its original position on the actuator cover.

Repairs and Replacement

Field repairs must not be made. For a replacement or an accessory, refer to the *Ordering Information* section in the *M9216 Series Electric Spring Return Actuators Product Bulletin (LIT-2681068).*

Technical Data

Product	M9216 Series Electric Spring Return Actuators	
Power Requirements	AGx, HGx, JGx:	20 to 30 VAC at 50/60 Hz or 24 VDC ±10%, 12 VA supply, Class 2
	BGx:	20 to 30 VAC at 50/60 Hz or 24 VDC ±10%, 10 VA supply, Class 2
	GGx:	20 to 30 VAC at 50/60 Hz or 24 VDC ±10%, 14 VA supply from 32 to 122°F (0 to 50°C) or 18 VA supply from -22 to 32°F (-30 to 0°C), Class 2
Input Signal	AGx:	24 VAC at 50/60 Hz or 24 VDC, 4.8 mA (on/off mode, 500 mA maximum)
	BGx:	24 VAC at 50/60 Hz or 24 VDC, 420 mA maximum
	GGx, HGx:	0 to 10 VDC or 0 to 20 mA
	JGx:	Potentiometer value is 100 ohms minimum to 10,000 ohms maximum
Input Signal Adjustments	AGx Factory Setting:	Terminals 1 and 3, CW rotation; Terminals 1 and 4, CCW rotation
	BGx Factory Setting:	Terminals 1 and 2, CW rotation
	GGx (Voltage or Current Input):	
	Switch Selectable:	0 (2) to 10 VDC or 0 (4) to 20 mA
	Factory Setting:	0 to 10 VDC, CW rotation with signal increase
	HGx (Voltage Input or Current Input):	
	Jumper Selectable, Fixed:	0 (2) to 10 VDC or 0 (4) to 20 mA
		Adjustable: Zero, 0 to 6 V (0 to 12 mA); Span, 2 to 10 V (4 to 20 mA)
	Factory Setting:	0 to 10 VDC, 0 to 20 mA, CW rotation with signal increase
	GGx, HGx, JGx:	Direction of action is user selectable Direct (CW) or Reverse (CCW) with signal increase.
Input Impedance	GGx, HGx:	Voltage Input, 200,000 ohms; Current Input, 500 ohms
	JGx:	1.8 Megohms
Feedback Signal	AGD:	135 ohm feedback potentiometer
	AGE:	1,000 ohm feedback potentiometer
	GGx, HGx:	0 to 10 VDC or 2 to 10 VDC for 90° (10 VDC at 1 mA) Corresponds to input signal span selection and rotation limits.
	JGx:	0 to 10 VDC for 90° (10 VDC at 1 mA)
Auxiliary Switch Rating	xGC:	Two SPDT (Single-Pole, Double-Throw) rated at 24 VAC, 1.5 A inductive, 3.0 A resistive, 35 VA maximum per switch, Class 2
Spring Return	Factory Setting:	CCW; Direction is selectable with the coupler.
Mechanical Output (Running Torque)	All Models:	140 lb·in (16 N·m) for one unit
	BGx, GGx, HGx:	280 lb·in (32 N·m) for two units in tandem
Rotation Range	Adjustable from 30 to 90°, CW or CCW, mechanically limited to 93°	
Rotation Time	70 to 130 seconds for 0 to 140 lb·in (0 to 16 N·m); 90 seconds nominal at 50% rated load (Powered rotation is faster in the spring return direction than in the spring winding direction; power failed spring return is less than 15 seconds.)	
Cycles	65,000 full stroke cycles	
Electrical Connection	GGx:	1/4 in. spade terminals with pluggable terminal blocks
	All Other Models:	Screw terminals for 22-14 AWG; maximum of two 18, 20, or 22 AWG each
	M9000-100:	One included with all models; two included with AGD, AGE, and xGC
Mechanical Connection	3/8 to 3/4 in. (10 to 20 mm) diameter round shaft; 3/8 to 5/8 in. (10 to 16 mm) square shaft	
Enclosure	NEMA 2, IP42	
Ambient Conditions	Operating, GGx:	-22 to 122°F (-30 to 50°C); 0 to 95% RH, non-condensing
	All Other Models:	-4 to 122°F (-20 to 50°C); 0 to 95% RH, non-condensing
	Storage, All Models:	-40 to 186°F (-40 to 86°C); 0 to 95% RH, non-condensing
Dimensions (H x W x D)	9.82 x 4.57 x 3.62 in. (249.4 x 116.0 x 91.9 mm)	
Shipping Weight	6.4 lb (2.9 kg)	
Agency Compliance	UL 873 Listed, File E27734, CCN XAPX CSA C22.2 No. 139 Certified, File LR85083, Class 3221 02 CE Mark, EMC Directive 89/336/EEC	

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

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