Applications

The M9220-GGx-3 Proportional Electric Actuators are direct-mount, spring return electric actuators that operate on AC/DC 24V power. These bidirectional actuators do not require a damper linkage, and are easily installed on dampers with 1/2 to 3/4 in. or 12 to 19 mm round shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm square shafts using the standard shaft clamp included with the actuator. An optional M9220-600 Jackshaft Coupler Kit is available for 3/4 to 1-1/16 in. or 19 to 27 mm round shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm square shafts.

A single M9220-GGx-3 Series Proportional Electric Spring Return Actuator provides a running and spring return torque of 177 lb·in (20 N·m). Two or three like models mounted in tandem deliver twice or triple the torque (354 lb·in [40 N·m] or 531 lb·in [60 N·m]). Integral line voltage auxiliary switches are available on the GGC models to indicate end-stop position or to perform switching functions within the selected rotation range.

IMPORTANT: Use this M9220-GGx-3 Proportional Electric Spring Return Actuator only to control equipment under normal operating conditions. Where failure or malfunction of the electric actuator could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the electric actuator.

IMPORTANT : Utiliser ce M9220-GGx-3 Proportional Electric Spring Return Actuator uniquement pour commander des équipements dans des conditions normales de fonctionnement. Lorsqu'une défaillance ou un dysfonctionnement du actuator risque de provoquer des blessures ou d'endommager l'équipement contrôlé ou un autre équipement, la conception du système de contrôle doit intégrer des dispositifs de protection supplémentaires. Veiller dans ce cas à intégrer de façon permanente d'autres dispositifs, tels que des systèmes de supervision ou d’alarme, des dispositifs de sécurité ou de limitation, ayant une fonction d’avertissement ou de protection en cas de défaillance ou de dysfonctionnement du electric actuator.
Installation
The M9220-GGx-3 Proportional Electric Spring Return Actuators mount directly to the surface in any convenient orientation using two M3 x 9.5 mm self-drilling sheet metal screws and the anti-rotation bracket (parts included with the actuator). No additional linkages or couplers are required. Electrical connections are color-coded and identified with numbers permanently marked on the actuator cable. A tag on the actuator cable identifies the electrical connections, and wiring details are also included on the actuator housing.

IMPORTANT: Do not install or use this M9220 GGx-3 Proportional Electric Spring Return Actuator in or near environments where corrosive substances or vapors could be present. Exposure of the electric actuator to corrosive environments may damage the internal components of the device, and will void the warranty.

Parts Included
• proportional electric spring return actuator with coupler
• anti-rotation bracket
• manual override crank
• two M3 x 9.5 mm self-drilling sheet metal mounting screws
• two No. 10-32 x 9/16 in. thread-forming conduit screws

Special Tools Needed
• torque wrench with 3/8 in. (10 mm) socket
• digital voltmeter or M9000-200 Commissioning Tool
• flat blade screwdriver
Figure 1: M9220-GGx-3 Proportional Electric Spring Return Actuator Dimensions, in. (mm)
Accessories

Table 1: Accessories and Replacement Parts (Order Separately)

<table>
<thead>
<tr>
<th>Code Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMPR-KC003¹</td>
<td>7 in. (178 mm) Blade Pin Extension (without bracket) for Johnson Controls® direct-mount damper applications (quantity 5)</td>
</tr>
<tr>
<td>M9000-153</td>
<td>Crank arm (quantity 1)</td>
</tr>
<tr>
<td>M9000-158</td>
<td>Tandem Mounting Kit used to mount two models of M9210/20 Proportional Electric Spring Return Actuators (quantity 1)</td>
</tr>
<tr>
<td>M9000-170</td>
<td>Remote Mounting Kit, horizontal. Kit includes mounting bracket, M9000-153 Crank Arm, ball joint, and mounting bolts (quantity 1)</td>
</tr>
<tr>
<td>M9000-171</td>
<td>Remote Mounting Kit, vertical. Kit includes mounting bracket, M9000-153 Crank Arm, ball joint, and mounting bolts (quantity 1)</td>
</tr>
<tr>
<td>M9000-200</td>
<td>Commissioning Tool that provides a control signal to drive 24 V On/Off, Floating, Proportional, and/or Resistive Electric Actuators (quantity 1)</td>
</tr>
<tr>
<td>M9000-320</td>
<td>Weather Shield Enclosure - NEMA 3R enclosure for protecting a single M9210/20 actuator from rain, sleet, or snow (quantity 1)</td>
</tr>
<tr>
<td>M9000-400</td>
<td>Jackshaft Linkage Kit. Open-ended design enables clamping onto a jackshaft without requiring access to the ends of the jackshaft (quantity 1)</td>
</tr>
<tr>
<td>M9000-519</td>
<td>Valve linkage for mounting M9220 actuator to 2-1/2 to 6 in. flanged ball valves</td>
</tr>
<tr>
<td>M9000-604</td>
<td>Replacement Anti-rotation Bracket Kit (with screws) for M9210-xxx-3 Series Proportional Electric Spring Return Actuators (quantity 1)</td>
</tr>
<tr>
<td>M9200-100</td>
<td>Threaded Conduit Adapter, 1/2 NPSM, for M9210(20) and M(VA)9208 Series Actuators (quantity 5)</td>
</tr>
<tr>
<td>M9220-600</td>
<td>1 in. (25 mm) Jackshaft Coupler Kit (with locking clip) for mounting M9210-xxx-3 Series Proportional Electric Spring Return Actuators on dampers with 3/4 to 1-1/16 in. or 19 to 27 mm round shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm square shafts (quantity 1)</td>
</tr>
<tr>
<td>M9220-601</td>
<td>Replacement Coupler Kit (with locking clip) for mounting M9210-xxx-3 Series Proportional Electric Spring Return Actuators on dampers with 1/2 to 3/4 in. or 12 to 19 mm round shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm square shafts (quantity 1)</td>
</tr>
<tr>
<td>M9220-602</td>
<td>Replacement Locking Clips for M9210-xxx-3 Series Proportional Electric Spring Return Actuators (five per bag)</td>
</tr>
<tr>
<td>M9220-603</td>
<td>Adjustable Stop Kit for M9210-xxx-3 Series Proportional Electric Spring Return Actuators (quantity 1)</td>
</tr>
<tr>
<td>M9220-604</td>
<td>Replacement Manual Override Cranks for M9210-xxx-3 Series Proportional Electric Spring Return Actuators (five per bag)</td>
</tr>
<tr>
<td>M9220-610</td>
<td>Replacement shaft gripper, 10 mm square shaft with locking clip (quantity 1)</td>
</tr>
<tr>
<td>M9220-612</td>
<td>Replacement shaft gripper, 12 mm square shaft with locking clip (quantity 1)</td>
</tr>
<tr>
<td>M9220-614</td>
<td>Replacement shaft gripper, 14 mm square shaft with locking clip (quantity 1)</td>
</tr>
</tbody>
</table>

¹ Furnished with the damper and may be ordered separately.

Mounting

The M9220-GGx-3 Proportional Electric Spring Return Actuators can be easily installed on dampers with 1/2 to 3/4 in. or 12 to 19 mm round shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm square shafts. An M9220-600 Jackshaft Coupler Kit is available for 3/4 to 1-1/16 in. or 19 to 27 mm round shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm square shafts; see Table 1 for more details. If the damper shaft extends less than 3-19/32 in. (91 mm), see the Removable Coupler section for further instructions. If the damper shaft extends less than 1-5/32 in. (29 mm), install an extension recommended by the damper manufacturer.
Counterclockwise (CCW) Spring Return Direction – Clockwise (CW) Powered Operation

For CCW spring return direction, mount the actuator to the damper shaft so that Side A of the actuator is away from the damper as illustrated in Figure 2. With power applied, the actuator drives CW from the 0° position, and spring returns CCW.

Clockwise (CW) Spring Return Direction – Counterclockwise (CCW) Powered Operation

To change the spring return direction to CW, mount the actuator to the damper shaft so that Side B of the actuator is away from the damper as illustrated in Figure 3. With power applied, the actuator now drives CCW from the 0° position, and spring returns CW.

Removable Coupler

The coupler may be installed on either side of the output hub. If the damper shaft is less than 3-19/32 in. (91 mm) long, insert the coupler in the face of the actuator closest to the damper. If the damper shaft is shorter than 1-5/32 in. (29 mm) long, a shaft extension is required to mount the actuator.
To change the position of the coupler, see Figure 4 and proceed as follows:

1. Mount the coupler on either Side A or Side B of the actuator, as determined by the shaft length.
2. Snap the locking clip securely into the coupler retention groove to retain the coupler.

**Manual Override**

Use only the supplied manual override crank to reposition the actuator hub when using the manual override feature.

**IMPORTANT:** Applying excessive torque to the manual override or running the manual override with a power tool may damage the internal components of the actuator and cause premature failure.

To reposition the actuator hub, proceed as follows:

1. De-energize the actuator.
2. Insert the hex end of the manual override crank into the manual override adjustment point on the face of the actuator.
3. Rotate the manual override crank in the direction indicated by the arrow on the label.
   **Note:** The actuator requires 27 rotations of the manual override crank from the fully spring return position to fully reposition the actuator hub. At the end of travel, the rotational resistance increases; do not force the actuator hub past this point.
4. Rotate the manual override crank a half turn in the opposite direction to lock the actuator hub in place.
   **Note:** To unlock the actuator hub, rotate the manual override crank in the direction indicated by the arrow on the label. The actuator hub automatically unlocks when power is applied to the actuator, and returns the actuator to normal drive and spring return operation.

**Mounting the Actuator**

To mount the actuator, proceed as follows:

1. See the dimensions in Figure 5 and Table 2 to ensure the correct positioning of the anti-rotation bracket.

**Figure 5: Positioning the Anti-Rotation Bracket**

**Table 2: Dimensions from Anti-rotation Bracket to Shaft Center**

<table>
<thead>
<tr>
<th>Shaft Diameter</th>
<th>Dimension A, in. (mm)</th>
<th>Dimension B, in. (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 to 9/16 in. (12 to 14 mm)</td>
<td>8-9/32 (210)</td>
<td>7 (178)</td>
</tr>
<tr>
<td>5/8 to 3/4 in. (16 to 19 mm)</td>
<td>8-5/32 (207)</td>
<td>6-29/32 (175)</td>
</tr>
</tbody>
</table>

**IMPORTANT:** The tab on the anti-rotation bracket must fit midpoint in the actuator slot. Positioning the tab midpoint in the slot prevents actuator binding and premature wear, and makes actuator removal easier.

2. Bend or cut the anti-rotation bracket to fit the damper frame or duct as illustrated in Figure 6.
Note: You can bend the anti-rotation bracket to fit a round damper.

3. Drill mounting holes in the damper frame or duct using the anti-rotation bracket as a guide (based on the measurements obtained in Table 2 and Figure 5).

4. Secure the anti-rotation bracket to the damper frame or duct using the two M3 x 9.5 mm self-drilling sheet metal screws provided and a 1/4 in. (6 mm) blade screwdriver or 5/16 in. (8 mm) nut driver.

5. Slide the actuator onto the damper shaft, and position the tab of the anti-rotation bracket into the slot at the bottom of the actuator as illustrated in Figure 6.

6. Rotate the damper blades to the desired position if the power is lost. To ensure a tight seal, insert the manual override crank and turn it in the direction indicated by the arrow on the label five turns; the position indicator should be near the 0° position on the scale. Quickly rotate the manual override crank a half turn in the opposite direction to temporarily lock the actuator hub in place.

7. Evenly hand tighten each clamp nut onto the U-bolt, keeping the actuator flat. Secure the U-bolt to the damper shaft and tighten to a torque of 100 to 125 lb-in (11 to 14 N·m).

8. To release the spring, turn the manual override crank in the direction indicated on the label; the actuator spring returns to its starting position. If this step is omitted, the spring releases automatically when power is applied to the actuator.

9. Remove the manual override crank and store it in an unused mounting hole.

10. Apply power long enough for the actuator to travel a full stroke, and verify that the actuator rotates freely throughout the range.

Note: If electric power is not available, complete this verification by reinserting the manual override crank and turning it in the direction indicated to rotate the coupler to the fully open position.

**Rotation Range Using Optional M9220-603 Adjustable Stop Kit**

The actuator is factory set for 90° rotation, and its rotation range is limited in 5° increments to a minimum of 30°. Stroke limiting stops are attached in the field to the shaft coupler side of the actuator to reduce the rotation range. Attaching a stroke limiting stop in the furthest mounting position reduces the rotation range of the actuator by 5°. Each progressive mounting position reduces the rotation range an additional 5°.

1. Check that the damper blade is accessible or that its position is permanently marked on the end of the damper shaft as illustrated in Figure 7.

2. Determine the desired rotation range. If a 65 to 90° rotation range is desired, add one stroke limiting stop. If a 35 to 60° rotation range is desired, add two stroke limiting stops.
**Note:** If two stroke limiting stops are applied, use the manual override crank to position and lock the actuator in a mid-stroke position to gain access to both stroke limiting stop mounting positions.

3. Mount the stroke limiting stops in the desired position using the two M4 x 10 mm self-tapping screws provided. Tighten the screws to a torque of 35 lb·in (4 N·m).

4. Manually reposition the coupler so that the coupler set screw aligns with the nodule guide that corresponds to the value determined in Step 2.

Example:

For a rotation range of 65°, mount one stroke limiting stop in the minimum stroke position as illustrated in Figure 8.

---

**Wiring**

The M9220-GGx-3 Proportional Electric Spring Return Actuator provides reliable, integrated damper control. An AC 24 V at 50/60 Hz or DC 24 V input signal between the black and red wires, and a DC 0(2) to 10 V input control signal, causes the output hub to rotate from -5 to 90° (unless an external mechanical limit is reached).

Once the actuator reaches the commanded position, it holds that position until power is removed. If power is removed, the actuator spring returns to its -5° position (unless an external mechanical limit is reached). A stall condition while driving between -5 to 90° causes the output hub to stop motion and hold its position until power is removed. Rotation is mechanically limited to the -5 and 90° positions by integral end-stops. Optional end-stops are available to limit the output hub travel. An anti-rotation bracket prevents rotational movement of the actuator body.

---

**CAUTION: Risk of Electric Shock.**
Disconnect the power supply before making electrical connections to avoid electric shock.

**MISE EN GARDE : Risque de décharge électrique.**
Débrancher l'alimentation avant de réaliser tout raccordement électrique afin d'éviter tout risque de décharge électrique.

**CAUTION: Risk of Property Damage.**
Do not apply power to the system before checking all wiring connections. Short circuited or improperly connected wires may result in permanent damage to the equipment.

**MISE EN GARDE : Risque de dégâts matériels.**
Ne pas mettre le système sous tension avant d'avoir vérifié tous les raccords de câblage. Des fils formant un court-circuit ou connectés de façon incorrecte risquent d'endommager irrémédiablement l'équipement.

---

**important:** Make all wiring connections in accordance with local, national, and regional regulations. Do not exceed the electrical ratings of the M9220-GGx-3 Proportional Electric Spring Return Actuator.

---

See Figure 9, Figure 10, and Figure 11 for proper wiring of the M9220-GGx-3 Proportional Electric Spring Return Actuator.
Figure 10: Control Wiring Diagrams

DC 0(2)...10V Control

<table>
<thead>
<tr>
<th>BLK</th>
<th>RED</th>
<th>GRY</th>
<th>ORN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

AC/DC 24 V

0(4)...20mA Control with External Resistor

<table>
<thead>
<tr>
<th>BLK</th>
<th>RED</th>
<th>GRY</th>
<th>ORN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

0(4)...20mA

500Ω / 0.25 W

DC 0(2)...10 V

Override to MIN position

<table>
<thead>
<tr>
<th>BLK</th>
<th>RED</th>
<th>GRY</th>
<th>ORN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

AC 24 V

COM

Y

U

Override to MAX position

<table>
<thead>
<tr>
<th>BLK</th>
<th>RED</th>
<th>GRY</th>
<th>ORN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

AC 24 V

COM

Y

U

Override to MIN, MID, MAX positions

<table>
<thead>
<tr>
<th>BLK</th>
<th>RED</th>
<th>GRY</th>
<th>ORN</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

AC 24 V

0(4)...20mA

500Ω / 0.25 W

DC 0(2)...10 V

Figure 11: M9220-GGx-3 Control Wiring Diagram (Overrides)

FUNCTION A B C

0% (MIN) / / /

50% (MID) / / /

100% (MAX) / / /

NORMAL / / /
Setup and Adjustments

Direction of Action

The M9220-GGx-3 Proportional Electric Spring Return Actuators are factory set for Direct Acting (DA) operation. In DA mode, applying an increasing input signal to the control input drives the actuator away from the spring return position. Reverse Acting (RA) operation is also available. In RA mode, applying an increasing input signal to the control input drives the actuator toward the spring return position. Figure 12 and Figure 13 indicate how the drive direction for the actuator depends on the spring return direction and the position of the mode selection switch.

<table>
<thead>
<tr>
<th>Mode Selection Switch Setting</th>
<th>Increasing Signal</th>
<th>Decreasing Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA</td>
<td>CW</td>
<td>CCW</td>
</tr>
<tr>
<td>RA</td>
<td>CCW</td>
<td>CW</td>
</tr>
<tr>
<td>RA</td>
<td>CW</td>
<td>CCW</td>
</tr>
<tr>
<td>DA</td>
<td>CCW</td>
<td>CW</td>
</tr>
</tbody>
</table>

Figure 12: Nominal Feedback Signal Relative to Rotation Position

Mode Selector Switch and CAL Function

The M9220-GGx-3 Proportional Electric Spring Return Actuators are factory set at Direct Acting (DA), DC 0 to 10 V control input (Figure 13). To change to RA operation, move the mode selection switch from DA to RA. The DC input signal is selectable from DC 0 to 10 V or from DC 2 to 10 V, which corresponds to 0 to 90° rotation. If the rotation range is reduced, the end-stop is reached with a reduced input signal. For example, if a DC 0 to 10 V input signal is selected and the rotation range is limited to 75°, the end-stop is reached at DC 8.3 V. If an external 500 ohm resistor is placed across the input (see Figure 10), the switch positions then select between 0-20 mA or 4-20 mA.

To calibrate the control input range, proceed as follows:

1. With power off, move the mode selection switch to the CAL position (Figure 13). Then, energize the actuator. The actuator automatically rotates until the end-stops are found, and proportionally reconfigures the control input range to the reduced rotation range.

2. Return the mode selection switch to the desired selection (example: DA, 0 to 10 VDC control input).

   Note: During normal operation, if the actuator stroke increases due to seal or seat wear, the input is redefined to the increased rotation range in approximately 0.5° increments.

3. If the actuator mounting position is changed or if the linkage is adjusted, repeat Steps 1 and 2 to reinitiate the CAL function.

   Note: To repeat calibration with power applied, move the mode selection switch out of the CAL position for at least 2 seconds before returning it to the CAL position. Auto calibration begins 5 seconds after you return it to the CAL position.
**Tandem Operation: GGx Master with GGx Slaves**

The tandem configuration (Figure 14 and Figure 16) provides twice (with two actuators) or triple (with three actuators) the running and spring return torque of a single actuator, or 354 lb·in (40 N·m), 531 lb·in (60 N·m). The actuators may be mounted in tandem using the M9000-158 Tandem Mounting Kit. To mount a third actuator, user-configured bracketing is required.

- Two or three M9220-GGx-3 actuators may be operated in tandem on the same shaft. If mounting two actuators, see Figure 14; for three actuators, see Figure 16.
- Each actuator requires separate 24 volt power. When two or more actuators connected in tandem share a common power source, the total maximum power draw is actually 1.5 times the normal running current for each actuator. (Total Power = Number of Actuators x Running Power x 1.5).
- Only one of the actuators can be configured as the master. Set the selector switch to the master position (Figure 15).

Follow these guidelines for tandem operation:

- DC 0(2)...10V Control with Tandem Connection

**Figure 14: Tandem Connection**

- Follow these guidelines for tandem operation:
  - DC 0(2)...10V Control with Multiple Slaves

**Figure 16: Tandem Connection with Three Actuators**

- The other GGx actuator(s) must be configured as slave(s), by setting the tandem selector switch to the slave position.
- The master can accept DC 0-10 V or DC 2-10 V, or 4-20 mA command signals based on the master’s switch settings and/or external resistor.
- The master and slave(s) must have matching RA/DA settings.
• The master and slave(s) must spring return in the same direction.

• Once tandem-operating actuators are mounted to a damper shaft, manual override is no longer an available function.

The feedback wire of the master (orange) is connected to the command wire(s) of the slave(s) (gray). As the master moves response to position commands, the master sets its feedback wire to 0 volts if moving counterclockwise, 5 volts if holding, or 10 volts if moving clockwise.

Each slave actuator must have its tandem selector switch (Figure 15) set on the slave setting. Its gray command wire must be connected the master’s orange feedback wire.

Position information, 0-10 (or 2-10) volts, is available on the slave actuator’s feedback wire (orange).

Note: Electrical override still functions after the actuators configured for tandem operation are mounted to a damper shaft. The actuator has a 150-second drive time when operating in this mode.

**Auxiliary Switches (GGC Model Only)**

The GGC models include two integral auxiliary switches with a switch adjuster accessible on either face of the actuator (as illustrated in Figure 2 and Figure 3). The nominal factory setting for Auxiliary Switch No. 1 is 11° closing, and the nominal factory setting for Auxiliary Switch No. 2 is 81° opening (relative to a 0 to 90° rotation range). See the Technical Specifications table for the auxiliary switch ratings.

**WARNING: Risk of Electric Shock.**

Disconnect or isolate all power supplies before making electrical connections. More than one disconnect or isolation may be required to completely de-energize equipment. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

**AVERTISSEMENT : Risque de décharge électrique.**

Débrancher ou isoler toute alimentation avant de réaliser un branchement électrique. Plusieurs isolations et débranchements sont peut-être nécessaires pour -couper entièrement l'alimentation de l'équipement. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

The switch point of Auxiliary Switch No. 1 is fixed. The switch point of Auxiliary Switch No. 2 is independently and continuously adjustable from 25 to 95°. See Figure 17 and use the method in the following example for the most accurate positioning of Auxiliary Switch No. 2.

To change the switch point of Auxiliary Switch No. 2, proceed as follows:

1. Position the actuator in the full spring return position.

   **Note:** Auxiliary Switch No. 2 is factory set to trip when the actuator reaches the 81° position.
2. Rotate the switch adjuster until it points to the desired switch point.

3. Connect Auxiliary Switch No. 2 to a power source or an ohmmeter, and apply power to the actuator. The actuator moves to the fully open position and holds while power is applied.

4. Observe the switch point. If required, repeat Steps 2 and 3.

**Repairs and Replacement**

A number of replacement parts are available; see Table 1 for more details. If the M9220-GGx-3 Proportional Electric Spring Return Actuator fails to operate within its specifications, replace the unit. For a replacement electric actuator, contact the nearest Johnson Controls® representative.

![Figure 17: Switch Point Settings](image-url)
## Technical Specifications

**M9220-GGx Proportional Electric Spring Return Actuators (Part 1 of 2)**

| Power Requirements | AC 24 V (AC 19.2 to 30 V) at 50/60 Hz: Class 2 (North America) or SELV (Europe), 15.5 VA running, 7.7 VA holding position; DC 24 V (DC 21.6 to 26.4 V): Class 2 (North America) or SELV (Europe), 6.7 W running, 2.9 W holding position |
| Transformer Sizing Requirements | 20 VA minimum per actuator |
| Input Signal/Adjustment | Factory set at DC 0 to 10 V, CW Rotation with signal increase; Selectable DC 0 (2) to 10 V or 0 (4) to 20 mA with field furnished 500 ohm, 0.25 W minimum resistor; Switch selectable direct or reverse action with signal increase |
| Control Input Impedance | Voltage Input: 100,000 ohms; Current Input: 500 ohms with Field Furnished 500 ohm resistor |
| Feedback Signal | DC 0 (2) to 10 V for desired rotation range up to 90°; Corresponds to rotation limits, 1 mA maximum |
| Auxiliary Switch Rating | GGC Models: Two Single-Pole, Double-Throw (SPDT), double-insulated switches with gold flash contacts: AC 24 V, 50 VA Pilot Duty; AC 120 V, 5.8 A resistive, 1/4 hp, 275 VA Pilot Duty; AC 240 V, 5.0 A resistive, 1/4 hp, 275 VA Pilot Duty |
| Spring Return | Direction is selectable with mounting position of actuator: Side A, actuator face away from damper for CCW spring return; Side B, actuator face away from damper for CW spring return |
| Running and Spring Return Torque | 177 lb·in (20 N·m) for a single actuator; 354 lb·in (40 N·m) for two like models mounted in tandem; 531 lb·in (60 N·m) for three like models mounted in tandem |
| Rotation Range | Adjustable from 30 to 90° CW or CCW with optional M9220-603 Adjustable Stop Kit; mechanically limited to 90° |
| Rotation Time | Power On (Running) 150 seconds for 0 to 177 lb·in (0 to 20 N·m) at all operating conditions; independent of load; 90 seconds for 0 to 177 lb·in (0 to 20 N·m) in calibration mode or override mode |
| Power Off (Spring Returning) 11 to 15 seconds for 0 to 177 lb·in (0 to 20 N·m) at room temperature; 35 seconds maximum for 0 to 177 lb·in (0 to 20 N·m) at -22°F (-30°C); 130 seconds maximum for 0 to 177 lb·in (0 to 20 N·m) at -40°F (-40°C) |
| Cycles | 60,000 full stroke cycles; 1,500,000 repositions |
| Audible Noise Rating | Power On (Running) <45 dBA at 39-13/32 in. (1 m); Power On (Holding) <20 dBA at 39-13/32 in. (1 m); Power Off (Spring Returning) <55 dBA at 39-13/32 in. (1 m) |
| Electrical Connections | Actuator (All Models) 48 in. (1.2 m) halogen-free cable with 18 AWG (0.75 mm²) wire leads; Auxiliary Switches (GGC Models) 48 in. (1.2 m) halogen-free Cable with 18 AWG (0.75 mm²) wire leads |
| Conduit Connections | Integral connectors for 3/8 in. (10 mm) flexible metal conduit |
### Mechanical Connections

<table>
<thead>
<tr>
<th>Description</th>
<th>Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Shaft Clamp</td>
<td>1/2 to 3/4 in. or 12 to 19 mm diameter round shafts, or 3/8 and 1/2 in. or 10, 12, and 14 mm square shafts</td>
</tr>
<tr>
<td>Optional M9220-600 Jackshaft Coupler Kit</td>
<td>3/4 to 1-1/16 in. or 19 to 27 mm diameter round shafts, or 5/8 and 3/4 in. or 16, 18, and 19 mm square shafts</td>
</tr>
</tbody>
</table>

### Aluminum Enclosure

NEMA 2 (IP54) for all mounting orientations

### Ambient Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Temperature</th>
<th>Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>-40 to 131°F (-40 to 55°C); 90% RH maximum, noncondensing</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>-85 to 185°F (-65 to 85°C); 95% RH maximum, noncondensing</td>
<td></td>
</tr>
</tbody>
</table>

### Compliance

<table>
<thead>
<tr>
<th>Region</th>
<th>Compliance Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>UL Listed, CCN XAPX, File E27734; to UL 60730-1, Automatic Controls for Household and Similar Use; , and UL 60730-2-14 Part 2, Particular Requirements for Electric Actuators (Models: All)</td>
</tr>
<tr>
<td>Canada</td>
<td>UL Listed, CCN XAPX7, File E27734; to CAN/CSA E60730-1, Automatic Controls for Household and Similar Use; and CAN/CSA E60730-2-14 Part 2, Particular Requirements for Electric Actuators (Models: All)</td>
</tr>
<tr>
<td>Europe</td>
<td>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.</td>
</tr>
<tr>
<td>Australia and New Zealand</td>
<td>RCM Mark, Australia/NZ Emissions Compliant (Models: All M9220-xGx and M9220-xDx)</td>
</tr>
</tbody>
</table>

### Shipping Weight

6.4 lb (2.9 kg)

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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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