

M9310/VA9310 Series

Electric Non-Spring Return Actuators



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The M9310/VA9310 Series Electric Non-Spring Return Actuators provide control of dampers in HVAC also control of valves with ISO Flange mounting such as VG1000 valve. All actuators in this series provide 88 lb-in (10 N·m) rated torque.

The series provides Automatic Signal Input Detection, which allows automatic recognition of input signals for on/off, floating, and proportional control.

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

For M9310 only, the actuators are configured for direct mounting and do not require damper linkage. Actuators can be mounted directly to a damper shaft from 3/8 to 3/4 in. (9.5 to 19 mm) diameter and 3/8 to 5/8 in.

(9.5 to 15 mm) square with a universal clamp.

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



Figure 1: M9310 Actuator without (left) and with Auxiliary Kit (middle), VA9310 Actuator (right)

Table 1: Features and Benefits (Part 1 of 2)

| FEATURES | BENEFITS |
|--|--|
| Automatic Signal Input Detection, On/Off, Floating, and Proportional Control with Adjustable Span and Offset | Increases availability at distributors and simplifies retrofits. |
| Easy Conversion to Valve Operation - Same Actuator Used for Dampers or Valves | Increases availability at distributors with only one actuator to learn. |
| Optional Auxiliary Kit | Increases availability at distributors. The auxiliary switch kit provides two line-voltage-capable single-pole, double-throw (SPDT) switches with continuously adjustable switch points, and the auxiliary potentiometer kit provides several potentiometer feedback options. Facilitates safety interfacing or signaling. |
| Backward Compatible Auxiliary Switch Kits and Auxiliary Potentiometer | Allows for a seamless retrofit without the need to replace the controller. |
| 88 lb-in (10 N·m) Rated Torque | Provides high torque in a compact package size to expand the range of applications in HVAC systems. |
| Self-Calibrating Input Signal to Adjust Stroke | Eliminates the need for a complex calibration procedure when adjusting stops. |

Table 1: Features and Benefits (Part 2 of 2)

| FEATURES | BENEFITS |
|--|--|
| 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 lifecycle by reducing wear. |
| Mode Configuration Switches | Permits calibration, input signal range selection, and control logic reversal for proportional control. |
| Integral Cables with Colored and Numbered Conductors | Simplify installation and field wiring. |
| Small Footprint | Allows application in smaller spaces than the M9106/M9109 and M9108 actuators. |
| M9106, M9109, and M9108 Series Actuators Replacement | Simplifies product selection and logistics. |
| 100,000 Cycles and 2.5 Million Repositions | Assure long time reliability. |
| NEMA5/IP54 Enclosure | Enhances the range of application environments. |
| Underwriters Laboratories Inc.® (UL), CE Mark, and RCM Compliance | Provides internationally recognized regulatory agency approvals. |
| Manufactured under International Standards Organization (ISO) 9001 Quality Control Standards | Ensures quality. |
| Position Indicator Handle (VA9310) | Allows intuitive indication of valve position |
| Bottom-Mounted Coupler (M9310) | Simplifies short shaft damper applications. |
| Same Weathershield as M9203 and M9208 Series Actuators | Keeps logistics simple and assures quick delivery time. |
| 5-Year Warranty | Protects consumer investment. |

Product Details

M9310/VA9310 Series Actuators operate with 24 VAC/DC to provide 88 lb-in. (10 N·m) rated torque. The actuators can be used with on/off, floating, or proportional controllers in HVAC systems that are controlled by an electronic controller or positioner.

Floating control is provided from a triac or relay. On/off control can be provided from a manual switch, controller, auxiliary switch from a fan motor contactor, or similar device.

The actuators have 90-second constant runtime for 90° rotation, independent of supply voltage frequency and load.

When the M9310/VA9310 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.

M9310/VA9310-HGA-3 Actuators Wiring Diagrams

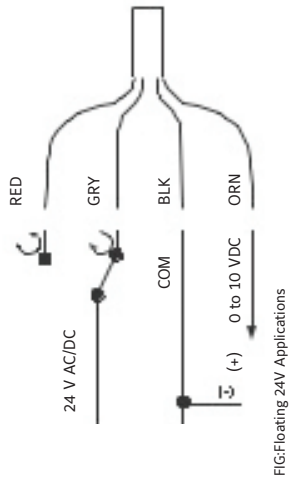


Figure 2: Floating 24 V Applications

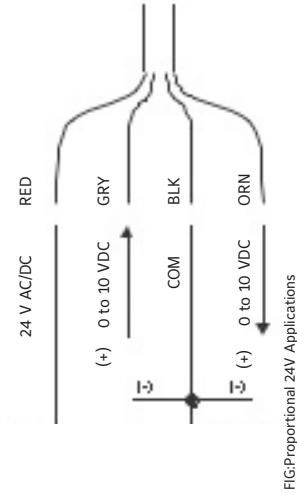


Figure 4: Proportional 24 V Applications

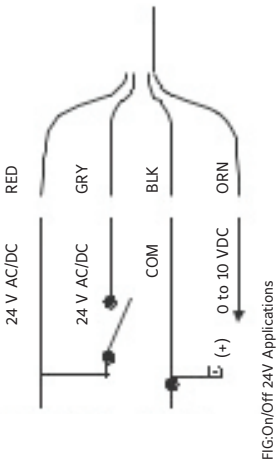


Figure 3: On/Off 24 V Applications

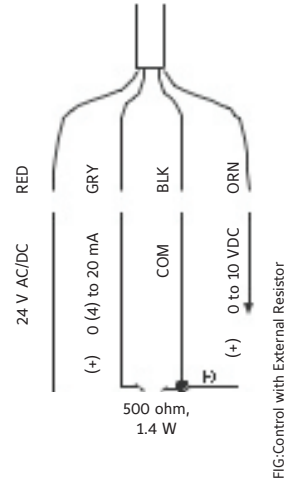


Figure 5: Proportional 24 V Applications - 0 (4) to 20 mA with External Resistor

IMPORTANT: Use these M9310 Series Electric Non-Spring Return Actuators 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.

Mounting Options

M9310 Series Damper Actuators can be converted into VA9310 Series Valve Actuators using the M9310-500 valve linkage.

VA9310 Series Actuators are mounted directly to the valve or with the M9000-561 thermal barrier when the high temperature fluid or low pressure steam are used or additional spacing for insulation is needed.

VA9310 Series Actuators can be easily converted into M9310 Series Actuators using the M9310-600 coupler.

Operation

M9310/VA9310 Series Actuators use a brushless DC motor controlled by a microprocessor. The microprocessor drives the motor at constant speed, independent of torque. The actuator slows down before it reaches its stop position allowing it to coast, further reducing gear wear. The microprocessor also monitors the brushless DC motor's rotation to prevent damage to the actuator in a stall condition. The actuator can be stalled anywhere within its rotation range without the need for mechanical end switches.

The actuator self-calibrates the control signal when an end stop is adjusted on the stroke. An auto-calibration has to be performed to change the feedback of the actuator.

Auto-Calibration Mode

The auto-calibration mode identifies the available range of travel of the coupler. During the auto-calibration mode, the actuator moves the coupler to the maximum and minimum end stops to identify the range of travel.

DIP Switches and Status LEDs

The actuators allow easy setting of the proportional input signals. See the installation instruction for details.

Ordering Information

Table 2: Selection Chart

| Code Number | Rotation Time For 90° | Power Requirement | Input Signal | | | | Position Feedback | Electrical Connection | | Auxiliary Switches |
|------------------------------|-----------------------|-------------------|--------------|------------|-----------------|----------------------------|-------------------|-----------------------|--|-----------------------|
| | Running (Seconds) | | On/Off | OnFloating | 0 (2) to 10 VDC | Adjustable Span and Offset | | 0 (2) to 10 VDC | 50 in. (1.27m) 18 AWG Halogen-free Cable | |
| M9310-HGA-3, VA9310-HGA-3 | 90 | X | X | X | X | X | X ¹ | X | Optional ² | Optional ³ |

1. Feedback is only available when 0 (2) to 10 V proportional input is used.

2. Order separately M9300-100 (quantity 5).

3. Order separately M9300-1 or M9300-2.

Table 3: Accessories (Order Separately)

| PICTURE | CODE NUMBER | DESCRIPTION |
|---|--------------------------|--|
|  | M9000-322 M9310 only | NEMA 4x, IP66/67 Weathershield Kit for damper application of M9104, M9310, M9203, and M9208 Series Electric Actuators |
|  | M9000-342 VA9310 only | NEMA 4X, IP66/67 Weathershield Kit for VG1000 Series Ball application of VA9104, VA9310, VA9203, and VA9208 Series Electric Actuators (quantity 1) |
|  | M9000-561 VA9310 only | Thermal Barrier Kit. Extends the VA9104, VA9310, VA9203, and VA9208 Series Electric Actuators applications to include low pressure steam |
|  | M9000-604 M9310 only | Replacement Anti-Rotation Bracket Kit for M9310, M9203, M9208, M9210, and M9220 Series Electric Actuators |
|  | M9000-606 M9310 only | Position indicator (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 1/2 in. electrician's fittings (quantity 5) |
|  | M9300-140 | External Auxiliary Feedback Potentiometer 140 ohm |
|  | M9000-151 M9310 only | Remote Mounting Kit, with crank arm and damper linkage for M9108 (16) (24), and M9300 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 M9310 only | Ball Valve Linkage Kit for converting M9310 actuators to VA9310 actuators for operating VG1000 ball valves |
|  | M9310-600 | Standard Coupler Kit, M9310 Series (round 3/8 to 3/4 in. [9 to 19 mm], square 3/8 to 5/8 in. [9 to 16 mm]) |

Dimensions

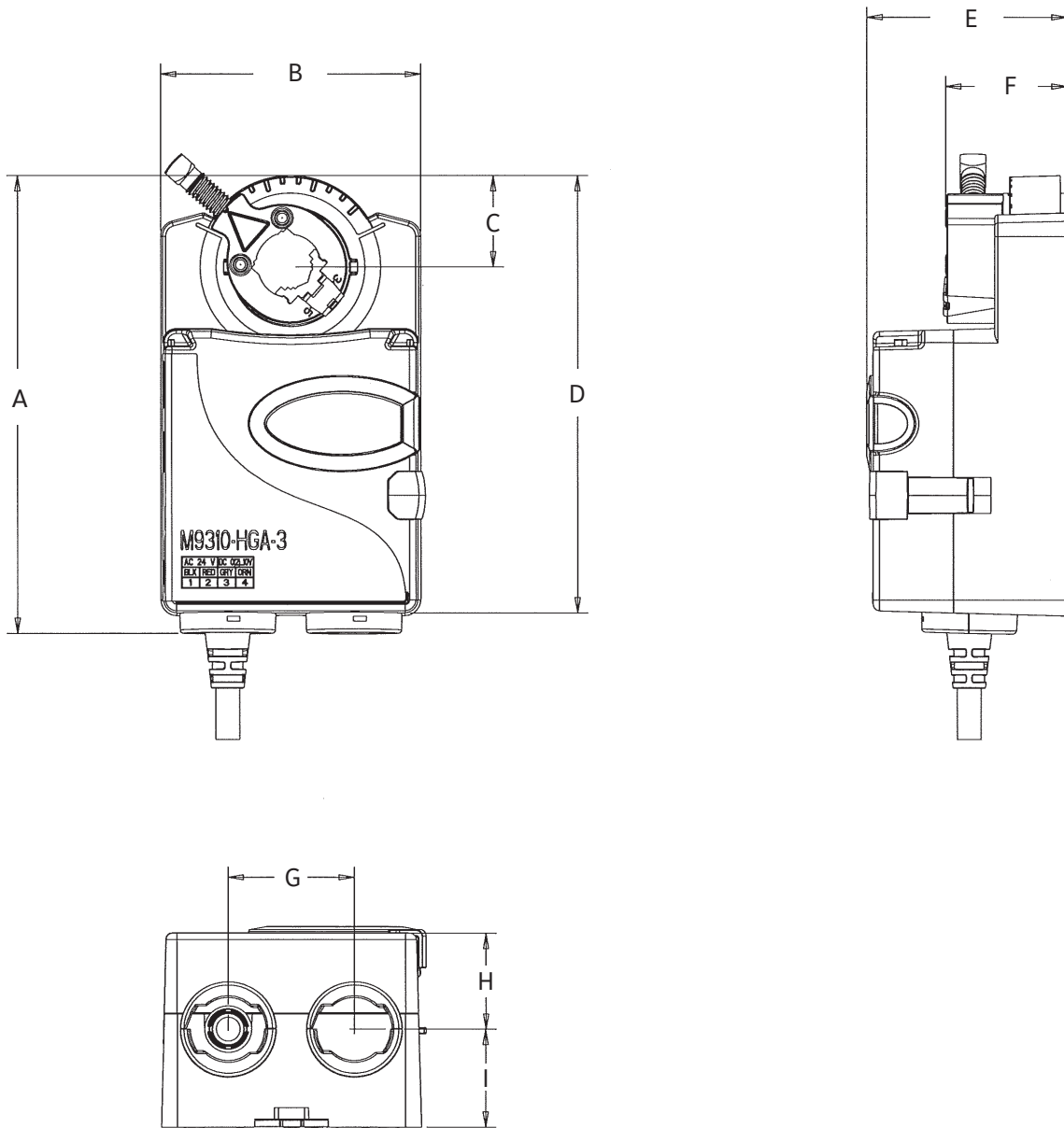


Figure 6: M9310-HGA-3 Dimensions (without accessory kit)

Table 4: M9310 Series Actuators Dimensions (without accessory kit)

| DIMENSIONS | A | B | C | D | E | F | G | H | I |
|------------|-----|----|----|-----|----|----|----|----|----|
| MM | 142 | 81 | 28 | 136 | 62 | 38 | 39 | 30 | 30 |

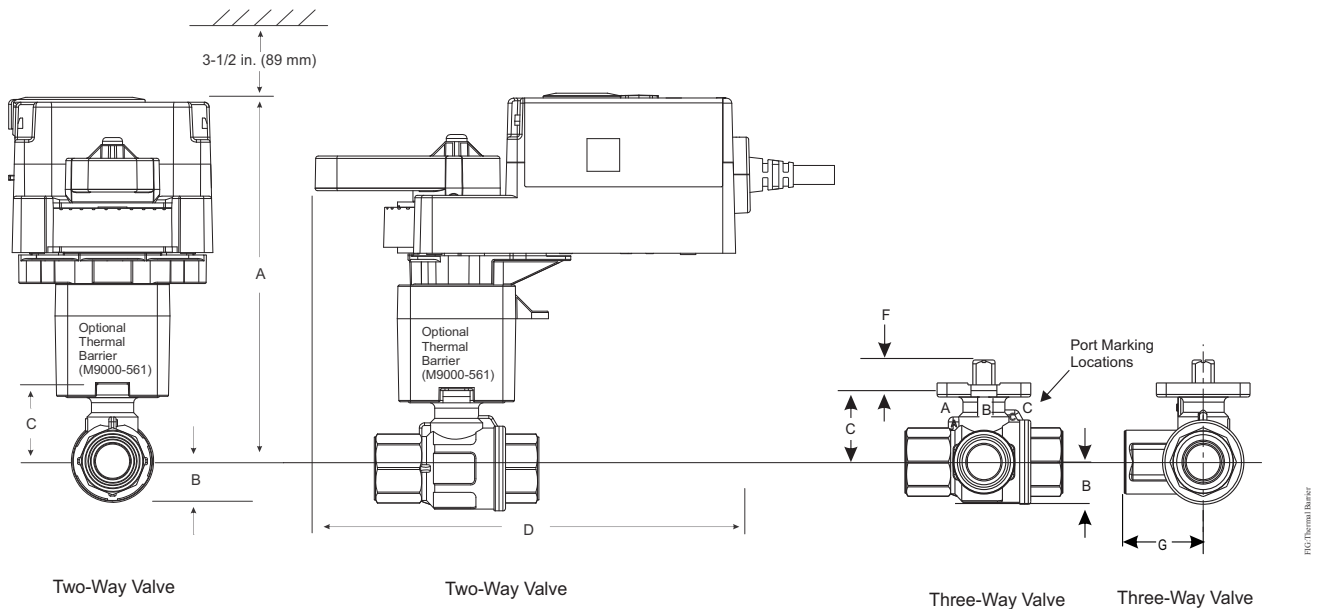


Figure 7: VA9310 Series Electric Non-Spring Return Actuator and Valve Dimensions (with Optional M9000-561 Thermal Barrier)

Table 5: VA9310 Actuated VG1205, VG1805 Series Ball Valve Dimensions, (mm)

| VALVE SIZE | A (With Thermal Barrier) | A (Without Thermal Barrier) | B | C | D | E | F | G |
|------------|--------------------------|-----------------------------|----|----|-----|-----|---|----|
| DN15 | 146 | 111 | 17 | 31 | 163 | 64 | 9 | 32 |
| DN20 | 146 | 111 | 17 | 31 | 163 | 71 | 9 | 36 |
| DN25 | 148 | 113 | 19 | 33 | 163 | 87 | 9 | 43 |
| DN32 | 159 | 124 | 26 | 44 | 163 | 100 | 9 | 50 |
| DN40 | 163 | 128 | 29 | 48 | 163 | 110 | 9 | 55 |
| DN50 | 168 | 133 | 37 | 53 | 163 | 123 | 9 | 62 |

Technical Specifications

M9310/VA9310 Series Electric Non-Spring Return Actuator

| | | |
|--|--|--|
| Product Description | M9310-HGA-3: On/Off and floating mode VA9310-HGA-3: On/Off and floating mode | M9310-HGA-3: Proportional mode VA9310-HGA-3: Proportional mode |
| Power Requirements | 24 VAC (19.2 to 28.8 VAC) at 50/60, Class 2 (North America) or SELV (Europe), 4.7 VA running. 24 VDC (21.6 to 28.8 VDC) Class 2 (North America) or SELV (Europe), 1.3 W running. | |
| Transformer Sizing Requirements | <6 VA | |
| Input Signal/Adjustments | 19.2 to 28.8 VAC at 50/60 Hz or 24 VDC $\pm 10\%$ Class 2 (North America) or SELV (Europe) | 0 (2) to 10 VDC or 0 (4) to 20 mA with field furnished 500 ohm 1/4 W resistor Offset: 0 to 10 VDC SPAN: 2 to 10 VDC |
| Control Impedance | 4.7k ohm | 100k ohm |
| Feedback Signal | - | 0 (2) to 10 VDC |
| Running Torque | 88 lb-in (10 N·m) | |
| Rotation Range M9310 only | Mechanically limited 35° to 95° $\pm 3^\circ$ in 5° increments | |
| Rotation Time for 90° of Travel | 90 seconds | |
| Rotation Time Auto-calibration | 35 seconds | |
| Cycles | 100,000 full stroke cycles; 2,500,000 repositions | |
| Audible Noise | <35 dBA at 0 to 88 lb-in (10 N·m) load, at a distance of 39-13/32 in. (1 m) | |
| Electrical Connections | 50 in. (1.27 m) UL Halogen-free cable with 18 AWG cable (0.82 mm ²) | |
| Conduit Connections | 1/2 in. NPSM (13 mm) threaded conduit connectors with M9300-100 conduit connector (optional) | |
| Mechanical Connections M9310 only | Round 3/8 in. to 3/4 in. (centered on 1/2 in.) Square 3/8 in. to 5/8 in. | |
| Ambient Conditions | Operating: -22 to 140°F (-30 to 60°C), 90% RH, noncondensing Storage: -40 to 185°F (-40 to 85°C), 95% RH, noncondensing | |
| Fluid Temperature Limits (Actuator and Valve Assembly) VA9310 only | VG12x1 and VG18x1 Series: 23 to 203°F (5 to 95°C) VG12x5 and VG18x5 Series: -22 to 212°F (-30 to 100°C) VG12x5 and VG18x5 Series with M9000-561 Thermal Barrier Installed: -22 to 284°F (-30 to 140°C) water; 15 psig (103 kPA) at 250°F (121°C) saturated steam | |
| Enclosure | IP54 | |
| Shipping Weight | 2 lb (0.9 kg) | |
| 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, 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. IEC 60730-1: Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements and IEC 60730-2-14, Automatic Electrical Controls for Household and Similar Use; Part 2 – Particular Requirements for Electric Actuators</p> <p>Australia and New Zealand: RCM, Australia/NZ Emissions Compliant</p> | |

The performance specifications are nominal and conform to acceptable industry standard. 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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Johnson Controls Building Efficiency delivers products, services and solutions that increase energy efficiency and lower operating costs in buildings for more than one million customers worldwide. Operating from 500 locations globally, the company is committed to growing the BE business. In 2014, we acquired Air Distribution Technologies and in 2015, we obtained a majority stake in the joint venture with Hitachi Appliances.

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