M9216 Series Electric Spring Return Actuators

The M9216 Series is a direct-mount, spring return line of electric actuators that operates on 24 VAC or VDC power and is available for use with on-off, floating, proportional, or resistive controllers. These bi-directional actuators do not require a damper linkage, and are easily installed on a round shaft up to 3/4 in. (20 mm) diameter or a square shaft up to 5/8 in. (16 mm). M9216 actuators can be direct or remote mounted to a damper, or mounted to a valve using one of the M9000-5xx Valve Linkage Kits.

A single M9216 model delivers up to 140 lb·in (16 N·m) of torque. Two BGx, GGx, or HGx models in tandem deliver twice the torque or 280 lb·in (32 N·m). The angle of rotation is mechanically adjustable from 30 to 90°. Integral auxiliary switches are available to indicate end-stop position or to perform switching functions at any angle within the selected rotation range. Position feedback is available through switches, a potentiometer, or a 0 (2) to 10 VDC signal.

Figure 1: M9216 Series Actuator

Features and Benefits

❑ **Multiple Torques: 140 and 280 lb·in (16 and 32 N·m)**	Allow selection most suitable for the application
❑ **Bi-directional, Return-to-Normal Spring Return**	Allows selectable rotation/spring return direction simplifying installation
❑ **Extended Temperature Range**	Meets the needs of most outdoor air applications
❑ **Output Position Feedback**	Provides simple, closed-loop control with accurate position sensing
❑ **Electronic Stall Detection**	Ensures higher reliability by deactivating the actuator motor when a stall condition is detected
❑ **Auto Stroke Calibration (GGx Models)**	Reduces field installation time and cost due to self adjustment
❑ **Zero and Span Adjustment (HGx Models)**	Allows sequential operation of dampers from a single input signal of 0 (2) to 10 VDC or 0 (4) to 20 mA
❑ **Manual Override**	Allows manual positioning when the actuator is not powered; simplifies setup and field adjustments
❑ **NPT Conduit Adaptor (Included)**	Meets electrical code requirements and allows the use of armored cable

Application

IMPORTANT:	This device is not designed or intended to be used in or near environments where explosive vapors or gases could be present, or environments where substances corrosive to the device's internal components could be present.

M9216 actuators are designed to position air dampers and valves in HVAC systems. Applications include:

- positioning return air, exhaust, or outdoor air dampers
- controlling face and bypass dampers
- positioning blades for variable volume fans
- positioning VG1000 Series ball valves and VG7000 Series globe valves when used with an M9000-5xx Valve Linkage

Refer to the manufacturer's information to properly size the damper, valve, and/or actuator.

Operation

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.

M9216 actuators operate on 24 VAC at 50/60 Hz or 24 VDC. They use a DC motor with stall detection circuitry that operates throughout the entire stroke. The proportional and resistive actuators employ noise-filtering techniques on the control signal to eliminate repositioning due to line noise. Mounting two each M9216 proportional (BGx, GGx or HGx) models in tandem provides twice the amount of running torque as a single unit.

Rotation is mechanically limited to 93° by integral end-stops. The position of the actuator is visually indicated from 0 to 90° on the cover. An anti-rotation bracket prevents lateral movement of the actuator.

The damper position can be set manually with the manual override feature in the event of a power failure.

Dimensions

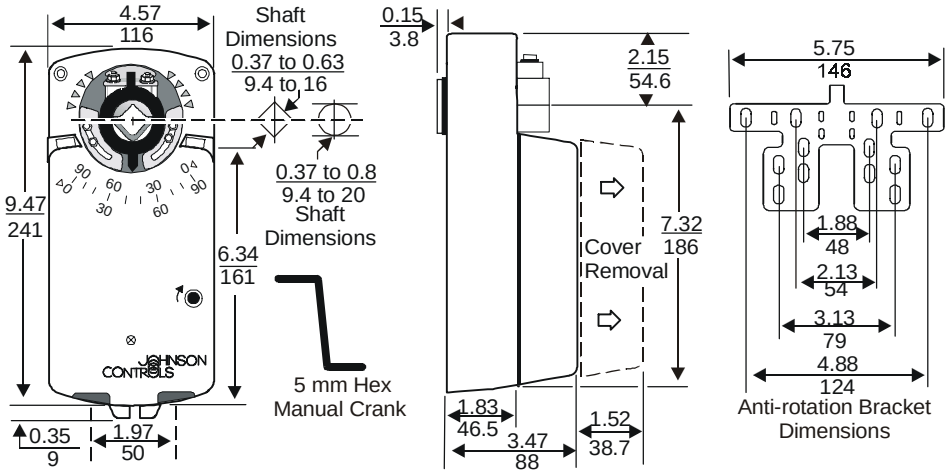

Figure 2: Actuator, Anti-rotation Bracket, and Manual Crank Dimensions, in. (mm)

Replacement and Repair

Field repairs must not be made. To order a replacement or an accessory, refer to the *Ordering Information* section.

Ordering Information

Refer to Table 1 or Table 2 for the desired product code number, and contact the nearest Johnson Controls representative.

Table 1: Actuators

M9216 Series Electric Spring Return Actuator 140 lb·in (16 N·m)	M9216-AGA-2	M9216-AGC-2	M9216-AGD-2	M9216-AGE-2	M9216-BGA-2	M9216-BGC-2	M9216-GGA-2	M9216-GGC-2	M9216-HGA-2	M9216-HGC-2	M9216-JGA-2	M9216-JGC-2
On/Off Control	*	*	*	*	■	■						
Floating Control	■	■	■	■								
Proportional Control							■	■	■	■		
VDC and mA Input with Zero and Span									■	■		
Resistive Input Control											■	■
Feedback												
135 ohm Potentiometer			■									
1000 ohm Potentiometer				■								
0 to 10 VDC							■	■	■	■	■	■
2 Auxiliary Switches		■				■		■		■		■

***** Can be used with 2-wire on/off control.

Notes: Use two actuators from the same model group (BGx, GGx, or HGx) for tandem operation. AGx, HGx, and JGx models have a 25-second delay upon startup.

Table 2: Accessories

Product Code Number	Description
DMPR-KR003*	Sleeve Pin Kit for Johnson Controls round dampers with a 5/16 in. diameter shaft
DMPR-KC003*	Blade Pin Extension without Bracket for Johnson Controls CD-1300 direct-mount applications
DMPR-KC254	Inside Frame Mounting Kit for damper applications requiring the actuator within the airstream
M9000-100**	Conduit Adaptor Kit
M9000-103	14 VA Transformer, 120/24 VAC, 60 Hz, Class 2
M9000-104	14 VA Transformer, 230/24 VAC, 60 Hz, Class 2
M9000-105	Pluggable 3-terminal block
M9000-106	Pluggable 4-terminal block
M9000-151	Base Mount Linkage Kit for remote inside duct mounting (not intended for M9216 tandem applications)
M9000-153	Crank Arm Kit for remote mounting (not intended for M9216 tandem applications)
M9000-154	1 in. Jackshaft Coupler for mounting on a 1 in. diameter damper shaft
M9000-158	Mounting Kit for tandem mounting two each M9216 BGx, GGx, or HGx models on a damper
M9000-200	Commissioning Tool provides a control signal to drive proportional, floating, or on/off actuators.
M9000-500	Valve Linkage Kit for mounting M9216 actuators to 1/2 to 2 in. (DN15 to 50) VG7000 Series globe valves
M9000-510	Valve Linkage Kit for mounting M9216 actuators to 1/2 and 3/4 in. (DN15 and DN20) 2-way or 3-way VG1000 Series ball valves, and 1 and 1-1/4 in. (DN25 and DN32) 2-way VG1000 Series ball valves
M9000-511	Valve Linkage Kit for field mounting M9216 actuators to 1 and 1-1/4 in. (DN25 and DN32) 3-way VG1000 Series ball valves

* Furnished with the damper and can be ordered separately.

** Furnished with the actuator and can be ordered separately.

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, minimum, Class 2
	BGx:	20 to 30 VAC at 50/60 Hz or 24 VDC ±10%, 10 VA supply, minimum, Class 2
	GGx:	20 to 30 VAC at 50/60 Hz or 24 VDC ±10%, 14 VA supply from 32 to 126°F (0 to 52°C) or 18 VA supply from -22 to 32°F (-30 to 0°C), minimum, 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 6V (0 to 12 mA); Span, 2 to 10V (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° (1 mA at 10 VDC) Corresponds to input signal span selection and rotation limits.
	JGx:	0 to 10 VDC for 90° (1 mA at 10 VDC)
Auxiliary Switch Rating	xGC:	Two SPDT (Single-Pole, Double-Throw) rated at 24 VAC, 1.5A inductive, 3A resistive, 35 VA maximum per switch, Class 2
Spring Return	Factory Setting:	Counterclockwise (CCW); Direction is selectable with the coupler.
Mechanical Output	Running Torque:	140 lb·in (16 N·m) for a single unit, 280 lb·in (32 N·m) for two in tandem
Rotation Range	Adjustable from 30 to 90°, Clockwise (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	Screw terminals for 22 to 14 AWG (Insert a maximum of two 18, 20, or 22 AWG per terminal.)	
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 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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