

# M9000-51x Series Valve Linkage Kits

## Installation Instructions

M9000-51x

Part No. 14-1201-13, Rev. G

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### Applications

Use the M9000-51x Series Valve Linkage Kits to field mount Johnson Controls® M9106 and M9100 Series Non-Spring Return and M9206, M9210, and M9220 Series Spring Return Electric Actuators to Johnson Controls VG1000 Series Ball Valves. The dual centering bearing design of the linkage maintains accurate stem alignment, eliminating side loading on the valve stem and stem seal, to provide longer seal life. The linkage kit venting and the overall height of the linkage kit, as well as piping insulation, minimize heat transfer to the electric actuator in higher fluid temperature applications.

### Installation

Install the VG1000 Series Ball Valves with the actuator at or above the centerline of the horizontal piping.

**IMPORTANT:** In steam applications, install the valve with the stem horizontal to the piping. Failure to follow this precaution may shorten the life of the actuator.

To minimize heat transfer in steam applications, wrap the valve and piping with insulation. Allow sufficient clearance to remove the actuator.

Before installing the electric actuator, use an adjustable wrench to manually rotate the valve stem several times. Rotating the valve stem breaks the torque that may have built up during long-term storage.

Wire all electrically actuated VG1000 Series Ball Valves in accordance with applicable electrical code requirements. Wire the input lines to the electric actuator correctly so that the valve moves in the proper direction.

**IMPORTANT:** Protect the actuator from dripping water, condensation, and other moisture. Water or moisture could result in an electrical short, which may damage or affect the operation of the actuator.

**IMPORTANT:** Do not cover the actuator with thermal insulating material. High ambient temperatures may damage the actuator, and a hot water pipe, a steam pipe, or other heat source may overheat it.

Install VG12x1, VG12x5, VG18x1, and VG18x5 Series Ball Valves with Port A as the inlet. VG1243 Series reduced port models feature a black arrow on the bottom of the valve outlet indicating the direction of flow for proper piping. Pipe all other models in either direction.

Contact the local Johnson Controls representative for compatibility concerns before using VG1000 Series Ball Valves to control the flow of fluids other than those outlined in the *Technical Specifications* table at the end of this document.

**IMPORTANT:** Take care to prevent foreign materials such as weld slag, thread burrs, metal chips, and scale from entering the piping system. This debris can damage or severely impede the operation of the valve by embedding itself in the seats, scoring the valve, and ultimately resulting in seat leakage. If the debris becomes embedded in the seats, subsequent flushing and filtering of the piping system with the valve installed does not remedy the problem.

### Servicing the Actuator or Piping System

When servicing the actuator or piping system:

- disconnect the power supply to the actuator before servicing



**WARNING: Risk of Electric Shock.**

Disconnect power supply before making electrical connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

- relieve the pressure in the piping system

- reconnect the power supply after servicing



**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.

**Parts Included**

**Table 1: Parts Included**

Description	Quantity					
	M9000-514	M9000-515	M9000-516	M9000-517	M9000-518	M9000-519
Actuator Mounting Bracket <sup>1</sup>	1	1	1	1	1	1
Adjustable Anti-Rotation Slider	1	1	1	1	1	1
M5 x 7 mm Machine Screws	2	2	2	2	2	2
Drive Shaft, Brown Color Index Mark <sup>1</sup>	1	1	—	—	—	—
Drive Shaft, Purple Color Index Mark <sup>1</sup>	—	—	1	—	—	—
Drive Shaft (No Index Mark) <sup>1</sup>	—	—	—	1	—	—
Drive Shaft, Blue Color Index Mark <sup>1</sup>	—	—	—	—	1	—
Drive Shaft, Orange Color Index Mark <sup>1</sup>	—	—	—	—	—	1
Retaining Ring <sup>1</sup>	1	1	1	1	1	1
15 mm I.D. Bearing <sup>1</sup>	1	1	1	1	1	1
20 mm I.D. Bearing <sup>1</sup>	1	1	1	1	1	1
Plastic Standoffs <sup>1</sup>	4	3	4	3	4	3
Thermal Isolator	1	1	1	1	1	1
Nut, Hex, Flanged Serrated, M6	—	—	—	—	4	4
Nut, Hex, Flanged, M5	4	4	4	4	—	—
Screw, Hex, Flanged, M5 x 0.8 x 25 mm long	4	4	4	4	—	—
Screw, Hex, Flanged, M6 x 1.0 x 25 mm long	—	—	—	—	4	4
Spring Lock Washer, M5	4	4	4	4	—	—
Spring Lock Washer, 1/4 in.	—	—	—	—	4	4
Tag, Steamfitters	1	1	1	1	1	1
Installation Instructions	1	1	1	1	1	1

1. The factory assembles these items as one unit.

## Special Tools Needed

Use a torque wrench to accurately tighten the screws or U-bolt clamp nuts to the specified torque, as specified further in this section. The noted hardware connects anti-rotation sliders to the linkage or holds the actuators to the linkage drive shaft.

After you have assembled the actuator to the valve, refer to the following documentation for proper actuator wiring and commissioning:

**IMPORTANT:** Use copper conductors only. Make all wiring connections in accordance with local, national, and regional regulations. Do not exceed the actuator's electrical ratings.

- *M9106-xGx-2 Series Electric Non-Spring Return Actuators Installation Instructions (Part No. 34-636-1085)*
- *M9108, M9116, M9124, and M9132 Series Electric Non-Spring Return Actuators Installation Instructions (Part No. 34-636-399)*
- *M9206-AGx-2S Series Floating Electric Spring Return Actuators Installation Instructions (Part No. 34-1280-238)*
- *M9206-Bxx-2S Series On/Off Electric Spring Return Actuators Installation Instructions (Part No. 34-1280-122)*
- *M9206-GGx-2S Series Proportional Electric Spring Return Actuators Installation Instructions (Part No. 34-1280-246)*
- *M9210-AGx-3 Floating Electric Spring Return Actuators Installation Instructions (Part No. 34-636-1654)*
- *M9210-Bxx-3 On/Off Electric Spring Return Actuators Installation Instructions (Part No. 34-636-1638)*
- *M9210-GGx-3 Proportional Electric Spring Return Actuators Installation Instructions (Part No. 34-636-1662)*
- *M9220-AGx-3 Floating Electric Spring Return Actuators Installation Instructions (Part No. 34-636-1689)*

- *M9220-Bxx-3 On/Off Electric Spring Return Actuators Installation Instructions (Part No. 34-636-1239)*
- *M9220-GGx-3 Proportional Electric Spring Return Actuators Installation Instructions (Part No. 34-636-1697)*

## Installation of M9000 Series Electric Actuators

A standard installation provides ample space to remove the actuator. M9106 Series Electric Actuators require at least 3-11/16 in. (94 mm) of clearance. All other M9100 Series Electric Actuators require clearance of at least 3-1/2 in. (89 mm). M92x0 Series Electric Actuators require clearance of at least 4-1/2 in. (114 mm).

The anti-rotation sliders are not pre-installed on the linkage and, therefore, must be field installed. See Table 2 for the distance from the centerline of the drive shaft to the outermost edge of the tab.

**Table 2: Default Settings for Anti-Rotation Sliders**

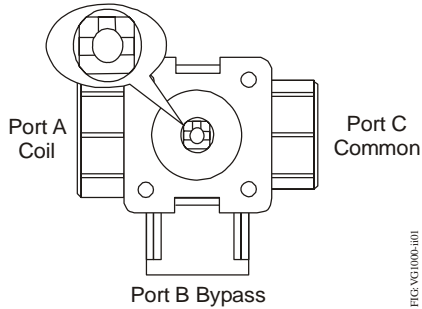
Linkage Kit Distance from Centerline to Tab		
Model	Inches	Millimeters
<b>M9000-514</b>	4-19/32	117
<b>M9000-515</b>	5-1/4	133
<b>M9000-516</b>	5-11/32	136
<b>M9000-517</b>	7-1/2	191
<b>M9000-518</b>	5-11/32 i	136
<b>M9000-519</b>	7-1/2	191

Tighten the screws holding the anti-rotation bracket to a torque of 21 to 25 lb-in (2.4 to 2.8 N-m).

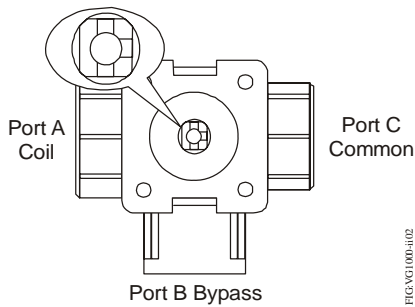
Two-way valves in the fully open position have the index marking on the top of the valve stem parallel with the direction of flow. Two-way valves in the fully closed position have the index marking perpendicular to the direction of flow.

VG1841 and VG1845 Series Three-Way Ball Valves have a different port configuration from VG1644 Series Three-Way Valves.

VG1841, VG1845, VG1871, VG1875, VG1891, and VG1895 Series Three-Way Valves use Port A as the inlet from the coil, Port B as the bypass inlet, and Port C as the common outlet. See Figure 1 and Figure 2, ignoring the index marks on the M9000-51x Linkage Kit drive shaft.

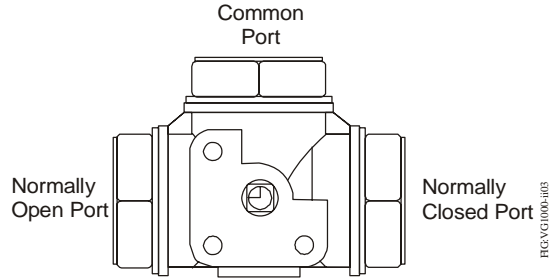


**Figure 1: VG18x1 or VG18x5 Series Three-Way Ball Valve (Port A Connected to Port C)**



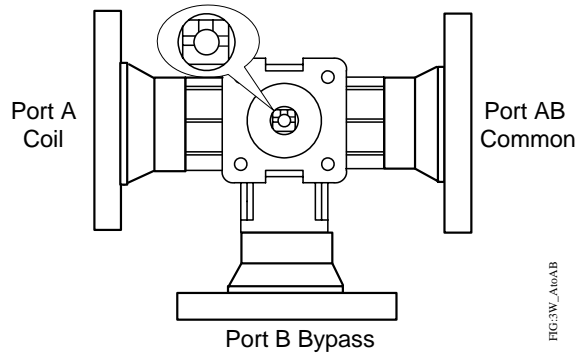
**Figure 2: VG18x1 or VG18x5 Series Three-Way Ball Valve (Port B Connected to Port C)**

VG1644 Series Three-Way Valves feature two index markings on the top of the valve stem, with one of the index markings parallel with the common port. The two index markings on the top of the drive shaft must align with the two index markings on the valve stem, as in Figure 3.

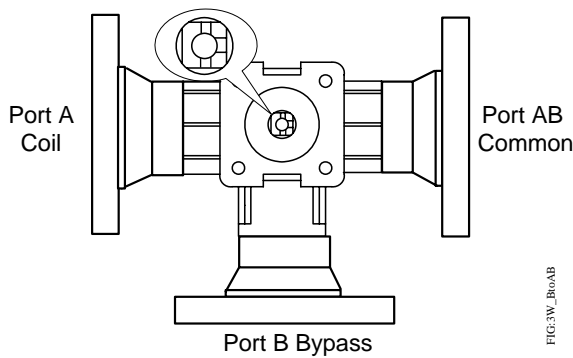


**Figure 3: Top View of V 1644 Series Three-Way Ball Valve (Actuator Fully Counterclockwise)**

VG18A5 Three-Way Flanged Valves use Port A as the inlet from the coil, Port B as the bypass inlet, and Port AB as the common outlet. See Figure 4 and Figure 5, and ignore the index marks on the M9000-51x Linkage Kit drive shaft.



**Figure 4: VG18A5 Series Three-Way Flanged Ball Valve (Port A Connected to Port AB)**



**Figure 5: VG18A5 Series Three-Way Ball Valve  
(Port B Connected to Port AB)**

To perform a standard installation, see Figure 6 through Figure 10 and proceed as follows:

1. For all valves, rotate the stem manually several times using an adjustable wrench to break the torque that may have built up during long-term storage. Then, rotate the stem to position the valve for the appropriate service.

**IMPORTANT:** Do not attempt to manually rotate the drive shaft while the actuator is installed without first releasing the actuator gears. Manually rotating the drive shaft without releasing the actuator gears may result in permanent damage to the actuator.

2. Place the thermal isolator over the valve actuator mounting flange aligning the holes in the thermal isolator with the holes in the mounting flange.
3. Install the mounting bracket assembly onto the thermal isolator and valve mounting flange. For all Two-Way and VG1644 Series Three-Way Valves, make sure the index markings on the top of the stem match the position of the index markings on the valve. When a two-way valve is fully open, the flats of the shaft end are parallel to the valve.

**Note:** Depending on the installation, position the mounting bracket assembly in any of the eight 45° increments as indicated by the index markings on the top surface of the mounting bracket.

4. Secure the mounting bracket assembly to the mounting flange of the valve, using the M5 x 16 mm, M5 x 25 mm, or M6 x 25 mm standard hex machine screws provided. Use the serrated washer head nuts and the lock washers provided for all valves that do not have tapped holes in the mounting flange. Using a cross pattern sequence, apply 35 to 45 lb-in (4.0 to 50 N·m) to the machine screws to avoid any side loading on the mounting bracket.
5. For the M9206, M9210, and M9220 Series Spring Return Actuators, determine the desired spring return direction. The actuators should spring return clockwise, as viewed from above the actuator, for a normally closed valve (with Port A closed).
6. Position the actuator coupler over the drive shaft and insert the tab of the anti-rotation slider into the slot on the base of the actuator. Check that the actuator base rests squarely on all standoffs, maintaining parallel alignment with the mounting bracket.

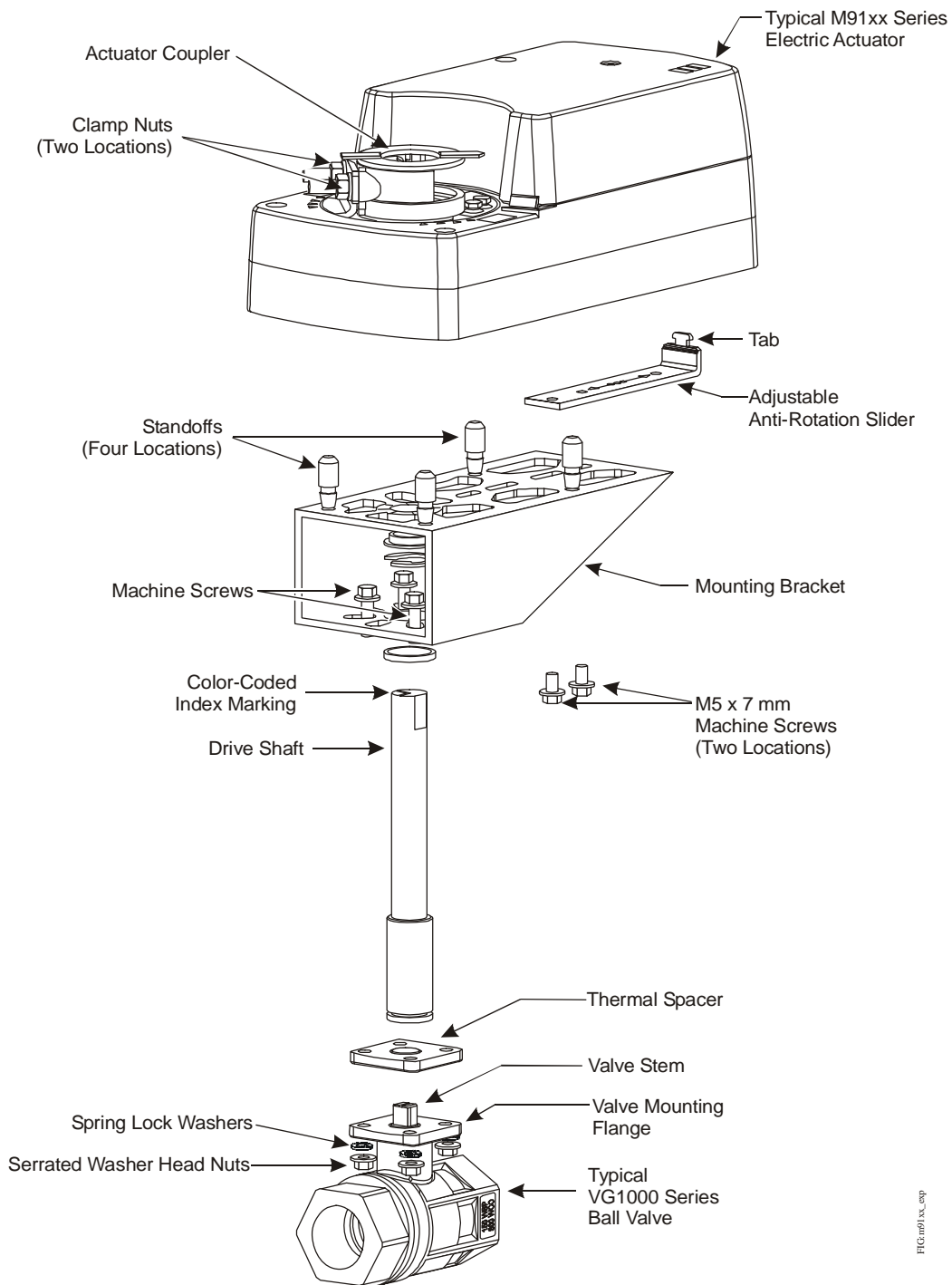
**Note:** If the slider has not been previously secured, secure the slider to the mounting bracket using a 1/4 in. (6 mm) blade screwdriver and the two M5 x 7 mm machine screws provided. Tighten these screws to a torque of 21 to 25 lb-in (2.4 to 2.8 N·m).

7. To secure the M9100, M9210, and M9220 Series Actuators to the linkage drive shaft, evenly tighten the two clamp nuts on the U-bolt of the actuator coupler to a torque of 60 to 65 lb-in (6.8 to 7.3 N·m). To secure the M9106 and M9206 Series Actuators to the linkage drive shaft, tighten the coupler set screw to a torque of 40 to 44 lb-in (4.5 to 5 N·m).

**Note:** For all Two-Way and VG1644 Three-Way Valves, check that the color-coded index marking remains aligned with the desired index marking on the top surface of the mounting bracket.

### Repair Information

If the M9000-51x Series Valve Linkage Kit fails to operate within its specifications, replace the unit. For a replacement linkage kit, contact the nearest Johnson Controls representative.



**Figure 6: Exploded View of M91xx Series Electric Actuator Field Installation on 1/2 in. through 2 in. Ball Valve**

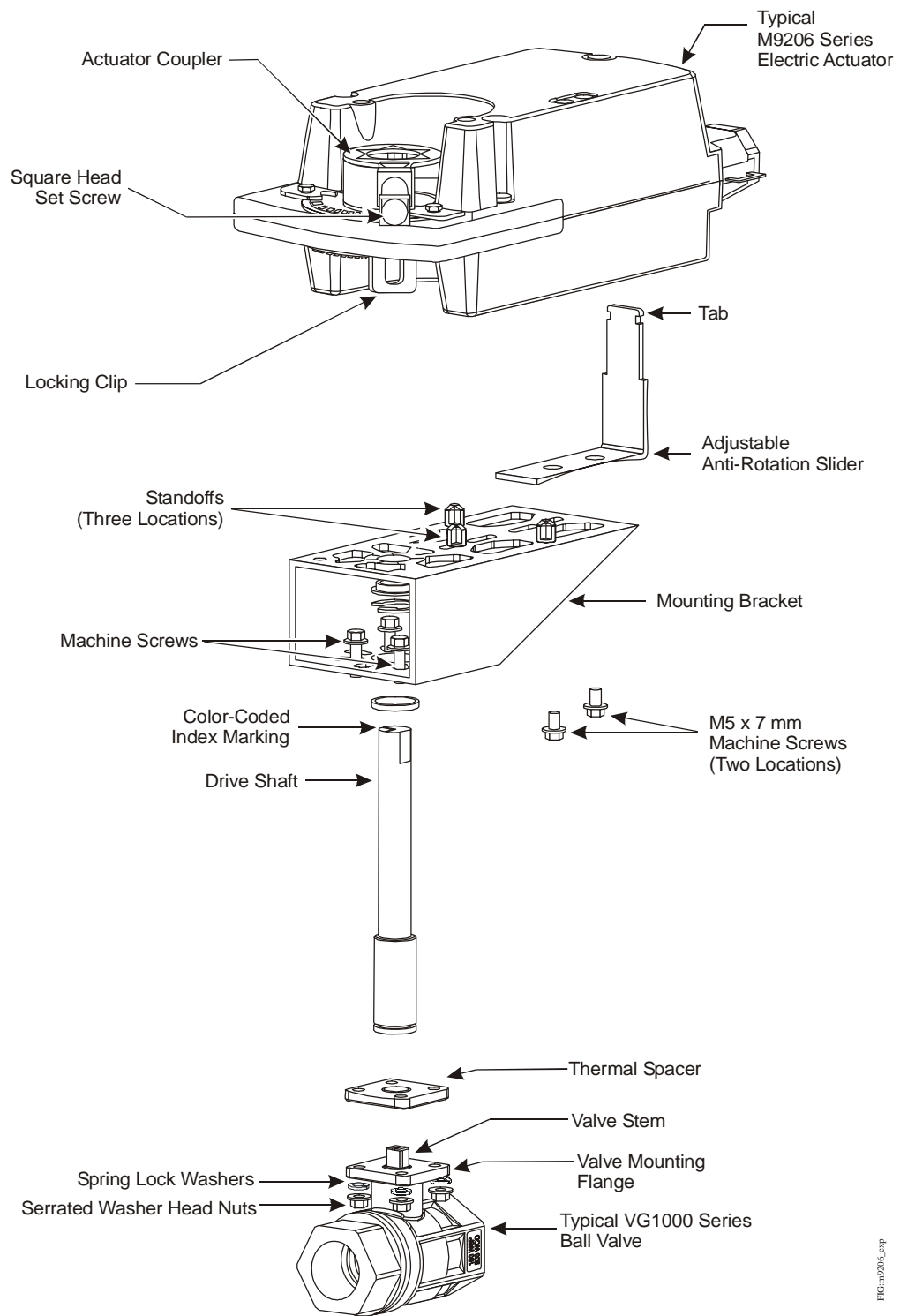
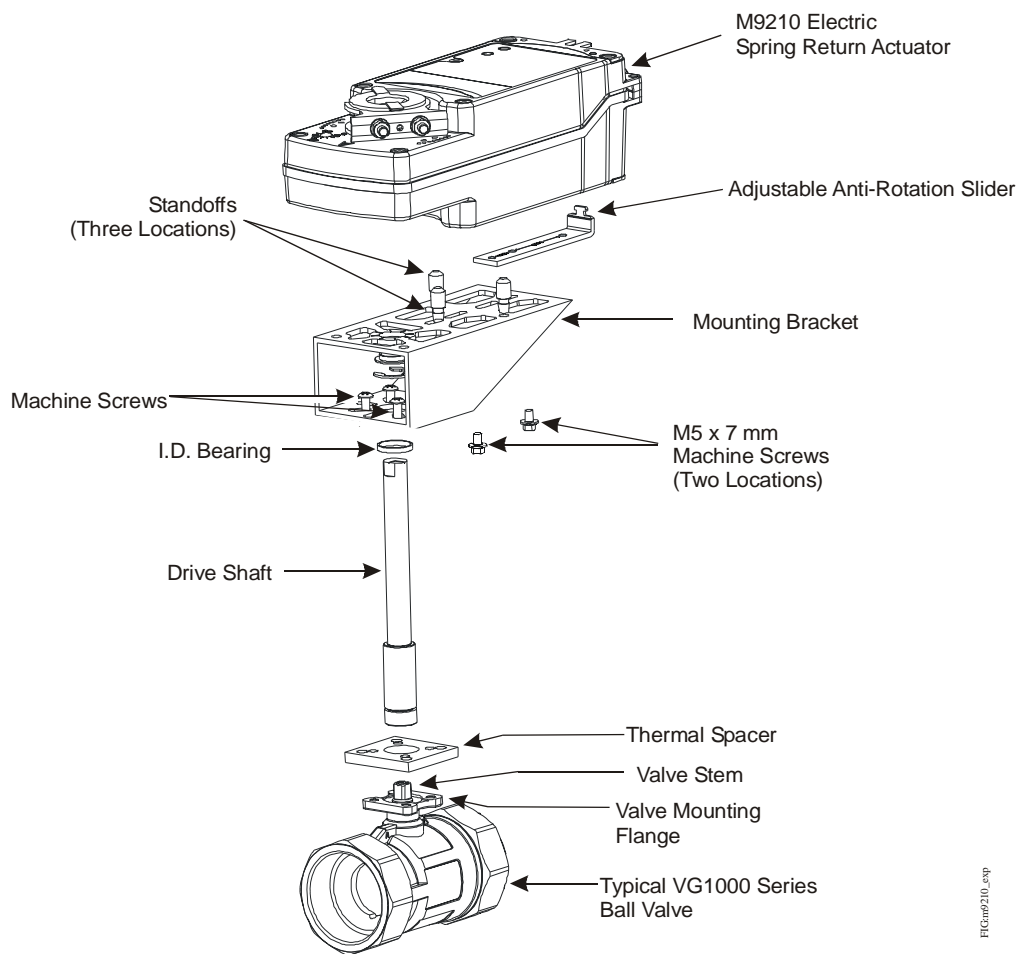


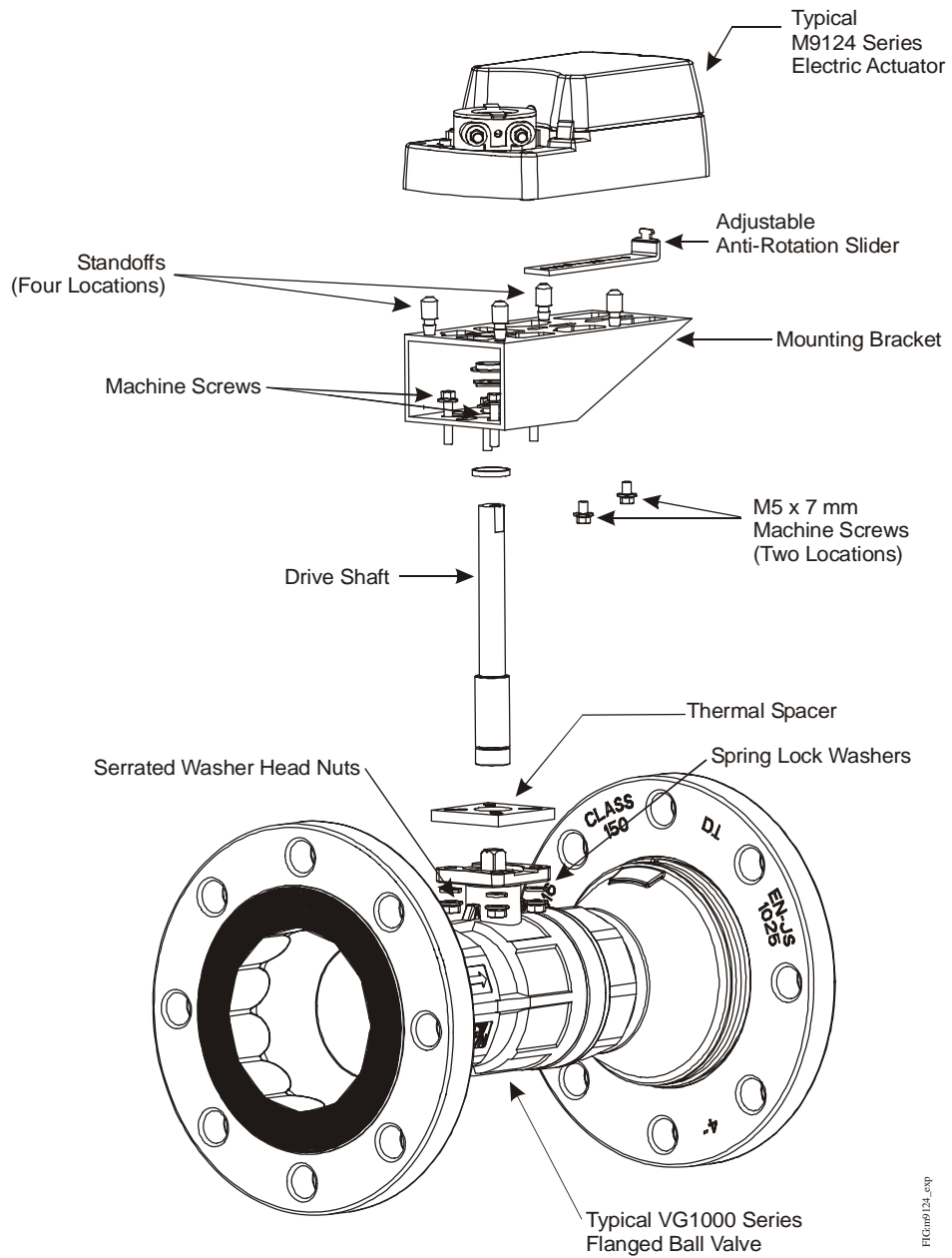
FIG.M9206\_exp

**Figure 7: Exploded View of M9206 Series Electric Actuator Field Installation**

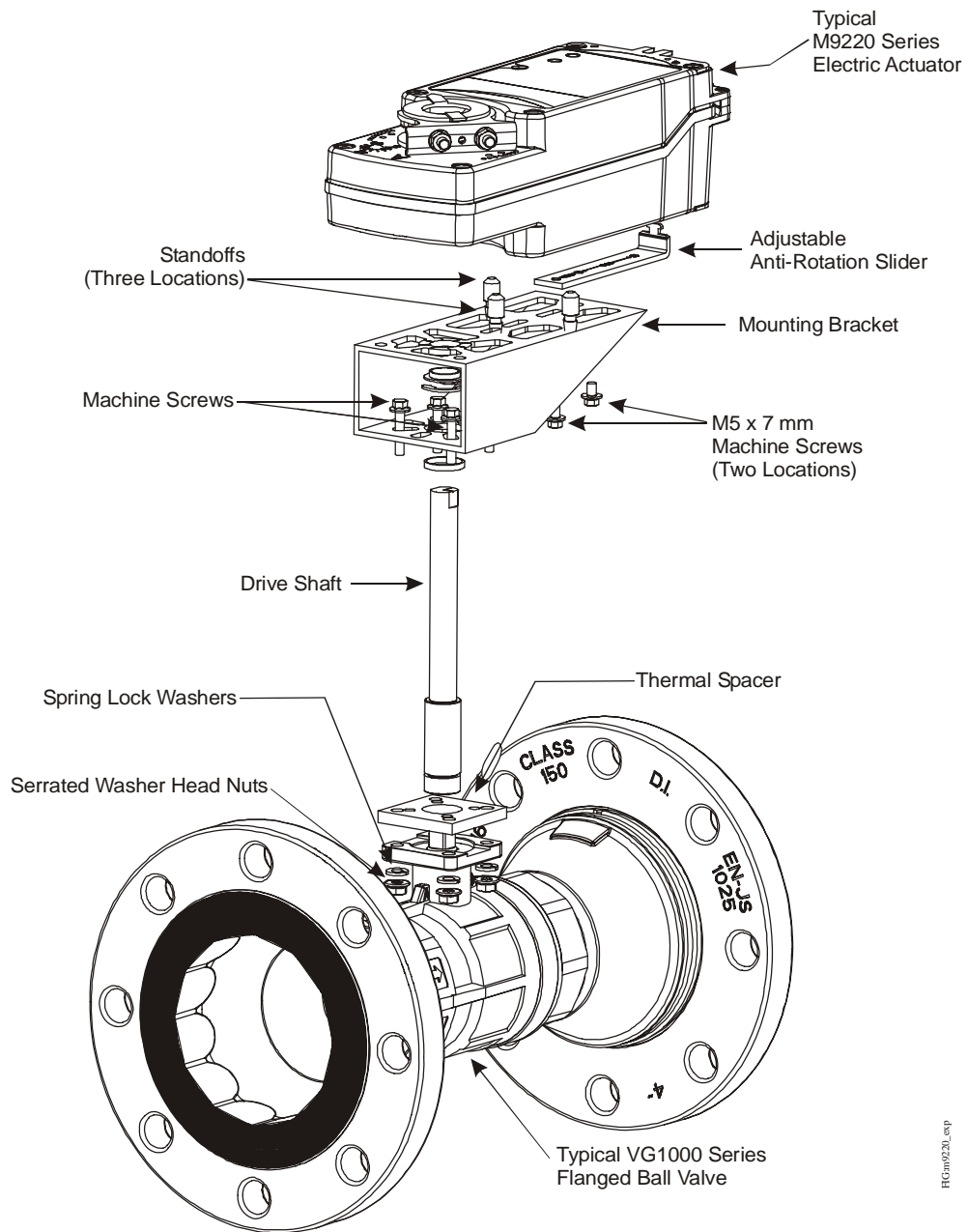


**Figure 8: Exploded View of M9210 Series Electric Actuator Field Installation**





**Figure 9: Exploded View of M9124 Series Electric Actuator Field Installation**



**Figure 10: Exploded View of M9220 Series Electric Actuator Field Installation**

## Technical Specifications

### M9000-51x Series Ball Valve Linkage Kits

<b>Service</b>		Hot Water, Chilled Water, 50/50 Glycol Solutions and Low Pressure Steam
<b>Maximum Actuator Fluid Temperature Limits</b>	284°F (140°C)	M9000-516 Linkage: M9100 Series Non-Spring Return Actuators
		M9000-517 Linkage: M9210 Series Spring Return Actuators
		M9000-518 Linkage: M9124 Series Non-Spring Return Actuators
		M9000-519 Linkage: M9220 Series Spring Return Actuators
<b>Maximum Steam Service</b>	15 psig Saturated Steam 250°F (121°C)	M9000-516 Linkage: M9100 Series Non-Spring Return Actuators
		M9000-517 Linkage: M9210 Series Spring Return Actuators
	25 psig Saturated Steam 267°F (130°C)	M9000-518 Linkage: M9124 Series Non-Spring Return Actuators
		M9000-519 Linkage: M9220 Series Spring Return Actuators
<b>Minimum Ambient Operating Temperature</b>	-40°F (-40°C)	M9000-517 Linkage: M9210 Series Spring Return Actuators
		M9000-519 Linkage: M9220 Series Spring Return Actuators
	-4°F (-20°C)	M9000-516 Linkage: M9100 Series Non-Spring Return Actuators
		M9000-518 Linkage: M9124 Series Non-Spring Return Actuators
<b>Maximum Ambient Operating Temperature</b>	122°F (50°C)	M9000-516 Linkage: M9100 Series Non-Spring Return Actuators
		M9000-518 Linkage: M9124 Series Non-Spring Return Actuators
	131°F (55°C)	M9000-517 Linkage: M9210 Series Spring Return Actuators
		M9000-519 Linkage: M9220 Series Spring Return Actuators
<b>Enclosure</b>		NEMA 3R, IP32
<b>Material</b>	Bracket	Aluminum
	Anti-Rotation Slider	1018 Steel
	Drive Shaft	12L14 Steel
	Standoff	Thermoplastic Resin
	Thermal Isolator	Polytetrafluoroethylene (PTFE)
<b>Shipping Weight</b>		1.5 lb (0.68 kg)

*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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