

## VA-4233-GGx Series Electric Valve Actuators

### Installation

Refer to Figures 2 through 4 for proper actuator orientation before attempting to make the installation.

**IMPORTANT:** Use this VA-4233-GGx Series Electric Valve Actuator only to control equipment under normal operating conditions. Where failure or malfunction of the VA-4233-GGx 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 VA-4233-GGx Actuator.

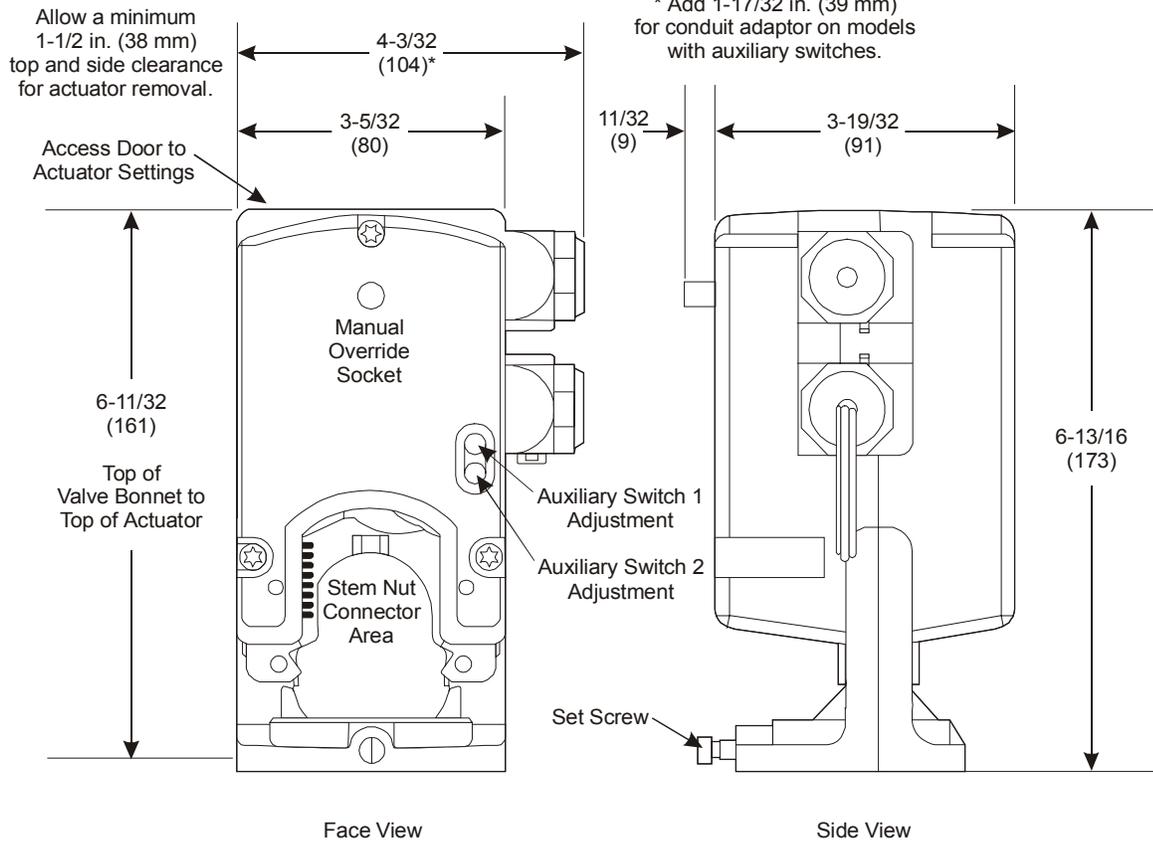
VA-4233-GGx Series Proportional Electric Valve Actuators operate on 24 VAC at 50/60 Hz or 24 VDC, and use a stepper motor with stall detection circuitry that operates throughout the entire actuator stroke. All models employ noise-filtering techniques on the control signal to eliminate repositioning due to line noise.

VA-4233-GGx Series Actuators position the valve in response to a control signal, in a manner defined by the mode switch that is field selected: 0 to 10, 2 to 10, or 6 to 9 VDC, or 0 to 20 or 4 to 20 mA input signal. A built-in direct or reverse (DA/RA) switch allows selection of the required control action. These actuators feature an AUTO stroke calibration function that enables the actuator to scale the selected input signal and feedback proportionally across the actual valve stroke.

To install the actuator onto the valve, proceed as follows:

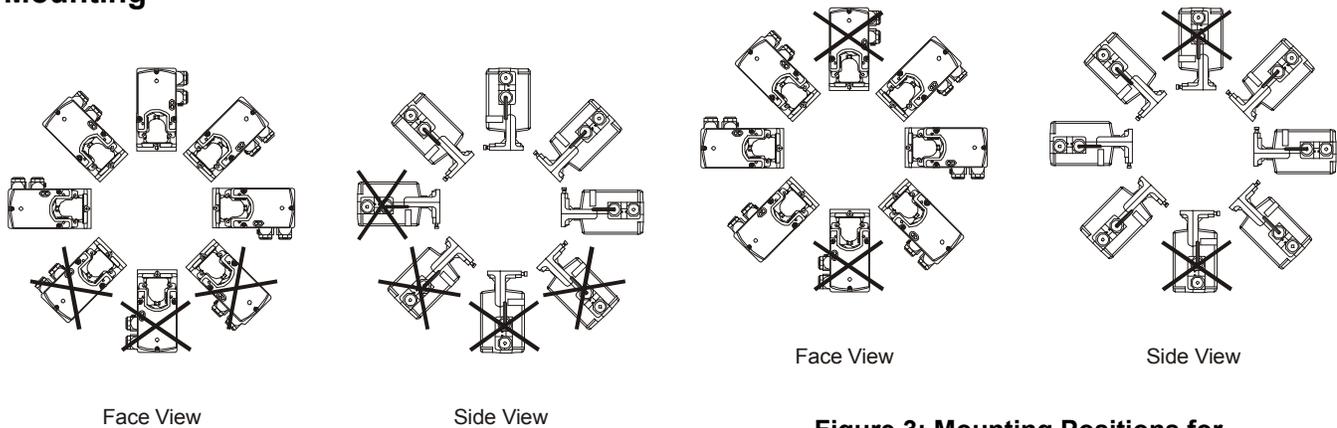
1. Open the door on the top of the actuator and check that the Fixed/Auto switch is in the Auto position. Also check that the Control Signal mode switches are set to the desired input range.
2. Depress the socket for the manual override to be certain that the actuator is in the retracted position.
3. Using the manual hand crank (included with the actuator), push in and turn the crank in the direction of the arrow approximately four full turns. Lock this position by winding the manual hand crank counterclockwise to the Lock Area zone (engraved on the face of the actuator). Remove the manual hand crank.
4. If replacing a Johnson Controls® M100, V-400, V-500, or MP8000 Series Actuator on a VG7000 Series Bronze Control Valve, thread a VG7000-1016 Bonnet Adaptor (ordered separately) onto the valve. Then proceed to Step 5.
  1. If installing the VA-4233-GGx Series Actuator on a 1/2 through 1-1/4 in. Invensys VB-7xxx or VB-9xxx Series Valve, use the parts included in the V-9999-BC1 Mounting Kit (ordered separately). Refer to the literature included with this kit, *V-9999-BC1 Mounting Kit to Mount VA-715x or VA-720x Series Electric Actuators to Barber-Colman® 1/2 through 1-1/4 inch VB-9xxx Valve Bodies (Part No. 14-1116-3)*, to complete the actuator installation.
5. Thread the jam nut (included with the actuator) onto the valve stem to the bottom of the threads. Then thread the special stem nut (included with the actuator) onto the valve stem, with the beveled side up. Position the stem nut so that half of a thread of the valve stem is exposed above the stem nut.
6. Using two adjustable wrenches, tighten the jam nut into the stem nut to secure the assembly in place.
7. Install the actuator and yoke assembly onto the stem nut assembly, making sure that the flats of the special stem nut are aligned with the internal flats of the actuator stem nut connector. When properly installed, the actuator will be aligned with the valve body.
8. Tighten the set screw to a torque of 10 to 20 lb·in (1.1 to 2.3 N·m), to secure the assembly.

## Dimensions



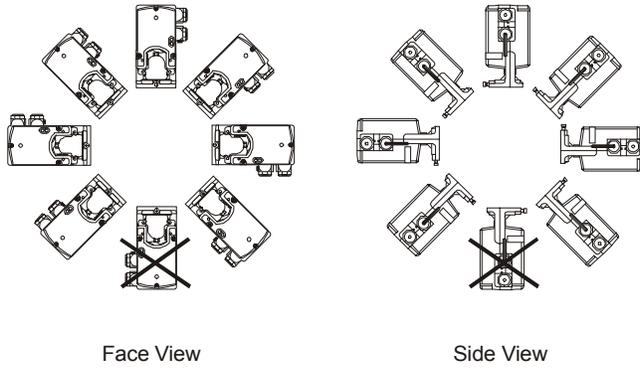
**Figure 1: Actuator Dimensions, in. (mm)**

## Mounting



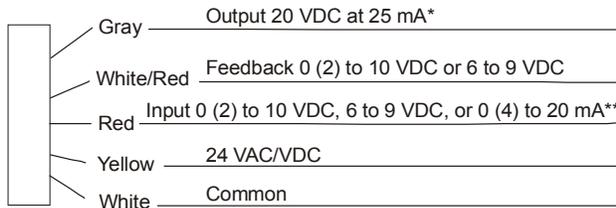
**Figure 2: Mounting Positions for Chilled Water Applications and Condensing Atmospheres**

**Figure 3: Mounting Positions for Steam Applications**



**Figure 4: Mounting Positions for Hot Water Applications**

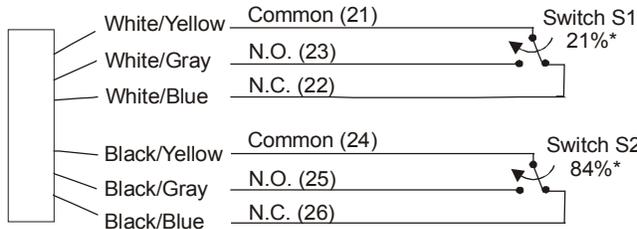
### Wiring



\* Available on VA-4233-GGx-2MP models only.

\*\* The control inputs shown will move the valve stem down as the control input increases, with the DA/RA switch in the DA mode.

**Figure 5: Actuator Wiring**



\* Refers to a full actuator stroke of 29/32 in. (23 mm). Switches are readjustable to all applicable Johnson Controls stroke ranges.

**Figure 6: Auxiliary Switch Wiring**

## Setup and Adjustments

### Mode Switches

The mode selection switches are located behind the door on the bottom of the actuator. To access these switches, insert a flat-blade screwdriver in the slot at the door edge to open the door. (See Figure 1.)

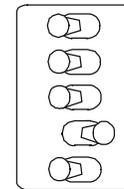
See Table 1 for the mode settings available.

**Table 1: Mode Selection Information**

Mode Switches	Switch Functions	Factory Settings
5	VDC or mA	VDC
4	0-10 VDC (0-20 mA) or 2-10 VDC (4-20 mA)	0-10
3	Direct Acting (DA) or Reverse Acting (RA)	DA
2	Fixed or Auto (See the <i>Fixed or Auto Mode</i> section.)	Auto
1	— or 6-9 VDC	—

Note: The 6 to 9 VDC setting of Switch 1 overrides Switch 4.

The mode switches are factory set with all five switches positioned as shown in Figure 7:



VDC ↔ mA  
 0-10 ↔ 2-10  
 DA ↔ RA  
 FIXED ↔ AUTO  
 — ↔ 6-9

**Figure 7: Position of the Mode Switches**

To change a factory setting, use a 1/8 in. (3 mm) flat-blade screwdriver to position the mode switch to the alternate setting. Close the door when finished.

### VDC or mA

The type of input control signal is determined by the position of Switch 5. When Switch 5 is in the VDC position (factory setting), the input signal is set for DC voltage. When Switch 5 in the mA position, the input signal changes to current input. (See Figure 7 and Table 2.)

**Table 2: Available Input Control Signals**

Control Signal		Mode Switch 5		Mode Switch 4		Mode Switch 1	
		VDC	mA	0-10	2-10	—	6-9
Voltage Input (VDC)	0-10	X		X		X	
	2-10	X			X	X	
	6-9	X		X			X
Current Input (mA)	0-20		X	X		X	
	4-20		X		X	X	

**Input Signal**

The range of the input signal is determined by the position of Switches 1 and 4. (See Table 1.)

With Switch 5 in the mA position, the feedback signal varies within the 0 to 10 V, 2 to 10 V, or 6 to 9 V range.

**Fixed or Auto Mode**

The actuators are factory set with Switch 2 in the AUTO position.

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).

The FIXED position is where a 0 to 10 VDC input signal (selected with Switches 1, 4, and 5) 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.

If the actuator’s mounting position is changed or the linkage adjusted, reinitiate the auto mode by moving Switch 2 to **fixed** for 5 seconds and then back to **auto**.

**Auxiliary Switch Adjustments (VA-4233-GGC-2 and -2MP Only)**



**WARNING: Electrical Shock Hazard.**

Be sure that all unused auxiliary switch leads are insulated to avoid the risk of electric shock or damage to the equipment.

The VA-4233-GGC-2 and -2MP Electric Valve Actuators feature two integral auxiliary switches with switch adjusters accessible on either face of the actuator.

**IMPORTANT:** Do not force the switch adjuster out of the allowable range, or damage to the auxiliary switch may occur.

Switch points are independently and continuously adjustable from approximately 0 to 74% of maximum actuator travel for Auxiliary Switch 1, and approximately 22 to 100% of maximum actuator travel for Auxiliary Switch 2.

If only one auxiliary switch is needed, use the appropriate switch. Use Auxiliary Switch 1 for the upper switch point, and Auxiliary Switch 2 for the lower switch point.

To change the switch points to the desired setting, proceed as follows:

1. Disconnect the actuator from the system controller.
2. Use the manual hand crank (included with the actuator) or an external power supply and a DC input signal to position the valve stem to the desired switch point. The Johnson Controls M9000-200 Commissioning Tool (ordered separately) is a convenient method for applying power to the actuator.
3. Use a 1/8 in. (3 mm) blade screwdriver to turn the auxiliary switch until it just trips.
  2. Looking at the actuator face **with** the engraved markings, clockwise rotation of the switch adjuster lowers the stem setting toward the valve, while counterclockwise rotation raises the stem setting away from the valve.
  3. Looking at the actuator face **without** the engraved markings, the switch adjuster rotation would be reversed.
4. Remove the M9000-200 Commissioning Tool (if used) and reconnect the actuator to the system controller.

## **Calibration**

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.

### ***AUTO Stroke Calibration***

Initial application of a power signal will drive the actuator and valve assembly to the full stem-up position and then the full stem-down position, and will store these positions in nonvolatile memory (retains data when power is lost or removed). The actuator will then drive to the midpoint, and then to the position determined by the applied control signal.

If the valve stroke increases due to disk or seat wear during normal operation, the actuator automatically calibrates to the increased stroke range. While AUTO stroke calibrating, the valve control function could be lost for up to three minutes. If this temporary loss of control function will result in system control problems during startup, the actuator should be mounted to the valve and have electric power supplied to it prior to startup. Doing so will allow the actuator to AUTO stroke calibrate itself. The Johnson Controls M9000-200 Commissioning Tool (ordered separately) is a convenient method for applying power to the actuator prior to startup.

## ***Canceling the Stored Memory***

The actuator will AUTO stroke calibrate only once, upon initial power application. Certain conditions, such as removal of the actuator from the valve, require cancellation of the stored memory for the actuator to adjust to its new position once it is remounted on the valve. To cancel the stored memory of an actuator that has been removed from the valve, proceed as follows:

1. Apply power to the actuator.
2. Open the door on the top of the actuator and move the Fixed/Auto switch to the Fixed position for ten seconds. Doing so will cancel the stored memory.
3. Remove power from the actuator.
4. Move the Fixed/Auto switch back to the Auto position.

## **Checkout**

To confirm that the auxiliary switches are set at the desired switch points, proceed as follows:

1. Disconnect the actuator from the system controller.
2. Apply an external power supply and a DC input signal, and check the upper and lower switch point settings. The Johnson Controls M9000-200 Commissioning Tool (ordered separately) is a convenient method for applying power to the actuator.

If the upper and lower settings are set at the desired switch points, proceed to Step 3; if not, repeat the auxiliary switch adjustment steps until the desired switch point settings are obtained.

3. Remove the M9000-200 Commissioning Tool (if used) and reconnect the actuator to the system controller.

## Technical Specifications

<b>Product</b>	VA-4233-GGx Series Electric Valve Actuators
<b>Models</b>	VA-4233-GGA-2 Direct Mount, Proportional Control VA-4233-GGA-2MP Direct Mount, Proportional Control, with 20 VDC Output at 25 mA VA-4233-GGC-2 Direct Mount, Proportional Control, with Two Auxiliary Switches VA-4233-GGC-2MP Direct Mount, Proportional Control, Two Auxiliary Switches, with 20 VDC Output at 25 mA
<b>Force Output</b>	Minimum 61 lb (271 N)
<b>Power Requirements</b>	20 to 30 VAC at 50/60 Hz or 24 VDC $\pm$ 10%; Class 2, 12 VA
<b>Input Signal</b>	0 (2) to 10 VDC, 6 to 9 VDC, or 0 (4) to 20 mA
<b>Input Signal Adjustments</b>	Factory Set at 0 to 10 VDC; Switch Selectable 0 (2) to 10 VDC, 6 to 9 VDC, or 0 (4) to 20 mA
<b>Direction of Action</b>	Factory Set at Stem-Up (Direct Acting); Switch Selectable Stem-Up or Stem-Down with Signal Increase
<b>Input Impedance</b>	Voltage Input: 200,000 Ohms Current Input: 500 Ohms
<b>Feedback Signal</b>	0 to 10 VDC, 2 to 10 VDC, or 6 to 9 VDC at 2 mA (Corresponding to Input Signal Selection)
<b>Switch Contact Rating (VA-4233-GGC-2 and -2MP Models Only)</b>	Two Single-Pole, Double-Throw (SPDT), Double Insulated Switches: 24 VAC, 50 VA Pilot Duty; 120 VAC, 5.8 A Resistive, 1/4 hp, 275 VA Pilot Duty; 240 VAC, 2.9 A Resistive, 1/4 hp, 275 VA Pilot Duty
<b>Maximum Stroke</b>	29/32 in. (23 mm)
<b>Nominal Timing for Stroke</b>	76 Seconds for 29/32 in. (23 mm) Stroke (Proportionally Less for Shorter Strokes)
<b>Nominal Spring Return Timing for 29/32 in. Stroke</b>	3 to 15 Seconds at Room Temperature and No Load (Proportionally Less for Shorter Strokes)
<b>Spring Return Direction</b>	Stem-Up
<b>Electrical Connections</b>	Actuator: 48 in. (122 cm) Cable with 20 AWG Wire Leads Auxiliary Switches (VA-4233-GGC-2 and -2MP Only): 48 in. (122 cm) Cable with 18 AWG Wire Leads
<b>Ambient Temperature Limits</b>	Operating: 32 to 122°F (0 to 50°C) Storage: -85 to 185°F (-65 to 85°C)
<b>Maximum Ambient Humidity Limits</b>	90% RH Noncondensing at 70°F (21°C) Ambient Temperature and 40°F (4°C) Fluid Temperature
<b>Fluid Temperature Limits (Actuator and Valve Assembly)</b>	35 to 250°F (2 to 121°C); 15 psig (103 kPa) Saturated Steam
<b>Acoustic Noise</b>	35 dB(A) Maximum at 39 in. (100 cm) per DIN 1946 and ISO 3745
<b>Agency Compliance</b>	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.

Refer to the VA-4233 Series Electric Valve Actuators Product Bulletin (LIT- 977552) for necessary information on operating and performance specifications for this product.



Controls Group  
507 E. Michigan Street  
P.O. Box 423  
Milwaukee, WI 53201

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