

## VA-6100 Series Electric Valve Actuators

### Installation

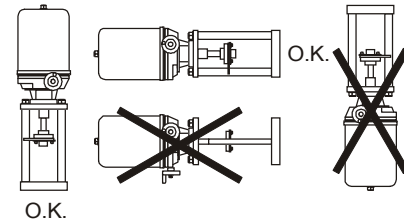
#### Special Tools Needed

Actuator/Valve Part	Recommended Actuator Mounting Tools
Packing Nut	1 in. Wrench for Valves with 1/2 in. Stem
	1-5/8 in. Wrench to Remove Old Packing Nut
Yoke Adaptor	1-7/8 in. Wrench
Stem Extender	7/8 in. Wrench for Valves with 1/2 in. Stem
Stem Nut	3/4 in. Wrench for Valves with 1/2 in. Stem
Actuator and Valve Stem Coupling Assembly Screws	5 mm Allen Wrench
Yoke Nut	Adjustable-Face, Pin-Style Spanner Wrench with Circle Diameter to 3 in.
Transfer Bolt Nut	10 mm Open-End Wrench, Thin (Ignition Wrench Style)
Potentiometer A or B	Jeweler's Screwdriver

#### Pre-Installation Details

Before installing a VA-6100 Series Electric Valve Actuator onto a VG2000 Series Cast Iron Flanged Globe Valve, please note the following:

- The valve should be mounted in an upright position, in a conveniently accessible location. When mounting the valve horizontally, orient the yoke so that the yoke supports are positioned vertically, one above the other (as illustrated in Figure 1).



**Figure 1: Proper Yoke Orientation**

- Protect the actuator from dripping water that could enter the actuator housing and damage the mechanism or motor.
- Do not cover the actuator with insulating material.
- Allow sufficient clearance to remove the actuator (as illustrated in Figure 4).
- Pipe the valve with the flow in the direction of the arrow on the valve body, so that the plug seats against the flow.



**CAUTION: Risk of Equipment Damage.**

Disconnect all power supplies before making wiring connections or prior to performing maintenance. Check all wiring connections before applying power to the system. Short-circuited or improperly connected wires will result in permanent damage to the equipment.

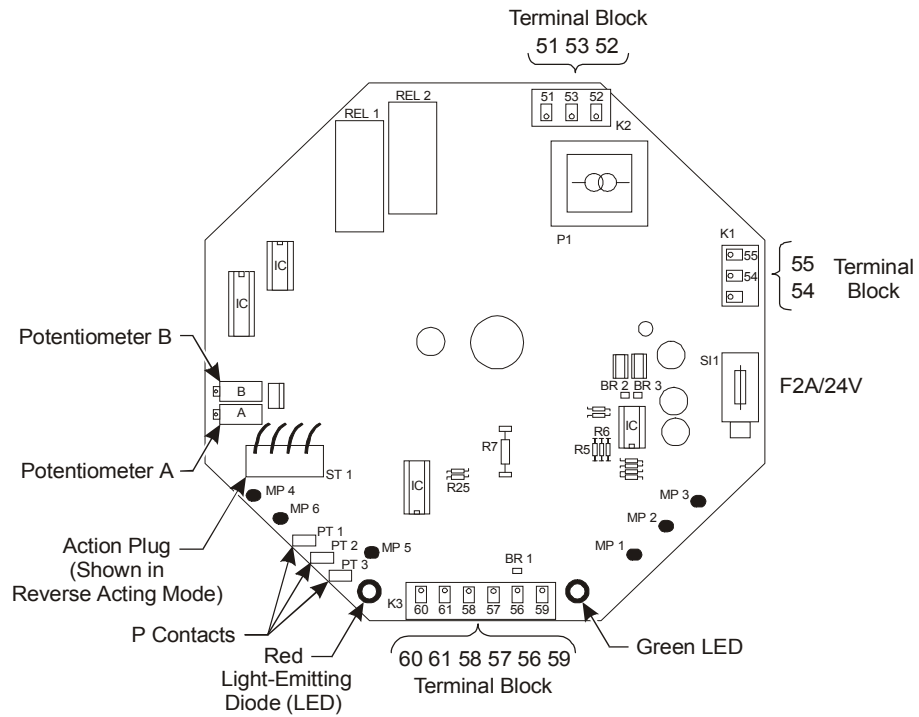
#### Transfer Bolt Setting

Prior to powering up the VA-6100-HGC Electric Valve Actuator, check that the transfer bolt is set at the proper stroke length for the valve size as follows:

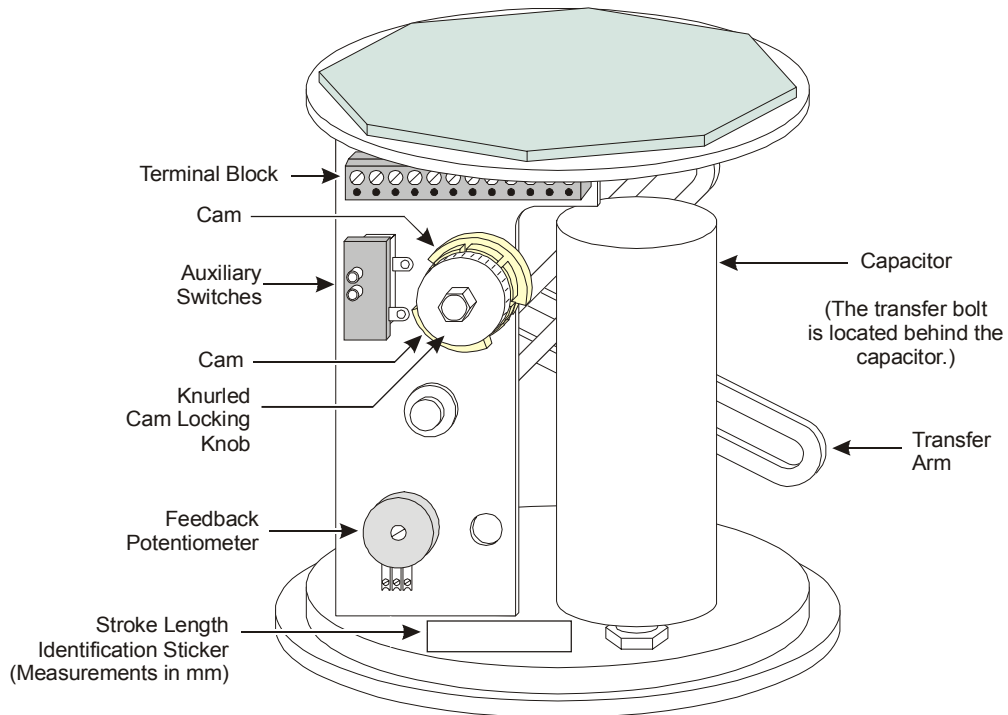
Valve Size	Stroke Length	Transfer Bolt Setting
4 in.	1-1/8 in.	28 mm
5 in.	1-3/8 in.	35 mm
6 in.	1-1/2 in.	38 mm

Refer to Figure 3 to locate the stroke length identification sticker, in order to determine the transfer bolt setting and associated stroke length.

## Parts Included

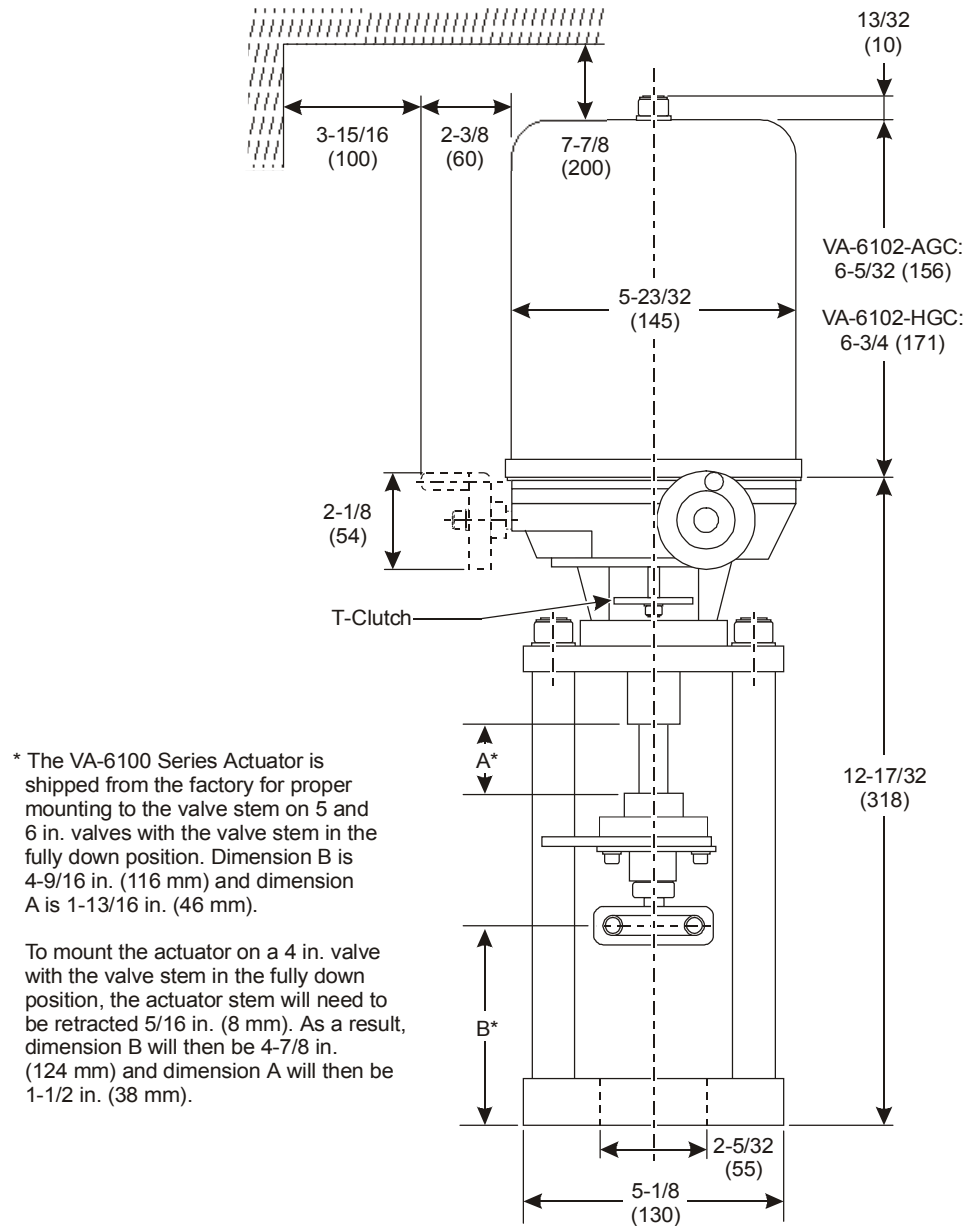


**Figure 2: Circuit Board Parts Identification**



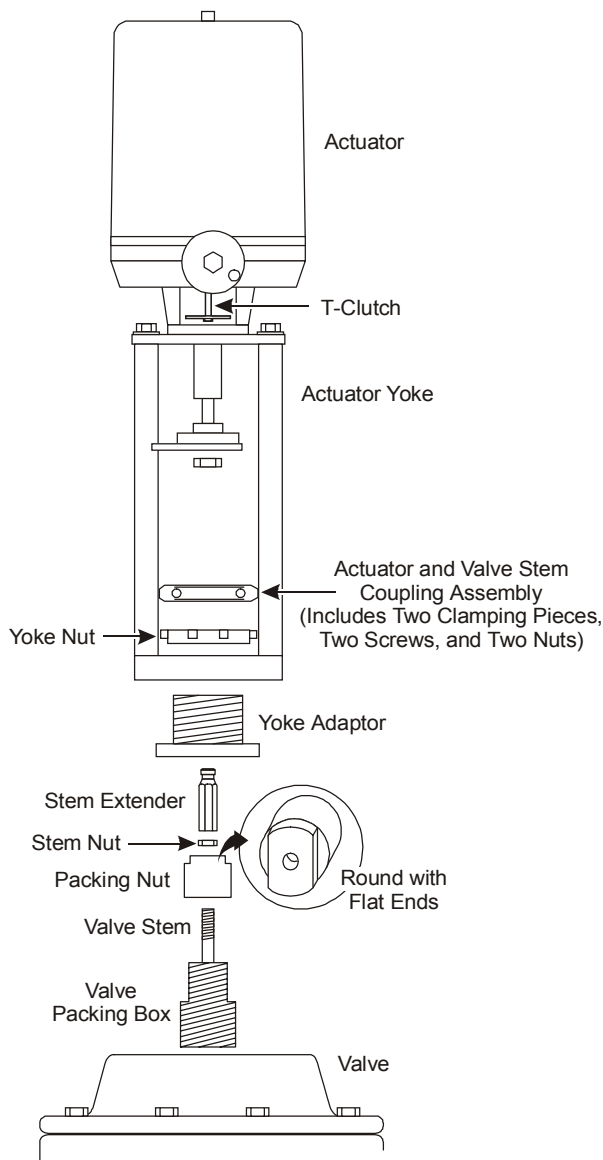
**Figure 3: Cam and Feedback Potentiometer Identification**

## Dimensions



**Figure 4: VA-6100 Series Electric Valve Actuator Dimensions, in. (mm)**

## Mounting



**Figure 5: Exploded View of Actuator Mounting**

To field mount a VA-6100 Series Electric Valve Actuator onto a VG2000 Series Cast Iron Flanged Globe Valve, refer to Figure 5 and proceed as follows:

**Note:** When mounting the actuator onto a 5 or 6 in. valve, proceed directly to Step 2.

- When mounting the actuator onto a 4 in. valve, retract the actuator stem 5/16 in. (8 mm) as illustrated in Figure 4 using the integral manual hand wheel. To use the manual hand wheel, pull down on the T-clutch and rotate the hand wheel counterclockwise to retract the actuator stem.
- Remove the hex packing nut from the valve and discard.
- Thread the yoke adaptor onto the valve packing box and tighten to a torque of 25 lb-ft (34 N·m).
- Push the valve stem fully down into the valve body.
- Thread the replacement packing nut (round with flat ends, included with the mounting kit) onto the valve packing box and tighten to a torque of 4 lb-ft (5.4 N·m).
- Thread the stem nut and the appropriate stem extender onto the valve stem down to the packing nut, without tightening either securely in place.
- Remove the actuator and valve stem coupling assembly from the actuator, without rotating the actuator stem.
- Mount the actuator and yoke nut onto the yoke adaptor, making sure that the side of the yoke nut with the small lip and standoff is facing downward.
- Thread the yoke nut onto the yoke adaptor and tighten to a torque of 20 lb-ft (27.2 N·m).
- Unscrew the stem extender to the point where it barely touches the actuator stem, being careful not to apply any force to the actuator stem.
- Secure the position of the stem extender by tightening the stem nut to a torque of 9 lb-ft (12.2 N·m).
- Secure the actuator stem to the stem extender using the clamping pieces, two screws, and two nuts of the actuator and valve stem coupling assembly. Position the actuator stem so that its flats are parallel to the actuator yoke. The clamping assembly is designed to securely hold the actuator stem without rotating.

When properly aligned, the actuator stem and stem extender will fit perfectly into the cutouts on the inside of the clamping pieces. Tighten the two clamping assembly screws to a torque of 4 lb-ft (5.4 N·m).

- Proceed to the *Setup and Adjustments* section to complete the installation.

## Wiring

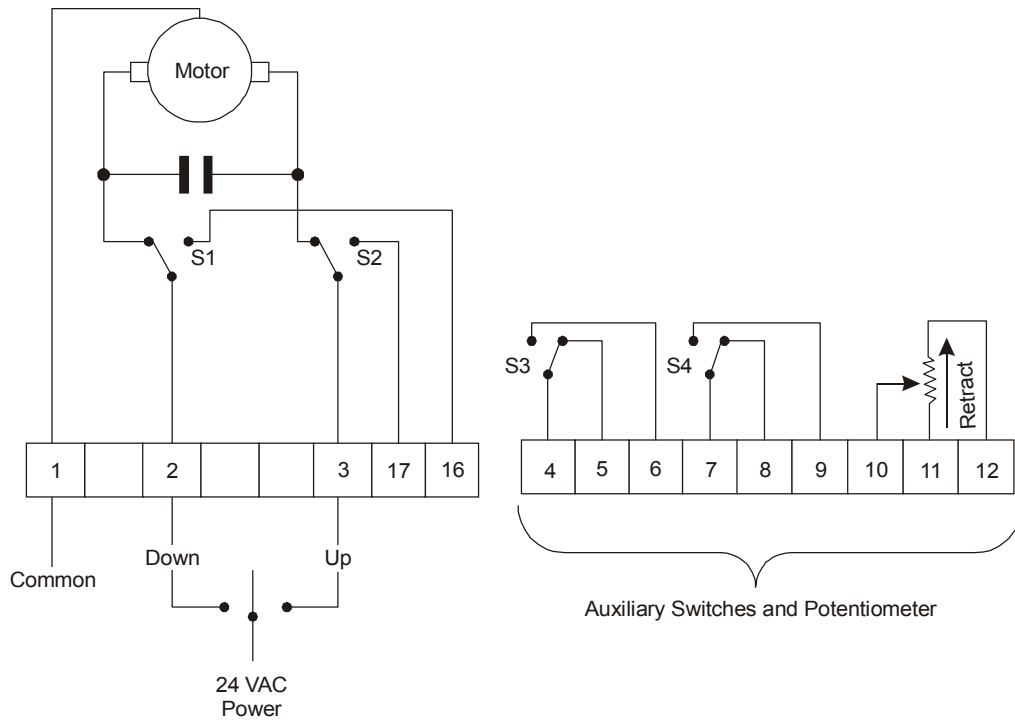


Figure 6: VA-6100-AGC Wiring Diagram for On/Off (Floating) Control

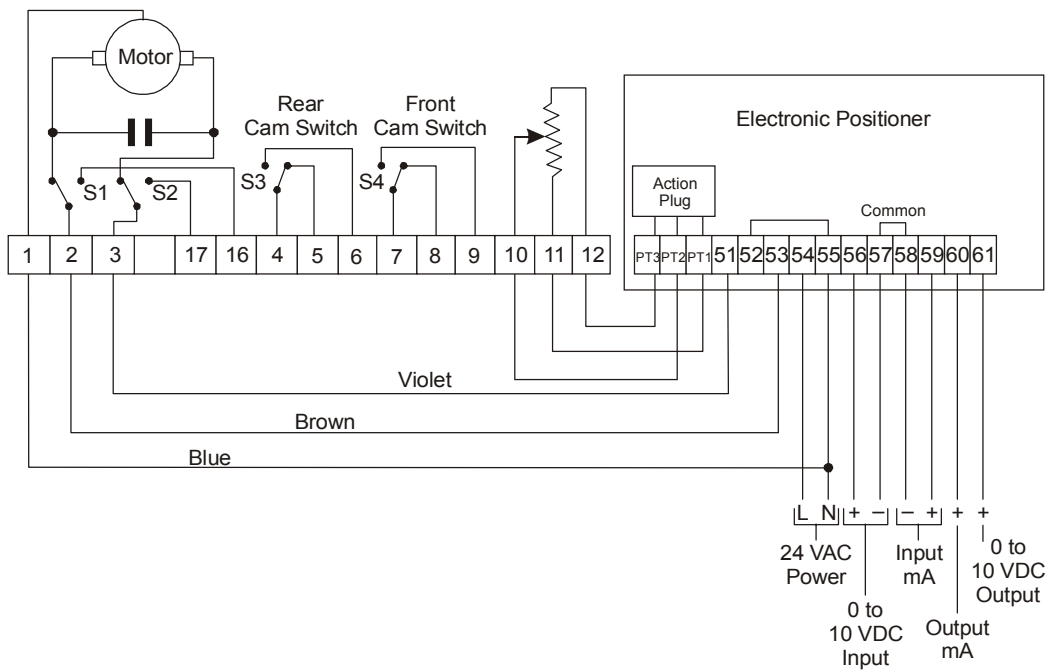


Figure 7: VA-6100-HGC Wiring Diagram for Proportional Control

## Setup and Adjustments



### **CAUTION: Risk of Equipment Damage.**

Do not power VA-6100 Series Electric Valve Actuators using the Johnson Controls M9000-200 Commissioning Tool. The M9000-200 provides a maximum power of 25 VA. The VA-6100-AGC Electric Valve Actuator requires 37 VA and the VA-6100-HGC requires 42 VA. If the M9000-200 is used to power either valve actuator, the commissioning tool could become damaged.

### **VA-6100-AGC Electric Valve Actuator**

**To adjust the potentiometer** on the VA-6100-AGC Electric Valve Actuator, proceed as follows:

1. Connect an ohmmeter to Terminals 10 and 11.
2. Rotate the feedback potentiometer clockwise to its stop. The ohmmeter should display a resistance of less than 10 ohms.
3. Apply 24 VAC power to Terminals 1 and 3 (as illustrated in Figure 6) to drive the valve stem fully up. The ohmmeter should display a resistance of 1,300 to 1,500 ohms for a 4 in. valve, 1,600 to 1,800 ohms for a 5 in. valve, and 1,700 to 1,900 ohms for a 6 in. valve.

**To adjust the auxiliary switches**, proceed as follows:

1. Refer to Figure 3 and locate the auxiliary switches, cams, and terminal block.
2. Loosen the knurled cam locking knob by turning it counterclockwise.
3. Adjust the actuator to the desired down position where the inner auxiliary switch is to be tripped.
4. Adjust the inner cam so that it just trips the inner auxiliary switch.
5. Adjust the actuator to the desired up position where the outer auxiliary switch is to be tripped.
6. Adjust the outer cam so that it just trips the outer auxiliary switch.
7. Tighten the knurled cam locking knob by turning it clockwise.

**To use the manual hand wheel** to control the valve, proceed as follows:

1. Disconnect the power.
2. Pull down on the T-clutch. The T-clutch is located below the manual hand wheel.

3. Rotate the manual hand wheel clockwise to extend the actuator stem and lower the valve stem. Rotate the manual hand wheel counterclockwise to retract the actuator stem and raise the valve stem.

### **VA-6100-HGC Electric Valve Actuator**

The actuator action for the VA-6100-HGC Electric Valve Actuator is as follows:

**Direct Acting:** As the control signal increases, the actuator stem fully extends and the valve stem moves to the fully down position. With no control signal, the actuator moves to the fully retracted position.

**Reverse Acting:** As the control signal increases, the actuator stem retracts and the valve stem moves to the fully up position. With no control signal, the actuator moves to the fully extended position.

**To switch from direct acting to reverse acting** or vice versa, proceed as follows:

1. Apply 24 VAC power to Terminals 54 and 55 (as illustrated in Figure 7) and determine if the actuator is set for direct acting or reverse acting.
2. Disconnect the 24 VAC power if the actuator is not set for the desired action. Skip Steps 3 and 4 if the actuator is set for the desired action.
3. Pull the action plug from the actuator circuit board (as illustrated in Figure 2), rotate it 180°, and plug it back into the circuit board.
4. Apply 24 VAC power to Terminals 54 and 55 (as illustrated in Figure 7) and check for the desired action.

**To adjust the operating range** of the VA-6100-HGC Electric Valve Actuator, refer to Figure 2 and proceed as follows:

1. Apply 24 VAC power to Terminals 54 and 55 (as illustrated in Figure 7).
2. Note the location of the green and red light-emitting diodes (LEDs) on either end of the terminal block. The green LED illuminates when the actuator motor is running and the red LED illuminates when the actuator motor is stopped.

3. **For direct action**, proceed as follows:
  - a. Input the desired minimum control signal between 0 and 8 VDC to Terminals 56 and 57 (as illustrated in Figure 7) for voltage applications, or input the desired minimum control signal between 0 and 16 mA to Terminals 58 and 59 (as illustrated in Figure 7) for current applications. The actuator motor may run, illuminating the green LED. If so, wait until the actuator motor stops and the red LED is illuminated before proceeding.
  - b. Connect a voltmeter to Terminals 57 and 61 or a current meter to Terminals 58 and 60 (as illustrated in Figure 7). The voltmeter should be on the 10 V range or the current meter should be on the 20 mA range.
  - c. Rotate the feedback potentiometer clockwise to its stop (as illustrated in Figure 3).
  - d. Locate Potentiometer B on the actuator circuit board (as illustrated in Figure 2) and adjust it until the voltmeter reads 0.35 V above the minimum control signal or the current meter reads 0.7 mA above the minimum control signal. The actuator should fully retract.
  - e. Check that the feedback potentiometer is fully clockwise and readjust it, if necessary. The motor may operate when the feedback potentiometer is adjusted. After the motor stops, readjust Potentiometer B until the voltmeter reads 0.35 V above the minimum control signal or the current meter reads 0.7 mA above the minimum control signal.
  - f. Input the desired maximum control signal between 2 and 10 VDC to Terminals 56 and 57 (as illustrated in Figure 7) for voltage applications, or input the desired maximum control signal between 4 and 20 mA to Terminals 58 and 59 (as illustrated in Figure 7) for current applications. The maximum control signal must always exceed the minimum control signal by at least 2 VDC or 4 mA.
  - g. Locate Potentiometer A on the actuator circuit board (as illustrated in Figure 2) and adjust it until the voltmeter reads 0.35 V below the maximum control signal or the current meter reads 0.7 mA below the maximum control signal. The actuator should fully extend.

**Note:** If Potentiometer A adjustment is insufficient, the transfer bolt will need to be adjusted. The transfer bolt is located behind the capacitor (as illustrated in Figure 3). For reference purposes, a scale with numbers that correspond to notches on the transfer lever is located on the surface just below the feedback potentiometer.

Loosening the transfer bolt nut and moving the transfer bolt location will change the span of the actuator operating range. If the voltage span from Steps 3c through 3g is insufficient, the center of the transfer bolt will need to be adjusted to a smaller number (as indicated on the scale). If the voltage span is too great, the center of the transfer bolt will need to be adjusted to a larger number (as indicated on the scale). Regardless of which way the transfer bolt is moved, direct action Steps 3c through 3g will need to be repeated.

4. **For reverse action**, proceed as follows:
  - a. Input the desired maximum control signal between 2 and 10 VDC to Terminals 56 and 57 (as illustrated in Figure 7) for voltage applications, or input the desired maximum control signal between 4 and 20 mA to Terminals 58 and 59 (as illustrated in Figure 7) for current applications. The actuator motor may run, illuminating the green LED. If so, wait until the actuator motor stops and the red LED is illuminated before proceeding.
  - b. Connect a voltmeter to Terminals 57 and 61 or a current meter to Terminals 58 and 60 (as illustrated in Figure 7). The voltmeter should be on the 10 V range or the current meter should be on the 20 mA range.
  - c. Rotate the feedback potentiometer clockwise to its stop (as illustrated in Figure 3).
  - d. Locate Potentiometer A on the actuator circuit board (as illustrated in Figure 2) and adjust it until the voltmeter reads 0.35 V below the maximum control signal or the current meter reads 0.7 mA below the maximum control signal. The actuator should fully retract.
  - e. Check that the feedback potentiometer is fully clockwise and readjust it, if necessary. The motor may operate when the feedback potentiometer is adjusted. After the motor stops, readjust Potentiometer A until the voltmeter reads 0.35 V below the maximum control signal or the current meter reads 0.7 mA below the maximum control signal.

- f. Input the desired minimum control signal between 0 and 8 VDC to Terminals 56 and 57 (as illustrated in Figure 7) for voltage applications, or input the desired minimum control signal between 0 and 16 mA to Terminals 58 and 59 (as illustrated in Figure 7) for current applications. The minimum control signal must always be at least 2 VDC or 4 mA less than the maximum control signal.
- g. Locate Potentiometer B on the actuator circuit board (as illustrated in Figure 2) and adjust it until the voltmeter reads 0.35 V above the minimum control signal or the current meter reads 0.7 mA above the minimum control signal. The actuator should fully extend.

**Note:** If Potentiometer B adjustment is insufficient, the transfer bolt will need to be adjusted. The transfer bolt is located behind the capacitor (as illustrated in Figure 3). For reference purposes, a scale with numbers that correspond to notches on the transfer lever is located on the surface just below the feedback potentiometer.

Loosening the transfer bolt nut and moving the transfer bolt location will change the span of the actuator operating range. If the voltage span from Steps 3c through 3g is insufficient, the center of the transfer bolt will need to be adjusted to a smaller number (as indicated on the scale). If the voltage span is too great, the center of the transfer bolt will need to be adjusted to a larger number (as indicated on the scale). Regardless of which way the transfer bolt is moved, reverse action Steps 3c through 3g will need to be repeated.

**To adjust the auxiliary switches** on the VA-6100-HGC Electric Valve Actuator, proceed as follows:

1. Refer to Figure 3 and locate the auxiliary switches, cams, and terminal block.
2. Loosen the knurled cam locking knob by turning it counterclockwise.
3. Adjust the actuator to the desired down position where the inner auxiliary switch is to be tripped.
4. Adjust the inner cam so that it just trips the inner auxiliary switch.
5. Adjust the actuator to the desired up position where the outer auxiliary switch is to be tripped.
6. Adjust the outer cam so that it just trips the outer auxiliary switch.
7. Tighten the knurled cam locking knob by turning it clockwise.

**To use the manual hand wheel** to control the valve, proceed as follows:

1. Disconnect the power.
2. Pull down on the T-clutch. The T-clutch is located below the manual hand wheel.
3. To extend the actuator stem and lower the valve stem, rotate the manual hand wheel clockwise. To retract the actuator stem and raise the valve stem, rotate the manual hand wheel counterclockwise.

## Repairs and Replacement

If the VA-6100 Series Electric Valve Actuator fails to operate within its specifications, unit replacement is required. For a replacement VA-6100 Actuator, contact the nearest Johnson Controls representative.



## Technical Specifications

<b>Product</b>	VA-6100 Series Electric Valve Actuators	
<b>Force Output</b>	1,350 lb (6,000 N)	
<b>Power Requirements</b>	<b>VA-6100-AGC Only</b>	20 to 28 VAC, 60 Hz; 37 VA Minimum
	<b>VA-6100-HGC Only</b>	20 to 28 VAC, 60 Hz; 42 VA Minimum
<b>Input Signal</b>	<b>VA-6100-AGC Only</b>	20 to 28 VAC, 60 Hz
	<b>VA-6100-HGC Only</b>	0 to 10 VDC or 0 to 20 mA; Minimum Control Signal Adjustable 0 to 8 VDC or 0 to 16 mA; Maximum Control Signal Adjustable 2 to 10 VDC or 4 to 20 mA*
<b>Input Impedance</b>	<b>VA-6100-HGC Only</b>	10,000 ohms with 0 to 10 VDC Input; 500 ohms with 0 to 20 mA Input
<b>Feedback Signal</b>	<b>VA-6100-AGC Only</b>	0 to 2,000 ohms
	<b>VA-6100-HGC Only</b>	0.35 to 9.65 VDC or 0.7 to 19.3 mA
<b>Switch Contact Rating</b>	5A, 24 VAC	
<b>Maximum Stroke</b>	1-21/32 in. (42 mm)	
<b>Nominal Timing for 1-1/2 in. Stroke</b>	111 Seconds	
<b>Ambient Operating Temperature Limits (Limited by the Actuator)</b>	-4 to 140°F (-20 to 60°C)	
<b>Agency Compliance</b>	UL 873 Listed, File E27734, CCN XAPX; cUL C22.2 No. 24-93 Listed, File E27734, CCN XAPX7	
<b>Enclosure Rating</b>	NEMA 4, IP 65	
<b>Shipping Weight</b>	16.5 lb (7.5 kg)	

\* The maximum control signal must always exceed the minimum control signal by at least 2 VDC or 4 mA.

*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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