

VA7800 Series Electric Valve Actuators

Product Bulletin

VA7800 Series

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The VA7800 Series of Electric Valve Actuators control VG7000 Series Bronze Globe Valves in Heating, Ventilating, and Air Conditioning (HVAC) systems. The VA7800 Series produce a minimum linear output force of 180 lb (800 N) and are ordered field mounted or factory coupled to 1/2 through 2 in. VG7000 Series Bronze Globe Valves. All actuators are direct mount and available in both Spring Return and Non-Spring Return models.

Spring Return models ship from the factory set for DC 0 to 10 V Proportional Control. With a change of DIP switch settings, this model can be field configured to On/Off or Floating Control. In addition to these settings, optional auxiliary switches are also available.

Non-Spring Return models are available in AC 24 V On/Off (Floating) Control, or DC 0 to 10 V Proportional Control. Models are available with or without optional auxiliary switches.



Figure 1: VA7800 Actuator

Table 1: Features and Benefits

Features	Benefits
Automatic Stroke Adjustment	Provides easy, quick, and precise commissioning.
Manual Override as Standard	Allows manual positioning of valve for easy commissioning and servicing.
IP54 Enclosure Protection	Allows installation in a wide range of environments.
Unique Swing-Gate Yoke	Offers fast and secure attachment to the valve.
Brushless Motor	Ensures low energy consumption and long life.
Proportional Model	Enables one model to be used for various control types.
Force-Controlled Motor Shut-Off	Reduces energy consumption, wear of the actuator, and protects the valve from excessive forces.
Stroke Position Indicator	Gives visual indication of valve operation, provides automatic adjustment of stroke indicators during first cycle of operation.
Status Light-Emitting Diode (LED)	Gives visual indication of actuator status and assists with diagnostic.
Optional Integrated Auxiliary Switches	Provides adjustable switch points with line voltage capability.
Integral Cable with Colored Conductors	Simplifies installation and field wiring.
Integral Connector for 3/8 in. (10 mm) Flexible Metal Conduit (FMC)	Simplifies installation and field wiring.
Underwriters Laboratories Inc.® (UL) and CE Compliant	Provides internationally recognized regulatory agency approval.

Application Overview

IMPORTANT: The VA7800 Series Electric Valve Actuators are intended to control saturated steam, hot water, and chilled water flow under normal equipment operating conditions. Where failure or malfunction of the VA7800 Series Valve 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 VA7800 Series Valve Actuator.

VA7810-Axx-2 Series Non-Spring Return On/Off and Floating Point Actuator

The VA7810-AGx-2 Series Non-Spring Return Actuators provide fail-in-place on/off or modulating control of valves in HVAC systems. On/Off Control is provided from a manual switch, an auxiliary switch from a pump contactor, or a similar device. Floating Point Control is provided from a triac or relay.

VA7810-HGx-2 Series Non-Spring Return Proportional Actuator

The VA7810-HGx-2 Series Non-Spring Return Actuators offer fail-in-place proportional control of valves in HVAC systems regulated by an electronic controller. These actuators are configured for response to 0 to 10 VDC, 2 to 10 VDC, 0 to 20 mA, or 4 to 20 mA. The VA7810-HGx-2 Series can also be custom configured for valve sequencing. The minimum setpoint is 0 to 6 VDC (0 to 12 mA), and maximum input signal is 3 to 10 VDC (6 to 20 mA). A 0 to 10 VDC, or 2 to 10 VDC feedback signal is available for position indication. The actuator features a preset actuator position with a stem that extends or retracts on loss of signal. However, when you select current input, this stem feature is not available.

VA7820-HGx-2/VA7830-HGx-2 Series Spring Return Proportional Actuator

The VA7820-HGx-2 and VA7830-HGx-2 Series Actuators are Spring Return actuators that provide fail-safe proportional control of valves in HVAC systems regulated by an electronic controller. In the event of power loss, the VA7820-HGx-2 Series Actuators spring return with the actuator stem fully retracted and the valve stem in the full up position. On loss of power, the VA7830-HGx-2 Series Actuators spring return with the actuator stem fully extended and the valve stem in the full down position.

These actuators are configured for response to 0 to 10 VDC, 2 to 10 VDC, 0 to 20 mA, or 4 to 20 mA. Both models of actuators can also be custom configured for valve sequencing. Minimum setpoint is 0 to 6 VDC (0 to 12 mA) and maximum input signal is 3 to 10 VDC (6 to 20 mA). A 0 to 10, or 2 to 10 VDC feedback signal is available for position indication. The actuators feature a preset actuator position with a stem that extends or retracts, on loss of signal. When current input is selected, this stem feature is not available.

Operation

The VA7800 Series of actuators offers up to 1 in. (25 mm) of linear stroke for the operation of Johnson Controls® VG7000 Series Bronze Control Valves. The actuators interface to all threaded stem VG7000 Valves. All actuators can be manually positioned by means of a 5 mm Allen wrench.

For non-spring return actuators, engage manual operation by inserting the Allen wrench into the hexagonal socket and pushing down to cut off the power to the motor. Turn the Allen wrench clockwise to extend the actuator stem; turn the wrench counterclockwise to retract the actuator stem.

For spring return actuators, manual operation requires that the power be disconnected. On loss of power, the actuator spring force moves the stem to its fail-safe position. For manual operation, insert the Allen wrench into the hexagonal socket and turn the wrench either clockwise or counterclockwise depending on the actuator model. When you reach the desired stem position, push the wrench down and slightly rotate the wrench in the opposite direction to lock it in position. When power resumes, the actuator is released from its manual position.

Note: After using manual control to position the actuator, it is recommended that a self-calibration cycle be performed to assure proper operation.

VA7810-AGx-2 Series Non-Spring Return On/Off and Floating Point Actuator

The VA7810-AGx-2 Series Non-Spring Return Actuators are offered with On/Off Control or Floating Control. Select these controls by applying power to different terminals located on the actuator. For a more detailed procedure, refer to the appropriate installation instructions for the actuator.

For On/Off Control, apply power continuously to Terminal 1 (Common) and Terminal 2 (Power). From this action, the actuator assumes its fully extended stem position. To fully retract the stem, apply power through the controlling device to Terminal 3. When power is removed from Terminal 3, the actuator returns to its fully extended position. In the event of power loss, the actuator remains in its last position.

To enable Floating Control, wire Terminal 1 to the common. Apply power to Terminal 2 to extend the actuator stem, or to Terminal 3 to retract the actuator stem. If power is removed from Terminal 2 and Terminal 3, or in the event of complete power loss, the actuator remains in its last position.

VA78x0-HGx-2 Series Proportional Control Actuators

The VA78x0-HGx Series Actuators operate with Proportional Control, On/Off Control, or Floating Control. Changes in DIP switch settings allow the selection of Control Type, Input Signal, Input Range, Action, actuator position at signal loss, and stroke speed. See Table 2 for a detailed reference of DIP switch settings.

Table 2: VA78x0-HGx-2 Series Proportional Control Actuators DIP Switch Settings (Part 1 of 2)

DIP Switch Number	Description	State	
1	Control Type	ON	Floating/on/off control
		OFF	Proportional control
2	Input Signal	ON	Current input signal
		OFF	Voltage input signal
3	Input Signal Range	ON	Custom setting
		OFF	Pre-defined setting
4		ON	2 to 10 V (4 to 20 mA)
		OFF	0 to 10 V (0 to 20 mA)
5	Action	ON	Reverse
		OFF	Direct

Table 2: VA78x0-HGx-2 Series Proportional Control Actuators DIP Switch Settings (Part 2 of 2)

DIP Switch Number	Description	State	
6	Preset Actuator Position at Signal Loss ¹	ON	Actuator Stem Extends
		OFF	Actuator Stem Retracts
7	Stroke Speed	ON	76 s/in. (3 s/mm)
		OFF	152 s/in. (6 s/mm)
8	Not Used	Not Used	

1. Control signal loss position preset does not operate when you select 0 to 20 mA or custom input range control.

The VA78x0-HGx Series Actuators are a direct acting and factory supplied set for 0 to 10 VDC Proportional Control. Field setting options exist for standard ranges of 0 to 20 VDC (0 to 20 mA) or 2 to 10 VDC (4 to 20 mA) control in the field. At the end of a span, the actuator control signal has a buffer zone of 0.3 V (0.6 mA) to ensure definite valve close-off.

You can set the actuators for custom signal ranges. Minimum setpoint is 0 to 6 VDC (0 to 12 mA) and maximum input signal is 3 to 10 VDC (6 to 20 mA). Position feedback signal is also available in Table 3.

Table 3: Position Feedback Signal for VA78x0-HGx-2 Series Proportional Control Actuators

Input Signal	Feedback Output
0 to 10 VDC	0 to 10 VDC
2 to 10 VDC	2 to 10 VDC
0 to 20 mA	0 to 10 VDC
4 to 20 mA	2 to 10 VDC
Custom Range	0 to 10 VDC

All VA78x0-HGx-2 Series Actuators feature a multicolored LED that provides operational status and failure analysis information. See Table 4 for a detailed description of LED color indicators.

Table 4: VA78x0-HGx-2 Series Actuators LED Status and Color Indicators

Status	LED Color		
	Green	Yellow	Red
Off	Power off		
Blink	Motor running	Power on after a black-out ¹ Temporary fault, possible valve sticking ²	High temperature ³
Fast Blink	Calibrating	Input signal failure	
Continuous On	Power on, motor not running	Custom calibration value out of range	Generic fault

1. After reaching both ends of the stroke, the input signal is recalibrated and the LED switches to green.
2. The actuator leaves this mode only if the push button is pressed for at least 5 seconds, and the previously detected error has been resolved.
3. This status is temporary. When the detected temperature decreases to the acceptable range, the LED switches back to green.

The actuator microprocessor carries out a failure diagnosis when a failure has been detected. The colored LED indicates the actuator status. When the microprocessor detects that the stem has come to an unexpected stop, it initiates a retry cycle. The retry cycle repeats three times, and if unsuccessful, the actuator switches to fault mode and the LED flashes yellow. If the problem is cleared, the actuator continues to function normally.

The LED also flashes yellow when power resumes after a power loss. The LED continues to flash yellow until the end stop is achieved or a recalibration process is manually started.

Wiring Diagrams

Figure 2 and Figure 3 show detailed diagrams for the wiring configurations of the VA7800 Series Electric Valve Actuators.

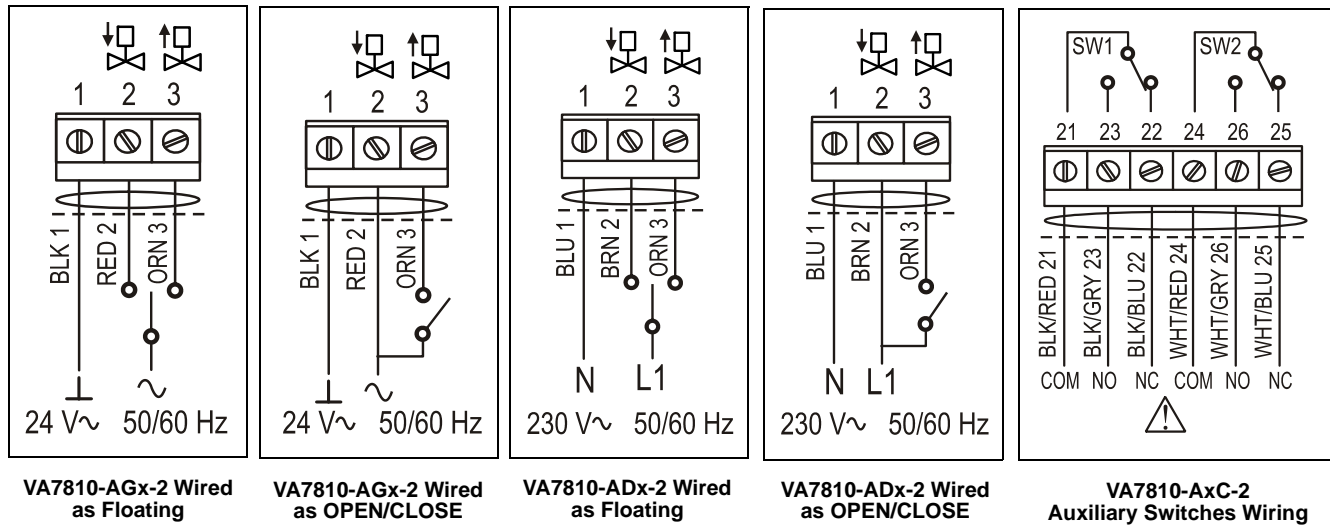


Figure 2: VA7810-Axx-2 Wiring Diagram

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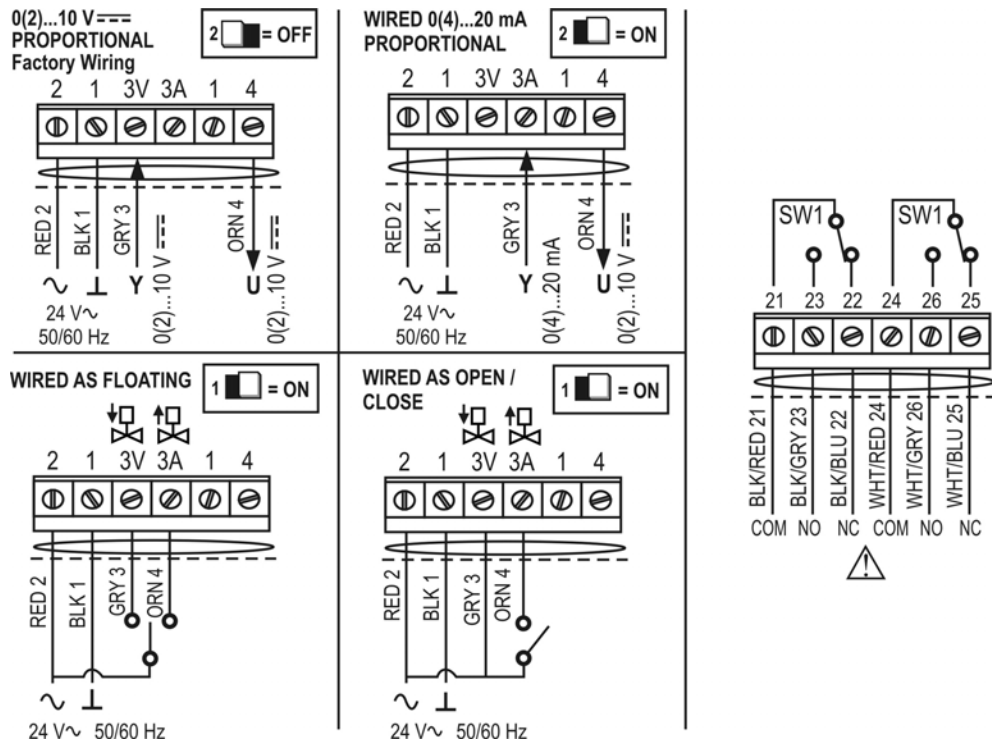


Figure 3: VA78x0-HGx-2 Wiring Diagram

Mounting

When mounting the actuator on a valve, the following precautions are recommended:

- Never cover the actuator with insulating material.
- Allow sufficient clearance to remove the actuator.
- Mount the valve in an upright angle or at an angle less than 90° from the vertical for fluid temperatures up to 212°F (100°C).
- Orient the actuator so that the yoke supports are one above the other when mounting the valve horizontally.

- Install the valve with the stem horizontal and insulate the pipe to minimize heat transfer to the actuator for fluid temperatures above 212°F (100°C).

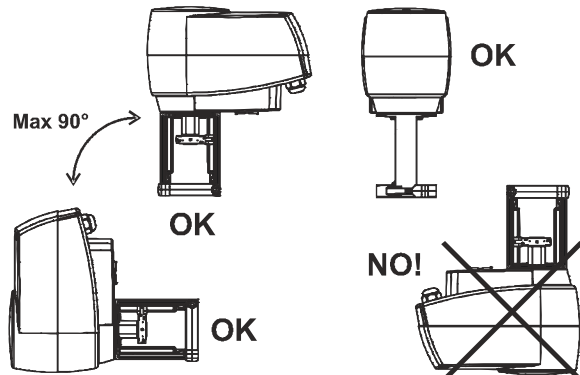


Figure 4: VG7800 Mounting

Ordering Information

Contact the nearest Johnson Controls representative and specify the desired product code number from Table 5.

Table 5: VA-78x0-xxx-2 Series Electric Valve Actuators

Code Number	Input Signal			Power Requirements			Action on Power Failure			Feedback	Auxiliary Switches	Nominal Stroke Time ¹ (Seconds)		
	On/Off	Floating Point	Proportional 0 (2) to 10 VDC 0 (4) to 20 mA	24 VAC 50/60 Hz ± 15%	230 VAC 50/60 Hz ± 15%	VA Rating	Non-Spring Return	Spring Return Actuator Retracted Valve Stem Full Up	Spring Return Actuator Extended Valve Stem Full Down			0 (2) to 10 VDC	2 SPDT, 1A, 3A Resistive, 1/4 HP	1/2 and 3/4 in. VG7000 (5/16 in. valve stroke)
VA7810-ADC-2	X	X	---	---	X	8	X	---	---	---	X	48	76	114
VA7810-AGA-2	X	X	---	X	---	3	X	---	---	---	---	48	76	114
VA7810-AGC-2	X	X	---	X	---	3	X	---	---	---	X	48	76	114
VA7810-HGA-2	X	X	X	X	---	6	X	---	---	X	---	24/48	38/76	57/114
VA7810-HGC-2	X	X	X	X	---	6	X	---	---	X	X	24/48	38/76	57/114
VA7820-HGA-2	X	X	X	X	---	11	---	X	---	X	---	24/48	38/76	57/114
VA7820-HGC-2	X	X	X	X	---	11	---	X	---	X	X	24/48	38/76	57/114
VA7830-HGA-2	X	X	X	X	---	11	---	---	X	X	---	24/48	38/76	57/114
VA7830-HGC-2	X	X	X	X	---	11	---	---	X	X	X	24/48	38/76	57/114

1. VA78x0-HGx-2 actuators have field selectable stroke speed; factory setting is the slowest speed.

Repair Information

If a VA78x0-xxx-2 Series Electric Valve Actuator fails to operate within specifications, replace the unit. For a replacement actuator, contact the nearest Johnson Controls representative.

Table 6: Accessories Ordering Information

Product Code Number	Description
V-9999-BC1	Mounting Kit to Mount VA-715x, VA-720x, VA78xx, or VA-4233 Series Electric Actuators to Barber Coleman® 1/2 through 1-1/4 Inch VB-9xxx Valve Bodies
V-9999-HW1	Mounting Kit to Mount VA-715x, VA-720x, VA78xx, or VA-4233 Series Electric Actuators to Honeywell® V5011A, F, and G, 1/2 through 3 Inch Single-Seated and V5013F Three-Way Valves
M9000-200	Commissioning Tool

Dimensions

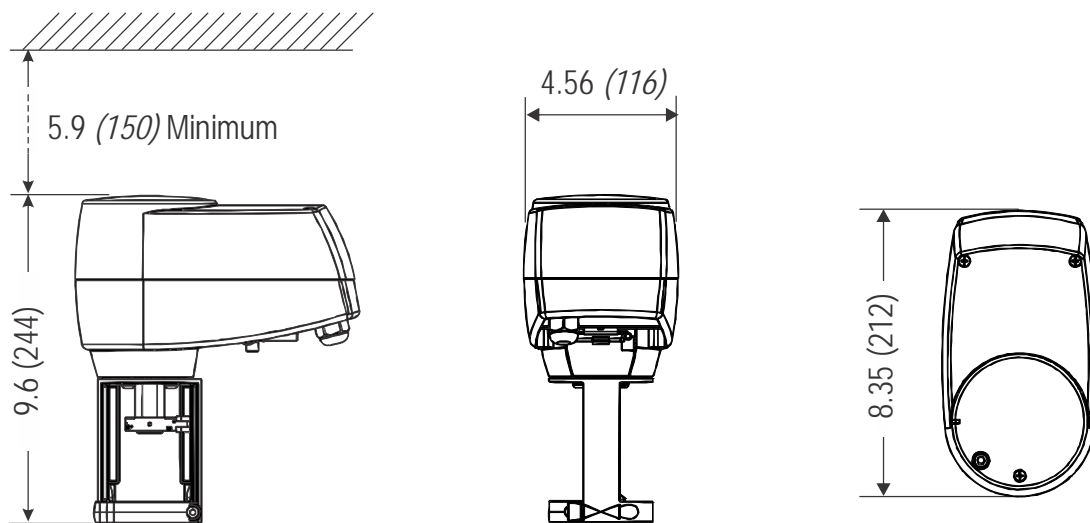


Figure 5: Dimensions, in. (mm)

Technical Specifications

Table 7: VA7810-AGx-2 and VA7810-ADx-2 Series On/Off (Floating) Electric Non-Spring Return Valve Actuators


Model		VA7810-AGx-2	VA7810-ADx-2
Thrust Force		180 lb (800 N) minimum	
Power Supply		AC 24 V (AC 19 to 30 V) at 50/60 Hz, Class 2	AC 230 V (AC 195 to 265 V) at 50/60 Hz
Transformer Sizing		3 VA	8 VA
Input Signal		AC 24 V (AC 19 to 30 V) at 50/60 Hz	AC 230 V (AC 195 to 265 V) at 50/60 Hz
Feedback		N/A	N/A
Auxiliary Switch Rating		Two Single-Pole, Double-Throw (SPDT), AC 230 V, 3.0 A Resistive, 1/4 hp	
Stroke		5/16 to 1 in. (8 to 25 mm)	
Stroke Speed		5/16 in. stroke: 48 seconds 1/2 in. stroke: 76 seconds 3/4 in. stroke: 114 seconds	
Ambient Operating Conditions		23 to 131°F (-5 to 55°C); 10 to 90% RH Noncondensing	
Enclosure Rating		NEMA 2 (IP54)	
Electrical Connection		48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm ²) Conductors and 0.25 in. (6 mm) Ferrule Ends	
Dimensions		9.6 x 4.56 x 8.35 in. (244 x 116 x 212 mm)	
Materials	Gearbox and Yoke	Die Cast Aluminum	
	Cover	Resin ABS/PC - UL94-V0	
	Stem	Stainless Steel	
	Coupler	Brass	
Life Cycles		100,000 full stroke cycles	
Shipping Weight		5.4 lb (2.45 kg)	
	United States	UL 60730 Listed Type 1 Enclosure, CCN XAPX, File E194024	
	Canada	UL 60730-1 Listed Type 1 Enclosure, CCD XAPX7, File E194024	
	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 the Low Voltage Directive.	

Table 8: VA7810-HGx-2 Series Proportional Electric Non-Spring Return Valve Actuators



Model		VA7810-HGx-2
Thrust Force		180 lb (800 N) minimum
Power Supply		AC 24 V (AC 19 to 30 V) at 50/60 Hz, Class 2
Transformer Sizing		6 VA
Input Signal		Switch Selectable: Proportional: DC 0 to 10 V, DC 2 to 10 V, 0 to 20 mA or 4 to 20 mA Programmable Proportional: Start Point: 0 to 6 VDC (0 to 12 mA) End Point: 3 to 10 VDC (6 to 20 mA) with 3 VDC (6 mA) minimum span On/Off (Floating): AC 24 V at 50/60 Hz Switch Selectable Direct or Reverse Action with signal increase Switch Selectable preset actuator position on loss of signal
Control Input Impedance		Voltage Input: 100k ohm Current Input: 120 ohm
Feedback		DC 0 (2) to 10 V corresponds to input range
Auxiliary Switch Rating		SPDT, AC 230 V, 3.0 A Resistive, 1/4 hp
Stroke		5/16 to 1 in. (8 to 25 mm)
Stroke Speed (Switch Selectable)		Slow (Factory Setting)
		Fast
		5/16 in. stroke: 48 seconds 1/2 in. stroke: 76 seconds 3/4 in. stroke: 114 seconds
		5/16 in. stroke: 24 seconds 1/2 in. stroke: 38 seconds 3/4 in. stroke: 57 seconds
Ambient Operating Conditions		23 to 131°F (-5 to 55°C); 10 to 90% RH Noncondensing
Ambient Storage Conditions		-40 to 176°F (-40 to 80°C); 5 to 95% RH Noncondensing
Enclosure Rating		NEMA 2 (IP54)
Electrical Connection		48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm ²) Conductors and 0.25 in (6 mm) Ferrule Ends
Dimensions		9.6 x 4.56 x 8.35 in. (244 x 116 x 212 mm)
Materials	Gearbox and Yoke	Die Cast Aluminum
	Cover	Resin ABS/PC - UL94-V0
	Stem	Stainless Steel
	Coupler	Brass
Life Cycles		100,000 full stroke cycles
Shipping Weight		5.4 lb (2.45 kg)
Compliance 	United States	UL 60730 Listed Type 1 Enclosure, CCN XAPX, File E194024
	Canada	UL 60730-1 Listed Type 1 Enclosure, CCN XAPX7, File E194024
	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 the Low Voltage Directive.

Table 9: VA7820-HGx-2 / VA7830-HGx-2 Series Proportional Electric Spring Return Valve Actuators

Model		VA7820-HGx-2 / VA7830-HGx-2	
Thrust Force		180 lb (800 N) minimum	
Power Supply		AC 24 V (AC 19 to 30 V) at 50/60 Hz, Class 2	
Transformer Sizing		11 VA	
Input Signal		Switch Selectable: Proportional: DC 0 to 10 V, DC 2 to 10 V, 0 to 20 mA or 4 to 20 mA Programmable Proportional: Start Point: 0 to 6 VDC (0 to 12 mA) End Point: 3 to 10 VDC (6 to 20 mA) with a 3 VDC (6 mA) minimum span On/Off (Floating): AC 24 V at 50/60 Hz Switch Selectable Direct or Reverse Action with signal increase Switch Selectable reset actuator position on loss of signal	
Control Input Impedance		Voltage Input: 100k ohm Current Input: 120 ohm	
Feedback		DC 0 (2) to 10 V corresponds to input range	
Auxiliary Switch Rating		SPDT, AC 230 V, 3.0 A Resistive, 1/4 hp	
Stroke		5/16 to 1 in. (8 to 25 mm)	
Stroke Speed		Slow (Factory Setting)	5/16 in. stroke: 48 seconds 1/2 in. stroke: 76 seconds 3/4 in. stroke: 114 seconds
		Fast	5/16 in. stroke: 24 seconds 1/2 in. stroke: 38 seconds 3/4 in. stroke: 57 seconds
Ambient Operating Conditions		23 to 131°F (-5 to 55°C); 10 to 90% RH Noncondensing	
Ambient Storage Conditions		-40 to 176°F (-40 to 80°C); 5 to 95% RH Noncondensing	
Enclosure Rating		NEMA 2 (IP54)	
Electrical Connection		48 in. (1.2 m) UL 758 Type AWM Halogen Free Cable with 18 AWG (0.85 mm ²) Conductors and 0.25 in. (6 mm) Ferrule Ends	
Dimensions		9.6 x 4.56 x 8.35 in. (244 x 116 x 212 mm)	
Materials	Gearbox and Yoke	Die Cast Aluminum	
	Cover	Resin ABS/PC - UL94-V0	
	Stem	Stainless Steel	
	Coupler	Brass	
Life Cycles		100,000 full stroke cycles	
Shipping Weight		7.3 lb (3.3 kg)	
	United States	UL 60730 Listed Type 1 Enclosure, CCN XAPX, File E194024	
	Canada	UL 60730-1 Listed Type 1 Enclosure, CCN XAPX7, File E194024	
	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 the Low Voltage Directive.	

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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