Product Bulletin
Issue Date December 2018

Flare Valves 1/2-Inch 2-Way and 3-Way

The 1/2-inch flared valve line accurately regulates the flow of hot or cold water in small Heating, Ventilating, and Air Conditioning (HVAC) terminal units. These 1/2-inch valves are available with a factory-installed V-3000-1 exposed type pneumatic actuator; enclosed actuators (V-3000-2) are also available (order separately). This valve style is available for field mounting the VA-805x Series electric actuators.

⚠ WARNING

This product is made of copper alloy, which contains lead. The product is therefore not to be used on drinking water.

⚠ WARNING

This product can expose you to chemicals including lead, which is known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.



Figure 1: 1/2-Inch Flare Valves

Features and Benefits	
❑ **1/2 in. OD SAE 45° Flare Connections**	Do not require solder installation with copper tubing; provide easy removal for maintenance
❑ **Standard Johnson Controls® Non-adjustable Ring Pack Packings**	Provide proven reliability and long life
❑ **Body-Rated 400 psig Static Pressure**	Does not restrict building location
❑ **Every Valve Tested for Tight Initial and Long-Term Shutoff**	Ensures occupant comfort and energy conservation
❑ **Factory-Assembled Valves Available with Pneumatic or Electric Actuators**	Install quickly and easily, minimizing job site time

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Application Overview

The 1/2-inch flared connection valve line accurately regulates the flow of hot or cold water in small HVAC terminal units. The V-3766, V-3966, and V-4332 1/2-inch valves are available with a factory-installed V-3000-1 exposed type pneumatic actuator. V-3000-2 enclosed actuators are also available (order separately).

The VB-3766, VB-3966, and VB-4322 1/2-inch valve bodies are available with or without a factory-coupled VA-805x electric actuator.

IMPORTANT: When using an electric actuator with these 1/2-inch flare valves, only use VA-805x Series electric actuators. Use of other actuators may cause malfunction of the valve or damage to the valve.

The valve and actuator provide a Push-Down-To-Close (PDTC) combination for Normally Open (N.O.) applications and a Push-Down-To-Open (PDTO) combination for Normally Closed (N.C.) applications.

All valves contain a modulating plug, which provides an equal percentage relationship between valve travel and flow at a constant pressure drop. A molded composition disc that ensures tight shutoff is bonded to the valve plug assembly and can be removed for servicing.

Operation

V-3000-1 and V-3000–2 Actuated Valves

Air pressure from a pneumatic controller moves the diaphragm of the actuator, which moves the piston against the forces of the internal spring and the fluids. The piston moves the valve plugs to a position where the diaphragm pressure and the spring force balance against the fluid forces.

These fluid forces cause the operating range to shift from the nominal spring range. Reducing the air pressure to the diaphragm of the actuator allows the spring to return the valve plug to its normal position.

VA-8050-1 and VA-8051-1 Actuated Valves

The controller sends a 24 VAC signal to the up or down terminal on the circuit board depending on the desired movement of the valve. This signal causes the motor to rotate in the proper direction and, through the lead screw and lever, move the valve stem and plug assembly up or down. When the controller stops sending a signal, the valve stem and plug assembly remains in place.

When the controller closes the valve, a shutoff force builds up. When this force reaches 50 pounds, the lever activates a force sensor that stops the motor. Field calibration of the force sensor is not required. The actuator maintains the shutoff force even if power to the controller is lost.

When the controller signals the valve to move in the opposite direction, the shutoff force is reduced and the valve modulates.

On VA-8051-1 actuated valves, an internal position feedback potentiometer is connected to the R, W, and S terminals. Specifically the wiper is connected to W. The wiper is at the R end when the actuator is retracted and at the S end when the actuator is fully stroked.

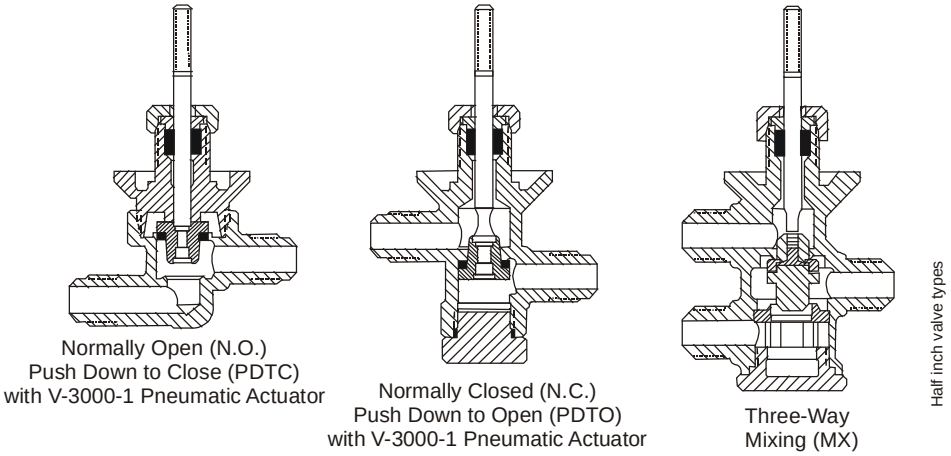


Figure 2: 1/2-Inch Valve Types

Dimensions for Pneumatically Actuated 1/2-Inch Flare Valves

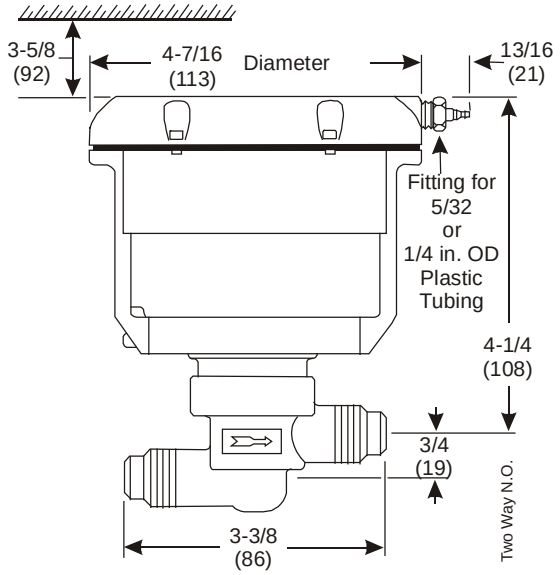


Figure 3: Two-Way Normally Open Valve with V-3000-1 Pneumatic Actuator (V-3766), in. (mm)

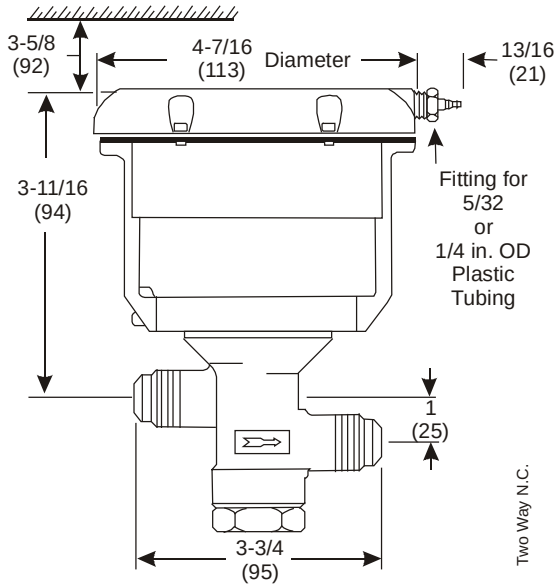


Figure 4: Two-Way Normally Closed Valve with V-3000-1 Pneumatic Actuator (V-3966), in. (mm)

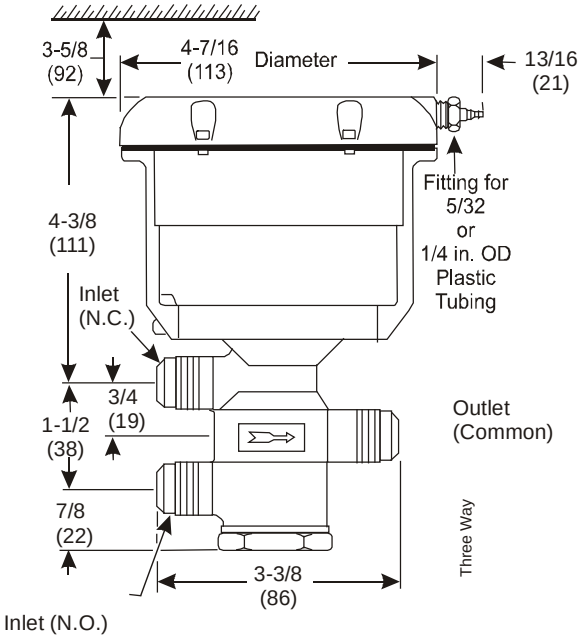


Figure 5: Three-Way Mixing Valve with V-3000-1 Pneumatic Actuator, in. (mm)

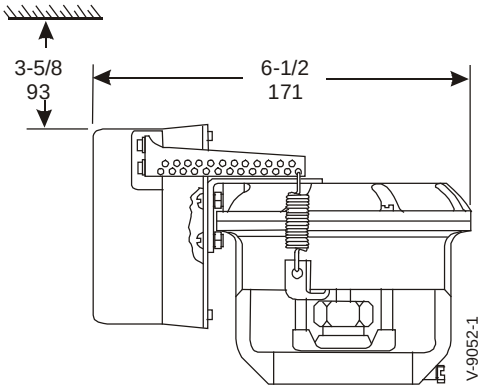


Figure 6: V-9052-1 Pneumatic Positioner, in. (mm)

Dimensions for 1/2-Inch Flare Valves with Electric Actuators

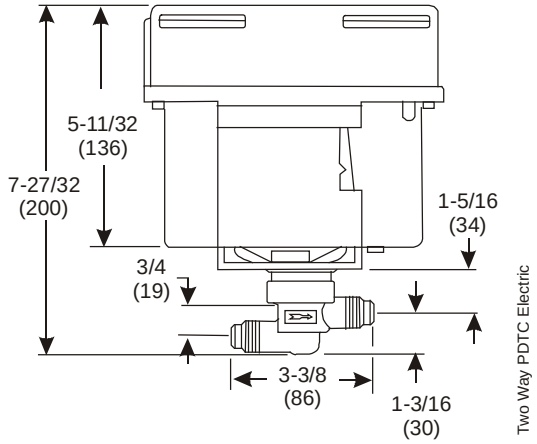


Figure 7: Two Way PDTC Valve with VA-805x Actuator (AV-805x), in. (mm)

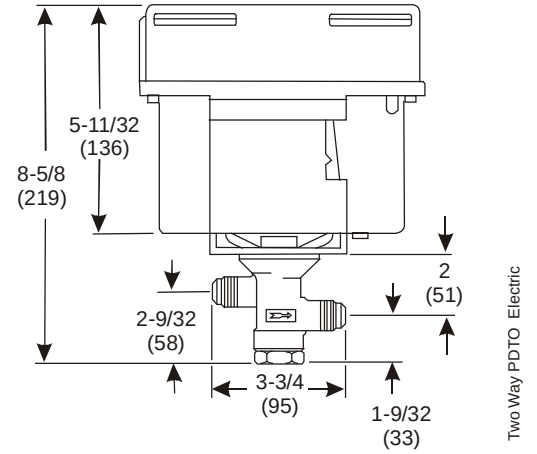


Figure 8: Two Way PDTO Valve with VA-805x Actuator (AV-805x), in. (mm)

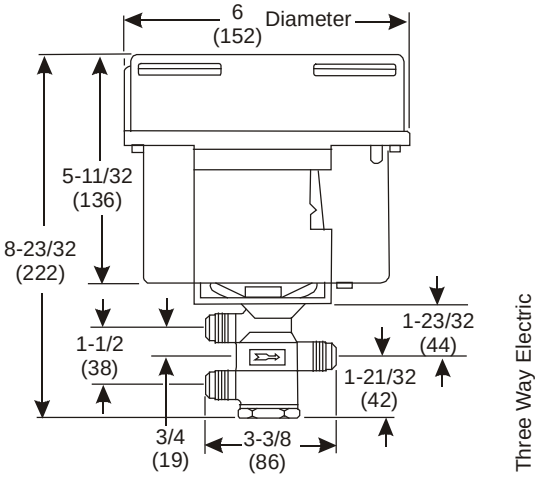


Figure 9: Three Way Mixing Valve with VA-805x Actuator (AV-805x), in. (mm)

Spring Shift Tables for 1/2 in. Flare Valves

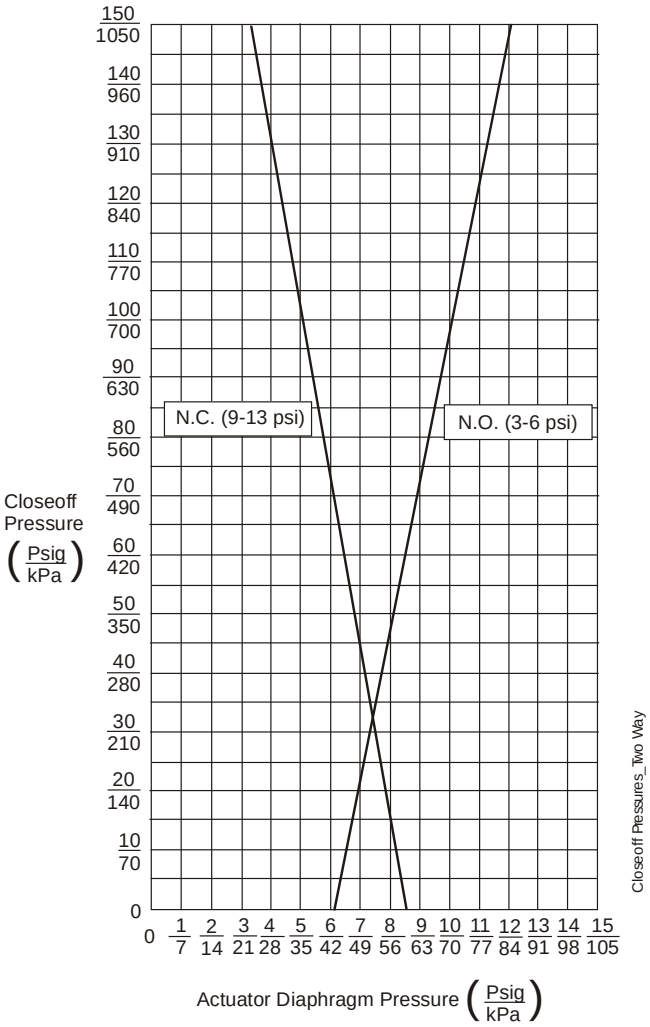


Figure 10: Closeoff Pressures, Two Way N.O. or N.C. Valve with V-3000-1 Pneumatic Actuator

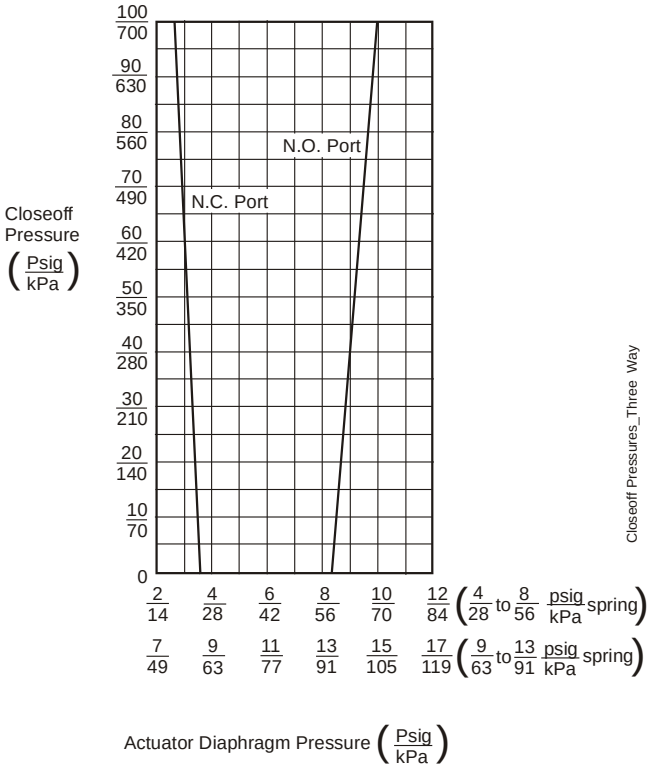


Figure 11: Closeoff Pressures, Three Way Valve with V-3000-1 Pneumatic Actuator

Valve Actuator Selection

V-3000 Series Pneumatic Actuators

Two models of V-3000 Series Pneumatic Actuators are available. The exposed model (V-3000-1) is designed for installation in a protected location. The enclosed model (V-3000-2), available separately, is designed for installation in a location where the actuator might be subjected to tampering. See Table 1 for actuator sizing selection.

Both models of the V-3000 actuator have a molded synthetic elastomer diaphragm design. This molded diaphragm provides a constant effective area throughout the valve stem stroke. All parts are protected by a sturdy, die-cast aluminum housing. Loosening the single set screw allows removal or repositioning of the actuator housing without disturbing the rest of the valve assembly.

A V-9502 Series Valve Positioner is available separately for use on the exposed model in applications where sequential operation is desired or additional positioning power is necessary. The V-9502 Pneumatic Valve Actuator Positioner is a precision relay device designed to operate a valve actuator in applications requiring stable, accurate control. The positioner provides maximum positioning power to resist external forces, which might otherwise overcome the actuator. See Table 2 and Table 3 for ordering information.

VA-8050 and VA-8051 Series Electric Actuators

The VA-8050-1 and VA-8051-1 Series Electric Actuators are synchronous motor-driven, non-spring return actuators that feature a force-sensing mechanism that ensures a constant 50 pound seating force.

Table 1: Electric Actuator Control Styles

Actuator	Description	Control Signal
VA-8050-1	Floating/Incremental	3-wire, 24 VAC
VA-8051-1[1]	Floating/Incremental with Feedback or Proportional	3-wire, 24 VAC or ±VDC signal

1. Includes a 3,400-ohm position feedback potentiometer for remote position indication to meters.

Valve Body Types for Electric Actuators

For floating/incremental signal non-spring return actuators (VA-8050 and VA-8051), the PDTC (VB-3766-1) body type meets the needs of any HVAC application. The PDTO (V-3966-1) type is not available with these actuators.

Table 2: Ordering Data for Pneumatically Actuated 1/2 in. Valves with Flared Connections

Valve Body	Maximum Cv	Style[1]	Rangeability[2]	Valve Suffix with V-3000 Actuator (Maximum Closeoff Pressure [psi])[3]		
				Spring Ranges (psi)		
				3 to 6	4 to 8	9 to 13
V-3766	1.0	N.O.	7:1	-1001 (345)	–	–
	1.7	N.O.	12:1	-1002 (345)	–	–
	3.2	N.O.	23:1	-1003 (345)	–	–
V-3966	1.7	N.C.	12:1	–	–	-1001 (240)
	3.2	N.C.	23:1	–	–	-1002 (240)
V-4332	1.2	MX	7:1	–	-1007 (240/240)	-1004 (240/240)
	2.0	MX	12:1	–	-1009 (240/240)	-1006 (240/240)

1. N.O. = Normally Open
   N.C. = Normally Closed
   MX = Mixing Valve, Maximum Closeoff Pressure (N.C. port/N.O. port)
2. Rangeability is defined as the ratio of maximum flow to minimum controllable flow.
3. Maximum closeoff pressures listed are for 20 psi supply pressure to diaphragm for normally open and 0 psi supply pressure to diaphragm for normally closed.

Table 3: Valid Pneumatically Actuated Flare Valve Code Numbers

Valid Pneumatic Valve/Actuator Assembly Code Number	Spring Range (psi)	Maximum Cv	Style
V-3766-1001 **V-3766-1002** **V-3766-1003**	3-6 3-6 3-6	1.0 1.7 3.2	N.O.
V-3966-1001 **V-3966-1002**	9-13 9-13	1.7 3.2	N.C.
V-4332-1004 **V-4332-1006** **V-4332-1007** **V-4332-1009**	9-13 9-13 4-8 4-8	1.2 2.0 1.2 2.0	MIX
VB-3766-1 **VB-3766-2** **VB-3766-3**	None None None	1.0 1.7 3.2	PDTC
VB-3966-1 **VB-3966-2**	None None	1.7 3.2	PDTO
VB-4332-4 **VB-4332-5**	None None	1.2 2.0	MIX

Table 4: Ordering Data for Electric Actuators

Valve Body	Style	Maximum Cv	Rangeability	Assembly Order Code No. (Max. Shutoff Pressure)	
				VA-8050	VA-8051
VB-3766-1	PDTC	1.0	7:1	AV-8050-1 (150 psi)	AV-8051-1 (150 psi)
VB-3766-2	PDTC	1.7	12:1	AV-8050-1 (150 psi)	AV-8051-1 (150 psi)
VB-3766-3	PDTC	3.2	23:1	AV-8050-1 (150 psi)	AV-8051-1 (150 psi)
VB-4332-4	MIX	1.2	7:1	AV-8050-1 (100 psi)	AV-8051-1 (100 psi)
VB-4332-5	MIX	2.0	12:1	AV-8050-1 (100 psi)	AV-8051-1 (100 psi)

Table 5: Accessories (Order Separately)

Product Code Number	Description
V-3000-2	Enclosed V-3000 Actuator for Field Mounting
V-3000-10	Valve Position Indicator for V-3000-1 Exposed Style Pneumatically Actuated Valves
VA-8000-102	Valve Position Indicator for Electrically Actuated Valves with VA-805X Actuators only
V-9502-15	Valve Positioner for Field Mounting to a V-3000-1 Exposed Style Pneumatically Actuated Valve
V-9502-20	Valve Positioner Spring for V-3000-1 Exposed Style Pneumatically Actuated Valves Using a V-9502-15 Positioner; 3.0 psi (21 kPa) Span
V-9502-101	Valve Positioner Spring for V-3000-1 Exposed Style Pneumatically Actuated Valves Using a V-9502-15 Positioner; 4.3 psi (30 kPa) Span
V-9502-19	Valve Positioner Spring for V-3000-1 Exposed Style Pneumatically Actuated Valves Using a V-9502-15 Positioner; 8.0 psi (56 kPa) Span

Table 6: Repair Kits

Valve Code Number	Repair Kit Code Number	Description
V-3766 **VB-3766**	V-3754-6010[1]	Spring Kit, 3-6 psig, 1/2 in. stroke for V-3011, V-3020, V-3752, V-3755, V-4510, V-5250 (1-1/2 and 2), V-3754 (1/2 and 3/4), and V-3766 (1/2) Valve with V-3000-1 or V-3000-2 Actuator
V-3966 **VB-3966**	V-3754-6009[1]	Spring Kit, 9-13 psig, 1/2 in. stroke for V-3011, V-3020, V-3212, V-3752, V-3755, V-3970, V-4322 (1-1/2 and 2), V-3974, V-3966, V-6139 (1/2), V-3754, V-3974, V-4324 (1/2 and 3/4) Valve with V-3000-1 or V-3000-2 Actuator
V-4332 **VB-4322**	V-4332-6001[1]	Spring Kit, 4-8 psig, 5/16 in. stroke for V-3212, V-3970, V-4322 (1/2 and 3/4), V-4332, V-4333 (1/2), V-4334 (5/8), and VT Valve with V-3000-1 or V-3000-2 Actuator
	V-3752-6022[1]	Spring Kit, 9-13 psig, 5/16 in. stroke for V-3011, V-3020, V-3212, V-3752, V-3755, V-3970, V-4322 (1/2 and 3/4), V-4334 (5/8), V-4332, V-4333, V-5416, V-7416 (1/2), V-6143 (3/8 and 3/4) and VT Valve with V-3000-1 or V-3000-2 Actuator
All Assemblies	V-9999-608[2]	Ring Pack Packing Kits: Single Pack
	V-9999-610[2]	10-Pack (Contains enough materials to repack 10 valves)
	V-9999-630[3]	50-Pack (Contains U-cups and O-rings only to repack 50 valves)

1. Spring kit contains: spring, upper and lower spring plate, stem extension, lock screw, and instructions.
2. Packing kit contains: O-rings, crocus cloth, assembly tool, gland nut liner, guide, extractor/installer, ring pack assembly, follower, grease, and instructions.
3. Silicone grease is not included in this kit; order V-9999-606 separately.

Note: For actuator repair parts, refer to the appropriate actuator product bulletin.

WARNING: BRASS MAY CONTAIN LEAD

To fulfill our obligations towards Article 33, in accordance to the European REACH Regulation No 1907/2006 EC, we hereby inform you that this article contains the following Substances of Very High Concern mentioned on the Candidate list:

- Lead

Technical Specifications

Models	**Pneumatic**	V-3766 - PDTC (Normally Open), V-3966 - PDTO (Normally Closed), V-4332 - 3-Way Mixing
	Electric	VB-3766 - PDTC, VB-3996 - PDTO, VB-4332 - 3-Way Mixing
Service		Hot and Cold Water
Control Air Connection (Pneumatic Operation)		1/8 in. NPT Barbed Fitting for 5/32 or 1/4 in. OD Polytubing for pneumatic actuators
Flow Characteristics		Equal Percentage
Actuator Sizing/Maximum Closeoff Pressure		See Table 2 and Table 4.
Valve Stem Diameter		1/4 in.
Flow Coefficients (Cv)		Two Way: 1.0, 1.7, 3.2; Three Way (Mixing): 1.2, 2.0. See Table 2, Table 3, Table 4, and Table 5.
Maximum Seat Leakage		PDTC (N.O.) and PDTO (N.C.): 0.05% of Maximum Rated Valve Capacity Three Way Mixing: 0.5% of Maximum Rated Valve Capacity
Maximum Recommended Differential Pressure for Valve Sizing		35 psi (245 kPa)
Rangeability		See Table 2 and Table 4.
Valve Stroke		5/16 in.
Maximum Allowable Pressure/Temperature		**(2-Way)** V-3766, VB-3766, V-3966, VB-3966 400 psi (2,800 kPa) up to 150°F (66°C) Decreasing to 345 psi (2,415 kPa) at 281°F (140°C) **(3-Way Mixing)** V-4332 and VB-4332 250 psi (1,750 kPa) Maximum at 281°F (140°C)
Ambient Temperature Limit		-10 to 150°F (-23 to 66°C) for pneumatic actuators -10 to 140°F (-23 to 60°C) with VA-805x actuator
Fluid Operating Temperature Limits		281°F (140°C) Maximum for pneumatic actuators 195°F (90°C) Maximum with VA-805x actuator
Materials	**Stem**	Stainless Steel
	Plug	PDTC (N.O.) and PDTO (N.C.): Brass with Molded and Bonded Composition Disc Three Way Mixing: Brass (metal-to-metal seating)
	Body	Cast Brass with Natural Finish
	Actuator	Die Cast Aluminum with Enamel Finish for pneumatic actuators. For electric actuators, refer to the relevant electric actuator product bulletin.
	Diaphragm	Molded Reinforced Synthetic Rubber for pneumatic actuators
Spring Ranges (Nominal)		3 to 6 psi (21 to 42 kPa) N.O. Only; 4 to 8 psi (28 to 56 kPa) MX Only; 9 to 13 psi (63 to 91 kPa) N.C. and MX for pneumatic actuators
Body Style and Sizes		Offset Globe for 1/2 in. SAE Flared Connections
Maximum Control Pressure		30 psi (210 kPa) for pneumatic actuators

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 shall not be liable for damages resulting from misapplication or misuse of its products.

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