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VX-7XXX-8XX Series
VX-7XXX-59X Series
VX-9XXX-8XX Series
VX-9XXX-59X Series

Linked Globe Valve Assemblies with DuraDrive™ Linear Series Actuators

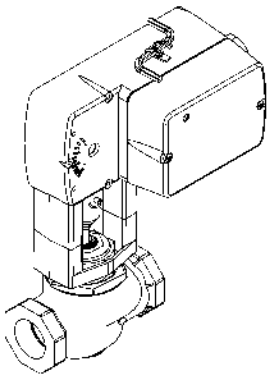
Selection Guide

Globe Valve Assemblies

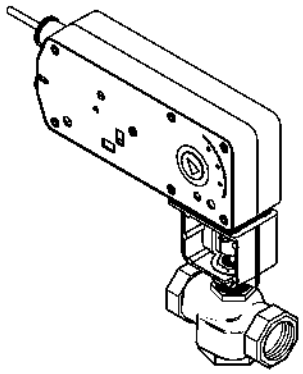
The Invensys VA, VF, and VS-7000 and -9000 series Linked Globe Valve Assemblies with DuraDrive Linear Series Actuators are complete actuator/valve assemblies that accept two position, floating, or proportional control, respectively, from a DDC system or from a thermostat, for control of hot water, chilled water, and steam.

These valve assemblies consist of Linear Series spring return DuraDrive actuators directly mounted on 1/2" up to 4" (15 mm to 80 mm) 2-way and 3-way globe valve bodies. 3-way assemblies are available for mixing (1/2" to 4") and diverting (1/2" to 2") applications. The Linear Series DuraDrive actuators feature linear travel and an integral linkage, eliminating the need for separate linkages.

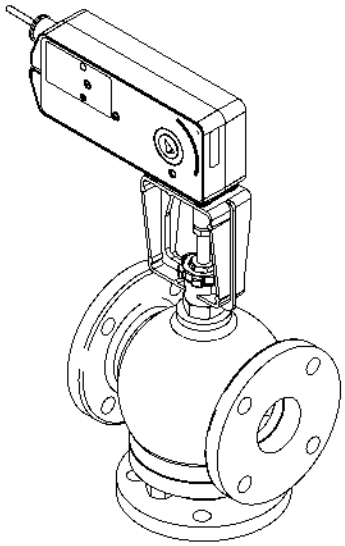
Typical applications *include* reheat on VAV boxes, fan coil units, hot and chilled water coils in air handling units, unit ventilators, and central system applications.



2-Way Linked Globe Valve Assembly (shown assembly uses MX51-710X actuator)



3-Way Linked Globe Valve Assembly (shown assembly uses MX51-720X actuator)



3-Way Linked Flanged Globe Valve Assembly (shown assembly uses MX61-720X actuator)

Note: All performance specifications are nominal and conform to acceptable industry standards. For applications at conditions beyond these specifications, consult Invensys Building Systems. Invensys shall not be liable for damages resulting from misapplication or misuse of its products.

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Applicable Literature

F-Number	Description	Audience	Purpose
F-27169	MA51-710X, MF51-7103, and MS51-7103 105 lbf (467 N) Linear Series DuraDrive Actuators General Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the actuator's features, specifications, and possible applications. Provides step-by-step mounting instructions.
F-27120	MAX1-720X, MFX1-7203, and MSX1-7203 220 lbf (979 N) Linear Series DuraDrive Actuators General Instructions		
F-27171	MA51-710X, MF51-7103, MS51-7103 Linear Series DuraDrive Actuators Installation Instructions		Describes the actuator's features and possible applications. Provides step-by-step mounting instructions.
F-27165	MX51-710X, MX51-720X, and MX61-720X DuraDrive Linear Series Spring Return Actuator Submittal Sheet	– Sales Personnel – Application Engineers	Describes features and specifications of the Linear Series DuraDrive actuators.
F-27167	VX-7XXX-XXX-X-P and VX-9XXX-XXX-X-P Two-Way and Three-Way Globe Valve Assemblies with DuraDrive Linear Series Spring Return Actuators Submittal Sheet		Describes features and specifications of the Globe Valve Assemblies using the Linear Series DuraDrive actuators.
F-26080	EN-205 Water System Guidelines	– Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes Invensys Building Systems approved water treatment practices.
F-24380	VB-7211 Series 1/2" to 1-1/4" Union Straightway NPT Stem Up Open, 2-Way Valves General Instructions	– Sales Personnel – Application Engineers – Installers – Service Personnel – Start-up Technicians	Describes the valve's features, specifications, and possible applications. Provides step-by-step mounting, installation, and checkout instructions.
F-26075	VB-7213 Series 1/2" to 2" Screwed NPT Stem Up Open, 2-Way Valves General Instructions		
F-26077	VB-7215 Series 15 mm to 50 mm Screwed Rp Stem Up Open, 2-Way Valves General Instructions		
F-24384	VB-7221 Series 1/2" to 1-1/4" Union Straightway NPT Stem Up Closed, 2-Way Valves General Instructions		
F-26073	VB-7223 Series 1/2" to 2" Screwed NPT Stem Up Closed, 2-Way Valves General Instructions		
F-26079	VB-7225 Series 15 mm to 50 mm Screwed Rp Stem Up Closed, 2-Way Valves General Instructions		
F-26074	VB-7313 Series 1/2" to 2" Screwed NPT 3-Way Mixing Valves General Instructions		
F-26078	VB-7315 Series 15 mm to 50 mm Screwed Rp 3-Way Mixing Valves General Instructions		
F-26076	VB-7323 Series 1/2" to 2" Screwed NPT 3-Way Diverting Valves General Instructions		
F-24382	VB-9213 Series 2-1/2" to 6" Screwed or Flanged Stem Up Open, 2-Way Valves General Instructions		
F-25672	VB-9215 Series 65 mm and 80 mm Screwed Stem Up Open, 2-Way Valves General Instructions		
F-24386	VB-9223 2-1/2" to 6" Screwed or Flanged Stem Up Closed, 2-Way Valves General Instructions		
F-25673	VB-9225 Series 65 mm and 80 mm Screwed Stem Up Closed, 2-Way Valves General Instructions		
F-24393	VB-9313 Series 2-1/2" to 6" Screwed or Flanged 3-Way Mixing Valves General Instructions		
F-25674	VB-9315 Series 65 mm and 80 mm Screwed 3-Way Mixing Valves General Instructions		

Selection Guide Contents

Features and Benefits

Features	Benefits
24 Vac, 120 Vac, and 230 Vac models.	Satisfies a wide range of power requirements.
Compact size.	Allows installation in limited spaces.
Spring return.	Valve returns to known position upon loss of power.
Manual override.	Allows valve positioning and preload adjustment, simplifying installation, start-up, and troubleshooting.
Rugged polymer or die-cast housings rated for up to NEMA 2, UL Type 2 (IP54).	Water-resistant rating supports use in most common indoor HVAC environments.
Valve sizes 1/2" to 4" and 15 mm to 80 mm (Union Straightway, NPT, Flanged, Metric) 2-Way and 3-Way.	Satisfies a wide range of application requirements.
Up to 250 psig (1724 kPa) close-off.	Meets variety of close-off requirements.
Built-in position feedback on MFX1-710X floating and all proportional models.	Offers maximum flexibility in selecting precise control for a wide variety of applications, significantly reducing installation time.
High fluid and ambient temperature ratings.	Allows use in harsh environments.
Proportional models feature control function switch or jumper.	Allows the selection of direct or reverse action for application flexibility.
Thermal isolation.	Protects the actuator from cold or excess heat generated by chilled water, hot water, or steam passing through the valve. Discourages condensation.
Spring-loaded PTFE valve packing.	Self adjusting. No tightening required.
250 psig valve body static pressure rating per ANSI Standards (B16.15—1985) for screwed cast bronze bodies. 125 psig valve body static pressure rating for cast iron flanged bodies.	Meets most demanding pressure requirements.
Overload protection on all models.	Eliminates application of excessive force on stem and overheating of actuator.
Highly visible position indicator.	Shows the valve position, facilitating setup, checkout, and troubleshooting.
24 Vac models require less than 10 VA.	Saves cost while meeting job specifications, by using fewer transformers and less energy.

Globe Valve Assembly Selection Procedure

When selecting a globe valve assembly, you must determine the applicable codes for the control signal type, valve body configuration, end connection, port size, and actuator. Select a globe valve assembly part number as follows:

1. **Control Signal Type, Valve Body Configuration, and End Connection**

   Referring to "Part Numbering System" on page 4, select the appropriate codes for these part number fields.

2. **Valve Size (Flow Coefficient)**

   If the required flow coefficient (C_v) has not yet been determined, do so as follows:

   a. Refer to the "Sizing and Selection" section on pages 8 to 11, to calculate the required C_v.

   b. Select the nearest available C_v and corresponding valve body port code from "Part Numbering System" on page 4.

3. **Actuator**

   Select the appropriate actuator and code, according to "Part Numbering System" on page 4, based on the control signal type, required valve normal position, and voltage requirements. For detailed actuator information, refer to the applicable actuator specifications on page 16, 19, or 21.

   Note: Globe Valve Assemblies are not available with MX51-7103-0X0 actuators (equipped with appliance wire). However, if required, you may field-assemble one of these actuators to a globe valve body. For information on MX51-7103-0X0 actuators, refer to page 16.

4. **Close-off Pressure**

   Confirm in Table-3 or Table-4 that the selected actuator and valve body combination provides sufficient close-off pressure. If no close-off pressure is shown, the valve body/actuator combination is not valid.

5. **Available Space**

   If available space is a consideration, check the appropriate dimensional figure (Figure-8 through Figure-19) and its accompanying table for any potential fit problems.

Linked Globe Valve Assembly

Part Numbering System

Linked Globe Valve Assemblies

V X - X X X X - X X X - X - X X

Control Signal Type
A = Two Position
F = Floating
S = Proportional

Configuration ⚠1
721, 725, 727, 921 = 2-Way, Stem Up Open
722, 726, 728, 922 = 2-Way, Stem Up Closed
731, 931 = 3-Way, Mixing
732 = 3-Way, Diverting

Connection
1 = Union Straightway [a]
2 = Flared End [b]
3 = Thread NPT
5 = Metric Thread (Rp) [c]

[a] 1/2" to 1-1/4" only.
[b] 1/2" only.
[c] 15 to 80 mm only.

Actuator

Two Position
MA51-7100=801
MA51-7103=N/A [d]
MA51-7103-100=804
MA51-7101=802
MA51-7200=592
MA51-7201=591
MA51-7203=593
MA61-7200=595
MA61-7201=594
MA61-7203=596

Floating
MF51-7103=N/A [d]
MF51-7103-100=804
MF51-7203=593
MF61-7203=596

Proportional
MS51-7103=N/A [d]
MS51-7103-20=N/A [d]
MS51-7103-30=N/A [d]
MS51-7103-40=N/A [d]
MS51-7103-50=N/A [d]
MS51-7103-60=N/A [d]
MS51-7103-100=804
MS51-7103-120=806
MS51-7103-130=808
MS51-7103-140=810
MS51-7103-150=812
MS51-7103-160=814
MS51-7203=593
MS61-7203=596

[d] Factory assemblies not available. Purchase actuator and valve body separately and field assemble.

Pattern Code
4 = Straightway
5 = Globe Flanged

Port Code

Size	2-Way Cv	2-Way P Code	3-Way Cv Mixing	3-Way Cv Diverting	3-Way P Code
1/2"	0.4	1	—	—	
	1.3	2	2.2	2.2	2
	2.2	3	—	—	
	4.4	4	4.4	4.4	4
3/4"	5.5	5	—	—	
	7.5	6	7.5	7.5	6
1"	10.0	7	—	—	
	14.0	8	14.0	15.0	8
1-1/4"	20.0	9	20.0	20.0	9
1-1/2"	28.0	10	28.0	28.0	10
2"	40.0	11	41.0	40.0	11
2-1/2"	56.0	12	67[e]	—	12
	65.0	12	74[f]	—	12
3"	85.0	13	91[e]	—	13
	85.0	13	101[f]	—	13
4"	145.0	14	170	—	14

	2-Way Kvs	2-Way P Code	3-Way Kvs Mixing	3-Way Kvs Diverting	3-Way P Code
15 mm	0.3	1	—	—	
	1.1	2	1.9	—	2
	1.9	3	—	—	
	3.8	4	3.8	—	4
20 mm	4.8	5	—	—	
	6.5	6	6.5	—	6
25 mm	8.7	7	—	—	
	12.0	8	12.0	—	8
32 mm	17.0	9	17.0	—	9
40 mm	24.0	10	24.0	—	10
50 mm	35.0	11	36.0	—	11
65 mm	56.0	12	58.0	—	12
80 mm	73.0	13	78.0	—	13

[e] Threaded valve body.
[f] Flanged valve body.

⚠1 The configuration of the valve assembly determines the valve stem position and flow, as shipped from the factory. See the table below.

Valve Assemblies	Valve Body Action	Factory Shipped Position		Action
		Valve Stem	Flow	
VX-721X-XXX-4-P VX-725X-XXX-4-P VX-727X-XXX-4-P VX-921X-XXX-X-P	2-Way Stem Up Open	Up	Open	A to AB Flow decreases as actuator extends
VX-722X-XXX-4-P VX-726X-XXX-4-P VX-728X-XXX-4-P VX-922X-XXX-X-P	2-Way Stem Up Closed	Up	Closed	A to AB Flow increases as actuator extends
VX-731X-XXX-4-P VX-931X-XXX-X-P	3-Way Mixing	Up	B to AB	A to AB Flow increases as actuator extends B to AB Flow decreases as actuator extends
VX-732X-XXX-4-P	3-Way Diverting	Up	B to AB	B to A Flow increases as actuator extends B to AB Flow decreases as actuator extends

System Design Considerations

Linked Globe Valve Assemblies

Note: The information in this section describes characteristics of the VB-7XXX and VB-9XXX valve bodies, which are used in the VX-7XXX and VX-9XXX valve assemblies.

Control Precision

2-Way Valves: All valves have modified equal percentage flow characteristics. That is, for equal increments of valve stem stroke, the change in flow rate with respect to valve stroke may be expressed as a constant percent of the flow rate at the time of the change. The change of flow rate with respect to valve stroke is relatively small when the valve plug is near the valve seat and relatively high when the valve plug is nearly wide open. See Figure-1 for typical modified equal percentage flow characteristics of VB-72XX and VB-92XX series valves.

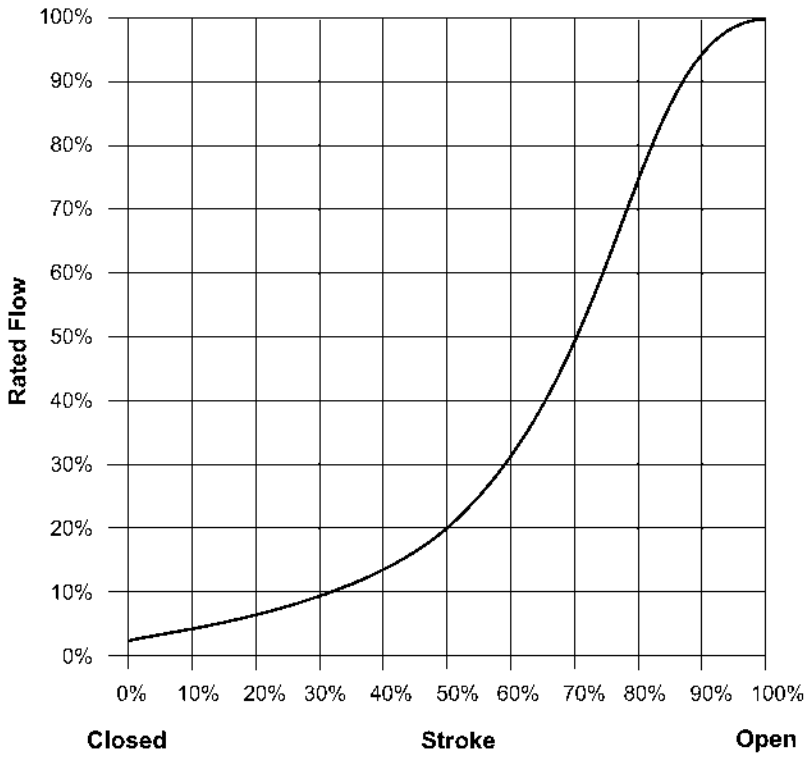


Figure-1 Typical Modified Equal Percentage Flow Characteristics.

3-Way Valves: 3-way mixing valves are designed so that the flow from either of the inlet ports to the outlet is approximately linear, which means the total flow from the outlet is almost constant over the stroke of the valve stem. See Figure-2 for typical flow characteristics of the VB-731X and VB-931X series valve bodies.

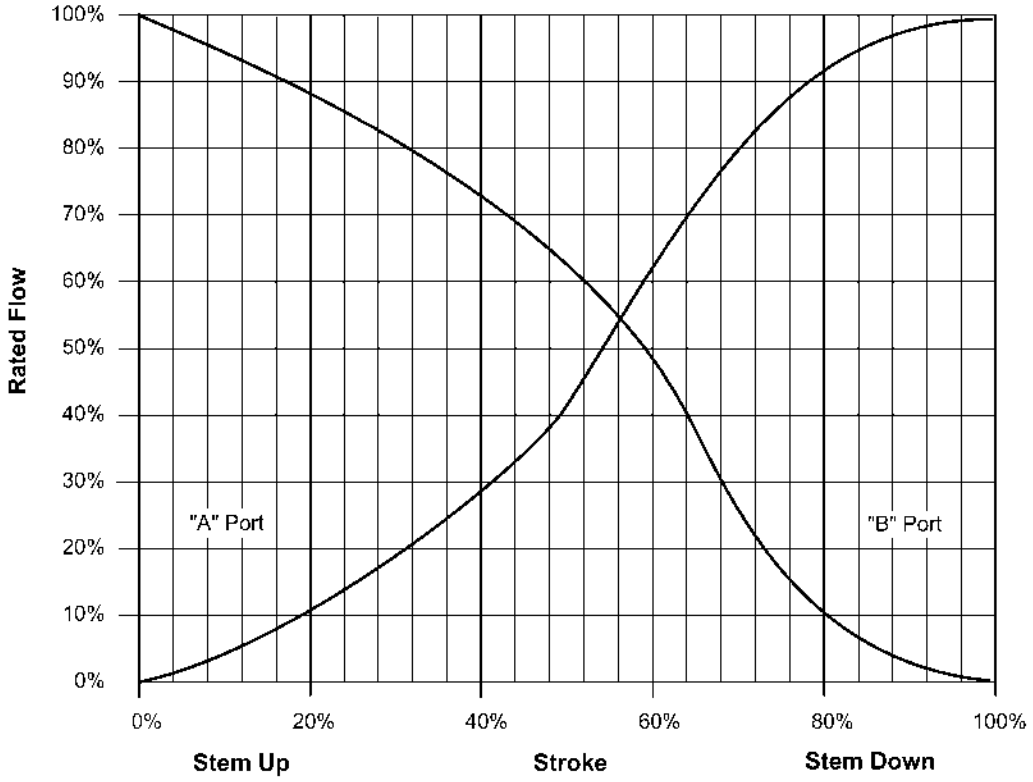


Figure-2 Typical Flow Characteristics.

Rangeability

Rangeability is the ratio of rated flow to the minimum controllable flow through a valve.

2-Way Valves: Table-1 lists the rangeability for VB-72XX and VB-92XX series globe valves. Refer to the model charts on the following pages for detailed valve information.

Table-1 Rangeability.

Nominal Valve Size		Port Code (P)	Nominal Rangeability
Standard	Metric		
1/2"	15 mm	1	5:1
		2	15:1
		3	25:1
		4	40:1
3/4"	20 mm	5	50:1
		6	60:1
1"	25 mm	7	60:1
		8	75:1
1-1/4"	32 mm	9	75:1
1-1/2"	40 mm	10	75:1
2"	50 mm	11	75:1
2-1/2"	65 mm	12	75:1
3"	80 mm	13	75:1
4"	—	14	75:1

3-Way Valves: For mixing valves, control begins as soon as plug displacement allows flow. Thus, the rangeability of 3-way valves normally exceeds 500:1, which is the reciprocal of 0.2% nominal leakage.

Temperature/Pressure Ratings

See Figure-3 for temperature and pressure ratings of 2-way and 3-way valves. Ratings conform with published values and disclaimer.

VB-7XXX-0-X-P and VB-9XXX-0-4-P (Cast Bronze Body)

Standards: Pressure to ANSI B16.15, Class 250, with 400 psi (2758 kPa) up to 150 °F (65 °C), decreasing to 346 psi (2386 kPa) at 281°F (138 °C).

Materials: Valve body is made of bronze, ASTM B584. Valve trim is 316 stainless steel stem with brass, stainless steel, or bronze plug, metal-to-metal or EPDM disc with PTFE packing parts. See Table-5 or Table-6 for further details.

VB-9XXX-0-5-P (Cast Iron Body with Flanged End Fittings)

Standards: Pressure to ANSI B16.1, Class 125, with 200 psi (1379 kPa) up to 150 °F (65 °C), decreasing to 169 psi (1165 kPa) at 281°F (138 °C).

Materials: Valve body is made of cast iron, ASTM A126 Class B. Valve trim is 316 stainless steel stem, brass or bronze plug, metal-to-metal or EPDM disc with PTFE packing parts. See Table-5 or Table-6 for further details.

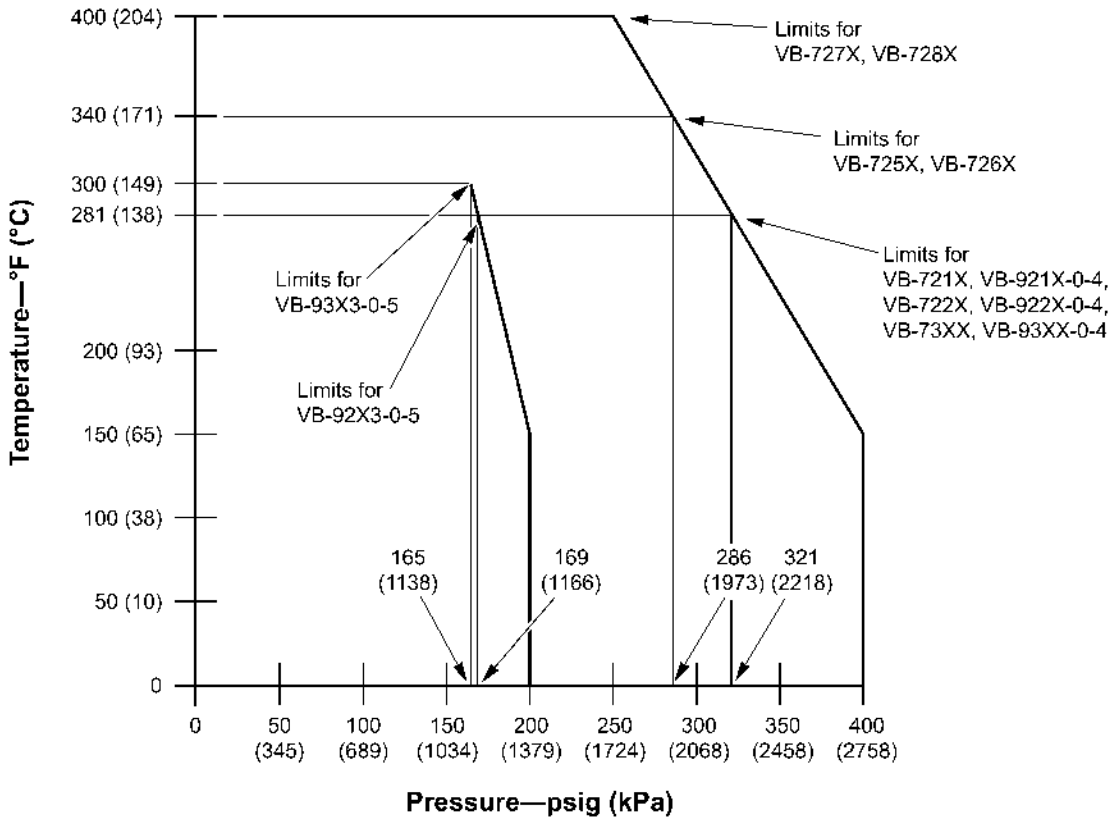


Figure-3 Temperature and Pressure Ratings for VB-7XXX and VB-9XXX Series Globe Valves.

Close-off Ratings

Nominal actuator close-off ratings are based on ANSI IV (0.01% leakage) with EPDM discs and PTFE discs in steam applications. Metal-to-metal trim such as brass 3-way and high temperature stainless are designed for ANSI III (0.1% leakage). Seat leakage for reduced port versions of metal-to-metal seats may match the full port versions, allowing up to 1% on the 0.4 C_v plugs.

Installation Considerations

Mounting Angle of Valve Assembly

Be sure to allow the necessary clearance around the valve assembly. The valve assembly must be mounted so that the valve stem is at least 5° above the horizontal. This ensures that any condensate that forms on the valve body will not travel into the linkage or actuator, where it may cause corrosion. On steam applications, where the ambient temperature approaches the limit of the actuator, the valve assembly must be mounted 45° from vertical. See the applicable Actuator General Instructions for details.

Insulation of Linked Globe Valve Assembly

The globe valve should be completely insulated to minimize the effect of heat transfer and condensation at the actuator.

Caution: The actuator and the integral linkage must not be insulated. Doing so will result in excess heat or condensation within the actuator.

Temperature Limits for Globe Valve Assembly

When installing the globe valve assembly, observe the minimum and maximum temperature limits given in the *Actuator Specifications and Valve Assembly Mounting Dimensions* section of this document.

Sizing and Selection

Flow Coefficient (C_v)

When sizing a valve, you must select a flow coefficient (C_v), which is defined as the flow rate in gallons per minute (GPM) of 60 °F water that will pass through the fully open valve with a 1 psi pressure drop (ΔP). It is calculated according to this formula:

$C_v = \frac{gpm}{\sqrt{\Delta P}}$, where ΔP is measured in psi.

Since the flow rate through the heat exchanger is usually specified, the only variable normally available in sizing a valve is the pressure drop. The following information in this section can be used to determine what pressure drop to use in calculating a valve C_v. Once you have calculated the C_v, consult "Part Numbering System" on page 4 to select the valve body having the nearest available C_v.

Note: Metric equivalent.

- The metric measure of flow coefficient is k_{vs}, which is calculated according to the formula: $k_{vs} = \frac{m^3/h}{\sqrt{\Delta P}}$ (where ΔP is measured in bar; 1 bar = 100 kPa).
- If the C_v is already known, it may be converted directly to its k_{vs} equivalent: $k_{vs} = \frac{C_v}{1.156}$.

Two-position Control

Two-position control valves are normally selected "line size" to keep pressure drop at a minimum. If it is desirable to reduce the valve below line size, then 10% of "available pressure" (that is, the pump pressure differential available between supply and return mains with design flow at the valve location) is normally used to select the valve.

Proportional Control

Proportional control valves are usually selected to take a pressure drop equal to at least 50% of the "available pressure." As "available pressure" is often difficult to calculate, the normal procedure is to select the valve using a pressure drop at least equal to the drop in the coil or other load being controlled (except where small booster pumps are used) with a minimum recommended pressure drop of 5 psi (34 kPa). When the design temperature drop is less than 60°F (33°C) for conventional heating systems, higher pressure drops across the valve are needed for good results (Table-2).

Table-2 Conventional Heating System.

Design Temperature Load Drop °F (°C)	Recommended Pressure Drop[a] (% of Available Pressure)	Multiplier on Load Drop
60 (33) or More	50%	1 x Load Drop
40 (22)	66%	2 x Load Drop
20 (11)	75%	3 x Load Drop

[a] Recommended minimum pressure drop = 5 psi (34 kPa).

Secondary Circuits with Small Booster Pumps: 50% of available pressure difference (equal to the drop through load, or 50% of booster pump head).

3-Way Proportional Mixing Valves Used to Bypass Flow

When 3-way proportional linked globe valve assemblies are used to control flow through a heating or cooling coil, the valve assembly is piped on the outlet side of the load to throttle the water flow through the load, and therefore control the heat output of the load (Figure-4).

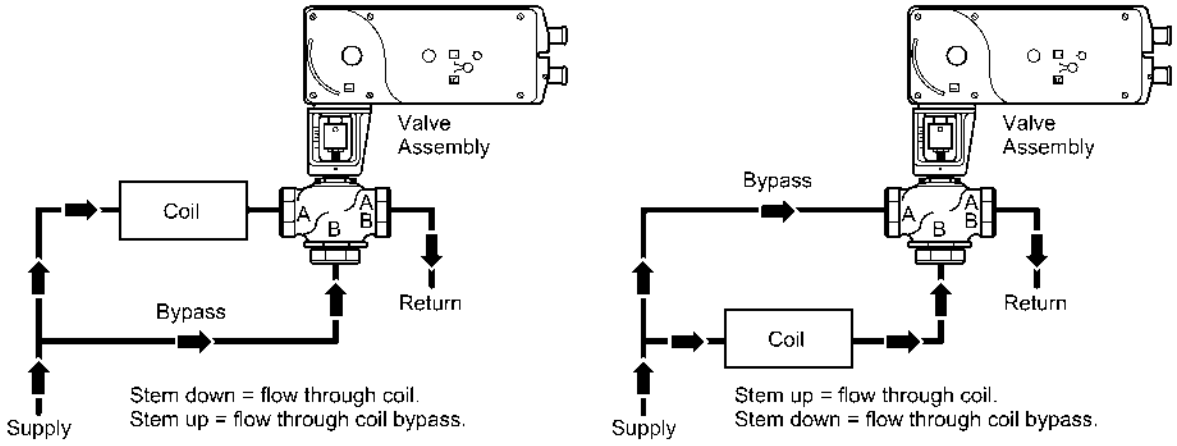


Figure-4 Typical Piping of 3-Way Mixing Valve for Control of Heating or Cooling Coil.

3-Way Proportional Mixing Valves Used to Blend Water Flows

Proportional 3-way mixing valves used to blend two water flows (Figure-5) control the heat output by varying the water temperature to the load at constant flow. These valves do not require high pressure drops for good control results. They can be sized for a pressure drop of 20% of the "available pressure" or equal to 25% of the pressure drop through the load at full flow.

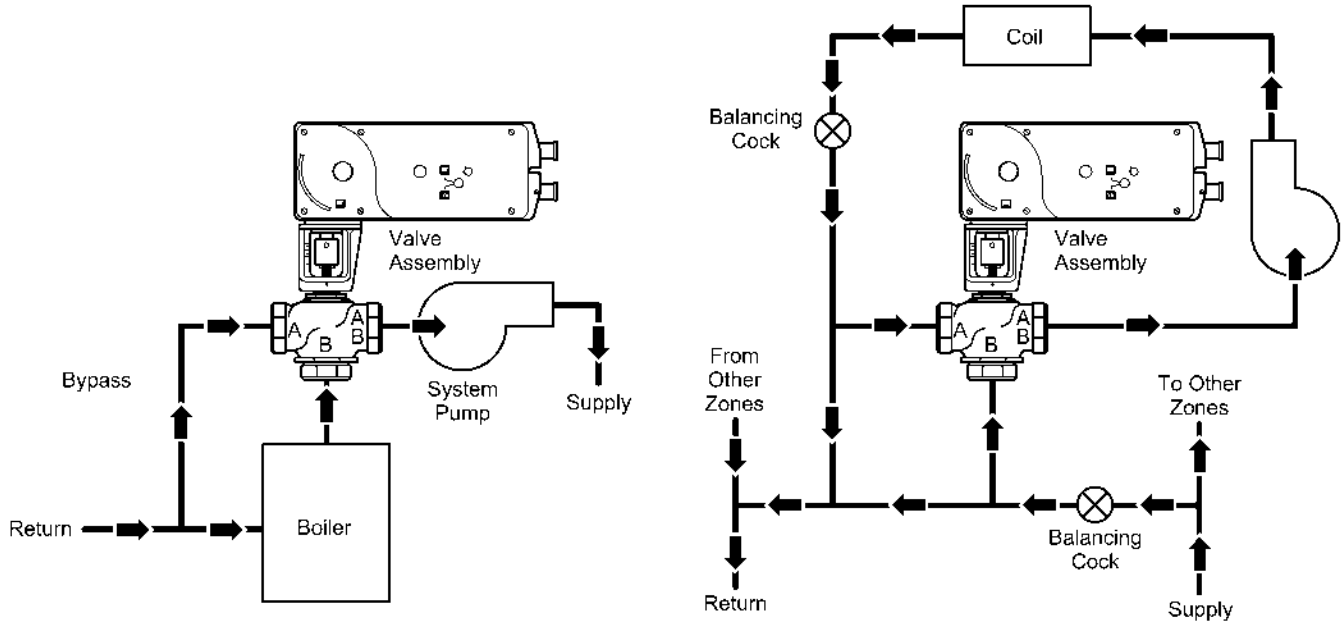


Figure-5 Typical 3-Way Mixing Valve Piping for Proportional Control Used to Blend Two Water Flows.

3-Way Diverting Valves

Proportional and two-position 3-way diverting linked globe valve assemblies are used to control the flow of hot or chilled fluids in heating systems, cooling coils, or other load by diverting the flow to either the load or a bypass. The valve must be piped with one inlet and two outlets. (Figure-6).

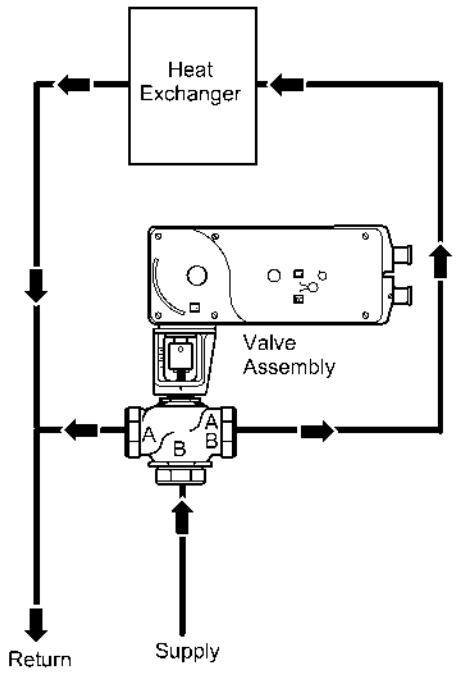


Figure-6 Typical 3-Way Diverting Valve Piping.

Cavitation Limitations on Valve Pressure Drop

A valve selected with too high a pressure drop can cause erosion of discs and/or wire drawing of the seat. In addition, cavitation can cause noise, damage to the valve trim (and possibly the body), and choke the flow through the valve.

Do not exceed the maximum differential pressure (pressure drop) for the valve selected. Refer to the chart in Figure-7.

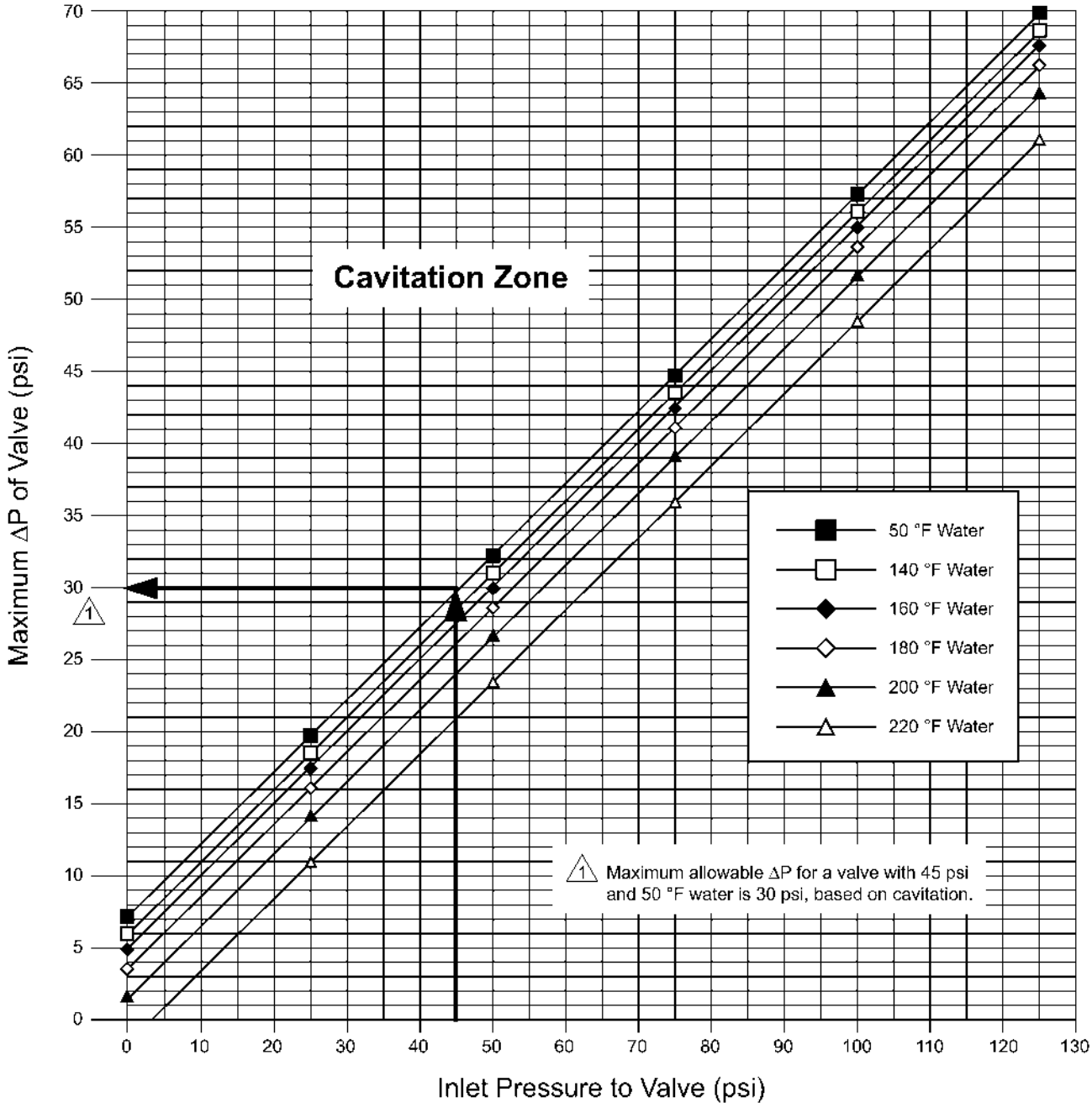


Figure-7 Maximum Allowable Differential Pressure (DP) for Water Valves.

Additional Valve Sizing Information

For additional valve sizing information, refer to the "Applicable Literature" section for a list of documents pertaining to valve sizing.

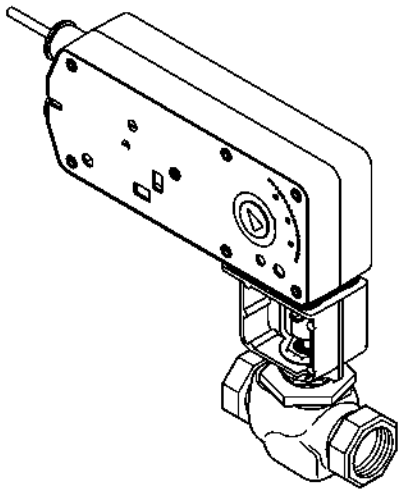
Valve/Actuator Combinations

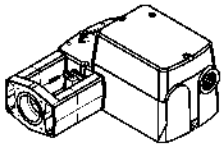
2-Way Linked Globe Valve Assemblies with Linear Series Actuators

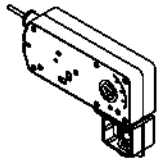
Note: Choose a valve assembly having a close-off pressure capability sufficient for the application. Not all valve body and actuator combinations are available factory-assembled. Some combinations must be field-assembled.

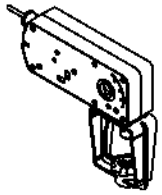
Table-3 2-Way Linked Globe Valve Assemblies with Linear Series Spring Return Actuators — Selection Chart.

2-Way Linked Globe Valve Assemblies









Actuator Force Rating		
105 lbf (467 N)	220 lbf (979 N)	
Actuator Model (Actuator Code)		
Two-Position MA51-710X (801) (802) MA51-7103 (N/A)[a] MA51-7103-100 (804) **Floating** MF51-7103 (N/A)[a] MF51-7103-100 (804) **Proportional** MS51-7103 (N/A)[a] MS51-7103-0X0 (N/A)[a] MS51-7103-1X0 (804) (806) (808) (810) (812) (814)	**Two-Position** MA51-720X (591) (592) (593) **Floating** MF51-7203 (593) **Proportional** MS51-7203 (593)	**Two-Position** MA61-720X (594) (595) (596) **Floating** MF61-7203 (596) **Proportional** MS61-7203 (596)

Valve Assembly Part Number[b]	P Code	Valve Size in. (mm)	C_V[c]	k_{VS}[b]	Actuator Close-off Pressure psi[de]			
					N.O.[f]	N.C.[g]		
VX-72X1-XXX-4-P VX-72X2-XXX-4-P VX-72X3-XXX-4-P VX-72X5-XXX-4-P[h]	1	1/2 (15)	0.4	0.3	250	250	—	—
	2		1.3	1.1				
	3		2.2	1.9				
	4		4.4	3.8				
	5	3/4 (20)	5.5	4.8	200	200		
	6		7.5	6.5				
	7	1 (25)	10.0	8.7	150	90		
	8		14.0	12				
	9	1-1/4 (32)	20.0	17	90	60	150	
VX-72X3-XXX-4-P VX-72X5-XXX-4-P[h]	10	1-1/2 (40)	28.0	24	60	35	100	—
	11	2 (50)	40.0	35	32	20	65	
VX-92X3-XXX-4-P[i] VX-92X3-XXX-5-P[j] VX-92X5-XXX-4-P[h]	12	2-1/2 (65)	56.0[i]	48[i]	—	—	—	33
			65.0[j]	56[j]				
	13	3 (80)	85.0	73				22
VX-9213-XXX-5-P[j] VX-9223-XXX-5-P[j]	14	4 (N/A)	145.0	125	—	—	—	12

[a] Models without actuator codes are not offered as factory assemblies. Purchase the actuator and the valve body separately and field assemble. For available factory assemblies, consult the price schedule.

[b] To determine a specific part number, see "Part Numbering System" on page 4.

[c] $C_V = \frac{gpm}{\sqrt{\Delta P}}$ (where ΔP is measured in psi) $k_{VS} = C_V / 1.156$ $k_{VS} = \frac{m^3/h}{\sqrt{\Delta P}}$ (where ΔP is measured in bar; 1 bar = 100 kPa).

[d] Close-off ANSI IV (.01%) for soft seats. For seat leakage ratings of specific valve bodies, see Table-5 and Table-6.

[e] Close-off pressure ratings describe only the differential pressure which the actuator can close-off with adequate seating force. Consult valve body specifications for other limitations. The rating value is the pressure difference between the inlet and outlet ports.

[f] Normally open (N.O.) assembly using stem up open valve body. See "Part Numbering System" on page 4.

[g] Normally closed (N.C.) assembly using stem up closed valve body. See "Part Numbering System" on page 4.

[h] Metric thread 15 to 80 mm (Rp 1/2 to Rp 3).

[i] Threaded valve body.

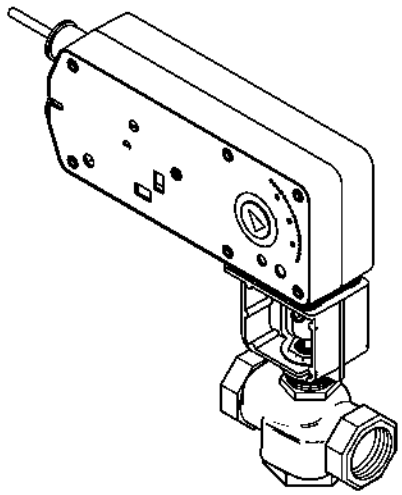
[j] Flanged valve body.

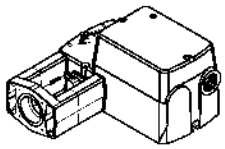
3-Way Linked Globe Valve Assemblies with Linear Series Actuators

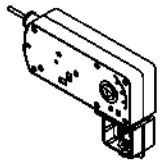
Note: Choose a valve assembly having a close-off pressure capability sufficient for the application. Not all valve body and actuator combinations are available factory-assembled. Some combinations must be field-assembled.

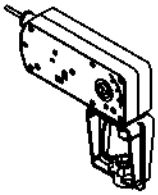
Table-4 3-Way Linked Globe Valve Assemblies with Linear Series Spring Return Actuators — Selection Chart.

3-Way Linked Globe Valve Assemblies[a]









Actuator Force Rating		
105 lbf (467 N)	220 lbf (979 N)	
Actuator Model (Actuator Code)		
Two-Position MA51-710X (801) (802) MA51-7103 (N/A)[b] MA51-7103-100 (804) **Floating** MF51-7103 (N/A)[b] MF51-7103-100 (804) **Proportional** MS51-7103 (N/A)[b] MS51-7103-0X0 (N/A)[b] MS51-7103-1X0 (804) (806) (808) (810) (812) (814)	**Two-Position** MA51-720X (591) (592) (593) **Floating** MF51-7203 (593) **Proportional** MS51-7203 (593)	**Two-Position** MA61-720X (594) (595) (596) **Floating** MF61-7203 (596) **Proportional** MS61-7203 (596)

Valve Assembly Part Number[c]	P Code	Valve Size in. (mm)	C_V[d]	k_{VS}[c]	Actuator Close-off Pressure psi[ae]		
Mixing **VX-7313-XXX-4-P** **VX-7315-XXX-4-P**[f]	**2**	1/2 (15)	2.2	1.9	250	—	—
	4		4.4	3.8			
	6	3/4 (20)	7.5	6.5	200		
	8	1 (25)	14.0	12.0	90		
	9	1-1/4 (32)	20.0	17	60	150	
	10	1-1/2 (40)	28	24	35	100	
	11	2 (50)	41	36	20	65	
Diverting **VX-7323-XXX-4-P**	**4**	1/2 (15)	4.4	3.8	250	—	—
	6	3/4 (20)	7.5	6.5			
	8	1 (25)	15.0	13.0			
	9	1-1/4 (32)	20.0	17.3		250	
	10	1-1/2 (40)	28	24.2			
	11	2 (50)	40	34.6			
VX-9313-XXX-4-P[g] **VX-9313-XXX-5-P**[h] **VX-9315-XXX-4-P**[f]	**12**	2-1/2 (65)	67.0[g]	58[g]	—	—	33
			74.0[h]	64[h]			
	13	3 (80)	91.0[g]	79[g]			22
			101.0[h]	87[h]			
VX-9313-XXX-5-P[h]	**14**	4 (N/A)	145.0	125	—	—	12

[a] Refer to Figure-4, Figure-5, and Figure-6 for typical piping diagrams for 3-way linked globe valve assemblies.

[b] Models without actuator codes are not offered as factory assemblies. Purchase the actuator and the valve body separately and field assemble. For available factory assemblies, consult the price schedule.

[c] To determine a specific part number, see "Part Numbering System" on page 4.

[d] $C_V = \frac{gpm}{\sqrt{\Delta P}}$ (where ΔP is measured in psi) $k_{VS} = C_V / 1.156$ $k_{VS} = \frac{m^3/h}{\sqrt{\Delta P}}$ (where ΔP is measured in bar; 1 bar = 100 kPa).

[e] Close-off pressure ratings describe only the differential pressure which the actuator can close-off with adequate seating force. Consult valve body specifications for other limitations. The rating value is the pressure difference between the inlet and outlet ports.

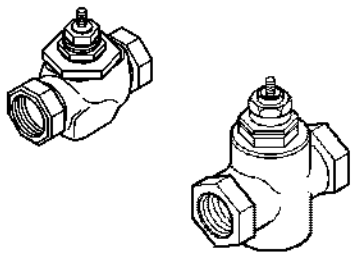
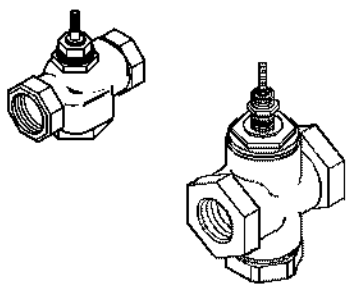
[f] Metric thread 15 to 80 mm (Rp 1/2 to Rp 3).

[g] Threaded valve body.

[h] Flanged valve body.

Globe Valve Body Specifications

Table-5 Specifications for 1/2" to 2" VB-7XXX Series and 2-1/2" and 3" VB-9XXX Series Globe Valve Bodies .

Specifications **NPT, Rp Screwed Valve Bodies**		**2-Way**	**3-Way**
			
Applications		Chilled or Hot Water, or Steam	Chilled or Hot Water
Type of End Fitting		NPT, Rp Screwed, Flared, Union Straightway	NPT, Rp Screwed, Flared
Size		**VB-7XXX Series** 1/2" through 2" (15 mm through 50 mm) **VB-9XXX Series** 2-1/2" and 3" (65 mm and 80 mm)	
Action		Stem Up Open or Stem Up Closed	Mixing or Diverting
Valve Body Series[a]		VX-72XX-0-4-P VX-92XX-0-4-P	VX-73XX-0-4-P VX-93XX-0-4-P
Flow Type		Equal Percentage[b]	Linear[b]
Valve Body Materials	**Body**	Bronze	Bronze
	Seat	Bronze (VB-721X, VB-722X)	Bronze
		Stainless Steel (VB-725X, VB-726X, VB-727X, VB-728X)	
	Stem	Stainless Steel	Stainless Steel
	Plug	Brass (VB-721X, VB-722X)	Brass (VB-73XX)
		Stainless Steel (VB-725X, VB-726X, VB-727X, VB-728X)	Bronze (VB-931X)
	Packing	Spring-loaded PTFE	Spring-loaded PTFE
	Disc	EPDM (VB-721X, VB-722X)	—
		PTFE (VB-725X, VB-726X)	
		None (VB-727X, VB-728X)	
ANSI Pressure Class (Figure-3)		250 psig (1724 kPa), up to 400 psig (2758 kPa) below 150 °F (66 °C)[c]	250 psig (1724 kPa), up to 400 psig (2758 kPa) below 150 °F (66 °C)[c]
Pressure Class (VB-7XX5)		PN16	PN16
Rangeability		See Table-1	500:1
Seat Leakage		ANSI Class IV (.01%) (VB-721X, VB-722X, VB-725X, VB-727X)	ANSI Class III (0.1%)
		ANSI Class III (0.1%) (VB-727X, VB-728X)	
STEAM			
Inlet Pressure — Maximum		35 psig (241 kPa)	—
Fluid Temperature — Maximum		281 °F (138 °C) (VB-721X)	—
		340 °F (171 °C) (VB-725X, VB-726X)	
		400 °F (205 °C) (VB-727X, VB-728X)	
Allowable Differential Pressure[d]		20 psi (138 kPa)	—
WATER			
Fluid Temperature — Minimum		**1/2" through 2"** 20 °F (-7 °C) **2-1/2" and 3"** 40 °F (4 °C)	**1/2" through 2"** 20 °F (-7 °C) **2-1/2" and 3"** 40 °F (4 °C)
Fluid Temperature — Maximum		**1/2" through 3"** 281 °F (138 °C)	**1/2" through 3"** 300 °F (149 °C)
Allowable Differential Pressure[d]		35 psi (241 kPa) Max. for Normal Lifespan (refer to "Cavitation Limitations on Valve Pressure Drop", on page 18)	35 psi (241 kPa) Max. for Normal Lifespan (refer to "Cavitation Limitations on Valve Pressure Drop", on page 18)

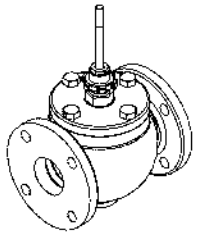
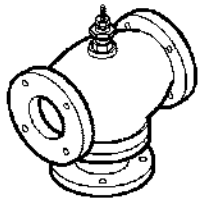
[a] To determine a specific part number, see the Linked Globe Valve Assembly Part Numbering System.

[b] See "2-Way Valves" on page 5 or "3-Way Valves" on page 6 for a detailed description of the flow

[c] Do not apply the above pressure rating to the piping system.

[d] Maximum recommended differential pressure. Do not exceed the recommended differential pressure (pressure drop) or the integrity of valve parts may be affected. Exceeding the maximum recommended differential pressure voids the product warranty.

Table-6 Specifications for Flanged 2-1/2" to 4" VX-9XXX Series Globe Valve Bodies.

Specifications **Flanged Valve Bodies**		**2-Way**	**3-Way**
			
Applications		Chilled or Hot Water, or Steam	Chilled or Hot Water
Type of End Fitting		Flanged	Flanged
Size		2-1/2 in. through 4 in.	2-1/2 in. through 4 in.
Action		Stem Up Open or Stem Up Closed	Mixing
Valve Assembly Series		VX-92XX-0-5-P	VX-931X-0-5-P
Flow Type		Equal Percentage[a]	Linear[a]
Valve Body Materials	**Body**	Cast Iron	Cast Iron
	Seat	Bronze	Bronze
	Stem	Stainless Steel	Stainless Steel
	Plug	Bronze	Bronze
	Packing	Spring-loaded PTFE	Spring-loaded PTFE
	Disc	Composite	—
ANSI Pressure Class (Figure-3)		125 psig (862 kPa), 200 psig (1379 kPa) below 150 °F (66 °C)[b]	125 psig (862 kPa), 200 psig (1379 kPa) below 150 °F (66 °C)[b]
Rangeability		75:1	Exceeds 500:1
Seat Leakage		ANSI Class IV (.01%)	ANSI Class III (0.1%)
STEAM			
Inlet Pressure — Maximum		35 psig (241 kPa)	—
Fluid Temperature — Maximum		281 °F (138 °C)	
Allowable Differential Pressure[c]		20 psi (138 kPa)	
WATER			
Fluid Temperature — Minimum		40 °F (4 °C)	40 °F (4 °C)
Fluid Temperature — Maximum		281 °F (138 °C)	300 °F (149 °C)
Allowable Differential Pressure[c]		35 psi (241 kPa) Max. for Normal Lifespan (refer to "Cavitation Limitations on Valve Pressure Drop" on page 11)	35 psi (241 kPa) Max. for Normal Lifespan (refer to "Cavitation Limitations on Valve Pressure Drop" on page 11)

[a] See "2-Way Valves" on page 5 or "3-Way Valves" on page 6 for a detailed description of the flow.

[b] Do not apply the above pressure rating to the piping system.

[c] Maximum recommended differential pressure. Do not exceed the recommended differential pressure (pressure drop) or the integrity of valve parts may be affected. Exceeding the maximum recommended differential pressure voids the product warranty.

Actuator Specifications and Valve Assembly Mounting Dimensions

Valve Assemblies with MA51-710X, MF51-7103, and MS51-7103 1/2" (13 mm) Stroke 105 lbf (467 N) Linear Series DuraDrive Actuators

Actuator Specifications

Inputs

Control Signal and Power Requirements

All 24 Vac circuits are Class 2. All circuits 30 Vac and above are Class 1

Part Number	Control Signal	Power Input				
		Voltage	Running 50/60 Hz		DC Amps	Holding 50/60 Hz
			VA	W		W
MA51-7100-000	Two-position SPST	120 Vac ±10% 50/60 Hz	7.9	6.2	—	2.1
MA51-7101-000		230 Vac ±10% 50/60 Hz	7.4	5.4		2.1
MA51-7103-000, MA51-7103-100		24 Vac ±20% 20 to 30 Vdc	5.3	4.1	0.15	1.2
MF51-7103-000, MF51-7103-100	Floating SPST		6.9	4.7	0.16	2.1
MS51-7103-000, MS51-7103-100	2-10 Vdc Proportional		6.6	4.2	0.14	1.5
MS51-7103-020, MS51-7103-120	0-3 Vdc Proportional					
MS51-7103-030, MS51-7103-130	6-9 Vdc Proportional					
MS51-7103-040, MS51-7103-140[a]			7.8	4.9	0.16	3.4
MS51-7103-050, MS51-7103-150	0-10 Vdc Proportional		6.6	4.2	0.14	1.5
MS51-7103-060, MS51-7103-160	02-20 mAdc Proportional					

[a] MS51-7103-040 and MS51-7103-140 feature a 20 Vdc power supply for System 8000 applications.

Connections

Connecting wiring:

MX51-710X-0X0 — Appliance wire, 3 ft. (0.9 m) long.
MX51-710X-1X0 — Plenum cable, 3 ft. (0.9 m) long.

Conduit connectors: Enclosure accepts 1/2" (13 mm) conduit connectors. For M20 metric connector, use AM-756 adaptor.

Motor Type

Brush DC motor.

Outputs

Electrical

Position feedback voltage (MF51-7103-XXX and MS51-7103-XXX):
For voltage ranges, the feedback signal is the same range as the input signal. The 0-20 mAdc current range and floating actuators have a 2-10 Vdc position feedback signal. The position feedback signal can supply up to 0.5 mA to operate up to four additional slave actuators.

Mechanical

Output force rating: 105 lbf (467 N).

Linear stroke: 1/2" (13 mm) nominal.

Timing

Part Number	Approximate Stroke Timing in Seconds @ 70 °F (21 °C)[a]	
	Powered	Spring Return
MA51-710X-XXX	27	19
MF51-710X-XXX	60	16
MS51-710X-XXX		

[a] Timing was measured with the actuator mounted onto a VB-7XXX series valve.

Manual override: Allows valve positioning and preload adjustment, using manual crank.

Reverse acting/direct acting jumper (MS51-7103-XXX): Permits reverse acting or direct acting linear motion.

Actuator Specifications (Continued)

Environment	
Temperature Limits	**Shipping and storage:** -40 to 160 °F (-40 to 71 °C) ambient. **Operating:** -22 to 140 °F (-30 to 60 °C) ambient. **Temperature restrictions:** For maximum ambient of 140 °F (60 °C), maximum fluid temperature must not exceed 366 °F (186 °C).
Humidity	5 to 95% RH, non-condensing.
Locations	NEMA 2, UL Type 2 (IEC IP54) with customer-supplied watertight conduit connectors.
Agency Listings (Actuator)	
UL	UL-873, Underwriters Laboratories (File #E9429 Category Temperature-indicating and Regulating Equipment).
cUL	UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24-93.
European Community	EMC Directive (89/336/EEC). Low Voltage Directive (72/23/EEC).
Australia	This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

Dimensions — 1/2" to 2" Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)								
		2-Way (Refer to Figure-8, Figure-10, and Figure-11)					3-Way (Refer to Figure-9 and Figure-12)			
		A	B	C	E	J	A	C	E	J
Union Straightway 2-Way (N.C.) VX-7221-8XX-4-P	1/2	4-3/16 (106)	2-11/16 (68)	1-3/16 (30)	7-7/16 (189)	6-5/8 (168)	—			
	3/4	4-15/16 (125)	3-3/16 (81)	1-3/16 (30)	7-7/16 (189)	6-7/8 (175)				
	1	6 (152)	3-5/8 (92)	1-3/4 (44)	7-1/2 (190)	7-3/8 (187)				
	1-1/4	6-1/4 (159)	3-15/16 (100)	1-3/4 (44)	7-3/4 (197)	7-3/8 (187)				
Union Straightway 2-Way (N.O.) VX-7211-8XX-4-P	1/2	4-3/16 (106)	2-11/16 (68)	1-3/16 (30)	7-7/16 (189)	6-5/8 (168)	—			
	3/4	4-15/16 (125)	3-3/16 (81)	1-1/16 (27)	7-7/16 (189)	6-7/8 (175)				
	1	6 (152)	3-5/8 (92)	1-3/16 (30)	8-1/8 (206)	7-3/8 (187)				
	1-1/4	6-1/4 (159)	3-15/16 (100)	1-3/8 (35)	8-1/8 (206)	7-3/8 (187)				
Flared 2-Way VX-7212-8XX-4-P VX-7222-8XX-4-P 3-Way VX-7312-8XX-4-P	1/2[a]	4 (102)	—	1-3/16 (30)	7-7/16 (189)	7-3/32 (180)	4 (102)	2-1/4 (57)	7-7/16 (189)	7-3/32 (180)
NPT/Metric Thread 2-Way (N.C.) VX-722X-8XX-4-P VX-726X-8XX-4-P VX-728X-8XX-4-P 3-Way VX-731X-8XX-4-P VX-732X-8XX-4-P	1/2	3-1/16 (78)	—	1-3/16 (30)	7-7/16 (189)	6-5/8 (168)	3-1/16 (78)	1-3/4 (44)	7-7/16 (189)	6-5/8 (168)
	3/4	3-5/8 (92)		1-3/16 (30)	7-7/16 (189)	6-7/8 (175)	3-5/8 (92)	1-13/16 (46)	7-7/16 (189)	6-7/8 (175)
	1	4-5/8 (118)		1-3/4 (44)	7-1/2 (190)	7-3/8 (187)	4-5/8 (118)	1-3/4 (44)	7-1/2 (191)	7-3/8 (187)
	1-1/4	4-5/8 (118)		1-3/4 (44)	7-3/4 (197)	7-3/8 (187)	4-5/8 (118)	1-3/4 (44)	7-3/4 (197)	7-3/8 (187)
	1-1/2	5-3/8 (137)		1-13/16 (46)	7-7/8 (200)	7-13/16 (198)	5-3/8 (137)	1-13/16 (46)	7-7/8 (200)	7-13/16 (198)
	2	6-1/8 (156)		2-1/4 (57)	8-9/16 (217)	8-5/32 (208)	6-1/8 (156)	2-1/4 (57)	8-9/16 (217)	8-5/32 (208)
NPT/Metric Thread 2-Way (N.O.) VX-721X-8XX-4-P VX-725X-8XX-4-P VX-727X-8XX-4-P	1/2	3-1/16 (78)	—	1-3/16 (30)	7-7/16 (189)	6-5/8 (168)	—			
	3/4	3-5/8 (92)		1-1/16 (27)	7-7/16 (189)	6-7/8 (175)				
	1	4-5/8 (118)		1-3/16 (30)	8-1/8 (206)	7-3/8 (187)				
	1-1/4	4-5/8 (118)		1-3/8 (35)	8-1/8 (206)	7-3/8 (187)				
	1-1/2	5-3/8 (137)		1-1/2 (38)	8-3/16 (208)	7-13/16 (198)				
	2	6-1/8 (156)		1-9/16 (40)	8-7/16 (214)	8-5/32 (208)				

[a] 5/8" O.D., SAE 45°.

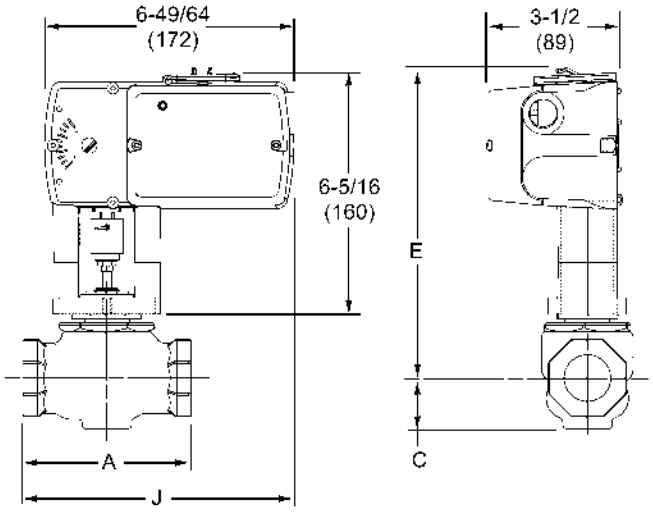


Figure-8 MX51-710X with 2-Way Globe Valve.

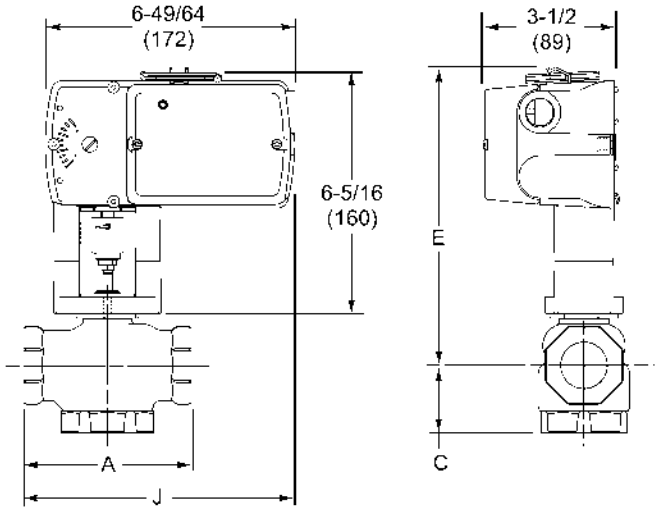


Figure-9 MX51-710X with 3-Way Globe Valve.

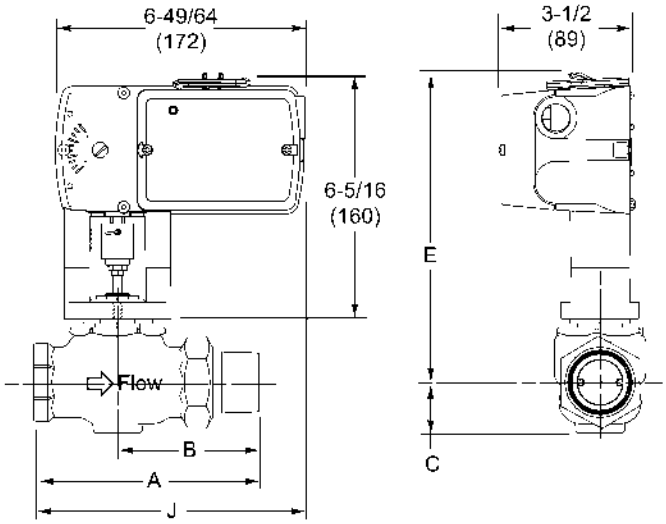


Figure-10 MX51-710X with 2-Way Union Straightway Globe Valve.

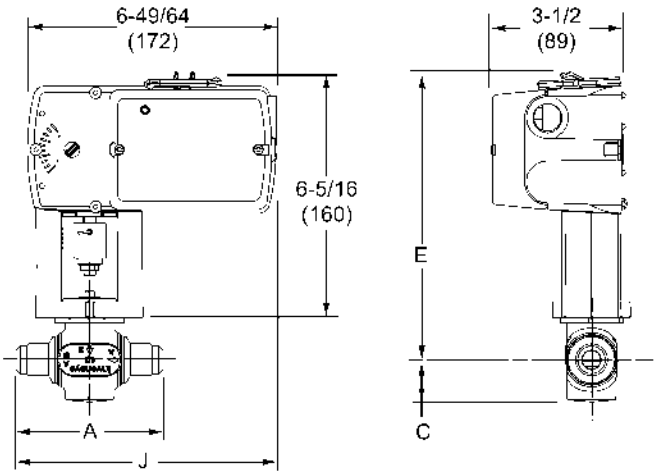


Figure-11 MX51-710X with 2-Way Flared Globe Valve.

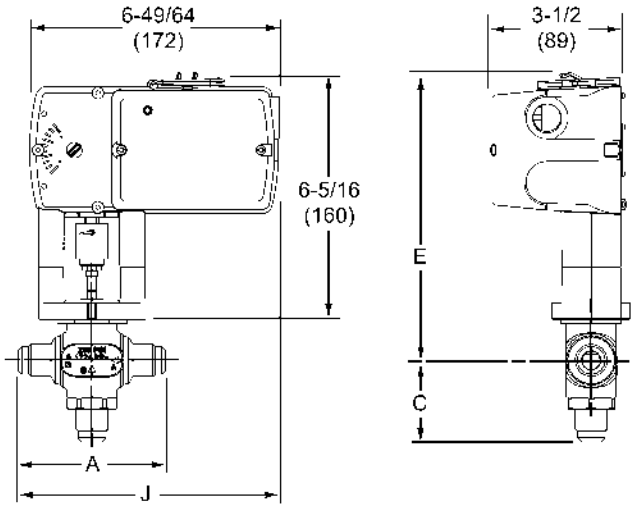


Figure-12 MX51-710X with 3-Way Flared Globe Valve.

Valve Assemblies with MA51-720X, MF51-7203, and MS51-7203
1/2" (13 mm) Nominal Stroke 220 lbf (979 N) Linear Series DuraDrive Actuators

Actuator Specifications

Inputs

Control Signal and Power Requirements

All 24 Vac circuits are Class 2. All circuits 30 Vac and above are Class 1

Part Number	Control Signal	Power Input						
		Voltage	Running				DC Amps	Holding
			50 Hz		60 Hz			50/60 Hz
			VA	W	VA	W		W
MA51-7200	Two-position SPST or Triacs	120 Vac ±10% 50/60 Hz	11.7	8.8	10.0	8.4	—	3.6/5.0
MA51-7201		230 Vac ±10% 50/60 Hz	15.5	9.5	10.6	8.5	—	4.6/3.3
MA51-7203		24 Vac ±20% 22 to 30 Vdc	9.8	7.5	9.7	7.5	0.29	2.8
MF51-7203	Floating Point SPDT or Triacs[a]	24 Vac ±20% 22 to 30 Vdc	9.8	7.7	9.7	7.7	0.30	3.3
MS51-7203	Proportional 2-10 Vdc or 4-20 Vdc[b]		9.8	7.4	9.7	7.4	0.28	2.9

[a] 500 mA rated.
[b] 4-20 mAdc control signal requires the addition of a 500 Ω resistor.

Connections

Connecting wiring: Appliance cable, 3 ft. (91 cm) long.

Conduit connectors: Enclosure accepts 1/2" (13 mm) conduit connectors. For M20 metric connector, use AM-756 adaptor.

Motor Type

Brushless DC.

Outputs

Electrical

Position feedback voltage (MS51-7203): 2-10 Vdc (max. 0.5 mA) output signal for position feedback or to operate up to four additional slave actuators.

Mechanical

Output force rating: 220 lbf (979 N).

Linear stroke: 1/2" (13 mm) nominal.

Timing @ 70 °F (21 °C): Approximately 100 seconds powered; 35 seconds spring return. Measured with no load applied to actuator.

Manual override: Allows valve positioning and preload adjustment, using manual crank.

Right/left switch (MS51-7203): Permits reverse acting or direct acting linear motion.

Environment

Temperature Limits

Shipping and storage: -40 to 160 °F (-40 to 71 °C) ambient.

Operating: 0 °F (-18 °C) to maximum ambient shown in table below.

Temperature restrictions

Part Number		Max. Allowable Ambient @ Max. Fluid Temperatures
Actuator	Valve Assembly	
MX51-720X	VX-721X-59X-4-P, VX-722X-59X-4-P	140 °F (60 °C) @ 281 °F (138 °C)
	VX-73XX-59X-4-P	120 °F (49 °C) @ 300 °F (149 °C)
	VX-725X-59X-4-P, VX-726X-59X-4-P	100 °F (38 °C) @ 340 °F (171 °C)
	VX-727X-59X-4-P, VX-728X-59X-4-P	90 °F (32 °C) @ 366 °F (186 °C)

Humidity

15 to 95% RH, non-condensing.

Locations

NEMA 2, UL Type 2 (IEC IP54) with customer-supplied watertight conduit connectors.

Agency Listings (Actuator)

UL	UL-873, Underwriters Laboratories (File #E9429 Category Temperature-indicating and Regulating Equipment).
cUL	UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24-93.
European Community	EMC Directive (89/336/EEC). Low Voltage DIrective (72/23/EEC).
Australia	This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

Dimensions — 1/2" to 2" Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)							
		2-Way (Refer to Figure-13)				3-Way (Refer to Figure-14)			
		A	C	E	J	A	C	E	J
NPT/Metric Thread **2-Way (N.C.)** **VX-722X-59X-4-P** **VX-725X-59X-4-P** **VX-726X-59X-4-P** **VX-727X-59X-4-P** **VX-728X-59X-4-P** **3-Way** **VX-73XX-59X-4-P**	1-1/4	4-5/8 (117)	1-3/4 (44)	8-3/8 (213)	11-11/16 (297)	4-5/8 (117)	1-3/4 (44)	8-3/8 (213)	11-11/16 (297)
	1-1/2	5-3/8 (137)	1-13/16 (46)	8-1/2 (216)	12-1/16 (306)	5-3/8 (137)	1-13/16 (46)	8-1/2 (216)	12-1/16 (306)
	2	6-1/8 (156)	2-1/4 (57)	9-3/16 (233)	12-7/16 (316)	6-1/8 (156)	2-1/4 (57)	9-3/16 (233)	12-7/16 (316)
NPT/Metric Thread **2-Way (N.O.)** **VX-721X-59X-4-P**	1-1/4	4-5/8 (117)	1-3/8 (35)	8-3/4 (222)	11-11/16 (297)	—			
	1-1/2	5-3/8 (137)	1-1/2 (38)	8-13/16 (224)	12-1/16 (306)				
	2	6-1/8 (156)	1-9/16 (40)	9-1/16 (230)	12-7/16 (316)				

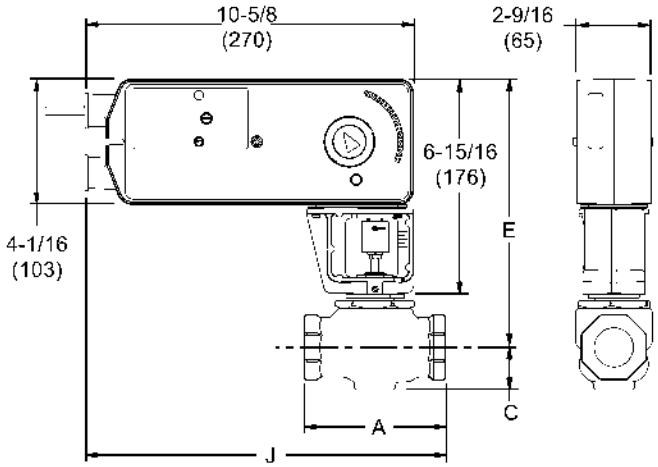


Figure-13 MX51-720X with 1/2" to 2" 2-Way Globe Valve.

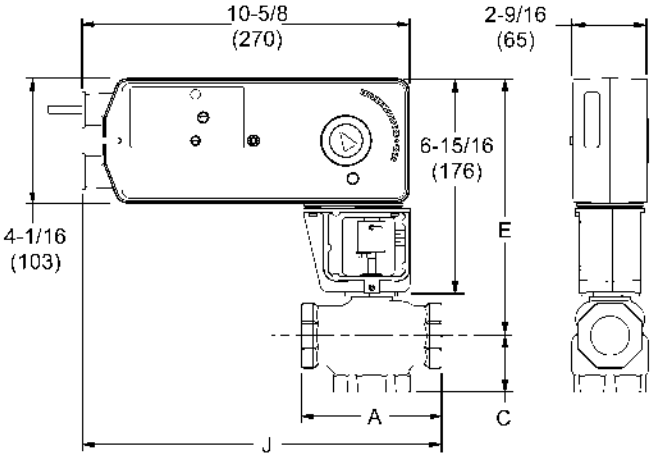


Figure-14 MX51-720X with 1/2" to 2" 3-Way Globe Valve.

Valve Assemblies with MA61-720X, MF61-7203, and MS61-7203
1" (25 mm) Nominal Stroke 220 lbf (979 N) Linear Series DuraDrive Actuators

Actuator Specifications

Inputs

Control Signal and Power Requirements

All 24 Vac circuits are Class 2. All circuits 30 Vac and above are Class 1

Part Number	Control Signal	Power Input						
		Voltage	Running				DC Amps	Holding
			50 Hz		60 Hz			50/60 Hz
			VA	W	VA	W		W
MA61-7200	Two-position SPST or Triacs	120 Vac ±10% 50/60 Hz	11.7	8.8	10.0	8.4	—	3.6/5.0
MA61-7201		230 Vac ±10% 50/60 Hz	15.5	9.5	10.6	8.5	—	4.6/3.3
MA61-7203		24 Vac ±20% 22 to 30 Vdc	9.8	7.5	9.7	7.5	0.29	2.8
MF61-7203	Floating Point SPDT or Triacs[a]	24 Vac ±20% 22 to 30 Vdc	9.8	7.7	9.7	7.7	0.30	3.3
MS61-7203	Proportional 2-10 Vdc or 4-20 Vdc[b]		9.8	7.4	9.7	7.4	0.28	2.9

[a] 500 mA rated.
[b] 4-20 mAdc control signal requires the addition of a 500 Ω resistor.

Connections

Connecting wiring: Appliance cable, 3 ft. (91 cm) long.

Conduit connectors: Enclosure accepts 1/2" (13 mm) conduit connectors. For M20 metric connector, use AM-756 adaptor.

Motor Type

Brushless DC.

Outputs

Electrical

Position feedback voltage (MS61-7203): 2-10 Vdc (max. 0.5 mA) output signal for position feedback or to operate up to four additional slave actuators.

Mechanical

Output force rating: 220 lbf (979 N) minimum; 495 lbf (2202 N) maximum stall.

Linear stroke: 1" (25 mm) nominal.

Timing @ 70 °F (21 °C): Approximately 190 seconds powered; 40 seconds spring return. Measured with no load applied to actuator.

Manual override: Allows valve positioning and preload adjustment, using manual crank.

Right/left switch (MS61-7203): Permits reverse acting or direct acting linear motion.

Environment

Temperature Limits

Shipping and storage: -40 to 160 °F (-40 to 71 °C) ambient.

Operating: 0 °F (-18 °C) to maximum ambient shown in table below.

Temperature restrictions

Part Number		Max. Allowable Ambient @ Max. Fluid Temperatures
Actuator	Valve Assembly	
MX61-720X	VX-9XXX-59X-4-P VX-9XXX-59X-5-P	140 °F (60 °C) @ 300 °F (149 °C)

Humidity

15 to 95% RH, non-condensing.

Locations

NEMA 2, UL Type 2 (IEC IP54) with customer-supplied watertight conduit connectors.

Agency Listings (Actuator)

UL	UL-873, Underwriters Laboratories (File #E9429 Category Temperature-indicating and Regulating Equipment).
cUL	UL Listed for use in Canada by Underwriters Laboratories. Canadian Standards C22.2 No. 24-93.
European Community	EMC Directive (89/336/EEC). Low Voltage DIrective (72/23/EEC).
Australia	This product meets requirements to bear the C-Tick Mark according to the terms specified by the Communications Authority under the Radiocommunications Act 1992.

Dimensions — 2-1/2" and 3" Screwed Globe Valve Assemblies

Valve Assembly Part Number		Valve Size in.	Valve Dimensions in inches (millimetres)							
			2-Way (Refer to Figure-15)				3-Way (Refer to Figure-16)			
			A	C	E	J	A	C	E	J
NPT/Metric Thread										
2-Way (N.O.) VX-9213-59X-4-P VX-9215-59X-4-P 2-Way (N.C.) VX-9223-59X-4-P VX-9225-59X-4-P	3-Way VX-9313-59X-4-P VX-9315-59X-4-P	2-1/2	8-1/2 (216)	3-13/16 (97)	13-15/16 (354)	13-9/16 (344)	8-1/2 (216)	4-5/8 (117)	13-15/16 (354)	13-9/16 (344)
		3	9-1/2 (241)	4-1/4 (108)	14-1/4 (362)	13-5/8 (346)	9-1/2 (241)	5 (127)	14-1/4 (362)	13-5/8 (348)

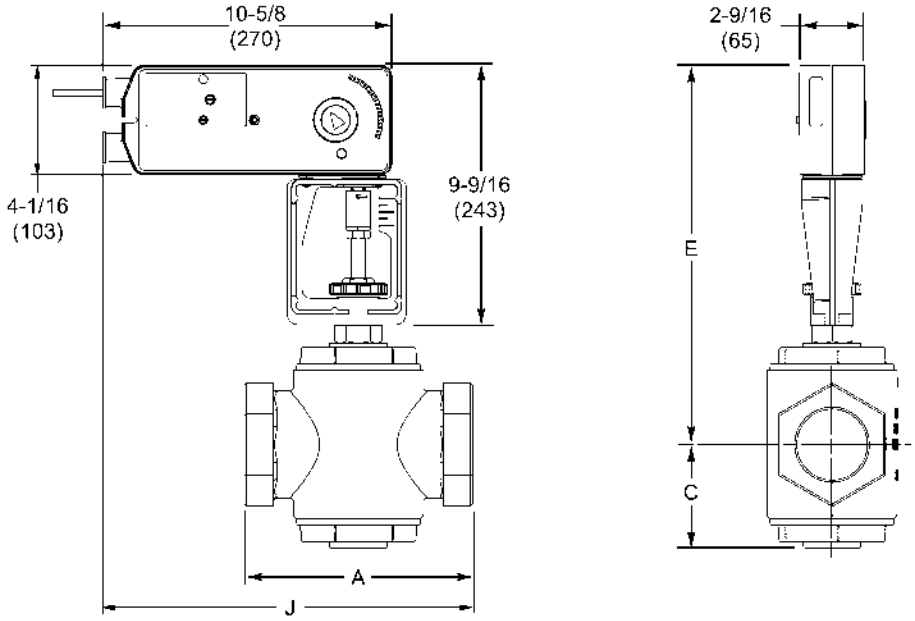


Figure-15 MX61-720X with 2-1/2" or 3" 2-Way Screwed Globe Valve.

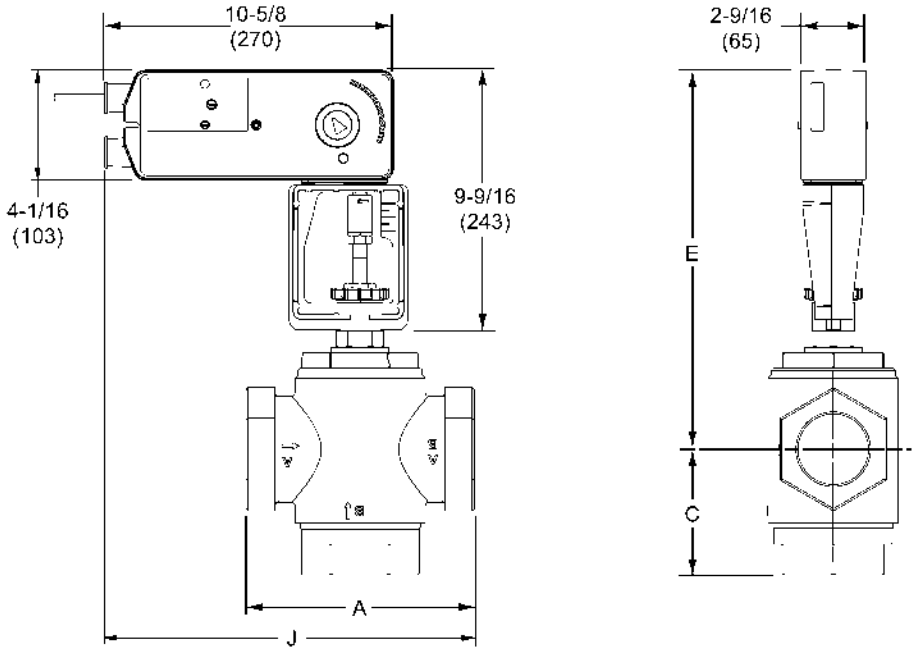


Figure-16 MX61-720X with 2-1/2" or 3" 3-Way Screwed Globe Valve.

Dimensions — 2-1/2" to 4" Flanged Globe Valve Assemblies

Valve Assembly Part Number	Valve Size in.	Valve Dimensions in inches (millimetres)											
		2-Way (Refer to Figure-17)						3-Way (Refer to Figure-19)					
		A	C	E	F	G	J	A	C	E	F	G	J
ASA Flanged 2-Way (N.O.) VX-9213-59X-5-P 3-Way VX-9313-59X-5-P	2-1/2	8-1/2 (216)	3-1/2 (89)	13 (330)	7 (178)	5-1/2 (140)	13-5/8 (346)	8-1/2 (216)	5-3/8 (137)	13-3/4 (349)	7 (178)	5-1/2 (140)	13-5/8 (346)
	3	9-1/2 (241)	3-3/4 (95)	14-1/2 (368)	7-1/2 (191)	6 (152)	14-1/8 (359)	9-1/2 (241)	6-3/8 (162)	14 (356)	7-1/2 (191)	6 (152)	14-1/8 (359)
	4	11-1/2 (292)	4-1/2 (114)	15-3/8 (391)	9 (229)	7-1/2 (191)	15-1/8 (384)	11-1/2 (292)	8-1/2 (216)	14-3/4 (375)	9 (229)	7-1/2 (191)	15-1/8 (384)
ASA Flanged 2-Way (N.C.) VX-9223-59X-5-P	2-1/2	8-1/2 (216)	4 (107)	12-3/8 (314)	7 (178)	5-1/2 (140)	13-5/8 (346)	—					
	3	9-1/2 (241)	5 (127)	12-5/8 (320)	7-1/2 (191)	6 (152)	14-1/8 (359)						
	4	11-1/2 (292)	7-1/8 (181)	13-3/8 (340)	9 (229)	7-1/2 (191)	15-1/8 (384)						

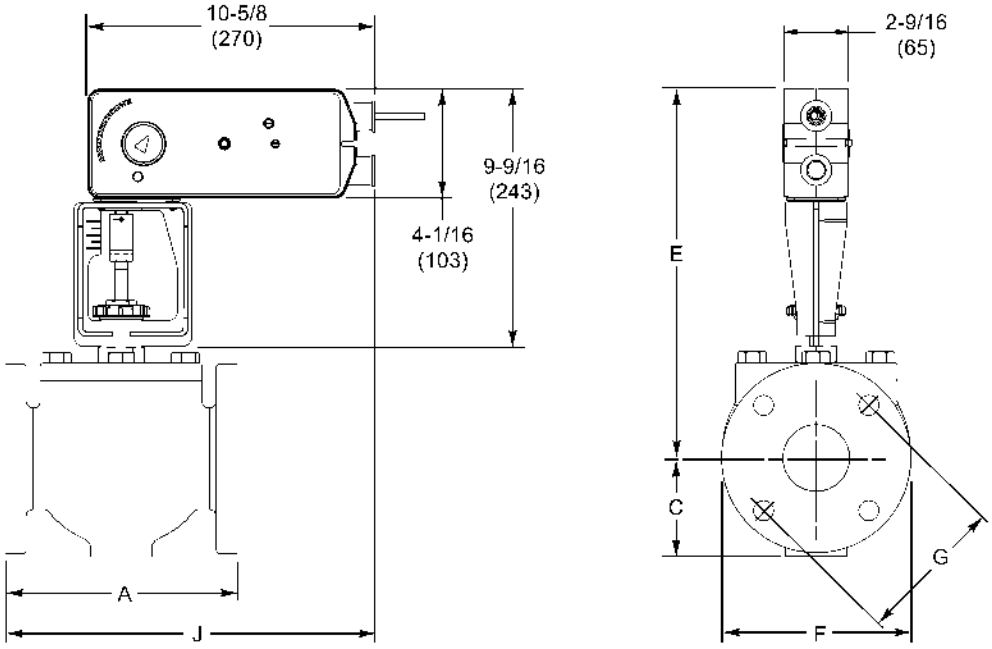


Figure-17 MX61-720X with 2-1/2" to 4" N.O. 2-Way Flanged Globe Valve.

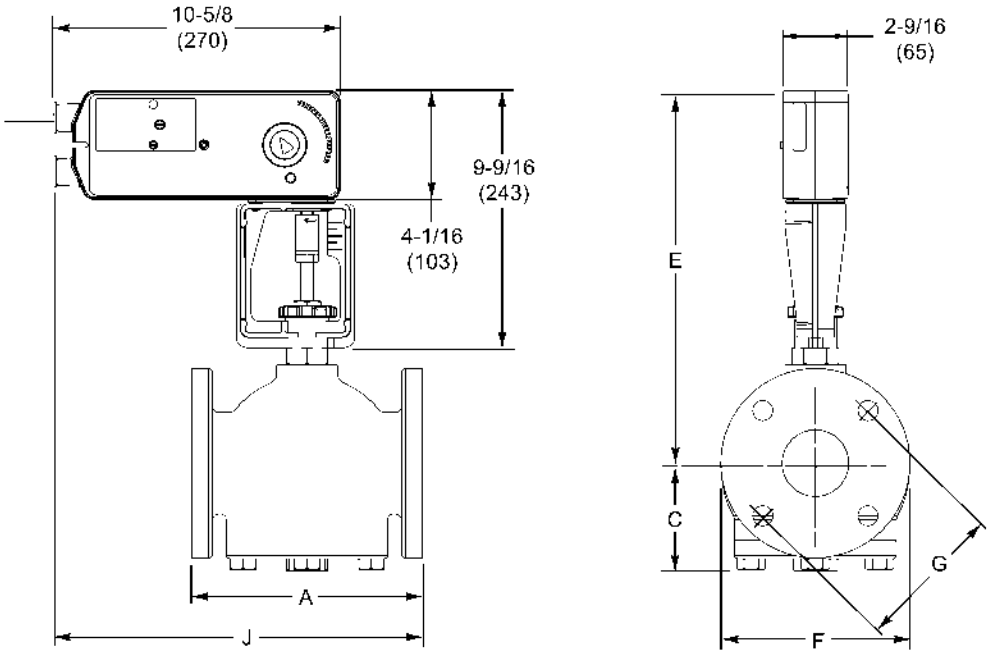


Figure-18 MX61-720X with 2-1/2" to 4" N.C. 2-Way Flanged Globe Valve.

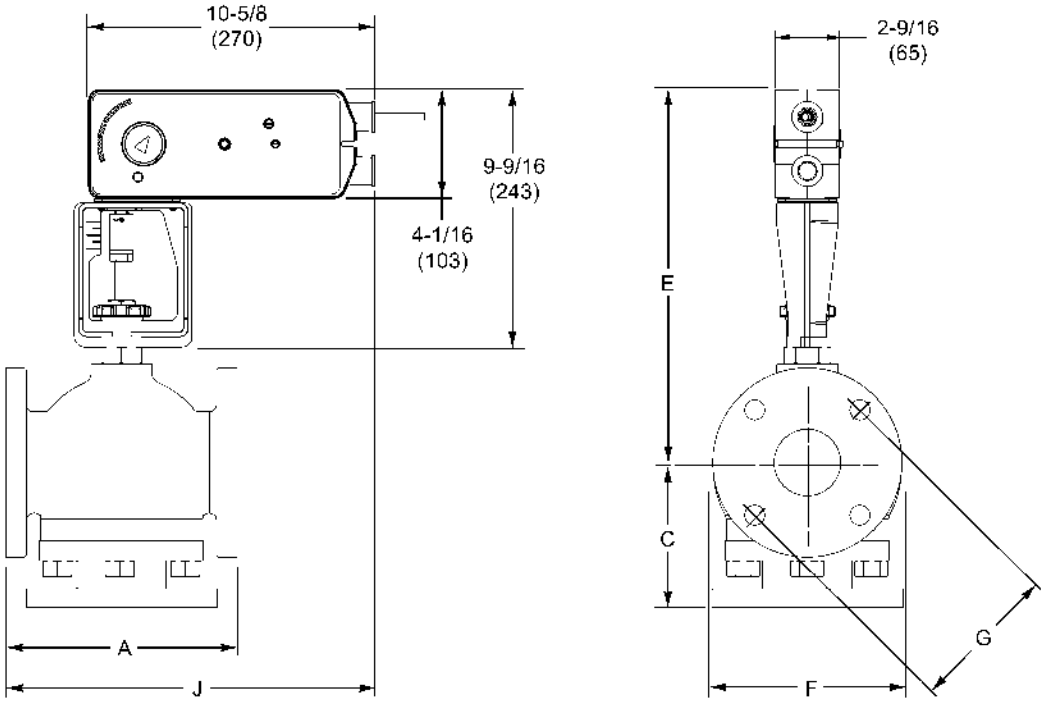


Figure-19 MX61-720X with 2-1/2" to 4" 3-Way Flanged Globe Valve.